DeKalb County
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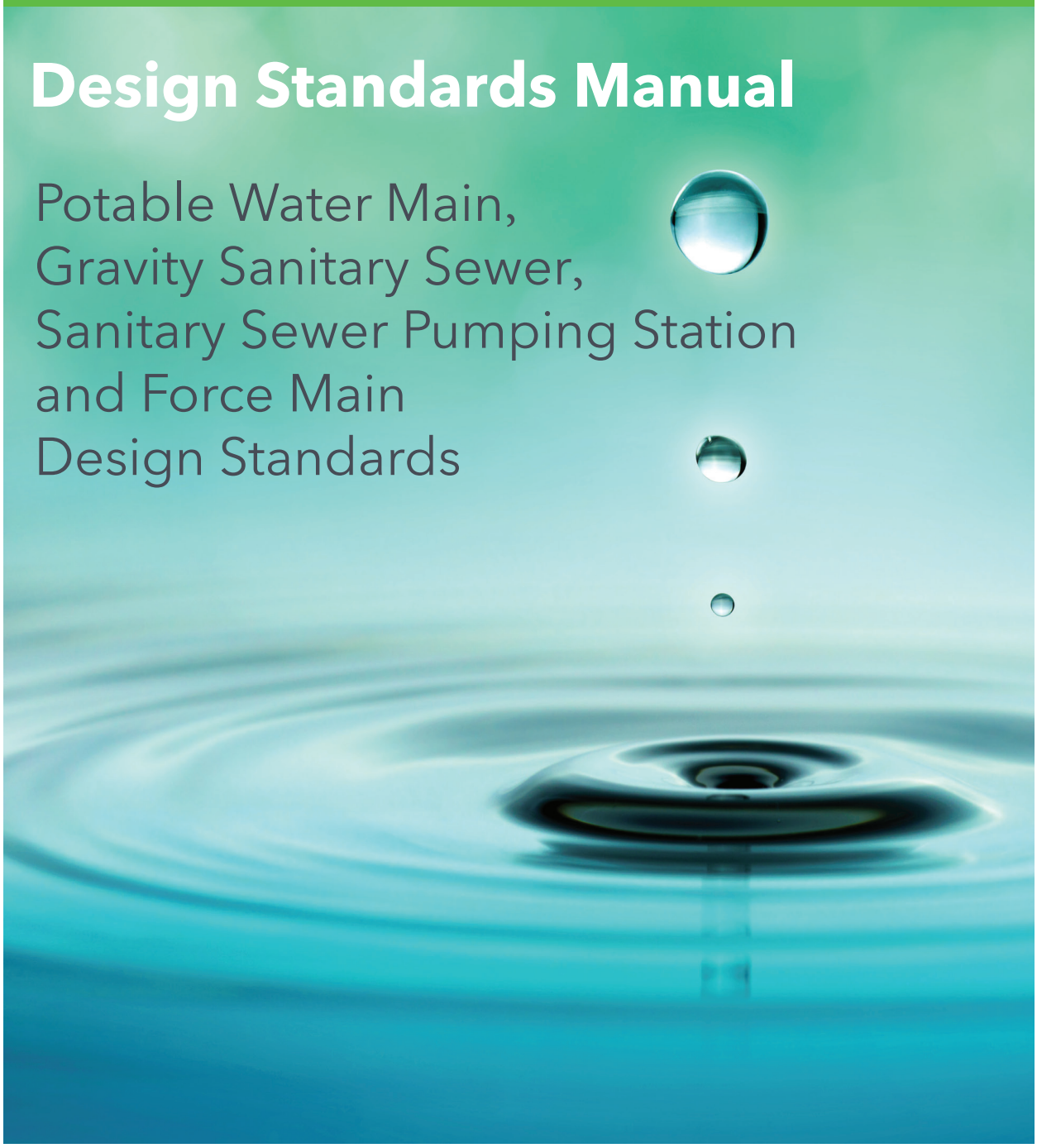
WATER Matters

Department of Watershed Management

Design Standards Manual

Potable Water Main, Gravity Sanitary Sewer, Sanitary Sewer Pumping Station and Force Main Design Standards



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List of Acronyms and Abbreviations

Abbreviation	Description
A & E	Architectural and Engineering
AACE	Association for the Advancement of Cost Consulting International
AAR	Amend and Resubmit
AASHTO	American Association of State Highway and Transportation Officials
AWWTP	Advanced Wastewater Treatment Plant
BCI	Building Cost Index (as published by *Engineering New Record*, ENR)
BIM	Building Information Modeling
BOC	DeKalb County Board of Commissioners
BoDR	Basis of Design Report
CADD	Computer-Aided Drafting and Design
CAR	Corrective Action Request
CC	Construction Contractor
CCI	Construction Cost Index (as published by *ENR*)
CD	Consent Decree
CIP	Capital Improvement Projects
CM	Construction Manager
CO	Change Order
COA	City of Atlanta
COR	Change Order Request
COTL	Communications and Outreach Task (or team) Leader
COUNTY	DeKalb County, Georgia
COW	DeKalb County Committee of the Whole
CPI	Consumer Price Index
CPM	Critical Path Method
CQP	Construction Quality Plan
CR	Change Request
CSI	Construction Specifications Institute
DB	Design-Build
DBB	Design-Bid-Build
DBC	Design-Build Contractor
DC	Design Consultant
DCDWM	DeKalb County Department of Watershed Management
DD	Deputy Director
DIR	Daily Inspection Report
DOT	Department of Transportation
DQA	Deliverable Quality Assurance
DQP	Design Quality Plan
DSDC	Design Services During Construction
DTO	Draft Task Order
DWD	DeKalb Workforce Development
DWM	Department of Watershed Management
DWM P&C	Procurement & Contracting

Abbreviation	Description
DWM PA	DWM Program Administrator
DWM PM	DWM Project Manager
DWO	Draft Work Order
EAC	Estimate of Completion
ECMS	Engineering and Construction Management Services
EHS	Environmental Health and Safety
ENR	*Engineering News Record*
EOR	Engineer of Record
EPA	United States Environmental Protection Agency
EPD	Georgia Department of Natural Resources Environmental Protection Division
EPRI	Electric Power Research Institute
ESA	Environmental Site Assessment
ETC	Estimate to Complete
FO	Field Order
GDOT	Georgia Department of Transportation
GIS	Geographic Information System
GMP	Guaranteed Maximum Price
GPS	Global Positioning System
GUPS	Georgia Utility Permitting System
GSA	General Services Administration
H&S	Health & Safety
ICT	Incident Communications Team
ICTL	Incident Communications Team Leader
IGA	Intergovernmental Agreement
IT	Information Technology
ITB	Invitation to Bid
ITL	Independent Testing Laboratory
KPI	Key Performance Indicator
LAC	Land Acquisition Consultant
LCC	Lifecycle Cost
LCCA	Lifecycle Cost Analysis
LCI	Labor Cost Index
LEP	Limited English Proficiency
LSBE	Local Small Business Enterprise
M&TE	Measuring and Test Equipment
MCI	Materials Cost Index (as published by *ENR*)
MCN	Make Corrections Noted
Mg/L	Milligrams per Liter
mgd	Million Gallons per Day
MOT	Maintenance of Traffic
MRF	Mobilization Request Form
MSA	Master Service Agreement
NCR	Non-Conformance Report
NET	No Exceptions Taken
NOA	Notice of Award

Abbreviation	Description
NTP	Notice to Proceed
OCIP	Owner Controlled Insurance Program
O&M	Operations and Maintenance
OSARP	Optimum Stockage Requirements Analysis Program
OPCC	Opinion of Probable Construction Cost
P&C	Procurement and Contracting
P&ID	Process & Instrumentation Drawing
P6	Oracle Primavera P6
PA	DWM Program Administrator
PASARP	Priority Assessment and Rehabilitation Program
PCM	Program Controls Manager
PCO	Public Communications and Outreach
PDR	Public Document Repository
PgM	Program Manager
PIF	Project Initiation Form
PIP	Public Involvement Plan
PIR	Project Initiation Report
PLT	Program Leadership team
PM	Project Manager
PMCM	Program Management and Construction Management
PMI	Project Management Institute
PMIS	Project Management Information System
PMO	Program Management Office
PMP	Program Management Plan
PMS	Program Master Schedule
PMT	Program Management Team
PMT PM	PMT Project Manager
PMT RTL	PMT Risk Task Lead
PO	Purchase Order
PPM	Program Procedure Manual
PR	Public Relations
PRA	Public Relations Administrator
PRM	Project Relations Manager
Program	DWM CIP Program
PSF	Project Fact Sheet
QA	Quality Assurance
QC	Quality Control
QMP	Quality Management Plan
QMS	Quality Management System
Report	Cost Estimate Report
RFD	Request for Deviation
RFI	Request for Information
RFP	Request for Proposal
ROW	Right-of-Way
SCP	Strategic Communications Plan
SOW	Scope of Work

Abbreviation	Description
SSO	Sanitary Sewer Overflow
SWC	Statewide Contracts
T&E	Threatened and Endangered
TBL	Triple Bottom Line
TCC	Total Construction Cost
TCP	Traffic Control Plan
TO	Task Order
TPB	Total Programmatic Budget
UCD	Unilateral Change Directive
USACE	United States Army Corps of Engineers
WBS	Work Breakdown Structure
WO	Work Order
WTP	Water Treatment Plant
WWTP	Wastewater Treatment Plant

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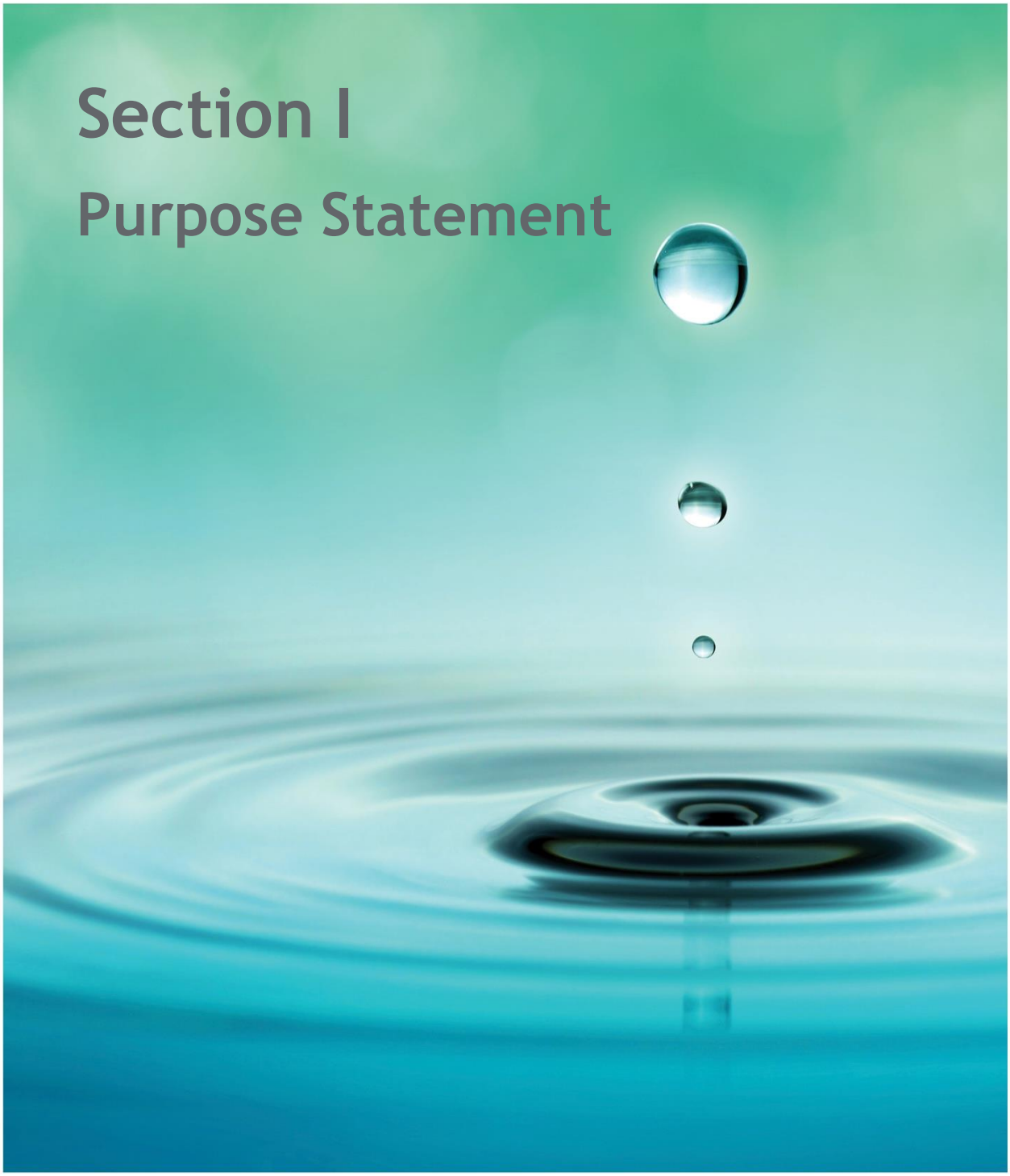
Section I

Purpose Statement



SECTION I
PURPOSE STATEMENT

Any oversight by the County during plan reviews shall not in any way relieve the **Developer / Contractor / Designer** from meeting the County Design Standards.

The *Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards* consists of current policies and procedures of the DeKalb County (**County**) Department of Watershed Management (**DCDWM**). Included herein are design criteria, submittal policies, construction requirements, inspection and acceptance procedures, Standard details, and other pertinent information. These revised Standards become effective on **December 1, 2017** and replace the previous versions and revisions.

The *Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards* were created to provide design information for **DCDWM** capital improvement projects and private development projects. These Design Standards provide construction guidance, specifications, policies, procedures, and other information necessary to construct water and sewer system improvements that meet the requirements set by **DCDWM**.

Project design shall follow the most current version of the *Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards*; changes, revisions, additions, and/or corrections can be made by **DCDWM** at any time without prior notification. The **Developer's Design Engineer** is responsible for ensuring that the project meets the latest requirements of these Design Standards.

The *Sanitary Sewer Pump Station and Force Main Standards* included within this document are to be used for pump stations and force main design and construction. Designs shall be submitted for review and approval by the **County**.

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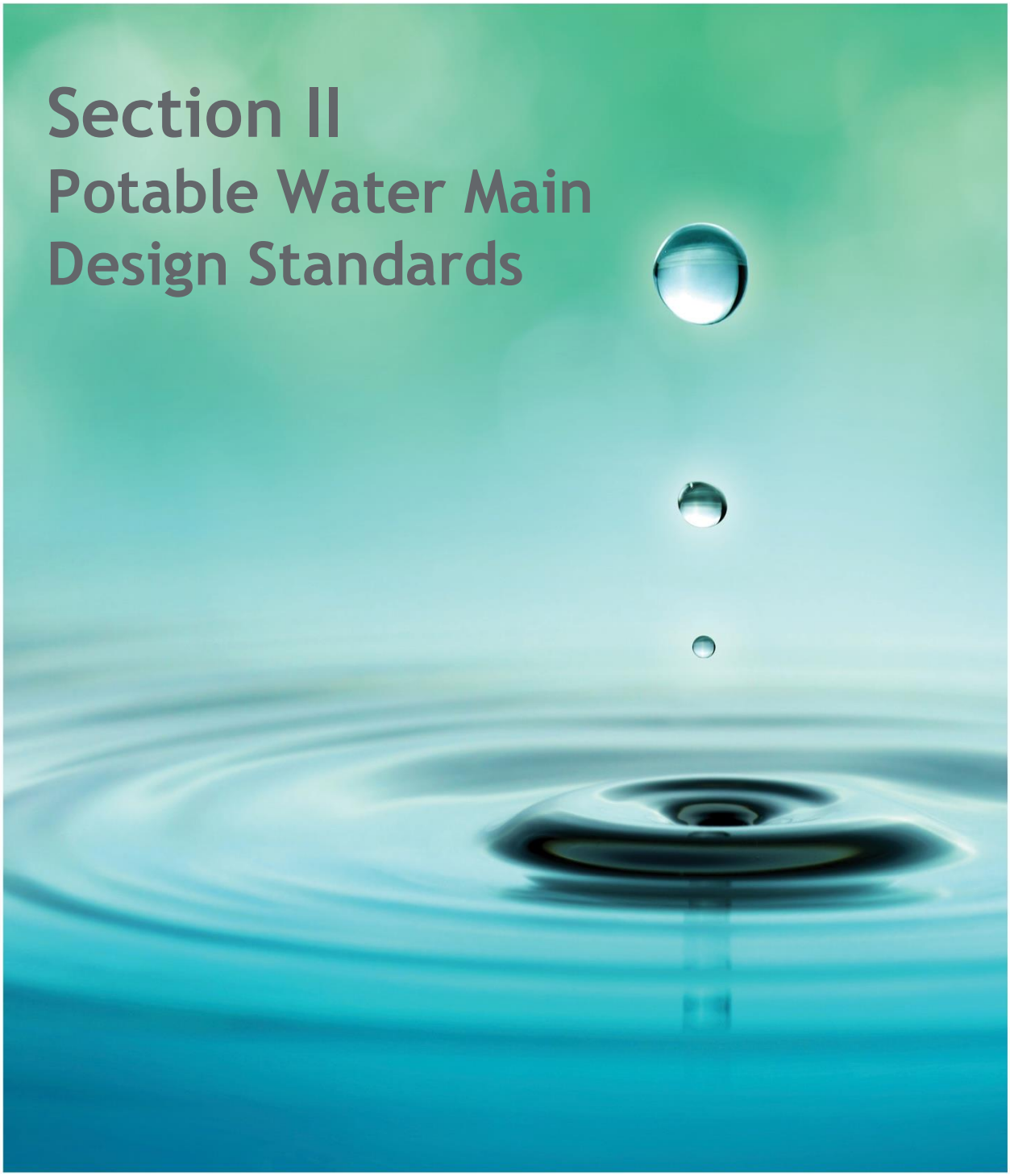
Section II
Potable Water Main Design Standards



SECTION II
POTABLE WATER MAIN DESIGN STANDARDS

A. Review and Approval Process

Design plans shall be submitted to the DeKalb County Department of Planning and Sustainability (**DCDPS**) for review and approval. Submittals, re-submittals, and retrievals of approval are processed by **DCDPS**. The **DCDPS** office is located at 330 West Ponce de Leon Avenue, Decatur, Georgia, 30030, and can be reached at **(404) 371-2518**. The design plan review and approval process flow charts are presented in **Appendix E.**

A Water Distribution System Plan Checklist is included in **Appendix A.**

B. Submittal Requirements

1. General

Four (4) sets of 24" x 36" design drawings and electronic files on a USB 3.0 Flash Drive in AutoCAD and PDF formats of design drawings shall be submitted. AutoCAD electronic files shall follow the format and requirements included in **Appendix E**: Digital File and Computer-Aided Drafting and Design (CADD) Requirements.

The plan set shall also include a legend depicting symbols used in the drawings, general notes pertinent to **DCDWM** requirements, and **DCDWM** standard details used within the plan set.

2. Information Required

The title block presented on each sheet shall include the name of the development; phase or unit of development (if applicable); Land Lot and District; name, address and phone number of **Developer** and **Developer's Design Engineer**; and professional seal of **Developer's Design Engineer** with signature.

A cover sheet shall be submitted including: a drawing index, location map with north arrow, and also include an approval block for **DCDPS** signature.

a) Plan View Requirements:

- Plan view shall have a scale of not more than fifty (50) feet to the inch (1" = 50').
- The view shall show location, size, and material of construction of the proposed pipelines within the project area.
- To schedule a chlorination test, the **Developer/Contractor** shall notify the **DCDWM** Inspector a minimum of forty-eight (48) hours in advance at (770) 621-7200.
- The proposed water mains shall be shown on the plans as solid lines with size, material, and pipe class called out. For example, " ."

- The plan view shall also show the hydrants, valves, meters, blow-off valves, etc.
- Plan view sheets shall include a north arrow.
- A table shall be provided in the plans identifying the coordinates for each water meter to be installed on the project.
- The preferred projection system to be used shall be verified with the **County,** in writing. An example is provided in **Table 2.1**.

Table 2.1
Water Meter Coordinates Example

Lot #	Water Meter #	Northing	Easting
5	108	672910	476292
6	109	543198	354328

- The plans shall identify the lots served by the new distribution mains within the plats or subdivisions under the project scope of work.
- Plans shall show the other buried existing or proposed utilities within the project area, including storm and sanitary sewers, drywells, buried telephone, natural gas, power, and cable TV lines that are concurrent with water main construction.
- Existing utilities shall be shown to the extent known, given records available to the **Developer's Design Engineer**.
- Existing utilities shall be shown as dashed lines. Construction details shall note that the buried utilities are to be field-located prior to construction.
- Plans shall show the tie-in point(s) of the proposed system to the existing **DCDWM** system.
- Plans shall include typical construction details of the tie-ins to existing pipelines; typical trench cross-sections, including bedding, backfill, and compaction requirements; fire hydrant; thrust restraint or blocking; and service connection details. Potable water main standard details are provided in **Appendix A.**
- A chlorination tap shall be indicated on the plans approximately three (3) to five (5) feet from the beginning of the project or as close as possible to the tap valve or connection point. Separate project "phases" shall have chlorination taps indicated for each phase.

b) Profile View Requirements:

Generally, profiles are not required for plan submittals on water mains smaller than sixteen (16) inches in diameter; however, special project considerations may require profiles for a portion of the project.

- Profiles are required for water mains sixteen (16) inches and larger.
- Profiles or crossing details with a vertical scale of not more than ten (10) feet to the inch shall be considered where pipeline projects encounter areas of numerous utilities that cannot be easily located, such as storm and sanitary sewers, and that have potential conflicts with the proposed water main(s).
- Profiles shall also be provided for pipelines proposed through a streambed or crossing Georgia Department of Transportation (GDOT) right-of-way.

3. Fire Line Requirements:

- Four (4) sets of site plans shall be submitted to the **DCDPS** for fire line review.
- One (1) set shall be sent by **DCDPS** to the Fire Marshall's office for their stamped approval.
- Plans approved by the Fire Marshall's office are sent to **DCDWM**, which will approve or reject plans and set the fire line fees to be paid.
- **Contractors** shall contact **DCDWM** at **(404) 371-4918** prior to any fire line work commencement on a project.
- Plan sets approved by the Fire Marshall's office and **DCDWM** will be sent back to the **DCDPS**. Once the readiness-to-serve fee has been paid, a copy of the receipt will be sent to **DCDWM** and a hard copy of the work release will be given to the Inspector, along with a copy of the approved plans.
- A pre-construction meeting with the fire line inspector shall take place 5 days before any fire line work shall begin.

NOTE: If a **Developer** or **Contractor** fails to complete any of these procedures, they may be asked to uninstall or expose any unapproved fire line to ensure it is in compliance with these Design Standards.

a. Fire Line submittal shall include the following information:

1. Name, address, and phone number of the **Developer** or **Owner**.
2. Name of entity or person responsible for costs relating to fire line installation, along with the name, address, and phone number of the local 24- (twenty-four-) hour contact person.
3. District and land lot of project.
4. Scale of drawing.
5. Name and address of project.

6. Street name, existing water main location, material, and size of the water main.
7. Size of fire line and total linear foot for each size of line and location.
8. Size and location of water meter, if required. The water meter shall be purchased so that its installation coincides with installation of the fire line.
9. Date when construction is scheduled to commence (this date is for planning purposes only and not an undertaking from the **County** to accelerate any approval processes; applications shall be subject to normal procedures and timelines).

Where a GDOT utility permit is required, the location of the connection to **DCDWM** utilities is subject to change, if so required by GDOT.

C. Design Criteria

1. Location

DCDWM's standard location for water main placement shall be as follows:

- For subdivisions, the proposed water main shall be located on the north side of east-west streets, and on the east side of north-south streets.
- For existing **County** roads, the proposed water main shall generally be located five (5) feet inside the right-of-way. For existing GDOT roads, the proposed water main shall be located five (5) feet inside the right-of-way. Unusual circumstances, such as embankments, obstructions, other utilities, etc., may warrant deviation.
- For private developments/subdivisions, the proposed water main shall be located four (4) feet from the back of the curb or as directed by the **County**.
- For non-subdivision streets, the proposed water main shall be located on that side of the road as determined by any existing lines to be tied into at the beginning and/or end of the project.
- For non-subdivision streets, the location may also be determined by existing rights-of-way, or lack thereof. Water mains shall be installed within deeded rights-of-way. Installations within "prescriptive" easements are not permitted.
- For non-subdivision streets, locations on the same side of the road as gas lines are to be avoided. In projects where any existing gas lines have "active" cathodic protection for corrosion prevention, the proposed water main shall be installed on the opposite side of the road, and may require additional protective measures, as specified by **DCDWM**.
- For non-subdivision streets where none of the above governs, the proposed water main shall be located on the side of the road that has the fewest conflicts (i.e., rock outcroppings, trees, side roads, fences, structures, involved landscaping, embankments, prescriptive easements, etc.). NOTE: The water main location shall maintain ten (10) feet of horizontal separation from existing parallel sanitary sewer mains, and typically three (3) feet vertical or minimum eighteen (18) inches vertical separation from any existing perpendicular crossing

of sanitary sewer mains unless provided with special protection, as approved by **DCDWM**.

2. Size

Unless otherwise specified by **DCDWM**, water mains serving single-family residential developments shall have a minimum diameter of eight (8) inches. Water mains serving commercial areas shall have a minimum diameter of twelve (12) inches. If adequate volumes for fire flow requirements and pressures are not available at the point of connection, a larger main and/or additional improvements shall be required. Determination of volume or pressure inadequacy shall be hydraulically modeled and calculated using fire flow test results obtained by the fire line crews that installed the hydrants and performed the pressure test, and shall be required of the **Developer**.

3. Depth of Pipe Burial

Water mains outside of paved areas and under paved areas shall have a minimum cover of four (4) feet. **DCDWM** may require cover greater than four (4) feet for pipes under roads with heavy vehicular loads and traffic.

4. Special Design Considerations

a) Freeze Protection

Protection from freezing shall be provided for pipes above ground (such as bridge crossings).

b) Thrust Restraint

Pipe thrust restraints shall be considered for pipelines above ground as well. Information regarding thrust restraint tie-rod installation is provided in Standard Detail G-008, in **Appendix E**. Thrust blocking shall be installed underground whenever pipe changes direction (tees and bends) and where unbalanced thrust forces (pressure and momentum) exist. Thrust blocking shall be wrapped in polyethylene, covering the tee/bend, and the bolts shall have a minimum thickness of 84 mils. The thrust blocking details are provided in **Appendix E**, Standard Details G-001, G-002, and G-003. These details are designed to a static pressure of 250 pounds per square inch (PSI) and a soil bearing pressure of 2,000 PSF. The dimensions for the thrust blocks indicated in **Appendix E** shall be adjusted by a register Professional Engineer (PE) with sealed calculations in accordance with the site conditions taking into consideration the undisturbed soil bearing pressure, and the maximum working pressure / surge pressure, or the test pressure of the pipeline, whichever is the greater. Special attention shall be given to thrust blocks where more than one pipe is laid parallel to another.

5. Separation from Non-Potable Conveyance Systems

a) Horizontal and Vertical Separations

Potable water mains shall maintain a ten- (10-) foot horizontal and eighteen- (18-) inch vertical clearance from non-potable pipelines (i.e., sanitary sewers, reclaimed water piping, etc.). Measurement shall be from outside of pipe to outside of pipe. If site conditions do not allow such minimum separations, **DCDWM** may allow deviation on a case-by-case basis, if supported by data from

the **Developer's Design Engineer**. The supporting data shall be submitted to **DCDWM** for approval. If it is impossible to obtain proper horizontal and vertical separation as described above, both the water and non-potable line shall be constructed of DIP meeting **DCDWM** Standards. Each line shall be pressure-tested to two hundred (200) pounds per square inch (PSI) minimum to confirm water-tightness.

b) Crossings

Water mains crossing over or under non-potable lines shall be laid to provide a minimum vertical distance of eighteen (18) inches between the outside of the water main and the outside of the non-potable line. If site conditions do not allow such minimum separations, **DCDWM** may allow deviation on a case-by-case basis, if supported by data from the **Developer's Design Engineer**. The supporting data shall be submitted to **DCDWM** for approval. The crossing shall be arranged so that the non-potable line joints shall be equidistant and as far as possible from the water main joints. Where a water main crosses under a non-potable line, adequate structural support shall be provided for the non-potable line to maintain line and grade.

When it is impossible to obtain the proper vertical separation as stipulated above, one of the following methods shall be specified and approval from the **County** obtained.

- Each line shall be designed and constructed equal to water pipe minimum standards and shall be pressure-tested to a minimum of two hundred (200) PSI to confirm water tightness.
- Either the water main or the non-potable line shall be encased in a water-tight casing pipe or concrete encasement that extends ten (10) feet on both sides of the crossing, measured perpendicular to the water main. The casing pipe shall meet the minimum depth and material requirements of the steel casing for jack and bore crossings.

6. Separation from Other Potential Sources of Contamination

Installation of water mains near other potential sources of contamination or any other facility, where the failure of the facility would subject the water main to toxic chemical or pathogenic contamination, shall be thoroughly evaluated by the **Developer's Design Engineer** on a case-by-case basis. Other potential sources of contamination include sites such as storage ponds, land disposal sites for wastewater or industrial process water containing toxic materials or pathogenic organisms, and solid waste disposal sites.

If a pipeline needs to be laid in an area with contaminated soils, certain precautions shall be taken. Research has shown that certain pipe materials and elastomers (such as those used in jointing gaskets and packing glands) may be susceptible to permeation by lower-molecular-weight organic solvents or petroleum products. The **Developer's Design Engineer** shall consult with **DCDWM**, the manufacturer, and the Georgia Department of Natural Resources Environmental Protection Division (EPD) before selecting materials for use in that area.

7. Cross-Connection Control Protection

a) Purpose

The purpose of the cross-connection control program is to protect the quality of water delivered to the customer (at the service connection), from contamination through cross-connections with other non-potable water or other liquids conveyed through piping.

b) Requirements

Under the authority of Section 25-27 and 25-34 of the DeKalb County Code, a backflow prevention assembly shall be installed on each connection to the **DCDWM** water distribution system to protect against the possibility of a contaminated backflow into the **DCDWM** water system. Existing services, new development and construction projects shall have backflow prevention assembly(ies) installed on domestic, commercial, fire line, irrigation services, and other services as required. Assemblies shall be tested after initial installation, annually, relocation, replacement, and any repairs to the backflow prevention assemblies. All testing is at the discretion of **DWM**. All cost of backflow prevention assembly installations shall be incurred by the **Developer/Contractor/Customer**.

All customers, excluding single family residential domestic service shall be responsible for the cost of installation, testing (backflow assemblies shall be tested annually), maintenance, relocation, and repair of the backflow prevention assembly(ies) used for containment at the service meter connection(s) and within their own internal private system(s) as necessary for isolation purposes.

Single family residential customers with dedicated irrigation system that is metered shall be responsible for the cost of the backflow prevention assembly as noted in the previous paragraph.

The **County** shall reserve the right to choose which type of backflow prevention assembl(ies) shall be approved for commercial customers. There are three (3) types of basic backflow assemblies that may be approved for commercial properties within the **County**:

- Water connections to facilities with low hazard potential—such as, general office buildings, and stores—require the installation of Double-Check Valve (DC) Assembly. **Table 2.2** and **Appendix A** provide more information.

- For water connections to dedicated fire line leads and/or dedicated fire line systems, the installation of a Double-Check Detector Assembly (DCDA) is required. **Table 2.2** below and **Appendix A** provide more information.

- Water connections to facilities with high hazard potential— such as animal clinics, animal grooming shops, car wash facilities, medical and

dental buildings, and irrigation systems—require the installation of Reduced Pressure Principle (RPP) assemblies. **Table 2.2** below and **Appendix A** provide more information.

Table 2.2 **Standard Detail Table** (Details in **Appendix A**)		
Low Hazard	W-014, Sizes ¾" - 2" (DC)	W-010, Sizes 2 ½" - 12" (DC)
Dedicated Fire Line	W-009, Sizes 2 ½" - 12" (DCDA)	W-013, Sizes 2 ½" – 12" (RPDA)
High Hazard	W-011, Sizes ¾" - 2" (RPP)	W-012, Sizes 2 ½" - 12" (RPP)

The two lists below indicate the specific facilities that require DC and RPP, respectively.

Typical facilities that may require DC as a minimum:

1. Restaurants without carbonators
2. Schools and colleges without laboratories
3. Daycare centers
4. Mobile home parks
5. Shopping centers (consult with the **DWM's** Backflow Prevention Section at **(404) 687-4075**)
6. General office building
7. Retail stores
8. Other general facilities

Typical facilities that may require RPP as a minimum:

1. Aircraft and missile plants
2. Animal clinics, animal grooming shops
3. Automotive repair with steam and/or acid cleaning equipment or solvent facilities
4. Auxiliary water systems (interconnected)
5. Canneries, packinghouses, and reduction plants
6. Car wash facilities
7. Centralized heating and air conditioning plants
8. Chemical plants
9. Chemically treated potable or non-potable water systems
10. Civil works (government-owned or -operated facilities not open for inspection by **DCDWM**).
11. Commercial laundries

12. Dye works
13. Film processing laboratories or laboratories using contaminating materials
14. Holding tank disposal stations
15. Hospitals and mortuaries
16. Medical and dental buildings
17. Irrigation systems
18. Restaurants with carbonators
19. Pools, baptismal pool, spas, and decorative fountains
20. Manufacturing, processing, and fabricating plants using contaminating materials
21. Motion picture studios
22. Oil and gas production facilities
23. Plating plants
24. Power plants
25. Radioactive materials processing
26. Restricted, classified or other closed facilities
27. Rubber plants
28. Sand and gravel plants
29. Sewage and storm drainage facilities
30. Shopping centers (consult with the **DWM's** Backflow Prevention Section at **(404) 687-4075**)
31. Any premises where a cross-connection is maintained
32. Water trucks, hydraulic sewer cleaning equipment, any connection to a fire hydrant with a **DWM** rented meter (**call the Utility Customer Operations Office at (404) 371-2697**)

All backflow prevention assemblies shall be tested at the time of initial installation, annually, relocation, replacement, and any repairs to the backflow prevention assembly(ies). All testing is at the discretion of **DWM.** Contact Backflow Prevention Section, at **(404) 687-4075** for pre- and post-installation inspections. A copy of the Backflow Prevention Device Test and Maintenance Report is provided in **Appendix A.** Alternatives to the above design requirements may be acceptable, but only with the written approval of **DCDWM,** Backflow Prevention Section for the variation. For written approval, the following information shall be submitted for review of a civil plan showing:

Existing	Proposed
water lines	water lines
meters	meters
types of water usage	types of water usage
backflow prevention assembly(ies)*	backflow prevention assembly(ies)*
utilities	Utilities
NOTE: *Backflow preventers are not to be installed in the right-a-way.	

8. Appurtenant Design Considerations

a) Valve Placement

Valves on distribution mains with diameters of twelve (12) inches or less shall be located a minimum of every one thousand (1,000) feet. Generally, four (4) valves are installed on every cross.

b) Air Release Valves

High points of distribution or transmission lines require air release valves. The air release valve installation is presented in Standard Detail W-019 **Appendix A.**

c) Fire Hydrants, Fire Lines, Flushing Valves, and Blow-offs

Fire hydrants shall be spaced every five hundred (500) feet in rural areas, every four (400) feet in residential areas, and every three hundred (300) feet in commercial areas, or as determined by the DeKalb County Fire Marshall.

If a fire hydrant is placed on a branch water line at a distance exceeding one hundred (100) feet from the point of tap on the water main, then the **Contractor** shall install a backflow prevention device, flush new water lines, remove air, and pass hydrostatic pressure and sterilization tests per **DCDWM** Standards.

Each fire hydrant shall be installed using a fire hydrant tee and six- (6-) inch isolation valve, and shall be so identified on the plan. Blow-offs or hydrants shall be installed at low points and dead ends in the distribution system to allow for sufficient flushing and proper disinfection of the water main. They shall be designed to achieve a minimum velocity of two and one half (2.5) feet per second (fps) in the main for scouring purposes. The Typical Blow-off assembly Standard Detail W-017 is provided in **Appendix A**.

Where possible, place a fire hydrant near the end of each main. Where this is not feasible due to spacing requirements, provide a one- (1-) inch blow-off on mains of eight (8) inches in diameter mains and a two- (2-) inch blow-off on mains that are twelve (12) inches and larger, for use in flushing (see Standard Detail W-017, **Appendix A**). A one- (1-) inch blow-off assembly on an eight- (8-) inch water main shall achieve a flushing velocity of one hundred sixty (160) fps, and a two- (2-) inch blow-off on a twelve- (12-) inch water main shall achieve a flushing velocity of ninety (90) fps. Blow-off assemblies shall be installed with freeze protection.

A backflow prevention assembly shall be installed on the fire lines.

All existing fire hydrants on mains to be abandoned as part of the submitted project shall be labeled as follows: "Existing fire hydrant to be salvaged and returned by **Contractor** to **DCDWM** Roadhaven Facility."

d) Sampling Stations

If requested by the **County**, lockable sampling stations shall be installed at locations as directed. A standard sampling station is provided in Standard Detail W-022 in **Appendix A.**

e) Angle, Curb, or Meter Stops

Separate, angle, curb, or meter stops for each service connection shall be installed. The service and meter installation Standard Details W-008 and W-021 are provided in **Appendix A.**

f) Private Fire Lines

Privately owned fire lines are subject to review and approval by **DCDWM** and shall meet the minimums of the latest NFPA 24 fire line codes. The Fire Marshall shall approve the size and flow requirements for the fire line. **DCDWM** shall determine the tapping fee and the fire line fee, including inspection of the construction. Private fire lines shall be constructed of DIP, as specified in Section II.D.2.

g) Meter Locations

All meters shall be located in green space. Meters shall not be located within driveways, sidewalks, or other paved areas. A three- (3-) foot-by-three-(3-) foot area of green space shall be allotted for each water meter to allow for the proper maintenance or replacement of meters. Meters for condominiums and individually metered high-rise apartments shall be placed into a meter bank. The **Contractor** shall ensure that **DCDWM** has access to the meters and meter banks to shut off service. Final grade shall be achieved prior to meter installation; orange cards provided by **DCDWM** shall be placed on stakes to mark where the meters are to be installed in the field. If, for any reason, the orange cards are not received from **DCDWM**, pieces of cardboard with the words “WATER METER” shall be placed on stakes to mark the desired location of the meter to be installed. The **Contractor** shall follow the water meter location Standard Detail W-020 in **Appendix A.**

h) Vaults

Vaults shall have only one (1) line entering and leaving the structure. For example, fire and domestic or irrigation services shall be located in separate vaults. Vaults shall be designed and stamped by a Professional Engineer registered in the State of Georgia and shall be submitted for approval by the **DCDWM**.

9. Design of Water Mains within GDOT Right-of-Way

If any portion of a proposed project enters a State of Georgia controlled right-of-way, then a GDOT permit application is required. Developer/Contractor shall submit to DCDWM the required material in hard copy and in electronic form, on a CD and a flash drive. Hard copy forms, permits, and drawings, etc. shall be 8 ½" X 11." Drawings need not be to scale. The measurements necessary for the permit application shall be submitted in the United States Customary System units. Generally, portions of the project design can may be reduced in size and match lined, if necessary, as long as the text is still legible. Compaction notes indicating compaction requirements shall be included on every construction drawing required for the application. (Reference Backfilling Trenches Section VI.A.12) Submittal shall include four (4) each of the following: plan, profile, traffic control plan, and relevant section from GDOT County map. The Georgia Department of Transportation Permitting Checklist is provided in **Appendix E.**

GDOT requires the GDOT permit application to be submitted through the GUPS. The Developer/Contractor is not to shall not submit the GDOT permit directly through the Georgia Utilities Permitting System (GUPS). The Developer/Contractor is to shall provide all necessary information, as stated in the previous paragraph. DCDWM will then review the information and provide comments (if necessary). Once the necessary information has been approved, DCDWM will submit the GDOT permit application through the GUPS. All Work, including furnishing materials for installing, relocating, and adjusting water distribution systems, shall be in accordance with the latest edition of GDOT Standard Specifications Section 670 – Water Distribution System and Section 847 - Miscellaneous Pipe details are available at http://tomcat2.dot.state.ga.us.

Note that:

- The minimum cover over water mains shall be four (4) feet.
- Traffic control shall be in accordance with the *Manual on Uniform Traffic Control Devices* (MUTCD), latest edition.
- Trench restoration within GDOT right-of-way shall be in accordance with GDOT Standard Detail 1401 Pavement Patching Details, available at http://tomcat2.dot.state.ga.us.
- All bore and jack pits shall be a minimum of ten (10) feet from the outside edge of pavement. Plans shall show casing size and carrier pipe size within the approach slab for bridge crossings. Details of how the carrier pipes shall be launched into and secured in the casing pipes shall also be shown on the plans.
- Fire hydrants shall be relocated to within five (5) feet of the right-of-way, per GDOT requirements.
- A note shall be added to the plans, stating: "Backflow prevention devices on private property shall be relocated by GDOT's **Contractor** at no expense to DeKalb County."

- In GDOT *Section 2.5.H. Service Lines* - Because it is in the interest of both the customer and Utility to have these connections, service lines are permitted on right-of-way as close to perpendicular as possible with the transmission facility with the exception that metering devices, vaults or pressure reducing mechanisms shall be located off the right-of-way. Any longitudinal installations of service lines shall be reviewed by the District Utilities Engineer on a case-by-case basis. This does not apply to installations serving a highway purpose.

D. Construction Materials and Installation

1. General

At no time shall any water main construction commence prior to approval of the plans and receipt of any required agreement documents.

The materials used for water main construction shall meet American Water Works Association (AWWA) Specifications. In the event of any corrosive soil conditions, the **Developer**/**Contractor** shall make recommendations for additional corrosion protection for the pipeline, valves and fittings.

Only **DCDWM**-approved **Contractors** shall install water mains within the **County** right-of-way or **County** easement. Only **DCDWM**-approved **Contractors** shall make any connections to the existing **DCDWM** system.

All water mains, valves, fire hydrants, and other appurtenances to be dedicated to, or owned by **DCDWM**, shall be installed according to the "approved" design. Field changes shall be pre-approved by **DCDWM**. The **Contractor** shall have a set of the "approved" design containing an original **DCDWM** stamp, and a copy of these Design Standards, most current edition, always on site.

Contractor shall adhere to the Federal, State, **County**, and local laws, ordinances, and regulations that in any manner affect the conduct of Work, including, but not limited to, initiating, maintaining, and supervising the safety precautions and programs in connection with the Work.

Throughout the construction, the **Contractor** shall fully comply with the applicable requirements of local, State, and Federal agencies in the control and containment of soil erosion, including post-construction maintenance of erosion control devices. The **Contractor** shall follow the latest edition of *The Georgia Manual for Erosion and Sedimentation Control*.

2. Acceptable Materials

a) Push-On Joint

All push-on DIP shall be manufactured in accordance with and meeting the latest requirements of AWWA C151/A21.51. Ductile iron fittings shall be manufactured in accordance with and meeting the latest requirements of AWWA C110/A21.10. Ductile iron joints shall be manufactured in accordance with and meeting the latest requirements of AWWA C111/A21.11. Pipe shall generally be designed for Type 1 laying conditions with four (4) feet of cover; however, exceptional

conditions may be indicated on the approved plans and specifications, and these shall take precedence.

Wall thickness of pipe shall be as specified under **Section II.D.2.d.**

b) Mechanical Joint

All mechanical joint DIP shall be manufactured in accordance with and meeting the latest requirements of AWWA C151/A21.51.

Wall thickness of pipe shall be as specified under **Section II.D.2.d.**

The mechanical joint herein specified for mechanical joint DIP and fittings shall meet the latest requirements of AWWA C110/A21.10 with joints meeting the latest requirements of AWWA C111/A21.11.

All nuts, bolts, and washers shall be in accordance with ASME/ANSI B1.1, unified inch screw threads, class 2A, external and class B, internal, low-carbon steel conforming to American Society for Testing and Materials (ASTM) A307 (60,000 PSI tensile strength). Corrosion protection of the fasteners shall be zinc-coated (hot dip) in accordance with ASTM A153, Class C and D, coated thickness grade.

All buried nuts and bolts shall be wrapped with Denso profiling mastic and wrapped in polyethylene sheeting with a minimum thickness 84 mils.

c) Flanged Pipe (Non-Buried Applications)

All flanged DIP shall be manufactured in accordance with and meeting the latest requirements of AWWA C151/A21.51 with joints meeting the latest requirements of AWWA C115/A21.15.

Wall thickness of pipe shall be as specified under **Section II.D.2.d.**

All flanged ductile iron fittings shall be manufactured in accordance with the latest requirements of AWWA C110, three hundred and fifty (350) PSI working pressure. Design of flanged ductile iron fittings shall be as directed, indicated, or noted on the approved drawings. In general, the **Contractor** shall use flanged fittings with long-radius elbows except where space limitations prohibit use of same. Design of special flanged fittings, including wall castings, shall conform to dimensions and details as directed, indicated, or noted on the approved drawings.

All nuts, bolts, and washers shall be in accordance with ASME/ANSI B1.1, unified inch screw threads, Class 2A, external and Class B, internal, low-carbon steel conforming to ASTM A307 (60,000 PSI tensile strength). Corrosion protection of the fasteners shall be zinc-coated (hot dip) in accordance with ASTM A153, Class C and D, coated thickness grade.

All buried nuts and bolts shall be wrapped with Denso profiling mastic and wrapped in polyethylene sheeting with a minimum thickness 84 mils.

d) Pipe Wall Thickness

DIP with push-on or mechanical joints shall have the minimum wall thickness shown in **Table 2.3.**

Table 2.3
Minimum Pipe Wall Thickness

Pipe Diameter (inches)	Pipe Class	Minimum Wall Thickness (inches)
4	51	0.26
6	51	0.28
8	51	0.30
10	51	0.32
12	51	0.34
14	51	0.36
16	51	0.37
18	51	0.38
20	51	0.39
24	51	0.41
30	51	0.43
36	51	0.48
42	51	0.53
48	51	0.58
54	51	0.65

NOTE: **Table 2.3** is based off American Cast Iron Pipe Company Ductile Iron product specifications. The table shows Special Thickness Class fifty-one (51). Each pipe size shall be Special Class 51 minimum.

All DIP with flanged joints shall be a minimum of Special Thickness Class fifty-three (53), minimum wall thickness, as shown in **Table 2.4**.

Table 2.4
Minimum Wall Thickness for Ductile Iron Pipe with Flanged Joints

Pipe Diameter (inches)	Pipe Class	Minimum Wall Thickness (inches)
4	53	0.32
6	53	0.34
8	53	0.36
10	53	0.38
12	53	0.40
14	53	0.42
16	53	0.43
18	53	0.44
20	53	0.45
24	53	0.47
30	53	0.51
36	53	0.58

Table 2.4 Minimum Wall Thickness for Ductile Iron Pipe with Flanged Joints		
42	53	0.65
48	53	0.72
54	53	0.81

NOTE: Pipe class and thickness of DIP larger than fifty-four (54) inches in diameter shall be taken into special consideration and shall require approval by **DCDWM**.

e) Service Materials

Service materials shall be constructed of copper pipe with fittings and appurtenances in accordance with the following:

Fittings shall meet the no lead (NL) designation. Copper service lines installed within GDOT right-of way shall be a minimum of one (1) inch in diameter.

(1) Copper Tubing and Fittings

Copper pipe (or tubing) shall be minimum three-quarter (¾) inch and be manufactured and furnished in accordance with the latest requirements of ASTM B88, Type "K." Fittings shall be of the compression "pack-joint" coupling type greater than 1," Fittings 1" and less shall be flared.

(2) Appurtenances

Appurtenances such as corporation stops, curb stops, and adaptors for copper service lines, shall meet the latest requirements of ASTM B62 for bronze construction and AWWA C-800 for threads. Fittings shall meet the NL designation.

1. Nut, Piggy-Back – ¾-inch Ford #C02-43 only; 1-inch Ford #C02-54 only.
2. Union, three-piece – ¾-inch Cop x Cop, Mueller #H-15400, Ford #C22-33, or James Jones J-1528 only. 1" Cop x Cop, Ford #C22-44, Mueller H-15400, Hays #5615, and James Jones J-1528 only.
3. Adaptor, ¾-inch, M.I.P. x Cop, Mueller H-15425, Ford #C28-33, or James Jones J-1531 only.
4. Adaptor, ¾-inch, F.I.P. x Cop, Mueller H-15450, Ford #C21-33, or James Jones J-1535 only.
5. Copper Adaptor, 1-inch, M.I.P. x Cop, Ford #C28-44, Mueller H-15425, or James Jones J-1531 only.
6. Copper Adaptor, 1-inch, F.I.P. x Cop, Ford #C21-44, Mueller H-15450, or James Jones J-1535 only.
7. Flare, copper, quarter bend, ¾-inch Ford #L02-33, Mueller #H-15069 only.
8. Flare, copper, quarter bend, 1-inch Ford #L02-44.

9. Stop, ball valve curb, ¾-inch Flair Inlet, ¾-inch F.I.P. outlet, 3/4-inch full port and a lock wing, Ford #B21-233W, A.Y. McDonald 6102-W, or James Jones J-1901 only.
10. Stop, ball valve curb, 1-inch Flair Inlet, 1-inch F.I.P. outlet, ¾-inch full port and a lock wing, Ford #B21-344W only.
11. Stop, ¾-inch corporation, CC x Copper, Ford #F-600-3, Mueller #H-15000, or James Jones J-1500 only.
12. Stop, 1-inch corporation, CC x Copper, Ford #F-600-4, Mueller #H-15000-1-inch, or James Jones J-1500 only.
13. Stop, 1½-inch corporation, CC x MIP, Mueller #H-10003, McDonald 3121, or James Jones J-89.
14. Copper, flare "Y" branch 1-inch x ¾-inch, Ford Y22-243 only.
15. Couplings 1 ½-inch Ford C44-66, or James Jones J-2609 only.

(3) Small Rough Brass Fittings

Small rough brass fittings are to be in accordance with the latest edition of the American National Standards Institute (ANSI) B16.15, and with Federal Specifications WW-P-460 and A-A-59617, domestic only. This includes the brass elbows, nipples, ells, tees, reducers, couplings, plugs, hex bushings for screwed fittings, and hex bushings.

(4) Bronze Fittings

Bronze fittings shall be in accordance with AWWA C800 latest edition and ASTM B62 latest edition specifications.

1. Gate valve with non-rising stem, bronze, solid wedge disc, and full flow FIP x FIP, one and one-half (1½) inch; heavy pattern solid bronze construction; with solid bronze hand wheel, oversize approximate 17/32-inch shaft (stem) diameter, packing providing field adjustment; double discs moveable in body, allowing debris to slip under disc as closure occurs; to be American-made with approximately 85-5-5-5 bronze, hydraulically tested individually in both open and closed positions, prior to shipment; equal to James Jones Company Model J-372, one and one-half (1½) inch.

2. Gate valve with non-rising stem, bronze, solid wedge disc and full flow FIP x FIP, two (2) inches; heavy pattern solid bronze construction; with solid bronze hand wheel, oversize approximate five-eighths- (5/8-) inch shaft (stem) diameter, packing providing field adjustment; double discs moveable in body allowing debris to slip under disc as closure occurs; to be American made with approximately 85-5-5-5 bronze, hydraulically tested individually in both open and closed positions, prior to shipment; equal to James Jones Company Model J-372, two (2) inches.

For standard water service installation, the **Contractor** shall follow Standard Details W-008 and W-021, **Appendix A**. Follow Standard Details W-001, W-002, and W-003**, Appendix A**, for water service installation on cul-de-sacs.

For installation of water mains in cul-de sacs, the **Contractor** shall follow Standard Details W-001, W-002, and W-003 in **Appendix A**. Typical water main stub-out installation is provided in Standard Detail W-006, **Appendix A**.

f) Valves

(1) Valve Boxes

All valves that are to be buried in the ground shall be provided with a valve box and cover. Where the depth of cover is more than five (5) feet, the **Contractor** shall provide suitable, permanently installed valve stem extensions and guides that have been approved by **DCDWM** prior to fabrication and placement. Placement of Valve covers and disc markers are illustrated in Standard Detail W-023, **Appendix A.**

(2) Valve Concrete Markers

Valve markers shall be furnished and installed with each valve on the proposed project, with the exception of fire hydrant branch valves. The markers shall be Class A concrete of GDOT specifications, four (4) inches square by four (4) feet long, and shall be of the same construction as that of highway right-of-way markers. The top one (1) foot and six (6) inches of the valve marker shall be displayed above ground. The words "Water Valve" shall be cast vertically into the marker beginning two (2) inches from the top of the marker. There shall also be a one (1) inch brass plug cast into the marker one (1) inch below the letter "e" of the word "Valve," with the distance, in feet, from the valve marker to the valve box. Distance shall be stamped on the brass plug in the field by the **Contractor** after installation. The markers shall be installed as close to the right-of-way line opposite the valve as is possible, with the brass plug facing the valve. The marker shall be located so as to avoid damage by traffic.

(3) Valve Cover with Marker Discs

Valve boxes installed in non-paved areas shall be installed with a twenty four- (24-) inch-by-twenty four- (24-) inch concrete collar. For valves sixteen (16) inches and larger, a three- (3-) inch diameter brass identification marker shall be installed with the concrete collar. The brass identification marker shall be stamped with valve size, type of valve, type of service, direction of opening, and number of turns to open. An example of a valve concrete collar with brass identification marker is shown in Standard Detail W-023 in **Appendix A.**

Valves sixteen (16) inches and larger installed in paved areas shall be installed with a three (3) inch diameter brass identification marker nine (9) inches (centerline to centerline) from the valve box. The brass identification marker shall be set with grout onto a four- (4-) inch-by-four- (4-) inch-by-eighteen- (18-) inch concrete column prior to installation next to the valve box. The brass identification marker shall not be cast or grouted directly onto the paved area. The brass identification marker shall be stamped with valve size, type of valve, type of service, direction of opening, and number of turns to open. An example of a brass identification marker installation in a paved area is provided in Standard Detail W-023 in **Appendix A.**

(4) Valves

The **Contractor** shall follow the general valve locations provided in Standard Detail W-016 in **Appendix A**. **DCDWM** shall have the discretion to determine the type of valve to be installed.

Some waters can promote galvanic corrosion and some soils can also be aggressive towards certain valve materials. The **Developer**/**Contractor** shall therefore select materials and corrosion protection systems that shall ensure the long-term integrity of the valves and fittings used. This applies for both above ground and buried applications. If necessary, the **Developer**/**Contractor** shall do additional tests to confirm the status of the water and soil before an application is submitted for approval to the **County**.

1. Gate Valves

   Gate valves shall conform to AWWA C500 (latest edition) for double-disc gate valves, or AWWA C509 (latest edition) for resilient-seated gate valves, and shall be as manufactured by American Flow Control, U.S. Pipe, Mueller, Clow, or approved equal.

   Gate valves shall be hand-operated, non-rising stem, with cast or ductile iron bodies, and adapted for joints as indicated in the approved design drawings, or as directed.

   Bolting materials of the valve shall only be zinc-coated (hot dip) in accordance with ASTM A153, Class C and D, coated thickness grade or Stainless Steel 304 (the latter shall be used only if no galvanic corrosion is promoted).

   All gate valves shall open by turning the operating nut to the left (counter-clockwise).

   Gate valves shall only be used in sizes of two (2) inches through ten (10) inches. Greater than ten (10) inches may be permitted if using resilient seated gate valves. Gate valves shall be submitted to the **DCDWM** for approval prior to installation.

   The valve ends shall be with mechanical joints. Fasteners shall be as specified under Section II.D.2.b above. Torque values for the bolts shall be as prescribed by the valve manufacturer and in combination with the specific gaskets that are used.

   All buried nuts and bolts shall be wrapped with Denso profiling mastic and wrapped in polyethylene sheeting with a minimum thickness of 84 mils.

   For gate valve installation, see Standard Detail W-007 in **Appendix A.**

2. Butterfly Valves

   Butterfly valves shall conform to the requirements of AWWA C504 (latest edition), and shall be as manufactured by American Flow Control, Henry Pratt, Allis-Chalmers, or approved equal.

   All butterfly valves shall be installed within a vault designed and stamped by a Professional Engineer registered in the State of Georgia and shall be submitted for approval by the **County**. Butterfly valves shall be hand-operated with cast or ductile iron bodies, and adapted for joints as indicated in the approved design drawings, or as directed by the **County**.

   All butterfly valves shall open by turning the operating nut to the left (counter-clockwise).

   Butterfly valves shall only be used in sizes sixteen (16) inches and larger.

g) Fittings and Appurtenances

(1) Ductile Iron Fittings

Fittings shall be ductile iron and shall conform to the requirements of AWWA C110 or AWWA C153, latest editions, with a minimum rated working pressure of three hundred and fifty (350) PSI.

(2) Tapping Sleeves

All tapping sleeves shall comply with the latest ANSI Standard, two hundred (200) PSI minimum working pressure for water mains of twelve (12) inches in diameter or less and one hundred and fifty (150) PSI minimum working pressure for water mains with a diameter larger than twelve (12) inches. Tapping sleeves shall be cast iron or ductile iron with mechanical joint ends as manufactured by American Flow Control, Mueller, or approved equal. Fabricated split steel tapping sleeves of the full-circle variety, as manufactured by Rockwell, JCM, or equal, may be used with the approval of **DCDWM**. When tapping an existing asbestos-concrete pipe, a stainless steel tapping sleeve, as manufactured by Ford, or approved equal, that contains a full gasketed surface within the sleeve body, shall be used due to variances in the manufactured OD of the asbestos-concrete pipe. Outlets shall be sized to permit a tap to be made using a full-size shell cutter.

All buried nuts and bolts shall be wrapped with Denso profiling mastic and wrapped in polyethylene sheeting with a minimum thickness 84 mils.

(3) Tapping Saddles

All tapping saddles shall be AWWA standard-approved with flanged connections. Tapping saddles shall be used only on DIP that is twenty-four (24) inches or larger. The use of service saddles is not allowed for tapping services or mains.

h) Fire Hydrants

Fire hydrants shall be manufactured in full compliance with the AWWA Standard for Dry-Barrel Fire Hydrants, AWWA C502 (latest edition), and as herein amended. Fire hydrants shall have an internal check valve flapper. Fire hydrants shall only be installed after being submitted and receiving approval from **DCDWM.** Only the following fire hydrants are approved by the **County**: American Darling, M & Style, Mueller, Clow, US Pipe, or Waterous. The **Contractor** shall follow the fire hydrant installation Standard Detail W-004 in **Appendix A.**

Type – Three- (3-) way, post-type, dry-top traffic model with compression main valve opening against and closing in the direction of normal water flow.

Size - Internal main valve diameter shall be a minimum of five and one-quarter (5¼) inches.

Identification - Each hydrant shall have the name of the manufacturer, the year made, and the nominal valve size in legible, raised letters cast on the barrel or bonnet.

Dry Top Bonnet - Each hydrant shall be constructed with a moisture-proof lubricant chamber that encloses the operating threads and provides automatic lubrication of the threads and bearing surfaces each time the hydrant is operated. This assembly shall be composed of a top "O" ring serving as a dirt and moisture barrier and a lower "O" ring that serves as a pressure seal.

Operating Nut - The operating nut shall be **DCDWM** standard four- (4-) sided nut and shall open by turning left (counter-clockwise). Nozzle caps shall come with heavy duty, non-kinking chains. Chains shall be securely affixed to the hydrant barrel and permit free turning of the nozzle caps and four- (4-) sided operating nut.

Traffic Design - The fire hydrant barrel sections shall be set to an elevation that does not exceed six (6) inches above grade at the flange connection. This is to ensure breakaway if impact occurs.

The main valve rod sections shall be connected at the ground line by a frangible coupling. The standpipe and ground line safety construction shall be such that the hydrant nozzles can be rotated to any desired position without disassembling or removing the top operating components and top section of the hydrant standpipe.

Main Valve - The main valve shall be made of synthetic rubber and formed to fit the valve seat accurately.

Main Valve Seat - The main valve seat shall be of bronze and its assembly into the hydrant shall involve bronze-to-bronze thread engagement. Two "C" ring seals shall be provided as a positive pressure seal between the bronze seat ring and the shoe. The valve assembly pressure seals shall be obtained without the employment of torque compressed gaskets. The hydrants shall be designed to allow the removal of the operating parts through the hydrant barrel by means of a single disassembly wrench without excavating.

Drain - The drain mechanism shall be designed to operate automatically with the operation of the main valve and shall allow momentary flushing of the drain ports. A minimum of two (2) internal and two (2) external bronze lined drain ports shall be required in the main valve assembly to drain the hydrant barrel.

Inlet Connection - The cast iron inlet elbow shall have a six- (6-) inch mechanical joint connection complete with accessories.

Extensions - Barrel extension sections shall be available in six- (6-) inch increments, complete with rod, extension coupling, and the necessary flanges, gaskets, and bolts so that the hydrant can be extended without excavating.

Nozzles - No lead shall be allowed in nozzle construction as a component of the metallic content.

Testing - Fire hydrants shall be tested in strict accordance with AWWA C502 (latest edition) at the point of manufacture. Certificates of Compliance shall be provided to **DCDWM** upon request.

Painting - Iron parts of the hydrant both inside and outside shall be painted in accordance with the latest requirements of AWWA C502. The final coat of the outside surfaces of the barrel above grade shall be composed of two field coats of Tnemec Series 2H, Hi-Build Tnemec-Glass or **County** approved equal. The top bonnet, including the lip and the nozzle caps, shall be painted the appropriate color as approved by **DCDWM**. Caps and weather covers shall have reflecting properties.

3. Bedding

A. Water

Bedding materials shall be in accordance with GDOT Standard Specification Section 812, Type I or II Foundation Backfill. The link below will take you to the information.

http://mydocs.dot.ga.gov/info/designbuild/Shared%20Documents/0010925/Shelf%20Specs%20and%20SP/Supp%20Specs/Suppl%20Specs/su812.pdf

Bedding requirements specified herein shall apply to potable water mains only. They are to be considered minimum bedding requirements and as such, do not relieve the **Contractor** of the responsibility to provide any additional bedding necessary for proper construction.

The bedding material shall be placed in the bottom of the trench after it has been excavated to an elevation sufficient to permit the placing of not less than six (6) inches, or as directed. The surface of the bedding material shall be spread to form a uniform support for the pipe and appurtenances. After installing each section of the pipe, additional bedding material shall be placed on either side of the pipe to an elevation consistent with the bedding type specified herein, as indicated on the plans or specifications, or as directed by **DCDWM**. This material shall be well tamped and compacted into place so as to secure a firm, even bearing.

Bedding material shall be placed for the full width of the trench bottom.

4. Tapping of Existing Mains

Connections to existing pipe lines shall generally be made by the use of tapping sleeves and valves, except as specifically indicated on the approved drawings to be otherwise, or as may be directed by **DCDWM**. Tapping of existing water mains shall be at the discretion of the **County**. Some existing lines shall not be allowed to receive taps or tie-in connections.

These requirements are based on County Ordinance Chapter 14, Article III, Division 4, Part B Section 14-313, amended by adding: The design shall include necessary improvements to the water system, including extensions along the entire roadway frontage of the development - adopted 28th day of July 1992.

In certain instances, it may be specified or desirable to tap a "dry" line. In this circumstance, a tapping sleeve and valve shall be required and the tap accomplished using a standard "tapping machine." Under no circumstances shall the **Contractor** be permitted to "burn" a hole in the main using oxyacetylene tools.

The **Contractor** shall furnish and install tapping sleeves and valves suitable for connection to the existing water mains at locations indicated on the approved plans, or as directed by the **County**. Tapping sleeve locations shall be required to have an approved designed thrust block. The **Contractor** shall verify the type, size, O.D., and class of the existing pipe before ordering the tapping sleeve and valve.

Prior to making the tap, the **Contractor**, in the presence of the **County** Construction Inspector, shall hydrostatically pressure-test the complete tapping sleeve and valve installation at a test pressure, for 30 minutes with zero-(0-) PSI loss, of two hundred (200) PSI, or fifty (50) PSI over the existing system static pressure, whichever is greater (pneumatic or air-pressure testing is prohibited).

The **Contractor** shall properly support the tapping sleeve and valve using bricks, blocks, wedges, or other substantial supporting materials that shall not permit the tapping valve or tapping machine to transfer any downward rotational force to the tapping sleeve. This support shall be provided before mounting the tapping machine.

The closing of any existing mainline valves to isolate a particular pipe for a "wet cut-in" shall be accomplished by the **Contractor** under the specific direction and presence of the **DCDWM** Construction Inspector and at such time shall be directed by **DCDWM**. Such shutdowns shall be approved in advance by **DCDWM**. The **Contractor** shall provide the labor and equipment sufficient to uncover valves and clean out valve boxes for access to any existing valves necessary to complete or repair work as part of the Project. **DCDWM** will provide the records and information available to assist in the locating of covered valves, and will also provide assistance in the form of electronic locating equipment. This assistance shall not relieve the **Contractor** of its responsibility to locate any necessary valves to accomplish the Work.

The **Contractor** shall be responsible for notifying the customers who will be affected by the interruption of water service. Such notification shall be made at least forty-eight (48) hours in advance of the planned shutdown. No service shall be interrupted without the **DCDWM** Inspector's prior approval.

a) Six- (6-) inch through Sixteen- (16-) inch Taps

When six- (6-) inch through sixteen- (16-) inch taps are to be made, **DCDWM** will furnish the tapping machine, provide for welding, if required, and do the actual tapping of the main. The **Contractor** shall be responsible for the excavation / shoring, furnishing, and installation of the tapping sleeve and valve, testing, backfilling, hauling, and anything else to provide a complete connection to the existing main. Upon successful pressure-test of the assembly, **DCDWM** will install and operate the tapping machine.

b) Greater than sixteen- (16-) inch Taps

Where greater than sixteen- (16-) inch taps are to be made, the **Contractor** shall be responsible for furnishing and operating the tapping machine and do the Work to make the installation complete. Tapping machine, sleeves, tapping spigot, valve, etc., shall be operated and installed under the supervision of skilled mechanics that have a minimum of six (6) years in tapping connection experience. For the sizes of existing steel pipe water mains, the **Contractor** shall furnish and install the tapping spigot by welding, as well as operate the **Contractor**-furnished tapping machine. The **Contractor** shall do the other Work required to complete the connection, including excavation, safety measures, backfilling, and paving (if required) as mentioned herein.

Note: During any tie-in, repair or excavation on a live line, only one (1) joint shall be uncovered/exposed without backfill during said operation.

5. Final Inspection

a) General

Record drawings shall be submitted with elevations to mean sea level, valve coordinates, meter box coordinates, and stub locations shown.

Pressure test, fire line inspection, backflow prevention test results, and disinfection reports shall be submitted. Also, paperwork shall be submitted, (e.g.,

engineering certificate, labor agreement, **Contractor's** proof of insurance, compaction test results, release for water main constructions, and water main construction documents). A copy of the Release for Water Main Construction form is provided in **Appendix A**.

E. Testing

1. Pressure and Leakage

Pipes, fittings, and appurtenances shall be laid in such a manner as to leave joints water-tight. After the pipe is laid, each section, as may be determined or defined by **DCDWM**, shall be properly and adequately flushed, the air removed, and then tested under a hydrostatic pressure of two hundred (200) PSI as measured at the lowest elevation of the test section. Where static pressure exceeds one hundred (100) PSI, the test pressure, as measured at the lowest elevation of the test section shall be equal to one hundred and fifty percent (150%) of the normal working pressure or one hundred percent (100%) of the pipe's rated pressure, whichever is less. If elevation differentials, within a test section, vary by more than forty five (45) feet, then the section shall be broken into shorter lengths by the insertion of additional valves.

All stub-outs, for future construction, shall be flushed and included in the pressure test. Each stub-out shall be properly plugged, braced, and tested with the stub-out valve open. Following a successful pressure test, the stub-out valves shall be left in the "closed" position. As stated previously, permanent dead ends shall be equipped with hydrants or blow-off assemblies.

All testing of water mains, fittings, and appurtenances shall be conducted in the presence of the **DCDWM** Construction Inspector, and under the Inspector's direction. Pre-testing of water mains is allowed. To facilitate the testing, the **Contractor** shall furnish:

1) A liquid oil-filled pressure gauge (pressure range from zero (0) to three hundred (300) PSI, with a minor graduation of one (1) PSI, for measuring the pressure on the water main;

2) A corporation cock in the main for pressure pump connection;

3) Suitable pump, piping, appliances, labor, and other items necessary to conduct the pressure test; and

4) A valve wrench and laborer to accompany the **DCDWM** Construction Inspector to verify that the valves, including fire hydrant branch valves, are fully open during the pressure test.

Each section of pipe shall be filled slowly with water and the specified test pressure shall be applied by means of a pump connected to the pipe in a satisfactory manner. The pump shall operate by pumping water from a separate reservoir into the main to be tested, until the specified test pressure is attained. The **Developer**/**Contractor** shall furnish the water necessary for flushing and testing of the main. The **Contractor** shall provide whatever means necessary to transport or convey the water from a designated source to the main, or rent a Fire Hydrant Meter to draw

water from a **County** fire hydrant into a water tanker to be used for pressure testing. To rent a fire hydrant meter, call **DCDWM** at **(404) 378-4475** for information. The office is located at 774 Jordan Lane, Decatur, GA 30033.

To schedule a test, the **Developer/Contractor** shall notify the **DCDWM** Inspector a minimum of forty eight (48) hours in advance at (770) 621-7200.

The use of fire hydrants as a connection for either hydrostatic testing or injection of chlorine solutions for disinfection is expressly prohibited.

Before applying the specified test pressure, the air shall be expelled from the pipe. To accomplish this, it may be necessary for the **Contractor** to install additional service taps at the highest elevations, including any intermediate points, of the section of the pipe to be tested, or at locations directed by **DCDWM**. Any such taps installed shall be removed by the **Contractor** prior to final acceptance of the main.

The test pressure shall be maintained for a minimum of two (2) hours with no more than a loss or gain of five (5) PSI during the testing period. This will allow for thorough examination for leakage and permit the **DCDWM** Construction Inspector to confirm that the air has been removed and that the valves within the test section of pipe are fully open. A Pressure Test Form is provided in **Appendix A.**

As stated previously, the backflow assemblies shall be tested at the time of installation, at least annually, and after conducting repairs of devices.

2. Disinfection

Before being placed in service, the new water main and accessories shall be disinfected by the continuous-feed method of disinfection; in accordance with the latest edition of AWWA C651 – Standard for Disinfection of Water Mains, unless otherwise noted in these Standards. Chlorinating equipment, materials, labor, and supplies shall be furnished by the **Contractor**.

Prior to chlorination, mud, dirt, debris, or other foreign matter shall be removed from the pipeline by thorough flushing using fire hydrants or other **County**-approved means. Each valve section of newly laid pipe shall be flushed independently. This shall be done prior to the pressure test to ensure removal of any trapped air within the pipe.

Chlorine shall be injected into the section of line being disinfected so that its entire capacity shall be filled with water containing chlorine in the amount of fifty (50) parts per million (ppm) or in such quantity as determined by **DCDWM**. The preferable point of application of the chlorinating agent is at the beginning of the pipeline extension, or any valve section of it. Application shall be through a corporation stop tapped into the newly laid pipe by means of a direct tap into the new line. Back pressure, causing a reversal of flow in the pipe being treated, shall be prevented. Temporary disinfection jumper for injection and sampling during disinfection and testing is provided in Standard Detail W-015, **Appendix A**. Provide sample points at maximum distance not to exceed 1200 feet and at the end of every branch line.

Use of fire hydrants as a point of application of the chlorinating agent is expressly prohibited.

The sterilizing agent shall be introduced at one end of the section and the water released from the opposite end until the sterilizing agent is present at the discharge end in such quantity as to indicate residual chlorine of fifty (50) ppm or as otherwise determined by **DCDWM**. Valves shall then be closed and the sterilizing solution permitted to remain in the pipeline section for not less than twenty-four (24) hours.

Following chlorination, the treated water shall be thoroughly flushed from the newly laid pipe at its extremities. This process shall continue until water sampled throughout the newly laid pipe tests chemically the same for residual chlorine as the water being served through the existing pipelines.

During the process of chlorinating the newly laid pipe, the valves or other appurtenances shall be operated to ensure the chlorinating agent is equally distributed throughout the pipeline.

NOTE: When the environmental laboratory representative attempts to obtain an acceptable sample, if they observe air, discolored water, trash, debris, too high or no chlorine residual in the water, no sample shall be taken until the main is re-flushed.

Due to the proximity of creeks, streams, ponds, or other bodies of water, the **Contractor** may be directed by **DCDWM** to de-chlorinate any water flushed from the main to prevent damage to aquatic organisms, plants, fish, etc. The method and system of de-chlorination shall be pre-approved by **DCDWM**. Should the bacteriological test fail due to bacterial growth, the **Contractor** shall re-chlorinate the entire pipeline.

Unless **DCDWM** directs otherwise, cuts made into existing lines for the insertion of valves or fittings, for repairs, or for any other purpose, shall be disinfected by thoroughly wetting the interior of the pipes, valves, fittings, etc. with a sprayed-on solution having residual chlorine of two hundred (200) ppm.

3. Microbiological

After flushing, the **Contractor** shall notify the Inspector that the main is ready for a bacteriological sample to be processed. Once the sample is processed, it shall remain in incubation a minimum of twenty four (24) hours before a "sample passed" certification from the Filtration Plant Laboratory can be obtained. The accepted water sample station assembly is provided in Standard Detail W-022, **Appendix A.** Typically, two samples are taken twenty four (24) hours apart and tested.

F. Final Approval

1. General

The Final Plat will be signed by **DCDWM** after the following items have been submitted and accepted by **DCDWM**:

Completion of installation, inspection(s) and testing(s) per **DCDWM**:

- Construction Project Log
- Submission of signed record drawings
- Submittal of Construction Completion Form

2. Construction Completion Form

Contractor/Developer shall send Inspector acceptance reports to **DCDWM**, 4572 Memorial Drive, Decatur, Georgia 30032, **770-621-7200**. **DCDWM** will send the "Construction Completion Form" once the as-built drawings are approved. **Contractor/Developer** shall submit a completed Construction Completion Form to **DCDWM** Construction Inspector prior to final plat approval. This form is provided in **Appendix A.**

3. Record Drawings

Record drawings (as-builts) shall be submitted to **DCDWM** before a project can receive final approval and/or Certificates of Occupancy. To avoid delays in the approval process of developments/subdivisions, as-built drawings should be submitted as soon as the water main installation is complete to allow sufficient time for review.

Record drawings shall be sharp, clear, clean, legible, and submitted on twenty four- (24-) inch-by-thirty six- (36-) inch plain paper and the AutoCAD electronic files shall be submitted on USB 3.0 Flash Drive. The AutoCAD files shall follow the format and requirements presented in **Appendix E** for the water appurtenances. The files shall also contain x, y, and z coordinates for the appurtenances using the **County's** approved coordinate plane.

Record drawings shall include a site plan and any supplemental or shop drawings as required by **DCDWM**.

One (1) complete set of record drawings and one (1) copy of the electronic files shall be submitted by the **Developer or Developer's Engineer to DCDWM** for review and approval. Four (4) sets of record drawings shall be submitted to **DCDPS** after final approval.

Record drawings shall be stamped, dated, and signed by a Professional Engineer or Land Surveyor registered in the State of Georgia.

a. Survey Standards for DeKalb Watershed Management

As-builts for all water and wastewater projects shall include all new and existing infrastructures directly adjacent to the project area. This includes, but not limited to, fire hydrants, water valves, water mains, water meters, tees, tap sleeves, bends, reducers, and plugs. Sewer infrastructure shall include manholes, sewer mains, force mains, air valves, cleanouts and all features in and around sanitary sewer lift stations.

The primary survey strategy will implement a GPS methodology. The consultant shall use the Real Time Kinematic Method (RTK) or Rapid Static Method (RSM) and equipment adequate to produce horizontal, vertical, and elevation coordinates (x, y, and z) that will be consistent with DWM methods (centimeter survey grade accuracy).

If is determined that a number of features cannot be located directly by GPS due to obstructions, a secondary survey will be employed to capture obscured points.

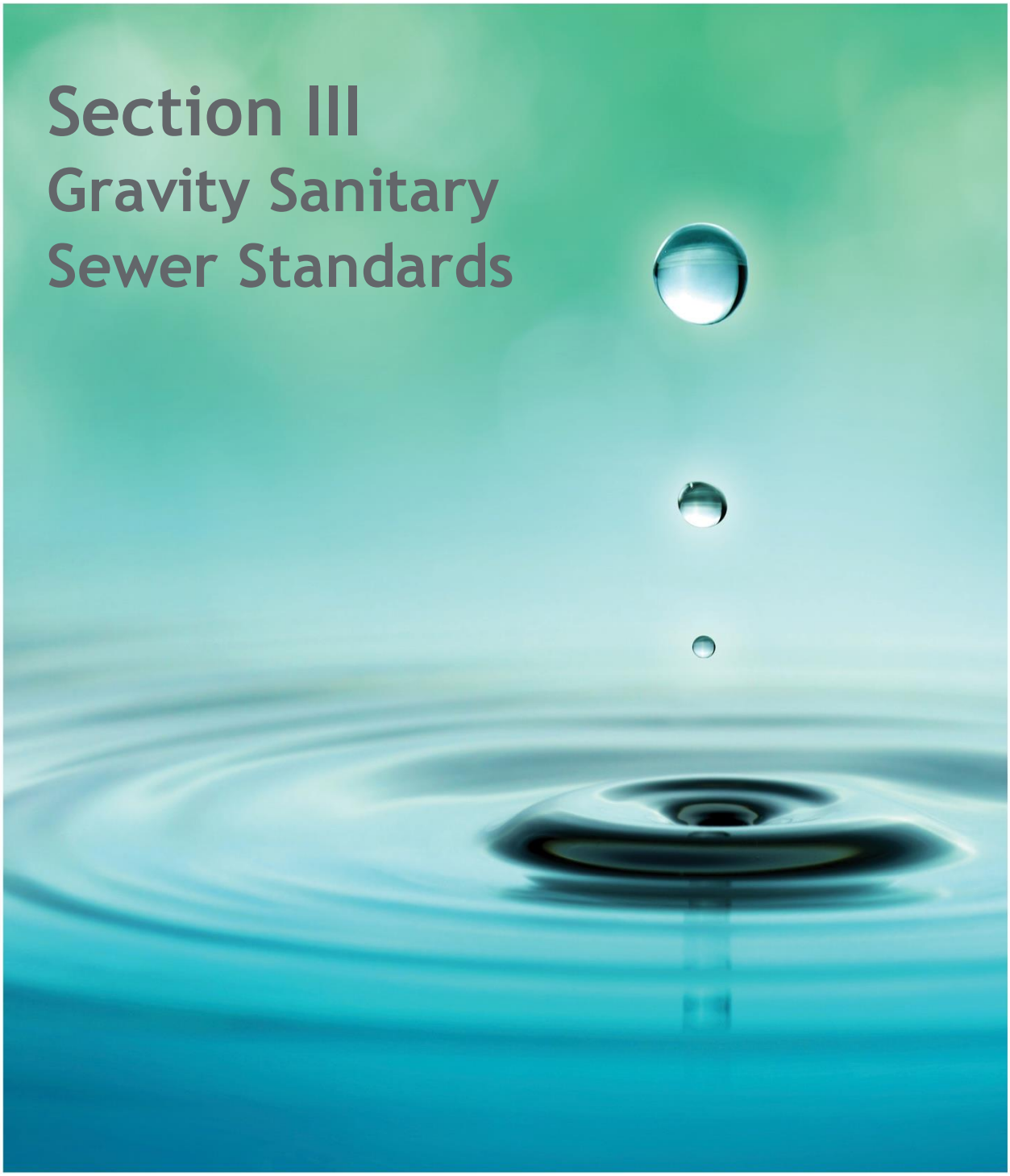
The secondary strategy should consist of surveying using conventional methods. Establishing a transit and back sight using GPS, establishing a traverse loop, maintaining a minimum of 1:10,000 closure for the traverse, and side shots being collected by occupying the traverse points. Side shots should be enough to adequately survey the required features and/or other relevant features. After data collection is complete, standard survey procedure dictates that the files will be downloaded into a coordinate geometry (COGO) package for any translation or rotation that might be required. The specifications for the datum and coordinate will be the Georgia West State Plane coordinate system. The horizontal datum will be the North American Datum (NAD83) and the vertical datum will be the North American Vertical Datum (NAVD88).

The GPS methodology is subject to change. Therefore, the **Developer/Contractor** is responsible and shall verify the methodology to be utilized with the **DCDWM** GIS supervisor prior to starting the survey for the record drawings.

DeKalb County
GEORGIA

WATER Matters

Section III
Gravity Sanitary Sewer Standards



SECTION III
Gravity Sanitary Sewer Standards

A. Review and Approval Process

Design plans shall be submitted to **DCDPS** for review and approval. Submittals, re-submittals, and retrievals of approval are processed by **DCDPS**, located at 330 West Ponce de Leon Avenue, Decatur, Georgia, 30030. **DCDPS** can be reached at **(404) 371-2518**. The design plan review and approval process flow charts are presented in **Appendix E**.

B. Submittal Requirements

1. General

Four (4) sets of twenty four (24-) inch-by- thirty six (36-) inch design drawings and electronic files on USB 3.0 Flash Drive in AutoCAD format of design drawings shall be submitted. AutoCAD electronic files shall follow the format and requirements presented in **Appendix E**: Digital File Format and CAD Requirements.

The plan set shall also include a legend depicting symbols used in the drawings, general notes pertinent to **DCDWM** requirements, and **DCDWM** standard details used within the plan set.

A Gravity Sanitary Sewer System Plan Checklist has been provided in **Appendix B**.

2. Information Required

The title block presented on each sheet shall include the name of the development; phase or unit of development (if applicable); Land Lot and District; name, address and phone number of **Developer** and **Developer's Design Engineer**; and professional seal of **Developer's Design Engineer** with signature.

A cover sheet shall be included with a drawing index. The cover sheet shall also include an approval block for **DCDPS** signature. Cover sheet shall include a location map with north arrow.

a) Plan View

Plan view shall have a scale of not more than fifty (50) feet to the inch [1" = 50']. Show the location, size and material of construction for the proposed pipelines within the project area. The proposed gravity sanitary sewer lines shall be shown on the plans as solid lines with size, material, use, and pipe class called out; for example "8-inch DIP (SS)-Class 350" or "8-inch PVC (SS)-SDR26." Plans shall show the location of the gravity sanitary sewer lines and manholes including the deflection angle at each manhole. Manholes shall be numbered on the plans. Plans shall also show any lift stations adjoining the gravity sanitary sewer system. Pump Station and Force Main Standards

are located in Section IV of these Design Standards. Proposed and existing easements shall be shown. Service connections with cleanouts (one per lot) shall be shown on the plans, including distance to the nearest manhole and length of service line. Tables shall be provided in the plans identifying the following gravity sanitary sewer information. Example information is shown in **Tables 3.1** and **3.2.**

Table 3.1
Example Gravity Sanitary Sewer Schedule

MH #	Rim Elev. (ft.)	Invert Elev. Out (ft.)	Invert Elev. In (ft.)	Pipe Length (ft.)	Pipe Dia. Material and Class	Slope %
SS1	1024.62	1017.62	1017.82	250	8" PVC-SDR26	1.8
SS2	1027.56	1022.32	1022.52			

Table 3.2
Example Gravity Sanitary Sewer Stub Location

Lot #	Sewer Stub #	Northing	Easting
23	182	672908	476298
24	183	543206	354320

Plans shall show the other buried existing or proposed utilities, including storm and gravity sanitary sewers, drywells, potable water mains, buried telephone, natural gas, power, and cable TV lines, within the project area that are concurrent with proposed gravity sanitary sewer construction. Existing utilities shall be shown to the extent known, given records available to the **Developer's Design Engineer**. Existing utilities shall be shown as dashed lines. Construction detail notes will specify that the buried utilities shall be field-located prior to construction.

Plans shall show the tie-in point(s) of the proposed gravity sanitary sewer system to the **DCDWM** existing system. Plans shall include typical construction details of the tie-ins to existing pipelines and structures; typical trench cross-sections including bedding, backfill, and compaction requirements; manhole; and service connection details. Gravity Sanitary Sewer standard details are provided in **Appendix B**.

The project benchmarks shall also be shown and referenced to state plane coordinates.

b) Profile View

Profiles shall show each manhole, sanitary sewer line, lift station, utility crossings etc. as referenced on the plan view. Profile shall list the slope, service line distance to sanitary sewer line, pipe utility use and material, size of pipe and bedding materials. Manholes shall be referenced by station and manhole number, including rim elevations and inverts to the nearest 0.00'.

Profile information shall also include any outside drop connection design information. Profiles shall have a vertical scale of not more than ten (10) feet to the inch.

C. Gravity Sanitary Sewer Line Design Criteria

1. Location

a) Gravity Sanitary Sewer Design Distance

The **DCDWM** standard location for gravity sanitary sewers lines shall be as follows:

(1) Sanitary sewers shall be designed with straight alignments between manholes. Curvilinear sanitary sewers are not permitted.

(2) Sanitary sewer lines shall be located as near the center of the street as practical.

(3) Shall be located a minimum of four (4) feet from the curb under the pavement.

(4) Shall be located within the public right-of-way or recorded easement

(5) Shall provide a minimum of ten (10) feet of horizontal clearance from any building, structure, water main or other utility, when practical.

(6) Maximum distance between manholes for sanitary sewer lines under twenty-four (24) inches: four hundred (400) feet.

(7) Maximum distance between manholes for sanitary sewer lines twenty-four (24) inches to thirty-six (36) inches: five hundred (500) feet.

(8) Maximum distance between manholes for sanitary sewer lines over thirty-six (36) inches: eight hundred (800) feet.

(9) No lateral shall cross property lines without a recorded easement.

(10) Crowns shall be matched on sewer lines.

b) Easement

“Onsite” easements are those easements falling within the boundaries of the current phase of the project. For subdivisions, these are shown on the plat and are dedicated through the process of recording the final plat.

"Offsite" easements are those easements falling outside the boundaries of the current phase of the project. Offsite easements that will be included in later phases of the same project and that cross property owned by and titled to the exact same entity as the one developing a subdivision may be dedicated by the final plat of the current phase of the project.

Offsite easements shall be submitted to and approved by **DCDWM** prior to issuance of offsite construction permits by **DCDWM**. Easements, either offsite for projects or onsite for commercial projects, shall be submitted and approved prior to final inspection.

Conditional easements or easements with special stipulations shall not be granted to or assigned to **DCDWM**.

Separate easement documents with plats and legal descriptions are required when obtaining easements from more than one landowner.

Construction of offsite lines shall not begin until the offsite easements are acquired and submitted to **DCDWM**. Construction of onsite lines, prior to acquiring offsite easements, is at the **Developer**'s own risk.

Offsite easements are to be negotiated by the **Developer** with the property owner. As a last resort, if the **Developer** is unable to acquire necessary easements through negotiation, **DCDWM** may request the DeKalb County Board of Commissioners' (BOC) approval to assist in acquisition through condemnation at the **Developer**'s expense. The final decision whether or not to condemn rests with the BOC.

A property can be condemned for easements only if the sanitary sewer line to be installed is a gravity line eight (8) inches in diameter, or larger, or if a force main from a **DCDWM** pump station is to be dedicated to **DCDWM**.

No permanent structures or trees are allowed in sewer easements.

Sanitary sewer lines shall be centered within the required permanent easement. Exceptions can be approved by **DCDWM**, but shall only be approved in special circumstances and when **DCDWM** determines that future repairs and maintenance can be accomplished without unreasonable difficulty.

Minimum temporary easement widths for gravity sanitary sewer lines shall be as listed in **Table 3.3**:

Table 3.3
Minimum Temporary Easement Widths per Main Diameter

Main Diameter	Cover Depth	Minimum Easement Width
15” and less	<8 ft.	20 ft.
15” and less	8-16 ft.	20 ft.
15” and less	16 ft. – 22 ft.	25 ft.
15” and less	23 ft. – 30 ft.	30 ft.
16” to 30”	<16 ft.	25 ft.
16” to 30”	16 ft. – 22 ft.	30 ft.
16” to 30”	23 ft. – 30 ft.	40 ft.
Greater than 30”	Any	50 ft.

Permanent easements shall be minimum twenty (20) feet in width; **DCDWM** retains the right to require a wider easement to be provided. For any easement that is acquired for less than $10,000, a release from lien holders is not required. Entities having ownership shall sign the easement as stated below:
FOR CORPORATIONS, Georgia law requires that documents transferring interest in real estate property shall be signed by the president or vice president of the corporation and be attested by the secretary or treasurer of the corporation or have the corporate seal affixed.

FOR LIMITED LIABILITY COMPANIES, Georgia law requires that documents be signed by a member.

FOR LIMITED PARTNERSHIP, Georgia law requires that documents be signed by the general partner. If the general partner is a corporation, set up the "by" signature block, in accordance with laws for corporations.

FOR GENERAL PARTNERSHIP, Georgia law requires that documents be signed by every partner.

FOR TRUSTS, Georgia law requires that documents be signed by every trustee for the trust.

FOR INDIVIDUALS, Georgia law requires that documents be signed by every individual holding title exactly as each took title.

Every signature on a document shall be witnessed by an unofficial witness and notarized. Notary's seal shall be affixed. Examples of **County** Sewer Easements for Entities and Persons are provided in **Appendix B**.

A plat (8-1/2" x 14" maximum) that shows the boundary of the easement area or a written legal description that can be followed on a submitted site plan shall be attached to each easement document and labeled as ATTACHMENT "A".

2. Size

a) General: Gravity Sanitary Sewer Lines

Gravity sanitary sewer lines shall be sized to accommodate the peak design flow subject to the following limitations:

(1) The d/D ratio for gravity sewer pipes shall not be greater than 0.8 at the peak flow condition.

(2) The minimum size for a sanitary sewer collection line is eight (8) inches. The minimum size for a sanitary sewer service line is six (6) inches.

b) Design Basis: Gravity Sanitary Sewer Line

Gravity sanitary sewer systems shall be designed on the basis of per capita flows for the design period in conjunction with a peaking factor, or approved alternative

methods. Design calculations for trunk and interceptor sewers shall be submitted to **DCDWM** for approval. Larger systems shall have hydraulic modeling performed. Replacement mains or rehabilitations of existing mains shall be designed on the basis of measured flows with projections for the design period as applicable. Documentation of the alternative method shall be provided upon request. “Source: Recommended Standards for Wastewater Facilities, 2014 Edition”.

(1) Average Daily Flow:

The average daily flow (ADF) that a site will generate is calculated based on the particular use of the site. **Table 3.4** shows sanitary flow generation factors, in gallons per day (GPD), which can be used to estimate sanitary flows from proposed and existing developments.

(2) Peak Flow:

Generally, the sewers shall be designed to carry at least the peak hourly flow when operating at capacity. Peak hourly flow shall be the design ADF in conjunction with a peaking factor. The peaking factor formula to be used is:

$$PF = \frac{18 + (P)^{0.5}}{4 + (P)^{0.5}}$$

Where P is the population in thousands. The above equation yields a peaking factor that is intended to cover normal infiltration and inflow for a well-maintained sewer system and/or those built with modern materials and construction methods. The peaking factor shall not be less than two and one-half (2.5). Where P is not known or cannot be reasonably assumed, PE (population equivalence) can be used. PE is Q (flow in gpm) divided by one hundred (100) gpcd for new systems and one hundred and twenty-five (125) gpcd for existing systems. “Source: Recommended Standards for Wastewater Facilities, 2014 Edition”.

Table 3.4
Sanitary Flow Contributions from Site-Specific Sources*

Facility	Gallons per Day (GPD)
Airports, Railroads, Bus Terminals	5/Passenger + 10/Employee
Stadiums, Racetracks, Assembly Halls	5/Seat
Bar/Lounge	30/Seat
Barber Shop/Beauty Salon	125/Chair +20/Employee
Bath House for Swimming Pool	10/Swimmer
Boarding Houses	75/Resident
Bowling Alley	75/Lane+20/Employee
Car Wash (non-recycling)	75/Car
Church	5/Sanctuary Seat

Table 3.4 Sanitary Flow Contributions from Site-Specific Sources*	
Campgrounds without Sewer Connections	100/Space
Campgrounds with Sewer Connections	150/Space
Country Club	25/Member
Day Camp	20/Person
Day Care Center	15/Person
Dental Office	20/Employee + 100/Chair
Fitness Center/Spa	50/Person
Food Service Restaurants Open 24 Hours/day	70/Seat + 25/Employee
Food Service Restaurants Open Less than 24 Hours/day	45/Seat + 25/Employee
Food Service Catering	50/100-square feet (sf) Floor Space
Funeral Home	300/Embalming + 100/Employee
Grocery Store	200/1000 sf Floor Space
Hospital	300/Bed + 100/Resident Staff
Hotel/Motel	100/Room
Laundry	500/Machine
Medical Offices	200/Exam Room
Nursing Home	150/Bed + 100/Resident Staff
Prison	125/Bed + 20/Employee
Resident Camps	60/Person
Residential Homes	150/Bedroom
Retail Stores	Larger of 400/Restroom or 100/Fixture
Schools – Day, Toilets Only	12/Person
Schools – Day, Toilets, Cafeteria	16/Person
Schools – Day, Toilets, Cafeteria, Gym	20/Person
Service Station	20/Person
Shopping Center/Mall	100/1000-sf Enclosure Space
Theaters	5/Seat
Veterinary Office	100/Run + 10/Cage + 20/Employee
*Flow Estimating Factors based on EPD *Large Community Design Guidance.*	

(3) Infiltration/Inflow (I/I):

Use of the per-capita flows and the peaking factor is intended to cover normal I/I for systems built with modern construction techniques. However, an additional allowance shall be made for I/I with existing conditions such as high groundwater, older systems, or a number of illicit connections. I/I for existing systems shall be made from actual flow data to the greatest extent possible.

3. Depth of Pipe Burial

The minimum depth of cover over a sanitary sewer line within the road right-of-way shall be seven (7) feet for PVC pipes. Maximum depth of cover over PVC pipes shall be fifteen (15) feet in paved and un-paved areas. Cover less than seven (7) feet within right-of-way requires the use of DIP and shall be approved only when site conditions dictate.

The minimum depth of cover over a sanitary sewer line in un-paved areas shall be four (4) feet for DIP. Cover less than four (4) feet in unpaved areas requires the use of DIP in a steel casing, and shall be approved only when site conditions dictate.

Any sanitary sewer line within 10 feet of the top of bank and parallel to a creek or stream shall be designed such that the top of the proposed pipe is at least one (1) foot below the bottom of the creek bed. The elevation of the creek bed shall be indicated on the plans. Each sewer line meeting the above situation shall be reviewed for approval by **DCDWM**. Refer to Section III.C.5.a, Sanitary Sewer Installation near Water Bodies and Wetlands, for design information pertinent to sanitary sewer installation near creeks, streams, and wetlands.

4. Slope of Gravity Sanitary Sewer

a) Minimum Slope and Velocities

Gravity sanitary sewers shall be designed and constructed to provide minimum velocities as shown in **Table 3.5**, based on Manning's formula, flowing full, and using an "n" value of 0.012. The minimum slopes required to maintain the minimum velocity are also shown in the table below. **Design Engineers** shall minimize grade changes throughout the entire pipeline project. Slopes shall be uniform from manhole to manhole**.** Existing field conditions may require slope modification with **DCDWM** approval.

Table 3.5
Gravity Sanitary Sewer Minimum Slope

Pipe Size, Inches	Minimum Design Slope, %
6	1.0
8	0.8
10	0.6
12	0.5
15	0.205
18	0.170
21	0.146
24	0.127
27	0.115
30	0.102
36	0.085
42	0.073
48	0.064
54	0.058
60	0.051

b) Slope for Bore and Jack Installations

Whenever possible, designs for bore and jack installations shall include a drop in the upstream manhole of not less than six (6) inches and shall allow a slope through the bore three (3) times as steep as the recommended minimum slope for that size pipe.

5. Special Design Considerations

a) Sanitary Sewer Installation near Water Bodies and Wetlands

(1) Any sanitary sewer line adjacent to a creek or lake shall be indicated on the plans. Creek crossings shall be made only when absolutely necessary and shall be encased meeting the bore and jack casing requirements. The casing with the carrier shall be constructed nearly perpendicular to the creek. Creek crossings that require open cut are subject to the minimum Georgia Soil and Water Conservation (GSWC) requirements for stabilization. A stabilization plan shall be designed by a Registered Professional meeting GSWC requirements and submitted to the **County** for approval. Sanitary sewer lines shall be designed to cause minimum impact to waters of the United States. See **Appendix D** for requirements associated with creek, stream, and lake crossings.

(2) All gravity sanitary sewer designs shall comply with U.S. Army Corp of Engineers (USACE) regulations pertaining to construction in wetlands and nationwide permits. When applicable, plans shall show jurisdictional wetland boundaries.

(3) Flotation calculations shall be provided for sanitary sewers and the relative appurtenances when high water tables are present. Enough weight shall be added to the manhole to prevent flotation, such as a thicker slab, wall, or anti-flotation collar.

b) High-Velocity Protection

To minimize erosion of the pipe, the maximum velocity (at d/D = 0.8) shall be nine (9) feet per second.

Sanitary sewers on sixteen percent (16%) slopes or greater shall be anchored securely with concrete, or equal.

Anchors shall be spaced as follows:

(1) Not over thirty-six (36) feet center to center on grades sixteen (16) percent and up to thirty-five (35) percent;

(2) Not over twenty-four (24) feet center to center on grades thirty-five (35) percent and up to fifty (50) percent;

(3) Not over sixteen (16) feet center-to-center on grades fifty (50) percent and greater.

c) Inverted Siphons

Siphons used for crossing bodies of water shall be considered on a case-by-case analysis only. Sufficient head and flow shall be available to provide a velocity in the siphon of at least two (2) fps at least once per day with a minimum pipe diameter of six (6) inches. Inverted siphons shall be at least dual barrel. One barrel shall be designed to achieve the two- (2-) fps flow condition with the second barrel to absorb the maximum flows from the upstream sewer pipe.

6. Separation from Potable Water Sources

a) Horizontal and Vertical Separations

Gravity sanitary sewer lines shall maintain a ten- (10-) foot horizontal and eighteen- (18-) inch vertical clearance from potable water mains. Measurement shall be from outside of pipe to outside of pipe. If site conditions do not allow such minimum separations, **DCDWM** may allow deviation on a case-by-case basis, if supported by data from the **Developer's Design Engineer**. The supporting data shall be submitted to **DCDWM** for approval.

If it is impossible to obtain proper horizontal and vertical separation as described above, both the gravity sanitary sewer line and potable water main shall be constructed of DIP meeting **DCDWM** Standards and shall be pressure-tested to two hundred (200) PSI to confirm water-tightness prior to backfilling.

b) Crossings

Gravity sanitary sewer lines crossing over or under potable lines shall be laid to provide a minimum vertical distance of eighteen (18) inches between the outside of the water main and the outside of the non-potable line. If site conditions do not allow such minimum separations, **DCDWM** may allow deviation on a case-by-case basis, if supported by data from the **Developer's Design Engineer**. The supporting data shall be submitted to **DCDWM** for approval. The crossing shall be arranged so that the non-potable line joints shall be equidistant and as far as possible from the water main joints. Where a water main crosses under a non-potable line, adequate structural support shall be provided for the non-potable line to maintain line and grade.

When it is impossible to obtain the proper vertical separation as stipulated above, one of the following methods shall be specified and approval from the **County** shall be required:

i. Each line shall be designed and constructed equal to water pipe minimum standards and each line shall be pressure-tested to two hundred (200) PSI minimum to ensure water tightness.

ii. Either the water main or the non-potable line shall be encased in a watertight casing pipe or concrete encasement that extends ten (10) feet on both sides of the crossing, measured perpendicular to the water main. The casing pipe shall meet the minimum depth and material requirements of the steel casing for bore and jack crossings. The casing pipe shall meet the material requirements of steel casing for bore and jack

crossings. Refer to Section VI.A.10, for bore and jack casing requirements.

7. Appurtenance Design Consideration

a) Gravity Sanitary Sewer Stubs

One six- (6-) inch sewer service stub shall be provided for each building. A stub is defined to be that section of pipe going from the main line sewer to the edge of the right-of-way or easement. Sewer service tie-ins shall be to the main sewer line. No tie-ins to the stack of any cleanout shall be allowed.

One six- (6-) inch cleanout shall be installed at the property line, edge of right-of-way, or edge of easement, see Standard Details S-012 and S-017 in **Appendix B.**

b) Gravity Sanitary Sewer Laterals

The sanitary sewer lateral line located on private property shall remain in private ownership. Its maintenance shall be the responsibility of the property owner. There is no maximum length limitation for privately maintained lateral lines.

8. Design of Gravity Sanitary Sewer within GDOT Right-of-Way

If any portion of a proposed project enters a State of Georgia controlled right-of-way, then a GDOT permit application is required. Developer/Contractor shall submit to DCDWM the required material in hard copy and in electronic form, on a CD and a flash drive. Hard copy forms, permits, and drawings, etc. shall be 8 ½" X 11." Drawings need not be to scale. The measurements necessary for the permit application shall be submitted in the United States Customary System units. Generally, portions of the project design can may be reduced in size and match lined, if necessary, as long as the text is still legible. Compaction notes indicating compaction requirements shall be included on every construction drawing required for the application. (Reference backfill trenches. Section VI.A.4) Submittal shall include four (4) each of the following: plan, profile, traffic control plan, and relevant section from GDOT County map. The Georgia Department of Transportation Permitting Checklist is provided in **Appendix E.**

In GDOT *Section 2.5.H. Service Lines* - Because it is in the interest of both the customer and Utility to have these connections, service lines are permitted on right-of-way as close to perpendicular as possible with the transmission facility with the exception that metering devices, vaults or pressure reducing mechanisms shall be located off the right-of-way. Any longitudinal installations of service lines shall be reviewed by the District Utilities Engineer on a case-by-case basis. This does not apply to installations serving a highway purpose.

GDOT requires the GDOT permit application to be submitted through the GUPS. The **Developer/Contractor** is not to shall not submit the GDOT permit directly through the Georgia Utilities Permitting System (GUPS). The Developer/Contractor is to shall provide all necessary information, as stated in the previous paragraph. DCDWM will then review the information and provide comments (if necessary). Once the

necessary information has been approved, DCDWM will submit the GDOT permit application through the GUPS. Traffic control shall be in accordance with the MUTCD, latest edition.

All bore and jack operations shall be approved by GDOT. Bore and jack pits shall be a minimum of ten (10) feet from outside edge of pavement. Plans shall show casing size and carrier pipe size within the approach slab for bridge crossings.

The documents necessary for said application shall be provided by the **Developer's Engineer to DCDWM.**

D. Gravity Sanitary Sewer Construction Materials and Installation

1. General

At no time shall any gravity sanitary sewer construction commence prior to approval of the proposed pipe material, the plans, receipt of the required documents/permits including necessary right-of-entry (ROE), easements, issuance of sanitary sewer construction permit to approved **Contractor** by **DCDWM,** and a preconstruction conference held with a **DCDWM** Inspector (seventy two (72) hours' advance notice required).

All gravity sanitary sewer lines, manholes, and other appurtenances to be governed by **DCDWM** shall be installed according to approved plans and profiles. The approved and permitted set of plans shall always be onsite. If a field change must occur, the redesigned area(s) shall be submitted for approval prior to installation, in accordance with **DCDWM** Standards and EPD Rules and Regulations for Water Quality Control, Chapter 391 3 6 .02 (10). The **Contractor** shall have a set of the "approved" design containing an original **DCDWM** stamp, and a copy of these Design Standards, current edition, always on site.

All sanitary sewers shall be Pressure Class 350 Ductile Iron Pipe (DIP), unless a different material is submitted and approved by **DCDWM**.

Sanitary sewers crossing storm sewers shall extend at least ten (10) feet (measured from face of pipe) on either side of the storm sewer. Contractor shall adhere to sanitary sewers crossing storm sewers shall be Pressure Class 350 DIP, and shall extend at least ten (10) feet (measured from face of pipe) on either side of the storm sewer.

Sanitary sewer construction shall be done in open trenches and in a manner to protect lines, sanitary sewers, or structures from unusual stresses.

The **Contractor** shall provide for the flow of the sanitary sewers, drains, or creeks interrupted during the progress of the Work and shall restore same to a preconstruction condition.

At the start of construction, the **Contractor** shall install an air plug in the first pipe laid out of the entrance manhole and in the downgrade side of the first newly installed manhole. Said plugs shall remain in place until final inspection and

approval is given by **DCDWM**. **Contractor** shall exercise extreme caution to ensure that plugs are not lost into the gravity sanitary sewer system.

Contractor shall adhere to the Federal, State, County, and local laws, ordinances, and regulations that in any manner affect the conduct of the Work, including but not limited to initiating, maintaining, and supervising the safety precautions and programs in connection with the Work.

The **Contractor** shall comply with the requirements of the **County** Soil Erosion and Sediment Control Ordinance, the provisions of the *Manual for Erosion and Sediment Control in Georgia*, and any special conditions required by EPD associated with any variances issued by the same, and any special conditions required by the **DCDWM** Inspector.

2. Acceptable Materials

a) Gravity Sanitary Sewer Lines

Gravity sanitary sewer lines shall be of DIP, PVC, or high-density polyethylene (HDPE).

The material selected shall be adapted to local conditions, such as, characteristics of industrial wastes, possibility of septicity, soil characteristics, exceptionally heavy external loadings, abrasion, and similar problems.

All sanitary sewers shall be designed to prevent damage from superimposed loads. Proper allowance for loads on the sanitary sewer because of the width and depth of a trench shall be made. When standard strength sanitary sewer pipe is not sufficient, the additional strength needed may be obtained by using extra-strength pipe or by special construction, such as improving bedding conditions or encasing the pipe in concrete.

Sanitary sewer pipe and fittings shall be marked in accordance with the latest ASTM/ANSI designations. As a minimum, marking for pipe shall include Manufacturer's name or trademark, nominal pipe size, specification designation and date of manufacture. Pipe markings shall appear at intervals of five (5) feet or less on pipe barrel. The pipe shall conform to the applicable specifications as follows.

(1) Polyvinyl Chloride (PVC) Pipe and Fittings:

- Pipe and fittings up to fifteen (15) inches in diameter shall be made in accordance with latest revision of ASTM D3034 for Type PSM PVC (SDR26).
- Pipe and fittings eighteen (18) inches and greater shall be made in accordance with the latest revision of ASTM F679 for Type PS46 PVC, unless otherwise specified herein.
- Elastomeric gasket joints shall utilize rubber gaskets conforming to the latest revision of ASTM F477 and shall be used exclusively on the Work.

- Standard pipe lengths not greater than thirteen (13) feet shall be used on the Work.
- PVC laterals shall have tracer wire to be traced by electronic means. This can be achieved by placing twelve- (12-) gauge wire over the pipe in the trench and connecting it to the manhole frame. The tracer wire shall terminate at the cleanout, located in the right-of-way.

(2) Ductile Iron (DIP) and Fittings:

- DIP with Protecto coating or an approved equal shall be required by **DCDWM** on a case-by-case during the design phase.
- Pipe shall be either push-on or mechanical joint type conforming to the latest requirements of the latest revision of ANSI Standard Specifications A21.50/A21.51, Pressure Class 350 Ductile Iron, unless otherwise specified herein.
- Provide fittings with a body thickness and radii of curvature conforming to the latest ANSI Standard Specification A21.10 and joints in accordance with the latest ANSI Standard Specification A21.11.
- Whenever connections are made between DIP and pipe of other materials, use of an approved type of transition gasket or coupling is required.
- All pipe and fittings shall be bituminous coated at the point of manufacture in accordance with the latest revision of ANSI A21.51.

(3) Steel (***Casing for Bore and Jack Only. Refer to Section VI***):

3. Pipe Laying

a) Gravity Sanitary Sewer Lines

Pipe shall be installed straight in alignment and true to grade, and shall exhibit a "full moon" configuration clearly visible between manholes.

All trenches shall be kept free from water while pipe laying is in progress. Water shall not be allowed to rise to within twelve (12) inches of the bottom of the pipe until jointing is completed. Refer to Section VI.A.6 for water removal requirements.

Pipe laying shall commence at the lowest manhole unless otherwise directed by the **DCDWM** Inspector and pipe shall be laid so that the spigot ends (if any) point in the direction of flow to prevent bedding material from entering the joint.

For pipe installed in flood plains, pipe joints shall be sealed on the outside using coal tar epoxy.

Pipe Cutting – Whenever a pipe requires cutting to fit the line or bring it to the required location, the Work shall be done in a satisfactory manner so as to leave a smooth end at right angles to the axis of the pipe. Jointing of field cut pipe shall be made in accordance with the Manufacturer's instructions.

Refer to Standard Detail S-020 **in Appendix B** for transition coupling requirements when transitioning between different pipe materials.

Refer to Standard Detail S-011 **in Appendix B** for requirements regarding the installation of a sanitary sewer line into an existing manhole structure.

Sanitary sewer PVC pipe shall be installed with twelve- (12-) gauge tracer wire over the top of the pipe. See Standard Detail S-023 in **Appendix B**. Connect the tracer wire to the manhole frame.

The open end of incomplete pipelines shall be provided with a temporary cap or plug carefully fitted so as to keep dirt, animals, and other substances from entering. This cap or plug shall be maintained in position when laying pipe is not actually in progress. Temporary plug requirements for gravity sanitary sewer lines are depicted in Standard Detail S-019, **Appendix B.**

b) Aerial Lines (To be avoided if possible.)

Ductile iron pipe shall be used for installations.

Piers shall be placed at every joint directly behind the bell or as directed by **DCDWM**. Whenever possible, pipe joints shall not be exposed.

Precautions against freezing, such as insulation and increased slope, shall be provided. Expansion jointing shall be provided between above ground and below ground sanitary sewers. Where buried sanitary sewers change to aerial sanitary sewers, special construction techniques shall be used to minimize frost heaving.

Provide aerial crossing detail drawings and pipe specifications on plans for review by **DCDWM**. The bottom of the pipe shall be placed no lower than the elevation of the fifty- (50-) year flood. Aerial lines shall be designed to avoid or minimize stream blockage during normal high water events.

4. Sewer Service Installation

a) Sewer Service Stubs

Sewer service stubs shall have a straight alignment. Whenever practical, sewer service stubs shall be installed perpendicular to the main. The main shall extend to the last property to be served such that the service stub is no more than twenty-two and one-half (22-1/2) degrees from perpendicular to either the main or the edge of the right-of-way. No sewer service shall cross through one property to another. See Section III.C.7.a for gravity sanitary sewer stub design considerations.

The minimum size of sanitary service lines is six (6) inches. Pipe material shall be either PVC or DIP conforming to the material requirements for main line sewer. Material requirements are presented in Section III.D.2.

Service stubs shall be connected to the gravity sewer system using a wye. See Standard Detail S-017 in **Appendix B.** Six- (6-) inch sewer service stubs are the minimum size allowed to directly enter a manhole. Bedding for service stubs shall meet the requirements for the pipe being installed.

As stated previously a six- (6-) inch cleanout shall be constructed on the service stub at the right-of-way or easement line. Cleanout requirements are depicted in Standard Detail S-012, **Appendix B**.

The minimum length of service stubs shall be to the right-of-way line or easement. Maximum length of stubs in road right-of-ways shall not exceed seventy-five (75) feet. Longer stubs shall not be allowed solely to avoid the cost of extending the main.

For deep service and alternate deep service connections follow requirements provided in Standard Details S-015 and S-016 in **Appendix B**.

The termination of the stub at the property line or easement line shall be clearly marked by a minimum six- (6-) foot length of a four- (4-) inch by four- (4-) inch wood post or a two- (2-) inch PVC pipe, painted safety day-glow green in conformance with OSHA Specifications 1910.144 (Ben Meadows Company #271127 or equivalent). Service stub marker requirements are depicted in Standard Detail S-018, **Appendix B**.

The minimum cover at finished grade for a sewer service shall be a minimum of four (4) feet at the end of stub.

The slope of the sanitary service from stub to terminal depth shall be at a minimum one percent (1.0%).

Stub shall not be deeper than is necessary to serve the lot or building.

Developer shall carve “S” into the curb directly over the sanitary service lateral as depicted in the plan view of Standard Detail S-017, **Appendix B**.

b) Sewer Lateral Lines (pipe system from building to sewer service stub)

See Section III.C.7.b for design considerations related to sanitary sewer lateral lines.

(1) Residential:

Minimum Size: four (4) inches.

A maximum of one lateral system per building is permitted.

A four- (4-) inch to six- (6-) inch adapter gasket and Fernco type coupling shall be used at connection to service stub.

Damaged ends of six- (6-) inch stub shall be sawed square prior to connection of sewer lateral.

(2) Commercial/Industrial:

Minimum Size: six (6) inches; size shall be evaluated on a case by case basis by **DCDWM.**

Minimum slope: one percent (1%): one-eighth (1/8) inch per foot.

Test Manhole: shall be located on lateral system, in non-paved area where possible, and shall be on private property (see Section III.E.d for Test Manholes).

A maximum of one (1) lateral system per building or unit.

Service lines shall be installed to the same standards as an eight- (8-) inch sewer line including bedding requirements.

For strip type retail centers, eight- (8-) inch lateral sewers shall be located at least thirty (30) feet away from the building to allow food service establishments space to install an exterior grease trap. Grease trap details are provided as Standard Details S-021 and S-022 in **Appendix B**.

E. Sanitary Sewer Manhole Design Criteria

1. Manhole

The **DCDWM** standard location for gravity sanitary manholes shall be as follows:

- Manholes shall be a minimum of four (4) feet from the curb line at the pavement.
- Manholes shall be within the public right-of-way.
- Manholes shall have a minimum of four (4) feet of clearance from drainage culverts and other underground utilities.
- Manholes outside of the right-of-way shall be centered within the recorded sanitary sewer easement.

a) Diameter: Manhole

The minimum inside diameter of manholes shall be forty-eight (48) inches. **Table 3.6** provides the sizing of manholes for inside drop pipe diameters. Manhole sizes shall be submitted for approval by the County. Manholes are mandatory when connecting significant industries to the system and shall be of adequate size to provide for monitoring and sampling equipment; see Section III.C.7.e Test Manhole.

Table 3.6 Manhole Sizing for Inside Drop Pipe Diameters		
MH Diameter (Feet)	**Inside Drop**	**Outside Drop**
5	≤ 16 inches	OK
*6	≤ 24 inches	OK
*7	≤ 36 inches	OK
*8	≤ 48 inches	OK

NOTE:

The * refers to the manholes may use a precast transition slab structure on top of the base section and then set riser sections to the correct grade elevation. The structure shall meet H20 loading at a minimum. Design loading calculations shall be submitted to the **County** for approval.

For depths greater than twenty (20) feet, incoming pipe larger than twenty-four (24) inches in diameter, or where penetration locations require, the manhole shall be sixty (60) inches or greater in diameter.

Safety platforms are required on all Manholes greater than 16' in depth.

Any manhole required to be over six (6) feet in diameter shall be submitted with incoming flow calculations within the manhole. These types of manholes are subject to being poured in place with a submitted design by a Professional Engineer registered in Georgia, for approval by the **County**.

Manholes with more than one (1) drop pipe (inside or outside) shall be submitted for review and the size of the manhole shall be at the discretion of the **County**.

b) Drop Connection

An inside or outside drop connection, or pipe, shall be provided for any size sanitary sewer line entering a manhole at an elevation of more than two (2) feet above the manhole invert. Drop connections shall be avoided for new gravity sanitary sewer systems; however, they may be unavoidable when connecting to existing structures (see Construction Details S-003 and S-027 in **Appendix B**).

Manholes with drop connection pipes shall be indicated on the construction plans, profile section. The County shall determine whether an inside or outside drop shall be approved and the size of manhole to be installed.

The outside drop pipe shall be constructed of ductile iron materials.

All outside ninety- (90-) degree elbows shall have thrust block poured below the elbow.

Inside drops shall be permitted on a case-by-case basis as approved by the **County**.

c) Doghouse Manholes

Doghouse manholes are to be utilized for connection to existing twelve- (12-) inch or larger sanitary sewer lines and may be authorized by the DCDWM Inspector on eight- (8-) and ten- (10-) inch lines for existing high flow conditions. See Construction Detail S-026 in **Appendix B**. No bypass pumping shall be paid by the County when doghouse manholes are installed.

For doghouse manholes, the existing pipe shall not be cut without authorization of the **DCDWM** Inspector.

The **DCDWM** Inspector shall be present when existing pipe is cut for doghouse or inserted manholes.

d) Test Manhole

At the discretion of **DCDWM** test manholes may be required for commercial and industrial buildings. And if required they shall be installed at locations to be approved by **DCDWM**.

Test manholes shall be required for commercial and industrial buildings and installed at locations to be approved by **DCDWM**.

Test manholes shall generally be of the same design and construction as other manholes and shall have six- (6-) inch minimum sanitary sewer lines into and out of the manhole.

Test manhole covers shall be bolt-down style with rubber gaskets.

Inverts of test manholes for certain industrial users may require modification for flow measuring capability; as determined by **DCDWM** and/or EPD.

Neither inside drops nor outside drops shall be permitted at test manholes.

An elevation drop of 0.2 feet shall be maintained through manhole invert.

(1) Depths

- Minimum Depth: four (4) feet, unless approved by DCDWM.
- Maximum Depth: ten (10) feet, unless approved by DCDWM.

(2) Placement

- On building lateral between service stub and where two (2) or more building laterals combine into one (1) pipe.
- Locate in non-paved area when possible.
- Within property limits of said building.

e) Watertight Manhole Covers

Watertight manhole covers shall be used wherever the manholes are constructed within the one hundred- (100-) year flood plain**.** Watertight manhole lids shall be bolted down.

- ***Gravity Sanitary Sewer Manholes***
  Manholes shall be precast reinforced concrete construction made in conformance with the latest edition of ANSI/ASTM C478. The minimum wall thickness for a four- (4-) foot-diameter manhole is five (5) inches.

- ***Resilient Connector (Rubber Boot)***
  All pipes entering a manhole shall be sealed by a resilient connection (rubber boot) meeting the latest revision of ASTM C923 such as A-Lok, Z-Lok or Kor-n-Seal. The material is to be ethylene propylene diene monomer (EPDM) rubber with a stainless steel band.

- ***Concrete***
  There shall be two classes of concrete: Class A for formed, reinforced cast-in-place structures and Class B for un-reinforced concrete thrust blocks, concrete cradles, concrete encasement, concrete fill and similar uses. Class A Concrete shall have a compressive strength of three thousand five hundred (3,500), four thousand (4,000), or four thousand five hundred (4,500) PSI. Class B Concrete shall have a compressive strength of two thousand five hundred (2,500) or three thousand (3,000) PSI. Concrete design mixes to be utilized shall be submitted for approval by the **County**. No bagged or sacked concrete shall be allowed.

2. Sanitary Manhole Installation

Standard sanitary sewer manholes shall be pre-cast reinforced concrete structures. A cast-in-place monolithic base may be allowed in certain locations if approved by **DCDWM**. Manholes shall be placed on a twelve- (12-) inch minimum cushion of compacted No. 57 stone. The standard precast sanitary manhole is provided in Standard Detail S-001 in **Appendix B.**

The use of Polymer MH's will be determined by **DCDWM** as needed by location during design phase.

Follow the requirements for sanitary manhole abandonment presented in Standard Detail S-005, in **Appendix B**, as needed.

a) Foundations

Foundations of manholes for sanitary sewers shall be Class "A" concrete. The bottom of the foundation shall be at least eight (8) inches thick and shall extend at least six (6) inches past the outside of the manhole as directed by **DCDWM**.

In the event that groundwater is present during the pouring of a cast-in-place manhole foundation, a pump shall be used to remove the groundwater. See Section VI.A.6 for water removal requirements. Prior to pouring, the subgrade

shall be stable, from muck, etc. After the concrete foundation has been poured, the pump shall continue to run for at least twelve (12) hours.

b) Precast Barrel and Base Section

Barrel joints shall be tongue and groove and shall meet the latest revision of ASTM C443 for O-ring gaskets; see Standard Detail S-004 in **Appendix B**. Barrel joints shall be installed to allow no infiltration into the manhole. Care shall be exercised during the handling of the precast units to avoid disturbing or damaging the gasket and to attain proper alignment of the joints. Pre-formed flexible joint sealants shall not be used on sanitary sewer manholes. Joints and lift holes shall be grouted smooth with non-shrink cement grout on the inside and outside.

All MH's during installation shall be wrapped with Gator wrap or an approved equal. In precast manhole construction, combination of joint lengths shall be selected to minimize the number of individual segments required to provide the total depth specified. Long joints shall be used in the bottom with shorter segments utilized for the top adjustments. The inside diameter of the manhole shall be as called out on the plans.

Manholes may be installed with a stub for future use. The stub shall be one (1) full joint of DIP with mechanical joint plug.

c) Manhole Cone

Manhole cones shall be eccentric and precast concrete. The top elevation on any manhole greater than three (3) feet above the finished grade shall have a flat top precast concrete with a bolt down type ERGO casting or equal. The top elevation of manhole frames shall be adjusted to grade in areas such as streets, alleys, and parking lots or where indicated on the plans. A maximum adjustment of up to twelve (12) inches shall be allowed. Precast concrete adjusting rings may be used with the approval of the **County**.

Adjustments greater than twelve (12) inches shall be made by changing precast riser sections.

The top of the wall of the manholes shall be leveled off with mortar so as to form a flat surface upon which the manhole frame is to rest.

d) Rehabilitation/Restoration of Brick within Existing Manholes

All steps will be removed prior to rehabilitation/restoration of any manhole, and are not to be replaced. Surfaces to be restored shall be abrasive blasted or hydro blasted with four thousand (4,000) PSI water pressure in accordance with SSPC SP13 / NACE 6 to remove the laitance, loose or damaged concrete and grout, oils, greases, chemical contaminants and previously applied coatings or sealers. Hydro blast brick mortar joints to a depth of one-half (1/2) inch to remove the loose material and to provide a clean, firm surface. Suitably prepared concrete and brick shall have a surface texture resembling coarse sand paper with substrate aggregate slightly exposed.

After surface cleaning, the visible pressure leaks shall be sealed using hydraulic cement in accordance with Manufacturer's instructions. Leaks shall be stopped prior to application of protective coating.

After leaks have been sealed using hydraulic cement, the area shall be spray coated with S-301, manufactured by Warren Environmental Inc., or approved equal, installed per Manufacturer's recommendations. Only **Contractor**s certified by the Manufacturers shall be allowed to apply the coating system. Surface preparation, thickness, mixing and application shall be in accordance with the Manufacturer's instructions. Manufacturer shall certify that the substrate is prepared properly and shall be responsible for the coating system installed. If the product can be installed by hand the manufacturer's installation requirements shall be followed.

e) Pipe Penetrations

Openings in precast bases to receive sanitary sewer pipes shall be cast at the factory at the required locations, size and height. Openings cored into manholes in the field shall be permitted only with a design, stamped by a Professional Engineer registered in the State of Georgia, with calculations showing after the core is made the structural strength shall be able to handle the proposed loading. At that time a written approval shall be given to proceed by **DCDWM**. Cores shall require a resilient connector that shall be submitted for approval by the **County**. Construction Inspector shall first inspect and then approve location and extent of cores in manholes.

Resilient connectors, or rubber boots, shall be cast into the manhole by the precast Manufacturer. Rubber boot shall be secured to pipe by stainless steel clamp and bolt assembly conforming to the requirements of ASTM C923 and ASTM A167, most current edition. Stainless steel elements of the rubber boot shall be totally non-magnetic Series 304 stainless steel, except the worm screw for tightening the steel band around the pipe that shall be Series 305 stainless steel. The rubber boot shall be installed per the Manufacturer's directions.

New pipe entry shall be at no less than a ninety- (90-) degree angle from direction of flow of existing manhole, unless the minimum inside drop is equal to the diameter of the lower pipe.

Upper pipe connections shall not enter manhole at barrel joint.

Pipes entering the manhole base shall be installed flush with the inside wall of the manhole.

Where sanitary sewer line is to be extended in the future, the manhole shall be furnished with a flexible sleeve and one joint of DIP with the upper end plugged.

f) Manhole Coring

The **Contractor** shall be responsible for performing manhole corings with proper coring equipment. Minimum distance between cores shall be twelve (12) inches. Missed cores or cores into a joint are not allowed and shall result in the entire section being replaced. Pipe cores shall be non-shrink grouted three hundred and sixty (360) degrees around the rubber boots inside and outside.

The coring shall not be backfilled until approved by the **DCDWM** Inspector. Failure, for any reason, to have the **DCDWM** Inspector approve the coring shall cause the Work to be halted until the cored manhole is excavated and the rubber boot exposed.

Boring or breaking into manholes shall require an approved submittal.

Cores for “future development” or “future tie-on” are only approved for an eight (8) inch stub and are only allowed when installed with a rubber boot, one full joint of DIP, and a mechanical joint cap.

g) Inverts (Channels) and Benches

The flow invert, or channel, straight through a manhole shall be made to conform as closely as possible in shape and slope to that of the connecting sanitary sewers. Rowlock (brick) or precast inverts are required. Crushed stone filler may be utilized under the bench, or table. Earth filler shall not be allowed. Minimum drop across manhole invert shall be two-tenths (0.2) of a foot to prevent solids deposition. Drops of one-tenth (0.1) of a foot across inverts shall only be permitted when site topography will not allow drops of two-tenths (0.2) of a foot.

The invert walls shall be formed, or shaped, to the full height of the crown of the outlet sanitary sewer in such a manner as to not obstruct maintenance, inspection, or flow in the sanitary sewers. When changing line sizes, the crowns (top insides) of the pipe shall be matched unless otherwise approved by **DCDWM**. New invert channels at tie-in manholes shall meet existing invert channel in a manner that provides proper hydraulic flow. Inverts formed with half pipe are not allowed. The invert of the manholes shall be shaped and smooth so that no projections will exist and flow channels will be formed in the inverts so that the manhole shall be self-cleaning and have smooth flow transitions. Inverts shall be free of areas where solids may be deposited.

Where curved flow inverts are specified in manholes, including branch inlets, slopes shall be increased as required to maintain acceptable velocities. Inverts shall be constructed with the same radius as the outflow pipe; see Standard Detail S-010 in **Appendix B**.

A bench shall be provided on each side of the manhole inverts. The bench shall be sloped to provide a minimum three- (3-) inch fall from the top of the bench to the crown (top inside) of the pipe or one-half (1/2) inch per foot, whichever is greater. No lateral sewer, service connection, or drop connection shall discharge onto the surface of the bench. The bench shall be constructed of aggregate-mix cement with smooth, veneer finish and troweled smooth from manhole wall to invert.

h) Steps

Prior to the **Contractor** ordering any manholes, the **Contractor** shall receive approval from **DCDWM** regarding the installation of steps within the manhole.

Manhole steps shall meet the latest revision of ASTM C478 and shall conform to the requirements of the Occupational Safety and Health Standards, U.S. Department of Labor. Steps shall be equal to M.A. Industries, Inc. Model (PS-1) or (PS-1 PF). The **Contractor** shall ensure that steps are installed securely and able to bear design loads.

The uppermost step shall be cast into the side of the manhole no greater than eighteen (18) inches below the top of manhole cover. The steps shall be continued in alignment downward along the interior vertical side of the manhole to a point no lower than the crown of the largest sanitary sewer. Spacing of steps shall not exceed twelve (12) vertical inches. Steps shall not descend over any pipe connection into the manhole. Step dimensioning and spacing are presented in Standard Details S-001 and S-006, **Appendix B**.

i) Frames and Covers

Manhole frames and covers within paved areas shall meet the latest revision of ASTM A48, Class 30 or ASTM 536. Covers are to be solid with exception of pick hole(s) located at the cover's circumference, not protruding through the cover. Cast iron frames and covers shall be matched for proper fit. The cast iron frame for the manhole cover shall be set at the required elevation and properly anchored to the precast manhole. Refer to Standard Details S-007 and S-009 in **Appendix B** for manhole frame and cover requirements in paved areas. With **DWM's** approval, the **Contractor** may use an ERGO type ring and cover. Approved manufacturers are ERGO by EJ - americas.ejco.com/hinged-manhole-cover, or approved equal. Composite MH frames and covers (bolt down and capable of H20 loading), ATG – Aqua Technology Group or approved equal. www.Aquatechnologygroug.com, shall only be used with the approval of **DCDWM**.

During the design phase **DCDWM** will determine if chimney seals will be required. Where there is evidence of leakage in existing manhole chimneys, chimney seals may be used with **DCDWM** approval.

Where manholes are constructed in non-paved areas, the top surface of the frame and cover shall have bolt-down lids with a watertight gasket. Locked manhole covers may be desirable in isolated easement locations or where vandalism may be a problem. Manholes in wooded or un-maintained easement

areas shall be a minimum of twenty-four (24) inches above ground level and a minimum of two (2) feet above the one hundred- (100-) year flood plain; whichever is greater. Manholes located within the one hundred- (100-) year flood plain shall contain manhole frames that are bolted to the eccentric cone in order to stabilize the manhole adjustment rings. In these cases, the manhole adjustment rings shall contain pre-drilled holes for the bolts from the pre-cast manufacturer. Manhole concrete rings shall be secured to each other. This is essential in flood plain areas where the slide and tilt of precast rings is likely to occur due to buoyancy. Provide anti-flotation collars in flood plain locations. If the manhole top elevation is to be three (3) feet or higher above grade a flat top manhole shall be required to allow for safe and easy access. Height above grade for manholes on sloped ground in un-maintained areas shall be measured on the uphill side of the manhole. Manholes in maintained grass areas may be flush with the ground. Refer to Standard Detail S-008 in **Appendix B** for manhole frame and cover requirements in non-paved areas.

Top of cover shall be factory imprinted to read **"DeKalb Sewer."**

The frames shall be properly set in place in a full bed of mortar and adjusted so as to make the top of the frame conform to the finished surfaces when located in streets, public highways and paved areas. In other locations, they shall conform to such elevations as are required. All frames and covers are to be set so as to provide access to the manhole.

j) Receiving Manhole: From Force Mains

A polymer concrete manhole shall be used. If the manhole is existing, the receiving manhole shall be coated with two (2) coats of three (3) mills coal tar epoxy on the exterior surfaces, and three (3) mm of forty percent (40%) fiberglass and sixty percent (60%) resin spray liner or precast lined three (3) mm of HDPE stud liner, or an approved epoxy meeting manufacturer’s requirements. Precast section joints/seams shall be wrapped with eight- (8-) inch joint wrap. Surface preparation, thickness, mixing, and application shall be in accordance with the manufacturer's instructions. Ventilation and odor control shall be installed and implemented. If coatings are to be used instead of a polymer concrete manhole they shall be submitted for approval to the **DCDWM.**

3. Backfilling Trenches

Backfill in trenches where pipe has been laid shall be placed continuously by hand in layers not exceeding six (6) inches in thickness and carefully and thoroughly consolidated by tamping simultaneously on both sides of the pipe to a height of twelve (12) inches above the top of the pipe. This backfilling and compacting shall be done promptly and before any backfill material is deposited directly from a machine bucket, loaders, trucks, or other mechanical equipment. Once using a machine bucket for backfilling, the bucket shall be lowered into the trench to deposit the material in such a manner as to avoid the shock of falling earth that could injure or damage the pipe or structure. Under no circumstances shall the material be allowed to fall from the machine or loader bucket directly onto the pipe or conduit in the trench. Follow Standard Detail G-004 provided in **Appendix E** for trench backfill procedures.

Except as otherwise ordered by **DCDWM**, the forms, bracing, and lumber shall be removed from the trench before backfilling.

Bottoms of trenches in earth shall be shaped or molded and compacted to the contour of the outside of the pipe, using bedding materials, as directed, or where indicated on the approved design, to give full support to the lower segment of the pipe. This shall be done in such a manner as to prevent any subsequent settlement of the pipe. Boulders or loose rock that might bear against the pipe shall not be permitted in the trench bottom, or in the backfill within the first two (2) feet above the top of the pipe. Bottoms of excavations that are of loose granular soils shall be compacted by vibratory compactor prior to laying of pipe to a minimum density of ninety-five percent (95%) of the maximum dry density as determined by the standard proctor test ASTM D698 (latest version).

Where foundation conditions are such that proper bedding cannot be provided, such as in quicksand, the **Contractor** may be directed by **DCDWM** to provide foundation cushion, concrete cradles, or other special provisions to provide support for the pipe.

Only after the backfill has been placed and hand-compacted to at least six (6) inches above the top of the pipe shall the Work proceed in the placement of the remaining backfill material that shall be carefully placed and compacted. In streets, other surfaced areas, or where directed, the backfill shall be placed and compacted in lifts not to exceed twelve (12) inches in thickness. Precautions shall be taken to avoid having any unincorporated material that may result in future settlement in these areas. Compaction shall be accomplished by approved mechanical tampers. The number of employees tamping shall at no time be less than the number of employees' backfilling, and if necessary, additional employees shall be kept in the trench to spread the material.

Backfill material shall be compacted to a density of not less than ninety-five percent (95%) of the maximum dry density as determined by the standard proctor test ASTM D698 (latest version). When directed, the **Contractor** shall arrange to have such compaction tests conducted by an independent testing firm; at a minimum every 50 LF shall be tested and locations shall be determined by **DCDWM**. Compaction tests shall be performed at the **Contractor**'s expense.

Materials used for backfilling shall be free from the perishable organics or other objectionable materials, and shall contain no stones larger than three (3) inches in its longest dimension.

No clay backfill shall be used in pipe trenches under roadways or other paved areas. In such paved areas where clay is encountered, trenches shall be backfilled with crushed rock compacted to a density of not less than ninety-five percent (95%) of the maximum dry density as determined by the standard proctor test ASTM D698 (latest version).

If, in the opinion of **DCDWM**, the original excavated material is unsuitable for use as backfill, such as perishable matter, refuse, building materials, wire, brush, stumps, ashes, large stones, muck, or other soft materials, the **Contractor** shall properly

dispose of the objectionable materials, and shall furnish, haul, and place borrow material suitable for proper backfill.

Backfilling shall not be done in freezing weather, except by permission of **DCDWM**, and shall not be done using frozen materials or upon frozen materials.

All backfilling shall be left with smooth, even surfaces, properly graded, and shall be maintained in such condition until final completion and acceptance of the Work, notwithstanding applicable warranty periods. Where directed by **DCDWM**, the **Contractor** shall mound the backfill slightly above the adjacent ground to allow for settlement.

4. Final Inspection

a) General

Record drawings shall be submitted with elevations to mean sea level, manhole rim/invert elevations, manhole coordinates, service line cleanout coordinates, and stub lengths/locations shown.

A CCTV inspection of the newly constructed sanitary sewer lines and structures shall be conducted by the **Developer**. The video and report shall be submitted to the **DCDWM** for approval, see Section III.E.3 for CCTV inspection requirements and the CCTV shall meet Pipeline Assessment and Certification Program (PACP) minimum standards.

F. Testing

1. Visual

The **Contractor** shall install the new gravity sanitary sewer system as watertight as practical. It is the **Contractor**'s responsibility to eliminate visible points of groundwater infiltration and any other significant points of leakage that can be located regardless of test results obtained as hereinafter required. Sanitary sewer lines completed in place shall be inspected and tested with a method satisfactory to the **DCDWM** showing a clear and unobstructed line between manholes. Lines and manholes shall be flushed and washed down before inspection and testing. The **Contractor**, at the Contractor's expense, shall perform system infiltration tests and air tests, as described below.

2. Air

All sanitary sewers shall be tested by the **Contractor** for leakage using low-pressure air testing, according to latest revisions of ASTM C924 for RCP, ASTM F1417 for plastic pipe, and ASTM A746 for ductile iron gravity sewer pipe, as specified herein. Pipe shall be backfilled prior to air testing. For pipes less than thirty-six (36) inches in diameter, the air test shall be performed by testing complete sections of pipe between manholes. For pipes thirty six (36) inches in diameter and over, the air test may be performed by testing each joint connection individually using a joint tester similar to the Cherne Joint Tester.

The following procedure shall be used for air testing a sanitary sewer system:

- Pneumatic plugs shall be seal-tested before being used in the actual test installation.
- One length of pipe shall be laid in the ground and sealed at both ends with the pneumatic plugs.
- Air shall be introduced into the plugs until a pressure of twenty-five (25) PSIg is reached.
- The sealed pipe shall be pressurized until the internal air pressure reaches five (5) PSIg and shall pass the test if held for five (5) minutes with no loss.
- The plugs shall hold against this pressure with bracing and with no movement.
- Plugs shall be readily removable to provide an unobstructed lateral house connection or extension.
- Wyes and/or stubs shall be plugged in a manner acceptable to the Inspector.

Where high groundwater is known to exist, the pounds of pressure that will be added to the internal air pressure used for the test shall be the height in feet of groundwater above the invert of the sanitary sewer divided by two and thirty-one one-hundredths (2.31).

At least two (2) minutes shall be allowed for air temperature in the test segment to stabilize, while internal air pressure remains no less than three and one-half (3.5) PSIg above groundwater pressure.

The elapsed time for the internal pressure to drop to two and one-half (2.5) PSIg above groundwater pressure will be accurately determined. If it is obvious to the inspector that no leakage is occurring, he may then terminate the test early with the required documentation. The air test is deemed acceptable if the elapsed time for the internal pressure drop equates to or exceeds three (3) hours.

If the installation fails to meet the requirements of this test, the **Contractor** shall determine the source of the leakage. The **Contractor** shall repair or replace the defective materials and/or workmanship. The installation shall then be retested for compliance with these Design Standards.

3. Closed-Circuit Television (CCTV)

A television inspection of the sanitary sewer shall be performed at the **Owner/Developer's** expense during final inspection and shall be submitted utilizing **DCDWM**'s required forms. The CCTV shall meet PACP minimum standards. **DCDWM** shall be provided with one hard copy of the TV inspection report, one (1) CD-ROM and one (1) flash drive showing the entire length of the gravity sanitary sewer tested. A copy of the first page of the CCTV inspection form is provided in **Appendix B**. The report shall contain the condition of the pipe, name, and location of the project, including street name, manhole number, type of pipe, depth, location of services, length, type of joints, roundness, and distance between manholes. Any

pipe found to be cracked, leaking, misaligned, bellied, or otherwise defective shall be removed and replaced. Record drawings certified and stamped by **Owner/Developer's Engineer** shall also be submitted to **DCDWM**. The **Owner/Developer** shall give adequate notice to **DCDWM** so that an Inspector can be present during the CCTV testing.

Internal grouting to repair new lines shall not be allowed, nor shall a "re-rounding" process to repair excessive deflection be allowed.

Following corrections of discrepancies, the line shall be re-inspected at no cost to **DCDWM**. Items shall be approved and accepted by **DCDWM** prior to submittal of the final plat.

4. Inflow/Infiltration

The **Contractor** shall measure inflow and infiltration (I/I) into each major segment of sanitary sewer during wet weather, as requested by **DCDWM**, and using suitable temporary weirs and depth measuring devices acceptable to **DCDWM**. These devices shall be furnished, installed, and removed by the **Contractor**.

For sanitary sewers sixteen (16) inches or less in diameter, no infiltration or leaks shall be allowed. Any infiltration flowing at any section of the sanitary sewer project shall be eliminated prior to final inspection and approval.

For sanitary sewers greater than sixteen (16) inches, the **Contractor** shall take action necessary to permanently reduce infiltration from the water sources into the constructed work to the flow rate determined by tests witnessed by the **DCDWM**. Acceptable I/I shall not exceed 0.01 gallons per inch of nominal pipe diameter per foot of pipe per twenty four (24) hours. Repair methods shall be approved by **DCDWM**.

No visible or known leaks shall be allowed regardless of infiltration test results.

5. Deflection (PVC Sewers)

The **Contractor** shall test PVC gravity sanitary sewers for excessive deflection by passing a mandrel through the pipe. Deflection of the pipe shall not exceed five (5) percent.

The mandrel size shall be based upon the maximum possible inside diameter, taking into account the allowable manufacturing tolerances of the pipe. The mandrels shall have an odd number of legs, or vanes, with a quantity equal to or greater than nine (9). The legs of the mandrel shall be permanently attached to the mandrel. A mandrel with variable sizes shall not be allowed. The mandrel shall be constructed of steel, aluminum, or other material approved by the **DCDWM** and shall have sufficient rigidity so the legs shall not deform when pulled through the pipe. The **Contractor** shall provide a proving ring for each size mandrel, with a tolerance of no more than 0.02-inch clearance. Before being used by the **Contractor**, the mandrel dimensions shall be checked by **DCDWM** using the proving ring.

The **Contractor** shall excavate and install properly any section of pipe not passing this test and re-test until results are satisfactory.

This test shall be performed twice:

1. Once within the first thirty (30) days of installation, and
2. Once during final inspection, but no sooner than thirty (30) days after pavement backfill is done.

6. Manholes

All manholes shall be vacuum tested. Manholes shall be tested in the presence of the **DCDWM** Inspector. The vacuum test shall consist of applying a vacuum to the manhole.

Each manhole shall be tested after the installation has been completed. If tested prior to backfill, the test shall conform to the latest revision of ASTM C1244. Pipes entering the manhole shall be plugged. The **Contractor** shall take care to securely brace the plug from being drawn into the manhole. The test head shall be placed at the inside of the manhole cover frame and the seal inflated. Pump shut off shall occur once a vacuum of ten (10) inches of mercury is drawn. With the valves closed, the time shall be measured for the vacuum to drop to nine (9) inches of mercury. The manhole shall pass if the time is greater than or equal to the following:

- Sixty (60) seconds for forty eight- (48-) inch-diameter,
- Seventy five (75) seconds for sixty- (60-) inch-diameter,
- Ninety (90) seconds for seventy two- (72-) inch-diameter manholes.

For manholes deeper than twenty (20) feet, the test times shall increase by one (1) second per foot of additional manhole depth. If the manhole fails the initial test, necessary repairs shall be made. Retesting shall proceed until a satisfactory test is obtained.

If the test is performed after the manhole has been backfilled, the procedure shall be modified per National Precast Concrete Association (NPCA) guidelines.

G. Final Approval

1. General

The Final Plat will be signed by **DCDWM** after the following items have been submitted and accepted by the Department:

- Approval by **DCDWM** of installation, inspection(s) and testing(s).
- Submission of signed record drawings.
- Submittal of Construction Completion Form.
- Submittal of one (1) electronic copy of the drawings on USB 3.0 Flash Drive, in AutoCAD format. Drawings shall contain elevations; where zero (0) foot represents the elevation at sea level. Relative depth/distance

alone shall not be accepted. This includes, specifically and not limited to, manhole rim/invert elevations, manhole coordinates, service line cleanout coordinates, and stub lengths and locations using the **County's** approved coordinate plane shall be provided in the drawings.

2. Construction Completion Form

Contractor/Developer shall send inspector acceptance reports to **DCDWM**, 4572 Memorial Drive, Decatur, Georgia 30032. **DCDWM** shall send the Construction Completion Form once the as-built drawings are approved. The **Contractor/Developer** shall submit a completed Construction Completion Form to **DCDWM** prior to final plat approval. A copy of the form is provided in **Appendix A.**

3. Record Drawings

Record drawings (as-builts) shall be submitted to **DCDWM** before a project can receive final approval, and/or Certificates of Occupancy. To avoid delays in the approval process of developments/subdivisions, as-built drawings shall be submitted as soon as the sanitary sewer installation is complete to allow sufficient time for review).

Record drawings shall be sharp, clear, clean, legible, and submitted on plain paper measuring twenty four (24") inches by thirty six (36") inches and the electronic AutoCAD files shall be submitted on a USB 3.0 Flash Drive.

Record drawings shall include a site plan and any supplemental or shop drawings as shall be required by **DCDWM.**

Four (4) complete sets of record drawings and one (1) copy of the electronic files shall be submitted by the **Developer** or **Developer's Engineer** to **DCDWM** for review and approval.

Record drawings shall be stamped, dated, and signed by a Professional Engineer or Registered Land Surveyor licensed in the State of Georgia.

a. Survey Standards for DeKalb Watershed Management

As-builts for all water and wastewater projects shall include all new and existing infrastructures directly adjacent to the project area. This includes, but not limited to, fire hydrants, water valves, water mains, water meters, tees, tap sleeves, bends, reducers, and plugs. Sewer infrastructure shall include manholes, sewer mains, force mains, air valves, cleanouts and all features in and around sanitary sewer lift stations.

The primary survey strategy will implement a GPS methodology. The consultant shall use the Real Time Kinematic Method (RTK) or Rapid Static Method (RSM) and equipment adequate to produce horizontal, vertical, and elevation coordinates (x, y, and z) that will be consistent with DWM methods (centimeter survey grade accuracy).

If is determined that a number of features cannot be located directly by GPS due to obstructions, a secondary survey will be employed to capture obscured points.

The secondary strategy shall consist of surveying using conventional methods. Establishing a transit and back sight using GPS, establishing a traverse loop, maintaining a minimum of 1:10,000 closure for the traverse, and side shots being collected by occupying the traverse points. Side shots should be enough to adequately survey the required features and/or other relevant features. After data collection is complete, standard survey procedure dictates that the files will be downloaded into a coordinate geometry (COGO) package for any translation or rotation that might be required. The specifications for the datum and coordinate will be the Georgia West State Plane coordinate system. The horizontal datum will be the North American Datum (NAD83) and the vertical datum will be the North American Vertical Datum (NAVD88).

The GPS methodology is subject to change; therefore the **Developer/Contractor** is responsible and shall verify the methodology to be utilized with the **DCDWM** GIS supervisor prior to starting the survey for the record drawings.

4. Warranty of Work

The **Contractor** (and **Developer** in private developments) shall warranty for a period of twelve (12) months from the date of final acceptance (from date of final plat approval or Certificate of Occupancy in private developments), sanitary sewer lines and manholes, appurtenances, trenches, roadway and surface restorations, landscaping, and any other areas disturbed by the construction of the project, to be free from defects, and to be installed in compliance with the regulations, specifications, plans, directions, and construction practices that govern said installations.

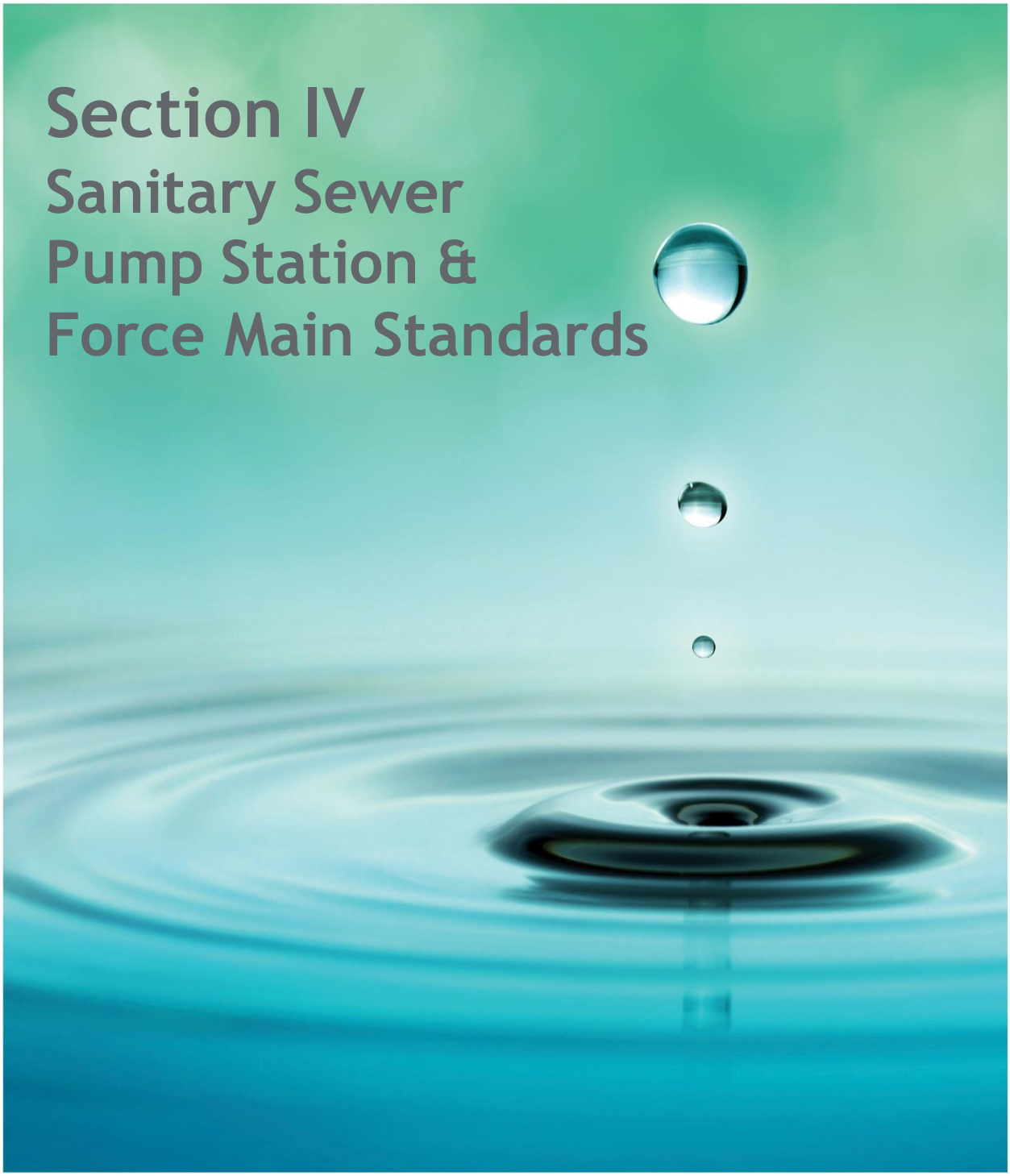
The **Contractor** shall be responsible for repairs to any leaking pipe, fittings, etc. Should trenches settle during the warranty period, **Contractor** shall promptly furnish and place fill to the original grade and restore any damaged landscaping. Should any leaks or trench settlement occur under new pavement, the **Contractor** shall be held responsible for the cost of the permitting, traffic control, testing repairs, including pavement replacement.

The determination of the requirement for the **Contractor** to perform Work under this guarantee shall be at the sole discretion of **DCDWM**.

DeKalb County
GEORGIA

WATER Matters

Section IV
Sanitary Sewer Pump Station & Force Main Standards



SECTION IV
SANITARY SEWER PUMP STATION AND FORCE MAIN STANDARDS

A. Review and Approval Process

1. General

DCDPS is responsible for reviewing and approving proposed sanitary sewer pump station projects in the **County**. The review by **DCDPS** is for general conformance to these Standards only. The **Developer/Contractor** shall have an experienced Professional Engineer registered in the State of Georgia to design the pump station facility, and the associated force main. The **Developer/Contractor** shall be fully responsible for the planning, design, construction, and initial startup and operation of the pump station facility, associated force main, and appurtenances. Any **Developer/Contractor /Design Engineer** seeking deviation from these Standards shall submit a written variance request to **DCDPS**. Approval or denial of the variance shall be at the sole discretion of **DCDPS**. The sanitary sewer pump station and force main review process flow chart is presented in **Appendix E**. (Projects within incorporated cities within DeKalb County also requiring water/sewer utility connections to the DeKalb County's systems, should follow flow charts (E3, E4, and E5) also contained in **Appendix E**.) Partial approval and acceptance of the lift station or force main will not be given under any circumstance.

2. Allowable Use of Pump Station Facilities

Pump stations shall be approved for construction in the **County** only where the installation of a gravity sanitary sewer system is not practical or feasible. "Practical or feasible" shall generally be interpreted to mean that wastewater can be conveyed by gravity flow to an existing sewer no more than five thousand (5,000) feet from the proposed development. This distance may be increased or decreased by **DCDWM** based on actual field conditions and the size of the development or project involved, at **DCDWM's** sole discretion. Generally, the **Developer/Contractor** of a residential, commercial, industrial, or mixed-use development requiring sanitary sewage collection shall have the responsibility to plan, design, permit, and construct the pump station (subject to **DCDPS** approval and meeting these Standards) and guarantee it for one (1) year after transfer of ownership to **DCDWM**.

3. Pump Station Conceptual Review and Approval Process

Before designing a pump station facility, a conceptual report shall be submitted to **DCDPS** presenting the proposed project. The main purpose of the conceptual report is to:

1. Make **DCDPS** and **DCDWM** aware of the proposed project.
2. Verify that a pump station is necessary or required.
3. Determine whether allowance(s) for additional flow to the pump station from off-site source(s) will be necessary.

4. Determine the level of review necessary to demonstrate available capacity in the receiving sanitary sewer.

Open the line of communication between the **Developer/Contractor** and **DCDPS**. Active communication shall be maintained throughout the planning, design, permitting, and construction of the proposed project.

DCDPS shall be allowed four (4) weeks from the time of submittal to review the conceptual report, after which point it would be approved as is or returned with comments. If **DCDPS** provides comments, **Developer/Contractor** shall address the comments and resubmit the conceptual report. **DCDPS** will be allowed four (4) weeks for review of each additional report resubmittal. The information to be submitted in the conceptual report shall meet the requirements of these Standards.

If **DCDPS** concurs that a wastewater pump station is necessary to serve the proposed development and the conceptual report is approved, the **Developer/Contractor** will be authorized to prepare a pump station design for further review. Upon final review and approval of the complete Professional Engineer-stamped final design, two sets of the submittal will be marked "APPROVED" and returned to the **Developer/Contractor**.

4. Pump Station Design Review and Approval Process

After reviewing these Standards, the **Developer/Contractor** shall prepare a design submittal for **DCDPS** to review the detailed design elements of the proposed pump station. The submittal shall include plans and calculations for the pump station and force main, electrical controls, programmable logic controller (PLC), generators, and other components, including the standard details and specifications for the pumps selected. The information in the design submittal shall meet the requirements of Section IV.B and the design criteria set forth in Section IV.C of these Standards.

DCDPS will be allowed four (4) weeks from the time of submittal to review the design report. **DCDPS** will return the submittal to the Applicant with comments to be addressed. **DCDPS** will be allowed two (2) weeks for any subsequent resubmittal review. After all comments have been addressed and approval has been given, two (2) sets of the submittal will be stamped "APPROVED" and returned to the Applicant.

If **DCDPS** approves the wastewater pump station design, the **Developer/Contractor** will be authorized to obtain all applicable permits, including a construction permit and electrical permit, to begin construction of the facility. Once a construction permit is obtained, a preconstruction conference shall be held with a **DCDWM** representative, County Collection System Inspector, and the **Developer/Contractor** before any work begins.

5. Design Review Variance Process

DCDWM shall approve or deny variance requests based on its sole discretion. The following supporting information shall be submitted to **DCDWM** to determine whether a variance will be allowed:

1. Equipment or material data sheets for the proposed variance item, if applicable.
2. Design calculation and preliminary drawings for the proposed variance item, if applicable.
3. References to industry standards supporting the proposed variance, if applicable.

6. Pump Station Acceptance by DCDWM Process

After the **Developer/Contractor** has completed the pump station construction, the **Developer/Contractor** shall contact **DCDWM** at the Polebridge Wastewater Treatment Facility to schedule a startup inspection. The **Developer/Contractor** shall work together with the **DCDWM** representative and the Collection System Inspector to complete the inspection and startup to **DCDWM's** satisfaction. In order for **DCDWM** to accept the pump station, the **Developer/Contractor** shall submit the information discussed in Section IV.B.3 and IV.B.4 of these Standards. Acceptance will be scheduled within three (3) business days. The following requirements shall be completed:

1. The **Developer/Contractor** shall establish a street address for the pump station. Pump stations shall have an address assigned prior to acceptance from **DCDWM**.
2. A visit to the pump station site will be scheduled with the **Developer/Contractor**, the Maintenance Superintendent, the Assistant Superintendent of Lift Stations, the Senior Electronic Technician (or Instrumentation and Control Specialist), as well as **DCDWM** and the **County** Collection System Inspector.
3. A facility inspection shall be performed. Any work not meeting **DCDWM** approval at this inspection will be noted and referenced in writing as a punch list. Punch list items from the **DCDWM** representative shall be added to the final punch list maintained by the Collection System Inspector. A work completion date shall also be stated on this punch list. Both parties will sign the punch list indicating agreement with the outstanding items and the completion schedule. The facility inspection shall demonstrate the following, as a minimum:
    a. All equipment units have been installed according to industry standards and manufacturer's instructions.
    b. The equipment units operate without overheating or overloading any parts and without vibration outside of manufacturer's standards and tolerances.
    c. There are no mechanical defects in any of the parts.
    d. The pumps can deliver the specified pressure and flow.
    e. The pumps are capable of pumping raw sewage.
    f. The pump controls operate the station in all required scenarios.
    g. The generator is sufficient to operate the pump station in an event of a

power outage and functions according to manufacturer's specifications.

h. All the instrumentation and controls are installed and function properly according to the specifications.

i. The communication between the instrumentation and controls and the central Supervisory Control and Data Acquisition (SCADA) system is established and functioning according to the specifications.

j. All cables, conduits, and wiring raceways meet the specifications.

k. All the necessary documentation for the instrumentation and controls including but not limited to wiring and cable labels, and controller IO labels are provided and are according to the specifications.

l. All alarms (high level, power outage) are operable and working.

4. The **Developer/Contractor** shall deed title to land on which the pump station and all appurtenances (including the access road) to **DCDWM**. The applicant shall also deed ownership of the pump station facility and all appurtenances to **DCDWM**. Proof/documentation of transfer of title shall be required before startup of the pump station will be initiated.

5. When all points of the punch list have been completed by the **Developer/Contractor** to the satisfaction of the Collection System Inspectors and the **DCDWM** Representative, **DCDWM** will issue a formal acceptance of the pump station.

6. After utilities have been connected, the startup of the pump station shall be conducted by the **Developer/Contractor** and a representative of the pump manufacturer, and shall be witnessed by the Collection System Inspector and the **DCDWM** Representative.

7. If the proposed pump station facility is not accepted by **DCDWM**, the **Developer/Contractor** will not obtain a Certificate of Occupancy for the proposed development.

8. The Applicant shall warranty the entire pump station facility for a period of one (1) year from the date of acceptance (as established by **DCDWM**) and shall promptly remedy, repair, or correct any defect or omission in the work during this one- (1-) year period.

9. The **Developer/Contractor** shall have utilities (water, electricity, telephone, and gas, if applicable) installed in their name, and shall pay these utility bills until after the one- (1-) year warranty and maintenance period.

10. After the one- (1-) year warranty and maintenance period, inspection of the facility shall be conducted by the **Developer/Contractor**, the Collection System Inspector, and the **DCDWM** Representative. If there are no outstanding problems, such as leaks, malfunctioning equipment, or deferred maintenance, the utility billing will be transferred to **DCDWM**. The **Developer/Contractor** will supply the **DCDWM** Maintenance Superintendent

with the account numbers for each utility.

7. Recommendations for Ordering Equipment and Utility Sources

Since manufactures' delivery times for pump stations, control panels, and telemetry and peripheral accessories may vary widely, it is recommended that orders for this equipment be placed when pump station design approvals are received from **DCDPS/DCDWM**. This will help to avoid delays at the time of final plat submittal for the proposed development.

It is also recommended that application for utility (water, electricity, telephone, and gas, if applicable) service to the pump station be made as early as possible. Experience has shown that connection of utility service is often a major reason for delays in pump station completion.

B. Submittal Requirements

1. General

Submittals shall be made to:

DCDPS
330 West Ponce de Leon Avenue
Decatur, Georgia 30030
(404) 371-2518

DCDWM Technical Services can be reached at:

4572 Memorial Drive
Decatur, Georgia 30032
(770) 621-7200

A Sanitary Sewer Pump Station and Force Main Checklist is provided in **Appendix C.** This checklist is used by **DCDWM** during design review and approval and is provided for information only.

2. Pump Station Conceptual Review and Approval Submittal

The conceptual review and approval submittal shall be presented in report format with maps and development plans to an appropriate scale. The following items shall be included in the report:

1. Completed Conceptual Review and Approval Form (see **Appendix C**).
2. Proposed site located on a United States Geological Survey (USGS) Quadrangle map, with the proposed pump station location shown. The map shall show the limits of the proposed development and of the sub-basin that drains to the pump station.
3. Location of proposed connection to receiving sanitary sewer.
4. Calculation for wastewater flows generated by the proposed development.
5. Calculation for wastewater flows generated in the remainder of the sub-basin.

3. Pump Station Design Review and Approval Submittal

The design review and approval submittal shall be presented in plan format with maps and development plans to an appropriate scale. Four (4) sets of 24"x36" design plans, one (1) electronic copy on compact disc (CD/DVD), or one (1) USB 3.0 Flash Drive (AutoCAD formats) of design plans shall be submitted. The Digital File and CAD Requirements are found in **Appendix E**.

The plan set shall include a legend depicting symbols used in the drawings, general notes pertinent to **DCDWM** requirements, and **DCDWM** standard details used within the plan set. A text box that denotes the flow rate from the selected pump (i.e., 366 gallons per minute, GPM), the size and cross sectional area of the discharge piping in the wet well [i.e., four- (4-) inch pipe, 0.087 ft^2], and the resulting velocity within the discharge piping i.e., 9.37 fps) shall be included on the pump station detail sheet. Also, a fitting schedule that contains pipe size and material, fitting sizes, and valve size and type, and other appurtenances (e.g., flow meter, pressure gauge, etc.) shall be listed on the pump station detail sheet. Pump station standard details are provided in **Appendix C**.

The following items shall be included in the design submittal and shall be stamped by a Professional Engineer registered in the State of Georgia:

1. Completed Design Review and Approval Form (see **Appendix C**).
2. Location map depicting property and land lot lines, buildings, streams, and roads.
3. Pump details, specifications, and shop drawings, including: Pump curve system head curve and calculations.
4. Wet-well information including: size, depth, operational elevations, and capacity, material, and buoyancy calculations.
5. Valve details, specifications, and shop drawings.
6. Flow meter details, specifications, and shop drawings.
7. Generator details, specifications, and shop drawings, along with automatic transfer switch specifications and shop drawings.
8. Telemetry equipment details, specifications, and shop drawings.
9. Single line electrical drawing and P&ID showing power distribution for the proposed pump station.
10. Force main design showing size, material, alignment, profile, and valve locations.
11. Depiction of receiving gravity sanitary sewer system and connection to proposed pump station force main.

12. Completed Pump Station Design Calculations Form (see **Appendix C**).

13. Conduit and raceway specifications. See Electrical Conduit Specifications in **Appendix E**.

4. Pump Station Acceptance by DCDWM Submittal

The pump station start-up check list is provided in **Appendix C**. At the startup inspection, the **Developer/Contractor** shall provide the following materials to **DCDWM**:

1. As-built drawings of the pump station facility.
2. Manufacturer's warranties.
3. A certified pump test curve from the manufacturer for all pumps.
4. A letter from the pump manufacturer stating the pumps are ready to be started and operated.
5. Operations and maintenance (O&M) manuals for pumps and generators.
6. A drawdown test performed by the **Design Engineer**.
7. Proof of transfer of title of deed and transfer of ownership to **DCDWM** to land on which the pump station and all appurtenances, including the access road, are located. The **Developer/Contractor** shall also deed ownership of the pump station facility itself, and all appurtenances, to **DCDWM**.

An example Pump Station Design Review and Approval Form is provided in **Appendix C**. Items one (1) and two (2) shall be provided in paper copy and electronic format on a 3.0 flash drive. Electronic files shall be in AutoCAD format. PDFs should be submitted in addition to the electronic CAD files. The electronic data shall be presented in **Table 4.1**.

Table 4.1
Pump Station Submittal File Structure

Folder	Information
Data Sheet	Completed project data forms
Engineering Design	Engineering design reports
As-built Drawings	As-built drawings of pump station, PDF format
As-built Drawings	As-built drawings of pump station, AutoCAD format
Pump Submittal	Manufacturer's submittals, reports, and tests of pumps
Shop Drawings	Other equipment shop drawings
O&M Manuals	O&M manuals for all equipment
Warranty Forms	Copies of all warranties
Deeds & Easements	Copies of all deeds and easements

C. Design Criteria

1. Pump Station Service Area Map

The potential service area of the pump station shall be clearly delineated on an area map. The service area shall include the area that can reasonably flow by gravity to the pump station site based on topography. The service area map shall also identify any areas being served by existing sewer facilities.

If the sanitary sewer drainage basin is larger than the proposed pump station service area, **DCDWM** reserves the right to require larger pumps, wet well, storage facilities, and gravity sewers. These will be required on a case-by-case basis.

2. Design within GDOT Right-of-Way

If any portion of a proposed project enters a State of Georgia controlled right-of-way, then a GDOT permit application is required. **Developer/Contractor** shall submit to **DCDWM** the required material in hard copy and in electronic form, on a CD and a flash drive. Hard copy forms, permits, and drawings, etc. shall be 8 ½" X 11." Drawings need not be to scale. The measurements necessary for the permit application shall be submitted in the United States Customary System units. Generally, portions of the project design may be reduced in size and match lined, if necessary, as long as the text is still legible. Compaction notes indicating compaction requirements shall be included on every construction drawing required for the application. (Reference backfill trenches Section VI.A.12) Submittal shall include four (4) each of the following: plan, profile, traffic control plan, and relevant section from GDOT County map. The Georgia Department of Transportation Permitting Checklist is provided in **Appendix E.**

In GDOT *Section 2.5.H. Service Lines* - Because it is in the interest of both the customer and Utility to have these connections, service lines are permitted on right-of-way as close to perpendicular as possible with the transmission facility with the exception that metering devices, vaults or pressure reducing mechanisms shall be located off the right-of-way. Any longitudinal installations of service lines shall be reviewed by the District Utilities Engineer on a case-by-case basis. This does not apply to installations serving a highway purpose.

GDOT requires the GDOT permit application to be submitted through the GUPS. The **Developer/Contractor** shall not submit the GDOT permit directly through the Georgia Utilities Permitting System (GUPS). The **Developer/Contractor** shall provide all necessary information, as stated in the previous paragraph. **DCDWM** will then review the information and provide comments (if necessary). Once the necessary information has been approved, **DCDWM** will submit the GDOT permit application through the GUPS. Requirements include, but are not limited to:

- **Developer/Contractor** shall refer to the GDOT Utility Accommodation Policy and Standards Manual, most current edition, for policies regarding construction of utilities within the public highway right-of-way.
- Traffic control shall be in accordance with the MUTCD, latest edition.
- Bore and jack pits shall be a minimum of ten (10) feet from the outside edge of pavement. Plans shall show casing size and carrier pipe size within the approach slab for bridge crossings.
- The documents necessary for said application shall be provided by the **Developer/Contractor's Design Engineer.** Any required GDOT documents not stated above shall be the responsibility of the **Developer/Contractor** at no cost to the **County.**

3. Calculation of Sanitary Flows

Flow calculations shall be presented in the Pump Station Design Calculations Form, **Appendix C**. The **Developer/Contractor** shall follow the submittal process described in Section IV.B, of these Standards.

Determination of design sanitary flows shall be based on wastewater flows expected to become tributary to the pump station for the entire development at build-out. The sanitary flows shall be identified as onsite sanitary flows and off-site sanitary flows. Onsite sanitary flows are those generated directly from the project site. Other flows shall be identified as off-site sanitary flows, and shall be based on wastewater flows expected to become tributary from the entire drainage basin over the life of the pump station. In addition, sanitary flows that will be realized immediately shall be identified as "initial flows" and the remaining flows shall be identified as "future flows."

a) Delineation of Drainage Basin

The drainage basin surrounding the proposed site shall be delineated with the location of the pump station as the most downstream point. If the entire drainage basin is within the proposed site, the Average Annual Daily Flow (AADF) is calculated by applying the flow generation factors from the table below. If there is additional off-site area within the drainage basin that is upstream of the proposed development, that area shall be accounted for when calculating the AADF. **DCDWM** will determine during the conceptual review and approval process whether a proposed pump station shall need to service off-site flows.

b) Average Annual Daily Flow

The AADF a site will generate is calculated based on the use of the site. **Table 4.2** below shows the sanitary flow generation factors, in GPD that can be used to estimate sanitary flows from proposed and existing developments.

4. Off-site Areas

If it is determined by **DCDPS** that off-site flows need to be accounted for in the design of the pump station, the following process shall be followed.

- If the off-site area is already developed, an analysis of the existing sites using the flow contributions in the above table will result in additional AADF that shall be accounted for.

- If the off-site area is not developed, the future land use shall be analyzed to determine the development potential of the area. A future land use map, DeKalb County, Georgia Comprehensive Plan, is available from **DCDWM**. The future AADF from these areas can be determined by applying the estimating factors listed in **Table 4.3.**

5. Peaking Factor

Generally, the sewers shall be designed to carry at least the peak hourly flow when operating at capacity. Peak hourly flow shall be the design ADF in conjunction with a peaking factor. The peaking factor formula to be used is:

$$PF = \frac{18 + (P)^{0.5}}{4 + (P)^{0.5}}$$

Where P is the population in thousands. The above equation yields a peaking factor that is intended to cover normal infiltration and inflow for a well-maintained sewer system and/or those built with modern materials and construction methods. The peaking factor shall not be less than two and one-half (2.5). Where P is not known or cannot be reasonably assumed, PE (population equivalence) can be used. PE is Q (flow in gpm) divided by one hundred (100) gpcd for new systems and one hundred and twenty-five (125) gpcd for existing systems. "Source: *Recommended Standards for Wastewater Facilities, 2014 Edition*".

6. Determination of Receiving Sewer Capacity

Before a new pump station addition is considered, it shall be determined that the receiving sanitary sewer is not already capacity limited. If the receiving sewer is already capacity limited, this can cause surcharging and create the potential for wastewater overflows.

During the pump station conceptual review and approval process, **DCDPS** will determine the level of analysis that shall be performed by **Developer/Contractor** to determine whether a proposed pump station will cause capacity problems. The **Developer/Contractor's Design Engineer** is responsible for determining the receiving sewer capacity.

7. Calculation of System Head Curve

The total dynamic head (TDH) is the head against which the pump shall work. The TDH is made up of static headloss and friction headloss. When TDH is plotted versus discharge, the resulting line is the system head curve.

a) Static Headloss

The static headloss is the distance that the wastewater flows shall be moved vertically, from the water surface elevation in the wet well to the receiving gravity sewer invert. System head curves shall be developed for the

following two static head conditions:

- Pump-off elevation
- Lead pump-on elevation

Table 4.2
Sanitary Flow Contributions from Site-Specific Sources

Contributor	Sanitary Flow, GPD
Airports, Railroads, Bus Terminals	5/Passenger + 10/Employee
Stadiums, Racetracks, Assembly Halls	5/Seat
Bar/Lounge	30/Seat
Barber Shop/Beauty Salon	125/Chair + 20/Employee
Bath House for Swimming Pool	10/Swimmer
Boarding Houses	75/Resident
Bowling Alley	75/Lane + 20/Employee
Car Wash (non-recycling)	75/Car
Church	5/Sanctuary Seat
Campgrounds without Sewer Connections	100/Space
Campgrounds with Sewer Connections	150/Space
Country Club	25/Member
Day Camp	20/Person
Day Care Center	15/Person
Dental Office	20/Employee + 100/Chair
Fitness Center/Spa	50/Person
Food Service - Restaurants Open 24 Hours/day	75/Seat + 20/Employee
Food Service - Restaurants Open Less than 24 hour/day	50/Seat + 20/Employee
Food Service - Catering	50/100-ft^2 Floor Space
Funeral Home	300/Embalming + 100/Employee
Grocery Store	200/1000-ft^2 Floor Space
Hospital	300/Bed + 100/Resident Staff
Hotel/Motel	100/Room
Laundry	500/Machine
Medical Offices	200/Exam Room
Nursing Home	150/Bed + 100/Resident Staff
Prison	125/Bed + 20/Employee
Resident Camps	60/Person
Residential Homes	150/Bedroom
Retail Stores	Larger of 400/Restroom or 100/Fixture
Schools - Day, Toilets Only	12/Person
Schools - Day, Toilets, Cafeteria	16/Person
Schools - Day, Toilets, Cafeteria, Gym	20/Person

Table 4.2 Sanitary Flow Contributions from Site-Specific Sources	
Contributor	**Sanitary Flow, GPD**
Service Station	20/Person
Shopping Center/Mall	100/1000-ft^2 Enclosure Space
Theaters	5/Seat
Veterinary Office	100/Run + 10/Cage + 20/Employee

Note: Flow estimating factors based on EPD Large Community Design Guidance

Table 4.3 Sanitary Flow Contributions Based on Land Use	
Future Land Use	**Sanitary Flow, GPD per acre**
Low Density Residential (0 to 4 dwelling units per acre)	675
Low-Medium Density Residential (0 to 8 dwelling units per acre)	1,170
Medium Density Residential (0 to 12 dwelling units per acre)	1,755
Medium-High Density Residential (0 to 18 dwelling units per acre)	2,025
High Density Residential (0 to 30 dwelling units per acre)	3,375
Commercial Low Density	390
Commercial High Density	1,000
Office / Professional	390
Industrial	1,000
Institutional	575
Agriculture	25
Transportation, Communication, Utilities	1,000

Note: Flow estimating factors based on literature research and historical flow data in DeKalb County.

b) Friction Headloss

The friction headloss is the head of water that shall be supplied by the pump to overcome the frictional losses in the pipe. It is a function of pipe length, diameter, flow rate, and the friction coefficient (C factor).

The design shall use the Hazen-Williams formula to calculate the friction headloss:

$$h_f = L\frac{10.44\ Q^{1.852}}{C^{1.852}D^{4.8655}}$$

Where
h_f is the friction headloss, in feet
L is the force main pipe length, in feet
Q is the flow rate, in GPM

C is the friction coefficient, dimensionless
D is the force main pipe diameter, in inches

Because the friction coefficient of the force main will change over time, system head curves shall be generated and evaluated for present (low friction) and future (high friction) conditions. The C factors indicated below shall be the only values allowed for these calculations. Friction headloss shall be analyzed for the following conditions:

a. The initial operating condition (C=130)

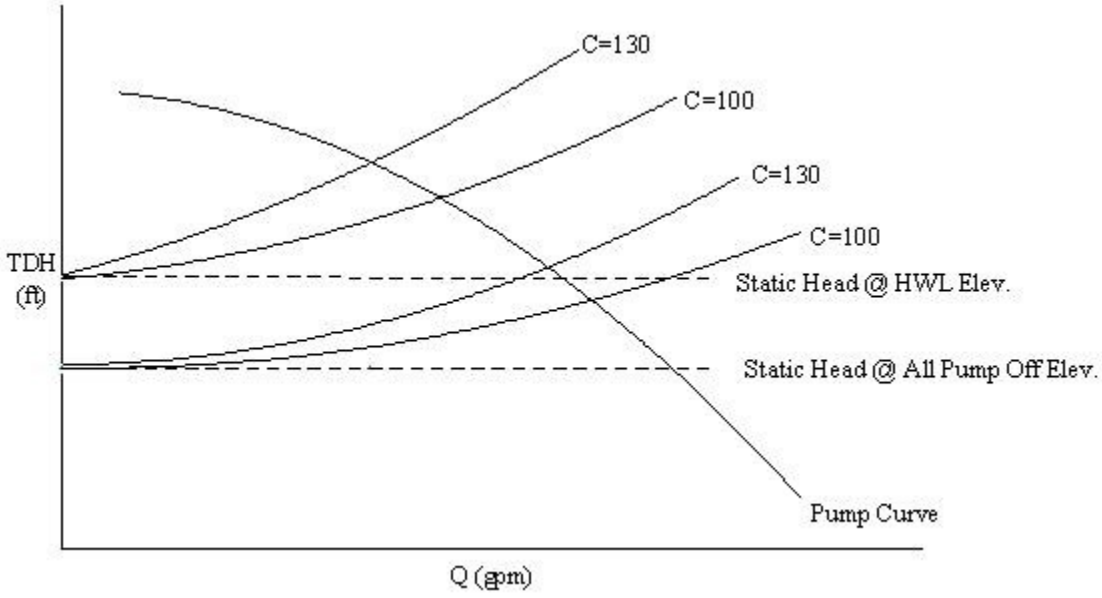
b. The system after it has aged (C=100)

This ensures that when selecting a pump, the operating range will be efficient throughout the lifetime of the pumping system.

8. System Head Curve

Add both static headloss conditions to each of the friction headloss conditions to arrive at four (4) separate system head curves. The pump selected shall be able to operate well under all four (4) pressure conditions. **Figure 4.1** illustrates example system and pump curves:

Figure 4.1
Example System and Pump Curves



The system head curves can be plotted using the force main discharge (Q) on the x-axis and the corresponding TDH values for each static head and friction headloss condition on the y-axis. These curves define the energy required to pump sanitary flows through the discharge system. The system head curve represents the conditions under which the pump shall operate at various inflows and TDH combinations for a specific set of pipe size, pipe material, and pipe length combinations. Once the system head curve is developed, a suitable pump can be chosen. When overlaid with pump performance curves provided by the manufacturer, it yields the pump operating ranges.

9. Pump Selection Process

Pump selection shall be based on a hydraulic analysis of the system through which the wastewater is to be conveyed. The design operating range is defined as the intersection of the pump curve and the calculated system curves for the various conditions. Pumps shall be selected such that the pumps shall be capable of pumping the required capacity for all total dynamic head requirements developed by the system for the lifetime of the pump station. The design operating range of the pumps shall be within ten percent (10%) on a flow basis of the best operating point of the pump, as determined by the manufacturer and identified on the pump curve. Pumps shall produce a velocity in the discharge piping between three (3) and seven (7) fps.

DCDWM shall permit only those new pump stations that use submersible Flygt pumps or approved equal by **DCDWM**. Variable speed pumps are not allowed. All pumps shall be equipped with external variable speed drives. Anything related to suction lift pumps shall be deleted.

The selected pumps shall be capable of pumping the peak design flow with the largest pump out of service. Pumps shall be non-clogging units capable of passing three- (3-) inch spherical objects.

Pumps shall be selected such that all design operating points are on the pump curve, as supplied by the pump manufacturer. In addition, pumps shall be selected such that the net positive suction head available ($NPSH_A$) shall be greater than 1.3 times the net positive suction head required ($NPSH_R$) at each of the design operating points. To the greatest extent possible, pumps shall operate at or near their highest efficiency point throughout their anticipated service life, taking into account increases in head requirements (due to increased friction losses) over time.

Pumps shall be selected such that they will not cavitate at any point within the design operating range. Pumps that operate within the unstable portion of the pump curve under any of the expected design conditions shall not be allowed. Freewheeling (i.e., operating at pump run-out) or deadheading (i.e., operating at pump shut-off) of pumps shall not be allowed.

The impeller chosen shall be the smallest available, so that there is flexibility for future pumping needs.

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

Material certification specifying the hardness of wearable parts shall be provided by the pump manufacturer. Pumps shall be constructed in an ISO 9001-certified facility.

10. Wet Well Design

1. Wet Well Geometry

   Wet Well overflow design requirements for overflow storage are generally required, however may be reduced or waived by DCDWM if the Developer's Design Engineer's calculations indicate that the overflow storage requirements of the Design Standards Manual are onerous.

   The following equation shall be used to determine the active storage volume in the wet well (the volume between the pump-on and pump-off elevations) needed to generate the required pump cycle time:

$$V = T\frac{Q_{PUMP}}{4}$$

   Where V is the active volume within the wet well, in gallons
   T is the allowable pump cycle time between starts, in minutes
   Q_{PUMP} is the pumping rate of a single pump, in GPM

   The geometry of the wet well shall be shaped such that the only flat surfaces occur directly under the pump inlets. The wet well floor shall have a minimum slope of 1:1 to the hopper bottom. The horizontal area of the hopper bottom shall be no greater than necessary for proper installation and function of the pump inlet. The walls shall be cylindrical, with an eight- (8-) foot minimum diameter and sized in accordance with the Hydraulic Institute Standards. The entry hatch shall be large enough to remove the pumps for servicing. No fixed ladders shall be permitted in the wet well. The wet well shall have a minimum depth of eight (8) feet.

2. Clearances

   Pump-to-pump and pump-to-sidewall clearances shall be the minimum specified by the manufacturer to minimize the potential for sedimentation problems.

   The top of the wet well shall be at least two (2) feet below the lowest building floor elevation receiving sewer service. This will provide a point of relief to prevent wastewater backups into homes. Variances from this requirement will be considered by **DCDWM** on a case-by-case basis.

3. Influent Sewer Lines

   The influent sewer line shall be introduced into the wet well at as flat a slope as possible, with a maximum velocity of flow entering the pump station not exceeding six (6.0) fps. Bringing the influent line into the wet well at a steep slope can cause air entrainment into the pump. The required sanitary storage volume shall be provided entirely within the wet well; backup into the influent line shall not be allowed. Only one inlet connection shall be permitted to a wet well. Any additional influent lines shall be combined into a manhole upstream of the wet well.

4. Sump Design

   The sump design is an integral part of the pump station. Proper pump performance depends on correct sump design, which will also reduce O & M costs. Ideally, the flow of water into any pump shall be uniform, steady, without swirl, and without entrained air. Unsteady flow will lead to mechanical problems in the pump and air entrainment will lead to cavitation in the pump. Pumps shall be designed in accordance with the manufacturer's recommendations.

5. Buoyancy Protection

   Wet wells structures shall be protected from the buoyant forces of groundwater.

   Buoyancy protection for wet wells shall be demonstrated through the use of flotation calculations.

   a. A geotechnical analysis shall be performed by a Professional Engineer registered in the State of Georgia to gather groundwater and soil data.
   b. Flotation calculations shall be performed by a Professional Engineer registered in the State of Georgia on wet well structures using groundwater table elevation determined in the geotechnical analysis.
   c. Buoyancy forces shall be computed by multiplying the volume displaced by the wet well by the associated weight in water.
   d. Opposing force shall be computed by adding the weights of the wet well barrel, bottom slab, top slab, the net weight of the saturated soil over the bottom slab, and any additional restrains.
   e. Flotation calculations shall not add the weight of the pumps, internal piping, and appurtenances, or wastewater present in the pump station, including the wastewater below the all- pumps-off activation level, into the downward forces used to counteract buoyancy.
   f. The use of the saturated weight of any soil above the extended footing of the pump station structure to the groundwater table elevation shall be allowed in the flotation calculations.

Flotation calculations shall show that the design of the below ground pump station structures will be protected from buoyancy with a factor of safety that is greater than 1.1. The factor of safety is obtained by dividing the opposing force by the buoyant force.

An anti-flotation collar at the base of pump station structures may be used to offset the buoyancy force. They shall meet a safety factor of greater than 1.1.

6. Pump Cycle Time

   Pumps shall be cycled such that the numbers of starts are minimized and resting times are maximized to avoid overheating and overstressing the pump motor. The minimum time between pump starts shall be ten (10) minutes at design flow. The minimum cycle time in a two- (2-) pump system shall be calculated when the inflow is at half the peak flow. Automatic pump alternation of the starting order of the pumps after shutoff shall be provided. The maximum cycle time shall not exceed thirty (30) minutes.

7. Pump Control Elevations

   Within the wet well, there shall be set elevations for the following conditions:

   a. High Level Alarm
   b. Lag Pump On
   c. Lead Pump On
   d. Pumps Off
   e. Low Level Alarm

   The lead pump is energized when the wastewater level reaches the lead pump-on elevation. The lead pump shall operate continuously until the water level is lowered to the pumps-off elevation. The lag pump shall be energized if the lead pump is incapable of handling the flow of wastewater, allowing the water level to reach the lag pump-on elevation. The lag pump shall then operate in unison with the lead pump until the water level is lowered to the pumps-off elevation. At this time, both pumps are de-energized. An automatic circuit shall alternate the lead pump and lag pump sequence on every pump down cycle. A time delay relay shall be provided to prevent both lead and lag pumps from starting at the same time.

   Storage shall be provided above the high-level alarm equal to three (3) hours at design flow. Storage volume is calculated to be that volume between the high- level alarm and the lowest point of overflow, and includes volume in the wet well and influent gravity sewer. The location of the lowest point of overflow shall be noted in the Design Review and Approval Submittal.

   The high level alarm elevation shall be set to provide one (1) foot of freeboard below the influent pipe.

   The lag pump-on elevation shall be set at a minimum of six (6) inches below the high level alarm elevation.

The lead pump-on elevation shall be set at the elevations that satisfy the individual pump cycling volumes.

The pumps-off elevation shall be no lower than the pump discharge flange elevation or minimum depth recommended by the manufacturer.

The low-level alarm elevation shall be set six (6) inches below the pumps off elevation.

8. Water-Level Sensors

   The water-level sensors activate the pumps and, therefore, are a vital component of the control system. **DCDWM** will allow only electronic sensors. The signals from these sensors are inputted to a PLC that shall control the starting and stopping of the pump motors.

9. Ventilation and Odor Control

   Smaller flows into the wet well during the warmer months of April through September increase the wastewater retention time. This may result in the raw sewage to go septic, volatile malodorous components. Pump stations located within forty (40) feet of a residence shall be equipped with an odor control system/device. For pump stations located with distances greater than (40) feet of a residence, an odor control device requirement will be determined by the **County**. Pump stations receiving industrial waste shall be required to provide an odor reduction system, unless exempted in writing by **DCDWM**. The odor reduction system shall be used to remove volatile malodorous components characteristic of municipal sewage off-gases. Odor control measures shall meet the minimum guidelines within these Design Standards.

   Most small pump stations do not have continuously powered air intake and exhaust on wet wells. Consequently, the wet wells are hazardous areas and stringently classified under the National Fire Protection Association (NFPA), OSHA, and the National Electric Code (NEC). The **Designer** shall eliminate any need to enter the wet well to perform routine maintenance activities. Guidelines related to wet well ventilation and the related subject of odor control include the following:

   a. To reduce odor problems caused by gas release, the fall of wastewater from the inlet sewer to the wet well water level shall be minimized based on the high level alarm elevation.

   b. The wet well shall be vented to the atmosphere. A four- (4-) inch vent shall be provided and extend through the concrete slab at the top of the wet well and shall be either elbowed down or covered, as shown in Standards Detail P-014, **Appendix C**, to prevent debris from entering the wet well. The vent shall include a suitable odor elimination attachment with insect screen.

   c. Because of poor ventilation and the presence of dangerous gases, wet wells are generally classified as Class I, Group D, Division 1 areas under the NEC. Explosion proof submersible pumps and measuring devices shall be the only equipment inside the wet well. Electrical connections in the wet

well shall also be explosion proof.

d. Wet wells are generally rated as Class A confined spaces according to OSHA regulations. This classification requires special safety procedures for entry.

Pump stations receiving industrial wastewater shall submit a water quality report to **DCDWM**. If it is determined that odor control is required, the receiving pump station shall be equipped with odor control measures, such as activated carbon. Odor control requirements shall be based on peak flow and detention time.

10. Overflow Vault Design

Approval of the use of overflow vaults shall be at the discretion of **DCDWM.**

a. Size

An overflow vault shall be required when the wet well structure does not have the capacity to hold a volume greater than or equal to three (3) times the peak hourly flow for design of the pump station.

Overflow vault shall be sized to contain a volume greater than or equal to three- (3-) hour storage volume at peak flow. Backflow of sewage into manholes upstream of the wet well is not permitted. The maximum number of storage vaults shall be limited to two (2) per station.

Example Overflow Vault Volume Calculation:

Peak Hourly Flow (Inflow to Pump Station)	= 200 GPM = 12,000 gallons per hour (GPH)
Storage Volume Criteria (Time)	= 3 hours
Volume of Overflow Vault	= 12,000 GPH* 3 hours
Volume of Overflow Vault	= 36,000 gallons

b. Buoyancy Protection

Below ground pump station structures shall be protected from the buoyant forces of groundwater. **Developer/Contractor's Design Engineer** shall submit stamped buoyancy protection calculations for approval.

11. Valve and Meter Vault Design

Wastewater pump stations shall have a combined below grade valve and meter vault, above or adjacent to the wet well. Guidelines for proper design of the valve and meter vault include the following:

a. Discharge Piping

The discharge piping from each pump shall be routed through the valve and meter vault with check valves and shutoff valves on horizontal stretches of pipe, to prevent solids from settling back on the check valve.

Check valves shall be placed upstream of shutoff valves with the ability to be replaced with no cutting. A flow meter shall be installed downstream of the valves in the valve and meter vault. The length of force main between the meter and the valves shall be straight and restrained, with the required lengths provided in accordance with the manufacturer's recommendations, with no bends or fittings in the line, to reduce turbulence of the wastewater entering the flow meter.

b. Pressure Gauges

Pressure gauges shall be installed within the valve and meter vault. The pressure gauge tap with diaphragm mounted seals shall be located on the side of each pipe in the valve and meter vault, see Standard Detail P-013 in **Appendix C** for placement. Gauge gradation shall not be more than one hundred and twenty percent (120%) of the maximum pressure anticipated at the pump station. Pressure gauge face shall be four (4) inches minimum and installed facing up toward to the access hatch; the pressure gauge shall be easily read by looking down into the valve and meter vault from the ground surface.

c. Vault Floor

The below ground valve and meter vault shall have a concrete floor with concrete sides and two aluminum hatches. The floor shall be sloped at two percent (2%) to a sump to collect rainwater.

d. Drain

A drain shall be provided in the valve and meter vault sump to discharge rainwater into the wet well. The drain pipe shall be four- (4-) inch DIP installed from a floor sump in the valve and meter vault to the wet well. A flapper style back-water check valve shall be installed on the valve and meter vault drain line to prevent a back-up of wastewater from the wet well into the valve and meter vault. The slope of the drain pipe shall be two percent (2%). The drain pipe shall be installed with a brass strainer and p-trap.

e. Confined Spaces Requirements

Below ground valve and meter vaults are confined spaces; therefore, they require adequate means for ingress and egress, including OSHA-approved ladders or steps and access hatches of sufficient size. There shall be at least twelve (12) inches between the edge of the vault ladder and the pipe wall to provide ease of access.

D. Construction Materials and Installation

1. General Requirements

The **Developer/Contractor** shall furnish, install, and dedicate to **DCDWM** the entire functioning pump station and force main system. The **Developer/Contractor's Design Engineer** (Professional Engineer registered in the State of Georgia) shall design the system. It shall include an access road and

station that are deeded to **DCDWM**. The design shall be reviewed and approved by the **DCDPS** and **DCDWM**.

The **Developer/Contractor** shall consult with **DCDWM** during the design of the system. The system shall be designed with all components sized to meet the development's flow adjusted for peaks. The **Developer/Contractor** shall size the system to meet future phases of the project. **DCDWM** may also require installation of larger capacity pumps, wet wells, force mains, generators, and other equipment to account for future upstream flows that would eventually drain into the pump station. Pump station equipment and force mains are manufactured in certain discrete sizes. The difference in capacity between the development's projected flow and the discrete size selected for the **Developer/Contractor's** project shall not be considered as the **Developer/Contractor's.** Any such extra capacity beyond that reserved for the original **Developer/Contractor** becomes available for **DCDWM** to use at its discretion.

The **Developer/Contractor's Design Engineer** shall locate the pump station to drain the largest possible watershed sub-basin. **DCDWM** will investigate the service impact associated with future **County** needs within the sub-basin and the potential installation of additional or larger force mains required to serve the sub-basin that will drain the pump station. If **DCDWM** decides an additional or larger force main is to be installed concurrent with the **Developer/Contractor's** project, the **Developer/Contractor** shall design the additional or larger mains. **DCDPS** and **DCDWM** will review the design of said additional or larger force mains. The additional and or larger force main cost may be negotiated with the **County**. There is no agreement that the **County** will absorb any of the additional cost.

If successful operation of a new pump station is dependent on one or more existing pump station(s), the **Developer/Contractor** shall evaluate the existing pump station conditions at its sole expense, as well as design and construct system upgrades to maintain adequate capacities of the existing pump station(s). The design shall be submitted to **DCDWM** for review and approval. During the startup phase, the **Developer/Contractor** shall demonstrate successful startup of the upgrades to the existing pump station prior to startup of the new pump station. If a **Developer/Contractor** has multiple pump stations in series, the startup sequence shall begin at the point of connection to the existing **County** system and proceed upstream to the other pump station(s).

1. Quality Assurance

   The pump manufacturer shall perform the following inspections and tests on each pump before shipment from factory. If more stringent testing is conducted by the manufacturer, those testing results may be accepted in lieu of the tests below, at the sole discretion of **DCDWM.**

   a. Impeller, motor rating, and electrical connections shall first be checked for compliance.

   b. A motor and cable insulation test for moisture content and/or insulation defects shall be made.

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

d. The pump shall be run submerged in water to a minimum of six (6) feet.

e. After operational testing, the insulation test shall be performed again.

f. A written report stating that the foregoing steps have been done shall be supplied with each pump at the time of shipment.

2. Operations and Maintenance Manual

The **Developer/Contractor** shall prepare and submit a minimum of four (4) hard copies and two (2) electronic copies of the Pump Station and Force Main O&M Manual to **DCDWM**. Electronic O&M manuals shall be in PDF format and drawings are to be in AutoCAD 2005 or later. O&M manuals shall contain the following components:

a. Technical data
b. Performance and operation elevations
c. Pump outline drawing
d. Control drawing and data
e. Submittal drawings
f. Access frame drawing
g. Redline as-built drawings
h. Equipment installation guides
i. Technical manuals
j. Specifications
k. Parts lists
l. Equipment usage instruction manuals
m. Applicable printed warranty
n. Manufacturer's equipment storage recommended startup procedure data form
o. Approved shop drawings, including design data for all installed equipment and each major component, and a pump curve/system curve analysis showing the design operating points
p. P&ID and Control panel wiring diagrams.
q. Warranty information for all installed equipment and each major component.
r. Inventory, functional descriptions, and complete operating instructions and troubleshooting for all installed equipment and each major component.

s. Instructions for startup/shut-down as well as for calibration and adjustment of all installed equipment and each major component. Recommended maintenance management system, including preventive and predictive maintenance, for all installed equipment and each major component.

t. Contingency plan and analysis of critical safety issues.

u. Contact information for local service companies as well as instructions for replacement of all installed equipment and each major component.

v. Contact information for local contractors capable of performing emergency repairs.

w. Contact information for regulatory and other agencies.

3. Training

Each pump station installation in **DCDWM** requires six (6) hours of onsite O&M training to be provided by the pump manufacturer to **DCDWM** maintenance personnel, and shall be paid for by the **Developer/Contractor**. The pump manufacturer's representative shall be present for the duration of the training.

4. Warranty

One (1) year from the date of transfer of ownership to **DCDWM,** a full preventive maintenance inspection shall be performed by the pump manufacturer or their representative; **Developer/Contractor** shall bear the cost of this inspection and any repairs not covered under the warranty. Other equipment supplied shall have manufacturer's standard warranties and shall provide a minimum of one (1) year of coverage. The **Developer/Contractor** shall be responsible for the cost of repairs to any pumps, pipes, valves, meters, fittings, and other items.

5. Spare Parts

Submersible wastewater pump stations shall be furnished with the following spare parts and accessories:

a. Six (6) each - Float switches or one (1) probe

b. Five (5) each - Spare fuses for each type and rating provided

c. Five (5) each - Spare lamps for each type provided

d. One (1) each - Discharge check valve

e. Four (4) each - Factory operation and maintenance manuals

f. One (1) each - Phase monitor relay

g. Five (5) each - Spare relays and relay sockets for each type provided

h. One (1) each - Programming key for transfer switch

i. One (1) each - Pressure transducer

j. Four (4) each - Sets of keys to the pump station and all lockable doors, cabinets or fixtures. The keys shall be the same as the existing keys to the pump station, generator, RTU, and transfer switch.

k. One (1) each - Valve key to operate the valves

l. One (1) each - Eight- (8-) foot ladder to access the valve and meter vault when necessary

Spare parts shall be boxed and clearly labeled as to the relevant equipment. Spare parts shall be of the same type and quality as the parts provided in the original equipment package. The spare parts shall be delivered to the **County's** Snapfinger Creek Advanced Wastewater Treatment Facility by the **Developer/Contractor**.

6. Site Work

1. Pump Station Site Layout

An example pump station site layout is provided in Standard Detail P-001, **Appendix C.**

a. A buffer shall be placed around each pump station site. The buffer will extend thirty (30) feet outside the fenced-in pump station to make a one hundred and twenty- (120-) foot-by-one-hundred-and-twenty- (120-) foot buffer. **DCDWM**, at its sole discretion, may require a larger buffer depending on the proximity of structures, type of development, size of the pump station, or other factors that may indicate a need for additional buffer. This buffer, which is required in residential subdivisions, shall be indicated on the final plat. In addition, a permanent easement, dedicated to **DCDWM**, shall be provided to include the required fenced-in area, with an additional six (6) inches extending beyond the fence on all sides. The one hundred and twenty- (120-) foot-by-one- hundred-and-twenty- (120-) foot buffer shall be even sloping grade away from the pad, free of "dips" and "hills" that could impede stormwater flow away from the pad. The one hundred and twenty- (120-) foot-by-one- hundred-and-twenty- (120-) buffer area shall not overlap lot lines, detention ponds, drainage easements, or other similar elements.

b. A twenty- (20-) foot-wide sanitary sewer easement shall be provided along the length of the force main unless it is located within State or **County** right-of-way. If located within the State or **County** right-of-way, the force main shall be located within the right-of-way with six (6) feet of clearance to the right-of-way line, or an easement shall be required.

c. A cleared drivable access from a main road, with a twenty- (20-) foot-wide permanent easement, to the Pump Station property line shall be dedicated to the **County**.

d. Earth slopes around the pump station created by “fill” that are steeper than three to one (3:1) shall be stabilized with rip-rap. Fill slopes shall be compacted to embankment fill requirements, as described below. A certified letter of compaction shall be provided to the **County** Inspector prior to final inspection. For the embankment fill, the **Contractor** shall use suitable material that is classified by the Unified Soil Classification System (USCS) in accordance with ASTM D2487 as CL. The **Contractor** shall verify that the largest particles in the fill are no greater in dimension than one-half the thickness of the compacted lift thickness.

e. **Developer/Contractor** shall install a concrete a walkway from the driveway to the four- (4-) foot walk-through gate.

f. **Developer/Contractor** shall install a system in front of the gate to divert water away from the station and into a storm drain.

g. **Developer/Contractor** shall not install the pump station within twenty (20) feet of a storm drain catch basin.

h. **Developer/Contractor** shall clear tree limbs or other shrubbery that extends over the fence prior to acceptance.

2. Access Road and Turnaround

a. An access road and turnaround shall be provided for all pump stations. Access road shall be paved at a twenty- (20-) foot-width minimum, and shall not exceed eight percent (8%) slope. Turnarounds shall have a forty five- (45-) foot turning radius, extending thirty (30) feet from the edge of pavement of the access road, to provide sufficient room for a vacujet truck-sized vehicle to turn around. The access road and turnaround shall be constructed of concrete, greater than one hundred thousand- (100,000-) pound loading, on a six- (6-) inch layer of aggregate base course stone at ninety five percent (95%) compaction. In no case shall uncompacted gravel or stone material be allowed for access road construction. A cross-section of the access road is provided in Standard Detail P-012, **Appendix C**. Examples of the access road and turnaround are provided in Standard Detail P-011, **Appendix C.**

b. The concrete access driveway shall have a twenty eight- (28-) day compressive strength of four thousand (4,000) PSI, minimum eight (8) inches thick and shall be reinforced with Number 5 rebar spaced twelve (12) inches on center on both the top and bottom faces and in each way as well (i.e., longitudinal and transverse). Pavement design shall meet loading exerted by a one hundred thousand- (100,000-) pound piece of equipment. Expansion joints shall be installed as needed in the access road and turn around.

c. Site plan to show finished grade contour lines with two- (2-) foot intervals in and around the pump station and access road. Spot elevations shall be provided on the pump station pad to show proper drainage. On all design plans and as-builts, show a separate pump station site plan detail with access road and turnaround and a separate proposed structural vault detail.

d. If the pump station is within fifty (50) feet of a road, **County** standard guard rails shall be provided to protect the station. If the access road is sloped greater than five percent (5%), the **Contractor** shall install guard rails and/or bollards to prevent vehicles from rolling off the access road and turnaround. The guard rail / bollards are to be installed maximum five (5) feet from the edge of access road and/or turnaround.

e. The access drive shall have adequate line of sight to allow the safe ingress and egress of maintenance vehicles and shall meet **County** minimum standards.

f. Lift station access road/driveway subgrade shall be accomplished in layers not exceeding six (6) inches in depth and each layer shall be thoroughly compacted to minimum ninety-five percent (95%) of the modified proctor maximum dry density as determined by ASTM D1557. This operation shall include any reshaping and wetting required to obtain proper compaction. Soft or otherwise unsuitable material shall be removed and replaced with suitable material. Unsuitable material shall be defined as:

- Organic clay, organic silt, or peat, as defined in ASTM D2487.
- Vegetation, wood, roots, leaves, and organic, degradable material.
- Stones or rock fragments over three (3) inches in any dimension.
- Porous biodegradable matter, excavated pavement, construction debris, rubbish, or refuse.
- Ice, snow, frost, or frozen soil particles.

g. Bollards shall be a minimum of six (6) inches in diameter steel pipe filled with four thousand (4,000) PSI concrete rounded at the top, and shall be three (3) feet deep with a height of five (5) above finish grade, and shall be painted with an approved an epoxy paint. Color shall be chosen by the **DCDWM**. Bollards shall be installed between the edge of the drive way and the pump station wet wells, vaults, pumping, and electrical equipment, as necessary, to prevent trucks from driving over the wet well and vaults or damaging equipment.

3. Utilities

a. The site plan shall show all existing and proposed utilities. Utility meters shall be mounted per the utility's specifications and shall be mounted outside of fenced station. If gas service is required, gas pipe shall be

buried underground.

b. The **Developer/Contractor** shall provide an eye wash station complete with vacuum breaker attached to the potable water hose connection.

c. The **Developer/Contractor** shall provide two (2) one hundred ten- (110-) volt, twenty- (20-) amp electrical outlets (receptacles) in industrial, NEMA-rated metal, weather, and chemical-resistant proof boxes. One outlet shall be located near the pump station jib crane. The second shall be located on the control panel support frame.

d. Potable Water Service

- Materials and Installation

  A copper potable water service with an approved double check valve backflow prevention device shall be provided for operation and maintenance purposes. The hose bib shall be a freeze-proof above ground type, Simmons #4802 yard hydrant or approved equal. The hose bib shall not be installed directly into the concrete pump station pad. A one- (1-) foot-diameter, six- (6-) inch-deep, gravel area shall be provided centered on the hose bib, see Standard Detail P-003 in **Appendix C**. The **Developer/Contractor** shall be responsible for installing the service line from the water meter to the pump station site, and purchasing the three-quarter- (3/4-) inch meter at his expense. Water meter will be set at the right-of-way by **DCDWM**.

  Backflow prevention device shall be installed in a hot box with heat tracing wire to prevent freezing. A yard hydrant with fifty (50) feet of three-quarter- (3/4-) inch UV-resistant red rubber two hundred and fifty (250) PSI commercial grade hose with brass nozzle shall be installed with stainless steel hanger.

e. Utilities shall be working prior to startup. No station shall be accepted without a phone line. The required utility information shall be brought to the startup. Required information includes account numbers, phone numbers and any letters or tests performed which require written documentation (i.e., letter of compaction, four- (4-) hour load bank test on generator, etc.).

4. Fencing

a. Materials and Installation

Pump Stations shall be enclosed by approved fencing one (1) foot inside of the property line, and shall be as specified below:

- Fences are to be eight (8) feet high #4 chain link wire with top rails and bottom tension wires.
- Three (3) strands of barbed wire at the top on angled extension

arms. Galvanized-steel barbed wire shall consist of two strands of twisted No. 12-1/2 gage wires with four- (4-) point barbs spaced three (3) inches apart and conforming to ASTM A121, with Class 3 zinc coating (minimum of 0.8 oz of zinc coating over each square foot of uncoated wire surface for No. 12-1/2 gage wire).

- HDPE fence slats and blinds (architectural brown or green) by TopLock with bottom locking, as directed by **DCDWM**.
- A two- (2-) foot chain that can be locked with a #2 Masterlock shall be provided. Chain lengths shall be permanently welded to the fence.
- Provide a twenty- (20-) foot-wide double swing gate on four- (4-) inch-diameter posts with a four- (4-) foot-wide walkthrough gate. Provide swing gates in accordance with ASTM F900.
- Fence posts shall be set into three (3) feet of concrete and spaced ten (10) feet apart. An example security fence with access gate is presented in Standard Detail P-009, **Appendix C.**

5. Noise Wall

   A noise wall is required, in lieu of a fence, when pump station is located within forty (40) feet of a residence.

   a. Materials and Installation

      The wall shall be constructed of eight- (8-) inch-thick concrete block.

      The wall shall be eight (8) feet tall. A section view of the noise wall is depicted in Standard Detail P-010 in **Appendix C**.

6. Security

   a. Ports of entry into the pump station facility and structures shall be locked.

   b. The pump station facility shall be provided with adequate lighting to facilitate normal and emergency operation and maintenance activities. Install LED security lights on a twenty (20) foot breakdown pole with automatic eye and pole lowering winch. The light shall be located near the pump station wet well, see Standard Detail P-001 in **Appendix C** for illustration. The pole shall be painted Architectural Brown. The light shall turn on automatically at night. The light pole is depicted in Standard Detail P-005, **Appendix C**.

   c. Lighting fixture shall be provided as needed. Follow guidelines set in Standard Detail P-005, **Appendix C**.

   d. Safety placards for all pump station structures and equipment, as required by OSHA, shall be provided and be readily visible.

e. The gate shall be equipped with an audio and visual alarm connected to the SCADA system.

7. Flood Resistance

a. Pump station structures as well as all associated equipment and appurtenances shall be protected from the one hundred- (100-) year flood.

- Such protection measures shall ensure that the pump station shall remain fully functional, operational, and free from physical damage during a one hundred- (100-) year flood.
- The pump station shall be protected from inundation of floodwaters by elevating structures at least two (2) feet above and twenty-five (25) feet horizontally away from the one hundred- (100-) year flood elevation.

b. The one hundred- (100-) year flood elevation shall be that as identified on the most recent FEMA Flood Insurance Rate map when available or as established through appropriate modeling techniques.

E. Concrete

1. General Requirements

a. Pump station structures shall be designed and built in complete compliance with all applicable state, local, and federal codes as well as any applicable OSHA Standards.

b. The slump of all concrete shall be not more than four (4) inches or less than one (1) inch unless specifically accepted by **DCDWM**.

c. The air content by volume of all concrete shall be from three percent (3%) to six percent (6%).

d. Concrete shall not contain a water-reducing and retarding admixture, unless specifically submitted and approved by the **County**.

e. The water-cement ratio of the design mix, which includes all water added, shall not be exceeded. Water-cement ratio of the design mix shall be according to the manufacturer’s recommendation.

f. The water reducing and retarding admixture shall be in accordance with the manufacturer's requirements if approved for use.

g. Concrete shall be structural concrete with a twenty eight- (28-) day compressive strength of four thousand (4,000) PSI.

h. Concrete shall be proportioned in accordance with the latest requirements of ACI 211.1.

F. Pump Station Pad

1. Size

a. A minimum eight- (8-) inch-thick, forty five- (45-) foot-by-forty-three- (43-) foot reinforced concrete pad shall be installed, with the size approved by the **DCDPS/DCDWM**.

2. Material and Installation

a. The pavement design shall meet loading exerted by a one hundred thousand- (100,000-) pound piece of equipment. The Pump Station pad shall be at a minimum eight (8) inches thick reinforced with Number 5 rebar spaced twelve (12) inches on center, on both the top and bottom faces and in each direction (i.e., longitudinal and transverse). Expansion joints shall be installed as needed in the pump station pad.

b. A concrete curb shall be constructed underground around the pump station, as shown in Standard Detail P-007 in **Appendix C**. Asphalt shall not be accepted for the pad.

c. The pump station pad shall be constructed on a six- (6-) inch layer of compacted aggregate base course stone over a prepared subgrade. Pump station subgrade shall be constructed on earth fill of select material. Selected backfill material shall consist of finely divided earth, stone, dust, sand, crushed stone, or other approved material free from all wood, vegetable matter, debris, and other objectionable material and having scattered clods, stone, or broken concrete less than two (2) inches in maximum dimension.

d. The pump station concrete pad shall be installed with a one half percent (0.5%) slope from the center of the pad to the edge of the pad. The pump station concrete pad shall be concaved and sloped away from the station to divert the storm water away from the station and toward a storm drain. Concrete shall extend six (6) inches past the station pad all the way around. Additionally, the installation of a flume, or stormwater piping (perforated pipe wrapped in filter fabric), to divert stormwater from the pad to a stormwater pond may be required by **DCDWM**.

e. The fill shall be placed in layers of not more than six (6) inches compacted thickness and compacted by the use of heavy rolling or power tamping equipment to secure at least ninety five percent (95%) of the standard proctor dry density. Backfills around structures shall be properly placed and compacted. The fills shall be brought up in layers. The layers shall be thoroughly compacted to at least ninety five percent (95%) of the standard proctor dry density, each layer to be not deeper than six (6) inches compacted thickness. Compaction around structures shall be by use of heavy power tamping equipment.

G. Wet Well and Accessories

1. General

a. If the wet well is less than thirty (30) feet deep, the pump station shall be a precast polymer concrete wet well with self-cleaning bottom. U.S. Composite Pipe, Inc. or approved equal.

b. If the wet well is (30) feet or greater in depth, the pump station shall be cast in place designed by a Professional Engineer registered in the State of Georgia. The wet well shall be coated Warren epoxy coating system or an approved epoxy coating system.

c. The wet well shall be provided with a depth as required to maintain the active storage volume, the emergency storage volume, and allow for proper operation of the duplex pumps.

2. Materials and Installation

a. Wet Well Sections

1. The minimum inside diameter of the wet well shall be eight (8') feet. The minimum wall thickness shall be eight (8") inches for all wet wells.

2. Pre-cast wet wells shall be constructed with a monolithic base structure as shown in Standard Detail P-013, **Appendix C.** The minimum base thickness shall be twelve (12) inches. The pre-cast top slab shall have thickness of ten (10) inches. Material for pre-cast wet wells shall be polymer concrete, four thousand (4,000) PSI at twenty eight (28) days. The maximum allowable absorption of the concrete shall not exceed eight percent (8%) of the dry weight. Barrel, top, and base sections shall have tongue and groove joints. Sections shall be joined using an approved preformed plastic gasket meeting the requirements of Federal Specifications SS-S-00210, "Sealing Compound, Preformed Plastic for Pipe Joints," Type 1, Rope Form. Joints shall be sealed with epoxy grout on both the internal and external walls for a smooth continuous wall. Each section of the precast wet well shall have not more than two holes for the purpose of handling and installing. These holes shall be tapered and shall be plugged with mortar after installation.

3. Base sections shall be placed on bedding rock. The bedding rock shall be firmly tamped and made smooth and level to assure uniform contact and support of the pre-cast structure. A pre-cast base section shall be carefully placed on the prepared bedding so as to be fully and uniformly supported in true alignment and making sure that all entering pipes can be inserted on proper grade. Pre-cast wet well section shall be handled by lift rings or non-penetrating lift holes. The first pre-cast sections shall be placed and carefully adjusted to true grade and alignment. Pre-cast sections shall be placed and aligned to provide vertical alignment with a one quarter- (1/4-) inch maximum tolerance per five (5) feet of depth.

4. Precast Concrete shall meet the requirements of the following applicable standards:

   - ASTM C478 “Standard Specification for Precast Reinforced Concrete Manhole Sections”
   - ASTM C913 “Standard Specification for Precast Concrete Water and Wastewater Structures”
   - ASTM C858 “Standard Specification for Underground Precast Concrete Utility Structures”
   - ASTM C923 “Standard Specification for Resilient Connectors Between Reinforced Concrete Manhole Structures, Pipes and Laterals”
   - ASTM C990 “Standard Specification for Joints for Concrete Pipe, Manholes and Precast Box Sections Using Preformed Flexible Joint Sealants”

5. If the wet well will be cast in place the **Developer/Contractor’s Design Engineer** shall submit stamped design calculations for approval.

6. The sections shall be uniformly supported by the base structure and shall not bear directly on any of the pipes. The completed wet well shall be rigid, true to dimensions, and watertight.

7. Wet well top slab shall extend three (3) inches above the pump station pad.

8. Concrete mix design shall be in accordance with ACI 318 and ACI 350 and meet the following requirements:

   - Twenty eight- (28-) Day Strength: four thousand (4,000) PSI
   - Cement Content: Minimum five hundred sixty (560) pounds per cubic yard
   - Air Content: five to seven percent (5% to 7%) in accordance with ASTM C231
   - Water to Cement Ratio: Maximum 0.44
   - Slump Range: three (3) to five (5) inches in accordance with ASTM C143
   - Use of fly ash shall be approved by **DCDWM**
   - Use of admixtures shall be approved by **DCDWM**

9. The concrete materials shall meet the following requirements:

   - Cement: Domestic Portland cement in accordance with ASTM C150, Type II
   - Fine Aggregate: Washed, inert, natural sand in accordance with ASTM C33

- Coarse Aggregate: No. 57 stone in accordance with ASTM C33
- Water: Clean, potable water free from injurious amounts of oils, acids, alkalis, salts, organic matter, or other deleterious substances

10. The concrete reinforcement shall meet the following requirements:

    - Steel reinforcing bars shall be in accordance with ASTM A615, Grade 60
    - Welded wire reinforcement shall be in accordance with ASTM A185

11. If groundwater is encountered during construction of the wet well, a six- (6-) inch perforated drain pipe surrounded by Number 57 Stone and wrapped with filter fabric shall be installed. The perforated drain pipe shall begin at the wet well base, slope downward and discharging to daylight as low as possible.

12. Section Joints

    a. Joints shall use 'O' ring gaskets for the seal between well sections. The date of manufacture and the name or trademark of the manufacturer shall be clearly marked on each pre-cast section.

13. Lifting Joints

    a. Sections shall be cured by an approved method for at least twenty eight (28) days prior to painting and shall not be shipped until at least two (2) days after having been painted. Lifting rings or non-penetrating lift holes shall be provided for after having been painted. Lifting rings or non-penetrating lift holes shall be provided for handling pre-cast wet well sections.

14. Access Hatch and Fall-Through Protection

    a. The wet well access hatch shall be double leaf aluminum hatch with pad locking ability and shall be sized appropriately to ensure ease of pump removal. Wet well access opening shall be installed with a protective grate for fall-through protection. Access hatches for valve vaults shall be water tight, aluminum hatches with locking pad ability. The hatch drain shall be piped to the wet well and include a trap.

    b. Each protective grate shall be designed to combine covering of the opening, fall-through protection per OSHA Standard 1910.23, and controlled confine space entry per OSHA Standard 1910.146. Welding shall be in accordance with ANSI/AWS D1.2-90 Structural Welding Code for Aluminum.

    c. The safety grate shall be made of 6061-T6 aluminum with a minimum ultimate strength of thirty eight thousand (38,000) PSI and a minimum yield strength of thirty five thousand (35,000) PSI, per ASTM B221.

Grate design shall use safety factors as defined in the "Specifications for Aluminum Structures," by the Aluminum Association, Inc., 5th addition, for "Bridge Type Structures."

d. Grating shall be designed to withstand a minimum live load of three hundred (300) pounds per square foot. Deflection shall not exceed one hundred fiftieth (1/150th) of the span.

e. Grate openings shall be sufficient to allow for visual inspection, limited maintenance and float adjustments while the safety grate fall through protection is left in place.

f. Design shall ensure that the fall-through protection is in place before the doors can be closed, thereby protecting the next operator.

g. Each grate shall be provided with a permanent hinging system that shall lock the grate in the ninety- (90)- degree position once opened. Grates in the open position create a physical barrier around the opening, protecting passing pedestrians.

h. Each grate shall have an opening arm that shall allow opening of the grate, while providing the grate as a barrier between the operator and the pit. The opening arm shall also be equipped with a controlled confined space entry lock (lock provided by others). This locking device shall prevent unauthorized entry to the confined space. The grating system shall allow anyone to make visual inspection and float adjustments without entering the confined space. The **Developer/Contractor** shall provide two (2) hatch keys for wet well and valve vault hatch locking devices.

i. Grate shall be coated with an OSHA-type safety orange color, promoting visual awareness of the hazard. The aluminum safety grates shall receive a two-coat powder coat system, applied by the electrostatic spray process. The base coat is a thermosetting epoxy powder coat finishes with a minimum thickness of two (2) to four (4) mils. The topcoat is a mar- resistant, TGIC polyester powder coating with a minimum thickness of two (2) to four (4) mils. Each coat shall be baked at 350 to 375 degrees Fahrenheit until cured.

15. Wet Well Lining and Coatings

a. The exterior of the wet well shall be coated with two (2) coats of three- (3-) mils coal tar epoxy. Coating shall be continuous, free of pin holes and or voids, and shall be applied in accordance with manufacturer's instructions. After the wet well top slab, base and all sections have been permanently set into place, seal outside with a chemically compatible non- shrink grout prior to exterior application of protective coal tar coating.

b. Non-penetrating lift holes shall be filled with non-shrink grout after installation of the sections. Concrete surfaces shall be free from oil, curing compounds, dust, dirt, and other interfering materials removed by sandblasting and shall be fully cured prior to the application of any coatings. The coating color shall be white or off-white. The cured epoxy resin system shall conform to the following minimum standards:

	Strength (psi)
Compressive Strength (ASTM D-695)	13,000
Flexural Strength (ASTM D-790)	13,000
Tensile Strength (ASTM D-638)	7,000
Flexural Modulus (ASTM-790)	500,000

c. Wet well walls and piping shall be coated with a corrosion-resistant coating system meeting the requirements of these standards.

d. Pump station wet well interiors and piping shall be lined by the following:

- Spray Coating with Concrete Chamfer Bottom:
  - The interior of the concrete wet well and concrete chamfered wet well bottom shall be spray coated with Warren or an approved equal epoxy coating applied per manufacturer's recommendations. Prior to applying the spray liner, eight- (8-) inch joint wrap shall be applied to the precast section joint seams. Surface preparation, thickness, mixing, and application shall be in accordance with the manufacturer's instructions.

16. Odor Control

Odor complaints from pump stations are generally caused by the release of H_2S gas, mercaptans and other foul smelling gases.

a. The odor control system shall include neutralizing or preventing production of odorous compounds. The **Developer/Contractor** shall provide for treatment of odorous compounds, containing and treating foul air, and enhancing dispersion of foul air.

b. The odor reduction system manufacturer shall be responsible for complete coordination of all equipment, piping, concrete pad, controls, and conduit and wiring required for the odor reduction system.

c. Options for odor control include chemical feed systems, which are designed to prevent the formation and release of odorous compounds, and air treatment systems, which are designed to capture and treat odors after they are produced, by means of adsorption, absorption, oxidation, or chemical biological stabilization. The odor reduction system may include, but is not limited, to:

- Odor reduction equipment, such as carbon filters, and the optimum replacement or regeneration procedure to be used
- Chemical feed.

17. Media System

    a. Recommended Manufacturers: Purafil and or approved equal by **DCDWM**.

    b. Substrate characteristics: Virgin, granular gas-phase type suitable for control of sewage treatment odors, designed for high loadings of organic compounds. **Contractor/Developer** shall furnish service for one (1) year from start-up of the system and the media shall be refilled at time of acceptance at **Contractor/Developer** cost.

    c. Testing: The testing shall establish the carbon usage rate and the optimum replacement or regeneration procedure to be used. The information shall be presented to **DCDWM** at the time of ownership transfer.

18. Chemical Feed System Components:

    a. Chemical pumps: Double diaphragm

    b. Piping, valves, and fittings: PVC schedule 80

    c. Pulsation dampeners: Materials resistant to pumped solution, size as recommended by the manufacturer

    d. Siphon valves: Material resistant to pumped solution

    e. Flow meter: Variable area type with indicator

    f. Chemical Storage Tanks:

        1. One-piece cross-linked high-density polyethylene with UV inhibitor

        2. Calibration molded into the tank in gallons and liters, molded in tie-down lugs designed to resist wind loads.

19. Ventilation Equipment

    a. Pump stations shall be adequately vented in complete compliance with all applicable local and state building codes as well as OSHA and NFPA Standards.

    b. At a minimum, pump station wet wells shall be provided with a gooseneck-type vent. Active ventilation units shall also be acceptable.

    c. Vents shall be constructed of stainless steel or Schedule 80 PVC with an UV inhibitor and shall be adequately supported to withstand damage during normal and emergency operation and maintenance.

    d. Vent elevations shall be a minimum of two feet above the one hundred-(100-) year flood elevation as identified on the most recent Federal

Emergency Management Agency (FEMA) map when available or as established through appropriate modeling techniques.

e. Vents shall be provided with an air vent filter and insect/bird screen of stainless steel or aluminum. Under no circumstances shall steel or galvanized steel be used.

H. Overflow Vault

1. Materials and Installation

a. Overflow vault shall be sized according to Standard Detail P-016 in **Appendix C**.

b. The walls and floor of the overflow vault shall be eight (8) inches thick.

c. The overflow and drain pipe connections from the wet well to the overflow vault shall be six- (6-) inch DIP.

d. The overflow vault shall be precast with an approved epoxy meeting the manufacturer's requirements.

e. The exterior of the overflow vault shall be coated with two (2) coats of three- (3-) mil coal tar epoxy.

f. The overflow vault shall be installed below ground with an access manhole located at the downstream end. The access manhole shall be installed with safety grate as described in these Design Standards. The overflow vault shall be vented with a four- (4-) inch UV rated Schedule 80 PVC or 316 Stainless Steel (SST) vent pipe to minimize the buildup of H_2S. Vents shall be provided with an air vent filter and an insect/bird screen of stainless steel.

g. The overflow vault shall be designed to withstand GDOT loads if the overflow vault is located under the driveway area or if vehicles have access to the area where the overflow vault is located. The top slab reinforcement shall be designed to withstand one hundred thousand (100,000) pounds of load.

h. The overflow pipe invert shall be equal to the wet well high-level alarm elevation. The overflow pipe shall maintain a two percent (2%) slope and discharge into the wall of the overflow vault. The overflow pipe shall not discharge into a corner of the overflow vault.

i. The overflow vault drain pipe connection to the wet well shall begin at a point in the floor of the overflow vault, maintain a two percent (2%) slope, and discharge into the pump station wet well minimum one (1) foot above the wet well bottom. The drain pipe shall be supplied with a six- (6-) inch plug valve, see Standard Detail P-016 in **Appendix C**.

j. The overflow vault floor shall have a two percent (2%) slope from the walls toward the floor drain.

k. The overflow vault shall be in accordance with Standard Detail P-016 in **Appendix C.**

I. Valve and Meter Vault

1. Materials and Installation

a. The valve vault may be constructed of the same approved materials as the wet well. The valve and meter vault shall be twelve (12) feet by six (6) feet (inside horizontal dimensions) and shall be constructed of concrete. The floor shall be sloped at two percent (2%) to a sump to collect rainwater.

b. Two (2) seventy two- (72-) inch-by-sixty (60-) inch double leaf aluminum hatches with fall protection grating complying with three hundred- (300-) PSI load rating, recessed lifting handle, and 316 SST hinges shall be provided for all valve and meter vaults.

c. Valves and flow meters shall be located directly under hatch openings. Valves shall be operational from the ground surface without the need of entering the vault. Flow meters and pressure gauges shall be readable from the ground surface without the need of entry. Piping and appurtenances within the valve and meter vault shall be set three (3) feet above floor elevation and shall be provided with stainless steel pipe supports. Piping within the valve vault shall be minimum three (3) feet below the ground surface.

d. Valve and meter vault, pump station, and other main structures shall be located minimum five (5) feet apart or approved by **DCDWM**.

e. The exterior of the vault shall receive two (2) coats of three- (3-) mil coal tar epoxy. Vault top slab shall extend three (3) inches above the pump station pad.

f. The pipes, valves, meters, and fittings within vault shall receive, after installation, one (1) three- (3-) mil coat of approved primer and one (1) three- (3-) mil coat of approved epoxy paint. Colors will be selected by **DCDWM** with the approval of the paint.

J. Pumps

1. General

a. Pump stations conveying residential, commercial, institutional, or industrial domestic wastewater shall be provided with pumps that are suitable for continuous duty in conveying raw, unscreened wastewater, as required.

b. The pumps shall be of identical size and type within each pump station facility.

c. A demonstration that the submersible pumps can be removed and installed in the wet well using a powered hoist and crane and without special equipment or manipulation shall be performed at startup.

1. Submersible Pumps

a. Materials and Installation

- Furnish and install a minimum of two (2) heavy-duty submersible constant speed wastewater pumps, as specified in these Design Standards and approved by **DCDWM**. Variable speed pumps may be permitted by **DCDWM** on a

case- by-case basis.

- Pumps and panels shall be manufactured by Flygt, Sulzer, KSB, Fairbanks, Flowserve or approved equal and approved by **DCDWM**.
- Pump suction shall be four (4) inches, six (6) inches, or eight (8) inches, but no less than four (4) inches or greater than eight (8) inches. Discharge openings to be engineered to meet minimum requirements.
- Staying within the design parameters, the pump selection shall be the largest pump with minimum diameter impeller to allow for future growth. Motor horsepower shall be non-overloading for a maximum diameter impeller.
- **Developer/Contractor** shall store, rotate, and handle pumps according to manufacturer's recommendations.
- Pumps shall be mounted in the wet well to meet the minimum installation instructions or as shown in the Standard Detail P-013, **Appendix C**.
- Pumps shall be readily removable and replaceable without dewatering the wet well or disconnecting any piping in the wet well. **Developer/Contractor** shall be responsible for demonstration of pump removal at the request of **DCDWM**.
- Base elbow shall be anchored to the wet well floor with stainless steel "J" bolts set six (6") inches into concrete. "J" bolts shall be hooked under reinforcing steel or as required by the wet well materials manufacturer.
- Each submersible pump shall be supplied with one (1) lifting system. The system shall be appropriately sized for the weight of the pump to be lifted.
- The pumps shall automatically connect to discharge elbows when lowered into place on a duel 316 SST (stainless steel) two- (2-) inch guide rail system requiring no bolts, nuts, or fasteners to affect proper sealing. The guide bars shall not support any portion of the weight of the pumps.
- Upper and intermediate guide rail supports shall be Type 316 stainless steel. The pump manufacturer shall submit the recommended locations of the guide rail supports to **DCDWM**.
- A minimum of one cable holder for each cable shall be provided. Cable holder shall be Type 316 stainless steel provided.
- Mating of the pump discharge flange and base elbow face shall be accomplished by a simple linear downward motion and utilize smooth metal surface contact.

- No portion of the pump shall bear directly on the floor of the wet well and no rotary motion of the pump shall be required for sealing. Minimum of six (6) inches of concrete shall be poured in bottom of the wet well after centerline of access cover is determined. Reinforcing steel shall be placed as required by the **Developer/Contractor's Design Engineer** and approval of **DCDWM.** Precast polymer concrete wet wells shall follow manufacturer's requirements**.**
- Sufficient submergence of the pump shall be provided to prevent the occurrence of vortexing within the wet well. In no case shall the all pumps-off activation level be less than the minimum level required for pump operation, as recommended by the pump manufacturer.

2. Pump Construction
   a. Major components shall be of gray cast iron, ASTM A-48, class 30 or 35. The metal surfaces coming into contact with the wastewater, other than stainless steel, shall be protected by a factory applied epoxy coating consisting of two (2) coats eight (8) to fifteen (15) mils thick, with total minimum DFT of 20 mils with a cured hardness of 90D in accordance with ASTM D2240. The epoxy shall be one hundred (100) percent solids by volume.
   b. Pump/motor unit mating surfaces, where watertight sealing is required, shall be machined and fitted with Viton rubber O-rings. Joint sealing shall be the result of controlled compression of rubber O-rings in two planes and O-ring contact on four sides without the requirement of a specific bolt torque limit. Rectangular cross-sectioned rubber, paper or synthetic gaskets that require specific torque limits to achieve compression shall not be considered equal. No secondary sealing compounds, elliptical 'O' rings, grease or other devices shall be used.
3. Cable Entry
   a. The power cable shall be suitable for the submersible pump applications and sized according to NEC and ICEA standards. The power cable shall be of sufficient length to reach from the pump to the control panel terminal block without splicing. The cable shall have enough slack such that it can be routed and secured out of the way of any equipment in the wet well. The outer jacket of the power cable shall be oil resistant.
4. Bearings
   a. Motor bearings shall be sealed and permanently grease lubricated with high temperature grease and be capable of being regreased. The minimum B-10 bearing life shall be one hundred thousand (100,000) hours at any point along the usable portion of the pump curve at maximum product speed.

5. Mechanical Seal
    a. Pumps shall be provided with a tandem mechanical shaft seal system consisting of two totally independent seal assemblies. Each seal shall contain one stationary and one positively driven rotating corrosion resistant tungsten-carbide or silicon-carbide ring. Seals shall operate in an oil lubricant reservoir that hydrodynamically lubricates the lapped seal faces at a constant rate. Each seal interface shall be held in contact by its own spring system. The seals shall not require maintenance or adjustment and shall be capable of operating in either clockwise or counterclockwise direction of rotation without damage or loss of seal.
    b. Should both seals fail and allow fluid to enter the stator housing, a port shall be provided to direct that fluid immediately to the stator float switch to shut down the pump and activate an alarm. Any intrusion of fluid shall not come in contact with the lower bearings. Each pump shall be provided with a lubricant chamber for the shaft sealing system. The lubricant chamber shall be designed to prevent overfilling and to provide lubricant expansion capacity. The seal lubricant chamber shall have drain and inspection plugs that are accessible from the outside of the pump unit. The seal system shall not rely upon the pumped media for lubrication. The motor shall be able to operate continuously while non-submerged without damage while pumping under load. Seal lubricant shall be FDA-approved and nontoxic.

6. Pump Shaft
    a. The pump shaft shall be made of Type 416 or Type 420 stainless steel or ASTM A576 Cr 1040 with Type 420 stainless steel sleeve and shall be completely isolated from the pumped liquid. Pump and motor shaft shall be a solid and continuous shaft. The pump shaft shall be an extension of the motor shaft. Couplings shall not be acceptable.

7. Impeller
    a. Impeller(s) shall be minimum ASTM A-48, Class 30 cast iron, dynamically balanced, multiple vanned, enclosed or semi-open, non-clogging design having long through-lets without acute turns. Impeller(s) shall be capable of handling solids, fibrous materials, heavy sludge and other matter found in wastewater. Impeller(s) shall be keyed to the shaft, retained with an expansion ring and shall be capable of passing a minimum three- (3-) inch-diameter solid.

8. Wear Rings
    a. Enclosed Impellers
        1. A wear ring system shall be used to provide efficient sealing between the volute and suction inlet of the impeller. Each pump shall be fitted with a Nitrile coated steel or brass ring insert that

is drive fitted to the volute inlet. The pump shall also have a stainless steel impeller wear ring heat-shrink fitted onto the suction inlet of the impeller.

b. Semi-Open Impellers
    1. A replaceable cast iron suction cover shall be used to provide efficient sealing between the volute and suction inlet of the impeller. The suction cover shall be designed such that it may be adjusted to maintain working clearances and hydraulic efficiencies.

c. Volute(s) shall be made of minimum ASTM A-48, Class 30 cast iron, non-concentric design, with smooth passages large enough to pass any size solid that may enter the impeller. Minimum discharge size shall be as specified in the design criteria.

9. Protection
    a. The stators shall incorporate thermal switches in series to monitor the temperature of each phase winding. Should high temperature occur, the thermal switches shall open, stop the motor, and activate an alarm. A float switch shall be installed in the seal leakage chamber. When the float switch is activated, the motor shall stop and an alarm shall be activated. The thermal switches and seal leakage float switches shall be monitored from the pump control panel. The wires for the thermal switches and moisture sensor may be a part of a composite motor cable. If separate cables are provided, they shall be of adequate length to reach the control panel without splicing.

10. Motor
    a. The pump motor shall be shall be submitted for approval by **DCDWM**. The pump motor shall be a NEMA B design, induction type with a squirrel cage rotor, shell type design, housed in an air filled, watertight chamber. The stator windings and stator leads shall be insulated with moisture resistant minimum Class F insulation rated for three hundred eleven degrees (311°) Fahrenheit. Bolts, pins, or other fastening devices requiring penetration of the stator housing shall not be used. The motor shall be specifically designed for submersible pump usage and designed for continuous duty pumping media of up to one hundred four degrees (104°) Fahrenheit with an even one hundred seventy six (176°) degrees Fahrenheit temperature rise and capable of fifteen (15) starts per hour. The rotor bars and short circuit rings shall be made of cast aluminum. Thermal switches shall be embedded in the stator end coils to monitor the temperature of each phase winding. These thermal switches shall be used in conjunction and supplemental to external motor overload protection and shall be connected to the control panel. The junction chamber shall be sealed off from the stator housing for connection of power and pilot sensor cables. Wire

nuts or crimping-type connectors shall not be used. The motor and pump shall be produced by the same manufacturer.

b. Motor shall have a minimum service factor of 1.15. The motor shall have a voltage tolerance of plus or minus ten percent (10%). A performance chart shall be provided in the submittal showing curves for torque, current, power factor, input/output kW and efficiency and data on starting and no-load characteristics.

c. The motor shall be UL or FM certified for Class 1, Division 1, Group D environments.

d. The motor and cable shall be capable of continuous submergence underwater without loss of watertight integrity to a depth of sixty five (65) feet.

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.

f. Variable Frequency Drives (VFD) shall be used for pumps twenty (20) horsepower and greater.

11. Motor Cooling System (if Required)

a. The motor cooling jacket shall encircle the stator housing and shall provide heat dissipation for the motor regardless of whether the motor unit is submerged in the pumped media or surrounded by air. The cooling jacket shall have one fill port and one drain port. The cooling system shall provide for continuous pump operation in liquid or ambient temperatures up to one hundred four degrees (104°) Fahrenheit. Restrictions below this temperature are not acceptable.

K. Hoist

1. Materials and Installation

a. Stationary electric hoists, “jib crane,” are the only acceptable type for pump station applications. The hoists shall be of stationary type mounted on a concrete pad of sufficient size and strength suitable for the hoist and anticipated load size and weight. An example jib crane base is provided as Standard Detail P-004. As shown in P-004, number five (5) rebar with two (2) ninety- (90-) degree bends shall anchor the jib crane to the concrete pad. Dimensions shown in P-004 are minimum values; the pad may need to be larger and/or deeper depending on the pump weight and jib crane installed. Electric hoist shall be weather proof with a weather-proof cover. Electric hoists to include ratchet type manual crank. Hoists shall be epoxy coated in a three- (3-) step process using Ameron Amercoat 68HS epoxy primer, Amercoat 385 epoxy, and a finish coat of Amercoat 450HS polyurethane paint. Portable hoists shall not be allowed.

b. The hoist system shall be designed so that the pumps can be lifted from the wet well and placed on a platform or maintenance vehicle easily. The hoist and accessories shall be rated for not less than one and one-half (1.5) times the heaviest anticipated load.

c. The acceptable hoist manufacturer for use in the **County** is Thern or approved equal by **DCDWM**.

d. The hoist system shall be mounted next to the pump station. Special care shall be taken to ensure the proper length and strength of hoist cable is provided.

e. Hoist shall be installed with stainless steel anchor bolts.

f. Power for the hoist shall be supplied via the pump station control panel with a dedicated circuit breaker located on the inner panel door. See the hoist placement reference Standard Detail P-013 in **Appendix C**.

L. Piping

1. Materials and Installation

a. Diameter

1. Pipe diameter shall be larger than the diameter of the maximum solid size that is passed by the pumps present in the pump station. The minimum allowable force main size is four (4) inches and the minimum allowable solid size that the pumps shall be able to pass is three (3) inches. The pipe shall be sized to achieve a flow velocity between three (3.0) and six (7.0) fps.

b. Wet Well Discharge Piping

1. Each pump shall have a separate discharge line from the base elbow in the wet well and through the valve vault to a point three (3) feet past the exterior of discharge side of the valve and meter vault. Discharge piping shall be 316 SST conforming to the latest requirements of ANSI/AWWA C104/A21.4-85 and have flange ends. These discharge lines shall be a minimum of four (4) inches inside diameter. The inlet pipes shall be properly installed so as to form an integral watertight unit. The pipes, valves, and fittings, unless otherwise stated, shall have flanged ends. The pipes, valves, and fittings shall be epoxy lined. Bolts, nuts, and washers used to connect these flange ends shall be of type 316 stainless steel. The pipe valves and fittings shall be installed as indicated in Standard Details P-001 and/or P-013, **Appendix C**.

2. A solid sleeve flex joint shall be used between the wet well and valve vault. Check valves used on submersible pump stations shall be Val-Matic “Swing Flex” with backflow actuator “Sure Shut” swing check with backflow actuator or an approved equal by **DCDWM**.

3. The pump stations shall have plug valves installed at the following locations:

   - On the discharge pipe of each pump in the valve vault (no valve shall be located in the wet well).
   - On the vertical bypass piping connection inside the pump station fence.
   - On the force main no more than three (3) feet outside the pump station fence.

4. A valve key for plug valves shall be provided to **DCDWM** for each pump station.

5. For pump stations less than eighteen (18) feet deep, each vertical discharge pipe in the wet well shall be of one (1) piece, continuous length. If the depth of the wet well exceeds eighteen (18) feet, flange pipe connections shall be used to connect the riser pipes and 316 SST pipe supports restraining the pipe to the wall of the wet well shall be used every five (5) feet. Under no condition shall adapter flanges be permitted in the wet well. The pump discharge pipes and fittings within the wet well shall receive, after installation, two (2) coats of coal tar epoxy paint. Each coat shall be eight- (8-) mil dry thicknesses.

6. For precast concrete wet wells, pipe penetrations shall be sealed with one (1) of the following methods using resilient connectors with stainless steel clamps in accordance with ASTM C923:

   - A-Look Products, Inc.
   - Trelleborg Pipe Seals Milford, Inc. (Kor-N-Seal)
   - County-approved equal

7. For cast-in-place concrete wet wells, pipe penetrations shall be sealed with one of the following methods:

   - Cast wall pipe into concrete when the walls are being poured
   - Cast in-wall sleeve with link-seal and non-shrink grout on inside face
   - County-approved equal

8. For fiber reinforced polyester wet wells, pipe penetrations shall be made in accordance with the manufacturer's recommended procedures.

2. Yard Piping

a. A bypass connection shall be installed on the force main in the valve and meter vault so emergency bypass pumping may be performed. The bypass line shall be quick disconnect equal to the size of the force main and have

a plug valve and a check valve.

3. Force Main

a. Materials

1. Force mains shall be constructed of DIP. The DIP, appurtenances, and fittings shall conform to the latest requirements of ANSI/AWWA C151/A21.51, “Ductile Iron Pipe, and Centrifugally Cast in Metal Molds for Water or Other Liquids.” The pipes, valves, and fittings shall be epoxy lined. PVC force mains shall not be allowed.

2. The thickness and pressure class of DIP required for the installation and operating conditions during the expected service life of the force main shall be determined in accordance with the latest requirements of ANSI/AWWA C150/A21.50, “Thickness Design of Ductile Iron Pipe.” The pipe class shall be such that the manufacturer’s allowable working pressure is either a minimum of twice the design working pressure, or one and one half times the design surge pressure, whichever is greatest.

3. Fittings for DIP shall conform to the latest requirements of ANSI/AWWA C110/A21.10, “Ductile-Iron and Gray-Iron Fittings, 3 In. through 48 In. for Water and Other Liquids” or ANSI/AWWA C153/A21.53, “Ductile Iron Compact Fittings, 3 In. through 24 In. and 54 In. through 66 In., for Water Service.”

4. Force mains of DIP shall have mechanical or gasket push-on type joints. If exposed, force mains of DIP shall have flanged joints. Restrained joint DIP may be used for anchoring purposes.

   - Gaskets shall be manufactured of vulcanized natural or synthetic rubber in accordance with the latest requirements of ANSI/AWWA C111/A21.11, “Rubber Gasket Joints for Ductile Iron and Gray- Iron Pressure Pipe and Fittings.”
   - Flanged DI pipe shall conform to the latest requirements of ANSI/AWWA C115/A21.15, “Flanged Ductile Iron Pipe with Ductile Iron or Gray Iron Threaded Flanges.”

5. Consideration shall be given to the existence of or the potential for development of corrosive environments within and outside the force main. Sources of corrosion may include: acidic soils, septic wastewater, and air entrainment within the force main. Where corrosion is deemed to be a serious problem, DIP shall be provided with cathodic protection or an internal/external encasement, lining, or coating appropriate for the pipe material and situation. Such encasements, linings, and coatings shall be manufactured or applied in accordance with the appropriate ANSI and AWWA Standards.

6. A corrosion-resistant lining shall be used on all force main piping. Lining shall be Protecto 401 ceramic epoxy or approved equal.

7. The **Developer/Contractor's Design Engineer** shall conduct an assessment of the proposed route of the force main to determine whether there are potential sources of external corrosion, such as stray currents or corrosive soils. The results of the analysis shall be submitted to **DCDWM** for review and approval. If sources of potential corrosion exist, the force main shall be provided with the required means for protecting the force main from corrosion. At a minimum, force mains shall have the manufacturer's standard coal tar coating and the top quarter of the pipe shall be painted green.

4. Cleaning / Maintenance

a. A self-cleaning velocity of at least three (3.0) fps shall be provided throughout the length of the force main. This will re-suspend any solids that may have settled out. However, if the length of force main exceeds five thousand (5,000) feet, the **Developer/Contractor** shall provide the following to further prevent the accumulation of solids:

- Drain or blow-off valves shall be installed at all low points in the force main. Such valves shall be connected to an available entry point into the wastewater collection system, provided with a connection for a vacuum pumper truck, or designed with some other method to prevent an intentional discharge of wastewater during their operation.
- Flushing ports along the length of the force main as well as a water supply of sufficient quantity and pressure shall be installed. Such ports shall be connected to an available entry point into the wastewater collection system, provided with a connection for a vacuum pumper truck, or designed with some other method to prevent an intentional discharge of wastewater during their operation. Pigging device launching and retrieval stations shall be of a size sufficient to clean the inside diameter of the force main.

5. Slope

No segments of the force main can have zero (0) slopes, to limit the accumulation of gasses. Low points shall also be avoided to prevent the accumulation of solids. High points shall have air release combination valves as determined by specifics of the design.

6. Receiving Manhole

a. The receiving manhole shall be a polymer concrete manhole. If it is an existing manhole, other methods shall be reviewed for approval by **DCDWM**. The receiving manhole shall have a four- (4-) inch vent with an approved activated carbon filter canister attachment to control odor.

7. Anchorage

a. Pipe under pressure shall be adequately anchored to resist thrusts that may develop at bends, tees, plugs, and at any other location where a change in flow direction occurs.

b. Such anchoring shall be provided through the use of concrete thrust blocking. Restrained joint pipe shall also be used, and calculations shall be submitted to **DCDWM** by the **Developer/Contractor.**

c. Concrete thrust blocks shall be located between the fitting to be anchored and undisturbed soil material. Appropriate thrust reaction block bearing areas shall be calculated based not only on the maximum expected force but also on the soil material. Concrete thrust blocks shall have a minimum compressive strength of three thousand (3,000) pounds PSI. Thrust blocking details are provided in **Appendix E**, Standard Details G-001, G-002, and G-003. Pipe thrust restraints shall be considered for pipelines above ground as well. Thrust restraint installation with tie-rod requirements are provided in Standard Detail G-008, **Appendix E**.

d. Self-restrained joints or joints restrained with tie rods and clamps shall both be acceptable. In both cases, component parts shall either be manufactured of corrosion-resistant materials or coated liberally with a corrosion-retarding product.

e. Anchoring devices shall be designed to withstand force main pressures of at least twenty-five percent (25%) greater than the maximum pump shut-off head, plus an allowance for water hammer and an appropriate factor of safety.

8. Valves and Appurtenances

1. Check Valves

   a. Materials and Installation

   - The check valves shall be non-clog. There shall not be outside levers, weights, springs, dash pots, or other accessories required. The ball shall be hollow steel with an exterior of Vulcanized Buna-N; it shall be resistant to grease, petroleum products, animal and vegetable fats, diluted concentrations of acids and alkalines (pH 4-10), tearing, and abrasion. The body and cover shall be of cast iron, meeting ASTM A126 Class B. Flange drilling shall be according to AISI B16.1, Class 125.

   - The valves shall consist of three (3) components; body, cover, and ball (one moving part). The design of the valves shall be such that it keeps solids, stringy material, grit, rags, etc., moving without the need for back flushing. In the operating mode, the ball shall not significantly impede flow through the valve, and shall provide full flow equal to the nominal size of the valve.

b. Acceptable check valve manufacturers are DeZurik, or an approved equal by **DCDWM.**

c. Furnish and install two (2) or more ball check valves, one (1) for each pump discharge.

d. When a double pump station is constructed, a check valve shall be installed on each force main, five (5) feet upstream of the joining wye or tee. This shall allow for the isolation of each pump station. Check valve shall be installed inside the valve and meter vault.

2. Plug Valves

a. Materials and Installation

- Plug valves shall be non-lubricated, eccentric type, resilient seated type with flanged joint ends, conforming to the latest revision of ANSI/AWWA C517-05. Plug valves shall be manufactured by DeZurik, or approved equal. Plug valves shall be installed with the below specified actuator type, with the valve seat in the correct orientation with respect to flow direction. Valves shall open by turning to the left, (counter-clockwise), when viewed from the stem.

- The buried valves shall have mechanical joint ends conforming to ANSI/AWWA C111/A21.11, and all exposed valves measuring four (4) inches in diameter and larger shall have Class 125 flat-face flanged ends, at a minimum, conforming to ANSI B16.1 or ANSI/AWWA C110/A21.10.

- The plug valves shall be 100 percent port eccentric. Valve pressure ratings, body flanges, and wall thicknesses shall be in full conformance with ANSI B16.1, latest revision. Valves shall seal leak-tight against full-rated pressure in both directions. Valve seats shall be tested to provide leak tight shut off to one hundred and seventy five (175) PSI for valves through twelve (12) inches, with pressure in either direction. In addition, a hydrostatic shell test shall be performed with the plug open to a pressure twice that of rating specified above to demonstrate overall pressure integrity of the valve body. For valves measuring fourteen (14) inches or more in diameter, the pressure shall be 150 psig bodies.

- For specific installation locations where the TDH plus the surge pressure exceeds the minimum pressure ratings above, Class 250 flat-face flanged ends and a four hundred 400 PSI for three- (3-) inch to twelve- (12-) inch valves) or three hundred (300) PSI for fourteen- (14-) inch and greater valves body shall be provided. Plug valves with one hundred seventy five (175) PSI bodies and Class 125 flat-face flanges shall have the following face-to-face dimensions.

Nominal Valve Diameter (inches)	Lay Length (inches)
4	9.0
6	10.5
8	11.5
10	13.0
12	14.0

- Valve bodies shall be constructed of high-strength cast iron conforming to ASTM A126 Class B or ductile iron, confirming to ASTM A536, Grade 64-45-12, latest revisions. Valve seats shall be formed by cast bodies with raised eccentric seats which have a corrosion-resistant welded-on overlay of not less than ninety percent (90%) pure nickel on all surfaces contacting the plug face or valve seats shall be replaceable 316 stainless steel seats. Valve seats shall be in accordance with AWWA C504 and AWWA C507, latest revisions. Seats composed of thermosetting epoxy or fusion bonded nylon shall not be acceptable. Screwed-in seats shall not be acceptable.

- Valves shall be furnished with resilient faced plugs with neoprene facing, suitable for use with wastewater; plug facings composed of natural rubber, Viton, or Nitrile are not acceptable. Valves shall be furnished with replaceable, permanently lubricated, stainless steel or fiberglass backed woven Teflon fiber, sleeve-type bearings in the upper and lower plug journals. Plug stem bearings shall comply with AWWA C504 and C507, latest revisions. Valves shall be bolted bonnet design. Valve shaft seals shall be in accordance with AWWA C504 and AWWA C507, latest revisions. The exposed valve nuts, bolts, springs, washers, and the like shall be Type 316 stainless steel. Installation shall be per manufacturer's recommendations.

- Radial shaft bearings shall be permanently lubricated, sleeve-type, sintered, oil-impregnated bearings composed of either Type 316 stainless steel in accordance with ASTM A-743, Grade CF-8M, or oil-impregnated bronze in accordance with ASTM B-127. Non-metallic radial thrust bearings shall NOT be acceptable. Thrust bearings/washers shall be composed of Type 316 stainless steel, Teflon, Nylon 11, or Nylatron. Shaft seals shall be either the U-cup type or multiple V-ring type and shall be composed of either EPDM or Neoprene; shaft seals shall be self-adjusting and repackable without removing the bonnet or actuator from the valve or removing the valve from the line. Plug valve and connecting pipe shall have the capability to be pigged without the use of special equipment.

- Plug valves and operators shall be installed according to the manufacturer's recommendations for conveying fluids with high solids concentrations. For horizontal installations, the plug valve shall be

installed so that the plug face is pointing upwards when the valve is open and the plug face is facing the pump when the valve is closed. For vertical installations, the plug valve shall be installed so that the plug face is pointing to the side when the valve is open and the plug face is pointing upwards when the valve is closed. The plug valves shall be installed horizontally with right angle operators pointing up to allow operation from grade.

e. Above ground valves six (6) inches in diameter and smaller shall have manual lever operators, unless otherwise approved by **DCDWM** and specified or noted on the Drawings.

f. Above ground valves eight (8) inches in diameter and larger shall be manually hand wheel operated through totally enclosed worm gear actuators, unless otherwise approved by **DCDWM** and specified or shown on the Drawings. Manual operators for plug valves mounted above six (6) feet from the operating floor shall be equipped with worm gear chain wheel actuators. The buried valves shall be provided with totally enclosed worm gear actuators, two- (2-) inch-square AWWA operating nuts, and valve boxes. Buried valve operators shall be extended to within six (6) inches of grade. The valves shall be provided with mechanical travel stops for the open and closed positions and shall rotate ninety (90) degrees from fully open to fully shut. Gear actuators shall be designed to produce the required operating torque with a maximum rim pull of eighty (80) pounds on a hand wheel/chain wheel and with a maximum input of one hundred fifty (150) foot-pounds on two- (2-) inch operating nuts. Actuator components between the input and the open and closed position stops shall be designed to withstand, without damage, a rim pull of two hundred (200) pounds for hand wheels / chain wheels and an input torque of three hundred (300) foot-pounds for two-(2-) inch operating nuts.

g. Valves shall be either directly cast with or provided with a corrosion-resistant nameplate, stating, at a minimum, the valve serial number, manufacturer, size, maximum shutoff pressure, and design pressure rating. The seat end shall be clearly indicated on the valve exterior relative to half of the body containing the plug/seat interface.

h. The plug valve manufacturer shall submit certified Shop Drawings showing the principal dimensions, construction, and materials used for all parts of the valve and actuator; certified Shop Drawings shall clearly indicate the minimum dimensions encountered within the valve port when the plug valve is fully open. Plug valve manufacturer shall certify that the plug valve(s) furnished are capable of operating in continuous duty service under the pressure and flow conditions at each installation location. Prior to valve shipment, plug valve manufacturer shall provide a written affidavit to the **Developer/Contractor** attesting that the plug valve(s) furnished comply with the requirements of the **DCDWM** specifications, comply with the applicable portions of ANSI/AWWA

C517-05, and match what is shown on the Shop Drawings. Each valve shall be hydrostatically tested and tested for bubble tightness at the factory after the operator has been mounted and adjusted, and manufacturer shall provide written certification of test conformance to the **Developer/Contractor** prior to valve shipment.

i. The internal and external ferrous components and surfaces of the valves, with the exception of stainless steel and finished or bearing surfaces, shall be shop painted with two (2) coats, ten (10) mils minimum dry film thickness, of the manufacturer's premium epoxy for corrosion resistance. Damaged surfaces shall be repaired in accordance with the manufacturer's recommendations.

j. Interior Valve Lining

- The interior ferrous surfaces of the plug valve that will have contact with wastewater, except the valve seating surfaces, shall be coated with a factory-applied, fusion-bonded, or thermosetting epoxy coating in accordance with AWWA C550, latest revision. Coating shall be free of holidays (missed or unpainted areas), with a minimum thickness of twelve (12) mils dry film thickness (DFT). Surfaces shall be clean, dry, and free from rust, oil, and grease before coating.

3. Plug Valve Actuators

a. Plug valves installed in valve vaults shall have mechanical gear actuators with hand wheel operators designed for submerged service.

- Plug valves buried underground shall have gear actuators with a two- (2-) inch-square nut operator designed for buried and submerged service. The plug valves shall have electrical operators for valves above twelve (12) inches, manufactured by Rotork, Limit Tork or approved equal by **DCDWM**.

b. Actuator shall clearly indicate valve position for above ground and valve vault installations and an adjustable stop shall be provided to set closing torque. Actuator shall be capable of withstanding an over-torque without damage up to three hundred (300) foot-pounds for hand wheel operators, or up to four hundred and fifty (450) foot-pounds for two- (2-) inch nut operators. Actuator mounting brackets for submerged service shall be totally enclosed and shall have gasket seals. The exposed valve nuts, bolts, springs, washers, and the like shall be Type 316 stainless steel.

4. Isolation Valves

a. Materials and Installation

- On force mains exceeding five thousand (5,000) feet, isolation valves shall be installed to facilitate future repairs. Valves shall be provided at a maximum spacing of every two thousand five hundred (2,500) feet and as directed by the **DCDWM**.

- The isolation valves shall have electrical operators for valves above twelve (12) inches, manufactured by Rotork, Limit Tork or approved equal by **DCDWM**.

- The isolation valves shall be located inside a standard valve box with a valve marker. The valve marker shall clearly denote "Sanitary Sewer Force Main."

- The isolation valve shall be located outside the fenced pump station area, minimum five (5) feet, from the fence.

- Isolation valves shall be eccentric 100 percent full plug valves.

5. Air Release/Vacuum Valves
   a. Materials and Installation
      - Air release/vacuum valves (combination valves) exhaust pockets of air in the force main accumulated during operation of the pump station and to exhaust or admit air during the filling or draining of the force main.

      - Acceptable automatic air release/vacuum valve manufacturers are Val-Matic Valve & Manufacturing Corporation, DeZurik/APCO, or approved equal by **DCDWM**.

      - Provide automatic air release/vacuum valves with flood protection in areas within the one hundred- (100-) year floodplain or any areas where flooding is anticipated to occur.

      - Automatic air valves/vacuum valves shall be of the quick-opening, slow-closing type to prevent the development of hydraulic surge conditions.

      - Automatic air release/vacuum valves shall be provided at all high points to prevent air locking of the force main and at locations along the force main where sub-atmospheric pressures or column separation may occur. The route of the force main shall be such that the number of air release/ vacuum valves shall be minimized to the greatest extent possible. At the **County's** discretion the force main bury depth shall be varied up to a maximum of ten (10) feet where deemed necessary to eliminate air release valves. One spare air release/ vacuum valve shall be provided for every five (5) air release/vacuum valves installed. A minimum of one (1) spare valve shall be provided per force main.

      - The air release/vacuum valves shall be located inside a concrete vault/manhole. The vault shall be appropriately sized for the installation and maintenance of the air release/vacuum valve and shall conform to these Design Standards. Approved air release/vacuum valve installation procedures are provided in Standard Detail P-017,

Appendix C. Air release valve manholes shall be installed such that the air release valve can be worked on and removed without the need to pull off the top of the manhole.

- The valves shall have an extended valve body, two- (2-) inch cleanout, one- (1-) inch drain with stainless steel ball valve, one half- (½-) inch outlet with stainless steel ball valve with hose connection, and a minimum two- (2-) inch inlet.

9. Pressure Gauge

1. Materials and Installation
   a. Pressure gauge sizing shall take into consideration the current discharge pressure, flow ranges, and future capacity of the pump station.

   b. Gauge gradation shall not be more than one hundred and twenty percent (120%) of the maximum pressure anticipated at the pump station.

   c. The pressure gauge tap shall have Type 316 diaphragm-mounted seals. Accepted diaphragm seal manufacturers are Ametek, Ashcroft, and Trerice.

   d. Pressure gauge face shall be four (4) inches minimum.

   e. Acceptable pressure gauge manufacturers are Ametek, Ashcroft, and Trerice. The acceptable isolation ring manufacturer is Onyx or approved equal.

   f. Pressure gauges shall be installed within the valve vault. Installation of wafer-style isolation ring of the same diameter as the force main piping shall be installed to facilitate the installation of a pressure gauge. The pressure gauge tap with diaphragm-mounted seals shall be located on the side of each pipe in the valve vault. See Standard Detail P-013 in **Appendix C** for placement. Pressure gauge face shall be installed facing up toward the access hatch; the pressure gauge shall be easily read by looking down into the valve vault. The pressure gauge shall be connected to the telemetry system via the control PLC for off-site monitoring.

10. Flow Meter

1. Material and Installation
   a. Meter sizing shall take into consideration the current capacity, flow ranges, and future capacity of the pump station.

   b. The acceptable flow meter manufacturers are Endress & Hauser and Krohne or approved equal by **DCDWM**.

   c. The electromagnetic induction flow meter shall generate a voltage linearly proportional to flow for full-scale velocity settings from one (1) to thirty three (33) feet/second. Standard accuracy shall be +/- two percent

(2%) of rate and +/- two percent (2%) of full-scale output for all meters.

d. The meters shall meet the following requirements:

- Connection type: Flanged 150# ANSI
- Tube Material: 316 SS
- Liner Material: Polyurethane
- Electrode Material: 316 SS
- Enclosure Class: NEMA 6P
- Empty Pipe Detection: Yes
- Fluid: Wastewater
- Flow Units: US Gallons (GPM)
- Temp (Max/Norm/Min): -5 to +140° F
- Electronics Mounting: Remote
- Remote Distance: 650 feet
- Type Span Adjustment: touch control/local
- Power Supply: 110 VAC
- Transmitter Output: 4-20mA and Pulse
- Transmitter Digital Communication: Highway Addressable Remote Transducer (HART)
- Aux. Input: Status input available for totalizer reset
- Display: Shall be remote, easy to be read without accessing the vault.

e. The flow meter shall be capable of measuring flow bi-directionally. The flow meter shall be totalizer capable for forward, backwards, and net (forward and backward) flow. The flow meter shall be capable of displaying instantaneous flow rate, as well as net totalizer value locally on its output screen. The flow meter shall provide local operator HMI for configuration of parameters and reading of data not normally displayed of its screen.

f. A properly sized magnetic flow meter shall be installed on the force main inside the valve and meter vault.

g. A bypass around the flow meter shall be provided for use during meter maintenance and repair. Two (2) isolation valves shall be installed for complete isolation of the flow meter from the system: one (1) on each side of the flow meter. Flow meters shall have an adequate straight run of pipe both upstream and downstream of the meter in accordance with the manufacturer's recommendations. Force main shall be straight a distance equal to five (5) times the nominal pipe diameter before and after the flow meter. The manufacturer's recommendation for proper installation shall

be followed.

h. The flow meter shall be connected to the telemetry system via the control PLC for off-site monitoring.

11. Electrical Power and Distribution

1. Electrical and Control Enclosure Pad

   a. Electrical and control panel slab shall extend three (3) inches above the pump station slab.

2. General Electrical System Requirements

   a. Electrical systems for pump stations shall be designed and installed in strict conformance with NFPA 70 "National Electric Code," NFPA 820 "Standard for Fire Protection in Wastewater Treatment and Collection Facilities," ANSI, as well as all applicable federal, state, and local codes. Underground and above ground power service installation is presented in Standard Detail P-002, respectively, in **Appendix C**.

   b. Three- (3-) phase power shall be provided for all pumps. Phase converters or single-phase power shall not be used. The power source may be 120/208V, 120/240V, or 480/277V.

   c. A main circuit breaker shall be used, and a fused main disconnect shall not be allowed on the main power feed. The main circuit breaker shall meet the following requirements:

      - Be of a type that can be locked in both on and off positions.
      - The switch shall be Underwriters Laboratory (UL) listed for service entrance.
      - The enclosure shall be NEMA 4 X 316 SS.
      - The switch shall be mounted inside the fenced area of the station.
      - Breaker shall have Long, Short, and Instantaneous (LSI) adjustment and ground fault protection as required by the NEC.

   d. The cabinet shall be designed to absorb vibrations or mechanical movement from the motor starts or other active equipment. These movements shall not cause undue vibrations in the control panel. As a minimum, starters of any size three (3) or greater shall include additional stiffeners or other vibration dampening equipment.

   e. Each pump and motor unit shall be provided with a separate electrical supply, motor starter, and alarm sensors, as well as electrical and instrumentation/control systems and components.

      - Electrical and instrumentation/control systems and components shall be located such that they may be disconnected from outside the wet well.

- Cables and conduits shall be provided with seals that are both water-tight and gas-tight, shall be protected from corrosion, and shall allow separate strain relief.

f. The main power feed to all pump stations shall be equipped with an above-grade, fused disconnect switch. The switch shall:

- Be of a type that can be locked in the on or off position.
- The switch shall be UL-listed for service entrance.
- The enclosure shall be NEMA 4X stainless steel and have a lockable knob on the cover as the opening mechanism.
- The switch shall be mounted inside the fenced area of the pump station.

g. The **Developer/Contractor** shall supply a fire extinguisher in a weather-guard enclosure.

h. The incoming electrical service shall have surge protection sized according to size of service. The surge suppressor shall have the following characteristics:

- The surge suppressor shall be in a NEMA 4X 316 stainless steel enclosure and shall provide line-to-line, line-to-neutral, line-to-ground, and neutral-to-ground protection modes as applicable for the power service.
- The surge suppressor shall be provided with a disconnect. Minimum surge current rating shall be 100-KA per mode, 200-KA per phase per NEMA LS-The surge suppression system shall be duty cycle-tested to survive 20-KV, 10-KA, IEEE C62.41 category surge current with less than five percent (5%) degradation of clamping voltage. The surge suppressor shall have minimum repetitive surge capacity of two thousand five hundred (2,500) impulses per mode and five thousand (5,000) impulses per phase. Status indicating lights and form “C” dry alarm contacts shall be provided.
- The surge suppressor shall be UL-listed and labeled under UL1449 and UL1283.
- The surge suppressor shall have up to 0-6 Gigahertz (Ghz) operation.
- The surge suppressor shall have SMA female connections on either end.
- The surge suppressor shall have 50 Ohm impedance.
- The surge suppressor shall have <0.9 bD insertion loss.
- The surge suppressor shall have an operating temperature range of -40˚F to 185˚F.

- Acceptable manufacturers include Liebert, Current Technology, Innovative Technology, or an approved equal by **DCDWM**.

i. A suppressor on one hundred twenty-volt (120V) AC power supply connections shall meet the following:

- First-stage high-energy metal oxide varistor and second stage bipolar silicon avalanche device shall be separated by series independence. The suppressor shall be tested and rated for a minimum of fifty (50) occurrences of IEEE 587 Category B test waveform.
- Clamping voltages shall be three hundred fifty (350) volts or less for the first stage, two hundred ten (210) volts or less for second stage.
- Response shall be five (5) nanoseconds maximum.
- Recovery shall be automatic.
- Continuous operation: five (5) amps minimum at one hundred thirty (130) volts AC for suppressor on power supply for one (1) four- (4-) wire transmitter or receiver, twenty (20) amps minimum otherwise.
- Temperature range shall be -4 degrees Fahrenheit to + 185 degrees Fahrenheit.
- Acceptable manufacturers include EDCO HSP-121, Phoenix Contact FSP-1, Schneider Electric TVS120LC, or approved equal.

j. A suppressor on analog signal lines shall meet the following:

- First-stage high-energy metal oxide varistor and second-stage bipolar silicon avalanche device separated by series impedance. Grounding wire, stud, or terminal provided.
- Test waveform: Linear eight- (8-) microsecond rise in current from zero (0) amps to a peak current value followed by an exponential decay of current reaching for half the peak value in twenty (20) microseconds.
- Surge rating: Suppressor tested and rated for a minimum of fifty (50) occurrences of two thousand- (2,000-) amp peak test waveform.
- DC clamping voltage: Twenty to forty percent (20-40%) above operating voltage for circuit. Clamping voltage tolerance less than plus or minus 10 percent (10%).
- Response shall be five (5) nanoseconds.
- Recovery shall be automatic.
- Maximum loop resistance shall be eighteen (18) ohms per conductor.

- Temperature range shall be -4 degrees Fahrenheit to + 185 degrees Fahrenheit.
- Approved manufacturers include EDCO PC-642 or SRA-64 Series or equal.

k. Prior to any pump station approval, the appropriate power company shall notify **DCDWM** at the Snapfinger Creek Advanced Wastewater Treatment Facility when three- (3-) phase power and voltage is available to the site. In the event that three- (3-) phase power is not readily available to the site, approval for use of a phase converter may be granted by **DCDWM** based on the specific site conditions. Single-phase motors shall not be allowed.

l. Communication Methods

- The Pump Station Control Panel (PSCP) shall be evaluated for **DCDWM's** choice of communication by the **Developer/Contractor**. Using the actual location and finished floor elevation of the PSCP location, the **Developer/Contractor** shall conduct a site survey to determine the Received Signal Strength Indicator (RSSI) (ideal value of -75 dBm to -100 dBm) on 3G modems or most current compatible technology using the carrier AT&T or approved equal by **DCDWM.** Interference with trees, construction, mountains, or simply distance from the tower could be problematic. The results of the site survey shall be submitted to the **DCDWM** Inspector, who will in turn provide it to the **DCDWM** Pump Station SCADA Manager for determination about the feasibility of cellular communication at the pump station site. After the conclusion of the field site survey, the **DCDWM** Pump Station SCADA Manager will make a determination as to whether cellular communication is feasible.
- If cellular communication is determined to be feasible, the **Developer/Contractor** shall include a cellular modem, antenna, and other necessary equipment for successful communication with the PSCP. The **Developer/Contractor** shall supply, install, and configure the equipment to achieve cellular communication satisfactory to the **County**. As a minimum, this equipment shall include a cellular modem, antenna, antenna cable, and antenna surge suppressor.
- If cellular communication is determined to be unavailable, the **Developer/Contractor** shall include an Ethernet modem in the panel. The Ethernet modem shall be an Allen Bradley 9300-RADES or approved equal. A telephone line shall be installed from the telephone system interface to the panel.

m. Pump Station Controls Electrical Requirements

- The **Developer/Contractor** shall furnish and install one and one quarter- (1-¼-) inch conduit connecting the pump station control panel to the generator transfer switch and to the generator control

panel. The **Developer/Contractor** shall install two (2), ten (10) conductor shielded cables in the one and one quarter- (1-¼-) inch conduit to the generator, and one (1), ten (10) conductor shielded cable in the one and one quarter- (1-¼-) inch conduit to the transfer switch. The ten (10) conductor cables shall be installed with eight (8) feet of slack in the pump station control panel, and four (4) feet of slack in the generator and transfer switch panels.

3. Electrical Grounding System

   a. A grounding system shall be installed as per the NEC, IEEE applicable and local codes and ordinances. An underground perimeter cable grounding system shall be installed with connections to at least the following equipment:

      - Wet well cover
      - Vault cover
      - Control panel mounting rack
      - Main disconnect switch
      - Pump station fence

   b. Bare solid copper wire (#4) is to be connected to the wet well cover and the valve and meter vault cover by way of an approved cad weld. Wire (#4) shall also be poured into the top slab of the wet well and the valve and meter vault at the foundry with a twelve- (12-) inch stub-out for field connection. Under no circumstances shall wire be allowed to run across the outside top slabs. A minimum of two (2) test wells shall be installed at the location determined by the **Developer/Contractor's Design Engineer** and approved by **DCDWM**.

12. Generator

1. General Requirements

   a. The engine generator set shall be a factory-assembled unit that is a standard production model with existing torsional analysis data. Mixing and matching engine and generator by a third-party supplier is not acceptable. The engine and generator shall be directly connected with a flexible coupling and shall be free from injurious torsional or other vibration.

   b. The pump stations shall have continuous standby power. The pump station shall be connected to an automatically activated stand-by power generation source with automatic transfer switch and reset. Design and installation of the continuous standby power shall conform to the requirements of NFPA 110, NFPA 30, NFPA 37, and all other applicable codes and ordnances. Transfer switch shall be rated for one hundred percent (100%) of full load of the main disconnect switch. The switch shall be provided with indicators for all phases of operation and

be equipped with a fully programmable timer for exercising the equipment. The switch shall be selectable for load or no load.

c. The acceptable standby power generator manufacturers are Caterpillar, Cummings, Kohler or approved equal by **DCDWM**.

d. A one- (-1) year (from the date of commissioning) comprehensive warranty shall be provided by the manufacturer to include parts and labor.

e. Generators shall meet all applicable, current U.S. Environmental Protection Agency (USEPA) air emission standards.

f. Generators shall be supplied with all auxiliary systems necessary for operation (i.e., batteries, battery charger, block heater, etc.).

g. The generator shall be housed in a weatherproof enclosure. Quiet site soundproofing shall be provided to reduce noise to sixty eight (68) db at a distance of twenty (23) feet for natural gas powered generators and seventy (70) db at a distance of twenty (23) feet for diesel-powered generators.

h. The generators shall be equipped with the quiet-run package.

i. Outdoor weather-protective housing with critical grade exhaust muffler shall be installed. The housing shall have hinged side access doors and a rear control door. The doors shall be lockable. The sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color. Vibration isolators as recommended by the generator set manufacturer shall be provided. The generator shall be mounted far enough away from obstructions to allow all doors to be opened ninety degrees (90˚). The conduits and gas lines shall be installed underground.

j. Generators shall be properly grounded. A generator ground grid shall be provided. Design of the grounding system shall comply with NEC, IEEE and all other applicable codes and ordnances.

k. The generators shall be installed to operate on natural gas, if available. The gas piping and connecting equipment shall be installed in accordance with the Georgia State Amendments to the Standard Gas Code, latest edition. The gas supply lines shall include a drip loop as well as all other equipment required for a safe and complete hookup. If gas is unavailable, a letter of exception shall be obtained from **DCDWM**. **Developer/Contractor** shall coordinate with the natural gas utility company for appropriate gas meter size based on peak gas generator consumption.

l. Generators above one hundred twenty five (125) kilowatts (kW) shall be diesel powered with one hundred (100) gallons minimum fuel storage

capacity or twenty four- (24-) hour operating time, whichever is greater. Fuel storage shall be accomplished by the use of corrosion-resistant, double-wall sub-base fuel tank only; no underground fuel storage shall be allowed. A leak detection device shall be provided in the interstitial space for sensing fuel leakage. The device contact shall be connected to the generator control panel terminals for telemetry. The diesel engine generator set shall be bermed and shall be designed to contain 110% of fuel tank volume. Berm volume calculations shall be shown on pump station submittal drawings.

m. Voltage regulation for step load from no load to rated load shall be within +/- four percent (4%) of rated voltage for units up to and including twenty five (25) kW and within +/- 5 percent (5%) or percent of rated voltage for units rated thirty (30) kW or higher. Voltage variation shall be within +/- 1 percent (1%) of the mean value for constant loads, from no load to rated load.

n. Generators shall be capable of powering the pump motors' starting current, electrical systems, instrumentation/controls and alarm systems, and other auxiliary equipment as may be necessary to provide for the safe and effective operation of the pump station.

   - Generators shall have the appropriate power rating to start and continuously operate under any connected load.
   - Generators shall be provided with special sequencing controls to delay lead and lag pump starts. Pumps shall start with a minimum fifteen- (15-) second lag time. Simultaneous starting of two (2) pumps shall be prevented.
   - A connection shall be provided so that the generator can power an external, portable load bank for maintenance purposes.

o. Generators shall be protected from operating conditions that would result in damage.

p. Generators shall be capable of shutting down and activating the audible and visual alarms and telemetry if a damaging operating condition develops.

q. Individual dry contacts shall be provided at the generator via optional relay output board to be used for connection to the PLC. Contacts shall be provided to remotely indicate the following:

   - Generator running
   - Generator fault
   - Generator warning
   - Low fuel level
   - Overrun condition

- High engine temp
- Low engine temp
- Low coolant
- Low oil pressure
- Fuel tank rupture basin alarm
- Not in auto

r. Generators shall be protected from damage when restoration of the power supply occurs.

s. Outdoor weather-protective housing with critical grade muffler shall be installed and located within the housing. The generating unit shall be adequately ventilated. The housing shall have hinged side access doors and a rear control door. The doors shall be lockable. The sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color. Vibration isolators as recommended by the generator set manufacturer shall be provided.

t. The generator is to be load-tested at one hundred percent (100%) full load onsite for a period of four (4) hours.

u. Generators shall be placed on a reinforced concrete pad to be designed by the **Design Engineer** based on the specific generator selected. The generator pad is depicted in Standard Detail P-008, in **Appendix C**.

v. Six (6) complete sets of O&M manuals and keys shall be provided to **DCDWM** for the generator automatic transfer switch.

w. A demonstration that the generator is capable of providing the required power with all installed pumps operating simultaneously shall be performed at the time of startup.

2. Automatic Transfer Switch

a. The standby power system shall include an automatic transfer switch to automatically start the generator in the event of loss of any phase of power, reverse power, or low voltage brownout. The standby power transfer switch shall not engage until after thirty (30) seconds of continuous power loss, or low voltage, occurs.

b. Automatic transfer switch shall be rate for one hundred percent (100%) of full load. The transfer switch shall be provided with indicators for all phases of operation and be equipped with a fully programmable timer for exercising the equipment.

c. The automatic transfer switch shall be configured to switch back on when power is restored to the pump station.

d. Automatic transfer switches shall be in a NEMA 4X stainless steel enclosure. Acceptable transfer switch manufacturers are Onan or approved equal. Individual dry contacts shall be provided at the transfer switch via an optional Onan relay output board to be used for connection to the PLC. A schematic depicting the transfer switch and generator run alarm is provided in Standard Detail P-021, **Appendix C**. Contacts shall be provided to remotely indicate the following:

- Source 1 available
- Source 1 connected
- Source 2 available
- Source 2 connected
- Transfer switch normal position
- Transfer switch emergency position
- AC line failure
- High battery voltage
- Low battery voltage

13. Telemetry

1. Every pump station shall be equipped with a telemetry system. The telemetry equipment shall be provided and installed by the **Developer/Contractor** in complete working order. The telemetry system shall contact personnel capable of initiating a response to a pump station alarm condition twenty four (24) hours per day, three hundred and sixty five (365) days per year.

2. The pump stations shall be equipped with Telog or approved equal Remote Transmitting, or Telemetry, Unit (RTU). The RTU shall be furnished and installed by the **Developer/Contractor**. A schematic of the I/O RTU connections shall be provided and posted on the inside of the enclosure door. RTU connections shall follow the requirements depicted in Standard Details P-019 and P-020, in **Appendix C**. A legend for electrical acronyms and terms is provided in Standard Detail P-018, **Appendix C**. The RTU unit shall be installed inside its own NEMA 4X 316 stainless steel enclosure. The RTU shall include the following items bundled as the Telog RS-33u-PLC Remote Telemetry Unit package:

   a. Telog RTU model number RS-33u or equivalent

   b. Latest version CPU module

   c. Multi-Channel Recorder (Remote Data Acquisition) Telog Model No. RS-3314; Mixed I/O: 8AI, 6DI

   d. Model No. 1 x RTT Cellular Packet Modem (eight hundred, 800 Mhz)

   e. Telog M-323S communication interface module

   f. Telog A-PMA Pole Mount Antenna – Omni directional one quarter- (¼-)

wavelength dipole antenna with three- (3-) db gain from CDMA/1xRTT cellular option; includes required length amount of coax cable and mounting brackets

g. Power Source: Model No. AC12B4, AC to twelve- (12-) volt DC battery backup and alarm feature when loss of AC power is detected

h. Battery

i. Door entry switch

j. Keyed door lock

3. **Developer/Contractor** shall be responsible for complete wiring and programming of the PLC and RTU.

4. **Developer/Contractor** shall provide a field O&M manual for the RTU and control equipment.

5. Human Machine Interface (HMI) Requirements

6. MR Systems shall complete required HMI changes. The **Developer/Contractor** shall assume the cost of these changes.

7. Relays:

   a. Relay mounting shall be plug-in-type socket.

   b. Relay enclosure shall be a furnished dust cover.

   c. Socket type shall be a screw terminal interface with wiring.

   d. Socket mounting shall be on the rail and shall provide hold-down clips.

   e. Signal switching relay shall include the following:

      - Type: Dry circuit
      - Contact Arrangement: two (2) Form C contacts
      - Contact Rating: ten (10) amps at twenty eight (28)V DC or one hundred twenty (120)V AC
      - Contact Material: Gold or silver
      - Coil Voltage: As noted or shown
      - Coil Power: 0.9 watts (DC), 1 .2VA (AC)
      - Expected Mechanical Life: ten million (10,000,000) operations
      - Expected Electrical Life at Rated Load: one hundred thousand (100,000) operations
      - Indication Type: Neon or LED indicator lamp
      - Seal Type: Hermetically sealed case

- Manufacturer: Potter and Brumfield; Allen Bradley, Siemens or Cutler Hammer or approved equal

f. Control circuit switching relay, non-latching shall include the following:

- Type: Compact general purpose plug-in
- Contact Arrangement: two (2) Form C contacts
- Contact Rating: ten (10)A at twenty eight (28)V DC or two hundred forty (240)V AC
- Contact Material: Silver cadmium oxide alloy
- Coil Voltage: As noted or shown
- Coil Power: 1.8 watts (DC), 2.7VA (AC)
- Expected Mechanical Life: ten million (10,000,000) operations
- Expected Electrical Life at Rated Load: one hundred thousand (100,000) operations
- Indication Type: Neon or LED indicator lamp
- Push-to-test button
- Manufacturer and Product: Allen Bradley 700-HC14A1, or approved equal

g. Control circuit switching relay, latching shall include the following:

- Type: Dual coil mechanical latching relay
- Contact Arrangement: two (2) Form C contacts
- Contact Rating: ten (10)A at twenty eight (28)V DC or one hundred twenty (120)V AC
- Contact Material: Silver cadmium oxide alloy
- Coil Voltage: As noted or shown
- Coil Power: 2.7 watts (DC), 5.3VA (AC)
- Expected Mechanical Life: five hundred thousand (500,000) operations
- Expected Electrical Life at Rated Load: fifty thousand (50,000) operations
- Manufacturer: Potter and Brumfield, Siemens, Allen Bradley, or approved equal

8. Ethernet Switch:

a. Provide an eight- (8-) port Ethernet switch for connection between automation equipment and telemetry connection

b. Ports: eight (8) RJ-45 10/100 megabytes per second (Mbps) 10/100BaseTX (auto-sensing; Full or Half Duplex)

c. Rugged industrial design
d. DIN-RAIL-mounted
e. Environmental specifications: -40° Fahrenheit to 158° Fahrenheit
f. Redundant power inputs
g. Unmanaged operation
h. Status LEDs: Power on and link/activity
i. Manufacturer and Model: N-TRON 308TX or equal approved

9. Cellular Modem:

a. Digi Connect WAN 3G – AT&T (DC-WAN-T302A)
b. Ports – one (1) Rs-232 DB-9; Up to two hundred thirty (230) kilobytes per second (Kbps) throughput; hardware and software flow control
c. RJ-45 ten/ten thousand (10/100) Mbps 10Base-T (auto-sensing, full or half duplex
d. USB Type A connector
e. Network Protocols – UDP/TCP, DHCP
f. Status LEDs – Ethernet, power on, cellular link/activity, signal strength bars or digital display
g. Microsoft Internet Explorer configurable

10. Antenna:

a. Digi (DC-ANT-DBHG) or equal
b. Dual-band high-gain cellular antenna
c. Fourteen- (14-) inch-tall antenna with magnetic mount

11. Coax Cable:

a. Fourteen- (14-) inch cable, fifty- (50-) Ohm SMA male connector
b. Two (2) dbi gain low band
c. Four (4) dbi gain high band

12. Coax Extension Cable:

a. Three- (3-) inch coax extension cable with SMA male connectors on either end
b. Three eighths- (3/8-) inch LMR400 coax cable fifty- (50-) Ohm, shielded, weatherproof coax, or equal

13. Telemetry Unit Testing

    a. The elements of the RTU hardware shall be tested to demonstrate that the total system satisfies all of the requirements of this specification. The SI shall coordinate all tests with **DCDWM**. The SI shall notify the **DCDWM** Division Director or designee two (2) weeks in advance of any tests.

    b. As a minimum, the testing shall include the following:

        - Functional onsite acceptance test

    c. Each test shall be in the cause-and-effect format. The person conducting the test shall initiate an input (cause) and upon the systems or subsections producing the correct result (effect), the specific test requirement shall have been satisfied. Each of the inputs or conditions shall be tested:

        - Digital inputs
        - Digital outputs
        - Analog inputs (minimum scale, mid-scale and maximum scale)
        - Power faults
        - Communication faults

    d. The tests shall be conducted in accordance with, prior engineer approved procedures. The results shall be documented on forms, and checklists within **Appendix C** or as specified by **DCDWM**. Each specific test to be performed shall be described and a space provided after it for signoff by the appropriate party after its satisfactory completion.

    e. Copies of these signoff test procedures, forms, and checklists shall constitute the required test documentation.

    f. Provide all special testing materials and equipment.

    g. Conduct a functional onsite acceptance test:

        - Tests shall be witnessed by **DCDWM** and all required parties.
        - Tests shall demonstrate specified functions, both hardware and software, to the satisfaction of **DCDWM**.

14. Enclosures

1. General

    a. Enclosures for electrical and control components for the pump station shall be located outside of the wet well and in a location such that they are readily accessible, ensure maximum electrical and personnel safety, and are protected from damage due to vehicular traffic and flooding. The electrical and control panels shall be installed at a minimum five (5) feet

from the fence. See Standard Detail P-001 in **Appendix C**. Electrical and control enclosure example layouts are provided in Standard Detail P-022, 240 V, and Standard Detail P-022, 480V, **Appendix C**.

b. Switching gear (transfer switch, breakers, etc.) shall be mounted in a panel box of NEMA 4X 316 stainless steel rating with a hinged three- (3-) point latched door with locking handle. Panel shall be set on painted galvanized, aluminum, or stainless steel legs mounted to a concrete base, with conduit stubs to enter at the bottom of the panel, and to be set in the concrete base for support. Any deviation shall require **DCDWM** approval.

c. The enclosures as well as all switches and indicator lights, whether mounted on an inner door or face of the enclosure, shall be provided with a label that conforms to UL descriptions and procedures.

d. No conduit runs or junction boxes shall be installed inside or on top of the wet well. Splicing of cables inside the wet well shall not be permitted.

e. The electrical and control panels shall be provided with a four- (4-) foot awning to allow access during inclement weather. The length of the awning shall be determined by the total length of electrical and control panels. The awning shall be eight (8) feet high. The front side shall be supported by four (4) vertical supports and the back side shall be supported by four (4) vertical supports. Eight- (8-) inch-to-ten- (10-) inch base plates shall be installed on vertical supports.

2. Cabinet fabrication
   a. Power distribution within the enclosure shall meet the following requirements:
      - Use one (1) one hundred twenty (120)V AC, sixty (60-) Hz feeder circuits.
      - Make provisions for feeder circuit conduit entry.
      - Furnish terminal board for termination of wires.
      - Provide one hundred twenty (120)V AC circuit breaker in each cabinet for incoming AC power.

3. Signal distribution shall meet the following requirements:
   a. Within Cabinets: four (4) to twenty (20) mA DC signals may be distributed as one (1) to five (5)V DC.
   b. Outside cabinets: Isolated four (4) to twenty (20) mA DC only.
   c. The signal wiring shall be twisted shielded pairs.

4. Signal switching shall meet the following requirements:
   a. Use dry circuit-type relays or switches.

b. No interruption of four (4) to twenty (20) mA loops during switching.
c. Switching transients in associated signal circuit.
d. Four (4) to twenty (20) mA DC signals: 0.2 mA, maximum.
e. One (1) to five (5) V DC signals: 0.05V, maximum.

15. Instrumentation and Controls

1. Wastewater Level Sensing Equipment
   a. Pump station cycles shall be controlled through the use of wastewater level sensing equipment in the wet well. Wastewater levels within the wet well shall be detected through the use of submersible pressure level transducer and three (3) mercury-free type ecofriendly float switches. One (1) float switch shall be used as a backup high level sensor and two (2) shall act as backup pump-on/off controls.

   b. Wastewater level sensing equipment shall be used to indicate the following levels and operate the pump station correspondingly:

      - Low-level alarm
      - Pumps-off
      - Lead pump-on
      - Lag pump-on
      - High-level alarm

   c. Wastewater level sensing equipment shall be located so as not to be affected by flows entering the wet well or the turbulence created by the suction of the pump. They shall also be installed in an accessible location.

   d. Where mercury-free type ecofriendly float switches are used, the cables shall be of sufficient length to be installed without splicing, plus an additional ten (10) feet of cable. The additional length of cable shall be coiled and secured within the wet well.

   e. Acceptable submersible level sensing equipment manufacturers shall be submitted for approval by **DCDWM**. Acceptable ultrasonic level sensing equipment is Milltronics MultiRanger 200. Equivalent sensing equipment may be allowed on a case-by-case basis, with written approval from **DCDWM**.

2. Components
   a. The conduit work shall be in accordance with the Electrical Conduit and Accessories Specifications for the DeKalb County Wastewater Treatment and Collection System, provided in **Appendix E**. A depiction of the control panel cables is provided in Standard Detail P-015, **Appendix C**.

b. Unless specified otherwise, electrical power supply to the instrumentation equipment shall be unregulated one hundred twenty (120) volts AC at the locations noted on the one-line and functional diagrams. The transmitted electronic analog instrument signals shall be 4-20 mA DC, unless noted otherwise, and shall be linear with the measured variable.

c. PSCP shall include physical barriers inside panel to prevent accidental access between telemetry and pump control areas of the panel.

d. Control panel shall be fabricated at the system integrator's panel shop. No field fabrication is allowed.

e. Cabinet shall be built to UL 508 standards and bear UL listing mark stating "LISTED ENCLOSED INDUSTRIAL CONTROL CABINETS."

f. Once wiring is installed, conduits shall be insulated (sealed) at each end; at the wet well and the enclosures. This shall prevent moisture transfer from the wet well into the electrical and control panel enclosures.

g. The conduits shall be PVC-coated rigid metal conduit with threaded couplings, manufactured by REDH2OT or approved equal. No threadless couplings shall be allowed. Conduits shall have bitumastic coating for underground installation.

h. Separate conduits shall be supplied for analog, discrete, communication, and power signals.

i. A phase monitor shall be provided in the pump control panel. The pump operation shall be inhibited when an open phase/phase reversal condition is detected. A contact of the phase monitor shall also be connected to the PLC for monitoring and remote indication of the open phase/phase reversal condition. The control wiring shall be stranded. No solid wire shall be allowed.

j. Control Panel layout to be determined by the Instrumentation and Controls (I&C) Specialist, and to be consistent among all new pump stations. An example front layout of a duplex pump station control panel is provided in Standard Detail P-024, **Appendix C**. The Control Panel layout shall be approved by **DCDWM.**

k. Allen-Bradley Micro Logix Programmable Controller shall be used to control and monitor all pump station functions. PLC to be connected to Telog RTU CPU via RS-33 Telog recording telemetry unit model R-3330, cellular communication, 120 V input (hard-wire protocol connection). Electrical legend is provided as Standard Detail P-018 in **Appendix C**.

l. Allen-Bradley PanelView Plus panel-mounted HMI connected to the PLC shall be used to set pump control parameters, and to monitor pump station status. A lockable cover shall be provided to protect the HMI from vandals.

m. Input/Output (I/O) modules shall be provided to monitor and control all pump station equipment in accordance with I/O list. See **Table 4.4**, Example I/O List. (However, each project will require its own specific I/O list and P&ID shall be submitted to **DCDWM** for review and approval.) Equipment located outside the pump control panel (generator, transfer switch, flow meter, and pressure gauge) shall route telemetry data to and from the pump station control panel PLC for integration with the telemetry system.

n. Pump soft starts shall be used for pumps twenty (20) HP or greater, with piping systems that see a large elevation difference or pressure surge greater than the pipe design pressure when the pump is turned on. This may occur when only one pump station is providing flow to a force main or if the pump soft starts are not required for pumps less than twenty (20) HP.

o. The pump control components, including PLC, phase monitor, HMI, soft starts (for 20 HP and larger) shall be installed in a single NEMA 4X Type 316 stainless steel enclosure.

p. The metal thickness of the enclosure shall be fourteen- (14-) gauge, minimum.

q. The doors shall be rubber gasket with continuous hinge and stainless steel lockable quick-release clamps.

r. The enclosure shall have a lockable handle on the outside of the each door.

s. Cabinet shall be sized to allow access around all the instruments for ease of operation and maintenance. The cabinet shall be designed to prevent overheating of instruments with an ambient air temperature of one hundred degrees (100°) Fahrenheit with one hundred percent (100%) humidity (non-condensing). Air conditioner units shall not be allowed.

t. Cabinet shall include a heater unit with thermostat control for protection of cabinet equipment. Heater shall be designed for an ambient air temperature of 10 degrees (10°) Fahrenheit with one hundred percent (100%) humidity (non-condensing).

u. Control panel shall be a NEMA 4X 316 stainless steel enclosure measuring seventy two (72 inches high x thirty six (36) inches wide x eighteen (18) inches deep, with a single dead front door. If additional space is required to house this equipment, the panel depth may be increased or a (72 inches high x seventy two (72) inches wide x eighteen (18) inches deep, double-door configuration may be used, with the telemetry equipment housed in the left-hand door and pump starters and protection equipment behind the right door.

v. Factory-applied white TGIC polyester urethane powder coating

electrostatically shall be applied to all outside and inside surfaces.

w. Acceptable Manufacturers: Hoffman Engineering Co., Saginaw, or approved equal.

x. Pumps twenty (20) HP or greater shall have soft stop capability. They shall include integral bypass contactors. Isolation contactors are not required unless specified by the **Design Engineer.** They shall have overload protection capability, and shall display current.

y. Each pump installed at the pump station shall be provided with a "Hand-Off-Auto" selector switch so that the operational mode of the pump may be selected.

z. Each pump installed at the pump station shall have a pump run timer that is capable of keeping a cumulative log of the operational time of each pump. Timers shall be factory-installed six- (6-) digit non-resettable elapsed time meters to show individual pump running time to the one-tenth (1/10th) of an hour.

aa. Sufficient indicator lights shall be used to demonstrate the operational status of the pump station. The indication lights shall be specific to the condition detected. At a minimum, indicator lights shall be provided for each pump to indicate pump-on condition and a pump alarm/failure condition. The following items shall be mounted on the inner door of the pump station control panel:

- Pump hand-off-auto switch
- Pump run light (red)
- Pump failure light (amber)
- Pump stop light (green)
- Soft start operator interface (if applicable)
- Pump stations shall have a six- (6-) digit non-resettable elapsed time meters for each pump individual pump running time to the one tenth (1/10th) of an hour.
- Engraved lamicoid nameplate with RTU number and station name.

bb. Control power transformer(s) shall be installed inside the panel in the motor control section. The transformer shall be sized at one hundred twenty five (125%) of the rated load and rated for machine tool service.

cc. Sufficient one hundred ten- (110-)V electrical receptacles shall be provided to facilitate maintenance at the pump station. If located in an outdoor area, the receptacles shall be of the ground fault interruptible type and shall be protected from the weather elements.

3. Control Panel Wiring

a. The power wire shall be stranded copper and sized as required for load and application according to the NEC. Electrical work shall be in accordance with the latest edition of the NEC and subject to all codes. Wiring within the control panel shall meet the following requirements:

- Wires for AC circuits shall be six hundred (600)V, Type THHN stranded conductor copper, and shall be sized for the current to be carried, but not smaller than No. 16 AWG.
- Wires for analog signal circuits shall be three hundred (300) V stranded copper and shall be twisted shielded pars not smaller than No. 16 AWG.
- Wires for other DC circuits shall be six hundred (600) V, Type THHN stranded copper not smaller than No. 16 AWG.
- Wiring shall be numbered and tagged at each termination on both ends.

b. Wiring for special signals such as communications, digital data, and multiplexed signals shall use manufacturer's standard cables.

c. The control wiring shall be stranded. No solid wire shall be allowed, except that the telemetry may be twenty-two (22-) gauge multi-pair telephone cable.

Table 4.4
Example I/O List

Pressure Transducer	Electromagnetic Flow Meter	Generator	Transfer Switch	Submersible Pumps
Pressure Signal	Flow analog Signal	Fuel Leak Warning	Source One Available	High Level Alarm
	Totalizer Reset	Generator Running Status	Source One Connected	Low Level Alarm
	Totalizer Pulse Output Signal	Generator Summary Fault	Source Two Available	Seal Failure Each Pump
		Switch Not In Auto Warning	Source Two Connected	Motor Over Tamp Each Pump
		Low Fuel Level Warning	Transfer Switch Normal Position	Pump Running Each Pump
		Overspeed Shutdown Fault	Transfer Switch Emergency Position	Not In Auto Each Pump
		Pre High Engine Temperature	AC Line Failure	Wet Well Level Signal
		Low Engine Temperature Fault	High Battery Voltage	Control Panel Phase Monitor

Table 4.4 Example I/O List				
Pressure Transducer	**Electromagnetic Flow Meter**	**Generator**	**Transfer Switch**	**Submersible Pumps**
		Low Coolant Level Warning	Low Battery Voltage	Control Panel Surge Suppressor Status
		Pre Low Oil Pressure Warning		Soft Starters Each Pump (*)
		Pre High Engine Temp Warning		
		Overcrank Shutdown Fault		
		High Engine Temp Fault		
		Low Oil Pressure Fault		
		Customer Fault 1		
		Customer Fault 2		
		Generator Summary Fault		

(*) Soft starters shall be required for twenty (20) HP and greater pumps and VFDs may be submitted for approval by the **DCDWM.**

- Installation shall be as follows:
- Restrain by plastic ties or wire management system.
- Hinge Wiring: Secure at each end so that bending or twisting shall be around longitudinal axis of wire. Protect bend area with sleeve.
- Arrange wiring neatly, cut to proper length, and remove surplus wire.
- Provide abrasion protection for wire bundles that pass through holes or across edges of sheet metal.
- Provide wire labels at both ends of terminated wire.
- If cellular communication is deemed to be unavailable, provide one RJ-11 telephone jack in the control panel. Phone wire from telephone interface to jack to be gel-filled direct burial cable.

4. Compression Clamp Type Terminals
   a. Strip, prepare, and install wires in accordance with terminal manufacturer's recommendations.
   b. Wires installed in a compression screw and clamp, maximum of one (1) for field wires entering enclosure, otherwise maximum of two (2).

c. Splicing and tapping of wires, allowed only at device terminals or terminal blocks.

d. Separate analog and dc circuits by at least six (6) inches from AC power and control wiring, except at unavoidable crossover points and at device terminations.

e. Arrange wiring to allow access for testing, removal, and maintenance of circuits and components.

f. Plastic wire duct fill: Do not exceed manufacturer's recommendations.

5. Terminal Blocks:
   a. Provide sufficient terminations to accommodate both present and future needs. Wire spare PLC module I/O points to their cabinet's terminal blocks. Provide three hundred- (300-)V screw clamp compression, dead-front barrier type terminal blocks with current bar providing direct contact with wire between the compression screw and yoke. Provide yoke, current bar, and clamping screw constructed of high-strength and high-conductivity metal. Use yoke that guides all strands of wire into the terminal. Use current bar providing vibration proof connection. Supply terminals that allow connection of wire without any preparation other than stripping. Rail mount individual terminals to create a complete assembly.

   b. Provide terminal constructed such that jumpers can be installed with no loss of space on terminal or rail.

   c. Size all terminal block components to allow insertion of all necessary wire sizes and types. Supply terminal blocks with marking system allowing the use of UL-approved terminal blocks manufactured by Allen Bradley, Cutler Hammer, Phoenix Contacts, or approved equal.

6. Grounding:
   a. Cabinets isolated copper grounding bus for all signal and shield ground connections: This ground bus shall be grounded at a common ground point. The signal grounding system shall meet NEC requirements.

      - Each analog loop shall be grounded at a single point for the loop. This single point shall be at location of the DC power supply for the loop.
      - Each analog loop shall have its wire shields connected to ground at a single point for the loop.
      - Discrete signals between cabinets shall be dry isolated contacts rated for five (5) amps continuous at one hundred twenty (120) V AC.

7. Power Supplies:
   a. Furnish as required power to instruments requiring external DC power, including two (2) wire transmitters and DC relays. Regulated DC power supplied for instrument loops shall be provided. Power supplies shall be suitable for an input voltage variation of +/- 10 percent (10%), and the supply output shall be fused or short-circuit-protected. Output voltage regulation shall be as required by the equipment supplied.
   b. Convert one hundred twenty (120)V AC, sixty- (60-)Hz power to DC power of appropriate voltage(s), with sufficient voltage regulation and ripple control to ensure that instruments being supplied can operate within their required tolerances.
   c. Provide output over voltage and over current protective devices to protect instruments and power supplies from damage due to power supply or external failure.
   d. Enclosures: NEMA 1.
   e. Mount such that dissipated heat does not adversely affect other components.
   f. Supply indicating-type fuses for each DC supply line to each individual two- (2-) wire transmitter and mount so fuses can be easily seen and replaced.
   g. Include fused push-to-test circuitry for each push-to-test indicating light.
   h. Provide internal cabinet light. Light shall be one hundred- (100-) watt LED bulb and shall be operated by a door switch.
   i. Provide service outlet with a breaker protected one hundred twenty- (120-)V, fifteen- (15-) amp, ground fault circuit interrupter duplex receptacle and weatherproof enclosure on the outside of the “mini power center” box or support.

8. Control Equipment:
   a. The PSCP shall include an Allen Bradley Micrologix 1200 PLC, associated I/O, and a PanelView Plus 600c local operator interface.
   b. The **DCDWM** may provide a standard PLC and HMI application program for the pump station PLC and HMI. **Contractor** shall set up the software for the pump station, including configuring device ranges, internet protocol address, motor current range, wet well level, set points and other settings, for a complete and operational PSCP.
   c. Allen Bradley Micrologix 1200 PLC (1762-L40AWA)
      - Twenty four (24) Digital Inputs, one hundred twenty (120) V AC
      - Sixteen (16) Digital Outputs, relay outputs
   d. Analog Input Module (Allen Bradley 1762-IF4)
      - Inputs four (4) differential 4-20 mA

e. Analog Input and Output Module (Allen Bradley 1762-IF2OF2)
   - Inputs two (2) differential 4-20 mA
   - Outputs two (2) single ended 4-20 mA

f. Allen Bradley PanelView Plus 600 Color with keypad and touch screen (2711P-B6C20A)
   - Screen: five and one half (5.5) inches
   - Combination touch and keypad
   - Ethernet Communication
   - RS-232 Communication
   - Power: one hundred twenty (120)V AC

g. NET-ENI Communication Module: (Allen Bradley 1761-NET-ENI)

h. PLC Functional Requirements: PLC I/O are shown below. Provide inputs, outputs, functions, or operations required for a completely operational system. Note that this list does not show the PLC's diagnostic fault detection points, which are nevertheless required.

i. Digital Inputs
   - DI-1 - Pump one (1) Auto Mode (1=Auto, 0=Manual)
   - DI-2 - Pump one (1) Run (1=On, 0=Off)
   - DI-3 - Pump one (1) Fault (1=Fault Alarm, 0=Normal)
   - DI-4 - Odor Control Run (1=On, 0=Off)
   - DI-5 - Pump two (2) Auto Mode (1=Auto, 0=Manual)
   - DI-6 - Pump two (2) Run (1=On, 0=Off)
   - DI-7 - Pump two (2) Fault (1=Fault Alarm, 0=Normal)
   - DI-8 - Odor Control Fail (1=Fault Alarm, 0=Normal)
   - DI-9 - Level Switch High (LSH) (0=Alarm, 1= Normal)
   - DI-10 - Level Switch Lag Start (LSM3) (0=Alarm, 1= Normal)
   - DI-11 - Level Switch Lead Start (LSM2) (0=Alarm, 1= Normal)
   - DI-12 - Level Switch Pump Stop (LSM1) (0=Alarm, 1= Normal)
   - DI-13 - Level Switch Low (LSL) (0=Alarm, 1= Normal)
   - DI-14 - Phase Loss (0=Alarm, 1= Normal)
   - DI-15 - Generator Auto (1=Auto, 0=Not Auto)
   - DI-16 - Automatic Transfer Switch (0=Generator, 1=Normal)
   - DI-17 - Generator Fault (0=Alarm, 1=Normal)

- DI-18 - Level Switch High High (LSHH) (0=Alarm, 1=Normal)
- DI-19 - Combustible Gas Alarm (0= High Alarm, 1=Normal)
- DI-20 - Cabinet Intrusion
- DI-21 - Station Intrusion [if available]
- DI-22 - UPS On
- DI-23 - UPS Fail
- DI-24 - Generator Run Status (1=On, 0=Off)

j. Digital Outputs

- DO-1 - Pump one (1) Run (1= On, 0=Off)
- DO-2 - Pump two (2) Run (1= On, 0=Off)
- DO-3 - Chemical Feed Pump 1 (1= On, 0=Off) [if available]
- DO-4 - Chemical Feed Pump 2 (1= On, 0=Off) [if available]
- DO-5 - Odor Control (1= On, 0=Off) [if available]
- DO-6 – Pole Lights (1= On, 0=Off) [if available]
- DO-7 - Spare
- DO-8 - Spare
- DO-9 - Spare
- DO-10 - Spare
- DO-11 - Spare
- DO-12 - Spare
- DO-13 - Spare
- DO-14 - Spare
- DO-15 - Spare
- DO-16 - Spare

k. Analog In

- AI - one (1) Wet Well Level
- AI - two (2) Flow Discharge [if available]
- AI - three (3) Pump 1 Motor Current
- AI - four (4) Pump 2 Motor Current
- AI - five (5) Discharge Pressure [if available]
- AI - six (6) Generator Fuel Level [if available]
- AI - seven (7) Combustible Gas Level

- AI - eight (8) Spare

l. Analog Out

- AO – one (1) Spare
- AO - two (2) Spare
- AO - three (3) Spare
- AO four (4) Spare

m. The **Developer/Contractor** shall provide all PLCs and associated equipment and cables to form a complete and functional controller with SCADA cellular monitoring, control, and data logging capability as required for the project.

n. The **Developer/Contractor** shall furnish and install all cables for interconnecting all components of the PLC inside the cabinet. These cables shall include cables to Network Bridge, power supplies, central processing unit.

o. The **Developer/Contractor** shall furnish all network cables needed to interface all applicable PLCs with network.

9. Uninterruptible Power Supply (UPS):
   a. Provide UPS system, sized for thirty (30) minutes backup time under one hundred fifty percent (150%) cabinet load (including all loop-powered instruments). UPS shall be installed in the PSCP.
   b. UPS shall be ferro-resonant type and shall include contact outputs for low battery, loss of utility power, and UPS operating.
   c. UPS shall contain a network management card capable of communicating status parameters via Ethernet using Simple Network Management Protocol (SNMP).
   d. Manufacturers: Allen Bradley 1609-U500NHC or approved equal by **DCDWM**.

10. Air Quality Combustible Gas Detector (walk-in wet wells):
    a. Pump station shall include an air quality combustible gas detector capable of qualifying the quality of air for human consumption as well as detecting the presence of lower explosive limit (LEL) gases.
    b. Instrument Function: Air Quality and Ambient air pollution monitor
    c. Instrument Description: Air Quality and Combustible gas catalytic detector (single-point)
    d. Signal Output: Contacts for Air Quality and gas level alarm indication and a four (4) to twenty (20) mAdc analog signal.
    e. General: The gas detector system shall consist of a sensor or sensors, a transmitter, a relay module, and a power supply. The sensor shall be

remotely mounted in the area to be monitored. Up to fifty feet of cable shall be permitted between the sensor and the transmitter. The sensor, transmitter and relay module shall share the same power supply. The gas detection system shall have the capability to detect an over-range condition. This condition shall be indicated on the transmitter Liquid Crystal Display (LCD) display or HMI and the output shall be locked at the maximum valve. The components of the system shall be approved for mounting in Class I, Division 1, Group C and D hazardous locations. The components of the system shall also be designed to meet NEMA 4X 316 requirements. The components of the system shall also be capable of operation in an ambient temperature range of minus four to one hundred twenty two (-4 to +122°) Fahrenheit.

f. Sensor: The sensor shall employ the principle of catalytic oxidation. As the combustible gas and air mixture comes in contact with the sensor, the combustible gas in the mixture is burned catalytically, raising the temperature of the sensor. As the temperature of the sensor rises, so does its electrical resistance producing a change in output. When specified, the sensor shall be provided with a duct mounting kit. The kit shall allow the sensor to operate at velocities up to sixty (60) miles per hour (mph).

g. Transmitter: The transmitter shall be microprocessor-based. Combustible gas concentration shall be continuously indicated, on a front-panel meter, in percent of LEL of the specified gas. The display shall be visible from a minimum of 5 feet and shall be present at all times, and shall not require being turned on or off. This readout shall be three and one half- (3½-) digit LCD. The transmitter shall display a warning when the sensor is nearing the end of its useful life. Calibration shall be by means of a non-intrusive calibration system. The calibration values, and zero and span, shall be set without opening the transmitter enclosure. The transmitter shall not be affected by ambient light either natural or man-made.

h. Relay Module: Dual-alarm set points, fully adjustable over the calibrated range of the monitor shall be provided. Indicating lamps shall provide positive indication of normal operation, concentration above lower set point (warning), and concentration above higher set point (danger).

i. Contact outputs shall be provided for unit trouble and each set point. Contacts shall be normally open and shall open when an alarm condition exists. A normally energized trouble relay shall be provided. The trouble relay shall de-energize and the contact shall open when a system fault is detected. Unless otherwise specified, the system shall be calibrated for methane gas. The warning set point shall be twenty percent (20%) lower explosive limit and danger set point shall be twenty five (25%) percent LEL.

j. Power Supply: The power supply shall accept nominal one hundred twenty (120) V, sixty- (60-) Hz power from the station power distribution. This power is not regulated, wave forms may be distorted,

and significant electrical noise may be present. The power supply shall provide the necessary power for the components of the gas detection system.

k. Installation: The sensor shall be installed in the location accessible by the operator and in clear view of the wet well. The air monitoring gas detection system shall be installed in accordance with the manufacturer's instructions and the specified functional requirements.

l. Test: The combustible gas detector shall be factory-tested by the manufacturer prior to shipment. The manufacturer shall provide three (3) certified copies of the test report. After installation, the unit shall be field tested.

m. Cable: The signal cable between the sensor and the transmitter shall be provided by the instrument manufacturer. A sufficient length of cable shall be provided for installation of a continuous run between the sensor and the electronics package.

n. Application: Unit shall be set up to indicate an alarm at five percent (5%) above normal gas levels.

o. Calibration: Instrument shall be calibrated onsite using manufacturer's recommended technique.

p. Acceptable manufacturers are MSA Ultima, Sensidyne Sensalert, or approved equal by **DCDWM**.

11. Indicating Lights

a. AC-indicating lights shall be the push-to-test transformer type with LED lamps. They shall be heavy-duty, with NEMA rating to match enclosure type. The escutcheon and lens color shall be as specified. DC indicating lights shall be LED type. DC lamps may be tested as a group using a common lamp test button.

b. Indicating lights shall be equipped with colored lenses as specified by **DCDWM**.

M. National Fire Protection Association Requirements

1. Applicable Requirements

a. The design and construction of the pump station shall comply with all requirements of NFPA 820 – Fire Protection in Wastewater Treatment and Collection Facilities.

b. At a minimum, the **Design Engineer** shall identify on the submittal plans all areas with hazardous classifications, and any equipment within those areas requiring special features for being located in a hazardous area.

2. Interpretation of Code

a. When there is a question as to whether a portion of the code is applicable, the **DCDWM** Director or designee shall have the final judgment as to the meaning of the code. The **Developer/Contractor** and **Design Engineer** shall comply with

the interpretation of the code as instructed by **DCDWM.**

N. Construction Oversight

1. General

a. When calling for an inspection, state whether it is preliminary, final, or other specific type of inspection. No approval of a project shall be granted by **DCDWM** until all inspections are conducted, all defects addressed, and all appropriate documents have been received and accepted. Letters of preliminary and final inspection/approvals will be sent to the **Developer/Contractor** by **DCDWM** and placed in Department files.

b. Jobsites shall be landscaped to an equal or satisfactory condition as presented prior to start of construction activities. Any damage to the existing system occurring during construction activities shall be promptly reported to the proper authorities so that proper action may be taken.

c. Inspections shall be as described in Sections IV.A and IV.B for pump station approval and acceptance.

d. At its sole discretion, **DCDWM** may "sign off" on the final subdivision plat without the pump station being complete, under the following conditions:

- The **Developer/Contractor** has made reasonable and diligent effort to design, order, and complete the station.
- A hold shall be placed upon certificates of occupancy and/or building permits.
- The **Developer/Contractor** shall present a "cash" bond equal to the value of the incomplete work or a letter of credit equal to twice the value of the incomplete work as determined by **DCDWM**.
- The associated fees have been collected.

e. A partial acceptance of the pump station may allow some use of the station prior to final acceptance. The conditions shall have prior approval of the DCDWM Division Director and the Field Operations Division Director. Under no circumstances shall the station be allowed to accept flow prior to the installation of the phone line.

O. Testing

1. Pressure and Leakage Testing

a. Force mains shall be subject to a test pressure equal to one hundred fifty percent (150%) of the total dynamic head for a minimum of two (2) hours. The test shall be performed using potable water. No leakage shall be allowed. The entire test shall be witnessed and approved by **DCDWM** prior to startup. To schedule a test, the **Developer/Contractor** shall notify the **DCDWM** Inspector a minimum of forty eight (48) hours in advance at **(770) 621-7200**.

b. The **Developer/Contractor** shall remove, valve off, or otherwise protect any equipment that might be damaged by the pressures used in the test. Pipe laid in trenches shall be back filled. Joints, fittings, and valves may be left exposed to be

examined during the test. Before applying the test pressure, any air shall be expelled from the pipe.

c. If combination air release valves are not available at high points, the **Developer/Contractor** shall make necessary taps and insert plugs after the test has been completed. Approval shall be obtained from the **County** before making any taps.

d. The **DCDWM** Inspector's approval of the force main shall become a part of the overall pump station and force main system approval. The **Developer/Contractor** shall bear the complete cost of the pressure test, including temporary plugging and blocking, and the repair of all leaks.

e. A copy of the Pressure Test Form is provided in **Appendix A.**

f. Certification tests shall be performed on the actual assembled pumps to be supplied. Pumps shall be tested in the manufacturer's facility and in accordance with the latest test code of the Hydraulic Institute Level A to determine head vs. capacity and kW draw required. Tests shall cover a range from shut-off to a minimum of twenty percent (20%) beyond the specified design performance capacity. Certification tests shall be conducted on each pump being supplied. A pump curve shall be generated showing actual flow, head, BHP, and hydraulic efficiency for each pump being supplied. A Professional Engineer registered in the State of Georgia shall certify each pump curve. Certified pump curves shall be submitted to **DCDWM**.

g. If a section of the force main fails the pressure test, the **Developer/Contractor** shall be required to pay a re-inspection fee, as determined by **DCDWM,** prior to each additional retest required.

2. Industrial Wastewater Sampling

a. A sampling point shall be provided upstream of the industrial wastewater discharge into the pump station. Sampling should be performed at a manhole or air release/vacuum valve upstream of the discharge. If the force main is longer than five thousand (5,000) feet, **DCDWM** may require additional sampling tabs to be provided.

b. Sampling tabs shall be located in an air release/vacuum valve vault along the force main and be installed per these Standards. The **DCDWM** shall approve the final location of all sampling tabs.

c. Prior to the acceptance of any industrial wastewater discharge into the **DCDWM** collection system, a water quality report shall be submitted to **DCDWM** for approval.

P. Final Approval

1. General

a. Final pump station approval and acceptance shall follow the requirements set forth in Section IV.A.6 of these Design Standards. Final pump station approval and acceptance submittals shall follow the requirements set forth in Section IV.B.4 of these Design Standards.

2. Startup

a. To schedule a startup, call the **DCDWM** Inspector a minimum of twenty four (24) hours in advance. The pre-startup check sheet shall be completed, signed, and received by the **DCDWM** Inspector twenty four (24) hours before startup.

b. The following personnel shall be on site during startup:

- General **Contractor** or **Developer**
- Electrical contractor
- Pump manufacturer
- Generator manufacturer
- **DCDWM** Inspector
- **DCDWM** pump station personnel
- **Design Engineer**
- Electrical Engineer
- Telemetry Integrator

3. Force Main Construction Completion Form

a. **Developer/Contractor** shall send inspector force main acceptance reports to **DCDWM**, 4572 Memorial Drive, Decatur, Georgia 30032. **DCDWM** shall send the Construction Completion Form once the as-built drawings are approved. **Developer/Contractor** shall submit a completed Construction Completion Form to **DCDWM** prior to final plat approval.

4. Record Drawings

a. Record drawings (as-builds) shall be submitted to **DCDWM** before a project can receive final approval, and/or Certificates of Occupancy. To avoid delays in the "approval process" of developments/ subdivisions, as-built drawings should be submitted as soon as the pump station and/or force main installations are complete to allow sufficient time for review. Surveying shall be performed by the **Design Engineer** to ensure the elevations and placements of appurtenances on as-builds are correct.

b. Record drawings shall be sharp, clear, clean, legible, and submitted on twenty four- (24-) inch x thirty six- (36-) inch plain paper and the electronic AutoCAD files shall be submitted on CD, DVD, and a flash drive.

c. Record drawings shall include a site plan and any supplemental or shop drawings as may be required by **DCDWM**.

d. Six (6) sets of Pump Station and force main as-built plans shall be submitted to **DCDWM** prior to scheduling a startup.

e. Pump station and force main as-built plans shall include an original signed and dated stamp of a Professional Engineer registered in the State of Georgia. Updated design calculations shall also be submitted with as-builds.

f. Pump station and force main as-built drawings shall reflect the structures as they are actually installed. The as-builds shall be completed from the approved construction drawings with redlines of construction changes, as well as notations

of any variances from the approved plans.

g. Survey Standards for DeKalb Watershed Management

As-builts for all water and wastewater projects shall include all new and existing infrastructures directly adjacent to the project area. This includes, but not limited to, fire hydrants, water valves, water mains, water meters, tees, tap sleeves, bends, reducers, and plugs. Sewer infrastructure shall include manholes, sewer mains, force mains, air valves, cleanouts and all features in and around sanitary sewer lift stations.

The primary survey strategy will implement a GPS methodology. The consultant shall use the Real Time Kinematic Method (RTK) or Rapid Static Method (RSM) and equipment adequate to produce horizontal, vertical, and elevation coordinates (x, y, and z) that will be consistent with DWM methods (centimeter survey grade accuracy).

If is determined that a number of features cannot be located directly by GPS due to obstructions, a secondary survey will be employed to capture obscured points.

The secondary strategy should consist of surveying using conventional methods. Establishing a transit and back sight using GPS, establishing a traverse loop, maintaining a minimum of 1:10,000 closure for the traverse, and side shots being collected by occupying the traverse points. Side shots should be enough to adequately survey the required features and/or other relevant features. After data collection is complete, standard survey procedure dictates that the files will be downloaded into a coordinate geometry (COGO) package for any translation or rotation that might be required. The specifications for the datum and coordinate will be the Georgia West State Plane coordinate system. The horizontal datum will be the North American Datum (NAD83) and the vertical datum will be the North American Vertical Datum (NAVD88).

h. A single line electrical drawing showing power distribution for the station shall be included in the as-built drawings.

i. If any changes were made to the force main route, wet well depth, or pumps after the submitted plans were approved, new design calculations shall be submitted with the as-built plans.

j. One (1) complete set of record drawings and two (2) copies of the electronic files (CD and flash drive) shall be submitted by the **Developer/Contractor** or **Developer/Contractor's Engineer** to **DCDWM** for review and approval.

k. Record drawings shall be stamped and signed by a Professional Engineer or Land Surveyor registered in the State of Georgia.

5. Warranty of Work

a. The **Developer/Contractor** shall provide a one- (1-) year comprehensive warranty of Work from the date of commissioning of the pump station. Should settling occur during the warranty period, **Developer/Contractor** shall promptly furnish and place fill to the original grade and restore any damaged landscaping. Should any leaks or settlement occur under new pavement, the **Developer/Contractor** shall be held responsible for the full cost of repairs,

including pavement replacement.

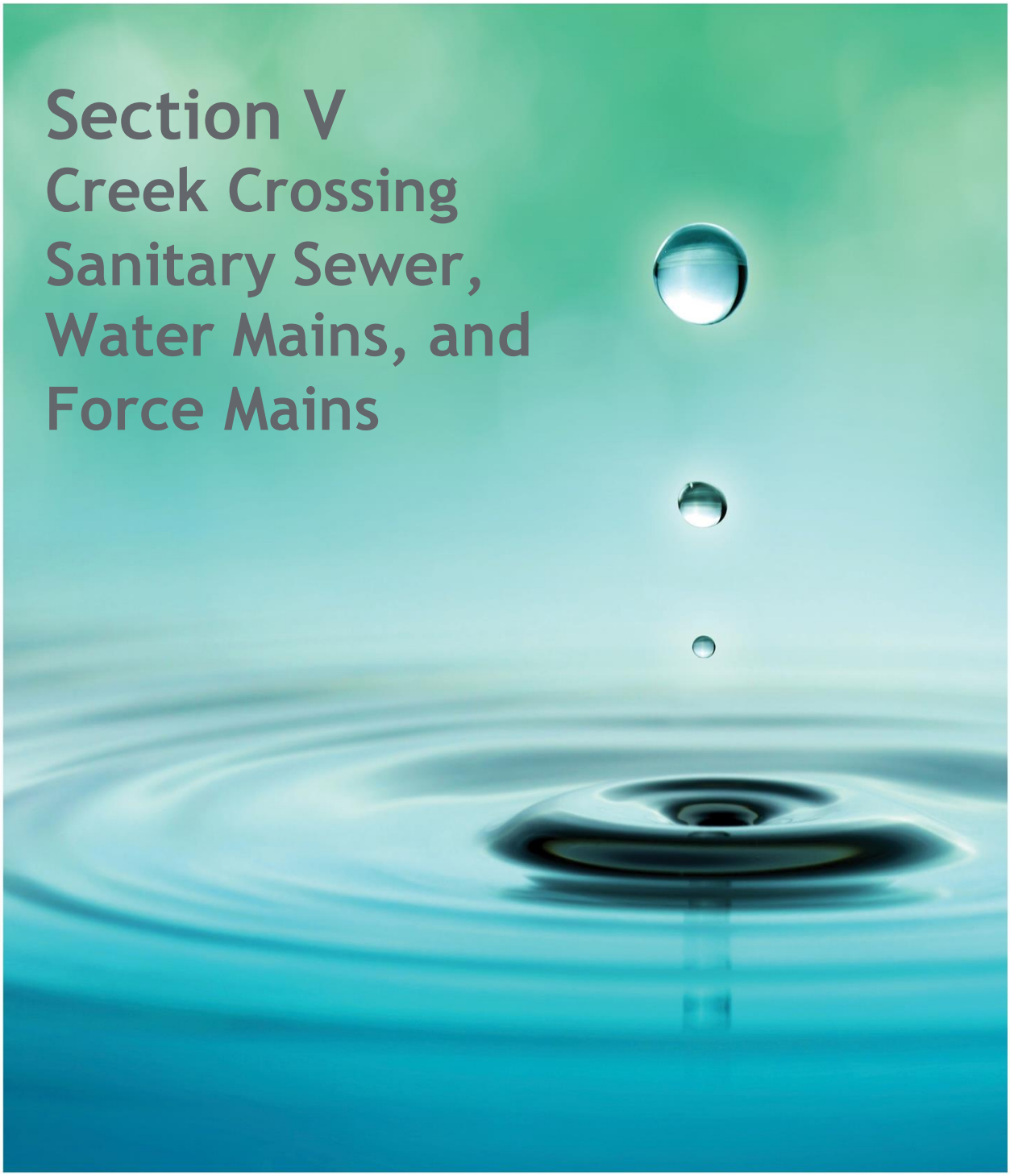
b. The determination of the requirement for the **Developer/Contractor** to perform work under this warranty shall be at the sole discretion of **DCDWM**.

c. If a project requires a series of pump stations, the warranty of Work period for each station shall extend until the warranty period for the last pump station expires.

DeKalb County
GEORGIA

WATER Matters

Section V
Creek Crossing Sanitary Sewer, Water Mains, and Force Mains



SECTION V
CREEK CROSSINGS - SANITARY SEWER, WATER MAINS, AND FORCE MAINS

A. Overview

Creek crossings or stream crossings primarily consist of two types:

- ***Aerial Crossings:*** Pipe is visible and usually a few to several feet above the creek bed, or attached to a roadway bridge.
- ***Buried Crossing***: Pipe is under the creek bed and in some instances, the top of the existing pipe or casing may be visible during low flow conditions occurring during summer months.
- ***Standard Details***: Please refer to standards in **Appendix D** for Creek Crossing details.

Sewer systems shall be designed to minimize the number of creek crossings. While designing creek crossings, use the proposed future creek bed elevation, and employ construction methods that would be minimally invasive to the stream. For example, the **Contractor** shall use rock cutting trenchers instead of explosives for sewers in rocky strata.

Collection system capacity and water quality can be jeopardized by damage to sewers at creek crossings.

1. Environmental and Buffer Requirements

A minimum buffer separation shall be maintained between sewers, force mains, and streams/surface water bodies classified as nutrient sensitive streams or watershed buffers (from normal high water). See also within these Design Standards for other requirements regarding minimum separation with streams, lakes and impoundments.

Before crossing streams or ditches, working within one hundred (100) feet of a private or public water supply sources or fifty (50) feet of non-water supply ponds, lakes, creeks or rivers**,** the **Developer's Design Engineer** shall verify whether the line is exempt and, if not, obtain a permit to encroach into a watershed or nutrient-sensitive river basin buffer. Unless otherwise permitted, water, sewer, or force mains crossing a stream, river, pond, or lake buffer are to be as nearly perpendicular as possible. The crossing is considered perpendicular if it intersects the stream or surface water between an angle of seventy five (75) and one hundred and five (105) degrees). The **Contractor** shall not disturb more than forty (40) linear (longitudinal) feet of a riparian buffer. The proposed design shall identify and adequately address the protection of the drinking water supply wells, sources, intake structures, and others, up to a distance of one hundred (100) feet of the sewer line installation. The **Contractor** shall adhere to the following best management practices in Zone 1, the lower thirty (30) feet beside the stream or surface water, during design/construction.

- Woody vegetation shall be cleared by hand. No grading allowed.
- Stumps shall remain except in trench where trees are cut. Disturbance to roots in buffer zone shall be minimized.
- The trench shall be backfilled with the excavated soil immediately following installation.
- Fertilizer shall not be used except for the one-time application to reestablish vegetation.
- Removal of woody vegetation shall be minimized with respect to the amount of disturbed area and the time the disturbed area remains disturbed.
- Measures shall be taken to ensure diffuse flow of water through the buffer after construction.
- In wetland areas, crane mats shall be used to minimize soil disturbance.
- Topsoil shall be separated from excavated material, so that the original topsoil is replaced over the excavated area.

2. Wetlands

The Professional Engineer registered in the State of Georgia whose seal appears on the drawings shall certify the following:

- The National Wetlands Inventory maps have been consulted.
- The appropriate plan sheet does/does not indicate areas of USACE Jurisdictional Wetlands as shown on the maps. If jurisdictional wetlands are indicated, the **Developer** shall obtain a Federal Wetlands Alteration (Section 404) permit prior to initiating construction activity and/or any land disturbance of the protected wetlands.

3. Landscaping

Trees and bushes shall not be planted near the collection system pipes and structures to prevent roots from entering the pipes causing blockages and cracked pipes. Planting for stabilizing disturbed areas shall be required to restore the area to its original or better condition. The specifications shall define the entity responsible for developing a grassing and planting and stream restoration plan for review and approval by the **County**.

4. Siltation and Erosion

Construction methods that shall minimize siltation and erosion shall be employed. The **Design Engineer** shall include in the project specifications the method(s) to be employed in the construction of sewers in or near streams. Such methods shall provide adequate control of siltation and erosion by limiting unnecessary excavation, uprooting trees and vegetation, dumping of soil or debris, pumping silt-laden water into the stream, changing course of stream without encroachment permit, leaving cofferdams in streams, and leaving behind temporary equipment. Specifications shall require cleanup, grading, seeding, sodding, and planting or total restoration of disturbed areas commence immediately to meet local and state standards. Exposed areas shall not remain unprotected at any given time. The disturbed stream bank shall be restored using bioengineering methods. If the velocity of flowing water is

anticipated to be greater than ten (10) fps, then cement stabilized backfill shall be used from bank to bank and covered with rip rap. In areas where there is planned channel improvement, the stabilized backfill shall be used up to the line of planned improvement.

5. Sewers In Relation To Storm Drainage Infrastructure

No sanitary sewer shall be located in a detention basin or other drainage structure. Sanitary sewer pipe and manholes shall not be located in or underneath the dam or dike of the detention basin, or located anywhere within twenty (20) feet horizontally of the projected maximum high water line of the detention basin.

6. Aerial Crossings for Sanitary Gravity Sewers and Force Mains

The aerial crossing shall be designed with minimal infringement on the floodway, typically by spanning the waterways. See **Table 5.1** below.

- **Large/wide creeks** - Piers and anchor collars or with pipes in a casing spanning over piers.
- **Medium-sized creeks** - Piers and anchor collars of I-beam anchored to stream banks with pipe resting on top of the I-beam.
- **Small creeks** - Pipe spanning creeks and anchored to concrete collars at the bank.

Table 5.1
Creek Crossing Design Guidance

Type	Span	Requirements
Large Width	>40 Feet	Submit Detailed Design
Medium Width	18 To 40 Feet	Submit Design if Span > 30 Feet
Narrow Width	<18 Feet	Use **County** Details
Note: Use reinforced cement concrete for piers and anchor collars.		

Methods of support/carriage of pipe other than the ones described above, requires review and approval of **DCDWM**. Visual impact shall be minimal after regrowth of vegetation. The pipe shall be adequately supported, protected from damage and freezing, accessible for maintenance, repair or replacement, and non-obstructive to flow line of surface water. The bottom of the pipe shall be placed no lower than the elevation of the fifty- (50-) year flood.

The **Engineer** or **Contractor** shall provide detail design drawings and pipe specifications for each crossing for review by **DCDWM**. Site conditions may dictate more stringent requirements than shown in the Standard Construction Details. The **Engineer** shall delineate on the plans flood elevations for the ten- (10-), twenty five- (25-), fifty- (50-) and one hundred- (100-) year flood events as defined by **DCDWM**. The design plans and structural details shall be signed, sealed, and dated by a Georgia Registered Professional Engineer.

Creek crossings for gravity sanitary sewer and force mains, unless otherwise approved by **DCDWM**, shall be constructed of epoxy-lined DIP with flexible restrained joints. **DCDWM** reserves the rights to approve seamless or straight seam steel pipes that need to be lined inside and coated outside in a manner similar to

epoxy-lined DIP. Spiral-welded steel pipes are not allowed by **DCDWM**. Pipes crossing wetlands and low-flow creeks shall have at least two (2) supports at each joint, with one support near the bell.

Interior Lining *of* the EDIP for gravity sanitary sewer and force main shall have a completely covered inner surface of the pipe from bell to spigot. The lining shall be virgin polyethylene complying with ANSI/ASTM D1248 and be a minimum of forty (40) mils in thickness as manufactured by American Cast Iron Pipe Company (ACIPCO) polybond lining, or U.S. Pipe Protecto 401 ceramic epoxy lining or Warren epoxy, epoxy-lined DIP, with lining defects such as cracking or holes in the lining shall not be installed and shall be removed from the site immediately to avoid a Stop Work Order. Field repair of epoxy is not permitted.

Exterior Coating

Gravity Sewer Pipe six (6) to twelve (12) inches shall be Pressure Class 350 in accordance with ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51.

Gravity Sewer Pipe sixteen (16) inches and Larger shall be a minimum of Pressure Class 250 in accordance with ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51. Loading and depths may require greater pressure classes of pipe.

Flanged Ductile Iron Pipe and Fittings shall be four (4) inches and larger. Flanged pipe shall be a minimum of Class 53 per AWWA C115. Flanged pipe, fittings, and appurtenances are for above ground use, inside vault, or lift wet well only. Flanged pipe shall be shop-fabricated, face drilled, lined and exterior coated by the manufacturer or the manufacturers lining company. Fabrication or lining of flanged pipe on site is not permitted. Complete shop drawings of the pipe, fittings, and appurtenances shall be submitted to **DCDWM** for approval before delivery to the site.

Pipe Joints **-** Proper joint technology, such as flanged, restrained, or mechanical; adequate supports to prevent excessive deflection and flexion; or a combination shall be provided for aerial pipe crossings. Pipe supports shall be designed to withstand the hydrodynamic effects of the stream flow pressure using the following formula:

$P = 2.5KV^2$

Where

2.5 = Safety factor against overturning

P = Pressure, psf

V = Velocity of water, fps

K = 4/3 for square ends, 1/2 for angle ends when angle is < 30°, and 2/3 for circular piers.

Expansion jointing shall be provided between above ground and below ground sewers. When buried sewers change to aerial sewers, special construction techniques shall be used to minimize heaving. Special construction details, submitted to the **County** for approval, also shall be required between above ground

and below ground sewer transition to account for seismic and sudden unexpected forces arising due to erosion of stream banks.

Impact of Flood Waters

If it is probable that the aerial pipe could be submerged by the stream flow, the effects of flow pressure on the pipe shall be taken into account when computing pier-overturning moments. For aerial crossings, the impact of flood waters and debris shall be considered in the design calculations.

The following criteria shall be used in design calculations:

- Pipe crossing shall be anchored in the bank in such a way that if the pipe supports are lost, the pipe system shall not separate, and shall be restrained by the anchor blocking of appropriate size in the bank. Anchor blocking structural computations and details shall be provided.
- Pipe joint stability calculations and details shall be provided.
- Pipe joints shall be flexible restrained joints.
- For wide stream crossings, steel pipe of appropriate thickness shall be used, with interior lining and external coating as mentioned above for epoxy-lined DIP. Design computations and details shall be provided.

Pipe Joint Seals – Pipe joints for epoxy-lined DIP shall be sealed externally using a flexible epoxy-based sealing compound to ensure a water tight joint, in addition to the rubber ring or other type of seals supplied by the manufacturer at the bell and spigot joint location.

Casing Pipe – Aerial crossings shall be a restrained carrier pipe inside a high-strength steel casing pipe. The minimum steel casing pipe for aerial crossings shall be 0.33 inch thick.

Freeze Protection – Precautions against freezing, such as insulation and increased slope, shall be provided. Expansion jointing shall be provided between above ground and below ground sewers. Where buried sewers transition to aerial sewers, special construction techniques shall be used to minimize frost heaving.

Concrete Collar Anchors – Concrete collars for casing anchoring shall be designed for each application by a Georgia Registered Professional Engineer. The collars shall be a minimum of four thousand (4,000) PSI reinforced concrete, minimum twelve (12) inches thick and four (4) feet square. Anchors shall have minimum reinforcing steel of #5 @ 12 E.W. The collars shall be installed eighteen (18) inches from end of casing pipe. Collars shall be secured to the casing. The collar shall not cover the casing to carrier end seals or be used as a pipe transition.

Concrete Piers – Piers for aerial crossings shall be designed for each location by a Georgia Registered Professional Engineer. Placement of the piers shall be approved by **DCDWM**. The piers shall be a minimum of five thousand (5,000) PSI concrete, minimum of two (2) feet square and well anchored into the bed rock or have sufficient depth as directed by the Geo-Technical Engineer. Piers shall have a minimum reinforcing steel of #5 @ 12 E.W., and E.F. The top of the pier shall have

an adjustable bracket or cylindrical cradle anchored in the concrete to secure the casing pipe. Anchors, cradles and exposed brackets shall be stainless steel and epoxy coated (minimum forty, 40, mils) to resist corrosion. Cushion material shall be placed between the pipe, clamps, and support. The invert elevation of the pipe from upstream to downstream piers shall match the design elevations.

Design Computations – Pipe supporting structures shall be designed to prevent frost heaving, overturning or settlement. Provide calculations for the aerial pipe crossings and supporting structures that are subject to hydrodynamic forces. Calculations are to provide for a minimum factor of safety of two and a half (2.5) against overturning and one and a half (1.5) for uplift due to buoyancy. Calculations shall also address applicable seismic and other unexpected loads.

Structures – The sewer interceptors, manholes, or other structures shall be located so they do not interfere with free discharge of flood flows of the stream. Portions of manholes above grade subject to hydrodynamic forces of flooding shall be designed to be watertight and be able to resist the flood forces with a safety factor of two and a half (2.5), as mentioned above for pipes and piers. Frames and covers shall be bolt-down watertight frames and covers. Manhole rims shall be twenty four (24) inches above the one hundred- (100-) year base flood elevation.

Buoyancy and Flotation – Buoyancy shall be considered and flotation of the manholes, piers, anchors or any other structure shall be prevented with appropriate construction where high groundwater or flooded conditions are anticipated. For design purposes, the **Engineer** shall assume water to top of manhole and that the manhole is empty. The **Contractor** shall be responsible for protection against flotation of pipe or structures installed or partially installed. Pipes or structures that are partially floated or completely floated from original installation locations shall be removed and reinstalled as per **DCDWM** Standards. Damaged pipe or structures shall be discarded and replaced in accordance with as per **DCDWM** Standards. The factor of safety for uplift is one and a half (1.5) for pipes and structures.

Anti-Seepage Collars – Wetland Areas – In areas where the sewer trench has the potential to drain wetlands, anti-seepage collars shall be installed. In these areas, a USACE 404 Wetland Permit and/or a NCDENR 401 Water Quality Permit may be required. Trench water shall not be diverted or pumped into the sanitary sewer system.

7. Buried Crossings for Sanitary Gravity Sewers and Force Mains

The buried crossing is to be designed with a steel casing and epoxy-lined DIP carrier pipe, and shall be as near perpendicular to the stream as possible, and shall be free from change in grade. Gravity sewers crossing creeks shall be placed below the streambed such that there is a minimum of two (2) feet bury below the streambed and minimum one (1) foot of cover over the casing. If the minimum two (2) feet bury depth cannot be attained, either encase the sewer in concrete or design the sewer as an aerial crossing as per above-mentioned criteria. Aerial sewers shall only be allowed when it can be demonstrated that no other practical alternative exists. The design and material requirements for aerial crossings also apply for buried crossings. The sewer shall be designed and constructed such that it remains watertight (exhibit zero infiltration), and free from changes in alignment or grade due to anticipated hydraulic loads, erosion, impact, etc., and tested per **DCDWM** Standards. Sewers

shall remain fully operational during the one hundred- (100-) year flood event. Sewers and associated appurtenances located along the creeks shall be protected against the normal range of high and low water flow conditions, including the one hundred- (100-) year flood event.

Bedding and Backfill – Special care shall be taken to provide a firm base for pipe bedding. The plans shall specify that the soft organic material within the creek banks shall be replaced with select imported backfill. Install concrete blocks under each bell and spigot joint when pipe is encased in concrete. In addition, a layer of four- (4-) inch to eight- (8-) inch cobbles shall be placed on top surface of trench area for the full width of the creek. Additional material used to backfill the trench shall be stone, coarse aggregate, washed gravel, or other material that will not readily erode, cause siltation, damage pipe during placement, or corrode the pipe.

Special design requirements shall be employed to prevent stream flow from sinking at the crossing and following the pipe bedding. This can be accomplished with an in-trench impounding structure of compacted clay or other acceptable impermeable material that will match with the native stream bed.

Check Dams - To prevent French drain effect of the sewer or any other pipe crossing the creek, install check dams upstream in the pipe conduit trench. Check dams shall be separate from any concrete encasement or steel casing.

Clay Plug - A clay plug shall be required at the downstream side of the crossing. The plug shall be a minimum of (four) 4 feet in length, shall extend the full width of the trench, and shall extend twelve (12) inches above and below the pipe.

Buried Pipe Cover Depth – The top of sewers entering or crossing streams shall be at a sufficient depth below natural bottom of the streambed to protect the sewer line. The following requirements shall be met:

- One (1) foot of minimum cover where the sewer is located in rock.
- Three (3) feet of cover in other material, unless the pipe is encased in concrete or in a steel casing.
- More than three (3) feet cover is required in major rivers, creeks or streams as determined by **DWM**.
- Minimum seven (7) feet cover is required in shifting creeks or stream channels.
- In paved stream channels, the top of sewer pipe shall be placed at least eighteen (18) inches below the bottom of the channel base.

Less cover may be approved by the **County** only if the proposed sewer crossing shall not interfere with future modifications to the stream channel. Justification for less cover shall be submitted in writing to **DCDWM** for review and approval.

8. Inverted Siphons for Sanitary Gravity Sewers

Inverted siphons shall be avoided whenever possible by exploring and exhausting the other options. It shall only be considered where avoidance or adjustment of the obstructing utility or structure or stream is not practical.

An inverted siphon can be designed for a portion of a wastewater main which dips below the hydraulic grade line to avoid any obstructions including but not limited to drainage structure, utility, tunnel, subways or stream. In order to pass these obstructions, a common method is for the sewer pipe to drop sharply, then run horizontally under the obstruction, and finally rise to the desired elevation.

An inverted siphon is designed to flow under pressure. The structure shall operate without excess head when flowing at design capacity. Therefore, special care shall be taken during design since head losses are greater for pressurized flow. If minor losses due to bends or elbows in the siphon are significant compared to the siphon length, then include the equivalent length of minor losses from bends, elbows, etc. to calculate the final length of the siphon. Typically, total head losses equal to the sum of the friction, entrance, exit, screens, elbows, transitions and bends losses.

Inverted siphons shall be designed according to the following design criteria:

Design Criteria

- Useful design life shall be fifty (50) years.
- Minimum pipe diameter shall be eight (8) inches.
- Minimum velocity of flow for sewage shall be three (3) fps to promote self-cleaning and to minimize siltation.
- Pressure-rated pipes and fittings shall be used. Gaskets shall be water tight at the pipe joints.
- Use welded smooth steel pipe with internal ceramic or epoxy coating as mentioned in the Buried Crossings section.
- The pipe shall be able to withstand the internal hydrostatic head measured to the centerline of the inverted siphon.
- Provide minimum two barrels, so that one be could be offline for maintenance, while the other barrel is in service.
- Design flow shall be the peak future projected flow based on **DCDWM** Standards.
- Peak hydraulic capacity per barrel to be determined taking into account full pipe flow.
- Design for minimum head loss. Convergence losses at the entrance are usually negligible, but divergence losses at the exit (outlet) can be significant.
- Convergence, divergence and other head losses shall be calculated, depending on actual conditions and hydraulic grade analysis.
- A hydraulic jump in the descending part of the siphon (upstream side) will greatly increase the head loss, and may cause problems of surging and “blow-back.” Water and air periodically surge back to the inlet.
- A “hydraulic seal” at the upper edge of the siphon pipe can prevent entrainment of air. Ensure in design of the inlet structure that the level of water always remains at least one (1) foot above the top of the inlet siphon pipe.

- If the head loss is too high, choose a larger pipe or different pipe material, or consider adjusting the inlet and outlet elevations.
- Multiply calculated head loss with a factor of safety of one and a quarter (1.25) to account for future deteriorated conditions.
- Provide minimum four (4) feet cover above pipe while crossing a natural stream or man-made depression.
- Maximum slope of the downstream (rising) leg of the inverted siphon shall be fifteen percent (15%).
- Provide necessary appurtenances for maintenance, convenient flushing, and cleaning equipment.
- Provide adequate clearances on the inlet and discharge structures for cleaning equipment, inspection, and flushing.
- Provide access road on the inlet and discharge sides so that inspection and maintenance can be easily accomplished.
- Air can become trapped, especially in long siphons, during filling. Therefore, filling of the siphon shall be gradual, not sudden.
- Provide air vents, pressure-release valves, or air jumper pipes to relieve air pressure.
- Provide a blow-off structure with a sump and submersible grinder pump at the lowest point in the alignment to be able to pump out the sediments.
- Other aspects governing buried crossings shall also apply for inverted siphons.

Design Development

- The arrangement of inlet and outlet details shall divert the normal flow to one conduit and allow overflow into the second conduit. Usually, the conduit taking the overflow will be right above the point where the approaching conduit is carrying the flow that the first conduit is able to carry at full flow.
- When multiple conduits are to be used, the conduits shall be arranged so that additional conduits can be brought to service as wastewater flows increase in future.
- The design shall allow any conduit/barrel to be taken out of service for cleaning.
- Siphon pipes, manholes and junction structures shall be designed to minimize nuisance odors and easy access to bends for cleaning.
- Inlet structures shall have trash racks to prevent debris from entering the siphon.

The following design steps may be used to adequately size a typical inverted siphon as applicable:

Step 1**:** Preliminary Sizing

Determine approximate location, size and type of conduits, inlet and outlet structures, or manholes, as needed. Conduit size(s) to be designed to carry peak flows may be determined as follows:

$D_1 = \sqrt{\frac{4Q_1}{\pi V}}$ and $D_2 = \sqrt{\frac{4Q_2}{\pi V}}$

Where, D_1 = Inside Diameter of Primary Conduit, feet.
D_2 = Inside Diameter of Secondary Conduit, feet.
Q_1 = Maximum Daily Flow, $feet^3$/second.
Q_2 = Peak Daily Flow, $feet^3$/second.
V = Velocity (Minimum 3 feet/second).

***Step 2*:** Preliminary Layout

Prepare a preliminary layout of the inverted siphon plan and profile to include the siphon, required inlet and outlet structures, existing or proposed ground line, and elevations at the siphon ends. The final layout shall provide the required cover, slope and bend angle details.

***Step 3*:** Head Loss Calculation

Compute the inverted siphon head losses using the preliminary layout and trial inlet and outlet geometry. Total head loss may be calculated as follows:

$H_f = (L_T)(S_f)$

Where:

H_f = Total Head Loss due to Friction.
L_T = Total Length of Siphon.
S_f = Friction Slope, and $S_f = (n^2V^2)/(2.2R^{4/3})$.
The total computed head loss shall be increased by twenty five percent (25%) to account for safety.

Ensure $1.25H_f$ < Head/Fall for each conduit or barrel.

In case $1.25H_f$ > Head/Fall, then adjust pipe diameter and velocity to achieve minimum velocity of three (3) feet/second.

***Step 4*:** Hydraulic Slope

Hydraulic slope across the inverted siphon shall meet the minimum slope requirements as established in the **DCDWM** Standards.

***Step 5*:** Finalize Calculations

The computed inverted siphon dimensions and angles shall be shown on the final siphon plan and profile layout. The final transition geometry and actual head losses shall be calculated and presented on the plans. If the actual head loss exceeds the available head, then more iterations may be needed by returning to step 1.

B. Force Main Creek Crossings

1. Force mains shall be routed such that the number of stream crossings is minimized. When a stream crossing is required by the design, the crossing shall be as nearly perpendicular to the stream flow as possible.

2. DIP with joints equivalent to water main standards or a watertight ferrous encasement pipe shall be used to construct force mains that cross streams.

3. Force main bedding, haunching, and backfill shall be appropriate for the installation location and pipe material. However, the ability of the bedding and backfill material to readily erode, cause siltation, damage the force main during installation, and corrode the force main after installation shall also be considered.

4. Aerial stream crossings shall require special permission from **DCDWM**. Only DIP with flanged joints, in conjunction with adequate supports, shall be used for aerial stream crossings.

    a. Supports for aerial stream crossings shall be designed to prevent frost heave, overturning, and settlement.

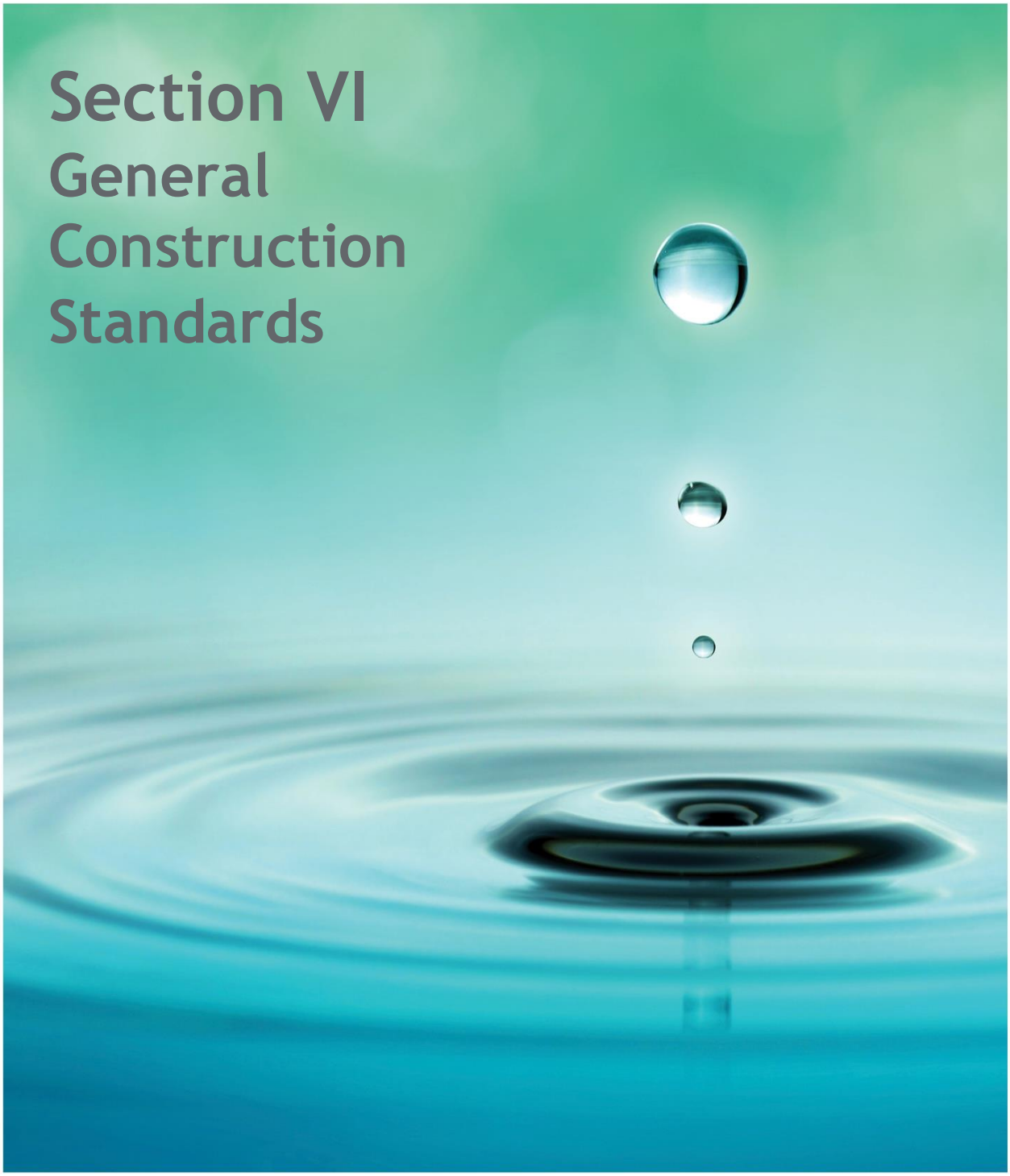
    b. The force main shall be adequately protected from freezing and heaving.

    c. The impact of floodwaters and debris shall be considered during the design of aerial crossings. The bottom of the force main pipes shall be placed no lower than the elevation of the twenty five- (25-) year flood stage of the stream.

DeKalb County
GEORGIA

WATER Matters

Section VI
General Construction Standards



SECTION VI
GENERAL CONSTRUCTION STANDARDS

A. General Construction Requirements

1. Locating Existing Utilities

On February 3, 2009, the Georgia Public Service Commission (PSC) approved the adoption of new utility rules 515-9-4-.02 and 515-9-4-.13 under the Georgia Utility Facility Protection Act. These new rules define Large Projects and describe the procedures to be taken should a project meet the specifications of a Large Project. DeKalb **County** has a Damage Prevention Program in place to eliminate damage to **DCDWM** utilities, investigate damage claims, and educate potential excavators about safe digging practices. **DeKalb County** requires that the projects submitted for approval by **DCDWM** that meet the criteria set by the PSC for a Large Project follow the procedures set out by the Georgia Utility Facility Protection Act.

Furthermore, **DCDWM** requires that if the project submitted for approval meets the criteria for Large Project status, a utility-locating schedule be submitted with the plans to be approved. This schedule shall describe in detail the **DCDWM** utilities that need to be located and at what phase of the project's completion this field location shall take place. This schedule shall be an individual document in the submittal and shall be submitted at the same time as the project documents. It shall be clearly labeled as the "Locating Schedule for Project Name," where "Project Name" is the name of the project submitted for approval.

2. Maintenance of Traffic

The **Contractor** shall obtain the necessary road opening permits from the County Department of Public Works Transportation Division at **(770) 492-5206**, including providing any required restoration bonds.

When a water main, sanitary sewer line, or force main is to be installed within the travel way of a County- or GDOT-controlled road, a traffic control plan (TCP) shall be required. The TCP, with the construction plans, shall be submitted to the reviewing agency for review and approval. The following roadway features shall be shown on the TCP:

- Pavement width
- Pavement type
- Speed limit
- Traffic lane designation
- Pavement markings
- Traffic signs/signals
- Side streets/intersection location

A TCP shall include the following:

- Legend
- Work hour restrictions
- Construction sequence/phasing
- Work zone designation
- Sign placement
- Taper length
- Traffic movement designation
- Drum/cone/barricade/barrier placement
- Flagging requirement/location
- Uniformed police officer requirement/location

The following agency shall be contacted when preparing a TCP:

- DeKalb County Department of Public Works Transportation Division, at (770) 492-5206.

The following publications govern the design and installation of TCPs and devices:

- *MUTCD* (latest edition)
- *GDOT Standard Specifications for Roads and Structures* (latest edition)
- *GDOT Roadway Design Manual* (latest edition)

DCDWM shall obtain the road opening permits required by GDOT. The **Contractor** shall not make any cuts on roadways requiring a permit from GDOT until such time as the permit is provided and prominently displayed onsite.

Highway utilities and traffic controls are to be maintained, and Work shall conform to the rules and regulations of the authorities, including the use of standard signs.

3. General

a. Rock Excavation / Blasting

Rock Excavation

1. Where rock is encountered within excavation for structures, it shall be excavated to the lines and grades indicated on the County approved drawings or as otherwise directed by the **DCDWM**.

2. Disposal of Rock: The **Contractor,** in a lawful manner shall dispose of rock, off site, that is surplus or not approved by **DCDWM** as suitable for use as riprap or backfill.

Blasting

1. No Blasting shall occur until the **Contractor** has received written approval from **DCDWM.** The **Contractor** shall notify **DCDWM** in writing the date, time of day of the first blast and the duration the blasting is to occur. The **Contractor** shall notify the **DCDWM** and local fire department before any charge is set.

2. The **Contractor** shall exhaust other practical means of excavating prior to utilizing blasting as a means of excavation. The **Contractor** shall provide a blaster certified licensed in the State of Georgia, and experienced workmen to perform blasting. The **Contractor** shall conduct blasting operations in accordance with all existing State and County ordinances and regulations and gain all required permits at their cost. The **Contractor** shall protect all buildings, structures and utilities from the effects of the blast. The **Contractor** is responsible for any damage due to the blasting and shall repair any resulting or associated damage at their cost.

3. The **Contractor** shall employ an independent, qualified specialty subcontractor, to: monitor the blasting by use of a seismograph; identify the areas where charges shall be used; conduct pre-blast and post-blast inspections of structures, including photographs or videos; and maintain a detailed written log that may be reviewed by the **DCDWM.**

4. Trench Excavation

Excavation Methods

a. All excavation shall be open cut unless otherwise indicated on the "approved" design or directed by **DCDWM**. In general, topsoil may be removed by machine method. Excavation below topsoil may also be performed by machine, but shall be supplemented by such hand dressing or leveling as may be required to conform to lines and grades as given by **DCDWM**. Material so removed shall be used in backfill, making embankments, filling low areas, or as otherwise directed.

b. Hand tool excavation shall be used where necessary to protect existing utilities and structures.

c. All slopes shall be carefully cut or graded to meet OSHA standards.

d. The final trimming of the bottoms and sides of excavations that is to be adjacent to concrete roads, sidewalks, curbs, or other structures shall be done just before the concrete is placed, or poured.

e. In open or improved lawn areas, excavation should be done, if possible, using a tractor-mounted backhoe and extreme care shall be taken to avoid damage to adjoining lawn areas. In areas not readily accessible by machinery and where excavation is required near existing trees and shrubberies that may be damaged by excavation equipment, the trench shall be excavated using hand tools.

f. The minimum width of trench from an elevation of twelve (12) inches above the top of the pipe to the bottom of the trench shall be as indicated on Standard Detail G-004, **Appendix E**.

g. In order to limit loads on the pipe, the maximum width of the trench shall not be more than twenty four (24) inches wider than the outside diameter of the pipe. This trench width restriction applies from the bottom of the bedding to twelve (12) inches above the top of the pipe. Trenches greater than six (6) feet deep shall be sloped from a point twelve (12) inches above the pipe to ground surface elevation. See Standard Detail G-004, provided in **Appendix E.**

h. Excavation of pipe trenches with sides sloping to the trench bottom shall not be permitted.

i. Should trenches be excavated with more than the specified maximum widths, **DCDWM** may require the Contractor to furnish concrete cradles or concrete encasement for the pipe.

5. Sheeting and Shoring

The **Contractor** shall be responsible for supporting and maintaining required excavations even to the extent of sheeting and shoring the sides and ends of excavations with timber or other supports. If the sheeting, braces, shores, stringers, wailing timbers, or other supports are not properly placed, or are insufficient, the **Contractor** shall provide additional or stronger supports as may be required. The requirement of sheeting or shoring, or of the addition of supports, shall not relieve the **Contractor** of its responsibility for their sufficiency.

Trench sheeting shall be left in place until the backfilling has been completed to an elevation not less than twelve (12) inches above the top of the pipe. Unless otherwise ordered by **DCDWM**, sheeting shall be cut off at the top of the lowest set of bracing and the upper section shall be removed.

Where, in the opinion of **DCDWM**, the removal of sheeting may endanger the Work, such sheeting shall be ordered to be left in place and the tops cut off as directed or as specified above. Removal of the sheeting shall be done in such a manner as to prevent injurious caving of the sides. Voids left by the sheeting along trenches shall be carefully filled and rammed with suitable tools.

In quicksand or soft ground, sheeting shall be driven to such depth below the bottom of the trench as directed by the Developer's/Design Engineer. A Professional Engineer Registered in the State of Georgia shall design all sheeting/shoring to meet OSHA standards.

6. Removal of Water

The **Contractor** shall pump out, or otherwise remove and properly dispose of, any water (e.g., stormwater and/or groundwater) as fast as it collects in the excavation. This procedure shall meet federal, state and local standards. Water shall not accumulate or be present in the excavated trench at any time. This removal is required regardless of the source.

All necessary precautions shall be taken to prevent disturbance at, and to properly drain, any areas upon which concrete is to be poured, or upon which pipe is to be laid.

Approved, and appropriate, equipment with sufficient capacity to remove water from the Work shall always be kept onsite. Equipment shall be used in such a manner as to not withdraw sand or cement from concrete. The **Contractor** shall also ensure that removal of any liquids will not interfere with the proper laying of pipe, or prosecution of any of the required Work for the complete construction of the project.

The flow in sewers, drains, gutters, or water courses encountered during the construction shall be adequately provided for by the **Contractor** to ensure these flows do not interfere with the prosecution of the Work, and are maintained in such a manner as to always ensure continuity of flow.

Unless otherwise permitted, groundwater encountered within the limits of excavation shall be lowered to an elevation not less than twelve (12) inches below the bottom of such excavation. This elevation is to be reached prior to the beginning of any pipe laying or concrete work and shall be so maintained until concrete and joint materials have attained initial set.

If raw sewage is encountered during performance of the Work, the **Contractor** shall immediately stop Work and shall notify **DCDWM**, which will then determine whether actions by the **Contractor** caused the leak. **DCDWM** mitigation guidelines shall be followed. Refer to **Appendix F.**

If other hazardous liquids or materials (as defined by the Federal, State of Georgia, DeKalb County, and Local jurisdiction in conjunction with the Comprehensive Environmental Response, Compensation, and Liability Act, (CERCLA), and Superfund Amendments and Reauthorization Act, SARA, Title III) are encountered during performance of the Work, the **Contractor** shall immediately stop Work and shall notify the appropriate State agency and **DCDWM**. Hazardous liquids include, but are not limited to gasoline, diesel fuel, and industrial solvents or cleaners. The Federal, State of Georgia, DeKalb County and/or Local jurisdiction(s) in conjunction with **DCDWM**, will then determine whether actions by the **Contractor** caused the liquids or materials to leak or be further dispersed. Any hazardous liquids or materials shall be properly disposed of as directed by the Federal, State of Georgia, DeKalb County and/or Local in jurisdiction(s) with **DCDWM**.

7. Pipe Handling

The **Contractor** shall unload all pipe, fittings, and accessories from trucks with hoists or by skidding. Pipe handled on skidways shall not be subjected to skidding or rolling against pipe already on the ground. Under no circumstances shall said materials be dropped off any delivery vehicle. Should any material be accidentally dropped, it shall be immediately labeled with indelible markings or tagged and set aside, or rejected as directed by **DCDWM**. If **DCDWM** has any questions regarding acceptability of said materials, the **Contractor** shall either remove and replace the questionable materials, or obtain a signed written statement from the manufacturer certifying the pipe, fittings, and/or accessories as "undamaged."

The **Contractor** shall use proper, suitable tools and appliances shall be used for the safe and convenient handling and laying of pipe and fittings. The **Contractor** shall take great care shall be taken to prevent the coating and lining from being damaged.

Pipe shall not be "strung," or laid out, along the project within existing highway rights-of-way, unless specifically directed to do so by **DCDWM**, and only then after receiving permission from the road authority that has jurisdiction. Pipe shall be stored in such a manner as to keep the interior free of dirt and other foreign matter.

The **Contractor** shall carefully examine the pipe and fittings for defects just before laying. No pipe or fitting that is known to be defective shall be laid. In the event that defective pipe or fittings are discovered after having been laid, the **Contractor** shall remove and replace with sound pipe or fittings in a manner satisfactory to and at no addition cost to **DCDWM**.

The **Contractor** shall maintain a clean Work site and clean materials throughout the project. Pipe and fittings shall be kept free from mud, dirt, and debris while stored onsite, and shall be thoroughly cleaned before being laid. During any stoppage in the laying of pipe, and when ending construction for the day, the **Contractor** shall install a mechanical or fitted plug in the open end of the pipe to prevent contamination of the pipeline. Should any accidental contamination occur, the pipe shall be thoroughly cleaned and swabbed out and inspected by **DCDWM** before new or further pipe installation shall commence.

8. Pipe Laying

All pipes shall be thoroughly cleaned before being laid and shall be kept clean until final acceptance of the Work.

The pipe shall be laid and jointed in the following manner:

- ***Clean Ring and Spigot*** – The gasket, groove, and pipe spigot shall be wiped clean of foreign material.
- ***Install Gasket*** – The ring shall be inserted in the groove, taking care to see that the gasket is evenly seated and free from twists.
- ***Apply Lubricant*** –The spigot end of the pipe from the pipe end to the full insertion mark shall be lubricated. Only the lubricant approved by the manufacturer shall be used. After the spigot end has been lubricated, it shall be kept clean and free of dirt, sand, or embedment material. If foreign matter adheres to the lubricated end, the spigot shall be wiped clean and re-lubricated.
- ***Assembly*** – After the pipe sections are aligned, the spigot end shall be pushed into the bell or coupling until it hits the stop and/or the reference insertion mark is in the proper location. The recommended assembly method is the use of a bar and a block. Pullers such as a “come along” may also be used if the pipe is protected from the chain or cable. Pipe deflection/offset shall not exceed the values listed in Standard Detail W-005**, Appendix A.**

Deflection off-set shall not exceed 75% of the manufacturer's recommended limit.

9. Restrained Joint Pipe

Table 6.1 below shows the acceptable restrained joint options. However, restrained joined pipe does not waive the required thrust blocking below ground. Above ground piping shall be designed using restrained joint piping with expansion and contraction considerations and shall be approved by the **County**.

Table 6.1
Acceptable Restrained Joints

Diameter (inches)	ACIPCO	U.S. Pipe	McWayne	Generic
4 - 12	Fast-Grip Flex Ring	Field Lok TR Flex	Push-On Restrained Joint Type A	MJ with Retainer Gland
16 - 24	Fast-Grip Flex Ring	Field Lok TR Flex	Push-On Restrained Joint Type A	MJ with Retainer Gland
30 - 36	Flex Ring	TR Flex	Push-On Restrained Joint Type B	MJ with Retainer Gland
42 - 48	Lok-Ring	TR Flex	N/A	MJ with Retainer Gland
54 - 64	Lok-Ring	TR Flex	N/A	N/A

a. Cathodic Protection

Cathodic protection of DIP shall be considered whenever corrosive soils or stray current could occur from MARTA, Atlanta Gas Light (AGL), or other facilities or utilities. Testing for corrosive soils or stray currents shall be at no cost to the **County** and shall be at the discretion of the **County**.

If repair of a water main is necessary, the **Contractor** shall follow Standard Detail W-018, **Appendix A,** for approved repair coupling installation. Cul-de-sac water main designs shall be submitted for approval by the **County**.

10. Bore and Jack

a. General

Working drawings shall show the size and location of bore and jack pits together with the sheeting and shoring to be used. In addition, such drawings shall include large-scale plan and profile of the proposed installation and affected structures if requested by **DCDWM**.

b. Casing Pipe

Casing pipe shall be new and unused pipe. The casing shall be made from steel plate having minimum yield strength of thirty-five thousand (35,000) PSI. The steel plate shall also meet the chemical requirements of ASTM A36, latest edition. At the discretion of the **County**, the outside of the casing pipe shall be

coated with coal tar epoxy having a minimum dry film thickness of sixteen (16) mils. Surface preparation shall be SSPC-SP-10. Epoxy shall have a minimum solids content of sixty-five percent (65%) by volume and shall be air or airless spray applied; minimum drying time shall be seven (7) days. Brushing shall be permitted in small areas only. Coating and recoating shall be done in strict accordance with the manufacturer's recommendations. Epoxy shall be Tnemec, Carboline, or Valspar.

The thicknesses of casing shown below are minimum thicknesses. Actual thicknesses shall be determined by the casing installer, based on its evaluation of the required forces to be exerted on the casing when jacking. Any buckling of the casing due to jacking forces shall be repaired at no additional cost to **DCDWM**.

The diameters of casings listed below are the minimum to be used. Larger casings, with **DCDWM** approval, may be provided at no additional cost to **DCDWM**, for whatever reasons the **Contractor** may decide, whether casing size availability, line and grade tolerances, soil conditions, or other factors. Casing and pipe support installation requirements are provided in Standard Detail G-009 in **Appendix E.**

c. Steel:

- Steel pipe shall be used for bore and jack casing.
- Pipe shall conform to the latest revisions of ASTM A134 or ASTM A139 with a minimum yield of thirty-five thousand (35,000) PSI. Alloy shall be in accordance with the latest edition of ASTM A36.
- Casing pipe may be uncoated and unlined with approval by the **County**.

d. Casing Sizes

Under railroads, the **Contractor** shall provide uncoated casings, unless otherwise required. The **Contractor** shall supply casing in accordance with the encroachment permits that are issued. **Table 6.2** shows the minimum casing sizes.

Table 6.2
Minimum Casing Sizes Under Railroads or Highways

Pipe Diameter (inches)	Casing Diameter (inches)	Wall Thickness (inches)	
		Coated	Uncoated
6	16	.250	0.282
8	18	.250	0.313
10	20	.281	0.344
12	22	.312	0.375
14	24	.344	0.407
16	30	.406	0.469

Table 6.2 Minimum Casing Sizes Under Railroads or Highways			
Pipe Diameter (inches)	Casing Diameter (inches)	Wall Thickness (inches)	
		Coated	Uncoated
18	30	.406	0.469
20	32	.438	0.501
24	36	.469	0.532
30	42	.500	0.563
36	48	.625	0.688
42	54	.750	0.813

e. Casing Spacers

Casing spacers shall meet one of the following requirements:

Casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09-inch-thick having a hardness of eighty-five (85) to ninety (90) durometer, minimum fourteen- (14-) gauge band and ten- (10-) gauge risers, with two- (2-) inch-wide glass reinforced polyester insulating skids. Runners shall be attached to stainless steel risers that shall be properly welded to the shell. The height of the runners and risers shall be manufactured such that the pipe does not float within the casing. Casing spacers shall be as manufactured by Cascade Waterworks Manufacturing Company, Pipeline Seal and Insulator, Inc., or Advanced Products and Systems, Inc.

f. Installation

Where pipe is required to be installed under railroads, highways, streets or other facilities by bore and jack method, the operations of the **Contractor** shall be subordinate to the free and unobstructed use of highway and structures and shall not weaken the roadbed or structure; see Standard Detail G-009 in **Appendix E**.

The **Contractor** shall proceed with the Work in such a manner as shall permit regular transaction of business by the highway department and/or property owner without delay or danger to life or property. The **Contractor** shall place necessary barricades, warning signs, signals, lights and, if necessary, watchmen for the protection of the public.

Jacks for forcing the casing 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 to properly support the section of the pipe and direct it to the proper line and grade. In general, roadbed material shall be excavated just ahead of the pipe.

Whenever possible, the pipe shall be jacked from the low or downstream end.

Excavated material shall be placed safely near the top of the working pit and disposed of as required. Use of water or other fluids will be permitted only to the extent necessary for lubrication. Jetting shall not be permitted.

The diameter of the excavation shall conform to the outside diameter and circumference of the casing pipe as closely as feasible. Any voids that develop during the installation operation shall be pressure grouted.

After the steel casing pipe has been installed, the carrier pipe shall be installed in the casing pipe. Care shall be exercised to maintain tight, fully seated joints in the carrier pipe. At each end of the casing pipe, the void between the carrier pipe and casing shall be sealed with casing end caps.

When requested by **DCDWM**, either grout shall be pumped between the carrier pipe and steel casing or sand shall be blown into the casing to fill the voids. Alternate methods shall be submitted for approval.

All sheeting placed for the jacking/auguring shall be completely removed by the **Contractor**.

All bore and jack designs shall include a manhole at or near each end of the jacked section.

When site conditions dictate, conventional tunneling techniques may be utilized as an alternate to bore and jack; see Standard Detail G-010 in **Appendix E.**

11. Work within GDOT Right-of-Way

All roadway restoration shall be done in accordance with the lawful requirements of the authorities within whose jurisdiction such pavement is located. Highway utilities and traffic controls are to be maintained, and Work shall conform to the rules and regulations of the authorities, including the use of standard signs. The **Contractor** shall furnish the bonds or checks that may be required by the highway authorities to ensure proper restoration of paved areas.

Trench restoration within a GDOT right-of-way shall be in accordance with GDOT Standard Detail 1401 Pavement Patching Details.

http://mydocs.dot.ga.gov/info/gdotpubs/ConstructionStandardsAndDetails/1401.pdf

12. Backfilling Trenches

A. Water and Force Main

Backfill in trenches where pipe has been laid shall be placed continuously by hand in layers not exceeding six (6) inches in thickness and carefully and thoroughly consolidated by tamping simultaneously on both sides of the pipe to a height of twelve (12) inches above the top of the pipe. This backfilling and compacting shall be done promptly and before any backfill material is deposited directly from a machine bucket, loaders, trucks, or other mechanical equipment.

When using a machine bucket for backfilling, the bucket shall be lowered into the trench to deposit the material in such a manner as to avoid the shock of falling earth that could injure or damage the pipe or structure. Under no circumstances shall the material be allowed to fall from the machine or loader bucket directly onto the pipe or conduit in the trench. The **Contractor** shall follow Standard Detail G-004, **Appendix E**, for trench backfill procedure.

Except as otherwise ordered by **DCDWM**, the forms, bracing, and lumber shall be removed from the trench before backfilling.

Bottoms of trenches in earth shall be shaped or molded and compacted to the contour of the outside of the pipe, using bedding materials, as directed, or where indicated on the approved design, to give full support to the lower segment of the pipe. This shall be done in such a manner as to prevent any subsequent settlement of the pipe. Boulders or loose rock that might bear against the pipe shall not be permitted in the trench bottom, or in the backfill within two (2) feet above the top of the pipe. Bottoms of excavations that are of loose granular soils shall be compacted by vibratory compactor prior to laying pipe to a minimum density of ninety-five percent (95%) of the maximum dry density as determined by the standard proctor test ASTM D698 (latest version).

Where foundation conditions are such that proper bedding cannot be provided, such as in quicksand, the **Contractor** may be directed by **DCDWM** to provide foundation cushion, concrete cradles, or other special provisions to provide support for the pipe.

Only after the backfill has been placed and hand-compacted to at least six (6) inches above the top of the pipe shall the Work proceed in the placement of the remaining backfill material, which shall be carefully placed and compacted. In streets, other surfaced areas, or where directed, the backfill shall be placed and compacted in lifts not to exceed twelve (12) inches in thickness. Precautions shall be taken to avoid having any unincorporated material that may result in future settlement in these areas. Compaction shall be accomplished by approved mechanical tampers.

Backfill material shall be compacted to a density of not less than ninety-five percent (95%) of the maximum dry density as determined by the standard proctor test ASTM D698 (latest version). When directed, the **Contractor**, at its expense, shall arrange and bear the burden of the cost to have such compaction tests conducted by an independent testing firm; the minimum number of tests shall be one per 50 LF of pipeline installed and the locations shall be determined by **DCDWM**.

Materials used for backfilling shall be free from the perishable organics or other objectionable materials, and shall contain no stones larger than three (3) inches in the stone's longest dimension.

No soil backfill shall be used in pipe trenches under roadways or other paved areas. In such paved areas, trenches shall be backfilled with crushed rock and compacted to the minimum required compaction of ninety-five percent (95%) of

the maximum dry density. When allowed by **DCDWM**, in non – paved areas the compaction may be less than ninety-five percent (95%) however no less than ninety percent (90%) of the maximum dry density.

If, in the opinion of **DCDWM**, the original excavated material is unsuitable for use as backfill (such as perishable matter, refuse, building materials, wire, brush, stumps, ashes, large stones, muck, or other soft materials), the **Contractor** shall properly dispose of the objectionable materials, and shall furnish, haul, and place borrow material suitable for proper backfill, as directed by **DCDWM**.

Backfilling shall not be done in freezing weather, except by permission of **DCDWM**, and shall not be done using frozen materials or upon frozen materials.

Backfilling shall be left with smooth, even surfaces, properly graded, and shall be maintained in such condition until final completion and acceptance of the Work, notwithstanding applicable warranty periods. Where directed by **DCDWM**, the **Contractor** shall mound the backfill slightly above the adjacent ground to allow for settlement.

13. Abandonment of Pipelines

- Prior to approval of plans that include abandonment of pipeline the Operations Management of Water and/or Sewer shall also review plans. All lines that are proposed for abandonment shall be approved by the **DCDWM**. The **Contracto**r shall submit a schedule and detail methods to be used on each pipeline to be abandoned.

- Abandoned pipe lines shall be inspected prior to filling.

- No abandonment shall proceed until approval from **DCDWM**.

- Filling abandoned pipelines shall conform to the requirements of a submittal approved by the **DCDWM**. The **Contractor** shall have a minimum of five (5) years' of documented experience in chemical grouting of pipe lines.

- All Sanitary Sewer lines shall be cleaned before CCTV and abandoning. Where indicated on the approved plans or as directed by the **DCDWM**, the **Contractor** shall perform television inspection, smoke testing, and/or dye testing to determine whether there are active service connections on sanitary sewer lines. The **Contractor** shall not fill pipe lines with active connections. Each line to be abandoned, at a minimum, shall have a brick bulkhead at each end. Flowable fill shall be pumped into the pipe line from the upstream end with sufficient pressure to ensure that the line is completely filled.

14. Flowable Fill

Reference www.dot.ga.gov - in the search engine bar type in - Section 600.

The contractor shall follow the minimum requirements of GDOT Section 600 and shall submit a design mix to **DCDWM** for approval.

B. Restoration of Pavements, Sidewalks, and Curbs

Standard Details G-005 and G-006, in **Appendix E**, shall be followed for the repair of concrete and asphaltic concrete surfaces.

1. Work Included

The **Contractor** shall furnish the materials for, and properly restore the pavements, drives, sidewalks, and curbs that may have been damaged, removed, or disturbed as a result of accomplishing the Work. Restoration and replacement shall be made to the satisfaction of **DCDWM**. This shall include in general, but without limitation, the necessary concrete, reinforcing steel, stone, cinders, gravel, slag, asphalt, or other bituminous material necessary for the proper completion and restoration of the Work as may be required, directed, or specified.

2. Materials and Workmanship

Materials to be used in the repair and restoration of pavements, drives, sidewalks, and curbs, shall be first quality and shall meet specifications. Materials removed while accomplishing the Work shall be disposed by the **Contractor** meeting all Federal, State and County laws. No existing material shall be reused in the Work unless pre-approved by DCDWM. Concrete shall be Class B plain concrete with a twenty eight- (28-) day compressive strength of three thousand (3,000) PSI minimum, unless otherwise specified in the drawings or specifications.

3. Restoring Pavements

After the pipe has been laid, appurtenant work constructed, and backfill completed, the **Contractor** shall furnish, place, restore, and maintain the pavements or roadway surfaces that have been removed or damaged by or in pursuit of the Work. The form and degree of restoration shall be as specified on the approved design, as specified herein, and/or as directed by **DCDWM**.

For backfilling roadway cuts, only crushed rock backfill shall meet a minimum of 95% compaction of standard proctor. See Section VI.12 for trench backfill requirements.

All roadway restoration shall be done in accordance with the lawful requirements of the authorities within whose jurisdiction such pavement is located. Highway utilities and traffic controls are to be maintained and Work shall conform to the rules and regulations of the authorities, including the use of standard signs. The **Contractor** shall furnish the bonds or checks that may be required by the highway authorities to ensure proper restoration of paved areas.

When removal of pavement is required (other than gravel types) the **Contractor** shall outline the area to be removed by making saw-cuts. Saw-cuts shall be vertical to allow the removal of the paving material in straight lines. If pavement breakage occurs beyond the saw-cut, the **Contractor** shall make a new straight saw-cut beyond the furthest point of breakage.

The concrete base course shall extend the full width of the trench cut plus a minimum of twelve (12) inches on either side of the trench. The existing pavement shall be neatly sawed along both sides of the ditch. The concrete used shall be Class A or B Concrete. Once the concrete base course has properly set, the concrete

surface shall be cleaned and a minimum of two (2) inches thick asphaltic concrete pavement shall be laid to match the level of the adjacent pavement, see Standard Detail G-005 in **Appendix E** for patch and 1.5 inches for asphaltic concrete for resurfacing requirements.

At any time that an existing road is cut longitudinally for a distance greater than one hundred (100) feet, the concrete shall be poured flush with existing and the street shall be resurfaced curb to curb with well compacted 1.5- inch minimum of asphaltic concrete. Existing road shall be restored to minimum of the preconstruction condition.

The **Contractor** shall be responsible for maintaining the pavement cuts prior to project acceptance and during the one- (1-) year maintenance period. Should any failures be noted associated with any portion of the Work, the **Contractor** shall remove the damaged surfaces and make full repairs; this includes adding and re-compacting approved backfill materials, placing and maintaining bituminous concrete pavement or stone road surfaces. Required pavement repairs necessitated due to pavement failure, either prior to final project acceptance or during the one- (1-) year maintenance period, shall be completed by the **Contractor** within five (5) working days of notification by **DCDWM**. Bituminous concrete pavements or stone road surfaces that the **Contractor** is required to replace shall be in at least as good condition at the end of the one- (1-) year maintenance period as it was before construction.

4. Roadway Permits

The **Contractor** shall be responsible for obtaining the road opening permits from the DeKalb County Department of Public Works Transportation Division at **(770) 492-5206**, including providing any required restoration bonds.

DCDWM shall obtain the road opening permits required by the GDOT. The **Contractor** is not permitted to make any type of cuts on roadways requiring a permit from GDOT until such time as the permit is provided and prominently displayed onsite.

5. Restoring Driveway Pavements

The **Contractor** shall repair or replace the driveway sections disturbed by the process of the Work. Driveways shall be constructed of the same materials and to the same thickness of the adjoining wearing surface. In restoring driveways, the subsoil and foundation material shall meet a minimum of 95% compaction so as to prevent any future settlement or cracking of the driveway pavement. In restoring concrete driveways, the base course shall be wetted prior to pouring new concrete. Where necessary to cut a concrete driveway, the cuts shall be made with a masonry saw, providing a smooth, straight line completely across the driveway. Partial cut-outs, crooked cuts, or cuts made by any other method other than masonry saw are not permitted. In general, or where directed, concrete slab removal shall be done in entire pavement sections (not fractions thereof) to the nearest existing expansion-joint.

6. Restoring Curbs

The **Contractor** shall restore the curbs and combination curbs and gutters that have been removed or disturbed in the progress of the Work. Curbing shall be made to conform accurately in size, line, grade, and materials as the adjoining section. In restoring curbs, the subsoil and foundation material shall meet a minimum of 95% compaction so as to prevent any future settlement of the concrete curbing. The sub-base shall be thoroughly rolled or tamped and shall be wet just before the concrete is placed, but shall show no pools of water.

7. Restoring Sidewalks

The **Contractor** shall restore the sidewalks that have been removed or disturbed in the progress of the Work. Sidewalks shall be constructed to the same dimensions and materials as the adjoining sections.

Where necessary to cut a sidewalk, entire sections shall be removed and replaced unless otherwise directed by **DCDWM**.

The sub-base shall be thoroughly rolled or tamped to a minimum of 95% compaction and shall be wetted just before the concrete is placed, but shall show no pools of water.

8. Contractor's Warranty of Restored Paved Surfaces

The **Contractor** shall meet a minimum of 95% compaction under areas to be paved. Any settlement that may occur during the one- (1-) year warranty period shall be corrected by the **Contractor** at its expense, including permitting, traffic control, removing, re-compacting, and replacing any paved surfaces that show signs of settlement, whether or not actual damage to the paved surface has occurred. This shall apply to the paved surfaces, including streets, drives, sidewalks, and curbs and gutters.

Should settlement, cracks, or other indications of failure, or impending failure, appear in the paved surface, the adjoining paving shall be removed to the extent necessary to secure a firm, undisturbed bearing. Removal, re-compaction, and replacement shall be in accordance with the specifications concerning these operations, as stated elsewhere.

C. Seeding / Sod Replacement

1. Work Included

The **Developer**/**Contractor** shall furnish the materials for, and properly restore to the satisfaction of **DCDWM**, the ground surfaces irrespective of type that may be disturbed in the progress of the Work. The **Developer**/**Contractor** shall refer to the Georgia Soil and Water Conservation Commission *Green Book,* latest edition, for erosion and sedimentation control for additional standards and requirements not listed in these Design Standards.

This shall include in general but without limitation, the spreading of topsoil, seeding, sod replacement, fertilizing, and mulching required restoring disturbed areas as may be necessary, directed, or specified herein. On "sod"-type lawns and other improved,

well-established grass areas, the sod/grass shall be carefully removed, kept alive, and replaced after the backfilling and grading is finished. The **Contractor** shall also remove the spoil from such areas as quickly as possible after the excavation is backfilled, and shall leave the premises in as good condition as before undertaking the Work. It is the intent of these Design Standards to restore the disturbed areas, to place seed and mulch in areas not specifically identified as improved lawns, to place topsoil and seed where improved lawns existed prior to construction, and to provide for "sod" removal and replacement in areas identified as such prior to construction.

a. Temporary Sedimentation and Erosion Control

Limitation of Exposure of Erodible Earth: The **Contractor** shall provide erosion and/or pollution control measures to prevent contamination of any river, stream, lake, reservoir, canal, or other water impoundments or to prevent detrimental effects on property outside the project right-of-way or damage to the project. Erosion and Sedimentation Control design shall be based on the Manual for Erosion and Sediment Control in Georgia, Georgia Soil and Water Conservation Commission, latest edition (Green Book), National Pollutant Discharge Elimination System (NPDES) permit requirements, and approved by **DCDWM.** The **Contractor** is responsible for installation and maintenance of all erosion control measures until expiration of one- (1-) year warranty period .

The **Contractor** shall use temporary erosion control features to:

- Correct conditions that develop during construction that were not foreseen at the time of design.
- Control erosion prior to the time it is practical to construct permanent control features.
- Provide immediate temporary control of erosion that develops during normal construction operation.

The **Contractor** shall schedule operations such that the area of unprotected erodible earth exposed at any one time is not larger than the minimum area necessary for efficient construction operations, and the duration of exposure of uncompleted construction to the elements is as short as practicable.

b. Acceptable Erosion Control Measures: (*Refer to the Erosion Control Manual*)

Temporary Mulching:

Furnish and apply a two- (2-) to four- (4-) inch-thick blanket of straw or hay mulch, as needed, then mix or force the mulch into the top two (2) inches of the soil to temporarily control erosion.

Artificial Coverings:

Use artificial coverings composed of natural or synthetic fiber mats, plastic sheeting, or netting as protection against erosion during temporary pauses in construction caused by inclement weather or other circumstances. Remove the material when construction resumes.

Use artificial coverings as erosion control blankets to facilitate plant growth while

permanent grassing is being established. For the purpose described, use non-toxic, biodegradable, natural or synthetic woven fiber mats.

Install the sediment control devices in a timely manner to ensure the control of sediment and the protection of lakes, streams, or any wetlands associated therewith and to any adjacent property outside the right-of-way as required.

At sites where exposure to such sensitive areas is prevalent, complete the installation of any sediment control device prior to the commencement of any earthwork.

c. Acceptable Sedimentation Control Measures:

- ***Sandbags***: Furnish and place sandbags in configurations to control erosion and siltation.
- ***Berms***: Construct temporary earth berms to divert the flow of water from an erodible surface.
- ***Baled Hay or Straw***: Provide bales having minimum dimensions of fourteen (14) by eighteen (18) by thirty-six (36) inches at the time of placement. Construct baled hay or straw dams as needed to protect against downstream accumulations of sediment.
- ***Temporary Silt Fences***: Furnish, install, maintain, and remove temporary silt fences, in accordance with the manufacturer's instructions.
- ***Rock Bags***: Furnish and place rock bags to control erosion and siltation.

d. Standard Specification for Seeding / Sod Replacement

The requirements of GDOT *Standard Specifications - Construction of Roads and Bridges*, Current Edition, and as revised to date, shall apply to the extent they are applicable for the seeding/sod replacement as directed by **DCDWM.** **GDOT 2013 Edition**

e. Topsoil

Where directed by **DCDWM**, the area to be seeded shall be covered with a layer of topsoil. The topsoil shall be of sufficient thickness that when spread and compacted, a minimum of five (5) inches shall be available. The **Contractor** shall furnish natural topsoil of a good condition and tillable structure. Obtain topsoil as borrow from an outside source of uniform texture, drainage, and other characteristics so as to constitute a homogeneous soil meeting the requirements of GDOT, and as approved by **DCDWM**. The **Contractor** shall furnish topsoil that is free from objectionable materials such as hard clods, stiff clay, sods, hardpan, partially disintegrated rock, large roots, or other materials that are not integrally a natural component of good agricultural soils, and that are harmful or not beneficial for successful plant growth. The **Contractor** shall not use topsoil containing frost or in an excessively wet (muddy) condition. If using existing material obtained from the initial excavation of the Work site for reuse as topsoil,

the **Contractor** shall first obtain approval from **DCDWM** as to the suitability of its content, including approval of location and method of storage of topsoil for reuse.

f. Seeding

Seeding shall be accomplished by the **Contractor** using a properly proportioned mixture of inoculated seed approved for use in "Zone One" as detailed in GDOT Standard Specifications. Seeding shall be only permitted in the specified planting season for "Zone One" for the specified mixture. Seeded areas shall be uniformly mulched immediately after seeding.

The **Contractor** shall maintain the seeded areas to include mowing, watering, and re-seeding any bare areas until a satisfactory stand of grass has been obtained and final acceptance of the Work has been received from **DCDWM**. Areas showing evidence of settlement or loss of topsoil shall be rebuilt and re-seeded as required.

In general, the **Contractor** shall replace existing maintained lawn areas with the same type of grass as was established prior to construction. Any deviations or alternatives proposed due to unavailability of seasonal grasses, or inappropriateness of seeding due to time of year shall be presented to the **DCDWM** Inspector in writing, with the signed authorization of the homeowner.

g. Preparation of Seeded/Sod Areas

The subgrade for any areas to be seeded shall be brought to a uniform grade by the **Contractor** and shall be free of stones larger than one (1) inch, as well as free of roots, gravel, or other debris. Where topsoil is required by **DCDWM**, the topsoil shall be uniformly graded, trimmed, and raked free of unsuitable materials, ridges, bumps, or depressions. Over this area, the **Contractor** shall spread agricultural lime at the rate of one hundred (100) pounds per one thousand (1,000) square feet and shall spread a 10-10-10 fertilizer uniformly on the surface of the ground at a rate of thirty-five (35) pounds per one thousand (1,000) square feet. The lime and fertilizer shall be mixed uniformly into the top four (4) inches of the soil using suitable harrows, tillers, or other mechanical equipment.

h. Sod Removal/Replacement

On well-established and "sod" type lawns, the **Contractor** may, at its discretion, using suitable sod cutting equipment, cut the sod into rolls, carefully remove and store the sod, and water and maintain the sod in a viable condition for replacement after backfill. Any such sod removed and replaced in this manner shall be shown to be living to the **DCDWM** Inspector prior to final acceptance of Project.

If sod is to be replaced with "new" sod, the **Contractor** shall only replace using sod of the same type as that removed. Any deviations or alternatives proposed due to unavailability of seasonal grasses shall be presented to the **DCDWM** Inspector in writing, with authorization of the homeowner.

D. Construction Oversight

1. General

When calling for an inspection, the **Contractor** shall state whether it is preliminary, final, or other specific type of inspection. No approval of a project shall be granted by **DCDWM** until the inspections are conducted, no defects noted, and the appropriate documents have been received and accepted. Letters of preliminary and final inspection/approvals will be sent to **Developers** and/or **Contractors** by **DCDWM** and placed in Department files.

Any damage to the existing system(s) occurring during construction activities shall be promptly reported to the proper authorities so that proper action may be taken. All associated costs due to damages by the Contractor shall be borne by the Contractor.

Cleaning of a newly installed system prior to inspection/approval shall not impair and/or damage an existing system.

Jobsites shall be landscaped to an equal or satisfactory condition as presented prior to start of construction activities.

2. Inspection Prior to Installation

Pipe shall be inspected and tested at the mill or warehouse by an independent testing laboratory to determine conformity with the requirements of ASTM standards. Signed and dated certificates stating results of inspection and tests shall be filed with **DCDWM**.

Prior to lowering pipe and appurtenances into the trench, a field inspection may be conducted.

E. Final Approval

1. General

The Final Plat will be signed by **DCDWM** after the following items have been submitted and accepted by **DCDWM**:

Completion of installation, inspection(s) and testing(s) per **DCDWM**:

- Construction Project Log
- Submission of signed record drawings
- Submittal of Construction Completion Form

2. Construction Completion Form

Contractor/Developer shall send Inspector acceptance reports to **DCDWM**, 4572 Memorial Drive, Decatur, Georgia 30032, **770-621-7200**. **DCDWM** will send the "Construction Completion Form" once the as-built drawings are approved. **Contractor/Developer** shall submit a completed Construction Completion Form to

DCDWM Construction Inspector prior to final plat approval. This form is provided in **Appendix A.**

3. Record Drawings

Record drawings (as-builts) shall be submitted to **DCDWM** before a project can receive final approval and/or Certificates of Occupancy. To avoid delays in the approval process of developments/subdivisions, as-built drawings should be submitted as soon as the water main installation, sewer main installation and pump station/force main installation are complete to allow sufficient time for review.

Record drawings shall be sharp, clear, clean, legible, and submitted on twenty four- (24-) inch-by-thirty six- (36-) inch plain paper and the electronic files shall be submitted on a USB 3.0 Flash Drive. The AutoCAD files shall follow the format and requirements presented in **Appendix E** for the water appurtenances. The files shall also contain x, y, and z coordinates for the appurtenances using the **County's** approved coordinate plane.

Record drawings shall include a site plan and any supplemental or shop drawings as required by **DCDWM**.

One (1) complete set of record drawings and one (1) copy of the electronic files shall be submitted by the **Developer or Developer's Engineer to DCDWM** for review and approval. Four (4) sets of record drawings shall be submitted to **DCDPS** after final approval.

Record drawings shall be stamped, dated, and signed by a Professional Engineer or Land Surveyor registered in the State of Georgia.

4. Survey Standards for DeKalb Watershed Management

As-builts for all water and wastewater projects shall include all new and existing infrastructures directly adjacent to the project area. This includes, but not limited to, fire hydrants, water valves, water mains, water meters, tees, tap sleeves, bends, reducers, and plugs. Sewer infrastructure shall include manholes, sewer mains, force mains, air valves, cleanouts and all features in and around sanitary sewer lift stations.

The primary survey strategy will implement a GPS methodology. The consultant shall use the Real Time Kinematic Method (RTK) or Rapid Static Method (RSM) and equipment adequate to produce horizontal, vertical, and elevation coordinates (x, y, and z) that will be consistent with DWM methods (centimeter survey grade accuracy).

If is determined that a number of features cannot be located directly by GPS due to obstructions, a secondary survey will be employed to capture obscured points.

The secondary strategy should consist of surveying using conventional methods. Establishing a transit and back sight using GPS, establishing a traverse loop, maintaining a minimum of 1:10,000 closure for the traverse, and side shots being collected by occupying the traverse points. Side shots should be enough to adequately survey the required features and/or other relevant features. After data

collection is complete, standard survey procedure dictates that the files will be downloaded into a coordinate geometry (COGO) package for any translation or rotation that might be required. The specifications for the datum and coordinate will be the Georgia West State Plane coordinate system. The horizontal datum will be the North American Datum (NAD83) and the vertical datum will be the North American Vertical Datum (NAVD88).

5. Warranty of Work

The **Contractor** (and **Developer** in private developments) shall warranty, for a period of twelve (12) months from the date of final acceptance (from date of final plat approval or Certificate of Occupancy in private developments), the water mains, appurtenances, gravity sewer main, force mains, pump stations, trenches, roadway and surface restorations, landscaping, and any other areas disturbed by the construction of the project, to be free from defects, and to be installed in compliance with the regulations, specifications, plans, directions, and construction practices that govern said installations.

The **Contractor** shall be responsible for repairs to any leaking pipe, fittings, etc. Should trenches settle during the warranty period, **Contractor** shall promptly furnish and place fill to the original grade and restore any damaged landscaping. Should any leaks or trench settlement occur under new pavement, the **Contractor** shall be held responsible for the cost of the permitting, traffic control, repairs, testing, temporary water to customers, including pavement replacement at the **Contractor's** expense.

The determination of the requirement for the **Contractor** to perform Work under this guarantee will be at the sole discretion of **DCDWM**.

APPENDIX A
POTABLE WATER MAIN DESIGN STANDARDS

DEKALB COUNTY WATERSHED MANAGEMENT
WATER DISTRIBUTION SYSTEM DESIGN PLAN CHECKLIST

The engineer is referred to the DeKalb County Department of Watershed Management "Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards" for general information on the preparation of water distribution systems.

This checklist is intended to be a guide in preparing Water Distribution System Plans. This checklist is not all encompassing. It is left to the Engineer's discretion to decide what additional information may be needed to complete the plans.

ALL SHEETS	
☐	Final plans shall be on 24"x36" paper sheets
☐	Final plans should be on 24" X 36" paper sheets.
☐	Each sheet except the cover sheet shall have a title block in the lower right corner containing: ☐ Project name. ☐ Project number (if DeKalb County project) ☐ Sheet number ☐ Total number of sheets ☐ Scale ☐ Drawer's, Designer's, and Checker's initials and date. ☐ Date (month/day/year)
☐	All sheets shall be sealed, signed and dated by a Registered Civil Engineer in the State of Georgia

COVER SHEET	
The Engineer shall provide a cover sheet with the following information:	
☐	Project name
☐	Drawing Index which provides sheet number and a description of the corresponding sheet
☐	Table of Quantities such as Pipe, valves, F.H.'s, meters, services etc.
☐	Vicinity map
☐	District and Land Lot number
☐	Engineering firm's name, address and telephone number
☐	Developer's name, address and telephone number
☐	Date (month/day/year)
☐	Signature Approval Blocks

SHEET 2	
The Engineer shall provide a general sheet containing the following information:	
☐	General notes covering important parameters as outlined in the DeKalb County Design Standards for Water, Sanitary Sewer, and Sanitary Sewer Pump Stations.
☐	Other notes as necessary to cover situations **not** covered by the Design Standards or by the DCDWM Standard Details.

DEKALB COUNTY WATERSHED MANAGEMENT WATER DISTRIBUTION SYSTEM DESIGN PLAN CHECKLIST	
☐	Legend showing symbols and line types used within the drawings.
☐	Engineering's firm title block containing firm's name, address, and phone number.
☐	Elevation datum and benchmark information in Georgia State Plane Coordinates.
☐	Note to be shown on plan: **Contractor shall notify DeKalb County Department of Watershed Management Inspector forty eight (48) hours prior to start of construction.**
PLAN & PROFILE SHEETS	
☐	Plan view shall show proper scale. Scale shall not be more than: Plan: 1 inch = 50 feet Profile: Horizontal – 1 inch = 50 feet Vertical – 1 inch = 10 feet
☐	Plan view shall show the following: ☐ All sheets, alleys and easements. They shall be dimensioned at least once and at breaks. Streets shall be identified by name. ☐ All abutting lots shall be identified by lot number, tract and subdivision. ☐ All topography within and to at least five (5) feet beyond easements and topography affected by construction shall be shown. ☐ Location of all above and underground utilities, including storm and sanitary sewers, dry wells, buried telephone lines, natural gas, power and cables. Existing utilities shall be shown as dashed lines or faded lines with type, size and other available information called out. ☐ All structures, paving, and other topographic features within vicinity, such as trees, shall be shown and identified by name, size and type. ☐ Location of proposed fittings and appurtenances such as fire hydrants, valves, meters, etc., shall be shown and identified by name, size, and type. ☐ Location of all existing and proposed easements. ☐ Location of all existing benchmarks shall be shown and identified by type. ☐ Location of all connections to existing waterlines with fittings clearly labeled and method of connection specified. ☐ Show bearings, curve information and stationing. ☐ Meter service connection shall be either stationed or dimensioned from property line. Also, provide offset dimension from the stationed centerline ☐ Location of soil boring holes. ☐ A chlorination tap shown on the plans approximate three (3) to five (5) feet from the beginning of the project or as close as possible to tap valve or connection points. ☐ All sheets shall have a north arrow orienting the plan view.
☐	Profile view shall show the following: ☐ Profiles are not required for water mains smaller than the sixteen (16) inches in diameter unless specifically required by DCDWM. ☐ Profiles are required for all water mains equal or greater than sixteen (16) inches in diameter. ☐ Profiles are required for all water mains crossing stream bed or Georgia Department of Transportation right-of-way.

DEKALB COUNTY WATERSHED MANAGEMENT WATER DISTRIBUTION SYSTEM DESIGN PLAN CHECKLIST	
	☐ Existing utilities which cross the proposed utility. Identified crossing utility by name, size, type of piping, location (station) and elevation. Location and elevation are to be obtained from 'as-built" plans paying particular attention to any differences in datum. **NOTE:** ***All existing underground utilities shown on profile are assumed to be shown in approximate location only*** ☐ Show proposed and existing grade line. ☐ All appurtenances such as valves, vaults, fittings and restraints. Identify by name, size, type, station and elevation. ☐ All sheets shall show match lines labeled as such with station and sheet number. ☐ Proposed water lines shall be shown as solid lines with sizes, material, and pipe classes called out. For example: 8 inch DIP (Water Main) – Class 51
DETAIL SHEETS	
☐	Include DeKalb County Standards Details to be used on the project.
☐	Include any other details specific to the project that are not covered by DeKalb County Standard Details.
☐	Detail sheets shall be located at the end of the plan set and referenced where used.
FIRELINE SUBMITTAL	
☐	Four (4) sets submitted to DeKalb County Department of Planning and Sustainability, including the following information: ☐ Name, address, and phone number of the developer or owner ☐ Name of entity or person responsible for costs relating to fire line installation along with name, address and phone number of the local twenty-four hour contact person. ☐ District and land lot of project. ☐ Street name, existing water main location, material and size of the water main. ☐ Size of fire line and total linear foot for each size of line and location. ☐ Size and location of water meter, if required. (Water meter must be purchased so installation will coincide with installation of fire line.)
☐	Plan approved by Fire Marshall's office.
☐	Note to be shown on plan: **Contact DCDWM, forty eight (48) hours prior to any fire line work commencement on the project.**

DeKalb County

DEPARTMENT OF WATERSHED MANAGEMENT

4572 Memorial Drive, Decatur, Georgia 30032
(770) 621-7200 * FAX (770) 724-1446 * TDD (770) 621-7237

Device Serial No.: _____
Test Date/Time _____
Tester Certification _____
Device Test Result ☐ Pass ☐ Fail

Backflow Prevention Device Test & Maintenance Report

(Please Print)

Account

Contact Name: _____ **Phone No.:** _____
Business Name: _____ **Meter #** **Meter Reading:**
Mailing Address: _____
Service Address: _____
City _____ **State** _____ **Zip:** _____

Device

Make: _____ **Model**: _____ **Size**: _____
Type: ☐ RPZ ☐ DC ☐ DCDA ☐ Detector Check
Date Installed: _____ **Location of property:** _____

☐	**New**		**Orientation**		**Use**		**Protection**
☐	**Existing**	☐	Vertical Up	☐	Domestic	☐	Containment
Previous Device		☐	Vertical Down	☐	Fire	☐	Isolation
Serial No.:		☐	Horizontal	☐	Irrigation		

Testing & Maintenance

	Initial Test Results			Repairs/Comments	Re-Test Results		
	Tightness		Differential		Tightness		Differential
Check Valve #1 (RPZ, DC, PVB)	☐ Leak ☐ Tight				☐ Leak ☐ Tight		
Check Valve #1 (RPZ, DC)	☐ Leak ☐ Tight				☐ Leak ☐ Tight		
Relief Valve (RPZ)							
Buffer (RPZ)							
Line Pressure							
Shutoff Valve #1	☐ Leak		☐ Tight				
Shutoff Valve #2	☐ Leak		☐ Tight				

Comments:

Test Procedure:

Notification

Alarm Company/Fire Department Notified: _____
Person Notified: _____ Notified By: _____
Turn Off Date/Time: Turn On Date/Time:

Test Kit

Test Kit Make: _____ Model: _____
Serial No.: _____ Last Calibration Date: _____

Tester

Tester Name: _____ Certificate Expiration Date: _____

Tester certifies that this assembly has been tested with the above listed procedure and verifies that isolation valves were returned to pre-test orientation.

Signature: _____ Telephone No.: _____

ENGINEER'S CERTIFICATE
CONSTRUCTION COMPLETION FORM

DEPARTMENT OF WATERSHED MANAGEMENT

DATE: _____

PROJECT NAME: _____

LAND LOT: **DISTRICT:**

This is to certify that _____

Have (has) been graded to within three (3) inches of the final grade, to conform to profile grade approved by DeKalb County Department of Planning and Sustainability;

That street(s) is (are) graded to proper width to allow for an eight (8) foot shoulder on each side of the curb. The shoulder is within three (3) inches of final grade;

That the proper catch basins have been erected, and the proper drainage facilities installed;

That sewers and sewer services have been installed;

That proof / documentation of 95% compaction has been provided as required;

That if easements are involved, they are within three (3) inches of final grade;

That no water mains will be laid until center line stakes have been installed and materials inspected and approved by Chief, Construction Management.

COMMENTS: _____

Signed: _____ **Date Approved:** _____

Developer's/Contractor's Design Engineer

DCDPS Development Engineer

DCDPS Chief Construction Manager

NOTE: Submit completed Engineers Certificate to the Development Division.

PLAN REVIEW CHECKLIST			
Project Name:			
Project Address:			
Reviewed by:		**Date:**	

General Information

General

☐	Show name, address and phone number of engineering/surveying firm.
☐	Show name, address and phone number of developer.
☐	Submit 4 sets of 24" x 36" construction plans.
☐	Plans must bear an original hand written signature and date across the seal of a Registered Land Surveyor licensed in the State of Georgia.
☐	Show the following on all plans: • North arrow • Location map • Graphic scale • Benchmark information in State Plane Coordinates
☐	Specify project title, project number (if DeKalb County Project), land lot, district, and parcel number in the title block.
☐	Show only unit/phase intended for final approval, specify unit and/or phase number.
☐	Show name of development.

Water

☐	Show and label all existing and proposed water mains.
☐	Show the location of all proposed water meters and label meter size along with the appropriate backflow prevention device per DWM Design Specifications.
☐	Show and label all proposed and existing easements.
☐	Fire Marshall Review stamped/approval required prior to DWM's sign off/approval.
☐	Backflow preventer devise is required to be installed on all water service connections lines, including; domestic, commercial, fire line, and irrigation services.
☐	Water connections to facilities with high hazard potential require the installation of Reduced Pressure Principle (RPP) assemblies.
☐	Fire hydrants shall be spaced every five hundred (500) feet in rural areas, every four hundred (400) feet in residential areas, and every three hundred (300) in commercial areas, or as determined by the DeKalb County Fire Marshall.
☐	Show size and length of bore and casing.
☐	Show label and station fire hydrants, valves and fittings.
☐	Label pipe size and type for each section of line.

PLAN REVIEW CHECKLIST			
Project Name:			
Project Address:			
Reviewed by:		**Date:**	

☐	Label all abutting lots by lot number, tract, subdivision and address.
☐	Show and label roads, right-of-way and pavement widths.
☐	Show and label all property boundaries, roads, right of ways with dimensions, all utility easements, phase lines, buffers and adjoining property owners.
☐	Potable water mains shall maintain a clearance of 10 (ten') feet horizontal and eighteen 918") inch vertical from all non-potable pipelines.
☐	Provide a table identifying the coordinates for each water meter to be installed.
☐	Show and label location of chlorination tap.
☐	Vaults shall have only one (1) line entering and leaving the structure.
☐	Refer to the Design Criteria section in the DCDWM Design Standards for all water main replacement specifications.
Sewer	
☐	Show all existing and proposed utilities.
☐	Show, label, and number all manholes including rim and invert elevations, and station numbers.
☐	Show stub locations for each lot with station numbers from manholes and lengths.
☐	Label all abutting lots by lot number, tract, subdivision and address.
☐	Show and label all sewer easements, permanent and temporary.
☐	Show and label individual building connections, clean-outs, grease traps (including size), oil/water separators, test manholes, etc.; including distances from manholes, length and size of laterals.
☐	Show angle deflection at manholes. Angle must be 90 degrees or greater in direction of flow.
☐	Show all water and storm sewer lines and appurtenances.
☐	Gravity sewer line material shall be PVC (SDR26) or DIP (Class 350).
☐	Add material list, including length, type, size and number of manholes for all lines 8" or larger.
☐	Show and label all property boundaries, roads, right of ways with dimensions, existing and proposed utility easements phase lines, buffers and adjoining properties owners.
☐	Service laterals shall **NOT** cross property lines.
☐	Manhole spacing: • Maximum distance between manholes for mains under 24": 400 feet • Maximum distance between manholes for mains 24" to 36": 500 feet • Maximum distance between manholes for mains over 36": 800 feet

PLAN REVIEW CHECKLIST			
Project Name:			
Project Address:			
Reviewed by:		**Date:**	

☐	Manholes shall be minimum of 4 feet from the curb line at edge of pavement when located within the public right-of-way.
☐	All permanent easements shall be a minimum of twenty (20) feet in width for all County maintained utilities. DWM retains the right to require additional easements where deemed necessary.
☐	Gravity sewer system shall be designed on the ba sis of per capita flows for the design period in conjunction with a peaking factor, or approval alternative methods. Sewer lines shall be sized according to the limitations set forth in the DCDWM Design Standards.
☐	Show and label any creeks, buffers, wetlands and flood plain limits.
☐	Show the size and location of all bore and jack pits.
☐	Show septic tank and drain field locations on plans. Provide a copy of the approval from DeKalb County Environmental Health Department.
☐	Discharge to a public sanitary sewer of storm water, surface runoff or groundwater is prohibited.
Sewer Profiles	
☐	Show all lines and manholes per site plan beginning at existing system.
☐	Show pipe length, slope, pipe size, and pipe type for each section of line.
☐	Show manhole numbers, stations numbers, rim elevations, inverts in and out elevations.
☐	Show outside drops at manholes with invert in elevation at top of drop and inverts in and out at bottom of drop.
☐	Show existing and proposed grade on profiles.
☐	Show horizontal and vertical scales.
☐	Show all utility crossings.
☐	Show DIP in all fill areas.
☐	Minimum depth of cover over a sanitary sewer line shall be 4 feet of cover unpaved areas and 7 feet of cover in paved areas.
☐	Maintain a minimum 0.20' elevation drop across manhole.
Notes	
☐	All design and construction for water, sewer, fire lines, lift stations and backflow prevention shall comply with DeKalb County Department of Watershed Management Design Standard Latest Edition. Actual field conditions may dictate more stringent requirements if deemed necessary by the construction inspector.
☐	Developer shall provide record drawings "As-Built Plans" and "Final Plats" in hard copy and electronic format, as well as, record all easements that will be dedicated to DeKalb County in the court house, prior to approval of the "As-Built Plans."
☐	F.O.G. Compliance (Grease Trap) review and approval required. Call (404)687-7150.

PLAN REVIEW CHECKLIST

Project Name:			
Project Address:			
Reviewed by:		**Date:**	

☐ Projects involving construction of townhomes and/or condominiums are required to have individual meters for each unit.

☐ Field changes during construction must be submitted for review and approved by the DeKalb County Department of Watershed Management **BEFORE** changes are implemented.

☐ Projects located within the Cities, the developer shall provide a maintenance bond to DeKalb County Watershed Management prior to approval of As-Built Plans.

☐ Contractor must jet clean and T.V. sanitary sewer after all connections is made to the existing sewer tie-in locations. Tracer wire is to be installed for all PVC pipes.

☐ Water and Sewer Fees need to be paid under the following circumstances:
- New Construction, Re-Development, Additions, Change of Use, etc.
- These fees are to be paid at 330 West Ponce De Leon Ave, 2nd Floor.
- Failure in payment of these fees will result in postponement of the plan review process.

Call (404) 371-4918 for fee calculations or any questions.

☐ Contractor to notify the DWM Construction Inspector at least 72 hours prior to commencing constructions activities.

Inspector	Contact No	Email	Coverage Areas
Mercer McGuire	770-687-4060	MMcGuire@dekalbcountyga.gov	Senior Inspector
Lonnie Kelley	404-371-2149	llkelley@dekalbcountyga.gov	15th, 16th, 12th
Bruce Mayhew	404-371-3218	bmayhew@dekalbcountyga.gov	15th, 16th, 11th
Daniel Tucker	404-687-4050	datucker@dekalbcountyga.gov	18th & 6th
Les Mosely	404-371-3213	lbmosley@dekalbcountyga.gov	18th
Joseph Young	678-794-3980	joyoung@dekalbcountyga.gov	16th, 12th

***** Check with DWM for periodic contact information updates *****

☐ Fire lines, F.O.G., Backflow Prevention and Lift Stations require a separate review.

☐ For Industrial site, notify DWM IPP at IPP@dekalbcountyga.gov, for FSE or non-residential buildings with a kitchen/breakrooms, check and confirm FOG review required in Hansen.

☐ Projects entering a State of Georgia controlled right-of-way will require GDOT permit. All required materials to be submitted to DWM. Refer to GDOT checklist for requirements.

☐ **To purchase copy a copy of the Design Standards, please call (770) 414-2383 or (770) 621-7272.**

PRESSURE TEST FORM

DEKALB COUNTY
DEPARTMENT OF WATERSHED MANAGEMENT

Project Name:		**Sewer Main:**	☐	**ADDITIONAL COMPONENTS**	
Constructed by:		**Force Main**	☐	**Number of Fire Hydrants =**	
		Water Main	☐	**Total Feet of Copper ¾" and 1" =**	
Tap Address:				**Total Feet of Copper 1-1/2" and Larger =**	

Test	**Pipe**		**Station**		**Length**	**Start**		**End**		**PSI**	**Pass/Fail**
Date	Size	Type	From	To		Time	PSI	Time	PSI	Loss	STATUS

TAPPING SLEEVE AND VALVE TEST RESULTS

County Inspector:		**Signature:**		Date:	
Tester's Name:		**Signature:**		Date:	
COMMENTS:					

(Allowable Loss for Force Mains and Water Mains = Max 5 PSI over 2 hours.)

(Allowable Loss for Taps = Max 0 PSI over 30 minutes.)

(Allowable Loss for Sewer Mains = 0 PSI over 5 min.)

DEPARTMENT OF WATERSHED MANAGEMENT
CONSTRUCTION MANAGEMENT

RELEASE for WATER MAIN CONSTRUCTION

DATE:			
PROJECT NAME:			
WR#:			
LAND LOT:		**DISTRICT:**	
DEVELOPER:			
CONTRACTOR:			

1. ☐	Copy if Contractor's Insurance		
2. ☐	Compaction Test	**DATE:**	
3. ☐	Engineer's Certificate	**DATE:**	
4. ☐	Invoice / Packing Slip		
5. ☐	Copy of Labor Agreement		
6. ☐	D.O.T. / R&D permit if required		
7. ☐	Inspector's Certification of Materials		

DATE:		**INSPECTOR:**	

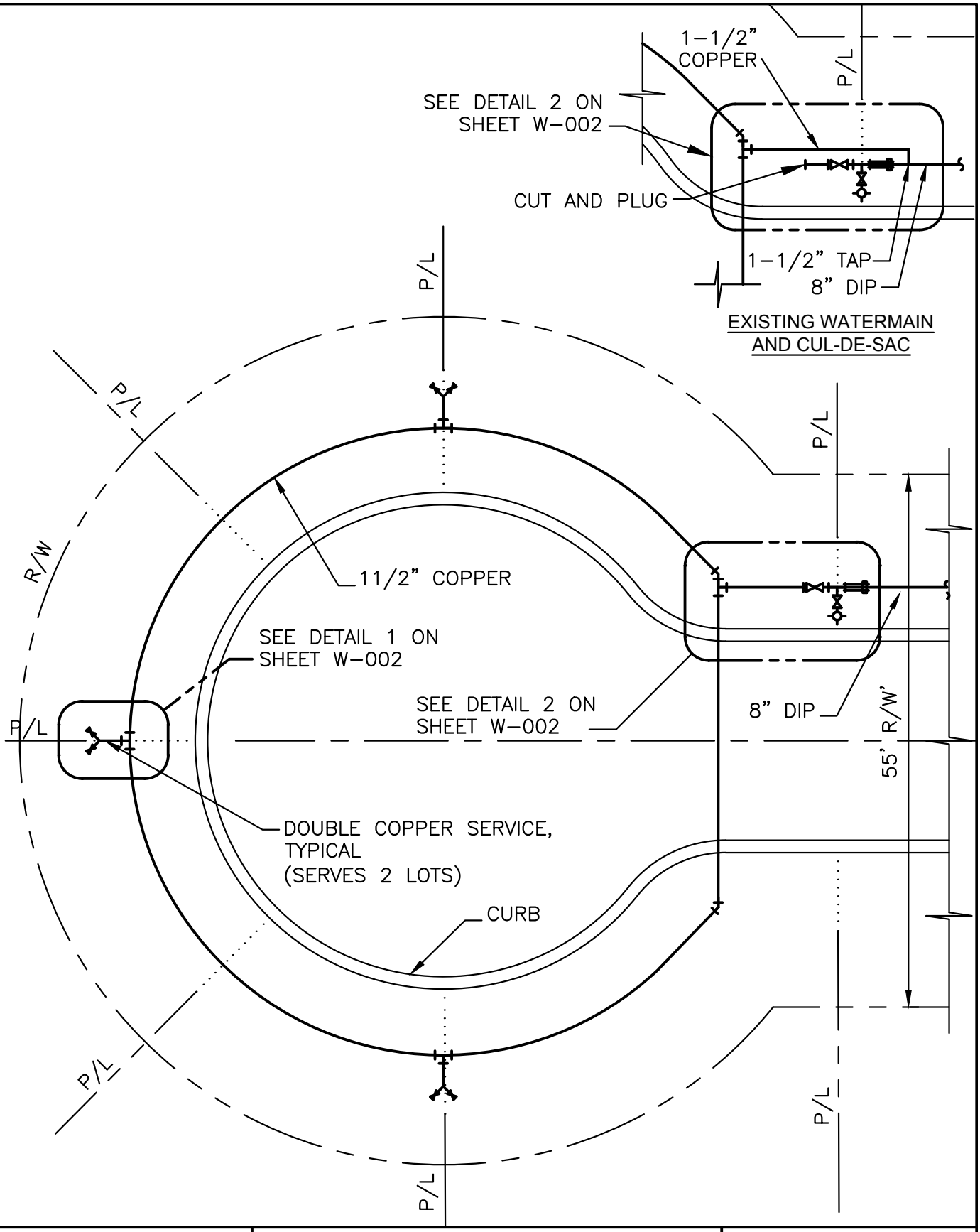
When the above items are approved and/or on file. Waterline construction is there authorized to begin.

Chief, Construction Manager

Department of Watershed Management
Standard Details List – Potable Water

Standard Details List – Potable Water	
Detail Number	**TITLE**
W-001	New Water Main New Cul-de-Sac Existing Water main and Cul-de-Sac
W-001.1	Water Main Eyebrow
W-002	Water Main Cul-de-Sac Details 1 & 2
W-003	Water Main Y-Branch Detail
W-004	Typical Fire Hydrant Detail Tap Installation
W-005	Maximum Allowable Offsets and Deflections
W-006	Typical Stub-Out
W-007	Typical Gate Valve Installation
W-008	Typical Service Line Installation
W-009	DCDA BFP Installation Non Hazardous Fire Line Installation
W-010	DC BFP Installation, 2-1/2 Inches and Larger
W-011	RPP BFP Installation 3/4” to 2”
W-012	RPP BFP Installation 2-1/2 Inches and Larger
W-013	RPDA BFP Installation 2-1/2 Inches and Larger
W-014	DC BFP Installation 3/4 Inch to 2 Inch
W-015	Temporary Disinfection Jumper Installation Detail
W-016	Intersection Detail Valve Locations
W-017	Typical Blow-off Detail
W-018	Repair Sleeve Detail
W-019	Air Release Valve Installation Detail
W-020	Water Meter Locations Detail
W-021	Residential Water Meter Installation Detail
W-022	Temporary Water Sample Station Detail
W-023	Valve Cover and Marker Disc
W-024	End of Water Line Plug & Sleeve Assembly

Standard Details List – Potable Water	
Detail Number	**TITLE**
W-025	Typical Commercial / Industrial Service Layout
W-026	Butterfly Valve and Vault Assembly No. 1
W-027	Butterfly Valve and Vault Assembly No. 2



DeKalb County GEORGIA

STANDARD DETAILS

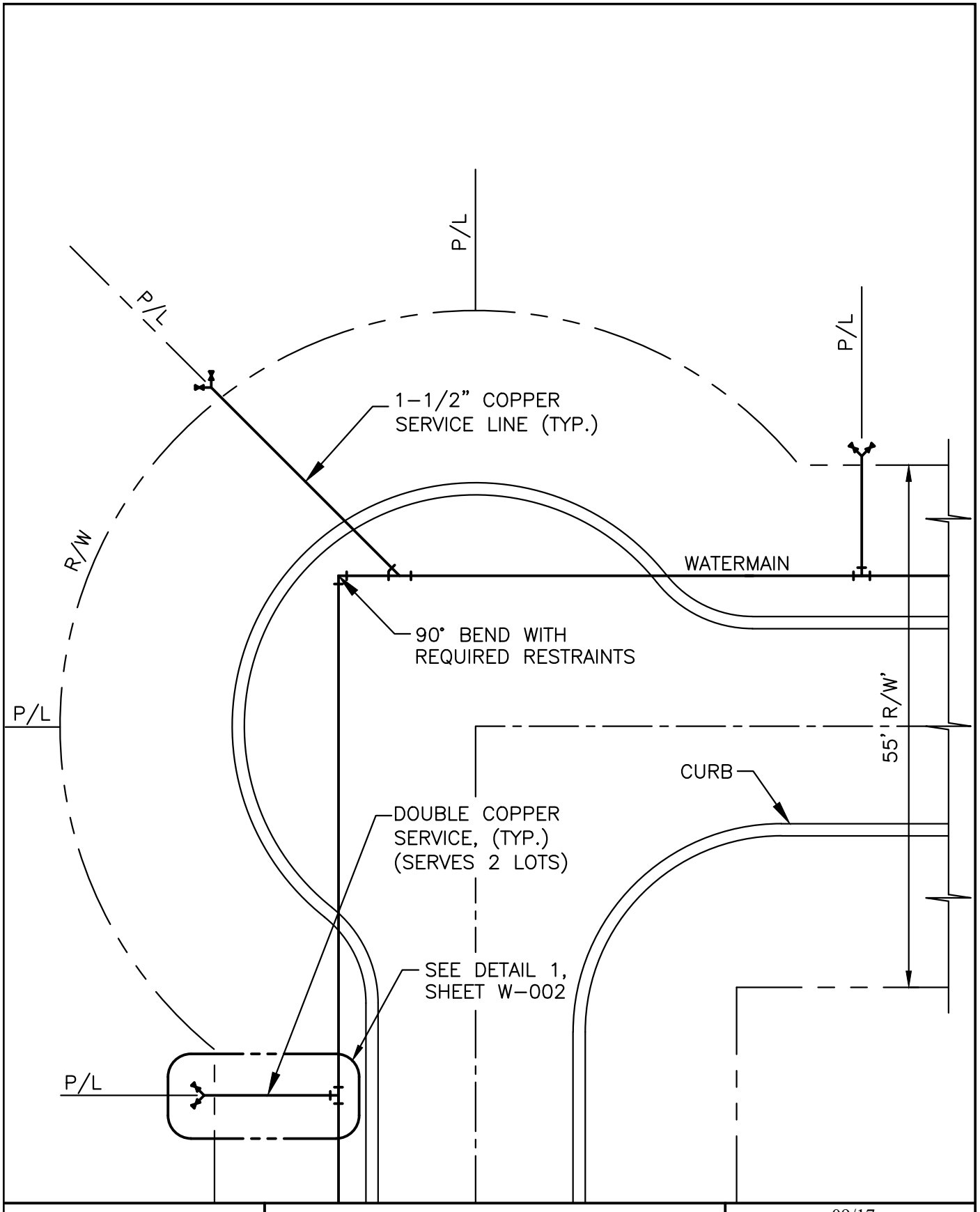
New Water Main
New Cul-de-Sac Dead End Street
Existing Watermain and Cul-de-Sac

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. W-001



DeKalb County
GEORGIA

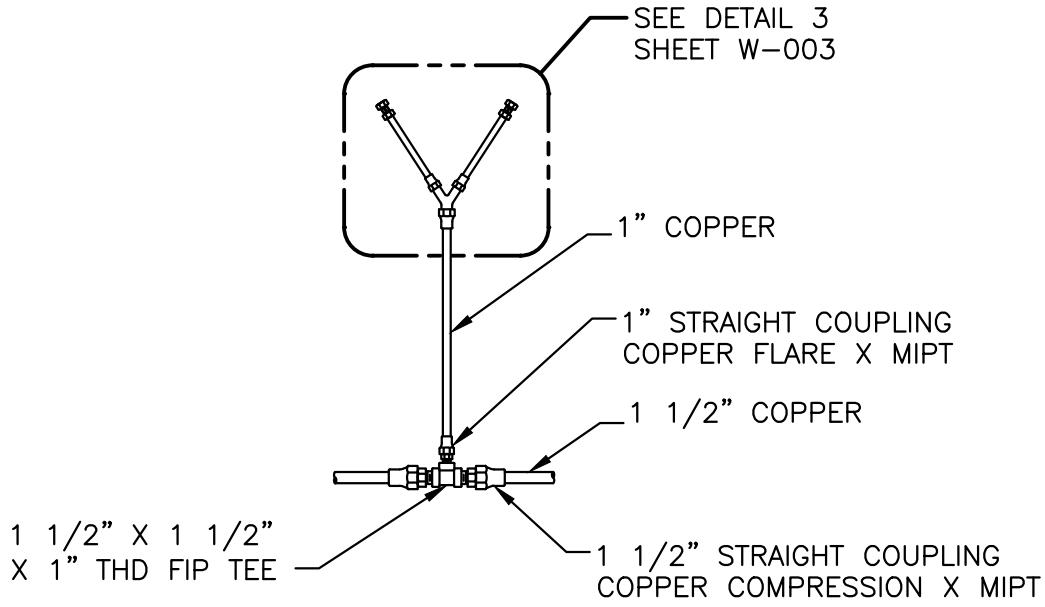
STANDARD DETAILS

09/17

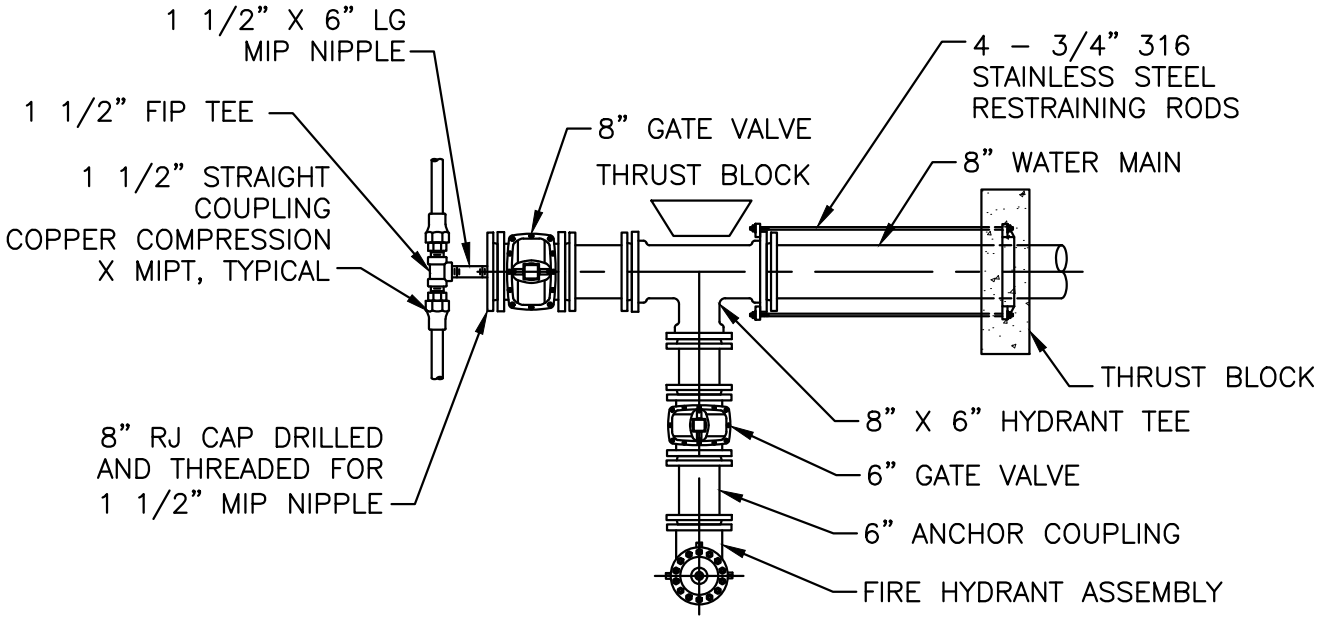
Water Main Eyebrow

NOT TO SCALE

DETAIL NO. W-001.1

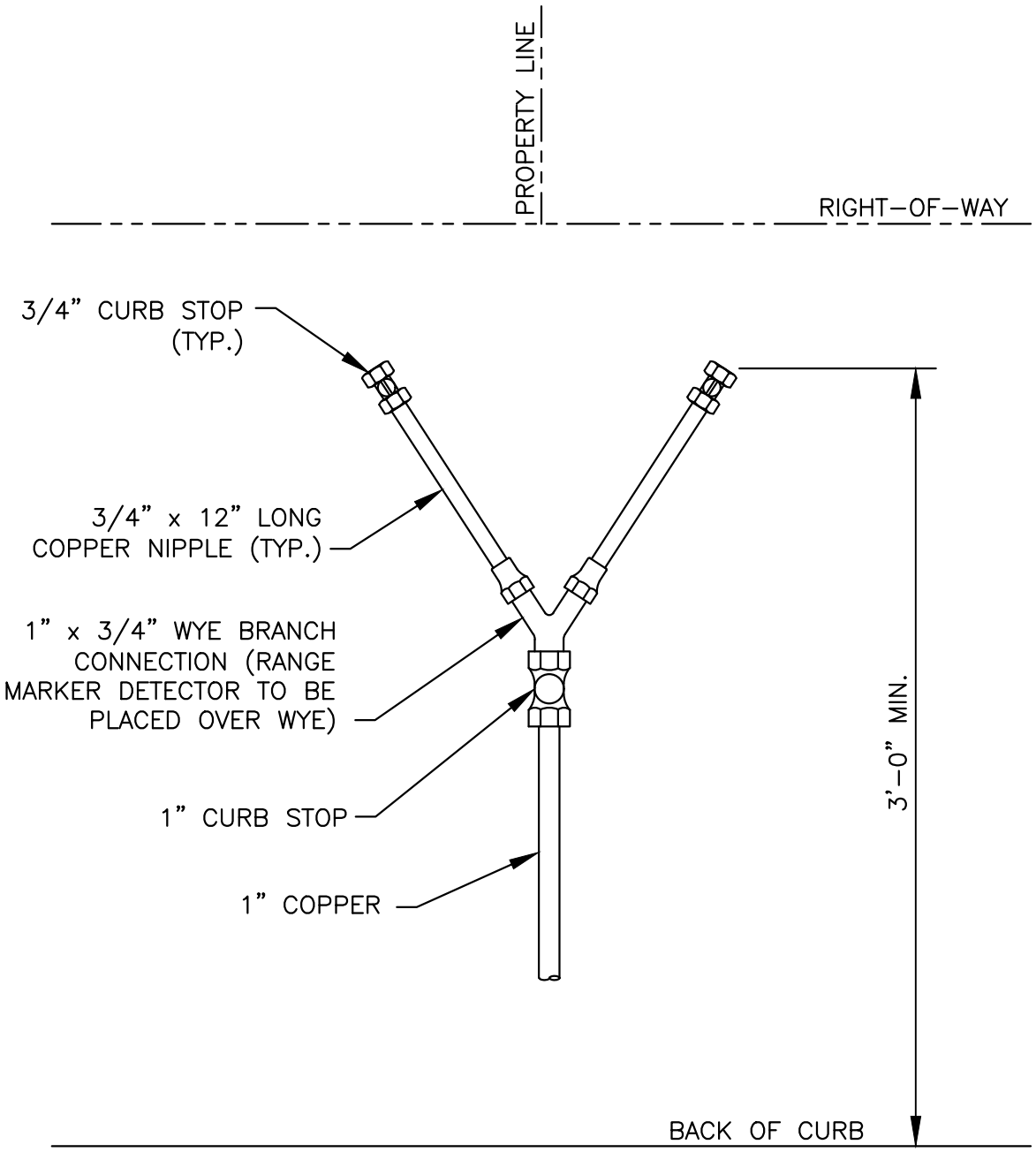


DETAIL 1



DETAIL 2

DeKalb County GEORGIA	**STANDARD DETAILS**	09/17
	Water Main Cul-de-Sac Details 1 & 2	WATER Matters
	NOT TO SCALE	DETAIL NO. W-002



DeKalb County GEORGIA

STANDARD DETAILS

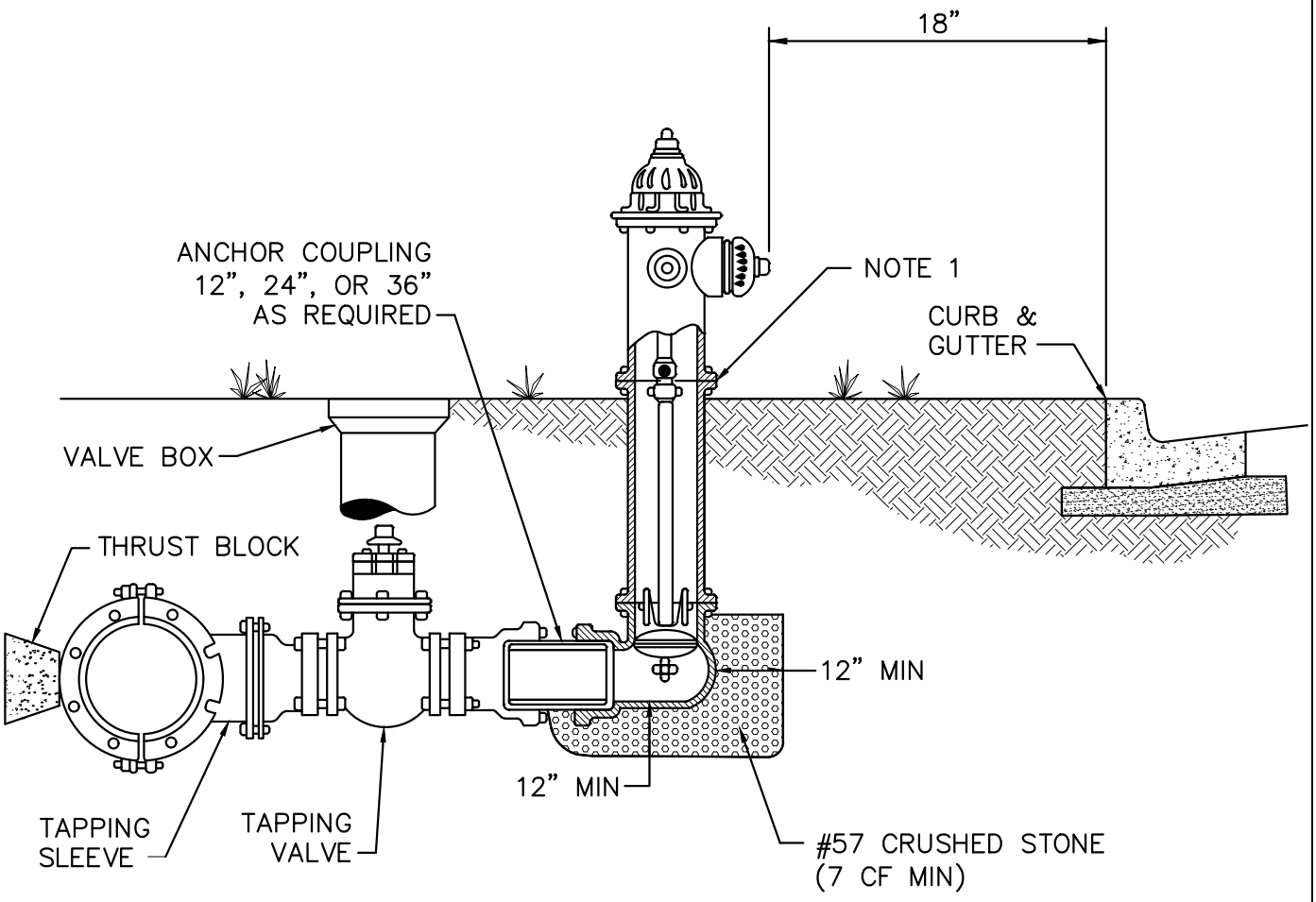
Water Main
Y-Branch Detail

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. W-003



NOTES:

1. BREAKAWAY FLANGE NOT GREATER THAN 6" ABOVE FINAL GRADE

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Typical Fire Hydrant Detail Tap Installation	WATER Matters
	NOT TO SCALE	DETAIL NO. W-004

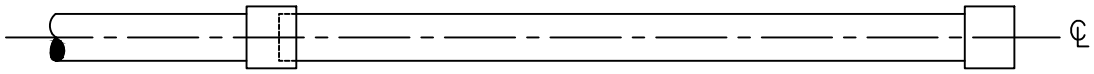


FIG. 1 COMPLETED JOINT
BEFORE OFFSET

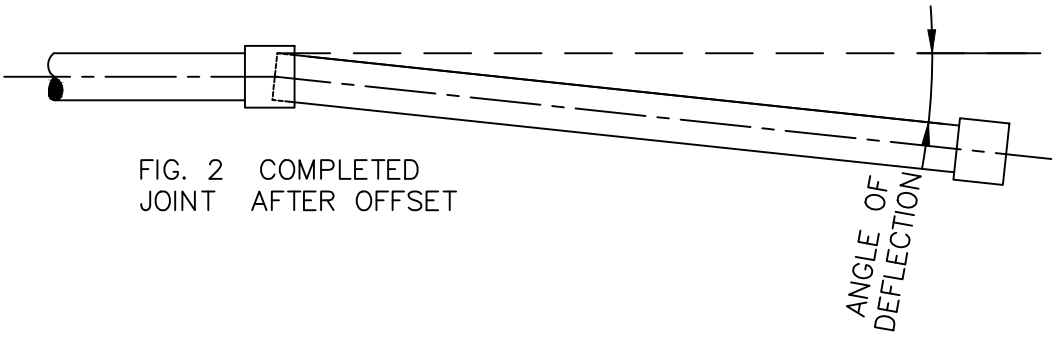
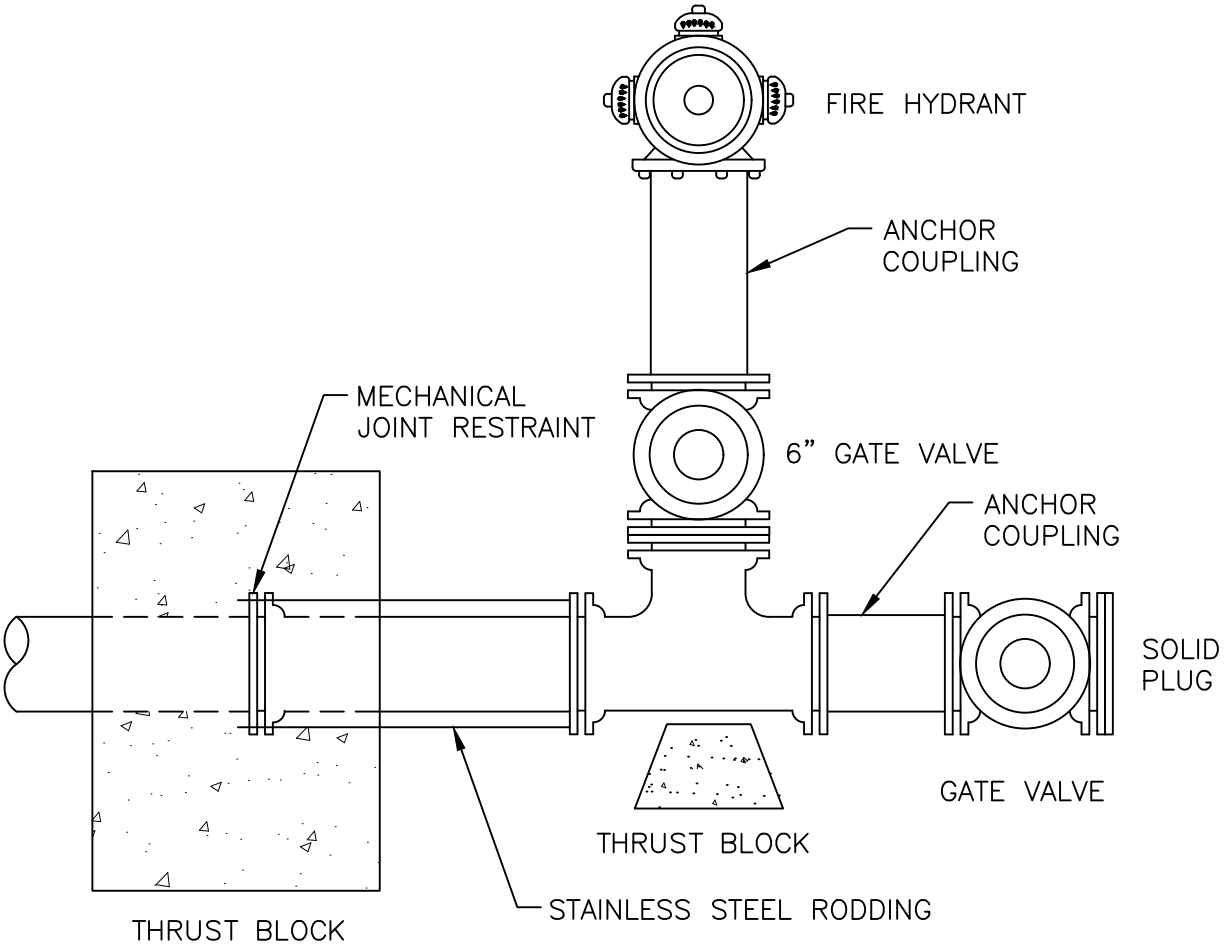


FIG. 2 COMPLETED
JOINT AFTER OFFSET

NOTES:

1. ALL JOINTS MUST BE ASSEMBLED AS SHOWN IN FIG. 1 BEFORE MAKING DEFLECTION.
2. ALL DEFLECTION ANGLES SHALL BE LESS THAN THE PIPE MANUFACTURERS MAXIMUM.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Maximum Allowable Offsets and Deflections	WATER Matters
	NOT TO SCALE	DETAIL NO. W-005



DeKalb County GEORGIA

STANDARD DETAILS

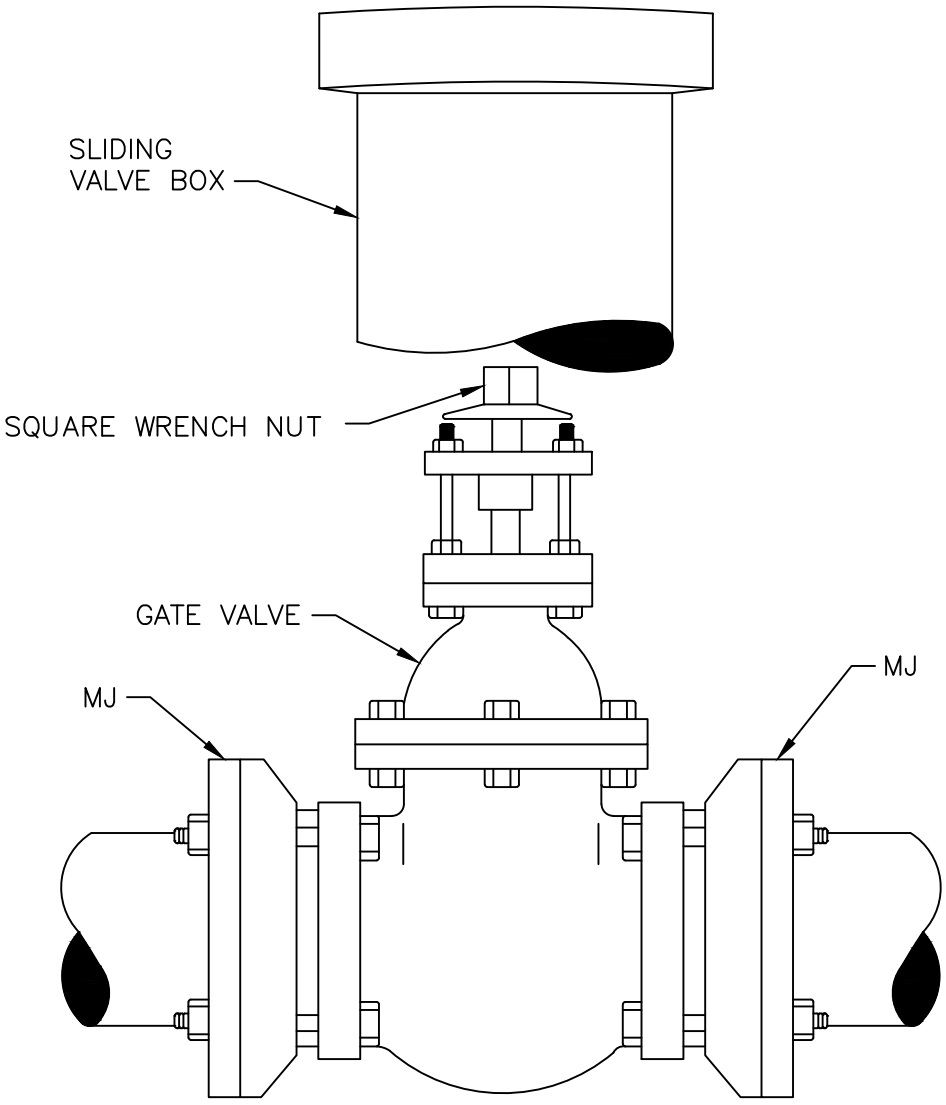
Typical Stub-Out

NOT TO SCALE

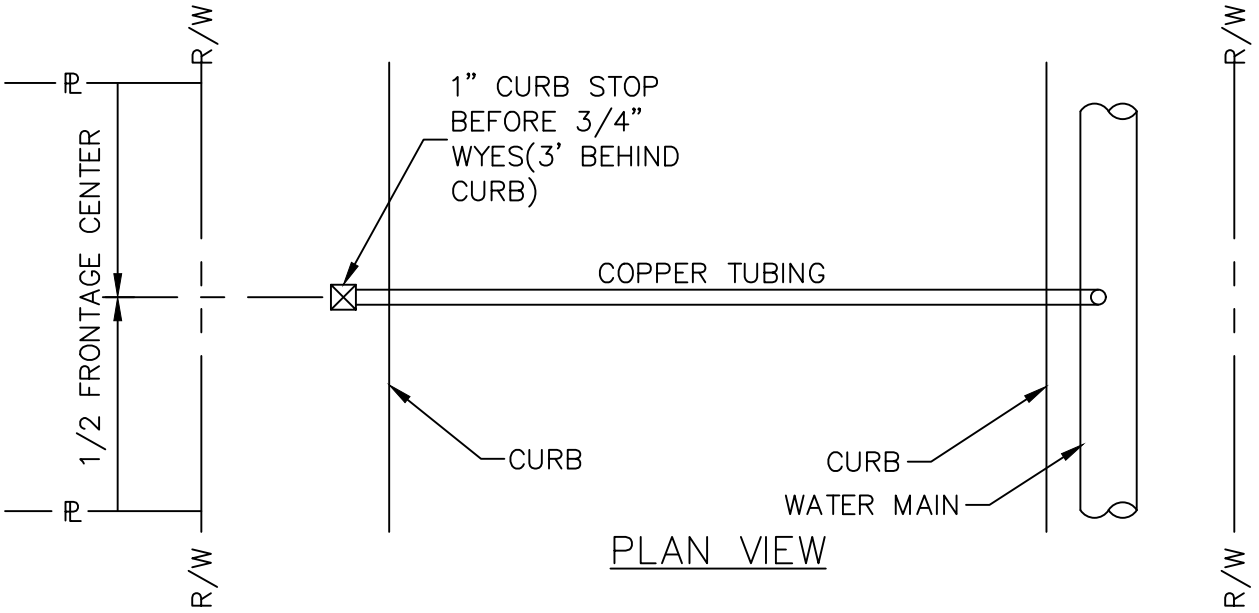
09/17

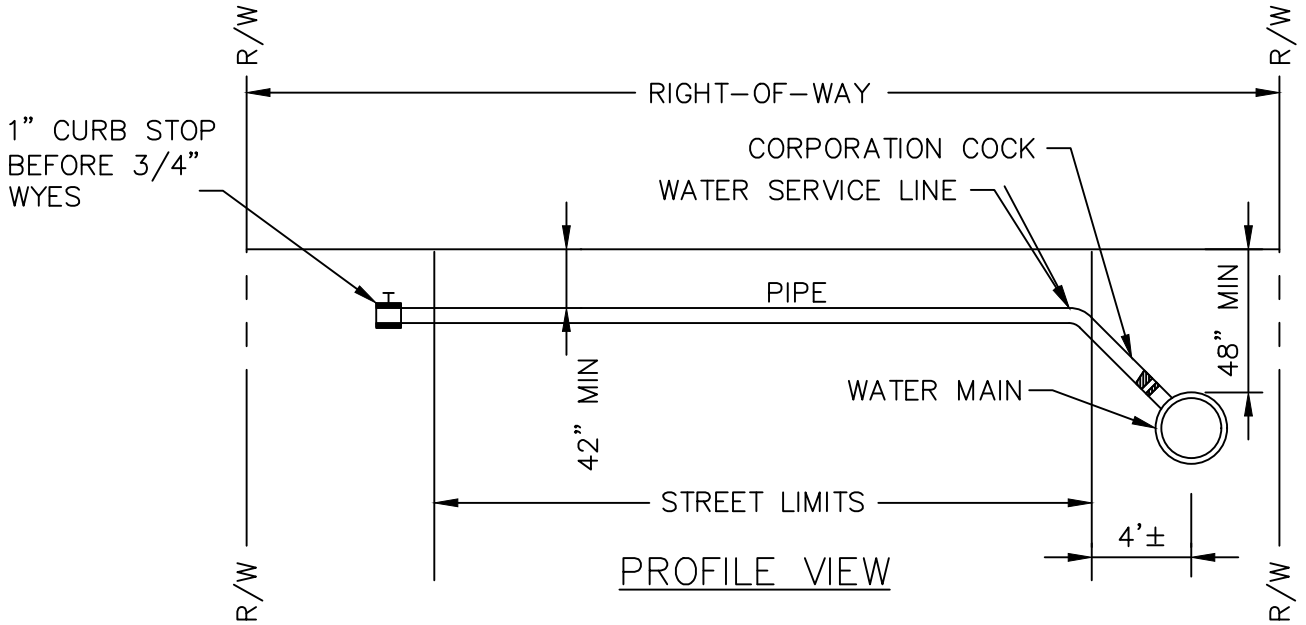
WATER Matters

DETAIL NO. W-006



DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Typical Gate Valve Installation	WATER Matters
	NOT TO SCALE	DETAIL NO. W-007





NOTES:

1. SERVICE LINES 1 INCH AND SMALLER SHALL BE INSTALLED USING COPPER TUBING WITH FLARE X MIPT.

2. LARGER SERVICE LINE MATERIAL SHALL BE AS SPECIFIED ON THE DRAWING, AND REQUIRES COUNTY APPROVAL.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Typical Service Line Installation	WATER Matters
	NOT TO SCALE	DETAIL NO. W-008

MINIMUM CONTAINMENT PROTECTION REQUIREMENT
NEW CONSTRUCTION AND RETROFIT INSTALLATIONS NONHAZARDOUS
DEDICATED FIRELINE SERVICE CONNECTION
SERVICE SIZE: 2 1/2" AND ABOVE
DOUBLE CHECK DETECTOR ASSEMBLY (DCDA)

SPECIFICATION: THE CUSTOMER/OWNER SHALL FURNISH AND INSTALL A DOUBLE CHECK DETECTOR ASSEMBLY (DCDA) BACKFLOW PREVENTION ASSEMBLY (BFP) IN A SIZE TO MATCH THAT OF THE REQUIRED FIRELINE SERVICE CONNECTION. THE BFP ASSEMBLY SHALL HAVE A METER ½ TO ¾" BY-PASS LINE AS SHOWN ON THE ILLUSTRATION. THE DCDA BFP SHALL BE PROVIDED WITH A RESILIENT SEATED OUTSIDE STEM AND YOKE FLANGED GATE VALVE NEAR THE INLET AND OUTLET SIDES OF THE ASSEMBLY. THE ASSEMBLY SHALL BE PROVIDED WITH THREE BRASS BALL VALVE TEST COCKS FITTED WITH BRASS OR PLASTIC THREADED PLUGS. A FOURTH TEST COCK SHALL ALSO BE PROVIDED ON THE UPSTREAM SIDE OF THE INLET SHUT-OFF VALVE. THE METERED BY-PASS LINE ON THE ASSEMBLY SHALL INCLUDE A BRONZE DETECTOR METER AND A DOUBLE CHECK (DC) BFP.

NOTE: ALL COMPONENTS OF THE ASSEMBLY SHALL BE CERTIFIED OR LISTED BY THE UNDERWRITER LABORATORIES AND FACTORY MUTUAL INSURANCE. THE DCDA BFP-ASSEMBLY SHALL HAVE APPROVAL AND CONFORM TO ALL CURRENT REQUIREMENTS OF THE UNIVERSITY OF SOUTHERN CALIFORNIA, FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (USC-FCCCHR), BE INDIVIDUALLY TESTED, SHIPPED AND INSTALLED AS A UNIT.

INSTALLATION INSTRUCTIONS: THE DCDA BFP SHALL NOT BE BURIED IN EARTH BUT INSTALLED BELOW GROUND IN A VAULT AS CLOSE AS PRACTICAL TO THE PROPERTY LINE OF THE PREMISES AND OUT OF RIGHT-OF-WAY. NO OTHER ASSEMBLY IS ALLOWED TO BE INSTALLED IN THE VAULT FOR DCDA BFP ASSEMBLY. PRIOR APPROVAL IS REQUIRED IF DCDA CANNOT BE INSTALLED OUTSIDE THE BUILDING, CLOSE TO THE PROPERTY LINE.

NOTE: UNDER NO CIRCUMSTANCES WILL ANY CONNECTION BE ALLOWED ON THE SYSTEM OTHER THAN FOR FIRE FIGHTING OR FIRE PROTECTION PURPOSES.

ASSEMBLY TESTING: ALL DCDA BFP'S SHALL BE FIELD TESTED FOLLOWING INSTALLATION, REPAIR, OR RELOCATION, AND AT LEAST ANNUALLY THEREAFTER.

PLAN APPROVAL AND INSPECTION: PLAN APPROVAL MUST BE OBTAINED AND INSPECTION SCHEDULED PRIOR TO WORK, THROUGH DEKALB COUNTY DEPARTMENT OF WATERSHED MANAGEMENT. CONTACT BACKFLOW PREVENTION SECTION AT (404) 687-4075 FOR BACKFLOW INSPECTION PRIOR TO INSTALLATION.

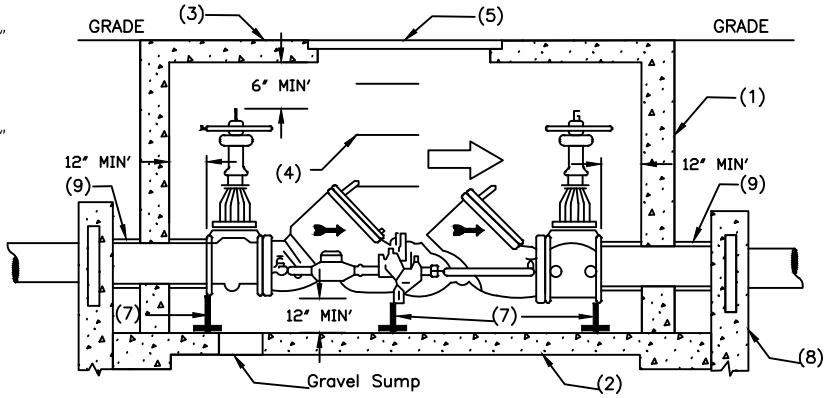
APPROVED ASSEMBLIES (OR EQUIVALENT):

AMES	3000 SS	2 ½", 3", 4", 6", 8", 10", 12"
BACKFLOW DIRECT DERINGER		2 ½", 3", 4", 6", 8"
CONBRACO	DCDA 4SG	2 ½", 3", 4", 6", 8"
FEBCO	LF856	2 ½," 3", 4", 6", 8", 10"
WATTS	709 DCDA	2 ½", 3", 4", 6", 8", 10"
WILKINS	350 DA	2 ½", 3", 4", 6", 8", 10", 12"

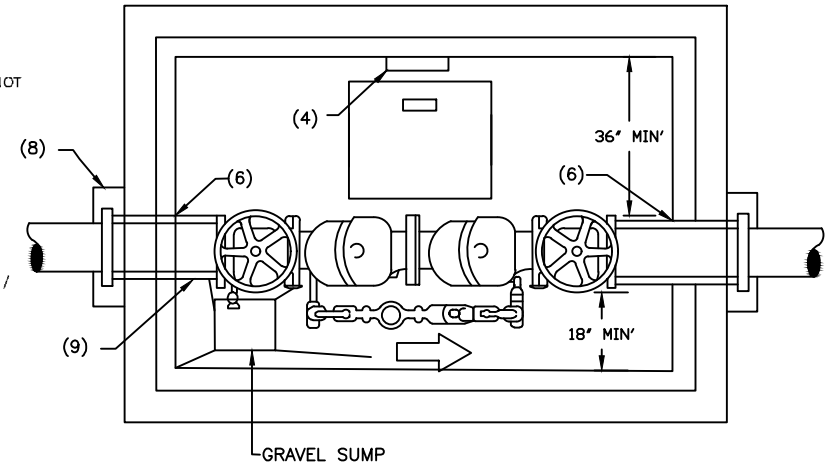
VAULT SPECIFICATIONS:

1. VAULT SHALL BE PRECAST REINFORCED CONCRETE WITH A MINIMUM THICKNESS OF AT LEAST 6" INCH.
2. VAULT BOTTOM SHALL BE 6" POURED CONCRETE SLAB, SLOPED TO 12" x 12" GRAVEL SUMP. SLAB TO BE POURED ON 12" OF NO. 57 COMPACTED STONE.
3. VAULT TOP SHALL BE REINFORCED CONCRETE WITH 36" x 36" ACCESS OPENING OFFSET TO ONE SIDE.
4. ACCESS LADDER DOWELED TO WALL AND CENTERED AT ACCESS OPENING.
5. HATCH COVER SHALL BE BILCO-ALUMINUM SINGLE, MODEL J-4AL OR EQUIVALENT.
6. VAULT INLET/OUTLET PIPE OPENINGS TO BE SEALED WITH NON-SHRINK GROUT OR MORTAR. PIPE MUST NOT SUPPORT VAULT.
7. BFP ASSEMBLY TO BE SUPPORTED AT THREE POINTS WITH PIPE STAND.
8. THRUST BLOCKING, AS REQUIRED, MUST BE IN ACCORDANCE WITH DCDWM SPECIFICATIONS.
9. THRUST TIE RODS SHALL BE BITUMASTIC COATED. ALL PIPE AND FITTINGS OF DUCTILE IRON.
10. VAULT TO BE INSTALLED ON OWNER'S PRIVATE PROPERTY.
11. ALL MATERIALS TO BE FURNISHED BY THE CUSTOMER / OWNER.

TYPICAL VAULT INSTALLATION
(MINIMUM CLEARANCE DIMENSIONS)



ELEVATION



PLAN VIEW

DeKalb County
GEORGIA

STANDARD DETAILS

DCDA BFP Installation
Non Hazardous Fire Line Installation

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. W-009

MINIMUM CONTAINMENT PROTECTION REQUIREMENT
NEW CONSTRUCTION AND RETROFIT INSTALLATIONS
SERVICE SIZE: 2 1/2 INCH AND ABOVE METER SIZE: 2 1/2 INCH AND ABOVE
DOUBLE CHECK VALVE ASSEMBLY (DC)

SPECIFICATION: THE CUSTOMER/OWNER SHALL FURNISH AND INSTALL A DOUBLE CHECK (DC) VALVE BACKFLOW PREVENTION ASSEMBLY (BFP) IN A SIZE TO MATCH THAT OF THE REQUIRED SERVICE LINE CONNECTION. THE DC BFP SHALL BE PROVIDED WITH AN EPOXY COATED RESILIENT SEATED FLANGED OUTSIDE STEM AND YOKE GATE VALVE NEAR THE INLET AND OUTLET SIDES OF THE ASSEMBLY. THE ASSEMBLY SHALL BE PROVIDED WITH THREE BALL VALVE TEST COCKS FITTED WITH BRASS OR PLASTIC THREADED PLUGS. A FOURTH TEST COCK SHALL ALSO BE PROVIDED ON THE UPSTREAM SIDE OF THE INLET SHUT-OFF VALVE.

NOTE: ALL COMPONENTS OF THE ASSEMBLY SHALL BE CERTIFIED BY A NATIONALLY RECOGNIZED TESTING LABORATORY. THE DC BFP ASSEMBLY SHALL HAVE APPROVAL AND CONFORM TO ALL CURRENT REQUIREMENTS OF THE UNIVERSITY OF SOUTHERN CALIFORNIA, FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (USC-FCCCHR). ASSEMBLY TO BE INDIVIDUALLY FACTORY TESTED, SHIPPED AND INSTALLED AS A UNIT.

INSTALLATION INSTRUCTIONS: THE DC BFP ASSEMBLY SHALL NOT BE BURIED IN EARTH BUT INSTALLED BELOW GROUND IN CONCRETE VAULT AS CLOSE AS PRACTICAL TO THE PROPERTY LINE OF THE PREMISES TO THE DOWNSTREAM OF THE WATER METER, AND OUT OF RIGHT-OF-WAY. NO OTHER ASSEMBLY IS ALLOWED TO BE INSTALLED IN THE VAULT FOR DC BFP ASSEMBLY. PRIOR APPROVAL IS REQUIRED FOR INTERIOR INSTALLATION OF BFP ASSEMBLY.

NOTE: UNDER NO CIRCUMSTANCES WILL A BY-PASS OR ANY INTERVENING CONNECTION BE ALLOWED BETWEEN THE WATER METER AND THE DC BFP ASSEMBLY UNLESS THAT CONNECTION IS PROTECTED BY AN APPROVED BFP ASSEMBLY.

CAUTION: SECTION 607.3, THERMAL EXPANSION CONTROL, NOTED IN THE 2006 INTERNATIONAL PLUMBING CODE, ADOPTED AS THE STATE OF GEORGIA PLUMBING CODE (WITH CURRENT AMENDMENTS) SHOULD BE INCORPORATED IN THE DESIGN OF INSTALLATIONS AND DULY NOTED ON ALL APPLICABLE DRAWINGS PRIOR TO THE INSTALLATION OF ANY INLINE CHECKING DEVICE(S).

NOTE: DOMESTIC DC-BFPAs SHALL BE LEAD FREE.

ASSEMBLY TESTING: ALL DC BFP'S SHALL BE FIELD TESTED FOLLOWING INSTALLATION, REPAIR, OR RELOCATION, AND AT LEAST ANNUALLY THEREAFTER.

PLAN APPROVAL AND INSPECTION: PLAN APPROVAL MUST BE OBTAINED AND INSPECTION SCHEDULED PRIOR TO WORK, THROUGH DEKALB COUNTY DEPARTMENT OF WATERSHED MANAGEMENT. CONTACT BACKFLOW PREVENTION SECTION AT (404) 687-4075 FOR BACKFLOW INSPECTION PRIOR TO INSTALLATION.

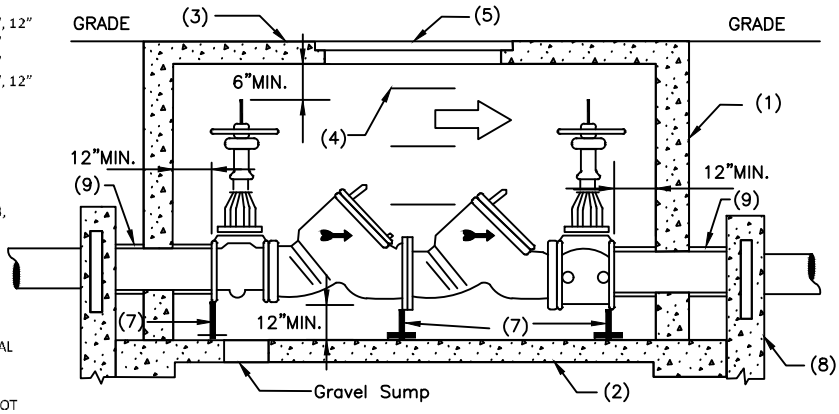
APPROVED ASSEMBLY (OR EQUIVALENT):

AMES	2000SS	2 ½", 3", 4", 6", 8", 10", 12"
BACKFLOW DIRECT DERINGER		2 ½", 3", 4", 6", 8"
CONBRACO	DCLF4A	2 ½", 3", 4", 6", 8", 10", 12"
FEBCO	LF850	2 ½", 3", 4", 6", 8", 10"
WATTS	LF709	2 ½", 3", 4", 6", 8", 10"
WILKINS	350	2 ½", 3", 4", 6", 8", 10", 12"

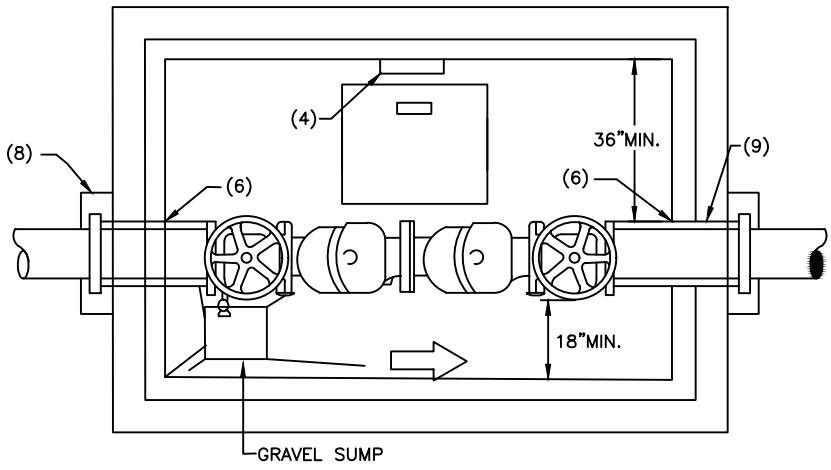
VAULT SPECIFICATIONS:

1. VAULT SHALL BE PRECAST REINFORCED CONCRETE WITH A MINIMUM THICKNESS OF 6" INCH.
2. VAULT BOTTOM SHALL BE 6" POURED CONCRETE SLAB, SLOPED TO 12" x 12" GRAVEL SUMP. SLAB TO BE POURED ON 12" OF NO. 57 COMPACTED STONE.
3. VAULT TOP SHALL BE REINFORCED CONCRETE WITH 36" x 36" ACCESS OPENING OFFSET TO ONE SIDE.
4. ACCESS LADDER DOWELED TO WALL AND CENTERED AT ACCESS OPENING.
5. HATCH COVER: BILCO-ALUMINUM SINGLE, MODEL J-4AL OR EQUIVALENT.
6. VAULT INLET/OUTLET PIPE OPENINGS TO BE SEALED WITH NON-SHRINK GROUT OR MORTAR. PIPE MUST NOT SUPPORT VAULT.
7. BFP ASSEMBLY TO BE SUPPORTED AT THREE POINTS WITH PIPE STAND.
8. THRUST BLOCKING, AS REQUIRED, MUST BE IN ACCORDANCE WITH DCDWM SPECIFICATIONS.
9. THRUST TIE RODS SHALL BE BITUMASTIC COATED. ALL PIPE AND FITTINGS OF DUCTILE IRON.
10. VAULT TO BE INSTALLED ON OWNER'S PRIVATE PROPERTY.
11. ALL MATERIALS TO BE FURNISHED BY THE CUSTOMER / OWNER.

TYPICAL VAULT INSTALLATION
(MINIMUM CLEARANCE DIMENSIONS)



ELEVATION



PLAN VIEW

DeKalb County GEORGIA

STANDARD DETAILS

DC BFP INSTALLATION
2 1/2 INCHES AND LARGER

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. W-010

MINIMUM CONTAINMENT PROTECTION REQUIREMENT
NEW CONSTRUCTION AND RETROFIT INSTALLATIONS
SERVICE SIZE: ¾ INCH THRU 2 INCH METER SIZE: ¾ INCH THRU 2 INCH
REDUCED PRESSURE PRINCIPLE ASSEMBLY (RPP)

SPECIFICATION: THE CUSTOMER/OWNER SHALL FURNISH AND INSTALL A REDUCED PRESSURE PRINCIPLE (RPP) BACKFLOW PREVENTION ASSEMBLY (BFP) IN A SIZE TO MATCH THAT OF THE REQUIRED SERVICE LINE CONNECTION. THE RPP BFP ASSEMBLY SHALL INCLUDE A FULL PORT BALL VALVE ON THE INLET AND OUTLET SIDES WITH A UNION BETWEEN THE ASSEMBLY AND EACH VALVE. THE ASSEMBLY SHALL HAVE THREE BALL VALVE TEST COCKS IN AN ACCEPTABLE POSITION FITTED WITH BRASS OR PLASTIC THREADED PLUGS. A FOURTH TEST COCK SHALL ALSO BE PROVIDED ON THE UPSTREAM SIDE OF THE INLET SHUT-OFF VALVE. A STRAINER SHALL BE INSTALLED IMMEDIATELY UPSTREAM OF THE BFP, UNLESS THE BFP IS DIRECTLY DOWNSTREAM OF THE METER.

NOTE: ALL COMPONENTS OF THE ASSEMBLY SHALL BE CERTIFIED BY A NATIONALLY RECOGNIZED TESTING LABORATORY. THE RPP BFP ASSEMBLY SHALL HAVE APPROVAL AND CONFORM TO ALL CURRENT REQUIREMENTS OF THE UNIVERSITY OF SOUTHERN CALIFORNIA, FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (USC-FCCCHR). ASSEMBLY TO BE INDIVIDUALLY FACTORY TESTED, SHIPPED AND INSTALLED AS A UNIT.

INSTALLATION INSTRUCTIONS: THE RPP BFP ASSEMBLY SHALL NOT BE INSTALLED BELOW GROUND. INSTALL ABOVE GROUND AS CLOSE AS PRACTICAL TO THE PROPERTY LINE OF THE PREMISES TO THE DOWNSTREAM OF THE WATER METER, AND OUT OF RIGHT-OF-WAY. AN ABOVE GROUND ENCLOSURE MUST BE PROVIDED FOR PROTECTION FROM FREEZING TEMPERATURES. INSTALL AN APPROVED DRAIN WITH AN AIR GAP WHERE RELIEF VALVE DISCHARGE COULD CAUSE DAMAGE ESPECIALLY WHEN BACKFLOW ASSEMBLYS ARE LOCATED INSIDE THE BUILDINGS. PRIOR APPROVAL IS REQUIRED FOR INSIDE INSTALLATION.

NOTE: UNDER NO CIRCUMSTANCES WILL A BY-PASS OR ANY INTERVENING CONNECTION BE ALLOWED BETWEEN THE WATER METER AND THE RPP BFP USED FOR SYSTEM PROTECTION UNLESS THAT CONNECTION IS PROTECTED BY AN APPROVED BFP.

CAUTION: SECTION 607.3, THERMAL EXPANSION CONTROL, NOTED IN THE 2006 INTERNATIONAL PLUMBING CODE, ADOPTED AS THE STATE OF GEORGIA PLUMBING CODE (WITH CURRENT AMENDMENTS) SHOULD BE INCORPORATED IN THE DESIGN OF INSTALLATIONS AND DULY NOTED ON ALL APPLICABLE DRAWINGS PRIOR TO THE INSTALLATION OF ANY INLINE CHECKING DEVICE(S).

NOTE: DOMESTIC RPP-BFPAs SHALL BE LEAD FREE.

ASSEMBLY TESTING: ALL RPP BFP'S SHALL BE FIELD TESTED AFTER INSTALLATION, REPAIR, RELOCATION, AND AT LEAST ANNUALLY THEREAFTER.

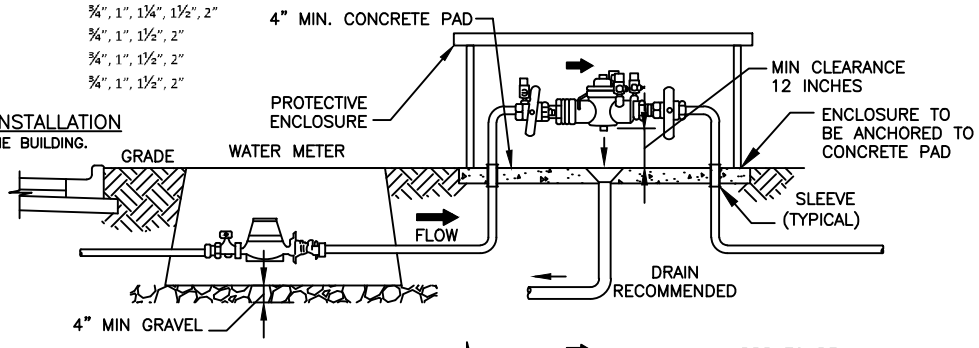
PLAN APPROVAL AND INSPECTION: PLAN APPROVAL MUST BE OBTAINED AND INSPECTION SCHEDULED PRIOR TO WORK, THROUGH DEKALB COUNTY DEPARTMENT OF WATERSHED MANAGEMENT. CONTACT BACKFLOW PREVENTION SECTION AT (404) 687-4075 FOR BACKFLOW INSPECTION PRIOR TO INSTALLATION.

APPROVED ASSEMBLYS (OR EQUIVALENT):

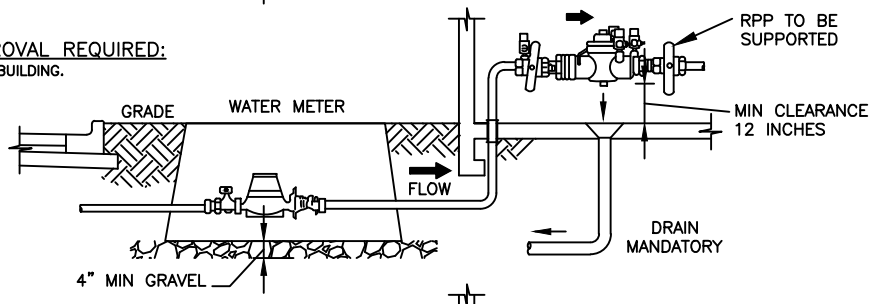
ARI RP500		¾", 1", 1 ¼", 1 ½', 2"
CONBRACO	RPLF4A	¾", 1", 1¼", 1½", 2"
FEBCO	LF860	¾", 1", 1½", 2"
WATTS	LFU009	¾", 1", 1½", 2"
WILKINS	975XL2	¾", 1", 1½", 2"

APPROVED INSTALLATION OF
REDUCED PRESSURE PRINCIPLE ASSEMBLY WITH DRAINAGE

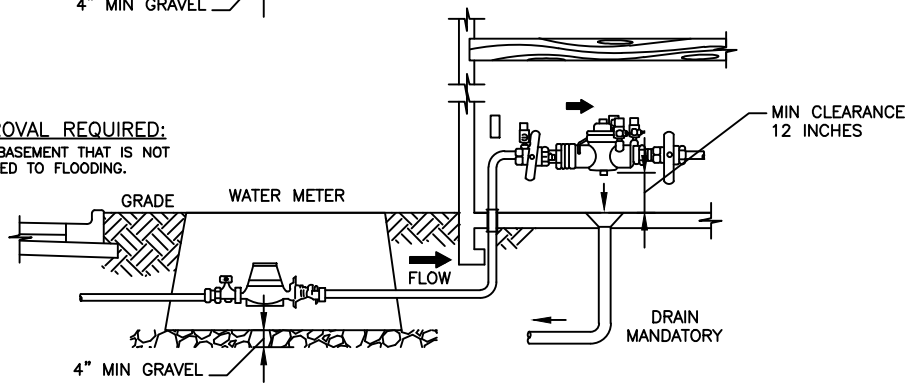
1. STANDARD INSTALLATION
OUTSIDE THE BUILDING.



2. PRIOR APPROVAL REQUIRED:
IN THE BUILDING.



2. PRIOR APPROVAL REQUIRED:
IN THE BASEMENT THAT IS NOT SUBJECTED TO FLOODING.



DeKalb County GEORGIA

STANDARD DETAILS

RPP BFP Installation 3/4" to 2"

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. W-011

MINIMUM CONTAINMENT PROTECTION REQUIREMENT
NEW CONSTRUCTION AND RETROFIT INSTALLATIONS
SERVICE SIZE: 2 1/2 INCH AND ABOVE METER SIZE: 2 1/2 INCH AND ABOVE
REDUCED PRESSURE PRINCIPLE (RPP) ASSEMBLY

SPECIFICATION: THE CUSTOMER/OWNER SHALL FURNISH AND INSTALL A REDUCED PRESSURE PRINCIPLE (RPP) BACKFLOW PREVENTION ASSEMBLY (BFP) IN A SIZE TO MATCH THAT OF THE REQUIRED SERVICE LINE CONNECTION. THE RPP BFP ASSEMBLY SHALL BE PROVIDED WITH AN EPOXY COATED, RESILIENT SEATED FLANGED OUTSIDE STEM AND YOKE GATE VALVE NEAR THE INLET AND OUTLET SIDES OF THE ASSEMBLY. THE ASSEMBLY SHALL BE PROVIDED WITH THREE BALL VALVE TEST COCKS IN AN ACCEPTABLE POSITION FITTED WITH BRASS OR PLASTIC THREADED PLUGS. A FOURTH TEST COCK SHALL ALSO BE PROVIDED ON THE UPSTREAM SIDE OF THE INLET SHUT-OFF VALVE.

NOTE: ALL COMPONENTS OF THE ASSEMBLY SHALL BE CERTIFIED BY A NATIONALLY RECOGNIZED TESTING LABORATORY. THE RPP BFP ASSEMBLY SHALL HAVE APPROVAL AND CONFORM TO ALL CURRENT REQUIREMENTS OF THE UNIVERSITY OF SOUTHERN CALIFORNIA, FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (USC-FCCCHR). ASSEMBLY TO BE INDIVIDUALLY FACTORY TESTED, SHIPPED AND INSTALLED AS A UNIT.

INSTALLATION INSTRUCTIONS: THE RPP BFP ASSEMBLY SHALL NOT BE INSTALLED BELOW GROUND. INSTALL ABOVE GROUND AS CLOSE AS PRACTICAL TO THE PROPERTY LINE OF THE PREMISES TO THE DOWNSTREAM SIDE OF THE WATER METER, AND OUT OF RIGHT-OF-WAY. AN ABOVE GROUND ENCLOSURE MUST BE PROVIDED FOR PROTECTION FROM FREEZING TEMPERATURES. INSTALL AN APPROVED DRAIN WITH AN AIR GAP WHERE RELIEF VALVE DISCHARGE COULD CAUSE DAMAGE ESPECIALLY WHEN BACKFLOW ASSEMBLIES ARE LOCATED INSIDE THE BUILDINGS. PRIOR APPROVAL IS REQUIRED FOR INSIDE INSTALLATION. ASSEMBLY SHALL BE SUPPORTED AT A MINIMUM OF THREE POINTS AND SHALL NOT BLOCK THE RELIEF VENT FROM FUNCTIONING.

NOTE: UNDER NO CIRCUMSTANCES WILL A BY-PASS OR ANY INTERVENING CONNECTION BE ALLOWED BETWEEN THE WATER METER AND THE RPP BFP USED FOR SYSTEM PROTECTION UNLESS THAT CONNECTION IS PROTECTED BY AN APPROVED BFP.

CAUTION: SECTION 607.3 THERMAL EXPANSION CONTROL, NOTED IN THE 2006 INTERNATIONAL PLUMBING CODE 2006, ADOPTED AS THE STATE OF GEORGIA PLUMBING CODE (WITH CURRENT COMBINED AMENDMENTS) SHOULD BE INCORPORATED IN THE DESIGN OF INSTALLATIONS AND DULY NOTED ON ALL APPLICABLE DRAWINGS PRIOR TO THE INSTALLATION OF ANY INLINE CHECKING DEVICE(S).

NOTE: DOMESTIC RPP-BFPAs SHALL BE LEAD FREE.

ASSEMBLY TESTING: ALL RPP BFP'S SHALL BE FIELD TESTED AFTER INSTALLATION, REPAIR, RELOCATION, AND AT LEAST ANNUALLY THEREAFTER.

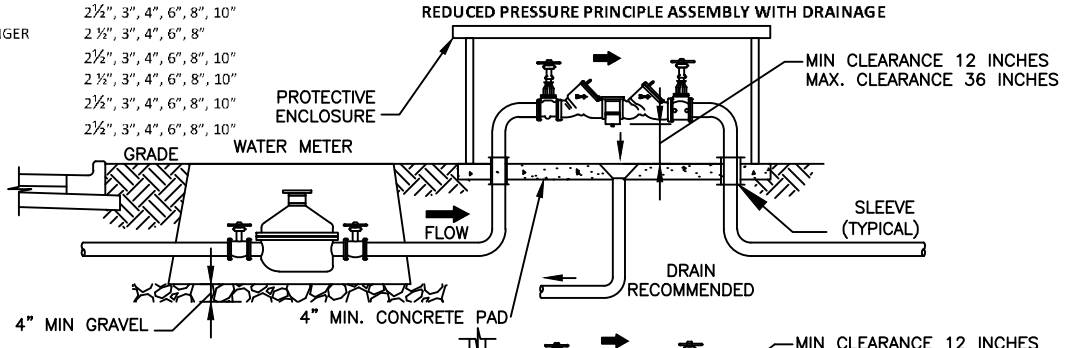
PLAN APPROVAL AND INSPECTION: PLAN APPROVAL MUST BE OBTAINED AND INSPECTION SCHEDULED PRIOR TO WORK, THROUGH DEKALB COUNTY DEPARTMENT OF WATERSHED MANAGEMENT. CONTACT BACKFLOW PREVENTION SECTION AT (404) 687-4075 FOR BACKFLOW INSPECTION PRIOR TO INSTALLATION.

APPROVED ASSEMBLYS (OR EQUIVALENT):

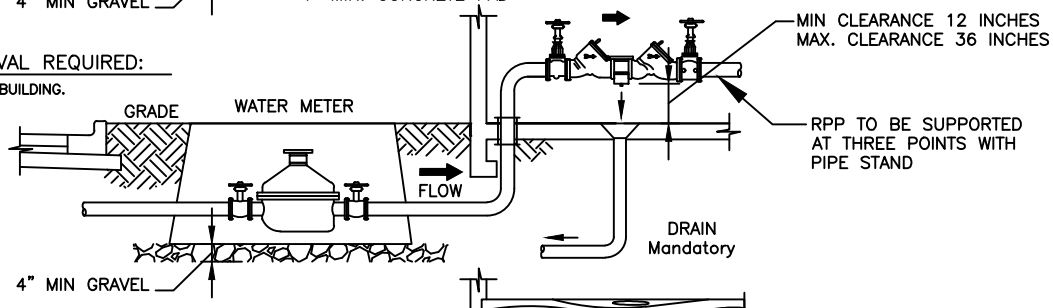
AMES	4000SS	2½", 3", 4", 6", 8", 10"
BACKFLOW DIRECT DERINGER		2 ½", 3", 4", 6", 8"
CONBRACO	RPLF4A	2½", 3", 4", 6", 8", 10"
FEBCO	LF860	2 ½", 3", 4", 6", 8", 10"
WATTS	LF909	2½", 3", 4", 6", 8", 10"
WILKINS	375XL	2½", 3", 4", 6", 8", 10"

APPROVED INSTALLATION OF
REDUCED PRESSURE PRINCIPLE ASSEMBLY WITH DRAINAGE

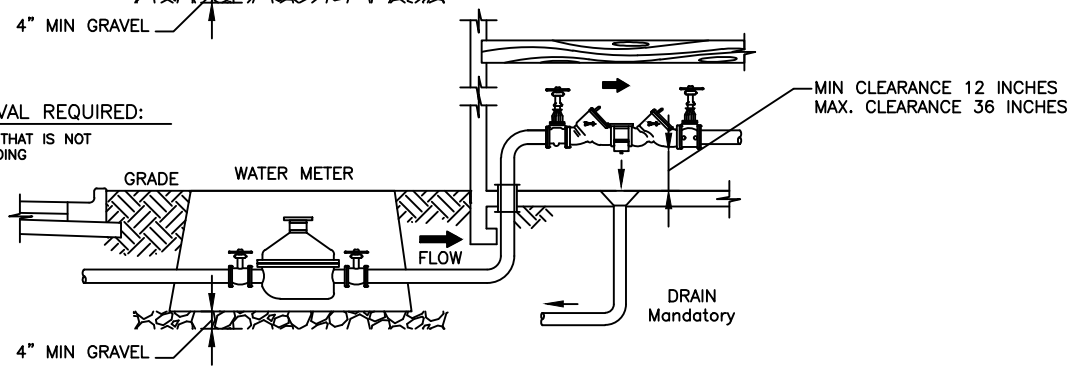
1. STANDARD INSTALLATION
OUTSIDE THE BUILDING.



2. PRIOR APPROVAL REQUIRED:
IN THE BUILDING.



3. PRIOR APPROVAL REQUIRED:
IN THE BASEMENT THAT IS NOT SUBJECT TO FLOODING



DeKalb County GEORGIA

STANDARD DETAILS

RPP BFP Installation 2 1/2 Inches And Larger

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. W-012

MINIMUM CONTAINMENT REQUIREMENTS FOR
NEW CONSTRUCTION AND RETROFIT
(DEDICATED) FIRELINE INSTALLATIONS
SERVICE SIZE: 2 1/2" AND ABOVE METER SIZE: 2 1/2" AND ABOVE
REDUCED PRESSURE DETECTOR ASSEMBLY (RPDA)

SPECIFICATION: THE CUSTOMER / OWNER SHALL FURNISH AND INSTALL A REDUCED PRESSURE DETECTOR ASSEMBLY BACKFLOW PREVENTER IN A SIZE TO MATCH THAT OF THE REQUIRED FIRE LINE SERVICE LINE CONNECTION. THE ASSEMBLY SHALL HAVE A METERED THREE QUARTER INCH (3/4") BYPASS LINE AS SHOWN ON THE ILLUSTRATION. THE RPDA BACKFLOW PREVENTION ASSEMBLY SHALL BE PROVIDED WITH A RESILIENT SEATED OUTSIDE STEM AND YOKE FLANGED GATE VALVE NEAR THE INLET AND OUTLET SIDES OF THE ASSEMBLY. THE ASSEMBLY SHALL BE PROVIDED WITH THREE BRASS BALL VALVE TEST COCKS FITTED WITH BRASS OR PLASTIC THREADED PLUGS. A FOURTH TEST COCK SHALL ALSO BE PROVIDED ON THE UPSTREAM SIDE OF THE INLET SHUT-OFF VALVE. THE METERED BYPASS LINE ON THE ASSEMBLY SHALL INCLUDE A BRONZE DETECTOR METER AND A REDUCED PRESSURE PRINCIPAL (RPP) BACKFLOW PREVENTION ASSEMBLY. THE ASSEMBLY AND BODIES SHALL BE EQUIVALENT TO CAST IRON COATED INSIDE AND OUT WITH FDA APPROVED FUSED EPOXY COATING AND ASSEMBLED WITH BOLTS THAT ARE RESISTANT TO ELECTROLYSIS. ALL INTERIOR COMPONENTS OF THE CHECKING ASSEMBLY SHALL BE EQUIVALENT TO BRONZE OR STAINLESS STEEL CONSTRUCTION AND BE ACCESSIBLE FOR MAINTENANCE AND REPAIR

NOTE: ALL COMPONENTS OF THE ASSEMBLY SHALL BE CERTIFIED BY A NATIONALLY RECOGNIZED TESTING LABORATORY. THE REDUCED PRESSURE DETECTOR ASSEMBLY SHALL HAVE APPROVAL AND CONFORM TO ALL CURRENT REQUIREMENTS OF THE UNIVERSITY OF SOUTHERN CALIFORNIA FOUNDATION FOR CROSS CONNECTION CONTROL AND HYDRAULIC RESEARCH (USC-FCCCHR). ASSEMBLY TO BE INDIVIDUALLY FACTORY TESTED, SHIPPED AND INSTALLED AS A UNIT.

NOTE: BEFORE INSTALLING BACKFLOW ASSEMBLY ON ANY FIRE SYSTEM CONSULT WITH THE FIRE AUTHORITY FOR ADDITIONAL REQUIREMENTS. (IE: OS &Y SHUTOFFS, ALARMS ETC.)

INSTALLATION INSTRUCTIONS: INSTALLATION OF A REDUCED PRESSURE DETECTOR ASSEMBLY BACKFLOW PREVENTION ASSEMBLY SHALL NOT BE BELOW GRADE. ASSEMBLY SHALL BE INSTALLED ABOVE GROUND AS CLOSE AS PRACTICAL TO THE PROPERTY LINE AND OUT OF THE RIGHT OF WAY. AN ABOVE GROUND ENCLOSURE SHALL BE PROVIDED FOR PROTECTION FROM FREEZING TEMPERATURES. INSTALL AN APPROVED DRAIN WITH AN AIR GAP. A CONCRETE PAD SHALL BE POURED WITH A MINIMUM OF FOUR (4) INCHES DEPTH. ASSEMBLY SHALL BE SUPPORTED AT A MINIMUM OF THREE (3) POINTS AND NOT BLOCKING THE RELIEF VALVE

NOTE: UNDER NO CIRCUMSTANCE WILL ANY CONNECTION BE ALLOW ON THE SYSTEM OTHER THAN FOR FIREFIGHTING OR FIRE PROTECTION PURPOSES

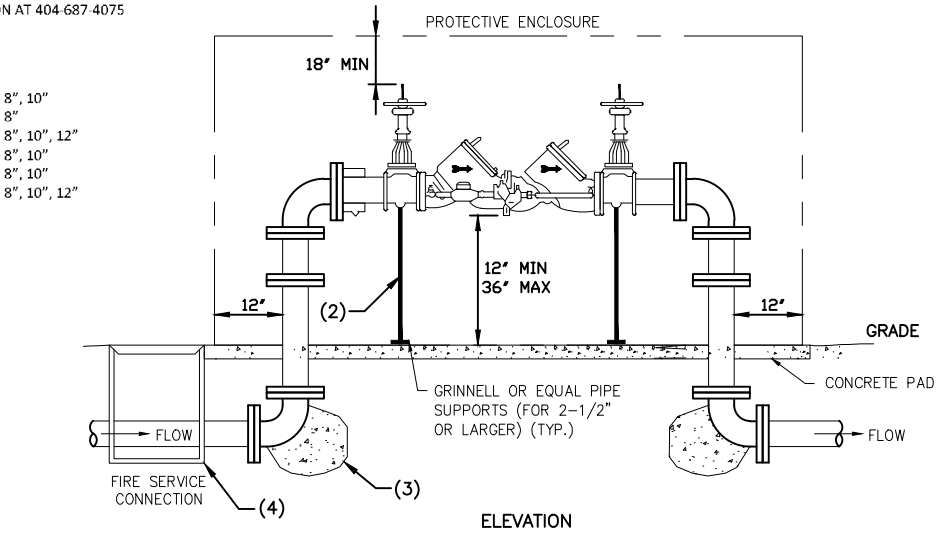
ASSEMBLY TESTING: ALL RPDA ASSEMBLIES SHALL BE TESTED AT TIME OF INSTALLATION, AFTER EACH REPAIR AELOCATION AND AT LEAST ONCE ANNUALLY

PLAN APPROVALS AND INSPECTIONS: SHALL BE OBTAINED AND SCHEDULED PRIOR TO WORK THROUGH DEKALB COUNTY DEPARTMENT OF WATERSHED MANAGEMENT. CONTACT CROSS- CONNECTION CONTROL SECTION AT 404-687-4075

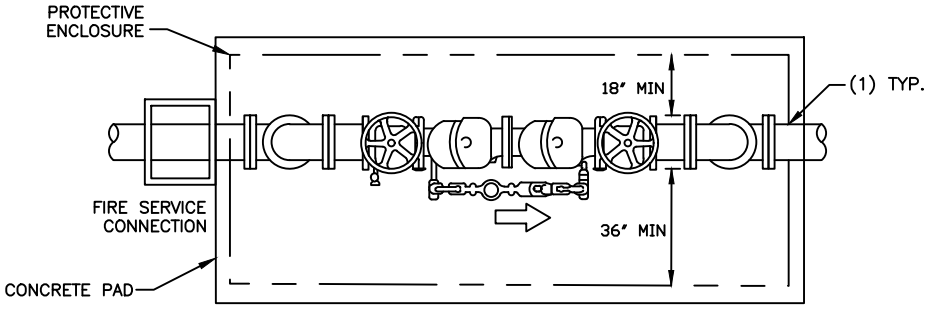
APPROVED ASSEMBLIES (OR EQUIVALENT):

AMES	5000	2 ½", 3", 4", 6", 8", 10"
BACKFLOW DIRECT DERINGER		2 ½", 3", 4", 6", 8"
Apollo/CONBRACO	RPDALF4A	2 ½", 3", 4", 6", 8", 10", 12"
FEBCO	826 TYPE YD	2 ½," 3", 4", 6", 8", 10"
WATTS	909 RPDA	2 ½", 3", 4", 6", 8", 10"
WILKINS	375ADA	2 ½", 3", 4", 6", 8", 10", 12"

1. VAULT INLET/OUTLET PIPE OPENINGS TO BE SEALED WITH GROUT OR MORTAR. PIPE MUST NOT SUPPORT VAULT.
2. BFP ASSEMBLY TO BE SUPPORTED AT THREE POINTS WITH PIPE STANDS. THE THIRD PIPE STAND SHALL BE INSTALLED IN THE LOCATION APPROVED BY DWM, (BACKFLOW SECTION).
3. THRUST BLOCKING, AS REQUIRED, MUST BE IN ACCORDANCE WITH DCDWM SPECIFICATIONS.
4. THRUST TIE RODS SHALL BE BITUMASTIC COATED. ALL PIPES AND FITTINGS OF DUCTILE IRON.
5. ALL MATERIALS TO BE FURNISHED BY THE CUSTOMER/OWNER.



ELEVATION



PLAN VIEW

DeKalb County GEORGIA

STANDARD DETAILS

09/17

RPDA BFP Installation 2 1/2 Inches And Larger

NOT TO SCALE

DETAIL NO. W-013

MINIMUM CONTAINMENT PROTECTION REQUIREMENT
NEW CONSTRUCTION AND RETROFIT INSTALLATIONS
SERVICE SIZE: ¾ INCH THRU 2 INCH METER SIZE: THRU ¾ INCH THRU 2 INCH
DOUBLE CHECK VALVE ASSEMBLY (DC)

SPECIFICATION: THE CUSTOMER/OWNER SHALL FURNISH AND INSTALL A DOUBLE CHECK (DC) VALVE BACKFLOW PREVENTION ASSEMBLY (BFP) IN A SIZE TO MATCH THAT OF THE REQUIRED SERVICE LINE CONNECTION. THE DC BFP ASSEMBLY SHALL INCLUDE A FULL PORT BALL VALVE ON THE INLET AND OUTLET SIDES WITH A UNION OR SWIVLE COUPLING NUT BETWEEN THE ASSEMBLY AND EACH VALVE. THE ASSEMBLY SHALL HAVE THREE BALL VALVE TEST COCKS IN THE VERTICAL POSITION FITTED WITH BRASS OR PLASTIC THREADED PLUGS. A FOURTH TEST COCK SHALL ALSO BE PROVIDED ON THE UPSTREAM SIDE OF THE INLET SHUT-OFF VALVE.

NOTE: ALL COMPONENTS OF THE ASSEMBLY SHALL BE CERTIFIED BY A NATIONALLY RECOGNIZED TESTING LABORATORY. THE DC BFP ASSEMBLY SHALL HAVE APPROVAL AND CONFORM TO ALL CURRENT REQUIREMENTS OF THE UNIVERSITY OF SOUTHERN CALIFORNIA, FOUNDATION FOR CROSS-CONNECTION CONTROL AND HYDRAULIC RESEARCH (USC-FCCCHR). ASSEMBLY TO BE INDIVIDUALLY FACTORY TESTED, SHIPPED AND INSTALLED AS A UNIT.

INSTALLATION INSTRUCTIONS: THE DC BFP ASSEMBLY SHALL NOT BE BURIED IN EARTH. INSTALL IN A UTILITY BOX ADJACENT TO OR AS CLOSE AS PRACTICAL TO THE PROPERTY LINE OF THE PREMISES TO THE DOWNSTREAM SIDE OF THE WATER METER, AND OUT OF RIGHT-OF-WAY. THE DC BFP ASSEMBLY MUST BE CENTERED IN THE ENCLOSURE.

NOTE: UNDER NO CIRCUMSTANCES WILL A BY-PASS OR ANY INTERVENING CONNECTION BE ALLOWED BETWEEN THE WATER METER AND THE DC BFP USED FOR SYSTEM PROTECTION UNLESS THAT CONNECTION IS PROTECTED BY AN APPROVED BFP. AT THE BOTTOM, SEE EXCERPT FROM STATE OF GEORGIA PLUMBING CODE ON THERMAL EXPANSION.

APPROVED UTILITY BOXES (OR EQUIVALENT):

CARSON INDUSTRIES	MODEL NUMBER I324CP2PGWL
CDR SYSTEM CORP.	MODEL NUMBER WA101324-18
BROOKS PRODUCTS, INC.	MODEL NUMBER 1324

NOTE: DOMESTIC DC-BFPAs SHALL BE LEAD FREE.

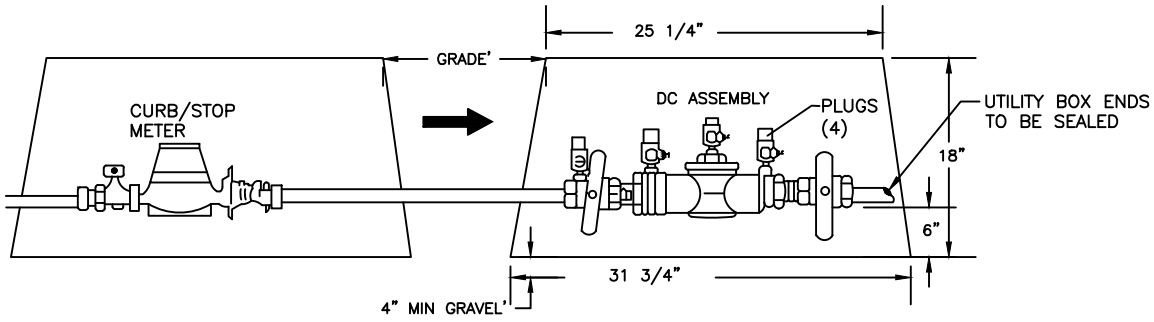
ASSEMBLY TESTING: ALL DC BFP'S SHALL BE FIELD TESTED FOLLOWING INSTALLATION, REPAIR, RELOCATION, AND AT LEAST ANNUALLY THEREAFTER.

PLAN APPROVAL AND INSPECTION: PLAN APPROVAL MUST BE OBTAINED AND INSPECTION SCHEDULED PRIOR TO WORK, THROUGH DEKALB COUNTY DEPARTMENT OF WATERSHED MANAGEMENT. CONTACT CROSS-CONNECTION CONTROL SECTION AT (404) 687-4075 FOR BACKFLOW INSPECTION PRIOR TO INSTALLATION.

APPROVED ASSEMBLYS (OR EQUIVALENT):

ARI	DC 500	¾", 1", 1¼", 1½", 2"
CONBRACO	DCLF4A	¾", 1", 1¼", 1½", 2"
FEBCO	LF850	¾", 1", 1¼", 1½", 2"
WATTS	LF007	¾", 1", 1½", 2"
WILKINS	350XL	¾", 1", 1¼", 1½", 2"

TYPICAL DC BFP INSTALLATION IN A UTILITY BOX



NOTE: FOR FINAL APPROVAL ASSEMBLY MUST BE CENTERED IN UTILITY BOX.

****** SPECIAL CAUTION ******

2006 INTERNATIONAL PLUMBING CODE ADOPTED AS THE STATE OF GEORGIA PLUMBING CODE (WITH CURRENT AMENDMENTS)

CAUTION SECTION 607.3 THERMAL EXPANSION CONTROL: A MEAN OF CONTROLLING INCREASED PRESSURE CAUSED BY THERMAL EXPANSION SHALL BE PROVIDED WHERE REQUIRED, IN ACCORDANCE WITH SECTION 607.3.2.

SECTION 607.3.1 PRESSURE REDUCING VALVE: FOR WATER SERVICE SYSTEM SIZES UP TO AND INCLUDING 2 INCHES (51 MM), An ASSEMBLY FOR CONTROLLING PRESSURE SHALL BE INSTALLED WHERE, BECAUSE OF THERMAL EXPANSION, THE PRESSURE ON THE DOWNSTREAM SIDE OF THE PRESSURE REDUCING VALVE EXCEED THE PRESSURE REDUCING VALVE SETTING.

SECTION 607.3.2 BACKFLOW PREVENTION ASSEMBLY OR CHECK VALVE: WHERE A BACKFLOW PREVENTION ASSEMBLY, CHECK VALVE OR OTHER DRVICE IS INSTALLED ON A WATER SUPPLY SYSTEM UTILIZING STORAGE WATER HEATING EQUIPMENT SUCH THAT THERMAL EXPANSION CAUSES AN INCREASE IN PRESSURE, A DEVICE FOR CONTROLLING PRESSURE SHALL BE INSTALLED.

DeKalb County GEORGIA

STANDARD DETAILS

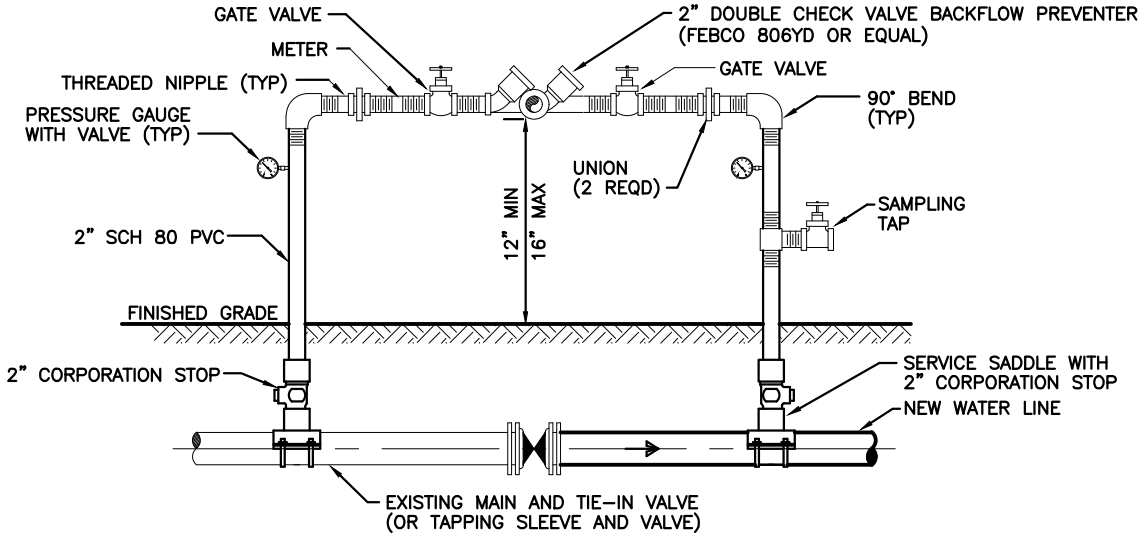
DC BFP Installation 3/4 Inch To 2 Inch

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. W-014



NOTES:

1. A TEMPORARY JUMPER CONNECTION IS REQUIRED AT ALL CONNECTIONS BETWEEN EXISTING ACTIVE WATER MAINS AND PROPOSED WATER MAINS.

2. THIS DETAIL IS TO BE USED FOR FILLING ANY NEW WATER MAIN AND FOR FLUSHING OF NEW MAINS UP TO 8" DIAMETER (2.5 FPS MINIMUM VELOCITY), AND FOR BACTERIOLOGICAL SAMPLING POINTS AT THE ENDS OF THE PROPOSED MAINS. THE JUMPER CONNECTIONS SHALL BE MAINTAINED UNTIL AFTER FILLING, FLUSHING, TESTING, AND DISINFECTION OF THE PROPOSED MAIN HAS BEEN SUCCESSFULLY COMPLETED AND CLEARANCE FOR USE FROM THE DCDWM HAS BEEN RECEIVED. THIS JUMPER CONNECTION SHALL ALSO BE USED TO MAINTAIN A MINIMUM PRESSURE OF 20 PSI IN THE PROPOSED MAINS AFTER DISINFECTION AND UNTIL THE CLEARANCE LETTER IS OBTAINED.

3. FLUSHING OF THE 10" DIAMETER AND LARGER WATER MAIN MAY BE DONE THROUGH THE TIE-IN VALVE UNDER VERY CONTROLLED CONDITIONS, AS FOLLOWS:

   A. THE TIE-IN VALVES SHALL BE OPERATED AND PRESSURE TESTED IN THE PRESENCE OF DCDWM AND ENGINEER TO VERIFY WATER TIGHTNESS PRIOR TO TIE-IN. VALVES WHICH ARE NOT WATERTIGHT SHALL BE REPLACED.

   B. THE TEMPORARY JUMPER CONNECTION SHALL BE CONSTRUCTED AS DETAILED. THE JUMPER CONNECTION SHALL BE USED TO FILL THE NEW MAIN AND FOR BACTERIOLOGICAL SAMPLING OF THE NEW MAIN AS REQUIRED BY THE DCDWM PERMIT.

      - FLUSHING SHALL NOT BE ATTEMPTED DURING PEAK DEMAND HOURS OF THE EXISTING WATER MAINS.
      - ALL DOWNSTREAM VALVES IN THE NEW SYSTEM MUST BE OPEN PRIOR TO OPENING THE TIE-IN VALVE.
      - MONITOR THE PRESSURE AT THE TIE-IN POINT. THE PRESSURE IN THE EXISTING MAIN MUST NOT DROP BELOW 35 PSI.
      - TIE-IN VALVE SHALL BE OPENED A FEW TURNS ONLY ENSURING A PRESSURE DROP ACROSS THE VALVE IS ALWAYS GREATER THAN 10 PSI.

   C. THE TIE-IN VALVE SHALL BE LOCKED CLOSED UNTIL FLUSHING BEGINS.

   D. THE TIE-IN VALVE SHALL BE OPENED ONLY FOR FLUSHING OF THE NEW MAIN. THE PROCEDURE SHALL BE DIRECTED BY THE DCDWM.

   E. AFTER FLUSHING, THE TIE-IN VALVE SHALL BE CLOSED AND LOCKED IN THE CLOSED POSITION.

4. THE CONTRACTOR SHALL PROVIDE DOCUMENTATION DEMONSTRATING THAT THE DOUBLE CHECK VALVE BACKFLOW PREVENTION DEVICE HAS BEEN TESTED AND IS IN GOOD WORKING ORDER AT THE TIME OF INSTALLATION.

5. EXCEPT AS REQUIRED TO FLUSH LINES GREATER THAN 8" IN DIAMETER, THE TIE-IN VALVE SHALL REMAIN LOCKED CLOSED UNTIL THE NEW SYSTEM HAS BEEN CLEARED FOR USE BY ALL PERTINENT AGENCIES.

6. UPON RECEIPT OF CLEARANCE FOR USE FROM DCDWM, THE CONTRACTOR SHALL REMOVE THE TEMPORARY JUMPER CONNECTION. STOPS ARE TO BE CLOSED AND PLUGGED WITH 2" BRASS PLUGS.

7. ALL INSTALLATION AND MAINTENANCE OF THE TEMPORARY JUMPER CONNECTION AND ASSOCIATED BACKFLOW PREVENTION DEVICE, FITTINGS, VALVE, ETC. SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.

DeKalb County GEORGIA

STANDARD DETAILS

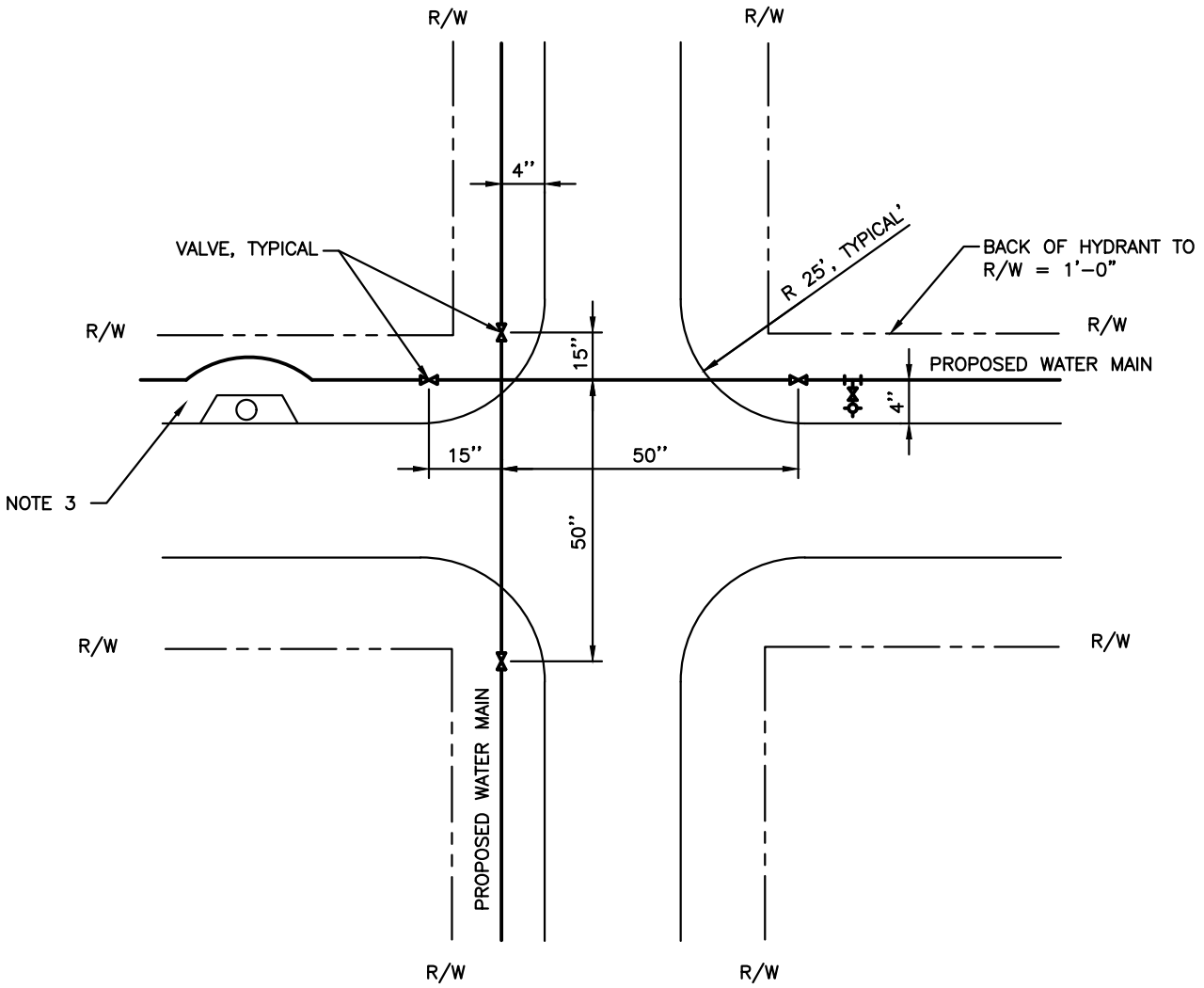
Temporary Disinfection Jumper Installation Detail

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. W-015



NOTES:

1. IF RADIUS IS NOT 25' ADJUST PIPE LENGTHS SO THAT VALVES ARE NOT IN STREET.
2. VALVES TO BE A MINIMUM OF 2'–0" FROM BACK OF CURB TO TOP SECTION OF BOX CONCRETE COLLAR. SEE DETAIL W–23.
3. WHEN GOING AROUND CATCH BASIN, USE 3 JOINTS OF PIPE, CENTERED, AND CHANGE ALIGNMENT BY DEFLECTING EACH JOINT. MAXIMUM DEFLECTION TO BE NO MORE THAN 4 DEGREES PER JOINT. PIPE SHALL CLEAR OUTSIDE WALL OF CATCH BASIN BY 4" MINIMUM.

DeKalb County GEORGIA

STANDARD DETAILS

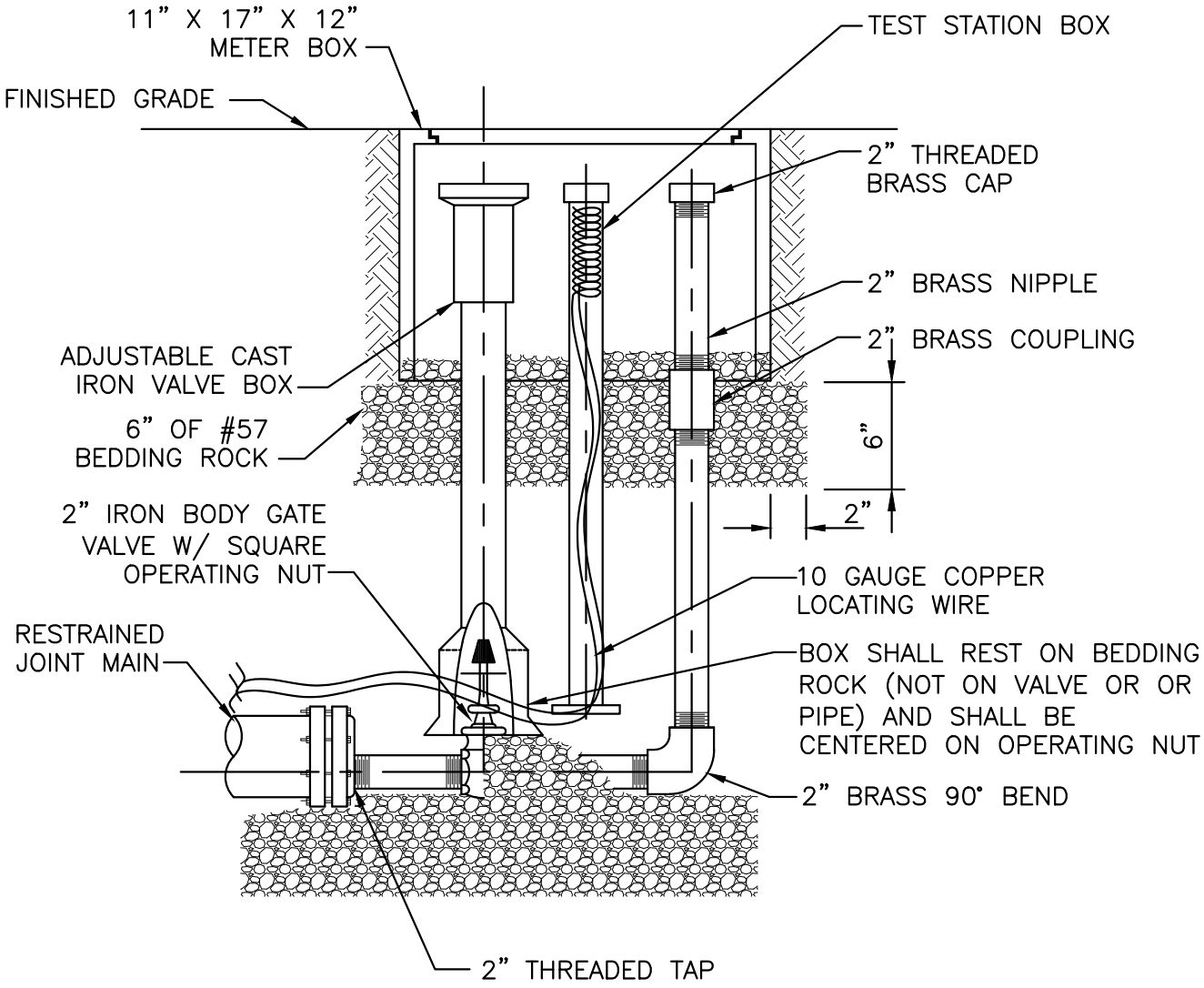
Intersection Detail Valve Locations

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. W-016



NOTES:

1. SEE DESIGN STANDARDS FOR 2" BRASS PIPE AND FITTING REQUIREMENTS.

DeKalb County
GEORGIA

STANDARD DETAILS

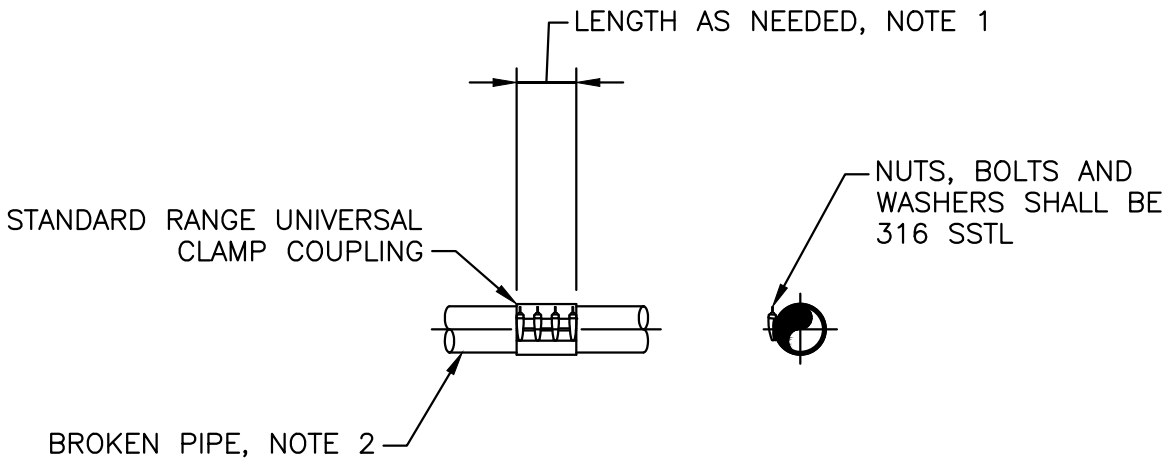
Typical Blow-off Detail

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. W-017



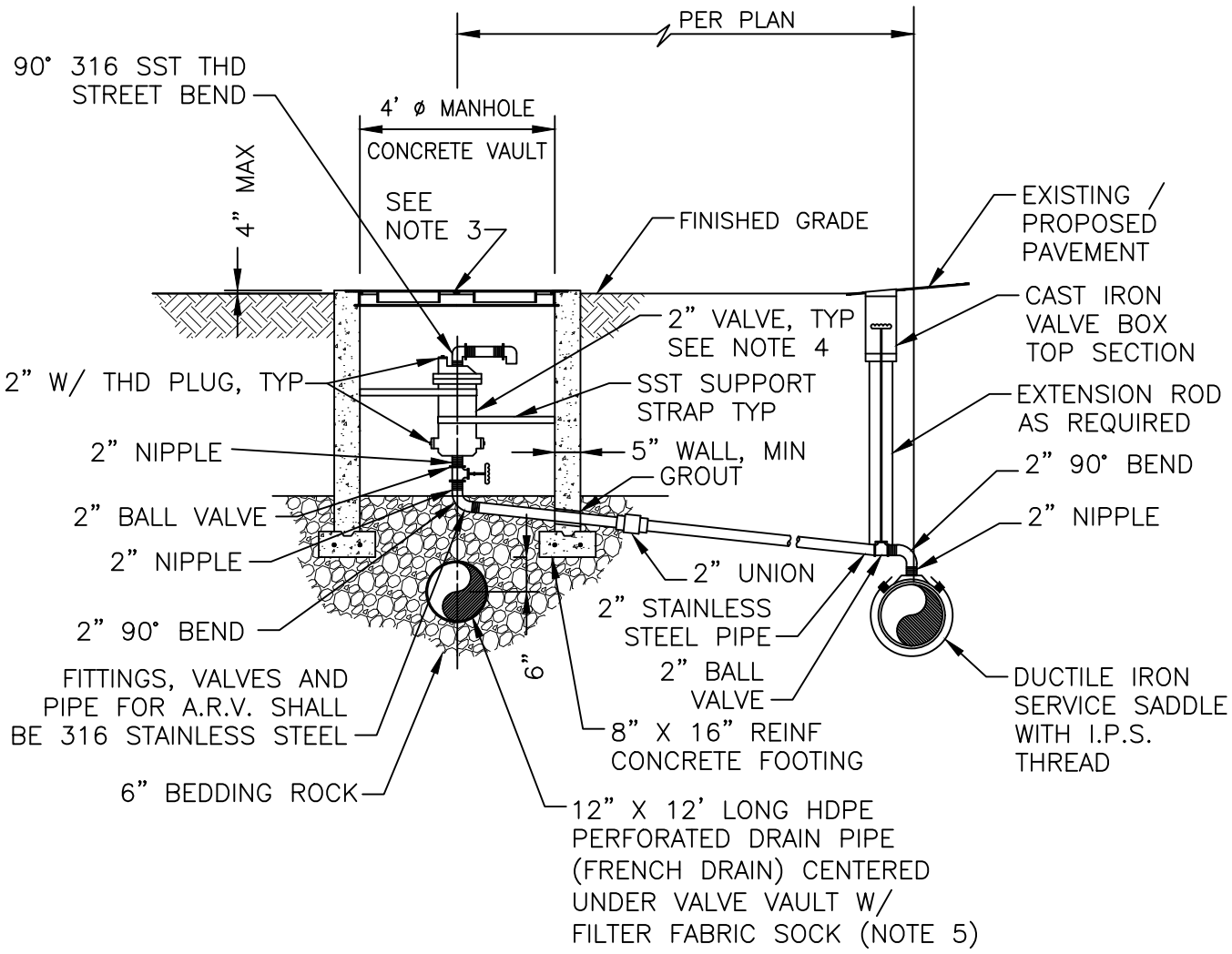
NOTES:

1. LENGTHS AS AVAILABLE FROM SPECIFIC MANUFACTURERS VARY AND MAY RANGE FROM 6 INCHES TO 30 INCHES.

2. UNIVERSAL CLAMP COUPLINGS ARE FOR THE REPAIR OF ASBESTOS–CEMENT, CAST IRON, DUCTILE IRON, STEEL AND PVC PIPE.

3. PRESSURE RANGES GENERALLY VARY FROM 150 psi TO OVER 500 psi DEPENDING ON FITTING LENGTH AND APPLICATION. SEE SPECIFIC MANUFACTURERS FOR SPECIFIC PRESSURE RATINGS.

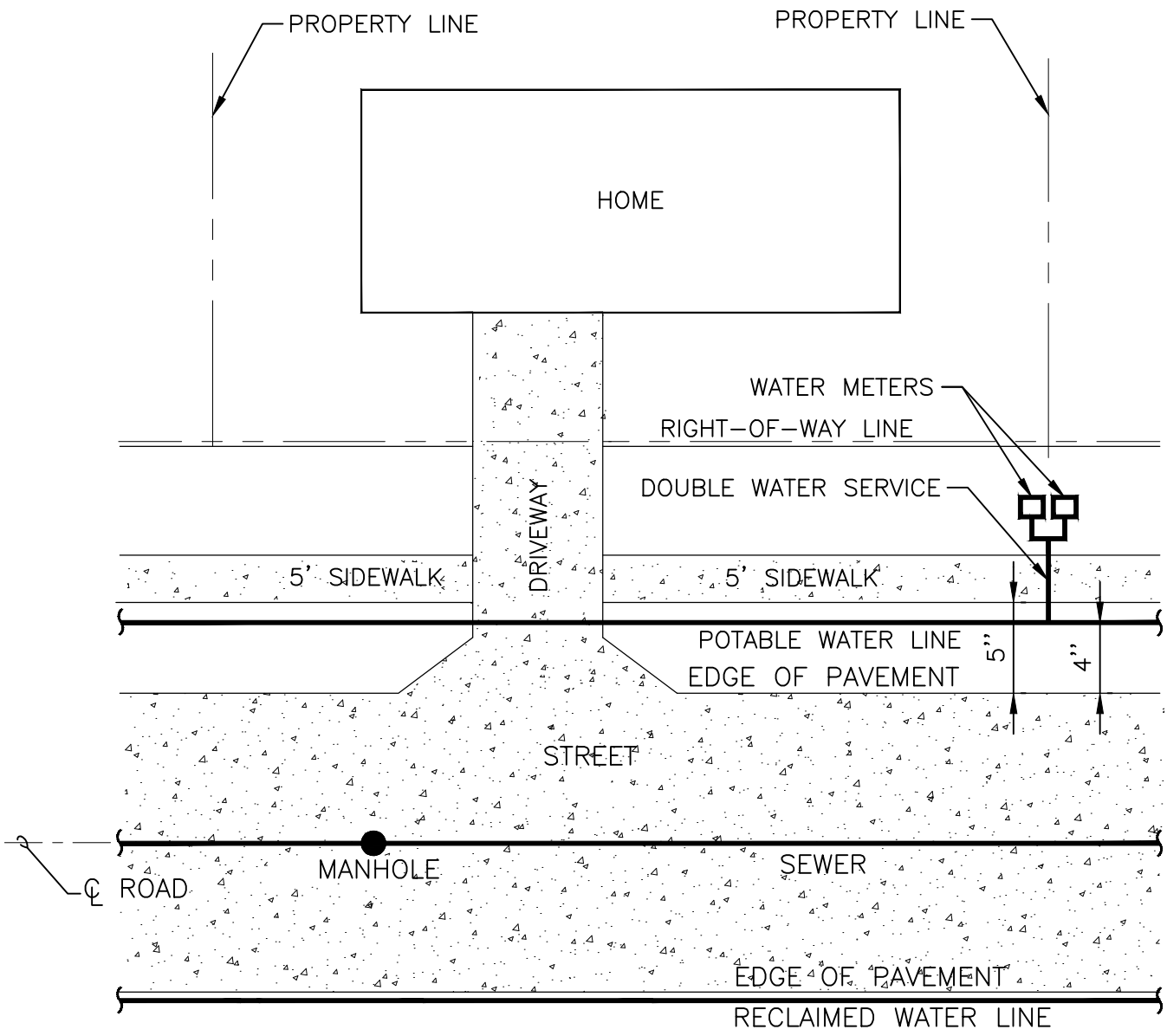
DeKalb County GEORGIA	**STANDARD DETAILS**	09/17
	Repair Sleeve Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. W-018



NOTES:

1. ABOVE DETAIL IS BASED ON 2" AIR RELEASE VALVE. CHANGE PIPE AND FITTINGS BY THE DEVELOPER'S ENGINEER AND APPROVED BY DCDWM PRIOR TO INSTALLATION.
2. THE MINIMUM DIMENSION FROM THE TOP OF THE WATERMAIN TO FINISHED GRADE SHALL BE 4.0 FEET.
3. FRAME AND COVER SHALL BE EQUIVALENT TO U.S. FOUNDRY USF 170-E-ORS.
4. FOR POTABLE WATER AND REUSE WATER MAINS, VALVE SHALL BE APCO #200 (2") OR EQUIVALENT.
5. FRENCH DRAIN BEDDING BEYOND VALVE VAULT SHALL CONSIST OF 24" x 24" TRENCH LINED W/ 6" MIN #57 BEDDING AROUND FRENCH DRAIN CENTERED IN TRENCH.

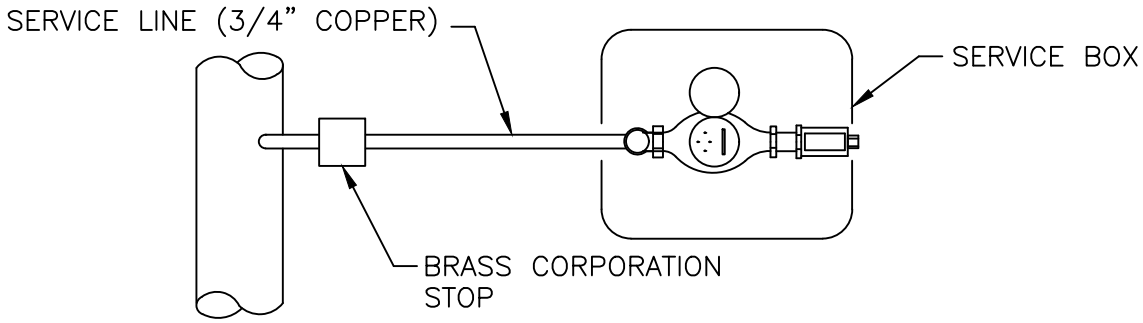
DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Air Release Valve Installation Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. W-019



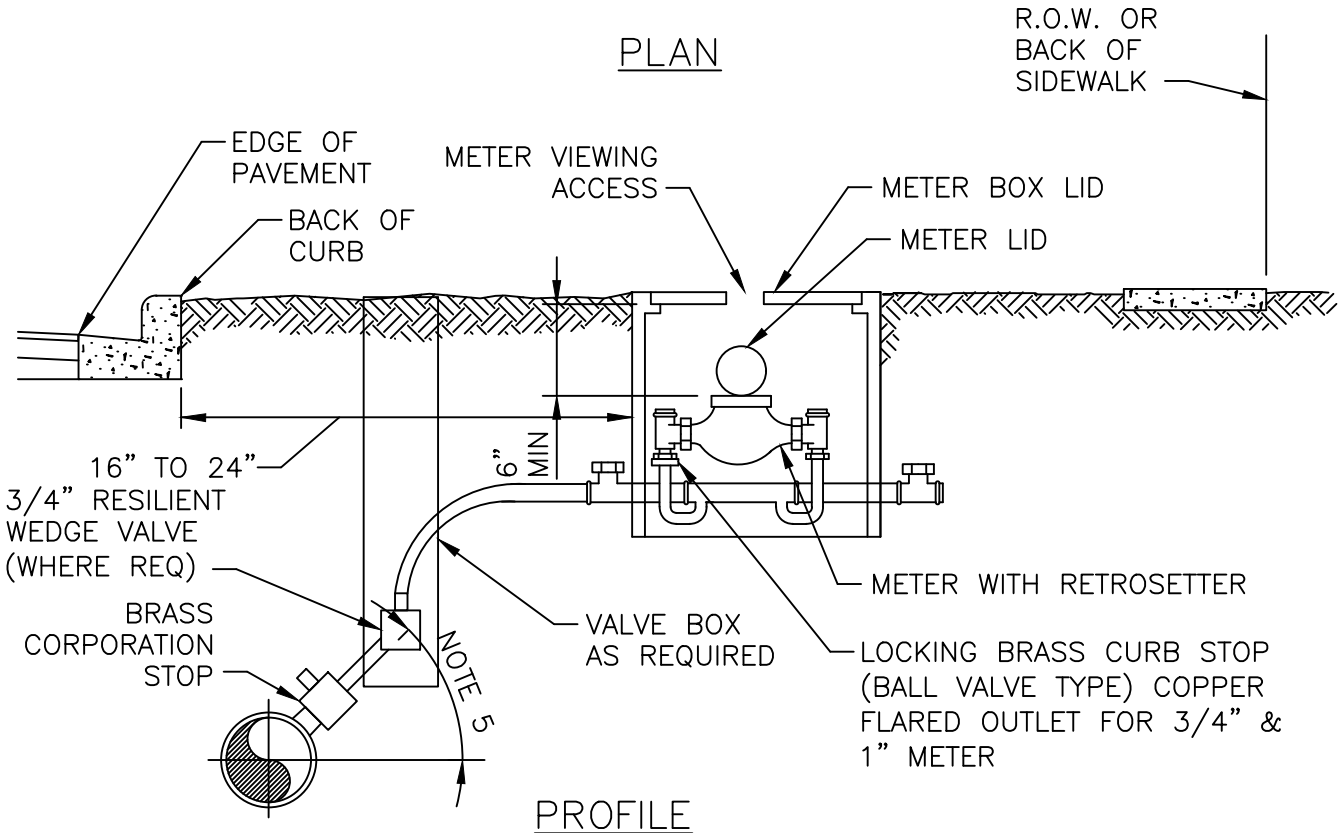
NOTE:

1. A 3' BY 3' AREA OF "GREEN SPACE SHALL BE ALLOTTED PER EACH WATER METER. METERS SHALL NOT BE LOCATED WITHIN PAVED AREAS.

DeKalb County GEORGIA	**STANDARD DETAILS**	09/17
	Water Meter Locations Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. W-020



PLAN



PROFILE

NOTES:

1. METER SHALL BE INSTALLED BETWEEN SIDEWALK AND CURB AND IN NO CASE SHALL IT BE INSTALLED IN SIDEWALK OR OTHER PAVED AREAS.

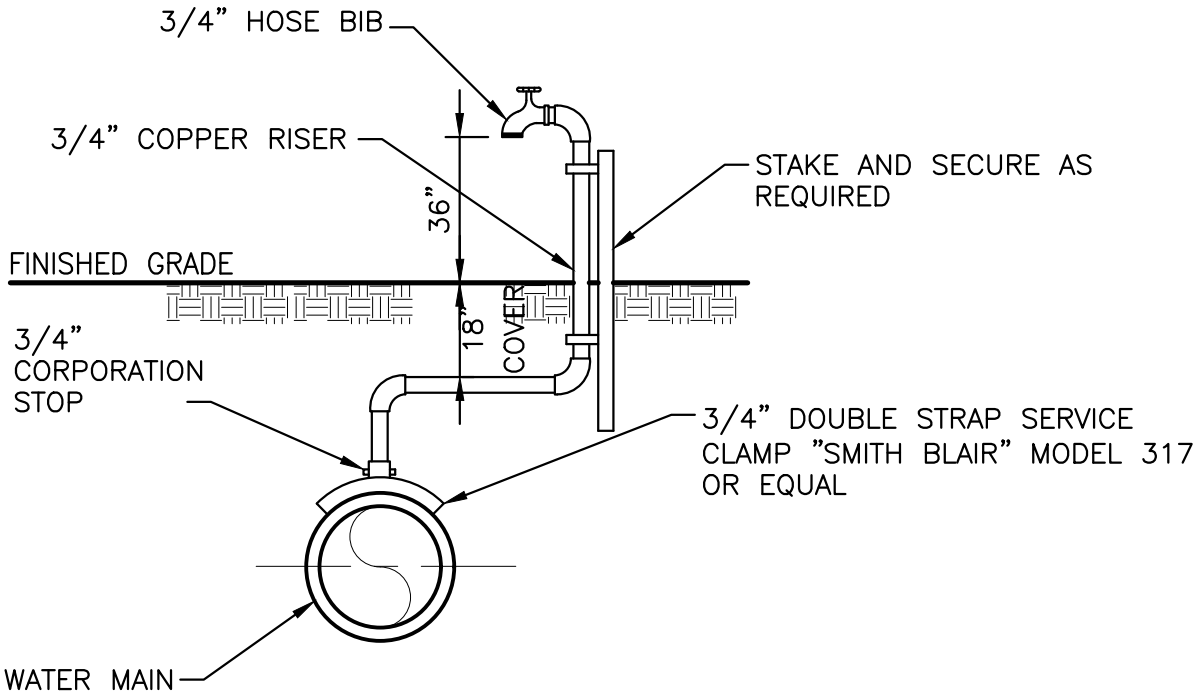
2. ALL POTABLE WATER IRRIGATION METERS REQUIRE AN APPROVED BACKFLOW PREVENTER.

3. ALL PROPERTIES WITH ALTERNATIVE WATER SYSTEMS (WELL, ETC.) REQUIRE BACKFLOW PREVENTERS.

4. SERVICE LINES SHALL NOT BE LESS THAN METER SIZE.

5. SERVICE TAP SHALL BE BETWEEN 10:00 O'CLOCK AND 2:00 O'CLOCK WITHOUT SADDLE TAP.

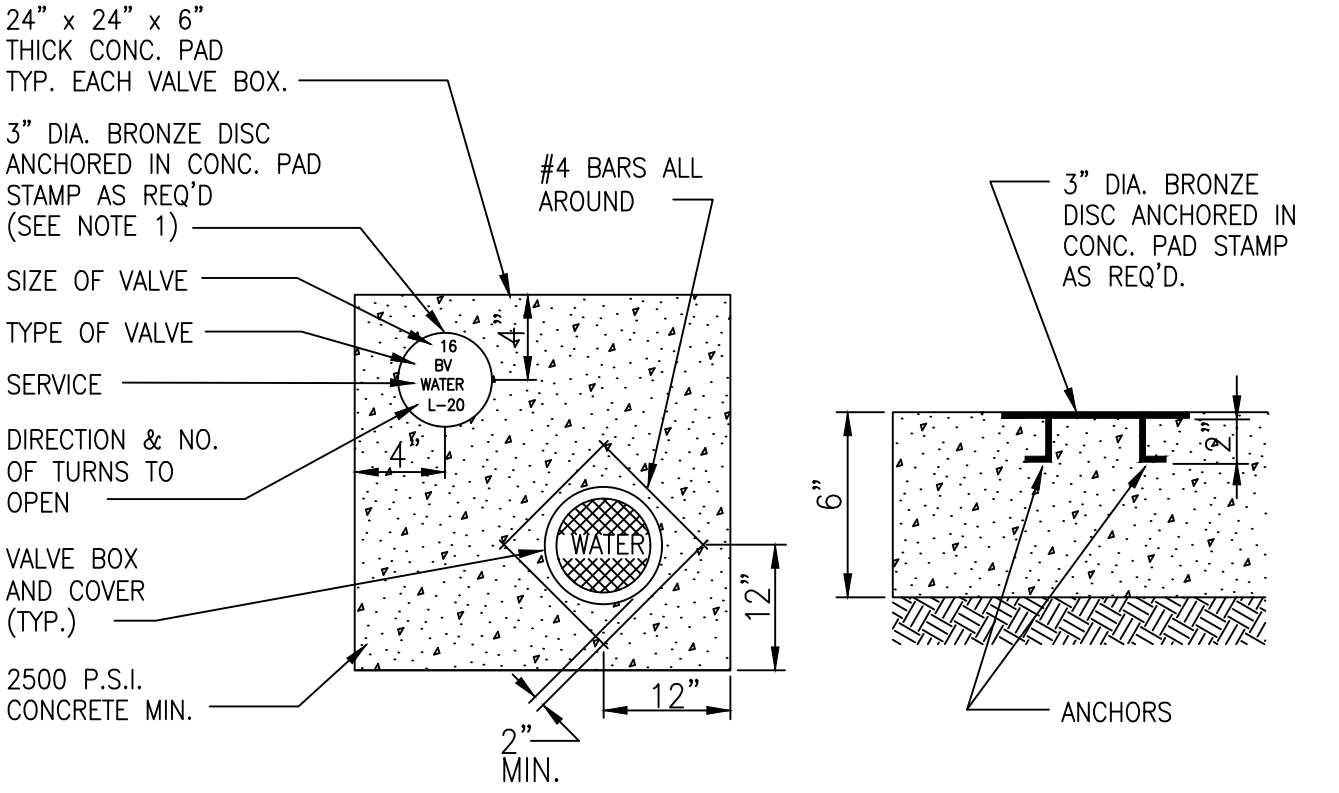
DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Residential Water Meter Installation Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. W-021



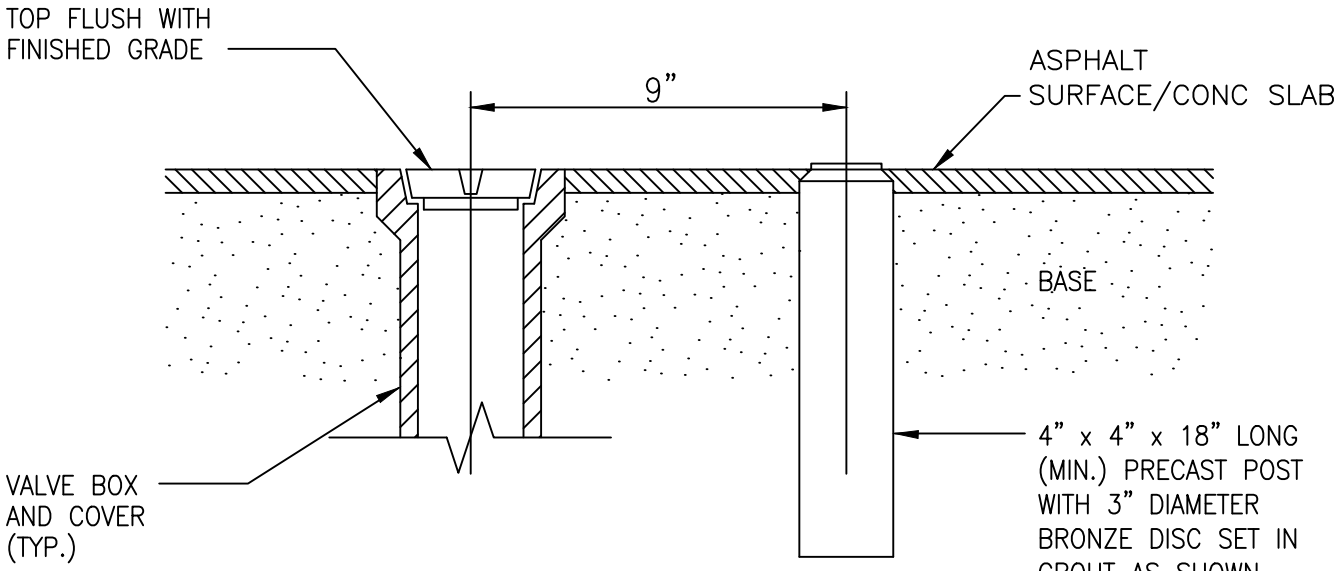
NOTES:

1. CONTRACTOR SHALL REMOVE SAMPLE POINT ASSEMBLY TO 3/4" CORPORATION STOP AND PLUG UPON WRITTEN ACCEPTANCE OF DISINFECTION BY DCDWM.

DeKalb County GEORGIA	**STANDARD DETAILS**	09/17
	Temporary Water Sample Station Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. W-022



UNIMPROVED CONDITION

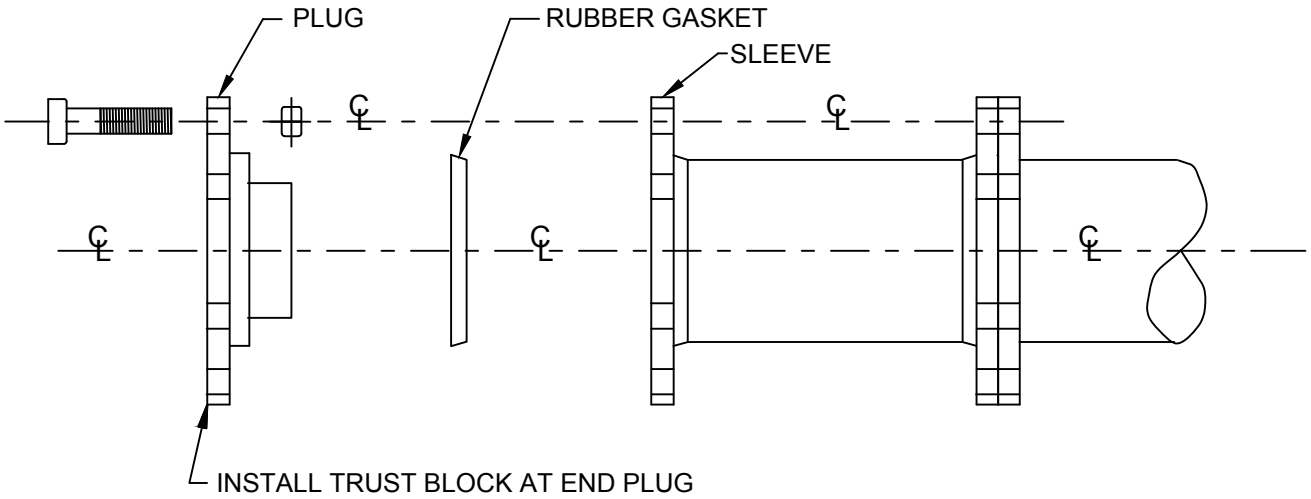


IMPROVED CONDITION

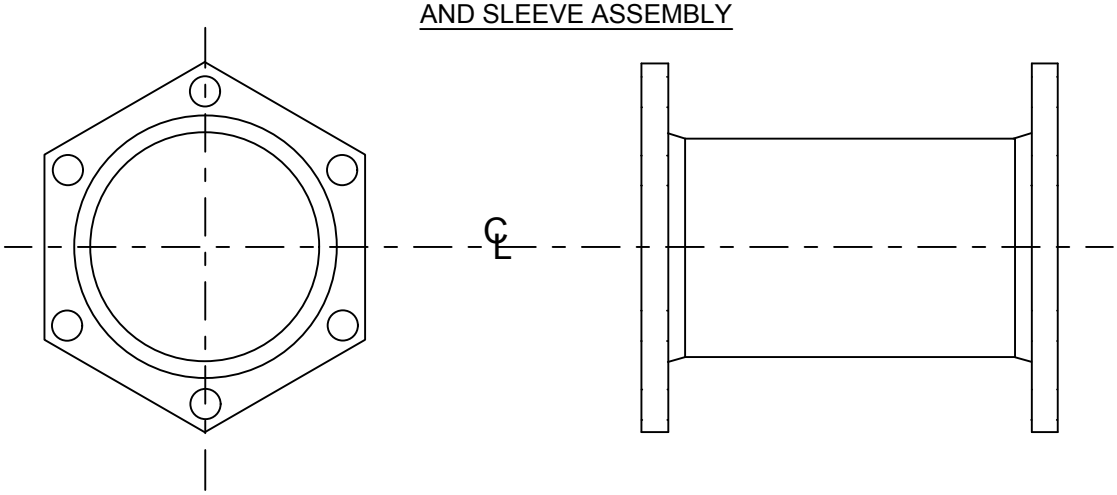
NOTES:

1. BRONZE IDENTIFICATION DISC SHALL BE REQUIRED FOR ALL VALVES 16" AND LARGER, OR AS REQUIRED BY DCDWM.
2. VALVE COLLAR DIMENSIONS MAY BE REDUCED TO 18" X 18" X 6" WHEN THE BRONZE IDENTIFICATION DISC IS NOT REQUIRED.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Valve Cover and Marker Disc	WATER Matters
	NOT TO SCALE	DETAIL NO. W-023



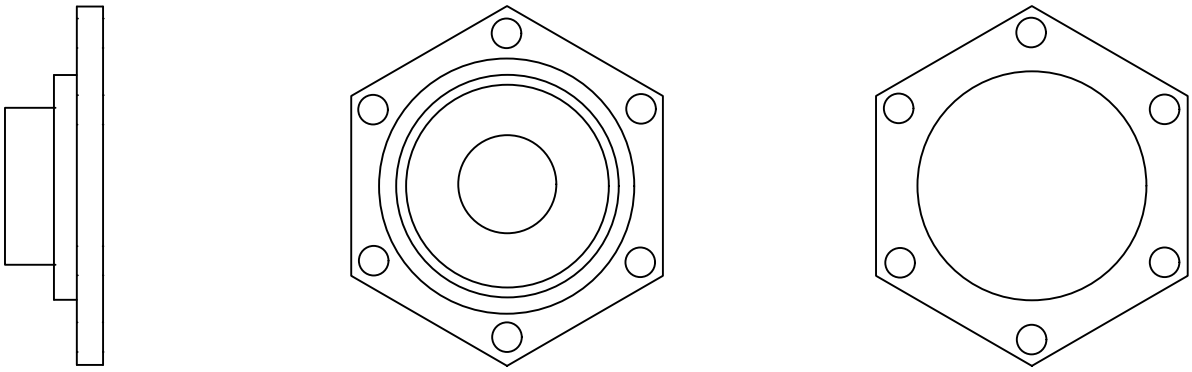
SIDE VIEW OF END-OF-LINE PLUG AND SLEEVE ASSEMBLY



END VIEW OF SLEEVE

SIDE VIEW OF SLEEVE

END OF WATERLINE SLEEVE



SIDE VIEW

BOTTOM VIEW

TOP VIEW

END OF WATERLINE PLUG

DeKalb County GEORGIA

STANDARD DETAILS

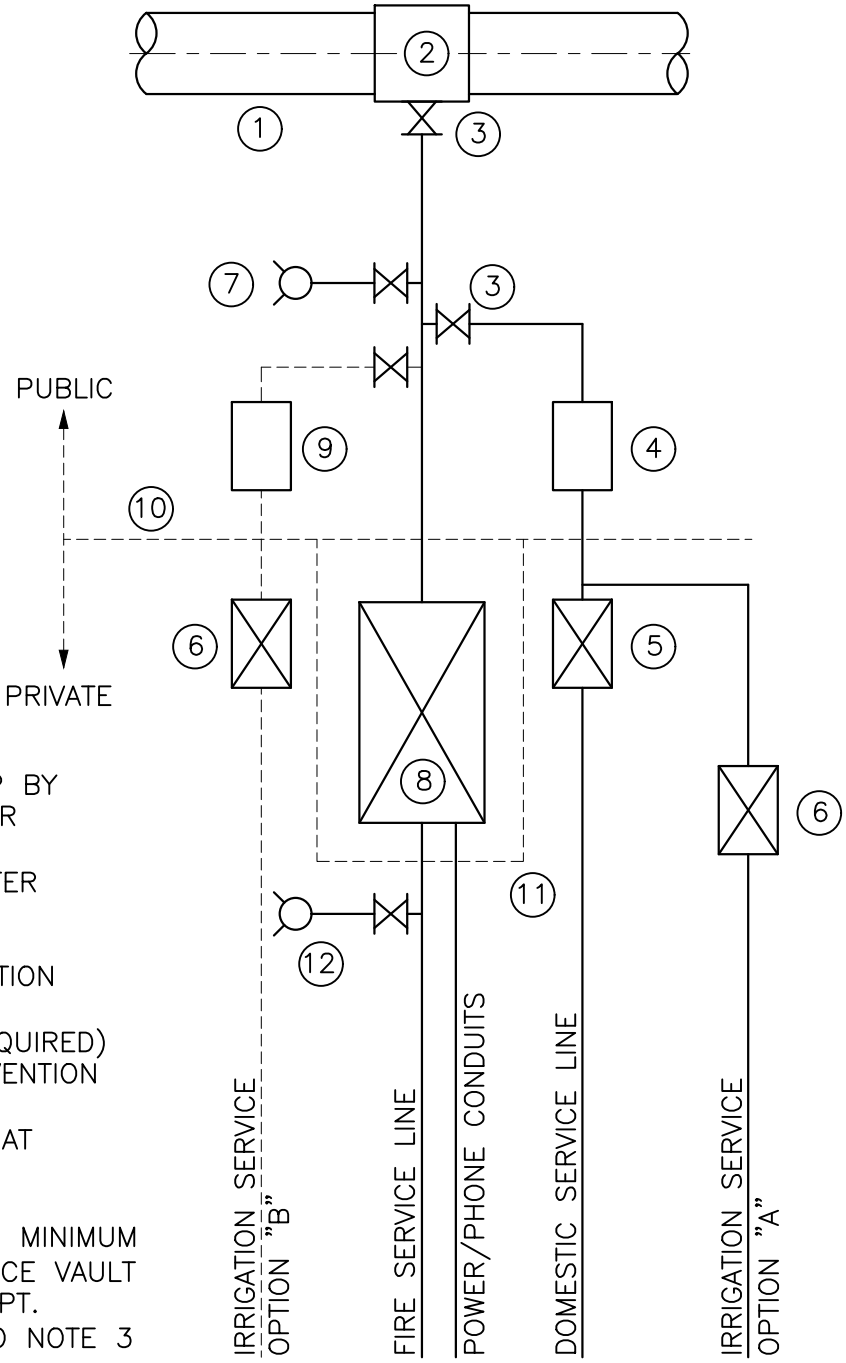
End of Water Line
Plug & Sleeve Assembly

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. W-024



KEYNOTES:

1. EXISTING WATER MAIN
2. SERVICE CONNECTION WET TAP BY DCDWM APPROVED CONTRACTOR
3. GATE VALVE (TYP.)
4. DOMESTIC WATER SERVICE METER
5. DOMESTIC SERVICE BACKFLOW PREVENTION ASSEMBLY
6. IRRIGATION BACKFLOW PREVENTION ASSEMBLY
7. PUBLIC FIRE HYDRANT, (IF REQUIRED)
8. FIRE SERVICE BACKFLOW PREVENTION ASSEMBLY
9. IRRIGATION METER, (OPTIONAL AT ADDITIONAL SDC EXPENSE)
10. RIGHT–OF–WAY LINE
11. PERMANENT UTILITY EASEMENT, MINIMUM 5'–0" OUTSIDE OF FIRE SERVICE VAULT
12. PRIVATE HYDRANT OR FIRE DEPT. CONNECTION, (FDC). REFER TO NOTE 3

NOTES:

1. THE IRRIGATION SYSTEM SHALL BE CONNECTED DOWNSTREAM OF THE DOMESTIC SERVICE BACKFLOW PREVENTION ASSEMBLY (OPTION A) OR SHALL HAVE ITS OWN METER AND BACKFLOW ASSEMBLY (OPTION B).
2. DOMESTIC AND FIRE SERVICE LINES 3" AND LARGER SHALL BE DUCTILE IRON.
3. PRIVATE FDC OR HYDRANT MUST BE LOCATED ON THE CUSTOMER SIDE OF BACKFLOW DEVICE.

DeKalb County GEORGIA

STANDARD DETAILS

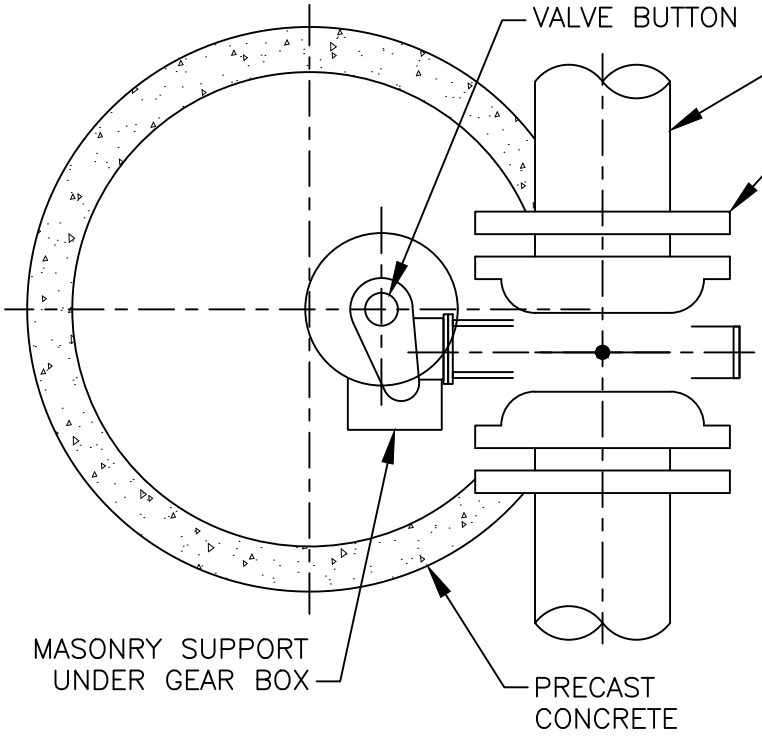
Typical Commercial / Industrial Service Layout

NOT TO SCALE

09/17

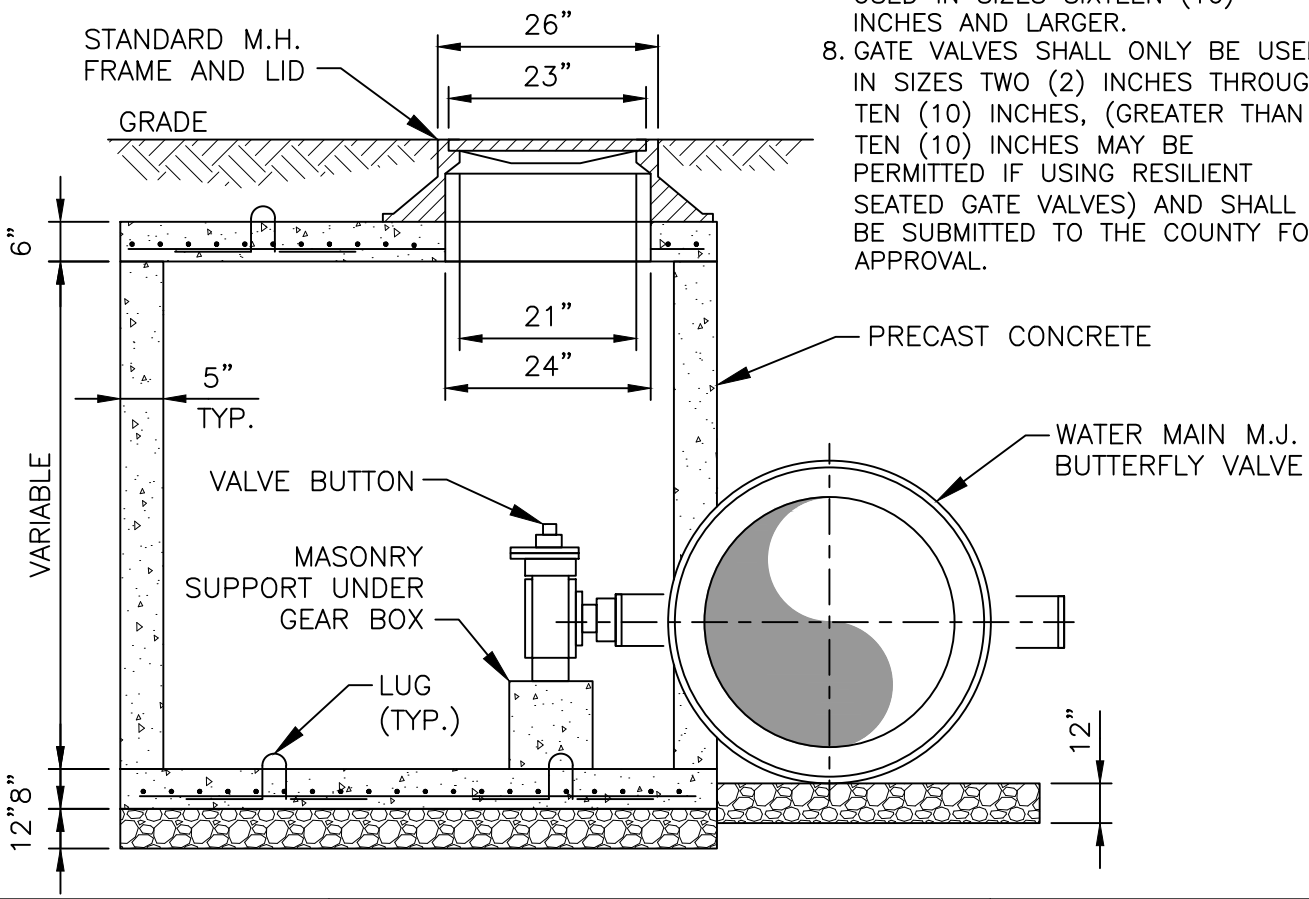
WATER Matters

DETAIL NO. W-025



NOTES:

1. PRECAST CONCRETE TOP SLAB TO BE USED WHERE HEAD ROOM IS REQUIRED
2. PRECAST 8" THICK CONCRETE SLAB WITH #4 EPOXY COATED REBARS 4" C/C, BOTH WAYS.
3. PROVIDE FOUR #4 REBAR LUGS FOR HANDLING. CUT THE LUGS AFTER PLACING THE SLAB IN POSITION.
4. PROVIDE 24" DIAMETER OPENING IN THE CENTER OR AS REQUIRED.
5. THE LOCATION OF THE MANHOLE TO BE DETERMINED ON INDIVIDUAL BASIS.
6. PROVIDE 12" THICK #57 STONE.
7. BUTTERFLY VALVES SHALL ONLY BE USED IN SIZES SIXTEEN (16) INCHES AND LARGER.
8. GATE VALVES SHALL ONLY BE USED IN SIZES TWO (2) INCHES THROUGH TEN (10) INCHES, (GREATER THAN TEN (10) INCHES MAY BE PERMITTED IF USING RESILIENT SEATED GATE VALVES) AND SHALL BE SUBMITTED TO THE COUNTY FOR APPROVAL.



DeKalb County GEORGIA

STANDARD DETAILS

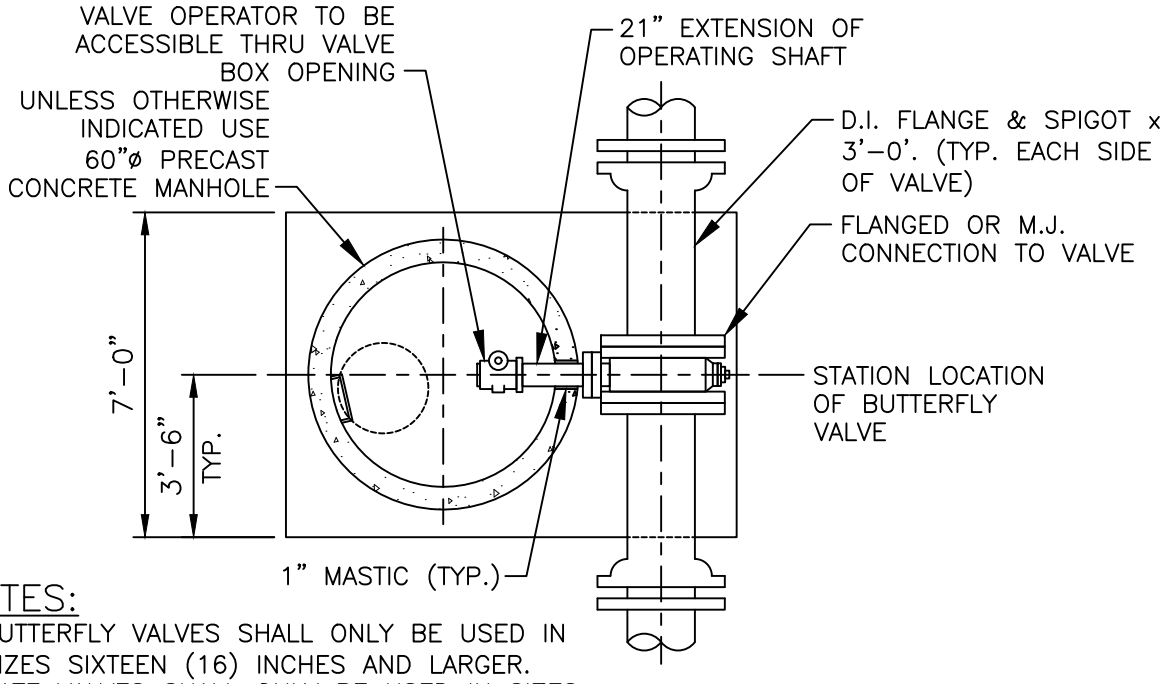
Butterfly Valve And Vault Assembly No. 1

NOT TO SCALE

09/17

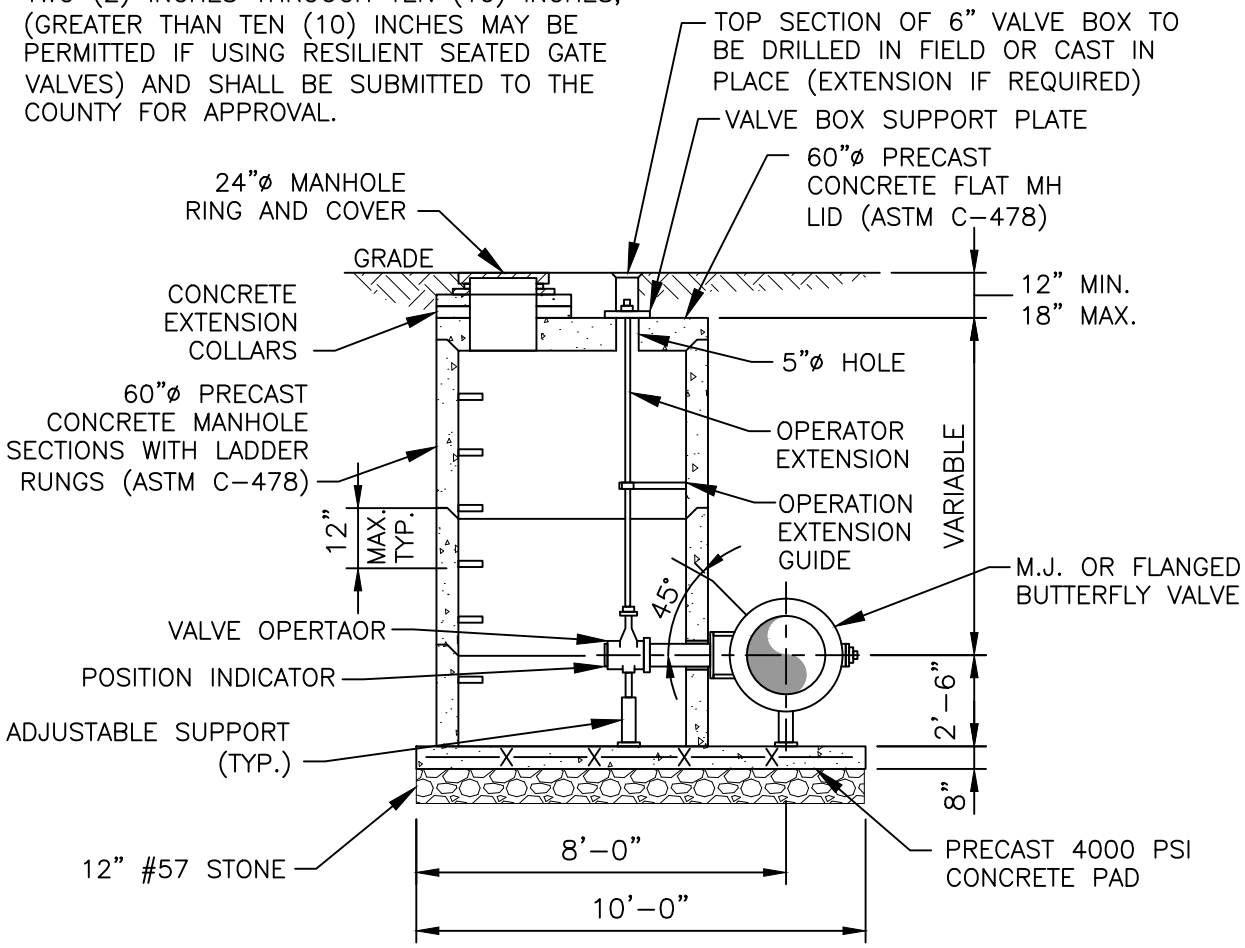
WATER Matters

DETAIL NO. W-026



NOTES:

1. BUTTERFLY VALVES SHALL ONLY BE USED IN SIZES SIXTEEN (16) INCHES AND LARGER.
2. GATE VALVES SHALL ONLY BE USED IN SIZES TWO (2) INCHES THROUGH TEN (10) INCHES, (GREATER THAN TEN (10) INCHES MAY BE PERMITTED IF USING RESILIENT SEATED GATE VALVES) AND SHALL BE SUBMITTED TO THE COUNTY FOR APPROVAL.



DeKalb County GEORGIA

STANDARD DETAILS

09/17

Butterfly Valve And Vault Assembly No. 2

NOT TO SCALE

DETAIL NO. W-027

APPENDIX B
GRAVITY SANITARY SEWER STANDARDS

DEKALB COUNTY WATERSHED MANAGEMENT
GRAVITY SANITARY SEWER SYSTEM PLAN CHECKLIST

The engineer is referred to the DeKalb County Department of Watershed Management "Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards" for general information on the preparation of water distribution systems.

This checklist is intended to be a guide in preparing Gravity Sanitary Sewer System Plans. This checklist is not all compassing. It is left to the Engineer's discretion to decide what additional information may be needed to complete the plans. Approval of plans does not relieve the contractor of meeting the DeKalb County Department of Watershed Management "Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards".

ALL SHEETS	
☐	Final plans shall be on 24" X 36" paper sheets.
☐	Each sheet except the cover sheet shall have a title block in the lower right corner containing: ☐ Project name. ☐ Project number (if a DeKalb County project). ☐ Sheet number. ☐ Total number of sheets. ☐ Scale ☐ Drawer's, Designer's and Checker's initials, and date. ☐ Date (month/day/year)
☐	All sheets shall be sealed, signed and dated by a Civil Engineer licensed in the State of Georgia

COVER SHEET	
The Engineer shall provide a cover sheet with the following information:	
☐	Project name
☐	Drawing Index which provides sheet number and a description of the corresponding sheet
☐	Table of Quantities such as Pipe, MH's, etc.
☐	Vicinity Map
☐	District and Land Lot number
☐	Engineering firm's name, address and telephone number
☐	Developer's name, address and telephone number
☐	Date (month/day/year)
☐	Signature Approval Blocks

SHEET 2	
The Engineer shall provide a general sheet containing the following information:	
☐	General notes covering important parameters as outlined in the DeKalb County Department of Watershed Management "Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards".
☐	Other notes as necessary to cover situations **not** covered by the Design Standards or by the DCDWM

DEKALB COUNTY WATERSHED MANAGEMENT GRAVITY SANITARY SEWER SYSTEM PLAN CHECKLIST	
	Standard Details.
☐	Legend showing symbols and line types used within the drawings.
☐	Engineering's firm title block containing firm's name, address, and phone number.
☐	Elevation datum and benchmark information in State Plane Coordinates
☐	Note to be shown on plan: **Contractor shall notify DeKalb County Department of Watershed Management Inspector 48 hours prior to start of construction.**
GRAVITY SANITARY SEWER PLAN & PROFILE SHEETS	
☐	Plan view shall show to proper scale. Scale shall not be more than: Plan: 1 inch 50 feet Profile: Horizontal: 1 inch = 50 feet Vertical: 1 inch = 10 feet
☐	Plan review hall show the following: ☐ All streets, alleys and easements. They shall be dimensioned at least once and at breaks. Streets shall be identified by name. ☐ All abutting lots shall be identified by lot number, tract and subdivision. ☐ All topography within and to at least five (5) feet beyond easements and topography affected by construction shall be shown. ☐ Location of all above underground utilities, including storm and sanitary sewers, water lilies, dry wells, buried telephone lines, natural gas, power, and cables. Existing utilities shall be shown as dashed lines or faded lines with type, size, and other available information called out. ☐ All structures, paving and other topographic features within the vicinity, such as trees, shall be shown and identified by name, size and type. ☐ Location of proposed sanitary sewer lines, manholes, and sewer services. Items shall be identified by name and number, size, and type, stations and deflection angles at manholes. ☐ Location of all existing and proposed easements. ☐ Location of all existing benchmarks shall be shown and identified by type. ☐ Location of all connections to existing sewer lines. ☐ Show horizontal clearance from buildings, structures, drainage culvert, and water mains. ☐ Show location of SS lines from the curb under the pavement. ☐ Show distance between SS manhole and the curb line. ☐ Sewer service connection and clean-out shall be either stationed or dimensioned from property line. Also, provide offset dimension from the stationed centerline. ☐ Location of soil boring holes. ☐ All sheets shall have a north arrow orienting the plan view.
☐	Profile view shall show the following: ☐ Existing utilities which cross the proposed utility. Identify crossing utility by name, pipe size, pipe material, type of utility (use), location (station), and elevation. Location and elevation are to be obtained from "as-built" plans paying particular attention to any differences in datum. **NOTE:** ***All existing underground utilities shown on profile are assumed to be shown in approximate location only.***

DEKALB COUNTY WATERSHED MANAGEMENT
GRAVITY SANITARY SEWER SYSTEM PLAN CHECKLIST

	☐ Show existing ground and proposed ground. ☐ Show manhole number, station, rim, and invert elevations. ☐ Maintain 0.2 feet elevation drop through manhole inverts.
☐	All sheets shall show match lines labeled as such with station and sheet number.
☐	Proposed sewer lines shall be shown as solid lines with sizes, slope, material, and pipe classes called out. For example: 8 inch DIP (SS) – Class 350.
☐	Show any lift stations adjoining the gravity sanitary sewer system.
☐	Show gravity sanitary sewer schedule. For example:

MH#	Rim Elev. (ft)	Invert In Elev. (ft)	Invert Out Elev. (ft)	Pipe Segment (From/To)	Pipe Length (ft)	Pipe Material And Class	Slope %
SS1	1024.62	1019.20	1019.20	SS1/SS2	250	8" DIP-Class 350	1.2
SS2	1023.90	1018.90	1018.90	SS2/SS3	262	8" PVC-SDR35	1.8

DETAIL SHEETS	
☐	Include DeKalb County Department of Watershed Management "Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards" to be used on the project.
☐	Include any other details specific to the project that are not covered by DeKalb County Department of Watershed Management "Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards".
☐	Detail sheets shall be located at the end of the plan set and referenced where used.

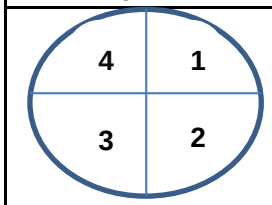
DeKalb County GEORGIA

WATER Matters

DEPARTMENT OF WATERSHED MANAGEMENT			
SANITARY		OTHER	
AREA:		TRUCK:	
DIST.:		LL	
STREET			
MANHOLE NO.:		TO NO.	
W.O. NO.		DATE:	

REASON FOR INSPECTION ☐ ROUTINE ☐ SPECIAL

LINE	CREW LEADER and DATE	TV: CAMERA QUADRANT				PICTURES MADE		DIST. IN FEET	LOCATION DATA AND COMMENTS
		1	2	3	4	NO PHOTO	VIDEO TAPE		
	A	B	C	D	E	F	G	H	
1									
2									
3									
4									
5									
6									
7									
8									
9									
10									
11									
12									



LINE DATA:

PIPE SIZE _____ IN.

TYPE OF PIPE _____

TYPE OF JOINT _____

SECTION LENGTH _____ FT.

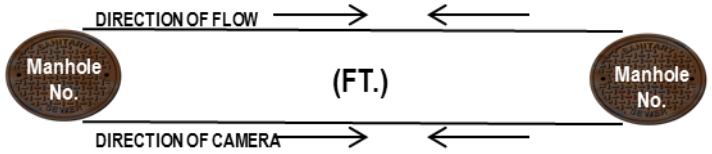
PIPE CONDITION _____

MANHOLE NO.: _____

MH DEPTH _____

LOCATION DIAGRAM

(Circle arrow in direction of measurement)



APPENDIX B
Fats, Oils, and Grease (FOG)

Sec. 25-265.10. Fats, Oils, and Grease (FOG)
Interceptor Physical Specifications/Requirements
Please contact FOG at (404) 687-7150 for more information.

(a) FOG Interceptors shall:

1) Be properly sized based on the results of an inspection and FOG evaluation performed by a FOG Control Program Manager or designee;

2) Be constructed of re-enforced materials suitable for load bearing and water tight to prevent I/I; refer to Standard Details S.024 and S.024.1;

3) Be pre-cast with a minimum of three thousand (3,000) PSI concrete per applicable ASTM standards with four percent (4%) to seven percent (7%) air entrapment;

4) Have an invert elevation of the inlet between three (3) inches to six (6) inches above the invert elevation of the outlet;

5) Contain a properly installed and functioning baffle wall and other flow control devices necessary to achieve an adequate time for FOG to properly separate, but not exceed, twenty four (24) hours;

6) Contain inlet and outlet Ts made of Schedule 40 PVC piping and at a ninety- (90-) degree angle with a minimum diameter of the inlet and outlet piping to be six (6) inches;

7) Include the outlet T six (6) inches from the manhole cover;

8) Include T piping of the inlet and outlet that is within eighteen (18) inches of the bottom and at least five (5) inches above the static liquid level of the tank;

9) Set the FOG interceptor level on a consolidated, stable base so that no settling or tipping of the FOG interceptor can occur;

10) Connect the fresh air fixtures to the FOG interceptor;

11) Have the outlet discharge line from the FOG interceptor directly connected to a sewer line tapped into the collection main;

12) Have properly labeled solid manhole covers to prevent inflow and infiltration;

13) Have two (2) or more manholes for entry to each chamber of hydraulic liquid mass;

14) Be accessible for inspections and have no permanent or temporary structure or container placed directly over the FOG interceptor or installed in areas subject to traffic such that it would interfere with operation, maintenance, or inspection of the

FOG interceptor; and

15) Be installed by a licensed plumber.

(b) The contents of any fryer oil containers shall not be mixed with any other FOG interceptor waste or any other non-toxic or toxic substances.

Sec. 25-265.11. Maintenance Requirements

(a) Depth: The depth of FOG (floating and settled) in the FOG interceptor shall not be equal to or greater than twenty (20) percent of the total operating depth of the interceptor.

(b) General requirements for FOG interceptors: In order to maintain FOG interceptors, Generators shall remove the sludge, floating materials, solids, and wastewater, and shall scrape excessive solids from the walls, floor, baffles, and pipe work, and shall pump FOG interceptors dry as set forth in these Standards and as required by the terms and conditions of the permit.

1) FOG interceptors shall be kept free from any I/I, such as grit, rocks, gravel, sand, eating utensils, cigarettes, shells, towels, rags, etc., as such inflow reduces the effectiveness of the FOG Interceptor, thereby increasing the need for more frequent cleaning.

2) To ensure that the FOG interceptor can be maintained properly, the FOG interceptor shall be free from any obstruction that would hinder the maintenance, function, and inspection of the interceptor.

3) A Georgia State permitted transporter shall perform the maintenance of FOG interceptors. Georgia State permitted transporters working in unincorporated DeKalb County shall have an active Georgia Waste Transporter Permit and a DeKalb County Transporter Permit in the manner and form set forth by O.C.G.A. §12-15-20, et seq. Transporters working in the County shall leave a copy of a non-hazardous waste manifest with the generator. Maintenance schedules may vary based on individual circumstances to protect the sewer system.

4) The Compliance Inspector has the authority to require the change of the FOG interceptors cleaning cycles for any generator at any time.

5) The discharge or introduction of any additives to the sewer system is unlawful and prohibited. The direct introduction of additives into the FOG interceptor is prohibited. Additives include, but are not limited to, biological agents such as enzymes, bacteria, and/or degreasing agents.

6) The generator shall be responsible for the proper removal and disposal of the FOG interceptor waste by a Georgia state permitted waste transporter and maintenance of records of disposal as specified in this section. Waste removed from each FOG interceptor shall be disposed of at an appropriate disposal facility designed to receive such waste.

7) No FOG interceptor pumpage shall be discharged to the sewer system as prohibited in these regulations.

8) FOG interceptor waste shall be required to be documented on a Georgia non-hazardous waste manifest. The Georgia non-hazardous waste manifest shall be complete with the information required by these regulations and state law.

9) Mechanical FOG interceptors are prohibited in the County.

(c) FOG Interceptors: Maintenance of FOG interceptors shall be performed at least once every ninety (90) days unless an alternative schedule is required in the permit. Skimming, decanting, and/or any reintroduction of water into FOG interceptors shall not be allowed under any conditions.

(d) Records: Generators shall maintain records of the date and time of cleaning and maintenance. FOG interceptor manifests shall be placed in a logbook, folder, or three-ring notebook. This book shall be made available on demand by the Compliance Inspector during inspection. Records of at least one (1) year shall be kept onsite and available. These records shall include:

(1) A logbook of FOG interceptor and/or FOG control device cleaning and maintenance.

(2) A record of best management practices being implemented, including employee training.

(3) Copies of records and manifests of waste transporting interceptor contents.

(4) Records of any spills and/or cleaning of the lateral sewer line.

(5) Records of sampling data and sludge height monitoring for FOG and solids accumulation in the FOG interceptors.

Sec. 25-265.25. Grease Trap Physical Specifications/Requirements

(a) FOG interceptors are required, but there may be circumstances when it is not possible to install them. The FSE shall provide a report from a licensed plumber explaining why a FOG interceptor installation is not possible. The FOG Program Manager will investigate the situation to decide if the installation constraints are valid. In cases where The FOG Program Manager finds that there is a valid reason why a FOG interceptor cannot be installed, a grease trap will be allowed.

(b) Grease traps shall:

(1) Be made of corrosion-resistant coated metal;

(2) Be properly sized based on the results of an inspection and FOG evaluation performed by the FOG Control Program Manager or designee;

(3) Contain properly installed and functioning baffle walls and other flow control devices necessary to achieve the appropriate retention time;

(4) Have at least a thirty- (30-) minute interior retention time before gray water is discharged into the sewer system;

(5) Tie the fresh air fixtures to the FOG interceptor;

(6) Comply with manufacturer's directions regarding the minimum distance between the FOG interceptor and the last fresh air fixture and include installation of a proper flow control device;

(7) Have a temperature of discharge entering the grease trap that does not exceed one hundred and forty degrees (140°) Fahrenheit; and

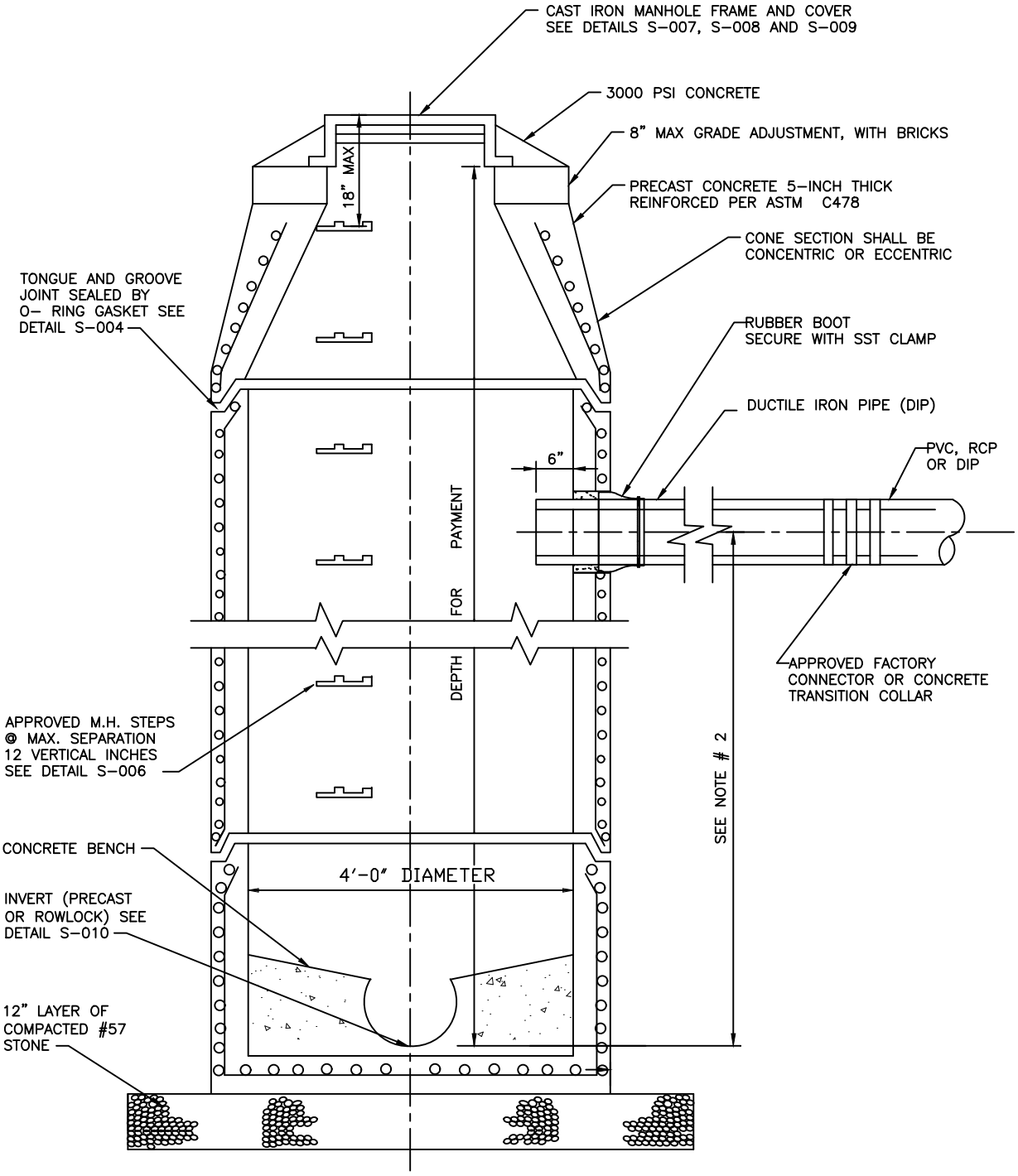
(8) Be Plumbing Drainage Institute-rated, be accessible for inspection, and be installed in accordance with the manufacturer's specifications by a licensed plumber and not a representative and/or an apprentice of the licensed plumber.

d. Maintenance: Grease trap maintenance shall be performed at the frequency established in the permit, but at least once every ninety (90) days, and the fresh air and/or safe way plumbing fixtures shall be connected. In-house cleaning of grease traps is prohibited. To ensure proper FOG interceptor maintenance, Grease traps shall be free from any obstruction that would hinder the maintenance of the Interceptor. Grease traps shall be easily accessible with a minimum vertical clearance of thirty six (36) inches.

Department of Watershed Management
Standard Details List – Gravity Sanitary Sewer

Standard Details List – Gravity Sanitary Sewer	
Detail Number	**TITLE**
S-001	Standard Precast Manhole
S-002	Safety Platform Detail
S-003	Outside Drop Connection for Precast Manhole
S-004	Manhole Joint Detail with Joint Wrap
S-005	Method of Manhole Abandonment
S-006	Typical Manhole Step
S-007	Concrete Collar for Manhole Frame and Cover
S-008	Bolt Down Manhole Frame and Cover
S-009	Traffic Manhole Frame and Cover
S-010	Invert Plan
S-011	New Line Connection to an Existing Structure
S-012	Typical Service Line and Clean Out Detail
S-013	Class “A” Bedding
S-014	Class “B” Bedding
S-015	Deep Service Connection Detail
S-016	Alternate Deep Service Connection Detail
S-017	Sanitary Sewer Lateral Connection
S-018	Service Stub Location Detail
S-019	Plug Location Detail
S-020	Transition Coupling Detail
S-021	Precast Concrete FAT, Oil & Grease Interceptor 1000, 1500 & 2000 Gal Capacity
S-022	Precast Concrete FAT, Oil & Grease Interceptor 2500 & 3000 Gal Capacity
S-023	Tracer Wire Detail for PVC
S-024	Large Diameter Manhole Base (Eccentric) Detail
S-025	Large Diameter Manhole Transition Base Detail

Standard Details List – Gravity Sanitary Sewer	
Detail Number	**TITLE**
S-026	Manhole Over Existing Sewer (Doghouse)
S-027	Piped Inside Drop Connection for Manhole



NOTES:

1. WHERE NECESSARY TO CONSTRUCT MANHOLE OVER EXISTING SEWER, 9" THICK CONCRETE POURED–IN–PLACE FOOTING/FOUNDATION MAY BE USED IN LIEU OF PRECAST BOTTOM SECTION.

2. WHERE DROP FROM INVERT OF MANHOLE TO INVERT OF INFLUENT PIPE(S) EXCEED 2'–0", AN OUTSIDE DROP CONNECTION SHALL BE REQUIRED EXCEPT WHEN DCDWM SPECIFICALLY APPROVES ITS ELIMINATION. SEE DETAILS S–003 OR S–027.

3. PRECAST ALL OPENINGS FOR PIPE IN BASE AND RISER UNITS.

DeKalb County
GEORGIA

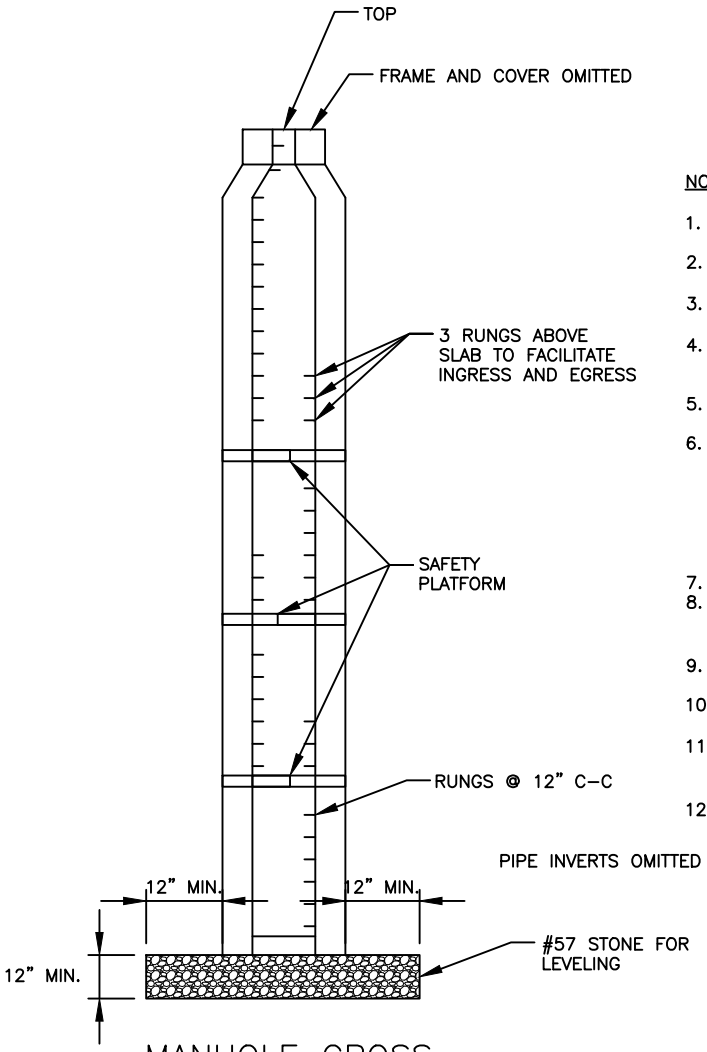
STANDARD DETAILS

09/17

Standard Precast Manhole

NOT TO SCALE

DETAIL NO. S-001



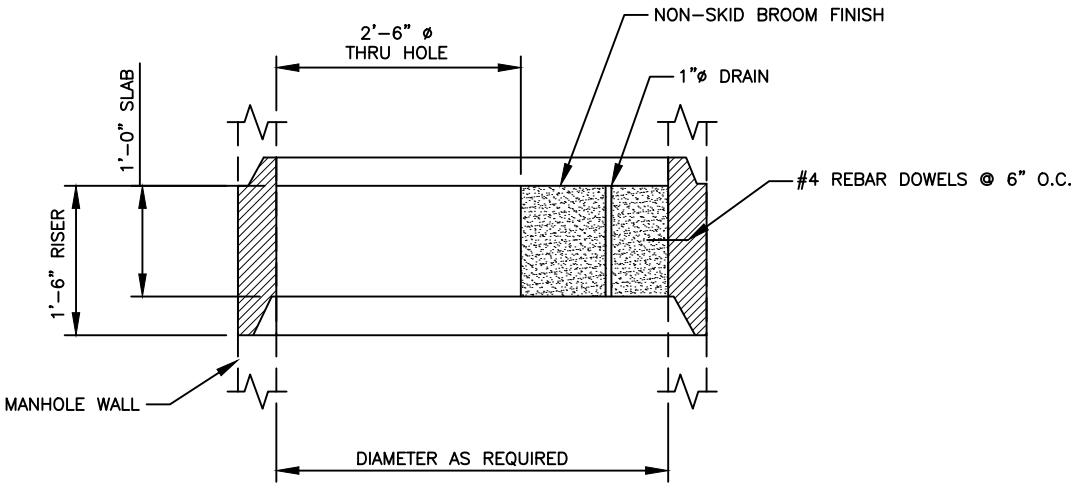
MANHOLE CROSS SECTION

NOTES:

1. A DEEP MANHOLE IS CONSIDERED TO BE GREATER THAN 24'-0" IN DEPTH.
2. SAFETY PLATFORMS ARE REQUIRED ON ALL MANHOLES EQUAL TO OR GREATER THAN 16'-0" IN DEPTH.
3. SAFETY PLATFORMS ARE TO BE PLACED A MAX. DISTANCE OF 8'-0"-10'-0" APART.
4. PLATFORMS ARE TO BE DESIGNED TO OBTAIN A STRENGTH OF 4,000 PSI IN 28 DAYS. MANHOLE AND PLATFORM DESIGN SHALL CONFORM TO ASTM SPECS. C478, LATEST EDITION
5. REINFORCING STEEL HAS A MIN. YIELD STRENGTH OF 60,000 PSI.
6. SAFETY PLATFORM SLAB IS DESIGNED FOR A CONCENTRATED LOAD (P) AS FOLLOWS:

MANHOLE DIAMETER (FT)	P (LB)
4	12,000
5	10,000
6	8,000

7. SAFETY PLATFORM IS TO BE PLACED BETWEEN RISERS.
8. SAFETY PLATFORM IS TO BE PLACED AT MIDPOINT OF A MANHOLE OVER 20'-0" IN DEPTH. TWO PLATFORMS TO BE PLACED IN EQUAL DISTANCE AT A MANHOLE DEPTH OF 24'-0".
9. SAFETY PLATFORM IS RO BE PRECAST CONCRETE OR APPROVED EQUAL.
10. ALTERNATE OPENINGS IN SAFETY PLATFORMS AS INDIVIDUAL DESCENDS.
11. MANHOLES IN EXCESS OF 24'-0" IN DEPTH SHALL BE PRE-APPROVED BY PUBLIC WORKS AND HAVE SAFETY PLATFORMS WITH 8'-0"-10'-0" SPACING.
12. MANHOLES 20'-0" OR MORE IN DEPTH INCREASE TO 5'-0'ø.



SECTION AT SAFETY PLATFORM

DeKalb County GEORGIA

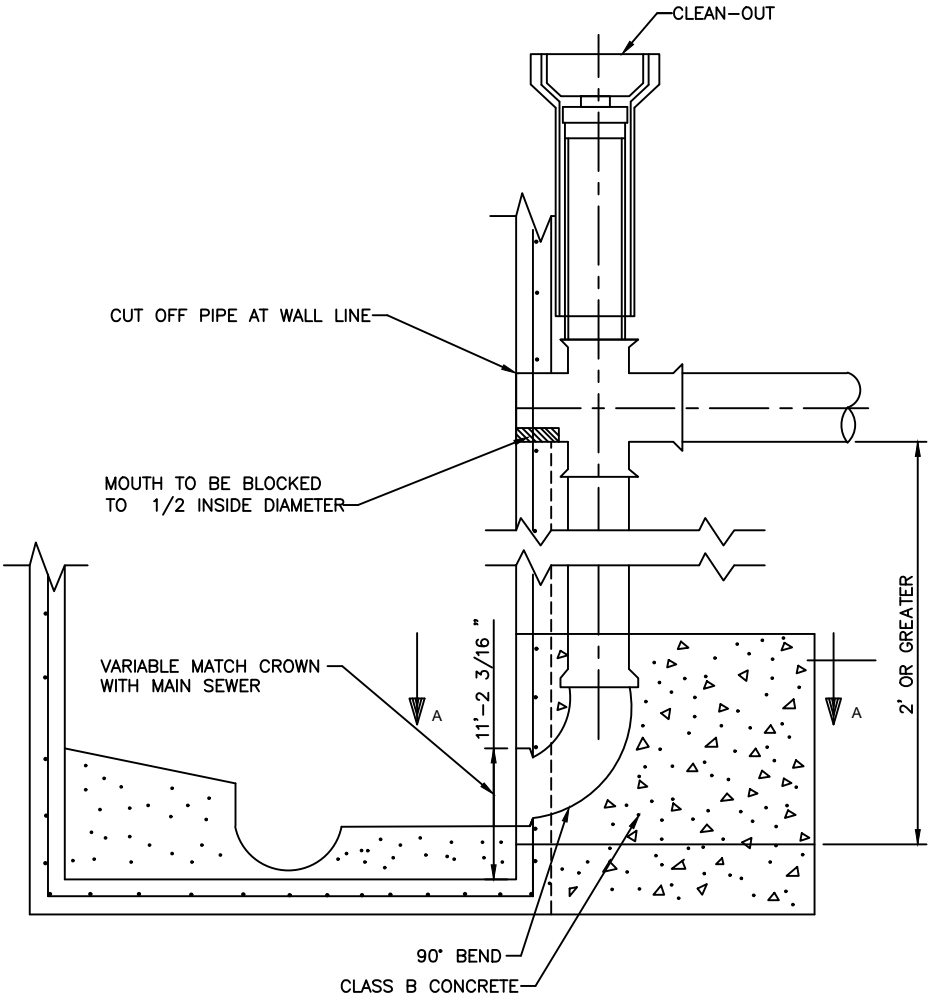
STANDARD DETAILS

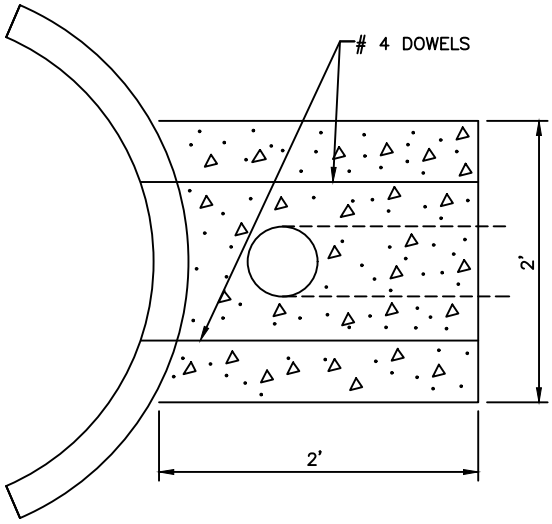
09/17

Safety Platform Detail

NOT TO SCALE

DETAIL NO. S-002

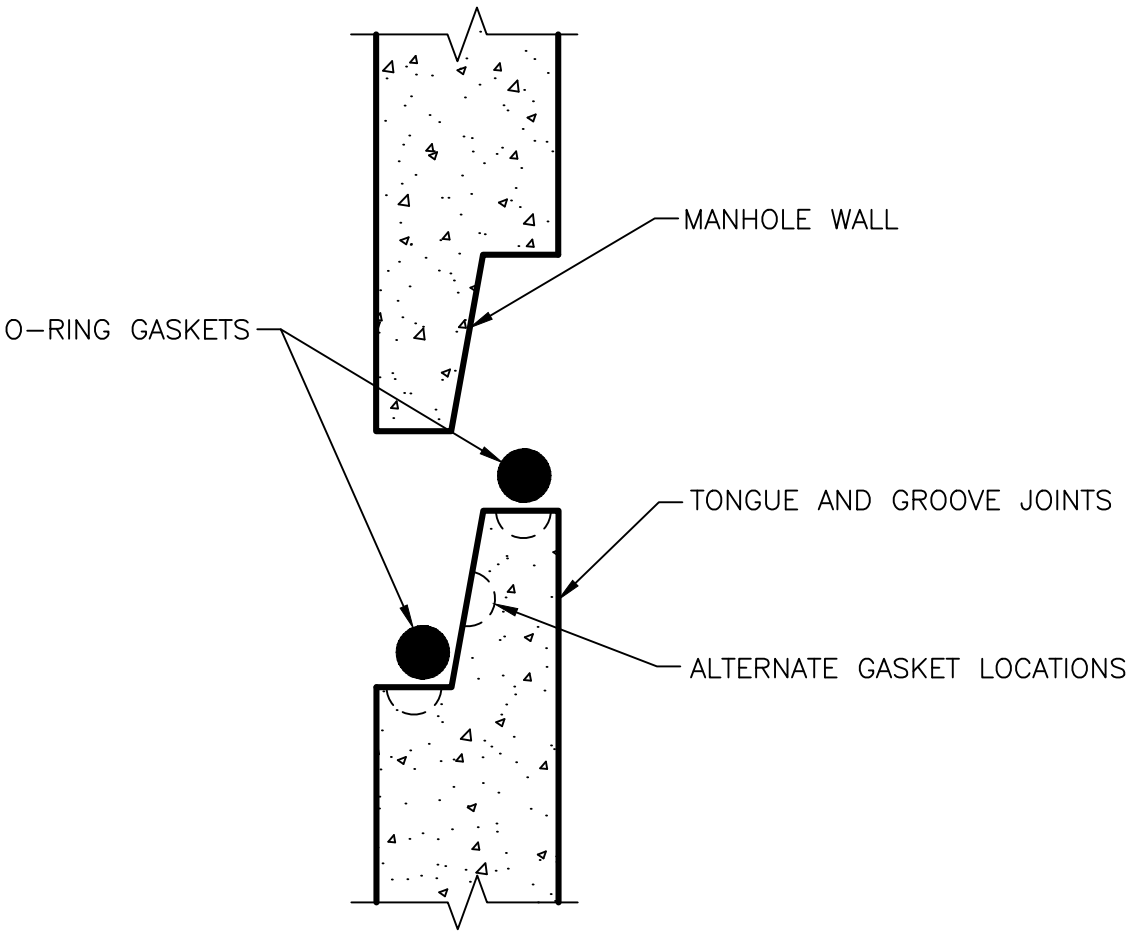




NOTES:
1. "DROP CONNECTION" SHALL INCLUDE THE EXCAVATION, MH CORE, CONCRETE, DIP, FITTINGS AND OTHER INCIDENTALS NECESSARY TO COMPLETE THE ITEM. DUCTILE IRON PIPE (18' MIN) INSTALLED UPSTREAM OF THE TEE.

2. ALL BENDS, TEES, AND FITTINGS REQUIRED TO INSTALL OUTSIDE DROP SHALL BE DUCTILE IRON.

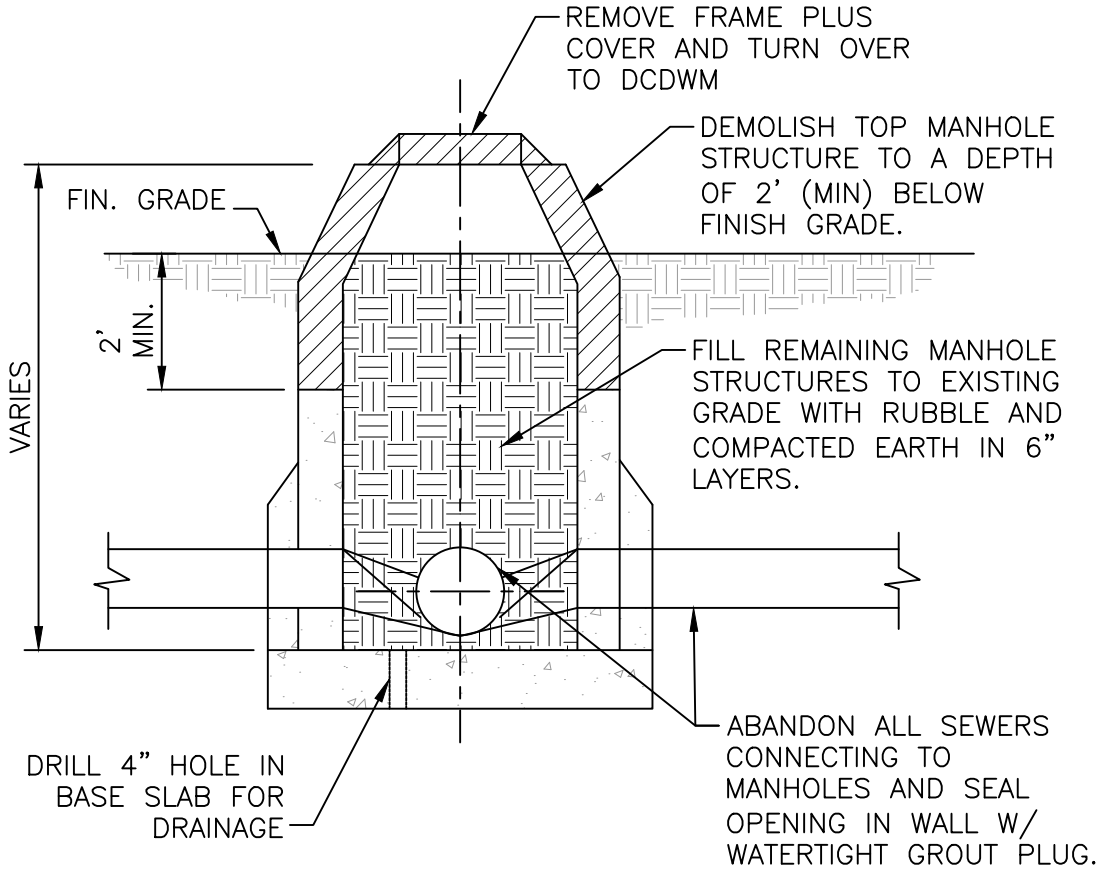
DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Outside Drop Connection For Precast Manhole	WATER Matters
	NOT TO SCALE	DETAIL NO. S-003



NOTE:

AFTER INSTALLATION JOINTS SHALL BE GROUTED SMOOTH WITH CEMENT GROUT ON INSIDE AND OUT. ALSO AN EXTERNAL WRAP SUCH AS INFI–SHIELD GATOR WRAP OR EQUAL SHALL SEAL EACH OUTSIDE JOINT.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Manhole Joint Detail With Joint Wrap	WATER Matters
	NOT TO SCALE	DETAIL NO. S-004



DeKalb County GEORGIA

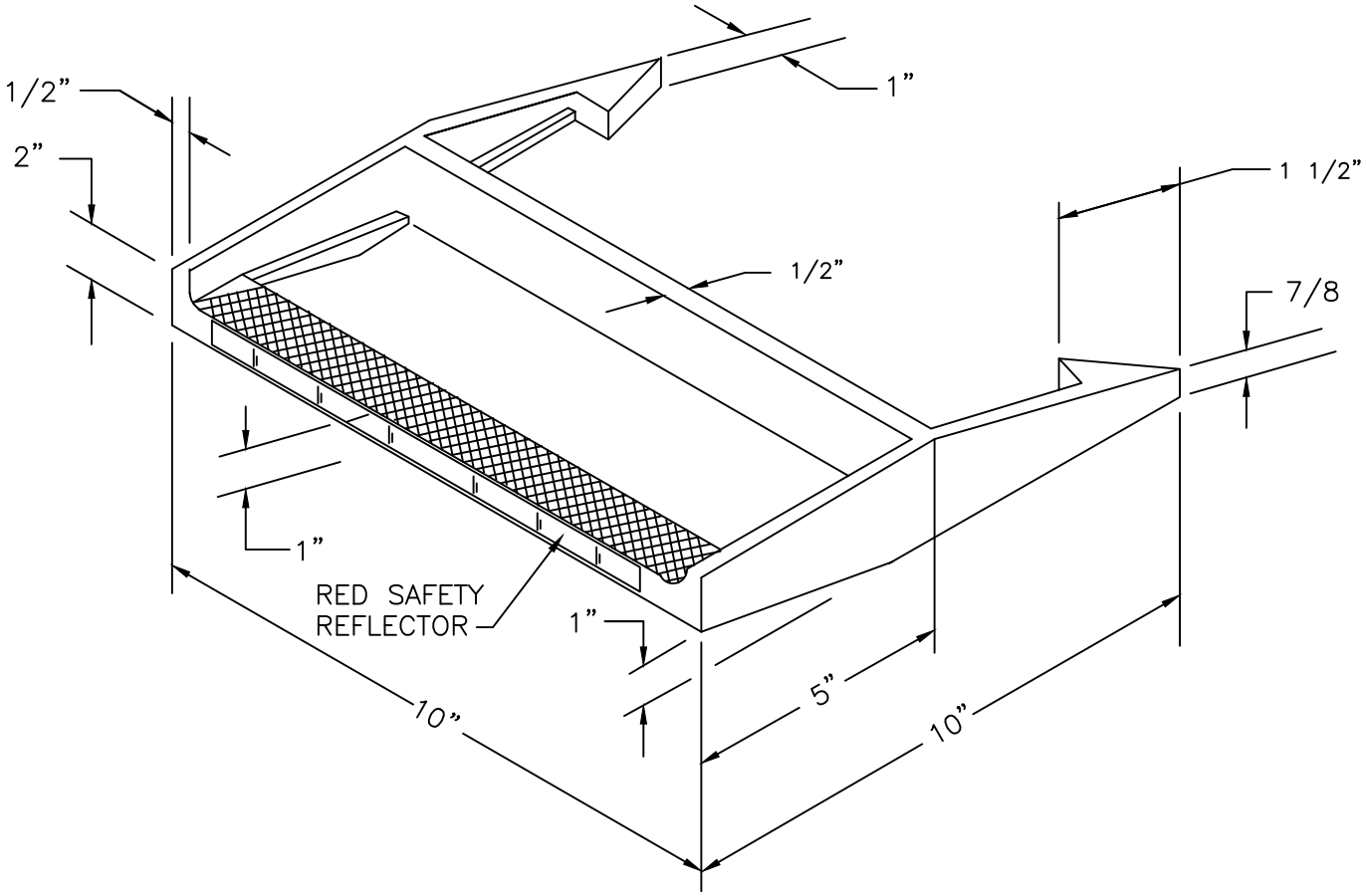
STANDARD DETAILS

09/17

Method of Manhole Abandonment

NOT TO SCALE

DETAIL NO. S-005



NOTES:

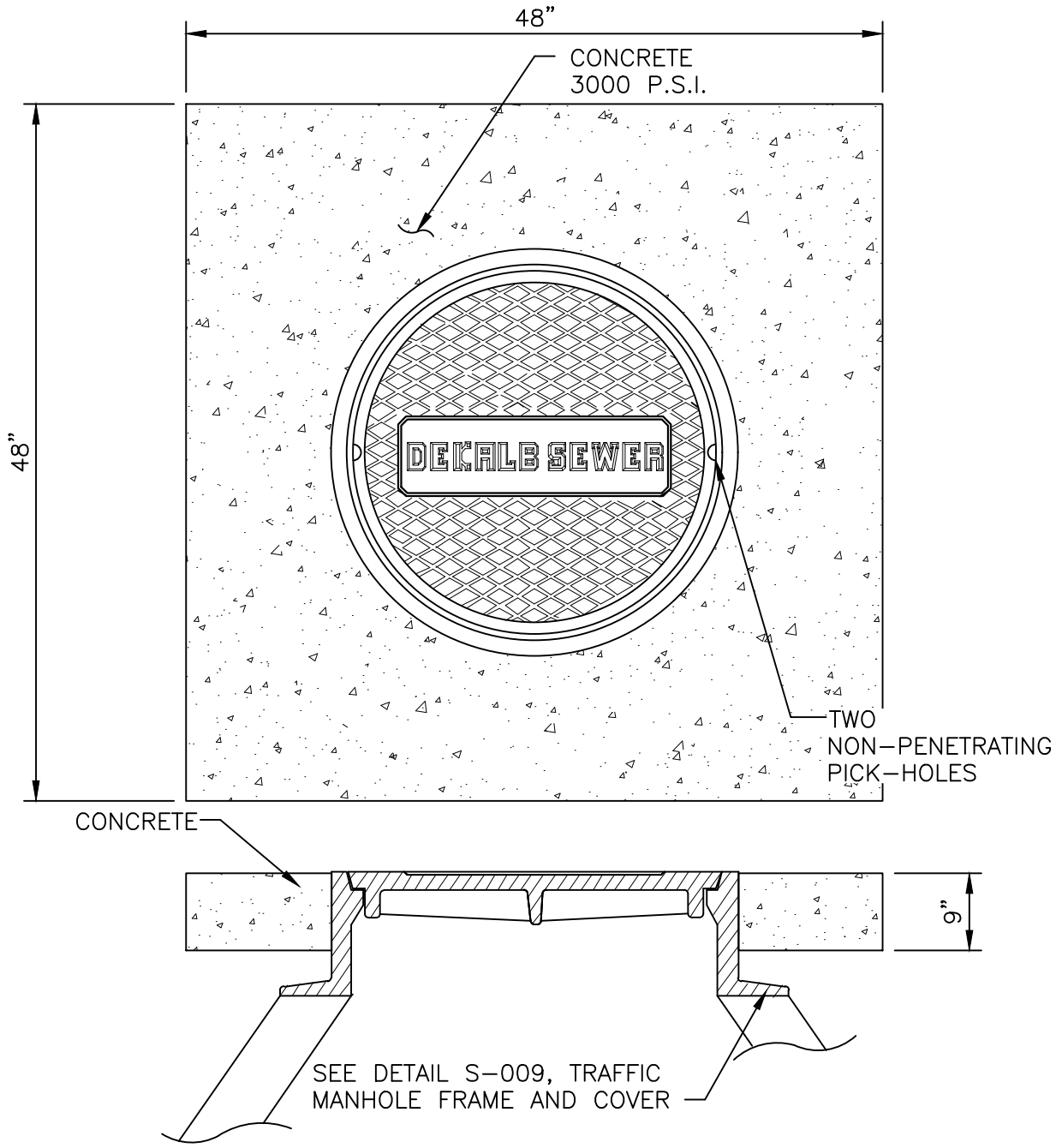
1. STEPS MAY BE CAST IRON, COATED STEEL, PLASTIC OR ALUMINUM AND MEET ASTM C-478 REQUIREMENTS.

2. MINIMUM DESIGN LIVE LOAD SHALL BE A SINGLE CONCENTRATED LOAD OF 300LBS.

3. STEPS SHALL BE A MINIMUM OF 10" WIDE. EMBEDDED A MINIMUM OF 3" AND PROJECT MINIMUM CLEAR DISTANCE OF 4".

4. MAXIMUM VERTICAL SPACING SHALL BE 12" IN THE COMPLETED MANHOLE.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Typical Manhole Step	WATER Matters
	NOT TO SCALE	DETAIL NO. S-006

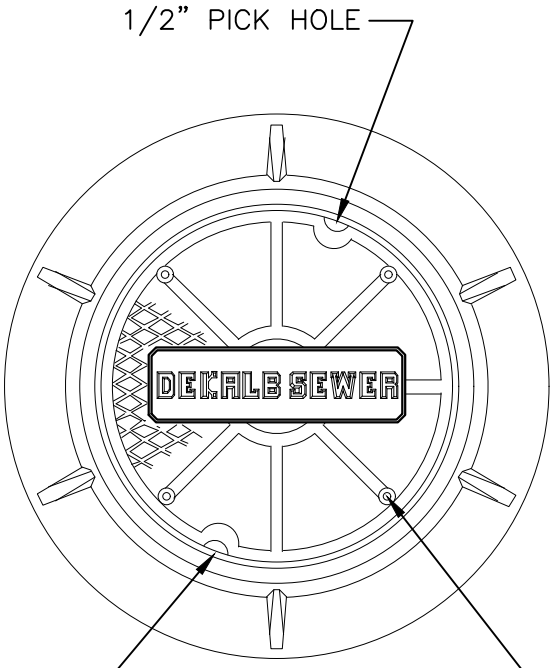


GRAY IRON ASTM A48 CL30
FRAME WT = 282 LBS
LID WT. = 178 LBS

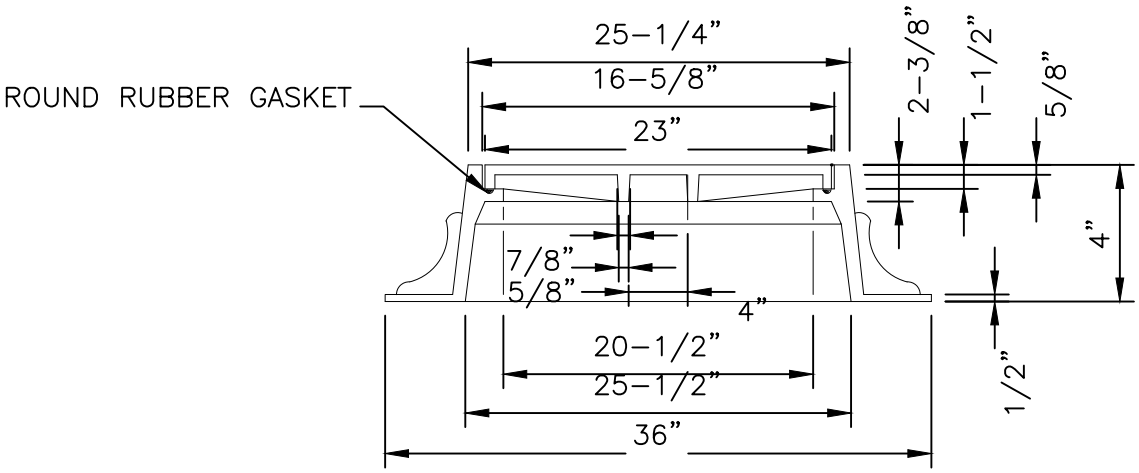
TOTAL WT. = 460 LBS

NOTE: CONCRETE COLLARS ONLY REQUIRED IN STREETS, ROADWAYS AND OTHER AREAS SUBJECT TO VEHICULAR TRAFFIC.

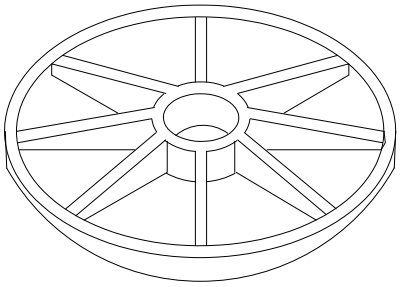
DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Concrete Collar for Manhole Frame and Cover	WATER Matters
	NOT TO SCALE	DETAIL NO. S-007



TOP VIEW



SIDE VIEW



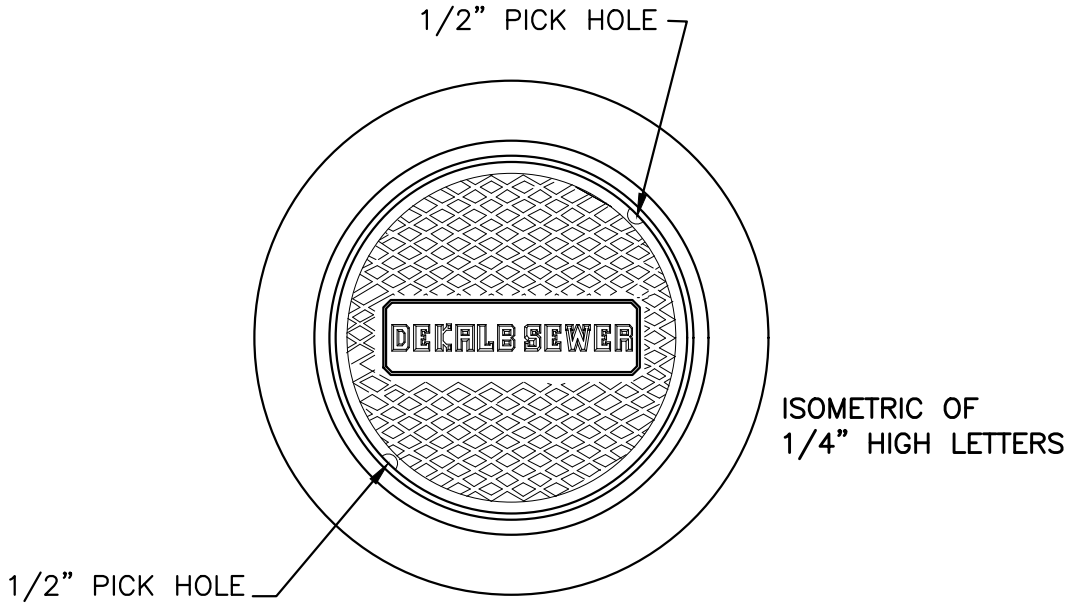
GRAY IRON
ASTM A48 CL30
TOTAL WT. = 320 LBS.

NOTES:

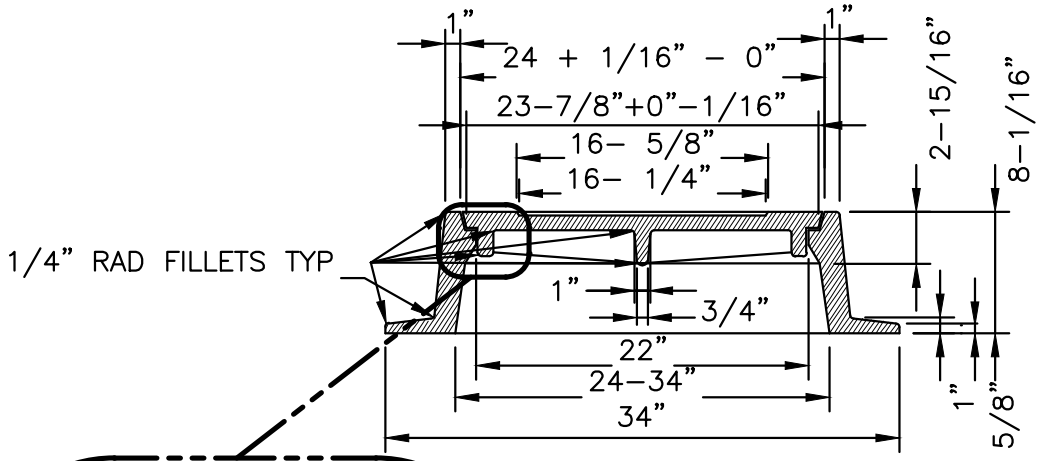
1. MANHOLES CONSTRUCTED IN NON-PAVED AREAS SHALL BE INSTALLED WITH BOLT DOWN LID.

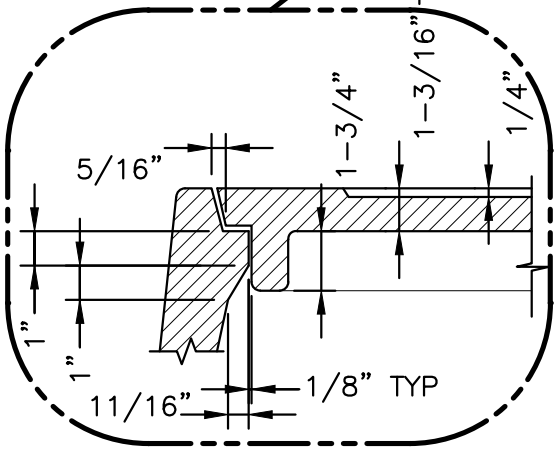
2. "DEKALB SEWER" MUST FIT WITHIN LID DIMENSIONS, LETTER HEIGHT WILL BE 2 INCHES.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Bolt Down Manhole Frame and Cover	WATER Matters
	NOT TO SCALE	DETAIL NO. S-008



TOP VIEW





SIDE VIEW

GRAY IRON ASTM A48 CL30
FRAME WT = 282 LBS
LID WT. = 178 LBS

TOTAL WT. = 460 LBS

NOTES:

1. "DEKALB SEWER" MUST FIT WITHIN LID DIMENSIONS, LETTER HEIGHT WILL BE 2 INCHES.

DeKalb County
GEORGIA

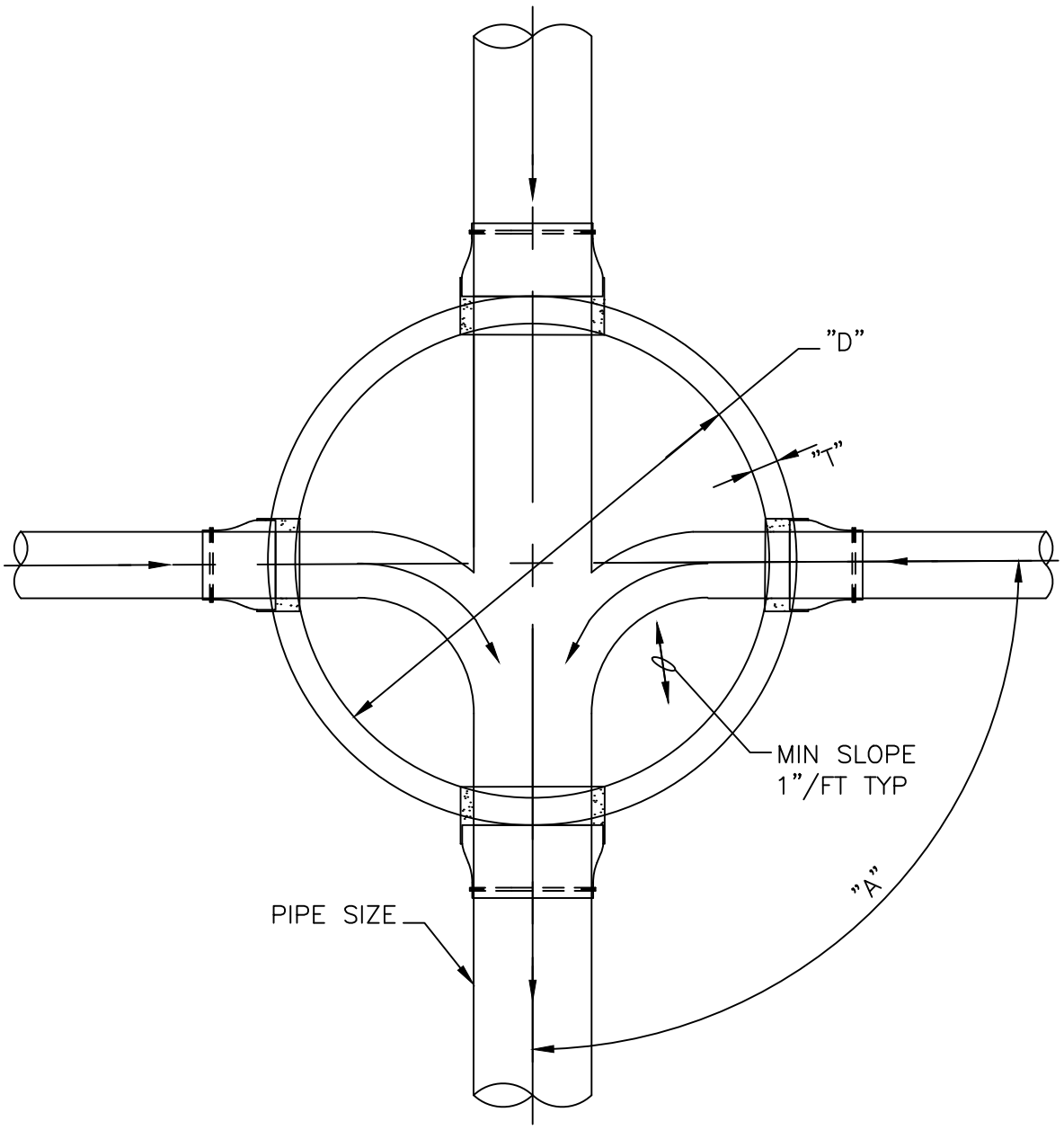
STANDARD DETAILS

09/17

Traffic Manhole Frame and Cover

NOT TO SCALE

DETAIL NO. S-009



PIPE SIZE	"A"	"D"	"T"
6" & 15"	0° – 90°	4'–0"	5"
18"	0° – 60°	4'–0"	5"
18"	60° – 90°	5'–0"	6"
21" & 24"	0° – 60°	5'–0"	6"
21" & 24"	60° – 90°	6'–0"	7"

NOTE:

1. MINIMUM CENTERLINE RADIUS OF MANHOLE INVERT = 1.5 x PIPE DIAMETER

DeKalb County GEORGIA

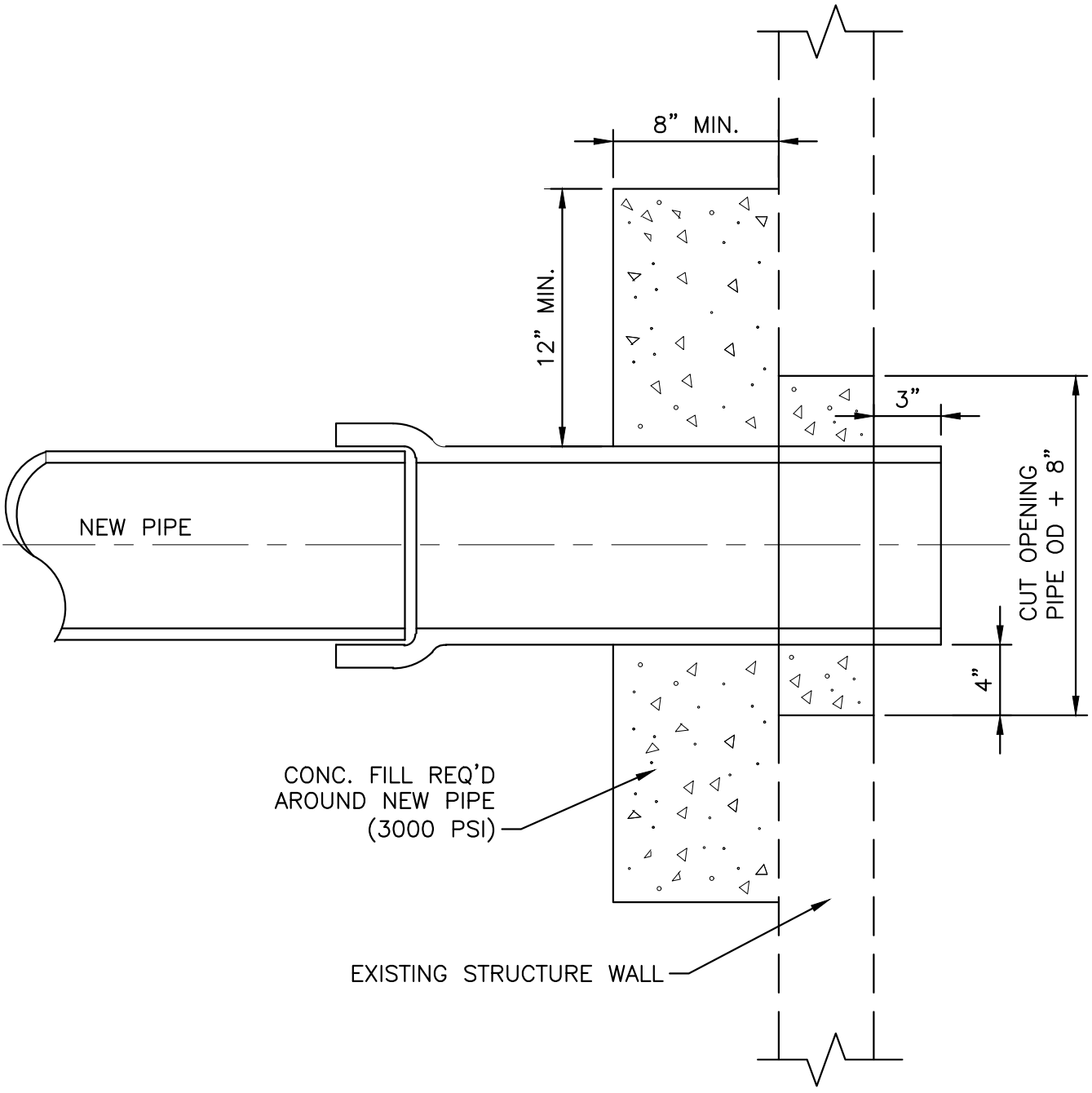
STANDARD DETAILS

09/17

Invert Plan

NOT TO SCALE

DETAIL NO. S-010



DeKalb County
GEORGIA

STANDARD DETAILS

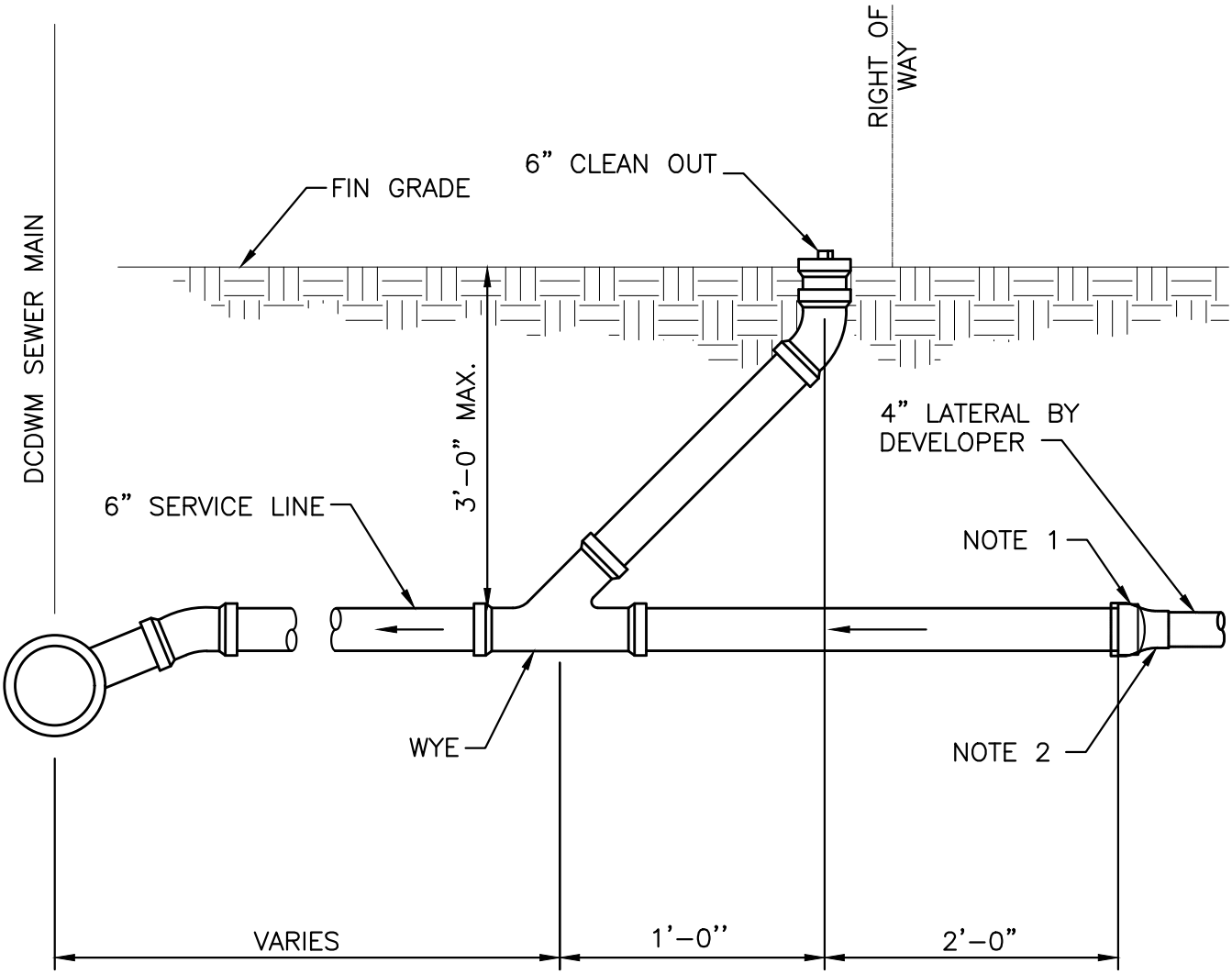
New Line Connection to an Existing Structure

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. S-011



NOTES:

1. PLUG 6" SERVICE LINE.
2. CONNECT DEVELOPER'S 4" LATERAL TO 6" SERVICE LINE W/ 4" X 6" FERNCO COUPLING INCLUDING SST BANDS

DeKalb County GEORGIA

STANDARD DETAILS

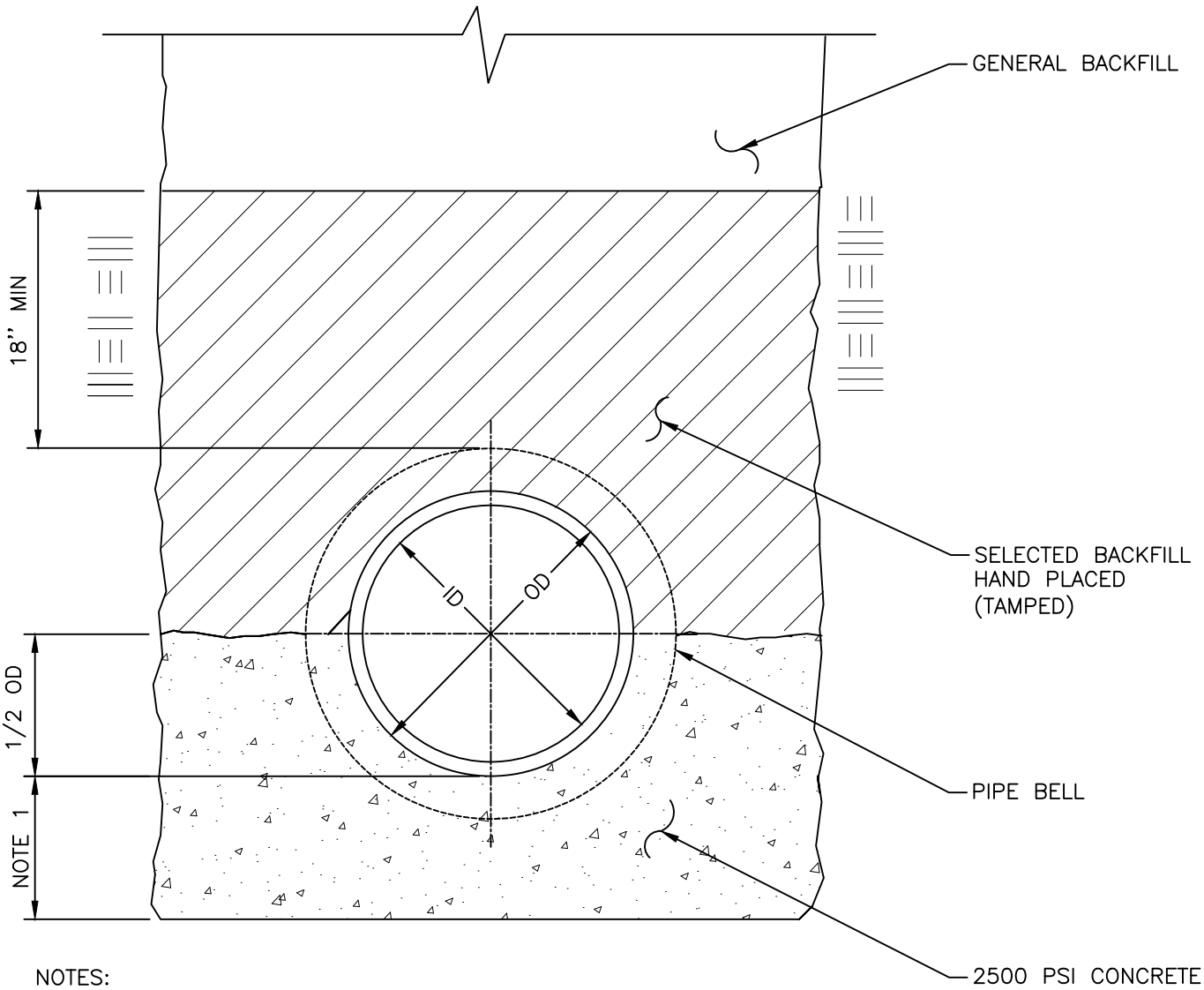
Typical Service Line and Clean Out Detail

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. S-012



NOTES:

1. CONCRETE DEPTH BELOW PIPE:

   a.) PIPE DIAMETER UP TO 12":

      i.) EQUAL TO 1/2 TIMES THE OUTSIDE DIAMETER (OD)

      ii.) MINIMUM 6"

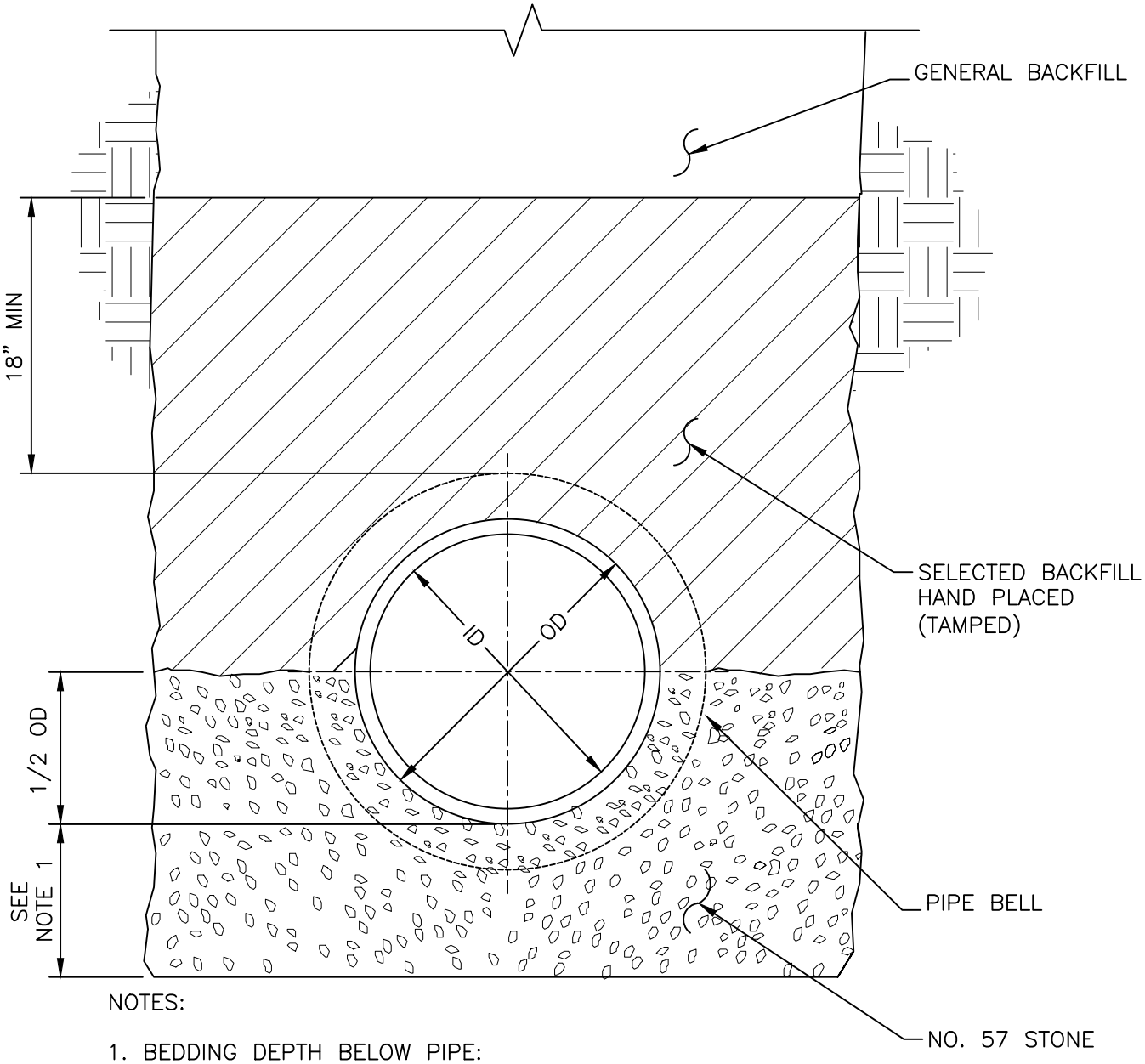
   b.) PIPE DIAMETER GREATER THAN 12":

      i.) EQUAL TO 1/4 TIMES THE OUSIDE DIAMETER (OD)

      ii.) MINIMUM 6"

   C.) MAXIMUM 12"

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Class "A" Bedding	WATER Matters
	NOT TO SCALE	DETAIL NO. S-013



NOTES:

1. BEDDING DEPTH BELOW PIPE:

   a.) PIPE DIAMETER UP TO 12":

      i.) EQUAL TO 1/2 TIMES THE OUTSIDE DIAMETER (OD)

      ii.) MINIMUM 4"

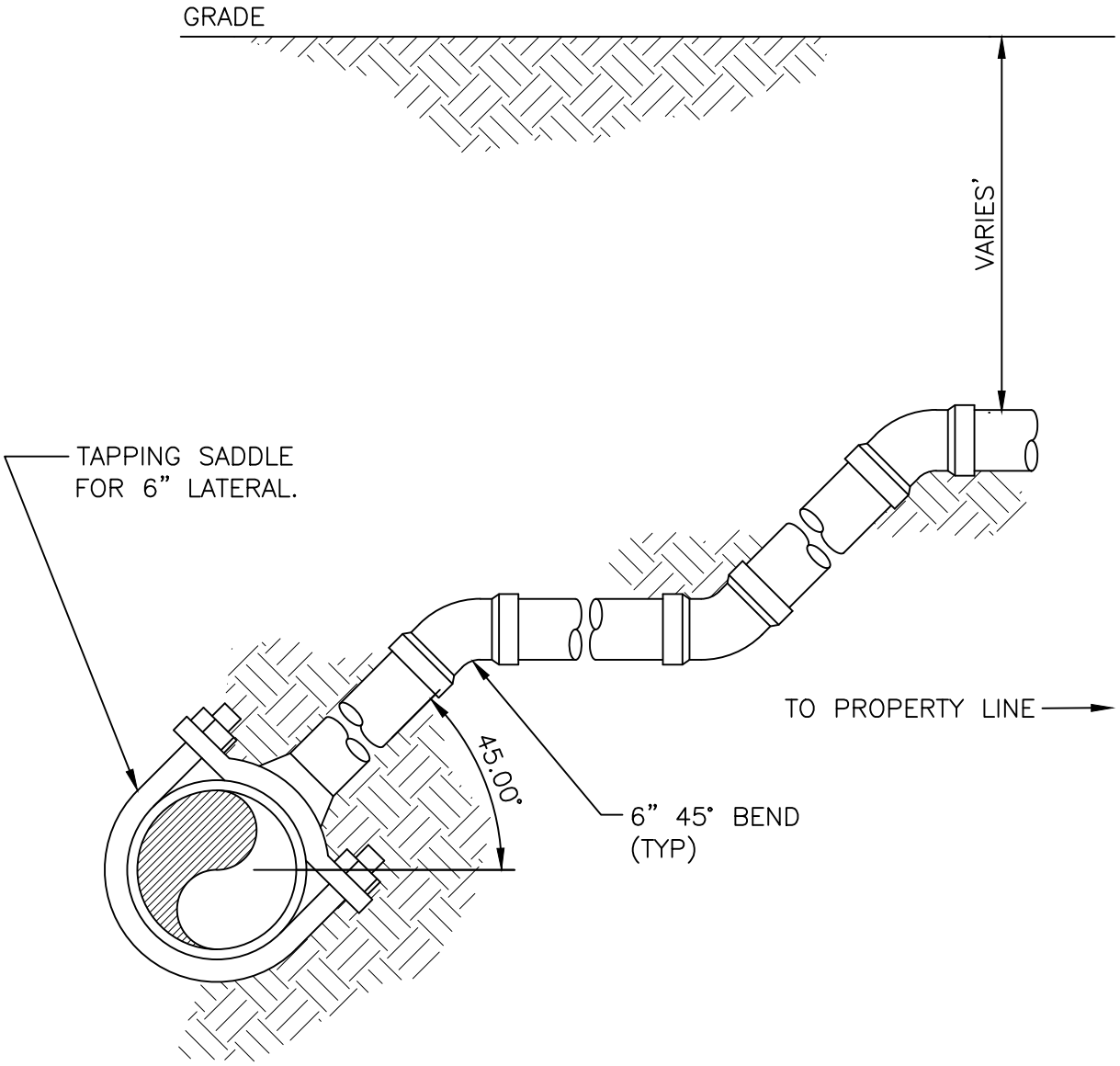
   b.) PIPE DIAMETER GREATER THAN 12":

      i.) EQUAL TO 1/4 TIMES THE OUSIDE DIAMETER (OD)

      ii.) MINIMUM 6"

   C.) MAXIMUM 12"

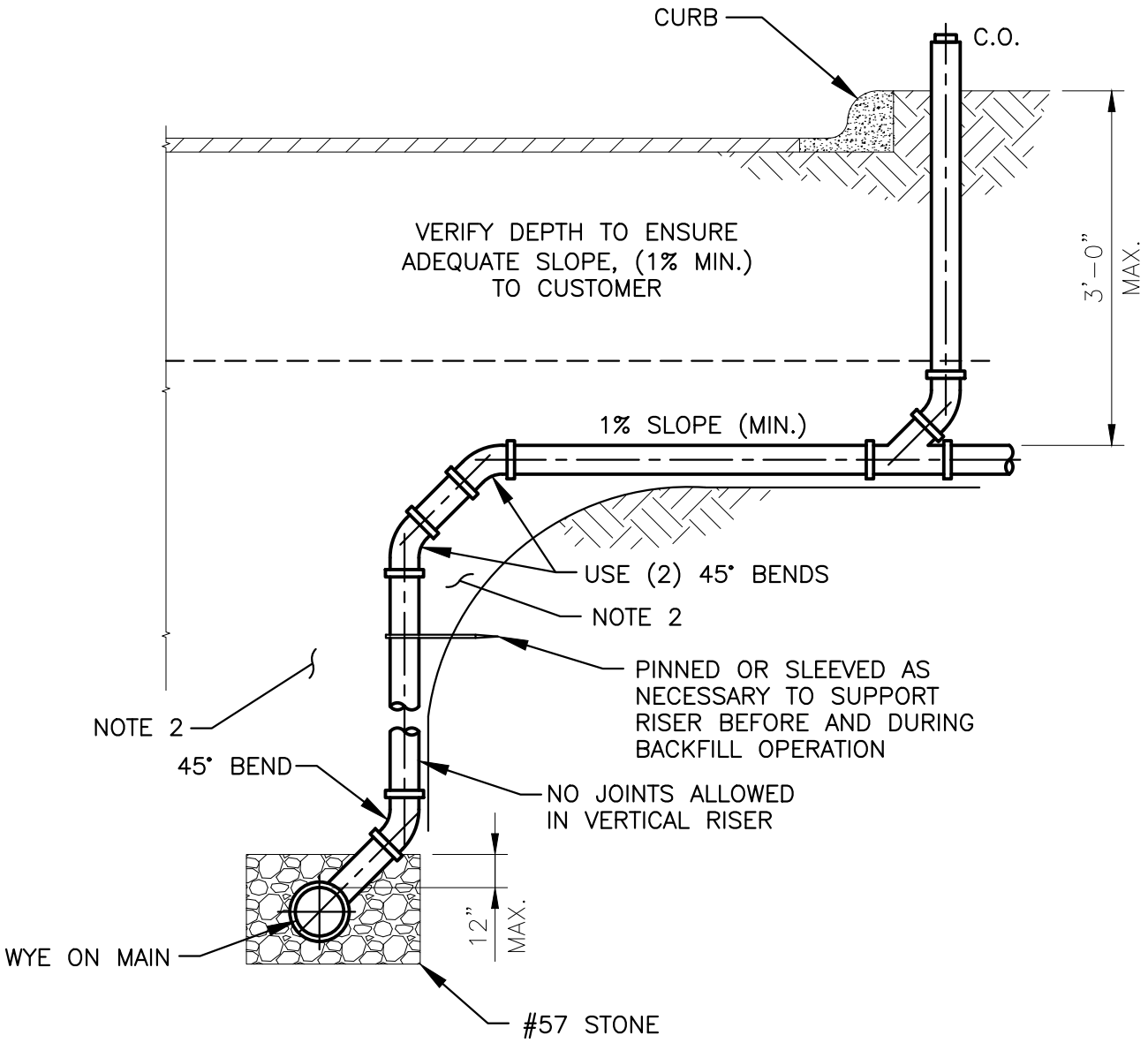
DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Class "B" Bedding	WATER Matters
	NOT TO SCALE	DETAIL NO. S-014



NOTES:
1. DEEP HOUSE CONNECTIONS MAY BE ALLOWED WHEN SEWER INVERT IS 12 FEET OR GREATER BELOW SURFACE.

2. FROM THE TAPPING SADDLE ALL LATERALS SHALL BE DIP.

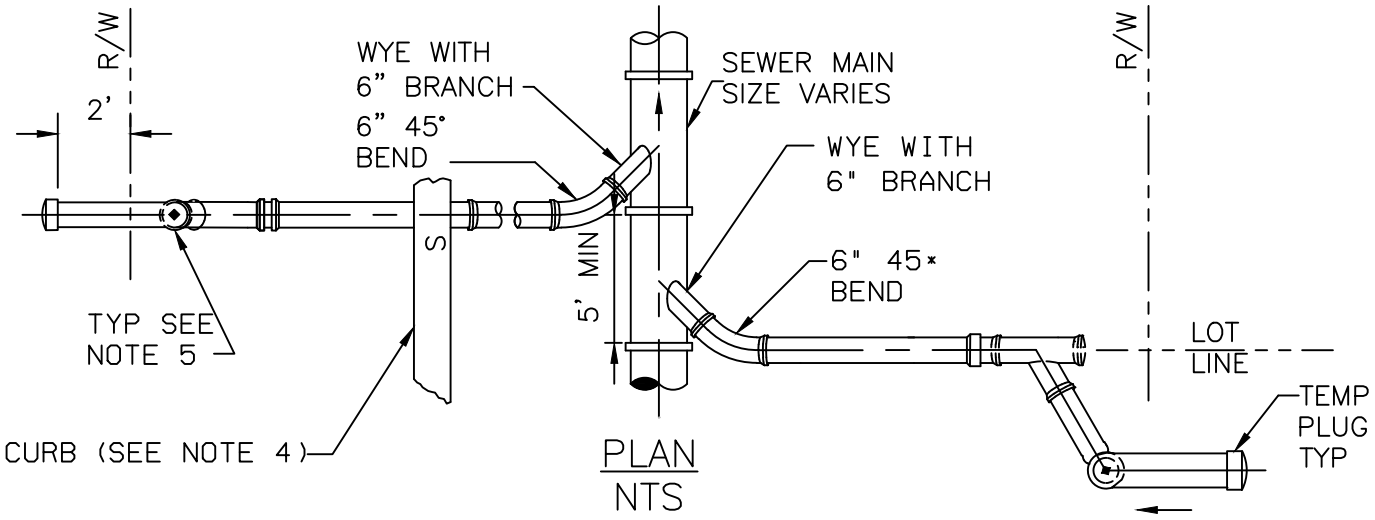
DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Deep Service Connection Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. S-015



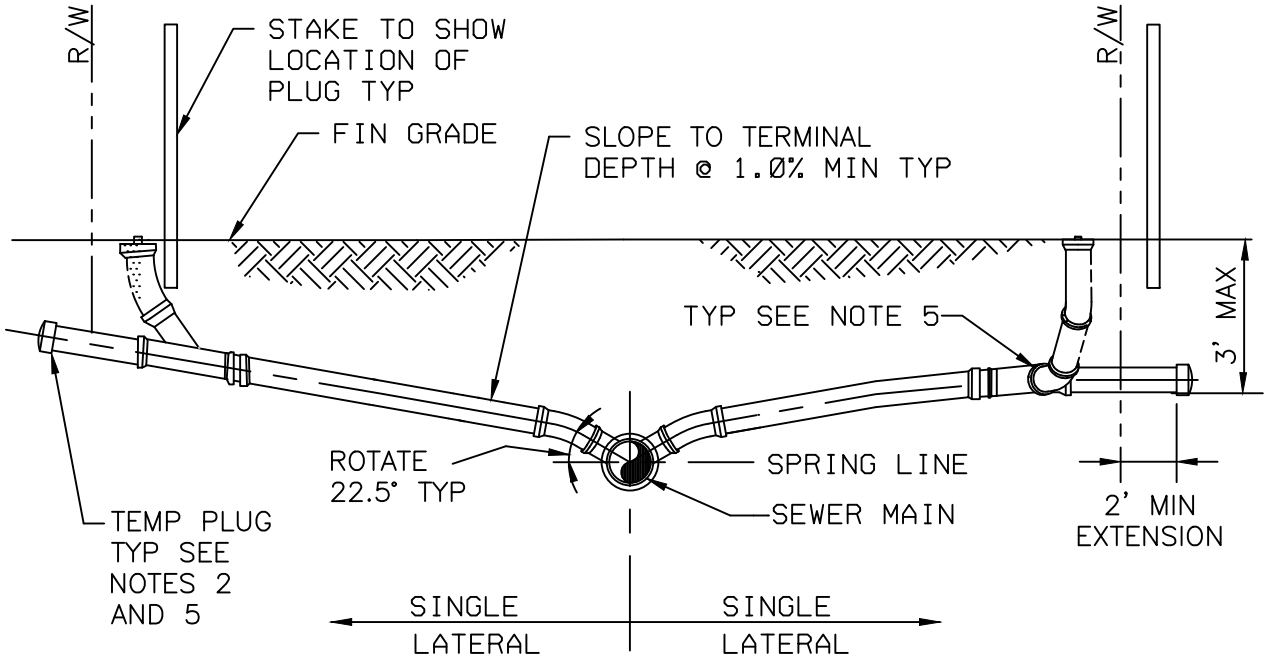
NOTES:

1. THIS DETAIL SHALL NOT BE USED WITHOUT WRITTEN PERMISSION FROM DCDWM.
2. CRUSHER RUN BACKFILL TAMPED IN 6" LAYERS TO NOT LESS THAN 95% STANDARD PROCTOR DENSITY BELOW ANY PAVED AREA.
3. ALL THE LATERAL CONNECTIONS INCLUDING THE WYE SHALL BE DIP.

DeKalb County GEORGIA	**STANDARD DETAILS**	09/17
	Alternate Deep Service Connection Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. S-016



PLAN
NTS

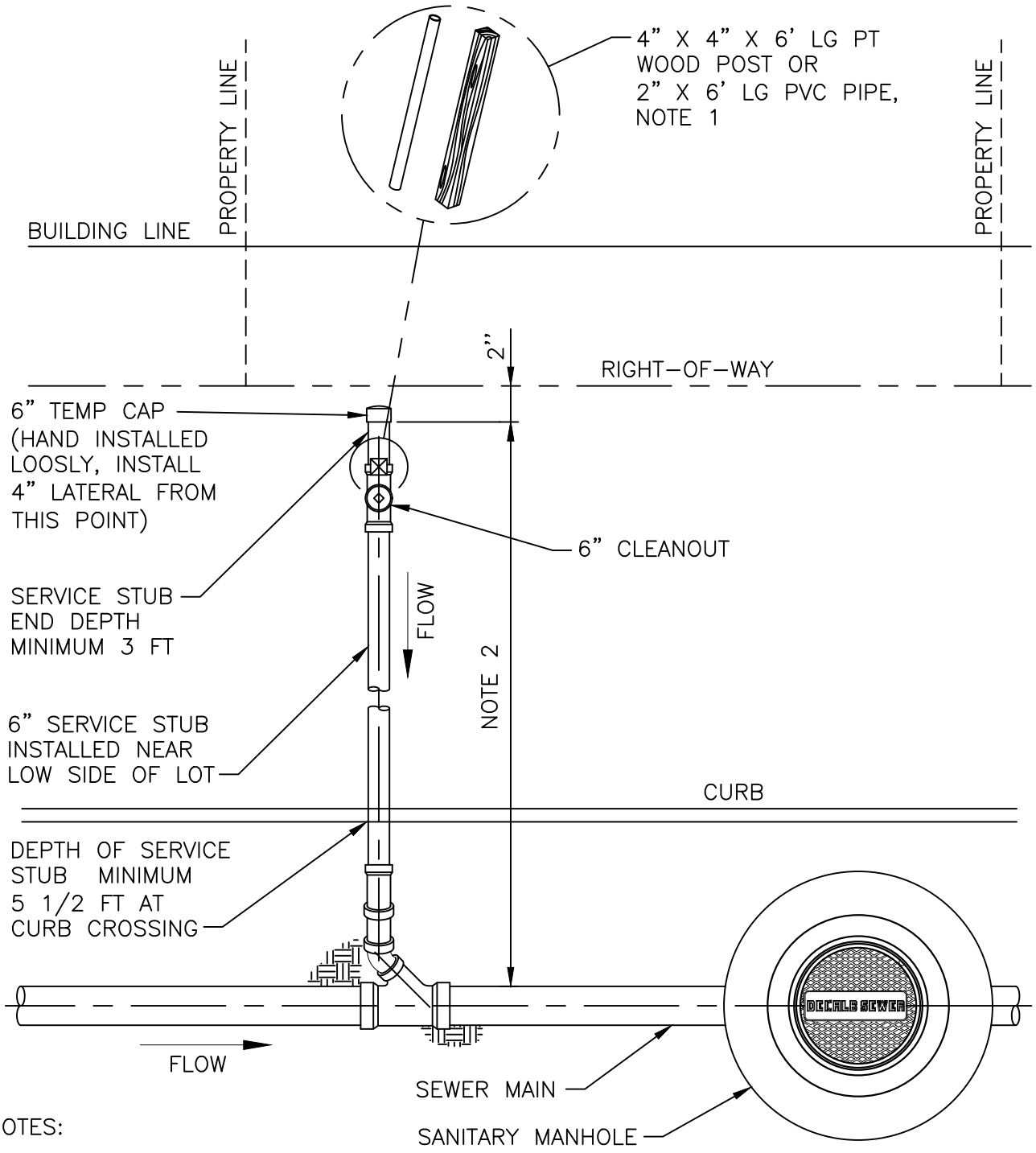


PROFILE
NTS

NOTES:

1. INVERT OF SERVICE LATERAL SHALL NOT ENTER SEWER MAIN BELOW SPRING LINE.
2. SERVICE LATERAL SHALL BE CAPPED BY DEVELOPER'S CONTRACTOR.
3. ALL FITTINGS SHOWN ARE TO BE INSTALLED.
4. SERVICE CONNECTIONS SHALL BE PERMANENTLY MARKED BY CUTTING AN "S" IN THE CURB DIRECTLY OVER THE LATERAL.
5. DEVELOPER'S CONTRACTOR SHALL INSTALL CLEANOUT.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	SANITARY SEWER LATERAL CONNECTION	WATER Matters
	NOT-TO-SCALE	DETAIL NO. S-017



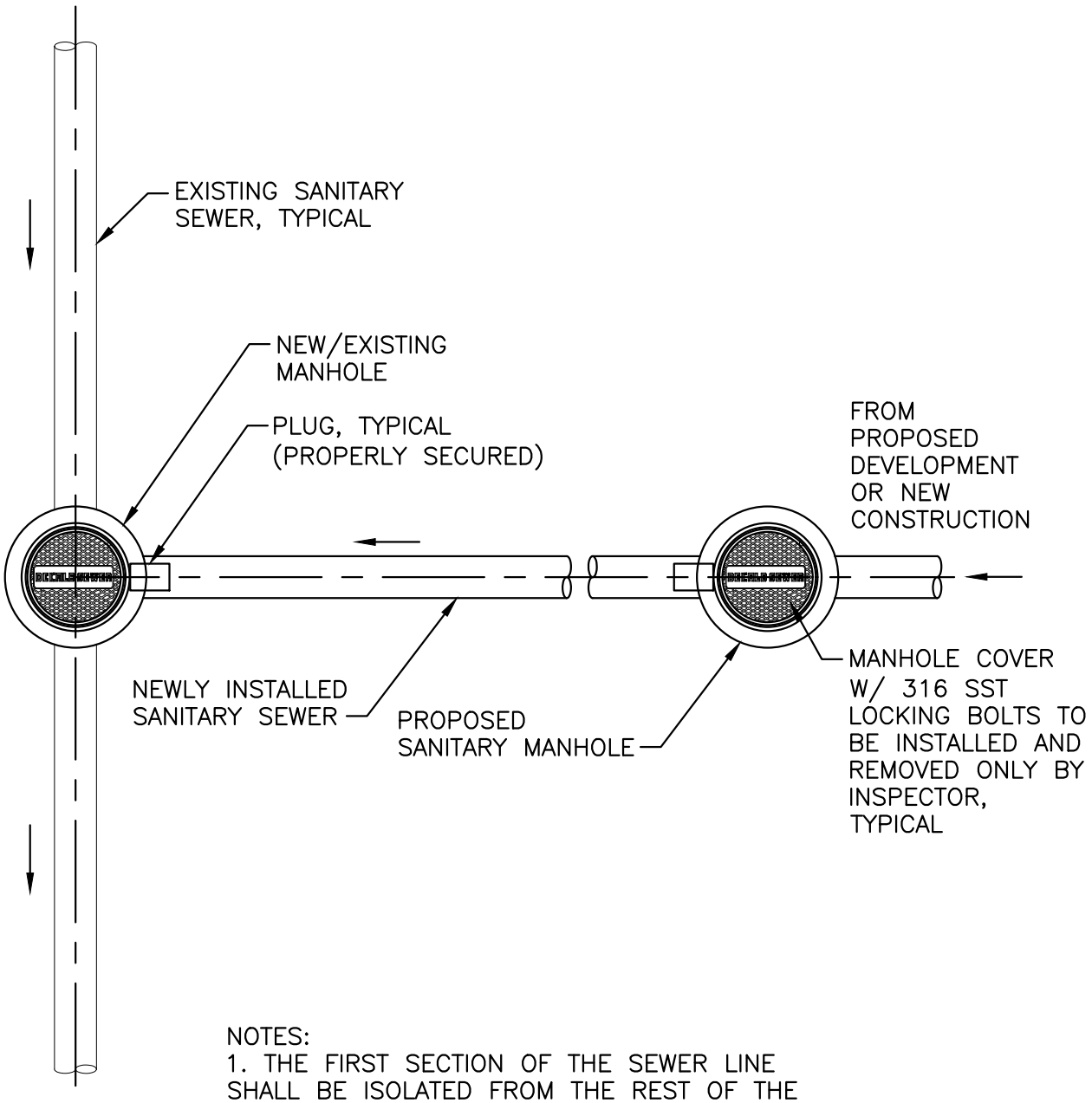
NOTES:

1. IDENTIFY AS PER OSHA SAFETY STANDARD SPECIFICATION 1910.44 UTILITY PROTECTION MARKING PAINT (GREEN)

2. MINIMUM LENGTH OF SERVICE STUB IS ONE FULL PIPE JOINT LENGTH OR TO THE RIGHT-OF-WAY.
MAXIMUM LENGTH OF SERVICE STUB IS 75 FEET.

3. REFER TO S-012 FOR SERVICE AND CLEANOUT PROFILE

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Service Stub Location Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. S-018



NOTES:
1. THE FIRST SECTION OF THE SEWER LINE SHALL BE ISOLATED FROM THE REST OF THE PROPOSED SYSTEM.

2. THE FIRST MANHOLE OF THE PROPOSED SYSTEM SHALL BE USED TO PUMP OUT ANY INFLOW/INFILTRATION, MUD, ETC., THAT ENTERED THE SYSTEM DURING CONSTRUCTION.

3. THE PLUGS SHALL NOT BE REMOVED UNTIL APPROVAL OF PROPOSED SEWER SYSTEM BY DCDWM INSPECTORS.

DeKalb County GEORGIA

STANDARD DETAILS

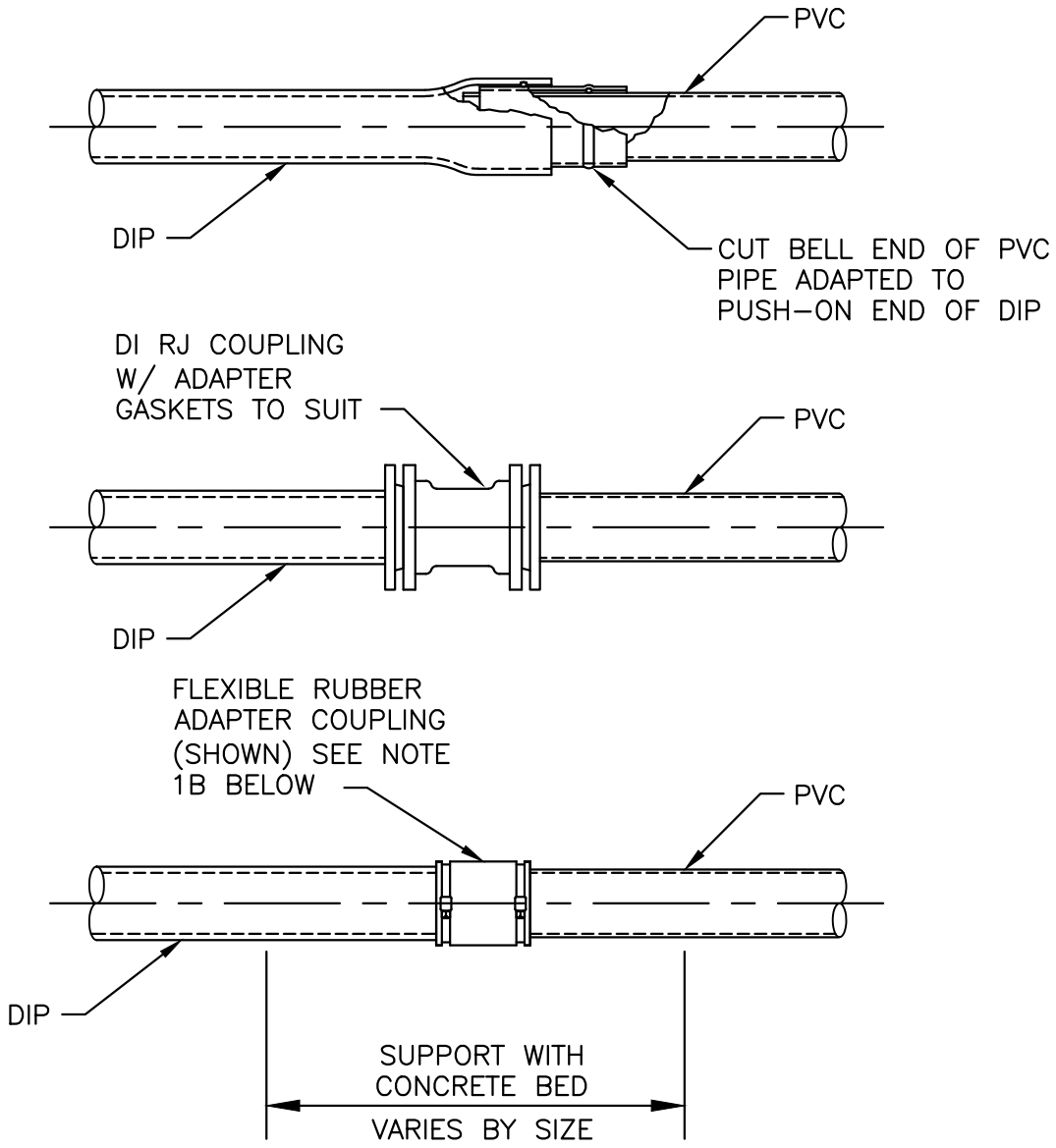
09/17

WATER Matters

Plug Location Detail

NOT TO SCALE

DETAIL NO. S-019



NOTES:

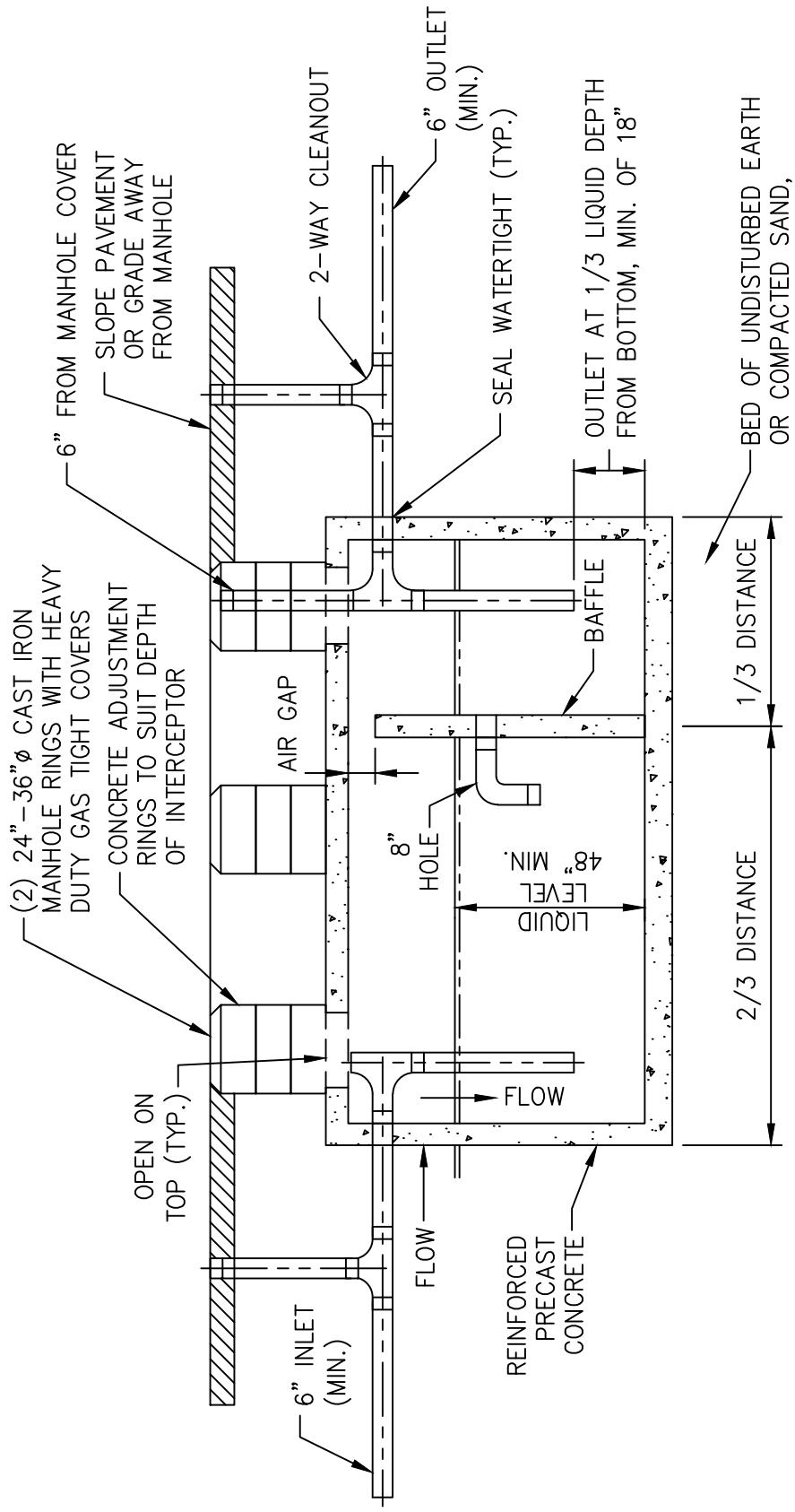
1. TRANSITION JOINTS: THE FOLLOWING SHALL BE UTILIZED FROM DUCTILE IRON PIPE TO PVC FOR PIPE SIZES LESS THAN 12 INCHES:

   A. WATER MAIN TYPE COMPRESSION COUPLINGS WITH ADAPTER GASKETS AS NEEDED.

   B. "FERNCO" TYPE FLEXIBLE RUBBER ADAPTER COUPLING (SHOWN) OR APPROVED EQUAL.

2. TRANSITION COUPLINGS SHALL BE CONSTRUCTED AS SHOWN ABOVE.

DeKalb County GEORGIA	**STANDARD DETAILS**	09/17
	Transition Coupling Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. S-020



DETAIL SHOWS GENERAL SCHEMATIC REQUIREMENTS. CONTRACTOR SHALL SUBMIT PROPOSED INTERCEPTOR INSTALLATION PLANS AND SPECIFICATIONS TO AUTHORITIES GOVERNING JURISDICTION FOR APPROVAL BEFORE ACQUISITION OF INTERCEPTOR. PROVIDE INTERCEPTOR WITH ADEQUATE STRUCTURAL STRENGTH TO ACCOMMODATE VEHICULAR TRAFFIC AT INSTALLATION LOCATION.

DeKalb County
GEORGIA

STANDARD DETAILS

PRECAST CONCRETE FAT, OIL & GREASE INTERCEPTOR 1000, 1500 & 2000 GAL. CAPACITY

Not To Scale

09/17

WATER Matters

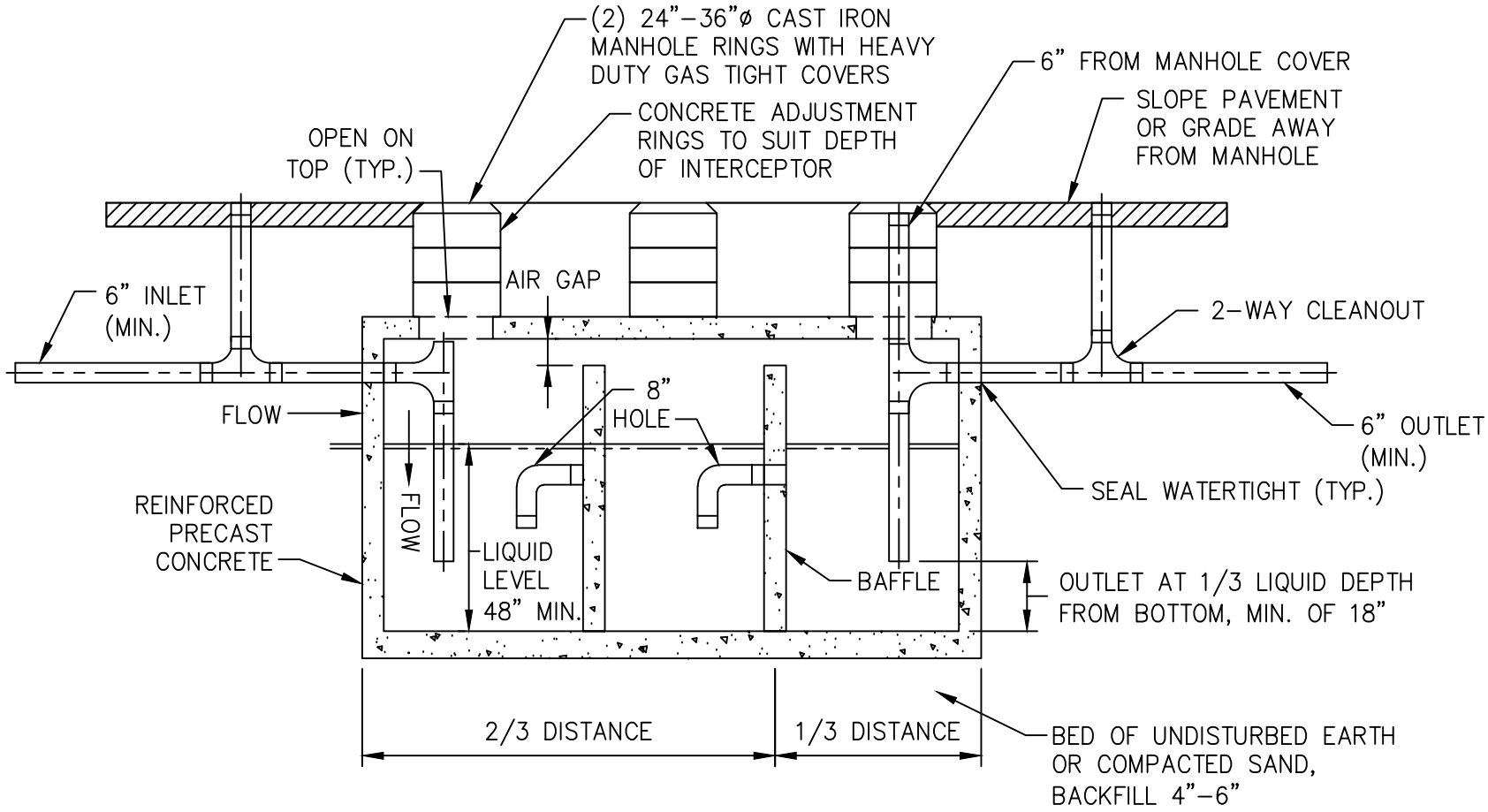
DETAIL NO. S-021

DeKalb County
GEORGIA

STANDARD DETAILS

PRECAST CONCRETE FAT, OIL & GREASE INTERCEPTOR 2500 & 3000 GAL. CAPACITY

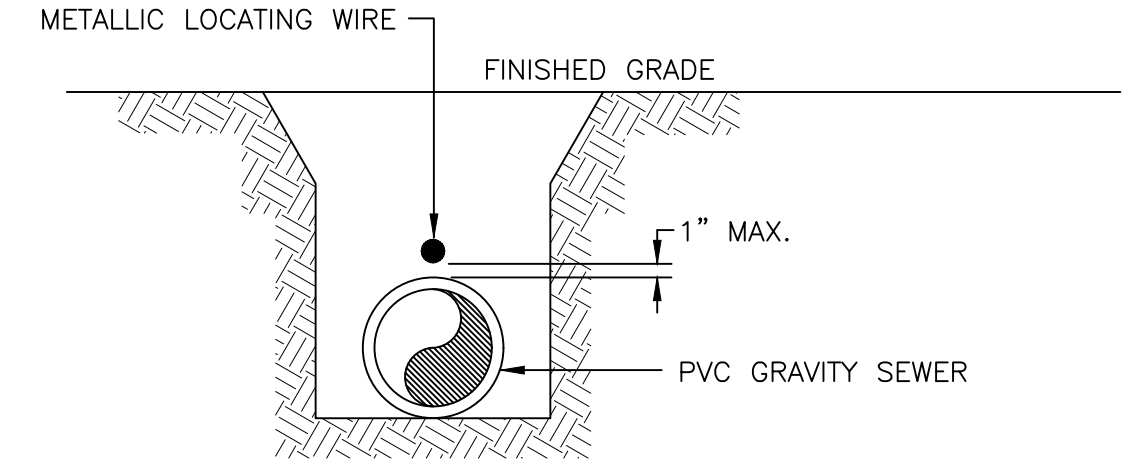
Not To Scale

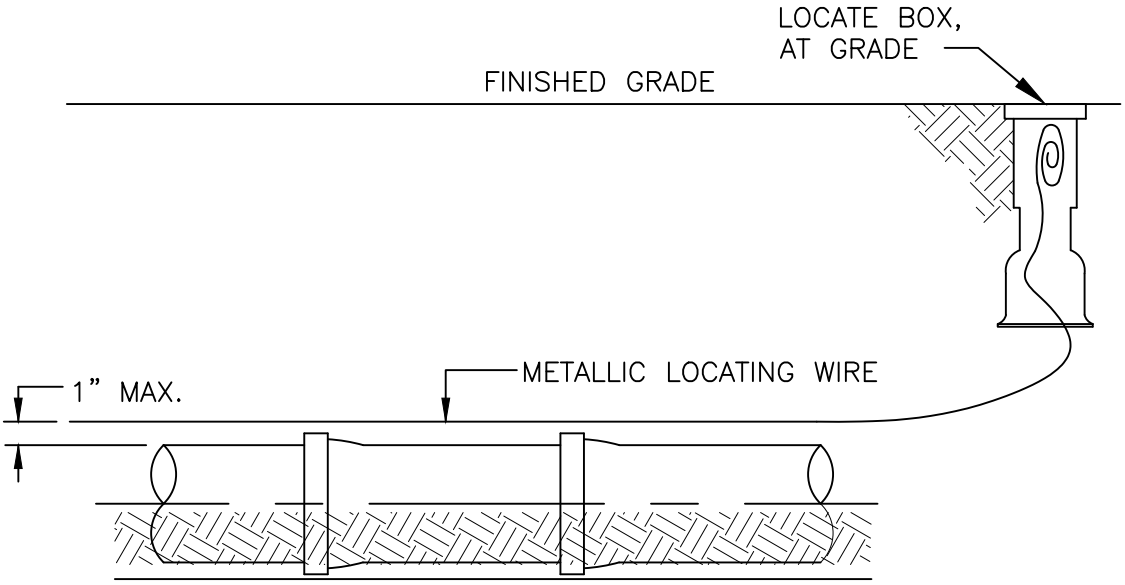


DETAIL SHOWS GENERAL SCHEMATIC REQUIREMENTS. CONTRACTOR SHALL SUBMIT PROPOSED INTERCEPTOR INSTALLATION PLANS AND SPECIFICATIONS TO AUTHORITIES GOVERNING JURISDICTION FOR APPROVAL BEFORE ACQUISITION OF INTERCEPTOR. PROVIDE INTERCEPTOR WITH ADEQUATE STRUCTURAL STRENGTH TO ACCOMMODATE VEHICULAR TRAFFIC AT INSTALLATION LOCATION.

DETAIL NO. S-022

09/17

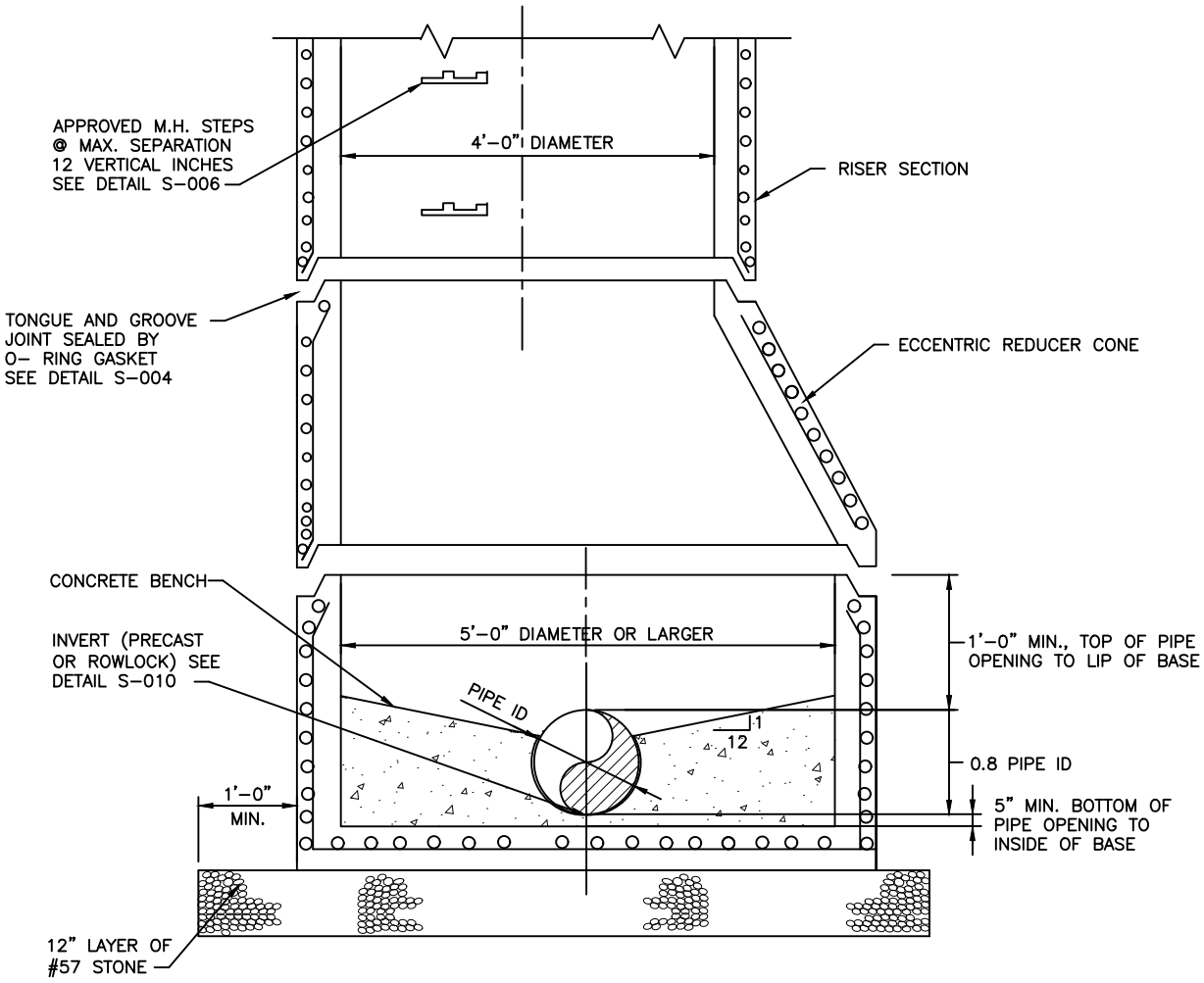




NOTES:

1. PVC PIPE SHALL REQUIRE INSULATED METALLIC LOCATING WIRE (12 GAUGE COPPER) CAPABLE OF DETECTION BY A CABLE LOCATOR
2. THE CABLE SHALL BE BURIED DIRECTLY ABOVE THE CENTERLINE OF THE PIPE. LOCATING WIRE SHALL TERMINATE AT THE MANHOLE FRAME
3. USE DUCT TAPE AS NECESSARY TO HOLD WIRE DIRECTLY ON THE TOP OF THE PIPE.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Tracer Wire Detail For PVC	WATER Matters
	NOT TO SCALE	DETAIL NO. S-023



DeKalb County
GEORGIA

STANDARD DETAILS

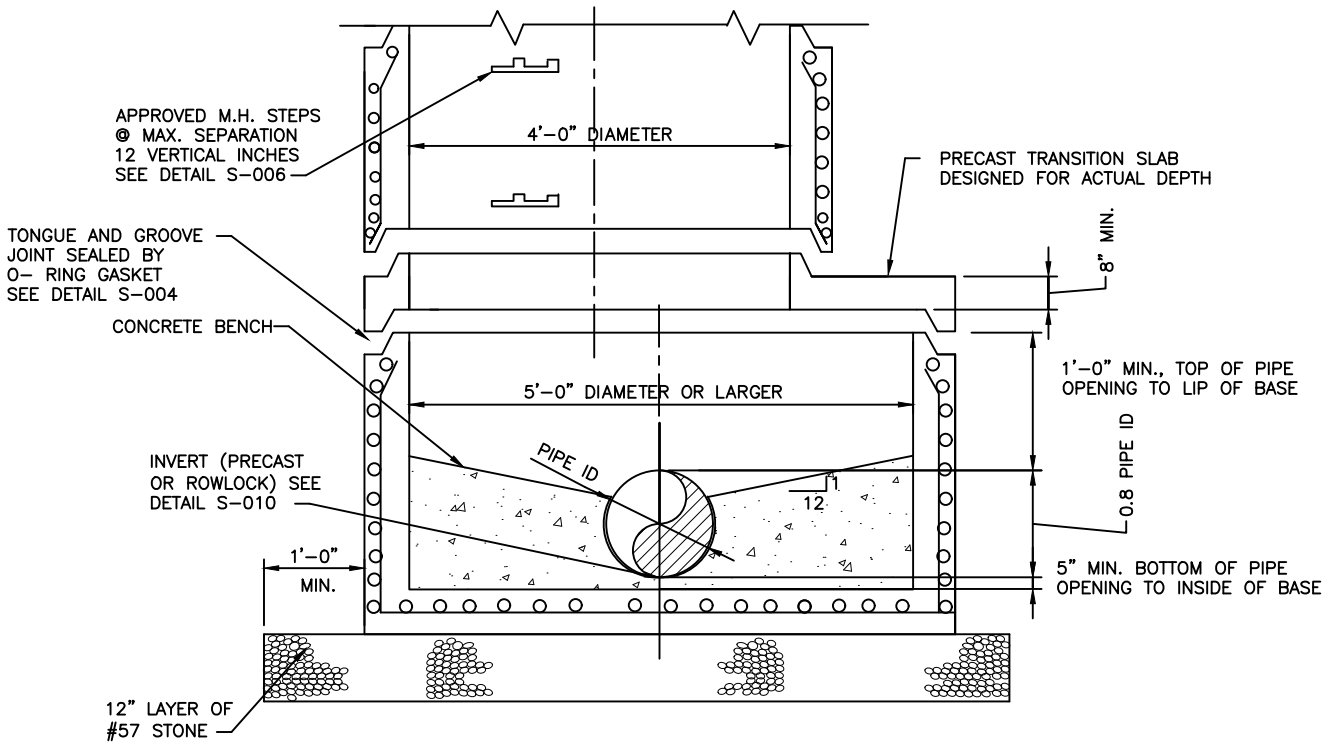
09/17

LARGE DIAMETER MANHOLE BASE (ECCENTRIC) DETAIL

NOT TO SCALE

WATER Matters

DETAIL NO. S-024



DeKalb County
GEORGIA

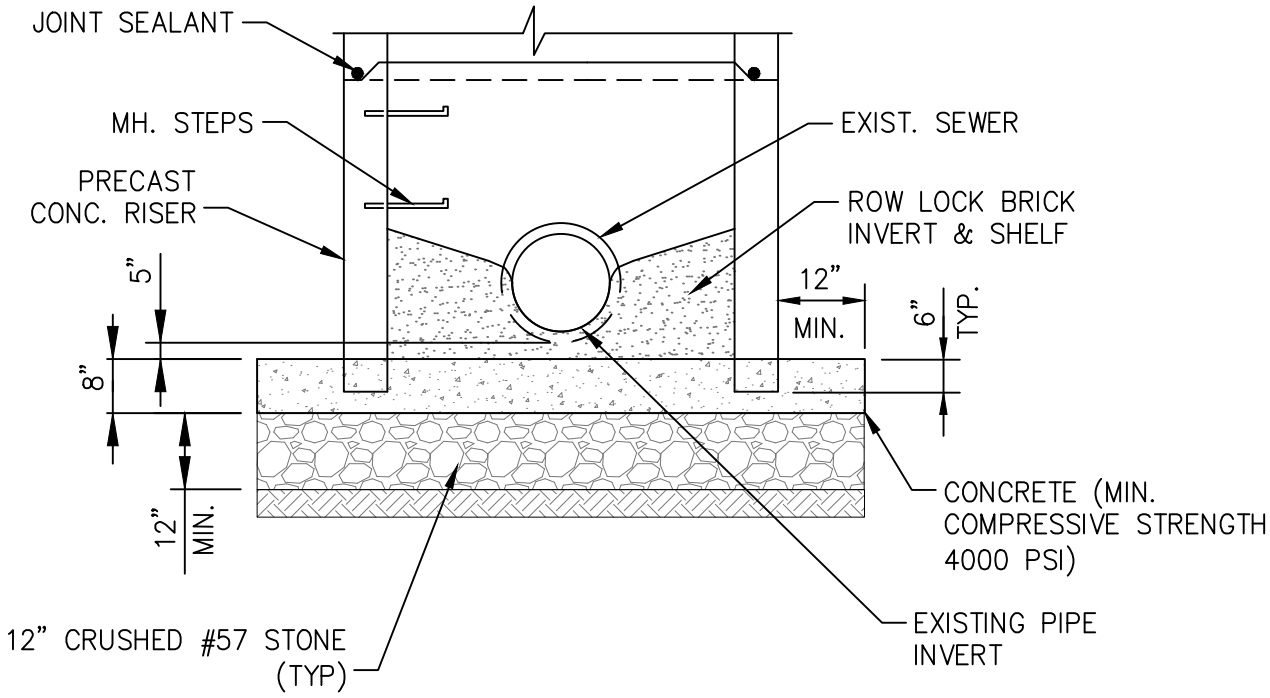
STANDARD DETAILS

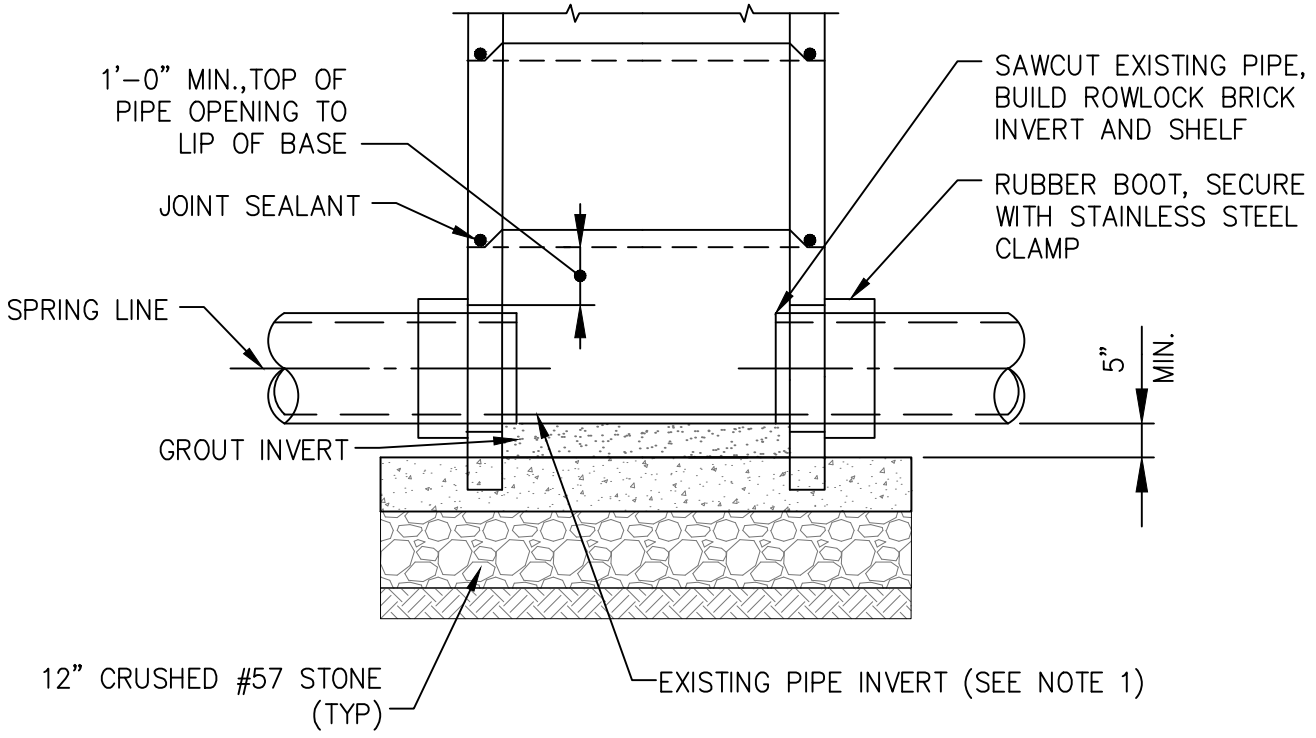
09/17

Large Diameter Manhole Transition Base Detail

NOT TO SCALE

DETAIL NO. S-025





NOTE:
1. MAY USE THE EXISTING PIPE AS THE MANHOLE CHANNEL WITH DCDWM APPROVAL. SHALL BE SAWCUT AT SPRING LINE AND SHELF.

DeKalb County
GEORGIA

STANDARD DETAILS

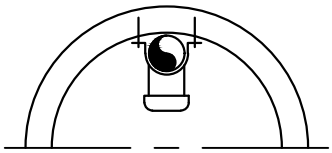
Manhole Over Existing Sewer (Doghouse)

Not To Scale

09/17

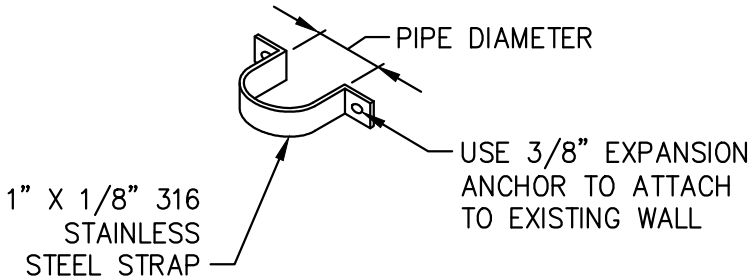
WATER Matters

DETAIL NO. S-026

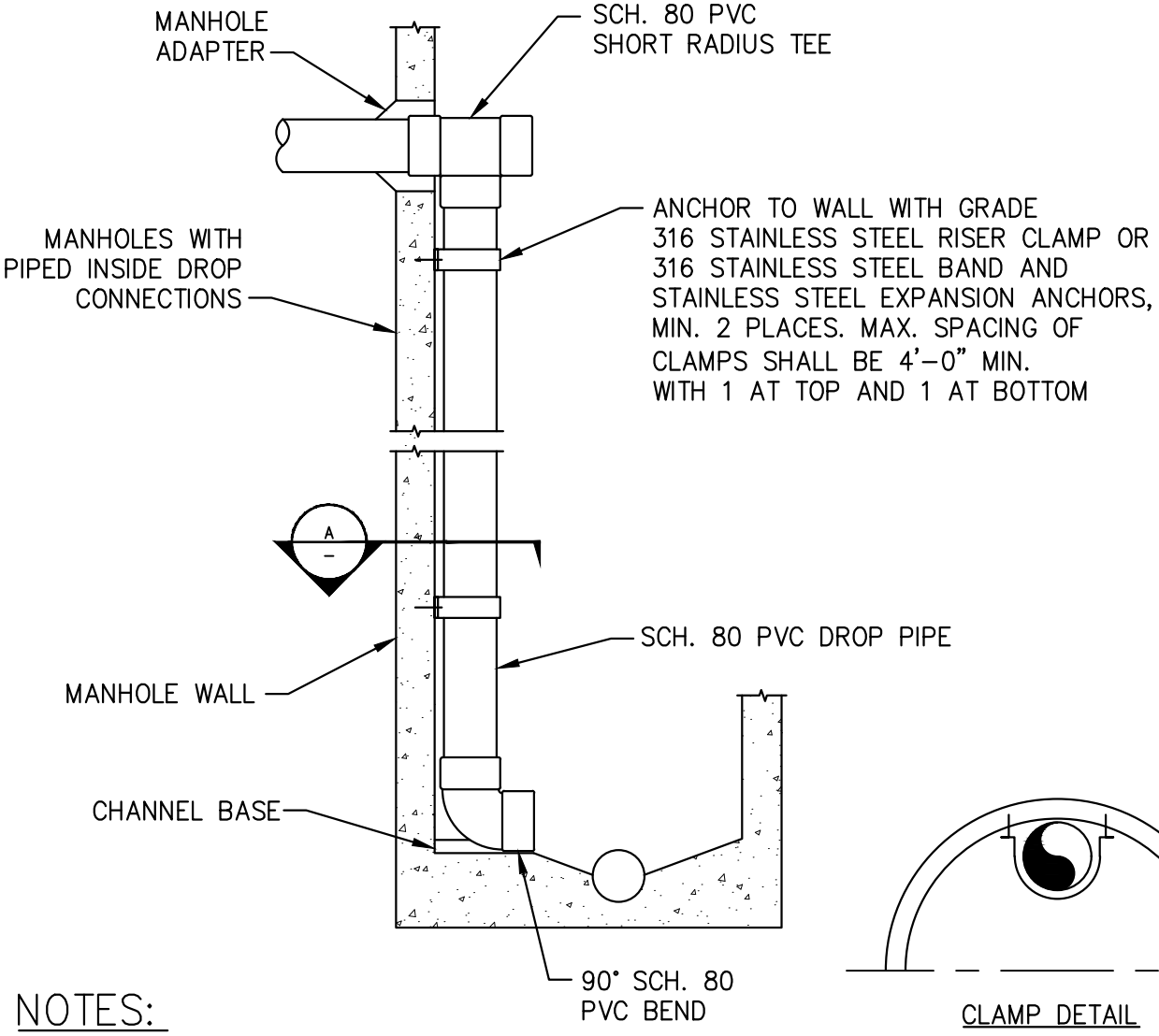


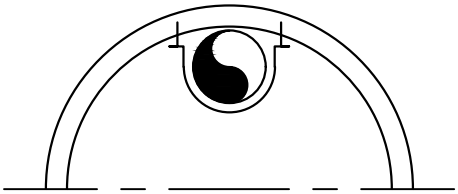
CLAMP DETAIL

A – SECTION
SCALE: NONE



STRAP DETAIL





CLAMP DETAIL

A – SECTION
SCALE: NONE

NOTES:

1. MINIMUM MANHOLE DIAMETER SHALL BE 5'–0".

DeKalb County GEORGIA

STANDARD DETAILS

09/17

PIPED INSIDE DROP CONNECTION FOR MANHOLE

Not To Scale

WATER Matters

DETAIL NO. S-027

APPENDIX C
SANITARY SEWER PUMP STATION AND FORCE MAIN STANDARDS

DEKALB COUNTY WATERSHED MANAGEMENT
CHECKLIST FOR SANITARY SEWER PUMP STATION DESIGN REVIEW & APPROVAL

Project Name:		**Date:**	Click here to enter a date.
Street Address:		**Review No.:**	
Engineer/Developer Name:			
Engineer/Developer Phone:		**Reviewed By:**	

CHECKLIST PROCEDURES

1.	**ADDRESS THE CORPORATE COMMENTS MARKED IN RED.**
2.	**RESPOND ON CHECKLIST IN GREEN TO INDICATE COMMENT WAS ADDRESSED.**
3.	**MENTION DRAWING NUMBER WHERE COMMENT WAS INCORPORATED.**
4.	**PLACE ALL LIST STATION DRAWINGS IN ONE LOCATION**
5.	**RETURN CHECKLIST, RED LINE PLANS AND REVISED PLANS THE REVIEWER.**

NOTE: All design drawings and associated calculations, are to be sealed, signed and dated by a Georgia – Licensed Professional Engineer.

ALL SHEETS

☐	Completed “Design Review Approval Form” as well as “Pump Station Design Calculations Form” (see “Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards” sample forms are located in Appendix L.
☐	Location map depicting property lines, land lot lines, buildings, existing utilities, creeks, stream buffers, and roads.
☐	Final plans should be on 24” X 36” paper sheets.
☐	Each sheet except the cover sheet shall have a title block in the lower right corner containing: ☐ Project name. ☐ Project number (if DeKalb County project) ☐ Sheet number ☐ Total number of sheets ☐ Scale ☐ Drawer’s, Designer’s, and Checker’s initials and date. ☐ Date (month/day/year)
☐	All sheets shall be sealed, signed and dated by a Registered Civil Engineer in the State of Georgia

COVER SHEET

The Engineer shall provide a cover sheet with the following information:

☐	Project name
☐	Drawing Index which provides sheet number and a description of the corresponding sheet
☐	Vicinity Map
☐	District and Land Lot number
☐	Engineering firm’s name, address and telephone number

DEKALB COUNTY WATERSHED MANAGEMENT CHECKLIST FOR SANITARY SEWER PUMP STATION DESIGN REVIEW & APPROVAL			
Project Name:		**Date:**	Click here to enter a date.
☐	Developer's name, address and telephone number		
☐	Date (month/day/year)		
☐	Signature Approval Blocks		
SHEET 2			
The Engineer shall provide a general sheet containing the following information:			
☐	General notes covering important parameters as outlined in the DeKalb County Design Standards for Water, Sanitary Sewer, and Sanitary Sewer Pump Stations.		
☐	Other notes as necessary to cover situations **not** covered by the Design Standards or by the DCDWM Standard Details.		
☐	Legend showing symbols and line types used within the drawings		
☐	Engineering's firm title block containing firm's name, address, and phone number		
☐	Elevation datum and benchmark information in Georgia State Plane Coordinates		
☐	Note to be shown on plan: **Contractor shall notify DeKalb County Department of Watershed Management Inspector 48 hours prior to start of construction.**		
PUMP STATIONS GENERAL			
☐	Pump Station Service Area Map clearly showing basin delineation of the area draining to the pump station by gravity.		
☐	Show all offsite areas that have the potential to discharge to the proposed pump station. Use the table found in Section IV.C.3.c of the "Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards" to calculate offsite flows. A future land use map is available from DeKalb County Department of Planning and Sustainability.		
☐	Pump Station Driveway Plan & Profile		
☐	Pump Station Overflow Vault Profile if approved to build		
☐	Pump Station Gravity Sewer Influent Profile		
☐	Pump Station to be located at the lowest point of the basin. Show ground contours and 100 year flood contour as well as 25 foot and 75 foot stream buffers (if applicable).		
☐	Average Daily Flow (ADF) to be calculated based on Sanitary Flow Contribution numbers specified in the table provided in Section IV.C.3.b of the "Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards".		
☐	Capacity Calculations for the receiving downstream sewer, to justify it is not capacity limited		
☐	Install Safety Placards for all pump station structures and equipment as per OSHA standards. Show details on standard detail drawings for contractor to follow.		
☐	Refer to "Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards" for more details.		
PUMPS			
☐	Pumps and Panels to be manufactured by an approved vendor.		

DEKALB COUNTY WATERSHED MANAGEMENT CHECKLIST FOR SANITARY SEWER PUMP STATION DESIGN REVIEW & APPROVAL			
Project Name:		**Date:**	Click here to enter a date.

☐	System Head Curve for different "C" values for new and aged pump conditions.
☐	Pump details, specifications and shop drawings as per standards. Explosion proof Submersible Constant Speed Pumps are to be used on all new pump stations. Variable Speed Pumps shall be approved on a case-by-case basis.
☐	Pump size and dimensions, as part of pump schedule.
☐	Pump clearances between pump-to-pump and pump-to-sidewall as per manufacturer's recommendation. Show all dimensions on wet well cross section.
☐	Water Level Sensors shall be a submersible pressure level transducer and three (3) mercury sealed type float switches connected to a PLC.
☐	Wells shall be cylindrical with a minimum 8 foot diameter.
☐	Minimum depth of wet well to be 8 feet.
☐	Indicate high and low ground water elevations. Provide sub-surface drainage around wet well base, such that the invert of the drain pipe day lights at an elevation at least 3 feet below the base of the wet well-to keep the ground water as low as possible around the wet well.
☐	Provide anti-flotation calculations to justify size of anti-flotation collar. The anti-flotation collar shall be an integral part of the wet well casting process.
☐	Concrete wet well shall be a composite MH.
☐	Indicate Pump Control Elevations in the Wet Well for the following conditions: High Level Alarm, Lag Pump On, Lead Pump On, Pumps Off, and Low Level Alarm.
☐	Mark Storage Volume above the high-level alarm and up to the lowest point of overflow. This volume shall be greater than or equal to volume generated over three hours at peak design flow. Backflow of sewage into manholes upstream of the wet well is not permitted. In lieu of storing the total three hour peak flow volume within the wet well, an overflow vault may be used with DCDWM approval.
☐	Provide calculations to justify adequacy of storage volume provided in the Wet Well. Overflow Vault calculations shall be provided if the County has approved an Overflow Vault for use. Entry hatch shall be large enough to remove pumps for servicing.
☐	No ladders shall be permitted in wet well.
☐	Provide hoist for equipment outside the wet well.
☐	Wet well floor shall have a minimum slope of 1:1 to the hopper bottom.
☐	Sump to be designed as per manufacturer's recommendation for a specific pump.
☐	Only one sewer line (having flat slope and minimum drop to prevent churning of sewage and air entrapment) to enter a wet well.
☐	Electric connections in the wet well shall be explosion proof.
VALVE & METER COMBINED VAULT	
☐	Valve details, specifications, and shop drawings.
☐	Minimum 12 foot by 6 foot in size.
☐	Combined Vault shall be below grade, but adjacent to the wet well, have a 2% sloped concrete floor with

DEKALB COUNTY WATERSHED MANAGEMENT CHECKLIST FOR SANITARY SEWER PUMP STATION DESIGN REVIEW & APPROVAL			
Project Name:		**Date:**	Click here to enter a date.

	sump, concrete side walls and aluminum hatches.
☐	Combined Vault sump to be connected to the wet well via a drainage pipe, check valve and gate valve and gate valve to drain rain water. The valves shall prevent back flow of wastewater into the vault.
☐	Check Valves to be placed upstream of Shut-off Valves.
☐	Pressure Gauge Taps with diaphragm mounted seals shall be located on each pipe upstream of the check valve.
☐	Flow meter details, specifications, and shop drawings.
☐	Flow meter to be installed downstream of Valves, minimum 5 feet on a straight length of pipe upstream and 5 feet downstream of the meter.
GENERATOR	
☐	Standby Generator (from Cummins or Caterpillar) details, specifications, and shop drawings.
☐	The standby generator shall have adequate capacity to run a pumps, equipment, lifting hoist, lighting, telemetry, etc. simultaneously. The engineer shall provide submittals to justify adequate capacity for review and approval by DCDWM.
☐	Automatic Transfer Switch specifications and shop drawings.
☐	Automatic Transfer Switch to be rated for 100% of full load, and placed in a NEMA 4X enclosure. Power outage, or low voltage, shall be experience for 30 seconds before the station is switched to generator power.
☐	Generators shall meet all new EPA air emission standards, and be equipped with auxiliary systems, such as batteries, battery charger, block heater, etc.
☐	Generators are to be installed to operate on natural gas.
☐	Leak detection device in the interstitial space for sensing fuel leakage. This device to be connected to generator telemetry.
☐	Provide Generator Natural Gas Calculations.
TELEMETRY	
☐	Telemetry equipment details, specifications, and shop drawings.
☐	Telemetry system to be capable of sending signals to personnel 24 hours per day, 365 days per year.
☐	RTU unit to be installed inside its own NEMA 4X enclosure, and be equipped with an antenna and pole.
☐	Telog or an approved remote Telemetry vendor shall meet the requirements stated below.
☐	Telog RS-33u-PLC Remote Telemetry Unit (RTU) package must include: ☐ Telog RTU model number RS-33u or equivalent. ☐ Latest version CPU module. ☐ Multi-Channel Recorder (Remote Data Acquisition) Telog Model No. RS.3314; Mixed I/O: 8AI, 6DI ☐ Model No. 1 x RTT Cellular Packet Modem. (800 Mhz) ☐ Telog M-323S communication interface module. ☐ Telog A-PMA Pole Mount Antenna – Omni directional ¼-wavelength dipole antenna with 3dB gain from CDMA/1Xrtt cellular option. Includes 6.6 feet of coax cable and mounting brackets.

DEKALB COUNTY WATERSHED MANAGEMENT CHECKLIST FOR SANITARY SEWER PUMP STATION DESIGN REVIEW & APPROVAL			
Project Name:		**Date:**	Click here to enter a date.
	☐ Power Source: Model No. AC12B4, AC to 12 Volt DC battery backup and alarm feature when loss of AC power is detected. ☐ Battery ☐ Door entry switch ☐ Keyed door lock		
☐	Human Machine Interface (HMI) requirements to be fulfilled employing MR Systems, Southern Flow and/or approved equal.		
ELECTRICAL			
☐	All Electrical Systems to comply with NFPA 70, "National Electric Code", NFPA 820 "Standard for Fire Protection in Wastewater Treatment & Collection Facilities", ANSI, as well as applicable federal, state and local codes.		
☐	Include Electrical Legend on plans.		
☐	Include Wiring Schedule on plans.		
☐	Include the following warning sign in bold on plans: "Lock out all power while working on any equipment to avoid electrical shock or equipment activation."		
☐	Main Power Feed to be above-grade, fused disconnect switch.		
☐	Incoming Electrical Service to be equipped with Surge Protection installed in a NEMA 4X enclosure.		
☐	Surge Suppressor shall be U.L. listed and labeled under UL 1449 and UL 1283. See Section IV.D.20.a(5) of the "Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards".		
☐	Single Line Electrical Drawing showing power distribution for the proposed pump station, including pump control panel detail.		
☐	Pump Station Power Riser Diagram		
☐	Electrical Conduits shall be at a minimum as stated within Appendix K – Electrical Conduit and Acc Spec Scan 1-1/4 inch minimum.		
☐	Electrical Conduits to contain two 10 conductor shielded cables with 8 feet slack in the pump station control panel and 4 feet of slack in the generator and transfer switch panels.		
☐	Soft Starters are required for pumps greater than or equal to 20 horsepower rating.		
☐	Electrical enclosures, Switching Gears, and Conduits shall be outside the Wet Well area, and protected from vehicular traffic and flooding.		
☐	Provide for electrical control panels 4'W x 8'H x 24'L awning and trim, 8" to 10" base plates on vertical supports. Four vertical supports front side, four vertical supports back side.		
INSTRUMENTATION AND CONTROLS			
☐	Wastewater levels within wet wells to be detected through the use of submersible pressure level transducer and three (3) mercury sealed type float switches.		
☐	Pump Station Control & Instrumentation Riser Diagram		
☐	Phase monitor to be connected to the PLC for monitoring and remote indication of open phase/phase		

DEKALB COUNTY WATERSHED MANAGEMENT CHECKLIST FOR SANITARY SEWER PUMP STATION DESIGN REVIEW & APPROVAL			
Project Name:		**Date:**	Click here to enter a date.

	reversal condition.
☐	Allen Bradley Micro Logix Programmable Controller to control and monitor all pump station functions.
☐	Connect PLC via MODBUS protocol.
☐	Connect Allen-Bradley HMI to PLC.
☐	PLC, Phase Monitor, HMI and Soft Starters to be installed in a single NEMA 4X Stainless Steel enclosure.
☐	Refer to Table 4.5 in Section IV.L.20.cc of the "Potable Water Main, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards" for the Submersible Pump Station I/O List.
☐	Electrical Grounding & Bonding Riser Diagram for all components as per National Electrical Code, local codes and ordinances.
LIGHTS	
☐	Lighting plans to include location, type and power distribution.
☐	Outside Lighting Control Schematic.
☐	Install two 120 Volt LED Security Lights on a 20 foot Break Down Pole with automatic eye and pole lowering winch. Pole to be painted architecturally brown and light to turn on automatically at night.
FORCE MAINS	
☐	Plan view shall show proper scale. Scale shall not be more than: ▪ Plan:1 inch = 50 feet ▪ Profile: Horizontal 1 inch = 50 feet ▪ Vertical 1 – inch = 10 feet
☐	Plain view shall show the following: ☐ All streets, alleys and easements. They shall be dimensioned at least once and at breaks. Streets shall be identified by name. ☐ All abutting lots shall be identified by lot number, tract and subdivision. ☐ All topography within and to at least five (5) feet beyond the easements and topography affected by construction shall be shown. ☐ Location of all above and underground utilities, including storm and sanitary sewers, water lines, dry wells, buried telephone lines, natural gas, power and cables. Existing utilities shall be shown as dashed lines or faded lines with type, size and other available information called out. ☐ All structures, paving and other topographic features within vicinity, such as trees, shall be shown and identified by name, size and type. ☐ Location of proposed force main lines and appurtenances. Pipeline should be identified by name, size, materials and stations. ☐ Location of all existing and proposed easements. ☐ Location of all existing benchmarks shall be shown and identified by type. ☐ Location of all connections to existing sewer lines. ☐ Show horizontal clearance from buildings, structures, drainage culvert, and water mains. ☐ Show tie in points to DCDWM existing system.

DEKALB COUNTY WATERSHED MANAGEMENT CHECKLIST FOR SANITARY SEWER PUMP STATION DESIGN REVIEW & APPROVAL			
Project Name:		**Date:**	Click here to enter a date.

	☐ All sheets should have a north arrow orienting the plan view.
☐	Profile view should show the following: ☐ Existing utilities which cross the proposed utility. Identify crossing utility by name, pipe size, pipe material, type of utility (use), location (station) an elevation. Location and elevation are to be obtained from "as-built" plans paying particular attention to any differences in datum. ☐ All force mains require a profile. **NOTE:** ***All existing underground utilities shown on profile are assumed to be shown in approximate location only.*** ☐ Show existing ground and proposed ground. ☐ Show manhole number, station, rim, and invert elevations. ☐ All appurtenances such as valves, vaults, fittings and restraints. Identify by name, size, type, station and elevation.
☐	All sheets shall show match lines labeled as such with station and sheet number.
☐	Proposed force main lines shall be shown as solid lines with sizes, ground cover, material, and pipe classes called out. For example: 8 inch DIP (FM) – Class 350.
☐	Show any lift stations adjoining the gravity sanitary sewer system.
☐	Force main should be constructed of epoxy-lined Ductile Iron Pipe (DIP) from the wet well up to the security fence and then may be constructed of HDPE or DIP.
☐	Provide Tracker Tape on HDPE pipes to facilitate accurate locating in the future.
☐	Provide valve with Quick Connect for a bypass pump (to be used in case of complete pump station failure).
☐	Include calculations to demonstrate that velocity of flow in the force main is a minimum of 3 feet per second and maximum of 7 feet per second.
☐	Force mains cannot be installed in lieu of gravity sewers to convey flow downhill to an existing receiving sewer.
☐	Provide isolation valve on the force main just beyond and low meter vault.
☐	Show details of receiving gravity sanitary sewer line, and connection of incoming force main. The connection details must include a cross section of the receiving structure as well as pertinent details such as inverts of all pipes, pipe sizes, pipe material, benching, ground elevation, top elevation, notes, etc.
DETAIL SHEETS	
☐	Include DeKalb County Department of Watershed Management "Potable Water, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards" Standard Details to be used on the project.
☐	Include any other details specific to the project that are not covered by DeKalb County Department of Watershed Management "Potable Water, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards" Standard Details.
☐	Detail sheets shall be located at the end of the plan set and referenced where used.
ODOR CONTROL	
☐	Odor Control equipment details, specifications, and shop drawings.

DEKALB COUNTY WATERSHED MANAGEMENT CHECKLIST FOR SANITARY SEWER PUMP STATION DESIGN REVIEW & APPROVAL			
Project Name:		**Date:**	Click here to enter a date.

☐	Wet well 4 inch vent to an Odor Control system.
☐	Odor Control is required for pump stations constructed within 40 feet of the residence.
SITE DESIGN	
☐	Pump Station Buffer Zone to be a minimum of 120 feet X 120 feet with a 45 foot X 43 foot pad at the center.
☐	Provide a 20 foot easement for force mains.
☐	Subgrade for pad, turnaround and access road, side slopes and any other features within the fence line must be compacted to a minimum of 95% Standard Proctor Compaction.
☐	Access Road and Turnaround to be constructed of concrete on a six-inch layer of 95% compacted aggregate base course.
☐	Pump Station Pad to be a minimum of 8-inch thick (on a compacted subgrade and minimum 6-inch 95% compacted aggregate base course) 45X43 foot reinforced concrete pad (45X43 foot fenced area) with at least 0.5% slope away from the center point. Provide curbing or footing around the pad to prevent runoff from eroding the underside of pad.
☐	Provide fences 8 foot high with number 4 chain link wire fabric with top rails, bottom tension wires and 3 strands of barbed wire at the top on angled extension arms.
☐	Provide 20 foot wide (minimum) gate on 6-inch diameter posts plus a 4 foot wide walk through gate.
☐	Side slopes steeper than 3H:1V to be protected with riprap.
☐	Minimum access road width to be 20 feet.
☐	Minimum turnaround radius to be 45 feet.
☐	Pump Station to be at least 2 feet above 25 feet horizontally away from the 100 year flood line as determined by the most recent FEMA Flood Insurance Rate Map, or as established by acceptable modeling techniques.
CONTRACTOR NOTES (TO BE SHOWN ON PLANS)	
☐	Contractor to ensure that Power Company notifies DCDWM or Snapfinger Creek Advanced Wastewater Treatment Facility about the availability of 3-Phase Power and Voltage to the site. See Section IV.L.k.16 of the “Potable Water, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards”.
☐	Demonstrate pumps will not cavitate freewheeling (operate at pump run-out), or deadheading (operate at pump shut-off). This type of operation shall not be allowed.
☐	Demonstrate minimum time between pump starts is 10 minutes.
☐	Provide 4 sets of Operation & Maintenance Manuals to DeKalb County for the Generator and Automatic Transfer Switch.
☐	Demonstrate Generator is load tested at 100% full load on site for a period of four (4) hours.
☐	Demonstrate generators are capable of shutting down and activating the audible/visual alarms and telemetry if a damaging operating condition develops.
☐	Provide Stand-by Generator (Cummins or Caterpillar) specifications and shop drawings.
☐	Provide Automatic Transfer Switch specifications and shop drawings.

DEKALB COUNTY WATERSHED MANAGEMENT CHECKLIST FOR SANITARY SEWER PUMP STATION DESIGN REVIEW & APPROVAL			
Project Name:		**Date:**	Click here to enter a date.

☐	Provide a 60-month (from date of commissioning) comprehensive warranty.
☐	Provide Telemetry equipment details, specifications, and shop drawings.
☐	Demonstrate Low-Level Alarm, Pumps-off, Lead Pump-on Lead Pump-off and High Level Alarm settings are functional.
☐	The Contractor shall install and provide all equipment as well as conduct tests in accordance with “DeKalb County Potable Water, Gravity Sanitary Sewer, and Sanitary Sewer Pump Station and Force Main Design Standards”.
☐	No underground fuel storage tanks shall be permitted.
☐	Contractor to install Safety Placards and warning Signs on all equipment as per OSHA standards.
☐	Contractor/Developer is responsible for complete writing and programming of the PLC and RTU.
☐	Contractor to put in “Best Faith effort” to obtain 480 Volts, 3 Phase Power at the pump station.

DeKalb County DWM
Pump Station Start-Up Checklist

PROJECT DATA			
Name of Project:		**Requested Start-up Date:**	Click here to enter a date.
Name of Developer/Contractor:			
Company:			
Phone:		**Fax:**	**E-mail:**
Proposed Project Location:			
Land Lot:		**District:**	

Check List	
☐	A Force Main Test must be completed and accepted.
☐	A pump draw down test must be completed and accepted.
☐	A certified of compaction from a licensed Geotechnical Engineer must be completed and accepted.
☐	The General Contractor/Developer, Electrical Contractor, and Pump Manufacturer personnel must be scheduled to be on site at Start-up.
☐	All utilities (i.e. – electric, water, telephone and gas, if applicable) must be installed and working at Start-up.
☐	Submersible pumps will need to be pulled out of the wet well at Start-up. (The General Contractor is responsible for this.)
☐	Pumps must be able to run off of the main power source, as well as off of the generator.
☐	All spare parts, O&M Manuals, and applicable paperwork should be brought to Start-up. (i.e. – 4-hour load bank test, letter of compaction, utility names and account numbers, etc.)

THESE ITEMS MUST BE COMPLETE FRIOR TO SCHEDULING A START-UP.

When this check off list is complete, it will need to be faxed to the Snapfinger Plant. Plant Superintendent Phone: (770) 808-2900

The desired Start-up date should be listed along with a contact name and phone number. If all the items are complete, you will be contacted with a Start-up date and time. Note: If any items that are checked are not complete upon arrival, the Pump Station Start-up will need to be rescheduled and a fee could be assessed for additional trips.

Signature: _____ **Date:** _____

1580 Roadhaven Drive, Stone Mountain, GA 30083
DEKALB COUNTY WATERSHED MANAGEMENT

DeKalb County DWM
Pump Station Design Review and Approval Form

PROJECT DATA

Name of Project: _____

Name of Developer/Contractor: _____

Company: _____

Name of Georgia Professional Engineer: _____

Company: _____

Proposed Project Location:

Land Lot: _____ **District:** _____

DESIGN DATA

Pump Manufacturer: _____

Pump Model: _____

Pump Impeller Diameter: _____

Pump Horsepower: _____

Pump Capacity Available for Future Development: _____

Pump Suction Opening Diameter (4" minimum): _____

Pump Discharge Opening Diameter (4" minimum): _____

Generator Type: _____

Generator Manufacturer: _____

Generator Load Rating: _____

Telemetry Equipment Manufacturer:

REQUIRED ATTACHMENTS

1. Location map depicting property and land lot lines, buildings, and roads.
2. Pump curve and system head curve.
3. Pump details, specifications, and shop drawings, including wet well elevations.
4. Valve details, specifications, and shop drawings.
5. Flow meter details, specifications, and shop drawings.
6. Generator details, specifications, and shop drawings, along with automatic transfer switch specifications and shop drawings.
7. Telemetry equipment details, specifications, and shop drawings.
8. Single line electrical drawing showing power distribution for the proposed pump station.
9. Force main design showing size, material, plan, profile, and valve locations.
10. Depiction of receiving gravity sanitary sewer system and connection to proposed pump station force main.

DeKalb County DWM
Pump Station Conceptual Review and Approval Form

PROJECT DATA			
Name of Project:			
Name of Developer/Contractor:			
Company:			
Name of Georgia Professional Engineer:			
Company:			
Proposed Project Location:			
Land Lot:		**District:**	

SITE DATA					
Area of Site:		**acres**	**Area of Drainage Basin:**		**acres**
Existing Land Use:					
Proposed Land Use:					
Number of Units or Building Area:					
Estimated Wastewater Flow:		**ADF gpd**			**Peak gpd**

ADDITIONAL INFORMATION		
Is existing suite within 100-year FEMA floodplain?		
Is existing site already developed?		
Is the offsite area within the drainage basin already developed?		
Distance to nearest gravity sanitary sewer:		feet
Location of Proposed Connection to Existing Sanitary Sewer:		
Reason proposed site requires a pump station facility:		

REQUIRED ATTACHMENTS

1. Proposed site located on a USGS Quadrangle map, with the proposed pump station location shown. The map shall show the limits of the proposed development and of the sub-basin that drains to the pump station.
2. Location of proposed connection to receiving sanitary sewer.
3. Projection of wastewater flows generated by the proposed development.
4. Projection of wastewater flows generated in the remainder of the sub-basin.

DeKalb County DWM
Pump Station Design Calculations Form

PROJECT DATA

Name of Project: _____

Name of Developer/Contractor: _____

Company: _____

Name of Georgia Professional Engineer: _____

Company: _____

Proposed Project Location:

Land Lot: _____ **District:** _____

DESIGN FLOW

Proposed Average Daily Flow =	_____	gpm
Offsite Average Daily Flow =	_____	gpm
Total Average Daily Flow =	_____	gpm
Peaking Factor =	_____	gpm
Total Peak Flow =	_____	gpm

SYSTEM HEAD CURVE

Static Head Loss =	_____	feet
Individual Pump Flow Rate =	_____	gpm
Force Main Diameter (4" Minimum) =	_____	inches
Effective Force Main Length =	_____	feet
Friction Head Loss, New Condition (C = 130) =	_____	feet
Friction Head Loss, Aged Condition (C = 100) =	_____	feet
Force Main Velocity = (2.0 ft/s minimum, 5.0 ft/s maximum)	_____	feet / second

WET WELL

Wet Well Diameter (6' minimum) =	_____	feet
Wet Well Depth =	_____	feet
Pump Cycle Time (10 minute minimum) =	_____	minutes
Active Storage Volume =	_____	gallons
Top of Wet Well Elevation =	_____	feet
High Level Alarm Elevation =	_____	feet
Lag Pump On Elevation =	_____	feet
Lead Pump On Elevation =	_____	feet
Pumps Off Elevation =	_____	feet
Low Level Alarm Elevation =	_____	feet
Force Main Invert =	_____	feet
Elevation at which Spill will Occur =	_____	feet

Location of Initial Spill: _____

ENGINEER'S CERTIFICATE
CONSTRUCTION COMPLETION FORM

DEPARTMENT OF WATERSHED MANAGEMENT

DATE: _____

PROJECT NAME: _____

LAND LOT: **DISTRICT:**

This is to certify that _____

Have (has) been graded to within three (3) inches of the final grade, to conform to profile grade approved by DeKalb County Department of Planning and Sustainability;

That street(s) is (are) graded to proper width to allow for an eight (8) foot shoulder on each side of the curb. The shoulder is within three (3) inches of final grade;

That the proper catch basins have been erected, and the proper drainage facilities installed;

That sewers and sewer services have been installed;

That proof / documentation of 95% compaction has been provided as required;

That if easements are involved, they are within three (3) inches of final grade;

That no water mains will be laid until center line stakes have been installed and materials inspected and approved by Chief, Construction Management.

COMMENTS: _____

Signed: _____ **Date Approved:** _____

Developer's/Contractor's Design Engineer

_____ _____

DCDPS Development Engineer **DCDPS Chief Construction Manager**

NOTE: Submit completed Engineers Certificate to the Development Division.

DEKALB COUNTY DEPARTMENT OF SUSTAINABILITY AND
DEPARTMENT OF WATERSHED MANAGEMENT
PUMP STATION DESIGN REVIEW AND APPROVAL FORM

Project Data

Name of Project: Baranco Condominiums

Name of Developer/Contractor: Tim Womack Company: Ambling Properties

Name of Georgia Professional Engineer: Lewis A. Waldrop Company: Haines Gipson

Proposed Project Location: Covinton Highway Land Lot: 196 District: 15

Design Data

Pump Manufacturer: Flygt

Pump Model: CP3202.181 MT

Pump Impeller Diameter: 173 mm

Pump Horsepower: 5 hp

Pump Capacity Available for Future Development: 0

Pump Suction Opening Diameter (4" minimum): 4"

Pump Discharge Opening Diameter (4" minimum): 4"

Generator Type: Liquid cooled sparc ignited for natural gass

Generator Manufacturer: Onan

Generator Load Rating: 25 KVA

Telemetry Equipment Manufacturer: Motorola

Required Attachments

1.	Location map depicting property and land lot lines, buildings, and roads.
2.	Pump curve and system head curve.
3.	Pump details, specifications, and shop drawings, including wet well elevations.
4.	Valve details, specifications, and shop drawings.
5.	Flow meter details, specifications, and shop drawings.
6.	Generator details, specifications, and shop drawings, along with automatic transfer switch specifications and shop drawings.
7.	Telemetry equipment details, specifications, and shop drawings.
8.	Single line electrical drawing showing power distribution for the proposed pump station.
9.	Force main design showing size, material, plan, profile, and valve locations.
10.	Depiction of receiving gravity sanitary sewer system and connection to proposed pump station force main.

DeKalb County GEORGIA

WATER Matters

DEKALB COUNTY DEPARTMENT OF SUSTAINABILITY AND
DEPARTMENT OF WATERSHED MANAGEMENT
PUMP STATION DESIGN REVIEW AND APPROVAL FORM

Project Data

Name of Project: Baranco Conduminiums

Name of Developer/Contractor: Tim Womack Company: Ambling Properties

Name of Georgia Professional Engineer: Lewis A. Waldro Company: Haines Gipson

Proposed Project Location: Covington Highway Land Lot: 196 District: 15

Design Flow

Proposed Average Daily Flow = 29.17 gpm

Offsite Average Daily Flow = 0 gpm

Total Average Daily Flow = 29.17 gpm

Peaking Factor = 4 gpm

Total Peak Flow = 116.7 gpm

System Head Curve

Static Head Loss = 30.5 feet

Individual Pump Flow Rate = 120 gpm

Force Main Diameter (4" minimum) = 4 inches

Effective Force Main Length = 293 feet

Friction Head Loss, New Condition (C = 130) = 3.1 feet

Friction Head Loss, Aged Condition (C = 100) = 5.0 feet

DeKalb County
GEORGIA

WATER Matters

Total Dynamic Head, New Condition (C = 130) = 33.6 feet

Total Dynamic Head, Aged Condition (C=100) = 35.5 feet

Force Main Velocity = 3.1 feet / second
(2.0 ft/s minimum, 5.0 ft/s maximum)

Wet Well

Wet Well Diameter (6' minimum) = 6 feet

Wet Well Depth = 30 feet

Pump Cycle Time (10 minute minimum) = 109 minutes

Active Storage Volume = 422 gallons

Top of Wet Well Elevation = 975.0 feet

High Level Alarm Elevation = 951.0 feet

Lag Pump On Elevation = 950.5 feet

Lead Pump On Elevation = 950.0 feet

Pumps Off Elevation = 948.0 feet

Low Level Alarm Elevation = 947.5 feet

Force Main Invert = 972.5 feet

Elevation at which Spill will Occur = 967.5 feet

Location of Initial Spill: Manhole 1-E

DeKalb County
GEORGIA

WATER Matters

Pump Station Design Calculations

For

Baranco Townhomes

Dekalb County, Georgia

EXAMPLE

Haines, Gipson & Associates, Inc.
1550 North Brown Road
Lawrenceville, Georgia 30043
(770) 491-7550
Fax (770) 491-7750

May 2006
Revised December 2006

DeKalb County GEORGIA | WATER Matters

Estimated sewage flows for lift station at Baranco Townhomes

Type of establishment	Estimated Flow per Unit	Size	Estimated Flow Gal/day	Estimated Flow GPM
Townhouse	400.0 (ADF)	105 (#Units)	42000	29.17
				29.17

Dekalb Co. Peaking Factor 4.01 Use PF = 4

Design flow for lift station 116.7 GPM

For a 4" dia force main - flow reqluired to maintain 2 ft/sec is 80 gpm

Provide design for 120 GPM

Active wet well volmue req'd 300

Elevation of lead pump on 950

Active Wet Well Volume 422

Elevation of pump off 948
Elevation of outlet at manhole 978.5 at outlet
Total static head 30.5 ft

Equiv. Length of pipe

	No.	Equiv Len	Total Len
4" pipe	186		186
90 deg elbows	6	12	72
inlet loss	1	6	6
outlet loss	1	2	2
4" gate valve	1	2	2
4" check valve	1	25	25

293 LF 4" pipe

DeKalb County
GEORGIA

WATER Matters

System head curve 1 for new conditions

Flow gpm	Pipe Dia in	"C"	Equiv L ft	Tot Frict ft	Static ft	TDH ft
50	4.000	130	293	0.61	30.5	31.11
60	4.000	130	293	0.86	30.5	31.36
70	4.000	130	293	1.15	30.5	31.65
80	4.000	130	293	1.47	30.5	31.97
90	4.000	130	293	1.82	30.5	32.32
100	4.000	130	293	2.22	30.5	32.72
120	4.000	130	293	3.10	30.5	33.60
140	4.000	130	293	4.13	30.5	34.63
160	4.000	130	293	5.29	30.5	35.79
180	4.000	130	293	6.57	30.5	37.07
200	4.000	130	293	7.99	30.5	38.49
220	4.000	130	293	9.53	30.5	40.03
240	4.000	130	293	11.19	30.5	41.69
260	4.000	130	293	12.98	30.5	43.48
280	4.000	130	293	14.88	30.5	45.38
300	4.000	130	293	16.91	30.5	47.41
320	4.000	130	293	19.05	30.5	49.55
340	4.000	130	293	21.32	30.5	51.82
360	4.000	130	293	23.69	30.5	54.19
380	4.000	130	293	26.18	30.5	56.68
400	4.000	130	293	28.79	30.5	59.29

System head curve 2 for new conditions

Flow gpm	Pipe Dia in	"C"	Equiv L ft	Tot Frict ft	Static ft	TDH ft
50	4.000	130	293	0.61	28.5	29.11
60	4.000	130	293	0.86	28.5	29.36
70	4.000	130	293	1.15	28.5	29.65
80	4.000	130	293	1.47	28.5	29.97
90	4.000	130	293	1.82	28.5	30.32
100	4.000	130	293	2.22	28.5	30.72
120	4.000	130	293	3.10	28.5	31.60
140	4.000	130	293	4.13	28.5	32.63
160	4.000	130	293	5.29	28.5	33.79
180	4.000	130	293	6.57	28.5	35.07
200	4.000	130	293	7.99	28.5	36.49
220	4.000	130	293	9.53	28.5	38.03
240	4.000	130	293	11.19	28.5	39.69
260	4.000	130	293	12.98	28.5	41.48
280	4.000	130	293	14.88	28.5	43.38
300	4.000	130	293	16.91	28.5	45.41
320	4.000	130	293	19.05	28.5	47.55
340	4.000	130	293	21.32	28.5	49.82
360	4.000	130	293	23.69	28.5	52.19
380	4.000	130	293	26.18	28.5	54.68
400	4.000	130	293	28.79	28.5	57.29

DeKalb County
GEORGIA

WATER Matters

System head curve 1 for aged conditions

Flow gpm	Pipe Dia in	"C"	Equiv L ft	Tot Frict ft	Static ft	TDH ft
50	4.000	100	293	1.00	30.5	31.50
60	4.000	100	293	1.40	30.5	31.90
70	4.000	100	293	1.86	30.5	32.36
80	4.000	100	293	2.38	30.5	32.88
90	4.000	100	293	2.96	30.5	33.46
100	4.000	100	293	3.60	30.5	34.10
120	4.000	100	293	5.04	30.5	35.54
140	4.000	100	293	6.71	30.5	37.21
160	4.000	100	293	8.59	30.5	39.09
180	4.000	100	293	10.68	30.5	41.18
200	4.000	100	293	12.98	30.5	43.48
220	4.000	100	293	15.48	30.5	45.98
240	4.000	100	293	18.18	30.5	48.68
260	4.000	100	293	21.08	30.5	51.58
280	4.000	100	293	24.18	30.5	54.68
300	4.000	100	293	27.47	30.5	57.97
320	4.000	100	293	30.96	30.5	61.46
340	4.000	100	293	34.63	30.5	65.13
360	4.000	100	293	38.50	30.5	69.00
380	4.000	100	293	42.54	30.5	73.04
400	4.000	100	293	46.78	30.5	77.28

System head curve 2 for aged conditions

Flow gpm	Pipe Dia in	"C"	Equiv L ft	Tot Frict ft	Static ft	TDH ft
50	4.000	100	293	1.00	28.5	29.50
60	4.000	100	293	1.40	28.5	29.90
70	4.000	100	293	1.86	28.5	30.36
80	4.000	100	293	2.38	28.5	30.88
90	4.000	100	293	2.96	28.5	31.46
100	4.000	100	293	3.60	28.5	32.10
120	4.000	100	293	5.04	28.5	33.54
140	4.000	100	293	6.71	28.5	35.21
160	4.000	100	293	8.59	28.5	37.09
180	4.000	100	293	10.68	28.5	39.18
200	4.000	100	293	12.98	28.5	41.48
220	4.000	100	293	15.48	28.5	43.98
240	4.000	100	293	18.18	28.5	46.68
260	4.000	100	293	21.08	28.5	49.58
280	4.000	100	293	24.18	28.5	52.68
300	4.000	100	293	27.47	28.5	55.97
320	4.000	100	293	30.96	28.5	59.46
340	4.000	100	293	34.63	28.5	63.13
360	4.000	100	293	38.50	28.5	67.00
380	4.000	100	293	42.54	28.5	71.04
400	4.000	100	293	46.78	28.5	75.28

Pumpstation cycle time

Wet well storage (gal)	422
Pump discharge (gpm)	120
Design max flow (gpm)	116
Time to pump down (min) *	105.5
Time to refill (min) **	3.6
Total cycle time (min)	109.1

* time to pump down is volume of wet well divided by pumping rate minus inflow rate

** time to refill is volume of wet well divided by inflow rate

EXAMPLE

Wet Well Storage

High water alarm elevation	951.00	
Lowest point of overflow elevation	967.50	
Invert of incoming sewer	957.83	
Station Diameter (ft)	6	
Storage Volume to invert (cf)	193	
Volume of overflow vault (cf)	2624	
Overflow vault square dim (ft)	19.60	inside dimention(use 12 X 32)
Max allowable elevation in box (ft)	957.83	elevation of invert of manhole 1-B
Total volume (cf)	2817	
Volume req'd for 3 hr. detention (cf)		2816

EXAMPLE

Wet Well Flotation Calculations

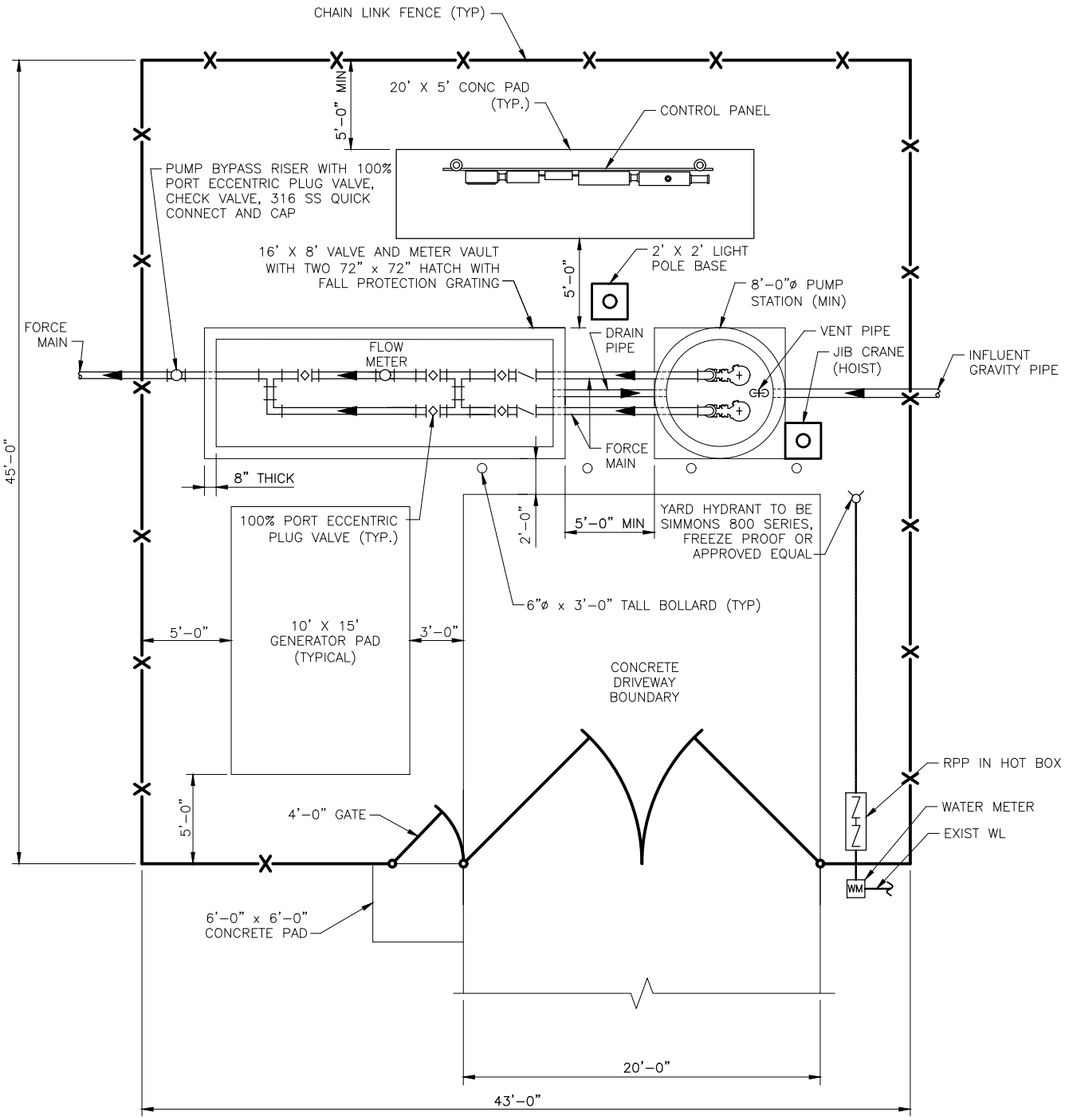
Elevation of high water		975.5
Elevation of bottom of wet well		946
Diameter of wet well		6
Wt of wet well		
wet well		45180
Bottom of wet well		5773
Wt of top slab		14109
Wt of flotation collar (6 CY)		24300
Total wt		89362
Buoyance force		
depth	29.5	
Diameter	7	70842
base		3994
Flotation collar		10108
Total buoyance force		84944
Factor of safety		1.052

Down Stream Sewer Capacity

Down stream sewer size	8 in
Down stream sewer slope	0.66 %
Pipe capacity	640000 GPD 444 GPM
Pump discharge	160 GPM
Estimated existing flow	15 GPM
Sewer capacity as a percent of max	0.61 % remaining

Department of Watershed Management
Standard Details List – Sanitary Sewer, Pump Station and Force Main

Standard Details List Sanitary Sewer Pump Station and Force Main	
Detail Number	**TITLE**
P-001	Pumping Station Site Plan (Typical/Example)
P-002	Pumping Station Overhead and Underground Power Detail
P-003	Hose Bib Service Connection Detail
P-004	Jib Crane (Hoist) Base
P-005	Pump Station Light Pole Detail
P-006	Pump Station High Water Alarm Light Mounting Detail
P-007	Pump Station Slab and Curb Detail
P-008	Generator Pad Detail
P-009	Fence and Gate Detail
P-010	Pump Station Noise Wall
P-011	Example Access Driveway & Turn Around Area
P-012	Pump Station Typical Drive Cross Section
P-013	Pump Station Detail
P-014	Pump Station Coating Detail for HDPE Liner
P-015	Pump Station Cable Detail
P-016	Example Pump Station Overflow Tank Detail
P-017	Combination Air-Vacuum Valve Installation Detail
P-018	Electrical Legend
P-019	Pump Station RTU Connections
P-020	Basic Pump Station Control Panel Detail RTU Alarm Inputs
P-021	Pump Station Generator Transfer Switch Generator Run Alarm
P-022	Pump Station Control Panel for (240V) and (480V)
P-023	Example Duplex Pump Control Schematic (480V)
P-024	Example Duplex Control Panel Enclosure Dead Front Layout



NOTES:

1. DETAIL IS EXAMPLE SITE PLAN. SIZES ARE RELATIVE AND BASED ON MINIMUM CRITERIA. LARGER WETWELLS, VALVE VAULTS, ETC, MAY BE REQUIRED BASED ON SITE SPECIFIC CONDITIONS.
2. PUMP STATION PAD AND DRIVEWAY SHALL INCLUDE EXPANSION JOINTS AS NEEDED.
3. PUMP STATION PAD, OVERFLOW VAULT TOP SLAB, AND DRIVEWAY REINFORCEMENT SHALL BE DESIGNED TO WITHSTAND 100,000 LB LOAD.
4. ELECTRICAL AND CONTROL PANELS SHALL BE PROVIDED WITH A 4 FT WIDE, 8 FT HIGH CANOPY. LENGTH OF CANOPY IS DETERMINED BY THE TOTAL COMBINED LENGTH OF ELECTRICAL AND CONTROL PANELS.

DeKalb County GEORGIA

STANDARD DETAILS

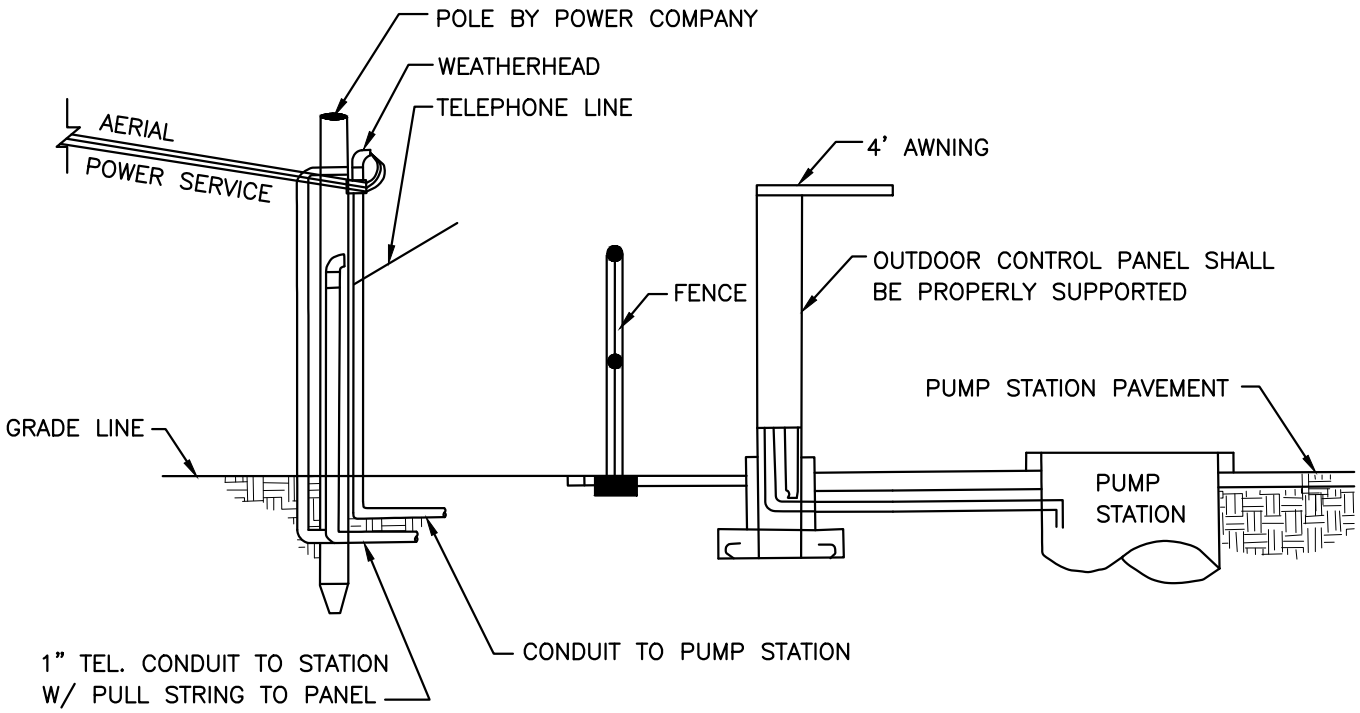
09/17

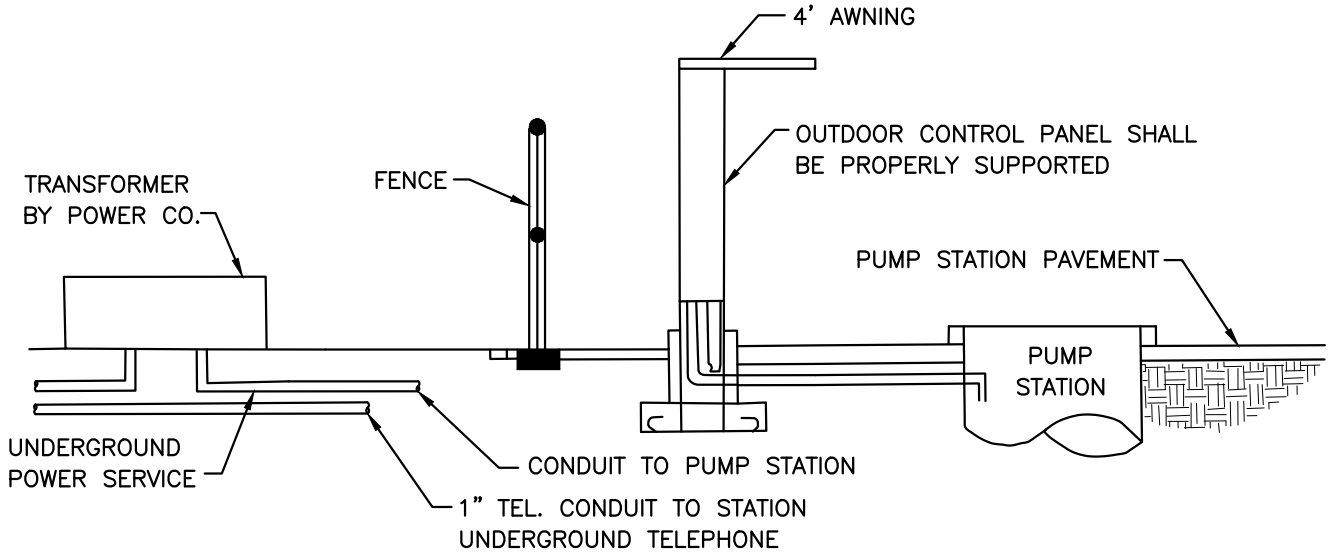
PUMP STATION SITE PLAN (TYPICAL/EXAMPLE)

NOT TO SCALE

WATER Matters

DETAIL NO. P-001



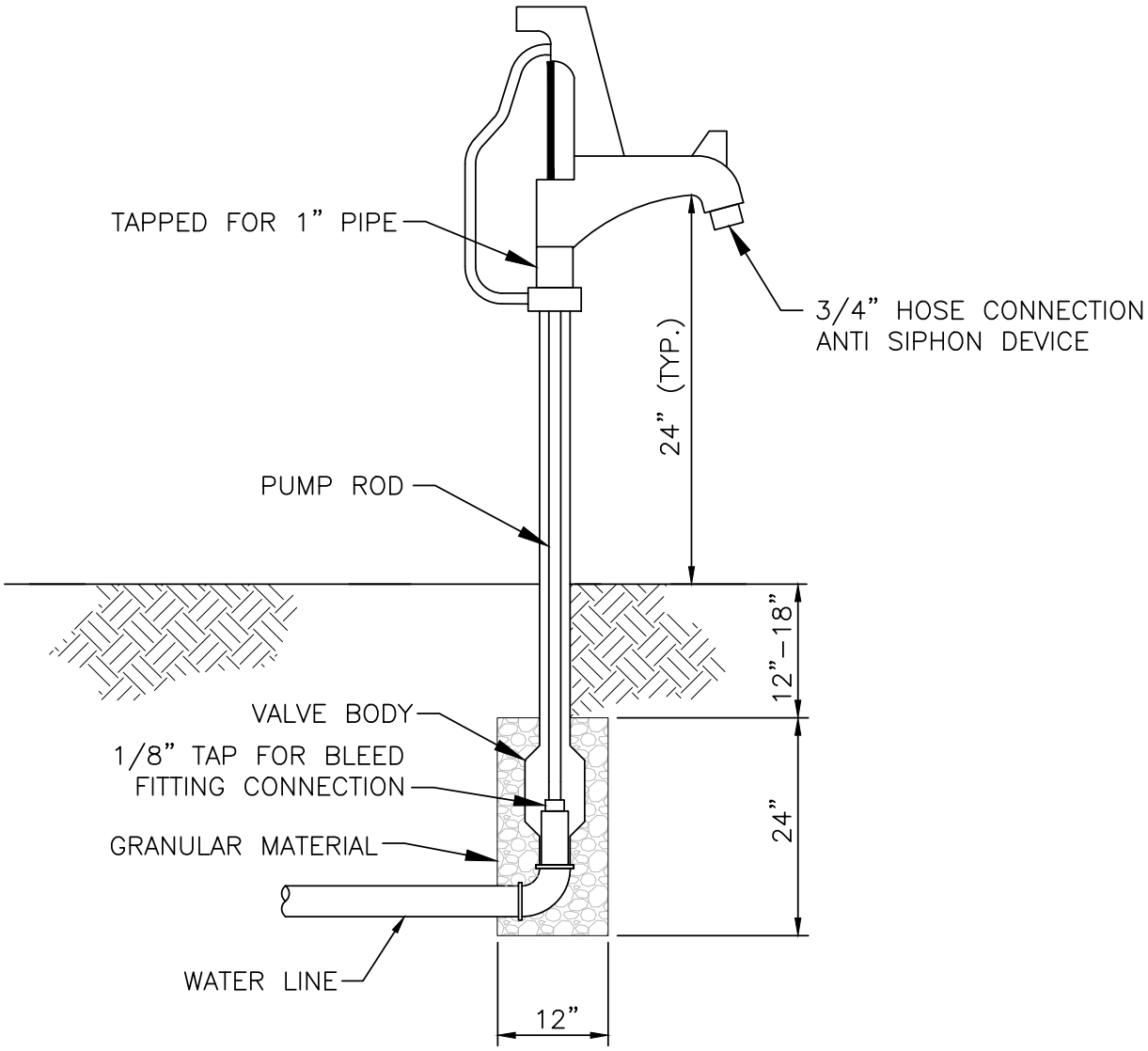


ALTERNATE

NOTES:

1. METER AND DISCONNECT SHALL BE PLACED ON ELECTRICAL/CONTROL PANEL SUPPORT. (MAIN BREAKER IS SHOWN ON P–022).
2. DISCONNECT SWITCH MUST BE LOCKABLE IN EACH POSITION.

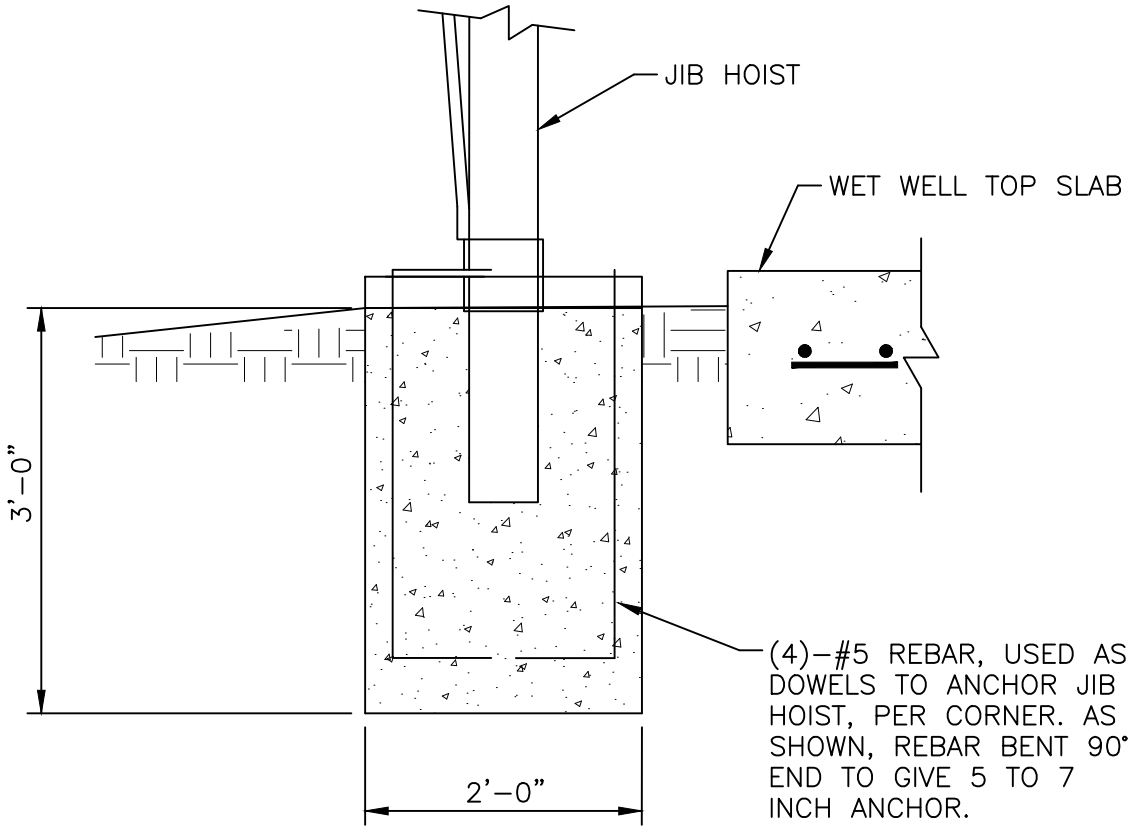
DeKalb County GEORGIA	**STANDARD DETAILS**	09/17
	Pump Station Overhead and Underground Power Detail NOT TO SCALE	WATER Matters
		DETAIL NO. P-002



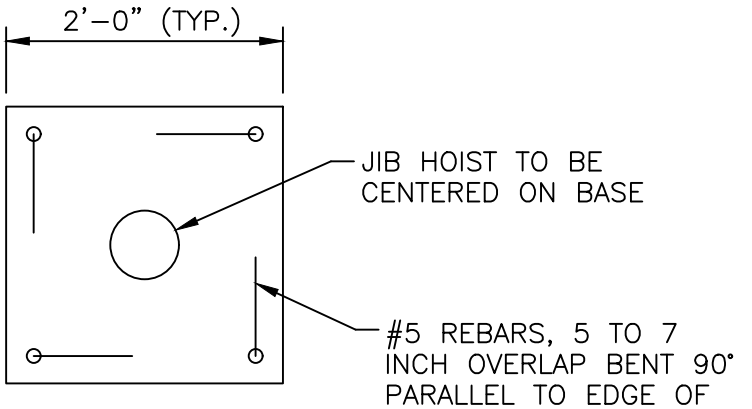
NOTES:

1. YARD HYDRANT TO BE SIMMONS 800 SERIES FREEZE PROOF OR APPROVED EQUAL.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	HOSE BIBB SERVICE CONNECTION DETAIL	WATER Matters
	NOT-TO-SCALE	DETAIL NO. P-003



PROFILE



PLAN

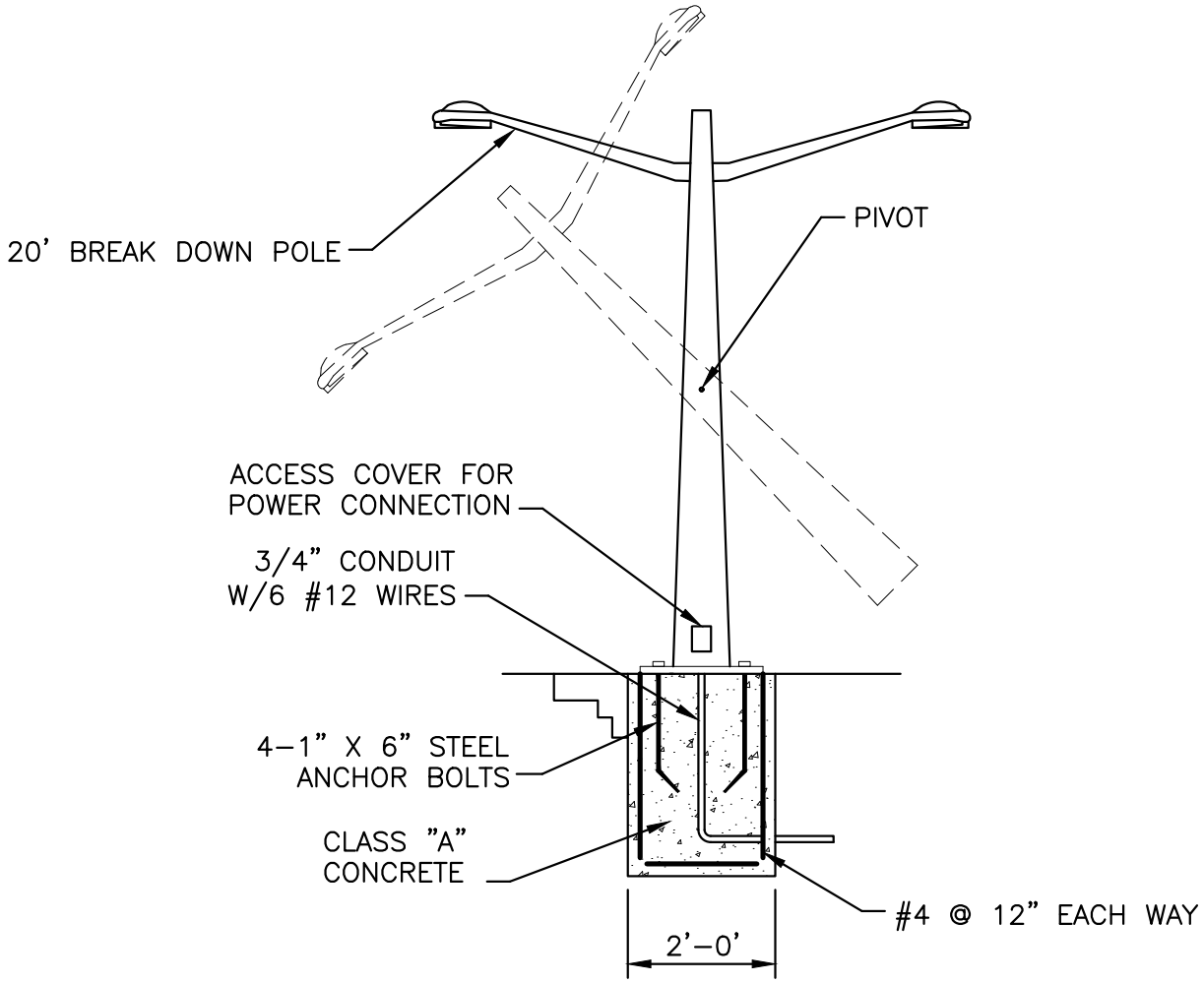
NOTE:

1. BASE OF THE JIB CRANE SHOULD BE DESIGNED ACCORDING TO THE MANUFACTURERS INSTALLATION STANDARDS AND LOAD CAPACITY OF THE CRANE. MINIMUM SIZE SHOULD BE NO LESS THAN 2'–0" x 2'–0" x 3'–0"

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Jib Crane (Hoist) Base	WATER Matters
	NOT TO SCALE	DETAIL NO. P-004

NOTE:

EXTERIOR HINGED LIGHT POLE WITH 200 WATT LED 3600 CONTROL, WITH HEAT AND IMPACT RESISTANT LENS. POLE IS TO BE ARCHITECTURAL BROWN AND IS TO BE SUPPLIED WITH LOWERING WENCH.



DeKalb County GEORGIA

STANDARD DETAILS

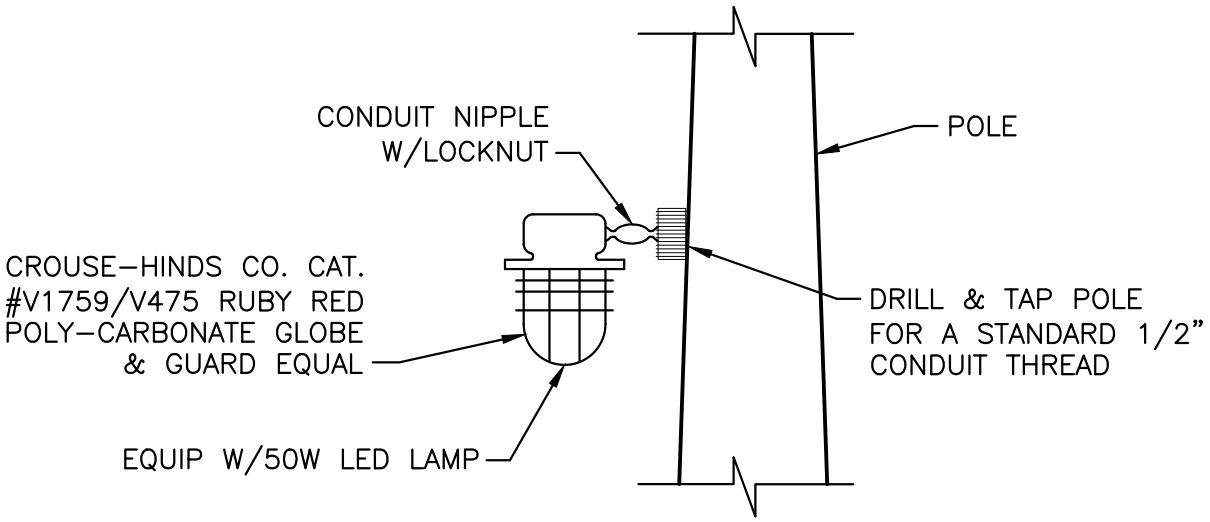
Pump Station
Light Pole Detail

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. P-005



NOTES:

1. THE LUMINAIRE SHALL BE PHOTOELECTRIC AND SWITCH CONTROLLED.

DeKalb County
GEORGIA

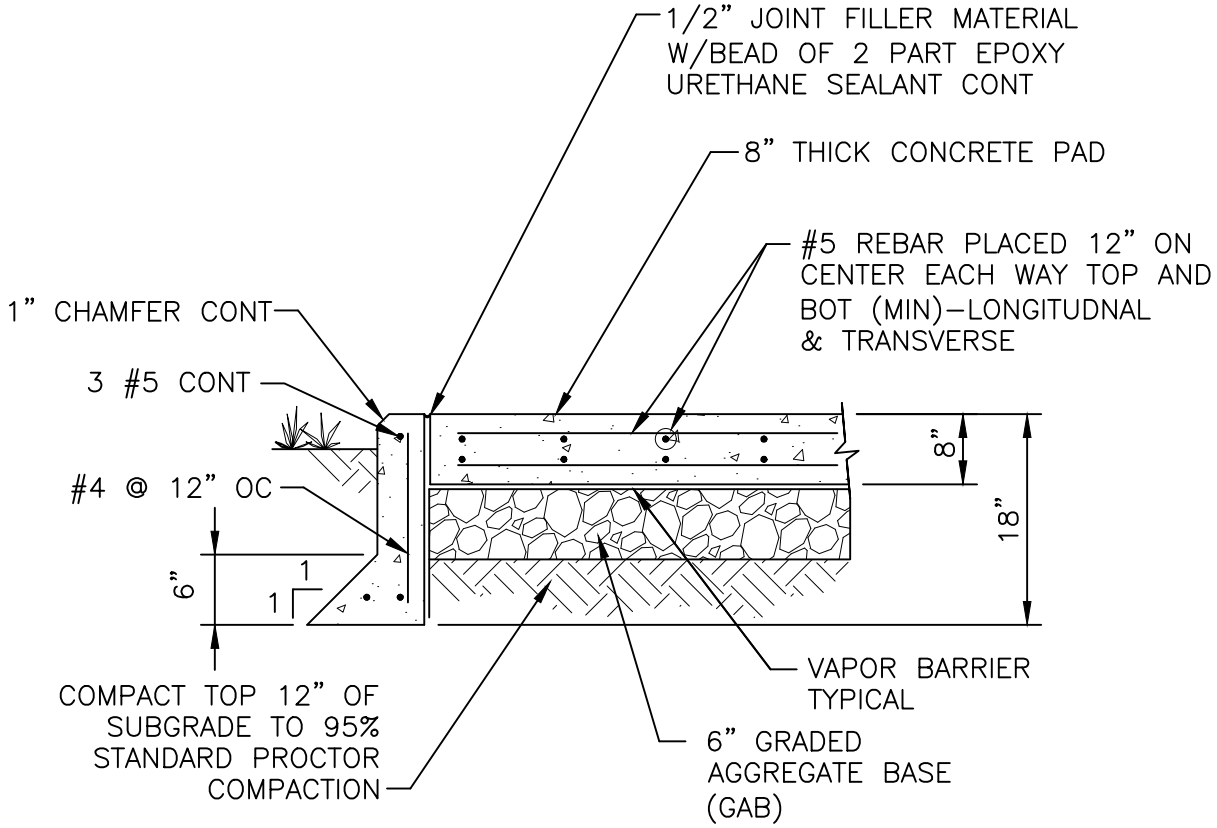
STANDARD DETAILS

Pump Station
High Water Alarm Light
Mounting Detail
NOT TO SCALE

09/17

WATER Matters

DETAIL NO. P-006



NOTES:

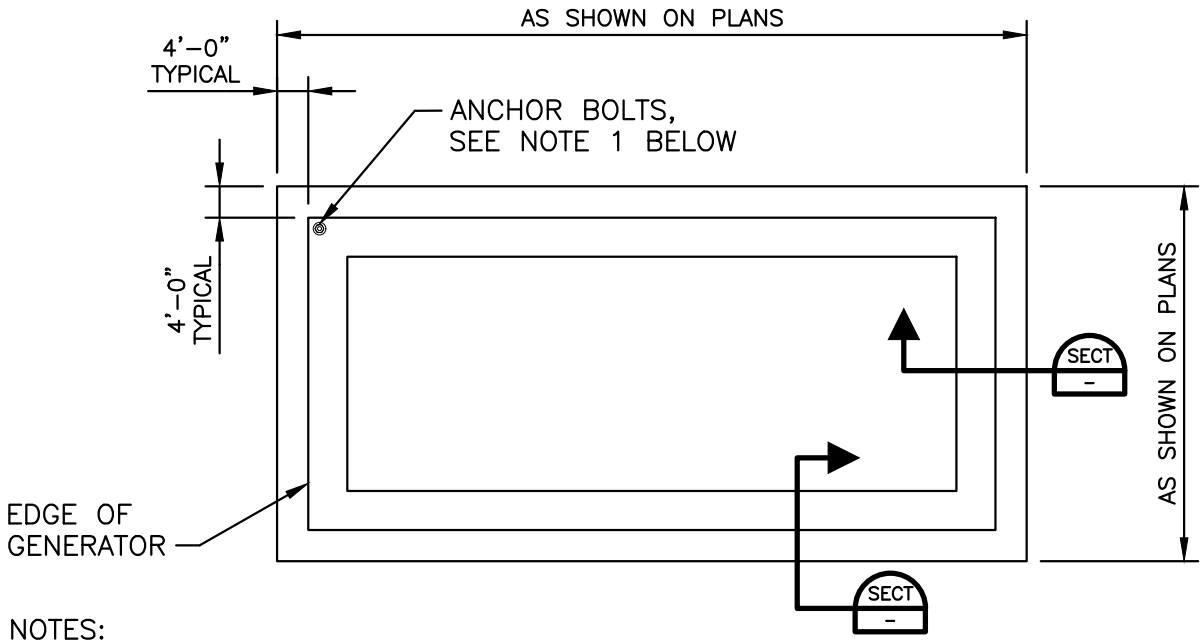
1. PUMP STATION CONCRETE PAD TO BE A MINIMUM OF 8" THICK ON A COMPACTED SUB–GRADE AND A MINIMUM 6" AGGREGATE BASE COURSE COMPACTED TO 95% STANDARD PROCTOR COMPACTION.

2. PROVIDE CURBING, AS SHOWN, AROUND THE PAD TO PREVENT RUNOFF FROM ERODING THE UNDERSIDE OF THE PAD.

3. PUMP STATION PAD AND DRIVEWAY SHALL INCLUDE EXPANSION JOINTS AS NEEDED.

4. PUMP STATION PAD AND DRIVEWAY REINFORCEMENT SHALL BE DESIGNED TO WITHSTAND 100,000 LB LOAD.

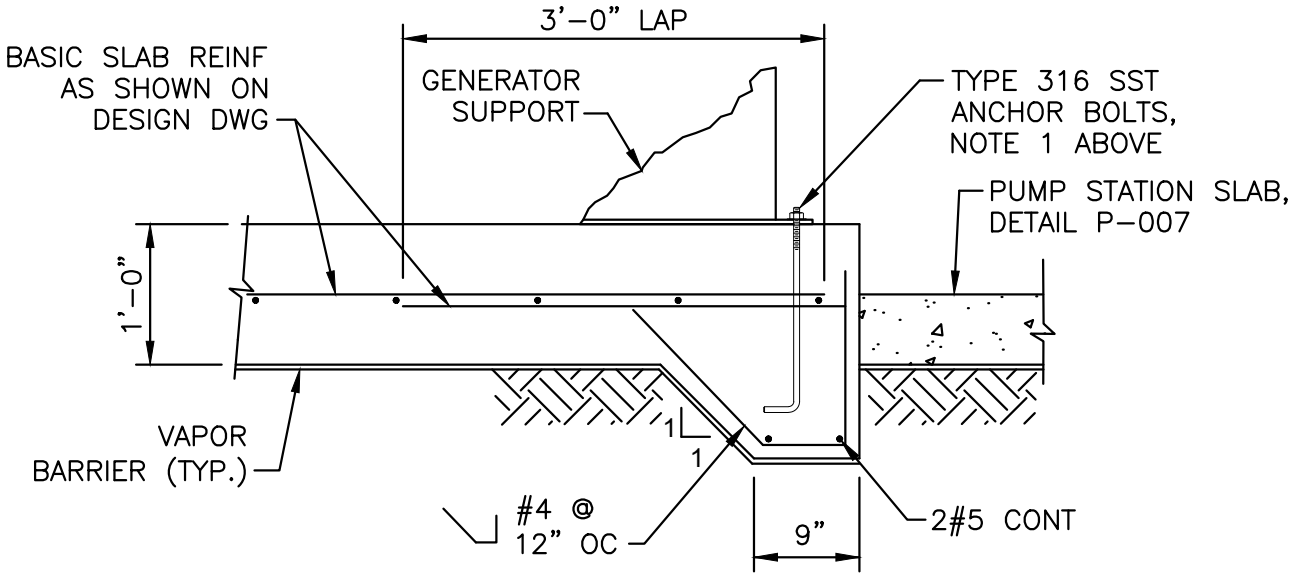
DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Pump Station Slab And Curb Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. P-007



NOTES:

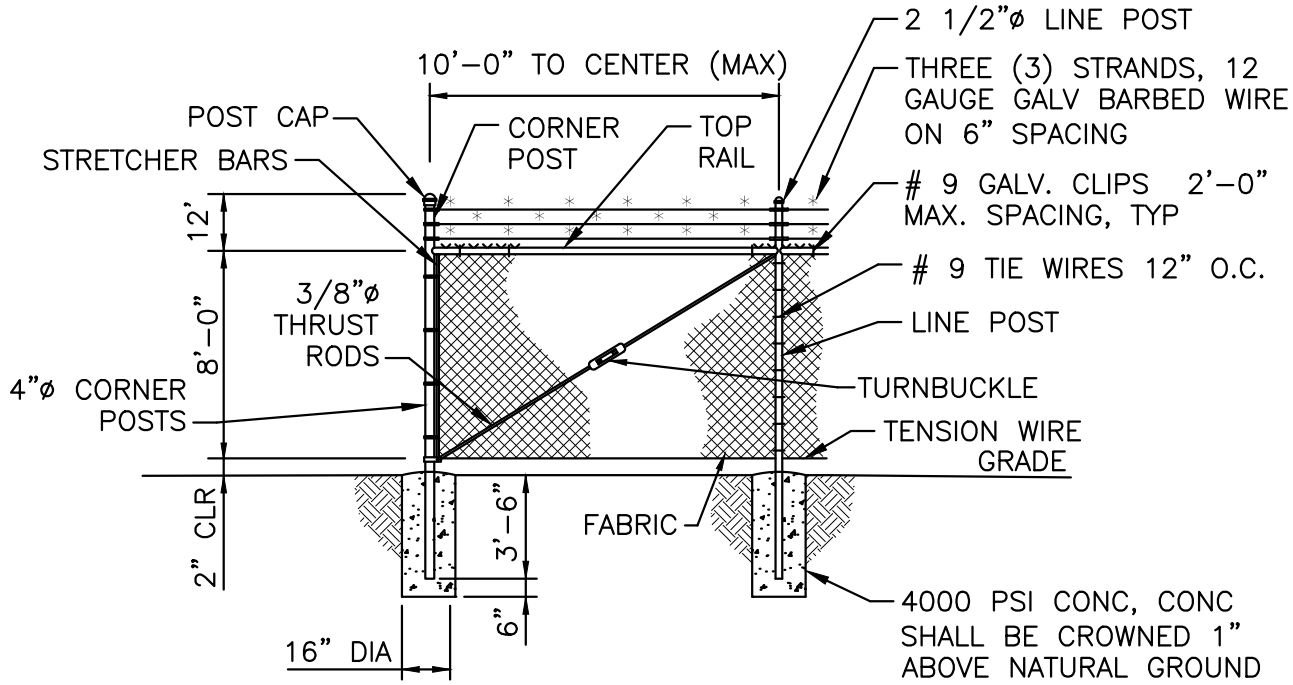
1. VERIFY QUANTITY, TYPE, DIAMETER AND LENGTH OF ANCHOR BOLTS REQUIRED BY MANUFACTURER PRIOR TO ORDERING AND/OR EMBEDDING FASTENERS IN CONCRETE SLAB.
2. DESIGN ENGINEER SHALL DESIGN GENERATOR SLAB TO MEET MINIMUM LOADING OF THE GENERATOR AND FUEL.

PLAN

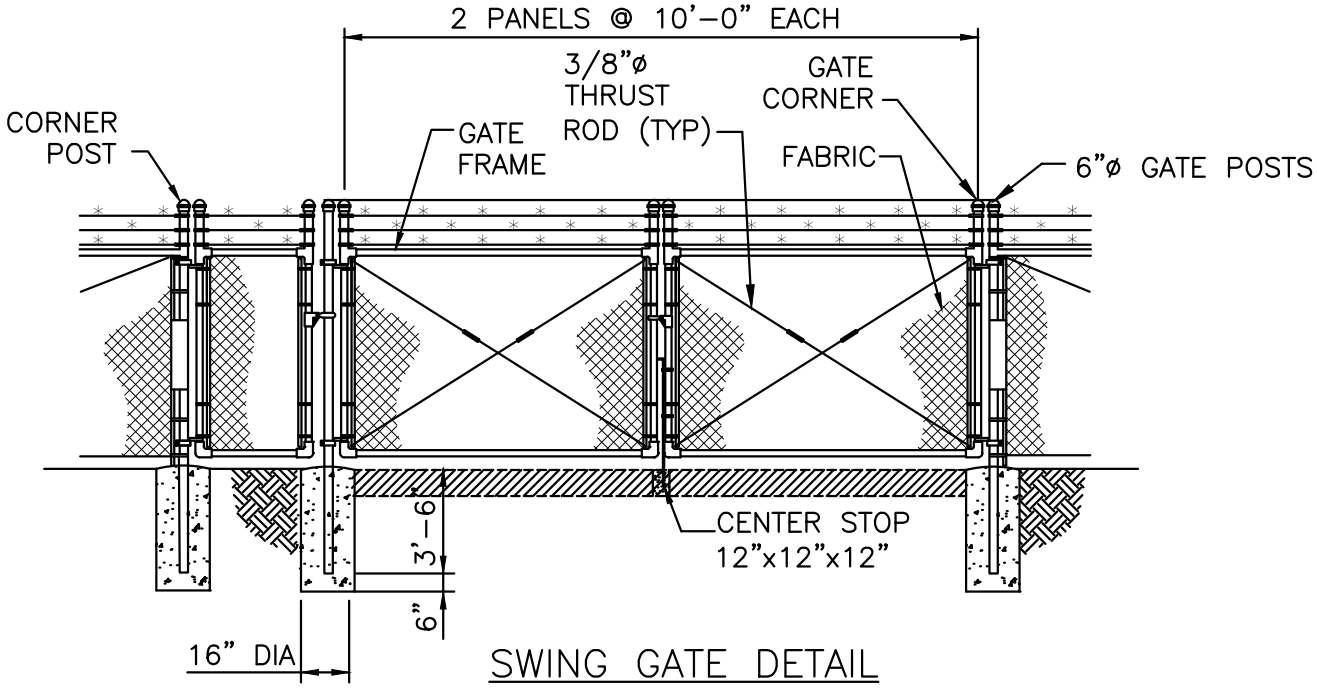


SECTION (TYPICAL)

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Generator Pad Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. P-008



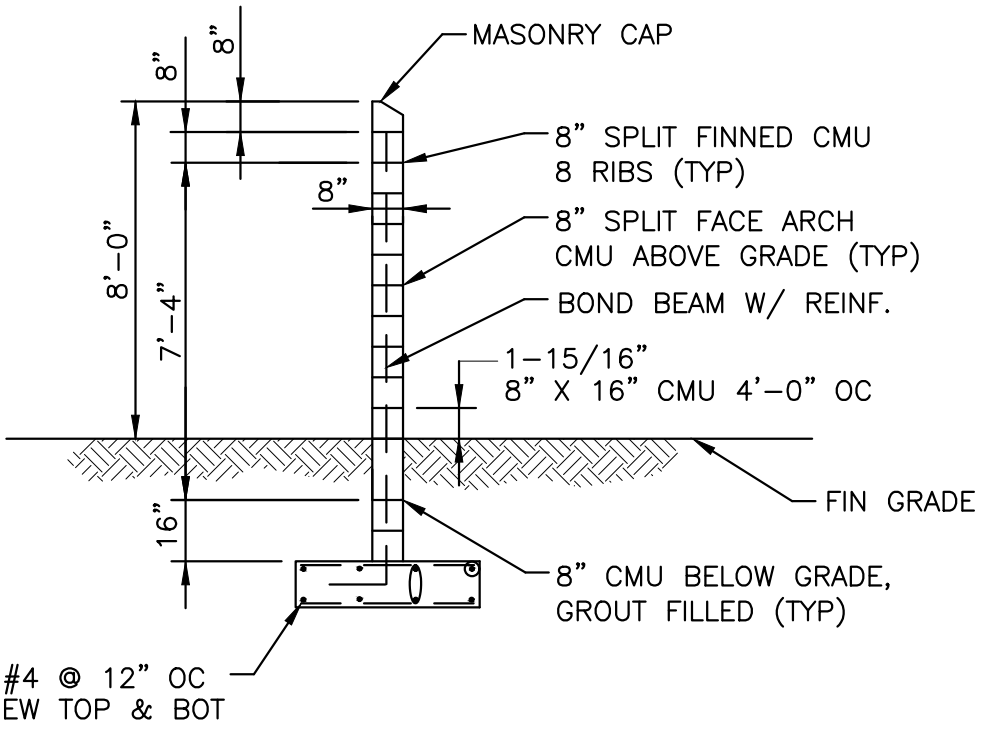
FENCING – CORNER DETAIL



SWING GATE DETAIL

NOTES:
1. THRUST RODS ARE REQUIRED FOR EACH GATE SECTION AND THE FIRST SPAN ON EACH SIDE OF A CORNER POST ONLY.
2. TOP LOCK HDPE FENCE SLATS ARE REQUIRED FOR ALL PUMP STATION FENCES.
3. NUMBER 4 CHAINLINK WIRE FABRIC W/TOP RAILS.

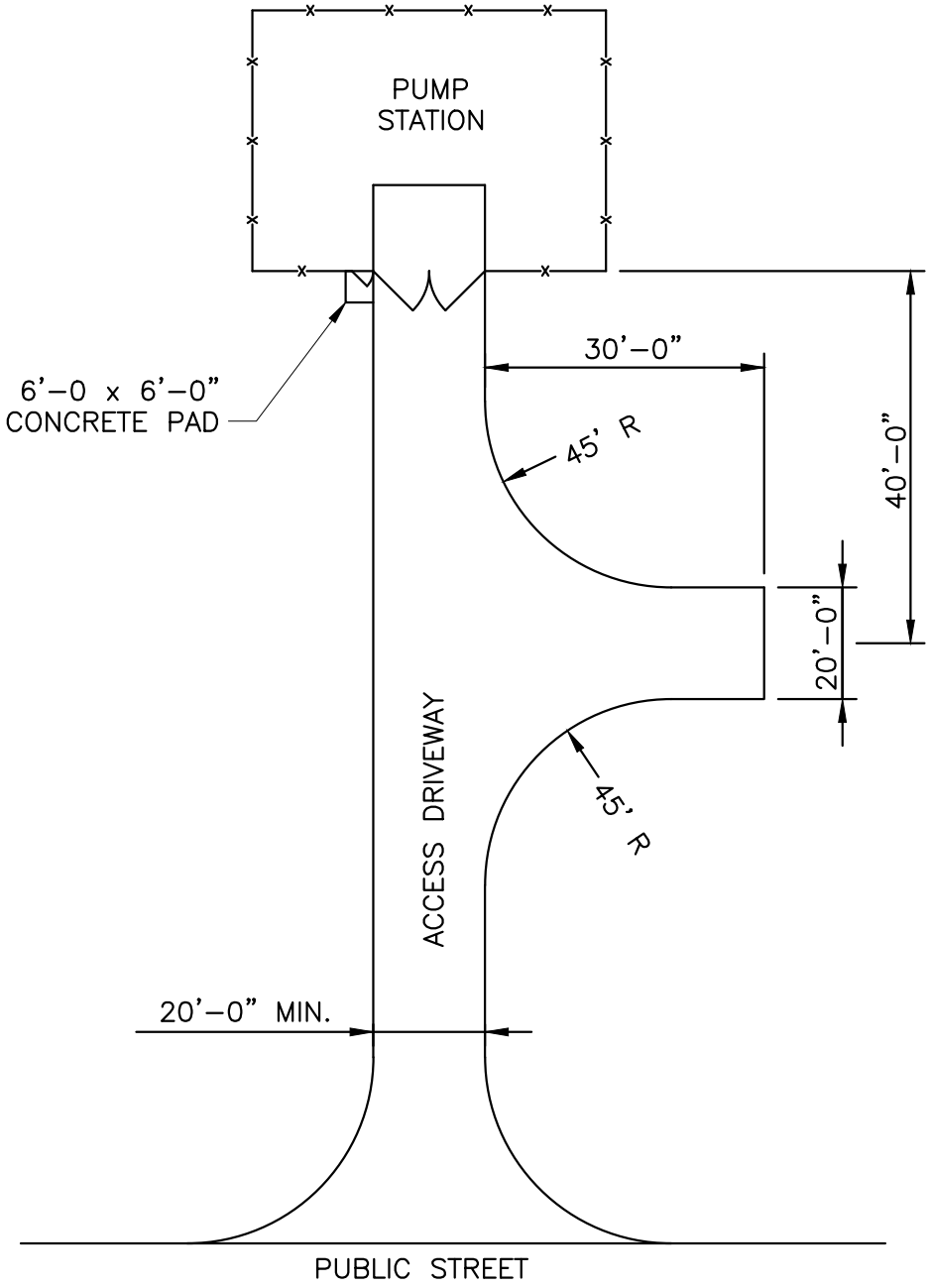
DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Fence and Gate Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. P-009



SECTION VIEW

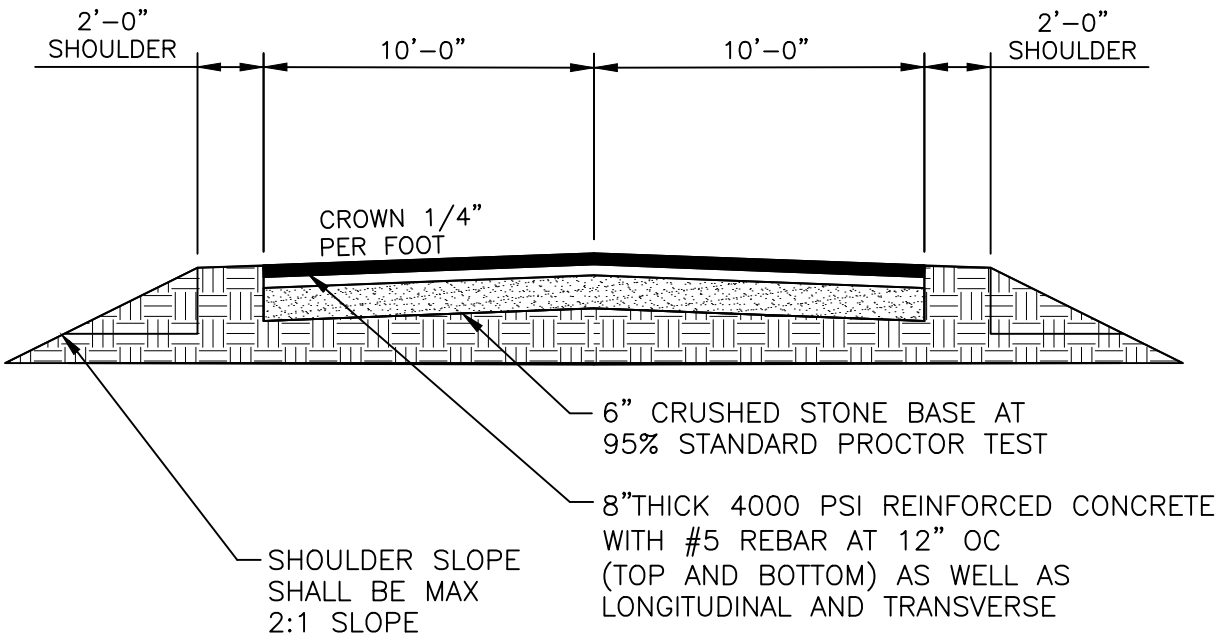
NOTES:
1. DEVELOPER TO PROVIDE WALL DESIGN DRAWINGS SIGNED AND SEALED BY A PROFESSIONAL ENGINEER.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Pump Station Noise Wall	WATER Matters
	NOT TO SCALE	DETAIL NO. P-010



NOTES:
1. ENSURE THAT HAZMAT TRUCK MAY ENTER, BACK OUT, TURN AROUND AND EXIT PUMP STATION IN A SAFE MANNER.
2. ACCESS DRIVEWAY SHALL INCLUDE EXPANSION JOINTS AS NEEDED.
3. ACCESS DRIVEWAY REINFORCEMENT SHALL BE DESIGNED TO WITHSTAND 100,000 LB LOAD.

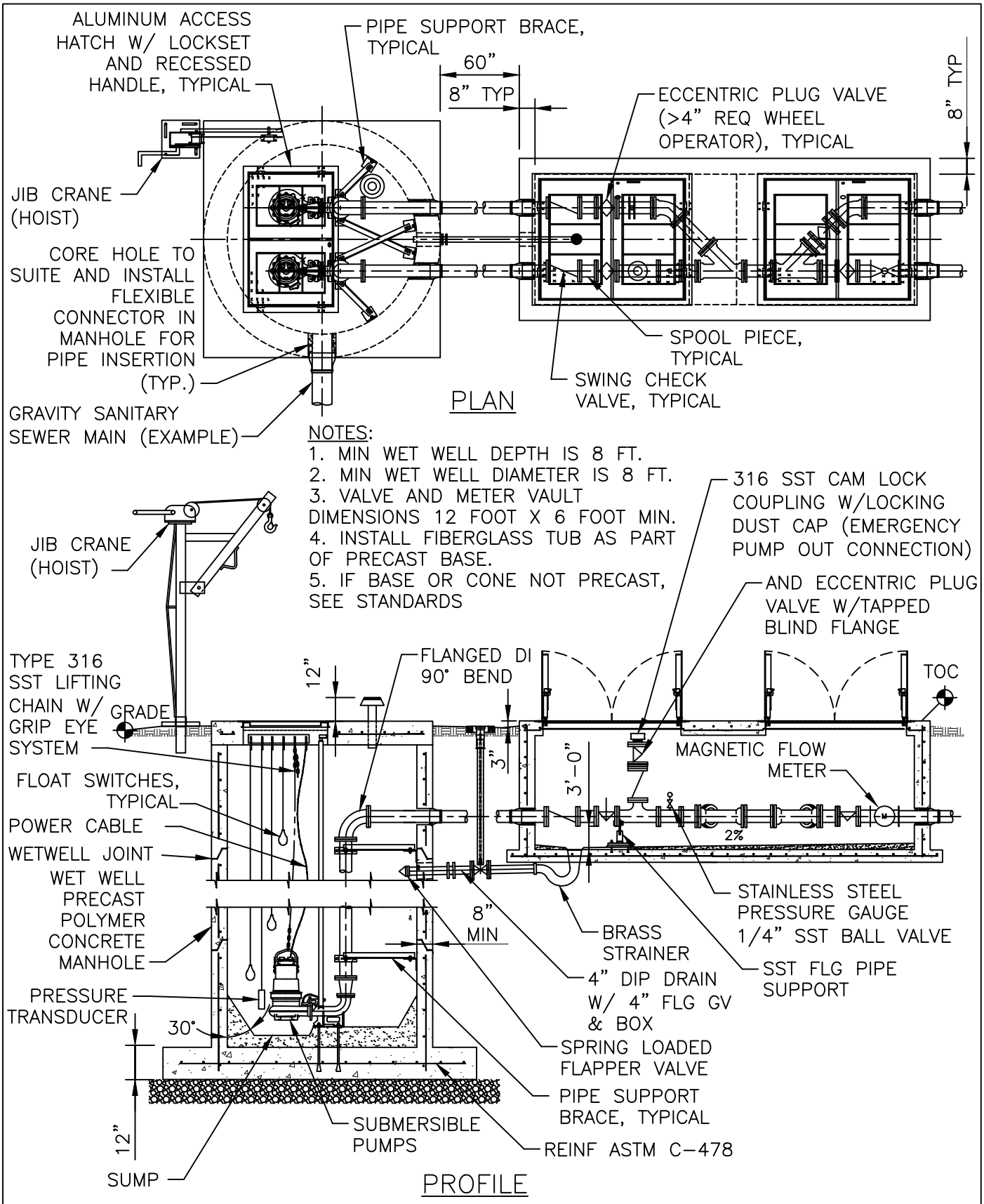
DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Example Access Driveway & Turn Around Area	WATER Matters
	NOT TO SCALE	DETAIL NO. P-011



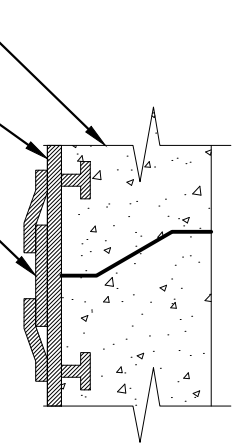
NOTES:

1. CONTRACTOR SHALL SUBMIT COPY OF PLAN AND PROFILES OF ACCESS ROAD FROM PUMP STATION SITE TO EXISTING ROAD OR STREET. SLOPE OF ACCESS ROAD SHALL COMPLY WITH DEKALB COUNTY REGULATIONS.
2. ACCESS DRIVEWAY SHALL INCLUDE EXPANSION JOINTS AS NEEDED.
3. ACCESS DRIVEWAY REINFORCEMENT SHALL BE DESIGNED TO WITHSTAND 100,000 LB LOAD.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Pump Station Typical Drive Cross Section	WATER Matters
	NOT TO SCALE	DETAIL NO. P-012



DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Pump Station Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. P-013

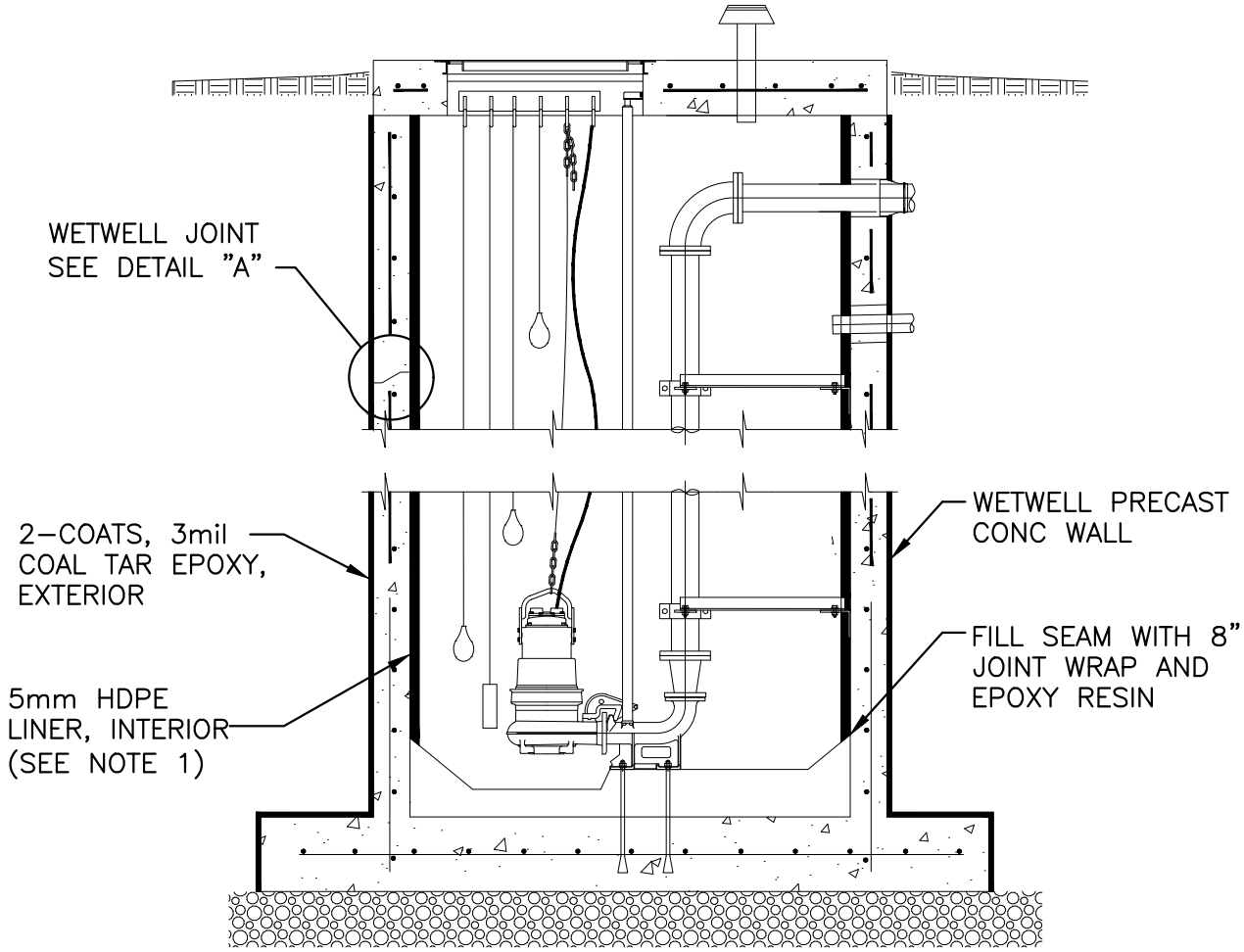


DETAIL "A"
PUMP STATION
JOINT SECTIONS

NOTE:

1. ADD SPRAYABLE EPOXY MEETING MANUFACTURER'S MINIMUM REQUIREMENTS AND THICKNESS MAY BE USED IN LIEU OF 5mm HDPE LINER. IF THIS PRODUCT IS APPROVED, THE ENTIRE INTERIOR AREA OF THE WET WELL WILL BE COATED (WALLS AND TUB).

2. ALL WETWELLS SHALL BE POLYMER CONCRETE UNLESS APPROVED DIFFERENTLY BY DCDWM.



DeKalb County
GEORGIA

STANDARD DETAILS

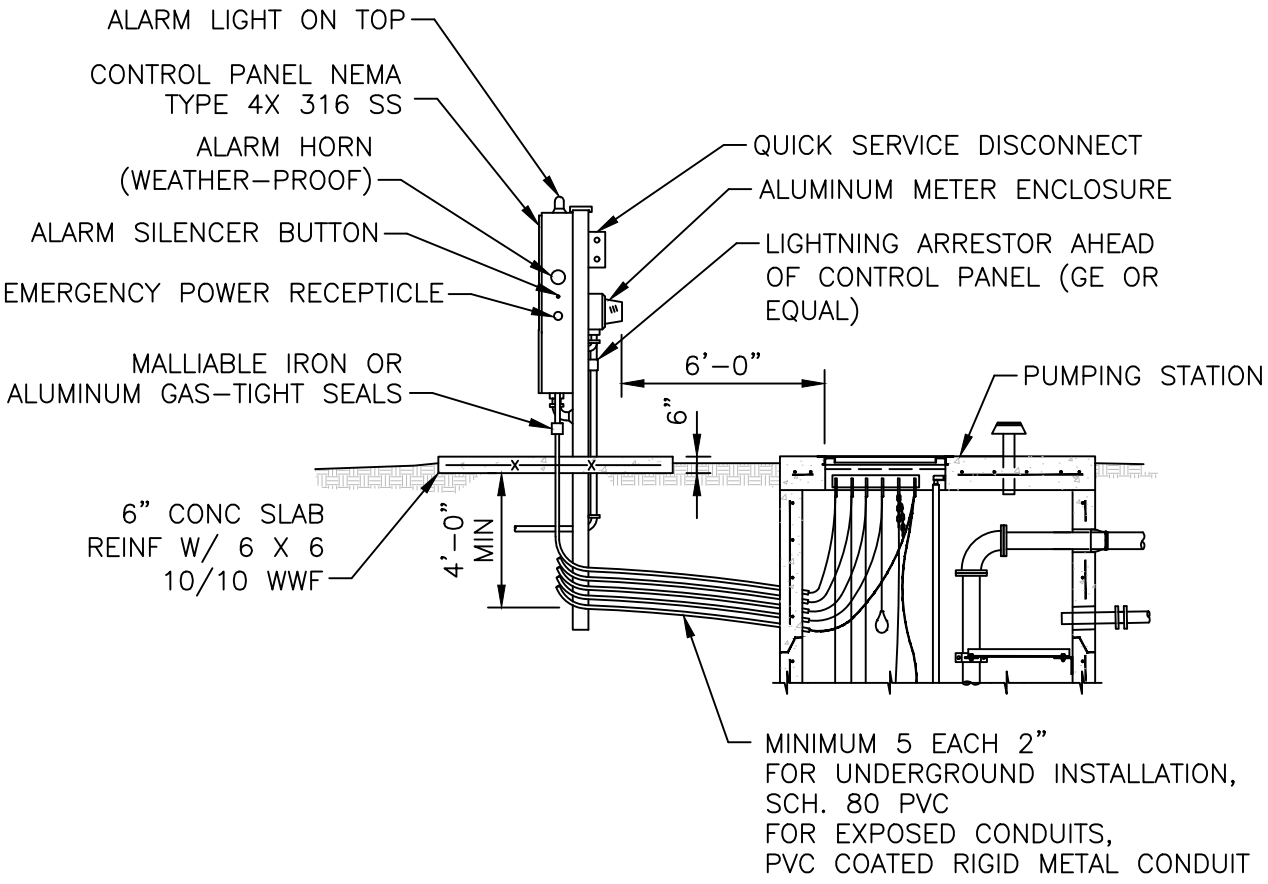
Pump Station Coating Detail
for HDPE Liner

NOT TO SCALE

09/17

WATER Matters

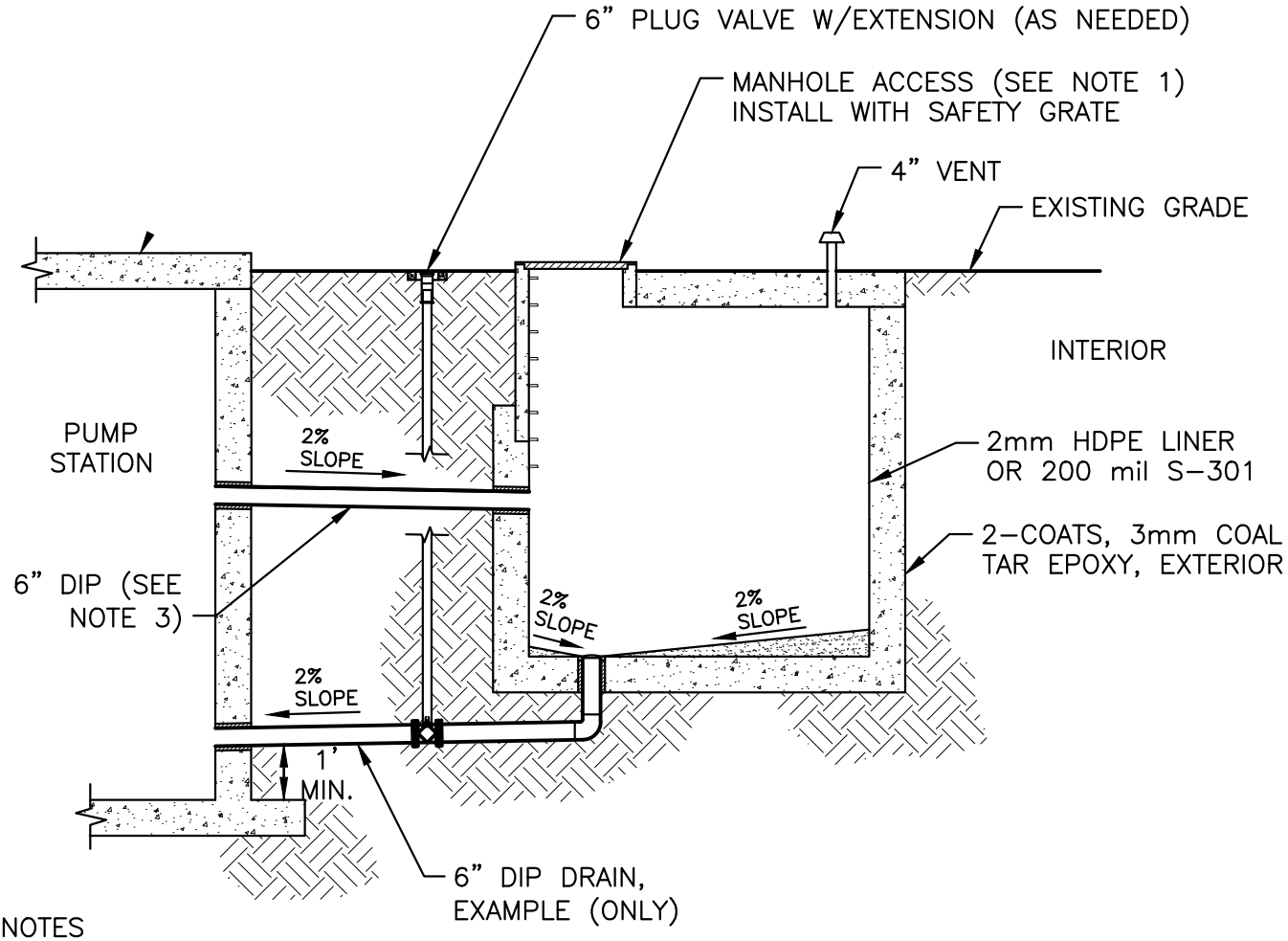
DETAIL NO. P-014



SECTION

NOTE:
CONTROL PANEL 4 FT. WIDE BY 8 FT HIGH AWNING NOT SHOWN FOR CLARITY.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Pump Station Cable Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. P-015



NOTES

1. FOLLOW REQUIREMENTS FOUND IN PART III GRAVITY STANDARDS FOR STEPS AND MANHOLE COVER REQUIREMENTS.
2. PIPES ARE ROTATED TO BE SHOWN IN THE SAME VIEW.
3. OVERFLOW PIPE INVERT SHALL BE EQUAL TO HIGH LEVEL ALARM AND THE 6" DIP SHALL MEET FORCE MAIN SPECIFICATION..
4. VOLUME OF OVERFLOW SHALL BE EQUAL TO THREE HOURS OF STORAGE AT PEAK FLOW, MINIMUM 32,000 GALLONS.
5. OVERFLOW TANK MUST BE ENTIRLEY WITHIN 120 FT BY 120 FT BUFFER AREA. MANHOLE ACCESS AND VENT TO BE LOCATED WITHIN FENCED AREA.
6. OVERFLOW VAULT AND TOP SLAB REINFORCEMENT SHALL BE DESIGNED TO WITHSTAND 100,000 LB LOAD.
7. OVERFLOW TANK SHALL ONLY BE USED WITH WRITTEN APPROVAL FROM THE COUNTY.

DeKalb County
GEORGIA

STANDARD DETAILS

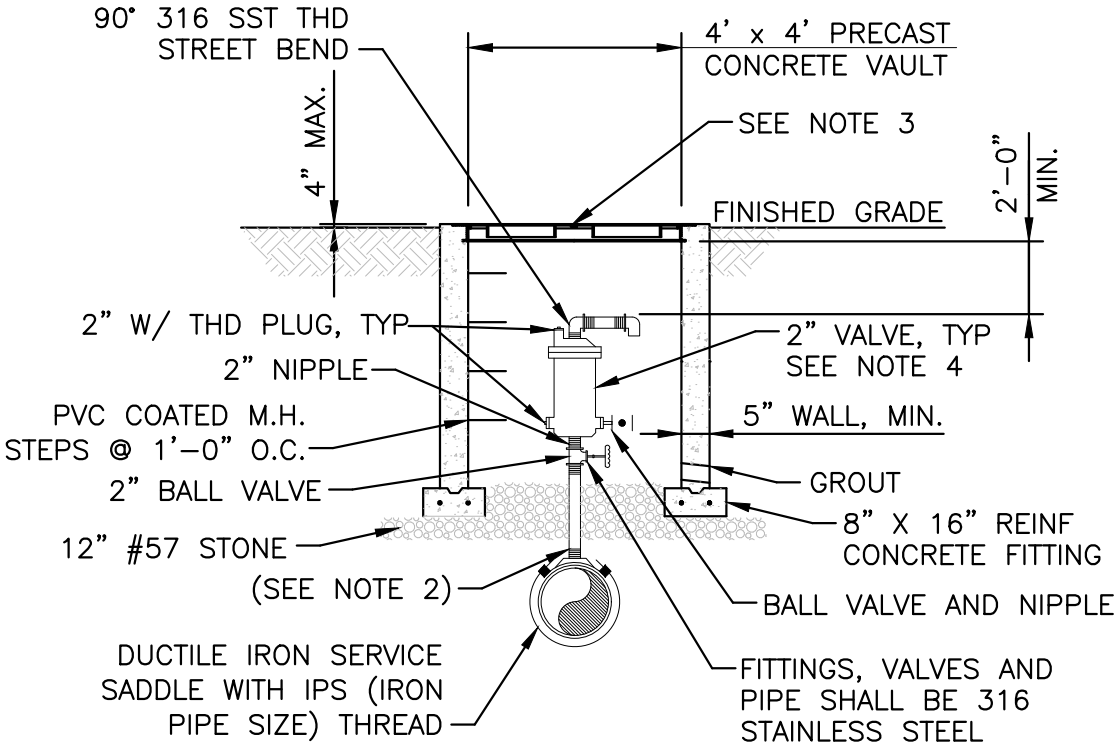
Example Pump Station
Overflow Tank Detail

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. P-016



NOTES:

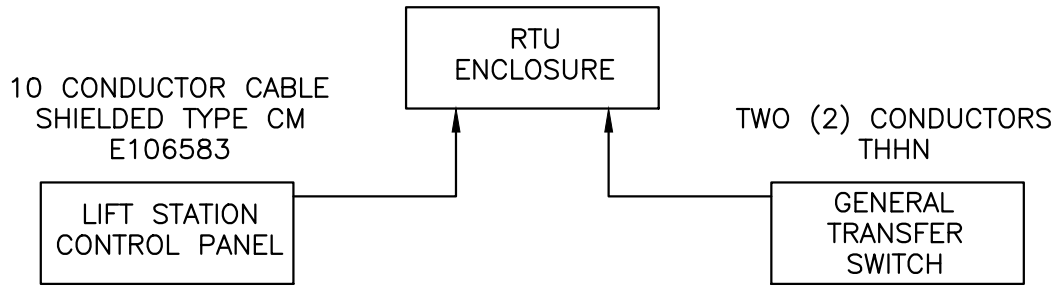
1. COMBINATION AIR-VACCUMN VALVES SHALL BE DETERMINED BY THE DEVELOPER'S ENGINEER AND APPROVED BY DCDWM PRIOR TO INSTALLATION.
2. THE MINIMUM DIMENSION FROM TOP OF PIPE TO FINISHED GRADE SHALL BE 4.0 FEET.
3. FRAME AND COVER SHALL BE EQUIVALENT TO U.S. FOUNDRY USF 170-E-ORS.
4. VALVE SHALL BE VALMATIC 28A W/BWA OR EQUAL. SIZE SHALL BE BASED ON FORCE MAIN SIZE.
5. THE WASTEWATER AIR/VACUUM RELEASE VALVE VAULT SHALL BE DESIGNED FOR VEHICULAR TRAFFIC LOADS.

DeKalb County GEORGIA	**STANDARD DETAILS**	09/17
	Combination Air-Vaccum Valve Installation Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. P-017

LEGEND

AH	–	ALARM HORN
AL	–	ALARM LIGHT
ASB	–	ALARM SILENCE BUTTON
ATS	–	ALTERNATOR TEST SWITCH
CCB	–	CONTROL CIRCUIT BREAKER
DPDT	–	DOUBLE POLE DOUBLE THROW
DRB	–	DUPLEX RECEPTACLE BREAKER
ECB	–	ELAPSE TIME METER
F	–	FUSE
FB	–	FUSE BLOCK
FL	–	FLASHER
FR	–	FLOAT REGULATOR
GFDR	–	GROUND FAULT DUPLEX RECEPTACLE
GR	–	GENERATOR RECEPTACLE
HOA	–	HANDS–OFF–AUTO SELECTOR SWITCH
MB	–	MOTOR BREAKER
MCB	–	MAIN CIRCUIT BREAKER
MS	–	MOTOR STARTER
OL	–	OVERLOAD
PL	–	PILOT LIGHT
PM	–	PHASE MONITOR
R	–	RELAY
RCB	–	RTU CIRCUIT BREAKER
RL	–	RUNNING LIGHT
RTU	–	REMOTE TRANSMITTING UNIT
TB	–	TERMINAL BLOCK
TTS	–	THERMAL TERMINAL STRIP
TVSS	–	TRANSIENT VOLTAGE SURGE SUPPRESSER
XFMR	–	TRANSFORMER

PUMP STATION RTU CONNECTIONS



RTU ENCLOSURE

MIXED I/O MODULE

	1	SPARE
	2	SPARE
	3	SPARE
	4	SPARE
	5	SPARE
FROM RTU ENCLOSURE DOOR LIMIT	6	SITE SECURITY
	7	PUMP 3 FAILURE*
	8	PUMP 4 FAILURE*
#14 AWG FROM GEN TRANS	9	GENERATOR RUNNING
	10	PUMP 1 FAILURE
	11	PUMP 2 FAILURE
	12	HIGH WET WELL
	13	
	14	COMMON
	15	SPARE
	16	SPARE
	17	SPARE
	18	SPARE
	19	SPARE
	20	SPARE
	21	SPARE
	22	SPARE
	23	SPARE
	24	SPARE

* IF NEEDED

DeKalb County GEORGIA

STANDARD DETAILS

Pump Station
RTU Connections

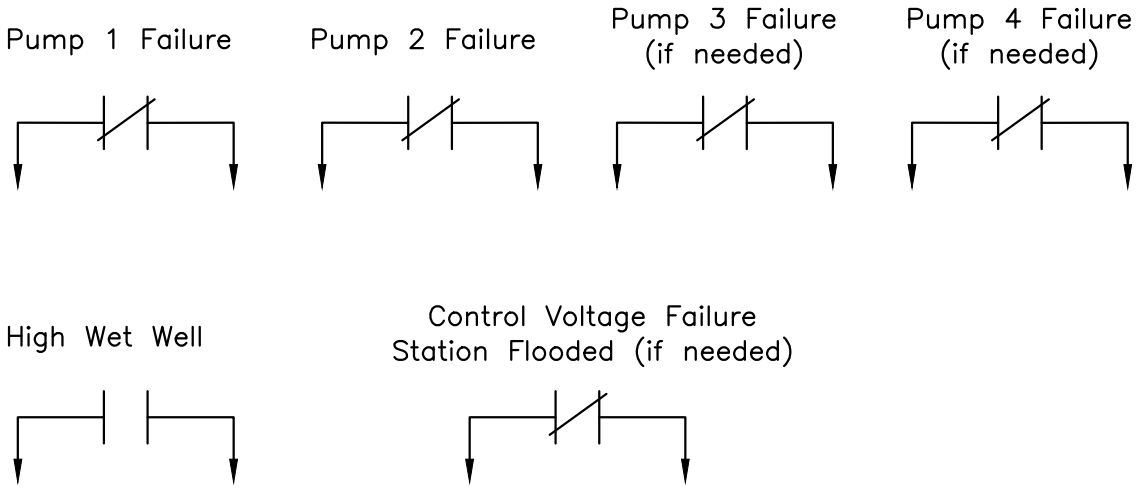
NOT TO SCALE

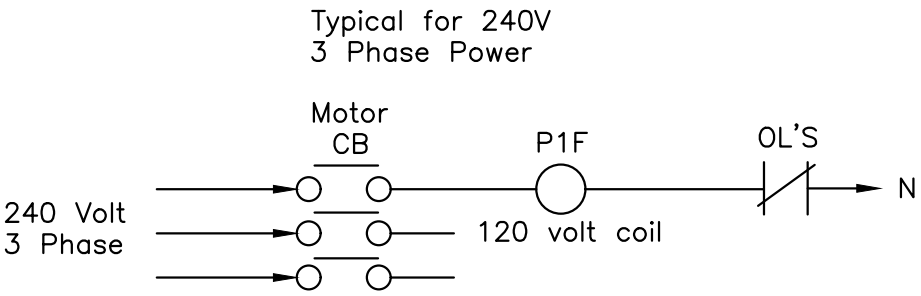
09/17

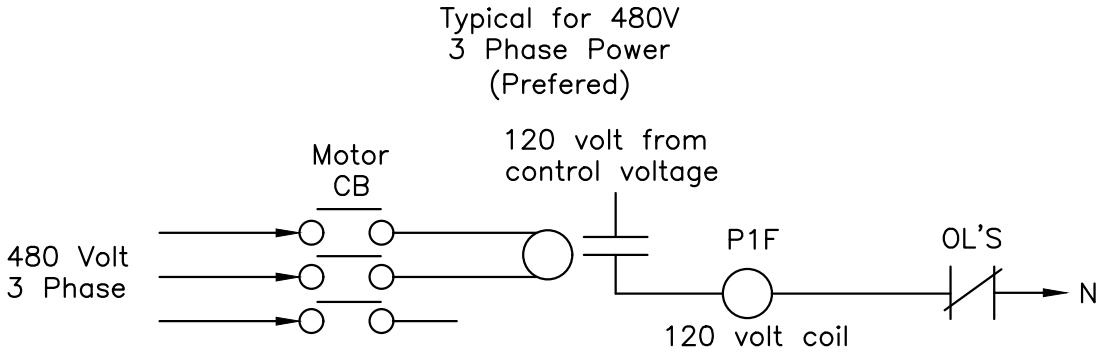
WATER Matters

DETAIL NO. P-019

Basic Lift Station Control Panel – RTU Alarm Inputs







Relay Type: 480 volt AC coil, Porter & Brumfield PRD–11AYO–480 or equal.

DeKalb County
GEORGIA

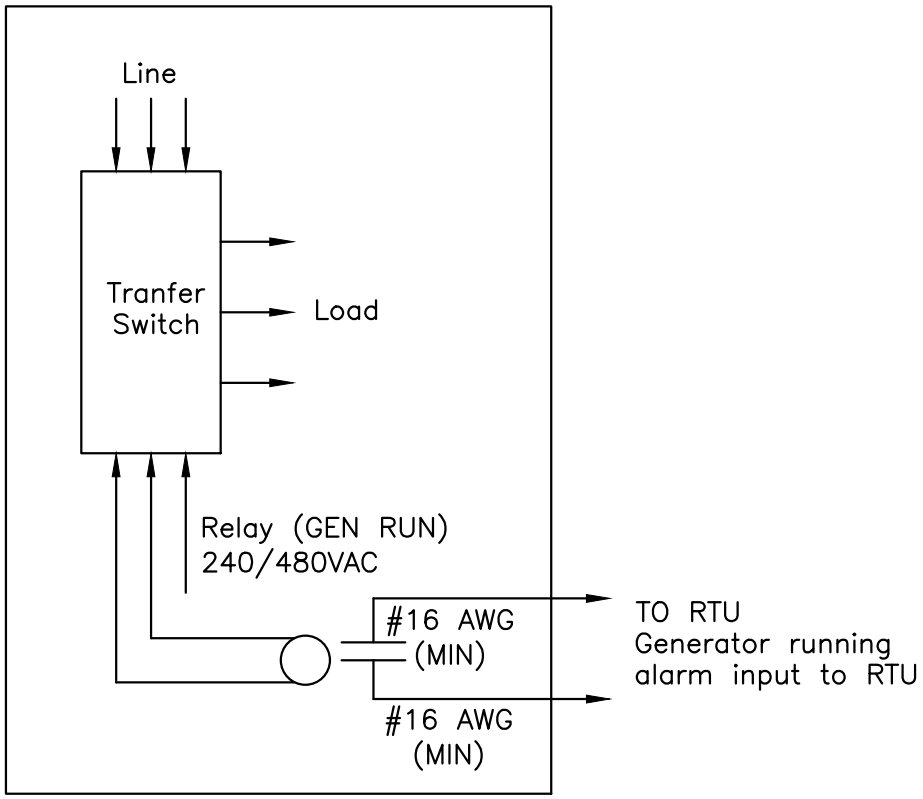
STANDARD DETAILS

Basic Pump Station
Control Panel Detail
RTU Alarm Inputs
NOT TO SCALE

09/17

WATER Matters

DETAIL NO. P-020



Relay Types: 240VAC coil, 8 pin cube type; 480VAC coil Porter & Brumfield PRD-11AYO-480 or equal.

DeKalb County
GEORGIA

STANDARD DETAILS

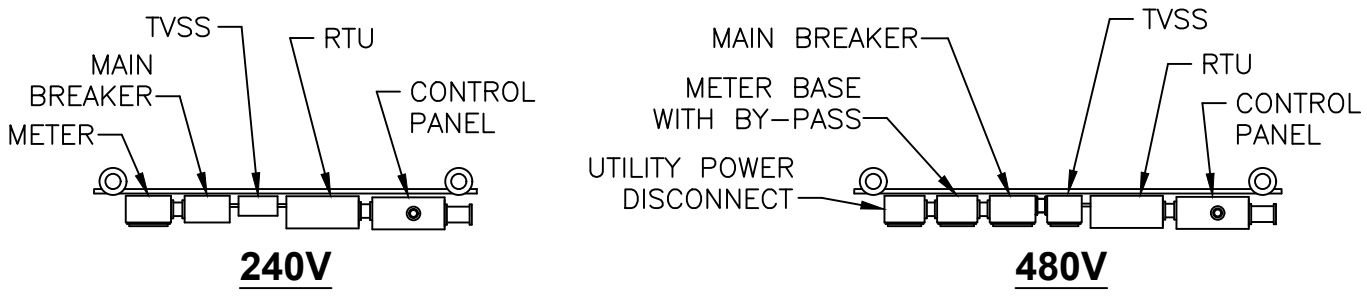
Pump Station
Generator Transfer Switch
Generator Run Alarm

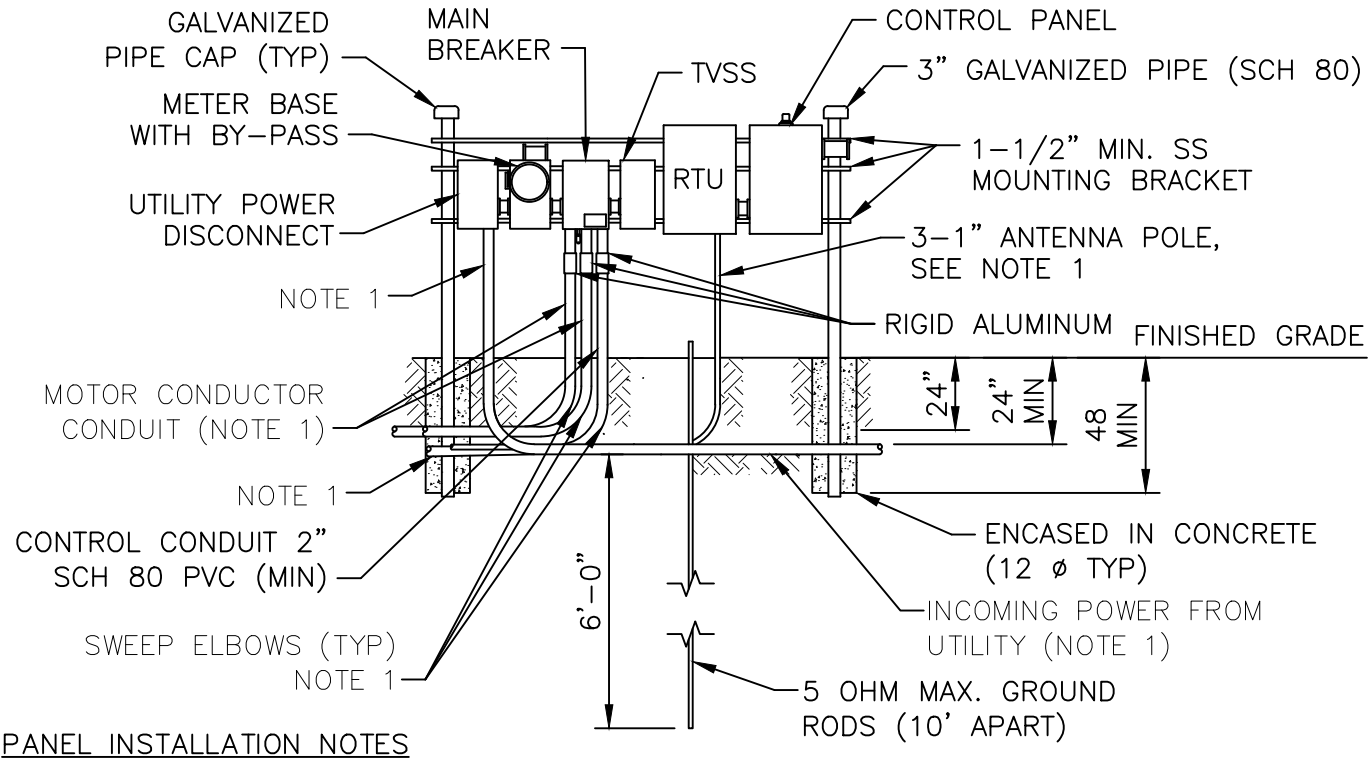
NOT TO SCALE

09/17

WATER Matters

DETAIL NO. P-021

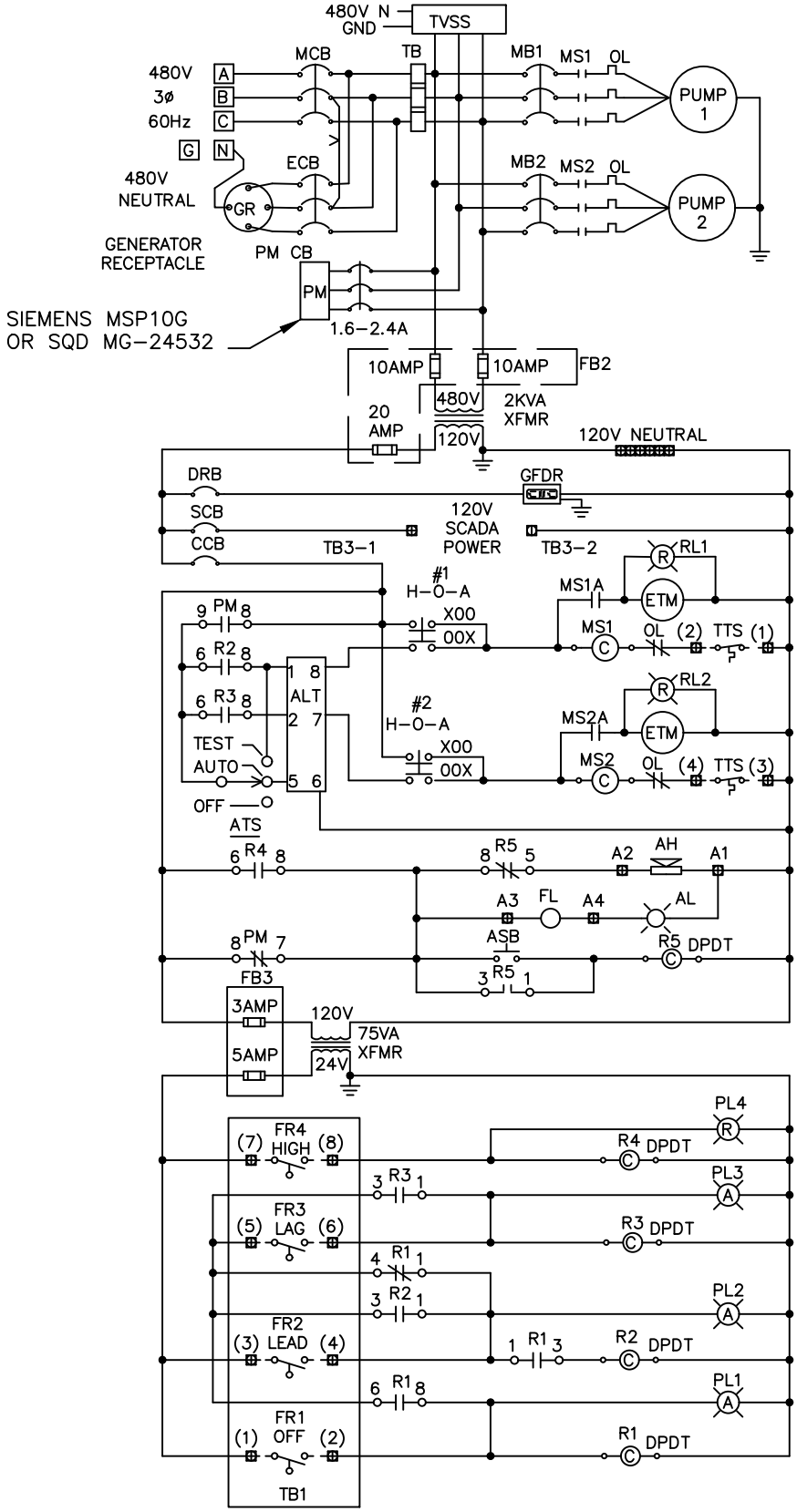




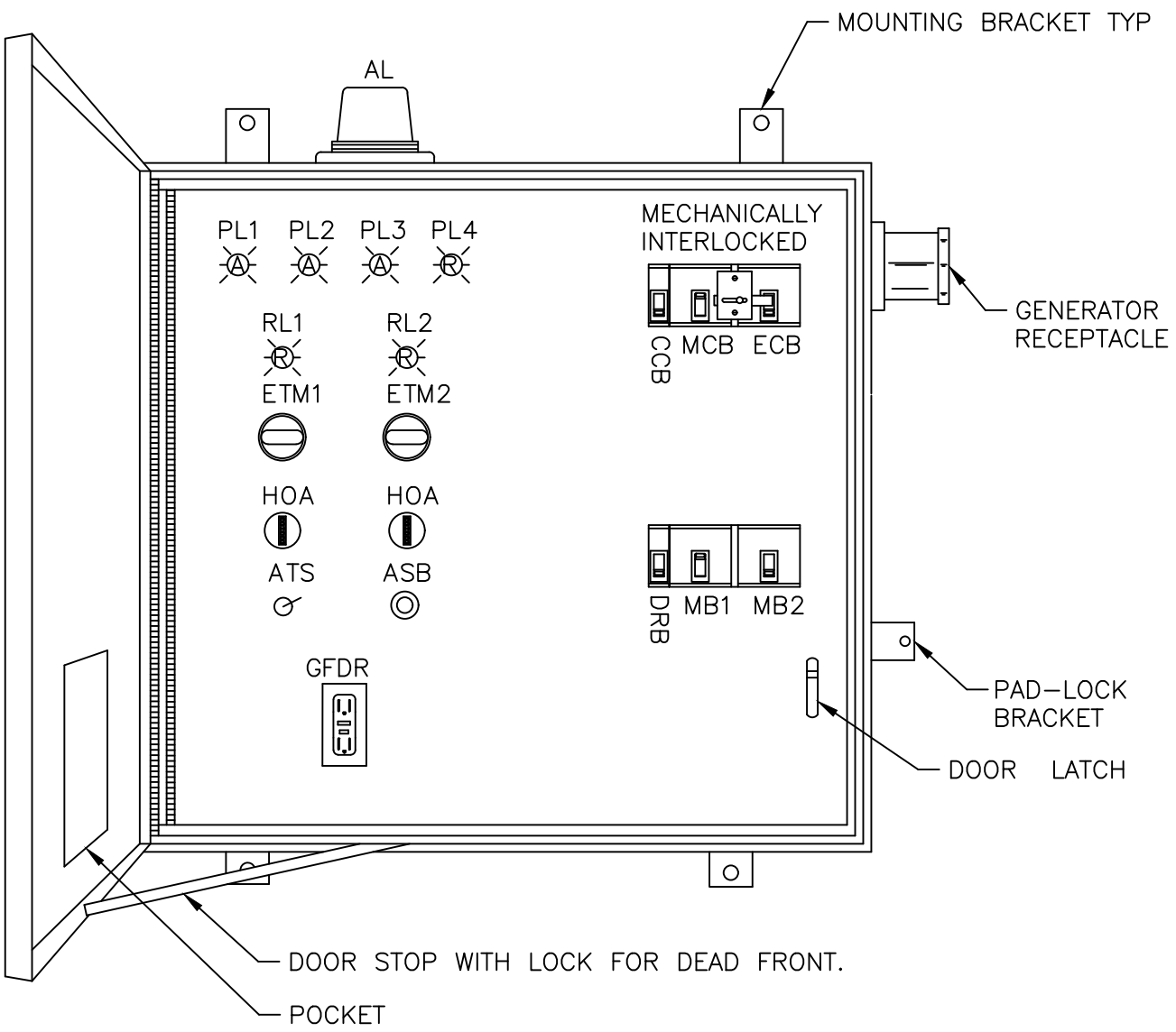
PANEL INSTALLATION NOTES

1. TO BE MINIMUM 2" SCH 80 PVC COATED RIDGED METAL CONDUIT BY REDHZOT.
2. POWER SUPPLY SHALL BE UNDERGROUND ON THE LIFT STATION SITE AND SHALL BE 3-PHASE, FROM A 3-PHASE SOURCE ONLY.
3. AN ELECTRICAL GROUNDING SYSTEM SHALL BE INSTALLED AS PER THE NATIONAL ELECTRICAL CODE, LOCAL CODES AND ORDINANCES. AN UNDERGROUND PERIMETER CABLE GROUNDING SYSTEM SHALL BE INSTALLED WITH CONNECTIONS TO AT LEAST WET WELL COVER, VALVE VAULT COVER, CONTROL PANELS, GENERATOR, UTILITY COMPANY TRANSFORMER, MANUAL DISCONNECT SWITCH AND METAL FENCE.
4. THE STATION NAME, UTILITIES I.D. NUMBER AND ADDRESS SHALL BE AFFIXED TO THE FRONT OF THE METER CABINET.
5. ALL MOUNTING HARDWARE & BRACKETS SHALL BE 316 STAINLESS STEEL.
6. ON A 4-WIRE, DELTA SYSTEM, THE HIGH-LEG SHALL BE IDENTIFIED WITH ORANGE COLOR TAPE AT ALL CONNECTION POINTS AND SHALL BE LOCATED ON THE "B" PHASE AT THE LINE SIDE OF THE MAIN DISCONNECT.
7. PANELS AND ELECTRICAL CABINETS SHALL BE COVERED WITH A 4 FT. by 8 FT. AWNING (NOT SHOWN).
8. 240V AND 480V ARE THE SAME EXCEPT INCOMING POWER METER WITH Y-PASS, FOR 240V, NO UTILITY POWER DOSCONNECT.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Pump Station Control Panel FOR (240V) AND (480V)	WATER Matters
	NOT TO SCALE	DETAIL NO. P-022



DeKalb County GEORGIA	STANDARD DETAILS Example Duplex Pump Control Schematic (480V) NOT TO SCALE	09/17 WATER Matters DETAIL NO. P-023



NOTES:

1. NEMA TYPE 3R BOX AND ALL HARDWARE AND BRACKETS SHALL BE 316 SS.
2. ALL CONTROL WIRE TO BE #16 AWG, MINIMUM.
3. CONTROL PANEL SHALL BE UL LISTED AND LABELED.

DeKalb County GEORGIA	STANDARD DETAILS Example Duplex Control Panel Enclosure Dead Front Layout NOT TO SCALE	09/17 WATER Matters DETAIL NO. P-024

APPENDIX D
CREEK CROSSINGS

APPENDIX D
Creek Crossings - Sanitary Sewer, Water Mains, and Force Mains

Overview

Creek crossings or stream crossings primarily consist of two types:

- Aerial Crossings: Pipe is visible and usually a few to several feet above the creek bed, or attached to a roadway bridge.

- Buried Crossing: Pipe is under the creek bed and in some instances, the top of the existing pipe or casing may be visible during low flow conditions occurring during summer months.

Sewer systems shall be designed to minimize the number of creek crossings. While designing creek crossings, use the proposed future creek bed elevation, and employ construction methods that would be minimally invasive to the stream. For example, the **Contractor** shall use rock cutting trenchers instead of explosives for sewers in rocky strata.

Collection system capacity and water quality can be jeopardized by damage to sewers at creek crossings.

Environmental and Buffer Requirements

A minimum buffer separation shall be maintained between sewers, force mains, and streams/surface water bodies classified as nutrient sensitive streams or watershed buffers (from normal high water). See also within these Design Standards for other requirements regarding minimum separation with streams, lakes and impoundments.

Before crossing streams or ditches, working within one hundred (100) feet of a private or public water supply sources or fifty (50) feet of non-water supply ponds, lakes, creeks or rivers**,** the **Developer's Design Engineer** shall verify whether the line is exempt and, if not, obtain a permit to encroach into a watershed or nutrient-sensitive river basin buffer. Unless otherwise permitted, water, sewer, or force mains crossing a stream, river, pond, or lake buffer are to be as nearly perpendicular as possible. The crossing is considered perpendicular if it intersects the stream or surface water between an angle of seventy five (75) and one hundred and five (105) degrees). The **Contractor** shall not disturb more than forty (40) linear (longitudinal) feet of a riparian buffer. The proposed design shall identify and adequately address the protection of the drinking water supply wells, sources, intake structures, and others, up to a distance of one hundred (100) feet of the sewer line installation. The **Contractor** shall adhere to the following best management practices in Zone 1, the lower thirty (30) feet beside the stream or surface water, during design/construction.

- Woody vegetation shall be cleared by hand. No grading allowed.
- Stumps shall remain except in trench where trees are cut. Disturbance to roots in buffer zone shall be minimized.

- The trench shall be backfilled with the excavated soil immediately following installation.
- Fertilizer shall not be used except for the one-time application to reestablish vegetation.
- Removal of woody vegetation shall be minimized with respect to the amount of disturbed area and the time the disturbed area remains disturbed.
- Measures shall be taken to ensure diffuse flow of water through the buffer after construction.
- In wetland areas, crane mats shall be used to minimize soil disturbance.
- Topsoil shall be separated from excavated material, so that the original topsoil is replaced over the excavated area.

Wetlands

The Professional Engineer registered in the State of Georgia whose seal appears on the drawings shall certify the following:

- The National Wetlands Inventory maps have been consulted.
- The appropriate plan sheet does/does not indicate areas of USACE Jurisdictional Wetlands as shown on the maps. If jurisdictional wetlands are indicated, the **Developer** shall obtain a Federal Wetlands Alteration (Section 404) permit prior to initiating construction activity and/or any land disturbance of the protected wetlands.

Landscaping

Trees and bushes shall not be planted near the collection system pipes and structures to prevent roots from entering the pipes causing blockages and cracked pipes. Planting for stabilizing disturbed areas shall be required to restore the area to its original or better condition. The specifications shall define the entity responsible for developing a grassing and planting and stream restoration plan for review and approval by the **County**.

Siltation and Erosion

Construction methods that shall minimize siltation and erosion shall be employed. The **Design Engineer** shall include in the project specifications the method(s) to be employed in the construction of sewers in or near streams. Such methods shall provide adequate control of siltation and erosion by limiting unnecessary excavation, uprooting trees and vegetation, dumping of soil or debris, pumping silt-laden water into the stream, changing course of stream without encroachment permit, leaving cofferdams in streams, and leaving behind temporary equipment. Specifications shall require cleanup, grading, seeding, sodding, and planting or total restoration of disturbed areas commence immediately to meet local and state standards. Exposed areas shall not remain unprotected at any given time. The disturbed stream bank shall be restored using bioengineering methods. If the velocity of flowing water is anticipated to be greater than ten (10) fps, then cement stabilized backfill shall be used from bank to bank and covered with rip rap. In areas where there is planned channel improvement, the stabilized backfill shall be used up to the line of planned improvement.

Sewers In Relation To Storm Drainage Infrastructure

No sanitary sewer shall be located in a detention basin or other drainage structure. Sanitary sewer pipe and manholes shall not be located in or underneath the dam or dike of the detention basin, or located anywhere within twenty (20) feet horizontally of the projected maximum high water line of the detention basin.

Aerial Crossings for Sanitary Gravity Sewers and Force Mains

The aerial crossing shall be designed with minimal infringement on the floodway, typically by spanning the waterways.

- **Large/wide creeks** - Piers and anchor collars or with pipes in a casing spanning over piers.
- **Medium-sized creeks** - Piers and anchor collars of I-beam anchored to stream banks with pipe resting on top of the I-beam.
- **Small creeks** - Pipe spanning creeks and anchored to concrete collars at the bank.

Creek Crossing Design Guidance		
Type	**Span**	**Requirements**
Large Width	>40 Feet	Submit Detailed Design
Medium Width	18 To 40 Feet	Submit Design if Span > 30 Feet
Narrow Width	<18 Feet	Use **County** Details
Note: Use reinforced cement concrete for piers and anchor collars.		

Methods of support/carriage of pipe other than the ones described above, requires review and approval of **DCDWM**. Visual impact shall be minimal after regrowth of vegetation. The pipe shall be adequately supported, protected from damage and freezing, accessible for maintenance, repair or replacement, and non-obstructive to flow line of surface water. The bottom of the pipe shall be placed no lower than the elevation of the fifty- (50-) year flood.

The **Engineer** or **Contractor** shall provide detail design drawings and pipe specifications for each crossing for review by **DCDWM**. Site conditions may dictate more stringent requirements than shown in the Standard Construction Details. The **Engineer** shall delineate on the plans flood elevations for the ten- (10-), twenty five- (25-), fifty- (50-) and one hundred- (100-) year flood events as defined by the **County** Flood Plain Supervisor. The design plans and structural details shall be signed, sealed, and dated by a Georgia Registered Professional Engineer.

Creek crossings for gravity sanitary sewer and force mains, unless otherwise approved by **DCDWM**, shall be constructed of epoxy-lined DIP with flexible restrained joints. **DCDWM** reserves the right to approve seamless or straight seam steel pipes that need to be lined inside and coated outside in a manner similar to epoxy-lined DIP. Spiral-welded steel pipes are not allowed by **DCDWM**. Pipes crossing wetlands and low-flow creeks shall have at least two (2) supports at each joint, with one support near the bell.

Interior Lining *of* the EDIP for gravity sanitary sewer and force main shall have a completely covered inner surface of the pipe from bell to spigot. The lining shall be virgin polyethylene complying with ANSI/ASTM D1248 and be a minimum of forty (40) mils in thickness as manufactured by American Cast Iron Pipe Company (ACIPCO) polybond lining, or U.S. Pipe Protecto 401 ceramic epoxy lining or Warren epoxy. epoxy-lined DIP, with lining defects such as cracking or holes in the lining shall not be installed and shall be removed from the site immediately to avoid a Stop Work Order. Field repair of epoxy is not permitted.

Exterior Coating

Gravity Sewer Pipe six (6) to twelve (12) inches shall be Pressure Class 350 in accordance with ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51.

Gravity Sewer Pipe sixteen (16) inches and Larger shall be a minimum of Pressure Class 250 in accordance with ANSI/AWWA C150/A21.50 and ANSI/AWWA C151/A21.51. Loading and depths may require greater pressure classes of pipe.

Flanged Ductile Iron Pipe and Fittings shall be four (4) inches and larger. Flanged pipe shall be a minimum of Class 53 per AWWA C115. Flanged pipe, fittings, and appurtenances are for above ground use, inside vault, or lift wet well only. Flanged pipe shall be shop-fabricated, face drilled, lined and exterior coated by the manufacturer or the manufacturers lining company. Fabrication or lining of flanged pipe on site is not permitted. Complete shop drawings of the pipe, fittings, and appurtenances shall be submitted to **DCDWM** for approval before delivery to the site.

Pipe Joints **-** Proper joint technology, such as flanged, restrained, or mechanical; adequate supports to prevent excessive deflection and flexion; or a combination shall be provided for aerial pipe crossings. Pipe supports shall be designed to withstand the hydrodynamic effects of the stream flow pressure using the following formula:

$$P = 2.5KV^2$$

Where

2.5 = Safety factor against overturning

P = Pressure, psf

V = Velocity of water, fps

K = 4/3 for square ends, 1/2 for angle ends when angle is < 30°, and 2/3 for circular piers.

Expansion jointing shall be provided between above ground and below ground sewers. When buried sewers change to aerial sewers, special construction techniques shall be used to minimize heaving. Special construction details, submitted to the **County** for approval, also shall be required between above ground and below ground sewer transition to account for seismic and sudden unexpected forces arising due to erosion of stream banks.

Impact of Flood Waters

If it is probable that the aerial pipe could be submerged by the stream flow, the effects of flow pressure on the pipe shall be taken into account when computing pier-overturning moments. For aerial crossings, the impact of flood waters and debris shall be considered in the design calculations.

The following criteria shall be used in design calculations:

- Pipe crossing shall be anchored in the bank in such a way that if the pipe supports are lost, the pipe system shall not separate, and shall be restrained by the anchor blocking of

appropriate size in the bank. Anchor blocking structural computations and details shall be provided.

- Pipe joint stability calculations and details shall be provided.
- Pipe joints shall be flexible restrained joints.
- For wide stream crossings, steel pipe of appropriate thickness shall be used, with interior lining and external coating as mentioned above for epoxy-lined DIP. Design computations and details shall be provided.

Pipe Joint Seals – Pipe joints for epoxy-lined DIP shall be sealed externally using a flexible epoxy-based sealing compound to ensure a water tight joint, in addition to the rubber ring or other type of seals supplied by the manufacturer at the bell and spigot joint location.

Casing Pipe – Aerial crossings shall be a restrained carrier pipe inside a high-strength steel casing pipe. The minimum steel casing pipe for aerial crossings shall be 0.33 inch thick.

Freeze Protection – Precautions against freezing, such as insulation and increased slope, shall be provided. Expansion jointing shall be provided between above ground and below ground sewers. Where buried sewers transition to aerial sewers, special construction techniques shall be used to minimize frost heaving.

Concrete Collar Anchors – Concrete collars for casing anchoring shall be designed for each application by a Georgia Registered Professional Engineer. The collars shall be a minimum of four thousand (4,000) PSI reinforced concrete, minimum twelve (12) inches thick and four (4) feet square. Anchors shall have minimum reinforcing steel of #5 @ 12 E.W. The collars shall be installed eighteen (18) inches from end of casing pipe. Collars shall be secured to the casing. The collar shall not cover the casing to carrier end seals or be used as a pipe transition.

Concrete Piers – Piers for aerial crossings shall be designed for each location by a Georgia Registered Professional Engineer. Piers are not permitted within the natural flow line of the creek. The piers shall be a minimum of five thousand (5,000) PSI concrete, minimum of two (2) feet square and well anchored into the bed rock or have sufficient depth as directed by the Geo-Technical Engineer. Piers shall have a minimum reinforcing steel of #5 @ 12 E.W., and E.F. The top of the pier shall have an adjustable bracket or cylindrical cradle anchored in the concrete to secure the casing pipe. Anchors, cradles and exposed brackets shall be stainless steel and epoxy coated (minimum forty, 40, mils) to resist corrosion. Cushion material shall be placed between the pipe, clamps, and support. The invert elevation of the pipe from upstream to downstream piers shall match the design elevations.

Design Computations – Pipe supporting structures shall be designed to prevent frost heaving, overturning or settlement. Provide calculations for the aerial pipe crossings and supporting structures that are subject to hydrodynamic forces. Calculations are to provide for a minimum factor of safety of two and a half (2.5) against overturning and one and a half (1.5) for uplift due to buoyancy. Calculations shall also address applicable seismic and other unexpected loads.

Structures – The sewer interceptors, manholes, or other structures shall be located so they do not interfere with free discharge of flood flows of the stream. Portions of manholes above grade subject to hydrodynamic forces of flooding shall be designed to be watertight and be able to resist the flood forces with a safety factor of two and a half (2.5), as mentioned above for pipes and piers. Frames and covers shall be bolt-down watertight frames and covers. Manhole rims shall be twenty four (24) inches above the one hundred- (100-) year base flood elevation.

Buoyancy and Flotation – Buoyancy shall be considered and flotation of the manholes, piers, anchors or any other structure shall be prevented with appropriate construction where high groundwater or flooded conditions are anticipated. For design purposes, the **Engineer** shall assume water to top of manhole and that the manhole is empty. The **Contractor** shall be responsible for protection against flotation of pipe or structures installed or partially installed. Pipes or structures that are partially floated or completely floated from original installation locations shall be removed and reinstalled as per **DCDWM** Standards. Damaged pipe or structures shall be discarded and replaced in accordance with as per **DCDWM** Standards. The factor of safety for uplift is one and a half (1.5) for pipes and structures.

Anti-Seepage Collars – Wetland Areas – In areas where the sewer trench has the potential to drain wetlands, anti-seepage collars shall be installed. In these areas, a USACE 404 Wetland Permit and/or a NCDENR 401 Water Quality Permit may be required. Trench water shall not be diverted or pumped into the sanitary sewer system.

Buried Crossings for Sanitary Gravity Sewers and Force Mains

The buried crossing is to be designed with a steel casing and epoxy-lined DIP carrier pipe, and shall be as near perpendicular to the stream as possible, and shall be free from change in grade. Gravity sewers crossing creeks shall be placed below the streambed such that there is a minimum of two (2) feet bury below the streambed and minimum one (1) foot of cover over the casing. If the minimum two (2) feet bury depth cannot be attained, either encase the sewer in concrete or design the sewer as an aerial crossing as per above-mentioned criteria. Aerial sewers shall only be allowed when it can be demonstrated that no other practical alternative exists. The design and material requirements for aerial crossings also apply for buried crossings. The sewer shall be designed and constructed such that it remains watertight (exhibit zero infiltration), and free from changes in alignment or grade due to anticipated hydraulic loads, erosion, impact, etc., and tested per **DCDWM** Standards. Sewers shall remain fully operational during the one hundred- (100-) year flood event. Sewers and associated appurtenances located along the creeks shall be protected against the normal range of high and low water flow conditions, including the one hundred- (100-) year flood event.

Bedding and Backfill – Special care shall be taken to provide a firm base for pipe bedding. The plans shall specify that the soft organic material within the creek banks shall be replaced with select imported backfill. Install concrete blocks under each bell and spigot joint when pipe is encased in concrete. In addition, a layer of four- (4-) inch to eight- (8-) inch cobbles shall be placed on top surface of trench area for the full width of the creek. Additional material used to backfill the trench shall be stone, coarse aggregate, washed gravel, or other material that will not readily erode, cause siltation, damage pipe during placement, or corrode the pipe.

Special design requirements shall be employed to prevent stream flow from sinking at the crossing and following the pipe bedding. This can be accomplished with an in-trench impounding structure of compacted clay or other acceptable impermeable material that will match with the native stream bed.

Check Dams - To prevent French drain effect of the sewer or any other pipe crossing the creek, install check dams upstream in the pipe conduit trench. Check dams shall be separate from any concrete encasement or steel casing.

Clay Plug - A clay plug shall be required at the downstream side of the crossing. The plug shall be a minimum of (four) 4 feet in length, shall extend the full width of the trench, and shall extend

twelve (12) inches above and below the pipe.

Buried Pipe Cover Depth – The top of sewers entering or crossing streams shall be at a sufficient depth below natural bottom of the streambed to protect the sewer line. The following requirements shall be met:

- One (1) foot of minimum cover where the sewer is located in rock.
- Three (3) feet of cover in other material, unless the pipe is encased in concrete or in a steel casing.
- More than three (3) feet cover is required in major rivers, creeks or streams.
- Minimum seven (7) feet cover is required in shifting creeks or stream channels.
- In paved stream channels, the top of sewer pipe shall be placed at least eighteen (18) inches below the bottom of the channel base.

Less cover may be approved by the **County** only if the proposed sewer crossing shall not interfere with future modifications to the stream channel. Justification for less cover shall be submitted in writing to **DCDWM** for review and approval.

Inverted Siphons for Sanitary Gravity Sewers

Inverted siphons shall be avoided whenever possible by exploring and exhausting the other options. It shall only be considered where avoidance or adjustment of the obstructing utility or structure or stream is not practical.

An inverted siphon can be designed for a portion of a wastewater main which dips below the hydraulic grade line to avoid any obstructions including but not limited to drainage structure, utility, tunnel, subways or stream. In order to pass these obstructions, a common method is for the sewer pipe to drop sharply, then run horizontally under the obstruction, and finally rise to the desired elevation.

An inverted siphon is designed to flow under pressure. The structure shall operate without excess head when flowing at design capacity. Therefore, special care shall be taken during design since head losses are greater for pressurized flow. If minor losses due to bends or elbows in the siphon are significant compared to the siphon length, then include the equivalent length of minor losses from bends, elbows, etc. to calculate the final length of the siphon. Typically, total head losses equal to the sum of the friction, entrance, exit, screens, elbows, transitions and bends losses.

Inverted siphons shall be designed according to the following design criteria:

Design Criteria

- Useful design life shall be fifty (50) years.
- Minimum pipe diameter shall be eight (8) inches.
- Minimum velocity of flow for sewage shall be three (3) fps to promote self-cleaning and to minimize siltation.
- Pressure-rated pipes and fittings shall be used. Gaskets shall be water tight at the pipe joints.

- Use welded smooth steel pipe with internal ceramic or epoxy coating as mentioned in the Buried Crossings section.
- The pipe shall be able to withstand the internal hydrostatic head measured to the centerline of the inverted siphon.
- Provide minimum two barrels, so that one be could be offline for maintenance, while the other barrel is in service.
- Design flow shall be the peak future projected flow based on **DCDWM** Standards.
- Peak hydraulic capacity per barrel to be determined taking into account full pipe flow.
- Design for minimum head loss. Convergence losses at the entrance are usually negligible, but divergence losses at the exit (outlet) can be significant.
- Convergence, divergence and other head losses shall be calculated, depending on actual conditions and hydraulic grade analysis.
- A hydraulic jump in the descending part of the siphon (upstream side) will greatly increase the head loss, and may cause problems of surging and "blow-back." Water and air periodically surge back to the inlet.
- A "hydraulic seal" at the upper edge of the siphon pipe can prevent entrainment of air. Ensure in design of the inlet structure that the level of water always remains at least one (1) foot above the top of the inlet siphon pipe.
- If the head loss is too high, choose a larger pipe or different pipe material, or consider adjusting the inlet and outlet elevations.
- Multiply calculated head loss with a factor of safety of one and a quarter (1.25) to account for future deteriorated conditions.
- Provide minimum four (4) feet cover above pipe while crossing a natural stream or man-made depression.
- Maximum slope of the downstream (rising) leg of the inverted siphon shall be fifteen percent (15%).
- Provide necessary appurtenances for maintenance, convenient flushing, and cleaning equipment.
- Provide adequate clearances on the inlet and discharge structures for cleaning equipment, inspection, and flushing.
- Provide access road on the inlet and discharge sides so that inspection and maintenance can be easily accomplished.
- Air can become trapped, especially in long siphons, during filling. Therefore, filling of the siphon shall be gradual, not sudden.
- Provide air vents, pressure-release valves, or air jumper pipes to relieve air pressure.
- Provide a blow-off structure with a sump and submersible grinder pump at the lowest point in the alignment to be able to pump out the sediments.
- Other aspects governing buried crossings shall also apply for inverted siphons.

Design Development

- The arrangement of inlet and outlet details shall divert the normal flow to one conduit and allow overflow into the second conduit. Usually, the conduit taking the overflow will be right above the point where the approaching conduit is carrying the flow that the first conduit is able to carry at full flow.
- When multiple conduits are to be used, the conduits shall be arranged so that additional conduits can be brought to service as wastewater flows increase in future.
- The design shall allow any conduit/barrel to be taken out of service for cleaning.
- Siphon pipes, manholes and junction structures shall be designed to minimize nuisance odors and easy access to bends for cleaning.
- Inlet structures shall have trash racks to prevent debris from entering the siphon.

The following design steps may be used to adequately size a typical inverted siphon as applicable:

***Step 1*:** Preliminary Sizing

Determine approximate location, size and type of conduits, inlet and outlet structures, or manholes, as needed. Conduit size(s) to be designed to carry peak flows may be determined as follows:

$$D_1 = \sqrt{\frac{4Q_1}{\pi V}} \quad \text{and} \quad D_2 = \sqrt{\frac{4Q_2}{\pi V}}$$

Where, D_1 = Inside Diameter of Primary Conduit, feet.
D_2 = Inside Diameter of Secondary Conduit, feet.
Q_1 = Maximum Daily Flow, $feet^3$/second.
Q_2 = Peak Daily Flow, $feet^3$/second.
V = Velocity (Minimum 3 feet/second).

***Step 2*:** Preliminary Layout

Prepare a preliminary layout of the inverted siphon plan and profile to include the siphon, required inlet and outlet structures, existing or proposed ground line, and elevations at the siphon ends. The final layout shall provide the required cover, slope and bend angle details.

***Step 3*:** Head Loss Calculation

Compute the inverted siphon head losses using the preliminary layout and trial inlet and outlet geometry. Total head loss may be calculated as follows:

$$H_f = (L_T)(S_f)$$

Where:

H_f = Total Head Loss due to Friction.
L_T = Total Length of Siphon.
S_f = Friction Slope, and $S_f = (n^2V^2)/(2.2R^{4/3})$.

The total computed head loss shall be increased by twenty five percent (25%) to account for safety.

Ensure $1.25H_f$ < Head/Fall for each conduit or barrel.

In case $1.25H_f$ > Head/Fall, then adjust pipe diameter and velocity to achieve minimum velocity of three (3) feet/second.

***Step 4*:** Hydraulic Slope

Hydraulic slope across the inverted siphon shall meet the minimum slope requirements as established in the **DCDWM** Standards.

***Step 5*:** Finalize Calculations

The computed inverted siphon dimensions and angles shall be shown on the final siphon plan and profile layout. The final transition geometry and actual head losses shall be calculated and presented on the plans. If the actual head loss exceeds the available head, then more iterations may be needed by returning to step 1.

Force Main Creek Crossings

a. Force mains shall be routed such that the number of stream crossings is minimized. When a stream crossing is required by the design, the crossing shall be as nearly perpendicular to the stream flow as possible.

b. DIP with joints equivalent to water main standards or a watertight ferrous encasement pipe shall be used to construct force mains that cross streams.

c. Force main bedding, haunching, and backfill shall be appropriate for the installation location and pipe material. However, the ability of the bedding and backfill material to readily erode, cause siltation, damage the force main during installation, and corrode the force main after installation shall also be considered.

d. Only DIP with flanged joints, in conjunction with adequate supports, shall be used for aerial stream crossings.

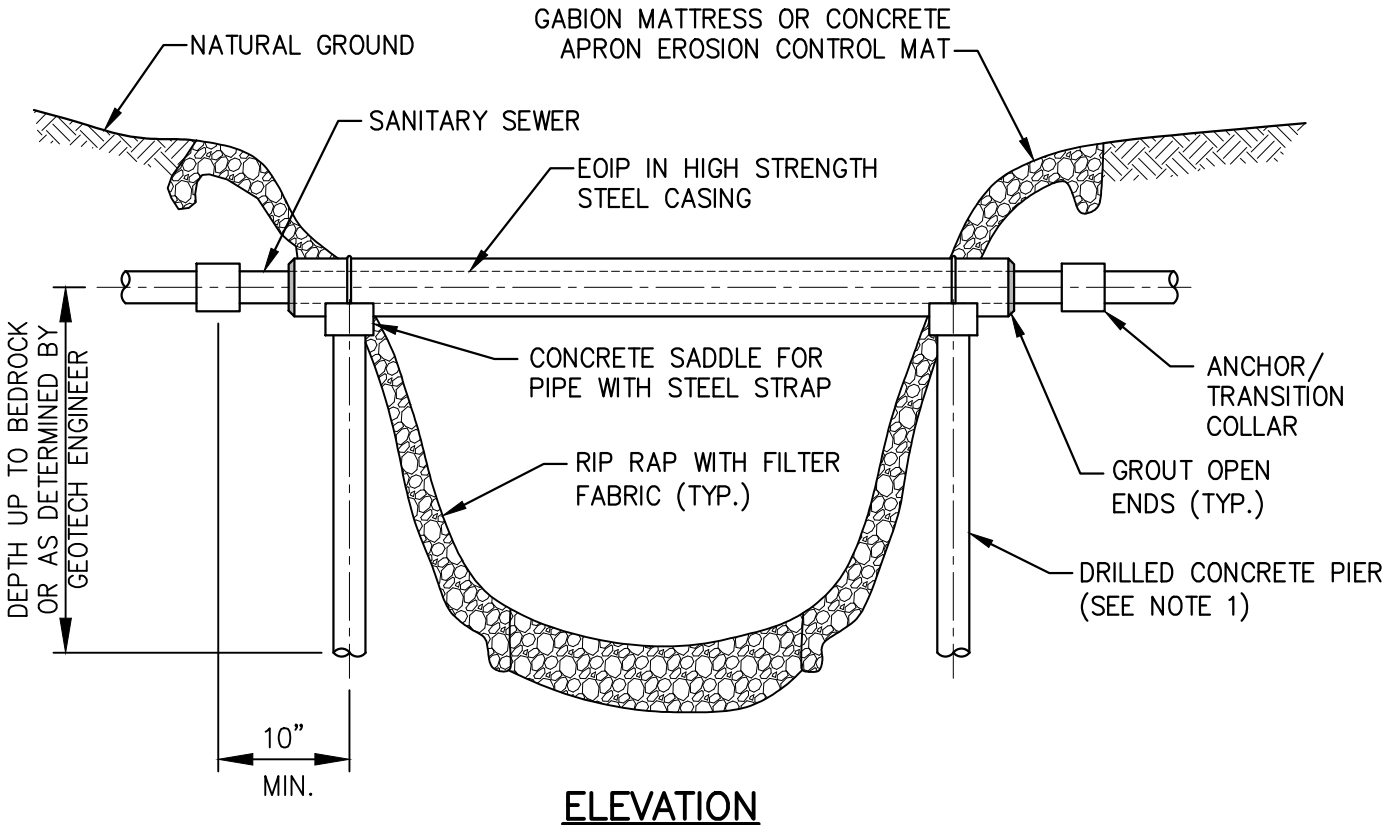
    1. Supports for aerial stream crossings shall be designed to prevent frost heave, overturning, and settlement.

    2. The force main shall be adequately protected from freezing and heaving.

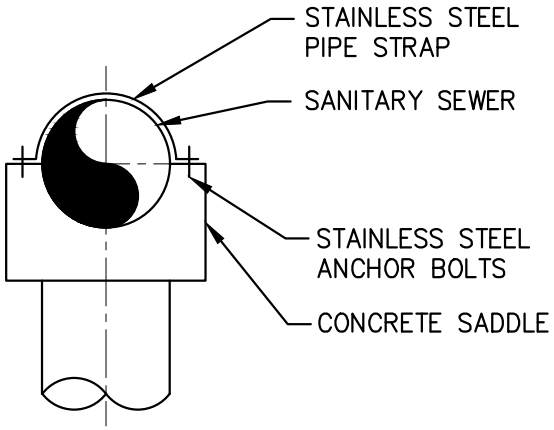
    3. The impact of floodwaters and debris shall be considered during the design of aerial crossings. The bottom of the force main pipes shall be placed no lower than the elevation of the twenty five- (25-) year flood stage of the stream.

Department of Watershed Management
Standard Details List – Creek Crossing

Standard Details List – Creek Crossing	
Detail Number	**TITLE**
CC-001	Drilled Pier Creek Crossing For Pipe Bottom Above The 50 Year Flood Elevation
CC-002	Inverted Siphon
CC-003	Pier Footing On Rock
CC-004	Pier
CC-005	Pipe Or Casting Anchorage Up To 24" Diameter Pipe
CC-006	Reinforced Concrete Anchor Pier and Footing (Sheet 1 of 2)
CC-007	Reinforced Concrete Anchor Pier and Footing (Sheet 2 of 2)
CC-008	Reinforced Concrete Pier and Footing (Sheet 1 of 2)
CC-009	Reinforced Concrete Pier and Footing (Sheet 2 of 2)
CC-010	Sanitary Sewer Creek Crossing Hold Down
CC-011	Sanitary Sewer Creek Crossing In Rock Utilizing Flowable Fill
CC-012	Typical Large Width Creek Crossing For Pipe Bottom Above 50 Year Flood Elevation (Sheet 1 of 2)
CC-013	Typical Large Width Creek Crossing For Pipe Bottom Above 50 Year Flood Elevation (Sheet 2 of 2)
CC-014	Typical Medium Width Creek Crossing For Pipe Bottom Above 50 Year Flood Elevation
CC-015	Typical Narrow Width Creek Crossing For Pipe Bottom Above 50 Year Flood Elevation



ELEVATION

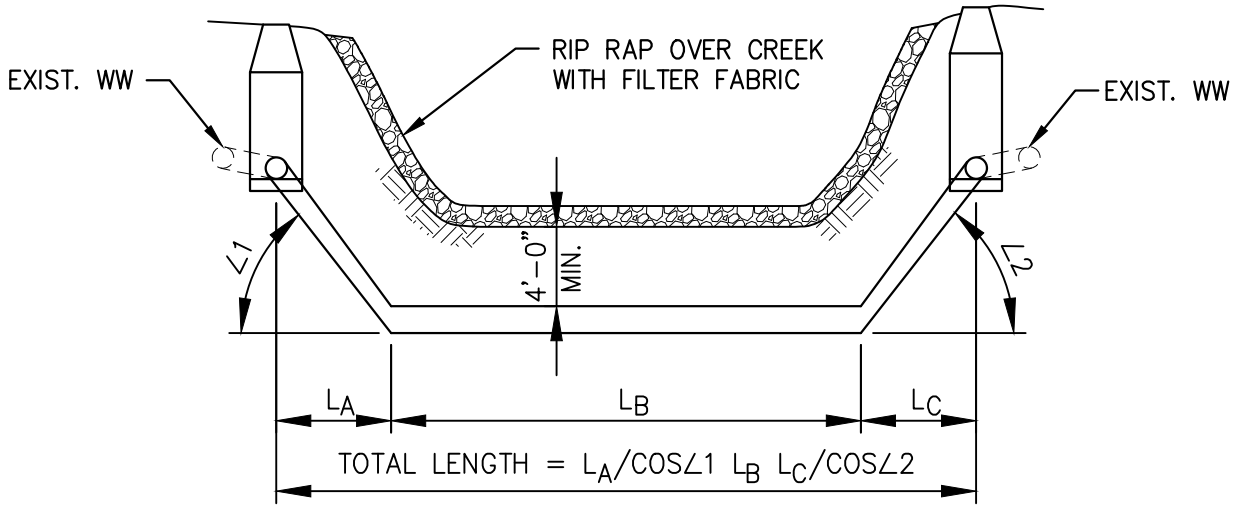


CROSS SECTION AT PIPE

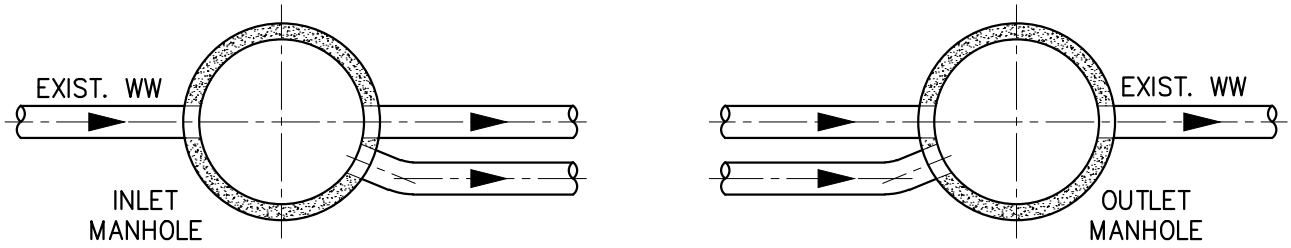
NOTES:

1. DRILLED PIER DIAMETER, DEPTH AND REQUIRED REINFORCING SHALL BE DESIGNED BY AN ENGINEER REGISTERED AND LICENSED IN THE STATE OF GEORGIA.
2. HIGH STRENGTH STEEL CASING PIPE SHALL BE DESIGNED TO SPAN FULL WIDTH OF CHANNEL OR CREEK.

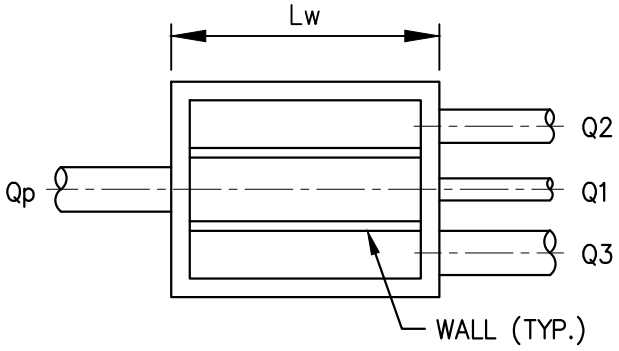
DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Drilled Pier Creek Crossing For Pipe Bottom Above The 50 Year Flood Elevation Not To Scale	WATER Matters
		DETAIL NO. CC-001



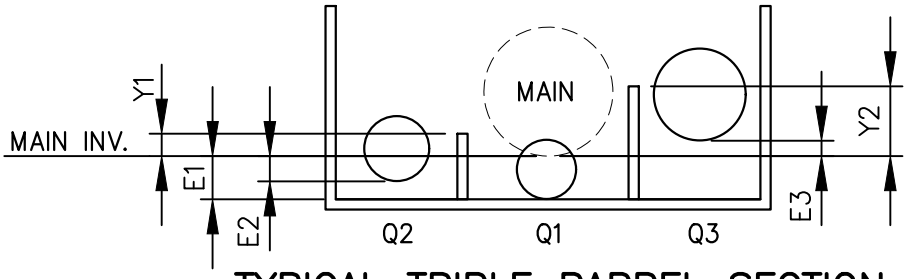
TYPICAL INVERTED SIPHON



TYPICAL DOUBLE BARREL LAYOUT

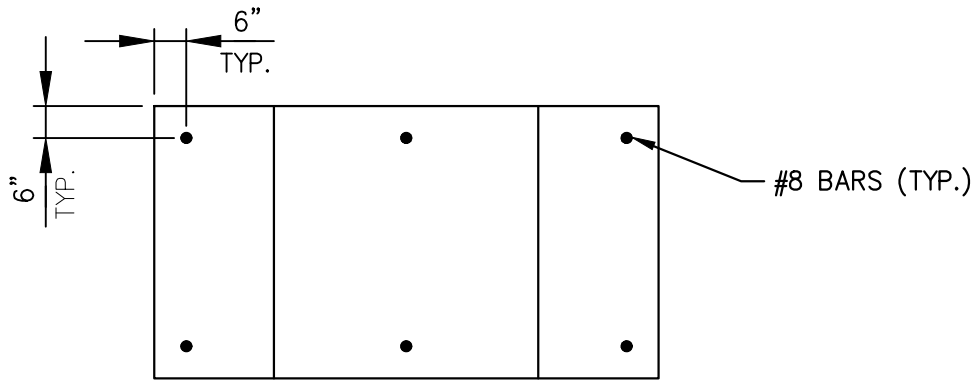


TYPICAL TRIPLE BARREL LAYOUT

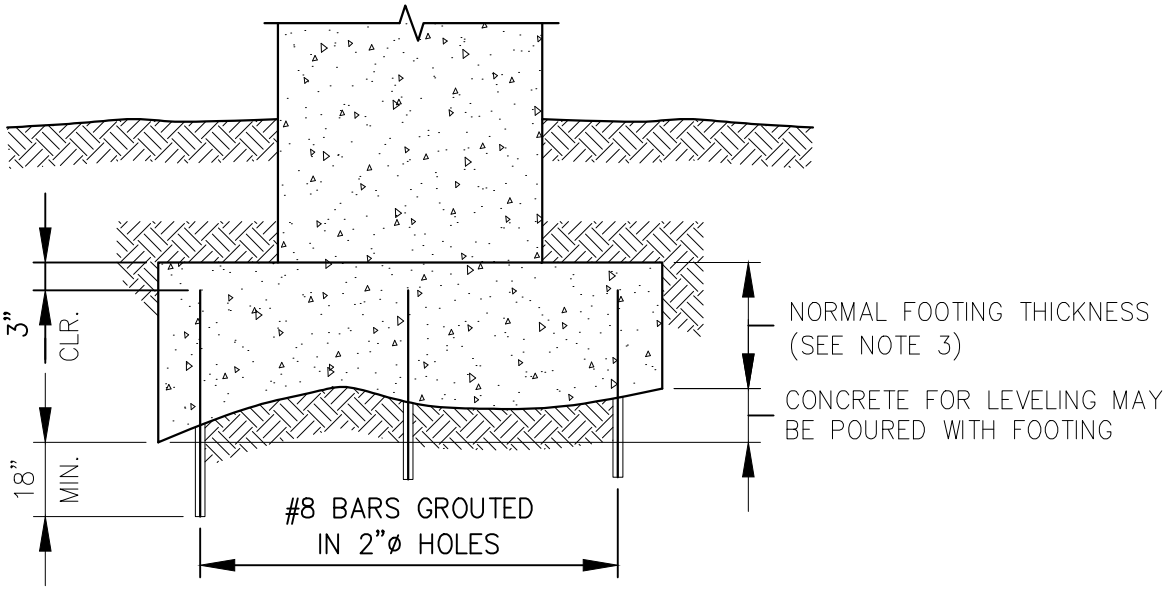


TYPICAL TRIPLE BARREL SECTION

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Inverted Siphon	WATER Matters
	Not to Scale	DETAIL NO. CC-002



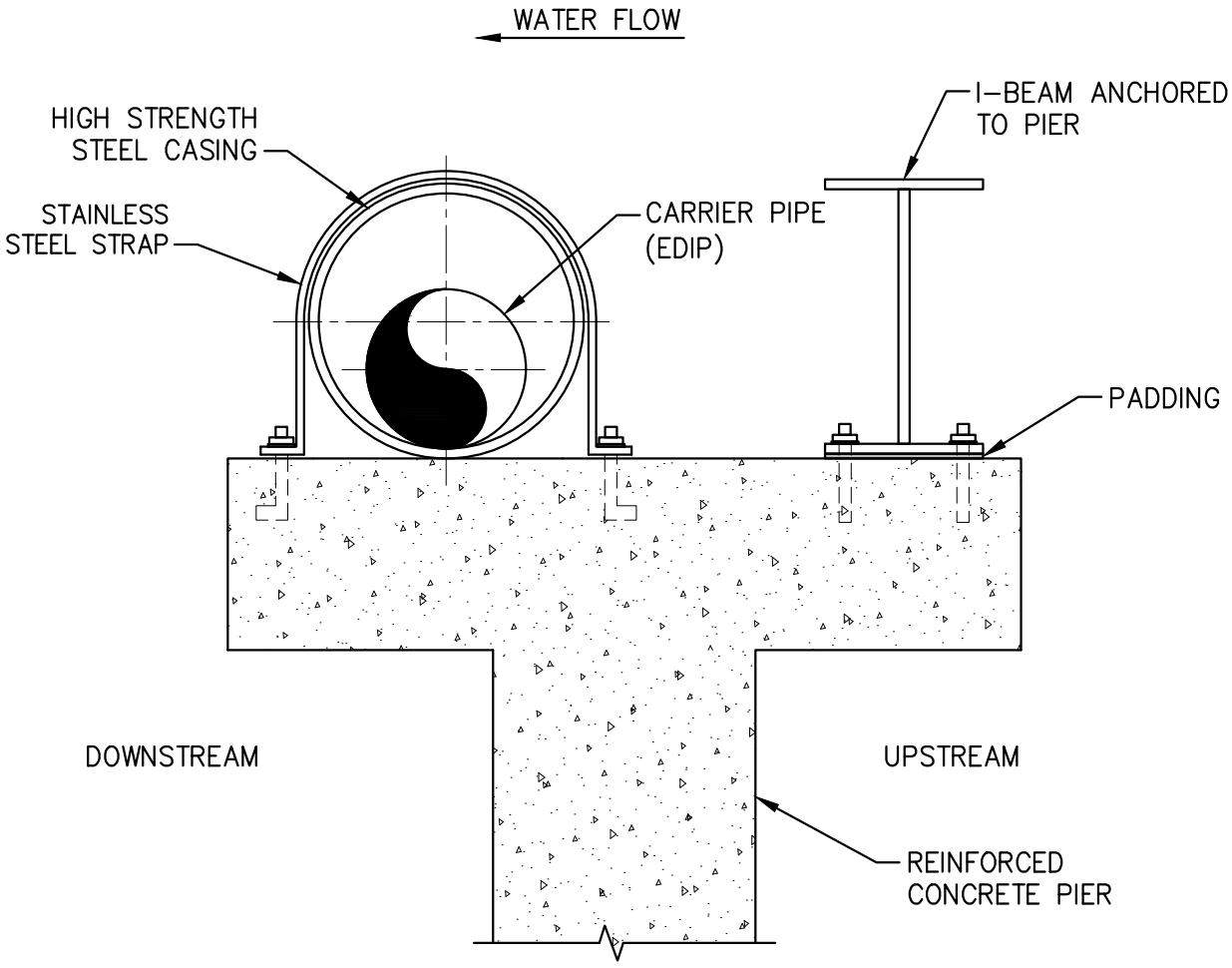
PLAN



NOTES:

1. CONCRETE SHALL BE 4,000 PSI MINIMUM.
2. THIS DETAIL SPECIFIES HOW TO TIE FOOTINGS TO ROCK. MAT STEEL FOR FOOTING SHALL BE TIED TO DOWELS.
3. MINIMUM THICKNESS OF FOOTING ABOVE ROCK TO BE SAME AS BASE THICKNESS OF PIER.
4. FINAL DIMENSIONS AND DETAILS TO BE DETERMINED BASED ON LOCATION, HEIGHT AND OTHER FIELD CONDITIONS. DETAILS MUST BE SIGNED, SEALED AND DATED BY A GEORGIA REGISTERED STRUCTURAL PROFESSIONAL ENGINEER.

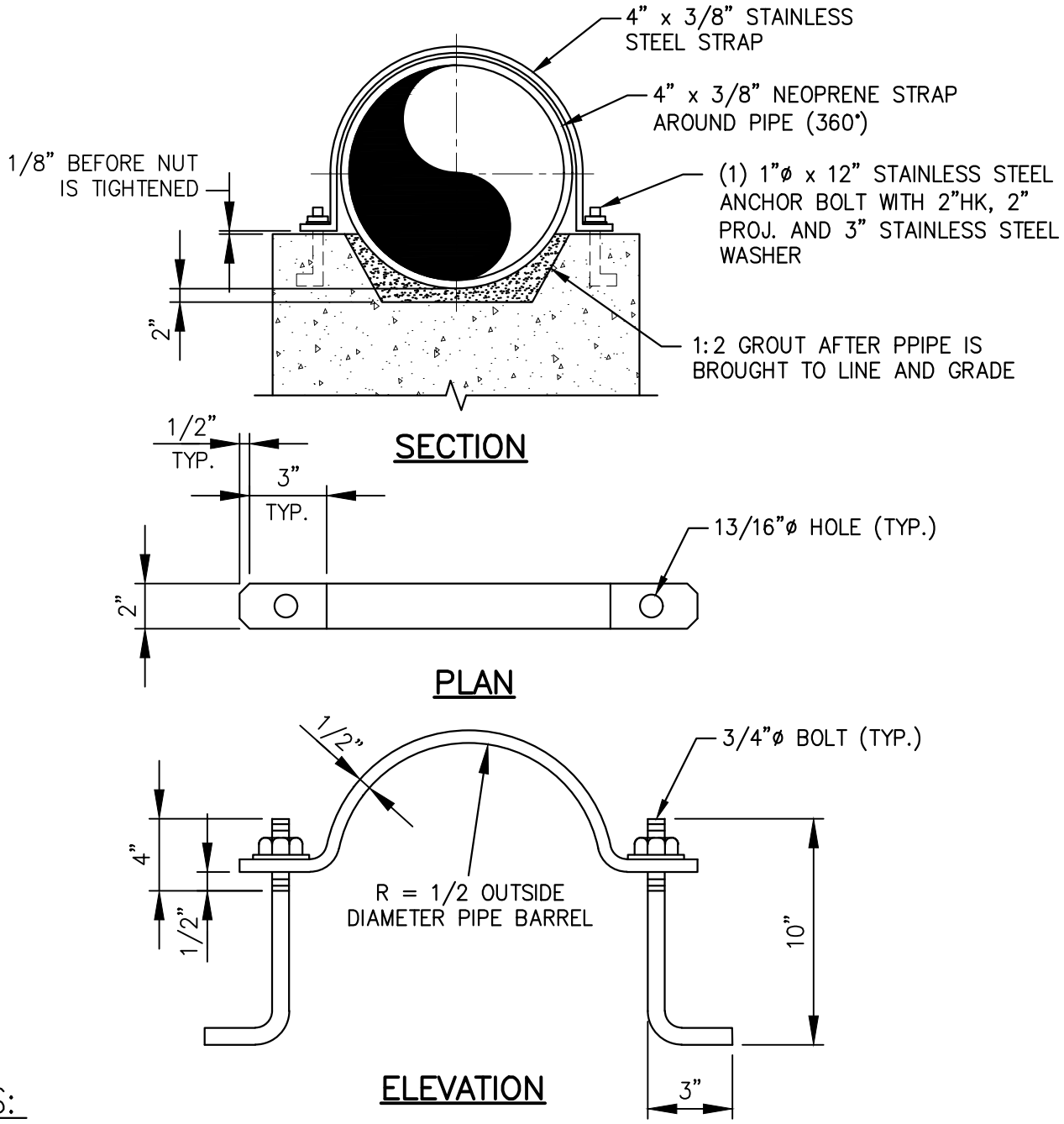
DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Pier Footing On Rock	WATER Matters
	Not to Scale	DETAIL NO. CC-003



NOTES:

1. USE EDIP IN A HIGH STRENGTH STEEL CASING PROTECTED BY AN I–BEAM ON UPSTREAM SIDE TO WITHSTAND IMPACT OF FALLEN TREES AND OTHER DEBRIS IF BOTTOM OF PIPE IS BELOW THE 50 YEAR FLOOD ELEVATION

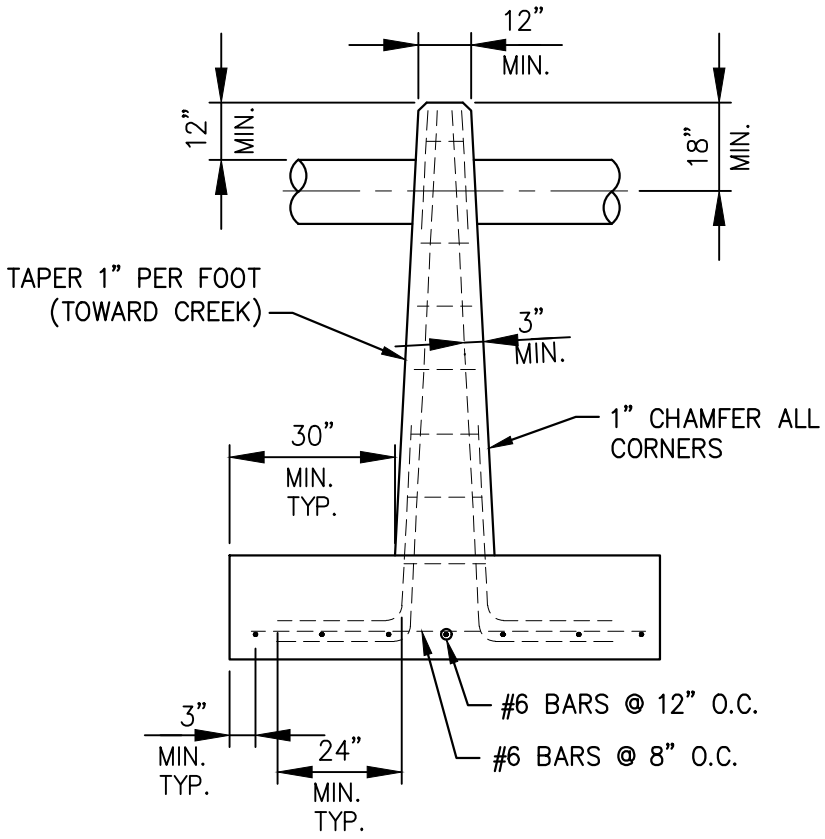
DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Pier	WATER Matters
	Not to Scale	DETAIL NO. CC-004

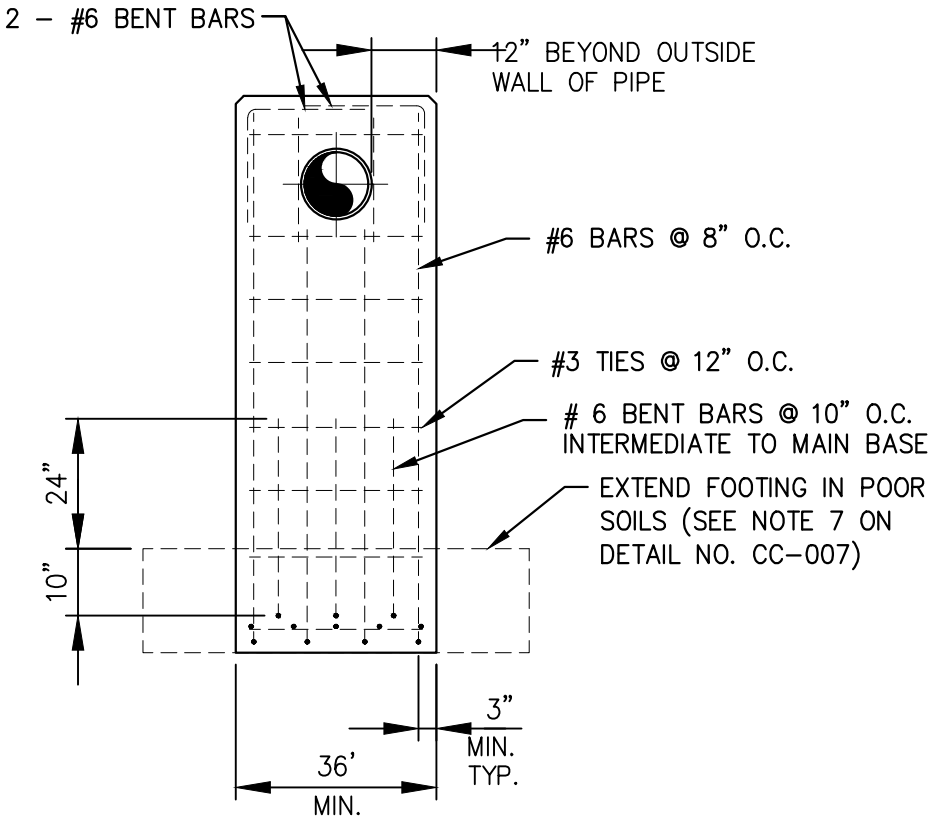


NOTES:

1. ANCHOR BOLTS AND STRAPS SHALL BE STAINLESS STEEL AND HOT ASPHALT DIPPED AND COATED WITH EPOXY.
2. STAINLESS STEEL OR IRON CAN BE USED.
3. FOR PIPES 24" AND LARGER USE 1"ø BOLTS AND 1–1/16"ø HOLE IN STRAP.
4. HOLES TO BE DRILLED IN STRAP.
5. PROVIDE WASHERS UNDER STRAP SUCH THAT STRAP IS PULLED DOWN TIGHT.
6. PROVIDE EXPANSION JOINTS BETWEEN ABOVE GROUND AND BELOW GROUND SEWERS.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Pipe or Casing Anchorage Up to 24"Ø pipe	WATER Matters
	Not to Scale	DETAIL NO. CC-005





DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Reinforced Concrete Anchor Pier and Footing (Sheet 1 of 2) Not to Scale	WATER Matters
		DETAIL NO. CC-006

NOTES:

1. CONCRETE SHALL BE 4,000 PSI MINIMUM.

2. DEPTH AND SIZE OF PIERS TO BE DETERMINED BY ENGINEER.

3. FOOTING THICKNESS SAME AS BASE THICKNESS OF PIER.

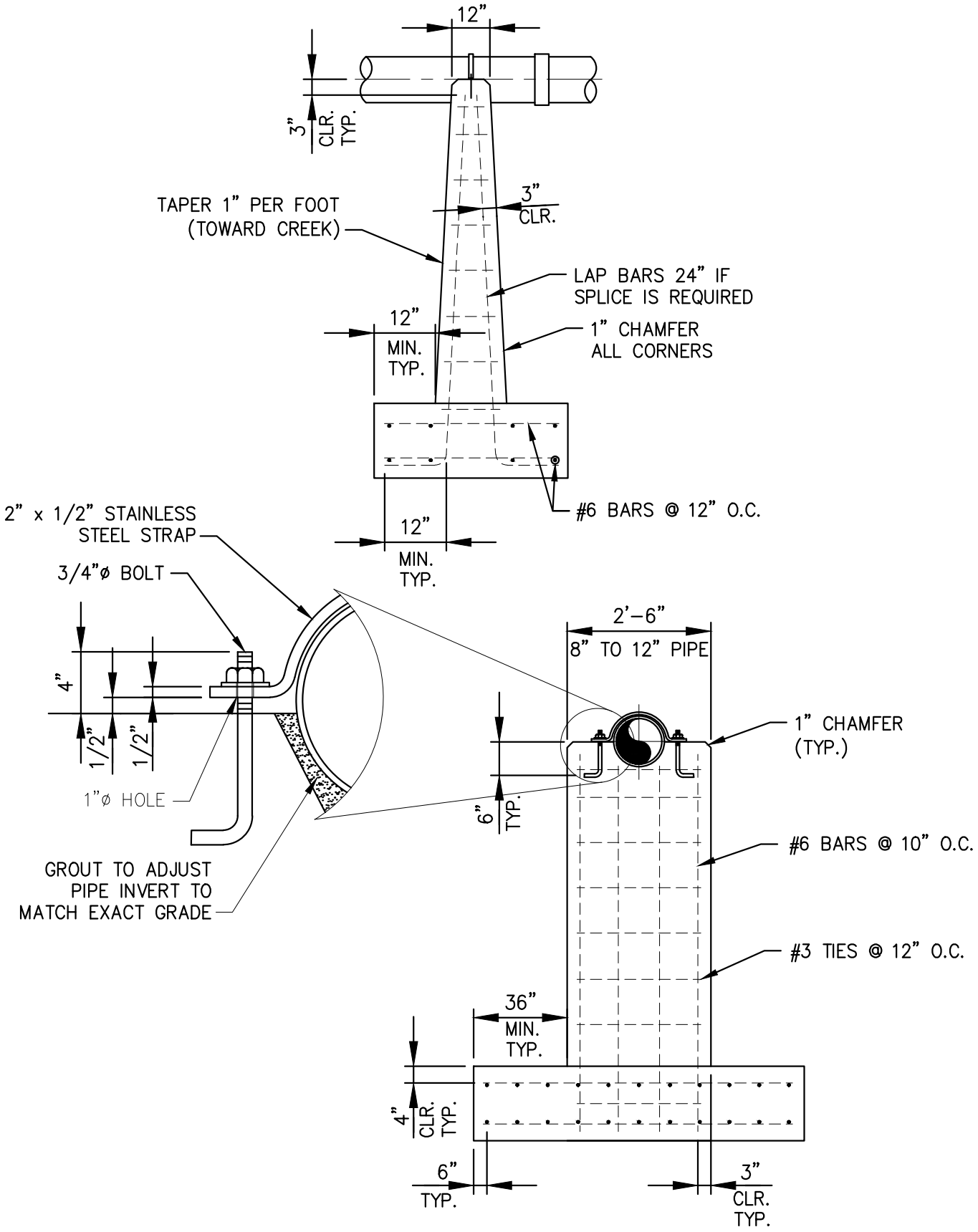
4. PIERS TO BE BUILT WITH LONG SIDE OF FOOTING PERPENDICULAR TO CREEK FLOW.

5. REINFORCING STEEL TO BE PLACED WITH A MINIMUM CLEARANCE OF 3" WITH THE SURFACE OF THE CONCRETE.

6. THE CREEK UPSTREAM AND DOWNSTREAM OF THE AERIAL CROSSING MAY NEED STRAIGHTENED FOR PROPER INSTALLATION OF THE PIERS. APPROVAL MAY BE REQUIRED FROM REGULATORY AGENCIES TO STRAIGHTEN CREEK. STABILIZE ALL DISTURBED BANKS WITH RIP RAP.

7. IN SOME INSTANCES WHEN POOR SOILS AND SUBGRADE EXIST, THE FOOTING MAY HAVE TO BE EXTENDED EACH WAY TO PROPERLY SUPPORT THE PIER. THE ENGINEER IS TO DETERMINE WHEN TO EXTEND THE FOOTING. LENGTH OF THE FOOTING TO BE AT LEAST EQUAL TO THE FOOTING LENGTH PERPENDICULAR TO THE CREEK.

8. FINAL DIMENSIONS AND DETAILS TO BE DETERMINED BASED ON LOCATION, HEIGHT AND OTHER FIELD CONDITIONS. DETAILS MUST BE SIGNED, SEALED AND DATED BY A GEORGIA REGISTERED STRUCTURAL PROFESSIONAL ENGINEER.



DeKalb County
GEORGIA

STANDARD DETAILS

Reinforced Concrete Pier and Footing (Sheet 1 of 2)

Not to Scale

09/17

WATER Matters

DETAIL NO. CC-008

NOTES:

1. CONCRETE SHALL BE 4,000 PSI MINIMUM.

2. MAXIMUM HEIGHT OF REINFORCED CONCRETE PIERS TO BE 20'–0".

3. FOOTING THICKNESS SAME AS BASE THICKNESS OF PIER.

4. PIERS TO BE BUILT WITH LONG SIDE OF FOOTING PERPENDICULAR TO CREEK FLOW, SEE NOTE 8.

5. PIER TO BE CENTERED ON FOOTING WHEN PIPE IS PARALLEL TO CREEK, SEE NOTE 8.

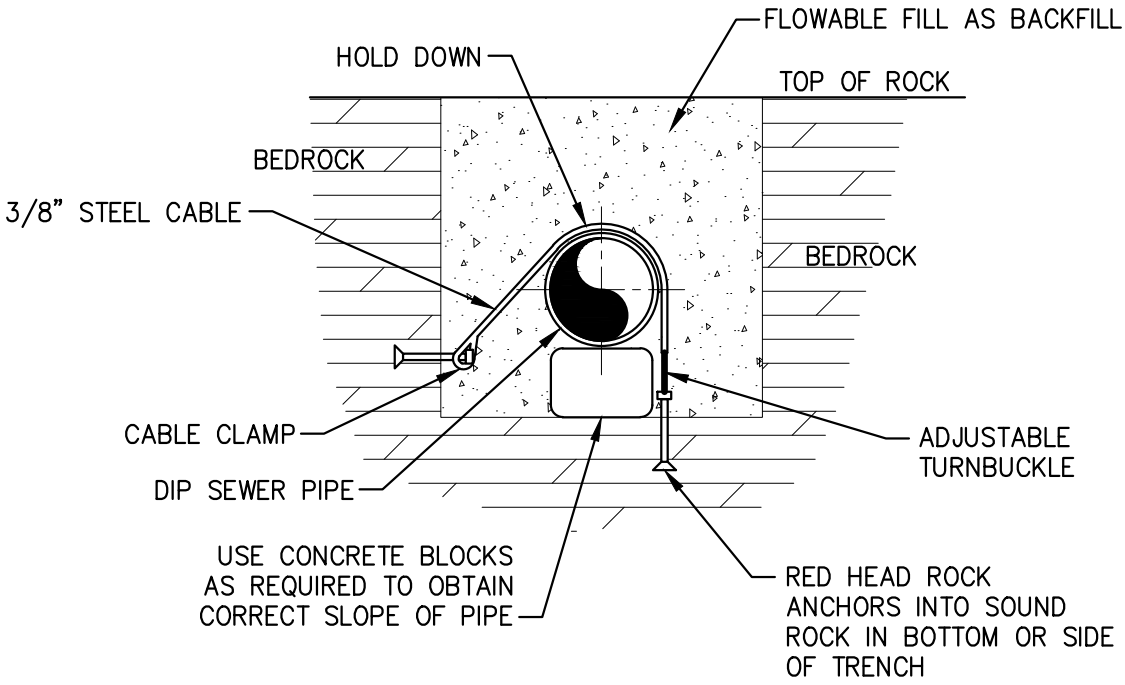
6. PIPE TO BE SET 1/2 IN PIER AND 1/2 PROTRUDING ABOVE PIER. WHEN PIERS ARE PLACED PARALLEL TO THE FLOW OF THE CREEK AND THE PIPE IS ON A SKEW WITH THE PIER, HOLDING STRAPS MAY STILL BE PLACED AT RIGHT ANGLES TO THE PIPE, PROVIDING THE ANCHOR COLTS ARE NOT SET WITH A CLEARANCE OF LESS THAN 2" TO THE SURFACE OF THE PIER.

7. REINFORCING STEEL TO BE PLACED WITH A MINIMUM CLEARANCE OF 3" WITH THE SURFACE OF THE CONCRETE.

8. IN SOME INSTANCES WHEN POOR SOILS AND SUBGRADE EXIST, THE FOOTING MAY HAVE TO BE EXTENDED EACH WAY TO PROPERLY SUPPORT THE PIER. THE ENGINEER IS TO DETERMINE WHEN TO EXTEND THE FOOTING. LENGTH OF FOOTING TO BE EQUAL EACH WAY.

9. THE CREEK UPSTREAM AND DOWNSTREAM OF THE AERIAL CROSSING MAY NEED STRAIGHTENED FOR PROPER INSTALLATION OF THE PIERS. APPROVAL MAY BE REQUIRED FROM REGULATORY AGENCIES TO STRAIGHTEN CREEK. STABILIZE ALL DISTURBED BANKS WITH RIP RAP.

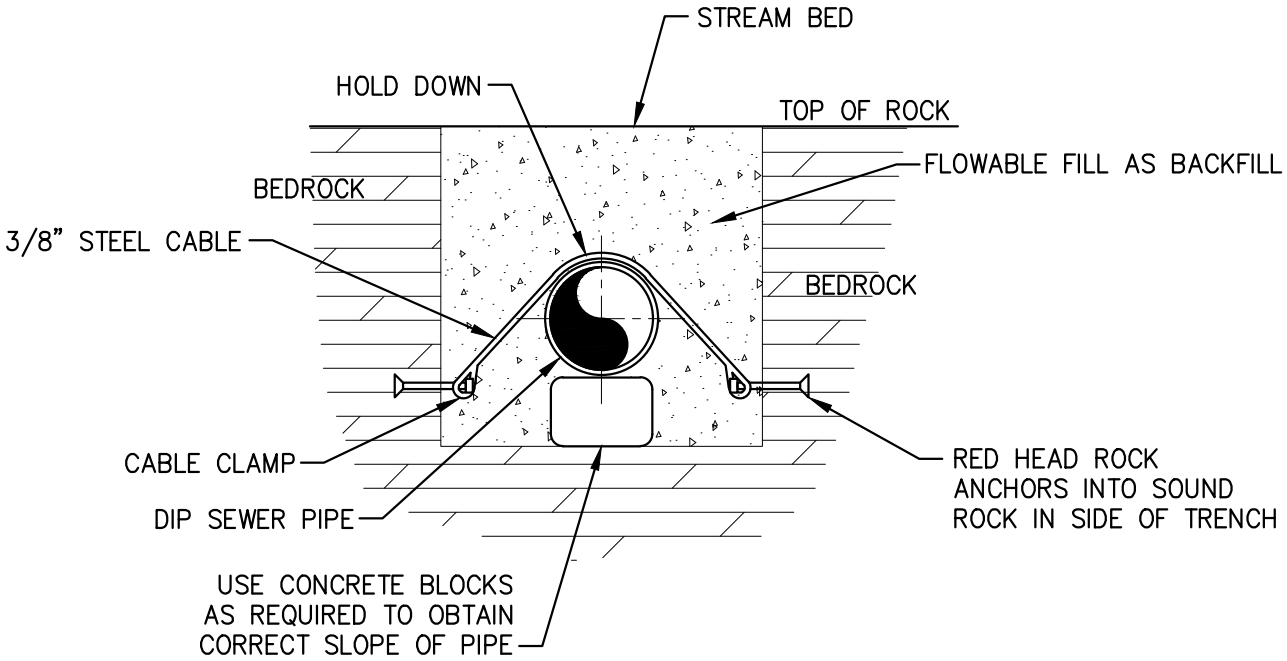
10. FINAL DIMENSIONS AND DETAILS TO BE DETERMINED BASED ON LOCATION, HEIGHT AND OTHER FIELD CONDITIONS. DETAILS MUST BE SIGNED, SEALED AND DATED BY A GEORGIA REGISTERED STRUCTURAL PROFESSIONAL ENGINEER.



NOTES:

1. ROCK ANCHORS TO BE 3/8"ø x 5" LONG INTO SOUND ROCK. ANCHORS TO BE IN TRENCH BOTTOM OR INTO TRENCH WALL BELOW THE INVERT OF THE PIPE.
2. HOLD DOWN TO BE 3/8" STEEL CABLE.
3. CONNECT CABLE TO ROCK ANCHORS WITH 3/8" FLAT WASHER AND CABLE CLAMPS.
4. TWO HOLD DOWNS PER LENGTH OF PIPE.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Sanitary Sewer Creek Crossing Hold Down	WATER Matters
	Not to Scale	DETAIL NO. CC-010



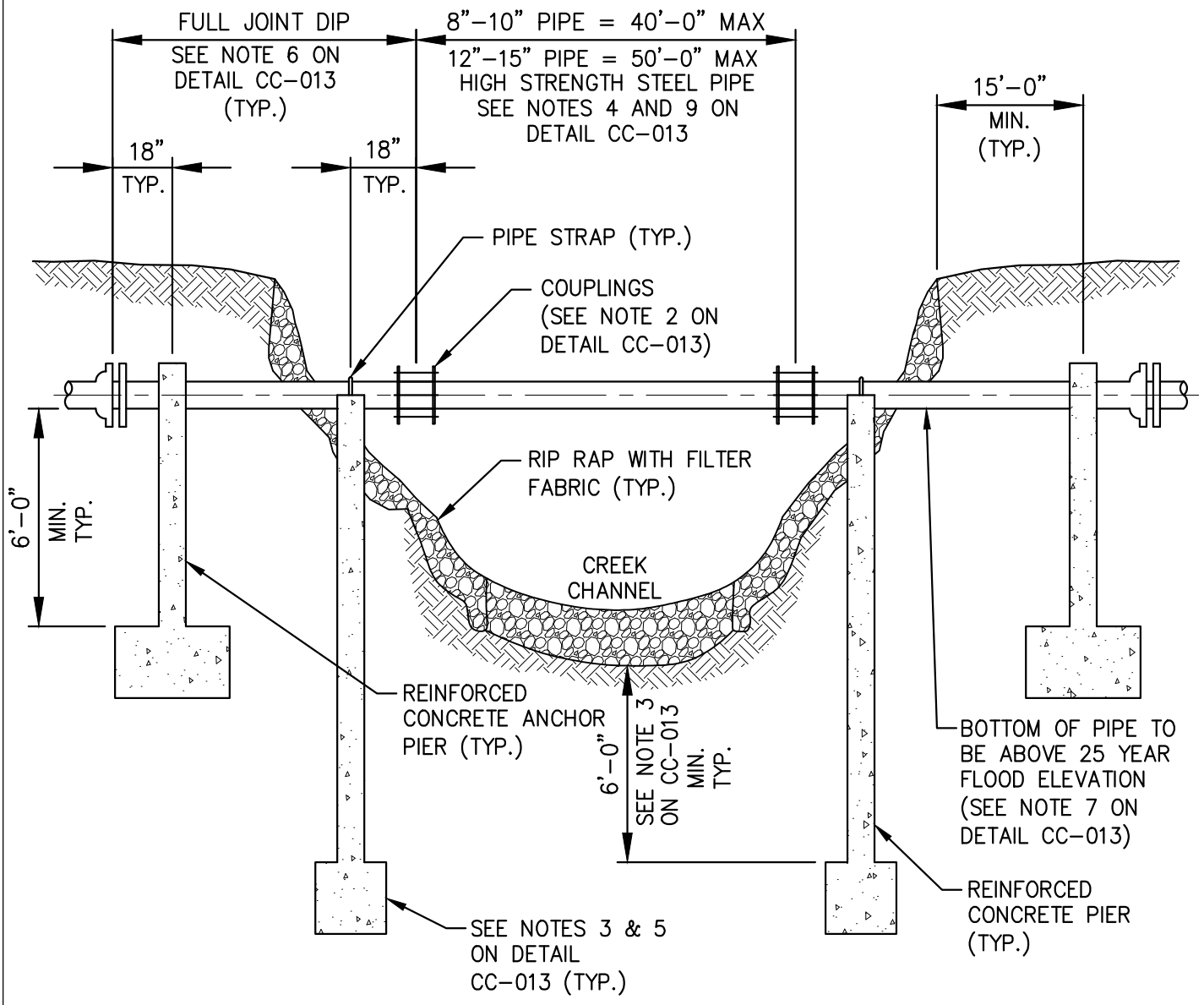
NOTES:

1. DO NOT LAY PIPE ON CRUSHED STONE BEDDING. DO NOT BACKFILL PIPE WITH CRUSHED STONE IN ROCK EXCAVATION AREAS.

2. FLOWABLE FILL TO BE UNDER AND AROUND DIP SEWER PIPE FROM BOTTOM OF TRENCH IN ROCK EXCAVATION AREAS TO TOP OF ROCK EXCAVATION.

3. FLOWABLE FILL TO BE GENERAL USE FLOWABLE FILL CONFORMING TO GEORGIA DEPARTMENT OF TRANSPORTATION (GDOT) STANDARD SPECIFICATIONS FOR ROAD AND BRIDGE CONSTRUCTION FOR CONTROLLED LOW-STRENGTH MATERIAL (CLSM) FOR GENERAL USE FLOWABLE FILL.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Sanitary Sewer Creek Crossing In Rock Utilizing Flowable Fill	WATER Matters
	Not to Scale	DETAIL NO. CC-011



DeKalb County GEORGIA

STANDARD DETAILS

Typical Large Width Creek Crossing For Pipe Bottom Above 50 years Flood Elevation (Sheet 1 of 2)

Not to Scale

09/17

WATER Matters

DETAIL NO. CC-012

NOTES:

1. THIS DETAIL APPLIES TO SEWERS RANGING FROM 8" TO 15" IN DIAMETER. FOR SEWERS GREATER THAN 15", SUBMIT A DETAILED DESIGN FOR REVIEW AND APPROVAL.

2. COUPLINGS SHALL BE LONG BODY TYPE AND COMPLETELY EXPOSED. COUPLINGS TO BE AS MANUFACTURED BY DRESSER INDUSTRIES – STYLE 62 TRANSITION COUPLING OR APPROVED EQUAL. CENTER RING LENGTH FOR 8" AND SMALLER PIPE SHALL BE 5". CENTER RING LENGTH FOR 10" TO 15" PIPE SHALL BE 7". THE CENTER RING, GLANDS, BOLTS AND NUTS SHALL RECEIVE A MINIMUM 40 MIL EPOXY.

3. FOOTING DEPTH SHALL BE SUITABLE GRADE AS DETERMINED BY THE ENGINEER., BUT SHALL NOT BE LESS THAN AS SHOWN, (EXCEPT WHEN PIER IS ANCHORED TO SOLID ROCK).

4. STEEL PIPE MUST BE SEAMLESS OR STRAIGHTSEAM. SPIRAL WELD IS NOT ALLOWED. THE INSIDE DIAMETER OF THE STEEL PIPE TO MATCH THE INSIDE DIAMETER OF THE DUCTILE IRON PIPE. STEEL PIPE TO BE COATED PER THE SPECIFICATIONS. USE DUCTILE IRON PIPE FOR NARROW CREEK CHANNELS, SEE NOTE 9.

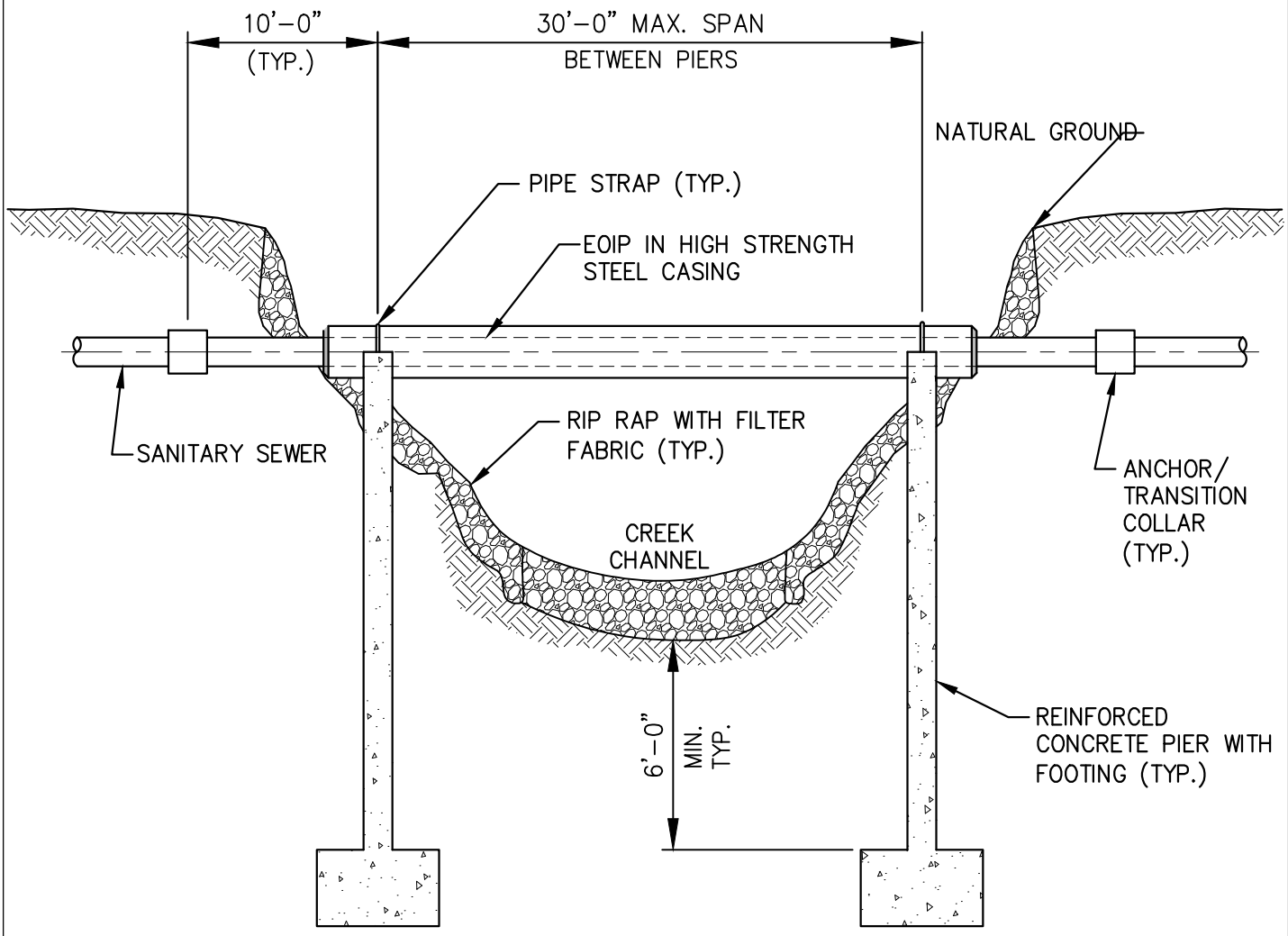
5. REFER TO DETAIL FOR PIERS ON SOLID ROCK.

6. DUCTILE IRON PIPE TO EXTEND TO THE NEXT MANHOLE. NO PIPE TRANSITIONS BETWEEN MANHOLES SHALL BE ALLOWED.

7. CREEK CROSSINGS MAY REQUIRE A PERMIT FROM THE STATE AND FEDERAL REGULATORY AGENCIES. WHERE THE PIPE BOTTOM CANNOT BE INSTALLED ABOVE THE 25 YEAR FLOOD ELEVATION, SPECIAL APPROVAL MUST BE GIVEN BY THE COUNTY AND/OR REGULATORY AGENCIES.

8. THE CREEK UPSTREAM AND DOWNSTREAM OF THE AERIAL CROSSING MAY NEED STRAIGHTENED FOR PROPER INSTALLATION OF THE PIERS. APPROVAL MAY BE REQUIRED FROM REGULATORY AGENCIES TO STRAIGHTEN CREEK. STABILIZE ALL DISTURBED BANKS WITH RIP RAP.

9. STANDARD DUCTILE IRON PIPE CAN BE USED FOR CREEK CROSSINGS IF THE CROSSING IS 18'–0" OR LESS. LONG SPAN DUCTILE IRON PIPE AS RECOMMENDED BY THE MANUFACTURER CAN BE USED FOR CROSSINGS 38'–0" AND LESS.



NOTES:

1. NO PIERS SHALL BE PLACED IN NORMAL FLOW OF CREEK, UNLESS APPROVED BY DWM ENGINEER.
2. ALL AERIAL CROSSINGS MUST BE APPROVED BY DEKALB COUNTY DEPARTMENT OF WATERSHED MANAGEMENT.
3. SPANS EXCEEDING 30'–0" REQUIRES SUBMITTAL OF DESIGN CALCULATIONS.
4. PIERS ARE NOT NEEDED UNLESS AERIAL SPAN IS OVER 18'–0" IN LENGTH.

DeKalb County
GEORGIA

STANDARD DETAILS

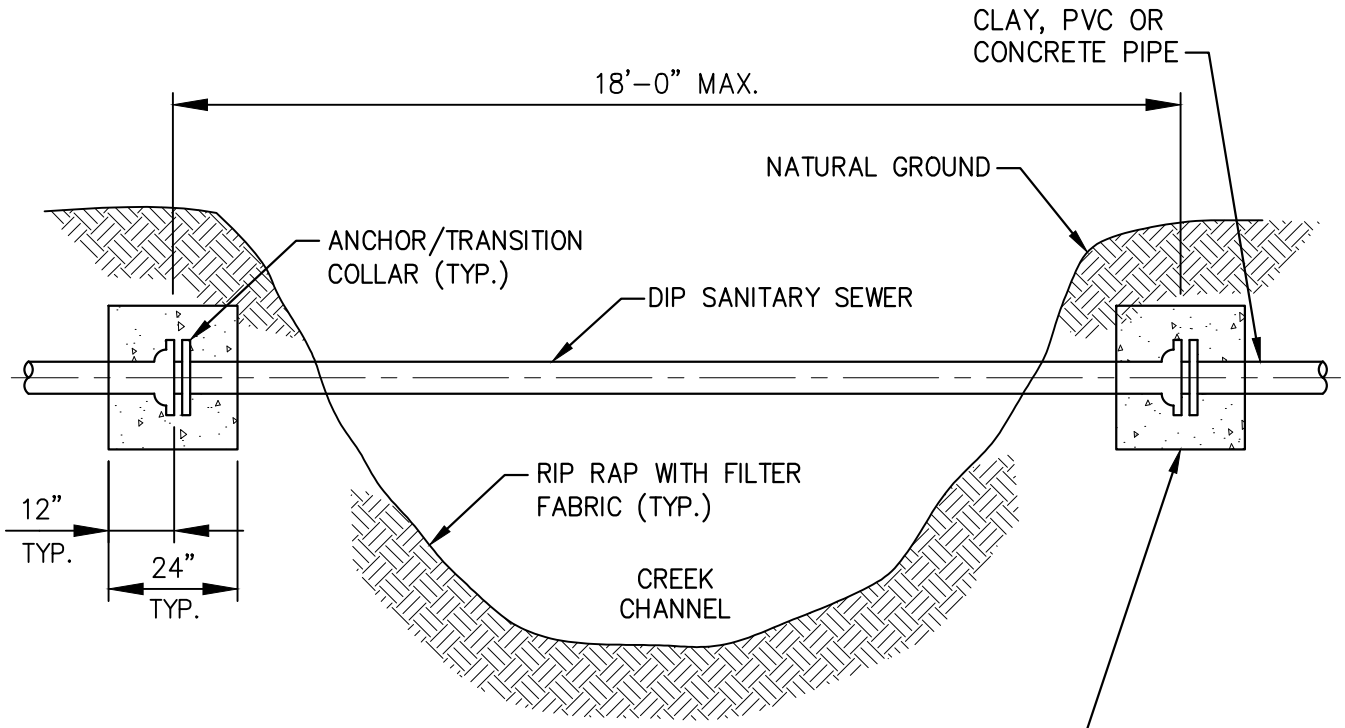
Typical Medium Width Creek Crossing For Pipe Bottom Above 50 Year Flood Elevation

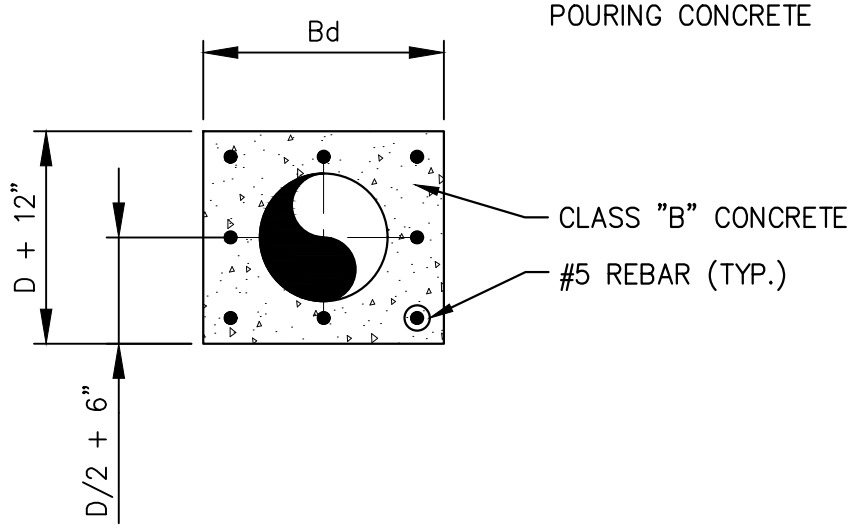
Not To Scale

09/17

WATER Matters

DETAIL NO. CC-014





NOTES:

1. NO PIERS SHALL BE PLACED IN NORMAL FLOW OF CREEK, UNLESS APPROVED BY DEKALB COUNTY DEPARTMENT OF WATERSHED MANAGEMENT.
2. ALL AERIAL CROSSINGS MUST BE APPROVED BY DEKALB COUNTY DEPARTMENT OF WATERSHED MANAGEMENT.
3. SPANS EXCEEDING 30'-0" REQUIRES SUBMITTAL OF DESIGN CALCULATIONS.
4. PIERS ARE NOT NEEDED UNLESS AERIAL SPAN IS OVER 18'-0" IN LENGTH.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Typical Narrow Width Creek Crossing For Pipe Bottom Above 50 Year Flood Elevation Not to Scale	WATER Matters
		DETAIL NO. CC-015

APPENDIX E
GENERAL DETAILS

GEORGIA DEPARTMENT OF TRANSPORTATION CHECKLIST

To obtain a Georgia Department of Transportation Utility Encroachment Permit, please contact the DeKalb County Department of Watershed Management Technical Service Division with the following information:

Construction Drawings

☐	Right-of-Way Width
☐	Pavement Centerline and Width
☐	Distance to Curb
☐	North Arrow
☐	Location of proposed installation showing distances to nearest intersecting street
☐	Length, size and type of utility
☐	Bore and Jack Pits (if required)
☐	Show posted speed limit
☐	Include an 8 ½ x11 map of location

PLAN REVIEW CHECKLIST			
Project Name:			
Project Address:			
Reviewed by:		**Date:**	

General Information

General

☐	Show name, address and phone number of engineering/surveying firm.
☐	Show name, address and phone number of developer.
☐	Submit 4 sets of 24” x 36” construction plans.
☐	Plans must bear an original hand written signature and date across the seal of a Registered Land Surveyor licensed in the State of Georgia.
☐	Show the following on all plans: • North arrow • Location map • Graphic scale • Benchmark information in State Plane Coordinates
☐	Specify project title, project number (if DeKalb County Project), land lot, district, and parcel number in the title block.
☐	Show only unit/phase intended for final approval, specify unit and/or phase number.
☐	Show name of development.

Water

☐	Show and label all existing and proposed water mains.
☐	Show the location of all proposed water meters and label meter size along with the appropriate backflow prevention device per DWM Design Specifications.
☐	Show and label all proposed and existing easements.
☐	Fire Marshall Review stamped/approval required prior to DWM’s sign off/approval.
☐	Backflow preventer devise is required to be installed on all water service connections lines, including; domestic, commercial, fire line, and irrigation services.
☐	Water connections to facilities with high hazard potential require the installation of Reduced Pressure Principle (RPP) assemblies.
☐	Fire hydrants shall be spaced every five hundred (500) feet in rural areas, every four hundred (400) feet in residential areas, and every three hundred (300) in commercial areas, or as determined by the DeKalb County Fire Marshall.
☐	Show size and length of bore and casing.
☐	Show label and station fire hydrants, valves and fittings.
☐	Label pipe size and type for each section of line.

PLAN REVIEW CHECKLIST			
Project Name:			
Project Address:			
Reviewed by:		**Date:**	

☐	Label all abutting lots by lot number, tract, subdivision and address.
☐	Show and label roads, right-of-way and pavement widths.
☐	Show and label all property boundaries, roads, right of ways with dimensions, all utility easements, phase lines, buffers and adjoining property owners.
☐	Potable water mains shall maintain a clearance of 10 (ten') feet horizontal and eighteen 918") inch vertical from all non-potable pipelines.
☐	Provide a table identifying the coordinates for each water meter to be installed.
☐	Show and label location of chlorination tap.
☐	Vaults shall have only one (1) line entering and leaving the structure.
☐	Refer to the Design Criteria section in the DCDWM Design Standards for all water main replacement specifications.
Sewer	
☐	Show all existing and proposed utilities.
☐	Show, label, and number all manholes including rim and invert elevations, and station numbers.
☐	Show stub locations for each lot with station numbers from manholes and lengths.
☐	Label all abutting lots by lot number, tract, subdivision and address.
☐	Show and label all sewer easements, permanent and temporary.
☐	Show and label individual building connections, clean-outs, grease traps (including size), oil/water separators, test manholes, etc.; including distances from manholes, length and size of laterals.
☐	Show angle deflection at manholes. Angle must be 90 degrees or greater in direction of flow.
☐	Show all water and storm sewer lines and appurtenances.
☐	Gravity sewer line material shall be PVC (SDR26) or DIP (Class 350).
☐	Add material list, including length, type, size and number of manholes for all lines 8" or larger**.**
☐	Show and label all property boundaries, roads, right of ways with dimensions, existing and proposed utility easements phase lines, buffers and adjoining properties owners.
☐	Service laterals shall **NOT** cross property lines.
☐	Manhole spacing: • Maximum distance between manholes for mains under 24": 400 feet • Maximum distance between manholes for mains 24" to 36": 500 feet • Maximum distance between manholes for mains over 36": 800 feet

PLAN REVIEW CHECKLIST			
Project Name:			
Project Address:			
Reviewed by:		**Date:**	

☐	Manholes shall be minimum of 4 feet from the curb line at edge of pavement when located within the public right-of-way.
☐	All permanent easements shall be a minimum of twenty (20) feet in width for all County maintained utilities. DWM retains the right to require additional easements where deemed necessary.
☐	Gravity sewer system shall be designed on the ba sis of per capita flows for the design period in conjunction with a peaking factor, or approval alternative methods. Sewer lines shall be sized according to the limitations set forth in the DCDWM Design Standards.
☐	Show and label any creeks, buffers, wetlands and flood plain limits.
☐	Show the size and location of all bore and jack pits.
☐	Show septic tank and drain field locations on plans. Provide a copy of the approval from DeKalb County Environmental Health Department.
☐	Discharge to a public sanitary sewer of storm water, surface runoff or groundwater is prohibited.
Sewer Profiles	
☐	Show all lines and manholes per site plan beginning at existing system.
☐	Show pipe length, slope, pipe size, and pipe type for each section of line.
☐	Show manhole numbers, stations numbers, rim elevations, inverts in and out elevations.
☐	Show outside drops at manholes with invert in elevation at top of drop and inverts in and out at bottom of drop.
☐	Show existing and proposed grade on profiles.
☐	Show horizontal and vertical scales.
☐	Show all utility crossings.
☐	Show DIP in all fill areas.
☐	Minimum depth of cover over a sanitary sewer line shall be 4 feet of cover unpaved areas and 7 feet of cover in paved areas.
☐	Maintain a minimum 0.20’ elevation drop across manhole.
Notes	
☐	All design and construction for water, sewer, fire lines, lift stations and backflow prevention shall comply with DeKalb County Department of Watershed Management Design Standard Latest Edition. Actual field conditions may dictate more stringent requirements if deemed necessary by the construction inspector.
☐	Developer shall provide record drawings “As-Built Plans” and “Final Plats” in hard copy and electronic format, as well as, record all easements that will be dedicated to DeKalb County in the court house, prior to approval of the “As-Built Plans.”
☐	F.O.G. Compliance (Grease Trap) review and approval required. Call (404)687-7150.

PLAN REVIEW CHECKLIST

Project Name:			
Project Address:			
Reviewed by:		**Date:**	

☐	Projects involving construction of townhomes and/or condominiums are required to have individual meters for each unit.
☐	Field changes during construction must be submitted for review and approved by the DeKalb County Department of Watershed Management **BEFORE** changes are implemented.
☐	Projects located within the Cities, the developer shall provide a maintenance bond to DeKalb County Watershed Management prior to approval of As-Built Plans.
☐	Contractor must jet clean and T.V. sanitary sewer after all connections is made to the existing sewer tie-in locations. Tracer wire is to be installed for all PVC pipes.
☐	Water and Sewer Fees need to be paid under the following circumstances: • New Construction, Re-Development, Additions, Change of Use, etc. • These fees are to be paid at 330 West Ponce De Leon Ave, 2nd Floor. • Failure in payment of these fees will result in postponement of the plan review process. Call (404) 371-4918 for fee calculations or any questions.
☐	Contractor to notify the DWM Construction Inspector at least 72 hours prior to commencing constructions activities.

Inspector	Contact No	Email	Coverage Areas
Mercer McGuire	770-687-4060	MMcGuire@dekalbcountyga.gov	Senior Inspector
Lonnie Kelley	404-371-2149	llkelley@dekalbcountyga.gov	15th, 16th, 12th
Bruce Mayhew	404-371-3218	bmayhew@dekalbcountyga.gov	15th, 16th, 11th
Daniel Tucker	404-687-4050	datucker@dekalbcountyga.gov	18th & 6th
Les Mosely	404-371-3213	lbmosley@dekalbcountyga.gov	18th
Joseph Young	678-794-3980	joyoung@dekalbcountyga.gov	16th, 12th

***** Check with DWM for periodic contact information updates *****

☐	Fire lines, F.O.G., Backflow Prevention and Lift Stations require a separate review.
☐	For Industrial site, notify DWM IPP at IPP@dekalbcountyga.gov , for FSE or non-residential buildings with a kitchen/breakrooms, check and confirm FOG review required in Hansen.
☐	Projects entering a State of Georgia controlled right-of-way will require GDOT permit. All required materials to be submitted to DWM. Refer to GDOT checklist for requirements.
☐	**To purchase copy a copy of the Design Standards, please call (770) 414-2383 or (770) 621-7272.**

WATER AS-BUILT CHECKLIST			
Project Name:			
Project Address:			
Reviewed by:		**Date:**	

General Information

General

☐	Show name, address and phone number of engineering/surveying firm.
☐	Show name, address and phone number of water main contractor.
☐	Show name, address and phone number of owner/developer.
☐	Submit 4 sets of 24” x 36” as-built drawings, AutoCAD file and electronic signed sealed PDF on a CD/DVD or flash drive.
☐	Plans must bear an original hand written signature and date across the seal of a Registered Land Surveyor licensed in the State of Georgia.
☐	Show the following on all plans: • North arrow • Location map • Graphic scale • Benchmark information in State Plane Coordinates
☐	Specify project title, project number (if DeKalb County Project), land lot, district, and parcel number in the title block.
☐	Show name of development with all name changes.
☐	Show, label and station fire hydrants, valves and fittings.
☐	Label pipe size and type for each section of line.
☐	Show, label and number all manholes including station numbers.
☐	Show stub locations for each lot with station numbers from manholes, lengths and depths.
☐	Label all abutting lots by lot number, tract, subdivision an address.
☐	Show and label roads, right-of-way and pavement widths.
☐	Submit a copy of the site plan or final plat.
☐	Show and label all property boundaries, roads, right of ways with dimensions, all utility easements, phase lines, buffers and adjoining property owners.
☐	Provide State Plane Coordinates for all valve and fire hydrant locations.
☐	Provide a material list shown on as-built drawing indicating the number of fire hydrants, valves and size/length/type of pipes.

WATER AS-BUILT CHECKLIST			
Project Name:			
Project Address:			
Reviewed by:		**Date:**	

☐	Show and label all permanent water easement with Book and Page Number. Provide easement documents for all easement and provide a letter signed and sealed by a Registered Land Surveyor licensed in the State of Georgia, stating they have all been addressed or that there are none.
☐	**FYI: Water mains will not be accepted until they have received 2 consecutive sets of acceptable bacteriological test samples**.
☐	**Include a copy of the checklist with re-submittal.**

Electrical Conduit And Accessories Specifications for the DeKalb County Wastewater Treatment and Collection System

All outdoor electrical conduits and supporting accessories for new installations at the Snapfinger plant, Polebridge plant and lift stations shall be of type PVC Coated REDH2OT supplied by PLASTI-BOND or an approved equal. This requirement applies to all outdoor, exposed and buried types of installations as well as any installation indoor and outdoor where the air is determined to be corrosive.

Equivalent substitution and/or exceptions due to conformance criteria, performance, availability or other considerations must be individually itemized and approved by the responsible party from the watershed Management's wastewater treatment plants.

All compounds used in conjunction with PLASTI-BOND conduits and accessories must be of the type specified or recommended by PLASTI-BOND for use with their products.

The following is a partial list of available PLASTI-BOND REDH2OT products:

Product	PLASTI-BOND REDH2OT Item	Description
Rigid Conduit	PLASTI-BOND Coated Galvanized Rigid Conduit	PVC coated rigid metal conduit with red urethane interior coating protects conductors from mechanical damage and corrosive attack. Electrical continuity is maintained across assembled joints.
Nipple	PLASTI-BOND Coated Nipples	Factory threaded nipples save you time and money in the field. Electrical continuity is maintained across assembled joints. *The exteriors of certain short nipples are coated with urethane in lieu of PVC. This is dictated by the manufacturing process as well as assembly considerations.
Pipe Strap Support	PLASTI-BOND Coated Pipe Straps	PLASTI-BOND PVC coated pipe straps are used to securely mount conduit to a wall or other structure for support. They are available in two types: a one-hole malleable iron strap or a two-hole stamped steel strap. Mounting hardware not provided.

Product	PLASTI-BOND REDH2OT Item	Description
Clamp Hanger Support	PLASTI-BOND Coated Clamp Hangers	PLASTI-BOND PVC coated conduit clamp hangers are used with threaded rod to securely suspend conduit runs supported from above. They are provided with stainless steel hardware.
Thread Rod Support	PLASTI-BOND Coated Thread Rods	PLASTI-BOND PVC coated all thread rod is used with coated conduit hangers and coated strut to securely suspend conduit runs supported from above. It is provided in 3/8" and ½" sizes and three standard lengths, 3', 6', and 10'.
Elbow	PLASTI-BOND Coated Elbows	Factory bent standard radius elbows are available and ready to ship. Factory bent elbows are more accurate, quicker to install and more economical, because they save field bending time and do not waste materials. Electrical continuity is maintained across assembled joints.
Pulling Elbow	PLASTI-BOND Coated Pulling Elbows	PLASTI-BOND pulling elbows are used at 90 degree bends in conduit runs to allow straight pulls at bends, to serve as pull outlets for stiff conductors, to allow for service entrance into buildings or to allow conductor entrance into motors. Electrical continuity of the conduit system is maintained across assembled joints.
Conduit Thread and Coupling	PLASTI-BOND Coated Conduit Thread and Coupling	PVC coated rigid metal conduit couplings with red urethane interior coating connect coated conduit sections. Electrical continuity is maintained across assembled joints. PVC sleeves on couplings seal off on conduit PVC coating when assembled to prevent corrosive liquids and vapors from attacking threaded joints.
Strut Support	PLASTI-BOND Coated Struts	PLASTI-BOND PVC coated strut is a versatile system of structural elements that can be used to build supports for a variety of applications. When combined with coated conduit hangers and other accessories, coated strut is a versatile and economical way to provide reliable support for conduit runs and other

Product	PLASTI-BOND REDH2OT Item	Description
		electrical and mechanical installations.
Pipe Strut Strap Support	PLASTI-BOND Coated Pipe Strut Straps	PLASTI-BOND PVC coated pipe straps are used with coated strut to support conduit installations in a variety of configurations. B2008 style straps may be used in either vertical or horizontal positions to support conduit. Straps provided with stainless steel hardware. Conduit spacing may be as close together as allowed by the couplings. B3690 style straps may be used with hanger rods or other means of support to securely fasten conduit runs.
Conduit Body	PLASTI-BOND Coated Form 8 & Form 7 Conduit Bodies for General Service	PLASTI-BOND conduit bodies with covers are offered in Form 8 and Form 7 styles, each with numerous configurations to provide a complete coated conduit system. May be used to make 90 degree bends, for pull outlets, to provide for taps or splices, to act as a mounting outlet for wiring devices or lighting fixtures etc. Electrical continuity of the conduit system is maintained across assembled joints.
Mogul Conduit Body	PLASTI-BOND Coated Mogul Style Conduit Bodies	PLASTI-BOND mogul style conduit bodies are offered in numerous configurations to provide a complete coated conduit system. Mogul BG Covers are sold separately. Mogul style fitting bodies have long openings and may be used to make bends in conduit runs, for pull outlets for stiff conductors, to provide additional room for taps or splices, etc. Electrical continuity of the conduit system is maintained across assembled joints.
Device Boxes	PLASTI-BOND Coated Cast Device Boxes and Covers	PLASTI-BOND device boxes and covers are available in several configurations and may be used in coated conduit systems to accommodate wiring devices, to serve as pull boxes for conductors, or to allow for splices and taps in conductors. Covers are available separately. Electrical continuity of the conduit system is maintained across assembled

Product	PLASTI-BOND REDH2OT Item	Description
		joints.
GUA Conduit Box	PLASTI-BOND Coted GUA Conduit Boxes – Hazardous Location	PLASTI-BOND GUA series conduit outlet boxes are installed in hazardous location conduit systems to serve as pull and splice box, to change the direction of a conduit run, to connect runs of conduit, or to provide access to conductors. They are provided with covers as standard. Inquire about special covers to allow use to mount lighting fixtures or as sealing fittings. Electrical continuity of the conduit system is maintained across assembled joints.
Sealing Fitting	PLASTI-BOND Coated sealing Fittings	PLASTI-BOND Sealing fittings are used in conduit runs to stop gasses, vapors or flames from migrating from one part of the conduit system to another. This limits the spread of any potential explosion, enhancing safety. The PVC and urethane coatings of the fittings protect them from corrosive atmospheres so they can continue to function in hazardous locations. These fittings are available in several different configurations and with optional breathers and drains to accommodate installation in a variety of locations and positions. The EY, EYM, EYD, and EYDEF styles of fittings are installation in vertical conduit runs. The EYA, EYAM, and EYSEF style fittings are for installation in either vertical or horizontal runs. The EZS and EZDM style fittings may be used in any angle of conduit run. These PLASTI-BOND sealing fittings should be used with a suitable system of sealing compound, such as Chico A, Chico X, or Chico A-P from Crouse-Hinds. Follow the installation instructions included with the sealing compound.
Knockout Hub	PLASTI-BOND Knockout Hubs ST Style	PLASTI-BOND ST style knockout hubs are used to terminate conduit runs through the wall of a sheet metal electrical enclosure. They are available with or without grounding lug. STTB

Product	PLASTI-BOND REDH2OT Item	Description
		style hubs are Through-Bulkhead fittings used to pass conduit runs through firewalls or bulkheads up to 1/8" thick. STTTB style hubs perform the same function for unlimited wall thicknesses, (furnished without nipples).
Conduit Outlet Box	PLASTI-BOND Coated OE Series Conduit Outlet Boxes	PLASTI-BOND OE Series Conduit Outlet Boxes are installed in hazardous location conduit systems to serve as pulling and splicing fittings, to connect runs of conduit, to change the direction of a conduit run, or to provide access to conductors. They are provided with covers. Electrical continuity of the conduit system is maintained across assembled joints.
Conduit Unions	PLASTI-BOND Coated Conduit UNF & UNY Unions	PLASTI-BOND UNF unions are used o connect conduit to conduit or to allow for future changes to the conduit system. Female threads are provided at each end. PLASTI-BOND UNY unions are used to connect conduit to a conduit fitting, junction box, or device enclosure. One end is a male thread and the other is female.
L Elbow	PLASTI-BOND Coated EL Style Malleable Elbows	PLASTI-BOND EL Style malleable elbows are used in a conduit run to change direction 90 degree or to terminate at a fitting or box. They are available with male threads only, female threads only, or male and female threads.
Service Entrance Elbow	PLASTI-BOND Coated LBY Service Entrance Elbows	PLASTI-BOND LBY type elbows are used as service entrance elbows between service entrance and vertical weatherhead conduit runs, to change direction of a conduit run 90 degree when space is limited, and for pull outlets. They are available for general service (Series LBY-50-GS through LBY-150-GS) and hazardous (Series LBY-50 through LBY-55) locations.
Expansion Joint	PLASTI-BOND XJG Conduit Expansion Joints	PLASTI-BOND XJG type expansion joints are used to connect two lengths of conduit subject to longitudinal movement, including that caused in

Product	PLASTI-BOND REDH2OT Item	Description
		long runs by thermal expansion and contraction.
Liquid Tight Connector	PLASTI-BOND Liquid Tight Connectors	PLASTI-BOND REDH2OT liquid tight connectors are used with liquid tight conduit to wire motors, transformers, processing equipment, pumps, etc. The flexible conduit and the PVC coated connector work together to seal out water and other corrosive liquids, protecting the conductors from damage
Reducing Coupling	PLASTI-BOND Coated reducing Couplings	PLASTI-BOND reducing couplings are used to connect two pieces of conduit of different size. They are available in 17 different size combinations.
Plug & Bushing	PLASTI-BOND Plugs and Bushings	GLL Grounding Bushings GLL style PVC coated threaded grounding bushings have an aluminum lug for copper or aluminum grounding conductors. RE Reducers RE style reducers reduce conduit hubs to a smaller size. They are provided with an integral bushing to prevent conductor damage and full, clean cut threads for ease of assembly. All RE reducers are coated inside and out with polyurethane for corrosion protection. PLG Plugs PLG style plugs are used to close unused conduit hubs. They are available with either recessed square drive sockets or raised square drive heads. All PLG plugs are completely coated with polyurethane for corrosion protection.
Strut Nut Support	PLASTI-BOND Coated Strut Nut Supports	PLASTI-BOND PVC coated strut nuts are used to assemble strut components and to secure coated a thread rod in a section of strut. These are available wit or without a spring to aid in placement and assembly.
Beam Clamp	PLASTI-BOND Coated Beam Clamps	PLASTI-BOND PVC coated beam clamps are used to securely support conduit runs by attaching them to beams, angles, trusses and other structural members. They are available in four different styles:

Product	PLASTI-BOND REDH2OT Item	Description
		Right Angle: to attach the conduit run at a 90 degree angle to a beam or structural member. **Parallel**: to attach the conduit run parallel to a beam or structural member. **Edge**: to attach the conduit run at a 90 degree angle to a thin beam or structural member. **Hanger Rod Beam Clamp**: to attach a single all thread rod to a beam or structural member.

GEORGIA DEPARTMENT OF TRANSPORTATION

MINIMUM INFORMATION REQUIRED FOR GUPS UTILITY PERMIT APPLICATION

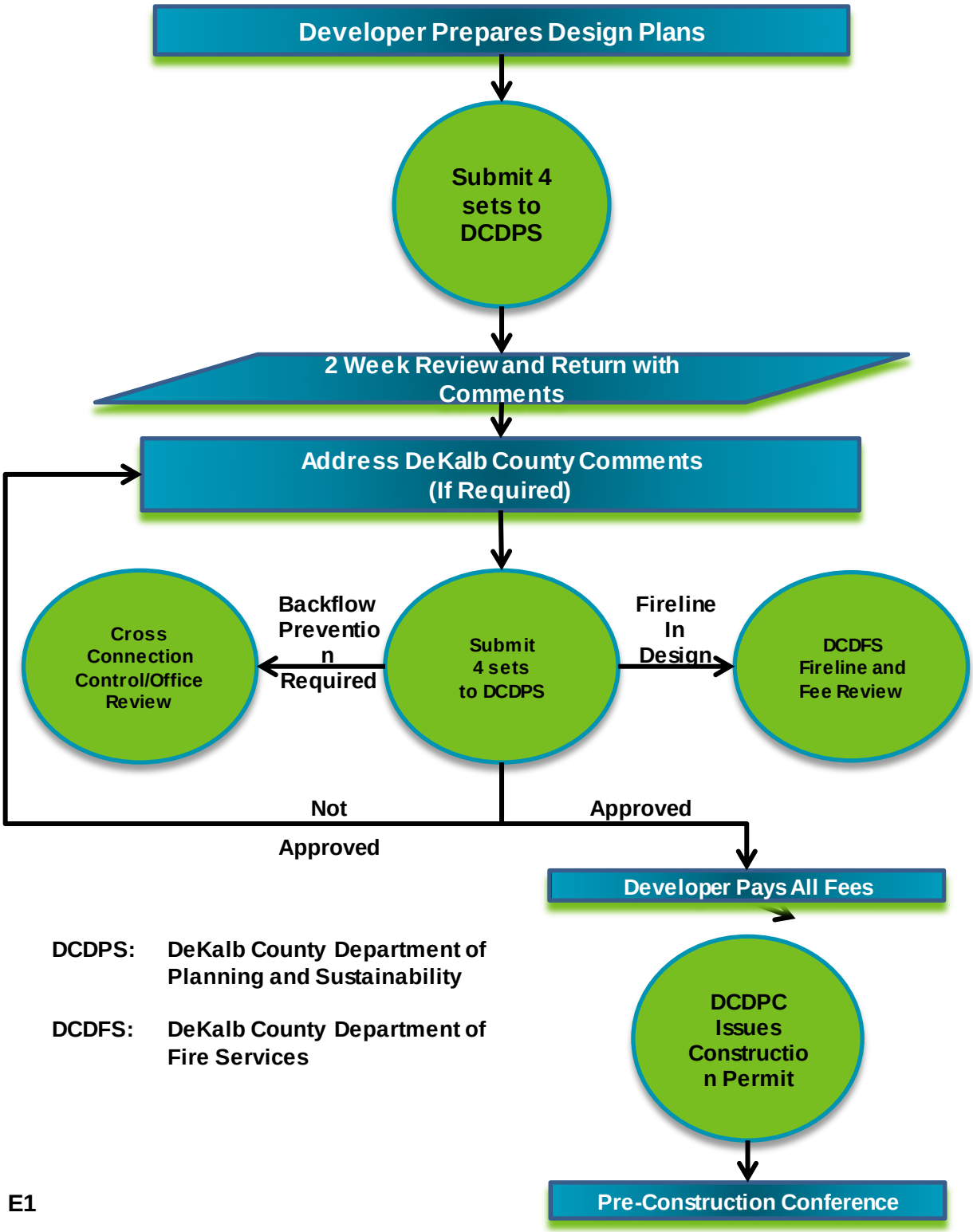
I.	**GENERAL PERMIT INFORMATION**	
☐	1.	State Route number or County Route/City Street number when permitting/adding facilities within a GDOT programmed project. (Note: Project permits will be submitted by the project identification (PI) number and this information will automatically populate)
☐	2.	County. (GUPS interactive map allows search by county to confirm boundaries)
☐	3.	Verify access control. (Additional restrictions apply on limited access routes)
☐	4.	Location. (GUPS will populate the milepost via the interactive map, need to field verify)
☐	5.	Assure Traffic Control (TC) is in accordance with current Manual on Uniform Traffic Control Devices **(MUTCD)**. Confirm a typical application shown in part 6 of the MUTCD will work with field conditions, if not, select and upload detailed TC plan. Any work done on the interstate or Limited Access Highway requires a detailed TC plan.
☐	6.	Description of proposed utility work.(Provide details – Size, type, and length including method of installation, and note if it is replacement, maintenance, reconducting, etc. type work, when applicable)
☐	7.	For aerial proposals, field verifies that there are no facilities that require transfer or removal of existing facilities on the entire route covered by this permit within that County. If transfers and/or removal are determined, they will be required to be performed under this permit. Pole transfer data information will need to be filled out and proposed plan submitted.
☐	8.	If blasting is required with permit, a supplemental form (DOT 8413X-Blasting Permit & Procedures Form) will need to be submitted with the general permit.
☐	9.	Provide legend, if applicable or required.
☐	10.	If project list that is populated by GUPS reflects project is UC (under construction) or close to letting, a coordination letter from prime contractor and utility adjustment schedule (UAS) when permit request is inside GDOT project under construction is required.
II.	**DETAILS REQUIRED IN SUPPORTING DOCUMENTS** Confirm supporting documents are legible when printed at 8 ½" X 11" or 11" X 17". NO DWG FILES ACCEPTED.	
	A. EXISTING FIELD CONDITIONS	
☐	1.	Dimensions of the roadbed – Must be English units. a. Pavement width. (Indicate centerline, curb & gutter or edge of pavement (EOP)) b. Distance to shoulder point, ditch and/or toe of slope. c. Show grass/concrete median and sidewalk, if applicable.
☐	2.	Right of way width. (Note: If r/w varies you will need to indicate these changes and not use the word "varies")
☐	3.	North Arrow.
☐	4.	Show location of traffic signals, if exists.
☐	5.	Location of all above and below ground structures to be navigated. (I.e. storm drain, culverts, bridges, existing utilities, walls, parking lots, buildings, driveways, side streets, signal, etc.)
☐	6.	Test holes are required when boring under or over existing facilities/structures. Show test hole locations and size with details on existing facility/structure.
☐	7.	Posted speed limit.

	GEORGIA DEPARTMENT OF TRANSPORTATION **MINIMUM INFORMATION REQUIRED FOR GUPS UTILITY PERMIT APPLICATION**
☐	8. Local Street names for state route and side streets shown.
☐	9. Note unpaved roads and if driveways are paved or dirt.
☐	10. Clearly identified and differentiate existing and proposed facilities in legend.
	B. DETAILS ON PROPOSAL
☐	1. Distance to proposed facility from right of way, edge of pavement and face of curb where curb exist.
☐	2. Depth of cover of proposed facility noted at back-slope, ditches, shoulders and pavement.
☐	3. Location of proposed installation showing distances to nearest intersecting street or milepost.
☐	4. Length, size, type of proposed utility, and distance between proposed structures.
☐	5. Detailed distances for offset portions of installation from right of way.
☐	6. **Boring (Detailed profile)** a. Type and length of bore. b. Length, size and type of casing, if applicable. (see #11) c. Bore pits – location dimensioned from edge of pavement, size and vertical difference from bottom of pit to EOP. Bore pits are to be minimum 1' to 1' ratio from EOP (for every 1' in depth 1' from EOP) or minimum of 10' from EOP, whichever is greater. d. Outside diameter of bore and outside diameter of facility being proposed. e. Shoring details if applicable. f. Plot existing facility/structure to be navigated. g. Depict right of way, ditches, pavement, etc. h. Special Provision for directional bore on limited access routes (Directional Boring under Interstate and Limited Access Highways).
☐	7. Pavement cuts – note jurisdiction, dimension, location from EOP and known travel lanes, size and method of repair. Note limits of mill and inlay if applicable. (Depends on age of existing pavement, please contact District Utilities Office for information).
☐	8. Method of installation. **(To choose multiple methods in GUPS, hold CTRL +click the additional methods.)**
☐	9. Detailed explanation for any installation other than in back five feet of the right of the right of way. **(Note on drawing why facilities cannot be located in the back five feet r/w or include exception letter if under pavement.)**
☐	10. Location of proposed fire hydrant, manholes, etc., including distance from pavement and right of way.
☐	11. Casing required when facility has "wash" factor (i.e., water, sewer, petroleum) or in the area of existing structures (bridges, culverts).
☐	12. Profile for all road crossings.
☐	13. Length and width of clearing.
☐	14. Interstate crossing shown on GDOT construction plans.

GEORGIA DEPARTMENT OF TRANSPORTATION MINIMUM INFORMATION REQUIRED FOR GUPS UTILITY PERMIT APPLICATION	
☐	15. Note whether company forces or sub-contractor will be used. (Special assurance form required for sub-contractor)
☐	16. Permit work required because access permit will be shown on GDOT approved permitted driveway drawings.
	C. ADDITIONAL INFORMATION FOR ABOVE GROUND FACILITIES
☐	1. Distance from edge of travel lane/face of curb for existing and proposed above ground facilities.
☐	2. Overhead clearance noted on profile for crossings at low point.
☐	3. Location of temporary poles or guy poles if applicable.
☐	4. Average daily traffic (ADT) volumes noted when clear zone must be evaluated.
☐	5. Indicate poles as new, replaced, or existing to remain.
☐	6. Cross-sections of the current terrain at the proposed above ground facility if above ground structures are inside clear zone. Cross-section to include slope ratios.
III.	**DETAILS REQUIRED FOR BRIDGE ATTACHMENTS** Bridge attachments will not be considered when, in the Department's judgment, practical alternative methods, including joint use of existing facilities, are available. (See sections 5.7 of UAM)
☐	1. Description. (e.g. 10" water main, four 6-inch diameter telephone conduits)
☐	2. The weight of the utility per foot including contents.
☐	3. The opening size required through end walls, back walls, and diaphragms.
☐	4. For water and sewer mains, the maximum diameter of the pipe bell or flanges.
☐	5. The hanger spacing with hanger details.
☐	6. Location on the bridge.
☐	7. Proposal shown on Department bridge plans.
☐	8. Anchor type and specifications.
IV.	**DETAILS REQUIRED FOR TUNNELS** See GDOT standard specifications section 555.
☐	1. Designed in compliance with AASHTO specifications for tunneling.
☐	2. Subsoil surveys, including the elevation of the water table and the classification and relative density of the soils from the ground line to 3 feet below the tunnel liner.
☐	3. Rock coring data, including rock type and core recovery, when applicable.
☐	4. Sequence of operation for dewatering where applicable.
☐	5. Shoring details if applicable.
☐	6. Survey of existing field conditions.
☐	7. Steel liner plates hot-dipped galvanized and bituminous-coated.

Flow Chart: Review and Approval Process for Potable Water and Gravity Sewer Systems

DeKalb County Department of Watershed Management



DCDPS: DeKalb County Department of Planning and Sustainability

DCDFS: DeKalb County Department of Fire Services

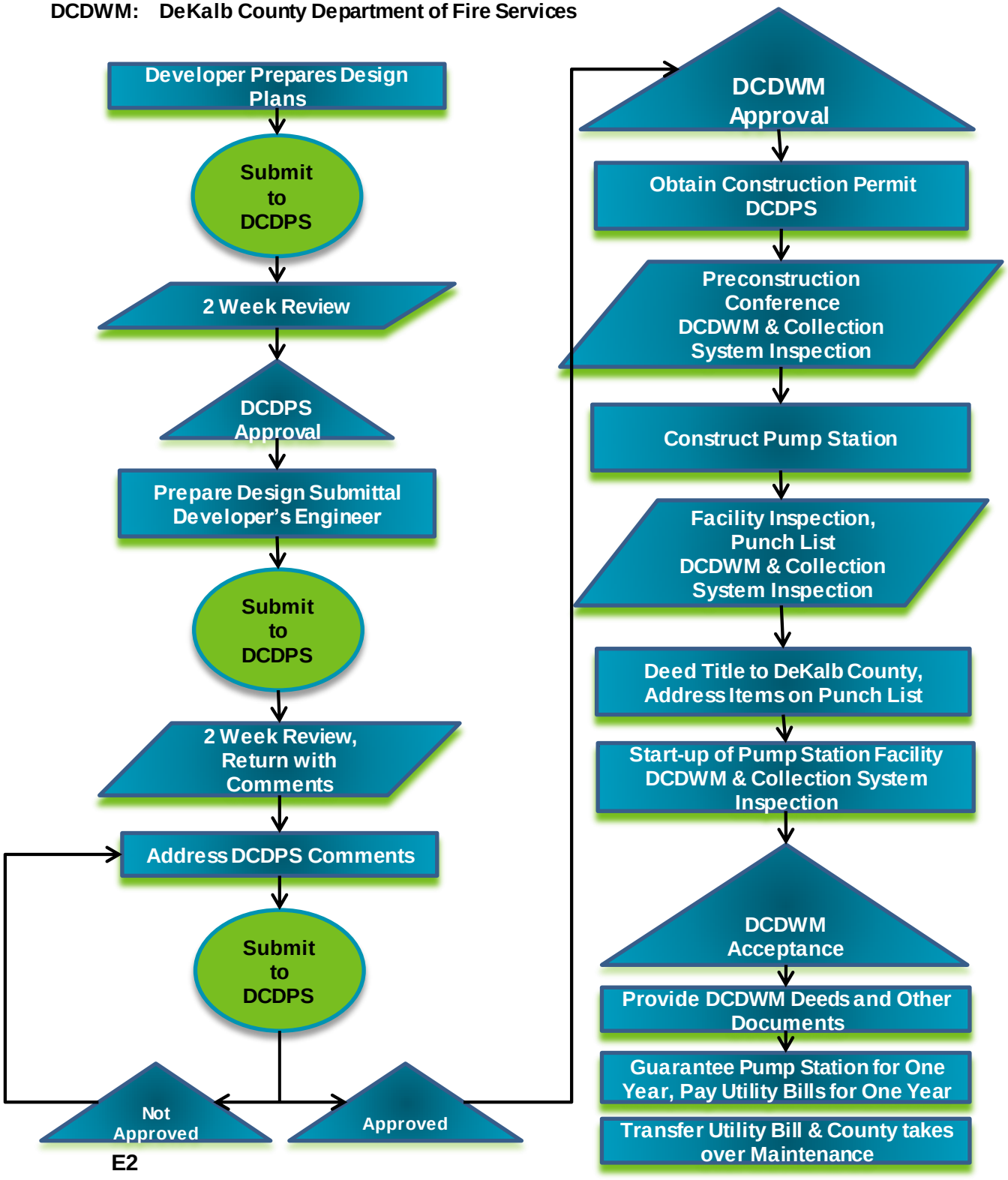
DeKalb County GEORGIA

WATER Matters

Flow Chart: Review and Approval Process for Potable Water and Gravity Sewer Systems

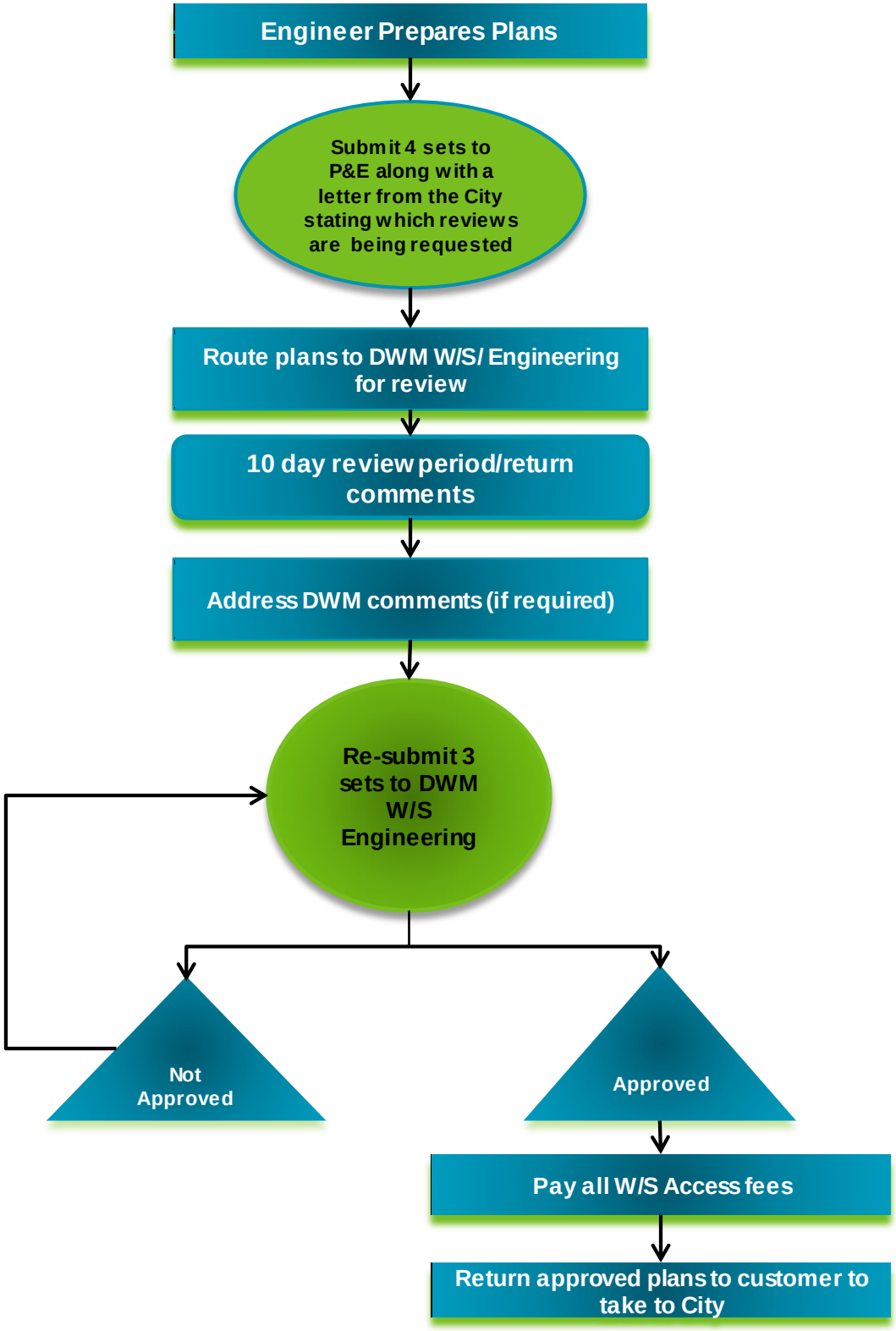
DeKalb County Department of Watershed Management

DCDPS: DeKalb County Department of Planning and Sustainability
DCDWM: DeKalb County Department of Fire Services



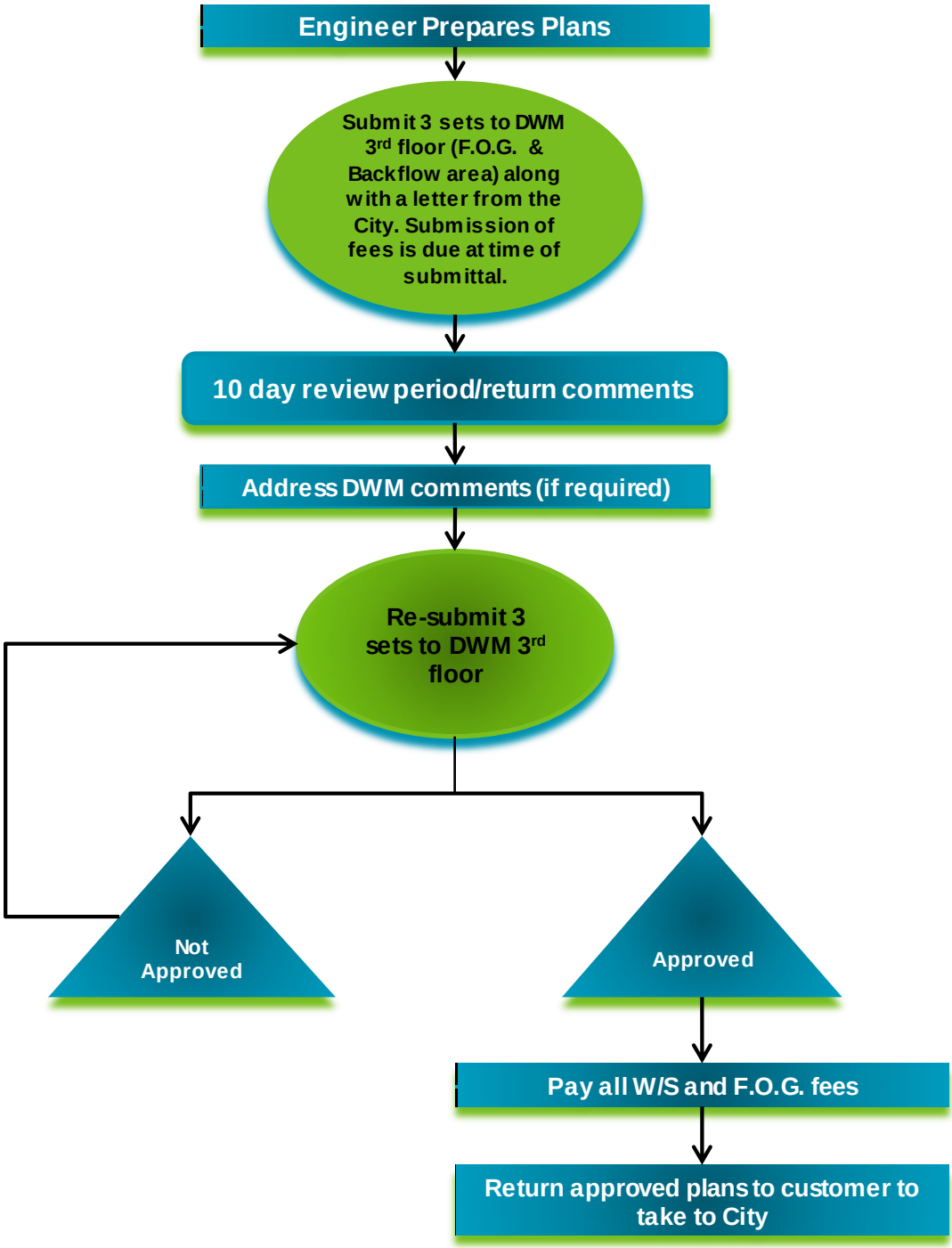
Flow Chart: Phase 1 Land Disturbance Permit Process – City Review Flow Chart

DeKalb County Department of Watershed Management



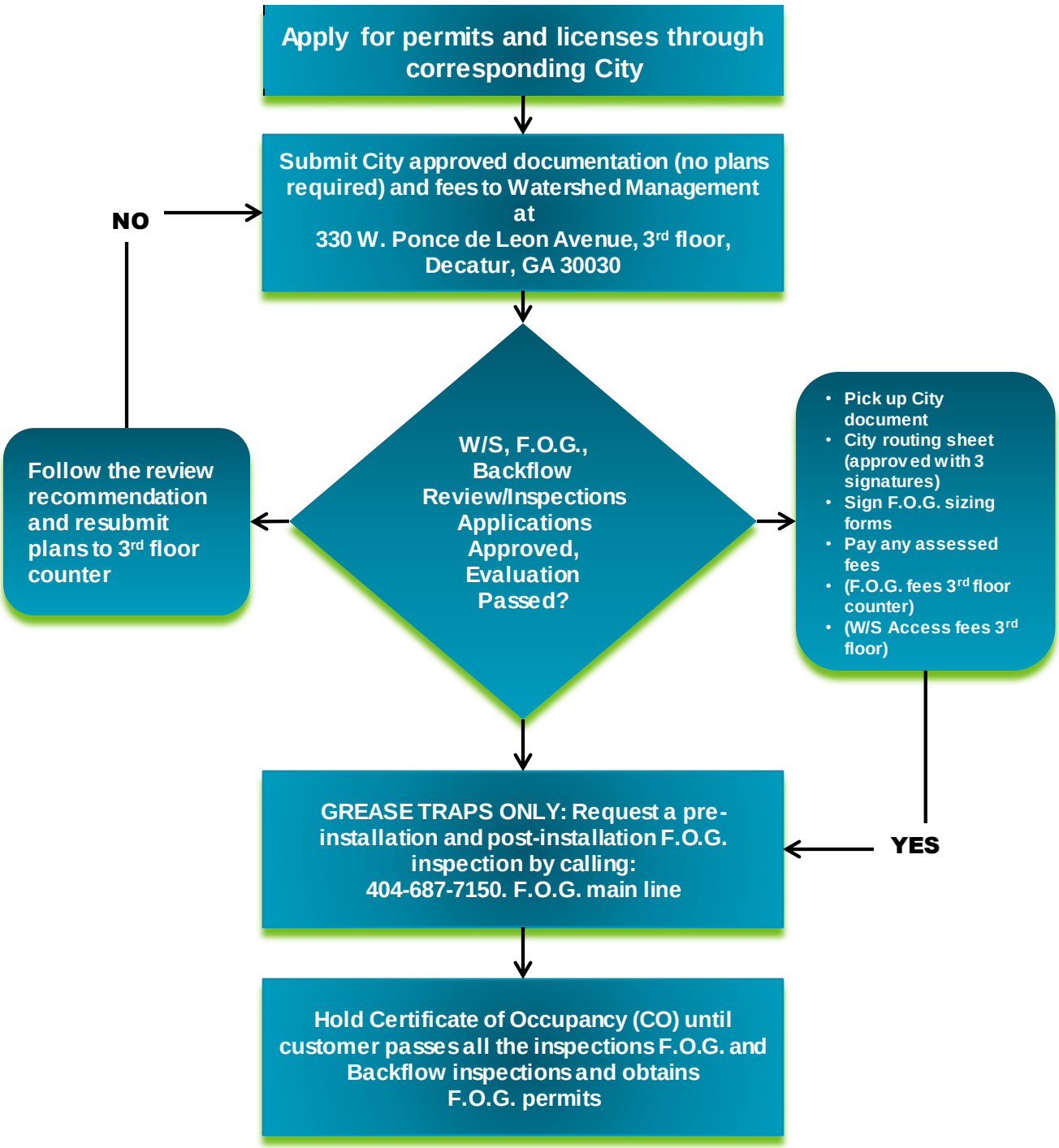
Flow Chart: Phase 1 Building Permit Review and Approval Process City Review Flow Chart

DeKalb County Department of Watershed Management



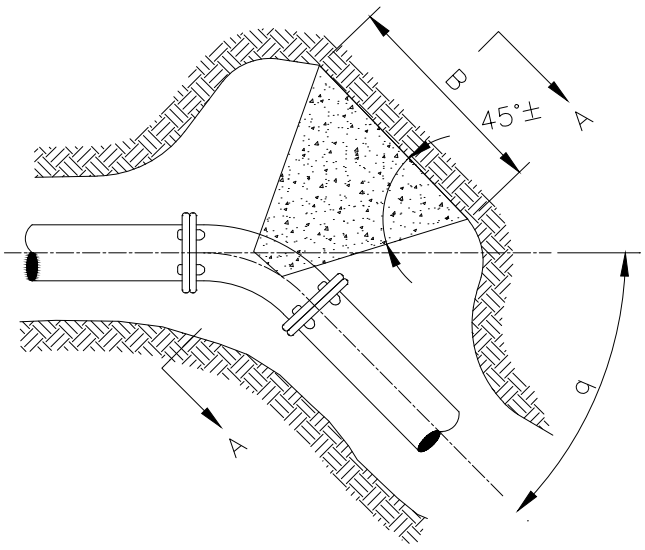
Flow Chart: Plan Review Procedure for Change of Ownership Flow Chart

DeKalb County Department of Watershed Management

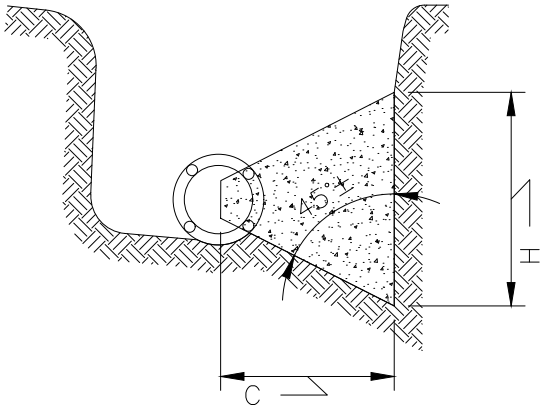


Department of Watershed Management
Standard Details List – General Details

Standard Details List – General Details	
Detail Number	**TITLE**
G-001	Blocking Detail Horizontal Thrust Water and Forcemain
G-002	Blocking Detail Downward Thrust
G-003	Blocking Detail Upward Thrust
G-004	Backfill and Allowable Trench Widths Detail
G-005	Typical Patch and Resurfacing Detail
G-006	Typical Asphalt Pavement Patch
G-007	Steel Plate Installation Urban and Residential
G-008	Thrust Restraint (150 psi) Tie-Rod Installation Detail
G-009	Casting and Pipe Support Installation Detail
G-010	Typical Tunnel Section



PLAN



SECTION A–A

FITTING θ	(IN)	B (FT)	H (FT)	C (FT)	VOL (YD^3)
11–1/4	6	0.9	0.8	0.45	0.010
	8	1.2	1.1	0.60	0.022
	10	1.5	1.3	0.75	0.041
	12	1.8	1.6	0.90	0.071
	16	2.3	2.2	1.15	0.149
22–1/2	6	1.3	1.1	0.65	0.023
	8	1.6	1.6	0.80	0.048
	10	2.1	1.9	1.05	0.097
	12	2.5	2.3	1.25	0.165
	16	3.3	3.0	1.65	0.362
45	6	1.7	1.6	0.85	0.050
	8	2.2	2.2	1.10	0.113
	10	2.8	2.7	1.40	0.222
	12	3.3	3.3	1.65	0.375
	16	4.5	4.3	2.25	0.887
90	6	2.3	2.2	1.15	0.118
	8	3.1	2.9	1.55	0.278
	10	3.8	3.7	1.90	0.530
	12	4.6	4.4	2.30	0.921
	16	6.1	5.9	3.05	2.142
TEES	6	2.1	1.8	1.00	0.073
	8	2.6	2.5	1.30	0.170
	10	3.2	3.1	1.60	0.319
	12	3.9	3.7	1.95	0.565
	16	5.1	5.0	2.55	1.303

NOTES:
1. DIMENSIONS OF THRUST BLOCKS WERE CALCULATED ASSUMING A STATIC PRESSURE OF 250 PSI AND A SOIL BEARING PRESSURE OF 2,000 PSF.
2. DIMENSIONS SHOWN CAN BE VARIED AS FIELD CONDITIONS DICTATE, BUT IT IS IMPORTANT THAT THE CORRECT VOLUME AS SHOWN IN TABLE BE USED AND THAT ALLOWABLE SOIL BEARING PRESSURE NOT BE EXCEEDED.
3. IT IS THE RESPONSIBILITY OF THE DESIGN ENGINEER TO VERIFY THAT THE THRUST BLOCKS IN THE CHART MEET THE REQUIRED FORCES THAT ARE ASSOCIATED WITH THE PROPOSED WATER LINE OR FORCE MAIN.

DeKalb County GEORGIA

STANDARD DETAILS

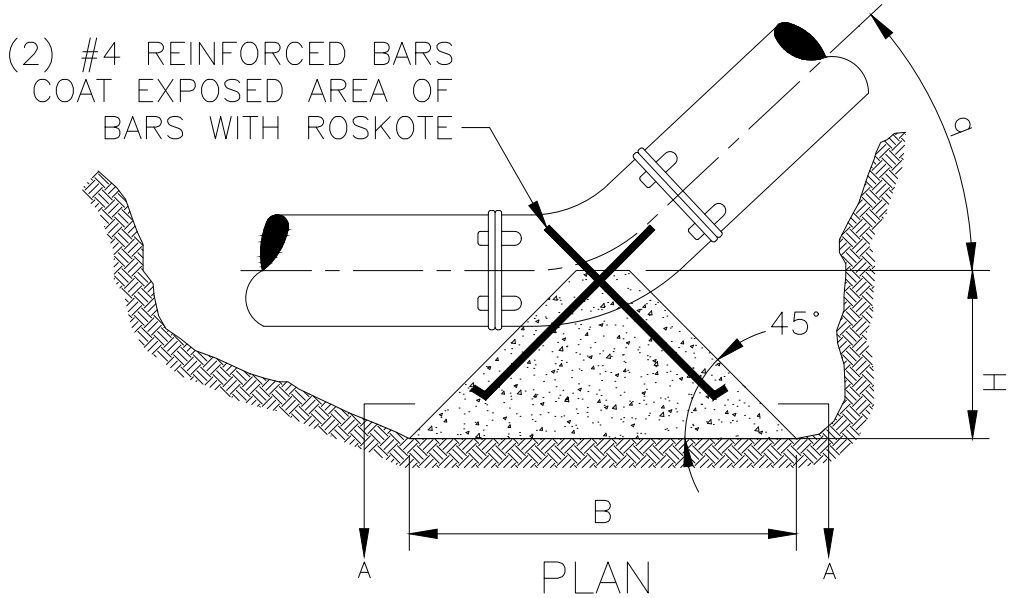
Blocking Detail Horizontal Thrust Water and Forcemain

NOT TO SCALE

09/17

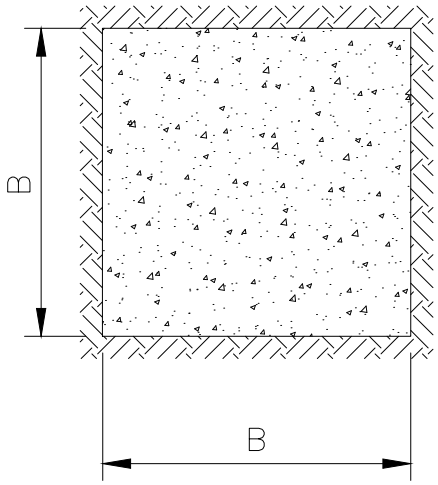
WATER Matters

DETAIL NO. G-001



PLAN

FITTING θ	DIA (IN)	B (FT)	H (FT)	VOL (YD^3)
11–1/4	6	1.0	0.3	0.008
	8	1.2	0.4	0.012
	10	1.5	0.6	0.026
	12	1.9	0.8	0.055
	16	2.4	1.0	0.110
22–1/2	6	1.3	0.5	0.017
	8	1.7	0.7	0.039
	10	2.1	0.9	0.075
	12	2.5	1.1	0.129
	16	3.2	1.6	0.308
45	6	1.7	0.7	0.039
	8	2.2	0.9	0.083
	10	2.7	1.2	0.164
	12	3.3	1.5	0.305
	16	4.3	2.0	0.688



SECTION A–A

NOTE:
1. DIMENSIONS OF THRUST BLOCKS WERE CALCULATED ASSUMING A STATIC PRESSURE OF 250 PSI, A DEPTH OF COVER OF 4 FT., AND A SOIL BEARING PRESSURE OF 2,000 PSF.
2. DIMENSIONS SHOWN CAN BE VARIED AS FIELD CONDITIONS DICTATE, BUT IT IS IMPORTANT THAT THE CORRECT VOLUME AS SHOWN IN TABLE BE USED AND THAT ALLOWABLE SOIL BEARING PRESSURE NOT BE EXCEEDED.
3. IT IS THE RESPONSIBILITY OF THE DESIGN ENGINEER TO VERIFY THAT THE THRUST BLOCKS IN THE CHART MEET THE REQUIRED FORCES THAT ARE ASSOCIATED WITH THE PROPOSED WATER LINE OR FORCE MAIN.

DeKalb County GEORGIA

STANDARD DETAILS

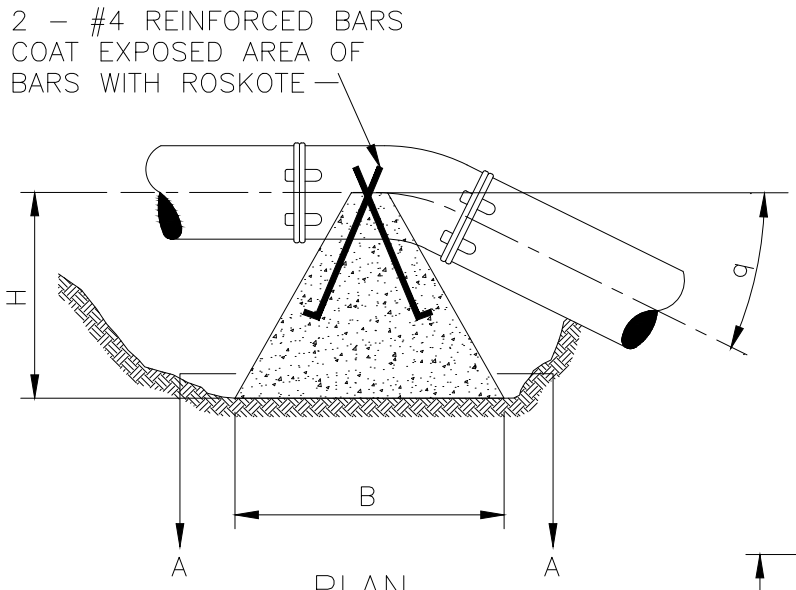
Blocking Detail
Downward Thrust

NOT TO SCALE

09/17

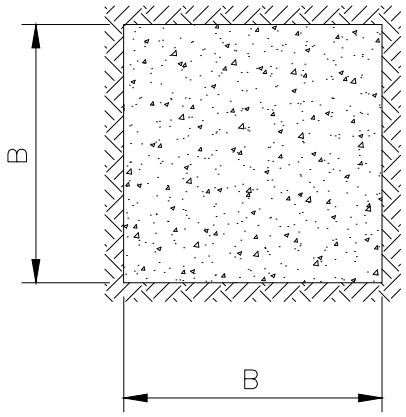
WATER Matters

DETAIL NO. G-002



PLAN

FITTING θ	DIA (IN)	B (FT)	H (FT)	VOL (YD^3)
11–1/4	6	3.0	2.2	0.4
	8	3.5	2.4	0.6
	10	4.0	3.2	1.0
	12	4.5	3.5	1.4
	16	5.0	4.8	2.4
22–1/2	6	3.5	2.9	0.7
	8	4.0	3.9	1.2
	10	4.5	4.6	1.9
	12	5.5	4.8	2.7
	16	6.5	5.9	4.8
45	6	4.5	3.4	1.3
	8	5.0	4.6	2.2
	10	6.0	5.1	3.5
	12	6.5	6.2	5.0
	16	8.0	7.3	8.8



SECTION A–A

NOTES:

1. VOLUME WAS CALCULATED NEGLECTING WEIGHT OF FITTING, WATER, AND BACKFILL USING A STATIC PRESSURE OF 250 PSI.

2. DIMENSIONS OF BLOCK WERE CALCULATED ASSUMING A SOIL BEARING PRESSURE OF 2,000 POUNDS PER SQUARE FOOT.

3. DIMENSIONS SHOWN CAN BE VARIED AS FIELD CONDITIONS DICTATE, BUT IT IS IMPORTANT THAT THE CORRECT VOLUME AS SHOWN IN TABLE BE USED AND THAT ALLOWABLE SOIL BEARING PRESSURE NOT BE EXCEEDED.

4. IT IS THE RESPONSIBILITY OF THE DESIGN ENGINEER TO VERIFY THAT THE THRUST BLOCKS IN THE CHART MEET THE REQUIRED FORCES THAT ARE ASSOCIATED WITH THE PROPOSED WATER LINE OR FORCE MAIN.

DeKalb County GEORGIA

STANDARD DETAILS

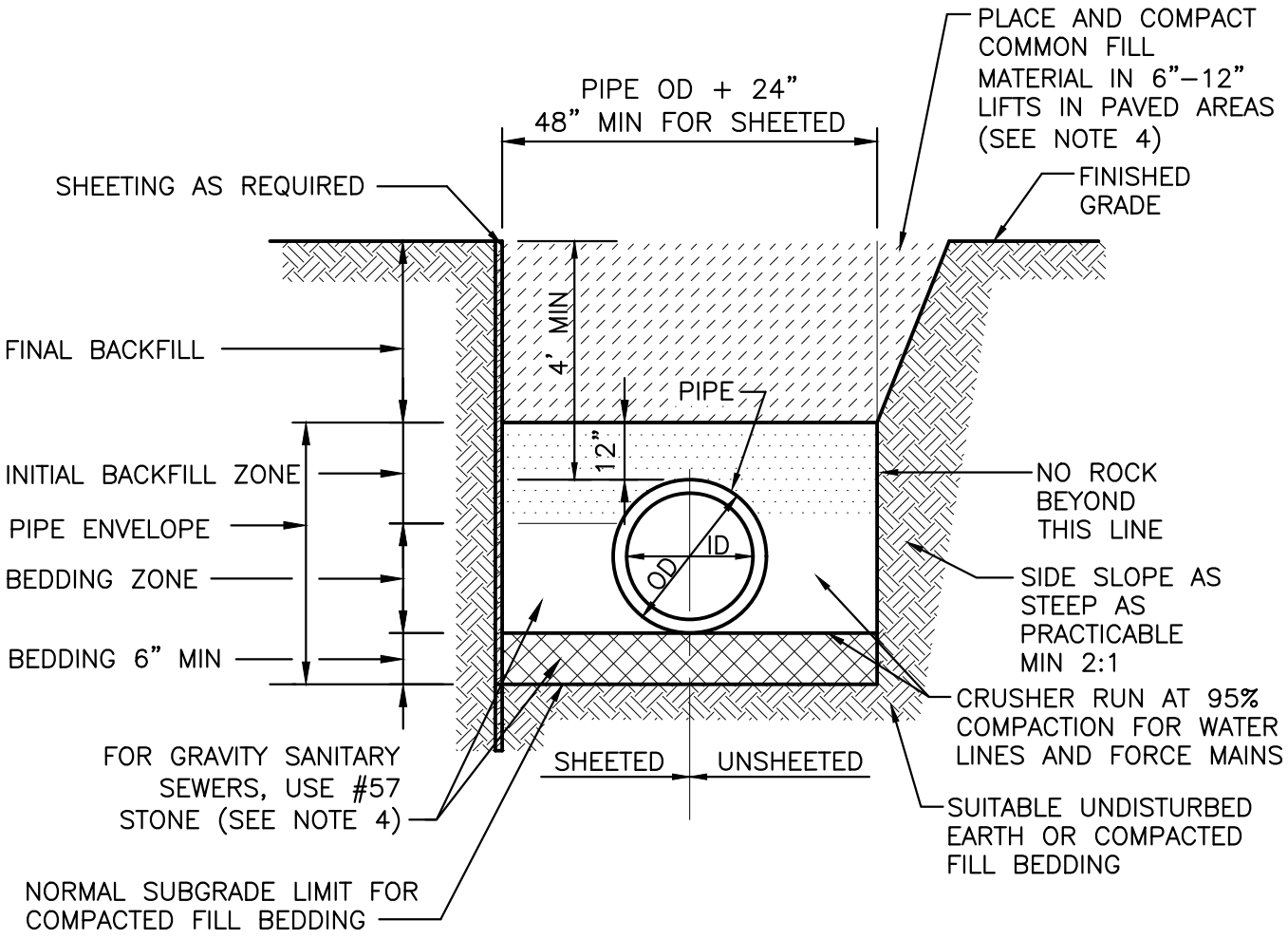
Blocking Detail
Upward Thrust

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. G-003



NOTES:

1. SEE DESIGN STANDARDS FOR ADDITIONAL BEDDING AND TRENCH BACKFILL REQUIREMENTS.
2. DEPTH OF COVER OVER WATER MAINS, FORCE MAINS AND GRAVITY SANITARY SEWERS SHALL BE 4'–0" AS MEASURED FROM TOP OF PAVEMENT OR FINISHED GRADE TO TOP OF PIPE.
3. NO ROCK, ONLY BEDDING MATERIAL IN BACKFILL FOR FIRST 2'–0" ABOVE TOP OF PIPE.
4. BEDDING AND BACKFILL TO BE CRUSHER RUN AT 95% COMPACTION UNDER ALL PAVING FROM 12" ABOVE THE TOP OF PIPE TO THE BOTTOM OF THE CONCRETE ROAD CAP.
5. BACKFILL TO BE FREE OF ORGANICS, OBJECTIONABLE MATERIAL AND STONES LARGER THAN 3" IN ITS LONGEST DIMENSION.

DeKalb County GEORGIA

STANDARD DETAILS

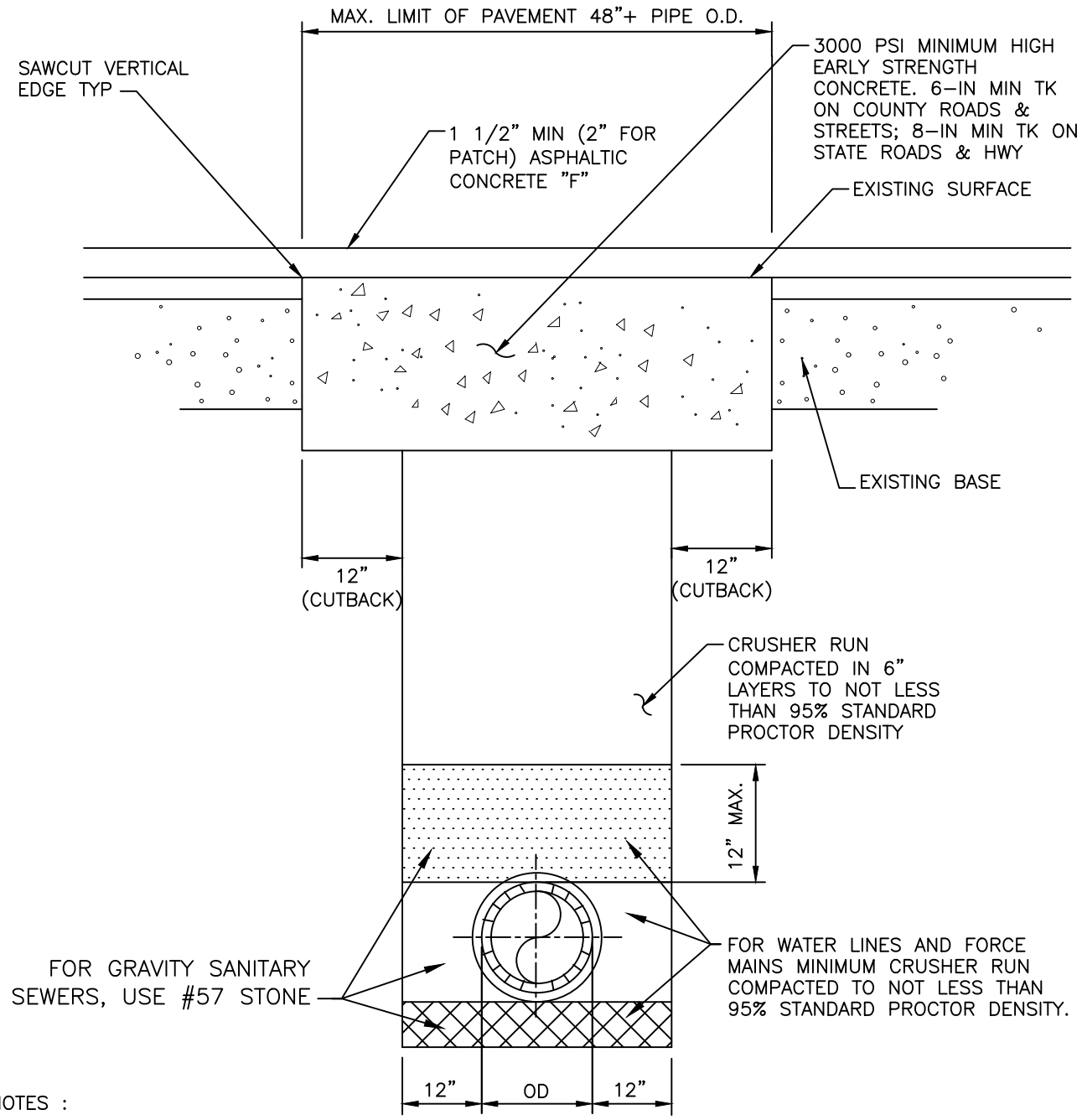
Backfill and Allowable Trench Widths Detail

NOT TO SCALE

09/17

WATER Matters

DETAIL NO. G-004



NOTES :

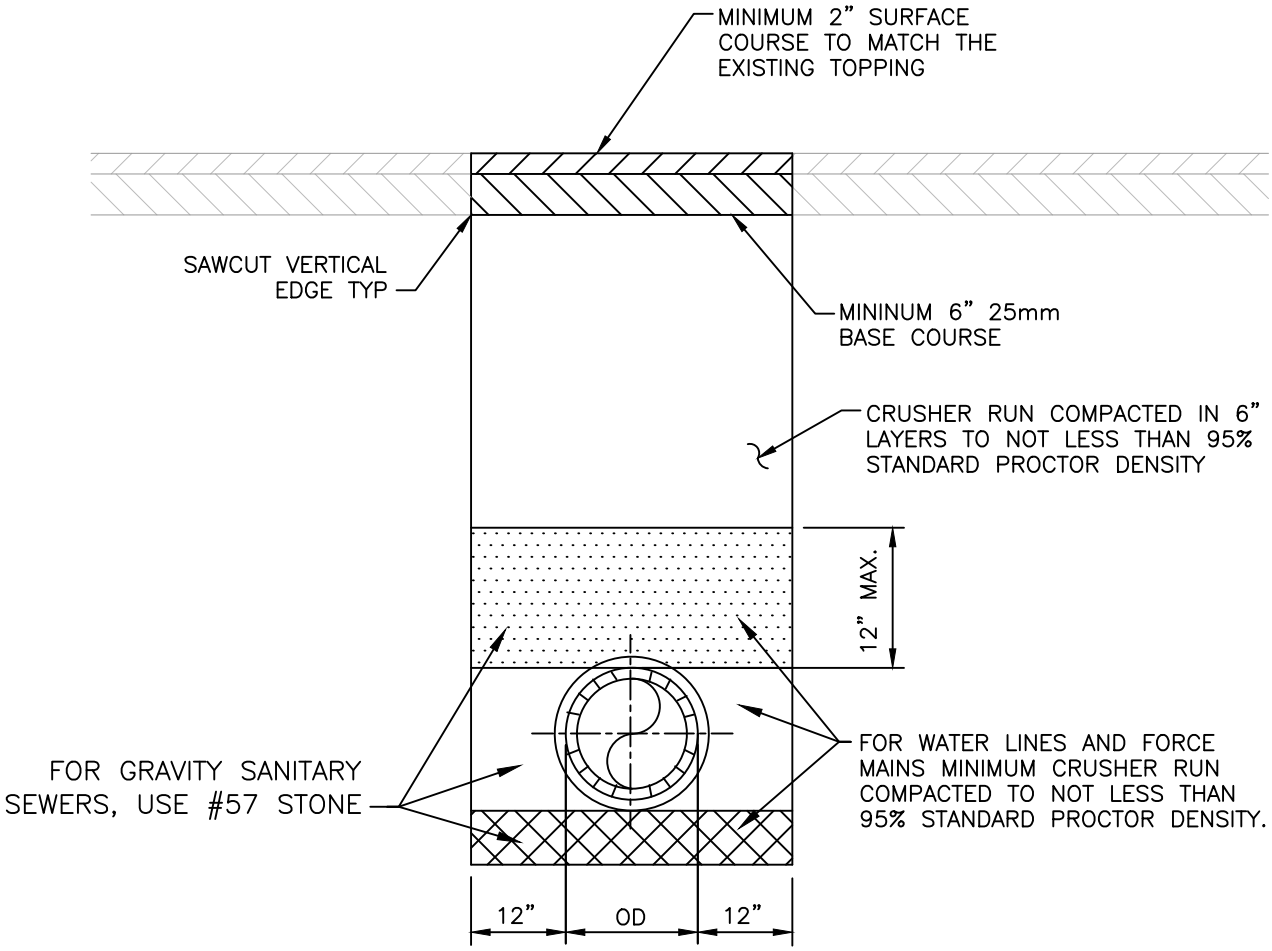
1. SAW CUT EXISTING PAVEMENT TO PROVIDE STRAIGHT VERT. JOINTS.

2. SURFACES TO BE CLEANED AND BITUMINOUS TACK COAT APPLIED BEFORE PLACEMENT OF ASPHALTIC TOP.

3. FOR EXIST SURFACE OF PORTLAND CEMENT CONCRETE, FURNISH NEW SURFACE OF 3000 PSI MINIMUM HIGH EARLY STRENGTH CONCRETE.

4. ON LONGITUDINAL CUTS EXCEEDING 100 FEET, THE CONC IN THE TRENCH SHALL BE BROUGHT FLUSH WITH THE EXISTING PAVEMENT AND THE ENTIRE WIDTH OF ROADWAY RESURFACED W/ 1-1/2 IN MIN THK OF ASPHALTIC CONC.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Typical Patch and Resurfacing Detail	WATER Matters
	NOT TO SCALE	DETAIL NO. G-005



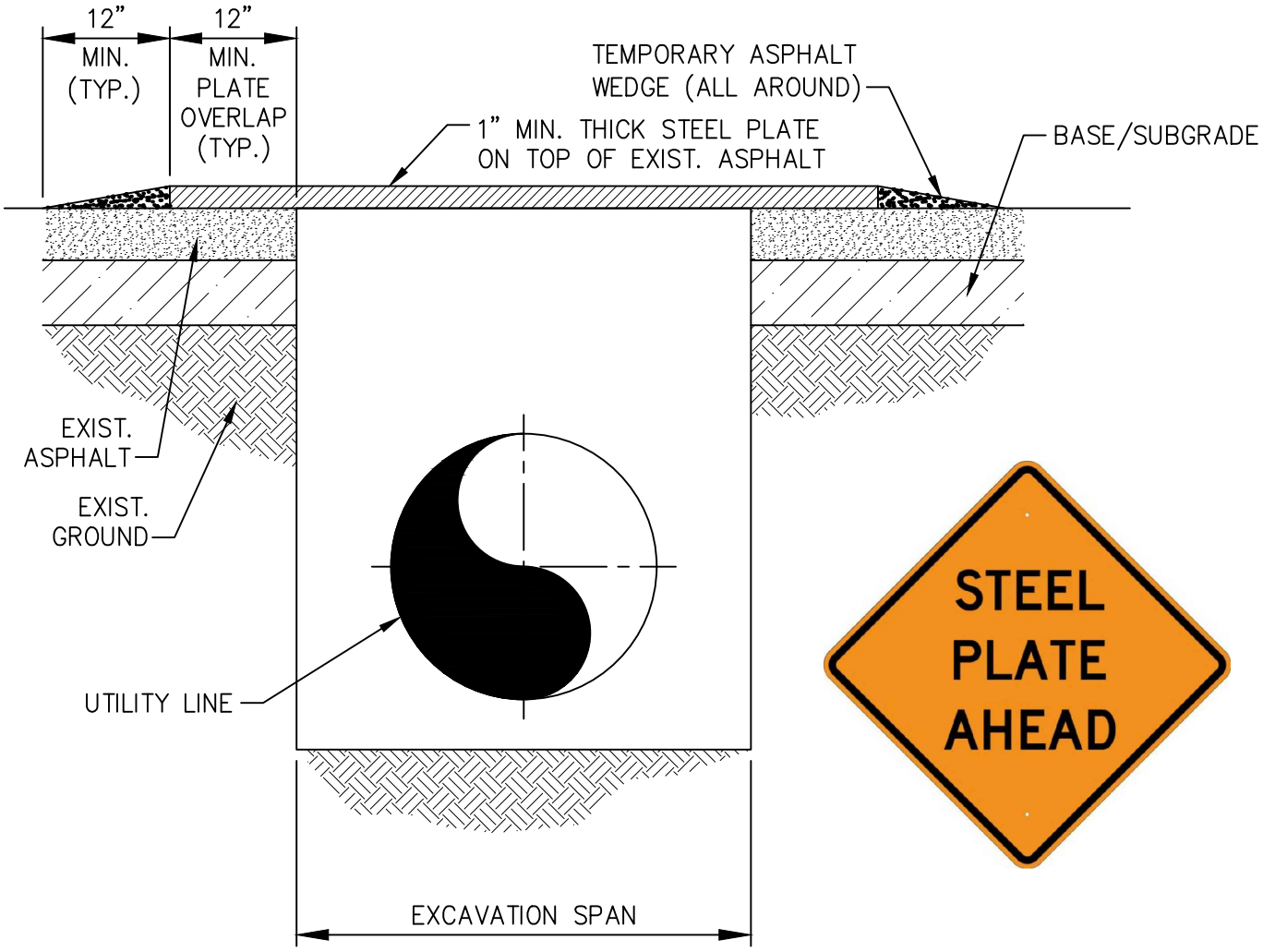
NOTES :

1. SAW CUT EXISTING PAVEMENT TO PROVIDE STRAIGHT VERT. JOINTS.

2. SURFACES TO BE CLEANED AND BITUMINOUS TACK COAT APPLIED BEFORE PLACEMENT OF ASPHALTIC TOP.

3. THIS DETAIL MAY ONLY BE USED WITH DCDWM'S APPROVAL.

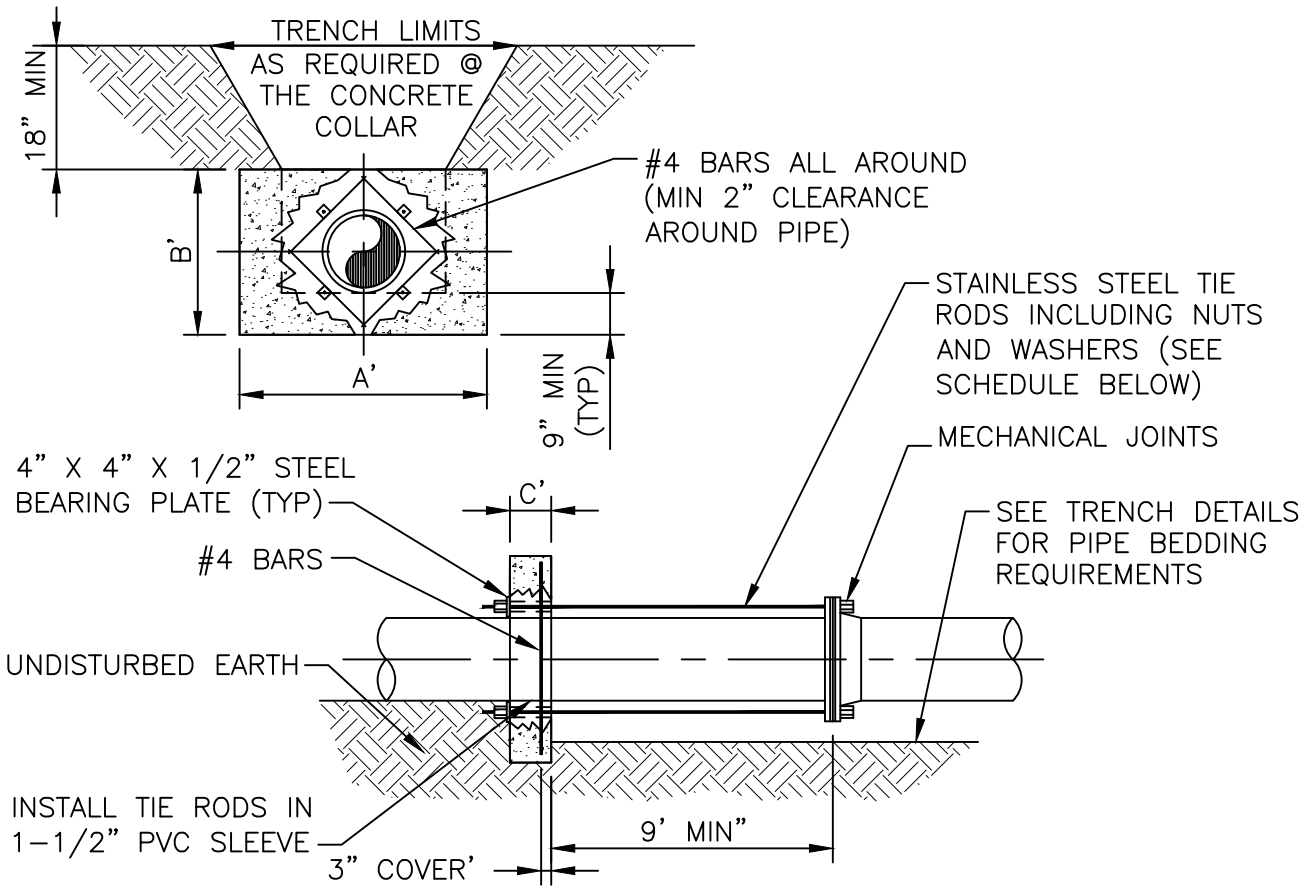
DeKalb County GEORGIA	STANDARD DETAILS	09/17
	Typical Asphalt Pavement Patch	WATER Matters
	NOT TO SCALE	DETAIL NO. G-006



NOTES:

1. INSTALLATION SHALL BE USED IN AREAS WHERE BACKFILLING OPERATIONS OF AN EXCAVATION IN THE ROADWAY CANNOT MEET THE MINIMUM COMPACTION REQUIREMENTS AND PERMANENT PATCHING PLACEMENT WITHIN THE SAME DAY.
2. ALL EXCAVATIONS SHALL BE BACKFILLED WITHIN THE ROADWAY.
3. EACH PLATE IS TO OVERLAP EXISTING PAVEMENT 12" MINIMUM IN EVERY DIRECTION AND MULTIPLE PLATES SHALL ABUT AND BE SECURED TO EACH OTHER.
4. EACH STEEL PLATE SHALL BE ANCHORED SECURELY TO PREVENT MOVEMENT.
5. TEMPORARY PAVING WITH A COLD ASPHALT MIX OR APPROVED EQUAL SHALL BE USED TO FEATHER EDGES OF THE PLATE TO FORM A WEDGED TAPER TO COVER THE EDGES OF THE STEEL PLATE.
6. THE STEEL PLATE SHALL BE REMOVED WITHIN 30 DAYS OF PLACEMENT WITH THE EXCAVATION MEETING THE MINIMUM COMPACTION REQUIREMENTS AND PERMANENT PATCHING INSTALLED.
7. ANY DITCH LINE NEEDING A STEEL PLATE LONGER THAN 30 DAYS SHALL REQUIRE DCDWM'S WRITTEN APPROVAL.
8. WARNING SIGNS ADVISING MOTORIST THAT THEY SHOULD EXPECT TO ENCOUNTER STEEL PLATES SHALL BE PLACED APPROXIMATELY 100 FEET IN ADVANCE OF THE STEEL PLATE LOCATION. THE SIGNS SHALL MEET MUTCD SIGN SIZE REQUIREMENTS, SHALL STATE STEEL PLATE AHEAD, AND SHALL BE VISIBLE TO THE MOTORIST.

DeKalb County GEORGIA	STANDARD DETAILS	09/17
	STEEL PLATE INSTALLATION URBAN AND RESIDENTIAL	WATER Matters
	Not To Scale	DETAIL NO. G-007



SCHEDULE OF DIMENSIONS AND MATERIALS					
PIPE SIZE (INCHES)	DIMENSIONS (FT.)			TIE RODS REQ'D	
	A	B	C	DIA. INCHES	NO.
6	2.0	2.0	1.0	3/4	2
8	2.5	2.5	1.0	3/4	2
10	3.5	3.0	1.0	3/4	2
12	5.0	3.0	1.0	3/4	2
16	6.0	4.0	1.5	3/4	4
20	8.0	5.0	1.5	3/4	6
24	9.0	6.0	1.5	3/4	8
NOTE: THRUST COLLAR AREAS TO BE COMPUTED ON BASIS OF 2000 LBS/SF SOIL RESTRAINT BEARING.					

NOTES:
1. ADDITIONAL REINFORCEMENTS SHALL BE AS SPECIFIED BY THE ENGINEER.
2. MINIMUM COMPRESSIVE STRENGTH FOR CONCRETE SHALL BE 3000 PSI.
3. BEDDING, BACKFILL AND COMPACTION SHALL BE AS SPECIFIED ELSEWHERE IN THE STANDARDS.
4. ALL FORM BOARDS SHALL BE REMOVED PRIOR TO BACKFILL.
5. NO ALLOWANCE SHALL BE MADE FOR FRICTION BETWEEN THE PIPE WALL AND THE THRUST COLLAR.
6. DESIGN PRESSURE:150 PSI.
7. PIPE SIZE GREATER THAN 24" DIAMETER SHALL HAVE THRUST RESTRAINT DESIGNED BY A REGISTERED P.E.

DeKalb County GEORGIA

STANDARD DETAILS

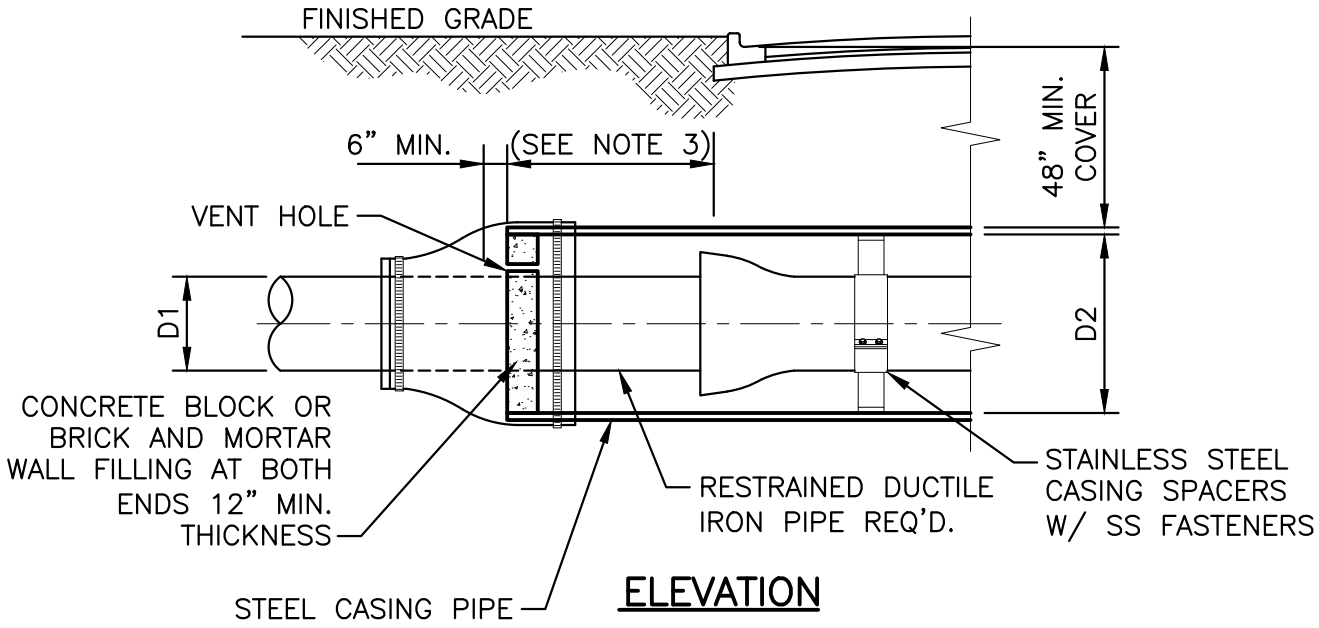
Thrust Restraint (150 psi)
Tie-rod Installation Detail

NOT TO SCALE

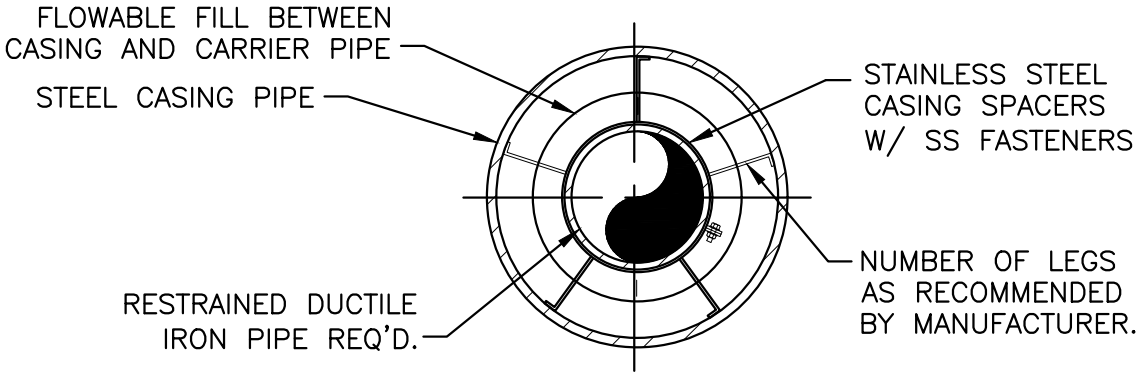
09/17

WATER Matters

DETAIL NO. G-008



ELEVATION



SECTION

CARRIER PIPE AND CASING PIPE SIZES (MIN.)										
CARRIER PIPE NOM. DIA. (DI)	2	4	6	8	10	12	14	16	20	24
CASING PIPE NOM. DIA. (D2)	6	14	16	18	20	22	24	30	32	36
WALL THICKNESS (IN.) COATED	0.250	0.250	0.250	0.250	0.281	0.312	0.344	0.406	0.438	0.469
WALL THICKNESS (IN.) UNCOATED	0.282	0.282	0.313	0.313	0.344	0.375	0.407	0.469	0.501	0.532

NOTES:

1. STAINLESS STEEL CASING SPACERS ARE REQUIRED AS SHOWN.
2. WHERE PRACTICAL, CASING SHALL EXTEND A MIN. OF 10'–0" BEYOND EDGE OF PAVEMENT OR LONGER AS REQUIRED BY LOCAL PERMITTING AGENCIES.
3. A MINIMUM OF 3 CASING SPACERS PER JOINT OF INSTALLED CARRIER PIPE SHALL BE PROVIDED.

DeKalb County GEORGIA

STANDARD DETAILS

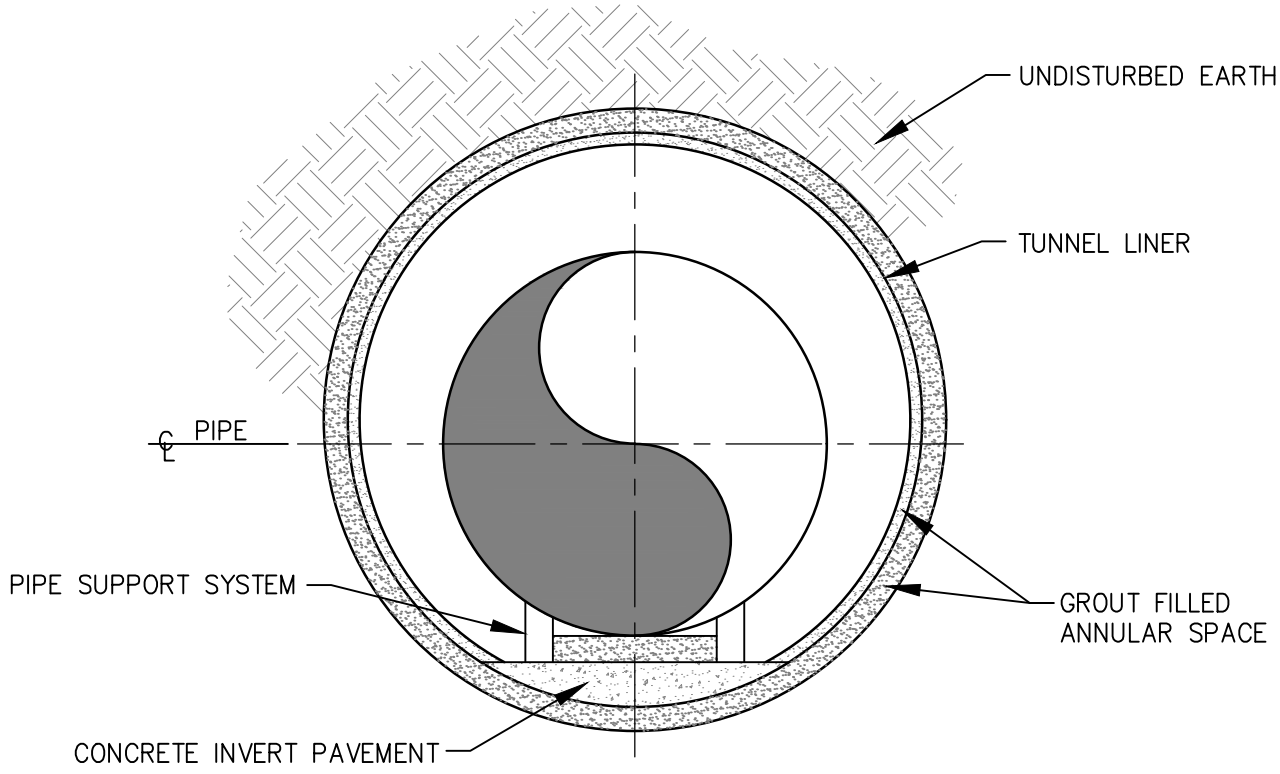
Casing And Pipe Support Installation Detail

NOT TO SCALE

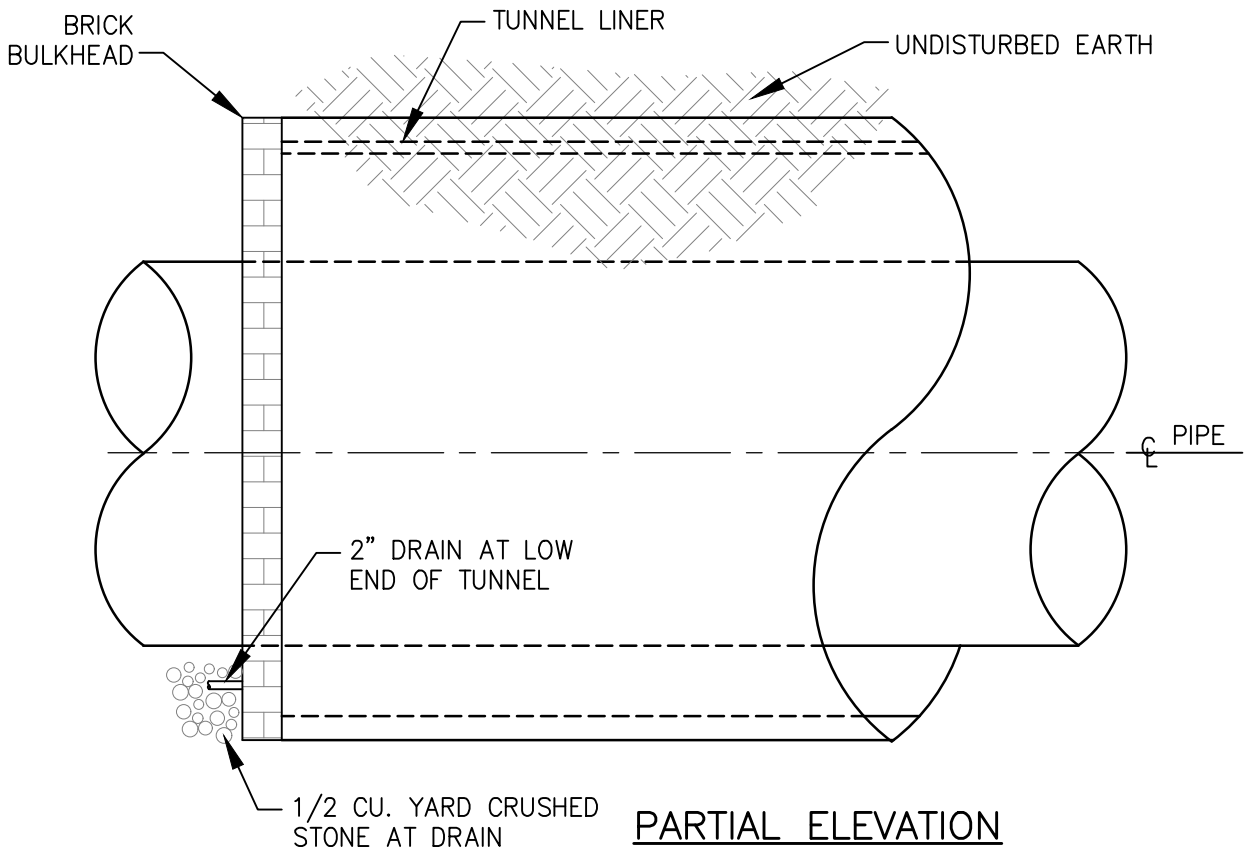
09/17

WATER Matters

DETAIL NO. G-009



TYPICAL TUNNEL SECTION



PARTIAL ELEVATION

DeKalb County
GEORGIA

STANDARD DETAILS

TYPICAL TUNNEL SECTION

Not to Scale

09/17

WATER Matters

DETAIL NO. G-010

APPENDIX F
STRATEGIC SPILL RESPONSE PLAN

Strategic Spill Response Plan

for the

DeKalb County Water & Sewer Department

Revision # 5
Date October 12, 2006

Prepared by Staff

Strategic Spill Response Plan

Contents

1.0 PURPOSE

The program meets the requirements for activities involving Sanitary Sewer Overflow (SSO) Responses in accordance with Section 402 of the Federal Water Pollution Control Act Amendment of 1972 and provides the DeKalb County Water & Sewer Department with guidance in conducting the day-to-day operations related to Sanitary Sewer Overflows.

The State of Georgia has the authority to regulate and enforce water quality standards, via the National Pollutant Discharge Elimination System (NPDES) Permitting Program, to protect waters of the State. The Executive Reorganization Act of 1972, as amended, and OCGA 12-5-20, Georgia Water Quality Act, established the Georgia Environmental Protection Division (Georgia EPD) to insure that public water bodies are preserved and protected, as a natural resource, for posterity. DeKalb County, being a legal governmental entity in the State of Georgia, was issued NPDES Permits by the state to discharge treated wastewater to present water bodies within the County. An essential requirement of the existing NPDES Permits is for DeKalb County to apply best management practices to prevent sewerage spills from escaping the current collection and treatment systems and entering water bodies of the state. Sewerage spills to Public waterways have the potential of polluting the water and eliminating aquatic communities that are essential to preserving and protecting the natural life of streams and rivers. In addition, pollution, caused by sewerage spills, can render public water bodies unfit for human consumption and contact. Therefore, based on the current NPDES Permit, sewerage spills from DeKalb County sewerage storage and containment systems, may result in sanctions including water quality monitoring, active remediation, monetary fines, etc., to alleviate the harmful effects of contamination to public water bodies.

2.0 SCOPE

The requirements outlined in this program apply to all operations involving Sanitary Sewer Overflows throughout the department and to any contractors employed by the department to carry out the Department's mission.

Spill response is of the highest priority within the DeKalb County Water & Sewer Department. Thus, the Water & Sewer Department is the arm of the County responsible for preventing spills from entering public water bodies within the County. The Water & Sewer Department is continuing to implement and update an effective spill response plan in keeping with the present NPDES Permit program. In order to effectively respond to all spills, the Filtration and Treatment (F&T) and Construction and Maintenance (C&M) Sections collaborate strategically in an effort to satisfy the permit requirements.

3.0 DEFINITIONS

Major Spill – Any spill of a volume of 10,000 gallons or more or that has a serious environmental impact resulting in a fish kill.

Minor Spill – Any spill of a volume less than 10,000 gallons and which does not have a serious environmental impact/fish kill.

Private Spill – Any spill that is on a private system not controlled by the County or is caused by an outside entity damaging or penetrating the County operated sanitary sewer system. This includes the portion of the individual homes sewer connection from the County cleanout typically located at the property line to the house.

Service Request (SR) – The initial form generated in Synergen to capture caller details, problem address, problem description and problem resolution information.

Spill - Under the rules of the state of Georgia for water quality section 391-3-6-.05(2)(a) reads, "*Spill means any discharge of raw sewage by a POTW to the waters of the state*."

4.0 RESPONSIBILITIES

4.1 Associate Director

4.1.1 The Associate Director is responsible for the overall Spill Response Program for the Water & Sewer Department and promotes compliance, reviews programs, approves and appoints various programs and staff as required to assure the safe and compliant operation of the Water & Sewer Department.

4.1.2 The Associate Director reviews all spill reports and investigations, makes needed program changes, takes appropriate disciplinary action, signs reports, and reports to the Executive Assistant, state and federal agencies as required.

4.2 Assistant Director

4.2.1 The Assistant Director is responsible for the coordination of the spill control program to include promotion of Department responsibilities, program review, program development, training administration and review, program and staffing augmentation and administration of the Spill Response Program.

4.2.2 The Assistant Director also insures the involvement of all levels of management in the programs.

4.2.3 The Assistant Director reviews all spill reports and investigations to make recommendations to the Associate Director for action.

4.2.4 The Assistant Director acts for the Associate Director in their absence to assure a timely and continuous response for the Sill Control Program.

4.3 Deputy Director, Filtration and Compliance

4.3.1 The Deputy Director, Filtration and Compliance is responsible for the day to day administration of the program, worker and site inspection, training and administration, review of changes in the rules and regulations governing the programs, equipment review and supply, records retention, program development, and other duties as required to administer the Water & Sewer Department Spill Response Program.

4.4 Other Deputy Directors, Managers, Supervisors, Crew Leaders

4.4.1 Deputy Director(s), Managers, Supervisors, Crew Leaders and other management and supervisory personnel are responsible to assure their employees are trained in and practice the principles of first response to spills, the spill response program and maintaining a compliant system.

4.4.2 Deputy Director(s), Managers, Supervisors, Crew Leaders and other management and supervisory personnel are responsible to assure their employees are active participants in any spill response that requires their assistance and such assistance is rendered in a timely manner.

4.4.3 Deputy Director(s), Managers, Supervisors, Crew Leaders and other management and supervisory personnel are active participants in the Spill Response Program and demonstrate this by participation in training, program

review and suggestions, administration of proper spill response and reporting work practices, record keeping, scheduling employees and assuring attendance in training, securing and maintaining adequate spill response equipment, job site inspections, and other duties as required to administer the Water & Sewer Department Spill Response Program.

4.5 Employees

4.5.1 Employees are responsible for:

4.5.1.1 Practicing safe and compliant work methods.
4.5.1.2 Properly wearing and maintaining safety equipment, tools and equipment.
4.5.1.3 Attending and learning from training sessions.
4.5.1.4 Reporting all spills and incidents within 24 hours.
4.5.1.5 Quickly responding to and controlling spills to minimize environmental impact and maintain compliance.
4.5.1.6 Properly storing, maintaining and operating spill response related equipment and vehicles.
4.5.1.7 Watching out for and reminding fellow employees of safe and compliant work practices.
4.5.1.8 Following all County, Department and Division safety rules and compliance programs.
4.5.1.9 Asking for directions if there is ever any question regarding a site-specific spill issue or concern.

5.0 PROCEDURES

5.1 Spill Reported to Dispatch Center

5.1.1 Spills are reported to the Water & Sewer Department via the Dispatch Center. Following a spill report, the Dispatch Center generates a service requisition to be immediately followed up for investigation and remediation by available C&M field crews for immediate action.

5.1.1.1 Spills are reported via:

5.1.1.1.1 Public Communications

5.1.1.1.2 Internal Communications

5.1.1.1.3 Regulatory Communications

5.1.2 In order to insure that the spill response is given immediate priority and appropriate follow-up actions, a duplicate service requisition is completed and forwarded to the Dispatch Center Manager. If the manager is unavailable, the duplicate service requisition is forwarded to the Manager or Deputy Director of the C&M Section.

5.1.3 Lift Station spills are handled by the specific staff involved in that area. They are to report the spill details to dispatch and secure a Service Request Number to include on paperwork and for record keeping purposes.

5.1.3.1 If the lift station team needs support, dispatch will coordinate the C&M response under the issued Service Request.

5.2 First Response Team

5.2.1 The C&M Section has an on-call "First Response Team." The First Response Team is a formulation of existing C&M staff including supervisors, equipment operators, crew workers, etc., with the capacity to respond to major spills occurring within the County.

5.2.2 Following notification of a major spill, the First Response Team will be dispatched to augment existing staff and provide support, as required, at the site.

5.2.3 The current on-call list of C&M employees associated with the First Response Team is provided as Attachment 1.

5.2.3.1 The current on-call list will be reviewed on a quarterly basis to assure accuracy in the names and contact information. As changes are made the list will be updated and replaced in this SOP.

5.3 Spill Response Procedure

5.3.1 Overview

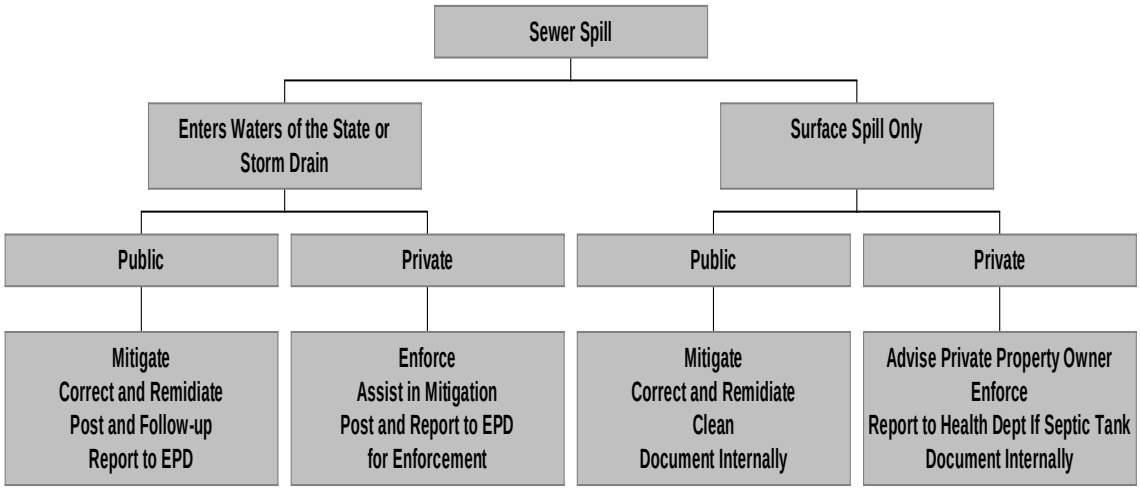
The Georgia EPD currently define a sewerage spill as follows:

Volume	Spill Type
Less than 10,000 gallons	Minor (unless serious environmental impact)
10,000 gallons & above	Major

Serious environmental impact Major

The Water & Sewer Department will respond to sanitary sewer spill types as shown in Table 1.

TABLE 1



5.3.2 Georgia EPD Spill Reporting Procedure

5.3.2.1 Prepare and hand-deliver hard copies of current Georgia EPD reporting forms to F&T Administrative Assistant or Compliance Administrative Assistant(s) (as a backup), Filtration & Treatment, to satisfy the Georgia EPD 24-hour reporting requirements. If F&T Administrative Assistant or Compliance Administrative Assistant(s) are unavailable, hand-deliver the completed spill reporting forms to the Dispatcher on duty so that the information can be reported to the Georgia EPD and other stakeholders within the required 24-hour period, as listed on the current Georgia EPD reporting forms.

5.3.2.1.1 **Due to the regulatory requirement to report the spill within the 24-hour window give the completed spill form to the F&T Administrative Assistant and/or Compliance Administrative Assistant(s) to assure reporting will occur. DO NOT leave a spill report at a workstation without informing the person orally that it is a spill report.**

5.3.2.2 In addition to completing the Georgia EPD spill reporting requirements, if a major spill occurs:

5.3.2.2.1 Contact Lab Monitor Supervisor immediately at 404-488-1603 (Cell), 770-322-0800 (Home) or 155*165599*2 (Direct Connect) to conduct sampling in accordance with Georgia EPD regulations.

5.3.2.2.2 The Deputy Director of C&M, and Assistant Director and Associate Director of the Water & Sewer Department shall also be notified of the spill immediately.

5.3.2.2.3 F&T Administrative Assistant and/or Compliance Administrative Assistant(s), in cooperation with the Dispatch Center, will provide copies of all spill information to the Compliance Section for their inspection and record keeping within 24-hours of receiving the spill documentation.

5.3.2.2.4 A copy of the spill reporting documentation will be provided to Customer Service Manager or Customer Support Assistant, C&M Section, within 5 working days from the reported spill.

5.3.2.2.4.1 Customer Service Manager or Customer Support Assistant will be responsible to contact the citizen that initially reported the spill to the Dispatch Center and follow up to make sure that the response from Water & Sewer was satisfactory. Documentation of the contact will be included in the reporting documentation.

5.3.2.3 If during the course of review any updated or erroneous information is presented, an appropriate corrected report will be sent to the original parties reported to.

5.3.3 Septic Tanks

5.3.3.1 If the spill involves a septic tank then a separate report shall be sent to the Health Department who has regulatory authority over all septic tanks.

5.3.4 Private Spill

5.3.4.1 Use available maps and site investigation to determine if the spill is occurring on a County-owned property or privately held property and if it is flowing into the waters of the State.

5.3.4.1.1 If it is identified as entering the waters of the State, perform an assessment to see if work on the County owned property could resolve the spill. This may include inspecting the existing sanitary sewer main in the vicinity of the on-going spill and arranging for support equipment such as Vactor-jet and/or rod trucks, etc. from the district as necessary. If a related cleanout is available, rod the existing service line to the sanitary sewer main as necessary to abate the spill.

5.3.4.1.1.1 If County line is blocked or causing the spill report as a County spill.

5.3.4.1.1.2 If no blockage or damage is found in County system report as Private spill.

5.3.4.1.2 If no County cleanout is available, install new County cleanout(s) if applicable.

5.3.4.1.3 If onsite inspection reveals that a private spill is entering the waters of the State, perform minimal work to prevent the spill from entering the water of the State and notify the property owner immediately to secure private resources to remedy the problem.

5.3.4.1.3.1 If owner is resistant to action notify a compliance inspector to issue a citation, shut off water to the site at the meter and follow-up to assure problem has been corrected before returning water service.

5.3.4.1.3.2 If it is not possible to measure the spill volume due to system configuration place an estimated quantity on the reporting form with an explanation of the circumstances.

5.3.4.1.3.3 Note all times for each action on the report so that the timeline is complete.

5.3.4.1.4 If a private spill is not immediately impacting waters of the State, perform a "temporary fix" to contain and prevent the spill from migrating to waters of the State if required and notify the property owner of their obligations to rectify the spill immediately.

5.3.4.1.5 The cost incurred to contain and/or mitigate the private spill will be submitted to the property owner for payment.

5.3.4.1.6 If the spill involves a septic tank advise the owner of the situation and provide a contact number for them to call.

5.3.4.1.6.1 Follow-up investigation should determine if County sewer is available and initiate enforcement action through the appropriate regulatory agency to tie the citizen into the sewer system.

5.3.4.1.7 Post the spill location with appropriate signage.

5.3.5 Manhole/Cleanout Overflow

5.3.5.1 When locating a manhole or cleanout overflow, make and document a complete and accurate assessment of the spill condition at the site including locations of county and private cleanouts.

5.3.5.1.1 Perform Georgia EPD spill notification and reporting requirements if it is determined that the spill entered the waters of the State.

5.3.5.1.2 Dispatch crew workers to investigate downstream of the spill site for possible fish kill and conduct "posting" activities as required by the Georgia EPD.

5.3.5.1.3 If the spill can be contained with minimal resources and support, do so immediately. Also, make arrangement for vactor-jet truck(s) to pick up the spill and clean the ground surface at the spill site.

5.3.5.2 If a spill from a manhole or cleanout is continuous:

5.3.5.2.1 Setup a by-pass pumping system immediately

5.3.5.2.2 Perform rodding and pressure washing as required to unclog the existing sanitary sewer main.

5.3.5.2.3 Schedule delivery of vactor-jet truck(s) to pick up spill and clean the ground surface at the spill site.

5.3.5.3 Compliance will conduct an investigation to identify the cause of the blockage in the sewerage piping system in coordination with C&M and other county resources as required. Based on the investigation, a service requisition may be generated to perform the following work activities:

5.3.5.3.1 Point Repair

5.3.5.3.2 Relining

5.3.5.3.3 Pipe bursting

5.3.5.3.4 Regularly scheduled root cutting or rodding/jet cleaning

5.3.5.3.5 New Line Installation

5.3.5.3.6 Enforcement action for FOG

5.3.6 Sanitary Sewer Main Break

5.3.6.1 If the spill is a result of a sanitary sewer main break:

5.3.6.1.1 Arrange for manpower and equipment, including a backhoe or excavator, as required, to repair the break.

5.3.6.1.2 If the pipe is greater than 20” or is in a location where an excavator is required to access the sanitary sewer main break, call the C&M Service Center and General Foreman at 770-621-7254, Nextel 155*61377*118, to arrange for transportation of excavator(s) and by-pass pumping system to properly address the spill.

5.3.6.1.3 Activate the First Response Team immediately to provide support as required.

5.3.6.1.3.1 Inform the Service Center and General Foreman of the number of pumps required.

5.3.6.1.3.2 If the pumps are unavailable in-house, call one or more of the on-call pump rental companies for immediate delivery Listed in Appendix

5.3.6.1.3.3 Prior to arrival of the excavator(s), establish a containment system to help supplement the by-pass system.

5.3.6.1.3.4 Call the Material Warehouse Supervisor at 770-621-7240, Nextel 155*61377*8, and make arrangement for delivery of materials required to restore the sanitary sewer main.

5.3.6.1.3.5 If required, call the Superintendent to arrange for additional crews.

5.3.6.1.3.6 Identify upstream and downstream manholes to conduct proposed by-pass pumping.

5.3.6.1.4 Activate Georgia EPD Spill Reporting Procedure

5.3.7 Lift Station/Plant Overflow

5.3.7.1 When notified by the F&T Section (or other Water & Sewer sections) of a potential or actual overflow at a lift station/plant

5.3.7.1.1 Arrange for the required vactor-jet truck(s) to provide backup support for the F&T Section.

5.3.7.1.2 If containment of the spill requires round-the-clock pumping, make arrangement for the by-pass pumping system to be delivered immediately to the spill site.

5.3.7.1.3 Also, be available to provide equipment and manpower, including the First Response Team, to support the F&T Section in properly addressing the lift station overflow.

5.3.7.1.4 F&T Section will coordinate dispatching staff to investigate downstream for possible fish kill.

5.3.7.2 After remediation of the lift station/plant overflow:

5.3.7.2.1 All pumps, hoses, and equipment will be collected, and returned to the Equipment Maintenance Center, at the 1580 Roadhaven Drive facility for proper inspection, cleaning, repair (if necessary) and storage.

5.3.7.2.2 **No equipment is to be stored prior to comprehensive inspection and cleaning by the C&M staff. The C&M Section shall keep a record of the inspection.**

5.3.7.3 Activate Georgia EPD Spill Reporting Procedure

5.4 Sign Posting/Removal for Spills that Reach the Waters of the State

5.4.1 Signs will be posted at the site of the spill, entry into the waters of the State and upstream of the site.

5.4.2 Additional signs will be posted at regular intervals at portions of the waterway affected by the flow of the contaminant.

5.4.3 Sign locations include but are not limited to bridge crossings, trails, boat ramps, recreation areas, and other points of public access of the affected area.

5.4.4 All posting locations will be photo documented, location listed on the task order, and removed at the appropriate time.

5.4.4.1 Documentation will be included for any missing signs during the required posting time and when they are picked up.

5.4.5 Signs posted will contain the following information:

5.4.5.1 Spill Date

5.4.5.2 Spill Location

5.4.5.3 Cause of the Spill

5.4.5.4 Estimated Volume of the Spill

5.4.5.4.1 If not known To Be Determined will be entered on the sign and all signs will be remarked when the volume is determined.

5.4.5.5 Receiving Stream

5.4.5.6 Corrective Action Taken

5.4.5.7 Contact Phone Number for Additional Information

5.4.6 If a spill does not reach the waters of the state or enter a storm drain no postings are required unless there is an immediate threat to human health or the environment.

5.5 Documentation

5.5.1 Field Notes

5.5.1.1 All field notes will be detailed in actions taken, methods used to calculate volumes, manpower involved, any contact information, and any other detail relative to the response.

5.5.1.2 Upstream and downstream manhole numbers and main ID's are to be included as soon as they are determined.

5.5.2 Synergen CMMS

5.5.2.1 Proper closeout of all service and work requests is essential for proper historical records. Adequate detail from the field notes is to be included along with employee time, supplies, and proper closeout codes.

5.5.2.2 If spill address is different than the original problem address then an associated service request is to be created for any different address and details of how it is related to the spill incident.

5.5.2.3 Each request related to a spill response will include whether a spill actually occurred along with details about location, if the spill reached the waters of the state and if it was private in nature.

5.5.2.4 Each request will have two codes entered on it. The first Problem code is the dispatched problem code describing the problem as related to W&S. The second code is the resolution code, which describes what actions the service crew took. Typically they will not be the same.

5.5.3 Spill Reporting Package

5.5.3.1 Copies of all paperwork are to be given to the F&T admins to include in the spill report file.

5.6 Stream Analysis

5.6.1 Stream Analysis form is attached as Appendix 10.

5.7 Compliance Inspection

5.7.1 FOG

5.7.2 Construction Inspection

5.7.3 Flow Monitoring

5.7.4 Inflow/Infiltration Inspection

5.8 Data Analysis

5.8.1 Periodic data analysis will take place to review the location, cause, frequency, potential corrective actions and effect of the various spills that may occur in the County. The results of these analyses will be used to help determine potential repair, rehabilitation locations, new line installations, septic tank elimination programs, and/or maintenance frequencies to utilize in directing the overall County spill reduction program.

5.9 Spill Volume Calculations

5.9.1 Manhole Overflow

5.9.1.1 Locate spill site, and go to the manhole downstream of it.

5.9.1.2 Using the Sludge Judge measure the level of flow at that manhole

5.9.1.2.1 Add one inch to your measurement due to tool calibration

5.9.1.2.1.1 Most of the time this value will be zero

5.9.1.2.1.2 If you do not see any flow or minimal flow that measurement is not possible use zero as the value.

5.9.1.3 Record the downstream level and the pipe size.

5.9.1.4 Record the time the blockage is removed and/or flow starts.

5.9.1.5 Measure the level at the spill manhole.

5.9.1.5.1 Using the Sludge Judge measure the level of flow and add one inch to your measurement due to tool calibration.

5.9.1.6 Record the level at the spill manhole and the pipe size when the flow returns to a normal rate.

5.9.1.7 Using the chart in Appendix 8 find the pipe size and go down its column to the depth of flow at the spill manhole

5.9.1.7.1 The number that is in the column and row intersection is the flow.

5.9.1.8 Repeat step 5.9.1.7 for the measurements at the downstream manhole.

5.9.1.8.1 The number that is in the column and row intersection is the flow.

5.9.1.9 Once you have the two flow rates, subtract the downstream number from the upstream number and record.

5.9.1.9.1 If this number is negative investigate further for additional flow sources or conditions.

5.9.1.10 Determine the number of minutes from the time the call came into dispatch until the time the spill was stopped.

5.9.1.11 Multiply the minutes from step 5.9.1.10 by the flow rate number from step 5.9.1.9.

5.9.1.12 Record this number as the spill volume.

6.0 TRAINING AND DUTIES

6.1 Training and Duties of Program Participants

6.1.1 All personnel involved in Strategic Spill Response Plan shall be trained in the requirements of this program.

6.1.2 Training shall be performed before the employee is assigned specific reporting duties.

6.1.3 Retraining will be performed whenever inspections indicate that an employee does not have the necessary knowledge or skills to work in the Strategic Spill Response Plan.

6.1.4 The Special Projects Coordinator will maintain training records. These records shall include the dates of the training program, the instructor of the training program, a copy of the written material presented, and the names of the employee(s) to whom the training was given.

6.2 Training and Duties of Workers

6.2.1 All personnel that perform work in Strategic Spill Response Plan shall comply with the requirements of this program. These personnel shall receive appropriate training that shall include, at a minimum:

6.2.1.1 The work practices that must be followed during the Strategic Spill Response Plan;

6.2.1.2 The use of tools and reporting documents that will typically be required during work in the Strategic Spill Response Plan;

6.2.1.3 The regulatory requirements of the Strategic Spill Response Plan

6.3 Training and Duties of the Supervisors

6.4.1 The Competent persons shall receive the training detailed above and shall, in addition, receive training requirements detailed in Section 3.0 and 4.0, and Appendices of the Strategic Spill Response Plan. The Competent Person shall:

6.3.1.1 Coordinate and actively participate in the training of departmental employees.

6.3.1.2 Ensure on a daily basis, or more often as detailed in this program, that the intent of the Strategic Spill Response Plan is met.

6.4 Contractor Awareness, Duties, and Responsibilities

6.4.1 A contractor that is performing Strategic Spill Response Plan work on DeKalb County managed property shall coordinate Strategic Spill Response Plan work with the assigned DeKalb County staff to assure the coordination of the work meets the requirements of the program and is performed in a safe manner.

7.0 REFERENCES

Georgia rules for water quality section 391-3-6

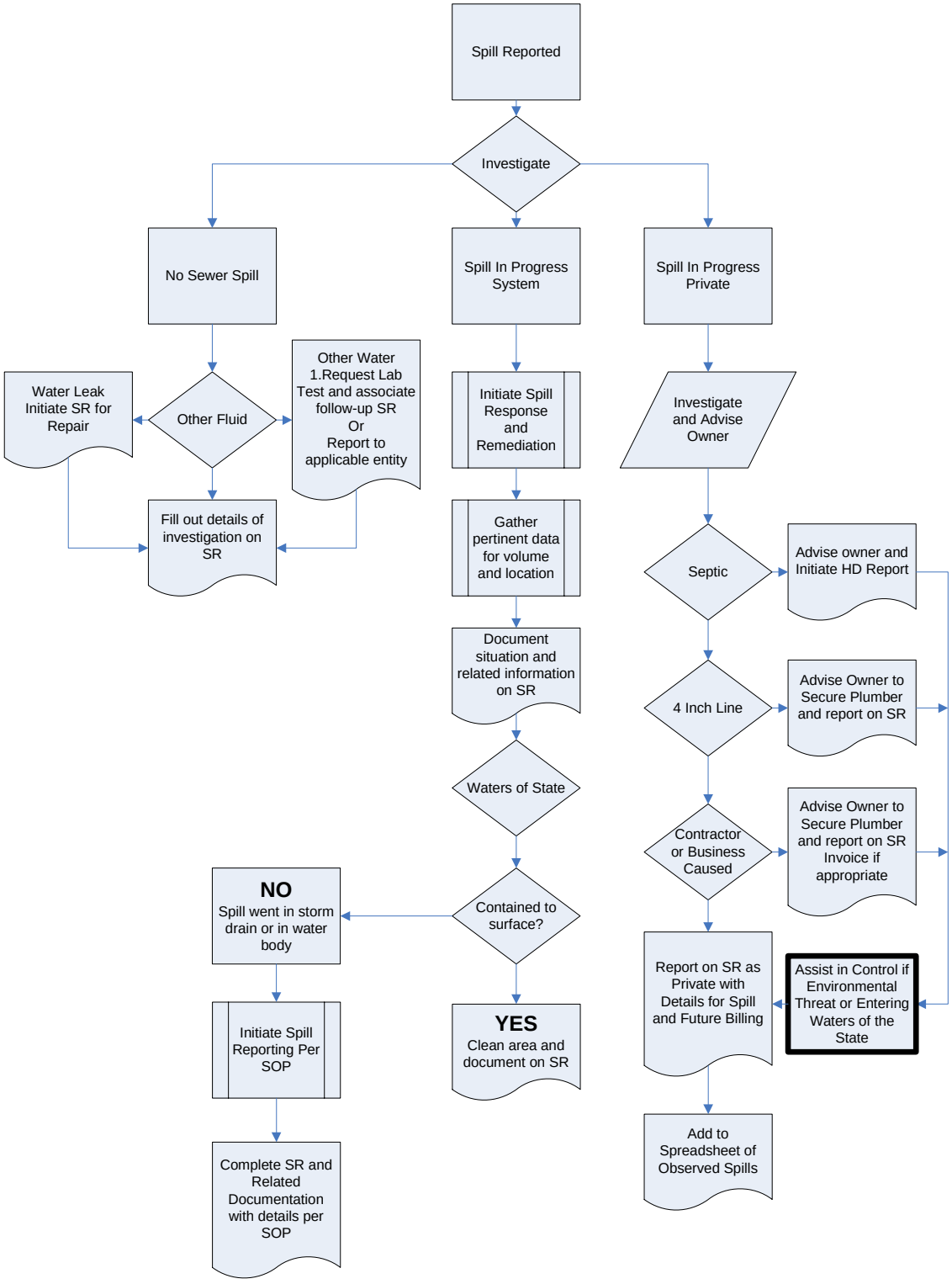
Clean Water Act

NPDES Permits

Water and Sewer Department Safety Manual

Appendix 1

C&M Spill Matrix



Appendix 2

First Response Call List

DISASTER RESPONSE EMERGENCY CALL LIST

DISTRICT 1

7-21-2006

Name	Job Title	Home Phone #	Cell Phone #
Steve Long	General Foreman	N/A	678-758-5204
Edgar Smith	General Foreman	770-465-7441	678-758-5202
Hubert Momon	General Foreman	770-267-9633	678-758-5212
Brad Smith	Crew Supervisor	770-784-9728	678-409-0978
Mike Sellers	Crew Supervisor	770-554-6670	770-873-2957
Dennis Miller	Crew Supervisor	404-294-1885	404-328-6678
Anthony Walker	Crew Supervisor	770-997-2107	404-285-4005
Karl Holzberger	Inspector	770-720-9116	678-794-8144
Stanley Bennett	PEO	404-289-1303	770-873-8072
Gary Pruitt	Crew Supervisor	770-841-0811	N/A
Michael Character	Crew Supervisor	404-241-3615	678-933-4011
Willie J. Brown	Crew Worker	404-243-4752	404-457-5564
DeWayne Zanders	Crew Worker	404-755-7497	678-283-1140
Kay Vougsanith	Crew Worker	404-468-7772	678-755-1755
Freddie Harris	Crew Worker	770-322-0495	N/A
Cody Poke	Crew Worker	404-281-1864	N/A
Robert Williams Jr	Crew Worker	678-754-7165	N/A
Arthur Griffen	Crew Worker	404-524-4824	N/A
Chao Vang	Crew Worker	770-482-1290	N/A

DISTRICT 2

7-17-2006

Name	Job Title	Home Phone #	Cell Phone #
Vantony Johnson	General Foreman	4047882687	678-476-1817
James Posea	PEO	770-995-9174	678-855-2448
Albert Hardy	Crew Worker	404-233-6560	
Ellis Virgle	Crew Worker	404-286-1749	404-668-1474
Andrew Shelton	Crew Worker	770-981-5371	N/A
Walter Tolen	PEO	404-284-6128	N/A
Roosevelt Fedrick	Crew Supervisor	678-526-0664	
Andrew Myers	PEO	404-294-0911	
Oudit Persaud	SEO	678-344-7641	
Bruce Arnold	PEO	404-286-4318	404-286-4318 or 404-281-9506
Richard Lewis	Crew Worker	404-284-8899	
Jevon Murry	Superintendent	770- 318-1510	770-981-8354

DISTRICT 3

Name	Job Title	Home Phone #	Cell Phone #
Adams, Don	General Foreman	(770) 972-7517	(404) 617-9499
Austin, John	Crew Supervisor	(770) 922-4461	(770) 206-0508
Babrow, Glanville	Mechanic	(770) 920-1237	(404) 455-9585
Clark, Bobby	Crew Worker	(678) 526-8460	N/A
Davis, Jerry	Inspector	N/A	(404) 786-5189
Grace, John	Fuel	(770) 736-1847	N/A
Hammitt, Demetrius	Crew Supervisor	N/A	(404) 396-1992
Horton, Willie	General Foreman	(770) 469-0623	(404) 873-1307
Jackson, Clifford	Crew Worker	N/A	(678) 558-8930
Jenkins, Keith	Crew Worker	(404) 288-0591	(404) 488-4539
Jenkins, Ronald	General Foreman	(404) 343-5811	(678) 643-1375
Johnson, Albert	Crew Worker	(404) 534-1443	N/A
Johnson, Darren	District Supt	(770) 484-6902	(678) 314-2003
Johnson, Horace	Crew Worker	N/A	(404) 484-4542
Johnson, Wayne	Low Boy	(770) 207-2284	(678) 467-7556
Jones, James	Crew Worker	(404) 244-5537	(404) 735-2966
Neville, Philip	General Foreman	(770) 554-1842	(770) 633-7352
Riley, Kirk	Crew Worker	(404) 343-1225	(770) 912-9761
Rogers, Matthew	Welder	(770) 385-9908	(678) 772-5057
Ruffin, David	Welder	N/A	(404) 226-7004
Sheppard, Robert	Crew Worker	(404) 241-8614	
Stamper, Charzell	Crew Supervisor	(770) 465-8924	(404) 587-0236
Turner, Tony	Crew Worker	N/A	(404) 441-1101 (404) 664-4269
Washington, Willie	Mechanic	(770) 322-0788	(678) 755-9686
Williams, Garry	Mechanic	(678) 583-4311	(404) 587-5049

CONSTRUCTION

Name	Job Title	Home Phone #	Cell Phone #
Fowler, Steve	Superintendent	770-513-7285	678-758-5189
Denney, Jerry	General Foreman	770-787-9125	404-379-5171
Holley, Russell	General Foreman	706-374-3740	678-758-5193
Jones, Darryl	General Foreman	404-289-2115	678-414-2528
Battle, John	General Foreman	404-286-8175	678-758-7729
Cardwell, Modriquiz	Crew Supv. CDL	404-288-2953	
Murrell, Keith	Crew Supv. CDL	770-385-7481	678-794-4874
George, Paul	Crew Supv. CDL	770-938-7267	678-614-9068
Bullock, Dennis	Crew Supv. CDL	770-962-1526	678-614-9406
Manuel, Robert	Crew Supv. CDL	678-342-2123	678-499-9936
Bryant, Greg	PEO	404-289-6682	678-614-9398
Morse, Roderick	PEO	770-987-3684	678-614-5429
Williams, Robert	PEO	404-284-9096	678-614-7957
Adams, Kevin	PEO	770-266-0622	
Jackson, Timothy	Crewman	404-284-2963	678-760-2184
Gunn, Lanorris	Crewman	404-761-0851	
Ethridge, Jimmy	Crewman	770-879-8154	
Jackson, Marquis	Crewman	404-284-2963	
Goodson, James	Crewman	404-437-2476	
Kent, Zetar	Crewman	404-246-3242	
Johnson, Darryl	Crewman	770-498-9442	
Williams, Antone	Crewman	404-438-5508	
Fields, Bobby	Crewman	770-385-5250	
Dunning, Bobby	Construction Inspector	770-786-3870	770-274-9027

DISPATCH

Name	Job Title	Home Phone #	Cell Phone #
Cooper, Eddie	Supervisor	770-987-1991	678-758-4892
Chapman, Terrence	Dispatcher	770-879-1310	404-547-0182
Flint, Trinette (Melissa)	Dispatcher	678-526-7828	404-704-4419
Peterson, Harold	Dispatcher	404-378-6845	404-234-0658

Appendix 3

Equipment List

The Water & Sewer Department has prepared a spill emergency equipment inventory to adequately respond to spills in DeKalb County. The following is a copy of the Spill Emergency Equipment Inventory that includes a list of supplemental pump rental establishments in the Atlanta Metropolitan area having existing agreements with DeKalb County.

Pumps

8” Acme Dynamics Quiet Zone: QZ AP 200-60
8” KHD Deutz
6” Sykes Pump: GP 150MS-60
6” Godwin CD150M Quietpack

Suction Hoses

8” – 40’ - (4) x 10’ sections
8” - 90° elbow
8” x 6” adapter
6” – 24’ – (1) x 24’ section
6” - 90° elbow

Discharge Hoses

8” – 450’ – (9) x 50’ sections
6” – 400’ – (8) x 50’ sections

Additional Couplings, etc.

8” – 24 couplings
6” – 20 couplings
8” strainer
8” strainer adaptor
6” strainer

Appendix 4

Vendor Contact List

Pump Rentals

Service Pump & Compressor (Hertz)
Darren DeSautell
(678) 581-9768
Mobile: (678) 858-5972
Nextel: 155*139664*1

Rain for Rent
Brett Stitt
(678) 594-6601
Mobile: (404) 516-5566
Nextel: 155*33309*5

Godwin Pumps
John Sybrandt
(770) 529-7559
Mobile: (678) 429-9104
Beeper: (800) 946-4646 #1097618

Neff Rental
Al Sanabria
(770) 936-0237
Mobile: (678) 898-0789
Nextel: 154*22*22067

Appendix 5

Spill Reporting Form
E.P.D. SEWER SPILL REPORT

Today's Date: _____

Address of Spill: _____**City**: _____

Who reported spill: _____

Date & time spill reported to us: _____

Date and time problem was corrected: _____

Estimated spill amount# of gallons: _____ **Private? :** _____(Yes or No)

Name of waterway/tributary that spill entered: _____

Reporting Foreman & #_____Service Request #_____

Fish Kill? : _____ (Yes or No) **Enter Waterway/Storm Drain?** : _____ (Yes or No)

Cause of Spill (if vandalism, explain & attach pictures)_____

_____

Action taken to correct problem: _____

_____

_____

Signs should be posted at site, site of entry into State waters, and along portions of waterway affected ***(i.e. bridge crossings, trails, boat ramps, recreation areas and other points of public access to affected waterway).*** Was this done? _____ (Minimum of 4) How many signs were posted? _____

Manhole #'s or Highlighted Map must be attached

_____

*******REPORT SPILLS THAT ENTER STATE WATERS WITHIN 24 HOURS*******
****WORK WEEK****
GET INFORMATION TO *ADMINISTRATIVE ASSISTANT* FOR REPORTING TO EPD. IF NOT AVAILABLE, NOTIFY EPD AND FAX HEALTH DEPARTMENT AND ADVISE *F&T MANAGER* OF SPILL.

_____EPD – **404-362-2680 – A minor spill can be faxed to EPD 404-362-2691**
_____Health Department – **404-508-7979 (fax)**
_____SSO Notification List

WEEKENDS: (Friday 4:00pm – Monday 8:00am) (Immediate Notification)

_____Health Department – FAX report to**:** 404-508-7979
_____Sanitary spill notification list followed (local media) within 24 hours
_____EPD MINOR: **(LESS THAN 10,000 GAL)** FAX REPORT TO: **404-362-2691**
_____EPD MAJOR: **(10,000 GALLONS OR MORE and/or fish kill)** CALL **1-800-241-4113**
EPD Report No._____
Name of Person reporting to EPD: _____

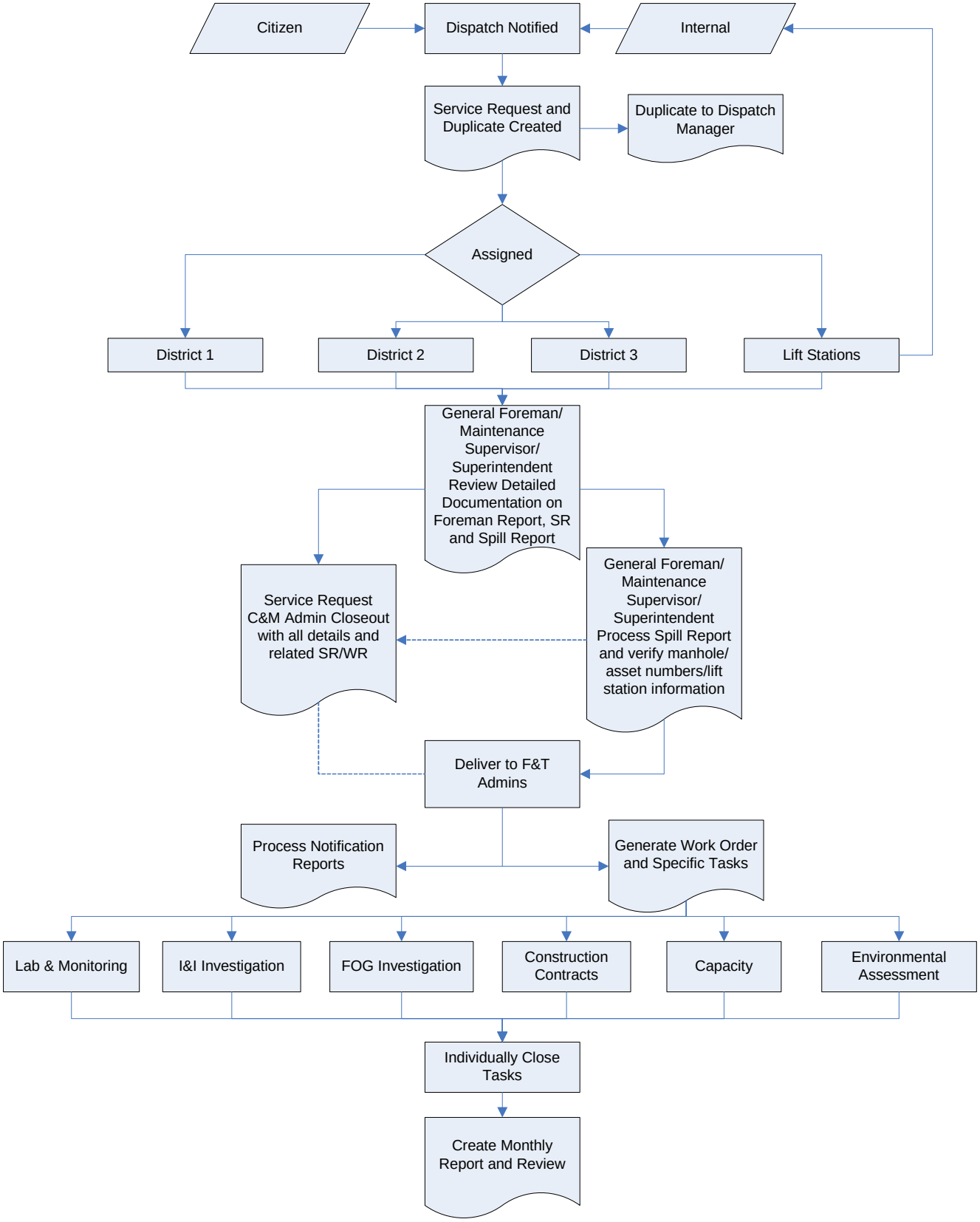
++++++***ATTACH FAX CONFIRMATIONS TO REPORT***++++++++

*****Nights & Weekends**: **MAJOR SPILL ONLY*****(**Immediate Notification**)
Contact for Lab: **Jay Ash** 404-488-1603 **Cell,** 770-322-0800 **H** or **Nextel Direct Connect** 155*165599*2
Date and Time contacted_____

Contact for Flow Monitoring: **Pao Vang, Cell** 678-758-5114 or Nextel Direct Connect 155*61377*95
Date and Time contacted_____

Appendix 6

Complete Spill Response Procedure



Appendix 7

Spill Notification Directory

Spills Notification Directory

First Name	Last Name	Title	Organization Name	Phone Number	Fax Number	E-Mail
External						
Immediately(All)						
David	Pike	Assistant Director	DeKalb County Health Department	(404) 508-7917	(404) 508-7979	davidpike@gdph.state.ga.us
Ryan	Cira	Program Manager	DeKalb County Health Department	(404) 294-3700	(404) 508-7979	rxcira@dhr.state.ga.us
Mohamed	Kolta	GIS Specialist	DeKalb County Health Department	(404) 294-3700	(404) 508-7979	mkolta@dhr.state.ga.us
Jeffrey H.	Larson	Manager	EPD, Permitting Compliance & Enforcement Program	(404) 362-2680	(404) 362-2691	FAX
Stanley	Brinkley	Plant Manager	Quarles Water Treatment Plant	(770) 971-1911	(770) 977-5619	sbrinkley@ccmwa.org
Mikel	Clark	Water Complex Superintendent	Chattahoochee Treatment Plant	(404) 982-1480 (404) 982-1496	(404) 609-7117	mikel.clark@atlwater.com
Danny	Friend	Superintendent	Hemphill Water Treatment Plant	(404) 982-1450	no fax	danny.friend@atlwater.com
Immediately (Major Only)						
Dr. S. E.	Bouchellon	Director	DeKalb County Health Department	(404) 294-3700	(404) 508-7979	sebouchellon@gdph.state.ga.us
Robert	Blake	E.H. Division Director	DeKalb County Health Department	(404) 294-3700	(404) 508-7979	rgblake@dhr.state.ga.us
Janice	Buchanon	Assistant Director	DeKalb County Health Department	(404) 294-3700	(404) 508-7979	jdbuchanon@dhr.state.ga.us
Karen	Thompkins	Program Manager	DeKalb County Health Department	(404) 294-3700	(404) 508-7979	krthompkins@dhr.state.ga.us
Within 24 hours (All)						
Larry	Conley	Reporter	DeKalb Extra-AJC	(404) 479-8613	(404) 370-7293	lconley@ajc.com
Kathy	Mitchell	Editor	The Champion Newspaper	(404) 373-7779 (ext. 104)	(404) 373 7721	kathym80@hotmail.com
Aileen	Harris	Co-founder	GoDekalb.com	(770) 310-1773		aileen@GoDekalb.com
Robin	Yamakala	Editor	The DeKalb/Doraville Neighbor	(770) 454-9388	(770) 454-9131	dekalb@neighbornewspapers.com
Jennifer	Parker	News Reporter	Crossroads News	(404) 284-1888	(404) 284-5007	editor@crossroadsnews.com
Bruce	Dortin	News Assignment Editor	WABE 90.1 FM	(678) 686-0321	(678) 686-0356	bruce_dortin@wpba.cbs.org
Chris	Camp	News Director	WSB 750 AM	(404) 897-7333	(404) 897-7593	chris.camp@wsbradio.com
Jeff	Parnsons	News Director	WGNX -TV 46 (CBS)	(404) 327-3000	(404) 327-3004	cbs46news@cbs46.com
Budd	McEntee	News Director	WAGA-TV (FOX)	(404) 898-0110	(404) 898-0169	newstipsatlanta@foxtv.com
Erica	Palmer	News Desk	WXIA-TV (NBC)	(404) 873-9189	(404) 881-0675	news11alive@yahoo.com
Kurt	Davis	Manager, Content/Coverage	WSB-TV 2 (ABC)	(404) 897-6276	(404) 897-7370	assignmentdesk@wsbtv.com
Dick	Williams	Editor	Dunwoody Crier	(770) 451-4147	(770) 451-4223	thecrier@mindspring.com
Internal						
Immediately(All)						
Richard	Stogner	County Administrator	DeKalb County			rstogner@co.dekalb.ga.us
Roy	Barnes	Associate Director, Water & Sewer	DeKalb County	ext. 243		robarnes@co.dekalb.ga.us
Charles	Lambert	Asst. Director, Water & Sewer	DeKalb County	ext. 231		cllambert@co.dekalb.ga.us
John	Walker	Deputy Director, Plant Ops /Compliance	DeKalb County	ext. 460		jawalker@co.dekalb.ga.us
Rudolph	Chen	Deputy Director, Tech. Services /C&M	DeKalb County	ext.213		rachen@co.dekalb.ga.us
Meral	Zarrell	Manager, F&T	DeKalb County	ext.526		mzarrell@co.dekalb.ga.us
Jay	Ash	Supervisor, WQC Lab	DeKalb County	(770) 981-0220		jtash@co.dekalb.ga.us
Marvin	Clark	Chemist, WQC Lab	DeKalb County	(770) 981-0220		mcclark@co.dekalb.ga.us
Dean	Williams	Environmental Proj. Coordinator	DeKalb County	(770) 808-2900		DNWILLIA@co.dekalb.ga.us
Malcolm	Tipton	Environmentalist	DeKalb County	(770) 981-0220		mttipton@co.dekalb.ga.us
Yanique	Swan	F&T Admin.	DeKalb County	ext.260		yiswan@co.dekalb.ga.us
Internal(Compliance)						
Within 24 hours(All)						
Pao	Vang	Crew Supervisor	DeKalb County	ext. 422		pvang@co.dekalb.ga.us
Antoinette	Fox	Admin.	DeKalb County	ext. 238		anfox@co.dekalb.ga.us
Chester	Gudewicz	Supervisor	DeKalb County	ext. 480		cagudewi@co.dekalb.ga.us
Claude	Cole	Supervisor	DeKalb County	ext. 490		cecole@co.dekalb.ga.us
Richard	Calhoun	Supervisor	DeKalb County	ext. 268		recalhoun@co.dekalb.ga.us
Nadine	Maghsoudlou	Engineer, Sr.	DeKalb County	ext. 229		nmaghsoudlou@co.dekalb.ga.us
Greg	Perry	GIS Specialist	DeKalb County	ext. 239		GHPerry@co.dekalb.ga.us
Uriah	Horn	Compliance Inspector	DeKalb County	ext. 494		uhorn@co.dekalb.ga.us

Appendix 8

Spill Calculation Charts

DEKALB COUNTY WATER & SEWER DEPARTMENT
SANITARY SEWER FLOW RATES FOR SPILL VOLUME DETERMINATIONS
(Gallons per Minute @ v = 2.0 fps & n = 0.013)

1. Determine time of initial caller notification of sewer spill.

2. Measure the flow, if any, in inches in sewer immediately downstream of blockage and determine flow rate from table.

3. Clear obstacles from blocked sewer, allow free & steady flow to stabilize, and note the time.

4. Measure the flow in inches in the previously blocked sewer and determine flow rate from the table.

5. Subtract the flow rate from the downstream sewer determined in 2 above, if any, from the flow rate from the previously blocked sewer determined in 4 above and multiply by the elapsed minutes from notification to clearance.

Depth of Flow (in)	Pipe Size (in)								
	6	**8**	**10**	**12**	**15**	**18**	**21**	**24**	**30**
1	20	20	25	30	30	35	35	35	50
2	50	60	70	75	90	95	105	115	120
3	90	105	125	135	155	170	185	205	230
4	125	155	180	205	235	260	285	305	355
5	155	205	245	275	325	355	400	430	475
6	175	250	305	350	410	465	505	550	625
7		290	365	425	500	570	635	680	955
8		315	420	495	600	680	750	830	935
9			465	565	690	795	885	965	1110
10			490	630	775	905	1010	1105	1295
11				675	865	1015	1150	1265	1455
12				705	945	1120	1270	1410	1645
13					1010	1220	1405	1555	1840
14					1070	1320	1525	1715	2005
15					1100	1415	1650	1855	2205
16						1490	1760	1990	2400
17						1550	1875	2140	2565
18						1585	1965	2270	2760
19							2055	2390	2950
20							2120	2515	3110
21							2160	2615	3295
22								270	347

6. Report total amount spilled to General Foreman and Superintendent.

								5	0
23								2780	3615
24								2820	3780
25									3930
26									4050
27									4175
28									4285
29									4355
30									4405

Depth of Flow (in)	Pipe Size (in)				
	36	42	48	54	60
1	40	60	55	65	55
2	135	140	150	160	195
3	260	265	275	305	330
4	380	415	460	485	485
5	540	585	460	635	720
6	685	735	815	855	915
7	870	930	1010	1090	1125
8	1035	1140	1215	1280	1420
9	1240	1365	1435	1540	1660
10	1420	1595	1720	1815	1900
11	1640	1785	1960	2105	2244
12	1865	2030	2205	2330	2510
13	2055	2280	2455	2635	2780
14	2290	2535	2715	2950	3155
15	2490	2745	2980	3190	3445
16	2730	3010	3315	3520	3740
17	2930	3280	3585	3855	4140
18	3170	3550	3865	4195	4445
19	3375	3770	4145	4455	4760
20	3615	4045	4425	4800	5180
21	3855	4315	4710	5155	5495
22	4055	4590	5065	5420	5820
23	4290	4810	5350	5780	6255
24	4480	5085	5640	6140	6585
25	4705	5355	5925	6500	6915
26	4890	5625	6215	6775	7355
27	5105	5835	6500	7135	7690
28	5275	6100	6855	7500	8025
29	5475	6355	7135	7775	8475
30	5660	6605	7415	8135	8810

Depth of Flow (in)	Pipe Size (in)				
	36	42	48	54	60
31	5805	6850	7690	8495	9150
32	5965	7040	7965	8765	9595
33	6085	7270	8235	9120	9930
34	6205	7495	8565	9475	10265
35	6290	7705	8820	9820	10710
36	6345	7860	9075	10080	11040
37		8050	9320	10420	11370
38		8220	9555	10755	11805
39		370	9785	11005	12125
40		8475	10060	11325	12445
41		8575	10270	11640	12865
42		8635	10465	11870	13175
43			10650	12170	13485
44			10815	12460	13885
45			10965	12735	14175
46			11100	12930	14465
47			11225	13185	14840
48			11280	13420	15115
49				13585	15380
50				13790	15720
51				13965	15965
52				14115	16200
53				14205	16495
54				14275	16705
55					16900
56					17135
57					17295
58					17430
59					17565
60					17625

Appendix 9

Private Property Letter

PRIVATE PROPERTY NOTIFICATION

The DeKalb County Water and Sewer Department has responded to a sewer spill complaint and discovered the source is not caused by or on County property. The State of Georgia Environmental Protection Division (EPD) has regulations against any spills of sewage or other substances that may impact the environment or more seriously enter the waters of the State. Immediate action is required on your part to eliminate and clean the area of the spill on your property. The County is required to report all spills within 24 hours to the EPD.

If the spill is entering or likely to enter the waters of the State, the County will respond to prevent environmental damage and invoice the County costs to the property owner. This response is minimal and is designed only to prevent spillage into the waters of the state. The County will not undertake repairs on private property since this is the property owner's responsibility.

If the spill is caused by construction activity the party doing the construction will be held liable for the spill. Enforcement action will be taken under the State Call Before You Dig program if applicable, County Codes and ordinances and current EPD rules, laws, guidelines or consent orders. All costs associated with the repair and corrective actions will be invoiced to the entity that caused the problem.

If a commercial establishment under the Fats, Oils and Grease program causes the spill, the County FOG program administrators will take enforcement actions.

If a multi-family establishment is involved the property managers/owners will be notified of their responsibility to mitigate, remediate, and eliminate current or future spills.

If a Septic Tank is involved, the State Health Department will be notified to take enforcement action.

If the problem is a private house line the homeowner is responsible for corrective action and repairs to prevent future problems. A private house line is defined as that portion of the sewer system from the County Property Line Cleanout to the house and any related plumbing in, on, or under the private house. Enforcement action may be taken if the mitigation is not undertaken in a timely manner.

Appendix 10

Stream Quality Survey

DeKalb County
Water & Sewer Department
Natural Resources Section

STREAM NAME	DATE
INVESTIGATOR	TIME
COUNTY	SITE LOCATION
WEATHER CONDITION	

STREAM QUALITY SURVEY REPORT

1. **STREAM REACH SAMPLE:** BANKFULL WIDTH _____ X 12 = STREAM REACH
2. **WATER FLOW:** PRESENT CONDITIONS

IN CHANNEL

☐ FLOODING OVER BANKS

☐ **DRY / NO FLOW**

3. **EMBEDDEDNESS:** EXTENT COBBLES OR ROCKS ARE EMBEDDED IN SILT.
   - ☐ SOMEWHAT / NOT EMBEDDED 0-25%
   - ☐ HALFWAY EMBEDDED 50%
   - ☐ MOSTLY EMBEDDED 75%
   - ☐ TOTALLY EMBEDDED 100%
4. **ORGANIC MATERIAL IN STREAM:**
   - ☐ NONE ☐ OCCASIONAL ☐ PLENTIFUL
5. **WATER ODOR:**
   - ☐ NONE ☐ CHEMICAL
   - ☐ SEWAGE ☐ CHLORINE
   - ☐ ROTTEN EGG
6. **WATER SURFACE:**
   - ☐ CLEAR ☐ FOAMY
   - ☐ OIL SHEEN ☐ OTHER
7. **STREAM SHADE COVER:**

TOTAL SHADING NO SHADING

100% 90% 80% 70% 60% 50% 40% 30% 20% 10% 0%

8. **WATER CLARITY:**

☐ TURBID – SUSPENDED SOLIDS

☐ NOT TURBID – NO SUSPENDED SOLIDS

9. **BANK EROSION:**

HOW VEGETATED IS THE LEFT BANK / LOOKING DOWNSTRAM / FOR THE LENGTH OF THE REACH?

100% 90% 80% 70% 60% 50% 40% 30% 20% 10% 0%

HOW VEGETATED IS THE LEFT BANK / LOOKING DOWNSTRAM / FOR THE LENGTH OF THE REACH?

100% 90% 80% 70% 60% 50% 40% 30% 20% 10% 0%

10. **ADDITIONAL COMMENTS AND OBSERVATIONS:**

_____

_____

_____

_____

_____

_____

_____

BIOLOGICAL SURVEY

11. **WILDLIFE IN AND AROUND STREAM:**

☐ AMPHIBIANS ☐ REPTILES ☐ MAMMALS

☐ WATERFLOW ☐ MUSSELS / CLAMS ☐ CRYSTANCEANS

12. **ARE THERE FISH IN THE STREAM:**

☐ NO ☐ YES / BUT RARE ☐ LARGE 7” AND ABOVE

☐ SMALL 1-2” ☐ MEDIUM 3-6”

13. **AQUATIC PLANTS IN STREAM:**

☐ NONE ☐ ATTACHED PLANTS ☐ FREE FLOATING

14. **EXTENT OF ALGAE IN STREAM:**

☐ NONE

☐ BROWNISH

☐ GREENISH

☐ OTHER

MACROINVERTEBRATE COUNT: A=1-9 B=10-99 C=100 PLUS

SENSTITIVE	LESS SENSITIVE	TOLERANT
☐ CADDIS FLIES	☐ DOBSONFLIES	☐ AQUATIC WORMS
☐ MAYFLIES	☐ FISH FLIES	☐ BLACK FLIES
☐ STONE FLIES	☐ CRANE FLIES	☐ MIDGE FLIES
☐ RIFFLE BEETLES	☐ DAMSELFLIES	☐ LEECHES
☐ WATER PENNIES	☐ DRAGONFLIES	☐ LUNGED SNAILS
☐ GRILLED SNAILS	☐ ALDERFLIES	
	☐ CRAYFISH	
	☐ SCIDS	
	☐ CLAMS	
	☐ MUSSELLS	
___ # LETTERS X 3	___ # LETTERS X 2	___ # LETTERS X 1

ADD TOTAL OF THESE FOR STREAM INDEX VALUE _____

WATER QUALITY RATING

_____> 20 EXCELLENT _____17 – 22 GOOD _____11- 16 FAIR _____ < 11 POOR