SUMMIT ENGINEERING, INC.
CIVIL ENGINEERING

HAROLD SEWER PROJECT PHASE III (SX2107005)

Floyd County, Kentucky

Technical Specifications
November 2013

Owner:
Southern Water and Sewer District
245 KY Route 680
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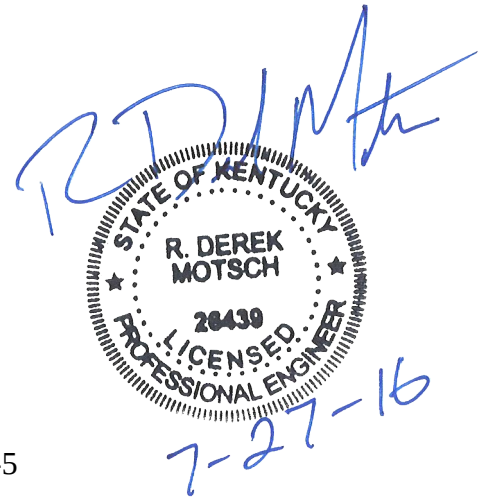
CIVIL ENGINEERING MINING ENGINEERING ENVIRONMENTAL ENGINEERING ARCHITECTURE SURVEYING

TECHNICAL SPECIFICATIONS



SECTION I

TECHNICAL SPECIFICATIONS

SPECIAL PROVISIONS

1.1 SCOPE

This specification sets forth OWNER'S special project requirements which are UNIQUE to this project. All requirements of this section shall be considered as integral parts of the successful completion of the Project. All items discussed herein are considered incidental to the overall accomplishment of the Project and no separate payment shall be made for these items.

1.2 START UP PERIOD, SUBSTANTIAL COMPLETION, COMPLETE AND READY FOR FINAL PAYMENT

1.2.1 Start Up Requirements – For Contract 2 to be deemed ready to commence the startup period, the Contractor shall have completed the following:

a) ALL sanitary sewer lines (includes all service lines) shall have been acceptance tested,

b) ALL grinder pump stations shall have been installed, shall have been successfully acceptance tested, and shall be ready to be energized.

c) Copies of official startup reports for each grinder pump shall have been submitted to the Engineer and,

d) The Owner's Operators shall have been successfully trained in the operation of the collection system and its components,

1.2.3 Start Up Period - The start up period commences after the startup requirements have been met. During the start up period the Contractor will be required to:

a) Complete the final plumbing connection of ninety percent (90%) of the residential grinder pumping stations and put stations into service,

b) Continue work on remaining project items to be completed to reach substantial/final completion.

c) Be responsible for ALL power, fuel, chemicals, and other consumables.

d) Be responsible for compliance testing as needed to comply with these specifications.

1.2.4 Substantial Completion – Contract 1 will be deemed substantially complete when ninety percent (90%) of the residential grinder pumping units are fully connected and put into service, as well as all major lift stations have been started up and are complete and in service.

1.2.5 Complete and Ready for Final Payment – See general conditions Article 14 requirements.

1.3 EXISTING OPERATIONS / SEQUENCE OF WORK

1.3.1 The CONTRACTOR shall coordinate all work through the ENGINEER. The CONTRACTOR shall notify OWNER and ENGINEER at least fourteen calendar days in advance of any shutdown of any wastewater process necessary to perform the work required by the Contract. In no event, shall the CONTRACTOR cause a discharge of raw wastewater into the waters of the Commonwealth.

1.3.2 The CONTRACTOR shall notify the OWNER and ENGINEER at least 10 calendar days prior to any construction activity at the site.

1.4 WORKING HOURS

Paragraph 6.3 of the General Conditions is supplemented as follows:

1.4.1 Regular working hours are defined as up to 8 hours per day, Monday through Friday, beginning no earlier than 7:00 a.m. and ending no later than 7:00 p.m., excluding holidays. Whenever the CONTRACTOR is performing any part of the work, with the exception of equipment maintenance and clean-up, OWNER'S representation and/or inspection will be required.

1.4.2 Requests to work other than regular working hours must be submitted to the OWNER'S designated representative, at least 48 hours prior to any proposed weekend work or scheduled extended work weeks, to give the OWNER ample time to arrange for representation and/or inspection during those periods. Periodic unscheduled overtime on weekdays will be permitted provided that two hours notice is provided to OWNER'S designated representative. Maintenance and clean-up may be performed during hours other than regular working hours.

1.4.3 The OWNER incurs additional expense when the CONTRACTOR exceeds regular working hours. Consequently, CONTRACTOR shall reimburse the OWNER for additional engineering and/or inspection costs incurred as a result of overtime work and in excess of the regular working hours stipulated herein. These costs shall be a line item deduction from the CONTRACTOR'S monthly payment request. Overtime costs for OWNER'S personnel shall be based on the individual's current overtime wage rate. Overtime costs for personnel employed by the ENGINEER shall be calculated in accordance with the terms of the ENGINEER'S contract with the OWNER.

1.4.4 Contractor shall perform work in compliance with OSHA (P.L. 91-596) and the Contract Work Hours and Safety Standards Act (P.L. 91-54).

1.5 CONFLICTING ELEMENTS

In the event of a conflict between the elements of the Contract Documents, the MORE STRINGENT REQUIREMENT ON THE CONTRACTOR SHALL GOVERN.

1.6 FISH AND WILDLIFE

The Contractor shall not remove trees larger than 5-inches in diameter at breast height between the dates, March 31 and October 15.

The Contractor is required to comply with all Indiana Bat Conservation Requirements as set forth by the United States Department of the Interior, Fish and Wildlife Service. It is the Contractor's responsibility to obtain any and all permits or surveys pertaining to the Indiana Bat and bear all costs associate therewith.

-- THE END --

SECTION II

TECHNICAL SPECIFICATIONS

GENERAL PROVISIONS

2.1 SCOPE

This section of the technical specifications is prepared to establish general requirements applicable to the entire Contract. All items discussed herein are considered incidental to the overall accomplishment of the Contract and no separate payment shall be made for these items.

2.2 IDENTIFICATION OF PARTIES

OWNER - Southern Water and Sewer District
The OWNER owns and is responsible for the completed wastewater facilities.

ENGINEER - Registered professional engineer designated by OWNER to provide design, construction inspection, and certification services.

CONTRACTOR- The entity(s) responsible under contract to OWNER to furnish labor, equipment, etc. to complete the work specified herein.

2.3 RECORD DRAWINGS

The CONTRACTOR shall furnish field marked up record drawings in accordance with the requirements of the 'Submittals' section of these specifications.

2.4 EXISTING UTILITIES AND UNDERGROUND FACILITIES

Attention is called to the presence of existing utilities and underground facilities. The CONTRACTOR is solely responsible to accurately locate, and avoid damage to, all existing utilities and underground facilities. See “Existing Utilities” Section herein.

2.5 SCHEDULES

2.5.1 Progress and Payment Schedules. Within 10 calendar days of Notice of Award, prepare and submit to the ENGINEER a proposed construction progress schedule. The schedule shall be in the form of a bar chart addressing the major project activities. The bar chart shall provide for a comparison of the proposed schedule to actual completion.

2.5.2 Submittal Schedules. Within 10 calendar days of Notice of Award, prepare and submit to the ENGINEER a proposed submittal schedule (See Standard General Conditions).

2.5.3 Schedule Updates. All project schedules shall be updated for each CONTRACTOR pay request.

2.5.4 WARNING: NO CONTRACTOR PAYMENTS SHALL BE APPROVED BY THE ENGINEER UNTIL ACCEPTABLE PROJECT SCHEDULES HAVE BEEN PROVIDED BY THE CONTRACTOR. CONTRACTOR PAY REQUEST APPLICATIONS WILL BE IMMEDIATELY RETURNED IF THEY ARE NOT ACCOMPANIED BY THE REQUIRED SCHEDULE UPDATES.

2.6 STAKING AND MARKING

The ENGINEER will be responsible for providing the survey reference monuments and benchmarks. Construction stakeout and "as built" surveys shall be the responsibility of the CONTRACTOR.

2.7 CONSTRUCTION PHOTOGRAPHS

2.7.1 The term "photograph" as used herein refers to a photographic view, including similar exposures taken to assure the usefulness of the photographic record. All photographs shall be taken in color, not black and white.

2.7.2 The CONTRACTOR shall digitally photograph the project limits prior to construction. The same views shall be re-photographed upon completion of all construction activities. In lieu of photography, CONTRACTOR may opt to video the project limits. The CONTRACTOR shall furnish the ENGINEER two copies of this video cassette for a completeness review. NO WORK CAN BE PERFORMED UNTIL THE ENGINEER HAS REVIEWED, AND ACCEPTED, THE PRE-CONSTRUCTION PHOTOGRAPHS AND/OR VIDEOS.

2.7.3 The CONTRACTOR shall have an average of 100 photographs per month made of the work during its progress and twenty (20) photographs of the completed facilities, in addition to those required above in paragraph 2.7.2.

2.7.4 All photographic work shall be done by a qualified, established photographer acceptable to the ENGINEER. A CD containing all construction photographs shall be provided to both the OWNER and ENGINEER upon project completion.

2.7.5 The photographer shall release all copyrights, or other restrictions, on the use of the photographic prints and/or film negatives and/or digital copies.

2.7.6 Each photograph shall have an identification label which provides:

1. Contractor's name
2. Short Description of View
3. Photo No. and Date Taken
4. Photographer's Firm Name

2.8 TESTING

The cost of all testing shall be borne by the CONTRACTOR unless directed otherwise. CONTRACTOR will not be paid for work performed each period until all necessary testing results have been provided to the ENGINEER in hard copy form.

2.9 INSTALLATION REQUIREMENTS

Manufactured articles, materials and equipment shall be applied, installed, connected, erected, used, cleaned, and conditioned as suggested by the respective manufacturers, unless otherwise specified herein.

2.10 PROOF OF COMPLIANCE

See Quality Control - Section IV

2.11 MAINTAINING DRAINAGE

At no time shall the flow of any existing streams or gullies be blocked. Ditches or culverts which become inoperable during the work effort shall be promptly cleaned out.

2.12 DUST AND LITTER CONTROL

All access roads, excavations, embankments, waste areas, etc. within the project boundaries shall be maintained free of dust and litter which could cause a nuisance to others. Dust control shall be performed as the work proceeds and whenever a dust nuisance occurs. From time to time, as the need arises, the construction area shall be policed to collect all scattered litter and debris.

2.13 CLEAN UP

After all construction work is complete, and prior to final inspection, all disturbed areas shall be cleaned and left in a sightly condition. All unused material shall be removed and disposed of properly.

2.14 REPAIR OF DAMAGE

Any damage done to structures, fills, roadways, or other areas shall be repaired at the CONTRACTOR'S expense before final payment is made.

Reasonable care shall be taken during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees which receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks receiving damage from equipment shall be treated with a tree dressing. All repairs or replacements of vegetation will be at the Contractor’s expense before final payment is made.

2.15 PROJECT LIMITS

The CONTRACTOR shall be responsible for satisfying himself as to the construction limits for the project. The CONTRACTOR shall not establish work, storage, or staging areas outside the project limits, unless otherwise directed or approved by the ENGINEER.

2.16 BURNING

There shall be no burning on this Project.

2.17 MATERIALS SUITABLY STORED

Request for payment for stored materials MUST be prepared in compliance with Paragraph 14.02 A.1 of the General Conditions.

2.18 EXPLANATION OF MEASUREMENT AND PAYMENT TERMINOLOGY

The various items of work will be measured and paid for as "Lump Sum," "Each," or by "Unit Prices" as established in these specifications. These methods of payment are defined as follows:

a) Lump Sum: When this term is used as an item of payment, it shall be inferred that the complete structure, structural unit or element of work is specified as the unit measurement. As such, it will be construed to include all necessary materials and accessories required for installation. No final measurements will be made.

b) Each: The definition for Lump Sum applies to the term "each" except more than one may be included in the Project and the actual number installed will be the final measurement.

c) Unit Price Quantities: When unit price quantities for a specific portion of the project are designated in the Contract Documents as the pay quantity, actual quantities for such specified portion serve as the basis for payment. Actual quantities shall be determined by the differences in measurements taken before and after construction.

d) Plan Quantities: When the specifications indicate that ‘Plan Quantities’ are the basis of payment, the design quantities enumerated on the bid schedule shall be the final pay quantity unless the related dimensions in the Drawings are revised by the Engineer.

-- THE END --

SECTION III

TECHNICAL SPECIFICATIONS

SUBMITTALS

3.1 SCOPE

This specification sets forth the procedure to be employed in submitting and processing all CONTRACTOR submittals.

3.2 SHOP DRAWINGS

3.2.1 The CONTRACTOR shall submit for the review of the ENGINEER Shop Drawings for all fabricated work and for all manufactured items required to be furnished in the Contract in accordance with the General Conditions and as specified herein. Shop Drawings shall be submitted in sufficient time to allow at least twenty-one (21) calendar days after receipt of the Shop Drawings from the CONTRACTOR for checking and processing by the ENGINEER.

3.2.2 ENGINEER's review of the CONTRACTOR's drawings shall be considered as a gratuitous service, given as assistance to the CONTRACTOR in interpreting the requirements of the Contract, and in no way shall it relieve the CONTRACTOR of any of his responsibilities under the Contract. Any fabrication, erection, setting or other Work done in advance of the receipt of Shop Drawings returned by the ENGINEER and noted as "Approved" or "Approved as Noted" shall be entirely at the CONTRACTOR's risk. The ENGINEER's review will be confined to general arrangement and compliance with the design concept and Specifications only, and will not be for the purpose of checking dimensions, weights, clearances, fitting, tolerances, interferences, coordination of trades, etc.

3.2.3 Unless otherwise stated elsewhere in the Contract Drawings, a total of six (6) copies of all reviewed Shop Drawings shall be furnished to the ENGINEER for his use in accordance with the following sequence of operations:

A) Initially six copies and one (1) reproducible copy shall be submitted to the Engineer for review. The ENGINEER will return one (1) copy and the reproducible copy to the CONTRACTOR after review.

B) When Shop Drawings are returned for correction, they shall be immediately corrected and resubmitted for review as described above, and such procedures will not be considered as grounds for delay in completing the Work.

C) Shop Drawings submitted by subcontractors shall be sent directly to the CONTRACTOR for preliminary checking. The CONTRACTOR shall be responsible for their submission to the ENGINEER at the proper time so as to prevent delays in delivery of materials.

D) The CONTRACTOR shall thoroughly check all subcontractors Shop Drawings as regards to measurements, sizes of members, materials and details to satisfy himself that they conform to the intent of the Specifications. Drawings found to be inaccurate or otherwise in error shall be returned to the subcontractors by the CONTRACTOR for correction before submitting them to the ENGINEER. Before submission, the CONTRACTOR shall mark (stamp) the drawings as being checked and approved by him, dated and signed. The CONTRACTOR's approval (stamp) shall constitute a representation that all quantities, dimensions, field construction criteria, materials, catalog numbers, performance criteria and similar data have been verified and that, in his opinion, the submittal fully meets the requirements of the Contract Documents and the scope of work involved. Shop Drawings that are not stamped will not be reviewed.

E) All details on Shop Drawings submitted for review shall clearly show the relation of the various parts and where the Work depends upon field measurements, such measurements shall be obtained by the CONTRACTOR and noted on the Shop Drawings before being submitted to the ENGINEER for review.

F) All submissions shall be properly referenced to indicate clearly the specification section, location, service and function of each particular item. All submissions for one item or group of related items shall be complete. The ENGINEER reserves the right to reject manufacturer's publications in the form of catalogues, pamphlets, or other data sheets when they are submitted in lieu of prepared Shop Drawings. Such submissions shall specifically indicate the item for which approval is requested. Identification of items shall be made in ink, and submissions showing only general information are not acceptable.

G) If the Shop Drawings contain any departures from the Contract requirements, specific mention thereof shall be made in the CONTRACTOR's letter of transmittal. Where such departures require revisions to layouts or structural changes to the Work, the CONTRACTOR shall, at his own expense, prepare and submit for approval revised layout and structural drawings. Such drawings shall be of the size approved by the ENGINEER.

H) All shop drawings shall be in English.

3.2.4 The ENGINEER will review the first and second shop drawing submittals at no cost to the CONTRACTOR. Review of the third submittal and any subsequent submittal will be at the CONTRACTOR's expense. Payment will be deducted from the Contract amount at a rate of 3 times direct labor cost plus expense.

3.3 RECORD DRAWINGS

3.3.1 The Record Drawings shall consist of the Contract Drawings (updated to 'As Built' conditions) and the approved Shop Drawings in reproducible form and shall be submitted to the ENGINEER at any time upon request during construction, but no later than the Final Inspection.

3.3.2 Contract Drawings shall be legibly marked to record actual construction including:

A) All deviations in location or elevation of any underground installation from that shown on the Contract Drawings.

B) Any significant changes in above ground installation from approved Shop Drawings or Contract Drawings.

C) No such deviations from the Contract Drawings or approved Shop Drawings shall be made without approval by the ENGINEER.

3.3.3 Specifications and addenda shall be legibly marked up to record:

A) Manufacturer, trade name, catalog number, and Supplier of each product and item of equipment actually installed.

B) Changes made by Change Order or Field Order.

C) Other matters not originally specified.

3.3.4 Shop Drawings shall be legibly annotated to record changes made after review.

3.3.5 Reproducible Record Drawings shall be submitted in accordance with the General Conditions, Supplementary Conditions, and General Requirements.

3.4 MEASUREMENT AND PAYMENT

Submittals shall be considered a part of CONTRACTOR'S Lump Sum Bid for "Mobilization/DeMobilization" and shall not be measured for separate payment.

-- THE END --

SECTION IV

TECHNICAL SPECIFICATIONS

QUALITY CONTROL

4.1 CODES, STANDARDS AND INDUSTRY SPECIFICATIONS

A) Material or operations specified by reference to published specifications of a manufacturer, testing agency, society, association or other published standards shall comply with requirements in latest revisions thereof and amendments or supplements thereto in effect on date of Advertisement for Bidders.

B) Discrepancies between referenced codes, standards, specifications and Contract Documents shall be governed by the latter unless written interpretation is obtained from ENGINEER.

C) Material or work specified by reference to conform to a standard, code, law, or regulation shall be governed by Contract Document when they exceed requirements of such references; referenced standards shall govern when they exceed Contract Documents.

D) Proof of Compliance:

Whenever Contract Documents require that a product be in accordance with Federal Specification, ASTM designation, ANSI specification, or other association standard, at ENGINEER'S request, CONTRACTOR shall present an affidavit from manufacturer certifying that product complies therewith. Where requested or specified, submit supporting test data to substantiate.

4.2 MANUFACTURER'S DIRECTIONS

Utilize manufactured articles, materials and equipment as directed by manufacturers unless herein specified to contrary. Discrepancy between an installation required by Contract Documents and manufacturer's instructions and recommendations shall be resolved by ENGINEER before work may proceed. In all cases, the more stringent requirements shall govern.

4.3 TESTING

A) All testing (when required) will be in accordance with the pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.

B) The OWNER will select the testing laboratories.

C) The CONTRACTOR will bear the cost of all testing unless directed otherwise.

-- THE END --

SECTION V

TECHNICAL SPECIFICATIONS

TEMPORARY FACILITIES

5.1 TEMPORARY OFFICE

5.1.1. Any CONTRACTOR whose combined aggregate value of contract work for the project exceeds $500,000 shall furnish and maintain a field office on site. The office shall be established at a location approved by the ENGINEER. AN AUTHORIZED REPRESENTATIVE OF THE CONTRACTOR SHALL BE IN THE FIELD OFFICE AT ALL TIMES WHILE WORK IS IN PROGRESS. Any CONTRACTOR whose combined aggregate value of work for the project is less that $500,000 is not required to furnish a field office on site. AN AUTHORIZED REPRESENTATIVE OF THE CONTRACTOR SHALL BE AT THE JOB SITE AT ALL TIMES WHILE WORK IS IN PROGRESS, HOWEVER.

5. 1.2. The CONTRACTOR shall provide for the duration of the project at least 400 sq. ft. of floor space in his building (and/or trailer) for the exclusive use of the ENGINEER throughout the period of construction. It shall be weathertight, have a tight floor at least 8-inches off the ground and shall be insulated all around with rigid insulation board not less than 1/2 inch thick, and suitably ventilated. The office shall have at least three screened windows capable of being opened, a screen door and a solid door provided with cylinder lock and three keys. The CONTRACTOR shall furnish and equip the ENGINEER's field office complete within five days of Notice-to-Proceed.

5.1.3. The field office provided for the ENGINEER shall be furnished by the CONTRACTOR as follows:

1. One plan table, 3 ft. x 5 ft. and one stool
2. Three additional chairs
3. Four-drawer, filing cabinet with lock
4. Air conditioner (12,000 BTU)
5. Waste paper basket

5.1.4. The CONTRACTOR shall supply all fuel for heating and pay all electrical bills. A watt-hour meter shall be installed for determination of electric consumption and appropriate charges for that consumption.

5.1.5. The CONTRACTOR shall furnish the ENGINEER's field office access to a telephone. With the exception of charges for long distance and toll calls, the CONTRACTOR shall pay all bills charged against the office telephone by the ENGINEER, including installation charge and all monthly charges throughout the construction period.

5.2 MATERIAL STORAGE

All CONTRACTORS must make arrangements for his/her staging areas and areas of material storage.

5.3 SANITARY FACILITIES

ALL CONTRACTORS shall provide and maintain all necessary sanitary facilities at the site, in accordance with all applicable regulations, and shall properly remove same at completion of the project.

5.4 UTILITIES

The obtaining of all utilities which may be required for the construction shall be the responsibility of each CONTRACTOR.

5.5 PROJECT SIGN

The CONTRACTOR shall furnish and install a sign reasonably conforming to the sign shown in the General Conditions and conforming to the size and dimensions shown on Figure 1.

5.6 SAFETY

CONTRACTORS shall comply with all pertinent provisions of Kentucky Safety Standards of Division of Occupational Safety, Department of Labor, and Federal Occupational Safety and Health Construction Standards, that are in effect at time this Contract is entered into and during period in which Contract is to be performed.

5.7 MEASUREMENT AND PAYMENT

Provision of temporary facilities shall be considered a part of CONTRACTOR'S lump sum for mobilization and shall not be measured for separate payment.

Temporary Black & White Construction Sign for projects funded by the Department for Local Government (DLG)

Matthew G. Bevin
Governor

Sandra K. Dunahoo
Commissioner

Office of the Governor
Department for Local Government

Project Title
Centered, Black Letters

Project Sponsor: City or County Government

Sponsor Address:

Architect or Engineer:

Contractor:

Kentucky UNBRIDLED SPIRIT™

This project is funded by a Community Development Block Grant administered by the Department for Local Government and financed by the U.S. Department of Housing and Urban Development.

Equal Opportunity Employer

Sign Dimensions: 1200mm x 2400mm x 19 mm (app. 4' x 8' x ¾") Plywood Panel (APA Rated A-B grade – Exterior)

SECTION VI

TECHNICAL SPECIFICATIONS

MOBILIZATION/DEMOBILIZATION

6.1 SCOPE

This element of work shall consist of the mobilization of the CONTRACTOR'S forces and equipment necessary for performing the work required under the Contract.

It shall include the purchase of contract bonds (including KTC encroachment permit bond); video taping pre-construction conditions of the project area and submitting copies to the OWNER, transportation of personnel, equipment, and operating supplies to the site; establishment of offices, buildings, and other temporary facilities at the site; development of submittals and record drawings in accordance with Section III of these specifications; and other preparatory and incidental work.

This specification covers mobilization for work required by the Contract at the time of award. If additional mobilization costs are incurred during performance of the Contract as a result of changes or added items of adjustment in contract price, compensation for such costs will be included in the price adjustment for the items of work changed or added.

6.2 PAYMENT

THE CONTRACTOR'S LUMP SUM BID FOR MOBILIZATION/DEMOBILIZATION MAY NOT EXCEED THREE PERCENT (3%)OF THE TOTAL BASE BID FOR THIS CONTRACT. Payment of the total lump sum price for "Mobilization/ DeMobilization" will constitute full compensation for all labor, materials, equipment, and all other items necessary for and incidental to completion of the work. If the CONTRACTOR elects to demobilize and remobilize before completion of the work, no additional payment will be made.

Payment will not be made under this item for the purchase costs of materials having a residual value, the purchase costs of materials to be incorporated in the project, or the purchase costs of operating supplies.

Fifty percent (50%) of the "Mobilization/Demobilization" price may be invoiced when the following conditions have been met:

1) the CONTRACTOR has submitted two (2) copies of the pre-construction conditions video of the project area to the OWNER.

2) the field office and sanitary facilities are in-place;

3) the CONTRACTOR has furnished the bond for the Kentucky Department of Highways Encroachment Permit in the name of the OWNER.

4) the CONTRACTOR's project schedules (construction, payment, and submittals) have been approved by the ENGINEER;

5) the CONTRACTOR has furnished a plan for disposal of waste materials;

6) the Project Sign has been erected; and

7) all project silt control systems have been installed.

The remaining fifty percent of "Mobilization/DeMobilization may **not** be invoiced until the CONTRACTOR has submitted acceptable 'Record Drawings' (As-Built Plans and Shop Drawings) in accordance with the requirements of Section III of these specifications.

-- THE END --

SECTION VII

TECHNICAL SPECIFICATIONS

MAINTAIN & CONTROL TRAFFIC

7.1 SCOPE

The purpose of this section is to outline the requirements for maintenance and control of traffic during construction.

7.2 QUALITY CONTROL

The Contractor's traffic control activities shall conform to the AASHTO Manual of Uniform Traffic Control Devices, the Kentucky Department of Highways publication "Standard Drawings", and to the requirements of Section 107 of the current edition of the Kentucky Department of Highways publication "Standard Specifications for Road and Bridge Construction."

7.3 CLOSING OF STREETS

It is understood that the construction activities may require the closure of certain streets within the Project Limits. The Contractor shall erect Detour signs when an alternate route is available at the intersections to inform motorists of the closures. If no alternate is available then the CONTRACTOR shall abide by KYDOH standards in stoppage of traffic. Appropriate barricades shall be erected to prevent traffic from entering the Project Limits when necessary.

In the event that the Owner does not secure right of access to the entire Project Area, access shall be maintained at all times for residents and emergency vehicles.

The roads in the project area are highly trafficked. The CONTRACTOR shall provide two (2) flashing message signs to alert drivers of utility work ahead and that delays may be possible. One sign shall be erected on each end of the “active” work area and shall be relocated as work progresses.

7.4 MEASUREMENT AND PAYMENT

“Maintain and Control Traffic” shall be considered a necessary and integral part of the Work and shall not be measured for separate payment. “Maintain and Control Traffic” shall be incidental to “Mobilization/Demobilization”.

--- THE END ---

SECTION VIII

TECHNICAL SPECIFICATIONS

CONSTRUCTION STAKING

8.1 SCOPE

The CONTRACTOR shall furnish all necessary personnel and equipment to provide all customary construction surveys including, but not limited to, the following:

a) Establish right-of-way and construction easement limits.

b) Establish the project construction centerlines

c) Provide adequate reference points to permit prompt re-establishment of the construction centerline throughout the construction.

d) Grade staking

e) Structure staking

f) Establish final “as-built” plan and profile location of all completed facilities and depict same on record drawings.

The CONTRACTOR's staking (survey) party shall be under the general supervision of an ENGINEER registered in the State of Kentucky. IT SHALL BE UNDERSTOOD THAT SUPERVISION OF THE CONSTRUCTION STAKING PARTY IS SOLELY THE RESPONSIBILITY OF THE CONTRACTOR AND ANY ERRORS AND INACCURACIES RESULTING FROM THE OPERATIONS OF THE CONSTRUCTION STAKING PARTY SHALL BE CORRECTED AT **NO** COST TO THE OWNER.

8.2 SUBMITTALS

Upon completion of the project, the CONTRACTOR shall submit the following to the ENGINEER:

a) the field notes,

b) 'as built' plans on hard annotated on construction plan set to show deviations from design with distances from permanent landmarks/benchmarks, of no less scale than the design drawings depicting the “as built” plan and profile location of all constructed facilities.

8.3 MEASUREMENT AND PAYMENT

"Construction Staking" shall be considered a necessary and integral part of the Work and shall not be measured for separate payment. “Construction Staking” shall be incidental to “Mobilization /DeMobilization.”

-- THE END --

SECTION IX

TECHNICAL SPECIFICATIONS

SILT CONTROL STRUCTURES

9.1 SCOPE

This work shall consist of furnishing all materials, equipment, labor, and incidentals necessary for the installation, maintenance, and removal of silt control facilities as directed by the ENGINEER.

9.2 GENERAL

The exact locations, configuration, and dimensions of the various types of silt control shall be directed by the ENGINEER at the time of construction. These structures shall be installed prior to any surface disturbance on the area for which they are necessary to control silt.

The CONTRACTOR shall schedule construction activities so that the amount of exposed soil is minimized. This is to be accomplished by disturbing only those areas which are to be worked immediately and by revegetating each area as soon as practical.

9.3 MATERIALS

9.3.1 Silt Control Hay Bales: Silt Control Bales shall consist of either straw or hay bales. All bales are to be firmly bound by twine, and are to be installed using wooden stakes or steel bars.

9.3.2 Silt Fence: Silt Fence filter fabric shall be specifically designed for this purpose by the manufacturer and shall meet or exceed the following specifications:

Bursting Strength	(ASTM D751)	150 psi
Grab Strength	(ASTM D1682)	100 psi
Permeability		0.02 to 0.03 cm/sec

Silt fence posts shall be either timber stakes (2" x 2" min) or pressed steel stakes set plumb and to sufficient depth to provide a sound anchor for the supporting wire fence and/or filter fabric.

9.3.3 Gabion Wire: The wire incorporated in the lid and body of gabion units shall be constructed of galvanized steel. The mesh shall be constructed by double twisting the adjoining wire, i.e., both wires must be twisted in an interlocking, nonraveling fashion. All wire for corners, edges, selvedges, and binding in both types of units shall be heavily galvanized with a minimum zinc coating of 0.80 ounces per square foot of uncoated wire surface, as determined by tests conducted in accordance with ASTM A90. The tensile strength of the wire shall be at least 60,000 pounds per square inch, and the mesh must have sufficient elasticity to permit 10 percent elongation diameter of the individual wires. The following minimum wire diameters are required for non-PVC coated units only.

Type /Use of Wire	--Minimum Diameters-- Gabion
Mesh wire	0.118
Selvedge/corner wire	0.150
Lacing/connecting wire	0.0866

9.3.4 Gabion Rock Fill: The baskets shall be filled with clean, hard, durable limestone from a source approved by the ENGINEER. The stone shall be well-graded, with sizes ranging from a minimum of 5 inches to a maximum of 8 inches for gabion baskets, as measured in the greatest dimension; and shall otherwise comply with the requirements of these Technical Specifications.

9.3.5 Gabion Anchors: Steel anchors shall be standard deformed type bars conforming to ASTM A-615. The bars shall be manufactured from new billet steel of American manufacture, and shall have a minimum yield strength of 60,000 psi (Grade 60).

9.4 FABRICATION OF GABIONS

9.4.1 General: The gabion units shall be fabricated in such a manner that the base, sides, ends, and lids can be assembled at the construction site into a rectangular unit of the specified sizes. The body of the units shall be of single unit construction, the base, ends, sides, and lids formed of a single woven mesh unit.

All perimeter edges of the mesh forming the unit shall be securely selvedged so that the joints formed by tying the selvedges have at least the same strength as the body of the mesh.

Lacing wire shall be supplied in sufficient quantity to permit all sides, ends, and diaphragms of the body to be securely fastened, as well as to fasten the top to all sides, ends, and diaphragms of the body.

Dimensions for height, length, and width are subject to a tolerance limit of +3% of the manufacturer's stated sizes.

9.4.2 Gabions: The gabions shall be constructed with a hexagonal weave having an opening of approximately 3 1/4 inches by 4 1/2 inches. When the gabion length exceeds its width, it shall be supplied with diaphragms to form individual cells of equal length and width. The gabion unit shall be furnished with the necessary diaphragms secured in proper position on the base in such a manner that no additional tying at this juncture will be necessary. The diaphragms shall be of the same material composition as the gabion.

9.4.3 Certification: Each shipment of gabions to a job site shall be accompanied by a certification from the manufacturer, which states that the material conforms to the requirements of this Specification. The certification shall be on the manufacturer's letterhead and shall be signed by an officer of that company.

9.5 INSTALLATION

9.5.1 Silt Control Bales: The general locations and typical configurations of the type of silt control is subject to adjustments based on individual site conditions. Installation is labor intensive in order to assure stable and durable usage; additional hand labor may be required to provide adequate footing for the bales.

9.5.2 Silt Fences: Silt fences shall be supported with vertical wood posts which are protected by means of a metal cap or other device to prevent damage when hammers are used to drive the posts into the ground.

9.5.3 Gabions: The foundation shall be accurately prepared to accept the gabions. The foundation shall be inspected and approved by the ENGINEER prior to placement of the units.

Empty units shall be assembled individually on a hard, flat surface -- generally at the installation site. Care must be exercised to assure that each basket is stretched or manipulated as necessary to achieve the proper rectangular shape. Sides, ends, and diaphragms must be erected (and laced) to ensure the correct orientation of all seams and creases. Once assembled, empty units shall be set to the lines and grades directed by the ENGINEER.

All units shall be connected to the adjoining units, while empty, by lacing wire along the perimeters of their contact surfaces. Securing diaphragms, ends and sides, closure of units, and connecting adjoining units shall be accomplished by continuous stitching with alternating single and double loops at 4-inch intervals. All ends of lacing wire are to be securely fastened and not protruding.

Empty units are to be stretched, after being properly laced and connected to the adjoining unit(s), to obtain uniform alignment and to remove kinks. A standard fence stretcher, "come-along" or other means of tensioning the unit may be used. Adjacent rows of gabion units are to be placed such that the seams are offset.

The units shall be carefully filled with stone by hand and/or machine to maintain alignment; to avoid bulges, damage to coating, and/or separation of units; and to minimize voids. The maximum height from which stone may be dropped into gabion units shall not exceed 36 inches. In gabions over 2-foot high, the stone is to be placed in 12-inch lifts; adjusted by hand, if necessary, to form a reasonable smooth surface, and cross-ties (or bracing wires) installed. Cross-ties are to be looped through the mesh on opposing sides of the basket, and the wire tightened by twisting.

The ENGINEER may require the CONTRACTOR to use hand labor to selectively place the layers of stone along exposed surfaces (i.e., top, front, and ends) to provide a uniform surface and an overall appearance suitable to the site-specific situation at each installation. After each unit has been filled, the lid shall be leveled as necessary and secured to the sides, ends, and diaphragms using the previously described lacing (or stitching) technique.

9.6 MAINTENANCE

During the course of the project, silt control structures shall be maintained in sound condition and accumulations of silt which may threaten their effectiveness shall be removed. Silt removed from silt control structures shall be spread in the general vicinity of the individual structures, except when such practices may be a detriment to the environment and/or the project.

Upon completion of the project, the ENGINEER may direct the CONTRACTOR to remove, clean, or replace silt control structures and revegetate such disturbances in accordance with the seeding section of these Technical Specifications.

9.7 MEASUREMENT AND PAYMENT

Provision of all silt control structures shall be a part of CONTRACTOR'S Lump Sum bid for "Mobilization/DeMobilization" and shall not be measured for separate payment.

-- THE END --

SECTION X

TECHNICAL SPECIFICATIONS

EXISTING UTILITIES

10.1 SCOPE

It shall be the CONTRACTOR's sole responsibility to locate existing utilities, make appropriate arrangements regarding relocation of existing utilities, either temporary or permanent, maintain the utility service throughout the construction period, and have final relocations performed at the end of the construction period. The CONTRACTOR shall notify affected utility owners, record locations of utilities on record drawings, hire specialty contractors, etc. as necessary.

All utility relocation work shall be conducted with the full knowledge and written consent of the ENGINEER and the utility owners involved. The CONTRACTOR shall comply with all applicable Federal, State and Local utility ordinances.

The CONTRACTOR shall bear sole, and full, responsibility for loss of project time arising from poor relocation coordination and from claims of damage relating to disruption of utility service. **The OWNER will not extend the Contract time for delays resulting from utility relocations.**

The utility owners affected by this project are as follows:

(See cover page of plans for name and contact numbers.)

10.2 AGREEMENTS

In general, when relocation of a utility is required, the relocation must be performed by the Utility Company or licensed agent of the utility company. Contractor shall secure written relocation agreements with each utility documenting the scope of the relocation activities and the responsibilities of the Utility Company and the Contractor with respect to the work and payment therefore.

10.3 SPECIAL REQUIREMENTS

The relocation agreements are subject to special requirements. These include:

-- NONE --

10.4 MEASUREMENT AND PAYMENT

CONTRACTOR'S protection and relocation of existing utilities as described in this section shall be considered a part of CONTRACTOR's Lump Sum bid for "Mobilization/DeMobilization" and shall not be measured for separate payment.

-- THE END --

SECTION XI

TECHNICAL SPECIFICATIONS

REMOVAL AND DISPOSAL OF EXISTING SEPTIC TANKS

11.1. SCOPE

A. Occasionally underground septic tanks, piping, and appurtenances are unavoidably encountered by construction. This specification is intended to address the proper removal and disposal of these facilities. IT IS NOT THE PROJECT INTENT TO REMOVE EVERY SEPTIC TANK TAKEN OUT OF SERVICE BY THIS PROJECT!

B. Fill voids created as a result of removals of existing underground septic tanks unavoidably encountered by construction.

11.2. REGULATORY REQUIREMENTS

A. Conform to applicable local code for removal of structures, safety of adjacent structures, dust control, and runoff control.

B. Obtain required permits and licenses from appropriate authorities. Pay associated fees including disposal charges.

11.3. PREPARATION

A. Provide, erect, and maintain erosion control devices, temporary barriers and security devices.

B. Protect existing landscaping materials, appurtenances, and structures which are not to be removed or demolished. Repair damages caused by removal operations at no cost to Owner.

C. Prevent movement or settlement of adjacent structures. Provide bracing and shoring as needed.

D. Mark location of utilities. Protect and maintain in safe and operable condition, utilities that are to remain. Prevent interruption of existing utility service to occupied or used facilities, except when authorized in writing by authorities having jurisdiction. Provide temporary services during interruptions to existing utilities as acceptable to governing authorities and Owner.

11.4. TANK REMOVAL

A. Prior to removal of tank, all waste shall be removed by pumping and transported to the nearest wastewater treatment plant.

B. After removal of all waste from the tank, the tank shall be removed from the ground and disposed of in accordance with all local, state and federal regulations.

C. Following removal of the tank, the pit shall be backfilled in accordance with the technical specifications in order to bring the ground back to its original elevation.

D. A licensed plumber shall then connect the house lateral to the sanitary sewer in accordance with the technical specifications.

11.5. MEASUREMENT AND PAYMENT

A. Measurement and Payment: Removal of septic tanks encountered in the process of construction shall be paid as "Each" as set forth in the Bid Schedule.

THE END

SECTION XII

TECHNICAL SPECIFICATIONS

SANITARY SEWER FORCE MAINS

12.1 PURPOSE

The purpose of this section is to outline the requirements for the proper construction of sanitary sewer force mains. A force main is defined as any wastewater pipeline conveying wastewater under pressure.

12.2 GENERAL REQUIREMENTS

The sanitary sewer force mains shall be laid in reasonable conformance to the lines and grades shown on the Design Drawings. In no event shall any section of force main be constructed at an elevation higher than that specified for the air release valve. No reach of force main shall be laid on a 0% slope. A #8 copper trace wire shall be laid on top of all non-metallic force mains and siphons. **This includes ALL 1.25" sanitary sewer service lines.**

12.3 QUALITY CONTROL

Submit five copies of the following:

A) Documentation to substantiate pipe material's compliance with these specifications.

B) Documentation to substantiate that pipe bedding materials will conform to requirements of these specifications.

C) Documentation of pressure and leak testing.

12.4 PIPE MATERIALS

PIPE:

12.4.1 HIGH DENSITY POLYETHYLENE PIPE: **The pipe shall be Green Stripe Pipe.** The Pipe shall be equal to Chevron Phillips Performance Pipe 4200 Series and shall be supplied in the following classes:

Nominal Size	Outside Dimension	Approximate ID
1.25” DR 11	**1.64**	**1.34**
2” DR 11	**2.349**	**1.917**
3” DR 11	**3.462**	**2.826**
4” DR 11	**4.431**	**3.633**
6” DR 11	**6.553**	**5.349**
8” DR 11	**8.531**	**6.963**
10” DR 11	**10.633**	**8.679**
12” DR 11	**12.611**	**10.293**
14” DR 11	**13.847**	**11.301**

Sizes are in inches

Pipe shall be manufactured from a PE 3408 resin listed with the Plastic Pipe Institute (PPI) as TR-4. The resin material shall meet the specifications of ASTM D3350-99 with a minimum cell classification of PE345464C. Pipe shall have a manufacturing standard of ASTM D3035 and be manufactured by an ISO 9001 certified manufacturer. The pipe shall contain no recycled compounds except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. The pipe shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.

12.4.2 ASTM 2241 POLYVINYL CHLORIDE PRESSURE PIPE, FITTINGS AND JOINTS – **ASTM 2241 PVC shall not be used on this project for force main construction**

FITTINGS:

12.4.3 BUTT FUSION FITTINGS: Butt fusion fittings shall be in accordance with ASTM D3261 and shall be manufactured by injection molding, a combination of extrusion and machining, or fabricated from HDPE pipe conforming to this specification. All fittings shall be pressure rated to provide a working pressure rating no less than that of the pipe. Fabricated fittings shall be manufactured using a McElroy Datalogger to record fusion pressure and temperature. A graphic representation of the temperature and pressure data for all fusion joints made producing fittings shall be maintained as part of the quality control. The fitting shall be homogeneous throughout and free of visible cracks, holes, foreign inclusions, voids, or other injurious defects.

12.4.4 ELECTROFUSION FITTINGS: Electrofusion Fittings shall be PE3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99 and be the same base resin as the pipe. Electrofusion Fittings shall have a manufacturing standard of ASTM F1055.

12.4.5 FLANGED AND MECHANICAL JOINT ADAPTERS: Flanged and Mechanical Joint Adapters shall be PE 3408 HDPE, Cell Classification of 345464C as determined by ASTM D3350-99 and be the same base resin as the pipe. Flanged and mechanical joint adapters shall have a manufacturing standard of ASTM D3216. All adapters shall be pressure rated to provide a working pressure rating no less than that of the pipe.

12.4.6 MECHANICAL RESTRAINT: Mechanical restraint for HDPE may be provided by mechanical means separate from the mechanical joint gasket sealing gland. The restrainer shall provide wide, supportive contact around the full circumference of the pipe and be equal to the listed widths. Means of restraint shall be machined serrations on the inside surface of the restrainer equal to or greater than the listed serrations per inch and width. Loading of the restrainer shall be by a ductile iron follower that provides even circumferential loading over the entire restrainer. Design shall be such that restraint shall be increased with increases in line pressure.

Serrated restrainer shall be ductile iron ASTM A536-80 with a ductile iron follower; bolts and nuts shall be corrosive resistant, high strength alloy steel.

The restrainer shall have a pressure rating of, or equal to that of the pipe on which it is used or 150 PSI which ever is lesser. Restrainers shall be JCM Industries, Sur-Grip or pre-approved equal.

Nominal Size	Restraint Width	Serrations per inch
4”, 6”	1-1/2”	8
8”, 10” & 12”	1-3/4”	8

Pipe stiffeners shall be used in conjunction with restrainers. The pipe stiffeners shall be designed to support the interior wall of the HDPE. The stiffeners shall support the pipe’s end and control the “necking down” reaction to the pressure applied during normal installation. The pipe stiffeners shall be formed of 304 or 316 stainless steel to the HDPE manufacturers published average inside diameter of the specific size and DR of the HDPE. Stiffeners shall be by JCM Industries or pre-approved equal.

12.5 INSTALLATION

GENERAL:

12.5.1 PIPE & FITTINGS: Size as indicated on the plans. Install as shown in accordance with manufacturer’s recommendations.

JOINING:

12.5.2 BUTT FUSION: Sections of polyethylene pipe should be joined into continuous lengths on the jobsite above ground. The joining method shall be the butt fusion method and shall be performed in strict accordance with the pipe manufacturer's recommendations. The butt fusion equipment used in the joining procedures should be capable of meeting all conditions recommended by the pipe manufacturer, including, but not limited to, temperature requirements of 400 degrees Fahrenheit, alignment, and an interfacial fusion pressure of 75 PSI. The butt fusion joining will produce a joint weld strength equal to or greater than the tensile strength of the pipe itself.

12.5.3 SIDEWALL FUSION: Sidewall fusion shall not be used or accepted.

12.5.4 MECHANICAL: Bolted joining may be used where the butt fusion method cannot be used. Flange joining will be accomplished by using an HDPE flange adapter with a ductile iron back-up ring. Mechanical joint joining will be accomplished using either a molded mechanical joint adapter or the combination of a Sur-Grip Restrainer and Pipe Stiffener as manufactured by JCM Industries, Inc. Either mechanical joint joining method will have a ductile iron mechanical joint gland.

12.5.5 OTHER: Socket fusion, hot gas fusion, threading, solvents, and epoxies may not be used to join HDPE pipe.

12.5.6 QUALITY AND WORKMANSHIP: The pipe and/or fitting manufacturer's production facility shall be open for inspection by the owner or his designated agents with a reasonable advance notice. During inspection, the manufacturer shall demonstrate that it has facilities capable of manufacturing and testing the pipe and/or fittings to the standards required by this specification.

12.5.7 PACKAGING, HANDLING & STORAGE: The manufacturer shall package the pipe in a manner designed to deliver the pipe to the project neatly, intact and without physical damage. The transportation carriers shall use appropriate methods and intermittent checks to insure the pipe is properly supported, stacked and restrained during transportation such that the pipe is not nicked, gouged, or physically damaged.

Pipe shall be stored on clean, level ground to prevent undue scratching or gouging. If the pipe must be stacked for storage, such stacking shall be done in accordance with the pipe manufacturer's recommendations. The pipe shall be handled in such a manner that it is not pulled over sharp objects or cut by chokers or lifting equipment.
Sections of pipe having been discovered with cuts or gouges in excess of 10% of the pipe wall thickness shall be cut out and removed. The undamaged portions of the pipe shall be rejoined using the heat fusion joining method.

Fused segments of the pipe shall be handled so as to avoid damage to the pipe. Chains or cable type chokers must be avoided when lifting fused sections of pipe. Nylon slings are preferred. Spreader bars are recommended when lifting long fused sections.

12.6 INSTALLATION

12.6.1 Installation of force main pipe shall conform to the installation requirements set forth in the Gravity Sewer Section of these specifications and the standard bedding and backfilling details of the Drawings.

12.7 TESTING

The completed force main and siphon shall be subjected to a combined pressure and leakage test as described in Section 4 of AWWA C600. The testing shall be subject to the following:

A) All tests shall be conducted in the presence of the ENGINEER.

B) The OWNER shall furnish a recording pressure gauge to be used for the pressure and leak test. The pressure charts from the test shall be retained by the OWNER as evidence of the testing.

C) Test waters can be potable water from the OWNER's water distribution system or raw water from a local reservoir. Withdrawals of water from the OWNER's system must be both authorized by the Public Works superintendent and metered. The OWNER will bill the CONTRACTOR for all waters used in accordance with its current rate schedule.

D) The test pressure shall be 100 psi or the maximum operating pressure of the lift station, whichever is greater.

E) Duration of test shall be no less than two hours.

F) Where leaks are evident on the surface where joints are covered, the joints shall be recaulked, repoured, bolts retightened or relaid, and leakage minimized regardless of total leakage as shown by test.

G) All pipe fittings and other materials found to be defective under test shall be removed and replaced.

H) Lines which fail to meet test requirements shall be repaired and retested as necessary until test requirements are complied with at no additional cost to OWNER.

12.8 CONNECTING FORCE MAIN TO MANHOLE

All sanitary sewer force mains to be connected to manholes must connect at the elevation indicated on the design drawings. If no connection elevation is listed, it shall be assumed that the force main shall penetrate at the invert elevation of the manhole that the connection is being made.

12.9 CONCRETE THRUST BLOCKS

Concrete thrust blocks shall be provided at all bends in the force main as shown on the Detail Sheets of the Design Drawings.

12.10 MARKING PIPE

12.10.1 The force main pipe shall be clearly labeled as a SANITARY SEWER at regular intervals so that the pipe cannot be confused with a potable water line. Marking tape is one alternate for complying with this specification. Fabricating the pipe with a resin color different from water line pipe is another alternate. Green Stripe Pipe is required.

12.10.2 Tracer Wire: A #8 copper trace wire shall be laid on top of all non-metallic force mains and siphons. Trace wires shall be installed along ALL 1.25-inch sanitary sewer service force mains and ALL trunk force mains 2-inch and larger.

Trace wire shall be pigtailed up for easy access by OWNER at the following locations:

1. Residential grinder pump stations' wet well lids or control panel
2. Pressure sewer lateral assembly meter pits
3. Valve cans
4. Air release meter pits
5. Major lift stations' valve pits.

12.11 MEASUREMENT AND PAYMENT

12.11.1 Measurement: Pipe for force mains and siphons in place, complete, successfully pressure tested shall be measured in linear feet along the pipe centerline. Pipe bends will not be measured for separate payment. Bends shall be measured in linear feet. No allowance shall be made for laps or drops at connections.

12.11.2 Payment: Payment for force mains and siphons will be made at the contract unit price for the applicable diameter as set forth in the Bid Schedule. Such payment shall constitute full compensation for all materials, labor, equipment, and incidentals necessary for the completion of the work.

-- THE END --

SECTION XIIIa

TECHNICAL SPECIFICATIONS

GRAVITY SANITARY SEWER LATERALS AND CLEANOUT HOUSE CONNECTIONS

PARTIAL & FULL SERVICE

13a.1 SCOPE

Furnish all labor, material, equipment and incidentals required to install, complete and ready for operation, a sanitary sewer service lateral (or stub out) and cleanout at each grinder pump station as shown on the Drawings and as specified herein. See "Simplex and Duplex Residential Grinder Pump Station(s) - Partial & Full Service" specifications for measurement and payment items for grinder pumps and appurtenances.

13a.2 SPECIAL REQUIREMENTS

Future Home/Residence Lateral: When a pressure sewer system is constructed in a previously unsewered residential area, the CONTRACTOR shall extend 10 feet of gravity sewer lateral from the grinder pump station in the direction of the future residence and install a cleanout, plug the lateral end, and erect a marker.

Existing Home/Residence Lateral – PARTIAL SERVICE: the CONTRACTOR shall extend 10 feet of gravity sewer lateral from the grinder pump station at a grade, slope, and orientation sufficient to allow the property owner to extend the stub in a straight linear direction to the existing house sewer lateral while maintaining the required pipe slope. CONTRACTOR shall then install a cleanout, plug the lateral end, and erect a marker for easy locating by the property owner.

The CONTRACTOR is not to connect the lateral to the resident's house sewer. Although any connection of a lateral within the limits of the project easements is covered by the DOW construction permit, the resident will be required to obtain the appropriate permits and make the final lateral connection to the sewer stub as provided by the contractor.

Any connection of a lateral beyond the limits of the easements is **NOT** covered by the DOW construction permit and, therefore, requires a plumbing permit, a plumbing inspection, and actual connection by a licensed plumber.

CONTRACTOR shall field locate actual existing sewer lateral location on each residence prior to setting grinder pump station. CONTRACTOR shall set the pump station in such a location as to allow the sewer lateral to flow by gravity into the station and minimize the length of sewer lateral pipe required to make the final lateral connection. **(See residential grinder pump specifications for additional location requirements for grinder pump stations).**

Existing Home/Residence Lateral – FULL SERVICE: the CONTRACTOR shall extend the gravity sewer lateral from the grinder pump station to the existing home sewer lateral and install a cleanout. The Contractor shall hire a licensed plumber to complete the final connection to the existing sewer lateral.

The CONTRACTOR must obtain all necessary permits, schedule the required inspections, pay all fees, and have a licensed plumber as a member of his construction field personnel. The provision of these services shall be considered incidental to the unit price bid for "Full Service – Simplex/Duplex Residential Grinder Pump Station, Complete In-Place Tested and In Service".

CONTRACTOR shall field locate actual existing sewer lateral location on each residence prior to setting grinder pump station. CONTRACTOR shall set the pump station in such a location as to allow the sewer lateral to flow by gravity into the station and minimize the length of sewer lateral pipe required to make the final lateral connection. **(See residential grinder pump specifications for additional location requirements for grinder pump stations).**

13a.3 MATERIALS

The pipe and fittings used for gravity sanitary laterals shall be PVC SDR 35 gravity sewer pipe or SCH 40 PVC sewer pipe.

13a.4 INSTALLATION

The OWNER and CONTRACTOR shall meet with the landowner to determine a mutually agreeable location for each lateral (or stub out) and cleanout prior to installation.

All open pipe ends shall be sealed with standard plugs to the satisfaction of the OWNER. To protect the sealed end from trenching equipment, a #4 bar four feet long shall be placed in the trench at a 45° degree angle six to twelve inches from the sealed end.

Under normal conditions, where elevations are not critical, house connection pipe shall be laid on a slope of not less than one foot per 100 feet (approximately 1/8 inch per foot). Where elevations are critical, minimum grade may be 0.5 foot per 100 feet laid with batter boards and grade line string, same as specified for main sewers.

The installation of house laterals (or stub outs) shall follow immediately or be concurrent with the construction of the grinder pumping station. This method of construction will permit more advantageous handling of backfilling and will also avoid possible damage by subsequent excavation.

The existing septic tank is to be abandoned in place unless CONTRACTOR "unavoidably" damages it with his construction activities. See "Removal and Disposal of Existing Septic Tanks" specification for more information.

All existing sewer laterals must be smoke tested by CONTRACTOR prior to connecting lateral to new grinder pump station. Smoke test is to verify existing structure plumbing is constructed correctly and all proper vents and water seal traps are in place. Also, to determine if any sources of inflow or infiltration are connected to home plumbing such as roof leaders, floor drains, etc. Contractor shall itemize sources.

13a.5 MEASUREMENT AND PAYMENT

Measurement and Payment: There shall be **NO** measurement or payment for gravity sewer cleanouts/stubs at grinder pumping stations as the work shall be considered an integral part of "Partial and Full Service - Simplex/Duplex Residential Grinder Pump Station, Complete, In-Place Tested (and In-Service)." Contractor shall incorporate sufficient length of 4-inch PVC gravity sewer laterals into his bid for said grinder pump stations.

Also, there shall be no separate measurement or special payment for disconnecting / reconnecting existing building sewers, for smoke testing existing building sewer systems, for four inch to six inch PVC adaptors, or for other work associated with installing building sewer systems as same shall be considered incidental to cost for "Partial and Full Service - Simplex/Duplex Residential Grinder Pump Station, Complete, In-Place Tested (and In-Service)".

CONTRACTOR should prepare his unit price bid accordingly.

-- THE END --

SECTION XIIIb

TECHNICAL SPECIFICATIONS

GRAVITY SANITARY SEWER LATERAL STUB AND CLEANOUT ASSEMBLY ON GRAVITY SEWER MAINS

13b.1 SCOPE

Furnish all labor, material, equipment and incidentals required to install, all sanitary sewer service lateral stub outs as shown on the Drawings and as specified herein.

13b.2 SPECIAL REQUIREMENTS

The CONTRACTOR will encounter a variety of existing connection situations ranging from straight pipes discharges to old septic tanks. The CONTRACTOR shall locate the location and elevation in which the old lateral exits the home foundation prior to installing sanitary sewer lateral stub and cleanout on new gravity sewer main.

This project does not require the contractor extend the sewer lateral all the way to the existing sanitary sewer lateral from the structure as well as does not require the Contractor to make the final connection to the structures sewer lateral.

However, in the event the Contractor's scope of work is changed during construction and any connection of a lateral at the building line is to be completed, it requires a plumbing permit, a plumbing inspection, and actual connection by a licensed plumber. It is the Contractor's responsibility to obtain all necessary permits, schedule the required inspections, pay all fees, and have a licensed plumber as a member of his construction field personnel to complete any final connections he may make. The provision of these services and payment shall be determined on a case by case basis if the Contractor's scope of work is changed.

13b.3 MATERIALS

The pipe and fittings used for gravity sanitary laterals shall be of the same material as the mainline. For example, laterals on PVC pipe mains shall be PVC and laterals on ductile iron pipe mains shall be ductile iron.

13b.4 INSTALLATION

The OWNER and CONTRACTOR shall meet with the landowner to determine a mutually agreeable location for each lateral stub out and cleanout assembly prior to installation to verify that the future connection from the existing home lateral to the capped sewer stub out is possible at the minimum grades discussed below. It is the CONTRACTOR's responsibility to determine grade between the existing lateral(s) and new lateral stub for each structure receiving a gravity sewer stub and cleanout assembly.

Definition of work for: "4" Sanitary Sewer Lateral Stub and Cleanout Assembly, Complete In-Place" - The CONTRACTOR shall install one 8"x8"x4" tee-wye on the main gravity sewer line, extend 20 linear feet of 4-inch sanitary sewer lateral at minimum slope (see below) toward existing location of sanitary sewer lateral exit from foundation wall, install one 4" sanitary sewer cleanout as per details in project plans, install glue on or push on cap on the end of new 4" lateral stub to prevent groundwater inflow to sanitary sewer, and to protect the sealed end from trenching equipment, install a #4 bar as long as needed and shall be placed in the trench at a 45° degree angle six to twelve inches from the sealed end and extend to the surface for easy locating by property OWNER for future extension. #4 bar shall be sufficiently capped and visible as per OSHA standards for exposed rebar. Any other parts, bends, fittings, materials, labor, excavation, or permits required to complete the sewer lateral stub and cleanout assembly installation shall be incidental to the construction of said assembly.

All laterals, unless otherwise specified or directed, shall be of the pipe specified herein before and as indicated on the Drawings. Trenching, pipe laying, joints and backfilling shall conform to the requirements set forth herein in the gravity sewer lines section of these specifications.

The plumbing code requires a double sweep tee cleanout at each lateral.

The lateral shall be laid on a uniform grade from the main sewer to meet the building sewer grade so that no bends will be needed for the final connection.

Under normal conditions, where elevations are not critical, lateral pipe shall be laid on a slope of not less than one foot per 100 feet (approximately 1/8 inch per foot). Where elevations are critical, minimum grade may be 0.5 foot per 100 feet.

The installation of "Sanitary Sewer Lateral Stub and Cleanout Assemblies" shall follow immediately or be concurrent with the construction of the main sewer. This method of construction will permit more advantageous handling of backfilling and will also avoid possible damage to the main sewer by subsequent exposure for connection of the service lines.

13b.5 MEASUREMENT AND PAYMENT

13b.5.1 Measurement and Payment: Sanitary Sewer Laterals shall be measured "Each" as set forth in the bid schedule for **"4" Sanitary Sewer Lateral Stub and Cleanout Assembly, Complete In-Place"**. Such payment shall constitute full compensation for all materials, labor, equipment, and incidentals necessary for the completion of the work.

Also, there shall be no separate measurement or special payment for smoke testing existing building sewer systems, for four inch to six inch PVC adaptors, or for other work associated with installing sewer lateral assemblies as same shall be considered incidental to cost for "4" Sanitary Sewer Lateral Stub and Cleanout Assembly, Complete In-Place".

CONTRACTOR should prepare his unit price bid accordingly.

-- THE END --

SECTION XIV

TECHNICAL SPECIFICATIONS

PRESSURE SEWER LATERAL ASSEMBLY

14.1 SCOPE

Furnish all labor, material, equipment and incidentals required to install, complete and ready for operation, a connection of a 1.25" force main from a simplex or duplex residential grinder station or a connection of a 2" force main from a triplex or quadplex residential grinder pump station to a force main or gravity sewer main as shown on the Drawings and as specified herein.

14.2 QUALITY ASSURANCE/SUBMITTALS

14.2.1 Submit five copies of itemized summary of source of manufacture of each item in pressure connection. Provide manufacturer's certification of compliance with specification for each item.

14.3 MATERIALS

14.3.1 Pressure Pipe: The HDPE 1.25" and 2" service force main is covered under the force main section of these specifications.

14.3.2 High Density Polyethylene Lateral Assembly. The pressure sewer lateral assembly shall consist of two (2) HDPE to stainless steel threaded adapters, one (1) red brass ball valve, one (1) red brass nipple, and one (1) red brass swing check assembly. All parts shall be of the diameter equal to the HDPE service line on which they are to be installed. All parts shall be as manufactured by the Ford Meter Company or approved equal and be suitable for wastewater applications.

All valves shall be rated for 200 psi service. The swing check valve shall be rated for 125 psi service. The entire assembly shall be shipped as a single unit suitable for housing in an 18" x 24" meter box.

14.3.3 Meter Box and Lid: The pressure sewer lateral assembly shall be housed in a high density polyethylene meter box of a size as required by the size of the assembly. The meter box shall be equipped with a **GREEN** polyethylene lid with the cast in place lettering of "SEWER" on top.

14.3.4 HDPE Tee: If the HDPE force main is to be connected to another polyethylene force main, the CONTRACTOR shall butt fuse an HDPE tee with an appropriate diameter branch into the main. The branch length shall be suitable for connection to the HDPE to stainless steel adapter of the pressure sewer lateral assembly.

14.3.5 Tapping Saddle: If the 1.25" or 2" HDPE force main is to be connected to a PVC gravity main, a tapping saddle will be required. Tapping saddles shall be Smith Blair 313-872-10 suitable for connection to PVC pipe with an OD equal to that of the PVC pipe being connected to. Each saddle shall be furnished with a C8655 "compression couple by male" fitting to allow compression connection to the HDPE force main as required.

14.4 INSTALLATION

14.4.1. Taps: Taps (where required) shall be made in accordance with the manufacturer's directions. The tap shall be protected by 6" of fine sand or gravel as indicated in the detail drawings.

14.4.2. Meter Box Setting: The meter boxes shall be set in a neat and workmanlike manner. The lid of the meter box shall be set:

1) flush with paved surfaces.
2) 0.5" above grade in improved lawns, and
3) 2" above grade in unimproved areas.

14.5 MEASUREMENT AND PAYMENT

14.5.1 Measurement: "Pressure Sewer Lateral Assembly" shall be measured 'Each.' For purposes of measurement and payment, no distinction shall be made between connections to HDPE force mains or connections to gravity sewer mains. The "Pressure Sewer Lateral Assembly" is defined to include the high density polyethylene grinder pump assembly, polyethylene meter box, cast iron lid, and HDPE tee (or brass tapping saddle, as applicable). No distinction will be made between 1.25" or 2" lateral assemblies.

14.5.2. Payment: Payment for "Pressure Sewer Lateral Assembly" will be made at the Contract Unit Price 'each' as set forth in the Bid Schedule for the actual quantity measured. Payment 'each' shall be considered full compensation for all materials, labor, equipment and incidentals necessary for the completion of the work.

- THE END -

SECTION XV

TECHNICAL SPECIFICATIONS

VALVES

15.1 SCOPE

This work shall consist of furnishing and installing valves on 1.25-inch diameter and greater High Density Polyethylene Pipe.

15.1.A QUALITY ASSURANCE/SUBMITTALS

15.1.A.1 Submit five copies of manufacturer's certification of compliance with applicable AWWA specifications. Certificate to be signed by corporate officer having authority to legally bind the company.

15.2 MATERIALS

15.2.1 General: Valves 2" and larger shall be resilient wedge gate valves. Valves less than 2" shall be thermoplastic ball valves (Nordstrom or equal) unless otherwise stated.

15.2.2 Gate Valves: All gate valves shall be of the **AWWA C515 RESILIENT WEDGE GATE VALVE TYPE** suitable for wastewater applications with iron body, nonrising stem, fully bronze mounted (Mueller or approved equal). GATE VALVES SHALL BE RATED FOR WORKING WATER PRESSURES OF 150 PSI. Valves shall be of standard manufacture and of the highest quality both as to materials and workmanship.

All gate valves for "below ground" service shall be furnished with mechanical joint end connections. Gate valves for "above ground" (or pit) installations shall be furnished with flanged end connections.

All gate valves shall have the name or monogram of the manufacturer, the year the valve casting was made, the size of the valve, and the working water pressure cast on the body of the valve.

Each gate valve for "below ground" service shall be installed in a vertical position with a valve box, as shown in the Design Drawings. Gate valves set with boxes shall be provided with a two inch square operating nut and shall be opened by turning to the left (counterclockwise). Each gate valve for "above ground" (or pit) installations shall be furnished with a hand wheel operator.

15.2.3 Ball Valves: Shall be **Nordstrom Poly-Water Valves suitable for wastewater applications,** or approved equal. Valves shall be manufactured from materials of equal or better quality to those as specified in the table below and be rated for working pressures of 160 psi or greater.

Valve Part	Material
Body	Polyethylene
Ball	Polypropylene
Seat	EPDM
Seat Retainer	Polypropylene
Stem	Modified Phenylene Oxide
Stem Seal	EPDM
Ground Water Seal	Neoprene
Adapter	Polypropylene

15.2.4 Eccentric Plug Valves: Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as those shown on the plans. Flanged valves shall be drilled to the ANSI 125/150-lb. Standard.

Valve bodies shall be of the ASTM A126 Class B Cast Iron. Bodies in 4" and larger shall be furnished with 1/8" welded overlay seam of not less than 90% pure nickel. Seat area shall be raised with raised surface completely covered with weld to insure that the plug face only contacts the nickel. Screwed in seats shall not be acceptable.

Port areas shall be unobstructed when open. Port area shall be rectangular and not less than 80% of full pipe area.

Plugs shall be of the ASTM A126 class B cast iron. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and the body seat, with the plug in the close position, shall be externally adjustable in the field with the valve in the line under pressure.

Bearings shall be sleeve type metal bearings and shall be sintered, oil impregnated permanently lubricated type 316 ASTM A743 Grade CD-8M.

Valve shaft seals shall be of the multiple V-ring type and shall be externally adjustable and repackable without removing the bonnet or actuator from the valve. Valve utilizing O-ring seals, non-adjustable packing, or so-called grit-excluders shall not be acceptable.

Pressure rating shall be 175 psi for valve through 12" and 150 psi for valves 14" through 72". Each valve shall be given a hydrostatic and seat test results being certified when the required by the specifications.

Valves shall be furnished with actuators as shown on the plans.

All valves shall be as manufactured by DeZurik, model PEC or pre-approved equal.

15.2.5 Valve Box and Cover: The valve box and cover shall be of cast iron construction (Clow F-2450, or equal) and shall be engraved with the word **"SEWER".** Valve Box (can) shall be vertically adjustable.

15.2.6 Valve Markers: Each valve assembly shall be delineated by a valve marker as detailed in the Drawings. The marker shall consist of a 3" green PE pipe embedded vertically adjacent to the valve. The marker shall include a weatherproof label identifying the valve owner and provide an emergency phone number for the owner.

15.2.7 Line Plug: If the valve is to be installed at the end of a line the CONTRACTOR shall provide a thrust backed plug.

15.3 INSTALLATION

Trenching, bedding, and backfilling requirements for gate valves shall conform to the installation requirements for water lines and fittings. The base of the valve shall be anchored in concrete as shown in the Design Drawings. The valve box shall be installed vertically, centered over the stem of the operating nut. The valve box base shall be placed at least two inches above the flanged joint of the valve cover. The top of the operating nut should be no higher than the hub or upper part of the valve box base where it connects to the center section.

15.4 MEASUREMENT AND PAYMENT

15.4.1 Measurement: Valves for buried service in-place, tested, and accepted shall be measured each. Valves installed in vaults, pits, and pumping stations shall be considered incidental to the complete price for the vault, pit or pumping station and shall not be measured for separate payment. All valve marking requirements shall be incidental to the cost of construction of the valve.

15.4.2 Payment: Valves measured for payment shall be paid for at the contract price "each" as set forth in the Bid Schedule. Payment as specified shall be considered as full compensation for all labor, materials, equipment, and incidentals necessary to perform the work as required. The valve box and cover and end valve marker shall be considered incidental to the installation and shall not be measured for separate payment.

-- THE END --

SECTION XVIa

TECHNICAL SPECIFICATIONS

SIMPLEX & DUPLEX RESIDENTIAL GRINDER PUMP STATIONS

PARTIAL & FULL SERVICE INSTALLATIONS

16a.1 SCOPE

Provide all labor, materials, and equipment necessary for furnishing and installing underground residential submersible sewage pumping station(s) complete and in proper operating condition. The work includes all work shown or implied on the Drawings. A 'partial' service leaves a working unit ready for the resident's connection. A 'full' service fully connects the resident's service to the new sewer system. The work includes (but is not limited to):

1. Coordination of final station location and controls location with resident and OWNER. **Station must be located within 20 linear feet of the foundation line where the sanitary sewer lateral passes through the foundation wall. Contractor shall anticipate the length of 4" gravity sewer lateral required as 20 LF per house and prepare his bid accordingly. Station must be located to allow resident's sewer to drain to station by gravity. IF STATION VENT WILL NOT BE LOCATED BELOW LEVEL OF LOWEST OCCUPIED FLOOR – CONTRACTOR SHALL OBTAIN ENGINEER'S WRITTEN INSTRUCTIONS BEFORE INSTALLING UNIT.**

2. Furnishing, installation, and start-up testing of factory built simplex or duplex submersible grinder pump station complete with enclosure, plumbing, and controls.

3. ~~**PARTIAL SERVICE** – All related electrical work required to place the pumping unit in service including mounting the station's disconnect/control panel on the resident's home. **Resident is required to make the final connection of the contractor installed disconnect to their breaker box. Resident must hire licensed electrician and secure necessary electrical permit.**~~

   FULL SERVICE – All related electrical work required to place the pumping unit in service including connection of the station disconnect/control panel to the resident's power supply is provided by the CONTRACTOR. CONTRACTOR must employ a licensed electrician for this service and secure all necessary electrical permits.

4. ~~**PARTIAL SERVICE** – Suitably stubbing out 10 LF of gravity sewer pipe complete with a cleanout and removable plug for the resident. **Resident is required to make the final connection of the contractor installed stub out to the existing gravity sewer lateral of the residence. Resident must hire licensed plumber and secure plumbing permit for connection.**~~

FULL SERVICE – CONTRACTOR shall connect resident's building sewer (also known as lateral) to the newly installed, operational grinder pumping unit. CONTRACTOR shall provide a 'clean out' in the lateral. CONTRACTOR must secure the necessary plumbing permit and employ a licensed plumber to make the final connection.

5. All related site work including clearing, grading, trenching, backfilling, surface restoration, clean-up, etc.

PLEASE NOTE - Installation of the Pumping Station 1-1/4" service main between the pump station and the main force main is covered under a separate section of these specifications and is not a part of this specification.

16a.2 QUALITY CONTROL

16a.2.1 Base Bidding: These specifications and the Drawings are based on the provision of an E-One submersible pumping unit. To simplify repairs and inventory of spare parts, the OWNER has mandated that the SUCCESSFUL BIDDER (CONTRACTOR) provide a single pump unit for use throughout the system.

16a.2.2 Guarantee: The manufacturer of the submersible pumping station shall guarantee all equipment supplied against defects in workmanship and material for a period of sixty (60) months after notice of OWNER's acceptance, but no greater than sixty-five (65) months after receipt of shipment. The OWNER will report any defects found during the warranty period to the MANUFACTURER. ALL replacement pumps and controls installed during as well as after the warranty period expires shall be warranted for sixty (60) months starting 3 months from date of shipment.

In the event a component fails to perform as specified or is proven defective in service during the warranty period, the Manufacturer shall repair or replace, at his discretion, such defective part without cost to the OWNER. He shall further provide, without cost, such labor as may be required to replace, repair, or modify major equipment components.

16a.2.3 Start-Up: The manufacturer shall provide the services of a factory-trained representative for a minimum period of two weeks on-site to perform initial start-up of the pumping units and to instruct the OWNER's operating personnel in the operation and maintenance of the equipment.

16a.3 SUBMITTALS

Each pump manufacturer must provide to the ENGINEER submittals as per the general conditions.

16a.4 MATERIALS - WET WELL

Fiberglass Construction**.** The tank shall consist of a single wall, laminated fiberglass construction. The resin used shall be of a commercial grade suitable for the environment. The reinforcing material shall be a commercial grade of glass fiber capable of bonding with the selected resin. The inner surface shall have a smooth finish and be free of cracks and crazing. The exterior tank surface shall be relatively smooth with no exposed fiber or sharp projections present.

The tank wall and bottom shall be of sufficient thickness and construction to withstand the imposed loading due to saturated soil at the specified burial depth for each available tank height. All station components must function normally when exposed to the external soil and hydrostatic pressures developed at the specified burial depth. The tank bottom shall be reinforced with a fiberglass plate extending beyond the tank walls to support concrete anchoring, as required, to prevent flotation. The tank shall include a solid fiberglass cover, secured with threaded stainless steel fasteners, providing low profile mounting.

The pump discharge piping components shall be 1-1/4" IPS and consist of PVC pipe fittings, a PVC ball valve, rated at 200 psi WOG, with integral union to facilitate piping disconnect. A 1'1/4" anti-siphon valve shall be integral to the piping inside the basin. Installation of the pump discharge piping shall require field assembly by the installing party. The tank shall have a discharge bulkhead, which terminates outside the tank wall with a 1-1/4" female pipe thread. The discharge bulkhead shall be factory installed and warranted by the manufacturer to be watertight. The tank shall be furnished with an EPDM grommet to accept a 4.50" OD (4" DWV or SCHD 40) inlet pipe.

The power and control cable shall be 32' in length standard and shall connect to the pump by means of the provided NEMA 6P electrical quick disconnect (EQD) and shall enter the tank through a watertight strain relief connector supplied by the manufacturer. Junction boxes will not be acceptable. Installation of the inlet grommet and cable strain relief shall require field penetration of the tank wall by the installing party. Provision shall be made for tank venting in the 4" inlet line in accordance with national and local plumbing code requirements.

See design drawings for tank sizes and details.

16a.5 MATERIALS – PUMPS

Pump(s) shall be of the progressive cavity or centrifugal design. The pumps must be capable of operating at negative total dynamic head without overloading the motor. Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

The pump(s) operations curve shall be as follows:

Ops Point 1	6.0 GPM	@ 230Ft
Ops Point 2	7.8 GPM	@ 185 Ft
Ops Point 3	10 GPM	@ 120 Ft
Ops Point 4	12 GPM	@ 70 Ft
Ops Point 5	15 GPM	@ 0 Ft

The pump(s) must be capable of delivering cleansing velocities as dictated by Division of Water of 2 feet/second against a continuous total dynamic head of up to 230 feet.

16a.5.1 PROGRESSIVE CAVITY PUMP: Each pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with mechanical seal. The rotor shall be constructed of stainless steel. The stator shall be of a specifically compounded ethylene propylene synthetic elastomer. Buna-N is not acceptable as a stator material. The material shall be suited for domestic wastewater service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, good aging properties, and outstanding wear resistance.

16a.5.2 MECHANICAL SEAL: Each pump shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless steel spring.

16a.5.3 GRINDER: Each grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece stainless steel motor shaft. The grinder impeller assembly shall be securely fastened to the pump motor shaft. The grinder will be of the rotating type with a stamped, stainless steel shredder ring assembly spaced in accurate, close annular alignment with the driven impeller assembly, which shall carry hardened, stainless steel cutter bars.

This assembly shall be dynamically balanced and operate without vibration over the entire range of specified operating pressures. The grinder shall be constructed so as to eliminate clogging and jamming under all normal operating conditions including pump starting. Sufficient vortex action shall be created by the grinder pump, to scour the tank free of deposits or sludge banks, which would impair the operation of the pump. These requirements shall be accomplished by the following, in conjunction with the pump:

1. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.

2. The grinder inlet shroud shall have a diameter no less than 5 inches.

The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects," such as paper, wood, plastic, glass,

rubber and the like, to finely divided particles that will pass freely through the passages of the pump and the 1-1/4" diameter discharge piping.

16a.6 MATERIALS - PUMP MOTORS

Each motor shall be a 240 Volt 60 Hertz, 1 Phase, capacitor start, ball bearing, squirrel cage induction type with a low starting current. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor.

16a.7 MATERIALS – CHECK & ISOLATION VALVES

A check valve and isolation valve for each pump shall be provided within the fiberglass wet well as depicted in the design drawings. Each pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve secured to the stainless steel pump discharge elbow. Each check valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Working parts will be made of a 300 series stainless steel and fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A non-metallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low backpressure. The valve body shall be injection-molded parts made of glass filled thermoplastic.

A pump isolation valve and check valve shall also be provided in a standard meter box enclosure at the point of connection of the service main to the main pressure sewer header. See the “Pressure Sewer Lateral Assembly” section of these specifications for “Measurement & Payment” details.

16a.8 MATERIALS - CONTROLS

CONTROLS: All necessary controls shall be located in the control cover of the core unit. The control cover will be attached with stainless steel fasteners. The grinder pump will be furnished with a length of 6 conductor 14 gauge, type SJOW cable, pre-wired and watertight to meet UL requirements. Non-fouling waste water level detection for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air-bell level sensor connected to a pressure switch. The level detection device shall have no moving parts in direct contact with the wastewater. High-level sensing will be accomplished in the manner detailed above by a second, independent, air-bell sensor and pressure switch of the same type. Float switches will not be acceptable.

To assure reliable operation of the pressure sensitive switches, each core shall be equipped with a breather assembly, complete with a suitable means to prevent entry of water into the motor compartment.

ALARM/DISCONNECT PANEL - SIMPLEX: Each Simplex Residential Grinder Pump Station shall include a NEMA 4X, Simplex Alarm/Disconnect Panel suitable for wall or

pole mounting. The NEMA 4X enclosure shall be manufactured of corrosion resistant thermoplastic and be furnished with a hinged cover and pad lock.

The simplex panel shall contain one (1), 15 amp, double pole circuit breaker for the power circuit and one (1) 15 amp, single pole circuit breaker for the alarm circuit.

ALARM/DISCONNECT PANEL - DUPLEX: Each Duplex Residential Grinder Pump Station shall include a NEMA 4X, UL listed Duplex Alternating Alarm/Disconnect Panel suitable for wall or pole mounting by the CONTRACTOR. The NEMA enclosure shall be manufactured of corrosion resistant thermoplastic and be furnished with a hinged cover and pad lock.

The duplex panel shall contain two (2), 15 amp, double pole circuit breakers for the power circuit and two (2) 15 amp, single pole circuit breakers for the alarm circuits.

THE ALARM/DISCONNECT PANEL(S) shall include a visual high-level alarm indicator. The visual alarm lamp shall be inside a red fluted lens mounted to the top of the enclosure in such a manner as to maintain NEMA 4 rating. The alarm sequence is to be as follows:

1. When liquid level in the tank rises above the alarm level, the contacts on the alarm pressure switch will close and the visual alarm will illuminate on the control panel.

2. The visual alarm will remain illuminated until the sewage level in the tank drops below the "off" setting of the alarm pressure switch.

16a.9 MATERIALS – CORE UNIT

Pump units with slide away couplings shall be provided. The slide away coupling shall allow the pump to be installed or removed without requiring personnel to enter the wet well. The Grinder Pump Station(s) shall have easily removable core assemblies consisting of the pump, motor, grinder, all motor controls, check valve, anti-siphon valve, EQD and wiring. Each grinder pump core unit shall be furnished with a polypropylene lifting harness or stainless steel chain. In the event that guide rails are used to facilitate easy removal, guide rail material must be stainless steel. All mechanical and electrical connections must provide easy disconnect accessibility for core unit removal and installation.

16a.10 MATERIALS - ACCESSORIES

A. All materials exposed to wastewater shall have inherent corrosion protection. Acceptable corrosion protection includes epoxy powder-coated cast iron, fiberglass, stainless steel, polyethylene, nylon, and PVC.

B. **CONTRACTOR shall supply one (1) spare grinder core pump, spare simplex control panel, wetwell cover with vent, two (2) pressure switches, two (2) contactors, one pair EQD connectors, for every twenty (20) grinder pump stations.** See line

item for “Spare Core Assembly and Controls for Residential Grinder Pump Station - Suitably Stored” on bid schedule. If quantity listed on bid schedule for this item differs from the quantity required by this specification the **greater** of the two quantities shall govern.

C. Electrical Systems & Components - All electrical systems and components shall be in full accordance with the current edition of the National Electrical Code. All power supply lines and control lines to the pump station shall be fully encased in rigid conduit meeting NEC requirements. All electrical systems and components in wet wells and enclosed spaces shall comply with National Electrical Code requirements. All conduits extending from the wet well to the control panel shall be sealed at the entrance to the control panel to prevent the intrusion of corrosive gases! The control circuitry shall be provided with “Ground Fault” interruption protection, which will de-energize the circuit in the event of any failure in the electrical integrity of the pump power cable.

16a.11 INSTALLATION

16a.11.1 Maintenance of Service: Wastewater service shall be maintained throughout the construction activity. No discharge to surface waters shall be allowed.

16a.11.2 Installation shall be in accordance with the Manufacturer's requirements and the referenced codes and specifications.

16a.11.3 Excavation: CONTRACTOR shall select means, methods, sequences and techniques of construction to both protect adjacent properties and to provide a stable, safe working environment. Decision as to whether to use sheet piles with wales and struts, manhole trench box, piles and lagging, or other methods of excavation support shall be the CONTRACTOR’S.

16a.11.4 Backfilling: Before backfilling is started, the excavated pit shall be cleared of all rubbish and debris and shall be de-watered. The backfill material shall be free of frozen lumps, vegetation and debris. Backfill material shall be placed in uniform horizontal layers not exceeding 6 inches in thickness (loose measure). As a precaution against the development of unbalanced stresses, the backfill shall be placed and compacted symmetrically about the excavation to 95% of Standard Proctor Density.

The grading shall be brought to the level of the existing topography or to the elevations established by the ENGINEER. Final dressing shall be accomplished by such methods as may be necessary to produce a uniform and smooth finish to all parts of the regrade. The surface shall be free from clods greater than two inches in diameter.

16a.12 TESTING

16a.12.1 Electrical: All electrical work shall be inspected and approved by an electrical inspector. Two copies of the Certificate of Approval shall be provided to the ENGINEER before final acceptance.

16a.12.2 Pump Test: The completed installation shall be given a running test of all equipment. While the pump(s) is/are running, all piping and seals shall be checked to insure that no leaks occur. All controls and warning indicators shall be checked for proper operation.

16a.12.3 Repair: Any defects or failure to meet the requirements of these specifications shall be promptly corrected by the CONTRACTOR by replacement. The decision of the OWNER as to whether or not the CONTRACTOR has fulfilled his obligation shall be final and binding on all parties.

16a.12.4 Factory Testing: Each grinder pump shall be submerged and operated for a minimum of 5 minutes. Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge line, level sensors and each unit's dedicated controls. All factory tests shall incorporate each of the above listed items. Actual appurtenances and controls which will be installed in the field, shall be particular to the tested pump only. A common set of appurtenances and controls for all pumps will not be acceptable. Certified test results shall be available upon request showing the operation of each grinder pump at two (2) different points on its curve, with the maximum pressure no less than 60 psi. The ENGINEER reserves the right to inspect such testing procedures with representatives of the OWNER, at the grinder pump manufacturer's facility.

16a.13 MEASUREMENT AND PAYMENT

16a.13.1 Measurement: Partial Service and Full Service - Simplex & Duplex Residential Grinder Stations shall be measured for payment as follows:

6a Full Service - Simplex Residential Grinder Pump Station,
Complete In Place Tested and In Service — EACH

6b Full Service - Duplex Residential Grinder Pump Station,
Complete In Place Tested and In Service — EACH

6d Pressure Sewer Lateral Assembly — EACH

6e Extra Vertical Height for Grinder
Pump Stations — VF

6f Spare Core Assembly and Controls for Residential Grinder

Pump Station - Suitably Stored EACH

NOTE – The 4" gravity sanitary sewer laterals installed with items 6a and 6b is INCIDENTAL to the grinder installation and <u>will not</u> be measured for separate payment. See sewer lateral specs for more information.

16a.13.2 Payment: Payment shall be made at the unit price ('EACH', 'LF', or 'VF' as applicable) for the actual number of units furnished / installed at the unit price set forth in the Contract. Payment shall constitute full compensation for all labor, materials, equipment and incidentals necessary to complete the work specified herein and no other separate payment shall be made. It is noted that the force main from the grinder station is a separate pay item and is not included as a part of this section.

-- THE END --

SECTION XVIb

TECHNICAL SPECIFICATIONS

TRIPLEX AND QUADPLEX RESIDENTIAL GRINDER PUMP STATIONS

16b.1 SCOPE

Provide all labor, materials, and equipment necessary for furnishing and installing underground submersible sewage pumping station(s) complete and in proper operating condition. The work includes all work shown or implied on the Drawings. The work includes (but is not limited to):

~~1a. TRIPLEX: The Contractor shall furnish, install, and start-up a complete factory-built and tested Triplex residential grinder pump unit consisting of fiberglass wet well, three (3) grinder pump cores, all suitably mounted on an integral stand of stainless steel, electrical quick disconnect (NEMA 6P), pump removal harness, discharge assembly/shut-off valve, anti-siphon/check valve assembly, electrical alarm assembly and all necessary internal wiring and controls. For ease of serviceability, all pump motor/grinder units shall be of like type and horsepower throughout the system.~~

1b. QUADPLEX: The Contractor shall furnish, install, and start-up a complete factory-built and tested Quadplex residential grinder pump unit consisting of fiberglass wet well, four (4) grinder pump cores, all suitably mounted on an integral stand of stainless steel, electrical quick disconnect (NEMA 6P), pump removal harness, discharge assembly/shut-off valve, anti-siphon/check valve assembly, electrical alarm assembly and all necessary internal wiring and controls. For ease of serviceability, all pump motor/grinder units shall be of like type and horsepower throughout the system.

2. Coordination of final station location and controls location with property owner and OWNER.

3. All related electrical work required to place the pumping unit in service including mounting the station's breaker box/control panel on the utility pole or structure as directed by property owner and OWNER and coordinating the power service drop (if needed).

4. Furnishing, constructing, and connecting the gravity lateral/cleanout to the structure/existing sewer system.

5. Furnishing and installation of the 2" pressure sewer lateral assembly at the point of connection of the service main with the interceptor force main.

6. All related site work including clearing, grading, trenching, backfilling, surface restoration, clean-up, etc.

PLEASE NOTE - Installation of the 2" service force main between the pump station and the trunk force main is covered under a separate section of these specifications and is not a part of this specification.

16b.2 QUALITY CONTROL

16b.2.1 Base Bidding: These specifications and the Drawings are based on the provision of an E-One submersible pumping unit. To simplify repairs and inventory of spare parts, the OWNER has mandated that the SUCCESSFUL BIDDER (CONTRACTOR) provide a single pump unit for use throughout the system.

16b.2.2 Guarantee: The manufacturer of the submersible pumping station shall guarantee all equipment supplied against defects in workmanship and material for a period of sixty (60) months after notice of OWNER's acceptance, but no greater than sixty-five (65) months after receipt of shipment. The OWNER will report any defects found during the warranty period to the MANUFACTURER. ALL replacement pumps and controls installed during as well as after the warranty period expires shall be warranted for sixty (60) months starting 3 months from date of shipment.

In the event a component fails to perform as specified or is proven defective in service during the warranty period, the Manufacturer shall repair or replace, at his discretion, such defective part without cost to the OWNER. He shall further provide, without cost, such labor as may be required to replace, repair, or modify major equipment components.

16b.2.3 Start-Up: The manufacturer shall provide the services of a factory-trained representative for a minimum period of two weeks on-site to perform initial start-up of the pumping units and to instruct the OWNER's operating personnel in the operation and maintenance of the equipment.

16b.3 SUBMITTALS

Each pump manufacturer must provide to the ENGINEER submittals as per the general conditions.

16b.4 MATERIALS - WET WELL

Fiberglass Construction**.** The tank shall consist of a single wall, laminated fiberglass construction. The resin used shall be of a commercial grade suitable for the environment. The reinforcing material shall be a commercial grade of glass fiber capable of bonding with the selected resin. The inner surface shall have a smooth finish and be free of cracks and crazing. The exterior tank surface shall be relatively smooth with no exposed fiber or sharp projections present.

The tank wall and bottom shall be of sufficient thickness and construction to withstand the imposed loading due to saturated soil at the specified burial depth for each available tank height. All station components must function normally when exposed to the external soil and

hydrostatic pressures developed at the specified burial depth. The tank bottom shall be reinforced with a fiberglass plate extending beyond the tank walls to support concrete anchoring, as required, to prevent flotation. Tanks shall include an aluminum checker plate cover, secured with threaded stainless steel fasteners, providing low profile mounting. This cover shall be a 1/3 – 2/3 split hinged cover for ease of access and pump removal.

The pump discharge piping components shall be 1-1/4" IPS and consist of PVC pipe fittings, a PVC ball valve, rated at 200 psi WOG, with integral union to facilitate piping disconnect. A 1-1/4" anti-siphon valve shall be integral to the piping inside the basin. Installation of the pump discharge piping shall require field assembly by the installing party. The tank shall have a discharge bulkhead, which terminates outside the tank wall with a 1-1/4" female pipe thread. The discharge bulkhead shall be factory installed and warranted by the manufacturer to be watertight. The tank shall be furnished with an EPDM grommet to accept a 6.625" OD (4" SDR35 PVC or SCH 40 PVC) inlet pipe.

The power and control cable shall be 32' in length standard and shall connect to the pump by means of the provided NEMA 6P electrical quick disconnect (EQD) and shall enter the tank through a watertight strain relief connector supplied by the manufacturer. Junction boxes will not be acceptable. Installation of the inlet grommet and cable strain relief shall require field penetration of the tank wall by the installing party. Provision shall be made for tank venting in the 4" inlet line in accordance with national and local plumbing code requirements.

See design drawings for tank sizes and details.

16b.5 MATERIALS – PUMPS

Pumps shall be of the progressive cavity or centrifugal design. The pumps must be capable of operating at negative total dynamic head without overloading the motor. Under no conditions shall in-line piping or valving be allowed to create a false apparent head.

The pump(s) operations curve shall be as follows:

Ops Point 1	6.0 GPM	@ 230 Ft
Ops Point 2	7.8 GPM	@ 185 Ft
Ops Point 3	10 GPM	@ 120 Ft
Ops Point 4	12 GPM	@ 70 Ft
Ops Point 5	15 GPM	@ 0 Ft

The pump(s) must be capable of delivering cleansing velocities as dictated by Division of Water of 2 feet/second against a continuous total dynamic head of up to 230 feet.

16b.5.1 PROGRESSIVE CAVITY PUMP: Each pump shall be a custom designed, integral, vertical rotor, motor driven, solids handling pump of the progressing cavity type with mechanical seal. The rotor shall be constructed of stainless steel. The stator shall be of a specifically compounded ethylene propylene synthetic elastomer. Buna-N is not acceptable as a stator material. The material shall be suited for domestic wastewater

service. Its physical properties shall include high tear and abrasion resistance, grease resistance, water and detergent resistance, temperature stability, good aging properties, and outstanding wear resistance.

16b.5.2 MECHANICAL SEAL: Each pump shall be provided with a mechanical shaft seal to prevent leakage between the motor and pump. The seal shall have a stationary ceramic seat and carbon rotating surface with faces precision lapped and held in position by a stainless steel spring.

16b.5.3 GRINDER: Each grinder shall be placed immediately below the pumping elements and shall be direct-driven by a single, one-piece stainless steel motor shaft. The grinder impeller assembly shall be securely fastened to the pump motor shaft. The grinder will be of the rotating type with a stamped, stainless steel shredder ring assembly spaced in accurate, close annular alignment with the driven impeller assembly, which shall carry hardened, stainless steel cutter bars.

This assembly shall be dynamically balanced and operate without vibration over the entire range of specified operating pressures. The grinder shall be constructed so as to eliminate clogging and jamming under all normal operating conditions including pump starting. Sufficient vortex action shall be created by the grinder pump, to scour the tank free of deposits or sludge banks, which would impair the operation of the pump. These requirements shall be accomplished by the following, in conjunction with the pump:

1. The grinder shall be positioned in such a way that solids are fed in an upward flow direction.

2. The grinder inlet shroud shall have a diameter no less than 5 inches.

The grinder shall be capable of reducing all components in normal domestic sewage, including a reasonable amount of "foreign objects," such as paper, wood, plastic, glass, rubber and the like, to finely divided particles that will pass freely through the passages of the pump and the 1-1/4" diameter discharge piping.

16b.6 MATERIALS - PUMP MOTORS

Each motor shall be a 240 Volt 60 Hertz, 1 Phase, capacitor start, ball bearing, squirrel cage induction type with a low starting current. Inherent protection against running overloads or locked rotor conditions for the pump motor shall be provided by the use of an automatic-reset, integral thermal overload protector incorporated into the motor.

16b.7 MATERIALS – CHECK & ISOLATION VALVES

A check valve and isolation valve for each pump shall be provided within the fiberglass wet well as depicted in the design drawings. Each pump discharge shall be equipped with a factory installed, gravity operated, flapper-type integral check valve secured to the stainless steel pump discharge elbow. Each check valve will provide a full-ported passageway when open, and shall introduce a friction loss of less than 6 inches of water at maximum rated flow. Working parts will be made of a 300 series stainless steel and

fabric reinforced synthetic elastomer to ensure corrosion resistance, dimensional stability, and fatigue strength. A non-metallic hinge shall be an integral part of the flapper assembly providing a maximum degree of freedom to assure seating even at a very low backpressure. The valve body shall be injection-molded parts made of glass filled thermoplastic.

A pump isolation valve and check valve shall also be provided in a standard meter box enclosure at the point of connection of the service main to the main pressure sewer header. See the "Pressure Sewer Lateral Assembly" section of these specifications for measurement and payment details.

16b.8 MATERIALS - CONTROLS

CONTROLS: All necessary controls shall be located in the control cover of the core unit. The control cover will be attached with stainless steel fasteners. The grinder pump will be furnished with a length of 6 conductor 14 gauge, type SJOW cable, pre-wired and watertight to meet UL requirements. Non-fouling waste water level detection for controlling pump operation shall be accomplished by monitoring the pressure changes in an integral air-bell level sensor connected to a pressure switch. The level detection device shall have no moving parts in direct contact with the wastewater. High-level sensing will be accomplished in the manner detailed above by a second, independent, air-bell sensor and pressure switch of the same type. Float switches will not be acceptable

To assure reliable operation of the pressure sensitive switches, each core shall be equipped with a breather assembly, complete with a suitable means to prevent entry of water into the motor compartment.

~~ALARM/DISCONNECT PANEL – TRIPLEX: Each Triplex Grinder Pump Station shall include one (1) NEMA 4X, Simplex Alarm/Disconnect Panel and one (1) NEMA 4X, Duplex Alternating Alarm/Disconnect Panel suitable for wall or pole mounting. The NEMA 4X enclosures shall be manufactured of corrosion resistant thermoplastic and be furnished with a hinged cover and pad lock.~~

~~The simplex panel shall contain one (1), 15 amp, double pole circuit breaker for the power circuit and one (1) 15 amp, single pole circuit breaker for the alarm circuit.~~

~~The duplex panel shall contain two (2), 15 amp, double pole circuit breakers for the power circuit and two (2) 15 amp, single pole circuit breakers for the alarm circuits.~~

ALARM/DISCONNECT PANEL - QUADPLEX: Each Quadplex Grinder Pump Station shall include two (2) NEMA 4X, Duplex Alternating Alarm/Disconnect Panels suitable for wall or pole mounting. The NEMA 4X enclosures shall be manufactured of corrosion resistant thermoplastic and be furnished with a hinged cover and pad lock.

Each duplex panel shall contain two (2), 15 amp, double pole circuit breakers for the power circuit and two (2) 15 amp, single pole circuit breakers for the alarm circuits.

THE ALARM/DISCONNECT PANEL(S) shall include a visual high-level alarm indicator. The visual alarm lamp shall be inside a red fluted lens mounted to the top of the enclosure in such a manner as to maintain NEMA 4 rating. The alarm sequence is to be as follows:

1. When liquid level in the tank rises above the alarm level, the contacts on the alarm pressure switch will close and the visual alarm will illuminate on the control panel.

2. The visual alarm will remain illuminated until the sewage level in the tank drops below the "off" setting of the alarm pressure switch.

16b.9 MATERIALS – CORE UNIT

Pump units with slide away couplings shall be provided. The slide away coupling shall allow the pump to be installed or removed without requiring personnel to enter the wet well. The Grinder Pump Station(s) shall have easily removable core assemblies consisting of the pump, motor, grinder, all motor controls, check valve, anti-siphon valve, EQD and wiring. Each grinder pump core unit shall be furnished with a polypropylene lifting harness or stainless steel chain. In the event that guide rails are used to facilitate easy removal, guide rail material must be stainless steel. All mechanical and electrical connections must provide easy disconnect accessibility for core unit removal and installation.

16b.10 MATERIALS - ACCESSORIES

A. All materials exposed to wastewater shall have inherent corrosion protection. Acceptable corrosion protection includes epoxy powder-coated cast iron, fiberglass, stainless steel, polyethylene, nylon, and PVC.

B. **Contractor shall supply one (1) spare grinder core pump, spare duplex alternating control panel, wetwell cover with vent, two (2) pressure switches, two (2) contactors, EQD pair of connectors for every twenty (20) grinder pumps installed.** See line item for "Spare Core Assembly and Controls for Residential Grinder Pump Station - Suitably Stored" on bid schedule. If quantity listed on bid schedule for this item differs from the quantity required by this specification the **greater** of the two quantities shall govern.

C. Electrical Systems & Components - All electrical systems and components shall be in full accordance with the current edition of the National Electrical Code. All power supply lines and control lines to the pump station shall be fully encased in rigid conduit meeting NEC requirements. All electrical systems and components in wet wells and enclosed spaces shall comply with National Electrical Code requirements. All conduits extending from the wet well to the control panel shall be sealed at the entrance to the control panel to prevent the intrusion of corrosive gases! The control circuitry shall be provided with "Ground Fault" interruption protection, which will de-energize the circuit in the event of any failure in the electrical integrity of the pump power cable.

16b.11 INSTALLATION

16b.11.1 Maintenance of Service: Wastewater service shall be maintained throughout the construction activity. No discharge to surface waters shall be allowed.

16b.11.2 Installation shall be in accordance with the Manufacturer's requirements and the referenced codes and specifications.

16b.11.3 Excavation: CONTRACTOR shall select means, methods, sequences and techniques of construction to both protect adjacent properties and to provide a stable, safe working environment. Decision as to whether to use sheet piles with wales and struts, manhole trench box, piles and lagging, or other methods of excavation support shall be the CONTRACTOR'S.

16b.11.4 Backfilling: Before backfilling is started, the excavated pit shall be cleared of all rubbish and debris and shall be de-watered. The backfill material shall be free of frozen lumps, vegetation and debris. Backfill material shall be placed in uniform horizontal layers not exceeding 6 inches in thickness (loose measure). As a precaution against the development of unbalanced stresses, the backfill shall be placed and compacted symmetrically about the excavation to 95% of Standard Proctor Density.

The grading shall be brought to the level of the existing topography or to the elevations established by the ENGINEER. Final dressing shall be accomplished by such methods as may be necessary to produce a uniform and smooth finish to all parts of the regrade. The surface shall be free from clods greater than two inches in diameter.

16b.12 TESTING

16b.12.1 Electrical: All electrical work shall be inspected and approved by an electrical inspector. Two copies of the Certificate of Approval shall be provided to the ENGINEER before final acceptance.

16b.12.2 Pump Test: The completed installation shall be given a running test of all equipment. While the pump(s) is/are running, all piping and seals shall be checked to insure that no leaks occur. All controls and warning indicators shall be checked for proper operation.

16b.12.3 Repair: Any defects or failure to meet the requirements of these specifications shall be promptly corrected by the CONTRACTOR by replacement. The decision of the OWNER as to whether or not the CONTRACTOR has fulfilled his obligation shall be final and binding on all parties.

16b.12.3.2 Factory Testing: Each grinder pump shall be submerged and operated for a minimum of 5 minutes. Included in this procedure will be the testing of all ancillary components such as, the anti-siphon valve, check valve, discharge line, level sensors and each unit's dedicated controls. All factory tests shall incorporate each of the above listed

items. Actual appurtenances and controls which will be installed in the field, shall be particular to the tested pump only. A common set of appurtenances and controls for all pumps will not be acceptable. Certified test results shall be available upon request showing the operation of each grinder pump at two (2) different points on its curve, with the maximum pressure no less than 60 psi. The ENGINEER reserves the right to inspect such testing procedures with representatives of the OWNER, at the grinder pump manufacturer's facility.

16b.13 MEASUREMENT AND PAYMENT

16b.13.1 Measurement: There shall be no measurement for payment as the work shall be lump sum.

16b.13.2 Payment: Payment shall be made at the Lump Sum Contract Price for each submersible pumping station as follows:

6c	Full Service - Quadplex Residential Grinder Pump Station, Complete, In-Place Tested and In-Service	LS

Payment shall constitute full compensation for all labor, materials, equipment and incidentals necessary to complete the work as specified herein and no other separate payment shall be made. It is noted that the force main from the grinder station is a separate pay item and is not included as a part of this section.

-- THE END --

SECTION XVII

TECHNICAL SPECIFICATIONS

ODOR CONTROL

17.1 SCOPE

Provide all labor, materials, and equipment necessary for furnishing and installing an odor control feed system complete and in proper operating condition. The work includes all work shown or implied on the Drawings. The work includes (but is not limited to):

1. Coordination of final odor control feed system location and controls location with property owner and OWNER.

2. Furnishing, installation, and start-up of a factory built liquid odor control feed system of the type as designated on the plans, complete with concrete slab, electrical, plumbing, controls enclosure, and controls as per manufacturer's recommendations.

3. All related electrical work required to place the odor control feed system in service including connecting the system's power to the pump station power supply.

4. Provide one (1) complete bulk tank of odor control chemical, in underground vault.

17.2 QUALITY CONTROL

17.2.1 Base Bidding: These specifications and the Drawings are based on the provision of a liquid odor control "Nitra-Nox drip style" feed system as manufactured by Aulick Chemical Solutions, Inc or approved equal. To simplify repairs and inventory of spare parts, the OWNER has mandated that the SUCCESSFUL BIDDER (CONTRACTOR) provide a single odor control feed system manufacturer/supplier for use throughout the system.

17.2.2 Guarantee: The manufacturer of the odor control feed system shall guarantee all equipment supplied against defects in workmanship and material for a period of sixty (60) months after notice of OWNER's acceptance, but no greater than sixty-five (65) months after receipt of shipment. The OWNER will report any defects found during the warranty period to the MANUFACTURER.

In the event a component fails to perform as specified or is proven defective in service during the warranty period, the Manufacturer shall repair or replace, at his discretion, such defective part without cost to the OWNER. He shall further provide, without cost, such labor as may be required to replace, repair, or modify major equipment components.

17.2.3 Start-Up: The manufacturer shall provide the services of a factory-trained representative for a minimum period of two weeks on-site to perform initial start-up and

calibration of the odor control feed system and to instruct the OWNER's operating personnel in the operation and maintenance of the equipment.

17.3 SUBMITTALS

Odor control system manufacturer must provide to the ENGINEER submittals as per the general conditions.

17.4 MATERIALS – CHEMICALS

17.4.1 Nitra-Nox: Nitra-Nox is a proprietary organic liquid chemical for control of wastewater odors. Nitra-Nox does not contain any hazardous components and has a verified shelf life of 2 years. Nitra-Nox freezes at 25 degrees Celsius. Nitra-Nox has the capability of removing H_2S in liquid form down to concentrations of less than or equal to 0.1 mg/l in liquid.

17.5 MATERIALS – EQUIPMENT

17.5.1 Concrete Pad: CONTRACTOR shall construct a concrete pad with dimensions as per plans and structural requirements as recommended by the approved odor control system manufacturer.

17.5.2 Cabinet: The odor control feed system shall contain one (1) NEMA 4X stainless steel cabinet with two (2) lockable handles and should be anchored sufficiently per manufacturer's recommendations.

17.5.3 Control Panel: A control panel shall be located inside the stainless steel cabinet and shall be non-metallic and corrosion resistant with dual 96 increment timers, dual on/off switches, and dual indicator lamps.

17.6 MATERIALS – CHEMICAL FEED SYSTEM

17.6.1 Tank: System must contain one (1) un-insulated high density polyethylene tank rated at 12.5 lbs. per gallon and having a capacity of that designated on the plans for each odor control system. The tank shall come equipped with 2" camlock attachment, valves, strains, & SCH 80 PVC plumbing as designated on the plans.

17.6.2 Chemical Feed Pumps: The odor control feed system shall contain two (2) pumps manufactured from Lutz Jesco America Corp or equal. These pumps shall be of comparable type to MAGDOS DE 8 Solenoid Actuated Diaphragm Pumps with Pentabloc (anti-siphoning device) and shall have a capacity of 1.6 gallons per hour max flow rate with a turn down rate from 0-100% of stroke frequency.

17.6.3 Calibration Column: A calibration column shall be installed in the metering pump's suction line in order to determine the system's required flow rate. The calibration column

shall be sized to handle maximum flows of 3.2 GPH (1.6 GPH per pump) based on the maximum pump flow rate.

17.6.4 All PVC pipe for the system shall be of type 1/2" SCH 80 PVC.

17.6.5 Lift Station Tap: A 1" drilled hole is required for a ½" SCH 80 PVC chemical feed line. The hole shall be drilled level with the chemical line feed into the side of the lift station wet well. Pipe shall extend 12" beyond inside edge of concrete wetwell wall.

17.7 INSTALLATION

17.7.1 Installation shall be in accordance with the Manufacturer's requirements and the referenced codes and specifications.

17.7.2 Chemicals: During "start up" **the CONTRACTOR is required to completely fill the odor control chemical feed bulk tank** with the appropriate odor control chemical (Nitra-Nox). Special payment will not be made for chemicals and this item shall be incorporated into the Contractor's lump sum bid for the odor control chemical feed system.

17.8 TESTING

17.8.1 Electrical: All electrical work shall be inspected and approved by an electrical inspector. Two copies of the Certificate of Approval shall be provided to the ENGINEER before final acceptance.

17.8.2 System Test: The completed installation shall be given a running test of all equipment. While the pump(s) is/are running, all piping and seals shall be checked to insure that no leaks occur. All controls and warning indicators shall be checked for proper operation.

17.8.3 Repair: Any defects or failure to meet the requirements of these specifications shall be promptly corrected by the CONTRACTOR by replacement. The decision of the OWNER as to whether or not the CONTRACTOR has fulfilled his obligation shall be final and binding on all parties.

17.9 MEASUREMENT AND PAYMENT

17.9.1 Measurement: There shall be NO measurement as the work shall be Lump Sum.

17.9.2 Payment: Payment shall be made at the Lump Sum Contract Price for each liquid odor control system as follows:

Item 6h – "Furnish and Install Liquid Odor Control System
Complete with all Necessary Controls and Accessories"

Payment as specified shall constitute full compensation for all labor, materials, equipment

and incidentals necessary to complete the work specified herein.

-- THE END --

SECTION XVIII

TECHNICAL SPECIFICATIONS

SUBMERSIBLE WASTEWATER PUMPING STATION – MAGNOLIA DRIVE LIFT STATION

18.1 SCOPE

Provide all labor, materials, and equipment necessary for furnishing and installing underground submersible sewage pumping station(s) complete and in proper operating condition. The work includes all work shown or implied on the Drawings. The work includes (but is not limited to):

1. Provision of a motor control center complete with control panel, service entrance, disconnects as required by AEP, and meter base;

2. Installation of one (1) precast concrete wet well and one (1) valve pit complete with aluminum access hatches.

3. Installation of two (2) new submersible pumping units complete with guide rails;

4. Installation of miscellaneous pipe, valving, etc.;

5. Associated electrical work, including power service drop in the Owner's name;

6. Construction of flow meter in meter vault at lift station;

7. Gravel surfacing of access road and limits of site inside security fence. At the end of construction the existing gravel driveway adjacent lift station site must be restored to a condition equal to, or better than it was prior to construction start;

8. All related site work including clearing, grading, trenching, backfilling, surface restoration, clean-up, installation of chain link fencing, site access, water service and yard hydrant, security lighting, etc.

9. Station startup with pumps and controls vendor, Engineer, station, Owner, Contractor and Inspector.

18.2 QUALITY CONTROL

18.2.1 Base Bidding: These specifications and the Drawings are based on provision of **Model 4VC400M4-40Hp Submersible Grinder Pump Units as manufactured by Myers**. The SUCCESSFUL BIDDER (CONTRACTOR) may submit an 'or equal' submittal for consideration in accordance with the procedures set forth in the General Conditions (unless his bid write-in precludes same).

18.2.2 Guarantee: The manufacturer of the submersible pumping station shall guarantee all equipment supplied against defects in workmanship and material for a period of five (5) years or 10,000 hours.

In the event a component fails to perform as specified or is proven defective in service during the guaranteed period, the Manufacturer shall repair or replace, at his discretion, such defective part. He shall further provide, without cost, such labor as may be required to replace, repair, or modify major equipment components.

18.2.3 Start-Up: The manufacturer shall provide services of a factory-trained representative for a maximum period of one day on-site to perform initial start-up of the pumping units and to instruct the OWNER's operating personnel in the operation and maintenance of the equipment.

18.3 SUBMITTALS

18.3.1 Submit six (6) bound copies of the following:

1. Manufacturer's warranty/guarantee.

2. Pump station Shop Drawings complete with station drawing, electrical schematics, and accessory components.

3. Pump station O & M Manuals. Manuals are to provide basic instructions for preventative and cyclic maintenance, sources of spare parts, etc.

18.4 MATERIALS - WET WELL & VALVE PIT

18.4.1 Pit: The wet well(s) and valve pit shall be constructed of HDPE pipe (of the diameters indicated on the Drawings) meeting the requirements of the manhole specifications provided herein and as indicated on the Drawings.

18.4.2 Access Hatch: Aluminum access hatches with clear openings of the size specified in the Drawings. All access hatches shall be rated for a live load of 150 psf. All access hatches shall be equipped with fall safety protection grating. Grating shall be hinged and easily accessible. Grating shall also be lockable in the open position to prevent closure during entry. Grate shall be rated for 150 psf live load (minimum).

18.5 MATERIALS - PUMPS

18.5.1 Quality Control & Performance: See Pump Performance Table on the applicable sheet of the Drawings.

18.5.2 Construction:

1. Type – Submersible grinder.

2. Volute/Shell - High strength grey cast iron, ASTM A-48, Class 30. All exposed nuts and bolts shall be type 304 stainless steel or brass construction. All surfaces, coming into contact with sewage, other than stainless steel or brass, shall be protected by an approved sewage resistant coating.

   The pump casing shall be of the volute design, of one piece construction, gray cast iron, ASTM A-48, Class 30, having centerline discharge to minimize clogging or flow interference, and to provide the proper weight distribution for use with the Easy-Lift disconnect system.

3. Impeller - ASTM A-48, Class 35B gray iron (or ASTM A-532 (Alloy III A) 25% chrome cast iron). The impeller shall be of a single-vane, fully shrouded enclosed design and shall have large passages to provide smooth flow transition and unimpeded passage of large spherical solids. All impellers shall be statically and dynamically balanced to ISO 1940, G.6.3. Solids passing capability of the impeller offered shall be clearly indicated on the manufacturer's performance curve.

4. Seals - Tandem mechanical shaft seal system. Upper seal-tungsten carbide ring against carbon ring. Lower seal - two tungsten carbide rings.

5. Shaft - The shaft shall be stainless steel – ASTM A479 S43100-T. Shaft sleeves will not be acceptable.

6. Junction Chamber - Electric cable shall enter motor through watertight elastomer grommets. Water sealing to be functionally separated from strain relief.

7. Grinder/Shredding Ring – Recessed, 440 SSTM 58-60 Rockwell or equal.

18.6 MATERIALS - SUBMERSIBLE PUMP MOTORS

1. Class – Submersible

2. Construction - NEMA B design, squirrel cage, induction, shell type design, housed in an oil-filled water tight chamber.

3. Power Service- See Pump Performance Table on the applicable sheet of the Drawings.

4. Speed - See Pump Performance Table on the applicable sheet of the Drawings.

5. Insulation - Class 'H' Suitable to 180 Deg. C

6. Electrical – As required by pump manufacturer

7. Motor horsepower shall be sufficient so that the pump is non-overloading throughout its entire performance curve, from shut-off to run-out. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of 65 feet or greater.

18.7 ADJUSTABLE FREQUENCY DRIVES (VFD)

18.7.1 General Scope

a. This section is to cover a complete Variable Frequency motor Drive (VFD) consisting of a pulse width modulated (PWM) inverter designed for use on a standard NEMA Design B induction motor.

b. The drive manufacturer shall supply the drive and all necessary controls as herein specified. The manufacturer shall have been engaged in the production of this type of equipment for a minimum of 20 years.

18.7.2 Quality Assurance

a. Referenced Standards:
   i. Institute of Electrical and Electronic Engineers (IEEE)
      1. Standard 519-1992, IEEE Guide for Harmonic Content and Control
   ii. Underwriters laboratories
      1. UL508C
   iii. National Electrical Manufacturer's Associate (NEMA)
      1. ICS 7.0, AC Adjustable Speed Drives
   iv. IEC 16800 Parts 1 and 2

b. Qualifications:
   i. VFDs and options shall be UL listed as a complete assembly. VFDs that required the customer to supply external fuses for the VFD to be UL listed are not acceptable. The base VFD shall be UL listed for 100 KAIC without the need for input fuses.
   ii. Acceptable Manufactures
      1. ABB ACH Series.
      2. VFDs that are manufactured by a third party and "brand labeled" shall not be acceptable.

18.7.3 Variable Frequency Drives

a. The VFD package as specified herein shall be enclosed in a UL listed Type 12 enclosure, completely assembled and tested by the manufacturer in an ISO9001 facility. The VFD tolerated voltage window shall allow the AFD to operate from a line of +30% nominal, and -35% nominal voltage as a minimum.

i. Environmental operating conditions: 0 to 40° C continuous. VFS's that can operate at 40° C intermittently (during a 24 hour period) are not acceptable and must be oversized. Altitude 0 to 3300 feet above sea level, less than 95% humidity, non-condensing.
ii. Enclosure shall be rated UL type 12 and shall be UL 1995 listed as a plenum rated VFD. VFDs without these ratings are not acceptable.

b. All VFDs shall have the following standard features:
i. All VFDs shall have the same customer interface, including digital display, and keypad regardless of horsepower rating. The keypad shall be removable, capable of remote mounting and allow for uploading and downloading of parameter settings as an aid for start-up of multiple VFDs.
ii. The keypad shall include Hand-Off-Auto selections and manual speed control. The drive shall incorporate "bumpless transfer" of speed reference when switching between "Hand" and "Auto" modes. There shall be fault reset and "Help" buttons on the keypad. The Help button shall include "on-line" assistance for programming and troubleshooting.
iii. There shall be a built-in time clock in the VFD keypad. The clock shall have a battery backup with 10 years minimum life span. The clock shall be used to date and time stamp faults and record operating parameters at the time of fault. If the battery fails, the VFD shall automatically revert to hours of operation since initial power up. The clock shall also be programmable to control start/ stop functions, constant speeds, PID parameter sets and output relays. The VFD shall have a digital input that allows an override to the time clock (when in the off mode) for a programmable time frame. There shall be four (4) separate, independent time functions that have both weekday and weekend settings.
iv. The VFDs shall utilize pre-programmed application macro's specifically designed to facilitate start-up. The Application Macros shall provide one command to reprogram all parameters and customer interfaces for a particular application to reduce programming time. The VFD shall have two user macros to all the end user to create and save custom settings.
v. The VFD shall have cooling fans that are designed for easy replacement. The fans shall be designed for replacement without requiring removing the VFD from the wall or removal of circuit boards. The VFD cooling fans shall operate only when required.
vi. The overload rating of the drive shall be 140% of its normal duty current rating for 1 minute every 10 minutes, 150% overload for 2 seconds. The minimum FLA rating shall meet or exceed the values in the NEC/UL table 430-150 for 4-pole motors.

vii. The VFD shall include a coordinated AC transient protection system consisting of 4-120 joule rated MOV's (phase to phase and phase to ground), a capacitor clamp and 5% impedance reactors.

c. All VFDs to have the following adjustments:
   i. Three (3) programmable critical frequency lockout ranges to prevent the AFD from operating the load continuously at an unstable speed.
   ii. Two (2) PID Set point controllers shall be standard in the drive, allowing pressure or flow signals to be connected to the VFD.
   iii. Two (2) programmable analog inputs shall accept current or voltage signals.
   iv. Two (2) programmable analog outputs (0-20ma or 4-20ma). The outputs may be programmed to output proportional to Frequency, Motor Speed, Output Voltage, Output Current, Motor Torque, Motor Power (kW), DC Bus voltage, Active Reference.
   v. Three (3) programmable digital Form-C relay outputs. The relays shall include programmable on and off delay times and adjustable hysteresis. The relays shall be rated for maximum switching current 8 amps at 24 VDC and 0.4 A at 250 VAC; Maximum voltage 300 VDC and 250 VAC; continuous current rating 2 amps RMS.
   vi. Seven (7) programmable preset speeds
   vii. Two (2) independently adjustable accel and decel ramps with 1 - 1800 seconds adjustable time ramps.
   viii. The VFD shall include a motor flux optimization circuit that will automatically reduce applied motor voltage to the motor to optimize energy consumption and audible motor noise.
   ix. The VFD shall include a carrier frequency control circuit that reduces the carrier frequency based on actual VFD temperature that allows the highest carrier frequency without derating the VFD or operating at high carrier frequency only at low speeds.
   x. The VFD shall include password protection against parameter changes.

d. The Keypad shall include a backlit LCD display. The display shall be in complete English words for programming and fault diagnostics (alpha-numeric codes are not acceptable). The keypad shall utilize the following assistants:
   i. Start-up assistants
   ii. Parameter assistants
   iii. Maintenance assistant
   iv. Troubleshooting assistant

b. All applicable operating values shall be capable of being displayed in engineering (user) units. The display shall be in complete English words (alpha-numeric codes are not acceptable).

c. Serial Communications
   i. The VFD shall have an RS-485 port as standard. The standard protocols shall be Modbus, Optional protocols for LonWorks, Profibus, Ethernet, and DeviceNet shall be available. Each individual drive shall have the protocol in the base VFD. The use of third party gateways and multiplexers is not acceptable. All protocols shall be "certified" by the governing authority. Use of non-certified is not allowed.
   ii. The DDC system shall also be able to monitor if the motor is running in the VFD mode or bypass mode (if bypass is specified) over serial communications. A minimum of 15 field parameters shall be capable of being monitored.

d. EMI/RFI filters. Each VFD shall include EMI/RFI filters. The onboard filters shall allow the VFD assembly to be CE Marked and the VFD shall meet product standard EN 61800-3 for the First Environment restricted level.

18.7.4 Installation

a. Installation shall be the responsibility of the mechanical contractor. The contractor shall install the drive in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.

b. Power wiring shall be completed by the electrical contractor. The contractor shall complete all wiring in accordance with the recommendations of the VFD manufacturer as outlined in the installation manual.

18.7.5 Startup

a. Certified factory start-up shall be provided for each drive by a factory authorized service center. A certified start-up form shall be filled out for each drive with a copy provided to the owner, and a copy kept on file at the manufacturer.

18.7.6 Product support

a. Factory trained application engineering and service personnel that are thoroughly familiar with the VFD products offered shall be locally available at both the specifying and installation locations. A 24/365 technical support line shall be available on a toll-free line.

18.7.7 Warranty

a. Warranty shall be 24 months from the date of certified start-up, not to exceed 30 months from the date of shipment. The warranty shall include all parts labor, travel time and expenses. There shall be 365/24 support available via a toll free phone number.

18.7.8 Transient Voltage Surge Suppressor (TVSS)

a. The control panel shall be furnished with a TVSS having a rating of 100ka/phase and carry a 20 year warranty. APT model TE-XDS-10

18.8 MATERIALS - CONTROLS

A. General: The motor control centers shall be completely self contained. Each center shall provide:

1. Combination circuit breaker/overload unit providing overload protection, short circuit protection, reset and disconnect for all phases.

2. Hand/Off automatic pump operations selector switch.

3. 120 volt control panel pilot circuitry.

4. Automatic alternator.

5. The pumps shall be back up controlled by mercury float displacement switches. Four floats shall be provided for each wet well, and each with an appropriate length of cord: (See 18.9 for additional information)

   a) Float One – All pumps off
   b) Float Two - Lead pump on
   c) Float Three - Two pumps on – light activates
   d) Float Four - High water alarm – horn and light activities

6. Control panel shall be able to supply adequate 120 volt power for connection of site security light, odor control feed system, future telemetry, magnetic flow meter and convenience outlets for operation of power tools, etc.

7. A NEMA 4 full dead front panel shall be furnished and installed appropriate for the electrical characteristics of the pump station. All aluminum pump control panels shall be a minimum size of 30″ wide x 30″ high x 8″ deep. Convenience receptacles shall be installed in the dead front door panel and be accessible from the front. All other pump controls and switches shall be mounted on a second internal door protected from the environment.

B. Construction: Panel to be NEMA 4X stainless steel construction.

C. Accessories: The panel shall include the following accessories:

1) Alarms

a) Pilot Lights. All alarm conditions shall trigger a front of control panel pilot light indicating the nature of the failure. In the absence of an alarm condition the pilot light shall be off. In an alarm condition the pilot light shall glow full strength and flash. All pilot lights/alarm buttons/etc shall be "push to test" for indicating the integrity of the bulb.

b) Common Annunciation. All alarm conditions shall trigger an external 60W light to notify the operator of an alarm condition. Only the high water alarm shall trigger the audible horn to alert the operator of a high water alarm condition.

c) High Wet Well Level

d) Pump Seal Leak

e) Over Temperature

2) The following items shall be provided:

1) Condensation Heater

2) Elapsed Time Meters

3) Pump Run Lights

4) Lightning Arrestor

5) Three-phase power monitor (phase loss, low voltage, phase reversal). Any of these conditions shall trigger external alarm light and alarm horn.

6) Pole Mounting Bracket

7) 2-110 Volt GFCI, Waterproof, Convenience Outlets Mounted on the exterior (front or side) of the main pumps control panel for operator

use.

8) 1-110 volt GFCI, convenience outlet mounted on the interior of the main pumps control panel for operator use.

18.9 MATERIALS – TELEMETRY

No telemetry on this station. Panel shall have space and connections inside for future hookup of telemetry.

18.10 MATERIALS - OTHER

N/A.

18.11 MATERIALS - SLIDE AWAY COUPLING

Pump units with slide away couplings shall be provided. The slide away coupling shall allow the pump to be installed or removed without requiring personnel to enter the wet well.

A galvanized lifting chain of the appropriate weight and length shall be provided for each pump supplied.

18.12 MATERIALS - VALVE PIT

18.12.1 Plumbing: All pipe, fittings, and joints in the valve pit 3" in diameter and larger shall be ductile iron pipe of the size indicated in the Drawings conforming to the latest AWWA specifications C151 with a pressure class of 350 as designated in AWWA C150.

The interior of the pipe shall be protected from corrosion by a cement mortar lining overlain with a bituminous seal coat meeting AWWA C104 (ANSI A21.4). The thickness of the lining shall be as set forth in Section 4-10-1 of AWWA C104. The exterior of the pipe shall receive either a coal tar or asphalt base coating a minimum of 1 mil thick.

All pipe, fittings, and joints in the valve pit smaller than 3" in diameter shall be SCH 80 PVC pipe.

18.12.2 Check Valve: Check valves shall be horizontal swing checks with outside spring and lever -- flanged joint. The valve body shall be cast iron and the trim shall be bronze. Clow F 5381 or equal.

18.12.3 Plug Valve: Valves shall be of the non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as those shown on the plans. Flanged valves shall be drilled to the ANSI 125/150-lb. Standard.

Valve bodies shall be of the ASTM A126 Class B Cast Iron. Bodies in 4" and larger shall be furnished with 1/8" welded overlay seam of not less than 90% pure nickel. Seat area shall be raised with raised surface completely covered with weld to insure that the plug face only contacts the nickel. Screwed in seats shall not be acceptable.

Port areas shall be full flow and unobstructed when open. Port area shall be rectangular and not less than 80% of full pipe area.

Plugs shall be of the ASTM A126 class B cast iron. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and the body seat, with the plug in the close position, shall be externally adjustable in the field with the valve in the line under pressure.

Bearings shall be sleeve type metal bearings and shall be sintered, oil impregnated permanently lubricated type 316 ASTM A743 Grade CD-8M.

Valve shaft seals shall be of the multiple V-ring type and shall be externally adjustable and repackable without removing the bonnet or actuator from the valve. Valve utilizing O-ring seals, non-adjustable packing, or so-called grit-excluders shall not be acceptable.

Pressure rating shall be 175 psi for valves through 12" and 150 psi for valves 14" through 72". Each valve shall be given a hydrostatic and seat test results being certified when the required by the specifications.

Valves shall be furnished with actuators as shown on the plans.

All valves shall be as manufactured by DeZurik, model PEC or pre-approved equal.

18.12.4 Pressure Gage: Pressure gages shall be installed on the discharge header as noted in the plans. The pressure gages shall have a minimum face diameter of 4.5 inches, read 0 to 200 FEET HEAD in 2' increments and be accurate to 1/2 percent of scale. The pressure gages shall be equipped with an isolation valve, snubber and protective diaphragm suitable for use with wastewater.

18.12.5 Ball Valve: Ball valves shall be bronze valves equal to a Grainger 4A800.

18.12.6 Emergency Quick Disconnect: Provide an emergency quick disconnect with valve and fittings as shown on the Plans.

18.12.7 Air Release: Furnish and install a combination air/vacuum release valve equal to A.R.I D-025.

18.12.8 Flow Meter: Furnish and install a 3-inch diameter electromagnetic wastewater flow meter assembly on the pump station discharge line outside the valve pit. Furnish and install digital flow meter readout and controls in weather proof housing and mount adjacent duplex control panel for easy viewing. Ultrasonic flow meter shall be Proline Promag 10W, MJK,

or approved equal and shall have totalizing and recording capabilities. Data shall be storable and retrievable for a period of up to 12 months prior while taking a flow reading every 10 seconds. The recorder shall be adjustable to take readings every 1 second up to once every minute (or more).

Flow meter assembly shall include installation of flow meter, controls, grounding rings for HDPE pipe, all necessary bends, fittings, electrical work, plastic meter box and lid, and all other labor and materials necessary to put flow meter into service.

18.12.9 Gate Valve: See gate valves specification. Gate valves in valve vault shall be hand wheel operated.

18.12.10 Paint: All plumbing in valve pit shall be painted as per AWWA specifications color scheme.

18.13 MATERIALS - ACCESSORIES

A. Wet Well Piping - All interior wet well piping 3" in diameter and larger shall be SDR11 HDPE. All interior wet well piping less than 3" in diameter shall be ductile iron pipe of the size indicated in the drawings.

B. Spare Parts - A complete replacement pump shaft seal assembly shall be provided for each pump station. The replacement seal assembly shall be packed in a suitable container along with complete installation instructions. A spare impeller shall also be provided for each pump station.

C. Electrical Systems & Components - All electrical systems and components shall be in full accordance with the current edition of the National Electrical Code. All electrical systems and components in wet wells and enclosed spaces shall comply with National Electrical Code requirements for Class I, Group D, Division 1 locations and shall be suitable for use in corrosive environments. All conduits extending from the wet well to the control panel shall be sealed at the entrance to the control panel to prevent the intrusion of corrosive gases! The control circuitry shall be provided with "Ground Fault" interruption protection that will de-energize the circuit in the event of any failure in the electrical integrity of the pump power cable. Further, all convenience outlets shall be ground fault protected.

18.14 INSTALLATION

18.14.1 Maintenance of Service: Wastewater service shall be maintained throughout the construction activity. No discharge to surface waters shall be allowed.

18.14.2 Installation shall be in accordance with the Manufacturer's requirements and the referenced codes and specifications.

18.14.3 Excavation: CONTRACTOR shall select means, methods, sequences and techniques of construction to both protect adjacent properties and provide a stable, safe working environment. Decision as to whether to use sheet piles with wales and struts, manhole trench box, piles and lagging, or other methods of excavation support shall be the CONTRACTOR'S.

18.14.4 Backfilling: Before backfilling is started, the excavated pit shall be cleared of all rubbish and debris and shall be de-watered. The backfill material shall be free of frozen lumps, vegetation and debris. Backfill material shall be placed in uniform horizontal layers not exceeding 6 inches in thickness (loose measure). As a precaution against the development of unbalanced stresses, the backfill shall be placed and compacted symmetrically about the excavation to 95% of Standard Proctor Density.

The grading shall be brought to the level of the existing topography or to the elevations established by the ENGINEER. Final dressing shall be accomplished by such methods as may be necessary to produce a uniform and smooth finish to all parts of the regrade. The surface shall be free from clods greater than two inches in diameter.

18.14.5 Paving: Provide bituminous, or gravel, paving as indicated by the Drawings. Restore all damaged curbs.

18.14.6 Fence: The chain link fence enclosure shall be erected in accordance with Kentucky Department of Highways Standard Drawings RFC-002-01 and RFG-005-02 and Section 722 of Standard Specifications for Road and Bridge Construction.

18.14.7 Sewer Line Relocations: Relocate all existing influent force mains and gravity sewers from the existing wet well to the newly constructed flow diversion manhole as depicted on the plans.

18.14.8 Connect to Existing: Connect new wet well and valve pit to existing valve pit and wet well as directed on the plans.

18.15 TESTING

18.15.1 Electrical: All electrical work shall be inspected and approved by an electrical inspector. Two copies of the Certificate of Approval shall be provided to the ENGINEER before final acceptance.

18.15.2 Pump Test: The completed installation shall be given a running test of all equipment. While the pump(s) is/are running, all piping and seals shall be checked to insure that no leaks occur. The pressure gages installed in the valve pit shall be used to monitor

static, operating, and shut off head conditions for each pumping unit. All controls and warning indicators shall be checked for proper operation.

18.15.3 Repair: Any defects or failure to meet the requirements of these specifications shall be promptly corrected by the CONTRACTOR by replacement. The decision of the OWNER as to whether or not the CONTRACTOR has fulfilled his obligation shall be final and binding on all parties.

18.16 MEASUREMENT AND PAYMENT

18.16.1 Measurement: There shall be no measurement for payment as the work shall be lump sum.

18.16.2 Payment: Payment shall be made at the Lump Sum Contract Price for each submersible pumping station as follows:

"Magnolia Lift Station, Complete In-Place Tested and Ready"

Payment as specified shall constitute full compensation for all labor, materials, equipment and incidentals necessary to complete the work specified herein.

-- THE END --

SECTION XIXa

TECHNICAL SPECIFICATIONS

CONCRETE SANITARY SEWER MANHOLES

19a.1 SCOPE

Furnish all labor, material, equipment and incidentals required to install complete and ready for operation all manholes and appurtenances as shown on the Drawings and as specified herein.

19a.2 QUALITY CONTROL

Submit five copies of the following:

A) Documentation of pre-cast components to be incorporated in manholes including bases, rings, tops, gaskets, exterior water-proofing coatings and frame with lid.

19a.3 MATERIALS AND INSTALLATION

Manholes shall be installed at the end of each line, at all changes in grade, size, or alignment and at all intersections. Manholes of the form and dimensions shown on the approved plans shall be built as directed. The manhole proper shall be constructed of precast concrete rings. Manholes shall be constructed on 3500 psi concrete foundations. **All manholes shall be waterproofed on the exterior.**

19a.3.1 Type "A" Manholes: The Type "A" manhole shall be a four foot diameter manhole five feet or more in depth, measured from the base of the cover frame to the lowest flowline elevation and shall be of eccentric cone top construction.

19a.3.2 Type "AA" Manholes: The Type "AA" manhole shall be a five foot diameter manhole five feet or more in depth, measured from the base of the cover frame to the lowest flowline elevation and shall be of eccentric cone top construction.

19a.3.3 Type "AAA" Manholes: The Type "AAA" manhole shall be a six foot diameter manhole five feet or more in depth, measured from the base of the cover frame to the lowest flowline elevation and shall be of eccentric cone top construction.

19a.3.4 Type "B" Manholes: Type "B" manholes shall be a four foot diameter manhole five feet or less in depth, measured from the base of the cover frame to the lowest flowline elevation and shall be of flat slab top construction.

19a.3.5 Type "D" Manholes: A drop pipe shall be provided for a sewer entering a manhole at an elevation of 25 inches or more above the manhole invert and shall be built as a part of the standard manhole. The pipe shall be laid as shown on the Drawings and encased with 3500 psi concrete from the drop stack to the reinforced base of the manhole.

19a.3.6 Precast Concrete Rings: Precast concrete rings for manholes shall conform to ASTM C478, Class II, Wall B, with a minimum concrete strength of 4,000 psi, except that rings for manholes over 12 feet deep shall be Class III. O-ring gaskets shall be installed between connected ring sections.

19a.3.7 Manhole Inverts: Manhole inverts shall be formed from 3500 psi concrete. Inverts for a "straight-through" manhole shall be formed by laying the pipe straight through the manhole, pouring the concrete invert, and then cutting out the top half of the pipe. Curved inverts shall be constructed of concrete, as shown, and shall form a smooth, even half-pipe section as shown on the Design Drawings. The inverts shall be constructed when the manhole is being built using prefabricated forms.

19a.3.8 Manhole Steps: Manhole steps shall be made of steel reinforced polypropylene plastic as the PSI manhole step manufactured by M.A. Inc., Inc. Peachtree City, Georgia, or any steel reinforced plastic step which produces equal or better performance.

19a.3.9 Manhole Frames and Covers: Standard manhole castings shall consist of J.R. Hoe & Sons MC 385 frame and lid, Neenah Foundry R-1683 frame and lid or approved equal.

Watertight manhole castings shall consist of cast iron frames with machined bearing surfaces, gasket seal, and bolted lids. They shall be J.R. Hoe & Sons M-375 watertight, Neenah Foundry R-1916 watertight or approved equal.

Manhole covers must sit neatly in the rings, with contact edges machined for even bearing and tops flush with ring edge. They shall have sufficient corrugations to prevent a slipperiness. The lids shall have two pick holes about 1-1/4 inches wide and 1/2 inch deep with 3/8 inch undercut all around. Lids on sanitary sewer manholes must not be perforated.

19a.3.10 Manhole Inserts: All manhole lids shall be equipped with a stainless steel insert to control storm water inflow through the pick holes. The lid shall be equal to the 304 stainless steel “sewer shield” as manufactured by Inflow Systems, Inc., Largo, Florida.

19a.3.11 Backfilling: Manhole backfilling shall not commence until the ENGINEER has inspected the structure. The manhole backfilling methodology shall conform to the methodology employed for the gravity lines adjacent the structure. Backfilling shall occur in uniform horizontal lifts around the full circumference of the structure

to avoid displacement by unbalanced loadings.

19a.4 TESTING OF MANHOLES

The testing of sewer manholes shall be accomplished by the CONTRACTOR as described herein. All manholes shall be subjected to the following tests:

a. Visual Inspection/Test.
b. Leakage (when requested by ENGINEER, Exfiltration).

19a.4.1 Test Methodologies - PVC & Ductile Iron Sewers

a. **Preparation.** Upon completion of backfilling and grading of the manhole, and immediately prior to testing activities, the CONTRACTOR shall clean the manhole of all debris and trash.

b. **Visual Inspection/Test.** The ENGINEER shall visually inspect the manhole barrel, in the presence of the CONTRACTOR, after CONTRACTOR completes the preparatory cleaning activities. If the Engineer's visual inspection reveals obvious defects such as a poorly formed invert, misaligned frame and lid, cracks, leakage, or if the inspection reveals that the CONTRACTOR has not constructed the manhole plumb, the ENGINEER shall notify the CONTRACTOR and OWNER in writing of the manhole's failing the visual inspection. The CONTRACTOR shall subsequently repair or replace all defective materials and/or workmanship, necessary to meet the visual test requirements, at no additional cost to the OWNER.

c. **Leakage.** The ENGINEER will direct the CONTRACTOR to conduct leakage tests if the manhole is located in an area of unusually high ground water, if the manhole is located within the limits of a stream course, or if, in the ENGINEER's opinion the manhole has not been constructed well. The CONTRACTOR shall subsequently conduct a leakage test in the presence of the ENGINEER. The leakage test shall be an exfiltration test conducted in accordance with ASTM C 969, Infiltration and Exfiltration Acceptance Testing of Installed Precast Concrete Pipe Sewer Lines. The maximum allowable exfiltration rate shall be 0.1 gallon per foot of diameter, per foot of head, per hour. If the exfiltration rate exceeds this value, the CONTRACTOR shall make the necessary repairs, at no additional cost to the OWNER.

19a.5 MEASUREMENT AND PAYMENT

19a.5.1 Measurement: Manhole Type 'A', 'AA', ‘AAA’, 'B' and 'D', in-place and accepted, will be measured each. The depth of Manholes, Type 'A', 'AA', ‘AAA’ and 'D' from base of cover frame to lowest flowline will be measured to the nearest vertical foot, rounding up for fractions of a foot equal to or greater than 6 inches and rounding down for lesser fractions.
Note – There shall be no extra payment for manholes exceeding six feet in depth. Contractor shall prepare his bid accordingly!

-- THE END --

SECTION XIXb

TECHNICAL SPECIFICATIONS

HIGH DENSITY POLYETHYLENE MANHOLES

19b.1 SCOPE OF WORK

Furnish all labor, material, equipment and incidentals required to install complete and ready for operation all manholes and appurtenances as shown on the Drawings and as specified herein.

19b.2 QUALITY CONTROL

Submit five copies of the following:

19b.2.1 Documentation of components to be incorporated in manholes including bases, rings, tops, gaskets, exterior water-proofing coatings and frame with lid.

19b.2.2 The manhole supplier shall submit certification that the HDPE material meets the specifications.

19b.2.3 The fabricator of the manholes shall submit drawings showing the position of the inlets, outlets and overall dimensions along with any other special features such as manways, ladders, etc.

19b.2.4 The fabricator shall submit data indicating that the manholes meet the requirements of ASTM F 1759, “Design of High Density Polyethylene (HDPE) Manholes for Subsurface Applications”. The manhole should be proven to have acceptable design for the following areas:

- 19b.2.4.1 Ring Compressive Strain
- 19b.2.4.2 Combined Ring Compressive and Ring Bending Strain
- 19b.2.4.3 Ring Buckling
- 19b.2.4.4 Axial Strain
- 19b.2.4.5 Axial Buckling
- 19b.2.4.6 Thickness of the bottom based on depth and groundwater. Thickness should be based on acceptable stress and deflection amounts.

19b.2.5 Calculations supporting these requirements will be part of the submittal package.

19b.2.6 The fabrication technician shall perform work in accordance to butt fusion of high-density polyethylene per ASTM D 2657 and for extrusion and hot air welding per ASTM C 1147. The fabricator shall submit the written quality assurance program used during fabrication of the manholes. The fabricator may be required to submit their overall QA/QC program for fabricating thermoplastic structures, the welding certification program for the fabrication technician per ASTM C 1147 and the facility safety program.

19b.2.7 The manholes and pipe shall be tested with water or air. The structure shall be determined to be leak free before shipping. A written certification shall be sent to the engineer certifying the manholes are leak free. The test results shall become part of the submittals. An identification plate indicating the job number, testing data, when built and by whom shall be attached to the manhole.

19b.3 MATERIALS

The pipe for the manholes shall be made from high-density polyethylene (HDPE) resins meeting the following requirements:

19b.3.1 HDPE MATERIAL SPECIFICATIONS

19b.3.1.1 HDPE Material - The HDPE material supplied under this specification shall be high density, high molecular weight as supplied by ISCO INDUSTRIES, LLC. Louisville, KY or approved equal. The HDPE material shall conform to ASTM D 3350-02 with minimum cell classification values of 345464 C.

19b.3.2 PHYSICAL PROPERTIES OF HDPE COMPOUND

19b.3.2.1 Density - the density shall be no less than 0.955 gms/ccm as referenced in ASTM D 1505.

19b.3.2.2 Melt Index - the melt index shall be no greater than 0.15 gms/10 minutes when tested in accordance with ASTM D 1238 -Condition 3.2.3.

19b.3.2.3 Flex Modulus - flexural modulus shall be 110,000 to less than 160,000 psi as referenced in ASTM D 790.

19b.3.2.4 Tensile Strength at Yield - tensile strength shall be 3,200 to less than 3500 psi in accordance with ASTM D 638.

19b.3.2.5 Slow Crack Growth Resistance shall be per ASTM

F 1473 (PENT Test). The results shall be greater than 100 hours.

19b.3.2.6 Hydrostatic Design Basis shall be 1,600 psi at 23 degrees C when tested in accordance with ASTM D 2837.

19b.4 HDPE MANHOLE CONSTRUCTION

19b.4.1 The manholes will be constructed of HDPE pipe. See drawings for size and class.

19b.4.2 The bottom thickness of the manholes will be as shown in plans.

19b.4.3 The inlets and outlets shall be extrusion welded on the inside and outside of the structure using good welding practice. Gussets shall be attached at 90 degrees, 180 degrees, 270 degrees, and 360 degrees around the inlets and outlets unless impractical.

19b.4.4 All manhole connections larger than 4" nominal OD pipe shall be butt fusion welded, electrofusion welded or flanged connections. For 4" OD pipe and smaller threaded transition fittings can also be used as well as the acceptable connections listed.

19b.4.5 Manholes shall be factory tested with water or with air. The hydrostatic test shall be conducted by filling the structure with water and checking for leaks. Minimum test duration will be one hour. If air is used, 2 to 5 psi shall be used for 30 minutes. Data showing the structure to be leak-free will be supplied. The owner or his representative may request to observe the test.

19b.4.6 The ladders in the manholes, if specified, shall conform to OSHA requirements.

19b.4.7 Top of the manholes shall be built to the requirements of the drawings. If air testing is required, flanged tops or manways will be required. Reinforced concrete pads spanning the HDPE manhole will be required when HDPE manholes are used in traffic areas. A traffic rated frame and cover will be required. A professional engineer shall approve the design of the concrete pad. His calculations must be included in the submittal.

19b.4.8 Restraints shall be designed as an integral part of the manhole by the fabricator/manufacturer to prevent strain at the inlets or outlets. These restraints shall be cast into a concrete collar around the pipe. Anti-flotation and/or anti-settling anchor collars, if required, shall be designed as an integral part of the manhole by the fabrication/manufacturer of the manhole. Shop drawings, approved by the specifying engineer shall be required for restraints, anchors, collars, etc...that are designed by the

manhole fabricator/manufacturer prior to acceptance of the HDPE structures.

19b.5 CONSTRUCTION PRACTICES

19b.5.1 Handling of Manholes. HDPE manholes shall be stored on clean, level, and dry ground to prevent undue scratching or gouging of the pipe. The handling of HDPE manholes shall be done in such a manner that there is no damage. Nylon slings are often used.

19b.5.2 Flanged Connections. Flange adapters shall be attached to HDPE manhole inlets and outlets stubs during fabrication by butt fusion welding per ASTM D 2657. A ductile iron back up ring will be used with each flanged connection. The rings will use a standard ANSI 150# bolt pattern. Check the drawings for materials required for corrosive conditions.

19b.5.2.1 Bolts shall be tightened in a “star pattern” to recommended torque values.

19b.5.2.2 Bolts must be tightened a second time after 24 hours to insure a positive seal.

19b.5.2.3 Gaskets are not required on HDPE to HDPE connections.

19b.5.3 Pipe Joining. HDPE pipe shall be joined using butt fusion. All butt fusion welds should be made as described in ASTM D 2657. Electrofusion welding can be used for making pipe welds. Hot air and extrusion welding are not permitted for pipe joining. All pipes and fittings welds should be made using a McElroy Manufacturing DataLogger. A record of the temperature, pressure and graph of the fusion cycle shall be maintained by the contractor.

19b.5.4 Handling of Fused Pipe -Fused segments of pipe shall be handled so as to avoid damage to the pipe. Limit bending of the pipe welded to fittings or manholes. Nylon slings are preferred.

19b.5.5 Equipment Mounting -Special provisions must be made when mounting pumps in an HDPE manhole. Bolting directly to the wall of the HDPE structure is never recommended.

19b.5.6 H-20 Highway Loads -Reinforced concrete pads spanning the HDPE manhole will be required when HDPE manholes are used in traffic areas. A traffic rated frame and cover will be required. A drawing showing key design features must be submitted as indicated in Section 19b.4.7 of this specification.

19b.6 DIRECT BURIAL INSTALLATION

19b.6.1 Trench Construction - The trench and trench bottom shall be constructed in accordance with ASTM D 2321, Section 6, Trench Excavation, and Section 7, Installation. The HDPE manhole shall be installed on a stable base consisting of 12" of Class I materials compacted to 95% proctor density per ASTM F 1759, Section 4.2. All required safety precautions for manhole installation are the responsibility of the contractor.

19b.6.2 Embedment materials -Embedment materials shall be Class I or Class II materials defined by ASTM D 2321, Section 5, Materials. Class I materials are preferred. Backfill and bedding materials shall be free of debris.

19b.6.3 Bedding of the manhole shall be preformed in accordance with ASTM D 2321, Section 7.2. Compaction shall conform to Section 7.5 and 7.51.

19b.6.4 Backfilling shall be done to conform to ASTM F 1759, Section 4.2, "Design Assumptions". This Specifications indicates that backfill shall extend at least 3.5 feet beyond the edge of the manhole for the full height of the manhole and extend laterally to undisturbed soils. Compaction shall be to 90% proctor density.

SECTION XX

TECHNICAL SPECIFICATIONS

GRAVITY SANITARY SEWER LINES

20.1 SCOPE

The purpose of this section is to outline the requirements for the proper construction of gravity sanitary sewer lines and facilities appurtenant thereto.

20.1.1 Construction Tolerances: Contractor shall provide necessary leveling equipment to check the elevation of the flow line of the pipe as follows:

GRADE	FLOW LINE ELEVATION CHECK	ALLOWABLE ERROR
.004 - .008	Every 100 feet	± .03
.008 - .012	Every 150 feet	± .05
Above .012	Every 190 feet	± .07

20.1.2 Quality Assurance/Submittals

Submit five copies of the following:

A) Documentation to substantiate pipe material's compliance with these specifications.

B) Submit five copies of CONTRACTOR'S Bedding and Backfilling Plan. At a minimum the plan shall:

1. Identify/acknowledge the segments of pipe line to be backfilled using "open", "gravel", and "paved" criteria,

2. Include a Proctor Curve for the backfill material for every 1900 LF of pipe trench (curve to be prepared and sealed by a geotechnical engineer licensed in the State of Kentucky),

3. Include quarry's material certification for all aggregates utilized for bedding, haunching, and initial protective backfill, and

4. Include name and qualifications of CONTRACTOR'S nuclear density technician (technician must be a full time employee of CONTRACTOR, spot checks by a sub-contracting testing firm are not acceptable).

C) Documentation of low pressure air testing, mandrel testing, and infiltration checks.

20.2 MATERIALS

All pipe, joint, and fittings for the sanitary sewer shall be constructed of the materials as indicated on the Design Drawings.

20.2.1 Polyvinyl Chloride Pipe and Fittings (PVC) - PVC pipe and fittings shall be extruded from Type I, Grade 1, polyvinyl chloride material designated as PVC 1119, meeting ASTM Specifications D 3034, Type PSM, and a standard dimension ratio of SDR 35.

The pipe shall be homogeneous throughout and free from cracks, holes, foreign inclusions or other defects. The pipe shall be as uniform as commercially practical in color. The workmanship, pipe dimensions and tolerances, outside diameters, wall thickness, eccentricity, sustained pressures, marking and all other requirements of the Commercial Standards CS 256-63 shall be conformed within all respects.

Pipe shall be furnished in 10 foot lengths. The pipe shall have a bell on one end. Male ends of pipe must be beveled on the outside. Pipe shall have a ring painted around the male end or ends in such a manner as to allow field checking of setting depth of pipe in the socket. This requirement is made to assist construction superintendents and inspectors in visual inspection of pipe installation.

Pipe must be delivered to job site by means which will adequately support it and not subject it to undue stress. In particular, the load shall be so supported that the bottom rows of pipe are not damaged by crushing. Pipe shall be unloaded carefully and strung or stored as close to the final point of placement as is practical. Pipe must not be exposed to the direct rays of the sun for an extended period of time as per manufacturer recommendations. If pipe is not to be installed shortly after delivery to the job site, it must be stored in a shaded location and strung as needed.

20.2.2 Ductile Iron Pipe, Fittings and Joints: Ductile iron pipe shall conform to the latest AWWA Specifications C151 (ANSI A21-51) with standard thickness as designated in AWWA C150. Thickness class shall be as follows:

DIAMETER	PRESSURE CLASS
8" - 12"	350
14" - 30"	250

The interior of the pipe shall be cement-mortar lined with bituminous seal coat in accordance with AWWA C104 (ANSI A21.4). Thickness of the lining shall be as set forth in Section 4-10-1 of the aforementioned specifications unless otherwise directed by the OWNER. The exterior of all pipe, unless otherwise specified, shall receive either a coal tar or asphalt base coating a minimum of one mil thick.

Where ductile iron pipe is to be installed in corrosive soil conditions, the pipe shall be protected by an eight mil thick polyethylene encasement meeting the requirements of ANSI 22.14. Such corrosive soils include but are not limited to salt marshes, saturated alkaline soils, cinder fills, areas of decaying vegetation, and waste dumps.

Bends and fittings shall be Mechanical Joint Compact Ductile Iron fittings, conforming to AWWA Specifications C153 for short body iron fittings. Fittings shall be tar-coated outside and shall receive the standard cement lining with bituminous seal coat on the inside as specified for the ductile iron pipe.

Joints shall be of the push-on (AWWA C111), mechanical joint (AWWA C111), flanged (AWWA C115) or ball and socket type as called for in the Plans. Bells for push-on type joints shall have an annular recess in the pipe socket to accommodate a single rubber gasket. Plain ends shall be suitably beveled to permit easy entry into the bell. The gasket is locked in place against displacement as the joint is assembled.

Mechanical joints shall be bolted and of the stuffing box type and shall consist of a bell with exterior flange and interior recess for the sealing gasket, a pipe or fitting plain end, a sealing gasket, a follower gland, tee-head bolts and hexagon nuts.

Joints for all bends and fittings for buried service shall be mechanical joint type only (AWWA C111). Flanged joint pipe shall be used in vaults, pits and above ground service installation. Flanged joint pipe may not be used for buried service.

20.2.3 Geotextile Type III - Geotextiles shall be woven or non-woven geotextile fabrics meeting the material and strength requirements for Type III fabrics as set forth in Section 215 of the Kentucky Department of Highways publication “Standard Specifications for Road and Bridge Construction.”

20.2.4 Bedding Stone - Bedding stone shall be durable crushed limestone meeting the requirements of Section 805 of the Current Edition of the Kentucky Department of Highways publication "Standard Specifications for Road and Bridge Construction."

20.3 INSTALLATION

20.3.1 Trench Excavation - Unless specifically directed otherwise by the ENGINEER, not more than 500 feet of trench shall be opened ahead of the pipe laying work of any crew and not more than 500 feet of open ditch shall be left behind the pipe laying work of any one crew.

All backfilled ditches shall be maintained in such a manner that they will offer no hazard to the passage of traffic. The convenience of the traveling public and property owners abutting shall be taken into consideration. All public or private drives shall be taken into consideration and shall be promptly backfilled or bridged. Excavated materials shall be disposed of so as to cause the least interference.

Trenches in which pipes are to be laid shall be excavated in open cut to the depths shown on the approved plans. The minimum allowable trench width shall not be less than the outside diameter of the pipe plus eight inches. Where rock is encountered, it shall be removed to a minimum depth of four inches below the pipe bells.

Unless specifically authorized by the ENGINEER, trenches shall in no case be excavated or permitted to become wider than two feet six inches plus the nominal diameter of the pipe at the level of or below the top of the pipe. If the trench does become wider than two feet six inches at the level of or below the top of the pipe, special precautions may be necessary, such as providing compacted granular fill up to the top of the pipe or providing pipe with additional crushing strength as determined by the ENGINEER. This determination shall take into account the actual trench loads that may result and the strength of the pipe being used.

All excavated materials shall be placed a minimum of two feet back from the edge of the trench. Where conditions exist that may be conducive to slides or cave-ins, proper and adequate sheeting, shoring and bracing shall be installed (as described hereafter) to provide safe working conditions and to prevent damage of work.

20.3.1.1 Trench Rock: "Sanitary sewer trench rock" is defined as any material which cannot be excavated from the pipe trench with an excavator (Caterpillar 320) having a break out force rated at not less than 35,750 lbs. and occupying an original volume of at least one (1.0) cubic yard.

"Sanitary sewer trench rock" will **NOT** be measured on this project for separate payment. **All excavation shall be unclassified.** THE CONTRACTOR IS EXPECTED TO EMPLOY A ROCK TRENCHER OR HOE RAM AS NECESSARY AND PREPARE HIS BID ACCORDINGLY.

20.3.1.2 Trench Drainage: The CONTRACTOR shall maintain all excavations free of water. He shall provide all dams, flumes, channels, sumps, or other works necessary to keep the excavation entirely clear of water and shall provide and operate pumps or other suitable equipment of adequate capacity for dewatering the excavation. He shall avoid producing mud in the trench or channel bottoms by his operations. If necessary, or so directed by the ENGINEER, the CONTRACTOR shall place crushed stone at his own expense to maintain a firm, dry excavation bottom and base. Pipe bedding, laying, jointing, and the placing of concrete shall be done in a water-free trench or excavation. The water shall be disposed of at the CONTRACTOR's expense. Waters removed from excavations shall not be disposed of in the sanitary sewer system.

Where the excavation extends below the water table, and lowering of the water table is necessary to prevent excessive inflows and maintain stability within the excavation, dewatering shall be performed. The CONTRACTOR shall use well points, sump pumps, or any other method of dewatering as required to lower the water table below the bottom of the excavations in a manner that will prevent the loss of fine soil particles. He shall obtain the ENGINEER's approval prior to the use of special dewatering equipment other than well points or sump pumps. Dewatering operations are considered incidental to the work and no additional compensations shall be made to the CONTRACTOR. Prior to beginning the work, the CONTRACTOR shall obtain, at his expense, the necessary dewatering permits from the Commonwealth of Kentucky, Department of Natural Resources and Environmental Protection Cabinet (KNREPC).

20.3.1.3 Obstructions: In cases where storm sewers, gas lines, water lines, telephone lines, and other utilities, or other underground structures are encountered, they shall not be displaced or molested unless necessary, in which case they shall be replaced in as good condition as found as quickly as possible.

The CONTRACTOR shall notify the utility companies 48 hours prior to excavation adjacent to their facilities.

20.3.1.4 Shoring, Sheeting and Bracing: Where unstable material is encountered or where the depth of excavation in earth exceeds six feet, the sides of the trench or excavation shall be supported by substantial sheeting, bracing and shoring, or the sides sloped to an angle of repose. Sloping the sides of the ditch to the angle of repose will not be permitted in streets, roads, narrow rights-of-way or other constructed areas unless otherwise specified. The design and installation of all sheetings, sheet piling, bracing and shoring shall be based on computations of pressure exerted by the materials to be retained under construction conditions. Adequate and proper shoring of all excavations shall be the entire responsibility of the CONTRACTOR; however, the ENGINEER may require the submission of shoring plans (accompanied by the supporting computations) for review prior to the CONTRACTOR undertaking any portion of the work.

Foundations adjacent to where the excavation is to be made below the depth of existing foundation, shall be supported by shoring, bracing or underpinning as long as the excavation shall remain open, or thereafter if required to insure the stability of the structure supported by the foundation, and the CONTRACTOR shall be held strictly responsible for any damage to said foundation.

Solid sheeting will be required for wet or unstable material. It shall consist of continuous vertical sheet piling of timber or steel with suitable walls and braces.

Care shall be taken to avoid excessive backfill loads on the completed pipelines, and the requirements that the width of the ditch at the level of the crown of the pipe be not more than two feet six inches plus the nominal diameters of the pipe shall, as set out hereinbefore, be strictly observed.

Trench sheeting shall not be removed until sufficient backfill has been placed to protect the pipe.

All sheeting, planking, timbering, bracing and bridging shall be placed, renewed and maintained as long as necessary.

20.3.1.5 Blasting: Blasting is not permitted on this project. In the event a situation arises where blasting cannot be avoided, the following shall apply. All blasting operations shall be conducted in accordance with the municipal ordinances, State laws, and Section 9 of the Manual of Accident Prevention in Construction published by the Associated General Contractors of America, Inc. All explosives shall be stored in conformity with said ordinances, laws and safety regulations. Any damage done by blasting is the responsibility of the Contractor and shall be promptly and satisfactorily repaired by him.

All shots shall be covered with heavy timber or steel blasting mats to prevent flying material. Unless otherwise specified or directed, delay caps shall be used to reduce earth vibrations and noise.

All blasting operations shall be covered by public liability insurance, or if said public liability insurance does not cover blasting, the CONTRACTOR shall have separate public liability insurance to cover his blasting operations.

All basting operations shall be supervised and performed by qualified personnel.

20.3.2 Pipe Bedding: In all cases the foundation for pipes shall be prepared so that the entire load of the backfill on top of the pipe will be carried on the barrel of the pipe and insofar as possible where bell and spigot pipe are involved so that none of the load will be carried on the bells.

Where undercutting and granular bedding are involved, the depth at the bottom of the bells of the pipe will be at least four inches above the bottom of the trench as excavated.

Supporting of pipe shall be as set out hereinbefore, and in no case shall the supporting of pipe on blocks be permitted. The Design Drawings present typical approved bedding methods.

20.3.2.1 Earth Foundation: All pipe shall be laid on a six inch bed of granular material to provide continuous support for the lower section of the pipe. Granular bedding shall be #9 crushed stone. Granular bedding shall be mechanically compacted prior to pipe placement.

20.3.2.2 Rock Foundation: If the trench bottom is in rock the excavation shall be undercut to a minimum depth of six inches below the bottom of the pipe. The pipe shall be laid on a bed of granular material to provide continuous support for the lower section of the pipe. Granular bedding shall be #9 crushed stone. Granular bedding shall be mechanically compacted prior to pipe placement.

20.3.2.3 Special Bedding: In wet, yielding mucky locations where pipe is in danger of sinking below grade or floating out of line or grade, or where backfill materials are of such a fluid nature that such movements of the pipe might take place during the placing of the backfill, the ENGINEER may order “Special Pipe Bedding.” When the ENGINEER orders “Special Pipe Bedding” (in writing), the CONTRACTOR shall:

a. overexcavate the mucky subgrade to the depth directed,

b. install a Type III geotextile as illustrated in the detail drawings,

c. backfill the geotextile with bedding stone, and

d. overlap the geotextile envelope in accordance with the detail drawings.

It is to be expressly understood that “Special Pipe Bedding” may only be employed upon written order of the ENGINEER.

20.3.3 Laying Pipe: The laying of sewer pipe in finished trenches shall be commenced at the lowest point so that the spigot or tongue ends point in the direction of flow.

If the CONTRACTOR desires, he may use a laser beam instrument to set the grades on sewer lines in lieu of using a grade
string and batter boards set from grade stakes. In using such an instrument, the CONTRACTOR shall be responsible for maintaining grades and elevations as called for on drawing profiles, and any variances found shall be corrected by the CONTRACTOR.

All pipe lengths shall be laid with ends abutting and true to line and grade as given by the ENGINEER. They shall be fitted and matched so that when laid they will form a sewer with a smooth and uniform invert. Supporting of pipe shall be as set out hereinbefore under "Pipe Bedding" and in no case shall the supporting of pipe on blocks be permitted.

Branches, fittings and specials for sewer lines shall be provided and laid as and where directed by the ENGINEER or shown on the plans.

Before each piece of pipe is lowered into the trench, it shall be thoroughly inspected to insure its being clean. Any piece of pipe or fitting which is known to be defective shall not be laid or placed in the lines. Any defective pipe or fitting discovered after the pipe is laid shall be removed and replaced with a satisfactory pipe or fitting. In case a length of pipe is cut to fit in a line, it shall be so cut as to leave a smooth end at right angles to the longitudinal axis of the pipe.

Granular bedding material as specified hereinbefore, shall be used to correct irregularities in the earth trench subgrade.

The interior of the pipe, as the work progresses, shall be clean. When laying of any pipe is stopped for any reason, the exposed end of such pipe shall be closed with a plywood plug fitted into the pipe bell, so as to exclude earth or other material.

No backfilling (except for securing pipe in place) over pipe will be allowed until the ENGINEER, or his representative has made an inspection of the joints, alignment and grade in the section laid, but such inspection shall not relieve the CONTRACTOR of further liability in case of defective joints, misalignment caused by backfilling and other such deficiencies that are noted later.

20.3.4 Concrete Cradle, Anchors or Encasement: Concrete cradle or encasement of sewer lines and/or fittings shall be placed where shown on the plans. Sewers on 19 percent slopes or greater shall be anchored securely with concrete anchors, spaced as follows:

A) Not over 36 feet center to center on grades 19 percent and up to 35 percent.

B) Not over 24 feet center to center on grades 35 percent and up to 50 percent

C) Not over 16 feet center to center on grades 50 percent and over

Concrete shall be KYDOH Class "B" and shall be mixed sufficiently wet to permit it to flow under the pipe to form a continuous bed. In tamping concrete, care shall be taken not to disturb the grade or line of pipe or injure the joints.

For this contract, concrete for pipe encasement and anchors is considered an incidental item included in the linear foot price of pipe.

20.3.5 Jointing Pipe: The pipe joints described shall be installed in accordance with the manufacturer's recommendations.

20.3.6 Backfilling Pipeline Trenches: All backfilling shall be accomplished in accordance with the bedding and backfilling detail provided in the Design Drawings. Any variances must be approved in writing by the ENGINEER.

When directed by the ENGINEER, the CONTRACTOR shall add water to the backfill material or dry out the material when needed to attain a condition near optimum moisture content for a maximum density of the material when it is tamped. The CONTRACTOR shall obtain a compaction of the backfill as indicated in the detail drawings at a moisture content within two percent of optimum.

Before final acceptance, the CONTRACTOR will be required to level off all trenches or to bring the trench up to the level of the surrounding terrain. The CONTRACTOR shall also remove from roadways, rights-of-way and/or private property all excess earth or other materials resulting from construction.

When the pipe trench crosses a street or roadway, the CONTRACTOR shall be responsible for maintaining the trench surface in a level condition at proper pavement grade at all times.

In all cases walking or working on the completed pipelines except as may be necessary in tamping or backfilling will not be permitted until the trench has been backfilled to a point one foot above the top of the pipe. The filling of the trench and the tamping of the backfill shall be carried on simultaneously on both sides of the pipe in such a manner that the completed pipeline will not be disturbed and injurious side pressures do not occur.

In all cases the pipe bedding, haunching and trench backfilling shall be done strictly according to the details in the plan set.

20.4 TESTING OF GRAVITY SEWER LINES

The testing of gravity sewers shall be accomplished by the CONTRACTOR as described herein. All gravity sewer lines shall be subjected to the following tests:

a. Visual Inspection/Test.

b. Leakage (Infiltration/Exfiltration).

c. Low pressure Air Test.

d. Deflection Test.

20.4.1 Test Methodologies

a. **Preparation.** Upon completion of backfilling and grading for the pipe reach to be tested, and immediately prior to testing activities, the CONTRACTOR shall clean the sewer of all debris and trash by rodding with appropriate tools. All proposed sewer laterals for the pipe reach to be tested must be in-place, temporarily plugged, and backfilled in the reach to be tested. THE CONTRACTOR SHALL PROVIDE BY-PASS PUMPING OF INTERRUPTED SEWER SERVICES AT NO ADDITIONAL COST TO THE OWNER FOR THE DURATION OF THE TESTING ACTIVITY

b. **Visual Inspection/Test.** The ENGINEER shall visually inspect the pipe reach to be tested, in the presence of the CONTRACTOR, after CONTRACTOR completes the preparatory cleaning activities. If the ENGINEER's visual inspection reveals obvious defects such as obstructions or leakage, or if the inspection reveals that the CONTRACTOR has not maintained the pipe on a 'gun barrel straight' line and grade from manhole to manhole, the ENGINEER shall notify the CONTRACTOR and OWNER in writing of the pipe sections failing the visual inspection. The CONTRACTOR shall subsequently repair or replace all defective materials and/or workmanship, necessary to meet the visual test requirements, at no additional cost to the OWNER.

c. **Leakage.** The CONTRACTOR shall conduct a leakage test in the presence of the ENGINEER. If the groundwater table is more than two feet above the invert of the pipe, an infiltration test shall be conducted. If the groundwater table is less than two feet above the invert of the pipe, the CONTRACTOR shall conduct an exfiltration test. To test for leakage, the pipe reach shall be isolated with removable plugs. For an infiltration test, the volume of water which enters the sewer in a 24 hour period is to be determined. For an exfiltration test the sewer is to be filled with water to a point two feet above the upstream invert, and the volume of water lost over a 24 hour period is to be determined. Leakage shall not exceed 190 gallons per mile of pipe per inch of pipe diameter. All leaks detected by this testing procedure shall be

repaired even though leakage is within limits. If leakage is not within limits, the CONTRACTOR shall repair or replace all defective materials and/or workmanship, and retest, as necessary to demonstrate that the repaired section meets the leakage requirements, at no additional cost to the OWNER.

d. **Low Pressure Air Test.** The CONTRACTOR shall conduct low pressure air testing in the presence of the ENGINEER. The air tests shall be conducted in accordance with the latest edition of the UNI-BELL Plastic Pipe Association Standard UNI-B-6-82 "Recommended Practice for Low-Pressure Air Testing of Installed Sewer Pipe."

All ties and ends of sewer services shall be plugged with flexible joints, plugs or caps securely fastened to withstand the internal test pressures. Such plugs or caps shall be readily removable, and their removal shall provide a socket suitable for making a flexible jointed lateral connection or extension.

The pipe must be clean prior to testing (See **Preparation**).

Air shall be slowly supplied to the plugged pipe installation until the internal air pressure is 4.0 pounds per square inch greater than the average back pressure of any ground water that may submerge the pipe. At least two minutes shall be allowed for temperature stabilization.

The air test requirements shall be satisfied if the time required (in seconds) for the pressure to decrease from 3.5 to 3.0 pounds per square inch (greater than groundwater backpressure) is not less than that shown in the "Specification Time Table" (Table A). The ENGINEER shall determine the test time for pipe test lengths not provided in Table A. If the time for the indicated 0.5 psi pressure loss is less than the stated limits, the CONTRACTOR shall repair or replace all defective materials and/or workmanship, and retest, as necessary to demonstrate that the repaired section meets the air test requirements, at no additional cost to the OWNER.

e. **Deflection Test (PVC and HDPE Pipe).** No less than 30 days after the completion of backfilling, the CONTRACTOR shall pass a calibrated mandrel, or other approved device, through the sewer pipe to demonstrate that no pipe deflection greater than 5 percent of the inside diameter of the pipe has occurred. The CONTRACTOR shall repair or replace all pipes exhibiting greater than 5 percent deflection, and retest, as necessary to demonstrate compliance with deflection criteria, at no additional cost to the OWNER.

TABLE "A"

SPECIFICATION TIME REQUIRED FOR A <u>0.5 PSIG PRESSURE DROP</u>
FOR SIZE AND LENGTH OF PIPE INDICATED FOR Q = 0.0015

1 PIPE DIAMETER (in.)	2 MINIMUM TIME (min: sec)	3 LENGTH for MINIMUM TIME (ft)	4 TIME FOR LONGER LENGTH (sec)	Specification Time for Length (L) Shown (min:sec)							
				100 (ft)	150 (ft)	190 (ft)	250 (ft)	300 (ft)	350 (ft)	400 (ft)	450 (ft)
4	1:53	597	.190 L	1:53	1:53	1:53	1:53	1:53	1:53	1:53	1:53
6	2:50	398	.427 L	2:50	2:50	2:50	2:50	2:50	2:50	2:51	3:12
8	3:47	298	.760 L	3:47	3:47	3:47	3:47	3:48	4:26	5:04	5:42
10	4:43	239	1.187 L	4:43	4:43	4:43	4:57	5:56	6:55	7:54	8:54
12	5:40	199	1.709 L	5:40	5:40	5:42	7:08	8:33	9:58	11:24	12:50
15	7:05	159	2.671 L	7:05	7:05	8:54	11:08	13:21	15:35	17:48	19:02
18	8:30	133	3.846 L	8:30	9:37	12:49	16:01	19:14	22:26	25:38	28:51
21	9:55	114	5.235 L	9:55	13:05	17:27	21:49	26:11	30:32	34:54	39:16
24	11:19	99	6.837 L	11:24	17:57	22:48	28:30	34:11	39:53	45:35	51:17
27	12:45	88	8.653 L	14:25	21:38	28:51	36:04	43:16	50:30	57:42	46:54
30	14:10	80	10.683 L	17:48	26:43	35:37	44:31	53:25	62:19	71:13	80:07
33	15:35	72	12.926 L	21:33	32:19	43:56	53:42	64:38	75:24	86:10	96:57
36	17:00	66	20.384 L	25:39	38:28	51:17	64:06	76:55	102:34	89:44	115:23

SOURCE: UNI-B-6-82

20.5 MEASUREMENT AND PAYMENT

20.5.1 Measurement: Gravity Sanitary Sewer Pipe in place, complete, successfully pressure tested shall be measured in linear feet along the pipe centerline. Pipe fittings (wyes, tees) will not be measured for individual payment as they are covered under the "Sanitary Sewer Lateral Stub and Cleanout Assembly" section of these specifications. Pipe bends will not be measured for separate payment. Bends shall be measured in linear feet of pipe. No allowance shall be made for laps or drops at connections.

"Special Pipe Bedding" - ordered in writing by the ENGINEER - in place and accepted shall be measured by the ton of bedding stone actually placed (to the top of the geotextile envelope). There will be no separate measurement of Geotextile Type III or other incidentals.

20.5.2 Payment: Payment for pipe will be made at the contract unit price per linear foot for each pipe diameter as set forth in the Bid Schedule for the actual quantities measured. Payment for fittings (wyes, tees) shall be made as directed in the "Sanitary Sewer Lateral Stub and Cleanout Assembly" section of these specifications. Such payment shall constitute full compensation for all materials, labor, equipment, and incidentals necessary for the completion of the work.

Payment for "Special Pipe Bedding" - ordered in writing by the ENGINEER - shall be made at the contract unit price per ton for the actual quantity measured. There shall be no separate payment for Geotextile Type III or other incidentals.

THE END

SECTION XXI

TECHNICAL SPECIFICATIONS

BORE AND/OR ENCASE

21.1 SCOPE

This work shall consist of furnishing and installing steel encasement pipes for sanitary sewer lines and force mains by boring, jacking, or open cut methods.

21.1.A Quality Assurance/Submittals

21.1.A.1 Submit five copies of certified mill test report on steel encasement pipe.

21.2 GENERAL

The CONTRACTOR shall comply with the previously obtained permits and approvals for completion of this work. Copies of the permits and/or approvals are reproduced in the Permits section of this document.

21.3 MATERIALS

21.3.1 Encasement Pipe: Encasement pipe shall be steel, plain end, uncoated, unwrapped, have continuously welded joints and have a yield point strength of 35,000 psi and conform to AWWA Specifications C200. The minimum wall thickness of the pipe shall be as indicated in the Detail Drawings.

In general, the inside diameter of the encasement pipe shall be 4 inches greater than the largest outside diameter of the carrier pipe. The Detail Drawings provide a table from which required encasement pipe diameters may be derived.

Field welding of encasement pipe shall be performed by a certified welder in accordance with the requirements of AWWA Specification C206-82.

21.3.2 Seals: A removable watertight rubber seal shall be used to seal the annulus between the excavation and the encasement pipe.

21.4 INSTALLATION - BORE AND JACK

No distinction shall be made between boring through earth or boring through rock. The CONTRACTOR shall conduct his own investigation of subsurface conditions and shall base his bid on his own findings.

The jacking will be allowed in one direction only. The installation procedure must provide for the placement of the encasement pipe concurrently with the removal of the soil.

Grouting between the excavation and the encasement pipe will be required if ordered by the ENGINEER or if, for any reason, the excavation exceeds one (1) inch larger than the outside

diameter of the liner. Grout holes shall be provided in the tunnel lining with a spacing not to exceed four and one-half (4.5) feet measured longitudinally. The location of the holes shall be varied around the periphery of the encasement pipe to suit field conditions which will permit the proper grouting sequence to insure complete filling of void spaces outside the encasement pipe. The CONTRACTOR shall fill all the void space outside the encasement pipe with Portland Cement grout. The machine used for grouting shall permit the application of a pressure up to seventy-five (75) pounds per square inch in excess of any external water pressure. A gage shall be provided which will accurately indicate working pressure and this gage shall be carefully watched during grouting operations. The pressure shall at no time be allowed to exceed that considered safe or which would distort the encasement pipe. Grout pipes shall be one and one-half (1½) inches inside diameter.

The carrier pipe shall be installed after the encasement pipe is in place. The installation of the carrier pipe shall be in accordance with the manufacturer's specifications using casing skids as shown in the Detail Sheets of the Design Drawings. After the carrier pipe has been installed, inspected, and tested as specified, both ends of the encasement pipe shall be closed with a removable, water-tight "boot" in a manner acceptable to the OWNER.

21.5 INSTALLATION - OPEN CUT

Where the encasement pipe is placed in open cut, the encasement pipe trenching, bedding, laying, and backfilling shall conform to the requirements of the applicable sections of these Specifications. The carrier pipe shall be installed after the encasement pipe is in place. The installation of the carrier pipe shall be in accordance with the manufacturer's specification using casing skids as shown in the Detail Sheets of the Design Drawings. After the carrier pipe has been installed, inspected, and tested as specified, both ends of the cover pipe shall be closed with a removable, watertight "boot" in a manner acceptable to the OWNER.

21.6 MEASUREMENT AND PAYMENT

21.6.1 Measurement: "Bore and Encasement for 'X' inch Pipe" of the applicable diameter will be measured by the linear foot of steel encasement pipe furnished, installed, inspected and accepted. "Open Cut Encase for ‘X’ inch Pipe" of the applicable diameter will be measured by the linear foot of steel encasement pipe furnished, installed, inspected and accepted.

21.6.2 Payment: Payment for "Bore and Encasement for 'X' inch Pipe" of the applicable diameter will be made at the contract unit price per linear foot as set forth in the Bid Schedule for the number of feet of encasement pipe measured. Payment for "Open Cut Encase for ‘X’ inch Pipe" of the applicable diameter will be made at the contract unit price per linear foot as set forth in the Bid Schedule for the number of feet of encasement pipe measured. Such payment shall constitute full compensation for all materials, labor, equipment and incidentals necessary for the completion of the work. Carrier pipe installed in the encasement pipe will be measured and paid for as indicated in the applicable sections of these Specifications.

-- THE END --

SECTION XXII

TECHNICAL SPECIFICATIONS

PAVEMENT REPLACEMENT

22.1 PURPOSE

The purpose of this section is to outline requirements for the proper replacement of roadway and parking lot surfaces damaged through installation of utilities and the construction of new surfaces to serve the completed facilities.

22.2 QUALITY ASSURANCE/SUBMITTALS

A) All standards, material, methods of installation, equipment and construction shall be in accordance with the current edition of the Kentucky Department of Highways (KYDOH) publication "Standard Specifications for Road and Bridge Construction," except as modified herein.

B) Submit five copies of the following:

1) Documentation to substantiate compliance with the materials section of this specification.

22.2 GENERAL

Existing paving in roadways, entrances, parking lots, etc. shall be restored to a condition equal to that which existed before the work began and to the satisfaction of the OWNER. In restoring improved surfaces new pavement is required. No permanent surface shall be placed within thirty (30) days after backfilling shall have been completed, except by order of the ENGINEER!

It is a project requirement that the CONTRACTOR furnish a temporary pavement equal in character to the existing pavement damaged by the construction within thirty (30) days of the completion of the trench backfilling. The CONTRACTOR shall maintain this temporary pavement until such time as the CONTRACTOR effects the permanent pavement replacement as set forth herein. CONTRACTOR'S INSTALLATION AND MAINTENANCE OF TEMPORARY PAVEMENT REPLACEMENT SHALL BE AT CONTRACTOR'S SOLE EXPENSE. This project requirement is established to encourage CONTRACTOR to complete permanent pavement replacements at the earliest possible date following backfilling.

22.3 PAVEMENT REPLACEMENT CLASSES

Pavement replacement includes the following types or classes:

1) Full Width Bituminous Replacement/Construction.

2) Bituminous Pavement Replacement with Concrete Sub-Slab.

3) Bituminous Pavement Replacement without Concrete Sub-Slab.

4) Concrete Pavement Replacement.

5) Gravel Surface Replacement.

22.4 MATERIALS

22.4.1 Bituminous Concrete Surface: Bituminous concrete conforming to Sections 401 and 402 of the current edition of the Kentucky Department of Highways Standard Specifications for Road and Bridge Construction shall be used for replacement of all existing bituminous surfaces. All bituminous material aggregates, mineral fillers, tack and seal coats shall meet the appropriate materials specifications of the aforementioned Department of Highways publication. Before placing any bituminous surface, the CONTRACTOR shall submit the design plant mix for the ENGINEER'S approval. This submittal shall address both the last date the mix was approved by the Department of Highways and the location where the mix was most recently used.

22.4.2 Concrete Surface: Concrete for pavement replacement shall be a mixture of Portland Cement, fine aggregate, coarse aggregate, with or without air extrainment, as required, combined in the proportions, mixed, and placed as specified for Class "A" concrete in Sections 501 and 601 of the publication Standard Specifications for Road and Bridge Construction, (1983 Edition, Kentucky Transportation Cabinet, Department of Highways).

22.4.3 Dense Graded Aggregate: Dense graded aggregate used for a base shall be a durable, crushed limestone meeting the requirements of Section 805 of the publication Standard Specifications for Road and Bridge Construction, (1983 Edition, Kentucky Transportation Cabinet, Department of Highways).

22.5 INSTALLATION OF BITUMINOUS SURFACES

22.5.1 General: The three classes of bituminous surface are Full Width Bituminous Pavement Replacement/Construction, Bituminous Pavement Replacement with Concrete Sub-Slab and Bituminous Pavement Replacement for Pavements without Concrete Sub-Slab. The main differences between these classes are as follows:

a) "Full Width Bituminous Pavement Replacement/ Construction" shall be the complete replacement of an existing pavement. The pavement thickness for "Full Width" replacement or construction shall be three (3) inches. The pavement width is subject to the width of the existing paved surface or as specified in the plans.

b) "Bituminous Pavement Replacement with Concrete Sub-Slab" shall require a 6" concrete sub-slab. The pavement thickness shall be no less than 3 inches. The pavement width shall not exceed the maximum widths as specified in the Detail Drawings.

c) "Bituminous Pavement Replacement without Concrete Sub-Slab" does not require a concrete sub-slab. The pavement thickness shall be no less than the existing pavement thickness. The pavement width shall not exceed the maximum widths as specified in the Detail Drawings.

22.5.2 Base Preparation: The pipe trench shall be backfilled as indicated on the Detail Drawings. This backfill shall be cut back, shaped, graded, and compacted. A base course of 6" of dense graded aggregate shall then be placed and compacted.

For Full Width Pavement Replacement/Construction the base course shall be prepared as follows:

a. Compact 6" of DGA in pipe trench per the Detail Drawings.

b. Clean the existing pavement of construction debris (mud, gravel, etc.) This requires brooming!

c. Potholes, ruts, and other severely deteriorated portions of existing pavement shall be patched with bituminous base.

d. The cleaned and patched surface shall be jointly inspected by the CONTRACTOR and the ENGINEER. The surface must be accepted in writing by the ENGINEER before tacking operations begin.

e. The cleaned and patched surface shall be shot with 0.4 lb/sy of RS-2 tack.

22.5.3 Surface Course: If the pavement replacement is "With Concrete Sub-Slab" then the subgrade shall be cut back to accommodate a 6" thick Class "A" concrete sub-slab (concrete shall conform to the applicable specifications herein).

The prepared pipe trench shall be paved with bituminous concrete Class I per the Detail Drawings. For full width construction, the full surface width shall receive a 2" base course and 1" surface course of bituminous concrete Class I per the Detail Drawings.

22.6 INSTALLATION OF CONCRETE SURFACES

22.6.1 Base Course: The pipe trench shall be backfilled as indicated on the Design Drawings. This backfill shall be cut-back, shaped, graded and compacted. A base course of 6" of dense graded aggregate shall then be placed and compacted.

22.6.2 Surface Course: The existing concrete pavement shall be cut-back with a concrete saw the distance as specified on the Design Drawings so that the final surface can be placed in a strip of uniform width. The subgrade shall be shaped, graded and compacted as directed by the ENGINEER. Class "A" concrete as described herein shall be placed to the greater of the existing pavement thickness or 6". The concrete slab shall be reinforced with 6" x 6" No. 4 wire mesh.

22.7 INSTALLATION OF GRAVEL SURFACES

22.7.1 Gravel Pavement Replacement: The pipe trench shall be backfilled as indicated on the Design Drawings. The trench backfill shall be cut-back, shaped, graded and compacted. A 6" course of dense graded aggregate shall then be placed and compacted.

22.8 MEASUREMENT AND PAYMENT

22.8.1 Measurement and Payment: Restoration, replacement, and repair of bituminous, gravel, and concrete surfaces, in place, and accepted by OWNER shall be made at the contract LUMP SUM price for “Pavement Replacement” as set forth in the bid schedule. Said payment shall be considered full compensation for all labor, materials, and incidentals required to replace damaged surfaces. CONTRACTOR is cautioned to carefully study the site surfaces and prepare his lump sum bid accordingly as there shall be NO other payment for surface restoration.

-- THE END --

SECTION XXIII

TECHNICAL SPECIFICATIONS

COMBINATION AIR AND VACUUM RELEASE VALVE AND PIT

23.1 SCOPE

The CONTRACTOR shall provide all labor, tools, materials and equipment to furnish and install air and vacuum release valves and pits as shown on the Design Drawings and as directed.

23.2 QUALITY ASSURANCE/SUBMITTALS

Submit six copies of the following:

Documentation to substantiate compliance with materials section of this specification.

23.3 MATERIALS

A. Tapping Saddle: Tapping saddles shall be of double band type construction.

B. Pipe: All pipe shall be 2" brass and maintain a working pressure of 160 psi.

C. Combination Air Valve:

- All air release valves shall be combination air/vacuum release valves designed for raw sewage and effluent. The valve shall be a model D-025 as manufactured by A.R.I or approved equal.
- Each valve is to have: 2" N.P.T. intake; corrosion resistant conical body of reinforced nylon; corrosion resistant non-metallic operating mechanism; stainless steel spring loaded float to allow for system vibrations and turbulence; & working pressures of 3-240 PSI.

D. A 2" brass isolation valve shall be furnished for installation between the discharge pipe and air valve.

E. Valves with steel or cast iron bodies or internal parts that are corrosive, are not acceptable.

F. Valve Pit: Valve pit shall be a polyethylene meter box 36" in diameter by 36" deep with extension ring for the cover. The cover shall be cast iron and engraved with the word "SEWER."

23.4 INSTALLATION

Installation shall include the complete assembly with pit and top, shut-off valves, blow-offs, air valves, isolation valve, piping, fittings, and union, all complete and ready for operation in general conformance with the Drawings. Work in and around the pit will be done in a workmanlike manner leaving the top of the box one inch above the original ground surface.

23.5 MEASUREMENT AND PAYMENT

A. Measurement: Combination Air and Vacuum Release Valve and Pit assemblies shall be measured each.

B. Payment: Combination Air and Vacuum Release Valve and Pit, Complete In-Place shall be paid for at the contract unit price each as established in the Bid Schedule. Payment as specified shall be considered full compensation for all labor, materials, equipment, and incidentals necessary to perform the work.

-- THE END --

SECTION XXIV

TECHNICAL SPECIFICATIONS

WATER SERVICE CONNECTIONS

24.1 SCOPE

This specification governs the provision of water service connections.

24.2 GENERAL

The CONTRACTOR shall provide .75" through 1" water service connections in accordance with this specification. Water service connections for meters in excess of 1" shall be provided by OWNER.

24.3 QUALITY ASSURANCE/SUBMITTALS

24.3.1 Submit five copies of itemized summary of source of manufacture of each item in water service connection. Provide manufacturer's certification of compliance with specification for each item.

24.4 MATERIALS

24.4.1 Service Pipe: Water service pipe shall be 0.75" or 1" seamless copper water tubing Type "K" complying with ASTM-B88 AWWA C800.

24.4.2 Tapping Saddle: Tapping saddles shall be brass band type saddles equal to Ford S70 series for PVC pipe and the Ford 202 series for ductile iron pipe. The saddles shall be threaded to receive the appropriate diameter AWWA corporation stop.

24.4.3 Corporation Stop: Corporation stops shall conform to AWWA C800-84. Corporation stops shall have AWWA CC tapered thread inlets and pack joint or compression outlets for use with copper service line. The stop connections shall be appropriate for the service pipe diameter employed.

24.4.4 Meter Setter: The meter coppersetter shall be equal to the Ford 70 series V172-7 with 7 inch rise. If a pressure reducing valve is specified, a tandem coppersetter equal to a Ford TV172-7 shall be employed.

24.4.5 Meter Box and Lid: The meter box for coppersetters shall be 18" internal diameter High Density Polyethylene Pipe. The meter box and lid shall be equal to the Russco LC218 FB-18. The meter box for tandem coppersetters shall be 18" internal diameter High Density Polyethylene Pipe. The meter box and lid shall be equal to the Russco LC218 FB-18.

24.4.6 Meter: The meters shall be Sensus SR 2 series Meters $^{5}/_{8}$" x ¾" or 1" cold water type as indicated.

24.4.7 Curb Stop: Curb stops shall be equal to a Mueller 110, compression coupling both ends. Curb stop shall be suitable for diameter of service pipe employed. Curb stop shall be furnished complete with curb box and cover.

24.5 INSTALLATION

24.5.1. Taps: **THERE SHALL BE NO DRY TAPS.** The taps shall be made in accordance with the manufacturer's directions. Service line shall be protected by 6" of fine sand or gravel as indicated in the detail drawings.

24.5.2. Meter Setting: The meter settings shall be accomplished in a neat and workmanlike manner. The lid of the meter box shall be set:

1) flush with paved surfaces.
2) 0.5" above grade in improved lawns, and
3) 2" above grade in unimproved areas.

24.5.3 THE CONTRACTOR MAY NOT INSTALL THE METER! A dummy meter shall be used to verify that each setting is installed in the proper working manner. The CONTACTOR shall deliver the meters (suitably boxed) to the OWNER's public works director.

24.6 MEASUREMENT AND PAYMENT

24.6.1 Measurement and Payment: No separate measurement or payment shall be made for water service connections as it is incidental to the construction of the "Bobcat Boulevard Lift Station, complete in-place, tested and ready for service."

- THE END -

SECTION XXV

TECHNICAL SPECIFICATIONS

SEEDING, CLEAN-UP & LANDSCAPING

25.1 SCOPE

The purpose of this section is to outline the requirements for proper seeding, clean-up, and landscaping of all areas disturbed by construction.

25.2 SUBMITTALS

Submit six copies of documentation demonstrating compliance with the materials requirements of this specification.

25.3 SEEDING AND CLEAN-UP

25.3.1 General: All areas disturbed by construction which are not specifically designated for future construction 'by others' shall be seeded in accordance with this specification.

25.3.2 Requirements: Seeding shall be accomplished as described hereinafter. Unless otherwise specified by the OWNER, all areas to be seeded shall be left smooth and thickly sown with a mixture of grasses at a rate of not less than 87 pounds per acre. Unless otherwise specified, the mixture shall consist of 60 percent Kentucky Fescue #31, 30 percent Creeping Red Fescue, and 10 percent White Clover. After completion of rough grading in seeding areas, the CONTRACTOR shall apply agricultural limestone at a rate of 4 tons/ac and then re-distribute previously stockpiled site topsoils to a loose depth of 6 inches. The topsoil shall then be fertilized with number 12-12-12 fertilizer at a rate of 1000 pounds per acre. After fertilizer has been distributed, the CONTRACTOR shall disc or harrow the ground to thoroughly work the fertilizer into the soil. The seed shall then be broadcast either by hand or by approved sowing equipment at the rate specified. The CONTRACTOR shall protect the seeded area with straw mulch or hay mulch at a rate of two tons per acre. Plastic netting shall be used to anchor the mulch on all slopes steeper than 3:1. **All seed shall be certified**. Any necessary reseeding or repairing shall be accomplished by the CONTRACTOR prior to final acceptance. If the construction work is brought to completion when, in the opinion of the ENGINEER, the season is not favorable for the seeding of grounds, then the CONTRACTOR shall delay this item of work until the proper season for such seeding as directed by the ENGINEER.

25.3.3 Success and Maintenance: All areas seeded shall have a ninety (90) percent vegetative cover of lawn grasses, free of noxious weeds, at the end of the first growing season. Additionally, no individual area of bare ground, where seeding has been unsuccessful, shall exceed one square yard in surface area. CONTRACTOR shall be responsible for full expense of corrective seeding necessary to meet this performance criterion. OWNER shall incur no expense for remedial seeding.

25.3.4 Equivalency: These seeding specifications are intended to establish an attractive cover of lawn grasses. The CONTRACTOR may submit an alternate plan for establishment of vegetative cover. However, no alternative revegetation methodology shall be employed

without the express written approval of the ENGINEER. If the CONTRACTOR employs an alternative revegetation methodology, he is still bound by the Success and Maintenance requirements of this specification.

25.4 LANDSCAPING

Reasonable care shall be taken during construction to avoid damage to vegetation. Ornamental shrubbery and tree branches shall be temporarily tied back, where appropriate, to minimize damage. Trees that receive damage to branches shall be trimmed of those branches to improve the appearance of the tree. Tree trunks damaged by construction shall be treated with a tree dressing.

During the course of construction, some existing vegetation may be damaged to an extent that the ENGINEER believes it will not survive. The ENGINEER may then direct the CONTRACTOR to replace said vegetation upon completion of the construction. THE ENGINEER MUST APPROVE (IN WRITING) ALL LANDSCAPING ACTIVITIES (and the cost of same) PRIOR TO THEIR PERFORMANCE. PAYMENT WILL NOT BE MADE FOR ANY LANDSCAPING ACTIVITIES PERFORMED WITHOUT PRIOR WRITTEN APPROVAL OF THE ENGINEER.

25.5 MEASUREMENT AND PAYMENT

25.5.1 Measurement: There shall be no measurement for "Seeding and Cleanup" as the work shall be Lump Sum. Landscaping shall be performed on a direct cost basis as described below.

25.5.2 Payment: Payment for "Seeding and Cleanup" shall be made at the Lump Sum contract price as set forth on the Bid Schedule. Payment as specified shall constitute full compensation for all labor, materials, equipment and incidentals necessary to complete the "Seeding and Cleanup" work specified herein.

The fixed amount shown on the Bid Schedule for "Landscape Allowance" represents the ENGINEER'S best estimate of the cost of repairing existing landscape features. The method of payment shall be reimbursement of the actual, documented costs of replacement plus five (5) percent. The ENGINEER must pre-approve the type, location, and cost of all landscape plantings as set forth above. Payment as specified shall constitute full compensation for all labor, materials, equipment and incidentals necessary to complete the "Landscaping" work specified herein.

-- THE END --

SECTION XXVI

TECHNICAL SPECIFICATIONS

STANDBY POWER GENERATOR SYSTEMS – TRAILER MOUNTED

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Provide all labor, materials, equipment, and services required to install the trailer mounted engine generator set and accessories as shown on the Contract Drawings and as specified herein.

1.02 SYSTEMS DESCRIPTION

A. The installation of the portable trailer mounted standby power system shall include new and current design equipment consisting of:

1. A diesel engine driven electric generating set to provide standby power completely filled with proper lubricants and coolants per manufacturer's recommendations.

2. An engine start-stop control system mounted on the generator set.

3. Trailer, ICC equipped, suitable for highway use and licensable.

4. Mounted accessories as specified.

5. Fifty-foot power cord for main output, 4 conductor, extra flexible, extra hard usage type, of proper ampere rating.

6. Connection box in NEMA 4 enclosure for power cable connections between electrical distribution equipment and portable generator.

B. Should a manufacturer provide larger motors than shown on the Drawings, the Contractor shall supply correspondingly larger generator sets to handle the larger motors at no extra cost.

1.03 QUALIFICATIONS

A. Acceptable manufacturers include Kohler, Onan, Caterpillar, Cummins, or equal.

B. The packaged sets (engine/generator/trailer) shall be built, tested, and shipped by the manufacturer of the engine so there is one source of supply and responsibility.

1.04 SUBMITTALS

A. Shop drawings and other items needed to establish compliance with the Drawings and these Specifications shall be submitted to the Engineer in accordance with Section 16010 - Submittals.

B. O & M instructions shall be submitted to the Engineer in accordance with Section 16010.

C. Shop Drawings shall be clearly marked and or highlighted as to which product, type, option, etc. is being submitted. Product literature with one or more styles / configurations for a single product shall have a written description of use for each of the styles / configurations represented on the literature. For example: Device boxes – Styles shall be listed as: For masonry walls, for electrical devices, for ceiling mounted light fixtures, etc

1.05 SYSTEM WARRANTY

A. The trailer mounted systems shall be warranted for 2 years from the date of initial startup. The manufacturer shall maintain a parts/service center in the Central/Eastern Kentucky area.

PART 2 - PRODUCTS

2.01 ENGINE - DIESEL

A. The engines shall be diesel fueled, turbocharged, after cooled or naturally aspirated as required, 4 cycle, water cooled with mounted radiator, fan, and water pump. They shall be in-line 6 or 4 cylinders, with brake horsepower ratings as listed, at the operating speed of 1,800 rpm. Intake and exhaust valves shall be heat resisting alloy steel, free rotating. Exhaust valve seat inserts shall be provided. Full pressure lubrication shall be provided by positive displacement lube oil pumps. The engine shall have air cleaner, fuel and oil filters with replaceable elements, lube oil cooler, and fuel transfer pumps. Engine speed shall be governed by a mechanical governor to maintain alternator frequency within 5 percent from no load to full load alternator output. The engines shall have 12 or 24 volt battery charging d-c alternators with transistorized voltage regulators. Starting shall be by 12 or 24 volt, solenoid shift, electric starters.

2.02 ENGINE INSTRUMENT

A. The engine instrument panel shall contain an oil pressure gauge, coolant temperature gauge, and battery charge rate ammeter.

2.03 ENGINE CONTROLS

A. The generating set shall contain a complete engine start-up control which starts engine on closing contact and stops engine on opening contract. A cranking limiter shall be provided to open the starting circuit in approximately 45 to 90 seconds of the engine is not started within that time. The engine controls shall also include a 2 position selector switch with the following positions: RUN-STOP. High engine temperature, low oil pressure, and over speed shutdown with signal light alarm terminals also be provided. An emergency stop button shall be provided on the exterior of the enclosure.

2.04 BRUSHLESS ALTERNATOR

A. The alternator shall be a 4-pole, revolving field design with temperature compensated solid state voltage regulator and brushless rotating rectifier exciter system. No brushes will be allowed. The stator shall be directly connected to the engine flywheel housing, and the rotor shall be driven through a semiflexible driving flange to insure permanent alignment. The insulation system shall be Class F as defined by NEMA MGI-1.65. The 3-phase, broad range alternator shall be 12 lead, reconnectible. The unit shall be equipped with a 300 percent short circuit sustaining feature.

2.05 UNIT PERFORMANCE

A. Frequency regulation shall not exceed 3 Hz. from no load to rated load. Voltage regulation shall be within plus or minus 2 percent of rated voltage, from no load to full rated load. The instantaneous voltage dip shall be less than 18 percent of rated voltage when full 3-phase load, at rated power factor is applied to the alternator. Recovery to stable operation shall occur within 2 seconds. Stable or steady state operation is defined as operation with terminal voltage remaining constant within plus or minus 1 percent of rated voltage. A rheostat shall provide a minimum of plus or minus 5 percent voltage adjustment from rated value. Temperature rise shall be within NEMA MG1-22.40 definition.

2.06 ALTERNATOR INSTRUMENT PANEL

A. The alternator instrument panel shall be wired, tested, and shock mounted on the generating set by the manufacturer of the alternator. It shall contain panel lighting, manual reset main line circuit breaker, field circuit breaker, frequency meter, running time meter, voltage adjusting rheostat, a-c voltmeter, a-c ammeter, voltmeter-ammeter phase selector switches with off position.

2.07 GENERATOR SET MOUNTING

A. General

1. The electric generating set shall be on a welded steel base which shall provide suitable mounting on a trailer. It shall be so located that load is balanced on the trailer for safe towing.

B. Trailer

1. Provide single or tandem axle trailers as required, of formed steel construction with integral 150 gallon fuel tanks to provide a minimum of 6 hours of standby power. The tanks shall be equipped with fuel sight gauges, fuel fill caps with vents, engine suction and return fuel lines. Axles, tires, and rims shall be Engineered to safely handle the loads encountered. Fenders shall be an integral part of each trailer frame. The trailers shall be equipped with the ICC safety package which includes electric brakes (the requirement for electric brakes shall be reviewed by the manufacturer, and if addition of this feature would provide for unsafe towing of smaller sets, it shall not be required), stop/turn/tail lights, safety chains, reflectors, and 6 way electrical connector. The trailer hitch shall be of the pintal type and the trailer tongue shall include a leveling jack with sand shoe capable of supporting the unit during operation. The sand shoe shall be fold-up type. Provide a spare tire mounted on a rim and affixed to the trailer with an appropriate mounting bracket. Also a jacking mechanism of proper rating shall be supplied suitable for use to change the tires. A lug wrench shall also be supplied.

C. Engine Generator Enclosure

1. Provide weatherproof enclosures over the trailer mounted engine generator sets, of 16 gauge formed steel construction and modular design. They shall include 2 doors and 1 fixed open air intake louver, door access at the generator end. All doors and louvers are to be mounted on piano hinges and have keylock doors and louvers are to be mounted on piano hinges and have keylock latches. Provide 5 keys for each different lock. Enclosure design shall permit operation of the engine generator set at full rated capacity with all doors closed. The silencer shall be mounted on top of the enclosures with all accessories herein specified installed by the engine generator manufacturer/supplier.

2.08 ACCESSORIES

A. All accessories needed for proper operation of the generator set shall be furnished and installed. These shall include residential type exhaust silencers with bird screen and raincaps, all exhaust piping, battery cables, battery warming pads, and fuel tanks and lines.

B. A unit mounted battery charger equal to a LaMarche 6 ampere A46 with high rate charging switch and jacket water heater (1.5 KW) shall be provided with a common cord (25 feet long) for connection to 240 volt, single phase power supply during storage. Battery warming pads shall also be powered from same cable.)

C. A duct style resistive load bank shall be furnished and installed on the unit that shall mount to the discharge side of the radiator. The unit shall be single step with a contactor, pilot light, and control switch for engaging and disengaging it. It shall be prewired to the generator output with no cords or plugs to connect for use. The load bank shall be engineered into the

system such that its presence and use will not detract from the full capabilities of the generator set as far as restricting air flow, etc. The load bank shall either be weatherproof or shall mount inside the generator housing. The load bank shall be as manufactured by Avtron, or equal.

D. Due to the bulk of the power cables from the generators, a rack, reel, or tray shall be furnished for ease of cable storage and removal. The rack shall be part of the trailer/housing assembly and sufficiently rigid to withstand regular use satisfactorily throughout the warranty period of the generator set.

2.09 RATINGS

A. One portable unit shall be required with permanent nameplates listing the site they operate, mounted on the housing near the starting controls. The listing for these nameplates shall be per the Drawings.

PART 3 - EXECUTION

3.01 INSTALLATION/APPLICATION/ERECTION

A. Installation shall be in accordance with Drawings, accepted Shop Drawings, these Specifications, and manufacturer's recommendations.

B. The Contractor shall be responsible for delivering the generator set to the Owner after all pump testing, engine startup, and phasing, full of fuel, with other fluids replenished as necessary. A chart shall be furnished converting inches of fuel depth in the tank to gallons of fuel remaining.

3.02 FIELD PAINTING

A. The Contractor and the equipment manufacturer shall coordinate shop paint and field paint to assure compatibility.

3.03 TESTING

A. The Contractor shall perform an operating test at each site where it is proposed for the generator to be used. The manufacturer's field technical representative shall actually conduct the test. The generator must be able to carry the available load at all sites up to its ratings.

B. Checking and adjustment of phase rotation shall be performed at all sites to make generator output conform to utility configuration. It is unacceptable to isolate a motor and look at its rotation - a phase sequence indicator shall be utilized.

3.04 START-UP AND TRAINING

A. Provide a factory authorized representative to administer start-up and training for the generator. A copy of the start-up report shall be submitted to the Owner and Engineer upon completion.

3.05 TOOLS AND SPARE PARTS

A. An adequate supply of the proper lubricants shall be provided to perform one oil change and engine service interval. In addition, spare elements shall be provided for one change of fuel, and air filters.

B. Any special tools required for normal operation and maintenance shall be furnished to the Owner by the equipment manufacturer.

END OF SECTION