

STANDARD SPECIFICATIONS AND DETAILS

FOR THE

CITY OF POOLER, GEORGIA



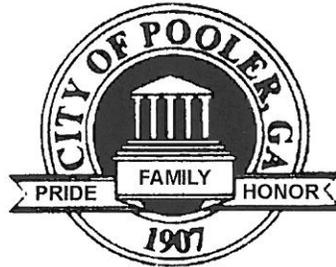
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FOR THE
STANDARD SPECIFICATIONS



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NOTICE

These **Specifications and Details** are provided as a courtesy and are not to be modified in any manner, they are the sole property of the **City of Pooler** and were created for the public's use. They must not be modified. All changes to specifications and/or to details shall be made by way of Special Conditions with prior approval of the **City of Pooler**.

The files have been made available as **Adobe PDF** files. The standard details files were created in **AutoCAD R-14** and converted to **Adobe PDF** files.

The PDF (portable document format) files listed below are available for viewing online using the **Adobe Acrobat Reader 3.0** (or later) file viewer. If you do not already have the **Adobe Acrobat Reader** installed on your system, you must download and install the software **prior** to viewing the document online (www.pooler.georgia.gov).

- ! CITY OF POOLER CHECKLIST AND NOTES
- ! TECHNICAL SPECIFICATIONS
- ! ELECTRICAL DETAILS
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CITY OF POOLER

Contractor Check List Pre-Construction Meeting

DATE: _____ TIME: _____

- _____ Emergency Phone Numbers, Pagers, Names, 24-hour contact person.
- _____ Field inspectors for the City will require a complete set of drawings on site. Amended plans shall be marked and ready for review at all times.
- _____ Any and all changes to the “APPROVED” plans, shall be approved by the City of Pooler before changes can be made.
- _____ All the utilities that will become the City’s property shall be placed inside the Road Rights of Ways, unless other easements are approved and shown on the “APPROVED” plans. Any utility installed outside the Road Rights of Ways and/or approved easements, shall be moved inside the approved areas before Pooler will accept ownership or the easements shall be, with City approval, shifted to include the utility.
- _____ During construction and until the City of Pooler accepts ownership of underground utilities, the contractor installing the underground utilities shall be responsible for line locations when a ticket for utility locations is requested. The City of Pooler will assist when possible (**Pooler will not be responsible or repair any damage during construction because of their assistance in locating any utility**).
- _____ If water is required during construction, all water shall be metered. The City of Pooler will issue hydrant meters; and an approved BFP shall be used on the meter.
- _____ City of Pooler will require “**Record Drawings**” **72 hours** before final inspection will be made. This will allow Pooler to field verify the As Builds.
- _____ Where 22½ degree and/or 45 degree mechanical joints are shown on “APPROVED” plans; they shall be installed. **JOINT DEFLECTION OF PIPE SHALL NOT EXCEED MANUFACTURE’S RECOMMENDATIONS.**



CITY OF POOLER

FIELD INSPECTION CHECKLIST

This checklist shall be completed by the City of Pooler field representative through out the installation process. Failure to have all items inspected and checked by the City of Pooler will result in rejection of the project until all items are corrected and/or addressed. Contact the Inspection Coordinator to schedule the following inspections at (912) 748-6652.

Materials Inspection at Job Site

- a) Water System Materials _____
- b) Sewer System Materials _____
- c) Lift Stations Materials _____

Structure Tie-Ins

- a) Water Laterals Crossings (sleeves) _____
- b) Water Main Tee's, Crosses, Bends, etc. _____
- c) Fire Hydrant Installation _____
- d) Gate Valves _____
- e) Sewer Manholes (coring) _____
- f) Air Release Valve (water & sewer) _____
- g) Jacking and Boring and/or Directional Boring _____
- h) Force Main tie-ins Sanitary Manholes _____
- i) Sanitary Mains tie-ins Existing Manholes _____
- j) Drop Manholes tie-ins _____
- k) 3M DBY-6 Direct Bury Splice Kit _____
- l) All water and sewer laterals are located _____
- m) Pressure testing of water and force mains _____
- n) Pressure testing of tapping saddles _____

All above items shall be inspected by Pooler for installation as per approved plans and marked on Pooler inspectors "ISSUED FOR CONSTRUCTION" plans.

Lift Station

- a) Wet Well _____
- b) Valve Pit _____
- c) Control Panel _____
- d) Fence _____
- e) Gravel Road and Fenced Area _____

- Water pressure Test (150 PSI for 2 Hours) _____
- Force Main Pressure Test (100 PSI for 2 Hours) _____
- Bacteria Test - Water System Results _____
- Mandrel Pull - Sanitary Sewer _____
- Television Inspection for Sanitary Sewer _____
- Other Miscellaneous (Describe) _____

The following must be permitted and on file with Inspection Department and Public Works Department before Final Acceptance/Final Inspection:

City of Pooler Field Inspection Checklist
Record Drawings
Location Wire Tracing Test(Water ans Sewer)
Fire Hydrant Flow Test

The following shall be inspected during final inspection by the City of Pooler

All valves are in working order
All fire hydrants, Painted, Chains Removed, Working Order
All Valves are installed and marked on record drawings
All water and Sewer Manholes are installed correctly and above finished grade
All Valve Boxes are installed correctly and above finished grade
All valve monuments are installed
All W&S on curbs for services
All water and sewer service laterals are installed correctly
All utilities are installed inside road R/W and/or approved easements

If any of these items are not completed and signed off by the City of Pooler Inspector, The City of Pooler will not conduct a final inspection for acceptance until issues are recorded and resolved.



CITY OF POOLER

CABLE LOCATION TEST

DATE: _____ TIME: _____

SUBDIVISION: _____

INSPECTOR: _____

All Hydrant(s) have Location Wire exposed at flange:
Yes _____ No _____ (If No give location) _____

All Blow off hydrant(s) have Location Wire exposed:
Yes _____ No _____ (If No give location) _____

All Water Manholes have Location Wire exposed at ring and cover:
Yes _____ No _____ (If No give location) _____

All Water Laterals have Location Wire exposed to Curb Stop:
Yes _____ No _____ (If No give location) _____

All Sewer Laterals have Location Wire exposed to cap:
Yes _____ No _____ (If No give location) _____

All Sewer Manholes have Location Wire exposed at ring and cover:
Yes _____ No _____ (If No give location) _____

Did all of the water mains Locate: Yes _____ No _____
If No: What areas did not locate: _____

Did all of the water laterals locate: Yes _____ No _____
If No: What areas did not locate: _____

Was Contractor notified of any and all deficiencies: Yes _____ No _____
If No: Why Not: _____

Was Design Engineer notified of any and all deficiencies: Yes _____ No _____
If No: Why Not: _____

Approved and acceptable to the City of Pooler: Yes _____ No _____
If No: Why Not: _____

Signed for acceptance: _____

Signed for denial: _____



CITY OF POOLER

FIRE HYDRANT FLOW TEST

DATE: _____ TIME: _____

SUBDIVISION: _____

INSPECTOR: _____

SIZE OF WATER MAIN: _____

Hydrant #1 Location _____ Hydrant #2 Location _____

PSI _____

PSI _____

GPM _____

GPM _____

Residual _____

Residual _____

Savannah Benton Drive Connection Open _____

Closed _____

Pooler Wells On _____

Off _____

Elevated Tank Level _____

Hydrant #1 Location _____

Hydrant #2 Location _____

PSI _____

PSI _____

GPM _____

GPM _____

Residual _____

Residual _____

Flow tested by: _____

Hydrant(s) Painted: YES _____ NO _____

Hydrant Chains Removed: YES _____ NO _____

Approved: YES _____ NO _____

Comments:

SECTION 01001
WATER AND SEWER REGULATIONS

Section 504 Easements.

(504.01) UTILITY EASEMENTS:

Public utility easements shall be provided where necessary. Such easements shall not be less than fifteen (15) feet in width and shall be located preferable in front of property. All utilities shall be installed underground.

(504.02) ACCESS EASEMENTS:

Public access easements shall be provided where necessary. Such easements shall not be less than twenty-five (25) feet in width and shall have a non-encroachment set back for structures. The access easement can be used as a part of common areas (**except access easements for Sanitary Sewage Lift Station**) belonging to Homeowners Association or Property Owners Association. If two (2) or more publicly owned utilities are installed inside the access easement an additional ten (10) feet of access easement shall be required for each additional utility. The City reserves the right to require additional access easement because of depth and size of utilities, when necessary. If publicly owned utilities are installed in the access easement and/or accessed through the easement, the utility owner (Water, Sewer, Storm, etc.) shall have an unlimited, unobstructed access 365 days, 24 hours a day. When necessary the City will require that an all weather access road be constructed by the developer for access.

Section 606 Water Supply and Sanitary Sewage

(606.04) PUBLICLY OWNED WATER SUPPLY AND SANITARY SEWAGE SYSTEM:

Water Supply and Sanitary Sewage Collection Systems that are Publicly Owned shall be placed in the road rights of ways and/or access easements (Section 504.02). Where utilities are installed between residential homes and/or commercial property the access easements can be used for open space requirements. (**Except: Access Easements for Sanitary Sewerage Lift Stations**) as defined in Section 606 Utilities #5.

Section 606 Additional requirements for water, sewer, and utilities include.

Water:

#6 All 14" or larger Gate Valves that are installed on the transmission line(s) and/or tie into a major transmission line shall be installed in a manhole. All Gate Valves that are located at the entrance of subdivision or other development that tie into a transmission line shall be installed in a manhole. All other Gate Valves can be installed in a cast iron valve box with a concrete collar and concrete valve marker post.

#15 All Fire Hydrants, Post Hydrants and/or Blow off shall require a # 12 solid copper tracing wire to be installed from the existing wire on the main up to the bottom of the apparatus, just above the finish grade with the wire being wrapped around the apparatus several times. A continuous loop in the wire shall be maintained for tracing.

Sewer:

9 All sewer laterals shall be installed 15' from the property corner marker. At no time shall it be permissible for the lateral to be located in the middle of the lot.

Utilities:

#1 All public Owned utilities shall be installed in the road rights of ways or approved access easements as defined in section 504.02.

#2 Sanitary Sewer, Water Mains, service laterals or other Publicly owned utilities shall not be installed behind or between lots without the express approval at the City of Pooler. If allowed the utility will need to be in a proper easement.

#3 When Lift Stations are required, the Lift Station shall not be located behind residential homes and/or commercial property without approval and an access easement as defined in sections 504.02 and 606 Utilities #5.

#5 The Access Easement to the Lift Station shall be a minimum width of 25'. The Access Easement shall have a road that is accessible during all weather condition with a minimum width of 15'. **Lift station gate openings shall be a minimum of 20-feet.** The road construction shall be of graded aggregate with a minimum depth of 8". The road shall be constructed to engineering approval and/or specifications. The City of Pooler reserves the right to have the access road mucked to the depth of the graded aggregate, if necessary.

#6 The immediate entrance at the paved Public Roadway to the Access Easements shall have a concrete pad. The minimum width shall be 15', a minimum depth of 15', minimum thickness of 4", and 4000 psi mixture of fiber reinforced concrete.

#9 All Lift Stations shall be constructed with submersible pumps only. The City and its engineers shall approve the pump size and manufacturer. All lift stations will have provisions for stand-by power. It will be at the City of Pooler's discretion if a permanent generator is required.

#12 All force mains shall be installed in the access easements and/or road rights of ways.

THE ORDINANCES OF THE CITY OF POOLER

SECTION 19-25, Adopted May 1, 2000

Sec. 19-25. No free service.

- A. It shall be unlawful for any person or persons to connect and/or obtain water from the water system of the City of Pooler for any purpose without the approval of the City of Pooler Water Department and/or Inspection Department.
- B. The minimum charge, as provided in the rate schedule, shall be made for such connections subscribed for. Water furnished for a given lot or construction site, shall be used on that lot or site only, and, except for fire fighting, the City of Pooler shall not under any conditions furnish water free of charge to anyone.
- C. Except for firefighting, it shall be unlawful for any person or persons to obtain water for a water tank or truck or for any other purpose from a fire hydrant, blow off, and/or any apparatus that will provide water from the City of Pooler water system without first obtaining a permit and metering device from the City of Pooler.
- D. The permit shall be purchased from the City of Pooler for a fee of \$120.00 per year from January 1 to June 30, \$60.00 per year from July 1 to December 31. The permit shall be displayed for easy inspection.
- E. The metering device shall be obtained for the City of Pooler. A security deposit for the cost of the meter shall be collected by the City of Pooler's Water Department before the metering device shall be issued.
- F. The fee for the water usage and the cost for damaged City property, (i.e. metering device, fire hydrants, blowoff, roads, sidewalks, curbs, etc.) shall be paid and/or corrected before the security deposit is refunded.
- G. It shall be unlawful for any person or persons, contractor, sub-contractor, builder, home owner, developer, or others to obtain water from a water lateral or laterals without an approved metering device, meter box, and backflow preventor at any time, during and/or after construction of a commercial site, residential site, or industrial site.
- H. The metering device shall be obtained from the City of Pooler for a scheduled fee. Any and all labor and/or material cost to install, maintain, repair or replace the water meter and/or box(es) shall be the responsibility of the person or persons who applied for and paid for all permit and building fees.
- I. Once a building permit is issued from the City of Pooler, the water meter, meter box, backflow device, and other required equipment, shall be installed prior to the first inspection by the Building Inspector and/or designee.

- J. Any and all water usage fees for construction shall be paid in full before a Certificate of Occupancy is issued.
- K. Any and all necessary repairs, or replacements to any water meter, meter boxes or laterals shall be completed at the expense of the contractor before the final inspection and a Certificate of Occupancy is issued.
- L. The City of Pooler reserves the right to disconnect at any time, any and all apparatus tied into the water system of the City of Pooler.
- M. Any person violating any of the provisions of this section shall be deemed to be guilty of an offense and upon conviction thereof shall be punished by a fine of not less than twenty-five dollars (\$25.00) nor more than five hundred dollars (\$500.00) or imprisonment not to exceed thirty (30) days, either or both, at the discretion of the court.

END OF SECTION 01001

SECTION 01300
PRECONSTRUCTION AND CLOSEOUT REQUIREMENTS FOR PRIVATE
DEVELOPMENT PROJECTS

The following requirements shall apply to all private development projects within the City limits of Pooler or other projects which utilize and connect to the City of Pooler water and sewer system.

1. CONSTRUCTION STANDARDS:

All projects constructed within the City limits of Pooler and/or connecting to the City of Pooler water and sewer system must be constructed in accordance with City of Pooler Standard Specifications. No exceptions shall be made for privately maintained systems.

2. REQUIRED COORDINATE SYSTEM:

All projects shall be tied to and shall be completed on the following datum in order to provide accurate input to the City's records.

Vertical datum shall be NAVD 1988

Note: FEMA Flood elevations are on NAVD 1988. Finish Floor elevation and other elevation that are required to be above the 100 year flood elevation must be adjusted.

Horizontal datum shall be State Plain Coordinates NAD 83 based on US survey feet.

3. PRE CONSTRUCTION CONFERENCE:

Prior to the beginning of construction a pre-construction conference will be scheduled and shall be attended by the Engineer of Record or other owner's representative, the Contractor and representative of the City. The preconstruction conference shall address at a minimum the following:

- Call Before You Dig
- List of emergency contacts and 24 hour phone numbers
- Introduction of the Project Manager and Inspector
- Public Relations
- Testing Reports
- Shop Drawings/Material Submittals
- Final Inspection
- Project Close-out
- Project Construction Schedule

4. MAINTENANCE AND OPERATIONAL SYSTEM MANUALS:

The city shall require that three (3) sets of maintenance manuals and operation manuals be supplied for all electrical and mechanical systems place as part of the work, which will be accepted for ownership and maintenance by the City. All product data for individual components shall be included in the manual.

5. RECORD DRAWINGS:

A. Record Drawing of the approved construction plans in the following format shall be delivered to the City by the owner's representative in the required coordinate system:

One (1) set on reproducible Mylar,
Two (2) sets on bond,
One complete set of digital record drawings on AUTOCAD drawing file and DXF on 3½" DS/HD diskette, CD or DVD disk.

B. One original letter signed and sealed by a professional Engineer registered in the State of Georgia certifying the project has been constructed in accordance with the approved plans and specifications.

C. Three (3) copies of all warranties, bonds and operation manuals.

D. Three (3) copies of recorded plats showing all required ROW and/or easements for public and/or private streets, drainage, utilities, and/or facilities.

The Record Drawings shall contain information on Pavement, Drainage Systems, Sanitary Sewer Collection System, Water Distribution Systems, Water Supply Systems, Wastewater Treatment Systems, Electrical Standby Generator systems and shall show the following:

Pavement:

1. Edge of pavement in relation to the center line of the road right-of-way.
2. Pavement profiles,
3. Installed thickness of base and material.

Drainage:

1. Structures with inverts of all pipes and elevation of all tops;
2. pipe diameter, material, length and slope;

3. location of all structures, headwalls, manholes, inlets and end treatments in relation to right-of-ways, property lines and other permanent structures;

Sanitary Sewer:

1. Structures with inverts of all pipes and elevation of all frames and covers;
2. pipe diameter, material, length and slope;
3. location of manholes in relation to right-of-ways, property lines and other permanent structures;
4. Lateral locations measured from the down stream manhole at the main and the property line if the lateral is not perpendicular to the main.

Water Distribution:

1. Location of the water mains, material and diameters;
2. Location of all valves, blow-off, fire hydrants, and sampling stations;
3. Location of all service lines with measurements from two permanent structures.

Other:

Location of all special construction requirements such as sheeting left in place, concrete cradles, concrete encasement, length of casing, diameter of casing and carrier pipe depicting the material and casing size and any directional drilling installation end points with transition coupling locations and sizes.

END OF SECTION 01300

SECTION 02200
EXCAVATION, FILLING AND GRADING

PART 1 - GENERAL

1.01 SUMMARY

This Section specifies the requirements for the following:

- A. Excavation required for structures and roadways.
- B Dewatering
- B. Shoring, sheeting and bracing as required.
- D. Wasting and disposal of excess or unsuitable materials.
- E. Furnishing and placing borrow material.
- F. Furnishing and placing granular foundation material.
- G. Subgrade preparation.
- H. Compaction.
- I. Site grading.

PART 2 - MATERIALS

2.01 EARTH FILL

Earth fill, including pavement subgrades, shall consist of all suitable materials from required excavations. Suitable materials for earth fill shall generally be composed of sands, clay-sand mixtures and silt-sand mixtures. Clay-sand and silt-sand mixtures shall be approved by the soil technician prior to being incorporated in fills. Clays, silts, and organic soils will be considered as unsuitable materials.

2.02 EXCAVATED MATERIALS

Suitable materials from on-site excavations shall be used in the permanent construction required under these Specifications. Suitable materials shall be excavated separately from materials to be wasted and the suitable materials shall be segregated by loads during the excavation operations and shall be placed in temporary stockpiles and later placed in the designated locations. Excavated materials, which, after drainage, are suitable for fill but which, when excavated, are too wet for immediate compaction shall be placed temporarily in stockpiles until the moisture content is reduced sufficiently to permit them to be placed in the earth fills.

2.03 UNSUITABLE MATERIAL

Where material encountered is unsuitable for subgrade construction of roads, sidewalks, curb and gutter and other structures, the material shall be excavated to the required depth of compaction (generally two feet below pavement base course or finished floor elevation),

disposed as directed and backfilled with suitable material. Unsuitable materials are those classified as MH, CH, OH, OL, and Peat in accordance with the Unified Soil Classification System. Excess water in material will not be a basis for establishing unsuitable material regardless of gradation. The Owner's representative shall be notified immediately upon encountering of unsuitable material.

2.04 BORROW

Borrow material shall consist of sand or sand-clay soils free of particles greater than 2 inches in diameter, roots, trash, and other deleterious material. Borrow material shall be capable of being shaped and compacted to the density specified herein.

PART 3 - EXECUTION

3.01 EXCAVATION

- A. Excavation shall include the loosening, loading, removing, transporting, stockpiling and disposing of all materials, wet or dry, necessary to be removed to construct all structures included in this Contract to the lines and grades, and at the locations, shown on the Contract Drawings.
- B. Excavation for structures shall conform to the depth and dimensions necessary for the proper installation of all structures detailed on the Contract Drawings to a tolerance of 0.1 feet. Unless shown on the Drawings excavation shall not be carried below the elevations shown on the Drawings. Where bottoms of excavations are slightly unstable and the Drawings do not require a stabilized granular backfill and the Owner's representative does not direct additional excavation and replacement, the Contractor may provide a gravel course, but such work will be considered as for the Contractor's convenience and will not be considered as extra work.
- C. Where any unauthorized excavation is made below the elevation indicated on the Contract Drawings, the excavation shall be restored to the proper elevation with compacted, well graded granular backfill. Such backfill shall be compacted as specified in Section 3.06 of this Section.
- D. Excavations for pipelines and underground utilities shall meet the requirements of Section 02221.

3.02 SHEETING AND SHORING

- A. Excavations, shall be properly shored, sheeted and braced by the Contractor to maintain excavation in a condition to permit the safe and efficient installation of all items of Contract work. Braced and sheeted trenches and open trenches shall comply with all state laws and regulations, and local ordinances relating to safety, life, health and property. Also, this shall conform to the Occupational Safety and Health Standards for Excavations, Final Rule (29 CFR Part 1926) as printed in the October

31, 1989 issue of the Federal Register.

- B. The sides and bottoms of the trenches shall be protected against any instability which may interfere with the proper laying of the pipe and as necessary for the safety of the workmen and others and as may be necessary to protect adjacent structures.

3.03 DEWATERING AND PROTECTION AGAINST WATER

- A. The Contractor shall remove water from the site and shall lower the ground water level as necessary to complete the excavations to the required depths and as required to maintain the excavations sufficiently dry so that all required work can be accomplished. The Contractor shall do such well construction, well pointing, sheeting, ditching, diking and pumping and shall construct necessary drains, channels, sumps and cofferdams to keep his excavations and new structures clear of ground water, storm water or sewage and to keep his construction areas dry during the progress of the work and until the finished work is accepted by the Owner, except as otherwise specified.
- B. The Contractor shall be responsible for the effect of dewatering operations on adjacent property and for the effect on water supplies located in the vicinity of the project.
- C. Adequate measures and protection shall be provided by the Contractor to protect his work from damage from uplift due to ground water, storm water, or flood water. Any damages which may result shall be the Contractor's responsibility.
- D. The Contractor shall accept all responsibility for damage to the work of this Contract because of floods and water pressures and other water damages and shall accept all risks of floods and other events which may occur.
- E. All water discharged by pumping operations shall be discharged so as not to interfere with work under this Contract or with existing structures and operations. Route of dewatering pipe shall be subject to the Engineer's review. Discharge facilities and water quality shall comply with applicable regulations of State and Federal agencies.
- F. Dewatering operations shall be uninterrupted and continuous during the course of the work so as not to endanger any construction in place or to present a hazard to workmen in and around the site. The Contractor shall take all measures necessary including, but not limited to, standby equipment and constant attendance to ensure that the dewatering system remains operational and effective throughout the period of time that it is required.

3.04 BACKFILLING

- A. All excavation shall be backfilled to the lines and grades shown on the Contract Drawings. Backfill adjacent to structures shall not be placed until forms, form lumber and all debris from construction has been entirely removed from around the work. No backfilling shall be done in unsuitable weather or over ground that is frozen or too wet.
- B. Backfill shall not be placed against structures until the concrete has cured at least 7 days. Backfill, in general, shall be placed in horizontal layers not in excess of 12 inches in thickness, except in the cases of embankment construction around structures and under roadway and piping locations, where backfill shall be placed in 6 inch layers, with each layer thoroughly compacted as specified hereinafter, prior to the addition of the succeeding layer.
- C. Fill immediately adjacent to walls shall be hand tamped and special care shall be taken to prevent any wedging action or eccentric loading against the walls.

3.05 EARTHFILL

Earth fill materials shall be placed in successive layers not exceeding 8 inches in loose depth for the full width of the area being filled. Fill material shall be compacted as required with heavy compaction equipment.

3.06 COMPACTION

A. General

Compaction of earth fill and all pavement subgrades shall be performed to the percentages of maximum standard or modified dry densities and to the depths as shown on the drawing or as follows:

1. Subgrades under Roadways
100 Percent Standard (ASTM Test D698) for a depth of 24 inches.
2. Subgrade and Fill for Structure
100% Standard (ASTM D-698). Compact top 12 inches of subgrade and each layer of fill.
3. Subgrade under Sidewalks, Curbs and Gutters
100 % Standard (ASTM D-698). Compact top 6 inches.
4. Unpaved Areas To Be Grassed, Sodded, or Landscaped.
90 % Standard (ASTM D-698).

B. Moisture Content

All compaction shall be performed at material moisture contents within 3 percentage points, plus or minus of optimum. Compaction and proof rolling equipment shall be as outlined in Section 02500 or as may be required for the type of fill being compacted.

3.07 TESTING

A. General

The Contractor will select a qualified independent testing laboratory for the purpose of identifying soils, checking densities, and classifying soils materials during construction. Payment for the testing will be by Contractor with the cost included in other items of the work.

The Contractor shall include the cost of one compaction test per 500 cubic yards of fill material, 300 linear feet of curb, and 1,500 square yards of base and one "proctor" test for each type of fill material to determine if the proper compaction has been attained.

B. Moisture-Density Tests

Testing shall be in accordance with ASTM Methods D698 or such other test as approved by the Engineer. A test shall be performed on each type of material used in the work regardless of source. Tests will be accompanied by particle-size analyses of the soils tested (ASTM Methods D421 and D422). Changes in color, gradation, plasticity or source of fill material will require the performance of additional tests. Copies of all test results shall be furnished to the Owner's representative.

C. Field Density Tests

Tests shall be made in accordance with ASTM Method D1556 or such other test as may be approved by the Owner. If any compaction test reveals that fill or backfill is not compacted as specified, the Contractor shall scarify and re-compact as required to achieve the specified density. Additional compaction tests shall be made to verify proper compaction.

D. Submittals

The soils technicians will submit formal reports of all compaction tests and retests to the Contractor and the Owner as soon as possible upon completion of the required tests.

This report information is to include but not be limited to the following:

1. Date of the test and date submitted.
2. Location of test.
3. Wet weight, moisture content and dry weight of field sample.

4. Description of soil.
5. Maximum dry density and moisture content of the lab sample which best matches the field sample in color, texture, grain size and maximum dry density.
6. Ratio of field dry density to maximum lab dry density expressed as a percentage.
7. Comments concerning the field density passing or failing the specified compaction.
8. Comments about re-compaction if required.

E. Compaction Results

The soils technician is to advise the Owner's representative and Contractor immediately of any compaction tests failing to meet the specified minimum requirements. No additional lift is to be placed on a lift with any portion failing.

3.08 GRADING

Upon completion of other construction operations, the entire site, within the limits shown on the Drawings, shall be brought to the finished grades shown. All surfaces shall be sloped to the grades indicated and which will provide proper drainage. All surfaces shall be raked smooth and shall be free of all vegetable matter, debris and stones larger than 2-1/2 inches. Allow for thickness of required topsoil.

END OF SECTION 02200

SECTION 02210
EROSION AND SEDIMENT CONTROL

PART 1 -GENERAL

1.01 SUMMARY

- A. This section specifies the requirements for temporary and permanent erosion and sedimentation controls.
- B. The Contractor shall not begin work until he is in full compliance with the LDA Permit that has been approved for the work associated with this project. Failure to install and maintain erosion control and sedimentation on the site shall constitute a violation of this permit for each day on which such failure occurs.

1.02 RELATED DOCUMENTS

- A. A Land Disturbing Activity Permit (LDA) is required for each project over 1.0 acre in disturbed area and is part of the Work associated with the project. The Contractor is required to comply with the best management practices for the control of erosion and sediment from the work site.
- B. NPDES Phase 2 General Permit Nos. GAR 100001, GAR 100002, GAR 100003 for the discharge of storm water associated with construction activity for projects one (1) acre and larger is required and is a part of the work associated with this project. Both the Owner and the Contractor are primary permittees (any entity that has submitted a Notice of Intent) of the Erosion, Sedimentation and Pollution Control Plan (ES&PCP). The Owner provides the ES&PCP to the Contractor. A copy of this permit will be provided to the Contractor and the Contractor shall comply with its provisions until the work is completed and accepted by the Owner.
- C. *The Contractor cannot start work until fourteen (14) days after the Owner has filed the Notice of Intent (NOI).*
- D. The ES&PCP and Comprehensive Monitoring Plan (CMP) will indicate when, where and how often the site inspection and water testing should be conducted. Inspections will be made by The City of Pooler.
- E. NPDES Phase 2 Stormwater Discharge Permit Fees as required by Rules & Regulations for Water Quality Control Chapter 391-3-6, Latest Revision is part of the permit requirement. These fees shall be paid prior to the commencement of any land disturbing activity.

1.03 EROSION AND SEDIMENTATION ACT - DEFINED

- A. It is the intent of this Specification that the Project Manager and the Contractor comply with all applicable requirements of the State of Georgia Erosion and Sedimentation Control Act of 1975 as amended and any County or Municipal Soil Erosion Ordinance.

Implementation of the requirements of the Act is based on the following:

1. The disturbed area and the duration of exposure to erosion elements should be minimized.
 2. Stabilize disturbed areas immediately.
 3. Retain or accumulate runoff.
 4. Retain sediment.
 5. Do not encroach upon watercourses.
- B. The Manual for Erosion and Sediment Control in Georgia further defines practices and requirements. All erosion and sedimentation control measures must be designed for a 25-year, 24-hour rain event. The Contractor is responsible for maintaining all sediment and erosion control measures on the project site during construction. The Contractor is responsible for any damage caused due to failure to implement these requirements. A Soil Erosion and Sedimentation Control Permit has been obtained by the Owner so that periodic inspections may be made by the City of Pooler. The Contractor is to cooperate with the person performing these inspections.

1.04 COORDINATION WITH CONTRACT PLANS

A Soil Erosion and Sedimentation Control Plan will be provided to the Contractor and is to be implemented as a part of the procedures necessary to implement requirements of the Act and Ordinance.

PART 2 - PRODUCTS

2.01 SILT FENCE FABRIC

- A. Silt fence fabric shall have the following characteristics:
1. Strong rot-proof synthetic fibers formed into either a woven or non-woven fabric.

2. No treatment or coating that might significantly alter its physical properties after installation.
3. Contains stabilizers and/or inhibitors to make the filaments resistant to deterioration resulting from exposure to sunlight or heat.
4. Makes a pervious sheet of synthetic fibers oriented into a stable network so that the fibers retain their relative position with respect to each other under normal handling, installation, and service conditions.
5. Has finished fabric edges to prevent the outer yarn from pulling away from the fabric.
6. Have no defects or flaws that would significantly affect its physical and/or filtering properties.

2.02 RIPRAP

Riprap shall meet the requirements of Section 805 of the GADOT Standard Specifications. Filter fabric for permanent riprap shall be Mirafi 140N or an approved equal.

2.03 STORM DRAIN OUTLET PROTECTION

Storm drain outlets shall be paved or have rock or other energy dispersion device associated with it as shown on the Drawings. A separation geotextile fabric shall be used beneath the riprap apron. The geotextile fabric shall be Mirafi 140N or an approved equal.

PART 3 - EXECUTION

3.01 IMPLEMENTATION

- A. All erosion and control measures must be installed prior to initiation of construction activity.
- B. A temporary construction egress pad shall be installed and maintained at any point where construction vehicles enter a paved road, street or parking area. The pad shall be used to prevent mud from leaving the construction area. The pad shall be constructed as shown on the Drawings.
- C. All disturbed areas shall be grassed by sodding or seeding, fertilizing, mulching and watering to obtain a ground cover which prevents soil erosion.
- D. All measures installed for sediment control shall be checked at the beginning and end of each day when construction is occurring to ascertain that the measures are in place and functioning properly.

- E. Erosion control measures shall be inspected by the Contractor after each rainfall event and at least daily during prolonged periods of continuous rainfall. Contractor shall make repairs and adjustments as necessary to maintain the effectiveness of all sediment and erosion control measures.
- F. The Contractor shall remove all silt fencing after permanent grassing is established and accepted by the Owner.
- G. Silt fence or straw bales shall be installed around storm drain inlets under construction and at existing inlets.
- H. The Contractor shall control dust by wetting down the access road with water or by using a deliquescent chemical if the relative humidity is over 30%. Chemicals shall be applied in accordance with the manufacturer's instructions.
- I. The Contractor shall clean mud and debris off of the roadways adjacent to the construction entrance on a daily basis.

3.02 SYMBOLS

The Soil Erosion and Sedimentation Control Plan contain standard symbols for the different types of measures for implementing the Act. These symbols are defined for conditions, design criteria and construction specifications in Chapter 6 of the Manual and on the Drawings.

END OF SECTION 02210

SECTION 02221
EXCAVATION, TRENCHING AND BACKFILL FOR UTILITY SYSTEMS

PART 1 - GENERAL

1.01 SUMMARY

This section specifies the requirements for excavation, trenching, and backfilling for all underground utility systems. Underground utility systems include water mains and services, sanitary sewers and services, storm drains, and sanitary sewer force mains.

1.02 RELATED SECTIONS

Section 02200 - Excavation, Filling and Grading

PART 2 - MATERIALS

2.01 BEDDING

A. Bedding material shall meet the following requirements:

1. Coarse sands and gravels with maximum particle size of 40 mm (1.57 inches), including variously graded sands and gravels containing small percentages of fines, generally granular and non-cohesive, either wet or dry.
2. Fine sand and clayey gravels, including fine sands, sand-clay mixtures, and gravel-clay mixtures.

2.02 BACKFILL

- A. Backfill material shall consist of suitable excavated materials or imported gravel meeting the requirements of #57 stone.
- B. All backfill material shall be free of stones, concrete and clay lumps larger than a cubic foot. Roots, stumps and rubbish which will decompose will not be permitted in the backfill. Backfill material shall have its moisture content corrected, as may be necessary before being placed in the trench to bring the moisture content to approximately "optimum" for good compaction. Any rock, stone, concrete, clay lumps larger than a cubic foot in volume, rubbish and debris shall be removed from the site and properly disposed of by the Contractor.

PART 3 - EXECUTION

3.01 GENERAL

Underground piping and utility systems which are to be installed in trenches whose lowest point of excavation is below the existing ground level and are unaffected by an excavation for structures, may be installed at any time during the course of the work. Piping and systems to be installed in or over fill, backfill or new embankments shall not be installed until all earthwork has been completed to rough grade, nor until settlement of the fill or embankment has taken place.

3.02 LOCATION AND PROTECTION OF UTILITIES AND STRUCTURES

- A. It shall be the responsibility of the Contractor to acquaint himself with the location of all utilities and structures both present and proposed, also all existing surface structures which may be affected by work under the Contract. The location of any underground structures furnished, shown on the Drawings or given on the site are based upon the available records but are not guaranteed to be complete or correct, and are given only to assist the Contractor in making a determination of the existence of underground structures.
- B. Overhead utilities, poles, etc., shall be protected against damage by the Contractor, and if damaged by the Contractor, shall be replaced by him. The Contractor shall notify those who maintain utilities sufficiently in advance of the proposed construction so that they may locate, uncover and disclose such work. If the progress of construction necessitates the removal or relocation of poles, overhead utilities and obstructions, the Contractor shall make all arrangements and assume all costs of the work involved.
- C. The Contractor shall provide for the continuance of the flow of any sewers, drains, water pipes, and water courses, and the like. Where such facilities, water courses, or electric overhead wires or conduits are interfered with by the work of the Contractor, the interruption shall be a minimum and shall be scheduled in advance with the Engineer and the utility owner.
- D. The Contractor shall restore all facilities interfered with to their original condition or acceptable equivalent. The cost of such restoration or damage caused directly by his work shall be paid for by the Contractor and shall be included in the prices bid for the items to which it pertains.

3.03 EXCAVATION AND TRENCHING

- A. Excavation
Excavate all materials encountered. See Section 02200 for additional requirements.

B. Caution in Excavation

The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures in the trench zone may be determined before being damaged. He shall be held responsible for the repair or replacement of such structures when broken or otherwise damaged because of his operations.

C. Trench Excavation

Trenches shall be wide enough to permit proper installation of pipe fittings and placing and compacting bedding and backfill materials. The width of the trench shall be sufficient to accommodate compaction equipment. Whenever possible, the clear width of the trench at the top of the pipe should not exceed the pipe outside diameter plus 24 inches.

D. Alignment and Grade

Trenches shall be excavated on the alignments shown on the Drawings, and to the depth and grade necessary to accommodate the pipes at the elevations shown. Where elevations of the invert or centerline of a pipe are shown at the ends of a pipe, the pipe shall be installed at a continuous grade between the two elevations.

E. Over Excavation

Excavation in excess of the depth required for proper shaping shall be corrected by bringing to grade the invert of the ditch with compacted coarse, granular material at no additional expense to the Owner. Bell holes shall be excavated to relieve bells of all load, but small enough to insure that support is provided throughout the length of the pipe barrel.

Excavation in excess of the depths required for manholes and other structures shall be corrected by placing a sub-foundation of 1500 psi concrete, at no additional expense to the Owner.

F. Rock Excavation

Rock found in trench shall be removed for a depth of at least six (6) inches below the bottom of the pipe.

3.04 SHEETING AND SHORING

Excavations, shall be properly shored, sheeted and braced by the Contractor to maintain excavation in a condition to permit the safe and efficient installation of all items of Contract work. Braced and sheeted trenches and open trenches shall comply with all state laws and regulations, and local ordinances relating to safety, life, health and property. Also, this shall conform to the Occupational Safety and Health Standards for Excavations, Final Rule (29 CFR Part 1926) as printed in the October 31, 1989 issue of the Federal Register.

3.05 DEWATERING AND PROTECTION AGAINST WATER

- A. The Contractor shall remove water from the site and shall lower the ground water level as necessary to complete the excavations to the required depths and so that all required work can be accomplished in the dry. The Contractor shall perform well construction, well pointing, sheeting, ditching, and pumping, and shall construct necessary drains, channels and sumps to keep his excavations and new structures clear of ground water, storm water or sewage and to keep his construction areas dry during the progress of the Work.
- B. Adequate measures and protection shall be provided by the Contractor to protect his work from damage from uplift due to ground water, storm water, or flood water. Any damages which may result due to dewatering shall be the Contractor's responsibility.
- C. All water discharged by pumping operations shall be discharged so as not to interfere with work under this Contract or with existing structures and operations. Water from dewatering operations shall be conveyed to the existing drainage features, using piping and pumping facilities provided by the Contractor. Route of dewatering pipe shall be subject to the Engineer's review. Discharge facilities and water quality shall comply with applicable regulations of State and Federal agencies.
- D. Dewatering operations shall be uninterrupted and continuous during the course of the work so as not to endanger any construction in place or to present a hazard to workmen in and around the site. The Contractor shall take all measures necessary including, but not limited to, standby equipment and constant attendance to ensure that the dewatering system remains operational and effective throughout the period of time that it is required.
- E. No water shall be allowed to run over any uncompleted portions of the work. No units of the work shall be constructed under water. The cost of dewatering shall be included in the price bid for the item of work for which it is required.

3.06 REMOVAL AND REPLACEMENT OF UNSUITABLE FOUNDATION MATERIAL

- A. When the trench is excavated to the plan depth or as required by these Specifications, and soft or other material not suitable for bedding purposes is encountered in the trench, the Contractor shall immediately notify the Engineer for inspection and measurement of the unsuitable material to be removed. Where, in the opinion of the Engineer, the subgrade of the pipe trench is unsuitable material, the Contractor shall remove the unsuitable material to a depth of 6" for the full width of the trench and furnish and place stone backfill in the trench to stabilize the subgrade. Payment for removal and replacement of unsuitable material shall be in accordance with the requirements of the Measurement and Payment Section.
- B. Attention is invited to the fact that the presence of water does not necessarily mean that stone backfill is required. If well points or other types of dewatering will remove

the water, the Contractor shall be required to completely dewater the trench in lieu of stone backfill. Removal and replacement of unsuitable material with stone backfill will be limited to areas where well pointing and other conventional methods of dewatering will not produce a dry bottom.

- C. No payment will be made for any overdepth excavation of soft unstable material due to the failure of the Contractor to provide adequate means to keep the trench dry.
- D. No payment will be made for any overdepth excavation of the unsuitable material and replacement not inspected and measured by the Engineer prior to excavation.

3.07 PLACEMENT OF BEDDING MATERIALS

- A. Bedding material shall be placed and compacted up to the springline of the pipe.
- B. Bedding material around the pipe shall be installed with care. Care shall be used to insure that sufficient material has been worked under the haunch of the pipe to provide adequate side support. Precautions must be taken to prevent movement of the pipe during placing of the material through the pipe haunch.
- C. Avoid contact between the pipe and compaction equipment. Compaction of bedding shall be done so that compaction equipment will not damage the pipe.
- D. ASTM D2321 "Underground Installation of Flexible Thermoplastic Sewer Pipe" shall be used in conjunction with the above.

3.08 PLACEMENT OF BACKFILL MATERIAL

- A. Backfilling operations in this work are referred to herein as Backfilling at the Pipe Zone, Type "A" and Type "B". Type A backfilling shall be used where trenches cross under roadways, paved areas, and structures. Type B backfilling shall be used in all other areas.
- B. Type "A" backfill shall consist of suitable excavated materials or imported gravel or soil placed in the trench in 6 inch thick layers from one foot above the pipe to finished grade. Each 6-inch layer shall be compacted before additional material is placed in the excavation. The density of the backfilled material after compaction shall be equal to 100 percent of the maximum density obtainable at optimum moisture content as determined by the Standard Proctor Test (ASTM D698). No water shall be used to secure compaction except for adding water to the backfill material before placing in the trench to bring moisture content to approximately "optimum" for good compaction.
- C. Type "B" Backfilling shall consist of suitable excavated materials or imported gravel or soil placed in the trench in 12 inch thick layers from the spring line of the pipe to finished grade. Each 12 inch thick layer shall be compacted before additional

backfill material is placed in the excavation. The density of the backfilled material after compaction shall be equal to 95 percent of the maximum density obtainable at optimum moisture content as determined by the Standard Proctor Test (ASTM D698). Water shall be added to backfill material only before being placed in the trench in order to bring the moisture content to approximately "optimum" for good compaction.

3.09 CONSTRUCTION ALONG HIGHWAYS, STREETS AND ROADWAYS

A. Operations

Excavation, trenching and backfilling along highways, streets and roadways shall be in accordance with the applicable regulations of the Georgia State Highway Department with reference to construction operations, safety, traffic control, road maintenance and repair.

B. Removing And Resetting Fences

Where existing fences must be removed to permit construction, the Contractor shall remove such fences. As construction progresses, reset the fences in their original location and to their original condition. All costs of removing and resetting fences and such temporary works as may be required shall be included in the prices for the utility line or as provided for in the Bid Proposal.

C. Protecting Trees, Shrubbery And Lawns

Trees and shrubbery along trench lines shall not be disturbed unless absolutely necessary. Trees and shrubbery necessary to be removed shall be properly heeled-in and re-planted. Heeling-in and re-planting shall be done under the direction of an experienced nurseryman. Where utility trenches cross established lawns, sod shall be cut, removed, stacked and maintained in suitable condition until replaced.

Topsoil underlying lawn areas shall likewise be removed and kept separate from general excavated materials. Removal and replacement of sod shall be done under the direction of an experienced nurseryman.

D. Protection of Traffic

Provide suitable signs, barricades and lights for protection of traffic, in locations where traffic may be endangered by construction operations. All signs removed by reason of construction shall be replaced as soon as condition which necessitated such removal has been cleared. No highway, street or roadway shall be closed without first obtaining permission from the proper authorities.

E. Drainage Structures

All side ditches, culverts, cross drains and other drainage structures shall be kept clear of excavated material and be free to drain at all times.

F. Maintaining Highways, Streets, Roadways and Driveways

The Contractor shall furnish proper equipment which shall be available for use at all times for maintaining highways, streets and roadways. All such streets, highways and roadways shall be maintained in suitable condition until completion and final acceptance of the work.

The Contractor shall repair all driveways that are cut or damaged and maintain them in suitable condition until completion and final acceptance of the work.

3.10 PROTECTION OF WATER SUPPLY PIPES

A. Parallel Installation

Water mains shall be laid at least ten (10) feet horizontally from any existing or proposed sanitary sewer, storm sewer or sewer manhole. The distance shall be measured edge to edge. When local conditions prevent a horizontal separation of 10 feet, the water main maybe laid closer to a sewer (on a case-by-case basis) provided the water main is laid in a separate trench or on an undisturbed earth shelf located on one side of the sewer at such an elevation that the bottom of the water main is at least 18 inches above the top of the sewer. The sewer materials and joints shall be the equivalent to water main standards of construction and be pressure tested as required in Section 02700 to assure water-tightness.

B. Crossing

Water mains crossing sewers, storm sewers or sanitary sewers shall be laid to provide a separation of at least 18 inches between the bottom of the water main and the top of the sewer. At the crossings, one full length of water pipe shall be located so that both joints will be as far apart as possible. When local conditions prevent a vertical separation of 18 inches, the sewer passing over or under the water mains shall be constructed of materials and with joints that are equivalent to water mains standards of construction and shall be pressure tested as required in Section 02700 to assure water-tightness.

C. Special Conditions

When water mains cross under sewers, additional measures shall be taken by providing:

1. A vertical separation of at least 18 inches between the bottom of the sewer and the top of the water main;
2. That the one full length of water pipe be centered at the point of crossing so that the joints will be equidistant and as far as possible from the sewer; and, special structural support for the water and sewer pipes be installed if required.
3. Both the sewer and the water main shall be constructed of water pipe

materials and subjected to hydrostatic test, as prescribed in Section 02700 - Water Distribution System and/or Section 02710 - Sewer Force Mains. Encasement of the water pipe in concrete shall also be considered.

3.11 REMOVE AND REPLACE PAVEMENT

- A. Pavement and base course which must be removed for constructing sewers, manholes, force mains, water lines, and all other appurtenances in streets shall be replaced as specified in Section 02500.
- B. The top 18 inches of subgrade material immediately under the paving base and also road shoulder shall be carefully removed and kept separate from the rest of the excavated material. This material shall be placed in the top 18 inches of the backfill. Further compaction shall be accomplished by leaving the backfilled trench open to traffic while maintaining the surface with crushed stone or gravel. Settlement in trenches shall be refilled with crushed stone or gravel, and such maintenance shall continue until replacement of pavement.
- C. Where utility lines are constructed on unpaved streets, roads or easements, the top 18 inches of soil shall be stripped and windrowed separate from the excavation from trenches. After the line has been installed and the backfill completed within 18 inches of the original grade, the salvaged surfacing shall be replaced. This work shall be considered as general clean-up along with the removal of surplus excavated materials from the site and the restoring of the surface outside trench limits to its original condition, the cost of which shall be included in the price bid for the utility line.

3.12 WALKS, DRIVES, CONCRETE CURB AND GUTTER

- A. Walks, driveways, and concrete curb and gutter designated for removal or are damaged during the course of construction shall be replaced in accordance with Section 02520, and the Standard Drawings.
- B. Sidewalks, driveways, and concrete curb and gutter shall be removed by making a vertical saw joint between any existing sidewalk, driveway, or curb and gutter that is to remain in place and the portion that is to be removed. The subgrade shall be compacted in accordance with the requirements of Section 02200. Concrete shall be placed in accordance with Section 02520.

3.13 TESTING

- A. General
The Contractor shall select a qualified independent testing laboratory, acceptable to the Engineer, for the purpose of identifying soils, checking densities, and classifying

soils materials during construction. All testing will be paid for by the Contractor. Copies of all test results shall be furnished to the Engineer.

B. Moisture-Density Tests

Testing shall be in accordance with ASTM Methods D698 or other tests acceptable to the Owner. A test shall be performed on each type of material used in the work regardless of source. Tests will be accompanied by particle-size analyses of the soils tested (ASTM Methods D421 and D422). Changes in color, gradation, plasticity or source of fill material will require the performance of additional tests. Copies of all test results shall be furnished to the Engineer.

C. Field Density Tests

Tests shall be made in accordance with ASTM Method D1556 or other tests acceptable to the Owner. Tests shall be made in accordance with the following minimum schedule or as required by the soils technician or as may be directed by the Engineer:

One test for each lift of backfill for each 200 feet of trench or fraction thereof.

D. Submittals

1. The soils technicians will submit formal reports of all compaction tests and retests.
2. The reports are to be furnished to the Owner and the Engineer as soon as possible upon completion of the required tests.
3. This report information is to include but not be limited to the following:
 - a. Date of the test and date submitted.
 - b. Location of test.
 - c. Wet weight, moisture content and dry weight of field sample.
 - d. Description of soil.
 - e. Maximum dry density and moisture content of the lab sample which best matches the field sample in color, texture, grain size and maximum dry density.
 - f. Ratio of field dry density to maximum lab dry density expressed as a percentage.
 - g. Comments concerning the field density passing or failing the

specified compaction.

h. Comments about re-compaction if required.

E. Compaction Results

1. If any compaction test reveals that fill or backfill is not compacted as specified, the Contractor shall scarify and re-compact as required to achieve the specified density. Additional compaction tests shall be made to verify proper compaction. These additional tests, required due to failure of the original test shall be paid for by the Contractor.
2. The soils technician is to advise the Engineer and the Contractor's Superintendent immediately of any compaction tests failing to meet the specified minimum requirements. No additional lift is to be placed on a lift with any portion failing.

END OF SECTION 02221

SECTION 02310
BORE AND JACK

PART 1 - GENERAL

1.01 SUMMARY

- A. This section specifies the requirements for the installation of pipeline crossings under roads, highways and railroad tracks. The Owner will obtain the necessary permits for all crossings.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Casing pipe

1. Casing Pipe shall be new and unused. Casing pipe shall meet ASTM A139 Grade B (Hydrostatic testing is not required). One end of the pipe shall be beveled to a standard 37 degree bevel.
2. Casing pipe shall be steel pipe with full circumference welded joints having minimum yield strength of 35,000 psi. Casing pipe shall be seamless or straight seam. Spiral weld pipe is unacceptable. Length and diameter shall be as shown on the Drawings.
3. Casing pipe wall thickness shall be as indicated unless shown otherwise on the Drawings. Thickness shall be as indicated below for minimum depth of 4'-6" ground cover, for pipe not coated or cathodically protected:

CASING PIPE WALL THICKNESS:

NOMINAL SIZE (INCHES)	RAILROAD CROSSING (INCHES)	HIGHWAY CROSSING (INCHES)
8	0.250	0.250
10	0.250	0.250
12	0.250	0.250
14	0.250	0.250
16	0.281	0.250
18	0.312	0.250
20	0.344	0.312
24	0.375	0.312

30	0.469	0.375
36	0.531	0.500
42	0.625	0.500
48	0.688	0.625
54	0.781	0.625
60	0.844	0.625
66	0.938	0.625
72	1.00	0.750

B. Carrier Pipe

Carrier pipe shall be restrained joint ductile iron pipe or restrained joint PVC pipe as indicated on the Drawings and shall conform to the requirements for pipe as specified in appropriate Section of these Specifications. The diameter of the casing shall be based on the nominal diameter of the carrier pipe as shown in the following tables:

PRESSURE SYSTEM CARRIER PIPE:

Carrier Pipe Nominal. I.D. (Inches)	Casing Nominal. I.D (Inches)
4	16
6	18
8	20
10	24
12	24
16	30
18	30
24	36
30	48
36	54
42	60
48	66

GRAVITY SYSTEM CARRIER PIPE:

Carrier Pipe Nominal. I.D. (Inches)	Under 100' Casing Nominal I.D. (Inches)	Over 100' Casing Nominal I.D. (Inches)
4	18	20
6	20	24
8	24	30
10	24	30

12	30	36
16	36	42
18	36	42
24	48	54
30	54	60
36	60	66
42	66	72
48	72	

4. Casing spacers shall be stainless steel with solid plastic or nylon runners and stainless steel hardware by Cascade, or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. Casing pipe

1. Installation of casing pipe, where indicated on the Drawings, shall be by boring and jacking as specified herein.
2. Suitable pits or trenches shall be excavated for the equipment and its operation. Where necessary, pits and trenches shall be securely sheeted and braced to prevent caving.
3. Construction shall be done in a manner that will not interfere with the operation of the facility, and shall not weaken the roadbed or structure.
4. Jacks for forcing the pipe through the roadbed shall have a jacking head constructed in such a manner as to apply uniform pressure around the ring of the pipe. The pipe to be jacked shall be set on guides, braced together, properly supported and directed to the proper line and grade. In general roadbed material shall be excavated just ahead of the pipe using the boring auger, the excavated material removed through the pipe, and the pipe forced through the roadbed into the excavated space.
5. The diameter of the excavation shall conform to the outside diameter and circumference of the pipe as closely as practical. Any voids which develop during the installation operation shall be pressure grouted with an approved mix.
6. Variation in the final position of the pipe from the line and grade established by the Engineer will be permitted only to the extent of 2 percent in lateral

alignment, and 1 percent in vertical grade.

7. When boring and jacking of pipe is once begun the operation shall be carried on without interruption insofar as practical, to prevent the pipe from becoming firmly set in the embankment.
8. Any pipe damaged in boring and jacking operations shall be removed and replaced by the Contractor at his expense.
9. The pits or trenches excavated to facilitate boring and jacking operations shall be backfilled immediately after the operation has been completed. Wet boring and jacking shall not be permitted.

B. Carrier Pipe

Carrier pipe joints shall be assembled and pushed through casing pipe on casing spacers. After installation of carrier pipe, the ends of the casing pipe shall be closed.

C. Casing Spacers

Casing spacer shall be installed in accordance with the manufacturer's recommendations.

END OF SECTION 02310

SECTION 02400
STORM DRAINAGE SYSTEM

PART 1 - GENERAL

1.01 SUMMARY

This section specifies the requirements for the installation of the storm drainage systems as shown on the drawings.

1.02. RELATED SECTIONS

Section 02200 - Excavation, Filling and Grading

Section 02221 - Excavation, Filling and Backfilling for Utility Systems

1.03 EXCAVATION AND BACKFILL

Excavation and backfilling shall be as specified in Section 02221, Excavation, Trenching and Backfilling for Utility Systems.

1.04 DELIVERY, STORAGE, AND HANDLING OF MATERIALS

A. Delivery and Storage

Materials delivered to site shall be inspected for damage, unloaded, and stored with the minimum of handling. Do not store materials directly on the ground. Inside of pipes and fittings shall be kept free of dirt and debris.

B. Handling

Materials shall be handled in such a manner as to insure delivery to the trench in sound undamaged condition. Pipe shall be carried to the trench, not dragged. Gasket materials and plastic materials that are not to be installed immediately shall not be stored in the direct sunlight.

PART 2 - PRODUCTS

2.01 PIPE FOR CULVERTS AND STORM DRAINS

Pipe for culverts and storm drains shall be as indicated and shall conform to requirements for the following types.

A. Concrete Pipe

Pipe shall be reinforced concrete pipe conforming to ASTM C76, Class III. The minimum pipe diameter shall be 15".

1. Joints

- a) Joints shall be made by use of a continuous rubber gasket conforming to the requirements of ASTM C443. Type II or III rubber gaskets shall be used on the pipe. Joints which do not fit tightly and uniformly shall be grouted after that segment of the line has been installed. All pipe joints shall be wrapped with a two foot wide strip of non-woven filter fabric lapped two feet.
- b) The assembly of the gasketed joint shall be performed as recommended by the pipe manufacturer. The elastomeric gaskets may be supplied separately in cartons or prepositioned in the bell joint or coupling at the factory. In all cases, clean the gasket, the bell or coupling interior, especially the groove spigot area to remove any dirt or foreign material before assembling. Inspect the gasket, pipe spigot bevel, gasket groove, and seating surfaces for damage or deformation. When gaskets are separate, use only gaskets which are designed for and supplied with the pipe. Insert them as recommended by the manufacturer.
- c) Lubricant should be applied as specified by the pipe manufacturer. Align the spigot to the bell and insert the spigot into the bell until it contacts the gasket uniformly.

2.02 DRAINAGE STRUCTURES

Drainage structures shall be of the following types, constructed of the materials specified for each type and in accordance with the indicated details.

A. Manholes and Inlets

Construction shall be of reinforced concrete, plain concrete, brick, precast reinforced concrete or precast concrete segmental blocks, complete with frames and covers or gratings. Precast concrete manholes and inlets shall be designed for the required depth and to sustain the required wheel loads and/or surface pressures. When manholes and inlets are to be constructed of prefabricated materials, shop drawings shall be submitted for approval before ordering the material.

B. Connection to Existing Inlets and/or Manholes

Pipe connections to existing inlets and/or manholes shall be in such a manner that the finished work will conform as nearly as practicable to the applicable requirements specified for new inlets and/or manholes, including all necessary concrete work, cutting and shaping.

B. Corrugated Polyethylene Pipe

Shall be high density polyethylene corrugated pipe with an integrally formed smooth interior. Corrugations shall be annular.

Pipe shall be made of polyethylene compounds which conform to the requirements of Cell class 335420C (min.) as defined and described in ASTM D-3350, except that carbon black shall not exceed 5%. Requirements for test methods, dimensions, and markings are those found in AASHTO Designations m-252 and M-294.

Minimum parallel plate pipe stiffness values shall be as follows:

<u>Diameter</u>	<u>Pipe Stiffness*</u>
15"	42 psi
18"	40 psi
24"	34 psi
30"	28 psi
36"	22 psi
42"	19 psi
48"	17 psi
60"	14 psi

* Per ASTM Test Method D-2412

Joints shall be integral bell and spigot with a gasket on the spigot end. Gasket material shall meet ASTM F-477.

Installation shall be in accordance with ASTM Recommended Practice D-2321 or as specified by the Project Engineer or Local approving agency.

A manufacturer's certification that the product was manufactured, tested, and supplied in accordance with this specification shall be furnished to the Project Engineer upon request.

2.03 MATERIALS FOR DRAINAGE STRUCTURES

A. Mortar

1. Mortar for connections to other drainage structures, and brick or block construction shall conform to ASTM C270, Type M, except the maximum placement time shall be one half hour.
2. Hydrated lime may be added to the mixture of sand and cement in a quantity equal to 25 percent of the volume of cement used. Hydrated lime shall conform to F.S. SS-L-351, Type M, or ASTM C141, Type A.

3. The quantity of water in the mixture shall be sufficient to produce a stiff workable mortar but in no case shall exceed 5 gallons of water per sack of cement. Water shall be clean and free of harmful acids, alkalies, and organic impurities. The mortar shall be used within 30 minutes after the ingredients are mixed with water.

B. Precast Reinforced Concrete Manholes

Manholes shall conform to ASTM C478 or AASHTO M199. Joints between precast concrete risers and tops shall be flexible plastic gasket and shall provide a flexible watertight joint. Flexible plastic gasket shall be RAM-NEK, or equal.

C. Precast Concrete Segmental Blocks

Blocks shall conform 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.

D. Bricks

Bricks shall conform to ASTM C62, Grade SW; ASTM C55, Grade S-I or S-II; or ASTM C32, Grade MS. Mortar for jointing and plastering shall consist 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. The joints shall be filled completely and shall be smooth and free from surplus mortar on the inside of the structure. Brick structures shall be plastered with 3/4 inch of mortar over the entire outside surface of the walls. For square or rectangular structures, brick shall be laid in stretcher courses with a header course every sixth course. For round structures, brick shall be laid radially with every sixth course a stretcher course.

E. Frame and Cover or Gratings

Fabrication shall be from one or more of the material options presented in F.S. RR-F-621, except the malleable cast iron option shall conform to ASTM A220, Grade 40010. Weight, shape, size and waterway openings for grates and curb inlets shall be as indicated on the plans. Frames and covers for curb inlets and for areas not subject to vehicular traffic or storage may be malleable iron if so indicated. Malleable iron frames and covers shall conform to ASTM A220 and shall be of the weight, shape and size indicated.

2.04 BEDDING

See Section 02221 "Excavation, Trenching and Backfill for Utility Systems," for additional requirements.

PART 3 - EXECUTION

3.01 PLACING PIPE

- A. Each pipe shall be carefully examined before being laid, and defective or damaged pipe shall not be used. Pipe lines shall be laid to the grades and alignment indicated. Proper facilities shall be provided for lowering sections of pipe into trenches. Under no circumstances shall pipe be laid in water, and no pipe shall be laid when trench conditions or weather are unsuitable for such work. Pipe shall be moved horizontally into place by use of a winch or other suitable means. A backhoe bucket or other means which could damage the pipe shall not be used. Diversion of drainage or dewatering of trenches during construction shall be provided as necessary. All pipes shall be inspected in place before backfilling, and pipe damaged during placement shall be removed and replaced at no additional cost to the Owner. No additional compensation will be given to the Contractor for the required diversion of drainage and/or dewatering of trenches.

3.02 BACKFILLING

Backfilling shall be done in accordance with Section 02221, "Excavation, Trenching and Backfill for Utility Systems."

3.03 RIPRAP

A. Materials

Bag riprap shall consist of sand and portland cement mixed at the ratio of 4:1 by weight. The amount of water used shall be sufficient to make up the optimum moisture content of the aggregate and cement, as determined by AASHTO T134.

B. Placement

The bags shall be uniformly filled to the maximum capacity which will permit satisfactory tying. The bagged rip-rap shall be placed by hand with the tied ends facing the same direction, with close, broken joints. After placing, the bags shall be rammed or placed against one another to produce the required thickness and form a consolidated mass. The top of each bag shall not vary more than 3 inches above the required plan.

3.04 STONE RIPRAP

A. Materials

The stone used for stone slope protection shall be sound, rough, dense and resistant to the action of air and water and satisfactory to the Engineer. The stone shall have a density of not less than 150 pounds per cubic foot. Neither the breadth nor the thickness of any piece of stone shall be less than one-third of its length. The stone will be subject to inspection on delivery and if found to be improper gradation or

quality, it will be rejected. The stone shall consist of quarry run sizes, graded as specified below:

STONE SLOPE PROTECTION

SIZE OF STONE PERCENT OF TOTAL WEIGHT SMALLER THAN THE GIVEN SIZE

Class I

100 lb.	100
60 lb.	80
25 lb	50
2 lb.	Not to Exceed 10

B. Placement

The slope protection shall be placed in such a manner as to produce a reasonable well-graded mass of material with the minimum practicable percentage of voids, and shall be constructed within the limits and to the lines, grades, and sections shown on the Plans. A tolerance of plus 6 inches or minus 3 inches from the limits shown on the Plans will be allowed in the finished surface on the slope protection except that the extreme of this tolerance shall not be continuous over an area greater than 100 square feet. Materials shall be placed in horizontal layers starting on the riverward edge of the section and worked up the slope. Dumping down the slope will not be permitted. Materials shall not be dropped from a height greater than 3 feet. Any damage to the slope due to the fault of the Contractor shall be repaired at no expense to the Owner. Stone shall be placed on geotextile fabric.

3.05 GEOTEXTILE FABRIC

Geotextile fabric shall have excellent puncture and tear resistance properties and act as a separation barrier between fine grain soils and load distributing aggregate fill material. Geotextile fabric shall be a woven fabric meeting the following requirements:

Fabric Property	Unit	Test Method	Typical Values
Grab Tensile Strength	lb	ASTM D-1682	200
Grab Tensile Elongation	%	ASTM D-1682	30 (MAX)
Burst Strength	psi	ASTM D-3786	400

Trapezoid Tear Strength	lb	ASTM D-1117	115
Puncture Resistance	lb	ASTM D-3787	85

Fabric shall be Mirafi 140, or equal.

3.06 SUBGRADE DRAINS

Subgrade drains will be provided from storm drain inlets where required because of the groundwater table. The subgrade drain will consist of a trench containing a 6 inch perforated pipe embedded in granular material as shown in the detail on the Plans. The drain will extend 10 feet in two directions from the inlet and will be extended beyond that point when instructed by the Owner or his representative. The drains will be constructed on a uniform slope toward the inlet.

3.07 SHOP DRAWINGS

Shop drawings shall be submitted on each manufactured item supplied under this Section along with other information as specified.

END OF SECTION 02400

SECTION 02451
CHAIN LINK FENCE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS:

Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 and 2 Specification Sections, apply to this Section.

Section 03300 - Concrete

1.2 SCOPE:

The work under this heading includes the furnishing and installation of chain link fences and gates with three strands of barbed wire on top as specified herein and as shown on the Drawings.

1.3 MANUFACTURER:

The fence shall be the product of a manufacturer who has demonstrated by actual installations of a similar nature that its product is of the type required. The Contractor shall include all supplementary parts necessary or required for a complete and satisfactory installation within the true meaning and intent of the Drawings. All runs of the fence shall present the same general appearance and the product of one manufacturer only will be accepted.

PART 2 - PRODUCTS

2.1 CHAIN LINK FENCING:

Fencing for chain link fence shall be as follows:

2.1.1 Fabric.

The chain link fence fabric shall conform to ASTM A392. The size of mesh shall be 2 inches and the wire shall be No. 9 Gauge Basic Open Hearth Steel, hot-dip galvanized after weaving with a minimum of 1.20 ounces of zinc or 0.40 ounces of aluminum per square foot of uncoated wire surface. The wire shall be standard finish with the top selvage knuckled and the bottom selvage twisted and barbed. Height of fence shall be **8-feet** excluding barbed wire top extension.

2.1.2 Wire Fabric Ties.

Wire fabric ties shall be No. 9 Gauge Hot-Dip Galvanized Steel Wire conforming to ASTM A112 and spaced 12 inches apart on all posts and 24 inches apart on all rails. Tie wires shall be a double loop and 6.5 inches in length. Clips are not allowed.

2.1.3 Posts, Rails and Braces.

Metal post shall comply with ASTM F-1083, Group IC, zinc coated. Rolled formed steel is not permitted. Gate posts shall be for the gate type specified subject to the limitation specified in ASTM F-900 and/or ASTM F-1184. Line and brace posts shall be 2-3/8 inches O.D., 3.55 pounds per linear foot, hot-dip galvanized steel pipe. Corner and end posts shall be 2-7/8 inches O.D., 5.79 pounds per linear foot, hot-dip galvanized steel pipe. The top rails and braces shall be 1-5/8 inches O.D., 2.27 pounds per linear foot, hot-dip galvanized steel pipe. Each brace section shall be a diagonally trussed with 3/ 8 inch round hot-dip galvanized steel rod with truss tightener and fittings. All posts shall be furnished with tops and required fittings for attaching fabric and rail. Fittings shall be of malleable iron or pressed steel.

2.1.4 Gates.

Gate frames shall be tubular shaped 1.90 inches, 0.120 inches minimum wall thickness, outside diameter with welded or steel fitted corners. Braces and trusses shall be furnished as required to prevent sagging of the gate. Frames shall be covered with fabric as specified for the fence.

Gate posts shall be as follows:

<u>Leaf Width</u>	<u>Post Diameter</u>	<u>Weight/Ft.</u>
0'-5'	4" OD	9.11 lbs.
6'-18'	6-5/8" OD	18.97 lbs.
Over 18'	8-5/8" OD	28.55 lbs.

Posts, frames and fabric shall be hot dipped galvanized as specified above.

2.1.5 Miscellaneous Fittings and Hardware.

Miscellaneous fittings and hardware shall be of design standard with the manufacturer. Miscellaneous fittings and hardware shall be zinc-coated steel, and shall be equal to the materials specified in Federal Specifications RR-F-183.

2.1.6 Barbed Wire.

Barbed wire shall be of three (3) strands of galvanized No. 12-1/2 gauge wire conforming to ASTM A121 for copper bearing wire with zinc coating, meeting the requirements of Class 3. Barbs shall be of 14 gauge full round wire with 4 points, wound at 4 inch intervals.

2.1.7 Tension Wire.

Tension wire shall be Type I, Class 4 Coating, in accordance with ASTM A-824

2.1.8 Welding.

Structural members of gates which are in contact shall be fully welded by a method that will procure a continuous weld on all sides and faces of joints at exposed edges. Surplus welding material shall be removed.

2.2 CONCRETE:

Concrete shall conform to ASTM C-94/C 94M, using ¾ inch maximum size aggregate, and having minimum compressive strength of 3,000 psi at 28 days. Grout shall consist of one part Portland cement to three parts clean, well-graded sand and the minimum amount of water to produce a workable mix.

2.3 ACCESSORIES:

2.3.1 Caps:

Cast Steel galvanized; sized to post diameter, set screw required.

2.3.2 Fittings:

Sleeves, bands rail ends, tension bars, fasteners and fittings; steel

2.3.3 Extension Arms:

Cast Steel galvanized, to accommodate 3 strands of barbed wire, single arm, sloped 45 degrees.

2.3.4 Gate Hardware:

Fork latch with gravity drop, two duckbill backstop; two 180 degree gate hinges per leaf and hardware for padlock.

2.3.5 Padlocks:

2" size – No. 17 by Master Lock Co, with chain. All padlocks keyed alike.

PART 3 - EXECUTION

3.1 INSTALLATION:

The site of the fencing shall be sufficiently cleared of obstructions, and surface irregularities shall be graded so that the fence will conform to the general contour of the ground. The bottom of the fence shall be placed a uniform distance above the ground, as shown on the Drawings.

Posts shall be set in concrete as shown on the Drawings, and shall be centered in the concrete. The tops of concrete bases shall be finished smooth slightly above the ground surface and sloped to drain.

After the posts have been installed and the concrete has set so that it will not be damaged, the rails and bracing shall be installed.

The fence fabric shall be tightly stretched and fastened to all rails and posts. Care shall be taken to not stretch the wire so tightly that it will break in cold weather or pull the posts out of line. Fastening to gate, end and corner posts shall be with stretcher bars, clamps and bolts. Top selvage shall be dressed flush with the top rail and the bottom shall be 1-1/2 inches

above the ground. Provide a 9 gauge high carbon tension wire along the bottom. Fabric shall be spliced by pulling the ends together and twisting in a spiral connection link or picket so as to make a continuous piece of fabric between end, corner and gate posts, as the case may be.

Each post shall be fitted with a 45 degree extension arm for barbed wire as shown. Extension arms shall be malleable iron suitable for three stands of barbed wire.

Splices in barbed wire shall be of the wrap or telephone type, with each end wrapped around the other wire for not less than 6 complete turns.

The gates shall be hung level and plumb with gate fittings on braced gate posts, and shall be attached in such a manner that they cannot be lifted off the hinges. Gates shall be adjusted for easy and proper operation. Gate frames shall be of adequate size members for the gate openings shown. Welded construction may be used, in which case the frame shall be hot-dip galvanized after fabrication. Fabric shall be stretched tight across the frame and permanently and neatly secured. All gates shall be fitted with suitable hardware for locking with a padlock. Hinges shall permit the gates to swing back against the fence line. Provide catch fittings to hold gates and a plunger rod and catch block in the center of the opening of the leaf gates.

End Section 02451

SECTION 02480
GRASSING AND SODDING

PART 1 - GENERAL

1.01 SUMMARY

This section specifies requirements for includes topsoiling, fertilizer, grassing and sodding.

1.02 GENERAL

All disturbed areas resulting from work under this Contract shall be grassed or sodded as shown on the Drawings. For roads under state jurisdiction, grassing on the right-of-way shall meet the requirements of the Department of Transportation Standard Specifications.

1.03 SUBMITTAL

Manufacturer's data shall be submitted to the Engineer on grass seed, sod and fertilizer before the materials are delivered to the project site.

PART 2 – MATERIALS

2.01 FERTILIZER

Fertilizer shall be 10-10-10 or better commercial fertilizer conforming to state fertilizer laws.

2.02 LIME

Lime shall be agricultural grade, ground limestone and shall meet the requirements of the Georgia Department of Agriculture. Lime shall be added based on the results of soil test.

2.03 STRAW MULCH

Straw mulch shall consist of straw or hay. The mulch shall be reasonable free of mature seed bearing stalks, roots, or bulblets and shall be free of Johnson Grass, Nutgrass, Sandbur, Wild Garlic, Wild Onion, Wild Mustard, Crotonaria, Pigweed, Witchweed, and Cocklebur.

2.04 WOOD CELLULOSE FIBER MULCH

Wood cellulose fiber mulch shall be made for wood chip particles manufactured for discharging uniformly on the ground when applied by a hydraulic water sprayer. It shall remain in uniform suspension in water under agitation and blend with grass seed and fertilizer to form an homogenous slurry. It shall be dyed (non-toxic) an appropriate color to facilitate metering of material.

2.05 SEED

- A. Seed shall meet the requirements of the Georgia Seed Laws and Rules and Regulations.

- B. Seed shall be delivered in suitable sealed containers labeled in accordance with applicable laws and regulations and including name and location of the producer. The pure live grass seed mixture shall be as shown on the Drawings.
- C. Mixtures of different types of seed called for in the seeding schedule shall be weighted and mixed in the proper proportions.

2.06 SOD

Sod shall be good quality, densely-rooted grass of the type indicated, free from noxious weeds. The sod shall be obtained from areas where soil is reasonably fertile and contains a high percentage of loamy topsoil. Before cutting, the sod shall be raked free of all debris and the grass cut to two inches. The thickness of the sod shall be such as to contain practically all of the dense root system of the grass and not be less than 1 inch thick. Sod shall be cut into uniform strips not less than 12 inches in width and 24 inches in length.

PART 3 - EXECUTION

3.01 SOIL PREPARATION

- A. Immediately before seeding, the soil shall be properly prepared for seeding. The areas shall be made smooth and uniform and shall conform with the finished grade and cross section shown on the Drawings. Area to be grassed, if not loose, shall be loosened to a minimum depth of 3 inches before lime, fertilizer, seed or sod is applied. Seeded areas shall be free of stones larger than 2 inches and of roots and debris of any size.

Soil test shall be performed prior to applying any seed or sod, thereby ensuring the PH is between 6.5 – 7, the range where grass and sod uptake fertilizers and maintain plant health.

- B. Seeded areas shall be moist when seeding and shall be kept moist by sprinkling until a good stand of grass is obtained and until the work is accepted by the Owner. Reseeding shall be done by the Contractor at his own expense as may be necessary to obtain a satisfactory stand of grass.
- C. The Contractor shall use mulch or other additive materials when conditions do not allow an acceptable stand of grass to grow. Mulch and additive materials shall contain no weed seeds.

3.02 SEEDING

- A. Seeding shall be performed during the periods and at the rates specified in the seeding schedule in the Drawings. Seeding shall not be performed when the ground

is frozen or excessively wet.

- B. Seeds are to be sown by a mechanical spreader either hand operated or machine operated. Seeding equipment shall be such as will continuously mix the seeds to prevent segregation
- C. Immediately after the seed has been sown, the entire area shall be raked lightly and rolled to pack the soil firmly around the seed. Seeded areas shall be uniformly mulched with a continuous blanket of straw immediately after seeded. Area shall be watered, not allowed to dry out until after germination, then water weekly at a minimum of 1" to ensure the establishment of a uniform healthy stand of grass. Straw shall be applied at a rate of 2 tons per acre. Area shall be watered, not allowed to dry out until after germination, then minimum 1" water weekly to ensure the establishment of a uniform stand of grass.

3.03 SOD

- A. Sod shall be placed between March 1st and December 1st. Sod shall be placed within 48 hours of cutting.
- B. Sod shall be moist when laid and placed on a moist bed. Sod shall be placed within 48 hours of cutting. The sod strips shall be carefully placed by hand, beginning at the toe of slopes and progressing upward, with the length of the strip at right angles to the direction of flow of surface water. All joints shall be tightly butted and end joints shall be staggered at least 12 inches. The sod shall be immediately pressed firmly into contact with bed by tamping or rolling. Screened soil shall be used to fill all joints between strips.
- C. Sod on slopes shall be pegged with sod pegs to prevent displacement. The sod shall be watered, mowed, weeded, repaired or otherwise tended to insure the establishment of a uniform healthy stand of grass.

3.04 HYDROSEEDING (WOOD CELLULOSE FIBER MULCH)

Hydroseeding shall be applied at a rate of 1500 pounds per acre in a slurry mixture of seed, fertilizer, and wood cellulose fiber mulch. The slurry mixture shall be regulated to ensure a uniform application of all materials at the rate specified.

3.05 MAINTENANCE AND RESEEDING

- A. All seeded and sodded areas shall be maintained without payment until acceptance of the Contract and any regrading, refertilizing, reseeding or resodding shall be done at the Contractor's expense. Any areas which fail to show a "catch" or uniform stand, for any reason whatever, shall be reseeded or resodded with the original mixture, and such reseeding or resodding shall be repeated until final acceptance. The Contractor shall properly water, mow, and otherwise maintain all seeded and sodded areas until

final acceptance.

- B. Damage resulting from erosion, gulleys, washouts, or other causes shall be repaired by filling with topsoil, tamping, refertilizing, and reseeding or resodding by the Contractor at his expense if such damage occurs prior to acceptance of the Contract.

END OF SECTION 02480

SECTION 02500
BASE COURSE AND BITUMINOUS PAVEMENT

PART 1 -GENERAL

1.01 SCOPE

Under this heading shall be included the furnishing and installation of base course and pavement as shown including subgrade preparation, base course and pavement.

1.02 RELATED SECTIONS

Section 02200 - Excavation, Filling and Grading

Section 02221 - Excavation, Filling and Backfilling for Utility Systems

Detail P10 – Typical Pavement Sections

1.03 GENERAL

Subgrade preparation shall include leveling, compacting and proof-rolling of the subgrade as required. Installation of the base course shall include the placing and compacting of the material with appropriate equipment. Pavement shall be placed as shown on the plans with the necessary equipment and shall include any prime coats or tack coats required. All work shall be in conformity with the lines, grades and typical cross-sections shown on the Plans. The Contractor must have all equipment and workers on the job site necessary to perform a given operation when it is initiated.

1.04 SUBGRADE PREPARATION

The subgrade shall be brought to the line and grade necessary to accommodate the base and pavement at the required finished grades. Subgrade shall be completely compacted in accordance with the requirements of Section 02200. All subgrade shall be proof-rolled as specified, before base course is placed on the subgrade.

PART 2 - MATERIALS

2.01 BASE COURSE

A. Preparation of Base

The surface of the base course will be inspected by the Engineer for adequate compaction and surface tolerances specified in applicable base course or sub-base course. Any ruts or soft yielding spots that may appear in the base course, any areas having inadequate compaction, and any deviations of the surface from the requirements specified for the base course shall be corrected by loosening the affected areas, by removing unsatisfactory material and adding approved material where required, and by reshaping and recompacting to line and grade and to the

specified density requirements. Compaction of base material shall be done by conventional means using a 30,000 to 40,000 pound vibratory roller or other means of obtaining the required compaction.

The lines and grades shown on the Contract Drawings for each pavement category of the Contract shall be established and maintained by means of line and grade stakes placed at the site of the work by the Contractor.

B. Graded Aggregate Base Course

The aggregate in the base course shall consist of a mixture of either crushed gravel, together with sand, sand-gravel, soil or other materials having similar characteristics combined as necessary to give a mixture conforming to the requirements, prescribed herein. The material and installation shall meet the requirements of Section 310 of the Georgia Department of Transportation Standard Specifications.

<u>Sieve Designation</u>	<u>Percent by Weight Passing</u>
2"	100
1-1/2"	97-100
3/4"	60-90
No. 10	25-45
No. 60	5-30
No. 200	0-15

C. Limerock Base Course.

At the Contractor's option limerock of either Miami or Ocala formation may be used, but limerock of only one formation may be used on any contract.

The minimum percentage of carbonates of calcium and magnesium in the limerock material shall be 70. The maximum percentage of water sensitive clay material shall be 3.

The liquid limit shall not exceed 35 and the material shall be non-plastic.

Limerock material shall not contain cherty or other extremely hard pieces, or lumps, balls or pockets of sand or clay size material in sufficient quantity as to be detrimental to the proper bonding, finishing, or strength of the limerock base.

At least 97 percent (by weight) of the material shall pass a 1-1/2 sieve and the material shall be graded uniformly down to dust. The fine material shall consist entirely of dust of fracture. All crushing or breaking up which might be necessary in order to meet such size requirements shall be done before the material is placed on the road.

2.02 BITUMINOUS PRIME

Bituminous prime shall be cutback asphalt RC-70 applied at the rate of 0.20 gallons per square yards. The material and application rate shall comply with Section 412 of the Georgia Department of Transportation Standard Specifications.

2.03 BITUMINOUS TACK COAT

The bituminous tack coat shall be an asphaltic material which meets the requirements of Section 413 of the Georgia Department of Transportation Standard Specifications. Application rate shall be at the rate indicated in the appropriate section on the plans or as shown on Detail P-10 "Typical Pavement Section".

2.04 PAVEMENT FABRIC

Fabric used for underlayment shall be equivalent to Phillip's Petromat.

2.05 BITUMINOUS PAVEMENT

The bituminous wearing surface shall be a plant mix conforming to the requirements of Section 400 of the Georgia Department of Transportation Standard Specifications. The job mix shall meet the requirements of 9.5mm or 12.5mm Superpave, Section 828 of the Georgia Department of Transportation Standard Specifications and shall have a Marshall Stability of 1500 pounds (50 blow) and a percent voids between 4 and 5.

A job mix formula indicating the single definite percentage for each sieve fraction of aggregate and for asphalt shall be submitted prior to surfacing operations. The job mix formula shall also show the stability as determined by the Marshall Method, the percent voids, the percent voids filled with asphalt, and the unit weight per cubic foot of compacted mix.

The general composition limits are extreme ranges of tolerances to govern mixtures made from any raw materials meeting the specifications. The submission of the job mix formula shall bind the Contractor to furnish paving mixture meeting the exact formula within allowable tolerances of plus or minus 1/2 percent for asphalt, plus or minus 7 percent of 1/2 inch and larger sieve sizes, plus or minus 5 percent for material passing the 1/2 inch thick sieve and retained on the No. 200, and plus or minus 1/2 percent of material passing the No. 200.

Compaction shall be done with an 8 to 10 ton steel-wheeled roller or other means approved by the Engineer. Thickness shown on the Drawings is a minimum. Smoothness shall not exceed one-eighth inch for a ten foot straight edge.

2.06 TRAFFIC STRIPING

Unless specifically approved otherwise by the City, all pavement markings and traffic striping on pavement to be accepted by the City shall be thermoplastic. When approved, or on private property, markings may be painted. All thermoplastic or paint shall conform

to the applicable sections of the Georgia Department of Transportation specifications. The color and pattern shall be as shown on the drawings.

PART 3 - EXECUTION

3.01 TESTING

A. The following tests will be made in accordance with the current edition of the appropriate Department of Transportation Standard Specifications or otherwise directed by the City of Pooler and/or their representative. All testing shall be by a certified laboratory approved by the City of Pooler.

1. Sub-grade compaction shall be one (1) test per 500 square yards, 100% Standard (ASTM D-698).
2. Base and pavement shall be cored for thickness at points determined in the field by the City or its representative and at a minimum of 2 per 500 LF (one on edge and one on centerline w/ edge alternating) square yards or a minimum of two (2) per project. In areas of thickness deficiency, additional cores shall be taken as directed by the City. Deficient areas, once fully defined shall be remediated to the satisfaction of the City without recourse.
3. At least one density determination shall be made for each 1,000 square yards of base. Asphalt extraction and aggregate gradation on the asphaltic concrete plant mix: one for each 200 tons of material, or fraction thereof, delivered to the job site. In-place density of the compacted base will be determined in accordance with the Sand Cone Method, ASTM D-1556 or Nuclear Method, ASTM D-2922.
4. Surface finish of the completed base shall not show any deviation in excess of ¼-inch when tested with a 10-foot straight edge. Deviation in thickness of the base shall be up to but not including 3/8-inch of the required thickness.
5. Striping width shall not be less than the specified width. No stripe shall exceed the specified width by more than ½-inch. The alignment of the stripe shall not deviate from the intended alignment by more than one inch on tangents and on curves up to and including one degree. On curves exceeding one degree, the alignment of the stripe shall not deviate from the intended alignment by more than 2-inches.

3.02 PROOF-ROLLING

Proof-rolling will be done with a loaded tandem dump truck (15 yards heaped) or as specified in the Department of Transportation Standard Specifications. Test rolling will

be done parallel to the centerline at speeds between 2 and 5 miles per hour; 3 to 4 passes depending on width of road shall be completed prior to final walk along proof roll.

END OF SECTION 02500

SECTION 02520
CONCRETE SIDEWALKS, CURB AND GUTTER

PART 1 - GENERAL

1.01 SUMMARY

This section specifies the requirements for the construction of concrete sidewalks, curb and gutter.

1.02 RELATED SECTIONS

Section 02200 - Excavation, Filling and Grading

Section 02221 - Excavation, Filling and Backfilling for Utility Systems

Section 03300 – Cast in Place Concrete

PART 2 - MATERIALS

2.01 CONCRETE

Concrete shall be composed of cement, admixtures, fine aggregate, coarse aggregate, and water proportioned and mixed to produce a plastic workable mix in accordance with the requirements of American Concrete Institute (ACI) Manual of Concrete Practice (Latest Edition), and shall be suitable for the specific conditions of placement. Concrete shall be Class “B” in accordance with Section 03300 and shall have a 28-day compressive strength of not less than 3,000 psi.

All concrete shall be ready mixed concrete in accordance with ASTM C94. All reinforcement shall comply with ASTM A615.

PART 3 - EXECUTION

3.01 SUBGRADE PREPARATION

The subgrade shall be brought to the line and grade necessary to accommodate the base and concrete at the required finished grades. Subgrade shall be compacted in accordance with the requirements specified in Section 02200 and Section 02500 including proofrolling. All curb and gutter areas will be proofrolled unless exception is authorized by City.

3.02 PREPARATION

Before placing concrete, all debris and water shall be removed from the places to be occupied by the concrete. Wood forms shall be thoroughly wetted or oiled, and the reinforcement cleaned of coatings. Formwork and the placement of reinforcement, pipes, anchors and other inserts shall be inspected by the Engineer before any concrete is deposited.

3.03 PLACING

The placing and depositing of all concrete shall be done in accordance with requirements of the ACI. Concrete shall be rapidly handled from mixer to forms and deposited as nearly as possible in its final position to avoid segregation due to re-handling or flowing. Concrete shall not be allowed to drop freely more than 4 feet. For greater drop a tremie or other means must be used. Concrete shall be spaced and worked by hand and vibrated to assure close contact with all surfaces of forms and reinforcement and leveled off at proper grade to receive finish. No concrete that has partially hardened or been contaminated by foreign material shall be deposited in the work. Concrete shall never be deposited upon soft mud or dry porous earth.

3.04 VIBRATION

Concrete shall be placed with the aid of manual vibration. The intensity of vibration shall be sufficient to cause flow or settlement of the concrete into place, but shall not be long enough to cause segregation of the mix. To secure even and dense surfaces, vibration shall be supplemented by hand spading in the corners and angles of forms and along form surfaces while the concrete is plastic under the vibratory action. Caution must be exercised to prevent any injury to the inside face of the forms or any movement of the reinforcement.

3.05 CONSTRUCTION JOINTS, CONTROL JOINTS AND EXPANSION JOINTS

- A. Joints shall be formed and located as indicated on the Standard Drawings. Final locations are subject to review and approval in the field.
- B. The rate and method of placing concrete and the arrangement of construction joint bulkheads shall be such that the concrete between construction joints shall be placed in a continuous operation. Whenever it is necessary to stop work, such stops shall be located and temporary bulkheads erected. Before concreting is resumed, the surfaces of previously placed concrete shall be roughened, cleaned, wetted and slushed with grout immediately before additional concrete is placed. Grout shall be one part Portland cement and two parts sand.
- C. Expansion joints shall be provided in walks, and curb and gutter where shown and at walls, intersecting walks and buildings. Expansion joints in walks and curb and gutter shall be made with 1/2 inch thick pre-molded, non-extruding expansion joint filler, "Flexcell," or "Meadows" or equal, extending through the full thickness of the concrete except the upper 1/4 - inch at 80 foot intervals. When sidewalk is adjacent to curb the expansion joints shall coincide, where possible. These shall be set accurately in place to straight lines and concreted in. Control joints in sidewalks shall be spaced at intervals equal to the width of the sidewalk and in curb and gutter at 10 foot intervals with a depth of cut equal to 1/3 of the thickness of the concrete. Edges of grooves, expansion joints and edges of walks and curb and gutter shall be rounded to a 1/4 - inch radius with suitable grooving and edging tools.

3.06 FINISHING

Walks and curb and gutter shall be finished as specified for troweled concrete except that final finishing shall be with wood floats or broomed, as directed, to produce non-slippery finish at right angles to the length unless otherwise directed. Completed work shall be finished true to line and grade and when tested with a 10 foot straightedge shall not show a variation of more than 1/4 - inch from a straight line.

3.07 PROTECTION AND CURING

- A. Protect concrete against frost, freezing temperatures, rapid drying and heavy rain after placing during this period, concrete shall be maintained above 70 degrees F. for at least 3 days or above 50 degrees F. for at least 5 days.
- B. Walks and other exterior concrete shall be cured by covering first with sprayed-on curing compound applied immediately after finishing and then also completely covered with an impermeable fiber filled paper for a period of not less than 72 hours.
- C. Membrane curing compound shall comply with ASTM C309 for Type I and paper shall comply with ASTM C171.
- D. Exterior concrete work constructed during hot weather shall be protected, in addition to the curing specified above, with Spencer Kellogg Anti-Spalling Compound, or Carter-Waters "Dek-Seal," or equal, applied as soon as conditions will permit after curing and when the concrete is clean and dry. The mixture shall be applied uniformly in 2 applications, in accordance with the manufacturer's recommendations. The second application shall not be made until after the first coat has been completely absorbed by the concrete.

3.08 REMOVAL OF FORMS

- A. Care shall be taken in the removal of the forms not to damage the surface of the concrete. Immediately after the forms are removed, all damaged or imperfect work shall be patched in a neat and workmanlike manner, or if badly damaged or imperfect, the work shall be rebuilt. Leave shoring in place until concrete member will support its own weight safely plus any loads that may be placed upon it.
- B. Freshly stripped surfaces shall not be pointed up or touched in any manner before having been inspected by the Engineer.

3.09 PATCHING AND FINISHING CONCRETE FORMED SURFACES

- A. Immediately after removing forms, all concrete surfaces shall be inspected, and any honeycomb, voids, stone pockets, and tie holes shall be patched before the concrete is thoroughly dry. Defective areas shall be chipped away to a depth of not less than 1 inch with the edges perpendicular to the surface. The area to be patched and a space

of at least 6 inches wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar. The patch shall be finished in such a manner as to match the adjoining surface.

- B. Immediately upon removing forms from finished concrete surfaces, they shall be cleaned of all cement fins and any air pockets shall be carefully filled with cement mortar worked in to insure a bond with the concrete and finished off to match the surrounding surface.
- C. All vertical exterior surfaces exposed in the finished work shall be finished to a smooth rubbed finish having a uniform appearance.

3.10 REJECTION OF WORK

- A. Concrete sidewalks and/or curb and gutter may be rejected if any one or more of the following conditions are found on the finished product.
 - 1. Concrete compressive strength test which fail to meet the requirements of the specifications,
 - 2. Improper or inadequate finish,
 - 3. Gutter/sidewalk slopes which do not conform to the drawings or the finish construction roadway and shoulder,
 - 4. Spalling or chipping of concrete surface,
 - 5. Observance of excessive honeycombing of finished concrete,
 - 6. Presence of full depth cracks of any size or hairline cracks of lengths greater than 4-inches,
 - 7. Absence or improper installation of expansion and construction joints in valley or curb and gutter,
 - 8. Vertical or horizontal displacement of curb and gutter.
- B. The City Inspector or other city representative shall have the final determination of whether finished products should be accepted or rejected. He may, at his discretion and if he considers it in the best interest of the City of Pooler, accept improvements containing one or more of the above. The manner of repairing/replacing rejected items shall also be at the sole discretion of the City.

3.11 CONSTRUCTION OF HANDICAP RAMPS AND SIDEWALKS

Contractor shall construct depressed curb and gutter, handicap ramps and sixteen (16) feet of sidewalk extending in each applicable direction as indicated on the approved plans from the end of the handicap ramp where sidewalks are required.. Handicap ramps and access shall comply with the current DOT standards unless indicated otherwise on the approved plans. All sidewalk and handicap ramps shall comply with the latest requirements of the American with Disabilities Act (ADA).

END OF SECTION 02520

SECTION 02545
PROTECTIVE COATING FOR CONCRETE AND MASONRY
SANITARY SEWER STRUCTURES

PART 1 – GENERAL

1.01 GENERAL

- A. This section specifies the requirements for protecting and/or rehabilitating the interior of concrete sanitary sewer structures by application of a protective coating to protect the concrete structure from hydrogen sulfide and acid generated by microbiological sources present in the municipal wastewater environment. Several acceptable alternate coatings are specified to allow competitive bids to be obtained. The protective coating shall also eliminate infiltration, repair voids, and enhance the structural integrity of the wetwell. Cementitious material will not be allowed for the protective coating, however, it will be allowed for patching operations.
- B. For lift station wetwells, coating limits shall be the wetwell walls and underside of top slab. Procedures for surface preparation, cleaning, application and testing are described herein.
- C. This specification also covers the requirements for corrosion protection of the ductile iron discharge pipes and fittings within the lift station wetwell, where shown or indicated.
- D. **Protective coating is generally not required on standard gravity manholes unless noted otherwise by the City or the Engineer.**
- E. **Protective coatings are required for all wet wells, receiving manholes, drop manholes, any structure where a force main terminates or high levels of corrosion are anticipated.**

1.02 REFERENCES {These or the latest Standards shall be complied for this project}

- A. ASTM D638 - Tensile Properties of Plastics.
- B. ASTM D790 - Flexural Properties of Unreinforced and Reinforced Plastics.
- C. ASTM D695 - Compressive Properties of Rigid Plastics.

- D. ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gauges
- E. ASTM D4541 - Pull-off Strength of Coatings Using a Portable Adhesion Tester.
- F. ASTM D2584 - Volatile Matter Content.
- G. ASTM D2240 - Durometer Hardness, Type D.
- H. ASTM D543 - Resistance of Plastics to Chemical Reagents.
- J. ASTM C109 - Compressive Strength Hydraulic Cement Mortars.
- K. ACI 506.2-77 - Specifications for Materials, Proportioning, and Application of Shotcrete.
- L. ASTM C478 - Bond Strength to Concrete: Concrete Failed.
- M. ASTM C496 - Tensile Strength of Chemically Setting Silicate and Silica Chemical Resistant Mortars.
- N. ASTM C579 - Compressive Strength of Chemically Setting Silicate and Silica Chemical Resistant Mortars.
- O. ASTM - The published standards of the American Society for Testing and Materials, West Conshohocken, PA.
- P. NACE - The published standards of National Association of Corrosion Engineers (NACE International), Houston, TX.
- Q. SSPC - The published standards of the Society of Protective Coatings, Pittsburgh, PA.
- R. ASTM C396 - Compressive Strength of Cement Mortars.
- S. ASTM C580 - Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concrete.
- T. ASTM D4541 - Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement.
- U. ASTM D4787 - Standard Practice for Continuity Verification of Liquid or Sheet Depth Applied to Concrete Substrates.

1.03 SUBMITTALS

A. Product Data:

1. Technical data sheet on each product used, including ASTM test results indicating the product conforms to and is suitable for its intended use per these specifications.
2. Material Safety Data Sheets (MSDS) for each product used.
3. Project specific guidelines and recommendations.
4. Reference documentation to confirm that the proposed coating system has a proven record of performance when used in the intended application, including a list of at least five (5) successful installations that have been in service for a period of at least three (3) years. The reference list shall include the name of the facility, the application date, a contact person, and a telephone number.
5. Warranty Certificate in accordance with Part 1.08 of this Section.
6. Applicator Qualifications
 - a. Manufacturer certification that Applicator has been trained and approved in the handling, mixing and application of the products to be used.
 - b. Certification that the equipment to be used for applying the products has been manufactured or approved by the concrete rehabilitation products manufacturer, protective coating manufacturer, and certified for proper use for this specific application.
 - c. Applicator must provide written documentation of having installed a minimum of 20,000 sq.ft. of protective coating similar to that specified within the last three (3) years.
 - d. Any project specific guidelines for the project.
 - e. Design details for any additional ancillary systems and equipment to be used in site and surfaced preparation, application and testing.

1.04 QUALITY ASSURANCE

- A. Applicator shall initiate and enforce quality control procedures consistent with applicable ASTM, NACE and SSPC standards and the protective coating manufacturer's recommendations.
- B. Coating Manufacturer's authorized field representative shall be on site prior to the application of the coating system to verify that the substrate has been properly prepared, and during the application of the coating system to certify that the coating system has been properly applied. The authorized field representative will provide the Owner with an accurate and objective written report stating inspection observations on the preparation, application, and final inspection verifying adherence to coating manufacturer recommendations, industry standards, and the written specifications.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. All materials are to be kept dry, protected from weather and stored under cover.
- B. Protective coating materials are to be stored according to manufacturer's recommendations. Do not store near flame, heat or strong oxidants.
- C. Repair and protective coating materials are to be handled according to their material safety data sheets.

1.06 SITE CONDITIONS

- A. Applicator shall conform with all local, state and federal regulations including those set forth by OSHA, RCRA and the EPA and any other applicable authorities.
- B. Method statements and design procedures are to be provided by the Contractor when confined space entry is required.
- C. During coating operations, Contractor shall provide temporary bypassing of the lift station.

1.07 ACCESS TO THE WORK SITE

- A. Contractor shall provide proper facilities for access and observation of the Work and also for any inspection or testing by others.
- B. Contractor shall provide access to site inspection.

1.08 WARRANTY

- A. Manufacturer shall warrant all work against defects in materials and workmanship for a minimum period of five (5) years, unless otherwise noted, from the date of final acceptance of the project. Manufacturer shall, within a reasonable time after receipt of written notice thereof, repair defects in materials or workmanship if any develop during said five (5) year period, and any damage to other work caused by such defects or the repairing of same, at his own expense and without cost to the Owner. No prorated warranties or exclusions for improper application will be accepted for this project. Manufacturer shall also be responsible for the costs associated with by-pass pumping to maintain continuous service if repairs are necessary during the warranty period.

PART 2 - PRODUCTS

2.01 GENERAL

Cementitious patching, repair, and structural restoration materials used shall be only those specified and pre-approved. Project specific submittals shall be provided including application, cure time and surface preparation procedures which permit optimum bond strength with protective coating.

2.02 STRUCTURAL RESTORATION & COATING PRODUCTS

- A. RAVEN LINING SYSTEMS, Inc. , Product 405
- B. SPECTRASHIELD™ LINER SYSTEMS
- C. TNEMEC PERMA SHIELD H₂S, Series 434

2.03 APPROVED REPAIR MATERIALS

- A. Repair materials shall be used to fill voids, structurally reinforce and/or rebuild substrate surfaces, etc. as determined necessary by the engineer and protective coating applicator. Quick blending, rapid setting, high early strength, fiber reinforced, non-shrink repair mortar that can be trowelled or pneumatically spray applied must be compatible with the specified protective coating and shall be applied in accordance with the manufacturer's recommendations.
- B. The following products are accepted and approved as compatible repair basecoat materials for protective topcoating for use within the specifications.
 1. Infiltration Control
All fast setting materials furnished shall be applied directly to active leaks under hydrostatic pressure from the exterior of the concrete in wetwell structures or control by dewatering methods. Materials shall consist of

rapid setting cements and various accelerating agents. Material shall not contain chlorides, gypsum, or metallic particles. Should groundwater be encountered, Contractor shall be responsible for utilizing a dewatering system(s) to remove water from the excavations.

2. Repair, patching, and structural restoration

All material furnished shall be designed to fill voids and to repair or reconstruct where no hydrostatic pressure exists. Material shall consist of rapid setting cements, NSG aggregates, and various accelerating agents. Material shall not contain chlorides, gypsum, or metallic particles.

All structural restoration materials shall be specifically designed for the rehabilitation of wastewater pump station wetwells and other related concrete structures. Materials shall contain poly fiber reinforcement, fused calcium aluminate, and chemical admixtures.

2.04 MATERIAL PROPERTIES

A. Raven Product 405

1. Structural Restoration Material

Repair materials shall be used to fill voids, structurally reinforce and/or rebuild surfaces, etc. as determined necessary by the engineer and protective coating applicator. Repair materials must be compatible with the specified epoxy coating and shall be applied in accordance with the manufacturer's recommendations.

The following products may be accepted and approved as compatible repair basecoat materials for epoxy topcoating for use within the specifications:

- a. 100% solids epoxy grout specifically formulated for epoxy topcoating compatibility. The epoxy grout manufacturer shall provide instructions for trowel or spray application and for epoxy topcoating procedures.
- b. Factory blended, rapid setting, high early strength, fiber reinforced, non-shrink repair mortar that can be trowelled or pneumatically spray applied may be approved if specifically formulated to be suitable for epoxy topcoating. Such repair mortars should not be used unless their manufacturer provides information as to its suitability for topcoating with an epoxy coating. Project specific submittals should be provided including application, cure time and surface preparation procedures which permit optimum bond strength with the epoxy coating.

- c. Shotcrete shall conform to all requirements of ACI-506.2-77 as published by the American Concrete Institute, Detroit, MI except as modified by these specifications. Shotcrete shall be composed of Portland Cement, aggregate and water so proportioned as to produce a concrete suitable for pneumatic application. Shotcrete ingredients shall be selected and proportioned in such a manner as will produce concrete which will be compatible for epoxy topcoating. Shotcrete shall have a minimum surface tensile strength of 300 psi. No coatings shall be applied prior to a full 28 day cure unless test patches of coatings exhibit acceptable bonding characteristics and no outgassing as prescribed herein or the repair mortar manufacturer certifies acceptable topcoating parameters.

2. Protective Coating Material

Product type	Amine cured epoxy
Color	Light blue
Solids Content (vol %)	100
Mix Ratio	3:1
Compressive Strength	18,000 psi
Tensile Strength	7,600 psi
Tensile Ultimate Elongation	1.5 %
Hardness	88
Film Thickness- Maximum	200 mils DFT per coat

B. SpectraShield Liner System

- 1. Structural Restoration Material
SpectraShield Liner Ssystem

- 2. Protective Coating
Multi-component stress panel liner system as follows:

- a. Liner

Moisture displacement barrier	Primer
Moisture barrier	Modified Polymer
Surfacer	Polyurethane/Polymeric blend foam
Final corrosion barrier	Modified polymer

- b. Primer shall be 100 % solids

- c. Modified polymer shall be sprayable, solvent free, two- component polymeric, moisture/chemical barrier specifically developed for the corrosive wastewater environment.

Tensile Strength, psi	> 1,500 psi
Elongation	>125 %
Tear Strength	350 psi
Hardness, Type D	55-65

- d. Polyurethane rigid structure foam

Density, nominal, core	4-10 lbs/CF
Compressive strength	90-150 psi
Shear strength	225-250 psi

- e. Total thickness of multicomponent stress panel liner shall be a minimum of 500 mils.
- f. Color- pink

C. TNEMEC Perma Shield H₂S, Series 434

1. Structural Restoration Material

Repair materials shall be used to fill voids, structurally reinforce and/or rebuild surfaces, etc. as determined necessary by the engineer and protective coating applicator. Repair materials must be compatible with the Perma Shield coating and shall be applied in accordance with the manufacturer's recommendations. Tnemec MortarClad, Series 218 or Tnemec Mortar Cast, Series 219 may be used.

2. Protective Coating

- a. An aggregate reinforced, 100 % solids, hybrid epoxy mortar (modified aliphatic amine epoxy mortar) designed for wastewater immersion/ fume environment.
- b. Primer-Concrete-Self priming or Tnemec Series 201 Epoxoprime Perma-Shield H₂S, Series 434- A thick fil, three part hybrid epoxy polymer designed to reduce permeability and withstand harsh wastewater environments.
- c. Film Thickness- 125 mils DFT minimum

- d. Topcoats-Perma-GlazeSeries 435, when specified, for improved aesthetics and additional protection against abrasion and chemical degradation .

2.05 STRUCTURAL RESTORATION MATERIAL AND PROTECTIVE COATING APPLICATION EQUIPMENT

Structural restoration mortars and protective coatings shall be applied with manufacturer approved equipment.

PART 3 - EXECUTION

3.01 ACCEPTABLE APPLICATORS

- A. Repair mortar must be applied by manufacturer trained and approved applicators. The repair mortar shall be applied according to manufacturer's recommendations.
- B. Protective coating must be applied by a Certified Applicator of the protective coating manufacturer and according to manufacturer's specifications.
- C. Appropriate flow control or flow diversion measures shall be taken.

3.02 EXAMINATION

- A. Appropriate actions shall be taken to comply with local, state and federal regulatory and other applicable agencies with regard to environment, health and safety.
- B. All bidders are required to verify that they have visited the jobsite, and are familiar with the conditions and the entire scope of work. Bidders shall field verify the attached plans and perform their own quantity measurements prior to bidding.
- C. Contractor shall provide a minimum 24 hour notice to the Inspector / Engineer for the following conditions:
 - 1. After final surface preparation is completed but before structure rehabilitation;
 - 2. After patching operations have cured, and
 - 3. After each coating layer is applied.
- D. Installation of the protective coating shall not commence until the concrete substrate has properly cured in accordance with these specifications.

- E. Temperature of the surface to be coated should be maintained between 60° F and 100° F during application. Prior to and during application, care should be taken to avoid exposure of direct sunlight or other intense heat source to the structure being coated. Where varying surface temperatures do exist, care should be taken to apply the coating when the temperature is falling versus rising (i.e., late afternoon into evening vs. morning into afternoon).

3.03 SURFACE PREPARATION

- A. Applicator shall inspect all surfaces specified to receive a protective coating prior to surface preparation. The existing piping, valves, and appurtenances shall be protected during structural rehabilitation and protective coating application.
- B. All contaminants including: oils, grease, incompatible existing coatings, waxes, form release, curing compounds, efflorescence, sealers, salts, or other contaminants shall be removed.
- C. All concrete or mortar that is not sound or has been damaged by chemical exposure shall be removed to a sound concrete surface or replaced.
- D. Old concrete must be firm and structurally sound as specified by the Engineer.
- E. Surface preparation method(s) should be based upon the conditions of the substrate, service environment and the requirements of the protective coating to be applied.
- F. Surfaces to receive protective coating shall be cleaned and abraded to produce a sound surface with adequate profile and porosity to provide a strong bond between the protective coating and the substrate. At a minimum, this will be achieved with a low pressure water cleaning equipment using a 0 degree rotating nozzle at a minimum 3,500 psi and 4 gpm. Other methods such as high pressure water jetting (refer to NACE Standard No. 6 /SSPC-SP 13), abrasive blasting, shotblasting, grinding, scarifying and/or acid etching may also be used. In addition, detergent water cleaning and hot water blasting may be necessary to remove oils, grease or other hydrocarbon residues from the concrete. The method(s) used shall be performed in a manner that provides a uniform, sound clean, neutralized surface that is not excessively damaged.

3.04 APPLICATION OF REPAIR MATERIALS

- A. Areas where structural steel has been exposed or removed shall be repaired in accordance with the Project Engineer's recommendations.

- B. Repair/Structural Restoration materials shall meet the specifications here and as described in part 2.03 and 2.04 of these specifications. The materials shall be applied utilizing proper equipment on to specified surfaces.
- C. Infiltration shall be stopped by using a material which is compatible with the specified repair mortar, waterproof quick setting mortar-type, that is suitable for topcoating with the specified protective coating. Contractor shall completely identify the types of grout, mortar, and sealant for repair of leak defects and provide case histories of successful use.
- D. Infiltration areas that require crack injection shall be covered in this scope of work. Injection holes shall be drilled through the wetwell at 120 degree angles from each other at the same plane of elevation. Rows shall be separated no more than three vertical feet, and the holes shall be staggered with the holes in the rows above and below. Provide additional injection holes near observed defects and pipe seals. A minimum of 6 injection holes shall be provided per defect.

Grout shall be injected through holes under pressure with a suitable probe. Injection pressure shall not cause damage to the wetwell structure or surrounding surface features. Grout shall be injected through the lowest holes first. Grouting from the ground surface will not be allowed. Provide additional injection holes if necessary to ensure grout travel, verified by field observation of grout at adjacent defects or holes. Patch injection holes using a waterproof quick setting mortar after cleaning with a drill.

- E. The approved repair materials shall provide a smooth surface with an average profile equivalent to coarse sandpaper to optimally receive the protective coating. No bugholes or honeycomb surfaces should remain after the final trowel procedure of the repair mortar.
- F. The repair materials shall be permitted to cure according to manufacturer recommendations. Curing compounds should not be used unless approved for compatibility with the specified protective coating.
- G. After required cleaning and repair is performed, all surfaces shall be inspected for remaining laitance prior to protective coating application. Any evidence of remaining contamination or laitance shall be removed by additional abrasive blast, shotblast or other approved method. If repair materials are used, refer to these specifications for surface preparation. Areas to be coated must also be prepared in accordance with these specifications after receiving a repair mortar and prior to application of the protective coating.

3.05 APPLICATION OF PROTECTIVE COATING

- A. Application procedures shall conform to the recommendations of the protective coating manufacturer, including material handling, mixing, environmental controls during application, safety, and spray equipment.
- B. The equipment shall be specifically designed to accurately ratio and apply the specified protective coating materials and shall be regularly maintained and in proper working order.
- C. The protective coating material must be applied by a Certified applicator of the protective coating manufacturer.
- D. Specified surfaces shall be coated by a moisture tolerant, solvent-free, protective coating properties as described in part 2.03B of these specifications. Application shall be to an average wet film thickness of 125 mils nominal dry film thickness.
- E. Application equipment approved by the coating manufacturer shall be used to apply each coat of the protective coating. .
- F. If necessary, subsequent topcoating or additional coats of the protective coating should occur as soon as the basecoat becomes tack free, ideally within 12 hours but no later than the recoat window for the specified products. Additional surface preparation procedures will be required if this recoat window is exceeded.

3.06 TESTING AND INSPECTION

- A. During application a wet film thickness gage meeting ASTM D4414 - Standard Practice for Measurement of Wet Film Thickness of Organic Coatings by Notched Gages, shall be used to ensure a monolithic coating and uniform thickness during application.
- B. After the protective coating has set hard to the touch it shall be inspected with high-voltage holiday detection equipment meeting ASTM D4787 – Standard Practice for Continuity Verification of Liquid or Sheet Depth Applied to Concrete Substrates. The spark tester shall be initially set at 100 volts per 1 mil (25 microns) of film thickness applied. All detected holidays shall be marked and repaired by abrading the coating surface with grit disk paper or other hand tooling method. After abrading and cleaning, additional protective coating material can be hand applied to the repair area. All touch-up/repair procedures, for areas that do not meet the specified thickness, shall follow the protective coating manufacturer's recommendations.

The NACE Certified Coatings Inspector must be present and monitor the holiday testing (and repairs, if necessary). The final inspection report is to include the holiday testing results.

- C. A final visual inspection shall be made by the Inspector and manufacturer's representative. Any deficiencies in the finished coating shall be marked and repaired according to the procedures set forth herein by Applicator.

END OF SECTION

SECTION 02557
HDPE LINER

PART 1 - GENERAL

1.01 SUMMARY

This Section specifies the requirements for furnishing and installing a High Density Polyethylene (HDPE) or Polypropylene Random Copolymer (PP-R) concrete protective liner (CPL) in new lift station/wet wells, new receiving manholes, new drop manholes, new force main termination manholes and manholes as required or as shown on the Drawings.

PART 2 - MATERIALS

2.01 LINER

- A. Liner shall be HDPE (high density polyethylene) or Polypropylene Random Copolymer (PP-R) with a minimum thickness of 2 mm. All HDPE liner sheets shall be extruded with a large number of anchoring studs, a minimum of (420/m², 39 ft²), manufactured during the extrusion process in one piece with the sheet so there is no welding and no mechanical finishing work to attach the studs to the sheet. The liner shall have a pull out of 112.5 lbs. /anchoring stud. Minimum distance between studs shall be no less than 2.1275”.
- B. Flat liner sheet, non anchored, used for overlapping joints, shall have a minimum thickness of 3mm. All joints shall be sealed by means of thermal welding performed by welders certified by the manufacturer.
- C. The lining shall have good impact resistance, shall be flexible, and shall have an elongation sufficient to bridge up to a ¼” settling crack, without damage to the lining. The liner shall be able to bridge any expansion cracks that may occur.
- D. The lining shall be repairable at any time during the life of the structure.
- E. A certified fabricator will custom fit the liner to the form work in order to protect the concrete surfaces from sewer gases. The interior surfaces to be protected shall include the walls, ceiling, and pipe entries.
- F. For all lined manholes the use of HDPE Grade rings shall be used in lieu of brick or precast grade rings. Grade rings shall meet HS-25 load rating. Butyl sealant shall be used between each ring to make a watertight joint. The first grade ring will be welded to the liner to provide a gas tight seal.

2.02 PHYSICAL PROPERTIES

- A. The welding rod shall be manufactured from the same resins and have the following properties:

Property	Testing Method	Unit	HDPE	PP-R
Density	ASTM D792-86.	g/cm ³	.0945	1.78
MFI (Melt Flow Index)	ASTM D1238-88	g/10min	(190/5)	(190/5)
Heat Reversion (Dimensional Stability)	ASTM D1638-83	%	<2	<2
Yield Stress	ASTM D638-89	PSI	≥ 2,320	≥ 2,900
Elongation of Yield	ASTM D638-89	%	≥ 12	≥ 10
Elongation at break	ASTM D638-89	%	≥ 200	≥ 50
Fire Classification	UL-94		V2	V2
Maximum Working Temperature		C_ F_	60 140	90 194

- B. Upon request, the manufacturer shall provide written certification that the liner used meets or exceeds the requirement of this specification.

PART 3 - EXECUTION

3.01 WELDING

- A. All welding shall be performed in accordance with the published directives and procedures of the manufacturer and by welders certified by the manufacturer. Completion of welding will provide a one piece monolithic concrete protective liner system that will provide excellent resistance to hydrogen sulfide attack and will not pull off the wall in the event that infiltration occurs.
- B. The following welding techniques are acceptable:
1. Extrusion Welding

2. Butt Welding
 3. Hot Air Welding
- C. Testing and supervision of the installation and welding shall be performed by qualified staff only and must be checked when completed by visually checking and by Spark Testing all welded joints.
- D. Sample welds shall be taken from each jobsite during the field welding process and submitted to the quality assurance department for testing. The following tests are performed: Shear and Peel Test. Shear weld test results shall meet or exceed at least 80% strength of parent material in a destructive test, which pulls the sample apart to test the strength and integrity of the extrusion weld. The peel test pulls the weld apart from the backside of the weld using a peeling type motion. The results of this test shall meet or exceed 60% of the value of the parent material.

END OF SECTION 02557

SECTION 02700
WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

This Section specifies requirements for water distribution systems.

1.02 RELATED SECTIONS

Section 02200 - Excavation, Filling and Grading

Section 02221 - Excavation, Trenching and Backfilling for Utility Systems

PART 2 - PRODUCTS

2.01 PIPE MATERIALS

All materials shall be certified for conformance with American National Standards Institute / National Sanitation Foundation Standard 61 (ANSI/NSF61).

A. Metal Pipe

1. Ductile Iron Pipe

- a. Ductile iron pipe shall be manufactured in accordance with ANSI /AWWA C151/A21.51, latest revision.
- b. Ductile iron pipe shall be of the thickness according to ANSI/AWWA C150/A21.50, latest revision, for Pressure Class 250.
- c. Flange Pipe or Victaulic grooved pipe shall be Pressure Class 350.

2. Fittings

- a. Fittings shall conform to ANSI/AWWA C111 A21.11, latest revision, and shall be push-on-type unless otherwise shown.
- b. Flanged Fittings shall conform to ANSI/AWWA C110/A21.10, latest revision. The AWWA C110 fitting flanges shall have facing and drilling which match AWWA C115 threaded-on flanges which also match ANSI B16.1 Class 125 flanges except where Class 250 are specifically noted.
- c. Mechanical joint fittings shall conform to ANSI/AWWA

C153/A21.53, latest revision. Bolts shall conform to ANSI B18.2.1, latest revision. Nuts shall conform to ANSI B-18.2.2, latest revision. Bolts and nuts shall conform to ANSI B1.1

3. Joints

- a. Push-on Joints shall conform to ANSI/AWWA C111/A21.11, latest revision.
- b. Flanged Joints shall conform to ANSI/AWWA C115/ A21.15, latest revision.
- c. Mechanical Joints shall conform to ANSI/AWWA C111/A21.11, latest revision. Bolts shall conform to ANSI B18.2.1, latest revision. Nuts shall conform to ANSI B-18.2.2, latest revision. Bolts and nuts shall conform to ANSI B1.1
- d. Restrained Joints - Restrained joints for pipe, valves and fittings shall be mechanical joints with ductile iron retainer glands equivalent to Ford 1390 Series, Mega-Lug, EBBA Series 1100 for Ductile Iron 4" and larger, EBBA Series 2000 PV for PVC Pipe 4" and larger, Flexlock, T-lock, Uni-Flange, or approved equal or push on joints equivalent to "Lock Ring", "TR Flex", "Super Lock", "Field Lock", or "MJ FIELD LOK Gasket, Series DI or Series PV" The joints shall be in accordance with the applicable portions of ANSI/AWWA C111/A21.11.

4. Lining

Lining for ductile iron pipe and fittings shall be a cement mortar lining meeting the ANSI/AWWA C104/ A21.4, latest revision, for standard thickness lining. After cement lining, the interior of the pipe shall be given a seal coat of approved bituminous material in accordance with ANSI/AWWA C104/A21.4, latest revision.

5. Exterior Coating

Exterior coating shall be an approved bituminous coating one mil thick in accordance with ANSI/AWWA C151/ A21.51, latest revision.

6. Conductive Joints

Where conductive joints are indicated on ferrous pipe that are subject to electrical thawing service, metal contact strips molded into the gasket are acceptable. Conductive gasket shall be capable of carrying 600 amps. These gaskets are not to be used where corrosion monitoring and cathodic protection are a requirement.

7. Bonded Joints
Where indicated on ferrous pipe, a metallic bond shall be provided at each joint, including joints made with flexible couplings, caulking, or rubber gaskets, of non-ferrous-metallic piping to effect continuous conductivity. The bond wire shall be Size 1/0 copper conductor suitable for direct burial shaped to stand clear of the joint. The bond shall be of the thermal weld type.

B. PVC Pipe

PVC pipe shall be Underwriters' Laboratories approved and listed and must meet all requirements of ASTM D2241 and bear the seal of conformance to NSF61. PVC pipe used for water mains shall be blue in color only. It shall meet or exceed AWWA C900 with the following supplemental specifications:

1. Pressure Pipe
 - a. Pipe less than 4 inches shall be Polyethylene Pipe, Pressure Class 200.
 - b. Pipe 4 inches to 12 inches shall be Class 150 with Dimension Ratio 18 or lower (thicker).
 - c. Pipe 14" and larger shall be Class 235 C905 DR 18.
2. Routine Hydrostatic Proof Test Requirements
Each piece of pipe shall be tested at four (4) times rated pressure class.
3. Outside Diameter
Pipe shall have cast iron pipe outside diameter.
4. Joints
Pipe shall have elastomeric-gasket integral bell end. Bell section shall have a thickened wall. Gasket groove Wall thickness shall meet or exceed the thickness of the pipe barrel.
5. Fittings
Fitting shall be ductile iron conforming to ANSI /AWWA C153/A21.53, latest revision, with cement mortar lining and seal coat in accordance with ANSI/AWWA C104/A21.4, latest revision, and one mil thick petroleum exterior coating in accordance with ANSI/AWWA C104/ A21.4, latest revision, unless otherwise shown.
6. Affidavit of Compliance
The manufacturer shall furnish an affidavit that all materials delivered comply with the requirements of this standard and supplemental specification.

7. Couplings

Couplings shall be furnished by the pipe manufacturer and shall accommodate the pipe for which they are to be used. They shall have the same minimum pressure rating as the pipe. Coupling method shall allow for expansion or contraction of each pipe section to be taken up at each end of the pipe. Couplings shall permit five (5) degree deflection (2 1/2 degrees on each side) of the pipe without any evidence of infiltration, exfiltration or breaking.

8. Gaskets

PVC pipe joint gaskets shall meet the requirements of ASTM F477.

C. High Density Polyethylene (HDPE)

Pipe supplied under this section shall be cast iron outside diameter, SDR-11. It shall meet the criteria for a Type III, Class C, Category 5, Grade PE34 piping material in accordance with ASTM D3350. Pipe shall have blue stripe.

1. All potable water pipe shall bear the National Sanitation Foundation (NSF) seal of approval stating compliance with ANSI/ NSF Standard 61.
2. Dimensional characteristics and pressure capabilities shall meet the requirements of ASTM D3261, Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for PE Plastic Pipe and Tubing; ASTM D2513 and AWWA C906-99, Polyethylene (PE) Pressure Pipe and Fittings.
3. Sections of polyethylene pipe should be joined into continuous lengths on the job site above ground. The joining method shall be the butt fusion method and shall be performed according to the manufacturer's recommendations.
4. End connections 12-inch and larger shall be flanged ends. Less than 12-inches may be flanged or MJ adapters with insert sleeves.
5. After polyethylene piping is installed, backfilled and all air removed, the Contractor shall apply a hydrostatic pressure of 150 psi to the pipe. The test pressure shall be allowed to stand without make-up pressure for a period of time as required by the pipe manufacturer and approved by the Engineer to allow for diameter expansion or pipe stretching to stabilize. After the required equilibrium period the test section shall be returned to the original test pressure.

2.02 VALVES

A. Gate Valves

Gate valves shall be as shown on the Drawings and shall conform to the following Specifications:

1. Resilient-Seated Gate Valves (3 Inches to 12 Inches)
 - a. Resilient-seated gate valves 3 inches to 12 inches shall conform to AWWA C509 with non-rising stem, suitable for buried service. Unless otherwise indicated or specified, gate valves shall be designed for a working pressure of not less than 250 psig.
 - b. Valves shall take full pressure on either face. Valves shall be from one manufacturer and similar sizes shall be identical and parts interchangeable. They shall be constructed with bolted bonnets provided with two O-ring stem seals which can be replaced with the valve under pressure in the full-open position.
 - c. Valves shall be constructed of materials conforming to AWWA C509. All internal and external surfaces shall be coated with fusion bonded epoxy to a minimum thickness of 8 mils.
 - d. Valve seats shall be coated with a rubber material conforming to AWWA C509 so that there shall be no rubber to metal contact when the valve is in the fully closed position.
 - e. Valves shall be hydrostatically tested in accordance with AWWA C509.
 - f. Valves shall be American, Waterous or equal and shall be furnished with standard operating nuts as shown on the Drawings.

B. Butterfly Valves

Butterfly valves 14-inches and larger shall be of the tight-closing, rubber seated type, with rubber seat positively locking in place against flow from either direction. No metal-to-metal seating surfaces will be permitted. Valves shall be bubble-tight at rated pressures with flow in either direction. Butterfly valves shall conform to ANSI/AWWA C504, Class 150B, and shall be suitable for buried service.

1. Valve body shall be high-strength cast iron ASTM A126 Class B with 18-8 Type 304 stainless steel body seat. Valves shall have Mechanical Joints per AWWA C111. All MJ accessories (bolts, glands, gaskets) shall be supplied by the valve manufacturer. Valves for below ground service shall be installed using restrained joints.

2. Valve shafts shall be 304 stainless steel and shall consist of a one-piece, extending full size through the entire valve or 18-8 stainless steel stub shaft design keyed to the vane with stainless steel torque plugs.
3. Valve discs shall be solid ductile iron with an epoxy coating making it corrosion resistant. The thickness of the discs shall not exceed 2-1/4 times the shaft diameter.
4. Valve seats shall be natural or synthetic rubber providing 360 degrees uninterrupted seating. The resilient seat shall be adjustable or replaceable in the field without burning or grinding. The seat shall be molded over a stainless steel ring for support and secured to the disc by corrosion resistant, self locking stainless steel screws.
5. All internal ferrous metal surfaces in the waterway shall be factory coated with a non-toxic, two-component, holiday-free, thermosetting epoxy to a nominal thickness of 4 mils. All external surfaces shall be coated with an epoxy coating conforming to AWWA C-550, with a minimum thickness of 10 mils.
6. All butterfly valves shall be manually operated. Operators shall be of the traveling nut, self-locking type and shall be designed to hold the valve in any intermediate position without creeping or fluttering. Operators shall be furnished with externally adjustable mechanical stop limiting devices. Valves shall have a 2-inch square operating nut and shall be installed with extension stems to extend the operating nut in accordance with the project details. The operator shall be integrally mounted on the valve mounting flange and shall have all gearing totally enclosed for buried service. Maximum force for operating nut shall be 40 pounds.
7. All valves shall be M&H model 4500, or approved equal.

C. Ball Valves

1. Ball valves 2 inches and smaller shall be designed for a working pressure of not less than 300 psi, domestic made brass, and shall conform to AWWA standard C 800-89.
2. Standard tee head stops in body permit 90 degree turn only.
3. Padlock wings shall be used on the tee head.

D. Air Release Valves

1. Air Release Valve shall be 2-inch screwed inlet. The air release valve shall be designed to permit automatic escape of large quantities of air from the pipeline when the line is being filled and must also allow accumulating air to escape while the line is in operation and under pressure. The body and cover shall be able to operate at pressures up to 300 psi. The open end of an air relief pipe from automatic valves or from a manually operated valve shall be extended to the top of the pit and provided with a screened downward facing elbow.
2. Air release valve manufacturer shall be Crispin Model No. PL-10 or VENT O MAT Series RBX.

E. Valve Manholes

1. General
Manholes shall be constructed at such points as designated on the Drawings. Riser and top sections shall be installed level and plumb, such that all manhole steps are in alignment. The top of manholes outside of roads, streets and highways shall be built to grades 2 inches above ground surface, unless otherwise shown. Manholes in roads, streets and highways shall be built to grades shown on the Drawings.

All valves installed within manholes must be installed such that the valve operator is also installed within the manhole. All valve operators must be accessible.

2. Precast Concrete Manholes
 - a. Precast Concrete manholes shall meet all requirements of ASTM C478, "Specification for Precast Reinforced Concrete Manhole Sections." Dog house manholes must have precast or poured in place bottoms. Brick or grout slabs are not acceptable.
 - b. Openings shall be custom made to meet the necessary pipe alignment conditions and invert elevations. All inlets and outlets shall be cast in or core drilled. Joints and gaskets shall conform to the applicable provisions of ASTM C443, "Joints for Circular Concrete Sewer and Culvert Pipe using Rubber Gasket" or Ram-Nek Premoulded Plastic Joint Sealer. Precast manholes shall be bedded on not less than 6 inches of compacted crushed stone. The crushed stone shall extend not less than 6 inches outside the walls of the manhole and under the entire length of pipe within the excavation for the manhole.

- c. All manhole joints shall be sealed with an external flexible rubber seal made of EPDM rubber with a minimum thickness of 65 mils. Each unit shall have a 2-inch wide by ¼-inch thick mastic strip on the top and bottom of the rubber wrap. The seal shall be designed to prevent leakage of water through the manhole joint. The flexible rubber seal shall be Infi-Shield Shield Wrap (Sealing Systems, Loretto, MN), Cretex (Cretex Specialty Company, Waukesha, WI) or approved equal.
- d. All external Manhole adjustment rings shall be sealed with a flexible rubber seal. Acceptable products include Infi-Shield External Uni-Band (Sealing Systems, Inc. Loretto, MN), Cretex Manhole Chimney Seals (Cretex Specialty Products, Waukesha, WI) or an approved equal.

3. Manhole Castings

Provide covers with the inscription "WATER" cast into the cover in lettering at least 2 inches high. Covers shall be 25-3/4 inches in diameter and shall be 2-inches thick at the bearing surface. Frame shall provide a 24-inch clear opening. Manhole covers and frames shall be USF 227, cover type "AS", or equal. Manhole cover shall have non-penetration pickhole without vent hole or other penetration.

F. Valve Boxes

- 1. Each buried valve shall be accompanied by a valve box of the adjustable type of heavy pattern, constructed of cast iron, and provided with cast iron cover.
- 2. The upper section of each box shall have a flange at the bottom, having sufficient bearing area to prevent settling. The bottom of the lower section shall enclose the operating nut of the valve. Boxes shall be of lengths consistent with pipe depths as shown on the Drawings. Boxes shall be adjustable, with a lap of at least 6-inches when in the most extended position. Covers shall have the word "WATER" cast in the top. Each valve box shall have a concrete round collar installed around the top along with a concrete valve marker at each valve.

G. Concrete Valve Marker

Concrete valve marker shall be 4"x4" square by 4'-6" in length with 4-#3 re-bar cast in 4,000 psi concrete. All corners shall have a 3/4" chamfer. A 2" brass marker plate with anchor shall be embedded in the top. The brass plate shall have a directional arrow pointing to valve with the distance to the nearest foot. The concrete valve marker shall be set 24" in the finish grade.

2.03 HYDRANTS

- A. Hydrants shall conform to AWWA C502. Main Valve opening size shall be 5-1/4 inches minimum and inside barrel diameter shall be 7 inches minimum with 3 feet minimum bury. Hose connections shall be two 2 1/2 inches and one 4 1/2 inches. Nipple caps shall **NOT** be chained to the barrel. Hydrant shall be DRY TOP type protecting operating threads from coming in contact with water. Operating threads will be grease lubricated through easily accessible Alemite fitting in top of operating nut. Direction of opening shall be counterclockwise and be cast on the head of the hydrant. Hose nipples shall be bronze or non-corrosive metal and threads shall be National Standard.
- B. Hydrants shall be traffic type utilizing stem breaking coupling and breakaway traffic flange. (Breakable bolts or nuts are not acceptable.)
- C. Hydrants shall be painted with 1 coat of primer and 2 finish coats of Tnemec Series 73 or an approved equal (fire hydrant yellow). Fire hydrant caps shall be painted with color designated by water main size in accordance with Pooler Standards.
- D. Hydrants shall be American Darling, Mueller, and M&H or approved equal.

2.04 POST INDICATOR VALVES & HYDRANT

- A. Each post indicator valve shall consist of a gate valve which meets these specifications and an indicator post which meets National Fire Protection Association Code, NFPA 13. The gate valve and post indicator shall be compatible. Post indicator shall be painted with three coats of paint Fire Hydrant Red in color.
- B. Post hydrant shall have a 2-inch brass ball valve installed at inlet with a valve box and concrete collar. The operating rod shall be non-turning, and all operating parts shall be removable from above ground with no special wrenches. The hydrant shall have a two and one half (2 1/2) inch NFS outlet and a two (2) inch inlet, unless otherwise specified on the Drawings. The hydrant shall be non-freezing, and self-draining with a three (3) inch ductile iron barrel. Post hydrant shall be M&H Post Hydrant Style 33, or approved equal.

2.05 YARD HYDRANTS

Yard hydrant shall have large cushion type plunger, positive shut-off, automatic drain feature to prevent freezing, with a depth of bury of four (4) feet. Yard hydrant shall have a 1" NPT inlet and a brass nozzle with 3/4" hose threads. Yard hydrants shall be Woodford Freezeless IOWA Model Y1, or equal.

2.06 SERVICES

A. Water Service Pipe Material

Pipe shall conform to AWWA Specifications C901-96, Polyethylene Pressure Pipe and Tubing, and shall be marked with AWWA requirements and the following:

<u>Polyethylene</u>	<u>To Be Marked On Pipe</u>
Nominal Size	X
ASTM D2837	X
SDR 9	X
PE 3408	X
Working Pressure - 160 psi	X
Water Service Tubing	X
National Sanitation Foundation (NSF 14)	X
Pipe Color	Blue

Unmarked pipe, without information noted above, will not be accepted. Polyethylene pipe shall comply with ASTM D1248 PE3408 Class III, A, 5, P34. Brass (Domestic Made) or bronze compression type fittings shall be used. Flared connections will not be permitted. Continuous metallic tape over the pipe will be required. No gooseneck will be allowed nor will solvent weld joints be allowed. Corporation and curb stops will be required on all laterals. Minimum nominal size shall be 1 inch.

B. Corporation Stops

At each tapped point a connection to the pipe shall be made by installing a corporation stop. Corporation stops shall be Ford F 1000-4-G AWWA/CC Ground Key Corporation Stop, or equal, as required for the type of pipe being tapped.

C. Curb Stops

Curb stop shall be 1 inch size or as shown on the Drawings and shall be Ford C14-44G1 FIP x GJCTS with a Brass, domestic made, square head cored plug, or equal.

D. Meter Box - 3/4" and 1"

Meter boxes shall be of cast iron and shall be 3/4" stretch box Ford LYL141-243T or stretch box Ford LY 111-444-YBL-T. NO APPROVED EQUAL The lid shall have the word WATER cast in it.

2.07 BACKFLOW PREVENTER

Backflow preventer shall comply with the City of Pooler's Backflow - Prevention and Cross-Connection Control Handbook.

All commercial units shall have an approved reduced pressure zone backflow preventer device with enclosure.

2.08 APPURTENANCES

A. Polyethylene Encasement

Polyethylene encasement shall have a nominal thickness of eight (8) mils and shall conform to AWWA C105. Polyethylene encasement is required whenever acidic soils are present during the installation of ductile iron pipe, ductile iron fittings and ductile iron fittings used on PVC pipes.

B. Dismantling Joint

1. The dismantling joint shall be a self contained flanged restrained joint fitting meeting the requirements of NSF 61 and ASTM C219. The dismantling joint shall be furnished as a complete assembly consisting of spigot piece, flange adapter, tie bars and gasket. The dismantling joint shall be designed so that no part of the restraint system extends outside the flange diameter. The internal bore shall match that of the pipe system.
2. The spigot piece shall be of steel meeting ASTM A28 6 Grade C. The flange adapter shall be either steel to ASTM A283 Grade C or Ductile Iron to ASTM A536 Grade 65-45-12. Tie bars shall be ASTM A193 Grade B7 threaded rod with rolled threads. The gasket shall be EPDM Grade E. The dismantling joint shall be supplied with an in-house applied fusion bonded epoxy coating applied by the fluidized bed method or Rilsan Nylon Coating. The coating shall comply with the requirements of NSF 61 and AWWA C550.
3. Dismantling joints shall be used where shown on the Drawings and shall be manufactured by Viking Johnson or an approved equal.

C. Sampling Station

Sampling Station shall have a 3/4-inch un-threaded nozzle. All stations shall be enclosed in a lockable, non-removable, aluminum-cast or stainless steel housing. When opened, the station shall require no key for operation and the water will flow in an all brass waterway. All parts shall be brass and be removable from above ground with no digging. A copper vent tube will enable each station to be pumped free of standing water to prevent freezing and to minimize bacteria growth. The exterior

pipng will be galvanized and shall be Model Eclipse No. 88 as manufactured by Kupferle Foundry or approved equal.

D. Tracing Wire & Marking Tape

1. Tracing wire shall be minimally #12 gauge solid copper with thermoplastic insulation suitable for direct bury applications. Tracing wire shall be continuous with all water mains, fire hydrants, post hydrants, sample stations.
2. All tracing wire is to be run through manholes, valve vaults and/or valve boxes and pinned at the top for access when cover is opened.
3. Underground marking tape shall be installed over all water mains (18-inches below grade). The tape shall consist of inert polyethylene material intended for buried service. It shall have a minimum thickness of 5 mils and be a minimum of 2-inches wide. Tape for water mains shall be blue with black lettering reading "CAUTION- WATER MAIN BURIED BELOW"

E. Utility Marking Post

Utility marking post shall be placed every 500 feet, at all change of direction or as shown on the Drawings above the utility and at fittings and labeled accordingly. The marking post shall be rigid enough to be easily installed in most soil conditions and durable to withstand repeated impacts. The marking post shall be a four (4) inches in width and remain flexible from -40 F to +140 F with UV stabilizers. The marker shall be highly visible standard fade resistant colors, White Background and Blue Lettering with the following imprinted thereon: international "No Dig" symbol, federal law warning, "WATER PIPELINE BELOW" with letter size and stroke to comply with the Federal Office of Pipeline Safety Specifications, City of Pooler's name, phone number and State one-call number. Markers shall be Rhino Tri View Test Station with poly tech coating, or approved equal.

F. Insulated Enclosures

Insulated enclosures shall consist of a fiberglass shell, insulated with urethane foam, provide security and freeze protection and shall provide drains sized for full port discharge, testing and maintenance access, vandal protection and optional freeze protection. The enclosure shall be GREEN in color. Insulated enclosures shall be manufactured by EzBox - Jacksonville, Florida, or approved equal.

G. Tapping Sleeves and Valves

Tapping sleeves and valves shall be used for making branch connections to an existing watermain. Tapping sleeves shall be provided at the locations indicated on the Drawings and shall be mechanical joint type, Mueller No. H-615, Clow F-5205 or approved equal. Tapping valves shall be mechanical joint type gate valves, Mueller

No. 667, Clow F-5093 or approved equal, and shall conform to the requirements of this Section.

H. Tapping Saddles 1" & 2" (Service Saddle):

Tapping saddles shall be used for making service connections on 4" and larger PVC and/or Ductile Iron Pipe. Drawings shall show a Smith Blair Series 317 service saddle or approved equal.

PART 3 - EXECUTION

3.01 INSTALLATION

A. General

1. The Contractor shall deliver all pipes, fittings, valves, hydrants and other accessories to the project site. All pipe, fittings, valves, hydrants, and accessories shall be handled with care to avoid damage. Pipe, fittings, valves and hydrants shall be inspected for cracks and other defects before they are installed. Defective pipe, fittings, valves, hydrants and other water main accessories shall not be installed.
2. Pipe shall be placed on the site of work parallel with the trench alignment and with bell ends facing the direction in which the work will proceed unless otherwise directed. No pipe shall be laid in water or when the trench condition or the weather is unsuitable for such work.
3. Pipe, fittings, valves, hydrants, and other water main accessories shall be thoroughly cleaned before installation the interior of all pipe, fittings, and other accessories shall be kept free from dirt and foreign matter at all times. Before installation of any materials, a City of Pooler representative shall inspect and approve all material before installation.
4. Pipe cutting shall be done in a neat and workmanlike manner without damage to the pipe. Deflection of pipe joints shall not exceed the pipe manufacturer's recommendations.
5. Completed pipelines shall not be left exposed in the trench. The trench shall be backfilled and compacted as soon as possible after the pipe has been installed.
6. The open end of the pipe shall be closed at the end of the work day and when laying pipe to keep debris and water in the trench from entering the pipe.

7. Water mains shall be installed to the lines and grades shown on the Drawings, with fittings, hydrants, services, and other appurtenances at the required locations.
- B. Ductile Iron Pipe
Ductile iron pipe shall be installed in accordance the City of Pooler Standard Details, Section 02221 of the Standard Specifications, and with ANSI/AWWA C600.
 - C. PVC Pipe
PVC pipe shall be installed in accordance the City of Pooler Standard Details, Section 02221 of the Standard Specifications, and with ASTM D2321.
 - D. Excavation and Backfill
Excavation and backfill shall be as specified in Section 02221, Excavation, Trenching and Backfilling for Utility Systems. A minimum cover over the top of the pipe of 36-inches from the proposed paving subgrade, shoulder or finish grade shall be provided.
 - E. Hydrants
Hydrants shall be set at such elevations that the connecting pipe will have the same depth of cover as the distribution mains. The connecting pipe shall be ductile iron pipe. The hydrant assembly shall be restrained from the main to the hydrant. Hydrants and valves shall have the interior cleaned of all foreign matter before installation. Not less than one (1) cubic foot of broken stone shall be placed around the base of the hydrant. Contractor shall place a bag over the hydrant to indicate its not being in service until after the watermain is put into service.
 - F. Water Service Connection
 1. Service lines shall be connected to 2-inch and larger mains with a corporation stop. Plugged tees or crosses for future connections shall be installed where shown on the Drawings. A house service connection shall be provided to vacant lots and the exact location marked on the curb with a "W". The mark shall be made on the vertical face of the curb and shall be a minimum of 1/4-inch deep made with a branding iron. Where services are provided at locations without curb, a 2"x4" 30-inch long pressure treated flag stake painted white shall locate the end of the lateral. Minimum cover of 30-inches shall be provided until a short transition to the service is stubbed out of the ground.
 2. Water service laterals installed under roadways shall have a case conduit that is installed a minimum of 30 inches below the road (laterals shall not be installed in the base of the road). Conduit shall be of adequate size for the service to fit in and out. Schedule 40 PVC pipe is permissible for use. Each end of the conduit shall be sealed.

3. Water service laterals shall be installed one foot short of the property line of all lots along street and right-of-ways in which watermain is constructed.
 4. Water service laterals stubbed out of the ground shall have insulated end valves to prevent freezing.
- G. Brass Nipples and Brass Pipe Fittings (Domestic Made)
Threads shall be cleanly cut with sharp tools and the jointing procedure shall conform to the best practice. Before jointing, all scale shall be removed from pipe by some suitable means. After cutting, all pipe shall be screwed together with an application of graphite and engine oil, Teflon tape, or other sealing compound applied to all threads and once a joint has been screwed on it shall not be backed off unless the threads are re-cleaned and new compound or Teflon tape applied. Unions shall be installed at every connection to the supply line.
- H. Connection to Existing Water System
The Contractor shall furnish necessary materials and perform all excavation, dewatering, shoring, backfilling, etc., necessary to make the connection of a new main to the existing watermain. The Contractor shall notify the Engineer and City of Pooler, a minimum of 48 hours in advance of construction. The Contractor shall be responsible for coordinating his construction with the Water Department.
- I. Damage to Water System
Damage to any part of the water system by the Contractor, or subcontractors that is repaired by Water Department forces shall be charged to the Contractor on the basis of time and material plus 30 percent for overhead and administration.
- J. Protection of Water Supply Systems
See Section 02221, for protection of Water Supply Systems.
- K. Polyethylene Encasement
Polyethylene encasement shall be used where noted on the Contract Drawings or where directed by the Engineer. Polyethylene encasement, where required, shall be installed on all ductile iron piping, fittings, valves, and appurtenances and installed according to the requirements of ANSI/AWWA C105/A21.5
- L. Joint Restraints
All restraints shall be installed in accordance with the manufacturer's specifications. Thrust blocking in lieu of restrained joints is not allowed.
- M. Utility Marking Posts
Utility marking post shall be placed where shown on the Drawings above the utility and at fittings and labeled accordingly. Spacing shall be as shown on the Drawings

and at a minimum of every 500 linear feet and at each change of direction.

N. Relocating Fire Hydrants

Fire hydrants shall be relocated according to the Drawings or as designated by the Engineer. When the existing hydrant lateral tee does not accommodate a new hydrant location, a new hydrant lateral tee shall be installed in the main. If the existing tee is removed and relocated to the new location of the hydrant assembly, a new section of pipe shall be installed in the main. All parts shall be protected during removal and relocation and lost or damaged items shall be replaced by the Contractor at no cost to the City. Relocated fire hydrants shall be installed in accordance with the requirements for new fire hydrants. Backfilling shall be in accordance with Section 02221.

3.02 HYDROSTATIC TESTING

- A. All pressure and leakage test shall be performed in accordance with the latest edition of AWWA C600. Leakage test shall be conducted simultaneously with the pressure test. The duration of the test shall be 2 hours and during the test the main or section of main under test shall be subjected to a pressure of 150 psi based on the highest point in the line or section under test, and connected at that elevation to the test gauge. Test pressure shall not vary more than 5 psi for the duration of the test. Testing allowance shall be defined as the quantity of makeup water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the test pressure after the pipe has been filled with water and the air has been expelled. Testing allowance shall not be measured by a drop in pressure in a test section over a period of time. Testing allowance is defined as the quantity of water to be supplied into the newly laid pipe or any valved section thereof, necessary to maintain the specified leakage test pressure after the air has been expelled and the pipe has been filled with water at the test pressure. No pipe installation will be accepted until the testing allowance is less than the number of gallons per hour as determined by the formula.

$$Q = \frac{L \times D \times \text{sq. rt. } (P)}{148,000}$$

Q = testing allowance (makeup water), in gallons per hour

L = the length of pipe tested in linear feet.

D = the nominal diameter of the pipe in inches

P = the average test pressure during the hydrostatic test in pounds per square inch (gauge).

- B. Should any test of pipe laid disclose leakage greater than the above specified, the Contractor shall at his own expense locate and repair the defective joints until leakage is within the specified testing allowance. All visible leaks shall be repaired regardless of the allowance used for testing. Line shall be retested until Testing

Allowance requirement are within the allowable leakage. All testing shall be at the Contractor's expense.

3.03 CLEANING AND DISINFECTION OF NEW MAINS

- A. All water mains, as well as those taken out of service for inspection, repair or other activities that might lead to contamination of water shall be disinfected before they are placed in or returned to service. The water passing through them must show by laboratory tests safe results before the system can be placed in service. Disinfection of all water lines and the disposal of the heavily chlorinated water, following the disinfection, shall be in accordance with AWWA C651, latest revision. The Atablet method of disinfection which consist of placing calcium hypochlorite granules or tablets in the water main as it is being installed and then filling the main with potable water when installation is completed is not allowed. Approved methods for the accomplishment of these are as follows:
1. The interior of the pipe shall be cleaned by brushing, swabbing or washing out all debris before laying. Branches and other openings shall be capped with plugs or heads until either capped or connected. The use of a cross connection device during flushing and disinfection to protect the active part of the water system shall be required. Before the main is chlorinated, it shall be filled to eliminate air pockets and shall be flushed to remove particulates. A flushing velocity of not less than 2.5 feet per second shall be maintained in pipe sizes less than 24-inches in diameter.
 2. Install sufficient number of sample points to give representative sampling on the newly installed lines. The hydrants should be at least 18 inches higher than main and must discharge toward the ground.
 3. Quality of water used during the disinfection procedure shall meet drinking water standards.
 4. Flush the new pipe lines for a full pipe open end flush until the water runs clear at the end of all mains and laterals. This should be done after the pressure test and before disinfection. Each valved section of the newly laid pipe should be flushed separately with potable water.
 5. Disinfect the pipe lines with chlorine. The preferable point of application of the chlorinating agent is at the beginning of the pipe line extension, or any valved section of it, and through a corporation cock inserted in the horizontal axis of the newly laid pipe. Water from the existing distribution system should be controlled to flow very slowly into the newly laid pipe during the application of the chlorine. Partially open all hydrants or valves on the newly laid line under treatment to prevent the building up of water pressure. The chlorine solution used for disinfection of water mains shall have a free

chlorine residual concentration not less than 25 mg/l. This heavily chlorinated water shall be retained in the main for at least 24 hours, during which time all valves and hydrants shall be operated to ensure disinfection of the appurtenances.

6. Allow the treated water to remain in the pipe line for at least 24 hours, the treated water in all portions of the main shall have a residual of not less than 10 mg/l free chlorine. Re-chlorinate if required results are not obtained on all samples. After the applicable retention period, the heavily chlorinated water must not be disposed in a manner that will harm the environment. Neutralizing chemicals, such as Sulfur Dioxide, Sodium Bisulfite, Sodium Sulfite or Sodium Thiosulfate should be used to neutralize the chlorine residual remaining in the water to be wasted. Flush all mains and lines until all the heavily chlorinated water has been removed. No chlorine or chlorinated water is to be disposed of in the sewer system, storm sewer, or surface waters.
7. Test water samples to make sure all chlorine has been flushed out or until the concentration of chlorine in the newly laid lines is no higher than that of a sample taken on the supply line. After final flushing and before the water main is placed into service, water samples shall be collected from the main and tested for microbiological quality in accordance with the Georgia Rules for Safe Drinking Water, Chapter 391-3-5. The laboratory results must show the absence of coliform organisms in the water. Reflush and re-disinfect the lines, as necessary, until satisfactory bacteriological results are obtained.
8. All water used for flushing and testing purposes must be metered. If metering is not possible, an engineer's estimate of the quantity of water used must be provided in writing to the City.

3.04 AMOUNT OF CHLORINE NECESSARY FOR DISINFECTION

- A. Chlorine required to produce 25 mg/l concentration in 100 feet (30.5 m) pipe by diameter.

Pipe Diameter (inches)	100% Chlorine		1% Chlorine Solution	
	(lbs)	(g)	(gal)	(L)
4	0.013	5.9	0.16	0.6
6	0.030	13.6	0.36	1.4

8	0.054	24.5	0.65	2.5
10	0.085	38.6	1.02	3.9
12	0.120	54.4	1.44	5.4
16	0.217	98.4	2.60	9.8

Note: 1 % chlorine solution may be prepared with sodium hypochlorite (contains 5% to 15% available chlorine) or calcium hypochlorite (contains approximately 65% available chlorine by weight). To prepare 1% chlorine solution using calcium hypochlorite, add one (1) pound (454 grams) of calcium hypochlorite in approximately 8 gallons of water.

- B. Amounts and types of chemicals advised to be used for neutralizing various residual chlorine concentrations on 100,000 gallons of water.

Residual Chlorine Concentrations	Chemicals							
	Sulfur Dioxide (SO ₂)		Sodium Bisulfate (NaHSO ₃)		Sodium Sulfide (Na ₂ SO ₃)		Sodium Thiosulfate (Na ₂ S ₂ O ₃ .5H ₂ O)	
mg/l	lb	Kg	lb	Kg	lb	Kg	lb	Kg
1	0.8	0.36	1.2	0.54	1.4	0.64	1.2	0.54
2	1.7	0.77	2.5	1.13	2.9	1.32	2.4	1.09
10	8.3	3.76	12.5	5.67	14.6	6.62	12.0	5.44
50	41.7	18.91	62.6	28.39	73.0	33.11	60.0	27.22

- C. The Engineer will arrange for the City of Pooler inspection. Lines will not be placed in operation until City of Pooler approval and Engineer directs Contractor to do so.

3.05 HYDRANT FLOW TEST

A hydrant flow test will be performed after the lines are placed in service as directed by the Engineer. Results of the test will be reported in writing to the Engineer.

3.06 IDENTIFICATION AND TRACER WIRE

A. Mylar Tape

Mylar tape shall be installed 18 inches below the finished grade over the top of the water mains. The tape shall be 2 inches wide, of blue color and have imprinted on

the tape "Caution - Water Line Below." The tape shall be laid the entire length of the trench.

B. Tracer Wire

1. Tracer wire shall be attached by means of securing the wire on top of the water main with a 12-inch long by 2-inch wide piece of duct tape. Attach the wire to the main every ten (10) feet.
2. Wire shall be bonded at splices with 3M DBY-6 Direct Bury Splice Kit at every connection
3. The wire shall be laid the entire length of the trench and shall be continuous. The Contractor shall demonstrate continuity in wire through the entire length of the project. At every valve manhole the wire shall be run through the pipe opening, up to the ring and cover, secured at the ring by means of grouting the ring to the top of the manhole. The wire shall continue in the same loop back to the opposite pipe opening, through it and continuing in one continuous loop along the main.
4. At every fire and post hydrant, the wire shall be run from the main to the hydrant tee, to the gate valve, wrapped around the gate valve once, then run to the bottom of the hydrant flange, up the hydrant, wrapped around it once at the finish grade, then back to the main in one continuous loop, and continuing along the water main.
5. At every water service lateral, the wire shall be run from the main and corporation stop to the curb stop and attached to the polyethylene pipe by a piece of duct tape wrapped around the wire and tubing. The wire shall be connected to the tracer wire at the main with a single strand from the water main to the curb stop or into the meter box.
6. At every sampling station, the wire shall be run from the main service connection up to the bottom inside of the sampling station, then back in one continuous loop to the water main, then continuing with the utility along the water main.
7. Tracing wire shall be a single strand installed from the main to all Utility Marking Post line markers with sufficient length at the marker to be wrapped around the marker several times. The City of Pooler will test all tracer wire prior to acceptance.

3.07 SHOP DRAWINGS

Shop drawings shall be submitted on each manufactured item supplied under this Section along with other information as specified herein.

3.08 CLEANUP

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

3.09 WATER VALVES

Gate and butterfly valves installed on transmission mains (12 inches and larger) shall be installed in a cast iron valve box with a concrete collar and concrete valve marker post. Gate and butterfly valves shall be installed in manholes only where noted on the Drawings. All 14-inch or larger gate valves that are installed on the transmission line(s) and /or tie into a major transmission line shall be installed in a manhole. All Gate Valves that are located at the entrance of subdivision or other development that tie into a transmission line shall be installed in a manhole. All other Gate Valves can be installed in a cast iron valve box with a concrete collar and concrete valve marker post.

3.10 RECORD DRAWINGS

The City of Pooler will require Record Drawings seventy two (72) hours before final inspection will be made. The Contractor shall keep on the work site one (1) set of clean Drawings stamped by the City or the City's representative "Issued for Construction" to which at the end of every day the necessary information will be marked by the Contractor's superintendent. All deviations from the Drawings shall be stationed and clearly marked. Record drawings shall include measurements between each valve, bends, permanent land markers, manholes, laterals locations from property corners, fire hydrants & manholes. In addition, state plan coordinates and GPS coordinates should be provided on all valves and manholes.

END OF SECTION 02700

SECTION 02710
SEWER FORCE MAINS

PART 1 - GENERAL

1.01 SCOPE OF WORK

This section covers the requirements for the installation of sanitary sewer force mains including excavation, pipe laying, backfilling, compaction and other work.

1.02 RELATED SECTIONS

Section 02200 - Excavation, Filling and Grading

Section 02221 - Excavation, Trenching and Backfilling for Utility Systems

Section 02545 - Protective Coating for Concrete and Masonry Sanitary Sewer Structures

Section 02557 - HDPE Liner

Section 02720 - Sanitary Sewers

Section 02730 - Reclaimed Water Distribution System

1.03 EXCAVATION AND BACKFILL

Excavation and backfilling shall be as specified in Section 02221, Excavation, Trenching and Backfill for Utility Systems. A minimum cover over the top of the pipe of three (3) feet from the proposed subgrade, shoulder or finished grade shall be provided.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS

Except where specifically noted on the Drawings, the following types of pipe shall be used:

A. Ductile Iron Pipe

1. Material

a. Ductile iron pipe shall be manufactured in accordance with ANSI A21.51, latest revision. Ductile iron pipe shall be of the thickness according to ANSI A21.50, latest revision, for Laying Condition Type 2.

b. Flange Pipe or Victaulic grooved pipe shall be Pressure Class 350.

2. Fittings

a. Fittings shall conform to ANSI/AWWA C111 A21.11, latest revision,

and shall be push-on-type unless otherwise shown.

- b. Mechanical joint fittings shall conform to ANSI/AWWA C153/A21.53, latest revision. Bolts shall conform to ANSI B18.2.1, latest revision. Nuts shall conform to ANSI B-18.2.2, latest revision. Bolts and nuts shall conform to ANSI B1.1.
- c. Flanged Fittings shall conform to ANSI/AWWA C110/A21.10, latest revision. The ANSI/AWWA C110/A21.10 fitting flanges shall have facing and drilling which match ANSI/AWWA C115/A21.15 threaded-on flanges which also match ANSI B16.1 Class 125 flanges except where Pressure Class 250 is noted.

3. Joints

- a. Joints shall conform to ANSI A21.11, latest revision, push-on-type unless otherwise shown.
- b. Restrained Joints - Restrained joints for pipe, valves and fittings shall be mechanical joints with ductile iron retainer glands equivalent to Ford 1390 Series, Mega-Lug, EBBA Series 1100 for Ductile Iron 4" and larger, EBBA Series 2000 PV for PVC Pipe 4" and larger, Flexlock, T-lock, Uni-Flange, or approved equal or push on joints equivalent to "Lock Ring", "TR Flex", "Super Lock", "Field Lock", or "MJ FIELD LOK Gasket, Series DI or Series PV" The joints shall be in accordance with the applicable portions of ANSI/AWWA C111/A21.11.

4. Lining

Lining for the interior of ductile iron pipe and fittings shall be 40 mils nominal dry film thickness of ceramic epoxy, conforming to ASTM E-96-66, ASTM B-117, ASTM 6-95, ASTM D-714-87, latest revision. Ceramic epoxy shall be Protecto 401, or equal. Lining application, inspection, and certification, handling and surface preparation of the area to receive the protective coating shall be in accordance with the manufacturer's specifications and requirements.

5. Exterior Coating

Exterior coating shall be an approved bituminous coating 1 mil thick in accordance with ANSI A21.51, latest revision.

6. Polyethylene Encasement

Polyethylene encasement shall conform to ANSI A21.5, latest revision for high density, cross-laminated polyethylene film. Polyethylene encasement

shall be used and installed according to the requirements of ANSI A21.5, Sec. 4.4, Method A and where indicated on the drawings.

B. PVC Pipe

PVC force main pipe shall be factory dyed industry standard **green** in color for sewer and **Pantone purple 522** using sunlight stable pigment in color for reclaimed water. See Section 02730 for Reclaimed Water Distribution System.

1. Material

- a. PVC Pipe for sewer force mains 4-inches through 12-inches shall conform to AWWA C900, DR 25, latest revision and pipe 14-inches and larger shall conform to AWWA C905, DR 25 unless specifically shown otherwise on the Drawings.
- b. Pipe less than 4 inches in diameter shall be Class 200 with dimension ratio of 21 or lower conforming to ASTM D2241, latest revision.

2. Outside Diameter

Pipe shall have an outside diameter equal to the outside diameter of ductile iron pipe.

3. Joints

PVC pipe joints shall have integral bell and spigot joints with elastomeric gasket conforming to ASTM F477, latest revision, integral thickened wall bell end. Gasket groove wall thickness shall meet or exceed the thickness of the pipe barrel.

4. Fittings

Fittings on 3-inch and larger pipe shall be ceramic epoxy lined ductile iron conform to ANSI/AWWA C-153/ A21.53, latest revision.

PVC fittings may be used on 2-inch pipe.

5. Couplings and Fittings

Couplings and fittings shall be furnished by the pipe manufacturer and shall accommodate the pipe for which they are to be used. They shall have the same minimum pressure rating as the pipe. Coupling method shall allow for expansion or contraction of each pipe section to be taken up at each end of the pipe.

6. Affidavit of Compliance

The manufacturer shall furnish an affidavit that all materials delivered comply with the requirements of this standard and supplemental specifica-

tion.

C. Polyethylene Pipe

High Density Polyethylene (HDPE)

Pipe supplied under this section shall be, SDR-11. It shall meet the criteria for a Type III, Class C, Category 5, Grade PE34 piping material in accordance with ASTM D3350. Pipe shall have **green stripe** for sewer.

1. Dimensional characteristics and pressure capabilities shall meet the requirements of ASTM D3261, Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for PE Plastic Pipe and Tubing; ASTM D2513 and AWWA C906-99, Polyethylene (PE) Pressure Pipe and Fittings.
2. Sections of polyethylene pipe should be joined into continuous lengths on the job site above ground. The joining method shall be the butt fusion method and shall be performed according to the manufacturer's recommendations. Pipe shall be pressure tested prior to connection to the sewer system.
3. End connections 12-inch and larger shall be flanged ends. Less than 12-inches may be flanged or MJ adapters with insert sleeves.

2.02 VALVES

A. Plug Valves

Plug valves shall be used on all sewer applications unless approved otherwise by the Engineer. Plug valves shall be of the non-lubricated eccentric plug type with a resilient seat seal. Plug valves for buried service shall be furnished with mechanical joint ends in accordance with ANSI Standard A21.11, latest revision. Plug valves located in valve vaults or above ground shall be furnished with flanged ends in accordance with ANSI 16.1, Class 125/150 standard faced and drilled. Port area for all valves shall be a minimum of 80% of the full pipe area. Valve bodies shall be of ASTM A-126 Class B cast iron. All exposed nuts, bolts, washers, springs, etc. shall be stainless steel.

Plug facing shall be non-metallic. The seat shall be nickel and welded to the body of the valve. Valves shall have their internal wetted surfaced protected by nonmetallic coatings factory applied, thermally bonded and in full conformance to AWWA Standard C550, latest revision.

Nominal valve pressure ratings, body flanges and wall thicknesses shall be in full conformance to ANSI B16.1. Valves shall seal leak-tight against full rated pressure in both directions.

Valves two inches (2") and larger for direct bury shall have gear actuators with 2" square operating nut and shall be capable of opening valve at rated pressure of 150 psi. All gearing shall be fully enclosed in a suitable housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. A suitable stop shall be set to provide water tight shut off in the closed position at full rated pressure. All exposed nuts, bolts and washers shall be stainless steel.

Valve actuators for buried or submerged service shall have seals on all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs, and washer used in buried service shall be stainless steel.

Plug valves shall be Dezurik Eccentric Plug Valves or an approved equal and shall be installed as shown on the Drawings.

B. Sewage Combination Air Valves

All valves shall be supplied with back-flushing attachment and hose. Body shall be cast iron of the long body design conforming to ASTM A48, Class 35 and shall be able to operate at pressures up to 300 psi with all internal parts and floats of stainless steel. The open vent end of the air release valve shall have an air relief pipe from automatic valves or from manually operated valves that shall be extended to the top of the pit and provided with a screened downward facing elbow. Sewage combination air valves shall be provided at points shown on the force main and shall be 2 inch size unless noted otherwise. The valves shall be capable of venting air from the pipeline while filling, permit air to reenter the pipeline to reduce the potential for vacuum on the system, and release air from the pipeline while the pipeline is pressurized. Valves shall be APCO Series 440 SCAV, Empire Figure #942, or equal.

PART 3 - EXECUTION

3.01 INSTALLATION

- A. Pipe and fittings shall, unless otherwise directed, be unloaded at the point of delivery, hauled to and distributed at the site of the project by the Contractor. They shall at all times be handled with care to avoid damage. In loading and unloading, they shall be lifted by hoists or slid or rolled on skidways in such a manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handling on skidways must not be skidded or rolled against pipe already on the ground. In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench. The interior of all pipe, fittings and other accessories shall be kept free from dirt and foreign matter at all times.

Cutting pipe for inserting fittings, or closure pieces, shall be done in a neat and workmanlike manner without damage to the pipe. Wherever necessary to deflect the pipe from straight line, whether in the vertical or horizontal direction to avoid obstructions, the degree of deflection shall be in accordance with manufacturer's instructions. No pipe shall be laid in water or when the trench condition or the weather is unsuitable for such work. Installation shall be in accordance with manufacturer's instructions.

B. Ductile Iron Pipe

Proper implements, tools and facilities shall be provided and used by the Contractor for the safe prosecution of the work. All pipe and fittings shall be carefully lowered into the trench piece by piece by means of derrick, ropes or other suitable tools or equipment in such a manner as to prevent damage to the pipe. Under no circumstances shall pipe or accessories be dropped into the trench.

Before lowering and while suspended, pipe shall be inspected for defects. Any defective, damaged or unsound pipe shall be rejected. All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered into its position in the trench and it shall be kept clean by approved means during and after laying.

Care shall be taken to prevent dirt from entering the joint space. At all times when pipe laying is not in progress, the open ends of the pipe shall be closed by approved means and no trench water shall be permitted to enter the pipe.

C. PVC Pipe

Pipe shall be installed in accordance with ASTM D2321, latest revision. Excavation, bedding and backfill shall be as specified in Section 02221.

D. Polyethelene Pipe

Pipe shall be installed in accordance with ASTM D2321, latest revision. Excavation, bedding and backfill shall be as specified in Section 02221.

3.02 HYDROSTATIC TESTING:

- A. All pressure and leakage test shall be performed in accordance with the latest edition of AWWA C600. Leakage test may be conducted simultaneously with the pressure test. The duration of the test shall be 2 hours and during the test the main or section of main under test shall be subjected to a pressure of 100 psi (for sewer lines) or 150 psi (for reuse water lines) based on the lowest point in the line or section under test, and connected at that elevation to the test gauge. The City can request 150 psi pressure test on high service lift station sewer force mains.

Test pressure shall not vary more than 5 psi for the duration of the test. Testing allowance shall be defined as the quantity of makeup water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the test pressure after the pipe has been filled with water and the air has

been expelled Testing allowance shall not be measured by a drop in pressure in a test section over a period of time. Testing allowance is defined as the quantity of water to be supplied into the newly laid pipe or any valved section thereof, necessary to maintain the specified leakage test pressure after the air has been expelled and the pipe has been filled with water at the test pressure. No pipe installation will be accepted until the testing allowance is less than the number of gallons per hour as determined by the formula.

$$L = \frac{S \times D \times \text{sq. rt. } (P)}{148,000}$$

L = testing allowance (makeup water), in gallons per hour

S = the length of pipe tested in linear feet.

D = the nominal diameter of the pipe in inches

P = the average test pressure during the hydrostatic test in pounds per square inch (gauge).

- B. Should any test of pipe laid disclose leakage greater than the above specified, the Contractor shall at his own expense locate and repair the defective joints until leakage is within the specified testing allowance. All visible leaks shall be repaired regardless of the allowance used for testing. Line shall be retested until testing allowance requirement are within the allowable leakage. All testing shall be at the Contractor's expense.

3.03 MANHOLES

- A. Precast Concrete manholes shall meet all of the requirements of Specification Section 02720, Sanitary Sewers.
- B. New manholes that receive flow from sewer force mains shall be completely lined (top, bottom, and sides) in accordance with Section 02557- HDPE Lining or Section 02545 Protective Coating for Concrete and Masonry Sanitary Sewer Structures and in accordance with the details on Drawings.
- C. Existing manholes that receive flow from sewer force mains shall be completely lined (top, bottom, and sides) in accordance with Section 02545 - Protective Coating for Concrete and Masonry Sanitary Sewer Structures and in accordance with the details on Drawings.
- D. Connection to existing manholes shall be by coring and placement of a flexible boot of proper size for the pipe diameter. Flexible pipe to manhole connector shall accommodate both angular and lateral misalignment and shall conform to ASTM C923 specifications. All pipe clamp bands and expansion bands shall be stainless steel. Flexible connectors shall be Lock Joint, Kor-N-Seal II, or equal.

3.04 MYLAR TAPE AND WIRE

A. Mylar Tape

Mylar maintenance tape shall be installed 18-inches below finished grade and on top of the trench above all force mains where non-metallic pipe is used. The tape shall be 2 inches wide, of **green** color and have imprinted on the tape "Caution-Force Main Below@. The tape shall be laid the entire length of the trench.

B. Wire

1. Tracing wire shall be minimally #12 gauge solid copper with thermoplastic insulation suitable for direct bury applications. Tracing wire shall be continuous with all force mains, valves, and appurtenances.
2. All tracing wire is to be run through manholes, valve vaults and/or valve boxes and pinned at the top for access when cover is opened.

3.05 UTILITY MARKING POST

Utility marking post shall be placed every 500 feet, at all change of direction or as shown on the Drawings above the utility and at fittings and labeled accordingly. The marking post shall be rigid enough to be easily installed in most soil conditions and durable to withstand repeated impacts. The marking post shall be a four (4) inches in width and remain flexible from -40 F to +140 F with UV stabilizers. The marker shall be highly visible standard fade resistant colors, White Background and Green Lettering with the following imprinted thereon: international "No Dig" symbol, federal law warning, "FORCE MAIN BELOW" with letter size and stroke to comply with the Federal Office of Pipeline Safety Specifications, City of Pooler's name, phone number and State one-call number. Markers shall be Rhino Tri View Test Station with poly tech coating, or approved equal.

3.06 RECORD DRAWINGS

The City of Pooler will require Record Drawings seventy two (72) hours before final inspection will be made. The Contractor shall keep on the work site one (1) set of clean Drawings stamped by the City or the City's representative "Issued for Construction" to which at the end of every day the necessary information will be marked by the Contractor's superintendent. All deviations from the Drawings shall be stationed and clearly marked. Record drawings shall include measurements between each valve, bends, permanent land markers, manholes, laterals locations from property corners, fire hydrants & manholes. In addition, state plan coordinates and GPS coordinates should be provided on all valves and manholes.

3.07 SHOP DRAWINGS

Shop drawings shall be submitted on each manufactured item supplied under this Section along with other information as specified herein.

END OF SECTION 02710

SECTION 02720
SANITARY SEWERS

PART 1 – GENERAL

1.01 SUMMARY

This section specifies the requirements for constructing sanitary sewer pipelines and structures.

1.02 RELATED SECTIONS

Section 02200 - Excavation, Filling and Grading

Section 02221 - Excavation, Trenching and Backfilling for Utility Systems

Section 02545 - Protective Coating for Concrete and Masonry Sanitary Sewer Structures

Section 02557 – HDPE Liner

PART 2 – MATERIALS

2.01 PIPE MATERIALS

Unless otherwise specified or shown on the Drawings, the following types of pipe shall be used:

A. PVC Sewer Pipe (Solid Wall)

1. PVC pipe and fittings shall meet the requirements of ASTM D3034 for pipe 15" and smaller, latest revision (SDR 26). Pipe 18" and larger shall conform to ASTM F679. Pipe and fittings shall be homogeneous throughout and free from cracks, holes, foreign inclusions, or other injurious defects. The pipe shall be as uniform as commercially practicable in color, opacity, density and other physical properties. Pipe shall be subject to inspection by the Engineer. Pipe which does not meet the requirements of this Section shall be so marked by the Engineer and the Contractor shall remove it from the job site upon notice being received of its rejection.
2. Joints
Joints for PVC pipe shall be integral wall bell and spigot rubber gasketed joints. Joints shall conform to ASTM D3212 and the gasket to ASTM F-477.

3. Certification
Each length of pipe shall be marked with the following information: Manufacturer, Size, PVC Cell Classification, Type PSM, SDR, PVC Gravity Sewer Pipe, ASTM D3034 and Code Number.
4. At the time of shipment, the manufacturer shall submit 3 copies of written certification and test results to the Engineer that the pipe was manufactured and tested in accordance with the above specifications.

B. Ductile Iron Pipe

1. Material
Ductile iron pipe shall be manufactured in accordance with ANSI A21.51, latest revision. Ductile iron pipe shall be of the thickness according to ANSI A21.50, latest revision, for Laying Condition Type 2. All laterals must be ductile iron pipe and include tracing wire.
2. Joints
Joints shall conform to ANSI/AWWA C111/A21.11, push-on-type as described in latest revision.
3. Fittings
 - a. Fittings shall conform to ANSI/AWWA C111 A21.11, latest revision, and shall be mechanical joint type.
 - b. Mechanical Fittings shall conform to ANSI/AWWA C153/A21.53, latest revision. Bolts shall conform to ANSI B18.2.1, latest revision. Nuts shall conform to ANSI B-18.2.2, latest revision. Bolts and nuts shall conform to ANSI B1.1.
 - c. Flanged Fittings shall conform to ANSI /AWWA C110/A21.10, latest revision. The ANSI/AWWA C110/A21.10 fitting flanges shall have facing and drilling which match ANSI/AWWA C115/A21.15 threaded-on flanges which also match ANSI B16.1 Class 125 flanges except where Pressure Class 250 is noted.

- C. Lining
Lining for the interior of ductile iron pipe and fittings shall be 40 mils nominal dry film thickness of ceramic epoxy, conforming to ASTM E-96-66, ASTM B-117, ASTM 6-95, ASTM D-714-87, latest revision. Ceramic epoxy shall be Protecto 401, or equal. Lining application, inspection, and certification, handling and

surface preparation of the area to receive the protective coating shall be in accordance with the manufacturer's specifications and requirements.

- D. Exterior Coating
Exterior coating shall be an approved bituminous coating 1 mil thick in accordance with ANSI/AWWA C153/A21.51, latest revision.
- E. Polyethylene Encasement
Polyethylene encasement shall conform to ANSI A21.5, latest revision for high density, cross-laminated polyethylene film. Polyethylene encasement shall be used where indicated on the Drawings.

2.02 MANHOLES

- A. Precast Concrete Manholes
Precast manholes shall meet all requirement of ASTM C478, "Specification for Precast Reinforced Concrete Manhole Sections." A 0.1 - foot minimum drop shall be required through all manholes where the horizontal alignment change is less than 45 degrees. A 0.2 -foot minimum drop shall be required through all manholes where the horizontal alignment change is 45 degrees to 90 degrees. Horizontal alignment changes greater than 90 degrees at a single manhole shall not be allowed. A wide sweep invert shall be required for all manholes where the horizontal alignment change is 90 degrees.
- B. Drop Manholes
Drop manholes shall be precast conforming to ASTM C478 and shall be built at the locations and in conformance with the details shown where the difference in invert elevation between incoming pipe and manhole invert is more than 2 feet. The drop pipe shall be the same size as the influent sewer. Inside drop manholes shall be six (6) foot diameter manhole. All hardware on ductile iron piping associated with drop manholes must be stainless steel.
- C. Joints
Joints and gaskets for all sanitary sewer manholes shall conform to the applicable provisions of ASTM C443, "Joints for Circular Concrete Sewer and Culvert Pipe using Rubber Gasket" or Ram-Nek Premoulded Plastic Joint Sealer. Bell and spigot surfaces shall be smooth, accurately formed, and provide a loose, sliding fit, with a clearance between the bell and spigot of not more than 1/6 inch.
- D. Flexible Connections
Connection to existing manholes shall be by coring and placement of a flexible boot of proper size for the pipe diameter. Flexible pipe to manhole connector shall accommodate both angular and lateral misalignment and shall conform to ASTM C923 specifications. All pipe clamp bands and expansion bands shall be

stainless steel. Flexible pipe connectors shall be Lock Joint, Kor-N-Seal II, or equal.

E. External Joint Seals

1. All external manhole joints shall be sealed with a flexible rubber seal made of EPDM rubber with a minimum thickness of 65 mils. Each unit shall have a 2-inch wide by ¼-inch thick mastic strip on the top and bottom of the rubber wrap. The seal shall be designed to prevent leakage of water through the manhole joint. The flexible rubber seal shall be Infi-Shield Shield Wrap (Sealing Systems, Loretto, MN), Cretex (Cretex Specialty Company, Waukesha, WI) or approved equal.
2. Manhole adjustment rings shall be sealed with a flexible rubber seal. Acceptable products include Infi-Shield External Uni-Band (Sealing Systems, Inc. Loretto, MN), Cretex Manhole Chimney Seals (Cretex Specialty Products, Waukesha, WI) or an approved equal.

F. Manhole Steps

Manhole steps shall be cast into the manhole riser and cone sections by the manufacturer. Steps shall be 12 inches wide, 5 inch projection, arranged in a single row 12 inches on center. Steps shall be of a tough copolymer polypropylene that encapsulates a 1/2-inch, Grade 60, steel reinforcing rod. Manhole steps shall have serrated tread and tall end lugs and shall have a 1,500 pound pull out resistance and a 300 pound impact resistance.

G. Manhole Castings and Covers

1. Provide covers with the inscription "SANITARY SEWER" cast into the cover in lettering at least 2 inches high. Covers shall be 25-3/4 inches in diameter and shall be 2-inches thick at the bearing surface. Frame shall provide a 24-inch clear opening. Manhole covers and frames shall be USF 227, cover type "AS".
2. Watertight manhole rings and covers are to be used whenever the manhole top may be flooded by high water (All manholes located within the 100 year flood plain or from street run-off). USF 227 AS-ORS for water tight, or AS covers with PARSON MANHOLE INSERT, or equal. All frames shall be suitable for cast iron or steel riser ring for upward adjustment of cover. Manhole cover shall have non-penetration pickhole without vent hole or other penetration.

- H. Manhole Frame Sealants
Manhole frames shall be sealed to the concrete structure with a flexible material either on the outside for new manholes or on the inside for old manholes to prevent inflow between the concrete cone structure and the frame for the manhole covers. Sealing material shall be installed in accordance with the manufacturer's recommendation. Sealant shall be Flex Seal & Infi-Shield External Seal (Cretex Products), or approved equal.

PART 3 – EXECUTION

3.01 LOCATION AND GRADE

- A. The line and grade of the sewer and the position of all manholes and other appurtenances will be according to the Drawings. The grade line as given on the profile or mentioned in these Specifications means the invert or bottom of the inside of the pipe.
- B. All necessary lines and grades will be laid out by the Contractor from the control lines and benchmarks furnished by the Engineer. The Contractor shall use a laser to conform accurately to the lines and grades shown on the Drawings.

3.02 ROADWAYS AND OTHER CROSSINGS

- A. Boring and jacking shall be in accordance with the provisions of Section 02310 of the City of Pooler Standard Specifications and the City of Pooler Standard Details.
- B. Sewer lines shall be 15 feet or greater distance from buildings or structures. Sewer laterals shall be located 5 feet from property corner.
- C. Work located in or under State Highways shall be in accordance with GADOT standards and the terms and conditions of the permit(s) issued by GADOT.
- D. Work located in or under railroad right-of-ways shall conform to the requirements of American Railway Engineering Association and the term and conditions of the permits issued by the affected railroad. Before commencing work within the rights-of-way of the railroads or highways, the Contractor shall verify that the Owner has obtained the required permits.

3.03 PROTECTION OF OTHER UTILITIES AND STRUCTURES

- A. Damage to Existing Utility Lines
1. Any damage done to existing utility lines, services, poles and structures of every nature shall be repaired or replaced by the Utility Owner at the Contractor's expense. The approximate locations of certain known

underground lines are shown on the Drawings for information. Existing small lines may not be shown. The Contractor shall locate these and other known utility lines and shall excavate and expose all existing underground lines in advance of trenching operations.

2. At locations where the sewer is to be constructed in roadways, the Contractor shall take all precautions, and comply with all requirements, as may be necessary to protect the improvements, including installation and maintenance of lights and barricades for protection of traffic.

3.04 PROTECTION OF WATER SUPPLY SYSTEMS

See Section 02221 for protection of water supply pipes

3.05 EXCAVATION, TRENCHING AND BACKFILL FOR UTILITY SYSTEMS

Excavation, trenching, and backfill shall be as specified in Section 02221 of the City of Pooler Standard Specifications.

3.06 DUCTILE IRON PIPE

Ductile iron pipe shall be installed in accordance the City of Pooler Standard Details, Section 02221 of the Standard Specifications, and with ANSI/AWWA C600.

3.07 PVC PIPE

PVC pipe shall be installed in accordance the City of Pooler Standard Details, Section 02221 of the Standard Specifications, and with ASTM D2321.

3.08 MANHOLE INSTALLATION

- A. Manholes shall be constructed at such points as designated on the Drawings. In all cases the channel shall be smooth and properly rounded. Special care shall be exercised in laying the channel and adjacent pipes to grade. The connection of the sewer with the wall and channel of the manholes shall be tight and smooth. Pipe connections shall be made to manholes using water stops, standard O-ring joints, special manhole couplings, or shall be made in accordance with the manufacturer's recommendations. The Contractor's proposed method of connection, showing materials selected and specials required, shall be submitted to the Engineer prior to installation.
- B. The top of manholes outside of roads, streets and highways shall be constructed to grades 3-inches above ground surface, unless otherwise shown. Manholes in roads, streets and highways shall be constructed as shown on the Drawings, to match pavement elevations.
- C. Precast manholes shall be bedded on 6 inches of compacted crushed stone. The crushed stone shall extend not less than 6 inches outside the base of the manhole and under the entire length of pipe within the excavation for the manhole.

- D. Manholes that are constructed on large sewers and have a diameter greater than six (6) feet shall be designed specifically for that use and approved by the City prior to permitting. Manholes shall provide for a safety rail 3-feet above the manhole bench and shall have stainless steel eye-bolts embedded on the up-stream side of the manhole centered on the outlet pipe. The inlet pipe shall extend into the manhole and shall have a flat shelf constructed over that portion of the pipe. Manhole steps shall be aligned with the eccentric manhole top and shelf below.
- E. Stub-Outs
Stub-outs from manholes shall be laid to the proper grade and alignment, plugged with a suitable pipe stopper and made watertight.
- F. Inverts
The completed channel (invert) cross-section shall be U-shaped and constructed to the crown (top) of the pipes. The bench shall provide good footage for workmen and a surface to place minor tools. A bench slope shall be ½"/foot and shall not exceed 1"/foot.

3.09 ADAPTORS

Prefabricated flexible couplings or adaptors shall be used for connecting pipe of dissimilar materials.

3.10 MYLAR DETECTABLE WARNING TAPE

Mylar detectable warning tape shall be installed 18-inches below finished grade in the trench above all sanitary sewers. The tape shall be 2 inches wide, of green color and have imprinted on the tape "Caution-Sanitary Sewer Below". The tape shall be laid the entire length of the trench.

3.11 SERVICE CONNECTIONS

- A. Service connections shall be at locations shown on the Drawings. The connection shall be made as shown on the Drawings, or shall be a pipe stubbed out from a manhole, and shall extend to a distance 1 foot from the property line at an elevation of at least 2 feet below the finished floor elevation of the building being served or deeper if necessary to provide service to a building as shown on the Drawings at a grade of 2% slope on service line.
- B. Ductile iron pipe must be used for service laterals. A 4" tee must be provided at the location of each lateral in new developments. Tracer wire is required on all service connections.

A tapping saddle must be used for connecting new laterals to existing gravity sewers. Rubber connections are not acceptable.

- C. A 2" x 4" 30-inch long pressure treated flag stake painted red shall be located at the end of each sewer lateral.

3.12 TESTING AND CLEANING

- A. Before acceptance of the sewer lines, they shall be tested and cleaned. Where obstruction is met, the Contractor shall be required to clean the sewers by means of rods or swabs or other instruments. The pipe line shall be straight and show a uniform grade between manholes.
- B. The Contractor shall notify the Engineer when the sewer lines have been cleaned and are ready for inspection. The Engineer in cooperation with the Contractor and the City of Pooler will agree upon a date when all parties will be present and make the inspection and perform the tests specified hereinafter.

3.13 INSPECTION

All sewer pipes, manholes and appurtenances shall be inspected by the Engineer and the Contractor. Inspection shall include lamping each sewer segment from manhole to manhole. All defects will be noted and a list thereof transmitted to the Contractor. The City of Pooler reserves the right to require the Contractor to televise any lines which fail any test. All laterals and sewer lines 4" and larger must be televised.

3.14 TEST FOR DEFLECTION

- A. When PVC Sewer Pipe is used, the Contractor will be required to perform a deflection test. The deflection may be checked by one of two techniques. One of these is through the use of a specially designed deflectometer which when pulled through a sewer section automatically measures and records at frequent intervals the pipe's vertical and horizontal diameters.
- B. The other technique is to use a "go, no-go" mandrel which is sized to such dimension that it will not "go" when encountering a deflection greater than 5 percent. This type of mandrel, as well as a deflectometer, must be of such design as to minimize the possibility of its being hung up in the pipe by silt or other residues.
- C. Test for deflection shall be conducted no less than 30 days after installation of the pipe. If deflection is found to be greater than five percent of the inside pipe diameter, the Contractor shall repair or replace that portion of pipe. Another deflection test will be conducted 30 days after repairs or replacement.
- D. Prior to testing, the pulling of a deflectometer and/or a "go-no-go" mandrel, shall be done by attached rope no more than 1/4" inch in diameter, pulling apparatus through the pipe by means of one person pulling on the rope, in either direction of the flow of the pipe.

3.15 LEAKAGE TESTING: GRAVITY SEWER MAINS AND LATERALS

- A. All new public and private gravity sewers and laterals shall be pressure tested a minimum of 30 days following final backfill in accordance with the Time-Pressure Drop Method specified in ASTM F1417 - Standard Test Method for Installation Acceptance of Plastic Gravity Sewer Lines Using Low-Pressure Air, latest revision.
- B. The pressure drop shall be measured for the following time period, depending on the diameter of the sewer pipe being tested (based on a maximum test section length of 400' (feet) between manholes):

6 inch	6 minutes
8 inch:	6 minutes
10 inch:	8 minutes
12 inch:	12 minutes
15 inch:	18 minutes
18 inch:	26 minutes

The CONTRACTOR shall furnish an air compressor which will provide at least three hundred cubic feet of air per minute at one hundred pounds per square inch along with all necessary plugs, valves, air hoses, connections and other equipment necessary to conduct the air test. Pressure gauges on test apparatus shall be a minimum of 4" diameter with a minimum of 1 psi graduations and a maximum range of 0-10 psi. Plugs in sewer eighteen inches (18") in size and larger shall be connected by cable for thrust reaction. A minimum of 5psi is required when testing lines 12" and smaller. If the air pressure test fails, a higher pressure must be used on the retest.

- C. The pressure drop over the time period shall not exceed 0.5 psi. The testing shall be performed by the Contractor, and a representative of the City shall be present to observe the test. The Contractor shall be responsible for all costs associated with performing the leakage testing, locating leaks, repairing leaks, and conducting additional leakage testing as necessary until the system passes the pressure test. No gravity sewers or laterals will be accepted by the City without a passing pressure test.

3.16 TESTING MANHOLES

Each manhole shall be visually inspected for leaks. All visible leakage into the manhole, around the casting, or from laterals will be unacceptable. All joints shall be tight and any visible leakage in the joints shall be repaired at the Contractor's expense.

3.17 SHOP DRAWINGS

Shop drawings shall be submitted on each manufactured item supplied under this Section along with other information as specified herein.

3.18 RECORD DRAWINGS

The City of Pooler will require Record Drawings seventy two (72) hours before final inspection will be made. The Contractor shall keep on the work site one (1) set of clean Drawings stamped by the City or the City's representative "Issued for Construction" to which at the end of every day the necessary information will be marked by the Contractor's superintendent. All deviations from the Drawings shall be stationed and clearly marked. Record drawings shall include measurements between each valve, bends, permanent land markers, manholes, laterals locations from property corners, fire hydrants & manholes. In addition, state plan coordinates and GPS coordinates should be provided on all valves and manholes.

END OF SECTION 02720

SECTION 02730

RECLAIMED WATER DISTRIBUTION SYSTEM

PART 1 - GENERAL

1.01 SCOPE OF WORK

1. This section covers the requirements for the installation of reclaimed water main distribution including excavation, pipe laying, backfilling, compaction and other work.
2. The Contractor shall comply with all local codes and regulations of local utilities. He shall coordinate work necessary for the completion of utilities with local utility companies and cooperate with the companies as required. The Reclaimed Water Distribution System shall comply with Georgia Environmental Protection Division's "Guidelines for Water Reclamation and Urban Water Reuse", latest revision.

1.02 RELATED SECTIONS

Section 02200 - Excavation, Filling and Grading

Section 02221 - Excavation, Trenching and Backfilling for Utility Systems

1.03 EXCAVATION AND BACKFILL

Excavation and backfilling shall be as specified in Section 02221, Excavation, Trenching and Backfill for Utility Systems. A minimum cover over the top of the pipe of three (3) feet from the proposed subgrade, shoulder or finished grade shall be provided.

PART 2 – PRODUCTS

2.01 PIPE MATERIALS

All pipe material, solder and flux shall be lead free (less than 0.2 percent lead in solder and flux and less than 8.0 percent lead in pipes and fittings). All materials shall be certified for conformance with American National Standards Institute / National Sanitation Foundation Standard 61 (ANSI/NSF61). Except where specifically noted on the Drawings, the following types of pipe shall be used:

A. Ductile Iron Pipe

1. Material

- a. Ductile iron pipe shall be manufactured in accordance with ANSI/AWWA C151/A21.51, latest revision. All pipes larger than 12" shall be ductile iron.
- b. Ductile iron pipe shall be of the thickness according to ANSW/AWWA C150/A21.50, latest revision, for Laying Condition Type 2, at a minimum.
- c. Flange Pipe shall be Pressure Class 350.

2. Fittings

- a. Fittings shall conform to ANSI/AWWA C111 A21.11, latest revision, and shall be push-on-type unless otherwise shown.
- b. Flanged fittings shall conform to ANSW/AWWA C110/A21.10, latest revision. The AWWA C110 Fitting flanges shall have facing and drilling which match AWWA C115 threaded-on flanges which also match ANSW B16.1 Class 125 flanges except where Class 250 are specifically noted.
- c. Mechanical Fittings shall conform to ANSI/AWWA C153/A21.53, latest revision. Bolts shall conform to ANSI B18.2.1, latest revision. Nuts shall conform to ANSI B-18.2.2, latest revision. Bolts and nuts shall conform to ANSI B1.1.

3. Joints

- a. Push-on joints shall conform to ANSW/AWWA 1, latest revision.
- b. Flanged joints shall conform to ANSW/AWWA C115/A21.15, latest revision. Use only full-face type, red rubber gasket, one-sixteenth inch thick, as manufactured by the U.S. Rubber Company, in all flanged joints.
- c. Mechanical Joints shall conform to ANSI/AWWA C111/A21.11, latest revision. All joints of mechanical joint ductile iron and fittings shall be installed in accordance with the requirements of AWWA C600, Section 3.4. Bolts shall conform to ANSI B18.2.1, latest revision. Nuts shall

conform to ANSI B-18.2.2, latest revision. Bolts and nuts shall conform to ANSI B1.1.

- d. Restrained joints for pipe, valves, and fittings shall be mechanical joints with ductile iron retainer glands equivalent to "Megalug" or push-on type joints equivalent to "Lock-Ring," "TR Flex," or "Super-Lock," and shall have a minimum rated working pressure of 250 psi. The coating shall consist of a minimum of two coats of liquid Xylan® fluoropolymer coating with heat cure to follow each coat. The coating system shall be Mega-Bond™ by EBAA Iron, or approved equal. Restrained joints shall be capable of being deflected after assembly and they shall have a preset deflection of no more than 5 degrees while being able to take up to 3 degrees of deflection after burial.

4. Lining

- a. Lining for ductile iron pipe and fittings shall be a cement mortar lining meeting the ANSI/AWWA C104/A21.4, latest revision, for standard thickness lining. After cement lining, the interior of the pipe shall be given a seal coat of approved bituminous material in accordance with ANSI/AWWA C104/A21.4, latest revision.

5. Exterior Coating

- a. Exterior coating shall be an approved bituminous coating one mil thick in accordance with ANSI/AWWA C151/A21.51, latest revision.

6. Protective Coating

- a. Pipe and fittings shall be coated in the field by an approved painting subcontractor. The subcontractor's experience qualifications shall be submitted for approval by City of Pooler.
- b. Buried ductile iron pipe and fittings shall be color coded as per general color code requirements listed in the Utility Location and Coordination Council's Uniform Color Code. Reclaimed water main pipe, joints, and fittings shall be marked with Pantone Purple 522C.
- c. The coating shall cover the top 180 degrees of the pipe outside diameter, except for the spigot area. The standard asphaltic pipe coating shall not be deleted if field painting is selected. The paint shall be an all acrylic, water reducible, fast drying, semi-gloss coating and shall be suitable

for painting over asphaltic coatings. Coating data shall be as follows:

- Coverage: theoretical 615 square feet per gallon at 1.0 mil dry film thickness
 - Dry film thickness: 1.0-2.0 mils per coat
 - Wet film thickness: 3.0-8.0 mils per coat
- d. Apply coating in accordance to manufacturer's recommendations.
- e. Paint shall be manufactured by Induron or approved equal.
- f. After installation, the Contractor shall paint all steel sleeves, tapping sleeves, threaded rods, straps, nuts, bolts, washers, couplings, or other connecting/restraining apparatus with either Roster Laboratories, Inc., "Roskote Mastic No. A-939", Koppers Company, Inc., "Bitumastic Superservice Black", or approved equivalent protective coating.

B. PVC Pipe:

PVC pipe shall be Underwriters' Laboratories approved and listed and must meet all requirements of ASTM D2241 and bear the seal of conformance to NSF61. PVC pipe used for reclaimed water mains shall be color-coded using sunlight stable pigment Pantone Purple 522C. It shall meet or exceed AWWA C900 with the following supplemental specifications:

1. Material

- a. PVC Pipe less than 4 inches shall be Polyethylene Pipe, 200 psi, SIDR-7CTS. Pipe 4 inches to 12 inches shall be C-900 with Dimension Ratio 18 or lower (thicker). Plastic pipes are not allowed for sizes larger than 12 inches.
- b. Routine Hydrostatic Proof Test Requirements – Each piece of pipe shall be tested at four (4) times rated pressure class by the Manufacturer.

2. Outside Diameter

Pipe shall have cast iron pipe outside diameter.

3. Joints

- a. PVC pipe joints shall have elastomeric-gasket integral bell end. Bell section shall have a thickened wall. Gasket groove wall thickness shall meet or exceed the thickness of the pipe barrel.
- b. Mechanical joints shall conform to ANSW/AWWA C111/A21.11, latest revision. All joints of mechanical joints ductile iron and fittings shall be installed in accordance with the requirements of AWWA C600, Section 3.4. Bolts shall conform to ANSW B18.2.1, latest revision. Nuts shall conform to ANSW B-18.2.2, latest revision. Bolts and nuts shall conform to ANSW B1.1.
- c. Restrained joints for pipe, valves, and fittings shall be mechanical joints with ductile iron retainer glands equivalent to "Megalug" or push-on type joints equivalent to Lock-Ring," "TR Flex", or Super-Lock" and shall have a minimum rated working pressure of 250 psi. The coating shall consist of a minimum of two coats of liquid Xylan® fluoropolymer coating with heat cure to follow each coat. The coating system shall be Mega-Bond™ by EBAA Iron, or approved equal. Restrained joints shall be capable of being deflected after assembly and they shall have a preset deflection of no more than 5 degrees while being able to take up to 3 degrees of deflection after burial.

4. Fittings

Ductile iron fittings shall be mechanical-joint type conforming to ANSI /AWWA C153/A21.53, latest revision, with cement mortar lining and seal coat in accordance with ANSI/AWWA C104/A21.4, latest revision, and one mil thick petroleum exterior coating in accordance with ANSI/AWWA C104/ A21.4, latest revision, unless otherwise shown.

5. Affidavit of Compliance

The manufacturer shall furnish an affidavit that all materials delivered comply with the requirements of this standard and supplemental specification.

6. Couplings and Fittings

Couplings and fittings shall be furnished by the pipe manufacturer and shall accommodate the pipe for which they are to be used. They shall have the same minimum pressure rating as the pipe. Coupling method shall allow for expansion or contraction of

each pipe section to be taken up at each end of the pipe. Couplings shall permit five (5) degree deflection 2 degrees on each side) of the pipe with any evidence of infiltration, exfiltration or breaking.

7. Gaskets

PVC pipe joint gaskets shall meet the requirements of ASTM 477.

2.02 STEEL CASING AND CASING SPACERS

Steel casing and casing spacers shall be manufactured and installed as specified below.

- A. Casing pipe shall be steel conforming to ASTM A139, yield point of 35,000 psi, of the diameter and thickness shown on the contract drawings for each crossing. All pipe within casing shall be restrained joint ductile iron.
- B. Casing spacers shall be bolt on style with a shell made in two (2) sections of Heavy T-316 Stainless Steel. Connecting flanges shall be ribbed for extra strength. The shell shall be lined with a PVC liner. All nuts and bolts shall be 18-8 Stainless Steel. Runners shall be made of Ultra High Molecular Weight Polymer with inherently high abrasion resistance and a low coefficient of friction. Runners shall be supported by risers made of Heavy T-316 Stainless Steel. The combined height of the supports and runners shall keep the carrier pipe a minimum of 0.75" from the casing pipe at all times. Casing spacers shall be as manufactured by Cascade Waterworks manufacturing company, or approved equal.

2.03 VALVES

A. Gate Valves

Gate valves shall be right hand operational only and shall conform to the following specifications:

- 1. Resilient-Seated Gate Valves (3 Inches to 12 Inches)
 - a. Resilient-seated gate valves 3 inches to 12 inches shall conform to AWWA C509 with non-rising stem.
 - b. Unless otherwise indicated or specified, gate valves shall be designed for a working pressure of not less than 250 psig.
 - c. Valves shall take full pressure on either face. Valves shall be from one manufacture and similar sizes shall be

identical and parts interchangeable. They shall be constructed with bolted bonnets provided with two O-ring stem seals, which can be replaced with the valve under pressure in the full-open position.

- d. Valves shall be constructed of materials conforming to AWWAC509. All internal and external surfaces shall be coated with fusion-bonded epoxy to a minimum thickness of 8 mils.
- e. Valves seats shall be coated with a rubber material conforming to AWWA C5009 so that there shall be no rubber to metal contact when the valve is in the fully closed position.
- f. Valves shall be hydrostatically tested in accordance with AWWA C509.

2. Ball Valves (2 Inches & Smaller)

Ball valves 2 inches and smaller shall be designed for a working pressure of not less than 300 psi, domestic made brass, and shall conform to AWWA standard C800-89.

- a) Standard tee head stops in body permit 90-degree right turn only.
- b) Padlock wings shall be used on the tee head.

B. Butterfly Valves 14 Inches and Larger

1. Butterfly Valves 14 Inches and Larger

- a. Butterfly valves 14-inches and larger shall be of the tight closing, right hand operational only, rubber seated type, with rubber seat positively locking in place against flow from either direction. No metal-to-metal seating surfaces will be permitted. Valves shall be bubble-tight at rated pressures with flow in either direction. Butterfly valves shall conform to ANSI/AWWA C504, Class 150B.
- b. Valve body shall be high strength cast iron ASTM A126 Class B with 18-8 Type 316 stainless steel body seat. Valves shall have mechanical joints per AWWA C111. All MJ accessories (bolts, glands, gaskets) shall be supplied by

the valve manufacturer. Valves for below ground service shall be installed using restrained joints.

- c. Valve shafts shall be 316 stainless steel and shall consist of a one-piece, extending full size through the entire valve or 18-8 stainless steel stub shaft design keyed to the vane with stainless steel torque plugs.
- d. Valve discs shall be solid ductile iron with an epoxy coating making it corrosion resistant. The thickness of the discs shall not exceed 2-1/4 times the shaft diameter.
- e. Valve seats shall be natural or synthetic rubber providing 360 degrees uninterrupted seating. The resilient seat shall be adjustable or replaceable in the field without burning or grinding. The seat shall be molded over a stainless steel ring for support and secured to the disc by corrosion resistant, self-locking stainless steel screws.
- f. All internal ferrous metal surfaces in the waterway shall be factory coated with a non-toxic, two-component, and holiday-free, thermosetting epoxy to a nominal thickness of 4 mils. All external surfaces shall be coated with an epoxy coating conforming to AWWA C-550, with a minimum thickness of 10 mils.
- g. All butterfly valves shall be manually operated. Operators shall be of the traveling nut, self-locking type and shall be designed to hold the valve in any intermediate position without creeping or fluttering. Operators shall be furnished with externally adjustable mechanical stop limiting devices. Valves shall have a 2-inch square-operating nut and shall be installed with extension stems to extend the operating nut in accordance with the project details. The operator shall be integrally mounted on the valve-mounting flange and shall have all gearing totally enclosed for buried service. Maximum force for operating nut shall be 40 pounds.
- h. All valves shall be M&H model 4500, or approved equal.

2. Tapping Sleeves and Valves

Tapping Sleeves and Valves shall be used for making branch connections to an existing water main. Tapping sleeves shall be provided at the locations indicated on the Drawings and shall be mechanical joint type, Mueller No. H-615, Clow F-5205 or approved equal. Tapping valves shall be mechanical

joint type gate valves, Mueller No. 667, Clow F-5093 or approved equal, and shall conform to the requirements of this Section.

3. Tapping Saddles (Service Saddle)

Tapping saddles shall be used for making service connections on 4" and larger PVC and/or Ductile Iron Pipe. Drawings shall show a Smith Blair Series 317 service saddle or approved equal. At each point where a 1" or 2" connection is required.

4. Air Release Valves

Air Release Valve shall be 2-inch screwed inlet. The air release valve shall be designed to permit automatic escape of large quantities of air from the pipeline when the line is being filled and must also allow accumulating air to escape while the line is in operation and under pressure. The body and cover shall be able to operate at pressures up to 300 psi. The open end of and air relief pipe from automatic valves or from a manually operated valve shall be extended to the top of the pit and provided with a screened downward facing elbow.

Air release valve manufacturer shall be Crispin Model No. PL-10 or VENT O MAT Series RBX, or approved equal.

5. Reclaimed Water Service Pipe Material

Pipe shall conform to AWWA Specifications C901-96, Polyethylene Pressure Pipe and Tubing, and shall be marked with AWWA requirements and the following:

	To Be Marked <u>On Pipe</u>
<u>Polyethylene</u>	
Nominal Size	X
ASTM D2837	X
SDR 9	X
PE 3408	X
Working Pressure - 160 psi	X
Water Service Tubing	X
National Sanitation Foundation (NSF14)	X
Pipe Color	Pantone Purple 522

Unmarked pipe, without information noted above, will not be accepted. Polyethylene pipe shall comply with ASTM D1248 PE3408 Class III, A, 5, P34. Brass (Domestic Made) or bronze compression type fittings shall be

used. Flared connections will not be permitted. Continuous metallic tape over the pipe and tracing wire will be required. No gooseneck will be allowed nor will solvent weld joints be allowed. Corporation and curb stops will be required on all laterals. Minimum nominal size shall be 1 inch.

6. Corporation Stops

At each tapped point a connection to the pipe shall be made by installing a corporation stop. Corporation stops shall be Ford F 1000-4AWWA/CC Ground Key Corporation Stop, or approved equal, as required for the type of pipe being tapped.

7. Curb Stops

Curb stop shall be 1 inch size or as shown on the Drawings and shall be Ford 14-44G1FIPxGJCTS with a Brass, domestic made, square head cored plug, or approved equal.

8. Service Saddles

Service saddles shall be epoxy coated, ductile iron, double strap-stainless steel manufactured by Smith-Blair, Model 317 Service Saddle, or approved equal.

9. Valve Box

1. Each buried valve shall be accompanied by a valve box of the adjustable type of heavy pattern, constructed of cast iron, and provided with cast iron cover.
2. The upper section of each box shall have a flange at the bottom, having sufficient bearing area to prevent settling. The bottom of the lower section shall enclose the operating nut of the valve. Boxes shall be of lengths consistent with pipe depths as shown on the Drawings. Boxes shall be adjustable, with a lap of at least 6-inches when in the most extended position. Covers shall have the words "RECLAIMED WATER" cast in the top. Each valve box shall have a concrete round collar installed around the top along with a concrete valve marker at each valve.

2.04 HYDRANTS

- A. Hydrants shall be color-coded using Pantone Purple 522 using sunlight stable pigment and shall conform to AWWA C502. All hydrants and valves shall be tagged and color-coded purple to differentiate reclaimed water valves from potable water. Hydrants shall be appropriately tagged or labeled "Do Not

- Drink” together with the equivalent standard international symbol to warn the public and employees that the water is not intended for drinking.
- B. Main Valve opening size shall be 5-1/4 inches minimum and inside barrel diameter shall be 7 inches minimum with 3 feet minimum bury. Hose connections shall be two 2 1/2 inches and one 4 1/2 inches. Nipple caps shall NOT be chained to the barrel. Hydrant shall be DRY TOP type protecting operating threads from coming in contact with water. Operating threads will be grease lubricated through easily accessible Alemite fitting in top of operating nut. Direction of opening shall be counterclockwise and be cast on the head of the hydrant. Hose nipples shall be bronze or non-corrosive metal and threads shall be National Standard.
 - C. Hydrants shall be traffic type utilizing stem breaking coupling and breakaway traffic flange. (Breakable bolts or nuts are not acceptable.)
 - D. Hydrants shall be American Darling, Mueller, and M&H or approved equal.

2.05 POST INDICATOR VALVES & HYDRANT

- A. Each post indicator valve shall consist of a gate valve which meets these specifications and an indicator post which meets National Fire Protection Association Code, NFPA 13. The gate valve and post indicator shall be compatible. Post indicator shall be painted with color-coded using Pantone Purple 522 using sunlight stable pigment.
- B. All hydrants and valves shall be tagged and color-coded purple to differentiate reclaimed water valves from potable water. Hydrants shall be appropriately tagged or labeled “Do Not Drink” together with the equivalent standard international symbol to warn the public and employees that the water is not intended for drinking.
- C. Post hydrant shall have a 2-inch brass ball valve installed at inlet with a valve box and concrete collar. The operating rod shall be non-turning, and all operating parts shall be removable from above ground with no special wrenches. The hydrant shall have a two and one half (2 1/2) inch NFS outlet and a two (2) inch inlet, unless otherwise specified on the Drawings. The hydrant shall be non-freezing, and self-draining with a three (3) inch ductile iron barrel. Post hydrant shall be M&H Post Hydrant Style 33, or approved equal.

2.06 VALVE MANHOLE

1. General

Manholes shall be constructed at such points as designated on the Drawings. Riser and top sections shall be installed level and plumb, such that all manhole steps are in alignment. The top of manholes outside of roads, streets and highways shall be built to grades 2 inches above ground surface, unless otherwise shown. Manholes in roads, streets and highways shall be built to grades shown on the Drawings.

2. Precast Concrete Manholes

Precast Concrete manholes shall be constructed of reinforced Class "A" Concrete. Walls shall be not thinner than 5 inches, or 1/12 of the inside diameter, whichever is greater. Precast manholes shall meet all requirements of ASTM C478, "Specification for Precast Reinforced Concrete Manhole Sections."

Rings shall be custom made with openings to meet the necessary pipe alignment conditions and invert elevations. All inlets and outlets shall be cast in or core drilled. Joints and gaskets shall conform to the applicable provisions of ASTM C443, "Joints for Circular Concrete Sewer and Culvert Pipe using Rubber Gasket" or Ram-Nek Pre-molded Plastic Joint Sealer. The sealing compound shall not leak at the joints (while being tested, if required, at 10 psi) for a period of 24 hours. Bell and spigot surfaces shall be smooth, accurately formed, and provide a loose, sliding fit, with a clearance between the bell and spigot of not more than 1/6 inch. Precast manholes shall be bedded on not less than 6 inches of compacted crushed stone at the Contractor's expense. The crushed stone shall extend not less than 6 inches outside the walls of the manhole and under the entire length of pipe within the excavation for the manhole.

3. Manhole Castings

Provide covers with the inscription "RECLAIMED WATER" cast into the cover in lettering at least 2 inches high. Covers shall be 25-3/4 inches in diameter and shall be 2-inches thick at the bearing surface. Frame shall provide a 24-inch clear opening. Manhole covers and frames shall be USF 227, or equal.

4. Meter Box

3/4" and 1" - Meter boxes shall be of cast iron and shall be 3/4" stretch box Ford LYL141-243T or stretch box Ford LY 111-444-YBL-T, or approved equal. The lid shall have the word "RECLAIMED WATER" cast in it.

5. Tracing Wire

Tracing wire shall be single strand #12 AWG, Vinylon - A THWN or THHN or gasoline and oil resistant II VW 600V or AWM. Tracing wire shall be continuous with all reclaimed water mains, valves, and hydrants. Tracing wire for reclaimed water laterals shall be a single strand from the main to the end of the service lateral terminating in the meter box. Tracing wire shall be a single strand installed from the main to all Utility Marking Post line markers with sufficient length at the marker to be wrapped around the marker several times.

6. Concrete Valve Marker

Concrete valve marker shall be 4"x4" square by 4'-6" in length with 4-#3 rebar cast in 4,000 psi concrete. All corners shall have a 3/4" chamfer. A 2" brass marker plate with anchor shall be embedded in the top. The brass plate shall have a directional arrow pointing to valve with the distance to the nearest foot and shall be labeled "Reclaimed Water Valve". The concrete valve marker shall be set 24" in the finish grade and shall be painted Pantone Purple 522.

7. Utility Marking Post

Utility parking post shall be placed every 500 feet or as shown on the Drawings above the utility and at fittings and labeled accordingly. The marking post shall be rigid enough to be easily installed in most soil conditions and durable to withstand repeated impacts. The marking post shall be a four (4) inches in width and remain flexible from -40E F to +140EF with UV stabilizers. The marker shall highly visible standard fade resistant colors, White Background and Pantone Purple 522 Lettering with the following imprinted thereon: international "No Dig" symbol, federal law warning, "RECLAIMED PIPELINE" with letter size and stroke to comply with the Federal Office of Pipeline Safety Specifications, City of Pooler's name, Water Distribution phone number and State one-call number. Markers shall be Rhino 3-Rail with poly tech coating, or approved equal.

8. Caution Tape

Caution tape shall consist of a minimum 4.0 mil thickness inert polyethylene plastic that is resistant to alkalis, acids and other destructive elements found in the soil. The tape shall have a minimum 3" width and a minimum tensile strength of 2,800 psi. A continuous warning message repeated every 16" to 36" shall be imprinted on the tape surface. The tape shall contain Pantone Purple 522 color designating the color code appropriate to the line being buried "Caution – Buried Reclaimed Water Line Below" imprinted in black. Caution tape shall be installed 24" above the pipe on all water mains.

PART 3 - EXECUTION

Excavation, trenching, and backfill for the reclaimed water distribution system shall be as specified below. A minimum cover over the top of the pipe shall be as specified in Subpart 1.03 from the sub-grade, shoulder or finish grade. A minimum 3' face to face minimum horizontal separation between reclaimed water main and water, sanitary sewer and drainage lines shall be provided. A minimum of 18 inches face to face minimum vertical separation between reclaimed water main and

sanitary sewer, water and drainage lines shall be provided.

3.01 INSTALLATION

- A. Ductile iron pipe shall be laid in accordance with ANSI/AWWA C600; Plastic pipe shall be laid in accordance with AWWA C605, AWWA M23, ASTM D2774, UNI-Bell UNI-B-3 and the pipe manufacturer's recommendations.

Pipe, fittings, valves, other accessories shall, unless otherwise directed, be unloaded at the point of delivery, hauled to and distributed at the site of the project by the Contractor. They shall at all times be handled with care to avoid damage. In loading and unloading, they shall be lifted by hoists or slid or rolled on skidways in such a manner as to avoid shock. Under no circumstances shall they be dropped. Pipe handled on skidways must not be skidded or rolled against pipe already on the ground. In distributing the material at the site of the work, each piece shall be unloaded opposite or near the place where it is to be laid in the trench. Coated pipe shall be handled in such a manner that a minimum of damage to the coating will result. Damaged coating shall be repaired. Pipe shall be placed on the site of work parallel with the trench alignment and with bell ends facing the direction in which the work will proceed unless otherwise directed. The interior of all pipe, fittings, and other accessories shall be kept free from dirt and foreign matter at all times. Valves shall be drained and stored in a manner that will protect them from damage by freezing before installation. Before installation of any materials, a City of Pooler Inspector shall inspect and approve all material before installation.

Cutting pipe for inserting fittings, or closure pieces, shall be done in a neat and workmanlike manner without damage to the pipe. Unless otherwise directed, pipe shall be laid with the bell ends facing the direction of laying. For lines on an appreciable slope, bells shall face upgrade. Whenever necessary to deflect the pipe from straight line, whether in the vertical or horizontal plane to avoid obstructions, the degree of deflection shall not exceed 2-1/2 degrees. No pipe shall be laid in water or when the trench condition or the weather is unsuitable for such work. Installation shall be in accordance with manufacturer's instructions.

All pipe and fittings shall be carefully lowered into the trench piece by piece by means of derrick, ropes or other suitable tools or equipment in such a manner as to prevent damage to the pipe. Under no circumstances shall pipe or accessories be dropped into the trench. Before lowering and while suspended, ductile iron pipe shall be inspected for defects and rung with a light hammer to detect cracks. Any defective, damaged or unsound pipe shall be rejected. All foreign matter or dirt shall be removed from the inside of the pipe before it is lowered into its position in the trench and it shall be kept

clean by approved means during and after laying. Care shall be taken to prevent dirt from entering the joint space. At all times when pipe laying is not in progress, the open ends of the pipe shall be closed by approved means and no trench water shall be permitted to enter the pipe.

Hydrants shall be set at such elevations that the connecting pipe will have the same depth of cover as the reclaimed distribution mains. The connecting pipe shall be ductile iron pipe. The hydrant assembly shall be restrained from the main to the hydrant. Hydrants and valves shall have the interior cleaned of all foreign matter before installation. Not less than one (1) cubic foot of broken stone shall be placed around the base of the hydrant. Contractor shall place a bag over the hydrant to indicate its not being in service until after the reclaimed watermain is put into service.

B. Alignment and Grade

The reclaimed water mains shall be laid and maintained to lines and grades established by the plans and specifications, with fittings and valves at the required locations unless otherwise accepted by the owner. Valve- operating stems shall be oriented in a manner to allow proper operation.

1. Prior Investigation - Prior to excavation, investigation shall be made to the extent necessary to determine the location of existing underground structures and conflicts. Care shall be exercised by the contractor during excavation to avoid damage to existing structures. The pipe manufacturer's recommendations shall be used when the reclaimed water main being installed is adjacent to a facility that is cathodically protected.
2. Unforeseen obstructions - When obstructions that are not shown on the plans are encountered during the progress of work and interfere so that an alteration of the plans is required, the owner will alter the plans, or order a deviation in line and grade, or arrange for removal, relocation, or reconstruction of the obstructions.
3. Clearance - When crossing existing pipelines or other structures, alignment and grade shall be adjusted as necessary, with the acceptance of the owner, to provide clearance as required by federal, state, and local regulations or as deemed necessary by the owner to prevent future damage or contamination of either structure.
4. Depth of Pipe - The Contractor shall perform excavation of whatever substances are encountered to a depth that will provide a minimum cover over the top of the pipe of 36-inches from the existing or proposed finished grade, for pipe 12-inches and smaller. Pipe larger than 12- inches in diameter shall have 48-

inches of cover from the finished grade. A maximum cover of 60” (inches) from finished grade shall be used unless approved by the City to avoid a conflict. If the cover will be less than 36”, duct iron pipe shall be used.

5. Fluorinated Hydrocarbon Gaskets - Fluorinated hydrocarbon gaskets are intended for use in soils where a possibility of petroleum contamination is present. Fluorinated hydrocarbon gaskets shall only be used where specifically called for on the drawings.

C. Trench Construction

1. The trench shall be excavated to the alignment, depth, and width specified or shown on the plans and shall be in conformance with all federal, state, and local regulations for the protection of the workers.
2. Trench Preparation – Trench preparation shall proceed in advance of pipe installation only as far as stated in the specifications or as directed by the owner. Discharge from any trench-dewatering pumps shall be conducted to natural drainage channels, storm sewers, or as directed by applicable regulatory agencies. Excavated material shall be placed in a manner that will not obstruct the work nor endanger the workers or the public, or obstruct sidewalks, driveways, roadways, or other structures. Placement of excavated material shall be done in compliance with federal, state, and local regulations.
3. Pavement Removal – Removal of pavement and road surfaces shall be a part of the trench excavation. The amount removed shall depend on the width of trench required for installation of the pipe and the dimensions of the area into which valves, hydrants, manholes, or other structures will be installed. The dimensions of pavement removed shall not exceed the dimensions of the opening required for installation of pipe, valves, hydrants, specials, manholes and other structures by more than 6 inches in any direction, unless otherwise required or accepted by the owner. Methods such as sawing, drilling, or chipping shall be used to ensure the breakage of pavement along straight lines.
4. Width – The width of the trench at the top of the pipe shall be the same as that afforded by the single-pass capabilities of normally available excavating equipment, and shall be ample to permit the pipe to be laid and joined properly and to allow the backfill to be placed as specified. Trenches shall be of such extra width, when required, to permit the placement of timber supports, sheeting,

bracing, and appurtenances as required by the safety requirements of the agency having jurisdiction.

5. Bell Holes – Holes for the bells shall be provided at each joint, but shall be no larger than necessary to allow joint assembly and to ensure that the pipe barrel will lie flat on the trench bottom. Push-on type joints require only minimum depressions for bell holes. Other than noted previously, the trench bottom shall be true and even to provide support for the full length of the pipe barrel, except that a slight depression may be provided to allow withdrawal of pipe slings or other lifting tackle without damaging coating or polyethylene encasement.
6. Clearances and bedding procedures shall be observed for pieces of concrete or masonry and other debris or subterranean structures, such as masonry walls, piers, or foundation encountered, all structures shall be removed to provide a clearance below and on each side of all pipe, valves, and fittings of at least 18 inches for pipe sizes 24 inches or smaller and 24 inches for pipe sizes 30 inches or larger. When excavation is completed, a layer of appropriate backfill material shall be placed on the bottom of the trench to the previously mentioned depths, leveled, and tamped.
7. Previous excavations - Should the trench pass over a sewer or other previous excavation, the trench bottom shall be sufficiently compacted to provide support equal to that of the native soil or to conform to other regulatory requirements in a manner that will prevent damage to the existing installation.
8. Protection of Property - Trees, shrubs, fences, and all other property and surface structures shall be protected during construction, unless their removal is shown in the plans and specifications or directed by the owner. Any cutting of tree roots or branches shall be done only as directed by the City of Pooler Engineering Department. Temporary support, adequate protection, and maintenance of all underground and surface structures, drains, sewers, and other obstructions encountered in the progress of the work shall be provided in accordance with specifications or applicable regulations. All properties that have been disturbed shall be restored as nearly as practical to their original condition.
9. Unsuitable subgrade material - When the subgrade is found to include ashes, cinders, refuse, organic material, or other unsuitable material, such material shall be removed to a minimum of at least 6 inches below the bottom of the pipe or to the depth

ordered by the engineer. The removed material shall be replaced, under the direction of the engineer, with clean, stable backfill material. The bedding shall be consolidated and leveled so that the pipe may be installed.

10. Safety - Appropriate traffic-control devices shall be provided in accordance with federal, state, and local regulations to regulate, warn, and guide traffic at the work site.

D. Pipe Installation

Pipe Installation - Proper implements, tools, and facilities shall be provided and used for the safe and convenient performance of the work. All pipe, fittings, and valves shall be lowered carefully into the trench by means of a derrick, ropes, or other suitable tools or equipment, in such a manner as to prevent damage to reclaimed water main materials and protective coatings and linings. Under no circumstances shall reclaimed water main materials be dropped or dumped into the trench. Where necessary, the trench shall be dewatered prior to installation of the pipe. Chains shall not be allowed to transport or lower pipe into the trench.

- a. Examination of material – All pipe, fittings, valves, and other appurtenances shall be examined carefully for damage and other defects immediately before installation.
- b. Pipe ends – All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe, and the outside of the plain end and the inside of the bell shall be wiped clean and dry and be free from dirt, sand, grit, or any foreign materials before the pipe is laid.
- c. Pipe cleanliness – Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing, or other materials shall be placed in the pipe at any time. Excessive flush water required to clean the pipe after installation may be charged to the contractor.
- d. Pipe placement – As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with acceptable backfill material
- e. Direction of bells – It is common practice to lay pipe with the bells facing the direction in which work is progressing; however, it is not mandatory. For example, when the main is being laid on a slope, the pipe is frequently laid with the bells facing uphill for ease of

installation. The direction of the bells is not functionally related to the direction of flow within the main.

- f. Pipe plugs – At times when pipe-laying is not in progress, the open ends of pipe shall be closed by a temporary water-tight plug approved by the owner. The plug shall be fitted with a means for venting. When practical, the temporary plug shall remain in place until the trench is pumped completely dry. Care must be taken to prevent pipe flotation, should the trench fill with water. Prior to removal of a permanent plug for extending the line or for any other reason, air and/or water pressure in the line shall be released.
- g. Joint deflection - When it is necessary to deflect pipe from a straight line in either the horizontal or vertical plane, the amount of joint deflection shall not exceed manufacturer's specifications
- h. Pipe cutting – Cutting pipe for insertion of valves, fittings, or closure pieces shall be done in conformance with all safety recommendations of the manufacturer of the cutting equipment. Cutting shall be done in a safe, workmanlike manner without creating damage to the pipe or cement-mortar lining.
- i. Cut ends and rough edges shall be ground smooth, and for push-on joint connections the cut end shall be beveled by methods recommended by the manufacturer and accepted by the owner.

E. Reclaimed Water Service Connection

- 1. Service lines shall be connected to 4- inch and larger mains with a corporation stop. Connections to mains smaller than 4-inches shall be made with a rigid connection. Plugged tees or crosses for future connections shall be installed where shown on the Drawings. A house service connection shall be provided to vacant lots and the exact location marked on the curb with a "RW". The mark shall be made on the vertical face of the curb and shall be a minimum of 1/4-inch deep made with a branding iron. Where services are provided at locations without curb, a 2"x4" 30-inch long pressure treated flag stake painted white shall locate the end of the lateral. Minimum cover of 30-inches shall be provided until a short transition to the service is stubbed out of the ground.
- 2. Reclaimed Water service laterals installed under roadways shall be installed a minimum of 30 inches below the road (laterals shall not be installed in the base of the road). Water service laterals shall be installed one foot short of the property line of all lots along street and right -of-ways in which reclaimed water main is constructed.

F. Brass Nipples and Brass Pipe Fittings (Domestic Made)

Threads shall be cleanly cut with sharp tools and the jointing procedure shall conform to the best practice. Before jointing, all scale shall be removed from pipe by some suitable means. After cutting, all pipe shall be screwed together with an application for graphite and engine oil, Teflon tape, or other sealing compound applied to all threads and once a joint has been screwed on it shall not be backed off unless the threads are re-cleaned and new compound or Teflon tape applied. Unions shall be installed at every connection to the supply line.

G. Connection to Existing Reclaimed Water System

The Contractor shall furnish necessary materials and perform all excavation, dewatering, shoring, backfilling, etc., necessary to make the connection of a new reclaimed main to the existing reclaimed water main. The Contractor shall notify the Inspector and City of Pooler, a minimum of 72 hours in advance of construction. The Contractor shall be responsible for coordinating his construction with the City of Pooler. No cross-connection between the reclaimed water system and the potable water system will be allowed.

H. Damage to Reclaimed Water System

Damage to any part of the reclaimed water system by the Contractor, or subcontractors that is repaired by City of Pooler shall be charged to the Contractor on the basis of time and material, plus 30 percent for overhead and administration.

I. Joint Restraints

All restraints shall be used in accordance with engineering and manufacturers specifications. Thrust block is not allowed. Joint restraints shall be: Ford 1390 Series, Mega-Lug, EBBA Series 1100 for Ductile Iron 4" and larger, EBBA Series 2000 PV for PVC Pipe 4" and larger, Flexlock, T-lock, Uni-Flange, or approved equal.

3.02 CLEANING OF NEW RECLAIMED MAINS

Clean the interior of all pipe by brushing, swabbing or washing out all debris before laying. Stop up all branches and other openings with restraint plugs until either capped or connected. The use of a cross connection device during flushing shall be required. A flushing velocity of not less than 2.5 feet per second shall be maintained in pipe sizes less than 24-inches in diameter. For larger diameter mains,

an alternative to flushing, such as broom sweeping of the main, is acceptable.

Flush the new pipe lines for a full pipe open end flush until the water runs clear at the end of all mains and laterals. This should be done after the pressure test.

The Contractor is responsible for coordinating with the City Inspector and the City Water Distribution Department to arrange a City of Pooler inspection. Lines will not be placed in operation until City of Pooler approval and the City Inspector directs Contractor to do so.

Install sufficient number of sample points to give representative sampling on the newly installed lines. The hydrants should be at least 18 inches higher than main and must discharge toward the ground.

3.03 IDENTIFICATION AND TRACER WIRE

Mylar tape shall be installed 18 inches below the finished grade over the top of the reclaimed water mains. The tape shall be 2 inches wide, of Pantone purple 522 color and have imprinted on the tape "Caution – Reclaimed Water Line Below." The tape shall be laid the entire length of the trench.

No. 12 AWG solid plastic-coated copper wire shall be installed on top of all water mains where non-metallic pipe is used and attached by means of securing the wire on top of the water main with a 12-inch long by 2-inch wide piece of duct tape. Attach the wire to the main every ten (10) feet.

Wire shall be bonded at splices with 3M DBY-6 Direct Bury Splice Kit at every connection

The wire shall be laid the entire length of the trench and shall be continuous. The Contractor shall demonstrate continuity in wire through the entire length of the project. At every valve manhole the wire shall be run through the pipe opening, up to the ring and cover, secured at the ring by means of grouting the ring to the top of the manhole. The wire shall continue in the same loop back to the opposite pipe opening, through it and continuing in one continuous loop along the main.

At every reclaimed water service lateral, the wire shall run from the main and corporation stop to the curb stop and attached to the polyethylene pipe by a piece of duct tape wrapped around the wire and tubing. The wire shall be connected to the tracer wire at the main with a single strand from the reclaimed water main to the curb stop or into the meter box.

City of Pooler will field verify all tracer wire prior to acceptance.

3.04 HYDROSTATIC TESTING

All pressure and leakage test shall be performed in accordance with the latest edition

of AWWA C600. Leakage test shall be conducted simultaneously with the pressure test. The duration of the test shall be 2 hours and during the test the main or section of main under test shall be subjected to a pressure of 150 psi based on the lowest point in the line or section under test, and connected at that elevation to the test gauge. Test pressure shall not vary more than 5 psi for the duration of the test. Testing allowance shall be defined as the quantity of makeup water that must be supplied into the newly laid pipe or any valved section thereof to maintain pressure within 5 psi of the test pressure after the pipe has been filled with water and the air has been expelled. Testing allowance shall not be measured by a drop in pressure in a test section over a period of time. Testing allowance is defined as the quantity of water to be supplied into the newly laid pipe or any valved section thereof, necessary to maintain the specified leakage test pressure after the air has been expelled and the pipe has been filled with water at the test pressure. No pipe installation will be accepted until the testing allowance is less than the number of gallons per hour as determined by the formula.

$$L = \frac{S \times D \times \text{sq root } (P)}{133,200}$$

S = the length of pipe tested in linear feet.

D = the nominal diameter of the pipe in inches

P = the average test pressure during the hydrostatic test in pounds per square inch (gauge).

Should any test of pipe laid disclose leakage greater than the above specified, the Contractor shall at his own expense locate and repair the defective joints until leakage is within the specified testing allowance. All visible leaks shall be repaired regardless of the allowance used for testing. Line shall be retested until testing allowance requirement are within the allowable leakage. All additional testing shall be at the Contractors expense.

The Contractor shall provide all necessary equipment and shall perform all work required in connection with the tests. Each section shall be tested by hydrostatic pressure of 150 pounds per square inch. Each section shall be slowly filled with water, care being taken to expel all air from the pipes. If necessary, the pipe shall be tapped at high points to vent the air. The required pressure as measured at the point of lowest elevation shall be applied for not less than 2 hours and all pipe, fittings, valves, and joints shall be carefully examined for defects. Each valve shall be opened and closed several times during the test. Failure of valve(s) to perform will result in its removal from the job site and replacement by the Contractor at his expense. All defective joints shall be repaired or replaced.

3.05 RECORD DRAWINGS

The City of Pooler will require Record Drawings seventy two (72) hours before final inspection will be made. The Contractor shall keep on the work site one (1)

set of clean Drawings stamped by the City or the City's representative "Issued for Construction" to which at the end of every day the necessary information will be marked by the Contractor's superintendent. All deviations from the Drawings shall be stationed and clearly marked. Record drawings shall include measurements between each valve, bends, permanent land markers, manholes, laterals locations from property corners, fire hydrants & manholes. In addition, state plan coordinates and GPS coordinates should be provided on all valves and manholes.

End of Section

SECTION 02740
LIFT STATION WETWELL
RECEIVING MANHOLE AND VALVE VAULT

PART I - GENERAL

1.01 SUMMARY

This section specifies the requirements for wetwells, valve vaults, and receiving manholes for sanitary sewer lift stations. One manhole shall be constructed within the fenced boundary of the lift station site and shall be identified as the "Receiving Manhole". All sewer to the site shall be routed to the receiving manhole and only one pipe shall carry the flow into the wet well from the receiving manhole. The pipe from the receiving manhole to the wet well shall be one nominal diameter larger than the largest incoming pipe into the receiving manhole. The hydraulic gradient shall be uniform through the receiving manhole by matching the crown of all of the pipes entering the receiving manhole.

1.02 RELATED SECTIONS

Section 02200 - Excavation, Filling and Grading

Section 02221 - Excavation, Trenching and Backfilling for Utility Systems

Section 02545 - Protective Coating for Concrete and Masonry Sanitary Sewer Structures

Section 02557 – HDPE Liner

Section 03300 – Cast-In-Place Concrete

Section 11064 – Submersible Raw Sewage Pumps and Accessories

PART 2 – MATERIALS

2.01 WETWELL VALVE VAULT AND RECEIVING MANHOLE

A. Precast Sections

Wetwells, valve vaults and receiving manholes shall be constructed of precast concrete sections conforming to ASTM C478. Precast concrete wet well and manhole sections shall be custom made with openings to meet the necessary pipe alignment conditions and invert elevations. All inlets and outlets shall be cast in or core drilled. Shop drawings shall be submitted consisting of manufacturer's standard details of various sections, before placing order for manholes

B. Joints

Joints and gaskets shall conform to the applicable provisions of ASTM C443, "Joints for Circular Concrete Sewer and Culvert Pipe using Rubber Gasket" or Ram-Nek Premoulded Plastic Joint Sealer.

- C. Top Slab
The top slab of the wet well shall be a precast concrete section meeting the requirements of ASTM C478 or Class 'A' cast-in-place reinforced concrete meeting the requirements of Section 03300. The top slab of the wet well shall be constructed to the dimensions shown on the Drawings.
- D. Exterior Joints
The exterior joints of wet wells, valve vault, and receiving manholes shall be sealed with a flexible rubber seal made of EPDM rubber with a minimum thickness of 65 mils. Each unit shall have a 2-inch wide by 1/4-inch thick mastic strip on the top and bottom of the rubber wrap. The seal shall be designed to prevent leakage of water through the manhole joint. The flexible rubber seal shall be Infi-Shield Shield Wrap (Sealing Systems, Loretto, MN), Cretex (Cretex Specialty Company, Waukesha, WI) or approved equal.
- E. Manhole Castings & Covers
1. All receiving manholes shall be provided with covers with the inscription "SANITARY SEWER" cast into the cover in lettering at least 2 inches high. Covers shall be 25-3/4 inches in diameter and shall be 2-inches thick at the bearing surface. Frame shall provide a 24-inch clear opening. Manhole covers and frames shall be USF 227, cover type "AS".
 2. Watertight manhole rings and covers are to be used whenever the manhole top may be flooded by high water (All manholes located within the 100 year flood plain or from street run-off). USF 227 AS-ORS for water tight, or AS covers with PARSON MANHOLE INSERT, or equal. All frames shall be suitable for cast iron or steel riser ring for upward adjustment of cover. Manhole cover shall have non-penetration pickhole without vent hole or other penetration.
- F. Chimney Seals
All receiving manhole adjustment rings shall be sealed with a flexible rubber seal. Acceptable products include Infi-Shield External Uni-Band (Sealing Systems, Inc. Loretto, MN), Cretex Manhole Chimney Seals (Cretex Specialty Products, Waukesha, WI) or an approved equal.
- G. Protective Coating
Protective coating shall meet the requirements of Section 02557 - HDPE Liner or Section 02545 – Protective Coating for Concrete and Masonry Sanitary Sewer Structures
- H. Drain Line Check Valve
Drain line from the valve pit to the wetwell manhole shall be a Tideflex Series 35 Check Valve or approved equal.

- I. Access Hatches
Access hatches shall meet the requirements of Section 11064 of the Standard Specifications.
- J. Hardware
All hardware and bolts within the wetwell, valve vault and receiving manhole shall be stainless steel.

PART 3 – EXECUTION

3.01 INSTALLATION

- A. Excavations for wet wells and receiving manhole shall meet the requirements of Section 02221 - Excavation, Filling, and Backfilling for Utility Systems.
- B. Precast wet well sections shall be placed on a concrete foundation designed to prevent flotation of the wet well when empty. The thickness of the foundation shall be as shown on the Drawings.
- C. The foundation of the wet well and the receiving manhole shall be bedded on 6 inches of compacted crushed stone placed on compacted subgrade as shown on the City of Pooler Standard Details.
- D. Protective coating shall be applied to the interior surface of new wetwells and receiving manholes as shown on the City of Pooler Standard Details in accordance with Section 02557.
- E. Existing wetwells and receiving manholes that receive increased flow from new projects shall be completely coated (top, bottom, and sides) in accordance with Section 02545 - Protective Coating for Concrete and Masonry Sanitary Sewer Structures.
- F. Piping within the valve vault shall be such that valves can be removed easily and should include a dismantling coupling. A minimum distance from the side of the vault to any joint or pipe of 18-inches is required.
- G. Access hatches meeting the dimensions shown on the Drawings shall be installed in the top slab of the wet well and the valve vault.

END OF SECTION 02740

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.01 SUMMARY

This section specifies the requirements for cast-in-place concrete construction and cement work.

1.02 DETAILS AND DIMENSIONS

The Drawings show the design requirements and dimensions for structural strength, but do not show detail dimensions to fit intricate architectural, mechanical, equipment, and electrical details. The concrete work shall be constructed so that it will conform to the clearances required by the architectural, electrical, mechanical and equipment designs and shall at Contractor's expense do all cutting and patching necessary.

1.03 QUALITY ASSURANCE

- A. Certified copies of test reports and certificates or other satisfactory evidence, where so specified, shall be furnished before delivering certified or tested materials to the project site.
- B. Tests of Cement
Tests of cement shall be made on the entire cement requirements, on car or warehouse samples or bin (sealed) samples in accordance with ASTM C150. No cement shall be used until tests have demonstrated that the cement complies with the Specifications.
- C. Tests of Aggregates
Tests of aggregates shall be performed in accordance with ASTM C33 and shall be made before work starts and at such times as may be necessary to determine whether or not the materials delivered comply with the Specifications. No aggregate shall be used which does not comply with the Specifications.

PART 2 - MATERIALS

2.01 GENERAL

- A. All concrete shall be normal weight with 28-day compressive strength not less than 4,000 psi except where concrete of lesser strength is specified for use as noted on the Drawings.

- B. Concrete shall be composed of cement, admixtures (if required), fine aggregate, coarse aggregate, and water. Concrete shall be classified as "A" or "B", and shall have 28 day compressive strengths not less than those listed below except that concrete containing high early strength cement shall have 7 day compressive strengths not less than those listed below.
- C. Class "A" concrete shall have a compressive strength of not less than 4,000 psi, and shall be used for all reinforced concrete work, unless otherwise specified.
- D. Class "B" concrete shall have a compressive strength of not less than 3,000 psi, and shall be used for concrete sub-foundations, concrete fill, pipe envelopes, thrust blocks and where so indicated on the Drawings.

2.02 CEMENT

Cement shall be a standard brand of Portland cement which conforms to the requirements of ASTM C150, Type II. Cement shall be delivered in original unopened sacks bearing the brand and manufacturer's name or in properly documented bulk shipments. Cement shall be stored in a weather tight building, and shall be protected at all times from moisture. The same brand of cement shall be used throughout the work.

2.03 CONCRETE AGGREGATES

- A. Concrete aggregates shall comply with the requirements of ASTM C33, except as otherwise specified hereinafter. Both coarse and fine aggregates shall be obtained from a source producing aggregates with a record of having no alkali-aggregate reaction causing "pop-outs" and the like; the aggregate producer shall submit a certification of such record.

- 1. Fine Aggregate

Fine aggregate shall consist of screened and washed, well graded natural sand having clean, hard, strong, durable, un-coated particles, and shall be free from injurious amounts of dust, lumps, soft or flaky particles, shale, alkali, organic matter, loam or other deleterious substances and shall comply with ASTM C33 except as may be otherwise specified herein.

- 2. Coarse Aggregate

- a. Coarse aggregate shall consist of screened and washed, well graded crushed stone or gravel having clean, hard, strong, durable, un-coated particles free from injurious amounts of soft, friable, thin, elongated or laminated pieces, alkali, organic or other deleterious matter. The grading shall be in accordance with ASTM C33 and as follows.

- b. Aggregates size 467 (1-1/2 inches to No. 4) shall be used for thicker sections where reinforcement is not closely spaced or close to forms. Aggregate size 57 (1 inch to No.4) and 67 (3/4 inch to No. 4) shall be used for thinner sections, heavily reinforced work, and all parts where the coarser aggregate might cause honeycombing, poor bond or exposed reinforcement.
- c. Aggregates shall be stored in such a manner as to prevent deterioration and/or intrusion of foreign matter and/or segregation. Any material which has deteriorated or which has been damaged shall not be used for concrete. The aggregates shall be stockpiled at least 24 hours prior to use.
- d. To avoid unnecessary or haphazard changes in consistency, the aggregates shall be obtained from a source which will insure uniform quality and grading and they shall be delivered to the work and handled in such a manner that variations in moisture content will not interfere with the steady production of concrete of uniform quality and consistency.

2.04 WATER

Water shall be potable and free of substances that may be deleterious to concrete or steel.

2.05 ADMIXTURES

- A. Admixtures shall be compatible with the concrete. All admixtures in a mix shall be from one manufacturer. Calcium chloride or admixtures containing calcium chloride are not acceptable.
- B. Water-reducing, high range admixture shall meet the requirements of ASTM C494, Type F.
- C. Water-reducing, high range and retarding (Type G) admixture (superplasticizer) shall meet the requirements of ASTM C494, Type F.
- D. Air entraining admixtures shall meet the requirements of ASTM C260.

2.06 CURING COMPOUND AND IMPERMEABLE FIBER FILLIED PAPER

Membrane curing compound shall comply with ASTM C309 for Type I and paper shall comply with ASTM C171.

2.07 FLOWABLE FILL

The mixture of dry material per cubic yard shall be 50 pounds cement, 600 pounds fly-ash, and 2,500 pounds sand. Depending on the slump requested for the specific job, water

added shall be 65 gallons (541 pounds) for a 6-inch slump, to 55 gallons (458 pounds) for a 3-inch slump. One cubic yard of 6-inch slump will contain more than 27 cubic feet due to the additional water. Unconfined compressive strength will be 80 psi at 7 days and 150 psi at 28 days.

2.08 WATERSTOPS

- A. Neoprene rubber waterstops shall be provided where contact will be with sewage, sludge and/or similar materials. Neoprene waterstop for expansion joints shall be center bulb type equal to No. 5318-91 by W. R. Grace and Company, or No. 3290-3 by Williams Products, Inc., or equal, and as specified herein. Neoprene waterstops for construction joints shall be No. 5318-60 by W. R. Grace and Company or No. 3066-3 by Williams, or equal.
- B. Polyvinylchloride waterstops shall be provided where contact will not be with sewage, sludge and/or the like. Polyvinylchloride waterstops for expansion joints shall be center-bulb type equal to No. 7C by W. R. Grace and Company, or No. 9380LB by Sonneborn-Contech, or equal and as specified. Polyvinylchloride waterstops for construction joints shall be No. 3 by W. R. Grace and Company, or No. 4316 by Sonneborn-Contech, or equal, and as specified here in.

PART 3 - EXECUTION

3.01 MEASUREMENT OF MATERIALS

- A. Each of the constituent materials shall be proportioning in each batch. Method of operation and scales shall be such as to obtain an accuracy of not less than 99 percent correct for each batch. Water may be measured by volume, in which case the apparatus shall be calibrated to insure the proper quantity in each batch.
- B. Unless bulk cement is used and is weighed and dispensed to the accuracy specified hereinbefore, batches shall be of such size that there will be no splitting of sacks of cement. Each sack shall contain 94 pounds of cement.

3.02 PROPORTIONING OF CONCRETE MIXES

- A. Design
Trial design batches and testing to meet requirements of the concrete specified shall be provided. The design mix shall contain aggregates representative of those proposed for use in the work and shall be in accordance with ACI 211.1. Tests for slump, unit weight, and air content shall be performed in the field.

- B. Entrained Air Content
Air entrainment shall be produced by adding an air entraining agent at the mixer. Air content shall be based on measurements made in concrete mixtures at point of discharge at the job site.
- C. Air Content
Air content by volume of concrete shall be maintained at 5 to 6 percent as determined in conformance with ASTM C231.
- D. Water-Cement Ratio
Mixes shall be proportioned by weight except that water and admixture may be by volume or by weight. Specimens shall be made and cured in conformance with ASTM C192 and tested in conformance with ASTM C39 or C78, as applicable. Curves representing the relation between the water-cement ratio and the average 28 day compressive or flexural strength, or earlier strength at which the concrete is to receive its full working load, shall be established for a range of values including the compressive and flexural strengths indicated or specified. Curves shall be established by at least 3 points, each point representing average values from at least 3 test specimens. The maximum allowable water-cement ratio shall be that shown by these curves to produce an average compressive strength or an average flexural strength of 15 percent greater than indicated or specified.
- E. Slump
1. Slump shall be determined in conformance with ASTM C143, and shall be within the following limits, provided the required strength is obtained: Maximum 4 inches, minimum 2-1/2 inches. When climatic conditions require the use of hot weather concreting practices, the slump shall have a range of 2-1/2 inches maximum and 2 inches minimum and the mix design shall be adjusted to provide the specified strength of concrete.
 2. When water reducing admixtures or superplasticizers is used, the following shall apply: Laboratory trial mixes shall be required to determine correct proportions and dosage to prevent bleeding and segregation of aggregates. The manufacturer's representative shall be present to provide technical assistance during mix design, and during initial field mixing, and placement of concrete when this additive is used.
 3. Since the plasticizing effects last approximately 30 to 60 minutes, depending on job conditions, the admixture shall be added at the project site to delivered concrete having an approximate slump of 2.5 inches, but not more than 3 inches. The maximum slump, after applied dosage and with proper mixing, shall not exceed 3 inches.

F. Mixing Concrete

1. Mixing concrete shall be done in a rotary batch mixing machine. The volume of each batch shall not exceed the rated capacity of the mixer. The batch materials shall be delivered to the mixer measured accurately to the required proportions and shall be mixed continuously for not less than one and one-half minutes after all materials including water are in the mixer, during which time the mixer shall rotate at the speed recommended by its manufacturer. The entire batch shall be discharged before recharging the mixer. Mixer shall be cleaned frequently.
2. Truck mixed concrete shall conform to ASTM C94. A concrete delivery ticket for each batch delivered shall be furnished to the Engineer before unloading with the following additional information:
 - a. Reading of revolution counter at first addition of water.
 - b. Type, brand and amount of each admixture.
 - c. Total water content of batch, or total water content per cubic yard of batch.
 - d. Design slump.
3. If water is added at the site, additional test cylinders will be required and the additional cylinders shall be at the Contractor's expense.

3.03 PREPARATIONS FOR PLACING CONCRETE

- A. Place all embedded items accurately and secure; set inserts and anchor bolts.
- B. Before beginning placement of concrete, all spaces to be filled with concrete shall be cleaned free of debris and foreign material. Forms shall be coated in a manner approved by the Engineer. Soil against which concrete is to be placed shall be moist, but not muddy. Surfaces of concrete previously placed, on or against which new concrete is to be deposited, shall be thoroughly cleaned of dirt, loose material and laitance and shall be well wetted and then slushed over with neat cement grout immediately before concreting. Forms shall be re-tightened as necessary.

3.04 PLACING CONCRETE

- A. Concrete shall be placed as soon as practicable after mixing. No concrete which has commenced to set or any re-tempered concrete shall be used. It shall be

deposited in such manner as to cause no separation or segregation of the ingredients. Methods of conveying concrete shall not cause excessive slump losses. Do not use aluminum pipes to convey concrete. Concrete shall not be dropped over 4 feet through space. It shall not be deposited in large quantities at one place and be permitted to run or to be worked any considerable distance, but shall be deposited in its final position as nearly as practicable.

- B. The coarse aggregate shall be worked back from the forms with a suitable tool so as to bring a full surface of mortar against the form, without the formation of excessive surface voids. All concrete shall be consolidated by mechanical vibration augmented as necessary by spading, rodding, or forking so that the concrete is thoroughly worked around the reinforcement, around embedded items, and into corners of forms, eliminating all air or stone pockets which may cause honeycombing, pitting, or planes of weakness. Mechanical vibrators shall have a minimum frequency of 7,000 revolutions per minute and shall be operated by competent workmen. Over-vibrating and use of vibrators to transport concrete within forms shall not be allowed. Vibrators shall be inserted and withdrawn at many points, from 18 to 30 inches apart. At each insertion, the duration shall be sufficient to consolidate the concrete but not sufficient to cause segregation, generally from 5 to 15 seconds duration. Spare vibrator shall be kept on the job site during all concrete placing operation.
- C. In vertical parts of small cross-section, the concrete shall be placed in small quantities to facilitate tamping and compaction. Concrete shall not be deposited in such manner as to shake or jar concrete in the process of setting. Wheeling over forms or concrete in such manner as to jar green concrete shall not be permitted. No wood spreaders shall be concreted in.
- D. The Contractor shall plan the amount of concrete work to be completed in each run. Concreting shall not be started until sufficient material and working force are available to complete the part of the work designated as a run. Concreting shall continue uninterrupted until the completion of the run, so that in no place will concrete be deposited in contact with concrete that has attained its initial set, except at construction joints.
- E. Concrete shall not be deposited in or through water.

3.05 SPOUTING

Chutes for conveying concrete shall be of metal or metal lines, and their slope shall be such that there will be no segregation. Handling the concrete at the discharge end of chutes shall be such that no segregation develops. Do not use aluminum for chute liner or for chutes. Chutes shall be thoroughly flushed with water before and after each run. The water used for this purpose shall be discharged outside the forms.

3.06 PLACING CONCRETE AGAINST OTHER CONCRETE

Before depositing new concrete on or against concrete that has hardened, re-tighten forms as necessary and roughen, clean and moisten the hardened concrete. The new concrete placed in contact with hardened or partially hardened concrete shall contain an excess of mortar to insure bond, and the cleaned and moistened surfaces of the hardened concrete shall first be slushed with a coating of neat cement grout against which the concrete shall be placed before the grout has attained its initial set.

3.07 LEVELING

- A. Slabs shall be struck off with a straightedge smooth and even to screeds set accurately at the required elevations and slopes. Slopes, depressions, etc., shall be formed as required by the Drawings. Depress the slabs as shown for sumps and the like.
- B. Immediately after the slab has been struck off, the screeds and screed supports shall be removed and the recessed and holes left by them shall be filled with concrete and carefully worked and tamped into place so as to leave no weakness.

3.08 INSERTS AND EMBEDMENTS

- A. Inserts
The Contractor shall place pipes, castings, or conduits to pass through concrete structures in the forms before placing the concrete. If it is not possible to place pipes, conduits, or castings on the forms, the Contractor shall provide openings for insertion of the pipes, conduits, or castings. Horizontal conduits, where shown in structural slabs and beams, shall be placed between the top and bottom layers of reinforcement.
- B. Pipes, castings, channels, pipes, or other metal parts that are to be embedded in concrete shall be set and secured in the forms prior to concrete placement. Unless otherwise specified, anchor bolts and inserts shall be embedded in concrete as shown. The Contractor shall provide inserts, anchors, or other bolts necessary for the attachment of piping, valves, metal parts, and equipment. Nailing blocks, plugs, strips, and the like necessary for the attachment of trim, finish and similar work shall be provided.
- C. Timely notice shall be given to all other Contractors and subcontractors and allow them a reasonable time for the placing of their portion of the work required to be embedded. No concrete shall be placed until all work to be concreted in had been placed and inspected by the Engineer.
- D. Wrap pipes with foam insulation where shown, using Armstrong Armaflex-22 or Dow Ethafoam, or equal in order to prevent concrete from bonding to the pipes and also to allow some relative movement.

3.09 COLD WEATHER PLACEMENT

- A. No concrete shall be deposited in cold weather, unless materials are heated and suitable protection and heat are provided. Weather shall be considered cold weather whenever the temperature is as low as or lower than 40 degrees F., or when there is a probability that such temperature will occur during the curing period. Calcium chloride shall not be used.
- B. All equipment, enclosures, protection, heating and method of carrying on the work shall be the responsibility of the Contractor.
- C. For concrete to be placed during cold weather, aggregates and water shall be heated to a temperature such that the concrete when mixed and when deposited shall have a temperature of not less than 60 degrees F. and not more than 80 degrees F. and shall be continuously kept at a temperature of 60 degrees to 80 degrees for a curing period of not less than 72 hours for concrete with Type 1 Cement, and not less than 48 hours for high-early strength concrete, after which maintain the temperature above 40 degrees F. for not less than four additional days. Keep concrete moist. Leave protection in place so that temperature of concrete will not drop at a faster rate than 20 degrees F. in 24 hours. Before depositing concrete, the forms, reinforcement and other objects with which concrete will come in contact, shall have been heated to a temperature of 60 degrees F. to 80 degrees F. Frozen concrete shall be immediately removed, and replaced with new work by the Contractor at his own expense. In order to maintain the temperature specified above, the Contractor shall entirely enclose the work with tarpaulins or other suitable material and shall furnish fuel and suitable heating equipment and the necessary labor and supervision. Heating devices shall exhaust all combustion gases outside of the enclosures. Full responsibility for the protection of the work shall rest with the Contractor. During cold weather, temperature records shall be kept, showing the temperature at 4 hour intervals of the outside air, of the air in the coldest part of the enclosure near the concrete, of the concrete as it is placed, and of the concrete in place at such points as the Engineer may direct. During freezing weather, such temperature records shall be kept night and day.

3.10 HOT WEATHER PLACEMENT

- A. Concrete materials shall be placed at the lowest practicable temperature except as specified hereinbefore for cold weather. When hot weather conditions exist that would seriously impair the quality and strength of the concrete, the concrete shall be placed in accordance with recommendations of ACI 305 except as otherwise specified herein.
- B. During hot weather conditions, the temperature of the concrete immediately before it is placed in the forms shall be between 50 degrees F. and 80 degrees F. Cement shall not be used when it has a temperature higher than 140 degrees F.

- C. Shaved ice may be used in the mixing water to reduce the temperature of the concrete at the mixer, but there shall be no ice in the concrete when it is discharged from the mixer.
- D. Retarder admixes may be used to control the setting time of the concrete. However, it must be demonstrated that the retarder admix will not change the specified requirements for the concrete, including strength, air entrainment, minimum shrinkage, etc. If such retarders are used, new concrete mix designs shall be made by the testing laboratory, at the Contractor's expense. Additional cement, if required by such new mix designs, shall be furnished by the Contractor at his own expense. No reduction in the specified amount of cement will be permitted.

3.11 CONSTRUCTION JOINTS

- A. Construction joints shall be as shown. Additional construction joints shall be made only at places where necessary. The location, detail and workmanship shall be such as to produce tight joints and no structural weakness and such as not to mar the appearance of the finished work. Key all joints for maximum shear value except as otherwise directed. Each construction joint shall be level or plumb, as the case may be.
- B. Expansion Joint Filler
Provide cork expansion joint material, ASTM D1752, Type II, in expansion joints for interior work as shown. Provide fiber expansion joint material conforming to ASTM D1751 in expansion joints for exterior work such as walks, etc., as shown and/or specified. Seal over interior expansion joints with sealant material conforming to ANSI A116.1 and over exterior expansion joints with sealant material conforming to Federal Specification TT-S-227E. Install materials as recommended by the manufacturers.
- C. Slip Joints
Where indicated, build in two layers of tar paper to prevent bond and to allow joints to slip.

3.12 WATERSTOP INSTALLATION

- A. Provide waterstops where shown on the Drawings. Also provide water stops in all expansion joints and in construction joints as required making structures watertight. Waterstops shall be installed in accordance with the manufacturer's recommendations.
- B. Waterstops shall be securely held in place during placement of concrete. The concrete shall be solid and completely embed waterstop.

- C. Field splices of waterstops are only acceptable in straight sections. Crosses, tees, and other shapes shall be fabricated by the waterstop manufacturer prior to delivery to the project. Where boots or unions are used, they shall be of the make material and manufacture and shall fit the waterstop section snugly.

3.13 CURING AND CARE OF CONCRETE

A. General

Concrete shall be protected against moisture loss, rapid temperature change, mechanical injury, and injury from rain or flowing water, for a period of 7 days. Concrete shall be maintained in a moist condition at temperatures above 50 degrees F. throughout the specified curing period and until remedial work is started under paragraph 3.14, Concrete Finishing. Concrete shall be protected from local applications of heat, rapid temperature change and rapid drying for the first 24 hours following the removal of temperature protection. During activities shall be started as soon as free water has disappeared from the surface of the concrete after placing and finishing. Curing, except during hot weather concreting, shall be accomplished by any of the following methods or combination thereof, as approved:

B. Moist Curing

Unformed surfaces shall be covered with burlap or mats, wetted before placing, and overlapped at least 6 inches. Burlap or mats shall be kept continually wet and in intimate contact with the surface. Sand or sawdust will also be acceptable if kept uniformly spread and wet. Where formed surfaces are cured in the forms, the forms shall be kept continually wet. If the forms are removed before the end of the curing period, curing shall be continued as on unformed surfaces, using suitable materials.

C. Impervious-Sheet Curing

All surfaces shall be thoroughly wetted with a fine spray of water and be completely covered with water-proof paper, polyethylene sheeting, or with polyethylene-coated burlap having the burlap thoroughly water-saturated before placing. Covering shall be laid with light colored side up. Covering shall be lapped not less than 12 inches and securely weighted down or shall be lapped not less than 4 inches and taped to form a continuous cover with completely closed joints. Sheets shall be weighted down to prevent displacement or billowing from winds. Coverings shall be folded down over exposed edges of slabs and secured by approved means. Sheets shall be immediately repaired or replaced if tears or holes appear during the curing period.

D. Membrane Forming Compound Curing

The compound shall be applied on damp surfaces as soon as the moisture film has disappeared. The curing compound shall be applied by power spraying equipment using a spray nozzle equipped with a wind guard. The compound shall be applied in a 2 coat continuous operation at coverage of not more than 400 square feet per gallon for each coat or at the manufacturer's recommended coverage, whichever is less. When application is made by hand sprayers, the second coat shall be applied in a

direction approximately at right angles to the direction of the first coat. The compound shall form a uniform, continuous, adherent, film that shall not crack, check or peel, and shall be free from pinholes or other imperfections. Surface subjected to heavy rainfall within 3 hours after compound has been applied, or surfaces damaged by subsequent construction operations within the curing period shall be re-sprayed at the rate specified above. Membrane curing compound shall not be used on surfaces that are to receive and subsequent treatment that depend on adhesion or bonding to the concrete. Where membranes forming curing compounds are used, permanently exposed surfaces shall be cured by use of a non-pigmented membrane forming curing compound containing a fugitive dye. Where non-pigmented type curing compounds are used, the concrete surface shall be shaded from the direct rays of the sun for the curing period. Surfaces coated with curing compound shall be kept free of foot and vehicular traffic and from other surfaces of abrasion and contamination during the curing period.

E. Hot Weather Curing

Curing for hot weather concreting shall be limited to moist curing methods. All exposed concrete and all forms shall be covered with burlap or carpet mats, wetted before placing, and overlapped at least 6 inches. Fog sprays shall be used during finishing operations and until the burlap or carpet mats are placed. Protective mats shall remain in place in a wet condition for 7 days. Protective mats shall remain in place for an additional 4 days without the application of water to permit gradual drying of the concrete surfaces. Forms may be removed after 3 days of moist curing provided that protective mats, in a wet condition, are replaced so as to cover all exposed concrete.

3.14 CONCRETE FINISHING

- A. Within 12 hours after forms are removed, surface defects shall be repaired as specified herein. Temperature of the concrete, ambient air and mortar during repair work including curing shall be above 50 degrees F. Fine and loose material shall be removed. Honeycombs, aggregate pockets, voids over 1/2 inch in diameter, and holes left by tie rods or bolts shall be cut out to solid concrete, reamed, thoroughly wetted, brush coated with neat cement grout, and filled with mortar. Mortar shall be a stiff mix of 1 part Portland Cement to not more than 2 parts fine aggregate passing the No. 16 mesh sieve, and minimum amount of water using White Portland Cement for all or part of the cement so that when dry, the color of the mortar shall approximately match the adjoining concrete color. Mortar shall be thoroughly compacted in place. Holes passing entirely through walls shall be completely filled from the inside face by forcing mortar through to the outside face. Holes that do not pass entirely through the wall shall be packed full. Patch work shall be finished flush and in the same plane as adjacent surfaces. Exposed patchwork shall be finished to match adjoining surfaces in texture and color. Patchwork shall be damp-cured for 72 hours.

- B. After the above operations have been completed, a smooth finish shall be given to exterior concrete surfaces that are to be exposed to view. The smooth finish shall consist of thoroughly wetting and then brush coating the surfaces with cement grout composed by volume of 1 part Portland cement to not more than 2 parts fine aggregate passing the No. 30 mesh sieve and mixed with water to the consistency of thick paint. White Portland cement shall be used for all or part of the cement, proportioned as determined by trial mixes, so that the final color of grout, when dry, will be approximately the same as the color of the surrounding concrete. Grout shall be cork or wood floated to fill all pits, air bubbles, and surface holes. Excess grout shall be scraped off with a trowel and the surface rubbed with burlap to remove any visible grout film. The grout shall be kept damp by means of for spray during setting period. The finish of any area shall be completed in the same day and the limits of a finished area shall be made at natural breaks in the finished surface.
- C. Surfaces of slabs on grade shall be float finished after the concrete has been placed, struck-off, consolidated, and leveled. Floating shall begin when the water sheen has disappeared and the set is sufficient to permit operation of a power driven float. The surface shall then be consolidated with power driven floats. Hand floating shall be done in locations not accessible to power floats. No sand, cement, or other substance shall be applied to the surface to absorb water. Excess surface water may be removed by applying burlap or cloth to absorb water. After one floating operation the trueness of the surface shall be checked with a 10 foot straightedge at not less than 2 different angles. All high spots shall be cut down and low spots filled during this procedure so that the maximum variation from a plane surface is 1/4 inch or less. A final floating shall then be done to a uniform, smooth, granular texture. After final floating, the surface shall be scored by drawing a broom or burlap belt across the surface in the direction indicated by the Engineer and to the finish as shown on the Drawings. Water shall not be added to concrete surfaces at any time.

3.15 WALKS, CURBS, GUTTERS AND OTHER SIMILAR EXTERIOR CONCRETE

- A. Walks, curbs, gutters and other similar exterior concrete shall be provided as required by the Drawings. Concrete walks and other exterior concrete shall be placed on subgrades prepared as specified in Section 02200, and shall be built to the grades and lines shown and as required to meet adjoining and/or existing work. Dampen subgrades before applying concrete.
- B. An air entraining admixture shall be added in accordance with the manufacturer's directions so as to produce concrete containing from 4-1/2 percent to 6-1/2 percent of entrained air. The slump shall be not more than 3 inches and not less than 2 inches. The concrete shall have a compressive strength of not less than 4,000 pounds per square inch and the cement content shall be not less than 611 pounds per cubic yard.

- C. Walks and other exterior concrete shall be cured by covering first with sprayed-on curing compound applied immediately after finishing and then also completely covered with an impermeable fiber filled paper for a period of not less than 72 hours.
- D. Exterior concrete work constructed during hot weather shall be protected, in addition to the curing specified above, with Spencer Kellogg Anti-Spalling Compound, or Carter-Waters "Dek-Seal," or equal, applied as soon as conditions will permit after curing and when the concrete is clean and dry. The mixture shall be applied uniformly in two applications, in accordance with the manufacturer's recommendations. The second application shall not be made until after the first coat has been completely absorbed by the concrete.
- E. Expansion joints shall be provided in walks where shown and at intersection walks and buildings. Expansion joints in walks shall be made with 1/2-inch thick premolded, non-extruding expansion joint filler, "Flexcell," or "Meadows," or equal, extending through the full thickness of the concrete except the upper 1/4-inch. There shall be set accurately in place to straight lines and concreted in. Edges of grooves, expansion joints and edges of Walks shall be rounded to a 1/4-inch radius with suitable grooving and edging tools. Walks shall be finished as specified for troweled concrete except that final finishing shall be with wood floats or broomed, as directed, to produce non-slippery surfaces. Direction of final floating or brooming shall be at right angles to the length unless otherwise directed. Completed work shall be finished true to line and grade when tested with a 10 foot straightedge shall not show a variation of more than 1/4-inch from a straight line.

3.16 MISCELLANEOUS CONCRETE WORK

Miscellaneous concrete work shall be done as required by the Drawings and/or as specified.

3.17 TESTS OF CONCRETE

- A. Standard 6-inch diameter compression test cylinders shall be made in the field and tested in the laboratory in accordance with ASTM C31, C39 and C172. Test cylinders shall be made in forms provided by the testing laboratory.
- B. Advance tests of the concrete shall be made. Six standard 6-inch compression cylinders, 3 to be tested in 7 days and 3 at 28 days, shall be made with the proportioning and materials proposed to be used for each of the principal mixes required for the work. The slump shall not be less than the greatest slump expected to be used in the structure for each of the mixes. The tests made on the aggregates, as required above, may be made a part of these tests, if suitably referenced on the reports, which shall be issued for 7 and 28 day tests. These tests shall be repeated, if necessary, because of channel in material or unsatisfactory results. The advance testing may be waived at the request of the Contractor and with the Engineer's approval if the concrete is being produced by an established ready-mix plant with

suitable records of mixes and testing and if the plant certifies that it will continue to use the same materials involved in the recorded testing.

- C. During the progress of the work, and for each different mix of concrete, a set of three standard 6-inch concrete cylinders shall be made and tested for each and every day's operation (or 8-hour shift) where more than 5 cubic yards of concrete are placed. Make an additional set of three cylinders for each additional 50 cubic yards of concrete where more than 50 cubic yards are placed in one day for 8-hour shift). The Contractor shall be responsible for seeing that these cylinders are made; cast the cylinders if testing laboratory personnel are not available. The cylinders of each set shall be molded from the same sample of concrete and tested; one at 7 days and one at 28 days. If high-early strength cement is used, then the tests shall be made at 3 and 7 days instead of at 7 and 28 days.
- D. Also, from each sample of concrete used for test cylinders, make one slump test in accordance with ASTM C143 and make one entrained air content test in accordance with ASTM C231. Samples shall be collected in accordance with ASTM C172.
- E. Each cylinder shall be marked with job name, Contractor's name, location of pour and date of pour. Cylinders shall be taken to the laboratory as soon as practicable. Keep cylinders in heavy, tightly sealed, plastic bags.
- F. Tests of concrete shall be made as required in this Section. If any test cylinder shows a strength of less than that required at 28 days, then the concrete represented by such cylinder shall be further tested in accordance with Article 17.3 of ACI 301, except that Paragraph 17.3.2.3 shall not apply. If such further tests show a compressive strength less than required, then the concrete shall be rejected and shall be replaced with new work at the specified strength by the Contractor at his own expense.

3.18 READY MIXED CONCRETE

Ready mixed concrete if used shall comply with these Specifications in all respects and with ASTM C94.

3.19 CONCRETE FILL

Concrete fill to form slopes in channels, hopper bottom shapes in pits, and similar usage, shall be provided as shown and shall conform to all applicable requirements in this Section. Take special care to get good bond to the structural concrete. Surfaces to receive fill shall be thoroughly cleaned of all laitance, droppings and dirt, by sandblasting or chipping, then washed and swept to produce a clean concrete surface free of all foreign matter and all loose particles. Surfaces shall be damp but not wet. Cover surfaces, horizontal and vertical, with sand-cement grout before applying the fill concrete. Finish sand-cement grout before applying the fill concrete. Finish surfaces with a steel trowel finish with sufficient accuracy to prevent liquids from forming puddles on the finished surfaces.

END OF SECTION 03300

SECTION 11064
SUBMERSIBLE RAW SEWAGE PUMPS AND ACCESSORIES

PART 1 - GENERAL

1.01 SUMMARY

This section specifies the requirements for be included the furnishing, testing and adjustment of submersible type raw sewage pumps, controls, check valves and plug valves, and related items.

1.02 RELATED SECTIONS

Section 02710 – Sewer Force Mains

Section 16000 – General Provisions - Electrical

Section 16912 - Pump Station Control Panel

1.03 GENERAL

- A. Each pump shall be suitable for service in raw, unscreened sewage with 3 inch solids and shall be capable of meeting the flow and total dynamic head (TDH) as shown on the Drawings. Pumps shall be as manufactured by ABS or Flygt.
- B. Shop drawings shall be submitted indicating anticipated performance curves of the following:
 - 1. Capacity vs head curves
 - 2. Brake horsepower curves
 - 3. Hydraulic efficiency curves
 - 4. Motor input KW curves
 - 5. Certified motor data curves
- C. Each curve shall cover full range of operation from shutoff to maximum capacity.
- D. Shop drawings shall show the principal dimensions of the pump assembly, including the size of suction and discharge and details of discharge connection, guide bars, guide brackets, foundation details, lifting cables, shaft seals, lubrication system, motor and casing, and power cable attachment. Shop drawings will be specifically detailed for this project. Guide bars, guide brackets and all hardware installed inside the wetwell shall be stainless steel.

1.04 QUALIFICATIONS OF MANUFACTURERS

The pump manufacturer shall maintain a fully staffed maintenance facility within twenty-five miles of Pooler, Georgia. The facility shall be accessible to the Owner for inspection prior to the awarding of the Contract. During inspection, the manufacturer shall demonstrate that he has facilities capable of routine and emergency maintenance of the pumps required by this Specification. The facility shall have on-site shafts, seals, impellers and related appurtenances necessary for routine and emergency maintenance of the specified pumps.

PART 2 - MATERIALS

2.01 PUMP DESIGN

The design of the pumps shall be such that the pump unit will be automatically and firmly connected to the discharge piping when lowered into place on its mating discharge connection. The pumps shall be easily removable for inspection or service, requiring no bolts, nuts or other fastenings to be disconnected. For this purpose, there shall be no need for personnel to enter the wetwell. The pumps and their appurtenances shall be capable of continuous submergence under water operation without loss of watertight integrity to a depth of 65 feet.

2.02 PUMP CONSTRUCTION

- A. All major parts, such as the stator casing, oil casing, sliding bracket, volute and impeller shall be of gray iron. All surfaces coming into contact with waste shall be protected by a coating suitable for use in raw sewage. All exposed bolts and nuts shall be of stainless steel.
- B. A wearing ring /contra block system shall be installed to provide efficient sealing between the volute and impeller. The impeller shall be gray cast iron of non-clogging design, capable of handling solids, fibrous materials, heavy sludge and other matter found in normal waste applications. The impeller shall be constructed with a long throughlet without acute turns. The impeller shall be dynamically balanced. Non-corroding fasteners shall be used.
- C. Each pump shall be provided with a mechanical rotating shaft seal system running in an oil reservoir. Each Flygt pump shall have an upper seal containing one stationary tungsten-carbide ring and one positively driven rotating carbon ring and one lower seal unit between the pump and oil chamber shall contain one stationary and one positively driven rotating ring of either tungsten-carbide. Each ABS pump shall have an upper seal containing one stationary carbon seal ring and one rotating seal ring made of corrosion resistant Cr-steel and one lower seal unit between the pump and oil chamber shall contain one stationary and one positively driven rotating ring of silicon carbide. The seal system shall not rely upon the pumped media for lubrication and shall not be damaged when the pump is run dry.

- D. The shaft sealing system shall be capable of operating submerged to depths of, or pressures equivalent to 65 feet. No seal damage shall result from operating the pumping unit out of its liquid environment. The seal system shall not rely upon the pumped media for lubrication.
- E. A sliding guide bracket shall be a part of the pump unit. The volute casing shall have a machined discharge flange to automatically and firmly connect with the cast iron discharge connection, which when bolted to the floor of the sump and discharge line, will receive the pump dischargers connecting flange without the need of adjustment, fasteners, clamps, or similar devices.
- F. Slide rails shall be such that either the ABS or Flygt pumps can be interchanged without modification. Installation of the pump unit to the discharge connection shall be the result of a simple linear downward motion of the pump unit guided by no less than two guide bars.
- G. No portion of the pump unit shall bear directly on the floor of the wetwell. There shall be no more than one 90-degree bend allowed between the volute discharge flange and station piping.
- H. The pump motor shall be housed in an air-filled watertight casing and shall have moisture resistant Class F, 155E C. insulation. The motor shall be NEMA Design B and designed for continuous duty.
- I. The cable entry water seal design shall be such that it precludes specific torque requirements to insure watertight submersible seal.
- J. Pump motor cable when installed shall be suitable for submersible pump applications and this shall be indicated by a code or legend permanently embossed on the cable. Cable sizing shall conform to NEC Specifications for pump motors shall be of adequate size to allow motor voltage conversion without replacing the cable.
- K. Tolerances of all parts shall be such that allows replacement of any part without additional machining required to insure sealing as described above. No secondary sealing compounds, greases or other devices shall be used.
- L. Each pump shall be provided with an adequately designed cooling system. Thermal radiators integral to the stator housing, cast in one unit, are acceptable. Cooling media channels and ports shall be non-clogging by virtue of their dimensions.
- M. Thermal sensors shall be used to monitor stator temperatures. These sensors shall be used in conjunction with and supplemental to external motor over current protection and available at the control panel.

2.03 MIX FLUSH SYSTEM

- A. Provisions shall be incorporated in the wet well to mix the sewage for flushing prior to the pumps coming on. Either of two systems are approved. The Flygt Mix Flush Valve or the ABS Compact Submersible Mixer System.
- B. When the Flygt System is used one pump in each sump shall be equipped with a valve to provide mixing within the sump at the time of start-up of the pump. The valve is to be mounted directly on the pump volute to direct part of the pumped discharge to flush solids into suspension at the start of each pumping cycle. The valve shall be open at the beginning of each pumping cycle and close under full pump discharge pressure after an adjustable pre-selected time. The valve shall be operated by the liquid being pumped through a self-contained hydraulic system. No external power source shall be required to operate the valve. Units using electrical input will not be accepted.
- C. When the ABS System is used one RW 200-280 compact submersible mixer shall be provide for each wetwell. The motor shall be water pressure tight encapsulate modular motor with cast iron housing, oil chamber and propeller form, together with the bracket, compact unit construction. Motor shall be three (3) phase, insulation class F, protection class IP 68. Rotor shaft shall be supported in lubricated-for-life ball bearings. Tandem shaft sealing with lip seal and silicon carbide mechanical seal. A solids deflection ring shall protect the mechanical seal from damage by ingress of solids or fibrous matter. Unit shall be equipped with a blockage free propeller which will not be clogged by trash, manufactured of cast iron. The mixer bracket shall allow a selection of various angles in the vertical plane. Swiveling in the horizontal plane shall be facilitated by the conical threaded pipe connection and the assembly shall be easily removed from the wetwell.

2.04 DISCHARGE PIPING IN WETWELL

Pump discharge piping inside the wetwell of the lift station shall be ductile iron in accordance with the requirements of Section 02710.

2.05 ACCESS FRAME AND COVER

Aluminum access frames complete with hinged and hasp-equipped aluminum, designed for 300 lb per square foot live load covers, upper guide holder and cable holder shall be furnished. Each door shall have a safety handle to maintain the door in the open position. Doors shall be of checkered aluminum plate. Cover guide bar holders shall be integral with the discharge connection.

2.06 LIQUID LEVEL SENSOR AND PUMP CONTROLLER

Liquid level sensor and pump controller shall be provided as specified in Section 16912.

2.07 CONTROL PANEL

The control panel shall be furnished by the pump supplier. See Division 16912 for additional requirements.

2.08 FIELD TESTS, ADJUSTMENT AND START-UP

- A. After completion of installation, each pumping unit and all related equipment shall be inspected and approved by a representative of the manufacturer as being in compliance with the manufacturer's recommendations and requirements. After such inspection, the equipment shall be tested by the manufacturer's representative in the presence of the Owner and Engineer. Each pump shall meet the performance requirements.
- B. Field test results shall be provided by the Contractor. Results shall be within minus one percent and plus five percent tolerance of the pump requirements stated herein and shall be certified by the pump manufacturer after field testing to be in conformance with the Contract Specifications. Pumps not meeting these requirements shall be replaced.
- C. Alignment of each pump unit shall be checked after installation of pump and piping to determine that the base is not distorted and pipe strain is not present.

2.09 PUMP WARRANTY

The pump manufacturer shall warrant the pumps in writing against defects in workmanship and material for a period of five (5) years or 10,000 hours of normal use, operation and service. The warranty shall be in printed form and apply to all similar units. Warranty shall cover both parts and labor on a pro-rated basis after the first year. The first year warranty shall cover 100 percent labor and materials cost.

The manufacturer shall furnish six sets of its Submittal Drawings, Operation and Maintenance Instruction Manuals and parts List.

2.10 CHECK VALVES

- A. Checkvalves for 4-in to 24-in diameter shall be swing type tight closing, resilient seated complete with outside lever and weight except where otherwise noted and shall meet the requirements of AWWA C508. The valves shall be constructed of cast iron, ASTM A126, Class B, bronze mounted, single disc, with 175 psi working water pressure, non-shock and hydrostatically tested at 300 psi. Valves shall be thermal bonded epoxy coated on all ferrous surfaces internally and externally.
- B. Hinge shafts shall be constructed of nominal diameter stainless steel 18-8, Type 316. The body seat ring shall be constructed of stainless steel or bronze. The resilient rubber seat shall be securely attached to the valve disc. When there is no

flow through the line, the disc shall hang lightly against its seat in practically a vertical position. When open, the disc shall swing clear of the waterway.

- C. Valves shall be so constructed that disc and body seat may easily be removed and replaced without removing the valve from the line. Valves shall be fitted with an extended hinge arm with outside lever and weight. The position of the weight shall be adjustable. Various weights shall be provided and installation approved by the Engineer. Lever shall be installed horizontal in the closed position, for both horizontal and vertical pipeline installations.

2.11 PLUG VALVES

- A. Plug valves shall be used on all sewer applications unless approved otherwise by the Engineer. Plug valves shall be of the non-lubricated eccentric plug type with a resilient seat seal. Plug valves for buried service shall be furnished with mechanical joint ends in accordance with ANSI Standard A21.11, latest revision. Plug valves located in valve vaults or above ground shall be furnished with flanged ends in accordance with ANSI 16.1, Class 125/150 standard faced and drilled. Port area for all valves shall be a minimum of 80% of the full pipe area. Valve bodies shall be of ASTM A-126 Class B cast iron. All exposed nuts, bolts, washers, springs, etc. shall be stainless steel. Resilient seat seals shall be of Buna-N or Neoprene, suitable for use in sewage service.
- B. Plug facing shall be non-metallic. The seat shall be nickel and welded to the body of the valve. Valves furnished shall have their internal wetted surfaced protected by nonmetallic coatings factory applied, thermally bonded and in full conformance to AWWA Standard C550, latest revision.
- C. Nominal valve pressure ratings, body flanges and wall thicknesses shall be in full conformance to ANSI B16.1. Valves shall seal leak-tight against full rated pressure in both directions.
- D. Valves two inches (2") and larger for direct bury shall have gear actuators with 2" square operating nut and shall be capable of opening valve at rated pressure of 150 psi. All gearing shall be fully enclosed in a suitable housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. A suitable stop shall be set to provide water tight shut off in the closed position at full rated pressure. All exposed nuts, bolts and washers shall be stainless steel.
- E. Valve actuators for buried or submerged service shall have seals on all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts, springs, and washer shall be stainless steel. Plug valves shall be Dezurik Eccentric Plug Valves or an approved equal and

shall be installed as shown on the Drawings.

2.12 LIFT STATION MONITOR

Lift station monitor for new and upgrade stations shall be "Web-to-Wireless Sewage Lift Station Monitor" by Omni-site, model XR50. Unit shall be installed in NEMA-4X polycarbonate enclosure provided by the manufacturer and shall include a factory installed lightning arrester (power supply). Refer to Section 16000 for electrical wiring details.

2.13 EMERGENCY STAND-BY GENERATORS

Provisions for emergency stand-by power will be included on all lift stations. It will be at the City of Pooler's discretion if a permanent generator is required.

END OF SECTION 11064

SECTION 11065
SUBMERSIBLE RAW SEWAGE GRINDER PUMPS AND ACCESSORIES

**GRINDER PUMPS WILL ONLY BE PERMITTED WHERE GRAVITY SEWER IS NOT
FEASIBLE AS DETERMINED BY THE CITY MANAGER.**

PART 1- GENERAL

1.01 SCOPE

Furnish and install a fully assembled simplex or duplex grinder pump package consisting of grinder pump(s) and motor(s), basin assembly, internal discharge piping, check valves, shut off valves, quick disconnect slide rail systems, lift chains, level controls, stainless steel level control bracket, junction box, inlet fitting, control panel, and related items as shown on the Drawings.

1.02 OPERATING CONDITIONS

Pump operating conditions shall be as indicated on the Drawings

PART 2 - MATERIALS

2.01 GENERAL

The grinder unit shall be capable of macerating all material in domestic and commercial sewage including reasonable amounts of foreign objects such as small wood, sticks, plastic, thin rubber, sanitary napkins, disposable diapers and the like to a fine slurry that will pass freely through the pump and 1-1/4 inch discharge pipe and shall have a minimum 2 horse power motor. **Pump shall be of the centrifugal type Meyers model WGL20-21, ABS Piranha, or equal with an integrally built-in grinder unit and submersible motor.**

2.02 MOTOR

- A. Pump motor shall be of the submersible type. Motor shall be single phase or three phase. Single phase motors shall be of capacitor start, capacitor run. Three phase motors shall be NEMA B type.
- B. Stator windings shall be of the open type with Class F insulation good for 155EC (311EF) maximum operating temperature.
- C. Motor shall have two heavy duty ball bearings to support pump shaft and take radial and thrust loads. Ball bearings shall be designed for 50,000 hours B-10 life.
- D. A heat sensor thermostat and overload attached to the top end of the motor windings to stop the motor if the motor winding temperature reaches 221EF. The high temperature shut off will cause the pump to cease operation, should a control failure

cause the pump to run in a dry wet well. The thermostat shall reset automatically when the motor cools to a safe operating temperature, or shall be operated from the outside control panel.

- E. The common motor pump and grinder shaft shall be of #416 stainless steel threaded to take pump impeller and grinder impeller.

2.03 SEALS

Motor shall be protected by two mechanical seals mounted in tandem with a seal chamber between the seals. Seal chamber shall be oil filled to lubricate seal face and to transmit heat from shaft to outer shell. Seal face shall be carbon and ceramic and lapped to a flatness of one light band. Lower seal faces shall be silicon carbide.

2.04 PUMP IMPELLER

The pump impeller shall be of the recessed type to provide an open unobstructed passage through the volute for the ground solids. Impeller shall be cast iron. Both grinder impellers and shredding ring shall be of 440C stainless steel hardened to a 58-60 Rockwell C.

2.05 CORROSION PROTECTION

All iron castings shall be pre-treated with a phosphate and chromic rinse and to be painted before machining and all machined surfaces exposed to the sewage water to be re-painted. All fasteners shall be 302 stainless steel.

2.06 SHOP DRAWING

Shop drawings shall be submitted indicating the performance curves of the pump showing capacity vs head. Each curve shall cover full range of operation from shutoff to maximum capacity.

2.07 BASIN

The basin shall be of the diameter and depth as shown on the Drawings. The basin shall be molded of fiberglass reinforced polyester resin manufactured by the lay-up and spray technique to assure that the interior surface is smooth and resin rich. The basin shall have a minimum wall thickness of 1/4 inch. A steel anti-flotation plate shall be molded into the bottom of the basin. A one-piece inlet fitting shall be provided for the inlet pipe as shown on the Drawings for field installation.

2.08 RAIL ASSEMBLIES

The lift out rail assemblies shall permit easy removal and installation of the pumps and lower check valves without the necessity of personnel entering the wetwell. Stainless steel guide brackets with guide yokes of sufficient bearing strength to prevent binding shall bolt to the pump. The yokes shall mate over the guide rails of a minimum of 1 inch running between an upper guide rail support and the discharge case. Discharge case shall be securely bolted to the floor of the wetwell so that slight deflection caused by the discharge pipe will not cause the quick disconnect pump flange to leak. All guide, brackets and hold downs shall be of non-sparking stainless steel construction.

2.09 CHECK VALVES

A heavy duty spring loaded check valve with cast iron body shall be an integral part of the discharge seal assemblies and lift out with the pump assemblies. The valve design shall be such to allow for operation when negative heads, up to 5 feet, are encountered. The valves shall be designed to operate at all pressures in the sewer system created by the grinder pumps.

2.10 DISCHARGE PIPING

Schedule 80 PVC discharge piping shall connect to the stationary discharge base lift assemblies and terminate at a 1-1/4 inch discharge flange mounted on the basin at the height shown on the Drawings.

2.11 LEVEL CONTROLS

Pump on, off, and alarm levels shall be control by mechanical float switches. Level control switches shall have sufficient length to reach the junction box without splices and shall be UL/CSA listed.

2.12 JUNCTION BOX

The junction box shall not be allowed in the wetwell. All cables shall be directed into the outside control panel. Stainless steel cable grips shall be provided to support the cables in the wetwell. Cables shall be routed through conduits and shall have flexible putty seal to prevent wetwell gasses from entering the control panel.

2.13 CONTROL PANEL

- A. A NEMA 4X fiberglass control panel shall be furnished with each pumping unit to be installed, as shown on the Drawings. The resin system shall be pigmented to impart a grey color to the enclosure and to be resistant to ultraviolet light. The enclosure shall be of one piece, weather proof construction and fitted with a closed cell neoprene gasketed cover. The cover shall be hinged with a heavy duty stainless steel piano hinge and lockable by means of two combination stainless steel latches and padlocks hasp.
- B. The panel shall include a double pole main disconnect breaker, I.E.C. rated motor contactor, Klixon overload, pump hand-off-auto switch (momentary in the hand position), pump run light, leal leak light, start and run capacitors, start relay, terminal blocks, ground lug, a red lexan alarm light, and all necessary wiring and brackets.
- C. All internal wiring shall be neat and color coded. Each wire shall be a different color or stripe and all incoming wires shall terminate into a box clamp type terminal block. A schematic diagram showing wire color shall be permanently fastened to the inside of the enclosure. An installation and Service Manual shall also be included with each control panel. The control panel shall be UL listed as an assembly.

END OF SECTION 11065

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TYPICAL SPECIFICATIONS

TYPICAL DETAILS

THESE ELECTRICAL STANDARDS HAVE BEEN DEVELOPED USING TYPICAL SITUATIONS AND ISSUED FOR GUIDANCE PURPOSES ONLY. THEY ARE NOT INTENDED TO BE USED FOR CONTRACT DOCUMENTS. THE CONCEPTS HEREIN ARE TO BE ADAPTED BY AN ELECTRICAL ENGINEER REGISTERED IN THE STATE OF GEORGIA FOR USE ON CITY OF POOLER, GEORGIA PROJECTS. THEY ARE NOT FOR USE FOR ANY OTHER PURPOSE OR FOR ANY OTHER GOVERNMENT ENTITY, DEVELOPER, OR PUBLIC SERVICE AGENCY. THERE ARE NO WARRANTIES OR GUARANTEES ASSOCIATED WITH THE USE OF THIS MATERIAL.

GENERAL NOTES

1. The City of Pooler has standardized the voltages to be used for lift stations. The two voltages are:
 - A. Three phase, 4 wire, 120/240 volt Delta. The service can either be open delta or with a bank of three transformers. Savannah Electric has provided open delta utilizing two pad mounted transformers in locations such as residential subdivisions on some occasions.
 - B. Three phase, 4 wire, 480Y/277 volts.
 - C. The voltage determination shall be a function of the service available from Savannah Electric and shall generally be the lowest cost to the City of Pooler.

If Savannah Electric cannot provide 120/240 volt Delta service utilizing pole mounted or pad mounted transformers then 480Y/277 volt service shall be used.

2. Motor starters shall normally be full voltage, non-reversing, across the line type. Where reduced voltage starters are necessary they shall be auto-transformer or solid state type. Reduced voltage starters will many times be desirable when a standby generator is being provided. For larger motors they may be required by SEPCO.
3. The City is providing their requirements to the developer in the form of these General Notes, Items of Specific Interest, typical specifications and typical details for installation of electrical work for adaptation to any lift station project. The developer's engineer is authorized to utilize these as general guides in any way that is beneficial to furnishing the City of Pooler with standardized installations. The user is cautioned that this information is only for guidance and that adaptations will be required for each installation and must be by an Electrical Engineer registered to practice Electrical Engineering in the State of Georgia. There are no warranties or guarantees associated with the use of this material.

ITEMS OF SPECIFIC INTEREST

SECTION 16054 - ELECTRICAL SUBMITTALS

Submittals to be required for at least the following items:

- SECTION 16111 - Raceway Systems
- SECTION 16126 - Safety and Disconnect Switches
- SECTION 16127 - Electrical Grounding
- SECTION 16166 - Surge Suppressors
- SECTION 16167 - Separately Enclosed Circuit Breakers
- SECTION 16620 - Standby Power Systems
- SECTION 16912 - Pump Station Control Panel

SECTION 16111 - RACEWAY SYSTEMS

1. Conduits to be (RGS) Rigid Galvanized Steel or (IMC) Intermediate Metal Conduit except as noted.
2. Conduit to be Schedule 80 PVC for system and surge protection grounding conductors.
3. Connectors for use with RGS and IMC conduit shall be Myers type hubs.
4. Provide corrosion protection for metallic conduits below grade and extending up to 6" above grade. Corrosion protection to be either of the following:
 - a. Field wrap with 3M Scotchrap No. 50, 2-inch wide (minimum) with a 50 percent overlay.
 - b. Factory-applied polyvinyl chloride, plastic resin, or epoxy coating.
5. Supporting materials including hardware shall be hot-dipped galvanized after fabrication or provide an equivalent level of corrosion protection.

SECTION 16126 - SAFETY AND DISCONNECT SWITCHES

1. Switches to be heavy duty type stainless steel enclosed NEMA Type 3R.
2. Switches to be identified with nameplates screwed and glued to the enclosure. Screws to be stainless steel. Switch identification to match designation on the drawing or provide a functional description such as

APump No. 1:

AService Disconnect@

3. Switches to be non-fused type unless otherwise required by code or manufacturer of driven equipment.

SECTION 16127 - ELECTRICAL GROUNDING

1. Provide ground rods as shown in the standard details.
2. Install an enclosure for each service ground rod similar to Quasite APC@ style, open bottom box, with nominal dimensions of 17"x11" side x 12" deep. Box cover and installation method shall be suitable for light vehicular traffic (8000 lbs over a 10" square). Box cover to be locking type and have the logo AGROUND.@
3. Provide grounding conductors in all branch circuit and feeder raceways sized in accordance with Article 250 of NFPA 70.

SECTION 16166 - SURGE SUPPRESSION

1. Provide surge suppressor at each station as follows:
 - A. Services rated 3 PH, 4W, 120/240 volts Delta.

Current Technology: TG 100 (100 KA)
Joslyn: 1452-85 (100 KA)
APT: TE/3000P (80 KA)
 - B Services rate 3 PH, 4W, 480Y/277 volts

Current Technology: TG150 (150 KA)
Joslyn: 1456-85-L (200 KA)
APT: TE/4000 HP (160 KA)
2. Enclosures shall be in NEMA 4X stainless steel.
3. In addition to the drawing details provide installation instruction in the specifications utilizing the following as a guide. Install in strict compliance with the manufacturer's written recommendation and this specification. The installation shall be such that bends in the conductor and the distance to point of connection are minimized. Prior to mounting any equipment on the service backboard, the Contractor shall determine the optimum location for mounting the surge suppressor. The total length of any energized lead connecting the suppressor to the service conductors shall be no longer than 18 inches and the minimum size be No. 2 AWG.

SECTION 16167 - SEPARATELY ENCLOSED CIRCUIT BREAKERS

1. Switches to be heavy duty type stainless steel enclosed NEMA Type 3R.
2. Switches to be identified with nameplates screwed and glued to the enclosure. Screws to be stainless steel. Switch identification to match designation on the drawing or provide a functional description such as

ANormal Power Circuit Breaker@

AEmergency Power Circuit Breaker@@

3. Switches to be 42,000 AIC rated minimum except shall be higher if indicated on the Contract documents.

SECTION 16620 - STANDBY POWER SYSTEMS

1. The complete system including the standby generator and the automatic transfer switch is to be provided by one manufacturer.
2. Manufacturers to be either Caterpillar or Onan/Cummins.
3. Fuel storage shall be for 24 hours of operation at full load. Tank to sub-base type.
4. Fuel to be diesel.

SECTION - 16912 - PUMP STATION CONTROL PANEL

1. Control panel to be furnished by the pump supplier.
2.
 - a. Control to be accomplished utilizing a multiTrode probe system for standard duplex station.
 - b. Control to be accomplished using hydromanager level sensor and controller with backup floats for high and low level alarms for stations requiring variable speed pumps.
3. Generator receptacle to be mounted adjacent to or on the control panel.

SECTION 16000
GENERAL PROVISIONS - ELECTRICAL

1.01 SCOPE OF WORK:

- A. Provide all labor, materials, equipment and supervision to construct complete and operable electrical systems as indicated on the drawings and specified herein, for Lift Stations for The City of Pooler. All materials and equipment used shall be new, undamaged and free from any defects.

1.02 REFERENCE STANDARDS:

- A. Applicable provisions of the State and Local Codes and of the following codes and standards are hereby imposed on a general basis for electrical work:
1. NEC, National Electrical Code (NFPA No. 70), 1996 Edition.
 2. Electrical Ordinance, City of Pooler, Current Edition.
 3. National Electrical Code, current edition.

1.03 COORDINATION:

- A. Coordinate work provided under this division of the specifications with work provided under other divisions of the specifications and work provided by owner, where applicable.

1.04 PROJECT STAFFING:

- A. The Contractor shall provide an electrical superintendent to plan, layout and supervise all work performed under this contract. **The superintendent shall have a minimum of 5 years experience in the supervision of projects of similar size and shall have a State of Georgia unrestricted electrical contractor's license.** The Contractor shall submit a resume for the proposed superintendent, for approval by the Engineer, prior to beginning work.

1.05 UTILITY CONNECTIONS:

- A. Coordinate the connections of electrical systems with exterior power services. Comply with requirements of governing regulations, and the specific utility companies.

1.06 PERMITS AND TEST; ELECTRICAL WORK:

- A. Submit a record copy (for Owner's records) of electrical work notices, permits, licenses, inspection or test reports, and similar items obtained in response to governing and imposed codes, regulations and standards.

1.07 ELECTRICAL DRAWINGS:

- A. Do not scale the electrical drawings. Obtain all dimensions from dimensioned drawings, field measurements and shop drawings.
- B. Electrical contract drawings are diagrammatic and indicate the general arrangement and connection of equipment and devices. The contractor shall review product data sheets, wiring diagrams, manufacturer's installation instructions, etc. and provide the connections required to place equipment into service. Do not rely solely on the conductor counts shown on the drawings.
- C. Discrepancies shown on different drawings, between drawings and specifications or between documents and field conditions shall be brought to the attention of the Architect.

1.08 EQUIPMENT REQUIRING ELECTRICAL SERVICE:

- A. Provide electrical connections for all electrically driven equipment. Except as otherwise indicated, the final connections are electrical work. Obtain a copy of the shop drawings of equipment. Review shop drawings to verify electrical characteristics and to determine rough-in requirements, final connection requirements, and location of disconnect switch, etc. Keep a copy of these shop drawings at the project site throughout the course of construction.
- B. Equipment to be connected includes, but is not limited to the following:
 - 1. Submersible Pumps
 - 2. Pump Control Panel
- C. The design of circuits for electrically driven equipment is based on the product of one manufacturer and may not be representative of all acceptable manufacturers. If equipment furnished has differing characteristics, make necessary adjustments to circuit components at no additional cost to the Owner, subject to the approval of the Architect.

1.09 EQUIPMENT REQUIRING INSTALLATION:

- A. Equipment requiring installation shall include, but not be limited to the following:

1. Pump Control Panel
2. Liquid Level Sensors

B. It shall be the responsibility of this Contractor to determine the requirements by reviewing the contract documents and meeting the Superintendent of the trade involved to review submittal data, shop drawings, etc.

PART 2 - PRODUCTS Not Applicable.

PART 3 - EXECUTION

3.01 ROLE OF THE SUPERINTENDENT:

A. The Division 16 Superintendent's duties shall include, but not be limited to the following:

1. Planning and layout of the work.
2. Coordination with other trades and the local utility company.
3. Posting addenda and changes in the work to maintain the Record Documents and to ensure that Division 16 personnel are working from up-to-date drawings and specifications.
4. Supervision of all Division 16 personnel.
5. Ongoing review of work in place to ensure compliance with the Contract Documents.
6. Administrative duties as required to fulfill the requirements of the General Conditions, Special Conditions and Division 1 specifications.

3.02 PROTECTION OF THE WORK :

- A. Protect the work during the course of construction. Do not install any equipment or materials until the proper environmental conditions have been established.
- B. Store materials in the manner recommended by the manufacturer until materials are installed. Materials rated for indoor use shall not be stored outdoors regardless of the packaging in which the materials are shipped.
- C. Protect incomplete conduit runs, outlet boxes, etc. from the entry of water or construction debris. Do not install equipment enclosures, wiring devices or conductors until the site is ready and the danger damage to the equipment is minimal.
- D. Install temporary protective covers over equipment mounted on the building exterior to prevent corrosion damage during cleaning of the building exterior, by others.

- E. Install temporary protective covers over equipment to prevent corrosion damage during cleaning or other operations which may damage equipment.
- F. Clean all equipment, inside and out, upon completion of the work. Scratched or marred surfaces shall be touched-up with touch-up paint furnished by the equipment manufacturer.
- G. Replace all equipment and materials that become damaged.

3.03 CUTTING AND PATCHING:

- A. Do not cut and patch. All penetrations required to do this work shall be cast in places.

3.04 INTERFACE OF ELECTRICAL WORK WITH OTHER TRADES:

- A. Where electrical work must adjoin or abutt to work installed by other trades, engage the services of the other trade to interface the work. Under no circumstances shall the Contractor performing work under this Division of the specifications modify or alter work installed by others.

END OF SECTION 16000

SECTION 16054
ELECTRICAL SUBMITTALS

PART 1 - GENERAL

1.01 GENERAL:

- A. Submit for review by the Engineer a schedule with engineering data of materials and equipment to be incorporated in the work. Submittals shall be supported by descriptive materials, i.e., catalog sheets, product data sheets, diagrams, performance curves and charts published by the manufacturer, to show conformance to Specifications and Plan requirements; model numbers alone shall be acceptable. Data submitted for review shall contain all information to indicate compliance with Contract Documents. Complete electrical characteristics shall be provided for all equipment.
- B. The purpose of shop drawing review is to demonstrate to the Engineer that the Contractor understands the design concept. Review of such drawings, schedules, or cuts shall not relieve the Contractor from responsibility for deviations from the drawings or specifications unless he has, in writing, called attention to such deviation at the time of submission, and received from the Engineer, in writing permission for such deviations.

1.02 RESPONSE TO SUBMITTALS:

- A. Shop drawings shall be evaluated by the Electrical Engineer in accordance with the following classifications:
 - 1. "No Exceptions Taken": No corrections, no marks. Items may be ordered.
 - 2. "Make Corrections Noted": A few minor corrections. Items may be ordered as marked up without further resubmission.
 - 3. "Revise and Resubmit": Minor correction. Item may be ordered at the Contractor's option. Contractor shall resubmit drawings with corrections noted.
 - 4. "Rejected": Major corrections or not in accordance with the contract documents. No items shall be ordered. Contractor shall correct and resubmit drawings.

1.03 FORMAT:

- A. Prior Approvals and Shop Drawings must be received by mail or hand delivered. Submittal data received by facsimile machine is not acceptable and will not be

reviewed.

1.04 EQUIPMENT AND MATERIALS REQUIRING SUBMITTALS:

- A. Section 16000 - General Provisions
 - 1. Superintendent's qualifications
- B. Section 16111 - Raceway Systems
 - 1. Raceways
 - 2. Outlet Boxes and Covers
 - 3. Pull Boxes
 - 4. Conduit Bodies
 - 5. Connectors and Couplings
 - 6. Corrosion Protection
- C. Section 16126 - Safety and Disconnect Switches
 - 1. Safety Switches
- D. Section 16127 - Electrical Grounding, 600V and Below
 - 1. Ground Rods
 - 2. Ground Rod Enclosures
- E. Section 16166 - Surge Protection Devices
 - 1. Enclosure
 - 2. Installation instructions
 - 3. Dimensional data
 - 4. Manufacturer's data sheet
- F. Section 16912 - Pump Station Control Panel
 - 1. Complete shop drawings
 - 2. Schematic wiring diagrams
 - 3. Liquid Level Sensors
 - 4. Ammeters
 - 5. Current Transformers
 - 6. Circuit breakers
 - 7. Starters
 - 8. Panel layouts
 - 9. Transformers
 - 10. Enclosure

- 11. Generator Receptacle
- 12. Manual Transfer Switch

PART 2 - PRODUCTS

Not Applicable.

PART 3 - EXECUTION

3.01 MANUFACTURER'S DATA:

- A. Include the manufacturer's comprehensive product data sheet and installation instructions.
- B. Where operating ranges are shown, mark data to show portion of range required for project application.
- C. Where pre-printed data sheet covers more than one distinct product-size, type, material, trim, accessory group or other variations, delete or mark-out portions of the pre-printed data which are not applicable.

3.02 EQUIPMENT LIST:

- A. Where more than one type of a product is being used (i.e. starters, disconnects, breakers, etc.) provide a list with each submittal correlating the type and size of product to the load served.

3.03 TEST REPORTS:

- A. Submit test reports which have been signed and dated by the firm performing the tests, and prepare in the manner specified in the standard or regulation governing the tests procedure as indicated.

END OF SECTION 16054

SECTION 16111
RACEWAY SYSTEMS

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. The requirements of this section apply to all electrical raceway systems installed under this contract. Electrical raceway system is defined to include but not be limited to all electrical raceways, boxes, fittings, supports, and other components necessary for a complete system.

PART 2 - PRODUCTS

2.01 ELECTRICAL RACEWAYS:

- A. The types of electrical raceways acceptable for use on this project include the following:

2.02 INTERMEDIATE METAL CONDUIT (IMC) OR RIGID GALVANIZED STEEL CONDUIT (RGS):

- A. Concealed or exposed; below grade and above grade metallic raceway system for all current carrying conductors.

2.03 RIGID NON-METALLIC CONDUIT (SCHEDULE 80 PVC):

- A. For system and surge protection grounding conductors only.

2.04 CONDUIT BODIES:

- A. Provide galvanized steel or cast metal conduit bodies constructed with threaded conduit ends, removable cover, and corrosion resistant screws.

2.05 CONNECTORS/COUPLINGS:

- A. Connectors/couplings for use with IMC and RGS conduit shall be Myers type hubs.

PART 3 - EXECUTION

3.01 RACEWAY INSTALLATION - GENERAL:

- A. Give the right-of-way in confined spaces to piping which are less conformable than electrical services.
- B. Complete the installation of electrical raceways before starting installation of cables within raceways.
- C. Metallic raceway systems shall be made electrically continuous to provide a low impedance path to ground for faults, as required by the NEC.

3.02 INSTALLATION:

- A. Tools using open flames are not acceptable for bending PVC conduit. Any section of conduit discolored or deformed in any way shall be cut out and replaced.

3.03 SUPPORTS:

- A. Raceways:
 - 1. Support all components of the electrical raceway system using wood screws to wood; by toggle bolts on hollow masonry units; by concrete inserts or expansion bolts on concrete or brick; by machine screws, welded threaded studs, or spring-tension clamps on steel work.
 - 2. Support individual raceways with conduit straps or clips.
 - 3. All supports shall be listed for the purpose. The use of makeshift supports is not acceptable. The use of wire ties or tie wraps to support raceways is unacceptable.
 - 4. Support conduits at distances required by the National Electrical Code.

3.04 CORROSION PROTECTION:

- A. Corrosion protection for underground metallic conduits shall be by one of the following means: field-wrapped with 3M Scotchrap No. 50, 2-inch wide (minimum), with a 50 percent overlay, or shall have a factory-applied polyvinyl chloride, plastic resin, or epoxy coating.

- B. All supporting materials shall be hot-dipped galvanized after fabrication or provide an equivalent level of corrosion protection. Protect exterior raceway systems from damage while the building exterior is cleaned. Replace any portions of the system showing signs of rust at the time of final inspection.

3.05 EXCAVATION, TRENCHING AND BACKFILLING:

- A. Perform all excavating, trenching and backfilling to install work of this project in accordance with applicable sections of Section 02221 of the specifications and ANSI C2.
- B. Secure conduits in trench to eliminate unnecessary curvature and to prevent movement of conduits while backfilling.
- C. Maintain 6" vertical separation between conduits installed one above the other. Backfill and compact each layer separately. The minimum cover requirements specified herein shall be referenced to the uppermost layer of conduits.
- D. Maintain minimum 12" horizontal and 6" vertical separation between conduits of different systems and between other underground utilities.
- E. Backfill shall be free of rocks, sticks, roots, trash or other debris which may injure conduits or diminish compaction.
- F. All service conduits shall be installed with a minimum cover of 24". Power conduits shall be installed with a minimum cover of 18". Communications conduits shall be installed with a minimum cover of 18".

3.06 RACEWAY LAYOUT:

- A. Unless noted otherwise, the layout of raceway is the responsibility of the Contractor. Provide pull and points as required by the NEC and ensure that all such points are readily accessible and not blocked by ducts, pipes, etc.

END OF SECTION 16111

SECTION 16126
SAFETY AND DISCONNECT SWITCHES

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. The requirements of this section apply to all safety and disconnect switches installed under this contract.

1.02 QUALITY ASSURANCE

- A. Manufacturers: Provide products produced by one of the following (for each type of switch):
1. Square D Company
 2. Cutler Hammer
- B. Submittals: Refer to Section 16054 for requirements.

PART 2 - PRODUCTS

2.01 SAFETY AND DISCONNECT SWITCHES:

- A. Provide heavy duty type, stainless steel enclosed safety switches, incorporating quick-break type switches, constructed so switch blades are visible in "OFF" position with the door open. Switches shall be equipped with operating handles which are an integral part of the enclosure base and whose positions are easily recognizable. Switches shall be padlockable in the "OFF" position. All current carrying parts shall be constructed of high-conductivity copper and silver-tungsten type switch contact. All switches shall be UL listed. Switches shall have engraved plastic nameplates indicating the load served, load rating and the branch circuit number.

(Ex: Pump No. 1
35.5A, 1ph, 208V
Fed from HA-2)

- B. Switches shall be non-fused type unless indicated otherwise or unless required by the manufacturer of the driven equipment. Where fuses are required, provide fuses of the type recommended by the equipment manufacturer.

- C. **Nameplates shall be screwed and glued to the enclosure.**

PART 3 - EXECUTION

3.01 INSTALLATION:

- A. Install switches in accordance with the installation details on the drawings.
- B. Group and lace conductors within enclosure with nylon tie straps.

END OF SECTION 16126

SECTION 16127
ELECTRICAL GROUNDING, 600V AND BELOW

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. The extent of electrical grounding work is as indicated on drawings and required by this section of the specifications. Grounding of electrical installations comprises both system and equipment grounding, and includes, but is not necessarily limited to, metal raceways, panelboard enclosures, cable shields, junction boxes and other non-current-carrying metallic parts of equipment.

1.02 QUALITY ASSURANCE

- A. Acceptable Manufacturers: Use products of manufacturer's regularly engaged in the production of grounding systems products. All materials shall be U.L. listed.
- B. Submittals: Refer to Section 16054 for requirements.

PART 2 - PRODUCTS

2.01 MATERIALS AND COMPONENTS

- A. General: Except as otherwise indicated, provide for each electrical grounding indicated or required, complete assembly of materials, including but not necessarily limited to cable, wire connectors, terminals, grounding rods/electrodes, bonding jumper braid, and other items and accessories needed for a complete installation. Where more than one type meets indicated requirements, selection is Installer's option. Where material or component is not otherwise indicated, provide products complying with NEC, and established industry standards.
- B. Electrical Grounding conductors: Unless otherwise indicated, provide bare or green insulated stranded copper electrical grounding conductors sized according to NEC or as shown or specified. Provide green insulated for conductors sized No. 10 AWG and smaller.
- C. Connectors: Connectors shall be exothermic weld, pressure or clamp type and shall be U.L. listed.
- D. Ground Rods: Sectionalized steel with copper-welded exterior, 3/4" dia. x 10'.

PART 3 - EXECUTION

3.01 INSTALLATION OF ELECTRICAL GROUNDING

- A. The grounding of the service equipment and separately derived systems shall be as indicated on the drawings or as specified herein.
- B. Bond to metal piping systems.
- C. Ensure that metal-to-metal contact is made between grounding connectors and painted or coated surfaces of equipment enclosures, piping systems, etc.
- D. Where concrete penetration is necessary, non-metallic conduit shall be cast flush with the points of concrete entrance and exit so as to provide an opening for the ground wire and the opening shall be sealed with a suitable compound after installation of the ground wire.
- E. Metallic raceway systems shall be made electrically continuous to provide a low impedance path to ground for faults, as required by the NEC.
- F. Install an equipment grounding conductor in all branch circuit and feeder raceways, sized in accordance with Article 250 of NFPA 70. Bond equipment grounding conductors to all outlet boxes with a screw used for no other purpose. Connect the equipment grounding conductor to device grounding terminals.
- G. Install an enclosure for each ground rod, similar to Quasite "PC" style, open bottom box, with nominal dimensions of 17" long x 11" wide x 12" deep. Box cover and installation method shall be suitable for light vehicular traffic (8000 lbs over a 10" square). Box cover shall be locking type and have the logo "GROUND".
 - 1. The rod and exothermic connection to the grounding electrode conductor shall be accessible from within enclosure. Fill the lower 2" of enclosure with crushed rocks. Top of enclosure shall be flush with finished grade.
 - 2. Install boxes in accordance with the manufacturers' instructions for the loading indicated. Note that full vehicular traffic rating requires the box to be encased in concrete and use of steel cover.
- H. Bonding Bushings and locknuts: Bushings and locknuts shall be required for:.

Bushings shall be connected to the respective enclosure by an equipment grounding conductor sized in accordance with Article 250 of the NEC.

3.02 TESTING

- A. Upon completion of installation of electrical grounding system, test resistance of each ground rod installation using the "Fall of Potential" or other approved method. Ground resistances shall be measured in normally dry conditions not less than 48 hours after rainfall. Where tests show resistance to ground is over 10 ohms, take appropriate action to reduce resistance to 10 ohms or less by driving additional sections of ground rods and/or by chemically treating soil encircling ground rod; then retest to demonstrate compliance. Provide forms to record the data as the tests are conducted. Forms shall be signed by the person conducting the test.

END OF SECTION 16127

SECTION 16166
SURGE PROTECTION DEVICES (SPD)

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

- A. Drawings and general provisions of the Contract, including General and Special Conditions and Division 1 Specification Sections, apply to this Section.

1.02 SCOPE OF WORK:

- A. Provide SPD units connected in parallel with power distribution equipment, as indicated. SPD units shall be mounted *external* to power distribution equipment. *The use of SS/EHF units integral with power distribution equipment is not acceptable.*

1.03 COORDINATION:

- A. Work under this section shall be closely coordinated with power distribution equipment specified under other sections.

1.04 REFERENCE STANDARDS AND PUBLICATIONS:

- A. Suppressors shall be designed, manufactured, tested and installed in accordance with the latest edition of the following guidelines and standards:

1. ANSI/IEEE C62.41.1 & C62.41.2
2. ANSI/IEEE C62.45.
3. UL 1449 Third Edition

- B. Provide certification that product performance has been verified by a nationally recognized third party testing laboratory.

1.05 SUBMITTAL:

- A. Refer to Section 16054 for requirements.

1.06 ACCEPTABLE MANUFACTURERS:

- A. This specification is based on the following:

1. Liebert
2. LEA
3. Current Technologies
4. Advanced Protection Technologies

PART 2 - PRODUCTS

2.01 GENERAL:

A. SPD for service equipment (to be designed by the Engineer):

1. Type 1 device.
2. Voltage: [120/240, 1PH, 3W], [120/208, 3PH, 4W], [277/480V, 3Ph, 4W], 60 Hz.
3. Modes: L-L, L-N, L-G.
4. Single pulse surge capacity per mode: [150,000] [225,000] [] amps.
5. Clamping Voltage: Manufacturer's rating per the distribution system's voltage.
6. Noise Attenuation: 100KHz - 100MHz.

B. SPD for lighting and appliance panels(to be designated by the Engineer):

1. Type 1 device
2. Voltage: [120/240, 1PH, 3W], [120/208, 3PH, 4W], [277/480V, 3Ph, 4W], 60 Hz.
3. Modes: L-L, L-N, L-G, N-G.
4. Single pulse surge capacity per mode: [56,250] [] amps.
5. Noise Attenuation: 100KHz - 100MHz.

2.02 FEATURES:

A. All units shall have the following features:

1. Phase LED indicator lights.
2. Disturbance counter.
3. 10-year repair / replacement warranty from manufacturer in the name of the Owner.

2.03 ENCLOSURES:

A. SPD enclosures shall be NEMA 1 unless shown to be installed in damp or wet locations. In such locations, enclosures shall be NEMA 3R or 4X.

PART 3 - EXECUTION

3.01 INSTALLATION:

A. Provide a SPD unit on each piece of service entrance equipment [and at each panelboard serving computer receptacles].

B. Install adjacent to electrical equipment, ensuring that lead lengths are as short as possible to achieve the level of protection specified herein. Lead lengths longer than 12" is unacceptable. Where field conditions make this requirement impossible, contact Architect during shop drawing phase before electrical room drawings are submitted.

- C. Connect to circuit breaker in electrical equipment as shown on the manufacturer's wiring diagrams.

3.02 STARTUP AND TESTING:

- A. Provide factory-certified start-up testing. Do not energize the units until so directed by the person performing the tests. Provide written documentation of the tests performed, person conducting the tests and test results. Submit with record documents.

END OF SECTION 16166

SECTION 16167
SEPARATELY ENCLOSED CIRCUIT BREAKERS

PART 1 - GENERAL

1.01 SCOPE OF WORK:

- A. Provide circuit breakers of ratings as indicated on the drawings and as specified herein.

1.02 QUALITY ASSURANCE:

A. Acceptable Manufacturers:

- 01. Square D Co.
- 02. Cutler Hammer

B. Compliance/Labels:

- 01. Equipment shall comply with the latest applicable standards of NEMA PB-1 and UL 67.
- 02. Where circuit breakers are used as service entrance equipment, they shall comply with all NEC and UL requirements for service entrance and UL service entrance label shall be provided.

- C. Submittals: Refer to Section 16054 for requirements.

PART 2 - PRODUCTS

- 2.01 General: Provide circuit breakers, enclosures and auxiliary components of types, sizes and ratings indicated. Enclosure shall be NEMA 4X outdoors and be constructed of code gauge stainless steel constructed without knock-outs.

- 2.02 Circuit Breakers: Provide bolt-in type, heavy duty, quick-make, quick-break, thermal-magnetic molded case circuit breakers. **Breakers shall be large E-frame type. Q-frame breakers are not acceptable.** Multi-pole breakers shall be common trip. Anti-turn solderless, pressure type connectors shall be provided suitable for aluminum/copper wire.

- 2.03 Provide with laminated plastic nameplate engraved with equipment served, voltage, and ampererating/type fault current rating, date, and feeder origination. Nameplate shall be screwed and glued to circuit breaker enclosure.

Ex: Pump No. 1
20 HP
480V, 3 phase, 3W
14,000 AIC
Fed from SWBD
9/96

PART 3 - EXECUTION

2.04 GENERAL:

- A. Label enclosed circuit breakers the same as specified for disconnect switches.
- B. Do not splice conductors in circuit breaker enclosure.
- C. Group and lace conductors within enclosure with nylon tie straps.

2.05 ADJUST AND CLEAN:

- A. Adjust operating mechanism for free mechanical movement.
- B. Touch-up scratched or marred surfaces to match original finish.

END OF SECTION 16167

SECTION 16912
PUMP STATION CONTROL PANEL

PART 1 - GENERAL

1.01 RELATED DOCUMENTS:

A. GENERAL:

01. The control panel shall be provided by the pump supplier. It shall be its standard panel with special features as described in the contract documents for this particular project. The control panel shall be installed under this division of the specifications.
02. This section of the specification is supplementary to Section 11064. Requirements shown in this section may be more stringent than other requirements in which case the requirements of this section shall govern.

B. QUALITY ASSURANCE:

01. All control system components shall be new and shall be of a standard product line. The manufacturer shall be capable of providing start-up service.
02. All equipment, materials and work on these panels shall be in compliance with all state, local and federal guidelines, and shall conform to the standards by the NEC NFPA No. 70, NEMA, and IEEE. All components shall be listed and labeled by Underwriters laboratories where applicable.

C. PUMP STATION CONTROL PANEL:

01. GENERAL: The following product information relates to the various control system components, and is general in nature. Should a component be shown on the plans and not described herein, such deletion shall not relieve the Contractor of providing such components to the Engineer's approval with no increase in contract amount.
02. The motor controllers and wiring have been only generally detailed, and it shall be the Contractor's responsibility to verify that the components proposed by his suppliers are compatible with the equipment to be controlled. Compliance with accepted standards and codes shall govern component sizing.

1.02 OPERATION REQUIREMENTS

- A. The control panel shall consist of interlocked main and emergency circuit breakers, motor circuit breakers, magnetic starters or variable frequency drives for each pump motor, and 20 ampere, 120 volt circuit breakers as required or indicated on the drawings. At least four 120 volt breakers will be required.. Where a generator is provided, the interlocked main

and emergency circuit breakers shall be deleted. For panels operating at 480 volts, provide a transformer sized as indicated, and if not indicated not less than 750VA for installations not requiring emergency power systems and 3000 VA minimum for systems with emergency power systems. All variable speed pump control operations shall be accomplished with an ultrasonic type level control system with floats for back-up high and low level alarms. Control switches (HOA) shall provide means to operate each pump manually or automatically and running lights shall be provided. Variable speed drives shall have speed indication and shall have a manual means of adjusting the speed when operating in the hand position. When operated in the automatic mode, the control assembly shall provide means to manually select or automatically alternate the position of the "lead" and "lag" pumps after each pumping cycle. Variable speed drives shall provide for automatic alteration of the pumps on a time basis if pumps do not shut down on a low level condition. The panel shall have field selectable provisions for locking out one pump when the station is operating on the stand-by generator.

1.03 LEVEL CONTROL SYSTEM (VFD DRIVE):

- A. Liquid level sensor shall be of the non-contacting, ultrasonic type designed specifically for use in the corrosive environment of a wastewater system and shall be Milltronics Hydromanager. All elements of the instrument, except the transducer, shall be contained in a NEMA 4X enclosure. The instrument shall have an LCD display for viewing applicable readings in standard US customary units. The enclosure shall not be required to be opened after initial calibration for the purpose of changing operation or display parameters. The pump controller shall provide for two pumps alternating and high and low level alarms. The transducer shall be sealed and encapsulated for operation in the environment of a wetwell. The transducer shall have a quick acting internal thermal sensor for temperature correction and shall have a minimum operating range of -20 to 150 degrees Fahrenheit. Minimum measurement range of transducer and monitor shall be 30 feet with a lanking zone of twelve (12) inches. Transducer shall differentiate between true target echo and other noises caused by water surface turbulence electrical noise, and pump noise to give reliable and accurate readings. Installation shall be by manufacturer's instructions. Level monitor shall be Hydromanager, as manufactured by Milltronics.
- B. Additionally there shall be two liquid level sensors provided for back-up high and low level alarms. The liquid level sensors shall be provided where indicated and shall consist essentially of mechanical switches encapsulated in corrosion-resistant casings. The switch cables shall enter the casing through a watertight compression type fitting suitable for use in corrosive environments. The casing shall contain an eccentric weight which is positioned to insure that the switch tilts in the proper direction. The entire float switch assembly shall be designed for use in raw sewage.

1.04 LEVEL CONTROL SYSTEM (STANDARD DUPLEX):

- A. The level control system shall be Multi Trode type or equivalent, comprising a multi-sensored probe in conjunction with a Multi Trode Controller. Systems utilizing multiple

probe devices, bubbler type, mercury float, pressure transducers, or ultrasonics, will not be considered equal. The system shall operate using extra low voltage AC as a method of determining liquid level. The level is sensed when the electrical conductivity of the liquid allows a small current to flow, which activates the controller.

- B. The Pump Controller shall accept inputs from the Multi Trode probe. Connection shall be simplified by the marrying of numbered probe cables (1-10, as terminated at a distinct terminal strip inside the control panel) to the appropriate terminals on the rear of the MT2PC controller.
- C. The probe length shall be as shown on the drawings or as determined by the Engineer as appropriate, but in any case not to exceed 2.5 m overall length.
- D. The probe shall be suspended, using the stainless steel hook from the stainless steel mounting bracket and cleaning squeegee, positioned at an appropriate place at the top of the wetwell. This shall be done in accordance with the manufacturer's installation instructions.
- E. The probe cable shall be routed from the wetwell to the control panel via a separate dedicated conduit.
- F. For ease of selection of pump duty (on and off) level and high (or low) level alarm setpoint, each of the 10 probe input wires shall be terminated at a terminal strip inside the control panel.
- G. The panel mounted Multirode MT2PC pump controller shall operate in conjunction with the multi-sensored probe by providing extra low voltage AC (12 VAC, 0.8mA. Max) via the numbered probe cables. It shall be capable of controlling and monitoring 2 pumps and 1 alarm (selectable - either high level or low level) by activating the pump starters and alarm devices. The MT2PC controller shall incorporate 20 front panel LED indicator lamps to give readouts of cycle and setting status, as well as 6 keypad switches to control the operation, reset the level alarm, and to select the Duty Mode. Additionally, the 4-way dipswitch on the rear panel shall be configured to provide the setting of basic operations to match the installation.

1.05 CONSTRUCTION

- A. The electrical control equipment shall be mounted within a NEMA Type 3R dead front enclosure, constructed of not less than 14 gauge Type 304 stainless steel. The enclosure shall be equipped with a door with 3 point latch and shall incorporate a removable back panel on which control components shall be mounted. Back panel shall be secured to enclosure with collar studs. Enclosure shall be equipped with a stainless steel driplip. The enclosure shall be equipped with a single handle actuated three point latch closing mechanism and continuous hinge.

1.06 COMPONENTS

- A. All motor branch circuit breakers and motor starters or variable frequency drives shall be of highest industrial quality, and securely fastened to the removable back panels with screws and washers. Back panels shall be tapped to accept all mounting screws. Self-tapping screws shall not be used to mount any component.
- B. A soft start, NEMA rated, motor starters as manufactured by Square D or Cutler Hammer, shall be furnished for each pump motor except that reduced voltage solid state starters shall be provided where indicated on the drawings or specified herein for standard duplex station. Variable frequency drives as manufactured by Square D or Cutler Hammer shall be provided for each pump motor where variable speed pumps are required. All motor controllers shall be equipped to provide overload protection on all phases. Motor starter contacts shall be easily replaceable without removing the motor starter from its mounted position.

1.07 OPERATING CONTROLS AND INSTRUMENTS

- A. All operating controls and instruments shall be securely mounted on the control compartment door. All controls and instruments shall be clearly labeled to indicate function.
- B. A six digit, nonreset elapsed time meter shall be connected to each motor starter or variable speed drive to indicate the total running time of each pump in hours and tenths of hours.
- C. Phase monitors shall be 230 volt, 3 phase stations and shall be equipped with an 11 pin model with two (2) form "C" contacts, 10 amp rated, as manufactured by Diversified Electronics. 480 volt, 3 phase stations shall be equipped with a surface mount unit by Diversified Electronics.
- D. Control terminal blocks shall be of the screw clamp type, rated 600 volts.
- E. Control wire shall be minimum 18 AWG, U.L. #1015. All control wire shall be routed through plastic wireway with snap on covers and be neatly bundled and tie wrapped to form a neat assembly. All control wires will be numbered and will correspond to the supplied electrical schematic.
- F. Engraved nameplates shall be supplied for marking all components. The labels shall be attached with a 5 mil thick, 3 M type adhesive. No foam tape will be acceptable. The labels shall be uniform in size with 1/4" minimum letter size.
- G. The control panel shall be equipped with a high level alarm system consisting of a weather proof red lexan light and alarm bell. Upon high level activation, the light will flash and the bell will sound. The bell will remain on until the high level condition clears

or until the alarm silence button is pushed. The light will remain on until the high level condition clears.

- H. The panel shall incorporate a power fail alarm to operate the alarm light and horn from a 12 VDC circuit from backup battery source.
- I. The control panel shall include one completely enclosed solid-state electronic module per pump to automatically monitor the motor winding insulation resistance of each pump in a duplex pumping station. The monitoring device shall have two pilot lights to indicate power on, and low megger reading, as well as an emergency bypass and motor reset. The power source is to be 115 VAC. The test voltage applied to the motor windings is to be in the range of 500 to 600 volts DC. The test current is to be limited to less than .25 milliamps. The device is to measure the winding resistance of the motor. If the motor winding leakage resistance falls below one megaohm, an alarm circuit is to be activated.
- J. Provide an indicating ammeter for each phase of each pump appropriately calibrated for the motor full load amps. Provide a current transformer for each meter.
- K. A control power transformer with disconnect and overload protection shall be provided.
- L. Provide a duplex GFI receptacle 5-20R.

1.08 POWER SYSTEM COMPONENTS:

- A. Wiring: Wiring shall be as shown on plans, or a minimum, as dictated by applicable codes (NEC, etc.). Wiring shall be suitable for the ultimate pump size. All wire shall be THWN and rated for 600 volts, unless noted otherwise.
- B. Where required generator receptacle of adequate size shall be provided for mounting adjacent to or on the control panel. Generator receptacle shall be an Appleton model AR2044 with an AJA200 angle adapter. Coordinate the exact requirements in the field to match plugs on the Owner's standby power system.

1.09 PROCEDURES:

- A. The basic control system function, indicators, components, and alarms shall be denoted herein for pump station. The Contractor shall be solely responsible for providing control system designs which meet these functional requirements, and approval of shop drawings will not relieve the Contractor of such responsibilities. The complete facilities shall be in accordance with all provisions of the Contract Documents and drawings. The Contractor's attention is directed towards the General Electrical specification for such information. All wiring in control panels shall be orderly with wireways provided, as necessary. Auxiliary circuit connections shall be made on terminal strips, and wiring shall be identified at each termination.

1.10 COMPONENT SIZING:

The contract documents have in some instances detailed certain component sizes and these shall be established as a minimum standard for the component. Should equipment be proposed which requires larger wire or component sizing, such changes shall be made with no increase in contract price.

1.11 FENCING/ELECTRIC SERVICE:

- A. All 230V/3 phase electric service not requiring a disconnect before the meter shall be placed outside of the fence. For 460V /3 phase service, the meter and disconnect can be on the inside of the fence; however, the meter and disconnect shall be either to the left or right or the entrance gate with three (3) foot clearance all the way around the meter. The meter must be readable from outside of the fence in all cases.

END OF SECTION 16912

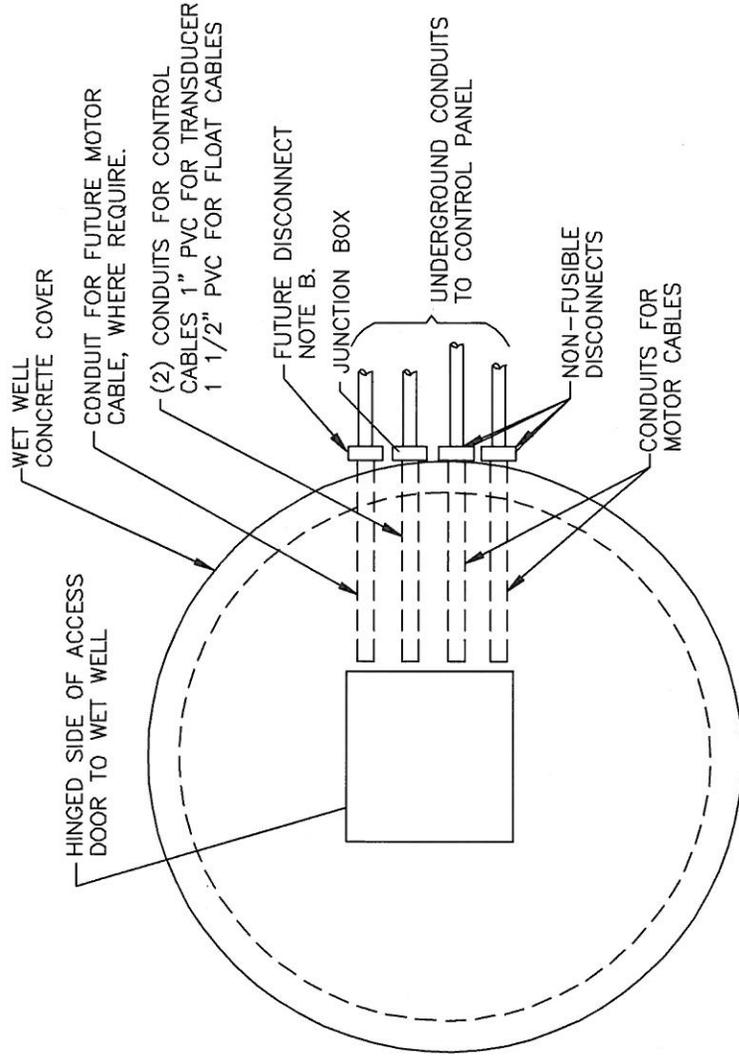
CITY OF POOLER

ELECTRICAL SYSTEM DETAILS

1/PID	WET WELL LAYOUT
2/PID	PUMP CABLE INSTALLATION
3A/PID	MULTITRODE INSTALLATION
3B/PID	FLOAT SWITCHES & LEVEL TRANSDUCER INSTALLATION
4/PID	LIGHTING/AERIAL SERVICE POLE DETAIL
5A/PID	SERVICE EQUIPMENT ELEVATION (FRONT VIEW)
5B/PID	SERVICE EQUIPMENT ELEVATION (REAR VIEW)
5C/PID	METER INSTALLATION
5D/PID	SERVICE EQUIPMENT SCHEDULE
1/PED	LIFT STATION ONE LINE DIAGRAM (TYPICAL WITH GENERATOR RECEPTACLE)
2/PED	LIFT STATION ONE LINE DIAGRAM (TYPICAL WITH GENERATOR)
3/PED	NOTES

The details are typical and must be adapted for each specific installation by an Electrical Engineer registered in the State of Georgia. Additional details may be required for a specific installation with specific or unusual requirements not covered by standard conditions.

REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.



- NOTES: A. ARRANGE CONDUIT ENTRIES SUCH THAT THEY DO NOT ENTER FROM THE HINGED SIDE OF THE ACCESS DOOR.
- B. PROVIDE A BOX TO TERMINATE CONDUITS FOR THE FUTURE MOTOR CABLE. SUPPORT BOX IN ACCORDANCE WITH DETAIL 2/PID.

1 WET WELL LAYOUT
 PID NO SCALE

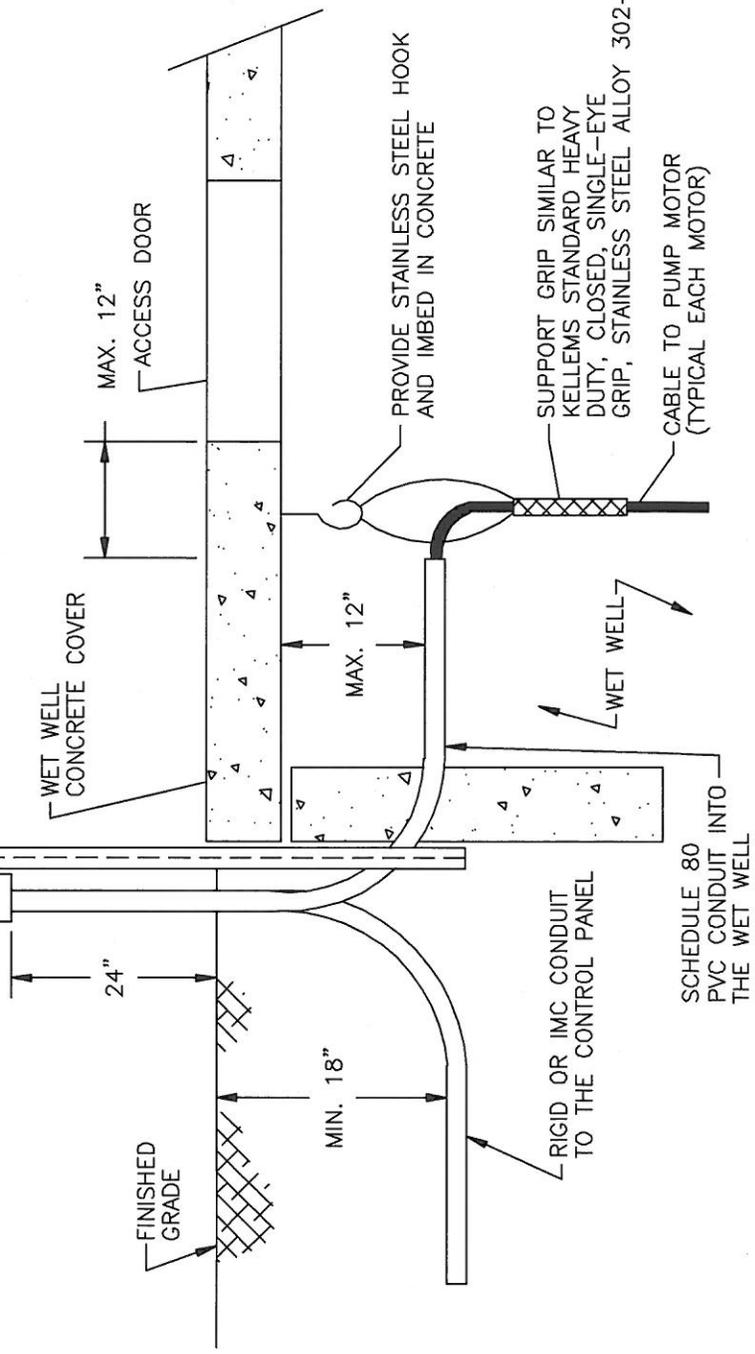
FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER

CITY OF POOLER 2011 STANDARD DETAIL	LIFT STATION		N.T.S.	1/PID
	SCALE:	DATE:	December 2006	1/PID

NON FUSIBLE DISCONNECT
OR CONTROL CABLE JUNCTION
BOX AS INDICATED. NEMA 4X

1 5/8"x1 5/8"x12 GA HOT
DIPPED GALVANIZED CHANNEL,
TWO PER DEVICE.

REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.

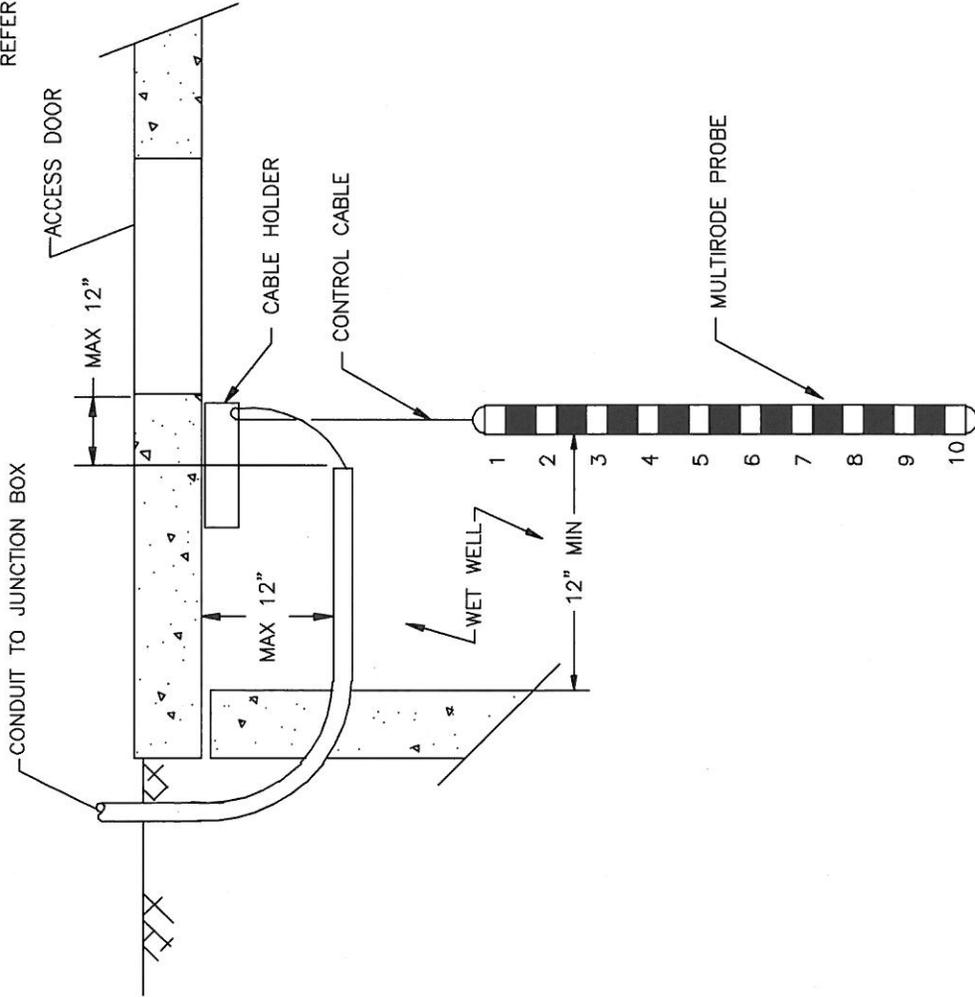


2 PUMP CABLE INSTALLATION
PID NO SCALE

FOR REFERENCE
ONLY. MUST BE ADAPTED
BY A GA REGISTERED
PROFESSIONAL ENGINEER

CITY OF POOLER 2011 STANDARD DETAIL	LIFT STATION		SCALE: N.T.S.	2/PID
			DATE: December 2006	

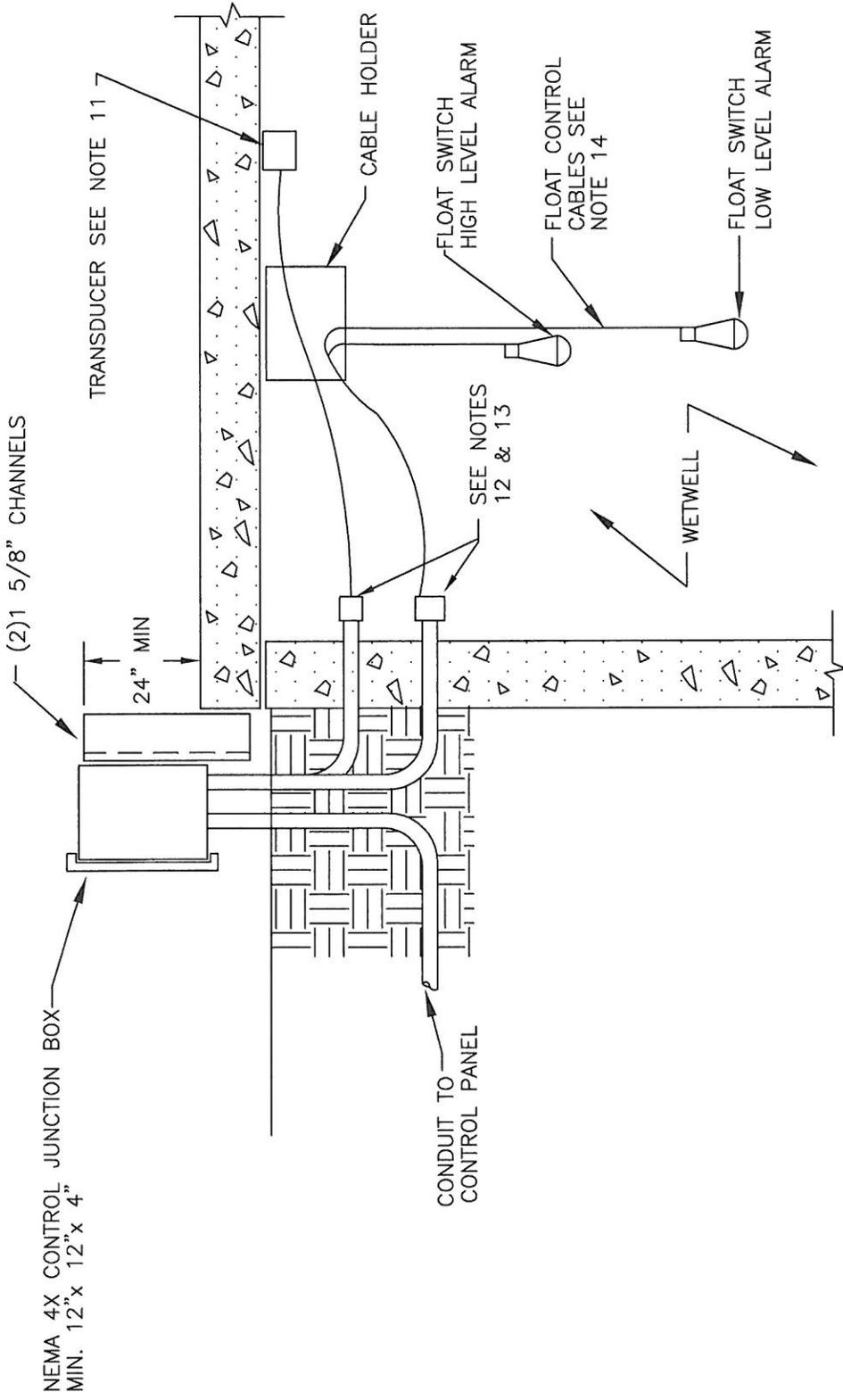
REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.



FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER

3 MULTITRODE INSTALLATION
PID NO SCALE

CITY OF POOLER 2011 STANDARD DETAIL	LIFT STATION		SCALE: N.T.S.	3A/PID
			DATE: December 2006	



3 FLOAT SWITCHES & LEVEL TRANSDUCER INSTALLATION

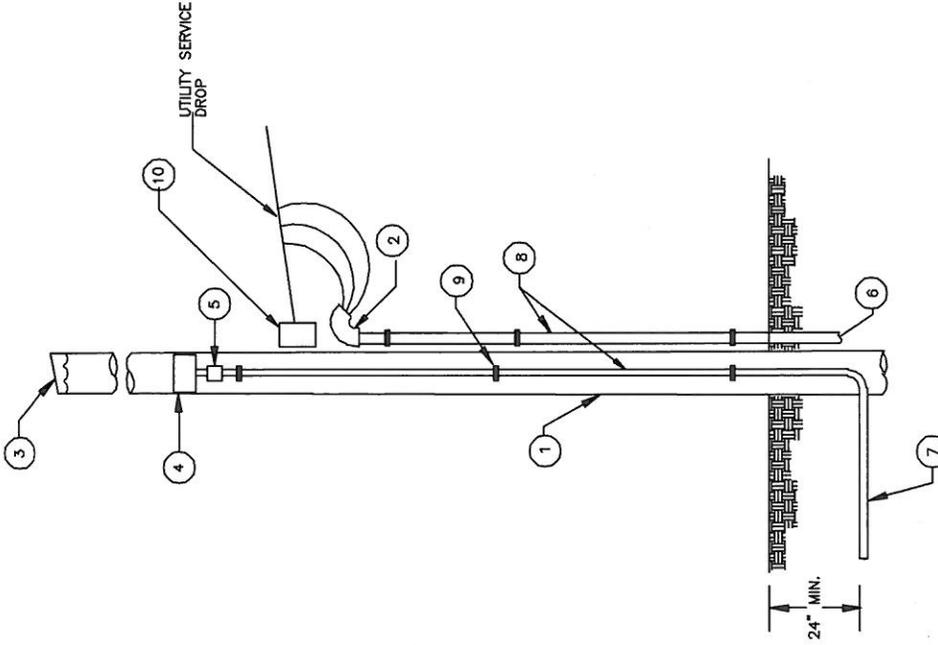
PID NOT TO SCALE

REFER TO DETAIL 3/PED FOR REFERENCED NOTES.
 REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.

FOR REFERENCE
 ONLY. MUST BE ADAPTED
 BY A GA REGISTERED
 PROFESSIONAL ENGINEER

CITY OF POOLER 2011 STANDARD DETAIL	LIFT STATION	N.T.S. <small>SCALE:</small> DATE: June 2012	3B/PID
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REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.



POLE REQUIREMENTS

- ① 35-FOOT, CLASS 5 POLE, PENTA TREATED WEATHERHEAD
- ② ALUMINUM POLE CAP
- ③ PROVIDE A LUMARK No. QZ31 QUARTZ LIGHT FIXTURE WITH A 300W LAMP, MOUNT THE FIXTURE ON A POLE, APPROXIMATELY 20' ABOVE FINISHED GRADE. AIM AT WET WELL
- ④ FS BOX
- ⑤ CONDUIT TO METER INSTALLATION
- ⑥ CONDUIT TO LIGHT CIRCUIT, IN CONTROL PANEL
- ⑦ RIGID GALVANIZED STEEL CONDUIT
- ⑧ TWO-HOLE PIPE STRAP AT 60" CENTERS, MAXIMUM
- ⑨ CLEVIS & SPOOL INSULATOR
- ⑩

NOTE: WHERE SERVICE IS FROM A PAD MOUNTED TRANSFORMER DELETE THE UNNEEDED ITEMS.

④ LIGHTING/AERIAL SERVICE POLE DETAIL
PID NOT TO SCALE

FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER

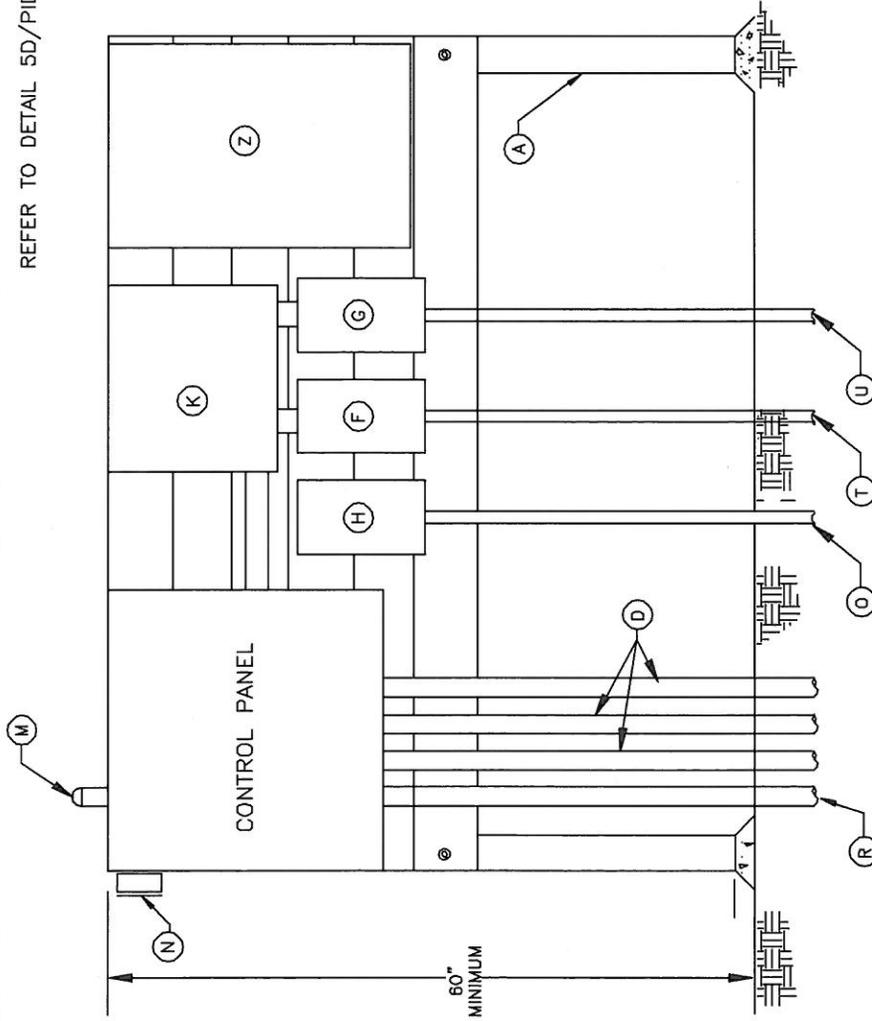
SCALE: N.T.S.
DATE: December 2006

LIFT STATION

CITY OF POOLER
2011 STANDARD DETAIL

4/PID

REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.



FRONT VIEW

NOTE: THIS DETAIL IS TYPICAL. SEE THE ELECTRICAL PLANS, ONE LINE DIAGRAMS AND SPECIFICATIONS FOR THE ACTUAL EQUIPMENT REQUIRED. ADJUST EACH SERVICE EQUIPMENT LAYOUT TO FIT.

5A SERVICE EQUIPMENT ELEVATION
PID NOT TO SCALE

FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER.

SCALE:

N.T.S.

DATE:

December 2006

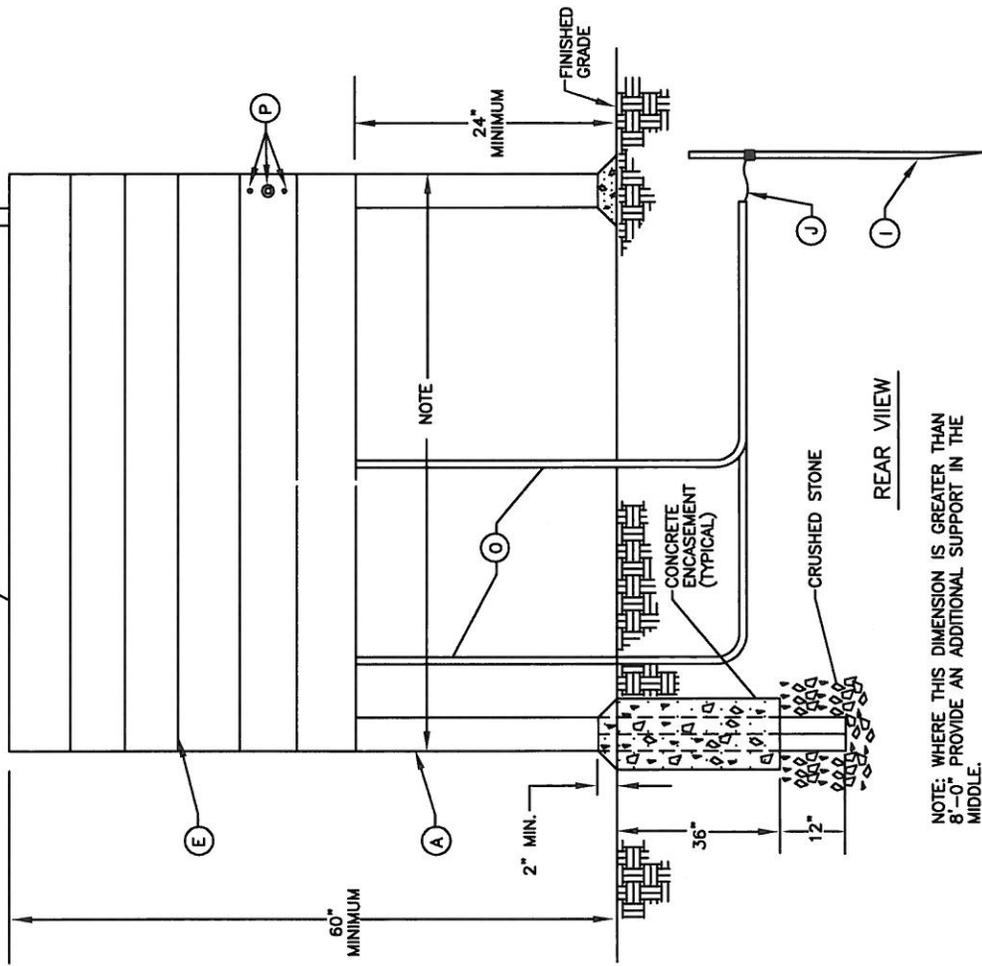
5A/PID

CITY OF POOLER
2011 STANDARD DETAIL

LIFT STATION

REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.
REFER TO DETAIL 3/PED FOR REFERENCED NOTES.

SEE NOTE 5.



NOTE: WHERE THIS DIMENSION IS GREATER THAN 8'-0" PROVIDE AN ADDITIONAL SUPPORT IN THE MIDDLE.

5B SERVICE EQUIPMENT ELEVATION
PID NOT TO SCALE

FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER.

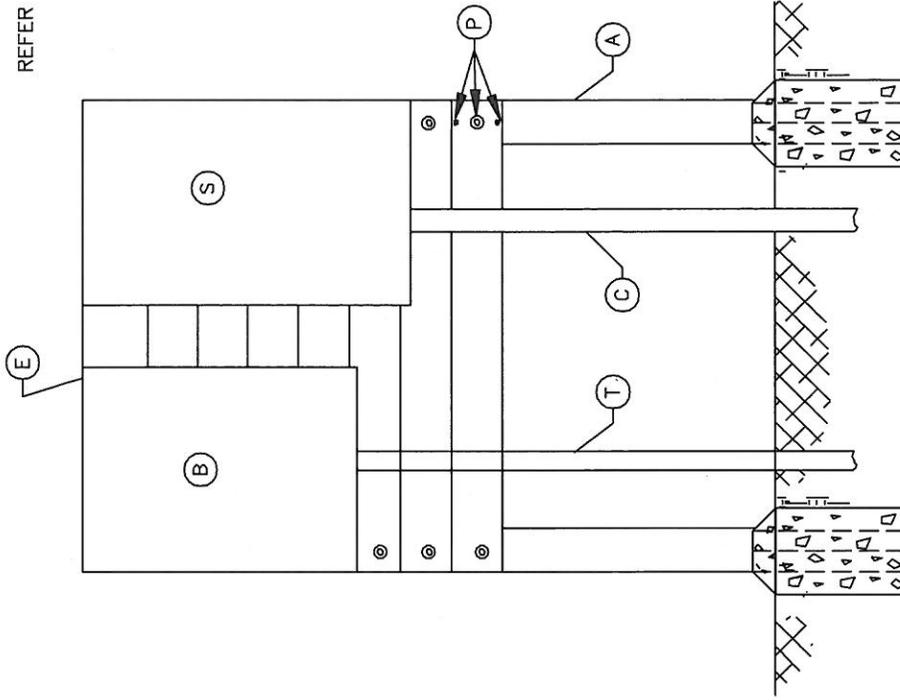
SCALE: N.T.S.
DATE: June 2012

CITY OF POOLER
2011 STANDARD DETAIL

LIFT STATION

5B/PID

REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.



NOTE: THE METER MAY BE INSTALLED ON THE SERVICE EQUIPMENT BACKBOARD IF THAT WORKS FOR A PARTICULAR INSTALLATION. A SERVICE DISCONNECT WILL ALWAYS BE REQUIRED AT POOLER LIFT STATIONS WHETHER OR NOT REQUIRED BY SAVANNAH ELECTRIC.

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5C METER INSTALLATION
PID NOT TO SCALE

SCALE

N.T.S.

DATE: December 2006

5C/PID

LIFT STATION

CITY OF POOLER
2011 STANDARD DETAIL

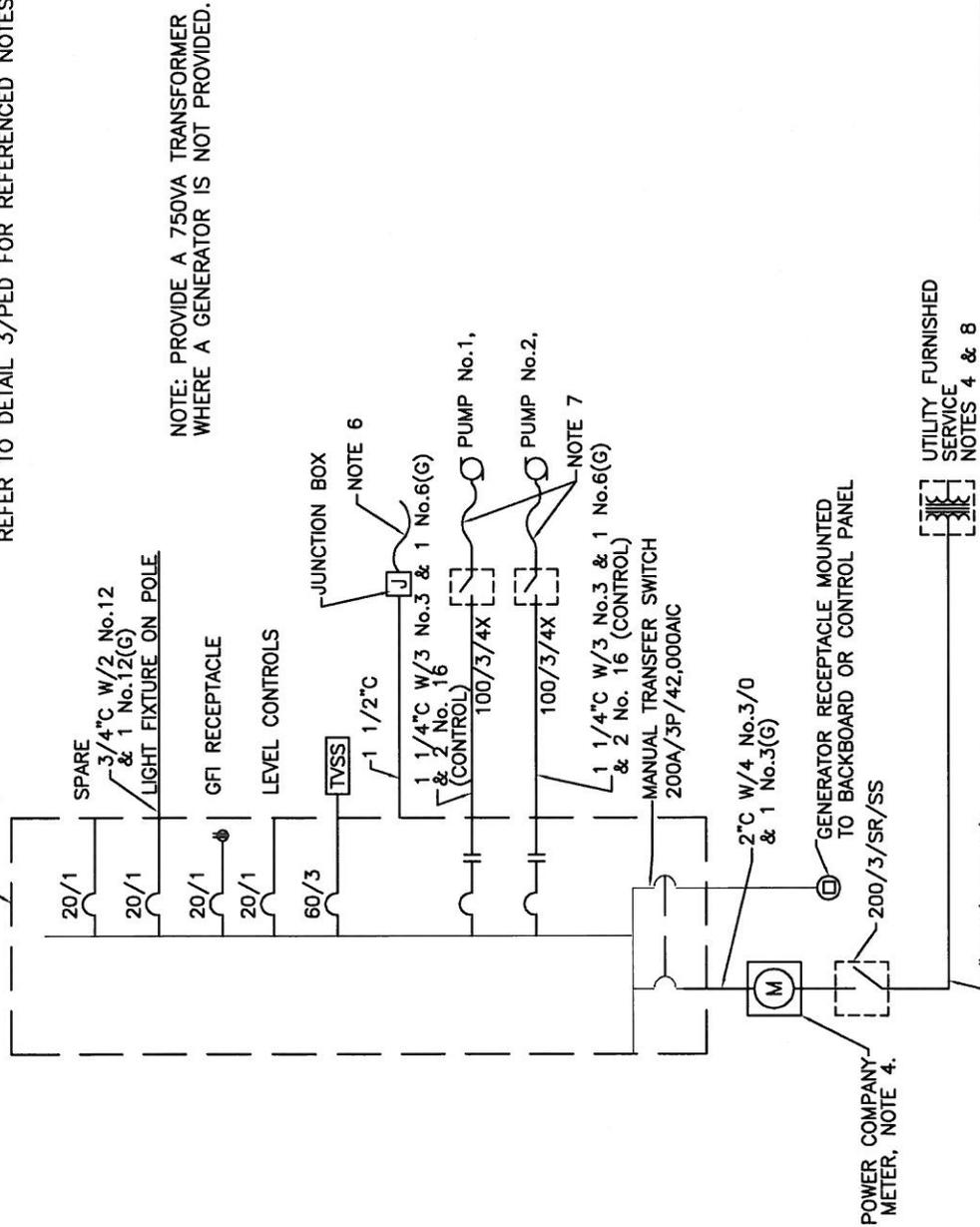
SERVICE EQUIPMENT SCHEDULE:

- (A) NOMINAL 4"x 6" TREATED POLE SET 48" INTO EARTH, CUT TO LENGTH AS REQUIRED IN THE FIELD. ENCASE IN CONCRETE TO A DEPTH OF 36".
- (B) POWER COMPANY METER.
- (C) SERVICE CONDUIT FROM THE PAD MOUNTED TRANSFORMER OR SERVICE POLE.
- (D) CONDUIT TO DISCONNECT OR CONTROL JUNCTION BOX AT WET WELL.
- (E) NOMINAL 2"x 8" TREATED LUMBER, FRONT AND BACK, PAINTED WITH TWO COATS OF FLAT GRAY PAINT. QUANTITY AS REQUIRED FOR EQUIPMENT AND RIGIDITY.
- (F) NORMAL POWER CIRCUIT BREAKER
- (G) EMERGENCY POWER CIRCUIT BREAKER
- (H) SURGE SUPPRESSION EQUIPMENT.(TVSS)
- (I) COPPERWELD GROUND RODS (3/4" x 10' - 0"). THREE REQUIRED, SPACED 10' ON CENTER IN A TRIANGULAR CONFIGURATION, WITH THE GROUND CONDUCTOR FORMING A CLOSED DELTA LOOP ON THE GROUND RODS.
- (J) PROVIDE SEPARATE No.4 BARE COPPER FOR SURGE PROTECTION AND SERVICE GROUND. CONNECT EACH TO THE GROUND FIELD.
- (K) AUTOMATIC TRANSFER SWITCH
- (L) GENERATOR RECEPTACLE
- (M) ALARM LIGHT
- (N) ALARM HORN
- (P) 3/8" BOLTS & 20D NAILS, (HOT-DIPPED GALVANIZED) AT EACH END OF EACH 2" x 8" BOARD.
- (O) CONDUIT: 3/4" PVC W/ 1 No. 4 BARE Cu. GROUNDING CONDUCTOR.
- (R) CONDUIT: 3/4" TO THE POLE LIGHT
- (S) SERVICE DISCONNECT: SERVICE EQUIPMENT RATED
- (T) CONDUIT BETWEEN METER AND SERVICE EQUIPMENT
- (U) CONDUIT FROM STAND-BY GENERATOR
- (Z) SCADA CABINET

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CITY OF POOLER 2011 STANDARD DETAIL	LIFT STATION		SCALE: N.T.S.	5D/PID
			DATE: December 2006	

REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.
REFER TO DETAIL 3/PED FOR REFERENCED NOTES.



NOTE: PROVIDE A 750VA TRANSFORMER WHERE A GENERATOR IS NOT PROVIDED.

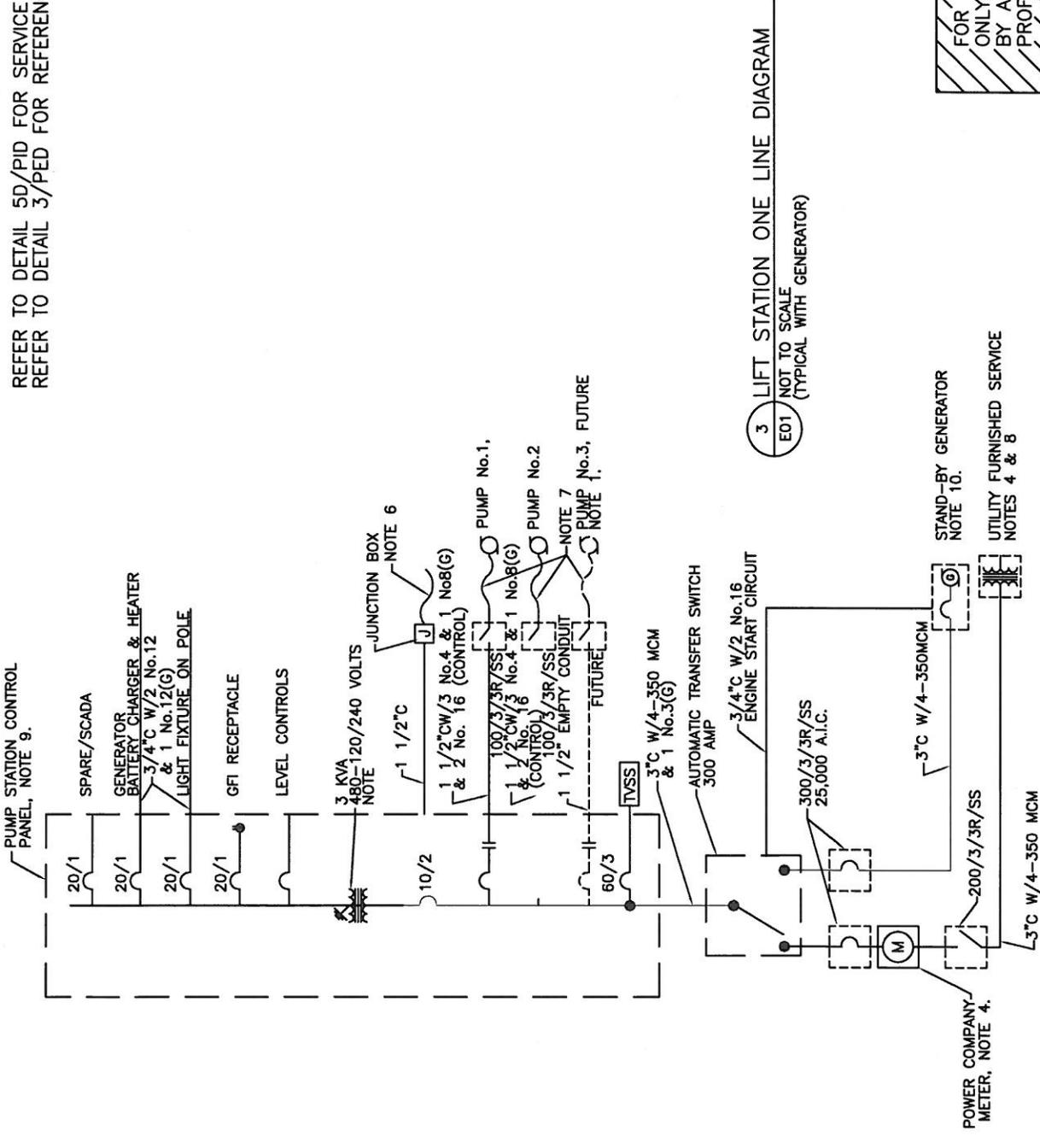
FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER

UTILITY FURNISHED SERVICE NOTES 4 & 8
GENERATOR RECEPTACLE MOUNTED TO BACKBOARD OR CONTROL PANEL
MANUAL TRANSFER SWITCH 200A/3P/42,000AIC
2\"/>

CITY OF POOLER 2011 STANDARD DETAIL	LIFT STATION		SCALE: N.T.S.	1/PED
			DATE: June 2012	

1 LIFT STATION ONE LINE DIAGRAM
NOT TO SCALE
(TYPICAL WITH GENERATOR RECEPTACLE)

REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.
REFER TO DETAIL 3/PED FOR REFERENCED NOTES.



3 LIFT STATION ONE LINE DIAGRAM
E01 NOT TO SCALE
(TYPICAL WITH GENERATOR)

FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER

<p>CITY OF POOLER 2011 STANDARD DETAIL</p>	<p>LIFT STATION</p>	<p>SCALE N.T.S.</p>	<p>DATE June 2012</p>	<p>2/PED</p>

NOTES:

1. THE SERVICE AND SERVICE EQUIPMENT HAS BEEN SIZED FOR THE FUTURE PUMP SHOWN.
2. ALL CONDUITS, EXCEPT GROUNDING CONDUCTOR CONDUIT, SHALL BE RIGID GALVANIZED OR IMC WITH CORROSION PROTECTION WHEN BURIED IN EARTH. CORROSION PROTECTION SHALL EXTEND TO 6" ABOVE FINISHED GRADE.
3. SEAL THE ENDS OF CONDUITS, ENTERING ANY ELECTRICAL ENCLOSURE FROM THE WETWELL, WITH PREMAGUM SEALING COMPOUND. IT IS NOT NECESSARY TO SEAL THE END IN THE WET WELL.
4. THE EXACT LOCATION OF THE METER AND THE PAD MOUNTED TRANSFORMER OR THE SERVICE POLE SHALL BE COORDINATED IN THE FIELD WITH THE UTILITY COMPANY AND WITH THE OTHER WORK ON THE PROJECT SITE.
5. SIZE THE BACKBOARD TO FIT EQUIPMENT TO BE INSTALLED.
6. PROVIDE CONDUITS TO THE WETWELL FOR INSTALLATION OF CABLES FOR LIQUID LEVEL SENSORS AS SHOWN IN DETAIL 1/PID.
7. PROVIDE ONE 3" CONDUIT TO THE WETWELL, FOR EACH POWER CABLE WHICH IS FURNISHED INTEGRAL WITH A SUBMERSIBLE PUMP. INSTALL CABLE AND MAKE CONNECTIONS. PROVIDE A CONDUIT FOR THE FUTURE PUMP.
- 8A. IT IS ANTICIPATED THAT SAVANNAH ELECTRIC WILL CHARGE THE OWNER TO PROVIDE SERVICE FOR THIS INSTALLATION. THE COST FOR THIS SERVICE WILL BE BORNE DIRECTLY BY THE OWNER. THE CONTRACTOR SHALL COORDINATE THE DETAILS OF SECURING THIS SERVICE ON BEHALF OF THE OWNER FOR EXECUTION BY THE OWNER AND THE COST OF THIS SERVICE WILL BE INCLUDED IN THE BASE BID FOR THE PROJECT.
- 8B. IT IS ANTICIPATED THAT SAVANNAH ELECTRIC WILL CHARGE TO PROVIDE SERVICE TO THIS INSTALLATION. THIS CHARGE WILL BE INCLUDED AS A MAXIMUM ALLOWANCE IN THE GENERAL CONTRACT. THE ALLOWANCE WILL BE (\$10,000) AND IT WILL BE USED TO PAY SAVANNAH ELECTRIC. ANY LEFT OVER WILL BE RETURNED TO THE OWNER BY CHANGE ORDER. ANY OVERAGE WILL BE CHARGED TO THE OWNER BY CHANGE ORDER. ALL COSTS INCLUDING GENERAL AND SUB CONTRACTORS O.H. AND PROFIT ASSOCIATED WITH SECURING THE SERVICE FROM SAVANNAH ELECTRIC WILL BE INCLUDED IN THE BASE BID. THE ALLOWANCE WILL BE APPLIED ONLY TO THE ACTUAL AMOUNT OF SAVANNAH ELECTRIC CHARGES.
9. THE CABINET FRONT PANEL, BACK PANEL AND ANY OTHER NECESSARY COMPONENTS SHALL BE SIZED FOR THE FUTURE PUMP SHOWN. THE FRONT PANEL SHALL HAVE CUT-OUTS WITH SCREW HELD COVERS TO ACCOMMODATE THE FUTURE DEVICES.
10. PROVIDE A CONCRETE PAD FOR THE GENERATOR. PAD SHALL BE 12" THICK WITH TOP 6" ABOVE FINISHED GRADE. THE DIMENSIONS SHALL EXCEED THOSE OF THE GENERATOR BY 12" ON ALL SIDES. PROVIDE REINFORCING MESH AT TOP AND BOTTOM PLACED 2" FROM THE SURFACES.
11. INSTALL TRANSDUCER ACCORDING TO MANUFACTURERS INSTRUCTION.
12. ALL CONDUITS IN WET WELL SHALL BE INSTALLED AND SUPPORTED SO THAT ENDS ARE ACCESSIBLE FROM WET WELL ENTRANCE.
13. SEAL THE CONDUITS, ENTERING DISCONNECTS AND JUNCTION BOXES FROM THE WET WELL, USE PREMAGUM SEALING COMPOUND. SEAL AT THE ENTRY INTO THE EQUIPMENT ONLY AND NOT IN THE WET WELL.
14. DO NOT SPLICE CABLE FOR FLOAT SWITCH OR LEVEL TRANSDUCER. TERMINATE ON TERMINAL BLOCKS WHICH SHALL BE MOUNTED IN THE CONTROL JUNCTION BOX AND IN THE MOTOR DISCONNECTS MOUNTED TO THE WETWELL.

REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.

FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER

SCALE

N.T.S.

DATE
June 2012

3/PED

CITY OF POOLER
2011 STANDARD DETAIL

LIFT STATION

CITY OF POOLER

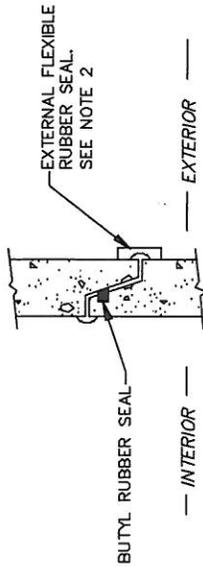
WATER DISTRIBUTIONS SYSTEM DETAILS

<u>Number</u>	<u>Description</u>
W-1	Air Release Valve
W-2	Separation Requirements for Reclaimed Water Mains
W-3	Valve Detail
W-4	Fire Hydrant Detail
W-5	Fire Hydrant Detail for Deep Bury
W-6	Fire Hydrant Detail under Ditch
W-7	Concrete Thrust Blocking
W-8	Jumper Connection Detail
W-9	Jack & Bore Detail (Water System Only)
W-10	Service Connection Detail
W-11	1" & 2" Tapping Saddle
W-12	Temporary Sampling Station
W-13	Valve Manhole for 4" to 8" Gate Valves
W-14	Valve Manhole for 10" & 12" Gate Valves
W-15	Valve Vault (14" to 48" Butterfly Valves)
W-16	Pipeline Crossing Detail
W-18	Manifold for Multiple 3/4" or 1" Meter Installation
W-19	Permanent Sampling Station
W-20	Reduced Pressure Zone Device Double Check Valve - Typical Inside Building Installation
W-21	Water Meter Installation 1" Service Pipe, 3/4" Water Meter & 1" Water Meter - Domestic, Irrigation and Commercial Use Only
W-22	Water Meter Installation 2" Service Pipe & 1-1/2" & 2" Water Meters - Irrigation Only
W-23	Water Meter Installation 2" Service Pipe & 1-1/2" & 2" Water Meters - Domestic
W-24	Sensus "Fireline" Model FL-720 Compound Water Meter - Installation Detail
W-25	Sensus "Fireline" Model FL-721 Fire Service Compound Water Meter - Installation Guide
W-26	Master Water Meter Installation Detail - 3" to 10"
W-27	Master Meter with Backflow Preventer Installation Detail
W-28	Backflow Preventer Detail (3/4", 1", 1-1/2", & 2")
W-29	Reduced Pressure Zone Device Double Check Valve - Typical Outside Installation Detail (3", 4", 6", 8", & 10" Sizes)
W-30	Vacuum Breaker Backflow Preventer - Typical Outside Installation (3/4", 1", 1-1/2", & 2" Sizes)

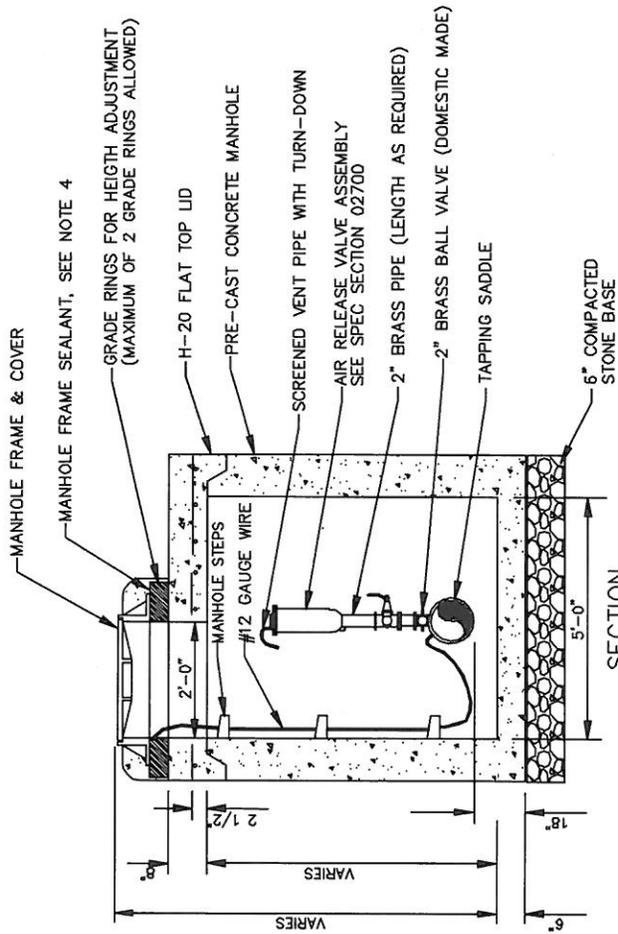
CITY OF POOLER

WATER DISTRIBUTIONS SYSTEM DETAILS (Continued)

<u>Number</u>	<u>Description</u>
W-31	Double Check Valve Assembly - Typical Outside Installation (3/4" through 2" Sizes)
W-32	Water Lateral Conduit Detail
W-33	Reduced Pressure Detector Assembly for Fire System
W-35	Double Detector Check Valve Assembly for Fire System
W-36	Fire Service System for Building
W-37	Post Hydrant Detail
W-38	Doghouse Manhole for Water Connection
W-39	Pipe Bedding Detail

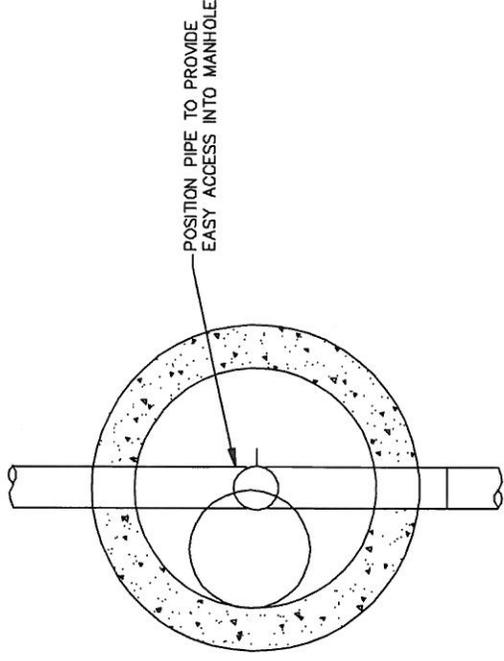


JOINT DETAIL



AIR RELEASE VALVE IN MANHOLE

NOT TO SCALE



PLAN

NOTE:

1. SET MANHOLE COVER 2" ABOVE NATURAL GRADE OR FLUSH WITH PAVING.
2. SEE STANDARD SPEC. SECTION 02700 FOR RUBBER SEAL REQUIREMENTS.
3. MANHOLE FRAME AND COVER SHALL BE USF 227, TYPE "AS" OR EQUAL. CLEAR OPENING SHALL BE 24" AND HEIGHT SHALL BE 6".
4. SEE STANDARD SPEC. SECTION 02700 FOR REQUIREMENTS.

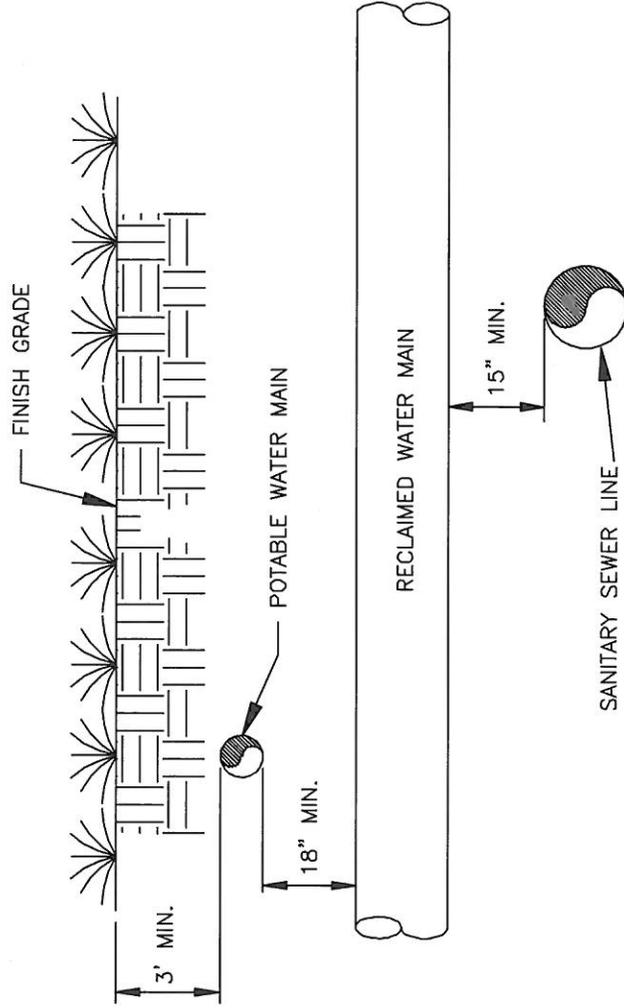
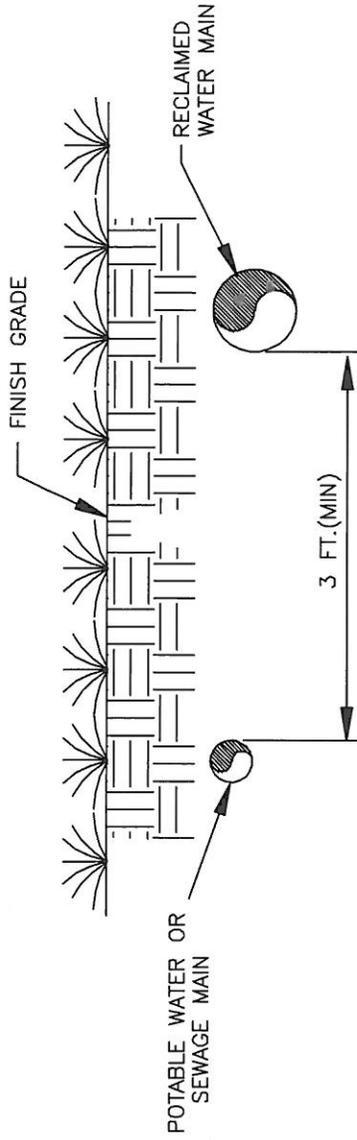
CITY OF POOLER
2011 STANDARD DETAIL

AIR RELEASE VALVE

SCALE: N.T.S.

DATE: January 2011

W-01



CITY OF POOLER
2011 STANDARD DETAIL

SEPARATION REQUIREMENTS
FOR RECLAIMED WATER MAINS

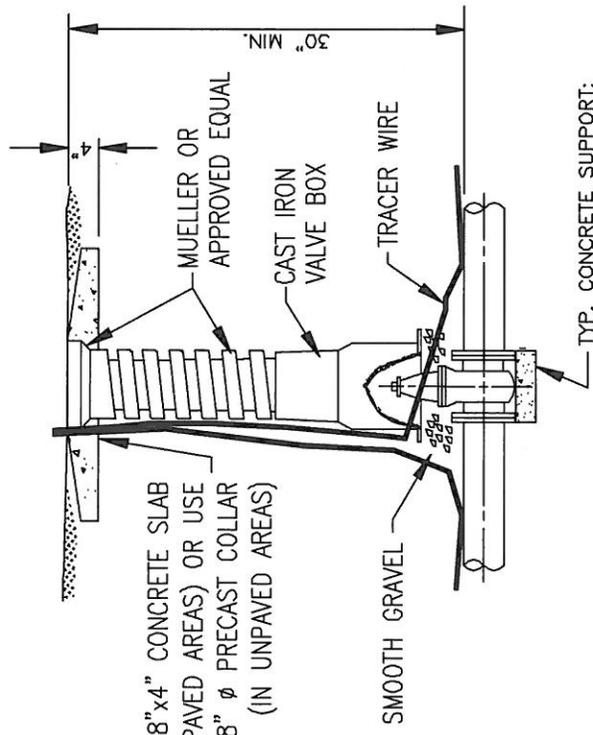
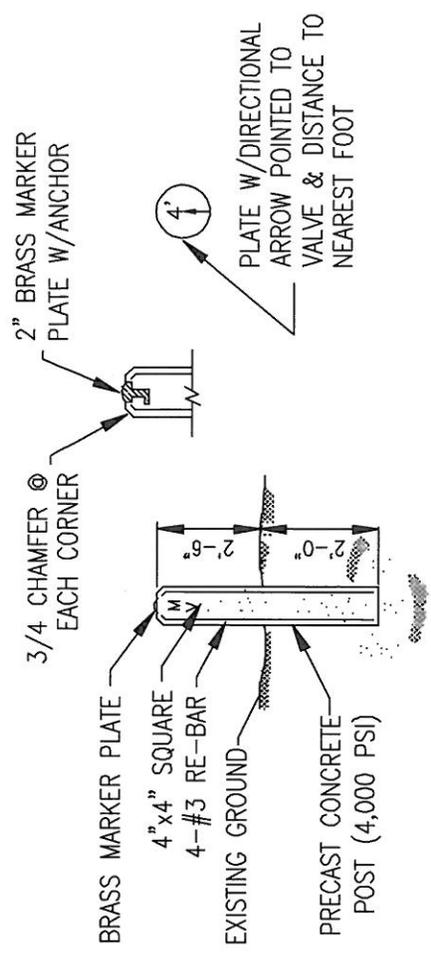
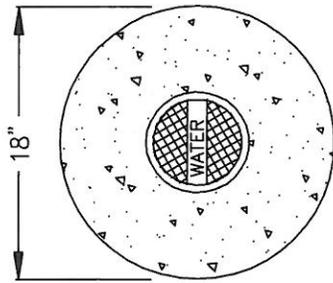
SCALE:

N.T.S.

DATE:

August 2006

W-02



CONCRETE VALVE MARKER

NOTE 1: WATER MAIN LINE VALVE MARKERS SHALL BE PAINTED FEDERAL SAFETY BLUE AND MARKED AS FOLLOWS:

- MV - MAIN VALVE
- AV - AIR RELEASE VALVE
- PIPELINE - PIPELINE MARKER

NOTE 2: DO NOT WRAP WIRE AROUND VALVE NUT.

VALVE AND VALVE BOX

CITY OF POOLER
2011 STANDARD DETAIL

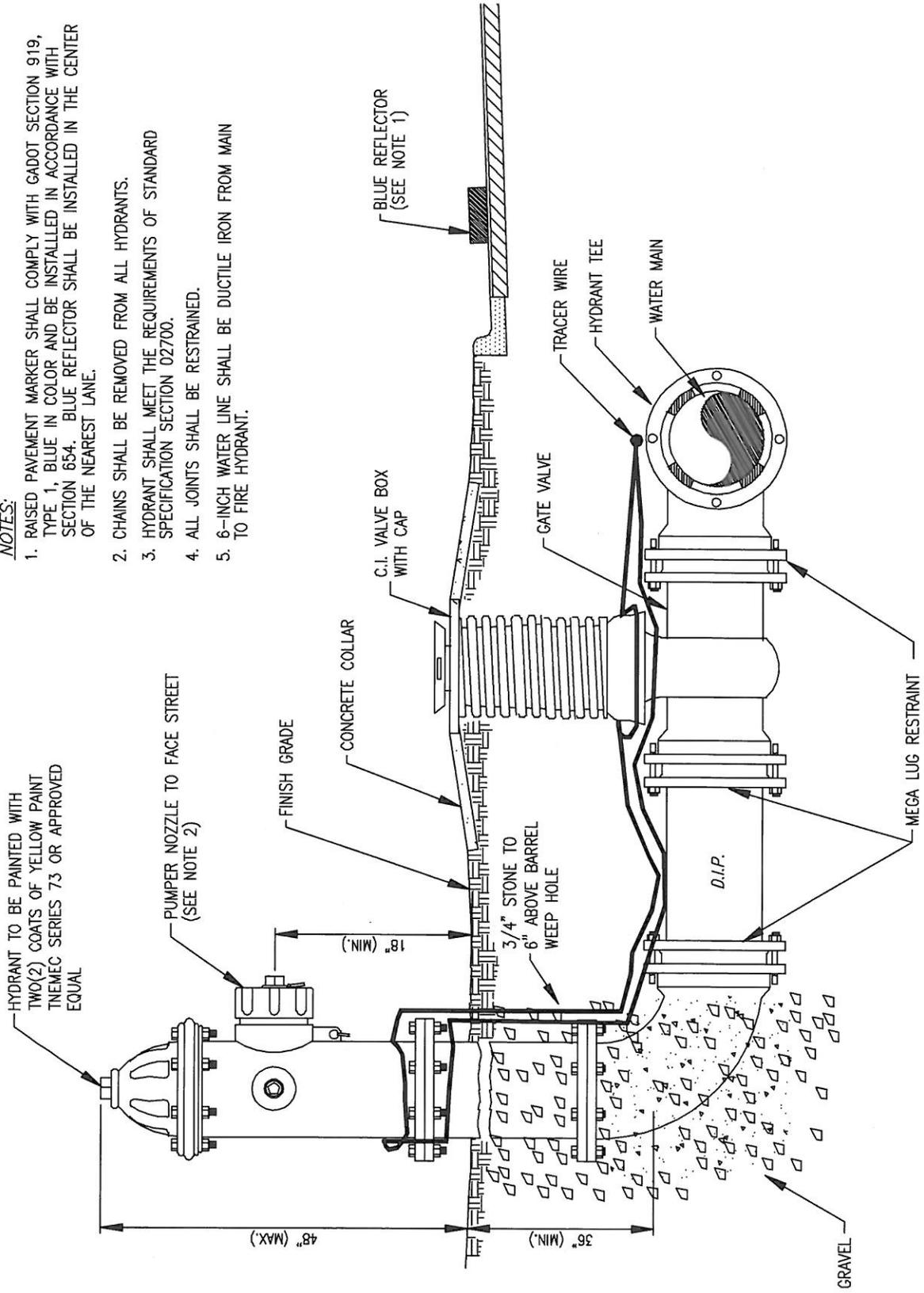
SCALE:	N.T.S.
DATE:	August 2006

VALVE DETAIL

W-03

NOTES:

1. RAISED PAVEMENT MARKER SHALL COMPLY WITH GADOT SECTION 919, TYPE 1, BLUE IN COLOR AND BE INSTALLED IN ACCORDANCE WITH SECTION 654. BLUE REFLECTOR SHALL BE INSTALLED IN THE CENTER OF THE NEAREST LANE.
2. CHAINS SHALL BE REMOVED FROM ALL HYDRANTS.
3. HYDRANT SHALL MEET THE REQUIREMENTS OF STANDARD SPECIFICATION SECTION 02700.
4. ALL JOINTS SHALL BE RESTRAINED.
5. 6-INCH WATER LINE SHALL BE DUCTILE IRON FROM MAIN TO FIRE HYDRANT.



CITY OF POOLER
2011 STANDARD DETAIL

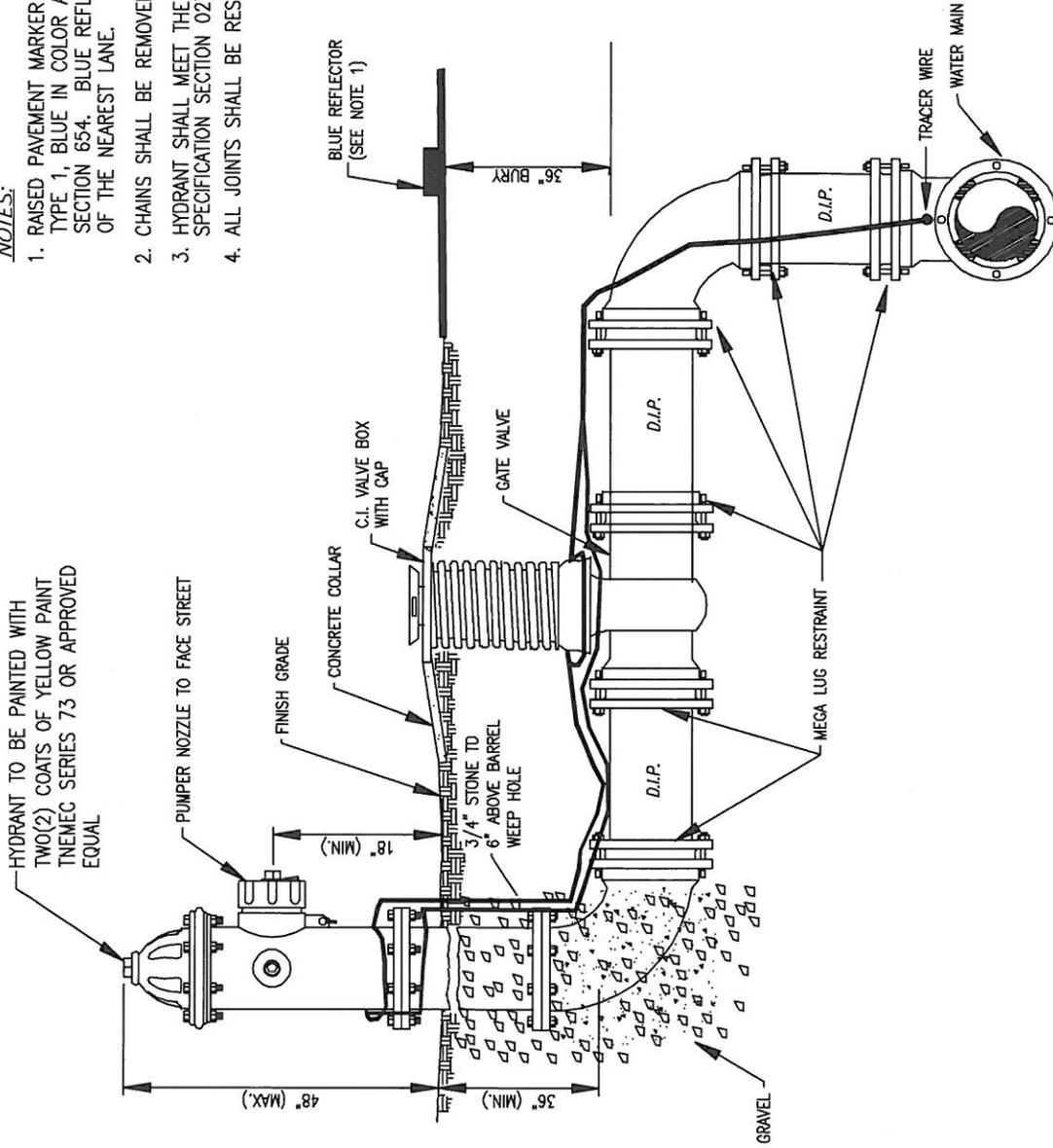
FIRE HYDRANT DETAIL

SCALE: N.T.S.

DATE: August 2006

W-04

- NOTES:**
1. RAISED PAVEMENT MARKER SHALL COMPLY WITH CADOT SECTION 919, TYPE 1, BLUE IN COLOR AND BE INSTALLED IN ACCORDANCE WITH SECTION 654. BLUE REFLECTOR SHALL BE INSTALLED IN THE CENTER OF THE NEAREST LANE.
 2. CHAINS SHALL BE REMOVED FROM ALL HYDRANTS.
 3. HYDRANT SHALL MEET THE REQUIREMENTS OF STANDARD SPECIFICATION SECTION 02700.
 4. ALL JOINTS SHALL BE RESTRAINED.



**FIRE HYDRANT DETAIL
FOR DEEP BURY**

**CITY OF POOLER
2011 STANDARD DETAIL**

SCALE:

N.T.S.

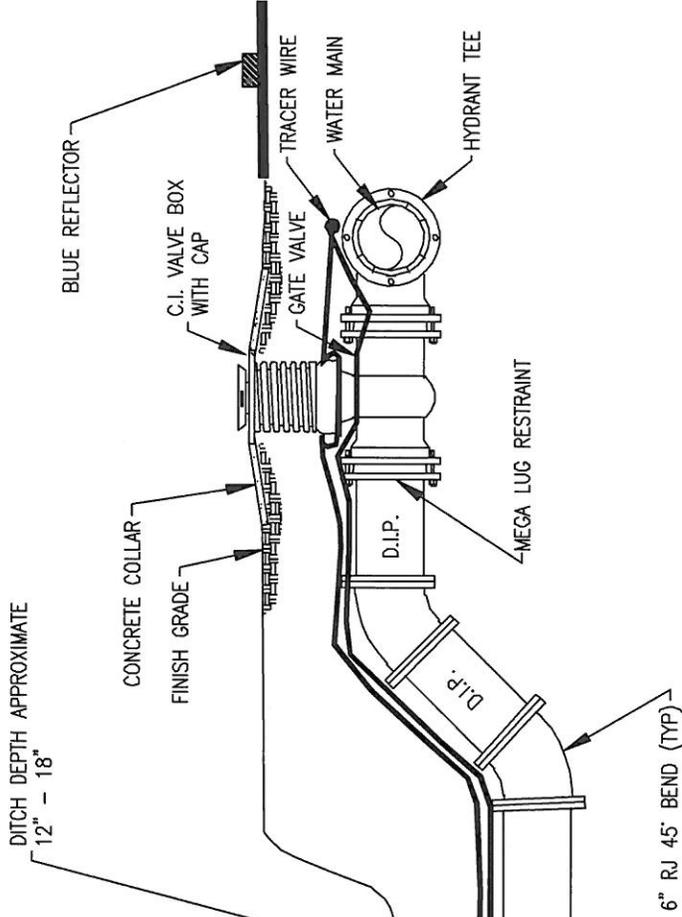
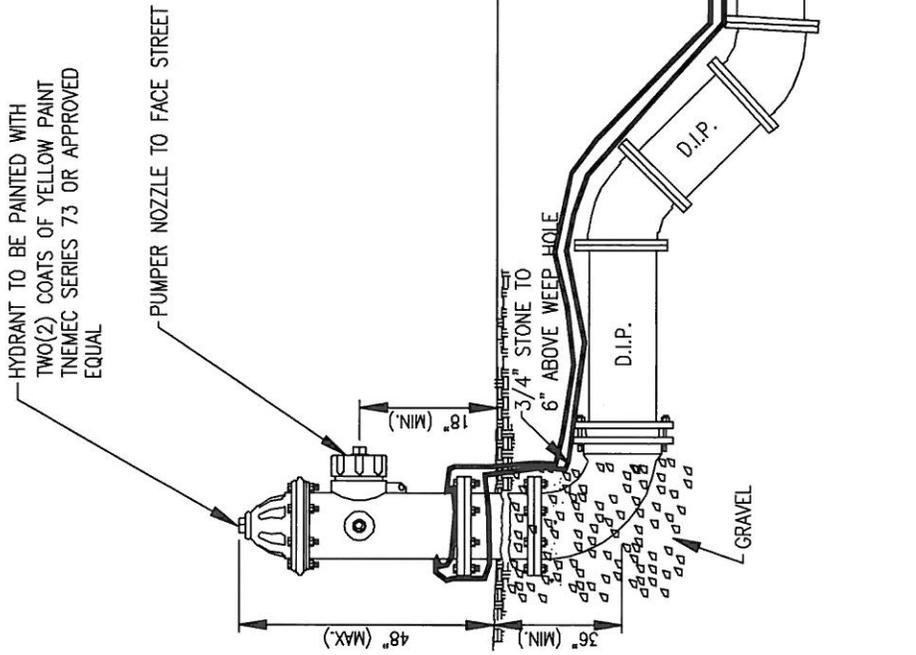
DATE:

August 2006

W-05

NOTES:

1. RAISED PAVEMENT MARKER SHALL COMPLY WITH CADOT SECTION 919, TYPE 1, BLUE IN COLOR AND BE INSTALLED IN ACCORDANCE WITH SECTION 654. BLUE REFLECTOR SHALL BE INSTALLED IN THE CENTER OF THE NEAREST LANE.
2. CHAINS SHALL BE REMOVED FROM ALL HYDRANTS.
3. HYDRANT SHALL MEET THE REQUIREMENTS OF STANDARD SPECIFICATION SECTION 02700.
4. ALL JOINTS SHALL BE RESTRAINED.



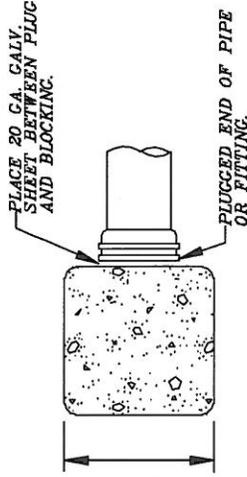
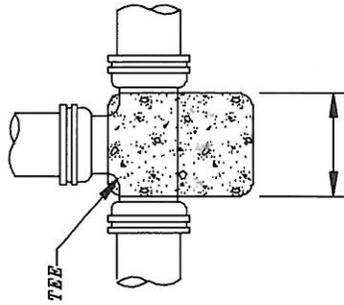
CITY OF POOLER
2011 STANDARD DETAIL

FIRE HYDRANT DETAIL
UNDER DITCH

SCALE: N.T.S.

DATE: January 2011

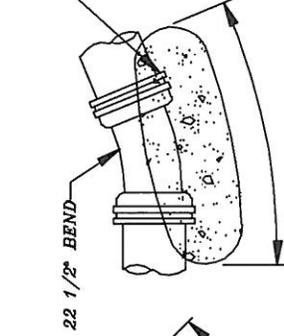
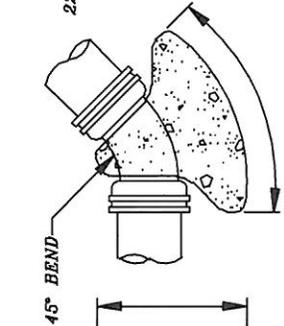
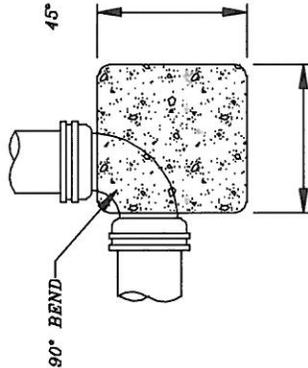
W-06



NOTE: CONCRETE THRUST BLOCKING SHALL ONLY BE USED WHERE MECHANICAL RESTRAINTS ARE NOT FEASIBLE. PRIOR APPROVAL MUST BE OBTAINED FROM CITY OF POOLER PRIOR TO USING THRUST BLOCKING.

PIPE	AREA AGAINST UNDISTURBED SOIL
2"	1'-0" ± 1'-0"
4"	1'-2" ± 1'-2"
6"	1'-6" ± 1'-6"
8"	1'-9" ± 1'-9"
10"	2'-2" ± 2'-2"
12"	2'-8" ± 2'-8"

PIPE	AREA AGAINST UNDISTURBED SOIL
2"	1'-0" ± 1'-0"
4"	1'-2" ± 1'-2"
6"	1'-6" ± 1'-6"
8"	1'-9" ± 1'-9"
10"	2'-2" ± 2'-2"
12"	2'-8" ± 2'-8"

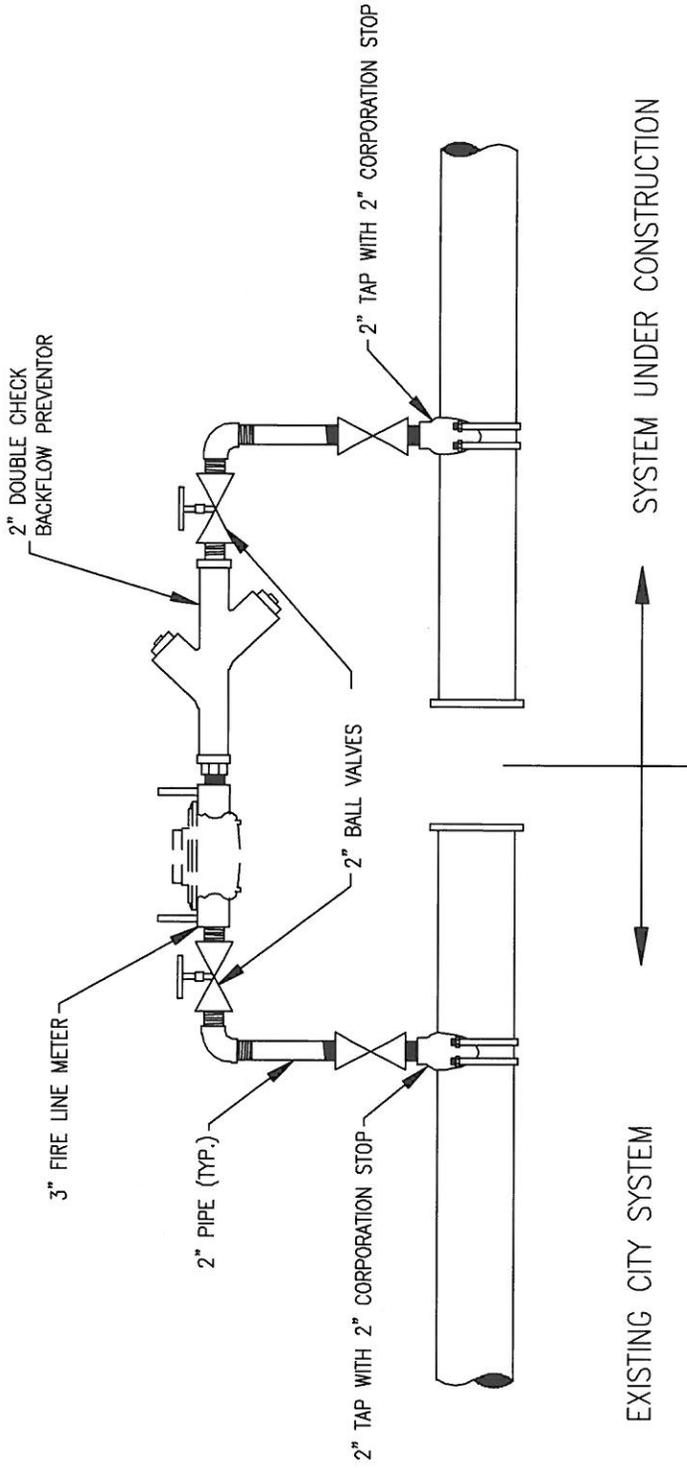


PIPE	AREA AGAINST UNDISTURBED SOIL
2"	1'-0" ± 1'-0"
4"	1'-0" ± 1'-0"
6"	1'-3" ± 1'-3"
8"	2'-0" ± 2'-0"
10"	2'-6" ± 2'-6"
12"	3'-0" ± 3'-0"

PIPE	AREA AGAINST UNDISTURBED SOIL
2"	1'-0" ± 1'-0"
4"	1'-0" ± 1'-0"
6"	1'-3" ± 1'-3"
8"	1'-6" ± 1'-6"
10"	2'-0" ± 2'-0"
12"	2'-8" ± 2'-8"

PIPE	AREA AGAINST UNDISTURBED SOIL
2"	1'-0" ± 1'-0"
4"	1'-0" ± 1'-0"
6"	1'-0" ± 1'-0"
8"	1'-2" ± 1'-2"
10"	1'-6" ± 1'-6"
12"	1'-8" ± 1'-8"

NOTE: PIPING LESS THAN 2" IN DIAMETER SHALL HAVE THE SAME REQUIREMENTS AS 2" DIAMETER PIPE.



NOTES:

1. ALL WATERLINE EXTENSIONS MUST CONTAIN A MINIMUM OF 1 JUMPER CONNECTION FOR FILLING/FLUSHING REQUIREMENTS.
2. FIRE LINE METER SHALL BE OBTAINED FROM CITY OF POOLER UPON PAYMENT OF APPROPRIATE DEPOSIT.
3. TAPPING SADDLES AND CORPORATION STOPS SHALL COMPLY WITH CITY OF POOLER SPECIFICATIONS.
4. CORPORATION STOPS ARE TO BE CLOSED AND PLUGGED WITH A BRASS PLUG AFTER REMOVAL OF JUMPER PIPING.

**CITY OF POOLER
2011 STANDARD DETAIL**

JUMPER CONNECTION DETAIL

SCALE:

N.T.S.

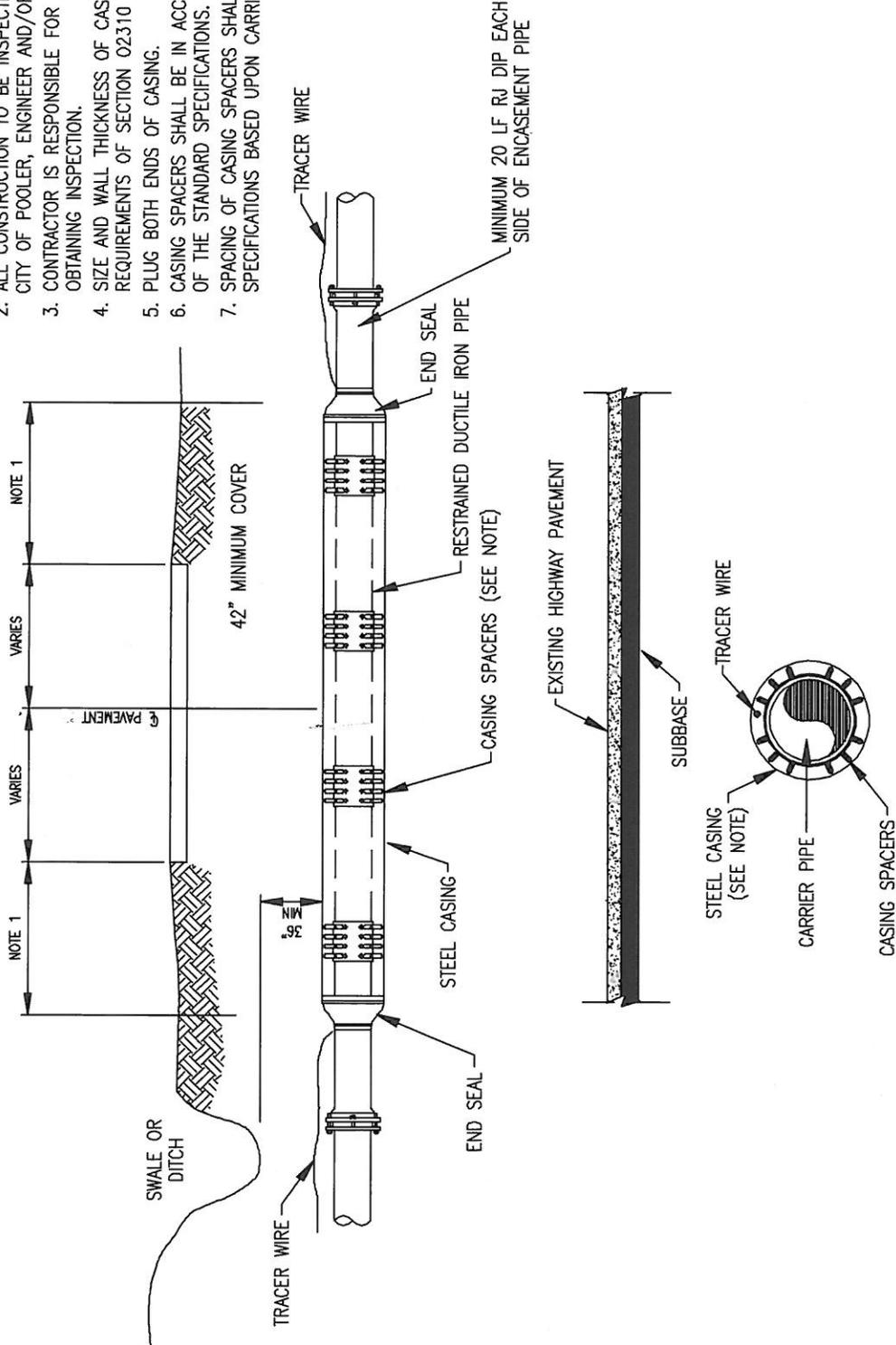
DATE:

August 2006

W-08

NOTES:

1. STEEL CASING TO EXTEND A MINIMUM OF 5' BEYOND EDGE OF PAVEMENT, 10 FEET ON STATE ROUTES.
2. ALL CONSTRUCTION TO BE INSPECTED AND APPROVED BY CITY OF POOLER, ENGINEER AND/OR STATE HIGHWAY DEPARTMENT.
3. CONTRACTOR IS RESPONSIBLE FOR NOTIFICATION AND OBTAINING INSPECTION.
4. SIZE AND WALL THICKNESS OF CASING TO MEET THE REQUIREMENTS OF SECTION 02310 OF THE SPECIFICATIONS.
5. PLUG BOTH ENDS OF CASING.
6. CASING SPACERS SHALL BE IN ACCORDANCE WITH SECTION 02310 OF THE STANDARD SPECIFICATIONS.
7. SPACING OF CASING SPACERS SHALL BE PER MANUFACTURERS SPECIFICATIONS BASED UPON CARRIER PIPE MATERIAL.



TYPICAL ROADWAY
BORE AND JACK DETAIL

CITY OF POOLER
2011 STANDARD DETAIL

JACK AND BORE DETAIL
(WATER SYSTEM ONLY)

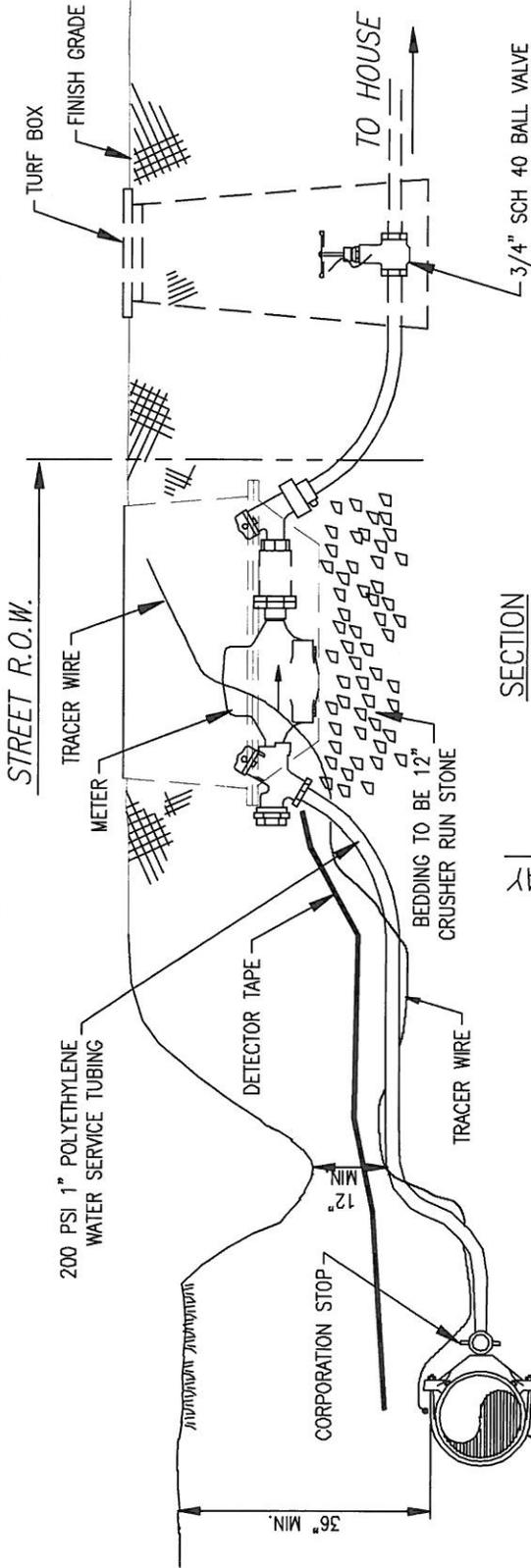
SCALE

N.T.S.

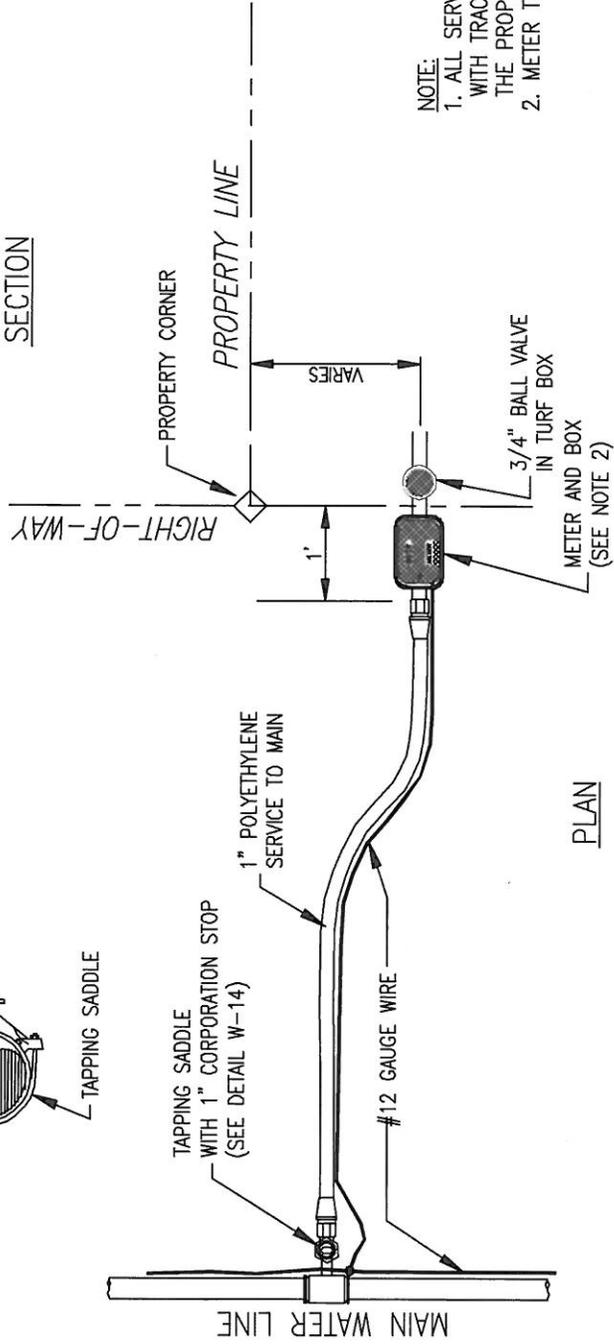
DATE

August 2006

W-09



SECTION



PLAN

- NOTE:**
1. ALL SERVICE PIPING SHALL BE WRAPPED WITH TRACER WIRE AND TERMINATED AT THE PROPERTY LINE.
 2. METER TO BE TOUCH READ SENSUS METER.

TYPICAL SINGLE SERVICE CONNECTION

**CITY OF POOLER
2011 STANDARD DETAIL**

SERVICE CONNECTION DETAIL

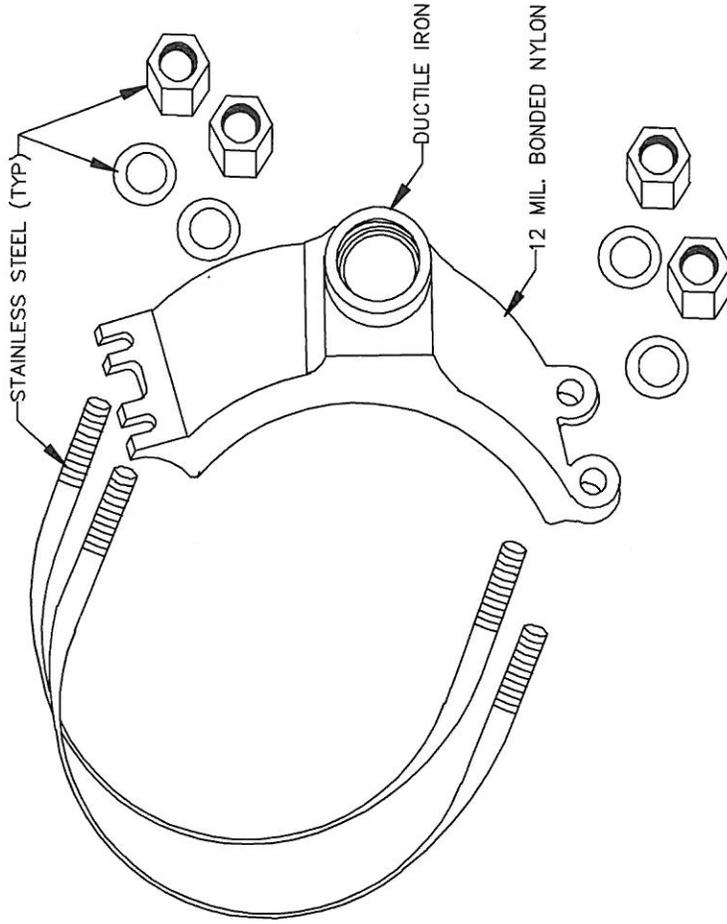
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N.T.S.

DATE:

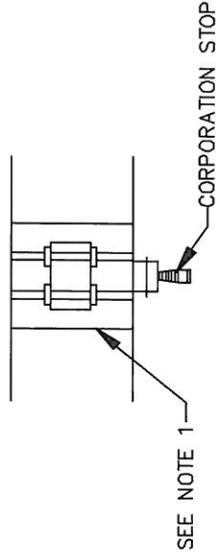
January 2011

W-10



NOTES:

1. TAPPING SADDLE TO BE DUCTILE IRON WITH TYPE 304 STAINLESS STEEL FORGED DOUBLE STRAPS, STAINLESS STEEL BOLTS, NUTS, AND WASHERS. FINISH IS FUSION BONDED NYLON TO AVERAGE THICKNESS OF 12MILS.
2. ALL TAPS ON WATER LINES WILL REQUIRE A TAPPING SADDLE.



CITY OF POOLER
2011 STANDARD DETAIL

1" & 2" TAPPING SADDLE

SCALE:

N.T.S.

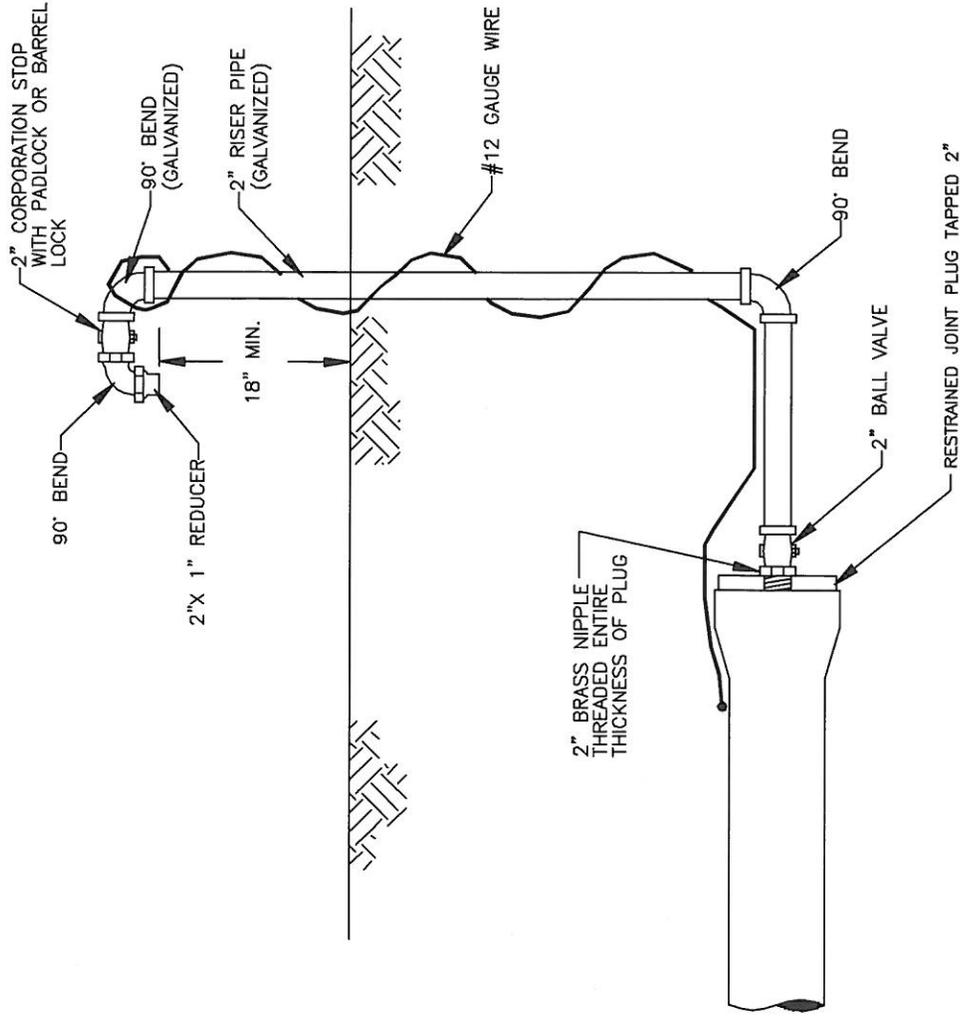
DATE:

August 2006

W-11

NOTE:

1. EXPOSED CORPORATION STOP SHALL BE SECURELY LOCKED AT ALL TIMES.
2. BALL VALVE SHALL BE TURNED OFF, BLOW OFF REMOVED, AND BALL VALVE PLUGGED AFTER WATER SAMPLES HAVE PASSED.

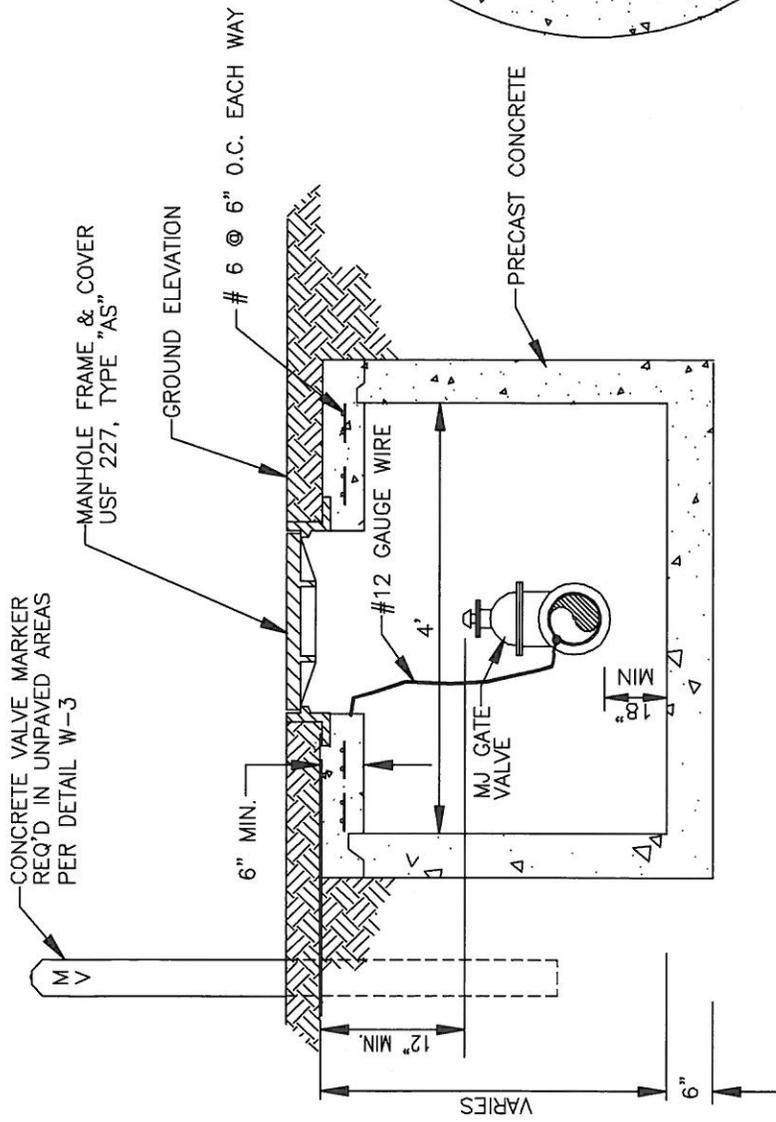


SCALE: N.T.S.
DATE: August 2006

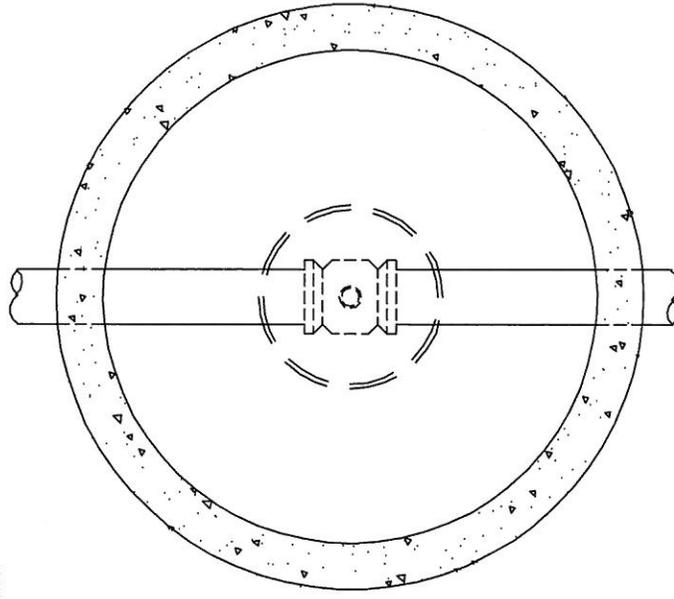
W-12

TEMPORARY SAMPLING STATION

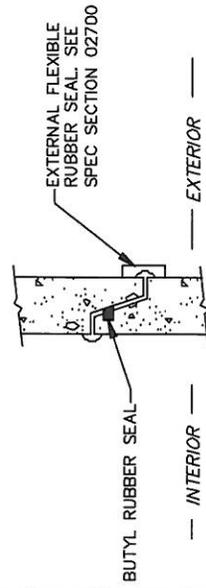
CITY OF POOLER
2011 STANDARD DETAIL



SECTION



PLAN



JOINT DETAIL

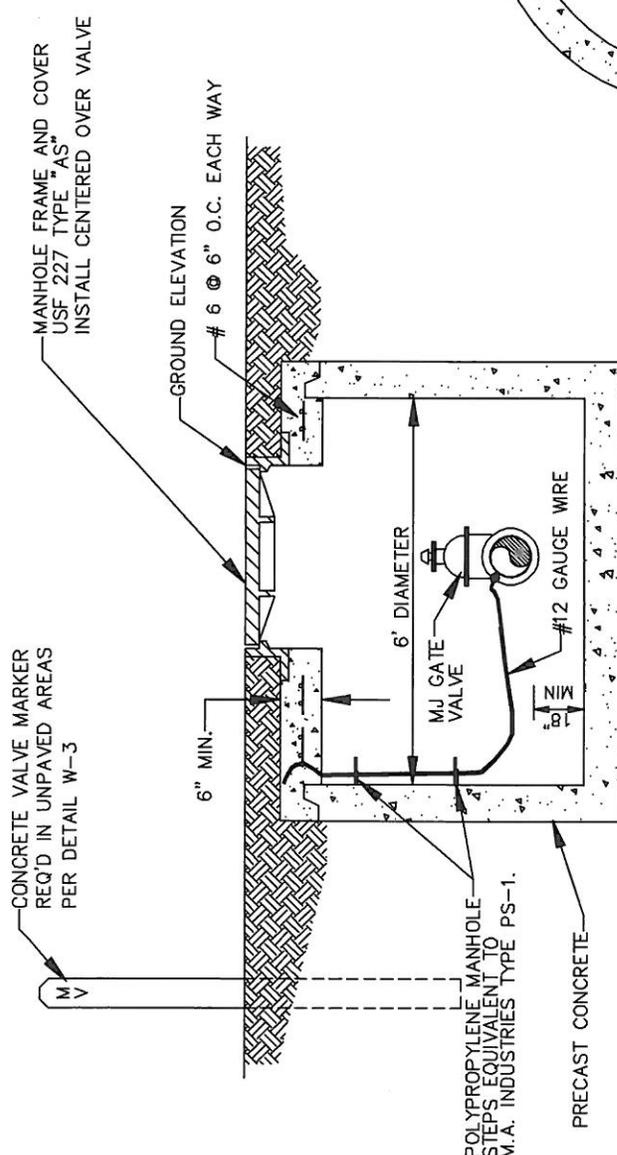
CITY OF POOLER
2011 STANDARD DETAIL

VALVE MANHOLE
FOR 4" TO 8" GATE VALVES

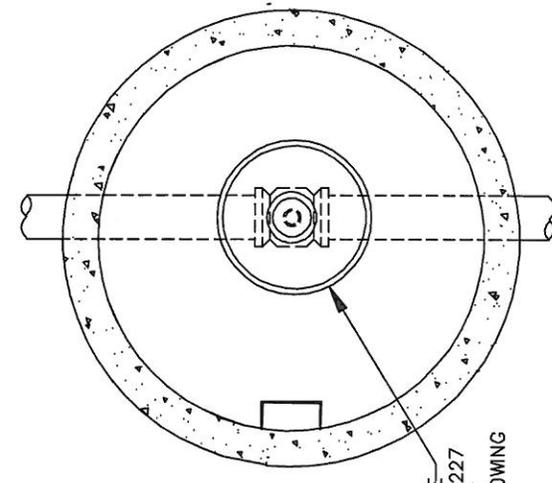
SCALE: N.T.S.

DATE: August 2006

W-13

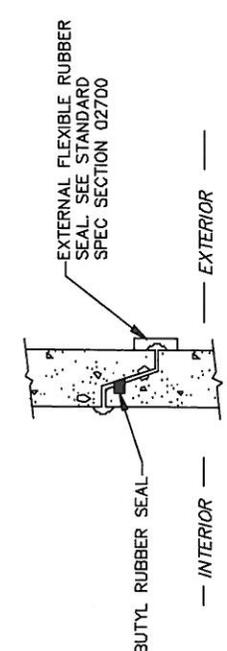


SECTION



PLAN

ACCESS MANHOLE FRAME
AND COVER TO BE USF 227
TYPE "AS". COVER MUST
HAVE STAMP SHOWING
TYPE OF UTILITY.



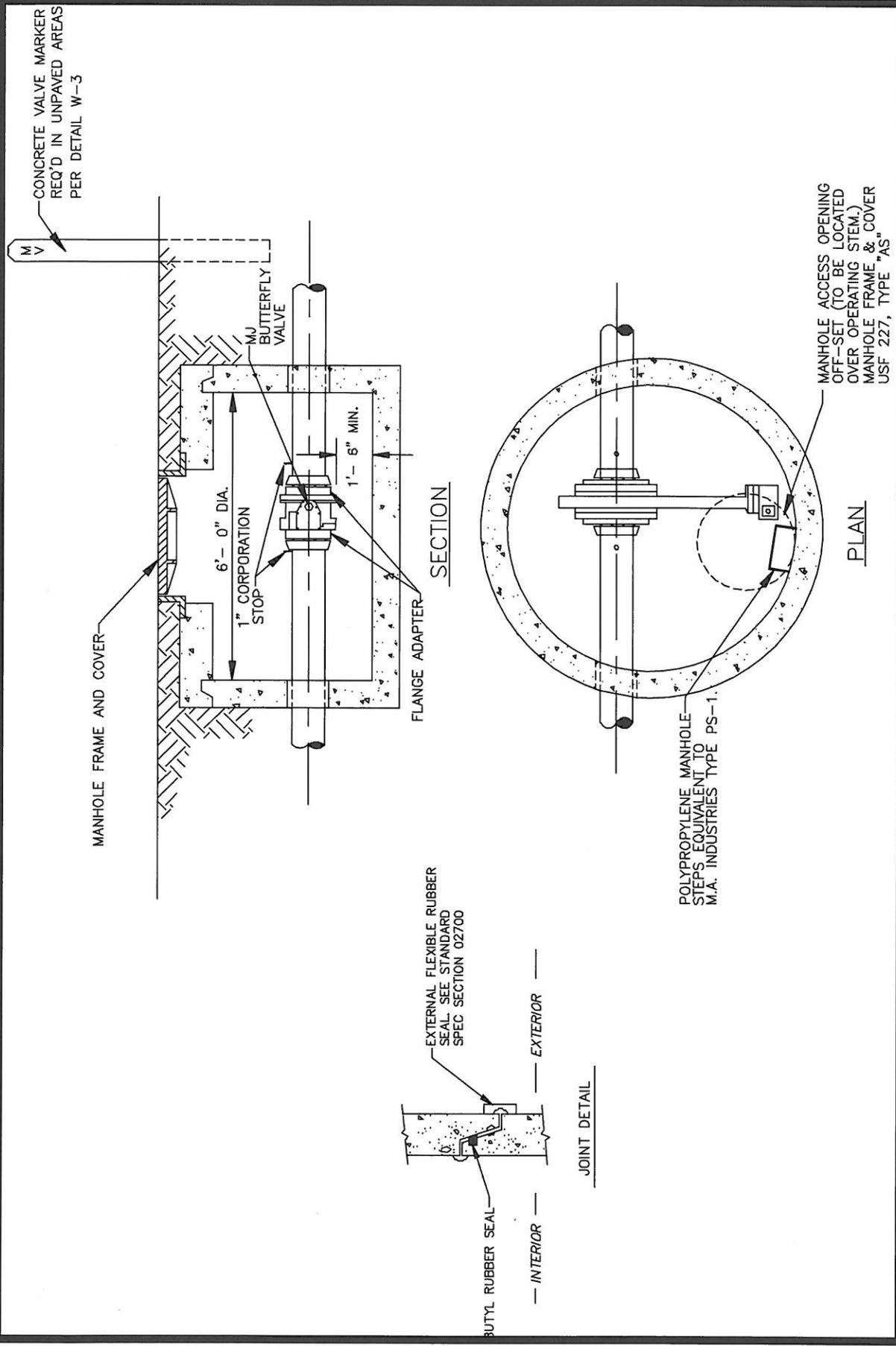
JOINT DETAIL

CITY OF POOLER
2011 STANDARD DETAIL

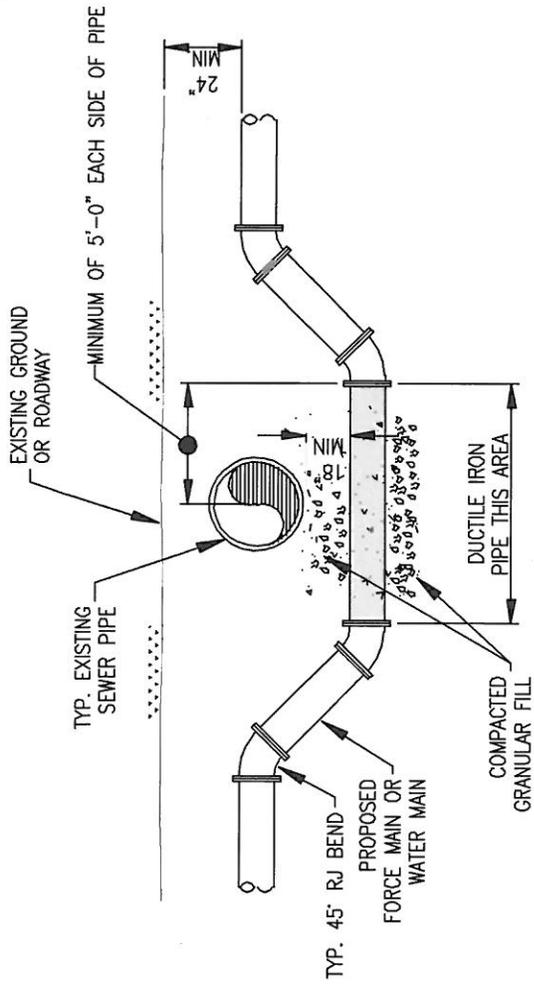
VALVE MANHOLE
FOR 10" & 12" GATE VALVES

SCALE: N.T.S.
DATE: January 2011

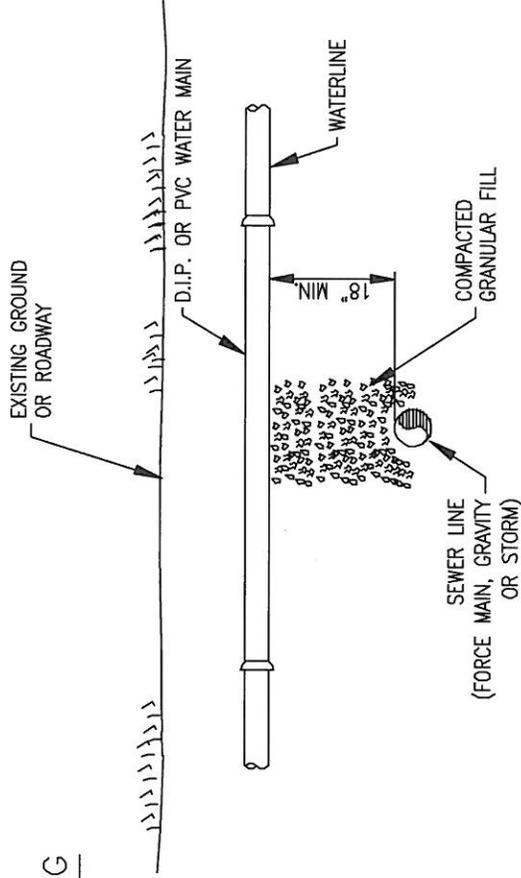
W-14



CITY OF POOLER 2011 STANDARD DETAIL	VALVE VAULT 14" TO 48" BUTTERFLY VALVE		SCALE: N.T.S.	W-15
			DATE: August 2006	



STORM/SANITARY SEWER CROSSING



SEWER CROSSING

CITY OF POOLER
2011 STANDARD DETAIL

PIPELINE CROSSING DETAIL

SCALE:

N.T.S.

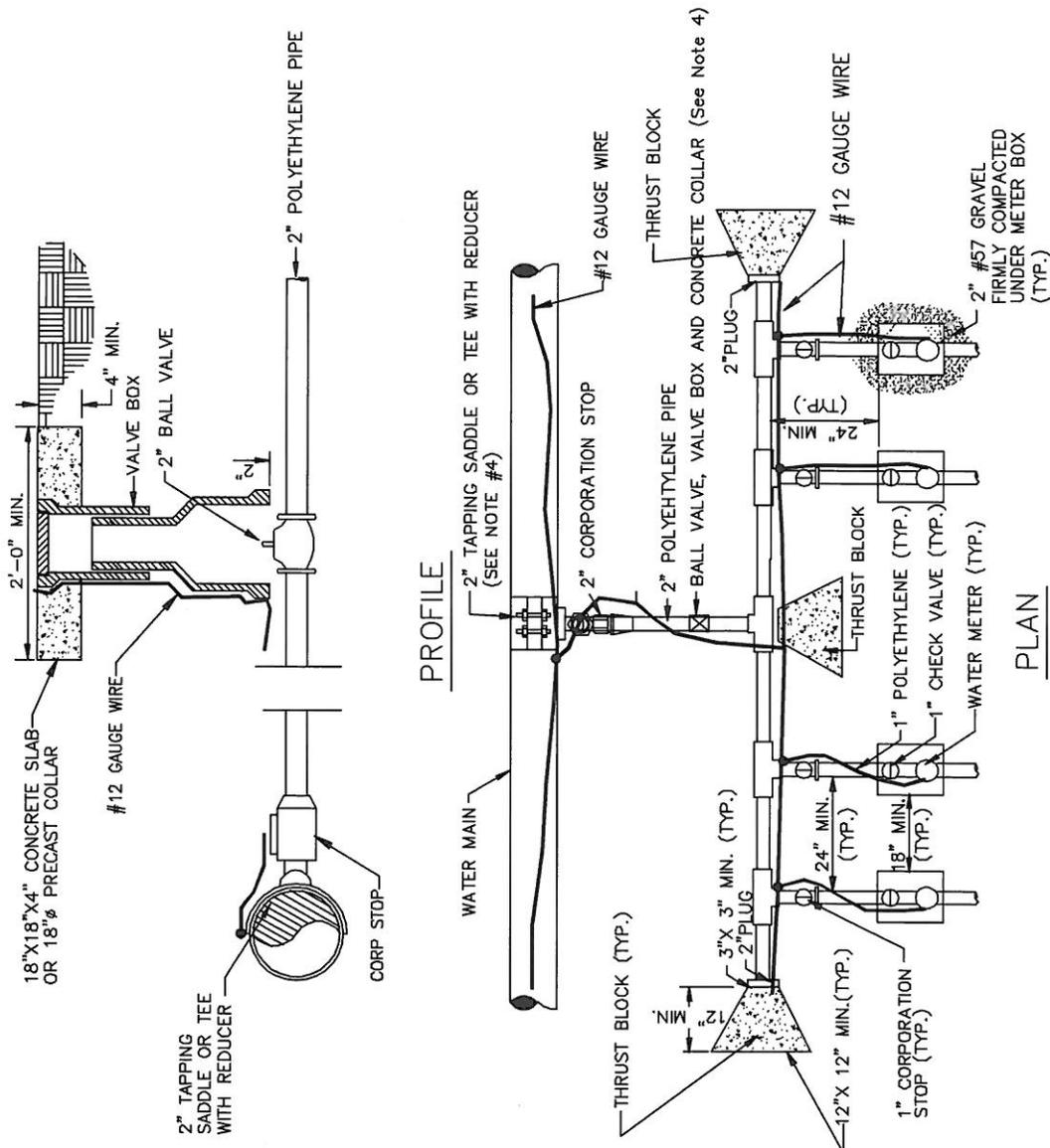
DATE:

August 2006

W-16

NOTES:

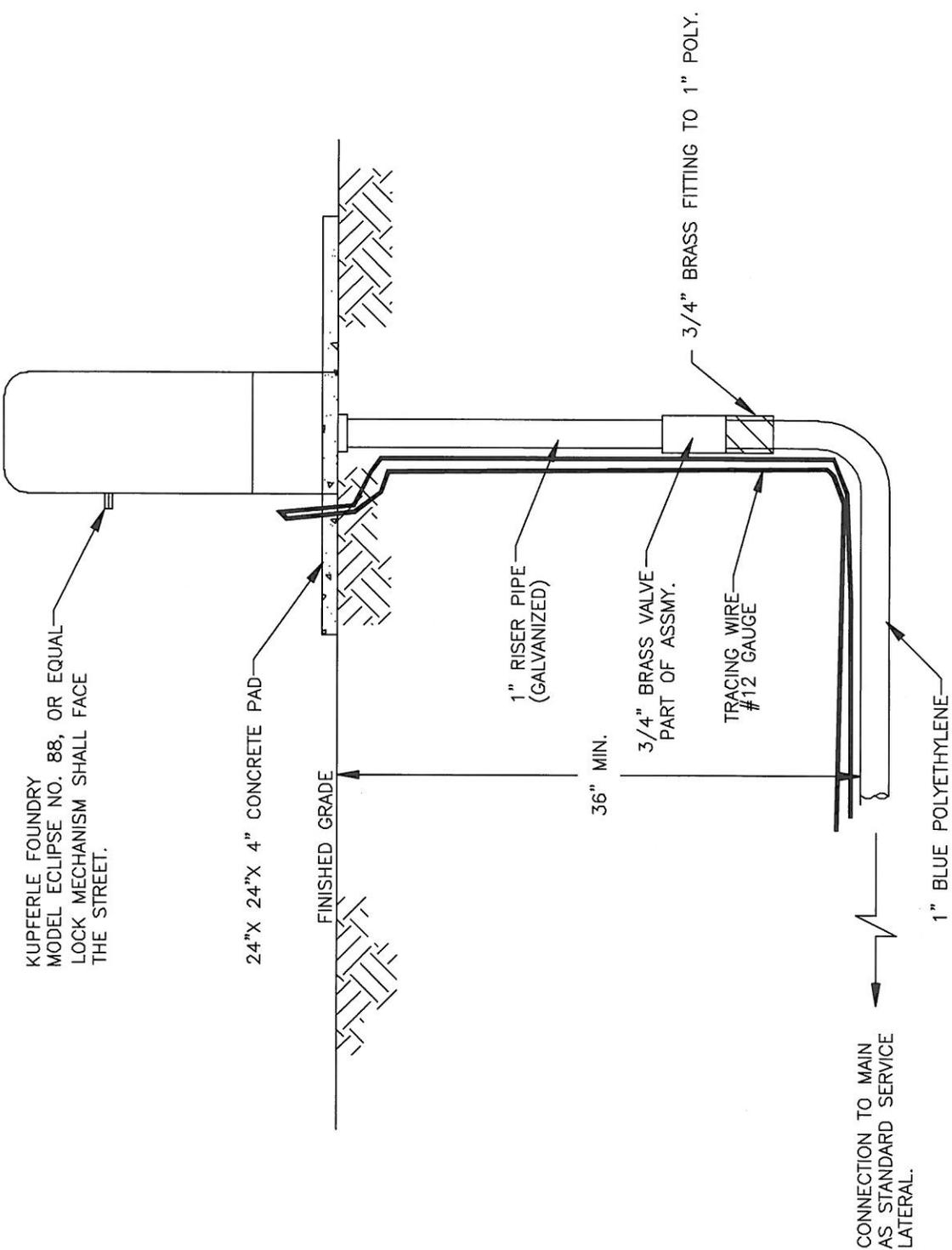
1. ALL METERS SHALL BE INSTALLED WITHIN CITY OF POOLER RIGHT OF WAY OR EASEMENT.
2. CONCRETE COLLAR IS NOT REQUIRED ON VALVE BOXES INSTALLED IN PAVED AREAS.
3. TAPPING SADDLE TO BE DUCTILE IRON WITH TYPE 304 STAINLESS STEEL DOUBLE STRAPS, BOLTS, NUTS, AND WASHERS. FINISH IS FUSION BONDED NYLON TO AVERAGE THICKNESS OF 12 MILS.
4. BALL VALVE NOT REQUIRED IF DISTANCE BETWEEN CORP STOP AND HEADER IS LESS THAN TEN FEET.



**MANIFOLD FOR MULTIPLE
3/4" OR 1" METER INSTALLATION**

**CITY OF POOLER
2011 STANDARD DETAIL**

SCALE: N.T.S.
DATE: January 2011



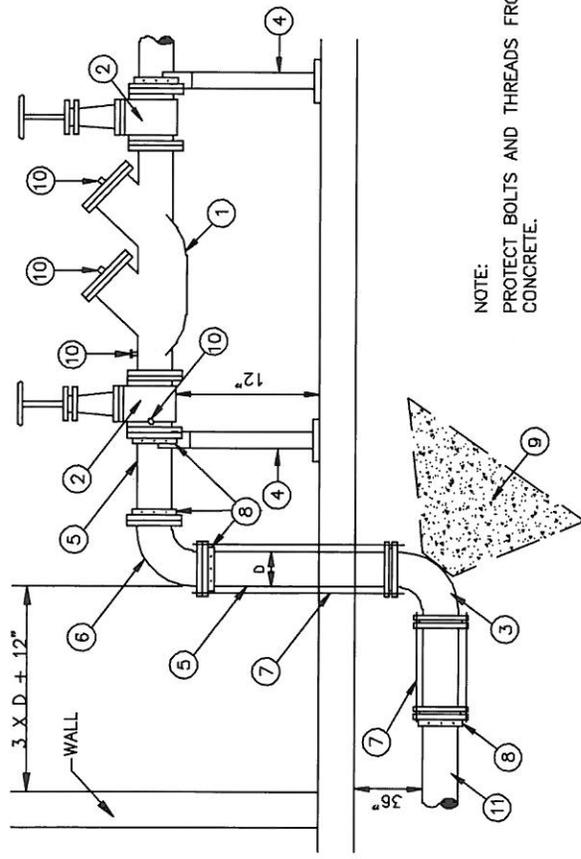
SCALE: N.T.S.

DATE: JANUARY 2004

PERMANENT SAMPLING STATION

CITY OF POOLER
2011 STANDARD DETAIL

W-19



NOTE:
PROTECT BOLTS AND THREADS FROM
CONCRETE.

MATERIALS

ITEM	QUAN.	DESCRIPTION
1	1	REDUCED PRESSURE ZONE DEVICE
2	2	OS&Y RESILIENT SEAT GATE VALVES
3	1	MJ DUCTILE IRON BEND
4	2	2" GALV. PIPE STAND BOLTED TO FLANGE
5	2	DUCTILE IRON PIPE CUT TO LENGTH
6	1	FLANGED BEND
7	4	RESTRAINT ROD
8	4	COMPANION FLANGE
9	1	THRUST BLOCKING
10	4	BRASS PLUGS INSERTED IN TEST COCKS
11	1	DUCTILE IRON PIPE

NOTES:

1. RISER COMING THRU THE FLOOR SHALL BE 12 INCHES PLUS 3 TIMES THE DIAMETER OF THE PIPE AWAY FROM NEAREST WALL. ALL UNDERGROUND PIPING WILL BE RODDED & THRUST PROTECTED. ALLOWANCES WILL BE MADE FOR THE EXPANSION OF THE CONCRETE AROUND THE RISER.
2. FOR FINAL APPROVAL ASSEMBLY MUST BE CENTERED IN ENCLOSURE (IF APPLICABLE), UNDER NO CONDITION WILL ANY CONNECTION BE ALLOWED BETWEEN THE SERVICE METER AND A BACKFLOW PREVENTER USED FOR THE SYSTEM CONTAINMENT. BACKFLOW PREVENTER SHALL ALWAYS BE INSTALLED DOWNSTREAM OF METER.
3. IF A PRESSURE MONITOR IS TO BE INSTALLED, ADD A TEE, VALVE, FITTINGS, AND MOUNT ON SUPPLY SIDE PRIOR TO BACKFLOW PREVENTER; UNDER NO CIRCUMSTANCE SHALL TEST PORTS BE MODIFIED OR UTILIZED FOR THIS OR OTHER APPLICATION, OTHER THAN BACKFLOW DEVICE TESTING.
4. IF DETECTOR CHECK IS ON A FIRE SYSTEM, NO METER WILL BE REQUIRED.

SCALE:

N.T.S.

DATE:

January 2011

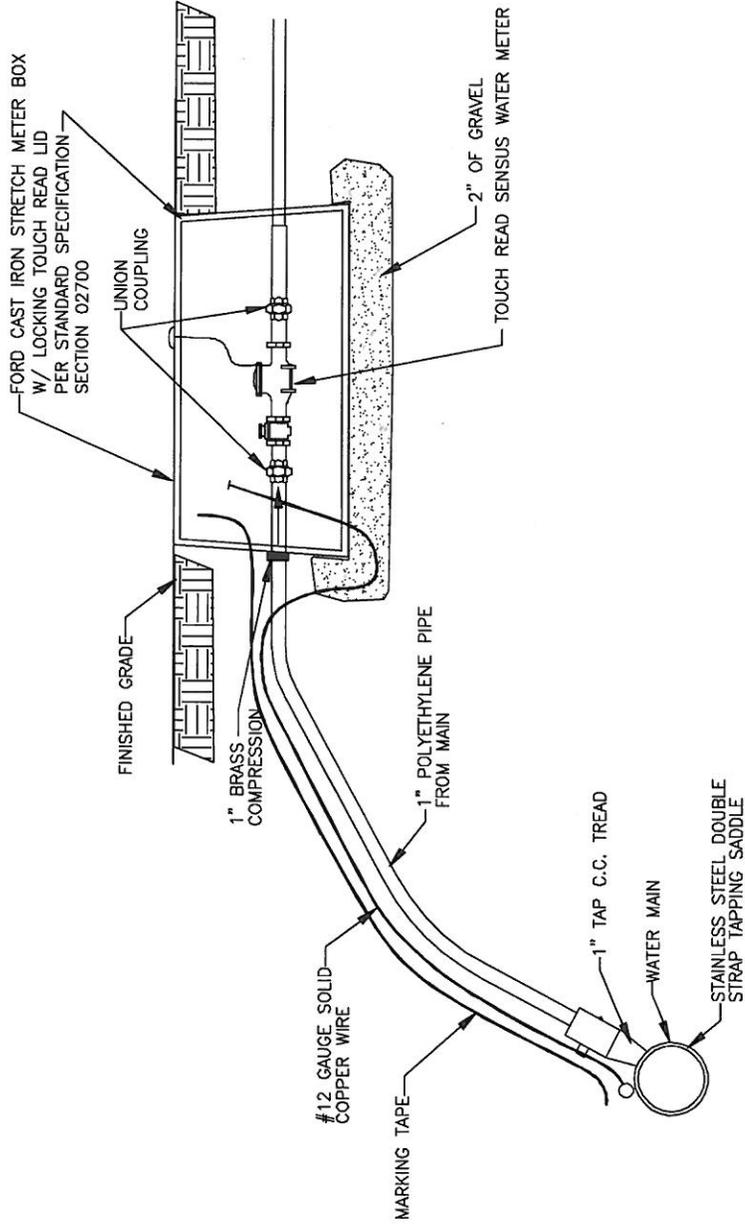
W-20

REDUCED PRESSURE ZONE DEVICE DOUBLE CHECK VALVE TYPICAL - INSIDE BUILDING INSTALLATION

CITY OF POOLER
2011 STANDARD DETAIL

GENERAL NOTES:

1. WATER METER AND STRETCH BOX FOR THE 3/4" & 1" WATER METERS SHALL BE PURCHASED FROM THE CITY OF POOLER.
2. THE INSTALLATION OF THE METER AND BOX SHALL BE DONE BY THE CUSTOMER REQUIRING SERVICE.
3. IF A WATER TAP IS REQUIRED FOR THE WATER SERVICE IT SHALL BE THE RESPONSIBILITY OF THE CUSTOMER REQUIRING SERVICE TO EXCAVATE THE WATER MAIN. THE CITY OF POOLER SHALL TAP THE WATER MAIN ONLY.
4. THE CUSTOMER REQUIRING SERVICE SHALL BE RESPONSIBLE FOR ALL EXCAVATION BACKFILLING AND RESTORATION OF EXCAVATED AREAS.



SCALE: N.T.S.
DATE: August 2006

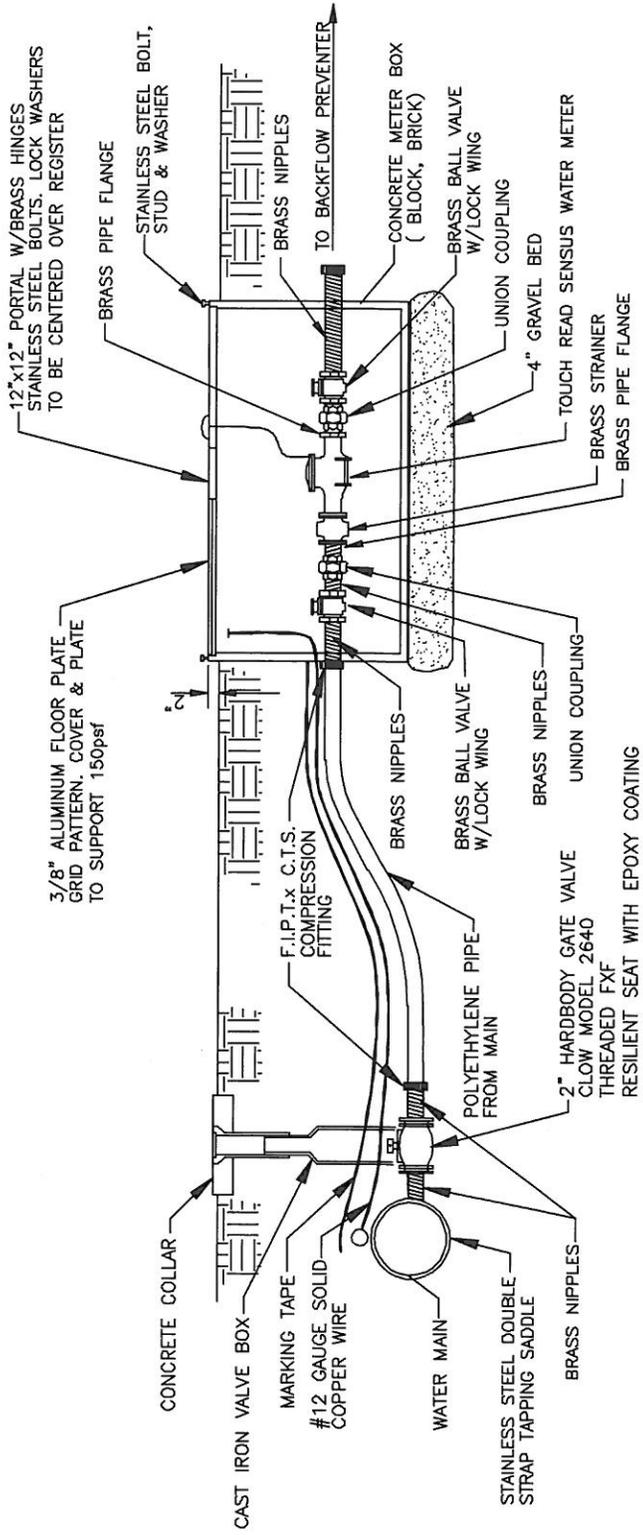
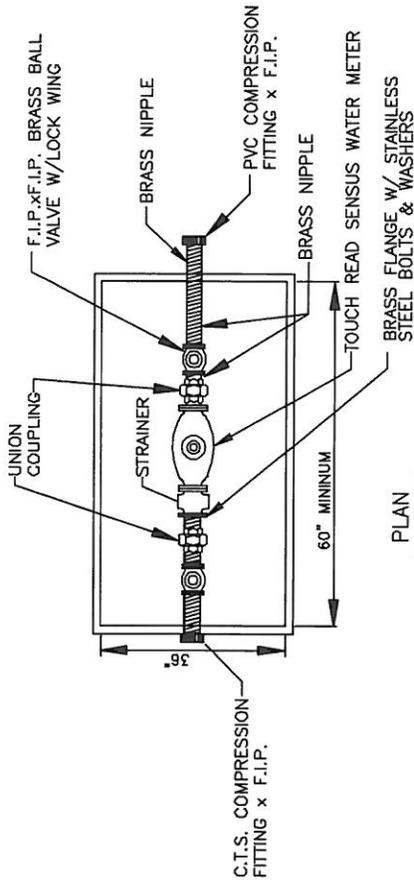
WATER METER INSTALLATION
1" SERVICE PIPE, 3/4" WATER METER &
1" WATER METER
DOMESTIC, IRRIGATION & COMMERCIAL USE ONLY

CITY OF POOLER
2011 STANDARD DETAIL

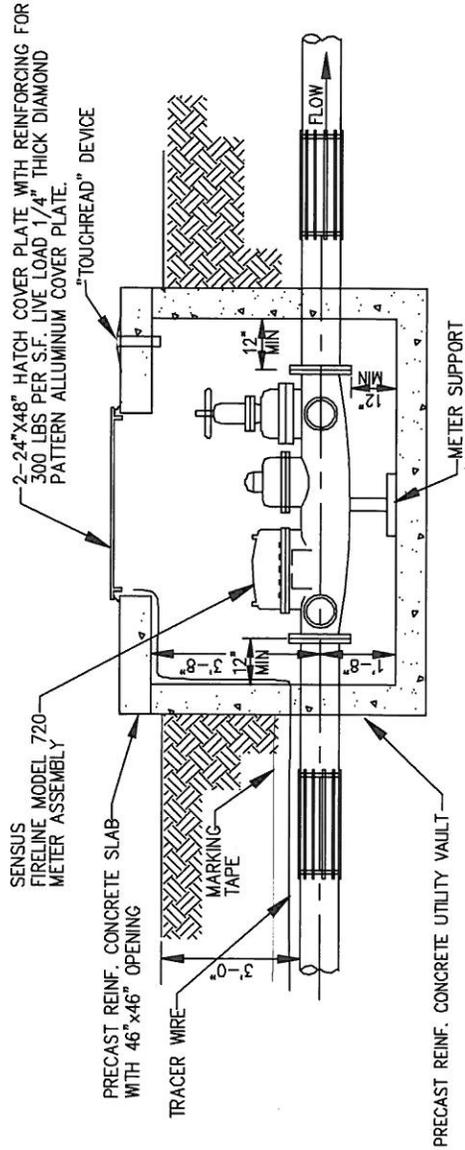
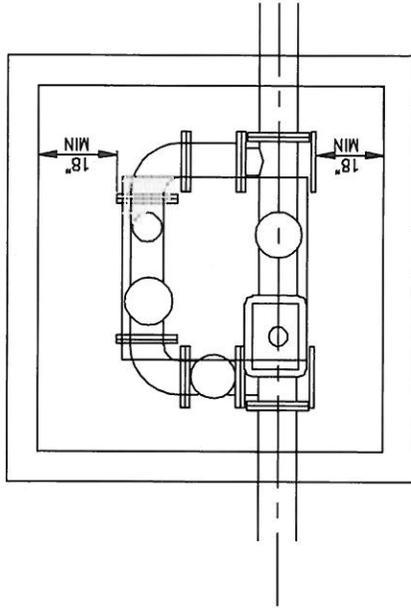
W-21

GENERAL NOTES:

1. WATER METER SHALL BE PURCHASED FROM THE CITY OF POOLER. THE CONCRETE METER BOX SHALL BE THE RESPONSIBILITY OF THE CUSTOMER REQUIRING SERVICE.
2. THE INSTALLATION OF THE METER AND BOX SHALL BE DONE BY THE CUSTOMER REQUIRING SERVICE.
3. IF A WATER TAP IS REQUIRED FOR THE WATER SERVICE IT SHALL BE THE RESPONSIBILITY OF THE CUSTOMER REQUIRING SERVICE TO EXCAVATE THE WATER MAIN. THE CITY OF POOLER SHALL TAP THE WATER MAIN ONLY.
4. THE CUSTOMER REQUIRING SERVICE SHALL BE RESPONSIBLE FOR ALL EXCAVATION BACKFILLING AND RESTORATION OF DISTURBED AREAS.



<p>CITY OF POOLER 2011 STANDARD DETAIL</p>	<p>WATER METER INSTALLATION 2" SERVICE PIPE & 1-1/2" & 2" WATER METERS IRRIGATION ONLY</p>	<p>N.T.S.</p> <p>SCALE: _____</p> <p>DATE: January 2011</p> <p>W-22</p>
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NOTES:

1. ALL JOINTS AND FITTINGS IN METER ASSEMBLY SHALL BE RESTRAINED BY THREADED RODS OR MEGALUGS.
2. ALL 2" COMPOUND METER BYPASS LINES SHALL BE INSTALLED INSIDE METER VAULT.
3. DOMESTIC MADE BRASS SHALL BE USED FOR ALL 2" AND 2-1/2" METER INSTALLATIONS.
4. DUCTILE IRON SHALL BE USED FOR 3" METER AND LARGER INSTALLATIONS.
5. MINIMUM 5 DIAMETER STRAIGHT PIPE UPSTREAM OF METER
6. MINIMUM 3 DIAMETER STRAIGHT PIPE DOWNSTREAM OF METER

SCALE: N.T.S.
 DATE: August 2006

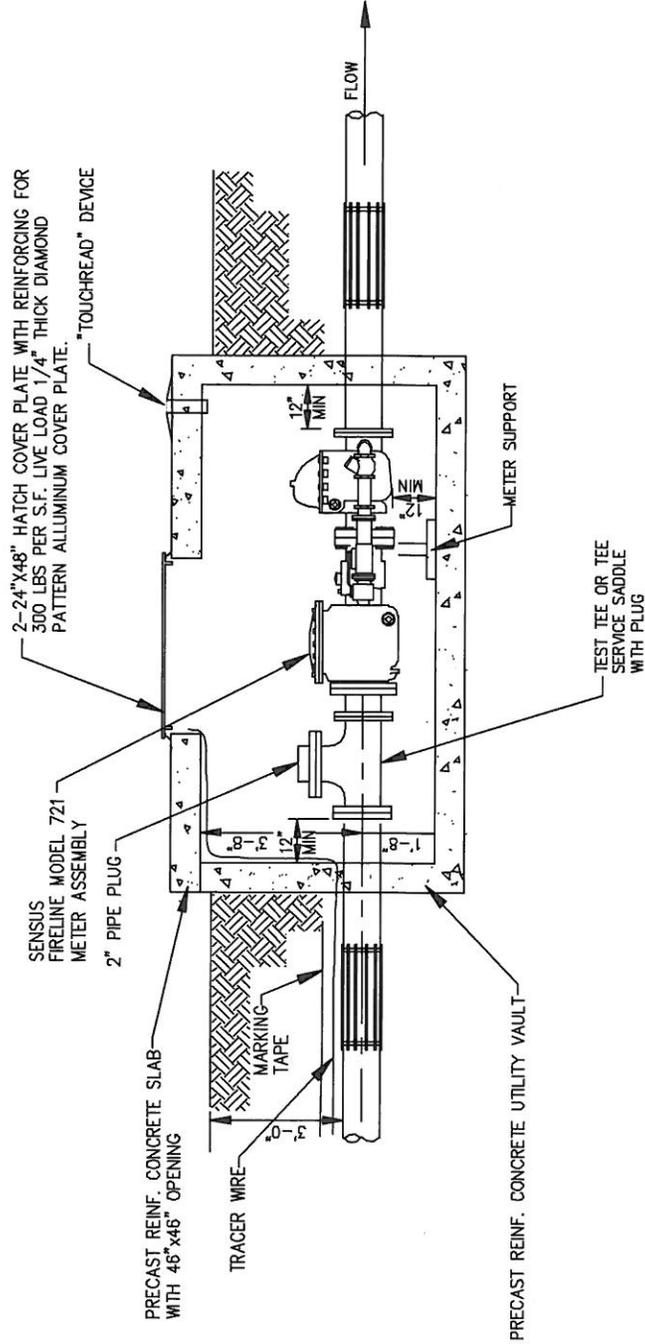
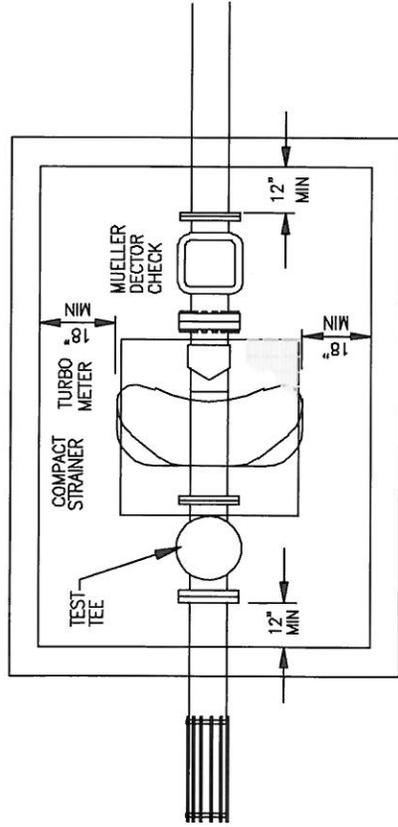
SENSUS "FIRELINE" - Model FL-720
 COMPOUND WATER METER
 INSTALLATION DETAIL

CITY OF POOLER
 2011 STANDARD DETAIL

W-24

NOTES:

1. ALL JOINTS AND FITTINGS IN METER ASSEMBLY SHALL BE RESTRAINED BY THREADED RODS, MEGALUGS OR APPROVED EQUAL.
2. ALL 2" COMPOUND METER BYPASS LINES SHALL BE INSTALLED INSIDE METER VAULT.
3. DOMESTIC MADE BRASS SHALL BE USED FOR ALL 2" AND 2-1/2" METER INSTALLATIONS.
4. DUCTILE IRON PIPE SHALL BE USED FOR 3" METER AND LARGER INSTALLATIONS.
5. MINIMUM 5 DIAMETER STRAIGHT PIPE UPSTREAM OF METER
6. MINIMUM 3 DIAMETER STRAIGHT PIPE DOWNSTREAM OF METER



SCALE:

N.T.S.

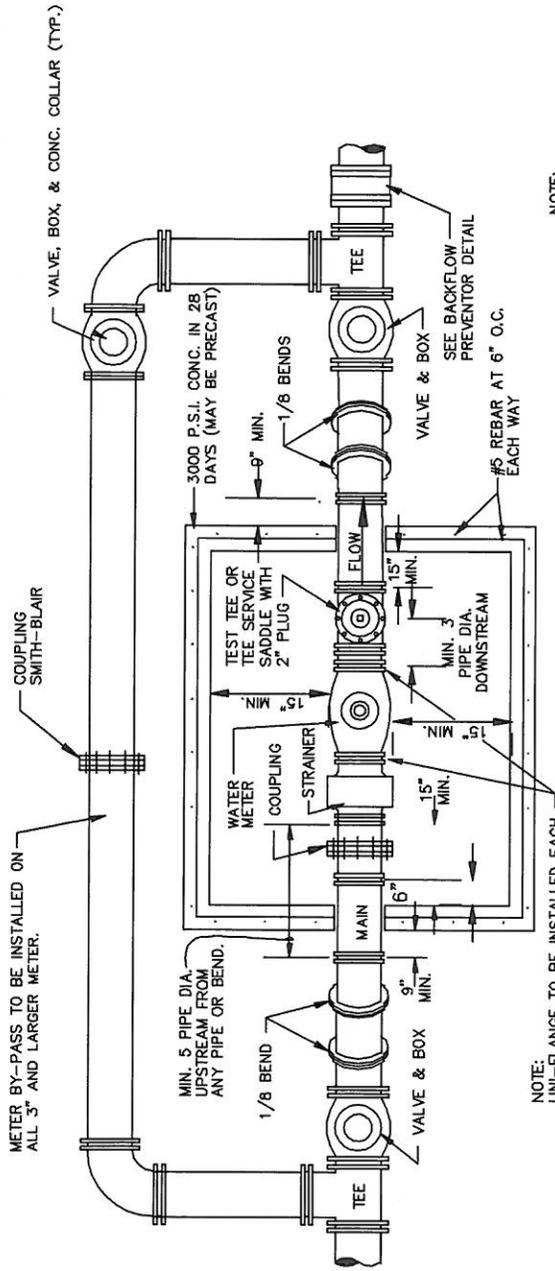
DATE:

August 2006

SENSUS "FIRELINE" - Model FL-721
FIRE SERVICE - COMPOUND WATER METER
INSTALLATION GUIDE

CITY OF POOLER
2011 STANDARD DETAIL

W-25



- NOTE:
1. USE OF BUTTERFLY VALVE SHALL REQUIRE METER WITH DOUBLE STRAINER.
 2. USE OF TURBINE METER SHALL REQUIRE U.L. APPROVED STRAINERS.
 3. COMPLETE BY-PASS ASSEMBLY IS REQUIRED ON ALL METERS.
 4. METERS 3" AND LARGER - ALL JOINTS FROM TEE TO TEE SHALL BE RESTRAINED.
 5. ALL PIPING FROM TAP TO BACKFLOW PREVENTOR SHALL BE DUCTILE IRON M.J. FITTINGS.

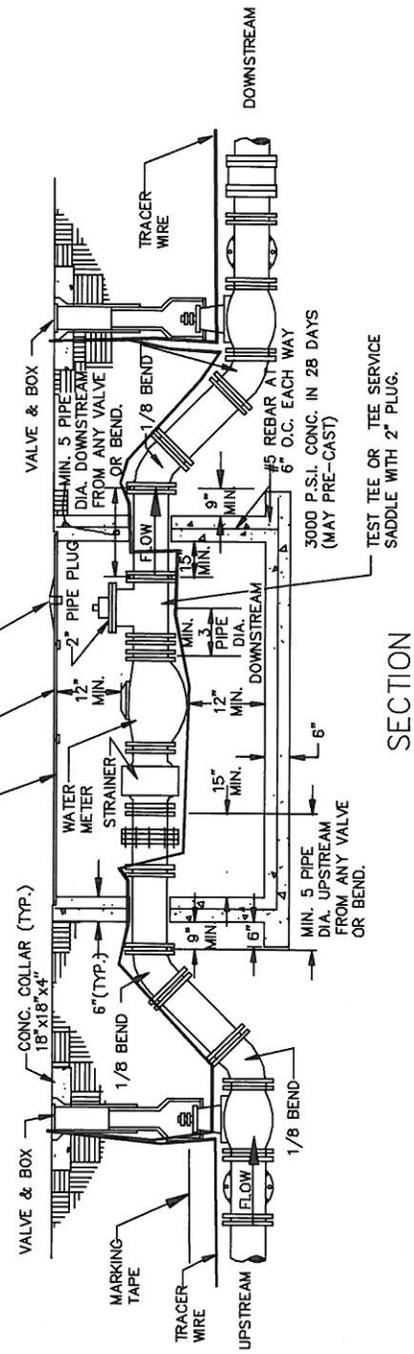
PLAN

NOTE:
UNI-FLANGE TO BE INSTALLED EACH SIDE OF METER

"TOUCHREAD" DEVICE

12"x12" PORTAL WITH HINGED COVER TO BE CENTERED OVER REGISTER

3/8" ALUMINUM FLOOR PLATE GRID PATTERN COVER & FRAME TO SUPPORT 150 LB./SQ. FT.



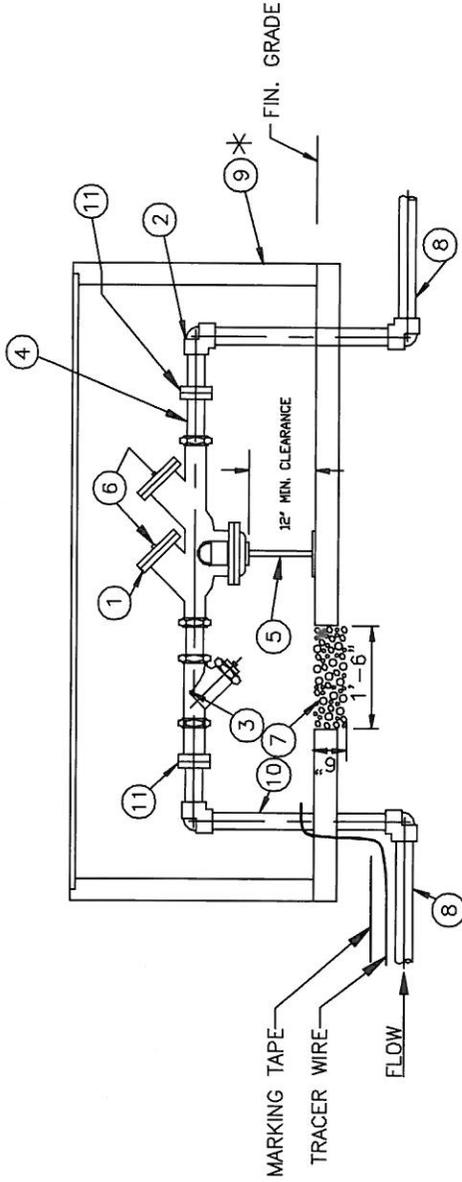
SECTION

CITY OF POOLER
2011 STANDARD DETAIL

MASTER WATER METER
INSTALLATION DETAIL - 3" to 10"

SCALE: N.T.S.
DATE: January 2011

W-26



MATERIALS

ITEM	QUAN.	DESCRIPTION
1	1	REDUCED PRESSURE ZONE DEVICE/DOUBLE CHECK VALVE
2	4	BRASS 90° (DOMESTIC MADE)
3	1	STRAINER W/ RPZ DEVICE/DOUBLE CHECK VALVE
4	4	BRASS NIPPLE (DOMESTIC MADE)
5	1	PIPE SUPPORT
6	2	BRASS PLUGS INSERTED IN TEST COCKS
7		6" GRAVEL & DRAIN
8		POLYETHYLENE PIPE WITH COMPRESSION FITTINGS
9	*	CITY APPROVED ENCLOSURE WITH HATCH COVER FOR BFP
10	2	CUT BRASS (DOMESTIC MADE)
11	2	UNION

* REQUIRED BY THE CITY FOR FREEZE PROTECTION

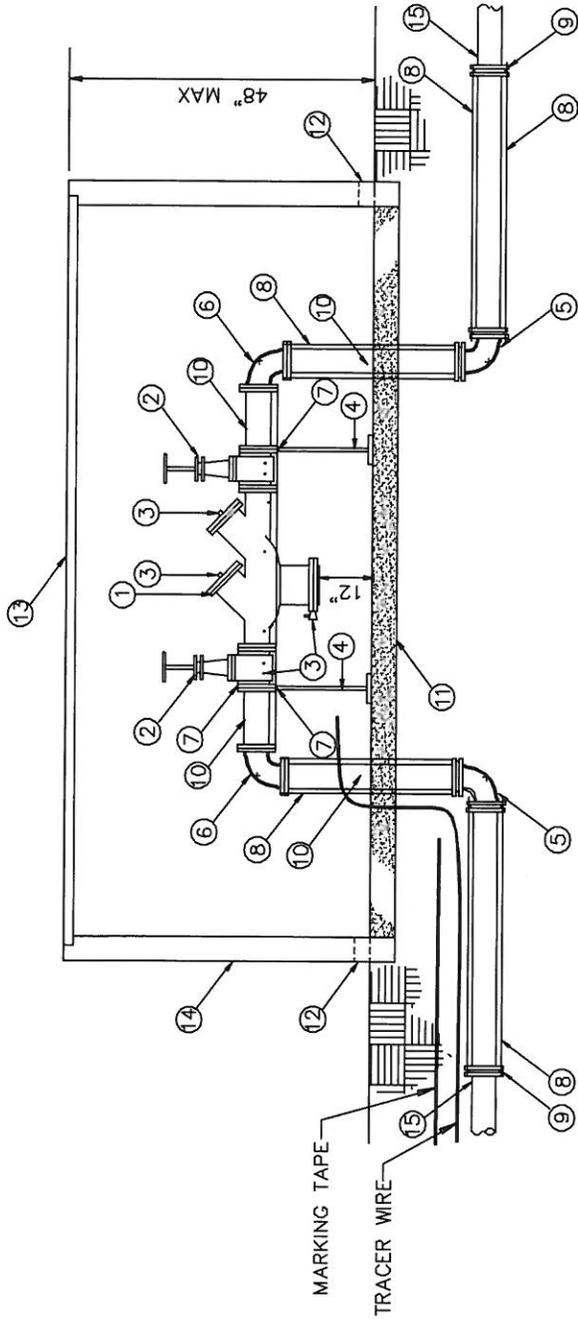
CITY OF POOLER
2011 STANDARD DETAIL

BACKFLOW PREVENTER DETAIL
3/4", 1", 1-1/2", 2"

SCALE: N.T.S.

DATE: January 2011

W-28



MATERIALS

ITEM	QUAN	DESCRIPTION
1	1	REDUCED PRESSURE ZONE DEVICE/DDCV, DCV
2	2	O.S & Y RESILIENT GATE VALVES
3	4	TEST COCKS
4	2	2" GALV. PIPE STAND & BASE BOLTED TO FLANGE
5	2	MJ 90° BENDS
6	4	FLANGED 90° BENDS
7	2	COMPANION FLANGES
8	8	3/4" DIA. GALV. OR CADMIUM ALL THREAD ROD
9	16	CARBON STEEL EYE BOLTS
10		DUCTILE IRON PIPE, CUT TO FIT
11		4" PEA GRAVEL IN BOTTOM OF PIT OR CONCRETE SLAB WITH DRAIN SUMP
12	2	DRAIN PORTS
13		3/8 ALUMINUM FLOOR PLATE
14		BOX-MASONRY BLOCK, POURED CONCRETE OR PREFABRICATED BOX, APPROVED BY CITY
15		DUCTILE IRON PIPE

1. FOR FINAL APPROVAL, ASSEMBLY MUST BE CENTERED IN ENCLOSURE (IF APPLICABLE). UNDER NO CONDITIONS WILL ANY CONNECTIONS BE ALLOWED BETWEEN THE SERVICE METER AND A BACKFLOW PREVENTER USED FOR THE SYSTEM CONTAINMENT. BACKFLOW PREVENTER SHALL ALWAYS BE INSTALLED DOWNSTREAM OF METER.
2. IF A PRESSURE MONITOR IS TO BE INSTALLED, ADD A TEE, VALVE, FITTINGS, AND MOUNT ON SUPPLY SIDE PRIOR TO BACKFLOW PREVENTER. UNDER NO CIRCUMSTANCE SHALL TEST PORTS BE MODIFIED OR UTILIZED FOR THIS OR OTHER APPLICATIONS, OTHER THAN BACKFLOW DEVICE TESTING.

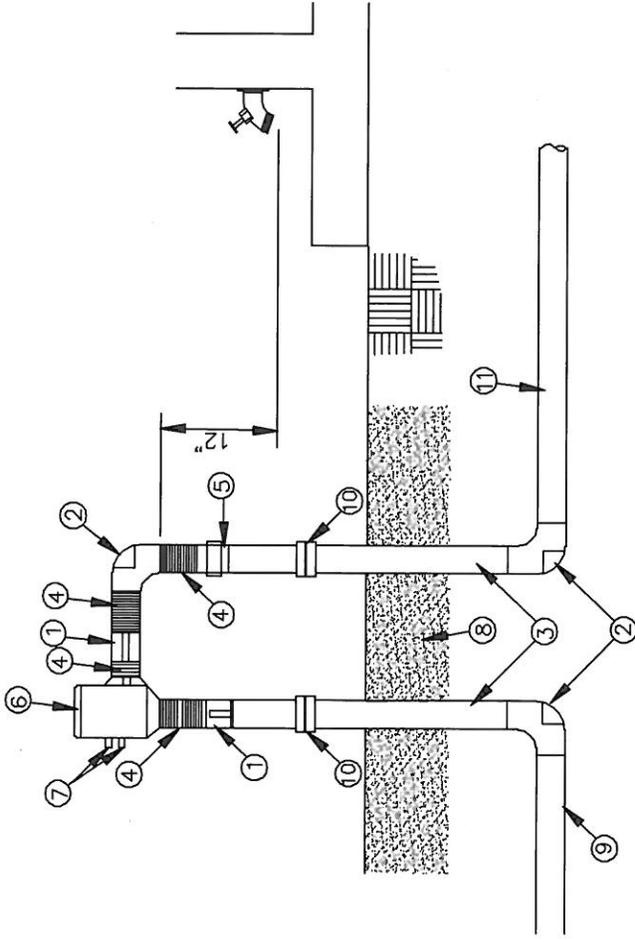
CITY OF POOLER
2011 STANDARD DETAIL

REDUCED PRESSURE ZONE DEVICE/DOUBLE CHECK
VALVE - TYPICAL OUTSIDE INSTALLATION DETAIL
(3", 4", 6", 8", & 10" SIZES)

SCALE: N.T.S.

DATE: August 2006

W-29



NOTES:

1. THE PRESSURE VACUUM BREAKER (PVB) CANNOT BE INSTALLED WHERE IT WILL BE SUBJECTED TO BACKPRESSURE. PVB SHOULD NOT BE USED AGAINST CONTAMINANTS. ONLY RPZ'S OR AIR GAPS.
2. EACH PVB SHALL BE INSTALLED IN ACCESSIBLE LOCATION TO FACILITATE INSPECTION AND SERVICING.
3. EACH PVB SHALL BE INSTALLED ON THE LINE TO THE IRRIGATION SYSTEM AND AT LEAST 12 INCHES ABOVE THE HIGHEST SPRINKLER HEAD OR OUTLET. (VALVES MAY BE LOCATED DOWNSTREAM FROM THE DEVICE).
4. APPROVED ENCLOSURE REQUIRED BY THE CITY FOR FREEZE PROTECTION. SEE W-28.

MATERIALS

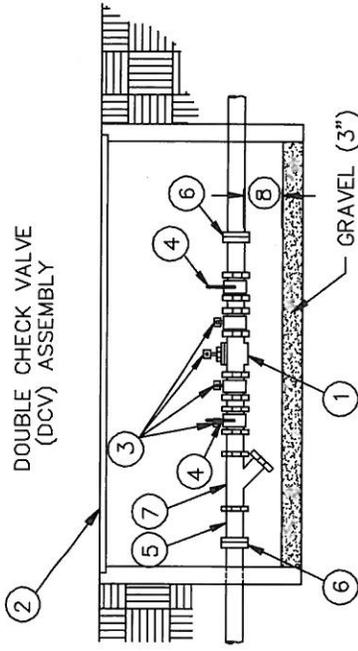
ITEM	QUAN	DESCRIPTION
1	2	BALL VALVE
2	3	BRASS ELBOWS (DOMESTIC MADE)
3		BRASS CUT TO LENGTH
4	4	CLOSE BRASS NIPPLES
5	1	BRASS UNION
6	1	PRESSURE VACUUM BREAKER
7	2	BRASS PLUGS INSERTED IN TEST COCKS
8		GRAVEL
9		BRASS (DOMESTIC MADE)
10	2	UNION
11		SCH 40 PVC

VACUUM BREAKER BACKFLOW PREVENTER
 TYPICAL OUTSIDE INSTALLATION
 (3/4", 1", 1-1/2" & 2" SIZES)

CITY OF POOLER
 2011 STANDARD DETAIL

SCALE: N.T.S.
 DATE: January 2011

W-30



MATERIALS	
ITEM	DESCRIPTION
1	DOUBLE CHECK VALVE ASSEMBLY
2	JUMBO METER BOX
3	TEST COCKS
4	FULL PORT BALL VALVES
5	BRASS
6	UNION
7	STRAINER
8	MINIMUM 6" CLEARANCE

INSTALLATION INSTRUCTIONS:

THE DCV ASSEMBLY SHALL NOT BE BURIED IN EARTH, BUT MAY BE INSTALLED IN A UTILITY BOX ADJACENT TO OR AS CLOSE AS PRACTICAL TO, THE OUTLET SIDE OF THE METER. UNDER NO CONDITION WILL ANY CONNECTION BE ALLOWED BETWEEN THE SERVICE METER AND A BACKFLOW PREVENTER USED FOR SYSTEM CONTAINMENT

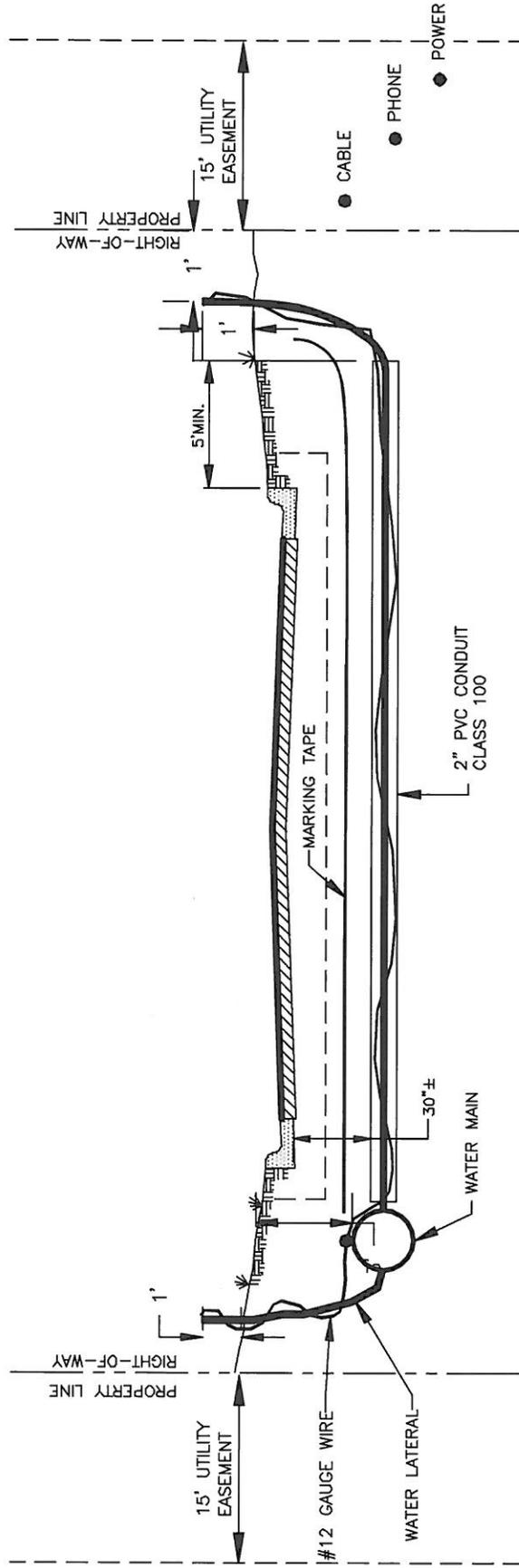
NOTES:

- FOR FINAL APPROVAL, ASSEMBLY MUST BE CENTERED IN ENCLOSURE. INSTALLER MUST PROVIDE FOR THERMAL EXPANSION WITHIN THE PROJECT
- PVC PIPE CAN BE USED IN THIS APPLICATION ONLY BECAUSE THE DEVICE IS INSTALLED DIRECTLY IN LINE WITH THE METER AND SUPPLY LINE. IF NOT DIRECTLY IN LINE WITH THE METER, BRASS (DOMESTIC MADE) WILL BE REQUIRED.
- THIS ASSEMBLY SHALL ONLY BE USED IN SPECIAL CIRCUMSTANCES APPROVED BY THE CITY.

CITY OF POOLER
2011 STANDARD DETAIL

DOUBLE CHECK VALVE ASSEMBLY
TYPICAL OUTSIDE INSTALLATION
(3/4" THROUGH 2" SIZES)

SCALE: N.T.S.
DATE: January 2011



CITY OF POOLER
 2011 STANDARD DETAIL

WATER LATERAL CONDUIT DETAIL

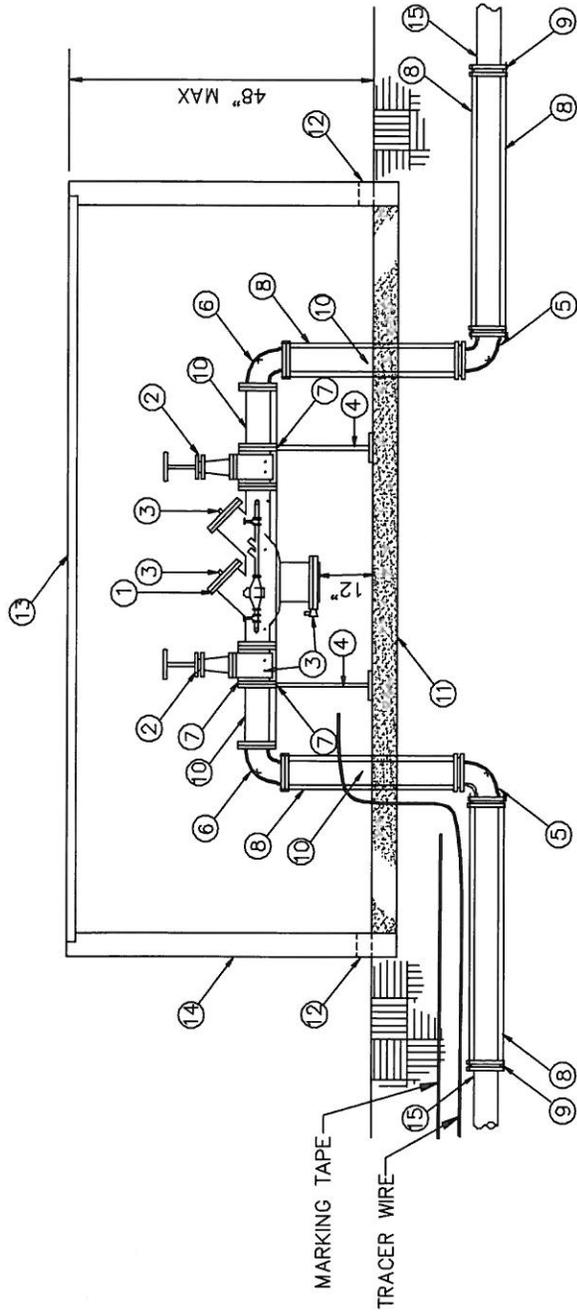
SCALE:

N.T.S.

DATE:

January 2011

W-32



MATERIALS

ITEM	QUAN.	DESCRIPTION
1	1	REDUCED PRESSURE DETECTOR ASSEMBLY
2	2	O.S. & Y RESILIENT GATE VALVES
3	4	TEST COCKS
4	2	2" GALV. PIPE STAND & BASE BOLTED TO FLANGE
5	2	MJ 90° BENDS
6	4	FLANGED 90° BENDS
7	2	COMPANION FLANGES
8	8	3/4" DIA. GALV. OR CADMIUM ALL THREAD ROD
9	16	CARBON STEEL EYE BOLTS
10		DUCTILE IRON PIPE, CUT TO FIT
11		4" PEA GRAVEL IN BOTTOM OF PIT OR CONCRETE SLAB WITH DRAIN SUMP
12	2	DRAIN PORTS
13		3/8 ALUMINUM FLOOR PLATE
14		BOX-MASONRY BLOCK, POURED CONCRETE OR PREFABRICATED BOX APPROVED BY CITY
15		DUCTILE IRON PIPE

1. FOR FINAL APPROVAL, ASSEMBLY MUST BE CENTERED IN ENCLOSURE (IF APPLICABLE). UNDER NO CONDITIONS WILL ANY CONNECTIONS BE ALLOWED BETWEEN THE SERVICE METER AND A BACKFLOW PREVENTER USED FOR THE SYSTEM CONTAINMENT. BACKFLOW PREVENTER SHALL ALWAYS BE INSTALLED DOWNSTREAM OF METER. IF DETECTOR CHECK IS ON A FIRE SYSTEM, NO METER WILL BE REQUIRED.
2. IF A PRESSURE MONITOR IS TO BE INSTALLED, ADD A TEE, VALVE, FITTINGS, AND MOUNT ON SUPPLY SIDE PRIOR TO BACKFLOW PREVENTER. UNDER NO CIRCUMSTANCE SHALL TEST PORTS BE MODIFIED OR UTILIZED FOR THIS OR OTHER APPLICATIONS, OTHER THAN BACKFLOW DEVICE TESTING.
3. APPLICABLE TO TALL BUILDINGS OVER TWO STORIES AND ESTABLISHMENTS WITH HAZARDOUS CONTAMINATIONS.

CITY OF POOLER
2011 STANDARD DETAIL

REDUCED PRESSURE DETECTOR ASSEMBLY
FOR FIRE SYSTEM

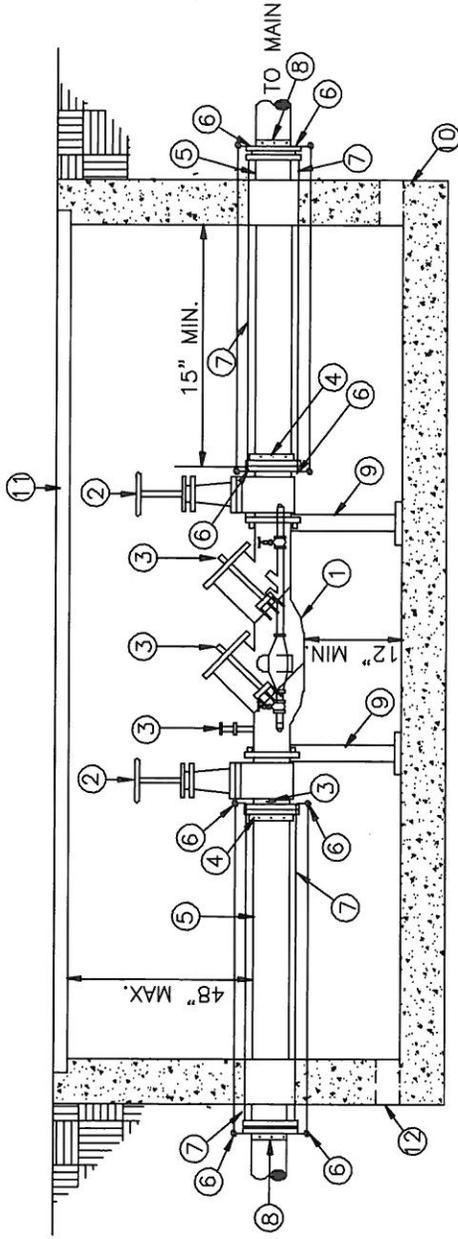
SCALE:

N.T.S.

DATE:

August 2006

W-33



NOTES:

1. FOR FINAL APPROVAL, ASSEMBLY MUST BE CENTERED IN ENCLOSURE (IF APPLICABLE). UNDER NO CONDITION WILL ANY CONNECTION BE ALLOWED BETWEEN THE SERVICE METER AND A BACKFLOW PREVENTER USED FOR THE SYSTEM CONTAINMENT. BACKFLOW PREVENTER SHALL ALWAYS BE INSTALLED DOWNSTREAM OF METER. IF DETECTOR CHECK IS ON A FIRE SYSTEM, NO METER WILL BE REQUIRED.
2. IF A PRESSURE MONITOR IS TO BE INSTALLED, ADD A TEE, VALVE, FITTINGS, AND MOUNT ON SUPPLY SIDE PRIOR TO BACKFLOW PREVENTER; UNDER NO CIRCUMSTANCE SHALL TEST PORTS BE MODIFIED OR UTILIZED FOR THIS OR OTHER APPLICATION, OTHER THAN BACKFLOW DEVICE TESTING.
3. IF ADDITIONAL SIAMESE CONNECTION IS REQUIRED FOR FIRE SERVICE, SEE DETAIL W51.

MATERIALS

ITEM	QUAN.	DESCRIPTION
1	1	DOUBLE DETECTOR CHECK VALVE ASSEMBLY
2	2	OS&Y RESILIENT SEAT GATE VALVES
3	4	TEST COCKS
4	2	COMPANION FLANGE
5		DUCTILE IRON PIPE, CUT TO FIT
6	8	CARBON STEEL EYE BOLTS
7	4	3/4 GALV. ALL THREAD ROD
8	2	MEGA LUG OR EQUIVALENT FOR DUCTILE PIPE
9	2	2" SCH. 40 GALV. PIPE STAND & BASE BOLTED TO FLANGE
10		PIT-CEMENT BLOCK, POURED CONCRETE, OR PREFABRICATED BOX PER CITY SPECS.
11		3/8 ALUMINUM FLOOR PLATE
12	2	DRAIN PORTS, SIZE ACCORDING TO PIPE SIZE

TYPICAL OUTSIDE INSTALLATION
(2", 3", 4", 6", 8", & 10" SIZES)

CITY OF POOLER
2011 STANDARD DETAIL

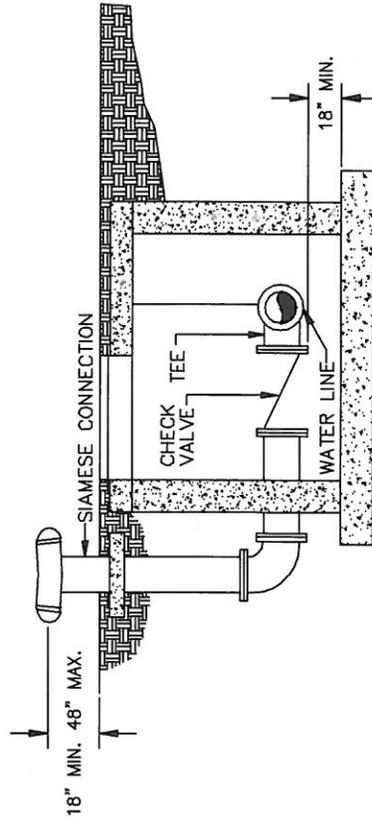
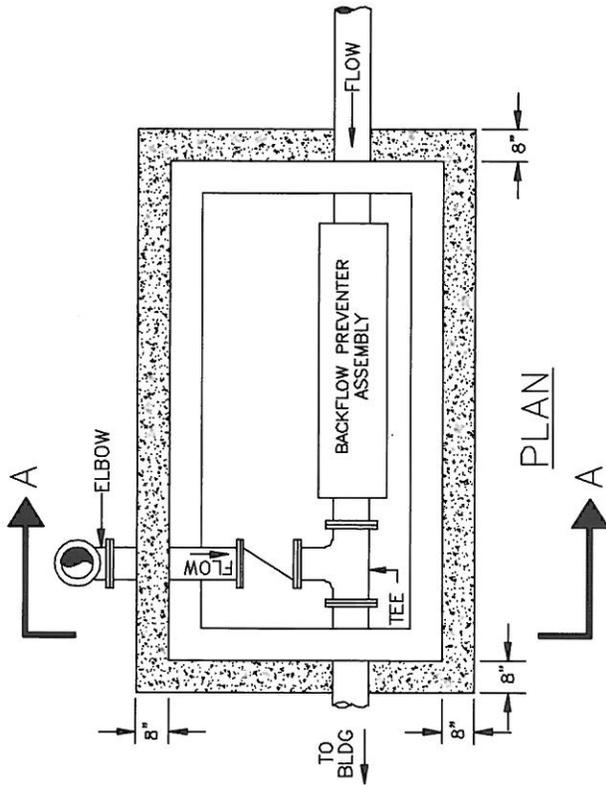
DOUBLE DETECTOR CHECK VALVE
ASSEMBLY FOR FIRE SYSTEM

SCALE:

N.T.S.

DATE:
August 2006

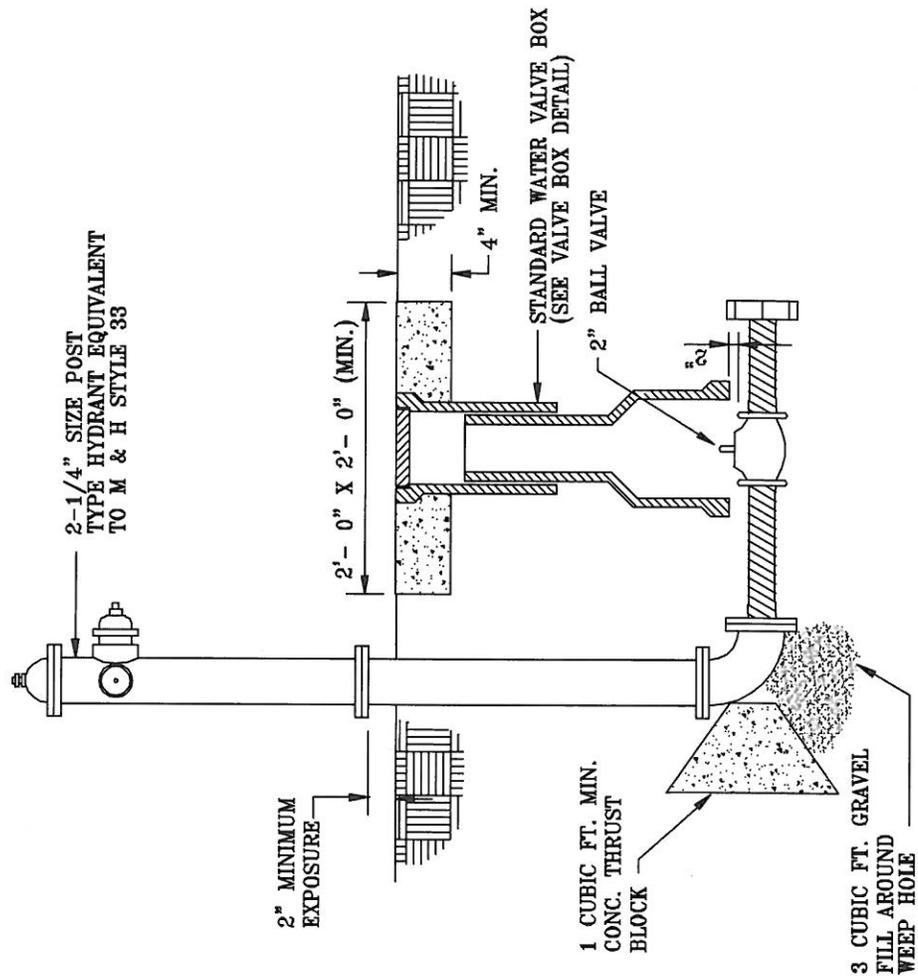
W-35



SECTION A-A

NOTES:

1. THE VALVE PIT SHALL BE SIZED TO ACCOMMODATE ALL PROPOSED EQUIPMENT.
2. THERE SHALL BE NO SHUTOFF VALVE IN THE FIRE SERVICE CONNECTION (PER NFPA 13).
3. ALL FITTINGS SHALL BE FLANGED.
4. ALL PIPING SHALL BE STEEL OR DUCTILE IRON.
5. SEE SITE PLANS FOR SIZES OF PIPES AND FITTINGS. SIAMESE CONNECTION TO BE IN ACCORDANCE WITH NFPA 13.
6. PROVIDE DRAINAGE AWAY FROM STRUCTURE.



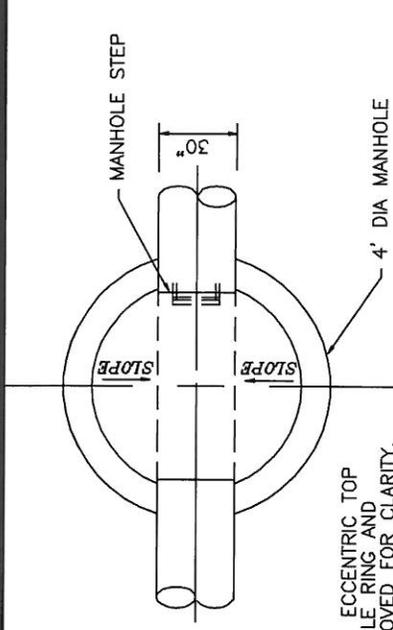
CITY OF POOLER
2011 STANDARD DETAIL

POST HYDRANT DETAIL

SCALE: N.T.S.

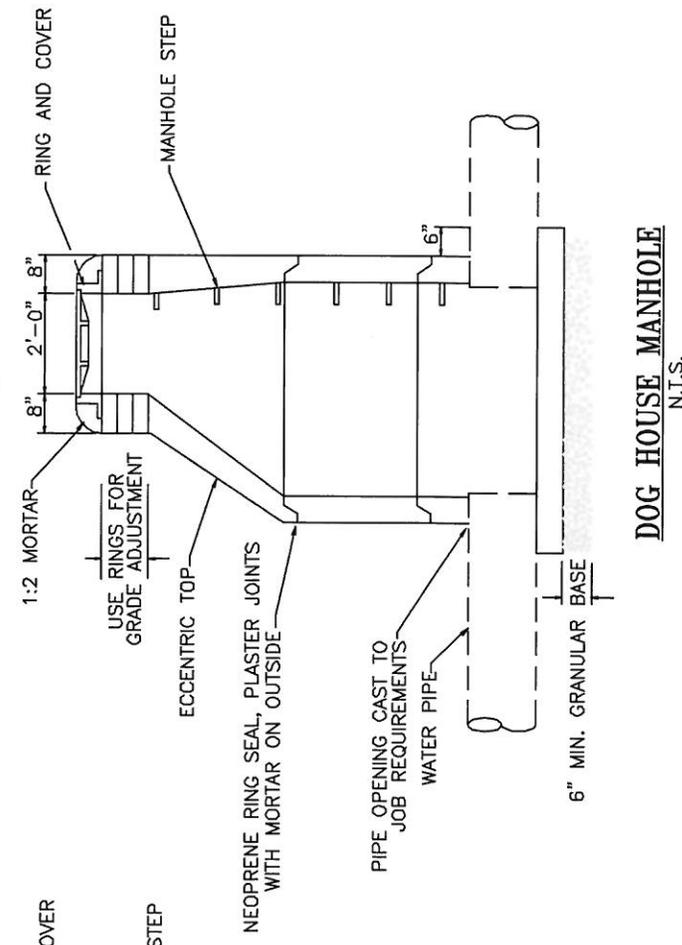
DATE: January 2011

W-37

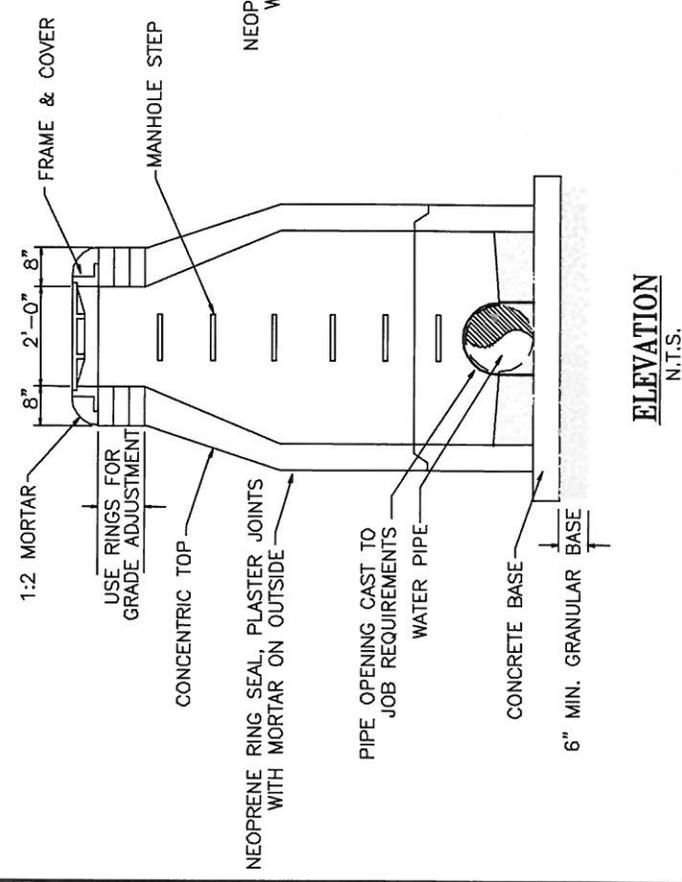


NOTE: THE ECCENTRIC TOP AND MANHOLE RING AND COVER REMOVED FOR CLARITY.

PLAN
N.T.S.



DOG HOUSE MANHOLE
N.T.S.



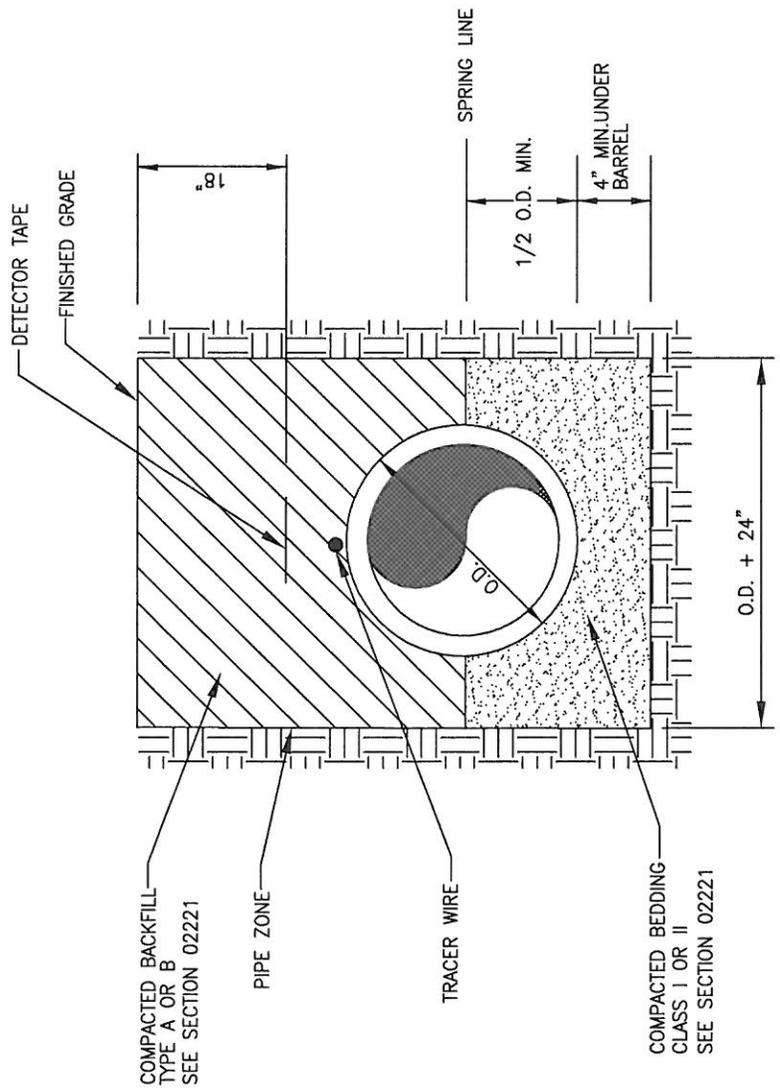
ELEVATION
N.T.S.

**DOGHOUSE MANHOLE FOR
WATER CONNECTION**

SCALE: N.T.S.
DATE: January 2011

**CITY OF POOLER
2011 STANDARD DETAIL**

W-38



TYPICAL BEDDING FOR PIPE

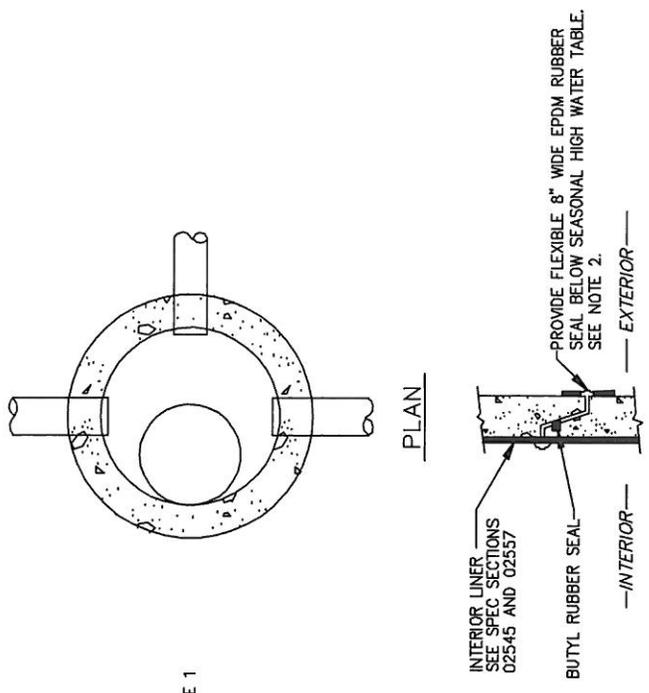
- NOTES:
1. SEE STANDARD DRAWING P-13 FOR PAVEMENT RESTORATION.
 2. TYPE A BACKFILLING SHALL BE USED UNDER ALL PAVED AREAS. TYPE B BACKFILL SHALL BE USED IN ALL OTHER AREAS.
 3. APPLIES TO DIP, PVC, & HDPE PIPE MATERIALS.

CITY OF POOLER 2011 STANDARD DETAIL	PIPE BEDDING DETAIL		SCALE: N.T.S.	W-39
			DATE: June 2012	

CITY OF POOLER

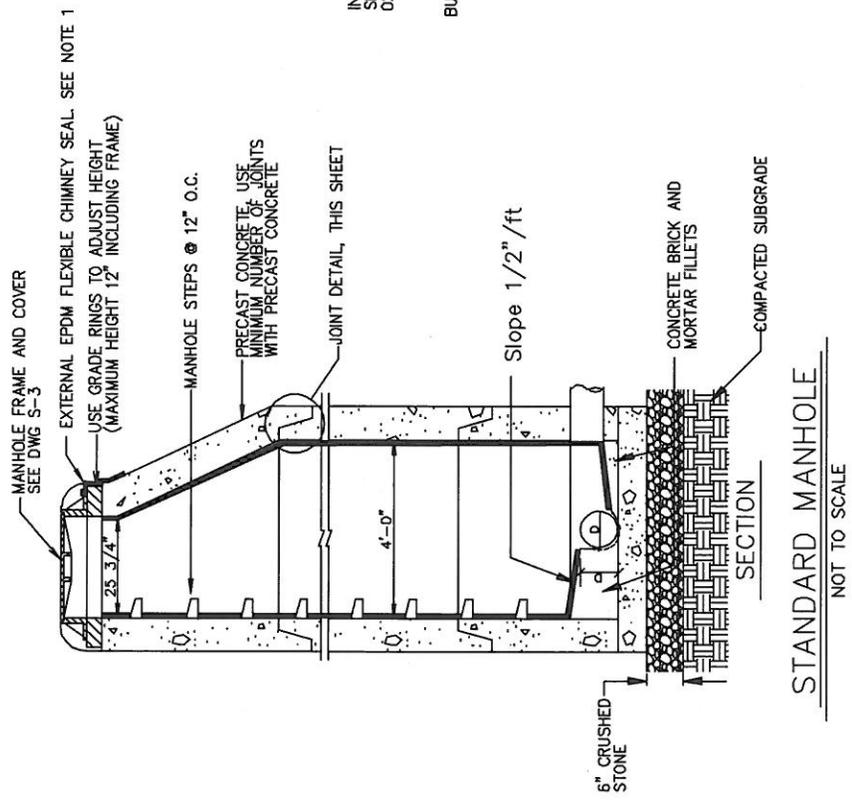
WASTEWATER COLLECTION SYSTEM DETAILS

<u>Number</u>	<u>Description</u>
S-1	Standard Manhole
S-2	Manhole Step Detail
S-3	Manhole Cover & Frame Detail
S-4	Force Main Drop Manhole
S-5	Force Main Drop into Shallow Manhole
S-6	Air Release Valve
S-7	Outside Drop into New Manhole
S-8	Inside Drop into Existing Manhole
S-9	Concrete Thrust Blocking
S-10	Valve Detail
S-11	Jack & Bore Detail
S-12	Pipe Bedding Detail
S-13	Grease Trap Detail
S-14	Sewer Lateral Detail
S-15	Chain Link Fence Detail
S-16	Lift Station Plan Detail
S-17	Lift Station Section Detail
S-18	Watertight Double Door Access Frame and Cover Detail
S-19	Typical Lift Station Site Plan
S-20	Non Freeze Yard Hydrant Detail
S-21	By-Pass Connection Detail
S-22	Doghouse Manhole for Sewer Force Main Connection
S-23	Private Sewer Lateral Detail



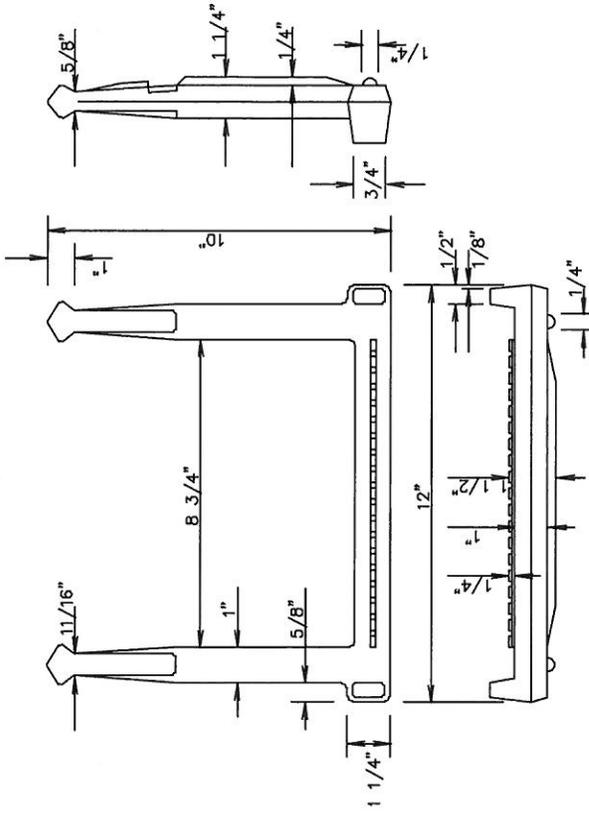
NOTES:

1. SEE STANDARD SPECIFICATION SECTION 02720 FOR CHIMNEY SHIELD REQUIREMENTS.
2. SEE STANDARD SPECIFICATION SECTION 02720 FOR RUBBER SHIELD REQUIREMENTS.

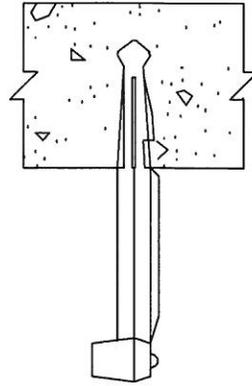


STANDARD MANHOLE
NOT TO SCALE

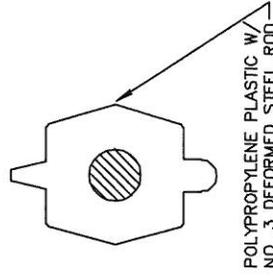
CITY OF POOLER 2011 STANDARD DETAIL	STANDARD MANHOLE		S-01
	SCALE: N.T.S.	DATE: August 2006	



MANHOLE STEPS SHALL BE M.A. IND., INC.
 MODEL NO. PST OR AN APPROVED EQUAL



STEPS SHALL BE PLACED INTO
 WET CONCRETE WALL DURING
 MANUFACTURE, OR HAND DRIVEN
 INTO PREFORMED HOLES AFTER
 CONCRETE HAS CURED.



POLYPROPYLENE PLASTIC W/
 NO. 3 DEFORMED STEEL ROD

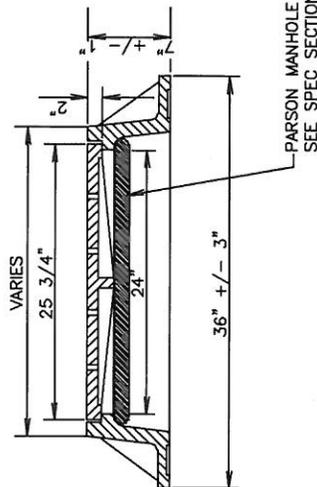
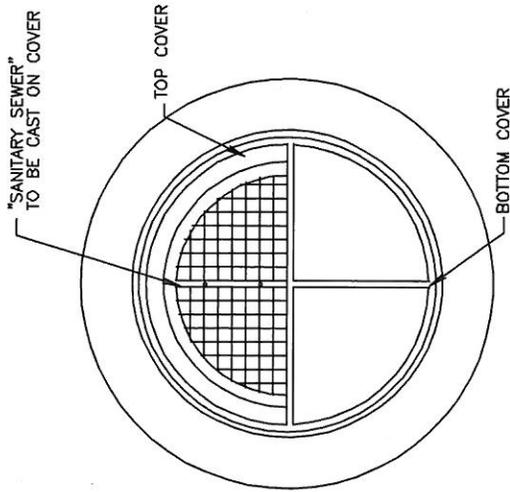
CITY OF POOLER
 2011 STANDARD DETAIL

MANHOLE STEP DETAIL

SCALE: N.T.S.

DATE: October 2001

S-02



NOTES:

- 1: CASTINGS SHALL BE OF UNIFORM QUALITY, FREE FROM BLOWHOLES, POROSITY, HARD SPOTS, SHRINKAGE, DISTORTION OR OTHER DEFECTS THEY SHALL BE SMOOTH AND WELL CLEANED BY SHOTBLASTING OR BY SOME OTHER APPROVED METHOD. CASTING SHALL NOT BE PAINTED.
- 2: MATERIALS USED IN THE MANUFACTURE OF CASTINGS SHOULD CONFORM TO AASHO M105/ASTM A48, CLASS 35B OF ASTM A48, CLASS 3D, FOR GRAY IRON.
- 3: ALL CASTINGS SHALL BE MANUFACTURED TRUE TO PATTERN: COMPONENT PARTS SHALL FIT TOGETHER IN A SATISFACTORY MANNER, ROUND FRAMES AND COVERS SHALL BE OF NON-ROCKING DESIGN, OR SHALL HAVE MACHINED BEARING SURFACES TO PREVENT ROCKING AND RATTLING UNDER TRAFFIC. FRAME SHALL BE SUITABLE FOR CAST IRON OR STEEL RISER RING FOR UPWARD ADJUSTMENT OF COVER. CLEAR OPENING SHALL BE 24".
- 4: MANHOLE COVER SHALL BE 25-3/4" IN DIAMETER AND SHALL BE 2-INCHES THICK AT THE BEARING SURFACE.
- 5: CASTINGS SHALL BE PROVIDED WITH THE INSCRIPTION "SANITARY SEWER" CAST INTO THE COVER IN LETTERING AT LEAST 2-INCHES HIGH. MANUFACTURER'S NAME, IF IT APPEARS ON THE COVER, SHALL BE CONFINED TO THE PERIPHERY.
- 6: MANHOLE COVERS AND FRAMES SHALL BE USF 227, TYPE "AS" OR EQUAL.

CITY OF POOLER
2011 STANDARD DETAIL

MANHOLE COVER & FRAME DETAIL

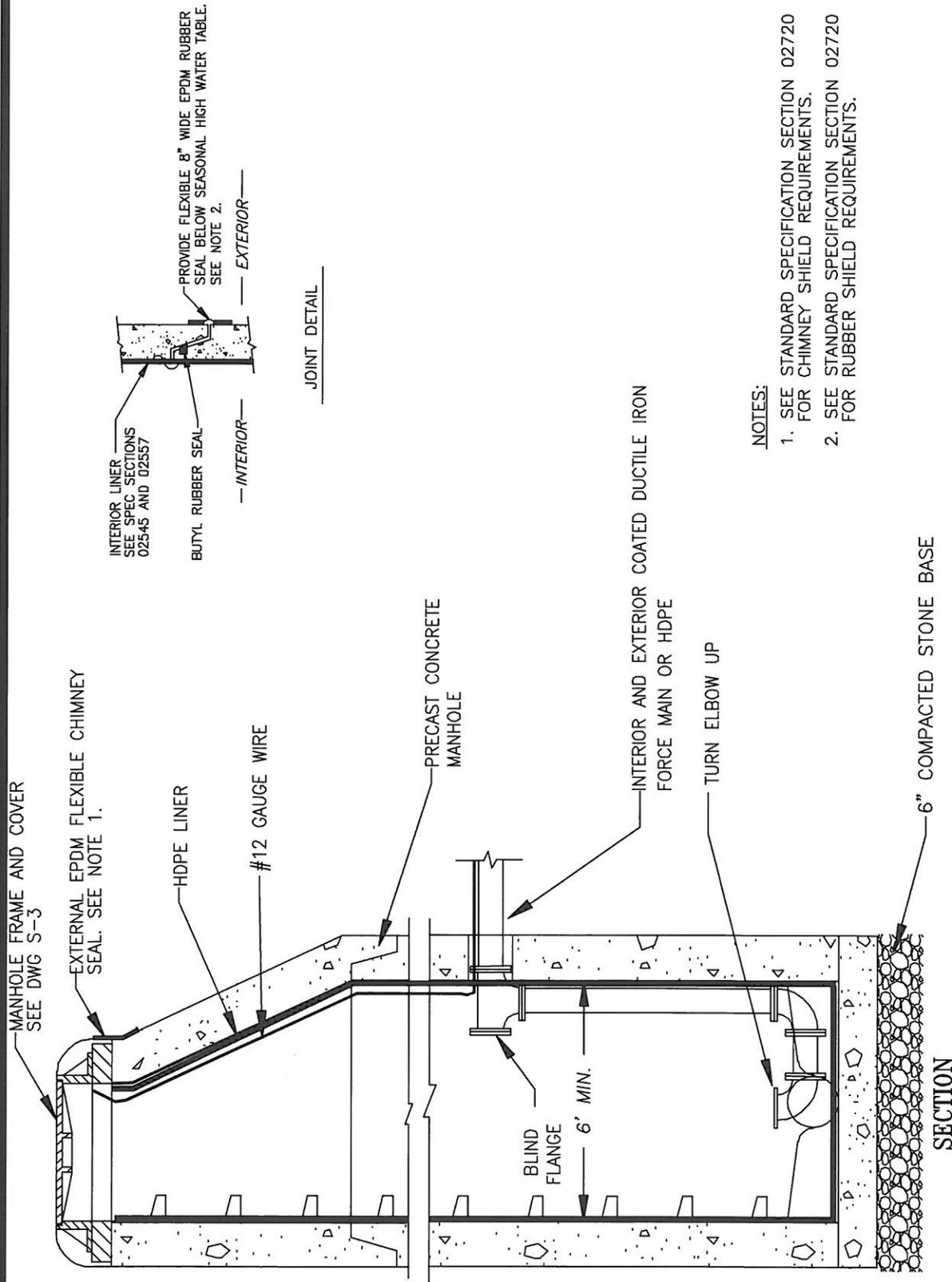
SCALE:

N.T.S.

DATE:

August 2006

S-03



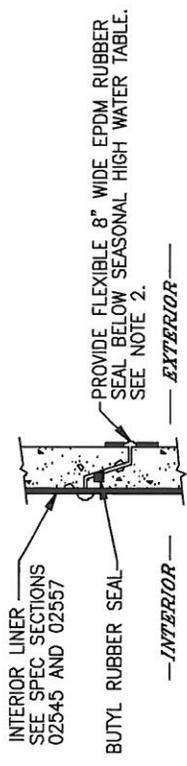
NOTES:

1. SEE STANDARD SPECIFICATION SECTION 02720 FOR CHIMNEY SHIELD REQUIREMENTS.
2. SEE STANDARD SPECIFICATION SECTION 02720 FOR RUBBER SHIELD REQUIREMENTS.

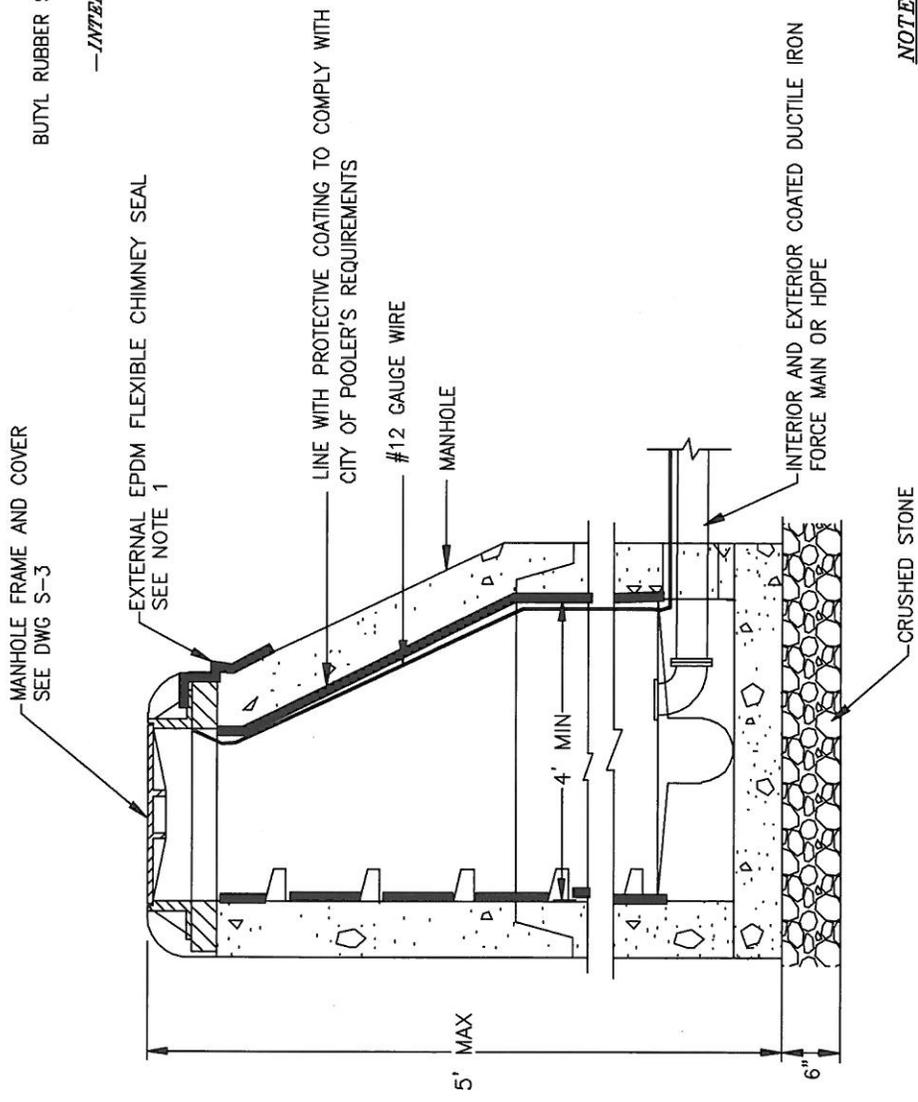
SCALE:	N.T.S.
DATE:	August 2006

FORCEMAIN DROP INTO MANHOLE

CITY OF POOLER
2011 STANDARD DETAIL



JOINT DETAIL

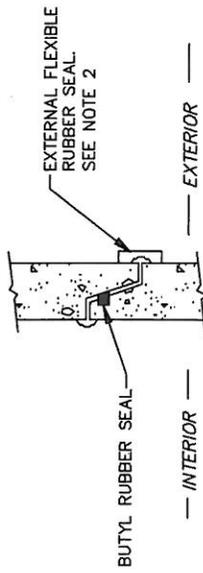


SECTION

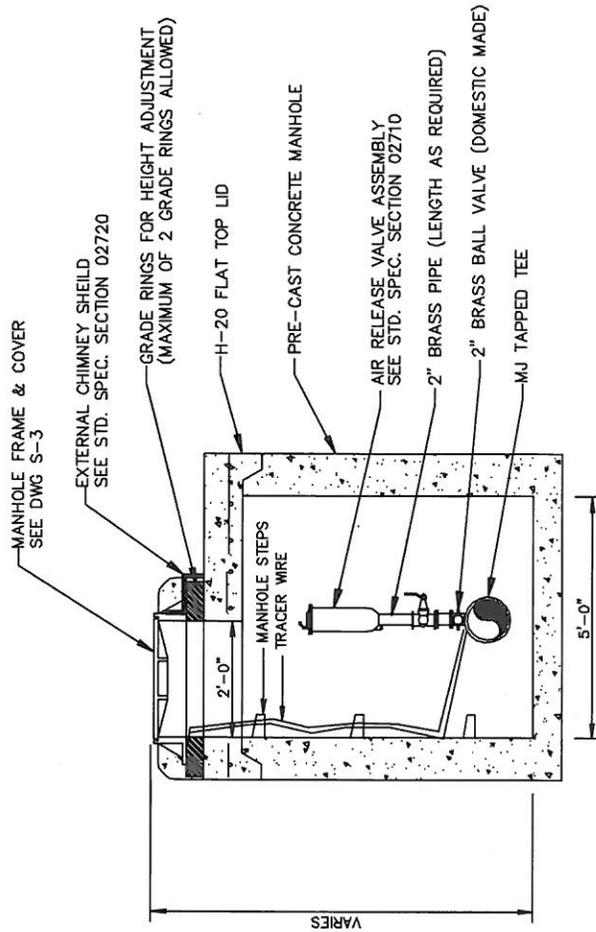
NOTES:

1. SEE STANDARD SPECIFICATION SECTION 02720 FOR CHIMNEY SHIELD REQUIREMENTS.
2. SEE STANDARD SPECIFICATION SECTION 02720 FOR FLEXIBLE RUBBER SHIELD REQUIREMENTS.

<p>CITY OF POOLER 2011 STANDARD DETAIL</p>	<p>FORCEMAIN INTO SHALLOW MANHOLE</p>	<p>SCALE: N.T.S.</p>	<p>S-05</p>
		<p>DATE: August 2006</p>	



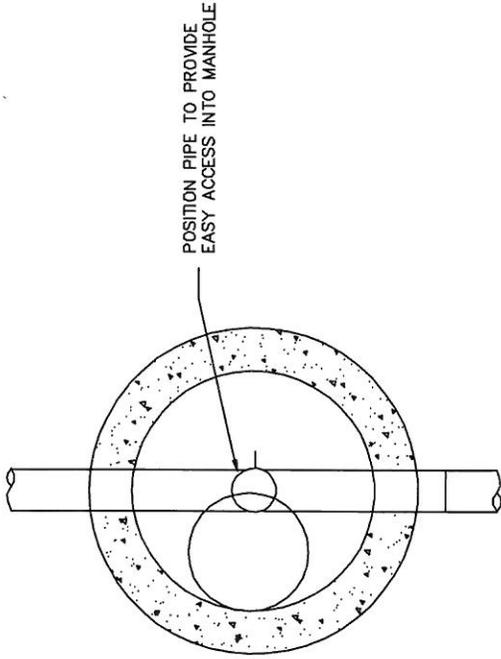
JOINT DETAIL



SECTION

AIR RELEASE VALVE IN MANHOLE

NOT TO SCALE



PLAN

NOTE:

1. SET MANHOLE COVER 2" ABOVE NATURAL GRADE OR FLUSH WITH PAVING.
2. SEE STANDARD SPEC. SECTION 02700 FOR RUBBER SEAL REQUIREMENTS.

SCALE

N.T.S.

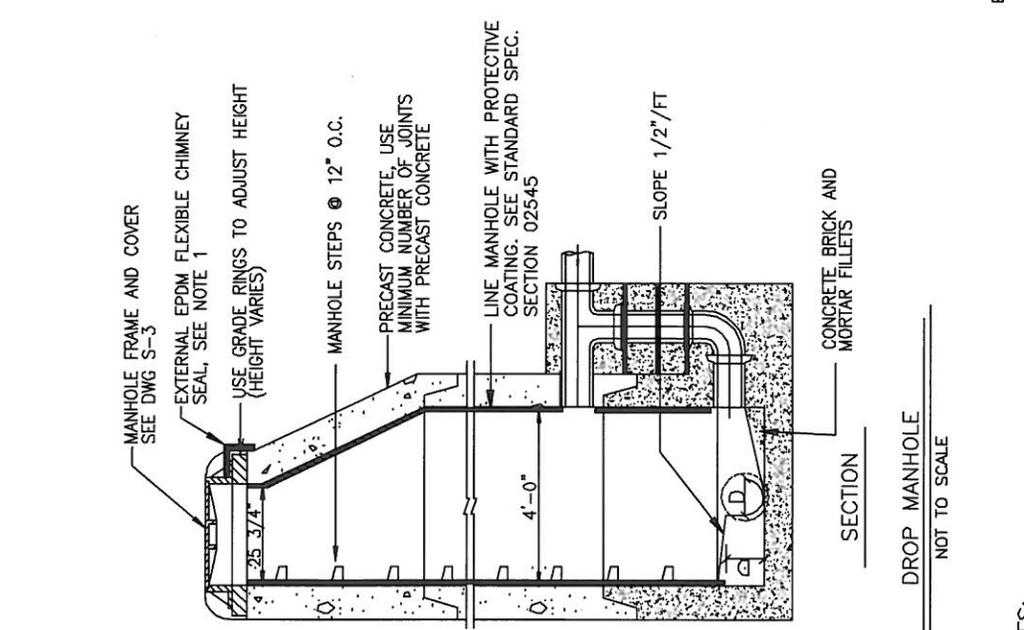
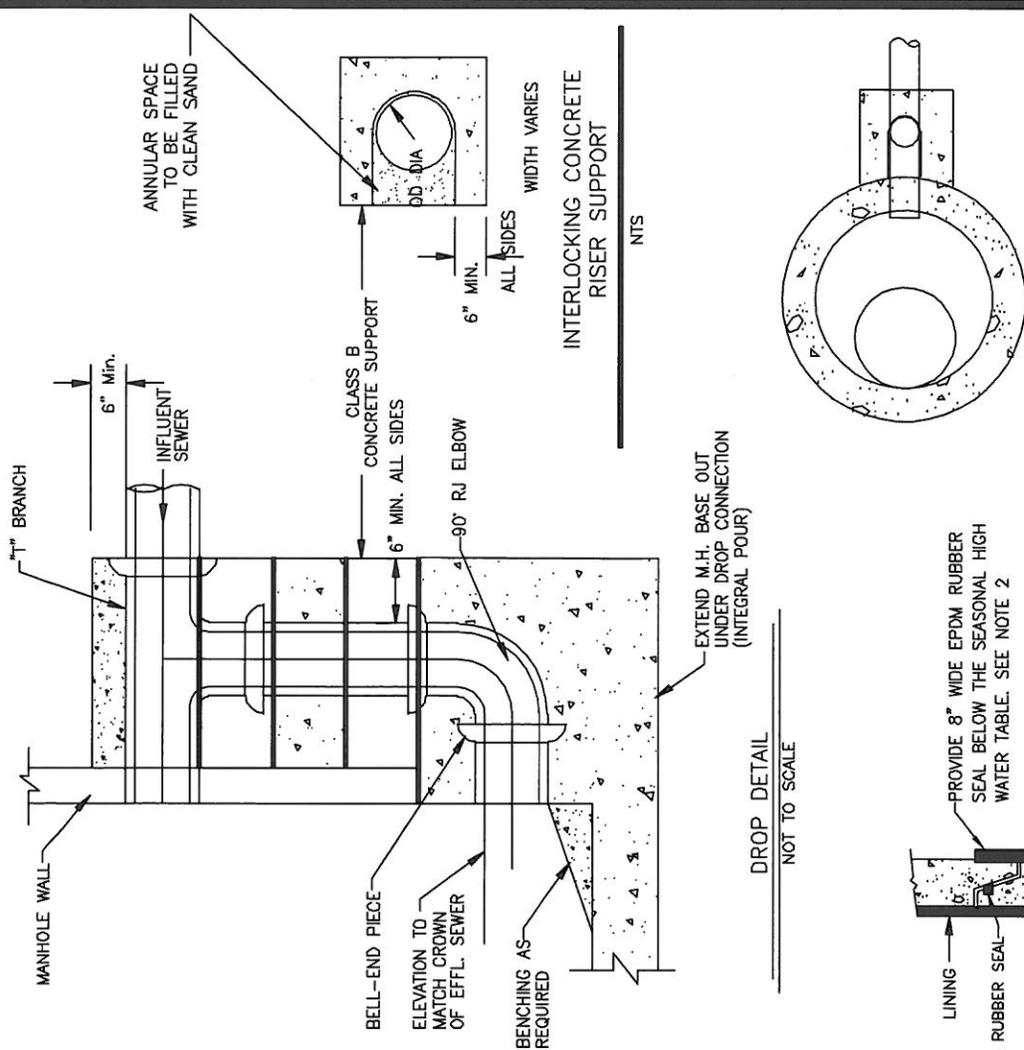
DATE

August 2006

AIR RELEASE VALVE

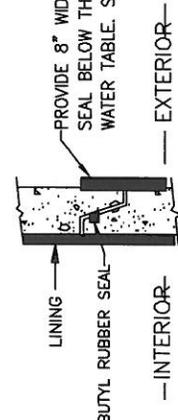
S-06

CITY OF POOLER
2011 STANDARD DETAIL



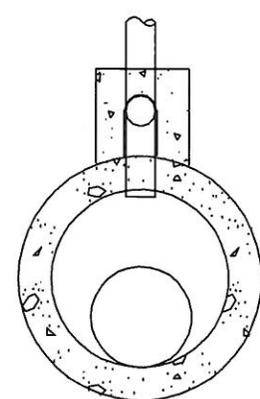
NOTES:
 1. SEE STANDARD SPECIFICATION SECTION 02720 FOR CHIMNEY SHIELD REQUIREMENTS.
 2. SEE STANDARD SPECIFICATION SECTION 02720 FOR FLEXIBLE RUBBER SHIELD REQUIREMENTS.

DROP MANHOLE
 NOT TO SCALE



JOINT DETAIL

DROP DETAIL
 NOT TO SCALE



INTERLOCKING CONCRETE RISER SUPPORT
 NTS

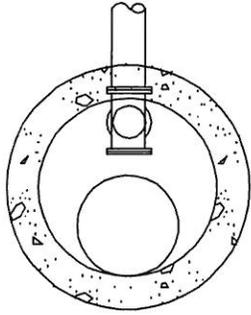
PLAN

CITY OF POOLER
 2011 STANDARD DETAIL

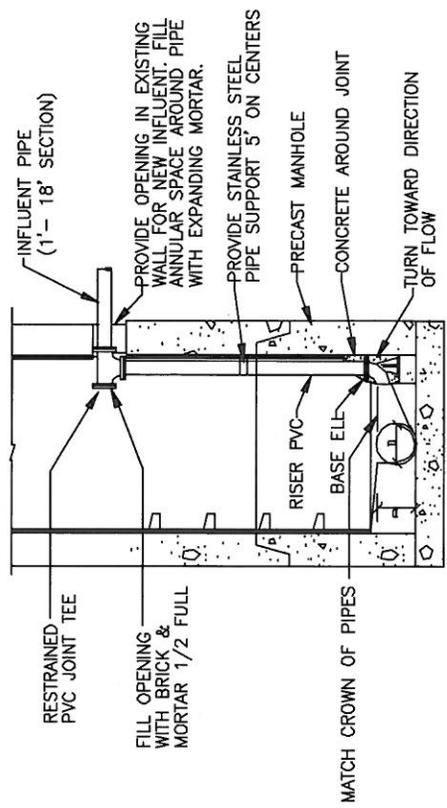
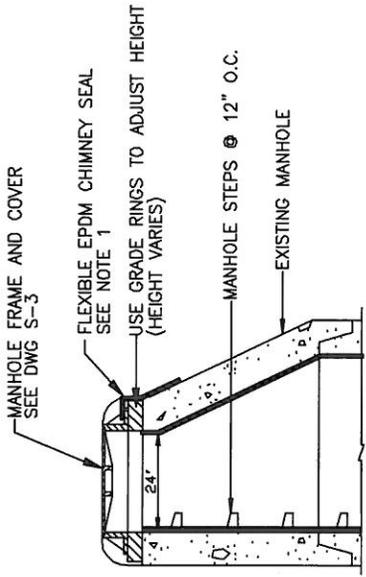
OUTSIDE DROP
 INTO NEW MANHOLE

SCALE: N.T.S.
 DATE: January 2011

S-07



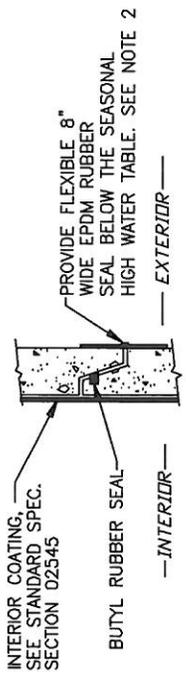
PLAN



SECTION

INSIDE DROP MANHOLE

NOT TO SCALE



JOINT DETAIL

NOTES:

1. SEE STANDARD SPECIFICATION SECTION 02720 FOR CHIMNEY SHIELD REQUIREMENTS.
2. SEE STANDARD SPECIFICATION SECTION 02720 FOR RUBBER SHIELD REQUIREMENTS.

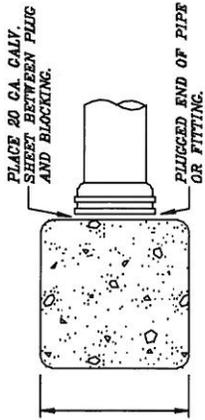
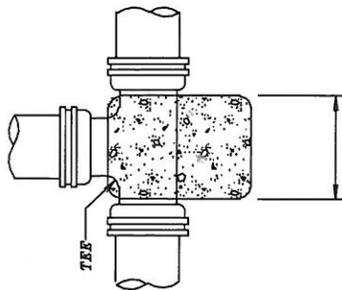
CITY OF POOLER
2011 STANDARD DETAIL

INSIDE DROP
INTO EXISTING MANHOLE

SCALE: N.T.S.

DATE: January 2011

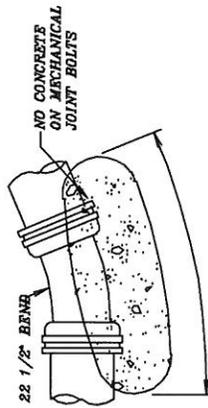
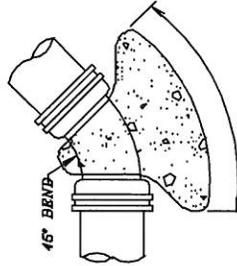
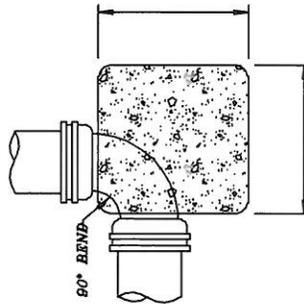
S-08



NOTE: CONCRETE THRUST BLOCKING SHALL ONLY BE USED WHERE MECHANICAL RESTRAINTS ARE NOT FEASIBLE. PRIOR APPROVAL MUST BE OBTAINED FROM CITY OF POOLER PRIOR TO USING THRUST BLOCKING.

PIPE	AREA AGAINST UNDISTURBED SOIL
2"	1'-0" ± 1'-0"
4"	1'-8" ± 1'-2"
6"	1'-8" ± 1'-8"
8"	1'-9" ± 1'-9"
10"	2'-2" ± 2'-2"
12"	2'-8" ± 2'-8"

PIPE	AREA AGAINST UNDISTURBED SOIL
2"	1'-0" ± 1'-0"
4"	1'-2" ± 1'-2"
6"	1'-6" ± 1'-6"
8"	1'-9" ± 1'-9"
10"	2'-2" ± 2'-2"
12"	2'-8" ± 2'-8"

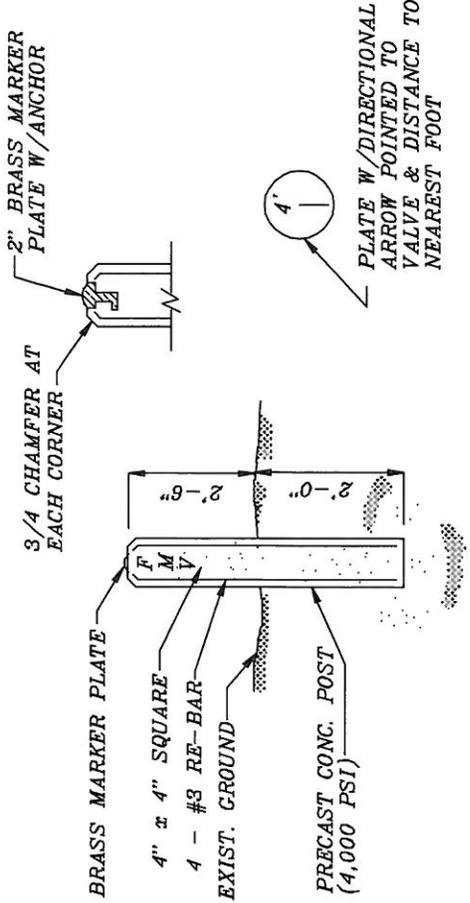


PIPE	AREA AGAINST UNDISTURBED SOIL
2"	1'-0" ± 1'-0"
4"	1'-0" ± 1'-0"
6"	1'-8" ± 1'-8"
8"	2'-0" ± 2'-0"
10"	2'-6" ± 2'-6"
12"	3'-0" ± 3'-0"

PIPE	AREA AGAINST UNDISTURBED SOIL
2"	1'-0" ± 1'-0"
4"	1'-0" ± 1'-0"
6"	1'-8" ± 1'-8"
8"	1'-6" ± 1'-6"
10"	2'-0" ± 2'-0"
12"	2'-5" ± 2'-5"

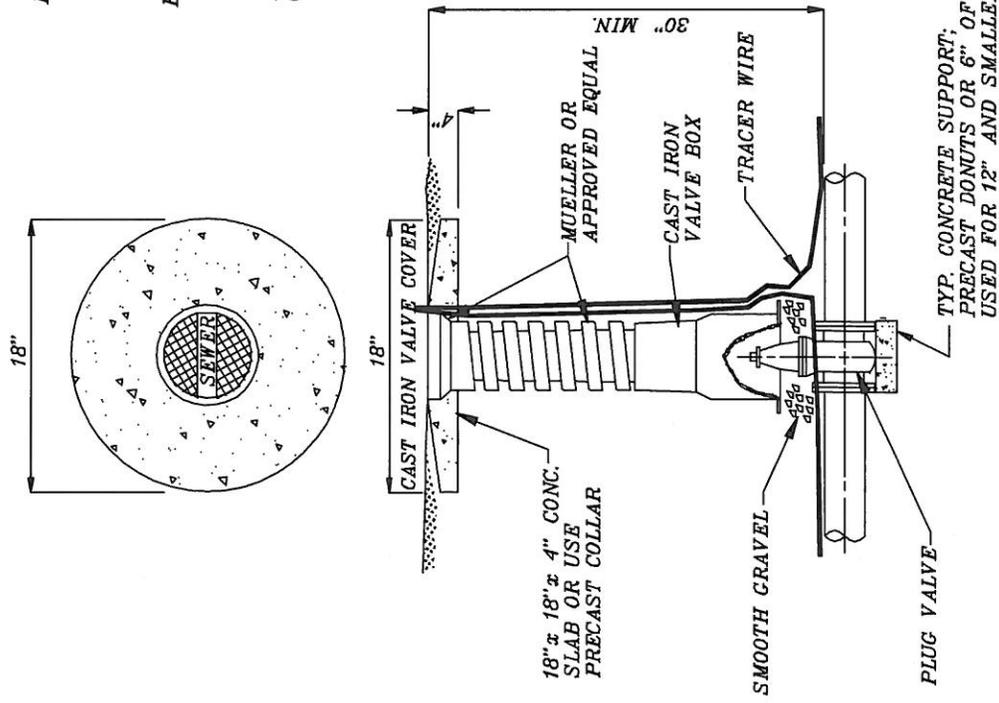
PIPE	AREA AGAINST UNDISTURBED SOIL
2"	1'-0" ± 1'-0"
4"	1'-0" ± 1'-0"
6"	1'-0" ± 1'-0"
8"	1'-2" ± 1'-2"
10"	1'-6" ± 1'-6"
12"	1'-8" ± 1'-8"

NOTE: PIPING LESS THAN 2" IN DIAMETER SHALL HAVE THE SAME REQUIREMENTS AS 2" DIAMETER PIPE.



CONCRETE VALVE MARKER

NOTE: FORCE MAIN LINE VALVE MARKERS SHALL BE PAINTED FEDERAL SAFETY GREEN AND MARKED AS FOLLOWS:
 FMV - FORCE MAIN VALVE
 AV - AIR RELEASE VALVE



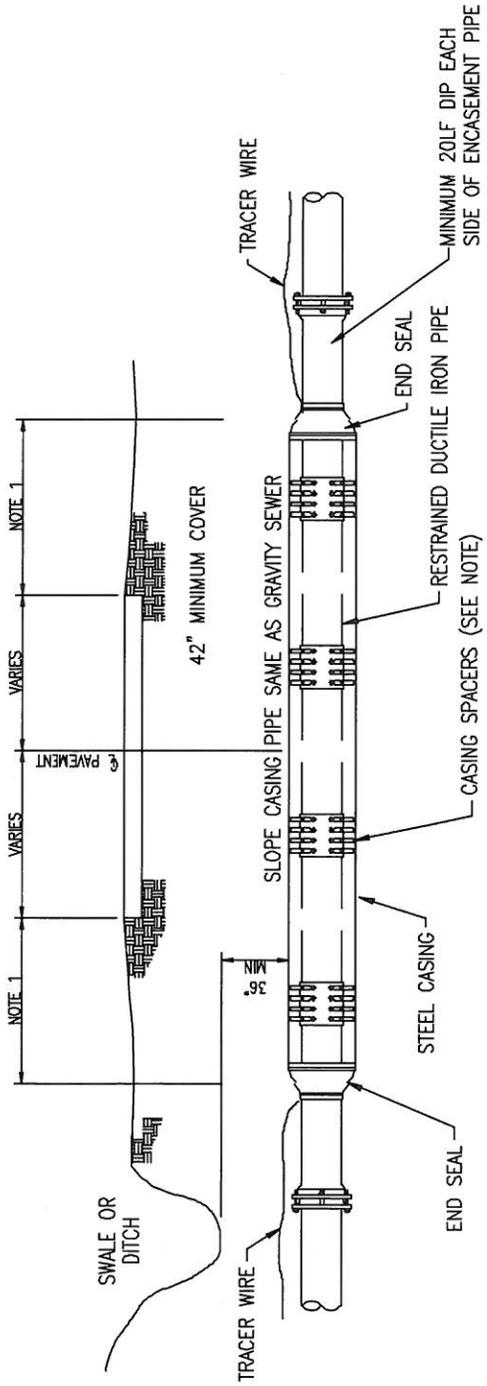
VALVE AND VALVE BOX

CITY OF POOLER
 2011 STANDARD DETAIL

VALVE DETAIL

SCALE:	N.T.S.
DATE:	August 2006

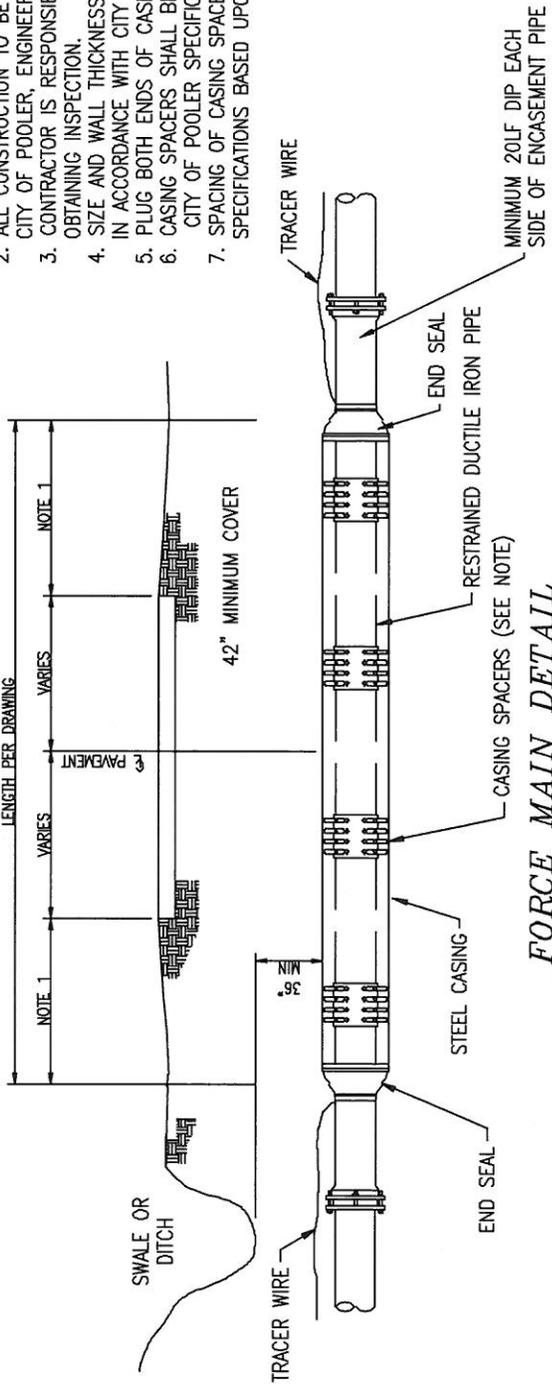
S-10



GRAVITY SEWER BORE DETAIL

NOT TO SCALE

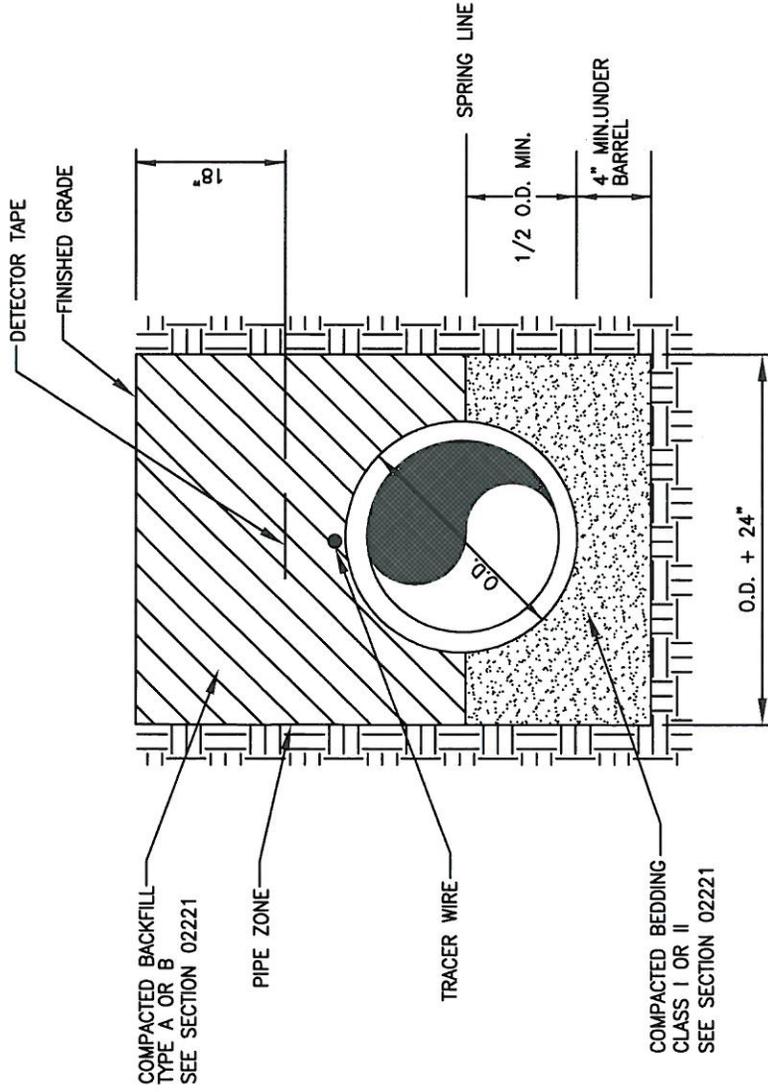
- NOTES:**
1. STEEL CASING TO EXTEND A MINIMUM OF 5' BEYOND EDGE OF PAVEMENT, 10 FEET ON STATE ROUTES.
 2. ALL CONSTRUCTION TO BE INSPECTED AND APPROVED BY CITY OF POOLER, ENGINEER AND/OR STATE HIGHWAY DEPARTMENT.
 3. CONTRACTOR IS RESPONSIBLE FOR NOTIFICATION AND OBTAINING INSPECTION.
 4. SIZE AND WALL THICKNESS OF CASING TO BE APPROVED IN ACCORDANCE WITH CITY OF POOLER SPECIFICATIONS.
 5. PLUG BOTH ENDS OF CASING.
 6. CASING SPACERS SHALL BE IN ACCORDANCE WITH CITY OF POOLER SPECIFICATIONS.
 7. SPACING OF CASING SPACERS SHALL BE PER MANUFACTURERS SPECIFICATIONS BASED UPON CARRIER PIPE MATERIAL.



FORCE MAIN DETAIL

NOT TO SCALE

CITY OF POOLER 2011 STANDARD DETAIL	JACK AND BORE DETAIL	SCALE N.T.S.	S-11
		DATE August 2006	



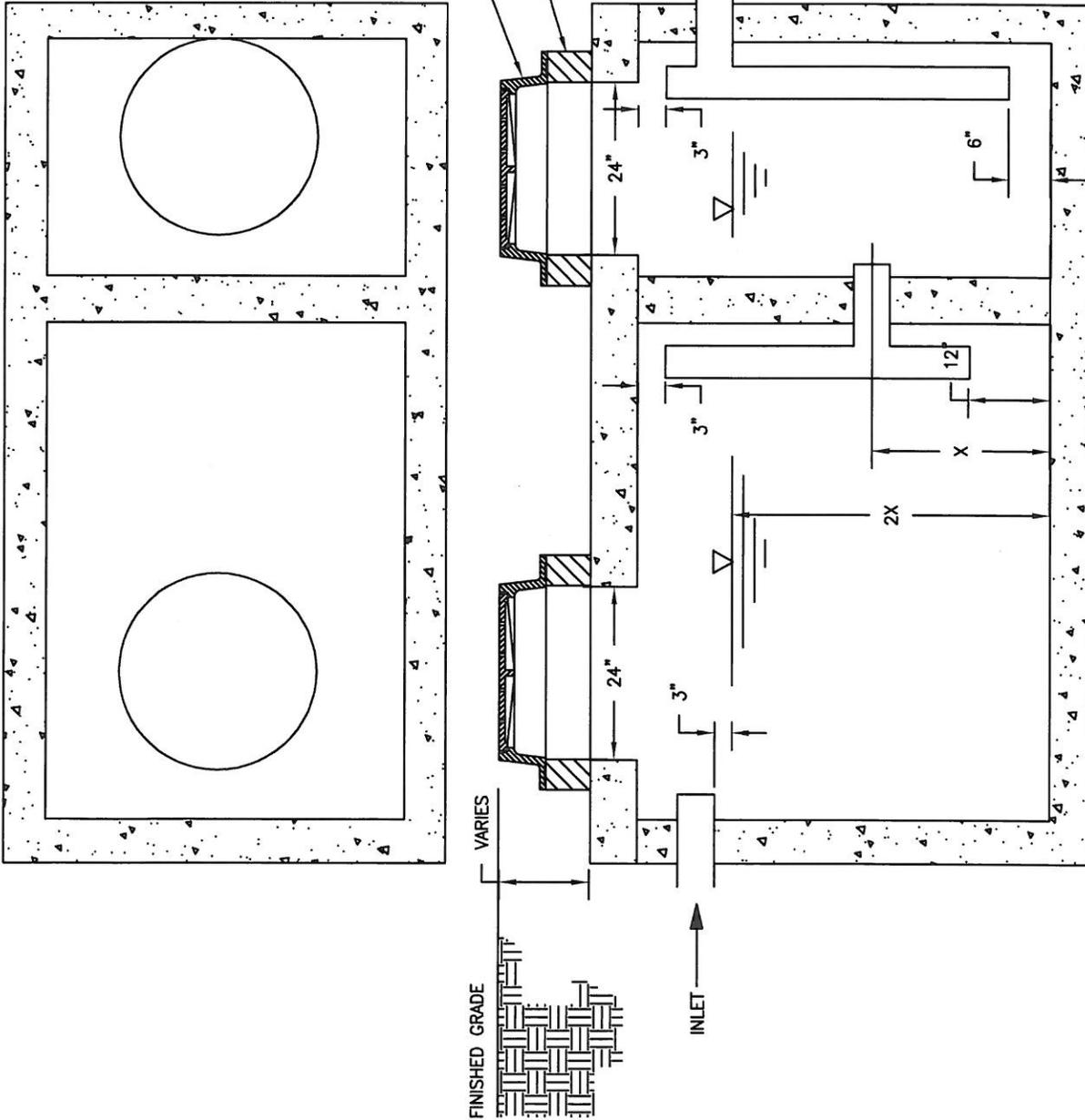
NOTES:

1. SEE STANDARD DRAWING P-13 FOR PAVEMENT RESTORATION.
2. TYPE A BACKFILLING SHALL BE USED UNDER ALL PAVED AREAS. TYPE B BACKFILL SHALL BE USED IN ALL OTHER AREAS.
3. APPLIES TO ALL GRAVITY, FORCEMAIN, AND RECLAIMED WATER MAINS.
4. APPLIES TO DIP, PVC, & HDPE PIPE MATERIALS.

TYPICAL BEDDING FOR PIPE

<p>CITY OF POOLER 2011 STANDARD DETAIL</p>	<p>PIPE BEDDING DETAIL</p>		<p>SCALE: N.T.S.</p>	<p>S-12</p>
			<p>DATE: June 2012</p>	

- NOTES:
1. MANHOLE RING & COVER SHALL BE GAS AND WATER TIGHT PROVIDING A 24" MINIMUM CLEAR OPENING. U.S. FOUNDRY # 195 EORS OR APPROVED EQUAL.
 2. VOLUME OF GREASE TRAP SHALL BE BASED UPON ULTIMATE LOADING. SIZING CALCULATIONS MUST BE APPROVED BY CITY OF POOLER. MINIMUM SIZE SHALL BE 1,000 GALLONS.
 3. CONCRETE GRADE RINGS SHALL BE UTILIZED TO BRING COVER TO FINISHED GRADE.

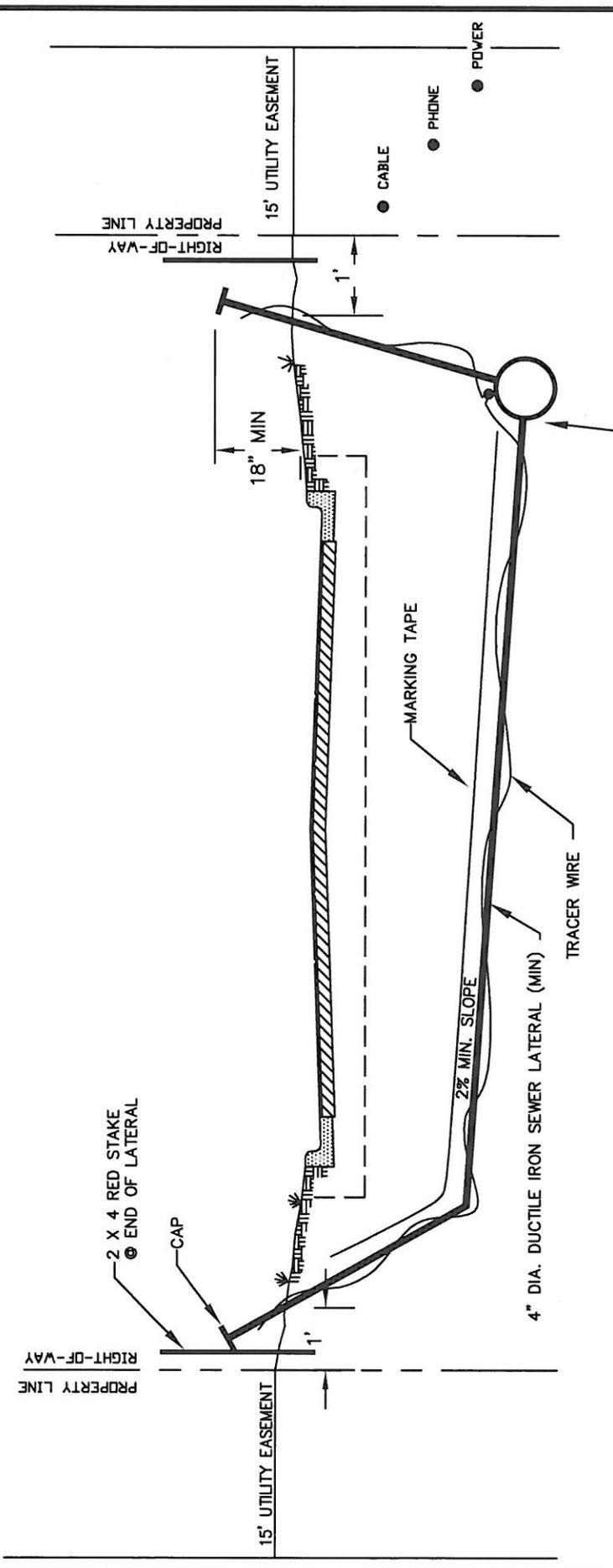


SCALE: N.T.S.
DATE: June 2012

GREASE TRAP DETAIL

CITY OF POOLER
2011 STANDARD DETAIL

S-13

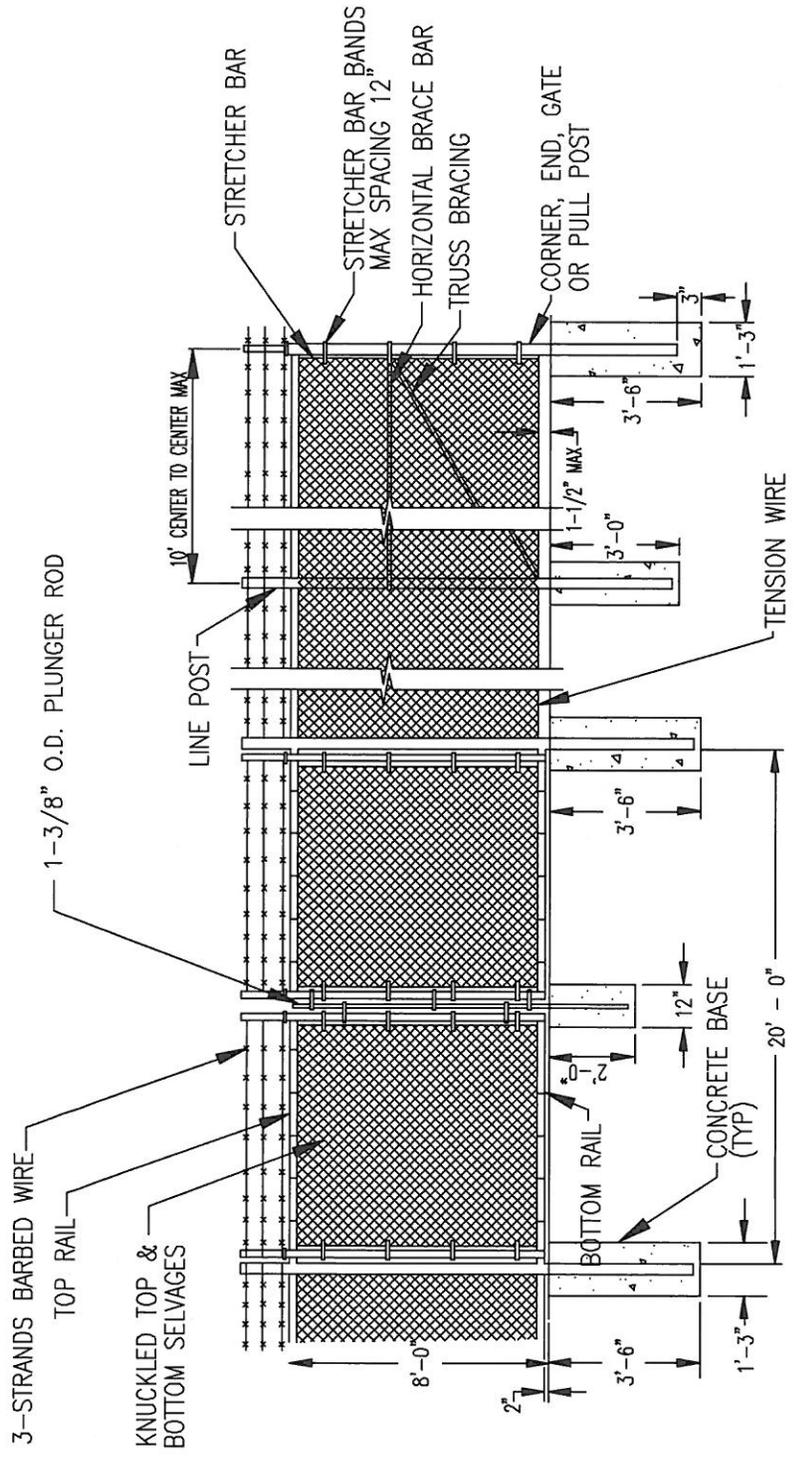


NOTES:
 1. ALL LATERALS CONNECTING TO AN EXISTING SEWER MUST USE TAPPING SADDLE.
 2. ALL LATERALS CONNECTION TO NEW SEWER REQUIRE A 4" TEE.

SCALE: N.T.S.
 DATE: June 2012

SEWER LATERAL DETAIL

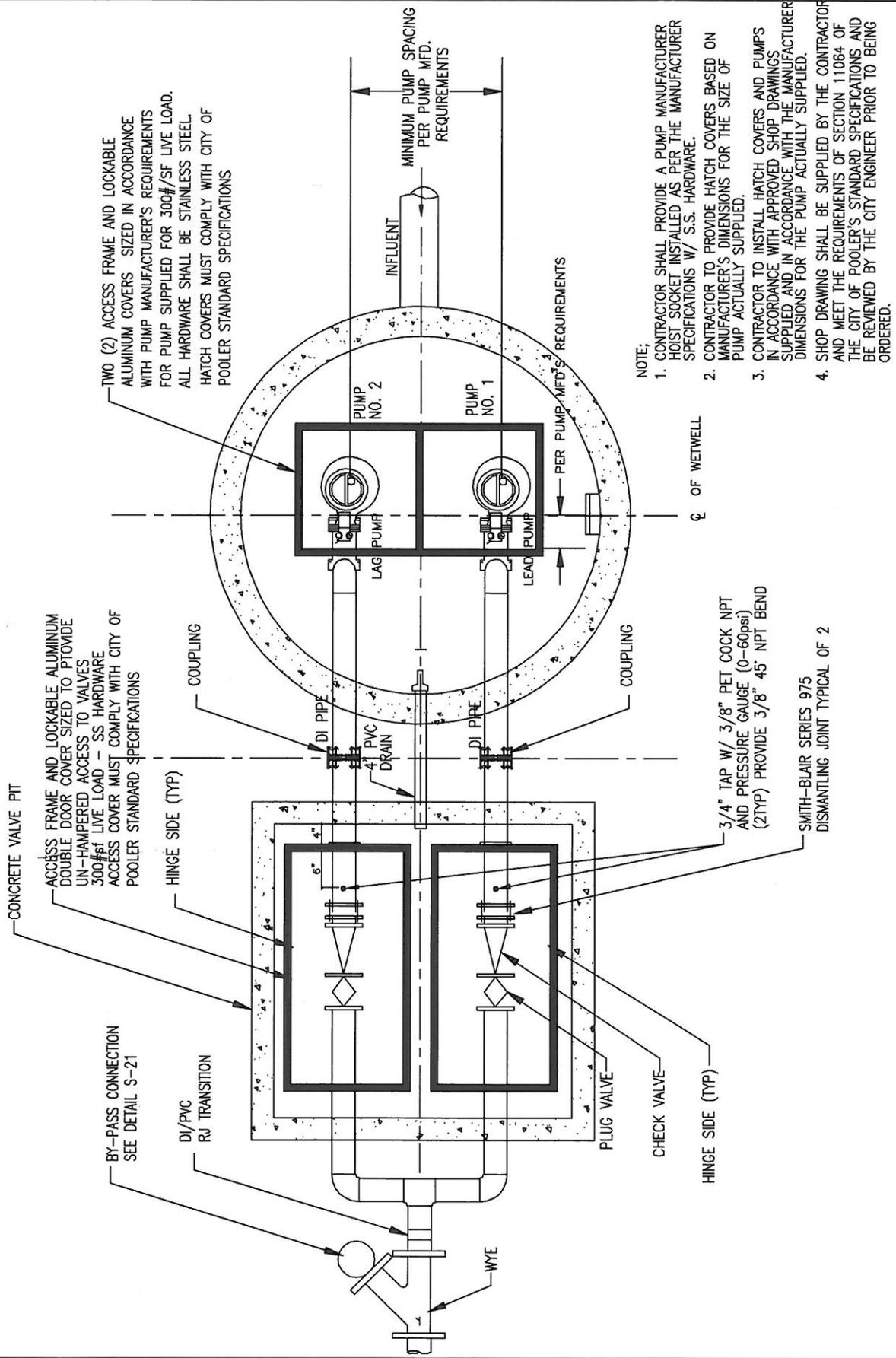
CITY OF POOLER
 2011 STANDARD DETAIL



- NOTES:
1. FABRIC TO BE ATTACHED TO HORIZONTAL RAILS W/ TIE WIRES AT 16" MAX SPACING MADE ON INSIDE OF FENCE AND NOT ACCESSIBLE FROM OUTSIDE
 2. FABRIC TO BE ATTACHED TO TENSION WIRES W/ HOG RINGS AT 24" MAX SPACING
 3. FABRIC TO BE ATTACHED TO LINE POSTS W/ SELF-LOCKING BANDS AT 12" MAX SPACING
 4. TOP RAIL TO TOP OF FABRIC SHALL BE 2" MAX
 5. ALL MATERIALS SHALL BE AS SPECIFIED IN SECTION 02451

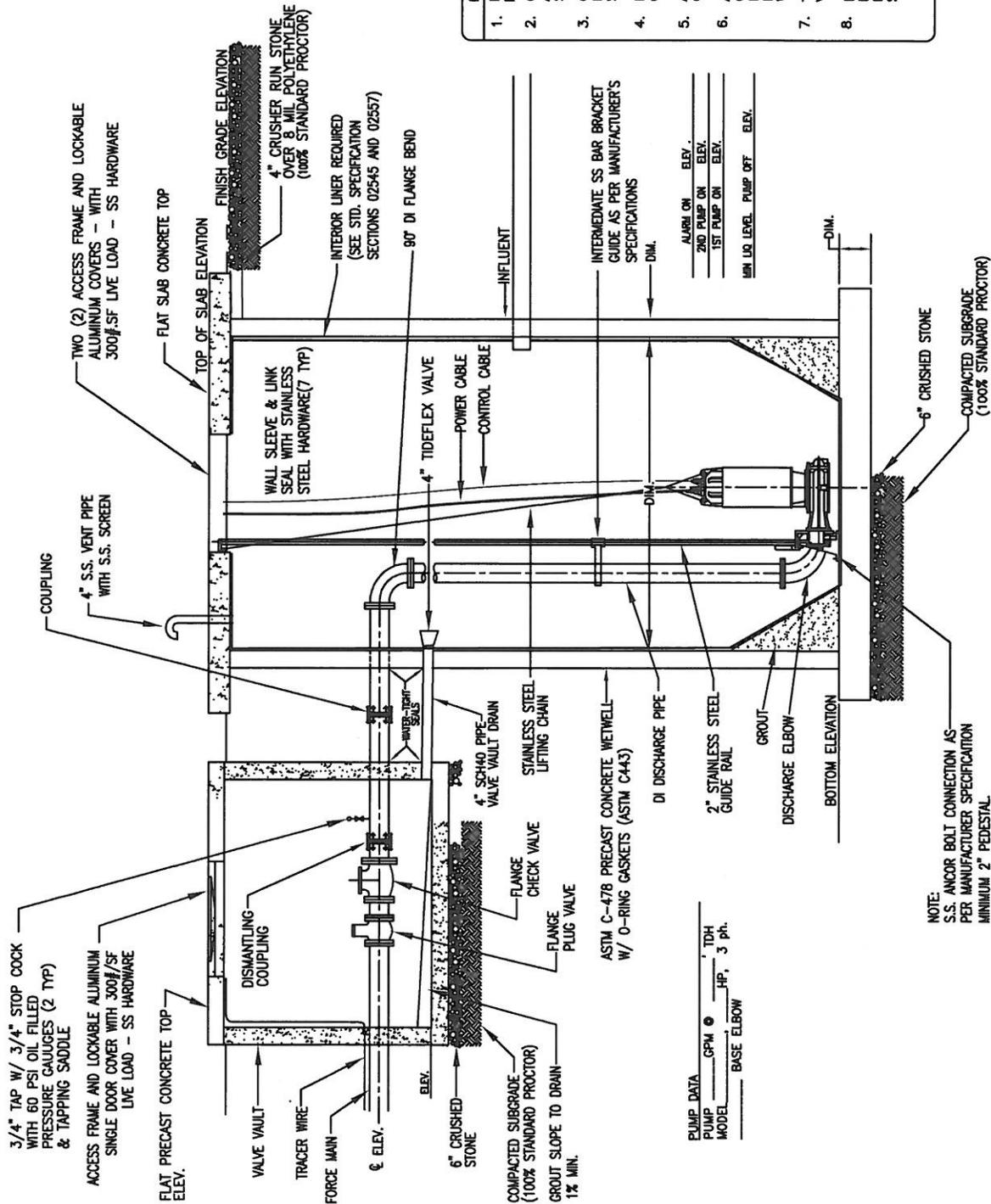
SCALE: N.T.S. DATE: August 2006	CHAIN LINK FENCE DETAIL	CITY OF POOLER 2011 STANDARD DETAIL
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S-15



- NOTE:
1. CONTRACTOR SHALL PROVIDE A PUMP MANUFACTURER HOIST SOCKET INSTALLED AS PER THE MANUFACTURER SPECIFICATIONS W/ S.S. HARDWARE.
 2. CONTRACTOR TO PROVIDE HATCH COVERS BASED ON MANUFACTURER'S DIMENSIONS FOR THE SIZE OF PUMP ACTUALLY SUPPLIED.
 3. CONTRACTOR TO INSTALL HATCH COVERS AND PUMPS IN ACCORDANCE WITH APPROVED SHOP DRAWINGS SUPPLIED AND IN ACCORDANCE WITH THE MANUFACTURER DIMENSIONS FOR THE PUMP ACTUALLY SUPPLIED.
 4. SHOP DRAWING SHALL BE SUPPLIED BY THE CONTRACTOR AND MEET THE REQUIREMENTS OF SECTION 11064 OF THE CITY OF POOLER'S STANDARD SPECIFICATIONS AND BE REVIEWED BY THE CITY ENGINEER PRIOR TO BEING ORDERED.

<p>CITY OF POOLER 2011 STANDARD DETAIL</p>	<p>LIFT STATION PLAN DETAIL</p>		<p>SCALE: N.T.S.</p>	<p>S-16</p>
				<p>DATE: January 2011</p>



- NOTES:
1. PUMP CONTROLS AND ALARM FLOATS NOT SHOWN FOR CLARITY.
 2. CONTRACTOR SHALL INSTALL HATCH COVERS AND PUMPS IN ACCORDANCE WITH APPROVED SHOP DRAWING AND MANUFACTURER'S DIMENSIONS.
 3. CONTRACTOR SHALL SUPPLY SHOP DRAWINGS IN ACCORDANCE WITH CITY STANDARD SPECIFICATION SECTION 11064.
 4. EQUIPMENT, MATERIAL AND PARTS SHALL NOT BE ORDERED UNTIL SHOP DRAWINGS ARE APPROVED.
 5. ALL WORK SHALL BE INSPECTED BY THE CITY OF POOLER OR THEIR REPRESENTATIVE.
 6. ALL WORK NOT IN CONFORMANCE WITH THE CITY OF POOLER STANDARD SPECIFICATIONS SHALL BE REMOVED AND REPLACE TO BRING THE WORK INTO COMPLIANCE. WORK NOT IN COMPLIANCE WILL NOT BE APPROVED FOR PAYMENT.
 7. TRACER WIRE TO TERMINATE INSIDE THE VALVE VAULT.
 8. EXTERIOR JOINTS OF WET WELL AND RECEIVING MANHOLE TO BE SEALED WITH FLEXIBLE EPDM RUBBER SEAL. SEE STANDARD SPECIFICATION SECTION 02740.

NOTE:
 S.S. ANCOR BOLT CONNECTION AS PER MANUFACTURER SPECIFICATION MINIMUM 2" PEDESTAL

PUMP DATA
 PUMP _____ GPM @ _____ TDH
 MODEL _____ HP, 3 ph.
 _____ BASE ELBOW

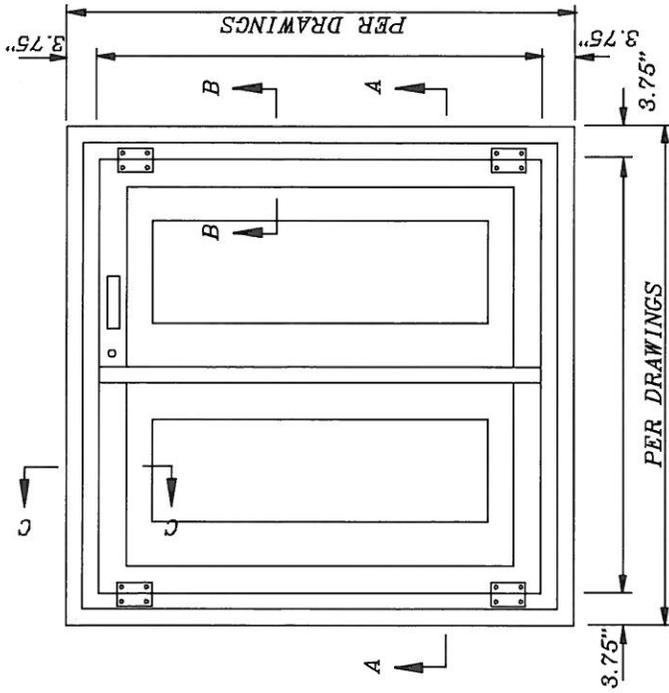
CITY OF POOLER
 2011 STANDARD DETAIL

LIFT STATION SECTION DETAIL

SCALE: N.T.S.

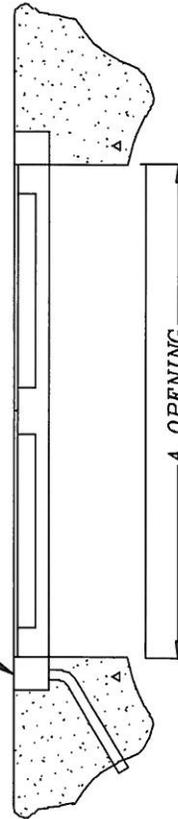
DATE: June 2012

S-17

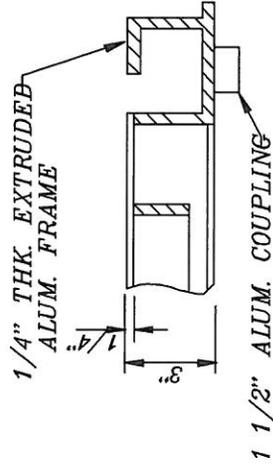


PLAN

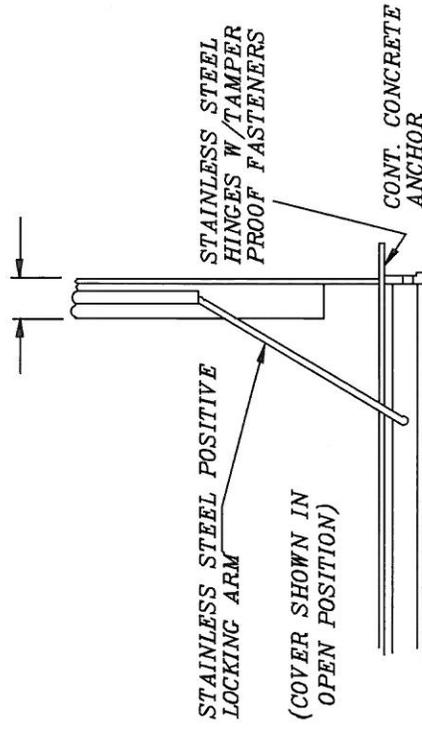
DRAINPIPE BY OTHERS



SECTION A-A



SECTION B-B



SECTION C-C

ACCESS COVER TO HAVE LOCKABLE HASP

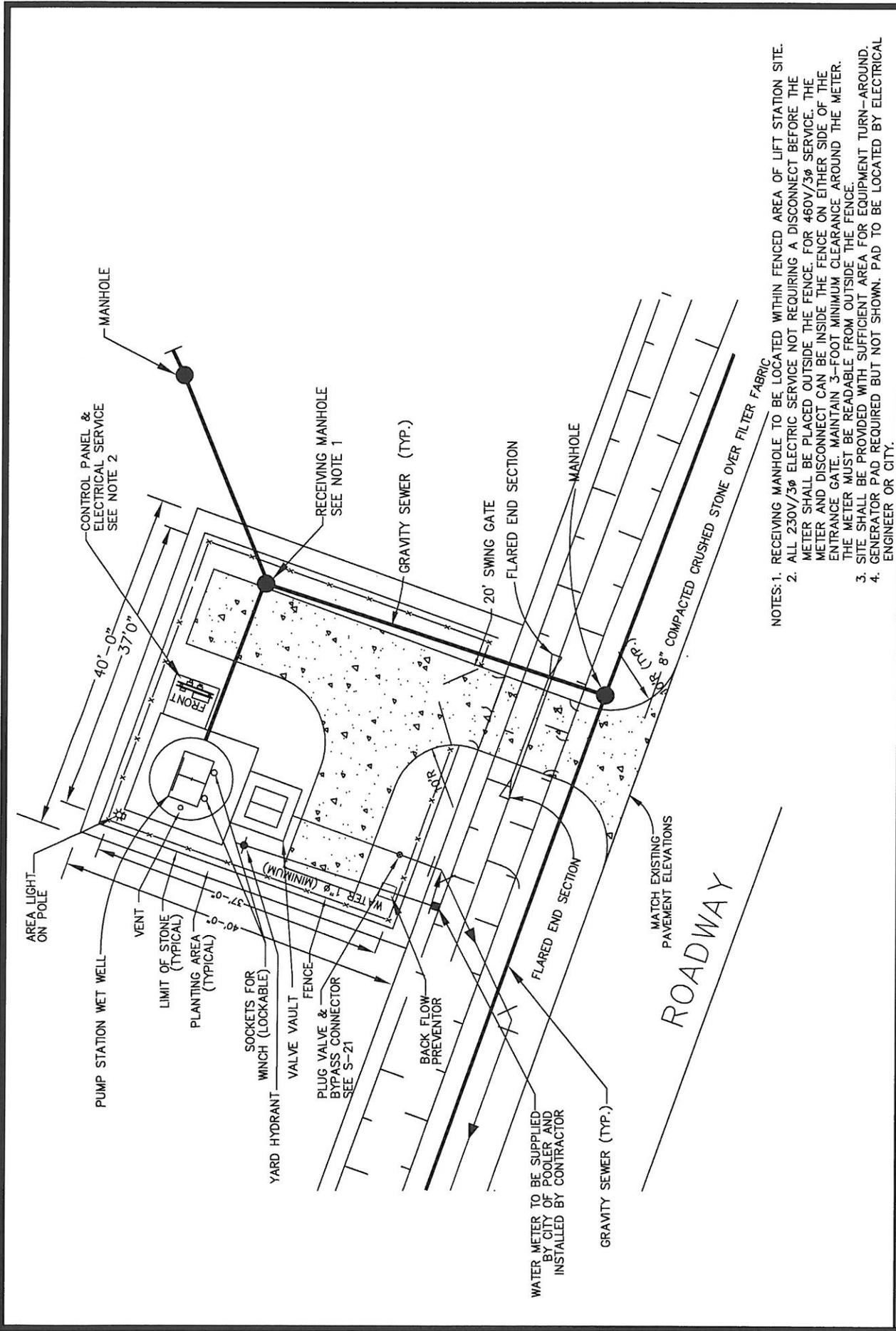
CITY OF POOLER
2011 STANDARD DETAIL

WATERTIGHT DOUBLE DOOR
ACCESS FRAME AND COVER DETAIL

SCALE: N.T.S.

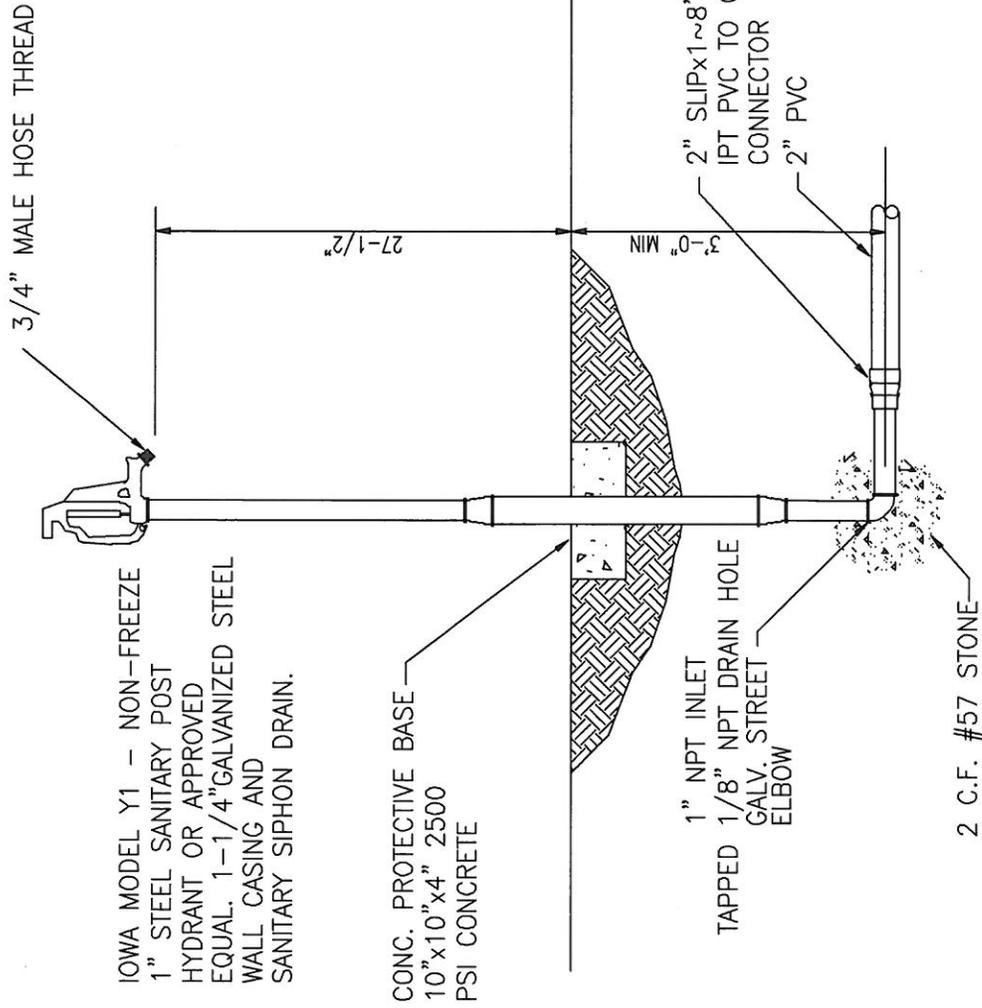
DATE: August 2006

S-18



- NOTES:
1. RECEIVING MANHOLE TO BE LOCATED WITHIN FENCED AREA OF LIFT STATION SITE.
 2. ALL 230V/3Ø ELECTRIC SERVICE NOT REQUIRING A DISCONNECT BEFORE THE METER SHALL BE PLACED OUTSIDE THE FENCE. FOR 460V/3Ø SERVICE, THE METER AND DISCONNECT CAN BE INSIDE THE FENCE ON EITHER SIDE OF THE ENTRANCE GATE. MAINTAIN 3-FOOT MINIMUM CLEARANCE AROUND THE METER. THE METER MUST BE READABLE FROM OUTSIDE THE FENCE.
 3. SITE SHALL BE PROVIDED WITH SUFFICIENT AREA FOR EQUIPMENT TURN-AROUND.
 4. GENERATOR PAD REQUIRED BUT NOT SHOWN. PAD TO BE LOCATED BY ELECTRICAL ENGINEER OR CITY.

<p>CITY OF POOLER 2011 STANDARD DETAIL</p>	<p>TYPICAL LIFT STATION SITE PLAN</p>		<p>SCALE: N.T.S.</p>	<p>S-19</p>
	<p>DATE: June 2012</p>			



CITY OF POOLER
2011 STANDARD DETAIL

NON FREEZE YARD HYDRANT DETAIL

SCALE

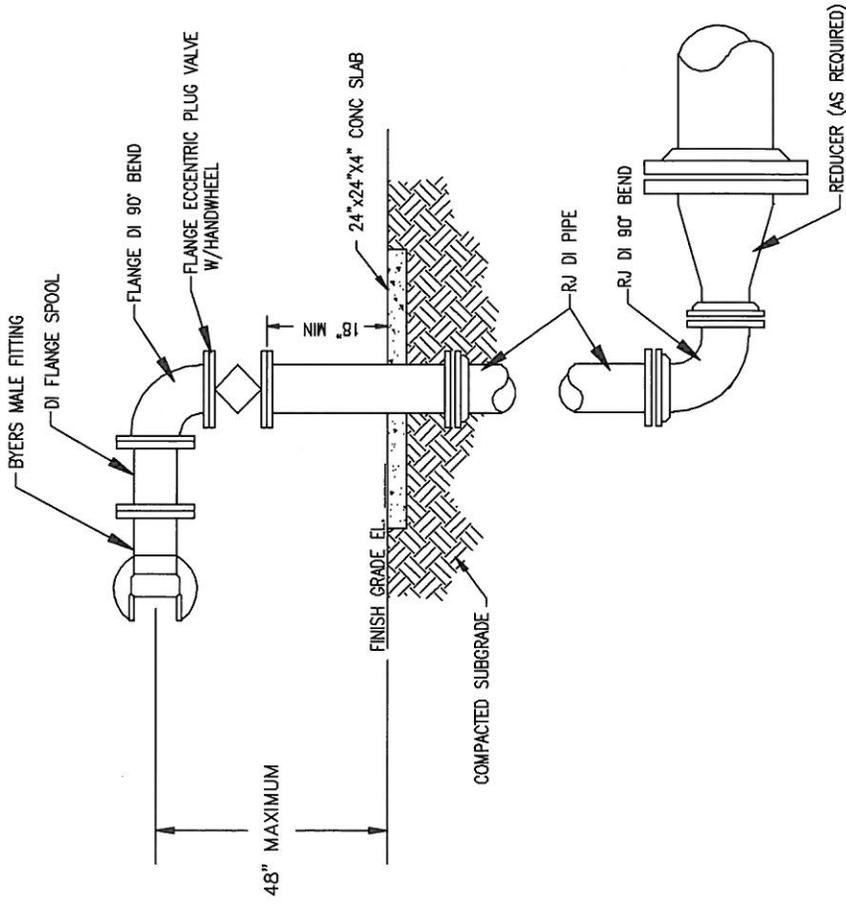
N.T.S.

DATE

August 2006

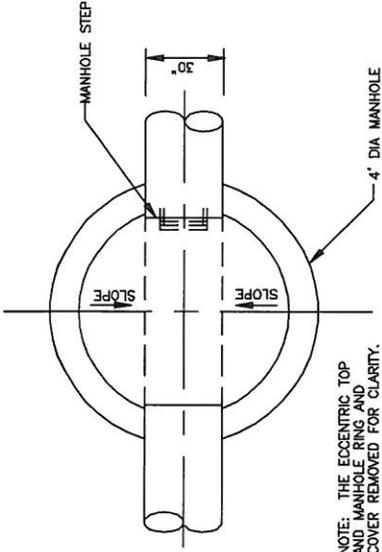
S-20

NOTES:
 1. BYPASS CONNECTION SHALL BE SIZED AS FOLLOWS:
 FORCE MAIN DIAMETER CONNECTION DIAMETER
 4" TO 8" 4"
 > 8" 6"



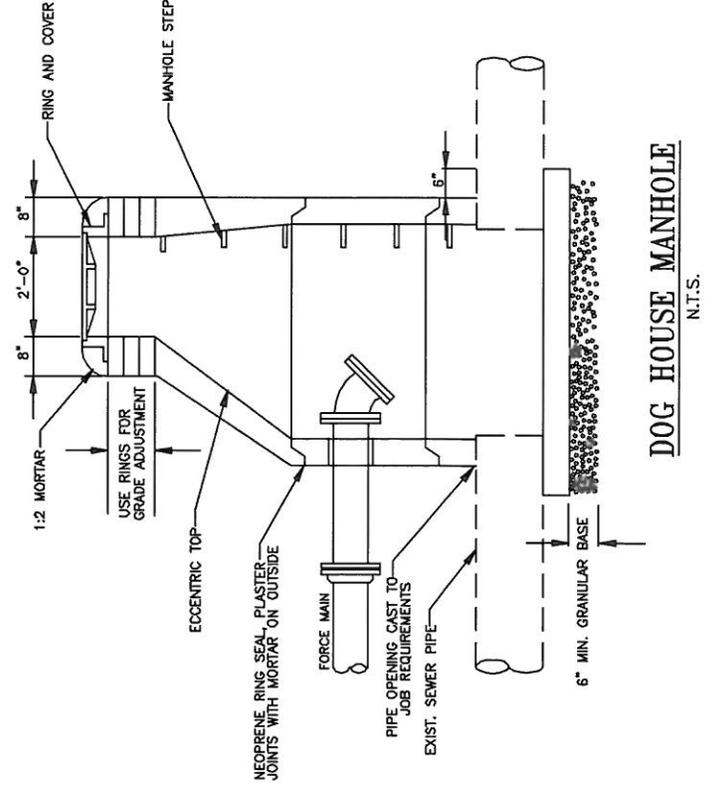
BY-PASS CONNECTION DETAIL
 NTS

CITY OF POOLER 2011 STANDARD DETAIL	SCALE: N.T.S.	S-21
	DATE: January 2011	

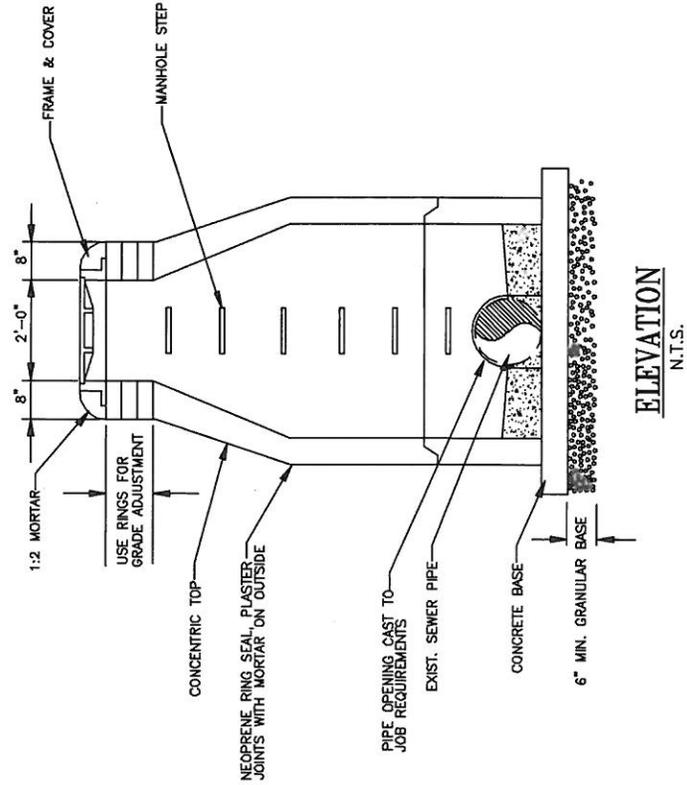


NOTE: THE ECCENTRIC TOP AND MANHOLE RING AND COVER REMOVED FOR CLARITY.

PLAN
N.T.S.



DOG HOUSE MANHOLE
N.T.S.



ELEVATION
N.T.S.

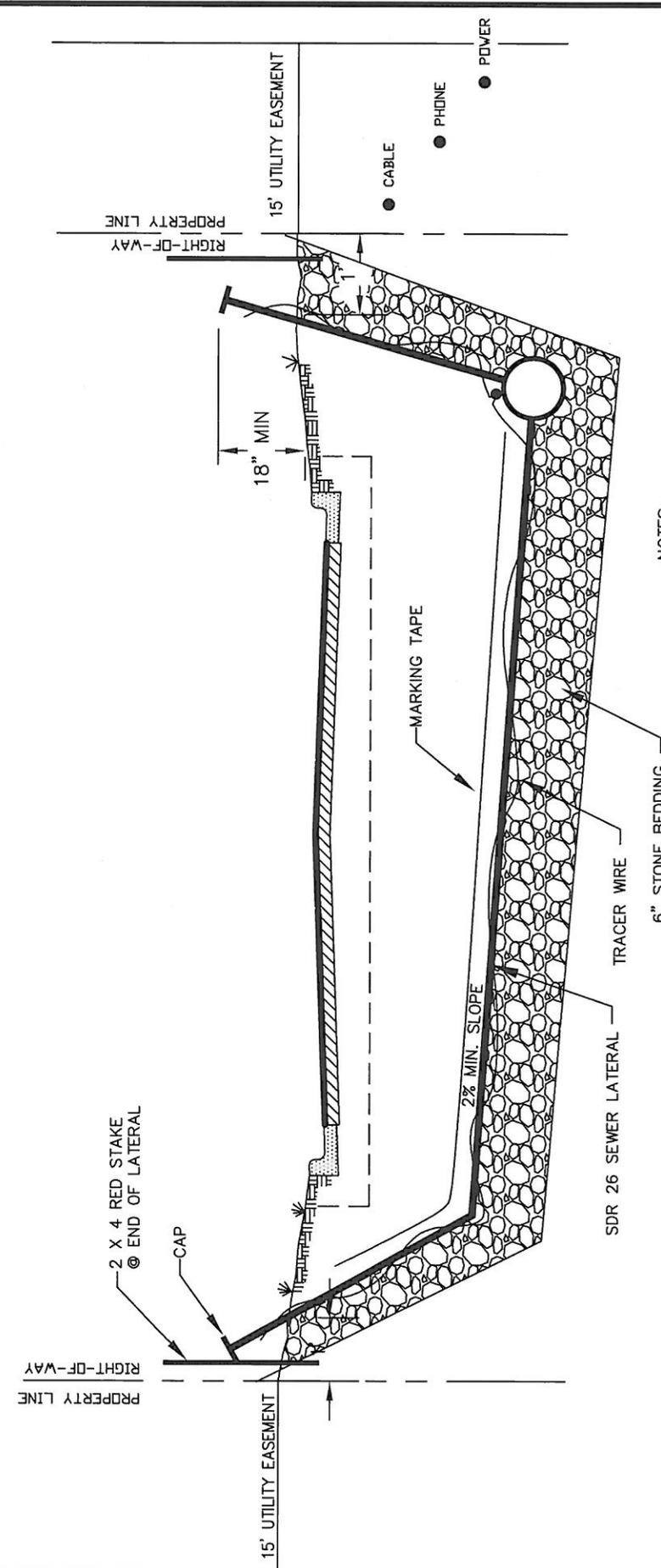
**DOGHOUSE MANHOLE FOR
SEWER FM CONNECTION**

SCALE: N.T.S.

DATE: January 2011

S-22

CITY OF POOLER
2011 STANDARD DETAIL



- NOTES:
1. ALL LATERALS CONNECTING TO AN EXISTING SEWER MUST USE TAPPING SADDLE.
 2. ALL LATERALS CONNECTION TO NEW SEWER REQUIRE A 4" TEE.
 3. ALL LATERALS MUST HAVE 6" OF STONE BEDDING UNDER THE ENTIRE LENGTH.
 4. ALL LATERALS MUST BE INSPECTED BY THE CITY PRIOR TO BURIAL.

SCALE: N.T.S.
 DATE: June 2012

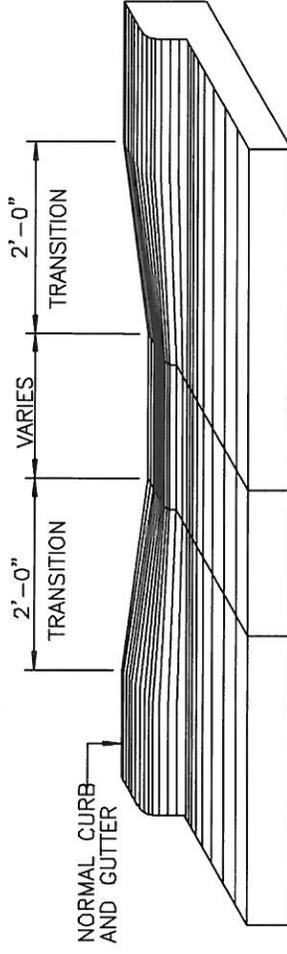
PRIVATE SEWER LATERAL DETAIL

CITY OF POOLER
 2011 STANDARD DETAIL

CITY OF POOLER

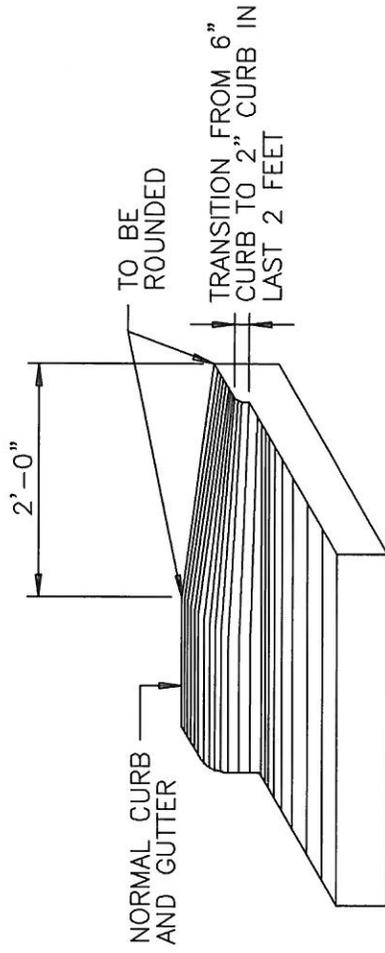
PAVING DETAILS

<u>Number</u>	<u>Description</u>
P01	Depressed Curb
P02	Feathering of Concrete Curb & Gutter
P03	18" Curb & Gutter
P04	Flush Header Curb
P05	Raised Concrete Header Curb
P06	Pavement / Curb Termination Detail
P07	Mountable Concrete Curb & Gutter
P08	Concrete Island Detail
P09	Raised Concrete Island
P10	Typical Pavement Sections
P11	Overlay Pavement Section
P12	Typical Section thru Roadway
P13	Pavement Replacement
P14	Pavement Replacement Detail Longitudinal Cuts
P15	Sidewalk and Walkway Details
P16	Handicap Ramp Details
P17	Handicap Ramp Details
P18	Handicap Ramp Details
P19	Standard Curb Inlet
P20	Grate Inlet w / Frame
P21	Precast Grate Inlet Detail
P22	Yard Inlet Detail
P23	Standard Precast Concrete Storm Manhole
P24	Typical Section through Swale (4:1)
P25	Storm Manhole Ring & Cover
P26	Ditch Inlet (Type "A")
P27	Roof Inlet Detail
P28	Concrete Lot Swale
P29	Concrete Headwall Detail
P30	Subgrade Drain
P31	Concrete Swale with Fillets
P32	Flared End Section Detail
P33	Plan of Curb Inlet on Radius



NOTE:
DRIVES ONLY, FOR HANDICAP SEE P-16

CITY OF POOLER 2011 STANDARD DETAIL	DEPRESSED CURB		P-01
	<small>SCALE:</small> N.T.S.	<small>DATE:</small> August 2006	



NOTE: THIS OCCURS AT END
OF CURB AND GUTTER
WHERE CALLED FOR ON
PLANS

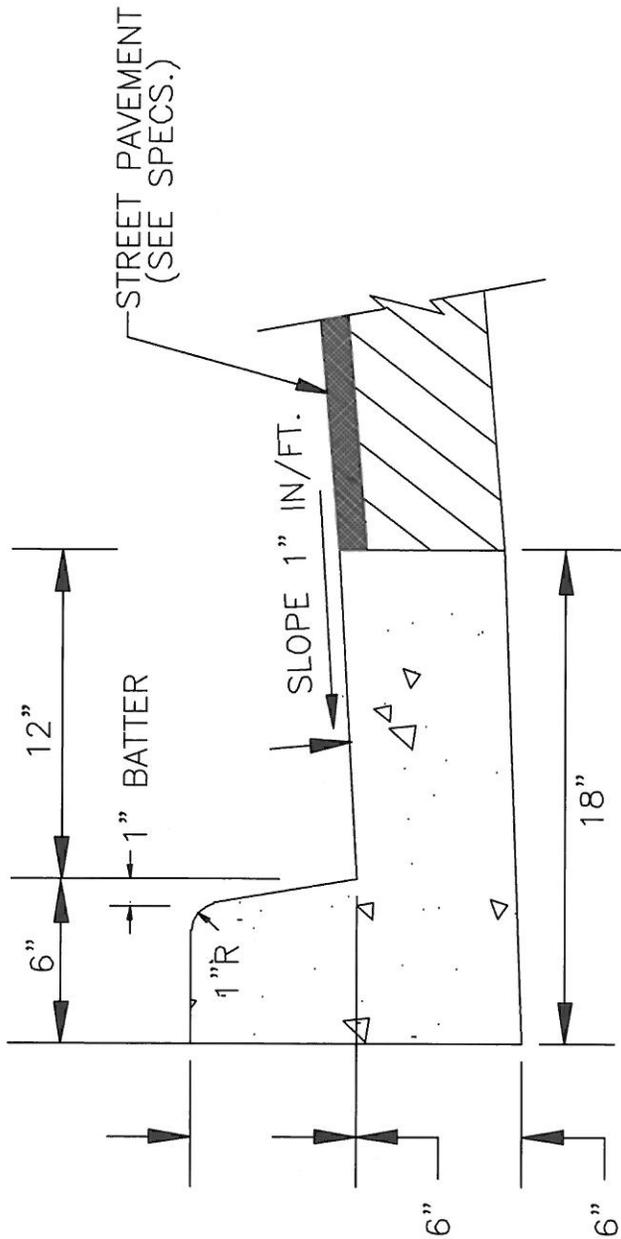
CITY OF POOLER
2011 STANDARD DETAIL

FEATHERING OF
CONCRETE CURB & GUTTER

SCALE: N.T.S.

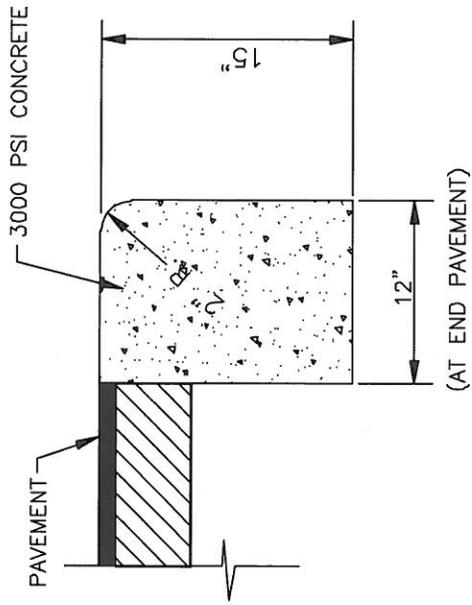
DATE: October 2001

P-02



NORMAL GUTTER

SCALE: N.T.S. DATE: January 2004	18" CURB & GUTTER	CITY OF POOLER 2011 STANDARD DETAIL	P-03
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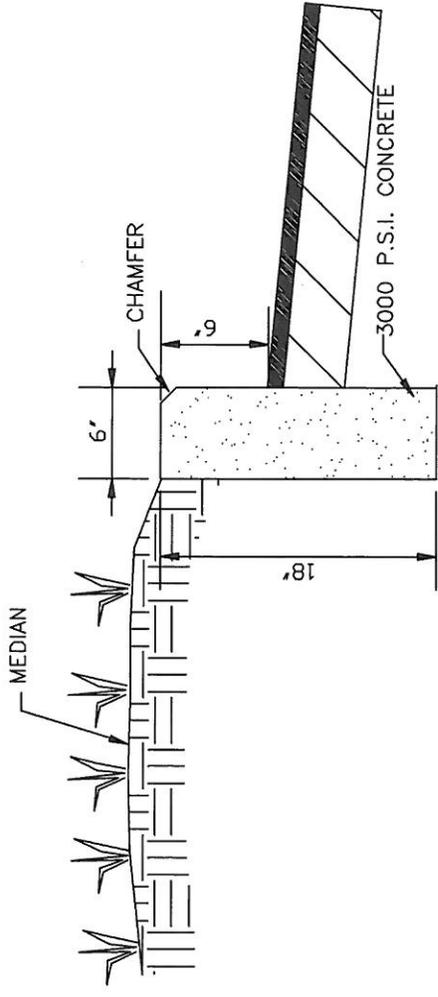
CITY OF POOLER
2011 STANDARD DETAIL

FLUSH HEADER CURB

SCALE: N.T.S.

DATE: August 2006

P-04

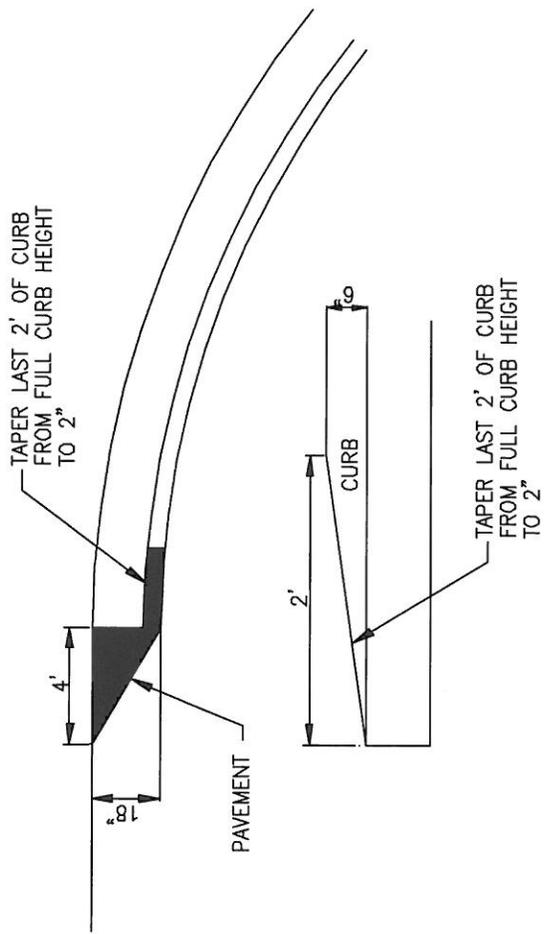


SCALE: N.T.S.
DATE: October 2001

P-05

RAISED CONCRETE HEADER CURB

CITY OF POOLER
2011 STANDARD DETAIL



CITY OF POOLER
2011 STANDARD DETAIL

PAVEMENT / CURB
TERMINATION DETAIL

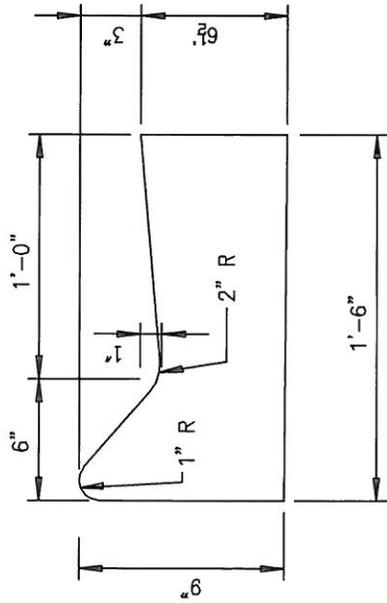
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N.T.S.

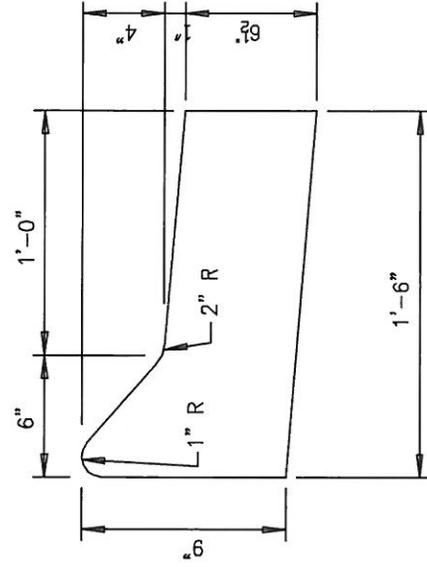
DATE:

January 2004

P-06



STANDARD



PITCHED

CITY OF POOLER
2011 STANDARD DETAIL

MOUNTABLE CONCRETE
CURB & GUTTER

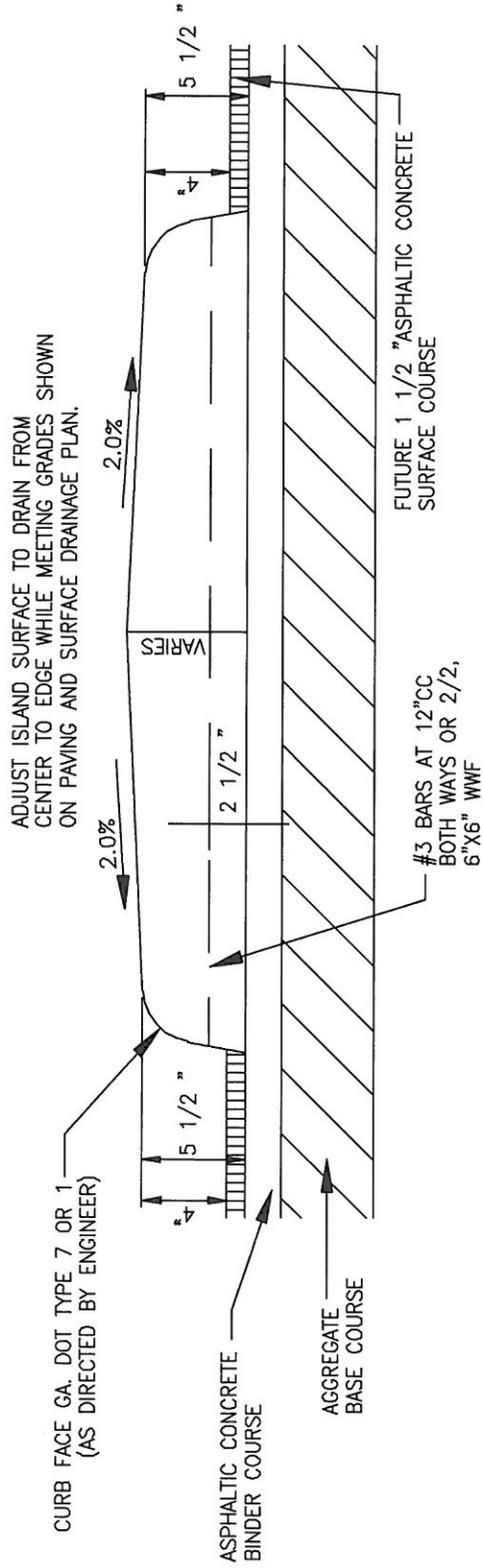
SCALE:

N.T.S.

DATE:

August 2006

P-07



NOTE:
 ISLAND SHALL BE CONSTRUCTED OF CONCRETE WITH A 28 DAY COMPRESSIVE STRENGTH OF 4000 PSI.

CITY OF POOLER
 2011 STANDARD DETAIL

CONCRETE ISLAND DETAIL

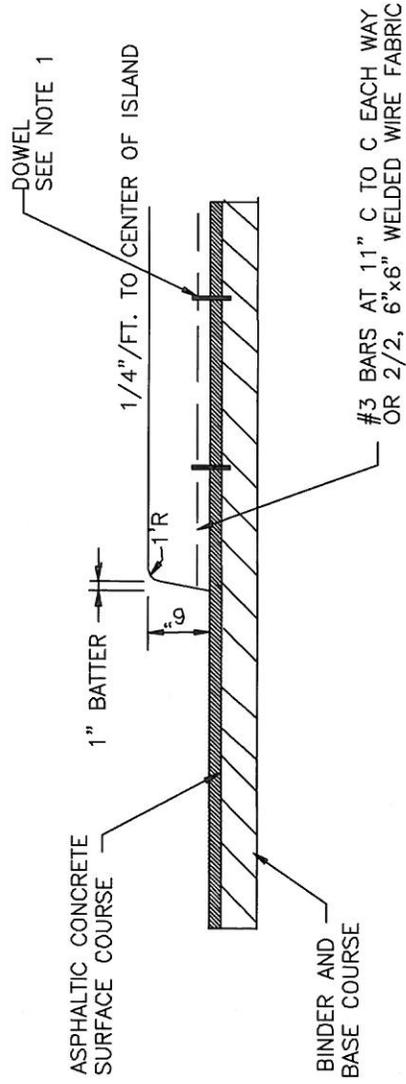
SCALE:

N.T.S.

DATE:

October 2001

P-08



NOTE:

- WHERE CONCRETE ISLANDS ARE BEING CONSTRUCTED DIRECTLY ON TOP OF EXISTING ASPHALT PAVEMENT THE CONTRACTOR SHALL PROVIDE 1/2" DIA. DOWEL BARS 8" LONG AT 3' SPACING 6" BEHIND THE PERIMETER EDGE. THE BARS SHALL NOT EXTEND CLOSER THAN 1 1/2" TO THE TOP OF THE ISLAND. PROVIDE CONTRACTION JOINTS IN A 10'x10' GRID.

CITY OF POOLER
2011 STANDARD DETAIL

RAISED CONCRETE ISLAND

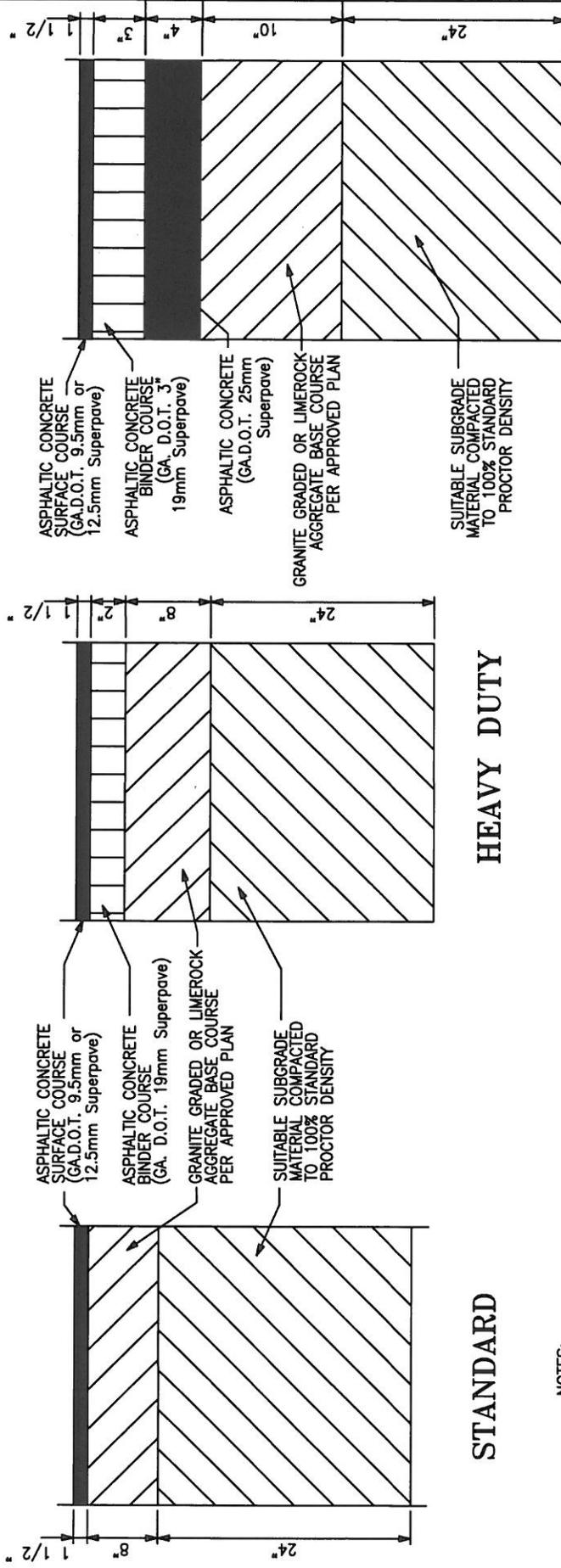
SCALE:

N.T.S.

DATE:

August 2006

P-09



STANDARD

HEAVY DUTY

HEAVY DUTY

NOTES:

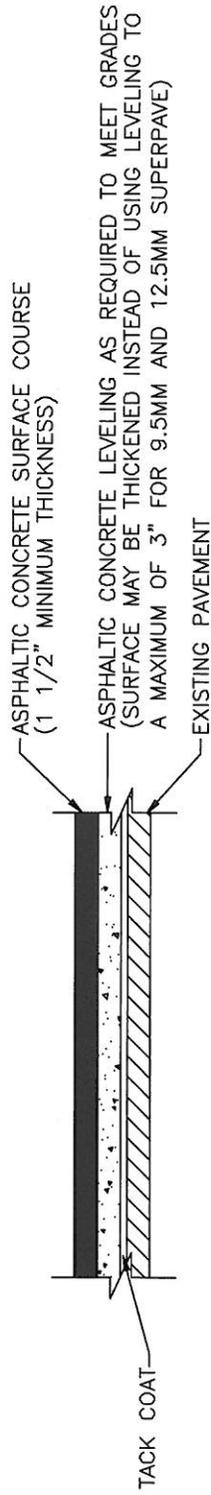
1. BITUMINOUS PRIME AND TACK COATS WILL BE APPLIED AS LISTED BELOW.
 - A. PRIME COAT SHALL BE APPLIED AT A RATE OF 0.20 GALLON PER SQUARE YARD TO THE SURFACE OF ALL GRANITE-BASE COURSES.
 - B. TACK COAT SHALL BE APPLIED AT A RATE OF 0.10 GALLONS PER SQUARE YARD TO THE SURFACE OF THE BINDER COURSE BEFORE PLACEMENT OF SURFACE COURSE.
2. REFER TO PAVING PLAN FOR LOCATION OF STANDARD AND HEAVY DUTY PAVEMENTS.

**CITY OF POOLER
2011 STANDARD DETAIL**

TYPICAL PAVEMENT SECTIONS

SCALE	N.T.S.
DATE	June 2012

P-10



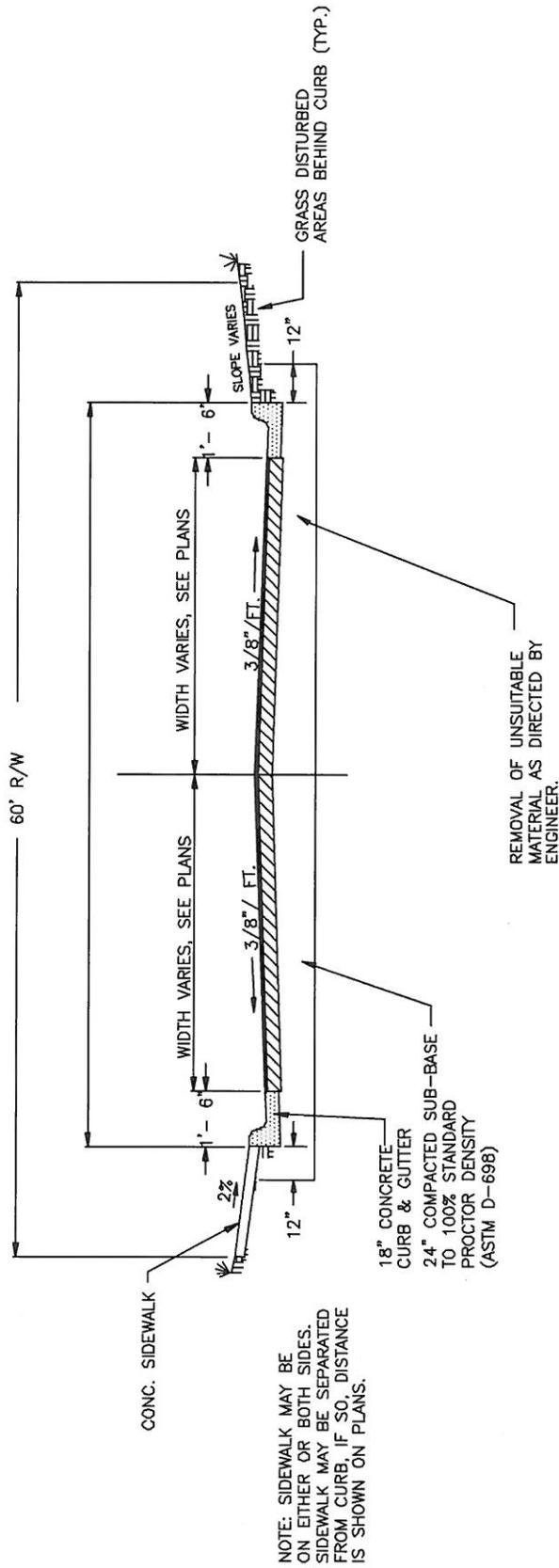
CITY OF POOLER
2011 STANDARD DETAIL

OVERLAY PAVEMENT SECTION

SCALE: N.T.S.

DATE: January 2004

P-11



SCALE: N.T.S.
 DATE: August 2006

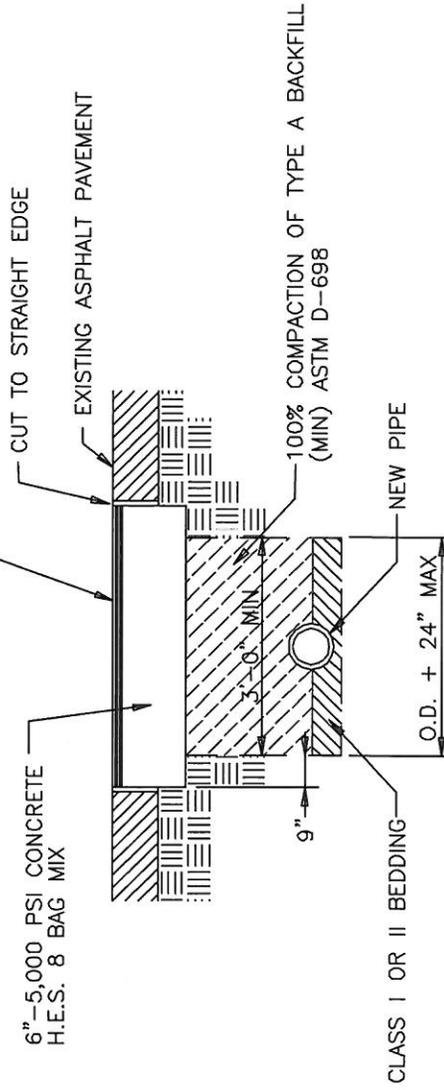
TYPICAL SECTION THRU ROADWAY

CITY OF POOLER
 2011 STANDARD DETAIL

NOTE :
 ALL LATERAL STREET CUTS MUST
 BE COVERED WITH STEEL PLATES
 OF SUFFICIENT THICKNESS TO SPAN
 THE CUT WITHOUT NOTICEABLE DE-
 FLECTION. PLATES TO REMAIN IN
 PLACE UNTIL THE CONCRETE BASE
 HAS GAINED SUFFICIENT STRENGTH
 TO WITHSTAND TRAFFIC LOADS (24
 HOURS MINIMUM).

1-1/2" ASPHALTIC CONCRETE, GA DOT 12.5MM SUPERPAVE

6"-5,000 PSI CONCRETE
 H.E.S. 8 BAG MIX



CITY OF POOLER
 2011 STANDARD DETAIL

SCALE:

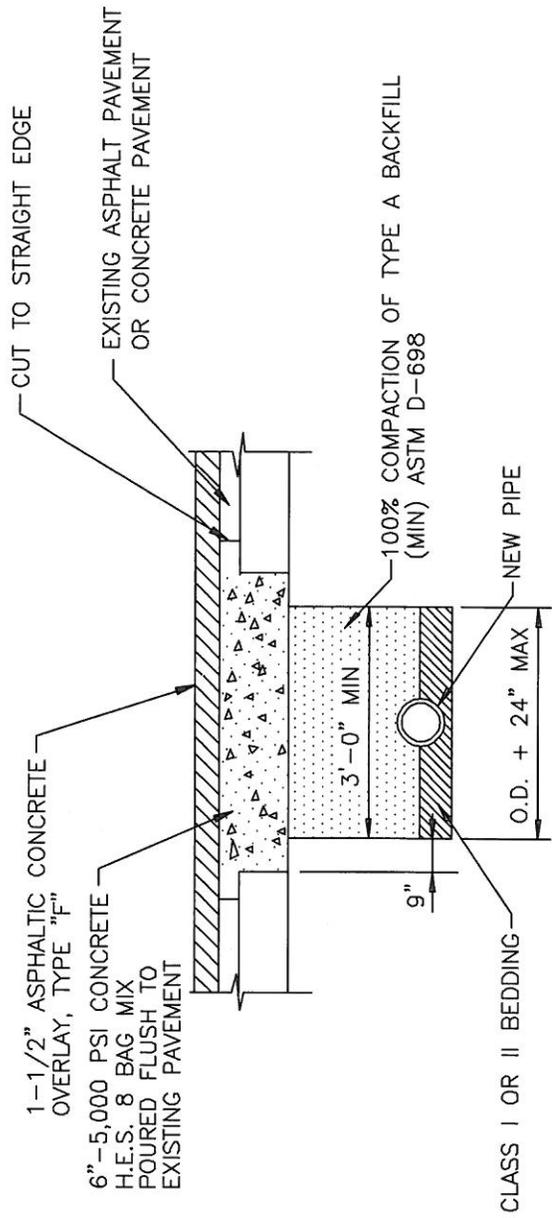
N.T.S.

DATE:
 August 2006

PAVEMENT REPLACEMENT

P-13

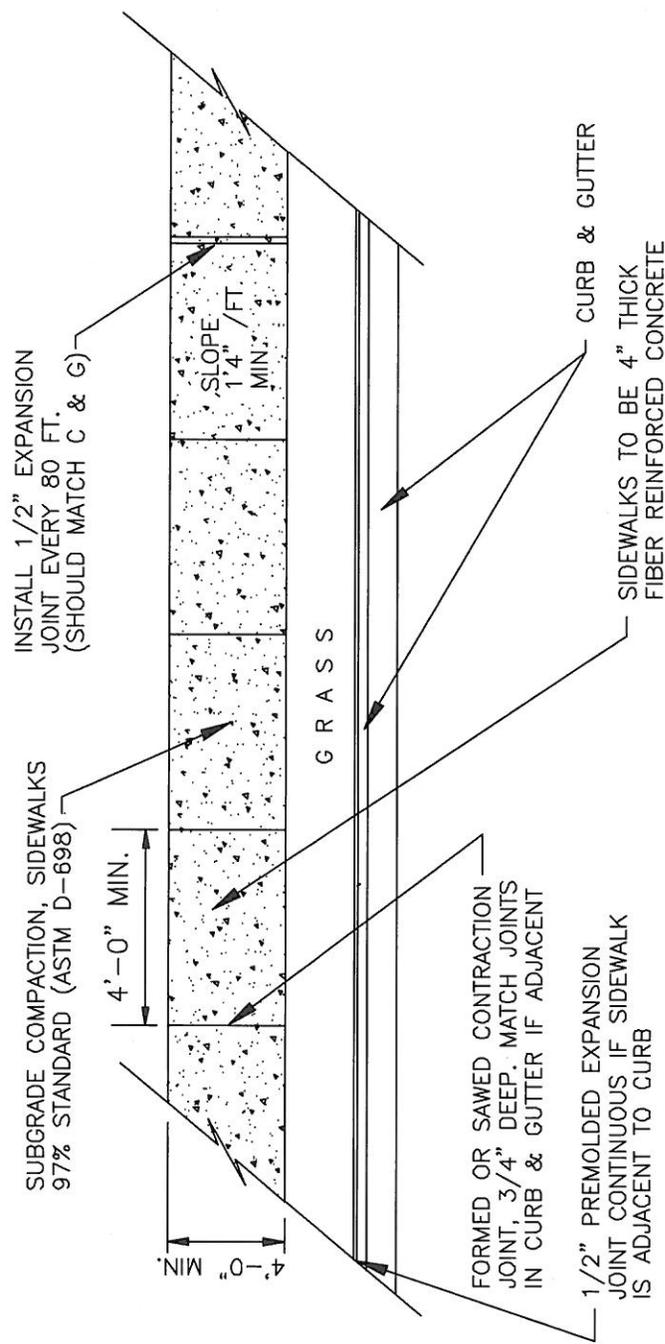
NOTE :
 LONGITUDINAL CUTS
 EXCEEDING 150 FT. IN
 LENGTH, THE CONCRETE
 IN TRENCH WILL BE BROUGHT
 FLUSH WITH THE EXISTING
 PAVEMENT AND THE EN-
 TIRE WIDTH OF ROADWAY
 RESURFACED WITH A MIN.
 OF 1-1/2" OF 12.5MM SUPERPAVE
 ASPHALT TOPPING OR
 SURFACE COARSE.



**PAVEMENT REPLACEMENT
 DETAIL LONGITUDINAL CUTS**

SCALE: N.T.S.
 DATE: August 2006

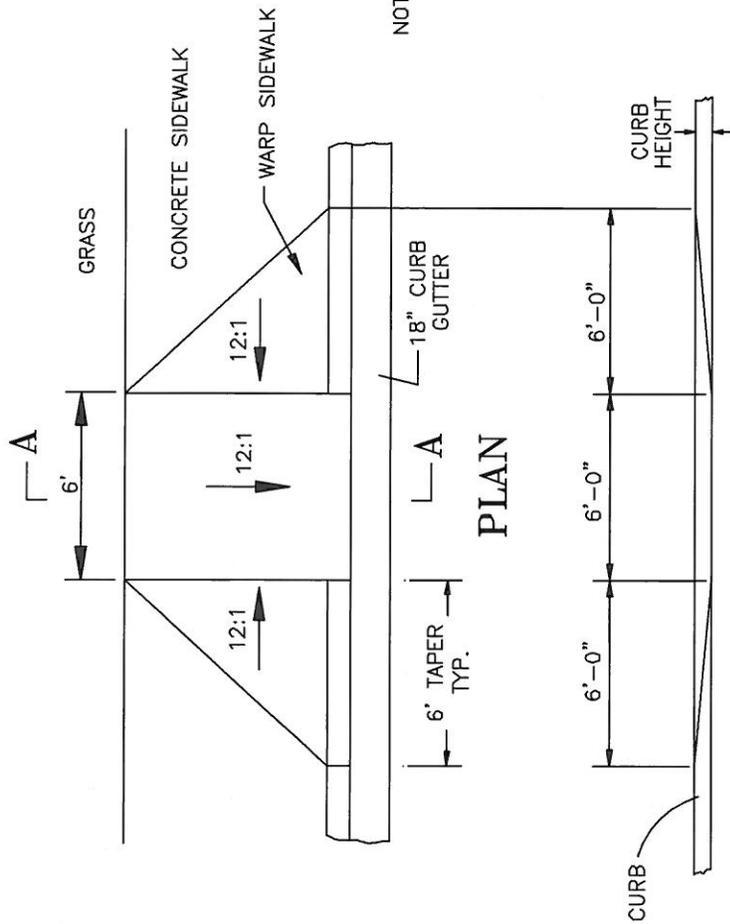
**CITY OF POOLER
 2011 STANDARD DETAIL**



NOTE:

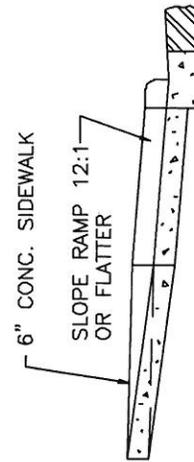
CONTRACTION JOINTS SPACING TO BE THE SAME AS WIDTH OF WALK.

<p>CITY OF POOLER 2011 STANDARD DETAIL</p>	<p>N.T.S.</p>	<p>P-15</p>
	<p>SCALE: N.T.S. DATE: January 2004</p>	
<p>SIDEWALK AND WALKWAY DETAILS</p>		



NOTE: RAMP SHALL HAVE BOTH A VISIBLE COLOR DIFFERENCE AND A RAISED TACTILE SURFACE TO SEPARATE IT FROM SIDEWALK. RAMP SHALL COMPLY WITH ALL APPLICABLE ADA REQUIREMENTS.

FRONT ELEVATION



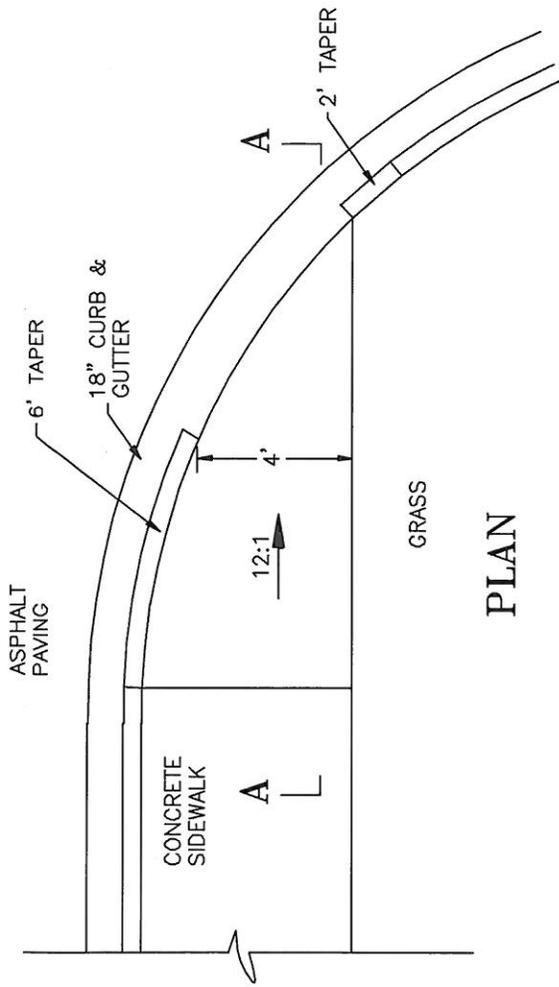
SECTION A-A

CITY OF POOLER
2011 STANDARD DETAIL

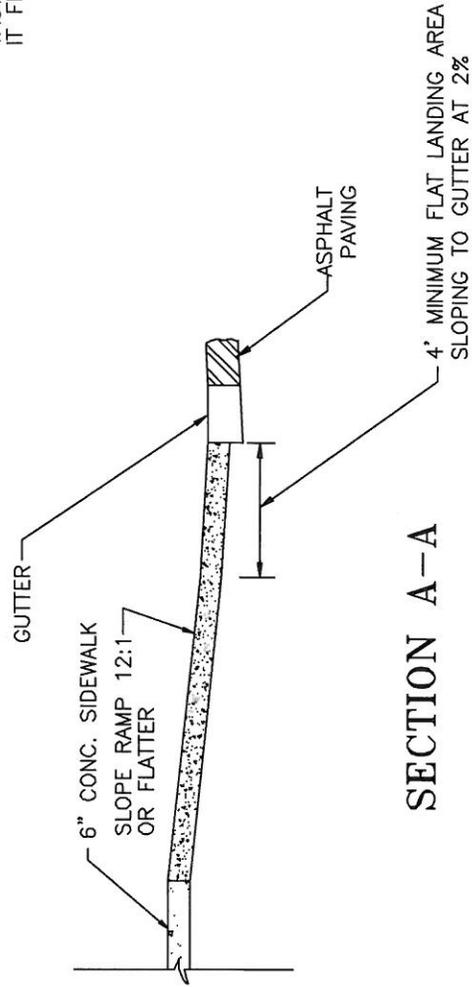
SCALE: N.T.S.
DATE: January 2011

P-16

HANDICAP RAMP DETAILS



NOTE: RAMP SHALL HAVE BOTH A VISIBLE COLOR DIFFERENCE AND A RAISED TACTILE SURFACE TO SEPARATE IT FROM SIDEWALK.

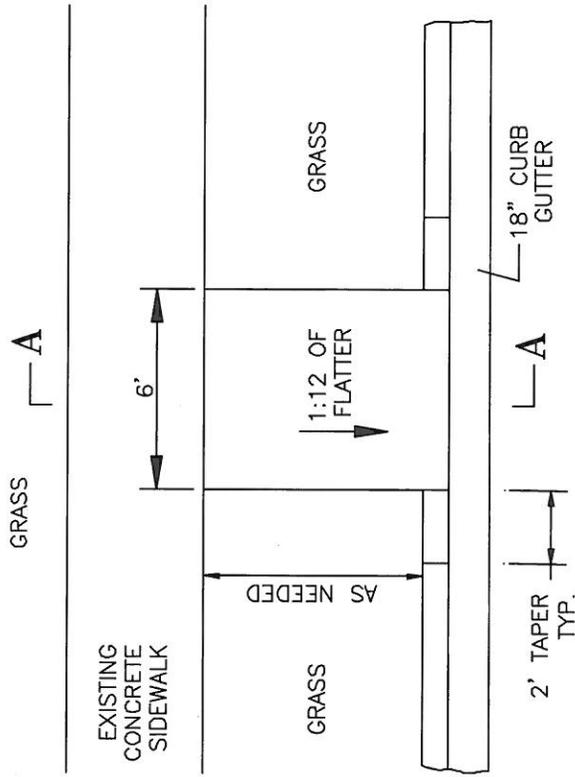


CITY OF POOLER
2011 STANDARD DETAIL

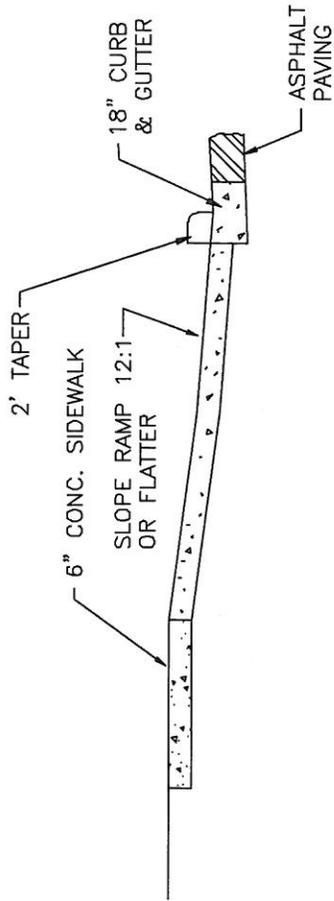
HANDICAP RAMP DETAILS

SCALE: N.T.S.

DATE: January 2011



PLAN



SECTION A-A

CITY OF POOLER
2011 STANDARD DETAIL

HANDICAP RAMP DETAILS

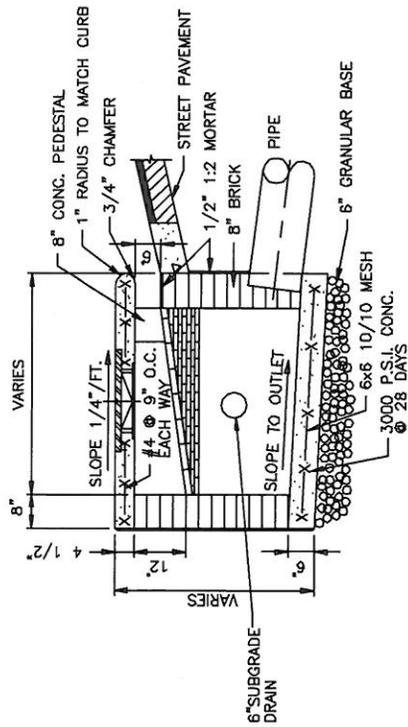
SCALE:

N.T.S.

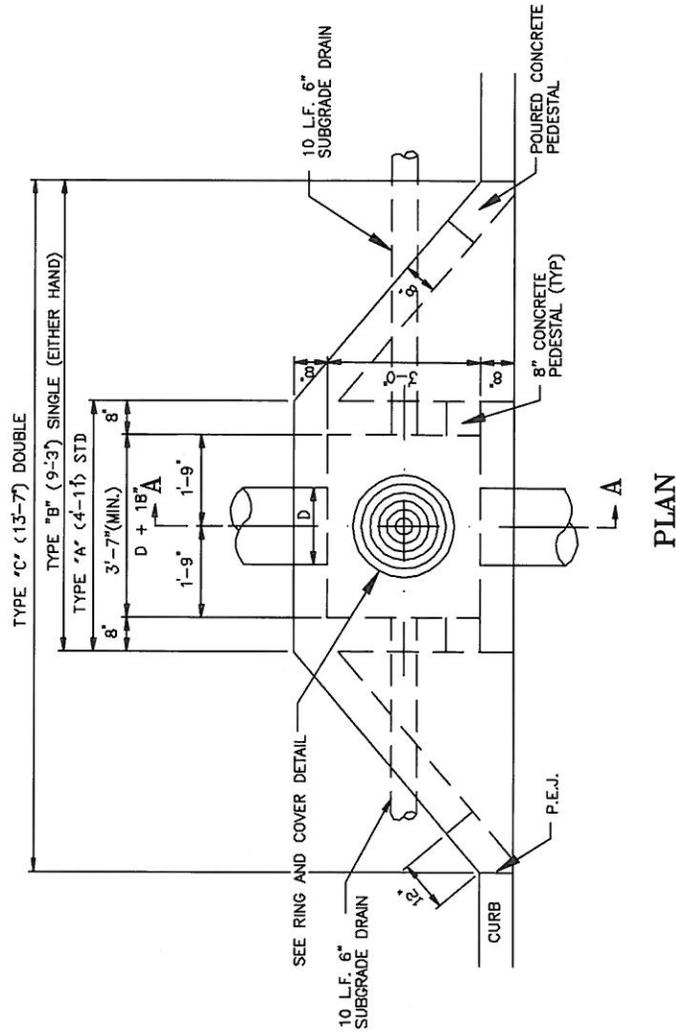
DATE:

October 2001

P-18



SECTION A-A



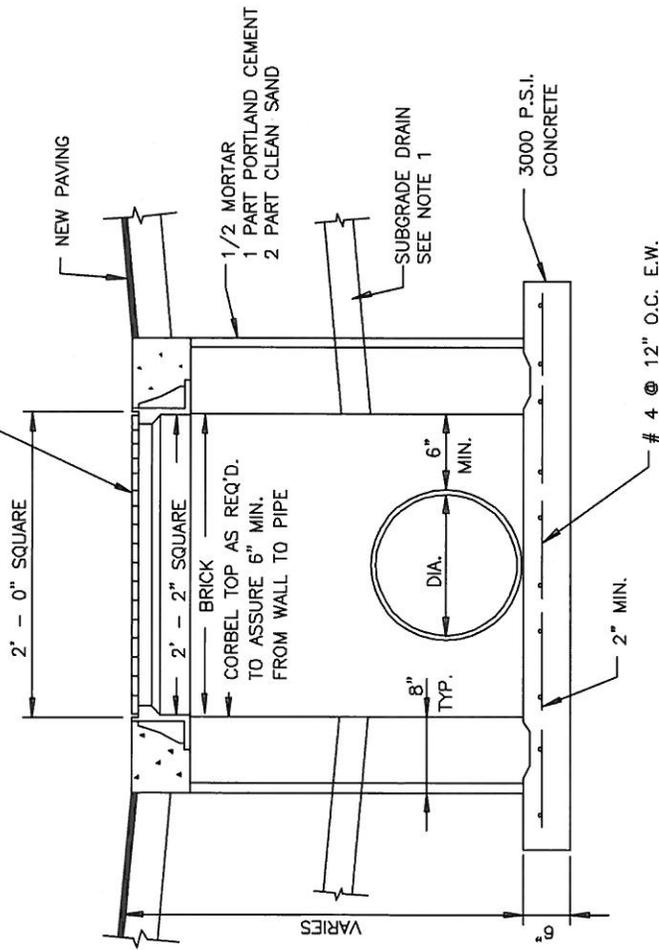
PLAN

NOTE:

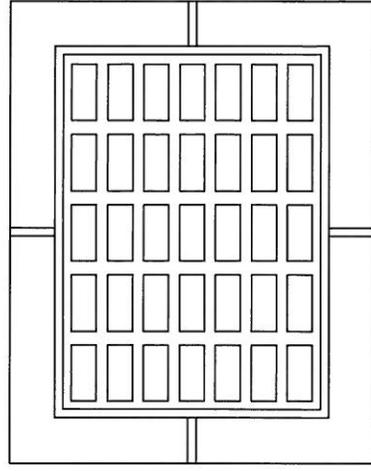
1. CHAMFER ALL EXPOSED CONCRETE EDGES 3/4" PIPE(S) @ INLET
2. SEE PAVING PLAN FOR LOCATION OF STORM PIPE(S) @ INLET
3. 10 L.F. OF 6" SUBGRADE DRAIN WILL BE INSTALLED OUT OF TWO SIDES OF EACH CURB INLET AND THE COST SHALL BE INCLUDED IN THE COST OF THE CURB INLET.
4. PRECAST CONCRETE BOXES ARE ALLOWABLE. KNOCK OUT BOXES WILL NOT BE ACCEPTED

<p>CITY OF POOLER 2011 STANDARD DETAIL</p>	<p>STANDARD CURB INLET</p>		<p>SCALE: N.T.S.</p>	<p>P-19</p>
			<p>DATE: August 2006</p>	

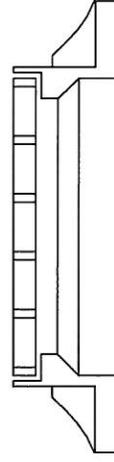
GRATE AND FRAME SIMILAR TO NEENAH FOUNDRY
CO. R-3433. WEIGHT 400#



- NOTES:
1. 10 L.F. PERFORATED SUBGRADE DRAIN BEDDED IN STONE. TWO SIDES OF INLET TO BE INCLUDED IN COST OF INLET



PLAN



GRATE AND FRAME SIMILAR TO NEENAH FOUNDRY
CO. R-3433. WEIGHT 400#

SECTION

GRATE INLET

CITY OF POOLER
2011 STANDARD DETAIL

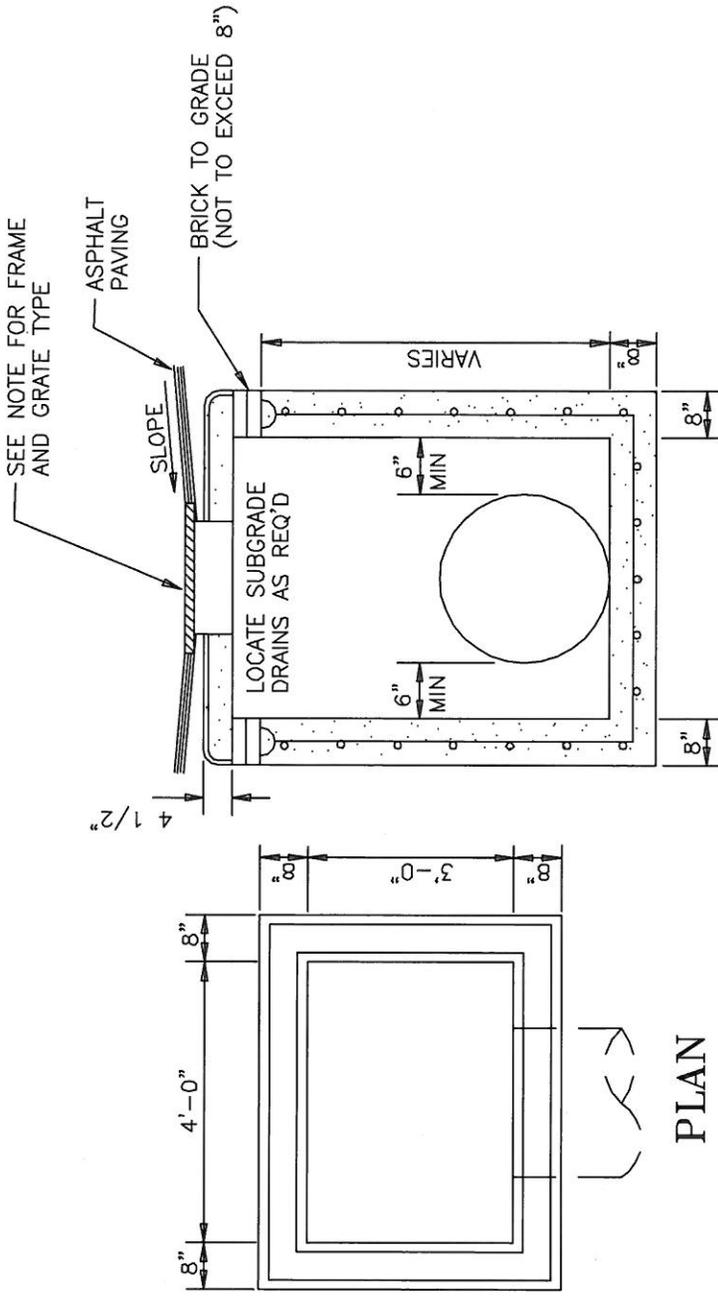
SCALE

N.T.S.

DATE
August 2006

GRATE INLET W/ FRAME

P-20

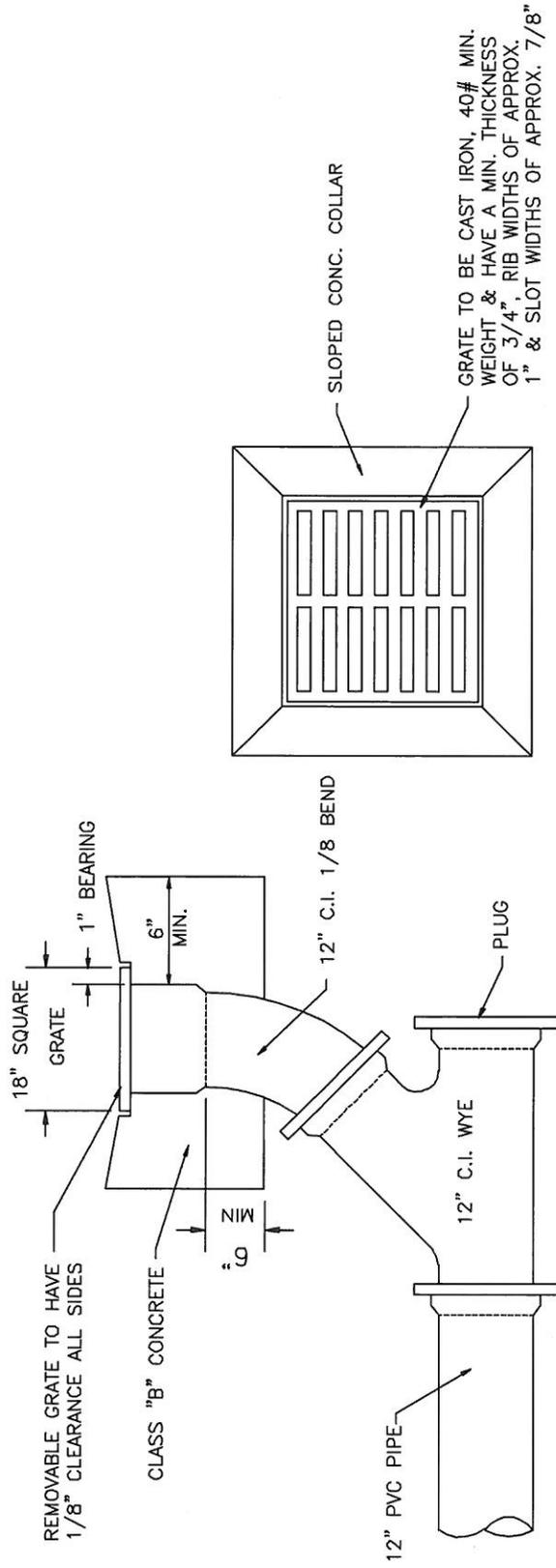


SECTION

PLAN

1. GRATE INLET SHALL BE NEEHAH FOUNDRY R-4721 HEAVY DUTY GRATE W/ R-4899 ANGLE FRAME, OR APPROVED EQUAL.
2. REINFORCING SHALL BE #4 BARS @ 8" O.C. EACH WAY.
3. PIPE OPENINGS SHALL BE PROVIDED BY THE MANUFACTURER AS REQUIRED.
4. ALL PIPE CONNECTIONS SHALL BE GROUTED WITH NON-SHRINKING CEMENT.
5. KNOCKOUT BOXES WILL NOT BE ACCEPTED.

<p>CITY OF POOLER 2011 STANDARD DETAIL</p>	<p>PRECAST GRATE INLET DETAIL</p>	<p>P-21</p>
		<p>SCALE: N.T.S.</p>
		<p>DATE: August 2006</p>



PLAN

SECTION

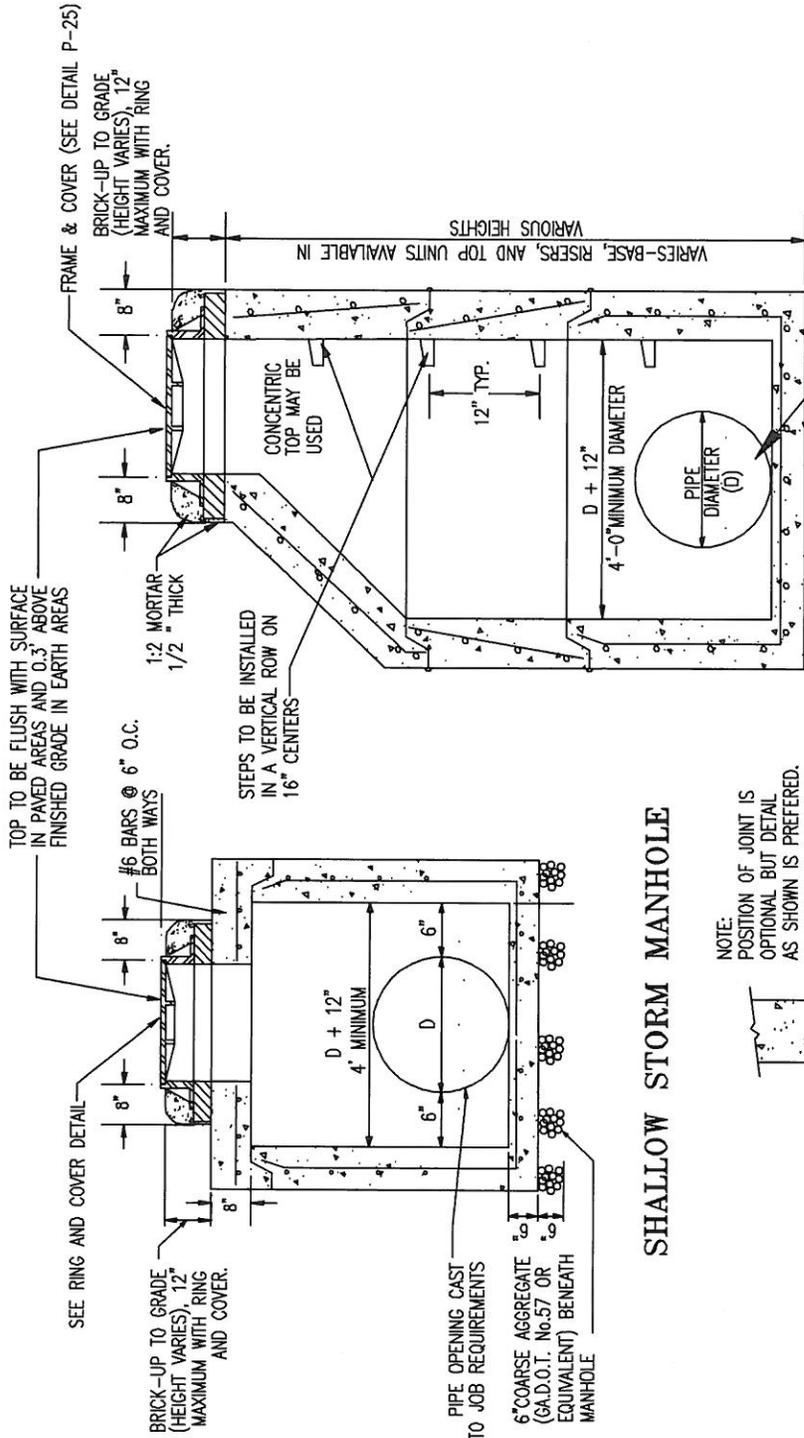
CITY OF POOLER
2011 STANDARD DETAIL

SCALE: N.T.S.

DATE: August 2006

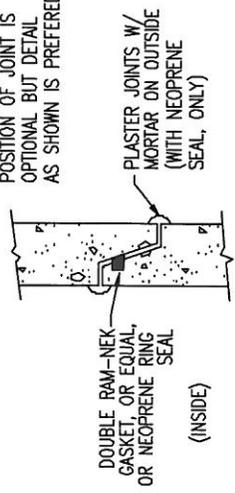
YARD INLET DETAIL

P-22



SHALLOW STORM MANHOLE

NOTE:
POSITION OF JOINT IS
OPTIONAL BUT DETAIL
AS SHOWN IS PREFERRED.



JOINT DETAIL

NOTE:
PRECAST REINFORCED CONCRETE MANHOLE TOPS, RISERS,
AND BASES SHALL CONFORM TO ASTM C-478-64F.

DEEP MANHOLE

NOTE:
WALL THICKNESS MAY BE ADJUSTED TO
STANDARD FOR LOCALITY IN WHICH
PROJECT IS SITUATED, BUT MINIMUM
THICKNESS SHALL BE 5" FOR MANHOLE 10'
OR LESS IN DEPTH AND 6" FOR DEEPER.

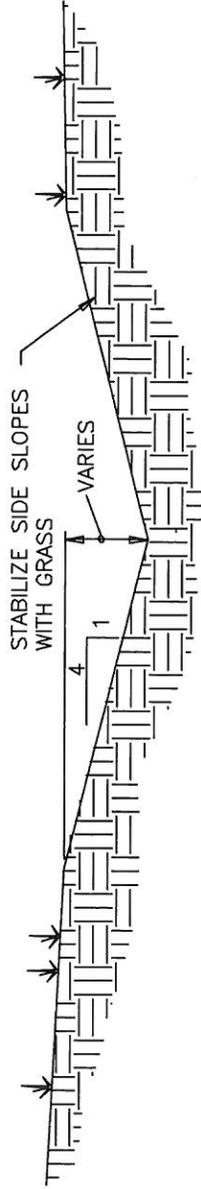
CITY OF POOLER
2011 STANDARD DETAIL

STANDARD PRECAST CONCRETE
STORM MANHOLE

SCALE: N.T.S.

DATE: August 2006

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CITY OF POOLER
2011 STANDARD DETAIL

TYPICAL SECTION
THROUGH SWALE (4:1)

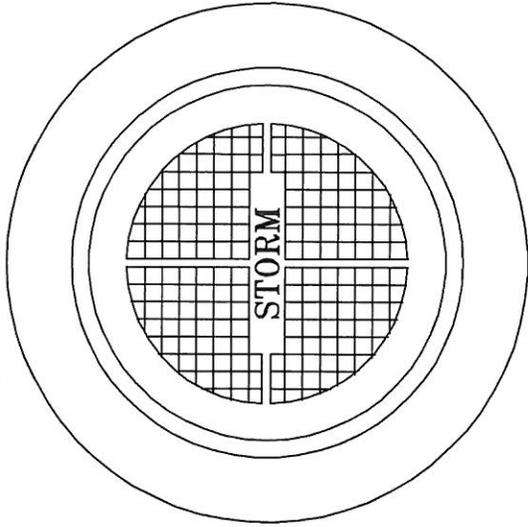
SCALE:

N.T.S.

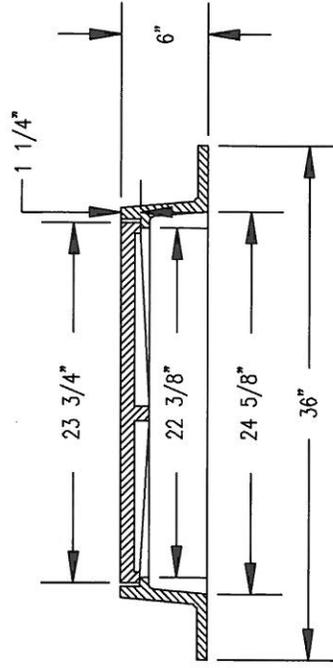
DATE:

August 2006

P-24



PLAN

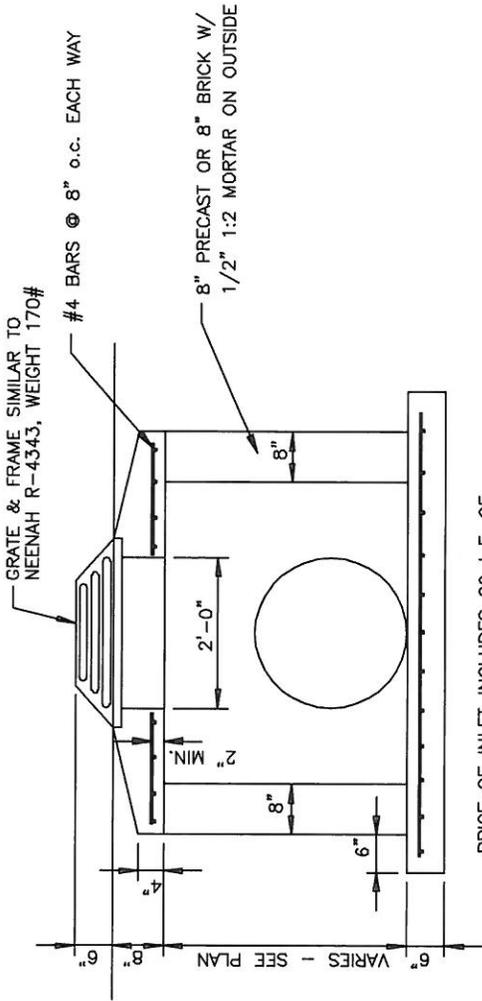


SECTION

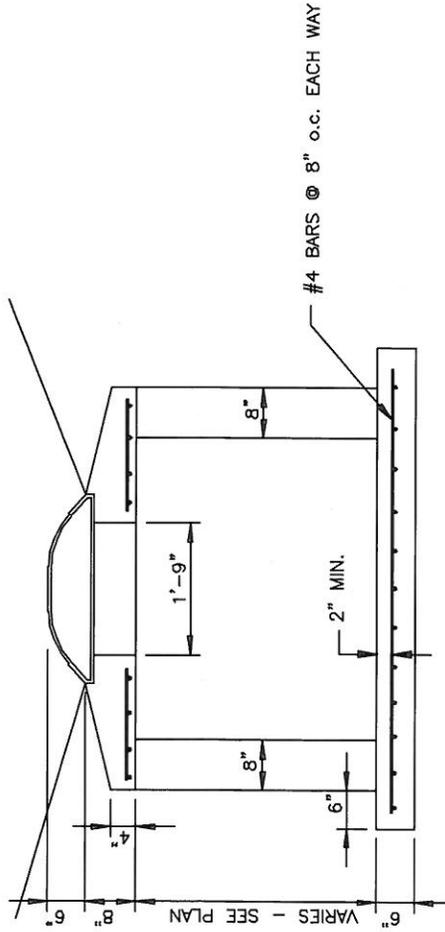
NOTE:

MANHOLE RIM & COVER SIMILAR TO U.S. FOUNDRY CO. USF 170-E. TOTAL WEIGHT 280# TYPE "C" LID TO HAVE MACHINED BEARING SURFACES. LID TO BE LETTERED "STORM" (NOT VENTED).

CITY OF POOLER 2011 STANDARD DETAIL	STORM MANHOLE RING & COVER		SCALE: N.T.S.	P-25
			DATE: August 2006	



PRICE OF INLET INCLUDES 20 L.F. OF SUBGRADE DRAIN W/ STONE & FILTER FABRIC . (10 L.F. IN TWO DIRECTIONS)



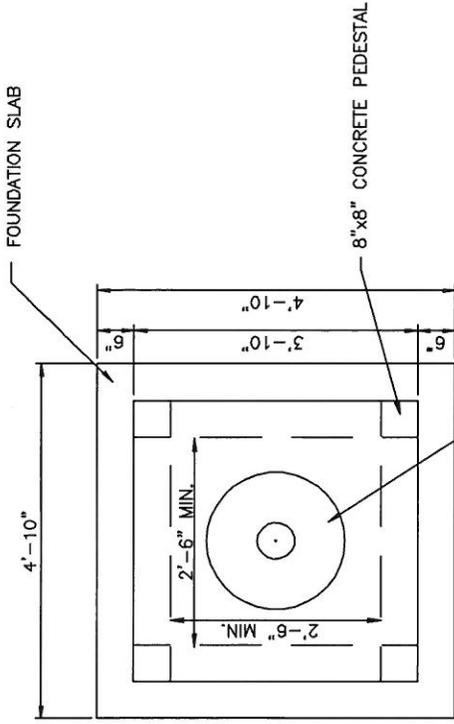
CITY OF POOLER
2011 STANDARD DETAIL

DITCH INLET (TYPE "A")

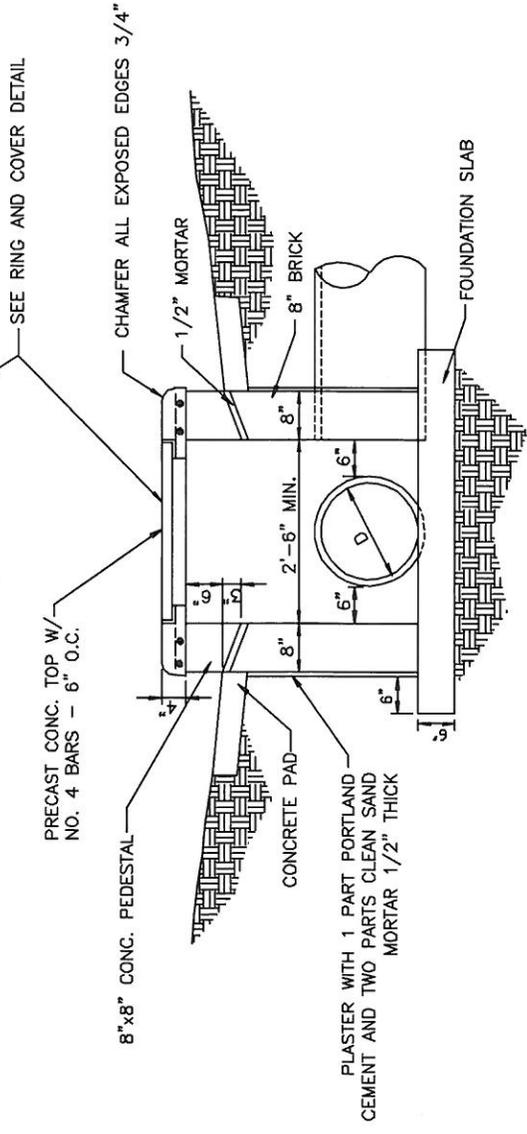
SCALE: N.T.S.

DATE: August 2006

P-26

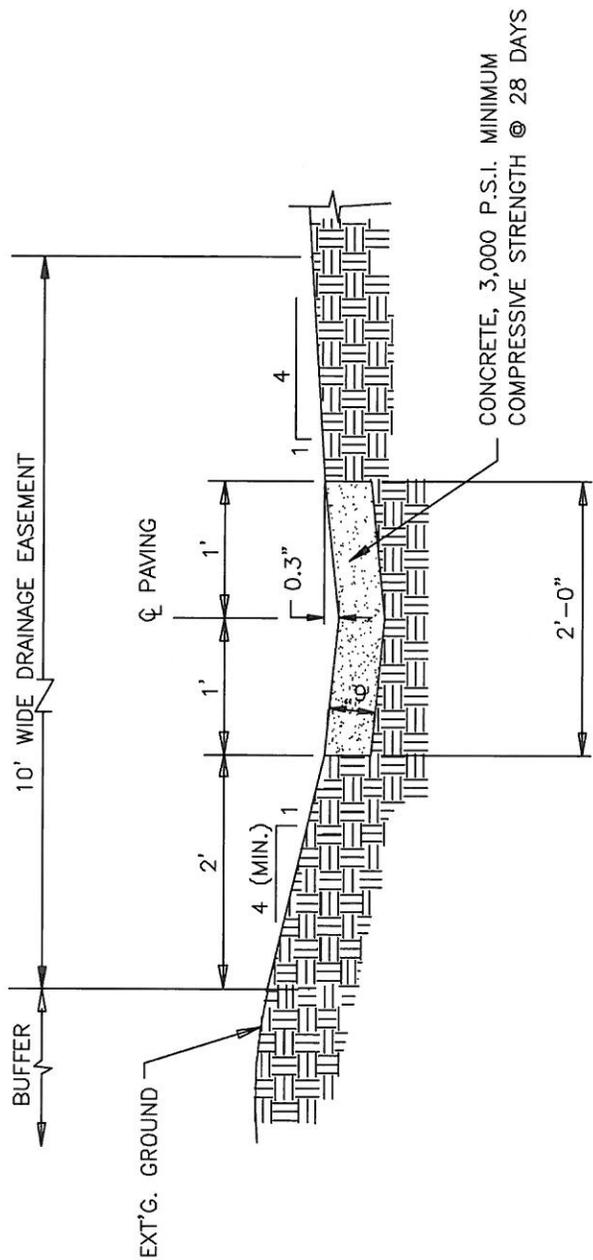


PLAN



ELEVATION

CITY OF POOLER 2011 STANDARD DETAIL	ROOF INLET DETAIL		SCALE: N.T.S.	P-27
	SEE RING AND COVER DETAIL		DATE: August 2006	



CITY OF POOLER
2011 STANDARD DETAIL

CONCRETE LOT SWALE

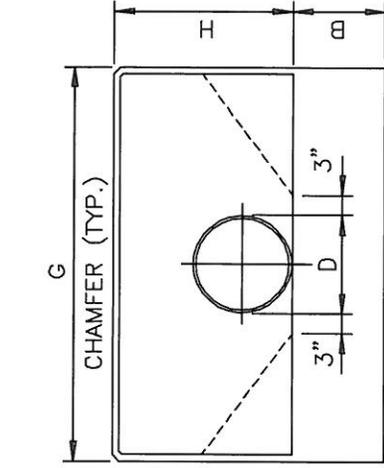
SCALE:

N.T.S.

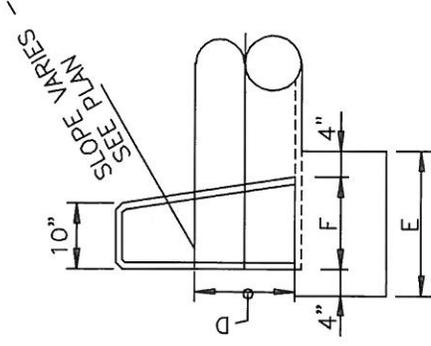
DATE:

August 2006

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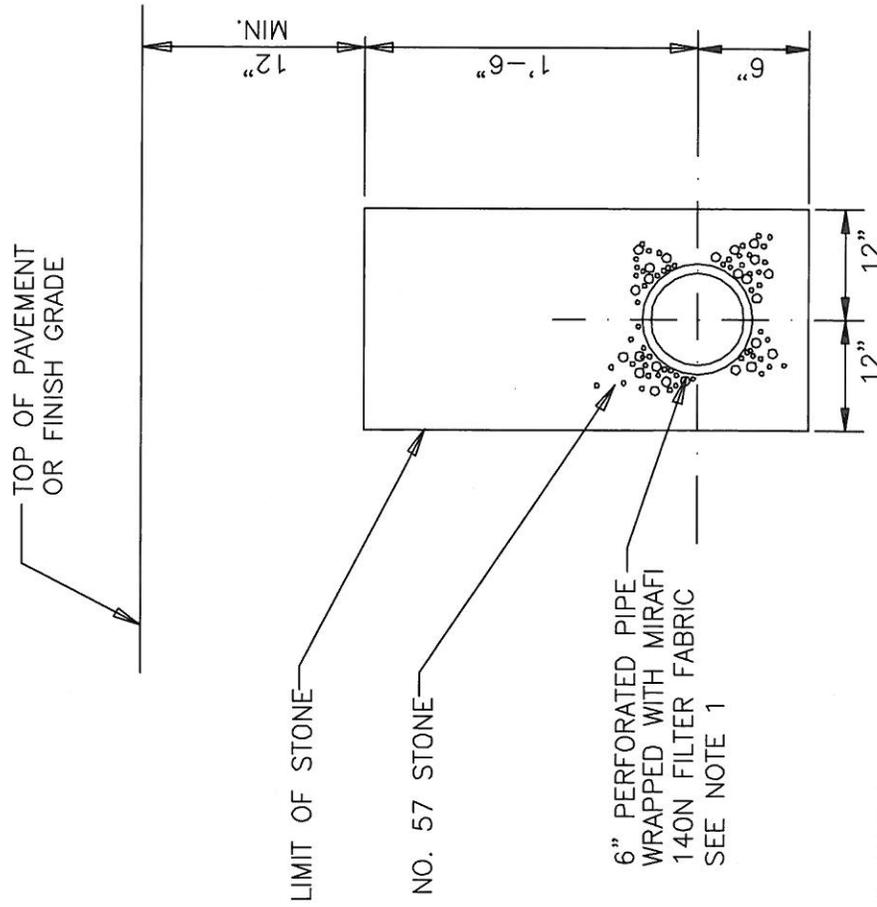
FRONT ELEVATION



END ELEVATION

NOTE: RECESS SURFACE OF FOOTING TO ACCOMMODATE THICKNESS OF GROUT MAT

OPENING D	DIMENSIONS										QUANTITIES ONE ENDWALL				CONC IN WALL & FT ³ FOR EACH ADD'L LINE
	WALL					FOOTING					CLASS "B" CONCRETE				
	G	H	B	E	F	WALL	FOOT	TOTAL	CU FT	CU YD					
12"	4'-0"	2'-0"	1'-2"	1'-10"	1'-0"	7.2	7.3	14.5	0.54	0.25					
15"	5'-0"	2'-3"	1'-2"	1'-10"	1'-2"	9.9	10.7	20.6	0.76	0.32					
18"	6'-0"	2'-6"	1'-3"	1'-11"	1'-3"	13.6	14.4	28.0	1.04	0.38					
24"	8'-0"	3'-0"	1'-4"	2'-0"	1'-4"	22.3	21.3	43.6	1.62	0.52					
30"	10'-0"	3'-6"	1'-6"	2'-2"	1'-6"	34.7	32.5	67.2	2.49	0.73					
36"	12'-0"	4'-0"	1'-8"	2'-4"	1'-8"	50.5	46.7	97.2	3.60	0.97					
42"	14'-0"	4'-6"	1'-10"	2'-6"	2'-0"	70.3	70.0	140.3	5.20	1.33					
48"	16'-0"	5'-0"	2'-1"	2'-9"	2'-0"	96.9	88.0	184.9	6.85	1.64					
54"	18'-0"	5'-6"	2'-4"	3'-0"	2'-0"	129.4	108.0	237.4	8.79	1.96					
60"	20'-0"	6'-0"	2'-6"	3'-2"	2'-0"	164.6	126.7	291.3	10.79	2.23					



NOTE: 1. SLOPE PIPE TO CURB INLETS
AS SHOWN ON DRAWINGS

CITY OF POOLER
2011 STANDARD DETAIL

SUBGRADE DRAIN

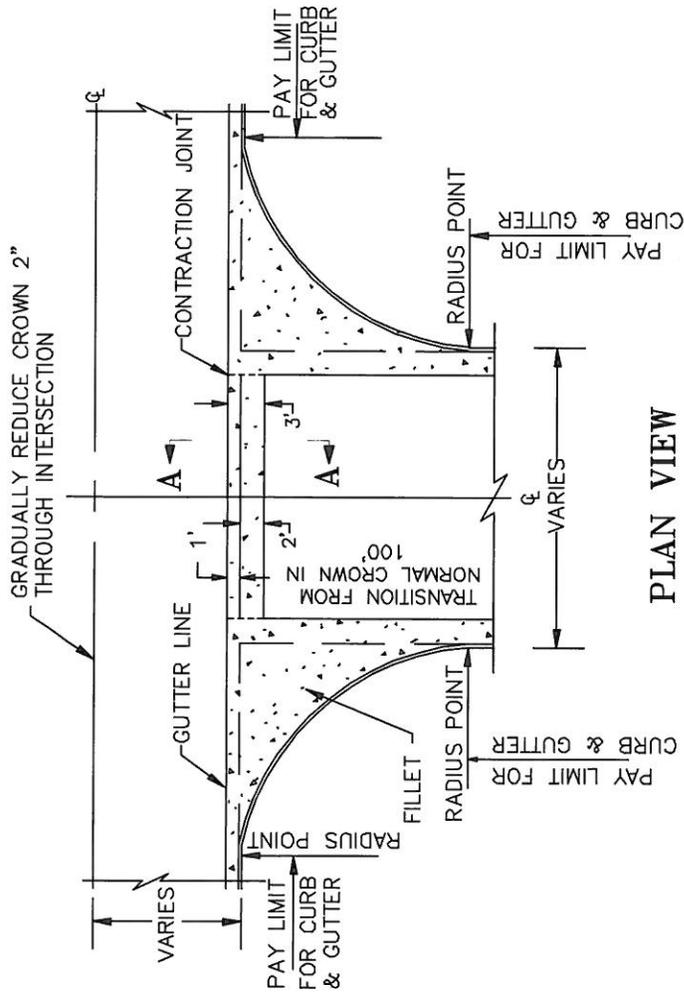
SCALE:

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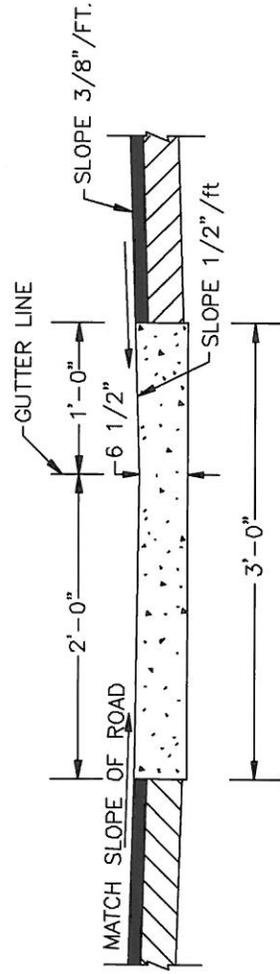
DATE:

August 2006

P-30



PLAN VIEW



SECTION A-A

NOTE:
 COMPACTED SUBBASE TO
 100% STANDARD
 (ASTM D-698)

CITY OF POOLER
 2011 STANDARD DETAIL

CONCRETE SWALE WITH FILLETS

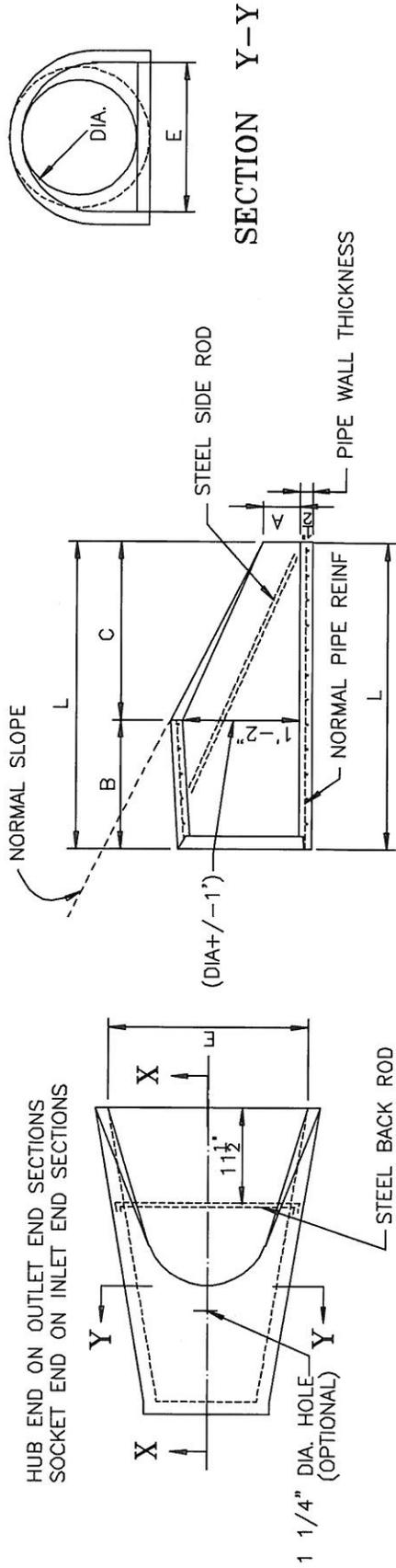
SCALE: N.T.S.

DATE: August 2006

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FLARE REINFORCEMENT & DIMENSIONS (+/-1" TOLERANCE)

PIPE DIA.	SIDE RODS	BACK RODS	FABRIC	SLOPE	A	B	C	L	E
12"	2-3X2'5"	NOT REQ'D	2"X8"8/9	2.2:1	4"	2'0"	4'1"	6'1"	2'0"
15"	2-3X2'11"	NOT REQ'D	2"X8"8/9	2.2:1	6"	2'3"	3'10"	6'1"	2'6"
18"	2-3X3'6"	NOT REQ'D	2"X8"8/9	2.2:1	9"	2'3"	3'10"	6'1"	3'0"
24"	2-3X5'0"	NOT REQ'D	2"X8"8/9	2.4:1	10"	3'8"	2'6"	6'2"	4'0"
30"	2-4X6'2"	NOT REQ'D	2"X8"8/9	2.4:1	12"	4'6"	1'8"	6'2"	5'0"
36"	2-4X7'5"	NOT REQ'D	2"X8"8/9	2.4:1	15"	5'3"	2'11"	8'2"	6'0"
42"	2-4X8'7"	NOT REQ'D	2"X8"8/9	2.4:1	21"	5'3"	2'11"	8'2"	6'6"



PLAN

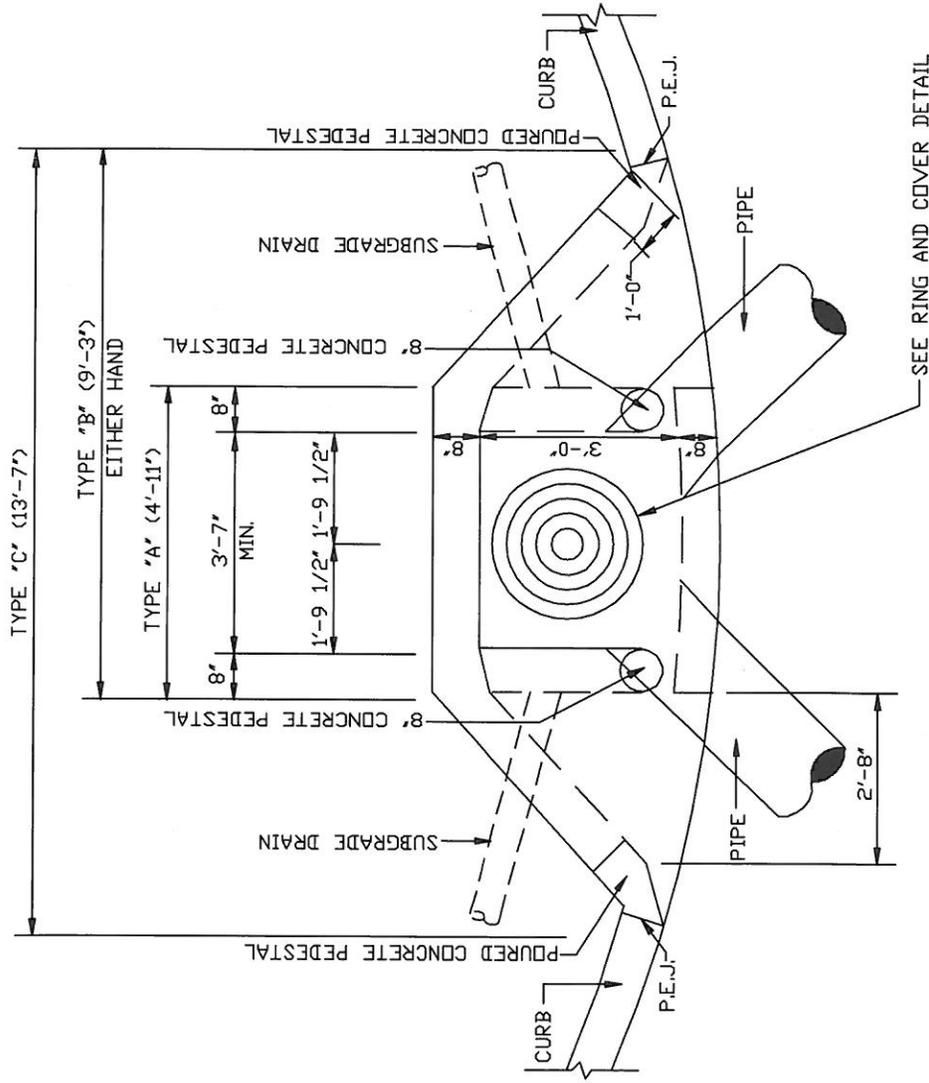
SECTION X-X

NOTE:
 REINFORCEMENT SHALL CONFORM TO ASTM A-82
 OR A-306 FOR CAGE WIRE AND ATSM
 A-185 FOR WIRE FABRIC

SCALE: N.T.S.
 DATE: August 2006

FLARED END SECTION DETAIL

CITY OF POOLER
 2011 STANDARD DETAIL



CITY OF POOLER
 2011 STANDARD DETAIL

PLAN OF CURB INLET ON RADIUS

SCALE: N.T.S.
 DATE: August 2006