CONTRACT DOCUMENTS
FOR THE CONSTRUCTION OF THE

PUMP STATION F
FORCE MAIN

PREPARED FOR

CITY OF KEY WEST

MAYOR: CRAIG CATES
COMMISSIONERS:

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Specifications

BID DOCUMENTS

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CH2MHILL

CH2M Hill Project No. 406518

AUGUST 2010

CITY OF KEY WEST

Key West, Florida

CONTRACT DOCUMENTS

for construction of the

PUMP STATION F FORCE MAIN

****

CONSISTING OF:
BIDDING REQUIREMENTS
CONTRACT FORMS
CONDITIONS OF THE CONTRACT
TECHNICAL SPECIFICATIONS

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CH2M HILL

Key West, FL
August 2010

Project No. 406518

Copy No._____

Pages

CONTENTS

TECHNICAL SPECIFICATIONS

DIVISION 1—GENERAL REQUIREMENTS

01 50 00 Construction Facilities and Temporary Controls 1- 11

DIVISION 2—EXISTING CONDITIONS

02 41 00 Demolition 1- 3

DIVISIONS 3 THROUGH 30 (NOT USED)

DIVISION 31—EARTHWORK

31 23 16 Excavation 1- 2
31 23 19.01 Dewatering 1- 4
31 23 23.15 Trench Backfill 1- 8

DIVISION 32—EXTERIOR IMPROVEMENTS

32 11 23 Aggregate Base Courses 1- 2
32 12 16 Asphalt Paving 1- 6
32 17 23 Pavement Markings 1- 2

DIVISION 33—UTILITIES

33 05 01 Conveyance Piping—General 1- 6
33 05 01.09 Polyvinyl Chloride (PVC) Pressure Pipe and Fittings 1- 4
33 12 16.29 Air Release and Plug Valve Assemblies 1- 3

DIVISIONS 34 THROUGH 49 (NOT USED)

DRAWINGS (BOUND SEPARATELY)

END OF SECTION

TECHNICAL SPECIFICATIONS

SECTION 01 50 00
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. Federal Emergency Management Agency (FEMA).
2. National Fire Prevention Association (NFPA): 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations.

1.02 SUBMITTALS

A. Informational Submittals:

1. Copies of permits and approvals for construction as required by Laws and Regulations and governing agencies.
2. Temporary Construction Submittals:
   a. Parking area plans.
   b. Contractor's field office, storage yard, and storage building plans, including gravel surfaced area.
   c. Staging area location plan.
   d. Traffic and Pedestrian Control and Routing Plans: As specified herein, and proposed revisions thereto.
3. Temporary Control Submittals:
   a. Noise control plan.
   b. Dust control plan.
   c. Plan for disposal of waste materials and intended haul routes.

1.03 MOBILIZATION

A. Mobilization shall include, but not be limited to, these principal items:

1. Obtaining required permits.
2. Moving Contractor's field office and equipment required for first month operations onto Site.
3. Installing temporary construction power, wiring, and lighting facilities.
4. Providing onsite communication facilities, including telephones.
5. Providing onsite sanitary facilities and potable water facilities as specified and as required by Laws and Regulations, and governing agencies.

6. Arranging for and erection of Contractor's work and storage yard.
7. Posting OSHA required notices and establishing safety programs and procedures.
8. Having Contractor's superintendent at Site full time.

B. No area is available at the Site on Owner's property for Contractor's temporary facilities. Provide lands and access to lands for temporary facilities for use by Contractor for duration of the Project.

1.04 PROTECTION OF WORK AND PROPERTY

A. Comply with Owner's safety rules while on Owner's property.

B. Keep Owner informed of serious onsite accidents and related claims.

C. Use of Explosives: No blasting or use of explosives will be allowed onsite.

1.05 VEHICULAR TRAFFIC

A. Traffic Control Plan: Adhere to traffic control plan reviewed and accepted by Engineer. Changes to this plan shall be made only by written approval of appropriate public authority. Secure approvals for necessary changes so as not to delay progress of the Work.

B. Traffic Routing Plan: Show sequences of construction affecting use of roadways, time required for each phase of the Work, provisions for decking over excavations and phasing of operations to provide necessary access, and plans for signing, barricading, and striping to provide passages for pedestrians and vehicles.

PART 2 PRODUCTS

2.01 PROJECT SIGN

A. Provide and maintain one, 8-foot wide by 4-foot high sign constructed of 3/4-inch exterior high density overlaid plywood. Sign shall bear name of Project, Owner, Contractor, Engineer, and other participating agencies. Lettering shall be blue applied on a white background by an experienced sign painter. Paint shall be exterior type enamel. Information to be included will be provided by Engineer.

PART 3 EXECUTION

3.01 TEMPORARY UTILITIES

A. Power:

1. No electric power is available at Site. Make arrangements to obtain and pay for electrical power used until final payment and acceptance by Owner, unless otherwise recommended by Engineer at Substantial Completion.
2. Cost of electric power will be borne by Contractor.
    a. Electricity Company: Keys Energy.
        1) Contact Person: Matthew Alfonso.
        2) Telephone: 305-295-1055.

B. Keys Electric requires all cranes and construction equipment to maintain a minimum of 15 feet working clearance from power lines. If construction equipment needs to enter the working clearance, then the Contractor must coordinate with the utility for a shutdown in the area. The Contractor will be responsible for notifying the effected community.

C. Lighting: Provide temporary lighting to meet applicable safety requirements to allow erection, application, or installation of materials and equipment, and observation or inspection of the Work.

D. Water:

1. No construction or potable water is available at Site. Make arrangements for and bear costs of providing water required for construction purposes and for drinking by construction personnel during construction.
2. Hydrant Water:
    a. Is available from nearby hydrants. Secure written permission for connection and use from water department and meet requirements for use. Notify fire department before obtaining water from fire hydrants.
    b. Use only special hydrant-operating wrenches to open hydrants. Make certain hydrant valve is open full, since cracking valve causes damage to hydrant. Repair damaged hydrants and notify appropriate agency as quickly as possible. Hydrants shall be completely accessible to fire department at all times.

E. Sanitary and Personnel Facilities: Provide and maintain facilities for Contractor’s employees, Subcontractors, and all other onsite employers’ employees. Service, clean, and maintain facilities and enclosures.

F. Fire Protection: Furnish and maintain on Site adequate firefighting equipment capable of extinguishing incipient fires. Comply with applicable parts of NFPA 241.

3.02 PROTECTION OF WORK AND PROPERTY

A. General:

1. Perform Work within right-of-way and easements in a systematic manner that minimizes inconvenience to property owners and the public.
2. No residence or business shall be cut off from vehicular traffic for a period exceeding 4 hours, unless special arrangements have been made.
3. Maintain in continuous service all existing oil and gas pipelines, underground power, telephone or communication cable, water mains, irrigation lines, sewers, poles and overhead power, and all other utilities encountered along line of the Work, unless other arrangements satisfactory to owners of said utilities have been made.
4. Where completion of the Work requires temporary or permanent removal or relocation of existing utility, coordinate all activities with owner of said utility and perform all work to their satisfaction.
5. Protect, shore, brace, support, and maintain underground pipes, conduits, drains, and other underground utility construction uncovered or otherwise affected by construction operations.
6. Keep fire hydrants and water control valves free from obstruction and available for use at all times.
7. In areas where Contractor’s operations are adjacent to or near a utility, such as gas, telephone, television, electric power, water, sewer, or irrigation system, and such operations may cause damage or inconvenience, suspend operations until arrangements necessary for protection have been made by Contractor.
8. Notify property owners and utility offices that may be affected by construction operation at least 2 days in advance: Before exposing a utility, obtain utility owner’s permission. Should service of utility be interrupted due to Contractor’s operation, notify proper authority immediately. Cooperate with said authority in restoring service as promptly as possible and bear costs incurred.
9. Do not impair operation of existing sewer system. Prevent construction material, pavement, concrete, earth, volatile and corrosive wastes, and other debris from entering sewers, pump stations, or other sewer structures.
10. Maintain original Site drainage wherever possible.

B. Barricades and Lights:

1. Provide as required by the Vehicle Code and in sufficient quantity to safeguard public and the Work.
2. Provide as necessary to prevent unauthorized entry to construction areas and affected roads, streets, and alleyways, inside and outside of fenced area, and as required to ensure public safety and the safety of Contractor's employees, other employer's employees, and others who may be affected by the Work.
3. Provide to protect existing facilities and adjacent properties from potential damage.
4. Locate to enable access by facility operators and property owners.
5. Protect streets, roads, highways, and other public thoroughfares that are closed to traffic by effective barricades with acceptable warning signs.
6. Locate barricades at the nearest intersecting public thoroughfare on each side of the blocked section.
7. Illuminate barricades and obstructions with warning lights from sunset to sunrise.

C. Signs and Equipment:

1. Conform to requirements of manual published by the Florida Department of Transportation.
2. Traffic Cones: Provide to delineate traffic lanes to guide and separate traffic movement.
3. Provide at obstructions, such as material piles and equipment.
4. Use to alert general public of construction hazards, which would include surface irregularities, unramped walkways, grade changes, and trenches or excavations in roadways and in other public access areas.

D. Trees and Plantings:

1. Protect from damage and preserve trees, shrubs, and other plants outside limits of the Work and within limits of the Work, which are designated on the Drawings to remain undisturbed.
    a. Where practical, tunnel beneath trees when on or near line of trench.
    b. Employ hand excavation as necessary to prevent tree injury.
    c. Do not stockpile materials or permit traffic within drip lines of trees.
    d. Provide and maintain temporary barricades around trees.
    e. Water vegetation as necessary to maintain health.
    f. Cover temporarily exposed roots with wet burlap, and keep burlap moist until soil is replaced around roots.

g. No trees, except those specifically shown on Drawings to be removed, shall be removed without written approval of Engineer.
h. Dispose of removed trees in a legal manner off the Site.

2. In event of damage to bark, trunks, limbs, or roots of plants that are not designated for removal, treat damage by corrective pruning, bark tracing, application of a heavy coating of tree paint, and other accepted horticultural and tree surgery practices.
3. Replace each plant that dies as a result of construction activities.

E. Existing Structures:

1. Where Contractor contemplates removal of small structures such as mailboxes, signposts, and culverts that interfere with Contractor's operations, obtain approval of property owner and Engineer.
2. Move mailboxes to temporary locations accessible to postal service.
3. Replace items removed in their original location and a condition equal to or better than original.

F. Finished Construction: Protect finished floors and concrete floors exposed as well as those covered with composition tile or other applied surfacing.

G. Waterways: Keep ditches, culverts, and natural drainages continuously free of construction materials and debris.

H. Dewatering: Construct, maintain, and operate cofferdams, channels, flume drains, sumps, pumps, or other temporary diversion and protection works. Furnish materials required, install, maintain, and operate necessary pumping and other equipment for the environmentally safe removal and disposal of water from the various parts of the Work. Maintain foundations and parts of the Work free from water.

I. Archaeological Finds:

1. General: Should finds of an archaeological or paleontological nature be made within the limits of the Site, immediately notify Owner and Engineer and proceed in accordance with the General Conditions. Continue the Work in other areas without interruption.
2. Archaeological Finds: Evidence of human occupation or use of an area within the contract limits prior to the Year 1900. Evidence may consist of skeletons, stone, or other utensils, or evidence of habitations or structures.
3. Paleontological Finds: Evidence of prehistoric plant or animal life, such as skeletons, bones, fossils, or casts and other indications such as pictographs.
4. Owner may order the Work stopped in other areas if, in Owner's opinion, the find is more extensive than may appear from uncovered material.

5. Protection of Finds:
    a. Cover, fence, or otherwise protect finds until notice to resume the Work is given.
    b. Cover finds with plastic film held in place by earth, rocks, or other weights placed outside the find. Should additional backfilling be necessary for safety or to prevent caving, place backfill material loosely over the plastic film.
    c. Sheet or shore as necessary to protect excavations underway. Place temporary fence to prevent unauthorized access.
    d. Dewater finds made below water table as necessary to protect construction Work underway. Divert groundwater or surface runoff away from find by ditching or other acceptable means.
6. Removal of Finds:
    a. All finds are property of Owner. Do not remove or disturb finds without Owner's written authorization.
    b. Should Owner elect to have a find removed, provide equipment, labor, and material to permit safe removal of find without damage. Provide transportation for delivery to individuals, institutions, or other places as Owner may find desirable, expedient, or required by law.

J. Endangered and Threatened Species:

1. Take precautions necessary and prudent to protect native endangered and threatened flora and fauna.
2. Notify Engineer of construction activities that might threaten endangered and threatened species or their habitats.
3. Engineer will mark areas known as habitats of endangered and threatened species prior to commencement of onsite activities.
4. Additional areas will be marked by Engineer as other habitats of endangered and threatened species become known during construction.

3.03 TEMPORARY CONTROLS

A. Air Pollution Control:

1. Minimize air pollution from construction operations.
2. Burning: Of waste materials, rubbish, or other debris will not be permitted on or adjacent to Site.
3. Conduct operations of dumping rock and of carrying rock away in trucks to cause a minimum of dust. Give unpaved streets, roads, detours, or haul roads used in construction area a dust-preventive treatment or periodically water to prevent dust. Strictly adhere to applicable environmental regulations for dust prevention.

4. Provide and maintain temporary dust-tight partitions, bulkheads, or other protective devices during construction to permit normal operation of existing facilities. Construct partitions of plywood, insulating board, plastic sheets, or similar material. Construct partitions in such a manner that dust and dirt from demolition and cutting will not enter other parts of existing building or facilities. Remove temporary partitions as soon as need no longer exists.

B. Water Pollution Control:

1. Divert sanitary sewage and nonstorm waste flow interfering with construction and requiring diversion to sanitary sewers. Do not cause or permit action to occur which would cause an overflow to existing waterway.
2. Prior to commencing excavation and construction, obtain Engineer's agreement with detailed plans showing procedures intended to handle and dispose of sewage, groundwater, and stormwater flow, including dewatering pump discharges.
3. Comply with procedures outlined in U.S. Environmental Protection Agency manuals entitled, "Guidelines for Erosion and Sedimentation Control Planning" and "Implementation, Processes, Procedures, and Methods to Control Pollution Resulting from All Construction Activity," and "Erosion and Sediment Control-Surface Mining in Eastern United States."
4. Do not dispose of volatile wastes such as mineral spirits, oil, chemicals, or paint thinner in storm or sanitary drains. Disposal of wastes into streams or waterways is prohibited. Provide acceptable containers for collection and disposal of waste materials, debris, and rubbish.

C. Erosion, Sediment, and Flood Control: Provide, maintain, and operate temporary facilities to control erosion and sediment releases, and to protect the Work and existing facilities from flooding during construction period. Erosion and Sediment Control shall be in compliance with the Florida Department of Environmental Regulation Erosion and Sediment Control Inspectors Manual, the latest edition.

3.04 STORAGE YARDS AND BUILDINGS

A. Coordinate requirements with Section 01 61 00, Common Product Requirements.

B. Temporary Storage Yards: Construct temporary storage yards for storage of products that are not subject to damage by weather conditions.

C. Temporary Storage Buildings:

1. Provide environmental control systems that meet recommendations of manufacturers of equipment and materials stored.
2. Arrange or partition to provide security of contents and ready access for inspection and inventory.
3. Store combustible materials (paints, solvents, fuels) in a well-ventilated and remote building meeting safety standards.

3.05 PARKING AREAS

A. Control vehicular parking to preclude interference with public traffic or parking, access by emergency vehicles, Owner's operations, or construction operations.

3.06 VEHICULAR TRAFFIC

A. Comply with Laws and Regulations regarding closing or restricting use of public streets or highways. No public or private road shall be closed, except by written permission of proper authority. Assure the least possible obstruction to traffic and normal commercial pursuits.

B. Conduct the Work to interfere as little as possible with public travel, whether vehicular or pedestrian.

C. Whenever it is necessary to cross, close, or obstruct roads, driveways, and walks, whether public or private, provide and maintain suitable and safe bridges, detours, or other temporary expedients for accommodation of public and private travel.

D. In making street crossings, do not block more than one-half the street at a time. Whenever possible, widen shoulder on opposite side to facilitate traffic flow. Provide temporary surfacing on shoulders as necessary.

E. Maintain top of backfilled trenches before they are paved, to allow normal vehicular traffic to pass over. Provide temporary access driveways where required. Cleanup operations shall follow immediately behind backfilling.

F. When flaggers and guards are required by regulation or when deemed necessary for safety, furnish them with approved orange wearing apparel and other regulation traffic control devices.

G. Notify fire department and police department before closing street or portion thereof. Notify said departments when streets are again passable for emergency vehicles. Do not block off emergency vehicle access to consecutive arterial crossings or dead-end streets, in excess of 300 linear feet, without written permission from fire department. Conduct operations with the least interference to fire equipment access, and at no time prevent such access. Furnish Contractor's night emergency telephone numbers to police department.

H. Temporary Bridges:

1. Construct temporary bridges at points where maintenance of traffic across pipeline construction is necessary.
2. Make bridges over public streets, roads, and highways acceptable to authority having jurisdiction thereover.
3. Bridges erected over private roads and driveways shall be adequate for service to which they will be subjected.
4. Provide substantial guardrails and suitably protected approaches.
5. Provide footbridges not less than 4 feet wide with handrails and uprights of dressed lumber.
6. Maintain bridges in place as long as conditions of the Work require their use for safety of public, except that when necessary for proper prosecution of the Work in immediate vicinity of bridge. Bridge may be relocated or temporarily removed for such period as Engineer may permit.

I. Detours:

1. Where authority having jurisdiction requires that traffic be maintained over construction work in a public street, road, or highway, and traffic cannot be maintained on original roadbed or pavement, construct and maintain detour around the Work.
2. Detour Striping:
   a. 5 days prior to starting Work on each sequence of the Project where detour striping is required, notify City Traffic Engineer's office to allow City sufficient time to paint approved detour striping.
   b. Clean pavement in area to be marked and have personnel available to assist painting crew by adjusting barricading for detour modification.
   c. When detour striping is no longer needed, notify City Traffic Engineer's office and sandblast off temporary detour lane markings which would not conform to permanent existing striping.

J. Coordinate traffic routing with that of others working in same or adjacent areas.

3.07 CLEANING DURING CONSTRUCTION

A. In accordance with General Conditions, as may be specified in other Specification sections, and as required herein.

B. Wet down exterior surfaces prior to sweeping to prevent blowing of dust and debris. At least weekly, sweep all floors (basins, tunnels, platforms, walkways, roof surfaces), and pick up all debris and dispose.

C. Provide approved containers for collection and disposal of waste materials, debris, and rubbish. At least at weekly intervals, dispose of such waste materials, debris, and rubbish offsite.

D. At least weekly, brush sweep entry drive, roadways, and all other streets and walkways affected by the Work and where adjacent to the Work.

END OF SECTION

SECTION 02 41 00
DEMOLITION

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this Section:

1. American National Standards Institute (ANSI): A10.6, Safety Requirements for Demolition Operations.
2. Occupational Safety and Health Administration (OSHA), U.S. Code of Federal Regulations (CFR) Title 29 Part 1926—Occupational Safety and Health Regulations for Construction.
3. Environmental Protection Agency (EPA), U.S. Code of Federal Regulations (CFR), Title 40:
   a. Part 61—National Emission Standards for Hazardous Air Pollutants.
   b. Part 82—Protection of Stratospheric Ozone.
   c. Part 273—Standards for Universal Waste Management.

1.02 DEFINITIONS

A. Demolition: Dismantling, razing, destroying, or wrecking of any fixed building or structure or any part thereof.

B. Salvage/Salvageable: Remove and deliver, to locations specified by Owner, the equipment, building materials, or other items so identified to be saved from destruction, damage, or waste; such property to remain that of Owner. Unless otherwise specified, title to items identified for demolition shall revert to Contractor.

1.03 REGULATORY AND SAFETY REQUIREMENTS

A. When applicable, demolition Work shall be accomplished in strict accordance with 29 CFR 1926-Subpart T.

B. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the General Conditions, Contractor’s safety requirements shall conform to ANSI A10.6.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 EXISTING FACILITIES TO BE DEMOLISHED OR RENOVATED

A. Structures: Sidewalks, curbs, gutters and street light bases shall be removed as required.

B. Utilities and Related Equipment:

1. Notify Owner or appropriate utilities to turn off affected services at least 48 hours before starting demolition activities.
2. Remove existing utilities as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by Engineer.
3. When utility lines are encountered that are not indicated on the Drawings, notify Engineer prior to further work in that area.
4. Remove meters and related equipment and deliver to a location as determined by the Owner or relocate as indicated on Drawings.
5. Plug sewer laterals with as shown on drawings to prevent groundwater infiltration.

C. Paving and Slabs:

1. Sawcut concrete and asphaltic concrete paving and slabs as indicated to full depth of paving.
2. Provide neat sawcuts at limits of pavement removal as indicated.

3.02 PROTECTION

A. Dust and Debris Control: Sweep pavements as necessary to control the spread of dust and debris that may result in foreign object damage potential to vehicular traffic.

B. Traffic Control Plan: Prepare and obtain Florida Department of Transportation approval for maintenance of traffic plan in accordance Section 01 50 00, Temporary Facilities and Controls.

C. Existing Work:

1. Survey the site and examine the Drawings and Specifications to determine the extent of the Work before beginning any demolition or renovation.
2. Take necessary precautions to avoid damage to existing items to remain in place, or to remain the property of Owner; any Contractor-damaged items shall be repaired or replaced as directed by Engineer.

3. Do not overload pavements to remain.

D. Protection of Personnel:

1. During demolition, continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the demolition site.
2. Provide temporary barricades and other forms of protection to protect Owner's personnel and the general public from injury due to demolition Work.

3.03 BURNING

A. The use of burning at the Site for the disposal of refuse and debris will not be permitted.

3.04 BACKFILL

A. Do not use demolition debris as backfill material.

3.05 UNSALVAGEABLE MATERIAL

A. Concrete, masonry, and other noncombustible material, except concrete permitted to remain in place, shall be disposed of in an offsite approved facility.

B. Combustible material shall be disposed of off the Site.

3.06 CLEANUP

A. Debris and rubbish shall be removed and transported in a manner that prevents spillage on streets or adjacent areas. Local regulations regarding hauling and disposal shall apply.

END OF SECTION

SECTION 31 23 16
EXCAVATION

PART 1 GENERAL

1.01 QUALITY ASSURANCE

A. Provide adequate survey control to avoid unauthorized overexcavation.

1.02 SEQUENCING AND SCHEDULING

A. Demolition: Complete applicable Work specified in Section 02 41 00, Demolition, prior to excavating.

B. Dewatering: Conform to applicable requirements of Section 31 23 19.01, Dewatering, prior to initiating excavation.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. Excavate to lines, grades, and dimensions shown and as necessary to accomplish Work. Excavate to within tolerance of plus or minus 0.1 foot, except where dimensions or grades are shown or specified as maximum or minimum. Allow for forms, working space, granular base, topsoil, and similar items, wherever applicable. Trim to neat lines where concrete is to be deposited against earth.

B. Backfill and prepare trench in accordance with Detail 3123-110 on the Drawings.

C. Do not overexcavate without written authorization of Engineer.

D. It shall be the Contractor's responsibility to make exploratory excavations as required to verify location, size, and elevation of existing utilities that may interfere with installation of the new pipe lines. Contractor shall perform this Work well in advance of trenching and pipe laying, but a minimum of 300 feet ahead. The Contractor shall call "48 hours before digging" the underground utilities location center at 1-800-432-4770.

3.02 UNCLASSIFIED EXCAVATION

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

3.03 SHORING, SHEETING, AND BRACING OF TRENCHES

A. Sheet and brace the trench when necessary to prevent caving during excavation in unstable material, or to protect adjacent structures, property, workers, and the public. Increase trench widths accordingly by the thickness of the sheeting. Maintain sheeting in-place until the pipe has been placed and backfilled at the pipe zone. Shoring and sheeting shall be removed, as the backfilling is done, in a manner that will not damage the pipe or permit voids in the backfill. All sheeting, shoring, and bracing of trenches shall conform to the safety requirements of the federal, state, or local public agency having jurisdiction. The most stringent of these requirements shall apply.

3.04 TRENCH WIDTH

A. Width of Trenches:

1. Single Pipes:
   a. Less than or equal to 15-inch Outside Diameter or Width: 16 inches.
   b. Greater than 15-inch Outside Diameter or Width: 24 inches greater than outside diameter or width of pipe.

B. Confine trench widths to dedicated rights-of-way or construction easements, unless special written agreements have been made with the affected property owner.

3.05 DISPOSAL OF SPOIL

A. Dispose of excavated materials, which are unsuitable or exceed quantity needed for fill or backfill, offsite, in a county-approved disposal facility.

END OF SECTION

SECTION 31 23 19.01
DEWATERING

PART 1 GENERAL

1.01 SUBMITTALS

A. Quality Control Submittals: Copies of any authorization and permits required to perform Work.

B. Dewatering plan.

PART 2 PRODUCTS (NOT USED)

PART 3 EXECUTION

3.01 GENERAL

A. The Contractor shall be responsible for design, installation, and operation of a dewatering system to keep excavations and trenches free of water.

B. Remove and control water during periods when necessary to properly accomplish Work.

C. Prior to beginning work, the Contractor shall develop a dewatering plan and submit it to the Engineer and the Owner. The Contractor's dewatering plan shall take into account limitations in the existing operating conditions of the Owner's sewage collection and pumping facilities. Final acceptance of the Contractor's dewatering plan will be based on demonstrated performance of the system to satisfy the requirements of dewatering as specified herein.

D. The Contractor shall not discharge water into the storm sewer system. The Contractor shall discharge water into the sanitary sewer system and prescreening is to be provided to prevent excess sand or trench materials from entering the system. The Contractor shall provide an acceptable plan to receive approval from the City of Key West prior to discharging into the sanitary sewer system.

E. If the dewatering requirements are not satisfied due to inadequacy or failure of the dewatering system, then loosening of the foundation material, instability of the slopes, or damage to the foundations or structures may occur, or other additional work or handling of materials may be required of the Contractor. The supply of all labor, materials, and equipment, and the performance of all work necessary to carry out additional work resulting from such inadequacy, premature shutdown, or failure of the dewatering system shall be undertaken by the Contractor to the satisfaction of the Engineer, and at no additional expense to the Owner.

3.02 DEWATERING SYSTEMS

A. Contractor shall design, furnish, install, operate, and maintain dewatering systems of sufficient size and capacity to permit excavation and subsequent construction in dry and to lower and maintain groundwater level a minimum of 2 feet below the lowest point of excavation. Continuously maintain excavations free of water, regardless of source, and until backfilled to final grade.

B. For excavations and trenches, dewatering systems shall include equipment and appurtenances installed outside structural limits and sufficiently below lowest point of excavation when possible, or to maintain specified groundwater elevation.

C. Design and Operate Dewatering Systems:

1. To prevent loss of ground as water is removed.
2. To avoid inducing settlement or damage to existing facilities, completed Work, or adjacent property.
3. To relieve artesian pressures and resultant uplift of excavation bottom.

3.03 DISPOSAL OF WATER

A. Obtain discharge permit for water disposal from authorities having jurisdiction.

B. Treat water collected by dewatering operations, as required by regulatory agencies, prior to discharge.

C. Discharge water as required by discharge permit and in manner that will not cause erosion or flooding, or otherwise damage existing facilities, completed Work, or adjacent property. Drainage of trench water through the pipeline under construction is prohibited.

D. Remove solids from treatment facilities and perform other maintenance of treatment facilities as necessary to maintain their efficiency.

3.04 WELL POINT REMOVAL

A. If well points are used, after removing the well point dewatering system, well point holes shall be filled with sand which shall be washed into the hole. Well point holes located in asphalt pavement surfaces or concrete pavements shall be filled with sand to the subgrade and the remaining portion of holes shall be filled with nonshrink grout.

3.05 CLEANING OF WASTEWATER PUMP STATION WET WELLS

A. After all work has been completed, and before final acceptance, the Contractor shall clean the wet wells of the wastewater pump stations that receive flow from the sanitary sewers into which the Contractor discharged water from his dewatering operations. The Contractor is advised that the cleaning can only be performed during periods of low wastewater flow into the stations. The Contractor shall coordinate the cleaning with the Owner at least two weeks in advance of the cleaning operations.

B. The sanitary sewers discharge into Pump Station DA.

C. Cleaning of the wet wells shall be considered incidental to the construction and included in the applicable unit prices stated in the Proposal.

3.06 ALTERNATE METHODS OF CONSTRUCTION

A. A combination of extremely porous substrata and relatively high ground water table exist at the sites of the proposed work. It is recognized that it may be very difficult and costly to dewater excavations. In view of this, the foregoing requirements for dewatering may be waived if the Contractor, at his option, chooses to employ an alternate method of construction. Prior to his selection of an alternate method of construction, the Contractor shall demonstrate that all reasonable means to dewater the excavation have been employed without success and shall obtain the concurrence of the Owner that the method selected is applicable to the conditions existing in the particular area. Concurrence by the Owner of the method selected, shall by no means relieve the Contractor of his obligation to install the system in accordance with the Contract Documents and to provide a completed functioning system.

B. Any alternate method of construction proposed by the Contractor shall include provision such that the trenches shall be undercut a minimum of 8 inches. The resulting excavation shall then be backfilled with approved pipe bedding material.

C. No additional payment will be made to the Contractor for excavation, backfill, sheeting, or any costs incurred for work or materials, or any other costs incurred, as a result of alternate methods of construction selected by the Contractor, but the prices established in the Proposal shall be full payment for the various items of work to be done.

D. The alternate method of construction, if selected by the Contractor, shall in no way be construed as relieving the Contractor of his basic responsibility for satisfactory completion of the work in accordance with these Contract Documents.

END OF SECTION

SECTION 31 23 23.15
TRENCH BACKFILL

PART 1 GENERAL

1.01 DEFINITIONS

A. Bedding Material: Granular material upon which pipes, conduits, cables, or duct banks are placed.

B. Imported Material: Material obtained by Contractor from source(s) offsite.

C. Lift: Loose (uncompacted) layer of material.

D. Pipe Zone: Backfill zone that includes full trench width and extends from prepared trench bottom to an upper limit above top outside surface of pipe, conduit, cable or duct bank.

E. Prepared Trench Bottom: Graded trench bottom after excavation and installation of stabilization material, if required, but before installation of bedding material.

F. Relative Compaction: The ratio, in percent, of the as-compacted field dry density to the laboratory maximum dry density as determined by ASTM D1557. Corrections for oversize material may be applied to either as-compacted field dry density or maximum dry density, as determined by Engineer.

G. Optimum Moisture Content: shall be determined by the ASTM standard specified to determine the maximum dry density for relative compaction. Field moisture content shall be determined on the basis of the fraction passing the 3/4-inch sieve.

H. Selected Backfill Material: Material available onsite that Engineer determines to be suitable for a specific use.

I. Well-Graded: A mixture of particle sizes that has no specific concentration or lack thereof of one or more sizes producing a material type that, when compacted, produces a strong and relatively incompressible soil mass free from detrimental voids. Well-graded does not define any numerical value that must be placed on the coefficient of uniformity, coefficient of curvature, or other specific grain size distribution parameters.

1.02 SUBMITTALS

A. Action Submittals:

1. Shop Drawings: Manufacturer's descriptive literature for marking tapes.
2. Flowable fill mix design.
3. Geotextile Fabric
4. Density Proctor Test

B. Quality Control Submittals: Certified Gradation Analysis: Submit not less than 30 days prior to delivery for imported materials or anticipated use for excavated materials, except for trench stabilization material that will be submitted prior to material delivery to Site.

PART 2 PRODUCTS

2.01 GEOTEXTILE

A. Geotextile shall be a pervious sheet of polyester, polyethylene, nylon, or polypropylene filaments, woven or nonwoven, and formed into a uniform pattern. The geotextile shall have the following minimum properties (except when a range is given) when measured in accordance with the referenced standard:

PHYSICAL PROPERTY	TEST METHOD	REQUIREMENTS
Grab Tensile Strength (lbs) minimum	ASTM D4632	200
Elongation (%)	ASTM D4632	60
Apparent Opening Size U.S. Sieve No.	ASTM D4632	30-70
Permeability (cm/sec)	ASTM D4632	0.35
Trapezoid Tear Strength (lbs) minimum	ASTM D4632	75
Ultraviolet Degradation (minimum)	ASTM D4632	80 percent strength retention after 500 hours

B. The geotextile shall be finished so that the filaments will retain their relative position with respect to each other. The edges of woven fabric shall be finished to prevent the outer material from pulling away from the fabric.

C. The Contractor shall provide manufacturer's certificate of compliance attesting that the geotextile meets the requirements of these Specifications. Provide mill certificates stating the length and width of fabric contained on each roll.

2.02 MARKING TAPE

A. Detectable:

1. Solid aluminum foil, visible on unprinted side, encased in protective high visibility, inert polyethylene plastic jacket.
2. Foil Thickness: Minimum 0.35 mils.
3. Laminate Thickness: Minimum 5 mils.
4. Width: 3 inches.
5. Identifying Lettering: Minimum 1-inch high, permanent black lettering imprinted continuously over entire length.
6. Joining Clips: Tin or nickel-coated furnished by tape manufacturer.
7. Manufacturers and Products:
   a. Reef Industries; Terra Tape, Sentry Line Detectable.
   b. Mutual Industries; Detectable Tape.
   c. Presco; Detectable Tape.

B. Color: In accordance with APWA Uniform Color Code for Temporary Marking of Underground Facilities.

Color*	**Facility**
Red	Electric power lines, cables, conduit, and lightning cables
Orange	Communicating alarm or signal lines, cables, or conduit
Yellow	Gas, oil, steam, petroleum, or gaseous materials
Green	Sewers and drain lines
Blue	Potable water
Purple	Reclaimed water, irrigation, stormwater and slurry lines
*As specified in NEMA Z535.1, Safety Color Code.	

2.03 TRENCH STABILIZATION MATERIAL

A. Granular Backfill: Shall be 2-1/2 inches minus crushed rock, reasonably well-graded from coarse to fine, and free from excessive dirt or other organic material with no more than 2 percent by weight passing the No. 200 sieve. The material shall be nonplastic.

2.04 BEDDING MATERIAL AND PIPE ZONE MATERIAL

A. Crushed gravel or crushed rock, free from dirt, conforming to size No. 57 (per FDOT Standard Specifications) gradation or similar accepted material and shall be imported, if necessary, at the Contractor's own expense. Lime rock screenings or material resulting from trench excavation, except for lime rock which has been crushed and graded to size as specified, will not be accepted for pipe bedding materials.

2.05 TRENCH BACKFILL

A. Same as specified in Paragraph 2.04 above for Bedding Material and Pipe Zone Material.

2.06 CONCRETE ENCASEMENT

A. Concrete encasement will be used where, in the opinion of the Engineer, there is insufficient cover over the pipe for proper cover and protection.

B. Mix: ASTM C94, Alternate 3.

1. Use a minimum of five sacks of cement per cubic yard of concrete.
2. Design for Minimum Compressive Strength at 28 Days: 2,500 psi.

2.07 SOURCE QUALITY CONTROL

A. Contractor's testing laboratory to perform gradation analysis in accordance with ASTM C136:

B. Certify Laboratory Performance of Mix Designs: Concrete.

PART 3 EXECUTION

3.01 TRENCH PREPARATION

A. Water Control:

1. As specified in Section 31 23 19.01, Dewatering.
2. Remove water in a manner that minimizes soil erosion from trench sides and bottom.
3. Provide continuous water control until trench backfill is complete.

B. Remove foreign material and backfill contaminated with foreign material that falls into trench.

3.02 TRENCH BOTTOM

A. Firm Subgrade: Grade with hand tools, remove loose and disturbed material, and trim off high areas and ridges left by excavating bucket teeth. Allow space for bedding material if shown or specified.

B. Soft Subgrade: If subgrade is encountered that may require removal to prevent pipe settlement, notify Engineer. Engineer will determine depth of overexcavation, if any required.

3.03 TRENCH STABILIZATION MATERIAL INSTALLATION

A. Rebuild trench bottom with trench stabilization material.

B. Place material over full width of trench in 6-inch lifts to required grade, providing allowance for bedding thickness.

C. Compact each lift so as to provide a firm, unyielding support for the bedding material prior to placing succeeding lifts.

3.04 BEDDING

A. Furnish imported bedding material where, in the opinion of Engineer, excavated material is unsuitable for bedding or insufficient in quantity.

B. Place over the full width of the prepared trench bottom in two equal lifts when the required depth exceeds 8 inches.

C. Hand grade and compact each lift to provide a firm, unyielding surface.

D. Minimum Thickness: As follows

1. Pipe 15 Inches and Smaller: 4 inches.
2. Pipe 18 Inches to 36 Inches: 6 inches.
3. Pipe 42 Inches and Larger: 8 inches.
4. Conduit: 4 inches.
5. Direct-Buried Cable: 4 inches.
6. Duct Banks: 4 inches.

E. Check grade and correct irregularities in bedding material. Loosen top 1 inch to 2 inches of compacted bedding material with a rake or by other means to provide a cushion before laying each section of pipe, conduit, direct-buried cable, or duct bank.

F. Install to form continuous and uniform support except at bell holes, if applicable, or minor disturbances resulting from removal of lifting tackle.

G. Bell or Coupling Holes: Excavate in bedding at each joint to permit proper assembly and inspection of joint and to provide uniform bearing along barrel of pipe or conduit.

3.05 BACKFILL PIPE ZONE

A. Upper limit of pipe zone shall not be less than following:

1. Pipe: 15 inches below finished grade
2. Conduit: 3 inches, unless shown otherwise.
3. Direct-Buried Cable: 3 inches, unless shown otherwise.
4. Duct Bank: 3 inches, unless shown otherwise.

B. Restrain pipe, conduit, cables, and duct banks as necessary to prevent their movement during backfill operations.

C. Place material simultaneously in lifts on both sides of pipe and, if applicable, between pipes, conduit, cables, and duct banks installed in same trench.

1. Pipe 10-Inch and Smaller Diameter: First lift less than or equal to 1/2 pipe diameter.
2. Pipe Over 10-Inch Diameter: Maximum 6-inch lifts.

D. Thoroughly tamp each lift, including area under haunches, with handheld tamping bars supplemented by “walking in” and slicing material under haunches with a shovel to ensure that voids are completely filled before placing each succeeding lift.

E. Do not use power-driven impact compactors to compact pipe zone material. Care shall be taken to prevent damage to the pipe. Deflection of pipe shall be kept to a minimum and in no case shall it exceed 5 percent of the pipe inside diameter.

3.06 MARKING TAPE INSTALLATION

A. Continuously install marking tape along centerline of all buried piping, on top of last lift of pipe zone material. Coordinate with piping installation drawings.

1. Detectable Marking Tape: Install with nonmetallic piping and waterlines.

3.07 BACKFILL ABOVE PIPE ZONE

A. General:

1. Process excavated material to meet specified gradation requirements.
2. Adjust moisture content as necessary to obtain specified compaction.
3. Do not allow backfill to free fall into the trench or allow heavy, sharp pieces of material to be placed as backfill until after at least 2 feet of backfill has been provided over the top of pipe.
4. Do not use power driven impact type compactors for compaction until at least 4 feet of backfill is placed over top of pipe.
5. Backfill to grade with proper allowances for topsoil, crushed rock surfacing, and pavement thicknesses, wherever applicable.
6. Backfill around structures with same class backfill as specified for adjacent trench unless otherwise shown or specified.

B. Trench Backfill: Place in lifts not to exceed 6 inches. Compact each lift to a minimum of 95 percent relative compaction prior to placing succeeding lifts.

C. Concrete Encasement:

1. Place above bedding.
2. Minimum Concrete Thickness: 12 inches on top and sides of pipe.
3. Do not allow dirt or foreign material to become mixed with concrete during placement.
4. Allow sufficient time for concrete to reach initial set before additional backfill material is placed in trench.
5. Prevent flotation of pipe.
6. Begin and end concrete backfill within 4 inches of a pipe joint on each end.
7. Do not encase pipe joints except within the limits of the concrete backfill.

3.08 UTILITY LINE CROSSINGS

A. Crushed stone backfill in accordance with Paragraph Bedding Material and Pipe Zone Material shall be used under all culverts, water, gas, gravity sewer lines, force mains, buried telephone conduit, and any other miscellaneous buried pipelines that cross the excavated trench. Crushed stone backfill shall be carried a minimum of 2 feet beyond the edge of the buried utility. Crushed stone backfill beneath these facilities shall be considered incidental to the work and no additional payment will be made to the Contractor.

3.09 PLACEMENT OF FILTRATION GEOTEXTILE

A. For placement of backfill above filtration geotextile, place the first lift of fill in a 12-inch lift to protect the geotextile material. Place additional granular fill in 6-inch lifts and compact each lift to 95 percent relative compaction.

B. The Contractor shall take precautions so the operation will not damage the geotextile material.

3.10 REPLACEMENT OF TOPSOIL

A. Replace topsoil in top 4 inches of backfilled trench outside paved areas.

B. Maintain the finished grade of topsoil even with adjacent area and grade as necessary to restore drainage.

3.11 MAINTENANCE OF TRENCH BACKFILL

A. After each section of trench is backfilled, maintain the surface of the backfilled trench even with the adjacent ground surface until final surface restoration is completed.

B. Topsoil: Add topsoil where applicable and as necessary to maintain the surface of the backfilled trench level with the adjacent ground surface.

C. Concrete Pavement: Replace settled slabs as specified in Section 32 16 00, Sidewalks and Curbs and Gutters.

D. Asphaltic Pavement: Replace settled areas or fill with asphalt as specified in Section 32 12 16, Asphalt Paving.

E. Other Areas: Add excavated material where applicable and keep the surface of the backfilled trench level with the adjacent ground surface.

3.12 SETTLEMENT OF BACKFILL

A. Settlement of trench backfill, or of fill, or facilities constructed over trench backfill will be considered a result of defective compaction of trench backfill and shall be corrected at no cost to the Owner. Structures damaged by settlement shall be restored to their original condition by the Contractor at no cost to the Owner.

END OF SECTION

SECTION 32 11 23
AGGREGATE BASE COURSES

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Association of State Highway and Transportation Officials (AASHTO):
   a. T180, Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18-in) Drop.
   b. Florida Department of Transportation (FDOT) Standard Specifications for Road and Bridge Construction (Standard Specifications).

1.02 DEFINITIONS

A. Completed Course: Compacted, unyielding, free from irregularities, with smooth, tight, even surface, true to grade, line, and cross-section.

B. Completed Lift: Compacted with uniform cross-section thickness.

C. Standard Specifications: When referenced in this section, shall mean the Florida Department of Transportation Standard Specifications for Road and Bridge Construction, Current Edition.

PART 2 PRODUCTS

2.01 FLOWABLE FILL

A. Provide flowable fill with the following specifications

1. 28-day compressive field strength of 500 psi.
2. Aggregate gradations must be submitted for review and approval. Maximum size No. 4 stone.
3. Slump Range: Flowable.
4. Cement Content: 250 pounds per cubic yard.
5. Water Cement Ratio: 0.65 range 0.6 to 0.7.

PART 3 EXECUTION

3.01 CONSTRUCTION OF COURSES

A. The Contractor shall provide a minimum 12 inches of 500 psi flowable fill.

3.02 SURFACE TOLERANCES

A. Finished Surface of Base Course: Within plus or minus 0.05 foot of grade shown at any individual point.

3.03 CLEANING

A. Remove excess material from the Work area.

END OF SECTION

SECTION 32 12 16
ASPHALT PAVING

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Association of State Highway and Transportation Officials (AASHTO):
   a. M17, Standard Specification for Mineral Filler for Bituminous Paving Mixtures.
   b. M81, Standard Specification for Cut-Back Asphalt (Rapid Curing Type).
   c. M82, Standard Specification for Cut-Back Asphalt (Medium Curing Type).
   d. M140, Standard Specification for Emulsified Asphalt.
   e. M208, Standard Specification for Cationic Emulsified Asphalt.
   f. T166, Standard Method of Test for Bulk Specific Gravity of Compacted Asphalt Mixtures Using Saturated Surface-Dry Specimens.
   g. T176 Standard Method of Test for Plastic Fines in Graded Aggregates and Soils by Use of the Sand Equivalent Test.
   h. T230, Standard Method of Test for Determining Degree of Pavement Compaction of Bituminous Aggregate Mixtures.
   i. T245, Standard Method of Test for Resistance to Plastic Flow of Bituminous Mixtures Using Marshall Apparatus.
   j. T246, Standard Method of Test for Resistance to Deformation and Cohesion of Bituminous Mixtures by Means of Hveem Apparatus.
   k. T247, Standard Method of Test for Preparation of Test Specimens of Bituminous Mixtures by Means of California Kneading Compactor.
   l. T283, Standard Method of Test for Resistance of Compacted Bituminous Mixture to Moisture Induced Damage.
   m. T304, Standard Method of Test for Uncompacted Void Content of Fine Aggregate (Method A).
2. Asphalt Institute (AI):
   a. Manual Series No. 2 (MS-2), Mix Design Methods for Asphalt Concrete.
   b. Superpave Series No. 2 (SP-2), Superpave Mix Design.

3. ASTM International (ASTM):
    a. D2041, Test Method for Theoretical Maximum Specific Gravity and Density of Bituminous Paving Mixtures.
    b. D4318, Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
    c. D4791, Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
    d. D5821, Test Method for Determining the Percentage of Fractured Particles in Coarse Aggregate.
    e. E329, Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction.

1.02 DEFINITIONS

A. Combined Aggregate: All mineral constituents of asphalt concrete mix, including mineral filler and separately sized aggregates.

B. RAP: Reclaimed asphalt pavement.

C. Standard Specifications: Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.

1.03 DESIGN REQUIREMENTS

A. Prepare asphalt concrete mix design, meeting the design criteria, tolerances, and other requirements of Section 334 of the Standard Specifications.

1.04 SUBMITTALS

A. Informational Submittals:

1. Asphalt Concrete Mix Formula:
    a. Submit minimum of 15 days prior to start of production.
    b. Submittal to include the following information: Properties as stated in Section 334 of the Standard Specifications.
2. Manufacturer’s Certificate of Compliance, in accordance with Section 01 43 33, Manufacturers’ Field Services, for the following materials:
    a. Aggregate: Gradation, source test results as defined in Section 334 of the Standard Specifications.
    b. Asphalt for Binder: Type, grade, and viscosity-temperature curve.
    c. Prime Coat: Type and grade of asphalt.
    d. Tack Coat: Type and grade of asphalt.
    e. Additives.
    f. Mix: Conforms to job-mix formula.

3. Statement of qualification for independent testing laboratory.
4. Test Results:
    a. Mix design.
    b. Asphalt concrete core.
    c. Gradation and asphalt content of uncompacted mix.

1.05 QUALITY ASSURANCE

A. Qualifications:

1. Independent Testing Laboratory: In accordance with ASTM E329.
2. Asphalt concrete mix formula shall be prepared by approved certified independent laboratory under the supervision of a certified asphalt technician.

1.06 ENVIRONMENTAL REQUIREMENTS

A. Moisture: Do not apply asphalt materials or place asphalt mixes when application surface is wet.

PART 2 PRODUCTS

2.01 MATERIALS

A. Prime Coat: Cut-back asphalt, conform to Section 300 of the Standard Specifications.

B. Tack Coat: Emulsified asphalt, conform to Section 300 of the Standard Specifications.

2.02 ASPHALT CONCRETE MIX

A. General:

1. Mix formula shall not be modified except with written approval of Engineer.
2. Source Changes:
    a. Should material source(s) change, establish new asphalt concrete mix formula before new material(s) is used.
    b. Make adjustments in gradation or asphalt content as necessary to meet design criteria.

B. Asphalt Concrete: as specified on the Drawings in accordance with Section 334 of the Standard Specifications.

C. Composition: Hot-plant mix of aggregate, mineral filler, if required, and paving grade asphalt cement. The several aggregate fractions shall be sized, uniformly graded, and combined in such proportions that resulting mixture meets grading requirements of mix formula.

D. Aggregate:

1. General: As specified in Section 334 of the Standard Specifications.

E. Mineral Filler: In accordance with Section 334 of the Standard Specifications.

F. Asphalt Cement: Paving Grade as shown on the Drawings in accordance with Section 334 of the Standard Specifications.

PART 3 EXECUTION

3.01 GENERAL

A. Traffic Control:

1. In accordance with Section 01 50 00, Temporary Facilities and Controls.
2. Minimize inconvenience to traffic, but keep vehicles off freshly treated or paved surfaces to avoid pickup and tracking of asphalt.

B. Driveways: Repave asphalt driveways from which pavement was removed. Leave driveways in as good or better condition than before start of construction.

3.02 LINE AND GRADE

A. Provide and maintain intermediate control of line and grade, independent of underlying base, to meet finish surface grades and minimum thickness.

B. Shoulders: Construct to line, grade, and cross-section shown.

3.03 APPLICATION EQUIPMENT

A. In accordance with Section 320 of the Standard Specifications.

3.04 PREPARATION

A. Existing Roadway:

1. Modify profile by grinding, milling, or overlay methods as approved, to provide meet lines and surfaces and to produce smooth riding connection to existing facility.
2. Paint edges of meet line with tack coat prior to placing new pavement.

B. Thoroughly coat edges of contact surfaces (curbs, manhole frames) with emulsified asphalt or asphalt cement prior to laying new pavement. Prevent staining of adjacent surfaces.

3.05 PAVEMENT APPLICATION

A. General: Place asphalt concrete mixture on approved, prepared base in conformance with Section 32 11 23, Aggregate Base Course.

B. Prime Coat:

1. Heat cut-back asphalt as specified in Section 330 of the Standard Specifications, prior to application.
2. Apply uniformly to clean, dry surfaces avoiding overlapping of applications.
3. Do not apply when moisture content of upper 75 millimeters (3 inches) of base exceeds optimum moisture content of base, or if free moisture is present.
4. Remove or redistribute excess material.
5. Allow a minimum of 5 full days for curing of primed surface before placing asphalt concrete.

C. Tack Coat:

1. Prepare material, as specified in Section 330 of the Standard Specifications, prior to application.
2. Apply uniformly to clean, dry surfaces avoiding overlapping of applications.
3. Do not apply more tack coat than necessary for the day's paving operation.
4. Touch up missed or lightly coated surfaces and remove excess material.

D. Pavement Mix:

1. Prior to Paving:
   a. Sweep primed surface free of dirt, dust, or other foreign matter.
   b. Patch holes in primed surface with asphalt concrete pavement mix.
   c. Blot excess prime material with sand.
2. Place asphalt concrete pavement mix as specified on the Drawings.
3. Total Compacted Thickness: As shown.
4. Apply such that meet lines are straight and edges are vertical.
5. Collect and dispose of segregated aggregate from raking process. Do not scatter material over finished surface.
6. Joints:
   a. Offset edge of each layer a minimum of 150 millimeters (6 inches) so joints are not directly over those in underlying layer.

b. Offset longitudinal joints in roadway pavements so longitudinal joints in wearing layer coincide with pavement centerlines and lane divider lines.
c. Form transverse joints by cutting back on previous day's run to expose full vertical depth of layer.

7. Succeeding Lifts: Apply tack coat to pavement surface between each lift.
8. After placement of pavement, seal meet line by painting a minimum of 150 millimeters (6 inches) on each side of joint with cut-back or emulsified asphalt. Cover immediately with sand.

E. Compaction: In accordance with Section 330 of the Standard Specifications.

F. Tolerances:

1. General: In accordance with Section 330 of the Standard Specifications.

3.06 FIELD QUALITY CONTROL

A. General: Provide services of approved certified independent testing laboratory to conduct tests.

B. Field Density Tests:

1. Perform tests from cores or sawed samples in accordance with AASHTO T230 and AASHTO T166.
2. Measure with properly operating and calibrated nuclear density gauge in accordance with ASTM D2950.
3. Maximum Density: In accordance with ASTM D2041, using sample of mix taken prior to compaction from same location as density test sample.

C. Testing Frequency:

1. Quality Control Tests:
   a. Asphalt Content, Aggregate Gradation: Once per every 400 mg (500 tons) of mix or once every 4 hours, whichever is greater.
   b. Mix Design Properties, Measured Maximum (Rice's) Specific Gravity: Once every 900 mg (1,000 tons) or once every 8 hours, whichever is greater.
2. Density Tests: Once every 450 mg (500 tons) of mix or once every 4 hours, whichever is greater.

END OF SECTION

SECTION 32 17 23
PAVEMENT MARKINGS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Association of State Highway and Transportation Officials (AASHTO):
   a. M237, Standard Specification for Epoxy Resin Adhesives for Bonding Traffic Markers to Hardened Portland Cement and Asphalt Concrete.
   b. M248, Standard Specification for Ready-Mixed White and Yellow Traffic Paints.
   c. M249, Standard Specification for White and Yellow Reflective Thermoplastic Striping Material (Solid Form).
2. ASTM International (ASTM): D4280, Standard Specification Extended Life Type, Nonplowable, Prismatic, Raised, Retroreflective Pavement Markers.
3. Federal Specifications (FS):
   a. A-A-2886A, Paint, Traffic, Solvent Based.
   b. TT-B-1325C, Beads (Glass Spheres); Retroreflective.

1.02 DEFINITIONS

A. Standard Specifications: Florida Department of Transportation Standard Specifications for Road and Bridge Construction, latest edition.

1.03 SUBMITTALS

A. Action Submittals:

1. Shop Drawings:
   a. Product Data:
      1) Paint.
      2) Thermoplastic material.
      3) Reflective markers.
      4) Epoxies, resins, and primers to be used.

PART 2 PRODUCTS

2.01 GENERAL

A. All products shall be in accordance with Section 710 of the Standard Specifications.

2.02 PAINT

A. Color: White or yellow.

B. Traffic paint in accordance with Section 710 of the Standard Specifications.

C. Homogeneous, easily stirred to smooth consistency, with no hard settlement or other objectionable characteristics during storage period of 6 months.

2.03 THERMOPLASTIC MARKING

A. Color: White or yellow.

PART 3 EXECUTION

3.01 GENERAL

A. Surface Preparation, Application, and Protection: In accordance with Section 710 of the Standard Specifications.

B. Contractor shall replace all markings disturbed during construction with equivalent size and material and as specified herein.

C. All areas having traffic stripes and reflective markers prior to paving shall be repainted and replaced. Temporary traffic painting shall be applied immediately after asphalt pavement has been placed. Permanent traffic painting may be applied only after the proper curing time for the asphalt.

END OF SECTION

SECTION 33 05 01
CONVEYANCE PIPING—GENERAL

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Concrete Institute (ACI): 301, Standard Specification for Structural Concrete.
2. American Water Works Association (AWWA):
   a. C110/A21.10, Ductile-Iron and Gray-Iron Fittings, 3 in. Through 48 in. (75 mm Through 1200 mm), for Water and Other Liquids.
   b. C115/A21.15, Flanged Ductile-Iron Pipe with Ductile-Iron or Gray-Iron Threaded Flanges.
   c. C219, Bolted, Sleeve-Type Couplings for Plain-End Pipe.
3. ASTM International (ASTM):
   a. A497, Standard Specification for Steel Welded Wire Fabric, Deformed, for Concrete Reinforcement.
   b. A615/A615M, Standard Specification for Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
   c. C94/C94M, Standard Specification for Ready-Mixed Concrete.
   d. C150, Standard Specification for Portland Cement.
   e. F593, Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

1.02 SUBMITTALS

A. Action Submittals:

1. Detailed pipe fabrication drawings showing pipe details, special fittings and bends, dimensions, coatings, and other pertinent information.
2. Layout drawing showing location of each pipe section and each special length.
3. Pipe pressure class.
4. Wall thickness, reinforcing, and strength calculations.
5. Product Data: Manufacturer’s data for couplings, saddles, gaskets, and other pipe accessories. Indicate maximum rated working pressure and test pressure for each item.

1.03 DELIVERY, STORAGE, AND HANDLING

A. In accordance with manufacturer’s recommendations.

B. Marking at Plant: Mark each pipe and fitting at plant. Include date of manufacture, manufacturer's identification, specification standard, diameter of pipe and other information required for type of pipe.

C. Pipe, specials, and fittings received at Project Site in damaged condition will not be accepted.

D. Gasket Storage: Store rubber gaskets in cool, well ventilated place, and do not expose to direct rays of sun. Do not allow contact with oils, fuels, petroleum, or solvents.

E. Store and support pipe securely to prevent accidental rolling and to avoid contact with mud, water, or other deleterious materials.

F. Handling:

1. Pipe shall be handled with proper equipment in a manner to prevent distortion or damage. Use of hooks, chains, wire ropes, or clamps that could damage pipe, damage coating or lining, or kink and bend pipe ends is not permitted.
2. Use heavy canvas, or nylon slings of suitable strength for lifting and supporting materials.
3. Lifting pipe during unloading or lifting into trench shall be done using two slings placed at quarter point of pipe section. Pipe may be lifted using one sling near center of pipe, provided pipe is guided to prevent uncontrolled swinging and no damage will result to pipe or harm to workers. Slings shall bear uniformly against pipe.
4. Pipe and fittings shall not be stored on rocks or gravel, or other hard material that might damage pipe. This includes storage area and along pipe trench.

PART 2 PRODUCTS

2.01 PIPE

A. As specified in Section 33 05 01.09, Polyvinyl Chloride (PVC) Pressure Pipe and Fittings.

2.02 JOINTS

A. As specified in Section 33 05 01.09, Polyvinyl Chloride (PVC) Pressure Pipe and Fittings.

2.03 FITTINGS

A. All fittings shall be ductile iron as specified in Section 33 05 01.09, Polyvinyl Chloride (PVC) Pressure Pipe and Fittings.

2.04 PIPE LOCATING TAPE

A. As specified in Section 31 23 23.15, Trench Backfill.

2.05 PIPE BEDDING AND PIPE ZONE MATERIAL

A. As specified in Section 31 23 23.15, Trench Backfill.

2.06 TRENCH STABILIZATION MATERIAL

A. As specified in Section 31 23 23.15, Trench Backfill.

PART 3 EXECUTION

3.01 GENERAL

A. Notify Engineer at least 2 weeks prior to field fabrication of pipe or fittings.

B. Furnish feeler gauges of proper size, type, and shape for use during installation for each type of pipe furnished.

C. Distributing Materials: Place materials along trench only as will be used each day, unless otherwise approved by Engineer. Placement of materials shall not be hazardous to traffic or to general public, obstruct access to adjacent property, or obstruct others working in area.

3.02 EXAMINATION

A. Verify size, material, joint types, elevation, and horizontal location of existing pipeline to be connected to new pipeline or new equipment.

B. Inspect size and location of structure penetrations to verify adequacy of wall pipes, sleeves, and other openings.

C. Damaged Coatings and Linings: Repair using coating and lining materials in accordance with manufacturer’s instructions.

3.03 PREPARATION OF TRENCH

A. Prepare trench as specified in Section 31 23 16, Excavation.

B. Unless otherwise permitted by Engineer, maximum length of open trench shall not exceed 250 feet.

3.04 INSTALLATION

A. General:

1. Join pipe and fittings in accordance with manufacturer's instructions, unless otherwise shown or specified.
2. Install individual pipe lengths in accordance with approved lay diagram. Misplaced pipe shall be removed and replaced.
3. Inspect pipe and fittings before installation, clean ends thoroughly, remove foreign matter and dirt from inside.
4. Flanged Joints:
   a. Install perpendicular to pipe centerline.
   b. Bolt Holes: Straddle vertical centerline, aligned with connecting equipment flanges or as shown on Drawings.
   c. Use torque-limiting wrenches to provide uniform bearing and proper bolt tightness.
   d. Flange Type: Use flat-faced flange when joining with flat-faced ductile or cast iron flange.
5. Couplings:
   a. Install in accordance with manufacturer's written instructions.
   b. Before coupling, clean pipe holdback area of oil, scale, rust, and dirt.
   c. Clean gaskets before installation.
   d. If necessary, lubricate with gasket lubricant for installation on pipe ends.
   e. Tighten coupling bolts progressively, drawing up bolts on opposite sides gradually until bolts have uniform tightness.

B. Buried Pressure Pipe:

1. Concrete Encased or Embedded Pipe: Do not encase joints in concrete, unless specifically shown on Drawings.
2. Placement:
   a. Keep trench dry until pipe laying and joining is completed.
   b. Exercise care when lowering pipe into trench to prevent twisting or damage to pipe.
   c. Measure for grade at pipe invert, not at top of pipe.
   d. Excavate trench bottom and sides of ample dimensions to permit proper joining, welding, visual inspection, and testing of entire joint.
   e. Prevent foreign material from entering pipe during placement.
   f. Close and block open end of last laid pipe section when placement operations are not in progress and at close of day's work.
   g. In general, lay pipe upgrade with bell ends pointing in direction of laying.

h. Deflect pipe at joints for pipelines laid on a curve using unsymmetrical closure of spigot into bell. If joint deflection of standard pipe lengths will not accommodate horizontal or vertical curves in alignment, provide:
   1) Shorter pipe lengths.
   2) Special mitered joints.
   3) Standard or special fabricated bends.
i. Check gasket position with feeler gauge to assure proper seating.
j. After joint has been made, check pipe alignment and grade.
k. Place sufficient pipe zone material to secure pipe from movement before next joint is installed.
l. Prevent uplift and floating of pipe prior to backfilling.

3. Tolerances:
   a. Deflection From Horizontal Line: Maximum 2 inches.
   b. Deflection From Vertical Line: Maximum 1 inch.
   c. Joint Deflection: Maximum of 75 percent of manufacturer's recommendation.
   d. Horizontal position of pipe centerline on alignment around curves maximum variation of 1 foot from position shown.
4. Cover Over Top of Pipe: Minimum 3 feet, unless otherwise shown.
5. Disposal of Excess Excavated Material: As specified in Section 31 23 16, Excavation.

3.05 THRUST RESTRAINT

A. Location: At pipeline tees, plugs, caps, bends, and locations where unbalanced forces exist.

3.06 CORROSION PROTECTION

A. Buried Pipe: As specified in the individual specifications following this section.

B. Notify Engineer at least 3 days prior to start of surface preparation, coating application, and corrosion protection work.

3.07 PLACEMENT OF PIPE LOCATING TAPE

A. Place pipe locating tape in accordance with Section 31 23 23.15, Trench Backfill.

3.08 PIPE BEDDING AND ZONE MATERIAL

A. Place pipe bedding and pipe zone material in accordance with Section 31 23 23.15, Trench Backfill.

3.09 FIELD QUALITY CONTROL

A. Pressure Leakage Testing: As specified in Section 33 05 01.09, Polyvinyl Chloride (PVC) Pressure Pipe and Fittings.

3.10 CLEANING

A. Following assembly and testing, and prior to final acceptance, flush pipelines with water at 2.5 fps minimum flushing velocity until foreign matter is removed. Dispose of water and flushed foreign matter.

B. If impractical to flush large diameter pipe at 2.5 fps, clean pipe in-place from inside by brushing and sweeping, then flush or blow line at lower velocity.

C. Remove accumulated debris through blowoffs 2 inches and larger or by removing spools and valves from piping.

END OF SECTION

SECTION 33 05 01.09
POLYVINYL CHLORIDE (PVC) PRESSURE PIPE AND FITTINGS

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Water Works Association (AWWA):
   a. C110, Ductile-Iron and Gray-Iron Fittings.
   b. C605, Underground Installation of Polyvinyl Chloride (PVC) Pressure Pipe and Fittings for Water.
   c. C905, Polyvinyl Chloride (PVC) Pressure Pipe and Fabricated Fittings, 14 Inches through 48 Inches (350 mm through 1,200 mm) for Water Transmission and Distribution.
2. ASTM International (ASTM):
   a. D2241, Standard Specification for Poly(Vinyl Chloride) (PVC) Pressure-Rated Pipe (SDR Series).
   b. D2321, Standard Practice for Underground Installation of Thermoplastic Pipe for Sewers and Other Gravity-Flow Applications.
   c. D2466, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40.
   d. D2467, Standard Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80.
   e. D3139, Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.

1.02 SUBMITTALS

A. Informational Submittals:

1. Manufacturer’s Certificate of Compliance, in accordance with Section 01 43 33, Manufacturers’ Field Services.
2. Hydrostatic Testing Plan: Submit at least 15 days prior to testing and at minimum, include the following:
   a. Testing dates.
   b. Piping systems and section(s) to be tested.
   c. Method of isolation.
   d. Method of conveying water from source to system being tested.
   e. Calculation of maximum allowable leakage for piping section(s) to be tested.

3. Certification of Calibration: Approved testing laboratory certificate if pressure gauge for hydrostatic test has been previously used. If pressure gauge is new, no certificate is required.
4. Test report documentation.

1.03 DELIVERY, STORAGE, AND HANDLING

A. Solvent Cement: Store in accordance with ASTM D2855.

PART 2 PRODUCTS

2.01 MATERIALS

A. Pipe:

1. PVC, conforming to requirements of AWWA C905 and ASTM D1784
2. DR shall be 25.
3. Pipe to be used for potable water conveyance shall be manufactured from National Sanitation Foundation (NSF) approved compounds.

B. Joints:

1. Rubber gasketed.
2. Conform to AWWA C905 and ASTM F477.

C. Fittings:

1. Ductile iron, conforming to AWWA C153 or AWWA C110.
2. Fittings shall be cement-lined and seal-coated in accordance with ANSI/AWWA Standard C104/A21.4-95, "Cement-Mortar Lining for Ductile-Iron Pipe and Fittings for Water."
3. Fittings shall be outside-coated with an asphaltic material applied by means of the airless spray method. The exterior coating shall meet AWWA Specifications for this type of coating, Spigot ends shall be beveled prior to painting and to an extent that will permit ready insertion of the spigot through the gasket area.

D. Restrained Joints:

1. Pipe restraint devices shall consist of multiple gripping wedges incorporated into a follower glad meeting the applicable requirements of ANSI/AWWA C110/A21.10.
2. Pipe restraints shall be installed where indicted on the Drawings.
3. Minimum Pressure Rating: 165 psi.

PART 3 EXECUTION

3.01 INSTALLATION

A. In accordance with ASTM D2321.

B. Joints: Rubber Gasketed: In accordance with manufacturer's written instructions.

C. Maximum Joint Deflection Mechanical Joint: 75 percent of manufacturer's recommended values.

D. No deflection is allowed at push-on joints.

3.02 INSPECTION AND HYDROSTATIC TESTING

A. General:

1. Notify Engineer in writing at least 5 days in advance of testing. Perform testing in presence of Engineer.
2. Using water as test medium, all newly installed pipelines shall successfully pass hydrostatic leakage test prior to acceptance.
3. Conduct field hydrostatic test on buried piping after trench has been completely backfilled and compacted. Testing may, as approved by Engineer, be done prior to placement of asphaltic concrete or roadway structural section.
4. Contractor may, if field conditions permit and as approved by Engineer, partially backfill trench and leave joints open for inspection and conduct an initial informal service leak test. Final field hydrostatic test shall not, however, be conducted until backfilling has been completed as specified above.
5. Supply of Temporary Water: In accordance with Section 01 50 00, Temporary Facilities and Controls.
6. Dispose of water used in testing.
7. Install temporary thrust blocking or other restraint as necessary to prevent movement of pipe and protect adjacent piping or equipment. Make necessary taps in piping prior to testing.
8. Prior to test, remove or suitably isolate appurtenant instruments or devices that could be damaged by pressure testing.
9. New Piping Connected to Existing Piping:
    a. Isolate new piping with grooved-end pipe caps, blind flanges, or other means as acceptable to Engineer.
    b. Provide appropriate thrust blocking.

B. Hydrostatic Testing Procedure:

1. Furnish testing equipment, as approved by Engineer, which provides observable and accurate measurements of leakage under specified conditions.
2. Maximum Filling Velocity: 0.25 foot per second calculated based on full area of pipe.
3. Expel air from piping system during filling.
4. Test Pressure: 100 psi above maximum system operating pressure. Obtain operating pressure from Owner.
5. Apply and maintain specified test pressure with hydraulic force pump. Valve off piping system when test pressure is reached.
6. Maintain hydrostatic test pressure continuously for 2 hours minimum, adding make-up water only as necessary to restore test pressure to within 5 psi of specified hydrostatic test pressure.
7. Determine actual leakage by measuring quantity of water necessary to maintain specified test pressure for duration of test.

C. Maximum Allowable Leakage:

$$L = \frac{ND(P)^{1/2}}{7400}$$

where:

L = Allowable leakage, in gallons per hour.
N = Number of joints in tested line.
D = Nominal diameter of pipe, in inches.
P = Average test pressure during leakage test, in pounds per square inch.

END OF SECTION

SECTION 33 12 16.29
AIR RELEASE AND PLUG VALVE ASSEMBLIES

PART 1 GENERAL

1.01 REFERENCES

A. The following is a list of standards which may be referenced in this section:

1. American Water Works Association (AWWA): C512, Air-Release, Air/Vacuum, and Combination Air Valves for Waterworks Service.
2. ASTM International (ASTM):
   a. C478, Standard Specification for Precast Reinforced Concrete Manhole Sections.
   b. D1785, Standard Specification for Poly (Vinyl Chloride) (PVC) Plastic Pipe, Schedules 40, 80, and 120.

1.02 SUBMITTALS

A. Action Submittals:

1. Product data sheets for make and model.
2. Complete catalog information, descriptive literature, specifications, and identification of materials of construction.
3. Maximum recommended test pressure; maximum and minimum recommended working pressures of air valves, isolation valves, flanges, connecting piping, and fittings.
4. Recommended seating materials for specified operating pressures.

B. Informational Submittals:

1. Manufacturers' Instructions:
   a. Installation and testing of products specified.
   b. Pipeline tapping and service saddle installation.
2. Operation and maintenance data.

PART 2 PRODUCTS

2.01 AIR VALVES

A. General:

1. Air release, air/vacuum, and combination air valves shall conform to AWWA C512.
2. Interior of air valves shall be coated in accordance with AWWA C550.
3. Air valves shall be factory tested in accordance with AWWA C512.

4. Suitable for operating pressures between 5 and 100 psi.

B. Sewage Air Release Valve 2 Inches:

1. Suitable for sewage service.
2. Automatically exhausts entrained air that accumulates in system.
3. Air/water inlet: NPT.
4. Air outlet: NPT.
5. Rated 150 psi working pressure; cast iron, ductile iron, or steel body, cover with stainless steel float and trim.

C. Manufacturer: APCO Valve & Primer; Model 400 Sewage Air Release Valve.

D. Service Saddle:

1. Stainless steel double straps.
2. Body: Ductile iron, nylon, or epoxy coated.
3. Bolts and Nuts: Type 304 stainless steel.
4. Comply with applicable portions of AWWA C800.
5. Manufacturers and Products:
   a. Mueller; Series DR2S.
   b. Romac; Style 202S or 202N.

E. Piping between Mainline and Air Valve: Stainless steel.

F. Valve Vault: Precast concrete manhole. Lid shall be designed for H-20 loading.

2.02 PLUG VALVE

A. The plug valves shall be of the nonlubricated eccentric type, with resilient faced plugs, and shall be designed for a minimum working water pressure of at least 150 psi. Plug valves 20-inch and smaller shall have an 80 percent minimum port area.

B. The plug valves shall be as manufactured by DeZurik, a unit of General Signal, Olson Technologies, Inc., or approved equal, and shall be the standard product of a manufacturer which has produced and sold such equipment for a period of at least 5 years.

C. Valves shall be suitable for buried, submerged service.

D. Mechanical joint valves shall have ends complying with ANSI/AWWA Standard C111/A21.11. "Rubber-Gasket Joints for Ductile Iron Pressure Pipe and Fittings." Mechanical joint gaskets, glands, tee-head bolts and hex nuts shall be included with the valve. Segmented glands or follower glands held in place by set screws will not be acceptable. Bolt holes in flanges of the mechanical joint shall be equally spaced and shall straddle the vertical centerline. Gaskets shall be shipped separately in suitable protective containers. Valves shall have neoprene gaskets.

E. Plug valve body and plug shall be of cast iron conforming to the requirements of ASTM Standard A126, "Gray Iron Castings for Valves, Flanges and Pipe Fittings," Class B, and all exposed nuts, bolts, springs, washers, and similar component items shall be AISI Type 316 stainless steel. Resilient plug facing shall be of neoprene.

F. Plug valves shall be furnished with a corrosion-resistant seat consisting of a welded-in overlay of high nickel content on all surfaces contacting the plug face and shall comply with ANSI/AWWA Standard C507.

G. Plug valves shall be furnished with replaceable, sleeve-type AISI Type 316 stainless steel bearings in the upper and lower journals, and shall comply with ANSI/AWWA Standard C507.

H. Plug valve shaft seals shall be designed for replaceable, manually adjustable, multiple ring "V" or "U" type packing of Buna-N or neoprene. The valves shall be of the bolted-bonnet type and shall comply with ANSI/AWWA Standard C507, Section 3.

I. Plug valves shall have stops at the fully-opened and fully-closed positions.

PART 3 EXECUTION

3.01 INSTALLATION

A. Valves:

1. In accordance with manufacturer’s printed instructions.
2. Orient valve in vault with easy access to operator.
3. Replace valves that drip or do not function properly.

B. Service Saddle:

1. Tap and install in accordance with manufacturer’s printed instructions.
2. Use adapters for size of line being tapped.

C. Valve Vault:

1. As shown on Drawings.
2. Install so finished grade of top of vault conforms to slope and elevation of adjacent ground.

D. Pipe Support: Install in accordance with details shown on Drawings.

3.02 TESTING AND INSPECTION

A. Air Valve:

1. May be either tested while testing pipelines, or as a separate step.
2. Isolation valves shall be in open position during pipeline test.

B. Isolation Valves: Test that valves open and close smoothly with operating pressure on one side and atmospheric pressure on the other.

C. Air and Vacuum Valves: Inspect valves as pipe is being filled to verify venting and seating is fully functional.

D. Verify leak-free performance during testing.

END OF SECTION

DRAWINGS
(BOUND SEPARATELY)