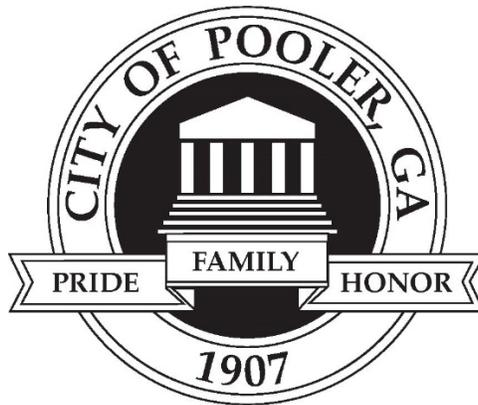


STANDARD SPECIFICATIONS AND DETAILS FOR THE CITY OF POOLER, GEORGIA

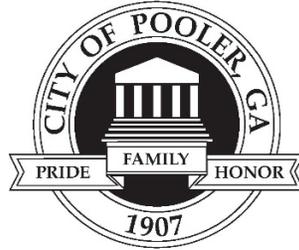


UPDATED IN 2025



ORIGINALLY PREPARED AND REVISED BY HGB IN 2012. REVISED BY EOM IN 2025

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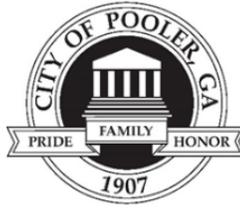
NOTICE

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 **Autodesk** and converted to Adobe PDF files.

The PDF (portable document format) files listed below are available for viewing online using the **Adobe Acrobat Reader** 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
- WATER DISTRIBUTION SYSTEM DETAILS
- WASTEWATER COLLECTION SYSTEM DETAILS
- STREETS AND DRAINAGE DETAILS



City of Pooler Pre-Construction Checklist

DEVELOPMENT NAME & PROJECT # _____

OWNER: _____ **PHONE NUMBER:** _____

ENGINEER: _____ **PHONE NUMBER:** _____

24 HR. EMERGENCY CONTACT #: _____ **PHONE NUMBER:** _____

CONTRACTOR _____ **PHONE NUMBER:** _____

EMAIL: _____ **CELL NUMBER:** _____

- Copy of Contractor's License
- Copy of General Contractor's License (level 1B Inspector must be present at the pre-construction meeting)
- Copy of Utility Contractor's License (Agreement with inspecting company must be provided)
- Copy of GSWCC License (level 1A) (Copy of the Blue Card must be provided)

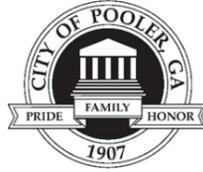
Construction Plans & Landscape Plans

- ***These plans must be the latest set of construction plans that has already be approved by the City Council. They must be stamped "ISSUED FOR CONSTRUCTION", and they must be stamped and signed by a Georgia professional engineer.*
- *Plans must include landscape and erosion control, streetlights notes, and irrigation notes.*
- *All Utilities are required to be underground.*
- *Plans must include the "Call Before Digging" logo.*
- *Amended plans shall be always marked and ready for review.*
- *Vertical and horizontal bends in water and sewer systems can't be replaced with deflection of the lines.*
- *Joint deflection of pipes shall not be allowed to exceed the manufacture's standards.*
- *Storm drainage outfall structures can't be replaced from the ones shown in the approved plans.*
- *The City's Standard Construction Details show the minimum standards allowed by the city. There are no variances for as-built conditions that do not meet these minimum standards.*

3 Full Sets PDF File

3 Full sets of Approved Site Plans with Landscape

Hold Harmless Agreements		
Hold harmless agreements are required in the following situations:		
<ul style="list-style-type: none"> • Irrigation System that is located in Utility Right -of-Way. • Water, Street, Sewer, and/or Stormwater Utilities are located in a private subdivision or development. • Landscaping that is placed in Utility Right-of-Ways. 		
Hold Harmless Agreements		<input type="checkbox"/>
Letter Stating Private Utilities if Applicable		<input type="checkbox"/>
Additional Information		
NPDES signed contract	<input type="checkbox"/>	
EPD Approval Letter (if applicable)	<input type="checkbox"/>	
LDA Submitted to the City of Pooler Inspection Department	<input type="checkbox"/>	N/A
Copy of the Minor LDA Permit (under 1 acre)	<input type="checkbox"/>	
Contingencies Listed in Council Approval (if applicable)	<input type="checkbox"/>	
Recorded Stormwater Maintenance Agreement and Schedule	<input type="checkbox"/>	
Proof of Notice of Intent (14 days waiting period)	<input type="checkbox"/>	N/A
Copy of GSWCC Approval	<input type="checkbox"/>	
Tree Deficit Reimbursement Receipt	<input type="checkbox"/>	N/A
Copy of NOI	<input type="checkbox"/>	
<ul style="list-style-type: none"> • All water that is required during construction must be metered using a device approved by the City of Pooler. • ** Owner shall provide "Record Drawings" and all the results of all required testing data <u>at least 72 hours</u> prior requesting a final inspection or a certificate of occupancy so that post-construction conditions and testing can be verified and approved. • Certified record drawings shall include topography of pond and outlet structure detail using post-construction survey data. Using record drawings, provide a certified hydrology verifying pond volumes and peak outflows from regulated storm events. • All as-builts must have coordinates (Georgia, southeast quadrant), and at least one benchmark with its coordinates and datums. • Two (2) hard copies of "Record Drawings" are required. • One PDF and DWG copy of "Record Drawings" is needed. The layers of the DWG file must be able to be exported to GIS. • A set of recordable Plats is required. It must include all required easements and must be signed be a GA RLS. • Submit at least 2 hard copies, a PDF copy and a digital copy that can be exported to GIS. 		



CITY OF POOLER – FIELD INSPECTION CHECKLIST

Development:

Engineering Firm: _____ **Representative:** _____

Phone No. _____ **Phone No.** _____

All developments that are to be dedicated to the City of Pooler shall be inspected at the various stages to ensure that the overall integrity of the project is maintained. Developers and Engineers are responsible to ensure the following list is complete before a final inspection is scheduled. Contact Tarra Duff, at Public Works Department to schedule the following inspections at (912)330-8650 Tduff@pooler-ga.gov

Erosion Control

	Date of Inspection	Inspector	Passed	Failed	Date of Re-inspection
Initial erosion control inspection					
Weekly NPDES Reports					
Grassing on all Disturbed Areas					

Notes: _____

Sewer

	Date of Inspection	Inspector	Passed	Failed	Date of Re-inspection
Material Inspection					
Existing Sewer Manhole Tie-ins					
Mandrell Pull					
Pressure Test					
Interior Visual Inspection					
Video Inspection all Sewer Lines					

Notes: _____

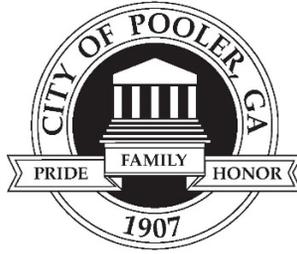
Water					
	Date of Inspection	Inspector	Passed	Failed	Date of Re-inspection
Material Inspection					
Bacteria testing report					
Water pressure test					
Fire Flow Test					
Continuity Test					
Meter Inspection					
Hydrant Meter Returned					
Tie -in					
Back Flow Inspection					
Notes: _____					

Street					
	Date of Inspection	Inspector	Passed	Failed	Date of Re-inspection
Documentation of soil testing					
Proof Roll Curb					
Proof Roll Sub-grade					
Proof Roll Base					
Compaction test Curb					
Compaction Test Sub-grade					
Compaction Test Base					
Asphalt Core Report					
Notes: _____					

Stormwater					
	Date of Inspection	Inspector	Passed	Failed	Date of re-inspection
Material Inspection					
Interior Visual Inspection of Storm Drains					
Video Inspection of Lines and Joints					
Tie-in _____					

Landscape					
	Date of Inspection	Inspector	Passed	Failed	Date of re-inspection
Tree Count					
Preferred Tree List					
Notes: _____					

Other	
<i>The following documents must be on record at Public Works prior to scheduling a final inspection.</i>	
	Date Received
C of C Packet with Engineer Certification	Received by _____
Record Drawings 72 hrs. Prior to Final	_____
Notes: _____	



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 to 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: _____

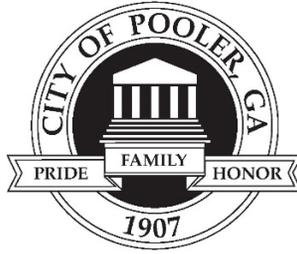
Was the contractor notified of all deficiencies: Yes _____ No _____
If No: Why not: _____

Was the Design Engineer notified of 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 No. 1 Location _____ Hydrant No. 2 Location _____

PSI	_____	PSI	_____
GMP	_____	GMP	_____
RESIDUAL	_____	RESIDUAL	_____

Savannah Benton Drive Connection Open _____ Closed _____

Pooler Wells On _____ Off _____ Elevated Tank Level _____

Hydrant No. 1 Location _____ Hydrant No. 2 Location _____

PSI	_____	PSI	_____
GMP	_____	GMP	_____
RESIDUAL	_____	RESIDUAL	_____

Flow test by: _____

Hydrant(s) Painted:	YES _____	NO _____
Hydrant Chains Removed:	YES _____	NO _____
Approved:	YES _____	NO _____

Comments:

SECTION 01001

GENERAL REGULATIONS FOR INFRASTRUCTURE

The following provisions include general policies that shall be accounted for in the design and construction of infrastructure within the City of Pooler. The provisions outlined below reiterate applicable City of Pooler regulations and standards that would typically apply to private development and subdivision projects that involve infrastructure (water, sewer, streets, etc.)

1. EASEMENTS:

a. 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 preferably along front property lines. All public utilities within easements dedicated for that purpose shall be installed underground.

Site Plans and Record Drawings with Utility Easements dedicated for the purpose of establishing City of Pooler access to public utilities shall be delineated and annotated as “City of Pooler Utility Easement”. Utility Easements intended to establish access for a Private Entity, shall be labeled as Private Utility Easement on Site Development Plans.

All easements and Easement Agreements must be recorded with the property and include a detailed description of the easement boundaries, access rights, and any restrictions on use. Easements shall run with the land and be binding on all successors and assigns. Fees for easement processing and recording are the responsibility of the developer.

Utility Easements shall not be encroached upon by any structure. Any encroachment into a Utility Easement shall be prohibited, unless expressly approved by the Utility Owner, which may require an executed hold harmless agreement, and conditions stipulated by the Utility Owner.

b. 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 setback for structures.

The access easement can be used as a part of common areas when easement is provided for utilities between residential and/or commercial properties (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 within 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 based on factors such as depth or size of infrastructure, 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 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.

2. PUBLICLY OWNED UTILITIES:

a. GENERAL:

- All public Owned utilities shall be installed within the boundaries of the right-of-way or approved access or utility easement.
- Water Mains, Sewer Mains, or their Service Laterals shall not be installed behind or between lots without the approval of the City of Pooler. If allowed the utility will need to be in a proper easement.
- New Construction of Water or Sewer Mains shall not be installed longitudinally under roadway pavement.
- Crossing of underground water, sewer, or storm pipes shall be minimized to the extent practical.
- When extension of public water or sewer mains will be necessary to establish new availability of service, the main shall be extended across the frontage of site to the property boundary.
- Potable water wells and septic systems shall be permitted by Chatham County Health Department.
- All utilities that cross streets shall be oriented such that they are perpendicular to the street. Fittings shall not be permitted to be installed in the pavement footprint of roadways or driveways.
- All trees whether existing or proposed shall be situated a minimum of 10 ft from any public utility. Any damage cause by nonconformance of this requirement shall

be mitigated at the property owner, HOA, or POA's expense.

- All freestanding signs foundations shall be situated a minimum of 10 ft from any public utility.
- Dry utilities shall not be installed any closer than 5 ft from public utilities, measured from outside edge of pipe to outside edge of conduit/line.
- Water or sewer laterals shall not be permitted to be installed under driveways. Likewise, no driveways shall be permitted to be constructed on top of water or sewer laterals.
- The City of Pooler shall reserve the right to dictate the location and alignment of public utilities, when situated along planned arterial roadways or roadways with planned widening projects. The intent is to encourage thoughtful layout of utility networks along corridors where improvements, widening, or modifications are anticipated.

b. WATER SYSTEM:

- Extension of public water systems shall be required to submit the GA EPD Drinking Water Form, and all required application materials, for review by the City of Pooler's Delegated Review Authority, as approved by the GA EPD. In the absence of a delegated review authority, the application materials shall be submitted to the GA EPD for review and approval.
- Public water systems shall be designed to achieve the minimum required standards presented in the GA EPD Minimum Requirements for Public Water Systems, the City of Pooler Code of Ordinance, and the City of Pooler Standard Specifications.
- Water Mains for Subdivision Projects are required to have a minimum diameter of 8-inches, unless otherwise approved by the City of Pooler. On Cul-de-Sacs with no fire hydrants present, the minimum size is reduced to 4-inch diameter.
- Water Mains shall be installed no closer than 4 ft from the back of curb or edge of roadway pavement.
- The water mains at cul-de-sac shall be installed around the cul-de-sac. This will eliminate any water laterals being installed under the cul-de-sac.
- All water laterals provided in residential subdivisions shall be a minimum of one-inch diameter.
- All water laterals shall be installed five feet from the property corner markers. At no time shall it be permissible for the laterals to be located in the middle of lots.

- When feasible all water mains shall be looped into the nearest main of equal size or larger.
- All residential, commercial, and industrial sites that have desire to establish water service from the City of Pooler Water System shall be in conformance with the City of Pooler's Cross-Connection & Backflow Prevention Policies.
- Commercial and Industrial parcels served by City of Pooler Water System shall install above ground backflow prevention devices and shelters. If not feasible, exceptions shall be granted at the discretion of City of Pooler Staff or their Designated Representatives.
- Water Mains designed and constructed for subdivision projects, which serve both domestic and fire protections needs, shall utilize the following schedule for Maximum Fire Hydrant Spacing:
 - 500 ft in Single Family Zoned Subdivisions
 - 300 ft in Multi-Family, Commercial, & Industrial Zoned Subdivisions
 - 250 ft in Mobile Home Parks
- Cut-off Valves shall be furnished at all water main tees with a diameter of 2-inches or larger. Valves shall be installed outside of the pavement footprint and within an appropriate valve box or manhole. Cut-Off Valves shall be installed at a maximum interval of 1000 feet.
- All Gate & Butterfly Valves (14-inch or greater) that are installed on the transmission line(s) and/or tie into a major transmission line shall be installed in a manhole. Gate Valves shall be specified for pipes with diameter of 2-inch thru 12-inch. Butterfly valves shall be required where water mains are 14-inches in diameter or larger. 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.
- Private Fire Water Lines connected to the public water system that serve fire protection needs on individual development sites shall be furnished with an isolation valve, just downstream of the connection to the public water system, and an appropriate backflow prevention device, just on the property side of the Right-of-Way line.
- All proposed extensions of public water systems shall be supplemented by design analysis and calculations demonstrating that the design meets or exceeds the minimum requirements established by the Georgia Environmental Protection Division, the City of Pooler, and all applicable nationally accepted engineering standards.

c. SANITARY SEWER SYSTEM:

- Extension of sanitary sewer system shall be required to submit the GA EPD Sanitary Sewer Extension Submittal (SSES) Form, and all required application materials, for review by the City of Pooler's Delegated Review Authority, as approved by the GA EPD. In the absence of a delegated review authority, the application materials shall be submitted to the GA EPD for review and approval.
- All sanitary manholes shall be installed with maximum distance of 350 ft.
- When feasible the sewer lateral shall be connected to sanitary manholes. All laterals tying to a manhole shall enter at an angle of at least 90 degrees from the direction of flow. Alternatively, sewer laterals shall be tied into the sanitary sewer by means of a sanitation tee (i.e. Inserta Tee) or wye.
- Gravity Sewer Mains shall be no smaller than 8-inch diameter. Gravity Sanitary Sewer Laterals shall be no smaller than 4-inch diameter.
- 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.

d. WASTEWATER LIFT STATION & FORCE MAIN:

- Lift Stations & Force Mains shall be designed in accordance with the Ten State Standards, the City of Pooler Standard Specifications, or any other applicable nationally accepted engineering practices.
- When Lift Stations are required, the Lift Station shall not be located behind residential homes and/or commercial property without City Approval and Access Easement.
- 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.
- The immediate entrance at the paved Public Roadway to the Access Easements shall have a concrete driveway. The minimum width shall be 15', minimum thickness of 4", and 4000 psi mixture of fiber reinforced concrete.
- All lift stations shall have a turnaround driveway provided unless it is deemed unnecessary by the City's Public Works Department.

- 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 or bypass pump is required.
- All lift stations with three HP or larger motors shall have true three phase power supply. No single phase, rotary phase, capacitor banks are permissible.
- The mounting panel for the controls, etc. shall be constructed out of 3-inch galvanized post and support brackets.
- All force mains shall be installed in the access easements and/or road rights of ways. When this is not feasible, force mains shall be permitted to be installed within Utility Easements.
- Lift Stations shall be furnished with an Emergency Generator. Lift Stations that serve more than one upstream lift station shall be furnished with a By-Pass Pump. The City Pooler reserves the right to determine whether Emergency Generator or Bypass Pump are required for public lift stations.
- All grinder pumps utilized in the City of Pooler shall require the Approval of the City Manager. Upon approval by the City Manager, all grinder pump stations shall be privately owned and maintained.

e. SERVICE RESTRICTIONS:

- It shall be unlawful for any person(s) 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.
 - 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 firefighting, the City of Pooler shall not under any conditions furnish water free of charge to anyone.
 - 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.
- a. 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.
- 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.

a. 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.

- It shall be unlawful for any person(s), contractor, sub-contractor, builder, homeowner, 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.
- 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.
 - a. 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.
 - b. All water usage fees for construction shall be paid in full before a Certificate of Occupancy is issued.
- 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.
- 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.
- 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.

3. STREETS:

a. PUBLIC STREETS:

All public streets shall be designed and constructed in accordance with the City of Pooler Code of Ordinance and Standard Specifications. Furthermore, the design of public street shall be supported by Nationally Accepted Engineering Standards. Safety is a priority for the design of public streets and at no time should a safety hazard be created, even if the minimum criteria of the Ordinance or Standard Specification are met. Some common examples of nationally accepted engineering standards that apply to the design of public streets and their corresponding right of ways include, but are not limited to, the following:

AASHTO – A Policy on Geometric Design of Highways & Streets (Green Book)
AASHTO – Geometric Design of Low Volume Local Roads
AASHTO – Roadside Design Manual
GDOT – Design Policy Manual
GDOT – Regulations for Driveway & Encroachment Control
NCHRP – Geometric Design of Driveways
FHWA – Manual on Uniform Traffic Control Devices
ADA – Public Right of Way Accessibility Guidelines
ADA – Standards for Accessible Design

b. PRIVATE STREETS:

i. DEFINITION:

Private streets or roadways are those located on private property that has not been dedicated to the City. They must have their own established right-of-way or access easement. These private rights-of-ways or access easements may also be required to have additional private or public utility easements.

1. The maintenance of private streets and roadways is the sole responsibility of the private individual(s) or entity that owns the property in which it is situated.
2. The maintenance of any public or private underground utility that is in an easement located in a private street right of way is the responsibility of the utility owner, unless an agreement between those parties has otherwise been established
3. The total and complete liability for any incident that may occur within the private streets, or their right of ways lies on the owner of said street or right of way. The exception being if sch incidents are caused by issues or negligence related to the private or public underground utilities located within their easements.
4. If any utility or any parts of the street network is not located within an easement, their maintenance and full liability lies upon property owner.

ii. CONSTRUCTION OF PRIVATE STREETS:

Private streets or roadways must adhere to the same design and construction standards as public streets. The designation of a street as private does not relieve the designer or owner of the responsibility to ensure the development of a safe, well-maintained street network that provides satisfactory traffic operations. Private Streets shall be situated behind a gate. Regardless of the gate's function or character, all roads behind gates shall be private.

iii. DEDICATION OF EXISTING STREETS & ROADWAYS:

An existing street that is privately owned shall not be dedicated to the City of Pooler if they meet any of the following conditions:

The street has not be designed and constructed under the same construction standard specified for City of Pooler Streets. The petitioner must conduct independent testing and inspections at their own expense to verify that the street(s) was designed and constructed to meet all applicable City Specifications. The city will determine the type of testing and inspections required for each request.

The street cannot be dedicated to the City of Pooler if it is located behind a gate.

The asphalt and all street infrastructure must not be damaged or in poor condition. Any visible damage or missing infrastructure must be repaired or installed before the petition is submitted to the city. After the petition is formally submitted, the city will inspect the street or roadway before a final recommendation can be made. The city staff or their representative(s) will evaluate and make the final determination on the petition. The City must approve the procedure that was used to repair all damage to any of the street or right of way components. All required modifications and repairs must be done in accordance with City Specifications.

The asphalt cannot be more than 10 years. If the pavement is more than 10 years old, the pavement shall be repaired, milled, and resurfaced before any dedication is requested. The petitioner must submit all related information corroborating that the performed work meets City Standards.

- The minimum milling depth allowed for residential streets is 1 inch.
- The minimum milling depth allowed for commercial or arterial roadways is 1.5 inch.
- The minimum asphalt type to be used for surface course in residential streets shall be 6.5mm (Per GDOT Standards)
- The minimum asphalt type t be used for surface course on commercial roadways shall be 12.5 mm (per GDOT Standards)

The City of Pooler Reserves the right to accept or deny any dedication request.

END OF SECTION 010010

SECTION 01300

PRECONSTRUCTION AND CLOSEOUT REQUIREMENTS

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. The following coordinate systems shall be utilized on all Approved Construction Plans and Record Drawings.

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.

The horizontal datum shall be State Plane Coordinates NAD 83 based on US survey feet.

3. PRECONSTRUCTION CONFERENCE

Prior to the start of construction, a pre-construction conference will be scheduled with the City of Pooler. The pre-construction conference shall be attended by the Engineer of Record or owner representative, the Contractor, and a City of Pooler Representative.

The following documents, submittals, and approvals shall be a prerequisite to schedule a preconstruction meeting with the City of Pooler, unless otherwise directed the City of Pooler:

1. Approved Construction Plans
2. Approved Permits issues by City of Pooler
3. Approved Permits issued by other Municipality, Agency, or Entity.
4. Notice of Intent (as applicable for NPDES Permit)
5. A list of key project personnel and their contact information. For projects where the City of Pooler issues an LDA Permit, the Contractor shall provide the contact information and license No. of the certified Blue Card holder that will be responsible for Erosion, Sedimentation, and Pollution Control BMP installation, inspection, and maintenance.

The preconstruction conference shall address the following:

1. Call Before You Dig (811)
2. List of emergency contacts and 24-hour phone numbers Introduction of the Project Manager and Inspector Public Relations
3. Erosion, Sedimentation, & Erosion Control
4. Required Testing & Inspections
5. Shop Drawings/Material Submittals Final Inspection
6. Project Close-out
7. 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 Drawings for approved construction plans shall be submitted by the owner's representative to the City of Pooler as specified below.
- B. The Record Drawings shall be furnished with a minimum sheet size of 24" x 36" and be presented with the required coordinate systems specified in Part 2 of this Section.

Two (2) sets of physical record drawings on Bond (printed & delivered)
 One complete set of digital record drawings in PDF file format.
 One complete set of digital record drawings in DWG or DNG file format.

- C. 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.

- D. Three (3) copies of all warranties, bonds and operation manuals.
- E. Three (3) copies of recorded plats showing all required ROW and/or easements for public and/or private streets, drainage, utilities, and/or facilities.
- F. The Record Drawings shall contain the following drawings within the submitted set:
 - 1. Title Sheet, Index, & Vicinity Map
 - 2. Staking Plan Sheets
 - 3. Water & Sewer Sheets (plans, profiles, special details)
 - 4. Paving/Drainage/Stormwater Sheets (plans, profiles, grading, neighborhood drainage, special details)
 - 5. Landscape Sheets
- G. Record Drawings shall convey the following information (as applicable):

General:

- 1. Record Drawings shall be stamped and sealed by the applicants engineer. Ensure that every sheet has been sealed, signed and dated by the Engineer of Record. The seal needs to be clear and readable.
- 2. The information block shall also indicate the name of the contractor responsible for construction and the date of construction completion.
- 3. Easements shall be Delineated and Labeled on Record Drawings.
- 4. If the Street, Utility System or Right-of Way is to be public or private, then indicate on each applicable sheet.
- 5. The location and elevation of the benchmarks referenced shall be shown on the drawing. If the referenced benchmarks are not within the project limits, then complete descriptions and locations must be provided.
- 6. Street names shall be identified on all streets.

Pavement:

- 1. Edge of pavement in relation to the center line of the road right-of-way.
- 2. Pavement profiles, with centerline grades, slopes, & vertical curve information.
- 3. Installed thickness of pavement material (i.e. base course, intermediate

source, or surface course material).

Drainage:

1. Location of all Structures in relation to right of ways, property lines, and other permanent structures.
2. Elevations for Structures shall include invert elevation of all influent and effluent pipes and the top elevation of all frames/covers.
3. Location and Alignment of all pipes and end treatments with the diameter, material, length and slope annotated.
4. Location of all structures, headwalls, manholes, inlets and end treatments in relation to rights-of-way, property lines and other permanent structures.
5. Clearly indicate elevation, longitudinal slope, and side slopes of open channels (ditches, canals, etc.).
6. For stormwater detention, provide elevations for invert and top of bank of dry detention basins. If basin is a wet pond, provide top of bank elevation and static water surface elevation. Include record detail of the outlet control structure, including elevations of the top of the control structure, throat, orifices, weirs, etc.

Sanitary Sewer:

1. Location and type of all Structures in relation to right of ways, property lines, and other permanent structures. If Drop Manholes are included, these should be annotated as such on the record drawings.
2. Elevations for Structures shall include invert elevation of all influent and effluent pipes and the top elevation of all frames/covers.
3. Location and Alignment of all pipes with the diameter, material, length and slope annotated.
4. Lateral locations measured from the downstream manhole at the main and the property line if the lateral is not perpendicular to the main.
5. Locate all appurtenances on force mains (i.e. valves, fittings at change in directions, etc.)
6. Wet well size and location. Elevations of top and bottom of wet well, in addition to lines entering the wet well.

7. All schedules which show pump, motor, or electrical information to be amended shall be provided with Record Drawings for Wet Wells.
8. All improvements (valve pit, water spigot, control panel, bends, fittings, Emergency Generator, Lighting, etc.) within the pump station site boundaries shall be located on the record drawings.
9. If installing pumps for wells or lift stations, A pump curve is required for all pumps installed. The pump curve shall be certified by the pump manufacturer and indicates the actual field measured point obtained during pump draw-down tests.

Water Distribution:

1. Location and alignment of the water mains with the pipe diameter, material, and length annotated.
2. Location of all Appurtenances, such as valves, fire hydrants, reducers, blow-off assemblies, etc.
3. Location of established service lines

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 professional/certified technician prior to being incorporated in fills. Clays, silts, and organic soils will be considered as unsuitable materials. Generally, Suitable Soil Materials are defined as those complying with ASTM D-2487 soil classification groups: GW, GP, GM, SM, SW, and SP or as certified by Owner's Geotechnical Professional.

2.02 EXCAVATED MATERIALS

Suitable materials from on-site excavations may be used in the permanent construction required under these Specifications. Suitable materials may 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 or worked 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 complying with ASTM D-2487 soil classification groups GC, SC, MH, ML, CL, CH, OL, OH, PT in accordance with the Unified Soil Classification System. Clays, silts, and organic soils including Peat will be considered as unsuitable materials. Excess water in materials will be a basis for establishing unsuitable material regardless of gradation. The Owner's representative shall be notified immediately upon encountering unsuitable material.

2.04 BORROW

Backfill and Fill Materials (Borrow) shall be suitable sand or sand/clay soils materials, free of clay, rock or gravel larger than 2" in any dimension, debris, waste, frozen materials, vegetable and other deleterious matter. Suitable materials for earth fill shall generally be composed of sands, clay-sand and silt-sand mixtures and shall be approved by the soils professional/certified technician or a professional Geotechnical Engineer prior to being incorporated in fills. Borrowed 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 City stamped and approved Contract Drawings. All suitable material removed during excavation shall be used as far as practicable in the formation of embankment, subgrades, and shoulders and at such other places as may be indicated on the Plans or directed by the Engineer.
- B. Excavation for structures shall conform to the depth and dimensions necessary for the proper installation of all structures detailed in 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 and shall be performed at Contractor Expense

- D. Excavations for pipelines and underground utilities shall meet the requirements of Section 02221.
- E. Additional Excavation: When excavation has reached required subgrade elevations and unsuitable materials exist, carry excavations deeper and replace excavated materials as directed by the Engineer. Dispose of unsuitable material as directed by the Engineer. The Contractor shall dispose of unsuitable and surplus materials except where the Engineer permits the use of such for fill slopes, or unless specific disposal areas are shown on the Plans.

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 October 31, 1989 issue of the Federal Register and all other regulatory requirements and latest approved local, state, federal requirements.
- 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.
- C. Sheet piling and Shoring operations within developed areas are to be installed using Sound Engineering Practices. Damage to adjacent structures shall be repaired by the Contractor at the Contractor's expense. Repairs shall be equal to or exceed existing conditions prior to damage. Contractors are encouraged to provide documentation of existing conditions and monitor construction activities to provide their defense to individuals' indicating they have been harmed by contractor work.

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, sheet piling, 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 damage 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. This provision shall also include upstream and downstream or adjacent flooding caused by the contractor.
 - 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 or cause harm to adjacent properties. All Cost for all damages shall be responsibility of 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.
- 3.04 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. Contractors' inability to manage groundwater and stormwater shall not obviate Contractor's Contract Time, liquidated damages and Contractor will be responsible for correcting all deficiencies caused by Contractor's inabilities at his expense.

3.05 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 on 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.

3.06 GROUND SURFACE PREPARATION FOR FILL

- A. All vegetation such as roots, brush, heavy sods, heavy growth of grass, decayed vegetation matter, rubbish, and other unsuitable material within the areas to be filled shall be stripped and removed prior to beginning the fill operation.
- B. Sloped ground surfaces steeper than 1 vertical to 4 horizontals, on which fill is to be placed shall be plowed, stepped, benched or broken up as directed, in such a manner that the fill material will bond with the existing surface.
- C. Surfaces on which fill is to be placed and compacted shall be wetted or dried as may be required to obtain the specified compaction.

3.07 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.

3.08 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 12 inches.
4. Unpaved Areas To Be Grassed, Sodded, or Landscaped.
90 % Standard (ASTM D-698).

B. Moisture Content

All compactions 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.

3.09 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 200 cubic yards of fill material, 300 linear feet of curb, and 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. Proof Rolling:

Proof rolling of the subbase or subgrade of all areas of new road paving will be required. Equipment shall have a minimum axle load of 6,000 pounds and a maximum axle load of 15,000 pounds or as determined by the Engineer.

E. 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.

F. 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.

3.10 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 smoothly 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. It should be noted that every effort shall reasonably be employed by the Contractor to control erosion with the use of, but not limited to, terraces, grassing, and silt fencing during the project. All erosion and sedimentation control measures or facilities, whether temporary or permanent, shall be continuously maintained by the Contractor so as to be effective, or as ordered by the Owner. Additionally, Contractor shall incorporate and utilize all necessary fencing and other safety barriers as necessary, or directed by Owner, to prevent trespassing into potentially dangerous areas of the erosion control area.

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 I00001, GAR I00002, GAR 100003 (Latest Edition), 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.

Owner or Owner's representative shall complete all inspections and water testing, documentation, reporting & etc., needed to comply with all State and Local Requirements. Inspections may 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.
- F. Areas of disturbance without construction activity for 14 or more days requires grassing of exposed areas of disturbance.

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 or neighboring properties.
- 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, 10, 5, & 2-year, 24-hour rain events. 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 the 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. Has 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 FW700 or an approved equal. Sizing shall be in accordance with the Manual for Erosion and Sediment Control in **Georgia**.

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 FW700 or an approved equal. Sizing shall be in accordance with the Manual for Erosion and Sediment Control in **Georgia**.

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. Rumble plates, shaker pads and other additional measures may be required by City in addition to standard Construction Entrances. The addition of the shaker pad/street sweeping/etc. may be required subsequent to the issuance of the land disturbance approval if offsite soil tracking occurs during construction. City may require Construction be halted until shaker pad/other measure are installed and maintenance program updated.
- 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. Contractors 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 contains 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. "Utility system" shall include underground piping and appurtenances for water distribution systems, storm water drains, and sewer collection systems. Dry Utility Installations are to be in compliance with the utility provider's requirements, all regulatory requirements and shall be installed in approved easements. The more stringent requirement shall dictate.

1.02 - EXISTING UTILITIES

- A. Before opening trenches, the Contractor shall examine all available records and explore for the location of all subsurface pipes, valves or other structures and reference such locations on the surface. (CALL BEFORE YOU DIG! Utilities Protection Center: 811).
- B. In opening trenches, every effort shall be made not to interfere with these utilities' structures. Expose existing piping by hand before excavating by machine. Excavate existing utilities sufficiently in advance of pipe laying to determine crossing arrangement. Slight deviations may be permitted in order to clear such structures. The Contractor shall be entirely responsible for the preservation of all underground or overhead utility lines and structures, such as gas, water, sewer lines, telephone conduit, power lines, etc., and shall replace, adjust, or repair, without cost to the City, any such lines damaged or interfered with as a result of their construction.
- C. Schedule work to keep roads and utilities in usable condition; coordinating all operation with the City of Pooler to avoid inconvenience insofar as practicable.

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.
3. Limestone materials which absorb moisture and solidify are not an acceptable bedding material unless approved by Geotechnical Engineer.

2.02 BACKFILL

- A. Backfill material shall consist of suitable excavated materials or imported gravel meeting the requirements of #57 stone. Limestone materials which absorb moisture, dissolve, and solidify are not an acceptable backfill material unless approved by Geotechnical Engineer.
- 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 July 17, 2023 or latest Final Rule 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 damage 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 underwater. 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 over depth 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 over depth 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 spring line of the pipe.
- B. Bedding material around the pipe shall be installed with care. Care shall be used to ensure 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 may be 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 equivalent to water main standards of construction and be pressure tested as required in Section 02700 to assure watertightness.

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 watertightness.

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. Steel casing of the diameter shown on the plans shall be jacked and bored in the locations indicated. Joints between sections of the steel casing shall be welded by a certified welder. Boring and jacking shall be in accordance with the provisions of Section 65 of the Georgia Department of Transportation Standard Specifications. After the carrier pipe has been installed, the ends of the casing shall be sealed with Class "C" concrete after observation by the Engineer. Where the work involves a State highway, the Resident Engineer of the State Department of Transportation shall be notified by the Contractor three (3) working days before the crossing is started. Where the work involves a railroad, the work shall conform to the requirements of American Railway Engineering Association specifications and the Division Superintendent of the Railroad shall be notified three (3) working days prior to beginning the work. 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.

PART 2 - PRODUCTS

2.01 MATERIALS

A. Casing pipe

1. Casing Pipe shall be new and unused. Casing pipe shall meet ASTM A139, latest edition, minimum yield strength point of 35,000 psi, Grade B (Hydrostatic testing is not required). One end of the pipe shall be beveled to a standard 37-degree bevel. Full pipe lengths shall be provided. All casing welds shall be continuous and made by a certified welder.
2. The 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 welding pipe is unacceptable. Length and diameter shall be as shown in the Drawings.
3. For casing pipe crossings under roadways/railroads, the Contractor shall comply with the regulations of said authority in regard to design, specifications, and construction. State highway casing installations shall be as specified in the

GDOT, “Utility Accommodation Manual,” and for railroads, the American Railway Engineering and Maintenance-of-Way Association (AREMA) manual for Railway Engineering, Chapter 1, Part 5, Section 5.3, “Specifications for Pipelines Conveying Non-Flammable Substances,” shall be applicable.

4. Where allowed by the affected utility owner(s), fusible PVC casing may be used with fusible PVC carrier pipe for sanitary force mains. The design engineer shall calculate the appropriate piping dimension ratio (DR) for fusible PVC casing considering earth, live, and groundwater, service loads and pullback forces. Use of PVC casing shall require the use of rubber boots for end seals. End seals shall be neoprene with 304 SS banding clamps as manufactured by Cascade CCES or approved equal. End seals shall be installed per manufacturer’s recommendations, to include casing spacer spacing to provide adequate reinforcement at end of casing pipe. All carrier pipes shall be restrained joint ductile iron or fusible PVC.

5. Casing pipe wall thickness shall be as indicated unless shown otherwise on the Drawings or dictated by Georgia Department of Transportation or Responsible Owner of Railroad or Right-of-Way Owner. Thickness shall be the more stringent requirement of the respective Owner or 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. Where allowed by the affected utility owner(s), fusible PVC casing may be used with fusible PVC carrier pipe for sanitary force mains. The design engineer shall calculate the appropriate piping dimension ratio (DR) for fusible PVC casing considering earth, live, and groundwater, service loads and pullback forces. Use of PVC casing shall require the use of rubber boots for end seals. End seals shall be neoprene with 304 SS banding clamps as manufactured by Cascade CCES or approved equal. End seals shall be installed per manufacturer's recommendations, to include casing spacer spacing to provide adequate reinforcement at end of casing pipe. All carrier pipes shall be restrained joint ductile iron or fusible PVC. 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.
10. The Pits, trenches and all construction activity shall be performed on properties controlled and/or owned by the Owner. All damages shall be rectified by Contractor at his expense.

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 I - GENERAL

1.01 SUMMARY

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

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 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.

1.05 REGULATORY REQUIREMENTS

A. Comply with requirements of authorities having jurisdiction for materials and installation of work of this Section.

B. Referenced GDOT Specification 550 and associated Specifications referenced in 550, GDOT Standard Drawings 1030D and 1030P, ASTM C76, ASTM C 506, ASTM C507, AASHTO M-274, AASHTO M-36, AASHTO M-196, AASHTO M294, ASTM C990, ASTM C1619, ASTM C443, ASTM F477. ASTM D3212, ASTM D1056, ASTM C478, ASTM C913, ASTM C923, ASTM C1478, ASTM F2510, ASTM A48, ASTM A615, ASTM D4101, ASTM C32, ASTM C55, ASTM C33, AASHTO R73, ASTM C 1479, ASTM A798, ASTM D2321, and ASTM C1840.

- C. The American Concrete Pipe & Box Culvert Installation guidelines published by American Concrete Pipe Association (info@concretepipe.org) could be used as a reference material, but the City of Pooler Specifications and Details take precedence.

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

The pipe shall be reinforced concrete pipe conforming to ASTM C76, Class III. The minimum pipe diameter shall be 15". Reinforced Concrete Elliptical culverts shall be reinforced Class HE-III, or VE-III, and shall conform to ASTM Specification C-507 or AASHTO Specification M-207. Concrete pipe shall be designed with no lifting holes. The lifting holes will jeopardize the structural integrity and hydraulic capacity of the pipe once installed. Hydraulic capacity confirmation must be completed for all pipe and for every project and shall be signed, sealed, and submitted to the City by a registered Engineer of the State of Georgia. The hydraulic design capacity shall use the following Manning's "n" coefficient for closed system storm water systems - 0.012 for RCP and 0.013 for HDPE and HDPP.

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 three-foot-wide strip of non-woven filter fabric (Mirafi 140N or equivalent) lapped completely twice around each joint.
- 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.

B. Plastic Pipe

To be used for subgrade drainage shall be rigid heavy duty corrugated polyethylene perforated pipe manufactured by Advance Drainage Systems (ADS N-12), or accepted equivalent, and shall conform to AASHTO M-252. The use of coiled tubing is not permitted and will be rejected. Usage of plastic pipe has to be approved by Storm Water Management.

C. Pre-cast Box Culverts:

- a) Pre-cast box culvert sections shall conform to ASTM specification C1577.
- b) Details – See Plans.
- c) Concrete - Mix design shall have a minimum compressive strength of 5,000 psi. The concrete mix design shall conform to ASTM C150 for cement and ASTM C33 for aggregates.
- d) Reinforcing Steel - shall conform to ASTM A185/A or A497/A.
- e) Joints and Gaskets - shall be watertight and conform to ASTM C1677-09.
- f) Filter Fabric – Mirafi 140N or equivalent.
- g) Box culvert sections shall be designed with no lifting holes.

D. 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. All pipe joints shall be wrapped with two layers of a three-foot-wide strip of non-woven filter fabric (Mirafi 140N or equivalent) lapped completely twice around each joint pipe.

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. This type of pipe cannot be used within the City's rights-of-way or easements.

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. No leaks in the manhole will be acceptable. All repairs made from inside the manhole or inlet shall be made with mortar composed of one part Portland cement and two parts clean sand; the mixing liquid shall be straight bonding agent equivalent to "Acryl 60" grout, and it must be inspected from both the inside and outside of the structure. For the connection to the structures, both the inside and outside must be grouted with hydrophilic cement. The City staff must inspect and approve any connections prior backfilling operations.

D. Underground Detention Chambers

All Underground Detention Chambers shall be reviewed and approved by

the City or their designated representative. The design engineer shall certify that the system was constructed in accordance with his/her design and meets all the manufacture's requirements.

2.03 MATERIALS FOR DRAINAGE STRUCTURES

A. Mortar

1. Mortar for brick or block construction shall conform to ASTM C270, Type M, except the maximum placement time shall be one half hour.
2. Mortar used at connections of pipe and drainage structures shall be composed of one part by volume of Portland cement and two parts of sand. The Portland cement shall conform to ASTM C-150, Type I or II. The sand shall conform to AASHTO Standard M-45 and shall be accepted gradation.3. 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, alkalis, 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 MI 99 and conform to the details on the project drawings. 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. The primer shall be applied to all contact surfaces of the manhole joint at the factory in accordance with the manufacturer's instructions.

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. Grates in pavement and in other flush-mounted type surfaces shall be on a “bicycle-safe” configuration consisting of 45 degrees diagonal bars or slotted grating with a maximum clear opening of 1” and a maximum length of 4”.

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. Pipelines shall be laid to the grades and alignment indicated on approved plans. 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 pipes 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." The City staff must inspect and approve any connections to drainage structures prior to backfilling operations.

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 T1 34.

B. Placement

The bags shall be uniformly filled to the maximum capacity which will permit satisfactory tying. The bagged riprap 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 (Granite)

A. Materials

The granite 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 size shall be designed for the specific site parameters, but in no case shall the stone consist of quarry run sizes, SMALLER than specified below:

STONE SLOPE PROTECTION

<u>SIZE OF STONE</u>	<u>PERCENTAGE OF TOTAL WEIGHT SMALLER THAN THE GIVEN SIZE</u>
--------------------------	---

CLASS I

100 lbs.	100%
60 lbs.	80%
25 lbs.	50%

02400-7

2 lbs. 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 as per manufacturers and recommendations

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	lbs.	ASTM D-4632	370 x 250
Grab Tensile Elongation	%	ASTM D-4632	15 (MAX)
CBR Puncture	lbs.	ASTM D-6241	950
Trapezoid Tear Strength	lbs.	ASTM D-4533	100 x 60
Wide Width Tensile Strength	lbs./ft	ASTM D-4595	2,700 x 1,740

Fabric shall be Mirafi FW700, or equal. Also acceptable are Mirafi 1100N, 1120N and 1160N, 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 inches 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 and be wrapped with a Mirafi 140N fabric or equal.

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 will only 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 A392-81-Class I. The size of mesh shall be 2 inches and the wire shall be No. 9 Gauge Basic Open-Hearth Steel, hot dip galvanized (black powder coated with green vinyl coated wire) 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. The 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 A1 12 and spaced 12 inches apart on all posts and 24 inches apart on all rails. Tie wires shall be a double loop and minimum 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 3 1/2 inches O.D., ASTM A120 Schedule 40 heavy duty., 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 coupled with slip on rail sleeves for every standard length generally 21' in length. Each brace section shall be 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 1/2"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 welding on all sides and faces of joints at exposed edges. Surplus welding material shall be removed. All welding shall be subsequently galvanized.

2.2 CONCRETE:

Concrete shall conform to ASTM C-94/C 94M, using³/₄ inch maximum size aggregate, and having minimum compressive strength of 3,000 psi at 28 days. Aggregate material (limestone) impacting water, cement ratios shall not be used. 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 backstops: 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 in 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 smoothly slightly above the ground surface and sloped to drain.

After the posts have been installed and the concrete has been 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. The 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 to make a continuous piece of fabric between end, corner, and

gate posts, as the case maybe.

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. Straw shall be stalks of wheat, rye, barley, oats, or other accepted straw. Hay shall consist of timothy, peavine, alfalfa, coastal Bermuda or other grasses from accepted sources. 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, Crotalaria, Pigweed, Witchweed, and Cocklebur. The Contractor shall also comply with all State and Federal domestic plant quarantine regulations.

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 a- homogenous slurry. The mulch fibers shall intertwine physically to form a strong moisture holding mat on the ground surface and allow rainfall to percolate the underlying soil. The mulch shall be heat processed so as to contain no germination or growth-inhibiting factors. 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 the name and location of the producer. The pure live grass seed mixture shall be as shown in the Drawings.
- C. Mixtures of different types of seed called for in the seeding schedule shall be weighted and mixed in the proper proportions.
- D. The Engineer reserves the right to test, reject, or accept all seeds before seeding.

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 tests 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. The Contractor will be required to produce a satisfactory stand of grass regardless of the period of the year the work is performed.
- 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 seeding. 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 the 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, re-fertilizing, 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, fertilizing, 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 on Project Plans, including subgrade preparation, base course, and pavement.

1.02 RELATED SECTIONS

Section 02200 - Excavation, Filling and Grading

Section 02221 - Excavation, Trenching and Backfilling for Utility Systems

Detail PIO - Typical Pavement Sections

1.03 GENERAL

Subgrade preparation shall include leveling, compacting, testing, 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. The subgrade shall be completely compacted in accordance with the requirements of Section 02200. All subgrades shall be proof rolled as specified before base course is placed on the subgrade. Deviations from Section 02200 shall be submitted by Professional Geotechnical Engineer to the City for consideration. Compaction testing and proof rolling shall be submitted to City for approval prior to installation of Curb & Gutter on Base Course installation.

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. Aggregate shall meet the applicable requirements of Section 800, Coarse Aggregate, of the Georgia Highway Department Specifications. The 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

2.02 BITUMINOUS PRIME

Bituminous prime shall be cutback asphalt RC-30 or RC-70 applied at the minimum 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. The tack coat shall consist of spraying the base course with AC-20 or AC-30, Asphalt Cement. When the temperature in the shade is 70° F or above an emulsion, such as CRS-2h or CRS-3, may be used. 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. Other Pavement section designs with alternate fabric characteristics may be submitted with sufficient backup data and design to the City for consideration.

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 void between 4 and 5. The Pavement Section thickness shall be designed by Owner based upon traffic volume loading and specific Site Parameters but shall NOT be less than Standard City Roadway Details requirements.

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 minimum. Smoothness shall not exceed one-eighth inch for a ten-foot straight edge.

2.06 TRAFFIC STRIPING

Unless specifically approved 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 in 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. Failed tests shall be rescheduled at the Owner's direction and retesting shall be paid for by the Contractor.

1. Sub-grade compaction shall be one (1) test per 250 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. Final Plat approval shall be withheld until all test requirement results are satisfactory and approved by the City.
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. Additionally, Curb & Gutter Proof-Rolling shall also be performed and deemed acceptable by the City prior to installation.

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 & gutter.

1.02 RELATED SECTIONS

Section 02200 - Excavation, Filling and Grading

Section 02221 - Excavation, Trenching & Backfill 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. Strength requirements shall be based on 28-day compressive strength unless a different test age is specified. The compressive strength of the concrete shall be determined by ASTM C39.

All concrete shall be ready mixed concrete in accordance with ASTM C94. Reinforcement shall comply with ASTM A615. When permitted, Fiber reinforcement shall be 1/2" or 3/4" collated, fibrillated polypropylene fibers meeting the requirements of ASTM C 1116, para. 4.1.3, Type III.

Aggregates for normal weight concrete shall meet the requirements for ASTM C 33 unless otherwise specified. Limestone aggregates which absorb water from concrete mix, thus modifying the water cement ratio and resulting in brittle concrete is NOT acceptable.

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 proof rolling. All curb & gutter areas will be proof rolled unless an 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 the 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 AMERICANS WITH DISABILITIES ACT

All concrete structures shall be designed and constructed to meet the requirements of the U.S. Department of Justice, Americans with Disabilities Act of 1990 (latest version). This law requires that all new places of public accommodations and commercial facilities be designed for persons with disabilities. Required guidelines for curb ramps and other handicapped related structures shall be as specified in U.S. Department of Justice, ADA Design Guide.

3.05 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 comers 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.

3.06 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 concrete work 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 were 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 ¼ - 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 ¼ - inch radius with suitable grooving and edging tools.
- D. Sawcut joints shall be located and detailed as indicated on the contract drawings. Cutting shall be timed properly with the set of concrete. Cutting shall be started as soon as the concrete has hardened sufficiently to prevent aggregates being dislodged by the saw. Cutting shall be completed before shrinkage stresses become sufficient to produce cracking.
- E. All expansion joints shall be sealed per detail on project drawings. Other joints to be sealed will be indicated on the project shop drawings to be submitted by the Contractor and approved by the Engineer. Joint sealant shall meet the requirements of ASTM C 920, Type S or M, Grade P, Class 25.

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 ¼ - 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. When the mean daily

outdoor temperature is less than 40 F, the temperature of the concrete shall be maintained between 50 and 70 F for the required curing period. Combustion heaters shall not be used during the first 24 hours unless precautions are taken to prevent exposure of the concrete to exhaust gases which contain carbon dioxide.

- B. When this is not acceptable, City may allow the Contractor to deliver concrete to meet the requirements of table 4.2.2.7 of ACI 301-99.
- 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. Membrane curing compound shall comply with ASTM C309 for Type I and paper shall comply with ASTM C171.
- E. 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 ensure a bond with the concrete and finished off to match the surrounding surface.
- 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 fails 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.
 9. Sidewalks/concrete not installed per the Americans with Disability Act.
 10. All replacement of rejected work shall be at the Contractor's Expense.
- B. The City Inspector or other City representative shall have the final determination of whether finished products should be accepted or rejected. He/she may, at his discretion and if he/she 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

The 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).

3.12 TESTING

Field sampling and testing shall be performed by an independent testing lab hired and paid for by the Owner. Samples of concrete shall be taken at random locations and at such times to represent the quality of the materials and work throughout the project. The laboratory shall provide the necessary labor, materials, equipment, and facilities for sampling the concrete and for casting, handling, and storing the concrete samples at the site of work. Sampling of plastic concrete will be in accordance with ASTM C172. Samples for pumped concrete shall be taken at the hose discharge point. Samples for other concrete shall be taken at the hopper of concreting equipment or transit mix truck. Testing shall be in accordance with Section 3300.

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, bottom slab 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. However, protective coatings are required for wetwell receiving manhole and two additional upstream manholes (all directions). Additionally, forcemain receiving manhole and two additional downstream manholes in all directions are to receive protective coatings.
- 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. Also, in addition to receiving wetwell and manhole, two additional manholes respectively upstream and downstream in all directions are also to receive protective coatings.

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
- F. ASTM D2584 Volatile Meter Counter.
- G. ASTM D2240 Durometer Hardness, Type D
- H. ASTM D543 Resistance of Plastics to Chemical Reagents.
- I. ASTM C109 Compressive Strength Hydraulic Cement Mortar
- J. ACI 506.2-77 Specification for Materials, Proportioning, and Application of Shotcrete.
- K. ASTM C478 Bond Strength of Concrete: Concrete Failure.
- L. ASTM C496 Tensile Strength of Chemically Setting Silicate and Silica Chemical Resistant Mortar.
- M. ASTM C579 Compressive Strength of Chemically Setting Silicate and Silica Chemical Resistant Mortar.
- N. ASTM The Publication Standards of the American Society for Testing and Materials, West Conshohocken, PA.
- O. NACE Published Standards of National Association of Corrosion Engineers (NACE International), Houston, TX.
- P. SSPC The Published Standards of the Society of Protective Coating, Pittsburg, PA.
- Q. ASTM C396 Compression Strength of Cement Mortars.
- R. ASTM C580 Standard Test Method for Flexural Strength and modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concrete
- S. ASTM D4541 Standard Test Method for Drying Shrinkage of Mortar Containing Hydraulic Cement.
- T. ASTM D4787 Standard Practice for Continuity Verification of Liquid or Sheet Depth Applied to Concrete.

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 surface preparation, application, and testing.

1.04 QUALITY ASSURANCE

- A. The 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 the 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. Applicators 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 for any inspection or testing by others.
- B. Contractor shall provide access to site inspection.

1.08 WARRANTY

- A. Manufacturer and Contractor 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 and Contractor 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. 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 top coating 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 it will produce concrete which will be compatible for epoxy top coating. 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 top coating 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. 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 the 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. The 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. The 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 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 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. The 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 by 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 the 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
(NEW CONSTRUCTION
PROJECTS)

PART I - 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. The 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. The 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:

<u>Property</u>	<u>Testing Method</u>	<u>Unit</u>	<u>HDPE</u>	<u>PP-R</u>
Density	ASTM 0792-86.	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 063 8-89	PSI	≥2,320	> <u>2,900</u>
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	60	90
		F	140	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 job site 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. Damages caused during the installation shall be repaired at contractor expense and repairs shall be performed in accordance with manufacturer's recommendations and repairs shall be certified by manufacturer that final product meets or exceeds manufacturer's recommendations.

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

C1 53/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/AWWAC 115/ 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 is 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 235 C905 DR 18.
 - 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. The 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 AWWAC **111**. 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.
8. Bonnets shall be secured with 316 Stainless bolts, nuts, and washers.

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 0 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.

Manholes shall be placed outside of hard surface unless approved during design. All valves installed within manholes must be installed such that the valve operator is also installed within the manhole. All valve operators must be installed in the center of the manhole opening.

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. The extension of the riser must be ductile iron or C-900.
- 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 have factory baked on safety yellow. Private fire hydrants that are boosted by a fire pump will be factory baked on fire hydrant red.
- D. Hydrants shall be American Darling, Mueller, Clow, and M&H or approved equal.

2.04 YARD HYDRANTS

Yard hydrant shall have a 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 an I " NPT inlet and a brass nozzle with 3/4" hose threads. Yard hydrants shall be Woodford Freezeless IOWA Model YI, or equal. Hydrants shall be painted with factory backed paint.

2.05 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:

	To Be Marked
<u>Polyethylene</u>	<u>On Pipe</u>
Nominal Size	X
ASTM D2837	X
SDR9	X
PE 3408	X
Working Pressure - 160 psi	X
Water Service Tubing	X
National Sanitation Foundation (NSF 14)	X
Pipe Color	Blue or Black with Blue stripe

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 solvently 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 LYLVI 4I-243T or stretch box Ford LY 111-444-YBL-T. NO APPROVED EQUAL The lid shall have the word WATER cast in it.

2.06 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 Green weatherproof enclosure. All commercial backflow preventors must be installed above ground.

2.07 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 A1 93 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 piping 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 workday 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.
8. All PVC, HDPE and any other plastic materials to be installed need to be 1 year old or less to be accepted.
9. The inside edge of all water lines must be located at least four feet (4') from the back of the curb or the edge of the pavement.

B. Ductile Iron Pipe

Ductile iron pipe shall be installed in accordance with 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, 2.02 Back Excavation, Trenching and Backfilling for Utility Systems. The slopes of the excavation need to comply with OSHA's regulations which are based on soil type. A minimum cover over the top of the pipe of 36-inches from the proposed paving subgrade, shoulder or finish grade shall be provided. All backfill materials shall be also complied with GDOT's Sections 812 and passed tests AASHTO T96 or GDT 7 (density of 95%), T27 and T11. The top 12 inches shall be compacted at 100% of the specified density. Limestone is not considered a suitable material for backfill.

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. The contractor shall place a bag over the hydrant to indicate

it's not being in service until after the watermain is put into service.

Fire Hydrant Monitoring Systems:

- 1 Fire Hydrant must be completely, and fully operational once the unit is installed. Unit does not require the need to shut water supply off, make modifications, and then recharge to obtain normal operations.
- 2 Pressure sensors must be located directly in the water supply line in the bottom plate of the hydrant main valve.
- 3 Supplied batter must have a minimum 3-year battery life when used with the factory default settings/parameters. Must not require power supply below grade.
- 4 Must not require Wi-Fi or Bluetooth for communication or operations.
- 5 Must have functionality across all platforms, desktop, laptop, tablet, mobile device, or smart phone.
- 6 Must have hosted software, which is user friendly and allows end user/client to migrate files directly from host to their water management software via CSV or Flat File to use with SCADA or similar utility infrastructure management software.
- 7 The device and all components must meet UL and ULFM requirements and have proper documentation to prove such.
- 8 Each new project requiring the installation of a new fire hydrant must include a minimum of 1 remote pressure and temperature monitoring system. For projects requiring more than 10 hydrants: 1 in every 10 hydrants must include such technology. (Ex. Projects requiring 9 hydrants will require 1 pressure/temperature module. Projects requiring 35 hydrants will require 4 pressure/temperature modules.)
- 9 Hydrant Technology is to be compatible with the McWane brand hydrants (Kennedy, M&H, and Clow) or approved equal.

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 shall be installed one foot short of the property line of all lots along street and rights-of-way in which watermain is constructed.
3. Water service laterals stubbed out of the ground shall have insulated end valves to prevent freezing.

4. Utility lateral connections and/or couplings are not allowed under the driveway.
- 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 joining, all scales shall be removed from pipe by some suitable means. After cutting, all pipes 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.
- 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 72 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 *ANSVAWWA 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.

- O. Meters must be installed three feet (3 ft.) from improved impervious surfaces and within the City's right-of-way.

3.02 HYDROSTATIC TESTING

- A. All pressure and leakage test shall be performed in accordance with the latest edition of AWWA C600. The 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 3 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 requirements 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 consists 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 the main and must discharge toward the ground.
 3. The quality of water used during the disinfection procedure shall meet drinking water standards.
 4. Flush the new pipelines 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 pipelines with chlorine. The preferable point of application of the chlorinating agent is at the beginning of the pipeline 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/I. 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 pipeline for at least 24 hours, the treated water in all portions of the main shall have a residual of not less than 10 mg/I 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 of 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. Re-flush 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/I 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	lbs.	Kg	lbs.	Kg	lbs.	Kg	lbs.	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 (Direct Bury)

- 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.
- 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. The extension to the riser must be Ductile Iron or C-900.

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 OPS 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 pipes shall be used:

A. Ductile Iron Pipe

1. Material

a. Ductile iron pipe shall be manufactured in accordance with ANSI A2 1.51, 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/AWWAC 111 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/AWWAC 110/A21.10, latest revision. The ANSI/AWWAC 110/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 be used on all ductile iron piping and be in a tube conform to ANSI/AWWA C105/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 in the drawings. The polyethylene film shall have the following characteristics:

Tensile Strength:	1,200 psi minimum
Elongation:	300 percent minimum
Dielectric Strength:	300V/mil thickness minimum
Thickness:	Nominal minimum thickness of 0.008 inch (8 mil)

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. All pipes shall be installed in accordance with ASTM D-2321.
- 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 and installed in accordance with ASTM D-2321.
- c. Pipe shall bear the National Sanitation Foundation seal of approval and shall comply with the requirements of Type I, Grade I (PVC 1120) of the ASTM resin specification D-1784. Certificates of conformance with the foregoing specifications shall be furnished with each lot of pipes supplied.

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 a 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. The 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 specifications.

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 stripes** 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 to minimum 150 psi for minimum 2-hours, 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 surface 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 watertight 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. The 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 minimum 2-inch size unless noted otherwise shown on approved construction plans. 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. 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. All damages, fees, costs and etc. shall be responsibility of Contractor. 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 the 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

Pipes 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 150 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 200 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. New Coatings shall also be applied to the receiving Manhole and the next two connecting manholes in all directions.
- 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. New Coatings shall also be applied to the receiving Manhole and the next two connecting manholes in all directions.
- 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 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, lateral's locations from property comers, fire hydrants & manholes. In addition, state plan coordinates and GPS coordinates should be provided on all valves and manholes. Lateral Tables providing distance from property line shall be required on Record Drawings.

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 I -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 pipes 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. PVC pipe shall be installed in accordance with ASTM D-2321, latest revision. All pipes shall be suitable for use as a gravity sewer conduit and shall be green in color. Provisions must be made for contraction and expansion at each joint with a rubber ring. Standard laying lengths shall be fourteen (14) feet or twenty (20) feet, ± 1 -inch, for all sizes. Fittings shall meet the same specification requirements as the pipe. The pipe shall be as uniform as commercially practicable in color, opacity, density, and other physical properties. Pipes shall be subject to inspection by the Engineer. Pipe which does not meet the requirements of this Section shall be 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 latest revision and the gasket to ASTM F- 477 latest revision.
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 unless geotechnical or physical conditions require more stringent conditions. All laterals must be ductile iron pipe and include tracing wire.
2. Joints
Joints shall conform to ANSI/A WWA C111/A21.11, push-on-type as described in latest revision.
3. Fittings
 - a. Fittings shall conform to ANSI/AWWA C111 A21.L1, 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 unless indicated otherwise. 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 C1 53/A21.51, latest revision. The finished coating shall be continuous, smooth, neither brittle when cold or sticky when exposed to the sun and shall be strongly adherent to the iron.
For Gasket / Spigot Ends, the gasket area and spigot end up to 6 inches back from the end of the spigot end must be coated with 6 mils nominal, 10 mils maximum DFT of Protecto 401 Joint Compound. The joint compound shall be applied by brush to ensure coverage. Care should be taken that the joint compound is smooth without excess buildup in the gasket seat or on the spigot ends.
- E. Interior Lining / Exterior Coating Repair
Any linings or coatings damaged in the field shall be repaired by power tool cleaning to bare metal and touched up using manufacturer's field repair kit to a 40-mil nominal coating. The City reserves the right to reject piping or fittings due to field or shipping damage of the protective coating system.
- F. 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.
- G. Minimum Gravity Sewer Line Installation Considerations
1. No Public gravity sewer conveying wastewater line shall be less than 8 inches in diameter.
 2. No Private Residential Project gravity sewer conveying wastewater line shall be less than 8 inches in diameter.
 3. No Private Commercial Project gravity sewer conveying wastewater line shall be less than 6 inches in diameter.

4. Three (3) feet minimum cover shall be provided for all sewers lines unless ferrous material pipe is specified. A ferrous material pipe, or other pipe with proper bedding to develop design supporting strength, shall be provided where sewers are subject to traffic bearing loads. Additional protection shall be provided for sewers that cannot be placed at a depth sufficient to prevent damage.
5. Buoyancy of sewers shall be considered, and flotation of the pipe shall be prevented with appropriate construction where high groundwater conditions are anticipated.
6. Minimum Slope for all sewers shall be designed and constructed to give mean velocities, when flowing full, of not less than 2.0 feet per second, based on Manning's formula using an "n" value of 0.012. The following are the minimum slopes which shall be provided; however, slopes greater than these are recommended.

Diameter of Pipe (inches)	Minimum Slope (feet per 100 feet)
6	0.60
8	0.40
10	0.28
12	0.22
14	0.17
15	0.15
16	0.14
18	0.12
21	0.10
24	0.08
27	0.07
30	0.06
36	0.05

Pipe installations not meeting the minimum standards shall be corrected prior to City acceptance or issuing a Certificate of Approval.

2.02 MANHOLES

A. Precast Concrete Manholes

Precast manholes shall meet all requirement of ASTM C478, "Specification for Precast Reinforced Concrete Manhole Sections, and also have a No. 4 rebar hoop around each pipe opening. The flat top slab sections shall handle HS-20 traffic loadings. 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. The 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 watertight, 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 within 5 feet from the 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. Before commencing work within the rights-of-way of the DOT, the Contractor shall verify that the Owner has obtained the required permits.
- D. Work located in or under railroad rights-of-way 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

- I. 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. Contractor usage and compliance with 811 Underground is required.
- 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 with 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 with 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 eyebolts 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.

G. Manhole Coatings

For force main discharge manholes (including the three (3) manholes downstream of the discharge manhole, and for Wetwell upstream Manholes (all directions) for a total of three (3) manholes), drop manholes; The protective coating shall be a polymer-based polyurethane or a high-build, solvent-free structural epoxy coating. For new Manholes, the protective coating shall be an acrylic polymer-based concrete coating and sealant. Procedures for surface preparation and application shall be in accordance with manufacturers recommendations.

3.09 ADAPTORS

Prefabricated flexible couplings or adaptors shall be used for connecting pipes of dissimilar materials. Flexible adaptors, other than boots used for connecting concrete structures, must be approved by the City of Pooler and/or their engineer.

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 3 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. If this depth is not practicable, Ductile Iron Pipe shall be used.

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. A trace 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.

After the completion of successful mandrel tests, record drawing confirming pipe slope installation, and cleaning, all newly constructed sewer lines and laterals must be televised by the Contractor prior to acceptance. Accordingly, all sewer lines, eight (8) inches in diameter and larger, and all laterals (independent of lateral size) that are installed within accepted public rights-of-way and easements will be televised, including those lines on private property that are connected to the public lines. The Contractor shall notify the City of Video schedule, so the City Inspector may be on site to witness televising. Televising crew shall be certified, and video shall include location mapping, pipe slope, date and time, crew. The contractor shall submit crew which shall provide video services and City has right to accept or reject crew performing work.

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 per- cent. 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. A 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 deflector 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 drops 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, lateral's locations from property comers, fire hydrants & manholes. In addition, state plan coordinates and GPS coordinates should be provided on all valves and manholes.

The recorded drawings are required to be certified by a Georgia Registered License Surveyor and the Georgia Professional Engineer of record for the project.

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, state, and federal codes, and regulations of local utilities. The Contractors 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. All interferences shall be installed in accordance with state and local regulatory requirements.

PART 2 - PRODUCTS

2.01 PIPE MATERIALS

All pipe material, solder and flux shall be lead free. 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 pipes 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 ANSI/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 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 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. 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:
 - Surface preparation: Clean and dry

- 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 with 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

The 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 ANSI/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 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. 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. The 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 without any evidence of infiltration, exfiltration or breaking.

7. Gaskets

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

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 always 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 C509 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.
- g. Valves shall be American, Waterous or approved equal and shall be furnished with standard hand wheels, chain wheels or nuts as shown on the Drawings and/or as specified.

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. The maximum force for operating nut shall be 40 pounds.
- h. All valves shall be M&H model 4,500 or approved equal.

2. Tapping Sleeves and Valves

Tapping Sleeves and Valves shall be used for making branch connections to an existing 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 an 1" or 2" connection is required.

4. Air Release Valves

Air Release Valve shall be a 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.

The 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:

Polyethylene Nominal Size ASTM D2837 SDR9
PE 3408
Working Pressure - 160 psi Water Service Tubing
National Sanitation Foundation (NSF14)
Pipe Color

To Be Marked On Pipe

X

XXXXX

X

Pantone Purple 522

Unmarked pipes, without the 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 1000-4-G AWWA/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 the 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 marking 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 four (4) inches in width and remain flexible from -40E F to +140EF with UV stabilizers. The marker shall be 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 of 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. Relational separations are dictated by the State Regulatory Agency (ie. Reclaimed Water Line to be below Water line, and etc).

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. Materials 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 at Contractor Expense. 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 pipes, 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 the 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 and replaced at Contractor expense. 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. The contractor shall place a bag over the hydrant to indicate it is not 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 4 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 is going to 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. Pavement removal shall occur in accordance with the City of Pooler standard details.

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 pipes, 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 pipes into the trench.

- a. Examination of material - All pipes, fittings, valves, and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective material shall be replaced prior to 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 a 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.
- 1. 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 trees 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 (except where sidewalks abut the right-of-way) and right -of-ways (except where sidewalks abut the right-of-way) 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 joining, all scale shall be removed from pipe by some suitable means. After cutting, all pipes 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 pipes 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 pipelines 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 the 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 tests shall be performed in accordance with the latest edition of AWWA C600. The 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 requirements 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, lateral's locations from property corners, fire hydrants & manholes. In addition, state plane coordinates and OPS coordinates should be provided on all valves and manholes.

End of Section

SECTION 02740

LIFT STATION WETWEL, RECEIVING MANHOLES AND UPSTREAM MANHOLES

PART I - GENERAL

1.01 SUMMARY

This section specifies the requirements for wetwell, receiving manholes and upstream 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. All the manholes located before the receiving manhole shall be identified as "Upstream Manholes". The pipe from the receiving manhole to the wet well shall be minimum 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 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, RECEIVING MANHOLE AND UPSTREAM MANHOLES

A. Precast Sections

Wetwells, receiving manholes and upstream 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. The footing shall be designed to prevent flotation of the empty structures. Wetwell and pit penetrations shall require stainless steel wall sleeves and link-seals with stainless steel hardware. Shop drawings shall be submitted consisting of manufacturer's standard details of various sections, before placing order for manholes. In addition to receiving manhole, two additional upstream manholes in all directions are to comply with all requirements of A. through F. of this section are to be adhered to. Likewise, three downstream manholes from forcemain discharge receiving manhole are also to comply with all requirements of A – F of Part 2.01.

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. See D. Exterior Joints for

outside protective coatings.

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 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 Inti-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. The 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 watertight, 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 Inti-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.

- A. Design of Concrete Structures shall be performed and stamped by a Professional Engineer registered in the State of Georgia. In no instance shall a concrete sidewalk be less than 4" thick nor a driveway less than 6" thick. The Engineer shall refer to City of Pooler Standard Construction Details for minimum design requirements of various structures.
- B. Construction loads shall not exceed what the member is able to carry safely and without damage. The Contractor is responsible for providing all supplemental support necessary to protect the structure until the concrete has reached its specified design strength.
- C. All concrete structures shall be designed and constructed to meet the requirements of the U.S. Department of Justice, Americans with Disabilities Act, Rev. July 1997. This law requires that all new places of public accommodations and commercial facilities be designed for persons with disabilities. Required guidelines for curb ramps and other handicapped related structures shall be as specified in U.S. Department of Justice, ADA Design Guide.

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. Portland blast furnace slag cement or Portland pozzolan cement shall conform to ASTM C 595. 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.

Fine and coarse aggregates shall be regarded as separate ingredients. Each size of coarse aggregate, as well as the combination of sizes when two or more are used, shall meet the appropriate grading requirements of the applicable ASTM specifications.

PART2 -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 (where allowed) 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.
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.
- b. 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.
- c. To avoid unnecessary or haphazard changes in consistency, the aggregates shall be obtained from a source which will ensure 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 and shall meet the requirements of ASTM C 94.

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.
- E. Where Fiber Reinforcement is called for, it shall be 1/2" or 3/4" collated, fibrillated polypropylene fibers meeting the requirements of ASTM C 1116, para. 4.1.3, Type III.

2.06 CURING COMPOUND AND IMPERMEABLE FIBER FILLED PAPER

Membrane curing compound shall comply with ASTM C309 for Type I and paper shall comply with ASTM C1 71.

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 required 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 MATERJALS

- A. Each of the constituent materials shall be proportioned 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. The 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. A tolerance of up to 1 inch above the maximum indicated shall be allowed for one batch in any five consecutive batches tested. When climatic conditions require the use of hot weather concrete 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. Truck mixed concrete shall conform to ASTM C94.
2. The Contractor shall submit proposed concrete mix designs for each type of concrete in the project. Proposed concrete proportions shall be subject to acceptance by the Engineer based on demonstrated ability to produce concrete meeting all requirements of the specifications. Concrete proportions shall be established on the basis of previous field experience as specified in ACI 301, Section 4.2.3 with materials to be employed in the work; or if field test results are not available, select the required test strength from Table 4.2.2.3. b of ACI 301-99. The contractor is not authorized to batch any concrete for use in this project until the mix design has been approved by the Engineer. 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.

3.02 PREPARATIONS FOR PLACING CONCRETE

- A. Place all embedded items accurately and securely; 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 shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete and shall have sufficient rigidity to maintain specified tolerances. The design and engineering of the formwork, as well as its construction, shall be the responsibility of the Contractor. The 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. Formwork Tolerances for formed surfaces shall be in compliance with ACI 117. Unless otherwise specified, formwork shall meet the requirements of ACI 301-99, Chapter 2.

3.03 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.

3.04 SPOUTING

Chutes for conveying concrete shall be of metal or metal lined, 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.

3.05 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 ensure 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.

3.06 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.

3.07 INSERTS AND EMBEDMENTS

- A. Inserts
The Contractor shall place pipes, castings, or conduits that are 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 has 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.

3.08 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 the 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 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 D1 752, Type II, in expansion joints for interior work as shown. Provide fiber expansion joint material conforming to ASTM D1751, ASTM D 1752, or ASTM D 994 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 embedded 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 same 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. These 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 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 the 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 weighed down to prevent displacement or billowing from winds. Covering 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 a 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 compounds 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. The 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 films. The grout shall be kept damp by means of four sprays during the setting period. The finish of any

area shall be completed on the same day and the limits of a finished area shall be made at natural breaks in the finished surface.

- C. The 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 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. 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 design, finishing, 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 (to be provided by manufacture)

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 construction plans. The submersible pumps shall be manufactured by Grundfos or approved equal Grundfos or approved equal.

Submersible pumps shall be readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well.

Submersible pumps and motors shall be designed specifically for raw sewage use, including totally submerged operation during a portion of each pumping cycle. Pumps shall be capable of handling raw sewage and passing spheres of at least three inches in diameter. Pump suction and discharge openings shall be at least four inches in diameter.

The equipment covered by these specifications is intended to be standard pumping equipment of proven ability as manufactured by a reputable firm having at least five years' experience in the production of such equipment. The equipment furnished shall be designed, constructed, and installed in accordance with the best practices and methods, and shall operate satisfactorily when installed as shown on the drawings.

All parts shall be so designed and proportioned as to have liberal strength and stiffness and to be especially adapted for the work to be done. Ample space shall be provided for inspection, repairs, and adjustment. The pump volute, motor and seal housing shall be high quality gray cast iron, ASTM A-48, Class 30. All necessary foundation bolts, plates, nuts, and washers shall be furnished by the equipment manufacturer, and shall be of Type 304 stainless steel. All external mating parts shall be machined, and Buna N rubber O-ring sealed on a beveled edge. Gaskets shall not be acceptable. Brass or stainless-steel nameplates giving the name of the manufacturer, voltage, phase, rated horsepower, speed, and any other pertinent data shall

be attached to each pump. The nameplate rating of the motors shall not be exceeded.

The pumps shall be capable of handling raw unscreened domestic wastewater and minimum three-inch diameter solid spheres. Pump operation shall be controlled automatically by means of multi-sensor probe sensors in the wet well. Pumps shall be mounted in the wet well as shown on the Drawings.

In all lift station cases, the receiving system must have available capacity to carry the proposed pump station discharge. Any upgrades required will be the responsibility of the customer requesting the pump station.

Pump Bypass Line – All isolated lift stations with flows less than 300 gpm and without upstream lift stations discharge shall include an approved pump bypass line, approved coupling device and valving connected to the discharge pipe after the check valves in order to utilize City Provided Temporary Portable pumps and appurtenances during pump or control failures. Pump Bypass Line shall comply with City of Pooler Details and shall include City compatible female cam-lock fitting and plug valve. Engineer to coordinate with City.

Isolated Emergency Power Hookup- All isolated lift stations (flows less than 300 gpm) and without upstream lift stations discharge shall be provided with City approved transfer switch and panel coupling device (receptacle) to connect a temporary portable external mounted generator in case a power outage occurs and allows the City to provide a temporary portable generator to power the lift station. Receptacle type shall be coordinated with City. Generator receptacle shall be 200 amps for 240-volt stations and 100 amps for 480-volt stations. Additionally, an 8" thick concrete generator pad shall be provided. Pad shall be located and oriented such that all electrical enclosures will remain outside any NFPA 820 designated hazardous area. Pads shall be furnished to accommodate equipment load without cracking or settling, but in no cases shall they be less than 3600psi concrete; 8" minimum thick with 6x6/W1.4xW1.4 welded wire mesh reinforcement. Final elevation shall be 8" above grade with 2' sloped edges for rubber tire trailer access. Horizontal sizing shall be coordinated with City.

For larger stations including lift station having flows over 300 gpm or having upstream lift station discharge shall have additional requirements such as but not limited to:

1. Permanent fixed generator/automatic transfer switch fully capable of powering lift station and all ancillary facilities. The system shall be provided complete with all necessary automatic starting equipment, transfer switch, fuel tank, supply and return fuel oil piping, exhaust system/silencer, generator output circuit breaker, and all other necessary appurtenances for complete and operable system. Fuel

capacity design shall be 48-hour minimum. Generator shall be compliant with City of Pooler Specifications and Details.

2. Permanent bypass pump system for lift stations Pump bypass facility shall be in accordance with City of Pooler Specifications and Details.

The City of Pooler reserves the right to determine whether an emergency generator or a bypass pump will be required for the lift station.

- 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 the 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

- A. Each pump shall have a flanged guide claw attached to the pump discharge flange by an ANSI flange connection. A replaceable Nitrile Butadiene Rubber (NBR) profile seal shall be provided as an integral part of the guide claw to form a leak-proof seal with the base discharge elbow.

- B. The guide claw shall direct the pump down by two vertical guide rails to the discharge connection in a simple linear movement without tilting the pump side wards. There shall be no need for any personnel to enter the wet well in order to remove the pumps. No portion of the pump shall be supported directly on the bottom of the wet well, guide rails or lifting chain. A cast iron or fabricated steel base plate with integral guide rail holders shall be provided. The base plate shall be designed with an integral 90° elbow.

2.02 PUMP CONSTRUCTION

- A. Major pump components including casing, impellers, motor frame shall be of at minimum Class 40B cast iron with smooth surfaces devoid of blowholes or other irregularities.
- B. All exposed nuts or bolts shall be 304 stainless steel. All metal surfaces coming into contact with the pumped media, other than stainless steel, shall be protected by a factory applied impact-resistance powder coating finish on the exterior of the pump.
- C. Critical mating surfaces where watertight sealing is required shall be machined and fitted with NBR O-rings. Joint sealing will be the result of controlled compression of rubber O-rings in two planes and O-ring contact of four sides without the requirement of a specific torque limit. Rectangular cross-sectioned gaskets requiring specific torque limits to achieve compression shall not be considered as adequate or equal.
- D. Pump and motor shaft shall be the same unit. The pump shaft is an extension of the motor shaft. The motor shaft shall be 316 stainless steel. The pump and motor shall be shipped from the factory as a finished product. Pumps that are assembled outside of the manufacture's facility are not allowed.
- E. Pump housing and motor housing shall be fastened together by a 316 stainless steel clamp in lieu of bolts for easy serviceability.

2.03 CABLE AND CABLE ENTRY SEAL

- A. The power cable shall be sized in accordance with NEC and ICEA standards and shall be of sufficient length to reach the junction box without need of splices. The outer jacket of the cable shall be oil resistant chloroprene rubber.
- B. The pump shall be equipped with a leak-proof stainless steel cable plug where the unscreened conductors of the cable are cast into the plug by means of a two-component sealant to prevent moisture from entering the motor via the cable core.
- C. The pump cable end (plug) shall incorporate in its design the ability to quickly disconnect the power cable from the pump without the need to

enter the pump. This cable plug shall allow the same plug to be utilized for 208/230/460-volt applications without the need to enter the pump.

2.04 PUMP MOTOR

- A. The pump motor shall be an induction type, IE3 component design with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber according to IEC class IP 68 and NEMA MG1, part 31. Oil filled motors shall not be considered acceptable or equal. Stator housing to be ASTM A-48 Class 40.
- B. The motor shall be explosion proof and inverter duty rated approved for use in Class 1, Division 1, Group C & D hazardous areas. The stator windings and stator leads shall be insulated with moisture resistant Class H insulation rated for 356°F (180°C).
- C. The stator shall be trickle impregnated and heat shrunk fitted into the cast iron stator housing. The use of bolts, pins or other fastening devices requiring penetration of the stator housing is not acceptable. The motor shall be designed for continuous duty handling pumped media of 104°F (40°C) and capable of up to 20 spaced starts per hour.
- D. The motor shall have voltage tolerance of plus or minus 10%. The motor shall be designed for operation up to 104°F (40°C) ambient temperature, with a temperature rise of class A not to exceed 176°F (80°C).
- E. The motor horsepower shall be adequate so that the pump is non-overloading throughout the entire pump performance curve from shut-off through run-out. Service factor shall be 1.15.

2.05 COOLING SYSTEM

Pump shall be of submersible design cooled by ambient fluids with no additional cooling system required.

2.06 BEARINGS

The pump shaft shall rotate on two bearings. Motor bearings shall be grease lubricated for the life of the bearing. The upper motor bearing and the lower bearings shall compensate for axial thrust and radial forces and shall consist of a roller bearing and two angular contact ball bearings.

2.07 MECHANICAL SEALS

- A. Mechanical seal shall be a cartridge style encased with a 316 stainless steel housing.
- B. Primary seal faces shall be silicon carbide / silicon carbide and secondary seal faces shall be carbon / ceramic.

2.08 PUMP SHAFT

The pump shaft must be a short overhung and dynamically balanced to eliminate shaft deflection. The motor shaft shall be 316 stainless steel.

2.09 IMPELLER

- A. The enclosed single channel tube style impeller shall be of cast iron ASTM A48 class 40B.
- B. Single channel tube impellers shall be fitted with a 304 stainless steel removable wear ring.
- C. Single channel tube impellers shall be wet balanced.
- D. The vortex style impeller shall be of cast iron ASTM A48 class 40B.
- E. Vortex impellers to be balanced to ISO scale G 6.3.

2.10 VOLUTE

The pump volute shall be single piece cast iron, ASTM A48, Class 40 B, with NBR coated 304 stainless steel stationary ring, with smooth passages large enough to pass any solids that may enter the impeller. Minimum through let shall be 3". Pump housing and motor housing shall be fastened together by a 316 stainless steel clamp in lieu of bolts for easy serviceability.

2.11 LIFTING BAIL

Lifting bail shall be cast 316 stainless steel bolted to the top of the pump. Bail shall be constructed so that the pump is in proper position to connect to elbow.

2.12 AUTO COUPLING SYSTEM

- A. Pumps shall be equipped with a complete auto coupling system to include factory upper guide rail brackets, base elbow, guide claw. Fabricated non factory components will not be accepted.
- B. The upper guide rail bracket shall be 316 stainless steel.
- C. The base elbow shall have a smooth interior to allow for specific solids passage. Base elbow shall be gray cast iron, ASTM A-48, Class 35 or better, with smooth surfaces devoid of blowholes or other irregularities. Base elbows shall have a factory applied spray coating.
- D. Minimum guide rail diameter shall be 2" for 4"-6" discharge and 1.5" for 2.5"-3" discharge. Guide rails to be 316 stainless steel with minimum thickness of 0.15" (schedule 40).

2.13 PUMP PROTECTION

- A. Each pump shall incorporate three thermal switches, one per stator phase wind and be connected in series, to monitor the temperature of the motor. Should the thermal switches open, the motor shall be stopped and an alarm indication shall be activated. Pump should also include thermistor to current stator temperature while pump is operating.
- B. Pumps shall have one normally closed moisture switches. The moisture switches shall be incorporated into the pump to sense moisture in the bottom of the stator housing. The switch shall be wired in series so that if a switch opens the motor is de-energized and the pump is stopped.
- C. A water leakage sensor shall be installed in the seal chamber to monitor the condition of the primary seal. The sensor shall measure the water content in the oil and converts the value into an analog current signal. The sensor shall measure the water content in the oil chamber from 0%-20% and send a continuous 4-20mA signal to a factory supplied seal fail module to allow for seal fail monitoring. This shall allow for constant trending of seal leakage without the need to remove the pump from the wet well. The sensor shall be fitted in a stainless-steel tube for mechanical protection. Seal fail sensor in pump shall be FM Approved.

2.14 MIX FLUSH SYSTEM

- A. Provisions shall be incorporated in the wetwell to mix the sewage for flushing prior to the pumps coming on. Either of two systems are approved. The Grundfos Compact Submersible Mixer System.
- B. When the Grundfos 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 provided 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. The 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.

2.15 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.

2.16 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.

2.17 LIQUID LEVEL SENSOR AND PUMP CONTROLLER

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

2.18 CONTROL PANEL

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

2.19 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.

2.20 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. Check valves 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. The 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 surfaces protected by nonmetallic coatings factory applied, thermally bonded and in accordance with

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 watertight 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 REMOTE MONITORING AND CONTROL SYSTEM

The system shall be the Grundfos Connect (GC) system as manufactured and maintained by Grundfos and have the functionality as listed.

- A. The pump station Remote Monitoring and Control system shall be an internet-based platform. It will be able to provide the monitoring, control and data management of the pumping system.
- B. The Remote Monitoring and Control system shall provide remote access to all relevant data and alarms from pumps, pump controllers and auxiliary equipment such as sensors or meters.
- C. Data from pump installations is cyclically transferred wirelessly via a 3G/4G wireless modem to a centrally hosted database and published to subscribers on a secure web server provided by the supplier.
- D. Data in the system should be updated every 5 minutes containing data points for every 1 minute unless there is an interruption in connection.
- E. Users have access via Internet/web browser to data from pump installations that are registered to their own account.
- F. The monitoring system is able to send out SMS and/or Email alarms to defined on-call site personnel.
 - 1. Users shall be able to configure the individual stations for which they would like to receive alarms.

- G. The system requires either a direct hard-wired internet connection or may use onsite 3G/4G coverage on a mobile telecommunications network via a 3G/4G data-modem connected to the pump system with a wireless antenna.
- H. The cellular connection shall use an e-sim module for connection to multiple cellular networks.
- I. The necessary hardware such as PC/ tablet-PC / Laptop or Smartphone with web browser and internet connection shall be provided by others.
- J. The hardware offered shall be based on a similar protocol communication platform as the pump manufacturer to ensure data communication reliability.
- K. The system shall be capable of operating and functioning as follows:
 - 1. Complete Overview – See the status of the entire system(s) on a map or any digital image.
 - 2. On- Line with pumps – remote monitoring, analysis and adjustments via PC/ tablet-PC/ Smartphone using only a web browser.
 - 3. Trends and reports – Follow system performance and reveal system problems as they happen.
 - 4. Automatic event log and service log for all pumps in the system.
 - 5. Shared documentation – Upload system documentation to a secure server making it accessible to all relevant personnel.
 - 6. Flexible on-call scheduling – Configurable rotating schedule of personnel who are alerted via SMS/ email alarms in rotating weekly schedules.
 - 7. Manage Pump Maintenance – Ability to plan service work based on actual operating data and receive notification when service is due.
- L. The Grundfos GRM system shall monitor the following signals from the pump station and display the status on screen in the system:
 - 1. Level from analog level device (AI)
 - 2. Backup high-level float switch status (DI)
 - 3. Backup floats circuit engaged or not (DI)
 - 4. Phase monitor status (DI)
 - 5. HOA switch in AUTO for each pump (DI)
 - 6. Run feedback/status from each pump (DI)
 - 7. Overload trip status for each pump (DI)
 - 8. Motor thermal sensor trip status for each pump (DI)
 - 9. Motor seal-fail sensor trip status for each pump (DI)
 - 10. Amp draw for each pump (AI)
 - 11. Run times for each pump (tabulated in control system)
 - 12. Start counts for each pump (tabulated in control system)

- M. Additional monitoring capabilities:
1. The system shall be capable of calculating and monitoring flow rates of the entire station and of each pump.
 2. The system shall be capable of monitoring up to four custom user-defined inputs from other devices, such as a generator, ATS, diesel bypass pump, etc. and shall have the ability to set an alarm condition for either the high or low state.
 3. The system shall be capable of monitoring up to three user-defined analog signals in addition to the analog signals for level, amperage, discharge pressure, power, flow, and water in oil.
 4. The system should be capable of monitoring a counter signal, such as from a rain gauge.
 5. The system should have the ability to configure up to one user-defined relay output that can be energized/de-energized remotely from the GRM system.

2.13. EMERGENCY STAND-BY GENERATORS

Provisions for emergency stand-by power will be included on all lift stations.

1. Isolated Lift Station Emergency Power Hookup- All isolated lift stations (flows less than 300 gpm) and without upstream lift stations discharge shall be provided with City approved transfer switch and panel coupling device (receptacle) to connect a temporary portable external mounted generator in case a power outage occurs and allows the City to provide a temporary portable generator to power the lift station. Receptacle type shall be coordinated with City. Generator receptacle shall be 200 amps for 240-volt stations and 100 amps for 480-volt stations. Additionally, an 8" thick concrete generator pad shall be provided. Pad shall be located and oriented such that all electrical enclosures will remain outside any NFPA 820 designated hazardous area. Pads shall be furnished to accommodate equipment load without cracking or settling, but in no cases shall they be less than 3600psi concrete; 8" minimum thick with 6x6/W1.4xW1.4 welded wire mesh reinforcement. Final elevation shall be 8" above grade with 2' sloped edges for rubber tire trailer access. Horizontal sizing shall be coordinated with the City. The system shall be in accordance with City Details and specifications.
2. Permanent Fixed Emergency Power System - For larger stations including lift station having flows over 300 gpm or having upstream lift station discharge shall have permanent fixed generator/automatic transfer switch fully capable of operating the station and all its systems at full capacity with all pumps operating and all ancillary facilities. The system shall be provided complete with all necessary automatic starting equipment, transfer switch, fuel tank, supply and return fuel oil piping, exhaust system/silencer, generator output circuit breaker, and all other necessary appurtenances for complete and operable system. Fuel capacity design shall be 2-day minimum. The generator set shall consist of a diesel fuel engine directly coupled to an electric generator, together with the necessary controls and

accessories to provide continuous electric power to the pump station for the minimum duration of a 48-hour failure of the normal power supply. Generator shall be compliant with City of Pooler Specifications and Details

A complete engine generator system shall be furnished and installed with fuel transfer pump, double lined fuel tank, battery, battery charger, muffler, radiator, control panel, remotely mounted automatic transfer switch, and all other accessories required for an operational system. All materials and parts of the generator set shall be new and unused. Each component shall be of current manufacture from a firm regularly engaged in the production of such equipment and shall meet City detail and specification requirements. The set shall be of a standard model in regular production at the manufacturer's place of business. Units and components offered under the specifications shall be covered by the manufacturer's City Required warranty on new machines. Generator shall be compliant with City of Pooler Specifications and Details.

- 2.14 PUMP BYPASS LINE – All isolated lift stations with flows less than 300 gpm and not receiving any upstream lift stations discharge shall include an approved pump bypass line, suitable for use with temporary pumps and for force main pigging. Pump Bypass Line shall comply with City of Pooler Details and shall include City compatible female cam-lock fitting and plug valve. Engineer to coordinate with City.

- 2.15 BY-PASS PUMP SYSTEM- All Lift Stations having flows over 300 gpm or receiving upstream lift station discharge shall have a Permanent bypass pump system with full flow capacity of lift station. The pump bypass system shall be in accordance with City of Pooler Specifications and Details and contractor shall coordinate with City of Pooler.

END OF SECTION
11064

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), 2020 Edition with 2021 Georgia Ammentments.
 2. Electrical Ordinance, City of Pooler, 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 Suppression
 - 1. Enclosure
 - 2. Installation instructions
 - 3. Dimensional data
 - 4. Manufacturer's data sheet
- F. Section 16210 – ENGINE DRIVEN EMERGENCY POWER SUPPLY SYSTEM
 - 1. Refer to paragraph 1.04

G. 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 tch

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 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 Form 7 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 aluminum 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 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. All hardware shall be 316 Stainless Steel.
 - 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. Eaton
- 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: Connection to ground rods (outside of panels) shall be exothermic weld 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 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. Eaton

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 16210

ENGINE DRIVEN EMERGENCY POWER SUPPLY SYSTEM

PART 1 – GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. The work required under this section of the specifications consists of the installation of the complete Engine Driven Emergency Power Supply System. All materials and devices which are an integral part of this system shall be provided under this section of the specifications.
- B. Definition: The Emergency Power Supply System (EPSS) shall consist of one or more engine driven generator sets, each of which contains an engine directly coupled to an electric generator, together with the necessary switchgear, controls, accessories, transfer devices, and fuel supply to provide electric power for the duration of any failure of the normal power supply.
 - 1. Automatic Transfer Switch (ATS): An automatic transfer switch is self-acting equipment for transferring one or more load conductor connections from one power source to another.
- C. For this project the contractor shall provide one 175kW/219kVA diesel engine-generator set with permanent magnet excitation, a 150mph wind rated, sound attenuating, aluminum housing, 24 hr fuel capacity double wall sub-base tank, a 400A 4-pole automatic transfer switch with programmed transition.
- D. The manufacturer of the generator set shall also be the manufacturer of the engine provided with the set. Equipment with engine from third party manufacturers will not be accepted or approved.

1.03 QUALITY ASSURANCE

- A. The following specifications and standards are incorporated into and become a part of this specification by reference.
 - 1. National Fire Protection Association (NFPA):
 - a. NFPA-37 Combustion Engines
 - b. NFPA-70 National Electrical Code. Equipment shall be suitable for use in systems in compliance to Article 700, 701 and 702.
 - c. NFPA-110 Emergency and Stand-By Power Systems. The generator set shall meet all requirements for Level 1 systems. Level 1 prototype tests

required by this standard shall have been performed on a complete and functional unit, component level type tests will not substitute for this requirement.

2. Electrical Generating Systems Association (EGSA) Standards:
 - a. EGSA CEP2 Codes for Emergency Power by States and Major Cities
 - b. EGSA GTD3 Glossary of Standard Industry Terminology and Definitions
 - c. EGSA ECB1 Performance Standard for Engine Cranking Batteries
 - d. EGSA TSS1 Performance Standard for Transfer Switches for use with Engine Generator Sets
 - e. EGSA BCES1 Performance Standard for Battery Chargers
 - f. EGSA ICAE1 Performance Standard for Electric Generator Set Instrument Control and Auxiliary Equipment
3. Institute of Electrical and Electronics Engineers (IEEE) Standards:
 - a. IEEE 446 IEEE Recommended Practices for Emergency and Standby Power Systems for commercial and industrial applications.
 - b. IEEE 472 Voltage Surge Withstand Capabilities
4. National Electric Manufacturers Association (NEMA) Standards:
 - a. NEMA MG1-1998 part 32. Alternator shall comply with the requirements of this standard.
 - b. ICS1-109 Test and Test Procedures for Automatic Transfer Switches
 - c. ICS 10-2005 Part 1 A.C. Automatic Transfer Switch
5. Underwriters Laboratories Inc. (UL) Publications:
 - a. UL 1008 Automatic and Non-Automatic Transfer Switches
 - b. UL508. The entire control system of the generator set shall be UL 508 listed and labeled.
 - c. UL142 – Sub-base Tanks
 - d. UL 1236 – Battery Chargers
 - e. UL2200 – The generator set shall be listed to UL2200 or submit to an independent third-party certification process to verify compliance as installed.
6. American National Standards Institute (ANSI):
 - a. C37.90a Voltage Surge Withstand Capability
7. Environmental Protection Agency (EPA):
 - a. EPA/530-SW-85-009 Leaking Underground Storage Tanks (LUST)
8. The control system for the generator set shall comply with the following requirements.
 - a. CSA C22.2, No. 14 – M91 Industrial Control Equipment.
 - b. EN50082-2, Electromagnetic Compatibility – Generic Immunity Requirements Part 2: Industrial
 - c. EN55011, Limits and Methods of Measurement of Radio Interference Characteristics of Industrial, Scientific and Medical Equipment.
 - d. FCC Part 15, Subpart B.
 - e. IEC8528 part 4. Control Systems for Generator Sets
 - f. IEC Std 801.2, 801.3 and 801.5 for susceptibility, conducted and radiated electromagnetic emissions.
9. The generator set manufacturer shall be certified to ISO 9001 International Quality Standard and shall have third party certification verifying quality

assurance in design/development, production, installation and service, in accordance with ISO 9001.

- B. Acceptable Manufacturers: Products of the following manufacturers, which comply with these specifications, are acceptable:
 - 1. Engine Driven Generator Sets:
 - a. Caterpillar
 - b. Cummins/Onan
 - c. MTU
 - d. Kohler
 - 2. Transfer Switches:
 - a. ASCO 7000 Series with Microprocessor Controller
 - b. Cummins/Onan OTEC Series with Power Command 40-01 Controller
 - 3. Sub-Base Fuel Tanks:
 - a. JRS
 - b. Globel
- C. Equipment Dimensions:
 - 1. Dimensions indicated on the drawings are maximum allowable and shall not be exceeded. Where equipment of acceptable manufacturers listed exceeds the maximum dimensions, products of such manufacturers shall not be acceptable.
- D. Coordination:
 - 1. Review shop drawings submitted under this and other sections, as well as other divisions, to ensure coordination between work required among different trades. Coordinate the installation sequence with other contractors to avoid conflicts and to provide the fastest overall installation schedule. Coordinate installation with structural features, equipment installed under other sections of the specifications, and electrical equipment to ensure access and to insure clearance minimums are provided.

1.04 SUBMITTALS

- A. Refer to the SHOP DRAWINGS, PRODUCT DATA AND SAMPLES Section for required procedures.
- B. Manufacturer's Product Data:
 - 1. Submit material specifications and installations data for products specified under Part 2 - Products to include:
 - a. Engine driven generator sets
 - b. Transfer switches
 - c. Sub-base fuel tanks
- C. Shop Drawings: Submit shop drawings to indicate information not fully described by the product data to indicate compliance with the contract drawings. Submittals containing less than the information listed below will be rejected.

1. Shop drawings for the engine driven generator sets shall contain not less than the information listed as follows:
 - a. Certification that the engine driven generator set(s) furnished will serve electrical loads indicated including motor starting loads with type(s) of starting indicated.
 - b. Stand-by rating of engine driven generator set(s) including voltage and phase.
 - c. Frequency and voltage regulation with maximum voltage dip and time of recovery to stable operation.
 - d. Output voltage adjustment range in percentage of rated plant voltage.
 - e. Alternator type and method of connection to prime mover.
 - f. Components contained in alternator instrument panel.
 - g. Rating of engine at operating speed, engine cycle and number of cylinders.
 - h. Type of engine lubrication system and verification of components specified.
 - i. Type of engine governor.
 - j. Components contained in engine instrument panel.
 - k. Fuel consumption at $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and full load.
 - l. Starting batteries including ampere hour rating.
 - m. Verification that all accessories specified is to be provided. This includes cold weather starting aid with rating and voltage indicated, exhaust system with muffler type indicated, and outdoor housing (where applicable) with verification of space available within housing for batteries.
 - n. Line and machinery constants of the generator furnished.
 - o. Terminal board connection diagram where reconnectable generators are specified.
 - p. Circuit breaker type, rating, A.I.C. rating and cable capacity of lugs.
2. Shop drawings for the transfer switch shall contain not less than the information listed as follows:
 - a. List of accessories contained in the control panel.
 - b. Withstand rating in RMS symmetrical amperes.

D. Quality and Service:

1. All materials and parts of the EPSS shall be new and unused. Each component shall be of current manufacture from a firm regularly engaged in the production of such equipment. Units and components offered under these specifications shall be covered by the manufacturer's parts and labor warranty for a minimum of five (5) years from date of Owner acceptance of the project on a new machine, a copy of which shall be included in the shop drawings submittal.
2. Submittals will be accepted only on engine driven generator sets and transfer switches which can be properly maintained and serviced without requiring the Owner to stock spare parts or wait longer than twenty-four hours for service. Submittals shall include the nearest location of permanent parts outlet from which parts may be obtained and written assurance that trained service personnel will be available on twenty-four hour's notice. Units with service centers more than 100 miles from project site will not be accepted.

E. Record Drawings

1. Include in each set three sets of operating, maintenance, and parts manuals covering all components for the EPSS. Each supplier shall provide instructions to the Owner in operation and maintenance of his equipment, both in written form and with on-site personnel for a minimum of six hours.
2. A schedule of each motor, indicating actual horsepower and means of starting, connected to the EPSS shall be provided to the Owner with the record drawings.

PART 2 – PRODUCTS

2.01 ENGINE DRIVEN EMERGENCY POWER SUPPLY (EPS)

A. Engine

1. The engine driven emergency power supply (EPS) shall be an internal combustion diesel driven prime mover. The generator set shall have the following characteristics:
 - a. 175 KW Capacity – Minimum*
 - b. 219 KVA Capacity – Minimum*
 - c. 480Y/277 Volts
 - d. 60 Hertz
 - e. 0.8 Power Factor
 - f. 3 Phase
 - g. 4 Wire

The generator set must be sized to start and run the loads shown within the parameters specified. Maximum voltage drop to be 20%.

2. Maximum one-step load at 0.8 P.F. is 98.7 KW (step 1). The load to be served by this generator set consists of 7.5kVA non-inductive load plus 128 total motor horsepower. The motors shall be started as shown in the following table:

Sequence	Horse Power	Code Letter	Starting Method
1. Initial Load	7.5kVA	-	-
1. Pump No. 1	64 HP (85A)	G	RVSS
2. Pump No. 2	64 HP (85A)	G	RVSS

Set RVSS for a maximum inrush of 300% FLA.

3. The rated net horsepower of the engine at the generator synchronous speed, with all accessories, shall not be less than that required to produce the KW specified in paragraph 1 above. The horsepower rating shall take into account generator efficiency and all accessory losses such as fans, battery charger, etc. The generator set shall be capable of producing the specified KW (without overload) for the duration of the power outage, under the following ambient conditions:
 - a. Altitude: 500 feet above mean sea level.
 - b. Air temperature at engine intake: 104 degrees F.
 - c. Humidity Range: 20 - 95 %.
4. Included with the shop drawing submittal shall be the manufacturer's estimate of supply fuel and oil consumption for the engine. The engine shall have an oil filter with replaceable elements, a lube oil cooler, and an oil reservoir.

5. The engine shall be equipped with a suitable governor (engine speed control) to maintain frequency within limit specified below by controlling engine and generator speed. Manufacturer shall indicate in submittal data whether mechanical, hydraulic, electrical, or hybrid governors are provided.
 - a. Type: Isochronous
 - b. Stability: +1/4 % maximum steady state frequency variation at any constant load from no load to full load.
 - c. Regulation: 5% maximum frequency deviation between no-load steady state and full load steady state.
6. The engine shall be electric start, provided with a solenoid energized motor with either positive engagement or clutch drive to the engine.
7. The engine starting batteries shall be sealed lead-acid recombination type. Batteries shall be rack mounted inside the weatherproof plant housing to minimize the distance from the batteries to the starter.
 - a. Provide battery straps and heaters.
8. A float type battery charger, compatible with the batteries selected, shall be furnished at the engine which shall maintain the starting batteries at full charge.
9. It shall have an equalize rate and a float rate charging system. An ammeter and voltmeter shall indicate the charge rate and the circuit shall be protected by either fuses or circuit breakers. The charger or charging circuit shall be so designed that it will not be damaged during the engine cranking cycle, for example, by a current limiting charger or a crank disconnect relay. It shall also be capable of recharging a discharged battery in 12 hours while carrying normal loads. The charger shall be equipped with alarm relays as required for remote annunciation equipment.
10. The engine shall be liquid cooled. The type of liquid cooling system shall be unit mounted radiator - consideration shall be given for air temperature rise across the engine in addition to ambient. Minimum capacity shall be rated for 104°F. minimum engine ambient temperature plus air temperature rise across the engine.
 - a. Provide an electric heater, thermostatically controlled, in the engine coolant system as a cold weather starting aid. Heater shall be for operation on 120 volt single phase A.C. for 1500 watt units and below and on 230 volt single phase A.C. for all other units and shall be permanently connected to a circuit from the building electrical system. Heater shall maintain 70°F. to 90°F.
 - b. Provide isolation valves or quick connect couplings for jacket water heater.
11. Air Supply/Exhaust System
 - a. Cleaner: An air cleaner and silencer shall be furnished, located and mounted as recommended by the engine manufacturer.
 - b. Exhaust: An exhaust system of suitable size, configuration, and material in accordance with engine manufacturer's recommendations shall connect the exhaust outlet of the engine to a silencer. The type of silencer shall meet the requirements of engine manufacturers and shall be critical. The silencer shall be located inside outdoor enclosure.

- c. The exhaust system including silencer shall be of such size that back pressure on the system will not exceed the back pressure permitted by the engine manufacturer's recommendation. A flexible connection shall be mounted at the engine exhaust outlet and the discharge end shall be protected against entry of precipitation. For piping rising up through the roof, provide condensation drip leg with valve at pipe elbow. Piping and silencer within reach of personnel or with 8'-0" of finished floor or grade shall be protected by screening and shall be insulated with two inches of calcium silicate insulation with aluminum jacket. All exhaust piping shall be gas tight.

- 12 The engine instrument panel shall be mounted at the engine and shall contain the following:
 - a. Oil pressure gauge to indicate lubricating oil pressure.
 - b. Temperature gauge to indicate cooling medium temperature.
 - c. Hour meter to indicate total actual running time.
 - d. Battery charging meter to indicate satisfactory performance of battery charging means.
 - e. Other instruments as recommended by the manufacturer for proper maintenance.

B. Generator

- 1. The generator shall be an engine-driven single or two bearings type, synchronous, brushless, and conforming to applicable standards. It shall be connected to the engine flywheel by means of a flexible type coupling for single bearing generators and elastic coupling for two bearing generators.
- 2. The generator shall be rated for 40°C. ambient. Class of insulation shall be NEMA Class H. The voltage regulation shall be plus or minus 2% from no load to full load with plus or minus 5% speed change and a 15°C. rise in ambient. The generator voltage dip from no load to full load shall not exceed 16%.
- 3. A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than 10 seconds.
- 4. Provide 120 volt condensation heater in windings.
- 5. For exterior installations, the EPS shall be provided in outdoor, weatherproof housing with removable panels for access to equipment. Color shall be as selected by the Engineer (off white). The starting batteries shall be rack mounted within the housing. Provide manufacturer's standard maintenance switched lighting system within housing. Enclosure shall be aluminum rated for 150 mph winds.
- 6. Provide sound attenuating, level 2, enclosure.
- 7. Provide LED service maintenance lights and weatherproof switch within the generator enclosure. Connect to the battery charger branch circuit.

C. Voltage Regulation

1. The generator shall be equipped with a volts-per-hertz type voltage regulator to maintain voltage within limits specified below:
 - a. Stability: + 2 % maximum voltage variation at any constant load from no load to full load.
 - b. Regulation: 4 % maximum voltage deviation between no load steady state and full load steady state.
 - c. Transient: 20 % voltage dip or overshoot on one-step application or removal of 0.8 power factor full load.
 - d. Transient: 2 seconds maximum voltage recovery time with application or removal of 0.8 power factor full load.
- D. Generator full main line circuit breaker.
1. A main line circuit breaker shall be supplied to protect the generator and controls from overloads and/or short circuits in the load. It shall be rated as indicated on the drawings. Interrupting current shall be 14000 amps RMS. Breakers shall comply with UL 489 and NEMA AB-3.
 2. Provide a second breaker of equal rating for load bank connection testing.
- E. Start and Stop Controls
1. Automatic starting and stopping controls shall be furnished to start the engine automatically when the normal electrical power fails or falls below specific limits and to stop the engine automatically after the normal power supply resumes. The signal for starting or stopping the engine shall be sensed through an auxiliary contact in the automatic transfer switch. The controls shall be capable of operating at 50% of normal DC system supplied voltage.
 2. The cranking cycle shall be initiated by manual start, loss of normal power at any transfer switch, clock exerciser, or the manually operated test switch at each ATS.
 3. Crank control and the time delay relays shall provide a minimum of 4 crank attempts of at least 7 seconds each, separated by appropriate rest periods. A sensing device shall automatically disconnect the starting circuit when the engine has started. If the engine has not started at the completion of the starting program, the overcrank signal shall indicate. The engine starting controls shall be locked out and no further starting attempts shall take place until the overcranking device has been manually reset.
 4. A selector switch shall be incorporated in the automatic engine start and stop controls. It shall include an "off" position that prevents manual or automatic starting of the engine; a "manual" position that permits the engine to be started manually by the pushbutton on the control cabinet and run unloaded; an "automatic" position that readies the system for automatic start or stop on demand or the automatic load transfer switches or of the programmed exerciser.
 5. A remote manual stop station similar to a break-glass station shall be provided on the generator weatherproof housing and on transfer switch cover and shall be tied into the engine controls to stop the engine when activated. Provide laminated plastic label with 1/4" minimum engraved letters to read "EMERGENCY GENERATOR SHUTDOWN". Background to be red and core to be white.
- F. Instrumentation

1. Local engine control and safety panel shall be provided, containing the following:
 - a. Automatic remote start capability.
 - b. "Manual-Off-Auto" switch.
 - c. Controls to shut down and lock out the prime mover under the following conditions: failure to start after specified cranking time, overspeed, low lubricating oil pressure, high engine temperature and operation of remote manual stop station.
 - d. Battery powered individual alarm indication to annunciate visually at the control and safety panel the occurrence of any condition itemized below; contacts or circuits for a common audible alarm signaling locally the occurrence of any itemized conditions listed below. Test switch shall be provided to test the operation of all lamps.

1) Indicator Function, Level 1 (At Battery Voltage):

	Control Panel Mounted Visual Indication	Shutdown of EPS
a) Overcrank	X	X
b) Low Water Temp. < 70° F (21°C)	X	
c) High Engine Temp. Pre-alarm	X	
d) High Engine Temp.	X	X
e) Low Lube Oil Pressure Pre-alarm	X	
f) Low Lube Oil Pressure	X	X
g) Overspeed	X	X
h) Low Fuel Main Tank	X	
i) EPS Supplying Load	X	
j) Control Switch Not In Auto Pos.	X	
k) Battery Charger Malfunctioning	X	
l) Low Voltage in Battery	X	
m) Lamp Test	X	
n) Contacts for Local & Remote		
o) Common Alarm	X	
p) Audible Alarm Silencing Switch		
q) Remote Emergency Stop	X	X
r) Fuel in containment	X	

- 2) Controls to shutdown the prime mover upon removal of initiating signal or manual emergency shutdown.

- 3) A.C. voltmeter with selector switch off position and positions for phase to phase and phase to neutral.
 - 4) A.C. ammeter with selector switch with positions for each phase.
 - 5) Frequency meter -- digital electronic type.
 - 6) Voltage adjusting to allow plus or minus 5% voltage adjustment.
 - 7) Manual reset circuit breaker.
 - 8) Water temperature gauge.
 - 9) Manual stop/start control.
 - 10) Elapsed time meter.
 - 11) Panel lights.
 - 12) Indicator lights for signals from engine instrument panel.
 - 13) Light to indicate switch has been left in the "off" position.
 - 14) Light to indicate remote start.
2. All instruments, controls, and indicating lights shall be properly identified. All wires shall be individually identified and must agree with the wiring diagram provided. All wiring shall be harnessed or flexibly enclosed. Terminals on all terminal blocks shall be individually identified. All instrumentation must be isolated from engine generator set vibration.
 3. Extend common pre-alarm including low fuel and common alarm signal to SCADA.

G. Enclosures and Connections:

1. All electrical enclosures, i.e., terminal cabinets, wire ways, circuit breaker enclosures, etc., shall be of adequate size to provide minimum bending radius as required by the NEC and measured from the terminals directly to the opposite wall of the enclosure, for the size conductor actually terminated within or passing through the enclosure.
 2. All factory provided enclosures shall have gasket and finish appropriate for the environment in which the unit is to be mounted. All wiring, wiring harness, etc., shall be protected from the elements, such as direct sunlight, moisture, etc. or shall be UL listed for direct exposure to the applicable elements. Include written documentation of the above with the shop drawing submittal.
- H. Provide flexible fuel connections at supply at return piping. Flexible hoses shall be steel reinforced type. Provide solenoid valve in series with gate valve in supply line. Solenoid valve shall be powered from generator batteries and shall be open only when generator is running.

2.02 TRANSFER SWITCH

- A. Transfer switch shall be rated at not less than as indicated on the drawings at rated voltage. Transfer switch shall be rated and marked for total system load.
- B. Transfer switch serving 480V three phase four wire loads shall be four poles with a switched neutral.
- C. Transfer switch shall be the automatic type with delayed transition and intermediate position.

- D. Transfer switch shall be rack mounted in a NEMA 4X stainless steel enclosure. Enclosure shall have hinged door with three point latching and factory installed key locking enclosure door. The switch shall only require front access.
- E. Operation shall be inherently double-throw whereby all contacts move simultaneously. Electrical spacing shall be equal to or exceed those listed in Table 15.1 of UL-1008. Only those main contact structures specifically designed for transfer switch service shall be acceptable. An overload or short circuit shall not cause the switch to go to a neutral position. A manual operating handle shall be provided. All main contacts shall be silver alloy type protected by arc quenchers and, for switches rated 600 amps and larger, by arching contacts. Operating transfer time shall be 1/15 second or less on switches rated below 600 amps.
- F. All switch and contacts, coils, springs and control elements shall be removable from the front of the transfer switch without removal of the switch panel from the enclosure and without disconnecting power conductors or drive linkages. Control and sensing relays shall be continuous duty industrial type with minimum contact rating of ten amps.
- G. Transfer switch shall be rated to withstand in RMS symmetrical amperes not less than the available symmetrical RMS amperes when protected by the circuit protective device on the line side of the transfer switch. Withstand rating of switch shall be based on switch contacts not welding under fault conditions. Provide switch with current limiting fuses to increase current withstand rating when switch is not rated for fault duty.
- H. The control panel for each automatic transfer switch shall contain the following accessories:
 - 1. Adjustable 0.5 to 6 second time delay on starting of EPS to override momentary power dips and interruptions of the normal services. Time delay shall be factory set at 1 second.
 - 2. Time delay on transfer to emergency adjustable from 0 to 60 seconds, factory set at 0 seconds.
 - 3. Test switch on enclosure door to simulate failure of the normal power source. ATS shall transfer load to the EPS.
 - 4. Push button to bypass time delay on re-transfer to normal.
 - 5. Close differential voltage sensing shall be provided on all phases of the normal power supply. The pickup voltage shall be adjustable from 85% to 100% of nominal and the dropout voltage shall be adjustable from 75% to 98% of the pickup value. The transfer to emergency will be initiated upon reduction of normal source to 85% of nominal voltage and re-transfer to normal shall occur when normal source restores to 95% of nominals.
 - 6. Independent single phase voltage and frequency sensing of the emergency source. The pickup voltage shall be adjustable from 85% to 100% of nominal. Pickup frequency shall be adjustable from 90% to 100% of nominal. Transfer to emergency upon normal source failure when emergency source voltage is 90% or more of nominal and frequency is 95% or more of nominal.

7. A time delay on re-transfer to normal source. The time delay shall be automatically bypassed if the emergency source fails and normal source is available. The time delay shall be field adjustable from 0 to 25 minutes and factory set at 15 minutes.
8. An unloaded running time delay for emergency generator cool-down, factory set at 5 minutes.
9. The transfer switch shall be the programmed transition type with intermediate position (adjustable time delay) before transfer. In phase monitor transition will not be accepted.
10. Pilot light for indicating switch in normal position (include fuses and auxiliary contact).
11. Pilot light for indicating switch in emergency position (include fuses and auxiliary contact).
12. An exerciser for exercising standby power plant on a weekly basis shall be provided in the transfer switch. Exerciser shall be set to exercise standby plant for one half hour per week under load. Time of plant exercise shall be set in field. Exerciser timer shall have reserve power back-up, either by battery or spring-wound clock, to ride through power outages to the switch.
13. Auxiliary contact (gold plated) which closes when normal source fails. (Closed after override delay of 0.5 to 6 seconds).
14. Auxiliary contact (gold plated) which opens when normal source fails. (Opens after override delay of 0.5 to 6 seconds).
15. Auxiliary contacts on same shaft as main contacts (closed on normal.)
16. Auxiliary contacts on same shaft as main contacts (closed on emergency).

2.03 FUEL SUPPLY

- A. A double wall fuel storage tank with sufficient fuel capacity to allow the EPS to operate continuously at full rated load for 24 hours (300 gallon minimum) shall be located in the skids below the generator set and shall be complete with all piping and fittings connected. No galvanized material shall be used in the tank or fueling system. The tanks shall be vented to atmosphere. A fuel level gauge shall be located as indicated on the drawings. The system shall be supplied to deliver an adequate amount of fuel to the engine from the storage tank. Pipe sizes shall be no smaller than the minimum recommended by the engine manufacturer to avoid fuel flow restriction. The engine supply and return line shall be equipped with a length of flexible fuel lines, unions, and gate valves. No copper lines are acceptable. Provide 200 gallons of fuel for testing.
- B. Provide a set of normally open contacts in fuel level indicating “LOW FUEL” in fuel tank. Interconnect with remote low fuel alarm specified earlier in this section.
- C. Provide leak detection monitoring system with a set of normally open contacts in secondary compartment of double wall tank space to indicate presence of fuel.
- D. Provide audible/visual alarm so that if tank is above 90% full, alarm sounds. Provide silence switch and engraved sign reading “DISCONTINUE FILLING IF ALARM SOUNDS.”

PART 3 – EXECUTION

2.04 EPS INSTALLATION

- A. The plant shall be anchored to a concrete base whose overall dimensions shall exceed the outside dimensions of the plant base by 12" in each direction. Base depth shall be 12". Reinforce base with No. 5 bars 12" on center in both directions. Use not less than 6-3/4" galvanized anchor bolts.
- B. Provide a laminated sign at the building service entrance equipment indicating type and location of on-site emergency power sources.
- C. Extend 120 volt and/or 240 volt emergency power circuits for fuel pump and cold weather starting aids from the building wiring system.
- D. Provide LED service maintenance lights and weatherproof switch within the generator enclosure. Connect to the battery charger branch circuit.
- E. Furnish the EPS with a sound attenuated aluminum enclosure. Provide manufacturer's Level II sound attenuation package.

3.02 TRANSFER SWITCH INSTALLATION

- A. Wall mounted transfer switch shall be installed where indicated on the drawings. Locate transfer switch to provide working clearance and full accessibility as required by the National Electrical Code.
- B. Lace and group conductors installed in transfer switch with nylon tie straps. Only one conductor shall be installed under terminals. Form and train conductors in enclosure neatly parallel and at right angles to sides of box. Uninsulated conductor shall not extend beyond one-eighths inch from terminal lug. Conductors shall be installed such that no stresses are transferred to terminal lugs.
- C. Mounting and Support
 - 1. Mounting
 - a. Enclosure shall be secured to structure by a minimum of four (4) fastening devices. Transfer switches 400 amps and larger shall be secured by a minimum of eight (8) devices. A 1.5-inch minimum diameter round washer shall be used between head of screw or bolt and enclosure.
 - b. Enclosures shall be mounted where indicated on the drawings or specified herein. Support from the structure with fastening device specified.
 - c. Attach enclosure directly to masonry, concrete, or wood surfaces.
 - d. Mount enclosure on metal channel (strut), which is connected to structure with fastening device specified, for installations on steel structure, sheet metal equipment enclosure, or sheet rock walls.
 - e. Do not splice conductors in enclosure. Where required, install junction box or wireway adjacent to transfer switch and splice or tap conductors in box. Refer to number of conductors in a conduit limitation defined in the WIRES AND CABLES section of the specifications and do not exceed.

- f. Conductors not terminating in transfer switch shall not extend through or enter transfer switch enclosure.
- g. Install push-in knock-out closure plugs in any unused knock-out openings.
- h. Free standing transfer switch (es) shall be installed on a four inch high concrete pad, with horizontal base dimension exceeding base dimension of switch by three inches.
- i. Cleaning and Adjustment
 - 1) After completion, clean the interior and exterior of dirt, paint and construction debris.
 - 2) Touch up paint all scratched or marred surfaces with factory furnished touch up paint of the same color as the factory applied paint.

3.03 TESTING

- A. Submit verification letter to engineer indicating successful completion of sequence of operations testing and certification that all functions are operational. Letter to request load testing approval and schedule of proposed test. Prior to load test, written approval must be provided by engineer. Representatives of the generator and transfer switch shall be present. The local authority having jurisdiction shall be given advance notification of the time of the final test in order that he may witness the tests.
- B. A failure of any test or any component during a test will require a complete retest program at no additional cost to the Owner.
- C. Provide all fuel, lubricants, and other consumables for testing.
- D. An on-site acceptance test shall be conducted as a final approval test for all Emergency Power Supply Systems.
 - 1. The test shall be conducted after completion of the installation with all EPSS accessory and support equipment in place and operating.
 - 2. Test Results. The EPSS shall perform within the limits specified in the standard NFPA-110, level I.
 - 3. The on-site installation test shall be conducted as required by NFPA 110.

3.04 O&M MANUALS

- A. At least three sets of an instruction manual(s) for all major components of the EPS shall be supplied by the Manufacturer(s) of the EPS and shall contain:
 - 1. A detailed explanation of the operation of the system.
 - 2. Instruction for routine maintenance.
 - 3. Detailed instructions for repair of the EPS and other major components of the EPS.
 - 4. Pictorial parts list and part numbers.
 - 5. Pictorial and schematic electrical drawings of wiring systems, including operation and safety devices, control panels, instrumentation and annunciators.
 - 6. Startup and testing report.

3.05 IDENTIFICATION

- A. Refer to the ELECTRICAL IDENTIFICATION section of these specifications for identification requirements.

END OF SECTION

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, reduced voltage solid state 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 3000VA for installations not requiring emergency power systems and 7500 VA minimum for systems with emergency power systems. All variable speed pump control operations shall be accomplished with an ultrasonic type of 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 SUBMERSIBLE TRANSDUCER FOR PRIMARY LEVEL CONTROL

- A. A submersible transducer manufactured from 316 stainless steel, containing a piezo resistive sensor with output signals proportional to applied pressure shall be supplied. The electronics shall be padded in a silicon compound for protection and have 316 stainless or plastic composite device protecting the sensing face of the transducer. The transducer shall operate from a power supply voltage of 10-30 VDC and supply a 4-20ma signal proportional to water level into the controller. The control signal shall be transmitted via a vented, molded polyurethane jacketed cable. The cable shall be gripped by a neoprene grommet and potted in place. The transducer shall have internal surge suppression.

1.04 BACKUP FLOAT SWITCHES

- A. Two mechanical float switches shall be supplied as a means of backup floats for backup high level functionality. The float configuration shall be a high-level float and a float that drops out the high level circuit. The float that drops out the backup high level circuit will not be used as a permissive float to provide or terminate power to the pumps (a low level float). If this functionality is desired, then a separate third float designated as a low level float shall be used for this purpose.
- B. Each float is to be suspended at the desired height from its own cable. The float switch case shall be made of polypropylene and the cable is sheathed with a special PVC compound. The float switch cables shall be supplied with a minimum 50' of cable. The float switch cable shall have three conductors, and the float shall have one form C contact (normally open and normally closed with one common). Float switches shall be manufactured by Conery and shall be series 2902 or approved equal.

1.05 REMOTE MONITORING AND CONTROL SYSTEM:

The system shall be the Grundfos Remote Management (GRM) system as manufactured and maintained by Grundfos and have the functionality as listed.

- A. The pump station Remote Monitoring and Control system shall be an internet-based platform. It will be able provide the monitoring, control and data management of the pumping system.
 - B. The Remote Monitoring and Control system shall provide remote access to all relevant data and alarms from pumps, pump controllers and auxiliary equipment such as sensors or meters.
 - C. Data from pump installations is cyclically transferred wirelessly via a 3G/4G wireless modem to a centrally hosted database and published to subscribers on a secure web server provided by the supplier.
 - D. Users have access via Internet/web browser to data from pump installations that are registered to their own account.
 - E. The monitoring system is able to send out SMS / Email alarms to defined on-call site personnel.
 - F. The system requires at pump site 3G/4G coverage on a mobile telecommunications network, a 3G/4G data-modem connected to the pump system and wireless antenna.
 - G. The necessary hardware such as PC/ tablet-PC / Laptop or Smartphone with web browser and internet connection shall be provided by others.
 - H. The hardware offering shall be based on the similar protocol communication platform as the pump manufacturer to ensure data communication reliability.
 - I. The system shall be capable of operating and functioning as follows:
 - 1. Complete Overview – See the status of the entire system(s) on a map or any digital image.
 - 2. On- Line with pumps – remote monitoring, analysis and adjustments via PC/ tablet-PC/ Smartphone using only a web browser.
 - 3. Trends and reports – Follow system performance and reveal system problems as they happen.
 - 4. Automatic event log and service log for all pumps in the system.
 - 5. Shared documentation – Upload system documentation to a secure server making it accessible to all relevant personnel.
 - 6. Flexible on-call scheduling – Configurable rotating schedule of personnel who are alerted via SMS/ email alarms in rotating weekly schedules.
 - 7. Manage Pump Maintenance – Ability to plan service work on the basis of actual operating data and receive notification when service is due.
- 1.06 PUMPING STATION DUPLEX CONTROL PANEL – GRUNDFOS
- A. Furnish and install one duplex control panel housed in a NEMA 4X stainless steel enclosure with door-within-door construction for operation on 480 volt, 3 phase, 3 wire 60 hertz feeder.

1. The enclosure shall be a NEMA 4X Stainless steel enclosure. The enclosure shall be a wall mount type with a minimum depth of 10" sized to adequately house all the components. Enclosures 36" wide or less shall have mounting feet in all four corners for ease in wall mounting. Enclosures larger than 36" wide shall be a double-door free standing type and will be provided with 12" leg stands. The enclosure door gaskets shall be rubber composition with a retainer or seamless foamed in place to assure a positive weatherproof seal. The gasket material shall not retain memory. The door shall open a minimum of 180 degrees. All enclosures shall come with lifting eyes for ease of lifting.
 2. A dead front inner door shall be mounted on hinges and shall contain cutouts for mounted equipment and provide protection of personnel from live internal wiring. The dead front door shall be powder coated white inside and out. Cutouts for breaker handles shall be provided to allow operation of breakers without entering the compartment. All control switches, indicator pilot lights, elapsed time meters and other operation devise shall be mounted on the external surface of the dead front. The dead front shall open a minimum of 150 degrees to allow access to equipment for maintenance. A ¾" break shall be formed around the perimeter of the dead front to provide rigidity.
 3. The backplate shall be manufactured of carbon steel and be powder coated white inside and out. All hardware mounted to the subpanel shall be accomplished with machine thread tapped holes. Sheet metal screws are not acceptable. All devices shall be permanently identified using engraved name plates. Use of DYMO type labels is not acceptable.
- B. For each pump motor there shall be included an individual motor circuit breaker, motor controller, manual reset, hand-off-auto selector switch, green running light and elapsed time meter and amp meter for Phase B. Provide door mounted pilot lamps for a high level alarm and phase failure/under voltage alarm. Provide alarm light mounted as shown on drawings. Provide 20 amp single pole breakers in control panel to serve auxiliary loads shown on the drawings. Provide phase failure/under voltage relay to deenergize motors and to provide signal alarm to SCADA. All components shall be NEMA rated.
- C. Units shall be precalibrated to match motors and control characteristics and factory sealed to ensure trip setting in tamperproof. A 24 volt control circuit transformer with disconnect and overload protection shall be included with an automatic electrical alternator for use with the level sensor function.
- D. Note that only the 24 volt control voltage shall be used in the wet well sensor circuits. The remainder of the controls shall be designed to operate on 120 volt, 60 hertz, single phase. The complete unit shall be completely tested and inspected at the factory prior to shipment. Complete electrical diagrams, dimensional drawings, and functional description shall be provided for approval by the Engineer.
- E. The level controller shall be a Grundfos CU362 with a color display screen.
- F. Provide the following sequence of operation and components:

1. Control Requirements: Control operations shall be as follows:
 - a. Start and stop pumps at required water levels in the wet well.
 - b. Alternate the sequence of starting (and stopping) between two pumps to equalize run time and record run time.
 - c. Progressively start the second pump if water level continues to rise above a predetermined level (Engineer to provide field elevation data).
 - d. Provide an alarm light and signal connection for abnormal conditions: High water level and phase failure/under voltage (Engineer to provide elevations), pump overload trip or other pump abnormal shutdown.
 - e. Display of operating conditions.
 - f. Provide controls so all pumps do not operate 1 minute after transfer to emergency or to normal power. Set controls so only one pump can start at one time.
2. Components:
 - a. Grundfos CU362 controller
 - b. Elapsed Time Meters: Per pump required - door mounted.
 - c. Hand-off-Auto Switch per pump - door mounted.
 - d. High level pilot lamp - door mounted.
 - e. Phase failure/under voltage pilot lamp - door mounted.
 - f. AMP Meter-B Phase-Door Mounted.
 - g. Motor controller for each pump provided
 - h. Motor Circuit breaker for each pump provided.
 - i. Protective relays and auxiliary relays. Relays shall be 8 or 11 pin round.
 - j. Terminals blocks for all connections.
 - k. Vaportight and waterproof alarm light with wire guard mounted as shown on drawings.

1.07 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.

END OF SECTION 16912

SECTION 111201
SPECIFICATIONS FOR POLES, MAST ARMS, LUMINAIRE MOUNTING ARMS AND TRAFFIC
SIGNAL SYSTEMS

PART 1 – GENERAL

1.01 SUMMARY

This section specifies specific requirements for traffic poles, mast arms, luminaire mounting arms and traffic signals at the time of transmittal. The city should be consulted to obtain the latest copy of these specifications prior to plan submission.

1.02 STANDARDS

The latest recent or current editions of the following standards apply to the materials and installation of all components:

- A. Referenced Standards
 - 1. Georgia Department of Transportation Standard Specifications; Construction of Transportation Systems and Traffic Signal Design Guidelines
 - 2. Manual on Uniform Traffic Control Devices for Streets and Highways (MUTCD)
 - 3. American Association of State Highway and Transportation Officials (AASHTO), “Standard Specifications for Structural supports for Highway Signs, Luminaires, and Traffic Signals” (1994 AASHTO Criteria).

1.03 GENERAL

- A. Design shall be based on wind velocity and parameters as defined by GDOT or as a minimum a wind velocity of 100 miles per hour with a gust factor of 1.3 as a minimum.
- B. The fabricator shall be certified to the International Organization of Standards (ISO) 9001 as set forth by the ISO quality certification program. Proof of this certification will be required to ensure that the fabricator has the personnel, organization, experience, procedures, knowledge, equipment, capability, and commitment to fabricate quality traffic pole structures.
- C. All welding shall be in accordance with Sections One (1) through Eight (8) of the American Welding Society (AWS) D1.1 Structural Welding Code. Tackers and welders shall be qualified in accordance with the code. Tube longitudinal seam welds shall be free of cracks and excessive undercut, performed with automatic processes, and be visually inspected. Longitudinal welds suspected to contain defects shall be magnetic particle inspected. All circumferential buttwelded tube splices shall be ultrasonically or radiographically inspected.
- D. Calculations and detailed drawings shall be submitted demonstrating compliance with the AASHTO specifications. They shall include stress analysis on the mast arm, luminaire arm, pole, base plate, and anchor bolts. Maximum loads and stresses shall be determined for the most critical wind direction.
- E. Stamped calculations shall be provided for traffic control structures.
- F. Traffic signage, transition tapers, roadway tangents, curves, sight distance must meet MUTCD, GDOT, and AASHTO requirements.

- G. Provide all required details on plans, including details as required to show ADA compliance. Show pedestrian push button locations that meet ADA requirements.
- H. Show property lines with dimensions on drawings.
- I. Show existing curb cuts within 300 feet of the site.
- J. The distance between curb cuts shall be 300' in general. Curb cuts closer may be approved subject to Engineer of Record providing narrative demonstrating that 300' is not practical and will not exacerbate existing traffic problems. Approval shall be provided in writing by the City of Pooler
- K. A traffic study shall be provided with signal timings and coordination plans.

PART 2 – MATERIALS

2.01 POLES

- A. The poles shall conform to the American Society of Testing and Materials (ASTM) A595, A607, or A572, with minimum yield strength of 55 kilo pound per square inch (ksi) and have constant linear taper of 0.14 inch/foot. The shaft shall be one piece, contain no circumferential welded splices, and be on a single ply (no laminated tubes). The pole shall have a reinforced four (4) inch by six and a half (6.5) inch hand hole with cover located one foot, six inches (1 ½ ') from the pole base. Each pole shall be provided with an end cap secured in place with set screws.
- B. Color: Powder Coated Thomarios RAL # 6009 Fir Green
- C. Decorative base or fluting: Not required.
- D. The pole structure finish shall be hot dipped galvanized in accordance with ASTM A123.

2.02 SIGNAL MAST ARM STRAIGHT – ROUND

- A. The straight round signal mast arm shall be fabricated from coil or plate conforming to ASTM A595 Grade A, with minimum yield strength of 55 ksi. The arm shall be round in cross section and have a constant linear taper of 0.14 inch/foot. The tube's seam weld shall be formed by Electric Resistance Weld (ERW) and shall be smooth with no visual appearance. All mast arms up to 50 feet in length shall be manufactured and shipped in one piece with no circumferential welded splices and be of a single ply (no laminated tubes). Each arm shall be provided with a cast end cap secured in place with set screws.

2.03 BASE PLATE

- A. Base plates shall conform to ASTM A36 or ASTM A572. Plates shall be integrally welded to the tubes with a telescopic welded joint.

2.04 CABINET

- A. Provide Cabinet Model 332 that meets the CALTRANS Specification with the addition of surge protection as detailed by GDOT. Cabinets should have an extended base for mounting the battery backup. Do not attach the battery external to the cabinet.

2.05 BATTERY BACKUP / UNINTERRUPTABLE POWER SUPPLY

- A. Battery backup should be used at all intersections unless the requirement is otherwise

specifically waived by the City of Pooler.

- B. With the Battery Backup submittal, provide calculations for determining the size of the inverter and batteries based on the actual power requirements for the intersection installation. Ensure that all auxiliary items are included in the calculations. Ensure the submittal specifies the model number and the firmware revision that is being supplied.

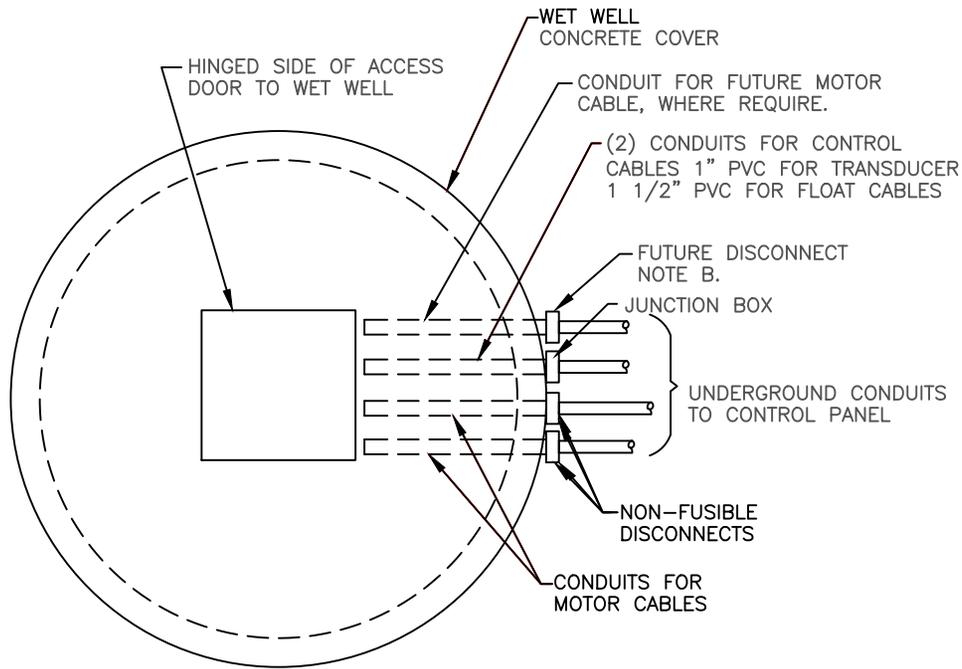
2.05 LUMINAIRE

- A. Arm Span: 12' (min)
- B. Rise: 3'-6" (+/-)
- C. Minimum 2" Sch 40 Pipe (2 3/8" O.D.)
- D. Color: Black

2.06 SIGNALS

- A. 12" LED with black aluminum louvered back plates and two-inch type IX retro-reflective tape along the perimeter.

END OF SECTION



- 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.
- C. IF APPLICABLE, PROVIDE AN ADDITIONAL BOX TO TERMINAL CONDUIT FOR A FUTURE BYPASS PUMP. INSTALLATION TO BE DONE IN ACCORDANCE WITH THE PUMP MANUFACTURE'S SPECIFICATIONS. SEE CITY DETAIL S-25.

REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.

FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER

1 WET WELL LAYOUT
PID NO SCALE

ORIGINAL: HGB-2006



CITY OF POOLER
2024 STANDARD DETAIL
LIFT STATION WET WELL
LAYOUT

REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

1/PID

NON FUSIBLE DISCONNECT
NEMA 4X

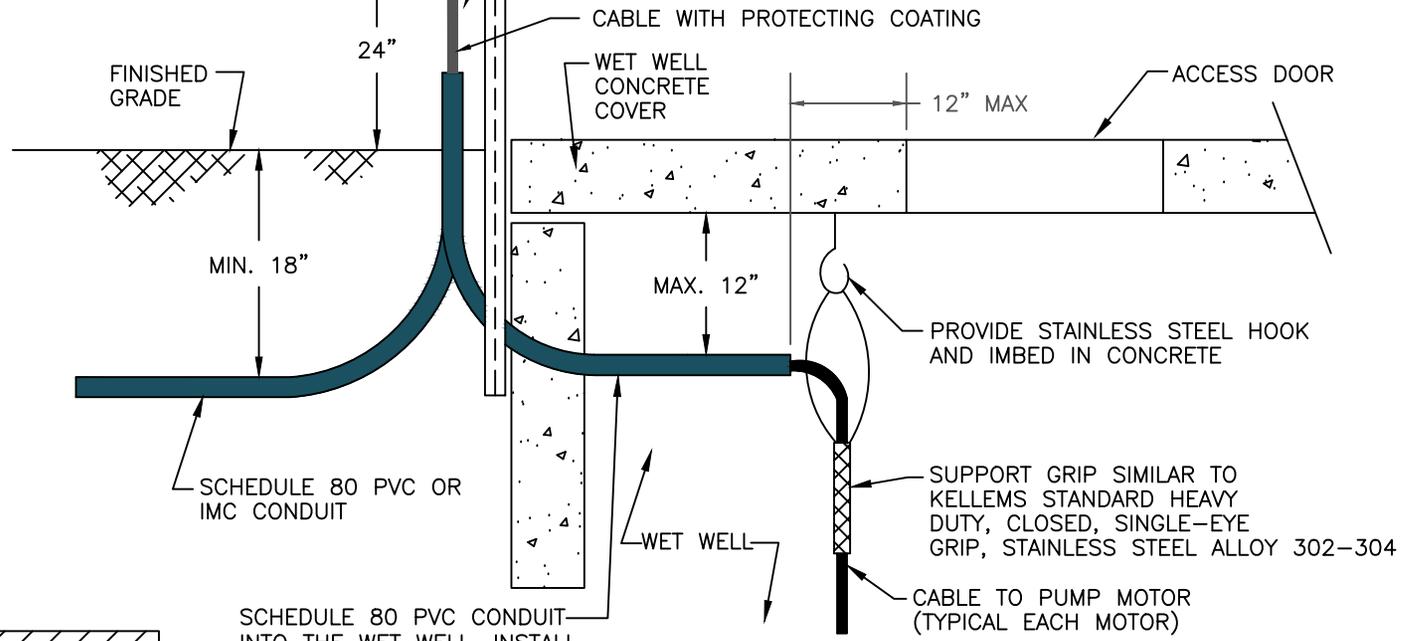
CGB W/ INTEGRAL CABLE
SUPPORT, SINGLE EYE,
STAINLESS STEEL

ALUMINUM OR
STAINLESS STEEL (304)

- AIR GAP AS PER NEC SPECS.
- IF PVC IS USED, INSTALL BELL END AT THE END OF CONDUIT.
 - IF ALUMINUM CONDUIT IS USED, INSTALL A GROUNDING BUSHING AT END OF THE CONDUIT.
 - SEAL ENDS OF CONDUITS WITH DUCT SEAL PUTTY.

NOTE:

ALL CONDUITS THAT ARE COMING FROM THE WETWELL AND ARE CONNECTED TO ANY PANEL MUST HAVE AN AIR GAP (PER NEC CODE).

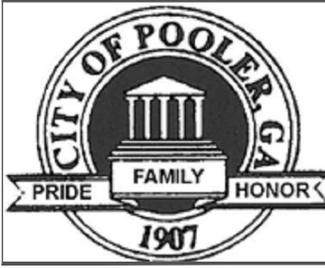


SCHEDULE 80 PVC CONDUIT INTO THE WET WELL. INSTALL SUPPORTS AS REQUIRED.

FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER

2 PUMP CABLE INSTALLATION
PID NO SCALE

ORIGINAL: HGB-2006



CITY OF POOLER
2024 STANDARD DETAIL

LIFT STATION

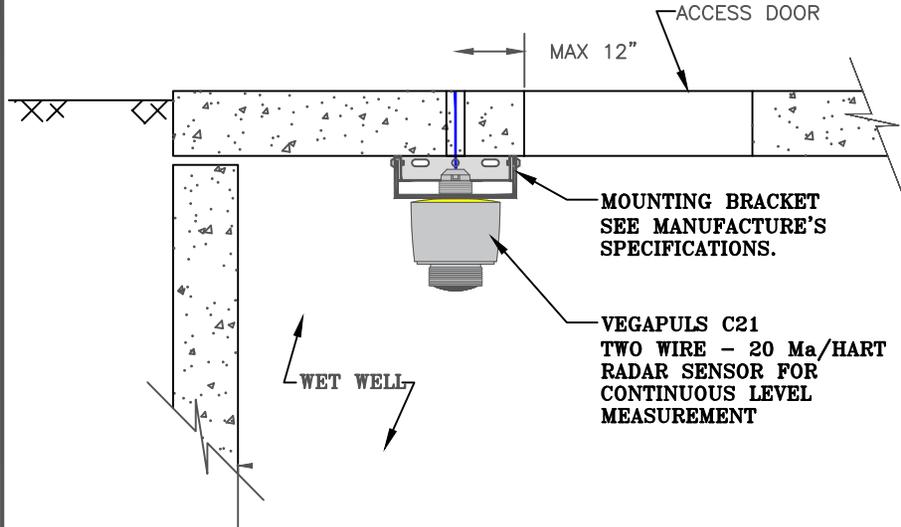
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

2/PID



TECHNICAL DATA:

MEASURING RANGE UP TO: 49.21FT
 DEVIATION: <OR EQUAL TO 2mm
 BEAM ANGLE: 8°
 MEASURING FREQUENCY: W-BAND (80 GHZ TECHNOLOGY)
 OUTPUT SIGNAL: 4 TO 20 mA/HART
 PROCESS FITTING: THREAD G1½, 1½ NPT, R1½
 MOUNTING CONNECTION: THREAD G1 1 NPT, R1
 PROCESS PRESSURE: -1 TO +3 BAR (-100 TO +300 KPA/-14.5 TO +43.51 PSIG)
 PROCESS TEMPERATURE: -40 TO +176 °F
 AMBIENT TEMPERATURE: -40 TO +176 °F
 BLUETOOTH STANDARD: BLUETOOTH 5.0 (DOWNWARD COMPATIBLE TO BLUETOOTH 4.0 LE)
 EFFECTIVE BLUETOOTH : 82 FT TYP.
 OPERATING VOLTAGE: 12 TO 35 V DC
 PROTECTION RATING: IP66/IP68 (3 BAR) ACC. TO IEC 60529, TYPE 6P ACC. TO UL 50

MATERIALS:

THE WETTED PARTS OF THE INSTRUMENT ARE MADE OF PVDF. THE PROCESS SEAL CONSISTS OF FKM. THE CONNECTION CABLE IS PUR INSULATED. SEE MANUFACTURE'S SPECS FOR A COMPLETE OVERVIEW OF ALL THE AVAILABLE MATERIALS AND SEALS.

HOUSING VERSIONS:

THE HOUSING IS OPTIMIZED FOR APPLICATIONS IN THE WATER/WASTE WATER INDUSTRY AND MANUFACTURED OF PVDF. DUE TO THE ENCAPSULATED CABLE GLAND, PROTECTION RATING IP66/IP68 (3 BAR) IS ACHIEVED.

ELECTRONICS VERSIONS:

THE INSTRUMENTS ARE AVAILABLE IN DIFFERENT ELECTRONICS VERSIONS. APART FROM THE TWO-WIRE ELECTRONICS WITH 4 TO 20 mA/HART, TWO DIGITAL VERSIONS WITH SDI-12 AND MODBUS/LEVELMASTER PROTOCOL ARE POSSIBLE.

FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER



CITY OF POOLER
2024 STANDARD DETAIL
LIFT STATION VEGAPULS C21
RADAR SENSOR FOR CONTINUOUS
LEVEL MEASUREMENT

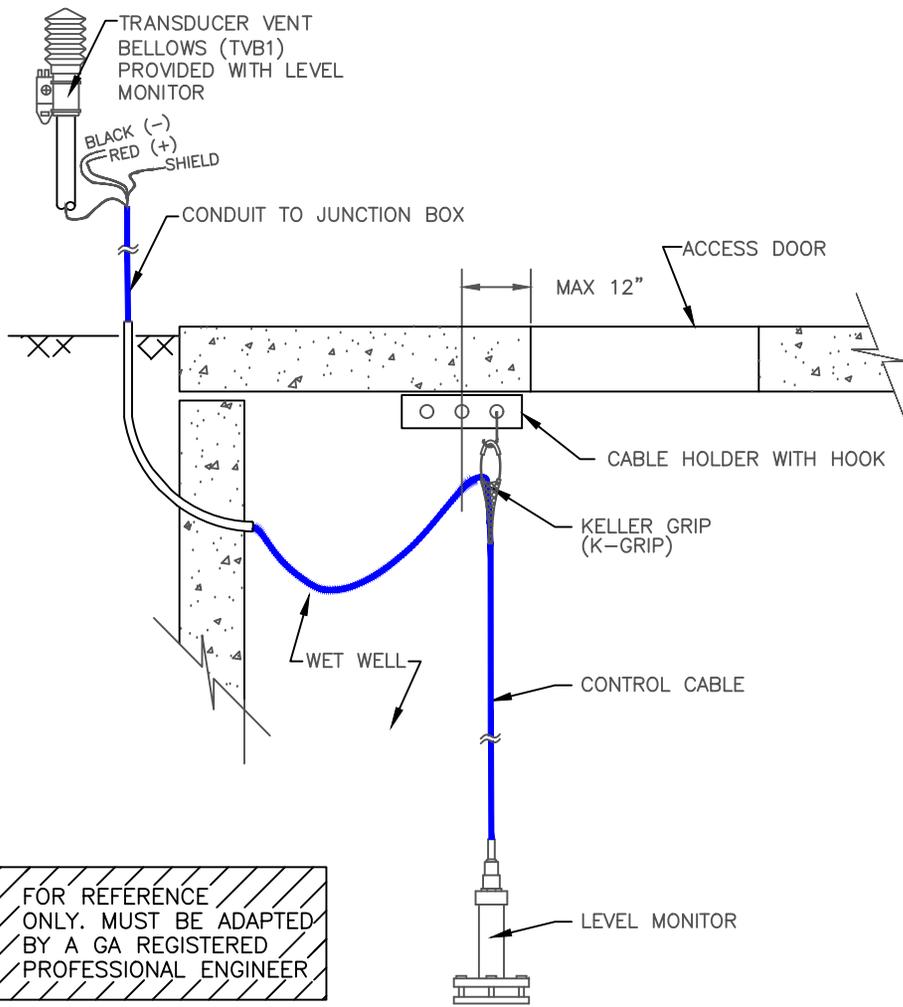
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: JULY, 2024

3A/PID

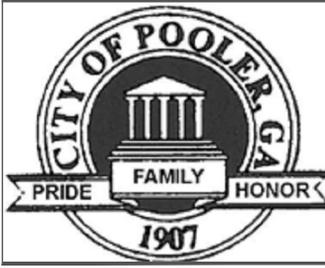


SPECIFICATIONS :

- ENCLOSURE MATERIAL: 316 STAINLESS STEEL
- ENCLOSURE DIAMETER: 3.75"
- CABLE JACKET MATERIAL: POLYURETHANE
- CABLE DIAMETER: 0.270 INCH
- WIRE SIZE: 20 AWG
- VENT TUBE DIAMETER: 0.060 INCH
- OPERATING VOLTAGE: 13 - 29 VDC
- OUTPUT SIGNAL: 4 - 20 MA, TWO WIRE
- OPERATING TEMP: +32 TO +140 °F
- ACCURACY: ± 0.5 % FULL SCALE
- WEIGHT (WITH 40 FEET CABLE): 6.0 LBS
- ADDITIONAL CABLE WEIGHT: 0.34 LBS PER 10 FEET

ORDERING INFORMATION:

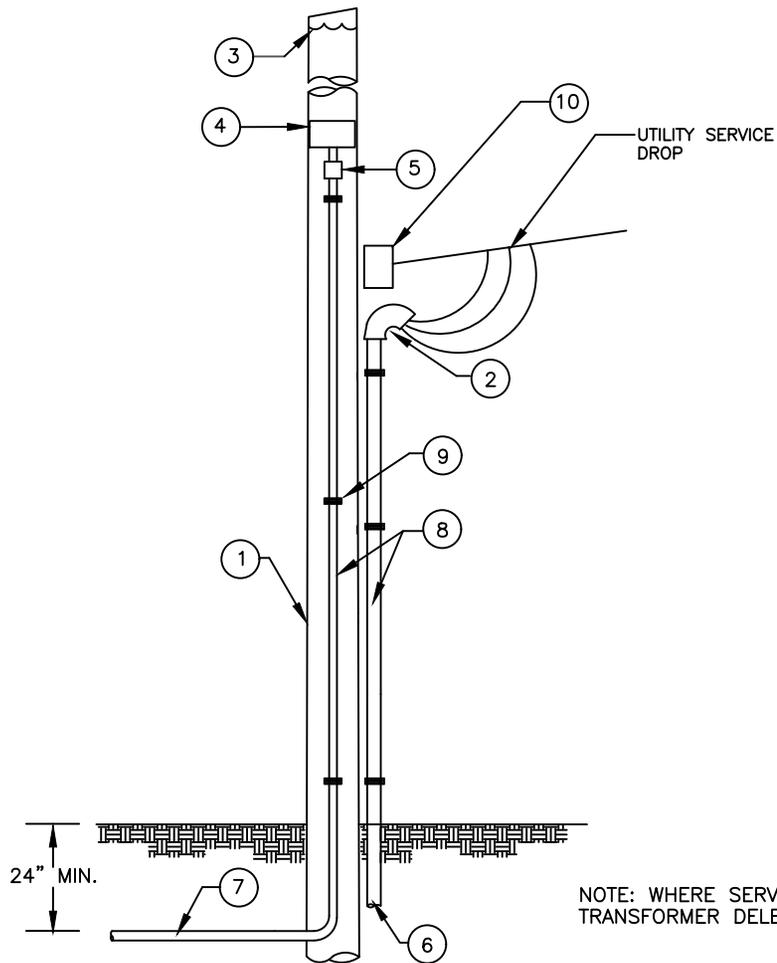
- PART NUMBER: LM - A - B
- PRESSURE RANGE (PSI): 5, 10, OR 15
- CABLE LENGTH (FEET): 40 FEET IS STANDARD FOR 5 & 10 PSI RANGE
60 FEET IS STANDARD FOR 15 PSI RANGE
- PROVIDED WITH LEVEL MONITOR:
TRANSDUCER VENT BELLOW (TVB1)
KELLEMS GRIP (K-GRIP)



CITY OF POOLER
2024 STANDARD DETAIL
LIFT STATION LEVEL MONITOR
SUBMERSIBLE PRESSURE TRANSDUCER

DONE BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: JULY, 2024

3B/PID



POLE REQUIREMENTS

- ① 35-FOOT, CLASS 5 POLE, PENTA TREATED
- ② WEATHERHEAD
- ③ ALUMINUM POLE CAP
- ④ PROVIDE A 5,000K LED MIN. (300W EQUIVALENT) LIGHT FIXTURE, MOUNT THE FIXTURE ON A POLE, APPROXIMATELY 20' ABOVE FINISHED GRADE. AIM LIGHT AT WET WELL.
- ⑤ FS BOX
- ⑥ CONDUIT TO METER INSTALLATION
- ⑦ CONDUIT, TO LIGHT CIRCUIT, IN CONTROL PANEL
- ⑧ RIGID GALVANIZED STEEL CONDUIT
- ⑨ TWO-HOLE PIPE STRAP AT 60" CENTERS, MAXIMUM
- ⑩ CLEVIS & SPOOL INSULATOR

NOTE: WHERE SERVICE IS FROM A PAD MOUNTED TRANSFORMER DELETE THE UNNEEDED ITEMS.

FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER

④ LIGHTING/AERIAL SERVICE POLE DETAIL
PID NOT TO SCALE

REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.

ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL**

LIFT STATION

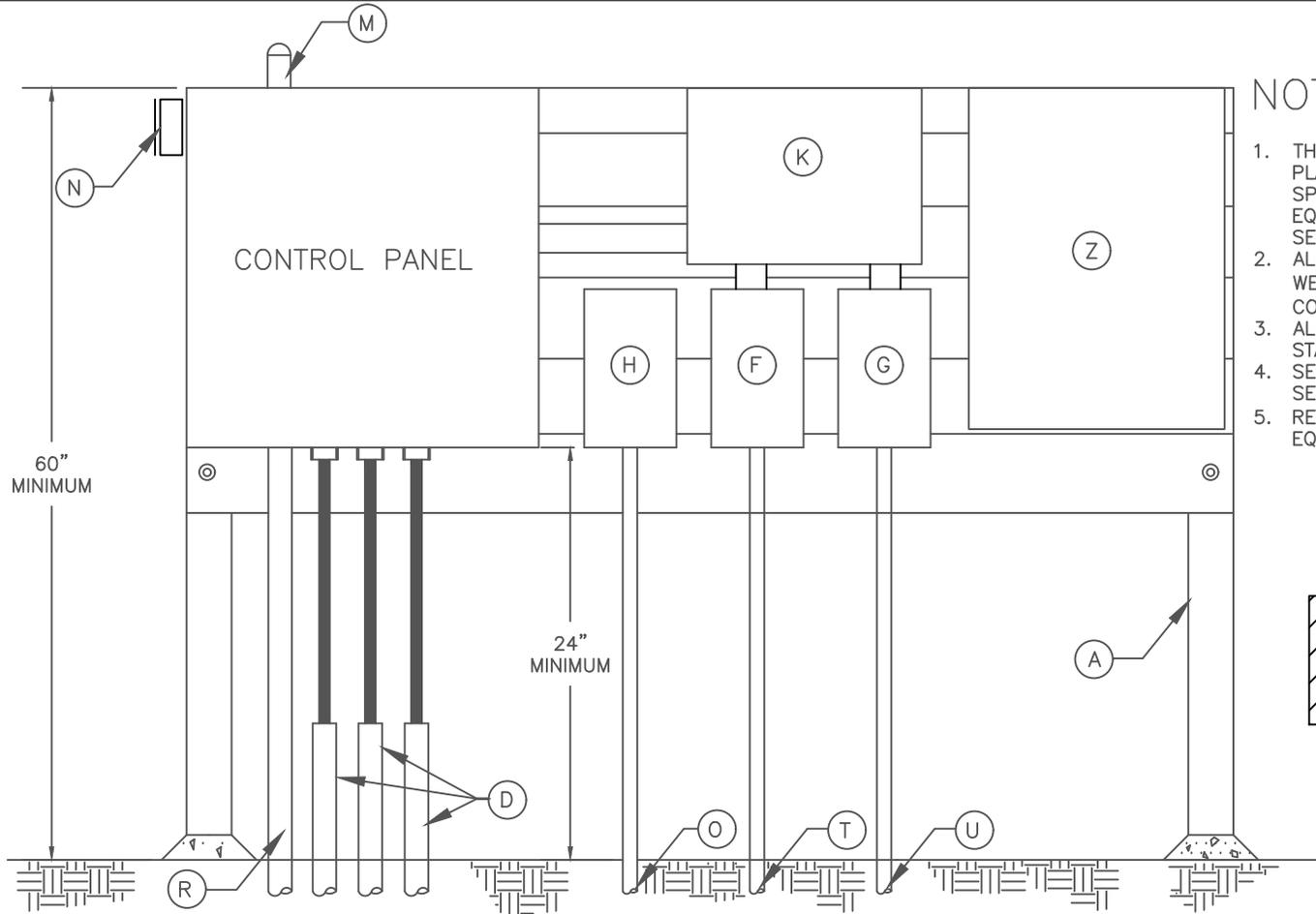
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

4/PID



NOTES:

1. THIS DETAIL IS TYPICAL. SEE ELECTRICAL PLANS, ONE LINE DIAGRAMS AND SPECIFICATIONS FOR THE ACTUAL EQUIPMENT REQUIRED. ADJUST EACH SERVICE EQUIPMENT LAYOUT TO FIT.
2. ALL CONDUITS COMING FROM THE WETWELL SHALL HAVE AN AIRGAP (PER CODE) BEFORE ENTERING ANY PANEL.
3. ALL CONTROL PANELS MADE OF STAINLESS STEEL OR ALUMINUM.
4. SEAL ALL END OF CONDUITS WITH DUCT SEAL PUTTY.
5. REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.

FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER

5A SERVICE EQUIPMENT ELEVATION
 PID NOT TO SCALE

ORIGINAL: HGB-2006



**CITY OF POOLER
 2024 STANDARD DETAIL**

LIFT STATION

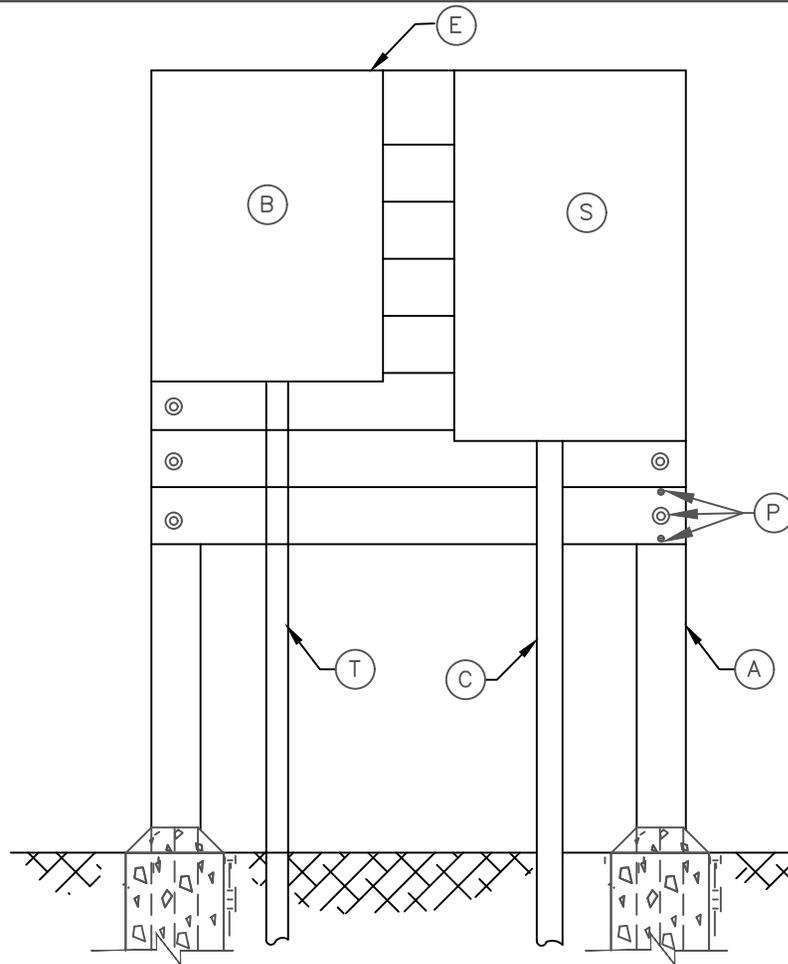
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

5A/PID



NOTES:

1. THE METER MAY BE INSTALLED ON ITS OWN BACKBOARD OR ON THE SERVICE EQUIPMENT UNISTRUCT FRAME (IF ALLOWED BY THE POWER COMPANY).
2. INSTALL POWER COMPANY OR APPROVED METER CAN PER POWER COMPANY'S SPECIFICATIONS.
3. SERVICE DISCONNECT SHALL BE A NONE FUSED SERVICE RATED TYPE 4X.
4. REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.

FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER

5C METER INSTALLATION
PID NOT TO SCALE

ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL**

LIFT STATION

REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

5C/PID

SERVICE EQUIPMENT SCHEDULE:

- (A) ALUMINUM OR STAINLESS STEEL SCH. 40 CONDUIT 48" INTO EARTH. CUT TO LENGTH AS REQUIRED IN THE FIELD. ENCASE IN CONCRETE TO A DEPTH OF 36".
- (B) POWER COMPANY METER. MOUNTED PER POWER COMPANY SPECIFICATIONS.
- (C) SERVICE CONDUIT FROM THE PAD MOUNTED TRANSFORMER OR SERVICE POLE PER POWER COMPANY SPECIFICATIONS.
- (D) CONDUIT TO DISCONNECT AT WET WELL.
- (E) SEE DETAIL S-27 FOR INFORMATION ON THE ALUMINUM OR STAINLESS STEEL UNISTRUT.
- (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) 304 (MIN.) STAINLESS STEEL HARDWARE.
- (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

FOR REFERENCE
ONLY. MUST BE ADAPTED
BY A GA REGISTERED
PROFESSIONAL ENGINEER

ORIGINAL: HGB-2006



CITY OF POOLER 2024 STANDARD DETAIL

LIFT STATION

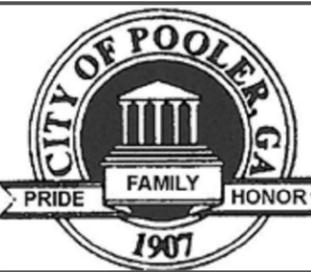
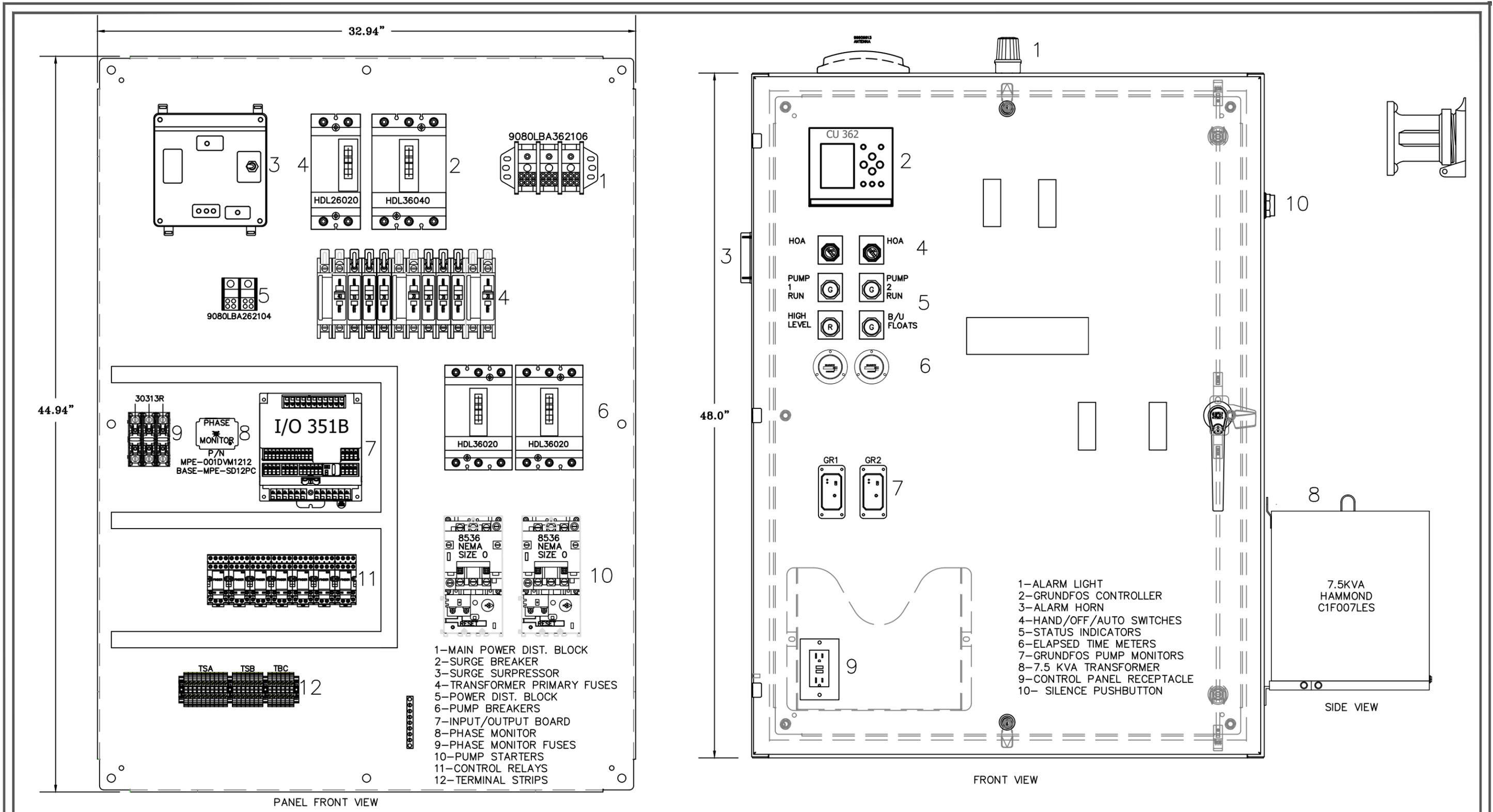
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DATE: APRIL, 2024

5D/PID



CITY OF POOLER
2024 STANDARD DETAIL

LIFT STATION - CONTROL PANEL

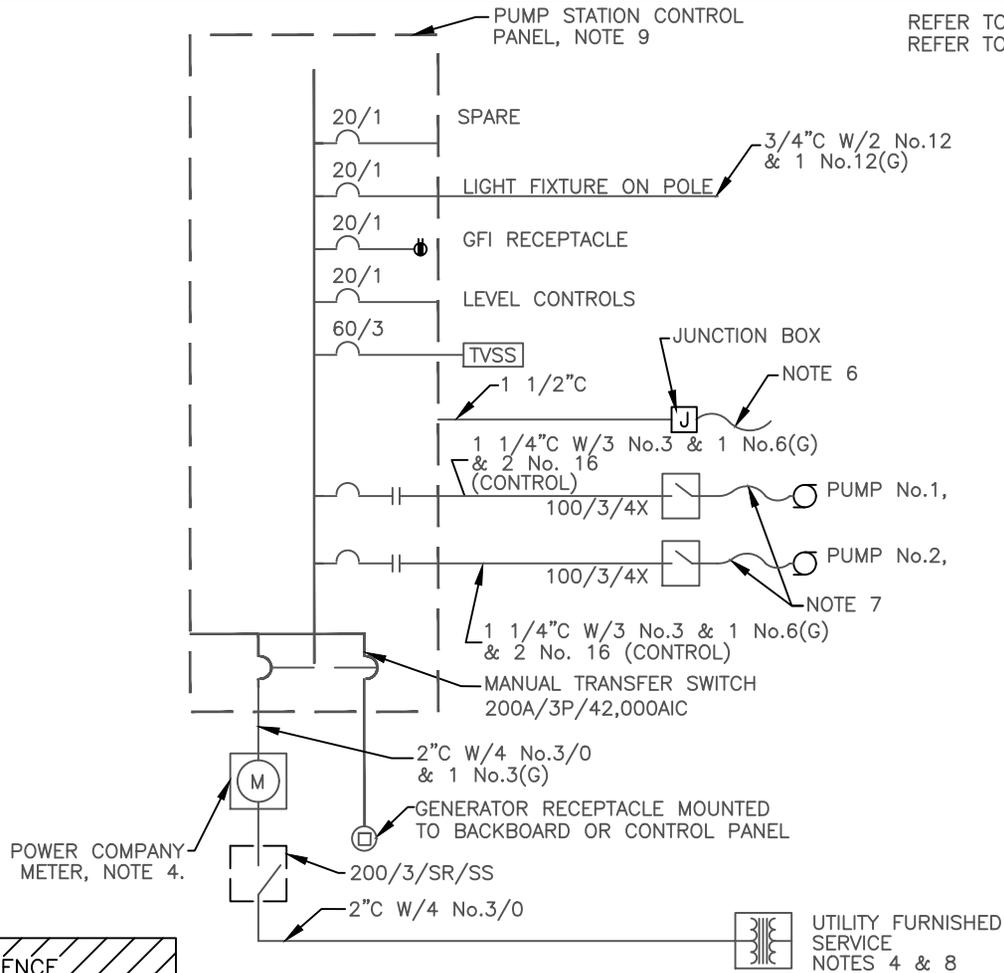
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SCALE: N.T.S.

DATE: APRIL, 2024

10-PID



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

1 LIFT STATION ONE LINE DIAGRAM
PED NOT TO SCALE
(TYPICAL WITH GENERATOR RECEPTACLE)

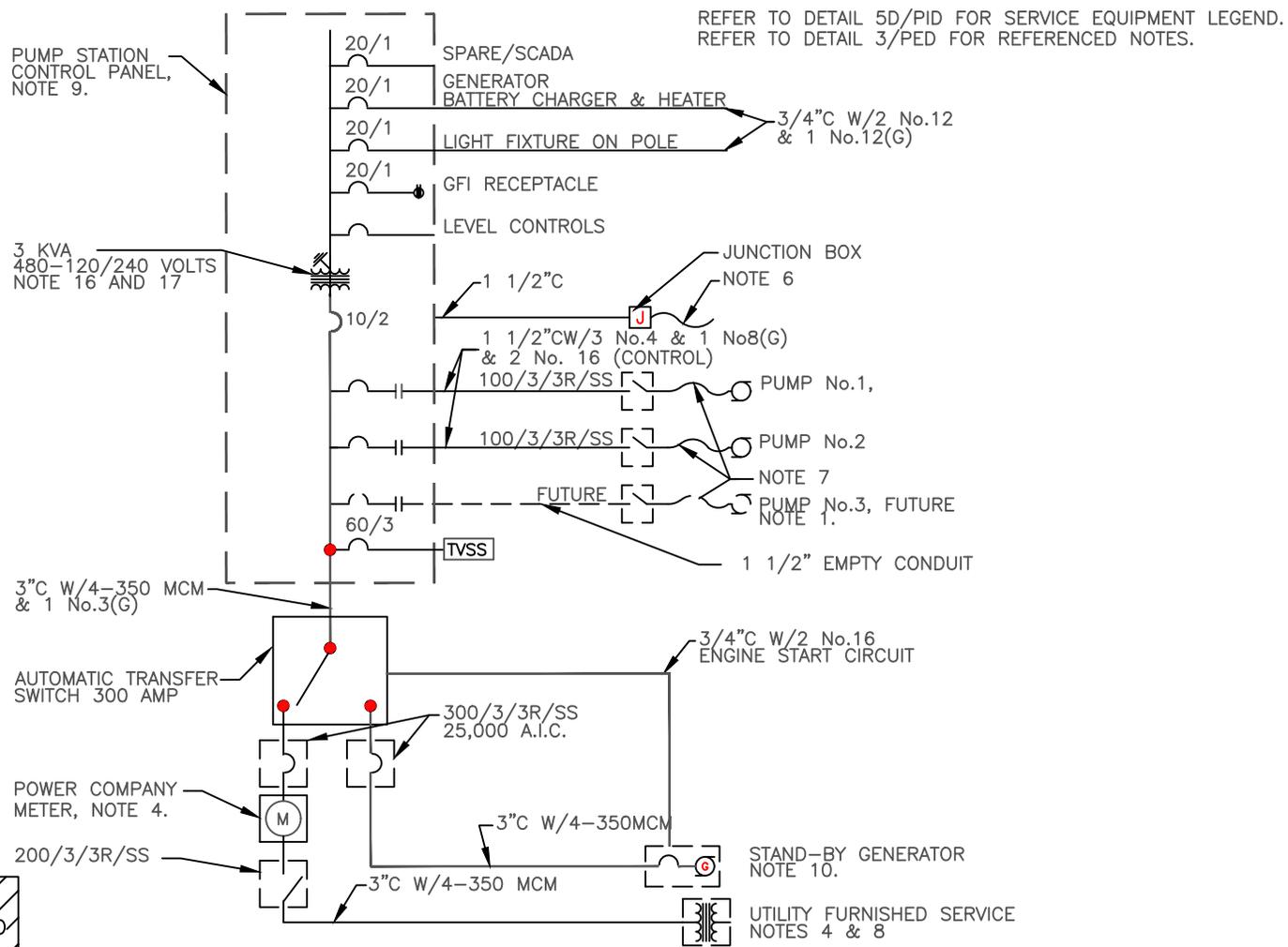
ORIGINAL: HGB-2012



CITY OF POOLER
2024 STANDARD DETAIL
LIFT STATION ONE LINE
DIAGRAM

CHECKED BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024

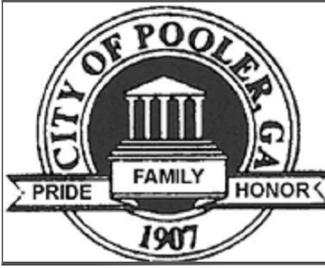
1/PED



FOR REFERENCE ONLY. MUST BE ADAPTED BY A GA REGISTERED PROFESSIONAL ENGINEER

3 LIFT STATION ONE LINE DIAGRAM
E01 NOT TO SCALE (TYPICAL WITH GENERATOR)

ORIGINAL: HGB-2006



CITY OF POOLER
2024 STANDARD DETAIL
LIFT STATION ONE LINE
DIAGRAM

REVISED BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024

2/PED

NOTES:

1. THE SERVICE AND SERVICE EQUIPMENT HAS BEEN SIZED FOR THE FUTURE PUMP SHOWN.
2. ALL CONDUITS, EXCEPT GROUNDING CONDUCTOR CONDUIT, SHALL BE SCHEDULE 80 PVC OR IMC WITH CORROSION PROTECTION WHEN BURIED IN EARTH. CORROSION PROTECTION SHALL EXTEND TO 6" ABOVE FINISHED GRADE.
3. CONDUITS FROM WETWELL TO JUNCTION BOXES AND/OR PANELS SHALL HAVE AN AIRGAP AS PER NEC.
4. THE EXACT LOCATION OF THE METER, THE MOUNTED TRANSFORMER'S PAD, 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 ALUMINUM UNISTRUT FRAME TO FIT ALL THE EQUIPMENT TO BE INSTALLED.
6. PROVIDE CONDUITS TO THE WETWELL FOR THE INSTALLATION OF CABLES FOR LIQUID LEVEL SENSORS AS SHOWN IN THE DETAIL 1/PID AND DETAIL S-25. BACKUP FLOATS SHALL BE 24V AC OR LESS.
7. PROVIDE ONE 3" CONDUIT TO THE WETWELL FOR EACH POWER CABLE WHICH IS FURNISHED INTEGRAL WITH EACH SUBMERSIBLE PUMP. INSTALL CABLES AND MAKE CONNECTIONS. PROVIDE ALL THE NECESSARY CONDUITS FOR THE FUTURE PUMP IN SECURE ACCESSIBLE LOCATION, WITH REMOVABLE CAPS.
8. IT IS ANTICIPATED THAT THE POWER COMPANY WILL CHARGE THE OWNER TO PROVIDE SERVICE FOR THIS FACILITY. 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 OF THE OWNER , AND THE COST OF THIS SERVICE WILL BE INCLUDED IN THE BASE BID OF THE PROJECT AS AN ALLOWANCE WHICH MUST BE SET IN THE GENERAL CONTRACT. ALL COST INCLUDING THE GENERAL CONTRACTOR, SUB-CONTRACTOR O.H., AND ANY PROFIT ASSOCIATED WITH SECURING THE SERVICE FROM THE POWER COMPANY SHALL BE INCLUDED IN THIS ALLOWANCE. ANY LEFT OVER FROM THE ALLOWANCE MUST BE RETURN TO THE OWNER BY CHANGE ORDER. ANY OVERAGE WILL BE CHARGED TO THE OWNER OWNER BY CHANGE ORDER.
9. THE CABINET FRONT PANEL, BACK PANEL, AND ANY OTHER NECESSARY COMPONENTS MUST BE SIZED FOR THE PROPOSED PUMPS SHOWN IN THE CONSTRUCTION PLANS. THE FRONT PANEL SHALL HAVE CUT-OUTS SCREW HELD COVERS TO ACCOMMODATE ALL THE FUTURE DEVICES.
10. PROVIDE A CONCRETE PAD FOR THE GENERATOR AND, IF APPLICABLE, ONE FOR THE BYPASS PUMP. THEY MUST BE AT LEAST 12" THICK WITH THEIR TOP 6" ABOVE THE FINISHED GRADE. THE DIMENSIONS SHALL EXCEED THOSE OF THE GENERATOR AND/OR BYPASS PUMP BY 12" ON ALL SIDES. PROVIDE REINFORCING MESH AT TOP AND BOTTOM PLACED 2" FROM THE SURFACES. IT IS THE RESPONSIBILITY OF THE DESIGN ENGINEER TO VERIFY IF THESE REQUIREMENTS CAN HANDLE THE EQUIPMENT LOADS.
11. INSTALL TRANSDUCER ACCORDING TO THE MANUFACTURES INSTRUCTIONS.
12. ALL CONDUITS IN THE WETWELL SHALL BE INSTALLED AND SUPPORTED SO THAT ENDS ARE ACCESSIBLE FROM THE WETWELL ENTRANCE.
13. THE CONDUITS ENTERING DISCONNECTS AND JUNCTION BOXES FROM THE WET WELL SHALL HAVE AN AIRGAP, AS PER NEC. SEAL AT THE ENTRY INTO THE EQUIPMENT ONLY. USE DUCT SEAL PUTTY TO SEAL THOSE ENTRIES.
14. DO NOT SPLICE CABLES FROM FLOAT SWITCHES OR LEVER TRANSDUCER. TERMINATE ON TERMINAL BLOCKS WHICH SHALL BE MOUNTED IN THE CONTROL JUNCTION BOX AND IN THE MOTOR DISCONNECTS MOUNTED TO THE WETWELL.
15. ALL MOUNTING HARDWARE SHALL BE STAINLESS STEEL (304) OR ALUMINUM.
16. ALL ELECTRICAL WIRING SHALL MEET THE LATEST NEC SPECS ADOPTED BY THE STATE.
17. CALL THE CITY OR ITS REPRESENTATIVE IF ANY QUESTIONS ON THE DETAILS AND THE SPECS ARISES. IF ANY DISAGREEMENT ON THE INTERPRETATION OF THE DETAILS AND THE SPECS ARISES, THE CITY'S INTERPRETATION TAKES PRECEDENCE.

REFER TO DETAIL 5D/PID FOR SERVICE EQUIPMENT LEGEND.

ORIGINAL: HGB-2012



**CITY OF POOLER
2024 STANDARD DETAIL**

LIFT STATION

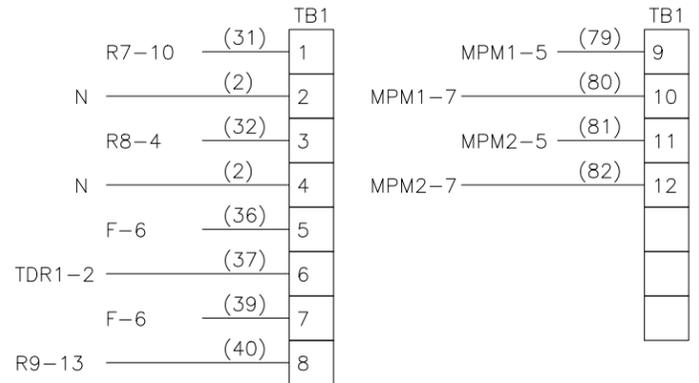
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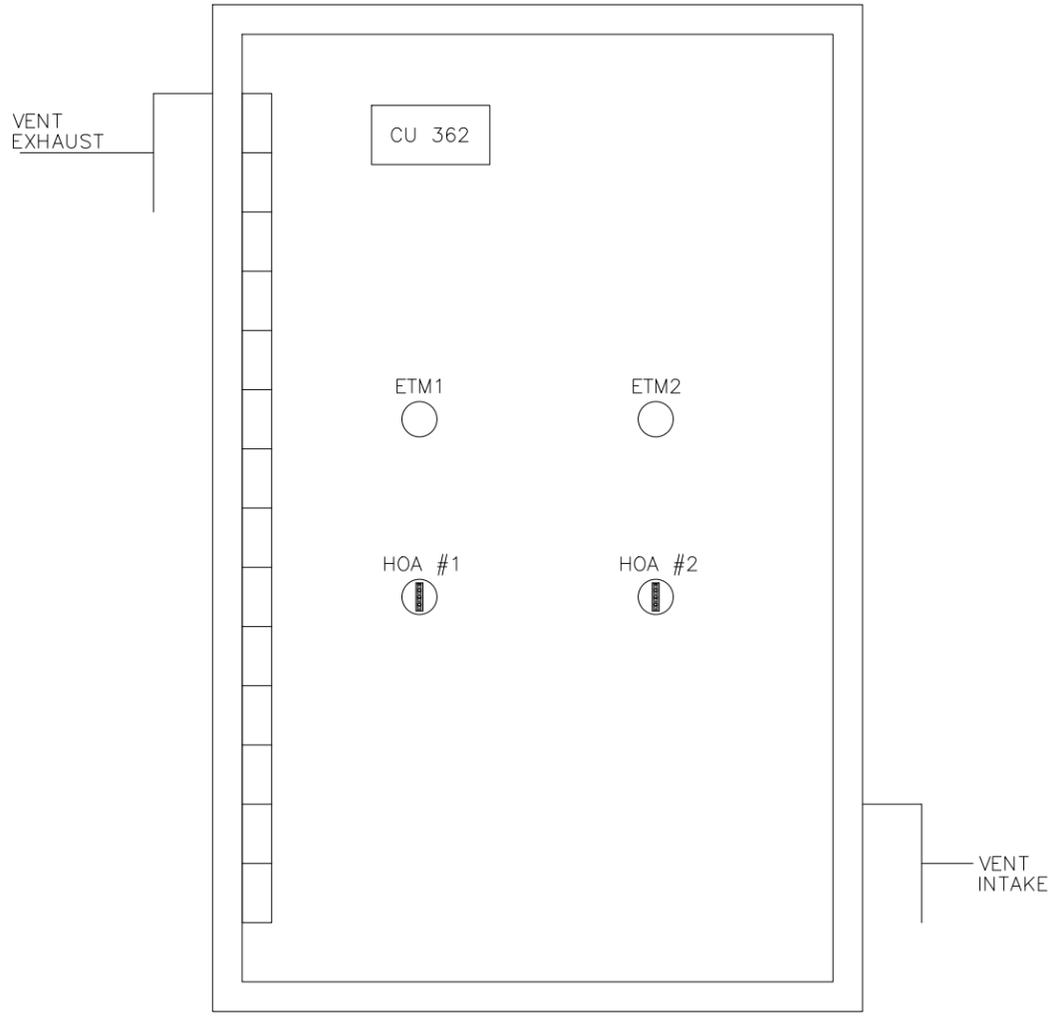
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DATE: APRIL, 2024

3/PED

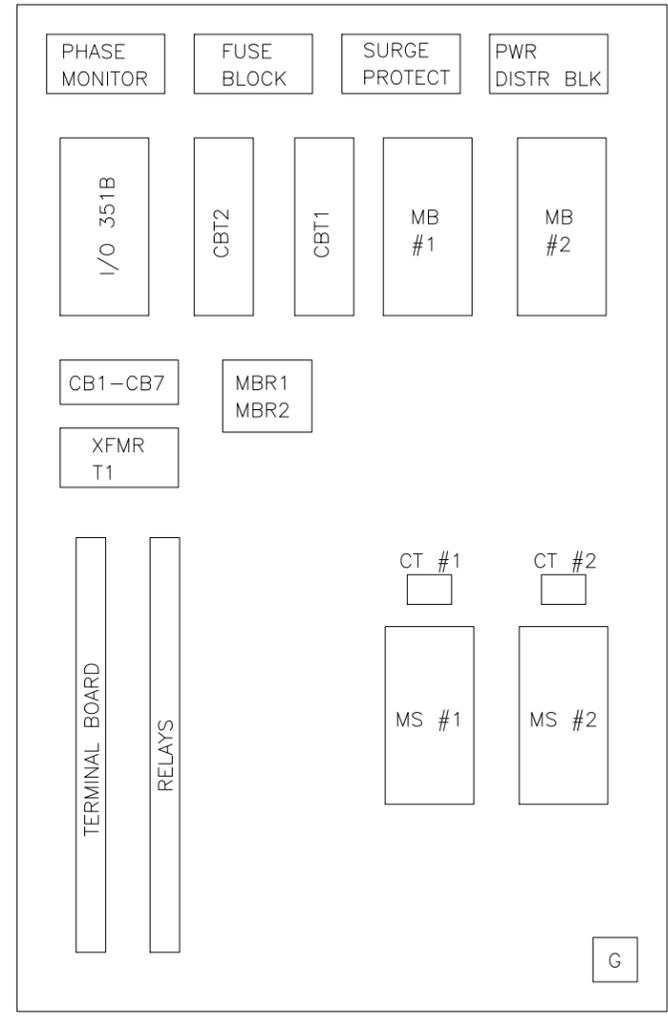


NOT DRAWN TO SCALE



OUTER DOOR NOT SHOWN

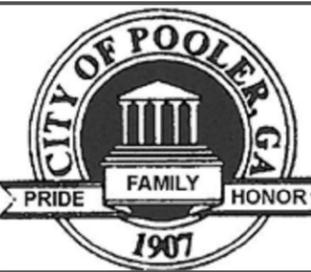
BACK PLANE GENERAL LAYOUT



NOT TO SCALE

LEGEND

- R() - RELAY
- RELAY CIRCUIT
- CIRCUIT BREAKER
- HAND-OFF-AUTO SELECTOR
- FUSE
- EARTH GROUND
- TRANSFORMER
- MPM - MOTOR PROTECTION MODULE
- AR - ALTERNATING RELAY COIL
- TDR - TIME DELAY RELAY COIL
- FAN - VENTILATOR FAN ASSEMBLY
- ETM - ELAPSED TIME (HOUR) METER
- CURRENT TRANSFORMER
- PHASE MONITOR - PHASE MONITOR RELAY COIL

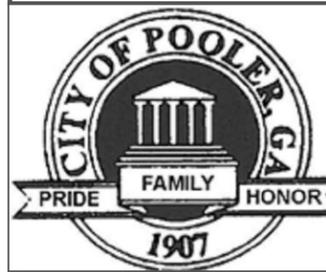
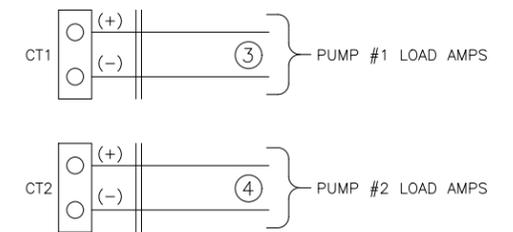
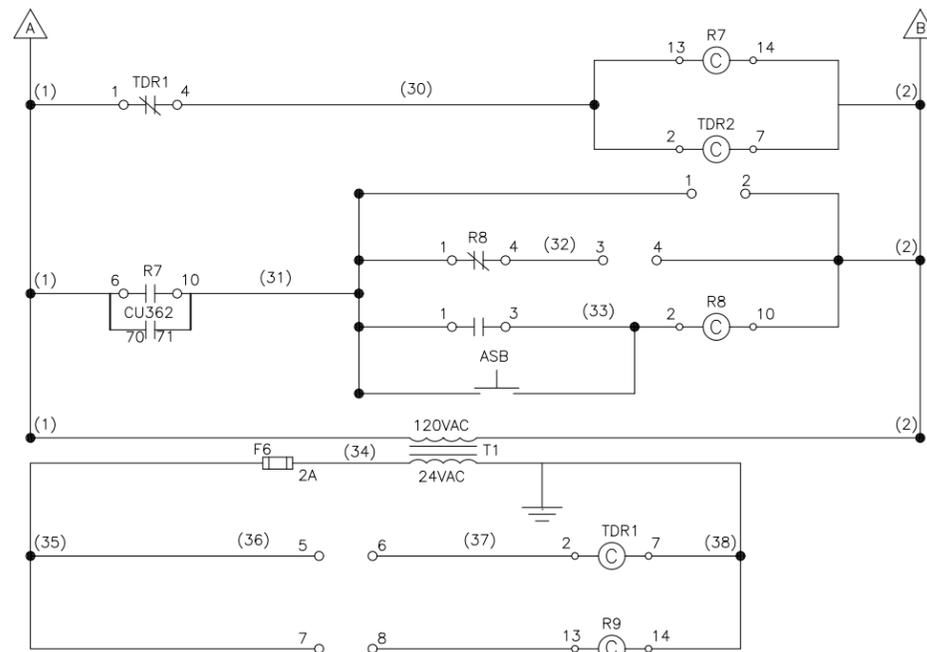
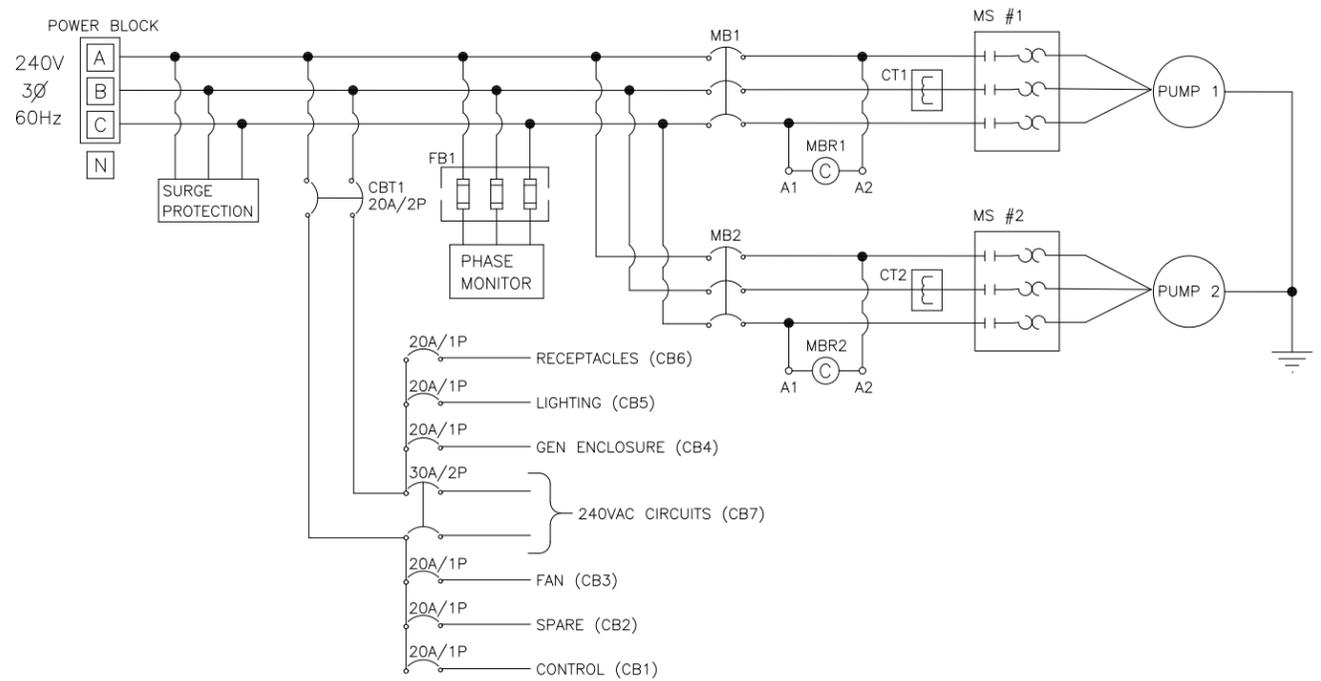
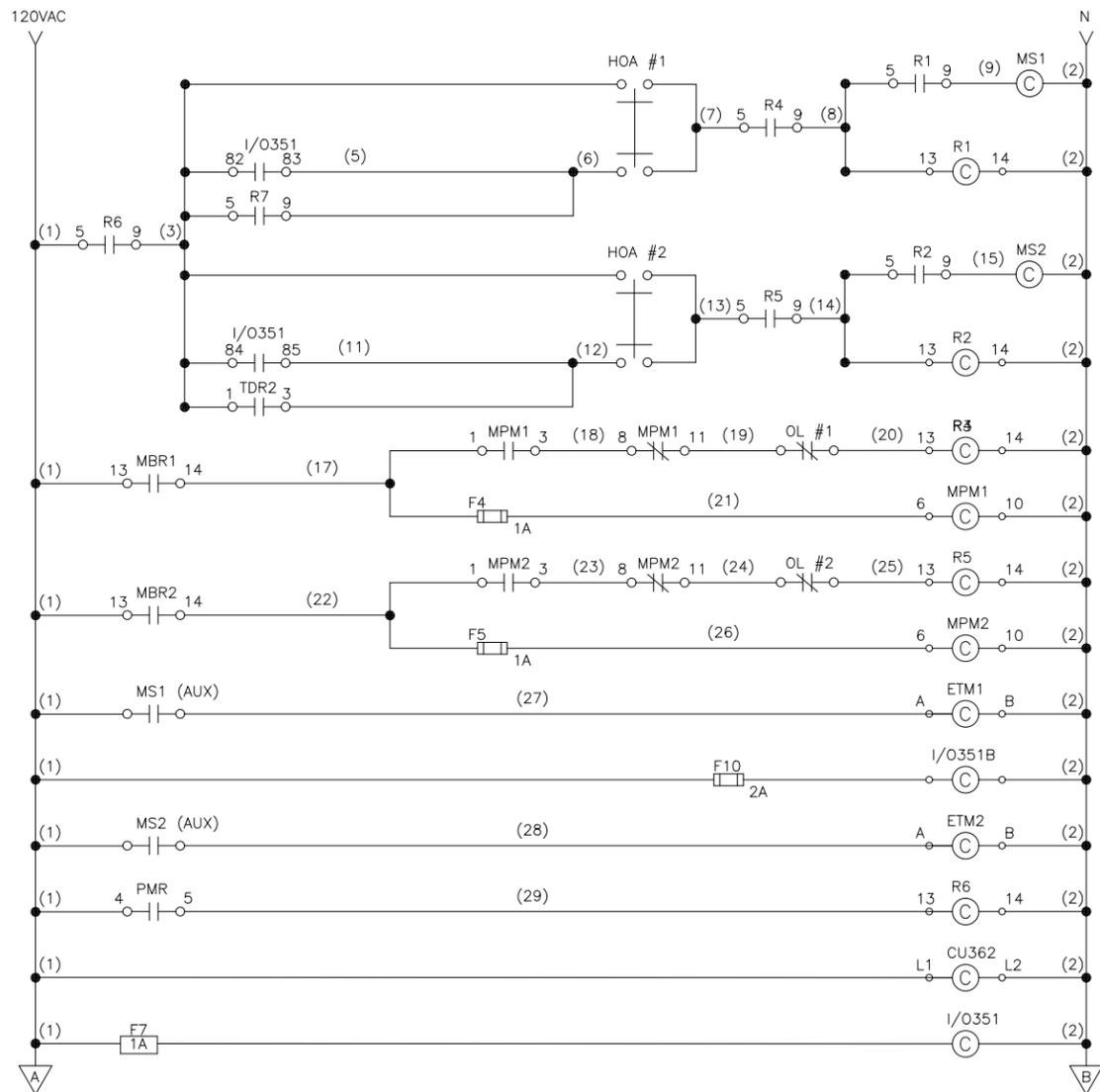


CITY OF POOLER
2024 STANDARD DETAIL

LIFT STATION - CONTROL PANEL 480V DUPLEX
USING NEMA MOTOR STARTERS GRUNFOS CU362 LEVEL CONTROL

DONE BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024

4B-PED



**CITY OF POOLER
2024 STANDARD DETAIL**

**LIFT STATION - CONTROL PANEL 240V DUPLEX
USING NEMA MOTOR STARTERS GRUNFOS CU362 LEVEL CONTROL**

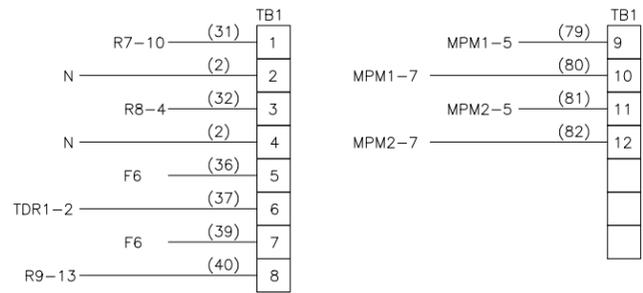
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SCALE: N.T.S.

DATE: APRIL, 2024

5A-PED

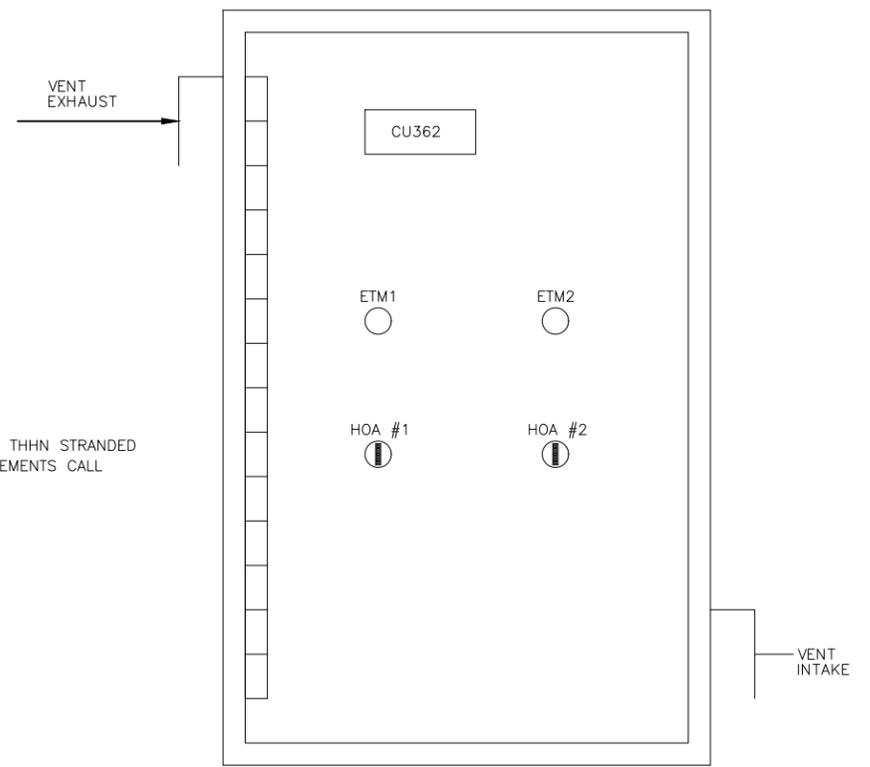


LEGEND

- R() - RELAY
- |○ - RELAY CIRCUIT
- |○ - CIRCUIT BREAKER
- - HAND-OFF-AUTO SELECTOR
- |— | FUSE
- ⊥ - EARTH GROUND
- ≡ - TRANSFORMER
- MPM - MOTOR PROTECTION MODULE
- AR - ALTERNATING RELAY COIL
- TDR - TIME DELAY RELAY COIL
- FAN - VENTILATOR FAN ASSEMBLY
- ETM - ELAPSED TIME (HOUR) METER
- ○ - CURRENT TRANSFORMER
- PHASE MONITOR - PHASE MONITOR RELAY COIL

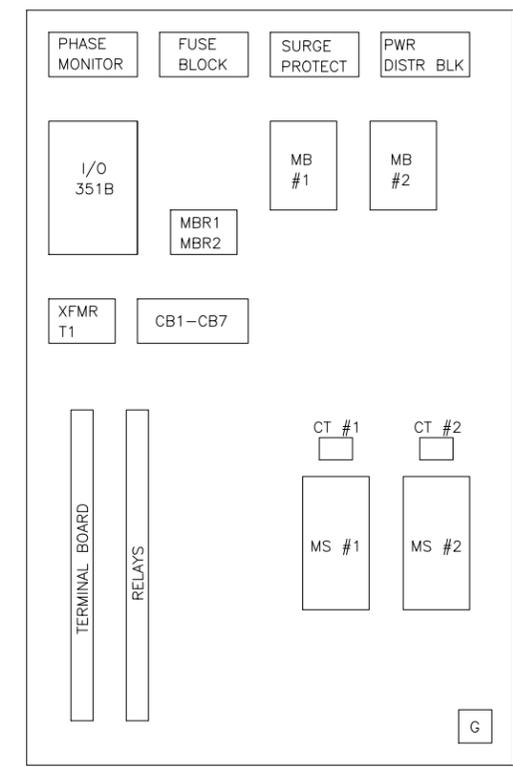
NOTE:
1. ALL WIRING SHALL BE AWG-16 THHN STRANDED EXCEPT WHERE POWER REQUIREMENTS CALL FOR LARGER GAUGE WIRE.

NOT DRAWN TO SCALE

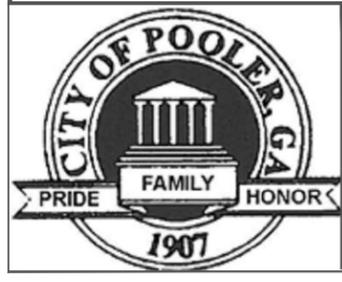


OUTER DOOR NOT SHOWN

BACK PLANE GENERAL LAYOUT



NOT TO SCALE

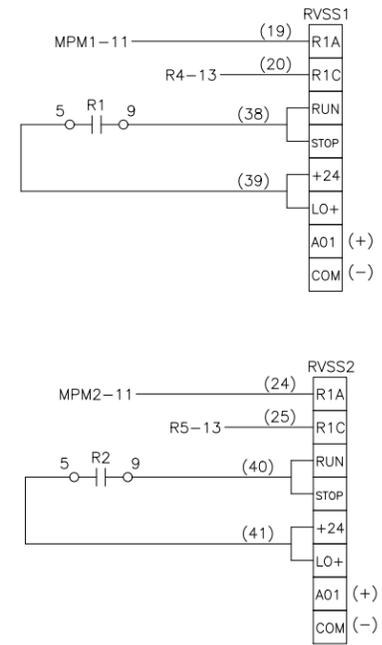
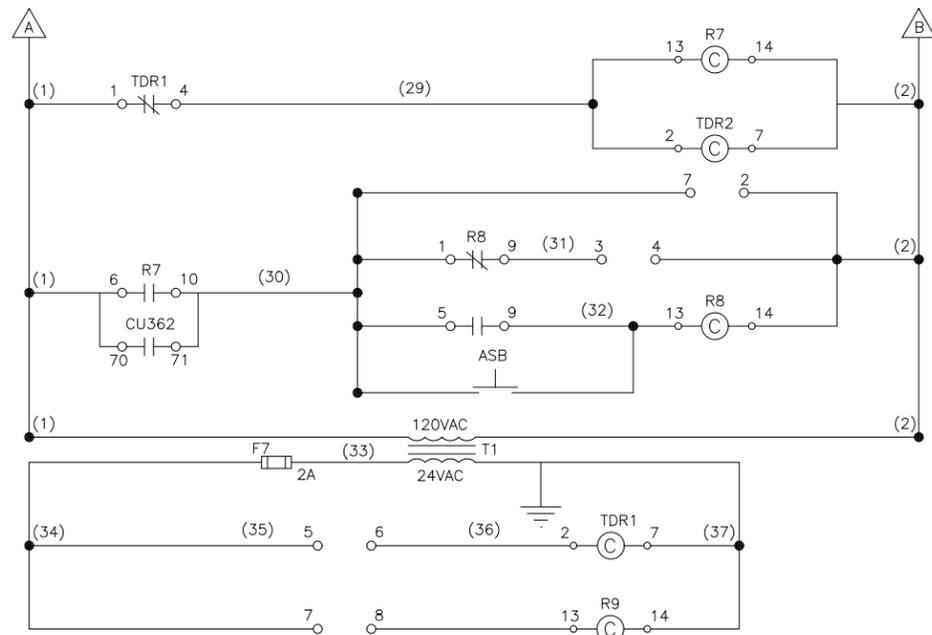
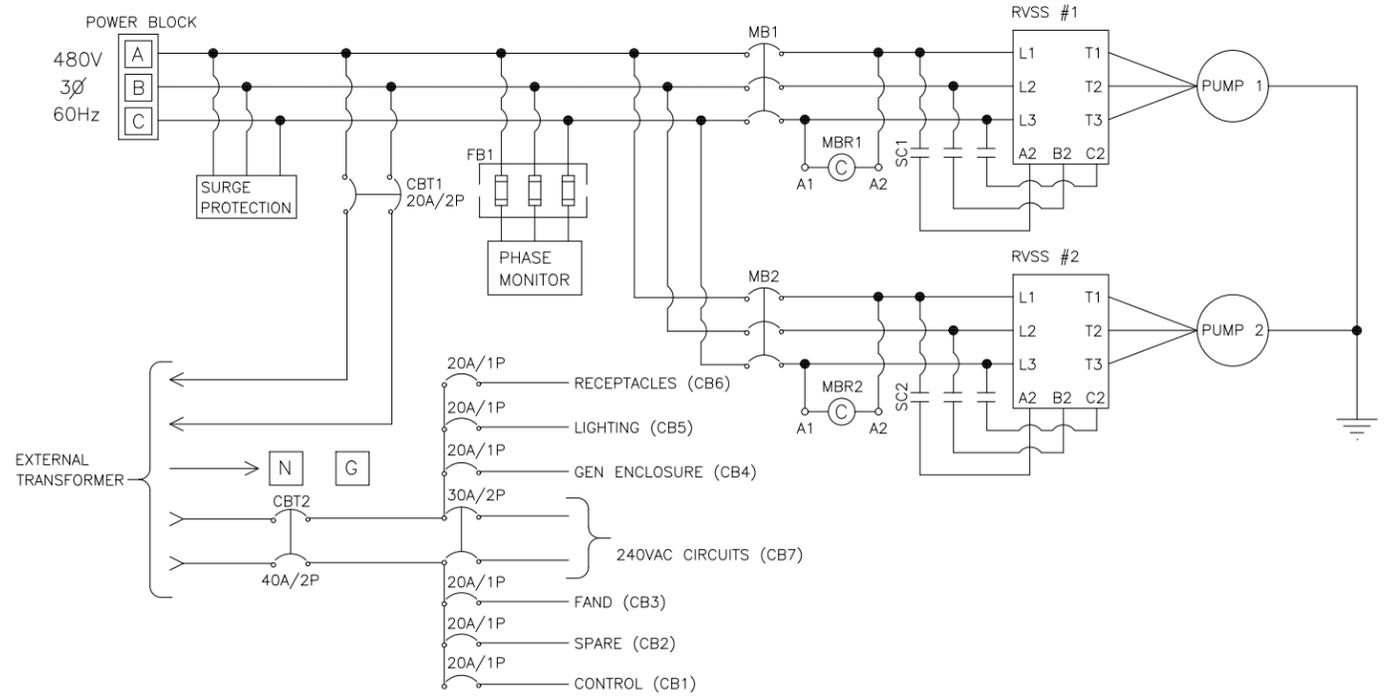
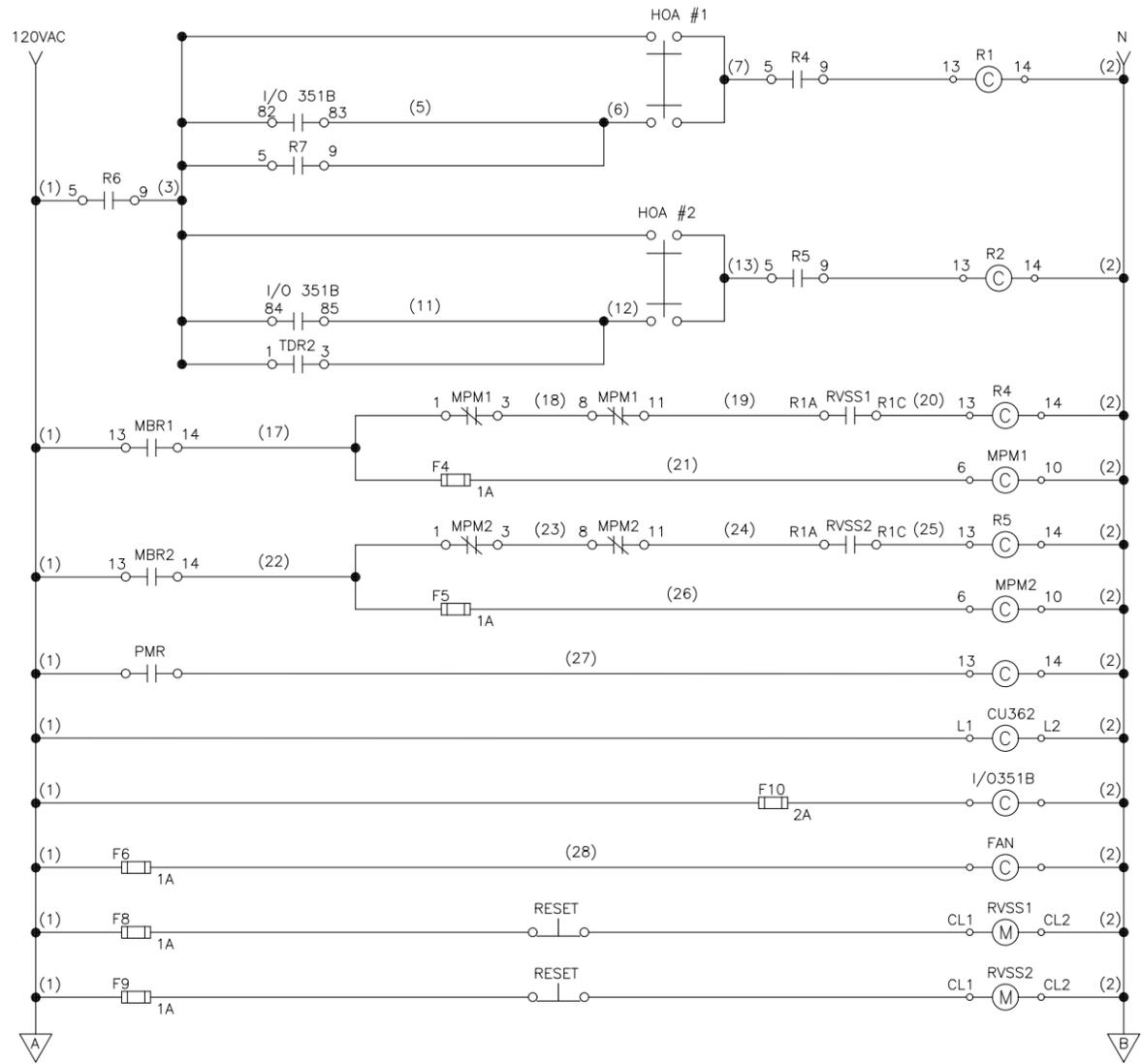


**CITY OF POOLER
2024 STANDARD DETAIL**

**LIFT STATION - CONTROL PANEL 240V DUPLEX
USING NEMA MOTOR STARTERS GRUNFOS CU362 LEVEL CONTROL**

**DONE BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024**

5B-PED



CITY OF POOLER
2024 STANDARD DETAIL

LIFT STATION - CONTROL PANEL 480V DUPLEX
USING RVSS MOTOR STARTERS GRUNFOS CU362 LEVEL CONTROL

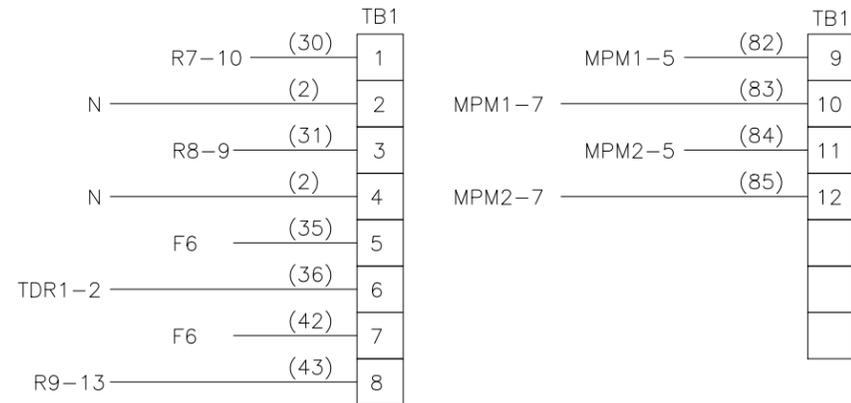
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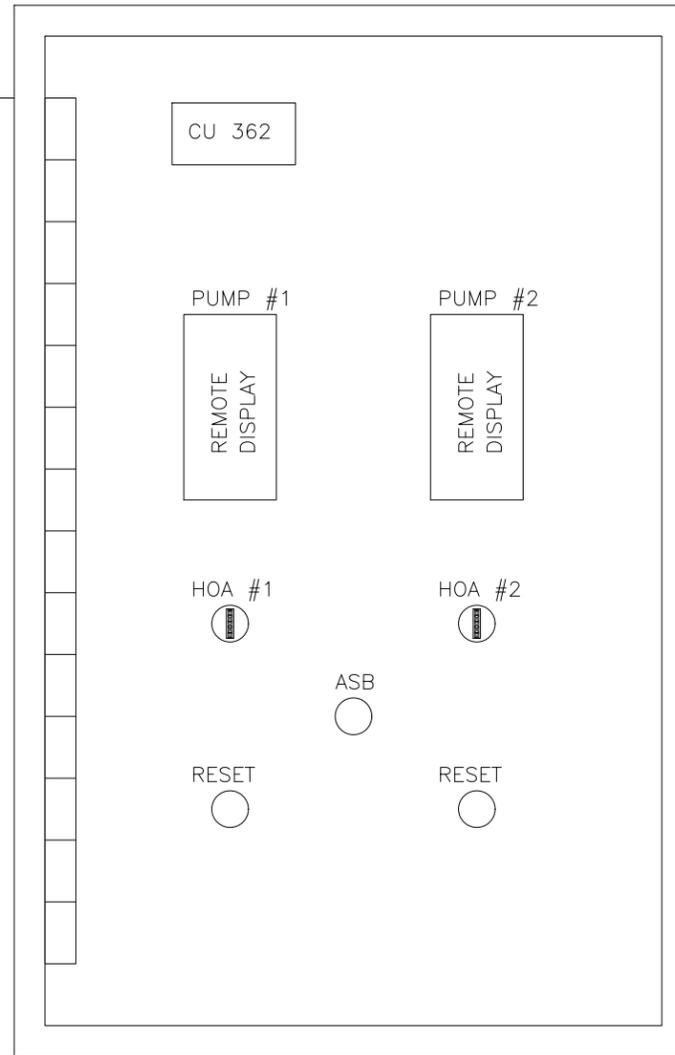
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DATE: APRIL, 2024

6A-PED

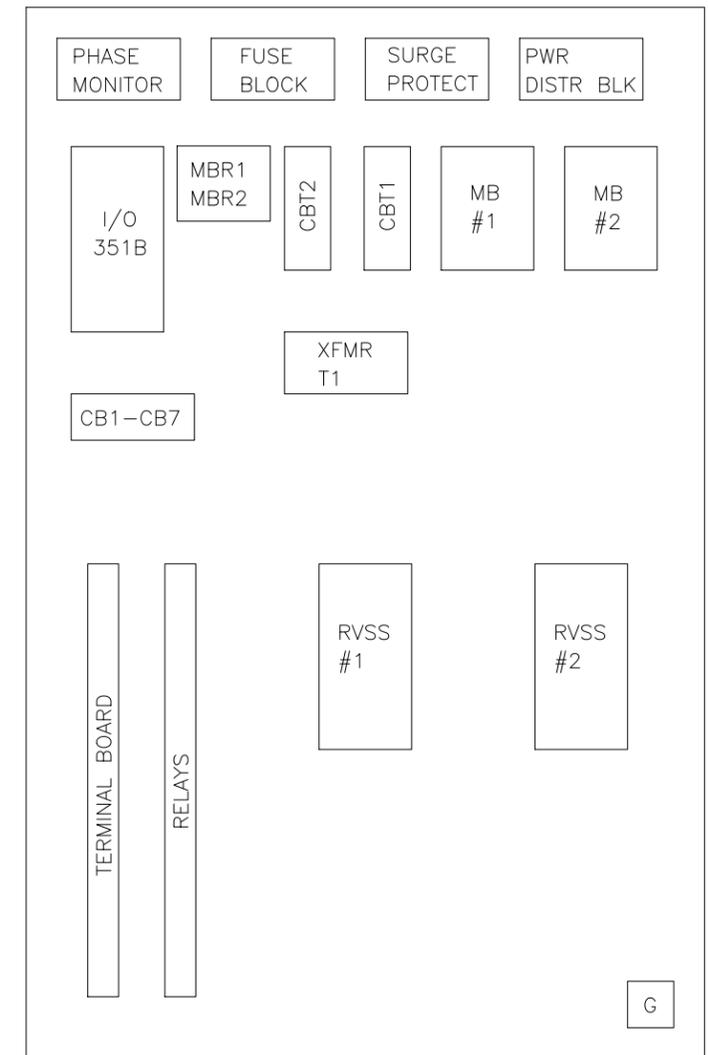


NOT DRAWN TO SCALE



OUTER DOOR NOT SHOWN

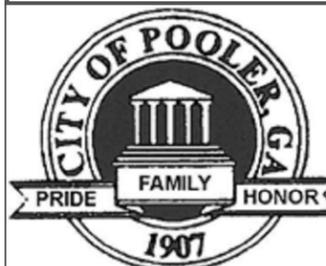
BACK PLANE GENERAL LAYOUT



NOT TO SCALE

LEGEND

- R() - RELAY
- |—○ - RELAY CIRCUIT
- |—○ - CIRCUIT BREAKER
- |—|—| - HAND-OFF-AUTO SELECTOR
- |—|—| - FUSE
- |—|—| - EARTH GROUND
- |—|—| - TRANSFORMER
- MPM - MOTOR PROTECTION MODULE
- AR - ALTERNATING RELAY COIL
- TDR - TIME DELAY RELAY COIL
- FAN - VENTILATOR FAN ASSEMBLY
- ETM - ELAPSED TIME (HOUR) METER
- - CURRENT TRANSFORMER
- PHASE MONITOR - PHASE MONITOR RELAY COIL



**CITY OF POOLER
2024 STANDARD DETAIL**

**LIFT STATION - CONTROL PANEL 480V DUPLEX
USING RVSS MOTOR STARTERS GRUNFOS CU362 LEVEL CONTROL**

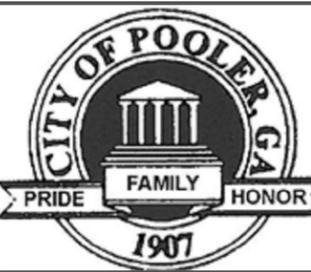
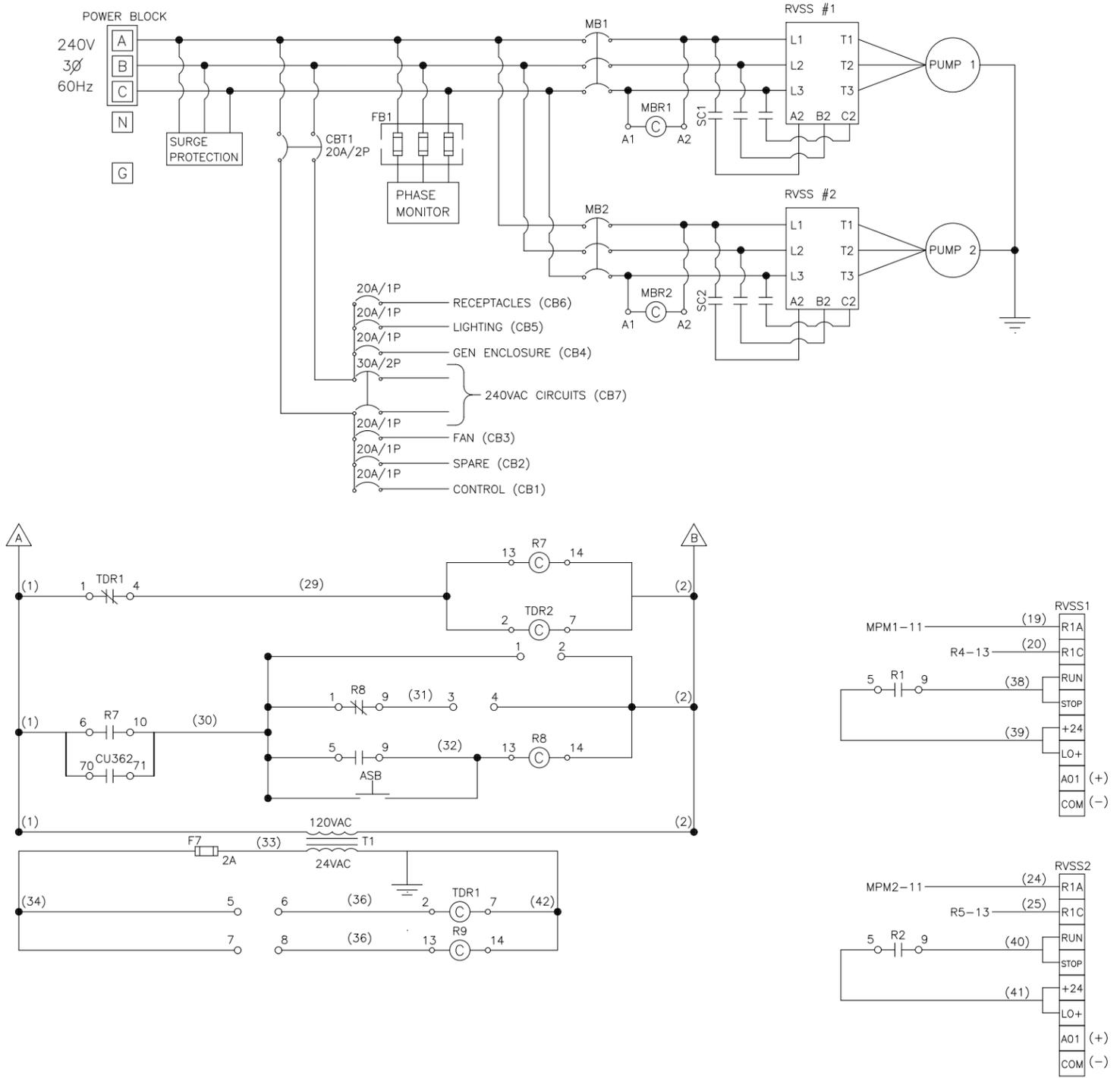
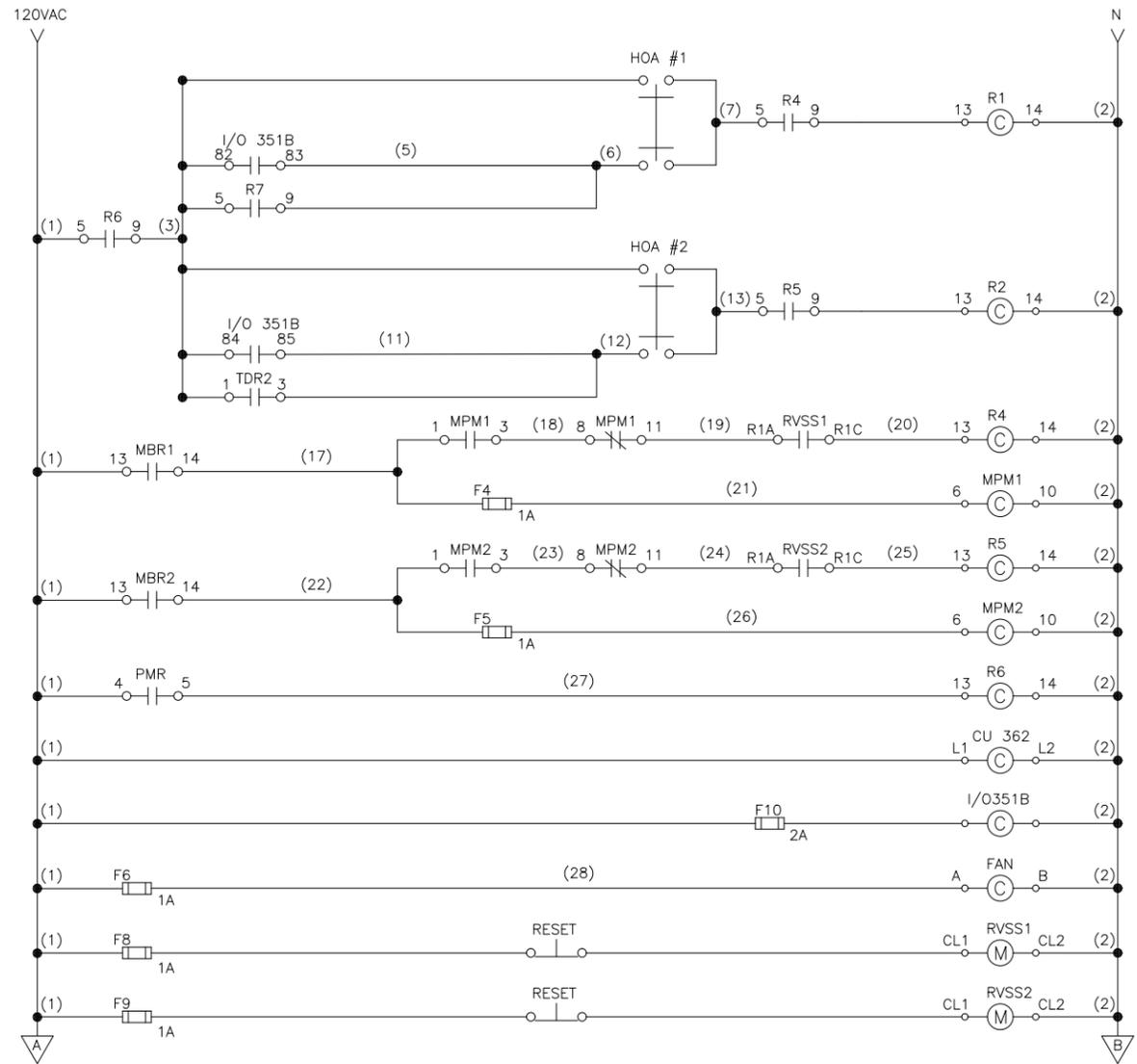
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

6B-PED



**CITY OF POOLER
2024 STANDARD DETAIL**

**LIFT STATION - CONTROL PANEL 240V DUPLEX
USING RVSS MOTOR STARTERS GRUNFOS CU362 LEVEL CONTROL**

DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

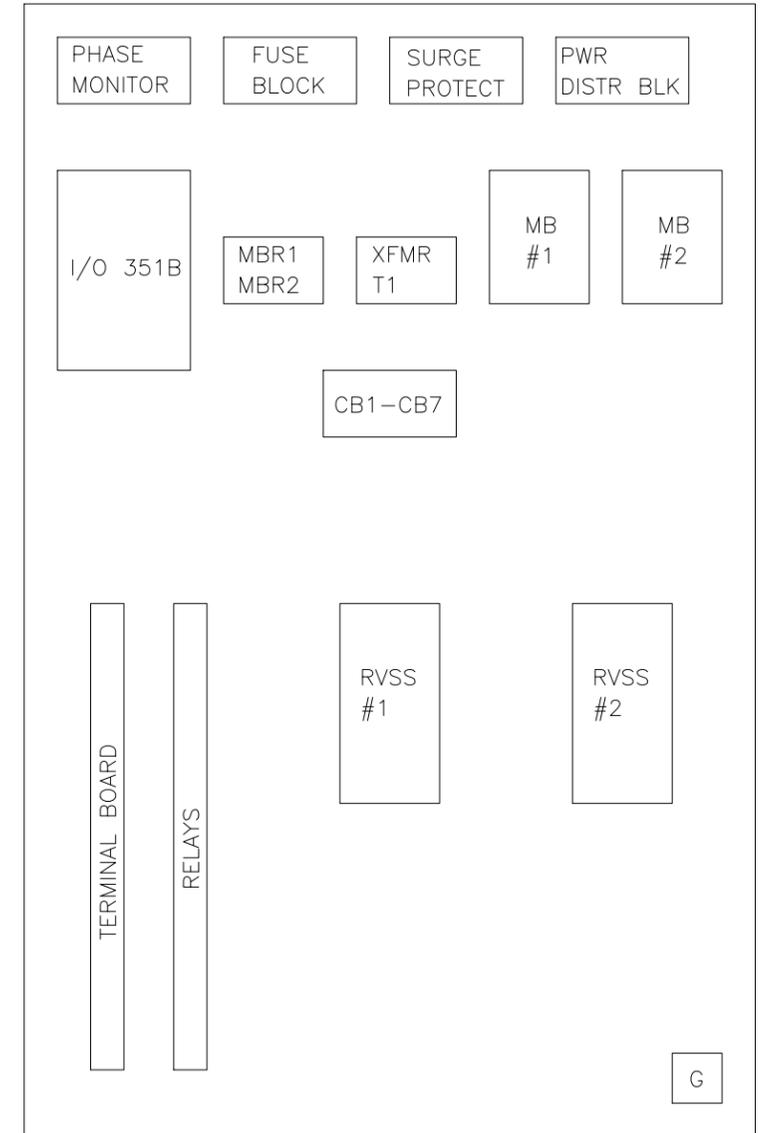
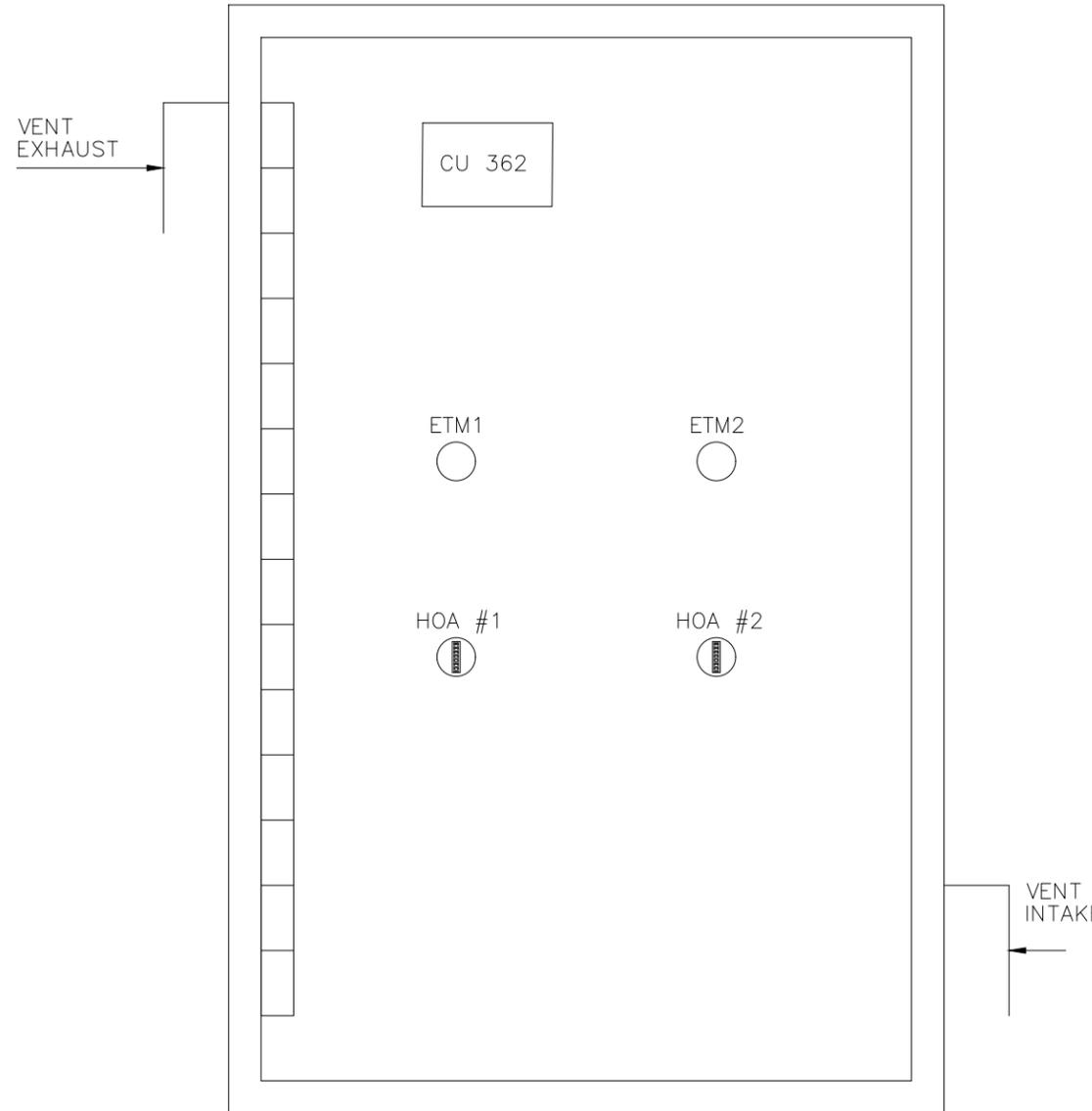
7A-PED

		TB1
R7-10	(30)	1
N	(2)	2
R8-9	(31)	3
N	(2)	4
ULC-18	(35)	5
TDR1-2	(36)	6
R7-3	(42)	7
R7-11	(43)	8
MPM1-5	(82)	9
MPM1-7	(83)	10
MPM2-5	(84)	11
MPM2-7	(85)	12

NOTE:
1. ALL WIRING SHALL BE AWG-16 THHN STRANDED EXCEPT WHERE POWER REQUIREMENTS CALL FOR LARGER GAUGE WIRE.

NOT DRAWN TO SCALE

BACK PLANE GENERAL LAYOUT

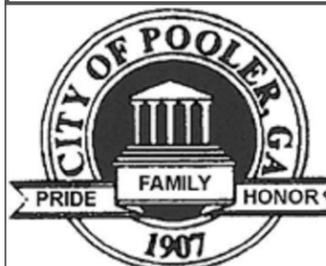


LEGEND

- R () - RELAY
- o---|---o - RELAY CIRCUIT
- o---|---o - CIRCUIT BREAKER
- o---|---o - HAND-OFF-AUTO SELECTOR
- |--- - FUSE
- |--- - EARTH GROUND
- |--- - TRANSFORMER
- MPM - MOTOR PROTECTION MODULE
- AR - ALTERNATING RELAY COIL
- TDR - TIME DELAY RELAY COIL
- FAN - VENTILATOR FAN ASSEMBLY
- ETM - ELAPSED TIME (HOUR) METER
- oo - CURRENT TRANSFORMER
- PHASE MONITOR - PHASE MONITOR RELAY COIL

OUTER DOOR NOT SHOWN

NOT TO SCALE



CITY OF POOLER
2024 STANDARD DETAIL

LIFT STATION - CONTROL PANEL 240V DUPLEX
USING RVSS MOTOR STARTERS GRUNFOS CU362 LEVEL CONTROL

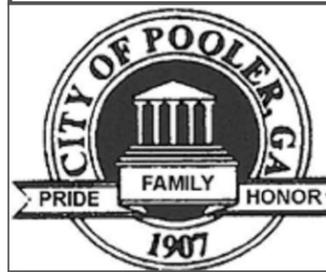
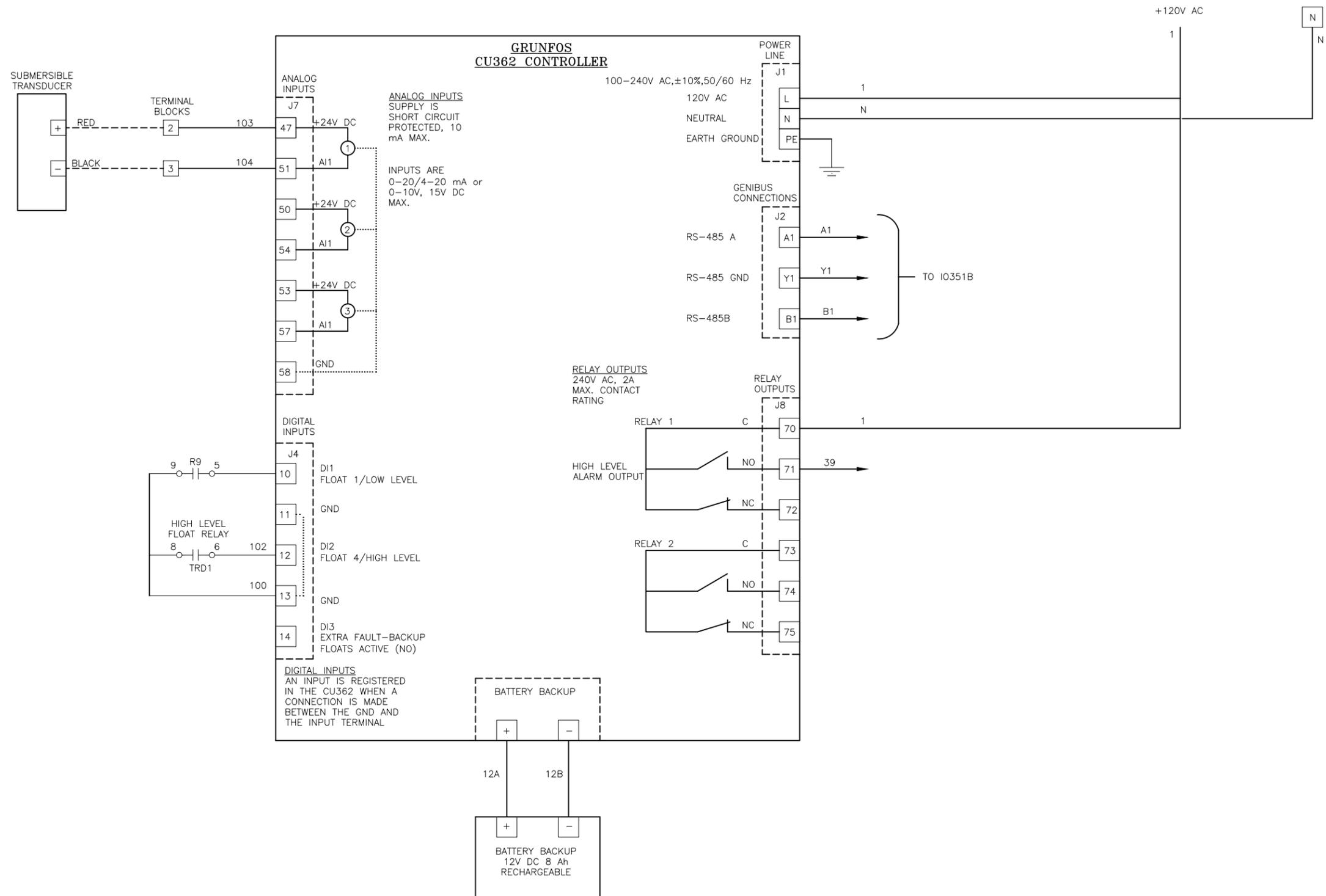
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

7B-PED



**CITY OF POOLER
2024 STANDARD DETAIL**

LIFT STATION - CU362 CONTROLLER WIRING RETROFIT

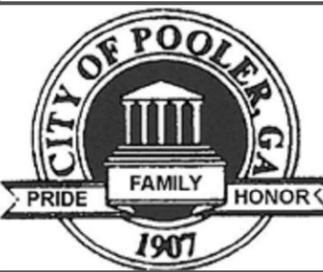
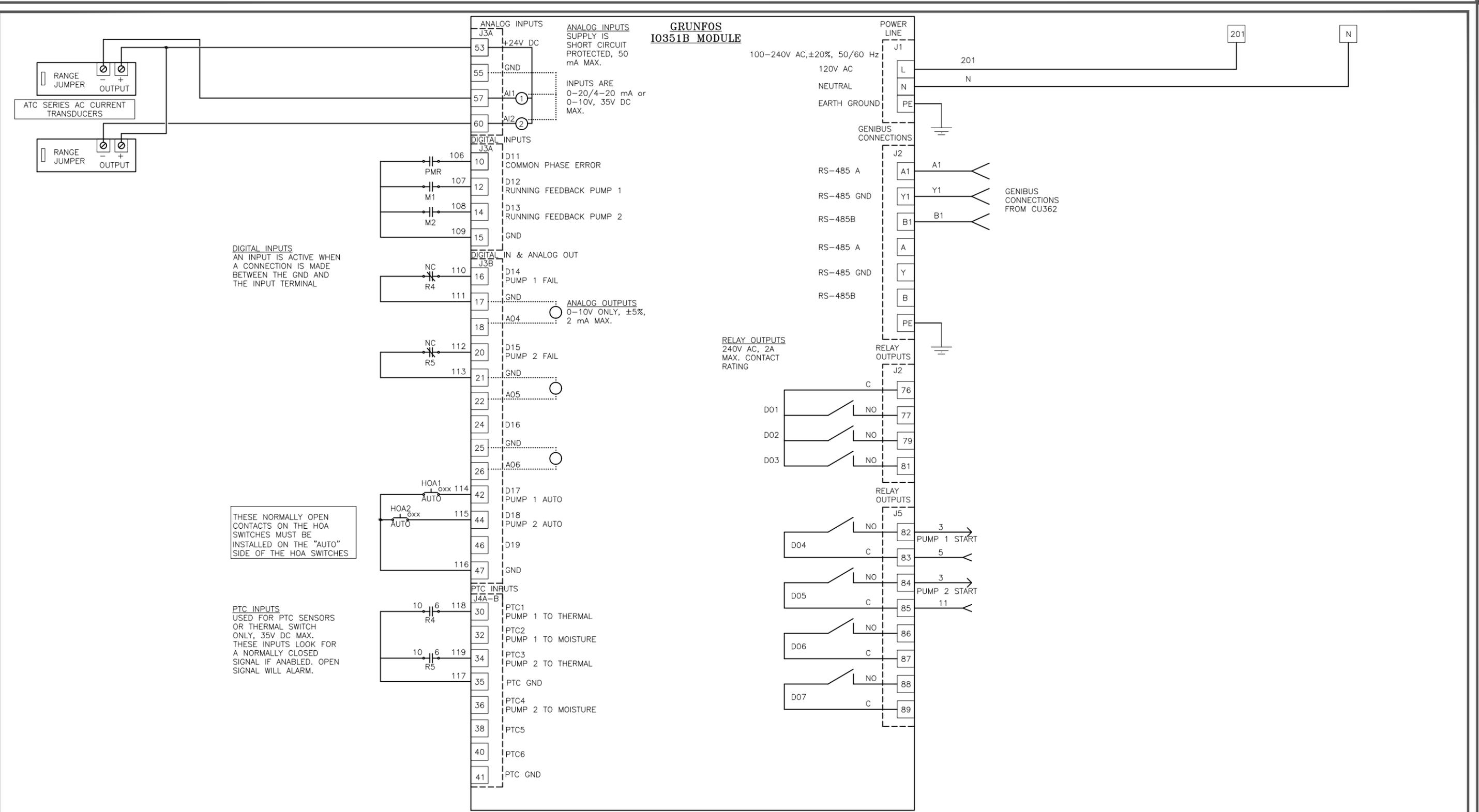
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

8A-PED



**CITY OF POOLER
 2024 STANDARD DETAIL**

LIFT STATION - IO351-B WIRING RETROFIT

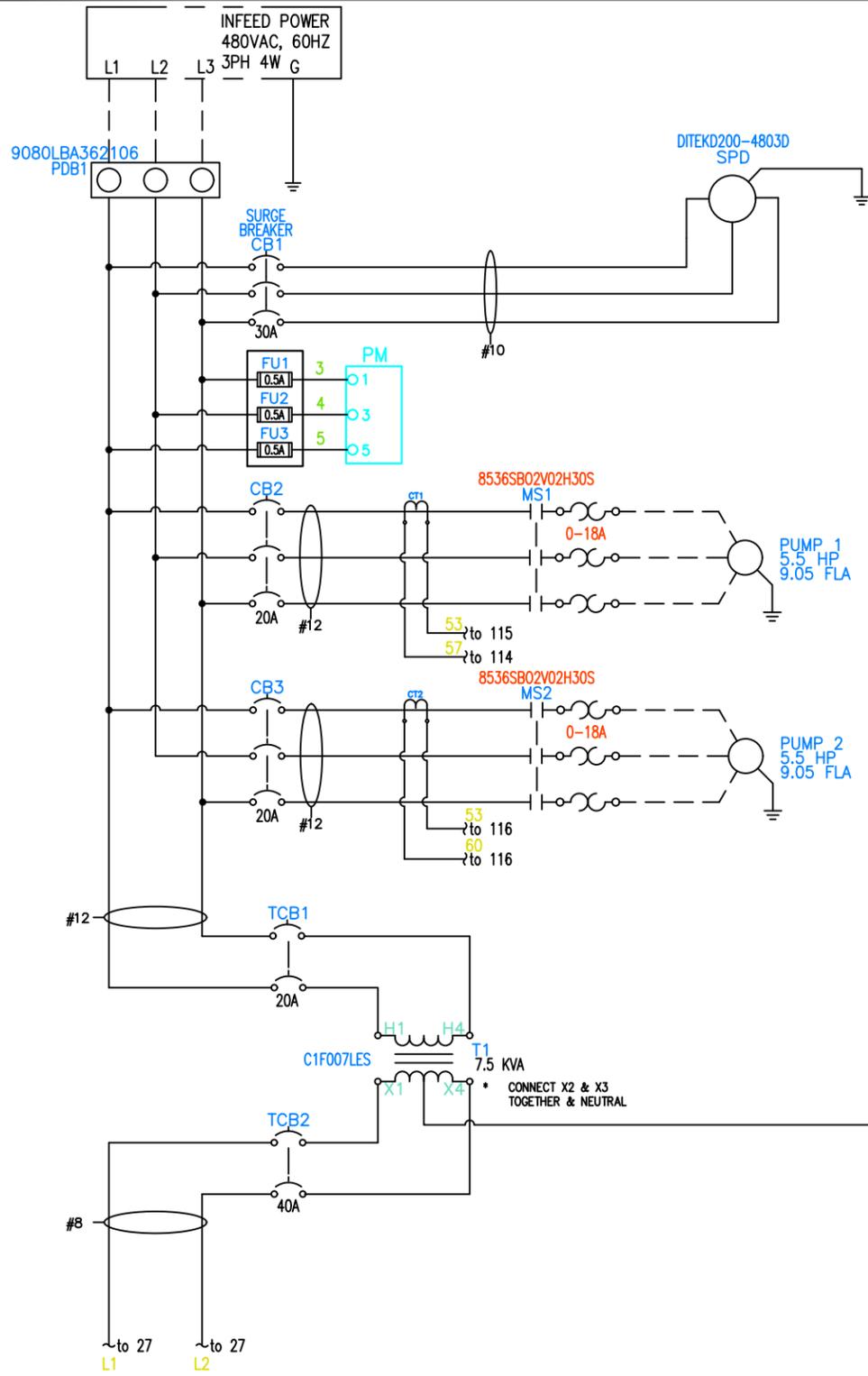
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CHECKED BY: J. W.

SCALE: N.T.S.

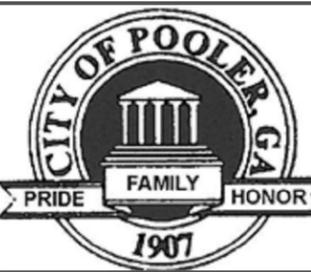
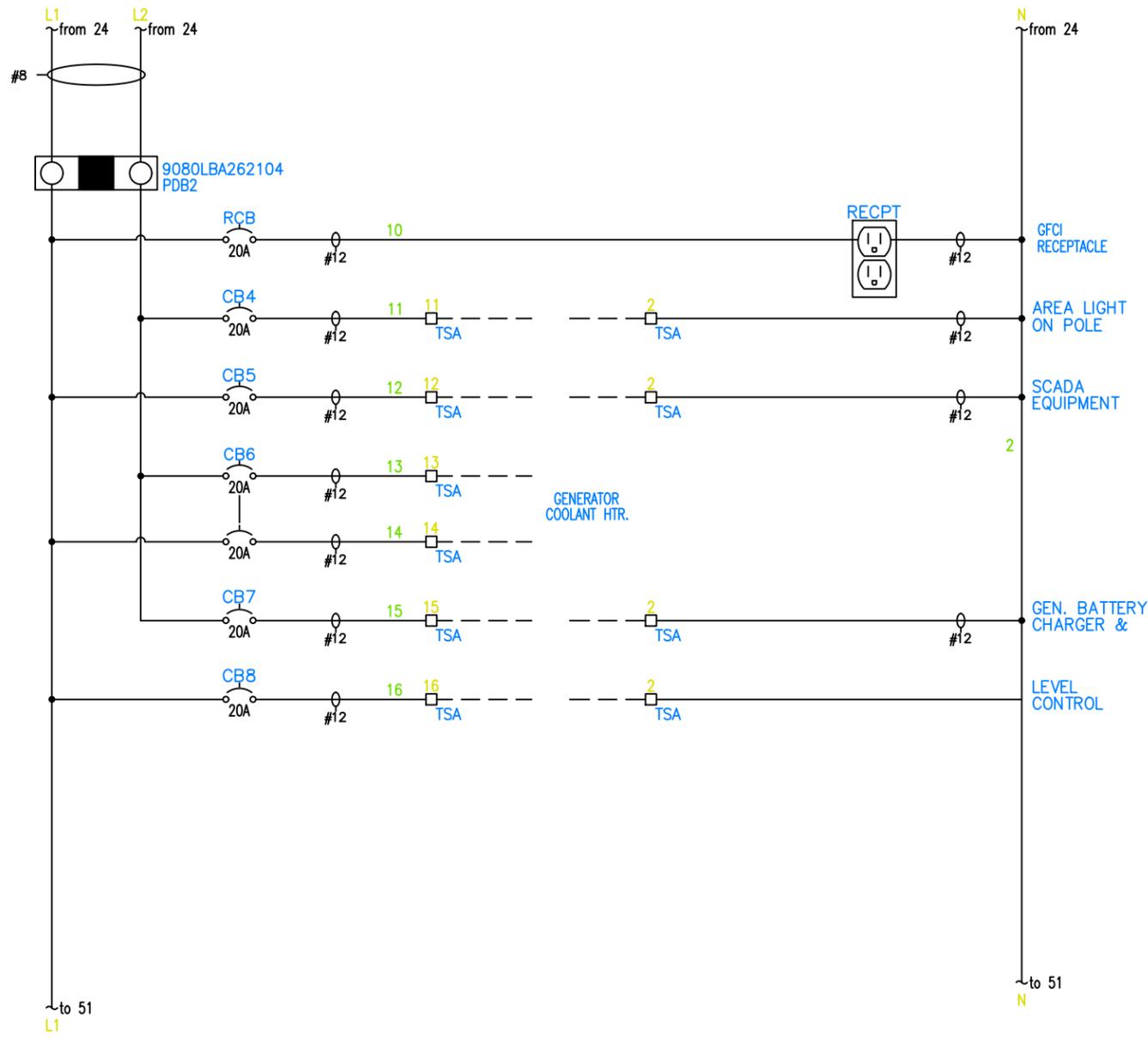
DATE: APRIL, 2024

9A-PED



PANEL REQUIREMENTS	
VOLTAGE	480
PHASE	3
FREQUENCY	60
SCCR	5000
TOTAL FLA	33.7
TYPE	4X
LARGEST MOTOR POWER REQUIREMENTS	
HP	5.5000
FLA	9.0500

STANDARD WIRE COLORS		
PHASE	208/230 VAC	460 VAC
L1	BLACK	BROWN
L2	RED	ORANGE
L3	BLUE	YELLOW
NEUTRAL	WHITE	GRAY
GROUND	GREEN	GREEN

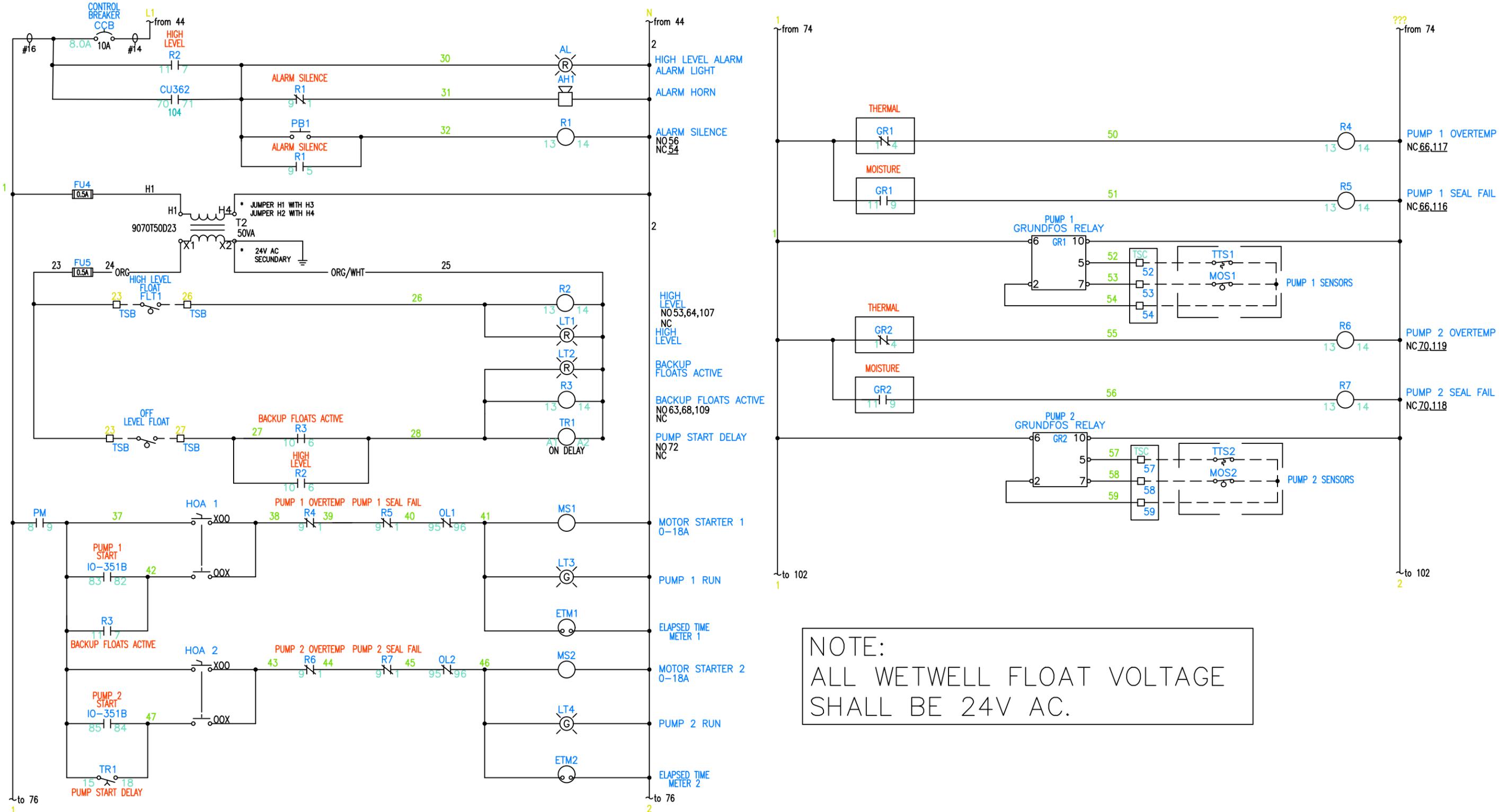


**CITY OF POOLER
2024 STANDARD DETAIL**

LIFT STATION - CONTROL PANEL SCHEMATICS

DONE BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024

10A-PED



NOTE:
ALL WETWELL FLOAT VOLTAGE
SHALL BE 24V AC.



**CITY OF POOLER
2024 STANDARD DETAIL**

LIFT STATION - CONTROL PANEL SCHEMATICS

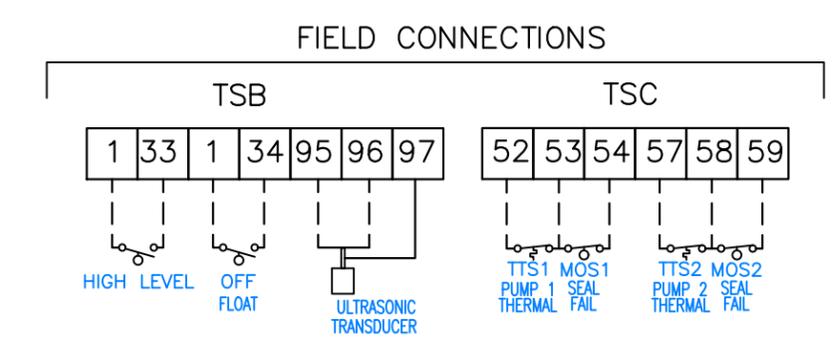
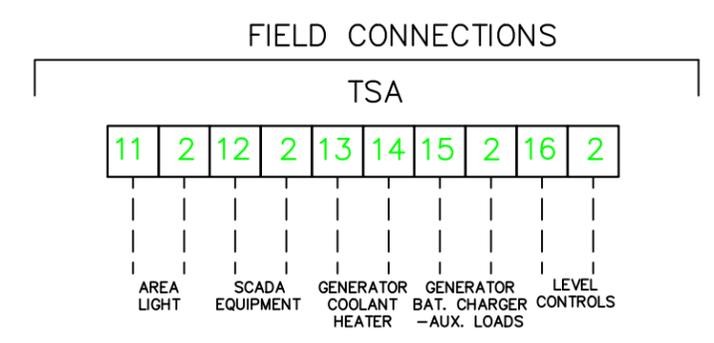
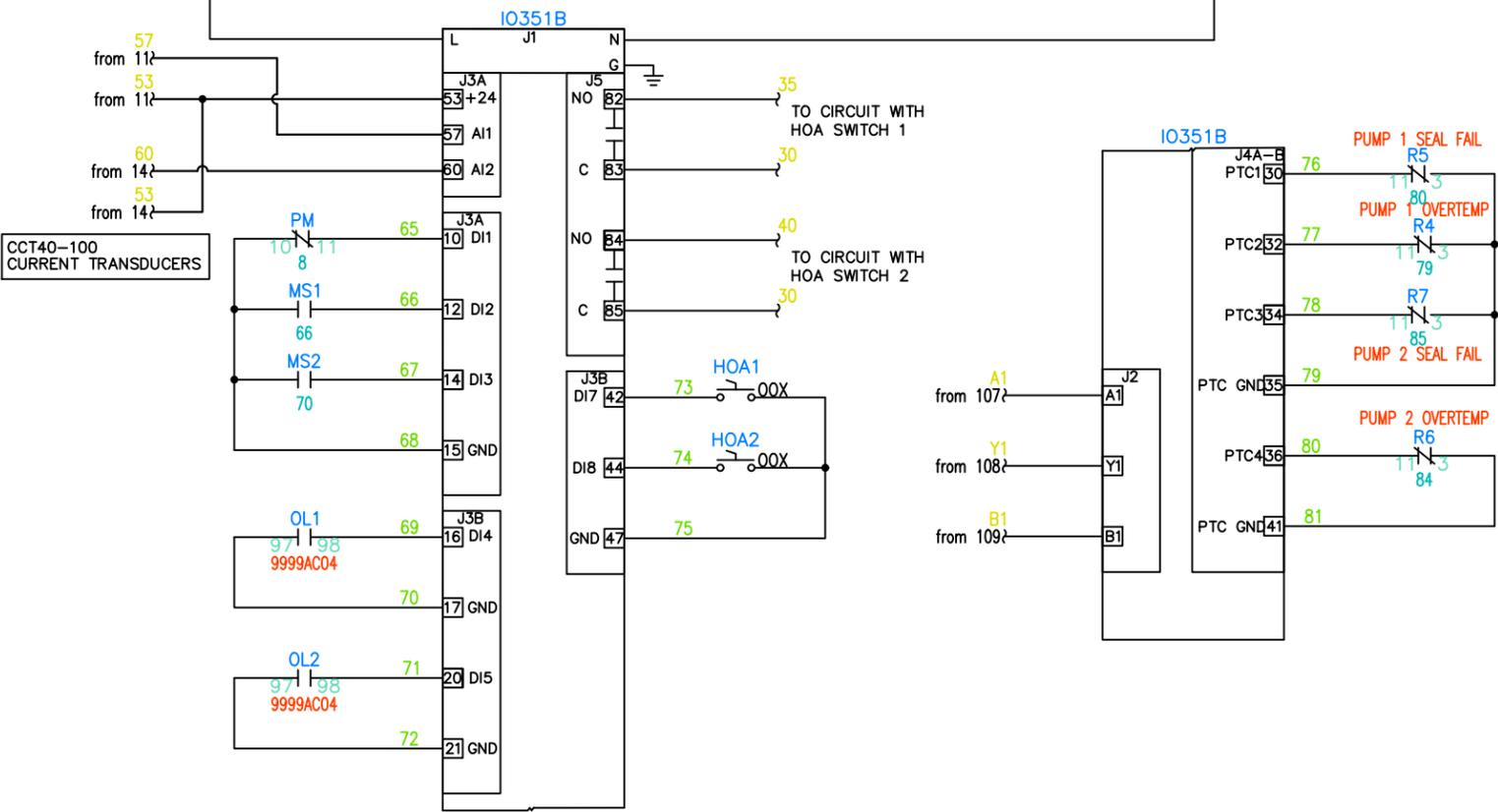
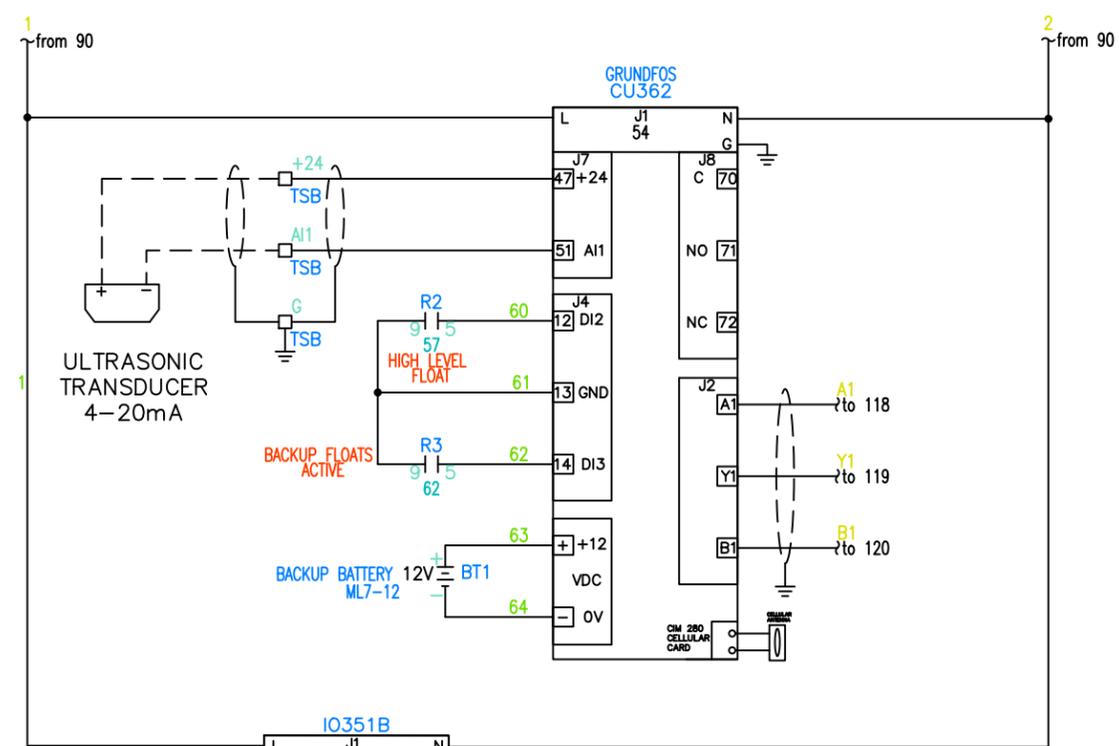
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

10B-PED



FUSE REPLACEMENT

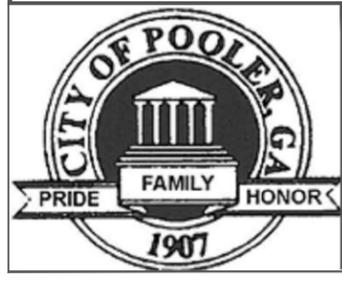
FU1,2,3	ATMR1/2
---------	---------

FIELD WIRING TORQUE SPECIFICATIONS

TERMINATION	WIRE SIZE	TORQUE
INCOMING POWER (MCB)	#8 AWG	80 LB-IN
INCOMING POWER (GND LUG)	#10AWG	80 LB-IN
PUMP POWER (MS1 & MS2)	#12 AWG	35 LB-IN
CONTROL AND SENSOR WIRING	#22 AWG - #16AWG	7.5 LB-IN

STANDARD WIRE COLORS

PHASE	208/230 VAC	460 VAC
L1	BLACK	BROWN
L2	RED	ORANGE
L3	BLUE	YELLOW
NEUTRAL	WHITE	GRAY
GROUND	GREEN	GREEN

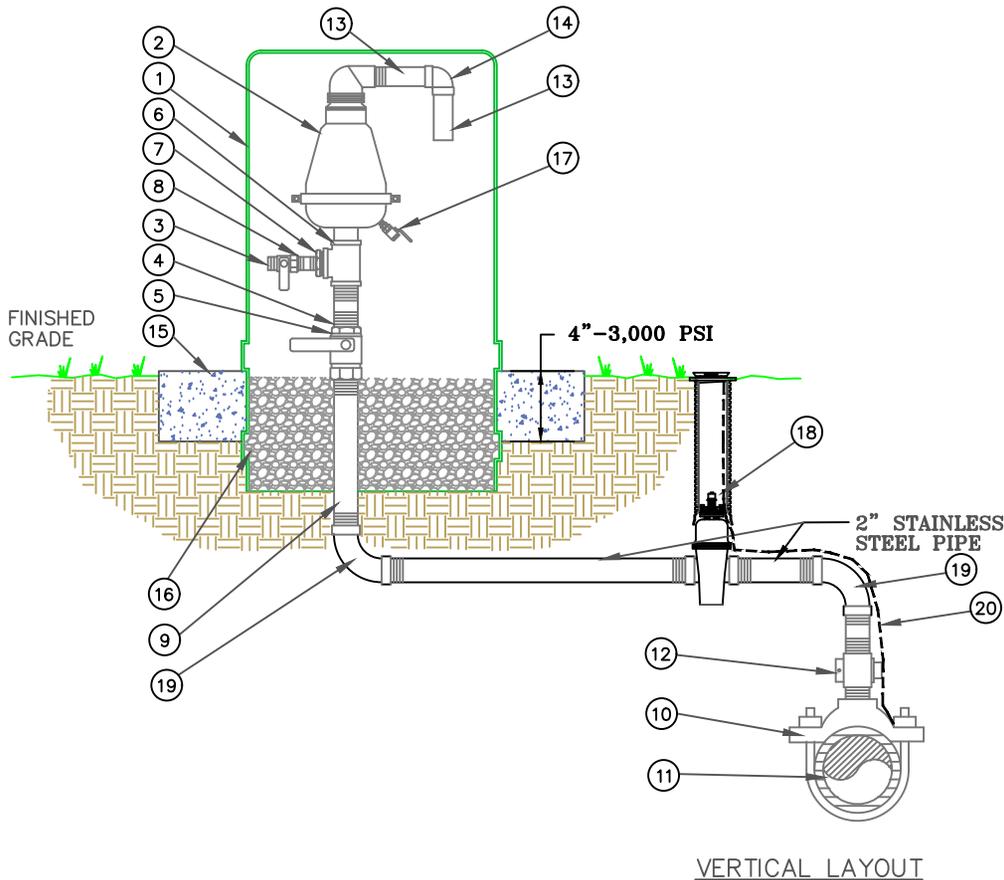


CITY OF POOLER
2024 STANDARD DETAIL

LIFT STATION - CONTROL PANEL SCHEMATICS

DONE BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024

10C-PED



M A T E R I A L S		
ITEM	QUANT.	DESCRIPTION
1	1	VENTED ENCLOSURE, IF NEEDED. IT MUST BE APPROVED BY PUBLIC WORKS
2	1	AIR RELEASE VALVE 2" NPT (SEE BELOW) SEWER AIR RELEASE VALVES SHALL BE ARI
3	1	1" CURB STOP, STAINLESS STEEL
4	1	2" x 4" NIPPLE, S.S.
5	1	2" BALL VALVE, S.S.
6	1	2" TEE, S.S.
7	1	2" X 1" REDUCER, S.S.
8	1	1" SHORT NIPPLE, S.S.
9	1	2" PIPE, S.S. LENGTH AS REQUIRED
10	1	2" DOUBLE STRAP TAPPING SADDLE, S.S.
11	1	4" & LARGER FORCEMAIN
12	2	2" CORPORATION BRASS
13	1	1-1/2" PIPE, PVC, LENGTH AS REQUIRED
14	1	1-1/2" x 90° ELBOW, PVC
15	1	CONCRETE SLAB AROUND ENCLOSURE
16		#57 WHITE ROCK
17	1	DRAIN VALVE
18	1	2" GATE VALVE AND BOX
19	2	2" - S.S. 45° BEND
20	1	TESTING WIRE

NOTES:

1. CITY OF POOLER SHALL HAVE THE OPTION OF REQUIRING THE AIR RELEASE VALVE ASSEMBLY WITH ODOR CONTROL SYSTEM TO BE INSTALLED WHERE ODOR MAY BE A CONCERN.
2. THE AIR RELEASE VALVE BODY AND COVER COULD BE MADE OF EITHER STAINLESS STEEL (304 OR 316) OR COMPOSITE MATERIAL. THE INTERNAL COMPONENTS MATERIALS MUST BE EITHER STAINLESS STEEL OR COMPOSITE MATERIALS. IT MUST MEET ASTM A48.



**CITY OF POOLER
2024 STANDARD DETAIL
AIR RELEASE
VALVES**

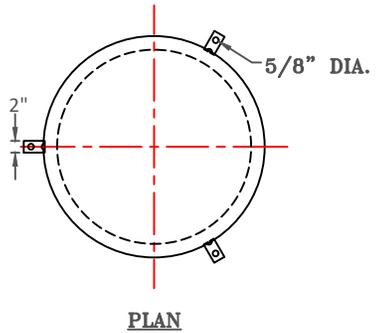
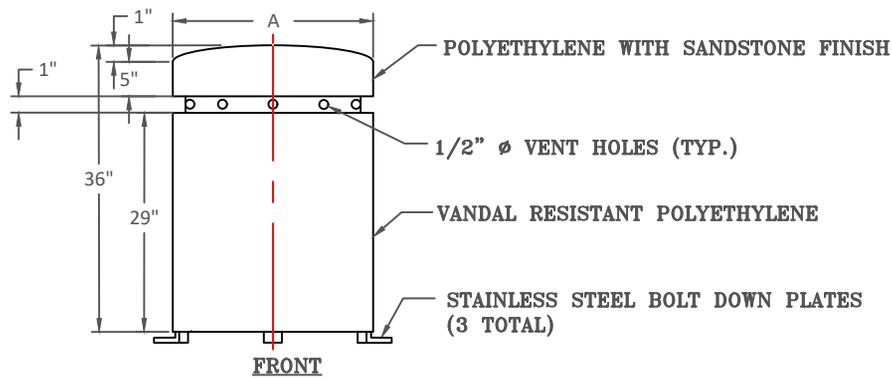
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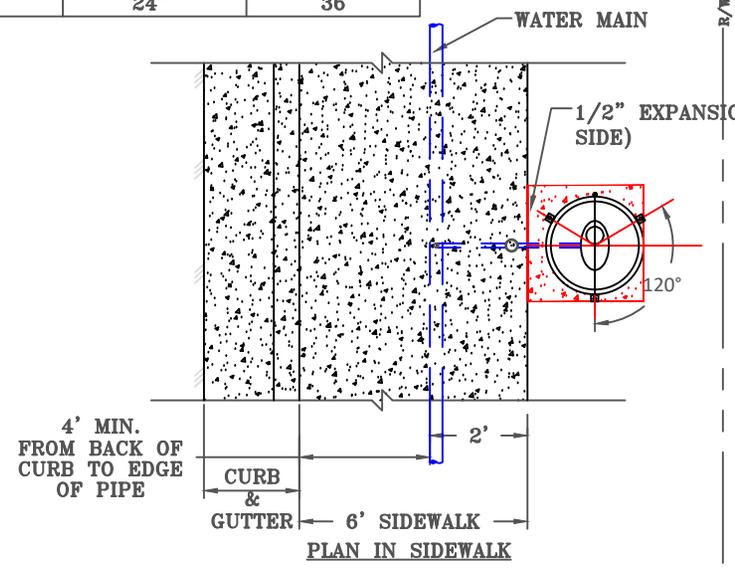
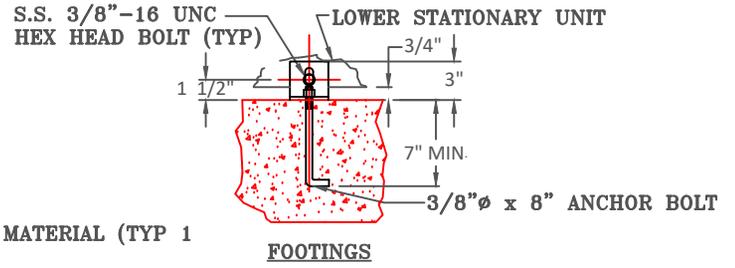
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DATE: APRIL, 2025

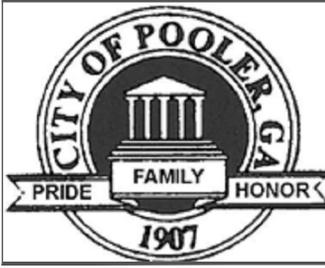
W-01



SIZING FOR AIR VALVE ASSEMBLY COVER		
VALVE SIZE	A (DIAMETER)	B (HEIGHT)
1"	12"	36"
2", 3", 4", & 6"	20"	36"
8"	24"	36"



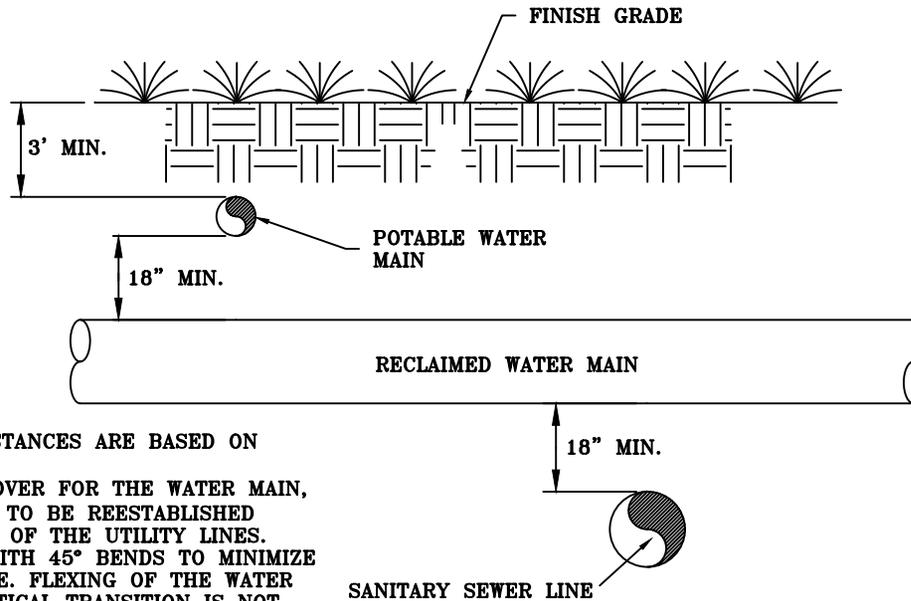
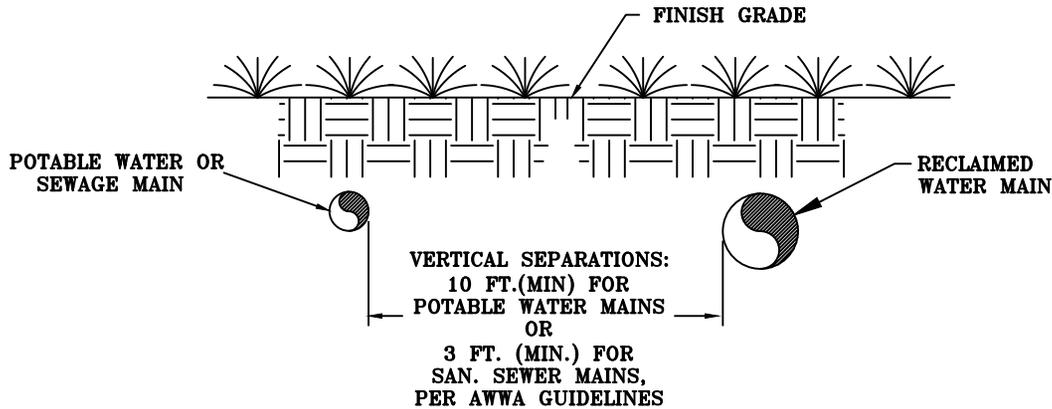
- NOTES:**
- ENGINEER TO VERIFY THE REQUIRED SIZE AND TYPE OF AIR VALVE ASSEMBLY PER PROJECT REQUIREMENTS.
 - USE ONLY THE APPROPRIATE STD. DRAWING(S) AND DESCRIPTIONS FOR CORRECT SIZE OF AIR VALVE ASSEMBLY.
 - MODEL NO. P6002001, 2 or 3 BY AMORCAST OR WATER PLUS CORP. MODEL #131632 OR APPROVED SIMILAR.
 - ALL EXPOSED FERROUS METAL SHALL BE COATED PER SPECS. EXTERIOR COLOR TO BE SANDSTONE FINISH.



**CITY OF POOLER
2024 STANDARD DETAIL
POLYETHYLENE ENCLOSURE
FOR AIR VALVES**

DONE BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024

W-01A



NOTE:

1. ALL REQUIRED MINIMUM DISTANCES ARE BASED ON AWWA'S GUIDELINES.
2. THE STANDARD VERTICAL COVER FOR THE WATER MAIN, 3' MIN. TO 4' MAX., NEEDS TO BE REESTABLISHED SOON AFTER THE CROSSING OF THE UTILITY LINES. THIS NEEDS TO BE DONE WITH 45° BENDS TO MINIMIZE THE TRANSITIONAL DISTANCE. FLEXING OF THE WATER LINE TO ACHIEVE THIS VERTICAL TRANSITION IS NOT ALLOWED.

ORIGINAL: HGB, 2006



CITY OF POOLER
2024 STANDARD DETAIL
SEPARATION REQUIREMENTS
FOR RECLAIMED WATER MAINS

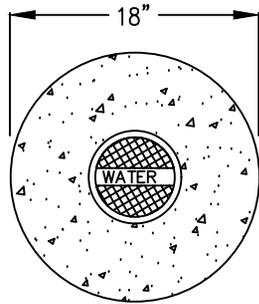
REVISED BY: EOM

CHECKED BY: J. W.

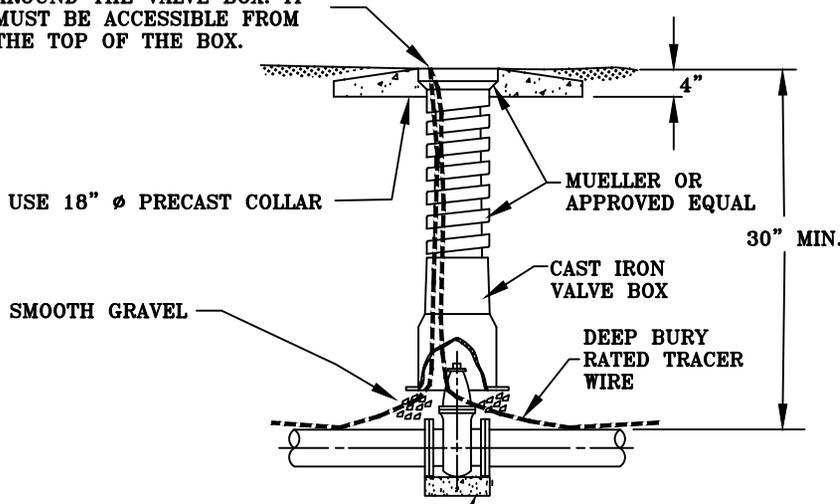
SCALE: N.T.S.

DATE: APRIL, 2024

W-02



TRACER WIRE MUST BE LOOPED AROUND THE VALVE BOX. IT MUST BE ACCESSIBLE FROM THE TOP OF THE BOX.



VALVE AND VALVE BOX

BRASS MARKER PLATE
4"x4" SQUARE
4-#3 RE-BAR
EXISTING GROUND
PRECAST CONCRETE POST (4,000 PSI)

3/4 CHAMFER @ EACH CORNER

2" BRASS MARKER PLATE W/ANCHOR

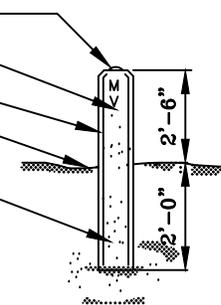


PLATE W/DIRECTIONAL ARROW POINTED TO VALVE & DISTANCE TO NEAREST FOOT

CONCRETE VALVE MARKERS

NOTE:

1. WATER MAIN LINE CONCRETE VALVE MARKERS SHALL NOT BE PAINTED AND SHOULD BE MARKED AS FOLLOWS:

- MV - WATER MAIN VALVE
- AV - AIR RELEASE VALVE
- PIPELINE - PIPELINE MARKER

2. DO NOT WRAP WIRE AROUND VALVE NUT.

TYP. CONCRETE SUPPORT; PRECAST DONUTS OR 6" OF GRAVEL MAY BE USED FOR 12" AND SMALLER VALVES

ORIGINAL: HGB- 2006



**CITY OF POOLER
2024 STANDARD DETAIL**

WATER VALVE

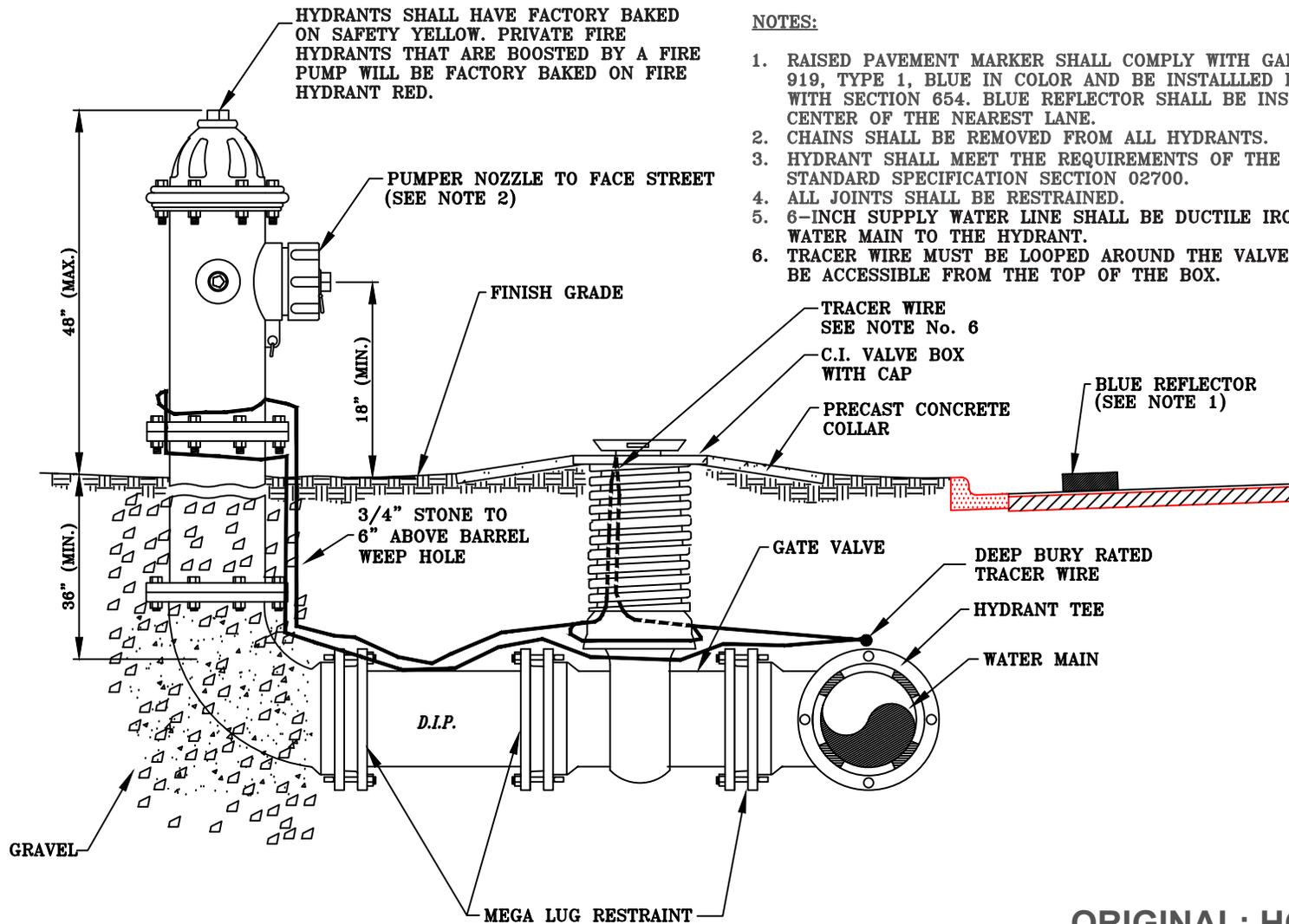
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

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 THE CITY'S STANDARD SPECIFICATION SECTION 02700.
4. ALL JOINTS SHALL BE RESTRAINED.
5. 6-INCH SUPPLY WATER LINE SHALL BE DUCTILE IRON FROM THE WATER MAIN TO THE HYDRANT.
6. TRACER WIRE MUST BE LOOPED AROUND THE VALVE BOX. IT MUST BE ACCESSIBLE FROM THE TOP OF THE BOX.

ORIGINAL: HGB- 2006



**CITY OF POOLER
2024 STANDARD DETAIL**

FIRE HYDRANT

REVISED BY: EOM

CHECKED BY: J. W.

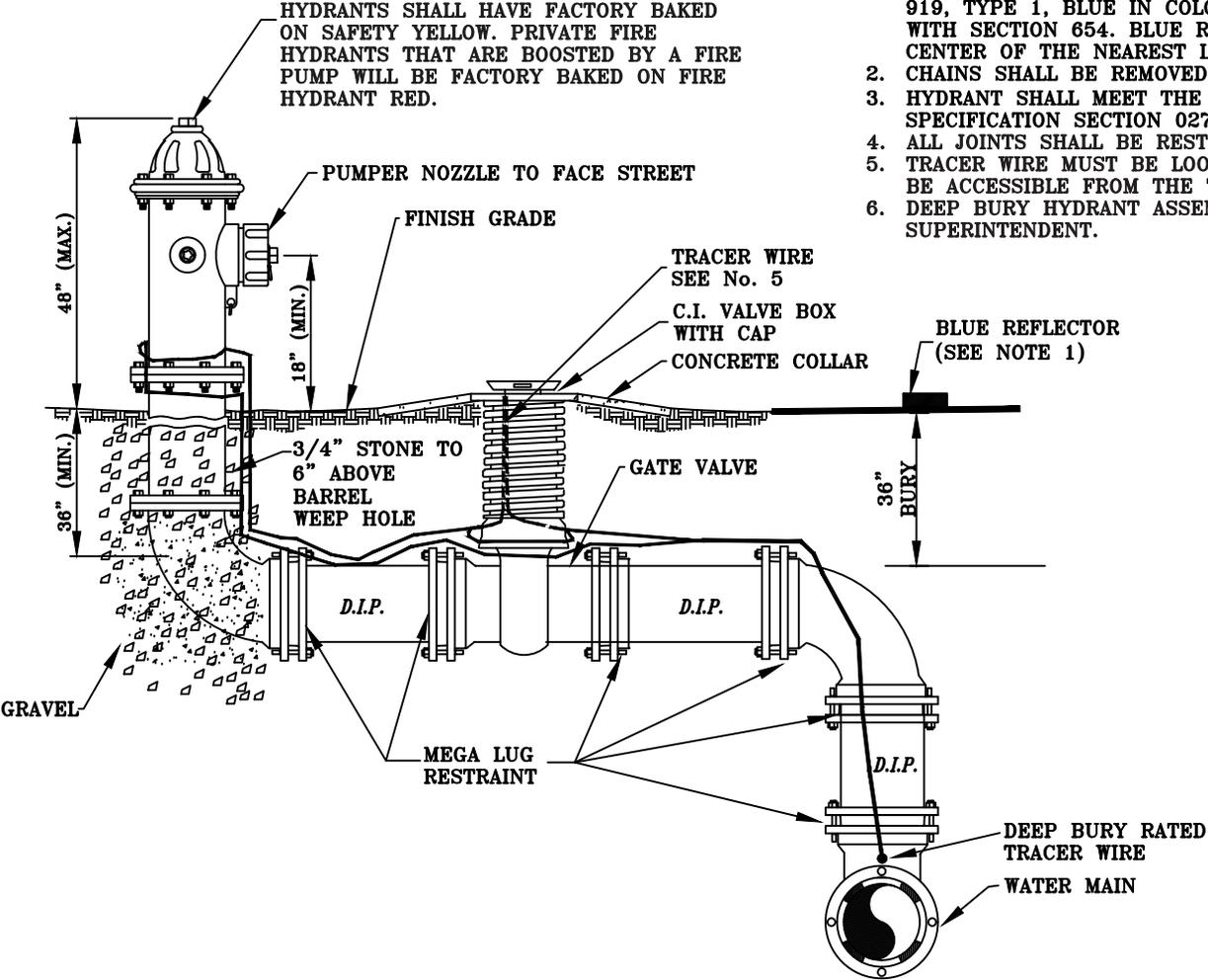
SCALE: N.T.S.

DATE: APRIL, 2024

W-04

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 THE CITY'S STANDARD SPECIFICATION SECTION 02700.
4. ALL JOINTS SHALL BE RESTRAINED.
5. TRACER WIRE MUST BE LOOPED AROUND THE VALVE BOX. IT MUST BE ACCESSIBLE FROM THE TOP OF THE BOX.
6. DEEP BURY HYDRANT ASSEMBLIES MUST BE APPROVED BY THE CITY SUPERINTENDENT.



ORIGINAL: HGB- 2006



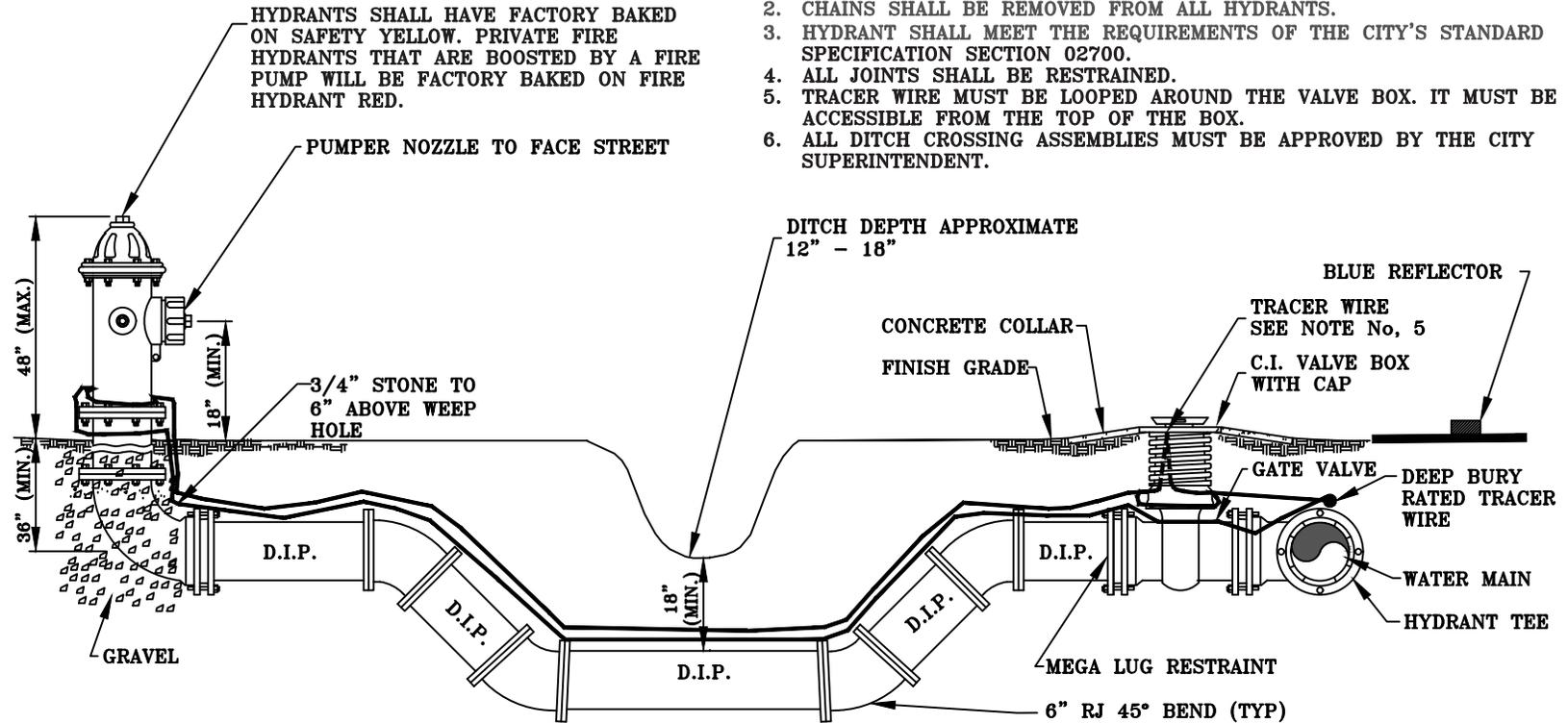
**CITY OF POOLER
2024 STANDARD DETAIL
FIRE HYDRANT FOR DEEP BURY
WATER MAINS**

CHECKED BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024

W-05

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 THE CITY'S STANDARD SPECIFICATION SECTION 02700.
4. ALL JOINTS SHALL BE RESTRAINED.
5. TRACER WIRE MUST BE LOOPED AROUND THE VALVE BOX. IT MUST BE ACCESSIBLE FROM THE TOP OF THE BOX.
6. ALL DITCH CROSSING ASSEMBLIES MUST BE APPROVED BY THE CITY SUPERINTENDENT.



ORIGINAL: HGB- 2011



**CITY OF POOLER
2024 STANDARD DETAIL**

FIRE HYDRANT UNDER A DITCH

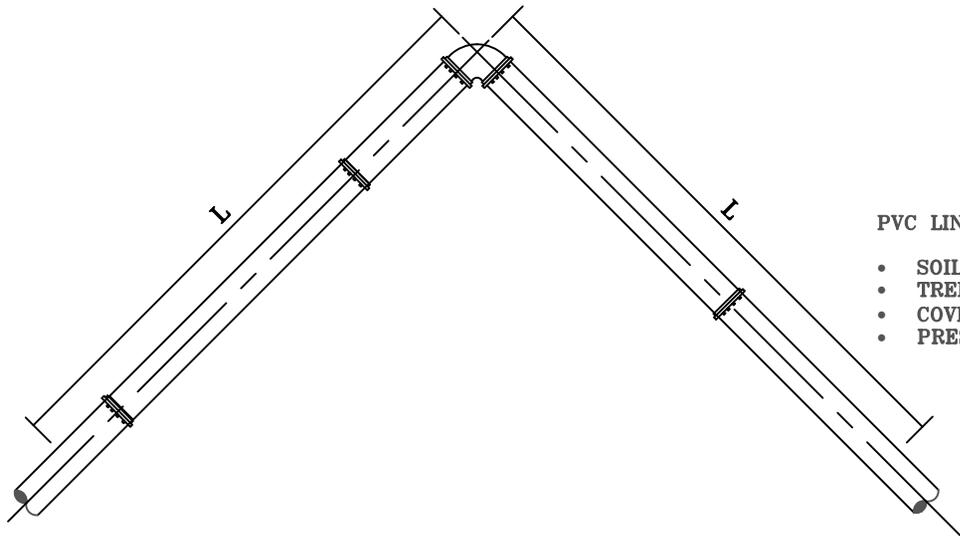
CHECKED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

W-06



PVC LINE:

- SOIL TYPE: SM
- TRENCH TYPE: 3
- COVER: 3' TO 12'
- PRESSURE: 150 PSI

PVC LINE

PIPE DIA.	BEND ANGLE			
	11 1/4°	22 1/2°	45°	90°
4	2	4	8	18
6	3	5	11	25
8	4	7	14	33
10	4	8	16	39
12	5	9	19	45
16	5	9	19	45
20	6	11	23	54
24	8	16	26	62

NOTES:

1. LENGTH OF RESTRAINT SHOWN IS IN FEET. PIPE DIAMETERS ARE IN INCHES.
2. WHERE LINES CONSIST OF BOTH DUCTILE IRON AND PVC WITHIN THE LIMITS OF REQUIRED RESTRAINT, LIMITS FOR PVC SHALL APPLY.
3. DIMENSIONS IN THESE TABLES ARE BASED ON THE DESIGN PARAMETERS SHOWN. THE ENGINEER SHALL PROVIDE CALCULATED RESTRAINT LENGTHS TO MEET THE CONDITIONS OF THEIR SITES IF THOSE SITE CONDITIONS ARE DIFFERENT FROM THE ONE SHOWN IN THIS DETAIL.

DIP LINE:

- SOIL TYPE: SM
- TRENCH TYPE: 3
- COVER: 3' MIN.
- PRESSURE: 150 PSI

DUCTILE IRON LINE

PIPE DIA.	BEND ANGLE			
	11 1/4°	22 1/2°	45°	90°
4	3	5	9	20
6	3	6	12	28
8	4	8	16	36
10	5	9	19	43
12	6	11	22	51
16	7	14	28	65
20	8	16	33	79
24	9	19	38	92

MINIMUM RESTRAINED LENGTH (L)



**CITY OF POOLER
2024 STANDARD DETAIL**

HORIZONTAL BEND RESTRAINT

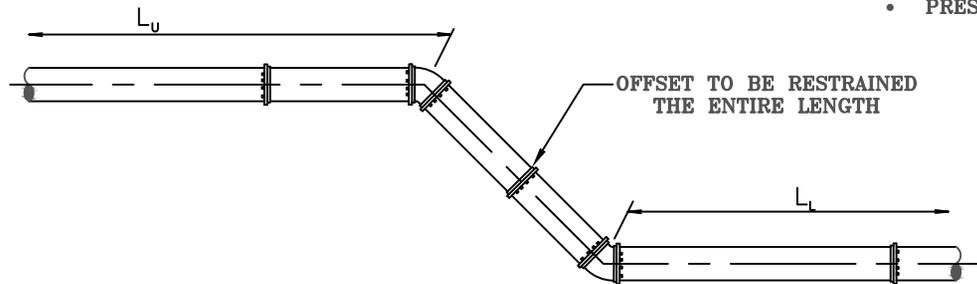
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

W-07A



PVC LINE:

- SOIL TYPE: SM
- TRENCH TYPE: 3
- COVER: 3' TO 12'
- PRESSURE: 150 PSI

PVC LINE

PIPE DIA.	BEND ANGLE					
	11 1/4°		22 1/2°		45°	
	L _U	L _L	L _U	L _L	L _U	L _L
4	4	1	8	2	17	3
6	6	1	11	2	23	4
8	8	2	15	3	30	6
10	9	2	18	4	36	7
12	11	2	21	4	43	8
16	10	3	21	5	42	10
20	13	3	25	6	51	12
24	15	4	29	7	60	15

NOTES:

1. LENGTH OF RESTRAINT SHOWN IS IN FEET. PIPE DIAMETERS ARE IN INCHES.
2. WHERE LINES CONSIST OF BOTH DUCTILE IRON AND PVC WITHIN THE LIMITS OF REQUIRED RESTRAINT, LIMITS FOR PVC SHALL APPLY.
3. DIMENSIONS IN THESE TABLES ARE BASED ON THE DESIGN PARAMETERS SHOWN. THE ENGINEER SHALL PROVIDE CALCULATED RESTRAINT LENGTHS TO MEET THE CONDITIONS OF THEIR SITES IF THOSE SITE CONDITIONS ARE DIFFERENT FROM THE ONE SHOWN IN THIS DETAIL.

DIP LINE:

- SOIL TYPE: SM
- TRENCH TYPE: 3
- COVER: 3' MIN.
- PRESSURE: 150 PSI

DUCTILE IRON LINE

PIPE DIA.	BEND ANGLE					
	11 1/4°		22 1/2°		45°	
	L _U	L _L	L _U	L _L	L _U	L _L
4	6	1	12	2	24	4
6	9	2	17	3	34	5
8	11	2	22	3	45	7
10	13	2	26	4	53	8
12	15	3	30	5	63	9
16	19	3	39	6	80	12
20	23	4	47	7	97	15
24	27	4	55	8	113	17



**CITY OF POOLER
2024 STANDARD DETAIL**

VERTICAL BEND RESTRAINT

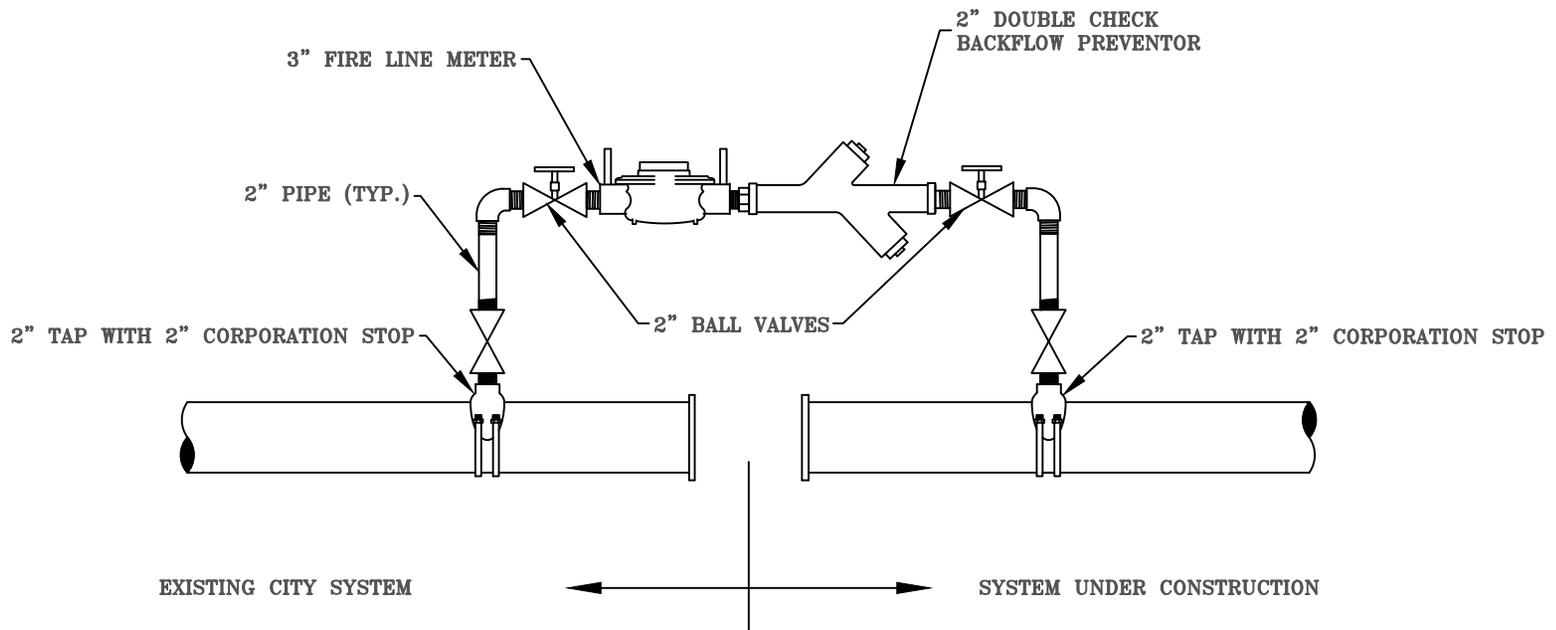
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

W-07B



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.

ORIGINAL: HGB- 2006



**CITY OF POOLER
2024 STANDARD DETAIL**

JUMPER CONNECTION

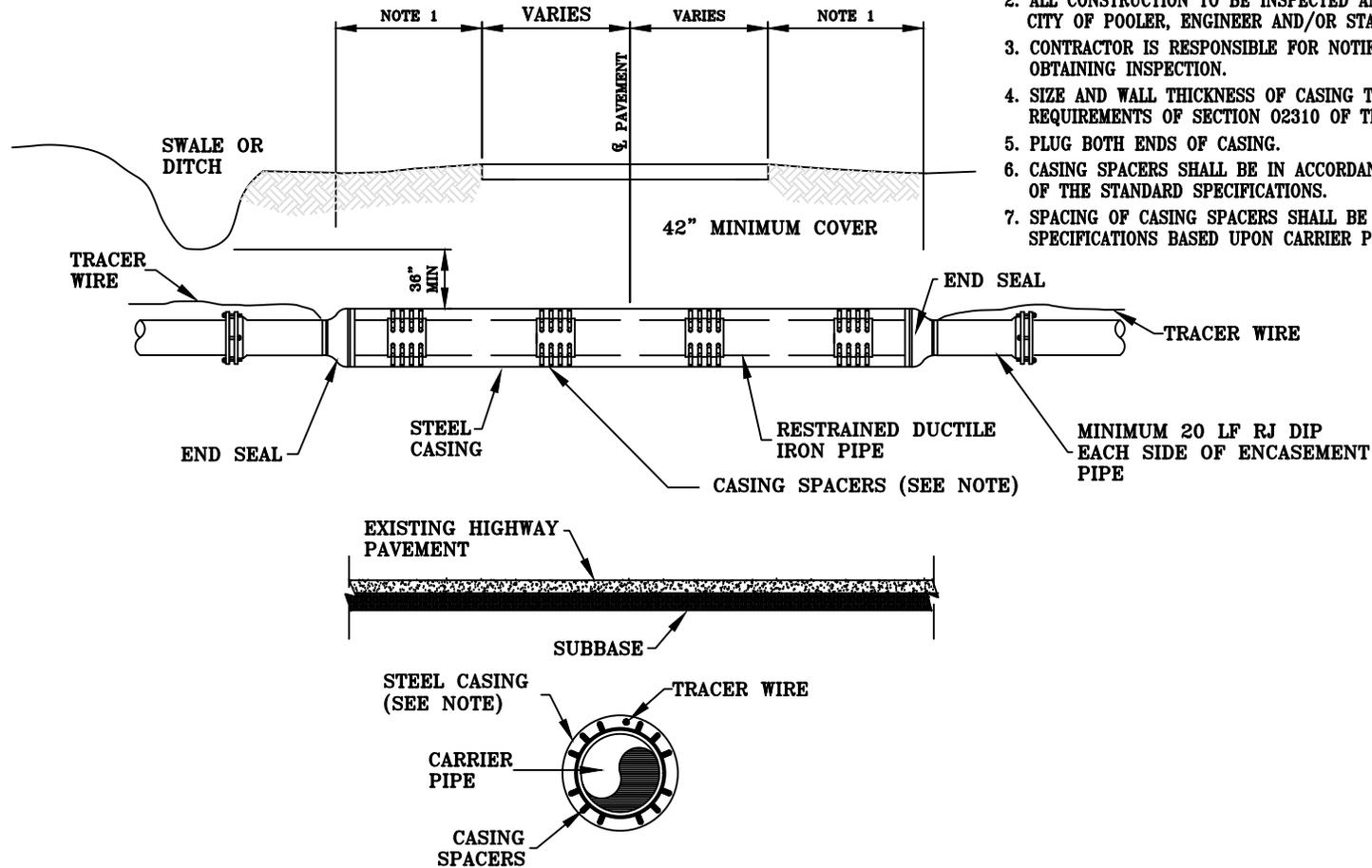
CHECKED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

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**

ORIGINAL: HGB- 2006



**CITY OF POOLER
2024 STANDARD DETAIL**

**JACK AND BORE
(WATER SYSTEM ONLY)**

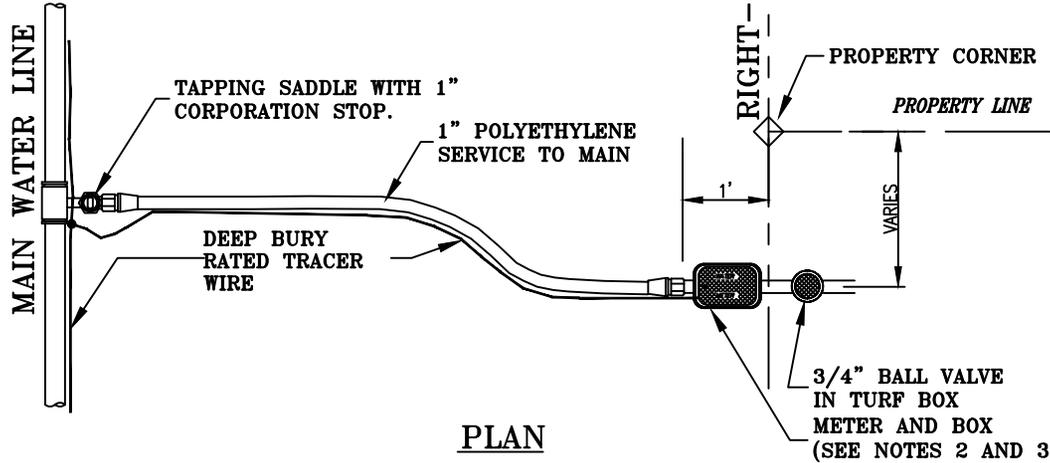
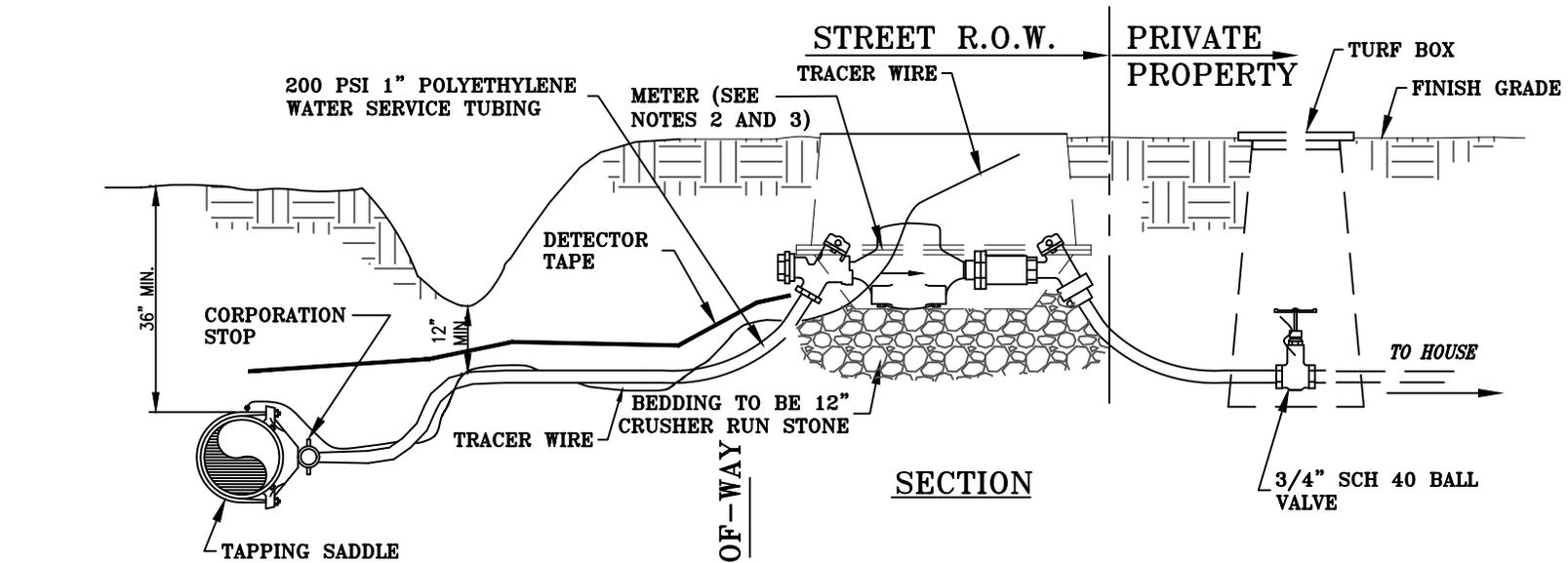
CHECKED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

W-09



- NOTE:**
1. ALL SERVICE PIPING SHALL BE WRAPPED WITH TRACER WIRE AND TERMINATED AT THE PROPERTY LINE.
 2. METERS MUST BE SMART POINT.
 3. METERS CAN'T BE INSTALLED IN HARD SURFACES LIKE CONCRETE.
 4. ALL SYSTEM COMPONENTS DOWNSTREAM FROM THE METER OR FROM THE PRIVATE SIDE OF THE PROPERTY LINE ARE PRIVATE. THEY ARE OWN AND SHALL BE MAINTAINED BY THE PROPERTY OWNER.

TYPICAL SINGLE SERVICE CONNECTION

ORIGINAL: HGB- 2006



**CITY OF POOLER
2024 STANDARD DETAIL**

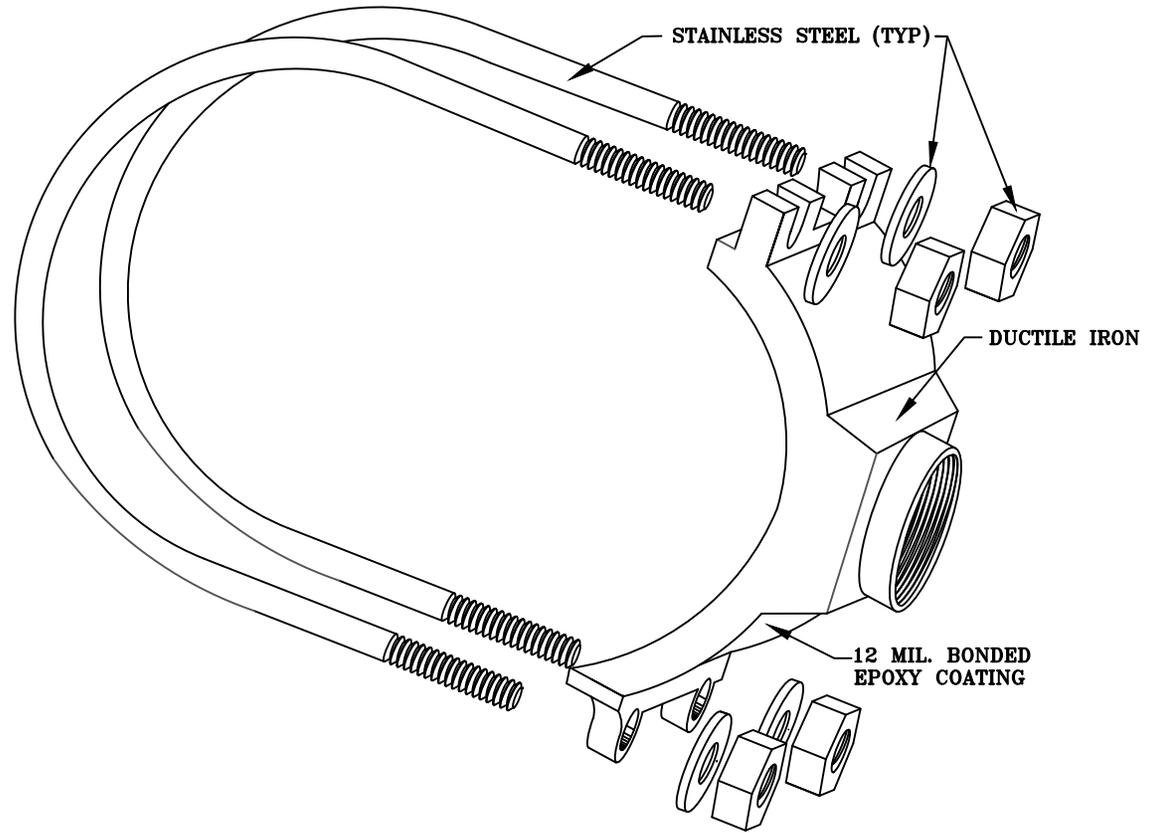
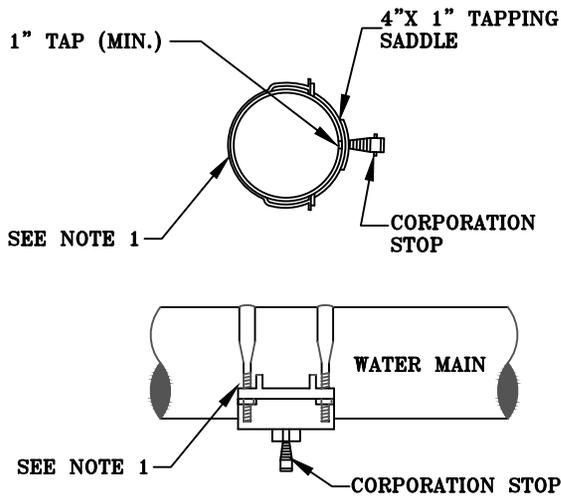
SERVICE CONNECTION

REVISED BY: EOM
 CHECKED BY: J. W.
 SCALE: N.T.S.
 DATE: APRIL, 2024

W-10

NOTES:

1. TAPPING SADDLE TO BE DUCTILE IRON WITH TYPE 304 STAINLESS STEEL FORGED DOUBLE STRAP, BOLTS, NUTS, AND WASHERS. FINISH IS FUSION BONDED NYLON TO AN AVERAGE THICKNESS OF 12 MILS.
2. ALL TAPS ON WATER MAIN LINES WILL REQUIRE A TAPPING SADDLE.



**CITY OF POOLER
2024 STANDARD DETAIL**

1" AND 2" TAPPING SADDLE

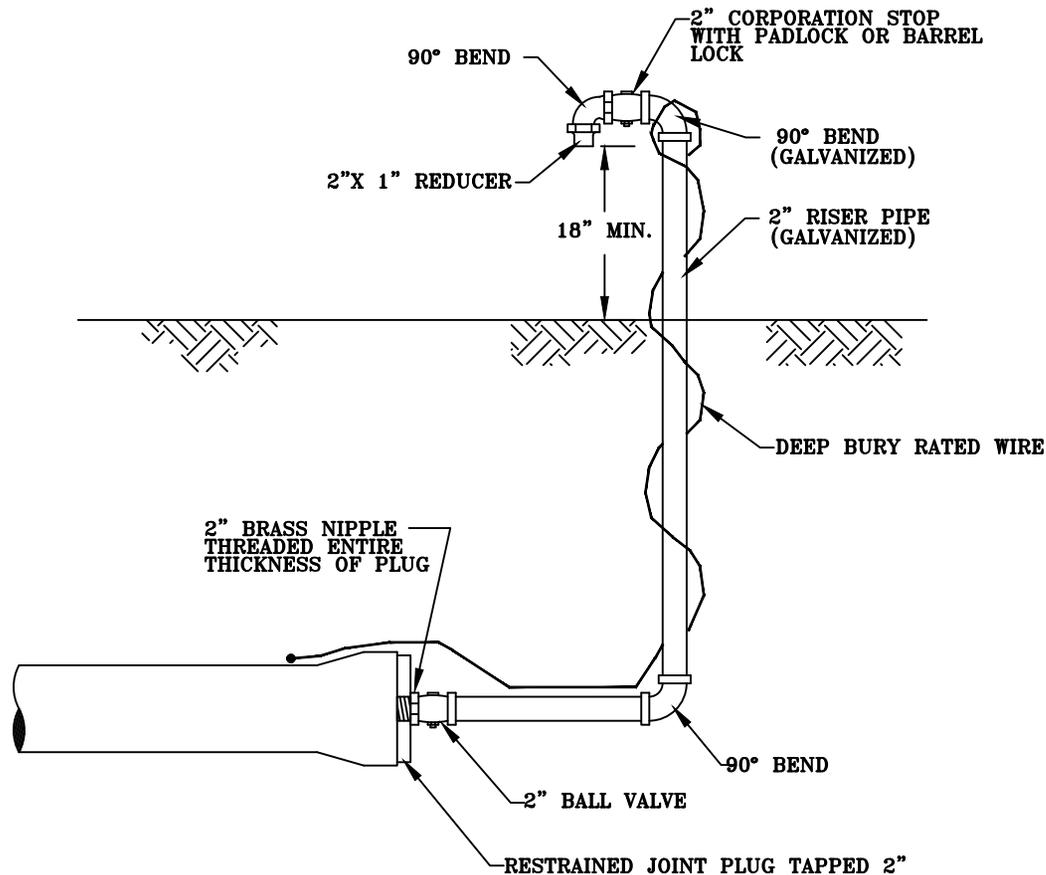
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

W-11



NOTE:

1. TO BE USED DURING CONSTRUCTION ONLY.
2. EXPOSED CORPORATION STOP SHALL BE SECURELY LOCKED AT ALL TIMES.
3. BALL VALVE SHALL BE TURNED OFF, BLOW OFF REMOVED, AND BALL VALVE PLUGGED AFTER WATER SAMPLES HAVE PASSED.

ORIGINAL: HGB- 2006



**CITY OF POOLER
2024 STANDARD DETAIL
TEMPORARY SAMPLING
STATION FOR CONSTRUCTION**

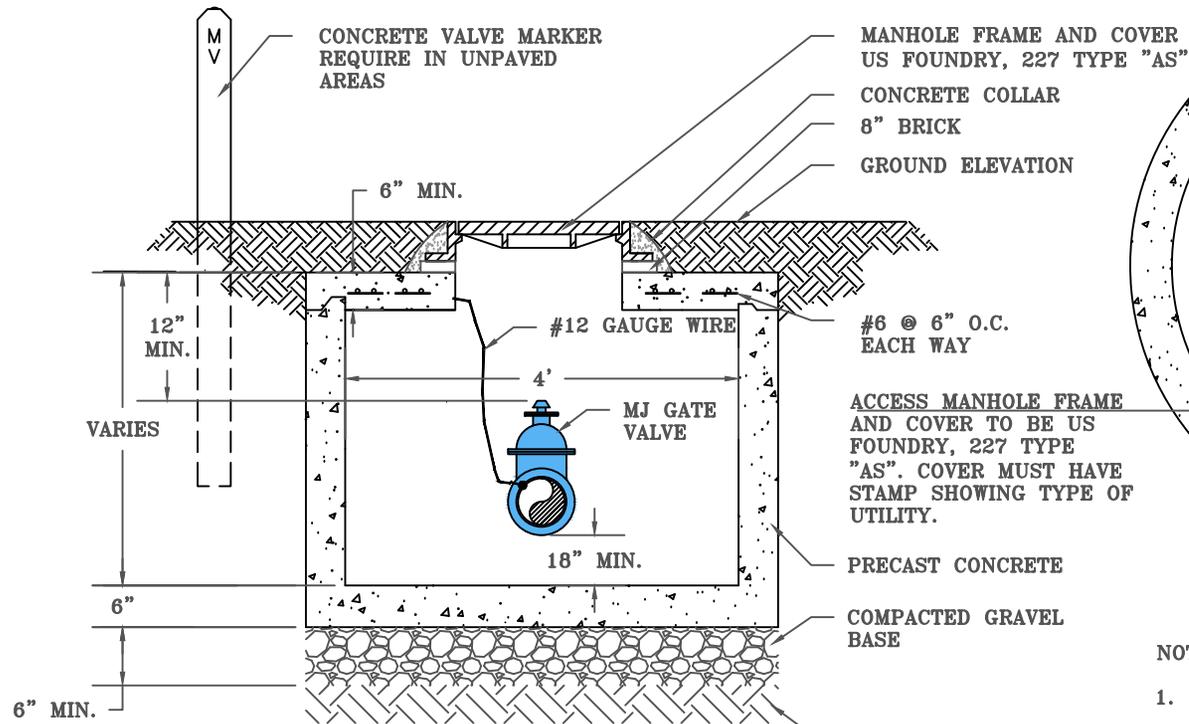
REVISED BY: EOM

CHECKED BY: J. W.

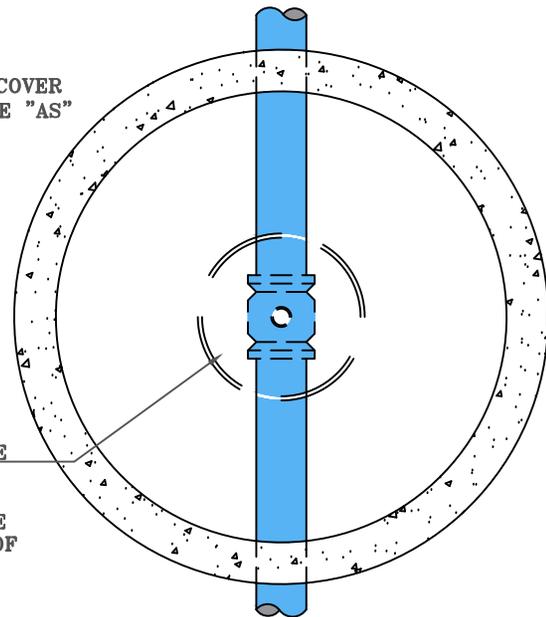
SCALE: N.T.S.

DATE: APRIL, 2024

W-12



SECTION

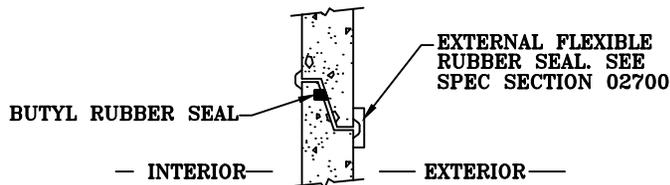


PLAN

NOTES:

1. THE BOTTOM OF THE MANHOLE FRAME SHALL NOT BE MORE THAN 12" ABOVE THE TOP OF THE MANHOLE STRUCTURE.
2. PRECAST CONCENTRIC CONE RISERS MAY BE USED WHERE REQUIRED FOR DEPTH.
3. THE MANHOLE FRAME AND COVER MUST BE CENTERED OVER THE VALVE OPERATING NUT.
4. MANHOLE STEPS SHALL BE PROVIDED FOR MANHOLES GREATER THAN 5 FEET DEEP. INSTALLATION MUST MEET THE LATEST OSHA REQUIREMENTS.
5. CHECK BUOYANCY OF M.H. AND MODIFY IF NEEDED.

ORIGINAL: HGB- 2006



JOINT DETAIL



**CITY OF POOLER
2024 STANDARD DETAIL
VALVE MANHOLE FOR 4" TO 8"
GATE VALVES**

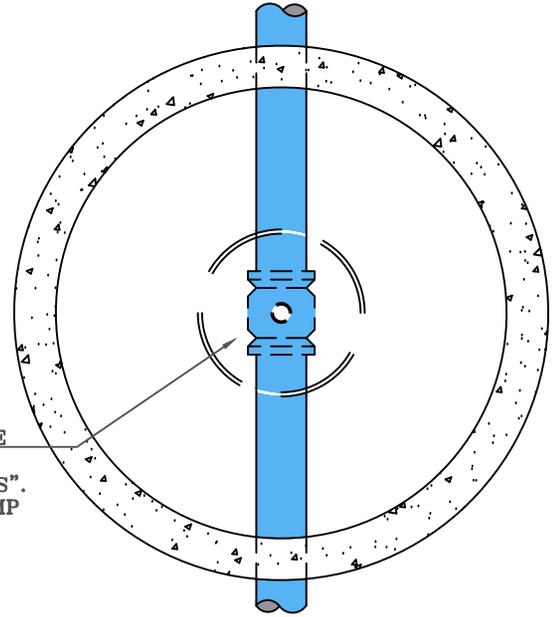
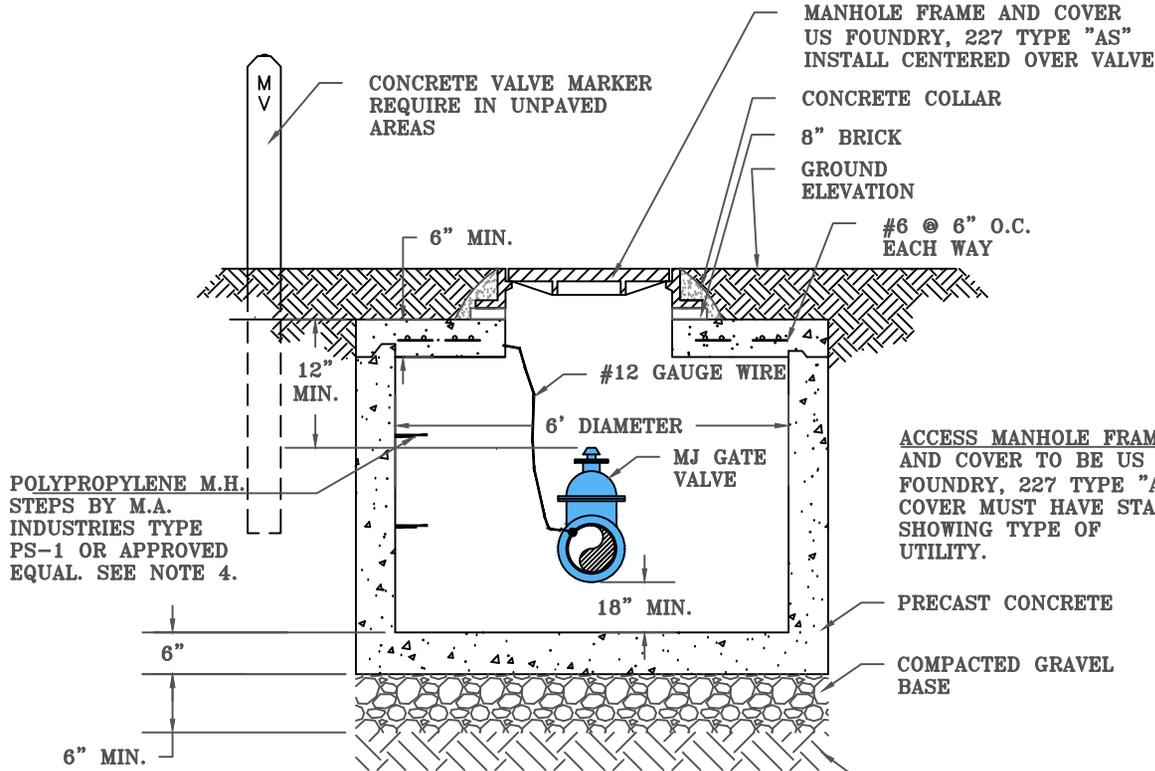
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

W-13



PLAN

ACCESS MANHOLE FRAME AND COVER TO BE US FOUNDRY, 227 TYPE "AS". COVER MUST HAVE STAMP SHOWING TYPE OF UTILITY.

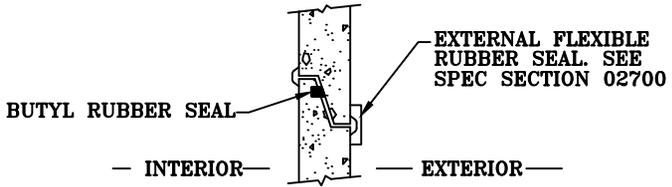
PRECAST CONCRETE
COMPACTED GRAVEL BASE

COMPACTED SOIL SUB-BASE. IF UNSUITABLE SOILS ARE FOUND, THEY MUST BE REPLACED, UP TO 2' DEEP, WITH SUITABLE SOILS THAT MEET ASTM-D-2487.

NOTES:

1. THE BOTTOM OF THE MANHOLE FRAME SHALL NOT BE MORE THAN 12" ABOVE THE TOP OF THE MANHOLE STRUCTURE.
2. PRECAST CONCENTRIC CONE RISERS MAY BE USED WHERE REQUIRED FOR DEPTH.
3. THE MANHOLE FRAME AND COVER MUST BE CENTERED OVER THE VALVE OPERATING NUT.
4. MANHOLE STEPS SHALL BE PROVIDED FOR MANHOLES GREATER THAN 5 FEET DEEP. INSTALLATION MUST MEET THE LATEST OSHA REQUIREMENTS.
5. CHECK BUOYANCY OF M.H. AND MODIFY IF NEEDED.

SECTION



JOINT DETAIL

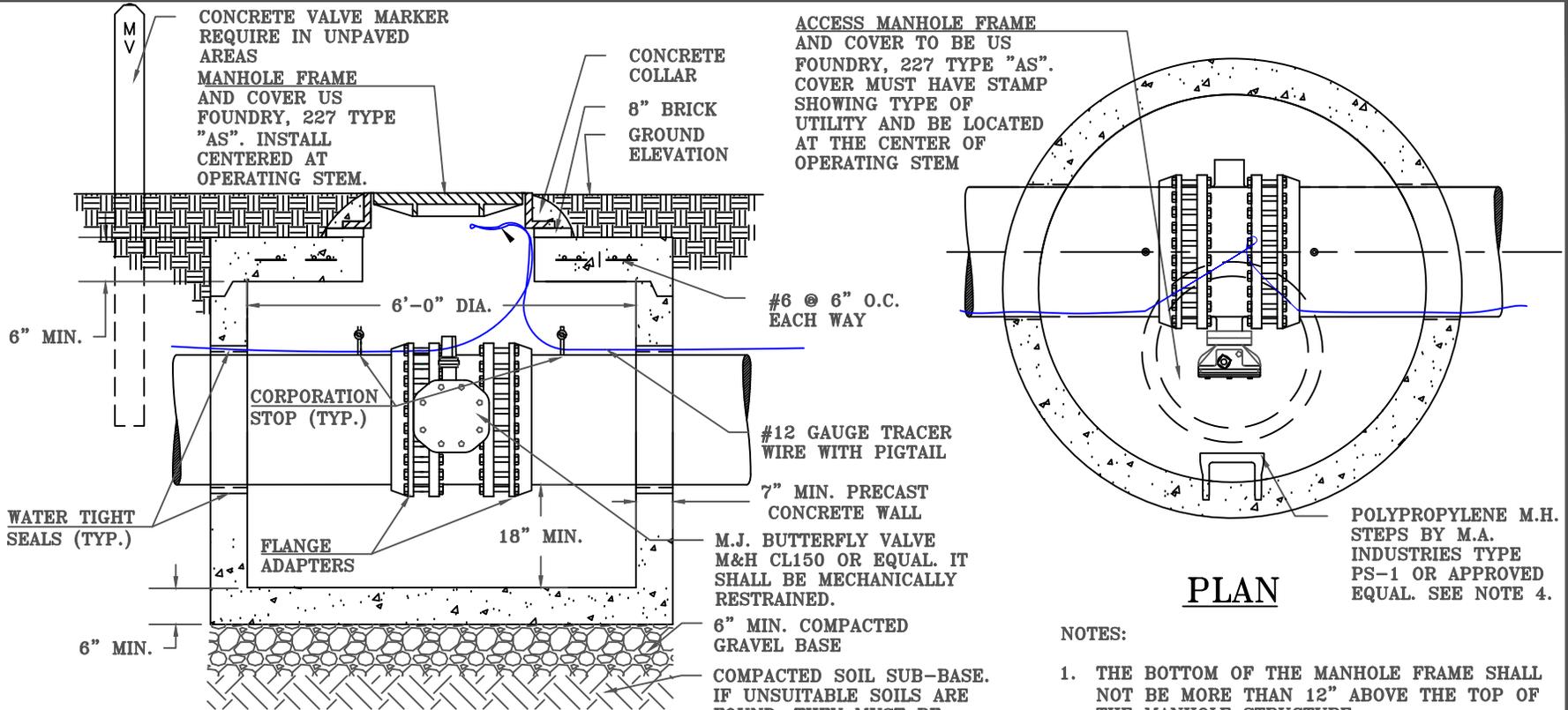
ORIGINAL: HGB- 2011



**CITY OF POOLER
2024 STANDARD DETAIL
VALVE MANHOLE FOR 10" TO 12"
GATE VALVES**

REVISED BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024

W-14



SECTION

PLAN

JOINT DETAIL

NOTES:

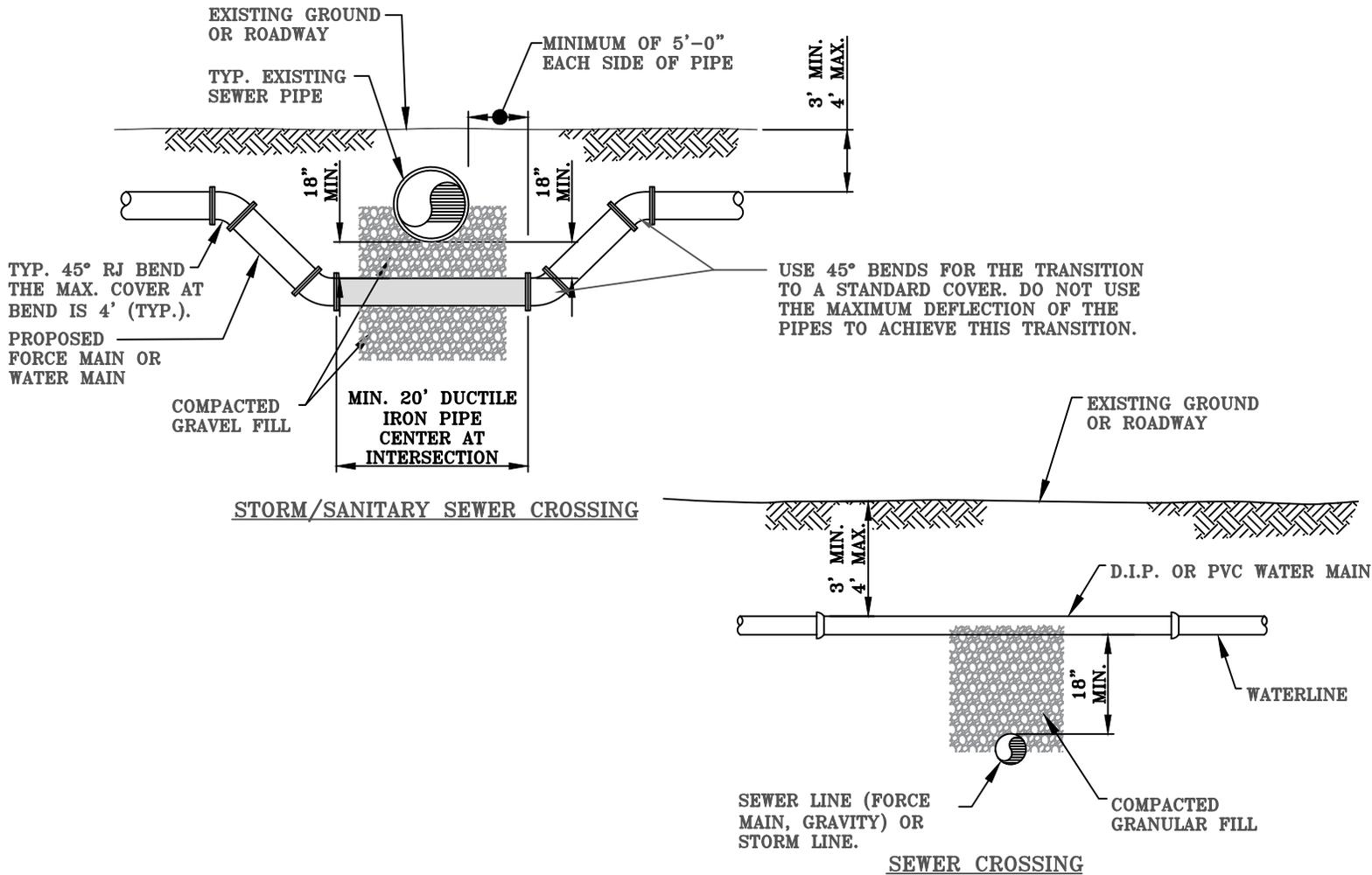
1. THE BOTTOM OF THE MANHOLE FRAME SHALL NOT BE MORE THAN 12" ABOVE THE TOP OF THE MANHOLE STRUCTURE.
2. PRECAST CONCENTRIC CONE RISERS MAY BE USED WHERE REQUIRED FOR DEPTH.
3. THE MANHOLE FRAME AND COVER MUST BE CENTERED OVER THE VALVE OPERATING NUT.
4. MANHOLE STEPS SHALL BE PROVIDED FOR MANHOLES GREATER THAN 5 FEET DEEP. INSTALLATION MUST MEET THE LATEST OSHA REQUIREMENTS.
5. CHECK BUOYANCY OF M.H. AND MODIFY IF NEEDED.



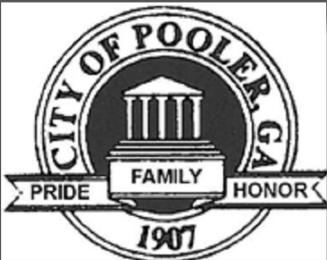
CITY OF POOLER
2024 STANDARD DETAIL
VALVE VAULT
14" TO 48" BUTTERFLY VALVE

DONE BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024

W-15



ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL**

PIPELINE CROSSING

REVISED BY: EOM

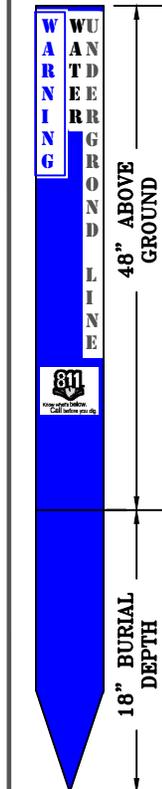
CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

W-16

TEST SPECIFICATIONS		TEST SPECIFICATIONS	
TENSILE STRENGTH	ASTM D638	VEHICLE IMPACT	10 IMPACTS @ 55 MPH - 10' WITHIN 30 SEC.
TENSILE ELONGATION	ASTM D638	ELONGATION @ BRAKE	ASTM D638 - 850%
TENSILE MODULUS	ASTM D638	FLEXURAL MODULUS	ASTM D790 - 185000 PSI
FLEXURAL STRENGTH	ASTM D790	HARDNESS	ASTM D2240 - 66 SHORE D SCALE
FLEXURAL MODULUS	ASTM D790	TENSILE IMPACT STRENGTH	ASTM D1822 - 115.00 FT-LB/IN
IZOD IMPACT STRENGTH	ASTM D256	TENSILE STRENGTH @ BRAKE	ASTM D638 - 4,200 PSI
HEAT DEFLECTION TEMP.	ASTM D648	BRITTLE TEMP.	ASTM D746 - -105 F
VICAT SOFTENING TEMP.	ASTM D1525	HEAT DEFLECTION TEMP.	ASTM D648 - 165 F
FLAMMABILITY	UL94	VICAT SOFTENING TEMP.	ASTM D1525 - 261 F
		DEFLECTION TEMP @ 66 PSI	ASTM D638 - 165 F



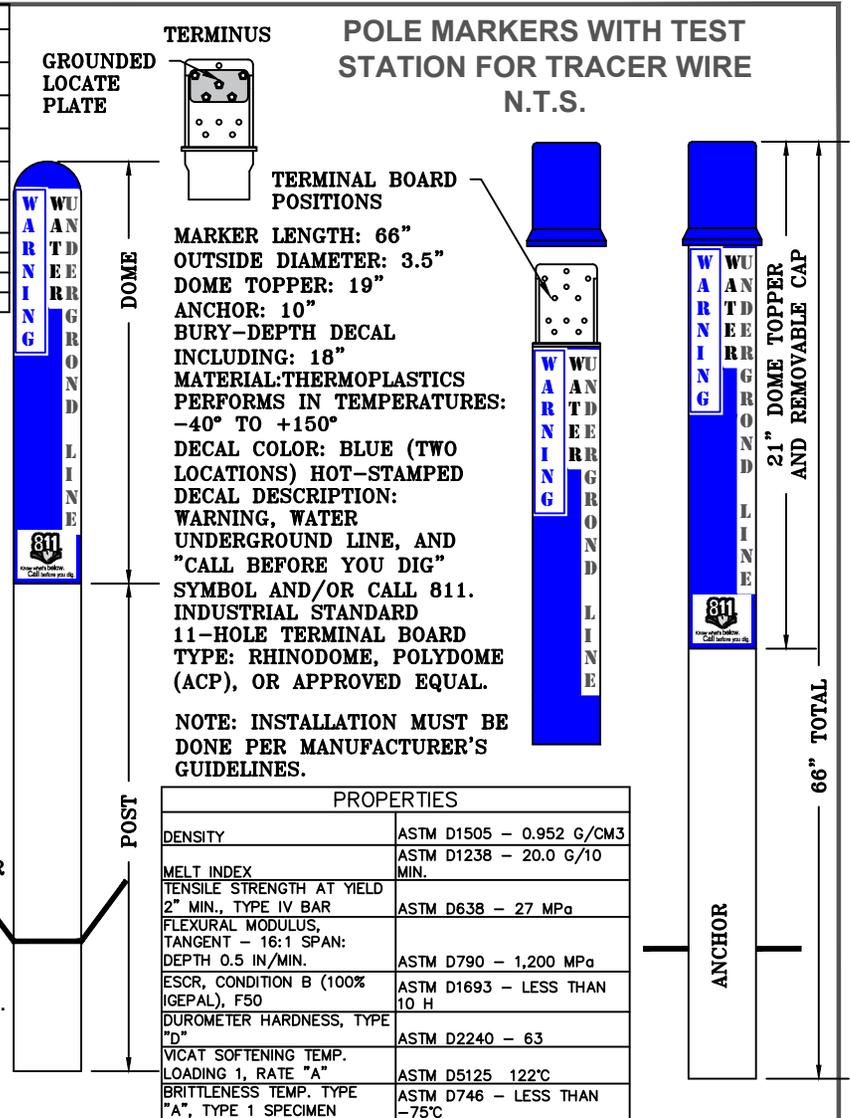
MARKER LENGTH: 66"
MARKER WIDTH: 4"
MARKER WEIGHT: 2.4 LBS
STANDARD DECAL LENGTH: 2.75"
MATERIAL: ENGINEERING FORMULATED THERMOPLASTIC
DECAL AND POST COLOR: BLUE
DECAL DESCRIPTION: WARNING, WATER UNDERGROUND LINE, AND "CALL BEFORE YOU DIG" SYMBOL AND/OR CALL 811.
TYPE: PRO-MARK PM301 FLEXIBLE MARKER OR APPROVED EQUAL.

POST LENGTH: 55"
POST WALL THICKNESS: 0.135"
ANCHOR OD: .80"/LENGTH 10"
TOTAL WEIGHT: 3.0 LBS.
STANDARD DECAL LENGTH: 2.75"
MATERIAL: VIRGIN PRIME HDPE
POST COLOR: BLUE
DECAL DESCRIPTION: WARNING, WATER UNDERGROUND LINE, AND "CALL BEFORE YOU DIG" SYMBOL AND/OR CALL 811.
TYPE: PRO-MARK PM303 FLEXIBLE MARKER POST OR APPROVED EQUAL.

NOTE: INSTALLATION MUST BE DONE PER MANUFACTURER'S GUIDELINES.

POLE MARKERS N.T.S.

- INSTALLATION NOTES:**
1. POLE MARKERS MUST BE INSTALLED EVERY 500 FT.
 2. EVERY OTHER MARKER MUST HAVE A TEST STATION WITH TRACER WIRE
 3. TESTING STATIONS NEED TO BE LOCATED AT EACH END OF LINES WITH CASINGS.
 4. A MINIMUM OF TWO MARKERS NEED TO BE INSTALLED. ONE OF THOSE MARKER NEEDS TO BE A TESTING STATION.



PROPERTIES	
DENSITY	ASTM D1505 - 0.952 G/CM3
MELT INDEX	ASTM D1238 - 20.0 G/10 MIN.
TENSILE STRENGTH AT YIELD 2" MIN., TYPE IV BAR	ASTM D638 - 27 MP _a
FLEXURAL MODULUS, TANGENT - 16:1 SPAN: DEPTH 0.5 IN./MIN.	ASTM D790 - 1,200 MP _a
ESCR, CONDITION B (100% IGEPAL), F50	ASTM D1693 - LESS THAN 10 H
DUROMETER HARDNESS, TYPE "D"	ASTM D2240 - 63
VICAT SOFTENING TEMP. LOADING 1, RATE "A"	ASTM D5125 122°C
BRITTLINESS TEMP. TYPE "A", TYPE 1 SPECIMEN	ASTM D746 - LESS THAN -75°C



CITY OF POOLER
2024 STANDARD DETAIL
UTILITY POLE MARKERS
FOR WATER LINES

DONE BY: EOM

CHECKED BY: J. W.

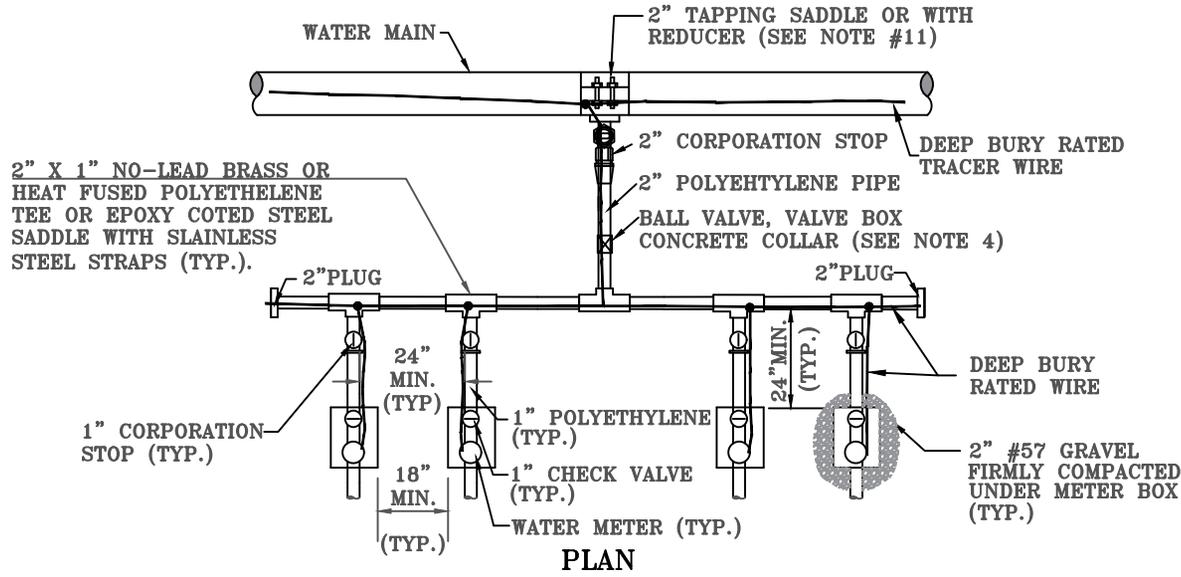
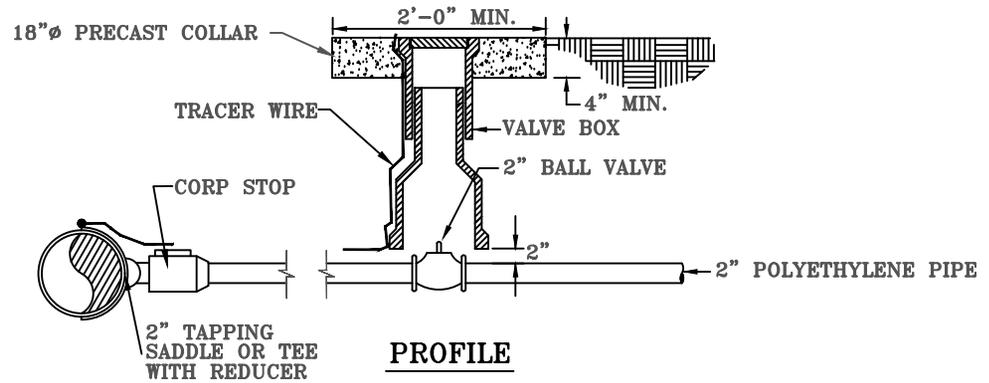
SCALE: N.T.S.

DATE: APRIL, 2024

W-17

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.
5. ALL METER MUST HAVE BACFLOW PREVENTORS.
6. LEAD FITTINGS, JOINTS, COUPLINGS, ETC. ARE NOT ALLOWED TO BE USED IN THE WATER SYSTEM.
7. DESIGN ENGINEER MUST VERIFY IF ANY COMPONENT OF THE MANIFOLD WILL REQUIRE TO BE RESTRAINED.



ORIGINAL: HGB-2011



**CITY OF POOLER
2024 STANDARD DETAIL
MANIFOLD FOR MULTIPLE 3/4"
OR 1" METER INSTALLATION**

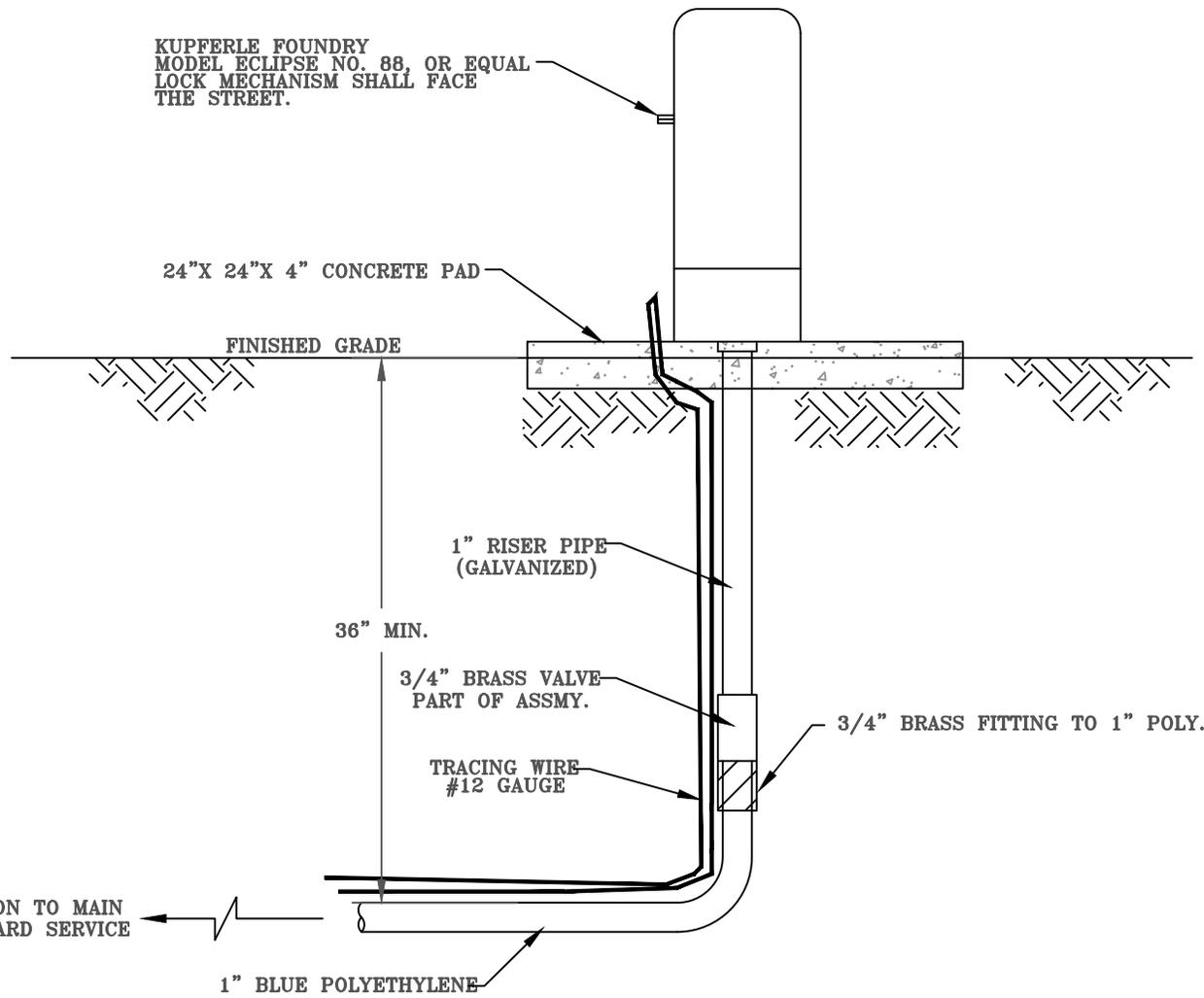
REVISED BY: EOM

CHECKED BY: J. W.

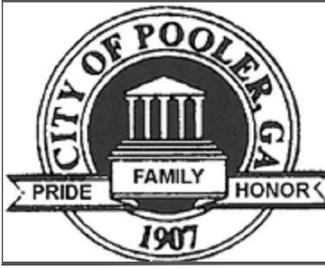
SCALE: N.T.S.

DATE: APRIL, 2024

W-18



ORIGINAL: HGB-2004

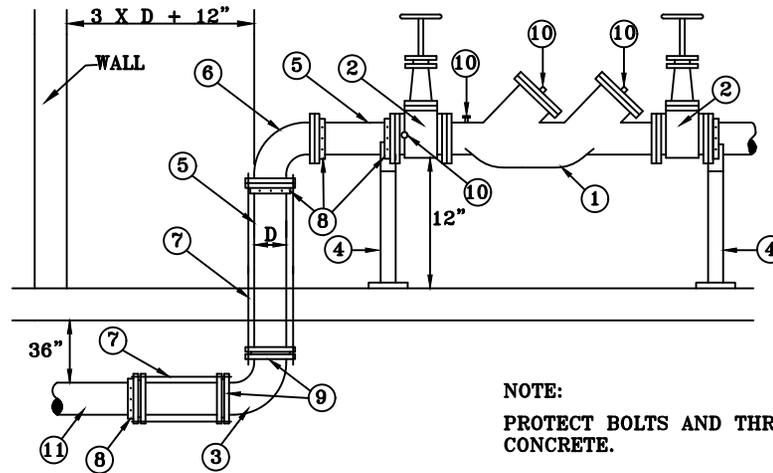


**CITY OF POOLER
2024 STANDARD DETAIL**

PERMANENT SAMPLING STATION

CHECKED BY: EOM
 CHECKED BY: J. W.
 SCALE: N.T.S.
 DATE: APRIL, 2024

W-19



NOTE:
PROTECT BOLTS AND THREADS FROM
CONCRETE.

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.

MATERIALS		
ITEM	QUAN.	DESCRIPTION
1	1	REDUCED PRESSURE ZONE DEVICE
2	2	OS&Y RESILIENT SEAT GATE VALVES
3	1	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	2	MJ RESTRAINTS
10	4	BRASS PLUGS INSERTED IN TEST COCKS
11		DUCTILE IRON PIPE

ORIGINAL: HGB-2011



CITY OF POOLER
2024 STANDARD DETAIL
REDUCED PRESSURE ZONE DEVICE
DOUBLE CHECK VALVE TYP.
 INSIDE BUILDING INSTALLATION

CHECKED BY: EOM

CHECKED BY: J. W.

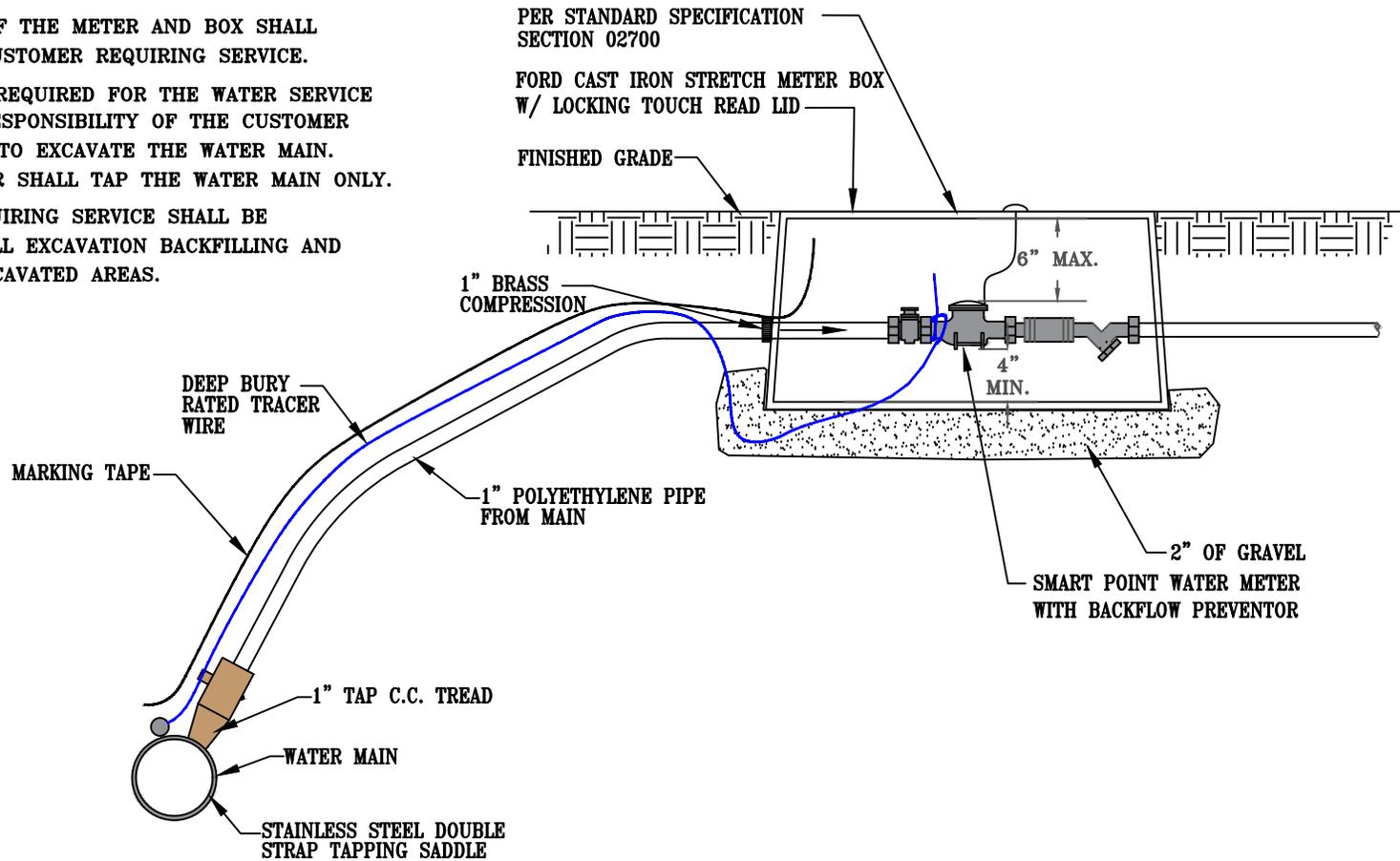
SCALE: N.T.S.

DATE: APRIL, 2024

W-20

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.



ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL**

WATER METER INSTALLATION
1" SERVICE PIPE, 3/4" OR 1" WATER METERS FOR
DOMESTIC, IRRIGATION & COMMERCIAL USE ONLY

REVISED BY: EOM

CHECKED BY: J. W.

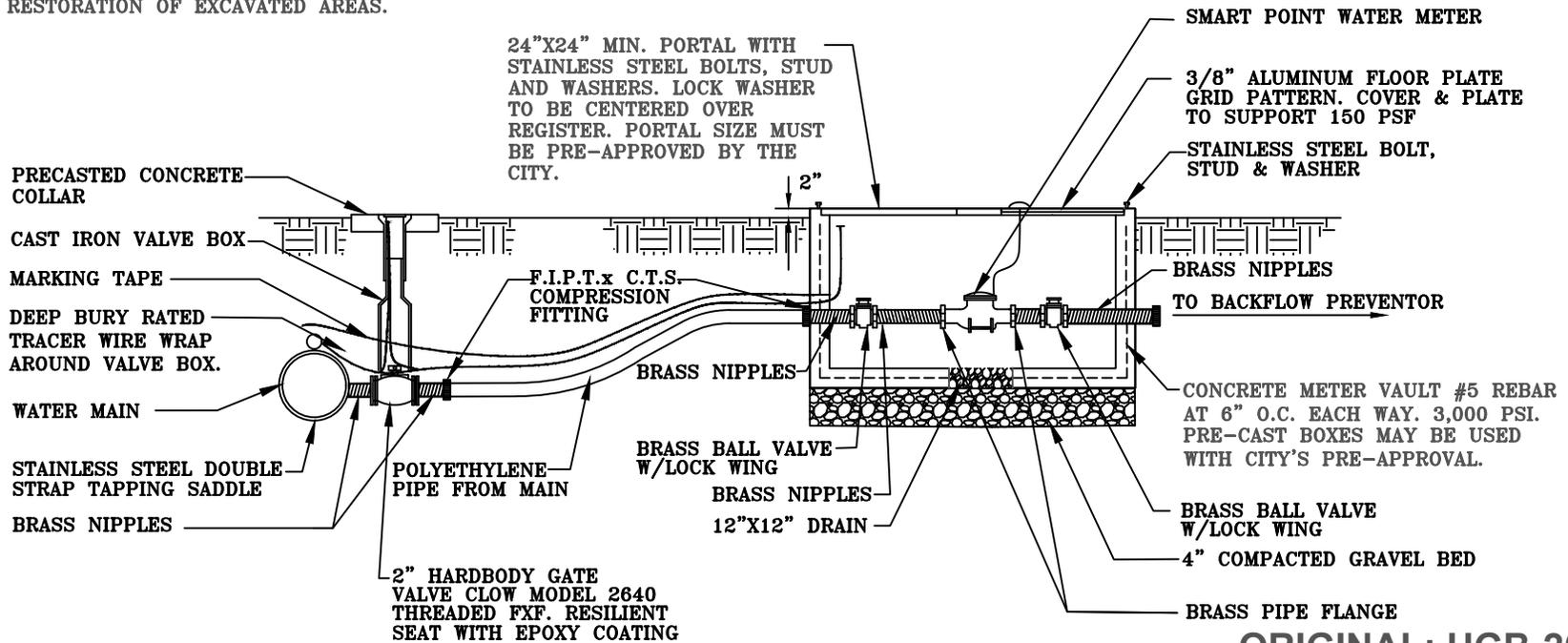
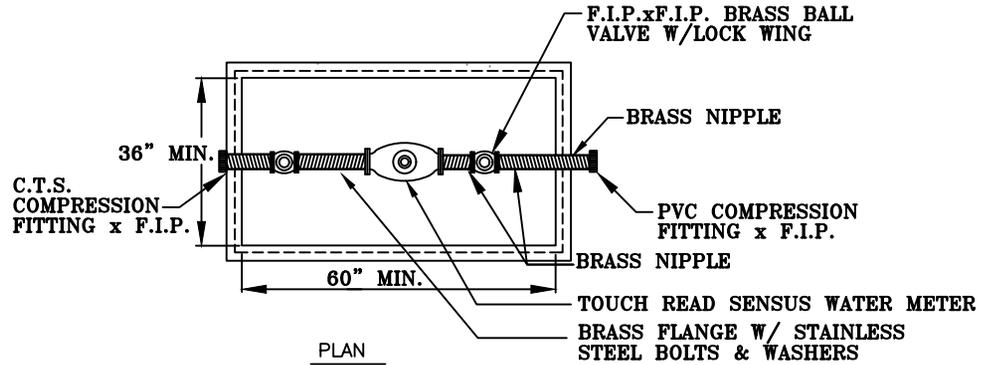
SCALE: N.T.S.

DATE: APRIL, 2024

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 THE BOX SHALL BE DONE BY THE CUSTOMER REQUIRING THE 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 TAP OF THE WATER MAIN SHALL BE DONE BY THE CITY OF POOLER.
4. THE CUSTOMER REQUIRING THE SERVICE SHALL BE RESPONSIBLE FOR ALL EXCAVATION BACKFILLING AND RESTORATION OF EXCAVATED AREAS.



ORIGINAL: HGB-2011



**CITY OF POOLER
2024 STANDARD DETAIL**

**WATER METER INSTALLATION
2" SERVICE PIPE, 1 1/2" OR 2" WATER METERS FOR
IRRIGATION ONLY**

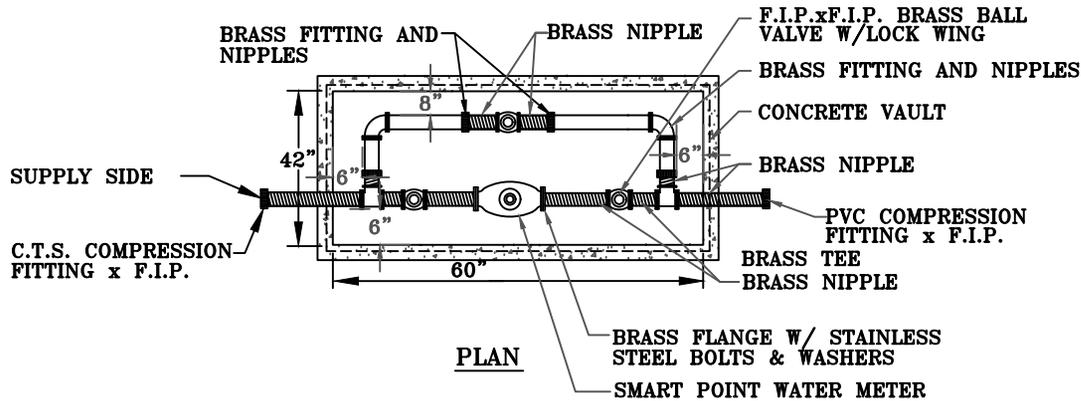
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

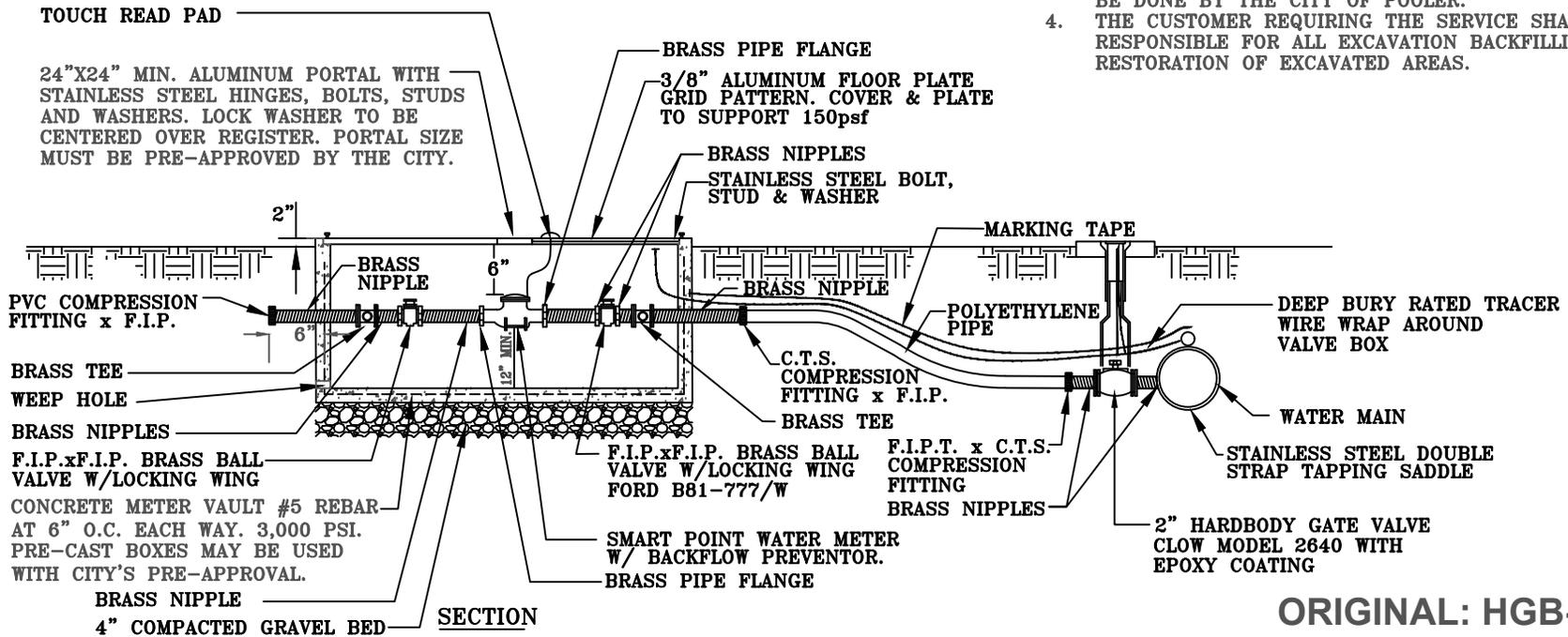
DATE: APRIL, 2024

W-22



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 THE BOX SHALL BE DONE BY THE CUSTOMER REQUIRING THE 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 TAP OF THE WATER MAIN SHALL BE DONE BY THE CITY OF POOLER.
4. THE CUSTOMER REQUIRING THE SERVICE SHALL BE RESPONSIBLE FOR ALL EXCAVATION BACKFILLING AND RESTORATION OF EXCAVATED AREAS.



ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL**

**WATER METER INSTALLATION
2" SERVICE PIPE & 1 1/2" OR 2" WATER METERS
DOMESTIC**

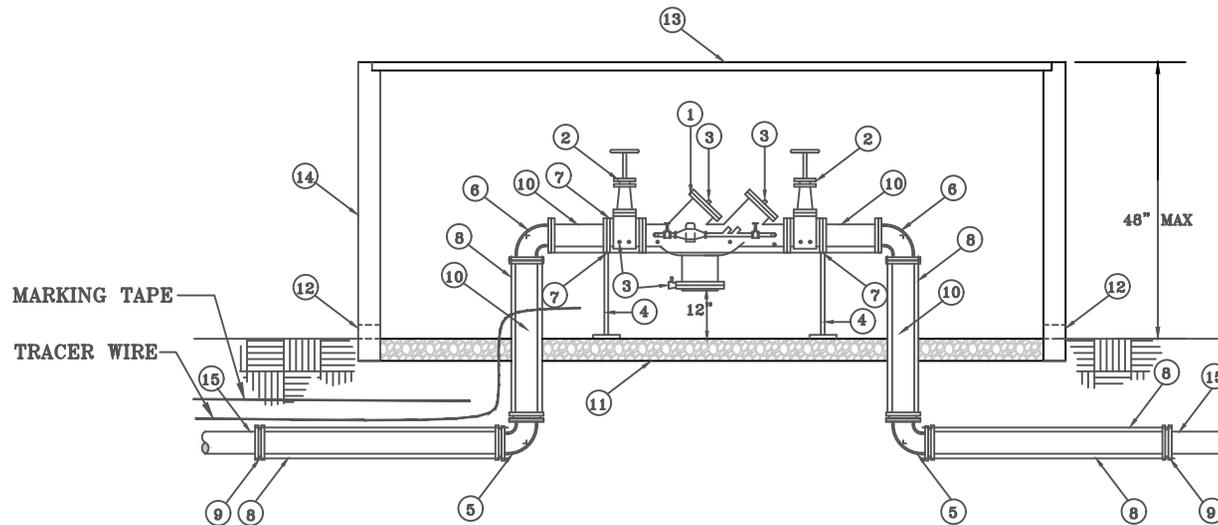
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

W-23



NOTE:

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.

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

ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL**

**REDUCED PRESSURE DETECTOR
FOR FIRE SYSTEMS**

CHECKED BY: EOM

CHECKED BY: J. W.

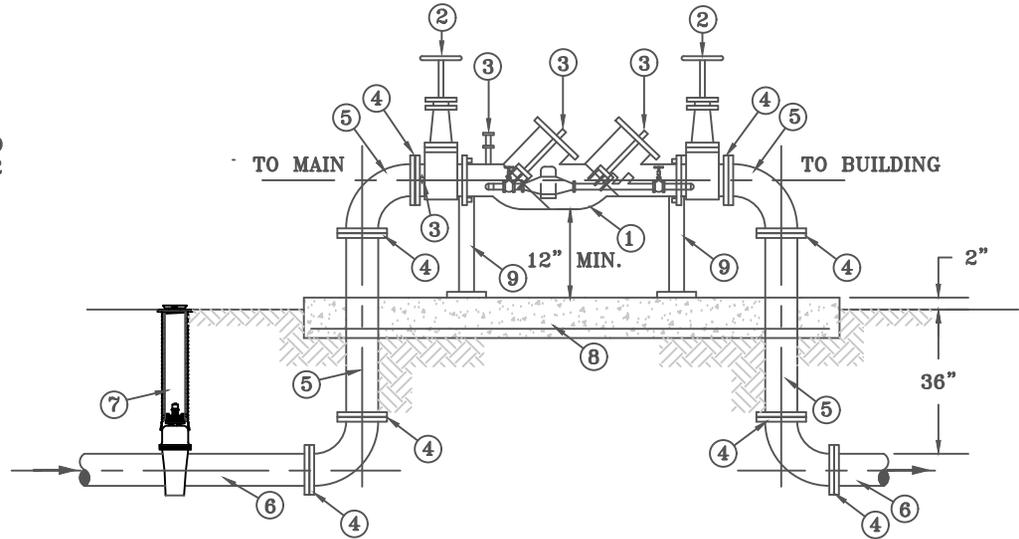
SCALE: N.T.S.

DATE: APRIL, 2024

W-24

NOTE:

1. 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. GUARD POST(S) MUST BE INSTALLED IF THE ASSEMBLY IS EXPOSED TO POSSIBLE DAMAGE FROM VEHICLES.
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 APPLICATIONS, OTHER THAN BACKFLOW DEVICE TESTING.
4. BACKFLOW PREVENTION DEVICES FOR FIRE PROTECTION SHALL BE DOUBLE DETECTOR CHECK VALVE ASSEMBLIES, THEY SHALL BE USC APPROVED, PAINTED RED, AND MEET ALL REQUIREMENTS OF ANSI/AWWA C510.
5. ALL PIPING AND EQUIPMENT ABOVE GROUND, EXCEPT FOR THE BRASS AND STAINLESS STEEL PARTS, SHALL BE FINISHED WITH RED ENAMEL PAINT (KOP-COAT 0508 LEAD-FREE).
6. THE FIRE DEPARTMENT SHALL PROVIDE THE LOCK AND THE CONTRACTOR SHALL PROVIDE THE CHAIN FOR THE GATE VALVES.
7. ADJUSTABLE PIPE SADDLE SUPPORT (GRINNELL FIG. 264, OR EQUAL) SIZED TO FIT CURVATURE OF OF THE DOUBLE DETECTOR CHECK VALVE ASSEMBLY, WITH GALVANIZED STEEL PIPE STAND AND FLOOR FLANGE. ATTACH FLOOR FLANGE TO CONCRETE SLAB WITH GALVANIZED EXPANSION BOLTS.
8. CITY DEPARTMENTS SHALL HAVE UNRESTRICTED AND CONTINUOUS ACCESS TO THE DOUBLE DETECTOR CHECK VALVE ASSEMBLY.
9. TYPICAL OUTSIDE INSTALLATION 3",4",6",8", 10" & 12" SIZES.



MATERIALS	
ITEM	DESCRIPTION
1	DOUBLE DETECTOR CHECK VALVE ASSEMBLY
2	OS&Y RESILIENT SEAT GATE VALVES
3	TEST COCKS
4	FLANGE FITTING (TYPICAL)
5	DUCTILE IRON PIPE
6	D.I.P OR PVC
7	GATE VALVE AND BOX
8	8" CONC. SLAB W/ #4 @ 12" C.C. E.W.
9	2" SCH. 40 GALV. PIPE STAND & BASE BOLTED TO FLANGE



**CITY OF POOLER
2024 STANDARD DETAIL**

**DOUBLE DETECTOR CHECK VALVE
ASSEMBLY FOR FIRE SYSTEMS**

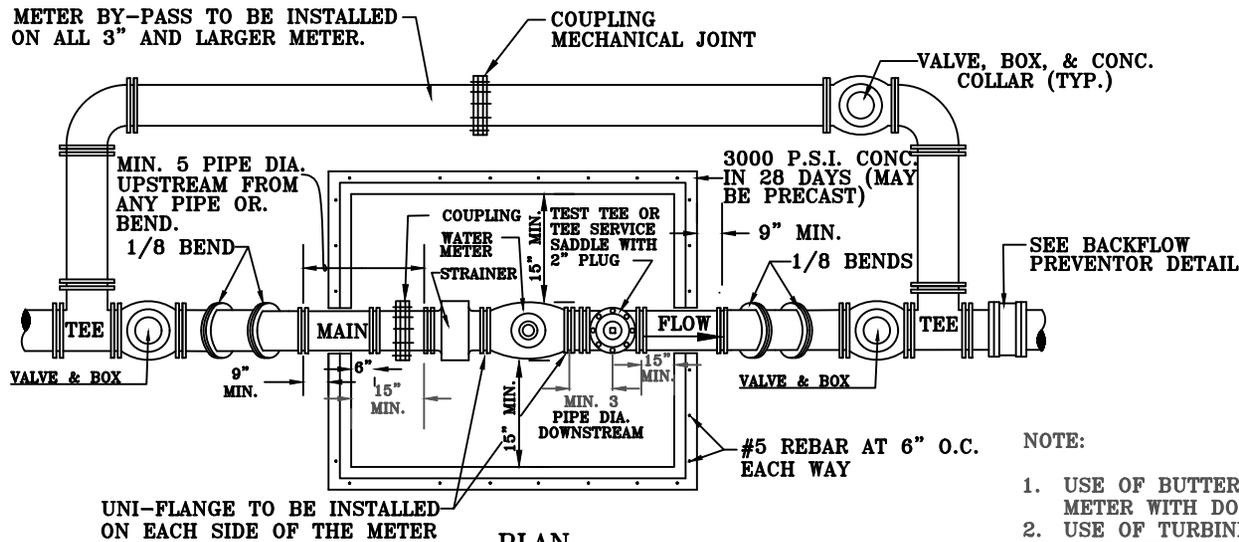
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

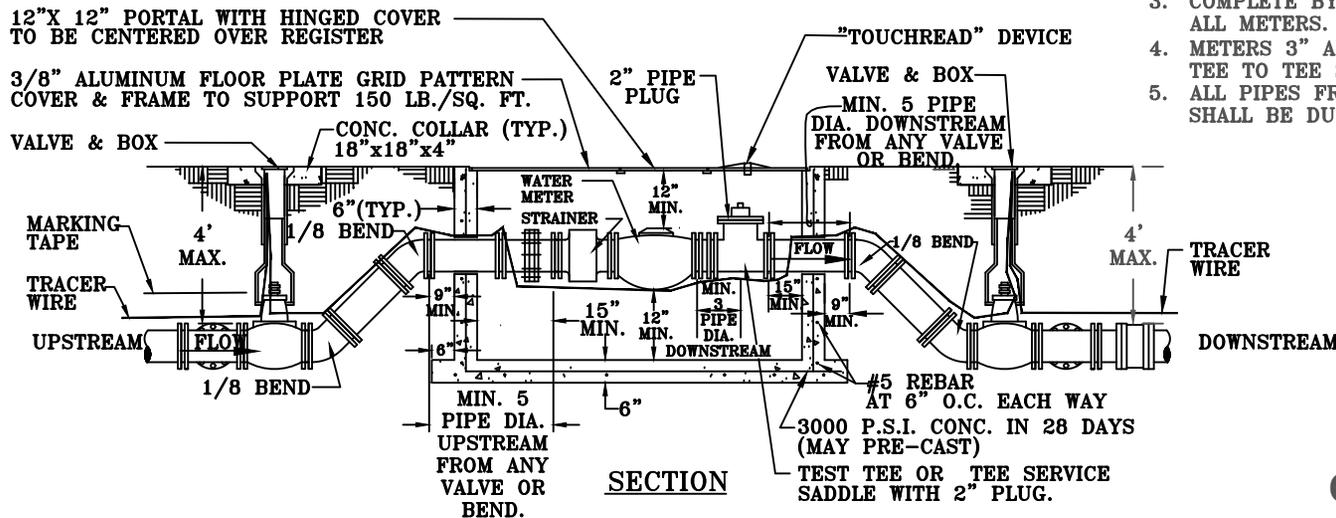
DATE: APRIL, 2025

W-25



NOTE:

1. USE OF BUTTERFLY VALVE SHALL REQUIRE METER WITH DOUBLE STRAINER.
2. USE OF TURBINE METER SHALL REQUIRE U.L. APPROVED STRAINER.
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 PIPES FROM TAP TO BACKFLOW PREVENTOR SHALL BE DUCTILE IRON WITH M.J. FITTINGS.



ORIGINAL: HGB-2011



CITY OF POOLER
2024 STANDARD DETAIL

MASTER WATER METER INSTALLATION
3" TO 10"

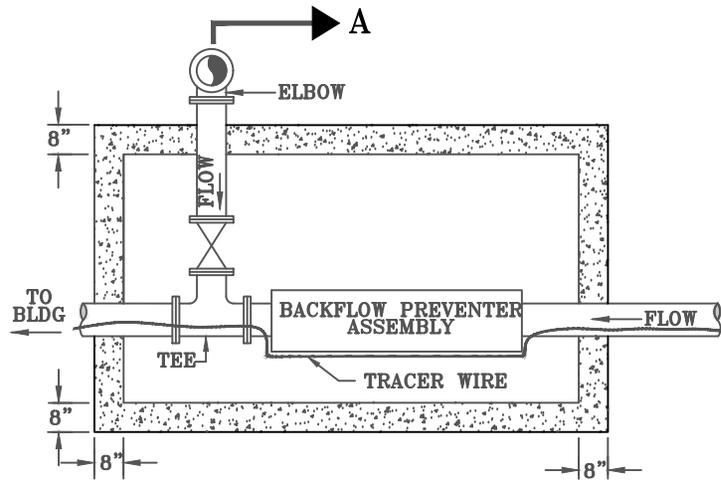
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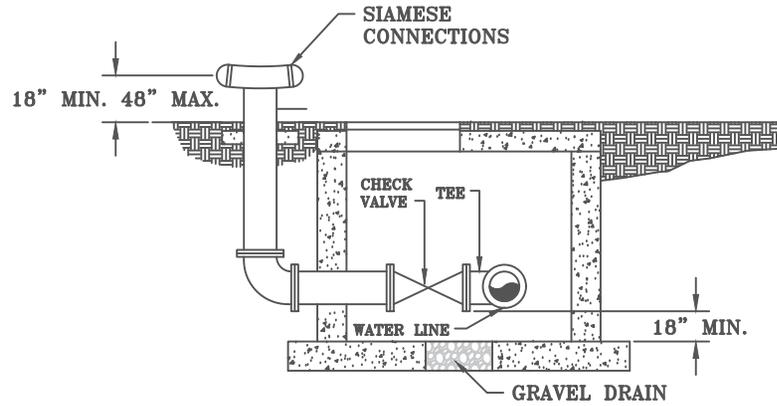
SCALE: N.T.S.

DATE: APRIL, 2025

W-26



PLAN
 → A



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.
7. IT MUST BE VISIBLE AND RECOGNIZABLE FROM THE STREET OR NEAREST POINT OF FIRE DEPARTMENT APPARATUS ACCESSIBILITY.
8. THEY SHOULD BE LOCATED AND ARRANGED SO THAT HOSE LINES CAN BE ATTACHED TO THE INLETS WITHOUT INTERFERENCE FROM NEARBY OBJECTS, INCLUDING BUILDINGS, FENCES, POSTS, LANDSCAPING, VEHICLES, OR OTHER FIRE DEPARTMENT CONNECTIONS.
9. IT SHOULD BE LOCATED NOT MORE THAN 100 FT FROM THE NEAREST FIRE HYDRANT CONNECTED TO AN APPROVED WATER SUPPLY.
10. ALL FIRE PROTECTION SYSTEMS NEED TO BE APPROVED BY THE FIRE MARSHALL.

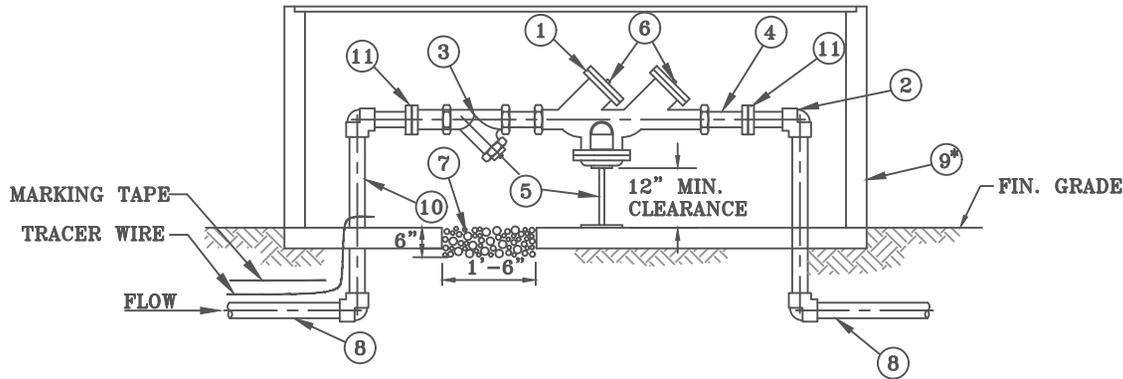
ORIGINAL: HGB-2011



**CITY OF POOLER
 2024 STANDARD DETAIL
 FIRE SERVICE SYSTEM FOR
 BUILDINGS**

**REVISED BY: EOM
 CHECKED BY: J. W.
 SCALE: N.T.S.
 DATE: APRIL, 2024**

W-27



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	STEEL PIPE SUPPORT WITH EPOXY COATING
6	2	BRASS PLUGS INSERTED IN TEST COCKS
7		6" GRAVEL & DRAIN
8		POLYTHYLENE PIPE WITH COMPRESSION FITTINGS
9 *		CITY APPROVED WEATHER PROOF ENCLOSURE WITH HATCH COVER FOR B.F.P.
10	2	CUT BRASS (DOMESTIC MADE)
11	2	UNION

* REQUIRED BY THE CITY FOR FREEZE PROTECTION

ORIGINAL: HGB-2011



CITY OF POOLER 2024 STANDARD DETAIL

BACKFLOW PREVENTER 3/4", 1", 1-1/2", AND 2"

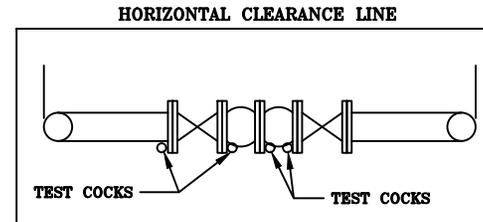
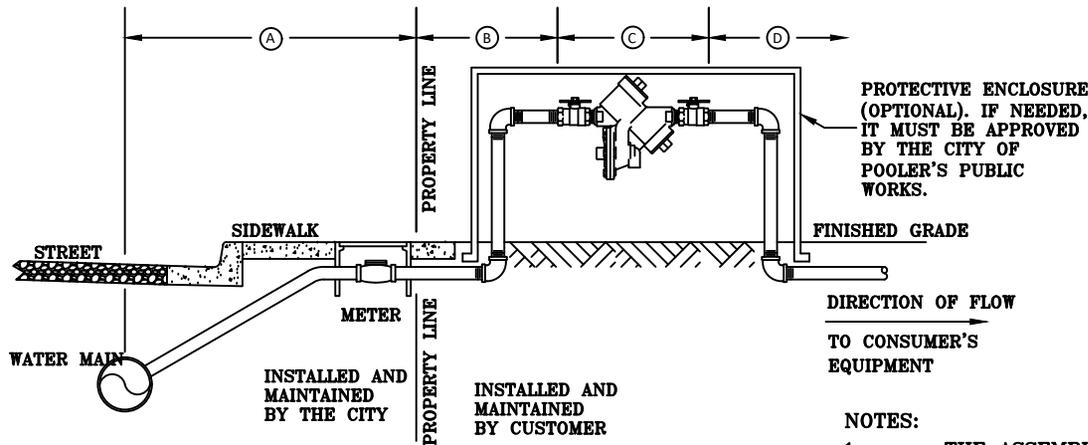
CHECKED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

W-28



NOTES:

1. THE ASSEMBLY MUST BE INSPECTED AND APPROVED BY THE CITY STAFF IMMEDIATELY AFTER INSTALLATION. THE ASSEMBLY MUST BE TESTED BY A CERTIFIED BACKFLOW TESTER.
2. NO CONNECTIONS, STRAINERS, OR TEES ARE PERMITTED BETWEEN THE METER AND BACKFLOW PREVENTER.
3. PRIOR TO INSTALLATION OF THE ASSEMBLY, THE WATER SERVICE SHALL BE FLUSHED.
4. A MANIFOLD CONNECTION WITH DUPLEX UNITS SHOULD BE INSTALLED IF AN UNINTERRUPTED SUPPLY OF WATER IS NECESSARY.
5. A PRESSURE RELIEF VALVE MAY NEED TO BE INSTALLED DOWNSTREAM OF THE REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTION ASSEMBLY PER SEC. 1007 OF THE UNIFORM PLUMBING CODE, AND/OR AS REQUIRED BY THE CITY.
6. SWAB INTERIOR OF PIPE, VALVES, AND FITTINGS, AND SWAB INTERIOR OF EXISTING MAINS TO WHICH NEW PIPING WILL BE CONNECTED (BOTH UPSTREAM AND DOWNSTREAM OF THE NEW BACKFLOW ASSEMBLY) WITH A 5% SODIUM HYPOCHLORITE SOLUTION. AFTER DISINFECTION, FLUSH WITH POTABLE WATER AGAIN UNTIL WATER IS FREE OF CHLORINE ODOR.
7. ANY BACKFLOW RELATED INSTALLATION AND/OR REPLACEMENT, INCLUDING PARTS, SHALL ADHERE TO THE MOST CURRENT CITY OF POOLER STANDARDS.

- Ⓐ INSTALL SERVICE LATERAL, EQUIPMENT AND METER PER CITY STNDS. LOCATIONS ARE SUBJECT TO APPROVAL BY PUBLIC WORKS.
- Ⓑ IF GIVEN A WAIVER TO INSTALL A BACKFLOW ASSEMBLY A CERTAIN DISTANCE FROM THE METER, THEN THE PIPING SHALL BE EXPOSED FROM THE SERVICE METER TO THE BACKFLOW ASSEMBLY WITH NO TEES (10 FT. MIN. DISTANCE) OR CONNECTIONS, AND ENCASED IN A TWO SACK SLURRY MIX. THE WORK SHALL BE WITNESSED AND APPROVED BY PUBLIC WORKS.
- Ⓒ THE ASSEMBLY SHALL BE INSPECTED AND APPROVED BY PUBLIC WORKS IMMEDIATELY AFTER INSTALLATION. THE ASSEMBLY MUST BE TESTED BY A CERTIFIED BACKFLOW TESTER.
- Ⓓ INSTALLED AND MAINTAINED BY CONSUMER MUST BE DONE PER CITY OF POOLER BUILDING AND SHOULD MEET ALL CITY SPECIFICATIONS.



**CITY OF POOLER
2024 STANDARD DETAIL
TYPICAL INSTALLATION
BACKFLOW PREVENTER**

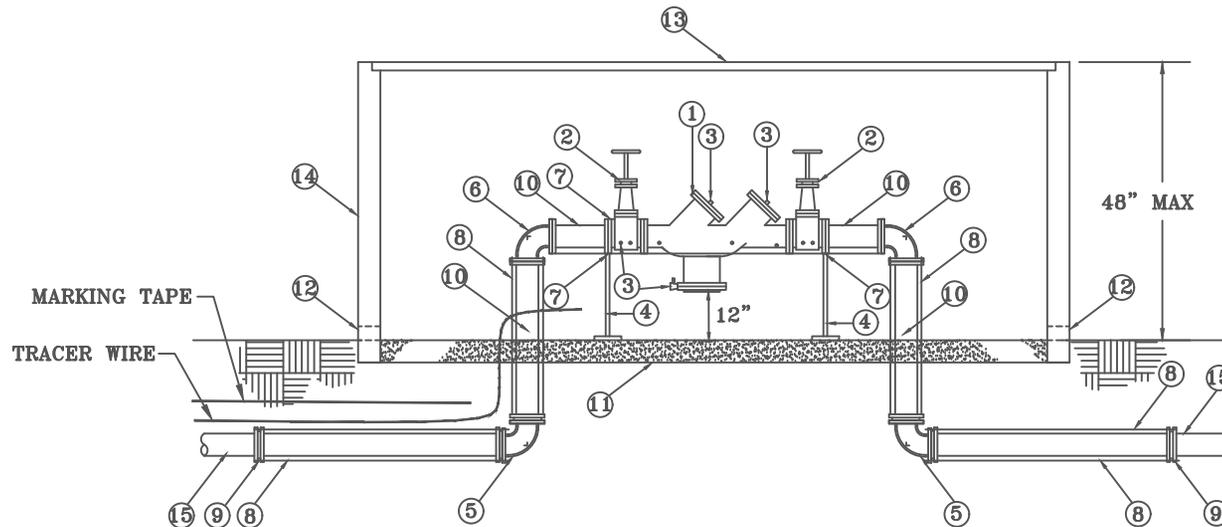
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

W-28A



MATERIALS		
ITEM	QUAN.	DESCRIPTION
1	1	REDUCED PRESSURE ZONE DEVICE/DCCV, 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

NOTES:

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.

ORIGINAL: HGB-2006



CITY OF POOLER
2024 STANDARD DETAIL
RPZ DEVICE/DOUBLE CHECK VALVE
TYPICAL OUTSIDE INSTALLATION
(3", 4", 6", 8" & 10" SIZES)

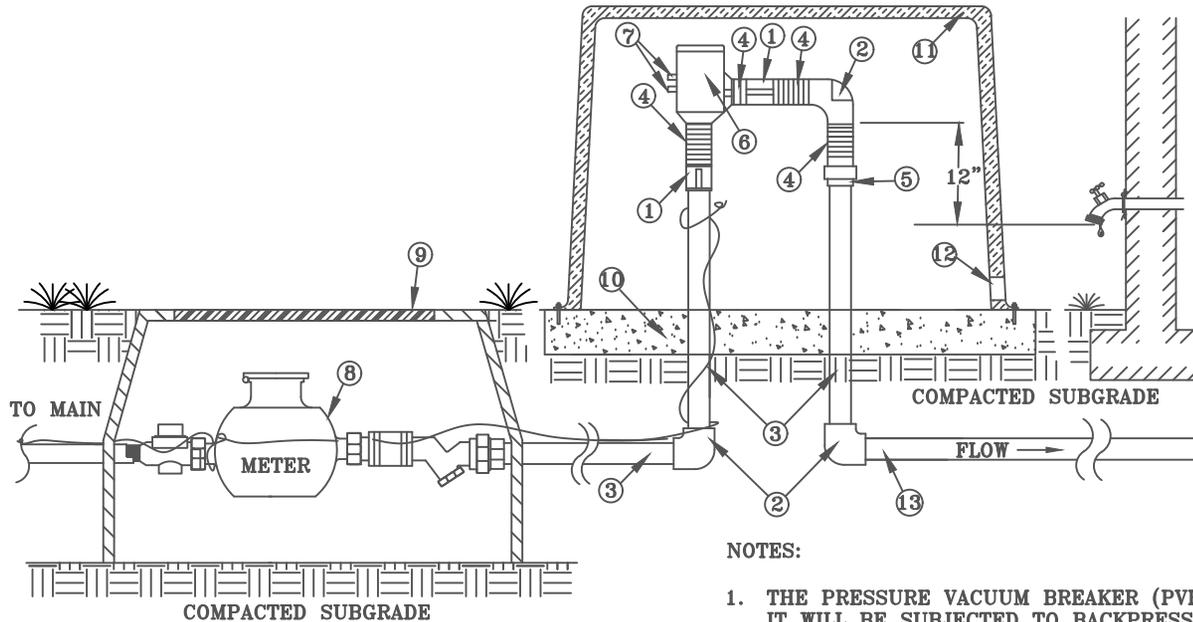
CHECKED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

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. FOR FINAL APPROVAL, ASSEMBLY MUST BE CENTERED IN ENCLOSURE (IF APPLICABLE). UNDER NO CONDITION WILL ANY CONNECTION BE ALLOWED BETWEEN THE SERVICE METER AND BACKFLOW PREVENTER USED FOR SYSTEM CONTAINMENT. THE BACKFLOW PREVENTER SHALL ALWAYS BE INSTALLED DOWNSTREAM OF METER.
5. 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 ANY USE OTHER THAN BACKFLOW DEVICE TESTING.
6. ALL BACKFLOWS SHALL BE ENCLOSED. APPROVED ENCLOSURE IS REQUIRED BY THE CITY FOR FREEZE PROTECTION.

ITEM		QUAN	DESCRIPTION
1	2		BALL VALVE
2	3		NO-LEAD BRASS OR COPPER ELBOWS
3			NO-LEAD BRASS OR COPPER PIPE CUT TO LENGTH
4	4		CLOSE NO-LEAD BRASS NIPPLES
5	1		NO-LEAD BRASS UNION
6	1		PRESSURE VACUUM BREAKER
7	2		TEST COCKS W/ NO-LEAD BRASS PLUGS
8	1		WATER METER
9	1		METER BOX
10			4" CONCRETE SLAB
11	1		PREFAB. ENCLOSURE BY HOT BOX OR EQUAL
12			DRAIN PORT
13			SCH 40 CUT TO LENGTH
			ALL COMPONENTS MUST BE MADE IN USA.

ORIGINAL: HGB-2011



**CITY OF POOLER
2024 STANDARD DETAIL
VACUUM BREAKER BACKFLOW
PREVENTER TYPICAL OUTSIDE
INSTALLATION (3/4", 1", 1-1/2" & 2")**

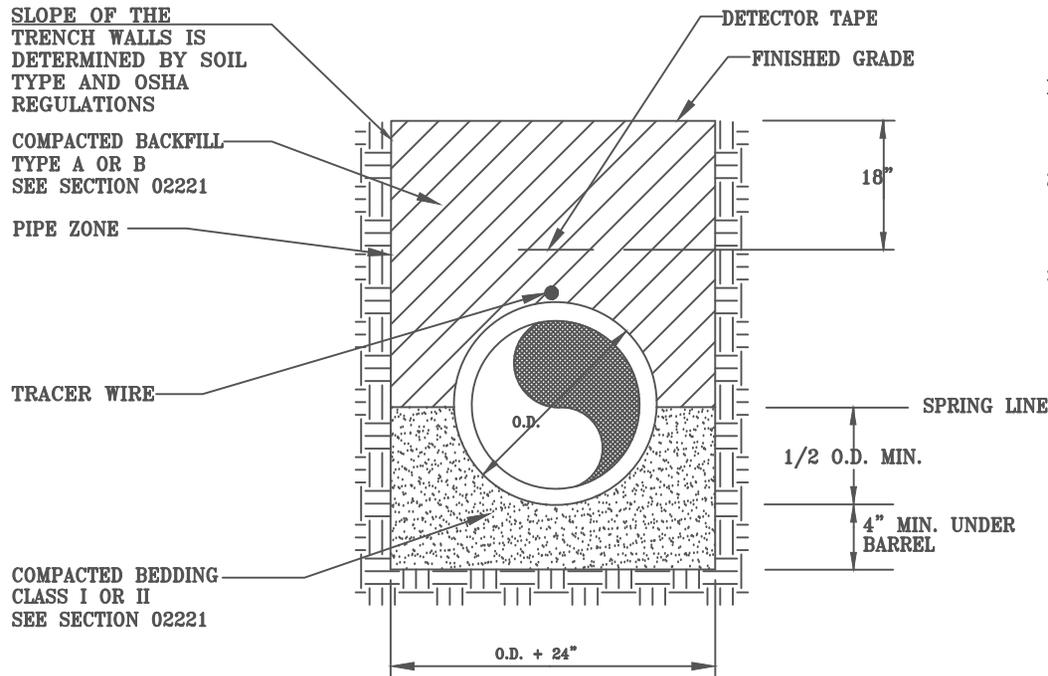
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

W-30



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.

TYPICAL BEDDING FOR PIPE

ORIGINAL: HGB-2012



**CITY OF POOLER
2024 STANDARD DETAIL**

PIPE BEDDING

REVICED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

W-31

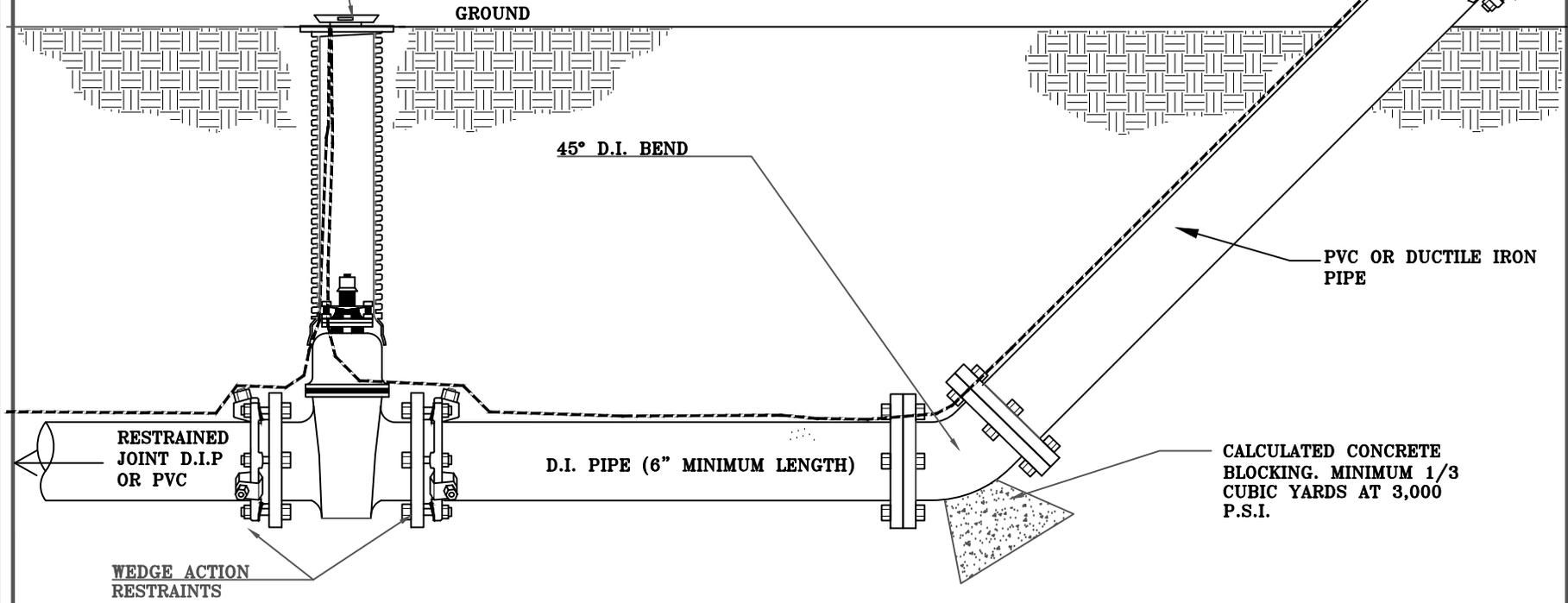
NOTES:

1. THIS DETAIL SHALL APPLY ONLY TO TEMPORARY CAPPING.
2. REQUIRED RESTRAINT AWAY FROM THE END CAP MAY BE MJ PIPE WITH WEDGE ACTION RESTRAINTS FOR PIPE \leq 12 INCH DIAMETER.
3. PIPE SHALL BE RESTRAINED AWAY FROM THE TAPPED 2" BALL VALVE.

VALVE BOX INSTALLATION WITH TRACER WIRE LOOP TO VALVE. TRACER WIRE TO BE WRAPPED AROUND THE VALVE BOX.

THREADED COUPLING TEMPORARY BLOW-OFF WITH A 2" BALL VALVE HEIGHT MUST BE LESS THAN 3' ABOVE GROUND

WEDGE ACTION RESTRAINED MECHANICAL JOINT TAPPED CAP



**CITY OF POOLER
2024 STANDARD DETAIL
TEMPORARY DEAD END
OF WATER MAIN**

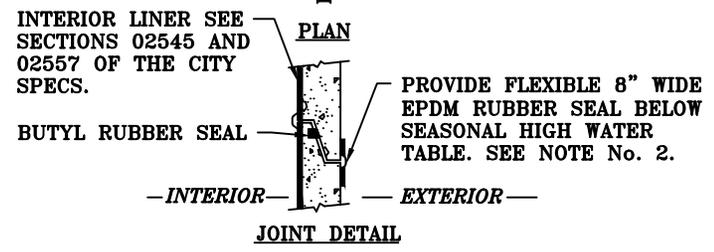
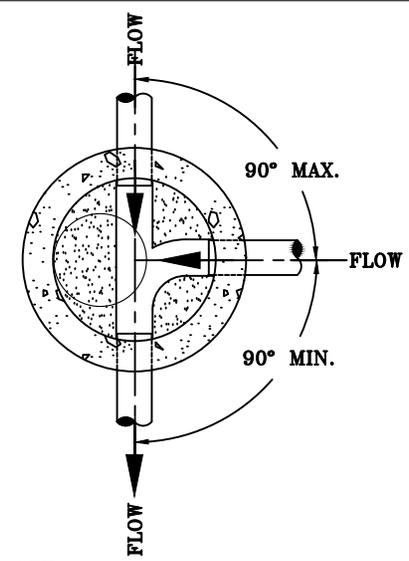
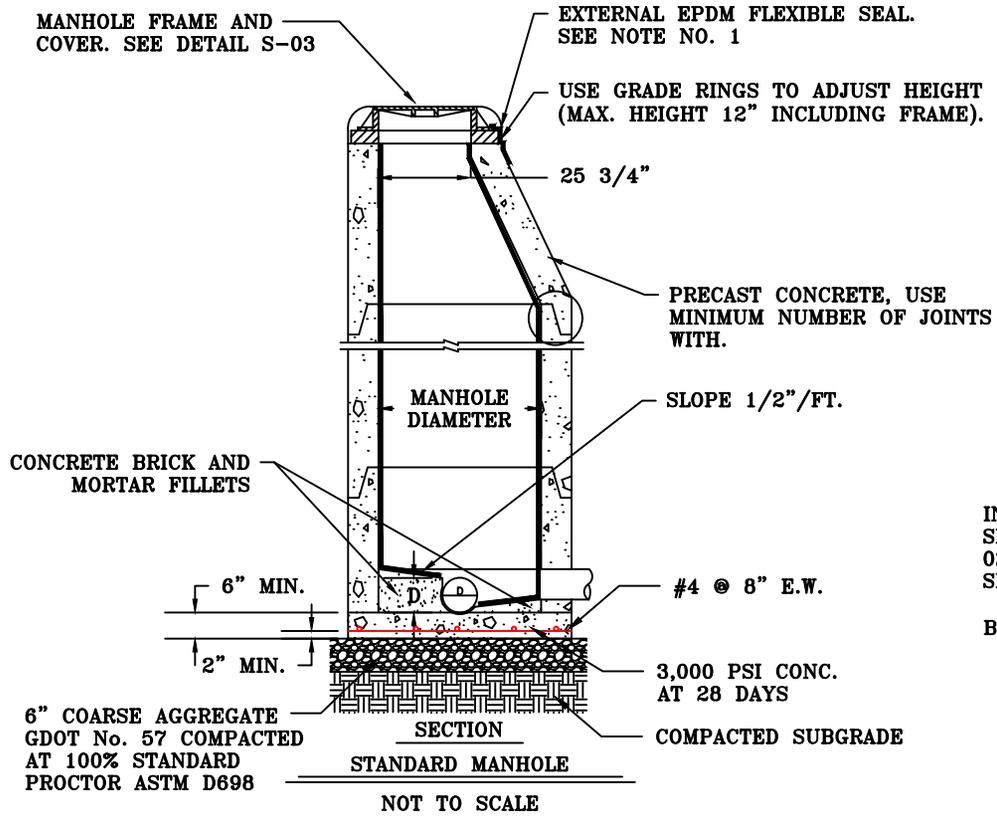
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2025

W-33



- NOTES:**
1. SEE STANDARD SPECIFICATION SECTION 02720 FOR CHIMNEY REQUIREMENTS.
 2. SEE STANDARD SPECIFICATION SECTION 02720 FOR RUBBER SHIELD REQUIREMENTS.
 3. PRECAST REINFORCED CONCRETE TOPS, RISER BASES AND REBARS SHALL CONFORM TO THE LATEST C-478 STD. SPECIFICATIONS.
 4. DO NOT INSTALL STEPS IN SAN. SEWER MANHOLES.
 5. BUOYANCY MUST BE CALCULATED BASED ON THE EXISTING SITE'S SOIL CONDITIONS. ALL BUOYANCY CALCULATIONS MUST INCLUDE A COPY OF THE SITE'S GEOTECHNICAL REPORT.

- REQUIRED MANHOLE DIAMETER (FT.):**
1. 4 FT. FOR PIPES UP TO 12"
 2. 6 FT. FOR PIPES LARGER THAN 12"

ORIGINAL: HGB-2006



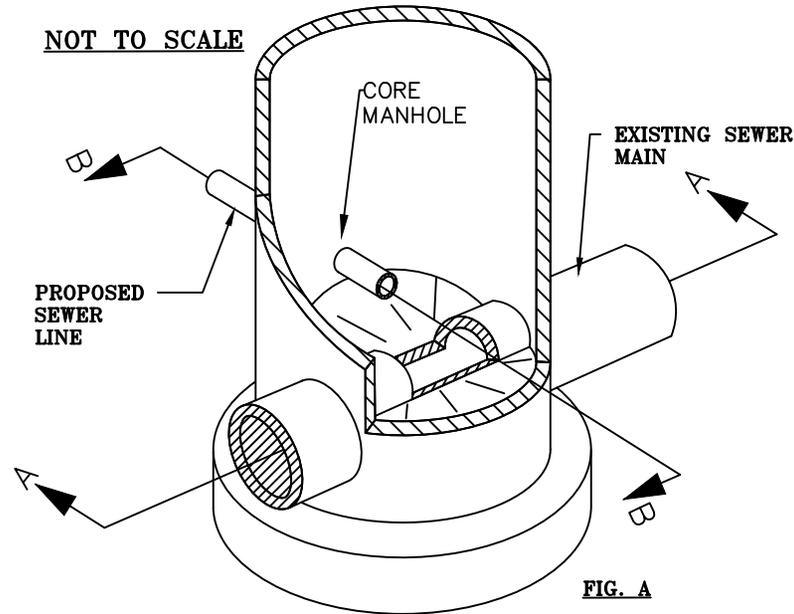
**CITY OF POOLER
2024 STANDARD DETAIL
STANDARD SANITARY SEWER
MANHOLE**

REVISED BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: OCT, 2024

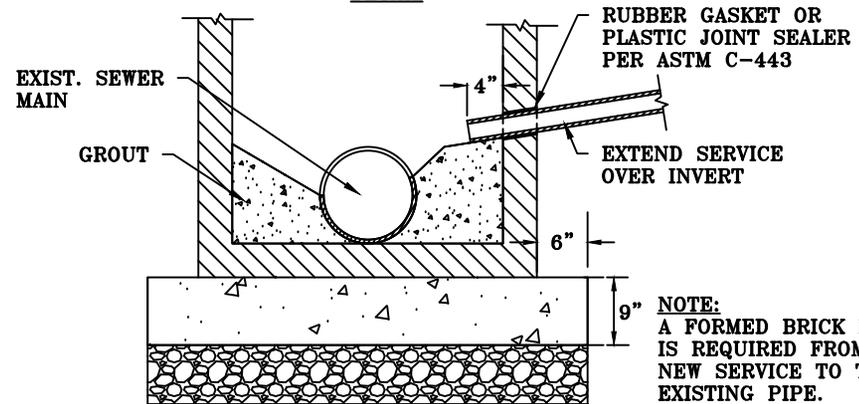
S-01

DOGHOUSE MANHOLES:

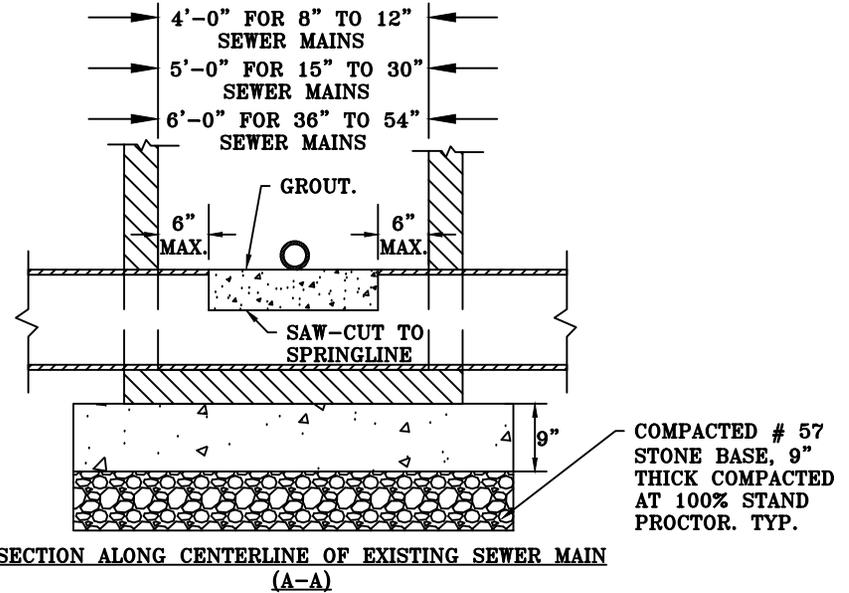
1. FIG.-A DOGHOUSE MANHOLES ARE USED; THE BASE SLAB MAY BE CAST-IN-PLACE OR PRECAST AND SHALL HAVE REINFORCING BARS EXTENDING INTO THE CONCRETE FILL USED FOR THE FLOW CHANNEL AND BENCH. THE DOGHOUSE MANHOLE SECTION SHALL HAVE OPENINGS PROVIDED BY THE MANUFACTURER TO FIT OVER THE EXISTING PIPE(S). THE OPENING AROUND THE EXISTING PIPE(S) SHALL BE SEALED WITH CONCRETE WHEN FORMING THE FLOW CHANNEL TO THE TOP OF THE BENCH AND THE REMAINING OPENING ABOVE THE BENCH WITH CONCRETE OR BRICK AND MORTAR.
2. FLOW SHALL BE MAINTAINED DURING DOGHOUSE MANHOLE CONSTRUCTION.
3. MANHOLE PAD TO REST UPON A MINIMUM OF 9" COMPACTED #57 STONE BASE.



**DOGHOUSE MANHOLE
DETAIL**



CROSS SECTION AT EXISTING SEWER MAIN (B-B)



CITY OF POOLER
2024 STANDARD DETAIL
DOGHOUSE MANHOLES
FOR SAN. SEWER LINES

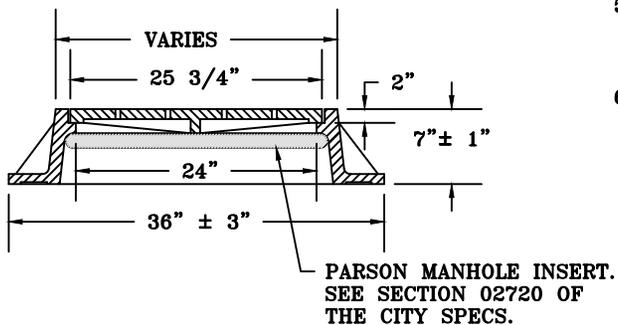
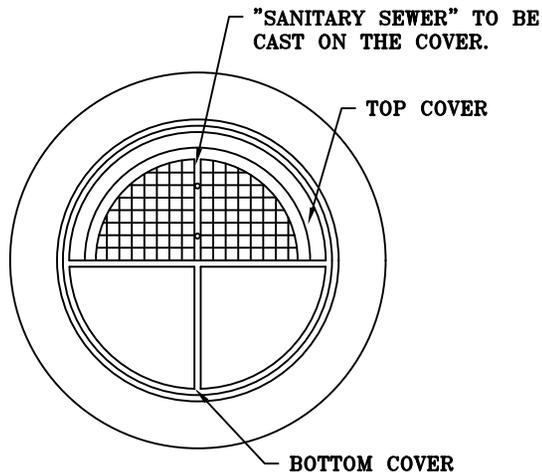
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: OCT, 2024

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 THE LATEST AASHTO M105/ASTM A48, CLASS 35B OF ASTM A48, CLASS 30, 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 OR EQUAL.

ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL
STANDARD SAN. SEWER
MANHOLE COVER & FRAME**

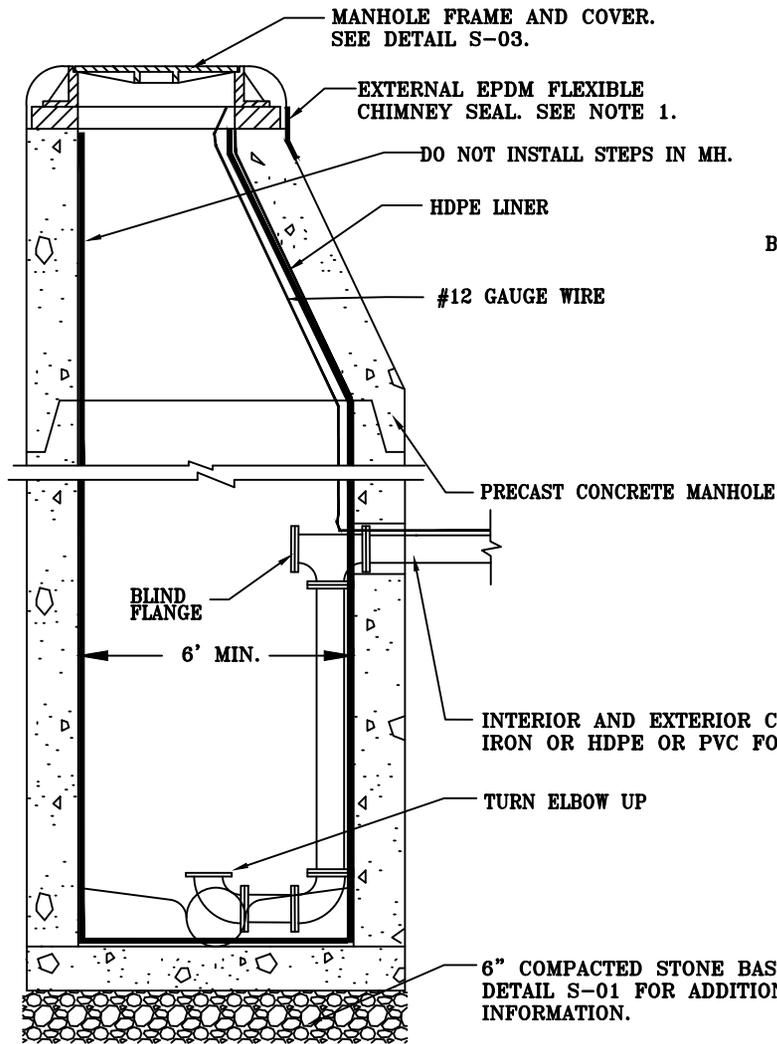
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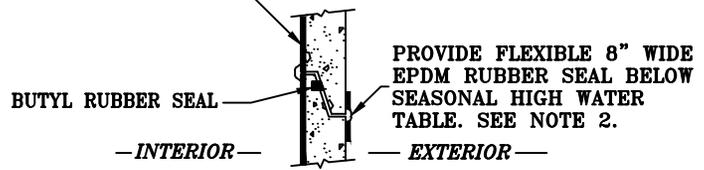
SCALE: N.T.S.

DATE: OCT, 2024

S-03



INTERIOR LINER. SEE SECTIONS 02545 AND 02557 OF THE CITY SPECIFICATIONS.



JOINT DETAIL

- NOTES:**
1. SEE SECTION 02720 OF THE STANDARD SPECIFICATIONS FOR CHIMNEY SHIELD REQUIREMENTS.
 2. SEE SECTION 02720 OF THE STANDARD SPECIFICATIONS FOR RUBBER SHIELD REQUIREMENTS.

SECTION

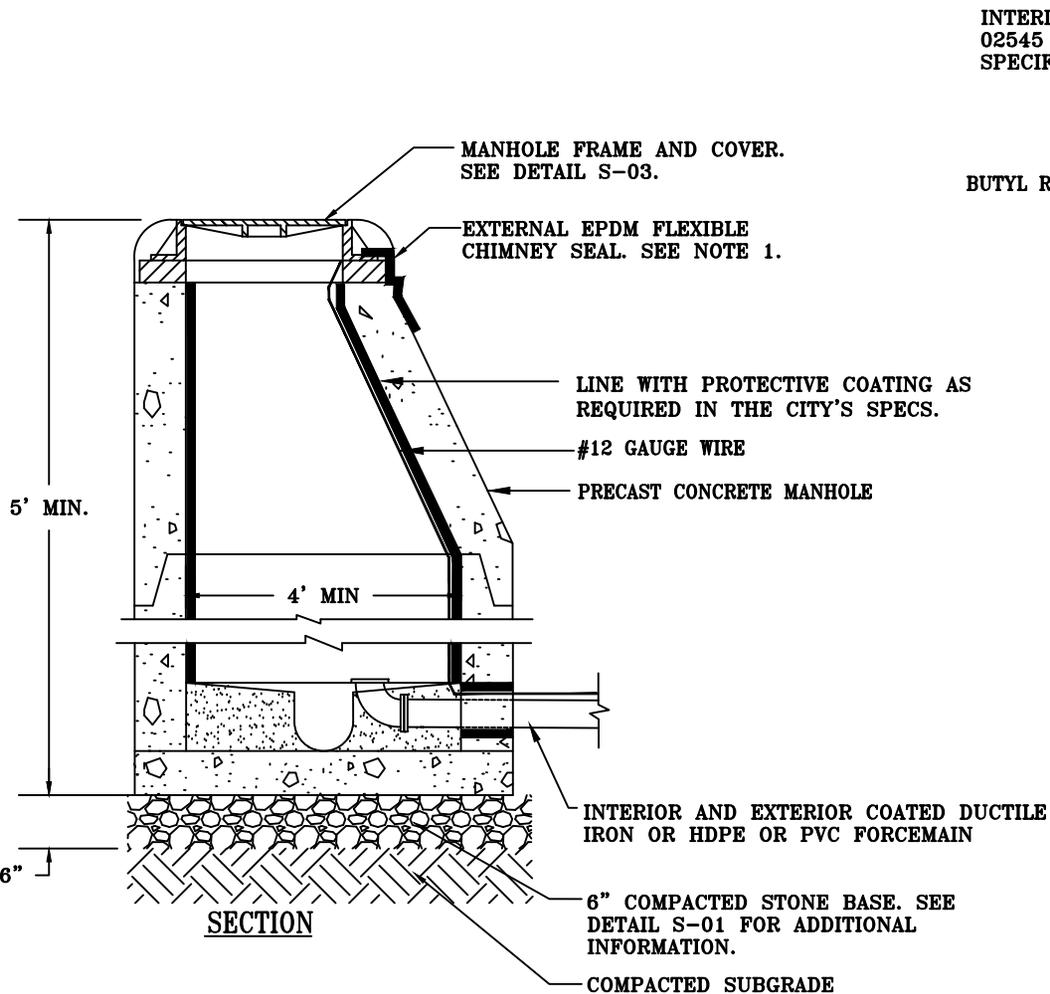
ORIGINAL: HGB-2006



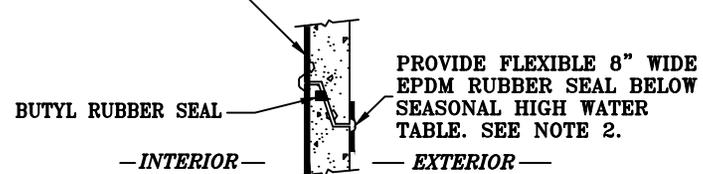
**CITY OF POOLER
2024 STANDARD DETAIL
STANDARD FORCEMAIN DROP
INTO MANHOLE**

REVISED BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: OCT, 2024

S-04



INTERIOR LINER. SEE SECTIONS 02545 AND 02557 OF THE CITY SPECIFICATIONS.



JOINT DETAIL

NOTES:

1. SEE SECTION 02720 OF THE STANDARD SPECIFICATIONS FOR CHIMNEY SHIELD REQUIREMENTS.
2. SEE SECTION 02720 OF THE STANDARD SPECIFICATIONS FOR FLEXIBLE RUBBER SHIELD REQUIREMENTS.

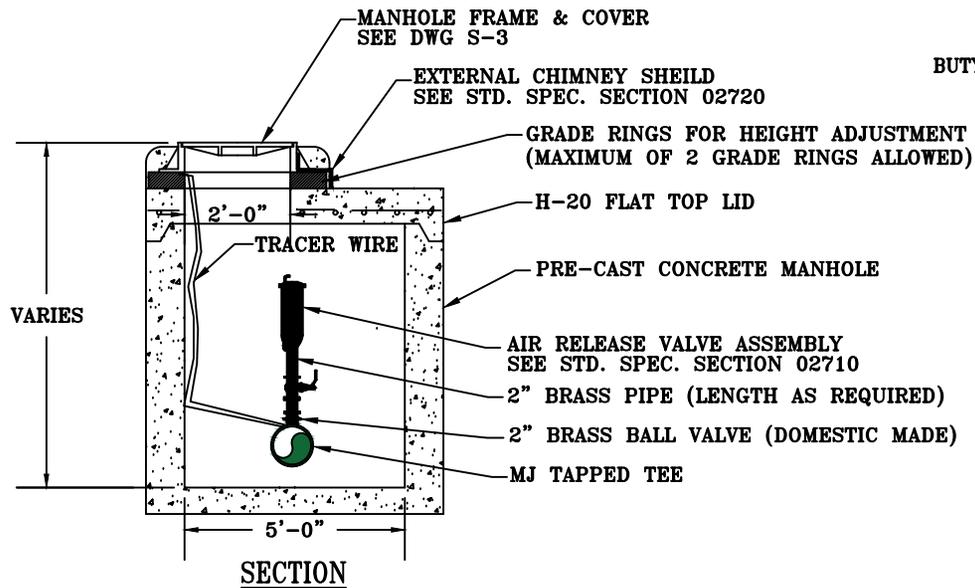
ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL
STANDARD FORCEMAIN DROP
INTO SHALLOW MANHOLE**

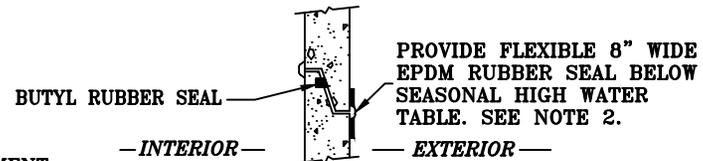
REVISED BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: OCT, 2024

S-05

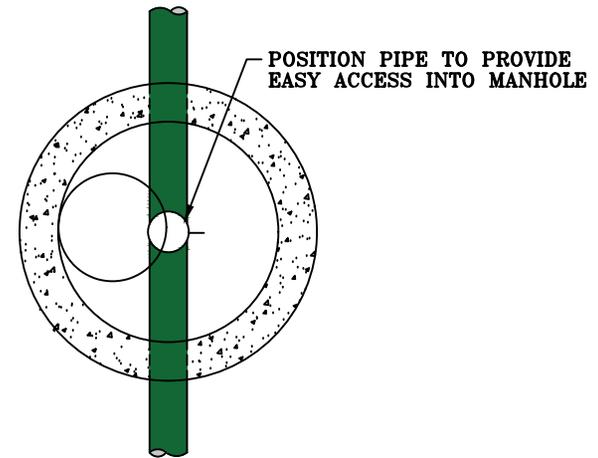


AIR RELEASE VALVE IN MANHOLE

NOT TO SCALE



JOINT DETAIL



PLAN

NOTES:

1. SET MANHOLE COVER 2" ABOVE NATURAL GRADE OR FLUSH WITH PAVING.
2. SEE SECTION 02720 OF THE STANDARD SPECIFICATIONS FOR FLEXIBLE RUBBER SHIELD REQUIREMENTS.

ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL**

AIR RELEASE VALVE

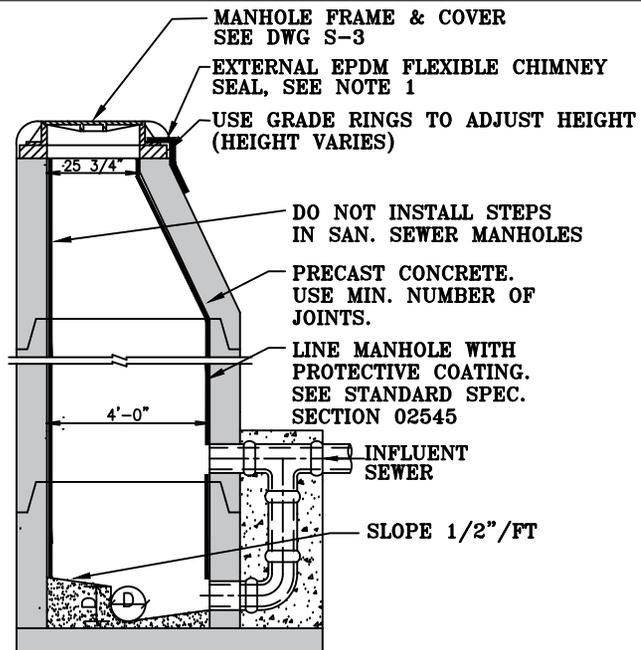
CHECKED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: OCT, 2024

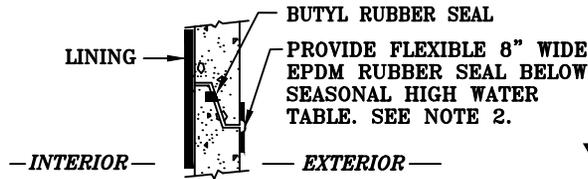
S-06



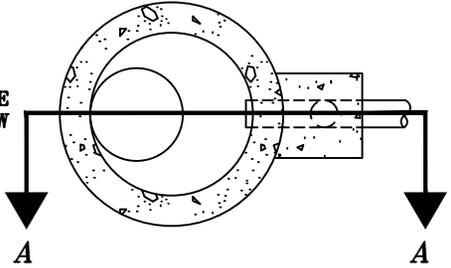
SECTION A-A

DROP MANHOLE

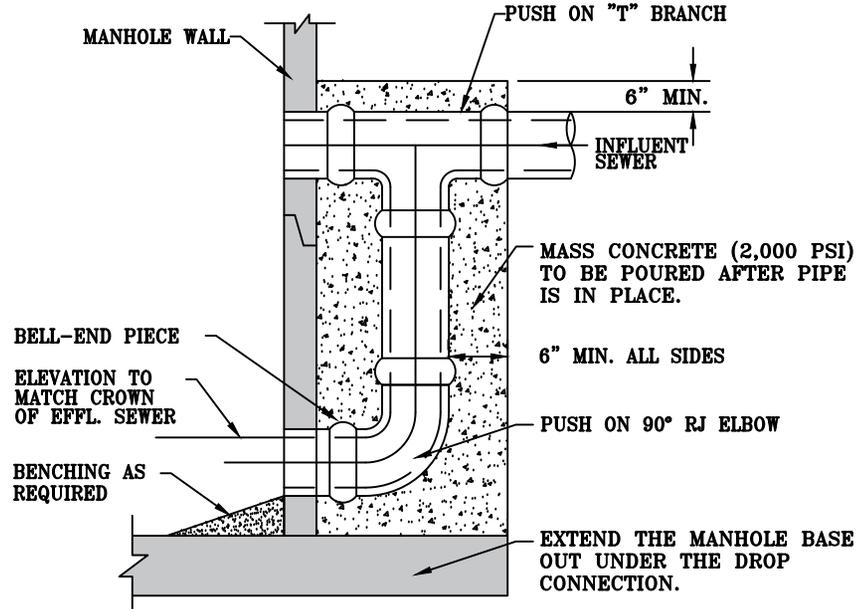
NOT TO SCALE



JOINT DETAIL



PLAN



DROP DETAIL

NOT TO SCALE

NOTES:

1. SEE SECTION 02720 OF THE STANDARD SPECS. FOR CHIMNEY SHIELD REQUIREMENTS.
2. SEE SECTION 02720 OF THE STANDARD SPECIFICATIONS FOR FLEXIBLE RUBBER SHIELD REQUIREMENTS.
3. PIPE AND FITTINGS WITHIN CONCRETE ENCASMENT SHALL BE WRAPPED WITH 6 MIL POLYETHYLENE PRIOR TO THE CONCRETE PLACEMENT.
4. ALL PIPE AND FITTINGS SHALL BE SDR 26 PVC.
5. THE CONNECTIONS TO AN EXISTING MANHOLE SHALL OCCUR BY CORE-DRILLING.
6. THE CONNECTIONS SHALL INCLUDE A WATERTIGHT BOOT.

ORIGINAL: HGB-2011



**CITY OF POOLER
2024 STANDARD DETAIL
OUTSIDE DROP INTO NEW
MANHOLE**

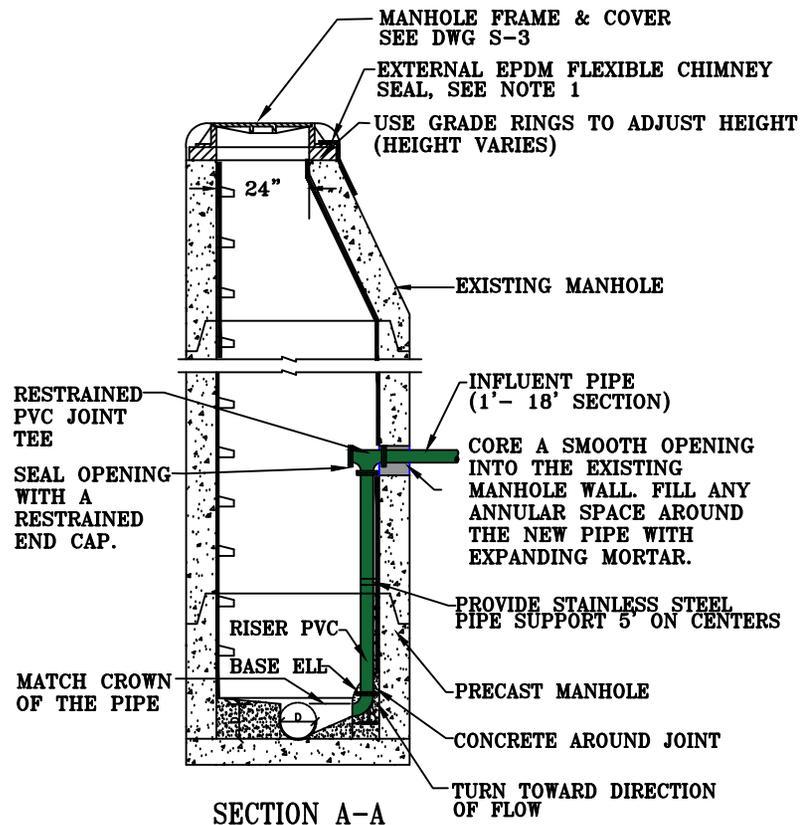
REVISED BY: EOM

CHECKED BY: J. W.

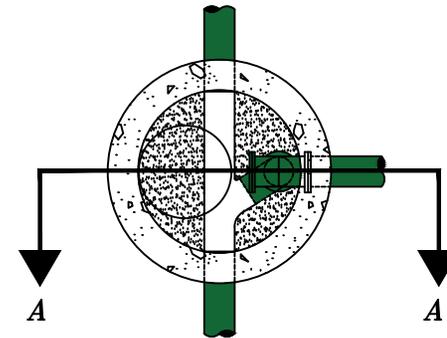
SCALE: N.T.S.

DATE: OCT, 2024

S-07



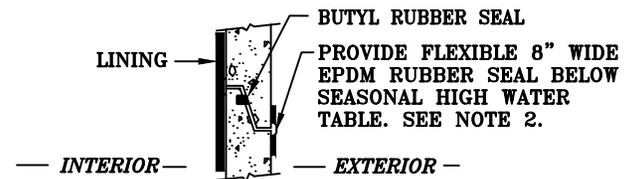
SECTION A-A
INSIDE DROP MANHOLE
NOT TO SCALE



PLAN
NOT TO SCALE

NOTES:

1. SEE SECTION 02720 OF THE STANDARD SPECS. FOR CHIMNEY SHIELD REQUIREMENTS.
2. SEE SECTION 02720 OF THE STANDARD SPECIFICATIONS FOR FLEXIBLE RUBBER SHIELD REQUIREMENTS.
3. EXISTING MANHOLE MUST BE 6' OR LARGER IN DIAMETER.
4. SHALLOW MANHOLES THAT ARE SMALLER THAN 6' IN DIAMETER MAY BE USED ONLY IF THEY ARE PRE-APPROVED BY THE CITY.
5. ALL PIPE AND FITTINGS SHALL BE SDR 26 PVC.
6. THE CONNECTIONS TO AN EXISTING MANHOLE SHALL OCCUR BY CORE-DRILLING.



JOINT DETAIL
NOT TO SCALE

ORIGINAL: HGB-2011



CITY OF POOLER
2024 STANDARD DETAIL
INSIDE DROP INTO EXISTING
MANHOLE

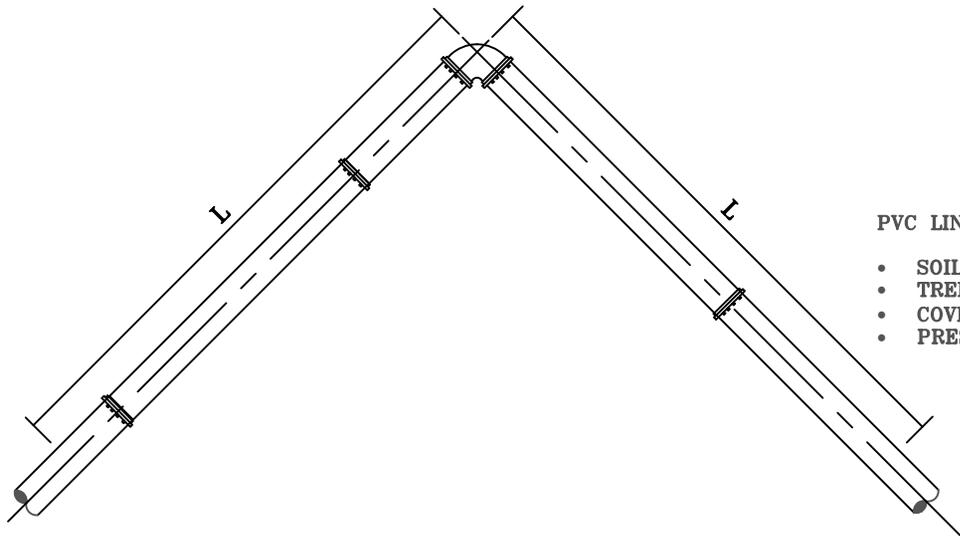
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: OCT, 2024

S-08



PVC LINE:

- SOIL TYPE: SM
- TRENCH TYPE: 3
- COVER: 3' TO 12'
- PRESSURE: 150 PSI

PVC LINE

PIPE DIA.	BEND ANGLE			
	11 1/4°	22 1/2°	45°	90°
4	2	4	8	18
6	3	5	11	25
8	4	7	14	33
10	4	8	16	39
12	5	9	19	45
16	5	9	19	45
20	6	11	23	54
24	8	16	26	62

NOTES:

1. LENGTH OF RESTRAINT SHOWN IS IN FEET. PIPE DIAMETERS ARE IN INCHES.
2. WHERE LINES CONSIST OF BOTH DUCTILE IRON AND PVC WITHIN THE LIMITS OF REQUIRED RESTRAINT, LIMITS FOR PVC SHALL APPLY.
3. DIMENSIONS IN THESE TABLES ARE BASED ON THE DESIGN PARAMETERS SHOWN. THE ENGINEER SHALL PROVIDE CALCULATED RESTRAINT LENGTHS TO MEET THE CONDITIONS OF THEIR SITES IF THOSE SITE CONDITIONS ARE DIFFERENT FROM THE ONE SHOWN IN THIS DETAIL.

DIP LINE:

- SOIL TYPE: SM
- TRENCH TYPE: 3
- COVER: 3' MIN.
- PRESSURE: 150 PSI

DUCTILE IRON LINE

PIPE DIA.	BEND ANGLE			
	11 1/4°	22 1/2°	45°	90°
4	3	5	9	20
6	3	6	12	28
8	4	8	16	36
10	5	9	19	43
12	6	11	22	51
16	7	14	28	65
20	8	16	33	79
24	9	19	38	92

MINIMUM RESTRAINED LENGTH (L)



**CITY OF POOLER
2024 STANDARD DETAIL**

HORIZONTAL BEND RESTRAINT

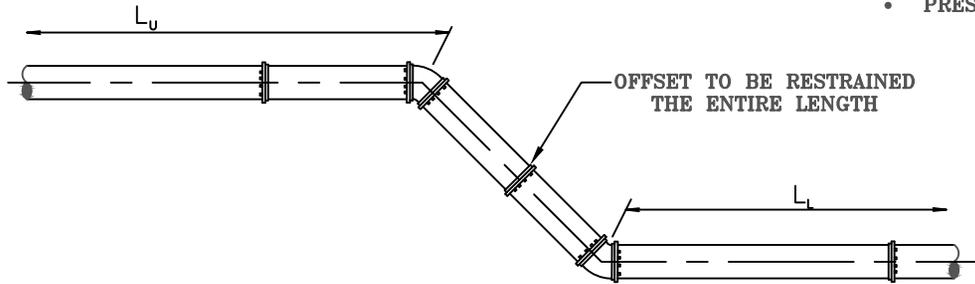
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: OCT, 2024

S-09A



PVC LINE:

- SOIL TYPE: SM
- TRENCH TYPE: 3
- COVER: 3' TO 12'
- PRESSURE: 150 PSI

PVC LINE

PIPE DIA.	BEND ANGLE					
	11 1/4°		22 1/2°		45°	
	L _U	L _L	L _U	L _L	L _U	L _L
4	4	1	8	2	17	3
6	6	1	11	2	23	4
8	8	2	15	3	30	6
10	9	2	18	4	36	7
12	11	2	21	4	43	8
16	10	3	21	5	42	10
20	13	3	25	6	51	12
24	15	4	29	7	60	15

NOTES:

1. LENGTH OF RESTRAINT SHOWN IS IN FEET. PIPE DIAMETERS ARE IN INCHES.
2. WHERE LINES CONSIST OF BOTH DUCTILE IRON AND PVC WITHIN THE LIMITS OF REQUIRED RESTRAINT, LIMITS FOR PVC SHALL APPLY.
3. DIMENSIONS IN THESE TABLES ARE BASED ON THE DESIGN PARAMETERS SHOWN. THE ENGINEER SHALL PROVIDE CALCULATED RESTRAINT LENGTHS TO MEET THE CONDITIONS OF THEIR SITES IF THOSE SITE CONDITIONS ARE DIFFERENT FROM THE ONE SHOWN IN THIS DETAIL.

DIP LINE:

- SOIL TYPE: SM
- TRENCH TYPE: 3
- COVER: 3' MIN.
- PRESSURE: 150 PSI

DUCTILE IRON LINE

PIPE DIA.	BEND ANGLE					
	11 1/4°		22 1/2°		45°	
	L _U	L _L	L _U	L _L	L _U	L _L
4	6	1	12	2	24	4
6	9	2	17	3	34	5
8	11	2	22	3	45	7
10	13	2	26	4	53	8
12	15	3	30	5	63	9
16	19	3	39	6	80	12
20	23	4	47	7	97	15
24	27	4	55	8	113	17



**CITY OF POOLER
2024 STANDARD DETAIL**

VERTICAL BEND RESTRAINT

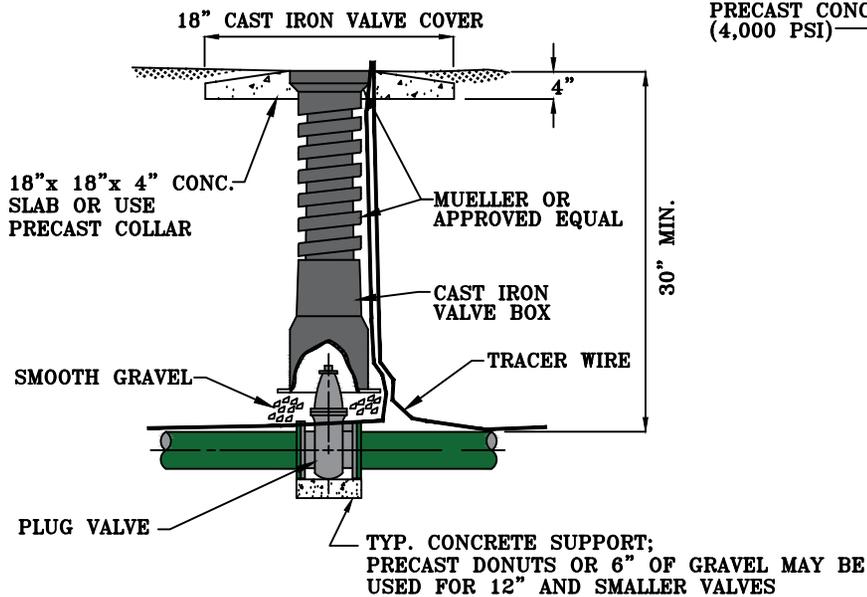
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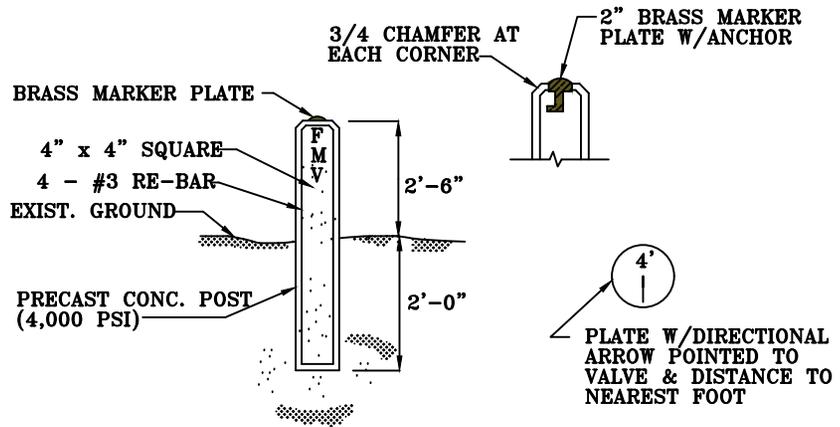
SCALE: N.T.S.

DATE: OCT, 2024

S-09B



VALVE AND VALVE BOX



CONCRETE VALVE MARKER

NOTES:

FORCE MAIN LINE VALVE MARKERS SHALL BE PAINTED FEDERAL SAFETY GREEN AND MARKED AS FOLLOWS:

- FMV - FORCEMAIN VALVE
- AV - AIR RELEASE VALVE

ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL**

VALVE BOX

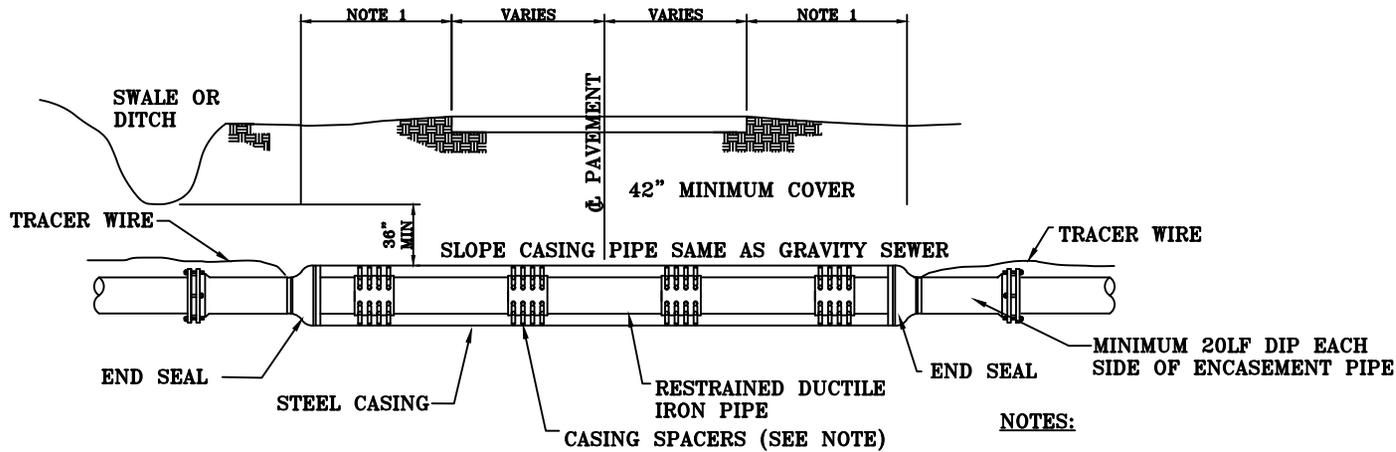
CHECKED BY: EOM

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SCALE: N.T.S.

DATE: OCT, 2024

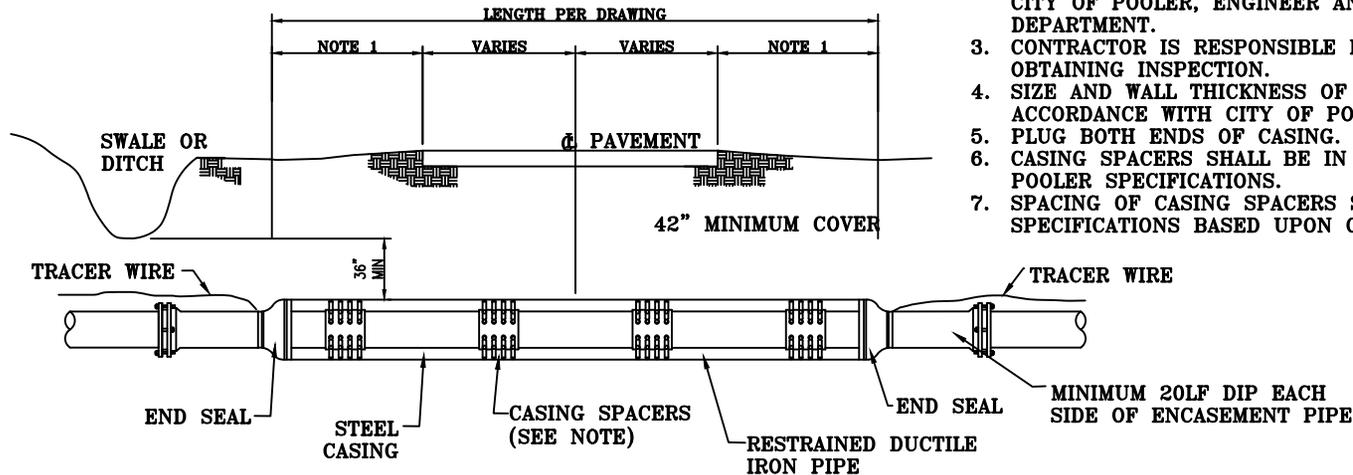
S-10



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

ORIGINAL: HGB-2006



CITY OF POOLER
2024 STANDARD DETAIL

JACK AND BORE

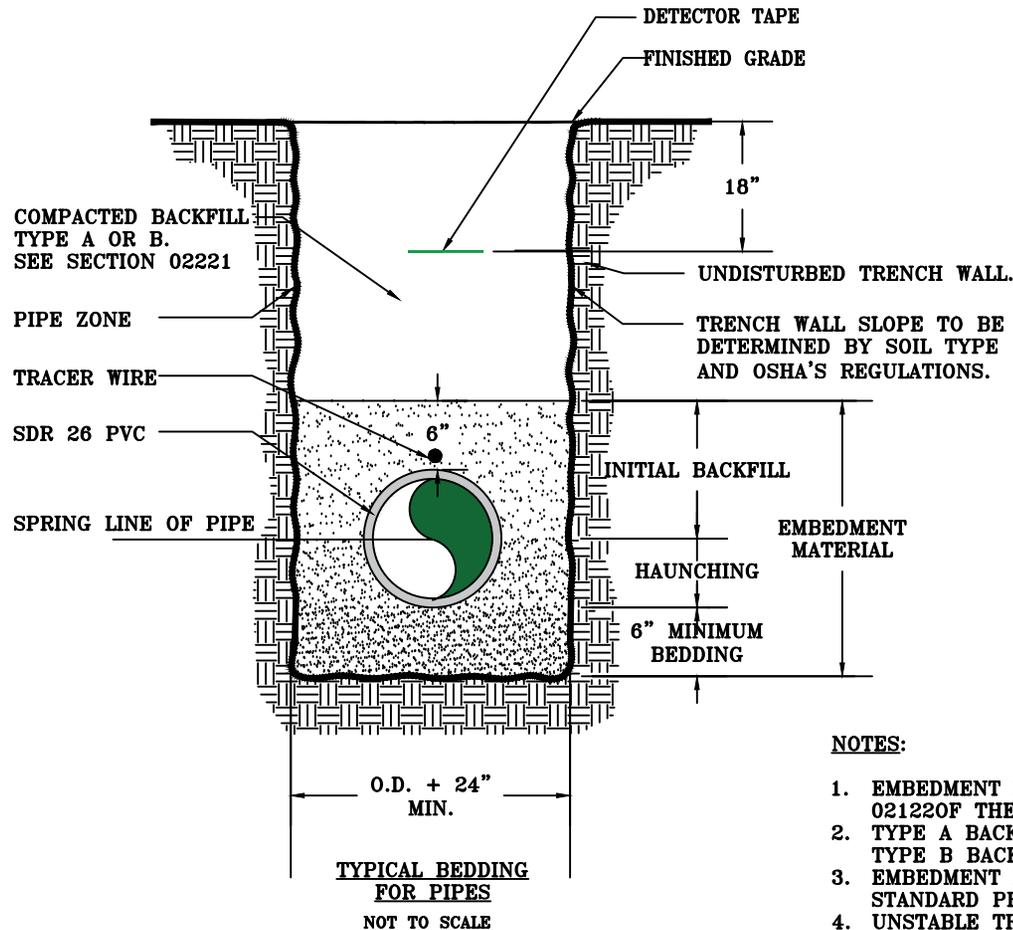
CHECKED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: OCT, 2024

S-11



NOTES:

1. EMBEDMENT MATERIAL MUST BE CLASS I OR II. SEE SECTION 021220F OF THE CITY SPECS AND ASTM 2321.
2. TYPE A BACKFILLING SHALL BE USED UNDER ALL PAVED AREAS. TYPE B BACKFILL SHALL BE USED IN ALL OTHER AREAS.
3. EMBEDMENT MATERIAL SHALL BE COMPACTED TO A MINIMUM 95% STANDARD PROCTOR DENSITY FOR CLASS I MATERIAL.
4. UNSTABLE TRENCH BOTTOMS SHALL HAVE AN APPROVED FOUNDATION PLAN PRIOR TO PIPELINE INSTALLATION.
5. SEE STANDARD DETAIL P-13 FOR PAVEMENT RESTORATION.
6. THIS DETAIL APPLIES TO ALL GRAVITY SAN. SEWER LINES, FORCEMAINS, AND RECLAIMED WATER MAINS.
7. THIS DETAIL APPLIES TO DIP, PVC, FPVC, AND HDPE PIPES.



CITY OF POOLER
2024 STANDARD DETAIL
TYPICAL BEDDING
FOR PIPES

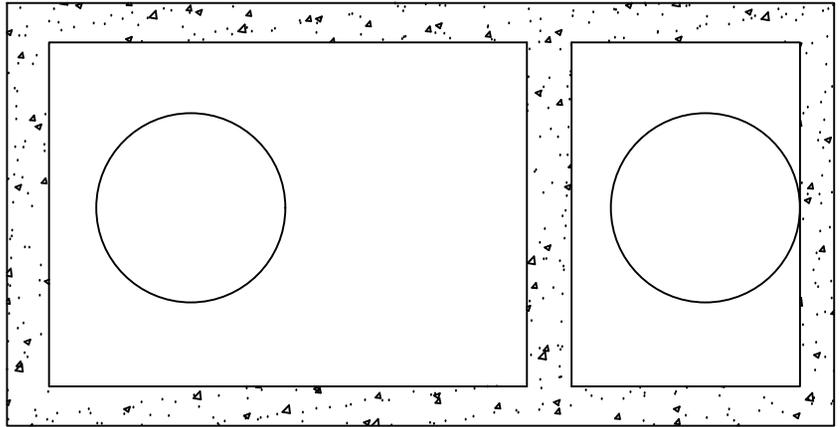
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

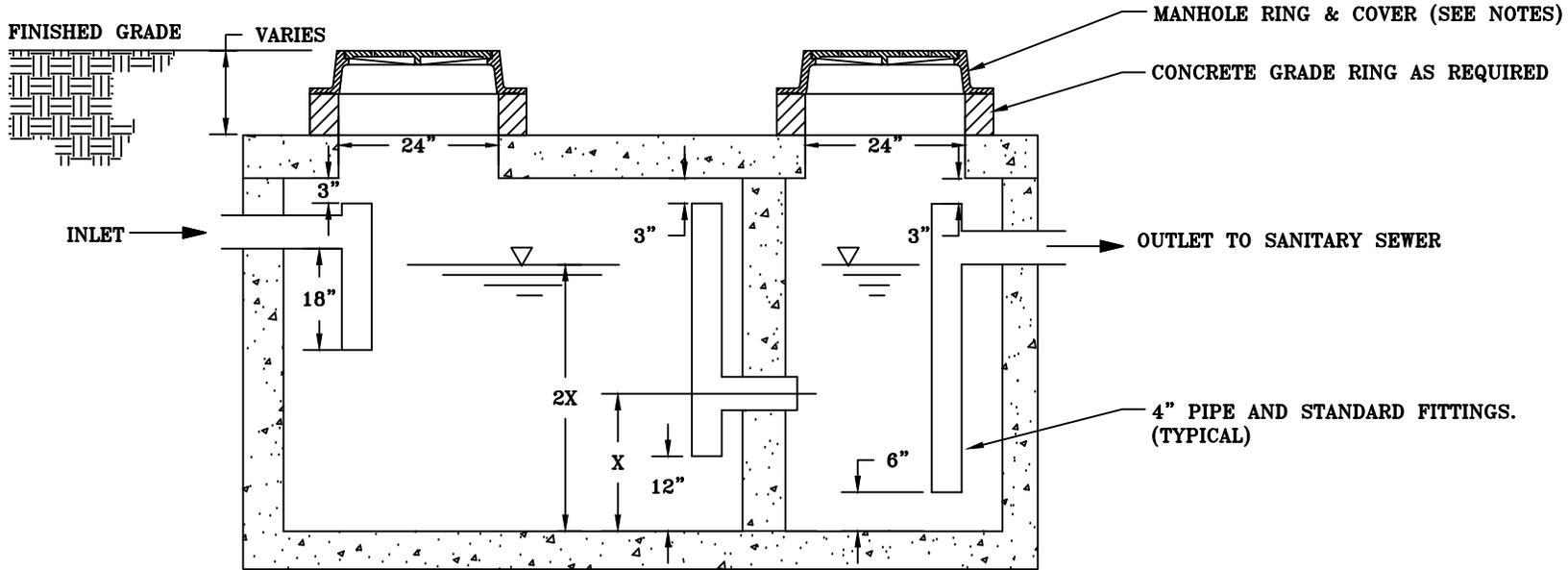
DATE: OCT, 2024

S-12



NOTES:

1. MANHOLE RING & COVER SHALL BE GAS AND WATER TIGHT PROVIDING A 24" MINIMUM CLEAR OPENING. US 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.
4. THIS DETAIL IS FOR THE MINIMUM GREASE TRAP SIZE. LARGER GREASE TRAPS MAY REQUIRE DIFFERENT CONFIGURATION WHICH IS DETERMINED BY THE PLUMBING SYSTEM DESIGN ENGINEER.



GREASE TRAP

REVISED BY: HGB-2020



**CITY OF POOLER
2024 STANDARD DETAIL**

GREASE TRAP

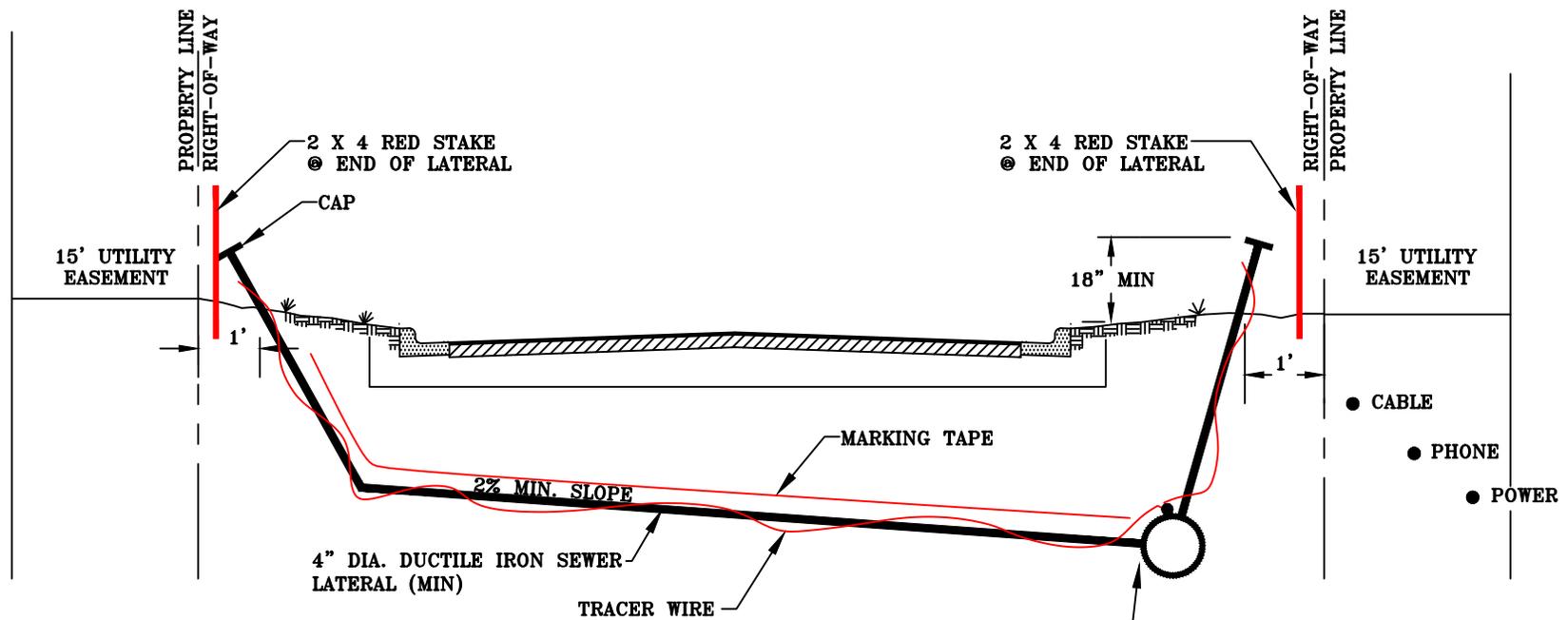
REVISED BY: EOM

CHECKED BY: J. W.

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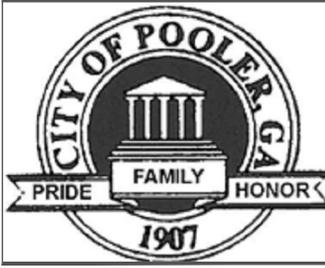
DATE: OCT., 2024

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.

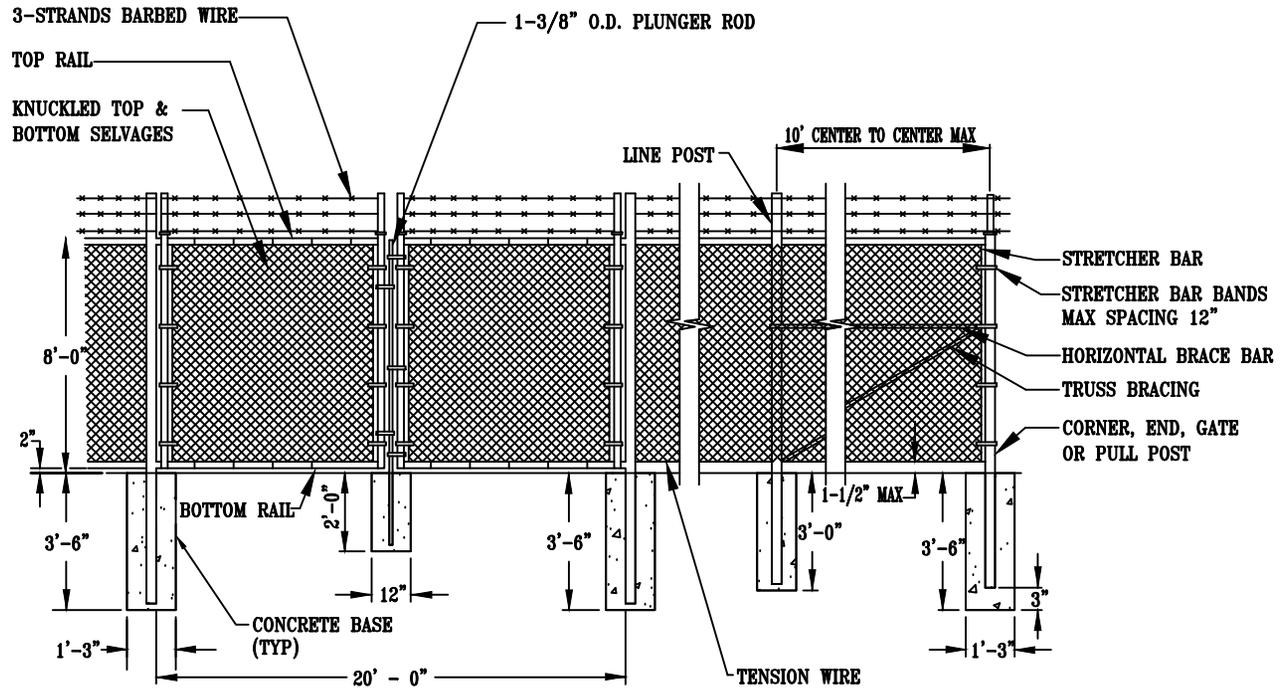
ORIGINAL: HGB-2012



CITY OF POOLER
2024 STANDARD DETAIL
SEWER LATERAL

CHECKED BY: EOM
 CHECKED BY: J. W.
 SCALE: N.T.S.
 DATE: OCT, 2024

S-14



NOTES:

1. FABRIC TO BE ATTACHED TO HORIZONTAL RAILS W/ TIE WIRES AT 16" MAX SPACING
MADE ON INSIDE OF FENCE AND NOT ACCESSABLE 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

ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL**

CHAIN LINK FENCE

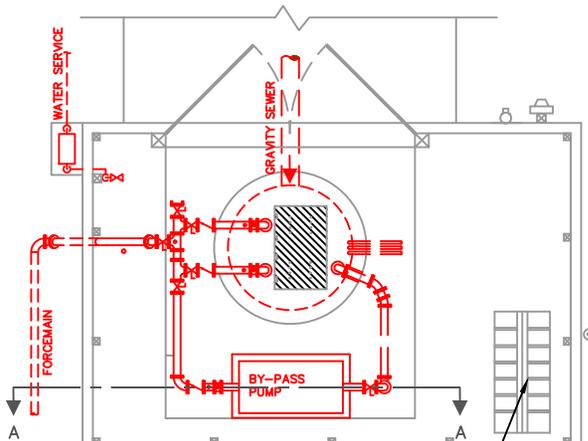
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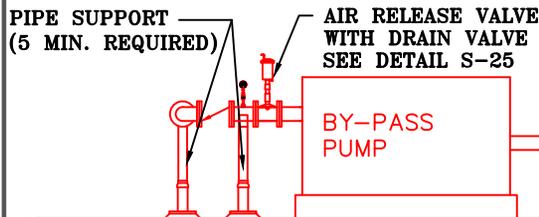
DATE: OCT., 2024

S-15



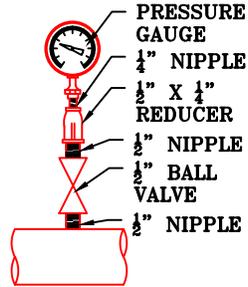
CONTROL PANEL SHELTER WITH STAINLESS STEEL JUNCTION BOXES SEE DETAIL NO. S-19B

PUMP STATION WITH BY-PASS PUMP SITE PLAN
N.T.S.

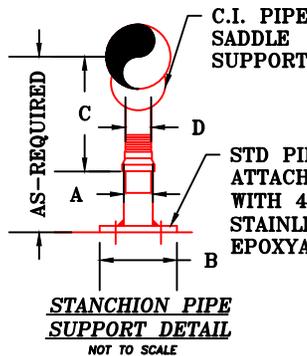


CROSS-SECTION A-A
N.T.S.

NOTE:
SEE DETAIL S-26 FOR INFORMATION ON THE WETWELL.

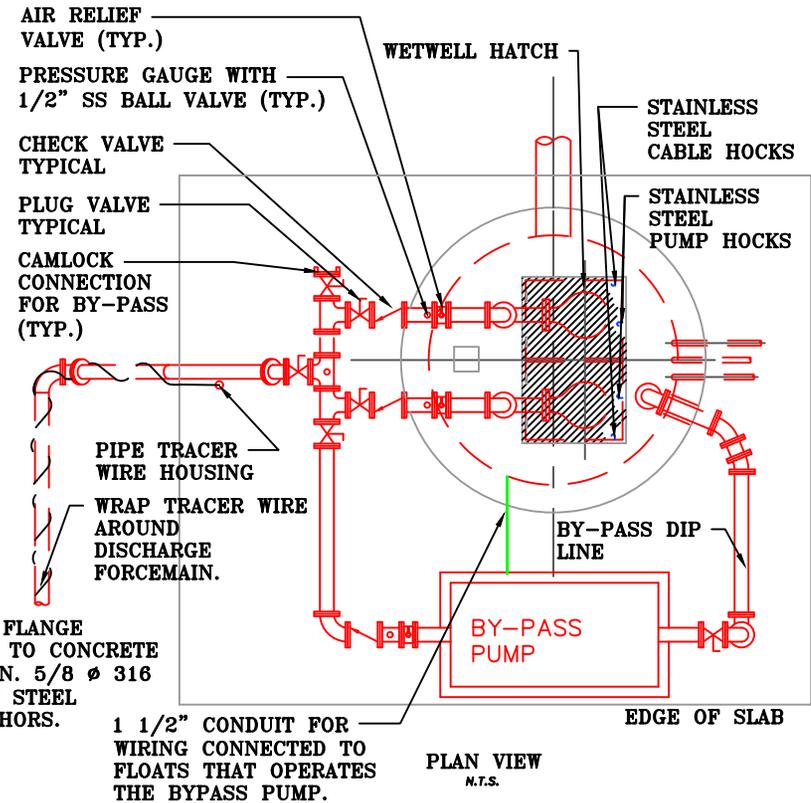


NOTES:
ALL HARDWARE SHALL BE STAINLESS STEEL.
PRESSURE GAUGE ASSEMBLY DETAIL
NOT TO SCALE



PIPE SUPPORT NOTES:
1. ALL HARDWARE, FLANGE, ANGLE, PIPES AND COUPLING SHALL BE 316 SS. PROVIDE NEOPRENE WAFFLE ISOLATION PAD, KORFUND LORPAD 40 UNDER SUPPORT FOOT WHEN PIPING IS ISOLATED OR SUPPORT IS ADJACENT TO MECHANICAL EQUIPMENT.
2. FOR BASE, HEIGHT AND FLANGE DIMENSIONS, SEE TABLE. ALL DIMENSIONS ARE IN INCHES.

PIPE SIZE	A	B	C		D
			MIN.	MAX.	
4	3	9	9-1/4	14	2-1/2
5	3	9	10	14-3/4	2-1/2
6	3	9	10-1/2	15-1/4	2-1/2
8	3	9	11-3/4	16-1/2	2-1/2
10	3	9	13-1/2	18-1/4	2-1/2



1 1/2" CONDUIT FOR WIRING CONNECTED TO FLOATS THAT OPERATES THE BYPASS PUMP.

PLAN VIEW
N.T.S.



CITY OF POOLER
2024 STANDARD DETAIL
LIFT STATION WITH BYPASS
PUMP PLAN

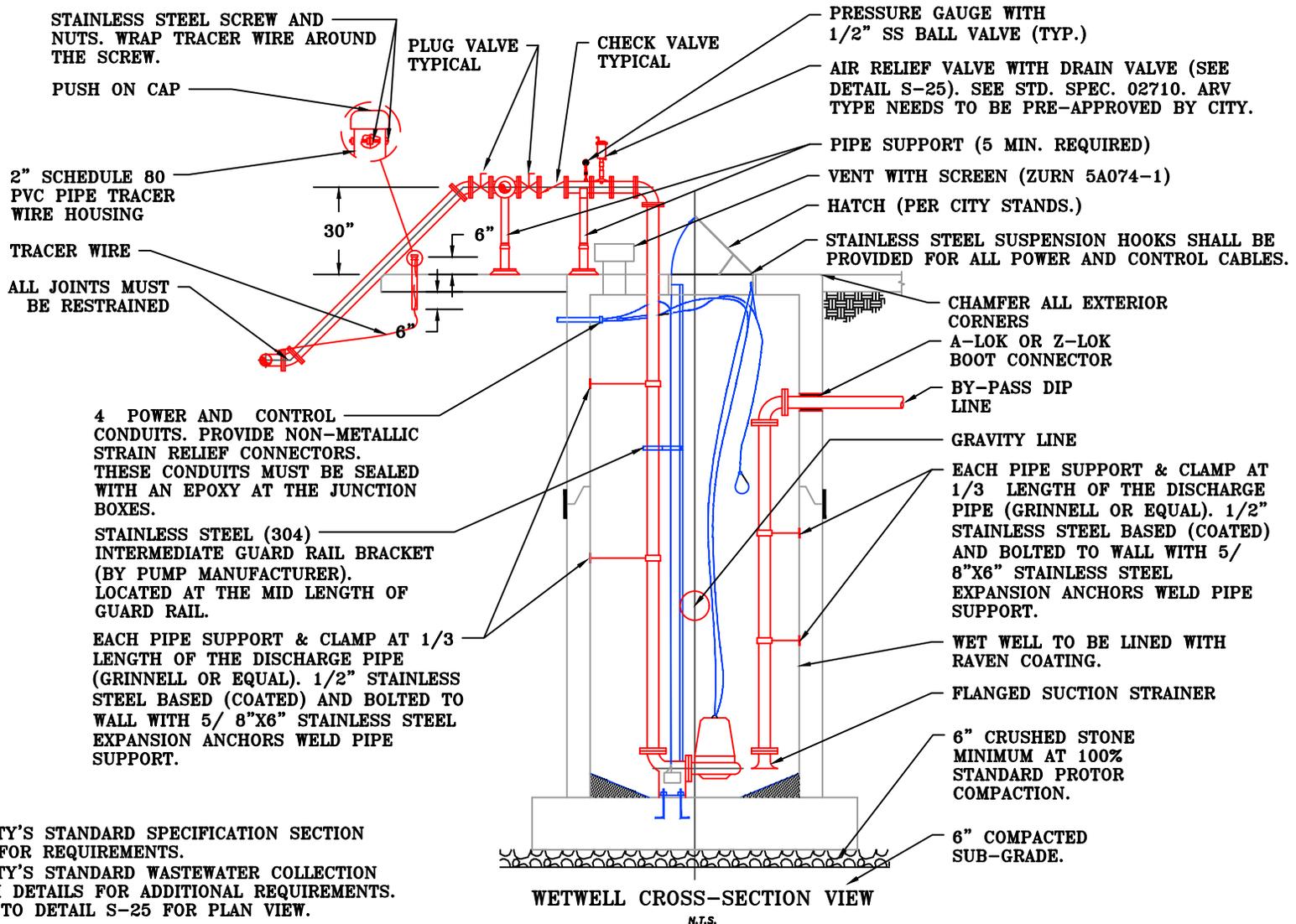
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CHECKED BY: J. W.

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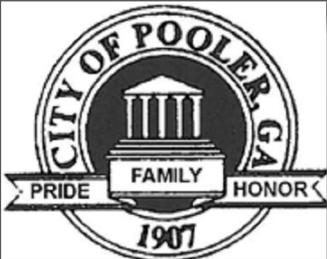
DATE: OCT., 2024

S-16A



NOTES:

1. SEE CITY'S STANDARD SPECIFICATION SECTION 02720 FOR REQUIREMENTS.
2. SEE CITY'S STANDARD WASTEWATER COLLECTION SYSTEM DETAILS FOR ADDITIONAL REQUIREMENTS.
3. REFER TO DETAIL S-25 FOR PLAN VIEW.



**CITY OF POOLER
2024 STANDARD DETAIL
ELEVATION OF LIFT STATION
WITH BYPASS PUMP**

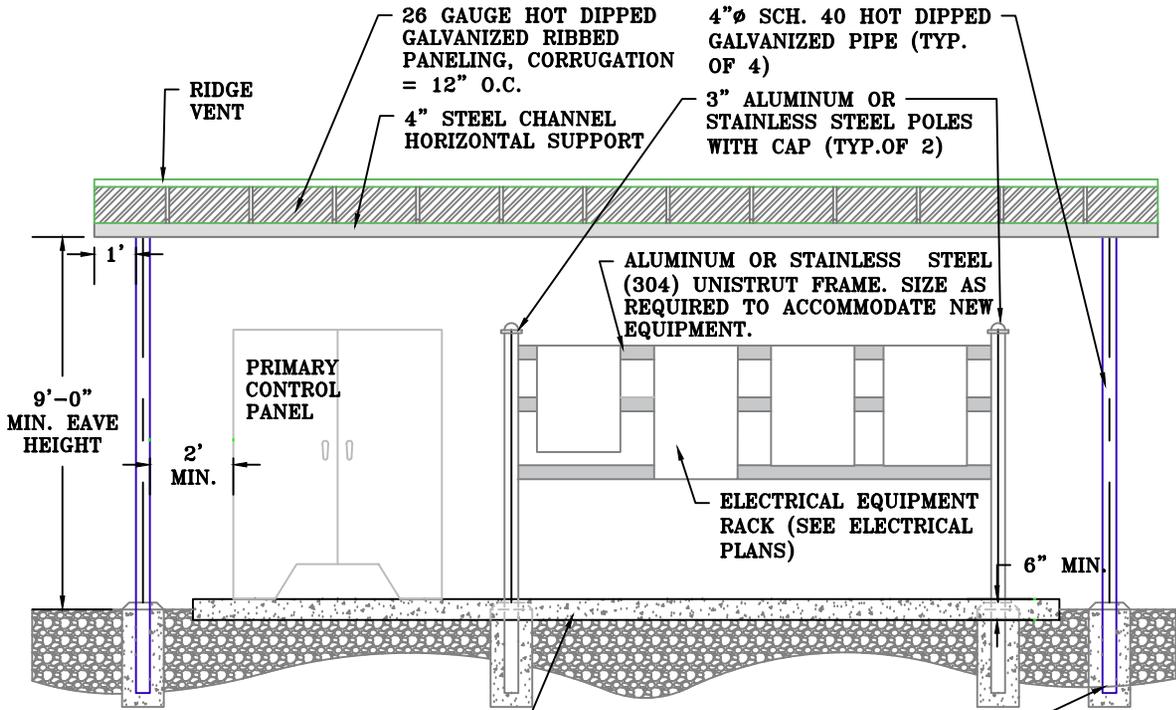
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: OCT., 2024

S-16B

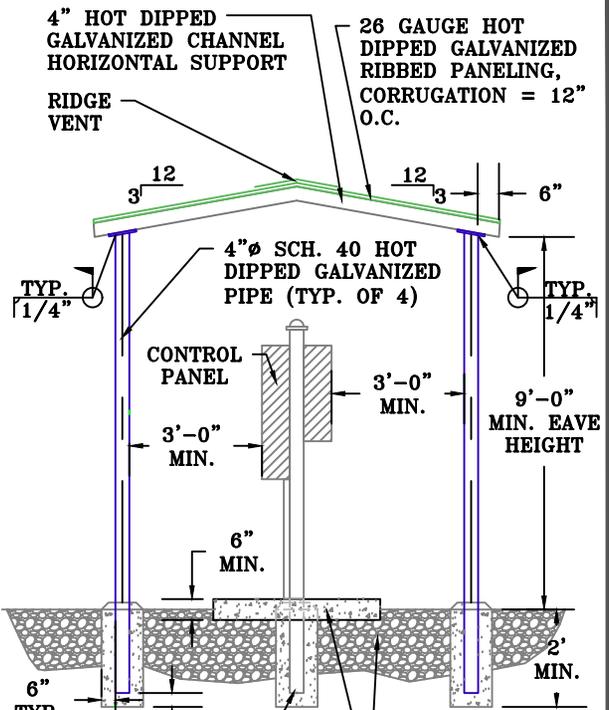


REINFORCED CONCRETE SLAB WITH # 2 WOVEN WIRE MESH (SIZE AS REQUIRED TO ACCOMMODATE EQUIPMENT AND SUPPORT STRUCTURE)

INSTALL PIPE MINIMUM 2' BELOW GRADE AND ENCASE IN CONCRETE (TYP. OF 6)

- NOTES:**
1. ALL ELECTRICAL PANELS SHALL BE NEMA 4X 316 S.S.
 2. ALL STEEL FOR SHELTER SHALL BE PAINTED PER CITY ENGINEER'S SPECS.
 3. SIZE OF STRUCTURE TO BE DETERMINED BY THE SIZE REQUIREMENTS OF THE CONTROL PANELS AND ELECTRICAL COMPONENTS.
 4. CONTRACTOR SHALL PROVIDE A SKETCH PLAN DESIGN OF THE STRUCTURE SHOWING THE ACTUAL DIMENSIONS OF THE CONTROL PANELS, ELECTRICAL COMPONENTS AND EQUIPMENT RACK LAYOUT.
 5. SHELTER MUST HAVE LED LIGHTS (5,000K) ABOVE THE PANELS AND EQUIPMENT RACK. THE LIGHT SWITCH MUST BE LOCATED NEAR THE PANEL.

CONTROL PANEL AND SHELTER ELEVATION



INSTALL PIPE MINIMUM 2' BELOW GRADE AND ENCASE IN CONCRETE (TYP. OF 6)

GRAVEL AREA
CONTROL PANEL SLAB

NOTE:
THIS DRAWING IS TO SHOW STANDARD CITY DETAILS AND MINIMUM REQUIREMENT AND SHALL ONLY BE USED AS GENERAL GUIDANCE. THE ENGINEER/CONTRACTOR IS RESPONSIBLE FOR THE DESIGN, SIZING AND SELECTION OF CONTROL PANEL, BREAKERS, TRANSFER SWITCHES, ETC. THIS SHEET TO BE MODIFIED TO ACCURATELY REFLECT THE ENGINEER'S/ CONTRACTOR'S DESIGN. SEE DETAILS S-25 AND S-26 FOR MORE INFO.

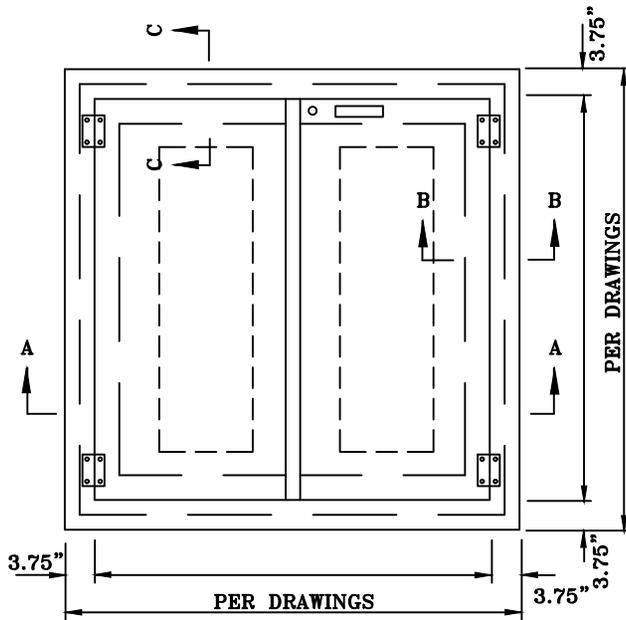
CONTROL PANEL AND SHELTER SECTION



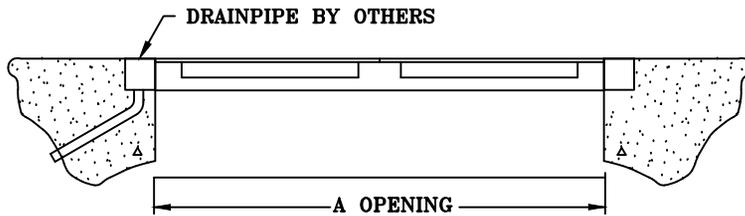
**CITY OF POOLER
2024 STANDARD DETAIL
CONTROL PANEL SHELTER
FOR LIFT STATIONS**

**DONE BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: OCT., 2024**

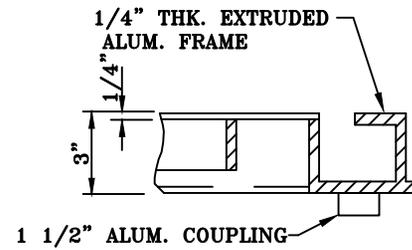
S-17



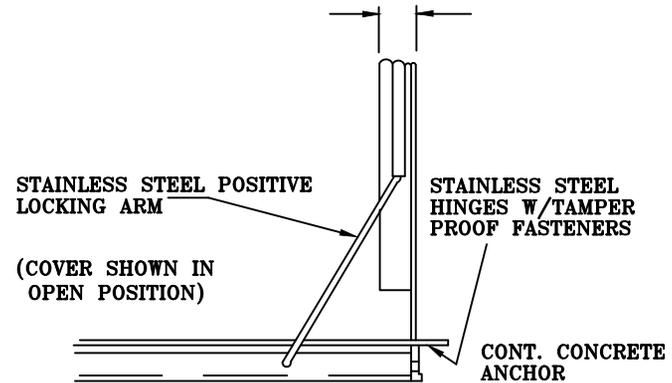
PLAN



SECTION A-A



SECTION B-B



SECTION C-C

NOTE: ACCESS COVER TO HAVE LOCKABLE HASP

ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL
WATERTIGHT DOUBLE DOOR
ACCESS FRAME AND COVER**

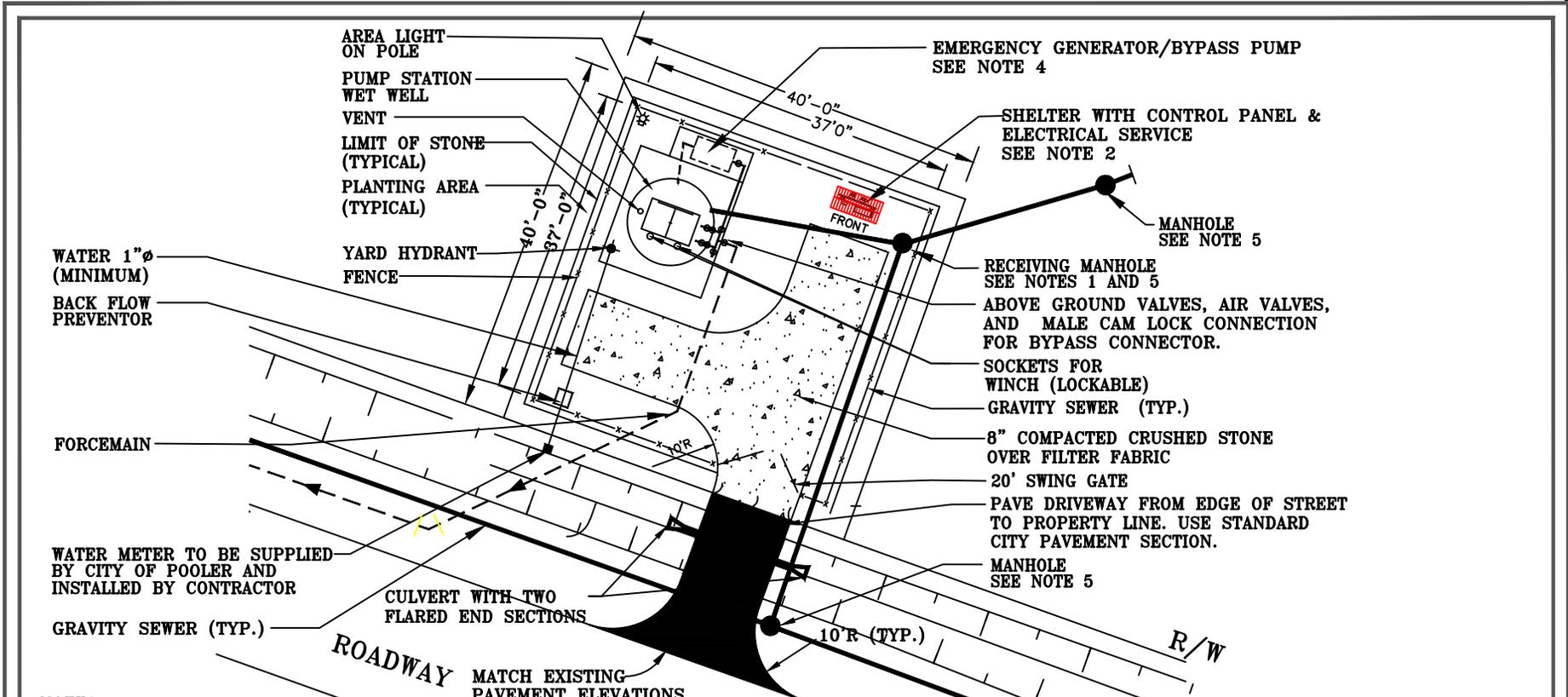
CHECKED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: OCT., 2024

S-18



NOTES:

1. RECEIVING MANHOLE TO BE LOCATED WITHIN FENCED AREA OF LIFT STATION SITE.
2. ALL 230V/3 ϕ ELECTRIC SERVICE NOT REQUIRING A DISCONNECT BEFORE THE METER SHALL BE PLACED OUTSIDE THE FENCE. FOR 460V/3 ϕ 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. EMERGENCY GENERATORS ARE REQUIRED ON ALL SEWER LIFT STATIONS. BYPASS PUMPS ARE REQUIRED IN ALL LIFT STATIONS WITH FLOW OVER 300GPM. THE CITY RESERVES THE RIGHT TO DETERMINE WHETHER AN EMERGENCY GENERATOR OR A BYPASS PUMP WILL BE REQUIRED. PAD TO BE LOCATED BY ELECTRICAL ENGINEER OR CITY.
5. MANHOLE MUST BE COATED WITH A STRUCTURAL EPOXY LIKE RAVEN OR APPROVED SIMILAR. SEE SECTION 02545 OF THE CITY SPECS.

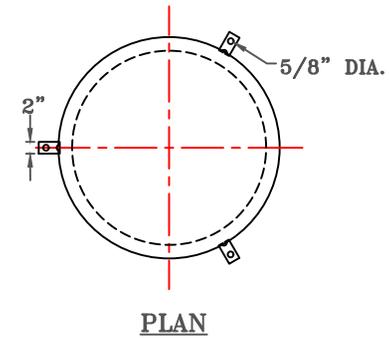
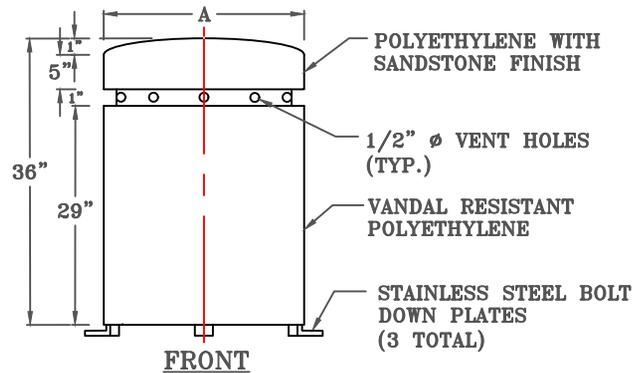
ORIGINAL BY: HGB 2012



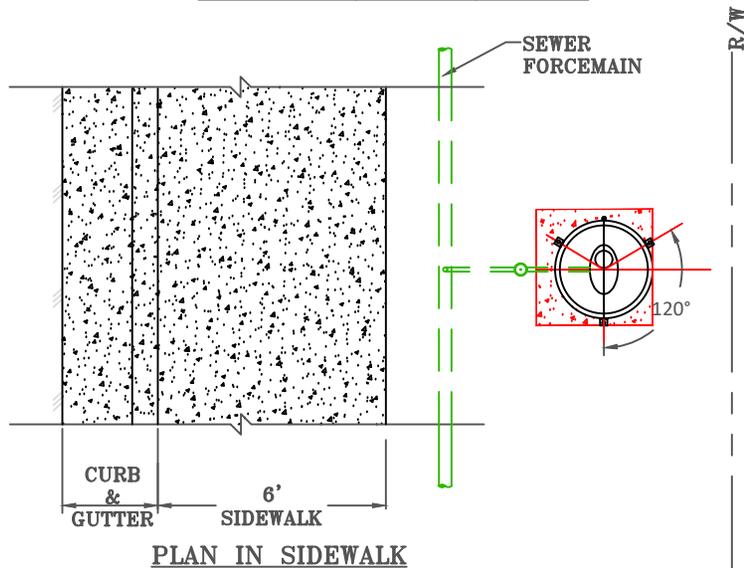
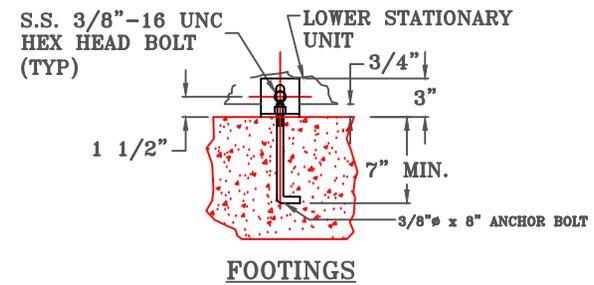
**CITY OF POOLER
2024 STANDARD DETAIL
TYPICAL LIFT STATION SITE
PLAN**

REVISED BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: OCT., 2024

S-19



SIZING FOR AIR VALVE ASSEMBLY COVER		
VALVE SIZE	A (DIAMETER)	B (HEIGHT)
1"	12"	36"
2", 3", 4", & 6"	20"	36"
8"	24"	36"



NOTES:

1. ENGINEER TO VERIFY THE REQUIRED SIZE AND TYPE OF AIR VALVE ASSEMBLY PER PROJECT REQUIREMENTS.
2. USE ONLY THE APPROPRIATE STD. DRAWING(S) AND DESCRIPTIONS FOR CORRECT SIZE OF AIR VALVE ASSEMBLY.
3. MODEL NO. P6002001, 2 or 3 BY AMORCAST OR WATER PLUS CORP. MODEL #131632 OR APPROVED SIMILAR.
4. ALL EXPOSED FERROUS METAL SHALL BE COATED PER SPECS. EXTERIOR COLOR TO BE SANDSTONE FINISH.



CITY OF POOLER
2024 STANDARD DETAIL
POLYETHYLENE ENCLOSURE
FOR AIR VALVES

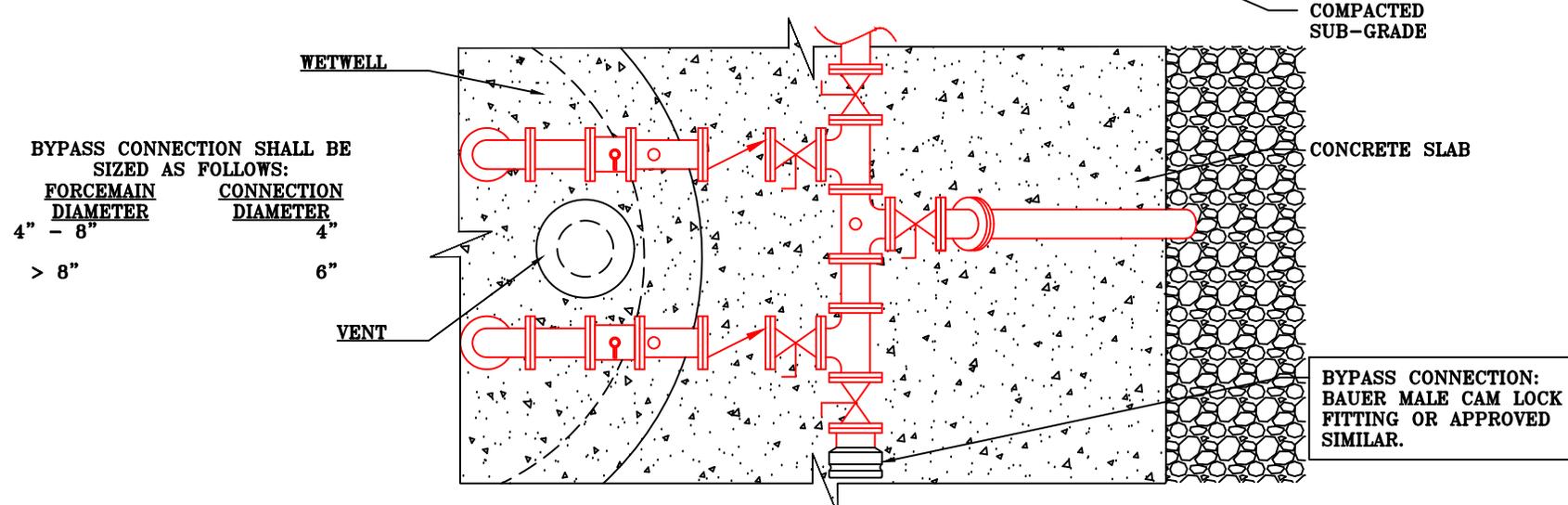
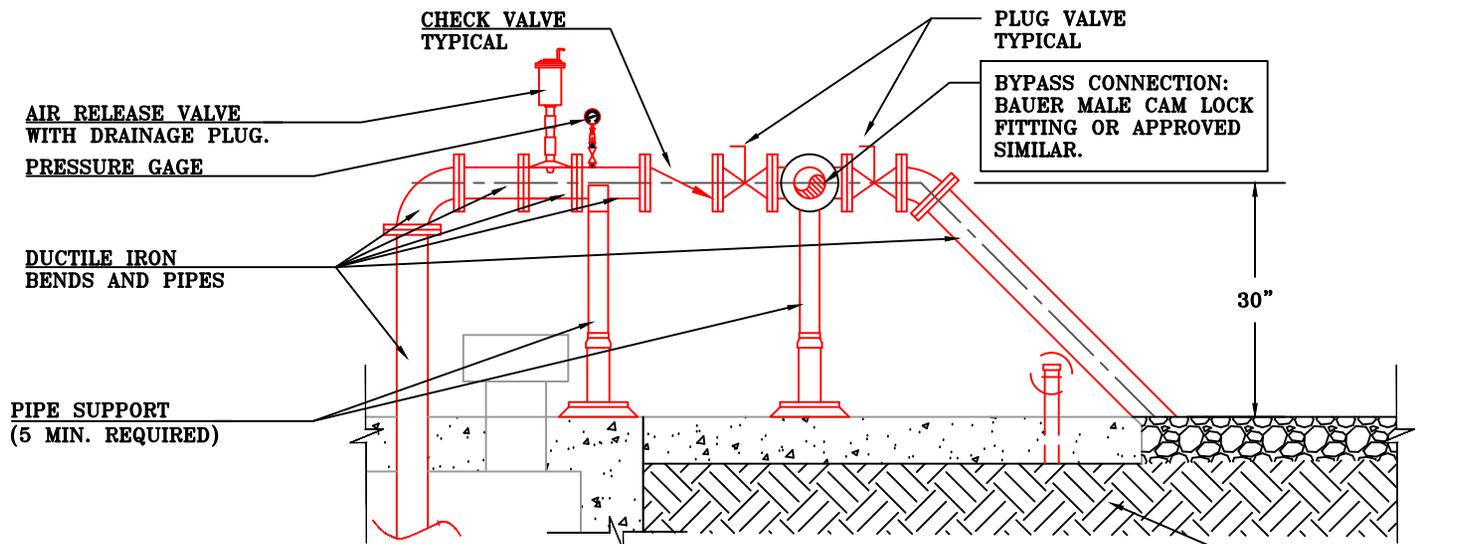
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: OCT., 2024

S-20



CITY OF POOLER
2024 STANDARD DETAIL
BYPASS CONNECTION

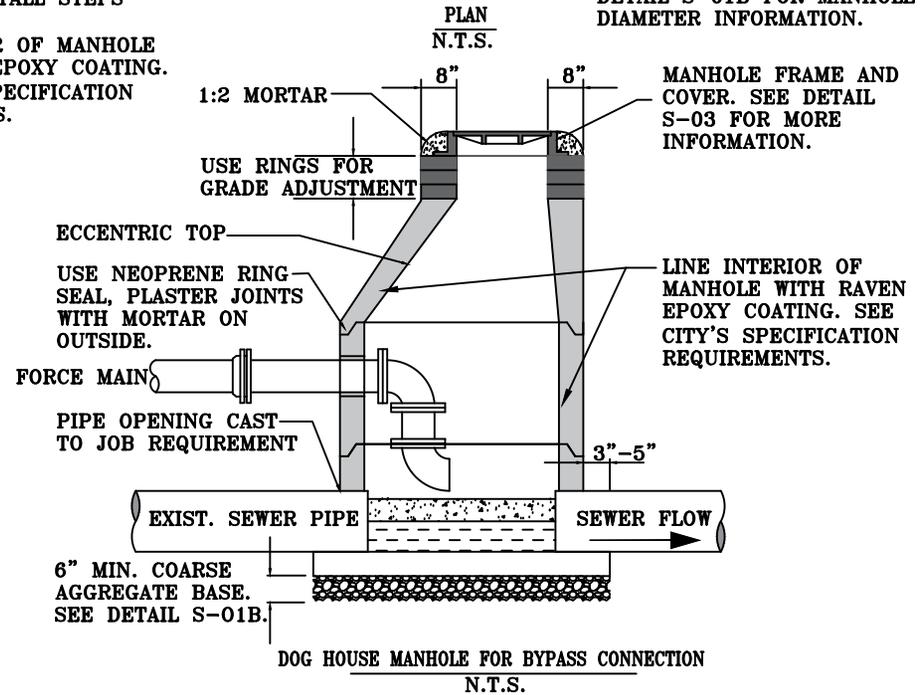
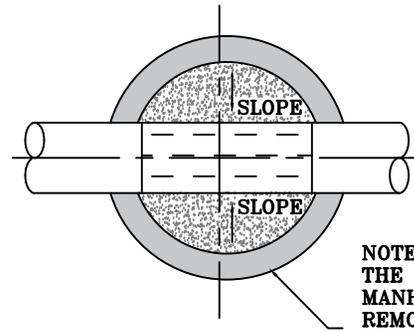
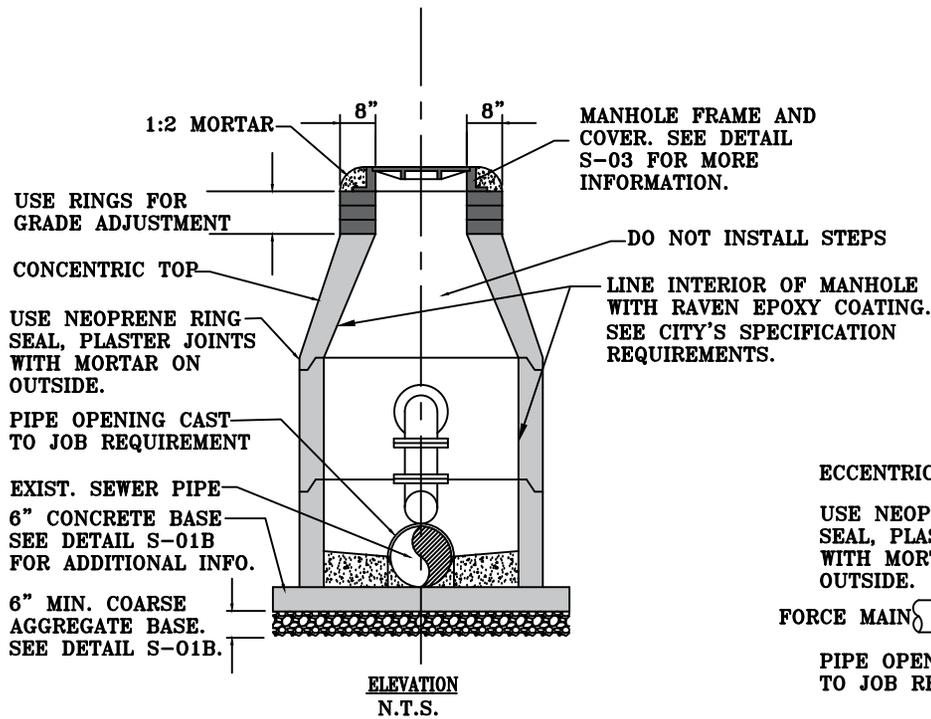
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: OCT., 2024

S-21



ORIGINAL: HGB-2011



**CITY OF POOLER
2024 STANDARD DETAIL
DOUGHOUSE MH FOR
FORCEMAIN CONNECTION**

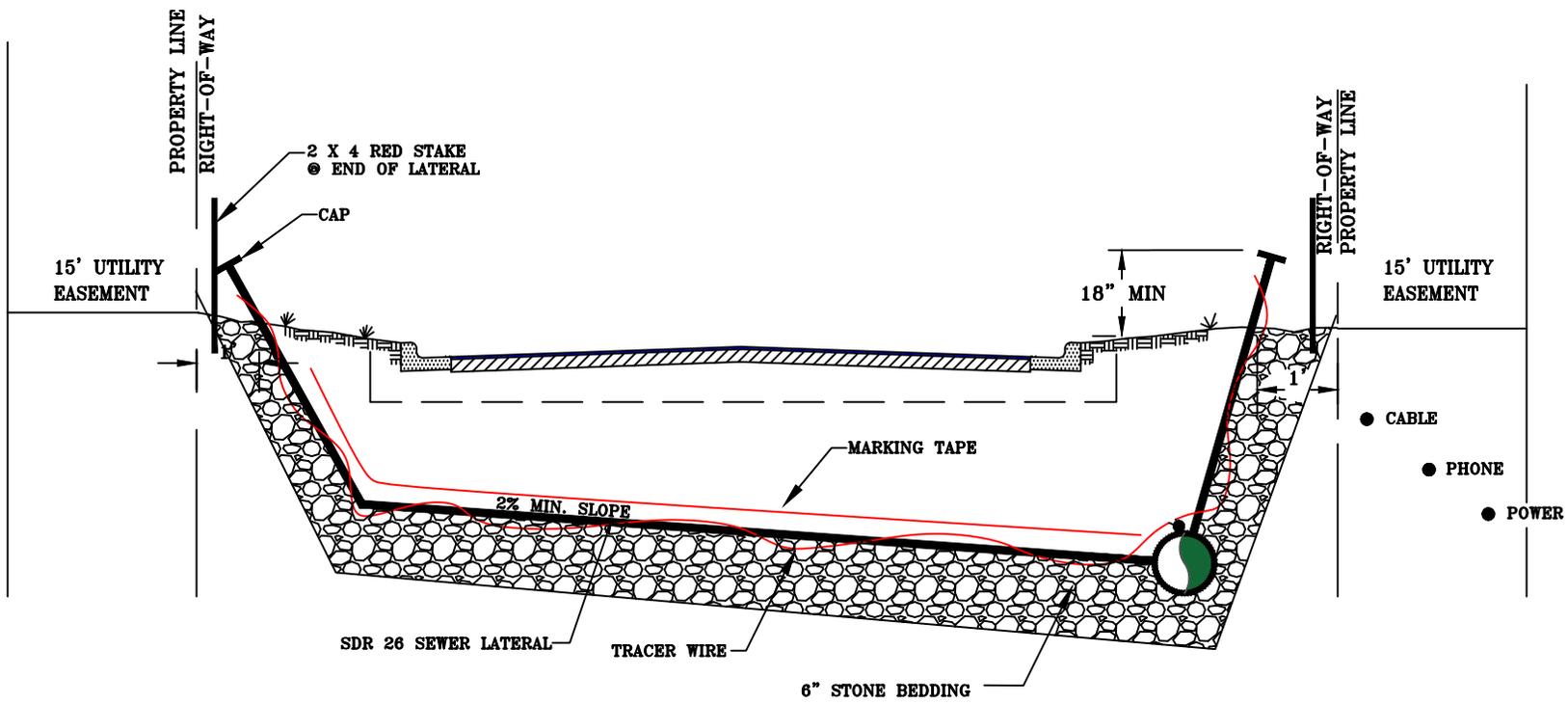
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: OCT, 2024

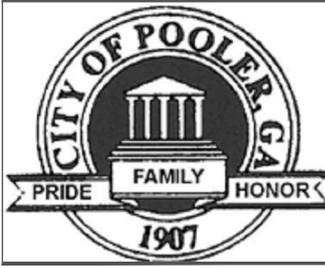
S-22



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.

ORIGINAL: HGB-2012



**CITY OF POOLER
2024 STANDARD DETAIL
PRIVATE SAN. SEWER
LATERAL**

REVISED BY: EOM

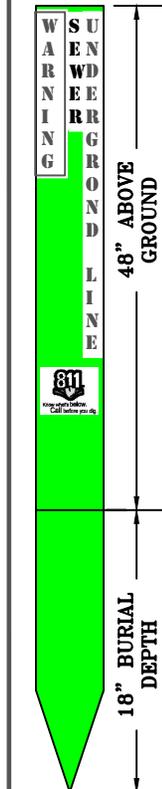
CHECKED BY: J. W.

SCALE: N.T.S.

DATE: OCT., 2024

S-23

TEST SPECIFICATIONS		TEST SPECIFICATIONS	
TENSILE STRENGTH	ASTM D638	VEHICLE IMPACT	10 IMPACTS @ 55 MPH - 10' WITHIN 30 SEC.
TENSILE ELONGATION	ASTM D638	ELONGATION @ BRAKE	ASTM D638 - 850%
TENSILE MODULUS	ASTM D638	FLEXURAL MODULUS	ASTM D790 - 185000 PSI
FLEXURAL STRENGTH	ASTM D790	HARDNESS	ASTM D2240 - 66 SHORE D SCALE
FLEXURAL MODULUS	ASTM D790	TENSILE IMPACT STRENGTH	ASTM D1822 - 115.00 FT-LB/IN
IZOD IMPACT STRENGTH	ASTM D256	TENSILE STRENGTH @ BRAKE	ASTM D638 - 4,200 PSI
HEAT DEFLECTION TEMP.	ASTM D648	BRITTLE TEMP.	ASTM D746 - -105 F
VICAT SOFTENING TEMP.	ASTM D1525	HEAT DEFLECTION TEMP.	ASTM D648 - 165 F
FLAMMABILITY	UL94	VICAT SOFTENING TEMP.	ASTM D1525 - 261 F
		DEFLECTION TEMP @ 66 PSI	ASTM D638 - 165 F



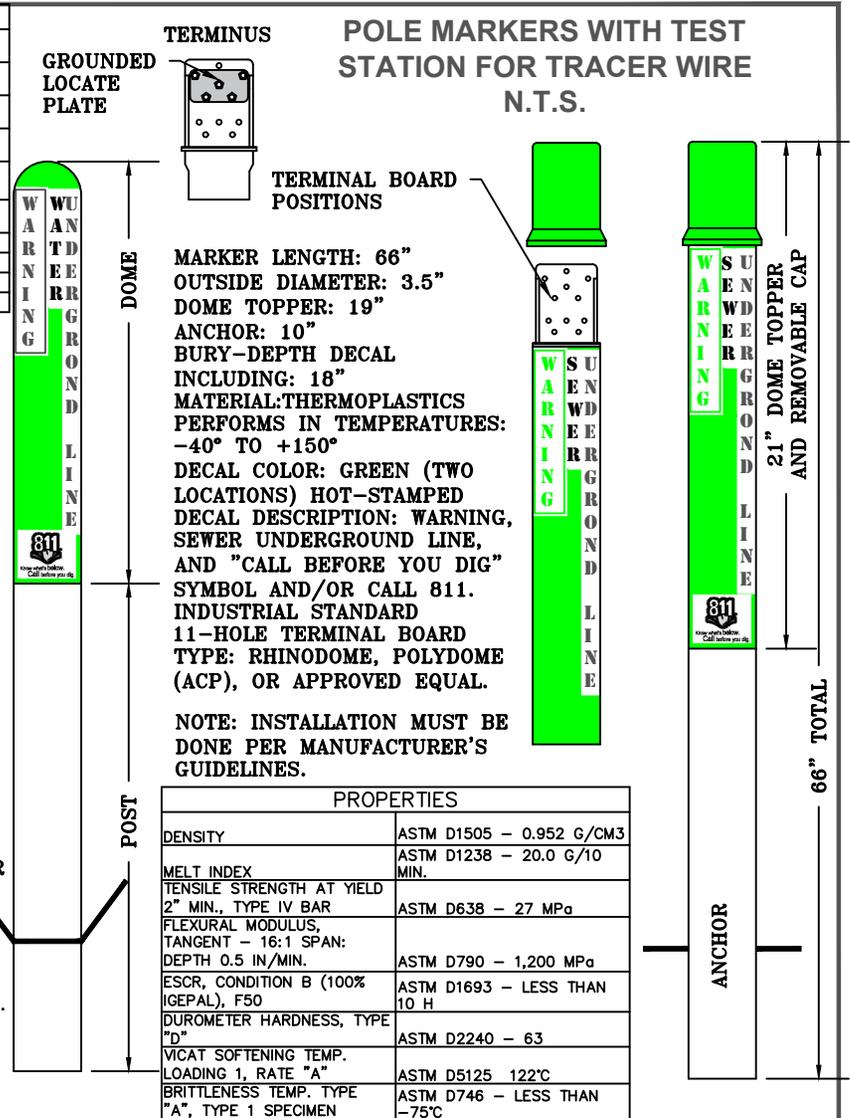
MARKER LENGTH: 66"
MARKER WIDTH: 4"
MARKER WEIGHT: 2.4 LBS
STANDARD DECAL LENGTH: 2.75"
MATERIAL: ENGINEERING FORMULATED THERMOPLASTIC
DECAL AND POST COLOR: GREEN
DECAL DESCRIPTION: WARNING, SEWER UNDERGROUND LINE, AND "CALL BEFORE YOU DIG" SYMBOL AND/OR CALL 811.
TYPE: PRO-MARK PM301 FLEXIBLE MARKER OR APPROVED EQUAL.

POST LENGTH: 55"
POST WALL THICKNESS: 0.135"
ANCHOR OD: .80"/LENGTH 10"
TOTAL WEIGHT: 3.0 LBS.
STANDARD DECAL LENGTH: 2.75"
MATERIAL: VIRGIN PRIME HDPE
DOMES COLOR: GREEN
DECAL DESCRIPTION: WARNING, SEWER UNDERGROUND LINE, AND "CALL BEFORE YOU DIG" SYMBOL AND/OR CALL 811.
TYPE: PRO-MARK PM303 FLEXIBLE MARKER POST OR APPROVED EQUAL.

NOTE: INSTALLATION MUST BE DONE PER MANUFACTURER'S GUIDELINES.

POLE MARKERS N.T.S.

- INSTALLATION NOTES:**
1. POLE MARKERS MUST BE INSTALLED EVERY 500 FT.
 2. EVERY OTHER MARKER MUST HAVE A TEST STATION WITH TRACER WIRE
 3. TESTING STATIONS NEED TO BE LOCATED AT EACH END OF LINES WITH CASINGS.
 4. A MINIMUM OF TWO MARKERS NEED TO BE INSTALLED. ONE OF THOSE MARKER NEEDS TO BE A TESTING STATION.



CITY OF POOLER
2024 STANDARD DETAIL
UTILITY POLE MARKERS
FOR SEWER MAINS

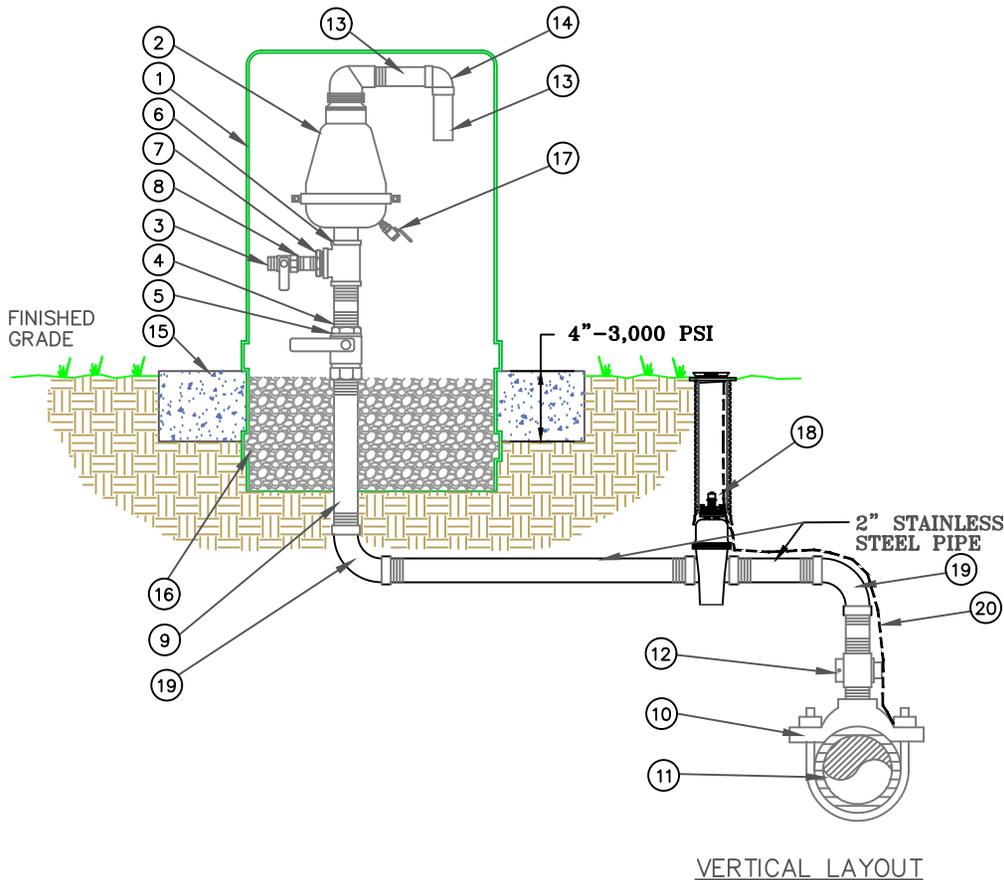
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: OCT, 2024

S-24



M A T E R I A L S		
ITEM	QUANT.	DESCRIPTION
1	1	VENTED ENCLOSURE, IF NEEDED. IT MUST BE APPROVED BY PUBLIC WORKS
2	1	AIR RELEASE VALVE 2" NPT (SEE BELOW) SEWER AIR RELEASE VALVES SHALL BE ARI
3	1	1" CURB STOP, STAINLESS STEEL
4	1	2" x 4" NIPPLE, S.S.
5	1	2" BALL VALVE, S.S.
6	1	2" TEE, S.S.
7	1	2" X 1" REDUCER, S.S.
8	1	1" SHORT NIPPLE, S.S.
9	1	2" PIPE, S.S. LENGTH AS REQUIRED
10	1	2" DOUBLE STRAP TAPPING SADDLE, S.S.
11	1	4" & LARGER FORCEMAIN
12	2	2" CORPORATION BRASS
13	1	1-1/2" PIPE, PVC, LENGTH AS REQUIRED
14	1	1-1/2" x 90° ELBOW, PVC
15	1	CONCRETE SLAB AROUND ENCLOSURE
16		#57 WHITE ROCK
17	1	DRAIN VALVE
18	1	2" GATE VALVE AND BOX
19	2	2" - S.S. 45° BEND
20	1	TESTING WIRE

NOTES:

1. CITY OF POOLER SHALL HAVE THE OPTION OF REQUIRING THE AIR RELEASE VALVE ASSEMBLY WITH ODOR CONTROL SYSTEM TO BE INSTALLED WHERE ODOR MAY BE A CONCERN.
2. THE AIR RELEASE VALVE BODY AND COVER COULD BE MADE OF EITHER STAINLESS STEEL (304 OR 316) OR COMPOSITE MATERIAL. THE INTERNAL COMPONENTS MATERIALS MUST BE EITHER STAINLESS STEEL OR COMPOSITE MATERIALS. IT MUST MEET ASTM A48.



**CITY OF POOLER
2024 STANDARD DETAIL
AIR RELEASE
VALVES**

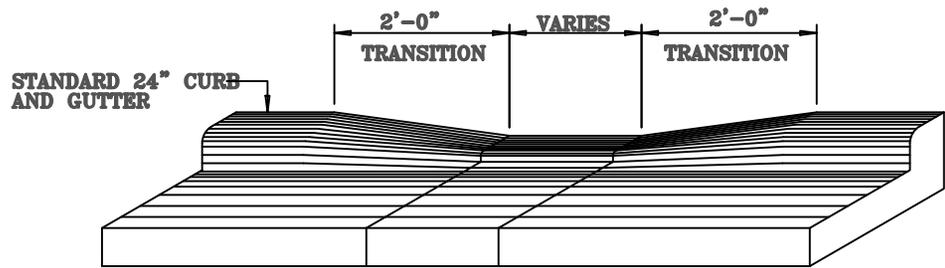
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2025

S-25



NOTES:
 THIS APPLIES TO DRIVEWAY ONLY. FOR
 HANDICAP SEE DETAIL P-16

ORIGINAL: HGB-2006

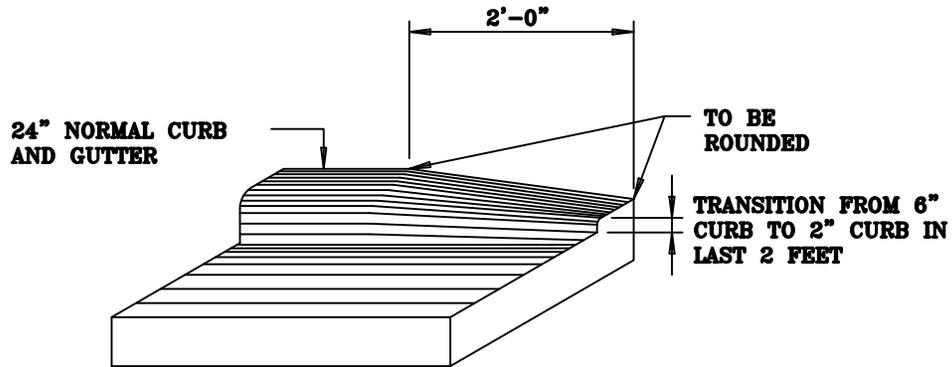


**CITY OF POOLER
 2024 STANDARD DETAIL**

DEPRESSED CURB

REVISED BY: EOM
 CHECKED BY: J. W.
 SCALE: N.T.S.
 DATE: APRIL, 2024

P-01



NOTES:
FOR END OF CURB AND GUTTER
AS INDICATED ON THE PLANS.

ORIGINAL: HGB-2001



CITY OF POOLER
2024 STANDARD DETAIL
FEATHERING OF CONCRETE
CURB AND GUTTER

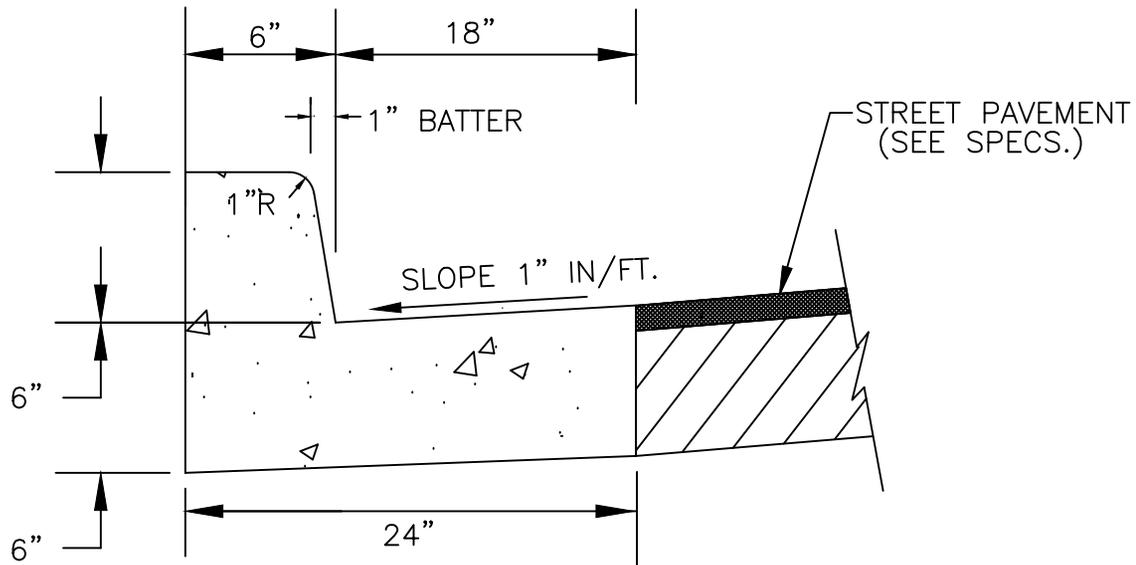
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

P-02



ORIGINAL: HGB-2001



CITY OF POOLER
2024 STANDARD DETAIL
NORMAL
24" CURB AND GUTTER

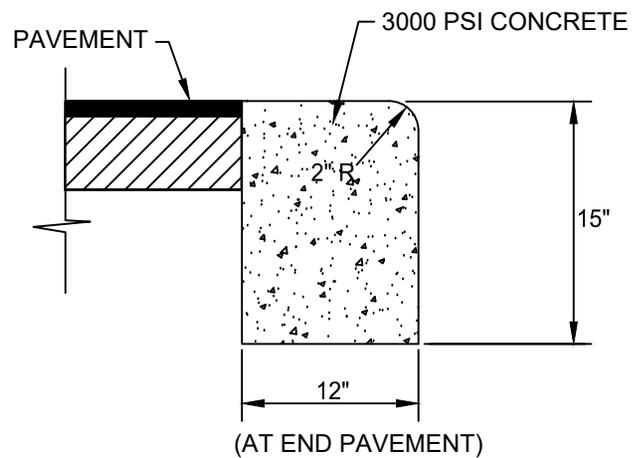
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

P-03



ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL**

FLUSH HEADER CURB

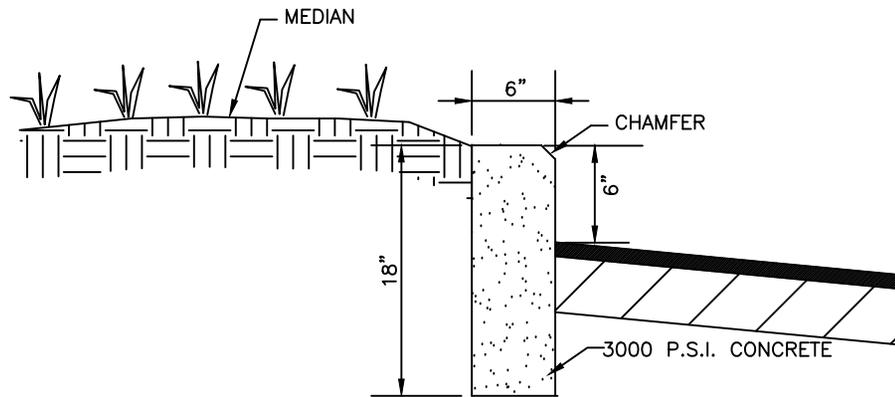
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

P-04



ORIGINAL: HGB-2001



CITY OF POOLER
2024 STANDARD DETAIL
RAISED CONCRETE HEADER
CURB

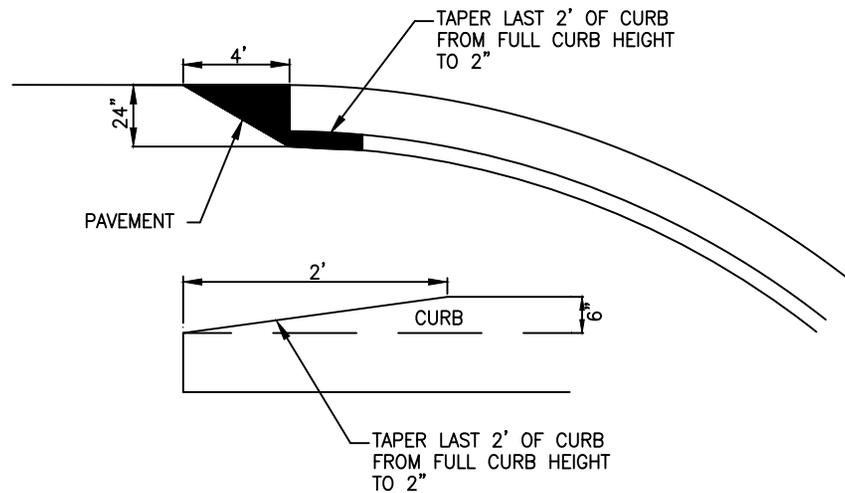
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

P-05



ORIGINAL: HGB-2004



CITY OF POOLER
2024 STANDARD DETAIL
PAVEMENT-CURB
TERMINATION

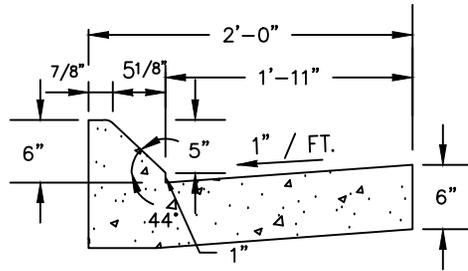
REVISED BY: EOM

CHECKED BY: J. W.

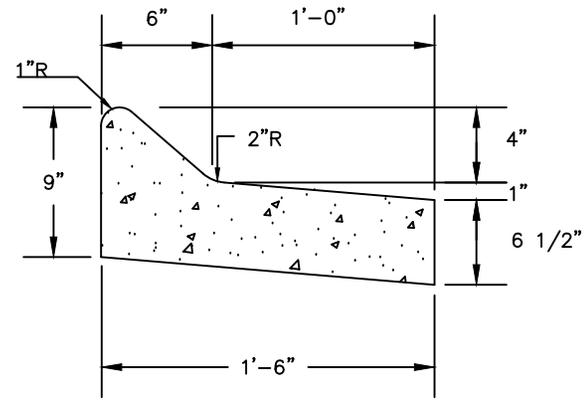
SCALE: N.T.S.

DATE: APRIL, 2024

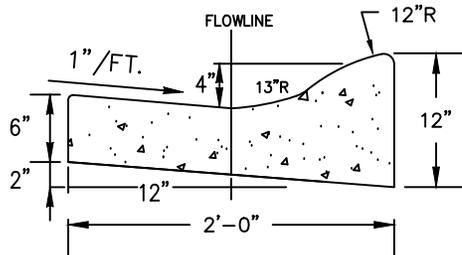
P-06



MOUNTABLE



PITCHED



ROLLED

NOTES:

1. ALL CONSTRUCTION SHALL CONFORM TO THE CITY OF POOLER TECHNICAL SPECIFICATIONS INCLUDING, BUT NOT LIMITED TO, SECTION 02200 - EXCAVATION FILLING AND GRADING AND SECTION 03300 - CAST-IN-PLACE CONCRETE.
2. BASE COMPACTION UNDER CURB TO BE 98% (ASTM D698).
3. CONTRACTION JOINTS TO BE SAW CUT NO LATER THAN 24 HOURS AFTER THE POUR.

NOTE:

THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.

ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL
MOUNTABLE CONCRETE
CURB AND GUTTER**

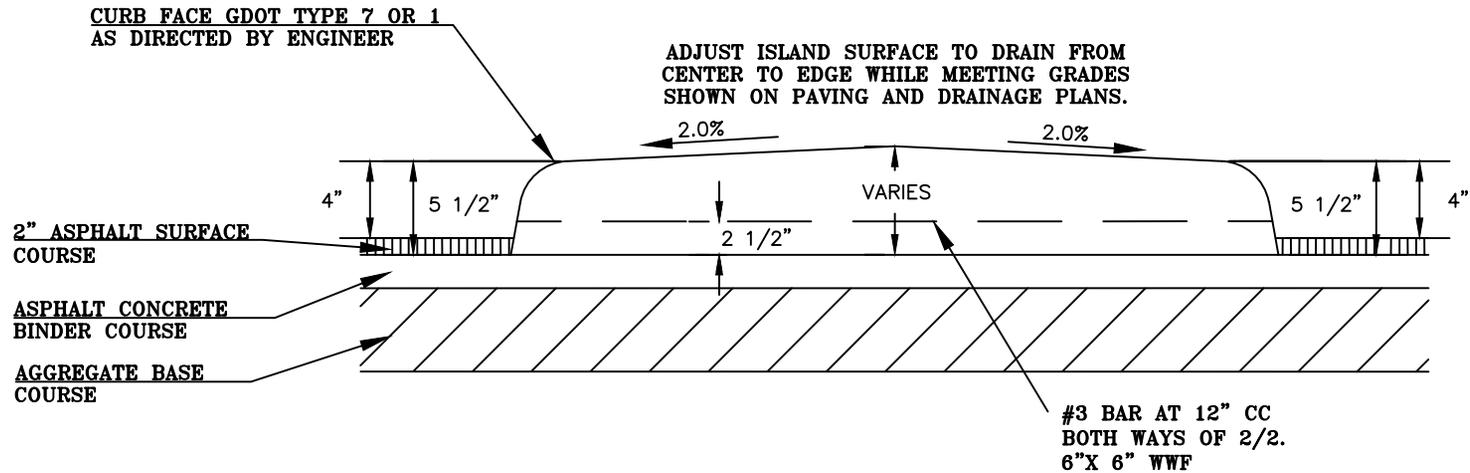
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

P-07



NOTES:

1. ALL CONSTRUCTION SHALL CONFORM TO THE CITY OF POOLER TECHNICAL SPECIFICATIONS INCLUDING, BUT NOT LIMITED TO, SECTION 02200 - EXCAVATION FILLING AND GRADING AND SECTION 03300 - CAST-IN-PLACE CONCRETE.
2. BASE COMPACTION UNDER CURB TO BE 98% (ASTM D698).
3. CONTRACTION JOINTS TO BE SAW CUT NO LATER THAN 24 HOURS AFTER THE POUR.
4. USE 4,000 PSI CONCRETE

NOTE:

THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.

ORIGINAL: HGB-2001



**CITY OF POOLER
2024 STANDARD DETAIL**

MEDIAN CONCRETE ISLAND

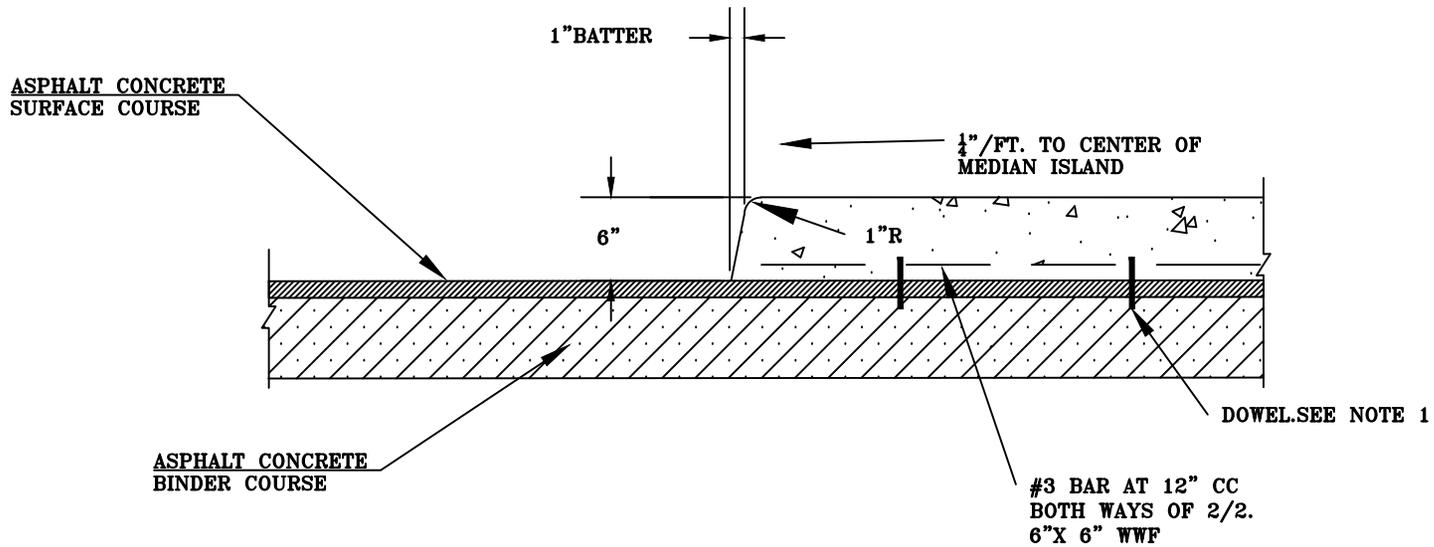
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

P-08



NOTES:

1. WHERE CONCRETE ISLAND 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 10'X 10' GRID.
2. ALL CONSTRUCTION SHALL CONFORM TO THE CITY OF POOLER TECHNICAL SPECIFICATIONS INCLUDING, BUT NOT LIMITED TO, SECTION 02200 - EXCAVATION FILLING AND GRADGING AND SECTION 03300 - CAST-IN-PLACE CONCRETE.
2. BASE COMPACTION UNDER CURB TO BE 98% (ASTM D698).
3. CONTRACTION JOINTS TO BE SAW CUT NO LATER THAN 24 HOURS AFTER THE POUR.
4. USE 4,000 PSI CONCRETE.

NOTE:

THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.

ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL
RAISED MEDIAN CONCRETE
ISLAND**

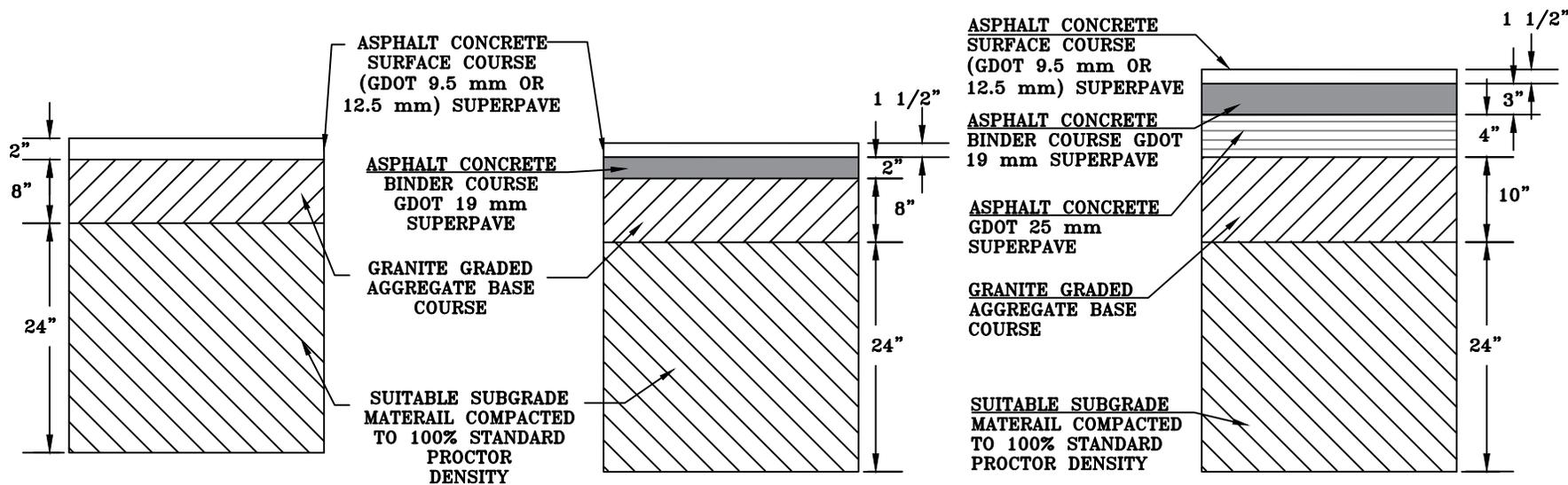
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

P-09



**STANDARD
TYPE 1**

**HEAVY DUTY
TYPE 2**

**HEAVY DUTY
TYPE 3**

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
 - 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 (TYPE 1) AND HEAVY DUTY PAVEMENTS (TYPES 2 AND 3).

NOTE:

THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.

ORIGINAL: HGB-2012



**CITY OF POOLER
2024 STANDARD DETAIL
TYPICAL PAVEMENT
SECTIONS**

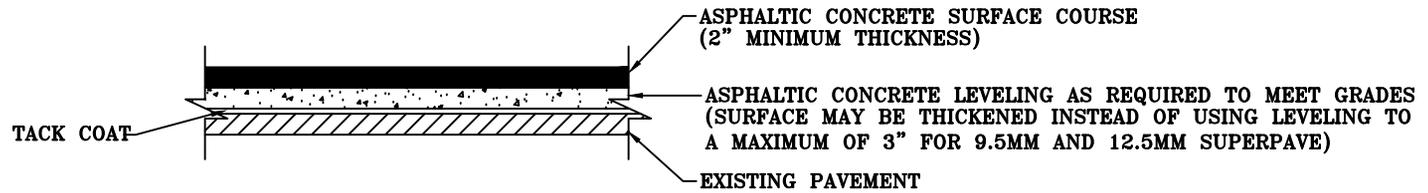
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

P-10



NOTE:
 THESE ARE THE CITY'S MINIMUM STANDARDS.
 TOLERANCES BEYOND THESE MINIMUM
 STANDARDS ARE NOT ACCEPTABLE AND WILL
 BE REJECTED.

ORIGINAL: HGB-2004



**CITY OF POOLER
 2024 STANDARD DETAIL
 OVERLAY PAVEMENT
 SECTION**

REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

P-11

NOTE:

SIDEWALK MAY BE ON EITHER ONE OR BOTH SIDES OF THE ROADWAY. THEY MAY BE SEPARATE FROM THE BACK OF THE CURB. THE SEPARATION FROM THE BACK OF THE CURB WILL BE SHOWN IN THE APPROVED CONSTRUCTION PLANS. IF THEY ARE SEPARATED, THE MINIMUM SEPARATION IS 2'.

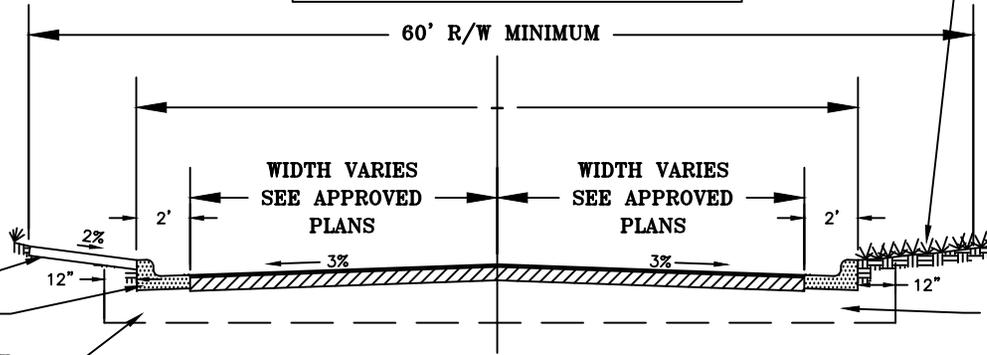
THE MINIMUM SIDEWALK FOR RIGHT-OF-WAYS WIDTH ARE:

1. IN SINGLE FAMILY RESIDENTIAL DEVELOPMENTS IS 4'.
2. IN MULTI-FAMILY RESIDENTIAL DEVELOPMENTS IS 6'.
3. IN COMMERCIAL DEVELOPMENT IS 6'.

CONCRETE SIDEWALK
 24" CONCRETE CURB AND GUTTER
 24" COMPACTED SUB-BASE TO 100% STANDARD PROCTOR DENSITY, ASTM D698.

NOTE:

THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.



BEHIND THE CURB, THE FIRST 3 FT. MIN. GRASS (SOD) FOR DISTURBED AREAS. HYDRO-SEEDING MAY BE USED ON THE OTHER DISTURBED AREAS. SEE GDOT STANDARDS FOR HYDRO-SEEDING. SLOPE VARIES.

REMOVAL OF UNSUITABLE MATERIAL AS INDICATED IN THE SOIL REPORT OR AS DIRECTED BY A PROFESSIONAL GEOTECHNICAL ENGINEER.

NOTES:

1. THIS DETAIL SUPERSEDES DETAILS P-12 AND THE STANDARD SPECIFICATIONS DATED AUGUST 2006.
2. SOIL TESTING IS REQUIRED TO DETERMINE IF THIS SECTION MEETS THE MINIMUM REQUIREMENTS FOR THE SITE'S SOIL CONDITIONS. THIS MUST BE CERTIFIED BY GEOTECHNICAL ENGINEER.
3. CONSTRUCTION SHALL CONFORM TO ALL THE APPLICABLE CITY OF POOLER STANDARD SPECIFICATIONS. SEE DIVISIONS 2 AND 3.
4. ALL HOT MIX ASPHALTIC CONCRETE MUST COMPLY WITH GDOT STANDARDS SECTION 400 AND ALL RELATED SECTIONS 106, 109, 413, 424, 802, AND 828. TEST PER EACH 250 TONS OF CONCRETE ASPHALT PER GDOT SPECIFICATIONS:
 - A. ONE ASPHALT EXTRACTION AND AGGREGATES.
 - B. ONE MARSHALL STABILITY TEST (NOT LESS THAN 1,500 LBS. FOR SURFACE COURSE).
 - C. ALL CORE HOLES SHOULD BE FILLED WITH HOT ASPHALT. HOLES MUST BE CLEANED, DRIED, AND TACK WITH AC-20 OR AC-30.
5. FOR AGGREGATES, USE THE ASTM C1077 STANDARD PRACTICES FOR TESTING.
6. THE CITY RESERVES THE RIGHT TO REQUIRE UNDER DRAINAGE AND/OR FILTER FABRIC ON THE BASIS OF FIELD TESTING.
7. THE BOTTOM OF ROAD BASE MUST BE LOCATED AT 2 FEET (MIN.) ABOVE THE SEASONAL HIGH GROUND WATER TABLE (AT ITS LOWEST POINT) UNLESS A GEOTECHNICAL ENGINEER CERTIFIES THAT THE PROPOSED ROADWAY DESIGN WILL NOT BE AFFECTED BY THE GROUND WATER TABLE AT THE SITE.
8. SOIL BORINGS TO BE DONE AT A MINIMUM OF 1 PER EVERY 500' OF PROPOSED ROADWAY. SEE ASTM D-1452 AND D-1587.
9. SUITABLE SUB-BASE MATERIALS ARE THOSE COMPLYING WITH ASTM D-2487 SOIL CLASSIFICATION GROUPS: GW, GP, SP AND SW SOILS AS CLASSIFIED UNDER THE UNIFIED SYSTEM.
10. BITUMINOUS PRIME AND TACK COATS WILL BE APPLIED AS LISTED BELOW:
 - A. PRIME COAT SHALL BE APPLIED AT A RATE OF 0.20 GALLONS PER SQUARE YARD TO THE SURFACE OF THE GRANITE BASE COURSES. SEE DETAIL P-10.
 - B. TACK COAT AC20 OR AC30 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.



**CITY OF POOLER
 2024 STANDARD DETAIL
 TYPICAL SECTION THRU
 ROADWAY**

DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

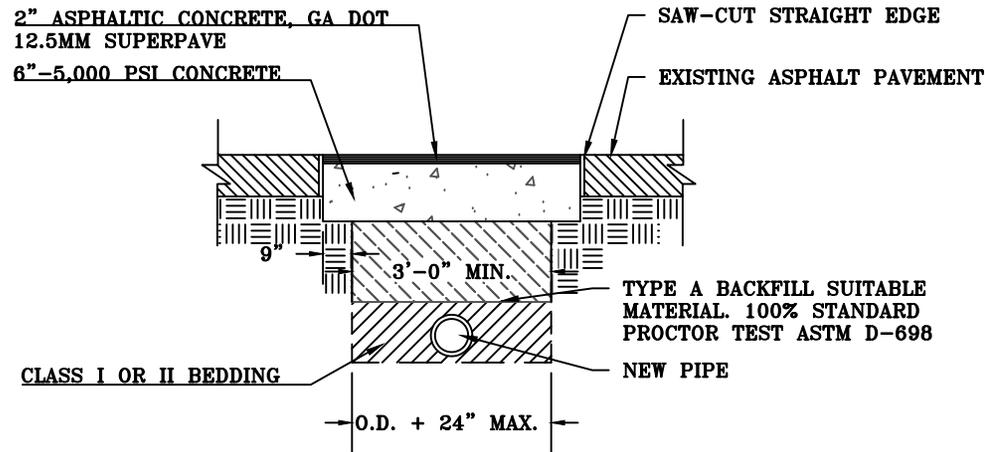
P-12

NOTE:

ALL LATERAL STREET CUTS MUST BE COVERED WITH STEEL PLATES OF SUFFICIENT THICKNESS TO SPAN THE CUT WITHOUT NOTICEABLE DEFLECTION. PLATES TO REMAIN IN PLACE UNTIL THE CONCRETE BASE HAS GAINED SUFFICIENT STRENGTH TO WITHSTAND TRAFFIC LOADS. 24 HRS. MINIMUM TIME.

NOTE:

THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.



ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL**

PAVEMENT REPLACEMENT

REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

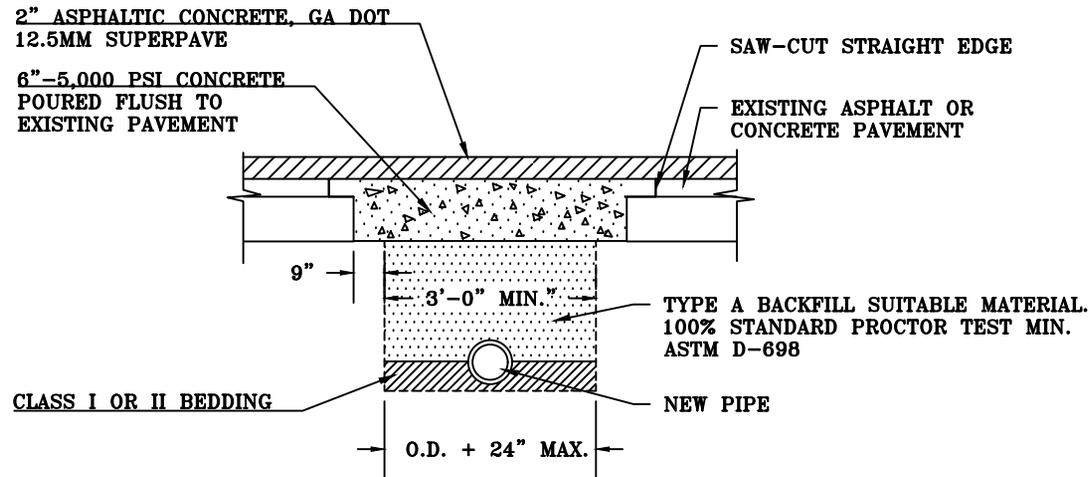
P-13

NOTE:

FOR LONGITUDINAL CUTS EXCEEDING 150 FT. IN LENGTH, THE CONCRETE IN TRENCH WILL BE BROUGHT FLUSH WITH THE EXISTING PAVEMENT AND THE ENTIRE WIDTH OF THE ROADWAY MUST BE RESURFACED WITH A MINIMUM OF 2" OF 12.5 mm SUPERPAVE ASPHALT TOPPING OR SURFACE COARSE.

NOTE:

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ORIGINAL: HGB-2006



**CITY OF POOLER
2024 STANDARD DETAIL
PAVEMENT REPLACEMENT
LONGITUDINAL CUTS**

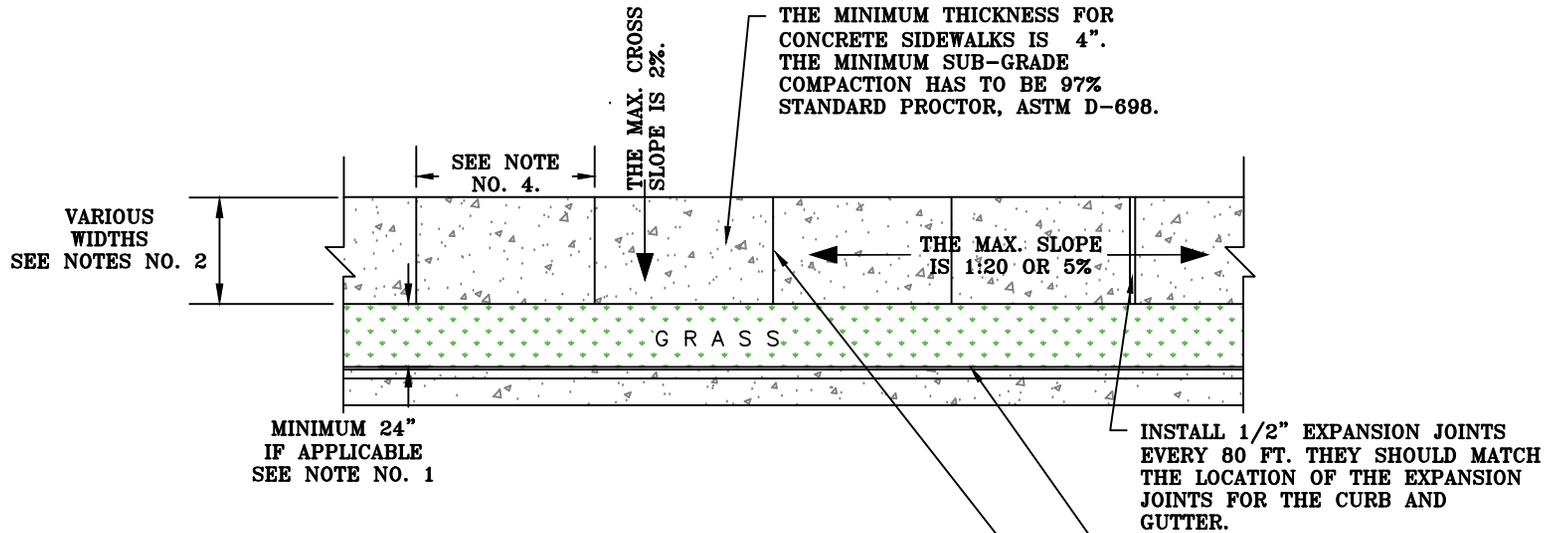
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

P-14



NOTE:

1. SIDEWALK MAY BE ON EITHER ONE OR BOTH SIDES OF THE ROADWAY. THEY MAY BE SEPARATE FROM THE BACK OF THE CURB. THE SEPARATION FROM THE BACK OF THE CURB WILL BE SHOWN IN THE APPROVED CONSTRUCTION PLANS. IF THEY ARE SEPARATED, THE MINIMUM SEPARATION DISTANCE IS 2'.
2. THE MINIMUM SIDEWALK WIDTH FOR RIGHT-OF-WAYS ARE:
 - a. IN SINGLE FAMILY RESIDENTIAL DEVELOPMENTS IS 4'. PASSING SPACES MUST BE CONSTRUCTED EVERY 200 FT.
 - b. IN MULTI-FAMILY RESIDENTIAL DEVELOPMENTS IS 6'.
 - c. IN COMMERCIAL DEVELOPMENT IS 8'.
3. THE TEXTURE OF THE SURFACE MUST BE FIRM, STABLE AND SLIP-RESISTANT.
4. CONSTRUCTION JOINTS SPACING TO BE THE SAME AS THE WIDTH OF THE SIDEWALK.
5. THE MINIMUM THICKNESS FOR CONCRETE SIDEWALKS IS 4".
6. THE MINIMUM SUB-GRADE COMPACTION MUST BE 97% STANDARD PROCTOR, ASTM D-698.
7. ALL SIDEWALKS MUST MEET ALL THE LATEST ADA STANDARDS.

NOTE:

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**CITY OF POOLER
2024 STANDARD DETAIL**

SIDEWALK AND WALKWAY

DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

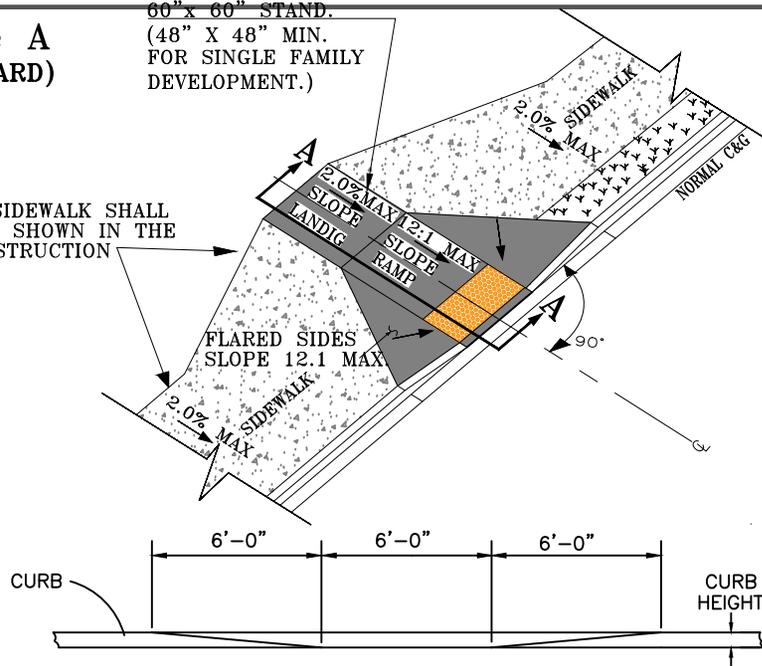
DATE: APRIL, 2024

P-15

Type A (STANDARD)

60" x 60" STAND.
(48" X 48" MIN.
FOR SINGLE FAMILY
DEVELOPMENT.)

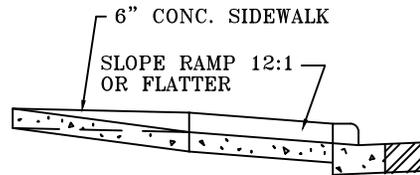
BACK OF THE SIDEWALK SHALL
BE LOCATED AS SHOWN IN THE
APPROVED CONSTRUCTION
PLANS.



FRONT ELEVATION

NOTES:

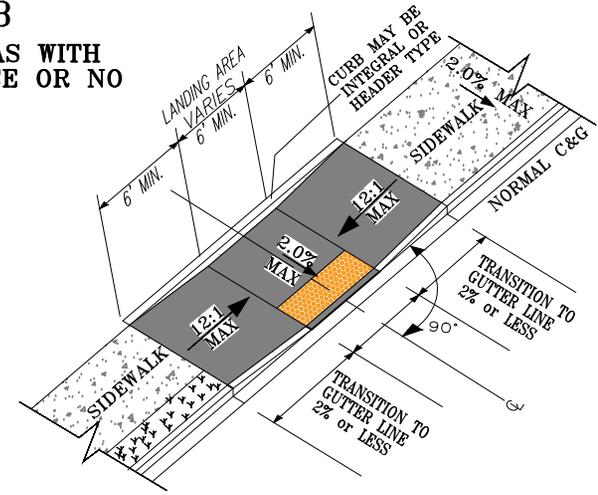
1. SEE DETAIL P-15 FOR MORE INFORMATION ON THE SIDEWALK.
2. ALL TECHNICAL CONSTRUCTION REQUIREMENTS THAT APPLY TO THE SIDEWALK ALSO APPLY TO THE HANDICAP RAMPS.
3. RAMP SHALL HAVE BOTH, A VISIBLE COLOR DIFFERENCE AND A RAISED TACTILE SURFACE TO DIFFERENTIATE IT FROM THE SIDEWALK.
4. RAMPS SHALL COMPLY WITH THE LATEST APPLICABLE ADA STANDARDS.



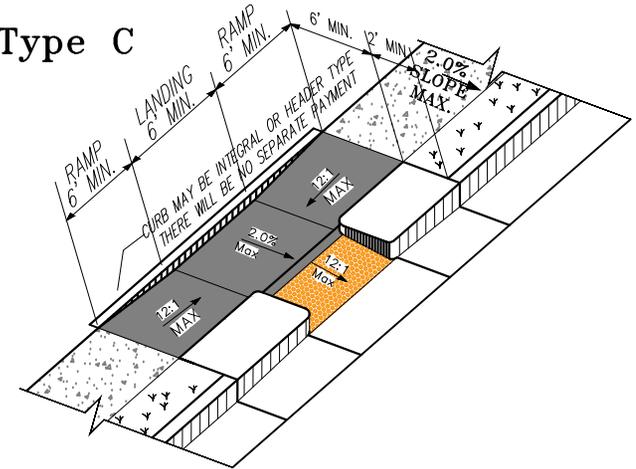
SECTION A-A

NOTE:
THESE ARE THE CITY'S MINIMUM STANDARDS.
TOLERANCES BEYOND THESE MINIMUM
STANDARDS ARE NOT ACCEPTABLE AND WILL
BE REJECTED.

Type B (USE IN AREAS WITH LIMITED SPACE OR NO LANDSCAPE)



Type C



**CITY OF POOLER
2024 STANDARD DETAIL**

HANDICAP RAMP

DONE BY: EOM

CHECKED BY: J. W.

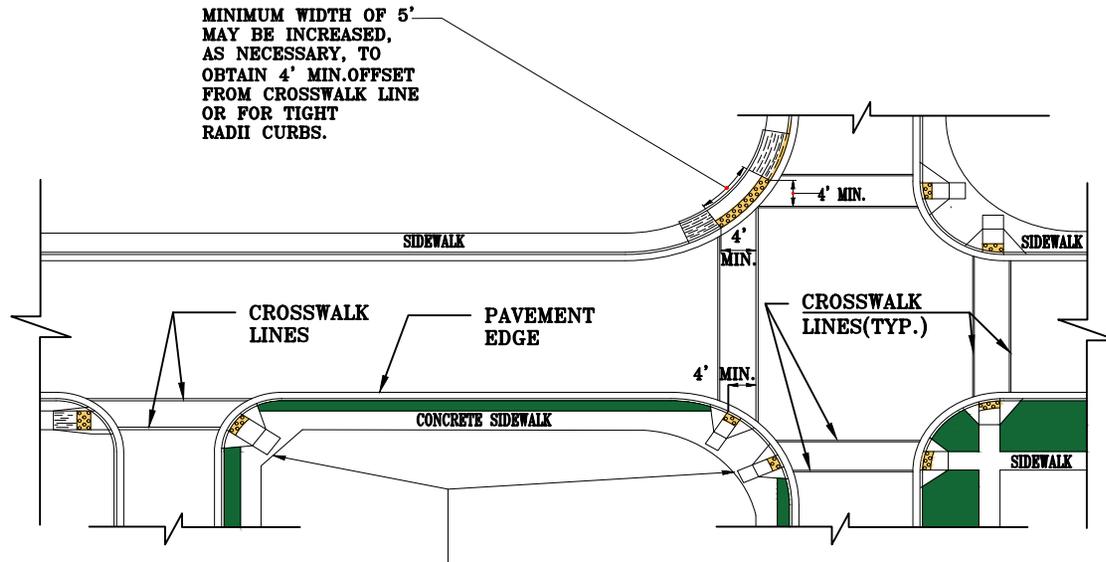
SCALE: N.T.S.

DATE: APRIL, 2024

P-16

TYPICAL LOCATIONS FOR CURB CUT RAMPS PLAN VIEW

NOTE:
THE RAMP LENGTH IS NOT REQUIRED TO EXCEED 15 FEET. THE RAMP SLOPE MAY EXCEED 12:1 IF THE SITE CONDITIONS PREVENT THE USE OF A RAMP 15 FEET LONG.



BACK OF SIDEWALK MUST BE LOCATED AS SHOWN IN THE PLANS OR AS DIRECTED BY THE ENGINEER SO AS NOT TO ENCROACH INTO THE REQUIRED LEVEL LANDING AREA.



**CITY OF POOLER
2024 STANDARD DETAIL**

HANDICAP RAMP (A)

DONE BY: EOM

CHECKED BY: J. W.

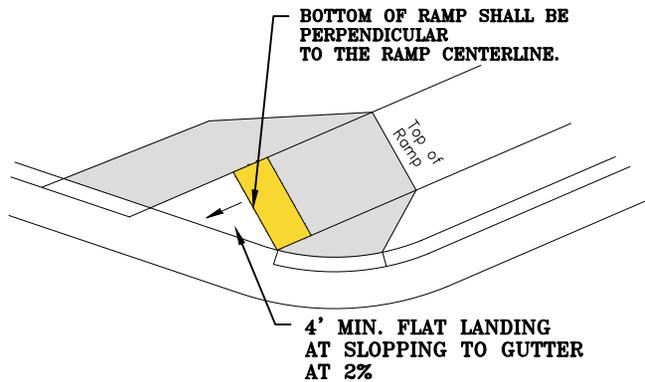
SCALE: N.T.S.

DATE: APRIL, 2024

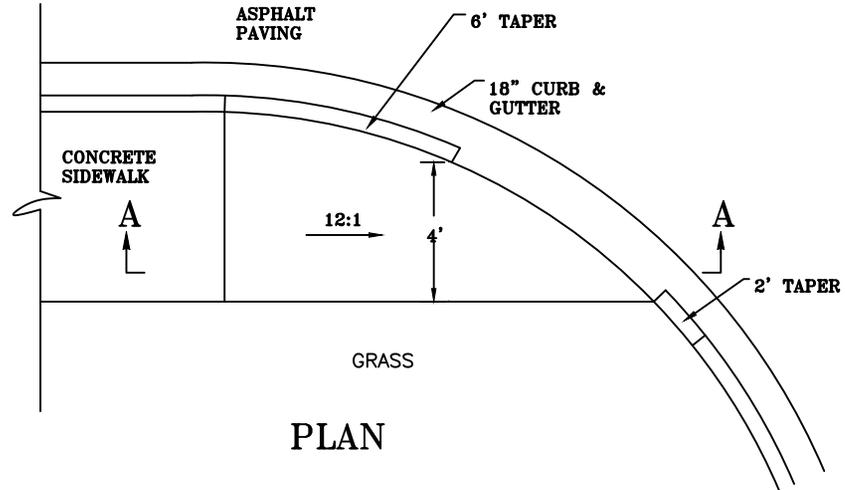
P-16A

NOTE:
 THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.

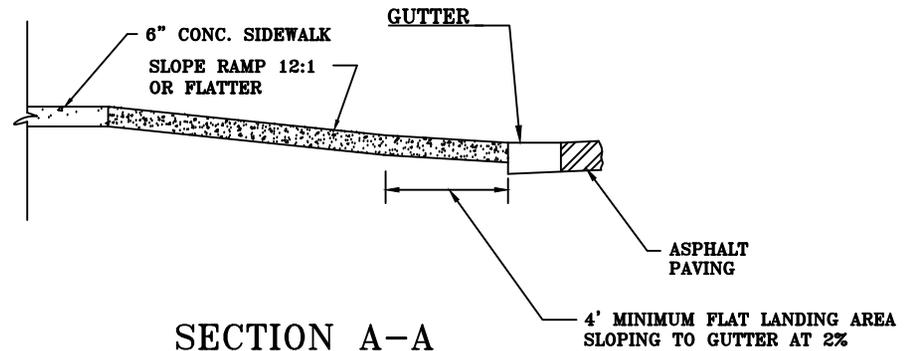
SKEWED RAMP
 (APPLIES ONLY TO RAMPS TYPE A AND D)



WHEN THE RAMP CENTERLINE IS NOT PERPENDICULAR TO THE CURB A LEVEL LANDING AREA WITH SLOPES LESS THAN 2.0% MUST BE PROVIDED AT THE BOTTOM OF THE RAMP.



NOTE: RAMP SHALL HAVE BOTH A VISIBLE COLOR DIFFERENCE AND A RAISED TACTILE SURFACE TO SEPARATE IT FROM SIDEWALK.



ORIGINAL: HGB 2011



CITY OF POOLER
2024 STANDARD DETAIL

HANDICAP RAMP (B)

REVISED BY: EOM

CHECKED BY: J. W.

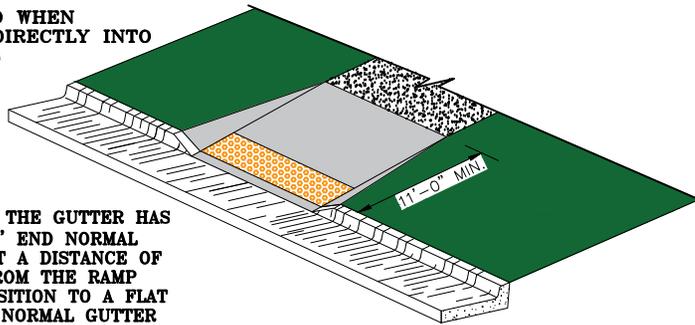
SCALE: N.T.S.

DATE: APRIL, 2024

P-17

Type D

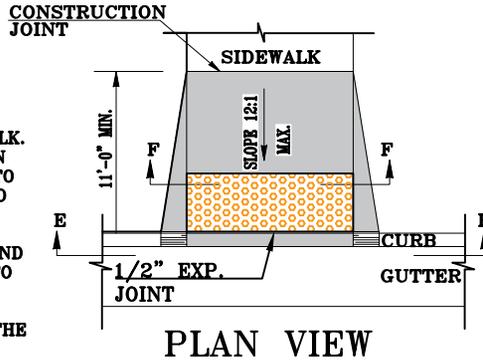
(NORMALLY USED WHEN SIDEWALK TIES DIRECTLY INTO THE CROSSWALK)



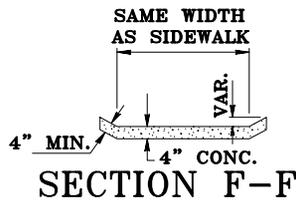
NOTE:
IN AREAS WHERE THE GUTTER HAS A SLOPE 1" IN 1' END NORMAL GUTTER SLOPE AT A DISTANCE OF 6 TO 10 FEET FROM THE RAMP AND BEGIN TRANSITION TO A FLAT GUTTER SLOPE. NORMAL GUTTER SLOPE SHALL BE RESUMED AT A SIMILAR DISTANCE BEYOND THE RAMP.

NOTES:

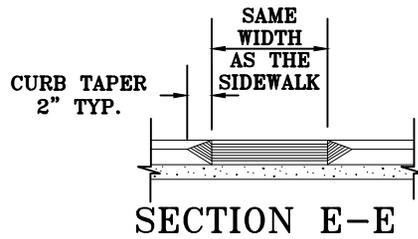
1. SEE DETAIL P-15 FOR MORE INFORMATION ON THE SIDEWALK.
2. ALL TECHNICAL CONSTRUCTION REQUIREMENTS THAT APPLY TO THE SIDEWALK ALSO APPLY TO THE HANDICAP RAMPS.
3. RAMP SHALL HAVE BOTH, A VISIBLE COLOR DIFFERENCE AND A RAISED TACTILE SURFACE TO DIFFERENTIATE IT FROM THE SIDEWALK.
4. RAMPS SHALL COMPLY WITH THE LATEST APPLICABLE ADA STANDARDS.



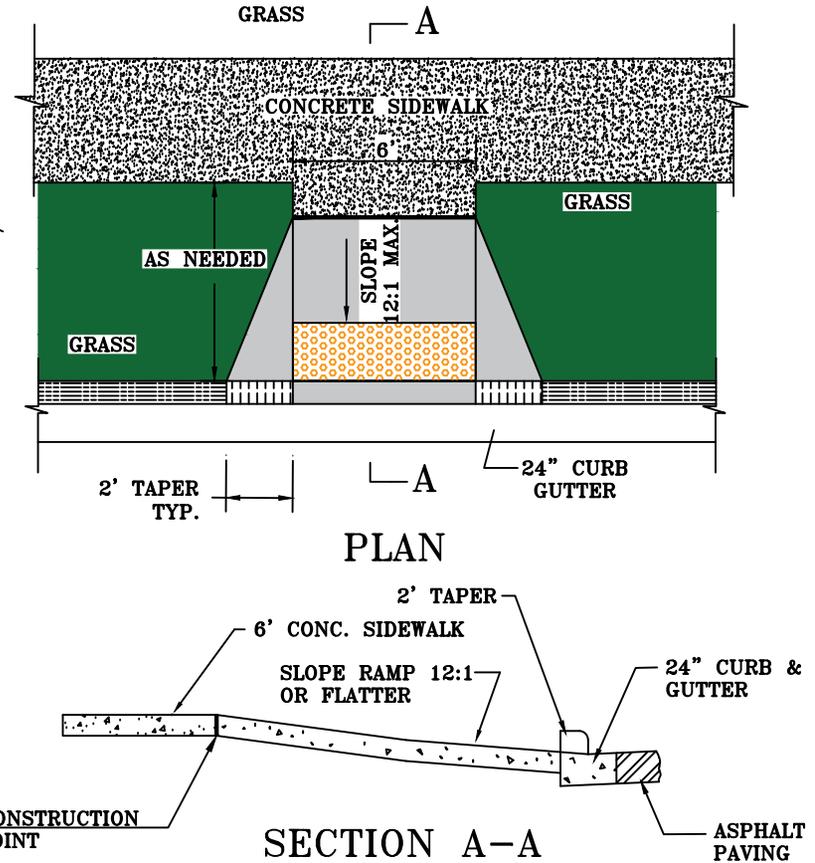
PLAN VIEW



SECTION F-F



SECTION E-E



PLAN

SECTION A-A

NOTE:
THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.



CITY OF POOLER
2024 STANDARD DETAIL

HANDICAP RAMP (C)

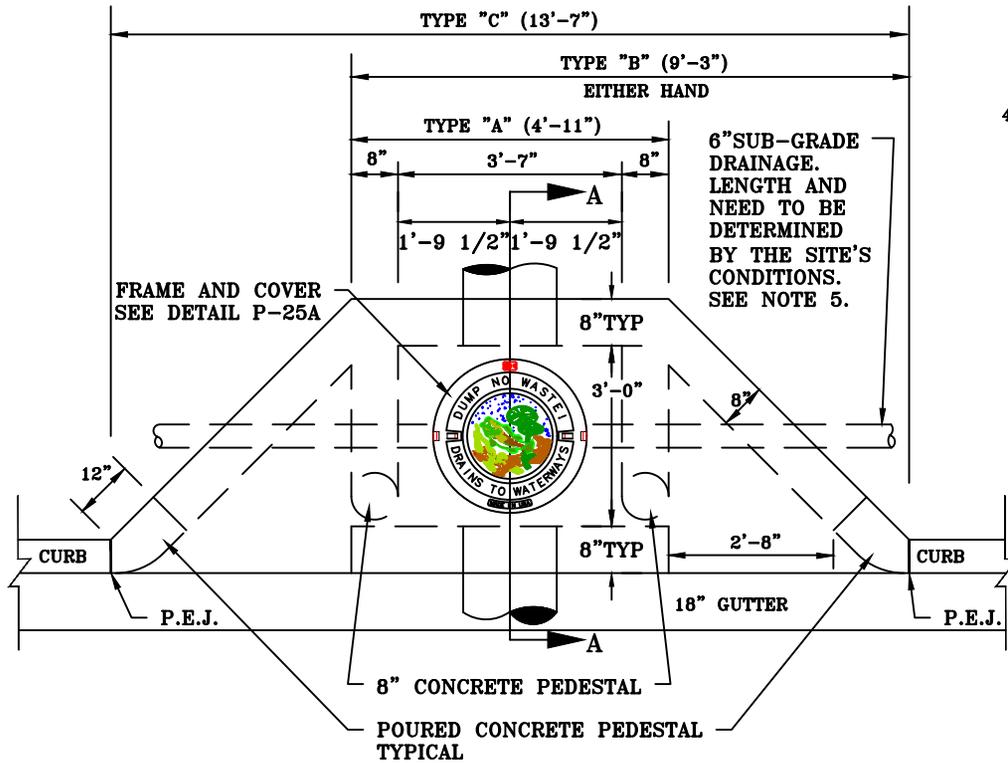
DONE BY: EOM

CHECKED BY: J. W.

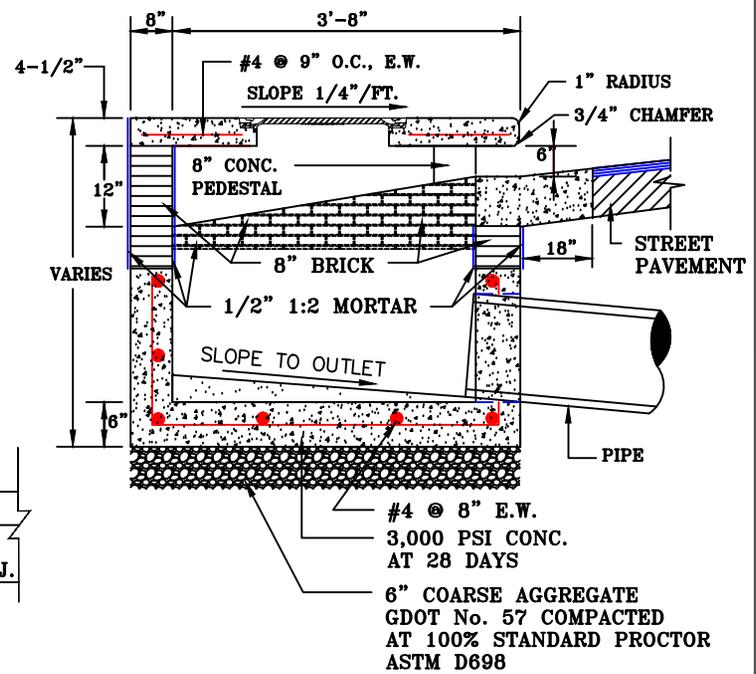
SCALE: N.T.S.

DATE: APRIL, 2024

P-18



PLAN VIEW



SECTION A-A

NOTE:
 THESE ARE THE CITY'S MINIMUM STANDARDS.
 TOLERANCES BEYOND THESE MINIMUM
 STANDARDS ARE NOT ACCEPTABLE AND WILL
 BE REJECTED.

- NOTE:**
1. CHAMFER ALL EXPOSED CONCRETE EDGE 3/4"
 2. FRAME AND COVER TO BE EAST JORDAN CATALOG #G1860RG OR EQUIVALENT (WEIGHT 120 LBS.). SEE DETAIL P-25A.
 3. PRECAST KNOCK OUT BOXES ARE NOT ACCEPTABLE.
 4. PIPE CONNECTING TO CURB INLET MUST BE SEALED INSIDE AND OUTSIDE OF STRUCTURE WITH BRICK AND MORTAR.
 5. A GEOTECHNICAL REPORT IS NEEDED TO DETERMINE THE NEED AND DESIGN OF A SUB-DRAINAGE SYSTEM.
 6. CONNECTIONS TO INLETS, ON BOTH INSIDE AND OUTSIDE OF THE STRUCTURES, MUST BE GROUTED WITH HYDROPHILIC CEMENT. CITY MUST GRANT APPROVAL PRIOR TO BACKFILLING OPERATIONS.



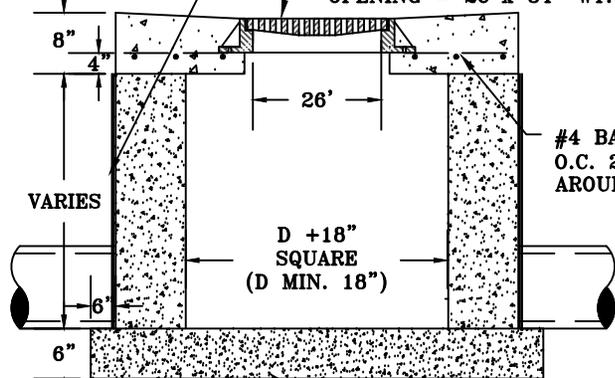
CITY OF POOLER
2024 STANDARD DETAIL
STANDARD CURB INLET

DONE BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024

P-19

PRECAST CONC.
OR 8" BRICK WITH
1/2" 1:2 MORTAR

HEAVY DUTY FRAME WITH GRATE (EAST
JORDAN EAST JORDAN #V5140-1
RECTANGULAR) OR EQUAL.CLEAR
OPENING = 26"x 34" WT. = 464 lbs.



#4 BARS @ 6"
O.C. 2" CLEAR
AROUND OPENING

D + 18"
SQUARE
(D MIN. 18")

FOUNDATION SLAB
(CONCRETE ONLY)

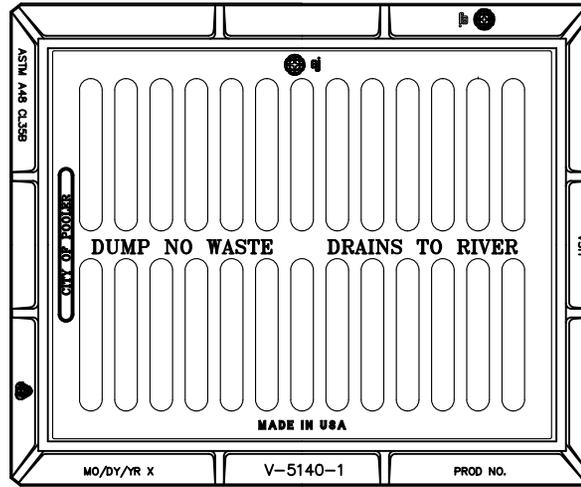
NOTE:
THESE ARE THE CITY'S
MINIMUM STANDARDS.
TOLERANCES BEYOND THESE
MINIMUM STANDARDS ARE
NOT ACCEPTABLE AND WILL
BE REJECTED.

SUBGRADE
DRAIN IF
REQUIRED BY
THE
GEOTECHNICAL
REPORT.

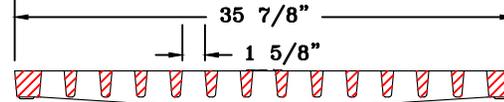
6" COARSE AGGREGATE
GDOT No. 57 COMPACTED
AT 100% STANDARD PROCTOR
ASTM D698

#4 @ 8" E.W.
3,000 PSI CONC.
AT 28 DAYS

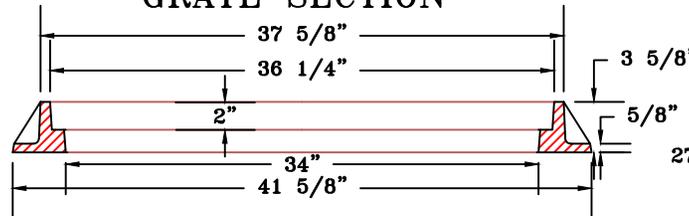
GRATE INLET



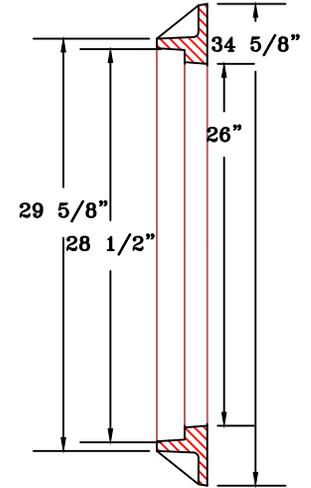
PLAN VIEW



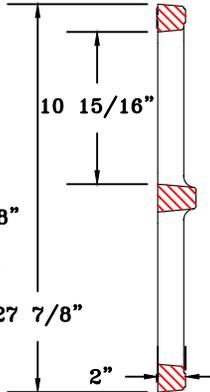
GRATE SECTION



FRAME SECTION



FRAME SECTION



GRATE SECTION

NOTE:

1. CHAMFER ALL EXPOSED CONCRETE EDGE 3/4".
2. FRAME AND GRATE TO BE EAST JORDAN CATALOG #V5140-1 OR EQUIVALENT, WEIGHT 464 LBS.
3. GRATE MUST PROVIDE "CITY OF POOLER" LOGO, "DUMP NO WASTE-DRAINS TO RIVER", "MADE IN USA", AND FOUNDRY STAMP
4. PRECAST KNOCK OUT BOXES ARE NOT ACCEPTABLE.
5. PIPE CONNECTING TO GRATE INLET MUST BE SEALED INSIDE AND OUTSIDE OF STRUCTURE WITH BRICK AND MORTAR



**CITY OF POOLER
2024 STANDARD DETAIL**

GRATE INLET WITH FRAME

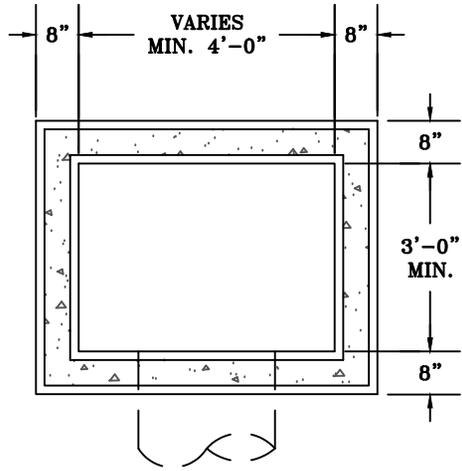
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

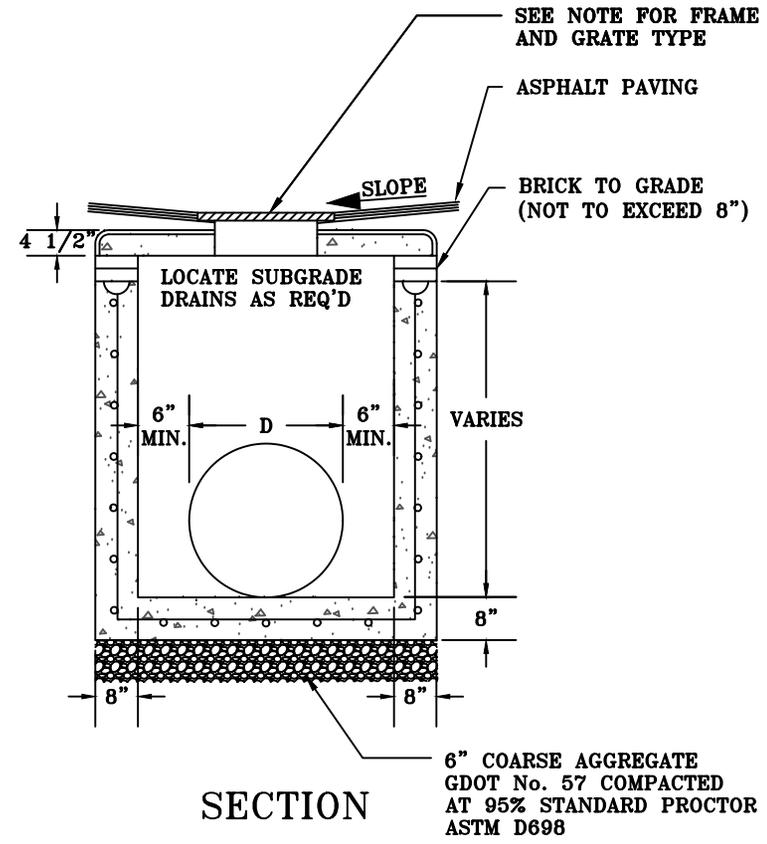
DATE: APRIL, 2024

P-20



PLAN

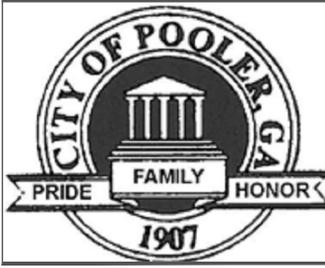
- NOTE:**
1. CHAMFER ALL EXPOSED CONCRETE EDGE 3/4".
 2. GRATE INLET SHALL BE NEENAH FOUNDRY R-4721 HEAVY DUTY GRATE W/ R-4899 ANGLE FRAME, OR APPROVED EQUAL.
 3. REINFORCING SHALL BE #4 BARS @ 8" O.C. EACH WAY.
 4. PIPE OPENINGS SHALL BE PROVIDED BY THE MANUFACTURER AS REQUIRED.
 5. ALL PIPE CONNECTIONS SHALL BE GROUTED WITH NON-SHRINKING CEMENT.
 6. PRECAST KNOCK OUT BOXES WILL NOT BE ACCEPTED.



SECTION

NOTE:
 THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.

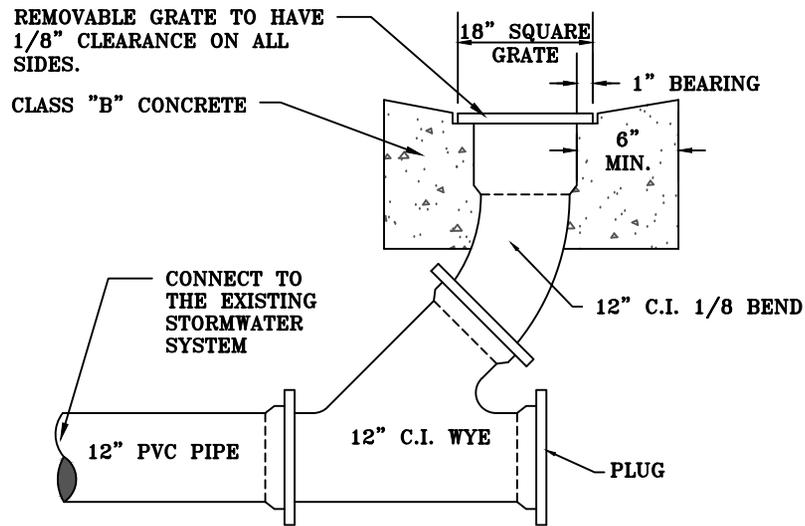
ORIGINAL BY: HGB 2006



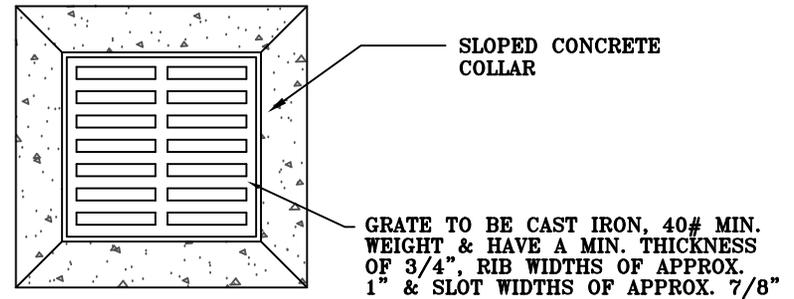
**CITY OF POOLER
 2024 STANDARD DETAIL
 PRECAST GRATE INLET**

REVISED BY: EOM
 CHECKED BY: J. W.
 SCALE: N.T.S.
 DATE: APRIL, 2024

P-21



SECTION



PLAN

ORIGINAL BY: HGB 2006



CITY OF POOLER
2024 STANDARD DETAIL
YARD INLET FOR SMALL
AREAS (<1/3 AC)

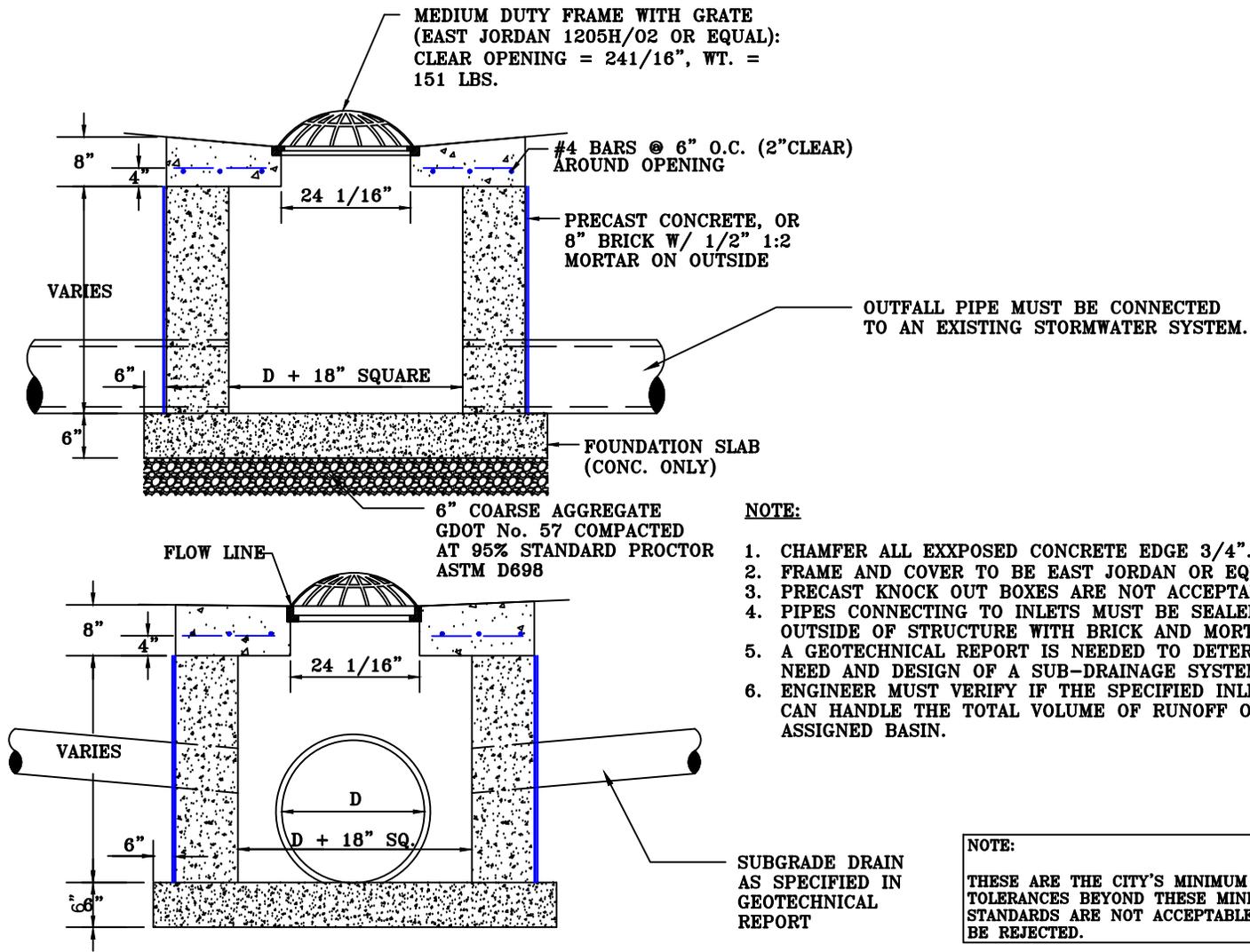
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

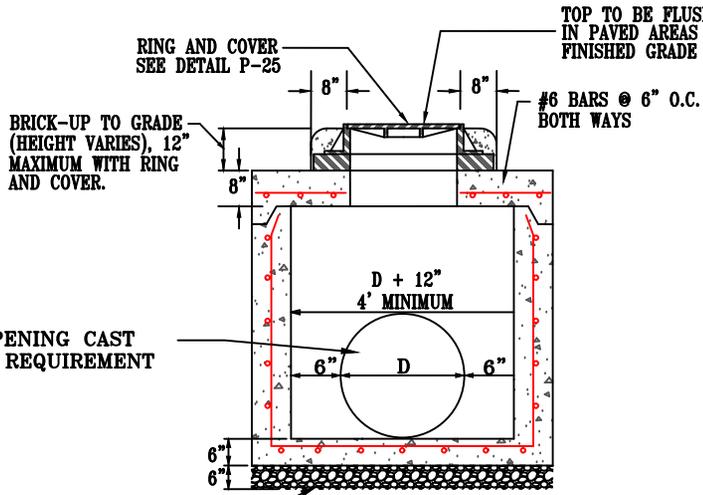
P-22



CITY OF POOLER
2024 STANDARD DETAIL
YARD INLET FOR AREAS
LARGER THAN 1/3 ACRE

DONE BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024

P-22A

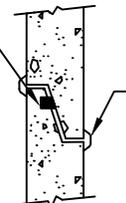


SHALLOW STORM MANHOLE

6" COARSE AGGREGATE
 GDOT No. 57 COMPACTED
 AT 95% STANDARD
 PROCTOR ASTM D698

DOUBLE RAM-NECK
 GASKET, OR APPROVED
 EQUAL, OR NEOPRENE
 RING SEAL.

(INSIDE)



JOINT DETAIL

NOTE:

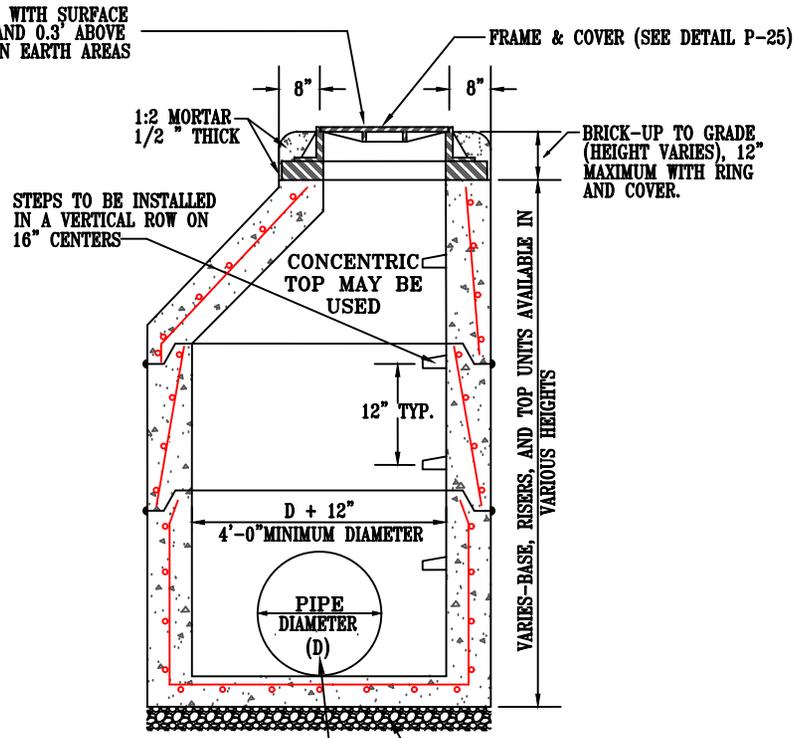
PRECAST REINFORCE CONCRETE MANHOLE TOPS,
 RISERS, AND BASES SHALL CONFORM TO ASTM
 C-478

NOTE:
 ALTHOUGH POSITION OF
 JOINT IS OPTIONAL, THE
 PREFERRED IS THE ONE
 SHOWN IN THIS DETAIL.

PLASTER JOINTS WITH
 MORTAR ON OUTSIDE.
 USE NEOPRENE SEAL
 ONLY.

NOTES:

1. WALL THICKNESS MAY BE ADJUSTED TO MEET THE SITE CONDITIONS WHERE THE PROJECT IS LOCATED. THE MINIMUM WALL THICKNESS ALLOWED IS 5" FOR MANHOLES THAT ARE 10' OR LESS IN DEPTH. FOR DEEPER MANHOLES, THE MINIMUM WALL THICKNESS IS 6'.
2. ENGINEER MUST VERIFY THE BUOYANCY OF THE MANHOLE AND MAKE ALL THE NECESSARY MODIFICATIONS IF NEEDED. THE GROUNDWATER TABLE ELEVATION MUST BE DETERMINED BY A SOIL TEST, ASTM D5092.
3. CONNECTIONS TO MANHOLES, ON BOTH INSIDE AND OUTSIDE OF THE STRUCTURES, MUST BE GROUTED WITH HYDROPHILIC CEMENT. CITY MUST GRANT APPROVAL PRIOR TO BACKFILLING OPERATIONS.



DEEP MANHOLE

PIPE OPENING CAST
 TO JOB REQUIREMENT

6" COARSE AGGREGATE GDOT
 No. 57 COMPACTED AT 100%
 STAND PROCTOR ASTM D698

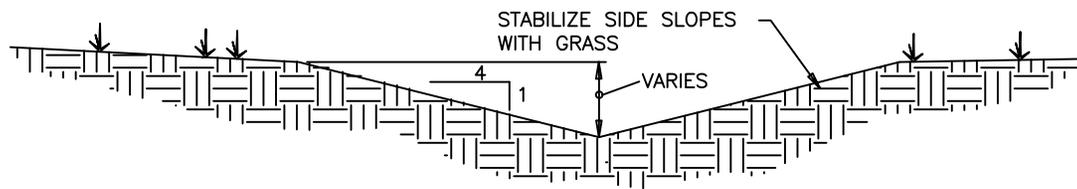
ORIGINAL BY: HGB 2006



CITY OF POOLER
2024 STANDARD DETAIL
STANDARD PRECAST
CONCRETE MANHOLE

DONE BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024

P-23



NOTE:
THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.

ORIGINAL BY: HGB 2006



**CITY OF POOLER
 2024 STANDARD DETAIL
 TYPICAL SECTION
 THROUGH SWALE (4:1)**

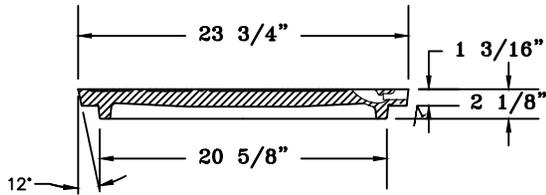
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

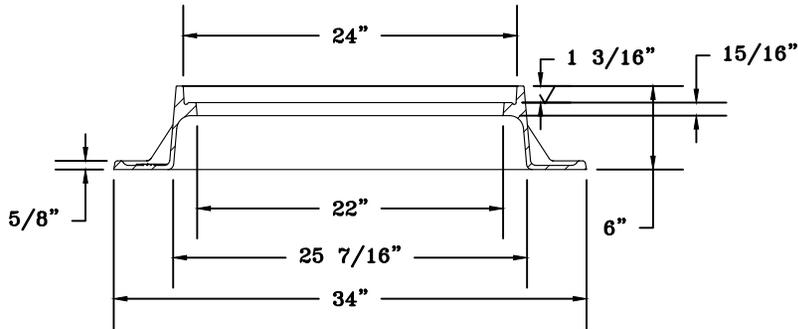
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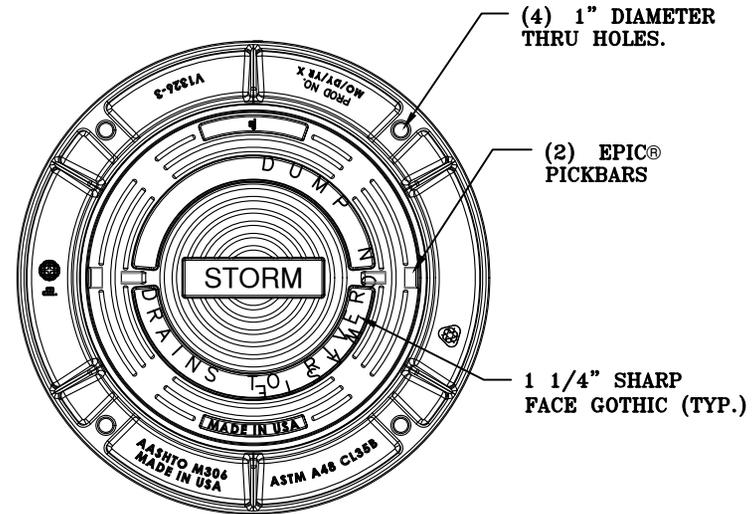
COVER SECTION

NOTE:

1. MANHOLE FRAME AND COVER: EAST JORDAN # V1326-3/V13227 OR EQUAL.
2. WEIGHT= 254 LBS.
3. DESIGN LOAD: HEAVY DUTY
4. LID TO BE LETTERED "DRAINS TO RIVER", "DUMP NO WASTE", "MADE IN USA", AND FOUNDRY STAMP
5. CERTIFICATION: ASHTO M306 and ASTM A48 CL35B



FRAME SECTION



- (4) 1" DIAMETER THRU HOLES.
- (2) EPIC® PICKBARS
- 1 1/4" SHARP FACE GOTHIC (TYP.)



CITY OF POOLER
2024 STANDARD DETAIL
STORMWATER MANHOLE
COVER AND FRAME

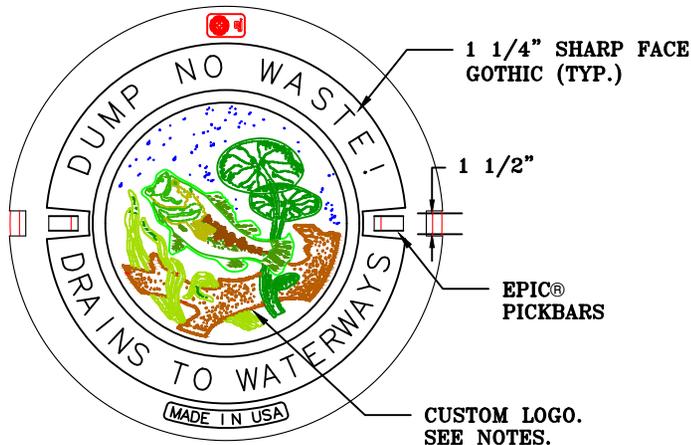
DONE BY: EOM

CHECKED BY: J. W.

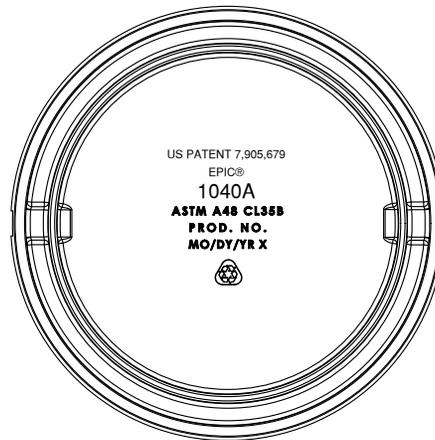
SCALE: N.T.S.

DATE: APRIL, 2024

P-25



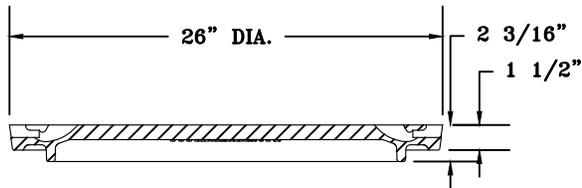
TOP VIEW



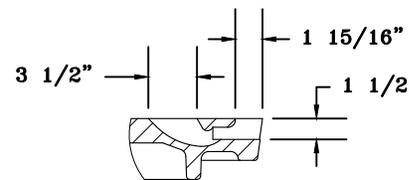
BOTTOM VIEW

NOTE:

1. INLET FRAME AND COVER: EAST JORDAN # 1040A/00104845 OR EQUAL.
2. MATERIAL: GRAY IRON (CL35B)
3. DESIGN LOAD: HEAVY DUTY
4. LID TO BE LETTERED "DRAINS TO RIVER", "DUMP NO WASTE", "MADE IN USA", AND FOUNDRY STAMP
5. CERTIFICATION: ASTM A48 CL35B



SECTION



EPIC® DETAIL



**CITY OF POOLER
2024 STANDARD DETAIL
STORMWATER INLET TOP
COVER AND FRAME**

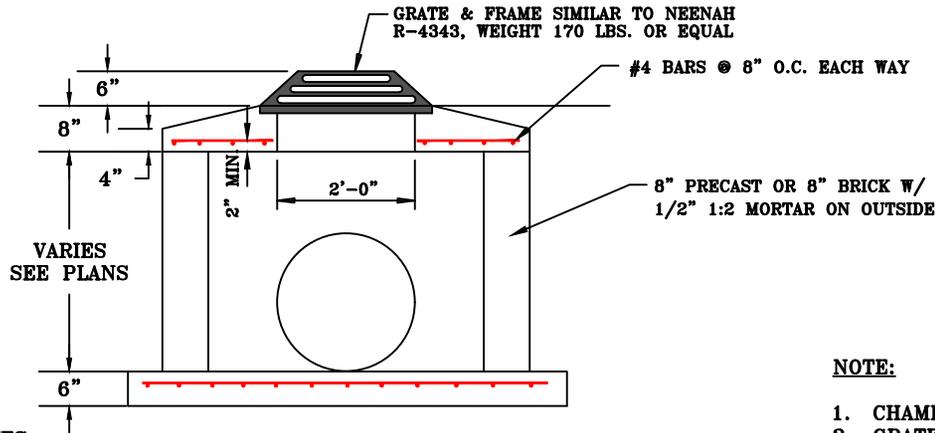
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

P-25A

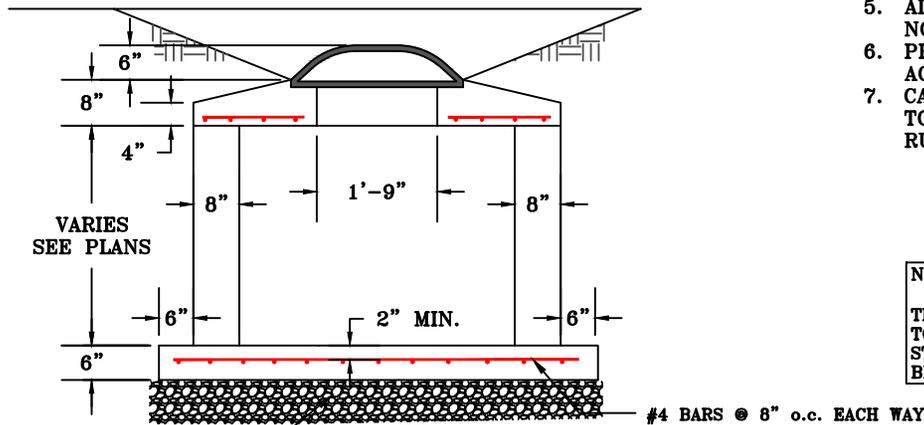


NOTES:

1. SUBGRADE DRAIN TO BE DETERMINED BY THE SOIL CONDITIONS AND RECOMMENDATIONS INDICATED IN THE SOIL REPORT.
2. ALL SUBGRADE DRAINAGE PIPES TO BE INSTALLED WITH FILTER FABRIC AND STONE PER MANUFACTURER'S RECOMMENDATIONS.

NOTE:

1. CHAMFER ALL EXPOSED CONCRETE EDGE 3/4".
2. GRATE INLET AND FRAME SHALL BE NEENAH FOUNDRY R-4343 LIGHT WEIGHT GRATE OR APPROVED EQUAL.
3. REINFORCING SHALL BE #4 BARS @ 8" O.C. EACH WAY.
4. PIPE OPENINGS SHALL BE PROVIDED BY THE MANUFACTURER AS REQUIRED.
5. ALL PIPE CONNECTIONS SHALL BE GROUTED WITH NON-SHRINKING CEMENT.
6. PRECAST KNOCK OUT BOXES WILL NOT BE ACCEPTED.
7. CAPACITY OF THE STANDARD GRADE INLET NEEDS TO BE VERIFIED. IT NEEDS TO HANDLE THE RUNOFF FROM THE AREA TO BE DRAINED.



6" COARSE AGGREGATE GDOT No. 57
 COMPACTED AT 95% STANDARD PROCTOR
 ASTM D698

NOTE:

THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.

ORIGINAL: HGB-2006



**CITY OF POOLER
 2024 STANDARD DETAIL**

DITCH INLET (TYPE "A")

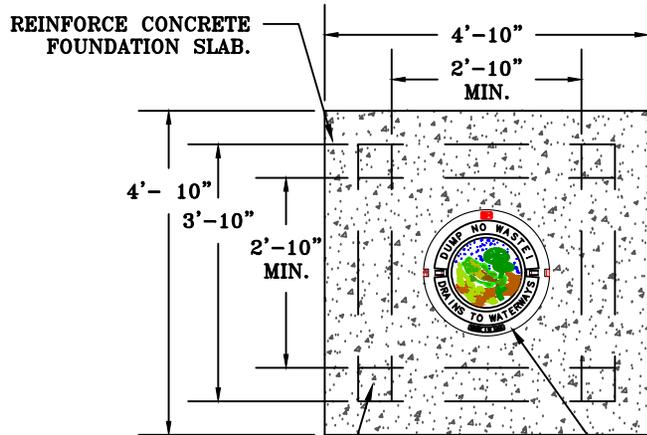
REVISED BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

P-26



PLAN

NOTE:

1. CHAMFER ALL EXPOSED CONCRETE EDGE 3/4".
2. INLET FRAME AND COVER: EAST JORDAN # 1040A/00104845 OR EQUAL. OR APPROVED EQUAL. SEE DETAIL P-25A.
3. REINFORCING SHALL BE No. 4 BARS @ 8" O.C. EACH WAY FOR THE BASE AND @ 6" O.C. FOR THE TOP.
4. PIPE OPENINGS SHALL BE PROVIDED BY THE MANUFACTURER AS REQUIRED.
5. ALL PIPE CONNECTIONS SHALL BE GROUTED WITH NON-SHRINKING CEMENT.
6. PRECAST KNOCK OUT BOXES WILL NOT BE ACCEPTED.
7. CAPACITY OF THE STANDARD INLET OPENING NEEDS TO BE VERIFIED. IT NEEDS TO HANDLE THE RUNOFF FROM THE AREA TO BE DRAINED.

8"X 8" CONCRETE PEDESTAL

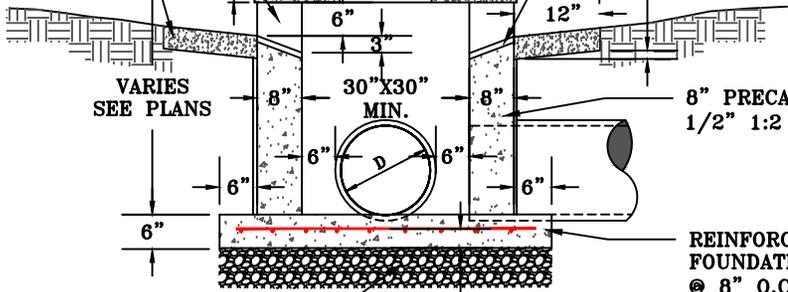
PRECAST CONCRETE TOP WITH No. 4 BARS - 6" O.C.

8"X 8" CONCRETE PEDESTAL

4" CONCRETE PAD

SEE RING AND COVER DETAIL P-25A

1/2" MORTAR



VARIES SEE PLANS

30"X30" MIN.

8" PRECAST OR BRICK WITH 1/2" 1:2 MORTAR ON OUTSIDE

REINFORCE CONCRETE FOUNDATION. No. 4 BARS @ 8" O.C. EACH WAY

6" COARSE AGGREGATE GDOT No. 57 COMPACTED AT 95% STANDARD PROCTOR ASTM D698 2" MIN.

NOTE:

THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.



**CITY OF POOLER
2024 STANDARD DETAIL**

ROOF INLET

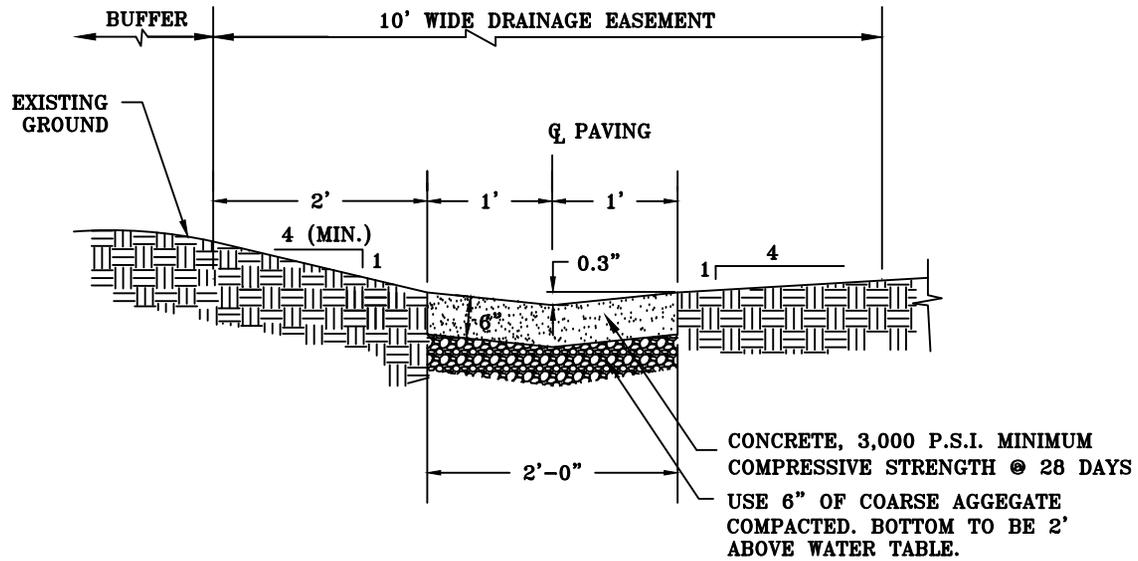
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

P-27



NOTE:
 THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.

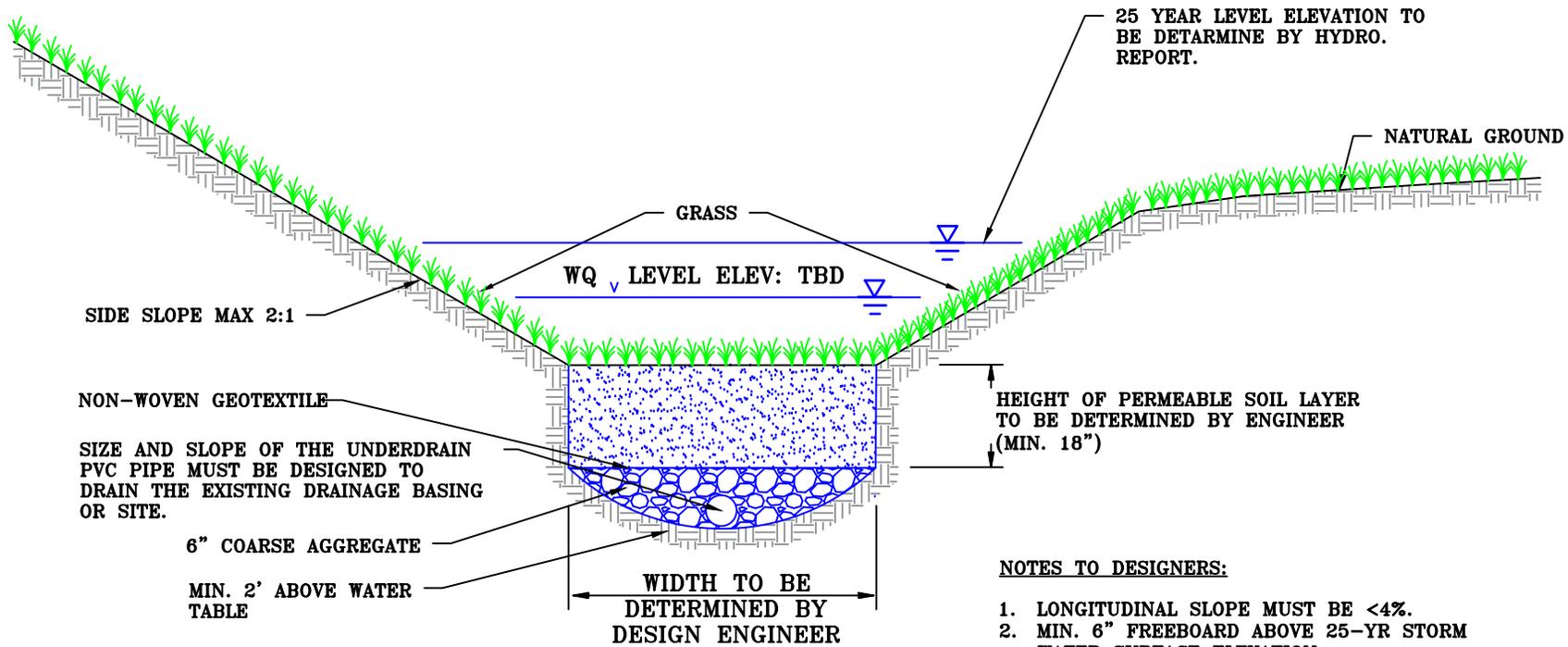
ORIGINAL BY HGB



CITY OF POOLER
2024 STANDARD DETAIL
CONCRETE LOT SWALE

REVISED BY: EOM
 CHECKED BY: J. W.
 SCALE: N.T.S.
 DATE: APRIL, 2024

P-28



NOTES TO DESIGNERS:

1. LONGITUDINAL SLOPE MUST BE <4%.
2. MIN. 6" FREEBOARD ABOVE 25-YR STORM WATER SURFACE ELEVATION.
3. MAXIMUM SIDE SLOPE IS 2:1.
4. WIDTH SHOULD BE BETWEEN 2' AND 8'.
5. MAXIMUM WQ_v PONDING DEPTH IS 18".

PERMEABLE SOIL REQUIREMENTS:

1. 0.25 PER HOUR MIN. INFILTRATION RATE.
2. COMPOSITION:
 - SAND - 85% TO 88% CLEAN WASHED
 - TOP SOIL - 8% TO 12%
 - ORGANIC MATTER - 3% TO 5%

NOTE:
 THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.



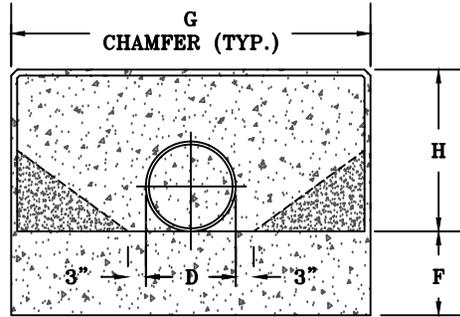
**CITY OF POOLER
 2024 STANDARD DETAIL
 DRY ENHANCED SWALE
 SECTION**

DONE BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024

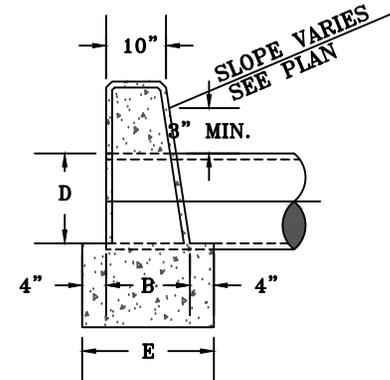
P-28A

NOTE:

1. WHEN DITCH PAVING IS SPECIFIED, RECESS SURFACE OF FOOTING TO ACCOMMODATE FOR THICKNESS OF PAVEMENT.
2. *FOR EACH ADDITIONAL PIPE LINE FROM 12" TO 30" IN DIAMETER, ADD 1'-6"+I.D., AND ABOVE THOSE SIZES, ADD 2'-0"+I.D.



FRONT ELEVATION



END ELEVATION

NOTE: RECESS SURFACE OF FOOTING TO ACCOMMODATE THICKNESS OF GROUT MAT

DIMENSIONS							QUANTITIES ONE ENDWALL				CONCRETE IN WALL AND FTG. FOR EACH ADD'T'L LINE
OPENING		WALL			FOOTING		CLASS "B" CONCRETE				
D	AREA SQ FT	G *	H	B	E	F	CUBIC FT		TOTAL		
							WALL	FOOT	CU FT	CU YD	
12"	0.8	4'-0"	2'-0"	1'-2"	1'-10"	1'-0"	7.2	7.3	14.5	0.54	0.25
15"	1.2	5'-0"	2'-3"	1'-2"	1'-10"	1'-2"	9.9	10.7	20.6	0.76	0.32
18"	1.8	6'-0"	2'-6"	1'-3"	1'-11"	1'-3"	13.6	14.4	28.0	1.04	0.38
24"	3.1	8'-0"	3'-0"	1'-4"	2'-0"	1'-4"	22.3	21.3	43.6	1.62	0.52
30"	4.9	10'-0"	3'-6"	1'-6"	2'-2"	1'-6"	34.7	32.5	67.2	2.49	0.73
36"	7.1	12'-0"	4'-0"	1'-8"	2'-4"	1'-8"	50.5	46.7	97.2	3.60	0.97
42"	9.6	14'-0"	4'-6"	1'-10"	2'-6"	2'-0"	70.3	70.0	140.3	5.20	1.33
48"	12.6	16'-0"	5'-0"	2'-1"	2'-9"	2'-0"	96.9	88.0	184.9	6.85	1.64
54"	16.0	18'-0"	5'-6"	2'-4"	3'-0"	2'-0"	129.4	108.0	237.4	8.79	1.96
60"	19.6	20'-0"	6'-0"	2'-6"	3'-2"	2'-0"	164.6	126.7	291.3	10.79	2.23

ORIGINAL:HGB 2006



**CITY OF POOLER
2024 STANDARD DETAIL
CONCRETE HEADWALL
STRAIGHT TYPE**

REVISED BY: EOM

CHECKED BY: J. W.

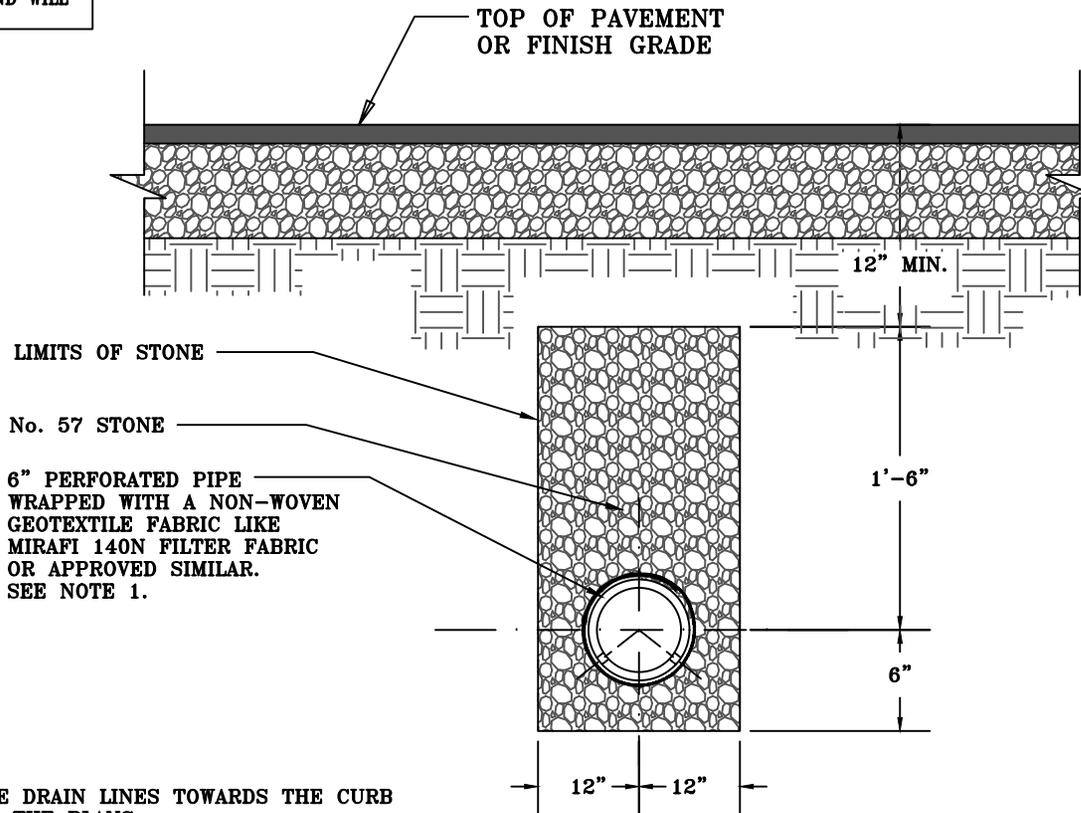
SCALE: N.T.S.

DATE: APRIL, 2024

P-29

NOTE:

THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.



NOTE:

1. SLOPE THE SUBGRADE DRAIN LINES TOWARDS THE CURB INLETS AS SHOWN IN THE PLANS.
2. LENGTH OF LINE WILL BE DETERMINE BY THE SITE'S SOIL CONDITIONS AND THE GEOTECHNICAL ENGINEER RECOMMENDATIONS.

ORIGINAL:HGB 2006



**CITY OF POOLER
2024 STANDARD DETAIL**

SUBGRADE DRAIN

REVISED BY: EOM

CHECKED BY: J. W.

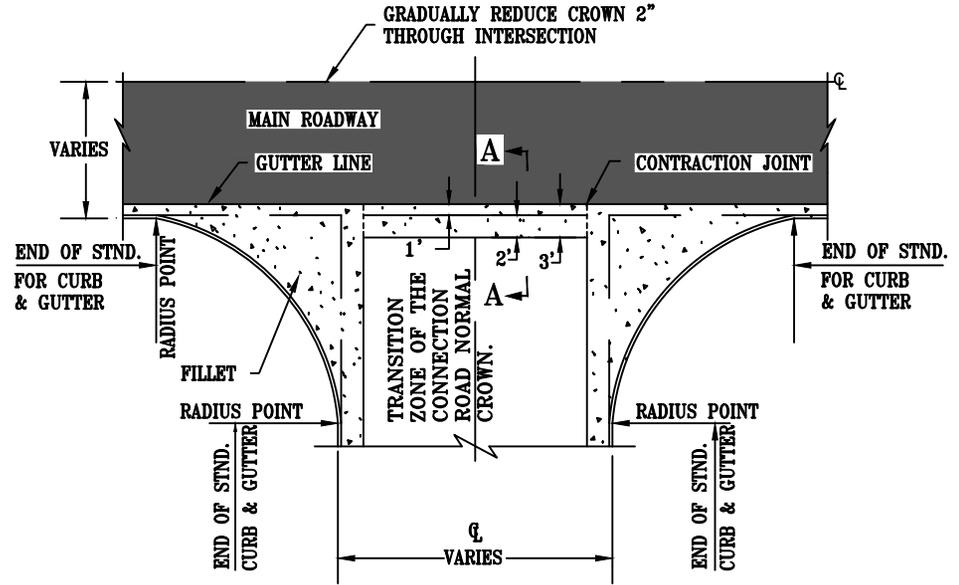
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DATE: APRIL, 2024

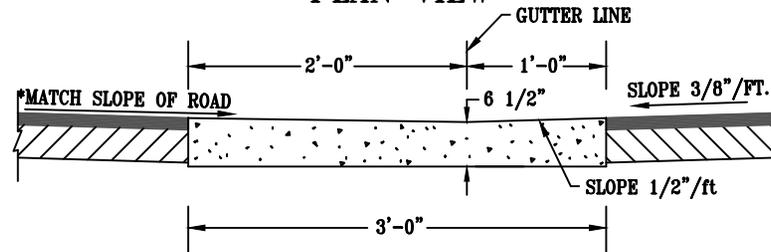
P-30

NOTES:

1. **** WHEN CONNECTING ROAD OR A COMMERCIAL DRIVEWAY, THE TRANSITION ZONE FROM A NORMAL CROWN TO ONE THAT MATCHES THE MAIN ROAD SLOPE MUST BE 100 FT. MINIMUM.**
2. **THE COMPACTION OF THE BASE AND SUB-BASE OF THE FILLET MUST MATCH THE ONE FOR THE PAVED AREAS, 100% STND. PROCTOR (ASTM D-698) AND SECTION 02200 OF THE CITY'S SPECS.**
3. **THE MIN. CONCRETE STRENGTH FOR THE FILLETS MUST BE 5,000 PSI PER SECTION 03300 OF THE CITY'S SPECS.**
4. **WHERE SPECIFIED, DEPRESS THE CURB FOR A HANDICAP RAMP.**
5. **ALL PAVEMENT AND CONCRETE CUTS MUST BE STRAIGHT SAW-CUT LINE.**
6. **TRAFFIC CONTROL MEASURES MUST BE IN-PLACE DURING THE CONSTRUCTION OF THE CONNECTING ROADWAY OR COMMERCIAL DRIVEWAY.**
7. **MAXIMUM DRIVEWAY SLOPE ON STATE ROADS:**
 - **WITHOUT VERTICAL CURVES +/- 6.25% (GDOT STANDARDS).**
 - **WITH VERTICAL CURVES: 10% (GDOT STANDARDS).**
 - **MAXIMUM OVERBREAK: 8% (GDOT STANDARDS).**
8. **MAXIMUM DRIVEWAY SLOPE ON LOCAL ROADS:**
 - **+/- 8% (NCHRP GEOMETRIC DESIGN OF DRIVEWAYS - AS RECOMMENDED BY AASHTO).**
 - **MAXIMUM OVERBREAK: 9%**



PLAN VIEW



SECTION A-A

NOTE:

THESE ARE THE CITY'S MINIMUM STANDARDS. TOLERANCES BEYOND THESE MINIMUM STANDARDS ARE NOT ACCEPTABLE AND WILL BE REJECTED.



**CITY OF POOLER
2024 STANDARD DETAIL
CONC. SWALE W/ FILLETS FOR
ROADS AND COMM. DRIVES**

DONE BY: EOM

CHECKED BY: J. W.

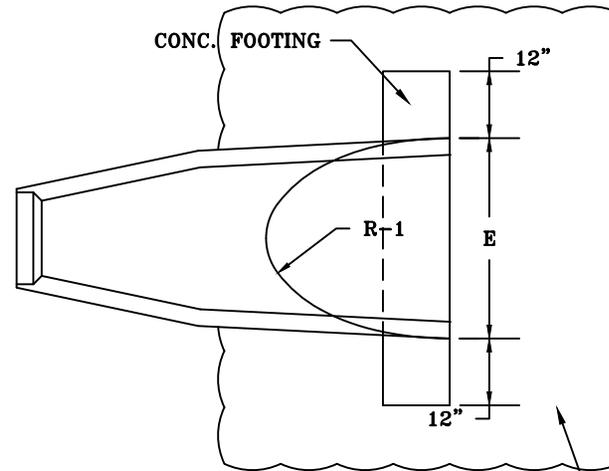
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DATE: APRIL, 2024

P-31

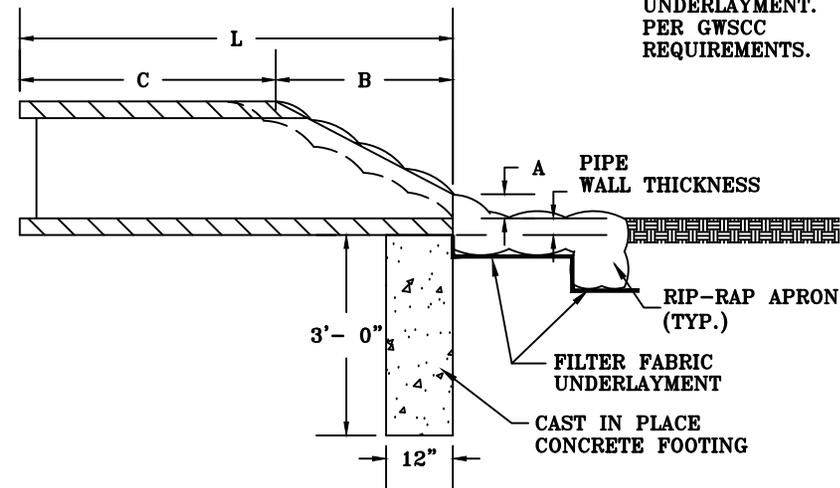
NOTE:

1. REFER TO GSWCC "MANUAL FOR EROSION AND SEDIMENT CONTROL IN GEORGIA", LATEST EDITION, STORM DRAIN OUTLET PROTECTION FOR REQUIRED RIP-RAP APRON DIMENSIONS
2. ALL CONCRETE WORK MUST MEET THE CITY'S STANDARDS IN SECTION 03300.
3. ALL STORMWATER PIPE WORK MUST MEET THE CITY'S STANDARDS IN SECTION 02400.



PLAN

RIP-RAP WITH FILTER FABRIC UNDERLAYMENT. PER GSWCC REQUIREMENTS.



SECTION

FLARE DIMENSIONS						
PIPE DIA.	A	B	C	L	E	R-1
15"	6"	2'-3"	3'-10"	6'-1"	2'-6"	1'-0"
18"	9"	2'-3"	3'-10"	6'-1"	3'-0"	1'-4"
24"	10"	3'-8"	2'-6"	6'-2"	4'-0"	1'-5"
30"	12"	4'-6"	1'-8"	6'-2"	5'-0"	1'-6"
36"	16"	5'-3"	2'-11"	8'-2"	6'-0"	2'-0"
42"	21"	5'-3"	2'-11"	8'-2"	6'-6"	2'-4"

REINFORCEMENT CONFORMS TO ASTM A1064



**CITY OF POOLER
2024 STANDARD DETAIL**

FLARED END SECTION

DONE BY: EOM

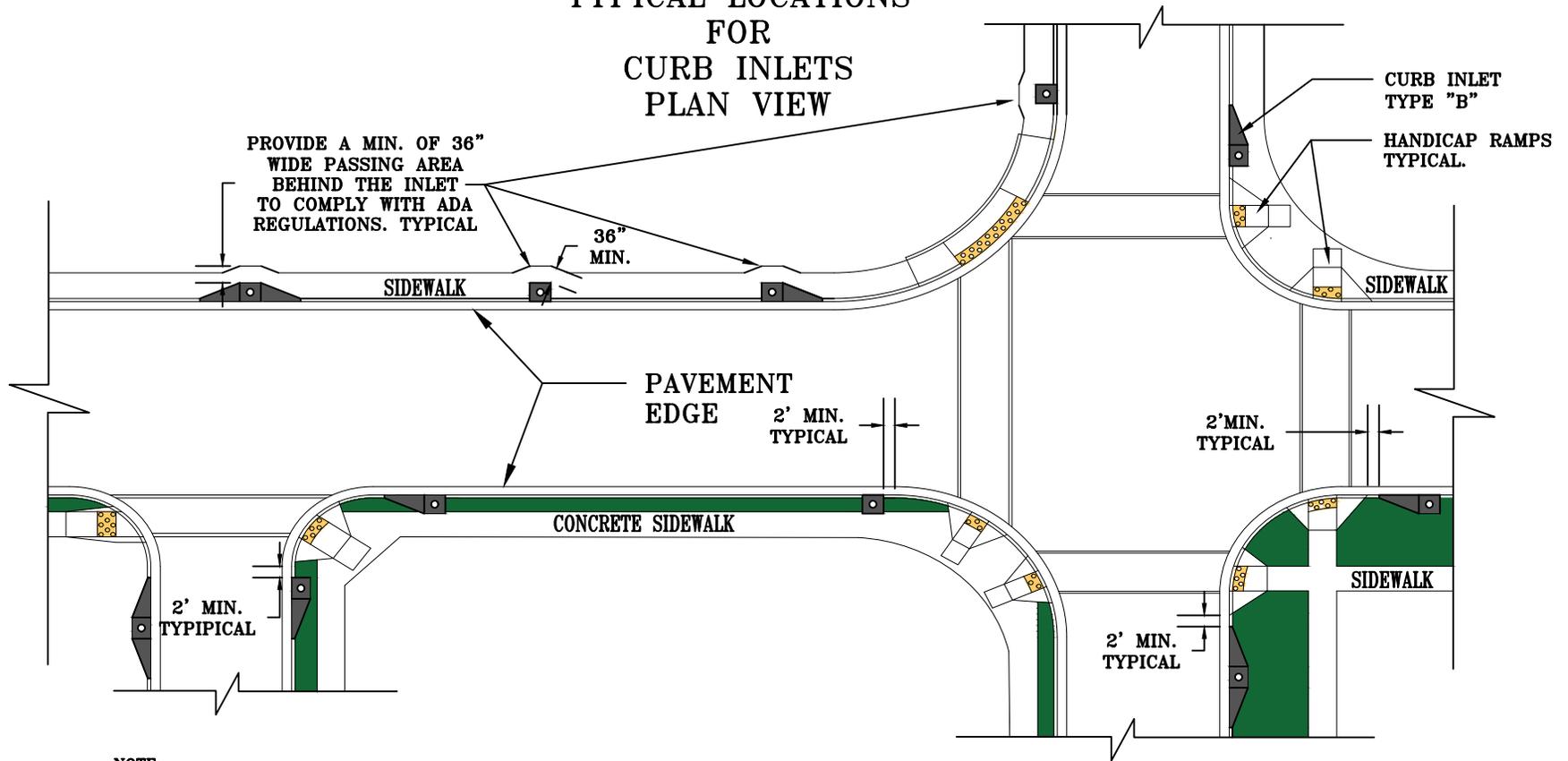
CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

P-32

TYPICAL LOCATIONS
FOR
CURB INLETS
PLAN VIEW



NOTE:

1. CURB INLETS CAN'T BE LOCATED ON THE RADIUS OF A ROADWAY CURVE.
2. CURB INLETS EDGE (OR P.E.J.) MUST BE LOCATED AT LEAST 2 FT. FROM THE TANGENT POINT OF THE RADIUS OF A ROADWAY.
3. CURB INLETS EDGE (OR P.E.J.) MUST BE LOCATED AT LEAST 2 FT. FROM CURB TRANSITION POINT OF A HANDICAP RAMP.
4. SIDEWALK NEED TO A 36" WIDE PASSING AREA BEHIND THE CURB INLET TO COMPLY WITH ADA REGULATIONS.



**CITY OF POOLER
2024 STANDARD DETAIL
CURB INLETS LOCATIONS**

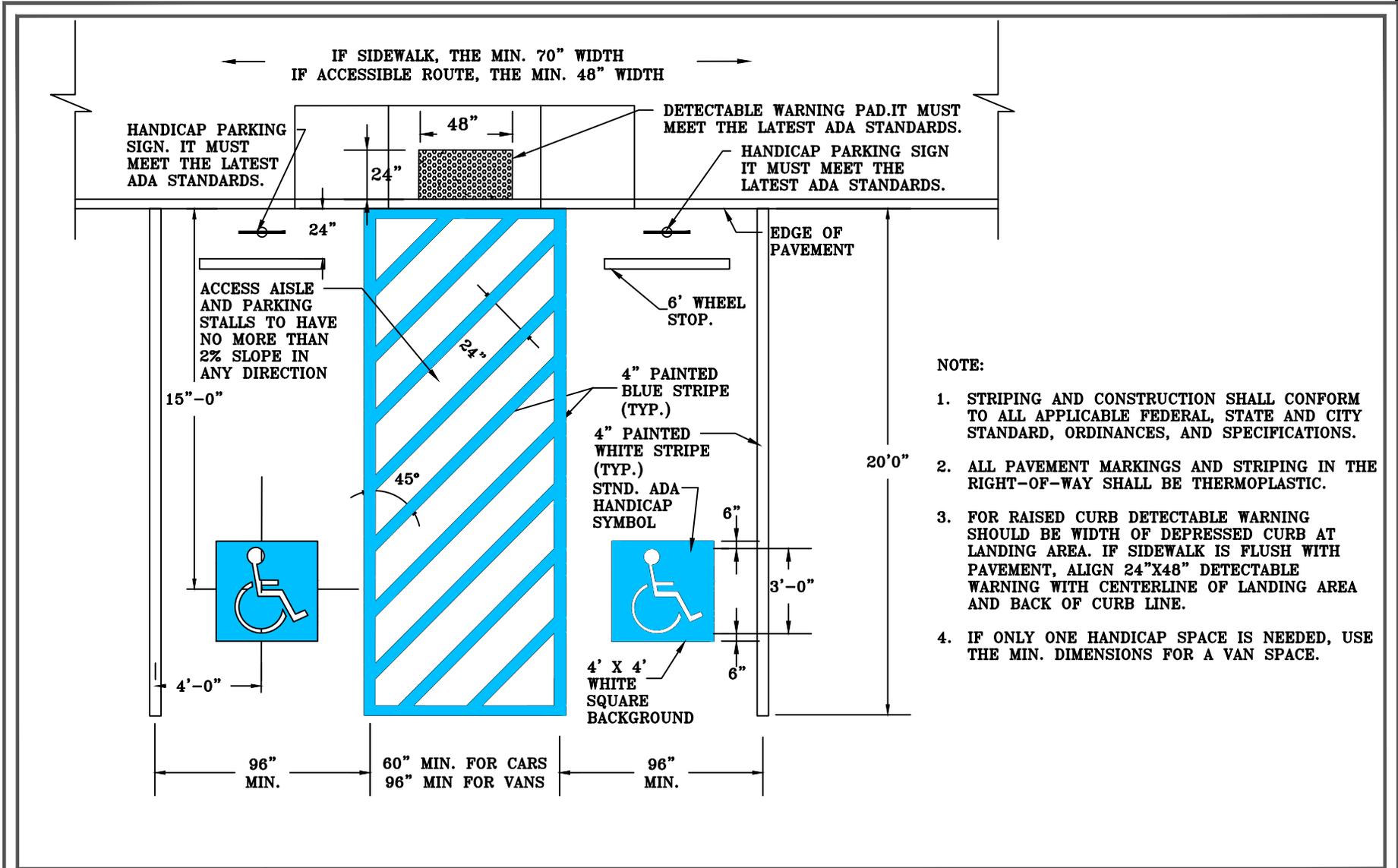
DONE BY: EOM

CHECKED BY: J. W.

SCALE: N.T.S.

DATE: APRIL, 2024

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CITY OF POOLER
2024 STANDARD DETAIL
HANDICAP PARKING
SPACE

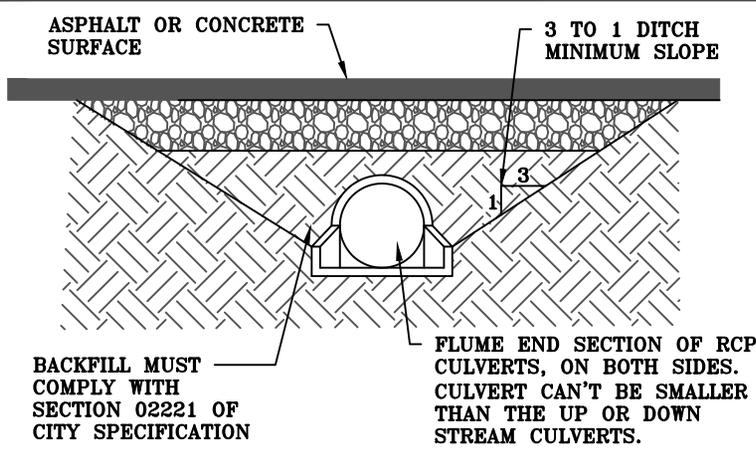
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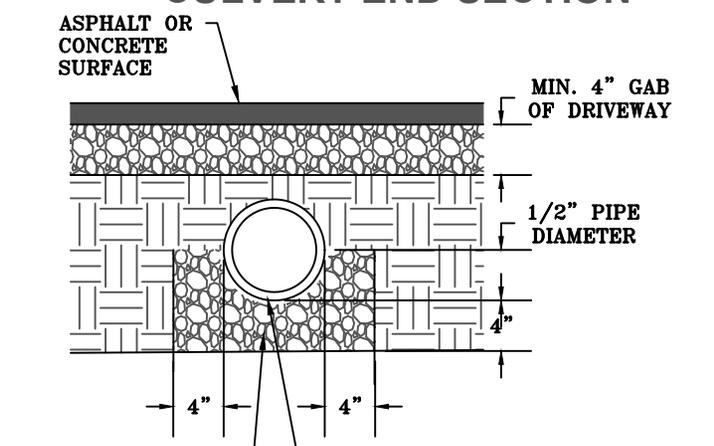
SCALE: N.T.S.

DATE: APRIL, 2024

P-34



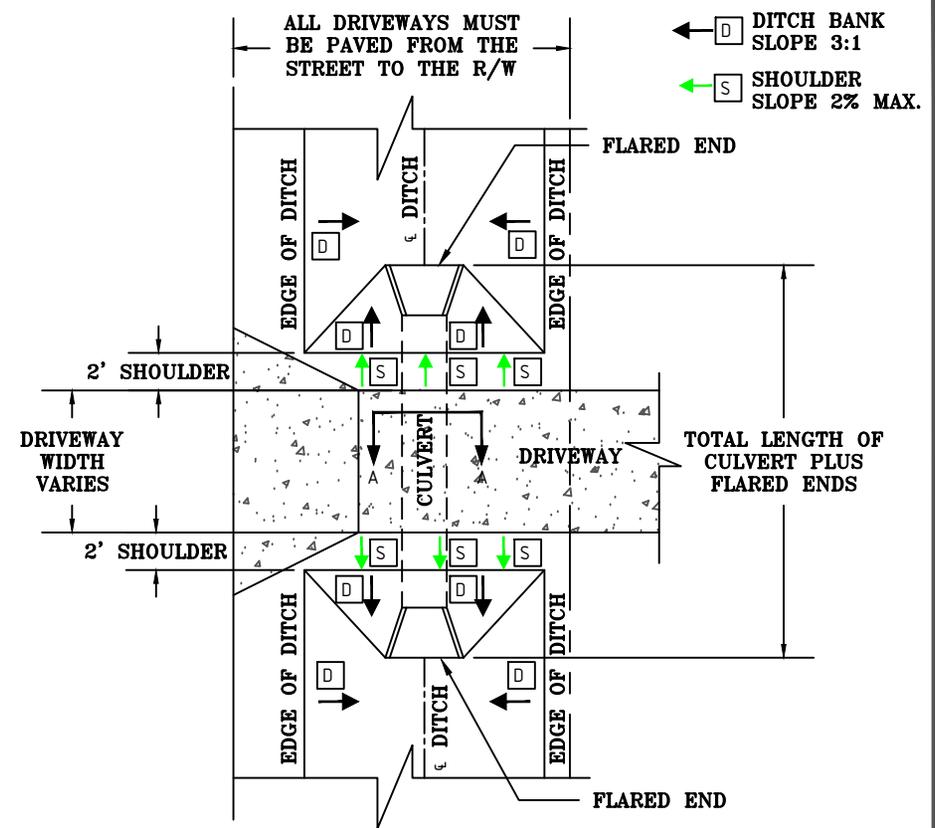
CULVERT END SECTION



CULVERT BEDDING. SEE SECTION 02221 OF CITY SPECIFICATION

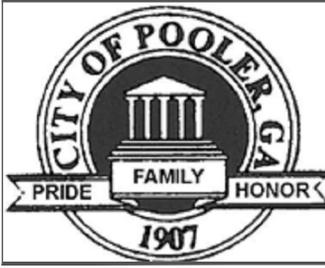
THE CITY ONLY ALLOWS RCP CULVERTS. 15" MIN. DIA. CULVERT CAN'T BE SMALLER THAN THE UP OR DOWN STREAM CULVERTS.

CROSS-SECTION A-A



NOTE:

1. MINIMUM SEPARATION BETWEEN THE BOTTOM OF THE CULVERT AND ANY UTILITY LINE MUST BE 18".
2. IN THE AREA WHERE CULVERT IS GOING TO BE INSTALLED AND UTILITIES WERE LOCATED, THE CONTRACTOR MUST HAND DIG IN THE AREA TO AVOID ANY DAMAGE TO EXISTING UTILITIES.
3. THE INSTALLATION OF THE CULVERT MUST BE DONE BY A LICENSED UTILITY CONTRACTOR.



CITY OF POOLER
2024 STANDARD DETAIL
RESIDENCIAL DRIVEWAY
CULVERT LAYOUT

DONE BY: EOM
CHECKED BY: J. W.
SCALE: N.T.S.
DATE: APRIL, 2024

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