WASTEWATER PUMP STATION IMPROVEMENTS

NORTH BAY VILLAGE

TECHNICAL SPECIFICAITONS

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SECTION 01000

GENERAL REQUIREMENTS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. Furnish all labor, equipment and materials to demolish two existing wet pit/dry pit wastewater pump stations, install two new submersible wastewater pump stations with control systems, remove/replace control systems at two additional existing pump stations throughout North Bay Village, and provide four (4) trailer mounted diesel engine driven generators. The project will include but not be limited to all demolition, pump station installation, controls, SCADA, electrical, gravity sewer, sanitary manholes, force main piping and fittings, start-up services, training, site restoration and all other appurtenances necessary for a complete and accepted project. Construction of this project will require close coordination with the Owner and Engineer.

B. Contractor is advised that the equipment arrangements as shown on the Drawings may vary with different manufacturers and Contractor is responsible at no cost to Owner (North Bay Village) for making the changes necessary to accommodate the specific equipment installed.

C. Omission of a specific item or component part of a system obviously necessary for the proper functioning of the system shall not relieve the Contractor of the responsibility of furnishing the item as part of the work at no additional cost to Owner.

D. The Specification Divisions and Drawings are an integrated part of the Contract Documents and as such will not stand alone if used independently as individual Sections, Divisions, or Drawing Sheets. The Drawings and Specifications establish minimum standards of quality for this Project. They do not purport to cover all details entering into the design and construction of materials or equipment.

E. Where portions of the work traverse or cross federal, state, county or local highways, roads, streets, or waterways, and the agency in control of such property

has established standard specifications governing items of work that differ from these specifications, the most stringent requirements shall apply.

1.02 QUALITY ASSURANCE

A. Laws and Regulations: Contractor shall give all notices and comply with all laws, ordinances, rules, and regulations applicable to the work. If Contractor observes that the Specifications or Drawings are at variance therewith, Contractor shall give Engineer prompt written notice thereof, and any necessary changes shall be adjusted by an appropriate modification. If Contractor performs any work, knowing or having reason to know, that it is contrary to such laws, ordinances, rules, and regulations, and without such notice to Engineer, Contractor shall bear all costs arising therefrom. However, it shall not be Contractor's primary responsibility to make certain that the Specifications and Drawings are in accordance with such laws, ordinances, rules, and regulations.

1.03 PROJECT SPECIFICATIONS

A. The Miami-Dade Standard Specifications and Details for Design and Construction of water and wastewater improvements are hereby incorporated by reference and the Contractor shall comply with all requirements. Such reference shall mean the current edition, including all supplements. In case of a conflict in the requirements of the Miami-Dade Standard Specifications and Details and the requirements stated herein, the requirements herein shall prevail.

B. Portions of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction and their Roadway and Traffic Design Standards, hereinafter referred to as the DOT Standard Specifications, are referred to herein and amended, in part, and the same are hereby made a part of this Contract to the extent of such references and shall be as binding upon the Contract as though reproduced herein. Such reference shall mean the current edition, including all supplements. In case of a conflict in the requirements of the DOT Specifications and the requirements stated herein, the requirements herein shall prevail.

C. Contractor will be required to submit Maintenance of Traffic (MOT) plans for work on the Village streets and State highways if applicable. Contractor shall coordinate with MOTs for nearby or highway work and obtain approval for all traffic control as required by the permit jurisdiction having authority

D. The applicable portions of North Bay Village Code and Florida Building Code shall apply to the project.

PART 2 SEQUENCE OF OPERATIONS

2.01 SCHEDULING

A. General: Prepare and submit schedule in accordance with the provisions of Section 01300.

B. All new pump station and control system improvements at each pump station must be complete, accepted, and ready for use before the existing stations and equipment can be deactivated.

C. Plan the Work and carry it out with minimum interference to the operation of the existing facilities. Prior to starting the work, confer with the Engineer and Owner's representative to develop an approved work schedule which will permit the facilities to function normally as practical. It may be necessary to do certain parts of the construction work outside normal working hours in order to avoid undesirable conditions. The Contractor shall do this work at such times, and at no additional cost to the Owner. Do not make connections between existing work and new work until necessary inspection and tests have been completed on the new work and it is found to conform in all respects to the requirements of the Contract Documents.

D. No work shall be started until the Contractor has received approved shop drawings, established material/delivery dates for all equipment, and received approval of the construction schedule from the Engineer or Owner. The Contractor shall have sufficient manpower, equipment, and material to complete the project.

E. No work shall commence without express consent of the Engineer or Owner.

F. If a privately-owned staging area is required, no work shall commence until approval of the facility is obtained in accordance with Village requirements.

2.02 MOBILIZATION AND DEMOBILIZATION

A. Contractor shall be responsible for mobilization and demobilization of labor, materials and equipment. Payment for mobilization and demobilization shall be included in the lump sum price for the Project.

2.03 COORDINATION

A. Contractor shall cooperate in the coordination of separate activities in a manner that will provide the least interference with the Owner's operations and other contractors and utility companies working in the area, and in the interfacing and connection of the separate elements of the overall project work.

B. If any difficulty or dispute should arise in the accomplishment of the above, the problem shall be brought immediately to the attention of the Project Manager or Owner.

2.04 SHUTDOWN OF EXISTING OPERATIONS OR UTILITIES

A. Continuous operation of the Owner's service functions is of critical importance. The Contractor's work shall not result in the interruption of sewage, water, or solid waste service to any customers.

B. Minimizing conflicts with the ongoing area-wide commercial activities is of critical importance. The Contractor's work shall minimize in the interruption of operations at any facility or business.

C. Connections to existing services or utilities, or other work that requires the temporary shutdown of any existing operations or utilities shall be planned in detail with appropriate scheduling of the work and coordinated with the Owner or Project Manager. Two business days advanced notice shall be given in order that the Owner or Project Manager may witness the shutdown, tie-in, and startup. The temporary shutdown must be approved by the Owner. All tie-in and bypass operations shall be the responsibility of the Contractor and are considered incidental to the cost of construction and provided at no additional cost to the Owner.

D. All materials and equipment (including emergency equipment) necessary to expedite the tie-in shall be on hand prior to the shutdown of existing services or utilities.

2.05 OPERATION OF EXISTING SYSTEM PROHIBITED

A. At no time undertake to close off any utility lines or open valves or take any other action which would affect the operation of existing systems. The Owner’s forces

will operate all valves. Provide at least one business day notice to Owner prior to any operations.

PART 3 SITE CONDITIONS

3.01 SITE INVESTIGATION AND REPRESENTATION

A. The Contractor acknowledges satisfaction as to the general nature and location of the work, the general and local conditions, particularly those bearing upon availability of transportation, availability of labor, water, electric power, roads, and uncertainties of weather, or similar physical conditions, the character of equipment and facilities needed preliminary to and during the prosecution of the work, and all other matters which can in any way affect the work or the cost thereof under this Contract.

B. Failure by the Contractor to become acquainted with the physical conditions and all the available information will not relieve the Contractor from responsibility for properly estimating the difficulty or cost of successfully performing the work.

3.02 UTILITIES

A. The Contractor shall be responsible for determining and/or confirming, at his cost, the locations of all utilities within the project area, and shall be responsible for contacting each utility including North Bay Village for location and notification prior to commencing work.

B. The Contractor shall contact potentially affected utilities as needed.

C. The Contractor shall contact Sunshine State One Call at 1-800-432-4770 at least 2 working days prior to any excavation and make arrangements for locating all utilities in the project area.

3.03 CONTRACTOR RESPONSIBILITY FOR UTILITY PROPERTIES AND SERVICE

A. Where the Contractor's operations could cause damage or inconvenience to utilities, telephone, television, power, water, or sewer systems, the operations shall be suspended until all arrangements necessary for the protection of these utilities and services have been made by the Contractor with the owner of the utility affected.

B. Notify all utility offices which are affected by the construction operation at least 2 working days in advance. Under no circumstances expose any utility without first obtaining permission from the appropriate agency. Once permission has been granted, locate, expose, and provide temporary support for all existing underground utilities.

C. The Contractor shall be solely and directly responsible to the Owner and operators of such properties for any damage, injury, expense, loss, inconvenience, delay, suits, actions, or claims of any character brought because of any injuries or damage which may result from the construction operations under this Contract.

D. Neither the Owner nor its officers or agents shall be responsible to the Contractor for damages as a result of the Contractor's failure to protect utilities encountered in the work.

E. In the event of interruption to domestic water, sewer, storm drain, or other utility services as a result of accidental breakage due to construction operations, promptly notify the proper authority. Cooperate with said authority in restoration of service as promptly as possible and bear all costs of repair. In no case shall interruption of any water or utility service be allowed to exist outside working hours unless prior approval is granted.

F. In the event the Contractor encounters water service lines or sewer laterals that interfere with trenching, he may, by obtaining prior approval of the property owner, the Engineer and the Owner, cut the service, dig through, and restore the service with similar and equal materials at the Contractor's expense.

G. The Contractor shall replace, at his own expense, all existing utilities or structures removed or damaged during construction, unless otherwise provided for in these Contract documents or ordered by the Engineer.

3.04 INTERFERING STRUCTURES

A. Take necessary precautions to prevent damage to existing structures whether on the surface, aboveground, or underground.

B. Protect underground and aboveground existing structures from damage. Where such existing fences, gates, sheds, buildings, or any other structure must be removed in order to properly carry out the construction, or are damaged during construction, restore to their original condition to the satisfaction of the property

owner involved at the Contractor's own expense. Notify the Project Manager of any damaged underground structure and make repairs or replacements before backfilling.

C. Without additional compensation, the Contractor may remove and shall replace in a condition as good as or better than original, such small miscellaneous structures as fences, mailboxes, and signposts that interfere with the Contractor's operations.

PART 4 SAFETY AND CONVENIENCE

4.01 SAFETY AND ACCESS

A. The Contractor shall do all work necessary to protect the general public from hazards, including, but not limited to, surface irregularities or unramped grade changes in pedestrian sidewalk or walkway, and trenches or excavations in roadway. Barricades, lanterns, and proper signs shall be furnished in sufficient amount to safeguard the public and the work. All barricades and signs shall be clean and serviceable, in the opinion of the Project Manager.

B. The Contractor shall notify all residences and businesses of planned construction at least 5 working days prior to the start of work in the block where they are located. Such notices shall be brochures or door-hangers with sufficient information to describe the extent and duration of the planned work. Notification activities shall be coordinated with the Village Engineer.

C. Homeowners and business owners shall be provided reasonable access. The Contractor shall provide temporary sidewalks, bridges or driveway access, including safe passage over open excavations as required.

4.02 ACCIDENT REPORTS

A. In addition, the Contractor must promptly report in writing to the Engineer all accidents whatsoever arising out of, or in connection with, the performance of the work whether on, or adjacent to, the site, giving full details and statements of witnesses. If death or serious injuries or serious damages are caused, the accident shall be reported immediately by telephone or messenger to the Project Manager.

B. If a claim is made by anyone against the contractor or any subcontractor on account of any accident, the Contractor shall promptly report the facts in writing to the Project Manager, giving full details of the claim.

4.03 PROTECTION OF PROPERTY

A. Protect stored materials located adjacent to the proposed work. Notify property owners affected by the construction at least two business days in advance of the time construction begins. During construction operations, construct and maintain such facilities as may be required to provide access by all property owners to their property. No person shall be cut off from access to his residence or place of business for a period exceeding 2 hours, unless the Contractor has made special arrangements with the affected persons.

B. The Contractor shall identify and isolate his active work zone in such a manner as to exclude all personnel not employed by him, the Project Manager, and the Owner.

4.04 FIRE PREVENTION AND PROTECTION

A. The Contractor shall perform all work in a fire-safe manner. He shall supply and maintain on the site adequate fire-fighting equipment capable of extinguishing incipient fires. The Contractor shall comply with applicable federal, state, and local fire-prevention regulations. Where these regulations do not apply, applicable parts of the National Fire Prevention Standard for Safeguarding Building Construction Operations (NFPA No. 241) shall be followed.

4.05 ACCESS FOR POLICE, FIRE, SOLID WASTE AND POSTAL SERVICE

A. Notify the fire department, police department, and Public Works (Solid Waste) before closing any street or portion thereof. No closing shall be made without the Owner's approval of MOT plan. Notify said departments when the streets are again passable for emergency and solid waste vehicles. Do not block off emergency vehicle access to consecutive arterial crossings or dead-end streets, in excess of 300 linear feet, without special written permission from the fire department. Conduct operations with the least interference to fire equipment access, and at no time prevent such access.

B. Maintain postal service facilities in accordance with the requirements of the U.S. Postal Service.

4.06 HURRICANE PREPAREDNESS PLAN

A. The Contractor's attention is drawn to the possibility of hurricane or severe storm conditions occurring at the site of work during Contract Work.

B. Within fourteen (14) days of the date of the Notice to Proceed, the Contractor shall submit to the Engineer and Owner a Hurricane Preparedness Plan. The plan should outline the necessary measures which the Contractor proposes to perform at no additional cost to the Owner in case of a hurricane or severe weather warning.

C. In the event of inclement weather, or whenever the Owner shall direct, the Contractor shall, and will, cause Subcontractors to protect carefully the Work and materials against damage or injury. Work and materials damaged due to inclement weather shall be removed and replaced at the expense of the Contractor.

1. Hurricane Watch: Upon designation of a hurricane watch, the Contractor shall be responsible for storing all loose supplies and equipment on the job site that may pose a danger. In addition, the Contractor shall remove all bulkheads and plugs in pipelines that would impede drainage in the case of flooding. Structures that may be in danger of floatation shall be flooded. The Contractor shall also cooperate with the Owner in protecting any other structures at the site.
2. Hurricane Warning: No mobile "temporary facility" under the control of or on the property of the Owner shall be staffed during a hurricane warning. Contractor facilities meeting these criteria shall be evacuated. Reasonable steps shall be taken to protect all such facilities and their contents from damage and to avoid the facility causing damage to the surroundings. Reasonable steps shall be taken to protect existing improvements from damage and to avoid damage to the surroundings caused by staged materials, equipment, or other facilities related to the project.

D. The Contractor may be required to backfill excavation depending on the severity of the approaching storm or the expected amount of rainfall. Additionally, erosion protection and inlet protection may also be required by the Owner depending on the site conditions at the time of the Hurricane Watch.

PART 5 PRESERVATION, RESTORATION, AND CLEANUP

5.01 SITE RESTORATION AND CLEANUP

A. At all times during the work, keep the premises clean and orderly, and upon completion of the work, repair all damage caused by equipment and leave the project free of rubbish or excess materials of any kind.

B. Stockpile excavated materials in a manner that will cause the least damage to adjacent lawns, grassed areas, gardens, shrubbery, or fences, regardless of whether these are on State or Village rights-of-way. Remove all excavated materials from grassed and planted areas, and leave these surfaces in a condition equivalent to their original condition.

5.02 FINISHING OF SITE, BORROW, AND STORAGE AREAS

A. Upon completion of the project, all areas used by the Contractor shall be properly cleared of all temporary structures, rubbish, and waste materials and properly graded to drain and blend in with the abutting property. Areas used for the deposit of waste materials shall be finished to properly drain and blend with the surrounding terrain. Grassed areas shall be restored as specified.

PART 6 PERMITS

6.01 GENERAL

A. Permits to be Obtained by the Contractor may include, but are not limited to the following:

1. Local Building permits.
2. Local and State contracting licenses.
3. State utility permit.
4. State/County dewatering permit (including contaminated sites).

B. All costs associated with the required permits are the Contractor's responsibility.

END OF SECTION

SECTION 01010

SUMMARY OF WORK

PART 1 GENERAL

1.01 WORK COVERED BY CONTRACT DOCUMENTS

A. Furnish all labor, equipment and materials to demolish two existing wet pit/dry pit wastewater pump stations, install two new submersible wastewater pump stations with control systems, remove/replace control systems at two additional existing pump stations throughout North Bay Village, and provide four (4) trailer mounted diesel engine driven generators. The project will include but not be limited to all demolition, pump station installation, controls, SCADA, electrical, gravity sewer, sanitary manholes, force main piping and fittings, start-up services, training, site restoration and all other appurtenances necessary for a complete and accepted project. Construction of this project will require close coordination with the Owner and Engineer.

B. Contractor's Duties:

1. Except as specifically noted, provide and pay for:

   a. Mobilization and demobilization
   b. Labor, materials, and equipment
   c. Tools, construction equipment, and fuel
   d. Electric, water and utilities required for construction
   e. Temporary utilities, provisions, and controls
   f. Freight, sales tax, and permit fees
   g. Maintenance of traffic
   h. Surveying, field engineering
   i. Record drawing information in a format acceptable to the Engineer.
   j. Compliance with all the conditions of the permits issued and required for this project.
   k. Construction dewatering
   l. Wastewater bypass pumping

1.02 CONTRACTS

A. Construct the work under a Lump Sum or Unit Price as indicated in the Contract Documents.

B. Subcontractors work directly for the Contractor.

1.03 WORK BY OTHERS AND FUTURE WORK

A. The Owner reserves the right to add or delete Work in accordance with the Contract.

1.04 CONTRACTOR-FURNISHED PRODUCTS AND RESPONSIBILITIES

A. Products furnished to the site and paid for by Contractor:

1. All products necessary to complete the work described herein these contract documents and specifications.

B. Contractor's Responsibilities:

1. Review and incorporate Owner-reviewed shop drawings, product data, and samples into the construction of the project.
2. Prepare, apply for, and obtain permits that are specified to be obtained by the contractor.
3. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
4. Repair or replace items damaged after receipt.
5. Arrange and pay for product delivery to site.
6. Handle, store, install, and delivered products.
7. Submit claims for transportation damage and replace damaged, defective, or deficient items.
8. Arrange for manufacturers' warranties, inspections, and service.

1.05 CONTRACTORS USE OF THE PREMISES

A. Details of the construction sequence will be discussed and decided at the Pre-Work Conference. Certain areas may be assigned priority to accommodate Owner's interest.

B. All work shall be within the limits of North Bay Village right-of-way. Contractor shall be responsible for maintenance of traffic when working within the public rights of way.

C. The staging area locations and costs are the responsibility of the contractor but must be coordinated with North Bay Village. The contractor shall always maintain access to North Bay Village facilities. The contractor shall restore the staging area to an equal or better condition than previously existed upon completion of the work.

D. The Contractor shall be fully responsible for the safety and security of the construction area including any temporary measures required to maintain its protection. The Contractor will be responsible for any damages or theft incurred to his tools, equipment, machinery, and new work in-place not yet been fully accepted by the Owner.

PART 2 PRODUCTS

A. Not Used

PART 3 EXECUTION

A. Not Used

END OF SECTION

SECTION 01020

ALLOWANCE

PART 1 SCOPE OF WORK

1.01 DEFINITION

A. Included in the contract sum is an allocation account for unforeseen conditions, potential construction changes and adjustments, if ordered and authorized by the Village in accordance with the contract documents.

1.02 ALLOWANCE ACCOUNT

A. Monies in the allocation account will be used only with pre-approval in writing by the Village and issuance of change order.

B. At the closeout of contract, monies remaining in the allowance account will be credited to the Village by change order.

1.03 SELECTION OF PRODUCTS UNDER ALLOWANCES

A. Engineer's Duties:

1. Consult with the Contractor in consideration of products and supplier or installers or changes in quantities of bid items.

2. Make selection in consultation with the Owner. Obtain Owner's written decision, designating:

    a. Product, model and/or class of materials.
    b. Accessories and attachments.
    c. Supplier and installer as applicable.
    d. Cost to Contractor, delivered to the site or installed, as applicable.
    e. Warranties
    f. Quantities

3. Transmit Owner's decision to the Contractor.

4. Prepare change orders.

B. Contractor's Duties:

1. Assist Engineer and Owner in determining qualified suppliers, quantities or subcontractor.

2. Obtain proposals from a minimum of three (3) suppliers and/or subcontractors when requested by Engineer.

3. Make appropriate recommendations for consideration of the Engineer.

4. Notify Engineer promptly of:

a. Any reasonable objections Contractor may have against any supplier, or party under consideration for installation.

b. Any effect on the construction schedule anticipated by selection under consideration.

1.04 CONTRACTOR RESPONSIBILITY FOR PURCHASE, DELIVERY AND INSTALLATION

A. On notification of selection, execute purchase agreement with designated suppliers and/or subcontractors.

B. Arrange for and process shop drawings, product data and samples, as required.

C. Make all arrangements for delivery.

D. Upon delivery, promptly inspect products for damage or defects.

E. Submit claims for transportation damage.

F. Install and finish products in compliance with requirements of referenced specification sections, including restoration.

1.05 ADJUSTMENT OF COSTS

A. Should the net cost be more or less than the specified amount of the allowance, the contract sum will be adjusted accordingly by change order. Should work be changed by change order:

1. The amount of the change order will recognize any changes in handling costs at the site, equipment, labor, installation costs, overhead, profit, and other expenses caused by the change order.

2. For products specified under a unit cost in the change order schedule of values, the unit cost shall apply to the additional quantities actually used.

B. Submit any claims for anticipated additional costs at the site, or other expenses caused by the selection under the allowance, prior to execution of the work.

C. Failure to submit claims within the designated time will constitute a waiver of claims for additional costs.

D. At contract closeout, reflect all approved changes in contract amounts in the final statement of accounting.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01060

REGULATORY REQUIREMENTS AND NOTIFICATION

PART 1 GENERAL

1.01 GENERAL

A. Contractor shall comply with and furnish all items necessary to satisfy any general and specific conditions that are part of the Contractor obtained permits and licenses.

B. Obtain and pay for all permits and licenses as provided for in the General Conditions, except as otherwise provided herein.

C. Schedule all inspections and obtain all written approvals of the agencies required by the permits, easements, and licenses.

D. The Contractor shall keep a copy of all permits complete with conditions, attachments, exhibits, and modifications at the work site and provide copies of the permits to the appropriate subcontractors. The contractor is responsible for ensuring that the permit conditions are explained to the appropriate construction personnel.

1.02 PERMITS BY OWNER

A. Miami-Dade County Department of Regulatory and Economic Resources/ Florida Department of Environmental Protection (FDEP) Wastewater Collection/Transmission System Permits.

1.03 PERMITS/EASEMENTS BY CONTRACTOR

A. The Contractor shall prepare and pay for a building permit from North Bay Village prior to initiating construction. The Contractor shall conform to the conditions of these permits as part of this Contract.

B. The Contractor shall prepare, submit, and pay for the Notice of Intent (NOI) to use the Generic Permit for Stormwater Discharge from Construction Activity,

which will include Stormwater Pollution Prevention Plan (SWPPP) as required by F.A.C. 62-621.300(4) and the Environmental Protection Agency (EPA) as part of the National Pollutant Discharge Elimination System (NPDES) prior to beginning work. The Contractor will be responsible for the application fee and the costs associated with preparation of the NOI and SWPPP. The Contractor shall conform to the conditions of this permit as part of this Contract.

C. The Contractor shall prepare, submit and obtain the appropriate dewatering permits and/or any temporary stormwater discharge permits from the South Florida Water Management District and/or Florida Department of Environmental Protection as may be required to execute the project. The contractor shall be responsible for any permitting and application fees associated with these permits. The Contractor shall conform to the conditions of this permit as part of this Contract.

D. Other Permits Required: The Contractor is responsible for obtaining any other permits that may be required by other agencies and shall conform to their conditions as part of this contract.

1.04 NOTIFICATIONS

A. The Contractor is required to notify North Bay Village Public Works Department 48 hours prior to initiating construction.

B. Contractor shall notify the Sunshine State One Call of Florida (SSOCF) service by dialing 811, 48 hours prior to digging for direct bury and 10 day prior to digging or initiating construction of underwater construction activities, as required by Florida Statues Chapter 556 throughout the duration of the construction project.

C. Contractor shall coordinate directly with North Bay Village Public Works Department for Village owned utility locations.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

Not Used

END OF SECTION

SECTION 01150

MEASUREMENT AND PAYMENT

PART 1 GENERAL

1.01 SCOPE OF THIS SECTION

A. The following explanation of the Measurement and Payment for the Bid Form items is provided; however, the omission of reference to any item shall not alter the intent of the Bid Form or relieve the Contractor of the necessity of constructing a complete project under this Contract.

1.02 METHOD OF MEASUREMENT

A. **Measurement of Length:** Unless otherwise specified for the particular items involved, all measurements of distance for items to be paid for on the basis of length shall be taken horizontally or vertically.

B. **Measurement of Area:** In the measurement of items paid for on the basis of area of finished work, the lengths and/or widths to be used in the calculations shall be the actual dimensions measured along the surface of the completed work within the neat lines shown or designated. At intersections, the measurement used for length of side area will be measured from the outside edge of the width allowed along the main trench.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 BID FORM

A. **BID ITEM NO. 1 – MOBILIZATION, BONDS & INSURANCE**

Measurement: Work as specified in this section shall consist of work preparatory to actual construction at the site. It shall include, but not be limited to, movement of personnel, equipment, supplies, and incidentals to the project site, and for the establishment of temporary offices, buildings, safety equipment and first aid supplies, sanitary and other facilities as required by these Specifications and state and local laws and regulations. This cost should include the construction of two (2) project signs that shall be displayed at approaches to the project area. The intent is that the signs will be freestanding. The sign shall display on both sides the project name, Village Logo, elected officials, and contact information. The costs of any and all permits, bonds and any required insurance, and any other preconstruction expense necessary for the start of the work, excluding the cost of construction materials, shall be included in this section. Also included in this section will be all costs associated with meetings and coordination with the Owner and Engineer for the purpose of discussing project progress.

Payment: Payment shall be made as a lump sum quantity in accordance with the following schedule and the contract documents:

Percentage Contract Amount Earned	Allowable Percentage of Lump Sum Price
5%	25%
10%	50%
25%	75%
50%	100%

The standard retainage will be applied to these allowances.

B. **BID ITEM NO. 2 - REMOVAL AND SALVAGE/DISPOSAL OF MAIN WASTEWATER PUMP STATION EXISTING EQUIPMENT/MATERIALS**

Measurement: The cost shall include demolition, removal and salvage/disposal of all existing equipment, materials, controls, and associated electrical system components.

Payment: Payment for this work shall be made at the lump sum price and shall include all labor and equipment needed to salvage/dispose of all existing equipment as indicated on the plans off site in a legal manner. Prior to disposal,

the Contractor will coordinate with Owner on any items to be salvaged or kept by the Village.

C. **BID ITEM NO. 3 – DEMOLITION OF MAIN WASTEWATER PUMP STATION BUILDING/WETWELL/DRY PIT STRUCTURES AND UTILTIES**

Measurement: The cost shall include demolition and disposal of the existing pump station, site elements in conflict with the proposed improvements, and existing utilities to be removed or placed out of service.

Payment: Payment for this work shall be made at the lump sum price and shall include all labor and equipment needed to demolish and remove the existing pump station building, wetwell, dry pit, FPL vault, existing gravity sewer, force main piping, and all asphalt, concrete, curbing, sidewalk, etc. as indicated on the plans off site in a legal manner. Bid item cost to include provisions and legal procedures for proper disinfection and disposal of any existing wastewater and/or debris in the wetwell or associated piping as part of the demolition process. Bid item also to include studies, such as asbestos, required by any authorities having jurisdiction prior to demolishing the structure.

D. **BID ITEM NO. 4 - REMOVAL AND SALVAGE/DISPOSAL OF MAIN WASTEWATER PUMP STATION GENERATOR AND FUEL SYSTEM**

Measurement: The cost shall include demolition, removal and salvage/disposal of the existing generator system.

Payment: Payment for this work shall be made at the lump sum price and shall include all labor and equipment needed to salvage/dispose of the existing generator, fuel system, generator system accessories, controls, and associated electrical system as indicated on the plans off site in a legal manner. Prior to disposal, the Contractor will coordinate with Owner on any generator related items to be salvaged or kept by the Village. Bid item cost to include provisions and legal procedures for proper removal and/or disposal of any fuels or contaminated fluids associated with the generator system.

E. **BID ITEM NO. 5 - REMOVAL AND SALVAGE/DISPOSAL OF HISPANOLA AVENUE WASTEWATER PUMP STATION EXISTING EQUIPMENT/MATERIALS**

Measurement: The cost shall include demolition, removal and salvage/disposal of all existing equipment, materials, controls, and associated electrical system components.

Payment: Payment for this work shall be made at the lump sum price and shall include all labor and equipment needed to salvage/dispose of all existing equipment as indicated on the plans off site in a legal manner. Prior to disposal, the Contractor will coordinate with Owner on any items to be salvaged or kept by the Village.

F. **BID ITEM NO. 6 – DEMOLITION OF HISPANOLA AVENUE PUMP STATION WETWELL/DRY PIT STRUCTURES AND UTILTIES**

Measurement: The cost shall include demolition and disposal of the existing pump station, site elements in conflict with the proposed improvements, and existing utilities to be removed or placed out of service. This cost shall also include field coordination and removal/relocation of all palm trees on the Hispanola Avenue as directed by the Village.

Payment: Payment for this work shall be made at the lump sum price and shall include all labor and equipment needed to demolish and remove the existing pump station wetwell, dry pit, existing gravity sewer, force main piping, and all asphalt, concrete, curbing, sidewalk, etc. as indicated on the plans off site in a legal manner. Bid item cost to include provisions and legal procedures for proper disinfection and disposal of any existing wastewater and/or debris in the wetwell or associated piping as part of the demolition process. Bid item also to include palm tree removal/relocation and studies, such as asbestos, required by any authorities having jurisdiction prior to demolishing the structure.

G. **BID ITEM NO. 7 - REMOVAL AND SALVAGE/DISPOSAL OF HISPANOLA AVENUE PUMP STATION GENERATOR AND FUEL SYSTEM**

Measurement: The cost shall include demolition, removal and salvage/disposal of the existing generator system.

Payment: Payment for this work shall be made at the lump sum price and shall include all labor and equipment needed to salvage/dispose of the existing generator, fuel system, generator system accessories, controls, and associated electrical system as indicated on the plans off site in a legal manner. Prior to disposal, the Contractor will coordinate with Owner on any generator related items to be salvaged or kept by the Village. Bid item cost to include provisions and legal procedures for proper removal and/or disposal of any fuels or contaminated fluids associated with the generator system.

H. **BID ITEM NO. 8 - INSTALL NEW SUBMERSIBLE MAIN WASTEWATER PUMP STATION WITH VALVE VAULT**

Measurement: The cost shall include work associated with installing new submersible wastewater pump station including but not limited to wetwell, valve vault, submersible pumps, all valves, piping, and fittings reflected on the pump station detail sheet, hatch covers, pump station accessories, and sump pump system.

Payment: Payment for this work shall be made at the lump sum price and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, pump station installation, connection to proposed sanitary sewer and force main systems, system restraining, concrete, clearing, grubbing, excavation and back fill, sheeting and shoring as needed, bypass pumping plan and equipment, dewatering, compaction, disposal of undesirable material, new fill, grading, safety, dust/erosion control, survey layout, asbuilt drawings, repair or replacement of existing utilities impacted or damaged during construction, operation and maintenance manuals, and training for a complete wastewater pump station installation. Any item not specified shall be considered incidental to the work.

I. **BID ITEM NO. 9 – INSTALL 8” C900 PVC FORCE MAIN AT MAIN WASTEWATER PUMP STATION**

Measurement: The cost shall include material and work associated with installing 8” C900 PVC force main piping as shown on the plans on a lineal foot basis in accordance with the unit prices contained in the proposal.

Payment: Payment for this work shall be made at the unit cost basis and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, force main installation, DIP fittings with protective coatings, connection to existing system, restraining devices, clearing, grubbing, excavation and back fill, sheeting and shoring as needed, bypass pumping plan and equipment, dewatering, compaction, disposal of undesirable material, new fill, grading, associated trench restoration, safety, dust/erosion, pressure testing, survey layout, asbuilt drawings, and repair or replacement of existing utilities impacted or damaged during construction for a complete force main installation. Any item not specified shall be considered incidental to the work.

J. **BID ITEM NO. 10 – 8" PLUG VALVES AT MAIN WASTEWATER PUMP STATION**

Measurement: The cost shall include material and work associated with installing 8" plug valves as shown on the plans in accordance with the unit prices contained in the proposal.

Payment: Payment for this work shall be made at the unit cost basis and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, valve installation, valve box installation, concrete pads, extension nuts, restraining devices, fittings, clearing, grubbing, excavation and back fill, dewatering, compaction, disposal of undesirable material, new fill, grading, associated trench restoration, safety, dust/erosion, pressure testing, survey layout, asbuilt drawings, and repair or replacement of existing utilities impacted or damaged during construction for complete a complete plug valve installation. Any item not specified shall be considered incidental to the work.

K. **BID ITEM NO. 11 – FORCE MAIN AIR RELEASE VALVE ASSEMBLY AT MAIN WASTEWATER PUMP STATION**

Measurement: The cost shall include material and work associated with installing air release valves as shown on the plans or as determined in the field in accordance with the unit prices contained in the proposal. The air release valves shall be automatic operation type and installed in a concrete vault with manhole cover as specified.

Payment: Payment for this work shall be made at the unit cost basis and shall include all labor, equipment, material, location and coordination of all existing

utilities prior to construction, automatic air release valve assembly installation, corporation stops, pipe, fittings, couplings, taps, valve vault/box, connection to force main, clearing, grubbing, excavation and back fill, dewatering, compaction, disposal of undesirable material, new fill, grading, associated trench restoration, safety, dust/erosion, pressure testing, survey layout, asbuilt drawings, and repair or replacement of existing utilities impacted or damaged during construction for complete a complete air release valve assembly installation. Any item not specified shall be considered incidental to the work.

L. **BID ITEM NO. 12 AND 13 – 18" AND 10" PVC GRAVITY SEWER AT MAIN WASTEWATER PUMP STATION**

Measurement: The cost shall include material and work associated with installing PVC, SDR 26 gravity sewer as shown on the plans on a lineal foot basis in accordance with the unit prices contained in the proposal.

Payment: Payment for this work shall be made at the unit cost basis and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, gravity sewer installation, connection to existing/proposed system, pipe couplings, clearing, grubbing, excavation and back fill, sheeting and shoring as needed, bypass pumping plan and equipment, dewatering, compaction, disposal of undesirable material, new fill, grading, associated trench restoration, safety, dust/erosion, testing, survey layout, asbuilt drawings, and repair or replacement of existing utilities impacted or damaged during construction for a complete force main installation. Any item not specified shall be considered incidental to the work.

M. **BID ITEM NO. 14 – INSTALL SANITARY MANHOLE AT MAIN WASTEWATER PUMP STATION**

Measurement: The unit price shall include work associated with installing new sanitary manholes including but limited to manhole structure, manhole covers and frames, invert channels, and accessories as shown on the plans.

Payment: Payment shall be at the contract unit price for the installation of sanitary manholes and shall include all costs for labor, equipment, materials, bypass pumping, connection to proposed/existing sanitary sewer system, grouting, interior and exterior protective coatings, clearing, grubbing, excavation and back fill, dewatering, compaction, disposal of undesirable material, new fill, grading,

trench restoration, testing, utility cover adjustment, survey layout, record drawings, and repair or replacement of existing utilities impacted or damaged during construction for a complete sanitary manhole installation. Any item not specified shall be considered incidental to the work.

N. **BID ITEM NO. 15 - INSTALL MACERATOR ASSEMBLY AT MAIN WASTEWATER PUMP STATION**

Measurement: The cost shall include work associated with installing a new wastewater macerator assembly including but limited to manhole structure, submersible macerator, manhole cover and frame, and accessories as shown on the plans.

Payment: Payment for this work shall be made at the lump sum price and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, macerator assembly installation, connection to proposed sanitary sewer system, restraining and anchoring requirements/devices, concrete, clearing, grubbing, excavation and back fill, bypass pumping, dewatering, compaction, disposal of undesirable material, new fill, grading, safety, dust/erosion control, survey layout, asbuilt drawings, repair or replacement of existing utilities impacted or damaged during construction, operation and maintenance manuals, and training for a complete wastewater macerator installation. Any item not specified shall be considered incidental to the work.

O. **BID ITEM NO. 16 – INSTALL ¾" HDPE WATER SERVICE WITH RPZ AT MAIN WASTEWATER PUMP STATION**

Measurement: The cos shall include work associated with installing a new ¾" HDPE water service including but not limited to HDPE piping, RPZ backflow assembly, hose bib, corporation stops, fittings, couplings, taps, connection to existing water meter, and accessories as shown on the plans.

Payment: Payment for this work shall be made at the lump sum price and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, water service installation, clearing, grubbing, excavation and back fill, dewatering, compaction, disposal of undesirable material, new fill, grading, associated site restoration, safety, dust/erosion, disinfection and bacteriological testing, pressure testing, survey layout, asbuilt drawings, and repair or replacement of existing utilities impacted or damaged during construction for a

complete water service installation. Any item not specified shall be considered incidental to the work.

P. **BID ITEM NO. 17 – INSTALL FENCE AT MAIN WASTEWATER PUMP STATION**

Measurement: The cost shall include material and work associated with installing new chain link fencing including but not limited fencing, posts, gate, fabric, truss rods, concrete footers, locking devices and accessories as shown on the plans on a lineal foot basis in accordance with the unit prices contained in the proposal.

Payment: Payment for this work shall be made at the unit cost basis and shall include all labor, equipment, material, location and coordination of all underground utilities prior to construction, fence and gate installation, building department permitting, clearing, grubbing, excavation and back fill, compaction, disposal of undesirable material, new fill, grading, safety, dust/erosion, survey layout, asbuilt drawings, and repair or replacement of existing utilities impacted or damaged during construction for a complete chain link fence and gate installation. Any item not specified shall be considered incidental to the work.

Q. **BID ITEM NO. 18 - INSTALL NEW SUBMERSIBLE HISPANOLA AVENUE PUMP STATION WITH VALVE VAULT**

Measurement: The cost shall include work associated with installing new submersible wastewater pump station including but not limited to wetwell, valve vault, submersible pumps, all valves, piping, and fittings reflected on the pump station detail sheet, hatch covers, pump station accessories, and sump pump system.

Payment: Payment for this work shall be made at the lump sum price and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, pump station installation, connection to proposed sanitary sewer and force main systems, system restraining, concrete, clearing, grubbing, excavation and back fill, sheeting and shoring as needed, bypass pumping plan and equipment, dewatering, compaction, disposal of undesirable material, new fill, grading, safety, dust/erosion control, survey layout, asbuilt drawings, repair or replacement of existing utilities impacted or damaged during construction, operation and maintenance manuals, and training for a complete

wastewater pump station installation. Any item not specified shall be considered incidental to the work.

R. **BID ITEM NO. 19 – INSTALL 8" C900 PVC FORCE MAIN AT HISPANOLA AVENUE PUMP STATION**

Measurement: The cost shall include material and work associated with installing 8" C900 PVC force main piping as shown on the plans on a lineal foot basis in accordance with the unit prices contained in the proposal.

Payment: Payment for this work shall be made at the unit cost basis and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, force main installation, DIP fittings with protective coatings, connection to existing system, restraining devices, clearing, grubbing, excavation and back fill, sheeting and shoring as needed, bypass pumping plan and equipment, dewatering, compaction, disposal of undesirable material, new fill, grading, associated trench restoration, safety, dust/erosion, pressure testing, survey layout, asbuilt drawings, and repair or replacement of existing utilities impacted or damaged during construction for a complete force main installation. Any item not specified shall be considered incidental to the work.

S. **BID ITEM NO. 20 – 8" PLUG VALVES AT HISPANOLA AVENUE PUMP STATION**

Measurement: The cost shall include material and work associated with installing 8" plug valves as shown on the plans in accordance with the unit prices contained in the proposal.

Payment: Payment for this work shall be made at the unit cost basis and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, valve installation, valve box installation, concrete pads, extension nuts, restraining devices, fittings, clearing, grubbing, excavation and back fill, dewatering, compaction, disposal of undesirable material, new fill, grading, associated trench restoration, safety, dust/erosion, pressure testing, survey layout, asbuilt drawings, and repair or replacement of existing utilities impacted or damaged during construction for complete a complete plug valve installation. Any item not specified shall be considered incidental to the work.

T. **BID ITEM NO. 21 – FORCE MAIN AIR RELEASE VALVE ASSEMBLY AT HISPANOLA AVENUE PUMP STATION**

Measurement: The cost shall include material and work associated with installing air release valves as shown on the plans or as determined in the field in accordance with the unit prices contained in the proposal. The air release valves shall be automatic operation type and installed in a concrete vault with manhole cover as specified.

Payment: Payment for this work shall be made at the unit cost basis and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, automatic air release valve assembly installation, corporation stops, pipe, fittings, couplings, taps, valve vault/box, connection to force main, clearing, grubbing, excavation and back fill, dewatering, compaction, disposal of undesirable material, new fill, grading, associated trench restoration, safety, dust/erosion, pressure testing, survey layout, asbuilt drawings, and repair or replacement of existing utilities impacted or damaged during construction for complete a complete air release valve assembly installation. Any item not specified shall be considered incidental to the work.

U. **BID ITEM NO. 22 – 18" PVC GRAVITY SEWER AT HISPANOLA AVENUE PUMP STATION**

Measurement: The cost shall include material and work associated with installing PVC, SDR 26 gravity sewer as shown on the plans on a lineal foot basis in accordance with the unit prices contained in the proposal.

Payment: Payment for this work shall be made at the unit cost basis and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, gravity sewer installation, connection to existing/proposed system, pipe couplings, clearing, grubbing, excavation and back fill, sheeting and shoring as needed, bypass pumping plan and equipment, dewatering, compaction, disposal of undesirable material, new fill, grading, associated trench restoration, safety, dust/erosion, testing, survey layout, asbuilt drawings, and repair or replacement of existing utilities impacted or damaged during construction for a complete force main installation. Any item not specified shall be considered incidental to the work.

V. **BID ITEM NO. 23 – INSTALL SANITARY MANHOLE AT HISPANOLA AVENUE PUMP STATION**

Measurement: The unit price shall include work associated with installing new sanitary manholes including but limited to manhole structure, manhole covers and frames, invert channels, and accessories as shown on the plans.

Payment: Payment shall be at the contract unit price for the installation of sanitary manholes and shall include all costs for labor, equipment, materials, bypass pumping, connection to proposed/existing sanitary sewer system, grouting, interior and exterior protective coatings, clearing, grubbing, excavation and back fill, dewatering, compaction, disposal of undesirable material, new fill, grading, trench restoration, testing, utility cover adjustment, survey layout, record drawings, and repair or replacement of existing utilities impacted or damaged during construction for a complete sanitary manhole installation. Any item not specified shall be considered incidental to the work.

W. **BID ITEM NO. 24 – INSTALL ¾" HDPE WATER SERVICE WITH RPZ AT HISPANOLA AVENUE PUMP STATION**

Measurement: The cost shall include work associated with installing a new ¾" HDPE water service including but not limited to HDPE piping, RPZ backflow assembly, hose bib, corporation stops, fittings, couplings, taps, connection to existing water meter, and accessories as shown on the plans.

Payment: Payment for this work shall be made at the lump sum price and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, water service installation, clearing, grubbing, excavation and back fill, dewatering, compaction, disposal of undesirable material, new fill, grading, associated site restoration, safety, dust/erosion, disinfection and bacteriological testing, pressure testing, survey layout, asbuilt drawings, and repair or replacement of existing utilities impacted or damaged during construction for a complete water service installation. Any item not specified shall be considered incidental to the work.

X. **BID ITEM NO. 25 – ELECTRICAL SYSTEM MODIFICATIONS AND NEW ELECTRICAL WORK AT MAIN WASTEWATER PUMP STATION**

Measurement: The cost shall include material and work associated with the modifications of the existing electrical service/distribution system as needed for the installation of the new control panel and associated control system components including but not limited to all conduit, wiring, and grounding at the Main Wastewater Pump Station.

Payment: Payment for modifications of the electrical distribution system as well as installation of new electrical system shall be made at the lump sum price and shall include all materials, labor, and all terminations and tie-in at the control panel and panelboards for a complete electrical service/distribution system installation. Cost shall also include coordination with FPL and the Owner as needed for the new electrical service.

Y. **BID ITEM NO. 26 – INSTALL NEW CONTROL PANEL AT MAIN WASTEWATER PUMP STATION**

Measurement: The cost shall include material and work associated with installing a new control panel system including but not limited to stainless steel control panel, variable frequency drive, programmable logic controller, operator interface, air conditioner, equipment rack, level transmitter, level switches, pressure transmitter, and SCADA system for the Main Wastewater Pump Station and associated wastewater macerator as shown on the plans.

Payment: Payment for this work shall be made at a lump sum cost and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, control panel installation, concrete, clearing, grubbing, excavation and back fill, compaction, disposal of undesirable material, new fill, grading, safety, dust/erosion control, survey layout, asbuilt drawings, repair or replacement of existing utilities impacted or damaged during construction, operation and maintenance manuals, and training for a complete control panel system installation. Any item not specified shall be considered incidental to the work.

Z. **BID ITEM NO. 27 – ELECTRICAL SYSTEM MODIFICATIONS AND NEW ELECTRICAL WORK AT HISPANOLA AVENUE PUMP STATION**

Measurement: The cost shall include material and work associated with the modifications of the existing electrical service/distribution system as needed for the installation of the new control panel and associated control system components

including but not limited to all conduit, wiring, and grounding at the Hispanola Avenue Pump Station.

Payment: Payment for modifications of the electrical distribution system as well as installation of new electrical system shall be made at the lump sum price and shall include all materials, labor, and all terminations and tie-in at the control panel and panelboards for a complete electrical service/distribution system installation. Cost shall also include coordination with FPL and the Owner as needed for the new electrical service.

AA. **BID ITEM NO. 28 – INSTALL NEW CONTROL PANEL AT HISPANOLA AVENUE PUMP STATION**

Measurement: The cost shall include material and work associated with installing a new control panel system including but not limited to stainless steel control panel, variable frequency drive, programmable logic controller, operator interface, air conditioner, equipment rack, level transmitter, level switches, pressure transmitter, and SCADA system for the Hispanola Avenue Pump Station as shown on the plans.

Payment: Payment for this work shall be made at a lump sum cost and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, control panel installation, concrete, clearing, grubbing, excavation and back fill, compaction, disposal of undesirable material, new fill, grading, safety, dust/erosion control, survey layout, asbuilt drawings, repair or replacement of existing utilities impacted or damaged during construction, operation and maintenance manuals, and training for a complete control panel system installation. Any item not specified shall be considered incidental to the work.

BB. **BID ITEM NO. 29 – ELECTRICAL SYSTEM MODIFICATIONS AND NEW ELECTRICAL WORK AT VILLAGE HALL PUMP STATION**

Measurement: The cost shall include material and work associated with the modifications of the existing electrical service/distribution system as needed for the installation of the new control panel and associated control system components including but not limited to all conduit, wiring, and grounding at the Village Hall Pump Station.

Payment: Payment for modifications of the electrical distribution system as well as installation of new electrical system shall be made at the lump sum price and shall include all materials, labor, and all terminations and tie-in at the control panel and panelboards for a complete electrical service/distribution system installation. Cost shall also include coordination with FPL and the Owner as needed for the new electrical service.

CC. **BID ITEM NO. 30 – INSTALL NEW CONTROL PANEL AT VILLAGE HALL PUMP STATION**

Measurement: The cost shall include material and work associated with installing a new control panel system including but not limited to stainless steel control panel, variable frequency drive, programmable logic controller, operator interface, air conditioner, equipment rack, level transmitter, level switches, pressure transmitter, and SCADA system for the Village Hall Pump Station as shown on the plans.

Payment: Payment for this work shall be made at a lump sum cost and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, control panel installation, concrete, clearing, grubbing, excavation and back fill, compaction, disposal of undesirable material, new fill, grading, safety, dust/erosion control, survey layout, asbuilt drawings, repair or replacement of existing utilities impacted or damaged during construction, operation and maintenance manuals, and training for a complete control panel system installation. Any item not specified shall be considered incidental to the work.

DD. **BID ITEM NO. 31 – ELECTRICAL SYSTEM MODIFICATIONS AND NEW ELECTRICAL WORK AT SOUTH TREASURE DRIVE PUMP STATION**

Measurement: The cost shall include material and work associated with the modifications of the existing electrical service/distribution system as needed for the installation of the new control panel and associated control system components including but not limited to all conduit, wiring, and grounding at the South Treasure Drive Pump Station.

Payment: Payment for modifications of the electrical distribution system as well as installation of new electrical system shall be made at the lump sum price and

shall include all materials, labor, and all terminations and tie-in at the control panel and panelboards for a complete electrical service/distribution system installation. Cost shall also include coordination with FPL and the Owner as needed for the new electrical service.

EE. **BID ITEM NO. 32 – INSTALL NEW CONTROL PANEL AT SOUTH TRASURE DRIVE PUMP STATION**

Measurement: The cost shall include material and work associated with installing a new control panel system including but not limited to stainless steel control panel, operator interface, equipment rack, level transmitter, level switches, pressure transmitter, and SCADA system for the South Treasure Drive Pump Station as shown on the plans.

Payment: Payment for this work shall be made at a lump sum cost and shall include all labor, equipment, material, location and coordination of all existing utilities prior to construction, control panel installation, concrete, clearing, grubbing, excavation and back fill, compaction, disposal of undesirable material, new fill, grading, safety, dust/erosion control, survey layout, asbuilt drawings, repair or replacement of existing utilities impacted or damaged during construction, operation and maintenance manuals, and training for a complete control panel system installation. Any item not specified shall be considered incidental to the work.

FF. **BID ITEM NO. 33 – ALL PUMP STATION SITE RESTORATION**

Measurement: The cost shall include all construction requirements for project restoration not included as part of a separate bid item so that all areas disturbed or damaged during construction shall be installed as shown on the plans or restored to conditions existing prior to the work.

Payment: Payment for all site restoration work shall be made at the lump sum price and shall include all materials, labor and equipment necessary to perform site restoration work including grading, milling, asphalt over restored utility trench, asphalt in milled areas, base material, limerock, and asphalt in new paved areas, new or restored concrete sidewalk, curbing, valley gutter, driveways, planting, sodding, landscape, irrigation, lighting, striping, signage, clean-up, and any other work required for project completion and acceptance. Any trench or

site restoration costs referenced as part of other bid items should be included in those bid items accordingly.

Restoration other than or in addition to what is indicated by the plans, specifications, and defined herein will be considered incidental to the construction and the costs of this incidental restoration should be included in the cost of project.

GG. **BID ITEM NO. 34, 35, 36 and 37 – PROVIDE TRAILER MOUNTED DIESEL ENGINE DRIVEN GENERATOR**

Measurement: The cost shall include all work associated with providing a new trailer mounted diesel engine driven generator at each pump station.

Payment: Payment shall be at the contract unit price for all labor, procurement to provide, new trailer mounted diesel engine driven generator, controls and instrumentation, wiring, fuel system, operation and maintenance manuals, start-up/testing, and training for a complete trailer mounted diesel engine driven generator.

HH. **BID ITEM NO. 38 – ALLOWANCE**

Measurement: The cost shall include a fixed amount per the Bid Form.

Payment: Use of the allocation account shall be for unforeseeable conditions, for construction changes and for availability adjustments, if ordered and authorized by the Village. At the closeout of contract, monies remaining in the contingency allowance will be credited to the Village by change order.

END OF SECTION

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section covers the requirements for submittal procedures as they pertain to:

1. Construction progress schedules
2. Proposed Products list
3. Shop drawings
4. Product data
5. Samples
6. Manufacturers' instructions
7. Manufacturers' certificates

1.02 SUBMITTAL PROCEDURES

A. Submittals shall be addressed to:

North Bay Village
1666 Kennedy Causeway, Suite 300
North Bay Village FL 33141

B. Sequentially number the transmittal forms. Resubmittals to have original number with an alphabetic suffix.

C. Identify Project, Contractor, Subcontractor or supplier, pertinent Drawing sheet and detail number(s), and specification Section number, as appropriate.

D. Drawings and schedules shall be checked and coordinated with the work of all trades involved, before they are submitted for review by the Engineer and shall bear the Contractor's stamp of approval as evidence of such checking and coordination. Drawings or schedules submitted without this stamp of approval shall be returned to the Contractor for resubmission.

E. If drawings show variations from Contract requirements because of standard shop practice or for other reasons, describe such variations in the letter of transmittal. If acceptable, proper adjustment in the Contract shall be implemented where appropriate. Failure to describe such variations does not relieve the Contractor of the responsibility for executing the work in accordance with the Contract, even though such drawings have been reviewed.

F. Each Shop Drawing shall have a blank area 3-1/2 inches by 3-1/2 inches, located adjacent to the title block. The title block shall display the following:

1. Number and title of the drawing.

2. Date of drawing or revision.

3. Name of project building or facility.

4. Name of contractor and subcontractor submitting drawing.

5. Clear identification of contents and location of the work.

6. Specification title and number.

7. Specification Section.

8. Applicable Drawing Number.

G. Revise and resubmit submittals as required; identify all changes made since previous submittal.

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

I. Requirements in this Section are in addition to any specific requirements for submittals specified in other Divisions and Sections of these Contract Documents.

1.03 CONSTRUCTION PROGRESS SCHEDULES

A. Submit initial progress schedule in triplicate within 15 days after date established in the Notice to Proceed for Engineer review.

B. Revise and resubmit as project conditions require. Revised schedules shall be submitted a minimum of two (2) weeks prior to commencement of Work covered by schedule.

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

D. Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.

E. Indicate estimated percentage of completion for each item of Work at each submission.

F. Indicate submittal dates required for shop drawings, product data, samples, and product delivery dates, including those furnished by Owner and under Allowances.

1.04 PROPOSED PRODUCTS LIST

A. Within 30 days after date established in the Notice to Proceed, submit a complete list of major products proposed for use, with name of manufacturer, trade name, and model number of each product.

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

1.05 SHOP DRAWINGS

A. Submit the number of opaque reproductions which Contractor requires, plus four copies, which will be retained by Engineer (maximum of eight).

B. After review, distribute in accordance with above and for Record Documents described in Section 01720 - Project Record Documents.

C. When used in the Contract Documents, the term "Shop Drawings" shall be considered to mean, Contractor's drawings plans for material and equipment which become an integral part of the Project. These drawings shall be complete and detailed. Shop Drawings shall consist of fabrication, erection and setting drawings and schedule drawings, manufacturer's scale drawings, and wiring and control diagrams. Cuts, catalogs, pamphlets, descriptive literature, and performance and test data, shall be considered only as supportive to required Shop Drawings as defined above.

D. Data on materials and equipment include, without limitation, materials and equipment lists, catalog data sheets, cuts, performance curves, diagrams, materials of construction and similar descriptive material. Materials and equipment lists shall give, for each item thereon, the name and location of the supplier or manufacturer, trade name, catalog reference, size, finish and all other pertinent data.

E. For all mechanical and electrical equipment furnished, provide a list including the equipment name, address, telephone number of the manufacturer's representative and service company so that service and/or spare parts can be readily obtained.

F. All manufacturers or equipment suppliers who proposed to furnish equipment or products shall submit an installation list to the Engineer along with the required shop drawings. The installation list shall include at least five installations where identical equipment has been installed and has been in operation for a period of at least one (1) year.

G. Only the Engineer will utilize the color "red" in marking Shop Drawing submittals.

1.06 PRODUCT DATA

A. Submit the number of copies which the Contractor requires, plus four copies which will be retained by the Engineer (with a maximum of eight).

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

1.07 SAMPLES

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

B. Submit samples of finishes in custom colors selected, textures, and patterns for Engineer’s selection.

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

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

E. Samples not destroyed in testing shall be sent to the Engineer or stored at the site of the work. Accepted samples of the hardware in good condition will be marked for identification and may be used in the work. Materials and equipment incorporated in the work shall match the accepted samples. Samples which failed testing or are not accepted will be returned to the Contractor at his expense, if so requested at time of submission.

1.08 MANUFACTURER'S INSTRUCTIONS

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

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

1.09 MANUFACTURER'S CERTIFICATES

A. When specified in individual specification Sections, submit manufacturers' certificate to Engineer for review, in quantities specified for Product Data.

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

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

1.10 RECORD DOCUMENTS

A. Engineer will review submitted record documents for compliance with specifications.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01400

QUALITY CONTROL

PART 1 GENERAL

1.01 WORK INCLUDED

A. This section covers the work as required to provide and/or coordinate:

1. Quality assurance and control of installation
2. References
3. Inspection
4. Manufacturers' field services and reports

1.02 REFERENCES

A. Conform to reference standard by date of current issue on date for receiving bids.

B. Should specified reference standards conflict with Contract Documents, request clarification from Owner or Engineer before proceeding.

C. The contractual relationship of the parties to the Contract shall not be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.03 QUALITY ASSURANCE/CONTROL OF INSTALLATION

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

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

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

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

E. Perform work by persons qualified to produce workmanship of specified quality.

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

1.04 MANUFACTURERS' FIELD SERVICES AND REPORTS

A. Submit qualifications of observer to Owner or Engineer 30 days in advance of required observations. Observer subject to acceptance of Owner or Engineer.

B. When specified in individual specification Sections, require material or Product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust, and balance of equipment and place equipment into operation as applicable, and to initiate instructions when necessary.

C. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

D. Submit report in triplicate within 30 days of observation to Owner or Engineer for review.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01500

CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 GENERAL

1.01 WORK INCLUDED

A. Temporary Utilities: Electricity, lighting, heat, ventilation, telephone service, water, and sanitary facilities.

B. Temporary Controls: Enclosures and fencing, protection of the Work, traffic control, temporary bypass sanitary pumping, and water control.

C. Construction Facilities: Access roads, parking, progress cleaning, and temporary buildings.

D. Some of the items specified herein are not specifically required for the project. However, these items shall be provided as required for the convenience of the Contractor or as required for proper completion of the Work.

1.02 TEMPORARY ELECTRICITY (AS APPLICABLE)

A. Provide and pay for power service, as required, from Florida Power and Light source.

B. Provide temporary electric feeder from electrical service. Power consumption shall not disrupt Owner's need for continuous service.

C. Provide separate metering and pay Florida Power and Light for cost of energy used.

D. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

E. Provide main service disconnect and overcurrent protection at a convenient location.

F. Permanent convenience receptacles may not be utilized during construction.

1.03 TEMPORARY LIGHTING (AS APPLICABLE)

A. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.

B. Maintain lighting and provide routine repairs.

1.04 TEMPORARY VENTILATION

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

B. Provide ventilation and other equipment and procedures as required to meet OSHA Confined Spaces Entry Requirements.

1.05 TEMPORARY WATER SERVICE (AS APPLICABLE)

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

B. All water used must be metered by Owner, but Contractor will not be charged for the metered water use.

C. Extend branch piping with outlets located so water is available by hoses with threaded connections.

D. Make arrangements with Owner for obtaining meter. Owner will also direct contractor as to where water may be obtained.

1.06 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Existing private facilities shall not be used.

1.07 FENCING

A. Construction: Commercial grade chain link fence.

B. Provide 6-foot high fence to secure material storage areas. Security fence shall be equipped with gates and locks.

1.08 TEMPORARY BYPASS SANITARY PUMPING

A. The Contractor shall be prepared to bypass wastewater as a part of the installation process. He shall submit complete, detailed plans for this aspect of the work to the Engineer for approval prior bypassing. The Contractor shall provide all pumps, piping, and other equipment to accomplish this task; perform all construction; obtain all permits; pay all costs; and perform complete restoration of all existing facilities to equal or better condition and to the satisfaction of the Engineer. At no time will sewage be allowed to spill onto any surface. Any leaks in temporary piping, hoses, connectors or equipment shall be sealed immediately, the spill thoroughly cleaned and the area disinfected.

A. The Contractor is required to have a vacuum/pumping truck on-site during periods when the Village's wastewater system is shut down and out of service. The truck must have adequate storage capacity to capture potential wastewater overages due to delays in Contractor operations or wastewater system failures.

B. Pump and bypass lines shall be of adequate capacity, size, and integrity to handle the flow without sewer back-up or leakage. A noise barrier shall be provided for the pumps as required by the Engineer. Bypass operations shall be manned at all times. Back-up pumps and bypass lines shall be available immediately in the event they are required. Bypass operations shall be continuously manned to prevent accidental spillage.

C. Under no circumstance shall the dumping of raw sewage be allowed. Such spills caused by the Contractor's operations shall be volumetrically measured, cleaned, and disinfected immediately by the Contractor using methods and disinfectants required by applicable law. Spills and other unpermitted discharges shall be immediately reported to the appropriate agency as required by applicable law. The Owner shall be so notified within the same time frame.

D. Bypassing of sewage shall be considered an incidental obligation of the Contractor and no separate payment shall be made for work.

1.09 PROTECTION OF INSTALLED WORK

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

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

C. Prohibit traffic from landscaped areas.

1.10 SECURITY

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

1.11 PROGRESS CLEANING

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

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

C. Remove waste materials, debris, and rubbish from sites weekly and dispose of at an approved site.

1.12 REMOVAL OF TEMPORARY UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary equipment, facilities, materials, prior to Final Inspection.

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

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

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01700

CONTRACT CLOSE-OUT

PART 1 GENERAL

1.01 WORK INCLUDED

A. Contract Close-out Procedures.

B. Final Inspection.

C. Contract Close-out Submittals.

D. Final Application for Payments.

E. Operation and Maintenance Manuals

1.02 SUBSTANTIAL COMPLETION

A. When Contractor considers the Work is substantially complete, he shall submit to the Owner or Engineer:

1. A written notice that the Work, or designated portion thereof, is substantially complete.

2. A list of items to be completed or corrected.

B. Within a reasonable time after receipt of such notice, the Owner or Engineer will make an inspection to determine the status of completion.

C. Should the Owner or Engineer determine that the Work is not substantially complete:

1. The Owner or Engineer will promptly notify the Contractor in writing, giving the reasons therefor.

2. Contractor shall remedy the deficiencies in the Work, and send a second written notice of substantial completion to the Owner or Engineer.

3. The Owner or Engineer will reinspect the Work.

D. When the Owner or Engineer finds that the Work is substantially complete, he will:

1. Prepare and deliver to Owner a tentative Certificate of Substantial Completion with a tentative list of items to be completed or corrected before final payment.

2. After consideration of any objections made by the Owner as provided in the Contract Documents, and when the Owner or Engineer considers the Work substantially complete, he will execute and deliver to the Owner and the Contractor a definite Certificate of Substantial Completion with a revised tentative list of items to be completed or corrected.

1.03 FINAL INSPECTION

A. When Contractor considers the Work is complete, he shall submit written certification that:

1. Contract Documents have been reviewed.

2. Work has been inspected for compliance with Contract Documents.

3. Work has been completed in accordance with Contract Documents.

4. Equipment and systems have been tested in the presence of the Owner's representative and are operational.

5. Work is completed and ready for final inspection.

B. The Owner or Engineer will make an inspection to verify the status of completion with reasonable promptness after receipt of such certification.

C. Should the Owner or Engineer consider that the Work is incomplete or defective:

1. The Owner or Engineer will promptly notify the Contractor in writing, listing the incomplete or defective work.

2. Contractor shall take immediate steps to remedy the stated deficiencies, and send a second written certification to the Owner or Engineer that the Work is complete.

3. The Owner or Engineer will reinspect the Work.

D. When the Owner or Engineer finds that the Work is acceptable under the Contract Documents, he shall request the Contractor to make closet submittals

1.04 RE-INSPECTION FEES

A. Should the Owner or Engineer perform re-inspections due to failure of the Work to comply with the claims of status of completion made by the Contractor:

1. Owner will compensate the engineer for such additional services.

2. Owner will deduct the amount of such compensation from the final payment to the Contractor.

1.05 CONTRACTOR'S CLOSE-OUT SUBMITTALS TO OWNER OR ENGINEER

A. Evidence of compliance with requirements of governing authorities.

B. Shall be in accordance with Section 01720 - Project Record Documents.

C. Spare Parts and Maintenance Materials: To requirements of the individual Specification Sections, as applicable.

D. Evidence of Payment and Release of Liens: To requirements of Contract Documents, Supplementary Conditions, and Supplementary Conditions (Construction) Exhibit WWFS-04Li.

E. Certificate of Insurance for Products and Completed Operations, as applicable.

F. Consent of Surety for final payment.

G. Final building permit inspection documents and Certificate of Occupancy as applicable.

1.06 FINAL ADJUSTMENT OF ACCOUNTS

A. Submit a final statement of accounting to the Owner or Engineer.

B. Statement shall reflect all adjustments to the contract Sum:

1. The original Contract Sum.

2. Additions and deductions resulting from:

   a. Previous Change Orders.
   b. Allowances.
   c. Unit Prices.
   d. Deductions for uncorrected Work.
   e. Penalties and Bonuses.
   f. Deductions for liquidated damages.
   g. Deductions for re-inspection payments.
   h. As-Built Quantities.
   i. Other adjustments.

3. Total Contract Sum, as adjusted.

4. Previous payments.

5. Sum remaining due.

C. Owner or Engineer will prepare a final Change Order, reflecting recommended adjustments to the Contract Sum that were not previously made by Change Orders.

1.07 FINAL APPLICATION FOR PAYMENT

A. Contractor shall submit the final Application for Payment in accordance with procedures and requirements stated in the Conditions of the Contract.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 01720

PROJECT RECORD DRAWINGS

PART 1 GENERAL

1.01 PROJECT RECORD DOCUMENTS

A. **Contractor is required to comply with all M-D WASD and Department of Environmental Resource Management (DERM) Asbuilt and Project Record drawing requirements.**

B. Maintain at the site for the Owner one record copy of:

1. Drawings.
2. Specifications.
3. Addenda.
4. Change Orders and other Modifications to the Contract.
5. Reviewed Shop Drawings.

1.02 RELATED SECTIONS

A. Section 01300 – Submittals

B. Section 01700 – Contact Closeout

1.03 MAINTENANCE OF DOCUMENTS

A. Store documents in approved location apart from documents used for construction.

B. Maintain documents in a clean, dry, legible condition and in good order. Do not use record documents for construction purposes.

C. Make documents available at all times for inspection by Owner and Engineer.

1.04 MARKING DEVICES

A. Provide felt tip marking pens for recording information in a color code.

1.05 RECORDING

A. Label each document "RECORD DRAWINGS" in neat large printed letters.

B. Record information currently with construction progress.

1. Do not conceal any work until required information is recorded.

C. Drawings; Legibly mark to record actual construction:

1. Field changes of dimension and detail.

2. Changes made by Field Order or by Change Order.

3. Details not on original Contract Drawings.

D. Specifications and Addenda; Legibly mark each Section to record:

1. Manufacturer, trade name, catalog number, and supplier of each item actually installed.

2. Changes made by Field Order or by Change Order.

4

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 SUBMITTAL

A. During the entire construction operation, the Contractor shall maintain records of all deviations from the Drawings and Specifications and shall prepare there from "Record Drawings" showing correctly and accurately all changes and deviations from the work made during construction to reflect the work as it was actually

constructed. Each month with the Contractor's Application for Payment, or as otherwise agreed, the Contractor shall submit to the Engineer a current listing and description of each change incorporated into the work since the preceding submittal. These drawings shall conform to recognized standards of drafting, shall be neat and legible, and signed and sealed by a Florida Registered Professional Land Surveyor.

B. At Contract Close-out, the Contractor is required to provide one (1) set of reproducible "Record Drawings" and an electronic file to the Engineer for the Owner. These drawings shall conform to recognized standards of drafting, shall be neat and legible, and signed and sealed by a Florida Registered Professional Land Surveyor.

C. Accompany "Record Drawing" submittal with transmittal letter in duplicate, containing:

1. Date.
2. Project title and number.
3. Contractor's name and address.
4. Title and number of each record document.
5. Signature of Contractor or his authorized representative.

END OF SECTION

SECTION 01730

OPERATING AND MAINTENANCE DATA

PART 1 GENERAL

1.01 RELATED INFORMATION

A. Compile product data and related information appropriate for Owner's maintenance and operation of products furnished under the Contract.

1. Prepare operating and maintenance data as specified in this Section and as referenced in other pertinent sections of Specifications.

B. Instruct Owner's personnel in the maintenance of products and in the operation of equipment and systems.

1.02 RELATED SECTIONS

1. Submittals - Section 01300
2. Contract Closeout - Section 01700
3. Project Record Documents - Section 01720

l.03 FORM OF SUBMITTALS

A. Prepare data in the form of an instructional manual for use by Owner's personnel.

B. Format:

1. Size: 8-1/2 in. x 11 in.
2. Text: Manufacturer's printed data, or neatly typewritten.
3. Drawings:
   a. Provide reinforced punch binder tab, bind in with text.
   b. Fold larger drawings to the size of the text pages.
4. Provide fly-leaf for each separate product, or each piece of operating equipment.

a. Provide typed description of product, and major component parts of equipment.

5. Cover: Identify each volume with typed or printed title "OPERATING AND MAINTENANCE INSTRUCTIONS". List:

a. Title of Project.

b. Identity of separate structure as applicable.

c. Identity of general subject matter covered in the manual.

C. Binders:

1. Commercial quality expandable catalog binders with durable and cleanable plastic covers.

2. When multiple binders are used, correlate the data into related consistent groupings.

l.04 CONTENT OF MANUAL

A. Neatly typewritten table of contents for each volume, arranged in a systematic order.

1. Contractor, name of responsible principal, address and telephone number.

2. A list of each product required to be included, indexed to the content of the volume.

3. List, with each product, the name, address and telephone number of:

a. Subcontractor or installer.

b. Maintenance contractor, as appropriate.

c. Identify the area of responsibility of each.

d. Local source of supply for parts and replacement.

4. Identify each product by product name and other identifying symbols as set forth in Contract Documents.

B. Product Data:

1. Include only those sheets which are pertinent to the specific product.

2. Annotate each sheet to:

a. Clearly identify the specific product or part installed.

b. Clearly identify the data applicable to the installation.

c. Delete references to inapplicable information.

C. Drawings:

1. Supplement product data with drawings as necessary to clearly illustrate relations of component parts of equipment and systems.

2. Coordinate drawings with information in Project Record Documents to assure correct illustration of completed installation.

3. Do not use Project Record Documents as maintenance drawings.

D. Written text, as required to supplement product data for the particular installation:

1. Organize in a consistent format under separate headings for different procedures.

2. Provide a logical sequence of instructions for each procedures.

E. Copy of each warranty issued.

1. Provide information sheet for Owner's personnel, give:

a. Proper procedures in the event of failure.

b. Instances which might affect the validity of warranties.

l.05 MANUAL FOR EQUIPMENT AND SYSTEMS

A. Submit three copies of complete manual in final form.

B. Content, for each unit of equipment and system, as appropriate:

1. Description of unit and component parts.

a. Function, normal operating characteristics, and limiting conditions.

b. Performance curves, engineering data and tests.

c. Complete nomenclature and commercial number of all replaceable parts.

2. Operating procedures:

a. Start-up, break-in, routine and normal operating instructions.

b. Regulation, control, stopping, shut-down and emergency instructions.

c. Summer and Winter operating instructions.

d. Alignment, adjusting and checking.

3. Servicing and lubrication schedule.

a. List of lubricants required.

4. Manufacturer's printed operating and maintenance instructions.

5. Original manufacturer's parts list, illustrations, assembly drawings and diagrams required for maintenance.

6. Other data as required under pertinent sections of specifications.

l.06 SUBMITTAL SCHEDULE

A. Submit one copy of completed data in final form fifteen days prior to final inspection or acceptance.

1. Copy will be returned after final inspection or acceptance, with comments.

B. Submit specified number of copies of approved data in final form 10 days after final inspection or acceptance.

l.07 INSTRUCTION OF OWNER'S PERSONNEL

A. Prior to final inspection or acceptance, fully instruct Owner's designated operating and maintenance personnel in the operation, adjustment and maintenance of all products, equipment and systems.

B. Operating and maintenance manual shall constitute the basis of instruction.

1. Review contents of manual with personnel in full detail to explain all aspects of operations and maintenance.

PART 2 PRODUCTS

A. Not Used

PART 3 EXECUTION

A. Not Used

END OF SECTION

SECTION 02062

HANDLING OF EXISTING EQUIPMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all supervised labor, equipment, materials and incidentals required to remove all existing equipment and all pipe, fittings, and appurtenances not required for the proper operation of the rehabilitated lift station. Removal will be consistent with the final configuration of the new lift station as indicated on the Drawings, as specified herein, or as required by the Engineer. The equipment shall be removed from their present locations and shall be stored as designated by the Owner.

B. Contractor shall furnish all supervised labor, equipment, materials, power, and incidentals required to clean, prepare, crate and store all existing equipment to be retained by the Owner.

1.02 SUBMITTALS

A. In accordance with the provisions of the General Conditions submit to the Engineer for approval the following:

1. Description of the salvaging procedure for each item of equipment covering the cleaning, preparation, and protection aspects of the operation.

2. Submittals shall include the type of rust-resistant coatings and all other materials to be used.

PART 2 PRODUCTS

A. Protective coatings used on all surfaces susceptible to corrosion shall be specifically suited for that purpose.

B. The Contractor shall select lubricants for all moving parts prior to packaging.

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor shall not proceed with the removal of any equipment, piping, or appurtenances without specific approval of the Engineer. Any equipment, piping or appurtenances removed without proper authorization, which are necessary for the operation of the existing utility system, shall be replaced to the satisfaction of the Engineer at the Contractor's expense.

B. Pieces of equipment weighing 150 pounds or more shall be provided with suitable skids before storing.

C. The Contractor shall take all necessary precautions against damaging the material and equipment to be stored. The Contractor shall repair any damage resulting from the Contractor's operations, as directed by and to the satisfaction of the Engineer. Itemized lists of materials removed and stored shall be given to the Engineer for disposition by the Owner as the items become available. A final typed itemized list shall be furnished to the Engineer in four copies at the completion of construction. The list shall include items, method of packaging, and place of storage.

3.02 SURFACE PREPARATION

A. The surfaces of all equipment and materials to be salvaged and stored shall be thoroughly cleaned, dried, and free of all rust, loose paint, dirt, and foreign matter. All equipment and materials shall be steam cleaned, except for electrical equipment and accessories.

B. The interior of all equipment shall be cleaned, flushed, and dried. Oil shall be flushed from all oil lubricated gear reducers and other related equipment and replaced with new oil.

C. Gears, bearing surfaces, other similar surfaces, and other surfaces which have started to rust shall be given a new coat of grease or other suitable rust-resistant coating.

3.03 PROTECTION

A. All equipment and materials to be salvaged and stored shall be properly protected from damage.

B. Any items of equipment damaged or lost due to the Contractor's carelessness, mishandling, or faulty procedures and/or workmanship shall be repaired or replaced in kind to the satisfaction of the Engineer.

C. Equipment which has been installed indoors shall not be exposed to the weather at any point of the salvaging and storage operation.

3.04 PACKAGING

A. Equipment and materials shall be crated, insofar as possible, in crates specifically constructed for the use intended. Crates shall be of wood construction. Steel reinforcing bands shall be used on all crates, and the weight of the crate and its contents shall not exceed 2,000 pounds.

B. Equipment shall be packaged as complete assemblies, where possible. Equipment assemblies which are larger than the above dimensions or weight requirements shall be broken down into subassemblies, where possible, before crating. Equipment which, in the opinion of the Engineer, cannot be readily broken down or which should not be broken down, shall not be crated.

C. Crates shall have cradles or supports built-in to the bottom of the crates such that the crates may be picked up by a forklift.

3.05 STORAGE

A. All existing equipment which is removed and is not to be used in the Work herein is to be protected and packaged as specified above and stored on site areas as directed by the Owner.

3.06 EQUIPMENT TO BE RETAINED

A. All equipment removed shall remain the property of the Owner unless designated otherwise by the Owner.

B. If the Owner elects not to retain ownership of a certain item, the item shall become the property of the Contractor and shall be removed from the site at the Contractor's expense.

C. The following materials are examples of the type that the Owner desires to keep:

1. Machinery and equipment
2. Pumps and motors

3.07 PRECONSTRUCTION VIDEO

A. At least one (1) week prior to the start of construction, the contractor shall have video recordings taken of all project areas. The areas include but are not limited to, all pump station site, full extend of all utility work, FPL related work, and construction staging areas. Such recordings shall be provided to the Owner and Engineer before the commencement of construction. These recordings shall serve as record of the conditions as they existed prior to the start of the work. They will be used in the event of a dispute that arises from restoration or damage claims. The contractor shall pay particular attention to existing damage on public and private property near the work area and ensure that these items are documented on the video.

B. Video tapes are to be delivered to the Owner and Engineer on a DVD in a standard video format that is able to be viewed on a Windows operating system. All videotapes shall become the property of the Owner.

END OF SECTION

SECTION 02064

MODIFICATIONS AND REHABILITATION OF EXISTING STRUCTURES AND EQUIPMENT

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all supervised labor, materials, equipment, and incidentals required to remove, modify, rehabilitate, alter and/or convert existing structures/manholes as shown or specified and as required for the installation of new mechanical equipment, piping, and appurtenances.

B. Rehabilitation includes but is not limited to the following:

1. Removal of existing equipment and structures as specified.

2. Installation or proposed wastewater equipment and controls.

1.02 NOTICES

A. The Contractor shall inform the Owner and the Engineer of the date of commencement and anticipated completion of the work one week before actual work beings. Sewage service must be maintained during rehabilitation work. The Contractor shall coordinate all work and scheduling with the Owner.

1.03 SAFETY

A. The Contractor shall conform to all work safety requirements of pertinent regulatory agencies and shall secure the site for working condition in compliance with the same. The Contractor shall erect such signs and other devices as are necessary for the safety of the work site. The Contractor shall perform all work in accordance with the applicable OSHA standards. Emphasis is placed upon the requirements for entering confined spaces, scaffolding, and the handling and storage of chemicals.

PART 2 PRODUCTS

Not Used.

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor shall cut, repair, re-use, excavate, demolish, or otherwise remove parts of the existing structures or appurtenances, as indicated on the Contract Drawings, herein specified, or as necessary to allow completion of the Work under this Contract. Contractor shall dispose of unwanted surplus materials resulting from the above work in a manner consistent with all Federal, State and local laws.

B. The Work shall include all necessary cutting and bending of reinforcing steel, structural steel, or miscellaneous metal work found embedded in the existing structures.

C. The Contractor shall dismantle and remove all existing equipment, piping, and other appurtenances required for the completion of the Work. Where called for or required, the Contractor shall cut existing pipelines for the purpose of making connections thereto. Anchor bolts for equipment and structural steel removed shall be cut off 1" below the concrete surface.

D. No existing structure, equipment, or appurtenances shall be shifted, cut, removed, or otherwise altered except as indicated in the Contract Documents or with the express approval of and to the extent approved by the Engineer.

E. When removing materials or portions of existing structures, or when making openings in walls and partitions, the Contractor shall take all precautions and use all necessary barriers and other protective devices so as not to damage the structures beyond the limits necessary for the new work and so as not to damage the structures or contents by falling or flying debris. Unless otherwise permitted, line drilling will be required in cutting existing concrete.

F. Materials and equipment removed in the course of making alterations and additions shall be handled per Section 02062.

G. All cutting of existing concrete or other material which requires bonding to new work shall be done in a manner to meet the requirements of the respective section of these Specifications covering the new work. If the work is not covered, the cutting shall be carried on in the manner and to the extent directed by the Engineer.

H. Where necessary or required for the purpose of making connections, the Contractor shall cut existing pipelines in a manner to provide an approved, restrained, joint. Where required, the Contractor shall weld beads, flanges, or provide Dresser couplings, as required.

I. Blasting will not be permitted to complete work under this Contract.

3.02 CONNECTING TO EXISTING PIPING AND EQUIPMENT

A. The Contractor shall verify exact location, material, alignment, joint, etc., of existing piping and equipment prior to making the connections called out in the Drawings. The verifications shall be performed with adequate time to correct any potential alignment or other problems prior to the actual time of connection.

END OF SECTION

SECTION 02065

DEMOLITION AND MODIFICATION

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish all supervised labor, materials, equipment, studies, and incidentals required for the demolition and modification of the pump station and control systems at all four (4) pump station locations as outlined below:

1. Complete or partial removal and disposal of specified existing buildings, structures, foundations, piping, mechanical equipment, electrical equipment and miscellaneous appurtenances encountered during construction operations.

2. Temporary modification of structures, equipment, appurtenances and utilities as necessary to allow for operation of the facilities during construction.

3. Demolition, partial removal and cutting of existing masonry, concrete, asphalt, etc. as required for the new construction.

4. Handling of salvageable material specified below.

5. Off-site disposal of excess and unacceptable materials including but not limited to concrete, concrete blocks, bricks, asphalt, soils, landscaping, etc.

6. Provisions and legal procedures for proper disinfection and disposal of any existing wastewater and/or debris in the wetwell or associated piping as part of the demolition process.

7. Provide all studies, such as asbestos, required by any authorities having jurisdiction prior to demolishing the structure.

8. This section may not cover all of the activities necessary to perform the Work. The Contractor shall exercise due concern for the utility system operation and shall direct all of the Contractor's activities toward maintaining continuous operation of the existing facilities and minimizing operation impacts.

1.02 CONDITION OF STRUCTURES

A. The Owner and the Engineer assume no responsibility for the actual condition of the structures to be demolished or modified.

B. By submitting a bid, the Contractor affirms that the Contractor has carefully examined the site and all conditions affecting the Work. Conditions existing at the time of inspection for bidding purposes will be maintained by the Owner insofar as practicable. However, variations within the structure may occur prior to the start of demolition work.

1.03 RULES AND REGULATIONS

A. The Building Code of the State of Florida shall control the demolition, modification or alteration of the existing buildings or structures.

B. No blasting shall be done on site.

C. Provide all studies, such as asbestos, required by any authorities having jurisdiction prior to demolishing the structure.

1.04 SUBMITTALS

A. Provide a detailed sequence of demolition and removal work as part of the Contractor's schedule.

B. Before commencing demolition work, all modifications necessary to bypass the affected structure will be completed. Actual work will not begin until the Engineer has inspected and approved the modifications and authorized commencement of the demolition work.

C. The above procedure must be followed for each individual demolition operation.

1.05 TRAFFIC AND ACCESS

A. Conduct demolition and modification operations, and the removal of equipment and debris to ensure minimum interference with roads, streets, walks both on- site and off-site and to ensure minimum interference with occupied or used facilities.

B. Special attention is directed towards maintaining safe and convenient access to the existing facilities by Owner's operations personnel and associated vehicles.

C. Do not close or obstruct streets, walks or other occupied or used facilities without permission from the Engineer. Provide alternate routes around closed or obstructed traffic in access ways.

1.06 PROTECTION

A. The Contractor shall conduct construction activities to minimize damage to adjacent buildings, structures, utilities, storm drainage, and other facilities, including persons.

1.07 DAMAGE

A. The Contractor shall immediately report damage caused to adjacent facilities by demolition operations. The Contractor shall promptly make all required repairs as directed by the Engineer and at no cost to the Owner.

1.08 UTILITIES

A. The shall be the Contractor's responsibility to maintain existing utilities in service and protect against damage during demolition operations.

1.09 POLLUTION CONTROL

A. For pollution control, use sprinkling, temporary enclosures, and other suitable methods as necessary to limit the amount of dust and dirt rising and scattering in the air to the lowest level of air pollution practical for the conditions of work. Comply with the governing regulations.

B. Clean adjacent structures and improvements of all dust, dirt, and debris caused by demolition operations. Return areas to conditions existing prior to the start of work.

C. Pollution control measures outlined in the Stormwater Pollution Prevention Plan shall be implemented during the entire construction timeline to control turbidity and sediment discharges to the stormwater system

D. The Contractor shall provide for any required water quality monitoring programs as may be outlined in the SFWMD Dewatering Permit, if applicable.

PART 2 PRODUCTS

A. Not Used

PART 3 EXECUTION

A. Not Used

END OF SECTION

SECTION 02200

EARTHWORK, EXCAVATION, AND BACKFILL

PART 1 GENERAL

1.01 SECTION INCLUDES

The work covered by this section consists of furnishing all labor, equipment, and materials, and performing all earthwork operations to include:

A. Excavation and backfill of structures, foundations, and pavements.

B. Surface preparation for structures, foundations, and pavements.

C. Excavation and backfill of pipe trenches.

D. Soil testing for pipe trenches and parking areas.

E. Site grading

1.02 REFERENCES

A. Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition.

B. American Society for Testing and Materials (ASTM)

D698 Moisture-Density Relationship of Soils.

D1556 Standard Method of Test for Density of Soil in Place by Sand Cone Method.

D1557 Method for Test for Moisture-Density Relations of Soils Using a 10-Pound Rammer and 18-Inch Drop.

D2487 Classification of Soils for Engineering Purposes.

D6938 Standard Test Method for In-Place Density and Water Content of

1.03 FIELD MEASUREMENTS AND COORDINATION

A. Verify that survey benchmark, control point, and intended elevations for the work are as shown on the Drawings.

B. Verify that work associated with lower elevation utilities is complete before placing higher elevation utilities.

1.04 SUBSURFACE SOILS DATA

A. Owner and Engineer make no representations or statements as to site or soil conditions, and therefore do not assume any responsibility for actual site or soil conditions. It shall be Contractor's responsibility to determine for himself existing site and/or soil conditions.

B. Geotechnical Engineering Study related to this project is included in Appendix B of the specifications.

C. The Contractor shall be aware that silty soils are anticipated to exist within the project area at depths as shown in the soils report. The contractor will be required to excavate to, remove, haul away, legally dispose of, and replace this material with suitable structure backfill as specified. All costs associated with debris excavation, disposal, new fill, and approved backfill shall be contained in the Contractor’s bid price.

PART 2 PRODUCTS

2.01 EXCAVATION

A. All excavation is unclassified. Complete all excavation regardless of the type, nature, or condition of the materials encountered.

2.02 SOURCE QUALITY CONTROL

A. If tests for a material type fail three times, the Engineer may reject the source supplier and require the contractor to submit a new source for approval, at no additional cost to the Owner. The in-situ material is considered acceptable

material and may be used, provided it meets the specified requirements.

B. Quality control of the work shall be the Contractor's responsibility and Contractor shall make every effort to produce the best quality work as specified on the Drawings and in these Specifications.

2.03 STRUCTURAL FILL AND BACKFILL

A. Fill and backfill under and around all structures shall be suitable on-site excavated material or approved imported material. Material shall be free of organic material, shall not have more than 10 percent by dry weight passing the U.S. Standard No. 200 sieve, and shall have no rocks larger than 3 inches in size. On-site Fine Sand (SP), without roots or other deleterious materials, is suitable material. Imported material if required must be provided by the Contractor at no additional cost to the Owner.

B. On site soils with more than 10% by dry weight passing the U.S. Standard No. 200 sieve and/or particle sizes larger than 3 inches are not suitable for use as fill under pavements or structures.

C. Backfill around structures shall be as specified above except that they shall not have more than 4% by dry weight passing the U.S. Standard No. 200 sieve.

2.04 EARTHFILL

A. On-site excavated material free from roots, trash, and rocks larger than 3 inches.

2.05 FLOWABLE FILL

A. Provide and place flowable fill in accordance with the requirements of Section 121 of the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Latest Edition.

2.06 WATER FOR COMPACTION

A. Contractor shall furnish potable water, as required. Contractor may coordinate with North Bay Village Public Works to arrange for a hydrant meter for water during construction. Costs associated with the hydrant meter shall be paid for by the Contractor. Water trucks shall be used as required.

2.07 EQUIPMENT

A. All equipment shall be suitable and adequate to perform the work specified. Compaction equipment shall be vibratory type. It is recommended that the contractor perform a preconstruction assessment of existing adjacent structures and monitor those structures for settlement during the construction period. Contractor shall notify Owner of any settlements that occur at existing adjacent structures.

PART 3 EXECUTION

3.01 PREPARATION

A. Identify required lines, levels, contours, and datum locations. Protect bench marks, survey control points, sidewalks, paving, and curbs from excavating equipment and vehicular traffic.

B. Locate, identify, and protect utilities that remain from damage.

3.02 STRIPPING TOPSOIL

A. Strip topsoil from entire site within boundaries of proposed construction lines to a depth of approximately 6" to 8.5”. The top materials stripped shall be removed and disposed of offsite, unless authorized for use on the site landscaping areas by the Engineer or Owner. Top materials shall not be used under roadway or parking areas.

B. Stripping of topsoil shall ensure that entire site is stripped and scraped clean of all brush, weeds, grass, roots, vegetation, etc.

3.03 FILLING

A. Except as otherwise specified, after stripping of topsoil all site areas which are below elevation required shall be compacted as specified and then over such areas clean granular fill placed and compacted in layers not exceeding 12" in uncompacted thickness. Each layer of fill shall be compacted to at least 95% of the modified proctor maximum dry density (ASTM D1557). If hand held

compaction equipment is used, the lift thickness should be reduced to 6 inches. Filling and compaction shall continue until subgrades required for various areas are reached. All holes and depressions caused from removal of trees, stumps, etc. shall be filled and compacted. Fill shall be good clean material as previously specified.

3.04 EXCAVATION UNDER STRUCTURES AND PAVEMENT AREAS

A. Excavation shall be performed to elevations and dimensions required by drawings with suitable allowance made for construction operations and inspections. Excavation carried to depths below required elevations shall be replaced in loose layers a maximum of 6" in depth and compacted in a manner to achieve a minimum density of 98% as determined by a modified proctor in accordance with ASTM D-1557. Contractor may place additional concrete in lieu of replacing and compacting excess excavation as specified above to fill excess cut. Correction of excess cut shall be responsibility of Contractor at no additional cost to Owner.

B. Compact disturbed load bearing soil in direct contact with foundations to achieve a minimum density of 98% as determined by a modified proctor in accordance with ASTM D-1557.

C. Verify that the specified density extends to 2 feet below the bottom of the structure or pavement base course to be installed.

D. Slope banks with machine to angle of repose or provide necessary shoring.

E. Do not interfere with 45 degree bearing splay of existing foundations without providing adequate means of shoring protection.

F. Grade top perimeter of excavating to prevent surface water from draining into excavation.

G. Correct areas over excavated in accordance with this section.

H. Remove excavated material unsuitable for backfill from site.

I. When muck or other deleterious materials is encountered in the excavation, it shall be completely removed within the area of the structure or pavement and to a depth where acceptable material is encountered. After removal of all muck or

other deleterious material, the area shall be backfilled with approved fill material as specified.

3.05 TRENCH EXCAVATION AND PREPARATION

A. Excavation: Excavate as required for the installation of all piping, utilities, conduits, and appurtenances.

B. Trench Width: Cut trenches sufficiently wide to enable installation, compaction and inspection. The maximum width will not be limited except where excessive trench width would cause damage to adjacent structures or piping.

C. Grade: Excavate the bottom of the trench to the line and grade shown, or as established by the Engineer with proper allowance for pipe bedding.

D. All trench work shall comply with the Trench Safety Act of 1990, with latest revisions.

E. Piping shall be installed in a dry trench.

F. The trench bottom shall provide a uniform and continuous support for the pipe. If materials are encountered in the trench unsuitable for proper bedding they shall be removed for the full trench width to a depth where suitable materials are encountered. The over excavated trench shall be backfilled with Pipe Bedding material in maximum 6 inch lifts and compacted to a minimum 90 percent modified Proctor maximum dry density (ASTM D-1557).

G. Bell holes shall be provided at each joint to permit the joint to be made properly. At no time shall the bells support the pipe when in the trench.

H. When muck or other deleterious materials is encountered in the trench, it shall be completely removed for the width of the trench at the pipe and to a depth where acceptable material is encountered. After removal of all muck or other deleterious material, the trench shall be backfilled with bedding material to the bottom of pipe grade as specified.

3.06 MAINTENANCE OF EXCAVATION

A. The excavation shall be maintained at a dry condition at all times.

B. All side slopes shall be such that material will not slide into the bottom of the excavation and any material doing so shall be immediately removed. Trench side slopes shall be in accordance with local codes, OSHA requirements, and the Trench Safety Act.

C. All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, fire and police call boxes, or other utility controls shall be left unobstructed and accessible until the work is completed.

D. Trees, shrubbery, fences, poles, bollards and all other property and surface structures shall be protected unless their removal is shown on the drawings or authorized by the Engineer. When it is necessary to cut roots and tree branches, such cutting shall be done under the supervision and direction of the Engineer.

E. The attention of the Contractor is drawn to the fact that during excavation at the project site, the possibility exists of the Contractor encountering various utilities (water, electrical, gas, or other) not shown on the drawings. The Contractor shall exercise extreme care before and during excavation to locate and flag these lines so as to avoid damage to the existing lines. Should damage occur to an existing line, the Contractor shall repair the line at no cost to the Owner.

F. It is the responsibility of the Contractor to ensure that all utility or other poles, the stability of which may be endangered by the close proximity of excavation, are temporarily stayed in position while the work proceeds in the vicinity of the pole and that the utility or other companies concerned be given reasonable advance notice of any such excavation by the Contractor.

3.07 BACKFILL UNDER STRUCTURES AND PAVEMENT AREAS

A. Backfilling of excavated areas under, around or over building and structural appurtenances and pavement, concrete or pavers shall be performed with clean fill materials which are free of debris, organics, trash or other deleterious substances. Suitable compaction equipment shall be used to obtain density described previously for entire depth of backfilling. Each layer of backfill under structures, pavements, and pavers shall be compacted to a minimum of 98% density as determined by a modified proctor in accordance with ASTM D-1557. Each layer of compacted

backfill shall not exceed 12 inches in thickness. If hand-held compaction equipment is used, reduce the loose lift thickness to 6 inches. The completed, compacted surface shall be at the proper final subgrade elevation.

B. Verify that the specified density extends to 12 inches below the bottom of the structure or pavement base course to be installed.

C. For precast structures whose foundations will be placed on bare rock, fill may consist of #57 bedding stone. Filter fabric shall be installed over the bedding stone at the rock horizon to prevent fines from migrating into the stone backfill.

D. For cast-in-place structures whose foundations will be placed on bare rock, the foundations may be cast directly onto the rock surface so long as the rock surface is properly dewatered and concrete is placed in the dry.

3.08 TRENCH BACKFILLING

A. Haunch Backfill: Carefully place Pipe Bedding material so as not to damage the pipe in maximum 6 inch loose lifts and compact to the pipe centerline. Use hand-held compaction equipment.

B. Pipe Zone: Backfill with Pipe Bedding material in maximum 12 inch loose lifts and compact to a point 12 inches above the pipe crown.

C. Under Pavement/Concrete/Paver Areas, and Structures: In areas where backfill settlement must be held to a minimum, backfill above the pipe zone with Pipe bedding material in maximum 12 inch loose lifts and compact to a minimum 98% maximum dry density (ASTM D1557) up to the subgrade elevation. Backfilling and compaction within the FDOT Rights of Way shall be in accordance with the FDOT Standard Specifications for Road and Bridge Construction, latest edition.

D. Outside Pavement/Concrete/Paver Areas: In areas where backfill settlement is not critical, backfill above the pipe zone with earthfill material to a density equal to or greater than the soil adjacent to the pipe trench, but not less than 90% of the maximum dry density (ASTM D1557), to final grade.

E. No material shall be used for backfill which contains muck or other deleterious material or material with an excessive void content. All backfill shall be composed of select clean granular material.

F. All trenches and excavation shall be backfilled immediately after all pipe and joints have been investigated and approved by the Engineer or Department, subject to satisfactory pressure and leakage test results, as required.

G. Backfill, in general, shall be kept up with the rate of pipe laying. No more than 200 feet of pipe trench shall be open at one time at any one project location.

H. See Miami-Dade Water and Sewer Standards for additional requirements.

3.09 BACKFILL AROUND STRUCTURES

A. Obtain Engineer's acceptance of concrete work and attained concrete strength prior to backfilling.

B. Backfill with Structural Backfill material placed in maximum 12 inch loose lifts and compacted to a minimum 98% of maximum dry density (ASTM D 1557).

C. Compact backfill adjacent to structures with equipment that will not damage the structure.

D. Backfill with flowable fill or other material shall be only if reviewed and approved by the Engineer.

3.10 SITE GRADING

A. Fill and contour site areas with Earthfill material to elevations shown and as required to prepare the site for landscape grading and sodding.

B. Place materials in maximum 8 inch loose lifts and compact as required to limit subsequent settlement.

3.11 COMPACTION TESTING

A. In-situ compaction testing shall be performed by a certified laboratory.

B. Compaction testing shall be done by nuclear density equipment or other approved methods. (ASTM D-2937, D-1557, D-6938)

C. Density testing shall be performed as follows:

1. Pipe Trenches: 1 test per lift per 100 feet of pipe.
2. Fill Under/Around Structures: 1 test per lift under each structure or 1 backfill test per lift per drainage or sanitary structure installed.
3. Fill Under Pavement Areas: 1 test per lift per 2,000 square feet of compacted surface area.

D. Test results in a specific location are only representative of a larger area if the contractor has used consistent compaction means and methods and the soils are practically uniform throughout. If it is determined by the Owner/Engineer that there are variations in the compaction methods and/or soil uniformity, additional testing may be required.

E. All costs associated with project testing are the responsibility of the Contractor.

3.12 FINAL AND FINISH GRADING

A. Using clean topsoil, perform all final and finish grading in all yard and planting areas indicated on drawings. Topsoil shall be placed to a minimum of 4" thickness, rototilled to a minimum depth of 8", leveled and finish graded in all areas. No pavement base course material or broken asphalt will be allowed as topsoil materials in grass/landscaping areas.

B. Final grading shall be performed and grades shaped to finished elevations indicated. Finish grades (top of the soil) shall be approximately 1-1/2" below edges of pathways, curbs and other paved or concrete slabs. After sod installation, the top of the sod shall not be more than 1/2" below or shall be flush with the grade established by any adjacent paved or curbed surface.

C. The Contractor shall verify that all finish subgrades are correct prior to beginning installation of sod and planting materials. Upon completion of the project work, the Contractor shall prepare "record drawings" verifying that all finish grades are in accordance with the contract documents and shall submit same to the Engineer for review and acceptance prior to requesting final inspection of the project. The "record drawings" shall be prepared by a surveyor registered in the State of Florida.

D. Upon project completion, all areas of site within immediate construction and adjacent areas shall be completely cleaned of all debris occasioned by this

construction of this construction. Particular attention is called to any cement, mortar, masonry drippings and plaster which shall be completely removed from planting and lawn areas and shall be disposed of offsite.

E. All areas adjacent to site and all areas not within contract construction areas shall be left in reasonably same condition as they were found prior to commencement of construction.

F. Any damage to the existing adjacent facilities including adjacent roads, and related areas such as, but not limited to, finish grades, slopes, grass sod, structures, pipe, etc. shall be repaired and restored to a proper and appropriate condition acceptable to the Owner and Engineer.

3.13 EXCESS MATERIAL

A. Remove all excess suitable material from the site and dispose of at Contractor’s expense.

B. Unsuitable materials shall also be removed and disposed of off-site at Contractor's expense.

END OF SECTION

SECTION 02800

RESTORATION OF SURFACE FEATURES

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work includes restoration of driveways, lawn areas, trees and plants, and any other existing areas affected by any and all pump station rehabilitation and replacement work. This section includes furnishing equipment, labor and materials, and performing all necessary and incidental operations to perform the required work.

B. Pruning, removal and relocation of palm trees from the center median on Hispanola Avenue as directed by the Village.

C. All areas disturbed or damaged during construction shall be restored to conditions existing prior to the work.

1.02 RELATED SECTIONS

A. Section 01000 – General Requirements

1.03 MEASUREMENT AND PAYMENT

A. Measurement and Payment for items covered by this section will be as detailed in Section 01150.

1.04 SUBMITTALS

A. Certification of quality by producer shall be delivered to Engineer ten days prior to use.

B. Submit sod certification for grass species and location of sod source.

C. Submit mix design for asphaltic concrete.

D. Submit data on joint filter, concrete admixtures, and curing compound.

E. Submit mix design for Portland cement concrete.

PART 2 PRODUCTS

2.01 SOD

A. The sod used for restoration shall match the existing in the area. In areas without well-established sod, Argentine Bahia sod shall be used.

B. The sod shall be sufficiently thick to secure a dense stand of live grass, with a minimum thickness of two inches. The sod shall be live, fresh, and uninjured at the time of planting. It shall be planted as soon as possible after being dug and shall be shaded and kept moist from the time it is dug until it is planted. The sod shall be approved by the Engineer before placing.

C. The sod shall be a minimum age of 18 months, with root development that will support its own weight without tearing when suspended vertically by holding the upper two corners.

2.02 PLANTS

A. Existing damaged plants shall be replaced by plants of equal type, quality and size whenever possible. All new plants shall be sound, healthy, vigorous, and free from defects, decay, disfigurement, bark abrasions, plant diseases, insects, and insect eggs/larvae. The new plants shall be approved by the Engineer before placing.

B. Existing plants may be removed, preserved, and replaced at the Contractor's option. Plants shall be handled by an approved nursery.

2.03 COMMERCIAL FERTILIZER

A. Commercial fertilizers shall comply with the state fertilizer laws.

B. The numeral designations for fertilizer indicate the minimum percentages respectively of (1) total nitrogen, (2) available phosphoric acid, and (3) water soluble potash contained in the fertilizer.

C. The chemical designation of the fertilizer shall be 12-8-8. At least 50 percent of the phosphoric acid shall be from normal super phosphate or an equivalent source that will provide a minimum of two units of sulfur. The amount of sulfur shall be indicated on the quantitative analysis card attached to each bag or other container.

2.04 WATER

A. The water used in the grassing operations may be obtained from any approved spring, pond, lake, stream, or municipal water system. The water shall be free of excess and harmful chemicals, acids, alkalies, or any substance that might be harmful to plant growth or disruptive to traffic. Salt water shall not be used.

2.05 ASPHALTIC CONCRETE PAVING

A. Asphaltic concrete for surface and base course applications shall be as specified in Section 331 of the FDOT Standard Specifications.

B. Primer: In accordance with FDOT Section 300, Prime and Tack Coats of Basis Courses.

C. Tack Coat: In accordance with FDOT Section 300.

D. Perform work in accordance with FDOT Section 300.

E. Pavement markings shall be replaced in their original location, color, and material where disturbed.

F. All equipment associated with the operations of pavement placement and related work shall be entirely suitable for the applicable operations performed and shall be maintained in good condition.

2.06 PORTLAND CEMENT CONCRETE PAVING AND SIDEWALKS

A. Portland cement concrete used in the performance of this concrete shall be Type I or Type II with a minimum 28-day compressive strength of 3,000 psi and shall conform to the requirements of Section 345 of the FDOT Standard Specifications.

B. Form materials shall conform to ACI 301.

C. Joint filter material shall be per FDOT Section 932.

D. Reinforcement shall be welded steel and wire fabric: Deformed type, A497.

E. Concrete materials shall be in accordance with FDOT Section 345 and related sections referenced under Section 345.

F. Curing compound shall be in accordance with FDOT Section 350.

G. Pavement markings shall be replaced in their original location, color, and material where disturbed.

H. All equipment associated with the operations of pavement placement and related work shall be entirely suitable for the applicable operations performed and shall be maintained in good condition.

PART 3 EXECUTION

3.01 LANDSCAPING RESTORATION

A. Any lawn area affected by the required work shall be restored to a condition equal to or better than the conditions existing before the work.

B. Where required plants shall be adequately balled with firm natural balls of soil, sized as set forth in "Grades and Standards." Balls shall be firmly wrapped with burlap or equally approved strong cloth. No balled plant will be planted if the ball is cracked or broken before or during the process of planting.

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3.02 SOD PLACEMENT

A. The areas over which the sod is to be placed shall be scarified or loosened to suitable depth. On areas where the soil is sufficiently loose, particularly on shoulders and fill slopes, the Engineer may, at his discretion, authorize the elimination of the ground preparation.

B. Contractor shall, at his expense, maintain the planted areas in a satisfactory condition until final acceptance of the project. Such maintenance shall include watering, filling, leveling, and repairing of any washed or eroded areas as necessary.

3.03 PAVEMENT REPLACEMENT

A. Asphalt pavement shall be removed by saw cutting on a straight line with edges as vertical as possible. Concrete pavement or asphalt surfaced concrete shall be removed by cutting with a concrete saw in as straight a line and as vertically as possible.

B. When placing the aggregate base course:

1. Correct irregularities in substrate gradient and elevation by scarifying, reshaping, and recompacting.

2. Place aggregate in maximum six inch layers and compact to 98% AASHTO T180.

3. Add small quantities of fine aggregate as appropriate to assist compaction.

4. Add water to assist compaction. If excess water is apparent, remove aggregate and aerate to reduce moisture content.

5. Use mechanical tamping equipment in areas inaccessible to compaction equipment.

6. The following tolerances for the aggregate base course shall be maintained.

a. Flatness: maximum variation of 1/4 inch measured with 10 foot (3m) straight edge.

b. Scheduled compacted thickness: within 1/4 inch.

C. When placing asphaltic concrete paving:

1. Verify that compacted granular base is dry and ready to support paving and imposed loads.

2. Verify gradients and elevations of base are correct.

3. Apply primer in accordance with FDOT Section 300.

4. Apply tack coat in accordance with FDOT Section 300.

5. Install Work in accordance with FDOT standards.

6. Place asphalt within 24 hours of applying primer or tack coat.

7. Compact pavement by rolling to specified density. Do not displace or extrude pavement from position. Hand compact in areas inaccessible to rolling equipment.

8. Perform rolling with consecutive passes to achieve even and smooth finish without roller marks.

9. All existing pavement edges shall be saw cut prior to placing new abutting asphalt pavement.

10. The following tolerances for the asphaltic concrete paving shall be maintained.

    a) Flatness: maximum variation of 1/4 inch measured with 10 foot (3m) straight edge.

    b) Scheduled compacted thickness: within 1/4 inch.

    c) Variation from true elevation: within 1/4 inch.

D. When placing Portland cement concrete paving and sidewalks:

1. Verify compacted subgrade is acceptable and ready to support paving and imposed loads.

2. Verify gradients and elevations of base are correct.

3. Prepare subbase in accordance with FDOT Section 350 Compact Subgrade to 100% maximum density AASHTO T-99.

4. Moisten subgrade to minimize absorption of water from fresh concrete.

5. Notify Engineer at least 24 hours prior to commencement of concrete operations.

6. Place and secure forms to correct locations, dimension, profile, and gradient.

7. Place joint filler vertical in position, in straight lines. Secure to formwork during concrete placement.

8. Place reinforcement at bottom of slabs-on-grade, 2" clear.

9. Place concrete in accordance with FDOT Section 350.

10. Place joint filler between paving components and building or other appurtenances.

12. Sidewalk paving: Broom finished with even, dustless surface.

13. Immediately after placement, protect pavement from premature drying, excessive hot or cold temperatures, and mechanical injury.

3.04 CURB REMOVAL AND REPLACEMENT

A. Curb removal and replacement required in the construction of this work shall be done by the Contractor. Reasonable care shall be exercised in removing the curb, and the Contractor shall either stockpile or dispose of this material as directed by the Engineer. Curb shall be replaced of like material in a manner and condition equal to or better than that existing at the time of removal. Materials and methods of replacing state highway sidewalks or curbs shall conform to the FDOT Standard Specifications.

3.05 CONCRETE SIDEWALK

A. Concrete sidewalk shall be removed by saw cutting on a straight line with edges as vertical as possible. The new sidewalk segments shall match the existing sidewalk as to width, thickness, and elevation and have a medium broom finish.

B. Expansion joints between the sidewalk and the curb or driveway or at fixed

objects and sidewalk intersections shall be 1/2-inch joints formed with a preformed joint filler.

END OF SECTION

SECTION 05540

ACCESS HATCHES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish and install access hatches, frames and accessories, where shown on the Drawings, and as specified herein.

1.02 QUALITY ASSURANCE

A. Codes: Access hatches shall conform with South Florida Building Code and OSHA requirements.

B. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

PART 2 PRODUCTS

2.01 HATCHES

A. General:

1. Hatches for valve vault shall be aluminum. In all cases hatches shall be designed for AASHTO H-20 wheel loads unless otherwise shown for pedestrian (300 PSF) loading.

2. The access hatches shall have T316 stainless steel hardware, EPDM gasket,/cushion, SS and aluminum hold open arm with release handle, padlock lug, pressure locks, and extruded aluminum frame. Hatches shall be equipped with a flush drop handle which does not protrude above the cover. Hinges shall be all stainless steel with tamper proof stainless steel bolts and nuts, and shall be removable for maintenance after the access hatch is cast in place. Access hatches shall be furnished with a safety chain (double door leaf design).

3. When mounted, door leaf shall be flush with the top surface of the frame, with the exception of the projecting lugs. Hatches shall be of skid proof design.

4. Hatches shall be gas tight.

5. Access hatches shall be provided with a lifetime guarantee.

B. Valve Vault:

1. Valve vault hatch shall be Model F1R, gas tight, double door as manufactured by Halliday Products, or approved equal.

C. For Submersible Pump Type Pump Stations:

1. Access hatches shall be Model F1R, gas tight, single door as manufactured by Halliday Products, or approved equal.

2. Frame shall be furnished with upper guide holder, level sensors and cable. Frame shall be securely placed and mounted above the pumps.

PART 3 EXECUTION

Not Used.

END OF SECTION

SECTION 11205

SUBMERSIBLE (WASTEWATER) PUMPS

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish and install submersible non-clog wastewater pumps and appurtenances and place in satisfactory operation, in a workmanlike manner, all machinery, equipment, apparatus and accessories required for a complete installation in accordance with these specifications.

B. The submersible non-clog wastewater pumps must be for use with variable frequency drives (VFD's).

C. It is the intent of these Specifications to obtain complete and operable equipment. All items and accessories appearing in the Drawings, in the manufacturer's literature as standard, and all items specified herein, shall be included. Items not included herein or on the Drawings or manufacturer's literature, but which can be reasonably inferred as necessary for the equipment to be properly and legally operable, shall be included.

1.02 REFERENCES

A. This section contains references to the following documents. They are a part of this section as specified and modified. In case of conflict between the requirements of this section and those of the listed documents, the requirements of this section shall prevail.

1.	ABMA 9-90	Load Ratings and Fatigue Life for Ball Bearings
2.	ABMA 11-90	Load Ratings and Fatigue Life for Roller Bearings
3.	ASTM A48-00	Gray Iron Castings
4.	ASTM A108-99	Steel Bars, Carbon, Cold Finished, Standard Quality
5.	ASTM A276-00a	Stainless and Heat-Resistant Steel Bars and Shapes

6.	ASTM A278-93	Gray Iron Castings for Pressure Containing Parts for Temperature up to 650 Degrees F
7.	ASTM A322-91	Steel Bars, Alloy, Standard Grades (1996)
8.	ASTM A576-90b	Steel Bars, Carbon, Hot Wrought, Special Quality (2000)
9.	ASTM A743/A743M-98a	Castings, Iron-Chromium, Iron-Chromium-Nickel, Corrosion-Resistances for General Application
10.	Hydraulic Institute	Standards of the Hydraulic Institute, (Current Edition)

1.03 SUBMITTALS

A. The Contractor shall submit the following after approval of drawings, but prior to construction of pump station:

1. Pump Drawings.
2. Pump performance curves, including other impeller sizes.
3. Predicted pump performance curves for each condition point specified in Part 2 showing head, power, efficiency and NPSH required on the ordinate plotted against capacity on the abscissa (x-axis).
4. Materials of construction.
5. Motor drawings
6. Complete electric motor data.

B. Submit in accordance with Section 01300, "Submittals"

1.04 QUALITY ASSURANCE

A. Pumping units and accessories shall be the standard product of manufacturers which have produced and sold such pumps and appurtenances for a period of at least 5 years for similar service.

B. Spare parts shall be available from the manufacturer, not the vendor. All mounting, guides, and spare parts shall be supplied by the manufacturer.

1.05 PUMP WARRANTY

A. The pump manufacturer shall warrant the units supplied to the owner against defects in workmanship and materials for a period of 5 years or 10,000 hours of operation, in normal use, operation and service. The warranty shall be in printed form and shall apply to all similar units. A copy of the warranty shall be supplied with each pump. The warranty shall consist of the following:

1. From 0 18 months or 0 - 3,000 hours, 100% warranty.
2. From 19 39 months or 3,001 6,500 hours, 50% warranty.
3. From 40 60 months or 6,501 10,000 hours, 25% warranty.

B. PART 2 PRODUCTS

2.01 PUMPS

A. Pump shall be totally submersible, non-clogging, electrically operated, designed specifically for use in municipal wastewater applications and capable of handling raw unscreened sewage. Pumping units shall be suitable for the allotted space shown on the Drawings and shall be satisfactorily suitable for the design conditions as specified. Pump stations will be located in an area where clogging of pumps by debris in the sewer is expected. The proposed pumps shall be capable of passing debris without clogging (to the satisfaction of the Engineer).

B. Source: Provide pumping units by one of the following submersible pumps approved for use in the Water and Sewer Department system:

1. Xylem/Flygt;
2. Homa;
3. Equal

C. Design: The design shall be such that the pump unit shall be automatically and firmly connected to the discharge piping when lowered into place on its mating discharge connection. The pump shall be so designed that it may be lowered to or raised from its place in the wet-well by Type 316 stainless steel chain or cable and accurately guided by pipe guide bars extending from the top of the station to the discharge connection. The pump shall be guided by no less than two (2) separate

Type 316 stainless steel guide rails of 3-inch minimum diameter. There shall be no need for personnel to enter the wet-well.

D. Discharge Connection: Mating discharge connection of pump unit (aka Base Elbow) shall be permanently affixed to the concrete in the wet well with Type 316 stainless steel epoxy set anchor bolts furnished by and of the size recommended by the pump manufacturer. However, anchor bolts shall be 3/4-inch stainless steel, minimum. Sealing of the pumping unit to the discharge connection shall be accomplished by a machined metal to metal watertight contact. Sealing of the discharge interface with a diaphragm, O-ring or profile gasket shall not be acceptable. Provide a six-inch discharge.

E. Each pump with its appurtenances and cable shall be capable of continuous submersion under water without loss of water-tight integrity. Major parts such a stator casing, oil casing, sliding bracket, volute and impeller shall be of cast iron ASTM A-48, Class 35B. All surfaces coming into contact with sewage other than stainless steel shall be protected by a coating resistant to sewage. All exposed bolts and nuts shall be Type 316 stainless steel.

F. The discharge connection (aka Base Elbow) shall be design and manufactured such that it will accept a Flygt N pump model. The base elbow shall be a product of the pump manufacturer and not a third party fabricator.

G. The pumps shall have a maximum weight of 1,500 pounds, as required to meet conditions described in these Specifications and design operating characteristics. Pumps shall have a minimum efficiency of 50% at Best Efficiency Point (BEP).

2.02 PUMP PERFORMANCE

A. Performance of the pumps shall meet the conditions of service as shown on the plans.

2.03 COOLING SYSTEM

A. Motors shall be sufficiently cooled by the surrounding environment or pumped media.

2.04 PUMP CONSTRUCTION

A. Material and Coating: The major pump components shall be ASTM A48, "Gray Iron Castings", Class 35B cast iron, with smooth surfaces devoid of blow holes and other irregularities; of sufficient strength, weight and metal thickness to insure long life, accurate alignment and reliable operation. All exposed nuts and bolts shall be Type 316 stainless steel. All surfaces coming into contact with sewage other than stainless steel shall be protected by an approved sewage resistant coating. The pump exterior shall be sprayed first with PVC epoxy primer. All remaining surfaces where watertight seal is required shall be machined and fitted with nitrile rubber "O" rings. Fittings shall be such that the sealing is accomplished by metal-to-metal contact between the machined surfaces.

B. Cable Entry Seal:

1. The cable entry water seal shall be designed to preclude specific torque requirements to insure a watertight and submersible seal. The cable entry shall be comprised of a cylindrical elastomer grommet flanked by stainless steel washers, all having a close tolerance fit against the cable outside diameter and the entry inside diameter and compressed by the entry body containing a strain relief function separate from the function of sealing the cable.

2. The cable entry junction chamber and motor shall be separated by a stator lead sealing gland or terminal board, which shall isolate the motor interior from foreign material gaining access through the pump top.

3. Cable entry assemblies utilizing an epoxy for sealing may be considered, on a case-by-case basis. Epoxy shall be locally and commercially available and shall have maximum published cure time of six (6) hours at room temperature and shall be suitable for use in a municipal sewerage environment.

C. Impeller: The impeller(s) shall be of gray cast iron, Class 35B, dynamically balanced, single or double shrouded, non-clogging design having a long throughlet without acute turns. The impellers shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in normal sewage applications. The impeller shall be of a single vane, 2 or 3 vane non-clogging design. Impeller(s) shall be keyed to the shaft, retained with an Allen head bolt and shall be capable of passing a minimum 3-inch diameter solid sphere. One impeller tool shall be provided with each pump.

D. Wear Rings: A wear ring or wear plate system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be equipped with a brass, or nitrile rubber coated steel ring insert that is drive fitted to the volute inlet.

E. Volute: Pump volute(s) shall be single-piece gray cast iron, Class 35B, non-concentric design with smooth fluid passages large enough at all points to pass any solids that may enter the impeller.

F. Shaft and Mechanical Seal:

1. The pump and rotor shaft shall be the same unit. The shaft shall be ANSI Type 420 series stainless steel or approved equal.

2. Each pump shall be provided with a tandem mechanical rotating shaft seal system. Seals shall run in an oil reservoir. Lapped seal faces must be hydro-dynamically lubricated at a constant rate. The lower seal unit, between the pump and the oil chamber shall contain one stationary and one positively driven rotating tungsten or silicon carbide ring. The upper seal unit, between the oil sump and motor housing, shall contain one stationary tungsten carbide or ceramic ring and one positively driven rotating carbon ring. The use of a positively driven rotating tungsten or silicon carbide ring is acceptable in lieu of the positively driven rotating carbon ring. Each seal interface shall be held in contact by its own spring system. The seals shall require neither maintenance nor adjustment but shall be easily inspected and replaceable. Each pump shall be provided with an oil chamber for the shaft sealing system. The oil chamber shall be designed to prevent over-filling and to provide oil expansion capacity. The drain and inspection plug with positive anti-leak seal shall be easily accessible from the outside. The pump shaft shall rotate on 2 permanently lubricated bearings with a minimum L10 rating of 50,000 hours.

2.05 PUMP MOTOR

A. The pump motor shall be squirrel cage induction, shell type design, housed in an air filled, watertight chamber and 1,800 RPM, 240/480 volts, 3 phase, 60 Hertz, 1.15 S.F., NEMA Type B. The stator winding and stator leads shall be insulated with moisture resistant Class F insulation which will resist a temperature of 155

degree centigrade. The stator shall be dipped and baked 3 times in Class F varnish. The motor shall be designed for continuous duty capable of sustaining a minimum of 12 starts per hour. Motors shall be approved for Class 1, Division II, Group D atmospheres in accordance with NEC classification for hazardous areas. Motors shall be able to start within the 1300% factor allowed by NEC 430-52 or documentation shall be provided as to why it cannot.

B. The submersible non-clog wastewater pumps must be for use with variable frequency drives (VFD's).

C. Motor bearings shall be permanently grease lubricated. Oil filled motors are not acceptable.

D. Thermal switches shall be embedded in the stator lead coils. All stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. At 125 degrees C (260 degrees F) the thermal switches shall open, stop the motor and activate an alarm. These thermal switches shall be used in conjunction with and supplemental to external motor overload protection and shall be connected to the control panel. Wire nuts or crimping devices are not acceptable. The motor and pump shall be designed and assembled by the same manufacturer

E. The pump motor cable shall be suited for submersible pump applications with Underwriters Laboratory approval permanently embossed on the cable. Cable sizing shall conform to the National Electric Code Specifications for pump motors. Each pump shall be furnished with ample cable such that one continuous length of cable, supplied by pump manufacturer, will be all that is required to run from pump, when lowered in the wet-well, to the controls, without need of splices.

F. The motor horsepower shall be adequate such that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out.

PART 3 EXECUTION

3.01 INSTALLATION

A. All equipment shall be installed as shown on the Plans and in accordance with these specifications.

B. All motors shall be factory mounted by the driven equipment manufacturer in accordance with the motor manufacturers drawings and instructions. Field installation of the unit, including final alignment shall be the responsibility of the Contractor.

C. Installation shall include furnishing all necessary appurtenances for initial operation and making final adjustments to place the equipment in operable condition.

D. All control and alarm wires, as required, shall be provided even if not shown on plan drawings.

3.02 PREPARATION FOR STORAGE

A. All flanges shall be covered to prevent damage. Pump motors, and shafts will be stored inside warehouses. Pumps may be stored outside, on wood members away from the ground, at sufficient elevation to prevent flooding, and protected from the weather by secured canvas or plastic coverings.

3.03 PUMP TESTS

A. The manufacturer shall perform the following inspections and tests on each pump before shipment from the factory:

1. Impeller, motor rating and electrical connections shall be checked for compliance with customer's purchase order.

2. Motor and cable insulation tests for moisture content or insulation defects shall be made.

3. Prior to submergence, the pump shall be run dry, to establish correct rotation and mechanical integrity.

4. Pump shall be run for 30 minutes submerged a minimum of 6 feet underwater.

5. After the operation tests, the insulation test is to be performed again. A written report, signed by a professional engineer, registered in the state

where the tests were performed, stating that all tests were performed and that the tests were satisfactorily accomplished, shall be supplied with each pump at the time of shipment.

3.04 FIELD QUALITY CONTROL

A. The supplier shall provide start-up service and training to place the pumps and controls in proper operation.

B. During this service, the Manufacturer's Representative shall review the operation of the pump station for proper installation and shall coordinate with Contractor and make recommendations.

C. The pumps shall be tested at start-up and the voltage, current and other significant parameters recorded. The manufacturer shall provide a formal test procedure and forms for recording the data.

D. The supplier shall submit a written report to the Contractor, stating results of the start-up inspection. A copy of the report shall be furnished to the Village.

END OF SECTION

SECTION 11215

SUMP PUMP

PART 1 GENERAL

1.01 SCOPE

A. The Contractor shall furnish and install sump pump and all appurtenances, as specified below, where shown on the plans or as required for a complete installation.

1.02 SUBMITTALS

A. The Contractor shall furnish full detailed manufacturer specifications, characteristic curves and shop drawings showing the make, model and descriptive data for the proposed pump unit. Submittals shall be approved prior to installation of pumping unit.

PART 2 PRODUCTS

2.01 SUMP PUMPING UNIT

A. Sump pump in the dry-well shall be a submersible type with a cast iron or bronze housing, by Barnes, Covert Pump Division, or approved equal. Pump shall be rated for duty in conditions it shall be subjected to, including being totally submerged. Unit shall contain mechanical seal with rotating carbon face and stationary ceramic face. The motor shall be single phased, oil-filled unit, with overload protection and maximum ½-horsepower.

B. Sump in shall be sized per sump pump manufacturer's recommendation, but unless approved, not less than dimensions shown on the Pump Station Drawings. Dry-well sump shall include space for external float switch. Float switch shall be furnished with 10 feet cord and piggyback plug.

C. Where installed in valve-pit, sump pump shall be 1/3-horsepower, single phase, oil filled unit, with overload protection. Unit shall be Series BP27, by Barnes, or approved equal.

PART 3 EXECUTION

3.01 INSTALLATION

A. All equipment shall be installed as shown on the approved plans.

B. Installation shall include furnishing all necessary wiring, piping and other necessary appurtenances for satisfactory operation and making final adjustments to place the equipment in operable condition.

C. All power, control and alarm wires as required shall be provided even if not shown on plans.

D. All installation, testing and start-up shall be provided by the contractor.

E. Dry-well Installation: Provide a sump and sump pump in the floor of the dry-well in a corner opposite the wet-well. Slope the floor from all directions toward the sump. The PVC pump discharge line shall contain two swing-disk type check valves and a gate valve and shall be piped to the top of the dry-well before passing through the wall into the wet-well.

F. Valve Vault Installation: Sump pump and local motor starting switch shall be installed in the valve pit and hard-wired to the control cabinet. Manual motor starting switch shall be NEMA 3, 4X and 12, corrosion-resistant, dust-tight and watertight. Discharge from pump shall be conveyed to the wet-well using 1-1/2 inch diameter PVC pipe.

END OF SECTION

SECTION 11330

WASTEWATER MACERTOR ASSEMBLY

PART 1 GENERAL

1.01 SUMMARY

A. This section of the specification describes the wastewater macerator assembly with manhole and controller. The equipment shall be installed as shown on the plans, as recommended by the supplier, and in compliance with all OSHA, local, state and federal codes and regulations.

B. Refer to Section 16050 for additional electrical requirements.

1.02 REFERENCES

A. The wastewater macerator shall, as applicable, meet the requirements of the following industry standards:

1. American Society for Testing and Materials (ASTM) A36: Carbon Steel Plate

2. American Society for Testing and Materials (ASTM) A536-84: Ferritic Ductile Iron Castings

3. American Society for Testing and Materials (ASTM) A48-83: Grey Iron Casting

4. American Society for Testing and Materials (ASTM) C 581: Practice for Determining Chemical Resistance of Chemical Thermosetting Resins Used in Glass-Fiber Reinforced Structures Intended for Liquid Service

5. American Society for Testing and Materials (ASTM) D 638: Standard Test Method for Tensile Properties of Plastics

6. American Society for Testing and Materials (ASTM) D 695: Standard Test Methods for Compressive Properties of Rigid Plastics

7. American Society for Testing and Materials (ASTM) D 790: Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials

8. American Society for Testing and Materials (ASTM) D 2583: Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor

9. American Society for Testing and Materials (ASTM)D 2584: Standard Test Method for Ignition Loss of Cured Reinforced Resins

10. American Society for Testing and Materials (ASTM)D 3753: Standard Specification for Glass-Fiber Reinforced Polyester Manholes

11. American Association of State Highway and Transportation Officials (AASHTO) H-20: Axial Loading

12. American National Standards Institute (ANSI) B16.42-1979, Class 150 Flanges

13. American Iron and Steel Institute (AISI) 303 Stainless Steel

14. American Iron and Steel Institute (AISI) 304 Stainless Steel

15. American Iron and Steel Institute (AISI) 316 Stainless Steel

16. American Iron and Steel Institute (AISI) 4130 Heat Treated Alloy Steel

17. American Iron and Steel Institute (AISI) 4140 Heat Treated Alloy Steel

18. American Iron and Steel Institute (AISI) 8620 Heat Treated Alloy Steel

19. American Iron and Steel Institute (AISI) 17-4 Stainless Steel

20. American Iron and Steel Institute (AISI) 4140 Heat Treated Hexagon Steel

21. Society of Automotive Engineers (SAE) 660 Bearing Bronze

B. Controllers shall, as applicable, meet the requirements of the following Regulatory Agencies:

1. National Electrical Manufacturer's Association (NEMA) Standards

2. National Electric Code (NEC)

3. Underwriters Laboratory (UL and cUL)

4. International Electrotechnical Commission (IEC)

1.03 DOCUMENTS

A. Submittals shall include equipment descriptions, functional descriptions, dimensional and assembly drawings, catalog data, and job specific drawings.

B. Operation and Maintenance Manuals shall include equipment descriptions, operating instructions, drawings, troubleshooting techniques, a recommended schedule, and the recommended lubricants.

1.04 QUALITY ASSURANCE

A. Identification

1. Equipment shall be identified with a corrosion resistant nameplate affixed in a conspicuous location.

2. Nameplate information shall include manufacturer's name and address, equipment model number, and serial number.

B. Manufacturer

1. Supplier shall be ISO9001 certified.

2. Supplier shall provide a list of reference sites for similar equipment for verification by the Engineer or Owner's Representative.

3. Supplier shall conduct factory testing and verification of equipment prior to shipment.

C. Installation & Start-up

1. Supplier shall provide services of a factory trained representative to check installation and review start-up of equipment and controls.

2. Supplier Representative shall inspect and approve site installation and supervise a review of the operation of the equipment.

3. Supplier Representative shall provide training on operation and maintenance requirements of the equipment to the Owner.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packaging

1. Containers or skids shall be constructed for normal shipping, handling, and storage.

2. Store products indoors or in weather protected area until installation. Protect from construction traffic and damage.

3. During the loading, unloading, and storage, care should be taken to ensure that the manhole is not dropped or otherwise damaged.

4. The manhole should be stored on a smooth surface free of sharp objects.

5. Nylon or fabric slings should be used in conjunction with a spreader bar to lift or move the manhole.

6. UNDER NO CIRCUMSTANCES SHOULD CABLES OR CHAINS BE USED.

1.06 WARRANTY

A. Manufacturer’s standard 12-month limited warranty shall be provided on equipment.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. The macerator assembly shall be in accordance with these specification and plans and shall be supplied by one of the following manufacturers:

1. Franklin Miller
2. JWC Environmental
3. Approved equal.

2.02 MACERATOR/SEWAGE GRINDER

A. General

1. The grinder shall be designed to reduce solids normally found in a sewage system.

2. The grinder shall be capable of handling the specified flow rate without the use of moving diverter screen(s).

3. Each grinder shall consist of the following main components:

   a. Grinder assembly (Lower Works)

   b. Drive assembly

   c. The channel frame shall facilitate the slide-in installation of the grinder, in the open channel.

4. Two-shaft design shall consist of two parallel shafts stacked with intermeshing cutter cartridges. The shafts shall counter-rotate with the driven cutter peripheral linear speed operating at approximately two-thirds (2/3) that of the drive cutter peripheral linear speed.

B. Grinder Performance

1. Macerator:

a. 8” x 12” cutting Chamber capable of processing up to 295 GPM Peak Flow.

C. Main Housing

1. The main housing components shall be a cast structure made of ASTM A536-84 ductile iron.

2. The main housing components shall be independent of and shall not be subject to wear from seal or labyrinth seal system and shall not constitute a seal wear element.

D. Cutters

1. The cutters shall be a monolithic cutter cartridge type comprising a plurality of 7-tooth cam shaped cutter elements. The cartridges shall be designed to eliminate individual cutter and spacer disks for improved strength and transmission of power from the shaft.

2. No cutter stack re-tightening shall be required with this system.

3. The cutter profile shall be a 7 tooth cam type to minimize frictional drag. To maintain particle size, the height of the tooth shall not exceed 1/2-inch above the root diameter. Cutter to cutter root diameter overlap shall not be less than 1/16-inch or greater than 1/4-inch to maintain the best possible cutting efficiency while incurring the least amount of frictional losses.

4. The inside configuration of cutters shall be hexagonal so as to fit the shafts with a total clearance not to exceed 0.015-inch across the flats to assure positive drive and minimize wear.

5. Cutter Cartridges shall be AISI 4140 Heat Treated Alloy Steel, The spaces defined by the adjacent side surfaces of the cutting edges and outer surface of the connecting spacer areas shall be cylindrically ground for uniformity. Each cutter cartridge shall further have a total accumulated tolerance of plus or minus .0005" to eliminate shimming, cutter stack tolerance accumulation and misalignment. The cutters shall be through-hardened to a minimum 45-49 Rockwell.

6. The cutters shall exert a minimum force of 450-lbs./HP continuously and 1430-lbs./HP at momentary load peaks at the tooth tip.

E. Shafts

1. Grinder drive and driven shafts shall be made of AISI 4140 heat treated hexagon steel with a tensile strength rating of not less than 135,000-psi. Each shaft size shall be a minimum of 2-inch hexagon (across the flats).

F. Bearings and Seals

1. The cutter shaft's radial and axial loads shall be borne by a sealed oversize deep-groove (Conrad type) ball bearing at each end. The bearings shall have a minimum rating of 9230 lbs. (basic dynamic rating).

2. The bearings shall be protected by a combination of a replaceable and independent tortuous path device and end face mechanical seals.

3. Face materials shall be tungsten carbide vs. tungsten carbide and not require an external flush. The seals shall employ elastomer members operating as opposing disk springs when compressed and at the same time maintain a positive seal face pressure to insure positive sealing. No metal springs shall be employed.

4. The bearings and seals shall be housed in a replaceable cartridge that supports and aligns the bearings and seals. The cartridge housings shall be constructed of hardened 17-4 PH stainless steel for superior resistance to corrosive and abrasive contaminants.

5. Components subject to wear shall be designed into replaceable elements and not be a part of the ductile iron unit main housing.

6. O-rings shall be made of Buna-N elastomers.

G. Reducer

1. The speed reducer shall be a grease-filled planetary or cycloidal type reducer with "Heavy-Shock" load classification. The reduction ratio shall

be 29:1. The high-speed shaft of the grinder shall be directly coupled with the reducer via a coupling.

2. The two-piece, three-lobed coupling shall have jaws that intermesh by at least 3/4" for dependable torque transmission.

H. Motor – Submersible

1. The unit shall incorporate a submersible explosion-proof motor coupled to a reducer comprising a sealed assembly suited for continuous or intermittent submerged service.

2. The motor shall be 5 HP 230/460 Volts 60 Hz. Submersible Explosion Proof, Class 1, Group D, Div. 1 capable of continuous-in-air operation. The gear reducer shall be fully sealed and capable of operating submerged continuously. The motor shall be supplied with 60 feet of cable.

3. The submersible motor shall further meet the following requirements:

a. Insulation: Moisture-resistant Class F 155EC/311EF.

b. Design: Squirrel cage induction, NEMA Design B for continuous operation

4. A coupling adapter shall be used having registers for accurate alignment and smooth operation. The coupling adapter shall be sealed to prevent water contamination. The adapter shall be firmly connected to the input of the reducer and shall rigidly support the submersible motor weight.

I. Painting and Protective Coatings

1. Steel and cast iron surfaces are to be cleaned, primed and painted with one prime and one finish coat, 3 to 5 mils per coat, Tnemec Series 66 Hi-Build Epoxoline (Epoxy Polyamide), Blue Color, Satin finish.

2.03 MANHOLE

A. Configuration

1. Size - Macerator assembly manhole shall be 48 inch diameter as shown on the plans with H-20 sanitary sewer manholes frame and cover

2. Construction - One-piece construction.

3. Materials:

   a. Fiberglass reinforced plastic, complying with ASTM D 3753, and latest edition.

   b. Factory-assembled, ready for installation except for field-installed equipment.

   c. The exterior surface shall be relatively smooth with no sharp projections. The surface shall be free of blisters larger than 1/2 inch in diameter, delamination and fiber show.

   d. The interior surfaces shall be resin rich with no exposed fibers. The interior surface shall be smooth for improved corrosion resistance and reduced sludge build-up. The surface shall be free of crazing, delamination, blisters larger than 1/2 inch in diameter, and wrinkles of 1/8 inch or greater in depth.

   e. Minimum 0.50 inches wall thickness.

   f. Integral fiberglass ladder bolted and glassed to the manhole wall with 1-1/2 inch diameter pultruded fiberglass rungs with a photoluminescent high visibility non-slip top surface and reinforced with threaded T-304 5/6 inch diameter stainless steel rods and solid 1-1/4 inch diameter pultruded fiberglass spacers.

   g. Inlet and outlet end connections laminated to the manhole barrel. The end connections shall be provided with pipe stubs with flexible PVC boots and stainless steel bands to connect to the existing wastewater collection system as shown on the plans.

   h. A 3/4 inch thick expanded polystyrene bead board shall be supplied to place under the manhole on the concrete slab.

i. A four (4) inch wide FRP integral mounting flange shall be molded to the base of the manhole barrel for anchoring to the manhole to the concrete slab.

j. An OSHA approved “Confined Space Entry” sign shall be applied to the interior surface of the manhole above the first ladder rung.

k. One (1) 2 inch NPT coupling to facilitate the installation of electrical power, or other cabling into the manhole.

l. A stainless steel rope hook for spare grinder cable.

m. Integral fiberglass manhole shoulder with non-slip surface.

n. Integral fiberglass channel with recessed grinder cavity and stainless grinder guides to accept the grinder.

o. Recessed open cell FRP grating over inlet and outlet channels.

p. Removable fiberglass bar screen.

q. The resins used shall be unsaturated, supplier certified, isophthalic polyester resins. Quality assurance records on the resin shall be maintained. Non-pigmented resin (with U.V. inhibitors) to allow for light or “sand” color of manhole surface in order to facilitate easy from grade interior inspection.

r. 15 mil gray isophatlic U.V. resistant gel coat on all exterior surfaces

s. Reinforcing materials shall be high performance commercial grade with a coupling agent that will provide a suitable bond between the glass reinforcement and the resin.

t. The manhole laminate shall consist of multiple layers of glass matting and resin. The surface exposed to the sewer / chemical environment shall be resin rich and shall have no exposed fibers.

4. Material Properties:

a. Manhole Barrel and Reducer:

1) Flexural strength (ASTM D 790):
   a) 15,400 PSI (reducer - hoop)
   b) 17,200 PSI (reducer - axial)
   c) 22,500 PSI (reducer - hoop)
   d) 14,300 PSI (reducer - axial)

2) Compressive Strength (ASTM D 695): 8,900 PSI (barrel)

3) Barrel Stiffness (ASTM D2412):

Manhole Length (ft.)	PSI
7-12	1.26

5. Manhole Type: Provide metering manholes of the following type:

a. 22-1/2 inch opening H-20 highway loading reducer designed and certified to withstand a 16,000 pound vertical dynamic wheel load and be fully compliant with AASHO H-20. Grade rings, cover, and frame as shown on the plans.

2.04 MACERATOR CONTROL PANEL (MCP), ELECTRICAL COMPONENTS & ACCESSORIES

A. MCP

1. The MCP shall be U.L listed and shall be rated for a minimum AIC rating of 65,000 AIC. The MCP shall be provided with sunshields on the front, top and sides of the enclosure. The MCP shall also include forced ventilation with an integral fan and filtered air vents.

2. A molded case main circuit breaker shall be provided and the handle of the circuit breaker shall be operational through the inner deadfront.

3. A surge protection device (SPD) shall be included to protect the motor and control equipment from lightning and induced line surges. The SPD shall be APT TE/XDS or approved equal.

4. An Automatic Reversing Controller and motor circuit protector shall be supplied with oil tight controls and overload heater protection.

5. The MCP shall provide control of the grinder and be designed to control one (1) 5 HP motor at 230/460 volts, 3 phase, 60 Hz. The controller shall have indicator lights, switches and other control devices.

    a. Enclosure shall be fiberglass reinforced polyester NEMA 4X.

    b. Enclosure shall house the control devices, motor starters, and PLC. PLC shall be rated for a minimum ambient temperature of 50 degrees C.

    c. Grinder ON-OFF/RESET-REMOTE three-position 22mm type, NEMA 4X selector switch

    d. In the OFF/RESET position, the grinder shall not run.

    e. In the ON position, the grinder shall run continuously.

    f. In the REMOTE position, the grinder shall start and stop as controlled by a future remote external device.

    g. Selector switch shall be the only method for resetting the controller after a failure.

    h. An electrical schematic diagram shall be permanently affixed to the interior side of the exterior enclosure door with a copy supplied to the Owner personal at start-up. The schematic diagram shall include the rated amperage and voltage for all components.

6. Pilot Lights

    a. Lights shall be LED type 22 mm, rated NEMA 4X.

    b. Lights shall indicate POWER ON, RUN, and FAIL.

7. Programmable Logic Controller (PLC)

    a. PLC shall have a minimum of 16K of memory.

8. Motor Starter

   a. Starter shall be a full-voltage reversing type with 120 volt operating coils.

   b. Overload relays shall be adjustable and sized to full load amperes (FLA) of the motor.

9. Control Transformer

   a. Control transformer shall be minimum 130 VA.

   b. Control transformer primary and secondary shall be fused for over current protection.

10. Current Transducer

   a. Current transducer shall have adjustable set point from 1-135A with 200 ms or less response time.

11. Fail Conditions

   a. When a grinder jam obstruction occurs, the controller shall stop the grinder and reverse the rotation to clear the obstruction. If the obstruction is cleared, the controller shall return the grinder to normal operation. If three (3) reverses occur within a 30 second interval, the controller shall stop the grinder motor in a jam condition and activate the grinder FAIL indicator and relay.

   b. When a power failure occurs while the grinder is operating, the grinder will resume operation once power is restored.

   c. When a power failure occurs while the grinder is in a fail condition, once power is restored the fail indicator shall reactivate and remain until reset.

   d. Reset of the grinder shall be accomplished from the controller only.

PART 3 EXECUTION

3.01 EXAMINATION

A. The grinder and controller shall be factory tested to ensure satisfactory operation.

B. Verify that the flume dimensions are correct and project conditions are suitable for installation. Do not proceed with installation until condition deficiencies have been corrected.

3.02 INSTALLATION

A. Install products in accordance with engineer's instructions, plans, etc., local codes, and in a manner consistent with the installation instruction and recommendation of the manufacturer.

B. Ensure that the product is installed plumb and true, free of twist or warp, within the tolerances specified by the manufacturer and as indicated in the contract documents.

C. Nylon or fabric slings should be used in conjunction with a spreader bar to lift or move the manhole.

D. UNDER NO CONDITIONS SHOULD CHAINS OR CABLES BE USED.

E. Excavate an area large enough to contain the manhole and the concrete pad while allowing for sufficient space to allow for a safe work environment.

F. Follow all OSHA requirements for open trench construction.

G. Pour a pad of sufficient width and length to support all of the manhole and the connecting piping. The thickness of the pad shall be as shown on the plans. The surface of the pad should be level to within 1/8 inch.

H. Clean the concrete slab of all sharp objects and debris before laying the foam pad provided with the manhole.

I. Install PVC boots on the manhole pipe stubs before lowering the manhole into the opening.

J. Lower the manhole onto the pad.

K. Drill holes in the base mounting flange, foam, and concrete pad to accept the stainless steel anchor bolts.

L. Check to ensure that the channel is level from side to side and from front to back, adjust the pad and anchor bolts, shimming if necessary.

M. Connect and secure piping.

N. DO NOT LUBRICATE THE PVC BOOTS.

O. Grout the areas between the manhole and the concrete pad.

P. WARNING: PACKAGED GRINDER MANHOLES MAY BE CLASSIFIED AS CONFINED SPACE ENTRY LOCATIONS. CONSULT ALL APPROPRIATE LOCAL, STATE, AND FEDERAL REGULATIONS BEFORE ENTERING.

Q. Grinder and controller shall be installed in accordance with the supplier's installation instructions, and in compliance with all OSHA, local, state, and federal codes and regulations.

3.03 OPERATION AND MAINTENANCE MANUALS

A. Supplier shall provide (2) Operation and Maintenance Manuals. The manuals shall include equipment descriptions, operating instructions, drawings, troubleshooting techniques, a recommended maintenance schedule, and the recommended lubricants.

B. Clean surfaces in accordance with the manufacturer’s instructions.

C. Remove trash and debris and leave the site in a clean condition.

3.04 TRAINING

A. A field training course shall be provided for operation and supervisory staff members. Field instruction shall cover items for successful operation contained in the operation & maintenance manuals.

END OF SECTION

SECTION 13300

SUPERVISORY CONTROL & DATA ACQUISITION (SCADA) SYSTEM

GENERAL REQUIREMENTS

PART 1 - GENERAL

1.01. SCOPE OF WORK

A. The overall system general requirements are given in this section. These requirements apply to each additional section of these specifications as noted herein and as specified in the associated sections.

B. Work includes engineering, furnishing, installing, testing, documenting and placing in operation upgrades, including a new Supervisory Control and Data Acquisition (SCADA) system, for the North Bay Village, Florida's wastewater collection system. The wastewater collection system comprises four lift stations which together supply raw sewage to Miami-Dade Utilities for treatment and disposal.

C. All work covered by this specification shall be performed by Barney's Pumps/Unitron, Lakeland, Florida or approved equal, henceforth referred to as the SYSTEM SUPPLIER. Contact Kevin Perdomo 863-860-3601

D. The Work generally includes the following major elements:

1. New Pump Station Control Panels (PSCP) at the following four lift stations:

    a. Main Pump Station - equipped with two Variable Frequency Drive (VFD) driven pumps.

    b. Hispanola Pump Station - equipped with two VFD driven pumps.

    c. Village Hall Pump Station - equipped with two VFD driven pumps.

    d. South Treasure Drive Pump Station - equipped with two constant speed pumps.

2. A new Personal Computer (PC) based SCADA master station at the City's Operations Facility.

3. Equipment at all 4 locations shall communicate via a cellular phone network.

E. The Work is specified in this Section and as further specified in the following sections:

1. Specification Section 13310: Field Instruments.

2. Specification Section 13315: Control Panels.

3. Specification Section 13325: SCADA System Hardware.

4. Specification Section 13326: SCADA System Programming.

F. The SYSTEM SUPPLIER shall provide all equipment, materials, programming, software, modifications to existing equipment, calibrations and services that are required to successfully install and place into operation a digital computer-based SCADA configured as shown on the Contract Drawings, and as specified herein.

G. The SYSTEM SUPPLIER may duplicate software logic code and database and graphics applications, as required, while still meeting the functional specifications. The ENGINEER may require modifications to the submitted graphics, reports and control logic without change to the contract price. All engineering development required by the SYSTEM SUPPLIER will be in accordance with the Conditions of this Contract.

H. It is the intent of these Contract Documents that the SYSTEM SUPPLIER be retained by the CONTRACTOR to have overall responsibility for designing, furnishing, interfacing, adjusting, testing, documenting, and starting-up the various SCADA equipment described in the Contract Documents. The specified intent is that the SYSTEM SUPPLIER will have overall responsibility for making sure the various systems, trades, suppliers, vendors, subcontractors, etc. come together as a complete coordinated system which will reliably perform the specified functions.

I. The CONTRACTOR shall ensure that the SYSTEM SUPPLIER coordinates closely with suppliers of other specialty equipment to ensure the required inputs and outputs for the SCADA are available.

J. Division of Work. It is the ultimate responsibility of the CONTRACTOR to furnish a complete and fully operable SCADA that reliably performs the specified functions. The CONTRACTOR is to assume full responsibility for additional costs

which may result from unauthorized deviations from the specifications. The CONTRACTOR is to establish the actual division of work with the minimum requirements as specified herein

K. The SYSTEM SUPPLIER shall be responsible for:

1. The integration of the system including the panel layouts and wiring, PLC programming, VFD programming and configuration, network communications programming, and computer system application software setup.

2. All application software configuration including all operator interface screens, reports, and database(s).

3. All hardware and software submittals. The SYSTEM SUPPLIER shall develop the panel shop drawings, wiring diagrams, plumbing diagrams, PLC and computer hardware configuration drawings and layouts, software documentation, and all other submittals defined herein and in the specification sections identified in paragraph 1.01E hereof. Coordination with the CONTRACTOR and other subcontractors shall be the responsibility of the SYSTEM SUPPLIER.

4. The final system operation and reliability. All required tests and training shall be under the on-site supervision of the SYSTEM SUPPLIER.

5. Ordering, fabrication, assembly, delivery and start-up of the SCADA. All panel fabrication defined in Specification Section 13315 shall be performed at the SYSTEM SUPPLIER’s shop.

6. Obtaining from the CONTRACTOR the required information on those field elements, equipment starters, local control panels, and other control equipment or devices that are required to be interfaced with, but that are not provided with the SCADA in order to provide full system coordination regarding interface, function, testing, and adjustment requirements.

7. Providing accessory devices including furnishing and installation of networking interface cards, interposing relays, control switches and signal converters necessary to perform the intent as described by the control strategies and services necessary to achieve a fully integrated and operational system as shown on the Contract Drawings and defined in the Specifications.

8. Coordinating all interface requirements with mechanical and electrical system suppliers and furnishing any signal isolation devices that might be required In order to insure compatibility between all equipment.

9. Providing any special manufacturer's cables required.

10. Defining the final installation and connection requirements of the SCADA at the jobsite through development of interconnection diagrams.

11. Verifying correctness of all final power and signal connections to the SCADA. The SYSTEM SUPPLIER shall make final adjustments to and calibrate all field elements provided with the SCADA.

12. Ensuring that:

    a. All components provided under this section are properly installed.

    b. The proper type, size and number of control wires with their conduits and junction boxes are provided and installed.

    c. Proper electric power circuits are provided for all components and systems.

L. The CONTRACTOR shall be responsible for:

1. Including within the electrical subcontractor's scope:

    a. Provision, installation and termination of field and power wiring to SCADA supplied control panels and field elements. Termination shall be made in accordance with final accepted interconnection diagrams developed by the SYSTEM SUPPLIER. The electrical subcontractor shall mark on the interconnect diagram the field wire numbers used for each termination point. The SYSTEM SUPPLIER shall finalize the interconnect diagrams by including these field wire numbers in the final as built version.

    b. Installation and termination of all specialty cables furnished by the SYSTEM SUPPLIER.

2. Including within the mechanical subcontractor’s scope installation of any in-line instrumentation. Installation shall be made in accordance with the

manufacturer's recommendations and under the direction of the SYSTEM SUPPLIER.

3. Equipment storage and protection until installed following the storage and handling instructions recommended by the SYSTEM SUPPLIER. Anti-static and winterization requirements shall be per the SYSTEM SUPPLIER's instructions and the SYSTEM SUPPLIER shall periodically verify that these instructions are followed.

4. Incorporating all necessary components into the system. Schedules included in the referenced specification sections do not necessarily indicate the complete component requirements of the SCADA.

5. Ensuring that the SYSTEM SUPPLIER coordinates work with other Divisions and Sections of the Specifications.

6. Requiring the SYSTEM SUPPLIER to observe and advise on the installation of equipment furnished by SYSTEM SUPPLIER and installed by CONTRACTOR to the extent required to certify, with the operational check-out tests, that the equipment will perform as required.

7. Ensuring that information on equipment provided under other Divisions and needed by the SYSTEM SUPPLIER to coordinate the SCADA is provided in a timely manner.

M. Equipment found to be defective prior to system acceptance shall be replaced and installed at no additional cost to the OWNER.

N. In the bid price, the SYSTEM SUPPLIER shall provide for obtaining the services of authorized field personnel from the manufacturer's of specialty instruments and from the suppliers of application software packages as necessary. Should these personnel be required during installation, start-up and checkout of the respective portions of the SCADA, such services shall be provided at no additional cost to the OWNER.

1.02. RELATED WORK

A. Division 15 – Mechanical. Installation of all mechanical piping and fittings, as well as in-line instruments supplied with and/or supplied for the SCADA.

B. Division 16 - Electrical. All conduits are provided and installed under Division 16, Electrical. With the exception of certain specified special manufacturer's cables, all wiring and cables are provided and installed under Division 16, Electrical.

C. Field devices such as motorized valves, pump motors, solenoid valves, etc. and local control panels for specialized subsystems such as chemical feed systems, etc. are supplied and installed under other Divisions of these Specifications.

1.03. SYSTEM DESCRIPTION

A. Each PSCP shall be furnished in a NEMA 4X, 316 stainless steel, rack mounted/sipported dead-front enclosure as shown on the Contract Drawings and meeting the requirements for outdoor panels set forth in Specification Section 13315.

B. PSCP shall comprise three sections, each furnished with doors, as follows:

1. The first section shall contain the RTU defined in Specification Section 13325 together with relays, field termination blocks, UPS, etc. This shall include the dead-front panel mounted RTU Operator Interface Terminal (OIT).

2. The second section shall contain Variable Frequency or Soft Starts for the pumps as defined in Division 16. This shall include the dead-front panel mounted control units.

3. The third section shall contain Main Breakers, line filters, 480 VAC distribution, etc. as defined in Division 16.

C. PSCP shall include the following major elements as shown on the Contract Drawings and further defined within Division 13:

1. Variable Frequency Drives (VFDs) or Full Voltage across the Line starters as applicable by site.

2. An external AC unit for stations with or VFDs.

3. An Operator Interface Terminal for local monitoring and control.

4. A PLC functioning as a SCADA Remote Telemetry Unit (RTU).

5. A GSM modem for interconnecting the RTU with the SCADA master station via an externally mounted antenna.

6. Back-up, float switch driven relay logic to control pump operations in the event of a loss of RTU control.

7. An Uninterruptible Power Supply for control system components.

8. Power distribution and conversion components.

9. Surge suppression on all power and signaling wires entering or leaving the panel.

D. A SCADA Interface Panel (SIP) shall be furnished at the Operations Facility to interconnect the RTU and the SCADA master station. The SIP shall be a wall-mounted NEMA 12 steel enclosure containing the following major elements:

1. A Master Telemetry Unit (MTU).

2. A GSM modem for interconnecting the MTU with the RTU via an externally mounted antenna.

3. An Ethernet switch for interconnecting the SCADA master station equipment and the MTU.

4. An Uninterruptible Power Supply for all SIP components.

E. The SCADA master station equipment shall comprise the following elements interconnected with each other and the MTU via the Ethernet switch in the SIP:

1. A tower PC SCADA server/workstation running VTScada HMI software and equipped with an Uninterruptible Power Supply.

2. A color laser printer.

1.04. SYSTEM INTEGRATION PLAN

A. Prior to <u>any</u> other shop drawing submittals the SYSTEM SUPPLIER shall submit a System Integration Plan (SIP). Other submittals received before this submittal will be returned without review.

B. The SIP shall identify, and provide details of, all SCADA functions. This shall include the following elements:

1. Field.

2. PLC.

3. System Inputs and Outputs.

4. HMI system.

C. Field. Provide an Excel spreadsheet that covers all field instruments. For each instrument define the following:

1. Tag Number.

2. Instrument Type.

3. Specification Section supplied under.

4. Signal Type.

5. Range or On/Off states as applicable.

D. PLC. Provide an Excel spreadsheet that covers all PLC. For each, define the following:

1. PLC Designation Number.

2. Location.

3. A list of I/O modules.

E. System Inputs and Outputs (I/O). Provide an Excel spreadsheet that lists all system I/O for the complete SCADA. For each point, the list shall include the following:

1. SCADA database tag number.

2. Signal Description.

3. I/O Type.

4. Range or On/Off state as applicable.

F. HMI system. This shall provide the following information:

1. Listing of HMI system hardware upon completion of the Work.

2. HMI system block diagram.

G. Following PLC programming, revise the system I/O spreadsheet to include all pseudo points (differentiated from physical I/O) that are used by the HMI.

H. Provide a fully updated SIP as part of the final system documentation.

1.05. SUBMITTALS

A. Furnish, as prescribed under the General Requirements, all required submittals covering the items included under this section and its associated sections of the work.

B. Submit complete, neat, orderly, and indexed submittal packages. Handwritten diagrams are not acceptable and all documentation submittals shall be made using CADD generated utilities.

C. Partial submittals or submittals that do not contain sufficient information for complete review or are unclear will not be reviewed and will be returned by the Engineer as not approved.

D. All submitted component data sheets shall be marked to specifically identify the model/part numbers to be furnished.

E. Provide all shop drawing submittals on thumb drive in PDF format.

F. In addition to the shop drawing submittals required in the related specification sections, submit the submittals defined below covering the complete system.

1. System Performance. This submittal shall be a written description of how the operator will control the system and the system's subsequent response. Every piece of controllable equipment shall be separately described and the following information included:

a. Use of local manual controls.

b. Use of OIT/HMI software controls.

c. Use of automatic controls.

2. Each functional description shall specifically identify any interlocks (hardware and software) and OIT/HMI alarms generated.

3. Operator Screens. This submittal shall include color copies of all proposed new and modified OIT/HMI operator screens. Modified graphics shall specifically indicate the revised portions.

4. Field Acceptance Test Plan. This submittal shall define the steps to be conducted during the required witnessed acceptance testing. The test shall be conducted in accordance with the general requirements set forth in Part 3 hereof. The submitted plan shall meet the following requirements:

a. Each of the equipment covered in the system performance submittal shall be tested.

b. For each equipment test, the required operator control actions and system response shall be demonstrated on the complete system, including each operator action, the response and appropriate HMI display/alarm updates.

G. The Contractor and System Supplier are hereby specifically advised that the above submittals shall be Approved or Approved As Noted prior to any witnessed performance testing.

H. Loop Diagram Submittal. This submittal may be made in conjunction with the submittals required under related specification sections. Loop diagrams, consisting of complete wiring and/or plumbing diagrams for each control loop showing all terminal numbers, the location of the dc power supply, the location of any booster relays or common dropping resistors, surge arrestors, etc. The loop diagrams shall be divided into four areas for identification of element locations: SCADA I/O point(s), panel face, back-of-panel, and field, respectively.

I. Test Procedures: Submit the procedures proposed to be followed during all required testing. Procedures shall include test descriptions, forms, and check lists to be used to control and document the required tests.

J. Test Reports: Upon completion of each required test, document the test by submitting a copy of the signed off test procedures to the Engineer.

1.06. FINAL DOCUMENTATION

A. After the demonstration tests have been completed and as a part of the final acceptance requirements, submit the SCADA record drawings. Record drawings shall include, corrected for any changes that may have been made up through Substantial Completion:

1. System block diagram.

2. Network architecture diagram.

3. Instrument loop wiring diagrams.

4. Panel wiring diagrams.

5. Panel elevations.

6. Interconnection diagrams showing terminal numbers at each wiring termination.

B. Record drawings shall be developed or converted to AutoCAD Version 2021. Provide AutoCAD files on a USB flash drive.

C. Operating and Maintenance (O&M) Manuals: Provide the specified number of complete sets of three-ring bound O&M manuals in accordance with Division 1. Provide separate manuals for each Specification Section, clearly marked. Include descriptive material, drawings, and figures bound in appropriate places. Include:

1. Cross references to 3rd party O&M manuals.

2. Additional operating and maintenance instructions in sufficient detail to facilitate the operation, removal, installation, adjustment, calibration and maintenance of each component provided with the SCADA.

3. Internal wiring diagrams (not already shown on the panel wiring diagram record drawings) for all components provided in the SCADA that clearly show all terminal block number designations and wire numbers.

4. Bill of Materials identifying the manufacturer and complete part number of all components.

5. All the submittal data for each component from the approved shop drawing submittals with corrections made on approved as noted items.

6. A USB flash drive containing the shop drawing data in PDF format in the binder sleeve.

D. Provide a final System Integration Plan.

E. Refer to the individual specification sections of the SCADA for final documentation requirements that are in addition to the above.

1.07. QUALITY CONTROL

A. Base bids for the SYSTEM SUPPLIER shall be as listed in the Contract Proposal. SYSTEM SUPPLIERs seeking ENGINEER approval shall have extensive experience in systems of similar size and complexity. Panel fabrication shop shall be a UL listed panel shop. Acceptance of alternates shall be made based on price, location of the fabrication shop, accessibility of personnel, PLC programming knowledge, and OWNER confidence. The SYSTEM SUPPLIER shall be subcontracted by and paid by the CONTRACTOR.

B. The SYSTEM SUPPLIER shall meet all of the requirements of these specifications, and, unless specifically stated otherwise, no prior acceptance of any subsystem, equipment, or materials has been made.

C. All equipment furnished by the SYSTEM SUPPLIER shall be of the latest and most recent design and shall have overall accuracy as guaranteed by the manufacturer.

D. Materials and equipment used shall be U.L. approved wherever such approved equipment and materials are available.

E. Component equipment shall be as supplied by one of the manufacturers named in the individual specification sections or approved equal. The design of the SCADA is based on the first-named manufacturer's equipment if there is a difference.

F. To facilitate the OWNER's operation and maintenance, products shall be of the same major manufacturer, with panel mounted devices of the same type and model as far as possible.

G. In order to insure the interchangeability of parts, the maintenance of quality, the ease of interfacing between the various subsystems, and the establishment of minimums with regard to ranges and accuracy, strict compliance with the above requirements shall be maintained.

H. The SYSTEM SUPPLIER shall designate a single point of contact for interface with the ENGINEER on this project. The ENGINEER reserves the sole right to approve or reject this point of contact.

I. The SYSTEM SUPPLIER's selected project personnel shall meet the following requirements:

1. Project engineer shall have at least 10 years' experience in installing similar systems and shall have a minimum of secondary education in the field of electronics or similar technical discipline.

2. Project technician assisting the project engineer for field element calibration and check out shall have at least five years experience in installing similar systems.

3. Key staff resumes shall be submitted for ENGINEER’s approval with the Project Plan as further detailed under submittals.

J. Service Facility: The SYSTEM SUPPLIER shall have an established service facility from which qualified technical service personnel and parts may be dispatched upon call. Such a service facility shall be no more than six (6) hours travel time from the jobsite.

K. The SYSTEM SUPPLIER shall provide experienced personnel on-site to coordinate and/or perform installation, termination, and adjustment; on-site testing; OWNER training; and startup assistance for the SCADA.

L. The SYSTEM SUPPLIER shall provide, on-site, an experienced project engineer to supervise and coordinate all of the on-site SCADA activities. An experienced technician may be provided to assist the project engineer in field element installation, field calibration, and checkout tests. The SYSTEM SUPPLIER's project engineer shall be on- site during the period required to effect all of the critical on-site activities related to the SCADA, particularly the software debugging, SCADA training, and witnessed testing activities.

1.08. STANDARDS

A. The design, testing, assembly, and methods of installation of the wiring materials, electrical equipment and accessories proposed under this Contract shall conform to the National Electrical Code and to applicable state and local requirements. UL listing and labeling shall be adhered to under this Contract.

B. Any equipment that does not have a UL, FM CSA, or other approved testing laboratory label shall be furnished with a notarized letter signed by the supplier stating that the equipment famished has been manufactured in accordance with the National Electric Code and OSHA requirements.

C. Any additional work needed resulting from any deviation from codes or local requirements shall be at no additional cost to the OWNER.

D. International Society of Automation (ISA) and National Electrical Manufacturers Association (NEMA) standards shall be used where applicable in the design of the SCADA.

E. All equipment used on this project to test and calibrate the installed equipment shall be in calibration at the time of use. Calibration shall be traceable to National Institute of Standards (NIS - formally NBS) calibration standards.

F. For the purposes of uniformity and conformance to industry standard, provide analog signal transmission modes of electronic 4-20 ma DC. No other signal characteristics are acceptable.

G. Discrete signals are two-state logic signals. Use 120V ac sources on all discrete signals unless otherwise noted or shown.

H. Provide appropriately sized electrical transient protection devices for all electrical elements of the system as further defined in the individual specification sections. For field mounted devices, provide protector enclosures to the electrical Subcontractor for mounting and installation.

1.09. WARRANTY AND GUARANTEES

A. In accordance with Division 1, the SYSTEM SUPPLIER shall furnish to the OWNER a written two year guarantee commencing with final acceptance, that all equipment and parts thereof, material and/or workmanship for the field elements, instruments, and control panels are of top quality and free from defects.

B. The SYSTEM SUPPLIER shall guarantee all equipment whether or not of his own manufacture.

1.10. SPARES AND EXPENDABLES

A. Obtain from the manufacturer(s) and provide the recommended critical spare parts as part of the work. Refer to the individual requirements listed in the associated specification sections for the SCADA for specific parts to be provided as a minimum. The spare parts are the property of the OWNER.

B. Obtain from the manufacturer(s) and furnish any special tools, calibration equipment and testing apparatus required for the proper adjustment and maintenance of the material provided.

PART 2 - PRODUCTS

THIS PART NOT USED

PART 3 - EXECUTION

3.01. SEQUENCE OF WORK

A. Prerequisite Activities and Lead Times: Do not start the following key project activities until the listed prerequisite activities have been completed and lead times have been satisfied:

1. Hardware Purchasing, Fabrication, and Assembly: Associated design related submittals completed (no exceptions, or approved as noted).

2. Shipment: Completion and approval of all design related submittals.

3. Startup: Operational Checkout Tests.

4. OWNER Training: Owner training completed and O&M manuals delivered.

5. Demonstration Tests: Operational Check-out Tests, Startup, OWNER Training, and Demonstration Test Procedures must be complete. Give 4 weeks' notice prior to the planned test start date.

B. Consoles, Panels, and Panel Mounted Equipment: Consoles, panels, and panel mounted equipment shall be assembled as far as possible at the SYSTEM SUPPLIER's shop. No work, other than correction of minor defects or minor transit damage, shall be done on the panels at the jobsite.

3.02. PAYMENTS

A. General: All work provided under this Section and its associated Sections for the SCADA shall be paid for in accordance with the approved payment Schedule of Values submitted by the CONTRACTOR. The approved Schedule of Values will be the basis for partial payment for work provided for the SCADA.

B. Partial Payment for Work Completed: The breakdown in the Schedule of Values allows for the partial payment of work completed for the SCADA. Before partial payment is considered for approval, each specific activity must be completed.

C. Substantial Completion: Substantial Completion for the project is as defined in the General Conditions. However, the following requirements must be fulfilled before consideration will be given for Substantial Completion of the SCADA:

1. All SCADA submittals have been completed.

2. The SCADA has successfully completed the Demonstration Tests.

3. The required Owner training has been implemented.

4. All spares, expendables, and test equipment have been received by OWNER.

D. Final Acceptance: SCADA final acceptance is defined as the date when the ENGINEER issues a written notice of final acceptance. For this Section, the following must have been completed before consideration will be given to the issuance of notice of final acceptance:

1. All punch-list items have been checked off.

2. Revisions to the SCADA O&M Manuals have been made (that may have resulted from the Demonstration Tests).

E. Partial Payment Limits: The partial payments for work provided for the SCADA shall satisfy the following limiting maximum criteria (percentages of the lump sum pay item for the SCADA):

1. Submittals (not including O&M Manuals) 15%

2. Training..... 5%

3. O&M Manuals 5%

4. Demonstration Tests 10%

3.03. PRODUCT HANDLING

A. Store and protect equipment until installation following the storage and handling instructions recommended by the equipment manufacturers. Place special emphasis on proper anti-static protection of sensitive equipment.

B. Protection During Construction: Throughout this Contract, provide protection for materials and equipment against loss or damage and from the effects of weather. Prior to installation, store items in indoor, dry locations. Provide heating in storage areas for items subject to corrosion under damp conditions. Provide covers for panels and other elements that may be exposed to dusty construction environments. Specific storage requirements shall be in accordance with the SYSTEM SUPPLIER's recommendations.

C. Corrosion Protection: Protect all consoles, panels, enclosures, and other equipment containing electrical or instrumentation and control devices, including spare parts, from corrosion through the use of corrosion-inhibiting vapor capsules. Prior to shipment, include capsules in the shipping containers, and equipment as recommended by the capsule manufacturer. During the construction period, periodically replace the capsules in accordance with the capsule manufacturer's recommendations. Replace all capsules just prior to Final Acceptance.

D. ESD Protection: Provide for the proper handling, storage, and environmental conditions required for the SCADA components deemed static sensitive by the equipment manufacturer. Utilize anti-stat wrist straps and matting during installation of these items to prevent component degradation. Flooring used in control areas shall be reviewed and approved by the SYSTEM SUPPLIER.

E. Adequately pack manufactured material to prevent damage during shipping, handling, storage and erection. Pack all material shipped to the project site in a container properly marked for identification. Use blocks and padding to prevent movement.

F. Ship materials that must be handled with the aid of mechanical tools in wood-framed crates.

G. Ship all materials to the project site with at least one layer of plastic wrapping or other approved means to make it weatherproof. Anti-stat protection shall be provided for all sensitive equipment.

H. Inspect the material prior to removing it from the carrier. Do not unwrap equipment until it is ready to be installed. If any damage is observed, immediately notify the carrier so that a claim can be made. If no such notice is given, the material shall be assumed to be in undamaged condition, and any subsequent damage that is discovered shall be repaired and replaced at no additional expense to the OWNER.

I. The CONTRACTOR shall be responsible for any damage charges resulting from the handling of the materials.

3.04. INSTALLATION

A. Material and Equipment Installation: Install the SCADA in locations indicated on the Drawings and follow manufacturers' installation instructions explicitly, unless otherwise indicated. Wherever any conflict arises between manufacturers' instruction and these Contract Documents, follow ENGINEER's decision, at no additional cost. Keep copy of manufacturers' instructions on the jobsite available for review at all times.

B. Install materials and equipment in a workmanlike manner utilizing craftsmen skilled in the particular trade. Provide work which has a neat and finished appearance. Coordinate I&C work with the OWNER and work of other trades to avoid conflicts, errors, delays, and unnecessary interference with operation of the existing plant during construction.

C. Provide finish on instruments and accessories that protects against corrosion by the elements in the environment in which they are to be installed. Finish both the interior and exterior of enclosures. Provide extra paint of each color used in the material from the manufacturer for touch-up purposes.

D. Equipment Finish: Provide materials and equipment with manufacturer's standard finish system. Provide manufacturer's standard finish color, except where specific color is indicated. If manufacturer has no standard color, finish equipment with light gray color.

E. Cleaning and Touch-up Painting: Keep the premises free from accumulation of waste material or rubbish. Upon completion of work, remove materials, scraps, and debris from premises and from interior and exterior of all devices and equipment. Touch-up scratches, scrapes, or chips in interior and exterior surfaces of devices and equipment with finishes matching as nearly as possible the type, color, consistency, and type of surface of the original finish. Clean and polish the exterior of all panels and enclosures upon the completion of the demonstration tests.

3.05. SYSTEM OPERATING CRITERIA

A. Stability: After controls have taken corrective action, as result of a change in the controlled variable or a change in setpoint, oscillation of final control element shall not exceed two (2) cycles per minute or a magnitude of movement of 0.5 percent full travel.

B. Response: Any change in setpoint or change in controlled variable shall produce a corresponding corrective change in position of final control element and become stabilized within 30 seconds.

C. Agreement: Setpoint indication of controlled variable and measured indication of controlled variable shall agree within 2 percent of full scale over a 6:1 operating range.

D. Repeatability: For any repeated magnitude of control signal, from either an increasing or decreasing direction, the final control element shall take a repeated position within 0.5 percent of full travel regardless of force required to position final element.

E. Sensitivity: Controls shall respond to setpoint deviations and measured variable deviations within 1.0 percent of full scale.

F. Performance: All instruments and control devices shall perform in accordance with manufacturer’s specifications.

3.06. TRAINING

A. The cost of training programs to be conducted with OWNER's personnel shall be included in the Contract price. The training and instruction, insofar as practicable, shall be directly related to the System being supplied.

B. The SYSTEM SUPPLIER shall provide detailed manuals to supplement the training courses. The manuals shall include specific details of equipment supplied and operations specific to the project.

C. The SYSTEM SUPPLIER shall make use of teaching aids, manuals, slide/video presentations, etc. After the training services, such materials shall be delivered to OWNER.

D. The training program shall represent a comprehensive program covering all aspects of the operation and maintenance of the system.

E. All training schedules shall be coordinated with, and at the convenience of the OWNER. Shift training may be required to correspond to the OWNER's working schedule.

F. Specific details of the nature and duration of training to be provided are defined in the individual specification sections.

3.07. TESTING – GENERAL

A. All elements of the SCADA, both hardware and software, shall be tested to demonstrate that the total system satisfies all of the requirements of the Contract Documents

B. As a minimum, the testing shall include shop tests, operational check-out tests, and Demonstration Tests.

C. Each test shall be in the cause and effect format. The person conducting the test shall initiate an input (cause) and, upon the system producing the correct result (effect), the specific test requirements will have been satisfied.

D. All tests shall be conducted in accordance with, and documented on, prior approved procedures, forms, and checklists. Each specific test to be performed shall be described and a space provided after it for signoff by the appropriate party after its

satisfactory completion. Copies of these signoff test procedures, forms, and checklists will constitute the required test documentation.

E. Provide all special testing materials and equipment. Wherever possible, perform tests using actual process variables, equipment, and data. Where it is not practical to test with real process variables, equipment, and data, provide suitable means of simulation. Define these simulation techniques in the test procedures.

F. The SYSTEM SUPPLIER shall coordinate all of their testing with the CONTRACTOR, the ENGINEER, all affected suppliers, and the OWNER.

G. The ENGINEER reserves the right to test or retest any and all specified functions whether or not explicitly stated in the approved test procedures. The ENGINEER's decision shall be final regarding the acceptability and completeness of all testing.

3.08. OPERATIONAL READINESS TEST (ORT)

A. Prior to startup and demonstration testing, certify that the entire installed SCADA (inspected, tested and documented) is ready for operation. These inspections and tests shall include Loop/Component inspections and tests. The SYSTEM SUPPLIER shall fully debug problems in the system as a whole. Final approval of control software will not be based on written descriptions of software functions alone, but on actual performance in the field.

B. Check the entire SCADA for proper installation, calibration and adjustment on a loop-by-loop and component-by-component basis to ensure that it is in conformance with related submittals and the SCADA Specifications.

C. The Loop/Component Inspections and Tests shall be implemented using approved forms and checklists. Example sheets are provided at the end of this Specification Section. These shall be developed by the SYSTEM SUPPLIER and submitted for approval.

D. Maintain the Loop Status Reports and Component Calibration Sheets at the jobsite and make them available to the ENGINEER at any time.

E. Witnessing: These inspections and tests do not require witnessing. However, the ENGINEER will review the Loop Status Sheets and Component Calibration Sheets and spot-check their entries periodically and upon completion of the Operational Check-out Tests. Correct any deficiencies found.

F. Final Documentation: The completed reports and sheets shall be assembled in one document and submitted together with a completed Manufacturer's Check-Out Certification.

3.09. FIELD ACCEPTANCE TEST (FAT)

A. Once the SCADA has passed the ORT, the SYSTEM SUPPLIER shall perform a witnessed Field Acceptance Test (FAT) on the complete SCADA. The FAT shall demonstrate that the SCADA is operating and in compliance with the Contract requirements. Each specified function shall be demonstrated on a paragraph-by-paragraph, and site-by-site basis.

B. Prior to the FAT, the entire installed SCADA shall be certified in writing by the CONTRACTOR that it is ready for operation.

C. The system shall operate for a continuous 100 hours without failure before this test will be considered successful.

D. The FAT shall cover the entire SCADA, including control functions, alarms, and status monitoring. Test procedures used for factory tests may be adopted for these tests if modified as required.

Loop Check-out Sheet

Project	Owner's Project No. (if applicable):	Page of
Project	Regulatory Agency Project No. (if	
HDR	Date:	

LEAK AND TERMINATION/CONTINUITY CHECKS

DESCRIPTION	**FIELD**					**CONTROL CAB**	
	LEAK CHECK(1)			TERM/CONT CHECK(2)		TERM/CONT CHECK(2)	
	Device Tag No.	Process Conn.	Signal Tube	Device Tag No.	Termination Ident.	Device Tag No.	Termination Ident.

1. Leak check for pneumatic signal tubing to be per ISA-PR7.1.
2. Termination/continuity check includes check at terminated equipment for: (a) correct polarity, (b) appropriate signal generation, transmission and reception, and (c) correct shield & ground terminations.

OPERATOR INTERFACE CHECK-OUT
MONITORING POINTS OBSERVED

PARAMETER TYPE	TAG NO.	TAG NO.	TAG NO.	TAG NO.	TAG NO.	TAG NO.
PROCESS VAR						
EQUIP STATUS						
ALARM POINT						

OPERATOR CONTROL FUNCTIONS CHECKED

FUNCTION TYPE	TAG NO.	LOCATION	TAG NO.	LOCATION	TAG NO.	LOCATION

AS LEFT SETTINGS

TAG NO.	SWITCH & ALARM SP	CONTROLLERS			
		Gain	Reset, rpm	Deriv. (rate), min	PV Set Point

Describe all interlocks checked, equipment started/stopped, valves/operators stroked. Describe modes of operation checked, and location of operator interface (local/remote).

_____

_____

_____

_____

I certify that the control loop referenced on this page has been completely checked and functions in accordance with applicable drawings and specifications.

Certified by:_____ Date:_____

Instrument Calibration Sheet

Project Name:	Owner's Project No. (if
Project Owner:	Regulatory Agency Project No.
HDR Project	Date:
Control Loop	

Instrument Tag	Transmitter/gauge span:
Manufacturer:	Switch set-point:
Model No.	Switch dead band:
Serial No.	Switch range:

TRANSMITTERS AND INDICATORS

	INCREASING INPUT			**DECREASING INPUT**		
% OF SPAN	**INPUT**	**OUTPUT**	**ERROR (% of span)**	**INPUT**	**OUTPUT**	**ERROR (% of span)**
0%						
25%						
50%						
75%						
100%						
Other (if applicable)						
Other (if applicable)						

SWITCHES

	INCREASING INPUT			**DECREASING INPUT**		
ACTUATION POINT	**INPUT**	**OUTPUT**	**ERROR (% of range)**	**INPUT**	**OUTPUT**	**ERROR (% of range)**
High (Increasing input)						
Low (Decreasing input)						

Maximum allowable error (per Contract Documents): _____

Remarks: _____

_____

_____

CALIBRATION EQUIPMENT UTILIZED

DEVICE TYPE	MFR/MODEL NO.	ACCURACY	NIST TRACEABILITY?

Certified by:_____ Date Certified:_____

END OF SECTION

SECTION 13310

SCADA SYSTEM FIELD INSTRUMENTS

PART 1 - GENERAL

1.01. SCOPE OF WORK

A. This Specification Section covers work related to the various field instruments to be supplied with the SCADA.

B. Field instrumentation, as specified herein, shall be furnished by the same SYSTEM SUPPLIER furnishing services and equipment as outlined in 13300.

1.02. RELATED WORK

A. Specification Section 13300 defines work associated with the overall SCADA.

B. Specification Section 13315 defines work associated with control panels and enclosures housing the various elements of the SCADA.

C. Specification Section 13325 defines work associated with the PLC-based RTU that will interface the system with the field instruments defined hereunder.

D. Physical Installation of field instruments is performed under Division 15, Mechanical.

E. Provision of all field and power wiring except manufacturer-supplied cables and installation of all such wiring is performed under Division 16, Electrical.

1.03. SUBMITTALS

A. Submit the following Field Instrumentation Shop Drawings in a single package:

1. Catalog information, descriptive literature, wiring diagrams, and shop drawings on all components of the field instruments, including all miscellaneous electrical and mechanical devices furnished under this section.

2. Individual data sheets for all components of the field instruments to supplement the above information by citing all specific features for each

specific component (e.g. scale range, materials of construction, special options included, etc.). Each component data sheet shall bear the component name and instrument tag number designation shown in the Drawings and Specifications.

3. Installation details for all field mounted devices to show conformance with the Contract Documents.

4. Configuration documentation for all programmable devices to indicate actual settings used to set the device scale, range, trip points, and other control parameters.

5. Proposed tag numbers for each specific instrument.

PART 2 - PRODUCTS

2.01. GENERAL REQUIREMENTS

A. Equipment to be installed in a hazardous area shall meet Class, Group, and Division classification as shown on the Contract Electrical Drawings, or comply with the local or National Electrical Code, whichever is the most stringent requirement.

B. All instruments shall be provided with mounting hardware and floor stands, wall brackets, or instrument racks.

C. Instrument cable lengths shall be determined by the SYSTEM SUPPLIER based on actual field installation requirements.

D. All transmitters shall be provided with either integral indicators or conduit mounted indicators in process units, accurate to two percent. Indicator readouts shall be linear in process units.

E. Electronic equipment shall utilize printed circuitry suitably coated to prevent contamination by dust, moisture and fungus. Solid-state components shall be conservatively rated for their purpose, to assure optimum long-term performance and dependability over ambient atmosphere fluctuations and 0 to 100 percent relative humidity. The field mounted equipment and system components shall be designed for installation in dusty, humid, and slightly corrosive service conditions.

2.02. LIGHTNING/SURGE SUPPRESSION

A. Surge suppressors and arrestors meeting the requirements of IEEE/ANSI Standard C-62.41 (latest revision) shall be provided on all electronic field instruments.

B. AC Powered Instruments. Lightning and surge protection shall be provided on both the AC power supply and signal lines. The instrument, a breaker and the surge suppressor shall be mounted on a ½-inch aluminum plate equipped with 1/8 inch sun shields on top and both sides with front panel facing north wherever practical. The mounting plate shall be connected to a ground rod via a #10 gauge wire. The protectors shall meet the following criteria:

1. NEMA 4X small case.

2. Response time of less than five nanoseconds.

3. AC Power protection: IEEE/ANSI Std. C-62.41 rated C3 at 330 Volts clamping level.

4. Signal line protection: 10,000 Amp 8 x 20 microsecond surge, clamped at 36 Volts clamping level.

5. Test jacks for low level signal monitoring.

6. Manufacturer/model: ASCO Model 265 or approved equal.

C. Loop Powered Instruments. Lightning and surge protection shall be provided on the 4-20 mA DC signal line. The protectors shall meet the following criteria:

1. Encapsulated in Stainless Steel Pipe nipples for in-line conduit mounting.

2. Response time of less than one nanosecond.

3. Capable of withstanding up to 400 occurrences of 500 Amps at 10 x 1 millisecond.

4. Series resistance of 5 ohms per line.

5. Protection of both lines plus shield

D. Manufacturer/model: ASCO Model 157 or approved equal

2.03. FIELD INSTRUMENTS

A. Submerged Pressure Level Measurement System. The level measurement system shall comprise a submerged pressure transducer (Pressure Transmitter, PT), factory attached and sealed interconnecting cable, and junction/termination box with front panel mounted loop-powered indicator (Level Indicator, LI) that indicates the depth of process fluid in the vessel being monitored. Within the pressure transmitter, process pressure variations shall be sensed by a barrier diaphragm and transferred via a non-compressible fill liquid to a Wheatstones Bridge strain gage diffused onto a silicon diaphragm. The electronics within the element shall produce an analog signal proportional to the process pressure.

1. Performance:

a. Static accuracy of the pressure transmitter shall be less than or equal to 0.25% full scale including the combined effects of nonlinearity, hysteresis and non repeatability, based on a Best Fit Straight Line at 25 degrees C.

b. The pressure transmitter shall be temperature compensated between 0 and 50 degrees C.

c. The shielded and vented interconnecting cable shall be of sufficient length to allow the pressure transmitter to be properly located within the tank, basin, wetwell, etc. being monitored. The cable shall be able to withstand 200 pounds of tensile strength, allowing the transducer to be suspended directly by the cable.

d. The cable shall be equipped with a dessicant filter at the surface end of the vent tube.

e. Transducer shall include 304 stainless steel spacers, nuts, and bolts to protect and keep the diaphragm off the tank floor.

f. Transducer shall be provided with a sealed air bag for compensating for atmospheric changes and to insure that no external moisture reaches the internal electronics.

g. The level indicator shall be loop-powered, backlit and rated for operation at up to 65 degrees C. Provide intrinsically safe model, Precision Digital PD688 or approved equal.

2. Materials:

    a. Exterior pressure transmitter parts – 316 Stainless Steel and Viton.

    b. Fill liquid - NSF approved for use in drinking water applications.

    c. Interconnecting cable jacket – Polyurethane.

    d. Terminal junction box – 316 Stainless Steel.

3. Ratings:

    a. Terminal junction box – NEMA 4X.

4. Electrical:

    a. Transmitter excitation: Loop powered.

5. Manufacturer, Model series:

    a. Contegra STX 130.

    b. No equal.

B. Level Switch, Float. The level switch shall be a direct acting, weighted float suspended on its own cable. As the liquid level rises the float tilts and actuates a hermetically sealed switch inside the float. The cable shall be terminated within a junction box located outside the tank or basin. For multiple float applications, all cables shall terminate in a single junction box.

1. Materials:

    a. Float wetted part – Polypropylene

    b. Cable – PVC jacketed

    c. Junction box – 316 SS

2. Ratings:

    a. Junction box – NEMA 4X

b. NSF approved for potable water.

3. Electrical:

a. Dry contact rated to 4.5 Amps at 120 VAC

b. Normally open or normally closed as required for the application

4. Options

a. Provide stainless steel hanging bar. Attach the float cables to the bar using Kellum grips.

b. Provide other supports/mounting accessories as required.

5. Manufacturer, model:

a. Anchor Scientific, Eco-float type G

b. Approved equal.

PART 3 - EXECUTION

3.01. INSTALLATION

A. Install the SCADA field instruments in strict accordance with the respective manufacturer's instructions and recommendations, in locations as shown on the Drawings, and as indicated on the installation details of the Drawings.

B. Fully calibrate each instrument.

3.02. TRAINING

A. Two hours of on-site (field) training shall be conducted at the OWNER's plant site and shall provide detailed hands-on instruction to OWNER's personnel covering all supplied field instruments.

B. Training shall include:

1. calibration procedures.

2. preventive maintenance methods and timing.

3. fault-finding techniques.

END OF SECTION

SECTION 13315

SCADA SYSTEM CONTROL PANELS

PART 1 - GENERAL

1.01. SCOPE OF WORK

A. This Specification Section covers work related to the control panels and enclosures to be supplied with the SCADA System.

B. The control panels, as specified herein, shall be furnished by the same SYSTEM SUPPLIER furnishing services and equipment as defined under Specification Section 13300.

C. The SYSTEM SUPPLIER shall design, furnish and install all interior wiring within the control panels and furnish complete wiring diagrams showing the electrical circuits inside the panel and interconnections between the panel and the external instruments and components.

D. Size control panel(s) to adequately dissipate heat generated by equipment mounted inside or on the panel front face.

1.02. RELATED WORK

A. Specification Section 13300 defines work associated with the overall SCADA,

B. PLC-based RTU as defined in Specification Section 13325 are to be mounted in control panels hereunder.

C. The panels defined hereunder are installed under Division 15, Mechanical.

D. Electrical equipment to be installed in PSCP are defined in Division 16.

1.03. SUBMITTALS

A. Submit the following control panel shop drawings in a single package:

1. Layout diagrams for all control panels and enclosures. Include panel elevations (front, side, interior), and sizing. Panel front elevations shall be

of sufficient scale to allow all engraved nameplates and inscriptions to be legible without the use of schedules.

2. A complete Bill of Materials for each panel cross-referenced to the panel layout drawings and identifying the manufacturer and complete part number of all components.

3. Wiring diagrams for all control panels. Diagrams shall be complete electrical wiring diagrams showing all components and all auxiliary devices such as relays, alarms, fuses, lights, fans, heaters, etc. All wires and terminals shall be numbered on the diagrams, and line cross-references shall be labeled. Include wiring interface to the PLCs where applicable. Include on these drawings a tag number to identify each component and referenced to a component identification list.

4. Data sheets for all components. The data sheets shall be marked to indicate those portions applicable to the components to be furnished.

5. Power requirements and heat dissipation summary for all control panels. Power requirements shall state required voltages, currents, and phase(s). Heat dissipations shall be maximums and shall be given in Btu/hr. The summary shall be supplemented with calculations.

PART 2 - PRODUCTS

2.01. GENERAL REQUIREMENTS

A. Equipment to be installed in a hazardous area shall meet Class, Group, and Division classification as shown on the Contract Electrical Drawings, or comply with the local or National Electrical Code, whichever is the most stringent requirement.

B. Electronic equipment shall utilize printed circuitry suitably coated to prevent contamination by dust, moisture and fungus. Solid-state components shall be conservatively rated for their purpose, to assure optimum long-term performance and dependability over ambient atmosphere fluctuations and 0 to 100 percent relative humidity. The field mounted equipment and system components shall be designed for installation in dusty, humid, and slightly corrosive service conditions.

C. Station Control Panels (PSCP) at remote SCADA sites shall be powered by a 480 VAC, 3-phase, 60 Hz source. All other panels shall be powered by 120 VAC single-phase, 60-Hz source. All regulators and power supplies required for compliance with the above shall be provided between power supply and interconnected equipment. Where equipment requires voltage regulation, constant voltage transformers shall be supplied.

D. All equipment, cabinets and devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The system shall contain products of a single MANUFACTURER, insofar as possible, and shall consist of equipment models which are currently in production.

E. The equipment furnished shall be designed to operate satisfactorily between 0 degrees C and 40 degrees C for indoor panels and 50 degrees C for outdoor panels at up to 95 percent Relative Humidity (non condensing).

F. Except where specifically noted otherwise, all outdoor panels and enclosures containing electronic or electrical components shall be equipped with sunshields on both sides, the front, the back and the top with a minimum separation of one inch and a maximum separation of one and one-half inches. Sun shields shall be 14 gauge Stainless Steel or 12 gauge Anodized Aluminum or thicker. Finish with reflective white, two part epoxy coating or reflective, white, polyester powder deposited coating.

G. All outdoor control panels and enclosures shall be equipped with 3 ½" stainless steel mounting uni-struts across the width of the back. For free-standing panels the struts shall be located half-way up the panel and six inches from the top. For other panels they shall be located 3" from the top and 3" from the bottom.

H. All switches shall have double-pole, double-throw contacts rated at a minimum of 600 volts-amperes (VA), unless specifically noted otherwise.

I. All equipment shall be designed and constructed so that in the event of a power interruption, the equipment specified hereunder shall resume normal operation without manual resetting when power is restored.

J. All discrete inputs entering the panel shall be wetted by 120 VAC. Provide isolation relays if necessary to accommodate this requirement.

K. All discrete output signals shall be equipped with interposing relays to electrically isolate them from the control system I/O.

2.02. LIGHTNING/SURGE SUPPRESSION

A. Surge suppressors and arrestors meeting the requirements of ANSI Standard C-62.41 (latest revision) shall be provided as further detailed below.

B. DC Signals. Lightning and surge protection shall be provided on all DC signal wires entering or leaving the panel. The protectors shall meet the following criteria:

1. 35 mm DIN rail mounted with spring terminals.

2. Response time of less than one nanosecond.

3. Operating signal current: up to 0.5 A

4. Capable of withstanding 5,000 Amps at IEEE/ANSI C-62.41 8 x 20 microseconds combination wave.

5. Nominal series resistance of less than 2 ohms each leg

6. Manufacturer/model:

   a. Dehn DCO RK ME

   b. Approved equal.

C. AC Signals. Lightning and surge protectors for all incoming 120 VAC discrete signals lines shall meet the following criteria:

1. Serial protection.

2. Nominal operating voltage: 120 VAC 47/63 Hz.

3. Response time of less than 0.25 nanoseconds.

4. Capable of withstanding up to 40,000 Amps at IEEE/ANSI C-62.41 8 x 20 microseconds combination wave.

5. Manufacturer/model:

   a. Phoenix Contact 2906840

   b. Approved equal.

D. 480 VAC Power. Lightning and surge protectors for 480 VAC power supply lines shall meet the following criteria:

1. Asco Model 430 Series or approved equal.

E. 120 VAC Power. Lightning and surge protectors for 120 VAC power supply lines shall meet the following criteria:

1. Serial protection with replaceable fuse.

2. Failure indicator.

3. Response time of less than five nanoseconds.

4. Capable of withstanding up to 10,000 Amps at IEEE/ANSI C-62.41 8 by 20 microseconds combination wave.

5. Manufacturer/model:

a. Asco model 265.

b. Approved equal.

2.03. PUMP MOTOR CONTROL COMPONENTS

A. Refer to Division 16 for requirements associated with Variable Frequency Drives, Soft Starts and related components.

2.04. AIR CONDITIONING UNIT

A. Each PSCP with a VFD shall be provided with an externally mounted AC unit.

B. The AC unit shall not compromise the NEMA 4X rating of the PSCP.

C. The AC unit shall maintain an internal PSCP temperature of no more than 25 degrees Celsius when the outside ambient temperature is 30 degrees Celsius with all internal components operating at maximum power.

2.05. BACKUP CONTROL

A. Each PSCP shall be equipped with relay logic for backup operation in the event of a RTU fault.

B. Each wet well shall contain three float switches; Pumping Off, Call Pump 1, and Call Pump 2.

C. The logic shall function as follows:

1. The logic shall enter a latch “In Backup” status if the RTU fails or the Call Pump 1 float stays tripped after an on-delay timer expires.

2. Pump 1 shall be called to start.

3. If the Call Pump 2 float stays tripped after an on-delay timer expires, call Pump 2 to start.

4. The pumps shall continue to run until one of the following conditions occur:

a. The associated call float switch resets after an off-delay timer expires.

b. Backup status is reset by a local pushbutton or by the operator via the HMI/OIT screen.

c. The Pumping Off float switch trips after an on-delay timer expires.

D. Stations with VFD driven pumps shall command the VFD to go to a preset speed when called to run in backup mode.

2.06. CONTROL PANELS AND ENCLOSURES

A. Finish:

1. All front panel openings for panel-mounted equipment shall be cut with counter-boring and provided with trim strips as required to give a neat finished appearance.

2. With the exception of stainless steel panels, all steel panel surfaces shall be treated with phosphatized treatment inside and out, and then finished on the exterior with two coats of baked enamel of the approved color. Interiors of panels shall be white, ANSI No. 51.

3. Stainless steel panels shall be No. 7 polished, 316 stainless steel.

B. Doors:

1. All control panels shall have a continuous piano hinge door for ease of access. A minimum of 80% of the panel interior shall be exposed by doors.

2. NEMA 4X rated panel door openings shall be sealed and fully gasketed.

3. The inside of each door shall be equipped with a print pocket. Provide individually laminated 11x17 sheets for all wiring diagrams.

4. Two-door enclosures shall have a removable center post.

5. Sealed panel doors shall be equipped with quick-release latches.

6. NEMA 1 rated panel doors shall be equipped with a three-point latching mechanism.

7. Where noted or shown on the drawings, doors shall be equipped with a fully gasketed glass window to allow viewing of internally mounted devices without opening the door.

C. All components and terminals shall be accessible without removing other components except for covers.

D. All conduit entry shall be from the bottom only.

E. No components shall be mounted on the interior sides of any panel.

F. All panels shall be provided with an isolated copper grounding bus to ground all signal shield connections.

G. Control Panels containing SCADA control system equipment shall each be equipped with an internal, hand-switch controlled, LED light and 120V, 15 amp, duplex utility receptacle.

H. All panels shall be provided with laminated as built electrical wiring diagrams in each panel.

I. Nameplates:

1. All front-face panel mounted controls and indicators shall be equipped with 10-year outdoor-rated adhesive laminated plastic nameplates to completely define their use. Provide Brady Type BBP31 or BBP33 as applicable or approved equal.

2. All internal components shall be equipped with identification tags

3. Each wire shall be uniquely identified and shall be labeled.

J. Power Supplies.

1. Uninterruptible power supplies (UPS) shall be provided in all control panels as follows:

a. Size the supplies for all internal equipment plus an additional 20% spare capacity.

b. Provide 15 minutes battery back-up capability at full load.

c. Provide relay option card for indication of “On UPS Power” and “Low Battery Level”.

d. For outdoor panels provide an UPS and battery rated for operation at up to 50 degrees C.

K. Provide two diode-auctioneered DC power supplies for analog signal use.

1. Provide individually fused DC power for field transmitters.

L. Electrical:

1. Main circuit breaker and branch circuit breaker for each branch circuit as required to distribute power from the main power feed.

2. All breakers accessible when the panel door is open.

3. No more than 20 devices on any single circuit.

4. No more than 12 amps for any branch circuit.

5. Panel (or site) lighting, receptacles, heaters, controls, telemetry and fans on separate branch circuits.

M. Wiring:

1. Power wiring shall be 300 volt, type THWN stranded copper, No. 14 AWG size, for 120V service.

2. Discrete wiring shall be 300-volt type THWN stranded copper, sized for the current carried, but not smaller than No. 16 AWG.

3. Analog signal wiring shall be 300 volt, stranded copper in twisted shield pairs, no smaller than No. 16 AWG.

4. Panel wiring shall be routed within wire troughs or panduits.

5. Hinge wiring shall be secured at each end with the bend portion protected by a plastic sleeve.

6. Analog or dc wiring shall be separated from any ac power or control wiring by at least six inches.

7. Terminal blocks shall be provided for all field wiring entering the panel. The greater of 4 or 15% spare terminal blocks shall be provided.

8. No more than one wire per screw and yoke termination.

N. Construction:

1. Minimum metal thickness: 14-gauge.

2. Stiffeners as required to prevent deflection under instrument loading and permit lifting without racking or distortion.

3. When required, removable lifting rings and fill plugs to replace rings after installation.

O. Miscellaneous Equipment:

1. All panels shall be protected from internal corrosion by the use of corrosion – inhibiting vapor capsules, Northern Instruments Model Zerust VC, Hoffman, model A-HCI, or equal.

2. All sealed panels shall be equipped with combination drain/breathers, Crouse-Hinds model ECD18; or equal.

3. When noted on drawings, panels shall be equipped with thermostatically controlled space heaters to maintain internal temperatures above dew point.

P. All panels shall be manufactured items, Hoffman Engineering, or equal.

2.07. FRONT PANEL DEVICES

A. Potentiometer. Units shall meet the following:

1. Three-terminal potentiometers with a total resistance of 1000 ohms and a power dissipation rating of 2 watts

2. Oil-tight construction, rated NEMA 13

3. Resolution of 1 percent, and linearity of plus or minus 5 percent.

4. Panel mounting accommodating panel thickness between 1/16 to ¼ inch.

5. Legend plates with marking as noted.

6. Allen-Bradley, type 800T, or equal.

B. Selector Switch. Units shall meet the following:

1. Heavy-duty, oil-tight, industrial type selector switches rated for NEMA 4 service.

2. Contacts rated for 120-volt ac service at 10 amperes continuous.

3. Number of positions and contact arrangements as required.

4. Factory-engraved legend plate indicating position definition.

5. Panel mounting accommodating panel thickness between 1/16 to ¼ inch.

6. Black knob type operator.

7. Square D Class 9001, Type K; Allen-Bradley type 800T, or equal.

C. Pushbutton. Units shall meet the following:

1. Heavy-duty, oil-tight, industrial type push buttons rated for NEMA 4 service.

2. Contacts rated for 120-volt ac service at 10 amperes continuous.

3. Number of positions and contact arrangements as required.

4. Factory-engraved legend plate indicating function.

5. Panel mounting accommodating panel thickness between 1/16 to ¼ inch.

6. Operator: Red extended head for STOP, green flush head for START, black flush head for other functions.

7. Square D Class 9001, Type K; Allen-Bradley type 800T, or equal.

D. Indicating Light. Units shall meet the following:

1. Heavy-duty, oil-tight, push-to-test industrial type with integral transformer for 120V AC application.

2. Rated for NEMA 4 service.

3. Screwed on flat-faced lenses in colors shown on the drawings.

4. Factory-engraved legend plates.

5. Square D type K, Allen-Bradley Type 800T, or approved equal.

2.08. INTERNAL PANEL COMPONENTS

A. Control/Interposing Relays: All relays shall meet the following:

1. Compact, general-purpose, plug-in type.

2. Socket mounted.

3. Contacts rated for not less than 10 amperes at 120V.

4. Equipped with neon status lights and test buttons.

5. Permanent, legible identification

6. Potter & Brumfield series KRPA or approved equal.

B. Time Delay Relay. Time delay relays shall meet the following:

1. Available functions: On delay, Off delay, or one shot.

2. Socket mounted.

3. Knob adjustment.

4. Contacts rated for not less than 10 amperes at 120V.

5. Timing range as appropriate for the application.

6. Magnecraft series W211 or approved equal.

C. Terminal Blocks. Terminal blocks shall meet the following requirements:

1. Terminals capable of accepting 10-26 AWG wire.

2. DIN-rail mounting.

3. Connectors shall be either copper or steel. Use of aluminum connectors shall not be permitted without prior approval of the Engineer

4. Phoenix Contact or approved equal.

2.09. SPARES AND EXPENDABLES

A. Provide the following spare parts:

1. One spare d.c. power supply of each type provided.

2. Five spare relays of each type provided.

3. 2 spare surge suppressors of each type provided

B. Provide the following expendables:

1. 12 corrosion inhibitor capsules

2. Ten spare fuses of each type and rating supplied.

3. Ten spare indicator light bulbs (minimum of 10) of each type and color supplied.

PART 3 - EXECUTION

3.01. INSTALLATION

A. Control Panels shall be installed at the locations indicated on the Contract Drawings.

B. Control panels shall be provided to the mechanical subcontractor for installation.

C. Verify the correct installation of all panels supplied under this Specification Section.

END OF SECTION

SECTION 13325

SCADA SYSTEM HARDWARE

PART 1 - GENERAL

1.01. SCOPE OF WORK

A. This Specification Section covers work related to the SCADA system hardware.

B. The work specified herein shall be furnished by the same SYSTEM SUPPLIER furnishing services and equipment as defined in 13300.

1.02. RELATED WORK

A. Related work specified elsewhere includes:

1. Specification Section 13300 defines work associated with the overall SCADA.

2. The equipment will be mounted in control panels under Specification Section 13315.

3. Specification Section 13326 defines work associated with the programming the SCADA.

1.03. SUBMITTALS

A. Provide the following submittals specific to the work defined herein:

B. A SCADA hardware shop drawing package that includes the following:

1. Block Diagram: A detailed system block diagram showing all major components. Identify components by model number. Show interconnecting cables diagrammatically (by type and size).

2. Bill of Materials: A list of all components, including all software. Group components by type and include component model number and part number, component description, quantity supplied, and reference to component catalog information.

3. Descriptive Information: Catalog information, descriptive literature, performance specifications, internal wiring diagrams, power and grounding requirements, power consumption, and heat dissipation of all elements. Clearly mark all options and features proposed for this project.

4. Installation Details. Equipment installation drawings showing external dimensions, enclosure material and spacing, mounting connections, and installation requirements.

PART 2 - PRODUCTS

2.01. GENERAL REQUIREMENTS

A. All equipment, cabinets and devices furnished hereunder shall be heavy-duty type, designed for continuous industrial service. The system shall contain products of a single MANUFACTURER, insofar as possible, and shall consist of equipment models which are currently in production. All equipment provided shall be of modular construction and shall be capable of field expansion through the installation of plug-in circuit cards or additional cabinets.

B. The equipment furnished shall be designed to operate satisfactorily between 0 degrees C and 40 degrees C at up to 95 percent Relative Humidity (non-condensing).

C. All equipment furnished shall be designed and constructed so that in the event of power interruption, or temperatures outside the operational range, the equipment specified hereunder shall go through an orderly shutdown with no loss of memory, and resume normal operation without manual resetting when power is restored.

2.02. SCADA MASTER HMI

A. Tower Server/Workstation. The system server/workstation shall meet the following minimum requirements:

1. Mid-Tower.

2. Intel four core Xeon Processor at 3.5 GHz.

3. 16GB RDIMM memory.

4. 1 TB SATA hard drive.

5. 1 GB NVIDIA graphics card.

6. Dual, 24-inch Ultrasharp wide screen monitors. Dell U2415 or approved equal.

7. Equipped with the following software:

   a. Windows 10 Professional 64 bit operating system.

   b. Microsoft Office Professional.

   c. HMI application software. Provide licensed VT SCADA software with a minimum of 1,000 tags.

8. Dell PowerEdge T5810 or approved equal.

9. Provide a 500VA Uninterruptible Power Supply for the Workstation.

B. Laser Printer. Provide a color laser printer that meets the following requirements:

1. 28 ppm print speed (black)

2. 600 x 600 dpi resolution

3. 250 sheet paper tray

4. Memory: 256 MB NAND Flash, 128 MB DRAM

5. HP Color LaserJet Pro M452dn or approved equal.

C. System Interface Panel. Provide a NEMA 12, wall-mounted steel enclosure with the following:

1. Ethernet Switch. Fully managed, industrialized switch with a minimum of eight RJ45 ports. N-Tron or approved equal.

2. The MTU and related components specified below.

3. Uninterruptible Power Supply.

2.03. REMOTE TELEMETRY UNIT (RTU) LOCATED INTEGRAL TO THE PSCP

A. The RTU shall meet the following general requirements:

1. Input Voltage – 12 or 24 vdc Max. Current (840mA@12, 420mA@24).
2. 7 Year battery backup for RTC and system data.
3. Graphic Display Screen.
4. Operating Temperature – 32 to 122°F.
5. Relative Humidity – 5% to 95% non-condensing.

B. Graphic Display Screen:

1. Resistive, analog touchscreen, TFT – LCD.
2. White LED backlight.
3. 800x600 resolution.
4. 5.7” viewing area
5. Pop-up keypad.

C. Memory Size

1. Application Logic – 2MB
2. Images – 32MB
3. Fonts – 1MB
4. Memory Bits – 8192
5. Memory Integers - 4092 (16-bit)
6. Long Integers – 512 (32-bit)
7. Double Word – 256

8. Memory Floats – 64 (32-bit)

9. Timers – 384 (32-bit)

10. Data Tables – 120k dynamic RAM data

11. HMI Display – 1024

D. Inputs/Outputs

1. Base Unit: 16 Digital Inputs, 8 Digital Outputs, and 3 Analog Inputs.

2. Expansion capabilities to 1024 total I/O.

E. Special Function. Unit shall contain a built-in Triplex Pump Controller function with the following features:

1. FOFO Alternation

2. Analog Control with setpoints

3. Software HOA Switches

4. Volumetric Flow Calculations

5. Fixed or Auto Alternation Selection

6. High Level and Low Level Alarm Setpoints

F. Communications

1. Two built in serial ports (RS-232 or RS-485)

2. One Ethernet Port

G. Sanders Sci-Text, no equal

2.04. MASTER TELEMETRY UNIT (MTU)

A. The MTU shall meet the following general requirements:

1. Input Voltage – 12 or 24 vdc Max. Current (840mA@12, 420mA@24).

2. 7 Year battery backup for RTC and system data.

3. Graphic Display Screen and nine Programmable Function Keys.

4. Operating Temperature – 32 to 122°F.

5. Relative Humidity – 5% to 95% non-condensing.

B. Graphic Display Screen:

1. Resistive, analog touchscreen, TFT – LCD.

2. White LED backlight.

3. 16 Bit colors, 800x600 resolution.

4. 10.4” viewing area

5. Virtual keyboard.

C. Memory Size

1. Application Logic – 2MB

2. Images – 80MB

3. Fonts – 1MB

4. Memory Bits – 8192

5. Memory Integers - 4092 (16-bit)

6. Long Integers – 512 (32-bit)

7. Double Word – 256

8. Memory Floats – 64 (32-bit)

9. Timers – 384 (32-bit)

10. Data Tables – 120k dynamic RAM data

11. HMI Display – 1024

D. Communications

1. Two built in serial ports (RS-232 or RS-485)
2. One USB Port – mini B
3. One Ethernet Port

E. Sanders Sci-Troll, no equal

2.05. CELLULAR COMMUNICATIONS

A. GSM Modem:

1. Performance GPRS: Class 10
2. Quad Band, GSM/GPRS 800/900/1800/1900MHz
3. Up to 85.6k bps
4. SMS Capable
5. Antenna Connector 50Ohm SMA Female
6. Standard SIM Connector
7. DE9 Serial Connector RS-232
8. Power Connector 2.5mm screw on
9. 9 to 32 VDC Input Voltage
10. 4.114”Wx1.065”Hx2.35”D
11. Operating Temperature -40 to 85°C
12. Relative humidity 20 to 90% noncondensing

B. Antennae:

1. Antennae shall be specified after site signal strength testing by SYSTEM SUPPLIER.

2. Antennae to be outdoor rated.

2.06. SPARES AND EXPENDABLES

A. Provide one spare RTU.

PART 3 - EXECUTION

3.01. TRAINING

A. Hardware Maintenance: Provide a minimum of one day of hardware training for up to three of the OWNER's personnel in the maintenance of the SCADA hardware which shall include:

1. Training in standard hardware maintenance for the equipment provided.

2. Specific training for the actual hardware configuration to provide a detailed understanding of how the equipment and components are arranged, connected, and set up.

3. Test, adjustment, and calibration procedures.

4. Troubleshooting and diagnosis.

5. Component removal and replacement.

6. Periodic maintenance.

B. Software Maintenance: Provide a minimum of one day of software training for up to four of the OWNER's personnel in the maintenance and use of the SCADA software.

END OF SECTION

SECTION 13326

SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) PROGRAMMING

PART 1 - GENERAL

1.01. SCOPE OF WORK

A. This Specification Section defines the requirements for SCADA system programming.

B. The Work defined herein shall be performed by the SYSTEM SUPPLIER defined in Specification Section 13300.

1.02. RELATED WORK

A. Specification Section 13300. SCADA - General Requirements.

B. Specification Section 13325: SCADA Hardware.

1.03. SUBMITTALS

A. Provide a SCADA system software submittal including the following:

1. A listing of all process graphic screens to be provided.

2. A written description of how the operator will interface with the process graphic screens. Support the description with samples of the graphics or pop-up windows to be used.

3. An example screen illustrating the proposed operator interface with the historical database.

4. An example screen illustrating the proposed operator interface with the alarm/event database.

5. An example screen illustrating the proposed trending displays.

6. A list of proposed trends and associated parameters.

7. Examples of proposed reports and associated parameters.

PART 2 - PRODUCTS

THIS PART NOT USED

PART 3 - EXECUTION

3.01. RTU PROGRAMMING – GENERAL MONITORING

A. Provide the following general monitoring functions for analog inputs:

1. For all analog inputs (pseudo and real):

a. Provide out of range alarms if the input signal goes outside the instrument's range

b. Provide individually operator adjustable emergency high and low alarms when the value goes outside the allowable process range.

c. Provide individually operator adjustable high and low alarms when the value goes outside the normal process operating range.

d. Provide a dead-band on all alarm settings.

e. Issue Return-to Normal alarms whenever the signal returns to within limits.

2. For all flow related analog inputs:

a. Monitor for and record minimum and maximum daily 5-minute average values. Record the date and time of occurrence for each.

b. Accumulate a running daily total flow. At midnight, transfer the total to yesterday's total and restart from zero.

c. Calculate a running daily average flow. At midnight, transfer the value to yesterday's average and restart the averaging.

3. For all level and pressure related analog inputs:

a. Monitor for and record minimum and maximum daily values. Record the date and time of occurrence for each.

B. Provide the following general monitoring functions for discrete inputs:

1. For all discrete inputs:

a. Indicate but do not alarm when a discrete signal changes, as expected, as a result of a control command.

b. Alarm whenever an un-commanded change of state occurs

c. For all local control switch position feedback discrete inputs, issue an advisory alarm to the operator whenever a position change is detected

d. Exclude from any control strategy any equipment whose local switch position precludes control. If an operator attempts to control the device through the system, issue a message indicating that the control cannot be accomplished together with the reason.

2. For all motorized equipment:

a. Accumulate equipment run times based on the running status feedback discrete input.

b. Reset the run time value to zero only on operator command via the HMI.

3. For all device failure discrete inputs:

a. Issue an alarm when the input indicates a device fault

b. Set a software fault for the controlled device that can only be reset by operator action after the fail signal has been removed.

3.02. RTU PROGRAMMING – GENERAL CONTROL

A. General Requirements applicable to the control strategies are:

1. All software fault conditions that are set can only be cleared by operator acknowledgement.

2. Wherever in the descriptions the control strategy refers to the operator, it is intended to mean via the Operator Interface Terminal (OIT) or HMI process graphics.

3. All control strategies shall run within the RTU. Data manipulation (calculated analog values, elapsed time functions, event determination) shall be performed by the RTU for the associated equipment it is monitoring. Any resulting values from these manipulations shall be reported as individual registers. The intent is to avoid utilizing the OIT software for this purpose.

4. The control functions described herein are not intended to be complete comprehensive programming logic descriptions. They describe only the general intended control operation required. Provide complete program logic to completely fulfill the functional requirements indicated.

5. Provide all programming necessary to support the functional requirements of the operator graphic screens.

6. Provide complete debugging services to address issues identified by the OWNER or ENGINEER during and after startup until final acceptance.

B. Common Constant Speed Motor Operator Control. For all constant speed equipment, provide an operator controllable software HAND/OFF/AUTO switch and proceed as follows:

1. While the switch is in HAND run the equipment.

2. While the switch is in OFF, stop the equipment and prevent any start commands.

3. While the switch is in AUTO, take start and stop signals from the appropriate automatic control strategy defined herein.

C. Common Variable Speed Motor Operator Control. For all variable speed equipment, provide an operator controllable software HAND/OFF/AUTO switch and SPEED potentiometer and proceed as follows:

1. While the switch is in HAND run the equipment at the speed set by the potentiometer.

2. While the switch is in OFF, stop the equipment and prevent any start commands.

3. While the switch is in AUTO, take start, stop, and speed signals from the appropriate automatic control strategy defined herein.

3.03. RTU AUTOMATIC CONTROLS

A. Establish a LEAD/LAG sequence for the pumps. Automatically rotate the sequence whenever all pumping stops or every 24 hours at midnight, whichever occurs first. Allow the operator to override this and manually assign the pumps.

B. Variable Speed Pump Control. At the Main and Hispanola Pump Stations, the pumps shall be controlled to maintain an operator adjustable wet well level. Proceed as follows:

1. Provide the following operator adjustable values:

   a. LSH – Upper operating wet well level. Limit this value to a maximum of 3" below the Call Lead backup float switch setting.

   b. LS – Target wet well level.

   c. LSL – Lower operating wet well level.

2. Call for the LEAD pump if the level reaches LSH for an operator adjustable time.

3. Use a single PID control loop to adjust the pump's speed to maintain a level of LS.

4. Call for the LAG pump in sequence if the LEAD pump fails to start or fails while running.

5. When the level reaches LS, freeze the PID and keep pump speed constant.

6. If the level rises to LSH or falls to LSL, restart the PID until the level begins to fall or rise, respectively then freeze the PID once more.

7. Call for the next pump in sequence if pump speed is at an operator adjustable maximum value and the level reaches LSH for an operator adjustable time. Temporarily suspend the PID and ramp down the speed to an operator adjustable value until both starting and running pumps' speeds are equal then resume the PID. Once the level reaches LS, freeze the PID once more.

8. Stop the longest running pump if the level falls to LSL for an operator adjustable time and pump speed is at an operator adjustable minimum.

C. Constant Speed Pump Control. At the Village Hall and South Treasure Drive Pump Stations shall be controlled as a standard duplex station based on operator adjustable levels. Proceed as follows:

1. Provide the following operator adjustable values:

a. LSHH – Call Lag Pump wet well level. Limit this value to a maximum of 3" below the Call Lead backup float switch setting.

b. LSH – Call Lead Pump wet well level..

c. LSL – Pumps Off wet well level.

2. If the level reaches LSH for an operator adjustable time, start the LEAD pump.

3. If the level reaches LSHH for an operator adjustable time, start the LAG pump.

4. If the level falls to LSL for an operator adjustable time, stop all pumping.

D. Alarm Callouts. Provide automatic cellular phone callouts for up to 12 alarms to up to 6 OWNER selected phone numbers.

3.04. GRAPHICS

A. Provide OIT graphics at Variable Speed pump sites that include the following:

1. Individual pump status (speed, running, stopped, fault, local and OIT H/O/A status, LEAD or LAG assignment). Provide operators the ability to change H/O/A position and LEAD/LAG assignment.

2. Current wet well level and set points. Provide operators the ability to change wet well level set points.

3. Current Backup status (normal, in backup) and operator controllable Backup Force and Reset pushbuttons.

4. Calculated discharge flow.

5. Current power status (primary or UPS).

B. Provide OIT graphics at Constant Speed pump sites that include the following:

1. Individual pump status (running, stopped, fault, local and OIT H/O/A status, LEAD or LAG assignment). Provide operators the ability to change H/O/A position and LEAD/LAG assignment.

2. Current wet well level and set points. Provide operators the ability to change wet well level set points.

3. Current Backup status (normal, in backup) and operator controllable Backup Force and Reset pushbuttons.

4. Calculated discharge flow.

5. Current power status (primary or UPS).

C. Replicate all OIT graphics, including operator functions, on the HMI screens

3.05. OTHER HMI PROGRAMMING

A. Alarm Log. Provide a log of all alarms issued by the system. The log shall include the date and time of detection. Provide the operator with the ability to sort the displayed log by any combination of the following:

1. Specific equipment.

2. Alarm description

3. Date and time.

B. Event Log. Provide a log of all events issued by the system. The log shall include all alarms, operator control commands and set point changes, alarm

acknowledgements and return to normal occurrences following an alarm condition. The date and time of occurrences shall be included together with, where applicable, the identity of the operator. Provide the operator with the ability to sort the displayed log by any combination of the following:

1. Operator.

2. Specific equipment.

3. Event description.

4. Date and time.

C. Historical Database. Provide a historical database that includes, as a minimum, the following information:

1. For all flows:

   a. Maximum daily value with time of occurrence.

   b. Daily accumulated value.

   c. Average daily value.

   d. Monthly maximum daily value, date and time of occurrence, updated each time the previous value is exceeded.

   e. Monthly average updated daily.

2. For all pressures:

   a. Maximum and minimum daily values with time of occurrences.

   b. Monthly maximum and minimum daily value, date and time of occurrence, updated each time the previous value is replaced.

3. For all analysis parameters:

   a. Maximum and minimum daily values with time of occurrences.

   b. Average daily value.

c. Monthly maximum and minimum daily value, date and time of occurrence, updated each time the previous value is replaced.

D. Trends. Provide up to four, six-parameter trends as selected by OWNER.

E. Reports. Provide the following reports:

1. Monthly Operations Report updated daily after midnight.

2. Monthly Maintenance Report containing accumulated pump run times for all equipment and date and time of last reset. Update this report daily after midnight.

3. Up to three additional reports as selected by OWNER.

3.06. PROGRAMMING ACCEPTANCE

A. Regardless of any submittal approvals, final acceptance of the system programming will occur during the final Demonstration Test.

B. The ENGINEER/OWNER reserves the right to require minor changes in the graphics and programming during the test.

3.07. TRAINING

A. The cost of training programs to be conducted with OWNER's personnel shall be included in the Contract price.

B. All training schedules shall be coordinated with, and at the convenience of the OWNER. Shift training may be required to correspond to the OWNER's working schedule.

C. Provide a minimum of one day training for the OWNER’s personnel in the use of the HMI graphics.

3.08. TESTING

A. Each test shall be in the cause and effect format. The person conducting the test shall initiate an input (cause) and, upon the system producing the correct result (effect), the specific test requirements will have been satisfied.

B. All tests shall be conducted in accordance with, and documented on, prior approved procedures, forms, and checklists. Each specific test to be performed shall be described and a space provided after it for signoff by the appropriate party after its satisfactory completion. Copies of these signoff test procedures, forms, and checklists will constitute the required test documentation.

C. Provide all special testing materials and equipment.

D. The SYSTEM SUPPLER shall coordinate all of their testing with the CONTRACTOR, the ENGINEER, all affected suppliers, and the OWNER.

E. The ENGINEER reserves the right to test or retest any and all specified functions whether or not explicitly stated in the approved test procedures. The ENGINEER's decision shall be final regarding the acceptability and completeness of all testing.

F. Prior to Substantial Completion, the SYSTEM SUPPLER shall demonstrate the fully operating system. This test will be witnessed by the OWNER and/or the ENGINEER.

G. The responsible test witness may require modification of the operator graphics displays, etc. during this test before it is considered successful.

END OF SECTION

SECTION 15050

PIPE AND FITTINGS

PART 1 GENERAL

1.01 DESCRIPTION OF WORK

A. The work covered by this section consists of providing all labor, material and equipment, and performing all construction required to install force mains, fittings, valves, taps, and accessories as specified and shown on the drawings.

1.02 SUBMITTALS

A. Reports on pressure tests and leakage tests will be prepared and submitted by the Contractor.

B. Record drawings must be submitted in accordance with the Miami-Dade Water and Sewer Department Standards.

C. Submit product data for all pipe, service connections, fittings, valves, accessories and other appurtenances in accordance with Division 1 specifications.

1.03 REFERENCE STANDARDS

A. Water system components which come into contact with drinking water must conform with ANSI/NSF Standard 61, Drinking Water Components.

B. All potable and waste water system components shall be supplied and installed per the applicable FDEP and Miami-Dade Water and Sewer Department Standards.

C. ANSI/ASTM D2466 - Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.

D. ANSI/AWWA C104 – Standard for Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water.

E. ANSI/AWWA C105 – Standard for Polyethylene Encasement for Ductile-Iron

Pipe Systems

F. ANSI/AWWA C110 – Standard for Ductile-Iron and Gray-Iron Fittings, 3 In. Through 48 In. for Water and Other Liquids.

G. ANSI/AWWA C111 – Standard for Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

H. ANSI/AWWA C115 – Standard for Flanged Ductile-Iron Pipe with Ductile-Iron or Gray Iron Treaded Flanges.

I. ANSI/AWWA C150 – Standard for the Thickness Design of Ductile-Iron Pipe.

J. ANSI/AWWA C151 – Standard for Ductile-Iron Pipe, Centrifugally Cast, for Water or Other Liquids.

K. ANSI/AWWA C153 – Standard for Ductile-Iron Compact Fittings, 3 In. Through 24 In. and 54 In. Through 64 In. for Water Service.

L. AWWA C210 – Standard for Liquid-Epoxy Coating Systems for the Interior and Exterior of Steel Water Pipelines.

M. AWWA C220 – Standard for Stainless-Steel Pipe, 4 In. and Larger.

N. AWWA C504 – Standard for Rubber-Seated Butterfly Valves.

O. AWWA C508 – Standard for Swing-Check Valves for Waterworks Service, 2 In. Through 24 In.

P. AWWA C517 - Standard for Resilient-Seated Cast-Iron Eccentric Plug Valves

Q. AWWA C509 – Standard for Resilient-Seated Gate Valves for Water Supply Service.

R. AWWA C511 – Standard for Reduced-Pressure Principle Backflow-Prevention Assembly.

S. AWWA C512 – Standard for Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.

T. AWWA C600 – Standards for Installation of Ductile-Iron Water Mains and Their Appurtenances.

U. AWWA C605 – Standard for Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.

V. AWWA C900 – Standard for Polyvinyl Chloride (PVC) Pressure Pipe, 4 In. Through 12 In. for Water Distribution.

W. AWWA C901 – Standard for Polyethylene (PE) Pressure Pipe and Tubing, ½ In. Through 3 In. for Water Services.

X. AWWA C905 - Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 In. Through 48 In. (350 mm Through 1,200 mm)

Y. AWWA C906 - Polyethylene (PE) Pressure Pipe and Fittings, 4 In. (100 mm) Through 63 In. (1600 mm), for Water Distribution and Transmission

Z. ASTM D1785 - Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

AA. ASTM D2855 - Making Solvent-Cemented Joints with Poly (Vinyl Chloride) (PVC) Pipe and Fittings.

BB. ASTM D2922 - Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth).

CC. ASTM D3035 - Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Controlled Outside Diameter

DD. ASTM D3139 - Joints for Plastic Pressure Pipes using Flexible Elastomeric Seals.

EE. ASTM D3261 - Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing

FF. ASTM D3350 - Standard Specification for Polyethylene (PE) Plastic Pipe and Fitting Materials

GG. ASTM F437-82 - Threaded Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 80.

HH. ASTM F439-87 - Standard Specification for Socket - Type Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe Fittings, Schedule 80.

II. ASTM 493-85 - Solvent Cements for Chlorinated Poly Vinyl Chloride (CPVC) Plastic Pipe and Fittings.

JJ. ASTM F714- Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Outside Diameter

KK. ASME/ANSI B16.5 –1996 – Pipe Flanges and Flanged Fittings.

LL. ASME/ANSI B 31.3 – 1996 – ASME Code for Pressure Piping.

MM. ASME/ANSI B 16.9 – Pipe Fittings.

1.04 SUBMITTALS

A. Submit under provisions of Section 01300.

B. Product Data: Provide data on pipe, pipe fittings, valves, tapping saddles/tapping valves, restraint, air release valves, and accessories.

C. Manufacturer's Certificate: Certify that pipe, fittings, and valves meet or exceed respective ANSI, AWWA, and/or NSF Standards.

PART 2 PRODUCTS

2.01 GENERAL

A. Although they may not be specifically shown on the drawings or called for elsewhere in the Technical Provisions, the Contractor shall include the cost of all fittings, piping supports, and miscellaneous appurtenances needed to provide a secure, workable pipe and valve system. Piping shall be supported by thrust restraints and tie rods as necessary to insure a stable installation. Adjustable pipe supports or piers shall be arranged to relieve attached equipment of all strain due to the weight of the pipe, fittings, valves, and the contents of the pipe.

2.02 APPROVED PRODUCTS

A. DUCTILE IRON PIPE AND FITTINGS

Ductile iron pipe and fittings shall conform to AWWA C110, C111, C115, C150, C151 and C153 and shall be in conformance with the Miami-Dade Water and Seer Department Standards as follows:

1. Joints: Buried pipe shall be AWWA approved push-on or mechanical joint pipe (AWWA/ANSI C111/C21.11). Exposed joints shall be AWWA approved flanged joint pipe, in accordance with ANSI/AWWA C115, or as detailed on the drawings. Pipe sizes 3” to 12” diameter shall be Class 52. Pipe sizes 14” and above shall be Class 51.

2. Fittings: Buried fittings shall be AWWA approved mechanical joint fittings. Exposed fittings shall be flanged fitting or as detailed on the drawings. Fittings 4” to 24” shall conform to AWWA C153/A21.52 and fittings 30” and above shall conform to AWWA C110/A21.10 or AWWA C153/A21.52.

3. Restrained joint pipe shall be constructed on all forcemain and watermains adjacent to all bends, crosses, tees, etc., where a change in direction occurs. Refer to the Table on the drawings for restrained pipe lengths.

4. Restrained joint types for 36" and smaller diameter shall be "Flex-Ring" as manufactured by American Cast Iron Pipe Company, "TR Flex" as manufactured by U.S. Pipe Company, or other approved joint restraint. Restrained joint fittings for 42" and larger diameter pipe shall be "Lok-Ring" as manufactured by American Cast Iron Pipe Company, "TR-Flex" as manufactured by U.S. Pipe Company, or “an approved equivalent”. All bolts and hex nuts shall be U.S. Steel COR Ten or “an approved equivalent”. The accessory package consisting of the restraining element and gaskets shall be packaged together as a complete unit noting the size on the outside of the sealed weather proof container. Mechanical joint fittings and bell restraints as specified in paragraph B.6. below may also be used at the Contractor's option.

5. Mechanical Joint Fittings shall conform to the requirements stated in

paragraph above. All bolts and hex nuts shall be U.S. Steel COR Ten or "an approved equivalent". The accessory package consisting of the retainer gland, bolts, nuts and gaskets shall be packaged together as a complete unit noting the size on the outside of the sealed weather proof container.

B. PVC PIPE

All products that come into contact with potable water shall be in conformance with the Miami-Dade Water and Sewer Department Standards as follows:

1. AWWA C900 and C-905 PVC Pipe

a. All PVC pipe shall meet AWWA C-900 and AWWA C-905 Standards and NSF requirements for potable water application. PVC pipe 4" through 12" shall be class 150, DR 18 pipe conforming to AWWA C900. Pipe greater than 12" shall conform to AWWA C905, DR 18 or better.

b. Fittings used in conjunction with the C900 PVC pipe shall be ductile iron, or PVC push-joint pressure rated fittings (SDR-35 min) as detailed on the drawings, mechanical joint.

C. PVC water main shall be blue in color. PVC water main pipe shall be blue in color.

2. Schedule 40 PVC Pipe

a. Rigid PVC (polyvinyl chloride) compound used in the manufacturer of schedule 40 pipe shall be Type I, grade 1 as identified in ASTM D1784. The pipe shall be NSF rated for potable water.

b. PVC schedule 40 shall meet the requirements of ASTM standard D1785 for physical dimensions and tolerances.

c. The marking on PVC Schedule 40 pipe shall meet the requirements of ASTM D1785 and state the material designation code, nominal pipe size, schedule of pipe, pressure rating in psi for water at 73° F., the ASTM designation number D1785 and the NSF seal for potable water.

d. Fittings used shall be PVC Schedule 40 and solvent welded in accordance with ASTM D1785.

C. STAINLESS STEEL PIPE: ANSI/ASTM A312, Schedule 5S, 10S, 40S

1. Stainless steel pipe shall conform to ASTM A312, Austenitic steel pipe, seamed, grade TP 316L.

2. Size shall be nominal pipe size (NPS) designation as shown with Schedule 5S, 10S, 40S wall thickness as indicated on the drawings, or specified herein.

3. Gaskets shall be suitable for their intended service.

4. Flanges: ANSI/ASTM A182, 150# Grade 316L.

5. Bolts and nuts, stainless steel hex head bolts and stainless steel heavy semi-finished hex nuts.

D. MODULAR PIPE SEAL

1. Provide Model "S-316" Link-Seal Modular Seal by PSI - Pipeline Seal and Insulator, Inc. or approved equivalent with EPDM seal elements, composite pressure plates, and 316 Stainless Steel bolts and nuts.

E. HEAVY DUTY EXPANSION JOINT

1. Provide heavy duty expansion joints as described in the plans. Joints shall be Style 601 by Mercer Rubber Co. or approved equivalent. Provide factory coating of Hypalon paint on flexible joint material surface, EPDM tube and cover, 316 stainless steel split retaining rings, 316 stainless control rods and gussets installed per manufacturers recommendations.

F. RESTRAINED FLANGE ADAPTER

1. Flanged adapters shall be made of ductile iron conforming to ASTM A536 and have flange bolt circles that are compatible with ANSI/AWWA C110/A21.10 (125#/Class 150 Bolt Pattern). Restraint for flange adapter shall consist of a plurality of individual actuated gripping wedges to maximize restraint capability. Torque limiting actuating screws shall be used to insure proper initial set of gripping wedges. The flange adapters

shall be capable of deflection during assembly or permit lengths of pipe to be field cut to allow a minimum 0.6 inch gap between the end of the pipe and the mating flange without affecting the integrity of the seal.

2. All internal surfaces of the gasket ring (wetted parts) shall be lined with a minimum of 15 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C213. Sealing gaskets shall be constructed of EPDM. The coating and gaskets shall meet ANSI/NSF-61. Exterior surfaces of the gasket ring shall be coated with a minimum of 6 mils of fusion bonded epoxy conforming to the applicable requirements of ANSI/AWWA C116/A21.16.

3. Restraint Ring coated with MEGA-BOND® Restraint Coating System More Information regarding MEGA-BOND can be found at www.ebaa.com.

4. The flange adapter shall be the Series 2100 MEGAFLANGE® Restrained Flange Adapter as produced by EBAA Iron, Inc. or approved equal.

PART 3 EXECUTION

3.01 SALVAGEABLE MATERIAL

A. Any existing equipment or material which is removed or replaced as a result of construction under this project may be designated as salvageable by the North Bay Village and if so shall be removed, cleaned, and delivered to a protected place specified by the Village. Any equipment or material not worthy of salvaging, as directed by the Village, shall be disposed of by the Contractor at a suitable location. Upon request of the Engineer, Contractor shall submit evidence of proper disposal.

3.02 CONSTRUCTION CONSTRAINTS

A. The Contractor shall give special considerations to accommodate the residents in minimizing downtime and disruption of water and sewer services during the entire construction period.

B. The Contractor will be required to submit as-builts including pressure test results

to the Engineer after the completion of the force main for submission to the Florida Department of Environmental Protection.

C. The Contractor shall coordinate any scheduled shut-down for an existing station with the Village at least fourteen (14) days in advance of such work. The Contractor shall comply with the following limitations:

1. The shut-down shall be scheduled at night during off-peak hours as determined by the Village. All additional costs for labor, equipment, etc. required to perform this work shall be paid for by the contractor.

2. The shut-down time shall be limited to a maximum of four hours. The time shall be closely coordinated with the Village. The contractor shall arrange for a tanker truck (if required) and bypass pump during the shutdown.

3. Contractor will be responsible for all bypass pumping and related costs for the duration of the bypass pumping operation.

4. Residents in the area that may be affected by the shut-down shall be provided with a minimum of 48 hours of notice.

D. It is the responsibility of the Contractor to prevent any sewage spills and sewage back-ups during any construction work.

E. In the event of a spill, it will be the contractor's responsibility to clean up in an approved manner by governing authority and to report the event accordingly.

F. In the event of sewage back up, the Contractor will be responsible for all costs associated with the cleanup, repair and replacement of properties.

3.03 CONSTRUCTION WATER

A. The Contractor will be responsible for making application for hydrant meters with backflow preventers. The Village will install necessary connections and backflow preventers at locations needed by the Contractor and approved by the Engineer. Maintenance of such is the responsibility of the Contractor. All associated fees including construction water will be paid for by the Contractor, see attached fee schedule. In an event that damage to these facilities occurs, the Contractor will be

responsible for all costs associated with their replacement by the Village's standard rate.

3.04 POTABLE WATER SYSTEM

A. Potable Water Systems shall be installed per the requirements of the Miami-Dade Water and Sewer Department Standards.

3.05 FORCEMAIN SYSTEM

A. Forcemain Systems shall be installed per the requirements of the Miami-Dade Water and Sewer Department Standards.

3.06 MARKING BY MANUFACTURER

A. Special markings shall be plainly marked on the applicable pipe indicating the weight, class of pipe, casting period, manufacturer's mark and year pipe was produced.

3.07 TESTS

A. All tests must be made in the presence of the Utility and Engineer unless waived in writing. The Contractor will notify the Utility or Engineer 48 hours in advance of testing.

B. Forcemain Systems shall be tested and inspected in accordance with AWWA C600 or C605 requirements as applicable.

3.08 EXISTING UTILITIES

A. The plans depict the approximate location of the known existing subsurface water, sanitary sewer, electric, telephone, gas, cable, and storm water utilities.

B. Contractor will arrange for underground utilities to be located by appropriate utility owners.

C. Notify Engineer of any substantial changes that would require a deviation in the plans.

D. Repair any damage done to existing utilities at no additional expense to the Owner.

3.09 PIPE INSTALLATION - GENERAL

A. Take all precautions necessary to ensure that pipe, valves, fittings, and other accessories are not damaged in unloading, handling, and installation. Examine each piece of material just prior to installation to determine that no damage has occurred. Remove any damaged material from the site and replace with undamaged material.

B. Exercise care to keep foreign material and dirt from entering pipe during storage handling and installation. Close ends of in-place at the end of any work period to preclude the entry of animals and foreign material.

C. All pipe shall be laid in a dry trench.

D. Use only those tools specifically intended for cutting the size and material and type pipe involved. Make cut to prevent damage to pipe or lining and to leave a smooth end at right angles to the axis of the pipe.

3.10 VALVES

A. Plug valves installed on this project, expect as noted below, shall be installed with the plug facing upstream. Ensure that the plug rotates upward to the fully open position.

B. Install valves with operator stems in a plumb direction on the side of the valve as shown on the Drawings. Locate valves where shown on Drawings. Thoroughly clean all materials installation. Check valves for satisfactory operation.

END OF SECTION

SECTION 15068

PVC FORCE MAIN

PART 1 GENERAL

1.01 DESCRIPTION

A. This section includes materials, installation, and testing of PVC force main conforming to AWWA C900. Size range is 4 through 12 inches.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 15050 - Piping and Fittings

1.03 SUBMITTALS

A. Submit shop drawings in accordance with the General Provisions.

B. Provide affidavit of compliance with AWWA C900.

C. Submit fully dimensioned cross-section of the bell and barrel of the pipe.

D. Show the bell maximum outside diameter in the pressurized area and its minimum wall thickness at the same location.

E. Submit copies of the following manufacturer-required tests conducted on project pipe:

1. Quick-burst strength of pipe and couplings.
2. Flattening resistance of pipe.
3. Record of additional tests after test sample failure.

F. Submit manufacturer's literature of gray iron and ductile-iron fittings including dimensions, thickness, weight, coating, lining, and a statement of inspection and compliance with the acceptance tests of AWWA C110 or C153. Submit copy of report of pressure tests for qualifying the designs of all sizes and types of AWWA C153 fittings that are being used in the project. The pressure test shall demonstrate that the minimum safety factor described in AWWA C153 is met.

G. Submit outline drawings and materials description of service connection saddles, corporation stops, and pipe plugs.

H. Submit test results for the restrained joint system to be used certified by an independent test laboratory demonstrating compliance with these specifications for each size and pressure rating.

I. Submit restrained joint system installation instructions. Include bolt torque limitations and assembly tolerances.

PART 2 PRODUCTS

2.01 PIPE

A. Pipe 4-inches through 12 inches shall conform to AWWA C900, rubber-ring gasket bell end or plain end with elastomeric gasket coupling, DR 18 or as shown in the drawings, cast iron equivalent outside diameter, material cell classification 12454 per ASTM D1784, latest revision.

2.02 FITTINGS

A. Fittings shall conform to AWWA C153, latest revision or AWWA C110, latest revision.

2.03 LINING AND COATING FOR FITTINGS

A. Line and coat fittings with fusion-bonded epoxy.

2.04 FLANGES

A. Flanges on outlets of fittings shall be Class 250 per ASME B16.1.

B. PVC flanges shall be of the one-piece solid socket design and shall be made of the same material as the pipe. Manufacturer’s pressure rating shall be at least 250 psi at a temperature of 73°F. Minimum burst pressure shall be 500 psi. Flanges shall match the dimensions of ASME B16.5, Class 250, steel flanges for outside diameter, bolt circle, and bolt holes.

2.05 OUTLETS AND NOZZLES

A. For outlets larger than 2 inches, use a Ductile Iron tee with a flanged or MJ outlet.

2.06 RESTRAINED JOINTS

A. Restrained joints shall be provided by restraining systems that incorporate a wedge restraint on the restraint ring to provide positive restraint.

B. Restraint devices for bell-and-spigot joints shall consist of a split restraint ring installed on the spigot, connected to a solid backup ring seated behind the bell.

C. Restraining Glands shall be EBAA Iron Series 2000 and 1600 or approved equal.

D. The ASTM A536 ductile iron casting of the restrained gland shall be bonded powder coated. The wedge and wedge assembly shall have a bonded liquid polymer coating applied for corrosion protection. The gland shall utilize torque limiting twist off wedge actuation screws.

E. T-bolts, studs, and connecting hardware shall be high-strength, low alloy material in accordance with AWWA C111.

F. Design restraining devices to have a 2:1 safety factor based on the design strength of the pipe.

PART 3 EXECUTION

3.01 PRODUCT MARKING

A. Legibly mark pipe at 5-foot intervals and each coupling to identify the nominal diameter, the outside diameter base, that is, cast-iron or steel pipe (IPS), the material code for pipe and couplings, the dimension ratio number, AWWA C900, and the seal of the testing agency that verified the suitability of the material for potable water service (NSF).

3.02 DELIVERY AND TEMPORARY STORAGE OF PIPE

A. Ship, store, and place pipe at the installation site, supporting the pipe uniformly. Avoid scratching the pipe surface. Do not stack higher than 4 feet or with weight on bells. Cover to protect from sunlight.

B. Do not drag PVC pipe over the ground, drop it onto the ground, or drop objects on it.

C. Store loose pipes on racks with a maximum support spacing of 3 feet. Provide shades for pipe stored outdoors or installed outdoors until the pipe is filled with water. Store fittings indoors in their original cartons.

D. Store solvent cement indoors or, if outdoors, shade from direct sunlight exposure. Do not use solvent cements that have exceeded the shelf life marked on the storage container.

3.03 HANDLING PIPE

A. Hoist pipe with mechanical equipment using a cloth belt sling or a continuous fiber rope that avoids scratching the pipe. Do not use a chain. Pipes up to 12 inches in diameter may be lowered by rolling on two ropes controlled by snubbing. Pipes up to 6 inches in diameter may be lifted by hand.

3.04 INSTALLING BURIED PIPING

A. Bedding material and backfill to 1 foot above the pipe for PVC shall be backfill with a max rock size of ¾-inch compacted in 6-inch lifts. The minimum trench width shall be the pipe width plus 24-inches (12-inches on each side).

B. Before installation, check pipe and fittings for cuts, scratches, gouges, buckling, kinking, or splitting on pipe ends. Remove any pipe section containing defects by cutting out the damaged section of pipe.

C. Install in accordance with AWWA C605, and as follows:

1. When installing pipe in trenches, do not deviate more than 1 inch from line or 1/4 inch from grade. Measure for grade at the pipe invert.
2. Compact material placed within 12 inches of the outer surface of the pipe by hand tamping only.
3. Compact trench backfill to the specified relative compaction. Do not float

pipe. Do not use high-impact hammer-type equipment except where the pipe manufacturer warrants in writing that such use will not damage the pipe.

3.05 ASSEMBLY OF RUBBER-GASKET PIPE JOINT

A. The spigot and bell or bell coupling shall be dirt free and slide together without displacing the rubber ring. Lay the pipe section with the bell coupling facing the direction of laying.

B. Insert the rubber ring into the groove in the bell in the trench just before joining the pipes. First clean the groove. Observe the correct direction of the shaped ring. Feel that the ring is completely seated.

C. Lubricate the spigot over the taper and up to the full insertion mark with the lubricant supplied by the pipe manufacturer. If the lubricated pipe end touches dirt, clean the pipe end and reapply lubricant.

D. Insert the spigot into the bell and force it slowly into position.

E. Check that the rubber ring has not left the groove during assembly by passing a feeler gauge around the completed joint.

END OF SECTION

SECTION 15100

VALVES, GENERAL

PART 1 GENERAL

1.01 SCOPE

A. The Contractor shall provide all tools, supplies, materials, equipment, and labor necessary for furnishing, installing, adjusting, and testing of all valves and appurtenant work, complete and operable. For buried valves, the Contractor shall furnish and install valve boxes to grade, with covers, extensions, and position indicators.

B. All valves specified herein shall be furnished with an affidavit from the manufacturer(s) certifying that the valves furnished comply with the applicable provisions of the AWWA specifications, as modified herein. That they were factory tested in accordance with the AWWA Standard Leakage and Hydrostatic Tests as modified herein, with a certified test report furnished to the Department for each valve.

1.02 REFERENCE SPECIFICATIONS, CODES, AND STANDARDS

A. All codes, as referenced herein, are specified in Section entitled "Reference Standards." As used herein, "ANSI" denotes the American National Standards Institute; "AWWA", the American Water Works Association; and "ASTM", the American Society for Testing and Materials.

B. Commercial Standards:

ANSI B16.1	Cast Iron Pipe Flanges and Flanged Fittings, Class 25, 125, 250, and 800.
ANSI B16.5	Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys.
ANSI/AWWA C500	Gate Valves for Water and Sewerage Systems

1.03 MANUFACTURER

A. All valves shall be the product of domestic manufacturing firms which have been engaged in the production of valves for not less than five (5) years.

1.04 QUALITY ASSURANCE

A. The Contractor is advised that he is required to furnish all labor, materials and equipment necessary to pressure test each valve bi-directionally, prior to installation, to the satisfaction of the Owner.

B. Unless otherwise specified, all interior bronze parts of valves shall conform to the requirements of ASTM B 62.

C. Provide valves that have the manufacturer's name and valve rating cast in body.

PART 2 PRODUCTS

2.01 VALVES

A. The Contractor shall furnish all valves, gates, valve operating units, stem extensions, operators and other accessories as shown or specified. All valves and gates shall be new and of current manufacture. All non-buried valves, 6-inch and larger, shall have operators with position indicators. Where buried, these valves shall be provided with valve boxes, covers and valve extensions. Valves mounted higher than 6-feet above working level shall be provided with chain operators. All valves shall have a minimum design pressure rating of 150 psi unless otherwise specified elsewhere herein.

B. Cast iron parts of valves shall meet the requirements of ASTM A126, "Standard Specifications for Gray Iron Castings for Valves, Flanges and Pipe Fittings, Class 'B'." Flanged ends shall be flat-faced and have bolt circle and bolt patterns conforming to ANSI B16.1 Class 125.

C. All castings shall be clean and sound, without defects of any kind and no plugging, welding or repairing of defects will be permitted. All bolt heads and nuts shall be hexagonal conforming to ANSI B18.2. Gaskets shall be full-face and made of synthetic elastomers in conformance with ANSI B16.21 suitable for the service characteristics, especially chemical compatibility and temperature.

Non-ferrous alloys of various types shall be used for parts of valves as specified.

D. All buried valves and other valves located below a concrete operating deck or level, specified or noted to be key operated, shall have an operator to finish grade or deck level, non-rising stem, a 2-inch square AWWA nut with skirt, and cover or box and cover, as may be required.

E. Gate valve stems shall be of bronze in accordance with AWWA C515, containing not more than 5 percent of zinc nor more than 2 percent of aluminum.

F. Except where otherwise specified, ferrous surfaces, exclusive of stainless steel surfaces, in the fluid passages of all valves 4-inch and larger shall receive an epoxy coating in accordance with AWWA C550. Flange faces of valves shall not be epoxy coated. The valve manufacturer shall certify in writing that such coating has been applied and tested in the manufacturing plant prior to shipment, in accordance with these Specifications.

2.02 VALVE OPERATORS

A. General

1. All butterfly valves, plug valves over 8-inch size and gate valves installed horizontally shall be furnished with geared operators, provided by the manufacturer. All valves of a particular size and pressure rating by a given manufacturer shall be supplied with the same operator. No variation will be permitted during the contract. All valve operators, regardless of type, shall be installed, adjusted, and tested by the valve manufacturer at the manufacturing plant.

2. All operators shall turn counter-clockwise to open. Operators shall have the open direction clearly and permanently marked. Field adjustment and testing of the operators and valves to ensure proper installation and operation shall be the responsibility of the Contractor.

B. Manual Operators

1. All manual operators shall be equipped with AWWA square nuts, handwheels or chain drives as appropriate. Valves mounted higher than 6 feet above floor or operating level shall have chain operators with chain

terminating 4 feet above operating level.

2. Operation of valves and gates shall be designed so that the effort required to operate the handwheel, lever or chain shall not exceed 40 pounds applied at the extremity of the wheel or lever. The handwheels on valves 14 inches and smaller shall not be less than 8 inches in diameter, and on valves larger than 14 inches the handwheel shall not be less than 12 inches in diameter.

3. Chainwheel operator shall be fabricated of malleable iron with pocketed type chainwheels with chain guards and guides. Chainwheel operators shall be marked with an arrow and the word "open" indicating direction to open. The operators shall have galvanized smooth welded link type chain. Chain that is crimped or has links with exposed ends is not acceptable.

PART 3 EXECUTION

3.01 INSTALLATION

A. All work shall be performed by skilled workmen experienced in similar installations. All valves shall be adequately supported by clamps, brackets, straps, concrete supports or other devices as shown or specified. All supports shall be secured to structures by approved inserts or expansion shields and bolts.

B. Install valves as recommended by manufacturer.

C. Install valves so that they are easily accessible for operation, visual inspection and preventive maintenance.

D. Install valves to be accessible for operation and free from interferences when operated. Position so that leakage will not contact any electrical equipment that may be located below.

E. The installation of all underground valves shall include a valve box and riser in accordance with the Details shown on the Plans or in the Standard Details for the various sizes and types of valves to be installed. Riser pipes and valve boxes shall be carefully centered and set flush with the finished grade if in paving, or with the top of the ground if out of paved areas. All valve boxes shall be held in position

with concrete as shown on the Plans or in the Standard Details.

END OF SECTION

SECTION 15115

CHECK VALVES

PART 1 GENERAL

1.01 SCOPE OF WORK

A. The Contractor shall furnish and install check valves complete and operable, including all appurtenances and accessories.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 15100 - Valves, General

PART 2 PRODUCTS

2.01 CHECK VALVE

A. General

1. The swing-check valves shall be standard (plain), outside lever-and-weight or outside lever-and-spring types, for normal horizontal installations, conforming to all of the applicable requirements of the most current ANSI/AWWA Standard C508, "Swing-Check Valves for Waterworks Service, 2-in. through 24 in. NPS". The valves shall be iron body, bronze mounted and suitable for buried service.

2. Valve bonnet opening shall be large enough to allow ample clearance for direct removal of disc by hand.

B. External Ferrous Items

1. All external ferrous items, except cast iron, shall be hot-dipped galvanized in accordance with the most current ANSI/ASTM Standard A123, "Zinc (Hot-Galvanized) Coatings on Iron and Steel Products", or ANSI/ASTM Standard A153, "Zinc Coating (Hot-Dip) on Iron and Steel Hardware", or stainless steel.

C. Flanged Valves

1. Flanged valves shall have ends plain-faced and drilled conforming to ANSI Standard B16.1, "Cast Iron Pipe Flanges and Flanged Fittings", Class 125. Bolt holes in the flanges shall be equally spaced and shall straddle the vertical and horizontal centerline. All joint materials for flanged valves will be furnished with the valves; neoprene for sewer and SBR for water applications.

D. Clapper

1. The clapper shall swing clear of the waterway when the valve opens, permitting a full flow through the valve equal to the nominal diameter of the pipe.

2. The body and clapper seating surface shall be metal to metal and shall be bronze.

3. The clapper disc and the clapper hinge arm, including the clapper disc cap screw, shall be bronze or cast iron. Clapper to hinge arm connection shall be such that the unit cannot be unscrewed by fluid flow.

E. Clapper Hinge Pin

1. The clapper hinge pin (shaft) shall be stainless steel conforming to AISI Type 316. For check valves with outside levers, the clapper hinge pin shall rest in bronze bushings and shall extend through the casing on the right-hand side when facing the valve inlet.

2. The clapper hinge pins shall rest in bronze bushings provided with a compression packing or double nitrile O-ring seal and shall extend through the casing on the right-hand side when facing the valve inlet. An opening shall be provided in each of two bosses on the body for easy access to either end of the hinge pin. The openings shall be tapped and provided with plugs.

2.02 TESTING

A. All check valves shall be tested at the factory in accordance with Section 5.2 of the most current ANSI/AWWA Standard C508 and a Certified Test Report shall be furnished with each valve.

PART 3 EXECUTION

3.01 GENERAL

A. All valves shall be installed in accordance with provisions of Section 15100, "Valves, General." Care shall be taken that all valves are well supported.

END OF SECTION

SECTION 15125

PLUG VALVES

PART 1 GENERAL

1.01 SCOPE

A. The Contractor shall furnish and install plug valves, complete and operable, as shown and specified herein, appurtenances, operators, and accessories.

1.02 RELATED WORK SPECIFIED ELSEWHERE

A. Section 15100, "Valves, General"

1.03 QUALITY ASSURANCE

A. The plug valve manufacturer shall have a line of parts available to support the plug valve furnished to the Village. Manufacturers with a history of unsatisfactory performance or discontinuing spare parts shall be disapproved.

PART 2 PRODUCTS

2.01 PLUG VALVE

A. The plug valves shall be of the non-lubricated eccentric type, with resilient faced plugs, and shall be designed for a minimum working water pressure of at least 150 psi for valves through 36-inch. Plug valves located at the discharge end of a pump station shall have a 100 percent port area. Plug valve 6-inch and smaller with an 80 percent minimum port area are acceptable only at locations away from lift stations. Plug valves 8-inch and larger shall be full opening with 100 percent port area. Plug valves, 8-inch and smaller shall be designed for operation in a horizontal pipeline with the valve shaft in a vertical position. Plug valves larger than 8-inch shall be designed for operation in a horizontal pipeline, with the valve shaft in a horizontal position and the operating shaft in a vertical position. The plug valves shall be as manufactured by DeZurik, Inc. or approved equal, and shall be the standard product of a manufacturer which has produced and sold such equipment for a period of at least five (5) years. Valves shall be suitable for

buried, submerged service.

B. Flanged valves shall have ends plain-faced and drilled conforming to ANSI Standard B16.1, "Cast Iron Pipe Flanges and Flanged Fittings", Class 125. Bolt holes in the flanges shall be equally spaced and shall straddle the vertical and horizontal centerlines. All joint materials for flanged valves will be furnished by others.

C. Mechanical joint valves shall have ends complying with ANSI/AWWA Standard C111/A21.11. "Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings". Mechanical joint gaskets, glands, tee-head bolts and hex nuts shall be included with the valve. Segmented glands or follower glands held in place by set screws will not be acceptable. Bolt holes in flanges of the mechanical joint shall be equally spaced and shall straddle the vertical centerline. Gaskets shall be shipped separately in suitable protective containers. Valves shall have neoprene gaskets.

D. Plug valve body and plug shall be cast iron conforming to the requirements of ASTM Standard A126, “Gray Iron Castings for Valves, Flanges and Pipe Fittings”, Class B, and all nuts, bolts, springs, washers, and similar component items exposed to the operating fluid shall be AISI Type 316 stainless steel. Resilient plug facing shall be of neoprene.

E. Plug valves shall be furnished with a corrosion-resistant seat consisting of a welded-in overlay of high nickel content on all surfaces contacting the plug face and shall comply with ANSI/AWWA Standard C507, "Ball Valves, 6 In. Through 48 In. (150 mm Through 1200 mm)", Section 3.2.

F. Plug valves shall be furnished with replaceable, sleeve-type AISI Type 316 stainless steel bearings in the upper and lower journals, and shall comply with ANSI/AWWA Standard C507, Section 3.2.

G. Plug valve shaft seals shall be designed for replaceable, manually adjustable, multiple ring "V" or "U" type packing of Buna-N or neoprene. The valves shall be of the bolted-bonnet type and shall comply with ANSI/AWWA Standard C507.

H. Plug valves shall have stops at the fully-opened and fully-closed positions.

I. Plug valves shall be designed for drip-tight shut-off in wet service applications at

pressure differentials up the full rating of the valve with pressure in either direction. Plug valves shall be provided with a manual operator sized to suit the maximum differential pressure across the valves.

J. Manufacturer shall supply operators producing larger output torque values if so required by their valves, but in no case shall operator output torque be less than that shown for the particular valve size and pressure.

K. In addition, the operator shall be capable of withstanding an input torque of 300 ft.lbs. on the operating nuts or a pull of 200 pounds on the handwheel without damage to operator components between the input and the stops.

L. All external ferrous items, except cast iron, shall be hot-dipped galvanized in accordance with ASTM Standard A123, "Zinc (Hot-Galvanized) Coatings on Iron and Steel Products", or ASTM Standard A153, "Zinc Coating (Hot-Dip) on Iron and Steel Hardware", or stainless steel.

M. Manual operators for valves 8-inch and smaller shall be lever actuated unless otherwise specified elsewhere herein.

N. Manual operators for valves 10-inch to 24-inch shall be totally enclosed worm gear type, permanently lubricated, suitable for buried and/or submerged conditions.

O. Manual operators shall be provided with completely enclosed mounting brackets or adapters. The operators shall be equipped with adjustable stops to prevent overtravel in both the open and closed position with standard 2-inch square operating nuts with skirts as listed elsewhere herein, or with handwheel if for above ground service. All plug valves shall open by turning the operating nut or handwheel counterclockwise. Orient operators with horizontal plug shafts such that the plug rotates upward upon opening.

P. The exterior valve surfaces shall be shop painted with two coats of asphalt varnish conforming to Federal Specifications TT-C-434A.

Q. Testing: Plug valves shall be tested in accordance with ANSI/AWWA C504, “AWWA Standard for Rubber-Seated Butterfly Valves”, Section 5, Subsection 5.2. The manufacturer shall furnish a certified test report with every valve stating that the valve has met the requirements of the tests.

PART 3 EXECUTION

3.01 GENERAL

A. All valves must be well supported.

B. The Contractor shall install valves with seats on the downstream side and unless shown otherwise, set valve (above 8-inch size) with the main axis of the plug horizontal.

C. Inspect a valve fully open and then tightly closed and test the various nuts and bolts for tightness before installation. Take special care to prevent any foreign matter from becoming lodged in or on the valve seat. Any valve that does not operate correctly shall be removed and replaced.

D. The installation of a buried eccentric plug valves shall include the installation of a concrete bearing pad and a ductile iron riser pipe, complete with valve box and cover, set in concrete. The valve operator shall be installed with the AWWA standard 2-in square operating nut supplied by the valve manufacturer.

END OF SECTION

SECTION 16050

ELECTRICAL

PART 1 GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required for a complete electrical system at the North Bay Wastewater Pump Station Improvements located in Miami-Dade County, Florida, as hereinafter specified and shown on the Drawings.

B. The work, apparatus and materials which shall be furnished under these Specifications and accompanying Drawings shall include all items listed hereinafter and/or shown on the Drawings. Certain equipment which will require wiring thereto and/or complete installation is indicated. All materials necessary for the complete installation shall be furnished and installed by the CONTRACTOR to provide complete power, lighting, instrumentation, wiring and control systems as indicated on the Drawings and/or as specified herein.

C. The CONTRACTOR shall furnish and install the necessary cables, protective devices, conductors, supports, raceways, exterior electrical system, etc., to serve lighting loads and miscellaneous electrical loads as indicated on the Drawings and/or as specified. The CONTRACTOR shall install any control panel or instrumentation/control device provided under this or any other sections on the specifications.

D. The work shall include complete testing of all equipment and wiring at the completion of the work and making any minor connection changes or adjustments necessary for the proper functioning of the system and equipment. All workmanship shall be of the highest quality; sub-standard work will be rejected.

E. For process instrumentation, furnish and install all conduit, wire and interconnections between primary elements, local indicators and receivers.

F. Each bidder or his authorized representatives shall, before preparing his proposal, visit all areas of the existing sites and structures in which work under this Section

is to be performed and inspect carefully the present installation. The submission of the proposal by this bidder shall be considered evidence that he or his representative has visited the existing site and noted the locations and conditions under which the work will be performed and that he takes full responsibility for a complete knowledge of all factors governing his work.

G. It is the intent of these Specifications that the electrical system shall be suitable in every way for the service required. All material and all work which may be reasonably implied as being incidental to the work of this Section shall be furnished at no extra cost.

1.02 SERVICE AND METERING

A. Permanent electrical power will be provided by Florida Power & Light at the voltages indicated on the drawings.

B. The CONTRACTOR shall furnish and install the secondary conduit and wire from the service transformer to the FPL meter at each station. The CONTRACTOR shall confirm the distance from the FPL service transformer to the FPL meter.

C. The CONTRACTOR is responsible for the service installation and coordination associated with providing electrical service to each pump station site. The CONTRACTOR shall be responsible for all FPL charges. The FPL Contact is Isabella Arcos (786) 719-0535. Isabella.arcos@fpl.com. Provide a total FPL electrical service allowance of $30,000 for all FPL services as noted below for each station:

- $10,000 for Hispanola
- $10.000 for the Main Pump Station
- $10,000 for South Treasure

1.03 CODES, INSPECTION AND FEES

A. All material and installation shall be in accordance with the latest edition of the National Electrical Code and all applicable national, local and state codes, laws and ordinances.

B. Pay all fees required for permits and inspections.

1.04 TESTS

A. Test all systems and repair or replace all defective work. Make all necessary adjustments to the systems and instruct OWNER's personnel in the proper operation of the systems.

B. The following minimum tests and checks shall be made prior to the energizing of electrical equipment. Test shall be by the CONTRACTOR and a certified test report shall be submitted providing all test results and stating that the equipment meets and operates in accordance with the Manufacturer's and job specifications, and that equipment and installation conforms to all applicable Standards and Specifications:

1. Testing of protective relays for calibration and proper operation.

2. Test all service and motor conductor 600 volt wire insulation with a megohm meter after installation. Make tests at not less than 1000 volts. Submit a written test report of the results to the engineer.

3. Mechanical inspection of all circuit breakers to assure proper operation.

C. The Engineer shall be notified forty-eight (48) hours before tests are made to enable the Owner to have designated personnel present.

1.05 SLEEVES AND FORMS FOR OPENINGS

A. Provide and place all sleeves for conduits penetrating slabs, floors, walls, partitions, etc. Locate all necessary slots for electrical work and form before concrete is poured. Include all conduits shown as future.

1.06 CUTTING AND PATCHING

A. All cutting and patching shall be done in a thoroughly workmanlike manner. Restore all areas where work is performed to like new condition.

1.07 INTERPRETATION OF DRAWINGS

A. The Drawings are not intended to show exact locations of conduit runs.

B. All three-phase circuits shall be run in separate conduits unless otherwise shown on the Drawings.

C. Unless otherwise approved by the Engineer, conduit shown exposed shall be installed exposed; conduit shown concealed shall be installed concealed.

D. Where circuits are shown as "home-runs," all necessary fittings and boxes shall be provided for a complete raceway installation.

E. The CONTRACTOR shall harmonize the work of the different trades so that interferences between conduits, piping, equipment, civil, and mechanical work will be avoided. All necessary offsets shall be furnished so as to take up a minimum space and all such offsets, fittings, etc., required to accomplish this shall be furnished and installed by the CONTRACTOR without additional expense to the Owner. In case interference develops, the Owner's authorized representative is to decide which equipment, piping, etc., must be relocated, regardless of which was installed first.

F. Verify with the Engineer the exact locations and mounting heights of lighting fixtures, switches and receptacles prior to installation.

G. The locations of equipment, fixtures, outlets, and similar devices shown on the Drawings are approximate only. Exact locations shall be as approved by the Engineer during construction. Obtain in the field all information relevant to the placing of electrical work and in case of any interference with other work, proceed as directed by the Engineer and furnish all labor and materials necessary to complete the work in an approved manner.

H. Surface mounted panel boxes, junction boxes, conduit, etc., shall be supported by spacers to provide a clearance between wall and equipment.

I. Circuit layouts shown are not intended to show the number of fittings, or other installation details. Furnish all labor and materials necessary to install and place in satisfactory operation all power, lighting, and other electrical systems shown. Additional circuits shall be installed wherever needed to conform to the specific requirements of the equipment.

J. The ratings of motors and other electrically operated devices together with the size shown for their branch circuit conductors and conduits are approximate only

and are indicative of the probable power requirements insofar as they can be determined in advance of the purchase of equipment.

K. All connections to equipment shall be made as shown, specified and directed and in accordance with the approved shop drawings, regardless of the number of conductors shown on the Electrical Drawings.

1.08 SIZE OF EQUIPMENT

A. The equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the Manufacturer shall be required to brace the equipment suitably, to insure that the tilting does not impair the functional integrity of the equipment.

1.09 RECORD DRAWINGS

A. As the work progresses, legibly record all field changes on a set of project Contract Drawings. When the project is complete, furnish a complete set of reproducible "As-built" drawings and electronic AutoCAD 2015 files for the Project Record Documents.

1.10 COMPONENT INTERCONNECTIONS

A. Component equipment furnished under this Specification will not be furnished as integrated systems.

B. Analyze all systems components and their shop drawings; identify all terminals and prepare drawings or wiring tables necessary for component interconnection.

C. Terminate all power cables per approved shop drawings. SYSTEM SUPPLIER to terminate all control cables per approved shop drawings.

1.11 SHOP DRAWINGS

A. As specified under other Sections, shop drawings shall be submitted for approval for all materials, equipment, apparatus, and other items as required by the Engineer.

B. Shop drawings, including manufacturer's name and product designation and catalog cutsheets, shall be submitted for the following equipment:

1. Macerator Control Panel
2. Pump Station Control Panel (PSCP)
3. Fused Disconnect
4. Meter Can
5. Electrical Equipment racks with Structural Engineering Certification
6. Surge protection devices
7. Boxes and Fittings
8. Wire & cable
9. Conduit
10. Conduit layout drawings
11. Ground Test Reports
12. Pumps, Pump motors and cables

C. Prior to submittal by the CONTRACTOR, all shop drawings shall be checked for accuracy and contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement that the shop drawings have been examined for conformity to Specifications and Drawings. This statement shall also list all discrepancies with the Specifications and Drawings. Shop drawings not so checked and noted shall be returned.

D. The Engineer's check shall be only for conformance with the design concept of the project and compliance with the Specifications and Drawings. The responsibility of, or the necessity of, furnishing materials and workmanship required by the Specifications and Drawings which may not be indicated on the shop drawings is included under the work of this Section.

E. The responsibility for all dimensions to be confirmed and correlated at the job site and for coordination of this work with the work of all other trades is also included under the work of this Section.

F. No material shall be ordered or shop work started until the Engineer's approval of shop drawings has been given.

1.10 Conduit Layout Drawings

A. In addition to the manufacturer's equipment shop drawings, the Contractor shall submit for the approval, electrical installation working drawings for the overall site containing the following:

1. Concealed and buried conduit layouts shown on floor plans drawn at not less than 1/4-inch = 1-foot-0-inch scale. The layouts shall include locations of process equipment, control panels, transformers, panelboards and equipment, motors, switches, motor starters, large junction or pull boxes, instruments, and any other electrical devices connected to concealed or buried conduits.

2. Plans shall be drawn on high quality reproducible, bond paper, size 34-inch x 22-inch, and shall be presented in a neat, professional manner.

3. Concrete floors and/or walls containing concealed conduits shall not be poured until conduit layouts are approved.

4. Site plan conduit layout drawings shall be at 1" = 10'-0".

Note: ACAD drawing files are available from the Engineer.

1.11 Demolition

A. Remove all electrical work associated with equipment shown to be removed (TBR) except those portions indicated to remain or be reused. Remove all unused exposed conduit and wiring back to point of concealment. Remove unused wiring in concealed conduits back to source (or nearest point of usage). Electrical work to be removed corresponds to the associated mechanical equipment to be removed.

B. Where electrical systems pass through the demolition areas to serve other portions of the premises, they shall remain or shall be suitably relocated and the system restored to normal operation. Coordinate outages in systems with the Owner. Where duration of proposed outage cannot be allowed by the Owner, provide temporary connections as required to maintain service.

C. All removals and relocations of existing installations cannot be completely detailed on the Drawings. Survey the site before submitting bid proposal.

D. Continuous service is required on all circuits and outlets affected by these changes, except where the Owner will permit outage for a specific time. Obtain Owner's written consent before removing any circuit from continuous service.

E. Where required to disconnect and/or remove any part of an existing circuit, reconnect that circuit to reestablish service in the remaining portion.

F. Remove exposed conduits, wireways, outlet boxes, pull boxes and hangers made obsolete by the alternations, unless specifically designated to remain. Exposed conduits shall be removed back to point of concealment, where they shall be cut and threaded for a cap. A threaded cap shall then be installed. Conduits may be removed back to first coupling if within 3-inches of point of concealment. Cut back in traffic areas to the floor level and patch.

G. Repair all walls to “Like new” condition and paint to match existing wall color.

1.12 Disposition of Removed Materials and Equipment

A. In general, it is intended that all materials and equipment indicated to be removed and returned to the OWNER by the CONTRACTOR shall, upon removal, remain the OWNER’s property, unless otherwise directed by the OWNER.

B. In general, it is intended that all materials and equipment indicated to be removed and disposed of by the CONTRACTOR shall, upon removal, become the CONTRACTOR's property and shall be disposed of off the site by the CONTRACTOR, unless otherwise directed by the OWNER.

C. Reuse of wire will not be permitted. An exception is the reuse or relocation when wire is part of an existing lighting branch circuit and reuse or relocation is specifically designated and can be accomplished without removing and re-pulling the wire.

D. All reusable and salvageable disconnect switches, starters, control devices, control panels and instruments, receptacles, etc. shall be sorted and returned to the OWNER.

E. All electrical equipment to be salvaged shall be removed and shall be moved by the CONTRACTOR to a location on the site for storage as directed by the OWNER.

1.13 Warranty

A. Provide a warranty for all the electrical equipment in accordance with the requirements of other sections. Under no circumstances shall the warranty be for less than one year starting from substantial completion.

PART 2 PRODUCTS

2.01 GENERAL

A. The materials used in all systems shall be new, unused and as hereinafter specified. All materials where not specified shall be of the very best of their respective kinds. Samples of materials or Manufacturer's specifications shall be submitted for approval as required by the Engineer.

B. Materials and equipment used shall be Underwriters Laboratories, Inc. listed and conform with applicable standards of NEMA and ANSI.

C. Electrical equipment shall, at all times during construction, be adequately protected against mechanical injury or damage by water. Electrical equipment shall not be stored out-of-doors. Electrical equipment shall be stored in dry permanent shelters. If any apparatus has been damaged, such damage shall be repaired by the CONTRACTOR at his expense. If any apparatus has been subject to possible injury by water, it shall be thoroughly dried out and put through such special tests as directed by the Engineer, at the cost and expense of the CONTRACTOR, or shall be replaced by the CONTRACTOR at his own expense.

D. All electrical panels, enclosures, raceways, conduits, wireways, boxes, cabinets, etc., shall be fabricated of metal. Nonmetallic substitutes are not acceptable. This does not apply to buried work.

2.02 RACEWAYS AND FITTINGS

A. All above ground power and control conduits shall be aluminum, unless otherwise noted below or on the electrical drawings.

B. All conduits between the wetwell and macerator starter panel and all conduits between the wetwell and PSCP shall be PVC coated GRS conduit.

1. All tools, (benders, threading machines, etc.) used with PVC coated conduit shall be designed and approved by the conduit manufacturer for use with

PVC coated conduit.

2. Tools shall not damage the PVC coating of the conduit. No patching of damaged PVC coated conduit will be permitted.

3. Any damaged conduit shall be removed and replaced without exception. Strap wrenches shall be used for tightening PVC coated conduits. Pipe wrenches, channel locks, chain wrenches, pliers, etc. shall not be used.

C. All other below grade conduits shall be schedule 80 PVC.

D. Conduit fitting material and coating shall match corresponding conduit specification.

E. Where metallic conduit is cut, the inside edge shall be reamed smooth to prevent injury to conductors.

2.03 CONDUCTORS

A. Wire for lighting and receptacle circuits above grade shall be type THWN-2.

B. Wire for all power motor circuits and below grade lighting and receptacle circuits shall be type XHHW-2, stranded.

C. Single conductor wire for control, indication and metering shall be type MTW No. 14 AWG, 19 stranded.

D. Multi-conductor control cable shall be No. 14 AWG, 19 strand.

E. Wire for process instrumentation or shielded control cable shall be No. 16 AWG, shielded and stranded.

PART 3 EXECUTION

3.01 CONDUIT INSTALLATION

A. Where conduits enter or leave all outlet boxes, cabinets safety switches, tap boxes, motor controllers, etc., other than those having threaded hubs, a standard lock nut shall be used on the outside of the box. Busings 1-inch and larger shall

be of an approved insulated type. Unless otherwise indicated, conduit 2-inches and larger shall be supported at intervals not exceeding six (6) feet and for smaller sizes at intervals not exceeding four (4) feet.

B. During construction, all installed raceways shall be temporarily plugged or otherwise protected from the entrance of moisture, dirt, trash, plaster, moisture, etc., through neglect of the CONTRACTOR to so protect them, shall be replaced by the CONTRACTOR without additional expense to the Owner. No kinked, clogged or deformed raceways will be permitted on the job. Raceways shall be cut to proper length so that ends will fit accurately in the outlets.

C. Size of raceway shall not be less than NEC requirements, but in no case shall be less than indicated on the Drawings. Combining of circuits, other than detailed, will not be permitted. The CONTRACTOR shall install larger size raceways than detailed where there is excessive length of unbroken run or excessive number of bends.

D. Bends in metallic raceways shall be made while "cold" and in no case shall the raceways be heated. Raceways shall not be bent through more than 90 degrees. The radius of bends shall not be less than six (6) times the internal diameter of the raceway. Not more than four (4) (equivalent 90 degree) bends will be permitted between outlets, the bends at the outlets being counted.

E. Raceways shall be properly aligned, grouped and supported. Exposed raceways shall be installed at the right angles to or parallel to the principal structural members. Concealed raceways, unless otherwise indicated, may take the most direct route between outlets. Raceways shall be firmly held in place. Raceways shall run to avoid trapping wherever possible. Where areas are indicated for future openings, foundations, etc., all raceways shall be run around such areas. The CONTRACTOR shall provide necessary inserts in poured concrete areas and shall furnish and install all necessary sleeves through walls, floors and roofs for passage of raceways. Sleeves through roofs and/or exterior walls shall be properly sealed by the CONTRACTOR against entrance of moisture, etc., into the building. Where necessary repairs to the building structure using material in no way inferior to that originally installed and using labor skilled in the trades involved.

F. Contractor shall provide 4” high concrete housekeeping pads around all conduits installed outdoors above grade.

3.02 BOXES

A. All boxes shall be 304 stainless steel. Install all outlet boxes, tap, junction or pull boxes, device boxes, etc., necessary for the complete installation as indicated on the Drawing and/or specified herein. All boxes shall be rigidly mounted and shall be equipped with suitable screw fastened covers. Where necessary for boxes to be supported away from the ceiling, structural steel members shall be provided for supports. All raceways entering boxes shall be mechanically and electrically secure. Open knockouts or holes in boxes shall be plugged with suitable blanking devices. Boxes shall be cleared of all plaster, dirt, trash, etc., before the installation of any wiring devices and/or before the installation of cover plates.

3.03 CONDUCTORS

A. Splices, taps and attachments of fittings and lugs shall be electrically and mechanically secure. Splices shall be compression type with heat shrink weatherproof boot. There shall be plenty of slack cable in boxes, outlets and cabinets to insure that there is no binding at the bushings. All lugs shall be of the correct sizes for the conductor in order to fit the conductor into a lug.

3.04 GROUNDING

A. The entire electrical system shall be completely and effectively grounded as required by the NEC and as specified hereinafter.

B. The CONTRACTOR shall test the ground resistance of the system by 3 point method fall of potential.

C. All metallic raceways shall be mechanically and electrically secure at all joints and at all boxes, cabinets, fittings and equipment. Metallic raceways entering the control panels or other electrical boxes shall be grounded to the appropriate ground bus. All metallic raceways shall be electrically continuous throughout the entire conduit system. Bond wires shall be used in exterior concrete pull boxes.

D. The ground plane shall consist of a minimum of three (3) - 5/8" x 20' copper ground rods spaced at a minimum distance of 10 feet apart. Rods and system ground shall be connected with a #2 bare copper ground to the service entrance

ground. The ground resistance shall be tested and additional rods or plates added to achieve a dry season resistance not exceeding 5 ohms.

3.05 CONDUCTOR COLOR CODING

A. All conductors shall be color coded as specified hereinafter. Color coding shall be by means of colored insulation material, colored braid or jacket over the insulation, or by means of suitable colored permanent, non-aging insulation tape equal to Scotch #471 or "Texcel 98" applied to conductors at each outlet, cabinet or junction point.

B. The following system of color coding shall be strictly adhered to:

1. Ground leads, green.

2. Grounded neutral leads, white.

3. Ungrounded phase wires of a wye connected 277/480-volt, 3-phase, 4-wire system shall be brown, purple, yellow and gray for the grounded conductor.

4. All control leads, other than line connected "hot" leads, shall be yellow, orange and brown and/or I.P.C.E.A. standard control cable coding provided method of identification is different from method used on power conductors.

C. The color coding assigned to each phase wire shall be consistently followed throughout the Work.

3.06 PAINTING

A. Painting shall be as specified in Division 9 and as shown on the Drawings except that all exposed raceways, fitting, boxes, supports, panelboards, etc., shall be prepared for painting by removing therefrom all oil, grease, dirt, etc. The CONTRACTOR shall employ the necessary precautionary methods to prevent painting over of obscuring any nameplate, designation, etc., on all electrical apparatus and devices.

B. The painting of motor controllers, pushbuttons, transformers, and similar electrical apparatus shall be limited to touching-up any surface scratched or

marred during shipment or erection. The materials used shall match exactly the surfaces being touched up.

3.07 SUPPORTS

A. The CONTRACTOR shall furnish and install all necessary supports for properly mounting all electrical equipment and raceways. Such supports shall be fabricated and installed in a neat manner, and care shall be taken so that no portion of the service rack structure is overloaded. Should the service rack structure sustain damage through carelessness or through failure of the CONTRACTOR to properly support and install the electrical equipment, the CONTRACTOR shall bear all costs involved in replacing such installation.

B. All steel shapes exposed to the weather shall be galvanized after all cutting, drilling, or welding is done. All shop connections shall be welded or riveted and all field connections shall be bolted on all outdoor structures. Where the field cutting or drilling of galvanized steel is necessary, the CONTRACTOR shall apply one (1) coat of priming paint and one (1) finish coat of aluminum and oil paint.

3.08 TESTS AND CHECKS

A. The following minimum tests and checks shall be made after the assembly of the motor control centers, but prior to the termination of any field wiring.

1. Megger terminals and buses after disconnecting devices sensitive to megger voltage.

2. A 1,000V DC megger shall be used for these tests.

3. The first test shall be made with main circuit breaker closed and all remaining breakers open. A second test shall be made with all circuit breakers closed.

4. The test results shall be recorded and forwarded to the Engineer for his review. Minimum megger readings shall be 100 megohms in both tests.

B. The following shall be done before energizing any control panel.

1. Remove all current transformer shunts after completing the secondary circuit.

2. Install overload relay heaters based on actual motor nameplate current. If capacitors are installed between starter and motor, use overload relay heaters based on measured motor current.

3. Check all mechanical interlocks for proper operation and vacuum clean all interior equipment.

END OF SECTION

SECTION 16216

TRAILER MOUNTED DIESEL ENGINE DRIVEN GENERATORS

PART 1 - GENERAL

1.01 SCOPE OF WORK

A. Furnish all labor, materials, equipment and incidentals required and install, put into operation, and field test 4 trailer mounted portable diesel engine driven generator units and appurtenances for North Bay Village as specified herein. Each trailer mounted unit shall be dedicated to its own pumping station and provided with a permanent label for each station as noted below:

1. Main Pump Station
2. Hispanola Pump Station
3. Village Hall Pump Station
4. Treasure Hall Pump Station

B. These Specifications are intended to give a general description of what is required, but do not cover all details which will vary in accordance with the requirements of the equipment as offered. It is, however, intended to cover the furnishing, the shop testing, delivery, and field testing, of all materials, equipment and appurtenances for the complete units as herein specified, whether specifically mentioned in these Specifications or not.

C. There shall be furnished and installed all necessary and desirable accessory equipment and auxiliaries whether specifically mentioned in these Specifications or not. This installation shall incorporate the highest standards for the type of service. The Contractor is responsible for field testing of the entire installation and in instruction of the regular operating personnel in the care, operation and maintenance of all equipment.

D. The standby electric power system shall include the following:

1. Portable diesel engine driven electric sets to provide standby power.
2. An engine start-stop control system mounted on the electric set.
3. Trailer and weatherproof enclosure.
4. Accessories as specified.

1.02 DESCRIPTION OF SYSTEMS

A. The generator unit shall be trailer mounted and shall be arranged for manual starting and stopping.

B. The portable diesel engine driven generator set shall be of the latest commercial type and design. The unit shall include all standard accessories. Workmanship shall conform to modern practices and shall include static and dynamic balancing of rotating parts of the generator set. Only new and current model will be considered. The unit offered under these Specifications shall be covered by the manufacturer's standard warranty and shall meet the requirements of the Specifications set forth herein. Major exceptions to specifications will be considered sufficient cause for rejection of the machine.

1.03 QUALIFICATIONS

A. The engine-generator set shall be the standard product, as modified by these Specifications, of a manufacturer regularly engaged in the production of this type of equipment. The unit to be furnished shall be of proven ability and shall be designed, constructed, and installed in accordance with best practices and methods. To qualify as a manufacturer, the engine must be the principal item manufactured and the completed engine generator set shall be supplied by that manufacturer's authorized distributor only.

B. The generator manufacturer shall have a minimum of 30 years of manufacturing and producing generators in the U.S.

C. The unit shall be shipped to the jobsite by an authorized engine distributor having a parts and service facility within a 50 mile radius of the jobsite. In addition, and in order not to penalize the Owner for unnecessary or prolonged periods of time for service or repairs to the emergency system, the engine generator set supplier must have no less than eighty percent (80%) of all engine replacement parts locally available at all times. Certified proof of this requirement shall be furnished to the Engineer upon request.

D. All equipment furnished under this Specification shall be new, unused, and the standard product of a manufacturer having a successful record of manufacturing

and servicing the equipment and systems specified herein for a minimum of 30 years.

E. The Generator Units shall be as manufactured by Kohler, Caterpillar, Cummins, or FDDA.

1.04 SUBMITTALS

A. Submit to the Engineer for approval in seven (7) copies of complete sets of equipment drawings, schematics, and wiring diagrams which shall show details of installation and connections to the work of other Sections, and brochures covering each item of equipment.

B. In the event that it is impossible to conform with certain details of the Specifications due to different manufacturing techniques, describe completely all nonconforming aspects.

C. The submittal data for each unit shall include, but not necessarily be limited to the following:

1. Equipment drawings showing plan and elevations of the complete generator unit; exhaust silencer; starting battery; battery charger; fuel tank; and all other items.

2. Engine Data:

   a. Manufacturer
   b. Model
   c. Number of cylinders
   d. RPM
   e. Bore x stroke
   f. BMEP at full rated load
   g. Piston speed, FPM
   h. Make and model and descriptive literature of electric governor (where required)
   I. Fuel consumption rate curves at various loads
   j. Engine maximum continuous pump drive duty rating (w/fan) HP (See 2.01)

k. Gross engine horsepower to produce generator standby rating (including fan and all parasitic loads) HP

3. Generator Data:

a. Manufacturer
b. Model
c. Rated KVA
d. Rated kw
e. Voltage
f. Temperature rise above 40 degree C ambient

1) Stator by thermometer
2) Field by resistance
3) Class of insulation

7. Generator efficiency including excitation losses and at 80 percent power factor.

1) Full load
2) ¾ load
3) ½ load

4. Generator Unit Control Data:

a. Actual electrical diagrams including schematic diagrams, and interconnection wiring diagrams for all equipment to be provided.
b. Legends for all devices on all diagrams.
c. Sequence of operation explanations for all portions of all schematic wiring diagrams.

5. Generator Unit and Accessories:

a. Weight of skid mounted unit
b. Overall length
c. Overall width
d. Overall height
e. Exhaust pipe size
f. CFM of air required for combustion and ventilation

g. Heat rejected to jacket water and lubricating oil, BTU/hr.
h. Heat rejected to room by engine and generator, BTU/hr.

6. Optional System Service Contract:

a. Equipment Supplier Company
Name
Address
City/State
Phone Number

b. Attach the number of copies required of System Service Contract to submittal.

7. Furnish the number of copies required of the manufacturers certified shop test record of the complete engine driven generator unit.

1.05 OPERATING INSTRUCTIONS

A. Operating and maintenance manuals shall be furnished. 1 hard copy and 1 electronic copy is required. The manuals shall be prepared specifically for this installation and shall include all required cuts, drawings, equipment lists, descriptions, etc. that are required to instruct operation and maintenance personnel unfamiliar with such equipment.

B. A factory representative of the generator unit manufacturer, who has complete knowledge of proper operation and maintenance, shall be provided for one day per unit supplied to instruct representatives of the Owner and the Engineer on proper operation and maintenance. With the Owner's permission, this work may be conducted in conjunction with the inspection of the installation and test run as provided under PART 3 - EXECUTION. If there are difficulties in operation of the equipment due to the manufacturer's design or fabrication, additional service shall be provided at no cost to the Owner.

1.06 SPECIAL TOOLS AND SPARE PARTS

A. The manufacturer shall furnish two (2) complete spare replacement sets of all filter elements, belts and fuses required for each generator unit.

1.07 PRODUCT HANDLING

A. All parts shall be properly protected so that no damage or deterioration will occur during a prolonged delay from the time of shipment until installation is completed and the units and equipment are ready for operation.

B. All equipment and parts must be properly protected against any damage during a prolonged period at the site. Parts and components shall not be dismantled for shipment.

C. Factory assembled unless permission is received in writing from the Engineer.

D. Finished surface of all exposed openings (exhaust, etc.) shall be protected by wooden blanks, strongly built and securely bolted thereto.

E. Finished iron or steel surfaces not painted shall be properly protected to prevent rust and corrosion.

F. Proper care shall be taken to protect parts from the entrance of water during shipment, storage and handling.

1.08 WARRANTY

A. The generator unit and fuel tank shall be warranted for a period of 5 years by the contractor and the equipment manufacturers. The trailer shall be warranted for a period of 1 year. Warranty period shall commence at the time of final acceptance by the Owner and shall be for all parts and labor.

B. The equipment shall be warranted to be free from defects in workmanship, design and materials. If any part of the equipment should fail during the warranty period, it shall be replaced in the machine(s) and the unit(s) restored to service at no expense to the Owner.

C. The manufacturer's warranty period shall run concurrently with the Contractor's warranty period. No exception to this provision shall be allowed.

PART 2 - PRODUCTS

2.01 RATINGS

A. The rating of the generator set shall not exceed the manufacturer's published standby rating. The gross engine horsepower required to produce the standby rating shall not exceed the manufacturer's published continuous duty rating by more than 150 percent. Continuous duty rating shall be as defined in BS649 or DIN6270 but in no case shall it exceed the manufacturer's published continuous duty rating for the engine as used in continuous rated pump drive applications at 1800 rpm output speed. The gross engine horsepower described above shall include all parasitic demands such as generator inefficiencies, fuel pumps, water pumps, radiator fan and all accessories necessary to the unit's proper operation while operating at rated load and at a rotative speed not to exceed 1800 rpm.

B. The diesel engine driven generator set shall be capable of producing the specified standby kw rating for continuous electrical service during interruption of the normal utility source and shall be certified to this effect by the manufacturer for the actual unit supplied. The engine shall be a permanent magnetic generator.

C. The diesel electric sets shall be capable of producing a 0.8 power factor when operating at sea level and 100 feet. The generator shall be capable of the voltage connections and ratings as listed below for each station.

Hispanola Pump Station
The Diesel Engine/Generator Unit at for a minimum of 120KW (277/480 volts, 3-Phase, 60 Hertz) at 0.8 power factor with fan and shall be suitable for starting the following loads:

Step 1-5KVA of Miscellaneous and Lighting loads
Step 2-70HP submersible pump motor-Code H (VFD)

Main Pump Station
The Diesel Engine/Generator Unit at for a minimum of 145KW (277/480 volts, 3-Phase, 60 Hertz) at 0.8 power factor with fan and shall be suitable for starting the following loads:

Step 1-5KVA of Miscellaneous and Lighting loads
Step 2-90HP submersible pump motor-Code H (VFD)

South Treasure Drive Pump Station

The Diesel Engine/Generator Unit at for a minimum of 45KW (120/240-volts, 3-Phase, 60 Hertz) at 0.8 power factor with fan and shall be suitable for starting the following loads:

Step 1-5KVA of Miscellaneous and Lighting loads
Step 2-5HP submersible pump motor-Code H (across the line)
Step 3-5HP submersible pump motor-Code H (across the line)

Village Hall Pump Station
The Diesel Engine/Generator Unit at for a minimum of 145KW (277/480-volts, 3-Phase, 60 Hertz) at 0.8 power factor with fan and shall be suitable for starting the following loads:

Step 1-5KVA of Miscellaneous and Lighting loads
Step 2-90HP submersible pump motor-Code H (VFD)

2.02 ENGINES

A. The engine shall be Tier 4 Final EPA Certified for Nonroad applications, single acting, solid injection turbo charged water cooled, not less than four (4) cylinder, either vertical or "V" type. Speed shall not exceed 1800 revolutions per minute at normal full load operation. The engine electronic governor shall maintain frequency regulation not to exceed +/- .25 percent from no load to full rated load and shall have a Vernier control with positive locking mechanism for manual operation and adjustment.

B. The engine shall be capable of satisfactory performance on No. 2 fuel oil (ASTM Designation D396). Diesel engines requiring a premium fuel will not be considered.

C. The engine shall be capable of operating at light loads for extended periods of time and shall provide a means to reduce carbonization. Periodic cleaning of exhaust ports shall not be required.

D. The engine shall be equipped with fuel filters, lube oil filters, intake air filters, lube oil cooler, fuel pump, engine driven water pump, and unit mounted instruments. Unit mounted instruments shall include a start-stop switch, water temperature gauge, battery charge ammeter and lubrication oil pressure gauge. The engine shall

be provided with over crank, low oil pressure, high water temperature, low coolant level and overspeed safety shutdowns of the manual reset type.

E. Injection pumps and injection valves shall be a type not requiring adjustment in service and shall be of a design allowing quick replacement by ordinary mechanics without special diesel experience. The engines shall have an individual mechanical injection pump and injection valve for each cylinder, any one of which may be removed and replaced from parts stock. Fuel injection pumps shall be positive action, constant-stroke pumps, activated by a cam driven by gears from the engine crankshaft. Fuel lines between injection pumps and valves shall be of heavy seamless tubing.

F. The fuel system shall be equipped with fuel filters have replaceable elements. Filter elements shall be easily removable from their housing for replacing without breaking any fuel line connections, or disturbing the fuel pump, or any other part of the engine. All fuel filters shall be conveniently located in one accessible housing, ahead of the injection pumps so that the fuel will have been thoroughly filtered before it reaches the pump. No screens or filters requiring cleaning or replacement shall be used in the injection pump or injection valve assemblies. The engines shall be equipped with a built-in gear-type, engine-driven fuel transfer pump, capable of supplying fuel through the filters to the injection pump at constant pressure.

G. In addition to the standard fuel filters provided by the engine manufacturer, there shall also be installed a primary fuel filter and a water separator in the fuel inlet line to the engine.

H. The engine shall have a gear-type lubricating oil pump for supplying oil under pressure to main bearings, crank pin bearings, pistons, piston pins, timing gears, camshaft bearings, valve rocker mechanism and governor. Effective lubricating oil filters shall be provided and so located and connected that all oil being circulated is continuously filtered and cleaned. Filters shall be accessible, easily removed and cleaned and shall be equipped with a spring loaded by-pass valve as an insurance against stopping of lubricating oil circulation in the event the filters become clogged. The engine shall have a suitable water cooled lubricating oil cooler.

I. The engine shall be provided with one or more engine mounted dry type air cleaners with restriction indicators and with of sufficient capacity to protect effectively the working parts of the engine from dust and grit.

J. The engine shall be equipped with an electric motor starting system which shall include an engine-driven generator, regulator, batteries, and a float charger. Batteries shall be 12 volt, Exide or approved equal. The float charger is to be of the automatic SCR voltage regulated type with maximum charge rate as recommended by the manufacturer but not less than two (2) amperes shall be provided to maintain batteries at full capacity during standby conditions. An ampmeter shall indicate the charge rate and the circuit shall be protected by either fuses or circuit breakers. The charger shall be so designated that it will not be damaged during the engine cranking. The charger shall operate on 120 V.A.C., single (1) phase power and shall be permanently installed within the generator set weather protective enclosure. The battery charger shall be installed in the enclosure and shall be wired directly to the batteries via the 15-amp shore power connector in the customer connection panel. Thirty (30) feet of weatherproof cable shall be provided to allow charging of the batteries. The battery charging cable shall be connected at each end by weatherproof receptacle/plug combination. The battery charger cord shall be OSHA approved.

2.03 COOLING SYSTEMS

A. The engine shall be furnished with a unit mounted radiator-type cooling system having sufficient capacity for cooling the engine when the diesel generator set is delivering full rated load in an ambient temperature not to exceed 120 degrees F. The engine shall be provided with a thermostatic valve placed in the jacket water outlet, between the engine and the cooling source. This valve shall maintain the proper jacket water temperature under all load conditions.

B. Closed circuit jacket water systems shall be treated with a rust inhibitor as recommended by the engine manufacturer.

C. The engine shall have a 1500 watt, 120 V thermostatical, controlled immersion jacket heater. Thirty (30) feet weatherproof cable (3#10) shall be provided and connected to the generator and the source voltage via receptacle plug combinations and a weatherproof cable via the 15-amp shore power connector in the customer connection panel.

2.04 EXHAUST SYSTEMS

A. A suitable silencer for critical silencing applications shall be furnished and mounted inside the engine. Silencers shall be constructed with inlet and outlet, required

number of appropriate mounting brackets and 1/2-inch N.P.T. drain connection. Silencers shall be critical grade. All exhaust equipment must be rated to withstand temperatures of approximately 1,000 degrees F. A flexible stainless steel pipe connection shall be provided between the engine exhaust stack and exhaust piping. One silencer raincap with counter weight shall be provided for the unit. Provide insulation (lagging) the muffler installed within the weatherproof enclosure to protect the enclosure from radiant heat. All exhaust openings shall be suitably sealed to prevent rain from entering the enclosure.

2.05 GENERATOR

A. The generators shall be dual voltage heavy duty three-phase, 60 Hertz, ball bearing construction, rotating field, synchronous type built to NEMA standards. A voltage regulator shall be provided to match the characteristics of the generator and engine. Voltage regulation shall be $\pm$ .25% from no load to full rated load. Readily accessible voltage droop, voltage level and voltage gain controls shall be provided. Voltage level adjustment shall be a minimum of $\pm$ 5%. Generator and exciter shall be inherently capable of parallel operation with other power sources of equivalent electrical characteristics. The generator shall be a single bearing type, 4 pole revolving field, connected directly to the flywheel housing, brushless type, temperature rise not to exceed 130°C over a 40°C ambient when operating at its rated capacity as specified herein.

B. The generator shall be of open dripproof construction, self ventilated and air cooled. A single row ball bearing sized for a minimum of 40,000 hours and to be furnished with a grease fitting.

C. Other features shall include volts per Hertz regulator, TIF less than 50, provide 300 percent short circuit sustaining capability, suitable for external SCR controlled equipment, and a large terminal box with bus bar terminal strips for load lead connections.

2.06 GENERATOR AND ENGINE CONTROL PANEL

A. A generator mounted NEMA 1, #14 gauge steel control panel, shall be furnished for the engine and generator unit. The panel shall contain, but not be limited to, the following equipment:

1. Frequency Meter
2. Voltmeter

3. Ammeter
4. Ammeter phase selector switch.
5. Voltmeter selector switch (4 position) line-to-line.
6. Starting controls as specified.
7. Voltage level adjustment rheostat.
8. Panel light.
9. Individual fault indicator lights for low oil pressure, high water temperature, overspeed, low coolant level and overcrank.
10. Three position function switch marked "manual," "off/reset," and "stop."
11. Oil pressure and water temperature gauges.
12. Panel lights, transformers, fuses, etc., as required.
13. Provide the following circuit breaker protected convenience receptacles in addition to the receptacles required for the battery charger and jacket heater.
    a) 120V, 20 amp duplex.
    b) 240V, 30 amp twist lock

2.07 TRAILER AND ACCESSORIES

A. The generator set shall be mounted and fully housed on a factory fabricated trailer with hinged side panels.

B. The trailers for the 145KW and 120KW generators shall be the two axle and the trailer for the 45KW shall be single axle. Trailers shall be tandem type with the I.C.C. package and shall be of adequate size for the weight of the generator set, batteries, etc., and shall contain a double walled, fuel tank with mechanical fuel gauge and 3-way valve to allow connection of auxiliary fuel tank. The trailer shall be furnished with all standard accessories which shall include flat fenders welded to body, heavy duty jack stand with pneumatic tire for tongue, hydraulic surge brakes, retractable jacks for rear corners, 10 ply high speed tires, tail lights, stop lights, turn lights, license plate holder with light, safety chains with grab hooks, heavy duty bumper, side reflectors, and towing bar and ring with accessories necessary for attachment to the transporting vehicle. Storage tray capable of securely storing two 50' portable cables shall be provided.

C. 480-volt, 3-phase wye operation provide one (1) 200A, 4-pole, 4-wire camlock receptacles on the rear of the trailer connected to the load side of a 200A breaker with 200A conductors, including ground wire. This applies to the following Pump Station portable generators:
    1. Main Pump Station
    2. Hispanola Pump Station

3. Village Hall Pump Station

D. 480-volt, 3-phase operation, provide one (1) 4 conductor portable cable with a #2 ground. Cable shall be rated 200 amps and shall be provided with a 200A Crouse Hinds AP20468-S22 (Reverse Service) plug on each end and camlock plugs on the other end. The camlock plugs shall pair with the camlock receptacles that are provided on the generator. Each cable shall be a minimum of 50 feet in length. This applies to the following Pump Station portable generator cords:

1. Main Pump Station
2. Hispanola Pump Station
3. Village Hall Pump Station

D. 120/240-volt, 3-phase operation provide 200-amp, 4-pole, 4-wire camlock receptacles on the rear of the trailer connected to the load side of a 200A breaker with 200A conductors, including ground wire. This applies to the following Pump Station portable generators:

1. South Treasure Drive Pump Station

E. 120/240-volt, 3-phase operation, provide one (1) 4 conductor portable cable with a #2 ground. Cable shall be rated 200 amps and shall be provided with a 200A Russellstoll#JP2044FR (Reverse Service) plug on each end and 240-volt camlock plugs on the other end. The camlock plugs shall pair with the camlock receptacles that are provided on the generator. Each cable shall be a minimum of 50 feet in length. This applies to the following Pump Station portable generator cords:

1. South Treasure Drive

F. The trailer shall conform to all local, state, and federal highway and safety regulations.

G. The trailer hitch shall have a 2-5/l6-inch ball coupler with safety chain.

2.08 TRAILER MOUNTED WEATHERPROOF ENCLOSURE

A. The complete engine-generator set shall be enclosed in a modular weatherproof shelter. The shelter shall be constructed of removable side panels and end panels and shall be skid base. The weatherproof enclosure shall be sound attenuated (74

dBA @ 23 feet). Engine exhaust shall discharge and be redirected by duct work to exhaust vertically.

B. The top and end panels shall be made from galvanized steel, and the side panels from galvanized steel. The design of the enclosure shall prevent rodents from entering the unit. The unit shall have hinged side doors on each side and double hinged doors at the control end equipped with key expanded metal grating in front for the radiator grill and fixed key locks for ease of engine maintenance. There shall be louvered air intake ports on the shelter sides and rear for proper air circulation within the shelter. The complete generator set and shelter shall be prime painted and have two finish coats of protective enamel paint. Paint color shall be as selected by the Engineer. Provisions shall be available for crane unloading by providing lifting eyes and spreader bar reinforcement.

2.09 SCHEDULED OIL SAMPLING

A. In order to forecast and minimize engine failure, the supplier of the equipment must provide an oil sampling analysis kit which operating personnel shall utilize for scheduled oil sampling.

B. The laboratory to which oil samples will be sent shall be located at and be a part of the local generator set supplier's facility, and shall be open to inspection during normal working hours. Independent laboratories not a part of the engine supplier's facility are disallowed as to conformance with this Specification.

C. Scheduled oil sampling shall be of the atomic absorption spectrophotometer method as opposed to the spectrographic analysis method and shall be accurate to within a fraction of one part per million for the following elements:

1. Iron
2. Chromium
3. Copper
4. Aluminum
5. Silicon
6. Lead - In addition, the sample shall be tested for the presence of water, fuel dilution, and anti-freeze.

D. All equipment needed to take oil samples shall be provided in a kit at the time of acceptance and shall include the following:

1. Sample extraction gun (1)
2. Bottles (10)
3. Written instructions (1)
4. Metal storage box (1)

2.10 FUEL SYSTEM

A. Base and Mounting - Provisions for crane unloading of the complete package shall be designed into the base of the unit.

B. Base Tank - Each generator shall be equipped with a double in-base fuel tank. Provide the following fuel tank sizes:

1. 276 gallon minimum for the 145KW
2. 192 gallon minimum for the 120 KW
3. 77 gallon minimum for the 45KW

C. The units shall be supplied with a lockable exterior located fill cap. All necessary fuel and vent lines for proper engine performance shall be provided as well as means to readily the fuel level in the tank without the use of a measuring stick.

D. The fuel tank dimensions shall be full size of the generator base and be formed from steel of a minimum metal thickness of 0.25 inch (1/4 inch) and shall be fitted with low fuel level inner wall leak alarm contact for local annunciation.

PART 3 - EXECUTION

3.01 INSTALLATION

A. The generator manufacturer shall supply the services of a factory representative to check over the completed generator installation, who will certify to the Engineer that the installation meets the approval of the manufacturer. A minimum of two (2) days are required. One day will be required specifically for training plant personnel in system operation and maintenance.

B. The Equipment Supplier shall install suitable jacket water additives as recommended by the engine manufacturer and approved by the Engineer, for prevention of both scale formation and corrosion in the water jackets and cooling system

components which are in contact with the engine jacket water. These additives shall be added to the cooling system prior to running the field acceptance test.

C. The Equipment Supplier shall install the complete exhaust system, together with the silencer, the piping and insulation, and the complete supporting system.

3.02 PAINTING

A. The engine generator set and associated equipment shall be shop primed and finish coated in accordance with the manufacturer's standard practice prior to shipment. Color shall be selected by the Engineer and an adequate supply of touch-up paint shall be supplied by the manufacturer.

3.03 INSPECTION AND TESTING

A. Prior to acceptance of the installation, equipment shall be tested to show it is free of any defects and subjected to full load test through the use of portable dry type load banks supplied for this purpose at the jobsite by generator set supplier.

B. The load bank will be capable of definite and precise incremental loading and shall not be dependent on the generator control instrumentation to read amperage and voltage of each phase. Rather, the test instrumentation will serve as a check of the generator set meters. Readings will be taken and recorded at 30 minute intervals during the test and at each occurrence of a load change.

C. Salt water brine tanks or those load banks requiring water as a source for cooling are not acceptable for this purpose and shall not be utilized for this test.

E. Load bank testing shall be done in the presence of the Owner and the Engineer only after the unit is accepted by the Engineer in accordance with the Specifications. TESTING SHALL BE FOR A PERIOD OF FOUR HOURS UNDER FULL LOAD. Furnish three copies of test data to Engineer which shall include voltage, amperage, frequency, oil pressure, coolant temperature, voltage switching and other items which are part of the manufacturer's standard start-up and tests request.

F. CONTRACTOR shall provide fuel for load bank testing. CONTRACTOR shall provide a full fuel tank upon completion and acceptance of the generator system.

3.04 SYSTEM SERVICE CONTRACT

A. The supplier of the standby power system must provide a copy of and make available to the OWNER his standard service contract which, at the OWNER's option, may be accepted or refused. This contract will accompany documents, drawings, catalog cuts, specification sheets, wiring or outline drawings, etc., submitted for approval to the designing ENGINEER. The contract shall be for the complete services rendered over a period of one (1) year.

3.05 WARRANTY

A. Equipment furnished under this Section shall be guaranteed against defective parts and workmanship under terms of the MANUFACTURER'S and dealer's warranty. But, in no event, shall it be for a period of less than 3 years (3000 Hour comprehensive) from date of substantial completion and shall include labor, parts and travel time for necessary repairs at the job site. Submittal data received without written warranties as specified will be rejected in their entirety. Warranties requiring a deductible are not acceptable.

B. Warranty shall include manufacturer's standard form in which manufacturer agrees to repair or replace components of packaged engine generators and associated auxiliary components that fail in materials or workmanship within specified warranty period.

C. All of the generator system equipment furnished shall be guaranteed against defects in material, parts, and workmanship. The generator system equipment warranty and associated coverage shall be for a period of 3 years. The warranty shall be comprehensive covering all furnished system equipment including, but not limited to, the complete generator sets and furnished diesel fuel oil sub base tank system equipment. The warranty shall commence on the date of satisfactory completion of generator system startup and load bank testing on site, and shall include labor, parts, travel time, expenses and expendable items (lubricating oil, coolant, filters, and other service items made unusable by the defect) necessary for repairs at the job site. The furnished generator set batteries are considered a consumable item and shall be warranted against defects in material and workmanship for a period of two (2) years from generator set startup, with no prorating.

D. The generator system supplier shall be directly capable, without subcontracting, and to be solely responsible to maintain and provide qualified Factory trained servicemen, the required stock and availability of replacement parts, technical

assistance, and complete equipment warranty administration on direct behalf of the generator equipment Manufacturers. Subcontracting or rerouting of these services by the generator supplier is not acceptable. Generator Supplier written certification of compliance to the specified warranty requirements shall be included in the furnished generator system Submittals and equipment parts and operation manuals furnished to Engineer and Owner for review and approval.

E. The generator system Submittals and furnished generator system parts, operation and maintenance manuals shall include written warranties and supporting documentation clearly indicating and certifying complete compliance by the generator supplier to provision to the Owner of these specified warranty requirements for all furnished generator system equipment.

F. The generator system supplier's failure to furnish the specified warranty coverage for the entire generator system shall be sufficient cause for Engineer / Owner complete rejection of the generator system supplier's submitted/furnished the generator system equipment. The CONTRACTOR and the generator system supplier shall be responsible for all project delays, costs, Engineer fees, and Owner revenue losses associated with any partial or complete rejection of the generator system supplier's submitted and/or furnished equipment.

END OF SECTION