DEVELOPMENT GUIDELINES FOR SANITARY SEWER SYSTEMS
HALL COUNTY PUBLIC WORKS AND UTILITIES DEPARTMENT
MAY 2013

This list of guidelines has been put together as an aid for developers during the permitting process. Although an effort has been made to include all County standards pertaining to the development of the County Sewer System, other items may be necessary as required by the Public Works and Utilities Department. This listing should not be considered as a static document and therefore, every effort to obtain the latest revision should be made. Contact the Public Works and Utilities Department at (770) 531-6800 for the latest revision of this document and/or the County's "Standard Specifications for Sanitary Sewers."

GENERAL

1. Minimum 10 feet horizontal distance between water and sewer lines.

2. Minimum 18 inches vertical distance between water and sewer lines.

3. Where water and sanitary sewer lines cross, the water main shall be 18-inches above the sewer. If the sewer must be above the water main the sewer shall be at least 18-inches above and encased in concrete a minimum of 10' on each side of the water main. Joints shall be spaced to provide maximum distance from crossing

4. Where sanitary sewer mains cross storm drains, minimum 18 inch vertical separation shall be maintained.

5. The minimum cover over water and sewer lines shall be 4 feet.

6. Sanitary sewers shall be located outside of paved areas where practical. Locating sanitary sewers in paved areas will only be allowed when no other alternative exists. Bore under existing roadways where possible to prevent pavement damage.

7. All elevation data shall be referenced to mean sea level (MSL) and survey horizontal data shall be referenced to state-plane coordinate system including all proposed manholes.

8. A legible project location map shall be provided on the drawings.

9. The County Public Works and Utilities Department shall be furnished 2 Initial sets of preliminary drawings for review prior to permit being issued.

10. Plans requiring sanitary sewer main construction shall be stamped by Professional Engineer or Registered Land Surveyor.

11. The following fees shall be paid prior to plan approval:
    a.) $25.00 plan review fee
    b.) $2.00 per linear foot sewer main inspection fee with a $50.00 minimum.

12. Drawings requiring water or sanitary sewer main construction shall bear the following notes:

The Hall County Public Works and Utilities Department shall be notified 24 hours prior to any water or sanitary sewer line construction or repairs. Only contractors approved by Hall County Public Works and Utilities Department will be allowed to perform construction or repairs connected to said sanitary sewer mains. Call the Construction Inspector's office at (770) 531-6800 prior to beginning any construction, or to apply to become an approved contractor.

All sanitary sewer materials and workmanship shall be in accordance with Hall County "Standard Specifications for Sanitary Sewers", latest edition. The Contractor shall be responsible for maintaining a marked-up set of design drawings showing all "as-built conditions". These "record drawings" shall be made available to the designer and the County Inspector upon request. The mark-ups shall be at the site at all times and shall be utilized to develop final record drawings. Final acceptance of sewer main construction will not be granted until as-built drawings have been received by Hall County Public Works and Utilities office.

13. The following note shall appear on the final plat and/or as-built drawing:

Owners Dedication Certificate
Hall County, Georgia
The owner of the land shown on this plat and whose name is subscribed thereto, and in person or through a duly authorized agent, acknowledges that this plat was made From an actual survey and dedicated to Hall County forever, all sanitary sewers, easements, and associated appurtenances thereon shown.

Owner_____
Date _____

14. Design professionals are required to use the latest edition of the Hall County standard details wherever applicable. Copies of the standard details are included as part of this document.

15. Two sets of prints and one CD, AutoCAD latest release, of the record drawings shall be furnished to the Public Works and Utilities Department after construction is completed. Building service stub-outs shall be measured from manholes and the length the stub-out extends from the sewer line shall be provided. Sewer force main valves shall be measured from hydrants, valve monuments, or other permanent structures. A minimum of three horizontal measurements per valve will be required.

16. No trees shall be located within perpetual sewer easements. The County's Tree Protection Ordinance shall be considered and addressed by the project owners, designers, and contractors as is applicable.

17. Contractors are required to possess a business license to work within the applicable jurisdiction. Proof of said license and all other applicable permits (Erosion Control, DOT, etc) shall be on the job site.

SANITARY SEWER

1. A 30'-0" permanent, recorded, easement shall be required on all 8-inch through 18-inch diameter sanitary sewers with up to 20' - 0" of cover and a 40' - 0" permanent, recorded easement shall be required if cover is over 20' - 0". A 40' - 0" permanent, recorded easement shall be required on all 24-inch and larger diameter sewers regardless of depth of cover. The sewer shall be on the centerline of the easement and no buildings or other structures shall be built within easements. Easements shall be shown on all plans including landscape plan. All sanitary sewer easements shall be fully executed prior to plan approval.

2. Developments requiring installation of public sewer mains within public right-of-way shall be required to sign and record a "Facilities Dedication" form prior to plan approval.

3. Proposed sanitary sewer flows shall be submitted prior to plan approval to determine if all downstream wastewater facilities including wastewater treatment plant, gravity sanitary sewer lines, and wastewater pumping stations shall have adequate capacity for future wastewater flows from proposed development.

4. All stream buffer encroachment variances shall be obtained from Georgia Environmental Protection Division and/or U.S. Army Corps of Engineers permit prior to plan approval.

5. Minimum slope for 8-inch and larger gravity sanitary sewer pipe shall be 0.50%, the maximum slope shall be 15.0%.

6. Gravity sanitary sewer pipe material shall be SDR 26 PVC unless depth of cover is 20' or greater, less than 4', or the sewer is to be laid in fill area. In these cases, the pipe shall be ductile iron, Class 50 with Polybond Plus or Protecto 401 interior coating. All non-metallic sanitary sewer pipe shall have locater wire in accordance with Section 3.12 of the Hall County Standard Sewer Specifications.

7. Bedding for sanitary sewers shall be Class B or greater.

8. Sanitary sewage force mains shall be ductile iron pipe, Class 50 with Polybond Plus or Protecto 401 interior coating

9. Service lateral pipe material shall be SDR 26 PVC, as required.

10. Cleanouts shall be placed on all building service laterals at the point at which County maintenance terminates. This point shall be the curb line, the property line, the right of way line, or the easement line as applicable. Cleanouts shall be 6-inch and have a brass cap. Clean-outs shall not be placed in pavement areas if at all possible. If in grassed areas a 12"X12" square concrete collar 6" deep shall be placed around the brass cap and be exposed.

11. All service lines shall be connected to gravity sewer pipe if at all possible. If connection to manhole is required, then, the invert of building service lines shall be placed at or above the crown of the County sewer but not to exceed 2 feet above the crown of the County sewer.

12. The minimum diameter of sanitary sewer pipe shall be 8-inches with the exception of building service laterals that may be 6-inches.

13. Manholes shall be placed at all changes in direction and grade of sanitary sewers. Manholes shall be spaced such that the distance between manholes does not exceed 350 feet. The minimum angle between lines entering and exiting a manhole is 90^{o} .

14. Outside drop connections shall be constructed at manholes on all influent sewers where the invert elevation is greater than 2 feet above the invert elevation of the effluent sewer. Outside drops shall not exceed 10 vertical feet. Slope of incoming pipe into outside drop manhole may not exceed 10%.

15. Sewage pumping stations will not be permitted unless the developer can demonstrate extreme hardship would result if the station were denied. Pumping stations will be discouraged and therefore, only permitted on a case by case basis. All pumping stations shall be located above the 100 year flood plain and out of storm drainage flow paths.

16. All sewage pumping stations shall have an auxiliary power source. Additionally, they shall be provided with a remote operation/alarm system compatible with the County's existing system and a potable water service with a reduced pressure zone (RPZ) backflow preventer.

17. Plans and profiles showing all utility and pipeline crossings as well as existing and proposed grades shall be provided for all sanitary sewers. Building services are exempt.

18. Sewer Maintenance Access shall be maintained on all Sanitary Sewer Easements. Maintenance Access is defined as alignment grades, soil compaction and cross slopes that will allow a sewer jet truck (weighing approximately 50,000 lbs.) to navigate easily. Maximum grade shall not exceed 20% and easement contour lines shall be shown on grading plans. Minimum of 2' contour intervals shall be used.

PRETREATMENT

1. Projects requiring Pre-Treatment shall bear the following note: "Prior to installing the Pre-Treatment device, contact the Engineering Inspectors office at 770-531-6800."

2. Sand traps and oil separators with sample station manholes shall be installed in all sanitary sewer service lines from service stations, garages, car washes, and similar operations. Domestic sewage shall not pass through sand traps or oil separators.

3. Grease traps and sample station manholes shall be installed in process waste lines of all sanitary sewer service lines for commercial, industrial, and institutional establishments with commercial type food preparation areas.

4. If dumpster pad drains are to be tied to the sanitary sewer, a grease trap and sample station manhole shall be placed between the pad and the County sewer. Domestic wastewater shall be excluded from the trap. Food process waste streams may utilize the same trap if sized appropriately.

5. Rainwater shall be prevented from entering the sanitary sewer at all dumpster pad locations and detailed on the drawings.

6. Grease trap and oil separator details shall be shown on the Project drawings and shall be approved prior to installation.

7. Oil separators shall be sized to handle two (2) times the average flow rate for the Project.

8. Grease traps shall be adequately sized for the flow of the project. Minimum size allowed shall be 1500 gallons.

9. Sample station manholes may be required on all commercial, industrial, and institutional sanitary sewer services. Domestic sewage shall not pass through the sample station manholes.

HALL COUNTY PUBLIC WORKS AND UTILITIES
Hall County Government Center
2875 Browns Bridge Road
3rd Floor
P.O. Drawer 1435
Gainesville, GA 30504
Contact: Ken Rearden P.E.
Phone: (770)531-6800

GAINESVILLE PUBLIC UTILITIES ENVIRONMENTAL SERVICES
2641 Old Flowery Branch Road
(Flat Creek Wastewater Plant)
757 Queen City Parkway
Gainesville, Georgia 30501
Contact: Horace Gee
Phone (770) 532-6192

GAINESVILLE PUBLIC UTILITIES BACKFLOW PREVENTION SECTION
757 Queen City Parkway
Gainesville, Georgia 30501
Contact: Jason Simms
Phone: (770) 535-2475

GAINESVILLE DEPARTMENT OF PLANNING & DEVELOPMENT
311 Henry Ward Way
PO Box 2496
Gainesville, Georgia 30503
Contact: Rusty Ligon
Phone (770) 531-6570

GAINESVILLE ENGINEERING & PUBLIC WORKS
300 Henry Ward Way, Suite 302
(Administration Building)
PO Box 2496
Gainesville, Georgia 30503
Contact: David Dockery
Phone: (770) 535-6882

GAINESVILLE BUILDING INSPECTION
311 Henry Ward Way
PO Box 2496
Gainesville, Georgia 30503
Contact: Rusty Ligon
Phone (770) 531-6570

HALL COUNTY ENGINEER
Hall County Government Center
2875 Browns Bridge Road
3rd Floor
PO Drawer 1435
Gainesville, Georgia 30504
Contact: Kevin McInturff
Phone: (770) 531-6800

HALL COUNTY PLANNING DEPARTMENT
Hall County Government Center
2875 Browns Bridge Road
3rd Floor
PO Drawer 1435
Gainesville, Georgia 30504
Contact: Srikanth Yamala
Phone: (770) 531-6809

HALL COUNTY BUILDING INSPECTIONS DEPARTMENT
2875 Browns Bridge Road
3rd Floor
PO Drawer 1435
Gainesville, Georgia 30504
Contact: Lamar Carver
Phone: (770) 531-6809

HALL COUNTY FIRE MARSHAL
731 East Crescent Drive
(Fire Station #7)
PO Drawer 1435
Gainesville, Georgia 30503
Contact: Scott Cagle
Phone: (770) 531-6838

GEORGIA DEPARTMENT OF TRANSPORTATION
UTILITIES ENGINEERING
2505 Athens Highway
PO Box 1057
Gainesville, Georgia 30503
Contact: Robby Oliver
Phone: (770) 532-5510

PLAN REVIEW CHECKLIST FOR SANITARY SEWERS

Hall County Public Works and Utilities Department

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PROJECT NAME _____

PLANS RECEIVED _____

PLANS REVIEWED _____

PLANS RETURNED TO ENGINEER/ARCHITECT WITH CORRECTIONS TO BE MADE _____

REVIEWED BY: _____ PHONE#: _____

****

COMMENTS:_____

_____

_____

_____

****ORIGINAL RED-LINE COMMENTS MUST BE RETURNED WITH REVISED PLANS FOR FINAL PLAN APPROVAL. CONTACT PLAN REVIEWEE AND SCHEDULE APPOINTMENT FOR PLAN APPROVAL/SIGN-OFF. ****

GENERAL

1) _____ 2 sets of preliminary drawings furnished for initial review.

2) _____ Plans requiring water or sewer main construction stamped by Professional Engineer or Registered Land Surveyor. (Fire sprinkler drawings prepared by sprinkler contractor and stamped with "Certificate of Competency" will not be accepted or approved.)

3) _____ Legible project location map provided.

4) _____ The following fees shall be paid prior to plan approval:
   a) $25.00 plan review fee
   b) _____linear feet sewer main x $2.00 per lf = $_____. ($50.00 minimum).

5) _____Elevation data referenced to mean sea level (MSL) and survey referenced to state-plane coordinate system including all proposed manholes.

6) _____ Drawings requiring sanitary sewer main construction shall bear the following notes:
"The Hall County Public Works and Utilities Department shall be notified 24 hours prior to any water or sanitary sewer line construction or repairs. Only contractors approved by Hall County Public Works and Utilities Department will be allowed to perform construction or repairs connected to said water or sanitary sewer mains. Call Engineering Inspector's office at (770) 531-6800 prior to beginning construction or to become an approved contractor."

"All water main and sanitary sewer materials and workmanship shall be in accordance with the Hall County "Standard Specifications for Construction Sanitary Sewers, latest edition."

"The Contractor shall be responsible for maintaining a marked-up set of design drawings showing "as-built" conditions. These "record drawings" shall be made available to the designer and/or the County Inspector upon request. The mark-ups shall be at the site at all times and shall be utilized to develop final record drawings. Final acceptance of water and/or sewer main construction will not be granted until as-built drawings have been received by Utilities Engineering and Planning office."

7) _____ Sewer details used match County standard details, latest edition.

8) _____ No trees shall be located within perpetual water or sewer easements or above fire protection water mains in order to prevent pipeline root damage. The County's Tree Protection Ordinance shall be considered and addressed by the project owners, designers, and contractors as is applicable.

9) _____ Minimum 10 feet horizontal distance between water & sewer lines.

10) _____ Minimum 18 inch vertical distance between water and sewer lines.

11) _____ Where water and sanitary sewer lines cross, the water main shall be 18 inches above the sewer. If the sewer must be above the water main the sewer shall be at least 18 inches above and encased in concrete a minimum of 10 feet on each side of the water main. Joints shall be spaced to provide maximum distance from crossing.

12) _____Where water or sanitary sewer mains cross storm drains; minimum 18 inch vertical separation shall be maintained.

13) _____ Minimum cover over sewer lines shall be 4 feet. Sewer mains 16-inches and larger shall have a minimum of 5-feet of cover.

14) _____Sanitary sewers shall be located outside of paved areas where practical. Locating sanitary sewers in paved areas will only be allowed when no other alternative exists. Bore under existing roadways where possible to prevent pavement damage.

SEWER

1)_____ A 30'-0" permanent, recorded, easement shall be required on all 8-inch through 18-inch diameter sanitary sewers with up to 20' - 0" of cover and a 40' - 0" permanent, recorded easement shall be required if cover is over 20' - 0". A 40' - 0" permanent, recorded easement shall be required on all 24-inch diameter sanitary sewers regardless of depth of cover. The sewer shall be on the centerline of the easement and no buildings or other structures shall be built within easements. Easements shall be shown on all plans including landscape plan. All sanitary sewer easements shall be fully executed prior to plan approval.

2) _____ Developments requiring installation of public sewer mains within public right-of-way shall be required to sign and record a "Facilities Dedication" form prior to plan approval.

3) _____ Proposed sanitary sewer flows shall be submitted prior to plan approval to determine if all downstream wastewater facilities including wastewater treatment plant, gravity sanitary sewer lines, and wastewater pumping stations shall have adequate capacity for future wastewater flows from proposed development.

4) _____ All stream buffer encroachment variances shall be obtained from Georgia Environmental Protection Division (E.P.D.) and/or U.S. Army Corps of Engineers Permit prior to plan approval.

5) _____ Minimum slope for 8-inch and larger gravity sanitary sewer pipe shall be 0.50%, the maximum slope shall be 15.0%.

6) _____ Gravity sanitary sewer pipe material shall be SDR 26 PVC unless depth of cover is 20' or greater, less than 4', or the sewer is to be laid in fill area. In these cases, the pipe shall be ductile iron, Class 50 with Polybond Plus or Protecto 401 interior coating. All non-metallic sanitary sewer pipe shall have locater wire in accordance with Section 3.12 of the Hall County Standard Sewer Specifications.

7) _____ Bedding for sanitary sewers shall be Class B or greater.

8) _____ Sanitary sewer force mains shall be ductile iron pipe, Class 50 with Polybond Plus or Protecto 401 interior coating. All non-metallic sanitary sewer pipe shall have locater wire in accordance with Section 3.12 of the Hall County Standard Sewer Specifications.

9) _____ Service lateral pipe material shall be SDR 26 PVC, as required.

10) _____ Cleanouts shall be placed on all building service laterals at the point at which County maintenance terminates. This point shall be the curb line, the property line, the right of way line, or the easement line as applicable. Cleanouts shall be 6-inch and have a brass cap. Use traffic-grade cleanouts when located within pavement areas.

11) _____ All service lines shall be connected to gravity sewer pipe if at all possible. If connection to manhole is required, the invert of building service lines shall be placed at or above the crown of the County sewer but not to exceed 2-feet above the crown of the County sewer.

12) _____ The minimum diameter of sanitary sewer pipe shall be 8-inches with the exception of building service laterals which may be 6-inches.

13) _____ Manholes shall be placed at all changes in direction and grade of sanitary sewers. Manholes shall be spaced such that the distance between manholes does not exceed 350 feet. The minimum angle between lines entering and exiting a manhole is 90^0.

14) _____ Outside drop connections shall be constructed at manholes on all influent sewers where the invert elevation is greater than 2 feet over the invert elevation of the effluent sewer. Outside drops shall not exceed 10ft. Slope of incoming pipe into outside drop manhole may not exceed 10%.

15) _____Sewage pumping stations will not be permitted unless the developer can demonstrate extreme hardship would result if the station were denied. Pumping stations will be discouraged and therefore, only permitted on a case by case basis.

16) _____ All sewage pumping stations shall have an auxiliary power source and a yard hydrant for wash down purposes. Additionally, they shall be provided with a remote telemetry system compatible with the County's existing system.

17)_____ Plans and profiles showing all utility and pipeline crossings as well as existing and proposed grades shall be provided for all sanitary sewers. Building services are exempt.

18) _____ Sewer maintenance access shall be maintained on all existing and proposed sanitary sewer easements. Maintenance access is defined as grades, soil compaction and cross slopes which will allow a sewer jet truck (weighing approximately 50,000 lbs.) to navigate easily. Maximum slope shall not exceed 20% and easement contour lines shall be shown on grading plans. Minimum of 2' contour intervals shall be used. Access to existing sanitary sewer easements located within proposed construction areas shall be maintained during all phases of construction.

Pretreatment Requirements

1) _____ Projects requiring Pre-Treatment shall bear the following note: "Prior to Pre-Treatment device installation, contact Engineering Inspectors office at (770) 531-6800."

2) _____ Sand traps and oil separators with sample station manholes shall be installed in all sanitary sewer service lines from service stations, garages, car washes, and similar operations. Domestic sewage shall not pass through sand traps, oil separators, or sample stations.

3) _____ Grease traps and sample station manholes shall be installed in process waste lines of all sanitary service sewers for commercial, industrial, and institutional establishments with food preparation areas. Domestic sewage shall not pass through grease traps or sample stations.

4) _____ Lint traps and sample station manholes shall be installed in all sanitary sewer service lines from laundry mats. Domestic sewage shall not pass through lint traps or sample stations.

5) _____ If dumpster pad drains are to be tied onto the sanitary sewer, a grease trap and sample station manhole shall be placed between the pad and the County sewer. Domestic wastewater shall be excluded from the trap. Food process waste streams may utilize the same trap if sized appropriately.

6) _____ Rainwater shall be prevented from entering the sanitary sewer at all dumpster pad locations. Method must be detailed on drawings.

7) _____ Grease trap and oil separator details shall appear on the project drawings and shall be approved prior to installation.

8) _____ Oil separators shall be sized to handle two (2) times the expected flow rate.

9) _____ Grease traps shall be sized as necessary with the minimum allowable size being 1500 gallons.

10) _____Sample station manholes may be required on commercial, industrial, and institutional sanitary service sewers. Domestic sewage shall not pass through sample station manholes.

FINAL PLAT / AS-BUILT PLAN REVIEW CHECKLIST FOR SANITARY SEWERS JANUARY 2009

Hall County Public Works and Utilities Department

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PROJECT NAME _____

PLANS RECEIVED _____

PLANS REVIEWED _____

PLANS RETURNED TO ENGINEER/ARCHITECT WITH CORRECTIONS TO BE MADE _____

REVIEWED BY:

_____

_____PHONE#:___

_____

****

COMMENTS:_____

_____

_____

_____

****ORIGINAL RED-LINE COMMENTS MUST BE RETURNED WITH REVISED PLANS FOR FINAL PLAN APPROVAL. CONTACT PLAN REVIEWEE AND SCHEDULE APPOINTMENT FOR PLAN APPROVAL/SIGN-OFF. ****

GENERAL

1) _____ 2 sets of as-built drawings furnished.

2) _____ Final plat and/or as-built drawings shall bear the following note:

> Owners Dedication Certificate
> Hall County, Georgia
> The owner of the land shown on this plat and whose name is subscribed thereto, and in person or through a duly authorized agent, acknowledges that this plat was made from an actual survey and dedicated to the County forever, all sanitary sewers, easements, and associated appurtenances thereon shown.
> Owner_____
> Date _____

3) _____ Plans stamped by Professional Engineer or Registered Land Surveyor.

4) _____ $25.00 plan review fee shall be paid prior to plan approval.

5) _____ Legible project location map provided.

6) _____ Elevation data referenced to mean sea level (MSL) and survey referenced to state-plane coordinate system including all new manholes.

SEWER

1) _____All sanitary sewer main testing and construction completed.

2) _____ Label existing perpetual sanitary sewer easements.

3) _____Label all pipe sizes and pipe material. (Including casing pipe if applicable)

4) _____ Label all existing manholes and service line clean-outs.

5) _____ Label manhole deflection angles.

6) _____ Include sanitary sewer profile with following information:

A. Pipe size, material, and slope
B. Pipe length between manholes
C. Manhole numbers corresponding to plan view numbers
D. Manhole elevations (top, invert in, invert out, outside drop at top and bottom
E. Existing utility crossings
F. Finished grade

PRETREATMENT

1) _____ Show location and type of existing pretreatment device (i.e. grease trap, lint/hair trap, oil interceptor, muffin monster, etc.) and sample station manhole.

INDEX OF DRAWINGS

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	INDEX OF DRAWINGS	—
DRAWN BY:			

MINIMUM DESIGN STANDARDS

A. REUSE DISTRIBUTION SYSTEM

1. THE ACRONYM "NPRL" SHALL BE USED TO DEFINE A NON-POTABLE REUSE LINE WHERE APPROPRIATE.

2. EACH SECTION OF REUSE PIPE SHALL BE PAINTED WITH PANTONE 522C OR 512C OR OTHER SHADE OF PURPLE ACCEPTED BY HALL COUNTY OVER A MINIMUM OF 60% OF THE CIRCUMFERENCE OF THE PIPELINE EXCEPT FOR ANY DISTINGUISHING MARKS OF MANUFACTURE OR PRODUCT INFORMATION WHICH SHALL REMAIN VISIBLE AND UNPAINTED.

3. REUSE PIPING SHALL BE WRAPPED IN A PANTONE 522C POLYETHYLENE TUBE WRAP WHERE REQUIRED FOR CATHODIC PROTECTION. (ANSI/AWWA C105/A21.5)

4. DURING THE INSTALLATION OF THE REUSE PIPING, A THREE INCH WIDE TAPE TO SAY "REUSE WATER - NONPOTABLE" (PURPLE WITH WHITE OR BLACK LETTERING) IS TO BE INSTALLED TWO INCHES ABOVE THE LINE DURING INSTALLATION.

5. REUSE PIPE MUST MAINTAIN 3-FEET HORIZONTAL SEPARATION AND 18-INCHES VERTICAL SEPARATION FROM BOTH PROPOSED AND EXISTING SANITARY SEWER FORCE MAINS AND WATER MAINS.

6. ALL REUSE WATER VALVES SHALL HAVE SQUARE VALVE BOXES WITH THE WORDS "RECLAIMED WATER" CAST IN THE LID. ALL BOXES MUST BE PAINTED ON THE INSIDE AND LID WITH PANTONE 522 OR 512 OR OTHER SHADE OF PURPLE ACCEPTED BY HALL COUNTY. VALVE BOXES SHALL BE RUSSCO C2503 6.5" SQUARE. NOTE: STANDARD ROUND VALVE BOXES ARE PROHIBITED IN THE NON-POTABLE REUSE SYSTEM

7. ALL VALVES MUST BE MARKED WITH A PURPLE DRIVABLE MARKER 78 INCHES LONG AND EXTEND TO 6" ABOVE THE VALVE. THE MARKERS ARE NOT TO PROTRUDE THE FINISHED SURFACE GRADE MORE THAN (3') FEET AND NO LESS THAN (18") INCHES ABOVE THE FINISHED GRADE. THERE MUST BE A LABEL ON BOTH SIDES OF THE MARKER WITH THE FOLLOWING INFORMATION; "REUSE WATER VALVE, DO NOT TAP, NON-POTABLE, BEFORE DIGGING CONTACT HALL COUNTY PUBLIC WORKS & UTILITIES, PHONE # 770-531-6800.

8. THERE SHALL BE NO PHYSICAL CONNECTION BETWEEN THE RECLAIMED WATER SYSTEM AND ANY OTHER WATER SUPPLY. AN ISOLATION VALVE DOES NOT CONSTITUTE A SEPARATION.

9. RECLAIMED WATER, USED FOR IRRIGATION, MAY ONLY BE CONNECTED TO "IN THE GROUND" SPRINKLER SYSTEMS OR TO A NON-STANDARD HOSE BIB LOCATED WITHIN A LOCKABLE METER BOX ONLY WHERE SPECIFICALLY APPROVED BY THE COUNTY IN THE END USER AGREEMENT. NO ABOVE GROUND SYSTEM WILL BE APPROVED ON RESIDENTIAL SITES.

10. ALL PIPING AND PIPELINES SHALL BE COLOR-CODED PANTONE PURPLE 522 USING SUNLIGHT STABLE PIGMENT.

11. ALL VALVES, HOSE BIBS WHERE ALLOWED, AND OUTLETS SHALL BE TAGGED AND COLOR-CODED PURPLE TO DIFFERENTIATE RECLAIMED WATER FROM POTABLE WATER. ALL RECLAIMED WATER VALVES AND OUTLETS SHALL BE APPROPRIATELY TAGGED OR LABELED "DO NOT DRINK" TOGETHER WITH THE EQUIVALENT STANDARD INTERNATIONAL SYMBOL TO WARN THE PUBLIC AND EMPLOYEES THAT THE WATER IS NOT INTENDED FOR DRINKING.

12. WHERE HOSE BIBS ARE ALLOWED, NON-STANDARD HOSE CONNECTIONS SHALL BE USED TO PRECLUDE THE INTERCHANGE OF HOSES WITH THE POTABLE WATER SYSTEM. HOSE BIBS ARE PROHIBITED FROM RESIDENTIAL CUSTOMER SITES.

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HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	REUSE DISTRIBUTION GENERAL NOTES	1.0
DRAWN BY:			

13. HOSE BIBS MUST BE INSTALLED UNDERGROUND WITHIN A LOCKABLE METER BOX. CAM LOCK CONNECTION ASSEMBLIES IN SMALL SIZES (1/2 TO 3/4 – INCH) WITH LOCKABLE METER BOXES WILL BE REQUIRED ON ALL HOSE CONNECTIONS DESIGNATED FOR REUSE WATER.

14. RECLAIMED WATER IRRIGATION SYSTEMS SHALL BE DESIGNED, CONSTRUCTED AND OPERATED SO AS TO MINIMIZE OVER SPRAY ONTO IMPERVIOUS SURFACES.

15. RUNOFF OF RECLAIMED WATER INTO DITCHES OR STREAMS SHOULD BE AVOIDED.

16. LOW TRAJECTORY NOZZLES, OR OTHER MEANS TO MINIMIZE AEROSOL FORMATION SHALL BE USED WITHIN 100 FEET OF OUTDOOR PUBLIC EATING, DRINKING AND BATHING FACILITIES. IRRIGATION SYSTEMS SHOULD BE DESIGNED SO THAT SPRAY DOES NOT GO OUTSIDE OF THE ESTABLISHED BOUNDARIES.

17. THE END USER SHALL NOT ALLOW RECLAIMED WATER TO BE USED TO FILL SWIMMING POOLS, HOT TUBS, SPAS, WADING POOLS OR OTHER RECREATIONAL CONTACT SYSTEMS.

18. THE CUSTOMER SHALL NOT ALLOW RECLAIMED WATER TO BE USED FOR THE CONSUMPTION (HUMAN OR ANIMAL), INTERCONNECTING WITH ANOTHER WATER SOURCE, OR SPRINKLING OF EDIBLE CROPS (GARDENS).

19. THE USE OF RECLAIMED WATER FOR AGRICULTURAL IRRIGATION OF CROPS NOT INTENDED FOR DIRECT HUMAN CONSUMPTION SHALL REQUIRE THE SPECIFIC AUTHORIZATION BY THE DIRECTOR OF HALL COUNTY PUBLIC WORKS AND UTILITIES AND THE GEORGIA EPD.

20. RECLAIMED WATER SHALL NOT BE USED FOR ANY PURPOSE OTHER THAN IRRIGATION UNLESS SPECIFICALLY AUTHORIZED BY HALL COUNTY PUBLIC WORKS AND UTILITIES WITHIN THE END USER AGREEMENT.

21. THE END USER SHALL NOT ALLOW RECLAIMED WATER TO ENTER THE DWELLING UNIT(S).

22. TANK TRUCKS AND OTHER PORTABLE EQUIPMENT THAT IS USED TO DISTRIBUTE RECLAIMED WATER SHALL BE CLEARLY IDENTIFIED WITH RECLAIMED OR NON–POTABLE WATER SIGNS. THE TRUCK USED TO TRANSPORT AND DISTRIBUTE RECLAIMED WATER MAY NOT BE USED TO TRANSPORT POTABLE WATER THAT IS USED FOR DRINKING WATER PURPOSES.

23. MALFUNCTIONING IRRIGATION SYSTEMS AND LINE BREAKS SHALL BE REPAIRED IMMEDIATELY. IMPROPER OPERATION ALLOWING RUNOFF DURING IRRIGATION MAY BE GROUNDS TO SHUT OFF SERVICE TO THE CUSTOMER.

24. SITES UTILIZING REUSE WATER FOR IRRIGATION SUCH AS GOLF COURSES, RESIDENTIAL DEVELOPMENTS, PARKS AND OTHER PUBLIC AREAS ARE REQUIRED TO POST VISIBLE SIGNS AT ALL ENTRANCE LOCATIONS.

B. NEW REUSE SERVICE INSTALLATIONS/METERS AND METER BOXES

1. RECLAIMED METERS MUST BE A NEPTUNE METER FOR RECLAIMED WATER OR EQUAL. TO ENSURE IDENTIFICATION OF RECLAIMED WATER METERS, THE INTERNATIONAL COLOR OF PANTONE 522 IS LOCATED ON THE LID OF REGISTER, THE REGISTER FACE, LID, SHROUD AND METER BOTTOM AND THE WORD "RECLAIMED" IS MARKED ON THE BRASS HOUSING.

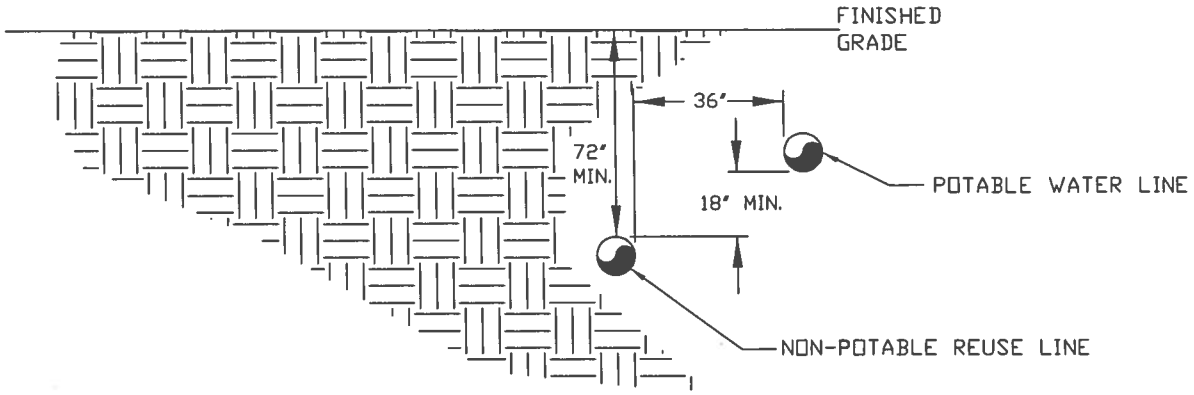
2. ALL RECLAIMED METERS WILL BE INSTALLED IN A CARSON–BROOKS PLASTICS BOX VIOLET IN COLOR 1419, 1220, OR 1324. METER BOX LIDS WILL BE VIOLET IN COLOR AND LABELED "REUSE WATER".

3. ALL RECLAIMED METER INSTALLATIONS MUST MAINTAIN A MINIMUM OF THREE (3) FEET FROM THE POTABLE WATER METER.

C. AS–BUILT DRAWINGS SHALL BE PROVIDED TO HALL COUNTY PUBLIC WORKS AND UTILITIES UPON COMPLETION OF EACH PHASE OF INSTALLATION.

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES

DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	REUSE DISTRIBUTION GENERAL NOTES	1.0
DRAWN BY:			

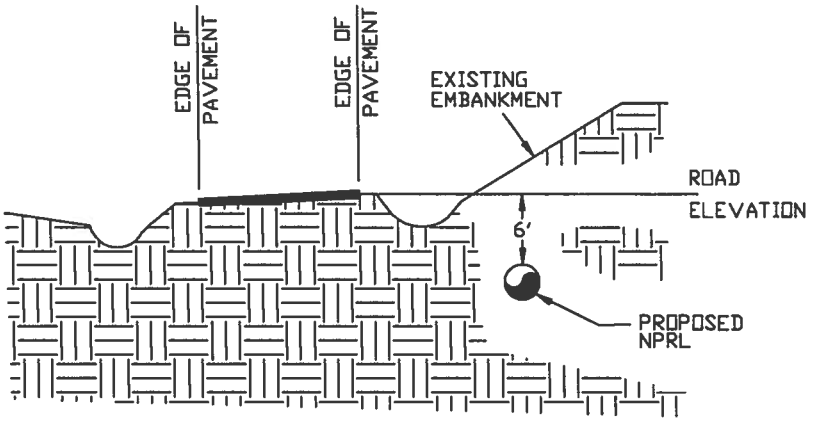


NOTES: 1. UNLESS OTHERWISE INDICATED ON PLANS, NON-POTABLE REUSE LINE TO BE INSTALLED WITH A MINIMUM OF 6 FEET OF SOIL COVER. THERE SHOULD BE AT LEAST 18 INCHES OF VERTICAL CLEARANCE AND 36 INCHES OF HORIZONTAL SEPARATION BETWEEN ANY POTABLE WATER LINE AND NON-POTABLE REUSE LINE.

2. ALL NON-METALLIC SANITARY SEWER PIPE SHALL HAVE LOCATOR WIRE IN ACCORDANCE WITH SECTION 3.12 OF THE HALL COUNTY STANDARD SEWER SPECIFICATIONS.

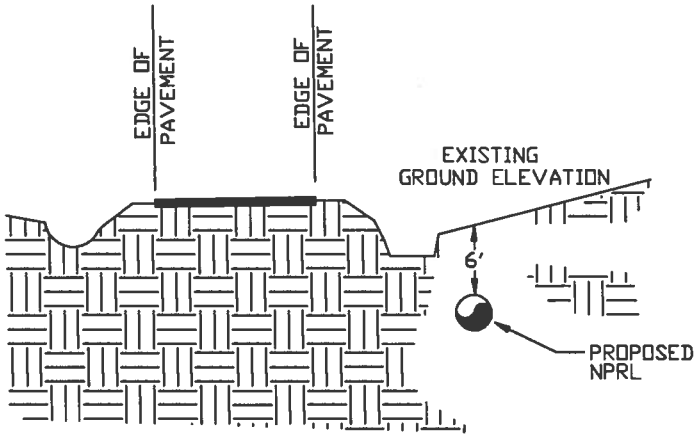
HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	UNDERGROUND NPRL LOCATION	2.0
DRAWN BY:			

WHERE GROUND ELEVATION IS ABOVE ROAD ELEVATION



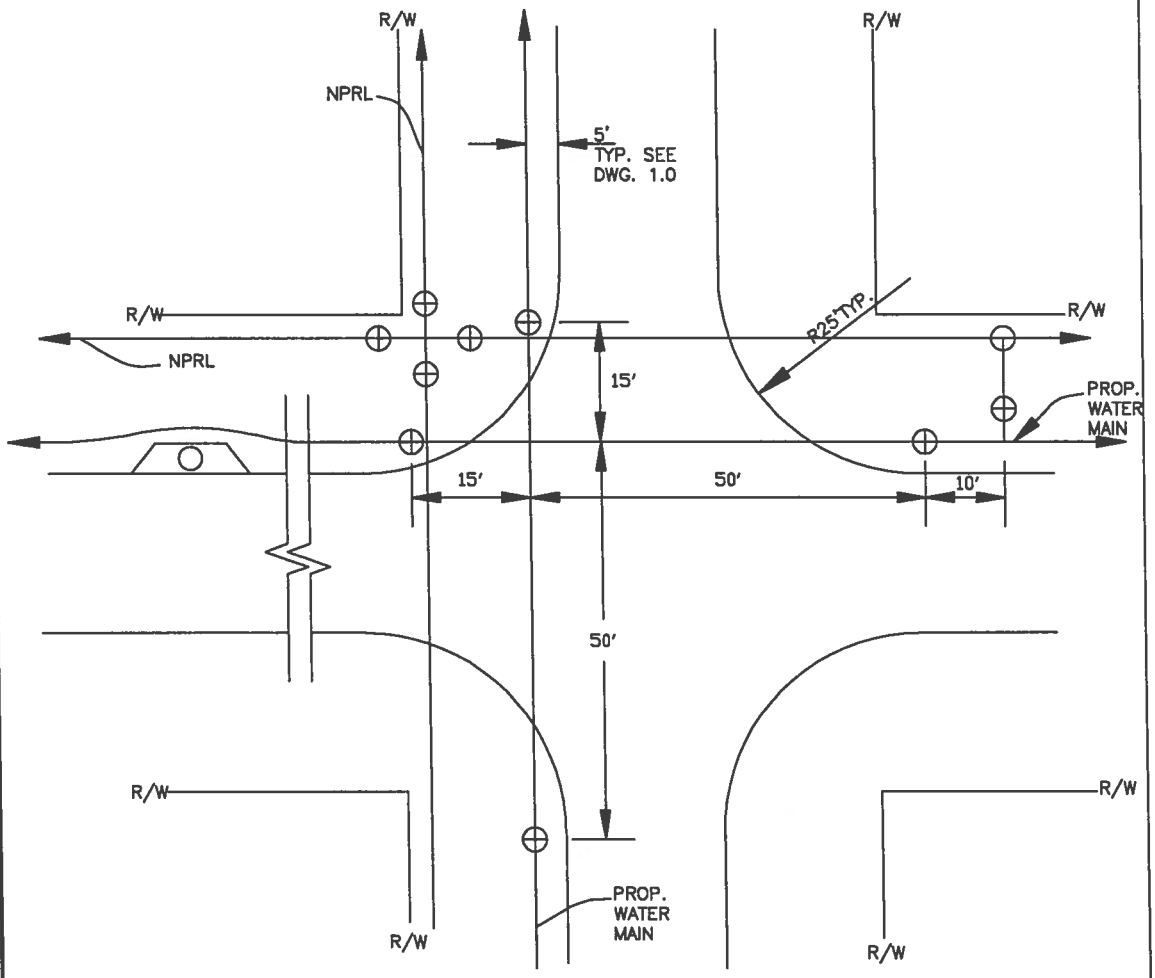
NOTE: UNLESS OTHERWISE INDICATED ON PLANS, PIPE TO BE INSTALLED WITH A MINIMUM OF 6 FEET OF SOIL COVER AND BE 6 FEET BELOW THE ROADWAY . PIPE SHALL BE LAYED IN THE BACK 5' OF THE RIGHT OF WAY.

WHERE GROUND ELEVATION IS BELOW ROAD ELEVATION



NOTE: UNLESS OTHERWISE INDICATED ON PLANS, PIPE TO BE INSTALLED WITH A MINIMUM OF 6 FEET OF SOIL COVER AND BE 6 FEET BELOW THE ROADWAY . PIPE SHALL BE LAYED IN THE BACK 5' OF THE RIGHT OF WAY.

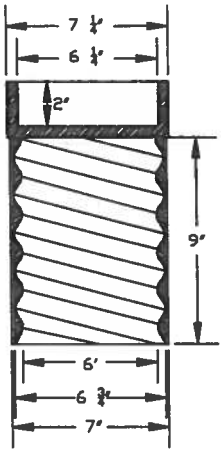
HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	NPRL DEPTH AT EDGE OF PAVEMENT	3.0
DRAWN BY:			



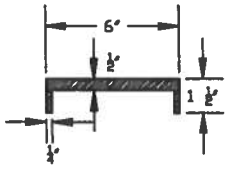
NOTES

1. DEPTH OF COVER OVER NPRL SHALL BE 6'0" AS MEASURED FROM TOP OF CURB.
2. MIN. 6" COMPACTED SOIL BETWEEN BOTTOM OF PIPE AND ROCK. MIN. 9" COMPACTED SOIL BETWEEN SIDES OF PIPE AND ROCK.
3. NO ROCK IN BACKFILL FOR FIRST 2'0" ABOVE TOP OF PIPE.
4. IF RADIUS IS NOT 25', ADJUST PIPE LENGTHS SO THAT VALVES ARE NOT IN STREET.
5. VALVES TO BE A MIN. OF 2'0" FROM BACK OF CURB. TOP SECTION OF BOX TO HAVE 2'0" CONCRETE COLLAR.

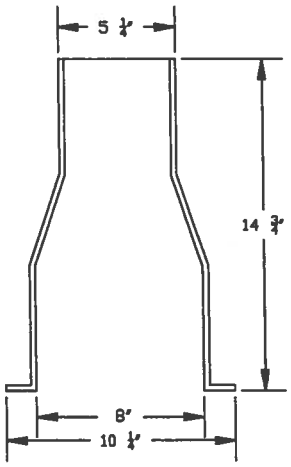
HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	NPRL INTERSECTION DETAILS	4.0
DRAWN BY:			



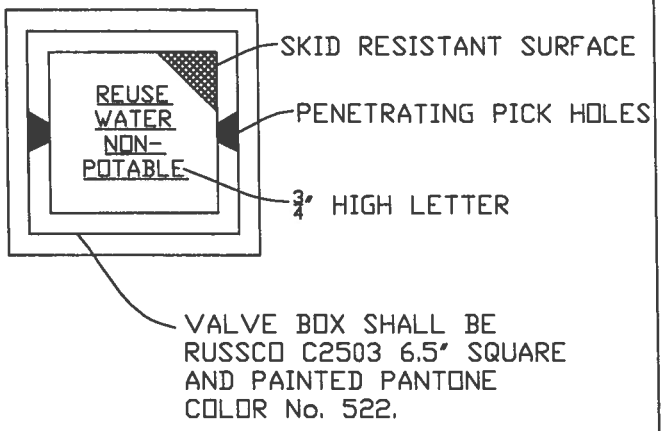
TOP SECTION



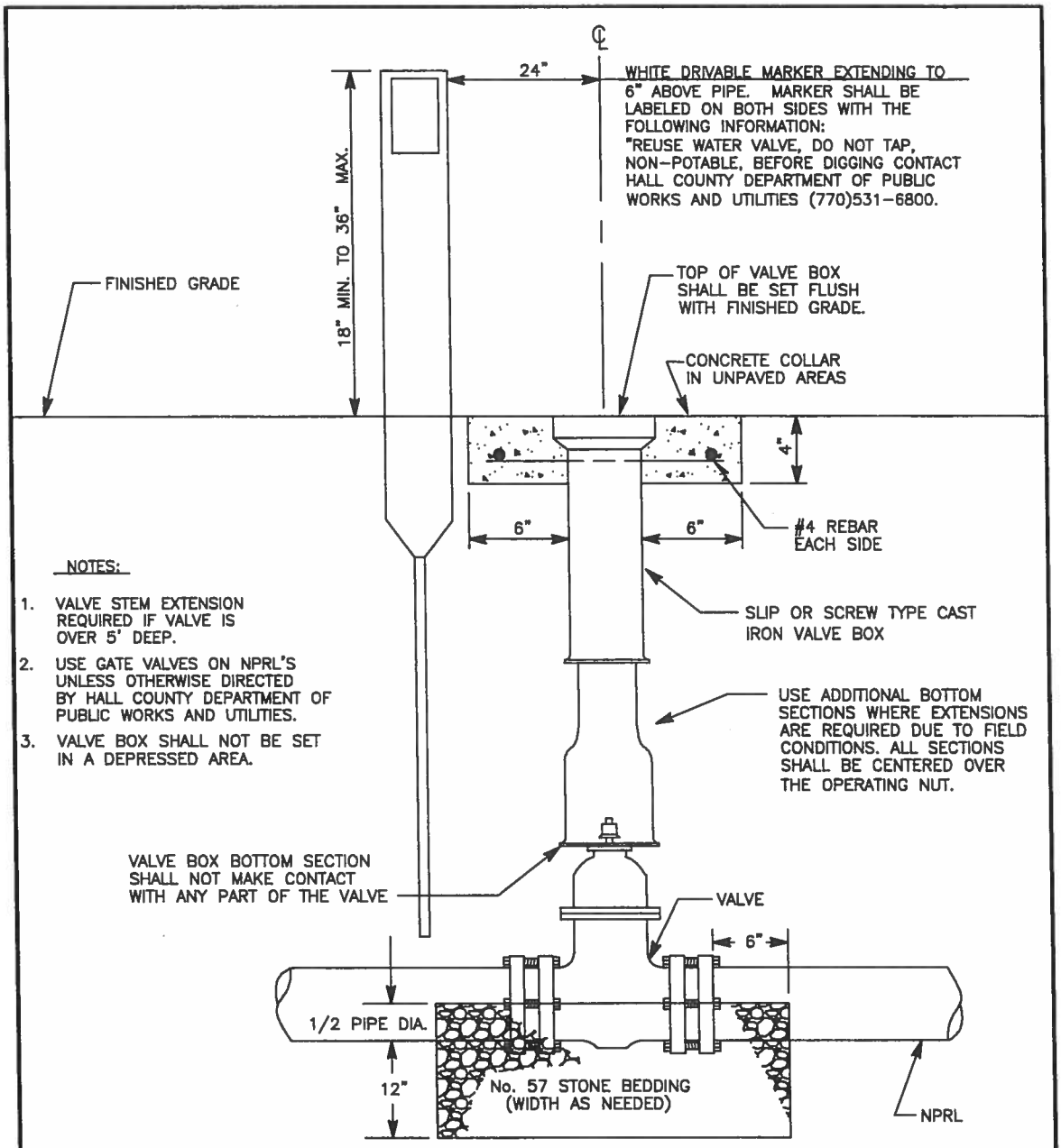
COVER



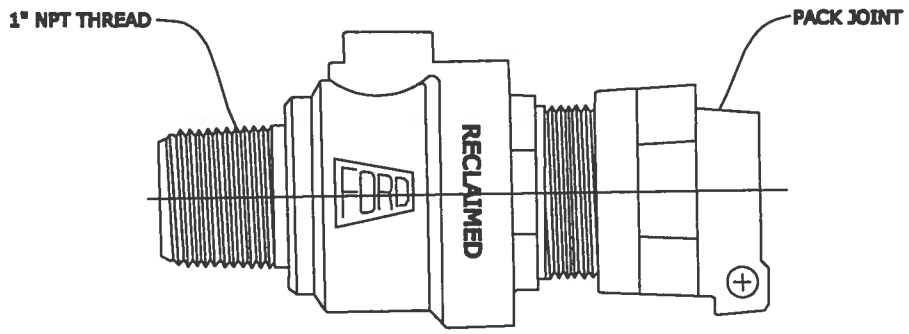
BOTTOM SECTION

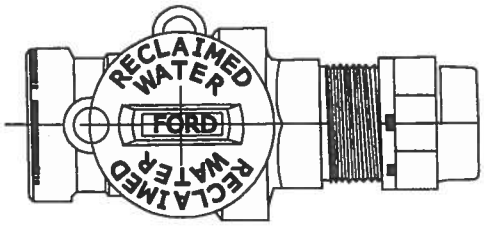


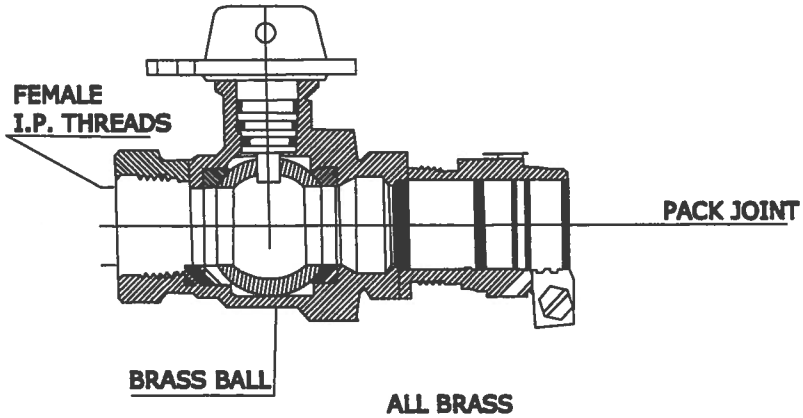
HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	**SEPTEMBER 2010**	**DETAIL TITLE:**	**DETAIL NO.**
SCALE:	**N.T.S.**	**NPRL VALVE BOX**	**5.0**
DRAWN BY:			



HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	TYPICAL NPRL VALVE INSTALLATION	6.0
DRAWN BY:			

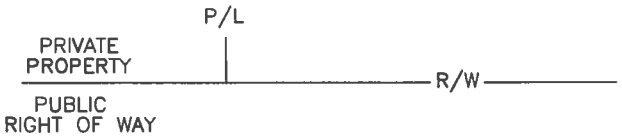


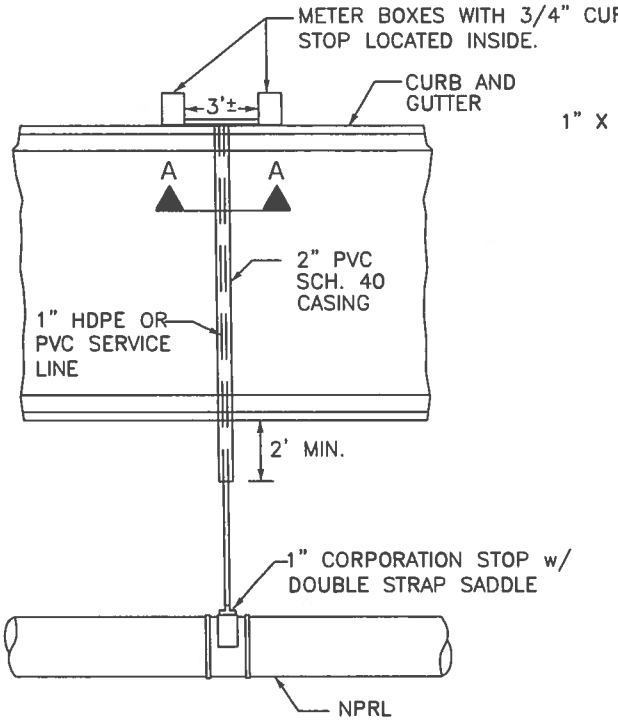




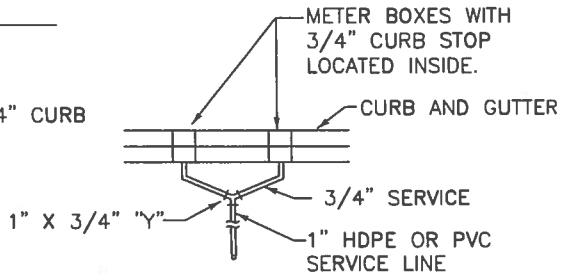
ALL BRASS
AWWA C800
ASTM B62

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	BRASS FITTINGS FOR METER INSTALLATION ON NPRL	7.0
DRAWN BY:			





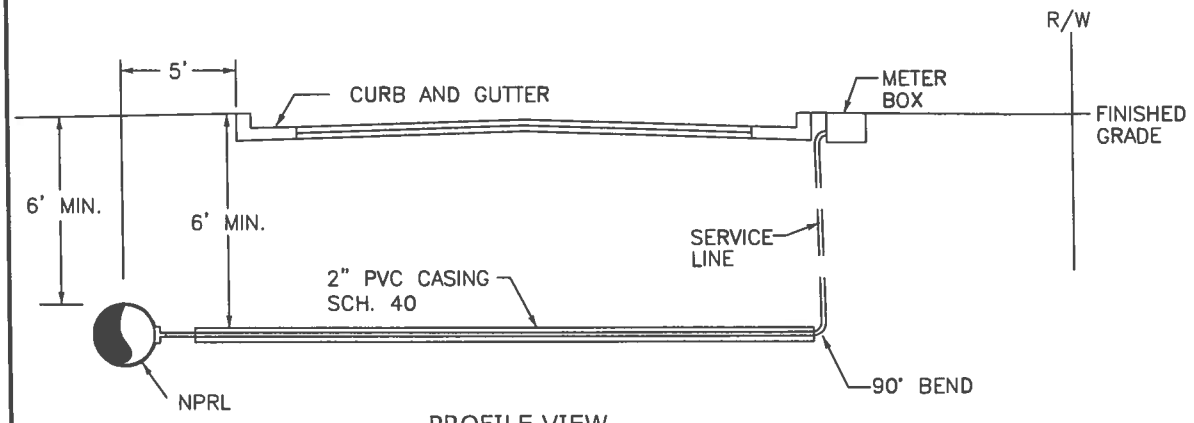
PLAN VIEW



SECTION A-A

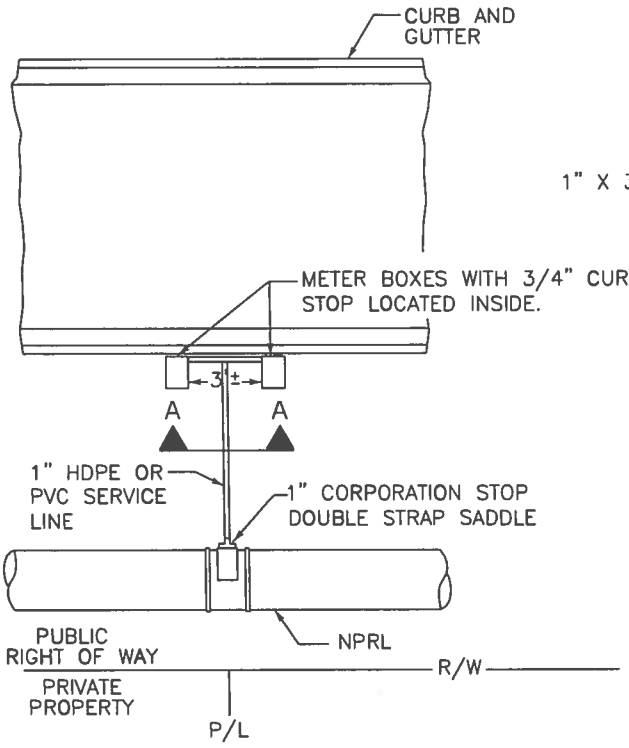
NOTES:

1. DOUBLE SERVICE LINES TO BE 1" WITH 3/4" WYES TO METER BOXES. SINGLE SERVICE LINES TO BE 3/4".
2. ALL PIPING AND CASING SHALL BE PANTONE PURPLE.
3. ALL NON-METALLIC SANITARY SEWER PIPE SHALL HAVE LOCATOR WIRE IN ACCORDANCE WITH SECTION 3.12 OF THE HALL COUNTY STANDARD SEWER SPECIFICATIONS.

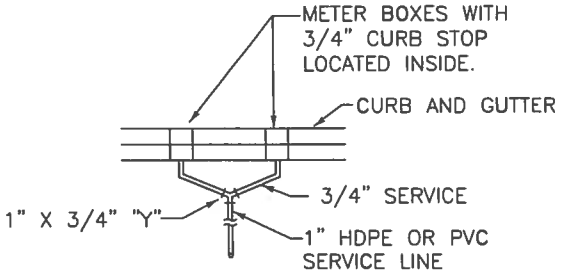


PROFILE VIEW

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	LONG SIDE 3/4" SERVICE FOR NPRL	8.0
DRAWN BY:			



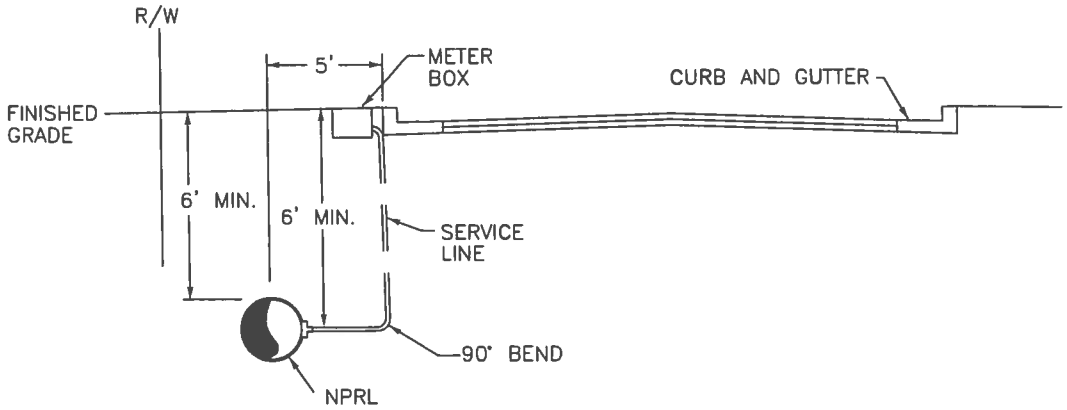
PLAN VIEW



SECTION A-A

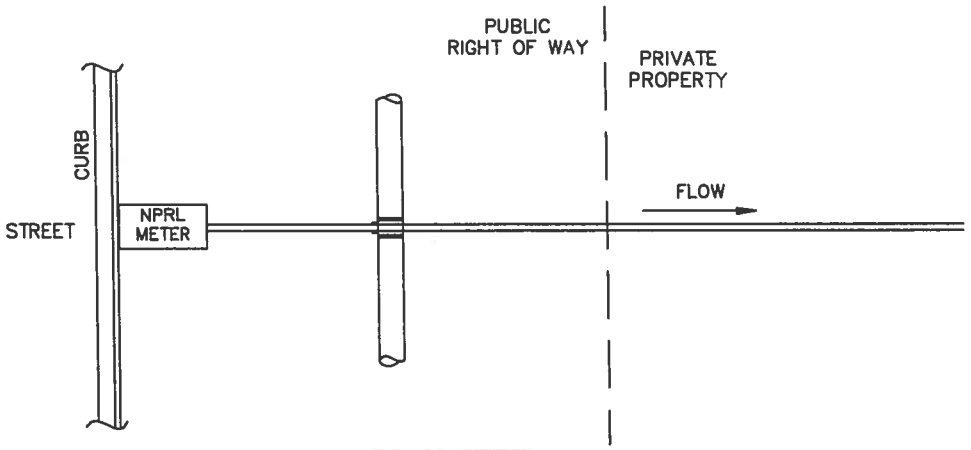
NOTES:

1. DOUBLE SERVICE LINES TO BE 1" WITH 3/4" WYES TO METER BOXES. SINGLE SERVICE LINES TO BE 3/4".
2. CURB STOPS SHALL BE 300 P.S.I. BALL-TYPE METER VALVES (FORD BALLCORP) OR APPROVED EQUAL.
3. CORPORATION STOPS SHALL BE 300 P.S.I. BALL-TYPE CORPORATION VALVES, FORD 300 P.S.I. BALL CORPORATION VALVE (FORD BRW41-777W) LOCKABLE, OR APPROVED EQUAL.
4. ADAPTERS, WYES AND ALL FITTINGS SHALL BE BRONZE 300 P.S.I. WORKING PRESSURE
5. ALL PIPING AND CASING SHALL BE PANTONE PURPLE.
6. ALL NON-METALLIC SANITARY SEWER PIPE SHALL HAVE LOCATOR WIRE IN ACCORDANCE WITH SECTION 3.12 OF THE HALL COUNTY STANDARD SEWER SPECIFICATIONS.

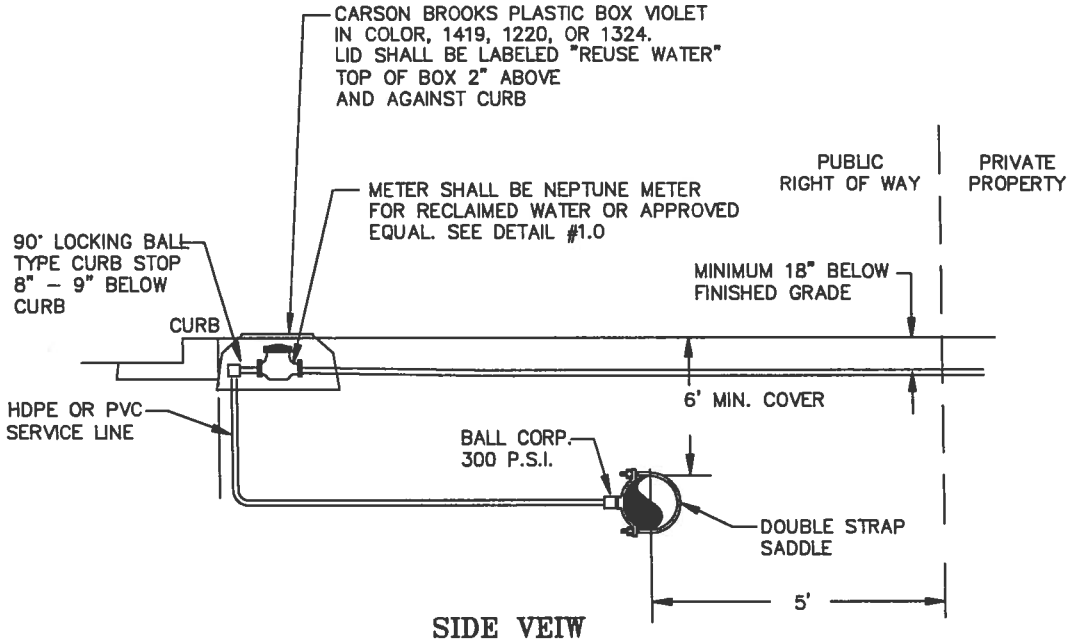


PROFILE VIEW

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	SHORT SIDE SERVICE FOR NPRL	9.0
DRAWN BY:			

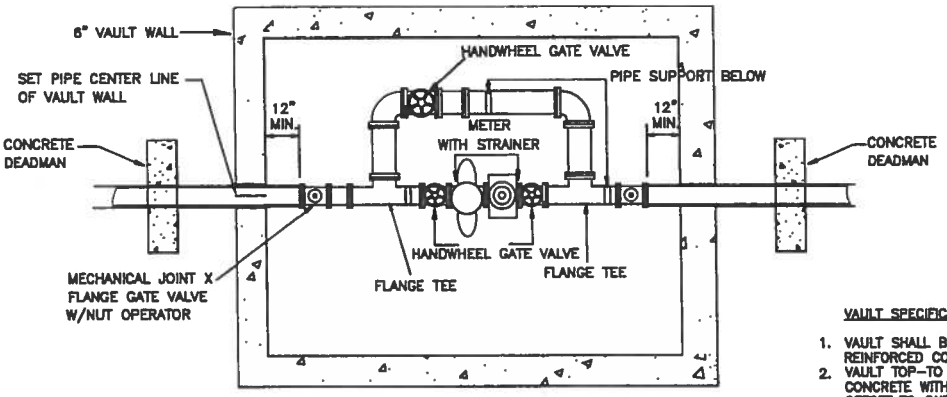


PLAN VIEW

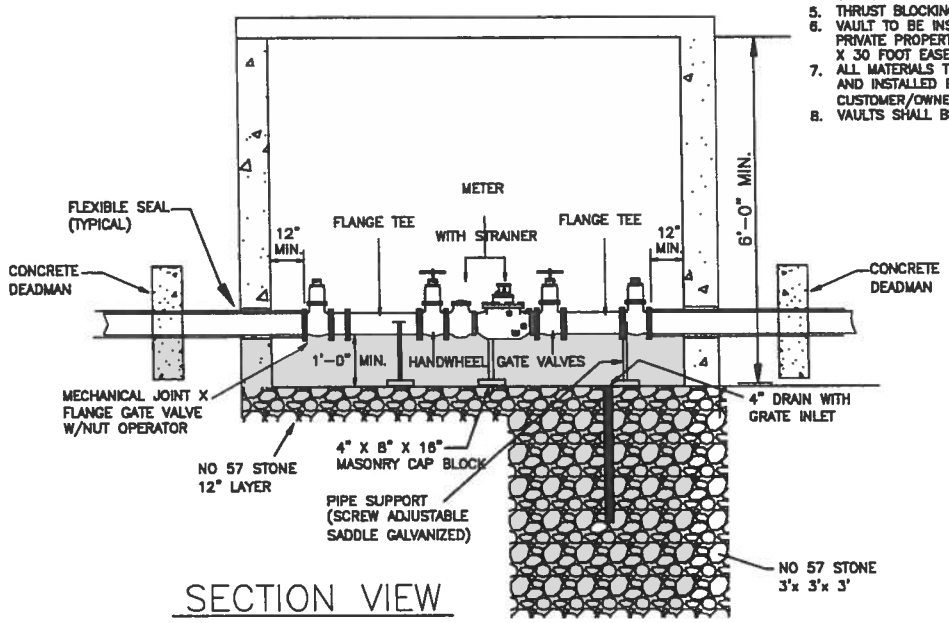


SIDE VEIW

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL No.
SCALE:	N.T.S.	NPRL METER BOX 2" AND SMALLER	10.0
DRAWN BY:			



PLAN VIEW



SECTION VIEW

VAULT SPECIFICATIONS

1. VAULT SHALL BE PRECAST REINFORCED CONCRETE
2. VAULT TOP–TO BE REINFORCED CONCRETE WITH HATCH OPENING OFFSET TO ONE SIDE
3. ACCESS LADDER–DOWELED TO WALL AND CENTERED AT HATCH OPENING
4. PIPE PENETRATIONS (ANNULUS BETWEEN CONCRETE AND OUTSIDE OF OF PIPE) SHALL BE SEALED WITH EXPANDING FOAM OR BRICKED AND GROUTED.
5. THRUST BLOCKING (AS REQUIRED)
6. VAULT TO BE INSTALLED ON OWNERS PRIVATE PROPERTY, PROVIDING A 15 X 30 FOOT EASEMENT.
7. ALL MATERIALS TO BE FURNISHED AND INSTALLED BY THE CUSTOMER/OWNER.
8. VAULTS SHALL BE 2 PIECE.

VAULT HATCH REQUIREMENTS

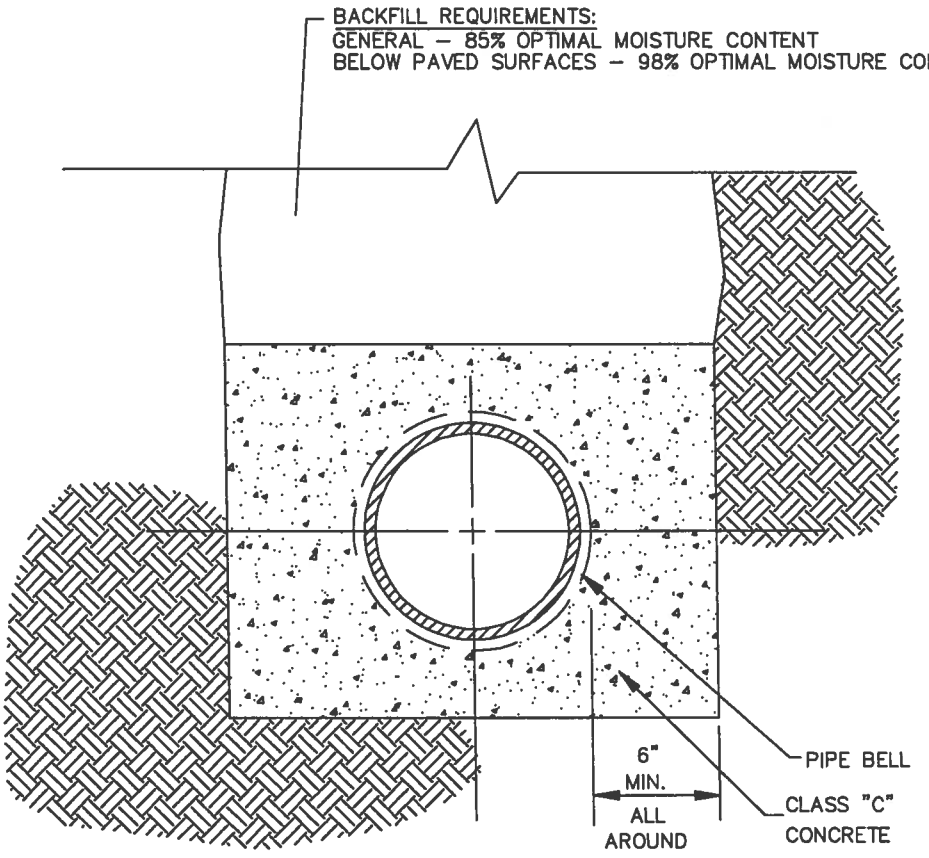
1. RATED TO WITHSTAND A MINIMUM H-10 LIVE LOAD.
2. A MANUAL LOCKING ARM TO PREVENT HATCH LIDS FROM CLOSING.
3. CAPABLE OF BEING SECURED USING A KEYED LOCK, OR BY A T-HANDLE LATCH.
4. 3" – 6" REUSE SERVICE: 36" X 36" HATCH
   GREATER THAN 6" WATER SERVICE: PER HCDPWU

VAULT SIZING REQUIREMENTS

VAULTS SHALL BE ADEQUATELY SIZED TO CONTAIN ALL PIPING, VALVES, BYPASS, FITTINGS, METER AND STRAINER ASSOCIATED W/ THE METER INSTALLATION.

A MINIMUM DISTANCE OF 12" SHALL BE MAINTAINED BETWEEN ANY PIPING AND 1) THE VAULT FLOOR AND 2) THE WALL RUNNING PARALLEL TO THE PIPING.

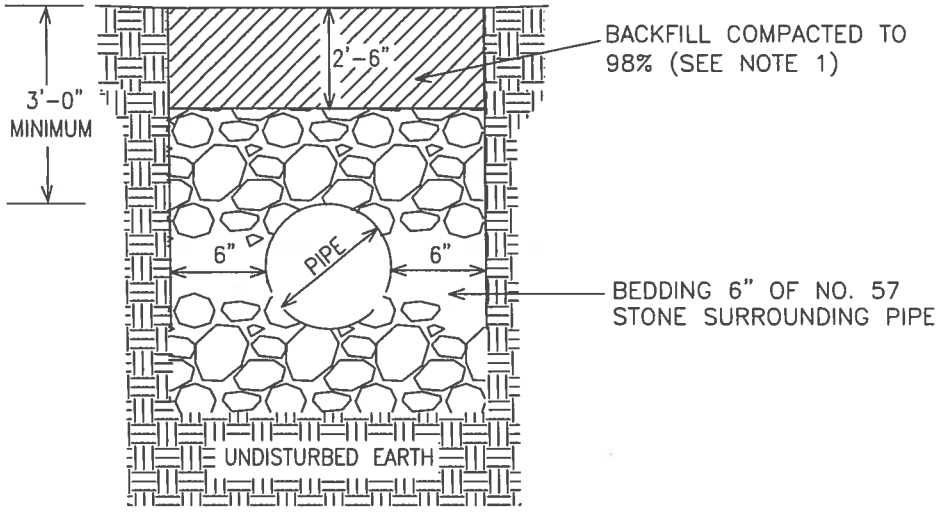
HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	**SEPTEMBER 2010**	**DETAIL TITLE:**	**DETAIL No.**
SCALE:	**N.T.S.**	**NPRL METER BOX 3" AND LARGER**	**11.0**
DRAWN BY:			



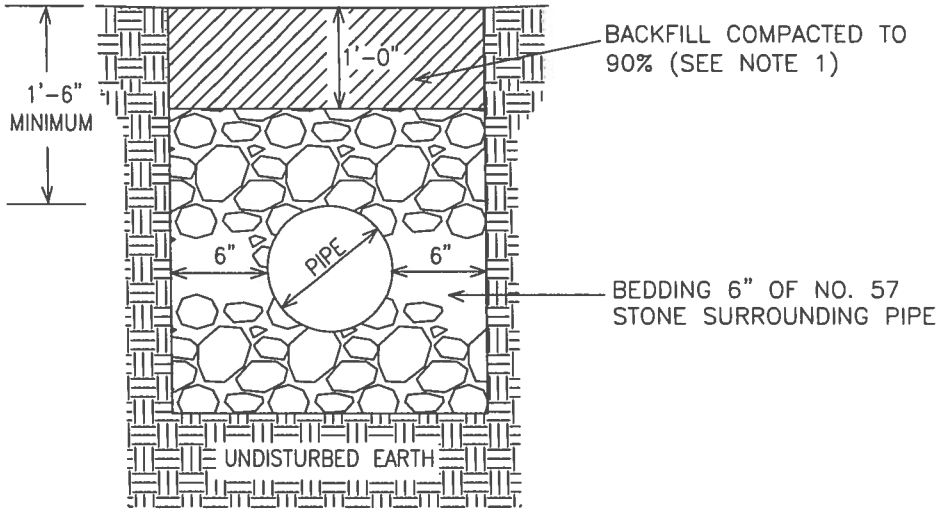
NOTES:

1. CONCRETE ENCASEMENT SHALL BE USED ON NPRL WHERE INSTALLATION CANNOT MAINTAIN MINIMUM THREE (3) FEET HORIZONTAL OR EIGHTEEN (18) INCHES VERTICAL SEPARATION FROM SANITARY SEWER, SANITARY SEWER FORCE MAIN, POTABLE WATER MAINS, AND STORM SEWER DRAIN LINES.

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	NPRL CONCRETE ENCASEMENT	12.0
DRAWN BY:			



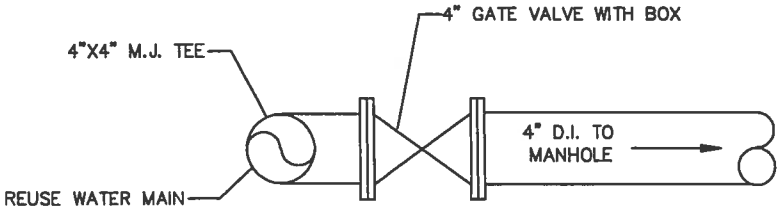
BEDDING FOR SERVICE BELOW PAVED SURFACES
(ROADS, SIDEWALKS, PARKING LOTS, ETC.)



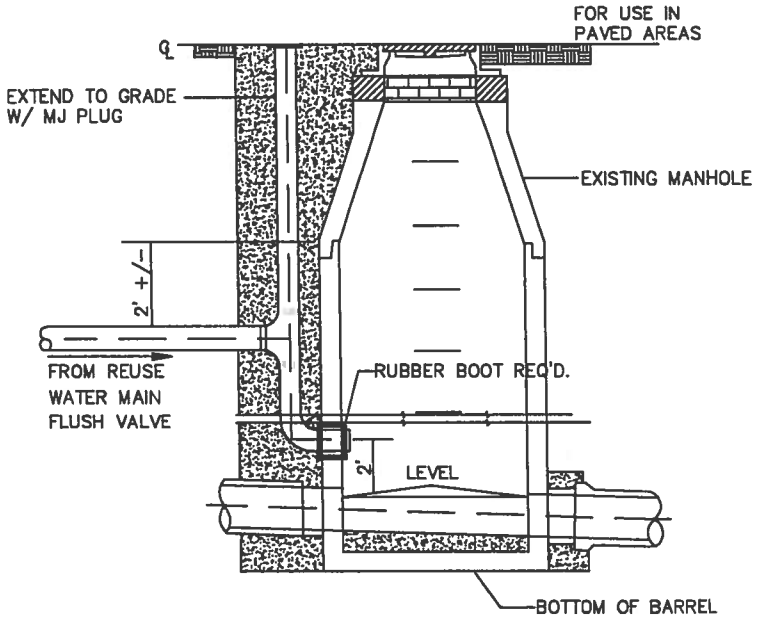
BEDDING FOR SERVICE OUTSIDE OF PAVED AREAS

NOTES:
1. COMPACTION % BASED UPON THE MAXIMUM DRY DENSITY AS DETERMINED BY A STANDARD PROCTOR ANALYSIS +/- 3% OF THE OPTIMUM MOISTURE CONTENT
2. UNSUITABLE SOILS ENCOUNTERED IN BOTTOM OF EXCAVATED TRENCH SHALL BE EXCAVATED & REPLACED WITH NO. 57 STONE.
3. ONLY SUITABLE SOIL SHALL BE USED AS BACKFILL.
4. ALL NON-METALLIC SANITARY SEWER PIPE SHALL HAVE LOCATOR WIRE IN ACCORDANCE WITH SECTION 3.12 OF THE HALL COUNTY STANDARD SEWER SPECIFICATIONS.

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL No.
SCALE:	N.T.S.	NPRL SERVICE LINE BEDDING	13.0
DRAWN BY:			

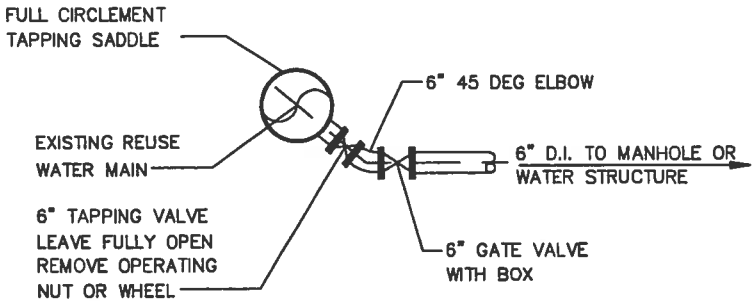


CUL-DE-SAC
REUSE FLUSH POINT DETAIL

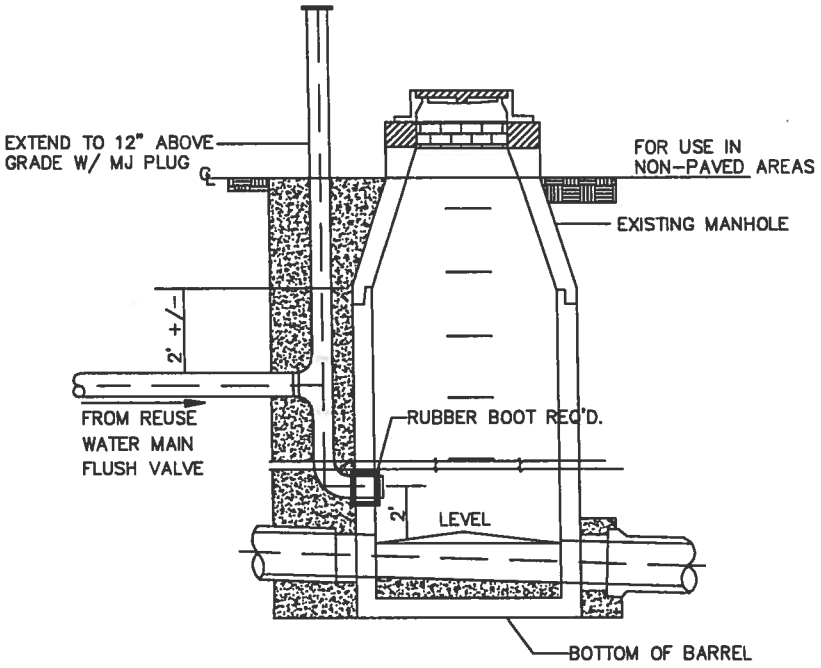


MANHOLE CONNECTION DETAIL

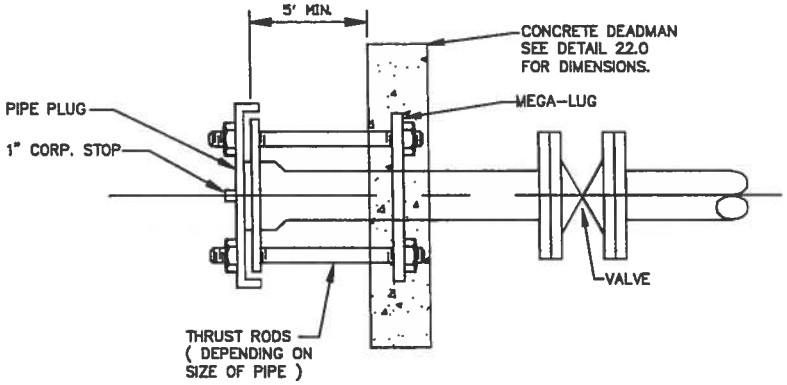
HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	**SEPTEMBER 2010**	**DETAIL TITLE:**	**DETAIL No.**
SCALE:	**N.T.S.**	**CUL-DE-SAC FLUSH POINT**	**14.0**
DRAWN BY:			



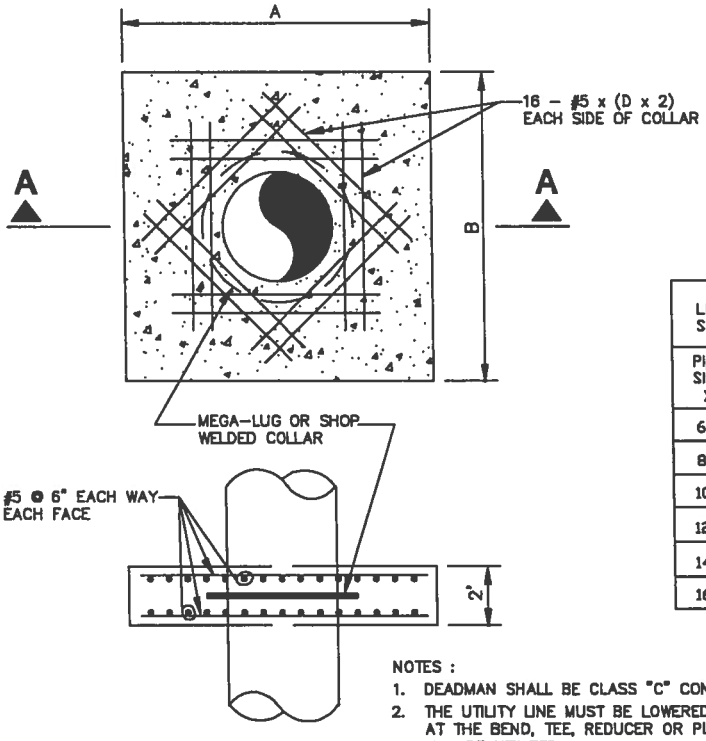
REUSE TAP AND VALVE DETAIL



HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	**SEPTEMBER 2010**	**DETAIL TITLE:**	**DETAIL No.**
SCALE:	**N.T.S.**	**IN LINE FLUSH POINT**	**15.0**
DRAWN BY:			



PIPE SIZE	ROD SIZE	NUMBER OF RODS
6"	3/4"	2
8"	3/4"	3
10"	3/4"	4
12"	3/4"	4
14"	3/4"	4
16"	3/4"	6



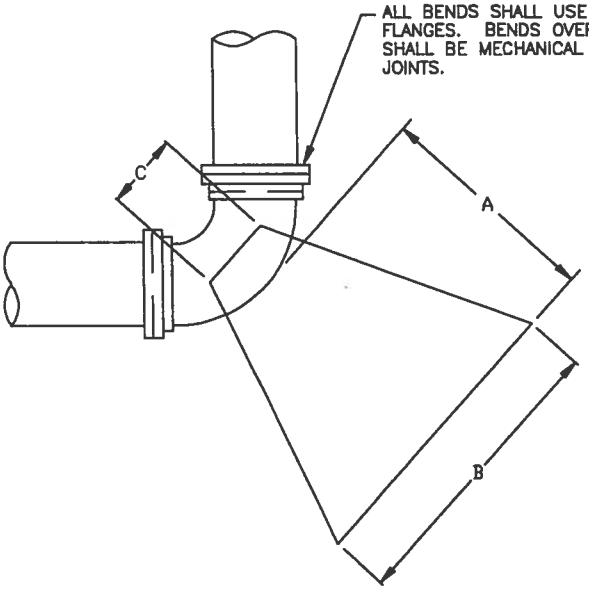
SECTION A-A

Line Pressure = 150 PSI Soil Pressure = 2000 PSF		
Pipe Size X	A	B
6"	2'-0"	2'-0"
8"	2'-6"	2'-6"
10"	3'-6"	3'-6"
12"	4'-0"	4'-0"
14"	4'-6"	4'-6"
16"	5'-0"	5'-0"

NOTES :

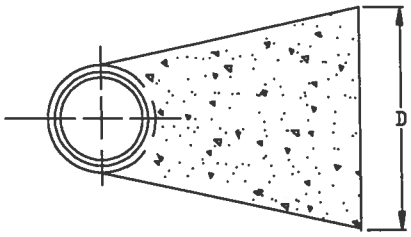
1. DEADMAN SHALL BE CLASS "C" CONCRETE ; "SACKCRETE" WILL NOT BE ALLOWED.
2. THE UTILITY LINE MUST BE LOWERED IN ORDER TO HAVE FIVE FEET (5') OF COVER AT THE BEND, TEE, REDUCER OR PLUG AT ALL LOCATIONS WHERE THESE FITTINGS MAY BE UTILIZED.
3. FOR SOIL CONDITIONS LESS THAN 2000 P.S.F. BEARING PRESSURE OR PIPE PRESSURE OVER 150 P.S.I. SPECIAL THRUST BLOCKS / RESTRAINT MUST BE COMPUTED AND APPROVED.
4. CONCRETE SHALL BE POURED AGAINST UNDISTURBED SOIL. DISTURBED SOIL TO BE COMPACTED TO 95% OPTIMUM MOISTURE CONTENT.
5. MAINTAIN 2" CLEARANCE BETWEEN PIPE WALL AND REBAR.

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	DEADMAN FOR PLUG CONCRETE DEADMAN	16.0
DRAWN BY:			



MINIMUM DIMENSIONS FOR CONCRETE BLOCKING

BEND	PIPE SIZE	A	B	C	D
11 1/4°	6"	1.0'	1.0'	7"	1.0'
	8"	1.0'	1.25'	7"	1.0'
	12"	1.0'	2.0'	11"	2.0'
	16"	2.0'	3.0'	15"	2.0'
	20"	2.0'	3.0'	19"	3.0'
	24"	3.0'	4.0'	22"	3.0'
	36"	4.0'	7.0'	33"	4.0'
22 1/2°	6"	1.0'	1.5'	7"	1.0'
	8"	1.0'	2.0'	7"	2.0'
	12"	2.0'	3.0'	11"	2.0'
	16"	2.0'	4.0'	15"	3.0'
	20"	3.0'	5.0'	19"	3.0'
	24"	4.0'	6.0'	22"	4.0'
	36"	5.0'	10.0'	33"	5.0'
45°	6"	1.5'	2.0'	7"	1.5'
	8"	2.0'	3.0'	7"	2.0'
	12"	2.0'	4.0'	11"	3.0'
	16"	3.0'	5.0'	15"	4.0'
	20"	4.0'	6.0'	19"	5.0'
	24"	5.0'	8.0'	22"	6.0'
	36"	6.0'	13.0'	33"	7.0'
90°	6"	1.5'	2.5'	7"	2.0'
	8"	2.0'	3.0'	7"	3.0'
	12"	4.0'	6.0'	11"	4.0'
	16"	4.0'	7.0'	15"	5.0'
	20"	8.0'	8.0'	19"	7.0'
	24"	6.0'	10.0'	22"	8.0'
	36"	7.0'	16.0'	33"	10.0'
TEES AND PLUGS	6"	1.5'	2.0'	7"	2.0'
	8"	2.0'	3.0'	7"	2.0'
	12"	2.0'	4.0'	11"	4.0'
	16"	3.0'	5.0'	15"	5.0'
	20"	4.0'	7.0'	19"	6.0'
	24"	5.0'	8.0'	22"	7.0'
	36"	7.0'	10.0'	33"	11.0'



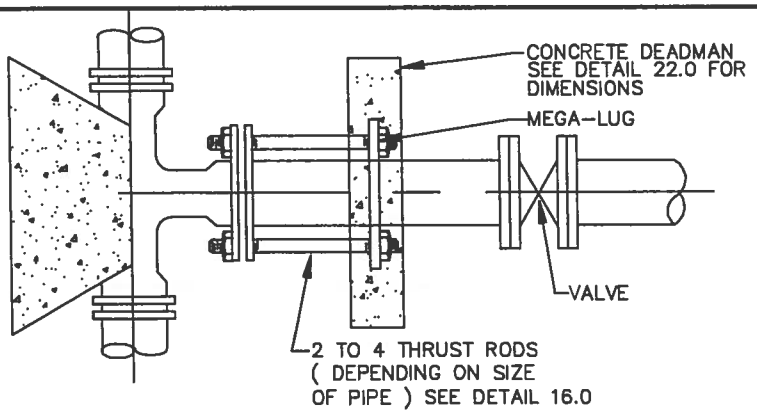
SECTION

NOTES:

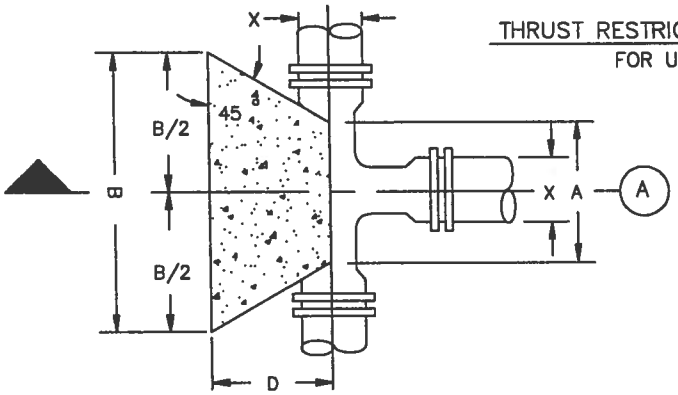
1. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI AT 28 DAYS.
2. THRUST BLOCK SHALL BE POURED AGAINST UNDISTURBED SOIL.
3. BOLTS/NUTS SHALL BE PROTECTED FROM CONCRETE COVERAGE.
4. DIMENSIONS ARE BASED ON 150 P.S.I. LINE PRESSURE, 3000 P.S.I. CONCRETE AND 2000 P.S.F. SOIL BEARING PRESSURE.

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES

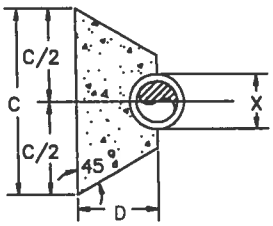
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	THRUST BLOCK DIMENSIONS	17.0
DRAWN BY:			



THRUST RESTRICTING DEAD MAN FOR TEE
FOR USE IN FILL AREAS.



TEE – PLAN



SECTION A

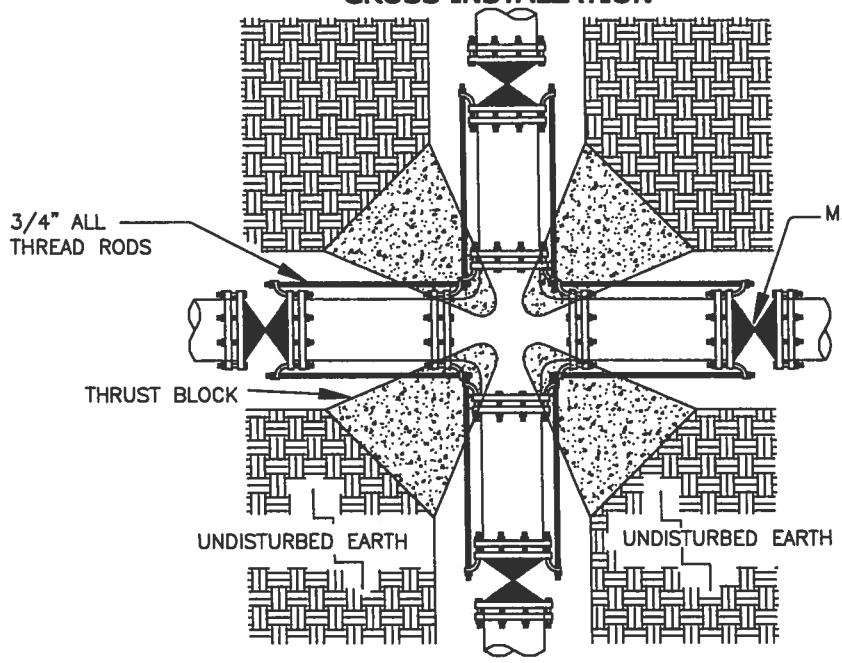
Line Pressure = 150 PSI Soil Pressure = 2000 PSF				
Pipe Size X	A	B	C	D
24"	2'-6"	6'-0"	6'-0"	3'-6"
20"	2'-4"	5'-0"	5'-0"	3'-0"
18"	1'-2"	4'-6"	4'-6"	2'-9"
16"	1'-6"	4'-0"	4'-0"	2'-6"
14"	1'-6"	3'-6"	3'-6"	2'-3"
12"	1'-3"	3'-0"	3'-0"	2'-0"
10"	1'-3"	2'-6"	2'-6"	1'-6"
8"	1'-0"	2'-0"	2'-0"	1'-6"
6"	0'-11"	1'-6"	1'-6"	1'-3"
4"	0'-10"	1'-0"	1'-0"	1'-0"

NOTES :
1. BLOCKING SHALL BE CLASS "C" CONCRETE ; "SACKCRETE" WILL NOT BE ALLOWED.
2. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI AT 28 DAYS.
3. THRUST BLOCK SHALL BE POURED AGAINST UNDISTURBED SOIL.
4. BOLTS/NUTS SHALL BE PROTECTED FROM CONCRETE COVERAGE.

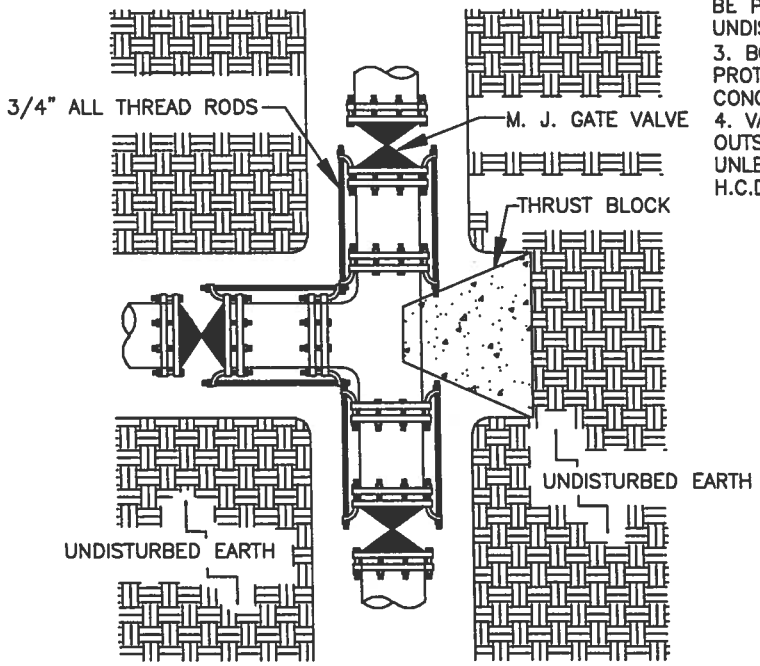
HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES

DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	THRUST BLOCK - TEE	18.0
DRAWN BY:			

CROSS INSTALLATION



TEE INSTALLATION



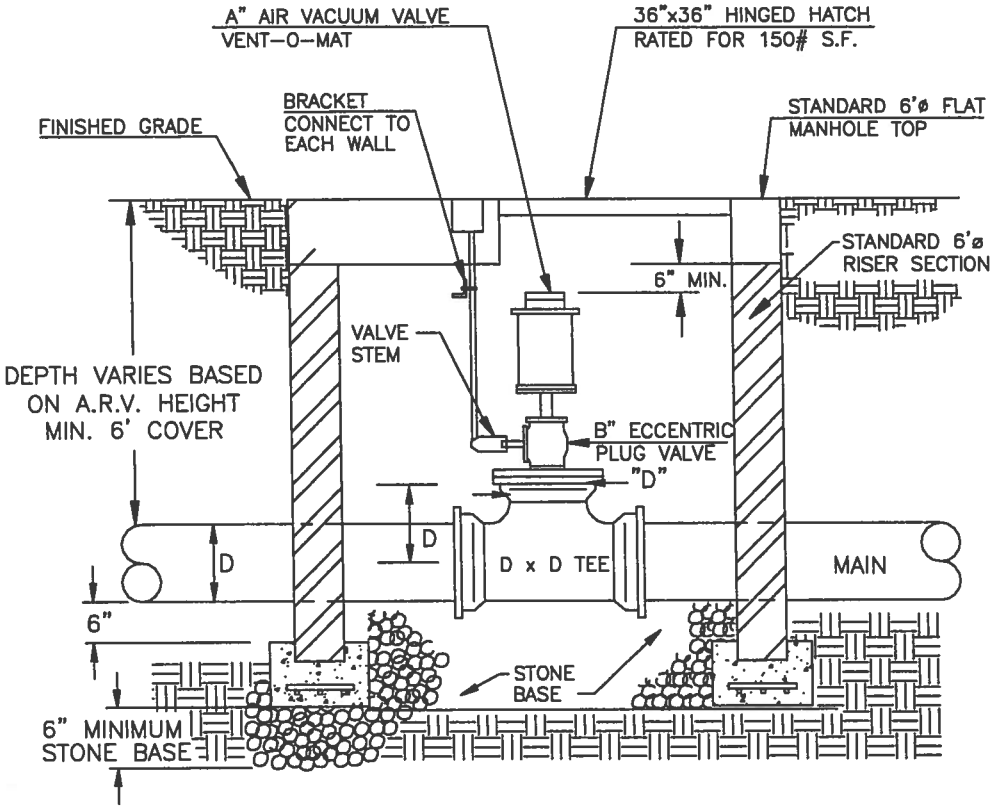
NOTES:

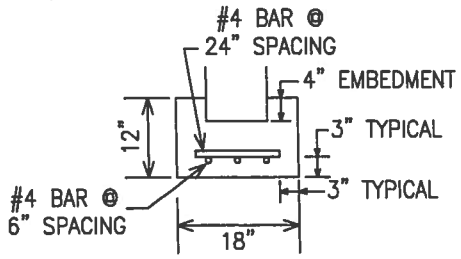
1. CONCRETE SHALL HAVE A MINIMUM COMPRESSIVE STRENGTH OF 3,000 PSI AT 28 DAYS.
2. THRUST BLOCK SHALL BE POURED AGAINST UNDISTURBED SOIL.
3. BOLTS/NUTS SHALL BE PROTECTED FROM CONCRETE COVERAGE.
4. VALVES TO BE LOCATED OUTSIDE OF PAVEMENT UNLESS APPROVED BY H.C.D.P.W.U.

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES

DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	THRUST RESTRAINT AT FITTING	19.0
DRAWN BY:			

"A" – TO BE SIZED PER ARV MANUFACTORS SPECIFICATIONS.
"B" – TO BE SIZED PER ARV MANUFACTORS SPECIFICATIONS.
"D" – MAIN SIZE

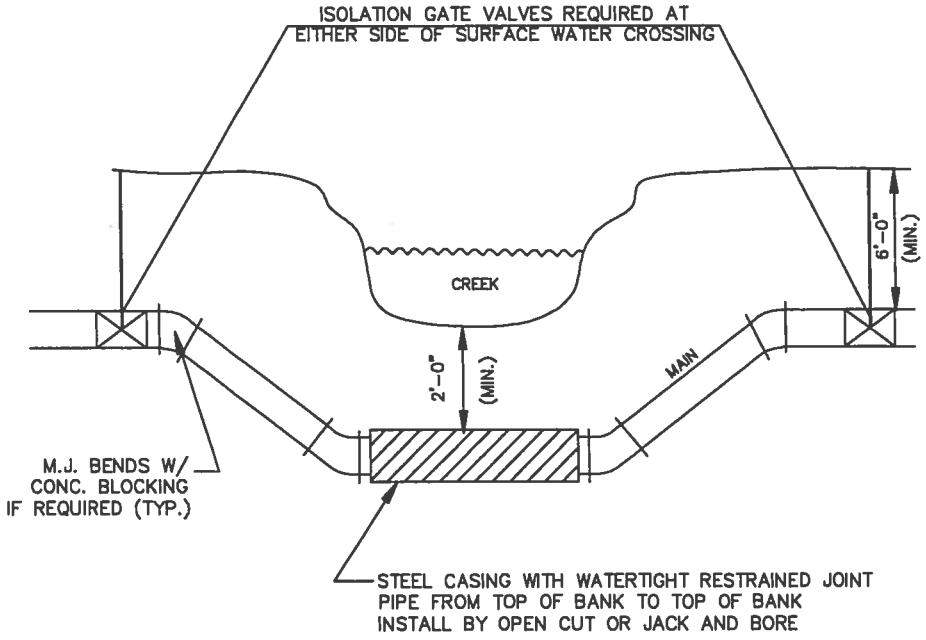




FOOTING DETAIL
SCALE: N.T.S.

NOTES:
1. PIPE SHOULD BE BURIED TO A DEPTH THAT WILL ACCOMMODATE THE MINIMUM REQUIREMENTS OF THIS STANDARD AND THOSE OF THE SPECIFIED ARV.
2. ORIFICE AREA OF A.R.V. SHALL NOT EXCEED TOTAL AREA PROVIDED BY VENT HOLES IN MANHOLE LID.

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	AIR/VACUUM RELEASE VALVE 2" AND SMALLER	20.0
DRAWN BY:			



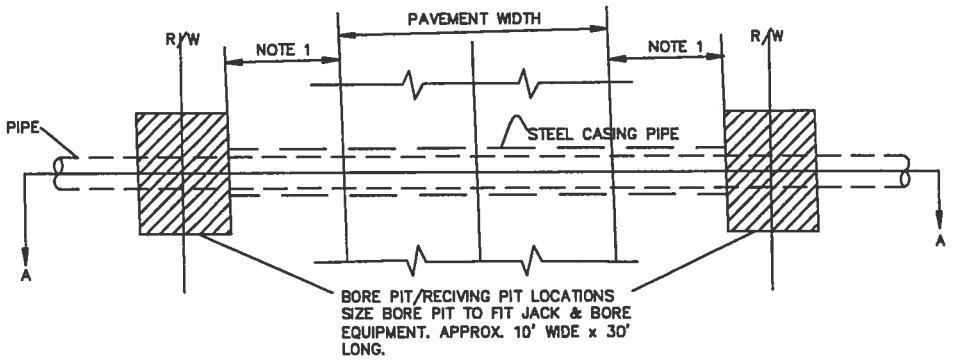
NOTE:

1. IF STATE WATERS ARE JACK AND BORED, BORE PITS MUST BE OUTSIDE OF THE STATE BUFFERS.

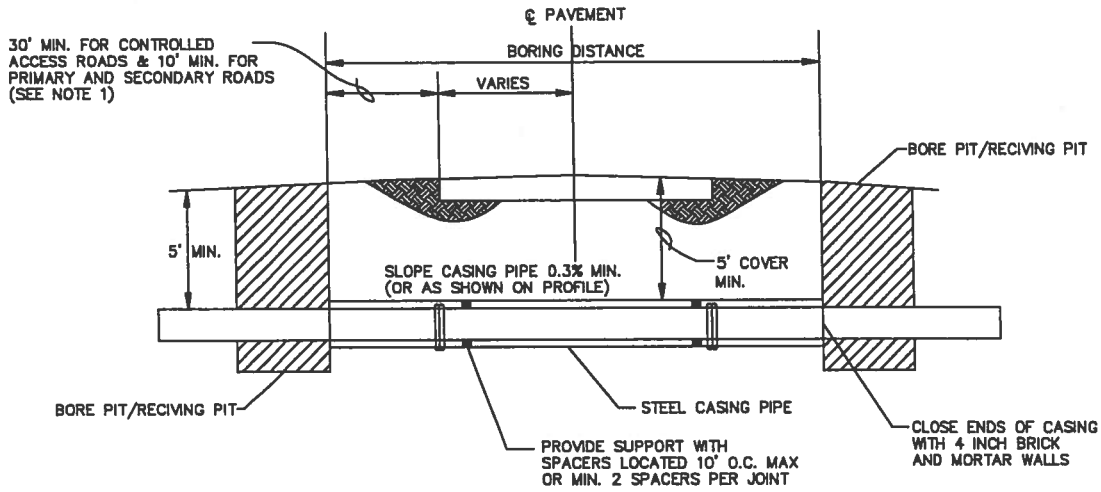
HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	PRESSURE MAIN CREEK CROSSING	21.0
DRAWN BY:			

NOTES:

1. THE NEAR EDGE OF THE PIT CAN BE NO CLOSER TO THE EDGE OF THE TRAVELED WAY THAN THE DEPTH BELOW THE SURFACE OF THE TRAVEL WAY UNLESS BULKHEADED.
2. CASING PIPE UP TO 20" SHALL HAVE A THICKNESS OF .375"
3. CASING PIPE OVER 20" SHALL HAVE A THICKNESS OF .5"
4. CASING PIPE UNDER RAILROAD MUST MEET RAILROAD REQUIREMENTS
5. ALL PIPE WITHIN CASING TO BE RESTRAINED JOINT.

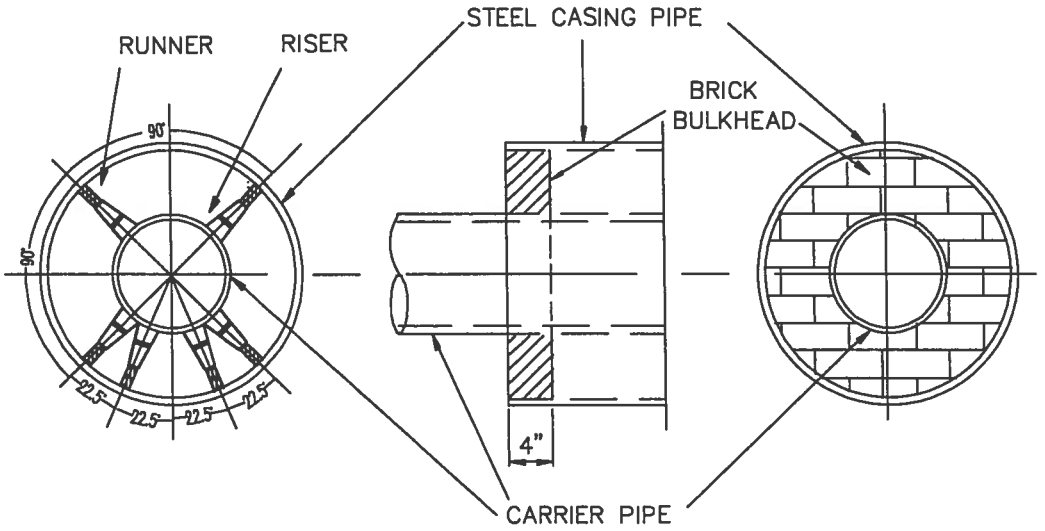


PLAN



SECTION A–A

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	CASING PIPE JACK AND BORE	22.0
DRAWN BY:			



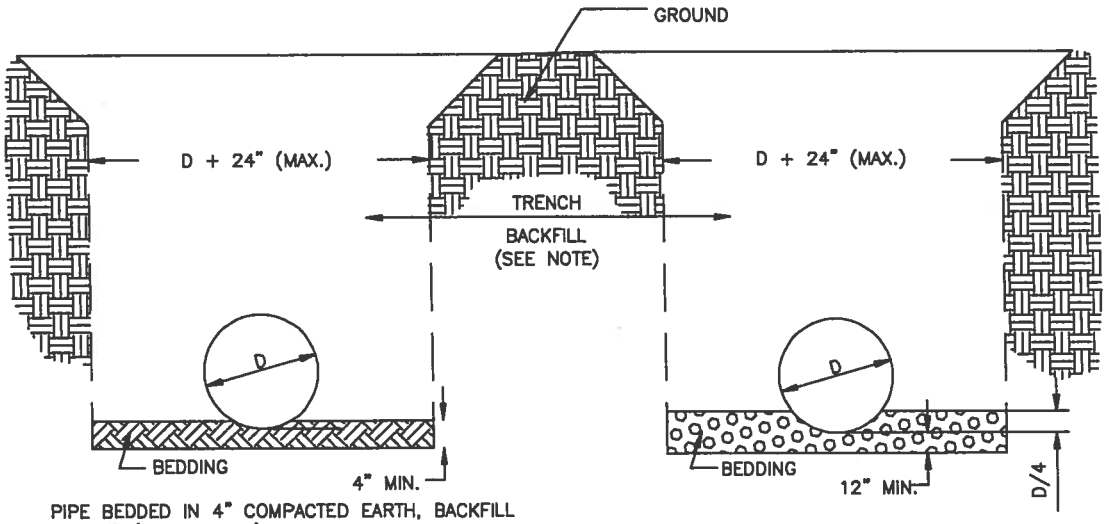
TYPICAL LAYOUT STAINLESS STEEL CASING SPACER DETAIL

BULKHEAD DETAIL

NOTES:

1. SPACER SHELL MUST BE A MINIMUM 14 GA. T 304 STAINLESS STEEL ALL SURFACES ARE FULLY CHEMICALLY PASSIVATED.
2. CASING PIPE UP TO 20" SHALL HAVE A THICKNESS OF .375 INCH
3. CASING PIPE OVER 20" SHALL HAVE A THICKNESS OF .5 INCH
4. SPACER LINER MUST BE PVC – .90 THICK, 85–90 DUROMETER (ASTM D1706–61T) (ASTM – B117) (ASTM – D149–61)
5. RUNNERS MUST BE ULTRA HIGH MOLECULAR WEIGHT POLYMER. WITH HIGH RESISTANCE TO ABRASION AND SLIDE WEAR, LOW DEFLECTION UNDER COMPRESSION AND DIELECTRIC INSULATION.
6. SPACER FASTENERS MUST BE 5/16" T304 STAINLESS STEEL
7. SPACER RISERS MINIMUM 10 GA. T 304 STAINLESS STEEL, MUST BE REINFORCED IF OVER 6".

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	AUGERED JACKED CASING	23.0
DRAWN BY:			

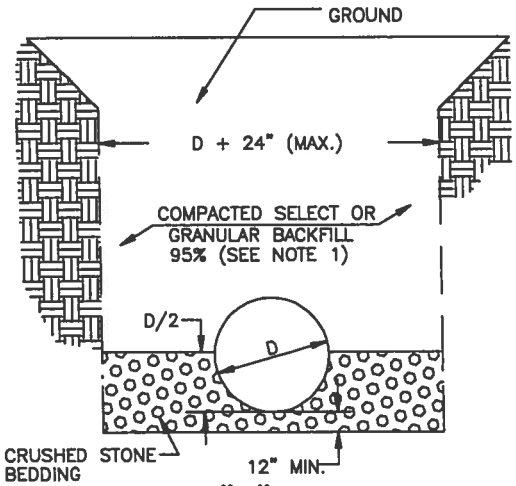


PIPE BEDDED IN 4" COMPACTED EARTH, BACKFILL TO 90% (SEE NOTE 1)

TYPE "III" BEDDING

PIPE BEDDED IN CRUSHED STONE (#57) TO DEPTH OF 1/4 PIPE DIAMETER.
BACKFILL COMPACTED TO GRADE 90% (SEE NOTE 1)

TYPE "IV" BEDDING



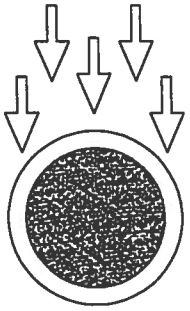
TYPE "V" BEDDING

NOTES:

1. COMPACTION % BASED UPON THE MAXIMUM DRY DENSITY AS DETERMINED BY A STANDARD PROCTOR ANALYSIS +/- 3% OF THE OPTIMUM MOISTURE CONTENT
2. TRENCH SHALL PROVIDE UNIFORM AND CONTINUOUS SUPPORT BETWEEN BELL HOLES.
3. COMPACTION BACKFILLS SHALL BE BUILT UP IN LAYERS AND EACH LAYER SHALL BE THOROUGHLY COMPACTED BEFORE BEGINNING ANOTHER LAYER. PUDDLING IS NOT ALLOWED. NO FROZEN OR WET MATERIALS MAY BE PLACED IN TRENCHES.
4. COMPACTION TESTS MAY BE REQUIRED IN EXISTING OR PROPOSED STREETS, SIDEWALKS, DRIVES AND OTHER EXISTING OR PROPOSED PAVED AREAS AT VARYING DEPTHS AND AT INTERVALS AS DETERMINED BY HALL COUNTY WITH A MINIMUM OF ONE TEST ON EACH JOB, OF ONE REQUIRED TEST FOR EACH 400' OR LESS OF NPRL CONSTRUCTION OR WHEN CONDITIONS IN THE OPINION OF HALL COUNTY WARRANT THE NEED FOR ADDITIONAL TEST.
5. NO LARGE ROCKS PERMITTED IN THE BACKFILL FROM BOTTOM OF TRENCH TO 2' (FEET) ABOVE PIPE.
6. FOR EXCAVATION IN POOR SOIL OR ROCK, REMOVE UNSUITABLE MATERIAL TO WIDTH AND DEPTH AS DIRECTED BEFORE PIPE IS LAID. THE SUBGRADE SHALL BE BACKFILLED WITH AN APPROVED MATERIAL TAMPED TO 95%.
7. IN EXCAVATING ROCK, MINIMUM OF 6" SELECT MATERIAL UNDER BOTTOM OF PIPE.
8. 95% COMPACTION REQUIRED WITHIN THE COUNTY RIGHT OF WAY.

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES

DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	BEDDING FOR DUCTILE IRON PIPE	24.0
DRAWN BY:			



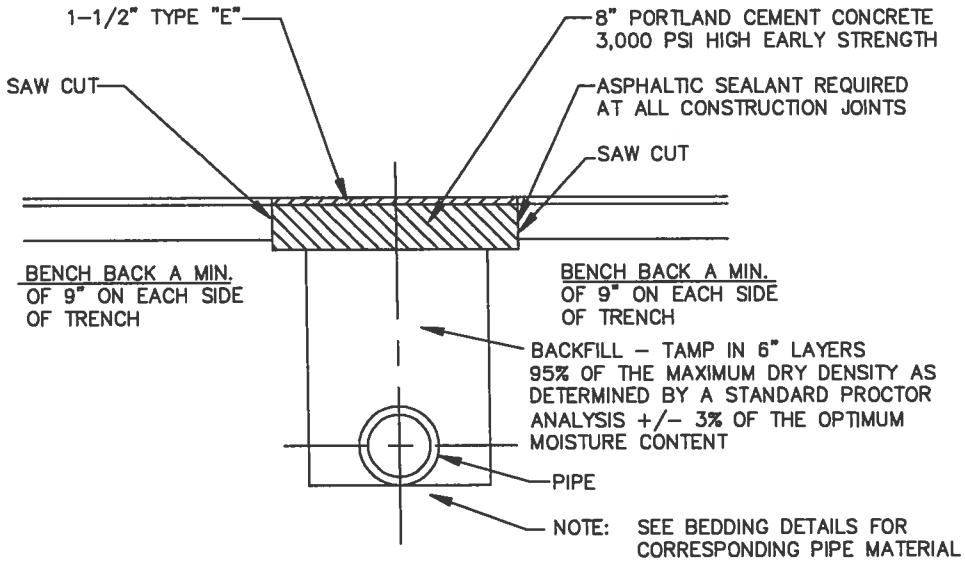
DUCTILE IRON PIPE DEPTH

SIZE INCHES	PRESSURE CLASS P.S.I.	LAYING CONDITIONS MAXIMUM DEPTH OF COVER IN FEET		
		TYPE III	TYPE IV	TYPE V
6	350	37	47	65
8	350	25	34	50
10	350	19	28	45
12	350	19	28	44
14	250 300 350	15 17 19	23 26 27	36 42 44
16	250 300 350	15 17 20	24 26 28	34 39 44
18	250 300 350	14 17 19	22 26 28	31 36 41
20	250 300 350	14 17 19	22 26 28	30 35 38
24	200 250 300 350	12 15 17 19	17 20 24 28	25 29 32 37

AWWA M41 TABLE 4 - 6

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES

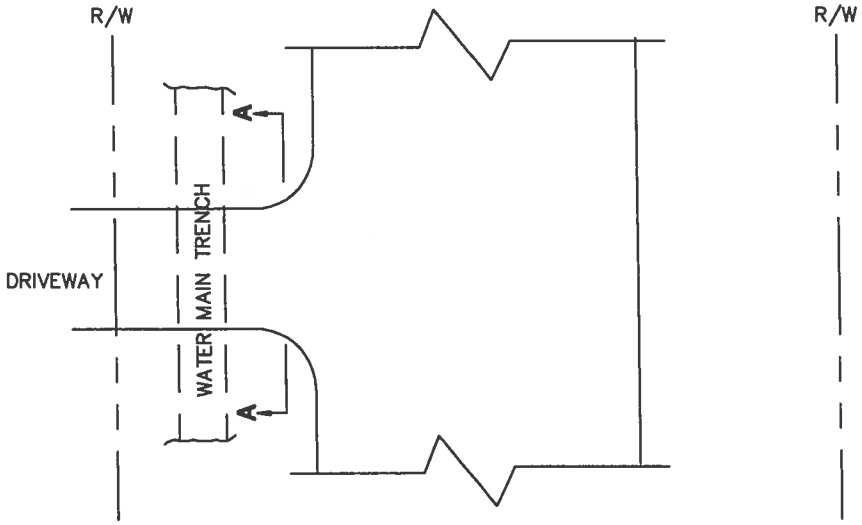
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL NO.
SCALE:	N.T.S.	MAXIMUM TRENCH DEPTHS, D.I.P.	25.0
DRAWN BY:			

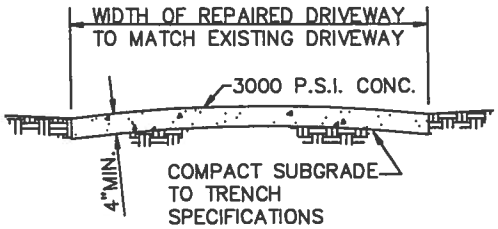


NOTES:

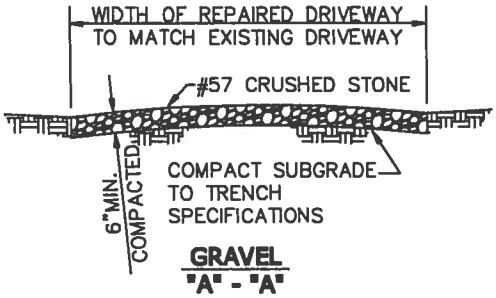
1. EXISTING PAVEMENT SHALL BE REPLACED IN ACCORDANCE TO THE STANDARDS REQUIRED BY HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES AND/OR THE GEORGIA DEPARTMENT OF TRANSPORTATION.
2. ALL LATERAL STREET CUTS MUST BE COVERED WITH STEEL PLATES OF SUFFICIENT THICKNESS TO SPAN THE CUT WITHOUT NOTICEABLE DEFLECTION. PLATES TO REMAIN IN PLACE UNTIL THE CONCRETE BASE HAS GAINED SUFFICIENT STRENGTH TO WITHSTAND TRAFFIC LOADS (24 HOUR MINIMUM).
3. ON LONGITUDINAL CUTS EXCEEDING 150 FT. IN LENGTH, THE CONCRETE IN THE TRENCH WILL BE BROUGHT FLUSH WITH THE EXISTING PAVEMENT AND THE ENTIRE WIDTH OF ROADWAY RESURFACED WITH A MINIMUM OF 1–1/2" OF TYPE "E" ASPHALT TOPPING OR SURFACE COURSE.
4. CONTRACTOR'S TRAFFIC CONTROL PLAN MUST BE APPROVED BY THE AUTHORITY HAVING JURISDICTION BEFORE WORK BEGINS.
5. FINAL APPROVAL OF CONTRACTOR'S PAVEMENT CUT REPAIRS RESIDES WITH THE AUTHORITY HAVING JURISDICTION. CONTRACTOR SHALL MEET ALL REQUIREMENTS OF SAID AUTHORITY.

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	**SEPTEMBER 2010**	**DETAIL TITLE:**	**DETAIL No.**
SCALE:	**N.T.S.**	**BACKFILLING UTILITY CUTS & REPLACING PAVEMENT**	**26.0**
DRAWN BY:			

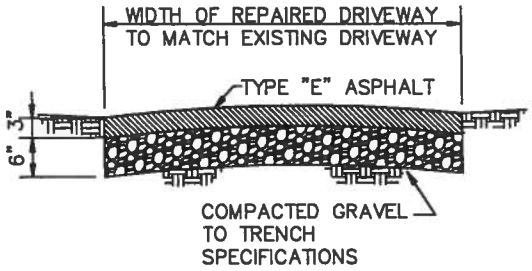




CONCRETE
"A" - "A"



GRAVEL
"A" - "A"

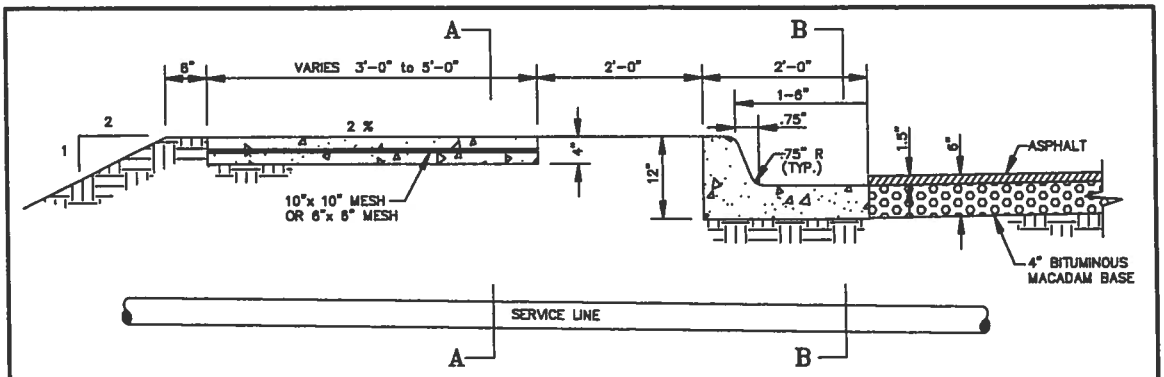


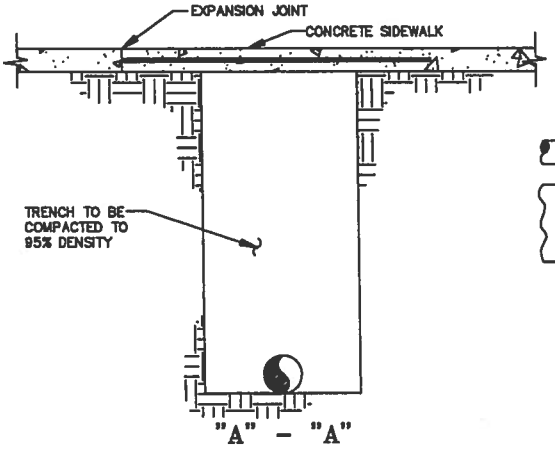
ASPHALT
"A" - "A"

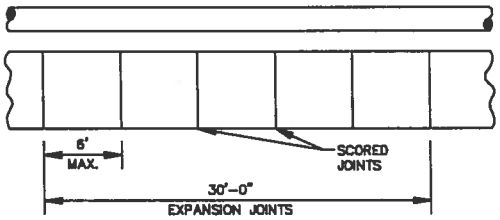
NOTES:

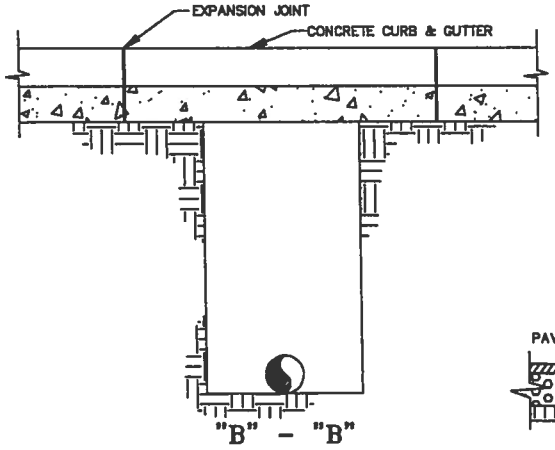
1. PAVED DRIVES – FINISH SURFACE OF REPAIRED AREA TO MATCH EXISTING SURFACE. EDGES OF CUT TO BE SAWN VERTICAL. EXPANSION MATERIAL TO BE USED AS DIRECTED.
2. GRAVEL DRIVES – FINISHED GRADE TO BE FLUSH WITH EDGE OF DRIVE – TYPICAL ALL DRIVES.

HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	**SEPTEMBER 2010**	**DETAIL TITLE:**	**DETAIL No.**
SCALE:	**N.T.S.**	**DRIVEWAY CUT REPAIRS**	**27.0**
DRAWN BY:			



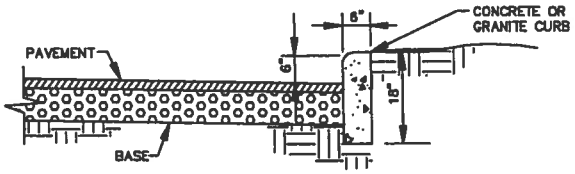




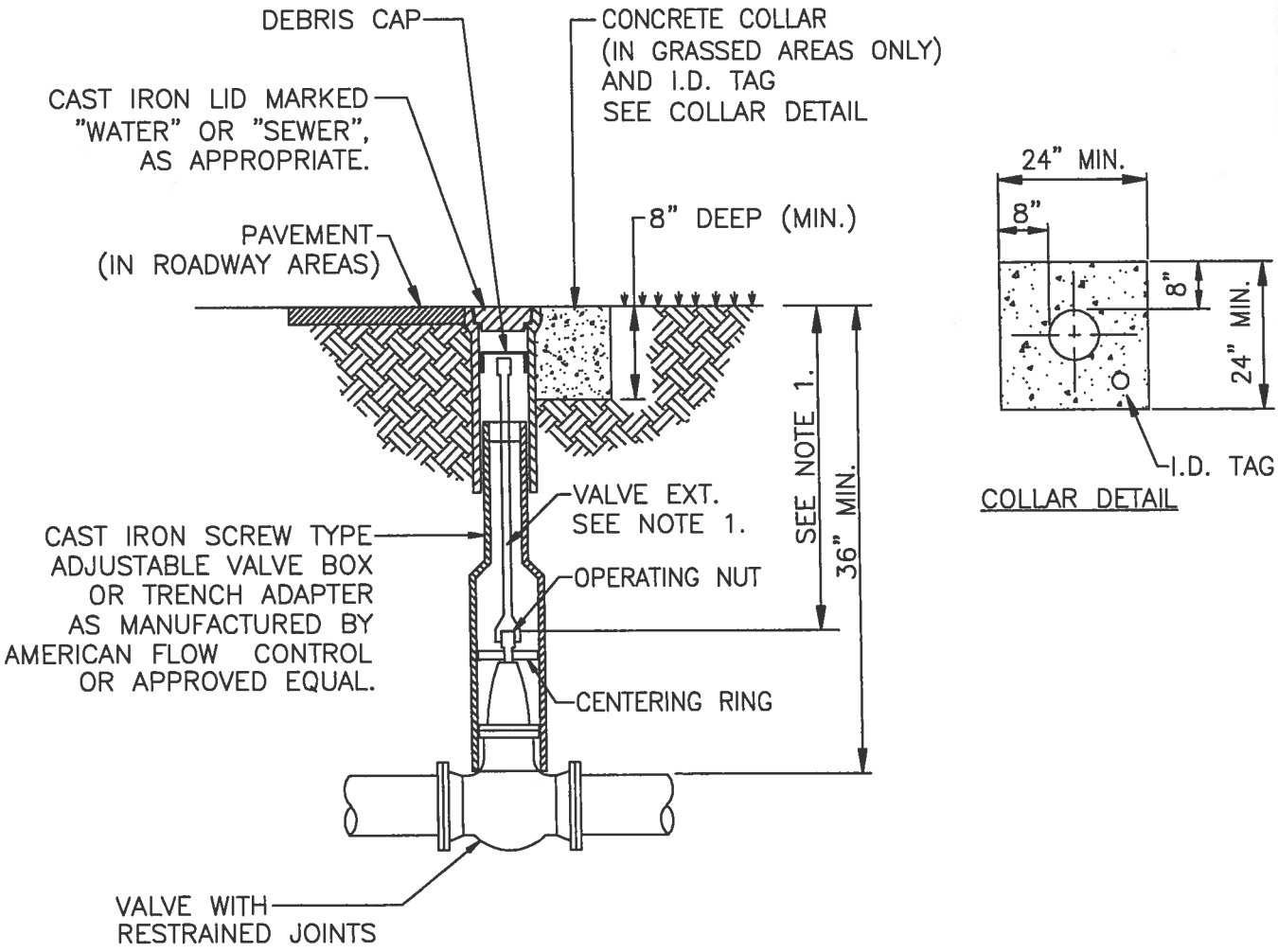


NOTES:

1. DETAILS ARE TYPICAL.
2. REPLACE SIDEWALKS, CURB AND GUTTER AND CURBING TO MATCH EXISTING MATERIALS OR AS DIRECTED.



HALL COUNTY DEPARTMENT OF PUBLIC WORKS AND UTILITIES			
DATE:	SEPTEMBER 2010	DETAIL TITLE:	DETAIL No.
SCALE:	N.T.S.	SIDEWALK, CURB & GUTTER REPAIRS	28.0
DRAWN BY:			

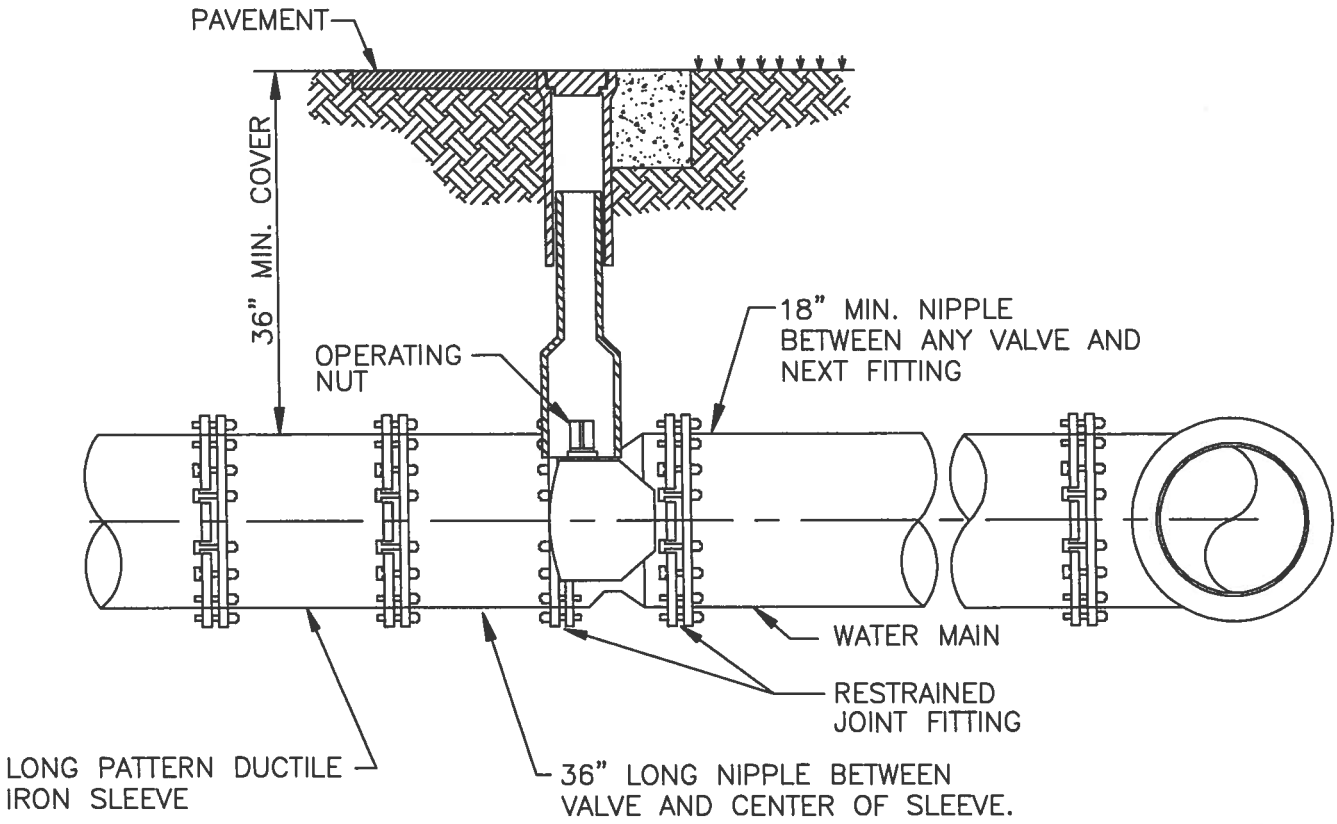


NOTES:

1. WHEN TOP OF OPERATING NUT IS DEEPER THAN 36", A HIGH STRENGTH STEEL EXTENSION WILL BE REQUIRED TO BRING OPERATING NUT TO NOT MORE THAN 24" BELOW FINISHED GRADE. EXTENSION BOLTS & NUTS SHALL BE 316 STAINLESS STEEL. A STEEL CENTERING PLATE WELDED TO THE EXTENSION IS ALSO REQUIRED.
2. VALVE BOXES IN PAVEMENT SHALL HAVE LOCKING COVERS & LIDS MARKED "WATER" OR "SEWER", AS APPROPRIATE.
3. ALL VALVE BOXES SHALL BE PROVIDED WITH A DEBRIS CAP.
4. A PLUMB DUCTILE IRON PIPE OR C-900 PVC RISER SHALL BE USED IF DEPTH SO REQUIRES, WITH APPROVAL.

PRESSURE PIPE VALVE BOX SETTING

REVISED:	HALL COUNTY PUBLIC WORKS & UTILITIES	STANDARD
SEPTEMBER 2010	ENGINEERING DIVISION	P-1



NOTES:

1. SEE "VALVE BOX SETTING" STANDARD (P-1) FOR ADDITIONAL DETAILS.
2. ALL BUTTERFLY VALVES SHALL BE INSTALLED WITH AN IN-LINE SLEEVE.
3. ALL JOINTS SHALL BE RESTRAINED.

PRESSURE PIPE
BUTTERFLY VALVE

REVISED:	HALL COUNTY PUBLIC WORKS & UTILITIES	STANDARD
SEPTEMBER 2010	ENGINEERING DIVISION	P-2

REVISED: SEPTEMBER 2010

HALL COUNTY PUBLIC WORKS & UTILITIES
ENGINEERING DIVISION

STANDARD P-3

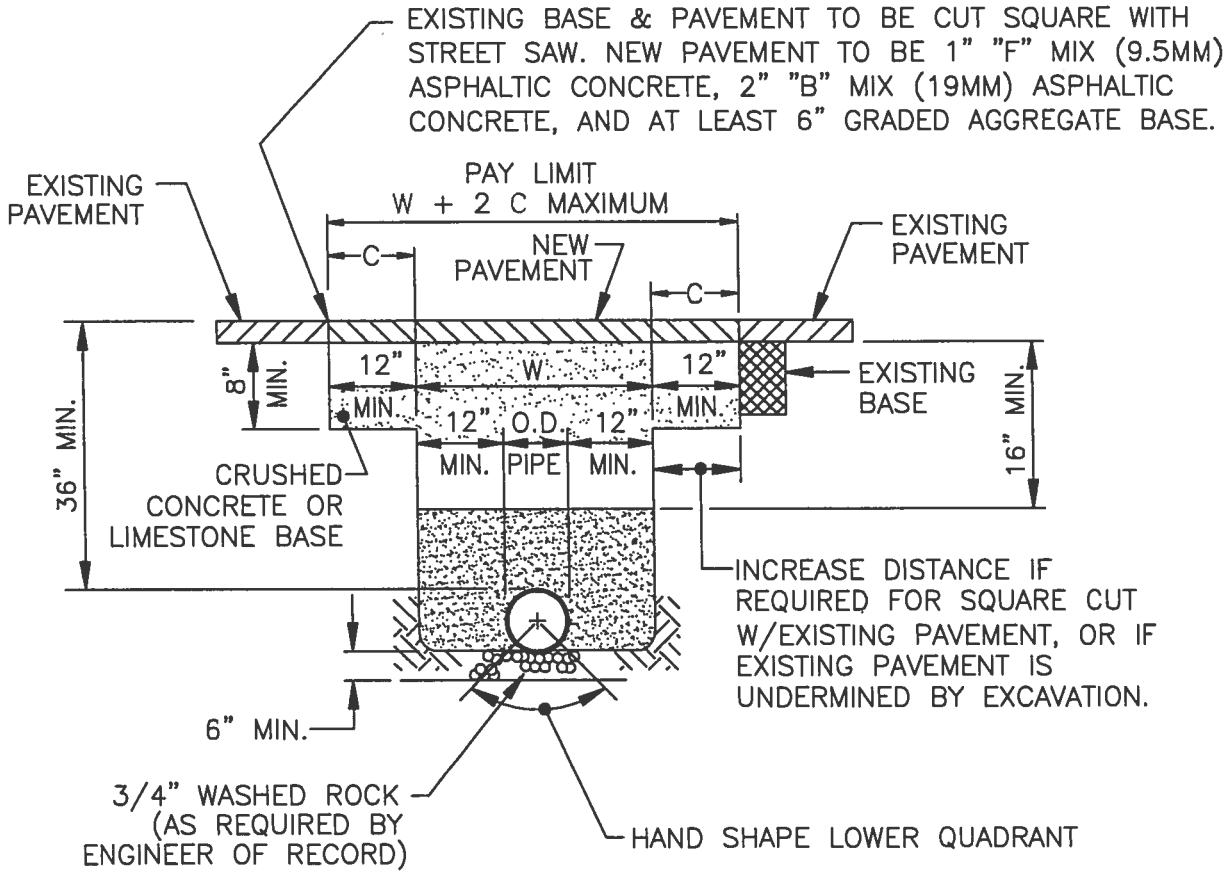
PRESSURE PIPE

DESIGN TABLE FOR THRUST RESTRAINT

NOMINAL PIPE DIAMETER (INCHES)	PIPE LENGTH (IN FEET) TO BE RESTRAINED IN EACH DIRECTION FROM FITTING													
	HORZ. 90° BEND	HORZ. 60° BEND	HORZ. 45° BEND	HORZ. 30° BEND	HORZ. 22.5° BEND	HORZ. 11.25° BEND	VERT. HORZ. 90° BEND	VERT. HORZ. 60° BEND	VERT. HORZ. 45° BEND	VERT. HORZ. 30° BEND	VERT. HORZ. 22.5° BEND	VERT. HORZ. 11.25° BEND	TEE (BRANCH)	DEAD END & VALVE
4	31	18	13	8	6	3	65	37	27	17	13	6	32	65
6	43	25	18	12	9	4	92	53	38	25	18	9	58	92
8	56	32	23	15	11	5	118	68	49	32	23	12	84	118
10	67	39	28	18	13	7	142	82	59	38	28	14	108	142
12	78	45	32	21	16	8	167	96	69	45	33	16	132	167
14	88	51	37	24	18	9	190	109	79	51	38	19	155	190
16	98	57	41	26	20	10	212	123	88	57	42	21	177	212
18	108	62	45	29	22	11	234	135	97	63	47	23	199	234
20	118	68	49	32	23	12	256	148	106	69	51	25	221	256
24	136	78	56	36	27	13	297	171	123	80	59	29	261	297
30	160	92	66	43	32	16	354	205	147	95	70	35	318	354
36	182	105	75	49	36	18	407	235	169	109	81	40	370	407
42	202	116	84	54	40	20	455	263	188	122	90	45	417	455
48	220	127	91	59	44	22	500	289	207	134	99	49	462	500
54	237	137	98	64	47	23	542	313	224	145	108	53	503	542
60	247	143	102	66	49	24	570	329	236	153	113	56	530	570
64	256	148	106	69	51	25	594	343	246	159	118	59	554	594

NOTES:

1. NO THRUST BLOCKS ALLOWED!
2. CHART EXTRACTED FROM DIPRA MANUAL, "THRUST RESTRAINT DESIGN FOR D.I.P.", 3RD EDITION,
   USING THE FOLLOWING DESIGN CRITERIA:
   TRENCH TYPE 2
   SOIL TYPE = SAND / SILT
   POLYWRAP REQUIRED = NO (MULTIPLY BY 1.50 FOR POLYWRAPPED PIPE)
   DESIGN PRESSURE = 150 PSI
   MINIMUM COVER REQUIRED = 3 FEET
3. TEE CALCULATIONS ARE BASED ON FULL OPENING TEE. CALCULATIONS MUST BE ADJUSTED IF RUN DIAMETER EXCEEDS TWICE THE BRANCH DIAMETER.
4. MINIMUM NUMBER OF JOINTS TO BE RESTRAINED SHALL BE MINIMUM LENGTH AS LISTED ABOVE PLUS ONE FULL LENGTH.
5. VALVES SHALL BE RESTRAINED AT EACH SIDE USING DEAD END CRITERIA LISTED IN TABLE ABOVE.



W = O.D. OF PIPE + 12" MIN. AT BOTH SIDES OF PIPE.

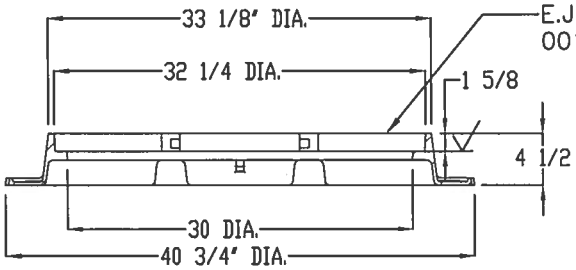
C = VARIES W/SOIL TYPE (CONTACT ENGINEER OF RECORD FOR DETERMINATION IN FIELD).

NOTES:

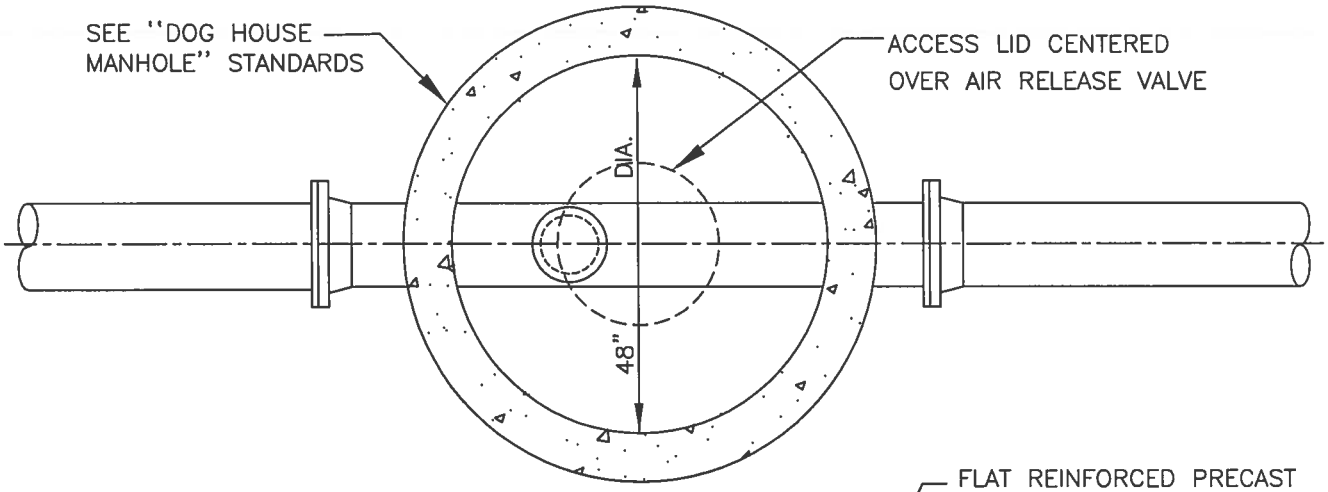
1. BACKFILL COMPACTION WITHIN R.O.W. SHALL BE 98% OF MAXIMUM DENSITY PURSUANT TO ASTM 1557. BACKFILL NOT IN R.O.W. SHALL BE 95% OF MAXIMUM DENSITY PURSUANT TO ASTM 1557. LIFTS SHALL BE 12 " MAXIMUM.
2. FOR ROADS NOT UNDER HALL COUNTY JURISDICTION, THE APPROPRIATE ROAD AUTHORITY STANDARDS SHALL TAKE PRECEDENCE OVER THE COUNTY STANDARDS. REFER TO GDOT, GAINESVILLE OR OTHER MUNICIPALITY'S STANDARDS, AS APPROPRIATE.
3. RESTRIPING MUST MATCH EXISTING WHENEVER NECESSARY.

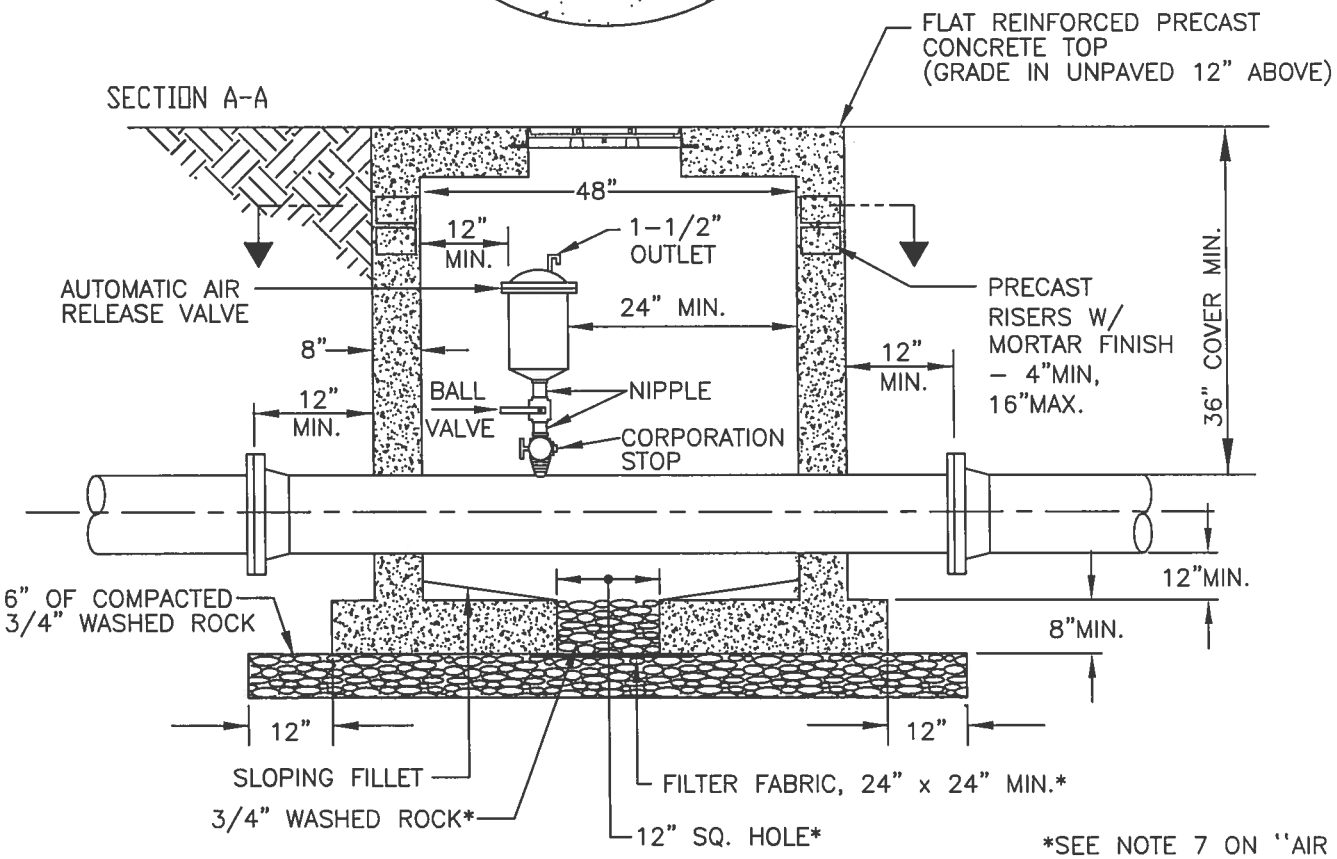
PRESSURE PIPE

PIPELINE TRENCH / BACKFILL / PAVEMENT RESTORATION



SECTION A-A





*SEE NOTE 7 ON "AIR RELEASE VALVE AND VAULT NOTES" STANDARD (P-6)

PRESSURE PIPE

AIR RELEASE VALVE AND VAULT

REVISED:	HALL COUNTY PUBLIC WORKS ENGINEERING DIVISION	STANDARD
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NOTES:

1. CONCRETE USED FOR VAULTS, MANHOLES, AND RISERS SHALL HAVE AN ULTIMATE COMPRESSIVE STRENGTH AT 28 DAYS OF 4000 P.S.I. CEMENT SHALL BE TYPE II PORTLAND.
2. VAULT SHALL BE PRECAST OR POURED IN PLACE CONCRETE IN ACCORDANCE WITH ASTM C478.
3. AIR RELEASE VALVE SHALL BE TYPE AND SIZE APPROPRIATE FOR SERVICE INTENDED.
4. ALL OPENINGS SHALL BE SEALED WITH WATERPROOF NON-SHRINK GROUT.
5. COATINGS ON INTERIOR & EXTERIOR OF MANHOLES AND VAULTS SHALL BE IN ACCORDANCE WITH PUBLIC WORKS & UTILITIES DEPT. APPROVED PRODUCT LIST, AND APPLIED IN TWO DIFFERENT COLORED COATS.
6. REINFORCED CONCRETE COLLAR REQUIRED WHEN MANHOLE OR VAULT IS OUTSIDE PAVEMENT.
7. NO SUMPS SHALL BE ALLOWED IN VAULTS FOR FORCE MAIN ARV'S.
8. SUMPS OF WATER MAIN ARV'S SHALL HAVE 3/4" WASHED ROCK PLACED IN SUMP ABOVE FILTER FABRIC.
9. FOR VAULT TO BE CONSTRUCTED OVER EXISTING PIPE, SEE "DOG HOUSE MANHOLE" STANDARDS.

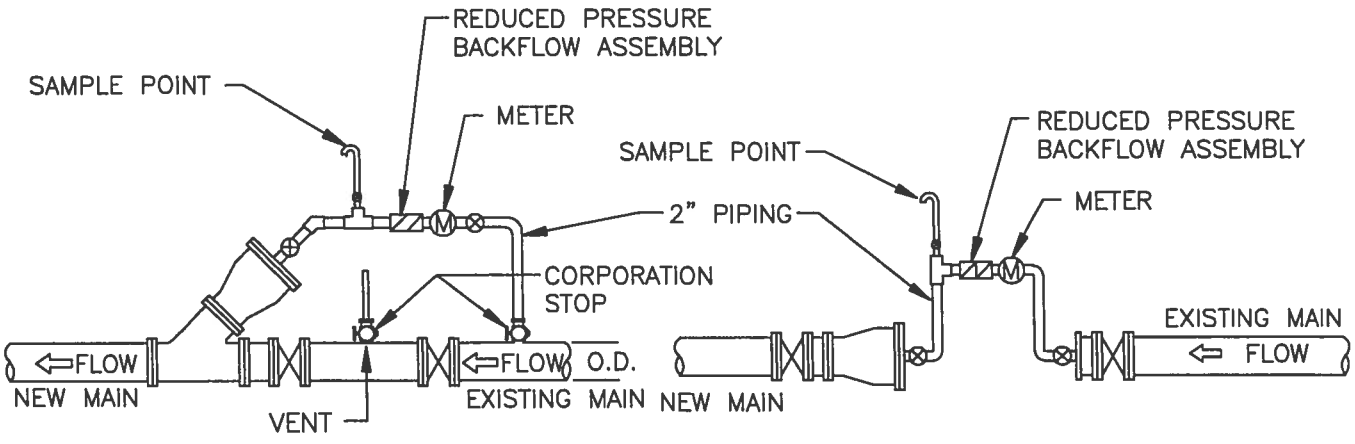
PRESSURE PIPE
AIR RELEASE VALVE
AND VAULT NOTES

EXCEPT AS INDICATED BELOW FOR SHORT LENGTHS, EACH SECTION OF PIPELINE SHALL BE THOROUGHLY CLEANED WITH ONE POLYURETHANE FOAM PIG EACH TIME.

A COUNTY PUBLIC WORKS & UTILITIES CONSTRUCTION COORDINATOR SHALL BE PRESENT AT THE TIME OF INSERTION AND EXIT OF THE PIGS. LINES SHALL BE PIGGED AND/OR FLUSHED UNTIL THE WATER RUNS CLEAR AND IS APPROVED BY THE PUBLIC WORKS & UTILITIES REPRESENTATIVE. THE COUNTY REPRESENTATIVE SHALL BE GIVEN 48 HOURS MINIMUM NOTICE PRIOR TO PIGGING OR FLUSHING.

ON SHORT LENGTHS OF PIPELINE (100' MAX.) CLEANING MAY BE ACCOMPLISHED BY FLUSHING WITH WATER AT A MINIMUM VELOCITY OF 2.5 FEET PER SECOND. WATER REQUIRED FOR TESTING AND CLEANING SHALL BE SUPPLIED BY THE CONTRACTOR AT THE CONTRACTOR'S EXPENSE. WATER SHALL BE FROM A SOURCE SATISFACTORY TO THE COUNTY.

1. REDUCER TO BE NEW MAIN SIZE PLUS 2" LARGER.
2. WYE TO BE PLUGGED AND RESTRAINED AT THE END OF PIGGING.
3. AT THE END OF THE PROJECT, ALL CORPORATIONS TO BE REMOVED AND CORPORATION PLUGS TO BE INSTALLED.
4. SAMPLE POINT TO BE LOCATED AFTER BACKFLOW PREVENTER.
5. ALL MATERIALS, PIPE AND FITTINGS TO BE TO HALL COUNTY SERVICE STANDARDS.
6. INSTALL REDUCER WITH PIG INSIDE. ONLY ONE PIG WILL BE ALLOWED TO BE RUN THROUGH THE MAIN AT A TIME. PIPE EXTENSION CAP MAY BE REQUIRED.



OPTION "A" OPTION "B"

PRESSURE PIPE
PIGGING PROCEDURE

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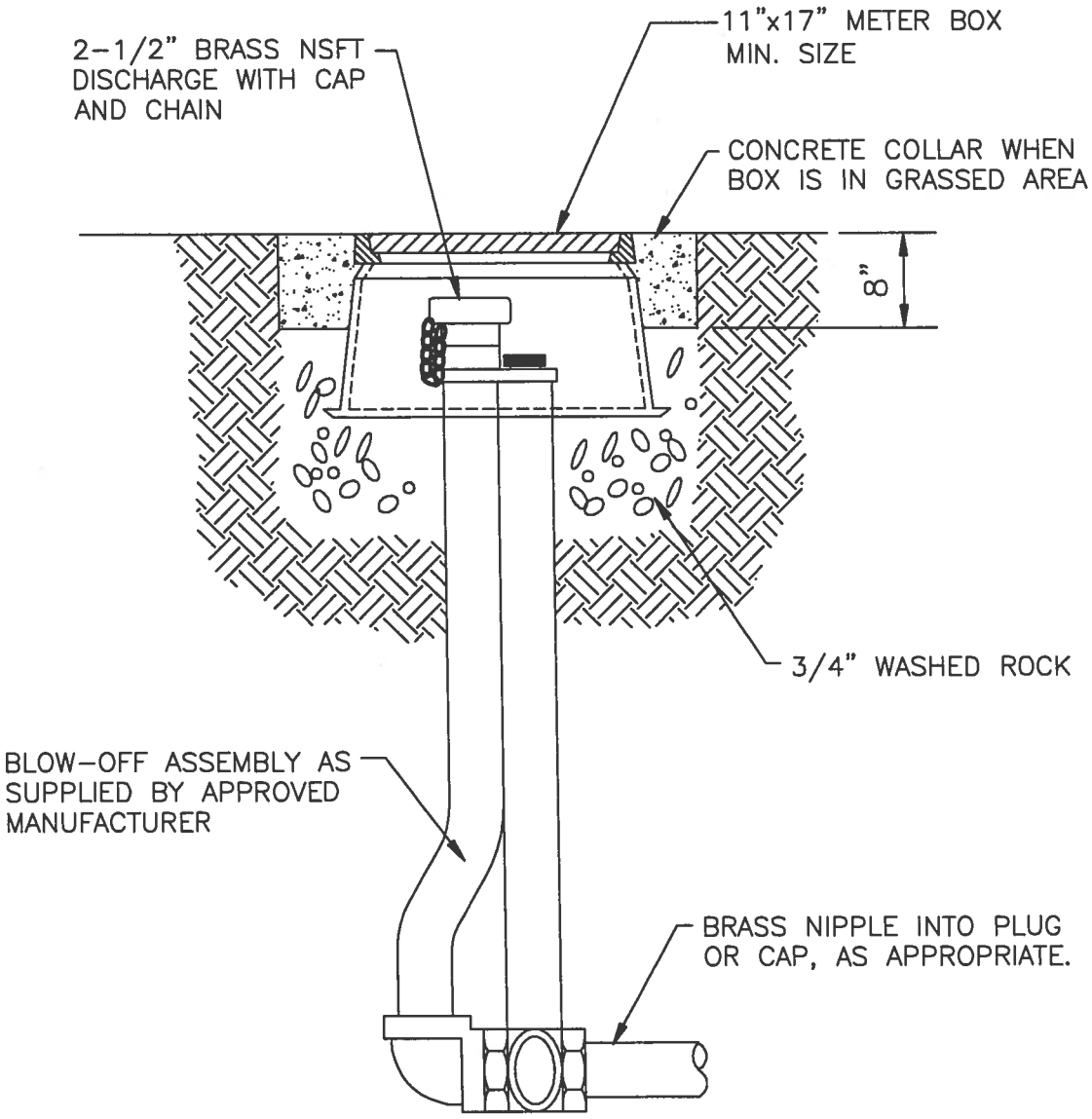

PRESSURE PIPE
2" TERMINAL
BLOW-OFF

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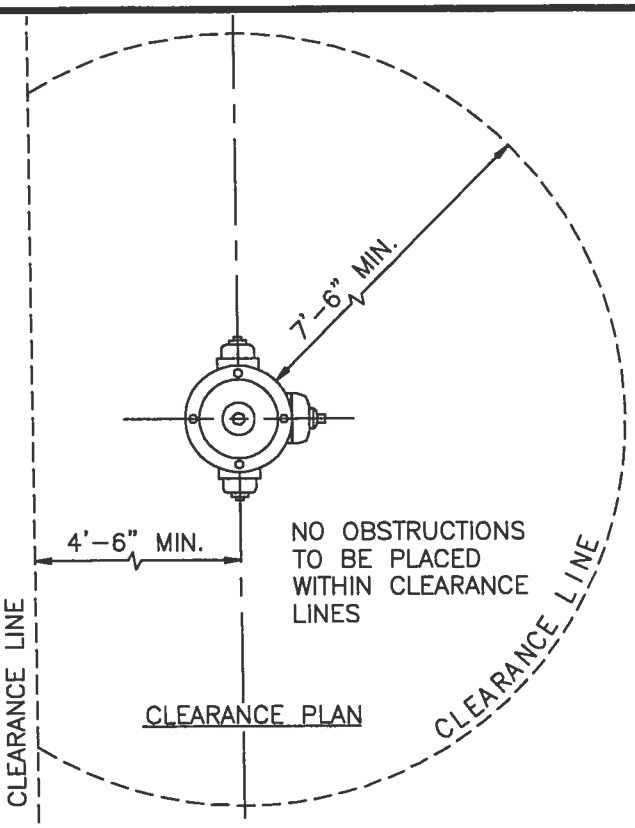
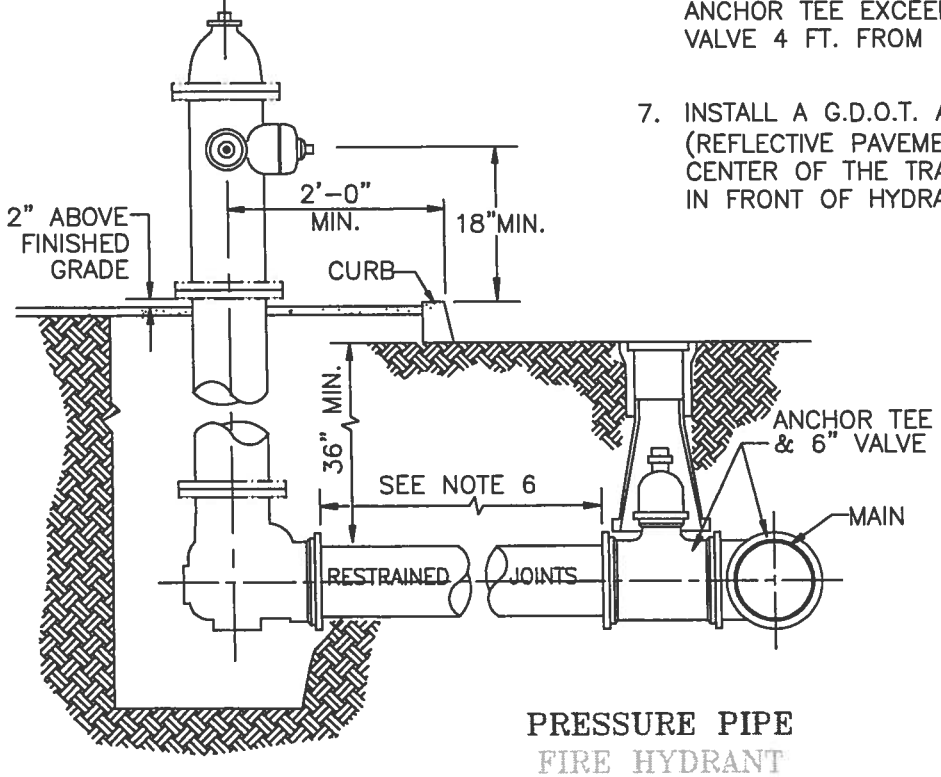


NOTES:

1. ALL HYDRANTS TO BE MANUFACTURED TO HALL COUNTY SPECIFICATIONS, INCLUDING IRON WEATHER CAP, PER HALL COUNTY APPROVED PRODUCTS LIST.
2. BONNET SHALL BE PAINTED WITH REFLECTIVE COATING. ALL OTHER PARTS ABOVE BREAKWAY FLANGE SHALL BE PAINTED SILVER. ANY OTHER PARTS BELOW BREAKWAY FLANGE SHALL BE PAINTED BLACK. ALL PAINT MATERIALS TO BE AS SPECIFIED ON APPROVED MATERIALS LIST.
3. FOR PROJECTS WITHIN OTHER MUNICIPALITIES R/W:
   HYDRANTS TO BE LOCATED IN DEDICATED EASEMENTS OUTSIDE OF R/W.
4. ALL JOINTS INCLUDING BELL AND SPIGOT SHALL BE RESTRAINED.
5. SEE "VALVE BOX SETTING" STANDARD FOR ADDITIONAL DETAILS.
6. IF DISTANCE BETWEEN FIRE HYDRANT AND ANCHOR TEE EXCEEDS 30 FT., ADD A SECOND VALVE 4 FT. FROM HYDRANT.
7. INSTALL A G.D.O.T. APPROVED BLUE R.P.M. (REFLECTIVE PAVEMENT MARKER) IN THE CENTER OF THE TRAVELING LANE, DIRECTLY IN FRONT OF HYDRANT.



PRESSURE PIPE
FIRE HYDRANT
CONNECTION

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HYDRANT INFO:

1. 50' MAXIMUM ALLOWABLE DISTANCE FROM A FDC (FIRE DEPARTMENT CONNECTION) TO A FIRE HYDRANT.

2. NORMALLY HYDRANTS SHALL BE A MINIMUM DISTANCE OF 40 FEET FROM A BUILDING. HYDRANTS CAN BE CLOSER THAN 40 FEET TO A BUILDING BASED UPON A REVIEW BY THE FIRE OFFICIAL.

3. FIRE HYDRANT SPACING;
   A. 300' SEPARATION BETWEEN HYDRANTS IN A COMMERCIAL ZONE
   B. 500' SEPARATION BETWEEN HYDRANTS IN A RESIDENTIAL NEIGHBORHOOD.
   C. 1,000' SEPARATION IN UNDEVELOPED AREAS.

4. 3.0' CLEARANCE IN FRONT AND TO THE SIDES (FULL-CIRCLE) OF HYDRANTS, 4.5' BEHIND.

5. WET FIRE HYDRANTS ARE REQUIRED PRIOR TO, DURING AND AFTER CONSTRUCTION.

6. THE FOLLOWING HORIZONTAL SEPARATION REQUIREMENTS FOR FIRE HYDRANT DRAINS IS REQUIRED:
   A. 3' (MINIMUM) FROM EXISTING OR PROPOSED STORM SEWER, STORMWATER FORCE MAIN, OR PIPELINE CONVEYING REGULATED RECLAIMED WATER
   B. 3' (MINIMUM) TO 10' (PREFERABLE) FROM EXISTING OR PROPOSED VACUUM-TYPE SANITARY SEWER
   C. 6' (MINIMUM) TO 10' (PREFERABLE) FROM EXISTING OR PROPOSED GRAVITY OR PRESSURE-TYPE SANITARY SEWER, WASTEWATER FORCE MAIN, OR PIPELINE CONVEYING NON-REGULATED RECLAIMED WATER.
   D. 10' (MINIMUM) FROM EXISTING OR PROPOSED ON-SITE SEWAGE TREATMENT AND DISPOSAL SYSTEM.

7. WHERE FIRE HYDRANTS ARE SUBJECT TO IMPACT BY A MOTOR VEHICLE, GUARD POSTS OR OTHER APPROVED MEANS SHALL COMPLY TO SECTION 312.

ROADWAY ACCESS:

1. 18' OF CLEARANCE FROM HYDRANTS TO ANYTHING ALONG THE ROADWAY, SUCH AS PARKING SPACES.

2. FOR FIRE TRUCK ACCESS, THE MIN. DRIVEWAY WIDTH ON THE ENTRY DRIVE SHALL BE 20'. LESS THAN 20' ON EXIT DRIVE CAN BE APPROVED BY THE FIRE OFFICIAL AFTER REVIEW.

3. THE MINIMUM RADIUS FOR CUL-DE-SAC DESIGNS IS 50' OF PAVED AREA, FOR FIRE TRUCK TURNING RADIUS. T OR Y TURN-A-ROUNDS CAN BE APPROVED BY THE FIRE OFFICIAL AFTER REVIEW.

4. FIRE TRUCKS NEED TO HAVE NO LESS THAN 13.5' HIGH VERTICAL CLEARANCE FOR THE TRUCK TO DRIVE THROUGH AN OPENING.

PRESSURE PIPE
FIRE DEPARTMENT REQUIREMENTS
FOR R.O.W. HYDRANTS

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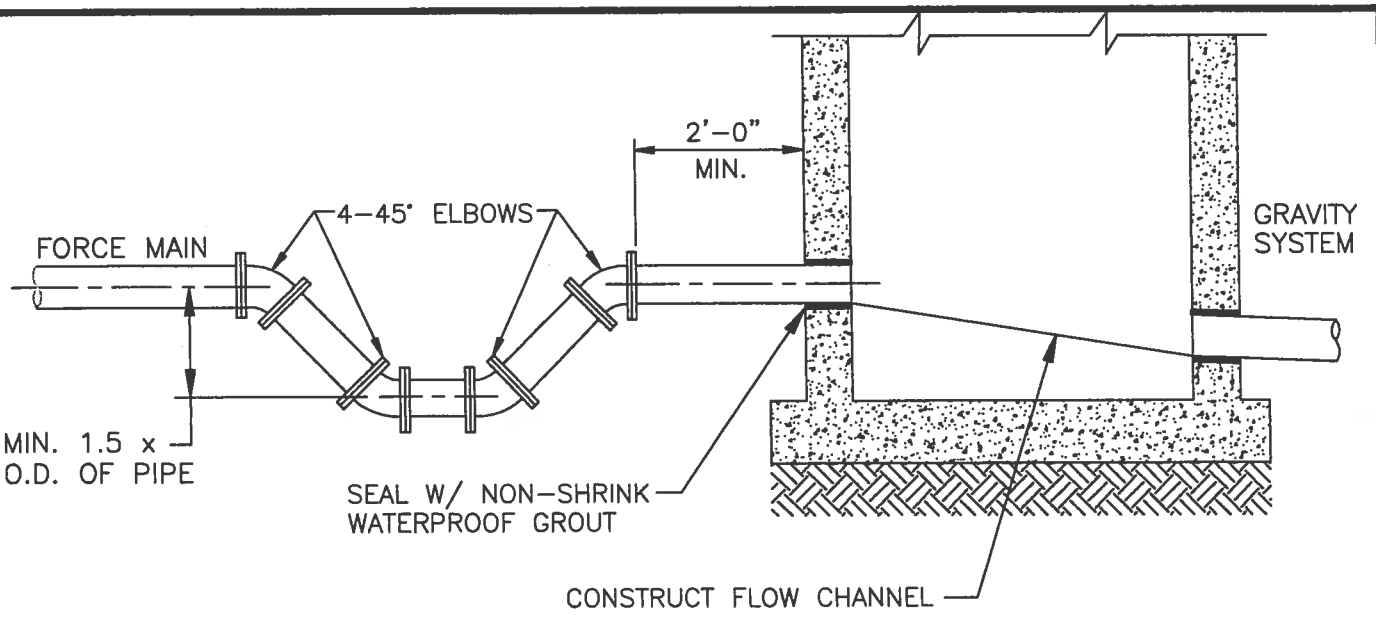

NOTES:

1. FORCE MAIN TO ENTER MANHOLE AT 180° ± 10° FROM GRAVITY OUTFLOW.
2. THE INVERT LEVEL OF FORCE MAIN AT POINT OF ENTRY SHALL BE NO MORE THAN 4" ABOVE INVERT OF GRAVITY OUTLET, AND NO LESS THAN 2 1/2".
3. ENTRY INTO EXISTING MANHOLES SHALL BE BY CORING ONLY.
4. TRAP TO BE INSTALLED PRIOR TO DROP INTO MANHOLE AND, IF POSSIBLE, SHALL BE LOCATED OUTSIDE OF PAVED AREAS.
5. USE TWO 45° ELBOWS BETWEEN TRAP AND MANHOLE IF ELEVATION DROP IS REQUIRED TO ENTER MANHOLE.
6. FLOW CHANNEL REQUIRED TO GRAVITY SYSTEM FROM FORCE MAIN.
7. INSIDE MANHOLE AND FLOW CHANNEL TO HAVE TWO DIFFERENT COLORED APPLICATIONS OF 100% SOLIDS EPOXY COATING OR OTHER COATINGS AS LISTED IN THE HALL COUNTY APPROVED PRODUCTS LIST.
8. MEGALUG 1100 SERIES M.J. ADAPTERS ON ALL 3" OR LARGER FITTINGS & PIPE.
9. IF FORCE MAIN IS TO DISCHARGE INTO AN EXISTING MANHOLE, THEN THE CONTRACTOR SHALL REPLACE OR REHABILITATE MANHOLE AS REQUIRED BY THE COUNTY. COST SHALL BE INCLUDED IN PRICE OF THE FORCE MAIN.

PRESSURE PIPE
FORCE MAIN
AT MANHOLE

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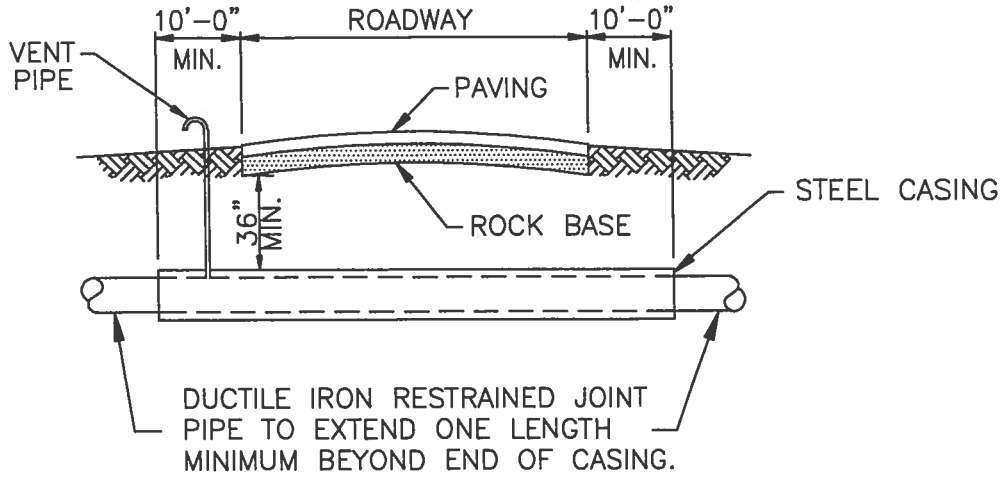
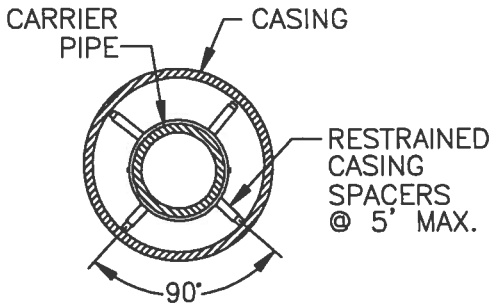


CARRIER PIPE SIZE	STEEL CASING	MIN. WALL THICKNESS	VENT PIPE SIZE
4"	12"	.188	2"
6"	14"	.250	2"
8"	16"	.250	2"
10"	18"	.250	2"
12"	20"	.250	3"
14"	24"	.250	3"
16"	24"	.250	3"
18"	30"	.250	4"
20"	30"	.250	4"
24"	36"	.250	4"
30"	42"	.312	4"
36"	48"	.375	4"
42"	60"	.500	4"
48"	72"	.500	4"



NOTES:

1. PIPE CASING SHALL BE IN ACCORDANCE WITH CURRENT ASTM SPECIFICATION A139 AND BE PROTECTED BY A BLACK BITUMASTIC COATING FOR PROTECTION AGAINST CORROSION.
2. EXCEPT AS NOTED, WALL THICKNESS SHALL BE AS NOTED IN TABLE ABOVE, EXCEPT THAT LATEST G.D.O.T. STANDARDS, OR RAILROAD STANDARDS SHALL APPLY TO THOSE INSTALLATIONS.
3. PIPE THROUGH CONFLICT STORM AND SANITARY STRUCTURES MUST USE THIS DETAIL. THE END OF THE CASING MUST EXTEND A MINIMUM OF 12" OUTSIDE OF THE STRUCTURE.
4. ENDS SHALL BE SEALED WITH APPROVED PRESSURE RESISTANT FITTINGS, NO GROUT.

PRESSURE PIPE
PIPE CASING

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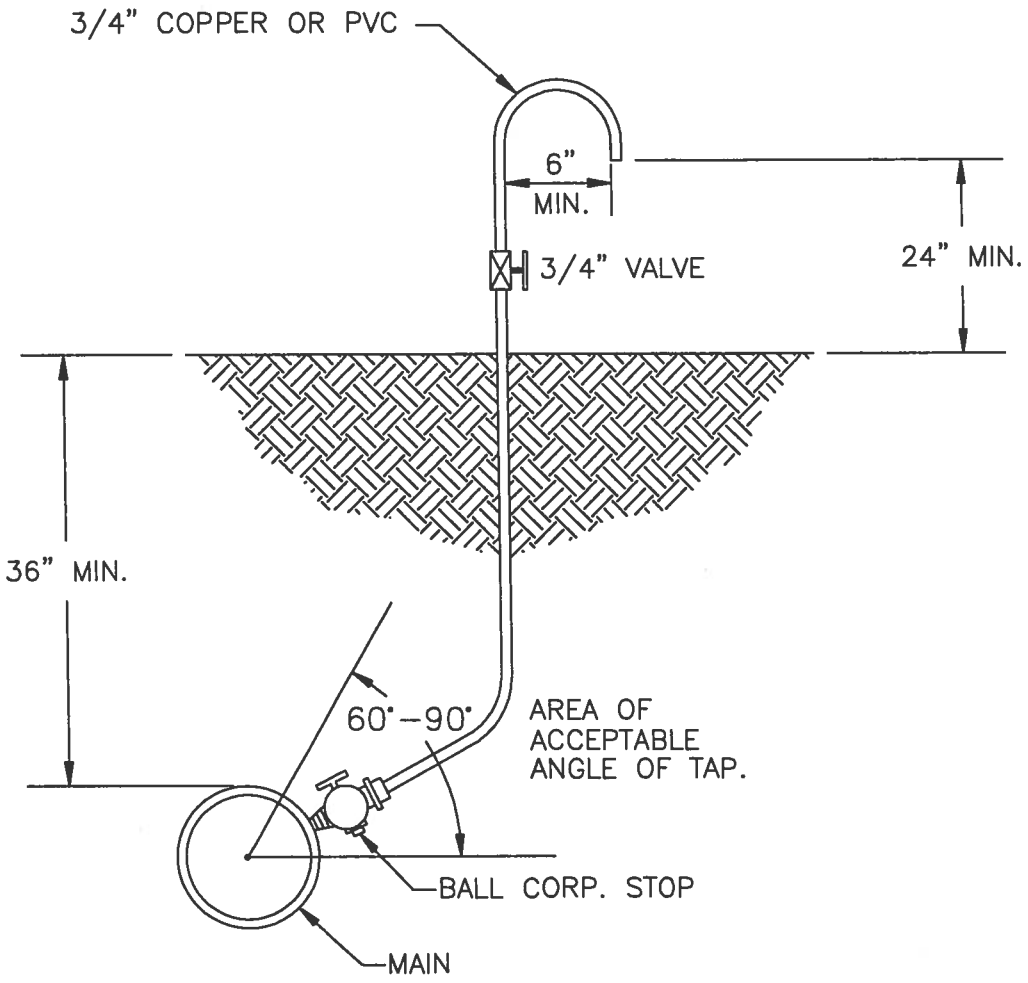
AFTER SATISFACTORY BACTERIOLOGICAL TESTING, REMOVE THE TUBING, CORPORATION AND PLUG THE MAIN WITH CORPORATION PLUGS.



SAMPLING POINT CONNECTION

PRESSURE PIPE
SAMPLING POINT

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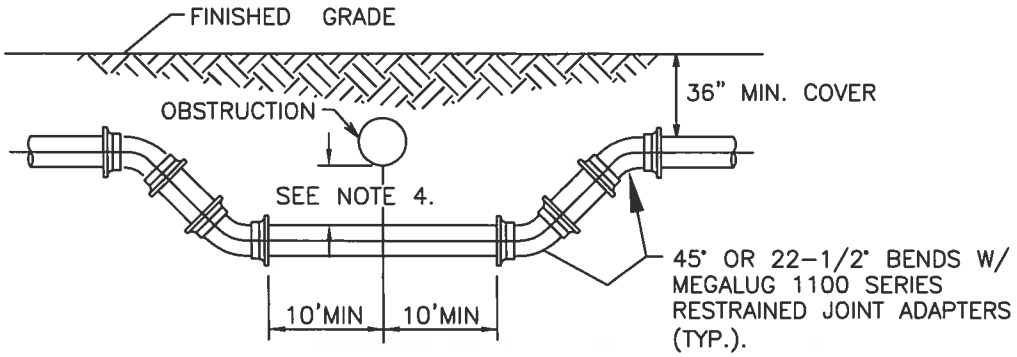
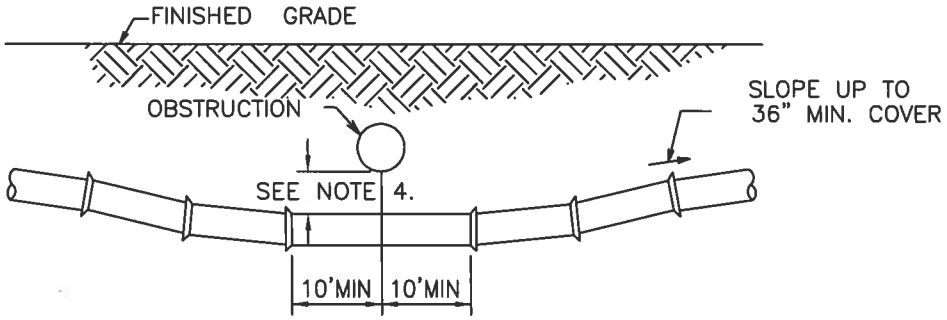


SPECIAL UTILITY CROSSING - FITTING TYPE



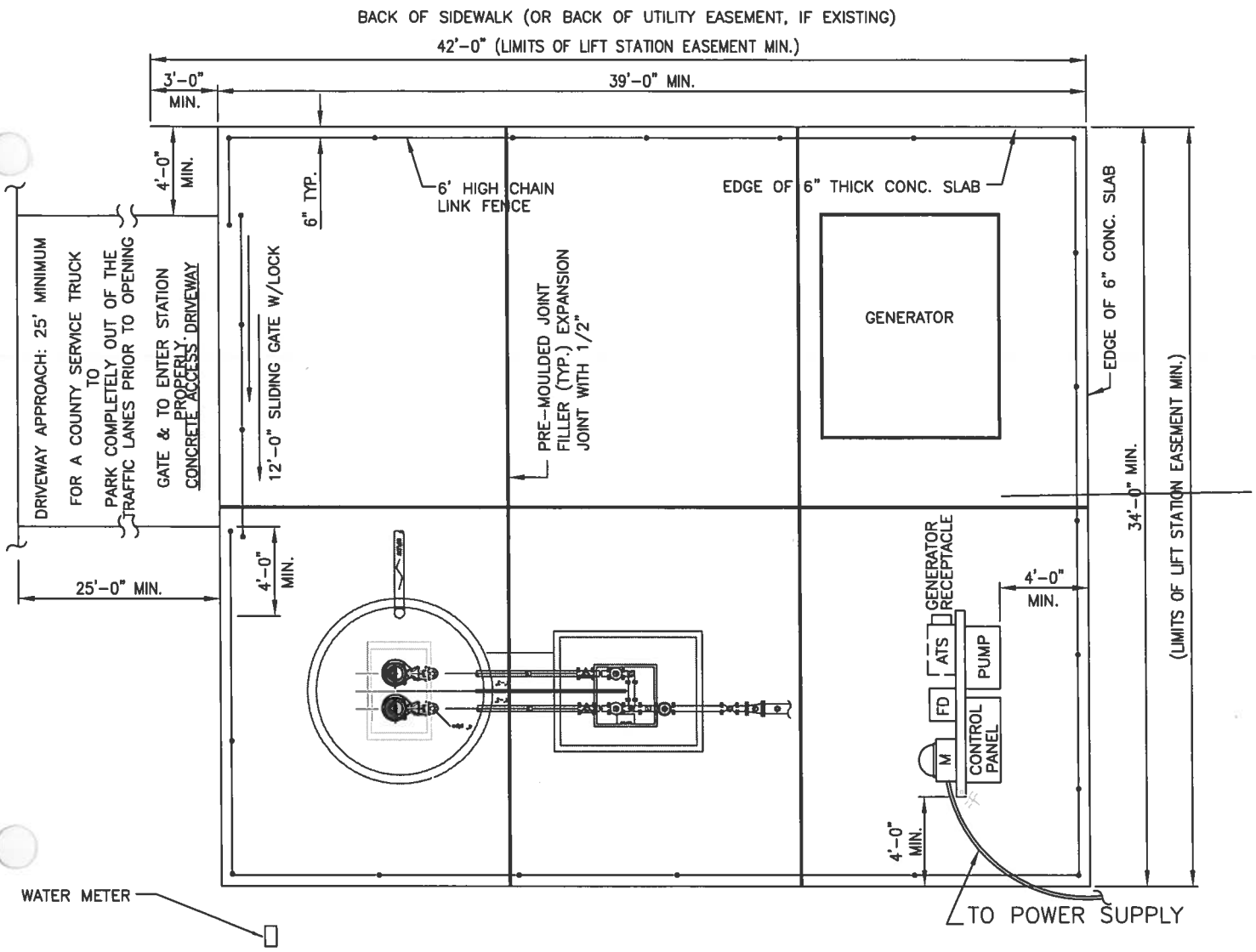
SPECIAL UTILITY CROSSING - DEFLECTION TYPE

N.T.S.

1. THE DEFLECTION TYPE CROSSING SHALL BE USED WHEREVER POSSIBLE. ONLY UNDER SPECIFIC ORDERS BY THE ENGINEER SHALL THE FITTING TYPE CROSSING BE ALLOWED.
2. CONSTRUCT DEFLECTION CROSSING USING 75% OF MANUFACTURER'S MAXIMUM JOINT DEFLECTION.
3. ALL MECHANICAL JOINTS SHALL BE RESTRAINED PER COUNTY STANDARDS.
4. UNLESS SHOWN OTHERWISE, 18" MIN. CLEARANCE WILL BE REQUIRED FOR WATER AND SEWER MAIN CROSSINGS. 6" MIN. CLEARANCE WILL BE REQUIRED FOR OTHER TYPE OF UTILITIES CROSSINGS.
5. IF DEFLECTION CANNOT BE OBTAINED THEN USE USE PIPE CASING AS SHOWN IN "PIPE CASING DETAIL"
6. WHERE EITHER OF THESE CROSSINGS OR THE ENCASEMENT DETAIL CANNOT BE USED, THEN A CONFLICT STRUCTURE MUST BE BUILT AROUND THE HALL COUNTY PRESSURE PIPE WITH THE HALL COUNTY PIPE ENCASED THROUGH THE STRUCTURE USING A CASING AS SHOWN IN THE "PIPE CASING DETAIL"

UTILITY CONFLICT CROSSING

PRESSURE PIPE



TYPICAL LIFT STATION – PLAN

NOTES:

1. CHAIN LINK FENCE W/ALL PARTS, INCLUDING POSTS & HARDWARE TO BE THERMALLY FUSED VINYL COATING OVER GALV. STEEL. POSTS TO BE CORED AND GROUTED INTO CONCRETE. FABRIC TO BE KNUCKLED TOP & BOTTOM.
2. INDICATED LIMITS OF LIFT STATION EASEMENT ARE MINIMUM, SUBJECT TO ACTUAL WETWELL & PIPE SIZES.
3. ACCESS DOORS TO WET WELL TO BE CHECKERED PLATE ALUMINUM, WITH RECESSED HANDLES AND 316 STAINLESS STEEL HARDWARE AS SPECIFIED ON APPROVED MATERIALS LIST.
4. PROVIDE A.T.S. WITH GENERATOR RECEPTACLE ON DRIVEWAY SIDE.
5. PROVIDE A TRAILER MOUNTED STAND–BY GENERATOR WITH CRITICAL GRADE SILENCER 25 dbs @ 50 FEET. UNIT SHALL CONTAIN A FUEL TANK SIZED TO PROVIDE 48 HOURS OF CONTINUOUS OPERATION. CONNECT GENERATOR TO THE AUTOMATIC TRANSFER SWITCH VIA THE SIDE MOUNTED GENERATOR RECEPTACLE.
6. STEEL FOR CONCRETE SLAB" #4 @ 12" O.C.B.W. & 4 SETS OF (2)#4 @ 4'–0" AROUND WET WELL.
7. GROUND ELECTRICAL SYSTEM TO REBAR IN CONCRETE PAD.

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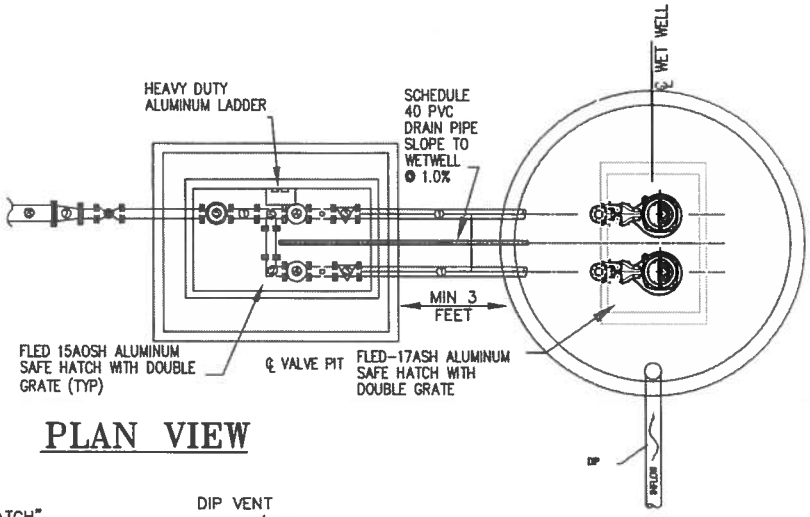
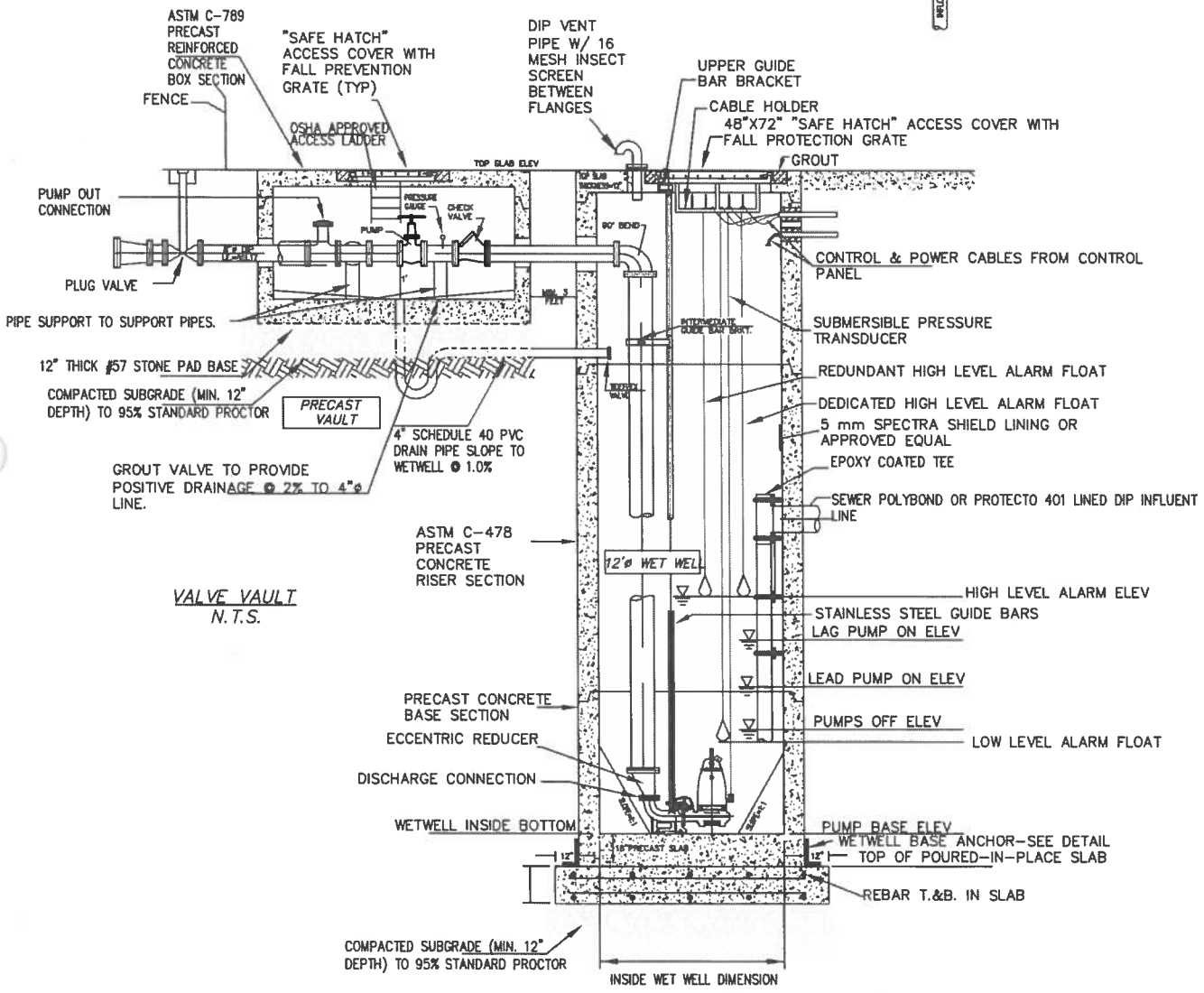


PLAN VIEW



VALVE VAULT
N.T.S.

SUBMERSIBLE LIFT STATION
WET WELL
SECTION THRU LIFT STATION

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LIFT STATION DATA	
TOP OF SLAB (ABOVE 100 YR. FLOOD)	EL "A"
*FINISH GRADE	EL "B"
℄ DISCHARGE PIPE	EL "C"
LOWEST INFLUENT LINE - INVERT/HIGH WATER ALARM	EL "E"
BACK UP LAG PUMP - ON	"E" - 3"
BACK UP LEAD PUMP - ON	"E" - 6"
LAG PUMP - ON (MAIN CONTROLLER)	"E" - 6"
LEAD PUMP - ON(MAIN CONTROLLER)	EL "F" "E" - 12"
BACK UP FLOAT LOW - OFF	EL "F" "E" - 12"
BOTH PUMPS - OFF	EL "G" "E" - 48"
PUMP SUCTION	EL "H" 4" ABOVE "I"
WET WELL BASE SLAB	EL "I" 6' BELOW EL "E"
PUMP SUCTION CLEARANCE	4" MIN. (EL "H" - EL "I")
PUMP DISCHARGE	DIA "J"
DIP EPOXY LINED OR HDPE PIPE	DIA "K"
COMMON FORCE MAIN	DIA "L"

*MAXIMUM 4" BELOW TOP OF SLAB (EL. "A")

LIFT STATION	MOTOR H.P.	VOLTAGE	DISTANCE TO FP&L SERVICE	WIRE SIZE	D.S.	MCB & ECB	MB1 & MB2	MOTOR STARTERS

MAXIMUM ALLOWABLE PUMP CAPACITY FOR SUBMERSIBLE LIFT STATIONS IS 1500 GPM

SUBMERSIBLE LIFT STATION
LIFT STATION
REQUIRED DATA

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MAY 2009	ENGINEERING DIVISION	SLS-3

PROJECT NAME: _____

PROJECT NO: _____ LIFT STATION NO. / NAME: _____

LIFT STATION LOCATION: _____

IN ATTENDANCE: _____

_____

_____

GENERAL INFORMATION

PUMP TYPE: _____

MANUFACTURER: _____

MODEL NO: _____ IMPELLER NO: _____ HP: _____

DESIGN POINT: _____ GPM: _____ FT. TDH: _____

MAIN BREAKER: _____ AMPS

MOTOR BREAKER #1: _____ AMPS STARTER #1 SIZE: _____

MOTOR BREAKER #2: _____ AMPS STARTER #2 SIZE: _____

MOTOR BREAKER #3: _____ AMPS STARTER #3 SIZE: _____

SERVICE WIRE No. AND SIZE: _____ , SERVICE WIRE CONDUIT SIZE: _____

LENGTH OF SERVICE RUN: _____

DESCRIPTION OF SERVICE RUN: _____

TRANSFORMER LOCATION: _____

WET WELL DIAMETER: _____ DISCHARGE PIPE SIZE: _____

WET WELL DIAMETER:	VOLUME PER FOOT:
4 - FOOT	94 GALLONS PER FOOT
6 - FOOT	211 GALLONS PER FOOT
8 - FOOT	376 GALLONS PER FOOT
10 - FOOT	587 GALLONS PER FOOT

SUBMERSIBLE LIFT STATION
PUMP TEST / START-UP FORM
To Be Completed by Contractor / Pump Manufacturer

GENERAL INFORMATION

PUMP No.: _____ DATE: _____ TIME: _____

FORCE MAIN PRESSURE (STATIC) NO PUMP RUNNING: _____ (PSI)

FORCE MAIN PRESSURE (STATIC) NO PUMP RUNNING: _____ (PSI)

FORCE MAIN PRESSURE #: _____ & _____ PUMP RUNNING: _____ (PSI)

FORCE MAIN PRESSURE #: _____ , _____ & _____ PUMP RUNNING: _____ (PSI)

1) INFLOW DETERMINATION:

ΔH= (BEGIN LEVEL, _____ FT.) - (END LEVEL, _____ FT.) = _____ FT.

TEST TIME = _____ MINUTES

INFLOW = ΔH=, _____ FT/ _____ MIN. VOLUME _____ = _____ GPM

2) PUMP FLOW:

ΔH= (END LEVEL, _____ FT.) - (BEGIN LEVEL, _____ FT.) = _____ FT.

TEST TIME = _____ MINUTES

PUMP FLOW = ΔH=, _____ FT/ _____ MIN. x VOL., _____ + INFLOW _____ = _____ GPM

VOLTAGES: A - B = _____ VOLTS AMPS: A = _____ AMPS

A - C = _____ VOLTS AMPS: B = _____ AMPS

B - C - _____ VOLTS AMPS: C = _____ AMPS

VOLTAGES: _____

_____

_____

_____

_____

_____

_____

_____

SUBMERSIBLE LIFT STATION
PUMP TEST / START-UP FORM
(To be completed by Contractor / Pump Manufacturer)

PERFORM MOTOR WINDING INSULATION RESISTANCE TESTING AS FOLLOWS:

A) PERFORM TEST PRIOR TO START-UP OF LIFT STATION WITH THE CONSTRUCTION COORDINATOR AND LIFT STATION PERSONNEL PRESENT.

B) USE A MOTORIZED OR BATTERY OPERATED METER, SET AT A TEST VOLTAGE AS CLOSE AS POSSIBLE TO THE NORMAL OPERATING VOLTAGE OF THE MOTOR.

C) LOG THE READINGS AT THE ONE MINUTE AND TEN MINUTE INTERVAL ON THE TABLE BELOW.

D) COMPLETE THE WINDING INSULATION POLARIZATION INDEX (P.I.)

P.I. TEST STARTED AT 500 VOLTS				
MOTOR NO.	TEST VOLTAGE	1 MIN. READING	10 MIN. READING	POLORIZATION INDEX
1				
2				
3				
4				

COMMENTS: _____

_____

_____

_____

_____

_____

_____

_____

SUBMERSIBLE LIFT STATION
P.I. TEST FORM
(To be completed by Contractor / Pump Manufacturer)

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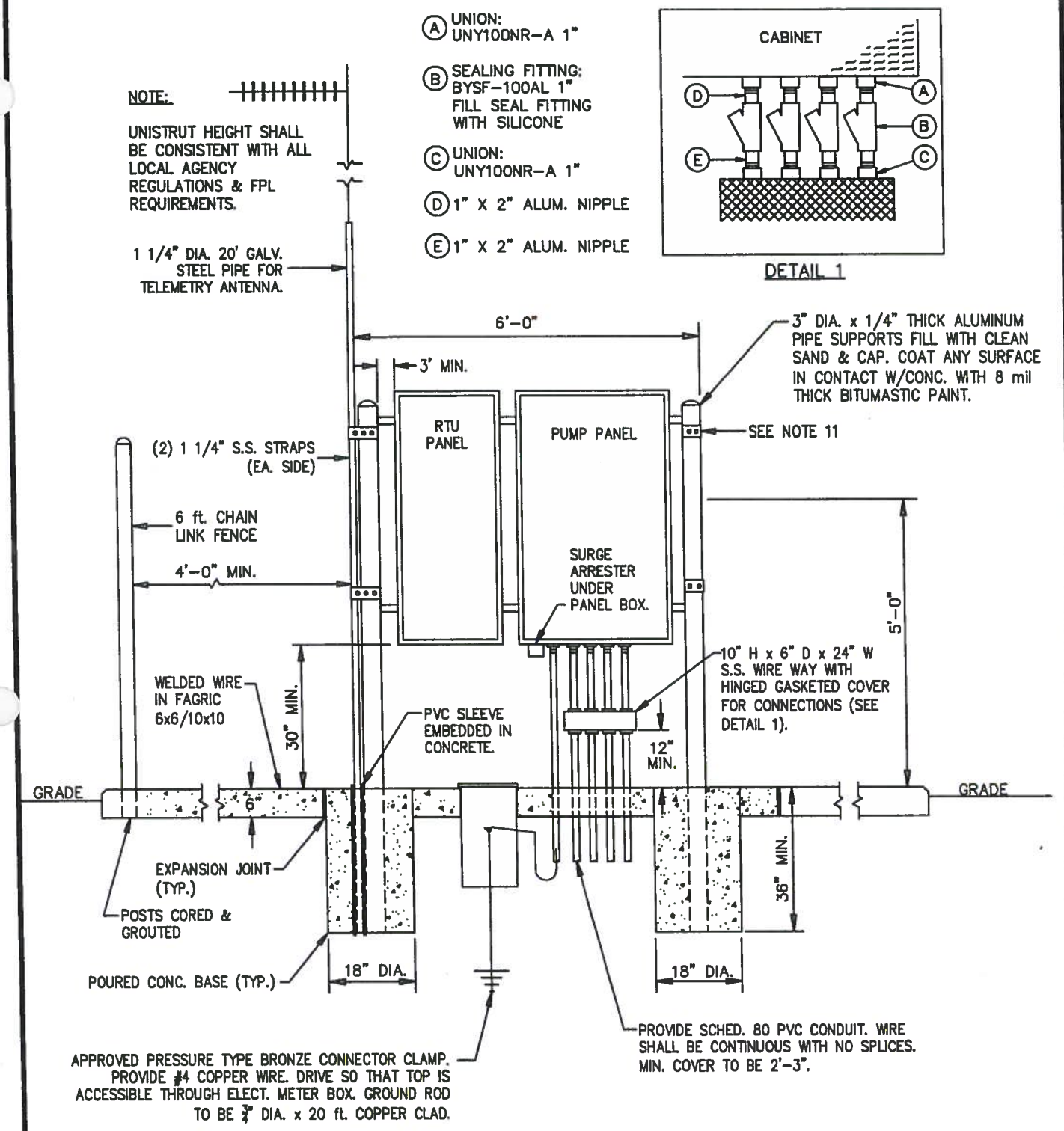

SUBMERSIBLE LIFT STATION
ELECTRICAL PANELS
ELEVATION

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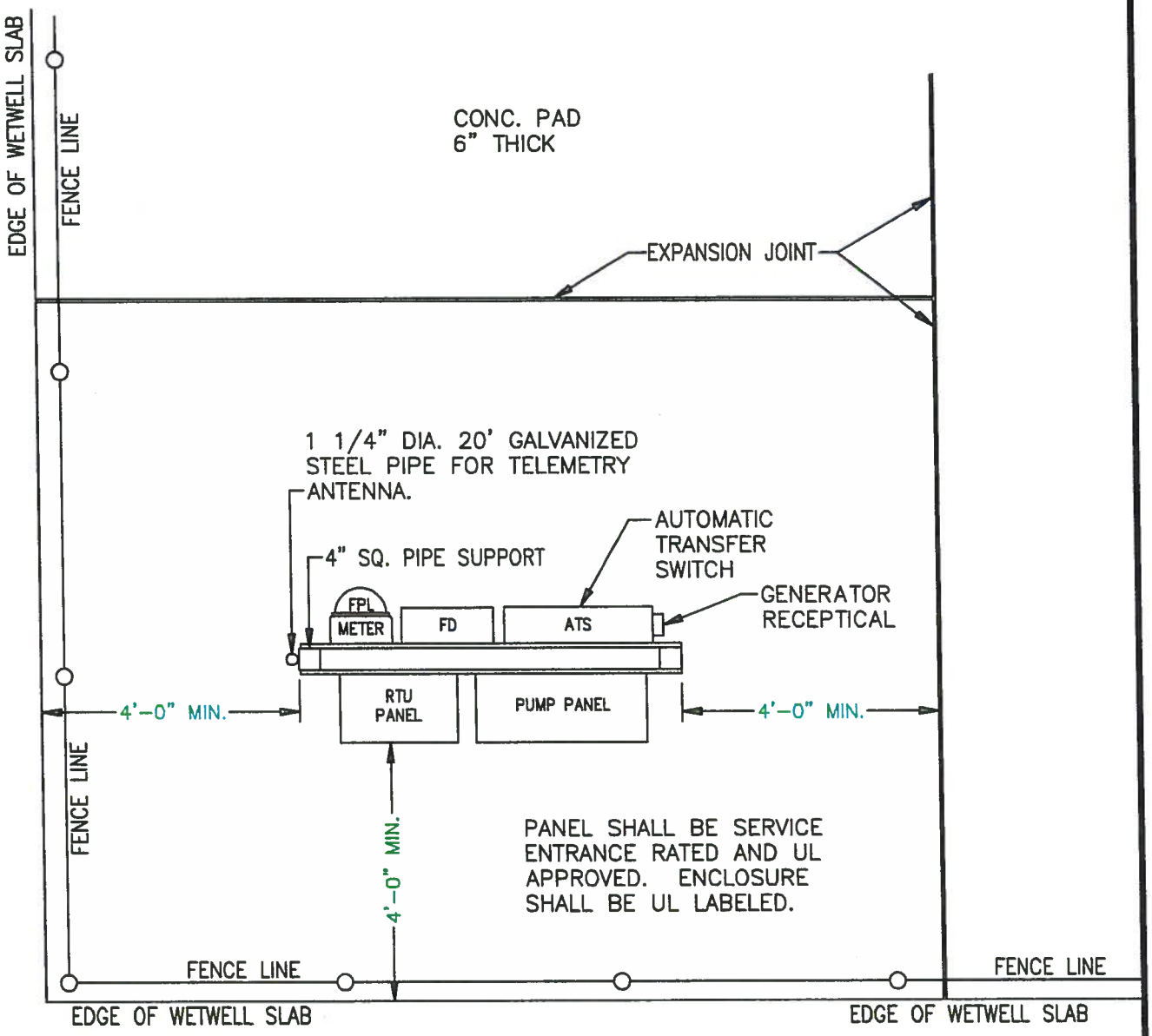

SUBMERSIBLE LIFT STATION
ELECTRICAL PANELS
PLAN VIEW

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NOTES:

1. TELEMETRY ANTENNA AND RELATED R.T.U. EQUIPMENT SHALL BE INSTALLED BY THE CONTRACTOR.
2. ALL CONDUIT SIZES INCLUDING TO FP&L SHALL BE SIZED FOR TWICE THE INSTALLED HORSE-POWER CAPACITY.
3. ALL WIRES SHALL BE COPPER RATED XHHW
4. BOND WIRE SIZED PER NEC TABLE 250-95 SHALL BE INSTALLED FROM THE GROUND BUS IN THE CONTROL PANEL TO EACH MOTOR CASING.
5. CONNECT PUMP AND FLOAT CABLES IN NEMA 3 R WIRE WAY WITH TERMINAL STRIP CONNECTORS. NO SPLICED WIRES ALLOWED. ALL PIPE/CONDUIT CONNECTIONS FROM WETWELL MUST RUN VIA THE WIREWAY.
6. WET WELL ACCESS DOOR SHALL BE ORIENTED SO AS TO PROVIDE A BARRIER BETWEEN THE ELECTRICAL SWITCH GEAR ASSEMBLY AND THE OPEN WET WELL.
7. CONTRACTOR SHALL COORDINATE ALL SERVICE INSTALLATIONS OF 3 PHASE POWER WITH FP&L. FEES TO BE CONTRACTOR'S RESPONSIBILITY. AFTER ACCEPTANCE OF STATION, CONTRACTOR SHALL MAKE ARRANGEMENTS AND COORDINATE TRANSFER OF FP&L SERVICE TO CITY'S ACCOUNT.
8. PROVIDE 5 FEET OF EXCESS WIRE EXPOSED AT SERVICE WEATHER HEAD OR BOX FOR CONNECTION BY FPL.
9. IF APPLICABLE THE L2 CONDUCTOR SHALL BE THE HIGHER VOLTAGE TO GROUND AND BE DURABLY AND PERMANENTLY MARKED BY AN OUTER FINISH THAT IS ORANGE IN COLOR, CLOCKWISE ROTATION.
10. ALL PANELS AND ELECTRICAL BOXES AND ASSOCIATED FITTINGS SHALL BE NEMA 3 R RATED, FOR HAZARDOUS LOCATION.
11. PANELS SHALL BE MOUNTED TO TWO 3" DIAMETER ALUMINUM POST SUPPORTS. PANEL SHALL BE BUILT BY A UL APPROVED SHOP AND ADHERE TO UL STANDARDS. PANEL SHALL HAVE A UL 508 LABEL ON THE INTERIOR OF THE ENCLOSURE DOOR. LENGTH OF THE POST SUPPORTS SHALL BE SIZED SO AS TO PROVIDE FOR 36" OF BURIAL (IN 2500 PSI CONCRETE) AND EXTEND TO 3 INCHES ABOVE THE TOP OF THE SUPPORTS. THE PANEL SHALL BE MOUNTED TO THE POST SUPPORTS WITH 1-5/8" X 1-5/8" 12 GAUGE STAINLESS STEEL UNISTRUT AT A HEIGHT CONSISTENT WITH FP&L'S REQUIREMENT FOR MOUNTING THEIR METER. ALL HARDWARE SHALL BE STAINLESS 316 STEEL.
12. MOUNT AN EMERGENCY GENERATOR RECEPTACLE ON THE DRIVEWAY SIDE OF THE AUTOMATIC TRANSFER SWITCH, APPROXIMATELY FIVE (5) FEET ABOVE FINISH GRADE. TERMINATIONS SHALL BE PIN 1 – L1, PIN 2 – L2, PIN 3 – L3, PIN 4 – GROUND.
13. PERFORM START-UP AS INSTRUCTED IN THE SPECIFICATIONS.
14. ALL APPLICABLE ELECTRICAL CODES (LATEST EDITION) MUST BE ADHERED TO INCLUDING WPB, NEC AND FP&L COMPANY REQUIREMENTS.
15. SEE STANDARD DETAILS PARTS LIST.

SUBMERSIBLE LIFT STATION
ELECTRICAL PANEL NOTES

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THE PUMP STATION PUMP PANEL SHALL BE PROVIDED WITH THE FOLLOWING FEATURES:

1. MAIN BREAKER, EMERGENCY BREAKER AND MOTOR BREAKERS SHALL BE 600 VOLT FRAME MINIMUM AND BE ABLE TO INTERRUPT THE AVAILABLE SHORT CIRCUIT CURRENT.
2. ALL WET WELL CONTROL CIRCUITRY SHALL BE 24 VOLT MAXIMUM.
3. SURGE ARRESTOR SHALL BE FIELD MOUNTED OUTSIDE THE PANEL AND SHIPPED SEPARATE TO PREVENT DAMAGE.
4. ELAPSED TIME METER FOR EACH PUMP SHALL BE PROVIDED.
5. PUMP MOTOR SELECTOR (HOA) SWITCHES REQUIRED. (TOGGLE SWITCHES SHALL NOT BE ACCEPTABLE.) PROVIDE ADDITIONAL STACK SWITCH ON "AUTO".
6. ALL MOTORS STARTERS AND BREAKERS SHALL BE MANUFACTURED BY CUTLER HAMMER COMPANY, ADVANTAGE TYPE 200, OR APPROVED EQUAL. MINIMUM MOTOR STARTERS SHALL BE NEMA–1, 600 V RATED. INNER PANEL COMPONENT LAYOUT AND BACK MOUNTING PANEL DRAWINGS SHALL BE PART OF THE SUBMITTAL FIFTEEN PERCENT OF PANEL SPACE SHALL BE RESERVED FOR FUTURE USE, ALLOCATED SPACE FOR STARTERS AND BREAKERS SHALL BE SUCH THAT THE NEXT HIGHER NEMA SIZE STARTER AND CORRESPONDING BREAKERS, INCLUDING MAIN AND EMERGENCY, SHALL PROPERLY FIT IN THE FUTURE (IF REQUIRED).
7. PANEL SHALL BE SURFACE WIRED WITH NUMBERED TERMINALS. TERMINAL STRIP SHALL BE LOCATED AT LEAST FOUR (4) INCHES FROM THE BOTTOM OF THE ENCLOSURE FOR ACCESSIBILITY.
8. RELAY CONTACTS SHALL BE RATED AT 10 AMP AND 120 VAC.
9. MOUNT AN 11" x 17" LAMINATED PLASTIC SCHEMATIC & PUMP DATA SHEET SHALL BE PERMANENTLY AFFIXED TO THE INTERIOR OF THE ENCLOSURE DOOR.
10. THE RTU PANEL SHALL CONTAIN THE BACK–UP CONTROLLER MOUNTED ON A DIN RAIL.
11. THE RTU PANEL SHALL ENCLOSE THE RADIO TELEMETRY SYSTEM CONSISTING OF A PUMP CONTROLLER, RADIO & ANTENNA. THE RTU SHALL BE FACTORY ASSEMBLED. ACCEPTABLE MANUFACTURERS SHALL BE:

    DCR ENGINEERING SERVICES INC.
    502 COUNTY ROAD, 640 EAST,
    MULBERRY, FL 33860
    (863) 428–8080

    SANTIS ENGINEERING INC.
    7011 N. ATLANTIC AVE. SUITE 101
    CAPE CANAVERAL, FL 32920
    (321) 868–6340

12. PROVIDE A LAMINATED 11" x 17" PLASTIC COPY OF THE ELECTRICAL SCHEMATIC DRAWING ATTACHED TO THE INTERIOR SURFACE OF THE ENCLOSURE OUTER DOOR. PROVIDE 6 COPIES FOR OFFICE USE.

SUBMERSIBLE LIFT STATION
PUMP PANEL REQUIREMENTS

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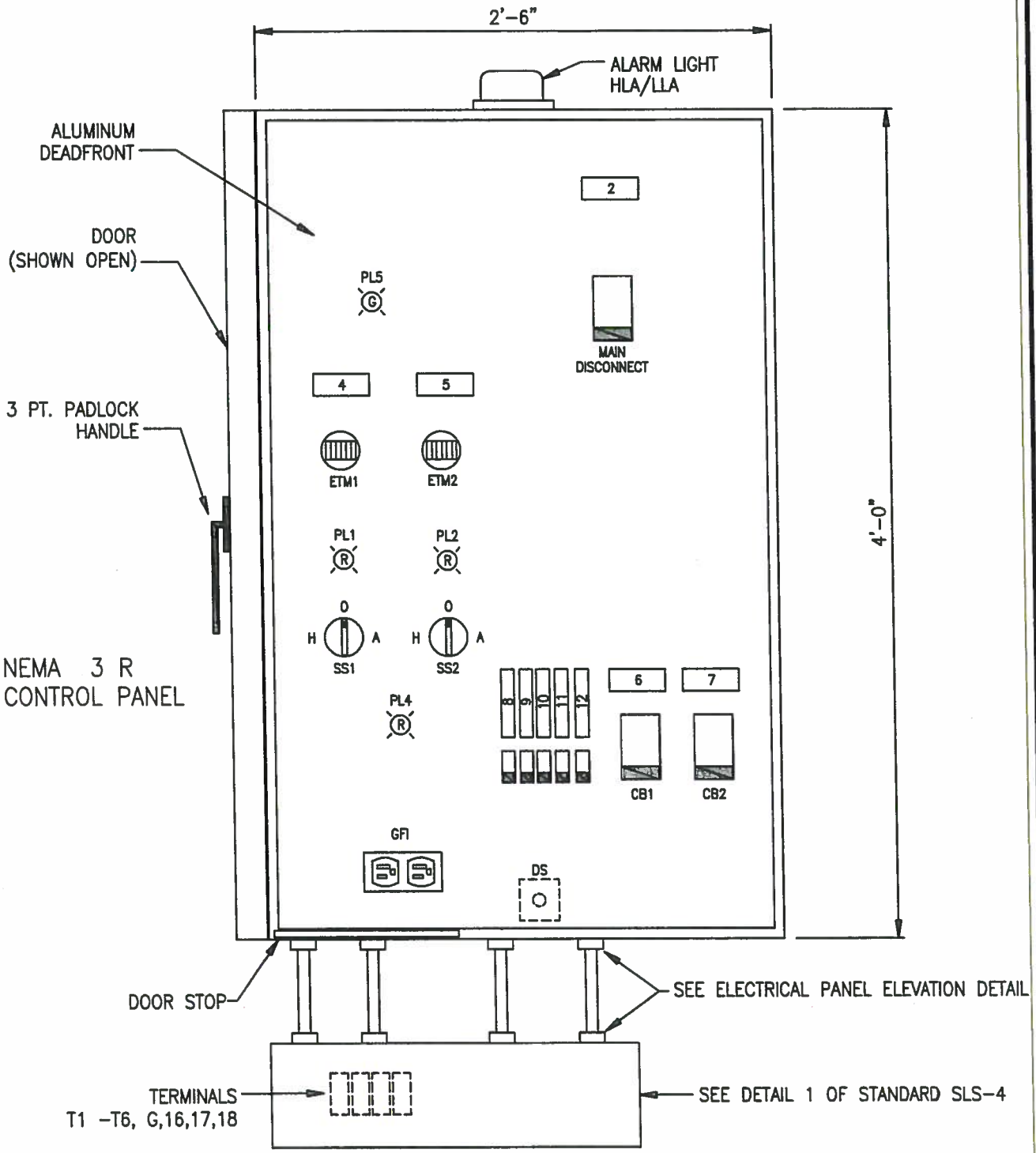
NAME PLATE SCHEDULE

NO.	SIZE	DESCRIPTION
1.	1 x 3"	DUPLEX PUMP PANEL
2.	1 x 3"	MAIN CIRCUIT BREAKER (MCB)
3.	--	--
4,6.	1 x 3"	PUMP NO. 1
5,7.	1 x 3"	PUMP NO. 2
8.	1/2 x 2"	CONTROLS
9.	1/2 x 2"	GFI
10.	1/2 x 2"	RTU
11.	1/2 x 2"	CONTROL POWER
12.	1-1/2 x 3"	CAUTION: TO AVOID RISK OF FIRE, REPLACE ONLY WITH SAME FUSE TYPE & FUSE RATING.
13.	1 x 3"	USE 75°C RATED COPPER WIRE
14.	1 x 3"	BACK-UP CONTROLLER
PL 1,2		ON
PL 3		ALARM LIGHT (HIGH)
PL 4		LOW LEVEL
PL 5		POWER ON
SS 1,2		HAND-OFF-AUTO

SUBMERSIBLE LIFT STATION
THE PUMP STATION PUMP PANEL



SUBMERSIBLE LIFT STATION
DEADFRONT VIEW
DUPLEX PUMP CONTROL PANEL

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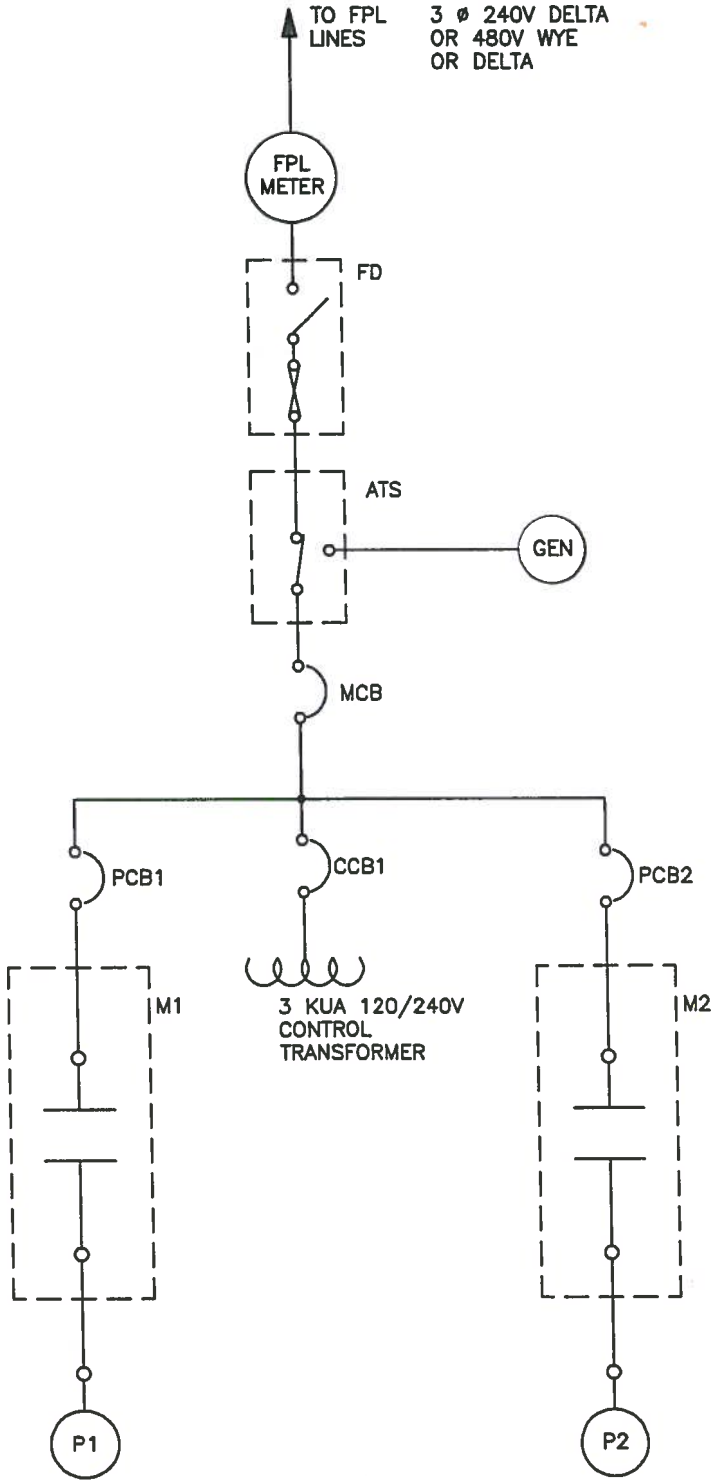

SUBMERSIBLE LIFT STATIONS
LIFT STATION ELECTRICAL SYSTEM
SINGLE LINE DIAGRAM

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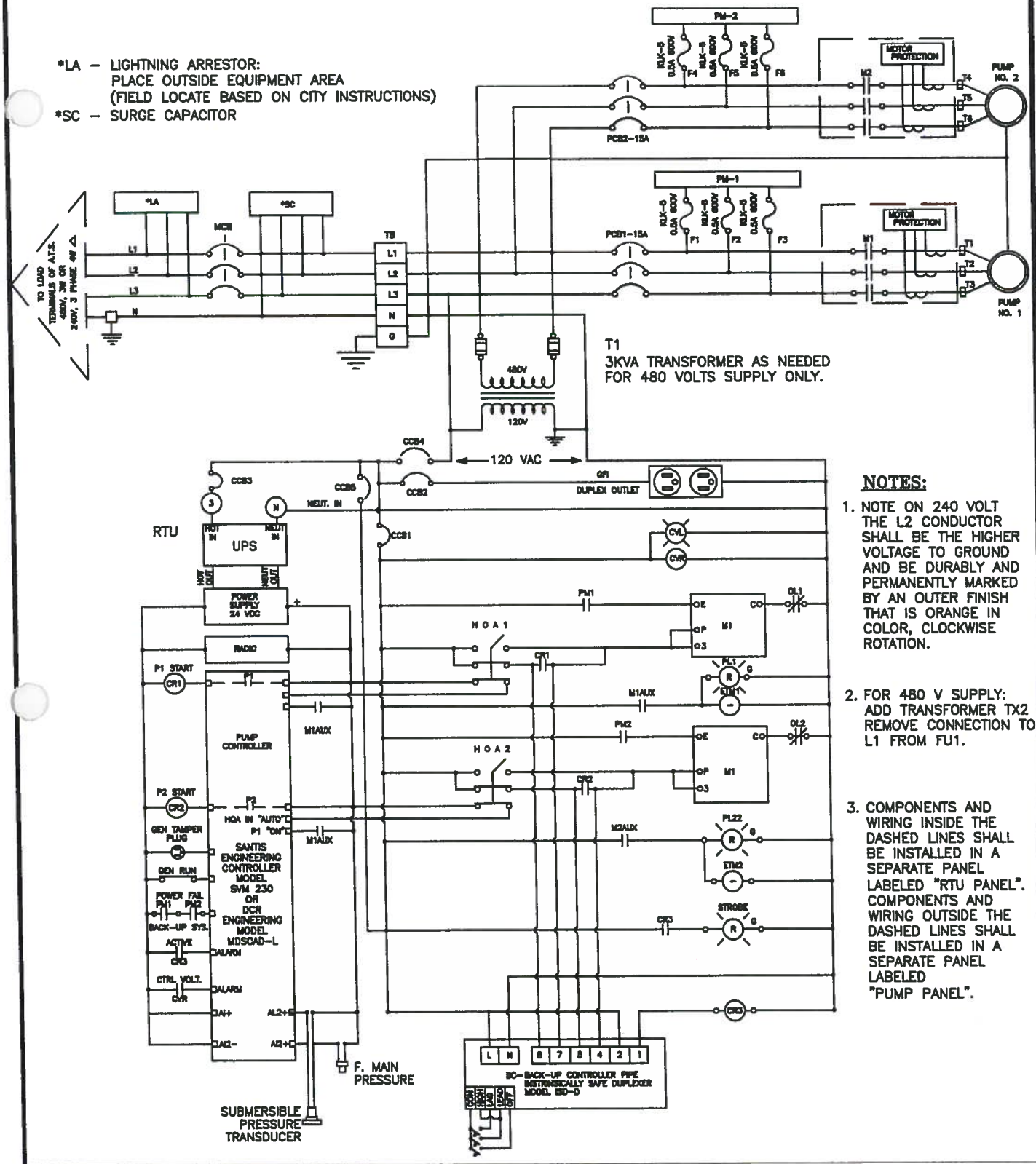
*LA – LIGHTNING ARRESTOR:
PLACE OUTSIDE EQUIPMENT AREA
(FIELD LOCATE BASED ON CITY INSTRUCTIONS)
*SC – SURGE CAPACITOR



NOTES:

1. NOTE ON 240 VOLT THE L2 CONDUCTOR SHALL BE THE HIGHER VOLTAGE TO GROUND AND BE DURABLY AND PERMANENTLY MARKED BY AN OUTER FINISH THAT IS ORANGE IN COLOR, CLOCKWISE ROTATION.
2. FOR 480 V SUPPLY: ADD TRANSFORMER TX2 REMOVE CONNECTION TO L1 FROM FU1.
3. COMPONENTS AND WIRING INSIDE THE DASHED LINES SHALL BE INSTALLED IN A SEPARATE PANEL LABELED "RTU PANEL". COMPONENTS AND WIRING OUTSIDE THE DASHED LINES SHALL BE INSTALLED IN A SEPARATE PANEL LABELED "PUMP PANEL".

SUBMERSIBLE LIFT STATIONS
PUMP & RTU ELECTRICAL PANELS

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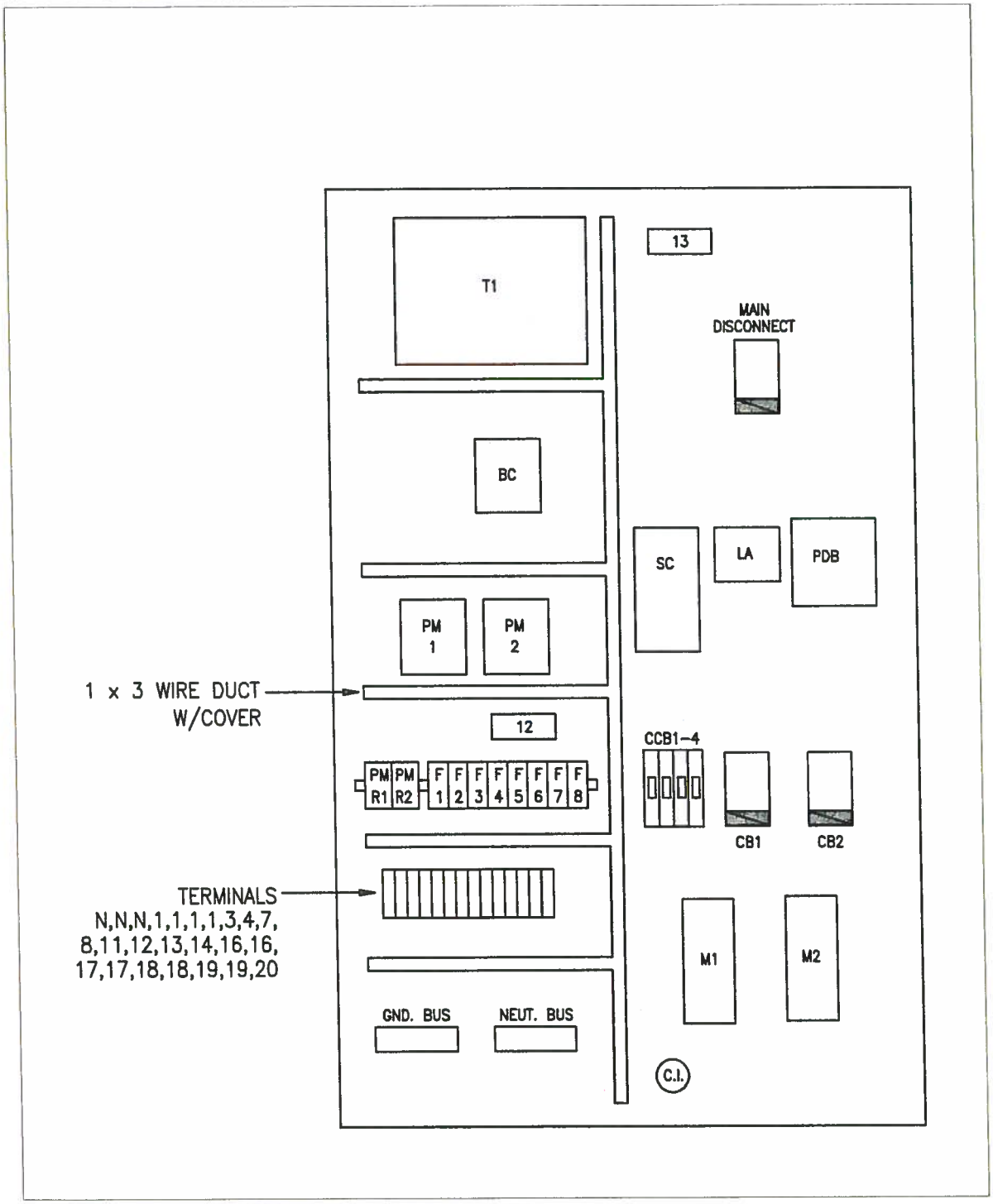

SUBMERSIBLE LIFT STATIONS
SUB-PANEL
LAYOUT

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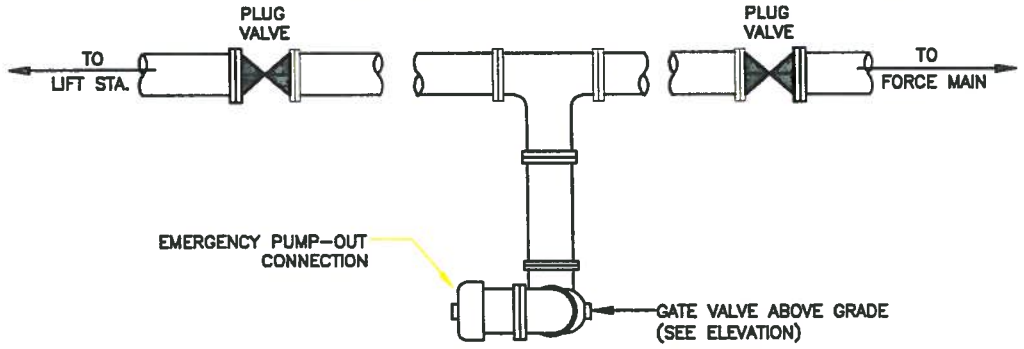
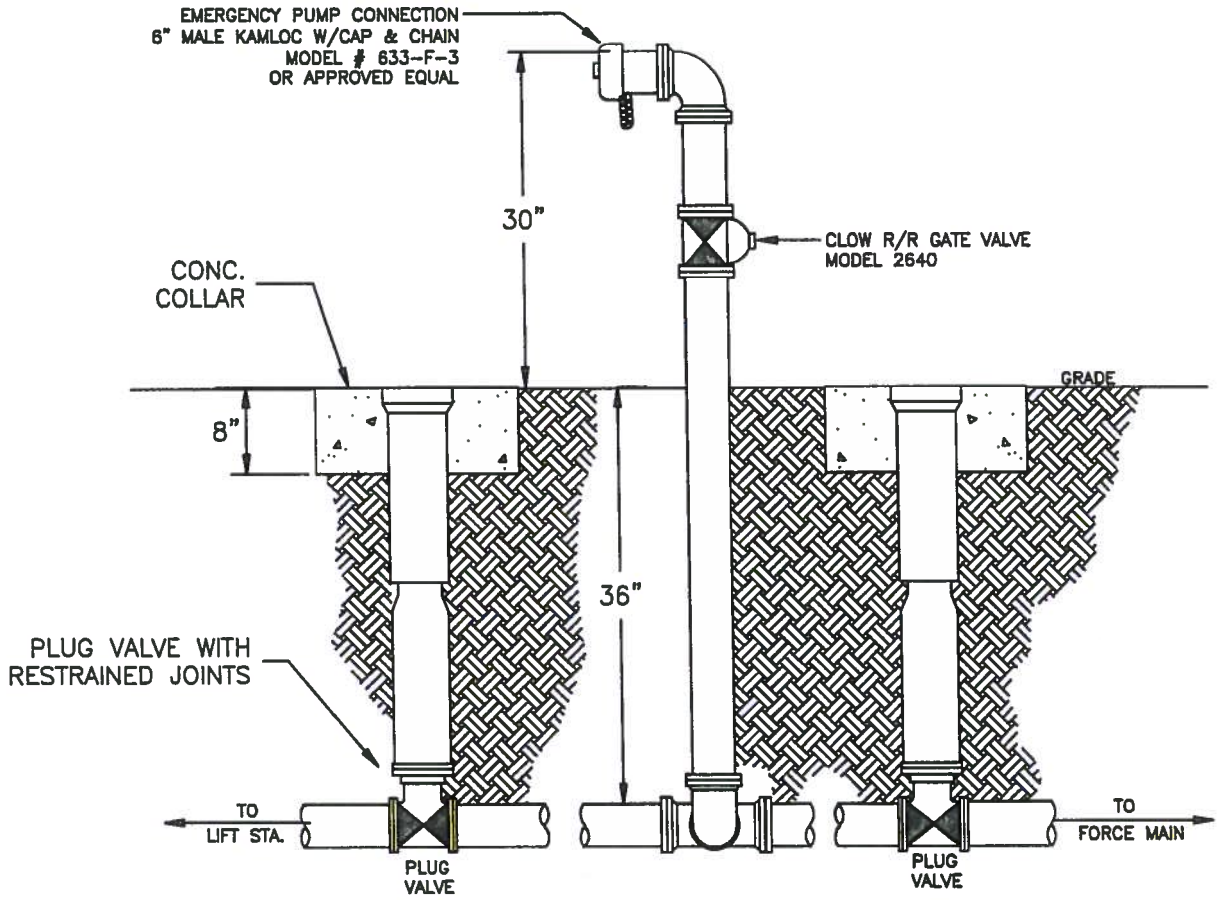


PLAN VIEW



ELEVATION VIEW

SUBMERSIBLE LIFT STATION
BY-PASS PUMP CONNECTION

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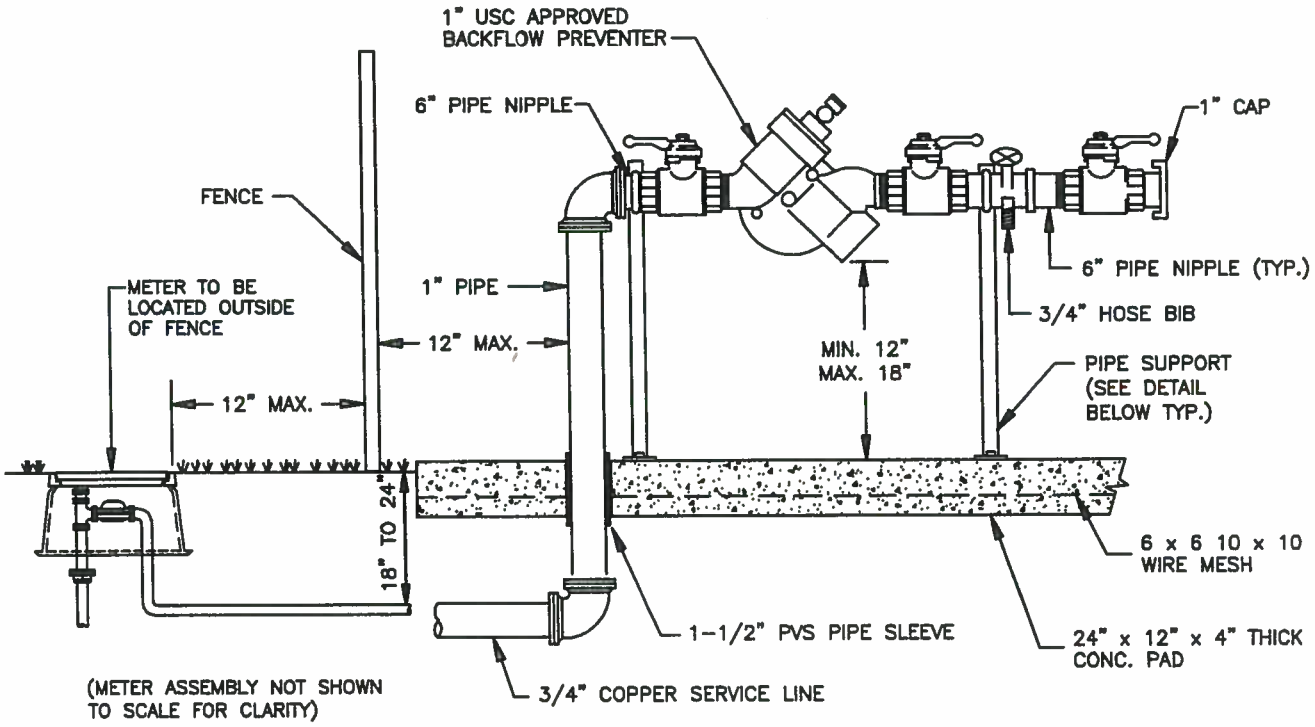
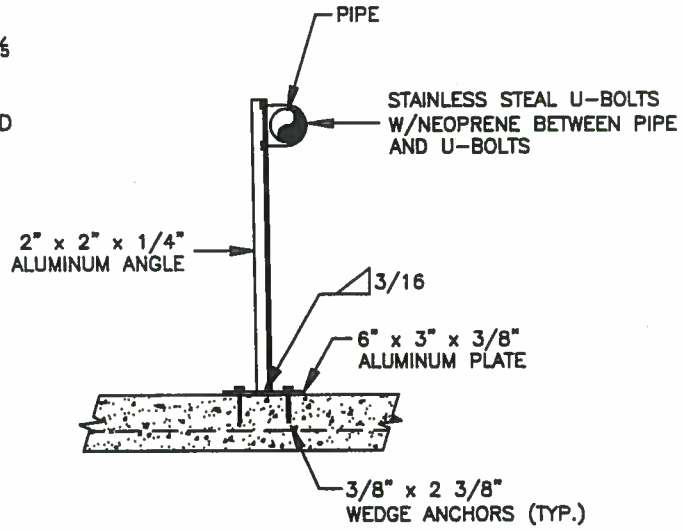
SEPTEMBER 2010		SLS-16



PIPE SUPPORT DETAIL

NOTES:

1. ALL PIPING SHALL BE BRASS OR TYPE "K" COPPER TUBING
2. ALL COPPER JOINTS SHALL BE MADE WITH 95/5 SOLDER
3. USE 1" RPZ BACKFLOW PREVENTER AS LISTED IN THE APPROVED PRODUCT LIST.



SUBMERSIBLE LIFT STATION
BACKFLOW DETAIL FOR
LIFT STATION WATER SERVICE

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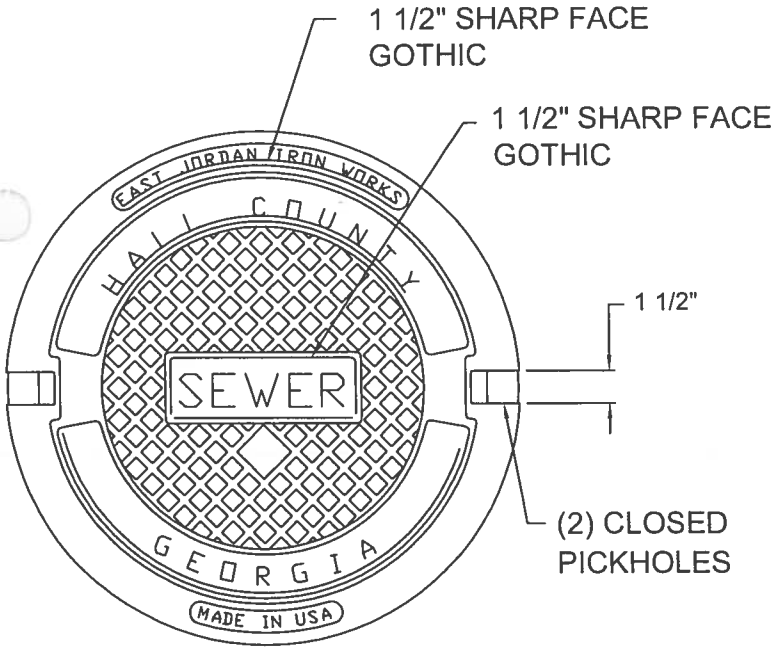
REVISED:
MAY 2009

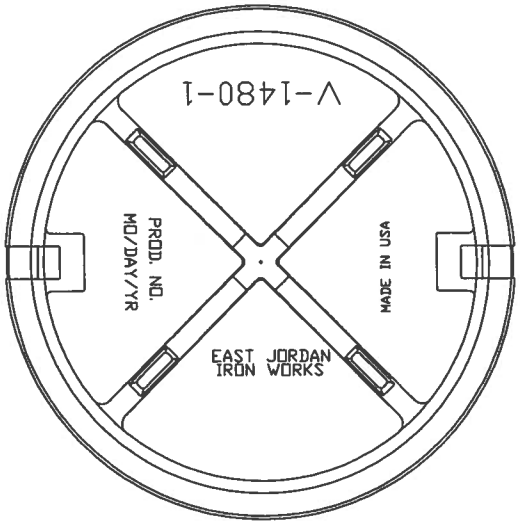
HALL COUNTY PUBLIC WORKS & UTILITIES
ENGINEERING DIVISION

STANDARD
SIS-18

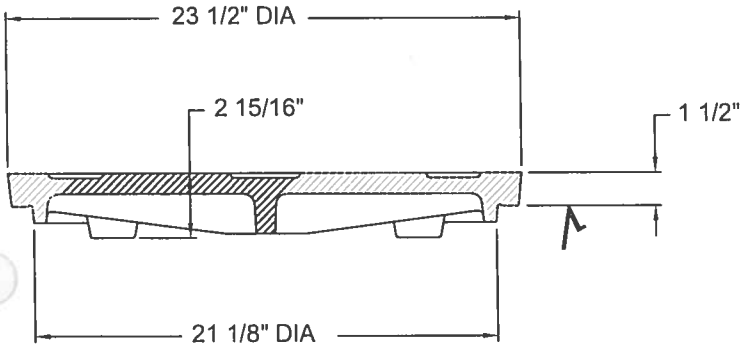
PUMP PANEL
MANUFACTURER'S LIST

LEGEND	NOMENCLATURE	MANUFACTURER	DESC. / PART No.	Qty.
CCB1,4	CIRCUIT BREAKER, 120V, 1P, 10A	CUTLER–HAMMER	QC1010	4
	AUXILARY CONTACT	CUTLER–HAMMER	W22	2
	ALARM MODULE	CUTLER–HAMMER	W/ BELL ALAMR MODULE	2
M1,2	STARTERS	CUTLER–HAMMER		2
CB1,2	CIRCUIT BREAKER, 600V	CUTLER–HAMMER	HFD	2
T1	CONTROL TRANSFORMER 480V/120V	SQUARE–D	CLASS 9070 T3000 D1	1
SOC	SOCKET & PPIN	OMRON	PF083A–E	2
PMR1,2	RELAY, 120V SOPT	OMRON	MK2P–S–AC120	2
PM1,2	PHASE MONITOR, 480V	MOTOR PROT. ELEC.	MPE 001–440–118	2
SOC	SOCKET	CUSTOM CONNECT	OT08	2
LA	LIGHTNING ARRESTER	SQUARE–D	SOSA3650	1
PCB	POWER IDST. BLOCK, 3P	GOULO	67513	1
SC	SURGE CAPACITOR	DELTA	CA603R	1
MCB	MAIN CIRCUIT BREAKER, 600V	CUTLER–HAMMER	HFD30__L	1
	ANGLE ADAPTER	APPLETON	AJA–100	1
ENCL	ENCLOSURE, NEMA 3R, 316 S.S. COMPLETE WITH: a: 316 S.S. DRIPSHIELD; b. ALUMIN. DEADFRONT; c. DOOR STOP KIT; d. LOCKABLE HANDLE	HOFFMAN	48"H x 30"W x 12"D	1
	SEAL–OFFS	APPLETON	EYSF–100	4
JBOX	JUNCTION BOX, NEMA, UX, 316 S.S.	HOFFMAN	10"H x 24"W x 6"D HINGED GASKETED COVER	1
BC	BACK–UP CONTROLLER	MOTOR PROTECTOR ELECTRONICS	INTRINSICALLY SAFE DUPLEXER MODEL ISD–D	1
RTU	REMOTE TERMINAL UNIT COMPRISING: a. ENCLOSURE, NEMA 3R, 316 S.S. 24"W x 24"H x 8"D; b. PLC CONTROLLER	DCR ENGINEERING OR SACHS ENGINEERING	a. MOSCADL – 3 SLOT W/ TRUNK RADIO (OR ALTERNATIVELY) b. MODEL SUM 230	1 1
LT	LEVEL TRANSDUCER	KPSI	SUBMERSIBLE LEVER TRANSDUCER 0 – 10 FT.	1
LT	LEVEL TRANSDUCER	CONTREGRA	ULTRASONIC LEVEL TRANSDUCER 0 – 10 FT.	1
ATS	AUTOMATIC TRANSFER SWITCH____AMPS, ____VOLTS	NO OUTAGE	GE ZENITH____AMP, 60 Hz, (NEMA 4x, 3POLE 120/240V OR 277/380V, 3HP, 4W, COT EXERCISIER, STANDARD A3A4 AUXILARY CONTACTS. ENCLOSURE NEMA 4x, 316 S.S.	1
GR	GENERATOR RECEPTACLE	APPLETON	240V – AR20044RS 480V – AR20044RSP4	1

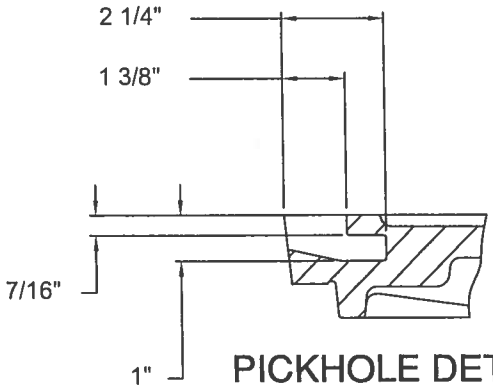




BOTTOM VIEW



SECTION



PICKHOLE DETAIL

NOTES:

1. Manhole cover and frame shall be constructed of Class 35b gray iron in accordance with ASTM A48.

2. Heavy duty design load.

3. Coating: undipped

4. √ Designates machined surface.

5. Country of origin: USA

GRAVITY SEWER SYSTEM

MANHOLE COVER & FRAME

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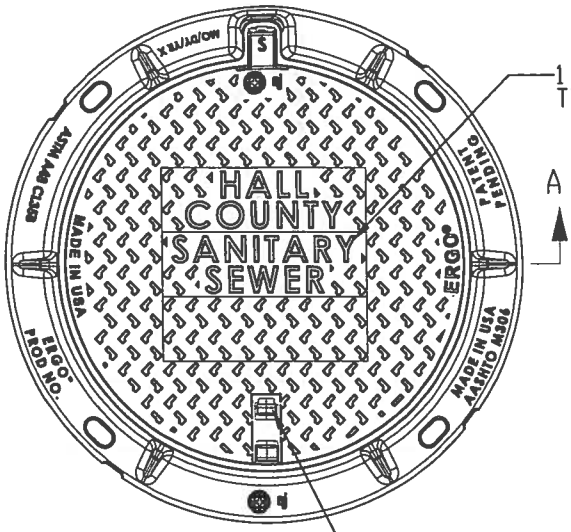
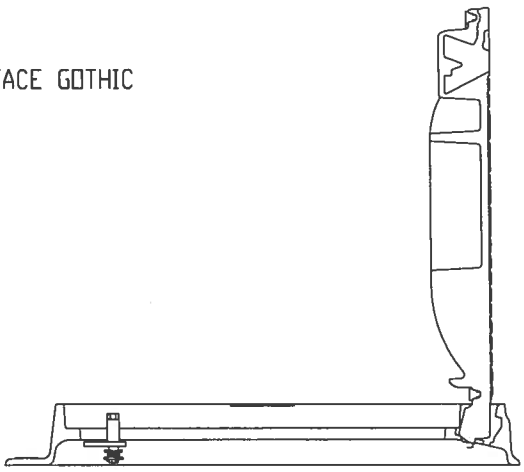
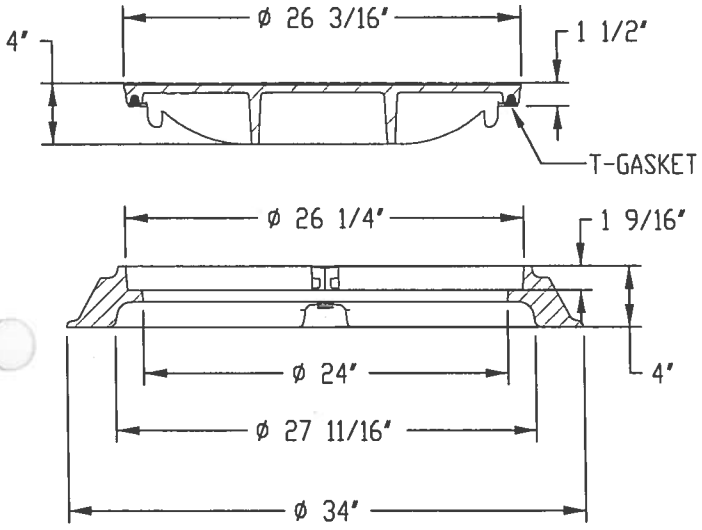
MAY 2013		GS-1A

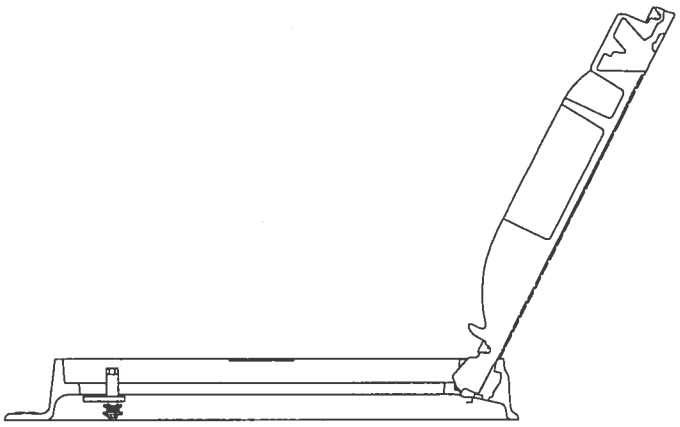




SAFETY LOCK@90 °



SECTION A-A



FULLY OPENED@120 °

NOTES:

1. Manhole cover shall be constructed of ductile iron (80-55-06).
2. Frame shall be constructed of Class 35b gray iron.
3. Certifications: ASTM A536 and ASTM A48.
4. Heavy duty design load.
5. Coating: undipped.
6. Country of origin: USA.

GRAVITY SEWER SYSTEM

HINGED MANHOLE COVER & FRAME

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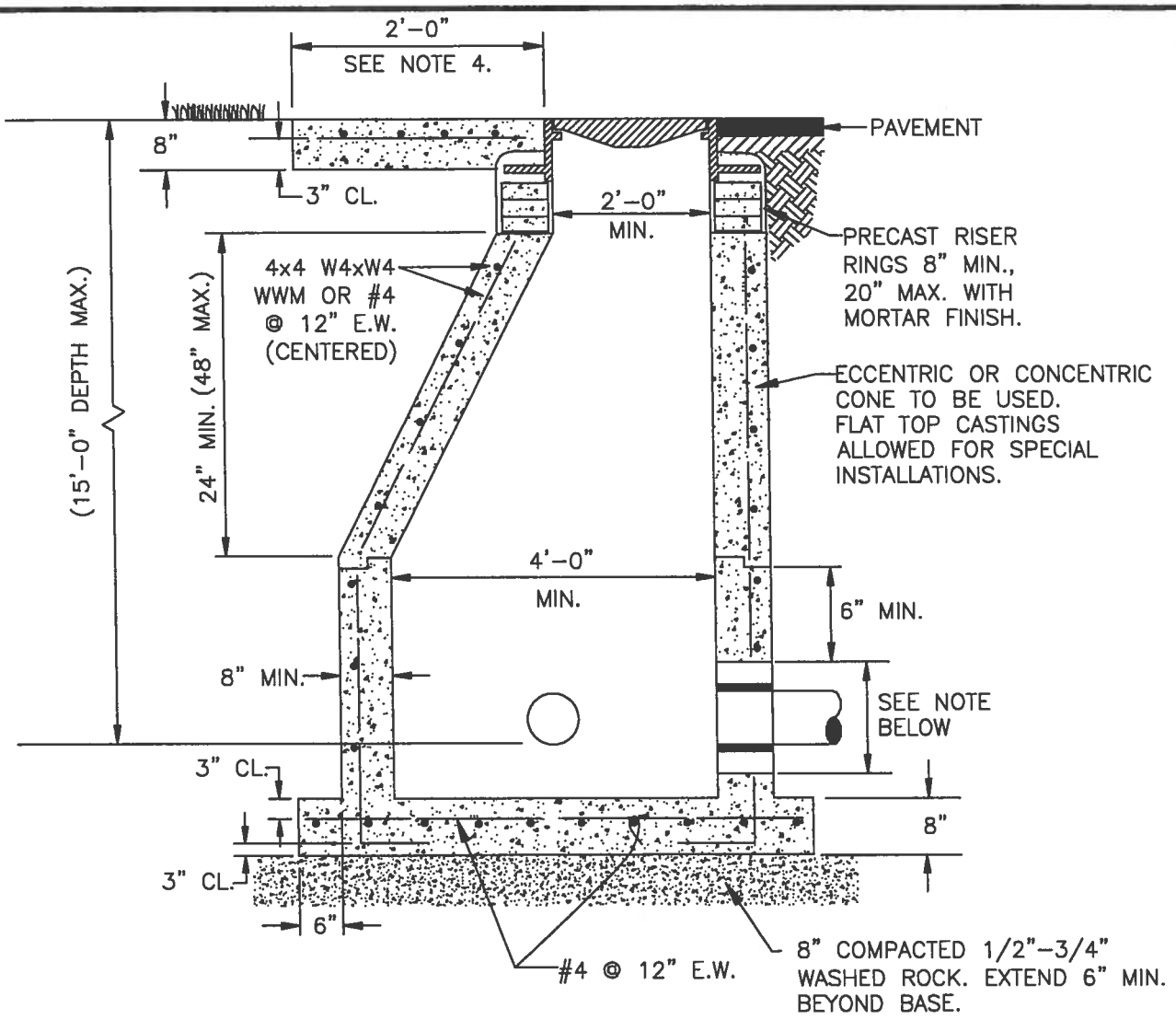
May 2013		GS-1B



NOTE:

1. ALL PIPE OPENINGS SHALL BE INSTALLED WITH "HARCO" PVC MANHOLE ADAPTERS OR APPROVED EQUAL. FOR PVC & DUCTILE IRON PIPE PENETRATIONS, ADAPTERS SHALL BE FIELD SEALED WITH NON-SHRINK WATERPROOF GROUT.
2. MIN. HOLE DIA. EQUALS OUTSIDE WALL OF PVC PIPE ADAPTER PLUS 4".
3. GRAVITY SEWER DEPTHS SHALL NOT EXCEED 15' EXCEPT BY SPECIFIC APPROVAL OF PUBLIC WORKS & UTILITIES DEPARTMENT. PIPE FOR SUCH INSTALLATION SHALL BE CLASS 50 DIP.
4. MANHOLES IN GRASSED AREAS & UNFINISHED ROADWAYS SHALL HAVE A 6 FT. SQUARE OR 6 FT. DIA. CIRCULAR CONCRETE COLLAR, WITH #4 @ 12" E.W. REINFORCING, BOTTOM WITH 4 SETS OF 2-#4 @ 45° TO MAIN REINFORCING.

GRAVITY SEWER
MANHOLE

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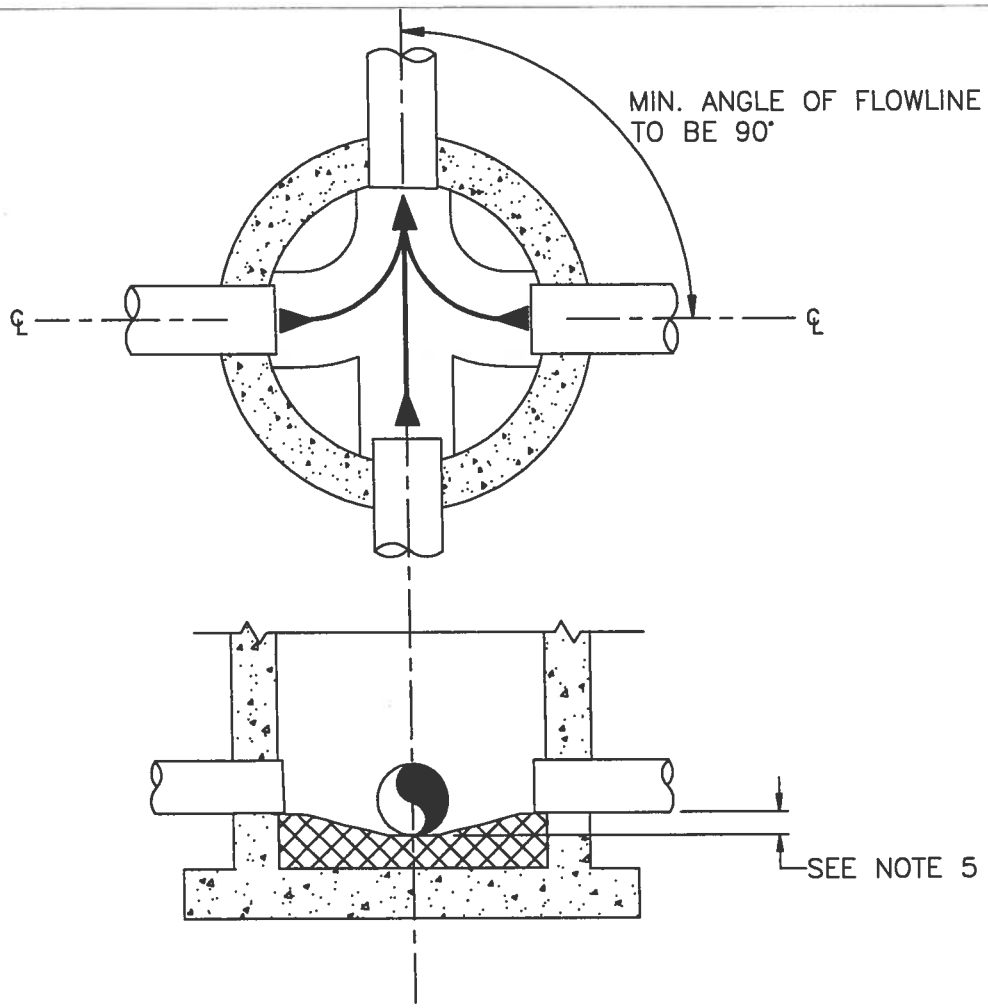


NOTES:

1. PROPERLY SHAPED FLOW CHANNELS SHALL BE CONSTRUCTED BETWEEN PIPES SO AS TO PROVIDE FOR SMOOTH FLOW BETWEEN THE INFLUENT PIPE(S) AND THE EFFLUENT PIPE.

2. SERVICE LATERALS ENTERING MANHOLES, MUST BE APPROVED BY THE PUBLIC WORKS & UTILITIES DEPARTMENT. FLOW CHANNELS SHALL BE PROVIDED.

3. FLOW CHANNELS SHALL BE CONSTRUCTED WITH 6" BRICK RUBBLE, BEDDED AND COVERED WITH 2" MIN. TYPE II PORTLAND CEMENT GROUT.

4. SIDE WALLS OF FLOW CHANNEL(S) SHALL BEGIN AT SPRING LINE OF EACH PIPE, AND SHALL BE SLOPED TO MATCH FLOW LINE.

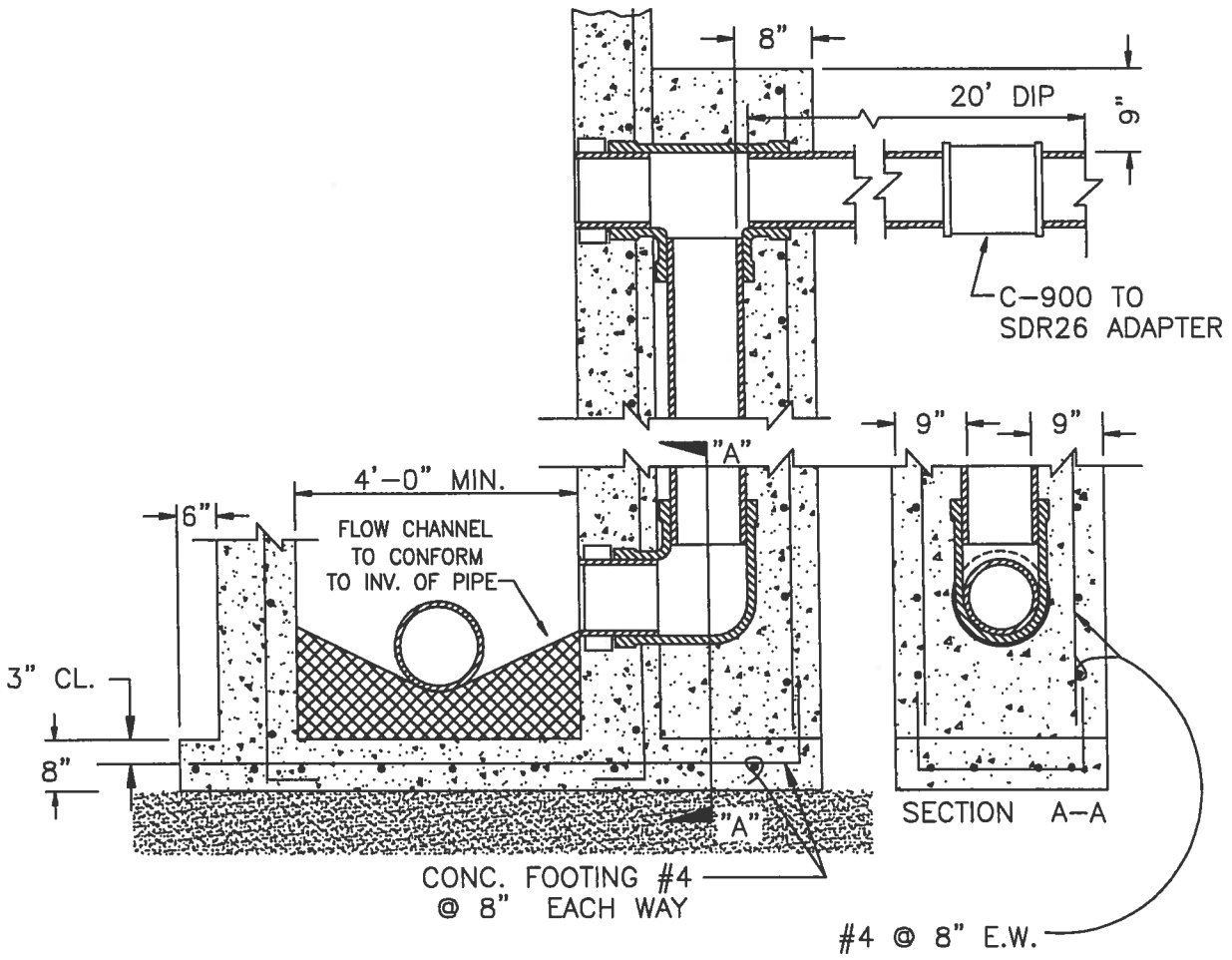
5. PROVIDE 0.1 FOOT MINIMUM DROP THROUGH MANHOLE BETWEEN HIGHEST INVERT AND LOWEST INVERT.

6. FORCE MAIN TO ENTER MANHOLE AT 180° ±10° FROM GRAVITY OUTFLOW.

GRAVITY SEWER

SEWER FLOW CHANNELS

REVISED:	HALL COUNTY PUBLIC WORKS & UTILITIES	STANDARD
SEPTEMBER 2010	ENGINEERING DIVISION	GS-3

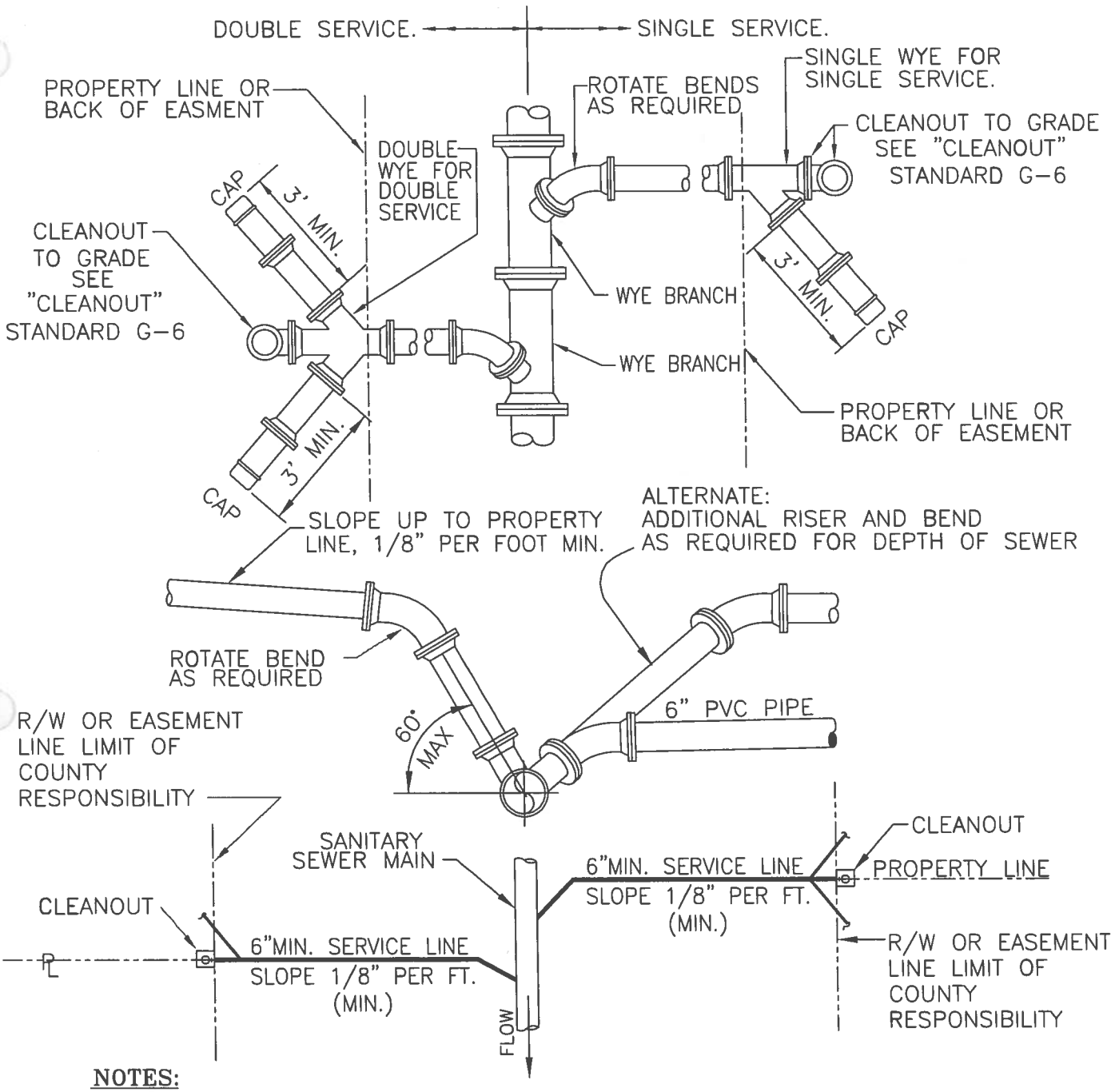


NOTES:

1. DETAILS NOT SHOWN ARE TO BE SIMILAR TO THOSE SHOWN FOR "MANHOLE" AND "SEWER FLOW CHANNEL" STANDARDS.
2. DROP MANHOLE MUST BE USED WHEN DIFFERENCE BETWEEN INVERTS IS 1'-6" OR MORE. PROVIDE A TEE AT THE TOP AND 90° BEND AT THE BOTTOM AS SHOWN.
3. ALL PVC PIPE MATERIALS TO BE C900.
4. INSIDE DROPS MAY BE APPROVED ONLY FOR EXISTING MANHOLES, AFTER DESIGN SUBMITTAL TO THE CITY'S PROJECT MANAGER.
5. STANDARD PRECAST DROP MANHOLE SECTION (4' DIA.) AND SLAB TO BE CAST MONOLITHICALLY.

GRAVITY SEWER
DROP
MANHOLE

REVISED:	HALL COUNTY PUBLIC WORKS & UTILITIES	STANDARD
SEPTEMBER 2010	ENGINEERING DIVISION	GS-4

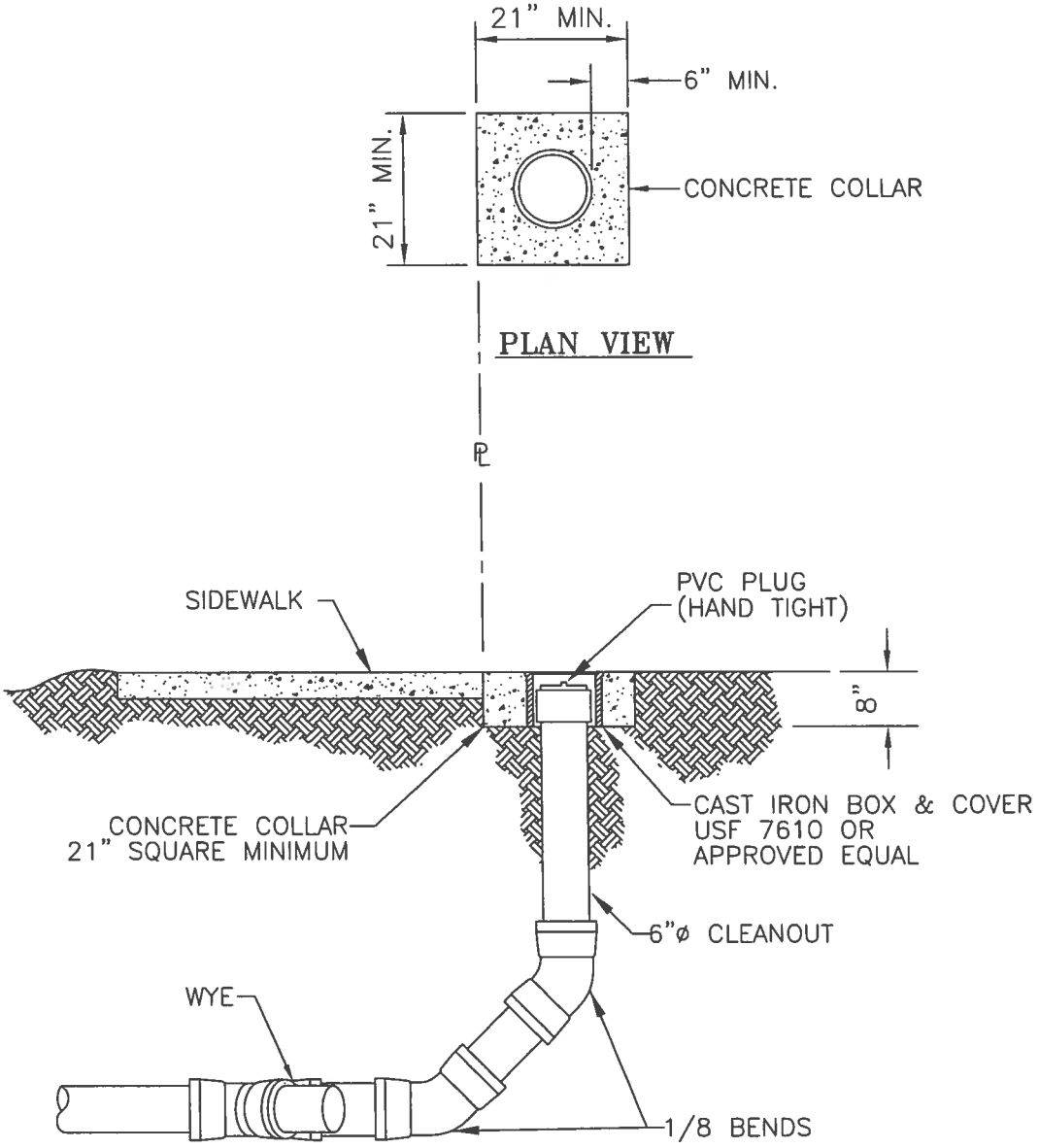


NOTES:

1. SERVICE LATERALS SHALL TERMINATE INSIDE PROPERTY LINE AT A MINIMUM DEPTH OF 3 FEET. HOWEVER, WHERE LOT SIZE IS SUCH THAT ADDITIONAL COVER IS REQUIRED TO MAINTAIN PLUMBING CODE REQUIREMENT FOR EFFLUENT PIPE FALL, MINIMUM DEPTH SHALL BE INCREASED ACCORDINGLY.
2. CLEAN OUT CONNECTION TO BE RAISED TO FINISHED GRADE PRIOR TO WATER METER ACTIVATION.
3. ALL NON-METALLIC SANITARY SEWER PIPE SHALL HAVE LOCATOR WIRE IN ACCORDANCE WITH SECTION 3.12 OF THE HALL COUNTY STANDARD SEWER SPECIFICATIONS.

GRAVITY SEWER
HOUSE LATERAL CONNECTIONS

REVISED:	HALL COUNTY PUBLIC WORKS & UTILITIES ENGINEERING DIVISION	STANDARD
SEPTEMBER 2010		GS-5



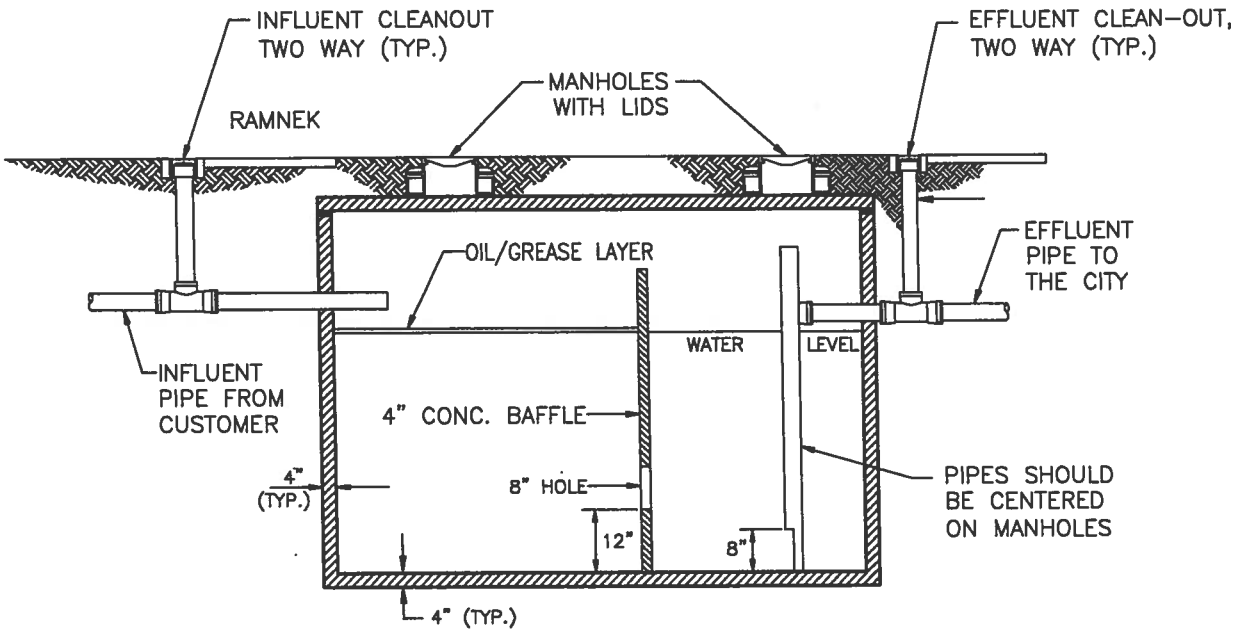
CROSS SECTION

NOTE:

1. WHEN SERVICE LINE DEPTH EXCEEDS 7 FT. OF COVER, WYE MAY BE INSTALLED ON VERTICAL SECTION WITH 3 FT. MIN. COVER.
2. CLEAN OUT CONNECTION TO BE RAISED TO FINISHED GRADE PRIOR TO WATER METER ACTIVATION.
3. ALL NON-METALLIC SANITARY SEWER PIPE SHALL HAVE LOCATOR WIRE IN ACCORDANCE WITH SECTION 3.12 OF THE HALL COUNTY STANDARD SEWER SPECIFICATIONS.

GRAVITY SEWER
CLEAN OUT

REVISED:	HALL COUNTY PUBLIC WORKS & UTILITIES ENGINEERING DIVISION	STANDARD
SEPTEMBER 2010		GS-6



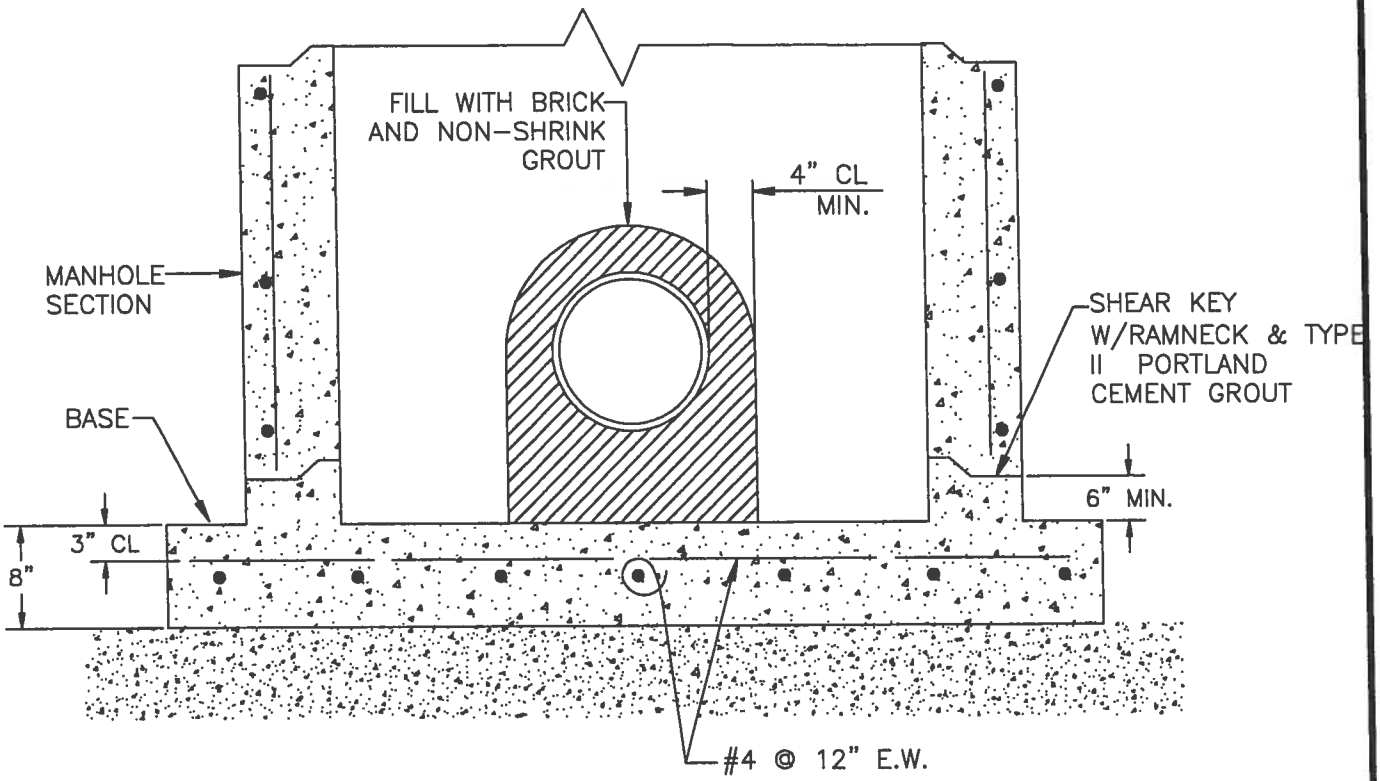
SIZING QUIDELINES FOR SEPARATORS	
WORK AREA	MINIMUM SIZE
1000 SQ. FT. OR LESS	50 GAL.
1001 – 2500 SQ. FT.	150 GAL.
2501 – 5000 SQ. FT.	300 GAL.
5001 – 9999 SQ. FT.	500 GAL.
10000 SQ. FT. or GREATER	750 GAL.

NOTES:

1. ALL NEW & EXISITING BUSINESSES OR INDUSTRIES THAT USE PETROLEUM BASED PRODUCTS IN THEIR DAY TO DAY ACTIVITIES WILL BE REQUIRED TO INSTALL AN OIL, GREASE/WATER SEPARATOR IF THEY CHOOSE TO OPERATE WITH OPEN FLOOR DRAINS.
2. NO DOMESTIC EFFLUENT SHALL BE ALLOWED TO DISCHARGE THROUGH THE OIL, GREASE/WATER SEPARATOR AS STATED IN WPB ORDINANCE 2838–96 OR LATEST REVISION.
3. VARIOUS OIL, GREASE/WATER SEPARATOR MODELS MANUFACTURED BY COMPANIES SUCH AS ZARN, SMITH, RGF ENVIRONMENTAL SYSTEMS, INC. AND OTHERS MAY BE SUBSTITUTED FOR THE ABOVE DESIGN WITH THE CITY'S APPROVAL.
4. SEE STANDARD DETAILS: MANHOLE FRAME/COLLAR & COVER DETAIL, MANHOLE DETAIL, AND CLEAN–OUT DETAIL FOR CLARIFICATION.
5. FINAL PRODUCT MUST MEET W.P.B. CONSTRUCTION SERVICE DEPARTMENT & ZONING REQUIREMENTS.
6. SIZE OF SEPARATOR WILL VARY & SHALL BE BASED ON TYPE OF PRODUCT, USE AND APPLICABLE AREA OR SPACE PER THE PLUMBING CODE & THE INDUSTRIAL PRETREATMENT CODE.

GRAVITY SEWER
GREASE / WATER SEPARATOR

REVISED:	HALL COUNTY PUBLIC WORKS & UTILITIES	STANDARD
SEPTEMBER 2010	ENGINEERING DIVISION	GS–7



NOTES:

1. TO CONSTRUCT NEW MANHOLE OVER EXISTING SEWER, SLIDE BASE UNDER PIPE AND SET MANHOLE SECTION ON TOP.
2. FOR ADDITIONAL DETAILS NOT SHOWN, SEE "GRAVITY SEWER MANHOLE" STANDARD GS-2.
3. CONTRACTOR SHALL BE RESPONSIBLE FOR SUPPORT OF EXISTING SEWER DURING INSTALLATION OF MANHOLE.

GRAVITY SEWER
"DOG HOUSE"
MANHOLE

REVISED:	HALL COUNTY PUBLIC WORKS & UTILITIES	STANDARD
SEPTEMBER 2010	ENGINEERING DIVISION	GS-8

1. ALL PIPE OPENINGS SHALL BE INSTALLED WITH "HARCO" PVC MANHOLE ADAPTERS OR APPROVED EQUAL FOR PVC PIPE PENETRATIONS. ADAPTERS SHALL BE FIELD SEALED WITH NON-SHRINK WATERPROOF GROUT.
2. MIN. HOLE DIA. EQUALS OUTSIDE WALL OF PVC PIPE ADAPTER PLUS 4"
3. LIFT HOLES ARE PERMITTED, BUT SHALL BE GROUTED WITH NON-SHRINK WATERPROOF GROUT.
4. ALL PENETRATIONS SHALL BE PRE-CAST OR CORE-DRILLED.
5. MANHOLE FABRICATION SHALL BE IN ACCORDANCE WITH LATEST EDITION OF ASTM C-478.
6. MANHOLES IN GRASSED AREAS & UNFINISHED ROADWAYS SHALL HAVE A 6 FT. SQUARE OR 6 FT. DIA. CIRCULAR CONCRETE COLLAR, WITH #4 @ 12" E.W. REINFORCING, BOTTOM WITH 4 SETS OF 2-#4 @ 45° TO MAIN REINFORCING.
7. COATINGS ON EXTERIOR OF MANHOLES SHALL BE TWO COATS 4 MIL EACH COAL TAR EPOXY.
8. FIRST MANHOLE UPSTREAM FROM A WET WELL SHALL BE 4'-0" DIA. (MIN.) FOR FULL HEIGHT. PROVIDE DOUBLE LID MANHOLE COVER & FRAME TYPE "A", U.S. FOUNDRY NO. 690-AH=M, OR APPROVED EQUAL, USED ON "A.R.V. MANHOLES. COVER TO BE MARKED AS SHOWN IN "MANHOLE INSTALLATION DETAILS".
9. GRAVITY SEWER DEPTHS SHALL NOT EXCEED 15' EXCEPT BY SPECIFIC APPROVAL OF PUBLIC WORKS & UTILITIES DEPARTMENT. PIPE FOR SUCH INSTALLATION SHALL BE CLASS 50 DIP EPOXY LINED.
10. ECCENTRIC CONES TO BE PLACED SO THAT RING & COVER ARE ON UPSTREAM SIDE OF MANHOLE.
11. WHEN A NEW LINE FLOW DROPS MORE THAN 1'-6", AT A MANHOLE, AN OUTSIDE DROP MANHOLE MUST BE USED. THIS SHALL ALSO APPLY TO LATERALS ENTERING MANHOLES.
12. NO INFILTRATION OR EXFILTRATION FOR NEW GRAVITY SEWERS SHALL BE ALLOWED. CHEMICAL REPAIR OF ANY LEAKS IS SPECIFICALLY NOT ALLOWED.
13. ALL MANHOLE FRAMES, AND COVERS ARE TO BE FLUSH WITH PROPOSED FINISHED GRADES OF WALKS, PAVINGS, SWALES, ETC. THEY SHALL HAVE CONCRETE COLLARS POURED IN ACCORDANCE WITH APPLICABLE STANDARDS.
14. FINISHED FLOOR ELEVATIONS OF NEW CONSTRUCTION OF ADJACENT BUILDINGS SHOULD BE A MINIMUM OF 6" ABOVE THE ELEVATION OF THE UPSTREAM SANITARY SEWER MANHOLE.
15. GRAVITY SEWER PIPE & LATERALS SHALL BE PVC PIPE WITH RING-TITE JOINTS (ASTM D-3034-SDR 26) OR APPROVED EQUAL.
16. FINAL LAMPING AND T.V. INSPECTION OF SANITARY GRAVITY SYSTEM TO BE MADE BY CONTRACTOR UPON COMPLETION OF SEWER SYSTEM. MANDREL SHALL BE PULLED THROUGH PIPE PRIOR TO T.V. INSPECTION. A COPY ON D.V.D. OF THE T.V. INSPECTION WITH VOICE OVER SHALL BE SUBMITTED WITH FINAL AS-BUILTS.
17. FINAL ACCEPTANCE OF WATER & SEWER INSTALLATION SHALL BE PREDICATED UPON RECEIPT OF FINAL AS-BUILTS, SIGNED & SEALED BY EITHER A LICENSED LAND SURVEYOR OR PROFESSIONAL ENGINEER OF RECORD. AS-BUILTS SHALL CONSIST OF ONE PAPER COPY, ONE MYLAR COPY & ONE DIGITAL COPY ON DISK, AUTOCAD RELEASE 2006 FORMAT, OR LATEST COMPATIBLE VERSION.
18. ALL AS BUILT MEASUREMENTS & ELEVATIONS TO BE MADE BY A LICENSED LAND SURVEYOR.
19. WARRANTY - ALL MATERIALS & EQUIPMENT TO BE FURNISHED AND/OR INSTALLED BY THE CONTRACTOR SHALL BE WARRANTED FOR A PERIOD OF ONE YEAR FROM THE DATE OF FINAL ACCEPTANCE THEREOF AGAINST DEFECTIVE MATERIALS, DESIGN AND WORKMANSHIP. UPON RECEIPT OF NOTICE FROM THE CITY OF CITY OF FAILURE OF ANY PART OF THE WARRANTED EQUIPMENT OR MATERIALS DURING THE WARRANTY PERIOD, THE AFFECTED PART, PARTS OR MATERIALS SHALL BE PROMPTLY REPLACED BY THE CONTRACTOR WITH NEW PARTS OR MATERIALS BY THE CONTRACTOR AT NO EXPENSE TO THE CITY. IN THE EVENT THE CONTRACTOR FAILS TO MAKE THE NECESSARY REPLACEMENT OR REPAIRS IMMEDIATELY AFTER NOTIFICATION, THE CITY MAY ACCOMPLISH THE WORK AT THE EXPENSE OF THE CONTRACTOR.
20. ALL NON-METALLIC SANITARY SEWER PIPE SHALL HAVE LOCATOR WIRE IN ACCORDANCE WITH SECTION 3.12 OF THE HALL COUNTY STANDARD SEWER SPECIFICATIONS.

GRAVITY SEWER SYSTEM

NOTES

SECTION 02730 - SANITARY SEWERS AND ACCESSORIES

PART 1 - GENERAL

1.1 SCOPE

A. This Section describes products to be incorporated into force mains, sewers, reuse and accessories, and requirements for the installation and use of these items. Furnish all products and perform all labor necessary to fulfill the requirements of these Specifications.

B. All construction shall comply with the Department of Labor, Occupational Safety and Health Administration, 29 CFR Part 1926, Sub-part P, latest edition.

1.2 RELATED DOCUMENTS

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

B. Supply all products and perform all work in accordance with the latest provisions of applicable American Society for Testing and Material (ASTM).

C. Supply all products and perform all work in accordance with the latest provisions of applicable American Water Works Association (AWWA).

D. Supply all products and perform all work in accordance with the latest provisions of applicable American National Standards Institute (ANSI).

1.3 QUALIFICATIONS

A. As requested by the Engineer, submit evidence that manufacturers have consistently produced products of satisfactory quality and performance for a period of at least two years.

1.4 SUBMITTALS

A. Complete drawings and engineering data, including shop drawings, shall be submitted to the Engineer.

1.5 TRANSPORTATION AND HANDLING

A. Unloading: Furnish equipment and facilities for unloading, handling, distributing and storing pipe, fittings, valves and accessories. Do not drop or dump materials. Any materials dropped will be subject to rejection without additional justification.

B. Handling: Handle pipe, fittings, valves and accessories carefully to prevent shock or damage in accordance with the manufacturer's written instructions and requirements. Do not use material damaged in handling.

1.6 STORAGE AND PROTECTION

A. Store all pipes which cannot be distributed along the route. Make arrangements for the use of suitable storage areas.

B. Stored materials shall be kept safe from damage. The interior of all pipes, fittings and other appurtenances shall be kept free from dirt or foreign matter at all times. Valves shall be drained and stored in a manner that will protect them from damage by freezing.

C. Pipe shall not be stacked higher than the limits recommended by the manufacturer. The bottom tier shall be kept off the ground on timbers, rails or concrete. Pipe in tiers shall be alternated: bell, plain end, bell, plain end. At least two rows of timbers shall be placed between tiers and chocks, affixed to each other in order to prevent movement. The timbers shall be large enough to prevent contact between the pipe in adjacent tiers.

D. Store joint gaskets in a cool location, out of direct sunlight. Gaskets shall not come in contact with petroleum products. Gaskets shall be used on a first-in, first-out basis.

1.7 QUALITY ASSURANCE

A. Product manufacturers shall provide the Engineer with written certification that all products furnished comply with all applicable provisions of these Specifications.

B. If ordered by the Engineer, each pipe manufacturer shall furnish the services of a competent factory representative to supervise and/or inspect the installation of pipe. This service will be furnished for a minimum of five days during initial pipe installation.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Ductile Iron Pipe and Fittings: The Contractor shall furnish pipe and fittings for exterior and interior installation for drain lines, sewer lines and force mains. Pipe and fittings shall be in accordance with the applicable ASTM and/or ANSI/AWWA Specifications, as amended to date, and the requirements specified herein and as detailed on the Drawings.

1. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include the following:

    1) American Cast Iron Pipe Company.
    2) U.S. Pipe.
    3) Union Foundry.
    4) Sigma.

5) Star Pipe.
6) Approved Equal.

2. Ductile Iron Pipe: Ductile iron pipe shall be furnished in normal lengths of 18 or 20 feet and shall conform to AWWA C 151 and shall be Pressure Class 250. Flanged pipe shall be minimum Class 53.

3. Fittings: Unless indicated otherwise, fittings shall be cast from ductile iron and shall conform to ANSI Specifications A 21.10 (AWWA C 110) or ANSI Specification A21.53 (AWWA C153). Fittings shall have standard mechanical or flanged joints as called for or shown on the Drawings. Mechanical joint fittings for size 3-inch through 24-inch shall be Class 350 for Ductile Iron. Mechanical joint fittings for size 30-inch through 48-inch shall be Class 250 for Ductile Iron.

4. Lining, Coating and Painting:

   a. Cement Lining and Coating: Lining for force mains shall be cement lined, except as specified herein and as indicated on the Drawings. Pipe and fittings shall be cement lined in accordance with AWWA C104 and have an interior seal coat. Pipe and fittings shall be furnished with a bituminous outside coating. Fittings may be furnished with minimum 6-mil nominal thickness fusion bonded epoxy coating conforming to ANSI/AWWA C550 and C116/A21.16 in lieu of bituminous coating.

   b. Fusion Bonded Lining and Coating: Lining for DIP gravity sewers shall be fusion bonded epoxy and polyurethane. Lining for DIP force mains shall be fusion bonded epoxy and polyurethane for a distance of 100 feet upstream and downstream of air and vacuum relief stations and all manholes, and at locations specifically detailed on the Construction Drawings. Pipe and fittings shall be lined with a composite lining utilizing a primer coating containing fusion bonded epoxy (FBE) and a surface coating containing fusion bonded polyurethane (FBP). The lining shall be Polybond Plus as supplied by American Cast Iron Pipe Company, or equal. Pipe and fittings shall be furnished with a bituminous outside coating. Fittings may be furnished with minimum 6-mil nominal thickness fusion bonded epoxy coating conforming to ANSI/AWWA C550 and C116/A21.16 in lieu of bituminous coating.

   c. As an acceptable alternate, the owner will accept a Protecto 401 Ceramic Epoxy Lining System as utilized by U.S. Pipe, or equal. The Protecto 401 Ceramic Epoxy Lining System shall be furnished in accordance with ASTM B 117, ASTM G 95, and ASTM D 714. All pipe and fittings shall be holiday tested at 2,500 volts (minimum) and shall be tested to insure a lining thickness of 40 mils (nominal DFT) minimum.

   d. Painting: Buried Force mains shall have a 12-inch green stripe painted in the top quarter of the pipe. Exposed pipe and fittings to be painted shall not be coated on the exterior but shall be thoroughly cleaned of all dirt, rust, scale, etc., by sandblasting. Submit primer data sheets with shop drawings.

5. Weights and Marking: Weights of pipe and fittings shall conform strictly to the requirements of ANSI Specifications. The class designations for the various classes of pipe and fittings shall be cast onto fittings in raised numerals, and cast or stamped on the

outside of each joint of pipe. Weights shall be plainly and conspicuously painted in white on the outside of each joint of pipe and each fitting after the exterior coating has hardened.

6. Jointing: Pipe and fittings shall be furnished with flange, mechanical or bell-and-spigot joints as indicated on the Drawings. Yard piping shall be furnished with mechanical or push-on joints and mechanical joint fittings, as shown on the Drawings. Interior piping shall be furnished with mechanical joints or flange connections, as shown on the Drawings. Flanges for pipe and fittings shall be ANSI Class 125 flanges, unless otherwise shown on the Drawings or specified, and shall be in accordance with ANSI A 21.10 (AWWA C 110) or ANSI Specification A21.53 (AWWA C153), drilled and faced in accordance with American Standard B17.1. Flanges for ductile iron pipe and fittings shall be ductile iron. Gaskets shall be 1/8-inch thick rubber, unless otherwise specified, may be either ring or full face in sizes 12-inch and smaller, and ring for sizes 14-inch and larger. Mechanical and bell-and-spigot joints for pipe and fittings shall be in accordance with applicable ANSI/AWWA specifications. Push-on joints for pipe shall be manufacturer's standard. Gaskets for mechanical and push-on joints shall conform to ANSI A 21.11 (AWWA C 111). Mechanical joint sleeves shall be furnished as needed.

7. Restrained Joints: Where shown on the Drawings and or specified, joints shall be restrained.

   a. Slip Joint: Restrained joint pipe shall be "Flex Ring" by American Cast Iron Pipe Company, "TR. Flex" by US Pipe, or approved equal.

   b. Mechanical Joint: The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1 and shall be EBAA Iron, Inc., MEGALUG or equal.

8. Concrete Blocking: Concrete blocking shall have a compressive strength of 4000 psi and be installed according to details and locations shown on the Contract Drawings.

9. Weights of Pipe: The American Water Works Specifications regarding minimum and maximum weights for specials shall apply. For pipe 16" and smaller in diameter, pipe will not be accepted in which the weight is less than the standard weight by more than five percent (5%). For pipe that is more than 16" in diameter, pipe will not be accepted in which the weight is less than the standard weight by more than 4%.

10. Certification: The manufacturer of iron pipe and fittings shall furnish both the Engineer and the Owner with certified reports stating that inspection and specified tests have been made and that the results thereof comply with the applicable ANSI/AWWA Specifications for each.

B. Polyvinyl Chloride (PVC) Gravity Sewer Pipe:

1. Acceptability of PVC pipe for gravity sewers is indicated in the following:

2. Standard Minimum Thickness as specified in ASTM D 1784: ASTM D 3034, SDR 26 12454B.

3. Wall Type: Solid Wall.

4. Acceptable for sewers greater than or equal to 6" and less than or equal to 18".

5. PVC gravity sewer pipe shall be supplied in lengths not longer than 13 feet.

6. Fittings: Fittings 15 inches in diameter and less shall be manufactured in accordance with ASTM D 3034. PVC compound shall be 12454B or 12454C as specified in ASTM D 1784.

   a. For sizes 8-inches and less in diameter, fittings shall be molded in one-piece with solvent welded joints. Minimum socket depths shall be specified in ASTM D 3034, Table 2.

   b. For sizes 10-inches and larger in diameter, fittings shall be fabricated from pipe conforming to ASTM D 3034 using solvent welding. No field fabrication of fittings will be allowed. All such fabrication shall be performed at the factory and the fittings shall be delivered ready for use.

7. Joints: Joints for pipe and fittings shall be of the integral bell and spigot type with a confined elastomeric gasket having the capability of absorbing expansion and contraction without leakage when tested in accordance with ASTM D 3212. Gaskets shall meet the requirements of ASTM F 477. The joint system shall be subject to the approval of the Engineer and shall be identical for pipe and fittings.

8. Manhole Connections - Solid Wall and Closed Profile Wall Pipe: The sewer shall be connected to manholes utilizing standard pipe sections.

9. Acceptance: Acceptance will be on the basis of the Engineer's inspection and the manufacturer's written certification that the pipe and fittings were manufactured and tested in accordance with the applicable standards.

C. Retainer Glands: Retainer glands shall be supplied by the ductile iron pipe supplier at the locations specifically indicated on the Drawings or specified. Retainer glands shall be the manufacturer's standard design and shall be designed for a minimum working pressure of 250 psi.

2.2 BEDDING MATERIAL

A. Bedding materials shall be #57 stone, unless shown or specified otherwise.

1. Crushed stone bedding material shall meet the requirements of Georgia Department of Transportation Specification 800.01 for No. 57 stone, Group II.

2.3 MANHOLES AND PRECAST CONCRETE PRODUCTS

A. Precast Concrete Sections:

1. Precast concrete sections shall meet the requirements of ASTM C 478. The minimum compressive strength of the concrete in precast sections shall be 4,000 psi.

2. The minimum wall thickness shall be one twelfth of the inside diameter of the base, riser or the largest cone diameter. Additionally, the wall thickness shall be sufficient for the proper installation of the rubber boots.

3. Transition sections, which convert bases that are larger than four feet in diameter to four-feet in diameter for risers, shall be designed by the manhole manufacturer to carry the live and dead loads exerted on the section.

4. Seal joints between precast sections by means of rubber O-ring gaskets or flexible butyl rubber sealant. Butyl rubber sealants shall meet the requirements of AASHTO M-198. Sealant shall be pre-formed type with a minimum nominal diameter of 1-inch. Butyl rubber sealant shall be equal to Kent Seal No. 2 or Concrete Sealants DS202.

B. Brick and Mortar: Brick shall be whole and hard burned, conforming to ASTM C 32 Grade MS. Mortar shall be made of one part Portland cement and two parts clean sharp sand. Cement shall conform to ASTM C 150. Sand shall meet ASTM C 33.

C. Iron Castings:

1. Cast iron manhole frames and covers shall meet the requirements of ASTM A 48 for Class 30 gray iron and all applicable local standards. All castings shall be tough, close grained, smooth and free from blowholes, blisters, shrinkage, strains, cracks, cold shots and other imperfections. No casting will be accepted which weighs less than 95% of the design weight. Shop drawings must indicate the design weight and provide sufficient dimensions to permit checking. All castings shall be thoroughly cleaned in the shop and given two coats of an approved bituminous paint before rusting begins.

2. Manhole frames and covers shall be standard and have the words "HALL COUNTY SANITARY SEWER" cast in the tops.

3. All frames and covers shall have machined horizontal bearing surfaces.

4. All manholes shall have standard frames and covers except where specifically shown otherwise on the Drawings. MH frame and cover clear openings shall be 32" for sanitary sewers 18" and larger.

5. Watertight covers shall be bolt-down type and shall be equipped with four 1/2-inch stainless steel bolts and a 1/8-inch red rubber or rubber O-ring gasket. Covers shall be rotatable and interchangeable. Bolt holes shall be bored through so that debris entering the bolt hole will fall in to the manhole. Bolt holes shall have the full 360 degree circle within the cover's radius when bored through the cover.

D. Rubber Boots: Provide preformed rubber boots and fasteners equal to those manufactured by Kor-N-Seal or Press Seal Gasket Corporation.

E. Shop Drawings: Shop drawings for manholes shall include details of all manhole components specified herein. Cut sheets for each manhole shall be provided as part of the shop drawing submittal. Cut sheets shall include plan, profile and layout information for each manhole.

2.4 CONCRETE

A. For sewers and accessories concrete shall have a compressive strength of not less than 4000 psi, and not less than 5.5 bags of cement per cubic yard and at a slump between 3 and 5-inches. For job mixed concrete, submit the concrete mix design for approval by the Engineer. Ready-mixed concrete shall be mixed and transported in accordance with ASTM C 94. Reinforcing steel shall conform to the requirements of ASTM A 615, Grade 60.

2.5 ECCENTRIC PLUG VALVES

A. Scope: The Contractor shall furnish and install eccentric plug valves on all sewage, sludge, and gas lines, as specified and as shown on the Drawings. Eccentric plug valves shall be furnished complete with operators and accessories or both at locations shown on the Drawings or where specified. Valves shall be manufactured by DeZurik, Clow, Pratt or equal. Plug valve manufacturer shall submit shop primer data sheets.

B. General: Valves shall be of the 90 degree turn, non-lubricated eccentric type with resilient faced plugs and shall be furnished with end connections as shown on the drawings. Flanged valves shall be faced and drilled to the ANSI 125/150 lb. standard. Mechanical Joint ends shall be AWWA Standard C111-64, grooved ends per AWWA C-606-87. Screwed ends shall be to the NPT standard. Experience in the manufacture of similar size and type valves shall be required and verifiable documentation shall be provided. The manufacturer of the plug valves shall submit valid documentation that they have successfully manufactured valve installations of the specified size, port type and eccentric design which have been successful in operation for at least five (5) years.

C. Valve Body: Valve bodies shall be of ASTM A126 Class B cast iron. Bodies in 4" and larger valves shall be furnished with a 1/8" welded overlay seat of not less than 90% pure nickel, machined to mate with the resilient faced plug. Valves that do not provide positive mating of the resilient faced plug with the nickel seat shall not be acceptable. Seat area shall be raised, with raised surface completely covered with weld to insure that the plug face contacts only nickel. Screwed-in seats shall not be acceptable. True eccentric action shall be required. Design of the valve shall provide for a rectangular port that allows contact between the welded nickel seat and the plug to occur only in the final 3 degrees of the plug movement. Round ported valves as well as other non-eccentric action valves shall not be acceptable. If requested, the manufacturer shall provide a complete site visit to the manufacturing facility for the Owner, Engineer and Contractor to witness the eccentric action of partially assembled valves and to verify the size and shape of the port area as well as the welded nickel seat.

D. Plugs: Plugs shall be of ASTM A126 Class B cast iron. The plug shall have a cylindrical seating surface eccentrically offset from the center of the plug shaft. The interference between the plug face and the body seat, with the plug in the closed position, shall be externally

adjustable in the field with the valve in line under pressure. The plug shall be completely coated with a hycar compound suitable for use with sewage. The hycar shall be applied at the factory to insure that the plug is completely coated and then heat-treated to insure a positive bond. Following this process, bare cast iron shall not be visible or exposed in the flow area to insure that the plug is abrasion resistant and suitable for service in raw sewage.

E. Bearings: Bearings shall be sleeve type metal bearings and shall be of sintered, oil impregnated, permanently lubricated type 316 ASTM A743 Grade CF-8M in ½" to 36" sizes. In valves larger than 36", the upper and lower plug journals shall be fitted with ASTM A-240 type 316 stainless sleeves with bearings of ASTM B30, Alloy C95400 aluminum bronze. Non-metallic bearings shall not be acceptable.

F. Shaft Seals: Valves shaft seals shall be of the multiple V-ring type and shall be externally adjustable and re-packable without removing the bonnet or actuator from the valve under pressure. Valves utilizing O-ring seals or non-adjustable packing shall not be acceptable.

G. Testing: Valve working pressure rating shall be 250 psi. If required for this working pressure, valve parts specified herein as cast iron may be provided as either ductile iron or stainless steel components as required. Each valve shall be given a hydrostatic and seat test at the factory with the results being certified in accordance with ANSI B16.1.

H. Actuators: Valve actuators for manual valves shall have nut, lever or gear actuators and tee wrenches, extension stems, floor stand, extension bonnet, etc. as indicated on the plans. All extension bonnets must have gear located at the operator stem extensions. Hand wheel operators on geared actuators are acceptable in a non-buried environment where the valve is installed less than six feet above the floor. When the valve is installed more than six feet above the floor level, a chainwheel operator on the geared actuator shall be installed. All valves 6" and larger shall be equipped with gear actuators. All gearing shall be enclosed in a semi-steel housing and be suitable for running in a lubricant with seals provided on all shafts to prevent entry of dirt and water into the actuator. The actuator shaft and the quadrant shall be supported on permanently lubricated bronze bearings. Actuators shall clearly indicate valve position and an adjustable stop shall be provided to set closing torque and to provide seat adjustment to compensate for change in pressure differential or flow direction change. All exposed nuts, bolts and washers shall be zinc plated. All buried valves 4" and larger shall have gear operators. Valve and gear actuators for buried or submerged service shall have seals on all shafts and gaskets on the valve and actuator covers to prevent the entry of water. Actuator mounting brackets for buried or submerged service shall be totally enclosed and shall have gasket seals. All exposed nuts, bolts and washers shall be stainless steel. All valves and actuators shall be fully manufactured in the USA. Foreign and/or imported components, castings and assembly shall not be acceptable. Documentation of this specification section shall be provided upon request or during the required site visits to the manufacturing facility.

2.6 RESILIENT SEATED GATE VAVES

A. General: The Contractor shall furnish resilient seated gate valves as indicated on the Drawings, and specified herein. Resilient seated gate valves size 2-inch through 12-inch shall conform, in general, with AWWA C 509 as amended to date, shall be equipped with O-ring packing, and shall be as specified herein and as detailed on the Drawings.

B. Construction: Resilient seated gate valves shall embody the best class of workmanship and finish, and shall open and close freely and easily. With the valve open, an unobstructed waterway shall be afforded, the diameter of which shall not be less than the full nominal diameter of the valve. If guides or guide lugs are used, the design shall be such that corrosion in the guide area does not affect sealing. Resilient seats may be applied to the body or gate and shall seat against a corrosion resistant surface. The surface may be either metallic or nonmetallic. Resilient seats shall be bonded or mechanically attached to either the gate or valve body. The mating surface of the resilient seat shall be machined to a smooth even finish. All stems shall be forged bronze stems.

C. Working Pressure: Water working pressure for valves shall be 250 psi.

D. Operation: All valves shall open left. Valves shall be operated by nut. Operating nuts shall conform to the present standard of the Owner, and shall have an arrow cast on them, indicating the direction for opening the valve.

E. Marking: Each valve shall be plainly marked with the manufacturer's name or particular mark, the year of manufacture, the size of the valve, and designation indicating working pressure, all cast on the bonnet or body.

F. Testing: All gate valves shall be tested in accordance with American Water Works Association Standards.

G. Jointing: All gate valves shall be furnished with mechanical joints, and necessary bolts, glands and gaskets unless otherwise shown on the Drawings or specified.

H. Manufacture: Valves shall be furnished as manufactured by Mueller, M&H Valve, US Pipe and American.

2.7 AIR VALVES

A. The Sewage Air Release & Vacuum Valve shall consist of a tubular all stainless steel fabricated body, hollow direct acting float and solid large orifice float in H.D.P.E., stainless steel nozzle and woven dirt inhibitor screen, nitrile rubber seals and natural rubber seat.

B. The valve shall have an integral "Anti-Surge" Orifice mechanism that shall operate automatically to limit surge pressures risk or shock induced by closure to less than 2 times valve rated working pressure.

C. The intake orifice area shall be equal to the nominal size of the valve i.e., a 6-inch valve shall have a 6-inch intake orifice. Large orifice sealing shall be affected by the flat face of the control float seating against a nitrile rubber O-ring housed in a dovetail groove circumferentially surrounding the orifice.

D. Discharge of pressurized air shall be controlled by the seating and unseating of a small orifice nozzle on a natural rubber seal affixed into the control float. The nozzle shall have a flat seating band surrounding the orifice so that damage to the rubber seal can be prevented.

E. The valve construction shall be proportioned with regard to material strength characteristics, so that deformation, leaking, or damage of any kind does not occur by submission to twice the designed working pressure.

F. Connection to the valve inlet shall be facilitated by flanged ends conforming to ANSI B16.1 Class 125 and AWWA C115.

G. Flanged ends shall be supplied with stainless steel screwed studs inserted for alignment to the specified standard.

H. Valves shall have a minimum pressure rating of 250 psi.

I. Valves shall be Vent-O-Mat, Series RGX for sewage application.

2.8 FLANGE ADAPTER

A. The flange adapter shall permit the connection of unthreaded, ungrooved, open-ended ductile iron pipe to ANSI/ASME B16.1, Class 125 flanges. The flange adapter shall meet the test requirements of ANSI/ASME B16.1 for Class 125 flanges. The adapter shall be ductile iron casting incorporating gripping wedges and gasket. The gasket shall provide a compression seal between the adapter, the pipe and the adjacent flange. Flange adapters are to be used only in locations specifically shown on the Drawings and shall be installed in accordance with the manufacturer's recommendations. The flange adapter shall be EBAA Iron Megaflange-Flange Adapter Series 2100.

2.9 CHECK VALVES

A. General: The Contractor shall furnish check valves at locations shown on the Drawings or specified.

B. PVC Ball Check Valves: PVC check valves shall be of the ball type with union body, Viton seat, and NPT threaded ends. Unless otherwise shown or required, all PVC valves shall be Schedule 80, Type I, Grade 1 PVC.

C. Solenoid Valves: Solenoid valves shall be ASCO Red Hat or equal.

2.10 VALVE OPERATOR AND ACCESSORIES

A. General: Valves shall be furnished with operators and accessories as shown and/or required for the intended service and in accordance with the following:

1. Gear Operator Locations: All valves 6-inches and larger, and all 4-inch and larger underground valves and valves submerged in sewage shall be gear operated. Below floor/grating valves operated from floor above shall have bushed extension stem with valve stand or floor box. Valves that are more than six feet above operating levels shall be geared for chain wheel operation for 6-inch or larger and chain-lever operated for 4-inch and smaller. Chain shall be zinc plated.

2. Gear Actuators: Gear actuators shall be submersible, and have a seal provided on all shafts which will prevent entry of water into the actuator, enclosed gearing shall run in oil or grease. Packing shall be adjustable without disassembling the actuator. Actuator shall clearly indicate valve position. Closing torque shall be set by an adjustable stop.

3. Handwheel Operators: Handwheel operators shall be provided as shown on the Drawings. Valve shall be designed for open LEFT operation. Valve operators shall be pre-tested at rated operating pressure using the specified valve operator to perform the opening and closing cycle; a certificate attesting to operation and leak tests shall be furnished with the valves upon shipment. All valves coated with a shop primer shall submit shop primer data sheet with shop drawings.

4. Chainwheel Operators: All valve operators located 6 feet or greater above the finished floor shall have chainwheel operators. The Chain drop shall be within 3 feet of the finished floor.

2.11 VALVE OPERATOR AND ACCESSORIES

A. All reclaimed water valves and outlets should be tagged or embossed to warn the public and the employees that the water is not intended for drinking.

B. All piping and pipelines must be color-coded using Pantone Purple 522 using sunlight stable pigment.

C. All valves and outlets must be tagged and color-coded purple to differentiate potable water lines from reclaimed water.

D. All reclaimed water valves and outlets must be tagged or labeled "DO NOT DRINK" in addition to the equivalent standard international symbol to warn the public and the employees that the water is not intended for drinking.

E. Where hose bibs are present on reclaimed water lines, different sizes from those on potable water lines must be established to preclude interchange of hoses.

F. Cam Lock connection assemblies in small sizes (9 1/2 to 3/4 inch) with lockable meter boxes will be required on all hose connections designated for reclaimed water.

G. All distribution and application facilities must be color-coded using Panton Purple 5622.

PART 3 - EXECUTION 3.1 EXISTING UTILITIES AND OBSTRUCTIONS

A. General: The Drawings indicate utilities or obstructions that are known to exist according to the best information available to the Owner. The Contractor shall call the Utilities Protection Center (UPC) (325-5000 or 1-800-282-7411) as required by Georgia law (Code Section 25-9-1 through 25-9-13) and all utilities, agencies or departments that own and/or operate utilities in the vicinity of the construction work site, at least 72 hours (three business days) prior to construction, to verify the location of the existing utilities.

B. Existing Utility Location: The following steps shall be exercised to avoid interruption of existing utility service.

1. Provide the required notice to the utility owners and allow them to locate their facilities according to Georgia law. Field utility locations are valid for only ten days after original notice. The Contractor shall ensure, at the time of any excavation, that a valid utility location exists at the point of excavation.

2. Expose the facility to verify its true location and grade for a distance of at least 200 feet in advance of pipeline construction. Repair, or have repaired, any damage to utilities resulting from locating or exposing their true location.

3. Avoid utility damage and interruption by protecting it with means or methods recommended by the utility owner.

4. Maintain a log identifying when phone calls were made, who was called, area for which utility relocation was requested, and work order number issued, if any. The Contractor shall provide the Engineer an updated copy of the log bi-weekly, or more frequently if required.

C. Conflict with Existing Utilities:

1. Horizontal Conflict: Horizontal conflict shall be defined as when the actual horizontal separation between a utility, main, or service and the proposed water main does not permit safe installation of the sewer by the use of sheeting, shoring, teeing-back, supporting, or temporarily suspending service of the parallel or crossing facility. The Contractor may change the proposed alignment of the sewer to avoid horizontal conflicts if the new alignment remains within the available right-of-way or easement and complies with regulatory agency requirements after a written request to and subsequent approval by the Engineer. Where such relocation of the sewer is not approved by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.

2. Vertical Conflict: Vertical conflict shall be defined as when the actual vertical separation between the utility, main, or service and the proposed sewer does not permit the crossing without immediate or potential future damage to the utility, main, service, or the sewer. The Contractor may change the proposed grade of the sewer to avoid vertical conflicts if the changed grade provides minimum required capacity maintains adequate cover and complies with regulatory agencies requirements, after written request to and subsequent approval by the Engineer. Where such relocation of the sewer is not approved by the Engineer, the Contractor shall arrange to have the utility, main, or service relocated.

D. Electronic Locator: Have available at all times an electronic pipe locator and a magnetic locator, in good working order, to aid in locating existing pipe lines or other obstructions.

E. Potable Water, Sewer and Reuse Separation:

1. Sanitary sewer lines should maintain a minimum 10-foot edge-to-edge separation from potable water mains. Minimum horizontal separation of three feet (outside of pipe to outside of pipe) must be maintained between reclaimed water lines and the potable water or the sewer lines. Where the sewer, or reclaimed water, crosses a potable water main, an

18-inch vertical separation from the bottom of the potable water to the top of the sewer or reclaimed water main shall be maintained. Where possible, a full joint of sewer pipe shall be centered over the water main. Any deviation shall be requested in writing to the Engineer.

2. Where a sewer, or reclaimed water line, crosses over a potable water main, the potable water main shall be encased in concrete to the first joint in each direction.

3. No water main shall be permitted to pass through or come in contact with any part of a manhole.

3.2 SOILS

A. All unsuitable excavated material must be properly disposed of in a manner acceptable to the County Public Works and Utilities Department and in a manner that will not adversely impact the environment.

3.3 CONSTRUCTION ALONG HIGHWAYS, STREETS AND ROADWAYS

A. General: Install pipe lines and appurtenances along highways, streets and roadways in accordance with the applicable regulations of, and permits issued by, the Georgia Department of Transportation and the U.S. Army Corps of Engineers with reference to construction operations, safety, traffic control, road maintenance and repair.

B. Street Closing: The Contractor shall obtain the approval of the following agencies at least 24 hours in advance before closing any streets:

1) Hall County Public Works and Utilities
2) Georgia Department of Transportation

C. Traffic Control:

1. The Contractor shall provide, erect and maintain all necessary barricades; suitable and sufficient lights and other traffic control devices; provide qualified flagmen where necessary to direct the traffic; take all necessary precautions for the protection of the work and the safety of the public. Flagmen shall be certified by a Georgia DOT approved flagman training program.

2. Construction traffic control devices and their installation shall be in accordance with the current Manual On Uniform Traffic Control Devices for Streets and Highways.

3. Placement and removal of construction traffic control devices shall be coordinated with the appropriate agencies and the Construction Manager a minimum of 48 hours in advance of the activity.

4. Placement of construction traffic control devices shall be scheduled ahead of associated construction activities. Construction time in street right-of-way shall be conducted to minimize the length of time traffic is disrupted. Construction traffic control devices shall be removed immediately following their useful purpose. Traffic control devices used intermittently, such as "Flagmen Ahead", shall be removed and replaced when needed.

5. Existing traffic control devices within the construction work zone shall be protected from damage. Traffic control devices requiring temporary relocation shall be located as near as possible to their original vertical and horizontal locations. Original locations shall be measured from reference points and recorded in a log prior to relocation. Temporary device locations shall provide the same visibility to affected traffic as the original device location. Relocated traffic control devices shall be reinstalled in their original locations as soon as practical following construction.

6. Construction traffic control devices shall be maintained in good repair, and shall be clean and visible to affected traffic for daytime and nighttime operation. Traffic control devices affected by the construction work zone shall be inspected daily.

7. Construction warning signs shall be black legend on an orange background. Regulatory signs shall be black legend on a white background. Construction sign panels shall meet the minimum reflective requirements of the Department of Transportation and Hall County. Sign panels shall be of durable materials capable of maintaining their color, reflective characters and legibility during the period of construction.

8. Channelization devices shall be positioned preceding an obstruction at a tapered length as required by the current Manual On Uniform Traffic Control Devices for Streets and Highways, as appropriate for the speed limit at that location. Channelization devices shall be patrolled to insure that they are maintained in the proper position throughout their period of use.

D. Construction Operations:

1. Perform all work along highways, streets and roadways to minimize interference with traffic.

2. Stripping: Where the pipe line is laid along road right-of-way, strip and stockpile all sod, topsoil and other material suitable for right of-way restoration.

3. Trenching, Laying and Backfilling: Do not open the trench any further ahead of pipe laying operations than is necessary. Backfill and remove excess material immediately behind laying operations. Complete excavation and backfill for any portion of the trench in the same day.

4. Shaping: Reshape damaged slopes, side ditches, and ditch lines immediately after completing backfilling operations. Replace topsoil, sod and any other materials removed from shoulders.

E. Excavated Materials: Do not place excavated material along highways, streets and roadways in a manner that obstructs traffic. Sweep all scattered excavated material off the pavement in a timely manner.

F. Drainage Structures: Keep all side ditches, culverts, cross drains, and other drainage structures clear of excavated material. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.

G. Landscaping Features: Landscaping features shall include, but are not necessarily limited to: fences; property corners; cultivated trees and shrubbery; manmade improvements; subdivision and other signs within the right-of-way and easement. The Contractor shall take extreme care in moving landscape features and promptly re-establishing these features.

H. Maintaining Highways, Streets, Roadways and Driveways:

1. Maintain streets, highways, roadways and driveways in suitable condition for movement of traffic until completion and final acceptance of the work.

2. During the time period between pavement removal and completing permanent pavement replacement, maintain highways, streets and roadways by the use of steel running plates. The edges of running plates shall have asphalt placed around their periphery to minimize vehicular impact. The backfill above the pipe shall be compacted, as specified elsewhere up to the existing pavement surface to provide support for the steel running plates.

3. Furnish a road grader or front-end loader for maintaining highways, streets, and roadways. Make the grader or front-end loader available at all times.

4. Immediately repair all driveways that are cut or damaged. Maintain them in a suitable condition for use until completion and final acceptance of the work.

3.4 PIPE DISTRIBUTION

A. Pipe shall be distributed and placed in such a manner that will not interfere with traffic.

B. No pipe shall be strung further along the route than 1,000 feet beyond the area in which the Contractor is actually working without written permission from the Owner. The Owner reserves the right to reduce this distance to maximum distance of 200 feet in residential and commercial areas based on the effects of the distribution to the adjacent property owners.

C. No street or roadway may be closed for unloading of pipe without first obtaining permission from the proper authorities. The Contractor shall furnish and maintain proper warning signs and obstruction lights for the protection of traffic along highways, streets and roadways upon which pipe is distributed.

D. No distributed pipe shall be placed inside drainage ditches.

E. Distributed pipe shall be placed as far as possible from the roadway pavement and no closer than five feet from the roadway pavement, as measured edge-to-edge.

3.5 LOCATION AND GRADE

A. General: The Drawings show the alignment and grade of the gravity sewer, force main and the position of manholes and other appurtenances. The slope shown on the profile and/or called for in the Specifications is the slope of the invert of the pipes.

B. Surveys: From the information on the Drawings and the survey points found on the Project site, the Contractor shall perform all surveys necessary for the establishment of the horizontal and vertical alignment of the sewer.

C. Reference Points:

1. The Contractor shall take all precautions necessary, which includes, but is not necessarily limited to, installing reference points, in order to protect and preserve the centerline or baseline established by the Engineer.

2. Reference points shall be placed at or no more than three feet from the outside of the construction easement or right-of-way. The location of the reference points shall be recorded in a log with a copy provided to the Engineer for use prior to his verifying reference point locations. Distances between reference points and the manhole centerlines shall be accurately measured to the nearest 0.01 foot.

3. The Contractor shall give the Engineer reasonable notice that reference points are set. The reference point locations must be verified by the Engineer, prior to commencing clearing and grubbing operations.

4. After the Engineer approves the manhole centerlines or baselines of the sewer, the Contractor shall perform clearing and grubbing.

D. Cut Sheets:

1. Cut sheets shall be utilized for basis of payment and confirming that the profile is as shown on the Drawings.

2. Prior to beginning installation of any section of the gravity sewer, prepare cut sheets from field run ground elevations and submit them to the Engineer for approval.

3. The survey, from which cut sheets are prepared, may be performed prior to or after clearing and grubbing operations. The surveyor shall obtain an elevation on each benchmark shown on the Drawings and provide this information to the Engineer.

4. No installation of the sewer shall commence prior to approval of the cut sheets.

5. Submittal of cut sheets shall be in accordance with these Specifications.

6. Cut sheets shall provide the station (to the nearest 1 foot) and the elevation (to the nearest 0.1 foot) at maximum 100 foot intervals, plus at each change in slope of the ground and at each manhole centerline. The cut sheet shall also show the invert elevation of the sewer at the corresponding sewer station. From a straight line interpolation of the data, the Contractor shall calculate and record the station of each point where there is change in the cut brackets indicated on the Bid form. The Contractor shall calculate and record the length of the sewer between each change in cut bracket. The Contractor shall also indicate the pipe material and class as well as the type of bedding. The slope of the sewer shall also be indicated between manholes. At least one offset hub or temporary benchmark shall be provided at each manhole. Its elevation and the resulting cut from the hub to the manhole invert shall also be shown on the cut sheets.

7. Construction shall begin at the low end of the sewer and proceed upstream without interruption. Multiple construction sites shall not be permitted without written authorization from the Engineer for each site. At a minimum, cut sheets between construction sites shall be submitted and approved before multiple construction sites will be permitted.

E. Damage: The Contractor shall be responsible for any damage done to reference points, base lines, center lines and temporary bench marks, and shall be responsible for the cost of re-establishment of reference points, base lines, center lines and temporary bench marks as a result of the operations.

3.6 LAYING AND JOINTING PIPE AND ACCESSORIES

A. General: Lay all pipe and fittings to accurately conform to the lines and grades established by the Engineer.

B. Pipe Installation:

1. Proper implements, tools, and facilities shall be provided for the safe performance of the work. All pipe, fittings and valves shall be lowered carefully into the trench by means of slings, ropes or other suitable tools or equipment in such a manner as to prevent damage to sewer materials and protective coatings and linings. Under no circumstances shall sewer materials be transported with forks of a lifting device into the pipe or dropped or dumped into the trench.

2. All pipe, fittings, valves and other appurtenances shall be examined carefully for damage and other defects immediately before installation. Defective materials shall be marked and held for inspection by the Engineer, who may prescribe corrective repairs or reject the materials.

3. All lumps, blisters and excess coating shall be removed from the socket and plain ends of each pipe. The outside of the plain end and the inside of the bell shall be wiped clean and dry and free from dirt, sand, grit or any foreign materials before the pipe is laid. No pipe which contains dirt shall be laid.

4. Foreign material shall be prevented from entering the pipe while it is being placed in the trench. No debris, tools, clothing or other materials shall be placed in the pipe at any time.

5. As each length of pipe is placed in the trench, the joint shall be assembled and the pipe brought to correct line and grade. The pipe shall be secured in place with approved backfill material.

6. It is common practice to lay pipe with the bells facing the direction in which work is progressing however, it is not mandatory.

7. Applying pressure to the top of the pipe, such as with a backhoe bucket, to lower the pipe to the proper elevation or grade shall not be permitted.

D. Alignment and Gradient:

Lay pipe straight in alignment and gradient and follow true curves, where shown on the Drawings, as nearly as practicable. Do not deflect any joint more than the maximum deflection recommended by the manufacturer or as detailed on the drawings.

1. Maintain a transit, level and accessories on the job to lay out angles and ensure that deflection allowances are not exceeded.

2. The Contractor shall check the invert elevation of the gravity sewer at each manhole and the pipe invert elevation at least three times daily: start, mid-day and end of day. Elevations shall be checked more frequently if more than 100 feet of pipe is installed in a day or if the pipe is being constructed at minimum slope.

3. The Contractor shall check the horizontal alignment of the sewer at the same schedule as for invert elevations.

4. Do not install force main or reuse main such as to generate a high point except where shown on the Drawings. Prior to backfilling the trench, the Contractor shall survey the elevation of force main top of pipe barrel at minimum 100-foot intervals, at all bends, at all air valves, and where elevations are shown on the Drawings. The location description and elevation of each benchmark used for this survey shall be recorded and all this information submitted to the Engineer. Vertical deflections required to avoid existing underground obstructions shall not result in a high point in the force main unless approved by the Engineer.

5. Any section of force main or reuse main which is determined to have been installed such that a high point is generated at a location other than that shown on the Drawings shall be removed and reinstalled to the correct elevation, unless the variation in elevation was approved in writing by the Engineer.

6. Proper alignment of the pipelines shall be maintained by laser.

7. Any pipe that has its alignment, grade or joints disturbed after installation shall be taken up and reinstalled at no cost to the Owner.

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

E. Joint Assembly: Push-on, mechanical and flange type joints shall be assembled in accordance with the manufacturer's recommendations.

F. Cutting Pipe:

1. Cut PVC or ductile iron pipe using a suitable saw.

2. Remove all burrs and smooth the end before jointing.

3. The Contractor shall cut the pipe and bevel the end, as necessary, to provide the correct length of pipe necessary for installing the fittings, valves, accessories and closure pieces in the correct location.

G. Pipe which has been laid, but during the course of work has had its alignment, grade or joints disturbed after it was installed, shall be taken up and re-laid.

H. Valve and Fitting Installation:

1. Prior to installation, valves shall be inspected for direction of opening, number of turns to open, freedom of operation, tightness of pressure-containing bolting and test plugs, cleanliness of valve ports and especially seating surfaces and handling damage and cracks. Defective valves shall be corrected or held for inspection by the engineer. Valves shall be closed before being installed.

2. Valves, fittings, plugs and caps shall be set and joined to the pipe in the manner specified in this Section for cleaning, laying and joining pipe, except that 12-inch and larger valves shall be provided with special support, such as treated timbers, crushed stone, concrete pads or a sufficiently tamped trench bottom so that the pipe will not be required to support the weight of the valve.

I. Air Release Valve Manholes:

1. Construct the vault or manhole as detailed on the Drawings.

2. The frame and cover shall be cast into the top slab or cone.

3. Where vent pipes are not shown on the Drawings, the frame and cover or floor door shall be provided with 1-inch holes to provide the equivalent opening as in air valve. The minimum number of holes shall be two. The quantity for each valve size is as follows: 2-inch, 4; 3-inch, 9; 4-inch, 16; 6-inch, 36; 8-inch 64.

4. Air release valves shall be installed at the high points of the pipeline as shown on the Drawings. The actual location of the high points are to be confirmed utilizing a surveyors level and the elevation submitted as specified in 3.05, C.5. No other high points are allowed.

J. PIPE BEDDING AND BACKFILL

1. Flexible Pipe: Shall be in accordance with ASTM D 2321 for Class I, II and III bedding materials.

2. Rigid Pipe: Shall be in accordance with ASTM C12 for Class A, B, and C bedding materials.

3. Trench backfill shall be compacted to a minimum of 95% modified Proctor density as determined in accordance with ASTM D 1557 in improved streets or streets that are planned to be paved.

3.7 MANHOLE AND PRECAST CONCRETE PRODUCT CONSTRUCTION

A. General: Construct manholes as shown on the Drawings.

B. Precast Concrete: Handle sections carefully to prevent cracking or chipping. Provide uniform bedding of the bottom section to prevent uneven loading. Install gaskets and joint sealants in accordance with manufacturer's recommendations to produce a watertight structure.

C. Pipe Connections: All pipes shall be connected to precast concrete manholes by a rubber boot provided in a cored or precast hole of the proper diameter.

D. Inverts: Form channels as shown on the Drawings, rounded, and troweled smooth. Maintain consistent grade through the invert.

E. Top Elevations: Build manholes outside of paved areas to 18-inches above finished grade unless otherwise shown on the Drawings or directed by the Engineer. Build manholes in paved areas to existing grades.

F. Drop Connections: Manholes requiring drop connections are shown or indicated on the Drawings. Construct drop connections of the same materials as the upstream sewer and in accordance with the details shown on the Drawings. Drop manhole connections are required for incoming sewer pipes that are more than 2 feet above the manhole invert.

G. Frames and Covers: Unless frame and cover is at grade, the frame shall be cast into the cone section.

H. Sealing: Seal all manhole joints and lift holes, both inside and out, with grout. Between precast sections, this is in addition to joint sealant.

I. Invert Elevations: The invert elevations shown on the Drawings shall be for the invert at the centerline of the precast concrete manhole. Prior to setting the laser or other vertical alignment control system for the sewer upstream of the manhole, the Contractor shall verify the elevation of the sewer installed at the manhole. Should the elevation differ from that shown on the Drawings, the Contractor shall take the following corrective action:

1. If the sewer is laid at negative grade or to a grade less than the grade shown on the EPD-approved drawings (i.e., bid drawings), the Contractor shall remove and reinstall the sewer at the correct grade at no additional cost to the Owner.

2. If the sewer is laid at a grade less than that shown on the Drawings, thus reducing the sewer's capacity, the Owner may require the sewer to be removed and re-laid at the correct grade at no additional cost to Owner. As a minimum, the grade to the next upstream manhole shall be adjusted such that the next upstream manhole shall be set at the correct elevation.

3. If the sewer is laid at a grade greater than that shown on the Drawings, and the Contractor can show that there are no conflicts with upstream existing utilities or obstructions, the Contractor shall adjust the grade of the next upstream manhole such that the next upstream manhole shall be set at the correct elevation. If such an adjustment, in the Engineer's opinion, is substantial, the grade adjustment shall be spread over multiple

sections of the sewer. If such an adjustment, in the Owner's opinion, significantly reduces the sewer's capacity, the Owner may require the Contractor to remove and relay that portion of the sewer laid at the improper grade.

J. Walls: Manholes shall be constructed such that their walls are plumb and cast-in steps are properly aligned for safe access.

3.8 THRUST RESTRAINT

A. General: Provide restraint at all points where hydraulic thrust may develop.

B. Concrete Blocking:

1. Provide concrete blocking for all bends, tees, valves, and other points where thrust may develop in addition to retainer glands, except where other means of thrust restraint are specifically shown on the Drawings.

2. Form and pour concrete blocking at fittings as shown on the Drawings and as directed by the Engineer. Pour blocking against undisturbed earth. Increase dimensions when required by over excavation.

C. Retainer Glands:

1. Retainer glands shall be ductile iron and shall be manufactured in the United States. All retainer glands on the Project shall be the product of a single manufacturer.

2. Retainer glands shall be provided at all mechanical joints, including fittings, valves and other locations as shown on the Drawings.

3. Retainer glands shall be of a wedge type. Wedge type retainer glands shall be MEGALUG, Series 1100 as manufactured by EBAA Iron, Inc.

D. Harnessing:

1. Provide harness rods only where specifically shown on the Drawings or directed by the Engineer.

2. Harness rods shall be manufactured in accordance with ASTM A 449 and shall have an allowable tensile stress of no less than 39,600 psi. Harness rods shall be hot dip galvanized or field coated with bitumastic before backfilling.

3. Where possible, harness rods shall be installed through the mechanical joint bolt holes. Where it is not possible, provide 90-degree bend eyebolts.

4. Eyebolts shall be of the same diameter as specified in AWWA C111 for that pipe size. The eye shall be welded closed. Where eyebolts are used in conjunction with harness rods, an appropriate size washer shall be utilized with a nut on each end of the harness rods.

3.9 INSPECTION AND TESTING

A. General: Clean and test lines before requesting final acceptance. Where any obstruction is encountered, clean the sewers by means of rods, swabs, or other instruments. When requested by the Engineer, flush out lines and manholes before final inspection. Notify the Owner and Engineer 48 hours prior to scheduling any tests so their presence can be made for any tests.

B. Gravity Sewers: Pipelines shall be straight and show a uniform grade between manholes. Correct any discrepancies discovered during inspection.

1. Infiltration Tests: Use only when groundwater is two feet above the top of the pipe.

a. Install suitable weirs in manholes selected by the Engineer to determine the leakage of ground water into the sewer. The maximum length of line for each infiltration test shall be 5,000 feet. Measure leakage only when all visible leaks have been repaired and the ground water is two feet above the top of the pipe. If leakage in any section of the sewer line exceeds 25 gpd per inch of diameter per mile, locate and repair leaks. Repair methods must be approved by the Engineer. After repairs are completed, re-test for leakage.

b. Furnish, install, and remove the necessary weirs, plugs, and bulkheads required to perform the leakage tests. Where continuous monitoring of flow level is required, the Owner will provide and operate monitoring equipment.

2. Exfiltration Tests: Choose one of the following when groundwater is not two feet above the top of the pipe.

a. Hydrostatic Test:

1) Test pipe between manholes with a minimum of 10 feet hydrostatic pressure, measured at the center of the pipe at the upstream manhole.

2) The ends of the pipe in the test section shall be closed with suitable watertight bulkheads. Inserted into the top of each bulkhead shall be a 2-inch pipe nipple with an elbow. At the upper end of the section, a 12-inch riser pipe shall be connected to the 2-inch nipple. The test section of pipe shall be filled through the connection in the lower bulkhead that shall be fitted with a valve until all air is exhausted and until water overflows the riser pipe at the upper end. Water may be introduced into the pipe 24 hours prior to the test period to allow complete saturation. House service lines, if installed, shall also be fitted with suitable bulkheads having provisions for the release of air while the test section is being filled with water.

3) During the test period, which shall extend over a period of two hours, water shall be introduced into the riser pipe from measured containers at such intervals as are necessary to maintain the water level at the top of the riser pipe. The total volume of water added during the test period shall not exceed 25 gpd per inch diameter per mile.

b. Low Pressure Air Test:

1) Prior to air testing, the section of sewer between manholes shall be thoroughly cleaned and wetted. Immediately after cleaning or while the pipe is water soaked, the sewer shall be tested with low-pressure air. At the

Contractor's option, sewers may be tested in lengths between manholes or in short sections (25 feet or less) using inflatable balls pulled through the line from manhole to manhole. Air shall be slowly supplied to the plugged sewer section until internal air pressure reaches approximately 4.0 psi. After this pressure is reached and the pressure allowed to stabilize (approximately two to five minutes), the pressure may be reduced to 3.5 psi before starting the test. If a 1.0 psi drop does not occur within the test time, then the line has passed the test. If the pressure drops more than 1.0 psi during the test time, the line is presumed to have failed the test, and the Contractor will be required to locate the failure, make the necessary repairs, and retest the line. The minimum test time for various Ductile iron and PVC pipe sizes shall be in accordance with ASTM F-1417 and as follows:

Nominal Pipe Size, inches	T (Time Min/100) Feet
6	3.8
8	7.6
12	11.3
15	14.2
16	15.1
18	17.0
20	18.9
24	22.8
30	28.3
48	91.2
54	115.4

2) Required test equipment, including inflatable balls, braces, air hose, air source, timer, rotameter as applicable, cut-off valves, pressure reducing valve, 0-15 psi pressure gauge, 0-5 psi pressure gauge with gradations in 0.1 psi and accuracy of ± two percent, shall be provided by the Contractor. Testing equipment shall be equal to Cherne Air-Loc Testing System.

3) The Contractor shall have the Owner and or Engineer present and keep records of all tests made. A copy of such records will be given to the Engineer or the Owner. Such records shall show date, line number and stations, operator, and such other pertinent information as required by the Engineer.

4) The Contractor is cautioned to observe proper safety precautions in performance of the air testing. It is imperative that plugs be properly secured and that care be exercised in their removal. Every precaution shall be taken to avoid the possibility of over-pressurizing the sewer line.

3. Deflection Test:

a. Test PVC gravity sewer for excessive deflection by passing a mandrel through the pipe. Testing shall conform to ASTM D 2122. Deflection of the pipe shall not exceed the following:

Nominal Pipe Diameter	Maximum Allowable Deflection
12-inches	5%
> 12-inches	4%

b. The mandrel size shall be based upon the maximum possible inside diameter for the type of pipe being tested, taking into account the allowable tolerances of the pipe. The mandrel shall have an odd number of legs, or vanes, with a quantity of such equal to or greater than nine. 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 Engineer, and shall have sufficient rigidity so the legs of the mandrel will not deform when pulling through a pipe. The mandrel dimensions shall be checked by the Engineer before use by the Contractor.

c. Excavate and reinstall properly any section of pipe not passing this test. Re-test until results are satisfactory.

d. This test shall be performed within the first 30 days of installation or during final inspection. The test shall not be performed until at least 7 days has passed since final backfill was placed. Deflection shall be limited to the limits specified above. Where excessive deflection is encountered, corrective measures shall be taken to bring deflection to within the allowable tolerance.

4. Television Inspection

Internal television inspection will be conducted on all new sewer lines. This inspection must be done in the presence of the Authority. The Authority must be notified at least 72 hours prior to any testing or inspection.

An independent testing firm, as approved by the Authority, shall conduct the test. A copy of all logs, photographs, and tapes will be submitted to the Authority.

The television camera used shall be designed and constructed for internal sewer inspections. The camera monitor shall be located inside a temperature controlled mobile unit that will accommodate three people observing the line inspection by television. A skilled technician shall control the operation of the equipment at all times from control and inside the mobile inspection unit.

The mobile inspection unit shall have the capabilities of taking still photographs of the view which appears on the monitor. The camera shall frame the entire screen in width and height.

The contractor shall keep a record of the television inspection work. The record shall contain at least the following:

1. Date and Time
2. Sewer line location
3. Sewer material
4. Size and length of line
5. Condition of pipe
6. Sewer lateral location on the periphery of the pipe and type of connection
7. Pipe damage – location and type

8. Infiltration points – location and description
9. Photographs – photo number and location

C. Force Main and Reuse Main Pressure and Leakage Test:

1. All sections of pipeline subject to internal pressure shall be pressure tested in accordance with AWWA C600. A section of line will be considered ready for testing after completion of all thrust restraint backfilling. Each segment of pipeline between line valves shall be tested individually. Conduct tests after pipe has been buried and properly backfilled but before any permanent covering is completed such as grass, pavement, etc.

2. Contractor may, if field conditions permit and Engineer approves, partially backfill trench and leave joints exposed for inspection and conduct an initial service leakage test. Final test shall not be done until all backfilling is competed as specified above.

3. Test Preparation:

   a. Flush pipeline section thoroughly at flow velocities adequate to remove debris from pipe and valve seats. Partially operate valves and hydrants to clean out seats. Provide correctly sized temporary outlets in number adequate to achieve flushing velocities.

   b. Provide temporary blocking, bulkheads, flanges and plugs as necessary, to assure all new pipes, valves and appurtenances will be pressure tested.

   c. Before applying test pressure, air shall be completely expelled from the pipeline and all appurtenances. Unless permanent air vents are in place, insert temporary corporation stops at highpoints to expel air as line is filled with water.

   d. Fill pipeline with a maximum filling velocity of 0.25 feet per second, calculated based upon the full area of the pipe, with water furnished by the Contractor. Provide a suitable pump with an accurate water meter to pump the line to the specified pressure. Differential pressure at valves and hydrants shall equal the maximum possible, but shall not exceed manufacturer's pressure rating.

4. Test Pressure: Test the pipeline and thrust restraints at 150 psi measured at the lowest point for two hours. Apply and maintain the test pressure with hydraulic force pump. Valve off the piping system when test pressure is reached.

5. Leakage: Leakage shall be defined as the quantity of water that must be pumped into the test section: equal to the sum of the water to maintain pressure within 5 psi of the specified test pressure for the test duration plus water required to return line to test pressure at the end of the test. Leakage shall be the total cumulative amount measured on a water meter.

   1) The Owner assumes no responsibility for leakage occurring through existing valves.

   Test Results: No test section shall be accepted if the leakage exceeds the limits determined under Section 4 of AWWA C600. The leakage test shall be repeated until the test section is accepted and repairs made. All visible leaks shall be repaired regardless of leakage test results.

2) Completion: After a pipeline section has been accepted, relieve test pressure, record the type, size and location of all outlets on record drawings.

D. Manholes: All manholes shall be tested and shown to be watertight. Prior to testing manholes for water tightness, all lift holes shall be plugged with a non-shrink grout, all joints between precast sections shall be properly sealed and all pipe openings shall be temporarily plugged and properly braced.

1. Exfiltration Test: manholes that have been backfilled, shall be tested for Exfiltration for a test time of one (1) hour by fill the manhole with water to the top of the ring. The maximum allowable Exfiltration rate shall be two (2) gallons per foot of depth per foot of manhole diameter.

5. Vacuum Test: In lieu of Exfiltration Tests, prior to backfilling each manhole shall pass the vacuum test as defined in ASTM C 1244, "Standard Test Method for Concrete Sewer Manholes by the Negative Air Pressure (Vacuum) Test." Vacuum shall be held at 10 inches of mercury for a period of 60 seconds with the vacuum pump shut off. If pressure drops below 9 inches, test has failed and repairs shall be made and retested.

3.10 PROTECTION AND RESTORATION OF WORK AREA

A. General: Return all items and all areas disturbed, directly or indirectly, by work under these Specifications to their original condition or better, as quickly as possible after work is started.

1. The Contractor shall plan, coordinate, and prosecute the work such that disruption to personal property and business is held to a practical minimum.

2. All construction areas abutting lawns and yards of residential or commercial property shall be restored promptly. Backfilling of underground facilities, ditches, and disturbed area shall be accomplished on a daily basis as work is completed. Finishing, dressing, and grassing shall be accomplished immediately thereafter, as a continuous operation within each area being constructed and with emphasis placed on completing each individual yard or business frontage. Care shall be taken to provide positive drainage to avoid ponding or concentration of runoff.

3. Handwork, including raking and smoothing, shall be required to ensure that the removal of roots, sticks, rocks, and other debris is removed in order to provide a neat and pleasing appearance.

4. The Engineer shall be authorized to stop all work by the Contractor when restoration and cleanup are unsatisfactory and to require appropriate remedial measures.

B. Man-Made Improvements: Protect, or remove and replace with the Engineer's approval, all fences, walkways, mail boxes, pipe lines, and drain culverts, power and telephone lines and cables, property pins and other improvements that may be encountered in the work.

C. Cultivated Growth: Do not disturb cultivated trees or shrubbery unless approved by the Engineer. Any such trees or shrubbery which must be removed shall be heeled in, and replanted under the direction of an experienced nurseryman.

D. Cutting of Trees: Do not cut trees for the performance of the work except as absolutely necessary. Protect trees that remain in the vicinity of the work from damage from equipment. Do not store spoil from excavation against the trunks. Remove excavated material stored over the root system of trees within 30 days to allow proper natural watering of the root system. Repair any damaged tree over 3 inches in diameter, not to be removed, under the direction of an experienced nurseryman. All trees and brush that require removal shall be promptly and completely removed from the work area and disposed of by the Contractor. No stumps, wood piles, or trash piles will be permitted on the work site.

E. Disposal of Rubbish: Dispose of all materials cleared and grubbed during the construction of the project in accordance with the applicable codes and rules of the appropriate County, State and Federal regulatory agencies.

F. Swamps and Other Wetlands:

1. The Contractor shall not construct permanent roadbeds, berms, drainage structures or any other structures that alter the original topographic features within the easement.

2. All temporary construction or alterations to the original topography will incorporate measures to prevent erosion into the surrounding swamp or wetland. All areas within the easement shall be returned to their original topographic condition as soon as possible after work is completed in the area. All materials of construction and other non-native materials shall be disposed of by the Contractor.

3. The Contractor shall provide temporary culverts or other drainage structures, as necessary, to permit the free migration of water between portions of a swamp, wetland or stream that may be temporarily divided by construction.

4. The Contractor shall not spread, discharge or dump any fuel oil, gasoline, pesticide, or any other pollutant to adjacent swamps or wetlands.

3.11 BYPASS PUMPING

A. Bypass pumping may be allowed or required as indicated on the Drawings for the proper execution of the work. Care shall be taken to ensure that the spillage of raw wastewater onto the ground or into a receiving stream or body of water does not occur. Bypass pumping that allows raw wastewater to come into contact with the ground or into a receiving stream or body of water is prohibited.

3.12 IDENTIFICATION AND LOCATOR WIRE

A. Install continuous underground detectable mylar warning tape during backfilling of trench for underground sewer and reuse piping. Locate below finished grade, directly over piping.

B. A continuous or properly spliced Number 12 AWG solid plastic coated copper wire shall be placed along all PVC pipe installations.

C. The locator wire shall run from the last hydrant to the galvanized pipe portions of the blow off assemblies and terminate in meter box. The locator wire shall be attached at each end in a manner, approved by the inspector, to allow direct access to the wire.

D. Care shall be taken during backfilling to prevent damaging or cutting of the locator wire.

E. All splices shall be made by using copper wire "U " bolt assemblies and then wrapping with electrical tape.

F. Wire shall be wrapped around pipe such that at least four (4) "wraps " are produced per length of pipe.

G. The tracer wire may be strung along the top of pipe instead of "wrapping " provided it is taped to the pipe every 5 feet to insure proper positioning during backfilling.

END OF SECTION