SECTION 01 57 19

TEMPORARY ENVIRONMENTAL CONTROLS

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Scope of Work

The work under this Section includes the temporary environmental control measures, including protection of air, water, soil, and surrounding areas, to prevent pollution and comply with regulatory requirements during construction.

1.2 DEFINITIONS

1.2.1 Contractor Generated Hazardous Waste

Contractor generated hazardous waste is materials that, if abandoned or disposed of, may meet the definition of a hazardous waste. These waste streams would typically consist of material brought on site by the Contractor to execute work, but are not fully consumed during the course of construction. Examples include, but are not limited to, excess paint thinners (i.e., methyl ethyl ketone, toluene), waste thinners, excess paints, excess solvents, waste solvents, excess pesticides, and contaminated pesticide equipment rinse water.

1.2.2 Electronics Waste

Electronics waste is discarded electronic devices intended for salvage, recycling, or disposal.

1.2.3 Environmental Pollution and Damage

Environmental pollution and damage is the presence of chemical, physical, or biological elements or agents which adversely affect human health or welfare; unfavorably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade the environment aesthetically, culturally or historically.

1.2.4 Environmental Protection

Environmental protection is the prevention/control of pollution and habitat disruption that may occur to the environment during construction. The control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2.5 Hazardous Debris

As defined in paragraph SOLID WASTE, debris that contains listed hazardous waste (either on the debris surface, or in its interstices, such as pore structure) in accordance

with 40 CFR 261. Hazardous debris also includes debris that exhibits a characteristic of hazardous waste in accordance with 40 CFR 261.

1.2.6 Hazardous Materials

Hazardous material is any material that: Is defined in 49 CFR 171, listed in 49 CFR 172, regulated as a hazardous material in accordance with 49 CFR 173; or requires a Safety Data Sheet (SDS) in accordance with 29 CFR 1910.1200; or during end use, treatment, handling, packaging, storage, transportation, or disposal meets or has components that meet or have potential to meet the definition of a hazardous waste as defined by 40 CFR 261 Subparts A, B, C, or D. Designation of a material by this definition, when separately regulated or controlled by other sections or directives, does not eliminate the need for adherence to that hazard-specific guidance which takes precedence over this section for "control" purposes. Such material includes ammunition, weapons, explosive actuated devices, propellants, pyrotechnics, chemical and biological warfare materials, medical and pharmaceutical supplies, medical waste and infectious materials, bulk fuels, radioactive materials, and other materials such as asbestos, mercury, and polychlorinated biphenyls (PCBs).

1.2.7 Hazardous Waste

Hazardous Waste is any material that meets the definition of a solid waste and exhibits a hazardous characteristic (ignitability, corrosivity, reactivity, or toxicity) as specified in 40 CFR 261, Subpart C, or contains a listed hazardous waste as identified in 40 CFR 261, Subpart D, or meets a state, local, or host nation definition of a hazardous waste.

1.2.8 Land Application

Land Application means spreading or spraying discharge water at a rate that allows the water to percolate into the soil. No sheeting action, soil erosion, discharge into storm sewers, discharge into defined drainage areas, or discharge into the "waters of the United States" must occur. Comply with federal, state, and local laws and regulations.

1.2.9 National Pollutant Discharge Elimination System (NPDES)

The NPDES permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States.

1.2.10 Oily Waste

Oily waste are those materials that are, or were, mixed with Petroleum, Oils, and Lubricants (POLs) and have become separated from that POLs. Oily wastes also means materials, including wastewaters, centrifuge solids, filter residues or sludges, bottom sediments, tank bottoms, and sorbents which have come into contact with and have been contaminated by, POLs and may be appropriately tested and discarded in a manner which is in compliance with other state and local requirements.

This definition includes materials such as oily rags, "kitty litter" sorbent clay and organic sorbent material. These materials may be land filled provided that: It is not prohibited in other state regulations or local ordinances; the amount generated is "de minimus" (a small

amount); it is the result of minor leaks or spills resulting from normal process operations; and free-flowing oil has been removed to the practicable extent possible. Large quantities of this material, generated as a result of a major spill or in lieu of proper maintenance of the processing equipment, are a solid waste. As a solid waste, perform a hazardous waste determination prior to disposal. As this can be an expensive process, it is recommended that this type of waste be minimized through good housekeeping practices and employee education.

1.2.11 Regulated Waste

Regulated waste are solid wastes that have specific additional federal, state, or local controls for handling, storage, or disposal.

1.2.12 Sediment

Sediment is soil and other debris that have eroded and have been transported by runoff water or wind.

1.2.13 Solid Waste

Solid waste is a solid, liquid, semi-solid or contained gaseous waste. A solid waste can be a hazardous waste, non-hazardous waste, or non-Resource Conservation and Recovery Act (RCRA) regulated waste. Types of solid waste typically generated at construction sites may include:

1.2.13.1 Debris

Debris is non-hazardous solid material generated during the construction, demolition, or renovation of a structure that exceeds 2.5-inch particle size that is: a manufactured object; plant or animal matter; or natural geologic material (for example, cobbles and boulders), broken or removed concrete, masonry, and rock asphalt paving; ceramics; roofing paper and shingles. Inert materials may be reinforced with or contain ferrous wire, rods, accessories and weldments. A mixture of debris and other material such as soil or sludge is also subject to regulation as debris if the mixture is comprised primarily of debris by volume, based on visual inspection.

1.2.13.2 Green Waste

Green waste is the vegetative matter from landscaping, land clearing and grubbing, including, but not limited to, grass, bushes, scrubs, small trees and saplings, tree stumps and plant roots. Marketable trees, grasses and plants that are indicated to remain, be re-located, or be re-used are not included.

1.2.13.3 Material Not Regulated As Solid Waste

Material not regulated as solid waste is nuclear source or byproduct materials regulated under the Federal Atomic Energy Act of 1954 as amended; suspended or dissolved materials in domestic sewage effluent or irrigation return flows, or other regulated point source discharges; regulated air emissions; and fluids or wastes associated with natural gas or crude oil exploration or production.

1.2.13.4 Non-Hazardous Waste

Non-hazardous waste is waste that is excluded from, or does not meet, hazardous waste criteria in accordance with 40 CFR 261.

1.2.13.5 Recyclables

Recyclables are materials, equipment and assemblies such as doors, windows, door and window frames, plumbing fixtures, glazing and mirrors that are recovered and sold as recyclable, wiring, insulated/non-insulated copper wire cable, wire rope, and structural components. It also includes commercial-grade refrigeration equipment with Freon removed, household appliances where the basic material content is metal, clean polyethylene terephthalate bottles, cooking oil, used fuel oil, textiles, high-grade paper products and corrugated cardboard, stackable pallets in good condition, clean crating material, and clean rubber/vehicle tires. Metal meeting the definition of lead contaminated or lead based paint contaminated may not be included as recyclable if sold to a scrap metal company. Paint cans that meet the definition of empty containers in accordance with 40 CFR 261.7 may be included as recyclable if sold to a scrap metal company.

1.2.13.6 Surplus Soil

Surplus soil is existing soil that is in excess of what is required for this work, including aggregates intended, but not used, for on-site mixing of concrete, mortars, and paving. Contaminated soil meeting the definition of hazardous material or hazardous waste is not included and must be managed in accordance with paragraph HAZARDOUS MATERIAL MANAGEMENT.

1.2.13.7 Scrap Metal

This includes scrap and excess ferrous and non-ferrous metals such as reinforcing steel, structural shapes, pipe, and wire that are recovered or collected and disposed of as scrap. Scrap metal meeting the definition of hazardous material or hazardous waste is not included.

1.2.13.8 Wood

Wood is dimension and non-dimension lumber, plywood, chipboard, hardboard. Treated or painted wood that meets the definition of lead contaminated or lead based contaminated paint is not included. Treated wood includes, but is not limited to, lumber, utility poles, crossties, and other wood products with chemical treatment.

1.2.14 Surface Discharge

Surface discharge means discharge of water into drainage ditches, storm sewers, or creeks meeting the definition of "waters of the United States". Surface discharges from construction sites are discrete, identifiable sources and require a permit from the governing agency. Comply with federal, state, and local laws and regulations.

1.2.15 Wastewater

Wastewater is the used water and solids that flow through a sanitary sewer to a treatment plant.

1.2.15.1 Stormwater

Stormwater is any precipitation in an urban or suburban area that does not evaporate or soak into the ground, but instead collects and flows into storm drains, rivers, and streams.

1.2.16 Waters of the United States

Waters of the United States means Federally jurisdictional waters, including wetlands, that are subject to regulation under Section 404 of the Clean Water Act or navigable waters, as defined under the Rivers and Harbors Act.

1.2.17 Wetlands

Wetlands are those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions.

1.2.18 Universal Waste

The universal waste regulations streamline collection requirements for certain hazardous wastes in the following categories: batteries, pesticides, mercury-containing equipment (for example, thermostats), and lamps (for example, fluorescent bulbs). The rule is designed to reduce hazardous waste in the municipal solid waste (MSW) stream by making it easier for universal waste handlers to collect these items and send them for recycling or proper disposal. These regulations can be found at 40 CFR 273.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Preconstruction Survey
Regulatory Notifications
Environmental Manager Qualifications
Employee Training Records
Environmental Protection Plan
Dirt and Dust Control Plan
Silica Dust Control Plan
Solid Waste Management Permit
Stormwater Pollution Prevention Plan (SWPPP) Stormwater Notice of Intent (for NPDES coverage under the general permit for construction activities)

SD-06 Test Reports

Monthly Solid Waste Disposal Report
Inspection Reports
Laboratory Analysis

SD-07 Certificates

Employee Training Records
Erosion and Sediment Control Inspector Qualifications

SD-11 Closeout Submittals

Regulatory Notifications
Assembled Employee Training Records
Solid Waste Management Permit
Stormwater Pollution Prevention Plan Compliance Notebook Stormwater Notice of Termination (for NPDES coverage under the general permit for construction activities) As-Built Topographic Survey
Waste Determination Documentation
Hazardous Waste/Debris Management
Solid Waste Management Report

1.4 ENVIRONMENTAL PROTECTION REQUIREMENTS

Provide and maintain, during the life of the contract, environmental protection as defined. Plan for and provide environmental protective measures to control pollution that develops during construction practice. Plan for and provide environmental protective measures required to correct conditions that develop during the construction of permanent or temporary environmental features associated with the project. Protect the environmental resources within the project boundaries and those affected outside the limits of permanent work during the entire duration of this Contract. Comply with federal, state, and local regulations pertaining to the environment, including water, air, solid waste, hazardous waste and substances, oily substances, and noise pollution.

Tests and procedures assessing whether construction operations comply with Applicable Environmental Laws may be required. Analytical work is to be performed by qualified laboratories; and where required by law, the laboratories are require to be certified.

1.4.1 Conformance with the Environmental Management System

Perform work under this contract consistent with the policy and objectives identified in the installation's Environmental Management System (EMS). Perform work in a manner that conforms to objectives and targets of the environmental programs and operational controls identified by the EMS. Support personnel when environmental compliance and EMS audits are conducted by escorting auditors at the Project site, answering questions, and providing proof of records being maintained. Provide monitoring and measurement information as necessary to address environmental performance relative to environmental, energy, and transportation management goals. In the event an EMS nonconformance or environmental noncompliance associated with the contracted services, tasks, or actions occurs, take corrective and preventative actions. In addition, employees are required to be aware of their roles and responsibilities under the installation EMS and of how these EMS roles and responsibilities affect work performed under the contract.

Coordinate with the installation's EMS coordinator to identify training needs associated with environmental aspects and the EMS, and arrange training or take other action to meet

these needs. Provide training documentation to the Contracting Officer. The Installation Environmental Office will retain associated environmental compliance records. Make EMS Awareness training completion certificates available to Government auditors during EMS audits and include the certificates in the Employee Training Records. See paragraph EMPLOYEE TRAINING RECORDS.

1.5 QUALITY ASSURANCE

1.5.1 Preconstruction Survey and Protection of Features

This paragraph supplements the Contract Clause PROTECTION OF EXISTING VEGETATION, STRUCTURES, EQUIPMENT, UTILITIES, AND IMPROVEMENTS. Prior to start of any onsite construction activities, perform a Preconstruction Survey of the project site at a minimum 30 days prior to any demolition with the Contracting Officer, and take photographs showing existing environmental conditions in and adjacent to the site. Submit a report for the record. Include in the report a plan describing the features requiring protection under the provisions of the Contract Clauses, which are not specifically identified on the drawings as environmental features requiring protection along with the condition of trees, shrubs and grassed areas immediately adjacent to the site of work and adjacent to the Contractor's assigned storage area and access route(s), as applicable. The Contractor and the Contracting Officer will sign this survey report upon mutual agreement regarding its accuracy and completeness. Protect those environmental features included in the survey report and any indicated on the drawings, regardless of interference that their preservation may cause to the work under the Contract.

1.5.2 Regulatory Notifications

Coordinate all regulatory notification requirements with the Installation Environmental Office. In all instances, the Installation Environmental Office provides all regulatory notifications. Typically, regulatory notifications include but are not limited to: demolition, renovation, NPDES defined site work, construction, removal or use of a permitted air emissions source, and remediation of controlled substances (asbestos, hazardous waste, lead paint).

1.5.3 Environmental Brief

Attend an environmental brief to be included in the preconstruction meeting. Provide the following information: types, quantities, and use of hazardous materials that will be brought onto the installation; and types and quantities of wastes/wastewater that may be generated during the Contract. Discuss the results of the Preconstruction Survey at this time.

Prior to initiating any work on site, meet with the Contracting Officer and installation Environmental Office to discuss the proposed Environmental Protection Plan (EPP) or equipment local requirement. Develop a mutual understanding relative to the details of environmental protection, including measures for protecting natural and cultural resources, required reports, required permits, permit requirements (such as mitigation measures), and other measures to be taken.

1.5.4 Environmental Manager

Appoint in writing an Environmental Manager for the project site. The Environmental Manager is directly responsible for coordinating contractor compliance with federal, state, local, and installation requirements. The Environmental Manager must ensure compliance with Hazardous Waste Program requirements (including hazardous waste handling, storage, manifesting, and disposal); implement the EPP; ensure environmental permits are obtained, maintained, and closed out; ensure compliance with Stormwater Program requirements; ensure compliance with Hazardous Materials (storage, handling, and reporting) requirements; and coordinate any remediation of regulated substances (lead, asbestos, PCB transformers). This can be a collateral position; however, the person in this position must be trained to adequately accomplish the following duties: ensure waste segregation and storage compatibility requirements are met; inspect and manage Satellite Accumulation areas; ensure only authorized personnel add wastes to containers; ensure Contractor personnel are trained in 40 CFR requirements in accordance with their position requirements; coordinate removal of waste containers; and maintain the Environmental Records binder and required documentation, including environmental permits compliance and close-out. Submit Environmental Manager Qualifications to the Contracting Officer.

1.5.5 Employee Training Records

Prepare and maintain Employee Training Records throughout the term of the contract meeting applicable 40 CFR requirements. Provide Employee Training Records in the Environmental Records Binder. Submit these Assembled Employee Training Records to the Contracting Officer at the conclusion of the project, unless otherwise directed.

Train personnel to meet EPA and Florida requirements. Conduct

environmental protection/pollution control meetings for personnel prior to commencing construction activities. Conduct additional meetings for new personnel and when site conditions change. Include in the training and meeting agenda: methods of detecting and avoiding pollution; familiarization with statutory and contractual pollution standards; installation and care of devices, vegetative covers, and instruments required for monitoring purposes to ensure adequate and continuous environmental protection/pollution control; anticipated hazardous or toxic chemicals or wastes, and other regulated contaminants; recognition and protection of archaeological sites, artifacts, waters of the United States, and endangered species and their habitat that are known to be in the area. Provide copy of the Erosion and Sediment Control Inspector Certification as required by State of Florida.

1.5.6 Non-Compliance Notifications

The Contracting Officer will notify the Contractor in writing of any observed noncompliance with federal, state or local environmental laws or regulations, permits, and other elements of the Contractor's EPP. After receipt of such notice, inform the Contracting Officer of the proposed corrective action and take such action when approved by the Contracting Officer. The Contracting Officer may issue an order stopping all or part of the work until satisfactory corrective action has been taken. FAR 52.242-14 Suspension of Work provides that a suspension, delay, or interruption of work due to the fault or negligence of the Contractor allows for no adjustments to the contract for time extensions or equitable adjustments. In addition to a suspension of work, the Contracting Officer may use additional authorities under the contract or law.

1.6 ENVIRONMENTAL PROTECTION PLAN

The purpose of the EPP is to present an overview of known or potential environmental issues that must be considered and addressed during construction. Incorporate construction related objectives and targets from the installation's EMS into the EPP. Include in the EPP measures for protecting natural and cultural resources, required reports, and other measures to be taken. Meet with the Contracting Officer or Contracting Officer Representative to discuss the EPP and develop a mutual understanding relative to the details for environmental protection including measures for protecting natural resources, required reports, and other measures to be taken. Submit the EPP within 15 days after notice to proceed and not less than 10 days before the preconstruction meeting. Submit the EPP not less than 60 calendar days before scheduled final site or building design approval. Revise the EPP throughout the project to include any reporting requirements, changes in site conditions, or contract modifications that change the project scope of work in a way that could have an environmental impact. No requirement in this section will relieve the Contractor of any applicable federal, state, and local environmental protection laws and regulations. During Construction, identify, implement, and submit for approval any additional requirements to be included in the EPP. Maintain the current version onsite. The EPP includes, but is not limited to, the following elements: 1.6.1 General Overview and Purpose

1.6.1.1 Descriptions

A brief description of each specific plan required by environmental permit or elsewhere in this Contract such as stormwater pollution prevention plan, spill control plan, solid waste management plan, contaminant prevention plan,, pesticide treatment plan, a historical, archaeological, cultural resources, biological resources and wetlands plan, traffic control plan, Hazardous, Toxic and Radioactive Waste (HTRW) Plan, Non-Hazardous Solid Waste Disposal Plan.

1.6.1.2 Duties

The duties and level of authority assigned to the person(s) on the job site who oversee environmental compliance, such as who is responsible for adherence to the EPP, who is responsible for spill cleanup and training personnel on spill response procedures, who is responsible for manifesting hazardous waste to be removed from the site (if applicable), and who is responsible for training the Contractor's environmental protection personnel.

1.6.1.3 Procedures

A copy of any standard or project-specific operating procedures that will be used to effectively manage and protect the environment on the project site.

1.6.1.4 Communications

Communication and training procedures that will be used to convey environmental management requirements to Contractor employees and subcontractors.

1.6.1.5 Contact Information

Emergency contact information contact information (office phone number, cell phone number, and e-mail address).

1.6.2 General Site Information

1.6.2.1 Drawings

Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, jurisdictional wetlands, material storage areas, structures, sanitary facilities, storm drains and conveyances, and stockpiles of excess soil.

1.6.2.2 Work Area

Work area plan showing the proposed activity in each portion of the area and identify the areas of limited use or nonuse. Include measures for marking the limits of use areas, including methods for protection of features to be preserved within authorized work areas and methods to control runoff and to contain materials on site, and a traffic control plan.

1.6.2.3 Documentation

A letter signed by an officer of the firm appointing the Environmental Manager and stating that person is responsible for managing and implementing the Environmental Program as described in this contract. Include in this letter the Environmental Manager's authority to direct the removal and replacement of non-conforming work.

1.6.3 Management of Natural Resources

a. Land resources

b. Tree protection

c. Replacement of damaged landscape features

d. Stream crossings

e. Fish and wildlife resources

1.6.4 Stormwater Management and Control

a. Ground cover

b. Erodible soils

c. Temporary measures

(1) Structural Practices

(2) Temporary and permanent stabilization

d. Effective selection, implementation and maintenance of Best Management Practices (BMPs).

e. Stormwater Pollution Prevention Plan (SWPPP).

1.6.5 Protection of the Environment from Waste Derived from Contractor Operations Control and disposal of solid and sanitary waste.

Control and disposal of hazardous waste.

This item consist of the management procedures for hazardous waste to be generated. The elements of those procedures will coincide with the Installation Hazardous Waste Management Plan when within an installation.
The Contracting Officer will provide a copy of the Installation Hazardous Waste Management Plan as applicable.

As a minimum, include the following:

a. List of the types of hazardous wastes expected to be generated

b. Procedures to ensure a written waste determination is made for appropriate wastes that are to be generated

c. Sampling/analysis plan, including laboratory method(s) that will be used for waste determinations and copies of relevant laboratory certifications

d. Methods and proposed locations for hazardous waste accumulation/storage (that is, in tanks or containers)

e. Management procedures for storage, labeling, transportation, and disposal of waste (treatment of waste is not allowed unless specifically noted)

f. Management procedures and regulatory documentation ensuring disposal of hazardous waste complies with Land Disposal Restrictions (40 CFR 268)

g. Management procedures for recyclable hazardous materials such as lead-acid batteries, used oil, and similar

h. Used oil management procedures in accordance with 40 CFR 279; Hazardous waste minimization procedures

i. Plans for the disposal of hazardous waste by permitted facilities; and Procedures to be employed to ensure required employee training records are maintained.

1.6.6 Prevention of Releases to the Environment

Procedures to prevent releases to the environment

Notifications in the event of a release to the environment

1.6.7 Regulatory Notification and Permits

List what notifications and permit applications must be made. Some permits require up to 180 days to obtain. Demonstrate that those permits have been obtained or applied for by including copies of applicable environmental permits. The EPP will not be approved until the permits have been obtained.

1.6.8 Clean Air Act Compliance

1.6.8.1 Haul Route

Submit truck and material haul routes along with a Dirt and Dust Control Plan for controlling dirt, debris, and dust on Installation roadways. As a minimum, identify in the plan the subcontractor and equipment for cleaning along the haul route and measures to reduce dirt, dust, and debris from roadways.

1.6.8.2 Pollution Generating Equipment

Identify air pollution generating equipment or processes that may require federal, state, or local permits under the Clean Air Act. Determine requirements based on any current installation permits and the impacts of the project. Provide a list of all fixed or mobile equipment, machinery or operations that could generate air emissions during the project to the Installation Environmental Office (Air Program Manager). Ensure required permits are obtained prior to installing and operating applicable equipment/processes.

1.6.8.3 Stationary Internal Combustion Engines

Identify portable and stationary internal combustion engines that will be supplied, used or serviced. Comply with 40 CFR 60 Subpart IIII, 40 CFR 60 Subpart JJJJ, 40 CFR 63 Subpart ZZZZ, and local regulations as applicable. At minimum, include the make, model, serial number, manufacture date, size (engine brake horsepower), and EPA emission certification status of each engine. Maintain applicable records and log hours of operation and fuel use. Logs must include reasons for operation and delineate between maintenance/testing, emergency, and non-emergency operation.

1.6.8.4 Compliant Materials

Provide the Contracting Officer a list of SDSs for all hazardous materials proposed for use on site. Materials must be compliant with all Clean Air Act regulations for emissions including solvent and volatile organic compound contents, and applicable National Emission Standards for Hazardous Air Pollutants requirements. The Contracting Officer may alter or limit use of specific materials as needed to meet installation permit requirements for emissions.

1.7 LICENSES AND PERMITS

Obtain licenses and permits required for the construction of the project and in accordance with FAR 52.236-7 Permits and Responsibilities. Notify the Contracting Officer of all equipment that may require permits or special approvals that the Contractor plans to use on site. This paragraph supplements the Contractor's responsibility under FAR 52.236-7 Permits and Responsibilities.

1.8 ENVIRONMENTAL RECORDS BINDER

Maintain on-site a separate three-ring Environmental Records Binder and submit at the completion of the project. Make separate parts within the binder that correspond to each submittal listed under paragraph CLOSEOUT SUBMITTALS in this section.

1.9 SOLID WASTE MANAGEMENT PERMIT

Provide the Contracting Officer with written notification of the quantity of anticipated solid waste or debris that is anticipated or estimated to be generated by construction. Include in the report the locations where various types of waste will be disposed or recycled. Include letters of acceptance from the receiving location or as applicable; submit one copy of the receiving location state and local Solid Waste Management Permit or license showing such agency's approval of the disposal plan before transporting wastes off property.

1.9.1 Monthly Solid Waste Disposal Report

Monthly, submit a solid waste disposal report to the Contracting Officer. For each waste, the report will state the classification (using the definitions provided in this section), amount, location, and name of the business receiving the solid waste.

1.10 FACILITY HAZARDOUS WASTE GENERATOR STATUS

Meet the regulatory requirements of this generator designation for any work conducted within the boundaries of this Installation. Comply with provisions of federal, state, and local regulatory requirements applicable to this generator status regarding training and storage, handling, and disposal of construction derived wastes.

PART 2 PRODUCTS

Not Used

PART 3 EXECUTION

3.1 PROTECTION OF NATURAL RESOURCES

Minimize interference with, disturbance to, and damage to fish, wildlife, and plants, including their habitats. Prior to the commencement of activities, consult with the Installation Environmental Office as applicable, regarding rare species or sensitive habitats that need to be protected. The protection of rare, threatened, and endangered animal and plant species identified, including their habitats, is the Contractor's responsibility. The following species are known and could be affected within the construction area: Gopher Tortoise.

Preserve the natural resources within the project boundaries and outside the limits of permanent work. Restore to an equivalent or improved condition upon completion of work that is consistent with the requirements of the Installation Environmental Office or as otherwise specified. Confine construction activities to within the limits of the work indicated or specified.

3.1.1 Flow Ways

Do not alter water flows or otherwise significantly disturb the native habitat adjacent to the project and critical to the survival of fish and wildlife, except as specified and permitted.

3.1.2 Vegetation

Except in areas to be cleared, do not remove, cut, deface, injure, or destroy trees or shrubs without the Contracting Officer's permission. Do not fasten or attach ropes, cables, or guys to existing nearby trees for anchorages unless authorized by the Contracting Officer. Where such use of attached ropes, cables, or guys is authorized, the Contractor is responsible for any resultant damage.

Protect existing trees that are to remain to ensure they are not injured, bruised, defaced, or otherwise damaged by construction operations. Remove displaced rocks from uncleared areas. Coordinate with the Contracting Officer and Installation Environmental Office to determine appropriate action for trees and other landscape features scarred or damaged by equipment operations.

3.2 STORMWATER

Do not discharge stormwater from construction sites to the sanitary sewer. If the water is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization in advance from the Installation Environmental Office for any release of contaminated water.

3.2.1 Construction General Permit

Provide a Construction General Permit as required by 40 CFR 122.26 or the State of Florida General Permit. Under the terms and conditions of the permit, install, inspect, maintain BMPs, prepare stormwater erosion and sediment control inspection reports, and submit SWPPP inspection reports. Maintain construction operations and management in compliance with the terms and conditions of the general permit for stormwater discharges from construction activities.

3.2.1.1 Stormwater Pollution Prevention Plan

Submit a project-specific Stormwater Pollution Prevention Plan (SWPPP) to the Contracting Officer for approval, prior to the commencement of work. The SWPPP must meet the requirements of 40 CFR 122.26 and the Florida State General Permit for stormwater discharges from construction sites.

Include the following:

a. Comply with terms of the Florida general permit for stormwater discharges from construction activities. Prepare SWPPP in accordance with state requirements. Use state guide Developing your Stormwater Pollution Prevention Plan located at https://floridadep.gov/water/stormwater/documents/construction-swppp to prepare the SWPPP.

b. Select applicable BMPs from EPA Fact Sheets located at https://www.epa.gov/npdes/national-menu-best-management-practicesbmps-stormwater#constr or in accordance with applicable state or local requirements.

c. Include a completed copy of the Notice of Intent, BMP Inspection Report Template, and Stormwater Notice of Termination, except for the effective date.

3.2.1.2 Stormwater Notice of Intent for Construction Activities

Prepare and submit the Notice of Intent for NPDES coverage under the general permit for construction activities to the Contracting Officer for review and approval.

Submit the approved NOI and appropriate permit fees onto the appropriate federal or state agency for approval. No land disturbing activities may commence without permit coverage. Maintain an approved copy of the SWPPP at the onsite construction office, and continually update as regulations require, reflecting current site conditions.

3.2.1.3 Inspection Reports

Submit "Inspection Reports" to the Contracting Officer in accordance with the State of Florida Construction General Permit.

3.2.1.4 Stormwater Pollution Prevention Plan Compliance Notebook

Create and maintain a three ring binder of documents that demonstrate compliance with the Construction General Permit. Include a copy of the permit Notice of Intent, proof of permit fee payment, SWPPP and SWPPP update amendments, inspection reports and related corrective action records, copies of correspondence with the Florida State Permitting Agency, and a copy of the permit Notice of Termination in the binder. At project completion, the notebook becomes property of the Owner. Provide the compliance notebook to the Contracting Officer.

3.2.1.5 Stormwater Notice of Termination for Construction Activities

Submit a Notice of Termination to the Contracting Officer for approval once construction is complete and final stabilization has been achieved on all portions of the site for which the permittee is responsible. Once approved, submit the Notice of Termination to the appropriate state or federal agency. Prepare as-built topographic survey information required by the permitting agency for certification of the stormwater management system, and provide to the Contracting Officer.

3.2.2 Erosion and Sediment Control Measures

Provide erosion and sediment control measures in accordance with state and local laws and regulations. Preserve vegetation to the maximum extent practicable.

Erosion control inspection reports may be compiled as part of a stormwater pollution prevention plan inspection reports.

3.2.2.1 Erosion Control

Prevent erosion byCompost Blankets, Geotextiles or temporary slope drains, or other, Contracting Officer approved means. Stabilize slopes by sodding, or such combination of these methods necessary for effective erosion control. Use of hay bales is prohibited.

3.2.2.2 Sediment Control Practices

Implement sediment control practices to divert flows from exposed soils, temporarily store flows, or otherwise limit runoff and the discharge of pollutants from exposed areas of the site. Implement sediment control practices prior to soil disturbance and prior to creating

areas with concentrated flow, during the construction process to minimize erosion and sediment laden runoff. Include the following devices: silt fence and storm drain inlet protection.

3.2.3 Work Area Limits

Mark the areas that need not be disturbed under this Contract prior to commencing construction activities. Mark or fence isolated areas within the general work area that are not to be disturbed. Protect monuments and markers before construction operations commence. Where construction operations are to be conducted during darkness, all markers must be visible in the dark. Personnel must be knowledgeable of the purpose for marking and protecting particular objects.

3.2.4 Contractor Facilities and Work Areas

Place field offices, staging areas, stockpile storage, and temporary buildings in areas designated on the drawings or as directed by the Contracting Officer. Move or relocate the Contractor facilities only when approved by the Contracting Officer. Provide erosion and sediment controls for onsite borrow and spoil areas to prevent sediment from entering nearby waters. Control temporary excavation and embankments for plant or work areas to protect adjacent areas.

3.3 SURFACE AND GROUNDWATER

3.3.1 Cofferdams, Diversions, and Dewatering

Construction operations for dewatering, excavation, and tunnel closure must be constantly controlled to maintain compliance with existing state water quality standards and designated uses of the surface water body.

Comply with the State of Florida water quality standards and anti-degradation provisions and the Clean Water Act Section 404. Do not discharge excavation ground water to the sanitary sewer, storm drains, or to surface waters without prior specific authorization in writing from the Installation Environmental Office or Contracting Officer. Discharge of hazardous substances will not be permitted under any circumstances. Use sediment control BMPs to prevent construction site runoff from directly entering any storm drain or surface waters.

If the construction dewatering is noted or suspected of being contaminated, it may only be released to the storm drain system if the discharge is specifically permitted. Obtain authorization for any contaminated groundwater release in advance from the Installation Environmental Officer and the federal or state authority, as applicable. Discharge of hazardous substances will not be permitted under any circumstances.

3.3.2 Waters of the United States

Do not enter, disturb, destroy, or allow discharge of contaminants into waters of the United States.

3.4 AIR RESOURCES

Equipment operation, activities, or processes will be in accordance with 40 CFR 64 and state air emission and performance laws and standards.

3.4.1 Burning

Burning is prohibited on the premises.

3.4.2 Silica Dust Control Plan

Develop, submit and obtain approval for a Silica Dust Control Plan that addresses site specific conditions associated with environmental and worker protection. Provide protections to limit worker exposure to respirable crystalline silica in accordance with 29 CFR 1926.1153 for all work associated with demolition, modification, and installation. Keep dust down at all times, including during nonworking periods. Do not dry power broom. Dry power brooming will not be permitted. Instead, use vacuuming, wet mopping, wet sweeping, or wet power brooming. Air blowing will be permitted only for cleaning nonparticulate debris such as steel reinforcing bars. Only wet cutting will be permitted for cutting concrete blocks, concrete, and bituminous concrete. Do not unnecessarily shake bags of cement, concrete mortar, or plaster. Since these products contain Crystalline Silica, comply with the applicable OSHA standard,
29 CFR 1910.1053 or 29 CFR 1926.1153 for controlling exposure to Crystalline Silica Dust.

3.4.2.1 Particulates

Dust particles, aerosols and gaseous by-products from construction activities, and processing and preparation of materials (such as from asphaltic batch plants) must be controlled at all times, including weekends, holidays, and hours when work is not in progress. Maintain excavations, stockpiles, haul roads, permanent and temporary access roads, plant sites, spoil areas, borrow areas, and other work areas within or outside the project boundaries free from particulates that would exceed 40 CFR 50, state, and local air pollution standards or that would cause a hazard or a nuisance. Sprinkling, chemical treatment of an approved type, baghouse, scrubbers, electrostatic precipitators, or other methods will be permitted to control particulates in the work area. Sprinkling, to be efficient, must be repeated to keep the disturbed area damp. Provide sufficient, competent equipment available to accomplish these tasks. Perform particulate control as the work proceeds and whenever a particulate nuisance or hazard occurs. Comply with state and local visibility regulations.

3.4.2.2 Abrasive Blasting

Blasting operations cannot be performed without prior approval of the Installation Air Program Manager. The use of silica sand is prohibited in sandblasting.

Provide tarpaulin drop cloths and windscreens to enclose abrasive blasting operations to confine and collect dust, abrasive agent, paint chips, and other debris.

3.4.3 Odors

Control odors from construction activities. The odors must be in compliance with state regulations and local ordinances and may not constitute a health hazard.

3.5 WASTE MINIMIZATION

Minimize the use of hazardous materials and the generation of waste. Include procedures for pollution prevention/ hazardous waste minimization in the Hazardous Waste Management Section of the EPP. Obtain a copy of the installation's Pollution Prevention/Hazardous Waste Minimization Plan for reference material when preparing this part of the EPP. If no written plan exists, obtain information by contacting the Contracting Officer. Describe the anticipated types of the hazardous materials to be used in the construction when requesting information.

3.5.1 Salvage, Reuse and Recycle

Identify anticipated materials and waste for salvage, reuse, and recycling. Describe actions to promote material reuse, resale or recycling. To the extent practicable, all scrap metal must be sent for reuse or recycling and will not be disposed of in a landfill.

Include the name, physical address, and telephone number of the hauler, if transported by a franchised solid waste hauler. Include the destination and, unless exempted, provide a copy of the state or local permit (cover) or license for recycling.

3.5.2 Nonhazardous Solid Waste Diversion Report

Maintain an inventory of nonhazardous solid waste diversion and disposal of construction and demolition debris. Submit a report to the Contracting Officer.

3.6 WASTE MANAGEMENT AND DISPOSAL

3.6.1 Solid Waste Management

3.6.1.1 Solid Waste Management Report

Provide copies of the waste handling facilities' weight tickets, receipts, bills of sale, and other sales documents. In lieu of sales documentation, a statement indicating the disposal location for the solid waste that is signed by an employee authorized to legally obligate or bind the firm may be submitted. The sales documentation must include the receiver's tax identification number and business, EPA or state registration number, along with the receiver's delivery and business addresses and telephone numbers. For each solid waste retained for the Contractor's own use, submit the information previously described in this paragraph on the solid waste disposal report. Prices paid or received do not have to be reported to the Contracting Officer unless required by other provisions or specifications of this Contract or public law.

3.6.1.2 Control and Management of Solid Wastes

Pick up solid wastes, and place in covered containers that are regularly emptied. Do not prepare or cook food on the project site. Prevent contamination of the site or other areas when handling and disposing of wastes. At project completion, leave the areas clean. Employ segregation measures so that no hazardous or toxic waste will become co-mingled with non-hazardous solid waste. Transport solid waste off property and dispose of it in compliance with 40 CFR 260, state, and local requirements for solid waste disposal. A

Subtitle D RCRA permitted landfill is the minimum acceptable offsite solid waste disposal option. Verify that the selected transporters and disposal facilities have the necessary permits and licenses to operate.

Manage hazardous material used in construction, including but not limited to, aerosol cans, waste paint, cleaning solvents, contaminated brushes, and used rags, in accordance with 49 CFR 173.

3.6.2 Waste Determination Documentation

Complete a Waste Determination form (provided at the pre-construction conference) for Contractor-derived wastes to be generated. All potentially hazardous solid waste streams that are not subject to a specific exclusion or exemption from the hazardous waste regulations (e.g., scrap metal, domestic sewage) or subject to special rules, (lead-acid batteries and precious metals) must be characterized in accordance with the requirements of 40 CFR 262.11 or corresponding applicable state or local regulations. Base waste determination on user knowledge of the processes and materials used, and analytical data when necessary. Consult with the Installation environmental staff for guidance on specific requirements. Attach support documentation to the Waste Determination form. As a minimum, provide a Waste Determination form for the following waste (this listing is not inclusive): oil- and latex -based painting and caulking products, solvents, adhesives, aerosols, petroleum products, and containers of the original materials.

3.6.2.1 Sampling and Analysis of Waste

3.6.2.1.1 Waste Sampling

Sample waste in accordance with EPA SW-846. Clearly mark each sampled drum or container with the Contractor's identification number, and cross reference to the chemical analysis performed. Conduct TCLP for any RCRA metals prior to demolition.

3.6.2.1.2 Laboratory Analysis

Follow the analytical procedure and methods in accordance with the 40 CFR 261. Provide analytical results and reports performed to the Contracting Officer. Coordinate all activities with Installation Hazardous Waste Manager.

3.6.2.1.3 Analysis Type

Identify hazardous waste by analyzing for the following characteristics: ignitability, corrosivity, reactivity, toxicity based on TCLP results.

3.6.3 Control and Management of Hazardous Waste

All hazardous waste will be managed by 45 SW CES/CEIE and F2F.

3.6.3.1 Hazardous Waste/Debris Management

Contractor will identify to Installation Environmental Office all construction activities that will generate hazardous waste or debris. Provide a documented waste determination for resultant waste streams. Identify, label, handle, store, and dispose of hazardous waste

or debris in accordance with federal, state, and local regulations, including 40 CFR 261, 40 CFR 262, 40 CFR 263, 40 CFR 264, 40 CFR 265, 40 CFR 266, and 40 CFR 268.

Coordinate the management and disposal of Hazardous Wastes with the Installation Environmental Office and deliver to the designated on-base storage facility at no additional cost to the Owner in accordance with federal, State, Local laws and the 45 SW Hazardous Waste Management Plan, latest edition. Store hazardous wastes in approved containers in accordance with 49 CFR 173 and 49 CFR 178. Hazardous waste generated within the confines of facilities is identified as being generated by the Government. Prior to removal of any hazardous waste from property, hazardous waste manifests must be signed by personnel from the Installation Environmental Office. Do not bring hazardous waste onto property. Provide the Contracting Officer with a copy of waste determination documentation for any solid waste streams that have any potential to be hazardous waste or contain any chemical constituents listed in 40 CFR 372-SUBPART D.

3.6.3.2 Waste Storage/Satellite Accumulation/90 Day Storage Areas

Accumulate hazardous waste at satellite accumulation points and in compliance with 40 CFR 262 and applicable state or local regulations. Individual waste streams will be limited to 55 gallons of accumulation (or one quart for acutely hazardous wastes). If the Contractor expects to generate hazardous waste at a rate and quantity that makes satellite accumulation impractical, the Contractor may request a temporary 90-day or 180-day, as appropriate, accumulation point be established. Submit a request in writing to the Contracting Officer and provide the following information (Attach Site Plan to the Request):

Contract Number	
Contractor	
Haz/Waste or Regulated Waste POC	
Phone Number	
Type of Waste	
Source of Waste	
Emergency POC	
Phone Number	
Location of the Site	

Attach a Waste Determination form for the expected waste streams. Allow 10 working days for processing this request. Additional compliance requirements (e.g., training and contingency planning) that may be required are the responsibility of the Contractor. Barricade the designated area where waste is being stored and post a sign identifying as follows:

"DANGER - UNAUTHORIZED PERSONNEL KEEP OUT"

3.6.3.3 Hazardous Waste Disposal

3.6.3.3.1 Responsibilities for Contractor's Disposal

Provide hazardous waste manifest to the Installations Environmental Office for review, approval, and signature prior to shipping waste off property.

3.6.3.3.1.1 Services

Provide service necessary for the final treatment or disposal of the hazardous material or waste in accordance with 40 CFR 260 - 40 CFR 279, local, and state, laws and regulations, and the terms and conditions of the Contract within 60 days after the materials have been generated. These services include necessary personnel, labor, transportation, packaging, detailed analysis (if required for disposal or transportation, include manifesting or complete waste profile sheets, equipment, and compile documentation).

3.6.3.3.1.2 Samples

Obtain a representative sample of the material generated for each job done to provide waste stream determination.

3.6.3.3.1.3 Analysis

Analyze each sample taken and provide analytical results to the Contracting Officer. See paragraph WASTE DETERMINATION DOCUMENTATION.

3.6.3.3.1.4 Labeling

During waste accumulation label all containers in accordance with 40 CFR 262. Prior to offering a waste for off-site transport, determine the Department of Transportation's (DOT's) proper shipping names for waste in accordance with 49 CFR 172 (each container requiring disposal) and demonstrate to the Contracting Officer how this determination is developed and supported by the sampling and analysis requirements contained herein. Label all containers of hazardous waste with the words "Hazardous Waste" or other words to describe the contents of the container in accordance with 40 CFR 262 and applicable state or local regulations.

3.6.3.3.2 Contractor Disposal Turn-In Requirements

Hazardous waste generated must be disposed of in accordance with the following conditions to meet installation requirements:

a. Provide DOT approved containers compatible with waste contents and in accordance with 49 CFR 173 for transportation of materials.

b. Band drums to wooden pallets.

c. No more than three 55 gallon drums or two 85 gallon over packs are to be banded to a pallet.

d. Band using 1-1/4 inch minimum band on upper third of drum.

e. Provide label in accordance with 49 CFR 172.101.

f. Leave 3 to 5 inches of empty space above volume of material.

3.6.3.4 Universal Waste Management

Manage the following categories of universal waste in accordance with federal, state, and local requirements and installation instructions:

a. Batteries as described in 40 CFR 273.2

b. Lamps as described in 40 CFR 273.5

c. Mercury-containing equipment as described in 40 CFR 273.4

d. Aerosol cans as described in 40 CFR 273.6

Mercury is prohibited in the construction of this facility, unless specified otherwise, and with the exception of mercury vapor lamps and fluorescent lamps. Dumping of mercury-containing materials and devices such as mercury vapor lamps, fluorescent lamps, and mercury switches, in rubbish containers is prohibited. Remove without breaking, pack to prevent breakage, and transport out of the activity in an unbroken condition for disposal as directed.

3.6.3.5 Electronics End-of-Life Management

Recycle or dispose of electronics waste, including, but not limited to, used electronic devices such computers, monitors, hard-copy devices, televisions, mobile devices, in accordance with 40 CFR 260-262, state, and local requirements, and installation instructions.

3.6.4 Releases/Spills of Oil and Hazardous Substances

3.6.4.1 Response and Notifications

Exercise due diligence to prevent, contain, and respond to spills of hazardous material, hazardous substances, hazardous waste, sewage, regulated gas, petroleum, lubrication oil, and other substances regulated in accordance with 40 CFR 300. Maintain spill cleanup equipment and materials at the work site. In the event of a spill, take prompt, effective action to stop, contain, curtail, or otherwise limit the amount, duration, and severity of the spill/release. In the event of any releases of oil and hazardous substances, chemicals, or gases; immediately (within 15 minutes) notify the Installation Fire Department, the Installation
Command Duty Officer, the Installation Environmental Office, the Contracting Officer and the state or local authority.

Submit verbal and written notifications as required by the federal (40 CFR 300.125 and 40 CFR 355), state, local regulations and instructions. Provide copies of the written notification and documentation that a verbal notification was made within 20 days. Spill

response must be in accordance with 40 CFR 300 and applicable state and local regulations. Contain and clean up these spills without cost to the Owner.

3.6.4.2 Clean Up

Clean up hazardous and non-hazardous waste spills. Reimburse the Owner for costs incurred including sample analysis materials, clothing, equipment, and labor if the Owner will initiate its own spill cleanup procedures, for Owner- responsible spills, when: Spill cleanup procedures have not begun within one hour of spill discovery/occurrence; or, in the Contracting Officer's judgment, spill cleanup is inadequate and the spill remains a threat to human health or the environment.

3.6.5 Mercury Materials

Immediately report to the Environmental Office and the Contracting Officer instances of breakage or mercury spillage. Clean mercury spill area to the satisfaction of the Contracting Officer.

Do not recycle a mercury spill cleanup; manage it as a hazardous waste for disposal.

3.6.6 Wastewater

3.6.6.1 Disposal of Wastewater

Disposal of wastewater must be as specified below.

3.6.6.1.1 Treatment

Do not allow wastewater from construction activities, such as onsite material processing, concrete curing, foundation and concrete clean-up, water used in concrete trucks, and forms to enter water ways or to be discharged prior to being treated to remove pollutants. Dispose of the construction- related waste water off property in accordance with 40 CFR 403, state, regional, and local laws and regulations.

3.6.6.1.2 Surface Discharge

For discharge of ground water, Surface discharge in accordance with the requirements of the NPDES or state STORMWATER DISCHARGES FROM CONSTRUCTION SITES permit.

3.7 HAZARDOUS MATERIAL MANAGEMENT

Include hazardous material control procedures in the Safety Plan. Address procedures and proper handling of hazardous materials, including the appropriate transportation requirements. Do not bring hazardous material onto property that does not directly relate to requirements for the performance of this contract. Submit an SDS and estimated quantities to be used for each hazardous material to the Contracting Officer prior to bringing the material on the installation. Typical materials requiring SDS and quantity reporting include, but are not limited to, oil and latex based painting and caulking products, solvents, adhesives, aerosol, and petroleum products. Use hazardous materials in a manner that minimizes the amount of hazardous waste generated. Containers of

hazardous materials must have National Fire Protection Association labels or their equivalent. Certify that hazardous materials removed from the site are hazardous materials and do not meet the definition of hazardous waste, in accordance with 40 CFR 261.

3.8 PREVIOUSLY USED EQUIPMENT

Clean previously used construction equipment prior to bringing it onto the project site. Equipment must be free from soil residuals, egg deposits from plant pests, noxious weeds, and plant seeds. Consult with the U.S. Department of Agriculture jurisdictional office for additional cleaning requirements.

3.9 MILITARY MUNITIONS

In the event military munitions, as defined in 40 CFR 260, are discovered or uncovered, immediately stop work in that area and immediately inform the Contracting Officer.

3.10 PETROLEUM, OIL, LUBRICANT (POL) STORAGE AND FUELING

POL products include flammable or combustible liquids, such as gasoline, diesel, lubricating oil, used engine oil, hydraulic oil, mineral oil, and cooking oil. Store POL products and fuel equipment and motor vehicles in a manner that affords the maximum protection against spills into the environment. Manage and store POL products in accordance with EPA 40 CFR 112, and other federal, state, regional, and local laws and regulations. Use secondary containments, dikes, curbs, and other barriers, to prevent POL products from spilling and entering the ground, storm or sewer drains, stormwater ditches or canals, or navigable waters of the United States. Describe in the EPP (see paragraph ENVIRONMENTAL PROTECTION PLAN) how POL tanks and containers must be stored, managed, and inspected and what protections must be provided. Storage of oil, including fuel, on the project site is not allowed. Fuel must be brought to the project site each day that work is performed.

3.10.1 Used Oil Management

Manage used oil generated on site in accordance with 40 CFR 279.
Determine if any used oil generated while onsite exhibits a characteristic of hazardous waste. Used oil containing 1,000 parts per million of solvents is considered a hazardous waste and disposed of at the Contractor's expense. Used oil mixed with a hazardous waste is also considered a hazardous waste. Dispose in accordance with paragraph HAZARDOUS WASTE DISPOSAL.

3.10.2 Oil Storage Including Fuel Tanks

Provide secondary containment and overfill protection for oil storage tanks. A berm used to provide secondary containment must be of sufficient size and strength to contain the contents of the tanks plus 5 inches freeboard for precipitation. Construct the berm to be impervious to oil for 72 hours that no discharge will permeate, drain, infiltrate, or otherwise escape before cleanup occurs. Use drip pans during oil transfer operations; adequate absorbent material must be onsite to clean up any spills and prevent releases to the environment. Cover tanks and drip pans during inclement weather. Provide procedures

and equipment to prevent overfilling of tanks. If tanks and containers with an aggregate aboveground capacity greater than 1320 gallons will be used onsite (only containers with a capacity of 55 gallons or greater are counted), provide and implement a Spill Prevention Control and Countermeasure (SPCC) plan meeting the requirements of 40 CFR 112. Do not bring underground storage tanks to the installation for Contractor use during a project. Submit the SPCC plan to the Contracting Officer for approval.

Monitor and remove any rainwater that accumulates in open containment dikes or berms. Inspect the accumulated rainwater prior to draining from a containment dike to the environment, to determine there is no oil sheen present.

3.11 INADVERTENT DISCOVERY OF PETROLEUM-CONTAMINATED SOIL OR HAZARDOUS WASTES

If petroleum-contaminated soil, or suspected hazardous waste is found during construction that was not identified in the Contract documents, immediately notify the Contracting Officer. Do not disturb this material until authorized by the Contracting Officer.

3.12 POST CONSTRUCTION CLEANUP

Clean up areas used for construction in accordance with Contract Clause: "Cleaning Up". Unless otherwise instructed in writing by the Contracting Officer, remove traces of temporary construction facilities such as haul roads, work area, structures, foundations of temporary structures, stockpiles of excess or waste materials, and other vestiges of construction prior to final acceptance of the work. Grade parking area and similar temporarily used areas to conform with surrounding contours.

-- End of Section --

SECTION 31 00 00

EARTHWORK

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Scope of Work

The work under this Section includes all labor, materials, and equipment necessary to perform excavation, filling, grading, and compaction of soils, including subgrade preparation and disposal of excess material, to achieve required lines, elevations, and site conditions as indicated on the Drawings for sitework. Perform all earthwork in accordance with "Supplemental Geotechnical Exploration" report requirements prepared by UES Professional Solutions, LLC, dated March 25, 2026.

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00

SUBMITTAL PROCEDURES: SD-01

Preconstruction Submittals

Shoring
Dewatering Work Plan
Shoring And Sheeting Plan
Subsurface Utility And Obstruction Location And Excavation Plan

SD-02 Shop Drawings

Subsurface Utility/Obstructions Location And Depth

SD-03 Product Data

Utilization of Excavated Materials
Opening of any Excavation or Borrow Pit
Shoulder Construction
Engineered Controls
Geotextile Fabric

SD-06 Test Reports

Testing

SD-07 Certificates

Testing

1.3 DEFINITIONS

1.3.1 Satisfactory Materials

Satisfactory materials comprise any materials classified by ASTM D2487 as GW, GP, GM, GP-GM, GW-GM, GC, GP-GC, GM-GC, SW, SP, SM, SW-SM, SC, SW-SC, SP-SM, SP-SC. Satisfactory materials for grading comprise stones less than 3 inches.

1.3.2 Unsatisfactory Materials

Materials which do not comply with the requirements for satisfactory materials are unsatisfactory. Unsatisfactory materials also include man-made fills; trash; refuse; backfills from previous construction; and material classified as satisfactory which contains root and other organic matter or frozen material. Notify the Contracting Officer when encountering any contaminated materials.

1.3.3 Cohesionless and Cohesive Materials

Cohesionless materials include materials classified in ASTM D2487 as GW, GP, SW, and SP. Cohesive materials include materials classified as GC, SC, ML, CL, MH, and CH. Materials classified as GM and SM will be identified as cohesionless only when the fines are nonplastic. Perform testing, required for classifying materials, in accordance with ASTM D4318, ASTM C136/C136M, ASTM D422 and ASTM D1140.

1.3.4 Degree of Compaction

Degree of compaction required, except as noted in the second sentence, is expressed as a percentage of the maximum density obtained by the test procedure presented in ASTM D698 abbreviated as a percent of laboratory maximum density. Since ASTM D698 applies only to soils that have 30 percent or less by weight of their particles retained on the ¾ inch sieve, express the degree of compaction for material having more than 30 percent by weight of their particles retained on the 3/4 inch sieve as a percentage of the maximum density in accordance with AASHTO T 180 and corrected with ASTM D4718/D4718M. To maintain the same percentage of coarse material, use the "remove and replace" procedure as described in NOTE 8 of Paragraph 7.2 in AASHTO T 180.

1.3.5 Topsoil

Material suitable for topsoils is defined as: natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth. Amend topsoil pH range to obtain a pH of 5.5 to 7.

1.3.6 Unstable Material

Unstable materials are too wet to properly support the utility pipe, conduit, or appurtenant structure.

1.3.7 Select Granular Material

Select granular material is defined as crushed stone with a gradation meeting the requirements of Section 290 of the Florida Department of Transportation (FDOT) Standard

Specifications for Road and Bridge Construction. This material may also be referred to as structural fill.

1.3.8 Initial Backfill Material

Initial backfill consists of select granular material or satisfactory materials meeting the requirements of Class I or Class II backfill as defined by AWWA M55. Provide initial backfill for plastic pipe with maximum particle size not exceeding 1/2 inch for pipe to 4 inches, 3/4 inch for pipes 6 to 8 inches, 1 inch for pipes 10 to 16 inches, and 1-1/2 inches for larger pipes as defined by ASTM D2774.

1.4 GEOTECHNICAL INVESTIGATION

Geotechnical investigation was performed as a separate effort. Implement results from investigation and associated report to support earthwork operations. Perform all earthwork in accordance with "Supplemental Geotechnical Exploration" report requirements prepared by UES Professional
Solutions, LLC, dated March 25, 2026

1.5 REQUIREMENTS FOR ENGINEERED CONTROLS

Use engineered temporary controls during all trenching and open excavation activities to preserve existing on-grade and buried utility infrastructure while completing installation of new pipe, structures and accoutrements. These controls are in addition to requirements to verify utility locations and depth and in addition to provisions defined by OSHA and EM-385 for Excavation Safety.

Use necessary controls required to prevent damage at excavations when reducing cover over buried pipe and infrastructure. Use planking, plating, or other measures as needed to distribute constructions loads over surrounding soil and prohibit additional loading on buried items. Provide necessary temporary thrust restraint where needed to replace restraint removed by excavation.

Submit product data for engineered controls including professional engineering certified tabulated data or engineered design verifying the required performance.

1.6 QUALITY ASSURANCE

1.6.1 Shoring and Sheeting Plan

Where shoring is required for excavation safety or support of utilities or structures, submit drawings and calculations, certified by a registered professional engineer, describing the methods for shoring and sheeting of excavations. Use the data provided within the Geotechnical Report to inform the design of shoring. On the drawings include material sizes and types, arrangement of members, and the sequence and method of installation and removal. In the calculations include all data and references used.

Provide inspection of excavations and soil/groundwater conditions throughout construction by a qualified person. The qualified person is responsible for performing pre-construction and periodic site visits throughout construction to assess site conditions. Update the

excavation, sheeting and dewatering plans as construction progresses to reflect changing conditions and submit an updated plan if necessary. Submit a written report, at least monthly, informing the Contractor and COR of the status of the plan and an accounting of the Contractor's adherence to the plan addressing any present or potential problems. The qualified person must be available to meet with the COR at any time throughout the contract duration.

1.6.2 Dewatering Work Plan

Construct all permanent work in areas free from water. Where dewatering is required, design, construct, and maintain all wells, pumps, vacuum systems, sumps, diversion, and drainage channels as necessary to maintain the areas free from water and to protect the areas to be occupied by permanent work from water damage. Remove all temporary works after they have served their purpose.

Submit procedures for accomplishing dewatering work. Submit drawings and calculations, certified by a registered professional engineer, describing the methods for dewatering of excavations. On the drawings include material sizes and types, arrangement of members, and the sequence and method of installation and removal. In the calculations include all data and references used. Use the data provided in the Geotechnical Report to inform the design of dewatering systems giving consideration to the water levels and soil types in selection of dewatering methods.

Comply with applicable groundwater withdrawal and protection regulations, acquiring required permits, and complying with water discharge regulation.

1.6.3 Utilities

Movement of construction machinery and equipment over, near, and in contact with pipes and utilities during construction is at the Contractor's risk. Complete excavation within 6 feet of known utilities by hand digging. Support uncovered lines or other existing work affected by the contract excavation until approval for backfill is granted by the COR. Report damage to utility lines or subsurface construction immediately to the COR.

1.6.4 Subsurface Utility Location and Excavation

Submit a Subsurface Utility and Obstruction Location and Excavation Plan and Subsurface Utility/Obstructions Location and Depth shop drawings. Provide utility location meeting the requirements in general accordance with the Standard Guideline for the Collection and Depiction of Existing Subsurface Utility Data, Standard Guideline ASCE 38-02, Quality Level A and in accordance with the requirements of AF-103.

Develop specific horizontal and vertical elevation information for all subsurface utilities (existing and abandoned) and obstructions within the construction corridor. This requirement applies to all subsurface utilities and obstructions and is not limited to content shown on project drawings. The locations of utilities shown on the drawings are based on best available information obtained from design utility investigation, survey and previous drawings and are augmented by various work performed in some locations since original construction. The approximate horizontal locations were obtained by various methods,

which did not include uncovering the soil above the utility to verify the suspected location. Minimal information regarding the elevation or relation to existing grade of these utilities has been collected since original construction for verification. Vertical location of the utilities shown on the profile drawings are from estimates developed from previous drawings and includes engineer's best judgment based on typical installations of those types of facilities on site. The physical location, size and configuration of the existing utilities adjacent to, underneath, or above the proposed pipeline to be installed will be determined by the Contractor.

Locate, horizontally and vertically, all the existing utilities crossing the proposed pipeline route and all those located within 10 feet horizontally as shown on the drawings. This location work will be completed in a phase prior to the beginning of construction on that phase of work. Based on the investigations, the location, dimensions, and elevation of the obstruction will be determined and recorded by the Contractor. Provide horizontal and vertical tolerances of plus or minus 0.1 feet.

PART 2 PRODUCTS

2.1 SOIL MATERIALS

2.1.1 Requirements for Offsite Soils

Provide soils and granular aggregate offsite borrow materials with no chemical or radiological contaminant in excess of undisturbed soil background concentrations.

2.1.2 Common Fill

Approved, satisfactory soil material with the characteristics required to compact to the soil density specified for the intended location.

2.1.3 Backfill and Fill Material

Excavated soil meeting the satisfactory soil material requirements defined herein.

2.1.4 Select Material

Provide materials classified as Granular Subbase per Section 290 of FDOT Standard Specifications for Road and Bridge Construction.

2.1.5 Topsoil

Natural, friable soil representative of productive, well-drained soils in the area, free of subsoil, stumps, rocks larger than one inch diameter, brush, weeds, toxic substances, and other material detrimental to plant growth.

2.1.6 Pipe Embedment Material

Except as specified otherwise in the individual piping section, provide embedment (bedding, haunching, and initial backfill) for piping installed by open excavation in accordance with AWWA M55, Class I or II, except as specified herein. Compact backfill to 12 inches over top of pipe to 95 percent of ASTM D698 maximum density. Provide embedment for plastic

piping from 6 inches below bottomed pipe to 12 inches above top of pipe. Provide materials per AWWA M55 as follows:

A. Class I: Angular, 0.25 to 1 inches (as allowed based on pipe diameter), graded stone, including a number of fill materials that have regional significance such as coral, slag, cinders, crushed stone, and crushed shells.
B. Class II: Coarse sands and gravels with maximum particle size of 1.5 inches (as allowed based on pipe diameter), including various graded sands and gravels containing small percentages of fines, generally granular and noncohesive, either wet or dry. Soil Types GW, GP, SW, and SP are included in this class as specified in ASTM D2487.

2.2 GEOTEXTILE FABRIC

Provide non-woven, polypropylene geotextile fabric meeting the requirements of AASHTO M 288. Provide materials that are resistant to UV, biological deterioration, rotting and natural basic and acidic conditions.

2.2 BURIED DETECTABLE WARNING AND IDENTIFICATION TAPE

Provide detectable three-layer laminate, consisting of a printed pigmented polyolefin film, a solid aluminum-foil core, and a clear protective film that allows inspection of the continuity of the conductive core; bright colored, continuous-printed on one side with the inscription of the utility, compounded for direct-burial service. Ensure tape has minimum width of 3 inches with tensile strength in accordance with ASTM D882. Color and printing must comply with ANSI Z535.1 and the below table:

Warning Tape Color Codes	
Red	Electric
Yellow	Gas, Oil; Dangerous Materials
Orange	Telephone and Other Communications
Blue	Water Systems
Green	Sewer Systems

2.2 MATERIAL FOR RIP-RAP

Provide Bedding material and rock conforming to DOT Specification Section 530 for construction indicated.

2.4.1 Bedding Material

Provide bedding material consisting of sand, gravel, or crushed rock, well graded, with a maximum particle size of 2 inches. Compose material of tough, durable particles. Allow fines passing the No. 200 standard sieve with a plasticity index less than six.

PART 3 EXECUTION

3.1 STRIPPING OF TOPSOIL

Strip topsoil to a depth of 6 to 12 inches. Spread topsoil on areas already graded and prepared for topsoil, or transported and deposited in stockpiles convenient to areas that are to receive application of the topsoil later, or at locations indicated or specified. Keep topsoil separate from other excavated materials, brush, litter, objectionable weeds, roots, stones larger than 2 inches in diameter, and other materials that would interfere with planting and maintenance operations. .

3.2 GENERAL EXCAVATION

Perform excavation of every type of material encountered within the limits of the project to the lines, grades, and elevations indicated and as specified. Perform the grading in accordance with the typical sections shown and the tolerances specified in paragraph FINISHING. Transport satisfactory excavated materials and place in fill or embankment within the limits of the work. Excavate unsatisfactory materials encountered within the limits of the work below grade and replace with satisfactory materials as directed. Include such excavated material and the satisfactory material ordered as replacement in excavation. Dispose surplus satisfactory excavated material not required for fill and unsatisfactory excavated material as specified in paragraph DISPOSITION OF SURPLUS MATERIAL. During construction, perform excavation and fill in a manner and sequence that will provide proper drainage at all times. Excavate material required for fill or embankment in excess of that produced by excavation within the grading limits or from other approved areas selected by the Contractor as specified.

3.2.1 Ditches, Gutters, and Channel Changes

Finish excavation of ditches, gutters, and channel changes by cutting accurately to the cross sections, grades, and elevations shown on the Contract Drawings. Do not excavate ditches and gutters below grades shown. Backfill any excessive open ditch or gutter excavation with satisfactory, thoroughly compacted, material or with suitable stone or cobble to grades shown. Dispose excavated material as shown or as directed, except in no case allow material be deposited a maximum 4 feet from edge of a ditch. Maintain excavations free from detrimental quantities of leaves, brush, sticks, trash, and other debris until final acceptance of the work.

3.2.2 Drainage Structures

Make excavations to the lines, grades, and elevations shown, or as directed. Provide trenches and foundation pits of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Clean rock or other hard foundation material of loose debris and cut to a firm, level, stepped, or serrated surface. Remove loose disintegrated rock and thin strata. Do not disturb the bottom of the excavation when concrete or masonry is to be placed in an excavated area. Do not excavate to the final grade level until just before the concrete or masonry is to be placed. Where pile foundations are to be used, stop the excavation of each pit at an elevation 1 foot above the base of the footing, as specified, before piles are driven. After the pile driving has

been completed, remove loose and displaced material and complete excavation, leaving a smooth, solid, undisturbed surface to receive the concrete or masonry.

3.2.3 Drainage

Provide for the collection and disposal of surface and subsurface water encountered during construction. Completely drain construction site during periods of construction to keep soil materials sufficiently dry. Construct storm drainage features (ponds/basins) at the earliest stages of site development, and throughout construction grade the construction area to provide positive surface water runoff away from the construction activity and provide temporary ditches, swales, and other drainage features and equipment as required to maintain dry soils. When unsuitable working platforms for equipment operation and unsuitable soil support for subsequent construction features develop, remove unsuitable material and provide new soil material as specified herein. It is the responsibility of the Contractor to assess the soil and ground water conditions presented by the plans and specifications and to employ necessary measures to permit construction to proceed.

Replace all clayey fine sand from estimated elevation of 166 ft NAVD to 164 ft NAVD88 below bottom of Pond 3 with clean, free draining sand. Refer to UES Supplemental Gentechnical Exploration Dated March 2026 for additional requirements. All pond side slopes to be sodded and bottom of pond to be seeded. Refer to Landscape Architectural drawings for additional requirements.

3.2.4 Dewatering

Control groundwater flowing toward or into excavations to prevent sloughing of excavation slopes and walls, boils, uplift and heave in the excavation and to eliminate interference with orderly progress of construction. By the use of well points, pumps, tile drains or other approved methods, prevent the accumulation of water in excavated areas. Continuously dewater excavations to maintain a ground water level no higher than three feet below the lowest point in the excavation. Design dewatering systems to allow for localized variations in the depth of excavations. Accomplish dewatering well enough in advance of excavation to ensure that groundwater is lowered prior to completing the final excavation to finish subgrade to preserve the integrity of the in-situ material.

All destabilized subgrade conditions caused by inadequate or untimely dewatering operations are to be undercut and backfilled with suitable backfill material at no additional cost to the Owner.

Piezometric observation wells are required to monitor the ground water level to ensure proper dewatering prior to excavation below the water table. The number of wells will vary depending on the size and depth of excavation. Operate and monitor dewatering systems in accordance with the recommendations of the geotechnical investigation report.

3.2.5 Trench Excavation Requirements

Excavate the trench as recommended by the manufacturer of the pipe to be installed. Provide vertical trench walls of such width as recommended in the manufacturer's printed installation manual for the pipe diameter. Shore trench walls more than 4 feet high, cut back

to a stable slope, or provide with equivalent means of protection for employees who may be exposed to moving ground or cave in, as determined by the Contractor's Safety Engineer or other competent person. Excavate trench walls which are cut back to at least the angle of repose of the soil. Give special attention to slopes which may be adversely affected by weather or moisture content. Do not exceed the trench width below the pipe top of 24 inches plus pipe outside diameter (O.D.) for pipes of less than 24 inches inside diameter, and do not exceed 36 inches plus pipe outside diameter for sizes larger than 24 inches inside diameter. Where recommended trench widths are exceeded, provide redesign, stronger pipe, or special installation procedures by the Contractor. The Contractor is responsible for the cost of redesign, stronger pipe, or special installation procedures without any additional cost to the Owner.

3.2.5.1 Bottom Preparation

Grade the bottoms of trenches accurately to provide uniform bearing and support. Remove stones of 2 inch or greater in any dimension, or as recommended by the pipe manufacturer, whichever is smaller, to avoid point bearing.

3.2.5.2 Removal of Unstable Material

Where unstable material is encountered in the bottom of the trench, remove such material to the depth directed and replace it to the proper grade with select granular material as provided in paragraph BACKFILLING AND COMPACTION. When removal of unstable material is required due to the Contractor's fault or neglect in performing the work, the Contractor is responsible for excavating the resulting material and replacing it without additional cost to the Owner.

3.2.5.3 Excavation for Appurtenances

Provide excavation for manholes, catch-basins, inlets, or similar structures of sufficient size to permit the placement and removal of forms for the full length and width of structure footings and foundations as shown. Clean rock or loose debris and cut to a firm surface either level, stepped, or serrated, as shown or as directed. Specify removal of unstable material. When concrete or masonry is to be placed in an excavated area, take special care not to disturb the bottom of the excavation. Do not excavate to the final grade level until just before the concrete or masonry is to be placed.

3.2.6 Underground Utilities

The Contractor is responsible for movement of construction machinery and equipment over pipes and utilities during construction. Report damage to utility lines or subsurface construction immediately to the Contracting Officer.

3.2.7 Structural Excavation

Ensure that footing subgrades have been inspected and approved by the Contracting Officer prior to concrete placement. Excavate to bottom of pile cap prior to placing or driving piles, unless authorized otherwise by the Contracting Officer. Backfill and compact over

excavations and changes in grade due to pile driving operations to 95 percent of ASTM D698 maximum density.

3.3 SELECTION OF BORROW MATERIAL

Select borrow material to meet the requirements and conditions of the particular fill or embankment for which it is to be used. Obtain borrow material from the borrow areas from approved private sources. Unless otherwise provided in the contract, the Contractor is responsible for obtaining the right to procure material, pay royalties and other charges involved, and bear the expense of developing the sources, including rights-of-way for hauling from the owners. Unless specifically provided, do not obtain borrow within the limits of the project site without prior written approval. Consider necessary clearing, grubbing, and satisfactory drainage of borrow pits and the disposal of debris thereon related operations to the borrow excavation.

3.4 OPENING AND DRAINAGE OF EXCAVATION AND BORROW PITS

Notify the Contracting Officer sufficiently in advance of the opening of any excavation or borrow pit or borrow areas to permit elevations and measurements of the undisturbed ground surface to be taken. Except as otherwise permitted, excavate borrow pits and other excavation areas providing adequate drainage. Transport overburden and other spoil material to designated spoil areas or otherwise dispose of as directed. Provide neatly trimmed and drained borrow pits after the excavation is completed. Ensure that excavation of any area, operation of borrow pits, or dumping of spoil material results in minimum detrimental effects on natural environmental conditions.

3.5 SHORING

3.5.1 General Requirements

Submit a Shoring and Sheeting plan for approval 15 days prior to starting work. Submit drawings and calculations, certified by a registered professional engineer, describing the methods for shoring and sheeting of excavations. Finish shoring, including sheet piling, and install as necessary to protect workmen, banks, adjacent paving, structures, and utilities. Remove shoring, bracing, and sheeting as excavations are backfilled, in a manner to prevent caving.

3.5.2 Geotechnical Engineer

Hire a Professional Geotechnical Engineer to provide inspection of excavations and soil/groundwater conditions throughout construction. The Geotechnical Engineer is responsible for performing pre-construction and periodic site visits throughout construction to assess site conditions. The Geotechnical Engineer is responsible for updating the excavation, sheeting and dewatering plans as construction progresses to reflect changing conditions and submit an updated plan if necessary. Submit a monthly written report, informing the Contractor and Contracting Officer of the status of the plan and an accounting of the Contractor's adherence to the plan addressing any present or potential problems. The Contracting Officer is responsible for arranging meetings with the Geotechnical Engineer at any time throughout the contract duration.

3.6 GRADING AREAS

Do not haul satisfactory material excavated in one grading area to another grading area except when so directed in writing. Place and grade stockpiles of satisfactory, unsatisfactory and wasted materials as specified. Keep stockpiles in a neat and well drained condition, giving due consideration to drainage at all times. Clear, grub, and seal by rubber-tired equipment, the ground surface at stockpile locations; separately stockpile excavated satisfactory and unsatisfactory materials. Protect stockpiles of satisfactory materials from contamination which may destroy the quality and fitness of the stockpiled material. If the Contractor fails to protect the stockpiles, and any material becomes unsatisfactory, remove and replace such material with satisfactory material from approved sources at no additional cost to the owner.

3.7 FINAL GRADE OF SURFACES TO SUPPORT CONCRETE

Do not excavate to final grade until just before concrete is to be placed. Roughen the level surfaces, and cut the sloped surfaces, as indicated, into rough steps or benches to provide a satisfactory bond. Protect all surfaces from erosion resulting from ponding or water flow.

3.8 GROUND SURFACE PREPARATION

3.8.1 General Requirements

Remove and replace unsatisfactory material with satisfactory materials, as directed by the Contracting Officer, in surfaces to receive fill or in excavated areas. Scarify the surface to a depth of 6 inches before the fill is started. Plow, step, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so that the fill material will bond with the existing material. When subgrades are less than the specified density, break up the ground surface to a minimum depth of 6 inches, pulverizing, and compacting to the specified density. When the subgrade is part fill and part excavation or natural ground, scarify the excavated or natural ground portion to a depth of 12 inches and compact it as specified for the adjacent fill.

3.8.2 Frozen Material

Do not place material on surfaces that are muddy, frozen, or contain frost.

3.9 UTILIZATION OF EXCAVATED MATERIALS

Use satisfactory material removed from excavations, insofar as practicable, in the construction of fills, embankments, subgrades, shoulders, bedding (as backfill), and for similar purposes. Submit procedure and location for disposal of unused satisfactory material. Dispose surplus satisfactory excavated material not required for fill and unsatisfactory excavated material as specified in paragraph DISPOSITION OF SURPLUS MATERIAL. Stockpile and use coarse rock from excavations for constructing slopes or embankments adjacent to streams, or sides and bottoms of channels and for protecting against erosion. Do not dispose excavated material to obstruct the flow of any stream,

endanger a partly finished structure, impair the efficiency or appearance of any structure, or be detrimental to the completed work in any way.

3.10 GEOTEXTILE FABRIC

Install geotextile fabric in strict accordance with manufacturer instructions for material separation and drainage installations. Where overlap is required to cover the area, provide overlap in accordance with manufacturer requirements. Take care not to disturb or damage geotextiles during placement and compaction of backfill.

3.11 BURIED DETECTABLE WARNING TAPE

3.11.1 Buried Detectable Warning and Identification Tape

Provide buried utility lines with utility identification tape. Bury tape 12 inches below finished grade; under pavements and slabs, bury tape 6 inches below top of subgrade. Terminate the ends of the detectable warning tape inside utility structures, valve boxes, or any other termination of the pipe with a minimum of 3 feet of tape, coiled, remaining accessible in each location.

3.12 FILLING, BACKFILLING AND COMPACTION

Compact backfill under roadways and within 5 feet of structures to a minimum of 95 percent laboratory maximum density as determined by ASTM D698, to prevent wedging action or eccentric loading upon or against the structure. Compact backfill in open areas to a minimum of 85 percent laboratory maximum density as determined by ASTM D698.

Prepare ground surface on which backfill is to be placed and provide compaction requirements for backfill materials in conformance with the applicable portions of paragraphs GROUND SURFACE PREPARATION. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.12.1 Trench Backfill

Backfill trenches to the grade shown. With prior approval, the trench may be partially backfilled prior to pressure testing as needed to restrain the pipe.

3.12.1.1 Replacement of Unstable Material

Replace unstable material removed from the bottom of the trench or excavation with select granular material placed in layers not exceeding 6 inches loose thickness.

3.12.1.2 Bedding and Initial Backfill

Provide bedding of the type and thickness shown. Place initial backfill material and compact it with approved tampers to a height of at least one foot above the utility pipe or conduit. Bring up the backfill evenly on both sides of the pipe for the full length of the pipe. Take care to ensure thorough compaction of the fill under the haunches of the pipe. Except as specified otherwise in the individual piping section, provide bedding for buried piping in accordance with AWWA C600, Type 4, except as specified herein. Compact backfill to top

of pipe under paved areas and structures to 95 percent of ASTM D698 maximum density. Compact backfill to top of pipe under open areas to 85 percent of ASTM D698 maximum density. Provide plastic piping with bedding to spring line of pipe. Provide materials as follows:

3.12.1.3 Final Backfill

Fill the remainder of the trench, except for special materials for roadways with satisfactory material. Place backfill material and compact as follows:

3.12.1.3.1 Roadways and Pavement

Place backfill up to the required elevation as specified. Do not permit water flooding or jetting methods of compaction.

3.12.1.3.2 Sidewalks, Turfed or Seeded Areas and Miscellaneous Areas

Deposit backfill in layers of a maximum of 12 inches loose thickness, and compact it to 85 percent maximum density for cohesive soils and 90 percent maximum density for cohesionless soils.

3.12.2 Backfill for Appurtenances

After the manhole, catchbasin, inlet, or similar structure has been constructed and the concrete has been allowed to cure for 48 hours, place backfill in such a manner that the structure is not be damaged by the shock of falling earth. Deposit the backfill material, compact it as specified for final backfill, and bring up the backfill evenly on all sides of the structure to prevent eccentric loading and excessive stress.

3.13 SPECIAL REQUIREMENTS

Special requirements for both excavation and backfill relating to the specific utilities are as follows:

3.13.1 Potable Water and Sanitary Sewer Forcemains

Excavate trenches to a depth that provides a minimum cover of 36 inches from the existing ground surface, or from the indicated finished grade, whichever is lower, to the top of the pipe.

3.13.2 Electrical and Communication Systems

Install equipment and devices in accordance with the manufacturer's published instructions and with the requirements and recommendations of NFPA 70 and IEEE C2. In addition to these requirements, install telecommunications in accordance with TIA-758 and RUS Bull 1751F-644.

Coordinate all electrical and communication work with the separate electrical design package and Section 26 05 00.00 40 COMMON WORK RESULTS FOR ELECTRICAL. Perform grounding in accordance with Section 26 05 26.00 40 GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS.

3.13.2.1 Underground Conduit and Duct Systems

Run conduit in straight lines except where a change of direction is necessary. Provide numbers and sizes of ducts as indicated. Ducts must have a continuous slope downward toward underground structures and away from buildings, laid with a minimum slope of 3 inches per 100 feet. Depending on the contour of the finished grade, the high-point may be at a manhole, a handhole, or between manholes or handholes. Terminate all PVC conduit end points in utility holes and buildings with end bells. The bell end of the conduits that enter manholes and handholes must be flush with the wall. Perform changes in ductbank direction as follows:

a. The minimum manufactured bend radius must be 18 inches for ducts of less than 3 inch diameter, and 36 inches for ducts 3 inches or greater in diameter.

b. As an exception to the bend radius required above, provide field manufactured longsweep bends having a minimum radius of 25 feet for a change of direction of more than 5 degrees, either horizontally or vertically, using a combination of curved and straight sections. Maximum manufactured curved sections allowed for use in field manufactured longsweep bend: 30 degrees.

Terminate underground ducts supplying buildings at a point 5 feet outside the building and projections thereof. Coordinate connections of the ducts to the service entrance with building design. Protect ends of underground conduit with plastic plugs until connections are made.

3.13.2.1.1 Treatment

Keep ducts clean of concrete, dirt, or foreign substances during construction. Make field cuts requiring tapers with proper tools and match factory tapers. Use a coupling recommended by the duct manufacturer whenever an existing duct is connected to a duct of different material or shape. Store ducts to avoid warping and deterioration with ends sufficiently plugged to prevent entry of any water or solid substances. Thoroughly clean ducts before being laid. Store plastic ducts on a flat surface and protected from the direct rays of the sun.

3.13.2.1.2 Conduit Cleaning

As each conduit run is completed, for conduit sizes 3 inches and larger, draw a flexible testing mandrel approximately 12 inches long with a diameter less than the inside diameter of the conduit through the conduit. After which, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs. For conduit sizes less than 3 inches, draw a stiff bristle brush through until conduit is clear of particles of earth, sand and gravel; then immediately install conduit plugs.

3.13.2.1.3 Galvanized Conduit Concrete Penetrations

Galvanized conduits which penetrate concrete (slabs, pavement, and walls) in wet locations must be PVC coated and extend from at least 2 inches within the concrete to the first coupling or fitting outside the concrete (minimum of 6 inches from penetration).

3.13.2.1.4 Multiple Conduits

Separate multiple conduits by a minimum distance of 3 inches, except that light and power conduits must be separated from control, signal, and telephone conduits by a minimum distance of 12 inches. Stagger the joints of the conduits by rows (horizontally) and layers (vertically) to strengthen the conduit assembly. Provide plastic duct spacers that interlock vertically and horizontally. Spacer assembly must consist of base spacers, intermediate spacers, ties, and locking device on top to provide a completely enclosed and locked-in conduit assembly. Install spacers per manufacturer's instructions, but provide a minimum of two spacer assemblies per 10 feet of conduit assembly.

3.13.2.1.5 Conduit Plugs and Pull Rope

Provide new conduit indicated as being unused or empty with plugs on each end. Plugs must contain a weephole or screen to allow water drainage. Provide a plastic pull rope having 3 feet of slack at each end of unused or empty conduits.

3.13.2.1.6 Duct Encased in Concrete

Construct underground duct lines of individual conduits encased in concrete. Depths to top of the concrete envelope must be not less than 18 inches below finished grade for electrical ducts and 24 inches below grade for communication ducts, , except under roads and pavement, concrete envelope must be not less than 24 inches below finished grade. Concrete encasement surrounding the bank must be rectangular in cross-section and provide at least 3 inches of concrete cover for ducts. Separate conduits by a minimum concrete thickness of 3 inches. Before pouring concrete, anchor duct bank assemblies, prevent floating during concrete pouring by driving reinforcing rods adjacent to duct spacer assemblies and attaching the rods to the spacer assembly. Provide color, type and depth of warning tape as specified in Section 31 00 00 EARTHWORK.

Duct bank envelopes connecting to underground structures must be flared to have enlarged cross-section at the manhole entrance to provide additional shear strength. Dimensions of the flared cross-section must be larger than the corresponding manhole opening dimensions by no less than 12 inches in each direction. Perimeter of the duct bank opening in the underground structure must be flared toward the inside or keyed to provide a positive interlock between the duct bank and the wall of the structure. Use vibrators when this portion of the encasement is poured to assure a seal between the envelope and the wall of the structure.

For duct bank connections to existing structures, break the structure wall out to the dimensions required and preserve steel in the structure wall. Cut steel and bend out to tie into the reinforcing of the duct bank envelope. Chip the perimeter surface of the duct bank opening to form a key or flared surface, providing a positive connection with the duct bank envelope.

During construction wherever a construction joint is necessary in a duct bank, prevent debris such as mud, and, and dirt from entering ducts by providing suitable conduit plugs. Fit concrete envelope of a partially completed duct bank with reinforcing steel extending a minimum of 2 feet back into the envelope and a minimum of 2 feet beyond the end of the

envelope. Provide one No. 4 bar in each corner, 3 inches from the edge of the envelope. Secure corner bars with two No. 3 ties, spaced approximately one foot apart. Restrain reinforcing assembly from moving during concrete pouring.

3.13.2.2 Precast Structures

Comply with ASTM C891 and manufacturer's instructions unless otherwise indicated. Install units level and plumb and with orientation and depth coordinated with connecting duct, to minimize bends and deflections required for proper entrances. Unless otherwise indicated, support units on a level bed of 3/4 inch granular fill over a layer of non-woven geotextile. Consolidate and compact granular fill by a minimum of three (3) passes with a vibratory plate. Extend bedding 12 inches beyond the limits of the structure on all sides.

In paved and concrete areas, set surface flush with finished grade. In unpaved areas, set covers structures one (1) inch above finished grade.

3.13.3 Rip-Rap Construction

Construct rip-rap in accordance with FDOT Specification Section 530 in the areas indicated. Trim and dress indicated areas to conform to cross sections, lines and grades shown within a tolerance of 0.1 foot.

3.13.3.1 Bedding Placement

Spread bedding material uniformly to a thickness of at least 3 inches on prepared subgrade as indicated. Compaction of bedding is not required. Finish bedding to present even surface free from mounds and windrows.

3.13.3.2 Stone Placement

Place rock for rip-rap on prepared bedding material to produce a well graded mass with the minimum practicable percentage of voids in conformance with lines and grades indicated. Distribute larger rock fragments, with dimensions extending the full depth of the rip-rap throughout the entire mass and eliminate "pockets" of small rock fragments. Rearrange individual pieces by mechanical equipment or by hand as necessary to obtain the distribution of fragment sizes specified above.

3.13.3.3 Grouting

3.14 EARTH EMBANKMENTS

Construct earth embankments from satisfactory materials free of organic or frozen material and rocks with any dimension greater than 3 inches. Place the material in successive horizontal layers of loose material not more than12 inches in depth. Spread each layer uniformly on a soil surface that has been moistened or aerated as necessary, and scarified or otherwise broken up so that the fill will bond with the surface on which it is placed. After spreading, plow, disk, or otherwise break up each layer; moisten or aerate as necessary; thoroughly mix; and compact to at least 90 percent laboratory maximum density for cohesive materials or 95 percent laboratory maximum density for cohesionless materials as determined by ASTM D698.

Compaction requirements for the upper portion of earth embankments forming subgrade for pavements are identical with those requirements specified in paragraph SUBGRADE PREPARATION. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.15 SUBGRADE PREPARATION

3.15.1 Proof Rolling

Finish proof rolling on an exposed subgrade free of surface water (wet conditions resulting from rainfall) which would promote degradation of an otherwise acceptable subgrade. After stripping, proof roll the existing subgrade with six passes of a dump truck loaded with 4 cubic yards of soil or 15 ton pneumatic-tired roller. Operate the roller in a systematic manner to ensure the number of passes over all areas, and at speeds between 2-1/2 to 3-1/2 mph. Notify the Contracting Officer a minimum of 3 days prior to proof rolling. Perform proof rolling in the presence of the Contracting Officer. Undercut rutting or pumping of material as directed by the Contracting Officer and replace with fill and backfill material.

3.15.2 Construction

Shape subgrade to line, grade, and cross section, and compact as specified. Include plowing, disking, and any moistening or aerating required to obtain specified compaction for this operation. Remove soft or otherwise unsatisfactory material and replace with satisfactory excavated material or other approved material as directed. Bring up low areas resulting from removal of unsatisfactory material required grade with satisfactory materials, and shape the entire subgrade to line, grade, and cross section and compact as specified.

3.15.3 Existing Subgrade

Determine the in-place density of the existing subgrade. If required density exists, no compaction of existing subgrade is required.

3.15.4 Compaction

Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment.

3.16 SHOULDER CONSTRUCTION

Construct shoulders of satisfactory excavated or borrow material or as otherwise shown or specified. Submit advanced notice on shoulder construction for rigid pavements. Construct shoulders immediately after adjacent paving is complete. In the case of rigid pavements, do not construct shoulders until permission of the Contracting Officer has been obtained. Finish compaction by sheepsfoot rollers, pneumatic-tired rollers, steel-wheeled rollers, vibratory compactors, or other approved equipment. Finish shoulder construction in proper sequence in such a manner that adjacent ditches will be drained effectively and that no damage of any kind is done to the adjacent completed pavement. Align the completed shoulders true to grade and shaped to drain in conformity with the cross section shown.

3.17 FINISHING

Finish the surface of excavations, embankments, and subgrades to a smooth and compact surface in accordance with the lines, grades, and cross sections or elevations shown. Provide the degree of finish for graded areas within 0.1 foot of the grades and elevations indicated . Finish gutters and ditches in a manner that will result in effective drainage. Finish the surface of areas to be turfed to a smoothness suitable for the application of turfing materials. Repair graded, topsoiled, or backfilled areas prior to acceptance of the work, and re-established grades to the required elevations and slopes.

3.17.1 Subgrade and Embankments

During construction, keep embankments and excavations shaped and drained. Maintain ditches and drains along subgrade to drain effectively at all times. Do not disturb the finished subgrade by traffic or other operation. Protect and maintain the finished subgrade in a satisfactory condition until subbase, base, or pavement is placed. Do not permit the storage or stockpiling of materials on the finished subgrade. Do not lay subbase, base course, or pavement until the subgrade has been checked and approved, and in no case place subbase, base, surfacing, or pavement on a muddy, spongy, or frozen subgrade.

3.17.2 Grading Around Structures

Construct areas within 5 feet outside of each building and structure line true-to-grade, shape to drain, and maintain free of trash and debris until final inspection has been completed and the work has been accepted.

3.18 PLACING TOPSOIL

Additional topsoil will not be required if work is performed in compliance with stripping and stockpiling requirements. On areas to receive topsoil, prepare the compacted subgrade soil to a 2 inches depth for bonding of topsoil with subsoil. Spread topsoil evenly to a thickness of 6 inches and grade to the elevations and slopes shown. Do not spread topsoil when frozen or excessively wet or dry.

3.19 TESTING

Perform testing by an owner approvedcommercial testing laboratory or the Contractor's validated testing facility. . Submit the results of all soil testing as frequently as necessary, but not less than once per month.

A. Determine field in-place density in accordance with ASTM D6938. When ASTM D6938 is used, check the calibration curves and adjust using only the sand cone method as described in ASTM D1556/D1556M. ASTM D6938 results in a wet unit weight of soil in determining the moisture content of the soil when using this method.
B. Check the calibration curves furnished with the moisture gauges along with density calibration checks as described in ASTM D6938; check the calibration of both the density and moisture gauges at the beginning of a job on each different type of material encountered and at intervals as directed by the Contracting Officer. When test results indicate, as determined by the Contracting Officer, that compaction is not as specified, remove the material, replace and recompact to meet specification requirements.
C. Perform tests on recompacted areas to determine conformance with specification requirements. Appoint a registered professional civil engineer to certify inspections and test results. Include with the certifications, a statement that the tests and

observations were performed by or under the direct supervision of the engineer and that the results are representative of the materials or conditions being certified by the tests. The following number of tests, if performed at the appropriate time, will be the minimum acceptable for each type operation.

3.19.1 Fill and Backfill Material Gradation

One test per 500 cubic yards stockpiled or in-place source material.
Determine gradation of fill and backfill material in accordance with ASTM C136/C136Mfor conformance to ASTM D2487 gradation limits; ASTM D1140 for material finer than the No. 200 sieve; ASTM D4318 for Atterberg limits; and ASTM D698 for moisture density relations.

3.19.2 In-Place Densities

For trenches, one test per 500 linear feet, or fraction thereof, of each lift of fill or backfill areas.

For general backfill in unpaved areas, one test per 5,000 square feet, or fraction thereof, of each lift of fill or backfill areas.

For structural backfill beneath roads or structures, one test per 1,000 square feet, or fraction thereof, of each lift of fill or backfill areas.

3.19.3 Check Tests on In-Place Densities

If ASTM D6938 is used, check in-place densities by ASTM D1556/D1556M.

3.19.4 Optimum Moisture and Laboratory Maximum Density

Perform tests for each type material or source of material including borrow material to determine the optimum moisture and laboratory maximum density values. One representative test per 500 cubic yards of fill and backfill, or when any change in material occurs which may affect the optimum moisture content or laboratory maximum density.

3.20 DISPOSITION OF SURPLUS MATERIAL

Remove surplus material and excavated unsatisfactory material not required or suitable for filling or backfilling, and brush, refuse, stumps, roots, and timber from property and properly disposed of in accordance with all applicable laws and regulations.

-- End of Section --

SECTION 32 12 16

HOT-MIX ASPHALT (HMA) FOR ROADS

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Scope of Work

The work under this Section includes all labor, materials, and equipment necessary to perform asphalt paving, including surface preparation, placement, and compaction of asphalt mixtures, to provide finished pavements meeting specified thicknesses, grades, and compaction requirements as indicated on the Drawings.

All asphalt materials, methods and quality control are to be in accordance with the Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction (most recent edition) except as modified herein.

1.1 General Modifications to Standard Specifications

City of Auburndale construction procedures and requirements supersede any conflicting requirement contained in the FDOT specifications. Specifically exclude content contained in Division I, General Requirements and Covenants - Sections 2, 3, 4, 8 and 9, and all references to contracting, payment, administration requirements, and other content conflicting contract documents located throughout the FDOT specifications.

If a conflict exists for which there is not a clear precedence between the FDOT specifications and project contract documents, notify the Contracting Officer immediately for direction.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Quality Control Plan

SD-03 Product Data

Mix Design
Quality Control
Coarse Aggregates
Fine Aggregates
Asphalt Binder
Prime Coat
Tack Coat

SD-06 Test Reports

Aggregates

QC Monitoring SD-07

Certificates

Asphalt Binder
Prime Coat
Tack Coat
Testing Laboratory

1.4 ENVIRONMENTAL REQUIREMENTS

Perform paving operations only when the surface and weather conditions are in accordance with the conditions listed in FDOT SPEC Section 330-3.

1.5 QUALITY CONTROL

Develop and submit a quality control plan fully detailing the contractor's quality management program of material suppliers and installations. Provide details of all quality control tests to be performed in the field, including the identification of the performing agency, testing and acceptance standards, and quality control testing agency qualifications and certifications. Include in the plan any required supplier or installer certifications.

1.5.1 Installer Qualifications

For existing pavement surface preparation and paving operations, provide

an installer with experience executing FDOT paving projects, including at least five overlay projects of similar contruction and scope. Projects involving asphalt overlay on existing concrete is preferred but not required.

For installation of the asphalt pavement interlayer reinforcement system, provide an installer, recommended or certified by the manufacturer and with documented experience in the installation of fiberglass interlayer grid systems for at least two projects of similar construction and scope.

A single installer to perform surface preparation, paving operations and installation of the interlayer reinforcement system is preferred to improve quality and efficiency, but is not required.

Submit installer qualifications and experience as part of the quality control plan.

1.5.2 Equipment

Provide mechanically-sound equipment capable of consistently meeting specification requirements in accordance with FDOT SPEC Section 330-5 for asphalt and Section 300-3 for prime and tack coats.

1.5.3 Hot Mix Asphalt

Source all raw and production materials from a plant meeting the requirements of FDOT SPEC Section 320 and listed on the FDOT Production Facility Listing of approved suppliers. Use a single supplier for the duration of the project. Submit plant and laboratory certifications as part of the quality control plan.

Perform asphalt roadway construction quality control in accordance with FDOT SPEC Section 330-2. Perform the required tests, record all results and submit quality control reports.

1.5.4 Prime and Tack Coats

Measure prime and tack coat application in accordance with FDOT SPEC Section 300-4.

1.6 MATERIAL STORAGE

Store all materials in a manner to ensure the material integrity is preserved in like-new condition. Provide necessary shelter from weather and temperature to meet manufacturer storage requirements. If required, install containment measures to protect material spills from entering the environment. Replace materials damaged during shipping, handling and storage at contractor's own cost.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Perform the work consisting of pavement courses composed of mineral aggregate and asphalt material heated and mixed in a central mixing plant and placed on a prepared course. Conform to the lines, grades, thicknesses, and typical cross sections indicated on the contract drawings. Construct each course to the depth, section, or elevation required by the contract drawings and roll, finish, and receive approval prior the placement of the next course.

2.2 HOT MIX ASPHALT

Provide a Superpave asphalt concrete in accordance with FDOT SPEC Section 334 for structural courses and Section 337 for friction courses. Develop and submit a mix design in accordance with FDOT SPEC Section 334-3 requirements for Traffic Level B loading for the nominal maximum aggregate sizes indicated on the contract drawings. Perform and submit testing to verify mixture acceptance in accordance with FDOT SPEC Section 334-5.

2.3 AGGREGATES

Provide coarse aggregates in accordance with FDOT SPEC Section 901. Provide fine aggregates in accordance with FDOT SPEC Section 902. Submit all aggregates test results verifying compliance with requirements for suitability of the material.

Required aggregate material gradations will be determined as part of the mix design. Once determined, submit the aggregate gradations verifying compliance with the applicable FDOT SPEC aggregate section.

2.4 ASPHALT BINDER

Provide Superpave Performance Graded (PG) asphalt binder, Grade 67-22, in accordance with FDOT SPEC Section 916-2. Submit product data, including material safety data sheets (SDS), and certification of conformance with applicable standards.

2.5 PRIME COAT

Provide prime coat in accordance with FDOT SPEC Section 916-3. Submit product data, including material safety data sheets (SDS), and certification of conformance with applicable standards.

2.6 TACK COAT

Provide tack coat, Grade 52-28, in accordance with FDOT SPEC Section 916-2. Submit product data, including material safety data sheets (SDS), and certification of conformance with applicable standards.

PART 3 EXECUTION

3.1 SURFACE PREPARATION

3.1.1 Existing Asphalt

Remove existing asphalt over existing concrete by milling in accordance with FDOT SPEC Section 327. Remove the existing asphalt layer to the extent that only the concrete surface remains.

3.1.2 New Base and Subbase

Prepare new base material for asphalt pavement in accordance with FDOT SPEC Section 330-4. For a limerock base, the base course to be compacted to a minimum density of 98 percent of the Modified Proctor maximum dry density and exhibit a minimum LBR of 100. The limerock material should comply with the latest edition of the FDOT Road and Bridge Construction specifications.

Prepare new subbase material for asphalt pavement in accordance with FDOT SPEC Section 290. Prepare stabilized subgrade materials immediately beneath the base course exhibit a minimum Limerock Bearing Ratio (LBR) of 40 as specified by FDOT. The stabilized subgrade should be compacted to at least 98 percent of the Modified Proctor maximum dry density (ASTM D 1557) value. Stabilized subgrade can be imported materials or a blend of on-site and imported materials. If a blend is proposed, we recommend that the contractor perform a mix design to find the optimum mix proportions. Compaction testing of the subgrade should be performed to full depth at a frequency of at least one (1) test per 10,000 square feet.

3.2 ASPHALT PAVING

Complete asphalt paving in accordance with FDOT SPEC Section 330 and referenced sections therein.

3.2.1 Leveling Course

For paving over existing concrete surfaces, provide a nominal 3/4 inch thick leveling course consisting of 9.5mm HMA. Vary thickness as required to achieve the final required pavement surface profile. Install the leveling course in accordance with FDOT SPEC Section 330.

3.2.2 Structure and Wearing Courses

Install structural and wearing (friction) courses in accordance with FDOT SPEC Section 330.

3.3 TRANSPORTING AND PLACING

3.3.1 Transporting

Transport the hot-mix asphalt from the mixing plant to the site in clean, tight vehicles. Schedule deliveries so that placing and compacting of mixture is uniform with minimum stopping and starting of the paver. Provide adequate artificial lighting for night placements. Hauling over freshly placed material will not be permitted until the material has been compacted as specified, and allowed to cool to 140 degrees F. To deliver mix to the paver, use a material transfer vehicle operated to produce continuous forward motion of the paver.

3.3.2 Placing

Place and compact the mix in accordance with FDOT SPEC Section 330-6 at a temperature suitable for obtaining density, surface smoothness, and other specified requirements. Upon arrival, place the mixture to the full width by an asphalt paver meeting the requirements of FDOT SPEC Section 330-5.2. Strike off the material in a uniform layer of such depth that, when the work is completed, it will have the required thickness and conform to the grade and contour indicated. Regulate the speed of the paver to eliminate pulling and tearing of the asphalt mat. Place the mixture in consecutive adjacent strips having a minimum width of 10 feet.

Stagger longitudinal joints between courses such that the offset between the longitudinal joint in the course immediately below is a minimum of 1 foot. Locate the joint in the surface course at the centerline of the pavement. Stagger transverse joints in pavement courses such that the joint in the course immediately below is offset a minimum of 10 feet from transverse joints in the previous course. Offset transverse joints in adjacent lanes a minimum of 10 feet.

On isolated areas where irregularities or unavoidable obstacles make the use of mechanical spreading and finishing equipment impractical, the mixture may be spread and luted by hand tools.

3.4 COMPACTION OF MIXTURE

After placing, thoroughly and uniformly compact the mixture by rolling in accordance with FDOT SPEC Section 330-7 with equipment meeting the requirements of FDOT SPEC Section 330-5.3.

Compact the surface as soon as possible after placement without causing displacement, cracking or shoving. Perform roller operations at a speed that is sufficiently slow enough to avoid displacement of the hot mixture and be effective in compaction. Immediately correct any displacement occurring as a result of reversing the direction of the roller, or from any other cause. Furnish sufficient rollers to handle the output of the plant. Continue rolling until the surface is of uniform texture, true to grade and cross section, and the required field density is obtained. In areas not accessible to the roller, thoroughly compacted the mixture with hand tampers or other satisfactory means.

To prevent adhesion of the mixture to the roller, keep the wheels properly moistened. Do not use fuel oil or other petroleum distillates to prevent adhesion. Do not use excessive water or any method which results in water being sprinkled directly onto the mixture.

Remove to full depth and replace with fresh hot mixture, any mixture that becomes loose and broken, mixed with dirt, contains check-cracking, or is in any way defective. All repair work to non-conforming materials is at the Contractor's expense. Skin patching will not be allowed.

3.5 JOINTS

Construct joints in accordance with FDOT SPEC Section 330-8. Construct all joints in a manner ensuring a continuous bond between the courses and to obtain the required density. Provide all joints with the same texture as other sections of the course and meet the requirements for smoothness and grade.

3.5.1 Transverse Joints

Perform paving operations to minimize the creation of transverse joints. Do not pass the roller over the unprotected end of the freshly laid mixture, except when necessary to form a transverse joint. When necessary to form a transverse joint, construct by placing a bulkhead or by tapering the course. Cut back the tapered edge to its full depth and width on a straight line to expose a vertical face prior to placing material at the joint. Remove the cutback material from the project. In both methods, install a light tack coat of asphalt material on all contact surfaces before placing any fresh mixture against the joint.

3.5.2 Longitudinal Joints

Remove longitudinal joints which are irregular, damaged, uncompacted, cold (less than 175 degrees F at the time of placing adjacent lanes), or otherwise defective by cutting back a maximum of 3 inches from the top of the course with a cutting wheel to expose a clean, sound vertical surface for the full depth of the course. Remove all cutback material from the project. Install a light tack coat of asphalt material on all contact surfaces before placing any fresh mixture against the joint. The Contractor will be allowed to use an alternate method if it can be demonstrated that density, smoothness, and texture can be met.

3.6 QUALITY CONTROL

3.6.1 General Quality Control Requirements

Develop and submit an approved Quality Control Plan. Submit the testing results from all manufacturer and field quality control tests. Do not commence field activities until the quality control plan has been approved addressing all elements which affect the quality of the pavement including, but not limited to:

a. Mix Design

b. Aggregate Grading

c. Quality of Materials

d. Stockpile Management

e. Proportioning

f. Mixing and Transportation

g. Mixture Volumetrics

h. Moisture Content of Mixtures

i. Placing and Finishing

j. Joints

k. Compaction

l. Surface Smoothness

3.6.2 Testing Laboratory

Perform all sampling and testing by FDOT approved laboratories, personnel, equipment and methods in accordance with the FDOT Laboratory Qualification Program. Submit FDOT testing laboratory certifications for each entity performing work on the project and include listing of certified testing methods to be performed for each.

Provide a fully equipped asphalt laboratory located at the plant and job site as necessary to meet the project testing requirements. Keep la boratory facilities clean and all equipment maintained in proper working condition. Provide the Contracting Officer unrestricted access to inspect the Contractor's laboratory facility, to witness quality control activities, and to perform any check testing desired. The Contracting Officer will advise the Contractor in writing of any noted deficiencies concerning the laboratory facility, equipment, supplies, or testing personnel and procedures. When the deficiencies are serious enough to adversely affect test results, all work will be suspended immediately and will not be permitted to resume until the deficiencies are corrected.

3.6.3 Quality Control Testing

Perform all quality control tests applicable to these specifications, the referenced FDOT specifications, and as set forth in the Quality Control Program. Include in the testing program, but not limited to, tests for the control of asphalt content, aggregate gradation, temperatures, aggregate moisture, moisture in the asphalt mixture, laboratory air voids, stability (NA for Superpave), flow (NA for Superpave), in-place density, grade and smoothness. Develop a Quality Control Testing Plan as part of the Quality Control Program.

Acceptance Testing Exceptions that apply to project quantities, as contained in FDOT SPEC Section 334-5.1.2 do not apply. Perform all required tests as described herein.

Collect all samples in accordance with FDOT FM 1-T 168 of quantities in accordance with FDOT SPEC Section 334-5.1.1.

3.6.3.1 Asphalt Content

Determine asphalt content in accordance with FDOT FM 5-563. Complete testing for each mix design.

3.6.3.2 Gradation

Determine asphalt aggregate gradations in accordance with FDOT FM 1-T 030. Complete testing for each mix design.

3.6.3.3 Volumetric Testing

Determine asphalt maximum specific gravity in accordance with FDOT FM 1-T 209 and AASHTO T 312. Complete testing for each mix design.

3.6.3.4 Temperatures

Check temperatures at least four times per lot, at necessary locations, to determine the temperature at the dryer, the asphalt cement in the storage tank, the asphalt mixture at the plant, and the asphalt mixture at the job site.

3.6.3.5 In-Place Density

Perform one core of in place asphalt pavement per stretch of roadway and test in accordance with FDOT FM 1-T 166 as a control and verification of the compaction effort. In addition to the core sample, utilize a nuclear gauge to monitor pavement density at a minimum of one location, per lane, per 500 feet of roadway. Conduct nuclear gauge density testing in accordance with ASTM D2950/D2950M.

3.6.3.6 Grade

Provide a final wearing surface of the pavement in accordance with the elevations and cross sections shown, varying not more than 0.05 foot from the plan grade established and approved at site of work. Match the top of the finished surface of the new pavement with the surface of abutting existing pavements. Deviation from the plan elevation will not be permitted in areas of pavements where closer conformance with planned elevation is required for the proper functioning of drainage and other appurtenant structures involved. Within 5 working days, after the completion of a particular lot incorporating the final wearing surface, test the final wearing surface of the pavement for conformance with the specified plan grade. Diamond grinding may be used to remove high spots to meet grade requirements. Skin patching for correcting low areas or planing or milling for correcting high areas will not be permitted.

Determine the final grade of the pavement surface in accordance with FDOT SPEC Section 330-9.

3.6.3.7 Smoothness

Determine the smoothness of the pavement surface in accordance with FDOT SPEC Section 330-9. After the final rolling, but not later than 24 hours after placement, test the surface of the pavement in each entire lot in such a manner as to reveal all surface irregularities exceeding the tolerances specified above. Separate testing of individual sublots is not required. If any pavement areas are ground, these areas must be retested immediately after grinding. Test each lot of the pavement in both a longitudinal and a transverse direction on parallel lines.

Where asphalt pavement is placed over existing concrete, ensure that there is no evidence of reflective cracking or depressions from the pavement below. Perform all testing in the presence of the Contracting Officer. Keep detailed notes of the results of the testing and furnish a copy to the Contracting Officer immediately after each day's testing.

3.6.3.7.1 Straightedge

Provide finished surfaces of the pavements with no abrupt change of 1/4 inch or more, and within the tolerances of 1/4 inch in both the longitudinal and transverse directions, when tested with an approved 12 feet straightedge.

3.6.3.7.2 Profilograph

Provide finished surfaces of the pavements with no abrupt change of 1/8 inch or more, and each 0.1 mile segment of each pavement lot with a Profile Index not greater than 9 inches/mile when tested with an approved California-type profilograph. If the extent of the pavement in either direction is less than 200 feet, test that direction by the straightedge method to meet requirements specified above.

3.6.3.8 Additional Testing

Any additional testing, which the Contractor deems necessary to control the process, may be performed at the Contractor's option.

3.6.3.9 QC Monitoring

Submit all QC test results to the Contracting Officer on a daily basis as the tests are performed. The Contracting Officer reserves the right to monitor any of the Contractor's quality control testing and to perform duplicate testing as a check to the Contractor's quality control testing.

3.6.4 Sampling

When directed by the Contracting Officer, sample and test any material which appears inconsistent with similar material being produced, unless such material is voluntarily removed and replaced or deficiencies corrected by the Contractor. Perform sampling in accordance with standard procedures specified.

-- End of Section --

SECTION 32 13 13.06

PORTLAND CEMENT CONCRETE PAVEMENT FOR ROADS AND SITE FACILITIES

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Scope of Work

The work under this Section includes all labor, materials, and equipment necessary to construct Portland cement concrete pavement, including subgrade preparation, formwork, placement, finishing, curing, and jointing of concrete, to provide durable pavement meeting specified thicknesses, lines, grades, and surface tolerances as indicated on the Drawings.

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-01 Preconstruction Submittals

Quality Control Plan
Joint Layout Plan

SD-03 Product Data
Curing Materials
Reinforcing Steel
Epoxy Resin
Ready-Mix Concrete
Portland Cement
Pozzolan
Aggregates
Admixtures
Premolded Expansion Joint Filler
Joint Sealant
Bonding Agent

SD-05 Design Data

Concrete Mix Design

SD-06 Test Reports

Air Content
Slump Tests
Compressive Strength Tests
Temperature Tests 1.3

DELIVERY, STORAGE, AND HANDLING

1.3.1 Concrete

Per ACI 301, Section 4.3.2.

1.3.2 Reinforcement

Per ACI 301, Section 3.1.2.

1.4 QUALITY ASSURANCE

1.4.1 Reinforcing Steel

ACI/MCP-4, Indicate bending diagrams, assembly diagrams, splicing and laps of bars, shapes, dimensions, and details of bar reinforcing, accessories, and concrete cover. Do not scale dimensions from structural drawings to determine lengths of reinforcing bars.

1.4.2 Formwork Design

Complete formwork design in accordance with ACI 347R, Chapter 4 and contain necessary task-specific consideration so that concrete structures will have the correct dimensions, shape, alignment, elevation and position with established tolerances. Design formwork such that it will safely support all vertical and lateral loads that might be applied until such loads can be supported by the concrete structure. Carry vertical and lateral loads to the ground by the formwork system or by the in-place construction that has adequate strength for that purpose. Responsibility for the design of the formwork rests with the contractor or formwork engineer hired by the contractor to design and be responsible for the formwork.

1.4.3 Control Submittals

1.4.3.1 Pumping Concrete

Submit proposed materials and methods for pumping concrete. In the submittal include mix designs, pumping equipment including type of pump and size and material for pipe, and maximum length and height concrete is to be pumped.

1.4.3.2 Safety Data Sheets

Submit Safety Data Sheets (SDS) as required by site requirements for all materials that are regulated for hazardous health effects. Permanently post the SDS at the construction site.

1.4.4 Test Reports

1.4.4.1 Concrete Mix Design

Submit copies of laboratory test reports for each strength and type of concrete showing that the mix has been successfully tested to produce concrete with the properties specified and that mix is suitable for the job conditions. Include mill test and all other tests for cement, aggregates, and admixtures in the laboratory test reports. Provide maximum nominal aggregate size, gradation analysis, percentage retained and passing sieve, and a graph of percentage retained verses sieve size. Submit test reports along with the concrete mix design. Obtain approval before placing concrete.

1.4.5 Quality Control Plan

Develop a concrete quality control program. Include in the plan the approved laboratories that will perform the required testing. Provide direct oversight for the concrete qualification program inclusive of associated sampling and testing. Submit all quality control to the Contracting Officer, Quality Manager and Concrete Supplier. Maintain a copy of ACI SP-15 and CRSI 10MSP at project site.

1.4.6 Quality Control Personnel Certifications

Include in the quality control plan the responsibilities of the various quality control personnel, including the names and qualifications of the individuals in those positions and a quality control organizational chart defining the quality control hierarchy and the responsibility of the various positions. Quality control personnel must be employed by the Contractor.

Submit American Concrete Institute certification for the following:

A. Quality control personnel responsible for inspection of concrete operations.

B. Lead Foreman or Journeyman of the Concrete Placing, Finishing, and Curing Crews.

C. Field Testing Technicians: ACI Concrete Field Testing Technician, Grade I.

1.4.6.1 Field Testing Technician and Testing Agency

Include in the plan data on qualifications of proposed testing agency and technicians for approval by the Contracting Officer prior to performing testing on concrete.

A. Perform testing by an ACI Concrete Field Testing Technician Grade 1 qualified in accordance with ACI SP-2 or equivalent. Equivalent certification programs must include requirements for written and performance examinations as stipulated in ACI SP-2.
B. Testing agencies that perform testing services on reinforcing steel must meet the requirements of ASTM E329.
C. Testing agencies that perform testing services on concrete materials must meet the requirements of ASTM C1077.

1.4.7 Laboratory Qualifications for Concrete Qualification Testing

The concrete testing laboratory must have the necessary equipment and experience to accomplish required testing. The laboratory must meet the requirements of ASTM C1077 and be Cement and Concrete Reference Laboratory (CCRL) inspected.

1.4.8 Laboratory Accreditation

The Contractor is responsible for providing laboratory and testing facilities at own expense. The laboratories performing the tests must be accredited in accordance with ASTM C1077, including ASTM C78/C78M and ASTM C1260. The accreditation must be current and must include the required test methods, as specified.

1.5 QUALIFICATIONS FOR WELDING WORK

Perform welding in accordance with AWS D1.4/D1.4M.

Verify that Welder qualifications are in accordance with AWS D1.4/D1.4M or under an equivalent qualification test approved in advance. Welders are permitted to do only the type of welding for which each is specifically qualified.

PART 2 PRODUCTS

2.1 MATERIALS FOR FORMS

Per ACI 301, Section 2.2.1.1.

2.1.1 Sidewalk Forms

Use sidewalk forms that are of a height equal to the full depth of the finished sidewalk.

2.1.2 Curb and Gutter Forms

Use curb and gutter outside forms that have a height equal to the full depth of the curb or gutter. Use rigid forms for curb returns, except that benders or thin plank forms may be used for curb or curb returns with a radius of 10 feet or more, where grade changes occur in the return, or where the central angle is such that a rigid form with a central angle of 90 degrees cannot be used. Back forms for curb returns may be made of 1-1/2 inch benders, for the full height of the curb, cleated together. In lieu of inside forms for curbs, a curb "mule" may be used for forming and finishing this surface, provided the results are approved.

2.2 FORM TIES AND ACCESSORIES

Per ACI 301, Section 2.2.1.1.

2.3 CONCRETE

2.3.1 Contractor-Furnished Concrete Mix Design

Location	f'c (Min.) 28-Day Comp. Strength (psi)	ASTM C33/C33M Maximum Nominal Aggregate	Slump (in)	Maximum Water-Cement Ratio (by weight)	Air Entrainment (%)
All areas	4000	1 inch	4 inches	0.5	4.5

2.3.2 Ready-Mix Concrete

Provide concrete that meets the requirements of ASTM C94/C94M and is proportioned for strength and quality requirements in accordance with ACI 318, Section 5.3 "Proportioning on the basis of field experience".

2.3.3 Curing Materials

Provide concrete curing material in accordance with ACI 301 Section 5 and ACI 308.1 Section 2. Submit product data for concrete curing compounds.
Submit manufactures instructions for placement of curing compound.

2.4 MATERIALS

2.4.1 Portland Cement

ASTM C150/C150M, Type I or IL.

2.4.1.1 Pozzolan

ASTM C618, add with cement. Replace 20 percent by weight of cementitious material with pozzolans.

2.4.2 Water

Potable water.

2.4.3 Aggregates

ASTM C33/C33M.

2.4.4 Nonshrink Grout

ASTM C1107/C1107M. Provide non-metallic grout with a minimum compressive strength of 8000 psi at 28 days.

2.4.5 Admixtures

ASTM C494/C494M: Type A, water reducing; Type B, retarding; Type C, accelerating; Type D, water-reducing and retarding; and Type E, water-reducing and accelerating admixture. Do not use calcium chloride admixtures.

2.4.5.1 Air-Entraining

ASTM C260/C260M. 2.4.5.2 High Range Water Reducer (HRWR)

(Superplasticizers)

ASTM C494/C494M, Type F. 2.4.6

Premolded Expansion Joint Filler

ASTM D1751 or ASTM D1752.

2.4.7 Joint Sealant

Sikasil-728 SL or approved equal conforming to ASTM C920 and ASTM D5893/D5893M.

2.4.8 Contraction Joint Filler for Curb and Gutter

Use hard-pressed fiberboard contraction joint filler for curb and gutter.

2.4.9 Form Release Agent

Per ACI 301, Section 2.2.1.3.

2.5 REINFORCING STEEL

2.5.1 Reinforcing Bars

Deformed bars ASTM A615/A615M, Grade 60. 2.5.1.1

Galvanized Reinforcing Bars

ASTM A767/A767M.

2.5.2 Wire

2.5.2.1 Welded Wire Reinforcement

ASTM A1064/A1064M.

2.5.2.2 Steel Wire

ASTM A1064/A1064M.

2.5.3 Reinforcing Bar Supports

Supports include bolsters, chairs, spacers, and other devices necessary for proper spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place.

Provide legs of supports in contact with formwork hot-dip galvanized, or plastic coated after fabrication, or stainless-steel bar supports.

Support bottom reinforcement of slab on grade using precast concrete reinforcement support.

2.5.4 Fiber-Reinforced Concrete

Provide fiber reinforced concrete in accordance with ASTM C1116/C1116M Type III, synthetic fiber reinforced concrete. Use a minimum of 1.5 pounds of fibers per cubic yard of concrete. Add fibers at the batch plant.

2.6 BONDING MATERIALS

2.6.1 Concrete Bonding Agent

ASTM C1059/C1059M, Type II.

2.7 EPOXY RESIN

Provide epoxy-resin materials that consist of two-component materials conforming to the requirements of ASTM C881/C881M, Class as appropriate for each application temperature to be encountered, except that in addition, the materials meet the following requirements:

A. Type IV, Grade 3, for use for embedding dowels and anchor bolts.

B. Type III, Grade as approved, for use as patching materials for complete filling of spalls and other voids and for use in preparing epoxy resin mortar.
C. Type IV, Grade 1, for use for injecting cracks.
D. Type V, Grade as approved, for bonding freshly mixed portland cement concrete or mortar or freshly mixed epoxy resin concrete or mortar to hardened concrete.

PART 3 EXECUTION

3.1 General

Per ACI 301, Section 5.3.1.

3.2 Sidewalk Subgrade

Place and compact the subgrade in accordance with Section 31 00 00 EARTHWORK. Test the subgrade for grade and cross section with a template extending the full width of the sidewalk and supported between side forms.

3.3 Curb and Gutter Subgrade

Place and compact the subgrade in accordance with FDOT requirements. Test the subgrade for grade and cross section by means of a template extending the full width of the curb and gutter. Use subgrade materials equal in bearing quality to the subgrade under the adjacent pavement.

3.4 Reinforcement and Other Embedded Items

Secure reinforcement, joint materials, and other embedded materials in position, inspected, and approved before start of concrete placing.

3.5 FORMWORKS

Per ACI 301, Section 2.1.3.

3.5.1 Reuse

Reuse forms providing the structural integrity of concrete and the aesthetics of exposed concrete are not compromised.

3.5.2 Tolerances for Form Construction

Per ACI 117.

3.5.3 Removal of Forms and Supports

Per ACI 301, Section 2.3.2.

3.5.4 Sidewalks

Set forms for sidewalks with the upper edge true to line and grade with an allowable tolerance of 1/8 inch in any 10 foot long section. After forms are set, grade and alignment must be checked with a 10 foot straightedge. Sidewalks must have a transverse slope of 1/4 inch per foot unless otherwise indicated, construct sidewalks that are located adjacent to

curbs with the low side adjacent to the curb. Do not remove side forms less than 12 hours after finishing has been completed.

3.5.5 Curbs and Gutters

Any existing curbs and gutters needing to be replaced for installing any proposed underground utilities or proposed infrastructure to match existing conditions. Remove forms used along the front of the curb not less than 2 hours nor more than 6 hours after the concrete has been placed. Do not remove forms used along the back of curb until the face and top of the curb have been finished, as specified for concrete finishing. Do not remove gutter forms while the concrete is sufficiently plastic to slump in any direction.

3.6 FORMED SURFACES

Coat contact surfaces of forms with form-coating compound before reinforcement is placed. Provide a commercial formulation form-coating compound that does not bond with, stain, or adversely affect concrete surfaces and impair subsequent treatment of concrete surfaces that entails bonding or adhesion nor impeded wetting of surfaces to be cured with water or curing compounds. Do not allow excess form-coating compound to stand in puddles in the forms or to come in contact with concrete against which fresh concrete is placed. Make thinning of form-coating compound with thinning agent of the type, in the amount, and under the conditions recommended by the form-coating compound manufacturer's printed or written directions.

3.7 PLACING REINFORCEMENT AND MISCELLANEOUS MATERIALS

Per ACI 301, Section 3.3.2.

3.7.1 General

Provide details of reinforcement that are in accordance with ACI 301 and ACI SP-66 and as specified.

3.7.2 Splicing

Provide splices not specified designed per ACI 318, Chapter 12.

3.7.3 Cover

Cover rebar in accordance with ACI 318, Chapter 7, and ACI 301, Table 3.3.2.3 unless otherwise noted in the contract drawings.

3.7.4 Expansion Joints and Contraction Joints

Provide expansion joints at edges of interior floor slabs on grade abutting vertical surfaces, and as indicated. Make expansion joints 1/2 inch wide unless indicated otherwise. Completely fill joints exposed to weather with joint filler material and joint sealant.

3.7.5 Concrete Pavement Joints

Provide concrete pavement contraction and expansion joints in accordance with ACI 325.12R-02. Submit a joint layout plan for approval by the Engineer prior to installation of concrete pavement. Unless otherwise approved or indicated, either use a jointer to cut the groove or saw a groove in the hardened concrete with a power-driven saw. Construct sawed joints by sawing a groove in the concrete with a 1/8 inch blade.

Form expansion joints using 1/8 inch joint filler strips. Joint filler in expansion joints surrounding structures and features within the sidewalk may consist of preformed filler material conforming to ASTM D1751 or ASTM D1752.

3.7.6 Sidewalk Joints

Construct sidewalk joints to divide the surface into rectangular areas. Space transverse contraction joints at a distance equal to the sidewalk width or five (5) feet on center, whichever is less, and continuous across the slab. Construct longitudinal contraction joints along the centerline of all sidewalks 10 feet or more in width. Construct transverse expansion joints at sidewalk returns and opposite expansion joints in adjoining curbs. Where the sidewalk is not in contact with the curb, install transverse expansion joints as indicated. Form expansion joints around structures and features which project through or into the sidewalk pavement, using joint filler of the type, thickness, and width indicated. Expansion joints are not required between sidewalks and curb that abut the sidewalk longitudinally.

3.7.6.1 Sidewalk Contraction Joints

Form contraction joints in the fresh concrete by cutting a groove in the top portion of the slab to a depth of at least one-fourth of the sidewalk slab thickness. Unless otherwise approved or indicated, either use a jointer to cut the groove or saw a groove in the hardened concrete with a power-driven saw. Construct sawed joints by sawing a groove in the concrete with a 1/8 inch blade. Provide an ample supply of saw blades on the jobsite before concrete placement is started. Provide at least one standby sawing unit in good working order at the jobsite at all times during the sawing operations.

3.7.6.2 Sidewalk Expansion Joints

Form expansion joints using 1/2 inch joint filler strips. Joint filler in expansion joints surrounding structures and features within the sidewalk may consist of preformed filler material conforming to ASTM D1752 or building paper. Hold joint filler in place with steel pins or other devices to prevent warping of the filler during floating and finishing. Immediately after finishing operations are completed, round joint edges using an edging tool having a radius of 1/4 inch. Remove any concrete over the joint filler. At the end of the curing period, clean the top of expansion joints and fill with cold-applied joint sealant. Use joint sealant that is gray or stone in color. Thoroughly clean the joint opening before the sealing material is placed. Do not spill sealing material on exposed surfaces of the concrete. Apply joint sealing material only when the concrete at the joint is surface dry and atmospheric and concrete temperatures are above 50 degrees F. Immediately remove any excess material on exposed surfaces of the concrete and clean the concrete surfaces.

3.7.7 Curb and Gutter Joints

Construct curb and gutter joints at right angles to the line of curb and gutter.

3.7.7.1 Contraction Joints

Construct contraction joints directly opposite contraction joints in abutting portland cement concrete pavements and spaced so that monolithic sections between curb returns will not be less than 5 feet nor greater than 15 feet in length.

A. Construct contraction joints (except for slip forming) by means of 1/8 inch thick separators and of a section conforming to the cross section of the curb and gutter. Remove separators as soon as practicable after concrete has set sufficiently to preserve the width and shape of the joint and prior to finishing.

B. When slip forming is used, cut the contraction joints in the top portion of the gutter/curb hardened concrete in a continuous cut across the curb and gutter, using a power-driven saw. Cut the contraction joint to a depth of at least one-fourth of the gutter/curb depth using a 1/8 inch saw blade.

3.7.7.2 Expansion Joints

Form expansion joints by means of preformed expansion joint filler material cut and shaped to the cross section of curb and gutter. Construct expansion joints in curb and gutter directly opposite expansion joints of abutting portland cement concrete pavement using the same type and thickness of joints as joints in the pavement. Where curb and gutter do not abut portland cement concrete pavement, provide expansion joints at least 1/2 inch in width at intervals not less than 30 feet nor greater than 120 feet. Seal expansion joints immediately following curing of the concrete or as soon thereafter as weather conditions permit. Seal expansion joints and the top 1 inch depth of curb and gutter contraction-joints with joint sealant. Thoroughly clean the joint opening before the sealing material is placed. Do not spill sealing material on exposed surfaces of the concrete. Concrete at the joint must be surface dry and atmospheric and concrete temperatures must be above 50 degrees F at the time of application of joint sealing material. Immediately remove excess material on exposed surfaces of the concrete and clean concrete surfaces.

3.7.8 Fabrication and Detailing

Per ACI 301, Section 3.2.2 and ACI SP-66. Submit fabrication drawings.

3.7.9 Tolerances

ACI 117 and as indicated. 3.8 BATCHING, MEASURING, MIXING,

AND TRANSPORTING CONCRETE

ASTM C94/C94M.

3.9 PLACING CONCRETE

Per ACI 301, Section 5.3.2. 3.10 FLOOR, SLAB, AND PAVEMENT FINISHES AND

MISCELLANEOUS CONSTRUCTION

3.10.1 Finish

Deposit concrete between the forms to a uniform height. Consolidate concrete to remove voids and air pockets. Do not move concrete horizontally with vibrator. Strike off concrete between forms using a form-riding paving machine or vibrating screed. Other strikeoff devices may be used, such as highway straightedge or scraping straightedge, when approved by the COR. Immediately after strikeoff, and before bleed water appears on the surface, level concrete with a bullfloat to obtain proper contour and grade. If bleed water is present prior to floating the surface, drag the excess water off or remove by absorption with porous material. Do not use dry cement to absorb bleed water. Do not use steel trowels or power finishing equipment. Finish the pavement to the elevations and thickness specified in the project drawings.

3.10.2 Final Surface Texture

For exterior pavements, broom concrete surface with a steel or fiber broom to produce corrugations between 1/16 and 1/8 inch deep. Broom perpendicular to the nearest edge of the pavement. Broom all areas of a panel in the same direction. Use the same type and manufacture of broom for all paved surfaces to provide a consistent appearance.

3.11 CURING AND PROTECTION

3.11.1 Concrete Curing Compound

Seal or cover joint openings prior to application of curing compound. Prevent curing compound from entering the joint. Apply in accordance with the recommendations of the manufacturer immediately after any water sheen which may develop after finishing has disappeared from the concrete surface and before joints are sawed. Apply curing compound to pavement edges after forms have been removed. Provide and maintain compound on the concrete surface throughout the curing period.

3.11.2 Protection of Treated Surfaces

Prohibit pedestrian and vehicular traffic and other sources of abrasion at least 72 hours after compound application. Maintain continuity of the coating for the entire curing period and immediately repair after any damage.

3.11.3 Protection After Curing

Protect finished concrete surfaces from damage by construction operations. Particularly load stresses, heavy shock and excessive vibration.

3.12 FIELD QUALITY CONTROL

3.12.1 Sampling

ASTM C172/C172M. Collect samples of fresh concrete to perform tests specified. ASTM C31/C31M for making test specimens.

3.12.2 Testing

3.12.2.1 Slump Tests

ASTM C143/C143M. Take concrete samples during concrete placement/discharge. The maximum slump may be increased as specified with the addition of an approved admixture provided that the water-cementitious material ratio is not exceeded. Perform tests at commencement of concrete placement, when test cylinders are made, and for each batch (minimum) or every 20 cubic yards (maximum) of concrete.

3.12.2.2 Temperature Tests

Determine at time of placement in accordance with ASTM C1064/C1064M.

3.12.2.3 Compressive Strength Tests

ASTM C39/C39M. Make six (6) test cylinders for each set of tests in accordance with ASTM C31/C31M. Take precautions to prevent evaporation and loss of water from the specimen. Test two (2) cylinders at seven (7) days, two (2) cylinders at 28 days, and hold two (2) cylinders in reserve. Take samples for strength tests of each mix design and from each 20 cubic yards of concrete placed each day not less than once a day. Each strength test result must be the average of two (2) cylinders from the same concrete sample tested at 28 days. If the average of any two (2) strength test results falls below f'c by more than 450 psi, take a minimum of three (3) ASTM C42/C42M core samples from the in-place work represented by the low test cylinder results and test. Concrete represented by core test is considered structurally adequate if the average of three (3) cores is equal to at least 85 percent of f'c and if no single core is less than 75 percent of f'c. Retest locations represented by erratic core strengths. Remove concrete not meeting strength criteria and provide new acceptable concrete. Repair core holes with nonshrink grout. Match color and finish of adjacent concrete.

3.12.2.4 Air Content

ASTM C173/C173M or ASTM C231/C231M for normal weight concrete. Test air-entrained concrete for air content at the same frequency as specified for slump tests.

Tolerance for air content as delivered in accordance with ACI 318, Section 4.4.1 requirements.

3.13 JOINTS

3.13.1 Contraction Joints in Slabs on Ground

Provide joints to form panels as indicated in accordance with ACI 301 Section 5.3.5.

3.13.2 Sealing Joints in Slabs on Ground

Seal all expansion joints and contraction joints as indicated. Install in strict accordance with manufacturer's instructions.

-- End of Section --

SECTION 32 17 23

PAVEMENT MARKINGS

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Scope of Work

The work under this Section includes all labor, materials, and equipment necessary to install pavement markings, including surface preparation and application of painted or thermoplastic markings, to provide durable, clearly defined traffic control markings as indicated on the Drawings.

1.2 GENERAL REQUIREMENTS

Provide all exterior signage by a single manufacturer. Provide exterior signage of the design, detail, sizes, types, and message content shown on the drawings, conforming to the requirements specified, and provided at the locations indicated. Submit exterior signage schedule in electronic media with spread sheet format. In the spread sheet include sign location, sign type, and message. Design signs complete with lettering, framing as detailed, and related components for a complete installation. Provide each sample consisting of a complete sign panel with letters and symbols. Samples may be installed in the work, provided each sample is identified and location recorded. Submit three color samples for each material requiring color and 12 inch square sample of sign face color sample.

1.3 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-03 Product Data

Exterior Surface Preparation
Thermoplastic compound
Exterior Signage

SD-06 Test Reports

Thermoplastic Compound

SD-07 Certificates

Volatile Organic Compound, (VOC); G
Thermoplastic Compound

1.4 QUALITY ASSURANCE

1.4.1 Regulatory Requirements

Submit certificate stating that the proposed pavement marking paint meets the Volatile Organic Compound, (VOC) regulations of the local Air Pollution Control District having

jurisdiction over the geographical area in which the project is located. As required by the site, submit Safety Data Sheets for each product.

1.5 DELIVERY AND STORAGE

Deliver paint materials, thermoplastic compound materials, and reflective media in original sealed containers that plainly show the designated name, specification number, batch number, color, date of manufacture, manufacturer's directions, and name of manufacturer.

Provide storage facilities at the job site for maintaining materials at temperatures recommended by the manufacturer.

1.6 PROJECT/SITE CONDITIONS

1.6.1 Environmental Requirements

Apply pavement markings to clean, dry surfaces, and unless otherwise approved, only when the air and pavement surface temperature is at least 5 degrees F above the dew point and the air and pavement temperatures are within the limits recommended by the pavement marking manufacturer. Allow pavement surfaces to dry after water has been used for cleaning or rainfall has occurred prior to striping or marking. Test the pavement surface for moisture before beginning work each day and after cleaning. Do not commence marking until the pavement is sufficiently dry and the pavement condition has been approved by the Contracting Officer. Employ the "plastic wrap method" to test the pavement for moisture as specified in paragraph TESTING FOR MOISTURE.

1.6.2 Traffic Controls

Place warning signs conforming to MUTCD near the beginning of the worksite and well ahead of the worksite for alerting approaching traffic from both directions. Place small markers along newly painted lines or freshly placed raised markers to control traffic and prevent damage to newly painted surfaces or displacement of raised pavement markers. Mark painting equipment with large warning signs indicating slow-moving painting equipment in operation.

When traffic must be rerouted or controlled to accomplish the work, provide necessary warning signs, flag persons, and related equipment for the safe passage of vehicles.

1.6.3 Lighting

When night operations are necessary, provide all necessary lighting and equipment. The Owner reserves the right to accept or reject night work on the day following night activities by the Contractor.

PART 2 PRODUCTS

2.1 EQUIPMENT

2.1.1 Surface Preparation

2.1.1.1 Surface Preparation Equipment for Roads and Automotive Parking

Areas

Mobile equipment must allow for removal of markings without damaging the pavement surface or joint sealant. Maintain machines, tools, and equipment used in the performance of the work in satisfactory operating condition.

2.1.2 Application Equipment

Provide and maintain machines, tools, and equipment used in the performance of the work in satisfactory operating condition, or remove them from the work site. Provide mobile and maneuverable application equipment to the extent that straight lines can be followed and normal curves can be made in a true arc.

2.1.2.1 Thermoplastic Application Equipment

2.1.2.1.1 Thermoplastic Material

Apply thermoplastic material with equipment that is capable of providing continuous uniformity in the dimensions and reflectorization of the marking.

2.1.2.1.2 Application Equipment

A. Provide application equipment capable of continuous mixing and agitation of the material, with conveying parts which prevent accumulation and clogging between the main material reservoir and the extrusion shoe or spray gun. All parts of the equipment which come into contact with the material must be easily accessible and exposed for cleaning and maintenance. All mixing and conveying parts up to and including the extrusion shoes and spray guns must maintain the material at the required temperature with heat-transfer oil or electrical-element-controlled heat.

B. Provide application equipment constructed to ensure continuous uniformity in the dimensions of the stripe. Provide an applicator with a means for cleanly cutting off stripe ends squarely and providing a method of applying "skiplines." Provide equipment capable of applying varying widths of traffic markings.

C. Provide mobile and maneuverable application equipment allowing straight lines to be followed and normal curves to be made in a true arc. Provide equipment used for the placement of thermoplastic pavement markings of two general types: mobile applicator and portable applicator.

D. Equip the applicator with a pressurized or drop-on type bead dispenser capable of uniformly dispensing reflective glass spheres at controlled rates of flow. The bead dispenser must operate automatically to begin flow prior to the flow of binder to assure that the strip is fully reflectorized.

2.1.2.2 Reflective Media Dispenser

Attach the dispenser for applying the reflective media to the thermoplastic dispenser and designed to operate automatically and simultaneously with the applicator through the same control mechanism. The bead applicator must be capable of adjustment and designed to

provide uniform flow of reflective media over the full length and width of the stripe at the rate of coverage specified in paragraph APPLICATION.

2.1.2.3 Preformed Tape Application Equipment

Provide and use mechanical application equipment for the placement of preformed marking tape which is a mobile pavement marking machine specifically designed for use in applying pressure-sensitive pavement marking tape of varying widths. Equip the applicator with rollers, or other suitable compaction device to provide initial adhesion of the material with the pavement surface. Use additional tools and devices as needed to properly seat the applied material as recommended by the manufacturer.

2.2 MATERIALS

Use thermoplastic for roads. The maximum allowable VOC content of pavement markings is 150 grams per liter. Color of markings are indicated on the drawings and must conform to ASTM D6628 for roads and automotive parking areas. Provide materials conforming to the requirements specified herein.

2.2.1 Thermoplastic Compound

2.2.1.1 Composition Requirements

Thermoplastic compound must conform to AASHTO M 249. Formulate the binder component as an alkyd resin.

2.2.1.2 Primer

A. Asphalt concrete primer: Provide thermosetting adhesive primer with a solids content of pigment reinforced synthetic rubber and synthetic plastic resin dissolved or dispersed in a volatile organic solvent for asphaltic concrete pavements. The solids content must not be less than 10 percent by weight at 70 degrees F and 60 percent relative humidity. A wet film thickness of 0.005 inch, plus or minus 0.001 inch, must dry to a tack-free condition in less than 5 minutes.

B. Portland cement concrete primer: Provide an epoxy resin primer for Portland cement concrete pavements, of the type recommended by the manufacturer of the thermoplastic composition.

2.2.2 Preformed Tape

Provide adherent reflectorized strip preformed tape in accordance with ASTM D4505 Retroreflectivity Level II, Class 1, 2 or 3, Skid Resistance Level B.

2.3 Panel And Post/Panel Type Signs

2.3.1 Posts

One-piece aluminum posts to be provided with minimum 0.125 inch wall thickness. Design posts to accept panel framing system described and to permit attachment of panel framing system without exposed fasteners. Provide caps for each post.

2.3.2 Panels

Provide modular message panels in sizes shown on drawings with panels fabricated from a minimum of 0.090 inch aluminum. Design panels to be interchangeable and to match specified FDOT referenced sign.

2.3.3 Mounting

Provide permanent mounting by embedding posts in concrete foundation as indicated.

PART 3 EXECUTION

3.1 EXAMINATION

3.1.1 Testing for Moisture

Test the pavement surface for moisture before beginning pavement marking after each period of rainfall, fog, high humidity, or cleaning, or when the ambient temperature has fallen below the dew point. Do not commence marking until the pavement is sufficiently dry and the pavement condition has been approved by the Contracting Officer or authorized representative.

Employ the "plastic wrap method" to test the pavement for moisture as follows: Cover the pavement with a 12 inch by 12 inch section of clear plastic wrap and seal the edges with tape. After 15 minutes, examine the plastic wrap for any visible moisture accumulation inside the plastic. Do not begin marking operations until the test can be performed with no visible moisture accumulation inside the plastic wrap. Re-test surfaces when work has been stopped due to rain.

3.2 EXTERIOR SURFACE PREPARATION

Allow new pavement surfaces to cure for a period of not less than 30 days before application of marking materials. Thoroughly clean surfaces to be marked before application of the paint. Remove dust, dirt, and other granular surface deposits by sweeping, blowing with compressed air, rinsing with water, or a combination of these methods as required. Remove rubber deposits, residual curing compounds, and other coatings adhering to the pavement by water blasting.

3.2.1 Early Painting of Asphalt Pavements

For asphalt pavement systems requiring painting application at less than 30 days, apply the paint and beads at half the normal application rate, followed by a second application at the normal rate after 30 days.

3.3 APPLICATION

Apply pavement markings to dry pavements only.

3.3.1 Thermoplastic Compound

Place thermoplastic pavement markings, free from dirt or tint, upon dry pavement. The temperature must be a minimum of 40 degrees F and rising at the time of installation. Apply all centerline, skipline, edgeline, and other longitudinal type markings with a mobile applicator. Place all special markings, crosswalks, stop bars, legends, arrows, and similar patterns with a portable applicator, using the extrusion method.

3.3.2 Preformed Tape

The pavement surface and ambient air temperature must be a minimum of 60 degrees F and rising. Place the preformed markings in accordance with the manufacturer's written instructions.

3.3.3 Cleanup and Waste Disposal

Keep the worksite clean and free of debris and waste from the removal and application operations. Dispose of debris at approved sites.

3.4 FIELD QUALITY CONTROL

3.4.1 Material Inspection

Examine material at the job site to determine that it is the material referenced in the report of test results or certificate of compliance. Provide test results substantiating conformance to the specified requirements with each certificate of compliance.

3.4.2 Dimensional Tolerances

Apply all markings in the standard dimensions provide in the drawings. New markings may deviate a maximum of 10 percent larger than the standard dimension.

3.4.3 Bond Failure Verification

Inspect newly applied markings for signs of bond failure based on visual inspection and comparison to results from Test Stripe Demonstration paragraph.

3.5 INSTALLATION

Signs to be installed in accordance with approved manufacturer's instructions at locations shown on the drawings. Signs to be installed plumb and true at mounting heights indicated, and by method shown or specified.

3.5.1 Anchorage

Anchorage and fastener materials to be in accordance with approved manufacturer's instructions for the indicated substrate. Anchorage not otherwise specified or indicated must include slotted inserts, expansion shields, and powder-driven fasteners when approved for concrete; toggle bolts and through bolts for masonry; machine carriage bolts for steel; lag bolts and screws for wood.

-- End of Section --

SECTION 33 05 61

PRECAST CONCRETE STRUCTURES FOR UTILITIES

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Scope of Work

A. The work under this Section includes the design, casting, delivery and erection of precast concrete structures for manholes and utility vaults as indicated on the Drawings.

1.2 PERFORMANCE REQUIREMENTS

Delegated Design: Design precast structural concrete, including comprehensive engineering analysis by a Professional Engineer licensed in the State of Florida, using performance requirements and design criteria indicated.

Structural Performance: Design precast structural concrete units and connections to withstand design loads indicated within limits and under conditions indicated.

1.3 SUBMITTALS

SD-02 Shop Drawings

Complete Fabrication And Erection Drawings

SD-03 Product Data

Joint Ring Gaskets
Bitumastic Sealing Material
Liner System
Pipe Connections
Grout
Precast Joint Encapsulation
Cement Mortar
Manhole Frame And Cover Castings
Manhole Cover Insert
Precast Concrete Liner System

SD-05 Design Data

Design Calculations

1.4 QUALITY ASSURANCE

1.4.1 Quality Control

Provide precast products from provider plant and production methods meeting the qualification requirements of PCI MNL-116 or similar industry standard.

1.4.2 Design

Submit complete design calculations including shear, moment, and buoyancy camber calculations to demonstrate that the design of the precast concrete structures and top slabs will comply with the performance requirements and design criteria for the project and this specification. Develop loading in accordance with ASTM C857. Where structures are to be installed in traffic areas, or are listed as traffic rated, design structure and top slab for AASHTO H20 loading. Provide the seal of a Professional Engineer licensed in the State of Florida on all design and computation sheets. For external pressure and buoyancy, assume design water table to be at finished grade.

1.4.3 Shop Drawings

Submit complete fabrication and erection drawings. Include in shop drawings; plans, elevations, dimensions, shapes, sections, openings, support conditions and types of reinforcement, including special reinforcement and anchorage plan. Detail fabrication and installation of all precast concrete structural units. Provide the seal of a Professional Engineer licensed in the State of Florida on all shop drawings.

1.4.4 Fabricator Qualifications

Provide precast concrete products from a reputable firm with experience in the engineering design and fabrication of similar structures. The precast manufacturer is responsible for engineering precast structural concrete units to comply with performance requirements. Design responsibility includes submittal of signed and sealed shop drawings and comprehensive engineering analysis by a qualified Professional Engineer licensed in the State of Florida.

The precast concrete manufacturer must participate in PCI's Plant Certification program and be designated a Group C, Category C1 - Precast Concrete Products PCI-certified plant or equivalent certification.

1.4.5 Design Standards

Comply with ACI 318, Building Code Requirements for Reinforced Concrete and design recommendations in PCI MNL-120 and "PCI Design Handbook - Precast and Prestressed Concrete," applicable to types of precast structural concrete units indicated.

1.4.6 Quality-Control Standard

For manufacturing procedures and testing requirements, quality-control recommendations, and dimensional tolerances for types of units required, comply with PCI MNL-116, "Manual for Quality Control for Plants and Production of Structural Precast Concrete Products."

1.4.7 Welding Qualifications

Qualify procedures and personnel according AWS D1.1/D1.1M, "Structural Welding Code - Steel" and AWS D1.4/D1.4M, "Structural Welding Code - Reinforcing Steel". Perform welding by certified welders performing only qualified procedures for the type of work.

1.5 DELIVERY, STORAGE, AND HANDLING

Perform transportation and erection of precast concrete products by qualified personnel using proper equipment. Perform lifting only at points indicated on shop drawings.

Support units during shipment on non-staining shock-absorbing material in same position as during storage. Only support units at the points and using the methods indicated by the manufacturer shop drawings.

Store units with adequate bracing and protect units to prevent contact with soil, to prevent staining, and to prevent cracking, distortion, warping or other physical damage.

1.6 INSPECTION

The quality of all materials, the process of manufacture, and the finished sections are subject to inspection and approval by the owner. Such inspection may be made at the place of manufacture, or at the site after delivery, and the sections are subject to rejection at any time on account of failure to meet any of the Technical Specification requirements; even though sample sections may have been accepted as satisfactory at the place of manufacture. Mark and immediately remove sections rejected after delivery to the job site. All sections damaged after delivery will be rejected, and if already installed, repaired, or removed and replaced, as directed by the owner at the Contractor's expense.

At the time of inspection, the sections will be carefully examined for compliance with the ASTM designation specified below and these specifications, and with the approved manufacturer's drawings. All sections will be inspected for general appearance, dimension, "scratch-strength", blisters, cracks, roughness, soundness, etc.

Imperfections may be repaired, subject to the approval of the owner, after demonstration by the manufacturer that strong and permanent repairs result. Prior to final approval, all repairs will be carefully inspected. Repair with cement mortar in accordance with section CEMENT MORTAR of this section. Epoxy mortar may be utilized for repairs, subject to the approval of the COR.

PART 2 PRODUCTS

2.1 PRECAST CONCRETE STRUCTURES

2.1.1 General

Provide precast concrete structures in accordance with the contract drawings and specifications herein. Clearly mark the date of manufacture and name or trademark of the manufacturer on the outside of each precast manhole section. Inspect and stamp each manhole section by an accredited testing laboratory.

2.1.2 Precast Concrete Manholes

Provide precast concrete manhole barrels and eccentric top sections in conformance with ASTM C478, except as otherwise specified herein. Construct manholes in accordance with the drawings and the following requirements:

1. Provide manholes of the diameters shown on the drawings, but in no case should the diameter be less than four (4) feet.

2. Provide manholes with a precast monolithic base structure with a minimum base thickness of eight (8) inches. Provide manhole walls with a minimum thickness of five (5) inches.Line the interior of manhole base sections, barrel sections and top sections as required in paragraph PRECAST CONCRETE LINER SYSTEM of this section.
3. Provide eccentric-type top cone sections unless noted otherwise.
4. Provide precast concrete flat top slabs for manholes where the cover over the top of the pipe is less than four (4) feet, as detailed on the drawings. Where required, provide the precast top slab to support overburden plus a live load equivalent to AASHTO H20 loading. The thickness of the top slab is to be as determined by the precast manufacturer's structural design engineer but may not be less than eight (8) inches.
5. For manholes to be installed around existing gravity, commonly referred to as "Dog House" manholes, allow for two styles of penetrations: Base Dog House Penetrations and Riser Dog House Penetrations.
    a. Base Dog House Penetrations consist of a cast-in-place concrete base slab and precast barrel and top sections. Construct the base slab as shown in the contract drawings and include a joint compatible with the bottom barrel section. Include in the bottom barrel section an inverted "U-shaped" slot to allow installation of the section over an existing pipe. Form flow channels in the manhole as detailed.
    b. Riser Dog House Penetrations consist of a precast concrete base slab, barrel and top sections. An inverted "U-shaped" slot is provided in a riser section joint to allow for placement over existing sewers entering the manhole above the flow channel. Plan wall section heights to allow for the slot to occur in the bottom of the higher wall section. Seal the annular space between the existing pipe and slot with hydrophilic waterstop and non-shrink grout.

2.1.3 Joints

Provide tongue and groove type joints sealed with round or other flexible type natural rubber joint ring gaskets in conformance with ASTM C990 or by a flexible preformed bitumastic sealing material (equal to Ram-Nek as manufactured by Henry Company, El Segundo, CA). Provide rubber joint ring gaskets and flexible preformed bitumastic sealing material by the precast concrete structure manufacturer.

If rubber joint ring gaskets are used, seal interior and exterior voids in the pipe joints with flexible sealing material specified above, installed in strict accordance with the manufacturer's printed instructions. If precast concrete sections are sealed with a flexible preformed bitumastic sealing material, apply adequate material so that "squeeze out" occurs at the interior and exterior of the joint. Trim excess jointing material from the inside of the structure prior to sealing the liner at the joint sections.

2.1.4 Lifting

Include in the design adequate lifting lugs, rings or non-penetrating lift inserts for lifting and installing the precast structures. Lifting holes through the structure are not permitted.

2.1.5 Concrete Materials

For manholes, provide concrete with a minimum compressive strength of 4,000 psi at 28 days. For vaults, design the mix to supply a minimum compressive strength of 5,000 psi at 28 days. Do not exceed a water-cement ratio of 0.45.

Provide all aggregates, fine and coarse, other than lightweight aggregates conforming to ASTM C33/C33M. Provide lightweight aggregates, fine and coarse, conforming to ASTM

C330/C330M. Ensure aggregates are free of deleterious substances causing reactivity with oxidized hydrogen sulfide. Grade both types of aggregates in a manner so as to produce a homogenous concrete mix. All materials are to be accurately weighed at a central hatching facility for mixing. Provide Portland cement Type II or 1L in accordance with ASTM C150/C150M.

2.1.6 Reinforcing

Provide Grade 60 reinforcing steel. Sufficiently tie reinforcing steel to withstand any displacement during the pouring operation.

2.1.7 Forms

Use metal forms for precast concrete and sufficiently design and brace to maintain their alignment under pressures of the concrete during placing. Integrally cast base and first section of precast structures.

2.1.8 Placing

Handle all concrete from the mixer or transport vehicle to the place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredients, until the approved unit is completed. The maximum allowable elapsed time from hatching to placement is 2-hours. Place concrete in layers not over 2-feet deep. Compact each later by mechanical internal or external vibrating equipment. Limit duration of the vibration cycle to the time necessary to produce satisfactory consolidation without causing objectionable segregation.

2.1.9 Curing

Cure precast sections by an approved method for at least 28 days prior to coating and do not be ship until at least 2 days after having been coated. Remove form oil, curing compounds, dust, dirt and other interfering materials from concrete surfaces by brush sand blasting.

For purposes of early reuse of forms, precast concrete may be steam cured after an initial set has taken place. Do not exceed steam temperature of 160°F, and raise the temperature from normal ambient temperatures at a rate not to exceed 40° F per hour.

Do not remove the steam cured unit from the forms until sufficient strength is obtained for the unit to withstand any structural strain to which it may be subjected during the form stripping operation. After the stripping of forms, further curing by means of water spraying or a membrane curing compound may be used, and be of clear or white type, conforming to ASTM C309.

2.2 PRECAST CONCRETE LINER SYSTEM

For sewer structures, provide an interior protective liner system to be installed on the interior surfaces of precast concrete sewer structures. Provide a protective liner to protect the concrete surfaces from microbial induced corrosion and other forms of chemical corrosion and abrasion. Protect all interior surfaces of the precast structure with the liner system, including walls, ceilings, and pipe entries. Provide the liner system of a light reflective color.

2.3 GRAVITY SEWER MANHOLE INVERTS

Precast manhole inverts into the manhole base section by the precast manhole manufacturer unless prior approval is obtained from owner to construct inverts in the field. Construct the manhole invert as a secondary concrete pour, following precast construction of the base section. Form and construct manhole invert flow channels and benches of solid poured concrete with no bricks, rubble or scrap concrete used as filler material. Use the same concrete to construct the manhole inverts and benches as the concrete design and cement type as specified for constructing the precast concrete manhole sections.

Provide "U" shaped invert flow channels with smooth and accurately shaped semi-circular bottoms from the invert to the spring line of the pipe with vertical, built up sides and benching outside the flow channel with no voids. Match the height of the manhole flow channel at the top of the "U" section through the manhole to the crown of the exiting sewer pipe. Provide channels with a smooth troweled finish, and provide changes in size, grade and alignment evenly. Form the drop within the manhole flow channel to follow the inlet to the outlet sewer pipe invert. Slope manhole benches a minimum of 1-inch per foot from the manhole wall down to the upper edge of the invert flow channel. Avoid steep slopes outside the invert channels. Finish the top of the manhole benches with a fine broomed finish, with brooming parallel to the flow line through the manhole to provide a non-slip working surface. Make changes in pipe size and grade through the manhole gradually and evenly. Form changes in the direction of the sewer or entering branch with a smooth curve with radius as long as practicable.

2.4 PIPE CONNECTIONS FOR CIRCULAR STRUCTURES

Provide resilient, water proof pipe connections for precast concrete circular structures, designed in accordance with ASTM C923. Provide connectors with a flexible watertight seal of the pipe to the structure. Do not use adhesives or lubricants in the installation of the connector into the structure.

Provide connectors for pipes twelve (12) inches and smaller in diameter consisting of a flexible elastomeric boot with stainless steel clamps. Install connectors either into a formed hole cast into the structure wall or a cored section of the manhole.

Provide resilient pipe connectors manufactured of EPDM elastomer in accordance with ASTM C923 that are resistant to ozone, weather elements, chemicals including acids, alkalis, animal and vegetable fats, oils and petroleum products.

Provide connectors with an integral expanding mechanism to positively lock the seal into the penetration. Specifically design the connector to fit the outside diameter pipe size to be installed at each structure on the Project. When the pipe is installed in the resilient manhole connector, the pipe must be capable of 7 degrees minimum deflection in any direction.

Provide all metal elements of the connector of Type 304 stainless steel, excluding the worm screw for tightening the stainless steel band around the pipe, which must be manufactured of Type 305 stainless steel. Torque the worm screw for tightening the steel band by a break-away torque wrench set for 60 to 70 inch-lbs.

2.5 PRECAST JOINT ENCAPSULATION

Encapsulate the exterior joints of all precast concrete sections with a heat shrink-wrap. Provide wrap material with a cross-linked polyolefin backing coated with protective heat

activated adhesive and a final thickness of 100 mils. Provide heat shrink-wrap designed to effectively bond to the concrete substrate, providing corrosion and moisture protection for the structure.

For manholes encapsulate the top of buried manholes including the manhole cone, grade rings and the cast iron frame with the heat shrink-wrap.

2.6 EXTERIOR COATING

Coat exterior surfaces of precast structures with primer coat and three finish coats of coal tar epoxy. Shop apply coating in three separate applications by the manufacturer in strict accordance with the coating manufacturer's recommendations. Provide alternating colors for each coat with the first coat colored black, the second coat colored red, and the third coat colored black. Prepare surface and apply coal tar epoxy coating per the manufacturer's specifications and installation procedures.

2.7 MANHOLE FRAME AND COVER CASTINGS

Provide gray iron castings for manhole frames, covers and other items in accordance with ASTM A48/A48M, Class 30. Provide castings true to pattern in form and dimensions and free of pouring faults and other defects which would impair their strength, or otherwise make them unfit for the service intended. Machine the seating surfaces between frames and covers to fit true. No plugging or filling will be allowed. Provide lifting or "pick" holes that do not penetrate the cover. Cast the words identifying the utility in all manhole covers as shown on the drawings. Provide manhole frames and covers rated for traffic bearing to meet AASHTO H20 loadings. Provide frames suitable for the future addition of a cast iron adjustment ring for upward adjustment of the cover top elevation. Apply a 10 mil coating of coal tar epoxy equal to Carboline Bitumastic 300-M to frames and covers, except for machined surfaces. Apply coatings in the field prior to placement of the castings. Remove rust, slag, concrete, mortar, dirt and debris from the castings prior to coating.

Provide precast leveling rings for setting cast iron frames over manholes two (2) inch thick with a minimum single No. 2 continuous reinforcing steel bar.

2.8 MANHOLE COVER INSERTS

Furnish and install all manhole assemblies complete with a manhole cover insert to prevent intrusion of stormwater, dirt, and debris and to help control emission of odors.

Provide the body of the insert of high density polyethylene co-polymer material that meets ASTM D1248, Class A, Category 5, Type 111 and with a minimum impact brittleness temperature of -180 degrees F. Provide the insert with a uniform uniform thickness of 1/8-inch or greater. Provide the insert to the dimensions of the manhole opening to allow easy installation within the manhole frame.

Include with the insert a gasket made of closed cell neoprene. Provide the gasket with a pressure sensitive adhesive on one side and be placed under the weight-bearing surface of the insert by the manufacturer. Ensure the adhesive is compatible with the insert material so as to form a long-lasting bond in either wet or dry conditions.

Attach a lift strap to the rising edge of the bowl insert. Construct the lift strap of 1 inch wide woven polypropylene web seared on all cut ends to prevent unraveling. Attach the lift strap

to the insert by means of a stainless steel rivet. Locate the strap to provide easy visual location.

Provide for ventilation of the insert by means of a vent hole located on the side wall of the dish 3/4 inch below the lip. Size the vent to allow a maximum release of 10 gallons per 24 hours and locate as described such that the vent is not affected by debris that might collect in the bottom of the bowl.

Provide proof of the insert durability in traffic impact loads via an engineer certified proof of test passing a collapse load of 2200 pounds minimum applied to a 5.5-inch square area in the center of the insert.

Clean the manhole frame of all dirt and debris before placing the manhole insert on the rim. Fully seat the manhole insert around the manhole frame rim to retard water from seeping between the cover and the manhole frame rim.

2.9 CEMENT MORTAR

Provide cement mortar used for construction repairs complying with ASTM C270, Type M. For cement used to prepare the mortar, provide one part Portland Type II or 1L cement and three parts silica sand. Use mortar

within one hour of initial preparation.

For filling annular spaces between pipe and pipe sleeves, holes in precast and to form the wet well bottom and fillets, provide non-shrink, non-metallic mortar meeting ASTM C1107/C1107M Grade C. Finish mortar smooth and flush with adjoining interior and exterior surfaces. When the mortar has set, coat with two coats, 10 mils dry film thickness per coat, of coal tar epoxy equal to Carboline Bitumastic 300-M.

PART 3 EXECUTION

3.1 EXCAVATION

Prepare an excavation large enough to accommodate the structure and permit sealing of openings, waterproofing, and backfilling operations. Perform all operations in accordance with 31 00 00 EARTHWORK.

3.2 INSTALLATION OF PRECAST STRUCTURES

Construct precast concrete structures in a workmanlike manner at the locations and dimensions indicated on Drawings. Set precast base sections and vaults on a foundation of crushed stone, a minimum of 12-inches thick. Provide crushed stone material of well graded crushed stone or crushed gravel meeting the requirements of ASTM C33/C33M, Gradation No. 57 (1-inch to No. 4 sieve). Install and compact the crushed stone materials for the foundation in 6-inch lifts. Refer to Section 31 00 00 - EARTHWORK, for a complete description of recommendations for the foundation preparation. Take care to prevent earth and other materials from entering precast structures.

Construct the precast structure such that the structure will not transmit dead or live loads to the piping. Carefully place precast base sections on the prepared stone bedding foundation so as to be fully and uniformly supported in true alignment and making sure that all entering pipes can be inserted on proper grade. Assemble units so that the structure conforms to the

elevations shown on the Drawings. Set each precast concrete unit plumb on a bed of sealant to make a watertight joint at least 1/2-inch thick with the concrete base or with the preceding unit. Point the inside joint and wipe off the excess sealant. Provide pipe connections at precast concrete structures at the locations shown on the Drawings. Provide resilient and waterproof connections.

Fill all interior and exterior joints between precast concrete sections with a joint sealant, as recommended by the precast structure manufacturer.

Fill all voids in interior and exterior precast concrete section joints and lift holes for precast concrete sections with a non-shrinking, non-metallic grout per CEMENT MORTAR of this section. Apply and cure grout in strict accordance with the manufacturer's recommendations. Finish the grout smooth and flush with the wall surface of the precast concrete structure.

Perform wall coring and modifications of precast penetrations on new or existing precast concrete structures by a power driven coring machine as manufactured by the flexible pipe connector manufacturer. Complete cutting prior to setting the manhole section in place to prevent any subsequent jarring which may loosen the joints. Construct such connection to existing manholes in accordance with the details for new units shown on the contract drawings and caulk water tight with non-shrink cement grout. Make all drop pipe connections at manholes in accordance with the contract drawings.

Complete manhole connections in a progressive manner to facilitate manhole and sewer testing as described in 33 30 00 SANITARY SEWERAGE.

3.3 TESTING

Prior to connection to piping system, test manhole structures for leakage by vacuum testing in accordance with ASTM C1244. Structure acceptable will be per the values listed in the standard.

Alternative test methods may be submitted for approval, but may only be approved at the discretion of the owner.

3.4 MANHOLE FRAMES AND COVERS

Place cast iron frames over precast concrete leveling rings, shimmed and set in Portland cement mortar to the required grade. No more than four courses of leveling rings may be used, unless approved by the COR. Set frames and covers accurately to grade to conform to the finished grade of the adjacent areas. Set the tops of manholes six (6) inches above finished grade in non-paved areas and flush with the pavement surface in paved areas.

3.5 LINER SYSTEM APPLICATION

Perform install the liner system in accordance with the most current edition of the liner manufacturer's guidelines. Perform all liner installation work by personnel who are trained and certified by the liner manufacturer.

3.6 BACKFILL

After the precast concrete structure and all appurtenances are in place and approved, place backfill to the original ground line or to the limits designated on the Drawings. Backfill

materials must consist of sand or loose earth, free from stones, clods, or other deleterious material. Place in horizontal layers not exceeding 8-inches in depth, and moisten and thoroughly compact to a minimum relative density conforming to the requirements of 31 00 00 EARTHWORK.

-- End of Section --

SECTION 33 11 00

WATER UTILITY DISTRIBUTION PIPING

PART 1 GENERAL

1.1 DEFINITIONS

1.1.1 Water Mains

Water mains include water piping having diameters 4-inches through 14-inches, specific materials, methods of joining, and any appurtenances deemed necessary for a satisfactory system.

1.1.2 Water Service Lines

Water service lines include water piping from a water main to a building service at a point approximately five (5) feet from building or the point indicated on the drawings, specific materials, methods of joining, and any appurtenances deemed necessary for a satisfactory system.

1.2 SUBMITTALS

SD-03 Product Data

Pipe, Fittings, Joints and Couplings
Valves
Valve Boxes
Backflow Preventer
Disinfection Procedures
Chlorinating Materials
PVC Joint Primer
PVC Joint Solvent
Post Indicator
Joint Restraint
Shop-Applied Lining and Coating
Air Release Valves
Fire Hydrants

SD-06 Test Reports

Backflow Preventer Tests
Bacteriological Samples
Leakage Test
Hydrostatic Test

SD-07 Certificates

Backflow Tester Certification
Backflow Certificate

1.3 QUALITY CONTROL

1.3.1 Regulatory Requirements

Comply with NSF/ANSI 14 or NSF/ANSI 61 and NSF/ANSI 372 for materials for potable water systems; comply with lead content requirements for "lead-free" plumbing as defined by the U.S. Safe Drinking Water Act. Provide materials bearing the seal of the National Sanitation Foundation (NSF) for potable water service.

Comply with NFPA 24 for materials, installation, and testing of fire main piping and components.

1.3.2 Qualifications

1.3.2.1 Backflow Preventers

1.3.2.1.1 Backflow Preventer Certificate

Certificate of Full Approval from FCCCHR List, University of Southern California, attesting that the design, size and make of each backflow preventer has satisfactorily passed the complete sequence of performance testing and evaluation for the respective level of approval. Certificate of Provisional Approval will not be acceptable.

1.3.2.1.1.1 Backflow Tester Certificate

Prior to testing, submit certification issued by the State or local regulatory agency attesting that the backflow tester has successfully completed a certification course sponsored by the regulatory agency.

1.4 DELIVERY, STORAGE, AND HANDLING

1.4.1 Delivery and Storage

Inspect materials delivered to site for required pipe markings and damage. Unload and store with minimum handling and in accordance with manufacturer's instructions to prevent cuts, scratches and other damage. Store materials on site in enclosures or under protective covering. Store plastic piping, jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes, fittings, valves, and other accessories free of dirt and debris or other contamination.

1.4.2 Handling

Handle pipe, fittings, valves, and other accessories in accordance with applicable AWWA standard, manufacturer's instructions and in a manner to ensure delivery to the trench in sound undamaged condition. Avoid injury to coatings and linings on pipe and fittings; make repairs if coatings or linings are damaged. Do not place other material, hooks, or pipe inside a pipe or fitting after the coating has been applied. Inspect the pipe for defects before installation. Carry, do not drag pipe to the trench. Use of pinch bars and tongs for aligning or turning pipe will be permitted only on the bare ends of the pipe. Clean the interior of pipe and accessories of foreign matter before being lowered into the trench and keep them clean during

laying operations by plugging. Replace defective material without additional expense to the owner. Store rubber gaskets, not immediately installed, under cover or out of direct sunlight.

Handle ductile iron pipe, fittings, and accessories in accordance with AWWA C600 and AWWA M41. Handle PVC pipe, fittings, and accessories in accordance with AWWA C605.

PART 2 PRODUCTS

2.1 MATERIALS

Provide all materials in accordance with AWWA and as indicated herein. Provide valves and fittings with pressure ratings equivalent to the pressure ratings of the pipe.

2.1.1 Pipe, Fittings, Joints And Couplings

Submit manufacturer's standard drawings and catalog cuts indicating the dimensions, materials and indication of conformance with standards applicable to specific material/item. Unless otherwise noted, provide all fittings and accessories of a pressure rating equal to or greater than the pipe.

Ensure and provide certification that all materials are certified for drinking water service in accordance with NSF/ANSI 61 and NSF/ANSI 372.

2.1.1.1 Ductile-Iron Piping

2.1.1.1.1 Pipe and Fittings

For above grade installations, provide Pressure Class 250 flanged ductile iron pipe in accordance with AWWA C115/A21.15. Provide flanged fittings in accordance with AWWA C110/A21.10 with a rating at least equal to that of the pipe. Provide flanges constructed of ductile iron with drilling and facing meeting the requirements of ASME B16.1 Class 125.

For buried pipe installations, provide Thickness Class 50 mechanical joint ductile iron pipe in accordance with AWWA C151/A21.51. Provide mechanical joint fittings in accordance with AWWA C110/A21.10 with a rating at least equal to that of the pipe.

For pipe spools crossing the soil/air interface (vertically installed), provide the buried end with mechanical joints and the above grade end with flanged joints.

2.1.1.1.2 Lining and Coating

Provide all ductile pipe and fittings with cement mortar lining in accordance with AWWA C104/A21.4. Provide lining of double thickness with an asphaltic seal coat as described in AWWA C104/A21.4.

Coat the exterior of buried ductile iron pipe and fittings with the standard asphaltic coating described in AWWA C151/A21.51.

For above grade pipe, coat the pipe using a moisture-cured urethane primer specifically designated for ductile iron pipe. Apply a compatible high-build, aliphatic topcoat. For potable

water provide topcoat dark blue in color and for fire water provide topcoat red in color. The coating system is to be of a single manufacturer.

All coatings are to be shop applied by the pipe manufacturer. Field repair any damages in accordance with manufacturer's instructions.

2.1.1.1.3 Joints and Jointing Material

Provide fully restrained joints at all locations.

For flanged joints provide hex bolts, heavy hex nuts, and full-face gaskets for flanged connections as recommended in Appendix A of AWWA C115/A21.15. Provide AWWA C115/A21.15 ductile iron flanges and conform to ASME B16.1, Class 125.

For mechanical joints provide tee head bolts, hex nuts, and gaskets as recommended in AWWA C111/A21.11.

2.1.1.2 PVC Piping

For PVC piping 4-inch and larger, provide AWWA C900 pipe meeting or exceeding ASTM D1784 cell class 12454, with a minimum Pressure Class 165 (DR25) for Potable Water service and Pressure Class 235 (DR 18) for Fire Service, with ductile iron outside diameter (DIOD).

2.1.1.2.1 Fittings for PVC Pipe

Ductile iron fittings in accordance with paragraph Ductile Iron Piping. Fittings with push-on joint ends are to conform to the same requirements as fittings with mechanical-joint ends, except for the factory modified bell design compatible for use with PVC pipe as specified.

2.1.1.2.2 Joints and Jointing Material for PVC

For push-on joints, use jointing material in accordance with ASTM D3139 and AWWA C111/A21.11 between pipes. Provide joint restraint across all push-on joints consisting of two ductile split rings, one serrated for the plain end pipe and one non-serrated for the bell end and connecting restraint bolts.

For connection of pipe to valves, metal fittings, and other accessories, use mechanical type joints with joint restraint. Provide restraint at the joint using a ductile iron body restraint device meeting AWWA C110/A21.10 and ASTM F1674 and consisting of pipe gripping ring with follower gland to provide positive restraint and sealing at the joint.

Provide each joint connection with an elastomeric gasket compatible for the bell or coupling used. Gaskets for push-on joints for pipe, ASTM F477. Gaskets for push-on joints and compression-type joints/mechanical joints for joint connections between pipe and metal fittings, valves, and other accessories, AWWA C111/A21.11, respectively, for push-on joints and mechanical joints.

2.1.1.2.3 PVC Piping for Service Lines

For PVC piping less than 4-inches, provide Schedule 40, NSF/ANSI 61 certified, ASTM D1785 polyvinyl chloride pipe with ASTM D1784 Cell Class 12454. Provide Schedule 40 fittings in accordance with ASTM D2466 of the same PVC material as the pipe.

Provide solvent joints in accordance with ASTM D2855 using a PVC joint primer meeting the requirements of ASTM F656 and PVC joint solvent meeting the requirements of ASTM D2564. Where Ductile Iron Pipe Size (DIPS) to Iron Pipe Size (IPS) transitions are required, provide Mechanical Joint to IPS transition gaskets in accordance with AWWA C111/A21.11.

2.1.2 Valves

2.1.2.1 Gate Valves 2 Inch Size and Larger on Buried Piping

For buried piping, provide resilient seated, non-rising stem (NRS) AWWA C515 gate valves with AWWA C111/A21.11 mechanical joint ends for connecting to the pipe. Except on lines smaller than 3-inches, where connecting to PVC, provide threaded ends. Coat the interior and exterior exposed metal surfaces of the valve in accordance with AWWA C550.

Provide gate valves to open by counterclockwise rotation of the valve stem. Provide a 2-inch square operating nut with a valve box for insertion of an operator or post indicator operator as indicated on the contract drawings and specified herein.

Ensure all valves are listed for fire service in accordance with UL 262, approved by FM 1120/1130. Provide all valves from a single manufacturer.

2.1.2.2 Gate Valves 3 Inch Size and Larger on Non-Buried Piping

Non-buried piping includes above ground installations and installations in meter boxes and valve pits.

For non-buried piping, provide resilient seated, outside stem and yolk (OS&Y) AWWA C515 gate valves with AWWA C110/A21.10 flanged ends for connecting to the pipe. Coat the interior and exterior exposed metal surfaces of the valve in accordance with AWWA C550.

Provide gate valves to open by counterclockwise rotation of the valve stem. Provide the gate valve with a handwheel that opens by counterclockwise rotation of the valve stem. Provide all valves from a single manufacturer.

2.1.2.3 Check Valves

Provide spring loaded, iron body, check valves of the swing-check type with AWWA C110/A21.10 flanged ends in accordance with AWWA C508. Coat the interior of valves with a protective interior coating in accordance with AWWA C550.

Provide all valves from a single manufacturer.

2.1.2.4 Water Service Valves

2.1.2.4.1 Gate Valves Smaller than 2 Inch in Size on Buried Piping

For gate valves smaller than 2-inches on buried piping provide lead-free brass MSS SP-80 gate valve, Class 150, solid wedge, non-rising stem, with flanged or threaded end connections as required by the piping material.

Provide gate valves to open by counterclockwise rotation of the valve stem. Provide a 2-inch square operating nut and a valve box for insertion of an operator.

2.1.2.4.2 Gate Valves Smaller Than 3 Inch Size on Non-buried Piping

Non-buried piping includes above ground installations and installations in meter boxes and valve pits.

For gate valves smaller than 3-inches on non-buried piping provide lead-free brass MSS SP-80 gate valve, Class 150, solid wedge, inside screw, rising stem. Provide valves with flanged or threaded end connections, and a handwheel operator.

2.1.2.4.3 Check Valves Smaller than 2 Inch in Size

Provide check valves for screwed fittings, made of lead-free bronze and in conformance with MSS SP-80, Class 150, Types 3 and 4 compatible for the application. Provide check valves with a minimum working pressure of 150 psi.

2.1.2.5 Air Release Valves

Provide AWWA C512 combination air/vacuum valves providing combined features of an air release valve and an air/vacuum valve. Provide valves of a single body, with double orifice, configured to perform the operations listed.

a. Allow large volumes of air to enter the line through the large air/vacuum orifice during pipeline drainage to break the vacuum.
b. Allow large volumes of air to escape the line through the larger diameter air/vacuum orifice when filling a pipeline. Close watertight when the liquid enters the valve.
c. During large orifice closure, open the smaller diameter air release to allow small pockets of air to escape automatically and independently of the large orifice.

Provide the valve with Buna N rubber seats fastened to the valve, without distortion, for drop tight shut off. Construct all floats and working parts of stainless steel. Construct the valve body and cover of cast iron conforming to ASTM A126, Class B. Epoxy coat the inside of the valve body and all exterior surfaces in accordance with AWWA C550. Equip the valve with the necessary attachments, including valves, quick disconnect couplings and hose, to permit back flushing after installation without diverting the valve.

Size the valve inlet/outlet and orifice sizes in accordance with the tables in the contract drawings for the attached line size. Locate air release valves at high points in the line as designated on the contract drawings, or where high points are created by necessary field routing changes.

2.1.2.5.1 Enclosures

Provide a concrete vault structure in accordance with the city utility standard details.

2.1.2.6 Valve Boxes

Provide a valve box for each gate valve on buried piping, except where an indicator post is shown. Construct adjustable valve boxes manufactured from cast iron of a size compatible for the valve on which it is used with a minimum shaft diameter of 5 1/4 inches. Provide cast iron valve boxes with a minimum cover and wall thickness of 3/16 inch and conforming to ASTM A48/A48M, Class 35B. Coat the cast-iron box with a heavy coat of bituminous paint. Cast the word "WATER" or "FIRE" on the lid as appropriate for the system.

For valve boxes located in pavement, provide AASHTO H-20 traffic load rated valve boxes. For standard, open field installations, provide valve boxes rated for general loading to include large mowing equipment.

Construct a cast-in-place concrete collar around each valve box as shown in the details of the contract drawings.

For every valve where the top of the valve operator nut is deeper than 16 inches below grade, provide an operator nut extension to bring the operator nut to less than 16 inches below grade. Provide the operator nut extension produced or recommended by the valve manufacturer to ensure compatibility. Provide operator extensions constructed of metal compatible with the valve and with corrosion resistant coating or material properties.

The use of plastic pipe valve box risers and precast concrete valve box collars is not permitted.

2.1.2.7 Post Indicators

Install post indicators conforming to UL 789 with lockable operator handles at the locations shown on the drawings. Provide post indicators from the gate valve supplier to ensure coordination between operator and valve. Paint post indicators red with a high-performance enamel intended for corrosion protection, both above and below grade. Provide manufacturer certification that post indicator meets all requirements of UL 789.

2.1.3 Fire Hydrants

2.1.3.1 Fire Hydrants

Provide Dry-barrel type fire hydrants, AWWA C502 or UL 246, "Base Valve" with 6-inch inlet, 5-1/4-inch valve opening, one 4-1/2-inch pumper connection, and two 2-1/2-inch hose connections.

Provide mechanical-joint end inlet; with end matching requirements as specified in AWWA C502 for size and shape of operating nut, cap nuts, and threads on hose and pumper connections. Provide fire hydrants with frangible sections as mentioned in AWWA C502.

Provide fire hydrants where indicated. Paint fire hydrants with at least one coat of primer and two coats of enamel paint. Paint barrel in accordance with city standards. Perform flow tests on existing and new hydrants in accordance with NFPA 291 and paint bonnet colors in accordance with measured flow and corresponding color from NFPA 291. Stencil fire hydrant number and main size on the fire hydrant barrel using black stencil paint.

2.1.4 Restrained Sleeve-Type Mechanical Couplings

For jointing of plain end pipe of different materials where no mechanical attachment point is available, use restrained sleeve-type mechanical couplings to join the pipe. Provide restrained couplings constructed of ductile iron in accordance with ASTM A536. Coat ductile iron couplings with fusion bonded epoxy in accordance with AWWA C213. Provide gaskets made from Styrene Butadiene Rubber (SBR) or Nitrile and compounded for water service. Provide bolts of high strength low alloy steel with heavy semi-finished hex nuts in accordance with AWWA C111/A21.11.

2.1.5 Backflow Preventers

Provide bronze AWWA C511 reduced pressure principal type backflow preventers with shutoff valves. The make, model, and size of backflow preventers to be installed must be included in the latest edition of the List of Approved Backflow Prevention Assemblies issued by the FCCCHR List and be accompanied by a backflow certificate of full approval from FCCCHR List. Submit backflow preventer product data, including all certifications and manufacturer installation requirements for certified installations.

Where required to reduce galvanic potential between the piping and backflow preventer materials, provide a dielectric type union or fitting.

2.1.5.1 Backflow Preventer Enclosure

Provide an insulated enclosure constructed of stainless steel.

2.1.6 Disinfection

Provide chlorinating materials conforming to the requirements of AWWA C651 and AWWA B301 for liquid chlorine or AWWA B300 for hypochlorites.

Upon completion of disinfection, dechlorinate the fluid prior to discharge in accordance with AWWA C655. Submit the materials product data and their SDS.

2.2 ACCESSORIES

2.2.1 Thrust Blocks

Provide concrete materials in accordance with 32 13 13.06 PORTLAND CEMENT CONCRETE PAVEMENT FOR ROADS AND SITE FACILITIES, except that the minimum compressive strength may be reduced to 3,000 psi at 28 days. Refer to the project details for sizing of thrust blocks.

2.2.2 Insulating Joints

Provide a rubber-gasketed insulating joint or dielectric coupling between pipe of dissimilar metals which will effectively prevent metal-to-metal contact between adjacent sections of piping.

2.2.3 Dielectric Fittings

Install dielectric fittings between threaded ferrous and nonferrous metallic pipe, fittings and valves, except where corporation stops join mains to prevent metal-to-metal contact of dissimilar metallic piping elements and compatible with the indicated working pressure.

2.2.4 Tracer Wire for Nonmetallic Piping

Provide tracer wire along the entire length of non-metallic pipe, regardless of installation method, in accordance with the requirements of 31 00 00 EARTHWORK.

2.2.5 Service Saddles

Provide NPT threaded service saddles with ductile iron bodies per ASTM A536 and double stainless steel straps conforming to ASTM A240/A240M with ASTM D2000 gaskets, where indicated on the contract drawings.

PART 3 EXECUTION

3.1 GENERAL

3.2 PREPARATION

3.2.1 Connections to Existing System

Perform all connections to the existing city water system in the presence of city utilities department.

3.2.2 Operation of Existing Valves

Do not operate valves on the city utility system unless expressly directed to do so by the city utility department.

3.2.3 Earthwork

Perform earthwork operations in accordance with Section 31 00 00 EARTHWORK.

3.3 INSTALLATION

Install all materials in accordance with the applicable reference standard, manufacturer’s instructions and as indicated herein.

3.3.1 Piping

Install piping to the lines and grades indicated in the contract drawings. Avoid the creation of dips and high points, except as designed. Do not lay pipe when conditions of trench or weather prevent installation. Provide a minimum of 2-1/2 feet (30 inches) of cover over top of pipe.

Terminate the work covered by this section at a point approximately 5 feet from the building, unless otherwise indicated.

During loading, transportation and unloading, take every precaution to prevent injury to the pipe. Do not drop pipe from trucks or allow to roll down slides without proper retaining ropes.

During transportation, rest each pipe on suitable pads, strips, skids or blocks securely wedged or tied in place. Replace any pipe damaged at the Contractor's own expense.

Remove fins and burrs from pipe and fittings. Before placing in position, clean pipe, fittings, valves, and accessories, and maintain in a clean condition. Provide proper facilities for lowering sections of pipe into trenches. Under no circumstances is it permissible to drop or dump pipe, fittings, valves, or other water line material into trenches.

Cut pipe cleanly, squarely, and accurately to the length established at the site and work into place without springing or forcing. Replace a pipe or fitting that does not allow sufficient space for installation of jointing material.

Support pipe at the design elevation and grade. Secure firm, uniform support. Wood support blocking is not permitted. Lay pipe so that the full length of each section of pipe and each fitting rests solidly on the pipe bedding; excavate recesses to accommodate bells, joints, and couplings. Provide anchors and support for fastening work into place. Make provision for expansion and contraction of pipelines. Keep trenches free of water until joints have been assembled.

At the end of each workday, close open ends of pipe temporarily with wood blocks or bulkheads.

3.3.1.1 Connections to Existing Water Lines

Make connections to existing water lines after disinfection has been completed and approval has been obtained from the owner. Complete in a manner to ensure a minimum interruption of service on the existing line. Make connections to existing lines under pressure in accordance with the recommended procedures of the manufacturer of the pipe being tapped and as indicated.

3.3.1.2 Ductile Iron Pipe

Unless otherwise specified, install pipe and fittings in accordance with the requirements of AWWA C600 for pipe installation, joint assembly, valve-and-fitting installation, and thrust restraint.

Make mechanical joints with the gaskets, glands, bolts, and nuts specified for this type joint; assemble in accordance with the applicable requirements of AWWA C600 and AWWA M41 for joint assembly and the recommendations of Appendix A to AWWA C111/A21.11.

Make flanged joints with the gaskets, bolts, and nuts specified for this type joint. Make flanged joints up tight; avoid undue strain on flanges, fittings, valves, and other equipment and accessories. Align bolt holes for each flanged joint. Use full size bolts for the bolt holes; use of undersized bolts will not be permitted. Do not allow adjoining flange faces to be out of parallel to such degree that the flanged joint cannot be made watertight without overstraining the flange. When flanged pipe or fitting has dimensions that do not allow the making of a flanged joint as specified, replace it. Only install flanged pipe aboveground or with the flanges in valve pits.

Assemble joints made with sleeve-type mechanical couplings in accordance with the recommendations of the coupling manufacturer.

Follow AWWA C600 and AWWA M41 for the maximum allowable deflection. If the alignment requires deflection in excess of the above limitations, provide special bends or a sufficient number of shorter lengths of pipe to achieve angular deflections within the limit set forth.

3.3.1.3 PVC Pipe

Unless otherwise specified, install pipe and fittings in accordance with the requirements of AWWA C605 for laying of pipe, joining PVC pipe to fittings and accessories, valves, and fittings; and with the recommendations for pipe joint assembly and appurtenance installation in AWWA M23, Chapter 7, "Installation."

Make push-on joints with the elastomeric gaskets specified for this type of joint, using either elastomeric-gasket bell-end pipe or elastomeric-gasket couplings. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel; for push-on joint connections to metal fittings, valves, and other accessories, cut spigot end of pipe off square and re-bevel pipe end. Use a lubricant recommended by the pipe manufacturer for push-on joints. Assemble joints in accordance with the requirements of AWWA C605 for laying the pipe and the recommendations in AWWA M23, Chapter 7, "Installation," for pipe joint assembly.

Construct joint offset in accordance AWWA C605. Do not exceed the minimum longitudinal bending as indicated by AWWA C605.

3.3.1.5 Plastic Service Piping

Install pipe and fittings in accordance with the applicable requirements of ASTM D2774 and ASTM D2855, unless otherwise specified. Handle solvent cements used to join plastic piping in accordance with ASTM F402.

3.3.1.6 Tracer Wire

Install a continuous length of tracer wire for the full length of each run of nonmetallic pipe. Attach wire to top of pipe in such manner that it will not be displaced during construction operations.

3.3.1.7 Fire Protection Service Lines for Sprinkler Supplies

Connect water service lines used to supply building sprinkler systems for fire protection to the water main in accordance with NFPA 24.

3.3.1.8 Water Service Piping

Connect water service piping to the building service where the building service has been installed. Where building service has not been installed, terminate water service lines approximately 5 feet from the building line at the points indicated; close such water service lines with plugs or caps.

3.3.2 Backflow Preventers

Install backflow preventers of type, size, and capacity indicated a minimum of 12 inches and a maximum of 36 inch above concrete base. Include valves and test cocks. Install according to the manufacturer's requirements and the requirements of plumbing and health department and authorities having jurisdiction. Support NPS 2 1/2 inch and larger backflow preventers, valves, and piping near floor with 12-inch minimum air gap, and on steel pipe supports. Do not install backflow preventers that have a relief drain in vaults or in other spaces subject to flooding. Do not install a bypass around backflow preventers.

3.3.2.1 Backflow Preventer Enclosure

Install a level concrete base with top of concrete surface approximately 2 inches above grade. Install protective enclosure over valve and equipment. Anchor protective enclosure to concrete base.

3.3.3 Separations from Sewer Piping

Do not lay water line closer than 6 feet horizontally (minimum), 10 feet preferred from any sewer line, unless specifically directed on the contract drawings. For vertical separation, maintain a minimum of 12 inches between water and sewer lines. When crossing a sewer line with a water line, maximize the joint distance from the crossing and in all cases ensure a minimum joint distance of three (3) feet. All distances are edge to edge. For non-standard conditions, refer to Rule 62-555.314, Florida Administrative Code (FAC). Unless directed in writing by the AHJ, do not violate minimum separations listed or employ alternative separation methods as allowed by FAC.

3.3.4 Flushing

Prior to disinfection, flush the lines at a rate to achieve scrubbing velocity to remove any debris, sediment, soils, or other items from the pipe prior to disinfection and testing.

3.3.5 Disinfection

Disinfection of systems supplying non-potable water is not required.

Prior to disinfection, provide disinfection procedures, proposed neutralization and disposal methods of wastewater from disinfection as part of the disinfection submittal. Disinfect new water piping and existing water piping affected by Contractor's operations in accordance with AWWA C651. Disinfect new water piping using the AWWA C651 continuous-feed method of chlorination, or alternative method approved by the AHJ. Ensure a free chlorine residual of not less than 10 parts per million after 24 hour holding period and prior to performing bacteriological tests.

3.3.6 Dechlorination

Perform bacteriological tests prior to flushing. Flush solution from the systems with domestic water until maximum residual chlorine content is within the range of 0.2 to 0.5 parts per million, the residual chlorine content of the distribution system, or acceptable for domestic use. Use AWWA C655 neutralizing chemicals.

3.3.7 Pipe Restraint

3.3.7.1 Concrete Thrust Blocks

Install concrete thrust blocks where indicated.

3.3.7.2 Restrained Joints

Install restrained joints at all pipe and fitting joints and all connections to valves, equipment, and appurtenances in accordance with manufacturer instructions.

3.3.8 Valves

3.3.8.1 Gate Valves

Install gate valves, in accordance with the requirements of AWWA C600 for valve-and-fitting installation and with the recommendations of the Appendix ("Installation, Operation, and Maintenance of Gate Valves") to
AWWA C500, AWWA C509 or AWWA C515, as applicable. Install gate valves on PVC water mains in accordance with the recommendations for appurtenance installation in AWWA M23, Chapter 7, "Installation." Make and assemble joints to gate valves as specified for making and assembling the same type joints between pipe and fittings.

3.3.8.2 Check Valves

Install check valves in accordance with the applicable requirements of AWWA C600 for valves and fitting installation. Make and assemble joints to check valves as specified for making and assembling the same type joints between pipe and fittings.

3.3.8.3 Combination Air Valves

Install pressure vacuum assemblies of type, size, and capacity indicated. Include valves and test cocks. Install according to the requirements of plumbing and health department and authorities having jurisdiction. Do not install pressure vacuum breaker assemblies in vaults or other space subject to flooding.

3.4 FIELD QUALITY CONTROL

3.4.1 Tests

Notify the owner a minimum of five (5) days in advance of hydrostatic testing. Coordinate the proposed method for disposal of wastewater from hydrostatic testing. Perform field tests, and provide labor, equipment, and incidentals required for testing. Provide documentation that all items of work have been constructed in accordance with the Contract documents.

3.4.1.1 Hydrostatic Test

Test the water system in accordance with the applicable AWWA standard specified below. Do not backfill utility trench or begin testing on any section of a pipeline where concrete thrust blocks have been provided until at least seven (7) days after placing the concrete.

Perform hydrostatic test at a minimum of 1.5 times the service pressure, but do not exceed the maximum pressure rating of the system and components.

Test ductile-iron water mains in accordance with the requirements of AWWA C600 for hydrostatic testing. The amount of leakage on ductile-iron pipelines with mechanical-joints or push-on joints is not to exceed the amounts given in AWWA C600; no leakage will be allowed at joints made by any other methods.

Test PVC plastic water systems made with PVC pipe in accordance with the requirements of AWWA C605 for pressure and leakage tests. The amount of leakage on pipelines made of PVC water main pipe is not to exceed the amounts given in AWWA C605, except that at joints made with sleeve-type mechanical couplings, no leakage will be allowed.

Test water service lines in accordance with requirements of AWWA C600 for hydrostatic testing. No leakage will be allowed at plastic service pipe joints, flanged joints, and threaded joints.

Test fire service lines in accordance with requirements of NFPA 25 for hydrostatic testing. No leakage will be allowed at plastic service pipe joints, flanged joints, and threaded joints.

3.4.1.2 Leakage Test

For leakage test, use hydrostatic pressure not less than the maximum working pressure of the system. Leakage test may be performed at the same time and at the same test pressure as the pressure test.

3.4.1.3 Bacteriological Testing

Perform bacteriological tests in accordance with AWWA C651. For new water mains use Option A and obtain two sets of samples for coliform analysis, each sample being collected at least 16 hours apart. Take samples every 1,200 ft plus one set from the end of the line and at least one from each branch greater than one pipe length. Analyze samples by a certified laboratory and submit the results of the bacteriological samples.

3.4.1.4 Backflow Preventer Tests

After installation conduct Backflow Preventer Tests and provide test reports verifying that the installation meets the FCCCHR Manual Standards.

3.4.1.5 Special Testing Requirements for Fire Service

Test water mains and water service lines providing fire service or water and fire service in accordance with NFPA 24. The additional water added to the system must not exceed the limits given in NFPA 24

3.4.1.6 Tracer Wire Continuity Test

Test tracer wire for continuity after service connections have been completed and prior to final pavement or restoration. Verify that tracer wire is locatable with electronic utility locating equipment. Repair breaks or separations and re-test for continuity.

3.5 SYSTEM STARTUP

Water mains and appurtenances must be completely installed, disinfected, flushed, and satisfactory bacteriological sample results received prior to permanent connections being made to the active distribution system. Obtain approval by the engineer prior to the new water piping being placed into service.

3.6 CLEANUP

Upon completion of the installation of water lines and appurtenances, remove all debris and surplus materials resulting from the work.

-- End of Section --

SECTION 33 30 00

SANITARY SEWERAGE

PART 1 GENERAL

1.1 SUBMITTALS

SD-01 Preconstruction Submittals

Traffic Control Plan

SD-02 Shop Drawings

Installation Drawings

SD-03 Product Data

Gravity Pipe
Pressure Pipe
Gaskets
Grinder Pump Lift Station

SD-06 Test Reports

Leakage Tests
Deflection Test

1.2 DELIVERY, STORAGE, AND HANDLING

1.2.1 Delivery and Storage

Check upon arrival; identify and segregate as to types, functions, and sizes. Store off the ground in a manner affording easy accessibility and not causing excessive rusting or coating with grease or other objectionable materials.

1.2.1.1 Piping

Inspect materials delivered to site for damage; store with minimum of handling. Store materials on site in enclosures or under protective coverings. Store plastic piping and jointing materials and rubber gaskets under cover out of direct sunlight. Do not store materials directly on the ground. Keep inside of pipes and fittings free of dirt and debris.

1.2.2 Handling

Handle PVC pipe, fittings, and accessories in accordance with Chapter 6 of AWWA M23. Protect pumps, controls, and wet-well components from moisture, sunlight, and mechanical damage. Coordinate electrical service, control integration, and tie-in to force main for the grinder pump lift station.

PART 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

Provide mains, laterals and building connections constructed of polyvinyl chloride (PVC) plastic pipe. The exterior sanitary gravity sewer system includes equipment, materials, installation, and workmanship as specified herein more than five (5) feet outside of building walls. Provide grinder pump lift station as a package assembly supplied by a single manufacturer.

2.2 MATERIALS

Provide materials conforming to the respective specifications and other requirements specified below. Submit manufacturer's product specification, standard drawings or catalog cuts.

2.2.1 Gravity Pipe

2.2.1.1 PVC Gravity Sewer Piping

2.2.1.1.1 PVC Gravity Pipe and Fittings

ASTM D3034, SDR 26 with ends suitable for elastomeric gasket joints.

2.2.1.1.2 PVC Gravity Joints and Jointing Material

Provide joints conforming to ASTM D3212. Provide gaskets conforming to ASTM F477.

2.2.2 Pressure Pipe

2.2.2.1 PVC Pressure Pipe and Associated Fittings

Provide pipe, couplings, and fittings manufactured of materials conforming to ASTM 1784 >, Class 12454B, meeting dimensional requirements of ASTM D1785, Schedule 80, with joints meeting the requirements of 150 psi working.

Provide fittings for solvent cement jointing conforming to ASTM 2467.

2.2.3 Sanitary Sewer Structures

Provide sanitary sewer manholes and lids in accordance with Specification 33 05 61 - PRECAST CONCRETE STRUCTURES FOR UTILITIES.

2.2.4 Grinder Pump Lift Station

2.2.4.1 Grinder Pumps

Provide a dual submersible grinder pump package that are: 1 horsepower (hp), 1725 rpm, 120/240V single-phase. Pump capacity minimum is 15 gallons per minute (gpm) at 0 pounds per square inch gauge (psig), 7.8 gpm at 80 psig. Pump materials must be cast-iron housing, stainless steel rotor, and elastomer stator. Select grinder pumps to meet or exceed the flow demands of the conveyance system.

2.2.4.2 Tank

Provide a tank that is polyethylene conforming to ASTM D3350, ribbed, and has a tapered bottom. Tank must have 4-inch Drain, Waste, and Vent (DWV) grommet; discharge must be a 1.25-inch PVC.

2.2.4.3 Valves and Fittings

Provide stainless steel check valve between the grinder pump lift station and force main, and isolation valves and unions for service.

2.2.4.4 Controls and Alarm Panel

Provide hardwire or wireless communication between grinder pump lift station and monitoring station. The enclosure for the communication equipment must be NEMA 4X compliant with audible and visual alarms. Option can be provided for remote monitoring of grinder pump lift station.

Provide electrical service in accordance with electrical specifications.

2.2.4.5 Accessories

Provide guide rails, lifting chains, vent assembly, and appurtenances required for grinder pump lift station installation and operation.

PART 3 EXECUTION

3.1 EXISTING UTILITIES AND OBSTRUCTIONS

3.1.1 General

Locate utilities in accordance with the requirements defined in 31 00 00 EARTHWORK to document the specific location and elevation of all utilities within the work areas. Using the utility locations develop and submit Installation Drawings showing complete detail, both plan and profile view details with proper layout and elevations, clearly indicating clearances between the proposed sewer line and existing utilities.

3.1.2 Location of Sewer Lines

Do not lay sewer line closer than 6 feet horizontally (minimum), 10 feet preferred from any water line, unless specifically directed on the contract drawings. For vertical separation, maintain a minimum of 12 inches between water and sewer lines. When crossing a water line with a sewer line, maximize the joint distance from the crossing and in all cases ensure a minimum joint distance of three (3) feet. All distances are edge to edge. For non-standard conditions, refer to Rule 62-555.314, Florida Administrative Code (FAC). Unless directed in writing by the AHJ, do not violate minimum separations listed or employ alternative separation methods as allow by FAC.

Alternative routing will be designed, or a waiver for implementation of alternative protection from FDEP and the Bureau of Public Water Supply must be approved.

3.1.3 Horizontal Conflict

Horizontal conflict is defined as when the actual horizontal separation between a utility, main, or service and the proposed sewer does not permit the crossing without adequate separation and/or safe installation of the sewer by the use of sheeting, shoring, tieing back, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the sewer to avoid horizontal conflicts if the new alignment remains within the available right of way or easement and complies with regulatory agency requirements after a written request to and subsequent approval by the owner.

3.1.4 Vertical Conflict

Vertical conflict is defined as when the actual vertical separation between a utility, main, or service and the proposed sewer does not permit the crossing without adequate separation and/or immediate or potential future damage to the utility, main, service, or the sewer. The Contractor may change the proposed grade of the sewer to avoid vertical conflicts if the change grade provided minimum required capacity, maintains adequate cover and complies with regulatory agencies requirements, after written request to and subsequent approval by the owner.

3.2 CONSTRUCTION ALONG HIGHWAYS, STREETS AND ROADWAYS

Install pipelines and appurtenances along highways, streets, and roadways in accordance with the applicable regulations of the site with reference to construction operations, safety, traffic control, road maintenance and repair.

3.2.1 Traffic Control

Provide, erect and maintain all necessary barricades, provide suitable and sufficient lights and other traffic control devices, provide qualified flagmen where necessary to direct traffic, and take all necessary precautions for the protection of the work and the safety of the public. Provide and install construction traffic control devices in accordance with the current Manual On Uniform Traffic Control Devices for Streets and Highways. Submit a Traffic Control Plan with specific details of each area traffic will be impacted.

Coordinate required traffic interruptions with site security and site operations through the owner a minimum of 48 hours in advance of the activity. Schedule placement of construction traffic control devices ahead of associated construction activities. Conduct construction time in street right of way shall to minimize the length of time traffic is disrupted. Remove construction traffic control devices immediately following their useful purpose.

Protect existing traffic control devices within the construction work zone from damage. Locate traffic control devices requiring temporary relocation as near as possible to their original vertical and horizontal locations. Reinstall relocated traffic control devices in their original locations as soon as practical following construction.

3.3 PREPARATION

3.3.1 Installation Drawings

Submit Installation Drawings showing complete detail, both plan and side view details with proper layout and elevations.

3.4 INSTALLATION

Lay all pipe and fittings to accurately conform to the lines and grades shown on the drawings. Only backfill pipe trenches after inspection by the owner. Before, during, and after installation, protect plastic pipe and fittings from any environment that would result in damage or deterioration to the material.

3.4.1 General

Provide and use proper implements, tools and facilities for the safe performance of the work. Carefully lower all pipe, fittings and valves into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to sewer materials and protective coatings and linings. Under no circumstances should materials be dropped or dumped into the trench.

Carefully examine all pipe, fittings, and other appurtenances for damage and other defects immediately before installation. Mark and hold for inspection by the owner defective materials, who may prescribe corrective repairs or reject the materials.

Properly store and handle all materials to maintain them dry and free from dirt, sand, grit or any foreign materials. Do not place any debris, tools, clothing or other materials in the pipe at any time. Do not lay any pipe which contains dirt.

As each length of pipe is placed in the trench, assemble joints and bring the pipe to correct line and grade. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade is not be permitted. Secure the pipe in place with approved backfill material.

Excavate, lay the pipe, and backfill as closely together as possible. Do not leave unjointed pipe in the trench overnight. Backfill and compact the trench as soon as possible after laying, jointing and inspection/testing is completed. Cover the exposed end of the installed pipe each day at the close of work and at all other times when work is not in progress. If necessary to backfill over the end of an uncompleted pipe or accessory, close the end with a suitable plug, either push on, mechanical joint, restrained joint or as approved by the owner.

3.4.2 Alignment and Grade

Lay pipe straight in alignment and gradient or follow true curves, where shown on the Drawings, as nearly as practicable. Do not deflect any joint more than the maximum deflection recommended by the manufacturer. Maintain a transit, level and accessories on the job to lay out angles and ensure that deflection allowances are not exceeded.

Check the invert elevation at each manhole and the pipe invert elevation at each joint.

Install all sewer pipe with a minimum cover of 36 inches.

3.4.3 Connections to Existing Lines

Obtain approval from the owner before making connection to existing line. Conduct work so that there is minimum interruption of service on existing line.

3.4.4 Installation of PVC Piping

For gravity pipe, install pipe and fittings in accordance with paragraph entitled "General Requirements for Installation of Pipelines" of this section and with the requirements of ASTM D2321 for laying and joining pipe and fittings. Make joints with the gaskets specified for joints with this piping and assemble in accordance with the requirements of ASTM D2321 for assembly of joints. Make joints to other pipe materials in accordance with the recommendations of the plastic pipe manufacturer.

For pressure pipe, unless otherwise specified, install pipe and fittings in accordance with AWWA C605. AWWA C605 includes requirements such as excavation, installation, and placement of appurtenances.

3.4.4.1 Solvent-Weld Joints

Comply with the manufacturer's instructions.

3.4.4.2 Pipe 4-inch Diameter and Larger

Make push-on joints with pipe with integral elastomeric gasket. For pipe-to-pipe push-on joint connections, use only pipe with push-on joint ends having factory-made bevel. For push-on joint connections to fittings, use cut spigot end of pipe off square, marked to match the manufacturer's insertion line and beveled to match factory supplied bevel. Use an approved lubricant recommended by the pipe manufacturer for push-on joints.

3.4.5 Concrete Work

Cast-in-place concrete is included in Section 32 13 13.06 PORTLAND CEMENT CONCRETE PAVEMENT FOR ROADS AND SITE FACILITIES. Support the pipe on a concrete cradle, or encased in concrete where indicated or directed.

3.4.6 Manhole Construction

In accordance with Specification 33 05 61 - PRECAST CONCRETE STRUCTURES FOR SEWERS

3.4.7 Construction Within Structures

Accurately locate and securely fasten wall pipe and wall sleeves in place before concrete is poured. Provide all wall pipe and sleeves with wall collars properly located to be in the center of the wall where the respective pipes are to be installed. Extend pipe passing through the sleeve no more than three feet beyond the structure without a piping joint.

Construct wall pipe and wall sleeves when the wall or slab is constructed. Blocking out or breaking of the wall for later installation is not permitted. Cutting or weakening of structural members to facilitate pipe installation is not permitted. Install all piping in place without springing or forcing.

Install unions where shown on the contract drawings, at all piping connections to equipment, at all valves, and wherever necessary to facilitate the dismantling of the piping system. Flanges on equipment may be considered as unions.

3.4.8 Grinder Pump Lift Station

3.4.8.1 Tank Installation

Set tank on compacted granular base with a minimum thickness of 12-inches, area must be clear of water during installation. Connect inlet and discharge per manufacturer instructions. Follow guidelines outlined within this specification for installing equipment near existing utilities.

3.4.8.2 Electrical Connections

Provide conduit and wiring per NEC guidelines for connection to the grinder pump lift station monitoring system and power supply.

3.5 FIELD QUALITY CONTROL

3.5.1 Tests

Notify the owner a minimum of five days in advance of testing. Perform field tests, and provide labor, equipment, and incidentals required for testing, except that water needed for field tests will be furnished by the owner. Produce evidence, when required, that any item of work has been constructed in accordance with the drawings and specifications.

Perform field tests and provide labor, equipment, and incidentals required for testing. Keep records of all inspection and testing reports and submit to the owner.

Take all precautions necessary to protect any equipment that might be damaged by the pressures used in the tests. Valve off, remove or otherwise protect delicate equipment. Securely anchor and restrain piping against movement prior to application of test procedures. Prior to the pressure test, partially backfill pipe laid in trenches to secure the pipe during the test. Leave exposed all joints, fittings and valves where possible. Carefully examine all exposed pipe, fittings, valves and joints during the pressure test.

3.5.2 Leakage Tests for Nonpressure Lines

Test lines for leakage by either infiltration tests and exfiltration tests, or by low-pressure air tests. When leakage or pressure drop exceeds the allowable amount specified, make satisfactory correction and retest pipeline section in the same manner. Correct visible leaks regardless of leakage test results.

Test leakage of gravity pipe in accordance with ASTM C969. The allowable leakage limit is located in ASTM C969. Make calculations in accordance with the Appendix to ASTM C969.

Test PVC pipe in accordance with UBPPA UNI-B-6. The allowable pressure drop is located in UBPPA UNI-B-6. Make calculations in accordance with the Appendix to UBPPA UNI-B-6.

3.5.3 Deflection Testing

Perform a deflection test on entire length of installed gravity pipeline. Complete testing not less than 30 days after final backfill, but not before the completion of work adjacent to and over the pipeline, including leakage tests, grading, paving, concreting, and any other superimposed loads. Deflection of pipe in the installed pipeline under external loads is not to exceed 4.5 percent of the average inside diameter of pipe. Determine whether the allowable deflection has been exceeded by use of a pull-through device or a deflection measuring device.

All deflection testing must be witnessed by the owner. Provide a minimum of five (5) days notice of scheduled tests. Submit deflection test procedures and equipment for approval. Submit documentation of deflection testing results with signatures of technicians and witnesses.

3.5.3.1 Pull-Through Device

This device is to be a spherical, spheroidal, or elliptical ball, a cylinder, or circular sections fused to a common shaft. Space circular sections on the shaft so that the distance from external faces of front and back sections will equal or exceed the diameter of the circular section. Pull-through device may also be of a design promulgated by the Uni-Bell Plastic Pipe Association, provided the device meets the applicable requirements specified in this paragraph, including those for diameter of the device, and that the mandrel has a minimum of 9 arms. Ball, cylinder, or circular sections are to conform to the following:

a. A diameter of 95 percent of the average inside diameter of the pipe; tolerance of plus 0.5 percent will be permitted.

b. Homogeneous material throughout, is to have a density greater than 1.0 as related to water at 39.2 degrees F, and a surface Brinell hardness of not less than 150.

c. Center bored and through-bolted with a 1/4 inch minimum diameter steel shaft having a yield strength of not less than 70,000 psi, with eyes or loops at each end for attaching pulling cables.

d. Suitably back each eye or loop with a flange or heavy washer such that a pull exerted on opposite end of shaft will produce compression throughout remote end.

3.5.3.2 Pull-Through Device Procedure

Pass the pull-through device through each run of pipe, either by pulling it through or flushing it through with water. Do not use mechanical pulling equipment to pull the device. If the device fails to pass freely through a pipe run, replace pipe which has the excessive deflection and completely retest in same manner and under same conditions.

3.5.3.3 Deflection Measuring Device

Sensitive to 1.0 percent of the diameter of the pipe being tested and be accurate to 1.0 percent of the indicated dimension. Prior approval is required for the deflection measuring device.

3.5.3.4 Deflection measuring device procedure

Measure deflections through each run of installed pipe. If deflection readings in excess of 4.5 percent of average inside diameter of pipe are obtained, retest pipe by a run from the opposite direction. If retest continues to show a deflection in excess of 4.5 percent of average inside diameter of pipe, replace pipe which has excessive deflection and completely retest in same manner and under same conditions.

3.6 CLEANUP AND RESTORATION

Return all items and all areas disturbed, directly or indirectly by work under these Specifications, to their original condition or better, as quickly as possible after work is started. Dispose of all materials cleared and grubbed during the construction of the project. Restore disturbed soil in accordance with 31 00 00 EARTHWORK.

-- End of Section --

SECTION 33 40 00

STORMWATER UTILITIES

PART 1 GENERAL

1.1 SUMMARY

1.1.1 Scope of Work

The work under this Section includes all labor, materials, and equipment necessary to construct storm drainage systems, including installation of pipes, structures, inlets, manholes, and appurtenances, as well as excavation, bedding, backfilling, and testing, to convey stormwater in accordance with the lines, grades, and details indicated on the Drawings.

1.2 SUBMITTALS

Submit the following in accordance with Section 01 33 00 SUBMITTAL PROCEDURES:

SD-02 Shop Drawings

Shop Drawing

SD-03 Product Data

Grout
Joint Ring Gaskets
Bitumastic Sealing Material

SD-07 Certificates

Frame and Cover or Gratings

1.3 DELIVERY, STORAGE, AND HANDLING

1.3.1 Delivery and Storage

Inspect materials delivered to site for damage and unload and store materials with minimal handling. Do not store materials directly on the ground. Keep the inside of pipes and fittings free of dirt and debris. Before, during, and after installation, protect plastic pipe and fittings from any environment that would result in damage or deterioration to the material. Keep a copy of the manufacturer's instructions available at the construction site at all times and follow these instructions unless directed otherwise by the Contracting Officer. Store solvents, solvent compounds, lubricants, elastomeric gaskets, and any similar materials required to install plastic pipe in accordance with the manufacturer's recommendations and discard if the storage period exceeds the recommended shelf life. Discard solvents in use when the recommended pot life is exceeded.

1.3.2 Handling

Handle materials in a manner that ensures delivery to the trench in sound, undamaged condition. Carry pipe to the trench.

PART 2 PRODUCTS

2.1 PIPE FOR CULVERTS AND STORM DRAINS

Pipe sizes for culverts and storm drains are indicated on the drawings.

2.1.1 Concrete Pipe

2.1.1.1 Reinforced Culvert and Storm Drain Pipe

Manufactured in accordance with and conforming to ASTM C76M ASTM C76, Class III.

2.1.2 Polypropylene(PP) Pipe

Provide double wall pipe meeting the requirements of ASTM F2736 or ASTM F2764/F2764M or ASTM F2881/F2881M, Class II. Basis of design: Provide Advanced Drainage Systems, Inc. (ADS) N-12 High Performance (HP) high-density polypropylene pipe

2.2 PIPE JOINTS

2.2.1 Concrete Pipe

2.2.1.1 Rubber Gasket Joints

Provide rubber gasket joints of a design and physical requirements conforming to ASTM C443.

2.2.1.2 Preformed Flexible Sealant Joints

Provide joints made with preformed flexible joint sealant conforming to ASTM C990.

2.2.2 Dual Wall and Triple Wall PP Pipe

Pipe to be joined with a gasketed integral bell and spigot joint meeting the requirements of ASTM F2736. Gaskets to be installed by the pipe manufacturer and be covered with a removable, protective wrap to ensure the gaskets are free from debris. Use a joint lubricant available from the manufacturer on the gasket and bell during assembly. ASTM F2881/F2881M for 12 to 60 inches pipe diameters must have a reinforced bell with a polymer composite band installed by the manufacturer. Provide fittings conforming to ASTM F2736. Utilize a spun-on, welded or integral bell and spigot with gaskets meeting ASTM F477 for bell and spigot connections.

2.3 MISCELLANEOUS MATERIALS

2.3.1 Concrete

Unless otherwise specified, provide concrete and reinforced concrete conforming to the requirements for 4,000 psi concrete under Section 32 13 13.06 PORTLAND CEMENT CONCRETE PAVEMENT FOR ROADS AND SITE FACILITIES.

Provide air content by volume of concrete mixture, based on measurements made immediately after discharge from the mixer, of 5 to 7 percent when maximum size of coarse aggregate exceeds 1-1/2 inches. Determine air content in accordance with ASTM C231/C231M. Provide a minimum concrete covering over steel reinforcing of not less than 1 inch thick for covers and not less than 1-1/2 inches thick for walls and flooring. For concrete deposited directly against the ground, provide a covering thickness of at least 3 inches between steel and ground. Provide expansion-joint filler material conforming to ASTM D1751, or ASTM D1752, or provide be resin-impregnated fiberboard conforming to the physical requirements of ASTM D1752.

2.3.2 Mortar

Mortar is not allowed for pipe joints. Provide mortar for pipe connections to drainage structures conforming to ASTM C270, Type M, except that the maximum placement time will be 1 hour. Provide a sufficient quantity of water in the mixture to produce a stiff workable mortar but in no case may the quantity exceed 5 gallons of water per sack of cement. Use water that is clean and free of harmful acids, alkalis, and organic impurities. Use the mortar within 30 minutes after the ingredients are mixed with water.

2.3.3 Precast Concrete Segmental Blocks

Provide precast concrete segmental block conforming to ASTM C139, not more than 8 inches thick, not less than 8 inches long, and of such shape that joints can be sealed effectively and bonded with cement mortar.

2.3.4 Brick

Provide brick conforming to ASTM C62, Grade SW; ASTM C55, Grade S-I or S-II; or ASTM C32, Grade MS. Provide mortar for jointing and plastering consisting of one part portland cement and two parts fine sand. Lime may be added to the mortar in a quantity not more than 25 percent of the volume of cement. Provide joints that are completely filled and that are smooth and free from surplus mortar on the inside of the structure. Plaster brick structures with 1/2 inch of mortar over the entire outside surface of the walls. Lay brick in stretcher courses with a header course every sixth course for square or rectangular structures. Lay brick radially with every sixth course a stretcher course for round structures.

2.3.5 Precast Reinforced Concrete Manholes and Catch Basins

2.3.5.1 General

Provide precast reinforced concrete manholes and catch basins conforming to ASTM C478/C478M and FDOT Index 425-052. Provide joints between precast concrete risers and tops that are made with flexible watertight, rubber-type gaskets meeting the requirements of paragraph PIPE JOINTS. Submit shop drawings in accordance with 01 33 00 SUBMITTAL PROCEDURES.

2.3.5.2 Precast Concrete Structures

Provide precast concrete structures in conformance with ASTM C478, except as otherwise specified herein. Construct structures in accordance with the drawings and the following requirements: 1. Provide of the dimensions shown on the drawings.

2. Provide structures with a precast monolithic base structure with a minimum base thickness of eight (8) inches. Provide walls with a minimum thickness of five (5) inches.

2.3.5.3 Joints

Provide tongue and groove type joints sealed with round or other flexible type natural rubber joint ring gaskets in conformance with ASTM C990 or by a flexible preformed bitumastic sealing material in conformance with FS SS-S-210A (equal to Ram-Nek as manufactured by Henry Company, El Segundo, CA). Provide rubber joint ring gaskets and flexible preformed bitumastic sealing material by the precast concrete structure manufacturer.

If rubber joint ring gaskets are used, seal interior and exterior voids in the pipe joints with flexible sealing material specified above, installed in strict accordance with the manufacturer's printed instructions. If precast concrete sections are sealed with a flexible preformed bitumastic sealing material, apply adequate material so that "squeeze out" occurs at the interior and exterior of the joint. Trim excess jointing material from the inside of the structure prior to sealing the liner at the joint sections.

2.3.5.4 Lifting

Include in the design adequate lifting lugs, rings or non-penetrating lift inserts for lifting and installing the precast structures. Lifting holes through the structure are not permitted.

2.3.5.5 Concrete Materials

For manholes, provide concrete with a minimum compressive strength of 4,000 psi at 28 days. For vaults, design the mix to supply a minimum compressive strength of 5,000 psi at 28 days. Do not exceed a water-cement ratio of 0.45.

Provide all aggregates, fine and coarse, other than lightweight aggregates conforming to ASTM C33/C33M. Provide lightweight aggregates, fine and coarse, conforming to ASTM C330/C330M. Ensure aggregates are free of deleterious substances causing reactivity with oxidized hydrogen sulfide. Grade both types of aggregates in a manner so as to produce a homogenous concrete mix. All materials are to be accurately weighed at a central hatching facility for mixing. Provide Portland cement Type II in accordance with ASTM C150/C150M.

2.3.5.6 Reinforcing

Provide Grade 60 reinforcing steel. Sufficiently tie reinforcing steel to withstand any displacement during the pouring operation.

2.3.5.7 Forms

Use metal forms for precast concrete and sufficiently design and brace to maintain their alignment under pressures of the concrete during placing. Integrally cast base and first section of precast structures.

2.3.5.8 Placing

Handle all concrete from the mixer or transport vehicle to the place of final deposit in a continuous manner, as rapidly as practicable, and without segregation or loss of ingredients, until the approved unit is completed. The maximum allowable elapsed time from hatching to placement is 2-hours. Place concrete in layers not over 2-feet deep. Compact each later by mechanical internal or external vibrating equipment. Limit duration of the vibration cycle to the time necessary to produce satisfactory consolidation without causing objectionable segregation.

2.3.5.9 Curing

Cure precast sections by an approved method for at least 28 days prior to coating and do not be ship until at least 2 days after having been coated. Remove form oil, curing compounds, dust, dirt and other interfering materials from concrete surfaces by brush sand blasting.

For purposes of early reuse of forms, precast concrete may be steam cured after an initial set has taken place. Do not exceed steam temperature of 160°F, and raise the temperature from normal ambient temperatures at a rate not to exceed 40° F per hour.

Do not remove the steam cured unit from the forms until sufficient strength is obtained for the unit to withstand any structural strain to which it may be subjected during the form stripping operation. After the stripping of forms, further curing by means of water spraying or a membrane curing compound may be used, and be of clear or white type, conforming to ASTM C309.

2.3.6 Frame and Cover or Gratings

Provide frame and cover or gratings made of cast gray iron, ASTM A48/A48M, Class 35B; cast ductile iron, ASTM A536, Grade 65-45-12; or cast aluminum, ASTM B26/B26M, Alloy 356.0-T6. Stamp or cast the word "Storm Sewer" into covers so that it is plainly visible. Submit shop drawings in accordance with 01 33 00 SUBMITTAL PROCEDURES

2.3.7 Steel Ladder

Provide a steel ladder where the depth of the storm drainage structure exceeds 12 feet. Provide ladders not less than 16 inches in width, with 3/4 inch diameter rungs spaced 12 inches apart. Provide two stringers that are a minimum 3/8 inch thick and 2-1/2 inches wide. Galvanize ladders and inserts after fabrication in conformance with ASTM A123/A123M.

2.3.8 Resilient Connectors

Provide flexible, watertight connectors conforming to ASTM C923/C923M for connecting pipe to manholes and inlets.

2.3.9 Mitered End Sections

Provide sections of a standard design fabricated with reinforced concrete in accordance with FDOT Index 430-021.

PART 3 EXECUTION

3.1 EXCAVATION FOR PIPE CULVERTS, BOX CULVERTS, STORM DRAINS, AND DRAINAGE
STRUCTURES

Excavate trenches, excavate for appurtenances and backfill for culverts

and storm drains, in accordance with the applicable portions of Section 31 00 00 EARTHWORK and the requirements specified below.

3.1.1 Trenching

Excavate trenches to the width indicated on the drawings or as specified herein. Trench width should permit satisfactory jointing and thorough tamping of the bedding material under and around the pipe. Place sheeting and bracing, where required, within the trench width as specified, without any overexcavation.

For precast concrete structures, prepare an excavation large enough to accommodate the structure and permit sealing of openings, waterproofing, and backfilling operations. Perform all operations in accordance with 31 00 00 EARTHWORK.

3.1.2 Removal of Unstable Material

Where wet or otherwise unstable soil incapable of properly supporting the pipe or box culvert, as determined by the Contracting Officer, is unexpectedly encountered in the bottom of a trench, remove such material to the depth required and replace with select granular material to the proper grade. Compact select granular material as specified in paragraph FINAL BACKFILL. When removal of unstable material is due to the fault or neglect of the Contractor while performing shoring and sheeting, water removal, or other specified requirements, perform such removal and replacement at no additional cost to the Owner.

3.2 BEDDING AND INITIAL BACKFILL

Provide a firm bedding foundation of uniform density throughout the entire length of the pipe or box culvert.

3.2.1 Concrete Pipe

Use select granular material conforming to Section 31 00 00 EARTHWORK. Compact haunch and outer bedding to at least 95 percent laboratory maximum density and place in layers not exceeding 6 inch loose thickness for compaction by hand-operated compactors and 200 mm 8 inches for other than hand-operated machines. Loosely place middle bedding and do not compact. After the pipe has been properly bedded, place haunch material, at a moisture content that will facilitate compaction, evenly along both sides of the pipe and thoroughly compact each layer with mechanical tampers or rammers to the springline of the pipe. Thoroughly compact the haunch material under the haunches of the pipe. For bell and spigot pipe, form a depression in bedding material for bells so entire barrel of pipe is uniformly supported. Minimize the length, depth, and width of bell depressions to that required for properly making the particular type of joint.

3.2.1.1 Trenches

After the pipe has been properly bedded and haunch material placed to the midpoint (springline) of the pipe, backfill and compact the remainder of the trench by spreading and rolling or compacting by mechanical rammers or tampers in layers not exceeding 6 inches. Test for density as necessary to ensure conformance to the compaction requirements specified below. Leave untreated sheeting in place beneath structures or pavements.

3.2.1.2 Fill Sections

For pipe placed in fill sections, uniformly spread fill material longitudinally on both sides of the pipe in layers not exceeding 6 inches in compacted depth, and compact by rolling parallel with pipe or by mechanical tamping or ramming. Prior to commencing normal filling operations, the crown width of the fill at a height of 12 inches above the top of the pipe must extend a distance of not less than twice the outside pipe diameter on each side of the pipe or 12 feet, whichever is less. After the backfill has reached at least 12 inches above the top of the pipe, place and thoroughly compact the remainder of the fill in layers not exceeding 8 inches.

3.2.2 Plastic Pipe

Provide bedding for PVC, PE, SRPE and PP pipe meeting the requirements of ASTM D2321. Use Class IB or II material for PVC, PE, SRPE pipe bedding, haunching, and initial backfill. Use Class I, II, or III material for PP pipe bedding, haunching and initial backfill.

3.3 JOINTING

3.3.1 Corrugated Pipe

3.3.1.1 Field Joints

Provide transverse field joints designed so that the successive connection of pipe sections will form a continuous line free of appreciable irregularities in the flow line. Provide joints meeting the general performance requirements described in AASHTO M 252. Suitable transverse field joints which satisfy the requirements for one or more of the joint performance categories can be obtained with the following types of connecting bands furnished with suitable band-end fastening devices: corrugated bands, bands with projections, flat bands, and bands of special design that engage factory reformed ends of corrugated pipe. Keep the space between the pipe and connecting bands free from dirt and grit so that corrugations fit snugly. While being tightened, tap the connecting band with a soft-head mallet of wood, rubber or plastic, to take up slack and ensure a tight joint.

3.3.1.2 Flexible Watertight, Gasketed Joints

Use lubricants or cements and other special installation requirements as recommended by the gasket manufacturer. Where sleeve type gaskets are used, place the gasket over one end of a section of pipe for half the width of the gasket. Then double over the other half over the end of the same pipe. When the adjoining section of pipe is in place, roll the doubled-over half of the gasket over the adjoining section. Correct any unevenness in overlap so that the gasket covers the end of pipe sections equally. Center connecting bands

over adjoining sections of pipe, and place rods or bolts in position and tighten nuts. Band Tightening: Tighten the band evenly, keep even tension on the rods or bolts, and the gasket; properly seat the gasket in the corrugations. Keep watertight joints uncovered for a period of time designated by the Contracting Officer. Before covering joints, measure the tightness of the nuts with a torque wrench. If the nut has tended to loosen its grip on the bolts or rods, retighten the nut with a torque wrench and keep uncovered until a tight, permanent joint is assured.

3.4 DRAINAGE STRUCTURES

3.4.1 INSTALLATION OF PRECAST STRUCTURES

Construct precast concrete structures in a workmanlike manner at the locations and dimensions indicated on Drawings. Compact the sub-base under the precast base sections to 98 percent of the maximum relative density at optimum moisture content as determined by ASTM D1557. Set precast base sections and vaults on a foundation of crushed stone, a minimum of 12-inches thick. Provide crushed stone material of well graded crushed stone or crushed gravel meeting the requirements of ASTM C33/C33M, Gradation No. 57 (1-inch to No. 4 sieve). Install and compact the crushed stone materials for the foundation in 6-inch lifts. Refer to Section 31 00 00 - EARTHWORK, for a complete description of recommendations for the foundation preparation. Take care to prevent earth and other materials from entering precast structures.

Construct the precast structure such that the structure will not transmit dead or live loads to the piping. Carefully place precast base sections on the prepared stone bedding foundation so as to be fully and uniformly supported in true alignment and making sure that all entering pipes can be inserted on proper grade. Assemble units so that the structure conforms to the elevations shown on the Drawings. Set each precast concrete unit plumb on a bed of sealant to make a watertight joint at least 1/2-inch thick with the concrete base or with the preceding unit. Point the inside joint and wipe off the excess sealant. Provide pipe connections at precast concrete structures at the locations shown on the Drawings. Provide resilient and waterproof connections.

Fill all interior and exterior joints between precast concrete sections with a joint sealant, as recommended by the precast structure manufacturer.

Fill all voids in interior and exterior precast concrete section joints and lift holes for precast concrete sections with a non-shrinking, non-metallic grout per MORTAR of this section. Apply and cure grout in strict accordance with the manufacturer's recommendations. Finish the grout smooth and flush with the wall surface of the precast concrete structure.

Perform wall coring and modifications of precast penetrations on new or existing precast concrete structures by a power driven coring machine as manufactured by the flexible pipe connector manufacturer. Complete cutting prior to setting the manhole section in place to prevent any subsequent jarring which may loosen the joints. Construct such connection to existing manholes in accordance with the details for new units shown on the contract drawings and caulk water tight with non-shrink cement grout. Make all drop pipe connections at manholes in accordance with the contract drawings.

Complete manhole connections in a progressive manner to facilitate system testing as described in section 3.6.

3.4.2 MANHOLE FRAMES AND COVERS

Place cast iron frames over precast concrete leveling rings, shimmed and set in Portland cement mortar to the required grade. No more than four courses of leveling rings may be used, unless approved by the COR. Set frames and covers accurately to grade to conform to the finished grade of the adjacent areas. Set the tops of manholes six (6) inches above finished grade in non-paved areas and flush with the pavement surface in paved areas.

3.5 FINAL BACKFILL

Backfill trenches with satisfactory material deposited in layers of a maximum of 8 inches loose thickness and compacted to 90 percent of maximum density for cohesive soils and 95 percent of maximum density for cohesionless soils in accordance with Section. Testing is the responsibility of the Contractor and will be performed at no additional cost to Owner. Unless otherwise specified, determine field in-place density of final backfill at a frequency of one test per 50 linear feet, or fraction thereof, of each lift of backfill. Submit test results in accordance with Section. Do not displace or damage pipe or box when compacting final backfill by rolling or operating heavy equipment parallel with the pipe or box. Movement of construction machinery over a culvert or storm drain at any stage of construction will be at the Contractor's risk. Repair or replace any damaged pipe. Protect concrete pipes with a minimum of 3 feet of cover prior to permitting heavy construction equipment to pass over them during construction.

Backfill precast concrete structures after the structure and all appurtenances are in place and approved. Place backfill to the original ground line or to the limits designated on the Drawings. Backfill materials must consist of sand or loose earth, free from stones, clods, or other deleterious material. Place in horizontal layers not exceeding 8-inches in depth, and moisten and thoroughly compact to a minimum relative density conforming to the requirements of 31 00 00 EARTHWORK.

3.6 FIELD QUALITY CONTROL

3.6.1 Tests

3.6.1.1 Deflection Testing

Conduct deflection test no sooner than 30 days after completion of final backfill and compaction testing. Clean or flush all lines prior to testing. Perform a deflection test on entire length of installed flexible pipeline upon completion of work adjacent to and over the pipeline, including backfilling, placement of fill, grading, paving, placement of concrete, and any other superimposed loads. Deflection of pipe in the installed pipeline under external loads must not exceed the limits in paragraph PLACING PIPE AND BOX CULVERT above as percent of the average inside diameter of pipe. Use a mandrel to determine if allowable deflection has been exceeded.

3.6.1.1.1 Mandrel

Pass the mandrel through each run of pipe by pulling it by hand. If deflection readings in excess of the allowable deflection of average inside diameter of pipe are obtained, stop and begin test from the opposite direction. The mandrel must meet the pipe manufacturer's

recommendations and the following requirements. Provide a mandrel that is rigid, nonadjustable, has a minimum of 9 fins, pulling rings at each end, and is engraved with the nominal pipe size and mandrel outside diameter. The mandrel must be 5 percent less that the certified-actual pipe diameter for plastic pipe, 5 percent less than the certified-actual pipe diameter for corrugated steel and aluminum, 3 percent less than the certified-actual pipe diameter for ductile iron culvert pipe. The Owner will verify the outside diameter (OD) of the Contractor provided mandrel through the use of Contractor provided proving rings.

3.6.1.2 Tracer Wire Continuity

Test tracer wire for continuity after initial and final backfilling of pipes. Verify that tracer wire is locatable with electronic utility location equipment. Repair breaks or separations and re-test for continuity.

3.6.2 Repair of Defects

3.6.2.1 Deflection Testing

When deflection readings are in excess of the allowable deflection of average inside diameter of pipe are obtained, remove pipe which has excessive deflection and replace with new pipe. Retest 30 days after completing backfill, leakage testing and compaction testing.

3.6.2.2 Inspection

Replace pipe or repair defects indicated in the Post-Installation Inspection Report.

3.6.2.2.1 Concrete Pipe

Replace pipes having cracks with a width greater than 0.1 inches.

3.7 PROTECTION

Protect storm drainage piping and adjacent areas from superimposed and external loads during construction.

3.8 WARRANTY PERIOD

Pipe segments found to have defects during the warranty period must be replaced with new pipe and retested.

-- End of Section --