# RICHLAND COUNTY UTILITIES DEPARTMENT

# PUBLIC SANITARY SEWER & WATER REGULATIONS AND SPECIFICATIONS MANUAL

SOUTH CAROLINA
URS CORPORATION
No. 934
CERTIFICATE OF AUTHORIZATION

SOUTH CAROLINA
LICENSED PROFESSIONAL ENGINEER
No. 21990
SHELBY OZBURN LEBRON

Shelby O. LeBron
7/27/2016

**JULY 2016**

RICHLAND COUNTY
GOVERNMENT
Office of the County Administrator

**ADMINISTRATIVE POLICY 2016 - 4**

**To** Richland County Department Directors
**From** Gerald Seals, Interim County Administrator
**Date** November 9, 2016
**Subject** Public Sanitary Sewer & Water Regulations and Specifications Manual

The County's Utilities Department (RCU) is responsible for approving, owing and operating new water and sanitary sewer systems and facility construction. These systems provide a vital service for the citizens of the County. Given the projected population growth of the County over the next 20 years, it is paramount for RCU to ensure that these County assets meet minimum industry design standards and are compatible with existing County equipment and inventories. Thus, RCU staff has prepared a standard set of guidelines for water and sanitary sewer system design and construction – "Public Sanitary Sewer & Water Regulations and Specifications Manual.

These guidelines and standards, which have been approved by the South Carolina Department of Health and Environmental Control, detail the expectations of RCU staff relative to water and sanitary sewer system design and construction submittals. Given that utility industry standards change periodically, these guidelines are subject to updates via RCU staff, and will be reissued to County staff accordingly. The purpose of this memorandum is to formally authorize and adopt these guidelines as an administrative policy of Richland County Government.

Thank you for your continued dedication and service to the citizens of Richland County.

In the Spirit of Excellence,

Gerald Seals
County (interim) Administrator

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## RESOLUTION

**Resolution Concerning the Adoption and Application of the PUBLIC SANITARY SEWER & WATER REGULATIONS AND SPECIFICATIONS for the Richland County Utilities Department.**

**WHEREAS:** The Richland County Utilities Department (RCU) is responsible for initiating overseeing, approving designs, inspecting, approving and finally owning and operating a significant amount of new water and sanitary sewer system and facility construction; and,

**WHEREAS:** It is critically important to the future operation, maintenance, longevity, and efficiency of the water and sanitary sewer systems of RCU that these items of new construction meet minimum design standards and be consistent with existing equipment and inventories; and,

**WHEREAS:** The staff of RCU, drawing on their own experience and that of knowledgeable engineering consultants, has prepared a standard set of guidelines for water and sanitary sewer system design and construction.

**NOW THEREFORE BE IT RESOLVED** by the County Administrator and RCU Director:

1. The attached "PUBLIC SANITARY SEWER & WATER REGULATIONS AND SPECIFICATIONS" are hereby adopted and RCU is hereby directed to reproduce sufficient copies and make them available at a cost of cost + 15% to interested Consulting Engineers, Developers and others.

2. These guidelines are intended to indicate what RCU expects from planning and design submittals. If an engineer chooses a design different than indicated in the guidelines on a particular project, RCU will review it and may choose to accept it for a specific project if it can be clearly shown that the design provides a better product for RCU than what the adopted guidelines would yield.

3. These guidelines are subject to change and it is the responsibility of the Developer and the Developer's Design Engineer to ensure that an up-to-date version of these "PUBLIC SANITARY SEWER & WATER REGULATIONS AND SPECIFICATIONS" are being used.

**Mr. Gerald Seals**
**County Administrator**

**Mr. Shahid Khan**
**Utilities Director**

# RICHLAND COUNTY UTILITIES DEPARTMENT

# PUBLIC SANITARY SEWER & WATER REGULATIONS AND SPECIFICATIONS MANUAL

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S.C. Department of Health and Environmental Control

August 02, 2016

AECOM
101 RESEARCH DR
COLUMBIA SC 29203-9389

RE: Standard Specifications for Water System
Richland County Utilities
Approval Number SS-002131

This office has reviewed the water system specifications submitted to this office on 5/09/2016, revised on 8/01/2016 for consideration of becoming Standard Specifications. Based on our review this letter may serve as your approval of these Standard Specifications. The specifications have been approved for the following:

Water Distribution Lines and Appurtenances

Please be advised that these Standard Specifications are only approved for those items specifically listed above.

For further submittals of projects, please indicate on the application for permit to construct that your specifications have been approved as Standard Specifications and that no additional copies will be necessary.

If you have any questions, please call me at 803-898-1941.

Sincerely,

Maia P Milenkova
Construction Permitting Section
Bureau of Water

S.C. Department of Health and Environmental Control

August 02, 2016

AECOM
101 RESEARCH DR
COLUMBIA SC 29203-9389

RE: Standard Specifications for Wastewater System
Richland County Utilities
Approval Number SS-002132

This office has reviewed the wastewater system specifications submitted to this office on 05/09/2016, revised on 8/01/2016 for consideration of becoming Standard Specifications. Based on our review this letter may serve as your approval of these Standard Specifications. The specifications have been approved for the following:

1. Gravity Sewers (PVC, DIP)
2. Force Mains (PVC, DIP)
3. Details (Standard Manhole, Drop Manhole, FM Tie-In)

Please be advised that these Standard Specifications are only approved for those items specifically listed above. Separate "Pump Station Specifications" must be submitted with each wastewater project that includes a pump station design.

For further submittals of projects, please indicate on the application for permit to construct that your specifications have been approved as Standard Specifications and that no additional copies will be necessary.

If you have any questions, please call me at 803-898-1941.

Sincerely,

Maia P Milenkova
Construction Permitting Section
Bureau of Water

# TAB - 1

## SECTION 1

## ADMINISTRATIVE PROCEDURES AND POLICIES
## GENERAL USAGE AND RATE STRUCTURE

### 1.1 DEFINITION OF RESPONSIBLE PARTIES

A. RICHLAND COUNTY UTILITIES DEPARTMENT (RCU)

1. RCU will review plans and specifications submitted and grant approval once all necessary revisions have been completed

2. RCU will reserve the right to request changes in the work that is not in accordance with RCU's Regulations and Specifications or if work is being performed in an improper manner that may result in incorrect installation of the water distribution or sanitary sewer system.

3. All work rejected by RCU shall be removed and redone to the satisfaction of RCU.

4. RCU reserves the right to request any work be uncovered if the work was covered contrary to RCU's request, if defective work is suspected or to correct defects discovered during RCU's inspections.

5. RCU reserves the right to disallow work from an Engineer or Developer who consistently does not comply with RCU's Regulations and Specifications.

6. RCU reserves the right to request revision so the Developer or Engineer's plans for any discrepancies found during construction that may have been overlooked during review of the plans and specifications.

B. DEVELOPER'S ENGINEER (Engineer)

1. The Developer's Engineer is the Engineer hired by a Developer or Property Owner to prepare plans for the extension of water and/or wastewater infrastructure.

2. The Engineer will:

   a. Request determination of water and/or wastewater availability from RCU.

b. Prepare and submit plans to RCU in accordance with the requirements of these standards, SCDHEC Regulations and all other local, state and federal regulations pertaining to the project.

c. Ensure plans are consistent with Richland County Planning Department's long-term master plans.

d. Make revisions to the plans to comply with RCU's requirements.

e. Submit to RCU all permit application requirements under the Delegated Review Program.

f. Submit to RCU all encroachment permit applications.

g. Review all phases of the work in progress during construction and conduct required testing of systems in the presence of RCU's field representative.

h. Certify the work performed is in accordance with the approved plans and these Standards.

i. Promptly furnish RCU with pertinent information concerning any changes required during construction. No major changes shall be performed without the prior approval of RCU.

j. Obtain final approval from RCU and all applicable state and federal agencies.

k. Provide all information and submittals as required for project completion and takeover.

## 1.2 GENERAL INFORMATION

A. RCU will consider for operation and maintenance only those water and wastewater systems which are within the boundaries of the RCU service area.

B. Design and construction of water and wastewater systems shall be in accordance with these Standards.

C. All connections to RCU's existing water and wastewater systems must be approved and inspected by RCU personnel.

D. No water or wastewater system shall be put into service, nor will any service application be accepted, prior to the receipt of all approved Project Completion and Takeover documents, applicable fees, and the Permit to Operate as issued by the South Carolina Department of Health and Environmental Control (SCDHEC).

E. RCU reserves the right to determine if a backflow assembly is required by conducting an assessment of the actual or potential Degree of Hazard.

F. Developers, Designers, Planners, Engineers and others associated with implementing projects are strongly encouraged to meet with RCU's Engineering Staff to review plans and coordinate proposed projects with Richland County Planning Department's long-term master plans.

G. A full description of RCU's fees can be referenced according to Section 1.17 of these Standards. RCU's fees are subject to review and may be amended from time to time.

H. Project submittals are to be sent to Richland County Utilities Department.

I. An Availability Letter will be valid for 12 months from the date of issuance.

J. Any subsequent changes to the proposed development deemed significant by RCU may invalidate the Availability Letter and necessitate the request of a new Availability Letter.

## 1.3 PRELIMINARY FEE DETERMINATION

A. Upon receipt of the Availability Letter, submit to RCU as one submittal the following items:

1. Water and/or Wastewater Availability Letter.
2. Completed Preliminary Fee Determination Worksheet.
3. One (1) copy of water and/or wastewater system plans.
4. One (1) copy of demolition plans, if applicable.
5. Water and/or wastewater calculations, if applicable.

B. In return, RCU will provide to the Developer and the Developer's Engineer a Preliminary Fee Determination for the following:

1. Tap Fee

## 1.4 PLAN REVIEW

A. Upon receipt of the Preliminary Fee Determination, submit a Plan Review package to RCU. The package shall include the following items or Plan Review will not proceed:

1. Engineering Services Fee Deposit.

2. One (1) overall plan sheet detailing the location of all existing and planned utilities, including water, sewer, stormwater and any other known underground or above ground utilities.

3. Approval Letter from the Planning and Zoning Department. This letter shall state that the site is approved for land development. Further review and approval of preliminary utility plan submittal shall not proceed until this letter is received by RCU. (RCU can review and approve the plan, but it will be contingent upon the approval from Planning and Zoning.)

4. Three (3) sets of water and/or wastewater system plans. Plans should include:

   a. Complete system design. Include cover sheet and drainage plans along with water and wastewater system plans. Plans shall be signed, sealed and dated by an Engineer registered in the state of South Carolina.

   b. Location and width of all RCU and other known utility easements.

   c. Indicate all rights-of-way as either public or private. Plans should also indicate ownership of existing roadways (City, County, or State). Indicate the agency to operate and maintain proposed roadways. Show all easements and rights-of-way and their ownership.

   d. For all commercial developments, location and size of all proposed water and wastewater services.

   e. County Tax Map Reference Number of Property and information showing City municipality, if one exists.

5. One (1) set of typed water and wastewater calculations signed, sealed and dated by an Engineer registered in the state of South Carolina.

6. Backflow Prevention - The Developer's Engineer shall either submit plumbing plans as part of the Plan Review or contact RCU to verify compliance with backflow requirements. Backflow requirements are applicable to commercial and residential sites. A complete listing of Backflow Requirements is available by contacting RCU.

B. RCU will return to the Developer's Engineer:

1. Confirmation of receipt of the Plan Review Package.

2. Written design change requirements and one (1) set of plans indicating necessary corrections.

3. Request for any' other required information pertinent to the proposed project.

C. Projects with "Services Only"

On projects consisting of "Services Only" (i.e., unmetered fire services, commercial, and domestic services), which do not require a SCDHEC permit for installation as defined in SCDHEC State Primary Drinking Water Regulation R61-58, the Developer's Engineer will be required to submit three (3) sets of plans and a description of the proposed work. RCU will review the plans and provide any request for revisions. Approval of the proposed "Services Only" plans will be communicated directly to the Developer's Engineer. Service applications will not be taken in Customer Service until such time as the plans are approved.

D. Projects with "Fire Hydrants Only"

On projects consisting of "Fire Hydrants Only", which do not require an SCDHEC permit for installation as defined in SCDHEC State Primary Drinking Water Regulation R61-58, the Developer's Engineer will be required to submit three (3) sets of plans and a description of the proposed work to RCU for plan review and project coordination.

## 1.5 PLAN APPROVAL

A. The Developer's Engineer will submit one revised copy of the water and/or wastewater system plans for review. Once an acceptable plan is approved, RCU will notify the Developer's Engineer in writing.

B. Upon approval of the plans, RCU will provide to the Developer a Water System Development Agreement for immediate execution. No project will

proceed prior to receipt of a fully executed Water System development Agreement.

C. Also upon approval of the plans, the Developer's Engineer is to submit the following:

1. Five (5) complete sets of approved plans.

2. Completed SCDHEC Construction Application.

3. Completed encroachment permit application. Applications containing errors or omissions will be returned for correction. Submit encroachment permit applications to RCU.

4. RCU can submit Delegated Review Program plans and the encroachment application at the same time for approval.

## 1.6 CONSTRUCTION ACTIVITY

A. Construction of water and/or wastewater systems must be performed by a RCU Approved Contractor. For water and wastewater construction contracts with a combined total less than $50,000, construction may be performed by a Contractor on RCU's Small Contracts Approved Contractors List. A list of Approved Contractors is available by contacting RCU at (803) 401-0050.

B. The SCDHEC Permit to Construct and all related construction permits and agreements must be received by RCU prior to beginning construction of water and/or wastewater systems.

1. Once all permits and agreements have been received by RCU, plans stamped "Approved for Installation" will be distributed to the Developer and the Developer's Engineer for use by the Contractor. No construction activity shall proceed prior to receipt of stamped plans. These stamped plans shall remain on the construction site at all times.

2. Construction activities must be coordinated in advance. No less than three (3) working days prior to the beginning of construction, the Notice of Construction Activity form, as included at the end of Section 1 of these Standards is to be received by RCU.

3. The Developer's Engineer is responsible for monitoring the project as required to verify the project has been installed in accordance with SCDHEC approved plans and specifications and RCU's Standards.

Copies of inspection reports generated by the Engineer shall be provided to the RCU Inspector.

4. If any requirements for carrying out project construction are not met, RCU reserves the right to issue a STOP WORK ORDER.

## 1.7 PROJECT PRE-COMMISSIONING

A. Upon completion of construction, the Developer's Engineer shall schedule a Pre-Commissioning.

B. No less than three (3) working days prior to the desired date of the Pre-Commissioning, a written request is to be received by RCU's Inspector.

C. The request shall include the following items, or Project Pre-Commissioning will not be scheduled:

1. One (1) draft hard copy of Record Drawings for review and final approval.

2. One (1) draft hard copy of all water main and wastewater force main Valve Cards for review and approval.

3. Pressure tests for all water mains and wastewater force mains signed by the Developer's Engineer or the Engineer's representative.

4. Low-pressure tests for wastewater gravity sewers signed by the Developer's Engineer or the Engineer's representative.

5. Complete Closed Circuit Television (CCTV) inspection submittal for wastewater gravity sewers, in accordance with the requirements of Section 7 of these Standards.

6. Mandrel test for wastewater gravity sewers, as directed by RCU.

D. Pump Stations - For projects involving wastewater pump stations, the following additional items shall be provided:

1. One (1) draft hard copy of Record Drawing for review and final approval.

2. All electrical schematics, drawdown test, and level settings laminated and mounted inside the control panel door.

3. Complete list of supplied spare parts as specified in Section 9 of these Standards.

## 1.8 RECORD DRAWINGS AND VALVE CARDS

A. Provide as one package the following Hard Copy and Digital submittals:

1. Hard Copy Submittals

a. Four (4) copies of As-Constructed Record Drawings and one (1) copy of Mylar reproducible As-Constructed Record Drawings with all water and/or wastewater appurtenances and attributes tied to State Plane Coordinates. Record Drawings shall reflect all As-Constructed conditions for mains, water services, and wastewater sewer lateral placements. Record Drawings shall be sealed, signed, and dated by an Engineer registered in the state of South Carolina and include the following items at a minimum:

i. Plan view for all water and wastewater projects.
ii. Plan and profile for all wastewater gravity sewers.
iii. Plan and profile for all wastewater force mains and water mains 8" and larger.
iv. Plan view and elevation view for wastewater pump stations.
v. Show all corresponding Street Addresses, Unit Numbers, Tax Map Numbers, Block Designations and Lot Numbers for each parcel shown on the drawings, including Wastewater Pump Stations.
vi. Show station numbers at all valves, manholes, fire hydrants, blow-offs, water services, wastewater sewer services, air release valves, bends, tees, reducers and all other fittings.
vii. Provide a Coordinate Table for all installed water and/or wastewater appurtenances in a tabular format on the Record Drawings. The table shall include Point Number, Northing, Easting, Elevation, Station Number and Description. Elevations must be provided for water valves (captured from top of nut, not the lid) and wastewater: manholes, cleanouts, and services. If abbreviations are used as descriptors, a key to those abbreviations must be provided.
viii. Line lengths and termination points.
ix. Indicate top elevation, invert elevation, and inside diameter of manholes. Include invert elevation of any other manhole connections to include inside drops and force main connections.

x. Reference benchmarks on drawings tied to State Plain Coordinates and note on plans for construction as well as Record Drawings.

xi. Surveyed locations of water and wastewater facilities, including gravity line elevations, shall be sealed, signed and dated by a Land Surveyor registered in the state of South Carolina and sealed, signed and dated by an Engineer registered in the state of South Carolina.

xii. Show all recorded plan and easement information on the Record Drawings.

xiii. Record Drawings must be clearly legible and of good quality. If the drawings indicate inaccuracies, they will be returned to the Developer's Engineer for revision. Project Commissioning will not occur until the Record Drawings are acceptable to RCU. The Developer's Engineer is responsible for the accuracy of all Record Drawings.

b. Two (2) sets of 8 1/2" x 11" Valve Cards

i. Valve Cards shall be prepared in accordance with RCU's Valve Card Detail for all wastewater force main valves, water valves, and hydrants, showing the manufacturer, model name, year, size, direction, and number of turns.

ii. Prepare Valve Cards for "Dummy" valve boxes for tracer wire when applicable.

iii. Valves are to be located by distance to two permanent reference points. Diagonal measurements or distances are not acceptable.

iv. Valve Cards must be clearly legible and accurate. If the drawings indicate inaccuracies, they will be returned to the Developer's Engineer for revision. Project Commissioning will not occur until the Valve Cards are acceptable to RCU. The Developer's Engineer is responsible for the accuracy of all Valve Cards.

2. Digital Submittals - The Developer's Engineer or Surveyor shall deliver digital files on a CD or DVD in AutoCAD format (.dwg). Charleston Water System does not use Civil Packages inside AutoCAD; therefore, the State Plane Coordinates must be tied to the drawing in AutoCAD in order for the drawings to be placed in the correct position inside GIS. For more information, contact RCU at (803)401-0050.
   a. As-Constructed Record Drawings in AutoCAD format

      i. Submit in accordance with the requirements of Part 1.8.A.1.a of this Section.

ii. Provide in South Carolina State Plane Coordinates oriented true north. Vertical coordinates shall be related to the National Geodetic Vertical Datum NGVD 1929 (Z coordinate). The Bench Mark and vertical datum shall be noted on the Developer's plans.

iii. Show each drawing entity with coordinates tied to SC Grid, and show the grid tie at the point of connection to the existing system with bearing and distance to the Grid monument used and identified.

iv. Have water and wastewater lines in separate drawing layers.

v. Have all water appurtenances (ie. hydrants, valves, services, tees, etc.) and all wastewater appurtenances (ie. manholes, valves, cleanouts, etc.) in separate drawing layers.

b. Coordinate Table - A Coordinate Table with coordinate values (Northing, Easting) and elevations related to NGVD 1929 for all installed water and/or wastewater appurtenances shall be delivered in a comma delimited ASCII file in the format Point Number, Northing, Easting, Elevation, Station Number and Description.

Elevations must be provided for water valves (captured from top of nut, not the lid) and wastewater: manholes, cleanouts, and services. If abbreviations are used as descriptors, a key to those abbreviations must be provided. Coordinate figures shall be based on the South Carolina State Plane Coordinate System, NAD 83. The surveyor also has the option to provide this file as a .txt or .xls file with the same format as referenced above.

c. Valve Cards in AutoCAD format - Submit in accordance with the requirements of Part 1.8.A.1.b of this Section.

## 1.9 PROJECT COMPLETION AND TAKEOVER

A. Upon satisfactory completion of the Project Pre-Commissioning, the Developer and the Developer's Engineer shall coordinate the submittal of the following closeout documents as a package:

1. Bacteriological Samples - Submit Bacteriological Samples from an SC DHEC certified laboratory. Samples must be less than 30 days old.

2. Record Drawings and Valve Cards - Submit final approved Record Drawings and Valve Cards in accordance with Part 1.8 of this Section.

3. Project Completion Questionnaire - Submit Project Completion Questionnaire. See Attachments to these Standards.

4. Certified Contractor's Affidavit and Final Waiver of Lien Submit Certified Contractor's Affidavit and Final Waiver of Lien showing a zero balance due to the Contractor. See Attachments to these Standards.

5. Bill of Sale and Affidavit of Title Submit Bill of Sale and Affidavit of Title conveying the constructed system to Richland County Utilities Department. See Attachments to these Standards.

6. Easement Plats - Submit six (6) prints and one (1) recordable white Mylar of all easement plats. Each must have original signature and seal. Do not use sepia Mylar. The Mylar shall be no larger than 22" x 34", as prepared in accordance with requirements set by RCU and the RMC Office. RCU will record all easement plats. For additional information concerning Easement Plat requirements, see Section 1.13 of these standards.

7. Easement Agreement - As an instrument of conveyance, submit a RCU Easement Agreement. See Attachments to these Standards.

   The starting date of the Maintenance Agreement shall be the same as the date of the Service Acceptance letter issued by RCU. The obligation for the Maintenance Agreement will be released only after all system deficiencies have been corrected. Work within the rights-of-way within the purview of the SCDOT, County, and/or City shall have an irrevocable guarantee for the specific time as prescribed by that agency. See Attachments to these Standards.

B. Upon receipt of all requirements for Project Completion and Takeover, RCU will issue an O&M letter to SCDHEC. This letter is in conjunction with any documentation from the Developer's Engineer required by SCDHEC for issuance of a Permit to Operate.

## 1.10 PROJECT COMMISSIONING

A. Upon issuance of the O&M letter, the Developer's Engineer shall schedule a Project Commissioning.

B. No less than three (3) working days prior to the desired date of the Project Commissioning, a written request is to be received by the RCU Inspector.

C. The items listed below shall be provided at the time of Project Commissioning. If any items are not provided or found to be incomplete, Project commissioning will not proceed and it will be necessary to reschedule until such time as all items are complete.

1. Two (2) hard copies of final Record Drawings sealed, signed, and dated by an Engineer registered in the state of South Carolina. These copies are in addition to those required in Part 1.8 of this Section.

2. Two (2) hard copies of all water main and wastewater force main Valve Cards. These copies are in addition to those required in Part 1.8 of this Section.

D. Pump Stations - For projects involving wastewater pump stations, the following additional items shall be provided:

1. Two (2) hard copies of final Record Drawings sealed, signed, and dated by an Engineer registered in the state of South Carolina. These copies are in addition to those required in Part 1.8 of this Section.

2. Complete set of spare parts as specified in Section 18 of these Standards.

3. Operation and Maintenance Manuals
   a. Four (4) copies of operation, maintenance, and service manuals for each piece of equipment prepared in the format that follows:

      i. Manuals shall be specific to the equipment supplied.
         a. Provide factory pump curves for installed pumps.
         b. Manuals applicable to many different configurations and which require the operator to selectively read portions of the instructions will not be accepted.
         c. The equipment model that the manual applies to shall be indicated by an arrow.
      ii. Table of Contents specific to each manual.
      iii. At the beginning of each manual, provide a description of the equipment to include model numbers, purchase order numbers, serial numbers, motor information, and performance and design criteria.
      iv. Correlate manuals with approved shop drawings and include the following minimum information:
         a. Parts list, including recommended spare parts.
         b. Guarantees.
         c. Provide a maintenance and lubrication schedule to be a summary of all preventative maintenance and lubrication.
         d. Address and telephone numbers of the source for repairs, spare parts, and service.
         e. Detailed descriptions of operating procedures for the item of equipment specifically written for this

installation, including start-up and shut-down procedures.

f. Equipment performance specifications, including pump curves and drawdown test data.

g. Results of start-up and any further recommendations resulting from start-up.

## 1.11 APPLICATION FOR NEW SERVICES

### A. General

1. Upon successful Project Commissioning and payment of all fees, RCU will issue a letter to SCDHEC in order to receive a Permit to Operate. This letter is in conjunction with any documentation from the Project Engineer required by SCDHEC. SCHEC will not issue a Permit to Operate until the project has met all of their requirements.

2. Please allow for administrative and scheduling time, as a majority of service installations require permitting to install the water meter.

3. If RCU has determined that a backflow prevention assembly is required, a notification will be mailed to the Owner. Water service will not be turned on until the assembly has been installed by the Owner's Contractor and inspected by RCU. It is the responsibility of the contractor installing the assembly to notify RCU and to schedule the inspection. Upon successful completion of the inspection, the assembly must be tested within seven (7) days after the date of inspection. Testing is the responsibility of the Owner and must be performed by a RCU Certified Backflow Prevention Assembly Tester.

   All wastewater services must be inspected by RCUs Wastewater Collection Department.

4. For wastewater services requiring a grease trap, a Grease Trap Application form must be completed and an inspection of the newly installed grease trap must be performed. Construction of grease traps shall be in accordance with RCU standards.

5. Prior to issuance of a Certificate of Occupancy all service connections shall be approved by RCU, and the requirements of all other pertinent agencies shall be met.

6. Applications for water, sewer and grease trap services are attached in Section 1.14 of these regulations.

B. Application For Water Service (RESERVED)

C. Application for Sewer Service

1. Application for sanitary service involves a contractual arrangement which requires the signature of the property owner or his legally appointed representative. Application must be made at RCU, 400 Powell Road, Columbia, S.C. The applicant must provide the street and number where service is desired. See attached Sanitary Sewer Service Agreement in Section 1.15 of these regulations.

2. The agencies assigning street numbers are:

   a. Inside the Columbia city limits: Department and Engineering, 2nd Floor, 1225 Laurel Street, Columbia, S.C.

   b. Richland County: Planning Management Department, 2020 Hampton Street, Columbia, S.C.

3. A department staff member verifies the following:
   a. That service is available and the system has the capacity to accept the additional loading.

   b. That location to be served is inside the County's service area.

   c. That location of service will be within a private easement, City street, Highway Department right-of-way or County road. This is done to determine what type of permit is required.

   d. That the property is served by County water. If not served, and water service is not available, a special agreement is required prior to approval of sewer service. See attached Sanitary Sewer Service Agreement in Section 1.15 of these regulations. If water service is available, applicant must also subscribe to this service.

4. If the location for service connection is within a SCDOT right-of-way, there will be a delay in making the tap. RCU must prepare and forward to the SCDOT an application for permission to work within the SCDOT right-of-way. Under normal conditions, the permit is received from the SCDOT within two to four weeks.

5. If the location for service connection is within the Hollingshed Creek Sewer service area, the property owner or his legally appointed representative shall execute a Residential/Commercial Contract

Agreement and Easement as attached in Section 1.15 of these regulations.

D. Emergency Permit Procedure in SCDOT Right-of-Way

If an applicant states that the connection is needed immediately and is an emergency, the engineer or applicant may provide the necessary application and sketch required by SCDOT or request that RCU prepare these documents as quickly as possible so that the applicant may deliver the documentation to the office of the Maintenance Engineer, SCDOT. The Maintenance Engineer will prepare a permit granting RCU permission to make the sewer tap.

## 1.12 PROJECT CANCELLATION

A. Any project without "Activity" from the Developer, the Developer's Engineer or the Developer's Utility Contractor for a period of twelve (12) months, concerning intent to proceed with the project, shall be cancelled by RCU and any letter of availability issued by RCU for utility service shall be considered withdrawn. Examples of "Activity" includes such actions as plan submittals, payment of fees, meetings with RCU and/or Engineering Staff, written correspondence concerning design, submittal of permit applications, and water/wastewater construction activities. Examples not considered "Activity" are submittals to other municipal planning departments or review boards, telephone calls, and correspondence with other permitting agencies.

B. Engineering Services Fee refunds will be handled according to the status of the project at the time it is canceled. If the Developer wishes to proceed with a project after RCU has closed its project file, a new project submittal will be required in conformance with current Standards and Engineering Services Fees will be assessed at the rates current at the time the project is resubmitted. No credit will be given for Engineering Services Fees previously retained by RCU.

## 1.13 EASEMENTS/ PLAT/ DEED/ AFFIDAVIT/ GIS

A. General

1. Easements shall be conveyed to the Richland County Utilities Department in a standard form that is acceptable to RCU and legal counsel.

2. All water mains and sanitary sewer facilities shall be installed outside of pavement when possible.

3. All water and sewer mains within the easement shall be platted so as to provide equal distance on each side.

4. Structures are not permitted within the easement.

5. Clear all easements of trees and debris. The easement is to be grassed unless other treatment is specifically approved by RCU.

6. Any proposed facility to be constructed within a RCU easement or any crossing of a RCU easement will require an Encroachment form to be filled out and approved by RCU prior to beginning construction.

B. Width of Easements

1. Water Mains. Width of easements for water mains shall not be less than fifteen (15) feet or ten (10) feet when adjacent to road right-of-way.

2. Sewer Force Mains. Width of easements for sewer force mains shall not be less than fifteen (15) feet or ten (10) feet when adjacent to road right-of-way.

3. Gravity Sewer.

   a. Less than six (6) feet deep - Width of easements shall not be less than fifteen (15) feet.

   b. Six (6) to eight (8) feet deep – Width of easements shall not be less than twenty (20) feet.

   c. Eight (8) feet deep or greater - Widths of easements shall not be less than twenty-five (25) feet.

4. Water and Sewer

   a. When water and sewer mains are placed in the same easement, mains shall be laid to provide a minimum ten (10) foot horizontal separation between water and sewer. The width of the easement shall be increased to provide a distance from the edge of the easement to the sewer main not less than ten (10) feet and the distance from the edge of the easement to the water main not less than five (5) feet.

b. When more than one line is placed in the same easement, the Engineer should coordinate with RCU to determine the minimum requirement for the easement.

5. All water and sewer mains within the easement shall be platted so as to provide equal distance on each side.

C. Easement Plat and Subdivision Plat. RCU requires two (2) Mylar and six (6) prints showing pump station site, water, and wastewater easement for recording at the appropriate courthouse. Plats recorded by the Developer's Design Engineer or surveying company for the Developer needs to send RCU one (1) Mylar and two (2) prints of the subdivision plat, signed and sealed with the recording information placed on the Mylar and prints. The signed easement document by Developer or owner of conveyance for water, wastewater and deed to pump station site with affidavit to be recorded by RCU.

D. GIS Data

1. The Developer's Engineer or Surveyor shall provide to RCU computer files of all associated drawings related to the Developer's subdivision in NAD 1983 FIPS 3900 South Carolina State Plane Coordinates. Vertical coordinates shall be related to the National Geodetic Vertical Datum N.G.V.D. 1929 (2.coordinate). The Bench Mark and vertical datum shall be NOTED on the developer's plans.

2. The Developer's Engineer or Surveyor shall deliver computer files on a CD or DVD disk in AutoCAD format (.dwg). The GIS Department at CPW does not use Civil Packages inside AutoCAD; therefore, the State Plane coordinates must be tied to the drawing in AutoCAD in order for the drawing to be placed in the correct position inside GIS. For more information, contact the GIS Manager at (843)727-6883.

## 1.14 APPLICATION FOR WATER SERVICE

A. See attached application.

## 1.15 APPLICATION FOR SEWER SERVICE

A. See attached application.

## 1.16 FEES

A. Refer to Ord. No. 939-82, § IV, 6-16-82.

## 1.17 ADMINISTRATIVE ATTACHMENTS

| | |
|---|---|
| Attachment 1 | Application for Individual Sanitary Sewer Service |
| Attachment 2 | Closeout Document Checklist |
| Attachment 3 | Sanitary Sewer Service Agreement |

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Richland County Utilities

## Civil Rights and Equal Opportunity (Federal Government Monitoring)

*The following information is being requested for Federal Government monitoring and reporting purposes. You are NOT REQUIRED to furnish this information, but are encouraged to do so. If you do not furnish ethnicity, race, or sex, under the Federal regulations, Richland County may be required to note the information on the basis of visual observation and surname if you have made this application in person. Richland County may not discriminate on the basis of the information you supplied or whether you choose to furnish it. The Information that you supply will not be used to determine utilities service.*

**Ethnicity:**

- ☐ Hispanic or Latino
- ☐ Not Hispanic or Latino
- ☐ I do not wish to provide this information

**Race:** *Check one or more*

- ☐ White
- ☐ Black or African American
- ☐ American Indian or Alaska Native
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ Asian
- ☐ Other_____
- ☐ I do not wish to provide this information

**Gender:**

- ☐ Female
- ☐ Male
- ☐ I do not wish to provide this information

## FOR INTERNAL USE ONLY

RCU use only:

I. Type of property: ☐ Residential ☐ Commercial ☐ Industrial

II. Type of sanitary sewer service: ☐ STEP ☐ LETTS ☐ Gravity ☐ Grinder

III. Total design flow_____(gpd) No. of taps _____ Tap fee $ _____

IV. SCDHEC Permit No. _____ RCU Permit No. _____

V. Subdivision _____

VI. Comments: _____

_____

_____

VII. ☐ New Customer ☐ Current Customer (Update Account) ☐ Transfer Account

VIII. Effective Date _____

IX. Water Meter Serial # _____ Account # _____

X. Richland County Utilities Representative (sign and date) _____

Finance Department use only (initial and date):

New account set up _____ SSN entered _____ Text entered_____

Scanned _____

RCU
Richland County Utilities

## Civil Rights and Equal Opportunity (Federal Government Monitoring)

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- ☐ Hispanic or Latino
- ☐ Not Hispanic or Latino
- ☐ I do not wish to provide this information

**Race:** *Check one or more*

- ☐ White
- ☐ Black or African American
- ☐ American Indian or Alaska Native
- ☐ Native Hawaiian or Other Pacific Islander
- ☐ Asian
- ☐ Other_____
- ☐ I do not wish to provide this information

**Gender:**

- ☐ Female
- ☐ Male
- ☐ I do not wish to provide this information

## FOR INTERNAL USE ONLY

RCU use only:

I. Type of property: ☐ Residential ☐ Commercial ☐ Industrial

II. Type of sanitary sewer service: ☐ STEP ☐ LETTS ☐ Gravity ☐ Grinder

III. Total design flow_____(gpd) No. of taps _____ Tap fee $ _____

IV. SCDHEC Permit No. _____ RCU Permit No. _____

V. Subdivision _____

VI. Comments: _____

_____

_____

VII. ☐ New Customer ☐ Current Customer (Update Account) ☐ Transfer Account

VIII. Effective Date _____

IX. Water Meter Serial # _____ Account # _____

X. Richland County Utilities Representative (sign and date) _____

Finance Department use only (initial and date):

New account set up _____ SSN entered _____ Text entered_____

Scanned _____

# RICHLAND COUNTY UTILITIES

## CLOSEOUT DOCUMENT CHECKLIST

1.) Lien Waiver.
2.) Deed\Easements documents- 2 copies each
3.) Offsite easements
4.) Offsite easements plats
5.) Final utility inspection report (approved)
6.) As built plans
    a.) 2 sets of plans
    b.) 1 set mylar
    c.) 1 CD/Disk (Autocad 2006 format)
7.) Engineers certifications
    a.) Construction conformance
    b.) Infiltration
8.) Pressure test
    a.) Gravity – Air test certification
    b.) Force Main – Pressure test certification
9.) Itemized project cost
10.) Materials list
11.) Sanitary sewer agreement – commercial
12.) Lift station plat
13.) Platted lift station deed
14.) Lift station start-up report
15.) Lift station draw down results.
16.) Wye stationing plan

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**STATE OF SOUTH CAROLINA )**
**)**
**COUNTY OF RICHLAND )**

**SANITARY SEWER SERVICE AGREEMENT**

This agreement entered into this _____ day of _____, _____ by and between _____, hereinafter known as the Customer, and The County of Richland, State of South Carolina , hereinafter known as the County.

WHEREAS, the Customer resides at property described as _____ _____ Richland County TMS _____ and desires sanitary sewer service to said property.

WHEREAS the County has received the Customer's request for service and finds it desirable to provide service subject to certain conditions and stipulations.

NOW, THEREFORE, in consideration of the mutual promises contained herein, the parties agree as follows:

1. The Customer will construct and/or maintain the onsite sewer system that consists of all necessary sewer mains-service lines, pump stations for force main service connection and/or gravity service connection and appurtenances required to serve this parcel. All materials and construction shall conform to Richland County, SCDHEC, and all other regulatory agency regulations.

2. The Customer will own, and/or operate and maintain all on-site sanitary sewer components and be responsible for all costs associated with the operation and maintenance of said components, including electrical service, in accordance with County/SCDHEC requirements. Not withstanding the above, the County shall respond in providing necessary operation and maintenance services to the sewer mains, service lines, pump stations and appurtenances if the property Customer fails to do so. The Customer shall pay the County, in responding to the necessary repairs, the County's direct costs plus all costs incurred by the County to correct any and all operation and/or maintenance problems.

3. The County shall provide a statement outlining the costs incurred, which shall be due and payable in its entirety within thirty (30) days from the date of such statement. Failure of the Customer to pay such costs within the thirty (30) day period shall result in termination of service until such time as payment is made. The Customer agrees and understands that Richland County has the right pursuant to the South Carolina Setoff Debt Collection Act to collect any sum due and owed by the Customer through offset of the Customer's state income tax. If Richland County chooses to pursue debts owed by the Customer through the Setoff Debt Collection Act, the Customer agrees to pay all fees and costs incurred through the setoff process, including fees charged by the Department of Revenue.

4. The Customer will comply with all fees, rate schedules, rules, regulations and ordinances of Richland County in connection with this service. If the Customer's account becomes

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delinquent, the sewer service shall be disconnected until such time as past due amounts, along with any other applicable costs, are paid.

5. The Customer will not allow any connection to this sewer system without prior approval of Richland County.

6. The County reserves the right at any time, without notice to interrupt service for maintenance, repairs or extensions without liability to the Customer for damages resulting therefrom.

7. The Customer will provide ingress and egress across this parcel to the on-site sewer system and be responsible for the cost of removal and restoration of fence, shrubbery an/or any other site improvements, which deny or impair access to the on-site sewer components.

8. The Customer agrees to release and hold harmless Richland County and its agents, officers and employees from and against any action for loss, personal injury and/or property damage sustained by reason of its exercise of the services expressed or implied within this agreement.

9. The Customer will not exceed the permitted flow of _____. Any additional usage shall be subject to additional charges as determined by the County.

10. No credit will be given for vacancies.

11. The Customer will pay an initial tap fee of $_____

12. The terms and conditions of this agreement shall be binding on the parties, their heirs, successors and assigns.

IN WITNESS WHEREOF, the undersigned have hereunto set their hands and seals this _____ day of _____, 20___.

SEAL

RICHLAND COUNTY UTILITIES

_____

CUSTOMER/S

_____

_____

WITNESS:

_____ By:_____
County of Richland

_____ Attest: _____

**STATE OF SOUTH CAROLINA )**
**)**
**COUNTY OF RICHLAND COUNTY )**

**PROBATE**
**AS TO THE GRANTEE**

PERSONALLY APPEARED before me the undersigned witness and made oath that he/she saw the within- named County of Richland, State of South Carolina, by its duly authorized offier sign, seal, and as their act and deed deliver their within written instrument of the uses and purposes therein mentioned that he/she, with the other witness witnesses, the execution thereof.

_____
Witness

Sworn to before me this _____

Day of _____, 20_____

_____
NOTARY PUBLIC FOR SOUTH CAROLINA

MY COMMISION EXPIRES _____

**SCDHEC Approved August 2016**

# SECTION 3

# WATER SYSTEM DESIGN STANDARDS

## 3.1 GENERAL

A. The following water system design guidelines are based on Federal, State and local health requirements and Richland County Utilities (hereinafter called "RCU") design criteria. All water design and installation shall meet or exceed the criteria established in the "Ten States Standards" and SCDHEC regulations.

B. All installations are to meet the bacteriological and chemical quality standards of the South Carolina Department of Health and Environmental Control (SCDHEC) – reference State Primary Drinking Water Regulations: R.61-58.

C. These design guidelines are applicable to all developments including but not limited to residential, commercial and industrial developments, subdivisions and/or parks requesting water service from RCU.

D. RCU will review and approve plans for the construction of new systems, extensions, or repairs only when designed in accordance with these standards.

E. Any variations from these standards must be approved, in writing, by RCU.

F. Developer's engineer must observe the construction for the project weekly (or as approved by RCU) and provide written updates to RCU inspection staff and certify the correctness of the related work on the contractor's record drawings.

## 3.2 WATER SYSTEM DESIGN CRITERIA

A. Arrange mains so they are looped and interconnected at intersections without using crosses.

B. Pressure:

1. The minimum pressure in all public water mains under conditions of maximum instantaneous demand shall be twenty-five (25) pounds per square inch at every customer's tap. Twenty (20) pounds per square inch will be acceptable at any tap when fire flows or flushing flows are provided in excess of maximum peak hourly flow.

C. Diameter:

1. Minimum main line size shall be six (6) inches. On a case-by-case basis, four (4) inch mains may be allowed on dead end lines provided the main cannot be extended and the main does not provide fire protection. Dead ends shall be minimized by looping all mains whenever possible.
2. The minimum size of water mains for providing fire protection and serving fire hydrants shall be six (6) inches in diameter. Larger size mains will be required if necessary to allow the withdrawal of the required fire flow while maintaining the minimum residual pressure.

## 3.3 SIZING OF LINES

A. Size piping based on either 1/5 the instantaneous maximum flow plus fire flow or maximum instantaneous demand, whichever is greater. When fire protection is to be provided, system design should be such that fire flows and facilities are in accordance with the requirements of RCU and the state Insurance Service Office (ISO).
B. Minimum design fire flow shall be 1000 gpm with a minimum residual pressure of 20 psi.
C. Design for 2.5 fps flushing velocity in accordance with SCDHEC regulations.
D. All water mains, including those not designed to provide fire protection, shall be sized using a hydraulic analysis based on flow demands and pressure requirements.
E. The Developer's Design Engineer is to determine available static and residual pressures at the delivery point for the water to a new development. The data is to be obtained under the direction of an engineer who is registered in the State of South Carolina.
F. Use Hazen and Williams design coefficient, C=120
G. The maximum instantaneous demand is to be calculated using the tables provided below, as published in the Community Water System Source Book by Joseph S. Ameen.

Table XXI - Maximum Instantaneous Flows for Residential Areas

| Number of Residences Served | Flow per Residence in GPM |
|---|---|
| 1 (First) | 15.0 |
| 2 – 10* | 5.0 |
| 11 – 20** | 4.0 |
| 21 - 30 | 3.8 |
| 31 - 40 | 3.4 |
| 41 - 50 | 3.2 |
| 51 - 60 | 2.7 |

| | |
|---|---|
| 61 -70 | 2.5 |
| 71 – 80 | 2.2 |
| 81 – 90 | 2.1 |
| 91 - 100 | 2.0 |
| 101 - 125 | 1.8 |
| 126 – 150 | 1.6 |
| 151 -175 | 1.4 |
| 176 – 200 | 1.3 |
| 201 – 300 | 1.2 |
| 301 – 400 | 1.0 |
| 401 – 500 | 0.8 |
| 501 – 750 | 0.7 |
| 751 -1,000 | 0.5 |

*Second, third, etc., through tenth residence served.
**Eleventh, twelfth, etc., through twentieth residence served.

Table XXII - Maximum Instantaneous Flows for Commercial Areas

| Type of Business | GPM on Basis Shown |
|---|---|
| Barber Shop | 3.0 gpm per chair |
| Beauty Shop | 3.0 gpm per chair |
| Dentist Office | 4.0 gpm per chair |
| Department Store* | 1.0 – 2.0 - 3.0 gpm per employee |
| Drug Store | 5.0 gpm |
| With Fountain Service | add 6.0 gpm per fountain area |
| Serving Meals | add 2.0 gpm per seat |
| Industrial Plants** | 4.0 gpm plus 1.0 gpm per employee |
| Laundry | 30.0 gpm per 1,000 pounds clothes |
| Launderette | 8.0 gpm per unit |
| Meat Market, Super Market | 6.0 gpm per 2,500 sq. ft. floor area |
| Motel, Hotel | 4.0 gpm per unit |
| Office Building | 0.5 gpm per 100 sq. ft. floor area or 2.0 gpm per employee |
| Physicians Office | 3.0 gpm per examining room |
| Restaurant | 2.0 gpm per seat |
| Single Service | 6.0 to 20.0 gpm total |
| Drive-In | 2.0 to 7.0 gpm total |
| Service Station | 10.0 gpm per wash rack |
| Theater | 0.2 gpm per seat |

| | |
|---|---|
| Drive-In | 0.2 gpm per car space |
| Other Establishments*** | Estimate at 4.0 gpm each |

*Including customer service.
**Not including process water.
***Non-water using establishments.

Table XXIII - Maximum Instantaneous Flows for Institutions

| Type of Institution | Basis of Flow, GPM |
|---|---|
| Boarding Schools, Colleges | 2.0 gpm per student |
| Churches | 0.4 gpm per member |
| Clubs: Country, Civic | 0.6 gpm per member |
| Hospitals | 4.0 gpm per bed |
| Nursing Homes | 2.0 gpm per bed |
| Prisons | 3.0 gpm per inmate |
| Rooming House | Same as Residential* |
| Schools: Day, Elementary, Junior, Senior High | |
| Number of Students | GPM Per Student |
| 0-50 | 2.00 |
| 100 | 1.90 |
| 200 | 1.88 |
| 300 | 1.80 |
| 400 | 1.72 |
| 500 | 1.64 |
| 600 | 1.56 |
| 700 | 1.44 |
| 800 | 1.38 |
| 900 | 1.32 |
| 1,000 | 1.20 |
| 1,200 | 1.04 |
| 1,400 | 0.86 |
| 1,600 | 0.70 |
| 1,800 | 0.54 |
| 2,000 | 0.40 |

*Each unit of an apartment building should be considered as an individual residence.

## 3.4 SEPARATION OF WATER MAINS AND SANITARY SEWERS

A. Where possible, locate water line at least ten (10) feet away, horizontally, from sewer lines and force mains. The distance shall be measured edge to edge.

B. Should ten (10) foot separation not be practical, then the water main may be located closer provided:

1. It is laid in a separate trench.

2. It is laid in the same trench with the water main located at one side on a bench of undistributed earth.

3. In either of the above cases, crown elevation of the sewer shall be at least 18" below invert elevation of water line at a minimum diagonal of 45 degrees.

C. Where water lines cross over sewers, maintain 18" minimum vertical distance between the outside of the water main and the outside of the sewer. This shall be the case where the water main is either above or below the sewer. If sewer mains are above the water main or within 18" of a sewer main, both the water and sewer main will be ductile iron. At crossings, one full length of water pipe shall be located so both joints will be as far from the sewer as possible. Mechanical joints will be used for the transition in the sewer line. Fernco couplings shall not be allowed. Special structural support for the water and sewer pipes may be required.

D. Special Conditions: When it is impossible to obtain the distances specified in R.61-58.4(D)(12)(a) and (b), RCU may allow an alternative design. Any alternative deign shall:

1. Maximize the distances between the water main and sewer line and the joints of each.

2. Use materials which meet the requirements of R.61-58.4(D)(1) for the sewer line, and,

3. Allow enough distance to make repairs to one of the lines without damaging the other.

## 3.5 DUCTILE IRON PIPE

A. All water mains shall be ductile iron pipe if the cover is less than three (3) feet. PVC may be utilized if the cover is greater than three (3) feet. Under no circumstance will services be allowed on HDPE pipe.

B. All ductile iron piping and fittings shall be wrapped in a polyethylene film in accordance with ANSI Standard A21.5 (AWWA C105). Color shall be blue for potable water and green for wastewater. Close all open ends and damaged areas securely with polyethylene tape to the satisfaction of RCU. If damaged polyethylene film cannot be repaired, replace with new film.

## 3.6 HIGH DENSITY POLYETHYLENE PIPE

A. Where water mains are constructed using the Horizontal Directional Drill method (HDD), High Density Polyethylene Pipe (HDPE) may be approved on a case-by-case basis. Under no circumstance will services be allowed on HDPE pipe.

## 3.7 GATE AND BUTTERFLY VALVES

A. 4" through 12": Use resilient wedge gate valves.
B. 16" and larger: Use butterfly valves unless specified otherwise.
C. Provide three (3) valves for a tee intersection and four (4) valves for two-offset tee intersections. See Detail
D. Sufficient valves shall be provided on water mains so that inconvenience and sanitary hazards will be minimized during repairs. Valves should be located at not more than 500 foot intervals. Valves should be placed to minimize the number of RCU customers out of service due to a main break and/or any maintenance operation. RCU reserves the right to require additional valves if it is deemed in the best interest of current and future RCU customers.

## 3.8 AIR RELEASE VALVES

A. Provide at high points in the water main.
B. Design water main to minimize the number of air release valves.
C. Air release valves shall be sized based on the size of the water main.
D. Maintain minimum 48" cover over water main at location of air release valve.
E. Provide at maximum 3000-foot intervals where water main is installed at little or no slope.
F. Automatic air release valves shall not be used in situations where flooding of the manhole or chamber may occur.
G. The open end of an air relief pipe from automatic valves shall be provided with a screened, downward facing elbow. The pipe from a manually operated valve should be extended to the top of the pit.

## 3.9 DEAD ENDS

A. Minimize dead ends by looping of all mains. Any dead ends must be reviewed for approval by RCU.

B. Where dead ends occur, provide a fire hydrant on lines 6" and larger and a blow off on lines 4" in diameter. RCU does not permit installation of Post

Hydrants for the purposes of flushing. Flushing devices should be sized to provide flows, which will give a velocity of at least 2.5 feet per second in the water main being flushed. See Details.

C. Do not connect any flushing device to any sanitary or storm sewer, or any other non-approved connection.

## 3.10 SPECIAL CASES

A. Contaminated Areas – All water mains shall be located out of all contaminated areas. If the main must run through a contaminated site, the main material must protect the water system from being contaminated.

B. Drain-fields and Spray-fields – Potable water lines shall not be closer than twenty-five (25) feet horizontally from any portion of a wastewater tile field or spray field, or shall be otherwise protected by an acceptable method approved by SCDHEC.

C. There may not be any connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contaminated materials may be discharged or drawn into the system.

D. Neither steam condensate nor cooling water from jackets or other heat exchange devices may be returned to the potable water supply.

## 3.11 SEWER AND STORM DRAINAGE SYSTEM INTERFERENCE

A. No water pipe shall pass through or come in contact with any part of a sewer manhole or storm drainage pipe or structure. Water lines may come in contact with storm sewers or catch basins if there is no other practical alternative, provided that ductile iron is used, no joints of the water line are within the storm sewer or catch basin and the joints are located as far as possible from the storm sewer or catch basin.

## 3.12 SURFACE WATER AND WETLANDS CROSSINGS

A. Where it is necessary for water mains to cross surface water or wetlands, the developer's engineer shall submit proposed method of construction to RCU's Design & Construction Department for review and approval prior to submitting plans for permitting.

B. As a general rule, RCU does not allow aerial water main crossings. Examples of aerial crossings include, but are not limited to, water mains constructed on piers or pilings, and water mains attached to structures such as roadways, bridges or piers. In the event they are approved, the pipe shall be adequately supported and anchored, protected from damage and freezing, accessible for repair and replacement.

C. The preferred method of installation for water mains crossing surface water or wetlands is by Horizontal Directional Drill or Jack and Bore. In either case, the developer's engineer shall submit plans to RCU's Design & Construction Department for review and approval prior to submitting plans for permitting.

D. For any underwater crossing, a minimum of 2 feet of cover shall be provided over the pipe. When crossing water courses that are greater than 15 feet in width, the following shall be provided:

a. The pipe material and joints shall be designed appropriately.

b. Valves shall be located so the section can be isolated for testing or repair; the valves (on both sides of crossing) shall be easily accessible and not subject to flooding.

c. A blow-off shall be provided on the side opposite the supply service sized in accordance with Section R.61-58.4(D)(7). Direct away from streams, over ground.

d. Use DIP with mechanical joints for any lines being installed in rock.

## 3.13 WATER MAIN RESTRAINT

A. General

1. Design restrained joints in accordance with DIPRA Standards for all fittings, valves and hydrants and pipe joints as required to resist forces during testing and normal operating pressures within the distribution system.

2. Retainer glands shall be used on all mechanical joint fittings. All tees, plugs, caps, and bends equal to or exceeding 11-1/4 degrees, as shown, and at other locations where unbalanced forces exist, must have acceptable thrust restraint.

3. All tees, bends, plugs, and hydrants on lines 2 ½ inches in diameter and larger shall be provided with reaction blocking, tie rods, or other approved method of restraint.

B. Blocking

1. Provide thrust blocking only at wet taps, as shown, or as directed by the RCU or the Developer's engineer. The concrete mix shall have 28-day compressive strength of not less than 3,000 pounds per square inch. The bearing surface shall be as shown or as directed by the RCU. Place the block so that the pipe and fitting joints will be accessible to repairs, unless otherwise shown. See Detail.

C. Restrained Joints

1. Provide restrained joint pipe and fittings on all piping at each fitting, valve, fire hydrant connection, and on the pipe joint as shown on plans.

2. Provide for use with mechanical joint pipe and fittings where applicable.

## 3.14 TAP SIZE IN RELATION TO MAIN SIZE

A. All water service taps shall be a minimum of one size smaller than the water main being tapped unless the water main being tapped is part of a looped water distribution system. In these cases the water service tap can be the same size as the main being tapped but cannot be larger. RCU reserves the right to stipulate the maximum size tap available off of any water main regardless of the main size and configuration, if it is deemed in RCU's best interest to do so.

## 3.15 BLOW OFF ASSEMBLIES

B. General

1. All 4" dead-end water mains shall be designed to include a 2-inch blow-off assembly. Fire hydrants shall be used as blow-offs on 6" mains and larger. Lines 6" and larger require a fire hydrant and 500 gpm to achieve a 2.5 fps scouring velocity.
2. 2" blow-off assemblies shall be set underground in a 1.5 ft x 2 ft Russco Box, model # MB-2202, as manufactured by Sigma Corporation. Top of box shall read "Water". Blow-off hydrant, or other such appurtenances to a distribution system shall not be connected directly to any storm drain or sanitary sewer, nor shall blow-offs be connected directly to any sewer. Such chambers or pits shall be drained to the surface of the ground where they are subject to flooding by surface water, or to absorption pits underground, and in the public right-of-way shall be installed to final grade. Blow-off chambers must include a removable extension to direct the water away from the blow-off box. See Detail.
3. 2 inch, 2 ½ inch, and 3 inch water main piping is not allowed in the distribution system.
4. A temporary blow-off may be utilized in cases where the main is to be extended. See Detail.

C. Materials

1. Blow-off hydrants shall be a non-freezing, self-draining type, with an overall length of 2-1/2 ft. Hydrants will be furnished with an FIP inlet, a non-turning operating rod and shall open to the right. All of the working parts shall be of bronze-to-bronze design. The outlet shall be bronze with a 2-1/2" NST. Hydrants shall be of locking type, to prevent unauthorized use as manufactured by Kupferle Foundry Co., Model #78, St. Louis MO, GIL Industries, Inc., Part #GH30, Pensacola, FL.

## 3.16 COVER

A. Provide suitable cover on all lines.

1. Pipe diameter, 4" – 16": 36" to 48" at finished grade.

2. Pipe diameter greater than 16": 48" at finished grade.

3. All piping located within the right-of-way of the South Carolina Department of Transportation and Department shall have a cover of 48" below the crown of the road when installed within the limits of the paved roadway, 36" cover when installed in the shoulder of right-of-way and a minimum of 18" separation under the design invert of drainage structures. The greater dimension of the above shall dictate minimum depth where applicable.

4. All piping located within a public right-of-way shall be constructed in accordance with applicable permits and RCU's minimum requirements.

5. Special conditions other than those listed above may be approved if requested in writing from the RCU.

## 3.17 CROSS CONNECTION CONTROL (BACKFLOW PREVENTION DEVICES)

A. There shall be no connection between the distribution system and any pipes, pumps, hydrants, or tanks whereby unsafe water or other contamination materials may be discharged or drawn into the system.

B. No by-passes shall be allowed, unless the bypass is also equipped with an equal, approved back-flow prevention device.

C. High hazard category cross connections shall require an air gap separation or an approved reduced pressure backflow preventer.

D. Reduced pressure principal backflow prevention assemblies shall not be installed in any area location subject to possible flooding. This includes pits or vaults which are not provided with a gravity drain to the ground's surface that is capable of exceeding the discharge rate of the relief valve. Generally, if installed in a pit, the drain line shall be 2 times the size of the line entering the backflow prevention device. The drain cannot empty into any type of ditch, storm drain, or sewer, which could flood water back into the pit.

E. All piping up to the inlet of the backflow prevention device must be suitable for potable water. The pipe must be AWWA or NSF approved. Black steel pipe cannot be used on the inlet side of the device.

F. Fire line sprinkler systems and dedicated fire lines, except those in the high hazard category shall be protected by an approved double check valve assembly.

**SCDHEC Approved August 2016**

## SECTION 4

## SEWER SYSTEM DESIGN STANDARDS

### 4.1 GENERAL

a. The following sanitary sewer system design guidelines are based on Federal, State and local health requirements and Richland County Utilities (hereinafter called "RCU") design criteria. All sewer design and installation shall meet or exceed the criteria established in the "Ten States Standards" and SCDHEC regulations.

b. These design guidelines are applicable to all developments including but not limited to residential, commercial and industrial developments, subdivisions and/or parks requesting sanitary sewer service from RCU.

c. RCU will review and approve plans for the construction of new systems, extensions, or replacement sewers only when designed in accordance with these standards. Any variations from these standards must be approved, in writing, by RCU.

d. Project engineer must observe the construction for the project weekly (or as approved by RCU) and provide written updates to RCU inspection staff and certify the correctness of the related work on the contractor's record drawings.

### 4.2 GRAVITY SEWER SYSTEM DESIGN CRITERIA

#### A. GRAVITY MAINS

1. A main is defined as any line between manholes.

2. Design mains in accordance with the requirements of the South Carolina Department of Health and Environmental Control Standards for Wastewater Facility Construction: R.61-67 and the requirements of these standards.

3. Diameter:

   a. Minimum diameter is 8"

   b. Maximum diameter shall not exceed the diameter of the downstream main from the point of connection.

4. All gravity mains shall be SDR 26 PVC unless conditions require DIP.

5. Flow Criteria – Design for minimum velocity of two (2) feet per second with pipe flowing full. Use Manning coefficient of roughness, n = 0.013.

6. Minimum pipe slope in percent (Feet per 1000 Feet):

| | |
|---|---|
| 8-inch | 0.40% |
| 10-inch | 0.28% |
| 12-inch | 0.22% |
| 15-inch | 0.15% |
| 18-inch | 0.12% |
| 20-inch | 0.10% |
| 24-inch | 0.08% |

7. Under special conditions, slopes that produce velocities less than 2.0 feet per second, in compliance with SCDHEC R.61-67, may be considered for approval by RCU.

B. SERVICE LINES

1. A service is defined as any line from a main or manhole to the right-of-way line, or edge of easement line, and shall not exceed 75 feet in length.

2. Diameter:

   a. Minimum diameter is 6" for the following applications:

      1) 6" service line may be provided, for no more than two residential units and only upon specific approval from the RCU.

      2) Single commercial building.

      3) Multi-family building up to four (4) units.

   b. Minimum diameter is 8" for multi-family buildings consisting of more than four (4) units.

3. Service Connections:

   a. 6" Services:

      1.) Connect at manholes when possible. Install so the crown of the gravity sewer main and service is the same elevation.

      2.) When connection at a manhole is not reasonable, connect to gravity main using wye branches. Wyes shall be of the same material and strength as the mains on which they are installed.

   b. 8" Services – Shall be connected at manholes. Install so the crown of the gravity sewer main and service is the same elevation.

4. Minimum slope for Services (Feet per 1000 Feet):

| | |
|---|---|
| 6-inch | 1.00% |
| 8-inch | 0.40% |

5. All sewer services shall be SDR 26 PVC unless conditions require DIP.

C. CAPACITY DESIGN

1. Where applicable, comply with the unit contributory loading criteria listed in the latest edition of Appendix A of the South Carolina Department of Health and Environmental Control Standards for Wastewater Facility Construction: R.61-67.

2. In determining the required capacities of new sanitary sewers, the following factors shall be considered:

   a. Peak hourly sewage flow (Average Daily Flow * 2.5).

   b. Additional maximum sewage or waste flow from industrial plants.

   c. Groundwater infiltration.

   d. Topography of area.

   e. Location of waste treatment plant.

   f. Depth of excavation.

g. Pumping requirements.

3. Per capita flow: New sewer systems shall be designed on the basis of an average daily per capita flow of sewage of not less than 100 gallons per day. This figure is assumed to cover normal infiltration, but an additional allowance should be made where conditions are unfavorable. Generally, the sewers should be designed to carry, when running full, not less than the following daily per capita contributions of sewage, exclusive of sewage or other waste flow from industrial plants:

$$Q = (10x10^{4}xP)(1+ 14/(4+(P^{0.5}))$$

Where "P" is the population in thousands.

4. Maximum infiltration: 100 gallons per inch of pipe diameter per mile per day.

D. GRAVITY SEWER PIPES

1. Straight alignment.

2. Make all connections to gravity lines and manholes at equal to or greater than 90° to the downstream line.

3. Depth adequate to receive wastewater from the lowest service and prevent freezing.

4. Slopes greater than 20%.

   a. Anchor using concrete anchors.

   b. Space Anchors as follows:

      1.) 36 feet on center for slopes 20 – 35%.
      2.) 24 feet on center for slopes 36 – 50%.
      3.) 16 feet on center for slopes 51% and higher.

5. Where a smaller sewer joins a larger one, match the crowns of each.

6. Where velocities are greater than 15 feet per second make special provisions for protection against displacement by erosion and shock.

7. Service laterals: Locate one (1) foot from property pin from opposite corner of water service lateral.

8. Locate sewer mains and manholes outside of paved roadway except for crossings or as approved by RCU in writing. No manhole covers are allowed in curbing.

9. Use PVC SDR-21 or Ductile Iron Pipe where wastewater main:

   a. Depth of cover is less than 3-feet.

   b. Depth of cover is greater than 18-feet.

   c. Crosses over water mains. The wastewater main shall transition to PVC SDR-21 or DIP. A full length of pipe shall be installed in the wastewater main centered so that each joint is equidistant from the water main. Joint of DIP water main shall also be installed so that each joint is equidistant from the wastewater main. Restrained joints shall be used for the transition in the wastewater main. Fernco type couplings are not acceptable.

   d. Crosses beneath water main with less than 18-inch vertical separation.

   e. Crosses beneath storm drainage pipe with less than 3-foot vertical separation.

   f. Crosses creeks, rivers and other water bodies.

   g. Is installed in casing.

E. SEPARATION OF WATER MAINS AND SEWERS

1. Where possible, locate sewer pipe at least ten (10) feet away, horizontally, from water lines.

2. Should ten (10) feet separation not be practical, then the sewer pipe may be located closer provided:

   a. It is laid in a separate trench.

   b. It is laid in the same trench with the water main located at one side on a bench of undisturbed earth.

   c. In either of the above cases, crown elevation of the sewer pipe shall be at least 18" below invert elevation of water line.

3. Where sewer pipes cross over or under water lines, maintain 18" minimum clearance between outside edges of the two pipes.

F. COVER

1. Provide suitable cover on all lines.

   a. Minimal cover depth for gravity sewer lines is as follows:

      1.) Less than 8-inch diameter: 30".

      2.) 8-inch and above: 36".

   b. Minimal cover depth for force mains is as follows:

      1.) 4-inch and 12-inch diameter: 36".

      2.) 14-inch diameter and larger: 48".

   c. All piping located within the right-of-way of the South Carolina Department of Transportation shall have a cover of 48" below the crown of the road when installed within the limits of the paved roadway, 36" cover when installed in the shoulder of right-of-way and a minimum of 18" separation under the design invert of drainage structures. The greater dimension of the above shall dictate minimum depth where applicable.

   d. Special conditions other than those listed above may be approved if requested in writing from RCU.

G. MANHOLES

1. Manhole Diameter:

   a. Up to 8-feet deep: minimum diameter 4-feet.

   b. Greater than 8-feet deep: Minimum diameter 5-feet.

2. Maximum manhole spacing: 400 feet.

3. Provide manholes at the end of each line, at all changes in grade, changes in size, changes in alignment, and at all intersections.

4. Minimal angle between sewer mains intersecting at manhole: 90°.

5. Manhole top elevations:

   a. One (1) foot above the fifty year flood elevation.

b. If located lower than fifty year flood elevation, use water-tight ring and cover.

c. Drop Manholes:

1.) Only inside drops are allowed.

2.) Use inside drop manholes where the difference in incoming and outgoing pipe invert elevation is 24" or greater. All other lines shall enter at the invert of the manhole.

3.) Drop manholes shall have a minimum inside diameter of 5-feet. See Details.

4.) Drop manholes requiring multiple drop lines shall be approved by RCU on a case by case basis.

d. Provide coatings per SECTION 6 Gravity Sewer Materials and Construction Specifications on all manholes where force main enters and in the next manhole downstream and in other locations as indicated on the plans.

## 4.3 FORCE MAIN DESIGN CRITERIA

### A. DESIGN CRITERIA

1. Design mains in accordance with the requirements of the South Carolina Department of Health and Environmental Control Standards for Wastewater Facility Construction: R.61-67 and the requirements of these standards.

2. Minimum pipe size: 4". Consideration and approval may be granted by RCU for STEP system's smaller diameter pipes according to Section 9 of these standards.

3. Minimum design velocity: 2 feet per second at design flow.

4. Design to use Hazen Williams design coefficient for new pipes: PVC: C=150, DIP: C=140, HDPE: C=155.

5. Maximum pipe size: Provide so as to maintain the minimum 2 feet per second velocity and minimize pump head.

6. Where applicable, comply with the unit contributory loading criteria listed in the latest edition of Appendix A of the South Carolina

Department of Health and Environmental Control Standards for Wastewater Facility Construction: R.61-67.

7. Peak hourly flow projections shall be two and one half (2.5) times the average daily flow projection.

B. VALVES

1. Air Release Valves:

   a. Design force main to minimize the number of air release valves.

   b. Provide at high points in the force main.

   c. Provide at a maximum 3000' intervals.

   d. Maintain minimum 36-inches of cover at location of air release valve.

   e. Provide valve vault as necessary. See Details.

2. Cushioned Swing Check Valves:

   a. Where a new force main connects to an existing force main, provide cushioned swing check valve. See Details.

   b. Provide valve vault. See Details.

3. Plug Valves:

   a. For force mains greater than 5,000 feet in length, provide a plug valve at the half way point, or every 4,000 feet.

   b. Where no other force main isolation valve exists, provide plug valve within 250 feet of an air release valve.

   c. Where a new force main connects to an existing force main, provide plug valve on each side of cushioned swing check valve. See Details.

   d. Provide valve box and valve box protection ring. See Details.

C. FORCE MAIN CONNECTION TO EXISTING GRAVITY SYSTEM

1. Connection to an existing gravity system shall be made at an existing manhole or by constructing a cut-in manhole.

2. Connection shall be no more than two (2) feet, vertically, above the receiving manhole's flow line.

3. Coat receiving manhole and next manhole downstream per Section 6 Sewer System Materials and Construction Specifications.

4. Manhole vents may be required where force mains are entering manholes.

D. CONNECTION TO AN EXISTING FORCE MAIN

1. Connection to an existing force main shall be made by the addition of a tee or wye. Under special conditions RCU will review submittals and may approve direct taps.

2. Provide check valve and two (2) isolating plug valves. See Details.

E. SEPARATION OF WATER MAINS AND SEWERS

1. Where possible, locate force main at least ten (10) feet away, horizontally, from water lines.

2. Should ten (10) feet separation not be practical, then the force main may be located closer provided:

   a. It is laid in a separate trench.

   b. It is laid in the same trench with the water main located at one side on a bench of undisturbed earth.

   c. In either of the above cases, crown elevation of the force main shall be at least 18" below invert elevation of water line.

3. Where force mains and water mains cross, the force main shall go under the water main and be at least 18" below the bottom of the water main.

F. COVER

1. Provide suitable cover on all lines. Minimum cover depth as follows:

   a. Less than 12-inch diameter: 36".

   b. 14-inch and above: 48".

   c. All piping located within the right-of-way of the South Carolina Department of Transportation shall have a cover of 48" below the crown of the road when installed within the limits of the paved roadway, 36" cover when installed in the shoulder of right-of-way and a minimum of 18" separation under the design invert of drainage structures. The greater dimension of the above shall dictate minimum depth where applicable.

   d. Special conditions other than those listed above may be approved if requested in writing from RCU.

G. DUCTILE IRON PIPE LOCATIONS

1. Force main crosses beneath storm drainage pipe with less than three (3) feet of clearance.

2. Force main crosses above a storm drainage or other pipe with less than 18" of clearance.

3. Force main crosses creeks, rivers and other water bodies.

4. Cover is less than minimum required in Part F above.

5. Cover is greater than 16'.

6. Force main is installed in casing.

7. RCU reserves the right to require DIP in specific locations.

**SCDHEC Approved August 2016**

## SECTION 5.1

## WATER DISTRIBUTION SYSTEM

## MATERIALS FOR CONSTRUCTION

A. GENERAL

1. This section includes pipe and fitting material specifications, joint materials, valves and encasement requirements.

2. All materials used in the construction of water distribution systems shall be new and unused when delivered on-site and shall be suitable for installation and operation under the conditions for which they are to be used.

B. MATERIALS

1. General:

   a. All chemicals/products added to public water supply must be third party certified as meeting the specifications of ANSI/NSF Standard 60.

   b. All materials/products that contact potable water must be third party certified as meeting the specifications of ANSI/NSF Standard 61.

   c. The pressure rating of pipe must be capable of handling 1.5 times the normal working pressure.

   d. All pipe fitting, packing, jointing materials, and valves must conform to Section C of the AWWA Standards.

   e. Asbestos cement pipe shall not be used in potable water systems except in the repair of existing asbestos cement lines.

   f. Thermoplastic pipe shall not be used above grade.

   g. Hydrant materials shall meet AWWA C502.

C. DUCTILE IRON PIPE (DIP)

1. Provide for all water mains. All sizes of pipe shall be laying length of 18'-0" to 20'-0".

2. Quality Assurance

a. Reference Standards of the American National Standards Institute (ANSI)

1) A21.4 Cement-mortar lining for cast iron and ductile iron pipe and fittings for water (AWWA C1 04).

2) A21.5 Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids. Linear Low Density. Thickness: 8 mils; Color: blue (AWWA C105).

3) A21.10 Gray iron and ductile iron fittings, 3" through 48" for water and other liquids (AWWA C11 0).

4) A21.11 Rubber gasket joints for cast iron and ductile iron pressure pipe and fittings (AWWA C111).

5) A21.15 Flanged cast iron and ductile iron pipe with threaded flanges (AWWA C115).

6) A21.50 Thickness design of ductile iron pipe (AWWA C150).

7) A21.51 Ductile iron pipe centrifugally cast, in metal molds or sand lined molds, for water or other liquids (AWWA C151).

8) A21.53 Ductile iron compact fittings for 3" through 48" (AWWA C153).

9) 816.1 Cast iron pipe flanges and flanged fittings, Class 25, 125,250, and 800.

10) 81.20.1 General Purpose (Inch) Pipe Threads.

11) 816.18 Cast Copper Alloy Solder Joint Pressure Fittings

12) ASTM 832 Standard Specification for Solder Metal

13) ASTM 843 Standard Specification for Seamless Red Brass Pipe, Standard Sizes.

14) ASTM 862 Standard Specification for Composition Ounce Metal Castings.

15) ASTM B88 Standard Specification for Seamless Copper Water Tube.

16) ASTM 8584 Standard Specification for Copper Alloy Sand

Castings.

b. Reference Standards of the American Water Works Association (AWWA)

1) C102 Polyethylene Encasement of Ductile Iron Pipe Systems

2) C116 Protective Fusion Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile Iron Pipe Systems

3) C600 Installation of Ductile Iron Water Mains and their Appurtenances

4) C651 Disinfecting Water Mains

5) C800 Underground Service Line Valves and Fittings

3. All buried pipe shall be pressure class as follows:

| Pipe Sizes (inch) | Pressure Class (psi) |
|---|---|
| 4-12 | 350 |
| 14-20 | 250 |
| 24 | 200 |
| 30-64 | 150 |

a. Pipe wall thickness shall be in accordance to bury depth as shown on drawing.

b. All buried ductile iron pipes and fittings shall be polyethylene wrapped.

c. Flange pipe or Victaulic grooved pipe shall be class 53.

4. Use cement mortar lining: ANSI/AWWA C1 04/A21.4, standard thickness.

5. Use mechanical or push-on joints: ANSI/AWWA C111/A21.11 as modified by ANSI/AWWA C151/A21.51.

6. Use rubber gaskets and lubricant: ANSI/AWWA C111/A21.11.

7. No metric sized pipe shall be permitted.

8. All pipe to be shipped with gaskets, glands, and bolts unless specified otherwise.

9. All pipe lengths must be tested to 500 psi working pressure prior to shipping.

10. Pipe with threaded components, i.e. flange or bell must be tested after installation of threaded component.

11. All new transmission water mains, 16-inch and larger, must be permanently marked in the RCU easement, at each valve location, with RCU approved above ground markers. See Detail

12. Acceptable products: American Cast Iron Pipe Company, Griffin Pipe Company and U.S. Pipe Company.

D. SERVICE PIPE

1. Minimum size - 1".

2. Provide Type K copper for services 1" - 2".

3. Marked with National Sanitation Foundation approval at 18" intervals.

E. FITTINGS

1. General:

   a. Cast iron fittings are not acceptable.

   b. Comply with ANSI A 21.4 (AWWA C104), ANSI A 21.53 (AWWA C153), and ANSI A 21.51 (AWWA C151)

2. Ductile iron pipe:

   a. Use 250 psi pressure rated ductile iron fittings unless otherwise indicated. Comply with ANSI/AWWA C11 0/A21.10 and ANSI/AWWA C153.

   b. Fittings for use with push-on joint pipe: ANSI/AWWA C111/A21.11.

   c. Compact fittings for piping 3" -48" may be provided in accordance with ANSI/AWWA C153/A21.53.88.

   d. Use cement mortar lining: ANSI/AWWA C104/A21.4, Standard thickness or epoxy lining.

3. No metric sized fittings shall be permitted.

4. All fittings to be shipped with gaskets, glands, nuts, and bolts unless specified otherwise. Nuts and bolts shall be made of Cor-Ten steel, 304 stainless steel, or 316 stainless steel. Tee bolts and nuts shall be made of

high strength low alloy steel (ASTM A307), Cor-Ten (ASTM A242), 304 stainless steel, or 316 stainless steel. Material type shall be marked on the nuts and bolts.

5. Fittings to be installed in the construction of water systems shall conform to those of standard design and in current inventory of RCU. No special manufactured fittings will be allowed without prior approval of RCU.

6. Acceptable products: American Cast Iron Pipe Company, Griffin Pipe Company and U.S. Pipe Company.

F. JOINT MATERIAL

1. Push-on joints, mechanical joints and restrained joints conform to: ANSI A21.11 (AWWA C111).

2. Lubricants, which will support microbiological growth, shall not be used for slip-on joints. Vegetable shortening shall not be used to lubricate joints.

3. The use of vegetable shortening is prohibited.

4. Flanged joints conform to ANSI A21.15 (AWWA C115) faced and drilled 250 pound.

5. Bolts, Nuts, and All-Threaded Rod:

   a. Tee bolts and nuts shall be made of high strength low alloy steel (ASTM A307), Cor-Ten (ASTM A242), 304 stainless steel, or 316 stainless steel. Externally threaded standard fasteners shall be Cor-Ten steel, 304 stainless steel, or 316 stainless steel. All fasteners shall have a minimum yield strength of 45,000 psi.

   b. All-thread rod shall be grade 316 stainless steel.

   c. Stainless steel materials shall contain sufficient chromium to resist corrosion, oxidation, and rust.

   d. Materials shall be sound, clean, and coated with a rust resistant lubricant, approved for use with potable water.

   e. Threads shall be in accordance with ANSI B1.1, Unified Inch Screw Threads, and with B1.2, Screw Threads, Gages, and Gaging, conforming to the coarse thread series (UNC) Unified Coarse, with threads Class 2A internal and Class 2B external.

   f. Bolts 3/4" and smaller shall be furnished with heavy hex heads conforming to ANSI B18.2.1.

g. Bolts larger than 3/4" may have either standard or heavy hex heads conforming to ANSI B18.2.1.

h. Bolts and nuts shall be a high strength, Cor-Ten steel, 304 stainless steel, or 316 stainless steel. Hex head shall be Cor-Ten steel, 304 stainless steel, or 316 stainless steel and comply with the dimensions outlined in ANSI/AWWA C111/A.21.11. The steel shall have minimum yield strength of 45,000 psi.

G. RESTRAINED JOINT PIPE AND FITTINGS

1. Provide restrained joint pipe and fittings on all piping at each fitting, valve, fire hydrant connection, and on the pipe joints. See Details.

2. Provide for use with mechanical joint pipe and fittings.

3. Restrained joint pipe will be indicated clearly on plans. The location and length of restrained joint pipe will be clearly marked on the drawings at all points where the direction or cross-sectional area of the pipe changes as well as at all bends, reducers, offsets, tees, wyes, dead ends, valves, and fire hydrants.

4. Acceptable products:

a. American Cast Iron Pipe - Fast Grip, Flex-Ring, Field Flex-Ring or Lock-Ring

b. US Pipe - TR Flex or Field Lok 350 Gaskets

c. Griffin Pipe -Snap-Lok Restrained Joint

d. EBAA - Megalug Restraint Gland

e. Ford -Series 1400 Restraint Gland

H. COUPLINGS - 4" AND LARGER

1. Provide couplings where needed to make piping connections.

2. Provide full-length mechanical joint ductile iron solid sleeve, 12" minimum length.

3. Provide cut-in sleeve, ductile iron, with mechanical restraint joint where installing fittings in an existing line.

I. PLUGS OR CAPS -4" AND LARGER

1. Provide at all pipe ends and unused branches of fittings.

2. Provide restrained joint.

J. METALLIC DETECTION TAPE

1. Provide 2" wide metallic detection tape on all buried piping.

   a. Provide 5.0 mil overall thickness with no less than a 50 gauge solid aluminum foil core.

   b. Foil to be visible from both sides.

   c. No inks or printing extended to the edges of the tape.

   d. Encase printing to avoid ink rub-off.

   e. Tensile strength -28 lbs/inch.

   f. Use heat set mylar inks.

2. Locate 12" below ground surface in pipe trench.

3. Color to be Safety Precaution Blue.

4. Wording on tape to indicate "Potable Water" at no greater than 24" on center.

K. VALVES

1. General:

   a. All valves shall be in conformance with the latest revision of all reference standards of AWWA or ANSI.

   b. 4" through 12"; Use resilient wedge gate valves.

   c. 16" and larger: Use butterfly valves unless specified otherwise.

   d. Open by turning clockwise with arrow cast in top indicating the direction of the opening unless on Navy Base in which case the valve shall open left.

   e. Two inch metal operating nut with arrow indicating direction of opening. Red for "open right" and black for "open left".

   f. Provide stem extensions on all valves where the top of the operator nut is located greater than 36" below the top of the valve box.

   g. All valves shall be equipped with a non-rising stem.

2. Quality Assurance

a. Reference Standards of the American National Standards Institute (ANSI)

| | | |
|---|---|---|
| 1) | A21.5 | Polyethylene Encasement for Ductile Iron Piping for Water and Other Liquids. Linear Low Density. Thickness: 8 mils: Color: blue (AWWA C105). |
| 2) | A21.11 | Rubber gasket joints for cast iron and ductile iron pressure pipe and fittings (AWWA C111). |
| 3) | B16.1 | Cast iron pipe flanges and flanged fittings, Class 25, 125, 250, and 800. |

b. Reference Standards of the American Water Works Association (AWWA).

| | | |
|---|---|---|
| 1) | C600 | Installation of Ductile Iron Water Mains and their Appurtenances. |
| 2) | C500 | Metal Seated Gate Valves |
| 3) | C504 | Rubber Seated Butterfly Valves |
| 4) | C509 | Resilient Seated Gate Valves |
| 5) | C515 | Thin Wall Valve |

3. Gate Valves:

a. All valves will meet or exceed all requirements of AWWA C509 or AWWA C515.

b. Outer valve body will have raised lettering cast in, providing manufacturers name, valve size, year of manufacture, pressure rating, location of casting and each part is to be clearly marked indicating ductile or cast iron.

c. All valves will be electrostatically, fusion-bonded epoxy coated, minimum 8-mil thickness inside and out, conforming to ANSI/AWWA C550 Standards.

d. Resilient wedge to be ductile iron fully encapsulated with EPDM elastomer, including guide path and will be US Food and Drug Administration approved for potable water and have an EPDM visible marking.

e. All valves will have a minimum 250 psi working pressure and a 500 psi static pressure.

f. Valve stem material will be bronze, brass, or Type 304 stainless steel.

g. Valves will have two upper o-ring seals on the stem above the thrust collar and at least one o-ring seal below the collar so designed to allow for replacement of the upper o-rings with the valve under full operating pressure.

h. Valves will have thrust washers located above and below the thrust collar to insure smooth frictionless operation.

i. All valves will have a 2" Ductile Iron wrench nut with direction of valve operation clearly visible when looking down on the nut. Hold-down nut or bolt will be Type 316 stainless steel. Wrench nuts will be color coded red for "Open Right" and black for "Open Left".

j. All exterior bonnet and thrust collar bolting, whether recessed exposed, are to be Type 316 stainless steel and marked by type.

k. Waterway seat area will be smooth without ridges or cavities and valves will have full size bore throughout the flow-way.

l. All valves will be hydrostatically pressure tested prior to shipment in compliance with AWWA C509 or AWWA C515 Standards and be covered by the Manufacturer's Ten Year limited Warranty form the date of purchase by the end user.

m. Joint connections as specified will conform to ANSI/AWWA Standards as follows:

1) Flanged outlets will conform to dimensions and drillings of ANSI B16.1, Class 15 or ANSI/AWWA C110/A21.10 and will not be considered equal to Tapping Outlets.

2) Mechanical joint outlets shall conform to ANSI/AWWA C111/A21.11

3) Threaded outlets will be NPT threads conforming to ANSI B1.20.1.

4) Acceptable product: Mueller, American AVK, or American Flow Control.

4. Butterfly Valves:

a. Provide butterfly valves conforming to AWWA Standard C504 for

Class 150B, unless otherwise specified.

b. Resilient and elastomer seats are to be synthetic rubber (EPDM).

c. Shafts to be turned, ground and polished, constructed of 18-8 Type 316 stainless steel.

1) Shafts to be of one piece design.

2) Attach disc to shaft with stainless steel tapered pins and locking nuts.

d. Spray coat all interior wetted ferrous surface with two-component epoxy applied to a nominal thickness of 3 to 4 mils.

e. Coating material to be AWWA and U.S. Food and Drug Administration approved for use with potable water.

f. Provide operators with not less than maximum operator torque, as determined in accordance with Appendix A of AWWA C504, to operate valves under actual line pressures and velocities.

1) Provide worm and gear, or traveling nut type, self-locking to prevent the valve disc from creeping or fluttering when it is in any intermediate position between open and closed.

2) Gear operators to be permanently lubricated, totally enclosed, with adjustable stops for the open and closed position.

3) All exterior fasteners shall be 316 stainless steel.

g. Epoxy coated inside and outside conforming to C550.

h. Ends shall be mechanical joint conforming to C111/A21.11.

i. Open by turning clockwise with arrow cast in top indicating the direction of the opening.

j. Rated for a 150 psi working pressure.

k. Acceptable product: DeZurik, or Pratt.

5. Tapping Valves 24" and smaller shall conform to the following:

a. Tapping valves shall conform to the requirements for gate valves as specified above in Item 3, Gate Valves.

b. Use resilient seated wedge valves: ANSI/AWWA C50/.C15.

c. Resilient wedge to be ductile iron fully encapsulated with EPDM elastomer, including guide path and will be US Food and Drug Administration approved for potable water and have an EPDM visible marking.

d. Acceptable product: Mueller, American AVK, American Flow Control

6. Tapping valves larger than 24" shall conform to the following:

a. Tapping valves shall conform to the requirements for gate valves as specified above in Item 3, Gate Valves.

b. Bronze seat, double disc type conforming to AWWA C500, or resilient seated wedge conforming to AWWA C515.

c. Resilient wedge to be ductile iron fully encapsulated with EPDM elastomer, including guide path and will be US Food and Drug Administration approved for potable water and have an EPDM visible marking.

d. Equipped with 4" by-pass valves.

e. Rated for a 200 psi working pressure.

f. Acceptable product: Mueller

L. VALVE BOXES

1. Provide at each buried valve.

2. Shall be full cast or ductile iron with iron covers suitable for heavy traffic use and conform to ASTM A-48, Class 20 Specifications.

3. Valve boxes shall be screw type and have a 5 1/4" inside shaft diameter.

4. Have the word "WATER" cast into the cover.

5. Coat box and cover with two (2) shop coats of bitumastic paint.

6. No part of the valve box or riser is to rest on the buried valve.

7. Acceptable product: Products of Tyler Union #6850 Series, Bingham & Taylor #4905 Series of U.S. manufacture only, AFC Box with external stem and locking lid, and East Jordan Ironworks #8550 Series.

M. VALVE BOX PROTECTION RING

1. Provide at each valve box in unpaved areas a precast concrete protection ring with the following:

a. Two (2) rings of#3 reinforcing steel, one (1) 21" diameter, and one (1) 24" diameter, or;

b. One (1) ring of #3 reinforcing steel, 19" in diameter with fiber-mesh concrete.

2. Inside dimensions to be 9 ¼".

3. Outside diameter to be 27".

4. Provide 5" thickness at interior with a continuous slope to 2" thickness at the outside.

5. Minimum weight of 110 lbs.

## N. SERVICES

1. General:

a. Water service taps less than 4" in diameter will not be permitted from mains that are greater than 12" in diameter. In cases where such a main provides the only service availability, the proponent for service will be required to construct a main extension suitable to meet their service needs, including fire protection if none exists.

b. Water service taps less than 6" in diameter will not be permitted from mains that are prestressed concrete cylinder pipe (PCCP). In cases where such a main provides the only service availability, the proponent for service will be required to construct a main extension suitable to meet their service needs including fire protection if none exists.

c. Water services will not be permitted from mains that are High Density Polyethylene (HDPE).

2. Existing PVC water mains:

a. Services 1" -2": Tapping saddle.

b. Services larger than 2": Tapping sleeve.

c. Note: 3" services will require a 4" tap.

3. DIP water mains:

a. Services less than 1 Direct tap.

b. Services 11/2" - 2": Tapping saddle.

c. Services greater than 2": Tapping sleeve.

d. Note: 3" services will require a 4" tap.

4. Tapping Saddles

a. Provide of the following materials:

1) Body -Ductile Iron ASTM-A536.

2) Bales and strips -Type 304 or 316 stainless steel.

3) Studs -Type 304 or 316 stainless steel.

4) Hardware -Type 304 or 316 stainless steel.

5) Iron pipe thread.

b. Provide double strap for all sizes or wide strap, double bolted.

c. Finish -Provide fusion bonded nylon to an average thickness of 12 mils.

d. Acceptable manufacturers are: Smith Blair-317, Ford-FC 202, Mueller-DR2S, JCM-406 or Romac-202N.

O. TAPPING SLEEVE

1. Tapping sleeve sizes 4" through 24" shall conform to the following criteria:

a. Provide ductile iron MJ type tapping split-type sleeve with flanged outlet.

b. Provide bolts, follower rings and gaskets on each end of the sleeve.

c. Provide for minimum working pressure of 150 psi.

d. Provide square head bolts with hexagonal nuts. All square head bolts and hexagonal nuts shall be Cor-Ten steel, 304 stainless steel, or 316 stainless steel.

e. Provide NPT test plug on top of the outlet.

f. Acceptable product: Mueller H-615, American Darling.

2. Tapping sleeves greater than 24" -Taps on existing mains greater than 24" shall be reviewed on a case-by-case basis. When approved, tapping

sleeves shall conform to the following criteria:

a. Provide 316 Stainless Steel, split-type sleeve with 316 stainless steel flanged outlet.

b. Provide full circumferential waffle gasket for high pressure application.

c. Provide high strength 316 stainless steel bolts and hex nuts. Nuts and washers shall be coated to prevent galling and seizure.

d. Provide for minimum working pressure of 150 psi.

e. Provide ¾" NPT test plug on top of the outlet.

f. Acceptable product: Dresser Style 630 -Heavy Stainless Steel Tapping Sleeve.

P. AIR RELEASE VALVES

1. Air release valves shall automatically exhaust accumulated air from a fluid system while the system is pressurized and operational at pressures up to 150 PSI.

2. The valve shall have ASTM A126 Class B cast iron body and cover with a threaded inlet and outlet connection. Valves shall have a Type 316 stainless steel float and a replaceable seat of Buna-N or other suitable material. Venting orifice and internal linkage mechanism shall be Type 316 stainless steel.

3. 1-inch valves shall be simple lever type, GA Figure 910, 2" valves shall be compound lever type, GA Figure 920 and 3" valves shall be compound lever type, GA Figure 922.

4. House air release valve in concrete manhole sections with vented lid. See Details.

Q. COMBINATION AIR VALVES FOR WATER

1. Combination air valves for water shall employ the Kinetic principle to exhaust large quantities of air during the filling of a pipeline or vessel. The valve shall be capable of venting air at up to sonic velocity without blowing shut, closing only after all the air has been vented. The valve shall continue to release small quantities of air under pressure as often as needed to keep the system free of accumulated air. The valve shall automatically open to allow air to reenter during draining or whenever a negative pressure occurs.

2. Body and cover shall be ASTM A126 Class B cast iron with Type 316 stainless steel floats and replaceable seats of Buna-N or other suitable

material. Internal linkage mechanism shall be Type 316 stainless steel.

3. All fasteners shall Type 316 stainless steel.

4. Air release orifice shall be suitable for 150 PSI maximum working pressure.

5. Valves 4-inch in size and smaller shall be one-piece body with NPT connections. Larger valves shall be dual-body with a flanged inlet per ANSI B16.1 Class 125 and an outlet cowl.

6. Valves up to 4-inch shall be GA Figure 945 and those 6-inch and larger shall be GA Figure 950.

7. House air release valve in concrete manhole sections with vented lid. See Details.

R. CORPORATION VALVES

Corporation Valves will have NPT thread inlets. The outlet connection will be CTS /OD, conductive compression (grip nut) type outlets. Accepted manufacturers and models are:

1. Mueller - Ori-Corp, Model # H-15023 (1 ½" and 2")

2. Mueller - 300 Corp, Model # B-25028 (1")

3. Ford - Ball Corp, Model # FB1100-Q-G (1" through 2")

4. A.Y. McDonald Ball Corp, Model # 4704-BT (1" through 2")

S. METER BOX

1. ¾" and 1" Meter Boxes:

   a. Contractor shall provide meter boxes.

   b. ¾" Meter Box - 5/8" x ¾" Ford Long Yokebox # LYLW 344-233-TP-CPW-G, angle key valve inlet, outlet with grip nut, equipped with removable plug.

   c. 1" Meter Box-Ford Yokebox # YL 111-444-TP, 1" female IPT on inlet and outlet: 10" from meter to grade level, 13.5" overall depth, '15" base diameter, 12-3/8" top overall diameter. Lid shall be equipped with removable plug for AMR setup.

2. 1 ½" and 2" Meter Boxes:

   a. Contractor shall provide meter boxes.

b. As manufactured by J&M Foundry

c. Model #P.C.1.5-2, Size: 29-5/8" Long x 16-1/8" Wide x 14" Deep, Material is ASTMA-48, Class 35B iron base with two piece iron lid rated for heavy traffic.

T. METER SETTER

Meter setters for 1 and 2" flanged meters are constructed of 85-5-5-5 brass and copper tubing, ball valve inlet with padlock wing, check valve outlet, brace pipe eyelet on FIP 90° Ells on inlet and outlet sides of set-up. The Contractor shall provide meter setters. Accepted manufacturers and models are:

1. Ford Meter Box Co. # VBH 76-15-44-66-G for 1 and # VBH 77-15-44-77G for 2"

2. Mueller Co. #B-2422-2 for 1 or 2" with 15" riser and 110 Compression connection

U. WATER SERVICE LINE PIPING

Copper water tube shall be Type K copper tubing, 0.065" minimum thickness, suitable for underground water services and supplied in conformance with ASTM B88.

V. BEDDING MATERIAL

1. Clean, well graded Class II and/or Class III soils.

2. Class II soils shall be used in the pipe zone. Use Class II or Class III soils above the pipe zone. Backfill material must be tamped in layers around the pipe and to a sufficient height above the pipe to adequately support and protect the pipe. Stones must not come in contact with the pipe and must not be within 6" of the pipe.

W. JACK AND BORE

1. General

a. Description

This section covers the work necessary to furnish and install steel casing carrier pipes under surface structures, where indicated, as specified herein, and as needed for a complete and proper installation.

b. Safety

Perform all excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970(PL 91-597), as amended.

2. Materials

a. Carrier Pipe

Carrier pipe shall be restrained joint ductile iron.

b. Steel Pipe Casing

Steel pipe casing shall be manufactured from steel conforming to ASTM A 139 for Grade S, with minimum yield strength of 35,000 psi before cold forming.

1) Pipe shall be straight seam welded. A protective coat will not be required. Spacers for installation of the carrier pipe shall be installed by the Contractor.

2) Minimum diameter and wall thickness of the steel piping shall be as listed in the following table.

| Restrained Joint DIP Carrier Pipe Size (inches) | Minimum Casing Size (inches) | Minimum Casing Thickness finches) |
|---|---|---|
| 4 | 14 | 0.250 |
| 6 | 16 | 0.281 |
| 8 | 18 | 0.312 |
| 10 | 20 | 0.375 |
| 12 | 24 | 0.375 |
| 14 | 26 | 0.438 |
| 16 | 30 | 0.469 |
| 18 | 32 | 0.500 |
| 20 | 36 | 0.532 |
| 24 | 42 | 0.625 |
| 30 | 48 | 0.688 |
| 36 | 54 | 0.781 |
| 42 | 56 | 0.812 |
| 48 | 62 | 0.875 |
| 54 | 72 | 1.000 |

3) The thicknesses of the casing shown in 2.b.2 are minimum thicknesses. Actual thicknesses shall be determined by the casing installer based on an evaluation of the required jacking forces.

c. Casing Spacers

Casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09" thick, also having a hardness of 85-90 durometer. Runners shall be attached to stainless steel risers which shall be properly welded to the shell. The height of the runners and risers shall be manufactured such that the pipe does not float in the casing. Casing spacers shall be as manufactured by Cascade Waterworks Manufacturing Company, Contractors Manufacturing, Inc., or approved equal.

3. Execution

a. Installation of Steel Pipe Casing

Installation of steel pipe casing shall be by the dry bore method at locations as shown on the Contract Drawings and approved by the applicable permits. Installation of steel pipe casing shall be in accordance with applicable regulations, the Contract Drawings, these specifications, and any permits required with respect to the particular boring.

1) Boring Pit and Receiving Pit

The boring pit shall be solid sheeted, braced, and shored as necessary to provide a safe operation. The Contractor shall take all precautions, and comply with all local, state and federal requirements as may be necessary to protect private property, public property and/or existing utilities. Maintain in dry condition by use of pumps, drains or other approved method.

The receiving pit shall be constructed in accordance with the Contract Drawings and applicable permits.

2) Line and Grade

The Contractor shall set the boring rig so that after the casing is complete, and the carrier pipe is installed, the invert of the pipe shall conform to grade and alignment as shown on the Contract Drawings. As the casing is installed, Contractor shall check the horizontal and vertical alignment frequently. Contractor shall install the boring at a 90-degree angle to the crossing unless permitting authority approves a different specific angle of crossing. The depth shall be a minimum depth as prescribed by the governing authority unless a deeper depth is dictated by design.

3) Boring

In all cases, boring and jacking of the casing pipe shall be accomplished by the dry jack and bore method without jetting, sluicing, or wet boring. For casing pipes 48-inch in diameter and larger, a closed face shield bore head shall be utilized in front of the casing. For casing pipes less than 48-inch in diameter, the casing may be installed via open face method whereby the hole shall be bored and cased through the soil by a cutting head on a continuous auger mounted inside the casing pipe. The distance between the leading end of the first auger section and the leading end of the casing shall be as necessary to maintain a solid plug of spoil material inside the forward portion of the casing. At no time during the boring and jacking operation shall the auger head be allowed to extend out in front of the casing being installed. The boring of the hole and jacking of the casing pipe shall be done simultaneously, with continuous installation, until the casing pipe is in final position.

4) Dewatering

Contractor shall fully investigate the location of all jack and bores for the project and determine required dewatering methodologies for each location in order to provide for and conduct a dry jack and bore. Contractor shall submit plans and specifications for dewatering to the Engineer for approval prior to beginning the process (for railways, railway authority must also approve). Pumps of sufficient capacity to handle the flow shall be maintained at the site, provided the Contractor has received approval from the engineer to operate them. Pumps in operation shall be constantly attended on a 24-hour basis until, in the sole judgment of the DOT or railway authority; the operation can be safely halted. When dewatering, a process for monitoring any settlement of tracks, roads, or structures must be in place. Prior to commencing boring, the Contractor shall verify, with acceptance by the Engineer, the absence of groundwater to below the lowest elevation of the casing at each entry/exit pit and as necessary along the casing route.

5) Diameter of Hole

Bored installations shall have a bored hole no more than 1" greater than outside diameter of the casing pipe to be installed. In the event that voids are detected, the voids shall be grouted.

6) Casing Pipe Length

Lengths of casing pipe shall be as long as practical for site conditions. Joints between lengths shall be completely welded in accordance with American Welding Society recommended procedures. Prior to welding joints, the Contractor shall ensure that both ends of the casing sections being welded are square. The length of the casing shall be such that each end of the casing shall extend a minimum of 6' beyond the edge of pavement/back of curb of a paved roadway, or if railway installation, in accordance with requirements of the railway authority.

7) Lubricant

The Contractor shall plan to use a casing lubricant, such as bentonite, in the event excessive frictional forces jeopardize the successful completion of the casing installation.

8) Jacking

Once the jacking procedure has begun, it shall be continued without stopping until the jacking and boring operation is complete.

9) Installation of the Carrier Pipe

a) Inspect carefully, ensuring that all foreign material is removed from the casing and the casing meets alignment criteria for the type of carrier pipe being used.

b) For pressure systems, the casing deflection shall not exceed the maximum deflection recommended by the carrier pipe.

c) Install casing spacers on the carrier pipe per the manufacturer's instructions.

d) Provide a minimum of one spacer per ten linear feet of pipe.

e) Install the carrier pipe in the casing ensuring each joint is pushed "home" before the joint is installed into the casing.

f) Provide centered and restrained configuration.

10) End Seals

Grout each end of the casing with concrete brick and Type II concrete in such a manner to prevent the infiltration of foreign materials into the casing pipe, but allowing leakage to pass in the event of a carrier pipe break.

b. Rights-of-Way, Easements, and Permits

c. Prior to the beginning of the Work, consult with the Engineer to determine that all rights-of-way, easements, permits or other legalities are in order and become familiar with the requirements thereof. Confine the Work as required to comply with such requirements. Any encroachment beyond such limits shall be the Contractor's responsibility.

d. Conflict of Specifications

Where laws or orders of public authority prescribes a higher degree of protection than specified herein, then the higher degree so prescribed shall be deemed a part of this specification and govern the specific installation.

X. RESTRAINING GLANDS

1. This section includes restraining gland material and quality assurance specifications

2. EBAA Megalug, Ford Series 1400, Sigma One-Lok Series SLD, or Cape Fear Industries - EZ Restraint for Ductile Iron will be used on all sizes of ductile iron pipe.

3. EBAA Megalug series 2000PV or Ford Series 1500 will be used on existing PVC pipe.

4. Quality Assurance

a. Reference Standards of the American National Standards Institute (ANSI).

1) A21.11 Rubber gasket joints for cast iron and ductile iron pressure pipe and fittings AWWA C111).

2) A21.53 Ductile iron compact fittings for 3" through 48" (AWWA C153).

3) A21.51 Ductile iron pipe centrifugally cast in metal molds or sand lined for water or other liquids (AWWA C151).

b. Reference Standards of the American Standards for Testing and Materials (ASTM): A536-84 Specifications for ductile iron castings (AWWA C110).

5. Materials

a. Components

1) Ductile iron restraint glands sizes 4" through 24" shall conform to ASTM A536-80 Specification for ductile iron casting.

2) Coating shall be a bituminous seal coat to conform with ANSI/AWWA C151/A21.51 Ductile iron pipe centrifugally cast in metal molds or sand lined molds for water or other liquids.

b. Joint Sizes

1) Dimensions of gland shall be such that it can be used with the standardized mechanical joint bell and tee-head bolts conforming to:

a) ANSI/AWWA C111/A21.11 Rubber gasket joints for gray iron and ductile iron pressure pipe and fittings.

b) ANSI/AWWA C153/A21.53 Ductile iron compact fittings for 3" through 48".

c. Other Requirements

1) The gland shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1.

2) No metric sized nuts or bolts shall be permitted.

3) Twist off nuts shall be used to insure proper actuating of restraining devices.

**SCDHEC Approved August 2016**

## SECTION 5.2

## WATER DISTRIBUTION SYSTEM

## CONSTRUCTION PROCEDURES

A. GENERAL

1. This section covers construction procedures normally required for work within the Richland County Utilities service area. It does not cover any special construction procedures which may be encountered for abnormal conditions.

2. Special construction procedures are to be presented to Richland County Utilities (hereinafter called "RCU") by the Developer's Engineer.

B. NOTICE OF CONSTRUCTION ACTIVITY

Construction activities must be coordinated in advance. No less than three (3) working days prior to the beginning of construction, the Notice of Construction Activity form, as included in Section 6 of these Standards, is to be received by Richland County Utilities' Construction Department.

C. OPERATION OF RICHLAND COUNTY UTILITIES VALVES AND HYDRANTS

1. No RCU valve or hydrant shall be operated without prior approval of RCU.

2. All hydrant and blow-off operations shall be done in a manner so that private property is not impacted and there shall be no flooding of streets or roadways or any other traffic problems created.

D. HANDLING OF MATERIALS

1. Store rubber gaskets and polyethylene film under cover and out of direct sunlight. Do not store nuts, bolts, glands, and other accessories directly on the ground. Keep inside of pipe and fittings free of dirt and debris.

2. Keep valves off the ground and keep interior free of dirt and debris. Do not expose valve interior to direct sunlight.

3. Handle pipe so as to ensure delivery to the trench in sound, undamaged condition.

4. Carry pipe into position.

5. Use pinch bars, slings or tongs for aligning or turning pipe.

6. Use care not to damage pipe linings.

## E. TRENCH EXCAVATION

This section of the Minimum Standards is provided to outline most types of laying conditions, but is not intended to cover all special laying conditions or the Engineer's special requirements.

1. Trench excavation shall be made in open cut and true to the lines and grades shown on the plans, unless boring is necessary or required. Banks of the trenches shall be cut in vertical, parallel planes equidistant from the pipe centerline. The horizontal distance between such planes, or the overall width of trench, shall vary with the size of the pipe to be installed. See Details.

2. Bell holes for bell-and-spigot pipe shall be excavated at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper installation of joints in the pipe.

3. When muck, quicksand, soft clay, swampy or other material unsuitable for foundations or sub-grade is encountered such material shall be removed and replaced with crushed stone.

4. After excavation, the area between the final pipe grade and the trench soil bottom shall be filled with crushed stone materials as required, compacted to proper grade, and made ready for pipe laying.

5. Debris encountered in trench excavation for water mains and other pipelines shall be removed for the overall width of trench which shall be as shown on the plans. It shall be removed to a depth of 6" below the bottom of the pipe for pipes smaller than 24" in size; 8" below the bottom of the pipe for pipes 24" to 36" in size; and 12" below the bottom of the pipe for pipes larger than 36" in size, if debris extends to such depth.

6. In all cases, materials deposited shall be placed so that in the event of rain, no damage will result to the work.

7. The sides of all excavations shall be sufficiently sheeted, shored and braced whenever necessary to prevent slides, cave-ins, settlements or movement of the banks and to maintain the excavation clear of obstructions. Maintain the walls of the excavation properly in place and protect all persons and property from injury or damage. Sheeting, shoring or bracing materials shall not be left in place unless as shown by the plans or permitted by RCU. All sheeting and bracing shall be left in place until the trench has been backfilled 1' above the top of the pipe.

F. TRENCH BACKFILL

1. The backfilling of pipeline trenches shall be started immediately after the pipe work has been inspected. The initial backfill material, placed to a height of 1' above the top of the pipe, shall consist of approved backfill material free from organic matter and deleterious substances, containing no rocks or lumps over 2" in any dimension. It shall be carefully placed and compacted through compaction of entire area backfilled. Backfill shall be deposited in 6" layers (before compaction) and thoroughly compacted with power tools to 95% of theoretical maximum density, modified Proctor ASTM-D-1557.

2. Where pipe trenches are cut across or along pavement, the trenches shall be backfilled in accordance with applicable permits.

3. Backfilling around structures shall be done in the manner specified above for pipe trenches by power tamping for the full depth of cut from the bottom of the finished grade.

4. All backfilling shall be done in such a manner as will not disturb or injure the pipe or structure over or against which it is being placed. Any pipe or structure injured, damaged or moved from its proper line or grade during backfilling operations shall be uncovered, repaired, and then re-backfilled as herein specified.

5. All excavations suspected of not meeting compaction requirements shall be tested for conformance by a RCU approved testing lab. Tests shall be performed at the locations and depths directed by RCU.

G. PIPE, VALVE, AND APPURTENANCE INSTALLATION

1. General:

   a. Inspect pipe for damage. Remove damaged and unacceptable pipe. Keep interior and joint surfaces clean and free of foreign materials. Install a mechanical joint or push-on type ductile iron plug whenever work stops for a period of a day or greater.

   b. Replace pipe where any part of coating or lining is damaged.

   c. Lower pipe and accessories into trench by means of derrick, ropes, belt slings, or other equipment approved by the manufacturer.

   d. Do not dump or drop any of the materials into the trench.

e. Except where necessary in making connections to other lines, lay pipe with the bells facing in the direction of laying.

f. Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated to accommodate bells, couplings, and joints.

g. Bell pipe using manufacture's approved leverage bar. Do not use machinery to bell pipe. Home line is to be clearly visible when pipe is joined.

h. Do not lay pipe in water or when trench conditions are unsuitable for the work. Keep water out of the trench until jointing is completed.

i. Re-lay pipe that has the grade or joint disturbed after laying.

j. Install hydrants and valves in accordance with manufacturer's recommendations. See Details.

k. Valves shall be carefully handled, cleaned and checked for operation prior to backfilling. Care shall be taken to ensure that no dirt, rock, or other obstacles that would interfere with the operation are left in the valve. Valves shall be installed in a position such that the plane of operation or rotation for the operating nut is parallel to the ground surface.

2. Alignment and Grade:

a. Fittings, valves and other appurtenances shall be located where shown on the approved plans, with the pipe being cut if necessary to assure accurate placement. Install the pipe, valves, and appurtenances to the alignment and profile shown on the approved drawings.

b. Pipe lines intended to be straight shall be so laid.

c. Where vertical or horizontal alignment requires deflection from straight lines or grade, do not exceed 75% of maximum deflection recommended by the pipe manufacturer or AWWA Standard 600.

d. If alignment requires deflection exceeding recommended limits, furnish bends to provide angular deflections within the allowable limits.

3. Jointing Pipe, Valves and Appurtenances:

a. Mechanical, Push-On, and Restrained Joint: Join pipe with mechanical or push-on type joints in accordance with the manufacturer's recommendations. Provide all special tools and devices, such as special jacks, chokers, and similar items required for proper installation. Lubricants for the pipe gaskets shall be used and shall be manufacturer's standard. All mechanical joints used on hydrants, hydrant leads, taps and valves shall have restraining glands.

b. Flanged: Prior to connecting flanged pipe, the faces of the flanges shall be thoroughly cleaned of all oil, grease, and foreign material. The rubber gaskets shall be checked for proper fit and thoroughly cleaned. Care shall be taken to ensure proper seating of the flange gasket. Bolts shall be tightened so that the pressure on the gasket is uniform. Torque-limiting wrenches shall be used to ensure uniform bearing insofar as possible. If joints leak when the hydrostatic test is applied, the gaskets shall be removed and reset and bolts re-tightened.

4. Installation of Restraining Glands:

a. Adjoining surfaces shall be clean, lubricated and meet the requirements of ANSI/AWWA C111/A21.11.

b. Install using assembly recommendations established in ANSI/AWWA C111/A21.11 as well as installation instructions provided by the manufacturer.

c. If twist-off nuts are provided, tighten screws until nuts breaks loose.

5. Thrust Blocking: Provide thrust blocking only at wet taps, or as directed by RCU. The concrete mix shall have a 28-day compressive strength of not less than 3,000 psi. The bearing surface shall be as shown or as directed by RCU. Place the block so that the pipe and fitting joints will be accessible to repairs, unless otherwise shown. See Details.

6. Cutting Pipe:

a. Cut pipe neatly and without damage to the pipe or lining.

b. Unless otherwise recommended by the pipe manufacturer, cut pipe with milling type cutter, rolling pipe cutter, or abrasive saw cutter. Do not flame cut. Use wheel cutters when practical. Cuts must be even and perpendicular with length of pipe. Dress cut ends of pipe in accordance with manufacturer's directives for the type of joint to be

made. Cut ends and rough edges should be ground smooth and, for push-on type connection, the cut end must be beveled slightly.

7. Polyethylene Encasement: All valves, pipes, hydrants, fittings, and appurtenances are to be wrapped in a linear low-density polyethylene film, 8 mil, color blue, in accordance with ANSI Standard A21.5 (AWWA C105). Close all open ends and damaged areas securely with poly-tape. If damaged polyethylene film cannot be repaired, replace with new film.

H. CONNECTIONS TO EXISTING MAINS

1. Connections to existing water mains shall be done by use of wet taps using tapping sleeves and tapping valves.

2. All water service taps shall be a minimum of one size smaller than the water main being tapped unless the water main being tapped is part of a looped water distribution system. In these cases the water service tap can be the same size as the main being tapped but cannot be larger.

3. RCU reserves the right to stipulate the maximum size tap available off of any water main regardless of the main size and configuration, if it is deemed in RCU's best interest to do so. See Details.

I. SETTING VALVES AND VALVE BOXES

1. Center valve box on the valve, setting plumb. Valve box shall not rest on any part of the valve. See Details.

2. Tamp earth fill around each valve box to a distance of 4' on all sides, or to the undisturbed trench face if less than 4'.

3. Install shaft extensions plumb without any binding.

4. Fully open and close each valve to manufacturer's specifications to assure that all parts are in working condition.

J. VALVE BOX PROTECTION RING

Place valve box protection ring around top of valve box. Top of the ring is to be level with top of valve box and or no more than 1" above finish grade. See Details.

K. INSTALLATION OF BLOW-OFFS

1. Ail working parts shall be serviceable from above grade with no digging.

2. Cap end of main with a mechanical joint cap or plug. Provide 2" tap in cap or plug.

3. Install corporation stop at cap or plug.

4. Provide a swing joint, comprised of two 90 degree bronze ells, to allow for expansion and contraction and to assist in establishing the correct grade. See Details.

L. INSTALLATION OF AIR RELEASE VALVES

1. Install air release valve using Type 316 stainless steel tapping sleeve, or 6" tee with tapped blind flange.

2. Set valve plumb.

3. Provide Type 316 stainless steel isolation ball valve.

4. Provide valve vault.

   a. Air release valves shall be enclosed in a 5' diameter precast manhole with a flat top slab as a minimum.

   b. Maintain minimum 12" clearance between top of air release valve and bottom of top slab.

   c. Base shall be formed using solid concrete blocks set on a 12" deep bed of compacted No. 57 stone.

   d. Provide manhole frame and cover.

M. METALLIC DETECTION TAPE INSTALLATION

1. Provide 2" wide metallic detection tape on all direct buried water mains.

2. Locate 12" below ground surface in pipe trench.

N. CONTRACTOR INSTALLED WATER SERVICES

The Developer's contractor is responsible for the installation of all water services less than 3". The services shall be installed at the time of the water main installation.

1. Description: This section includes material, installation and quality assurance specifications for all 3/4" through 2" metered water services, installed by RCU approved contractors. Contractor will install the tap and

service piping from the main to the property line, to include the meter box. Contractor will supply all approved material, except for the meter.

2. Quality Assurance:

   a. Reference Standards of the American National Standards Institute (ANSI):

      - B1.20.1 General Purpose (Inch) Pipe Threads
      - B16.18 Cast Copper Alloy Solder Joint Pressure Fittings
      - ASTM B32 Standard Specification for Solder Metal
      - ASTM B43 Standard Specification for Seamless Red Brass Pipe, Standard Sizes
      - ASTM B62 Standard Specification for Composition or Ounce Metal Castings
      - ASTM B88 Standard Specification for Seamless Copper Water Tube
      - ASTM B584 Standard Specification for Copper Alloy Sand Castings

   b. Reference Standards of the American Water Works Association (AWWA):

      - C600 Installation of Ductile Iron Water Mains and Appurtenances
      - C105 Polyethylene Encasement for Ductile Iron Pipe Systems
      - C116 Protective Fusion Bonded Epoxy Coatings for the Interior and Exterior Surfaces of Ductile Iron and Grey Iron Fittings for Water Supply
      - C800 Underground Service Line Valves and Fittings

3. Material / Components:

   a. Castings:

1) Materials in contact with potable water shall be made of copper alloy no. C83600, in accordance with the chemical and mechanical requirements of ASTM B62 or ASTM B584. This alloy contains nominally 85% copper and 5% each tin, lead, and zinc.

2) Service saddles shall be made of ductile iron in accordance with the chemical and mechanical requirements of ASTM A536.

3) Straps, nuts and bolts shall be made of Type 304 or Type 316 stainless steel.

b. Exterior Coating: Ductile iron saddles shall have a fusion applied 10 mil epoxy or nylon coating in accordance with AWWA Standard C116/A21.16.

c. Joint Material: All parts such as gaskets, seals, o-rings, and compression components may be of other materials selected for endurance, corrosion resistance, and strength, and must comply with AWWA standards and the latest amendments to the Safe Drinking Water Act (SDWA).

4. General Design: All fittings, valves and materials used shall be acceptable for the purpose intended.

5. Detailed Design:

a. Corporation Valves: Corporation Valves will have NPT thread inlets. The outlet connection will be CTS /OD, conductive compression (grip nut) type outlets. Accepted manufacturers and models are:

1) Mueller - Ori-Corp, Model # H-15023 (1-1/2" and 2")

2) Mueller - 300 Corp, Model # B-25028 (1")

3) Ford - Ball Corp, Model # FB1100-Q-G (1" through 2")

4) A.Y. McDonald Ball Corp, Model # 4704-BT (1" through 2")

b. Service Saddles: Service Saddles shall only be used on 1-1/2" and 2" taps unless otherwise approved by RCU, Service Saddles will have a ductile iron body with an IPT threaded outlet, double bolted or double strapped Type 304 or

316 stainless steel straps. Ductile bodies are to be fusion bonded epoxy or nylon coated. Accepted manufacturers and models are:

1) Ford, model # FC 202

2) Mueller, model # DR2S

3) JCM, model #406

4) Romac, model # 202N

5) Smith-Blair #317

c. Service Line Fittings: Service Line Fittings used for installation shall be designed to connect service lines by means of threads and compression.

d. Copper Water Tube: Copper Water Tube shall be Type K copper tubing, 0.065" minimum wall thickness, suitable for underground water services and supplied in conformance with ASTM B88.

e. Curb Stops: Provide curb stops for 1-1/2" and 2" services. Accepted manufacturers and models are:

1) Mueller, Model # H-15209

2) A.Y. McDonald, Model # 6100-WT

3) Ford, Model # B44

f. Meter Boxes for 3/4" and 1" services: Contractor shall provide meter boxes. Meter boxes for 3/4" and 1" services are manufactured by Ford to meet RCU specifications. The models are as follows:

1) 3/4" Meter Box: 5/8" x 3/4" Ford Long Yokebox # LYLVV 344-233-TP-CPW-G, angle key valve inlet, outlet with grip nut, equipped with removable plug.

2) 1" meter box: Ford Yokebox, #YL111-444-TP, 1" female IPT on inlet and outlet: 10" from meter to grade level, 12-1/2" - 13-1/2" overall depth, 15" base diameter, 12-3/8" top overall diameter, equipped with removable plug.

g. Meter Boxes for 1-1/2" and 2" services:

Contractor shall provide meter boxes. Meter Box by J & M Foundry for 1-1/2" and 2" services is specified as follows:

Model #P.C.1.5-2, Size: 29-5/8" long x 16-1/8" wide x 14" deep; material is ASTM A48, Class 35B, iron base with two-piece iron lid, rated for heavy traffic.

h. Meter Setters: Meter setters for 1-1/2" and 2" flanged meters are constructed of 85-5-5-5 brass and copper tubing, ball valve inlet with padlock wing, check valve outlet, brace pipe eyelet on FIP 90 degree ells on inlet and outlet sides of set-up. The Contractor shall provide meter setters. Accepted manufacturers and models are:

1) Ford Meter Box Co. # VBH 76-15-44-66-G for 1-1/2" and # VBH

2) Mueller Co. #6-2422-2 for 1-1/2" or 2" with 15" riser and 110 compression connection

6. Installation:

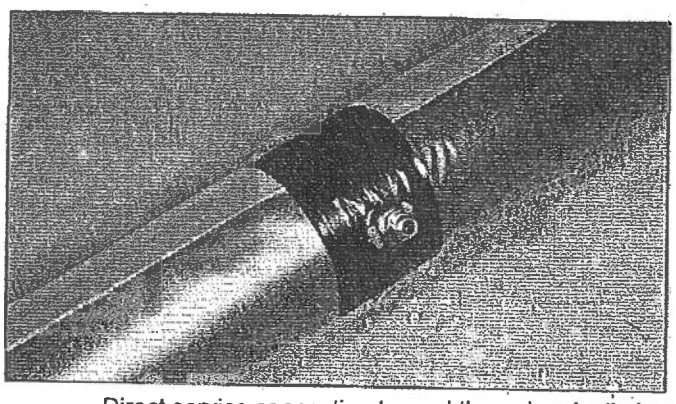
a. 1" direct taps are required for 3/4" and 1" services on ductile iron mains, and will have NPT threads. All taps will be located at the 2 o'clock or 10 o'clock position on the main under system pressure, and must be installed in accordance with AWWA Standard C-600. Polyethylene wrap will be protected and replaced in accordance with ANSI/AWWA C105/A21.5 and ANSI/AWWA C600, Section 8: Service Taps.

b. Saddle taps are required on all PVC mains and when making 1-1/2" and 2" taps on ductile iron mains. Taps will be made with through-the-saddle style tapping machines, using coupon-type tapping bits under system pressure. The tapered iron drill bit shall be used where saddles are required on ductile iron. All saddle taps are to be located at the 2 o'clock or 10 o'clock position on the main.

c. Polyethylene Wrap: When direct tapping on pipe encased in polyethylene wrap, cover the area of the pipe to be tapped with dielectric tape to protect the polyethylene wrap from additional damage. Make an "X" shaped cut at the tap location prior to making the tap. When using a saddle on ductile iron, remove only the portion of wrap that will allow the saddle gasket to come in complete contact with the pipe. Repair all rips or cuts with polyethylene tape, cover the

saddle with wrap on all pipe and the copper service for 3' from the main. See Figure 1 below.

Figure 1.



Direct service connection tapped through polyethylene adhesive tape & polyethylene film

d. Pipe Installation:

1) All service lines will be installed with a minimum of 36" to a maximum of 48" of cover on all street crossings, and a minimum of 24" under all open ditches.

2) PVC sleeves are optional on service lines crossing streets, driveways or parking areas. The Contractor may install a capped 4" Schedule 40 PVC water service carrier pipe to provide the flexibility of installing the water service line at a later date during the construction period. The carrier pipe will be used to install copper water service lines. The carrier pipe shall be installed a minimum of 36" and a maximum of 60" below the surface of the road and made easily accessible. The carrier pipe shall be flagged with direct burial electronically detectable tape.

3) Swing joints, double 90 degree bends at the service tap, are required on all 1" and 2" services to allow for expansion and contraction to the service and to assist in establishing the correct grade for street crossings.

e. Meter Box Installation:

1) The contractor will be responsible for the final finished grade of boxes until all connections are complete, the system has received South Carolina Department of Health and Environmental Control (SCDHEC) approval to operate, and

RCU has accepted the system. Installations will comply with the following requirements:

a) Boxes shall be placed on a 6" bed of gravel with the top of the box placed flush with the finished grade of the property. Concrete blocks 4" x 8" x 16" will be used to support and level the larger PC box for 1-1/4" and 2" services.

b) Meter setters shall utilize 1" PVC pipe through the eyelets to stabilize the setup during backfill procedures.

f. Meter Installation: The following requirements shall be met prior to RCU installing a meter:

1) Pre-Tap Services:

a) Meter box shall be flush and level to final grade (grade once landscaping has been completed).

b) Water shall be on at box (from main).

c) Box shall be tied to house, unit, condo, apartment, etc.

d) Contractor must provide assistance when meters are being installed where it is not readily evident as to what the meter/meter box is serving to verify meter is serving the proper customer.

2) Full Tap Services:

a) Customer must provide correct address/location where service is to be installed.

b) RCU has the right to install the service at a location it deems suitable, if:

- The customer does not place the orange card at a desired location.

- The customer's desired location is not suitable for the service installation.

3. All Services:

a. Service shall not be installed in concrete or asphalt such as driveway, sidewalk, etc. Exceptions may be made in city setting with the approval of RCU.

b. Meter box shall not be installed within 3' of trees, bushes, shrubs, etc. If anything is planted, placed or installed within the 3' radius, the customer may be required to move, trim, prune, etc., so that RCU may gain access to its appurtenance(s).

c. If the customer requests a meter box be installed in a flowerbed, the customer must remove plants for a 3' radius around the area and a 3' path to the public right of way. If plants are not removed, RCU shall not be responsible for damages to the plants.

d. Meter shall be installed within two (2) years from date of work order or monies will be refunded.

e. Disinfection: Pipe and fittings will be kept free of any debris and trash during installation, and will be flushed completely after installation.

f. Pressure Testing: Pressure testing may be required on Contractor-installed service lines. If specified, each service shall be subjected to and successfully meet a pressure test of 150% of its working pressure, but not less than 150 psi. This test should be made following an approved test on the new main installation and should be treated separately. No tests will be permitted using air pressure.

g. Backfilling: All backfilling will be done in accordance with these Standards and all applicable permits.

h. Record Drawings and Valve Cards: Record Drawings and Valve Cards shall be provided in accordance with the requirements of Section 3 of these Standards.

O. JACK AND BORE

1. General:

a. Description: This section covers the work necessary to furnish and install steel casing carrier pipes under surface structures, where indicated, as specified herein, and as needed for a complete and proper installation.

b. Safety: Perform all excavation and backfilling activities in accordance with the Occupational Safety and Health Act of 1970(PL 91 -597), as amended.

2. Materials:

a. Carrier Pipe: Carrier pipe shall be restrained joint ductile iron.

b. Steel Pipe Casing: Steel pipe casing shall be manufactured from steel conforming to ASTM A 139 for Grade B, with minimum yield strength of 35,000 psi before cold forming.

1) Pipe shall be straight seam welded. A protective coat will not be required. Spacers for installation of the carrier pipe shall be installed by the Contractor.

2) Minimum diameter and wall thickness of the steel piping shall be as listed in the following table.

| Restrained Joint DIP Carrier Pipe Size (inches) | Minimum Casing Size (inches) | Minimum Casing Thickness (inches) |
|---|---|---|
| 4 | 14 | 0.250 |
| 6 | 16 | 0.281 |
| 8 | 18 | 0.312 |
| 10 | 20 | 0.375 |
| 12 | 24 | 0.375 |
| 14 | 26 | 0.438 |
| 16 | 30 | 0.469 |
| 18 | 32 | 0.500 |
| 20 | 36 | 0.532 |
| 24 | 42 | 0.625 |
| 30 | 48 | 0.688 |
| 36 | 54 | 0.781 |
| 42 | 56 | 0.812 |
| 48 | 62 | 0.875 |
| 54 | 72 | 1.000 |

3) The thicknesses of the casing shown in 2.b.2 are minimum thicknesses. Actual thicknesses shall be determined by the casing installer based on an evaluation of the required jacking forces.

c. Casing Spacers: Casing spacers shall be flanged, bolt-on style with a two-section stainless steel shell lined with a PVC liner, minimum 0.09" thick, also having a hardness of 85-90 durometer. Runners

shall be attached to stainless steel risers which shall be properly welded to the shell. The height of the runners and risers shall be manufactured such that the pipe does not float in the casing. Casing spacers shall be as manufactured by Cascade Waterworks Manufacturing Company, Contractors Manufacturing, Inc., or approved equal.

3. Execution:

a. Installation of Steel Pipe Casing: Installation of steel pipe casing shall be by the dry bore method at locations as shown on the Contract Drawings and approved by the applicable permits. Installation of steel pipe casing shall be in accordance with applicable regulations, the Contract Drawings, these specifications, and any permits required with respect to the particular boring.

1) Boring Pit and Receiving Pit: The boring pit shall be solid sheeted, braced, and shored as necessary to provide a safe operation. The Contractor shall take all precautions, and comply with all local, state and federal requirements as may be necessary to protect private property, public property and/or existing utilities. Maintain in dry condition by use of pumps, drains or other approved method. The receiving pit shall be constructed in accordance with the Contract Drawings and applicable permits.

2) Line and Grade: The Contractor shall set the boring rig so that after the casing is complete, and the carrier pipe is installed, the invert of the pipe shall conform to grade and alignment as shown on the Contract Drawings. As the casing is installed, Contractor shall check the horizontal and vertical alignment frequently. Contractor shall install the boring at a 90-degree angle to the crossing unless permitting authority approves a different specific angle of crossing. The depth shall be a minimum depth as prescribed by the governing authority unless a deeper depth is dictated by design.

3) Boring: In all cases, boring and jacking of the casing pipe shall be accomplished by the dry jack and bore method without jetting, sluicing, or wet boring. For casing pipes 48-inch in diameter and larger, a closed face shield bore head shall be utilized in front of the casing. For casing pipes less than 48-inch in diameter, the casing may be installed via open face method whereby the hole shall be bored and cased through the soil by a cutting head on a continuous auger mounted inside the casing pipe. The distance between the leading end

of the first auger section and the leading end of the casing shall be as necessary to maintain a solid plug of spoil material inside the forward portion of the casing. At no time during the boring and jacking operation shall the auger head be allowed to extend out in front of the casing being installed. The boring of the hole and jacking of the casing pipe shall be done simultaneously, with continuous installation, until the casing pipe is in final position.

4) Dewatering: Contractor shall fully investigate the location of all jack and bores for the project and determine required dewatering methodologies for each location in order to provide for and conduct a dry jack and bore. Contractor shall submit plans and specifications for dewatering to the Engineer for approval prior to beginning the process (for railways, railway authority must also approve). Pumps of sufficient capacity to handle the flow shall be maintained at the site, provided the Contractor has received approval from the engineer to operate them. Pumps in operation shall be constantly attended on a 24-hour basis until, in the sole judgment of the DOT or railway authority; the operation can be safely halted. When dewatering, a process for monitoring any settlement of tracks, roads, or structures must be in place. Prior to commencing boring, the Contractor shall verify, with acceptance by the Engineer, the absence of groundwater to below the lowest elevation of the casing at each entry/exit pit and as necessary along the casing route.

5) Diameter of Hole: Bored installations shall have a bored hole no more than 1" greater than outside diameter of the casing pipe to be installed. In the event that voids are detected, the voids shall be grouted.

6) Casing Pipe Length: Lengths of casing pipe shall be as long as practical for site conditions. Joints between lengths shall be completely welded in accordance with American Welding Society recommended procedures. Prior to welding joints, the Contractor shall ensure that both ends of the casing sections being welded are square. The length of the casing shall be such that each end of the casing shall extend a minimum of 6' beyond the edge of pavement/back of curb of a paved roadway, or if railway installation, in accordance with requirements of the railway authority.

7) Lubricant: The Contractor shall plan to use a casing lubricant, such as bentonite, in the event excessive frictional forces

jeopardize the successful completion of the casing installation.

8) Jacking: Once the jacking procedure has begun, it shall be continued without stopping until the jacking and boring operation is complete.

9) Installation of the Carrier Pipe:

a) Inspect carefully, ensuring that all foreign material is removed from the casing and the casing meets alignment criteria for the type of carrier pipe being used.

b) For pressure systems, the casing deflection shall not exceed the maximum deflection recommended by the carrier pipe.

c) Install casing spacers on the carrier pipe per the manufacturer's instructions.

d) Provide a minimum of one spacer per ten linear feet of pipe.

e) Install the carrier pipe in the casing ensuring each joint is pushed "home" before the joint is installed into the casing.

f) Provide centered and restrained configuration.

10) End Seals: Grout each end of the casing with concrete brick and Type II concrete in such a manner to prevent the infiltration of foreign materials into the casing pipe, but allowing leakage to pass in the event of a carrier pipe break.

b. Rights-of-Way, Easements, and Permits: Prior to the beginning of the Work, consult with the Engineer to determine that all rights-of-way, easements, permits or other legalities are in order and become familiar with the requirements thereof. Confine the Work as required to comply with such requirements. Any encroachment beyond such limits shall be the Contractor's responsibility.

c. Conflict of Specifications: Where laws or orders of public authority prescribes a higher degree of protection than specified herein, then the higher degree so prescribed shall be deemed a part of this specification and govern the specific installation.

## P. HYDROSTATIC TESTING

1. Conduct hydrostatic testing in accordance with AWWA C600.

   a. Conduct tests on each line or valved section of line.

   b. Clean and flush line of dirt and foreign material.

   c. Test pressures shall be 150 psi based on the elevation of the lowest point of the section under test and corrected to the elevation of the test gauge.

   d. Slowly fill main in order to expel air from the main through the air release valves or other appurtenance.

   e. Tests are to be conducted in the presence of the Developer's Engineer or his representative and witnessed by a RCU representative.

2. Pressure tests:

   a. Pressure leakage test shall be conducted in accordance with AWWA C600. Each section of the pipeline shall be subjected to and successfully meet a pressure test of 150% of its working pressure, but not less than 150 psi. The line shall be slowly filled with water and all air expelled through the air valves or other means.

   b. A suitable test pump, furnished by the Contractor, shall be connected to the line by means of a tap in the line, or other suitable method, and the proper test pressure slowly applied to the line. The test pressure, +/- 5 psi, shall be maintained for at least two (2) hours. Leaks, if found, shall be immediately repaired. The Developer's Engineer or his representative shall be present on site and confirm the test results.

   c. Replace defective pipe, joints, fittings and valves with new material and repeat the test until results are satisfactory.

3. Leakage test:

   a. Conduct leakage test after the pressure test has been satisfactorily completed.

   b. Duration of each leakage test: minimum of two (2) hours.

c. Testing allowance shall be defined as the maximum quantity of makeup water that is added into a pipeline undergoing hydrostatic pressure testing, or any valved section thereof, in order to maintain pressure within +/- 5 psi of the specified test pressure (after the pipeline has been filled with water and the air has been expelled). No pipe installation will be accepted if the quantity of makeup water is greater than that determined by the following formula:

$$L = \frac{SD\sqrt{P}}{148{,}000}$$

Where:

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

S = length of pipe tested, in feet

$D$ = nominal diameter of pipe, in inches

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

1) When testing against closed metal seated valves, an additional leakage per closed valve of 0.0078 gallons per hour per inch of nominal valve size will be allowed.

2) Should test disclose leakage greater than that specified above, repair, or if necessary, remove and replace the defective joint or valve until the leakage is within the specified allowance.

## Q. DISINFECTION

1. Conduct disinfection in accordance with AWWA C651 before being placed in service.

   a. Upon completion of testing, disinfect all water mains in accordance with SCDHEC requirements.

   b. Newly laid valves or other appurtenances shall be operated several times while line is filled with chlorinating agent.

   c. Should initial treatment fail to meet results specified, repeat procedures until satisfactory results are obtained.

2. Procedure:

a. Flush line to extent possible with available pressure and outlets, prior to disinfection.

b. Apply chlorine as liquid chlorine and chlorine compound such as calcium hypochlorite with known chlorine content. Water from the existing distribution system or other source of supply should be controlled so as to flow slowly into the newly laid pipeline during the application of chlorine.

c. Apply through corporation cock in top of main, at beginning of section being sterilized.

d. Use proper feeder and flow regulator to introduce chlorinating agent.

e. Application rate shall not be less than 50 ppm.

f. Retain chlorinated water in main not less than 24 hours.

g. At end of retention period, at least 10 ppm of chlorine shall remain in the water at the extreme end of section.

h. Flush the system with potable water and the sampling program begins.

3. Acceptance:

a. Provide two (2) separate samples for each sample location, taken at 24 hour intervals, free of coliform bacteria. The Developer's Engineer or contractor shall pull samples in accordance with SCDHEC specifications. Provide a copy of sample results to RCU.

b. Prior to sampling, the chlorine residual must be reduced to normal system residual levels or be non-detectable in those systems not chlorinating. The chlorine residual must also be measured and reported.

c. Sample locations shall be as required by SCDHEC and, at a minimum, at the following locations:

1) The tie-in location of new and existing water mains.

2) The end of all dead-end mains.

3) At intervals of no more than 1,200'.

4) All sample locations are to be given an identifying label

d. All samples must be analyzed by a State certified laboratory.

R. DECHLORINATION OF CHLORINATED DISINFECTION WATER

Dechlorinate the chlorinated water used for disinfecting water mains to meet the requirements of SCDHEC.

**SCDHEC Approved August 2016**

## SECTION 6

## GRAVITY SEWER
## MATERIALS AND CONSTRUCTION SPECIFICATIONS

### PART 6.1 - GENERAL

#### 6.1.1 DESCRIPTION

A. These specifications cover materials and procedures for the complete installation of gravity sewers and appurtenances incident to the construction of extensions to be connected to Richland County Utilities (hereinafter called "RCU") sewerage system.

B. Unless otherwise noted or approved by RCU all materials shall be manufactured in the United States.

C. Construction detail drawings in SECTION 15, Standard Details, are integral to these specifications.

D. No project will be constructed that does not comply with SECTION 5, Sewer System Design Standards.

E. NOTICE OF CONSTRUCTION ACTIVITY - Immediately prior to the beginning of construction, notify RCU.

#### 6.1.2 HANDLING OF MATERIALS

A. Handle pipe so that the coating and lining will not be damaged. If any part of the coating or lining is damaged, repair it in accordance with the manufacturer's recommendation and to the satisfaction of RCU or their representative.

B. Install pipe and appurtenances at the locations shown on the plans and to the position, alignment and grade shown thereon, or in the event of grade conflicts, as directed by RCU or their representative. The Contractor shall erect, mark and maintain suitable barricades to protect the work and maintain public safety.

C. All pipe shall be subject to inspection at the pipe plant, trench, or other point of delivery, for the purpose of culling and rejecting pipe, independent of laboratory tests, which does not conform to the requirements of these specifications. Such pipe shall be marked by RCU or their representative and the Contractor shall remove it from the project site upon notice being received of its rejection.

D. Storage and handling shall be in accordance with manufacturer's recommendation.

E. Storage of PVC pipe:
   1. Store in unit packages as received from manufacturer until just prior to use.
   2. Stack units to prevent deformation to pipe barrel and bells.
   3. Protect from direct sunlight by covering with opaque material.

F. Avoid severe impact blows, gouging or cutting by metal surfaces or rocks.

G. Handle pipe so as to ensure delivery to the trench in sound, undamaged condition.
   1. Carry pipe into position - do not drag.
   2. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.
   3. Use care not to injure pipe linings.

H. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during layout operations by plugging or other approved method.

I. Before installation, inspect each piece of pipe and each fitting for defects and replace material found to be defective before or after laying with sound material meeting the specified requirements.

J. Rubber gaskets: Store in a cool dark place until just prior to time of installation.

## 6.1.3 PROTECTION OF OTHER UTILITIES

A. The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown, may be determined. He shall be held responsible for the repair of such structures when broken or otherwise damaged.

B. Protection of Property and Surface Structures - Trees, shrubbery, fences, poles and all other property and surface structures shall be protected during construction operations unless their removal is authorized by RCU. Any fences, poles or other manmade surface improvements which are moved or disturbed by the Contractor shall be restored to their original condition, after construction is completed, at the Contractor's expense. Any trees, shrubbery or other vegetation which are approved or ordered for removal by RCU shall be removed completely, including stumps and roots, by the Contractor. Responsibility for any damage or claims for damage caused by construction operations to shrubbery or other landscape improvements which were not authorized for removal by RCU shall be assumed by the Contractor.

## 6.1.4 JOB CONDITIONS

A. Construction in Easements - In easements across private property, the Contractor shall confine all operations to the easement area and shall be responsible and liable for all damage outside of the easement area. Trees, fences, shrubbery or other type of surface improvements located in easements shall be protected during construction. The provisions above shall apply to all easement areas as well as to public rights-of-way. Precautions shall be taken by adequate sheeting or other approved method to prevent any cave-in or disturbance beyond the easement limits or damage to improvements within the easement. In general, the easement area is intended to provide reasonable access and working area for efficient operations to be performed within the restrictions shown on the plans. The

Contractor shall be responsible for organizing his operations to perform within the restrictions shown on the plans. When requested, the owner shall make available to the bidders and furnish to the Contractor a copy of the construction easements.

B. Water used for construction and testing will be furnished by the Contractor through approved connections to the available water lines. Approved backflow prevention devices at each connection will be furnished by the contractor to reduce possibility of contamination.

C. Barricades, Guards and Safety Provisions - To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, lanterns and guards as required shall be placed and maintained by the Contractor at his expense during the progress of the construction. All material piles, equipment and pipe which may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor. The rules and regulations of O.S.H.A and appropriate authorities respecting safety provisions shall be observed.

D. Contractor to provide a video of the entire gravity sewer line route in DVD format to RCU prior to beginning any related construction activities.

E. Schedule delivery of materials to provide the least interference and inconvenience to the public.

## PART 6.2 – PRODUCTS

### 6.2.1 PIPE AND FITTINGS

A. Pipe Size and Type Selections:

1. For sizes 15" and smaller use PVC.
2. For sizes 16" and larger use DIP.
3. For depths of less than 3' use DIP.
2. For depths of 3' to 16' use PVC SDR-35 or DIP.
3. For depths of 16' and greater use DIP.

B. Ductile-iron pipe and fittings (DIP):

1. Not less than the thickness Class 50.
2. Fittings - Pressure Class 150, ANSI A21.50 (AWWA C150) and ANSI A21.51 (AWWA C151).
3. Push-on-joints or mechanical joints.
4. Pipe joints including gaskets to comply with ANSI A21.11 (AWWA C111).
5. Fittings to comply with ANSI A21.10 (AWWA C110).
6. Use fittings with pressure rating of 150 psi: ANSI/AWWA C110/A21.10.
7. Lining:
   a. Standard outside coating of coal tar or asphalt base material.

b. Amine cured Novalac Epoxy polymeric lining, 40 mils nominal thickness, Protecto 401 by Vulcan Painters, Birmingham, Alabama.

8. Use sleeves when transition is required from PVC sewer main to DIP. Fernco or similar couplings are not allowed.

C. Polyvinyl chloride pipe and fittings (PVC):

1. Conform to the requirements of ASTM specifications D3034.
2. Wall thickness shall be SDR35. Do not use saddle type fittings.

D. Detectable Safety Type:

1. Include on all gravity line installations.
2. Electronically or magnetically detectable.
3. Directly bury over the pipe 12" below the ground surface continuously.
4. At least 2" wide, green on top, and boldly labeled every 18" to 32" as follows "CAUTION SEWER LINE BURIED BELOW".
5. Tensile strength of not less than 4000 psi, a dart impact strength of not less than 120 grams per 1.5 mils, be not less than 0.0055" thick, and include sufficient metal to allow easy detection at the above stated depths.
6. Designed to last as long as the pipe it is installed over, even in adverse soils.

E. General information:

1. All materials used in the construction of sewers shall be new and unused when delivered on-site and shall be suitable for installation and operation under the conditions for which they are to be used.

2. Casing pipes shall be installed at:
   a. Railroad crossings, as directed by the railroad;
   b. Interstate and four land road crossings;
   c. highway crossings, as directed by SCDOT, or;
   d. as designated by RCU.
3. No sewer line of any type shall be allowed to pass through any storm drainage structure.

## 6.2.2 MANHOLES

A. General:

1. All manholes over 12' deep shall be reviewed during design with RCU.
2. Where the difference in the invert elevation between an intersecting sewer and a manhole is 2' or more:
   a. Provide a drop manhole.
   b. Provide a drop connection of pipe and fittings of the proper size and material outside the manhole.
3. Where the work requires special stream or railroad crossings or other extraordinary conditions, or where alternate types of construction that are not covered by these specifications, submit the materials and construction methods for approval to RCU.

B. Standard Manholes:

1. Use precast manholes.
2. Comply with ASTM C478.
2. Portland cement: ASTM C150, Type II, 4,000 psi and absorption shall not exceed 6%.
3. Minimum wall thickness:
   a. 4' Diameter 5"
   b. 5' Diameter 5"
   c. 6' Diameter 6"
   d. Cone sections - 8" at their top.
4. Monolithic base slab with walls. Bottoms cast with invert and bench are acceptable. Cast-in-Place Bases - Unless otherwise specified, cast-in-place bases shall be at least six (6) inches in thickness and shall extend at least six (6) inches radially outside of the outside dimension of the manhole section.
5. Minimum thickness of bottom:
   a. 4' diameter 6"
   b. 5' and 6' diameter 8"
6. Flat slab top sections: HS-20 traffic loadings.
7. Cast openings for inlet and outlet sewer pipe:
   a. Circular, accurately made, and located as required for each manhole.
8. Set base riser sections on compacted #57 stone, 12" in thickness.

9. Provide flexible pipe boot conforming to ASTM C923m with dual stainless steel straps.
10. Joints - O-ring seals or butyl rubber type sealer.
    a. O-rings:
        1) Conform to ASTM C443.
        2) Set in a rectangular groove cast into the tongue section of each manhole.
        3) Installed as recommended by the manhole manufacturer.
    b. Butyl rubber sealer:
        1) "Ram-Nek" joint sealer or equal.
        2) Set on only clean and dry surfaces.
        3) Place as recommended by the manufacturer.
    c. After manhole sections are joined, cover the inside of the joint with a smooth tapered coat of premixed non-shrink grout to a thickness of ½" at the joint.
11. When dissimilar pipe size occurs, the elevation of the crown of the pipes must be the same.
12. Manhole inverts:
    a. Constructed of cement grout.
    b. The same cross section as the invert of the sewers which they connect.
    c. Carefully form to the required size and grade by gradual and even changes in sections.
    d. Make changes in direction to flow through the sewer to a true curve with as large a radius as the size of the manhole will permit.
    e. Use concrete brick only to form the invert channel walls.
    f. Fill all other annular space with non-shrink concrete grout.
    g. Do not use fillers, such as broken block, gravel, sand, or excavated material, in the construction of fillets (benches).
    h. "U" design with top of "U" even with b the diameter of pipe.
    i. Do not extend invert piping inside manhole any further than 2".
    j. The slope of the invert benches shall provide a minimum of 2" higher than the crown of the pipe.
13. Manhole sections - free from large honeycomb, cracks, spalds, large chips, exposed reinforcing, and broken bells or spigots.
    a. Allowable deviation in form joints of ¼".
    b. Edges of bells and spigots - even and straight.
14. Size lift holes and inserts for a precision fit with the lift devices.
    a. Do not penetrate through the manhole wall.
    b. Comply with OSHA Standard 1926.704.
15. Provide flat slab tops where manhole depth is less than 4'-0".
16.

| ***Standard Manholes Schedule of Governing Dimensions*** | |
|---|---|
| **Pipe Size** | **Manhole Diameter** |
| | |

| *Standard Manholes Schedule of Governing Dimensions* | |
|---|---|
| **Pipe Size** | **Manhole Diameter** |
| 8" to 15" | 4' - 0" |
| 16" to 30" | 5' - 0" |
| 36" to 42" | 6' - 0" |

C. Exterior joint collar:

1. Install an exterior joint collar on all manhole joints.
2. Provide a 12" wide band.
3. Acceptable product: Seal Wrap Exterior Joint Sealer by Mar-Mac Manufacturing Company.

D. Manhole frames and covers:

1. All manhole ring and covers shall have bearing surfaces ground so that the covers will fit solidly in all positions and insure a tight fit. This specification is applicable for all ductile iron and cast iron castings. Ductile iron castings shall be manufactured from iron conforming to ASTM A536 grade 80-55-06 as noted in section 3.2 of AASHTO M306-04. Cast iron castings shall be manufactured from iron conforming to ASTM A48 Class 35B as noted in section 3.1 of AASHTO M306-04. All manhole ring and covers shall be marked "Richland County Utilities" and "Sanitary Sewer". Use only heavy-duty manhole ring and covers for both traveled and non-traveled areas.

2. Standard Frame and Cover castings shall be as follows:

   a. East Jordan Iron Works, Inc. (EJIW) model #1045 frame and 1040A cover
   b. Neenah Foundry R-1642 ring and cover
   c. US Foundry model #755-NC

E. Watertight Manhole Frame and Covers

1. Use watertight frame and covers when manhole is located below the 100 year flood plain elevation and as indicated on the plans and where required by RCU.
2. Provide one of the following watertight manhole frame and cover castings:
   a. East Jordan Iron Works, Inc. (EJIW) model #1033 HingeCo
   b. Neenah Foundry model "Lift Mate"
   c. US Foundry model #750-KI

3. Provide stainless steel bolts to hold the cover to the frame.
4. Grouting the frames to the manhole chimney is not an approved method of installation.

F. Manhole Coatings and Liners:

1. Standard epoxy coating – Coat manhole with coal tar epoxy, Tnemec "Tneme-Tar" or equal as follows:
   a. Interior 21 dry mils.
   b. Exterior 7 dry mils.
   c. Do not coat joints.
2. Epoxy Liner - Provide epoxy liner on manhole (new or existing) where a force main enters and in the next manhole downstream and in other locations as indicated on the plans. RCU reserves the right to require coatings in additional down stream manholes.
   a. Acceptable product:
      1) 125 mills Raven 405 Epoxy.
   b. Surface preparation:
      1) Follow all manufacture's recommendations for surface preparation for new or existing manholes.
   c. Provide testing in accordance with requirements in this Section.
   d. Installation to be by certified installer.

G. Drop Manholes

1. Where the free drop in manholes exceeds two feet, measured from the invert of the inlet sewer to the invert of the outlet sewer, the Contractor shall construct drop manholes in accordance with detailed plans. Materials and workmanship shall be in accordance with the General Specifications.

H. Service Laterals:

1. Install service laterals where required to provide a connection from the sanitary sewer to all lots.
2. For multi-family where space may be limited RCU may allow the use of a cast iron box by Neena (R-19 76).
3. Each service to consist of 6" diameter DIP or PVC and conform to the requirements of these guidelines. Install a service wye at the end of each service lateral and plug in a manner to allow for air testing.
4. Depth - 36" below finished grade, and a maximum of 60". Do not exceed 75' in length, laterals that are less than 20' in length on single family dwellings may be 4" in diameter with approval by RCU.
5. In landscaped areas, cleanout cap shall be SMARTPlug as manufactured by GPK Products, Inc. It shall terminate between 3" and 6" below finish grade.
6. In paved areas, a PVC clean-out plug shall be installed 3" below finish grade and covered by Neenah R-1976 frame and lid.

7. In no case is the clean out to be placed within 15' of the building it is serving. See Details.
8. Install elder valves on all sewer services:
   a. Cleanout pipe for the elder valve shall rise at least three (3') feet above grade and be capped.
   b. Do not place the elder valve within 15' of the building it is serving.
   c. For a single residence, do not place the elder valve in a driveway or sidewalk.
   d. When any wastewater collection system is installed in a location where RCU will not own and operate the water distribution system, install 4" Elder Valves upstream of the 6"x4" double wye at the property line. See standard details.
9. Mark the location of all services that are in an area where new curb and gutter with an "S", minimum 3" in height, stamped into the curb and gutter. Place a two-inch green PVC pipe extending 4' above grade in the ground at termination of each service lateral.
10. Connect service laterals at manholes whenever possible and installed so the crown of main sewer line and service lateral are the same elevation.
11. Connect to street sewers using wye branches and ells.
12. Do not stack service lines vertically over the sewer main.
13. Comply with details in the Details Section.
14. Locate service lateral within one (1) foot from property corner on opposite corner of water lateral.
15. Minimum cover required by SCDOT and RCU of service lateral is 24". SCDOT and the Department may require concrete encasement under drainage ditch on an individual review.
16. Construct a riser to grade where the depth of the sewer invert is greater than 12' feet, a service riser shall be constructed to finished grade and terminated with a manufactured plug. Use care in backfilling around risers. Where the excavated material is not suitable for this purpose according to RCU, place granular material around the riser

## 6.2.3 PIPE AND MANHOLE FOUNDATION AND BACKFILL MATERIALS

A. Pipe and Manhole Bedding Materials:

1. No. 57 crushed stone - granite, or well graded approved slag rock.

B. Backfill Materials:

1. Reuse of existing excavated materials will be allowed provided the materials are compactable, dried or dampened to their optimum moisture content, are free from roots, large clods of clay, and are granular and non-cohesive in nature.
2. Select fill shall be sand-clay, fine sand or sand gravel mixes with a maximum of 25% passing a wash #200 sieve.

## 6.2.4 CASING, SPACERS, AND END SEALS FOR UTILITIES

A. General:

1. Provide bore and jack with casing for pipes larger than 2".
2. Casing pipe to be 2" larger in diameter than the bell of the carrier pipe based on the following:
   a. Casing pipe to be a minimum of 2" larger than the largest outside diameter of the carrier pipe (joints and couplings) if the carrier pipe is less than 6" in diameter. If the diameter of the carrier pipe is 6" or larger, the diameter of the casing pipe shall be a minimum of 4" larger than the largest outside diameter of the carrier pipe (joints and couplings).
   b. The end of casing pipe to extend a minimum of six (6) feet from the edge of pavement/back of curb.
   c. The top of the casing pipe shall be a minimum of four (4) feet below the crown of the finished asphalt roadway.
   d. The top of the casing pipe shall be a minimum of two (2) feet below the design invert of roadside drainage ditches and pipes.

B. Casing pipe for dry bores

1. Steel complying with ASTM A139 for Grade B with minimum yield strength of 35,000 psi.
2. Provide ends suitable for field welding.
3. Minimum wall thickness as follows:

| Diameter of Casing (Inches) | Minimum Wall Thickness (Inches) |
|---|---|
| 6 thru 14 | 1/4 |
| 16 and 18 | 5/16 |
| 20 and 22 | 3/8 |
| 24 and 26 | 7/16 |
| 28 thru 32 | ½ |
| 34 thru 42 | 9/16 |
| 44 thru 48 | 5/8 |
| 50 thru 54 | 3/4 |

C. Pipeline casing spacers:

1. Provide pipeline casing spacers for piping installed in casing.
2. Provide a minimum of one spacer per ten linear feet of pipe for ductile iron pipe and a minimum of one spacer per six linear feet for PVC pipe.
3. Provide spacer with shell of 14 gauge Type 316 stainless steel.
4. Provide shell liner of .090" thick PVC, 85-90 durometer.

5. Provide 5/16" stainless steel connecting bolts and lock nuts, minimum three (3) per flange.
6. Runners from 2" wide ultra high molecular weight polymer with a high resistance to abrasion and a coefficient of friction of 0.11-0.13 in accordance with ASTM D-1894.
7. Support runners on 14 gauge reinforced Type 316 stainless steel risers welded to shell.
8. All metal surfaces to be fully passivated.
9. The diameter as measured over the runners shall exceed the pipeline bell or coupling outside diameter.
10. Acceptable product: Cascade Manufacturing or approved equal.

D. End seals:

1. Seal each end with brick and mortar to prevent the entrance of foreign material.

## PART 6.3 - EXECUTION

### 6.3.1 GRAVITY SEWER CONSTRUCTION METHODS

A. Excavation in Advance of Construction - The amount of trench excavated approximately to grade shall not exceed one hundred fifty (150) feet, and no trench excavation whatever shall be made farther than three hundred (300) feet in advance of sewer construction, unless specifically authorized by RCU.

B. Use of Explosives - Should the Contractor elect to use explosives to loosen rock or for any other purposes in the prosecution of the work, he shall obtain the required permits and the written permission of RCU. The City Fire Chief and Police Chief shall be notified. If construction is outside RCU Limits, the Contractor shall be responsible for determining whether a County permit is required and for obtaining any permit so required. The Contractor shall be responsible for and shall make good any damage caused by blasting or accidental explosions. Methods, procedures, and all necessary precautions shall be taken by the Contractor as required by Federal and State laws, County regulations, if applicable, City regulations, the Standard Fire Prevention Code, O.S.H.A. Rules and Regulations, or any other local authority. The hours of blasting will be set by RCU.

C. Stoppers or Bulkheads - Dead ends of all sewers, wyes, etc. shall be closed with approved stoppers securely cemented in place. When shown on the plans or required by RCU, such openings shall be tightly walled up with brick masonry or concrete. Tight fitting stoppers or bulkheads shall be securely placed in or across the end of all sanitary sewer lines when construction is stopped at the end of each day's work or for any other cause. When work is stopped temporarily on

sanitary sewers, the end of the pipe shall be closed to prevent trash or debris from entering the pipe. Such stoppers need not be water tight.

D. Subsurface Exploration - All information available to RCU, if any, on subsurface conditions will be made available for examination by prospective bidders. However, it is understood and agreed that RCU shall in no way be held responsible for interpretation of this information, its accuracy or its thoroughness. Prospective bidders shall make such subsurface explorations as they believe necessary to verify and supplement information received from RCU.

1. Exploratory Excavation - Whenever, in the opinion of RCU, it is necessary to explore and excavate to determine the best line and grade for construction of the proposed pipe line, the Contractor shall make explorations and excavations for such purposes.

2. Braced and Sheeted Trenches - Open-cut trenches shall be sheeted and braced or otherwise protected as required by any governing Federal or State laws and municipal ordinances, and as may by necessary to protect life, property, or the work. In any event, the minimum protection shall conform to the recommendations in O.S.H.A. Safety and Health Standards for Construction. A sand box or trench shield may be used in lieu of sheeting when permitted by O.S.H.A. and approved by RCU. When close-sheeting is used, it shall be so driven as to prevent adjacent soil from entering the trench either below or through such sheeting.

   a. Where sheeting and bracing are used, the trench width shall be increased as directed by RCU. RCU may order the sheeting driven to the full depth of the trench or to such additional depth as may be required for the protection of the work. Where soil in the lower limits of the trench has the stability to meet the O.S.H.A. standards, RCU at his discretion may permit the Contractor to stop the driving of sheeting at such designated elevation above the trench bottom. The granting of permission by RCU, however, shall not relieve the Contractor in any degree from his full responsibility under the contract. Sheeting and bracing which have been ordered left in place shall be cut off at the elevation ordered by RCU. Trench bracing, except that ordered left in place, may be removed when the backfilling has reached the respective levels of such bracing. Sheeting, except that ordered left in place, may be removed after the backfilling has been completed or has been brought to an elevation that permits its safe removal.

E. Removal of Water - At all times during construction provide and maintain ample means and devices with which to promptly remove and properly dispose of all water entering the excavations or other parts of the work until all work to be performed therein has been completed. No sanitary sewer shall be used for disposal of trench water, unless specifically approved by RCU and then only if the

trench water does not ultimately arrive at existing pumping or sewage treatment facilities.

F. Structure Protection - Temporary support, adequate protection and maintenance of all underground and surface structures, drains, sewers and other obstructions encountered in the progress of the work shall be furnished by the Contractor at his expense and under the direction of RCU. The structures which may have been disturbed shall be restored upon completion of the work.

1. Take all reasonable precautions against damage to existing utilities. However, in the event of a break in an existing water main, gas main, sewer or underground cable, he shall immediately notify the responsible official of the organization operating the utility interrupted. The Contractor shall lend all possible assistance in restoring services and shall assume all cost, charges or claims connected with the interruption and repair of such services if the location of said utility was marked by the owner thereof prior to excavation.

G. Removal of Pavement, Sidewalk, Driveway and Curb - Wherever the pipe is located along or across an improved surface, the width of the trench shall be held as nearly as possible to the width specified. Where brick or concrete pavement, sidewalk, driveway or curbing is cut, the width of the cut will exceed the actual width of the top of the trench, in accordance with Standard Detail. Exposed surfaces of portland cement or asphaltic concrete shall be cut with a pavement saw before breaking. Care shall be taken in cutting to insure that a straight joint is sawed.

H. Replacement of Permanent Type Pavement, Sidewalks, Driveways, Curbs, Gutters and Structures - The Contractor shall restore (unless otherwise specified or ordered by RCU) all permanent type pavements, sidewalks, driveways, curbs, gutters, shrubbery, fences, poles, and other property and surface structures removed or disturbed during or as a result of construction operations to a condition which is equal in appearance and quality to the condition that existed before the work began. The surface of all improvements shall be constructed of the same material and match in appearance the surface of the improvement which was removed.

1. Materials shall conform to SCDOT Standard Specifications for Highway Construction, latest edition.
2. Refer to Standard Details.

6.3.2 PIPE CUTTING

A. Cut pipe neatly and without damage to the pipe. Level pipe to ensure final homing of pipe without damage to gasket.

B. Unless otherwise recommended by the pipe manufacturer, cut pipe with mechanical cutter only.

1. Use wheel cutters when practical.
2. Cut plastic pipe square and remove all burrs.

6.3.3 LOCATING

A. Rough grading shall be done prior to installation of wastewater mains.

B. Sewer lines in relation to water lines must conform to "Ten State Standards".

B. Where possible, locate sewer pipe at least ten (10) feet away, horizontally, from water lines. Measure distances from edge to edge.

C. Should ten (10) foot separation not be practical, then the sewer pipe may be located closer provided:

1. It is laid in a separate trench.
2. It is laid in the same trench with the water main located at one side on a bench of undisturbed earth.
3. In either of the above cases, crown elevation of the sewer shall be at least 18" below invert elevation of water line.
4. The distances between the sewer line and the potable water main and the joints of each should be maximized.
5. There should be enough distance to make repairs to one of the lines without damaging the other.

D. Where water lines cross over, maintain 18" minimum clearance between crown of sewer and invert of water lines.

E. Where sewer lines cross over water mains, the sewer main shall transition to ductile iron pipe. A full length of ductile iron pipe shall be installed in the sewer main centered so that each joint is equidistant from the water main. Joint of ductile iron pipe water main shall also be installed so that each joint is equidistant from the ductile iron pipe section of the sewer main.

F. When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the sewer shall be designed and constructed equal to water pressure pipe, and shall be pressure tested to assure water tightness prior to backfilling.

G. Interconnections:

1. There shall be no physical connections between a public or private potable water supply system and a sewer, or appurtenances thereto which would permit the passage of any sewage or polluted water into the potable

supply. No water pipe shall pass through or come in contact with any part of a sewer manhole.

2. Storm drains shall not be connected to sanitary sewer.

H. Relation to Water Works Structures:

1. While no general statement can be made to cover all conditions, it is generally recognized that sewers shall meet the requirements of the appropriate reviewing agency with respect to minimum distances from public water supply wells or other water supply sources and structures.

## 6.3.4 INSTALLATION

A. Trench, backfill and compact for the work of this Section in strict accordance with pertinent provisions of these specifications, and the following requirement:

1. Maximum trench widths, depths and bedding methods.
   a. Install all sewers complying with tables for depths of cut and class of bedding included hereinafter.
2. Ductile-iron pipe:

| MAXIMUM DEPTHS IN FEET | | | |
|---|---|---|---|
| | | | Class of Bedding |
| | | | B |
| PIPE SIZE | MAX. TRENCH WIDTH | CLASS OF PIPE | TYPE 1 OR TYPE 2 |
| 8" | 2'2" | 50 | 32 |
| 10" | 2'4" | 50 | 32 |
| 10" | 2'4" | 51 | 35 |
| 12" | 2'6" | 50 | 32 |
| 12" | 2'6" | 51 | 35 |
| 12" | 2'6" | 52 | 35 |
| 14" | 2'9" | 50 | 32 |
| 14" | 2'9" | 51 | 35 |
| 14" | 2'9" | 52 | 35 |
| 16" | 3'0" | 50 | 32 |
| 16" | 3'0" | 51 | 35 |
| 16" | 3'0" | 52 | 35 |
| 18" | 3'2" | 50 | 32 |
| 18" | 3'2" | 51 | 35 |
| 18" | 3'2" | 52 | 35 |
| 20" | 3'6" | 50 | 32 |

| | | | |
|---|---|---|---|
| 20" | 3'6" | 51 | 35 |
| 20" | 3'6" | 52 | 35 |
| 24" | 3'10" | 50 | 30 |
| 24" | 3'10" | 51 | 34 |
| 24" | 3'10" | 52 | 35 |
| 30" | 4'7" | 50 | 26 |
| 30" | 4'7" | 51 | 30 |
| 30" | 4'7" | 52 | 34 |
| 36" | 5'5" | 50 | 27 |
| 36" | 5'5" | 51 | 31 |
| 36" | 5'5" | 52 | 35 |
| 36" | 5'5" | 53 | 35 |
| 42" | 6'1" | 50 | 27.5 |
| 42" | 6'1" | 51 | 27.5 |
| 42" | 6'1" | 52 | 31.5 |

3. Polyvinyl chloride pipe (SDR35):

| MAXIMUM DEPTHS IN FEET | | |
|---|---|---|
| | | **Class of Bedding** |
| | | **B** |
| **PIPE SIZE** | **MAX. TRENCH WIDTH** | **TYPE 2* ONLY** |
| 4" | 2'0" | 30 |
| 8" | 2'2" | 30 |
| 10" | 2'4" | 30 |
| 12" | 2'6" | 30 |
| 15" | 2'10" | 30 |
| 18" | 3'2" | 30 |
| 21" | 3'6" | 30 |
| * Class B Bedding (Type 2) shall extend to the top of the pipe. | | |

4. Bedding and tamping:
   a. Class B (Type 1) Bedding (Ductile iron pipe only):
      1) Shape bottom of trench to a level 2" below bottom of pipe; bring bed to proper level by spreading and thoroughly tamping fine granulated moist earth and sand to conform accurately to one-fourth circumference of pipe barrel; provide suitable material if not available from trench excavation; lay pipe, backfill and hand tamp in thin layers to

height three-fourths of pipe diameter, using material same as bedding material; complete trench backfill as specified in the guidelines.

2) In lieu of Class B (Type I) bedding for ductile iron pipe, Class B (Type 2) bedding may be used.

b. Class B (Type 2) Bedding:

1) Undercut 4" below pipe barrel, full width of trench; bring to grade with compacted crushed stone complying with SCHD Aggregate No. 5, except for PVC sewers, use SCHD Aggregate No. 57, then:

a) For pipe other than PVC, place stone in 6" layers to top of pipe, compacting by slicing with shovel.

b) For PVC pipe, place granite/slag only (Aggregate No. 57) in 6" layers to the top of the pipe, compacting by slicing with shovel.

2) In lieu of Class B (Type 2) bedding, fine granulated material may be used from the excavation provided that the trench is dewatered prior to excavation and a dry trench is maintained until the pipeline is completely backfilled.

3) Trench backfill complying with the requirements contained in the guidelines.

B. Pipe laying:

1. General:

a. Order of Construction – Begin construction of all sewers at the low point in the line in every case working toward the high point. Each section of sewer pipe shall be specified to be laid to the appropriate line and grade, as designed, working in the upstream direction with the bell end laid upgrade.

b. Protect pipe during handling against shocks and free fall. Remove extraneous material from the pipe interior.

b. Gravity sewer pipe installation must comply with ANSI/ASTM D2321-74 as the minimum acceptable standard as well as any additional requirements as stated herein.

c. Before sewer pipe is placed in position in the trench the bottom and sides to the trench shall be carefully prepared as per manufacturer's specifications. Each pipe shall be accurately placed to the exact line and grade called for on the plans. Laser equipment shall be used in setting pipe in lieu of the batter board method.

d. Pipe shall be laid in a full bed of crushed stone (ASTM C33, Gradation 67). Pipe laying shall proceed upgrade, starting at the lower end of the grade and with the bells upgrade. Pipe shall be straight when placed in the trench. Trench bottoms found to be at incorrect grade after pipe laying operations have begun shall be

corrected and brought to exact line and grade. Fill required shall be crushed stone.

e. After each line of pipe has been laid, it shall be carefully inspected and all earth, trash, rags, and other foreign matter removed from the interior.

f. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and so as to avoid sudden offsets.

g. All jointing of pipe and fittings shall be in accordance with the pipe manufacturer's recommendations.

h. Any leaks or defects discovered at any time after completion of the work shall be repaired immediately. All pipe in place shall be carefully protected from damage until the backfilling operations have been completed.

i. Water shall not be allowed to run through the pipe or stand in the trench.

j. Sewer Pipe Laying - Laying of sewer pipe shall be accomplished to line and grade in the trench only after it has been dewatered and the foundation and/or bedding has been prepared. Mud, silt, gravel and other foreign material shall be kept out of the pipe and off the jointing surfaces.

   1) All pipe laid shall be retained in position so as to maintain alignment and joint closure until sufficient backfill has been completed to adequately hold the pipe in place. All pipes shall be laid to conform to the prescribed line and grade shown on the plans, within the limits that follow.

   2) Variance from established line and grade shall not be greater than one thirty-second (1/32) of an inch, per inch of pipe diameter and not to exceed one-half (1/2) inch provided that any such variation does not result in a level or reverse sloping invert; provided also, that variation in the invert elevation between adjoining ends of pipe, due to non-concentricity of joining surface and pipe interior surfaces, does not exceed one sixty-fourth (1/64) inch per inch of pipe diameter, or one-half (1/2) inch maximum.

   3) The sewer pipe, unless otherwise approved by RCU, shall be laid up grade from point of connection on the existing sewer or from a designated starting point. The sewer pipe shall be installed with the bell end forward or upgrade, unless approved otherwise. When pipe laying is not in progress the forward end of the pipe shall be kept tightly closed with an approved temporary plug.

k. When existing structures, utilities, or other obstructions are an impediment to the alignment of the proposed pipe line and they constitute an alteration of the plans, the Developer will address any required deviations from the plans and arrange with the owners of the utilities or structures for the removal, relocation, or reconstruction of the obstructions. Any resulting changes must be

reviewed and approved by RCU prior to proceeding with construction.

2. Polyvinyl chloride pipe:
   a. Use proper bedding as specified above.
   b. Comply with ASTM D2321, except as otherwise specified herein.
3. Ductile-iron pipe:
   a. Use proper bedding as specified above.
   b. Comply with ANSI/AWWA C600, except as otherwise specified herein.

6.3.5 MANHOLES

A. Set bases level and plumb on proper bedding.

B. Clean bells and spigots.

C. Apply joint sealer, or ring gasket to wall section(s), set firmly in place to assure watertight joints.

D. Connect pipe boot to piping with dual stainless steel straps.

E. Grout lift holes from the outside using non-shrink grout.

F. Install exterior joint collar.

1. Follow manufacturer's recommendations.
2. Clean the surface.
3. Remove the protective paper and place the band around the manhole, mastic side to the manhole and spanning the joint.

G. Form the invert channels directly in the concrete of the manhole base, with mortar and brick. Smooth the floor of the manhole outside the channels, and slope toward the channels at not less than 1" per foot nor more than 2" per foot.

1. Shape the invert channels to be smooth and semi-circular, conforming to the inside of the adjacent sewer section. Inverts shall be to crown of pipe.
2. Make changes in direction of flow with a smooth curve of as large a radius as the size of the manhole will permit.
3. Make changes in size and grade of channels smoothly and evenly.
4. Slope invert uniformly from invert of inlet to invert of outlet.

H. Match manhole top to grade utilizing concrete grade rings or cement brick as specified, maximum height 8".

1. If located in pavement, set rim elevation to match finished pavement grade.
2. Leveling and final grading of manhole frames and covers shall be accomplished by using a maximum of two (2) 4" concrete grade rings

or one (1) 6" grade ring. Grade rings shall be laid in a full bed of non-shrink grout and covered after laying with a smooth coating of non-shrink grout or hydraulic cement a minimum of 2" thick.

3. After the manhole has been set in its final position, the cast iron frame for the cover shall be carefully set above finished grade and properly bonded using WrapidSeal Manhole Encapsulation System as manufactured by Canusa, or approved equal. Where manholes are constructed in paved areas, sidewalks, etc., the top surface of the frame and cover shall be tilted so as to conform to the exact slope, crown, and grade of the existing pavement.

## 6.3.6 CONNECTIONS TO EXISTING SYSTEM

A. Make connections to existing manholes in the presence of RCU. Notify RCU 72 hours before starting a connection. Core drill all new holes in existing manholes.

B. Construct new manhole over existing gravity main breaking upper half of existing pipe after base of manhole is completed so as not to obstruct flow of the existing pipe.

C. At existing manhole tie-ins, temporarily block and/or divert sewage flows, perform other miscellaneous work.

1. Use high-early strength cement for mortar, forming proper channels with minimum interruption to service of the existing sewer.

## 6.3.7 INSPECTIONS AND TESTING

A. General:

1. RCU will require that all sanitary sewer systems pass the following test prior to acceptance.
2. Notify RCU 72 hours before inspections.

B. Air Testing:

1. Conduct low pressure air tests on all completed sections of gravity sewer.
2. Utilize an air compressor to provide at least 300 cubic feet of air per minute at 100 psi, air hose, connection and other equipment necessary to conduct the air tests. Connect plugs in sewers 18" in size and larger by cable for thrust reaction.
3. Air testing shall conform to ASTM F-1417 (Plastic Pipe).

C. Equipment:

1. Plug Design:
   a. Use either mechanical or pneumatic plugs.

b. Design to resist internal testing pressures without the aid of external bracing or blocking.
c. Internally restrain or externally brace the plugs to the manhole wall as an added safety precaution throughout the test.

2. Singular Control:
   a. To facilitate test verification by the inspecting Engineer, pass all air used through a single, above ground control panel.
3. Above Ground Air Control Equipment:
   a. Include a shut-off valve, pressure regulating valve, input pressure gauge, and a continuous monitoring pressure gauge having a pressure range from 0 to at least 10 psi.
   b. Gauge to be no less than 4" in diameter with minimum divisions of 0.10 psi and an accuracy of ±0.04 psi.
4. Hoses:
   a. Use two separate hoses to:
      1) Connect the control panel to the sealed line for introducing low pressure air.
      2) A separate hose connection for constant monitoring of air pressure build-up in the line.
5. Pneumatic Plugs:
   a. If pneumatic plugs are utilized, use a separate hose to inflate the pneumatic plugs from the above ground control panel.

D. Line Preparation:

1. Laterals, Stubs, and Fittings:
   a. During sewer construction, properly cap or plug all service laterals, stubs, and fittings into the sewer test section to not allow for air loss that could cause an erroneous air test result.
   b. Restrain gasketed caps, plugs, or short pipe lengths with bracing stakes, clamps and tie-rods, or wire harnesses over the pipe bells.

E. Test Procedure:

1. Plug Installation and Testing:
   a. After a manhole to manhole reach of pipe has been backfilled to final grade, prepared for testing, and the specified waiting period has elapsed, place the plugs in the line at each manhole and secured.
   b. Seal test all plugs before use.
      1) Lay one length of pipe on the ground and sealing it at both ends with the plugs to be checked.
      2) Pressurize the sealed pipe to 9 psig.
      3) The plugs should hold against this pressure without bracing and without any movement of the plugs out of the pipe.
      4) No persons shall be allowed in the alignment of the pipe during plug testing.

c. Plug the upstream end of the line first to prevent any upstream water from collecting in the test line. d. When plugs are being placed, visually inspect the pipe adjacent to the manhole to detect any evidence of shear in the pipe due to differential settlement between the pipe and the manhole. A probable point of leakage is at the junction of the manhole and the pipe, and this fault may be covered by the pipe plug, and thus not revealed by the air test.

2. Line Pressurization:
   a. Slowly introduce low pressure air into the sealed line until the internal air pressure reaches 4.0 psig greater than the average back pressure of any groundwater above the pipe, but not greater than 9.0 psig. Immediately before testing, if groundwater is present, determine the groundwater elevation by appropriate means.
3. Pressure Stabilization:
   a. After a constant pressure of 4.0 psig (greater than the average groundwater back pressures), is reached, throttle the air supply to maintain that internal pressure for at least 2 minutes to permit the temperature of the entering air to equalize with the temperature of the pipe walls.
4. Timing Pressure Loss:
   a. When temperatures have been equalized and the pressure stabilized at 4.0 psig (greater than the average groundwater back pressure), shut off the air hose from the control panel to the air supply.
   b. Observe the continuous monitoring pressure gauge while the pressure is decreased to no less than 3.5 psig (greater than the average back pressure of any groundwater over the pipe).
   c. At a reading of 3.5 psig, or any convenient observed pressure reading between 3.5 psig and 4.0 psig (greater than the average groundwater back pressure), commence timing with a timing device that is at least 99.8% accurate.
   d. A predetermined required time for a specified pressure drop shall be used to determine the lines acceptability. Traditionally, a pressure drop of 1.0 psig has been specified. However, other pressure drop values may be specified, provided that the required holding times are adjusted accordingly. If the specified pressure drop is 0.5 psig rather than the more traditional 1.0 psig, then the required test times for a 1.0 psig pressure must be halved. Specifying a 0.5 psig pressure drop is desirable in that it can reduce the time needed to accomplish the air test without sacrificing test integrity. Therefore, the following subsections contain provisions for both the traditional 1.0 psig pressure drop and the more efficient 0.5 psig pressure drop. All requirements for a specified 0.5 psig drop are given in parentheses.
5. Determination of Line Acceptance

a. If the time shown in Table I (or Table II), for the designated pipe size and length, elapses before the air pressure drops 1.0 psig (or 0.5 psig); the section undergoing test shall have passed and shall be presumed to be free of defects. The test may be discontinued once the prescribed time has elapsed even though the 1.0 psig (or 0.5 psig) drop has not occurred.

6. Determination of Line Failure
   a. If the pressure drops 1.0 psig (or 0.5 psig) before the appropriate time shown in Table I (or Table II) has elapsed, the air loss rate shall be considered excessive and the section of pipe has failed the test.
7. Line Repair or Replacement
   a. If the section fails to meet these requirements, determine the source, or sources of leakage and repair or replace all defective materials and/or workmanship to the satisfaction of RCU. The extent and type of repair which may be allowed, as well as results, shall be subject to the approval of RCU. Retest the completed pipe installation.
8. Specified Time Tables
   a. To facilitate the proper use of this recommended practice for air testing, the following tables are provided. Table I contains the specified minimum times required for a 1.0 psig pressure drop from a starting pressure of at least 3.5 psig greater than the average back pressure of any groundwater above the pipe's invert. Table II contains specified minimum times required for a 0.5 psig pressure drop from a starting pressure of at least 3.5 psig greater than the average back pressure of any groundwater above the pipe's invert. Both Tables also include formulas for calculating required test times for various pipe sizes and odd lengths. A series of examples are provided in the Appendix to this recommended practice that demonstrate proper use of the Tables.

F. Pipe Deflection:

1. The initial diametric deflection shall not exceed 5%. The Mandrel pull shall be as described in the Ten State Standards. Do not use any mechanical device in the Mandrel pull.
2. Test all PVC gravity sewer pipe, 8" diameter and larger, after installation and backfill by the Contractor. Perform testing at the Contractor's expense using a 5% mandrel acceptable to RCU. Initial deflection of pipe to not exceed 5%. Perform all deflection testing in the presence of RCU and RCU's representative (hereinafter called "Engineer"). Notify RCU and RCU in sufficient time to insure that the both will be present during deflection tests. Deflection test records shall identify the location and

deflection amount at all points where deflection exceeds the specified limit. Such records shall be certified by the Contractor, and shall be furnished to RCU prior to acceptance and payment.

3. Pipe with initial deflection exceeding the specified limit will be unacceptable.
   a. Re-bed to the correct deflection and retested for deflection.

G. Visual Inspection:

1. All gravity sewer manholes and pipelines will be visually inspected by the RCU's Inspector prior to acceptance. Gravity sewer manholes shall be to final grade, have no visible infiltration, contain properly formed and sloped inverts, and be properly coated as outlined in previous sections. Gravity sewer pipelines shall be of uniform slope with no portion holding water. Repairs to gravity sewer pipelines shall be performed in manner equivalent to new construction. Fernco style couplings or repair bands shall not be used. If the RCU's Inspector suspects that the gravity sewer pipeline does not meet the above stated criteria, a video inspection, at the Contractor's expense, may be required.

H. At their discretion, in addition to air testing, pipe deflection test, and visual inspection, RCU may require the following:

1. Leaking and Infiltration:
   a. All pipe joints shall be watertight. Infiltration of groundwater or other leakage into the sewer (including manholes) shall not exceed 50 gallons per mile of sewer per inch of inside diameter of the sewer per 24 hours in any section of the completed work, and in no case shall it exceed 3,000 gallons per mile per 24 hours. The infiltration rate into each section of the sewer shall be measured by the temporary installation of suitable metal or plastic weirs as authorized by RCU. These weirs shall be furnished, installed, and removed by the Contractor. Any leaks into the sewer shall be located, repaired and corrected.

2. Manhole Vacuum Test

   a. All manholes shall be tested via vacuum testing per ASTM C1244 except that the minimum test times shall be as defined in the Manhole Vacuum Test Table (test times modified from those in ASTM C-1244). Vacuum testing shall not be performed until the manhole is completely finished, including applying any protective coating where specified.

      Manholes shall be thoroughly cleaned of all silt, debris and foreign matter of any kind prior to the vacuum testing and then again prior to final inspection as required.

      The vacuum test unit shall be placed at the top of the manhole

structure to include the frame/cone interface/seal in the test. A plate test unit will likely be required to perform the test. Bladder units can be used as long as the bladder does not cover the interface of the frame and the cone section.

Vacuum tests shall be performed by placing the testing unit at the top of the manhole in accordance with the manufacturer's recommendations. A vacuum of 10 inches of mercury shall be drawn on the manhole, the valve on the vacuum line of the test unit closed, and the vacuum pump shut off. The time shall be measured for the vacuum to drop to 9 inches of mercury. The manhole shall pass if the time for the vacuum reading to drop from 10 inches of mercury to 9 inches of mercury meets or exceeds the test times indicated in Table 1 below. The test times in Table 1 are modified from those in ASTM C-1244. Table 1 shall be included on the Contractor's test reports. Refer to ASTM C-1244 for further requirements.

Any leaks found during the vacuum testing shall be repaired by the Contractor in a manner approved by RCU. The manhole shall be vacuum tested again after such repairs are made until the manhole passes the vacuum test at no additional cost to the Owner.

Manhole Vacuum Test Table

| MINIMUM VACITM TEST TIMES FOR VARIOUS MANHOLE DIAMETERS | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Manhole Depth (feet) | Manhole Diameter (inches) | | | | | | | | |
| | 36 | 42 | 48 | 54 | 60 | 66 | 72 | N4 | 96 |
| | Test Time (seconds) | | | | | | | | |
| 8 | 60 | 60 | 60 | 60 | 60 | 60 | 66 | 72 | 78 |
| 10 | 60 | 60 | 60 | 60 | 66 | 72 | 82 | 98 | 114 |
| 12 | 60 | 60 | 60 | 70 | 78 | 86 | 98 | 118 | 138 |
| 14 | 60 | 60 | 70 | 82 | 92 | 102 | 114 | 136 | 158 |
| 16 | 60 | 68 | 80 | 92 | 104 | 116 | 134 | 160 | 188 |
| 18 | 64 | 76 | 90 | 104 | 1 IS | 130 | 146 | 178 | 208 |
| 20 | 70 | 84 | 100 | ! 16 | 130 | 144 | 162 | 194 | 226 |
| 22 | 78 | 92 | 110 | 128 | 144 | 158 | 17S | 212 | 246 |
| 24 | 84 | 102 | 118 | 140 | 156 | 174 | 194 | 232 | 270 |
| 26 | 92 | 110 | 128 | 150 | 170 | 188 | 210 | 250 | 290 |
| 28 | 98 | 118 | 138 | 162 | 182 | 202 | 226 | 270 | 314 |
| 30 | 106 | 126 | 148 | 174 | 1% | 216 | 242 | 288 | 334 |

There shall be no groundwater infiltration or other leakage (active or evidence of being previously active) through the manhole walls, benches, inverts or pipe connections at the manholes. If leakage is found, it shall be eliminated with an appropriate grout or non-shrink cement mortar approved by RCU. These repairs will be made at no additional cost to RCU. Injection grouting (Avanti AV-202 Multigrout or approved equal) may be required to stop leaks around the pipe connections or in the invert channel or benches - grout material must be submitted to RCU. RCU's decision on how defective manholes are repaired shall be final. If any defective manholes are discovered after they have been installed or during the warranty period, they shall be repaired or replaced in a satisfactory manner at no additional cost to RCU.

Repaired manholes, including those repaired during the warranty period, shall be vacuum tested again at no additional cost to RCU.

3. Soil Compaction Test:

   a. All trenches suspected of not meeting the compaction requirements stated previously shall be tested for conformance by a RCU approved testing lab and at the locations and depths requested by RCU.

4. Video Inspection:

   a. Where, in the opinion of RCU, the integrity of the system cannot be determined by the procedures outlined above, video inspection by an independent sewer inspection service approved by RCU may be required prior to issuance of Service Authorization. The cost of said video inspection shall be incurred by the Contractor.

**able I**
**Specification time required for a 1.0 psig pressure drop for size and length of pipe indicated for Q=0.0015**

| 1 Pipe Diameter (in) | 2 Minimum Time (min:sec) | 3 Length for Minimum Time (ft) | 4 Time for Longer Length (sec) | Specification Time for Length (L) Shown (min:sec) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 100 ft | 150 ft | 200 ft | 250 ft | 300 ft | 350 ft | 400 ft | 450 ft |
| 4 | 4:00 | 597 | 0.380L | 4:00 | 4:00 | 4:00 | 4:00 | 4:00 | 4:00 | 4:00 | 4:00 |
| 6 | 5:40 | 398 | 0.854L | 5:40 | 5:40 | 5:40 | 5:40 | 5:40 | 5:40 | 5:42 | 6:24 |
| 8 | 7:34 | 298 | 1.520L | 7:34 | 7:34 | 7:34 | 7:34 | 7:36 | 8:52 | 10:08 | 11:24 |
| 10 | 9:26 | 239 | 2.374L | 9:26 | 9:26 | 9:26 | 9:53 | 11:52 | 13:51 | 15:49 | 17:48 |
| 12 | 11:20 | 199 | 3.418L | 11:20 | 11:20 | 11:24 | 14:15 | 17:05 | 19:56 | 22:47 | 25:38 |
| 15 | 14:10 | 159 | 5.342L | 14:10 | 14:10 | 17:48 | 22:15 | 26:42 | 31:09 | 35:36 | 40:04 |
| 18 | 17:00 | 133 | 7.692L | 17:00 | 19:13 | 25:38 | 32:03 | 38:27 | 44:52 | 51:16 | 57:41 |
| 21 | 19:50 | 114 | 10.470L | 19:50 | 26:10 | 34:54 | 43:37 | 52:21 | 61:00 | 59:48 | 78:31 |
| 24 | 22:40 | 99 | 13.674L | 22:47 | 34:11 | 45:34 | 56:58 | 68:32 | 79:46 | 91:10 | 102:33 |
| 27 | 25:30 | 88 | 17.306L | 28:51 | 43:16 | 57:41 | 72:07 | 86:32 | 100:57 | 115:22 | 129:48 |
| 30 | 28:20 | 80 | 21.366L | 35:37 | 53:25 | 71:13 | 89:02 | 106:50 | 124:38 | 142:26 | 160:15 |
| 33 | 31:10 | 72 | 25.852L | 43:05 | 64:38 | 86:10 | 107:43 | 129:16 | 150:43 | 172:21 | 193:53 |
| 36 | 34:00 | 66 | 30.768L | 51:17 | 76:55 | 102:34 | 128:12 | 153:50 | 179:29 | 205:07 | 230:46 |

**Table II**
**Specification time required for a 0.5 psig pressure drop for size and length of pipe indicated for Q=0.0015**

| 1 Pipe Diameter (in) | 2 Minimum Time (min:sec) | 3 Length for Minimum Time (ft) | 4 Time for Longer Length (sec) | Specification Time for Length (L) Shown (min:sec) | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 100 ft | 150 ft | 200 ft | 250 ft | 300 ft | 350 ft | 400 ft | 450 ft |
| 4 | 4:00 | 597 | 0.190L | 4:00 | 4:00 | 4:00 | 4:00 | 4:00 | 4:00 | 4:00 | 4:00 |
| 6 | 4:00 | 398 | 0.427L | 4:00 | 4:00 | 4:00 | 4:00 | 4:00 | 4:00 | 4:00 | 4:00 |
| 8 | 4:00 | 298 | 0.760L | 4:00 | 4:00 | 4:00 | 4:00 | 4:00 | 4:26 | 5:04 | 5:42 |
| 10 | 4:43 | 239 | 1.187L | 4:43 | 4:43 | 4:43 | 4:57 | 5:56 | 6:55 | 7:54 | 8:54 |
| 12 | 5:40 | 199 | 1.709L | 5:40 | 5:40 | 5:42 | 7:08 | 8:33 | 9:58 | 11:24 | 12:50 |
| 15 | 7:05 | 159 | 2.671L | 7:05 | 7:05 | 8:54 | 11:08 | 13:21 | 15:35 | 17:48 | 20:02 |
| 18 | 8:30 | 133 | 3.846L | 8:30 | 9:37 | 12:49 | 16:01 | 19:14 | 22:26 | 25:38 | 28:51 |
| 21 | 9:55 | 114 | 5.235L | 9:55 | 13:05 | 17:27 | 21:49 | 26:11 | 30:32 | 34:54 | 39:16 |
| 24 | 11:20 | 99 | 6.837L | 11:24 | 17:57 | 22:48 | 28:30 | 34:11 | 39:53 | 45:35 | 51:17 |
| 27 | 12:45 | 88 | 8.653L | 14:25 | 21:38 | 28:51 | 36:04 | 43:16 | 50:30 | 57:43 | 46:54 |
| 30 | 14:10 | 80 | 10.683L | 17:48 | 26:43 | 35:37 | 44:31 | 53:25 | 62:19 | 71:13 | 80:07 |
| 33 | 15:35 | 72 | 12.926L | 21:33 | 32:19 | 43:56 | 53:52 | 64:38 | 75:24 | 86:10 | 96:57 |
| 36 | 17:00 | 66 | 15.384L | 25:39 | 38:28 | 51:17 | 64:06 | 76:55 | 89:44 | 102:34 | 115:23 |

6.3.8 GENERAL

A. Wyes and Tees:

1. Install wye and tee branches in sanitary sewer lines as required. If such branches are not to be used immediately, cap as specified by manufacturer for the sewer pipe.
2. If the work consists of the construction of a sewer that is to replace an existing sewer, connect all of the existing service lines to the new line by a method approved by RCU prior to construction.
3. Install wyes and tees in sanitary sewers so as to properly serve each existing house and each vacant lot facing or abutting on the street or alley in which the sewer is being laid, and at such other locations as may be designated by RCU. The exact location of each connection shall be determined by the Engineer before backfilling.
4. Wyes and tees shall be of the same material and strength as the sewers on which they are installed.
5. Mark location of all wyes, tees and service laterals installed.

B. Connections to Existing Sewers:

1. Connections to existing manholes shall be made in the presence of the RCU Inspector.
2. Notify RUC 48 hours before starting a connection.
3) Core drill all new holes in existing manholes.

C. Pipe Protection:

1. Will have less than 3' of cover.
2. Where foundation conditions are not satisfactory as determined by the soil conditions, lay sewer pipe either on a Class B concrete cradle, pipe foundation material, or constructed of ductile iron pipe, as approved in advance by RCU.
3. Where sewer pipe is laid under storm drainage pipe, there must be a minimum of 18" of separation or more. If unable to obtain 18" of clearance, use one joint of DIP centered under the drainage line.

D. Pipe storage and handling shall be in accordance with the pipe manufacturer's recommendations. Pipe shall be stored on a smooth surface to avoid point loadings. Pipe shall be handled with care so as to prevent damage. Correct equipment should be used to load or unload pipe so as to eliminate dropping, etc.

F. All excavated areas, backfills, embankments, trenches and access roads, grading and ditches shall be maintained in good condition at all times until final acceptance by RCU. Where trench backfill has settled, trenches shall be brought back to grade.

G. Piling Excavated Material - All excavated material shall be piled in a manner that will not endanger the work and that will avoid obstructing sidewalks and driveways. Fire hydrants under pressure, valve pit covers, valve boxes, curb stop boxes, or other utility controls shall be left unobstructed and accessible. Gutters shall be kept clear or other satisfactory provisions made for street drainage. Natural watercourses shall not be obstructed.

## 6.3.9 TRENCH EXCAVATION

A. This section of the guidelines is provided to outline most types of laying conditions, but is not intended to cover all special laying conditions or RCU's special requirements.

1. Trench excavation shall be made in open cut and true to the lines and grades shown on the plans, unless boring is necessary or required. Banks of the trenches shall be cut in vertical, parallel planes equidistant from the pipe center line. The horizontal distance

between such planes, or the overall width of trench, shall vary with the size of the pipe to be installed. The overall width of trench shall be as recommended by the manufacturer.

2. Excavate bell holes for bell-and-spigot pipe at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper installation of joints in the pipe.
3. When muck, quicksand, soft clay, swampy or other material unsuitable for foundations or sub-grade are encountered, remove and replace such material with crushed stone or satisfactory backfill material wasted from trench excavation at other locations or from other sources at no additional cost.
4. After excavation, the area between the final pipe grade and the trench soil bottom shall be filled with crushed stone materials as required, compacted to proper grade, and made ready for pipe laying.
5. Remove debris encountered in trench excavation for sewers and other pipelines for the overall width of trench which shall be as shown on the plans. Remove to a depth of 6" below the bottom of the pipe for pipes smaller than 24" in size; 8" below the bottom of the pipe for pipes 24" to 36" in size; and 12" below the bottom of the pipe for pipes larger than 36" in size, if debris extends to such depth.
6. In all cases, place materials deposited so that in the event of rain, no damage will result to the work.
7. Sufficiently sheet, shore and brace the sides of all excavations whenever necessary to prevent slides, cave-ins, settlements or movement of the banks and to maintain the excavation clear of obstructions. Wood or steel sheet piling of ample design and type shall have sufficient strength and rigidity to withstand the pressures exerted and to maintain the walls of the excavation properly in place and protect all persons and property from injury or damage. Sheeting, shoring or bracing materials shall not be left in place unless as shown by the plans or permitted by RCU. All trench sheeting and bracing shall be left in place until the trench has been backfilled one foot above the top of the pipe.
8. Comply with all OSHA guidelines.

B. Excavation and Backfill - Excavation and backfill shall include all excavation, backfilling, compacting, disposal of surplus material, restoration of all disturbed surfaces, and all other work incidental to the construction of trenches, including any additional excavation which may be required for manholes or other structures forming a part of the pipe line.

1. Surface Removal - Along the proposed pipe lines as indicated on the plans, the Contractor shall remove the surface materials only to such widths as will permit a trench to be excavated which will afford sufficient room for proper efficiency and proper construction. Where sidewalks, driveways, pavements and curb and gutter are

encountered, care shall be taken to protect such against fracture or disturbance beyond reasonable working limits. In areas specified on the plans, the top twelve (12) inches shall be piled separately and preserved so that it may be restored after the remainder of the backfill is replaced.

2. Excavation by Hand or Machine - Where working space will permit, trenches may be excavated by machine, provided that by so doing, public and private improvements will not be subjected to an unreasonable amount of damage, otherwise hand excavation shall be employed.

3. Width of Excavation - The bottom width of the trench at and below the top of the pipe, and inside any sheeting and bracing used, shall not be less than the widths shown in the following tables:

   b. When construction is under an unimproved surface the following table shows the minimum trench widths:

| Pipe Size | Width | Pipe Size | Width | Pipe Size | Width |
|---|---|---|---|---|---|
| 6" | 2' 6" | 27" | 4' 3" | 66" | 9' 1" |
| 8" | 2' 6" | 30" | 4' 7" | 72" | 9' 8" |
| 10" | 2' 6" | 33" | 5' 4" | 78" | 10' 3" |
| 12" | 2' 8" | 36" | 5' 8" | 84" | 10'10" |
| 15" | 2'10" | 42" | 6' 3" | 90" | 11' 5" |
| 18" | 3' 2" | 48" | 6'10" | 96" | 12' 0" |
| 21" | 3' 8" | 54" | 7'11" | 102" | 12' 7" |
| 24" | 4' 0" | 60" | 8' 6" | 108" | 13' 2" |

   b. When construction is under an improved surface, the following table shows the minimum trench widths:

| Pipe Size | Width | Pipe Size | Width | Pipe Size | Width |
|---|---|---|---|---|---|
| 6" | 3' 0" | 27" | 4' 9" | 66" | 9' 7" |
| 8" | 3' 0" | 30" | 5' 0" | 72" | 10' 2" |
| 10" | 3' 0" | 33" | 5' 9" | 78" | 10' 9" |
| 12" | 3' 0" | 36" | 6' 1" | 84" | 11' 4" |
| 15" | 3' 0" | 42" | 6' 9" | 90" | 11' 7" |
| 18" | 3' 6" | 48" | 7' 4" | 96" | 12' 6" |
| 21" | 3' 9" | 54" | 7'11" | 102" | 13' 1" |
| 24" | 4' 6" | 60" | 9' 0" | 108" | 13' 8" |

   c. The strength or class of pipe shall be as indicated on the plans or Special Provisions.

   d. Trench sheeting and bracing or a trench shield shall be used when required by the rules and regulations of O.S.H.A. The

bottom of the trench excavation shall conform to the details shown on the plan.

e. Excavation Below Grade - Where the excavation is carried beyond or below the lines and grades given by the RCU, the Contractor shall, at his expense, refill all such excavated space with suitable material as approved by the Engineer.

f. Rock Excavation - Wherever "rock" is used as the name of an excavated material, it shall mean boulders or pieces of rock, concrete, or masonry measuring one-half (1/2) cubic yard or more, hard shale, solid ledge rock, or masonry which, in the opinion of RCU, requires for its removal the continuous use of pneumatic tools or drilling and blasting. Where the proposal does not contain a pay item for ROCK EXCAVATION, the additional cost of rock removal as defined by these specifications shall be paid on extra work basis unless otherwise specified.

1.) Before payment is allowed for rock excavation, the contractor shall be required to demonstrate the material cannot be removed "by hand pick" or by power operated excavator or shovel. No payment will be made for Rock Excavation unless air tools or explosives were used by the contractor. No payment will be made for rock excavation unless RCU approves such payment in writing prior to excavation.

6.3.10 TRENCH BACKFILL

A. The backfilling of pipeline trenches shall be started immediately after the pipe work has been inspected. The initial backfill material, placed to a height of one (1) foot above the top of the pipe, shall consist of approved backfill material free from organic matter and deleterious substances, containing no rocks or lumps over 2" in any dimension.

1. It shall be carefully placed and compacted through compaction of the entire area backfilled.
2. Backfill shall be deposited in 6" layers (before compaction) and thoroughly compacted with power tools to 95% of theoretical maximum density, modified Proctor ASTM-D-1557.

C. Where trenches are not under pavement, sidewalks, or in alleys, the backfill material above pipe zone shall be compacted to a sufficient density to prevent settlement. Any deficiency in backfilling the trenches, or depressions caused by settlement, shall be repaired.

D. Where pipe trenches are cut across or along pavement, backfill trenches with select fill material placed and compacted in 6" lifts.

1. Backfill for shallow cuts (three (3) feet and less) under paved roadway shall be 100%flowablefill.
2. Backfill for deep cuts (over three (3) feet) under paved roadway may be class II backfill placed and compacted in 6" lifts to a point three (3) feet below the top of existing asphalt and then 100% flowable fill to the top of the subgrade.
3. Cut all bitumastic and concrete pavements, regardless of thickness, prior to excavation of the trenches as specified in the South Carolina Department of Transportation Policy. Width of the pavement cut lines shall be one (1) foot past the edges of the trench at ground surface. Pavement cut lines shall be parallel and even. Any ragged or uneven cuts shall be cut smooth and straight before patching. Pavement and concrete materials removed shall be hauled from the site and not used for trench backfill.
4. Curbs and gutters and sidewalks shall be removed and replaced from joint to joint.
5. Replace road base and asphalt in accordance with South Carolina Department of Transportation (SCDOT) regulations.
6. Refer to RCU standard details.

D. Backfilling around structures shall be done in the manner specified above for pipe trenches by power tamping for the full depth of cut from the bottom of the finished grade.

E. All backfilling shall be done in such a manner as will not disturb or injure the pipe or structure over or against which it is being placed. Any pipe or structure injured, damaged or moved from its proper line or grade during backfilling operations shall be uncovered, repaired, and then re-backfilled as herein specified.

I. Backfill - All sanitary sewer pipe and services shall be bedded on a minimum of 4" of gravel and backfilled with gravel up to the spring line.

1. Backfill material above the granular cradle to a point twelve (12) inches above the top of the pipe shall be placed in layers of six (6) inches thickness, loose measure, and each in such manner as not to disturb or injure the pipe. The balance of the backfill material shall be placed in uniform layers of twelve (12) inches thickness, loose measure, and each layer shall be compacted by ramming or tamping with tools approved by RCU. All compaction shall not be less than 95% standard proctor, for the soil.

2. Where called for on the plans, those areas where sewers are crossing open areas where early settlement is not critical, backfill from 12" from the top of the pipe to the surface, shall be made by any acceptable

method which will not dislodge or damage the pipe or cause bridging action in the trench. Only selected excavated material free from clods or stones shall be used in backfilling up to twelve (12) inches above the top of the pipe. Water-soaking or other methods of trench settlement will not be required in this case. Excess material shall be neatly rounded over the top of the trench as directed by RCU to allow reshaping of the surface to level out any uneven settlement that may occur.

J. Selected Granular Backfill - Where called for on the plans, material conforming to this specification for selected granular backfill shall be placed and compacted in those locations shown on the plans. Where sewers, water mains, or other pipe conduits are constructed under permanent type pavements, driveways or sidewalks, selected granular backfill shall be used to fill the trench to the bottom of the permanent type surface to be reconstructed and shall be compacted by either water jetting or mechanical methods before the permanent surface is constructed.

1. Materials for selected granular backfill shall consist of sand, stone sand, crushed stone, pit run or crushed gravel, or crushed boiler slag well graded within the following limits. Selected granular backfill shall be reasonably free from an excess of soft and unsound particles and other objectionable matter.

SELECTED GRANULAR BACKFILL

| | SIEVE SIZE | | | PERCENT PASSING | | | | |
|---|---|---|---|---|---|---|---|---|
| TYPE | 1-1/2" | 1" | 1/2" | #4 | #8 | #16 | #100 | #200 |
| A | 100 | 90-100 | 60-100 | 40-80 | 25-60 | 20-45 | | 0-15 |
| B | | 100 | 60-95 | 40-60 | | 15-45 | | 5-15 |
| C | | | | 84-100 | | | 0-40 | 0-10 |
| D | | | 100 | 94-100 | | 45-85 | 0-10 | |

2. Granular materials from local deposits, graded reasonably close to the limits specified above, and approved by RCU, may be used for selected granular backfill.

3. At the time of use, the selected granular backfill shall be free of frozen lumps and foreign materials that may have become mixed with it during handling.

K. Granular Cradle - Granular cradle shall be required only where indicated on the drawings or where ordered by RCU. Material for granular cradle shall be stone screenings, crushed stone, pit run gravel, washed gravel, crushed boiler slag or other granular material approved by RCU. Granular cradle shall be well graded within the limits stated below and shall be free from excess of soft or unsound particles or other objectionable matter. The type of granular cradle to be used in specific location will be designated by RCU.

1. For reasonably good non-granular foundation conditions, Type A, or Type C granular cradle will be designated. Where, in the opinion of RCU, the foundation conditions are not suitable for use of one of the above types of granular cradle then Type B granular cradle or concrete cradle may be used. The actual selection is to be made by RCU. Granular cradle shall be allowed for separate payment only in the locations where the use of these items is specified or ordered by RCU. A change in type of cradle material shall not be made unless a minimum of two (2) cubic yards of material is allowed for payment.

GRANULAR CRADLE GRADATIONS

| | Sieve Size | | | Percent Passing | | | |
|---|---|---|---|---|---|---|---|
| TYPE | 1-1/2" | 1" | 1/2" | #4 | #8 | #16 | #200 |
| A | 100 | 90-100 | 60-100 | 40-80 | 25-60 | 20-45 | 0-15 |
| B | 100 | 60-95 | 10-30 | 0-5 | | | |
| C | | 100 | 60-95 | 40-60 | | 15-45 | 5-15 |

2. Granular materials, from local deposits, graded reasonably close to the limits specified above and approved by RCU for use as granular cradle may be used.

3. Where the natural foundation soil, on which sewer pipes are to be bedded, consists of material suitable in its natural state for shaping and bedding a sewer, no granular cradle will be required. Where granular cradle is not required, the trench ahead of the pipe shall not be excavated below a plane one-twelfth (1/12) the inside diameter of the pipe above the flow line of the sewer. The pipe layer shall excavate the remainder of the trench to conform to the outside of the bottom of the pipe in order that the barrel of the pipe will have a bearing of not less than one-fourth (1/4) of its circumference and for not less than three-fourths (3/4) of its length. Bell holes shall be dug

for bell and socket around the pipe from the outside. Under no condition shall they be so shallow that the pipe will be supported by the bell. After the joint is made, the bell hole shall be carefully filled with sand, fine earth or clay without tamping.

L. Concrete Cradle - Where subgrade conditions, in the opinion of RCU, warrant extra precautions for the bedding of pipe RCU may order the construction of a concrete cradle in conformance with the size and dimensions indicated on standard detail SSC-4. All concrete used in concrete cradles shall have a minimum compressive strength of twenty-five hundred (2,500) psi at twenty-eight (28) days.

M. Compacting Backfill - When called for on the plans, trench backfill shall be compacted by jetting and water-soaking in the manner described below. The trench compaction shall be started at the point of lowest elevation of the trench and worked up along the trench. Jetting and water-soaking shall not begin until the trench has been backfilled to within six (6) inches of the finished surface.

1. Jet Holes - The holes through which water is injected into the backfill shall be centered over the trench backfill and at longitudinal intervals of not more than six (6) feet. Additional holes shall be provided if deemed necessary by RCU to secure adequate settlement. All holes shall be jetted and shall be carried to a point one (1) foot above the pipe. Drilling the holes by means of augers or other mechanical means will not be permitted. Care shall be taken in jetting so as to prevent direct contact with, or other disturbance of the pipe.

2. Water Soaking - Water required for jetting and water soaking shall be provided as set forth in Special Provisions. The water shall be injected at a pressure and rate just sufficient to sink the holes at a moderate rate. After a hole has been jetted to the required depth, the water shall continue to be injected until it begins to overflow the surface. An approved soil auger shall be used for boring test holes. As soon as the jetting and water soaking has been completed, all holes shall be filled with soil and compacted. Surface depressions resulting from backfill substance caused by jetting and water soaking shall be filled and re-compacted by tamping or rolling to the satisfaction of RCU.

## 6.3.11 INSTALLATION OF CASING, SPACERS, AND END SEALS

A. Locate to avoid interference with traffic, adjacent structures, etc. to such extent possible.

B. The casing deflection shall not exceed the maximum deflection recommended by the carrier pipe manufacturer.

C. Excavate to required depth, providing sheeting and shoring necessary for protection of the work and for safety of personnel.

D. Maintain entry pits in dry condition by use of pumps, drains or other approved method.

E. Install casings by dry-boring through the casing while simultaneously jacking the casing.

F. Any proposed alternate method shall be approved in writing by RCU.

G. Weld joints to provide a watertight joint.

H. Install casings for gravity sanitary sewer to grade, not varying more than 3/32" per foot of length from the indicated grade.

I. Installing pipe in casing:

1. Inspect carefully, insuring that all foreign material is removed from the casing and the casing meets alignment criteria for the type of carrier pipe being used.
2. Install casing spacers on the carrier pipe per the manufacturer's instructions.
3. For sanitary sewer provide spacer sizing and length necessary to obtain the pipe slope and elevations as shown on the plans.
4. Provide restrained configuration.
5. Install the carrier pipe in the casing insuring each joint is pushed "home" before the joint is installed into the casing.

J. Seal each end with brick and mortar to prevent the entrance of foreign material.

## 6.3.12 INSTALLATION OF TUNNELS

A. Where shown on the plans or where specifically authorized by RCU, pipe lines shall be constructed in tunnels. This work will be done in accordance with requirements of any associated permits obtained from railroads, local authorities, state or county highway departments, or in accordance with the following paragraphs.

1. The tunnel shall be only of sufficient width and height to provide free working space. The sides and roof of the tunnel shall be braced sufficiently to support the external loads and to prevent caving, bulging, and settlement of the earth.

2. The Contractor shall backfill all tunnels with well compacted sand, fine gravel or stone screenings as rapidly as the conditions permit.

3. The backfill material shall be deposited in the tunnel in such a manner as not to injure or disturb the pipe. The filling of the tunnel shall be carried on simultaneously on both sides of the pipe in such a manner that injurious side pressures do not occur. Special care shall be taken to compact the backfill under the haunches of the pipe. The remainder of the tunnel, or such portion of the remainder as may be possible, shall then be backfilled by one of the following methods, at the option of the Contractor, if in the opinion of RCU, the method is practicable.

   a. The material shall be deposited in uniform layers not to exceed twelve (12) inches thick (loose measure) and such layer either inundated or deposited in water.

   b. The tunnel shall be backfilled with loose material or only partly backfilled at a time, if necessary, and settlement secured in either case by introducing water through holes jetted into the material to a point approximately two (2) feet above the top of the pipe.

   c. If neither of the above methods is practicable or can be used for only a portion of the backfill, the remainder of the tunnel shall be completely backfilled with material carefully deposited in uniform layers and each layer compacted by ramming or tamping with tools approved by RCU.

4. When sheeting and bracing have been used, sufficient bracing shall be left across the trench as the backfilling progresses to hold the sides and top firmly in place without caving or settlement before the backfilling material shall be filled in a manner meeting the approval of RCU.

5. Any depressions which may develop within the area involved in the construction operations due to settlement of the backfilling material shall be filled in a manner meeting the approval of RCU.

6. Use of Casing Pipe - The Contractor may, subject to the approval of RCU, use metal casing pipe as a tunnel liner in place of timber shoring. The diameter, gauge and type of such pipe, method of placing and method of installing carrier pipe within it shall be subject to the approval of RCU. The entire void space between tunnel liners and pipe shall be filled with compacted sand or other approved material if such method of construction is used.

7. Jacking or Boring of Pipe - The Contractor may, subject to the approval of RCU, use pipe bored into position with or without tunnel liners, for tunneled sections of pipe. In such cases all conditions of performance of the work shall be subject to the approval for RCU.

8. Restoration of Surfaces - Restoration of surfaces shall include the removal of the existing surface, the disposal of surplus material, and the construction of new surfaces as indicated on the plans or special provisions. The type of surface restoration required shall be shown on the plans or described in the special provisions.

## 6.3.13 CLOSED CIRCUIT TELEVISION (CCTV) INSPECTION OF SEWER LINES

A. It is the intent of this specification to provide inspection criteria for all sanitary sewer pipelines installed as part of any new development project. This specification requires that the pipelines be inspected utilizing the Pipeline Assessment Certification Program (PACP) inspection standards and closed-circuit television techniques. This process has been developed to identify and locate any sewer line defects, determine corrective action, and perform/document post-correction inspection.

B. Scope of work:

1. The Contractor shall video inspect all mainline sections from manhole to manhole, and all service laterals from the right-of-way boundary to the mainline connection or manhole connection. Video inspection shall be performed after the pipe has been laid and passed the low-air pressure and deflection testing. It is in the best interest of the Contractor to complete this task in a timely manner.
2. Prior to performing CCTV inspection activities, the Contractor shall thoroughly clean the sewer line(s) and service laterals designated to be televised. After cleaning, all equipment will be removed from the sewer line(s). Just prior to performing the video inspection procedure, water must be introduced into the nearest upstream manhole until observed at the nearest downstream manhole. This will insure that any pipe segments with bellies are easily identified during CCTV inspection.

C. CCTV and associated equipment:

1. Television inspection equipment shall have an accurate footage counter that will display on the monitor and record the camera distance from the centerline of the starting manhole. Line segment inspections shall be made manhole to manhole. Prior to the beginning of each CCTV inspection, manhole identification numbers, as indicated on project drawings or as supplied by the Developer's Engineer, will be displayed in the title and shall become a part of the video record. Manhole identification numbers shall correspond to the numbers shown on the project plans.
2. The camera shall be of the remotely operated pan and tilt type. The rotating camera and light head configuration shall have the capability of panning 360 degrees with tilt capability of providing a full view of the pipe to ensure complete inspection of the mainline pipe and service laterals.
3. The camera, television monitor, and other components shall be color. To ensure peak picture quality throughout all conditions encountered,

the color camera shall be equipped with the necessary circuitry to allow for the remote adjustment of the optical focus iris from the power control unit at the viewing station. A variable intensity control of the camera lights shall also be located at the viewing station.

4. All fog shall be evacuated from the pipeline and the pipeline kept clear of any fog during the CCTV inspection process.
5. Lighting and camera quality shall be suitable to allow a clear, in-focus picture for the entire inside periphery of pipelines extending at least ten (10) feet in front of the camera. In High Density Polyethylene (HOPE) or ductile iron poly-lined pipe, lighting should be sufficient enough to provide a clear view at least two (2) feet in front of the camera. The replay of the recorded video information shall be free of electrical interference and shall provide a clear stable image.

D. Execution:

1. It is the responsibility of the Contractor to provide the CCTV Contractor with a set of RCU approved Construction Plans prior to CCTV inspection activities. Line segment inspections shall be made manhole to manhole.
2. Internal inspection of pipelines shall be performed by PACP certified personnel, trained in the identification of pipe deficiencies and condition assessment utilizing closed-circuit television inspection equipment. A full 360 degree view of the pipe is required during inspection. The pipe must be clear and free of any dirt and/or debris. The CCTV inspection technician shall have full control of the movement of the television camera unit at all times. The travel speed of the camera shall be variable but uniform and shall not exceed 30 feet per minute. Any means of propelling the camera through the sewer line which would produce non-uniform or jerky movement of the camera, will not be acceptable. The television system shall be capable of performing line segment inspection in increments of 400 feet with one setup. Service laterals shall be inspected utilizing a CCTV inspection push system, capable of inspecting up to one hundred (100) feet of pipe.
3. As directed by RCU, the Developer's Engineer or his representative, the camera shall be stopped to view and analyze conditions that appear unusual or uncommon. The CCTV inspection technician shall, at all times, be able to move the camera through the tines in either direction without the loss of quality in the video presentation.
4. The interior of the pipe shall be carefully inspected to determine the location and extent of all deficiencies. Pipe conditions that result in a question of proper installation procedures shall be noted so that these conditions can be reviewed and, if necessary, corrected before actual acceptance of the sewer system.
5. CCTV inspections will take place immediately after testing and prior to the pre-commissioning of the project. This will allow deficiencies found during the CCTV inspection process to become part of the project's punch list.
6. Access for CCTV inspection purposes shall be made via existing line segment manholes and lateral cleanouts. Should access to a particular sewer segment be difficult, and where adjacent segments require television inspection, the CCTV contractor may be allowed to complete the inspection of multiple sewer line segments with one setup. When multiple sewer line segments are inspected utilizing one setup, the CCTV contractor shall zero the footage counter at each subsequent sewer manhole to establish a uniform starting point for each line segment televised.

7. At all defects and service connections, the camera shall be stopped and the pan and tilt features shall be used to obtain a clear picture. At each service lateral, the camera shall be panned to view up each lateral or point of connection. Make note of any deficiencies through the use of Data Collection Software.

8. Contractor shall record inspection in a PACP format and the video shall be recorded in an extra-high quality CD/DVD format. The title block shall include the following information:
   a. Date.
   b. Television operator's identification (name, ID number, etc.).
   c. Segment numbers: Shall be designated by RCU.
   d. Upstream manhole number.
   e. Downstream manhole number.
   f. Size of sewer pipe.
   g. Pipe material.
   h. Closest cross street or address where the line segment is located.
   i. Direction of movement of camera and direction of normal flow.
   j. Location of service connections indicated by clock position and with counter distance in feet from centerline of beginning manhole. Location (start and end counter distances in feet from centerline of beginning manhole) and description of obstructions, structural defects, longitudinal and/or circumferential cracking, joints including open and/or offset joints, ovality, leakage or evidence thereof, break in connections, protruding connections, mineral deposits, roots, previous repairs, deposits on pipe walls, sags, and other abnormalities with respect to the condition of the sewer with counter distance in feet from centerline of beginning manhole. CCTV contractor's log shall contain the same information.

9. CD/DVD shall visually display, at a minimum, CCTV contractor's name, project name, date of inspection, pipe segment number, manhole numbers or lateral lot numbers. The distance between manholes shall be verified by measuring tape. If the counter distance and the taping distance differ by more than 2 feet per 100 feet, the run shall be re-televised by CCTV contractor.

10. CD/DVD shall be maintained and delivered in a hard case, which shall display the project name, project number, date of inspection, manhole segment number(s) inspected, and camera operator's identification. No segment shall be split between two disks. A disk may have multiple segments, so long as an entire section is on one disk. Original disks of all sections will be provided to the RCU representative along with the respective television inspection field logs to be reviewed for completeness and soundness of construction. After review and approval, copies will be provided for the Contractor and Developer's Engineer. Originals will remain the property of RCU.

11. If during video operations the television camera will not pass safely through the entire sewer line segment being inspected, CCTV contractor shall set up equipment in the reverse, so that the inspection can be performed from the opposite manhole. Where an obstruction is encountered and a reverse set up is required, the distance shall be entered into the log and noted on the video format from which manhole the measurements are being made. If under the reverse setup the camera again fails to pass through the entire sewer line segment, inspection shall be considered complete. All obstructions in the sewer segment that prohibit passage of the television camera shall be immediately reported to RCU by the CCTV contractor, referencing location and nature of the obstruction. No correction work shall proceed until utility contractor receives direction

from the Developer's Engineer or RCU representative regarding removal or repair of deficiency.

12. Should CCTV contractor's televising equipment become lodged in any sewer line, it shall be removed by CCTV contractor at his expense. This shall include, if necessary, excavation and repair of the sewer main and/or lateral, underground utility repairs, backfilling and surface restoration. Upon removal of CCTV equipment and repair, CCTV contractor shall re-televise the line segment to demonstrate to the Developer's Engineer or the RCU representative that the line segment has been placed back into operational condition with no further deficiencies.

E. Acceptance:

1. CCTV contractor shall present inspection video and inspection logs on CD/DVD disk. A continuous image in complete conformance with these specifications with a full view of the internal pipe surface is required. CCTV contractor shall re-clean and televise any segment for which the video does not present a clear image of at least 100% of the internal pipe surface at all times, and/or is accompanied by an incomplete inspection log.
2. Any of the following observations shall be considered defects:
   a. Any bellies in a joint of pipe will be cause for rejection of the pipe segment.
   b. Joint separations.
   c. Offset joints.
   d. Chips in pipe ends.
   e. Cracked or damaged pipe or evidence of the presence of an external object bearing upon the pipe (rocks, roots, etc.).
   f. Infiltration.
   g. Roots.
   h. Debris or other foreign objects inside of pipe.
   i. Other obvious deficiencies when compared to Approved Plans, Permits, and/or Minimum Standards.
3. RCU will require corrections prior to acceptance of the project.
4. The Contractor shall be notified in writing of any deficiencies revealed by the television inspection that will require repair. The Contractor shall excavate and make the necessary repairs. Upon completion of discrepancies, the line segment(s) shall be re-inspected at the Developer's/Contractor's expense. CCTV inspection video shall be submitted to RCU for review upon completion of discrepancies.

## 6.3.14 MEASUREMENT AND PAYMENT

A. Work under this section will be measured and paid for as specified below. Wherever units of measure, i.e., lineal feet, each, lump sum, and similar units of measurement are mentioned in the proposal, it shall be interpreted to mean the unit installed in accordance with the plans and specifications, and ready for use.

B. Gravity Sewer Pipe – Gravity Sewer Pipe length will be measured from center to center of manholes and depth of cut from invert to original ground line at centerline. The original ground line will be determined immediately prior to the beginning of trench excavation. It is the Contractor's

responsibility to notify RCU 24 hours in to verify measurements. Payment will be made at the unit prices per lineal foot as stated in the proposal for the type of pipe specified and shall include cost of excavation, bedding, backfilling, cleanup, testing, etc.

C. Ductile iron sewers (extra) - Where ductile iron pipe is shown in lieu of PVC sewer pipe, payment will be made at the unit price stated for PVC pipe at the pipe size and depth of cut, plus the unit price (extra) stated in the proposal for the particular size of ductile iron pipe.

D. Manholes - Manholes more than six (6') feet in depth shall be measured to the nearest one-tenth (0.10) of a foot, from invert of the outlet pipe vertically to the top of the casting, for the purpose of determining the additional depth of manhole to be paid for at the unit bid price per vertical foot in additional to the base price for each. Payment shall include all costs of excavation, backfilling, materials, grade rings, stone base, standard frame and cover, cleaning, testing, connection to existing sewer system, etc., plus a unit price per foot, for all depth in excess of six (6') feet, plus a unit price per vertical foot for each DROP MANHOLE CONNECTION where they occur. Where more than one (1) type or size manhole designation is called for, each shall be covered by a separate bid item of the following form:

1. _____ (TYPE or SIZE) MANHOLE, each.
2. ADDITIONAL DEPTH OF MANHOLE, per vertical foot.
3. DROP MANHOLE CONNECTION, per vertical foot.

E. Drop manhole connections – Drop manholes shall be measured to the nearest one-tenth (0.10) of a foot, from invert of the inlet pipe to the invert of the manhole. Payment will be made at the unit price bid per vertical foot for the various sized drop pipes which shall include all costs for pipe elbows, tee, pipe and encasement.

F. Watertight Manhole Frame and Cover (extra) – Where watertight manhole frame and covers are called for, payment will be made at the unit price stated in the proposal and shall include all labor, tools, materials and equipment for furnishing and installing this lid in lieu of a standard manhole ring and cover.

G. Service Sewers – Measurement for service sewers shall be along the pipe from the outside surface of the main sewer to the extreme end of the last pipe or fitting placed. Measurement shall be to the nearest one (1) foot. Measurement for service risers shall be from invert of the service wye to the top of the riser fitting along the centerline of the pipe. Measurement shall be to the nearest one (1) foot. Payment shall be at the unit contract price per lineal foot for each size indicated.

H. Service Risers - Payment for service risers shall be at the unit contract price per foot for the size indicated. Bends, adapters and plugs shall be

considered as incidental to the construction and all costs thereof shall be included in other pay items of the proposal.

I. Wyes (extra) - Payment will be made at the unit price stated for sewer pipe at the size and depth of cut plus the unit price (extra) stated in the Proposal for the particular size of wye branch. Payment shall include cost of stopper sealed in place. Payment for cut-in connections to main sewers where no wye branch exists shall be included in the contract unit price for wye branches.

J. Concrete encasement will be paid for at the unit price per linear foot of concrete stated in the proposal, such price to be paid in addition to that paid per foot of sewer for the various depths encountered. The unit price stated in the proposal shall include the costs of the additional depth of excavation, the furnishing of concrete blocking, and the laying of pipe to line and grade on the blocking.

K. Polyethylene encasement will be paid for at the unit price per linear foot as stated in the Proposal.

L. Cleanouts - Payment will be made at the unit price stated for each in the Proposal. Payment shall include cost of piping to the cleanout and plug.

M. Steel Casing Pipe or Tunnel – Payment shall be made for these items at the unit price per lineal foot based on the distance shown on the plans or on the proposal. The unit bid price per lineal foot shall include all labor, materials, tools, and equipment necessary to complete the work. Unit bid price does not include the carrier pipe.

N. Crushed Stone – Crushed stone to be used in stabilizing the bottom of trenches, etc., will be measured and paid for per ton at the unit price shown on the proposal. Price shall include the material and the labor incident to the placing of the stone and any additional extra depth of trench or excavation necessary to accommodate the crushed stone.

O. Unclassified Excavation – Unclassified excavation will not be paid for separately, the cost of which shall be included in the unit price for other items of work. When the removal of existing structures or materials is classified separately as a contract pay item, payment will be made in accordance with the contract price; otherwise such work will be considered as incidental work and will not be paid for directly, but its cost shall be included in the unit price for other items of work. In either case, such price or prices shall be full compensation for all labor, materials, tools, equipment and incidentals necessary to complete the work and in the case of pavement cut and removal, shall include the cost of the required permit for cutting pavement, unless cost of permit fees are included as a bid item in the proposal.

P. Exploratory Excavation – Payment for exploratory excavation, where ordered by RCU, will be paid at the unit price per cubic yard stated in the proposal.

Q. Rock Excavation - Where rock excavation is to be measured for payment, quantities will be determined by RCU. Rock required to be removed shall be computed by the cubic yard. Dimensions for pay purposes shall be the difference in elevation between the top and bottom of the rock as determined by RCU and the specified ditch width for the pipe size being laid. Where rock is encountered in the bottom of the trench, the maximum depth for payment purposes will be six (6) inches below the bottom of the pipe. Payment shall be made at the contract unit price per cubic yard. These prices shall be full compensation for furnishing all materials, for all preparation and excavation of rock, for backfilling the excavated trench to the bottom of the pipe with selected backfill material, and for all labor, equipment, tools and incidentals necessary to complete the work.

R. Remove and Replace Paving - Where excavation in pavement is required the work will be paid for at the unit bid price per lineal foot listed on the proposal and shall be measured along the centerline of construction. Extra width will not be measured for payment. The unit bid price for this item includes all labor, tools, equipment and materials necessary to complete the work. The unit bid price shall also include the cost of using flowable fill as backfill material and/or compaction to 95% maximum density as determined by AASHTO T-99 procedures. All compaction testing shall be certified by an approved laboratory. The unit bid price shall also include the cost of removing all paving materials which are not suitable for backfilling the trench from the job.

S. Remove and Replace Asphalt Drive and Remove and Replace Concrete Drive - This work will be paid for at the unit bid price per lineal foot shown on the proposal. Measurement for payment will be along the centerline of construction. Extra width will not be measured for payment. The unit price bid for this item shall include all labor, tools, equipment and materials necessary to accomplish the work and shall include the cost of removing all paving materials which are not suitable for backfill in the trench from the job.

T. Resurface Existing Pavement - Payment for resurfacing existing pavement shall be made at the unit bid price per square yard in accordance with field measurements of area made by RCU or their representative. The Contractor shall furnish all asphalt weight tickets at the time the work is accomplished. The computed yield, arrived at by dividing the weight of asphalt used by the measured area shall be a minimum of 150 pounds per square yard. In those areas where the work is acceptable to the State Department of Public Transportation and RCU, yet the computed yield is less than 150 pounds per square yard, payment will be made for the item in direct ratio of the square of the actual yield to the square of 150 pounds per square yard.

U. Concrete Sidewalk - Concrete sidewalk shall be measured for payment based on the amount of sidewalk ordered removed and replaced. The width used for computing quantities shall be the actual width of the sidewalk unless otherwise approved by RCU. The unit bid price per square foot for this item includes all labor, tools, equipment and materials necessary to complete the work.

V. Sheeting and Bracing – No separate measurement or payment for sheeting and bracing and all other incidental work shall be made unless it is ordered to be left in place, specified, shown on the plans, or as directed by RCU, otherwise it shall be included in the contract price for other items. Payment for sheet piling ordered left in place shall be made at the contract unit price per square foot as shown on the proposal.

W. Sodding, Fertilizing and Seeding - Measurement of surfaces to be sodded or seeded shall be made of the area within the rights-of-way designated by RCU for restoration. Payments shall be made at the contract unit bid price to the nearest one-tenth (0.10) acre and the cost of restoring any disturbed areas beyond the right-of-way, to the satisfaction of RCU, shall be borne by the Contractor.

X. Connections to Other Sewers or to Appurtenances - The lump sum price for making connections to other sanitary sewers and appurtenances shall be full compensation for removing, repairing and/or replacing pipe and/or structures and shall be full compensation for the completed work in place including all materials, labor, tools and equipment required to complete the work.

END OF SECTION

**SCDHEC Approved August 2016**

# SECTION 7

# FORCE MAIN SYSTEM MATERIALS AND CONSTRUCTION SPECIFICATIONS

## PART 7.1 – GENERAL

### 7.1.1 DESRIPTION

A. These specifications cover materials and procedures for the complete installation of gravity sewers and appurtenances incident to the construction of extensions to be connected to Richland County Utilities (hereinafter called "RCU") sewerage system.

B. Unless otherwise noted or approved by RCU all materials shall be manufactured in the United States.

C. Construction detail drawings in SECTION 15, Standard Details, are integral to these specifications.

D. No project will be constructed that does not comply with SECTION 5, Sewer System Design Standards.

E. NOTICE OF CONSTRUCTION ACTIVITY - Immediately prior to the beginning of construction, notify RCU.

### 7.1.2 HANDLING OF MATERIALS

A. Handle pipe so that the coating and lining will not be damaged. If any part of the coating or lining is damaged, repair it in accordance with the manufacturer's recommendation and to the satisfaction of RCU or their representative.

B. Install pipe and appurtenances at the locations shown on the plans and to the position, alignment and grade shown thereon, or in the event of grade conflicts, as directed by RCU or their representative. The Contractor shall erect, mark and maintain suitable barricades to protect the work and maintain public safety.

C. All pipe shall be subject to inspection at the pipe plant, trench, or other point of delivery, for the purpose of culling and rejecting pipe, independent of laboratory tests, which does not conform to the requirements of these specifications. Such pipe shall be marked by RCU or their representative and the Contractor shall remove it from the project site upon notice being received of its rejection.

D. Storage and handling shall be in accordance with manufacturer's recommendation.

E. Storage of PVC pipe:
   1. Store in unit packages as received from manufacturer until just prior to use.
   2. Stack units to prevent deformation to pipe barrel and bells.
   3. Protect from direct sunlight by covering with opaque material.

F. Avoid severe impact blows, gouging or cutting by metal surfaces or rocks.

G. Handle pipe so as to ensure delivery to the trench in sound, undamaged condition.
   1. Carry pipe into position - do not drag.
   2. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.
   3. Use care not to injure pipe linings.

H. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during layout operations by plugging or other approved method.

I. Before installation, inspect each piece of pipe and each fitting for defects and replace material found to be defective before or after laying with sound material meeting the specified requirements.

J. Rubber gaskets: Store in a cool dark place until just prior to time of installation.

## 7.1.3 PROTECTION OF OTHER UTILITIES

A. The Contractor shall proceed with caution in the excavation and preparation of the trench so that the exact location of underground structures, both known and unknown, may be determined. He shall be held responsible for the repair of such structures when broken or otherwise damaged.

B. Protection of Property and Surface Structures - Trees, shrubbery, fences, poles and all other property and surface structures shall be protected during construction operations unless their removal is authorized by RCU. Any fences, poles or other manmade surface improvements which are moved or disturbed by the Contractor shall be restored to their original condition, after construction is completed, at the Contractor's expense. Any trees, shrubbery or other vegetation which are approved or ordered for removal by RCU shall be removed completely, including stumps and roots, by the Contractor. Responsibility for any damage or claims for damage caused by construction operations to shrubbery or other landscape improvements which were not authorized for removal by RCU shall be assumed by the Contractor.

## 7.1.4 JOB CONDITIONS

A. Construction in Easements - In easements across private property, the Contractor shall confine all operations to the easement area and shall be responsible and liable for all damage outside of the easement area. Trees, fences, shrubbery or other type of surface improvements located in easements shall be protected during construction. The provisions above shall apply to all easement areas as well as to public rights-of-way. Precautions shall be taken by adequate sheeting or other approved method to prevent any cave-in or disturbance beyond the easement limits or damage to improvements within the easement. In general, the easement area is intended to provide reasonable access and working area for efficient operations to be performed within the restrictions shown on the plans. The

Contractor shall be responsible for organizing his operations to perform within the restrictions shown on the plans. When requested, the owner shall make available to the bidders and furnish to the Contractor a copy of the construction easements.

B. Water used for construction and testing will be furnished by the Contractor through approved connections to the available water lines. Approved backflow prevention devices at each connection will be furnished by the contractor to reduce possibility of contamination.

C. Barricades, Guards and Safety Provisions - To protect persons from injury and to avoid property damage, adequate barricades, construction signs, torches, lanterns and guards as required shall be placed and maintained by the Contractor at his expense during the progress of the construction. All material piles, equipment and pipe which may serve as obstructions to traffic shall be enclosed by fences or barricades and shall be protected by proper lights when the visibility is poor. The rules and regulations of O.S.H.A and appropriate authorities respecting safety provisions shall be observed.

D. Contractor to provide a video of the entire gravity sewer line route in DVD format to RCU prior to beginning any related construction activities.

E. Schedule delivery of materials to provide the least interference and inconvenience to the public.

## PART 7.2 – PRODUCTS

### 7.2.1 PIPE AND FITTINGS

A. Ductile-iron pipe and fittings (DIP):

1. 4" - 12" pressure class 350
2. 14" - 64" pressure class 250
3. Flanged pipe - class 53 (minimum)
4. Underwater pipe - minimum of class 50.
5. Use mechanical or push-on joints: ANSI/AWWA C111/A21.11 as modified by ANSI/AWWA C151/A21.51.
   a. Provide low alloy steel bolts for mechanical joints.
   b. Approved push-on joints: Fastite, Tyton, or Bell-tite.
6. Use rubber gaskets and lubricant: ANSI/AWWA C111/A21.11.
7. Use fittings with pressure rating of 150 psi: ANSI/AWWA C110/A21.10.
8. Lining:
   a. Amine cured Novalac Epoxy polymeric lining, 40 mils nominal thickness, Protecto 401 by Vulcan Painters, Birmingham, Alabama.
9. All DIP force main and Residential pump station installations shall also include the installation of metallic tracer wire laid 6" above the pipe.

B. Polyvinyl chloride pipe and fittings (PVC):

1. Gaskets to comply with ASTM F477.
   a. Natural rubber gaskets are not acceptable.
2. 4" - 12":
   a. Comply with ANSI/AWWA C900, Table 2, Pressure Class 150.
3. 14" and larger:
   a. Comply with ANSI/AWWA C905 Table 2, pressure class 165.
4. Plastic pipe 3" and smaller:
   a. Comply with ASTM D2241 for PVC 1120, SDR 26.
5. Use integral bell or coupling type with elastomeric gaskets.
6. Factory-install gaskets integral with the pipe.
7. Use ductile iron fittings with pressure rating of 150 psi: ANSI/AWWA C110/A21.10 or ANSI/AWWA C153/A21.53.88.
   a. Lining per Part A.8 above.
8. Provide adaptor glands, gaskets, etc. as required to accommodate any differences in pipe and fitting dimensions.
9. Couplings: Ductile iron, Class 50, full length.
10. All PVC force main installations shall also include the installation of metallic tracer wire laid 6" above the pipe.

C. Detectable Safety Type:

1. Include on all force main installations.
2. Electronically or magnetically detectable.
3. Directly bury over the pipe 12" below the ground surface continuously.
4. At least 2" wide, green on top, and boldly labeled every 18" to 32" as follows "CAUTION SEWER LINE BURIED BELOW".
5. Tensile strength of not less than 4000 psi, a dart impact strength of not less than 120 grams per 1.5 mils, be not less than 0.0055" thick, and include sufficient metal to allow easy detection at the above stated depths.
6. Designed to last as long as the pipe it is installed over, even in adverse soils.

D. Tracer wire:

1. All wastewater force main installations, regardless of piping material, shall also include the installation of a locator wire.
2. The locator wire shall be taped to the top of the pipe with polyethylene tape during the pipe laying operation.
3. For wastewater mains, which are installed by the open-trench method, the locator wire shall be stranded 12-gauge copper with insulation rated UF or USE by Underwriter's Laboratories.
4. For wastewater mains, which are installed by a trenchless method (horizontal directional drilling or other), the locator wire shall be

stranded 10-gauge stainless steel with insulation rated UF or USE by Underwriter's Laboratories.

5. Underground splice connections shall be minimized and shall be rated for direct burial service.
6. Location of "dummy" valve boxes:
   a. The tracer wire shall be looped into "dummy" cast-iron water valve boxes (with caps labeled "SEWER" and painted white) installed at grade level, one being installed adjacent to the valve vault at the source pump station.
   b. Additional valve boxes shall be installed at intervals of no greater than every one thousand (1000') feet along the length of the force main (unless the main was installed by a trenchless method).
   c. A final valve box shall be installed at the discharge point of the force main, whether that be at a manhole or at a "tee" into another force main. The looped termination shall allow for the connection of an electronic locator transmitter.
7. Prior to acceptance of the wastewater force main by RCU, the Contractor shall demonstrate that the locator wire functions properly.
   a. The Contractor shall use one of several commercially available utility locating instruments to energize and trace the locator wire.
   b. When the wastewater force main is installed in the road shoulder, green-marking flags (pin flags) shall be installed along the length of the wastewater main at intervals of no greater than twenty (20') feet.
   c. Where the force main is installed under concrete or asphalt, green marking paint shall be used.
   d. Testing of the locator wire and installation of the marking flags shall be done prior to scheduling a final inspection of the wastewater system.

E. Polyethylene (PE) Pipe:

1. Use polyethylene (PE) pipe only for directional drilling under creeks or marsh crossings.
2. Comply with AWWA C-906, SDR 11 and working pressure of 160 psi minimum.
3. SDR high performance, high molecular weight, high density polyethylene pipe, and conform to ASTM D 1248 (Type III C, Category 5, P34).
4. Minimum cell classifications values - 345434C as referenced in ASTM D-3350 - latest edition.
5. The fittings supplied in this specification to be molded or manufactured from a polyethylene compound having a cell classification equal to or exceeding the compound used in the pipe.

F. Physical properties:

1. The pipe shall conform to the physical properties as described herein.
2. Typical pipe physical properties:

| Property | Test Method | Unit | Value |
|---|---|---|---|
| Density | ASTM Method | gms/cc | 0.955 |
| Melt Index | ASTM D-1238 (190/2.16) | gms/10 min | |

**Environmental Stress Cracking Resistance:**

| | | | |
|---|---|---|---|
| Condition A, B, & C, F-0 | ASTM D-1693 | hrs | >5000** |
| Compressed Ring, F-60 | ASTM F-1248 | hrs | >1500 |
| Tensile Strength, Yield Type IV Specimen | ASTM D-638 (2"/min) | psi | 3200 |
| Elongation at Break Type IV Specimen | ASTM D-638 (2"/min) | % | >750 |
| Victate Softening Temp | ASTM D-1525 | °F | 257 |
| Brittleness Temp | ASTM D-746 | °F | <-180 |
| Flexural Modulus | ASTM D-790 | psi | 135,000 |
| Modulus of Elasticity | ASTM D-638 | psi | 130,000 |
| Hardness | ASTM D-2240 | Shore D | 65 |
| Linear Thermal Expansion Coef. | ASTM D-696 | in./in./°F | 1.2x10-4 |
| Thermal Conductivity | Dynatech-Colora BTU, In./Thermoconductor ft./2hrs/°F | | 2.7 |

**Long Term Strength:**

| | | | |
|---|---|---|---|
| 73°F | ASTM D-2837 | psi | 1600 |
| UV Stabilizer | ASTM D-1603 | %C | 2.5 |
| Material Cell Classification | ASTM D-1248 | | 345434C |
| Material Description | PPI Recommendation | | PE 3408 |

G. Quality control:

1. Pipe manufacturer to supply pipe resin and fittings to ensure complete control of the pipe quality.
2. The pipe shall contain no recycled compound except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.
3. The pipe shall be homogenous throughout and free of visible cracks, holes, foreign inclusions, or other deleterious defects and shall be identical in color, density, melt index, and other physical properties.
4. Polyethylene resin:

a. All ingredients pre-compound prior to extrusion of pipe, in plant blending is not acceptable. Provide certification that the pipe produced is represented by the quality assurance testing.

b. Additionally, test results from manufacturer's testing or random sampling by RCU's representative that do not meet appropriate ASTM standards or manufacturer's representation, may be cause for rejection of pipe represented by the testing.

c. These tests may include density and flow rate measurements from samples taken at selected locations within the pipe wall and thermal stability determinations according to ASTM D 3350, 10.1.9.

d. Certified lab data may be requested to verify the physical properties of the materials supplied under this specification or may take random samples and have them tested by an independent laboratory.

5. RCU reserves the right to reject any polyethylene pipe and fittings failing to meet any of the requirements of this specification.

7.2.2 RESTRAINED JOINT PIPE AND FITTINGS

A. Provide where indicated on the plans and on all piping at each fitting, valve, and pipe joints to a minimum distance of 18' on each side of the fitting or valve for 12" piping and smaller and to a minimum distance of 36' on each side of the fitting for piping over 12" as a minimum.

B. Use the ductile iron pipe research association's (DIPRA) "Thrust Restraint Designed for Ductile Iron Pipe" procedure for calculating restrained joint lengths. See standard detail.

C. Provide for use with mechanical joint pipe and fittings.

D. Provide "MEGALUG" as manufactured by EBAA Iron Sales, Inc. of Eastland, Texas on all fittings.

E. Concrete thrust blocking can be used on a case-by-case basis as approved by Department.

F. Clearly mark the location and length of restrained joint pipe on the drawings at all points where the direction or cross-sectional area of the pipe changes as well as at all bends, reducers, offsets, tees, wyes and valves.

7.2.3 AIR RELEASE AND VACUUM VALVES

A. Provide combination air valve for sewage.

B. Maintain minimum 54" cover over force main at location of air valve.

C. The combination air valve shall be suitable for use at pressures up to 150

PSI.

D. The valve shall have Type 316 stainless steel body, cover and cover bolts with a NPT inlet and outlet connection. Valves shall have a Type 316 stainless steel float and a replaceable seat of Buna-N or other suitable material. Venting orifice and internal linkage mechanism shall be Type 316 stainless steel.

E. Valve size shall be 1" or 2" size as shown on the plans, both sizes to be supplied with 2" NPT pipeline connection.

F. Valve shall be supplied with flushing attachments consisting of 2" stainless steel inlet isolating ball valve, 1" stainless steel blow off ball valve and ½" stainless steel flushing ball valve and stainless steel pipe nipples and a 5' rubber hose with quick connect couplings. Provide 316 stainless steel ball ¼ turn valves with lever actuator by Apollo or approved equal.

G. Valves shall be GA Industries Figure 942SS-F.

H. Valve manhole:

a. Air release valves shall be enclosed in a 4' diameter precast manhole with a flat slab top as a minimum standard.

b. Manhole wall sections shall be coated with Raven Epoxy System #405, 120 mils nominal thickness.

c. Provide manhole frame and vented cover. See Details.

## 7.2.4 CASING, SPACERS AND END SEALS FOR UTILITIES

A. General:

1. Provide bore and jack with casing for pipes larger than 2". See detail.
2. Casing pipe to be 2" larger in diameter than the bell of the carrier pipe.
   a. Casing pipe to be a minimum of 2" larger than the largest outside diameter of the carrier pipe (joints and couplings) if the carrier pipe is less than 6" in diameter. If the diameter of the carrier pipe is 6" or larger, the diameter of the casing pipe shall be a minimum of 4" larger than the largest outside diameter of the carrier pipe (joints and couplings).
   b. The end of casing pipe to extend a minimum of six (6) feet from the edge of pavement/back of curb.
   c. The top of the casing pipe shall be a minimum of four (4) feet below the crown of the finished asphalt roadway.

d. The top of the casing pipe shall be a minimum of two (2) feet below the design invert of roadside drainage ditches and pipes.

B. Casing pipe for dry bores:

1. Steel complying with ASTM A139 for Grade B with minimum yield strength of 35,000 psi.
2. Provide ends suitable for field welding.
3. Minimum wall thickness as follows:

| Diameter of Casing (Inches) | Minimum Wall Thickness (Inches) |
|---|---|
| 6 thru 14 | ¼ |
| 16 and 18 | 5/16 |
| 20 and 22 | 3/8 |
| 24 and 26 | 7/16 |
| 28 thru 32 | ½ |
| 34 thru 42 | 9/16 |
| 44 thru 48 | 5/8 |
| 50 thru 54 | ¾ |

C. Pipeline casing spacers:

1. Provide pipeline casing spacers for piping installed in casing.
2. Provide a minimum of one spacer per ten linear feet of pipe for DIP pipe and one spacer per six linear feet of pipe for PVC pipe.
3. Provide spacer with shell of 14 gauge Type 316 stainless steel.
4. Provide shell liner of .090" thick PVC, 85-90 durometer.
5. Provide 5/16" stainless steel connecting bolts and lock nuts, minimum three (3) per flange.
6. Runners from 2" wide ultra high molecular weight polymer with a high resistance to abrasion and a coefficient of friction of 0.11-0.13 in accordance with ASTM D-1894.
7. Support runners on 14 gauge reinforced Type 316 stainless steel risers welded to shell.
8. All metal surfaces to be fully passivated.
9. The diameter as measured over the runners shall exceed the pipeline bell or coupling outside diameter.
10. Acceptable product: Cascade Manufacturing or approved equal.

D. End seals: Grout each end of the casing with concrete brick or Type II concrete.

E. All carrier pipe shall be restrained joint DIP.

## PART 7.3 - EXECUTION

### 7.3.1 HANDLING OF MATERIALS

A. Handle pipe so as to ensure delivery to the trench in sound, undamaged condition:

1. Carry pipe into position - do not drag.
2. Use pinch bars or tongs for aligning or turning the pipe only on the bare end of the pipe.
3. Use care not to injure pipe linings.

B. Thoroughly clean interior of pipe and accessories before lowering pipe into trench. Keep clean during layout operations by plugging or other approved method.

C. Before installation, inspect each piece of pipe and each fitting for defects:

1. Replace material found to be defective before or after laying with sound material meeting the specified requirements.

D. Rubber gaskets: Store in a cool dark place until just prior to time of installation.

### 7.3.2 PIPE CUTTING

A. Cut pipe neatly and bevel pipe end without damage to the pipe.

B. Unless otherwise recommended by the pipe manufacturer, cut pipe with mechanical cutter only.

1. Use wheel cutters when practicable.
2. Cut plastic pipe square and remove all burrs.

### 7.3.3 LOCATING

A. Rough grading shall be done prior to installation of wastewater mains.

B. Sewer lines in relation to water lines must conform to "Ten State Standards".

C. Where possible, locate sewer pipe at least ten (10) feet away, horizontally, from water lines. Measure distances from edge to edge.

D. Should ten (10) foot separation not be practical, then the sewer pipe may be located closer provided:

1. It is laid in a separate trench.

2. It is laid in the same trench with the water main located at one side on a bench of undisturbed earth.
3. In either of the above cases, crown elevation of the sewer shall be at least 18" below invert elevation of water line.

E. Where water lines cross over, maintain 18" minimum clearance between crown of sewer and invert of water lines.

F. Where sewer lines cross over water mains, the sewer main shall transition to ductile iron pipe. A full length of ductile iron pipe shall be installed in the sewer main centered so that each joint is equidistant from the water main. Joint of ductile iron pipe water main shall also be installed so that each joint is equidistant from the ductile iron pipe section of the sewer main.

G. When it is impossible to obtain proper horizontal and vertical separation as stipulated above, the sewer shall be designed and constructed equal to water pressure pipe, and shall be pressure tested to assure water tightness prior to backfilling.

H. Interconnections:

1. There shall be no physical connections between a public or private potable water supply system and a sewer, or appurtenances thereto which would permit the passage of any sewage or polluted water into the potable supply. No water pipe shall pass through or come in contact with any part of a sewer manhole.
2. Storm drains shall not be connected to sanitary sewer.

I. Relation to Water Works Structures:

1. While no general statement can be made to cover all conditions, it is generally recognized that sewers shall meet the requirements of the appropriate reviewing agency with respect to minimum distances from public water supply wells or other water supply sources and structures.

### 7.3.4 ALIGNMENT OF PIPE

A. Pipe lines intended to be straight shall be so laid.

B. Where vertical or horizontal alignment requires deflection from straight lines or grade, do not exceed 75% of maximum deflection recommended by the pipe manufacturer.

C. If alignment requires deflection exceeding recommended limits, furnish bends to provide angular deflections within the allowable limits.

D. Thrust blocking or restraint joints shall be provided at all changes in alignment greater than or equal to 30 degrees.

7.3.5 PLACING AND LAYING

A. General:

1. Lower pipe and accessories into trench by means of derrick, ropes, belt slings, or other equipment approved by the manufacturer.
2. Do not dump or drop any of the materials into the trench.
3. Except where necessary in making connections to other lines, lay pipe with the bells facing in the direction of laying.
4. Rest the full length of each section of pipe solidly on the pipe bed, with recesses excavated to accommodate bells, couplings, and joints.
5. Take up and relay pipe that has the grade or joint disturbed after laying.
6. Do not lay pipe in water, or when trench conditions are unsuitable for the work; keep water out of the trench until jointing is completed.
7. Securely close open ends of pipe, fittings, and valves when work is not in progress.
8. Replace pipe where any part of lining is damaged.
9. Lay pipe to the grades indicated on the plans. Avoid excessive high points in the force main.
10. Where soils are unsuitable, pipe shall be laid in a full bed of crushed stone (ASTM C33, Gradation 57), see standard detail.
10. After each line of pipe has been laid, it shall be carefully inspected and all earth, trash, rags, and other foreign matter removed from the interior.
11. Each joint shall be laid so that it will form a close concentric joint with adjoining pipe and so as to avoid sudden offsets.
12. All jointing of pipe and fittings shall be in accordance with the pipe manufacturer's recommendations.
13. Any leaks or defects discovered at any time after completion of the work shall be repaired immediately. All pipe in place shall be carefully protected from damage until the backfilling operations have been completed.
14. Water shall not be allowed to run through the pipe or stand in the trench.

B. Ductile iron pipe:

1. Mechanical and push on joints, install in accordance with ANSI/AWWA C600.
2. Gaskets: Handle, lubricate where necessary and install in strict accordance with manufacturer's recommendations.

C. Plastic pipe:

1. Install in accordance with ASTM D-2321, latest revision.
2. Clean gasket, bell or coupling interior, especially groove area.
3. Lubricate gasket as recommended by manufacturer.
4. Align spigot to bell, insert spigot into bell until it contacts gasket uniformly.
5. Use manufactures approved leverage bar to bell pipe.
   a. Home line is to be clearly visible when pipe is joined.

D. Restrained joints:

1. Install in accordance with manufacturer's instructions.
2. Tighten set screws to the manufacturer's rated torque using a torque wrench.
   a. If twist-off nuts are provided, tighten screws until nut breaks loose.

## 7.3.6 INSTALLATION OF AIR RELEASE VALVES

A. Compact backfill thoroughly over pressure sewer.

B. Set valve plumb, use a 316 stainless steel nipple between pressure sewer and valve.

C. Install manhole wall sections plumb and level.

D. PVC force mains 6" and larger: Install air release valve using 316 stainless steel tapping sleeve.

E. DIP force mains 6" and larger: Install air release valve using 4" boss.

F. All force mains smaller than 6": Install air release valve using 316 stainless steel tapping saddle.

G. Install gravel drainage bed.

H. Install manhole wall sections plumb and level. Manhole wall sections shall be coated with Raven Epoxy System #405, 120 mils nominal thickness.

## 7.3.7 INSPECTIONS AND TESTING

A. RCU requires that all sanitary sewer systems pass the following test prior to acceptance (notify RCU 72 hours before inspections):

1. Soil Compaction Test

a. All trenches suspected of not meeting the compaction requirements stated previously shall be tested for conformance by a Department approved testing lab and at the locations and depths requested by RCU.

2. Pressure Test:
   a. Expel all air from force main prior to testing.
   b. All force mains shall successfully pass a pressure test of one and one half times working pressure, but in no case less than 100 psi. The pressure test is to hold for two (2) hours.
   c. The following AWWA formula of allowable pressure loss will determine if a force main is acceptable:

$$L = SD\frac{\sqrt{P}}{133200}$$

where;

L = Allowable Leakage in gal/hr
S = Length of Pipe Tested in feet
D = Nominal Diameter in inches
P = Average Test Pressure in psig

   d. Satisfy leakage test in accordance with AWWA C-600 (DIP) or AWWA C-605 (PVC).

7.3.8 INSTALLATION OF CASING, SPACERS, AND END SEALS

A. Locate to avoid interference with traffic, adjacent structures, etc. to such extent possible.

B. Excavate to required depth, providing sheeting and shoring necessary for protection of the work and for safety of personnel.

C. Maintain entry pits in dry condition by use of pumps, drains or other approved method.

D. Install casings by dry-boring through the casing while simultaneously jacking the casing.

E. Any proposed alternate method shall be approved in writing by the RCU.

F. Continuously weld joints of casing pipe to insure a watertight joint. Provide a bore pit of sufficient size to accommodate the required length of assembled casing necessary to insure that at no time the end of the casing comes to a

rest under the pavement during the boring and jacking operation. No welding of steel casing under pavement.

G. Installing pipe in casing:

1. Pipe shall be restrained joint DIP through entire length of carrier pipe.
2. Inspect carefully, insuring that all foreign material is removed from the casing and the casing meets alignment criteria for the type of carrier pipe being used.
3. For pressure systems, the casing deflection shall not exceed the maximum deflection recommended by the carrier pipe.
4. Install casing spacers on the carrier pipe per the manufacturer's instructions.
5. For sanitary sewer provide spacer sizing and length necessary to obtain the pipe slope and elevations indicated on the plans.
4. Provide centered or restrained configuration.
5. Install the carrier pipe in the casing insuring each joint is pushed "home" before the joint is installed into the casing.

H. Grout each end of the casing with concrete brick or Type II concrete.

## 7.3.9 TRENCH EXCAVATION

A. This section of the guidelines is provided to outline most types of laying conditions, but is not intended to cover all special laying conditions or RCU's special requirements.

1. Trench excavation shall be made in open cut and true to the lines and grades shown on the plans, unless boring is necessary or required. Banks of the trenches shall be cut in vertical, parallel planes equidistant from the pipe center line. The horizontal distance between such planes, or the overall width of trench, shall vary with the size of the pipe to be installed. The overall width of trench shall be as recommended by the manufacturer. When vertical banks for trench excavation are not practical to construct or create dangerous conditions to workmen, the banks may be sloped provided that such excavation does not damage adjacent structures. When trench banks are sloped, such banks shall be cut to vertical planes as specified above for that part of the ditch below the level of 12" above the top of the pipeline. The bottom of the trench shall be level in cross section and shall be cut true to the required grade of the pipe and pipe embedment materials.
2. Excavate bell holes for bell-and-spigot pipe at proper intervals so that the barrel of the pipe will rest for its entire length upon the bottom of the trench. Bell holes shall be large enough to permit proper installation of joints in the pipe.

3. When muck, quicksand, soft clay, swampy or other material unsuitable for foundations or sub-grade are encountered, remove and replace such material with crushed stone.
4. After excavation, the area between the final pipe grade and the trench soil bottom shall be filled with crushed stone materials as required, compacted to proper grade, and made ready for pipe laying.
5. Remove debris encountered in trench excavation for sewers and other pipelines for the overall width of trench which shall be as shown on the plans. Remove to a depth of 6" below the bottom of the pipe for pipes smaller than 24" in size; 8" below the bottom of the pipe for pipes 24" to 36" in size; and 12" below the bottom of the pipe for pipes larger than 36" in size, if debris extends to such depth.
6. In all cases, place materials deposited so that in the event of rain, no damage will result to the work.
7. Sufficiently sheet, shore and brace the sides of all excavations whenever necessary to prevent slides, cave-ins, settlements or movement of the banks and to maintain the excavation clear of obstructions. Wood or steel sheet piling of ample design and type shall have sufficient strength and rigidity to withstand the pressures exerted and to maintain the walls of the excavation properly in place and protect all persons and property from injury or damage. Sheeting, shoring or bracing materials shall not be left in place unless as shown by the plans or permitted by RCU. All trench sheeting and bracing shall be left in place until the trench has been backfilled one foot above the top of the pipe.
8. Comply with OSHA guidelines.

7.3.10 TRENCH BACKFILL

A. The backfilling of pipeline trenches shall be started immediately after the pipe work has been inspected. The initial backfill material, placed to a height of one (1) foot above the top of the pipe, shall consist of approved backfill material free from organic matter and deleterious substances, containing no rocks or lumps over 2" in any dimension.

1. It shall be carefully placed and compacted through compaction of entire area backfilled.
2. Backfill shall be deposited in 6" layers (before compaction) and thoroughly compacted with power tools to 95% of theoretical maximum density, modified Proctor ASTM-D-1557.

B. Where trenches are not under pavement, sidewalks, or in alleys, the backfill material above pipe zone shall be compacted to a sufficient density to prevent settlement. Any deficiency in backfilling the trenches, or depressions caused by settlement, shall be repaired.

C. Where pipe trenches are cut across or along pavement, backfill trenches with select fill material placed and compacted in 6" lifts. Replacement of road base and asphalt shall be in accordance with South Carolina Department of Transportation (SCDOT) regulations.

D. Backfilling around structures shall be done in the manner specified above for pipe trenches by power tamping for the full depth of cut from the bottom of the finished grade. Where pipe trenches are cut across or along pavement, the trenches shall be backfilled as follows:

1. Backfill for shallow cuts (three (3) feet and less) under paved roadway shall be 100% flowable fill.
2. Backfill for deep cuts (over three (3) feet) under paved roadway may be class II backfill placed and compacted in 6" lifts to a point three (3) feet below the top of existing asphalt and then 100% flowable fill to the top of the subgrade.
3. Pavement Cuts: Cut all bitumastic and concrete pavements, regardless of thickness, prior to excavation of the trenches as specified in the South Carolina Department of Transportation Policy.
   a. Width of the pavement cut lines shall be one (1) foot past the edges of the trench at ground surface.
   b. Pavement cut lines shall be parallel and even. Any ragged or uneven cuts shall be cut smooth and straight before patching.
4. Curbs and gutters and sidewalks shall be removed and replaced from joint to joint.
5. Pavement, concrete, and other unsuitable materials removed shall be hauled from the site and not used for trench backfill.
6. Replacement of road base and asphalt shall be in accordance with South Carolina Department of Transportation (SCDOT) regulations.

E. All backfilling shall be done in such a manner as will not disturb or injure the pipe or structure over or against which it is being placed. Any pipe or structure injured, damaged or moved from its proper line or grade during backfilling operations shall be uncovered, repaired, and then re-backfilled as herein specified.

## 7.3.11 MEASUREMENT AND PAYMENT

A. Work under this section will be measured and paid for as specified below. Wherever units of measure, i.e., lineal feet, each, and similar units of measurement are mentioned in the proposal, it shall be interpreted to mean the unit installed in accordance with the plans and specifications, and ready for use.

B. Sewer Pipe - Sewer pipe will be measured from center of pipe and depth of cut from invert to original ground line at centerline. The original ground line will be determined immediately prior to the beginning of trench excavation. It

is the Contractor's responsibility to notify RCU 24 hours in advance so that measurements can be made.

1. Ductile Iron Sewers - Where ductile iron pipe is shown, payment will be made at the unit bid price per lineal foot and shall include all necessary materials, tools and equipment necessary to install and grout the cast iron carrier pipe inside the casing. The unit bid price does not include the casing pipe. Payment will be made at the unit prices per lineal foot as stated in the proposal for the type of pipe specified and shall include cost of excavation, bedding, backfilling, cleanup, testing, etc.
2. PVC Sewers - Where PVC pipe is shown, payment will be made at the unit bid price per lineal foot and shall include all necessary materials, tools and equipment necessary to install and grout the cast iron carrier pipe inside the casing. The unit bid price does not include the casing pipe. Payment will be made at the unit prices per lineal foot as stated in the proposal for the type of pipe specified and shall include cost of excavation, bedding, backfilling, cleanup, testing, etc.
3. Steel Casing Pipe - The payable boring footage will be the distance shown on the plans or as specified by RCU. The unit bid price per lineal foot of STEEL CASING PIPE shall include all labor, materials, tools, and equipment necessary to install the casing.

C. Tunnel - TUNNEL will be paid for at the unit prices bid per lineal foot for TUNNEL for the various type and sizes for the actual length of tunnel work as shown on the plans. Payment shall include all labor, materials and equipment necessary to construct the tunnel, complete in place, including excavation and backfill, shoring and bracing, furnishing and laying casing pipe where required and all other work necessary for a complete installation. Unit bid price does not include the carrier pipe.

D. Concrete Cradle - Measurement shall be made along the centerline of the pipe and the pay quantity shall be determined per Standard Detail. Payment for furnishing CONCRETE CRADLE shall be made at the contract unit price per cubic yard for CONCRETE CRADLE. The contract price for CONCRETE CRADLE shall also include the cost of removing and disposing of the material replaced by the CONCRETE CRADLE. Unit price does not include the pipe.

E. Concrete Encasement - Measurement shall be made along the centerline of the pipe and the pay quantity shall be determined per Standard Detail. Payment for furnishing CONCRETE ENCASEMENT will be at the unit price per cubic yard of class of concrete stated in the proposal, such price to be paid in addition to that paid per foot of sewer for the various depths encountered. The unit price stated in the proposal shall include the cost of additional depth of excavation, the furnishing and placing of concrete and laying of pipe to line and grade on bricks. See Standard Detail.

F. Granular Cradle - Measurement of GRANULAR CRADLE shall be made by the cubic yard in place, based on the quantities per lineal foot for the respective size of conduit, as shown on Standard Detail. Payment for GRANULAR CRADLE shall be made at the contract unit price per cubic yard for the type of GRANULAR CRADLE used. The contract unit price for GRANULAR CRADLE shall also include the cost of removing and disposing of the materials replaced by the GRANULAR CRADLE. When ordered by RCU, payment for additional depth of GRANULAR CRADLE shall be made at the contract unit price per cubic yard for GRANULAR CRADLE measured in place.

G. Selected Granular Backfill - Measurement shall be made along the centerline of the pipe and the pay quantity shall be determined from Standard Detail. Payment shall be made at the contract unit price per cubic yard for SELECTED GRANULAR BACKFILL. SELECTED GRANULAR BACKFILL in excess of the maximum quantity as herein specified shall be furnished and placed by the Contractor at his own expense.

H. Crushed Stone - CRUSHED STONE, to be used in stabilizing the bottom of trenches, etc., will be measured and paid for per ton at the unit priced bid by the Contractor for CRUSHED STONE, which price shall include the material and the labor incident to the placing of the stone and any additional extra depth of trench or excavation necessary to accommodate the CRUSHED STONE.

I. Unclassified Excavation - UNCLASSIFIED EXCAVATION will not be paid for separately, the cost of which shall be included in the unit price for other items of work. When the removal of existing structures or materials is classified separately as a contract pay item, payment will be made in accordance with the contract price; otherwise such work will be considered as incidental work and will not be paid for directly, but its cost shall be included in the unit price for other items of work. In either case, such price or prices shall be full compensation for all labor, materials, tools, equipment and incidentals necessary to complete the work and in the case of pavement cut and removal, shall include the cost of the required permit for cutting pavement, unless cost of permit fees are included as a bid item in the proposal.

J. Exploratory Excavation - The cost of such excavation, where ordered by RCU, will be paid at the contract unit price per cubic yard for "EXPLORATORY EXCAVATION".

K. Rock Excavation - Where ROCK EXCAVATION is to be measured for payment, quantities will be determined by RCU. Rock required to be removed shall be computed by the cubic yard. Dimensions for pay purposes shall be the difference in elevation between the top and bottom of the rock as determined by RCU and the specified ditch width for the pipe size being laid. Where rock is encountered in the bottom of the trench, the maximum depth

for payment purposes will be six (6) inches below the bottom of the pipe. Payment shall be made at the contract unit price per cubic yard for ROCK EXCAVATION. These prices shall be full compensation for furnishing all materials, for all preparation and excavation of rock, for backfilling the excavated trench to the bottom of the pipe with selected backfill material, and for all labor, equipment, tools and incidentals necessary to complete the item.

L. Remove and Replace Paving - Where excavation in pavement is required the work will be paid for at the unit bid price per lineal foot for REMOVE AND REPLACE PAVEMENT and shall be measured along the centerline of construction. Extra width will not be measured for payment. The unit bid price for this item includes all labor, tools, equipment and materials necessary to complete the work. The unit bid price shall also include the cost of using flowable fill as backfill material and/or compaction to 95% maximum density as determined by AASHTO T-99 procedures. All compaction testing shall be certified by an approved laboratory. The unit bid price shall also include the cost of removing all paving materials which are not suitable for backfilling the trench from the job. There will be no extra payment for any of the above work, the cost of which shall be included in the unit bid price for "Remove and Replace Paving".

M. Remove and Replace Asphalt Drive and Remove and Replace Concrete Drive - This work will be paid for at the unit bid price per lineal foot for REMOVE AND REPLACE ASPHALT DRIVEWAY or REMOVE AND REPLACE CONCRETE DRIVE. Measurement for payment will be along the centerline of construction. Extra width will not be measured for payment.The unit price bid for this item shall include all labor, tools, equipment and materials necessary to accomplish the work and shall include the cost of removing all paving materials which are not suitable for backfill in the trench from the job.

N. Resurface Existing Pavement - Payment for RESURFACING EXISTING PAVEMENT will be made at the unit bid price per square yard in accordance with field measurements of area made by RCU. The Contractor shall furnish RCU all asphalt weight tickets at the time the work is accomplished. The computed yield, arrived at by dividing the weight of asphalt used by the measured area shall be a minimum of 150 pounds per square yard. In those areas where the work is acceptable to the State Department of Public Transportation, yet the computed yield is less than 150 pounds per square yard, payment will be made for the item in direct ratio of the square of the actual yield to the square of 150 pounds per square yard.

O. P C Concrete Sidewalk - Concrete sidewalk shall be measured for payment based on the amount of sidewalk ordered removed and replaced by RCU. The width used for computing quantities shall be the actual width of the

sidewalk unless specified otherwise by RCU. The unit bid price per square foot for this item will be complete payment for the above work.

P. Sheeting and Bracing - Payment for SHEETING AND BRACING, except when ordered left in place, and all other work incidental to SHEETING AND BRACING, shall not be made separately unless specified or as shown on the plans or as directed by RCU, but shall be included in the contract price for other items.

1. Payment for timber sheeting ordered left in place shall be made at the contract unit price per 1,000 board feet of TIMBER SHEETING LEFT IN PLACE.

2. Payment for STEEL SHEET PILING when specified shall be made at the contract unit price per square foot for STEEL SHEET PILING.

3. Payment for STEEL SHEET PILING ordered left in place shall be made at the contract unit price per square foot for STEEL SHEET PILING LEFT IN PLACE.

Q. Sodding, Fertilizing and Seeding - Measurement of surfaces to be sodded or seeded shall be made of the area within the rights-of-way designated by RCU for restoration. Payments shall be made at the contract unit bid price to the nearest one-tenth (0.10) acre, for FERTILIZING AND SEEDING of class specified. The cost of restoring areas beyond the right-of-way, designated by RCU, shall be borne by the Contractor.

R. Connections to Other Sewers or to Appurtenances - The lump sum price for making connections to other sanitary sewers and appurtenances shall be full compensation for removing, repairing and/or replacing pipe and/or structures and shall be full compensation for the completed work in place including all materials, labor, tools and equipment.

END OF SECTION

# TAB - 8

## SECTION 8

## CONTROL OF FATS, OILS AND GREASE

### 8.1 General

In an effort to curb overflows from grease accumulation in its sanitary sewer mains, the County Council adopts this Fats, Oils and Grease Control section. Any industrial, commercial or non-residential facility connected to the sanitary sewer collection and treatment system involved in the preparation or serving of foods and other establishments with the potential to discharge fats, oils and greases will be subject to the conditions of this Section.

The purpose of this Section is to aid in the prevention of sanitary sewer blockages and obstructions from contributions and accumulation of fats, oils, and greases into the sanitary sewer system from industrial or commercial establishments, particularly food preparation and serving facilities.

In addition to the control of fats, oils, and grease each user shall take appropriate steps to prevent the discharge of petroleum oil, non-biodegradable cutting oil, or products of mineral oil origin; including, but not limited to fuel oil; sludge; oil refuse; oil mixed with wastes other than dredged spoil; fats, oils or greases of animal, fish, or marine mammal origin; vegetable oils, including oil from seeds, nuts, fruits, or kernels; and other oils and greases, including synthetic oils and mineral oils in amounts that will cause interference or pass-through of the sewer collection and/or treatment systems.

### 8.2 Definitions.

*Chain of custody:* a multi-part form approved by Richland County Utilities such as a manifest which documents the collection, transportation, and delivery of a sample(s), usually from the point of sample collection to delivery at a testing laboratory. The form shall document a description of the sample, who collected it, where it was collected from, and what time the sample was collected. Each time the sample(s) is transferred to another person, the time and date shall be noted along with the name of the receiving party such that any and all persons having custody of the sample(s) at one time or another can be specifically identified.

*County:* The governing body of the County of Richland, South Carolina and its Administration; its political subdivision, and/or its geographical area.

*Fats, oils, and greases (FOG):* Organic polar compounds derived from animal and/or plant sources that contain multiple carbon chain triglyceride molecules. These substances are detectable and measurable using analytical test procedures established in the United States Code of Federal Regulations 40 CFR 136, as may be amended from time to time. All are sometimes referred to herein as grease or greases.

*Food service establishments:* Those industrial, commercial or nonresidential establishments primarily engaged in activities of preparing, serving, or otherwise making food available for consumption by the public, such as restaurants, bars, private clubs, religious organizations, commercial kitchens, caterers, motels, hotels, schools, hospitals, cafeterias, prisons, correctional facilities, residential health care institutions, and other entities which may prepare food and have the potential to discharge grease to the sanitary sewer system. These establishments use one (1) or more of the following preparation activities: cooking by frying (all methods), baking (all methods), grilling, sautéing, rotisserie cooking, broiling (all methods), boiling, blanching, roasting, toasting, or poaching. Also included are infrared heating, searing, barbecuing, and any other food preparation activity that produces a hot, food by-product in or on a receptacle that requires washing. Those permanent facilities required to have a South Carolina Department of Health and Environmental Control food service license shall normally be included.

*Grease interceptor:* A structure or device designed for the purpose of removing and preventing fats, oils, and greases from entering the sanitary sewer collection system. These devices are often below-ground units in outside areas and are built as two- or three- chambered baffled tanks.

*Grease trap:* A device for separating and retaining waterborne greases and grease complexes prior to the wastewater exiting the trap and entering the sanitary sewer collection and treatment system. Such traps are typically compact under-the-sink units that are near food preparation areas.

*Minimum design capability:* The design features of a grease interceptor and its ability or volume required to effectively intercept and retain greases from grease-laden wastewaters discharged to the public sanitary sewer. All systems shall be designed such that no more than 100 mg/l of fats, oils, and/or grease shall be discharged to the public sewer system at any time.

*Neutralizing Device:* A tank or manufactured device installed to dilute or neutralize acids or corrosive liquids prior to discharge into collector lines. Such devices shall be automatically provided with a sufficient intake of diluting water or neutralizing medium, so as to make its contents non-injurious before being discharged into the collection system.

*Non-residential establishment:* A facility or business, having the potential to discharge FOGs and/or other oils and greases into the sanitary sewerage system, in which the primary purpose is not for the general inhabitance of persons, and may include food service establishments and other commercial or

industrial activities such as automotive repair facilities, machine shops, schools, car washes, and manufacturing facilities.

*Oil separator:* A device which serves to trap and retain oils or flammable liquid to prohibit the introduction into the sewer system by accident or otherwise.

*RCU:* Richland County Utilities, a department of the County of Richland providing water and sewer services.

*Sand separator:* A device which is designed to trap sand and other solids and prohibit entry into the sewer system and may operate in conjunction with or as a component of a grease interceptor or oil separator.

*SCDHEC:* South Carolina Department of Health and Environmental Control

*User :* Any person, including those located outside the jurisdictional limits of the County, who contributes, causes or permits the contribution or discharge of wastewater into a publicly owned treatment works (POTW), including persons who contribute such wastewater from mobile sources, such as those who discharge hauled wastewater.

**8.3 Wastewater discharge limitations.**

In addition to those items referenced in Section 8.1 generally, no user shall allow wastewater discharge from subject grease interceptor, grease trap, or alternative pretreatment technology to exceed one hundred (100) milligrams per liter of fats, oil and grease as measured by methods provided in 40 CFR 136.

**8.4 Food service establishment and non-residential users with potential to discharge FOGs; permit requirement.**

All food service and other establishments with the potential of discharging wastewater containing fats, oils and grease to the Richland County Utilities (RCU) sanitary sewer collection systems are to be permitted by the County and subject to the following requirements:

*1. Grease interceptor requirements*: All permitted food service and related establishments are required to install, operate, and maintain an approved type and adequately-sized grease interceptor necessary to maintain compliance with the objectives of the ordinance and related regulations. All grease interceptors must meet the requirements of the RCU standards in addition to County building codes and the latest addition of the International Plumbing Code as adopted by the South Carolina Building Codes Council.

*2. Implementation*: All new food service establishment facilities and other non-residential facilities with the potential to discharge FOGs and/or other greases and oils are subject to grease interceptor and/or oil/water separator requirements. All such facilities must obtain prior approval from RCU for grease

interceptor design and sizing prior to submitting plans for a building permit. The grease interceptor must provide for a minimum hydraulic retention time of twenty four (24) minutes at actual peak flow or twelve (12) minutes at the calculated theoretical peak flow rate as predicted by the International Plumbing Code fixture criteria, between the influent and effluent baffles with twenty (20) percent of the total volume of the grease interceptor being allowed for sludge to settle and accumulate, identified hereafter as the sludge pocket.

Existing facilities with planned modification in plumbing improvements or not in accordance with the ordinance or RCU Public Sewer & Water Regulations and Specifications standards will be required to provide plans to comply with the grease interceptor requirements. All existing establishments, determined by RCU to have a reasonable potential to adversely impact the County's sewer systems will be notified of their obligation and provided with a compliance schedule to install a grease interceptor and related appurtenances.

3. The construction and location criteria for grease Interceptors shall be in accordance with Environmental Protection Agency (EPA) Guidance Document, "On site Wastewater Treatment and Disposal Systems," Chapter 8.

4. Prior to placing the grease interceptor and/or grease trap into operation the owner of the establishment shall request an inspection and shall be approved by RCU.

5. *Variance to install a grease trap in lieu of grease interceptor:* Grease interceptors required under this ordinance shall be installed unless RCU authorizes the installation of an indoor grease trap or other alternative pretreatment technology and determines that the installation of a grease interceptor would not be feasible. The food service establishment bears the burden of demonstrating that the installation of a grease Interceptor is not feasible. If an establishment desires, because of documented space constraints, an alternative to an out-of-building grease interceptor, the request for an alternative grease trap or location shall contain the following information. In addition to general information the following information must be provided by the food service establishment:

a. Location of RCU sewer main and easement in relation to available exterior space outside building.

b. A schematic or plan of existing plumbing at or in a site that uses common plumbing for all services at that site.

c. Specific manufacturer literature on the proposed system.

d. Inability to pay for the required modifications shall not be deemed an acceptable reason for non-compliance.

## 8.5 Grease interceptor design requirements.

1. Grease interceptor sizing and installation must be approved by RCU. The grease interceptor must provide for a minimum hydraulic retention time of twenty-four (24) minutes at actual peak flow or twelve (12) minutes at the calculated theoretical peak flow rate as predicted by the International Plumbing Code fixture criteria, between the influent and effluent baffles with twenty (20) percent of the total volume of the grease interceptor being allowed for sludge to settle and accumulate, identified hereafter as the sludge pocket. No interceptor total volume shall be less than 1000 gallons. The grease interceptor shall have a minimum of two (2) compartments with fittings designed for grease retention.

2. Grease interceptors shall be installed at a location where they shall be easily accessible for inspection, cleaning, and removal of intercepted grease. The grease interceptor may not be installed in any part of the building where food is handled. Location of the grease interceptor must meet the approval of RCU, and may require approval of the County building official and/or SCDHEC.

3. All grease Interceptors, whether singular or in series, must be directly accessible from the surface and must be fitted with an extended outlet sanitary tee that terminates 6" to 12" above the tank floor. The minimum access opening dimensions shall be 18" x 18" or a minimum of 24" in diameter. Two (2) access openings (inlet and outlet) to underground traps are required and should be removable with ease by one person.

See typical detail for 1,000 gallon capacity trap in the detail section.

4. All below ground grease Interceptors must either be two-chambered or individual tanks in series. If two-chambered, the dividing wall must be equipped with an extended elbow or sanitary tee terminating 6" to 12" above the tank floor. An extended outlet sanitary tee must also be provided at the outlet of the second chamber. Both chambers must be directly accessible from the surface.

## 8.6 Grease interceptor Operation & Maintenance requirements.

1. All such grease interceptors shall be serviced and emptied of accumulated waste content as required in order to maintain minimum design capacity or effective volume. These devices should be inspected at least monthly. Users who are required to maintain a grease interceptor shall:

a. Maintenance of grease traps/interceptors must include thorough pump-out and/or cleaning as needed by removing any accumulated grease cap and sludge pocket as often as necessary, up to and including daily, but at intervals of not longer than ninety (90) days at the user's expense. Grease interceptors shall be kept free of inorganic solid materials such as grit, rocks, gravel, sand, eating utensils, cigarettes, shells, towels, rags, etc., which could settle into this pocket and thereby reduce the effective volume of the grease interceptor.

b. If any skimmed or pumped wastes or other materials removed from a grease interceptor are treated in any fashion on site and reintroduced back into the grease interceptor as an activity of and after said on-site treatment, the user shall be responsible for the attainment of the established grease numerical limit of 100 mg/l on all discharges of wastewater from said grease interceptor into the County sanitary sewer collection and treatment system.

c. Operate the grease interceptor in a manner so as to maintain said device such that attainment of the grease limit is consistently achieved. Consistent shall mean any wastewater sample taken from the effluent of said grease interceptor shall be equal to or less than the limit stated in Section 8.3 Wastewater discharge limitations.

d. The use of biological or enzyme additives as a grease degradation agent is conditionally permissible, upon written approval by RCU. Any establishment using this method of grease abatement shall maintain the trap or interceptor in such a manner that attainment of the grease wastewater discharge limit, as measured from the trap's outlet, is consistently achieved. Upon determination that any such products has caused interference with the County's collection and/or treatment systems the User shall be notified to immediately discontinue the use of any such products.

e. The use of automatic grease removal systems is conditionally permissible, upon prior written approval by the RCU. Any establishment using this equipment shall operate the system in such a manner that attainment of the grease wastewater discharge limit, as measured from the unit's outlet, is consistently achieved.

f. RCU reserves the right to make determinations of the grease interceptor adequacy and need, based on review of all relevant information regarding grease interceptor performance, facility site and building plan review and to require repairs to, or modification or replacement of such units.

g. In no case shall the total accumulation of grease, oil, floating materials, and sediment be allowed to occupy more than twenty-five percent (25%) of the capacity of the first stage of the grease interceptor.

h. If sampling test results for an establishment are more than twenty-five percent (25%) of the wastewater discharge limit, and the establishment does not have an approved extension to its cleaning schedule, the establishment shall immediately clean and inspect the trap and will be required to clean its grease interceptor(s) at an interval of thirty (30) days or less, for a period of time to be determined by RCU.

4. The user shall maintain a written record of trap maintenance for a minimum of three (3) years. All such records will be available for inspection by RCU at all reasonable times. RCU may require the submittal of any maintenance contracts, hauling manifests, and cleaning records. Records shall include at a minimum the date of service, estimated volume removed, person and/or

company performing the service, and the means and location of disposal. RCU reserves the right to observe any and all cleaning and maintenance activities whether performed by the user or a contracted operator.

5. Non grease-laden sources are not allowed to be connected to the sewer lines intended for grease interceptor service.

6. Access manholes, with a minimum diameter of twenty-four (24) inches, shall be provided over each chamber and sanitary tee. The access manholes shall extend at least to finished grade and be designed and maintained to prevent water inflow or infiltration. The manholes shall also have readily removable covers to facilitate inspection grease removal, and wastewater sampling activities.

**8.7 Grease trap requirements.**

1. Upon approval by RCU, a grease trap complying with the provisions of this section may be installed instead of a grease interceptor. The grease trap must be installed in the waste line leading from sinks, drains, and other fixtures or equipment in food service and other establishments where grease may be introduced into drainage or sewage system in quantities that can affect line stoppages or hinder sewage treatment or private sewage disposal.

2. Grease trap sizing and installation must be approved by RCU.

3. No grease trap shall be installed which has a stated flow rate of more than fifty-five (55) gallons per minute except when specifically approved by RCU.

4. Grease traps shall be maintained in efficient operating conditions by periodic removal of the accumulated grease in accordance with an established schedule. No such collected grease shall be introduced into any drainage piping or public sewer and shall be properly disposed or recycled in accordance with acceptable practices and all environmental regulations.

5. No food waste disposal unit or dishwasher shall be connected to or discharge into a grease trap.

6. Wastewater in excess of one hundred-forty degrees Fahrenheit (140° F / sixty degrees Celsius (60° C) shall not be discharged into a grease trap.

**8.8 Requests for cleaning schedule extension.**

An establishment may apply to RCU for an extension of the required cleaning frequency set forth in the ordinance. The representative of the establishment who wishes to apply for the cleaning schedule extension shall notify RCU in advance of the intent to apply for the extension. RCU may grant an extension on a required cleaning frequency on a case-by-case basis where the user has demonstrated, with defensible analytical results, the specific grease

interceptor or grease trap will produce an effluent in consistent compliance with the ordinance if such an extension is granted.

The notification of intent to apply for an extension shall include:

1. Facility information:

a. The name and address of the facility;

b. Name and telephone number of the facility contact;

c. Normal business hours; and

d. The type of business;

2. Treatment unit information:

a. The type of treatment unit and the capacity in gallons;

b. A brief description of the treatment unit;

c. The time(s) of day the greatest hydraulic and organic loadings to the treatment unit normally occur;

d. The date of the most recent cleaning and inspection of the unit;

e. A statement of the physical condition of the unit; and

f. Where applicable, the name of any treatment products used.

3. A proposed sampling schedule, including:

a. The date(s) the user proposes to collect the samples;

b. The times each sample will be collected;

c. The name and telephone number of the person who will collect the samples, including qualifications; and

d. The name and telephone number of the laboratory which will analyze the samples and its SCDHEC laboratory identification number;

4. Other information as may be requested by RCU.

The user shall obtain approval of the proposed sampling schedule prior to initiation of the sampling and analyses. The user shall certify the sampling schedule will be carried out as submitted or as approved. RCU shall reserve the right to modify a sampling schedule as deemed necessary. The user shall be required to provide analytical results for not less than three (3) oil and grease

analyses for samples collected during peak flow periods through the unit during the normal working hours of a twenty-four (24) hour period.

a. Samples shall be collected at an approved sampling port and shall be collected by a qualified person properly trained in the collection and handling of wastewater samples.

b. Samples shall be 45-60 days after the most recent cleaning.

c. Samples shall be analyzed, separately, by a reputable laboratory approved by SCDHEC using approved analytical procedures.

d. The user shall submit a written request for a cleaning schedule extension, including:

e. A copy of the cleaning and maintenance records for the treatment unit for the previous twelve months;

f. A copy of the laboratory analytical reports, including quality control data and appropriate chains of custody;

g. Incomplete or unverifiable results shall not be considered. RCU may grant extensions to the cleaning schedule as follows:

5. A thirty (30) day extension may be granted where the average oil and grease concentration of the analyses is less than 66% of the concentration limit and no single concentration exceeded 70% of the concentration limit.

6. A sixty (60) day extension may be granted where the average oil and grease concentration of the analyses is less than 50% of the concentration limit and no single concentration exceeded 60% of the concentration limit.

7. A ninety (90) day extension may be granted where the average oil and grease concentration of the analyses is less than 33% of the concentration limit and no single concentration exceeds 50% of the concentration limit.

8. In no case shall an extension greater than ninety (90) days be granted. Extensions granted shall begin on the date the samples for which results were submitted were collected as documented on the chain of custody. Where an extension has been granted, the unit shall consistently produce an effluent in compliance with the terms of this or other applicable Ordinance. RCU shall reserve the right to collect and analyze samples of any User's discharge and may revoke, without notice, any extension where RCU believes it is in the best interest of the proper protection and operation of its collection and treatment systems.

9. Where an extension has been granted and any sample analysis indicates an exceedance of the oil and grease limitation by twenty-five (25%) percent or more, the user shall immediately clean and inspect the trap and shall return to the

original cleaning schedule. Where the User has been required to return to an original cleaning frequency, the user shall be required to submit a new request for extension if desired.

10. Where an extension has been granted and any sample analysis indicates an exceedance of the oil and grease limitation of any magnitude by less than25%, the user shall immediately clean and inspect the trap and shall decrease the maximum time between cleanings by at least thirty (30) days.

11. Where an extension has been granted and RCU must clean associated public sewer lines and the stoppage is traceable to or known or suspected to be caused by the user's facility, the user shall immediately clean and inspect the trap and shall return to the original cleaning schedule. The user will be required to submit a new request for extension if desired.

### 8.9 Violation; penalties.

Any person, establishment or entity which fails to comply with any of the regulations and requirements set forth in this section, including, but not limited to, cleaning grease interceptors or grease traps at necessary intervals, providing up-to-date cleaning logs, or which refuses to open grease interceptors or grease traps for inspections by RCU inspectors or exceeds discharge limits, is in violation of the ordinance, and is subject to the following actions and penalties:

1. Notice of Violation: RCU shall serve or have served any person, establishment, or entity in violation of the ordinance with written notice stating the nature of the violation, and providing a reasonable time limit for satisfactory compliance. This shall not relieve the person, establishment, or entity of liability for any violations occurring before or after receipt of the notice of violation.

2. Compliance order: A compliance order is an order which directs the person, establishment, or entity to achieve or restore compliance by a particular date specified within the order. Terms need not be discussed with the person, establishment, or entity in advance.

3. Should the user discharge grease in violation of this Section or Ordinance, and the County initiated sewer system cleaning in order to restore a blockage or other malfunction of its collection or treatment systems, the individual, establishment, or entity responsible for causing the failure will be required to reimburse the County for actions taken to restore its systems. The cost of the cleaning plus a fifteen percent (15%) handling fee shall be added to the individual, establishment, or entity's sewer utility bill.

4. Termination of Services: Any user that violates this ordinance is subject to termination of sewer and/or water services. Such user will be notified of the proposed termination of its services and be offered an opportunity to show cause why the proposed action should not be taken.

5. Penalties: Any person, establishment, or entity who violates any portion of this Section of the Ordinance is guilty of a misdemeanor and is subject to a fine not to exceed five hundred ($500.00) dollars, with each day of violation or noncompliance to constitute a separate offense. In conjunction with fines, the County is entitled to pursue all other criminal and civil remedies to which it is entitled under authority of statutes or other ordinances against a person, establishment, or entity in violation of this Section. Remedies may include, but not be limited to publishing of the responsible party's name in the local media and/or notifying the SCDHEC.

# TAB - 9

# Section 9
# Sewer Pump Station
# Design and Specifications

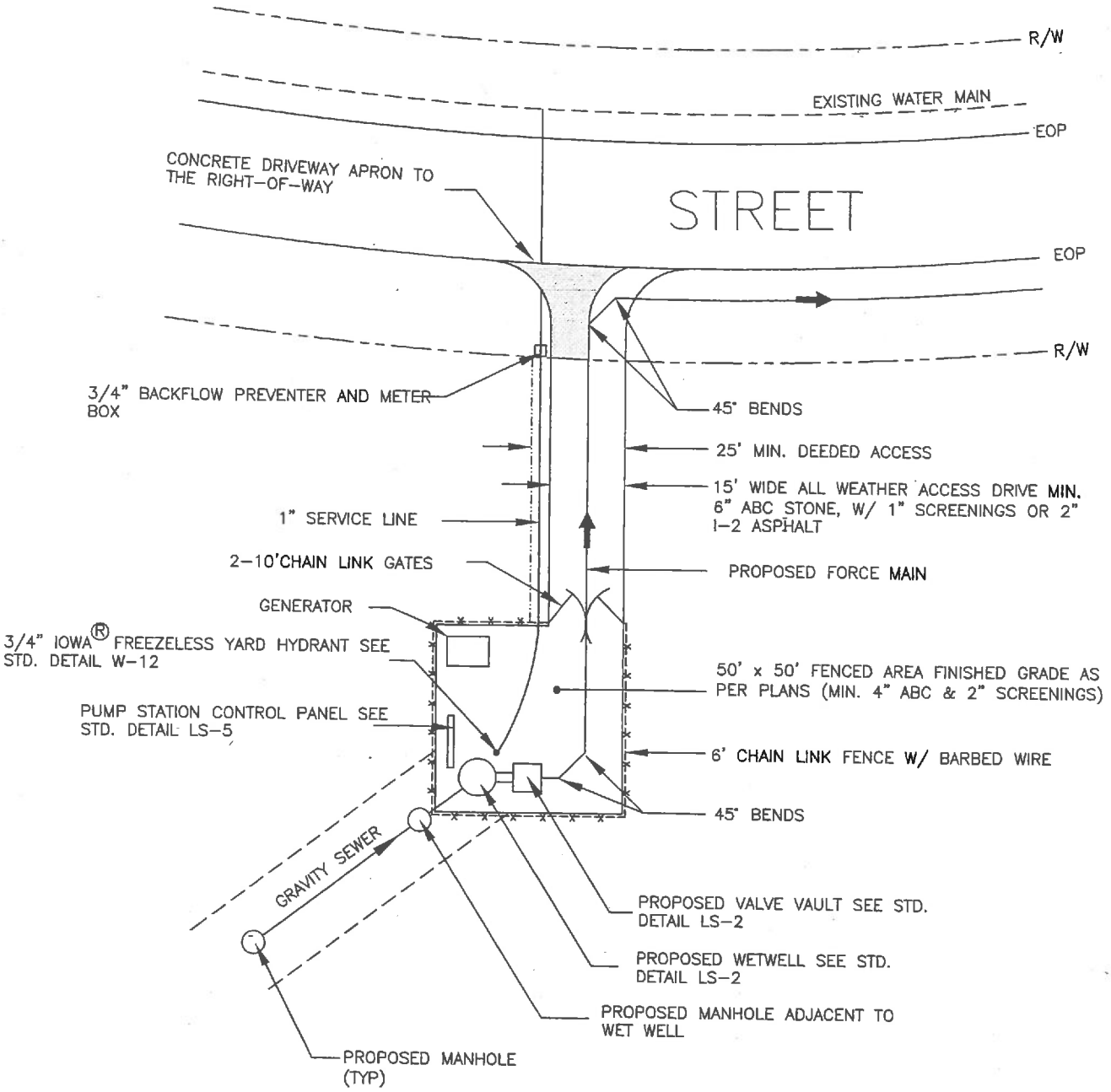
## 9.1 Sewer Pump Station Details

| | |
|---|---|
| PS 1.0 | Typical Site Layout |
| PS 2.0 | Top View/Plan View/Wetwell/Valve Vault |
| PS 3.0 | Wetwell – Section View |
| PS 4.0 | Valve Vault – Section View |
| PS 5.0 | Electrical Panel |
| PS 6.0 | General Notes |
| PS 7.0 | Standard Control Panel |

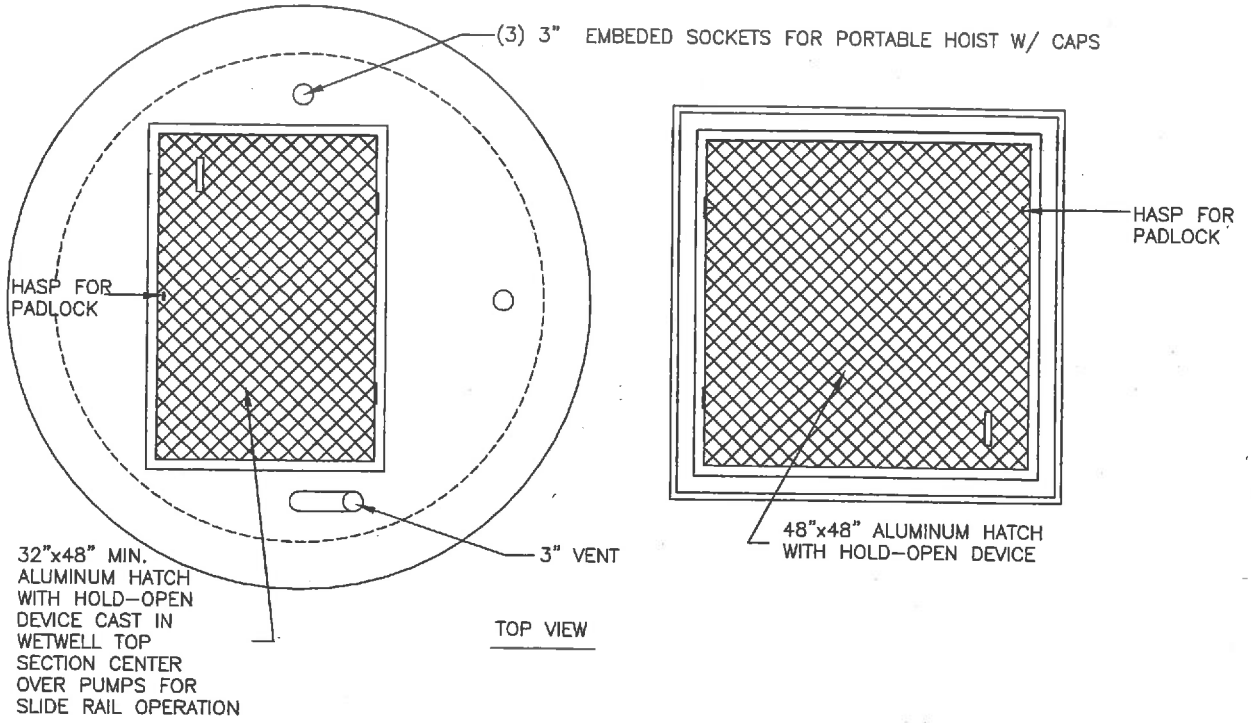
## 9.2 Generator Specifications

Specifications for Portable Standby Generator Sets
Specifications for Stationary Generator Sets

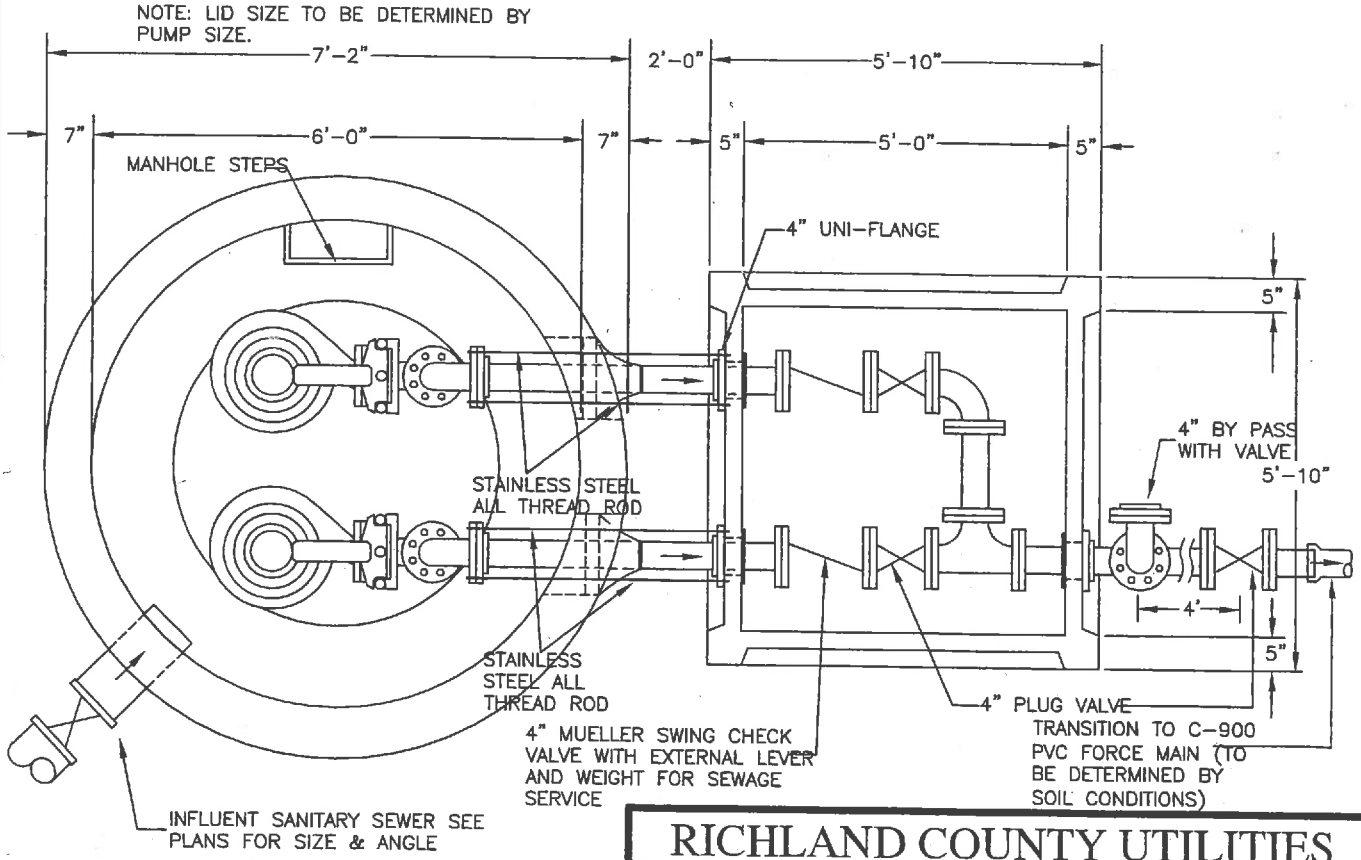
# 9.1
# Sewer Pump Station Details




| RICHLAND COUNTY UTILITIES | |
|---|---|
| PUMP STATION DETAILS: TYPICAL SITE LAYOUT | DRAWING: PS 1.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |



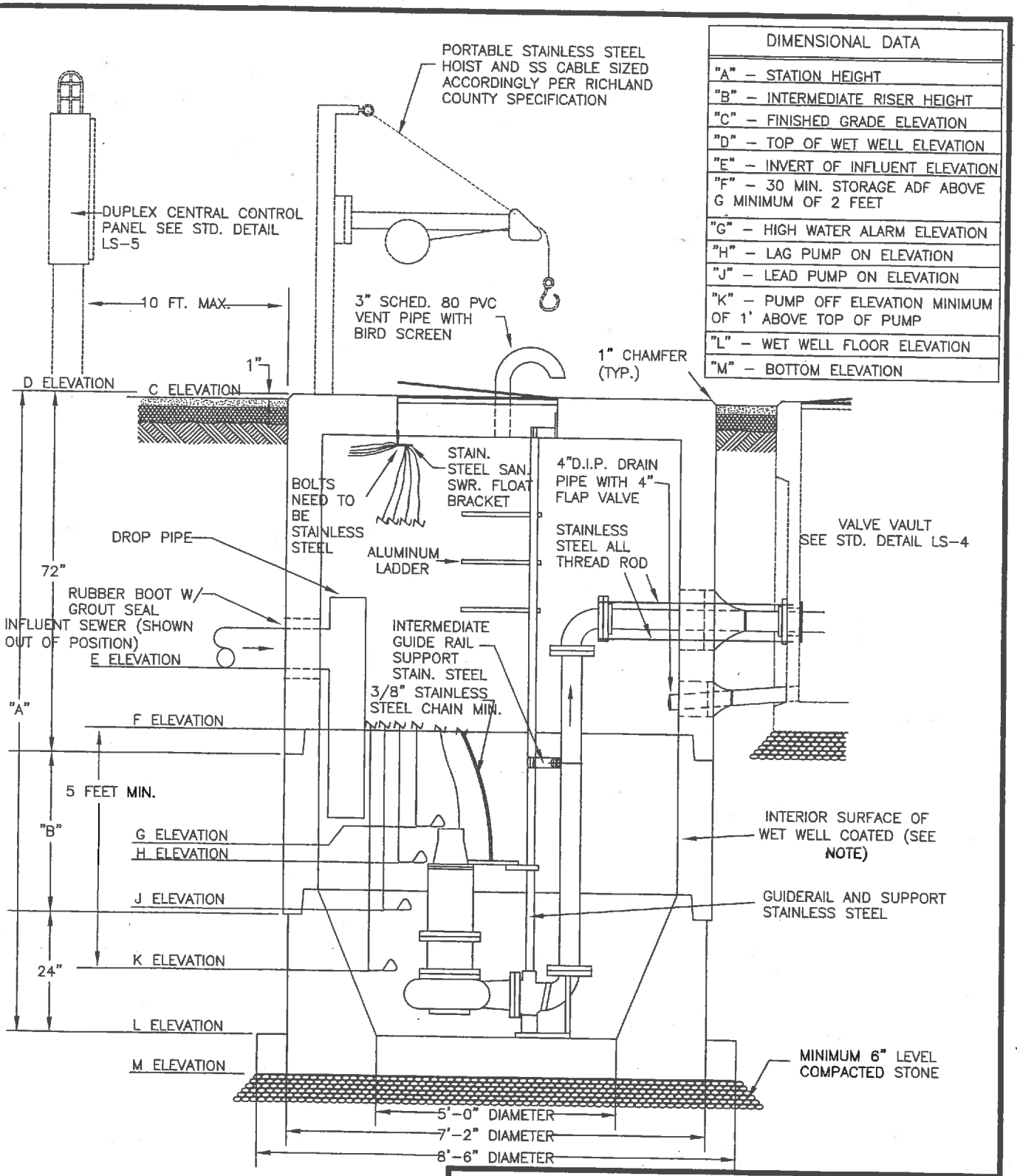

TOP VIEW




PLAN VIEW

# RICHLAND COUNTY UTILITIES

| PUMP STATION DETIALS: TOP VIEW/PLAN VIEW WETWELL/VAVLE VAULT | DRAWING: PS 2.0 |
|---|---|
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |



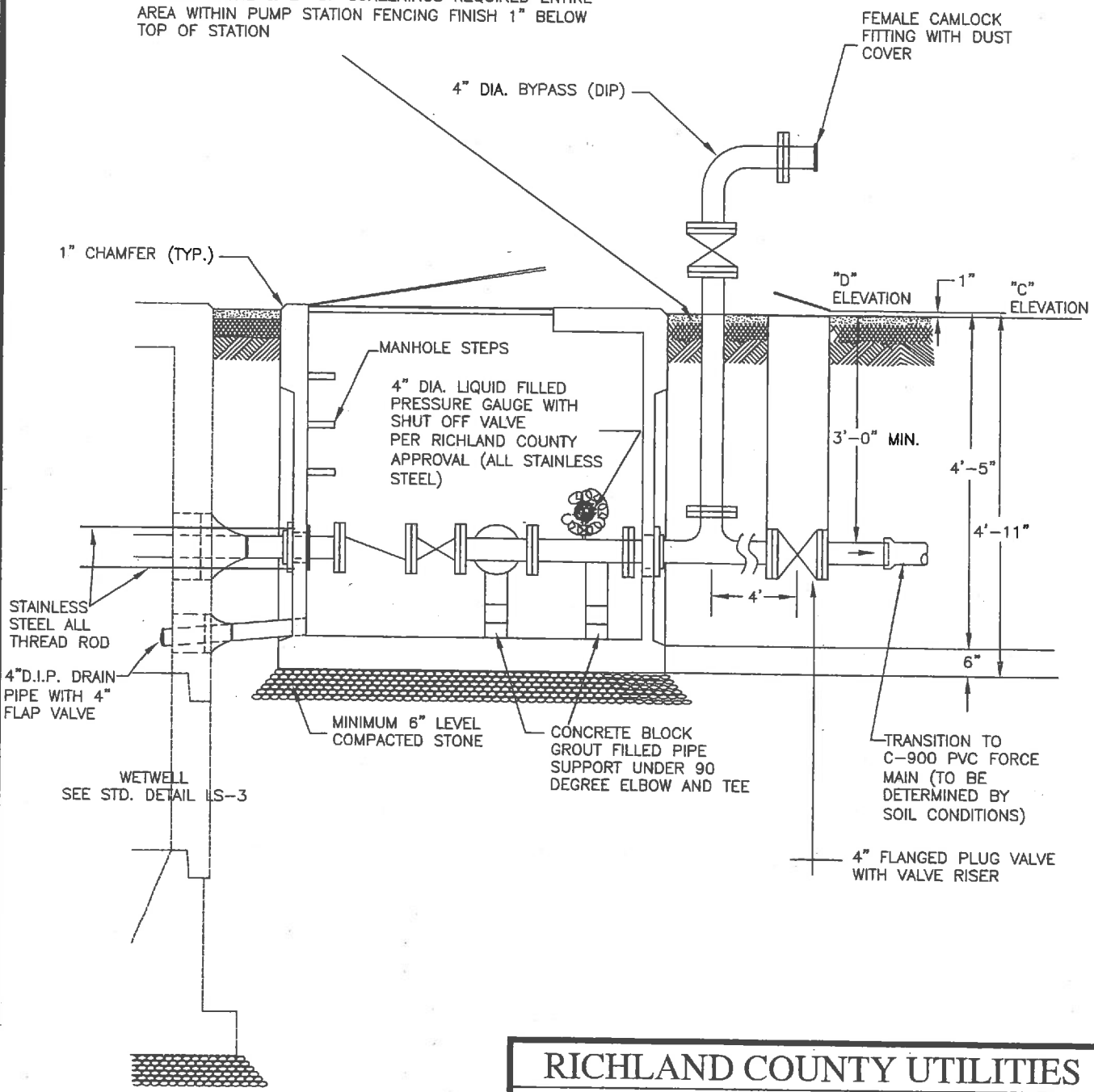

| DIMENSIONAL DATA |
|---|
| "A" – STATION HEIGHT |
| "B" – INTERMEDIATE RISER HEIGHT |
| "C" – FINISHED GRADE ELEVATION |
| "D" – TOP OF WET WELL ELEVATION |
| "E" – INVERT OF INFLUENT ELEVATION |
| "F" – 30 MIN. STORAGE ADF ABOVE G MINIMUM OF 2 FEET |
| "G" – HIGH WATER ALARM ELEVATION |
| "H" – LAG PUMP ON ELEVATION |
| "J" – LEAD PUMP ON ELEVATION |
| "K" – PUMP OFF ELEVATION MINIMUM OF 1' ABOVE TOP OF PUMP |
| "L" – WET WELL FLOOR ELEVATION |
| "M" – BOTTOM ELEVATION |

# RICHLAND COUNTY UTILITIES

| | |
|---|---|
| PUMP STATION DETAILS: WETWELL – SECTION VIEW | DRAWING: PS 3.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

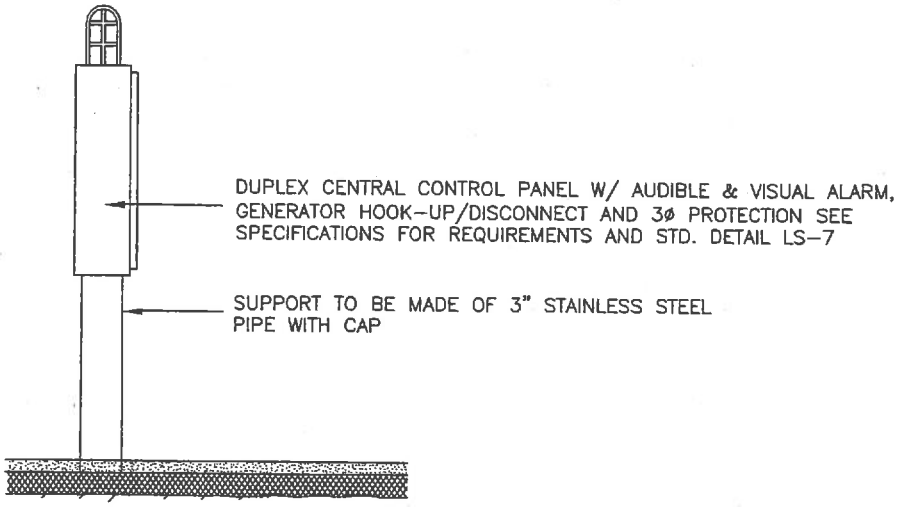
| DIMENSIONAL DATA |
| --- |
| "C" – FINISHED GRADE ELEVATION |
| "D" – TOP OF VALVE BOX ELEVATION |

NOTE:
4" ABC STONE & 2" OF SCREENINGS REQUIRED ENTIRE AREA WITHIN PUMP STATION FENCING FINISH 1" BELOW TOP OF STATION

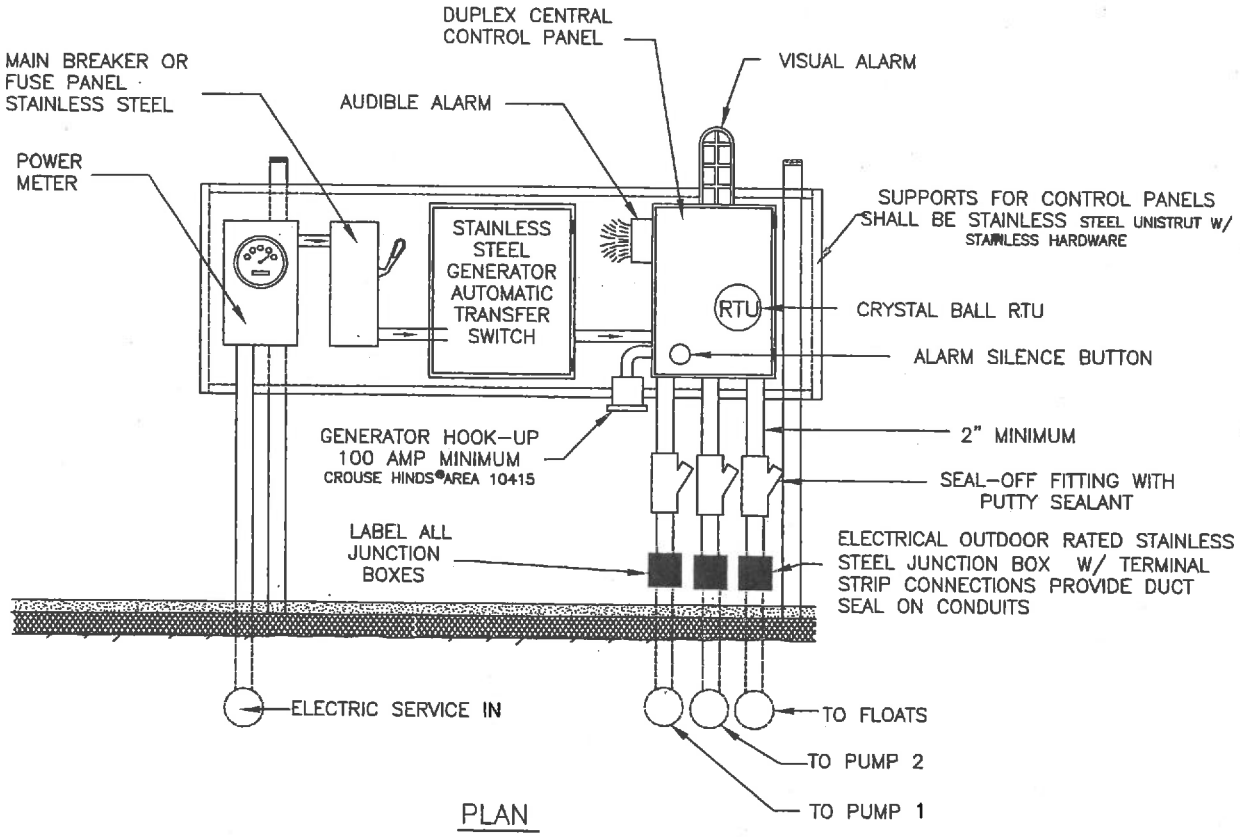



# RICHLAND COUNTY UTILITIES

| PUMP STATION DETAILS: VALVE VAULT–SECTION VIEW | DRAWING: PS 4.0 |
| --- | --- |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




SECTION




PLAN

| RICHLAND COUNTY UTILITIES | |
|---|---|
| PUMP STATION DETIALS: ELECTRICAL PANEL | DRAWING: PS 5.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

## GENERAL NOTES

1. ALL INTERNAL WETWELL PIPING AND VALVE VAULT PIPING SHALL BE CLASS 52 DIP.

2. ALL FLANGES SHALL BE 125# STANDARD.

3. PUMP SLIDE RAILS SHALL BE EXTRA STRENGTH STAINLESS STEEL.

4. CONTRACTOR SHALL PROVIDE A S.S. PORTABLE ELECTRIC HOIST WITH S.S. CABLE.

5. CONTRACTOR SHALL INSTALL PUMP DISCHARGE PIPING AND SLIDE RAILS LEVEL AND PLUMB FOR EASE OF PUMP REMOVAL. HOIST AND EACH PUMP SHALL BE REMOVED AND REINSTALLED IN THE PRESENCE OF THE ENGINEER TO DEMONSTRATE PERFORMANCE.

6. WETWELL SHALL BE TESTED FOR LEAKAGE AND SHALL NOT EXCEED 1" OF WETWELL DEPTH IN 24 HOURS.

7. PUMP DRAWDOWN TEST SHALL BE CONDUCTED FOR EACH PUMP IN THE PRESENCE OF THE ENGINEER.

8. CONTRACTOR TO INSTALL BACKFLOW PREVENTER AND METER BOX AT RIGHT-OF-WAY & NON-FREEZE HYDRANT AT WETWELL.

9. CONTRACTOR SHALL INSTALL APPROPRIATE SIZED GENERATOR AND TRANSFER SWITCH PER RICHLAND COUNTY SPECIFICATIONS. OPERATION OF ALL ELECTRICAL CONTROLS INCLUDING GENERATOR AND TRANSFER SWITCH SHALL BE DEMONSTRATED IN THE PRESENCE OF THE ENGINEEER AND RICHLAND COUNTY. (REFER TO GENERATOR SPECIFICATIONS)

10. CONTRACTOR SHALL PROVIDE RICHLAND COUNTY A SPARE PUMP EQUAL TO THE INSTALLED PUMP.

11. CONTRACTOR SHALL PROVIDE AND INSTALL A STAINLESS STEEL PORTABLE HOIST WITH S.S. CABLE AND ADJUSTABLE LIFITNG ARM, SIZED ACCORDINGLY WITH DROP IN SOCKET AND RAIN CAP HOIST SPECIFICATIONS SHALL BE APPROVED BY RICHLAND COUNTY UTILITIES. CONTRACTOR SHALL DEMONSTRATE HOIST OPERATION BY INSTALLING AND RETRIEVING BOTH PUMPS.

12. INTERIOR OF WET WELL SHALL BE COATED WITH NEOPOXY® 120 MILS OR AGRU SURE-GRIP® HDPE LINER OR APPROVED EQUIVILANT.

13. ALL DUCTILE IRON PIPE AND FITTINGS SHALL BE COATED INSIDE AND OUT FOR SANITARY SEWER APPLICATIONS.

| RICHLAND COUNTY UTILITIES | |
|---|---|
| PUMP STATION DETAILS: GENERAL NOTES | DRAWING: PS 6.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

## CONTROL PANEL SPECIFICATIONS

A. ENCLOSURE

1. MINIMUM SIZE 30X36X12
2. NEMA 4X
3. STAINLESS STEEL
4. CONTINUOUS HINGE
5. DEAD FRONT
6. PAD LOCKABLES SS SINGLE HANDLE 3 POINT LATCH

B. COMPONENTS

1. NEMA RATED STARTER (ONE PER PUMP) SQUARE D/FURNAS
2. NEMA RATED BREAKER (ONE PER PUMP) SQUARE D
3. PHASE/ VOLTAGE MONITOR TIMEMARK 8-PIN OCTAL
4. ELAPSED TIME METER (ONE PER PUMP) CRAMER # 6 X 137 – HOURS/NON RESETTSABLE
5. CONTROL CIRCUIT 120 VOLTS
6. RUN LIGHT, GREEN (ONE PER PUMP)
7. SEAL FAIL LIGHT, RED (ONE PER PUMP)
8. AUDIBLE ALARM, RED (120 VOLTS)
9. VISUAL ALARM, RED (120 VOLTS)
10. H.O.A. SWITCH (ONE PER PUMP)
11. GFI DUPLEX CONVENIENCE RECEPTACLES WITH 15 AMP BREAKER
12. SURGE AND LIGHTNING PROTECTION WITH FUSES
13. AUDIBLE SILENCE BUTTON
14. AUTOMATIC ELECTRICAL ALTERNATOR WITH SELECTOR SWITCH FURNAS
15. HEATER WITH THERMOSTAT
16. INTERIOR PANEL LIGHT
17. SPARE 15 AMP. CIRCUIT BREAKER
18. PHASE FAILURE RELAY WITH PIN TYPE PLUG IN SOCKET AND FUSES

C. GENERATOR RECEPTACLE

1. CROUSE HINDS AREA 10415

D. MISC.

1. AREA LIGHT WITH ON/OFF LIGHT SWITCH
2. ALL SWITCHES, LIGHTS, AND METERS PROPERLY LABELED WITH ENGRAVED NAMEPLATES.
3. ALL WIRING PROPERLY LABELLED AT ALL CONNECTIONS
4. ELECTRICAL DISCONNECT PRIOR TO CONTROL PANEL (STAINLESS STEEL)
5. MINIMUM CONDUIT SIZE 2 INCHES
6. MINIMUM NUMBER OF CONDUITS – 3 (1 FOR CONTROL WIRING, 1 FOR EACH PUMP POWER CABLE)
7. ALL CONDUITS ENTERING THE CONTROL PANELS OR OTHER ENCLOSURES FROM THE WET WELL SHALL BE SEALED WITH GAS-TIGHT FITTINGS ( MYERS TYPE HUBS)
8. CONTRACTOR SHALL PROVIDE, INSTALL AND HAVE OPERATIONAL A CRYSTAL BALL RTU COMPATIBLE WITH THE COUNTY'S EXISTING SYSTEM

NOTE: CIRCUIT BOARD CONTROL ARE NOT ACCEPTABLE.

CONTROL PANEL SPECIFICATIONS MUST BE SUBMITTED AND APPROVED BY RICHLAND COUNTY PRIOR TO INSTALLATION, TO INCLUDE BUT NOT LIMITED TO SCHEMATICS AND COMPONENTS LISTS.

NOTICE: THESE SPECIFICATIONS ARE SUBJECT TO REVISIONS WITHOUT NOTICE. CONTACT RICHLAND COUNTY TO RECEIVE THE CURRENT SPECIFICATIONS.

| RICHLAND COUNTY UTILITIES | |
|---|---|
| PUMP STATION DETAILS: STANDARD CONTROL PANEL | DRAWING: PS 7.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

# 9.2
# Generator
# Specifications

# Richland County Utilities

## Specifications for Portable Standby Generator Sets

1. Generator to be sized accordingly to operate the largest facility (pump station, wellhouse, etc.) with all equipment operating simultaneously with a rating of 80° C temperature rise.

2. Generator to be mounted on a low profile style tandem-axle trailer (which do not require self-leveling apparatuses). 2" ball-type hitch for generator sizes 60KW and less. 2 and 5/16" ball hitch for larger than 60 KW.

3. Generator to have a voltage selector switch for the following voltages: 120/208 Wye, 120/240 Delta 277/450 Wye, 3-Phase 60 Hz.

4. Generators using variable frequency drives or solid state motor starter, shall require isochronous governor and permanent magnet generator.

5. Generator set to have sound-attenuated enclosure.
6. Generator set to include a Main Breaker sized at the maximum amperage rating for that unit. If the main breaker is larger than 100 amps, then a secondary 100 amp breaker to be installed in series after the main breaker with a 30 #2/4 power cable and generator connector per Richland County Utilities Specifications.
7. Generator set to be provided complete with power cable, cable connectors, fuel, etc.
8. Three (3) copies of the O & M Manuals to be provided with the generator set, along with Training and Startup provided by the Manufacturer or Mfr's Representative.
9. The following items should also be provided as standard equipment on the generator set:

- A.C. Voltmeter
- Voltage Adjusting Rheostat
- A.C. Ammeter
- A.C. Frequency Meter
- A.C. Ammeter/A.C. Voltmeter Phase Selector Switch
- Thermal Overload Protection
- Battery Tray and Cable
- Low Coolant Level Shutdown
- Tandem Axle Trailer w/2" Bail-Type Hitch
- Trailer Lights w/4-wire Flat Plug Connector
- Spare Wheel and Tire
- Safety Grounding Rod
- Run-Stop-Remote Engine Selector Switch
- Oil Pressure Gauge
- Water Temperature Gauge
- High Capacity Radiator
- Fan Guard
- High Temperature Shutdown
- Battery "Trickle" Charger
- Overspeed Detection and Shutdown
- Line Circuit Breaker 100 amp 3 Pole
- Safeguard Breaker
- Panel Fuse
- Panel Lights
- Hour Meter
- Battery Charging Ammeter
- Safety Shutdown Indicators
- Remote Start and Remote Alarm Terminal
- Solid State Regulation
- Low Oil Shutdown
- Pre-Heat Diesel Starting
- Fully Instrumented Control Panel
- Sound-Attenuated Enclosure
- Fully Fueled
- Oil and Antifreeze Fill
- Trailer equipped with surge brakes
- Trailer to be low profile style
- Fuel tank size to be determined by size generator

# Richland County Utilities

## Specifications for Stationary Generator Sets

1. Generator to be sized accordingly to operate the largest facility (pump station, wellhouse, etc.) with all equipment operating simultaneously with a rating of 80° C temperature rise.

2. Generator to be installed on an appropriately-sized concrete base pad (6" minimum) with a sound-attenuated enclosure.

3. Generator unit to have a 12-lead "alternator" to allow for voltage reconfiguration/reconnection, if necessary. Generator shall be wired for the specific voltage for that facility.

4. Generators using variable frequency drives or solid state motor starter, shall require isochronous governor and permanent magnet generator.

5. An automatic transfer switch shall be installed for automatic operation of the generator and facilities upon power failure. Automatic transfer switch and controls to be wired for routine "exercising" of generator set with manual selector switch to choose from "Load or "No Load" conditions.

6. Generator set and transfer switch to be installed according to all applicable rules and requirements.

7. Generator sets with a size of 15 KW or less to be operated using propane fuel. Units larger than 15 KW shall utilize diesel fuel. Fuel tank for generator unit shall be sized accordingly, and shall be capable of operating generator unit under full load for a minimum of 48 hours. Generator unit to be fully fueled prior to initial startup.

8. Three (3) copies of the O & M Manuals to be provided with the generator set, along with Training and Startup provided by the Manufacturer or Manufacturers Representative.

9. The following items should also be provided as standard equipment on the generator set:

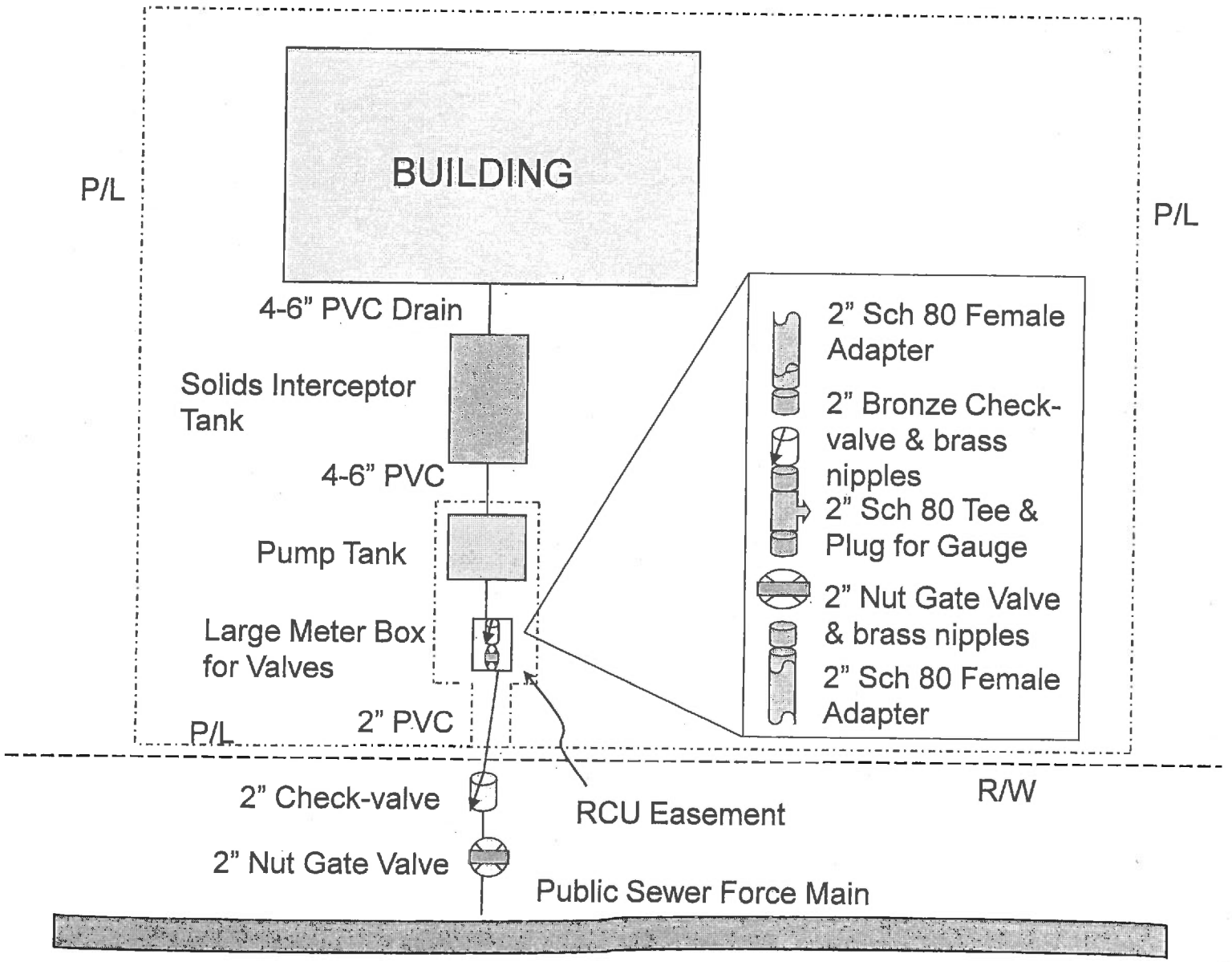
- A. C. Voltmeter
- Voltage Adjusting Rheostat
- A. C. Ammeter
- A. C. Frequency Meter
- A.C. Ammeter/A.C. Voltmeter/Phase Selector Switch
- Thermal Overload Protection
- Battery Tray and Cable
- Low Coolant Level Shutdown
- Panel Fuse
- Hour Meter
- Oil Pressure Gauge
- Run-Stop-Remote Engine Selector Switch
- Water Temperature Gauge
- Battery "Trickle" Charger
- High Temperature Shutdown
- Overspeed Detection and shutdown
- Oil and Antifreeze Fill
- Engine Block Heater
- Battery Charging Ammeter
- Panel Lights
- Safety Shutdown Indicators
- Solid State Regulation
- Low Oil Shutdown
- Fully Instrumented Control Panel
- Pre-Heat Diesel Starting (Where Applicable)
- Sound Attenuated Enclosure

# TAB - 10

# Section 10
# Individual Septic Tank Effluent Pumping System Design and Construction Specifications

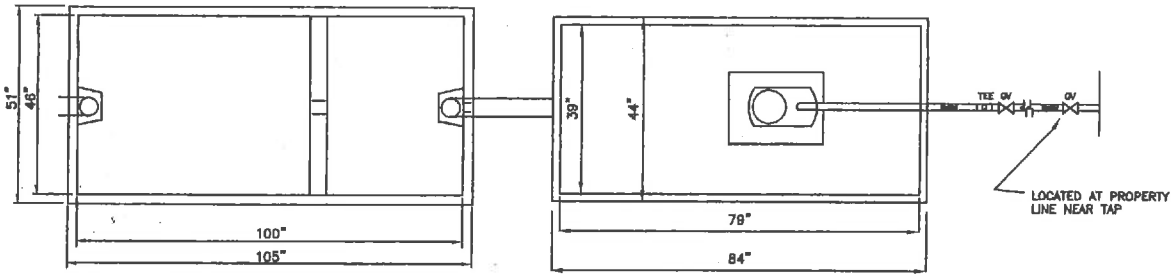
## 10.1 Typical STEP System Layout

# TYPICAL STEP SYSTEM LAYOUT



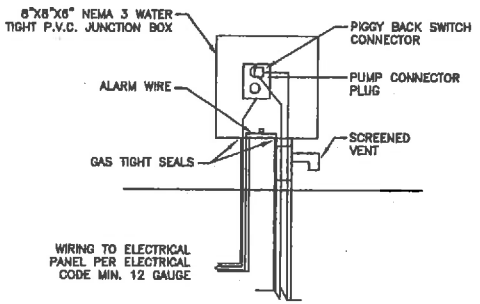

N.T.S.

NOTE: ALL FITTINGS SHALL BE A MINIMUM OF SCH 80 UNLESS OTHERWISE NOTED. GALVANIZED FITTINGS ARE NOT ACCEPTABLE.

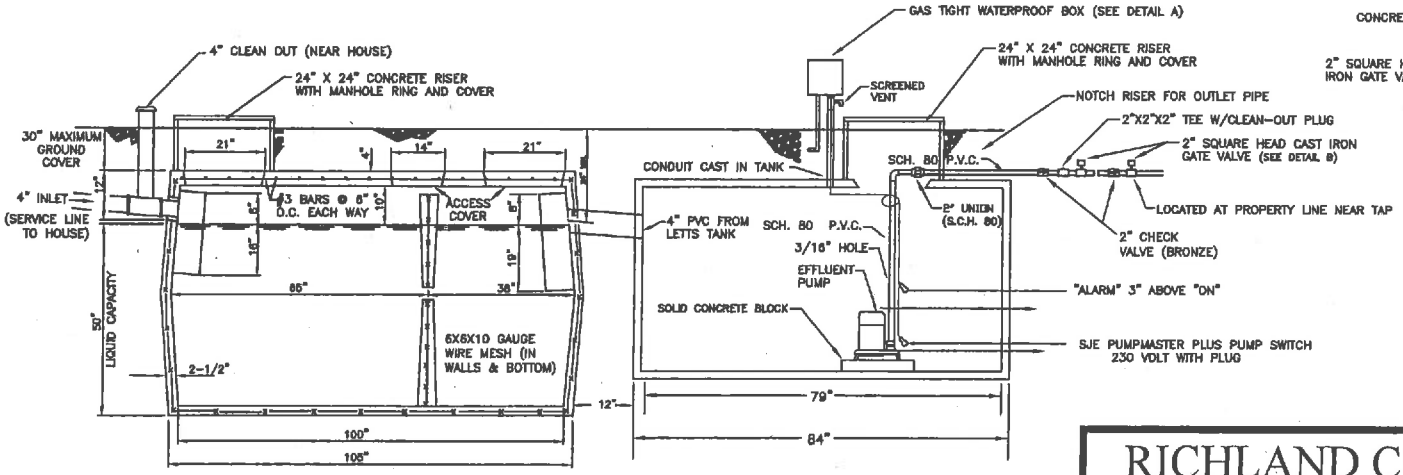



PLAN VIEW
N.T.S.

PLAN VIEW
N.T.S.

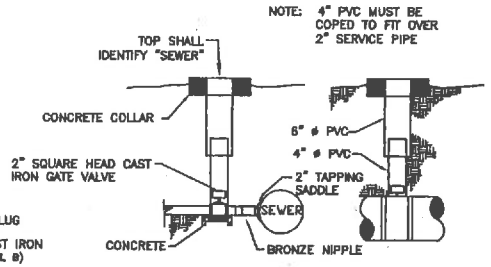



DETAIL A
N.T.S




SIDE VIEW
1,025 GALLON TWO COMPARTMENT SEPTIC TANK
N.T.S.

SIDE VIEW
500 GALLON PUMP BASIN
N.T.S.




DETAIL B
VALVE BOX DETAIL
N.T.S

# RICHLAND COUNTY UTILITIES

| SINGLE FAMILY RESIDENTIAL EFFLUENT SYSTEM | DRAWING: STEP 1.0 |
|---|---|
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

TAB - 11

# SECTION 11

# STANDARD DETAILS

## 11.1 GENERAL DETAILS

| | |
|---|---|
| GD 1.0 | Pipe Bedding Detail |
| GD 1.2 | Class "A" Bedding |
| GD 1.4 | Class "B" Bedding |
| GD 1.6 | Class "C" Bedding |
| GD 2.0 | Valve and Tee Setting |
| GD 3.0 | Restrained Joint |
| GD 4.0 | Bell Joint Clamp |
| GD 5.0 | Vertical Offset |
| GD 6.0 | Concrete Encasement |
| GD 7.0 | Tapping Sleeve and Valve |
| GD 8.0 | Precast Concrete Collar |
| GD 9.0 | Concrete Collar |
| GD 10.0 | Valve Box |
| GD 11.0 | Tracer Wire |
| GD 12.0 | Pipe and Casing Jack and Bore |
| GD 13.0 | Pipe Bollard |
| GD 14.0 | Valve Marker |
| GD 15.0 | Precast Vaults |
| GD 16.0 | Typical Fence Line Span |
| GD 17.0 | Pump Station Vehicle Gate |
| GD 18.0 | Repair Section – Main Road Cut |
| GD 19.0 | Repair Section – Secondary Road Cut |
| GD 20.0 | Repair Section – Paved Driveway Cut |

## 11.2 WATER DETAILS

| | |
|---|---|
| WA 1.0 | Water Main Bedding |
| WA 2.0 | Blowoff Assembly |
| WA 3.0 | Water Air Release Valve Installation |
| WA 4.0 | ¾" – 1" Single Water Service Near Side |
| WA 5.0 | ¾" – 1" Single Water Service Far Side |
| WA 6.0 | 1 ½" – 2" Water Service |
| WA 7.0 | 3" Compound Meter with Bypass |
| WA 8.0 | 4"-10" Meter with Bypass |
| WA 9.0 | Typical Fire Hydrant Installation |
| WA 10.0 | Fire Hydrant Protection |
| WA 11.0 | Typical Unmetered Fire Service Line |

## 11.3 GRAVITY SEWER DETAILS

| | |
|---|---|
| GS 1.0 | Precast Manhole |
| GS 2.0 | Standard Manhole Inverts |
| GS 3.0 | Manhole Inverts |
| GS 4.0 | Precast Shallow Manhole |
| GS 5.0 | Inside Drop Manhole |
| GS 6.0 | Drop Manhole |
| GS 7.0 | Cut-In Manhole |
| GS 8.0 | Sewer Service Connection |
| GS 9.0 | Deep Service Connection (PVC) |
| GS 10.0 | Exterior Gravity Cleanout |
| GS 11.0 | Sewer Service and Cleanout Installation |
| GS 12.0 | Cleanout in Landscaped Area |
| GS 13.0 | Sewer Service and Cleanout with Eldervalve |
| GS 14.0 | Minimum Bedding for Gravity Sewer Line |
| GS 15.0 | Granular Cradle |
| GS 16.0 | Concrete Cradle |

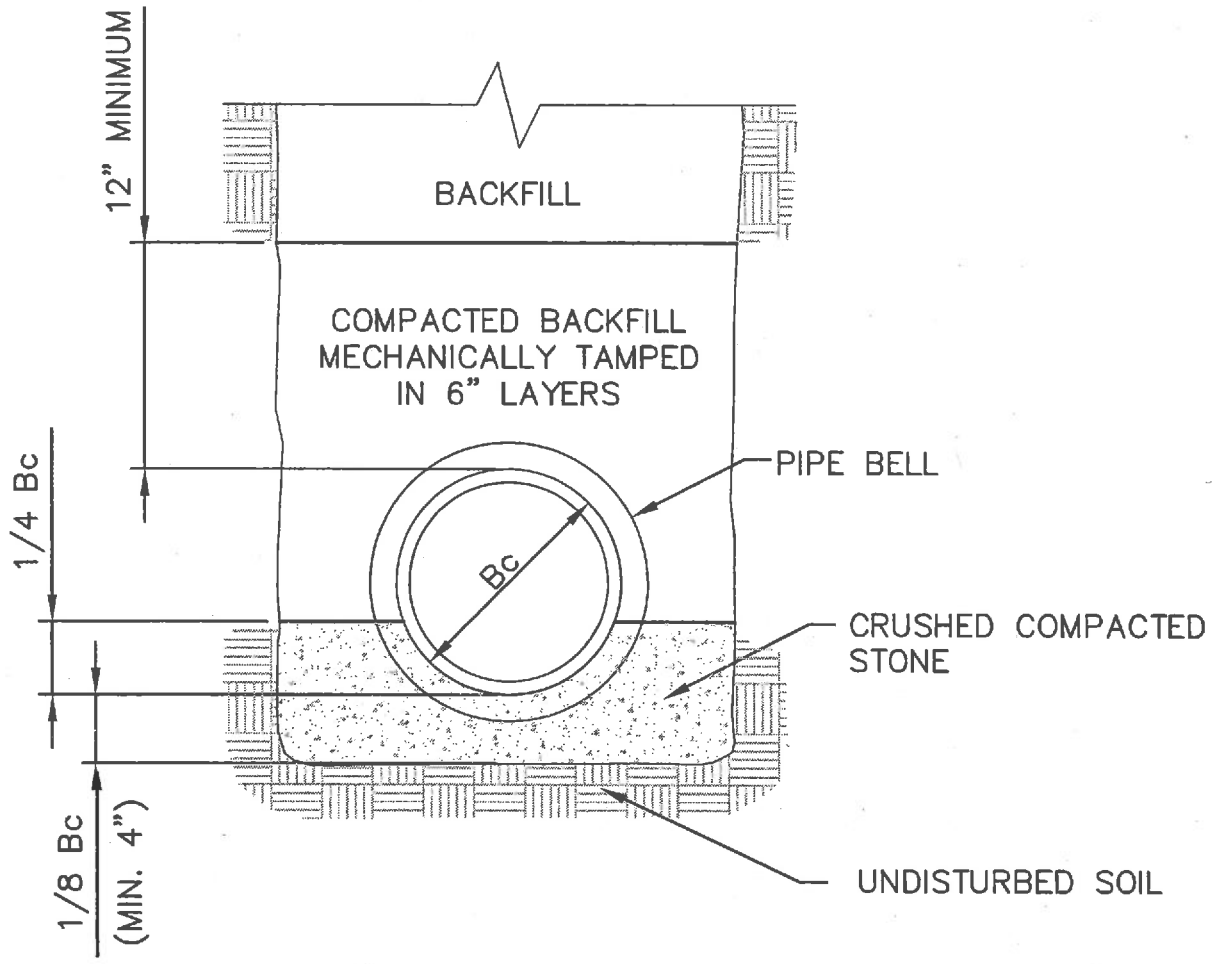
## 11.4 FORCE MAIN DETAILS

| | |
|---|---|
| FM 1.0 | Sewer Air Release Valve Manhole |
| FM 2.0 | Force Main Tie-In at Manhole |
| FM 3.0 | Force Main Connection Valve Vault |

## 11.5 GREASE TRAP DETAIL

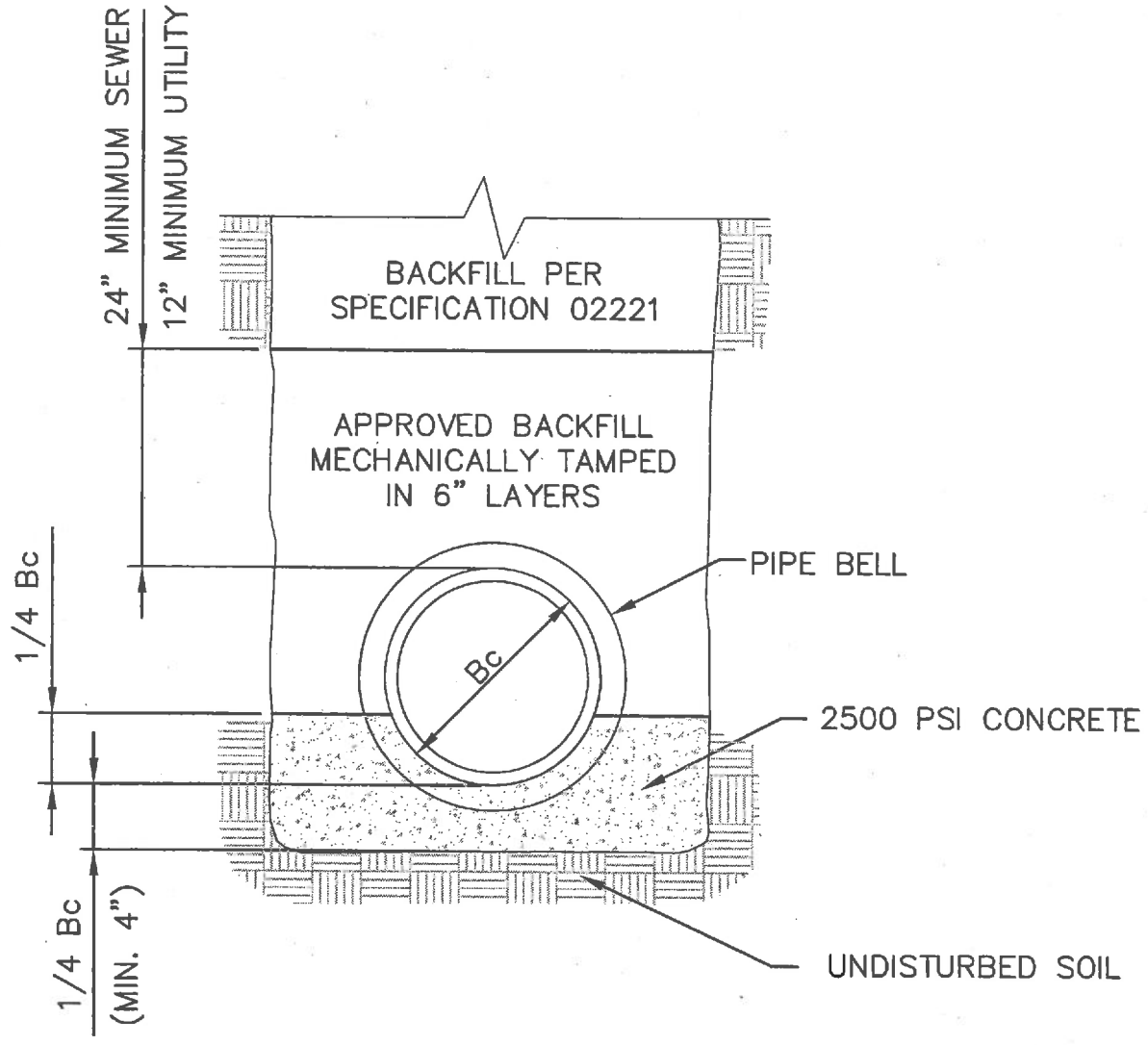
| | |
|---|---|
| GT 1.0 | 1,000 Gallon Grease Trap |

# 11.1
# General Details



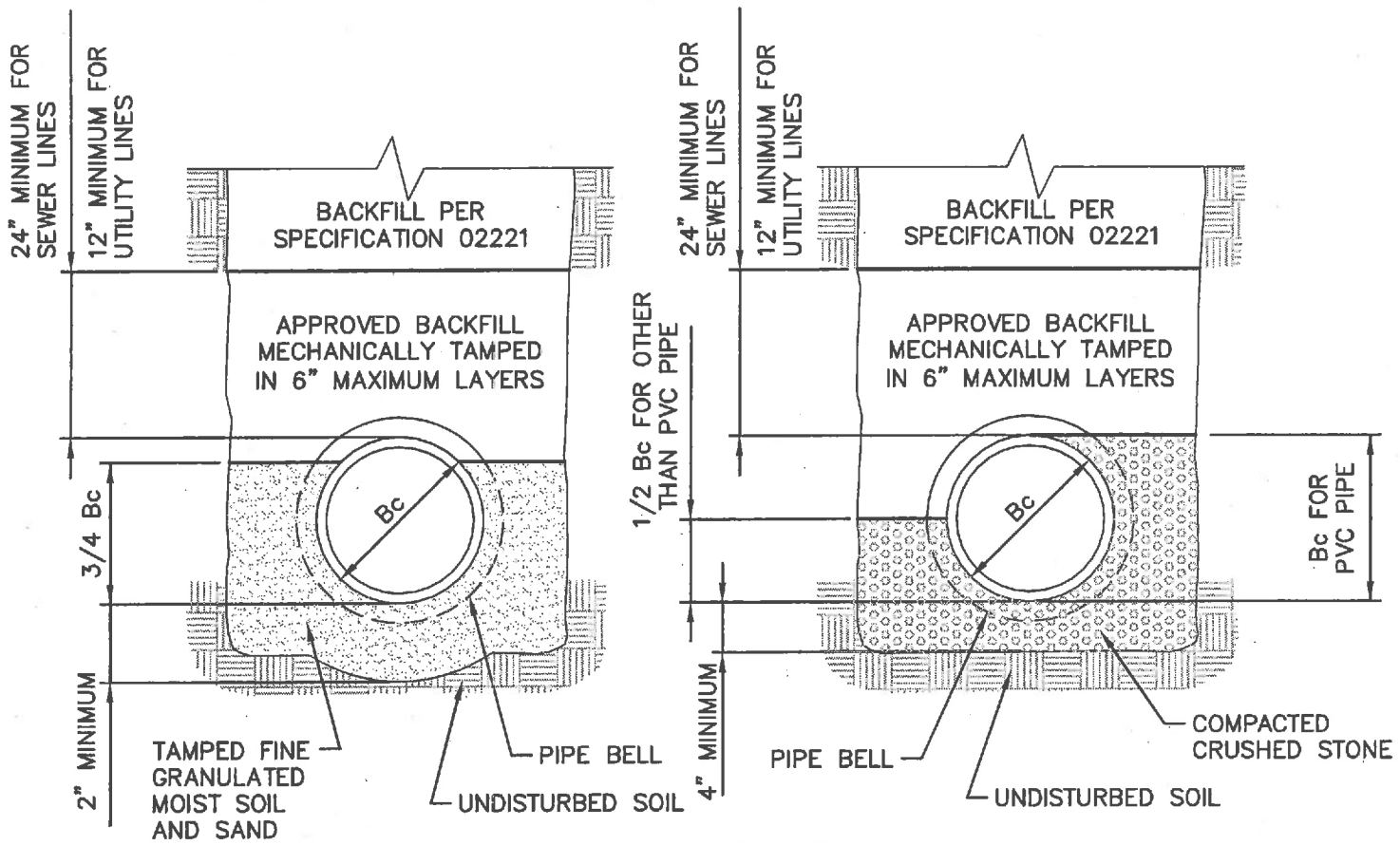

PIPE BEDDING DETAIL

| RICHLAND COUNTY UTILITIES | |
|---|---|
| PIPE BEDDING DETAIL | DRAWING: GD-1.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




CLASS "A" BEDDING

| RICHLAND COUNTY UTILITIES | |
|---|---|
| CLASS "A" BEDDING | DRAWING: GD-1.2 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |



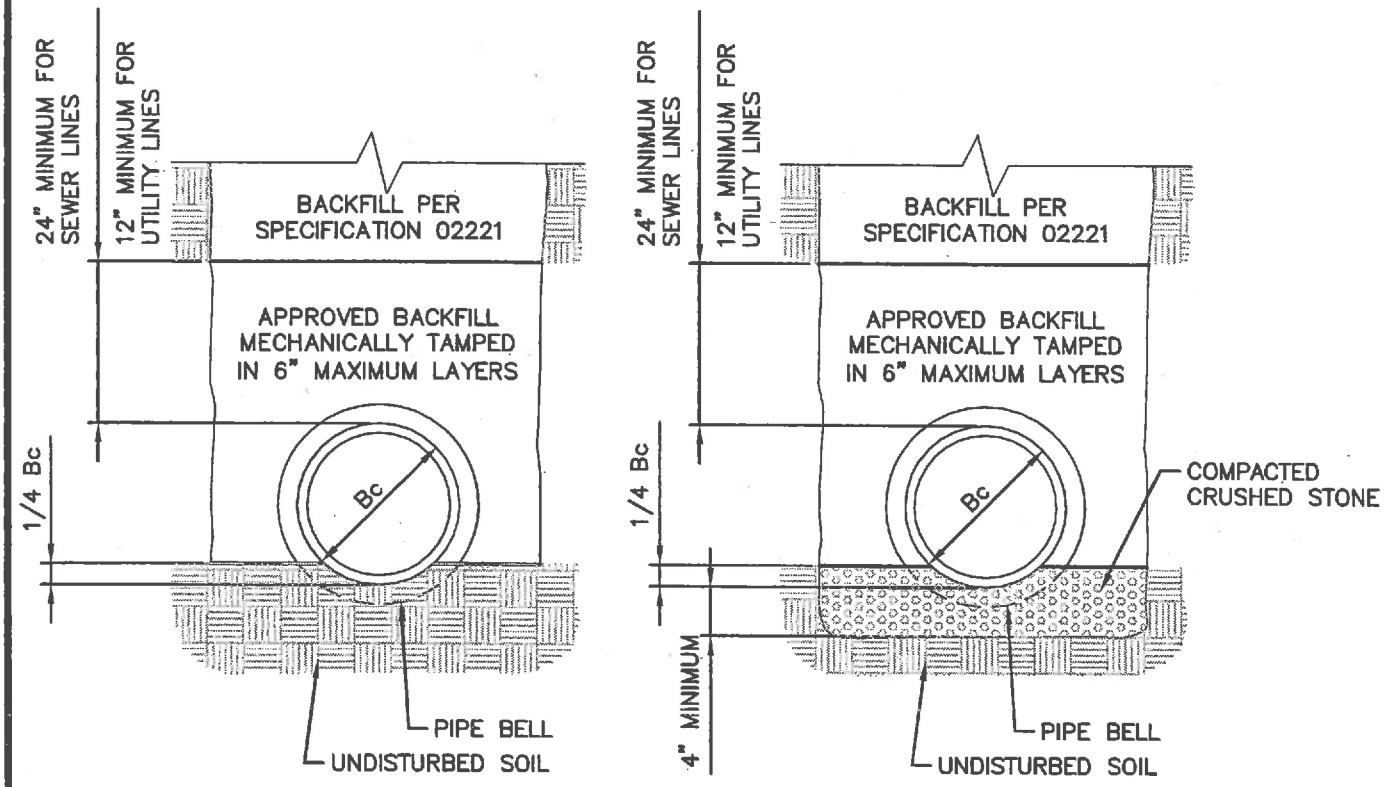

NOTE: 1/4 Bc HAND SHAPED BOTTOM – SHAPE BELL HOLES FOR USE IN DRY EARTH TRENCHES ONLY. APPLICABLE TO BOTH EARTH AND ROCK TRENCHES.

TYPE 1

TYPE 2

# CLASS "B" BEDDING

| RICHLAND COUNTY UTILITIES | |
|---|---|
| CLASS "B" BEDDING | DRAWING: GD-1.4 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

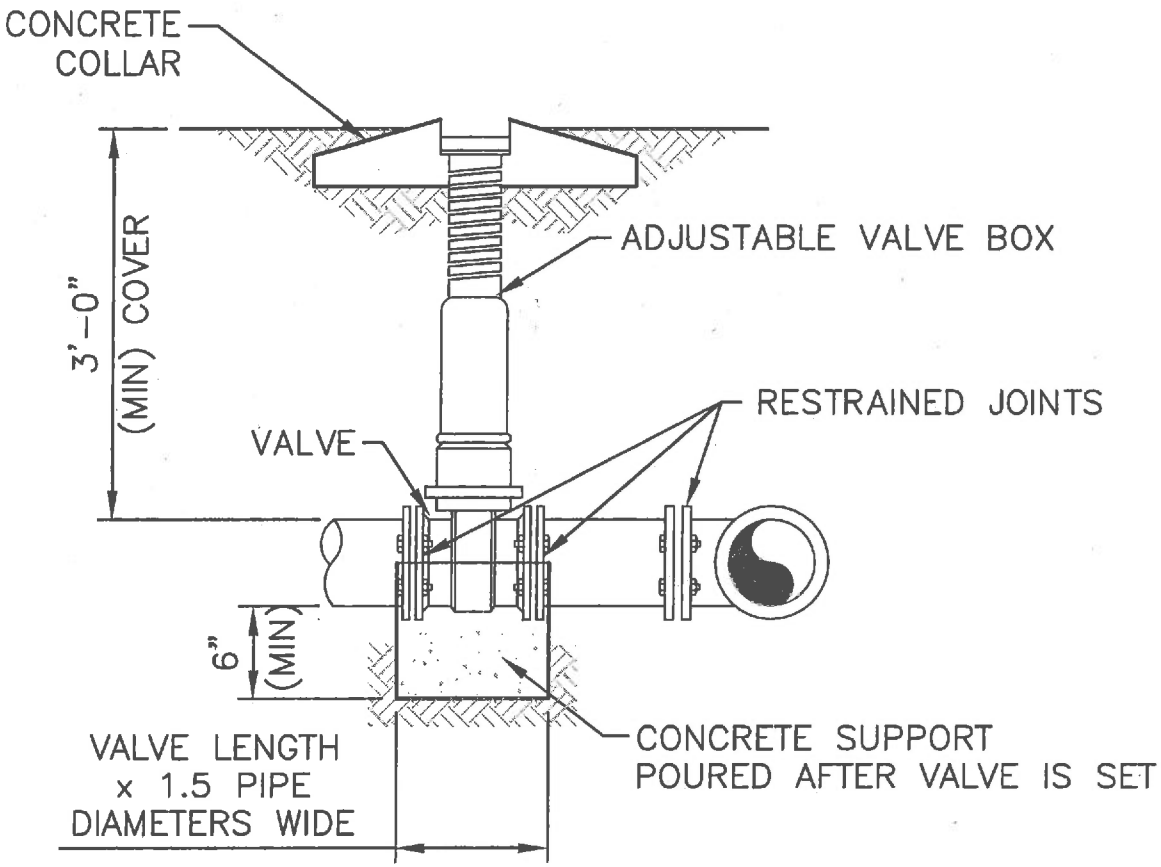



NOTE: HAND SHAPED BOTTOM – SHAPE BELL HOLES FOR USE IN DRY EARTH TRENCHES ONLY. APPLICABLE TO BOTH EARTH AND ROCK TRENCHES.

TYPE 1 TYPE 2

CLASS "C" BEDDING

| RICHLAND COUNTY UTILITIES | |
|---|---|
| CLASS "C" BEDDING | DRAWING: GD-1.6 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




VALVE AND TEE SETTING

| RICHLAND COUNTY UTILITIES | | |
|---|---|---|
| VALVE AND TEE SETTING | | DRAWING: GD-2.0 |
| DATE: JULY 2016 | DRAWN BY: BPB | |
| SCALE: NTS | APPROVED BY: | |

NOTES:

THE FOLLOWING CONDITIONS WERE USED TO CALCULATE THE RESTRAINED LENGTHS:

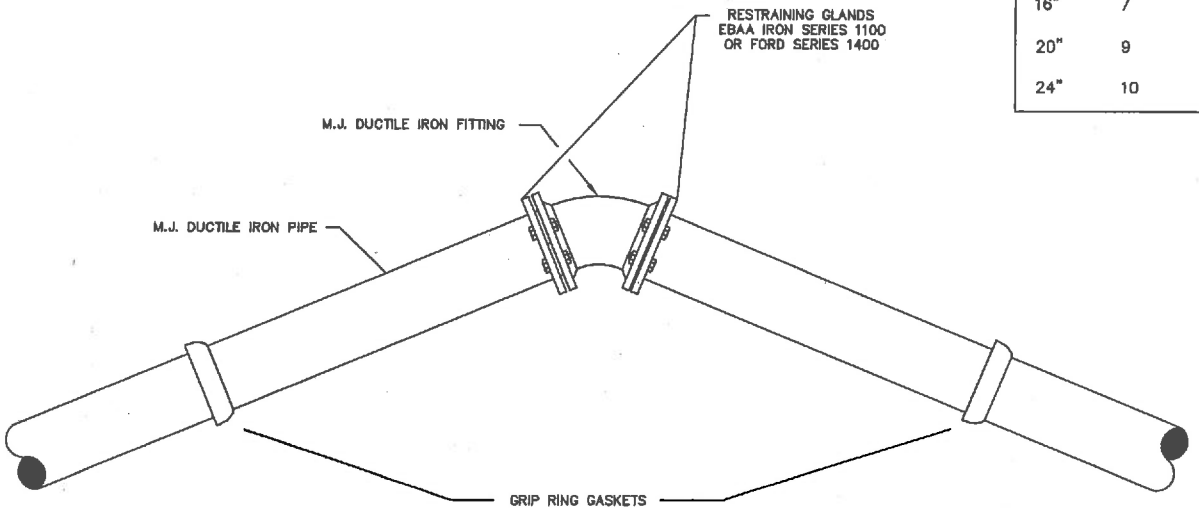
- LAYING CONDITION IS TYPE 3)
- SOIL DESIGNATED AS SAND-SILT)
- DEPTH IS 3 FT.)
- DESIGN PRESSURE (TEST) IS 150 PSI)
- SAFETY FACTOR IS 1.5.

FOR THE TEE BRANCH AND REDUCER, LENGTHS ARE BASED ON BRANCHING AND REDUCING FROM THE NEXT LARGER SIZE IN THE TABLE. DEVIATIONS FROM THESE CONDITIONS MUST BE BASED ON THE ABOVE PARAMETERS.

RESTRAINT JOINT TABLE

RESTRAIN ALL JOINTS WITHIN THESE LENGTHS (IN L.F. EACH SIDE OF THE BEND)

| SIZE | 11 1/4° | 22 1/2° | 45° | 90° | TEE BRANCH | DEAD END | REDUCER |
|---|---|---|---|---|---|---|---|
| 4" | 2 | 5 | 10 | 24 | 37 | 60 | 44 |
| 6" | 3 | 7 | 14 | 33 | 64 | 85 | 46 |
| 8" | 4 | 9 | 18 | 43 | 90 | 110 | 44 |
| 10" | 5 | 10 | 21 | 51 | 113 | 133 | 45 |
| 12" | 6 | 12 | 25 | 60 | 133 | 155 | 84 |
| 16" | 7 | 15 | 31 | 76 | 177 | 198 | 83 |
| 20" | 9 | 18 | 37 | 90 | 217 | 238 | 83 |
| 24" | 10 | 21 | 43 | 104 | 255 | 277 | 115 |




RESTRAINED JOINT

| RICHLAND COUNTY UTILITIES | |
|---|---|
| RESTRAINED JOINT | DRAWING: GD-3.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

NOTES:

THE FOLLOWING CONDITIONS WERE USED TO CALCULATE THE RESTRAINED LENGTHS:

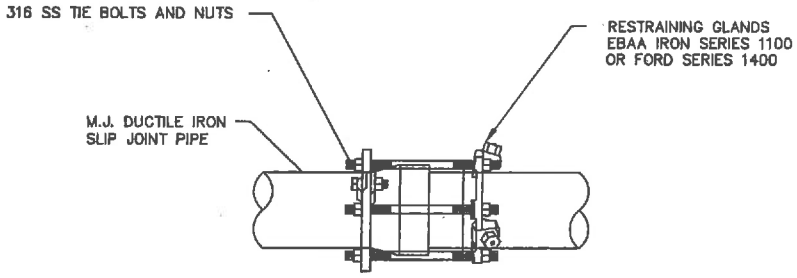
- LAYING CONDITION IS TYPE 3;
- SOIL DESIGNATED AS SAND-SILT;
- DEPTH IS 3 FT.;
- DESIGN PRESSURE (TEST) IS 150 PSI;
- SAFETY FACTOR IS 1.5.

FOR THE TEE BRANCH AND REDUCER, LENGTHS ARE BASED ON BRANCHING AND REDUCING FROM THE NEXT LARGER SIZE IN THE TABLE. DEVIATIONS FROM THESE CONFIGURATIONS MUST BE RECALCULATED BASED ON THE ABOVE PARAMETERS.

RESTRAINT JOINT TABLE

RESTRAIN ALL JOINTS WITHIN THESE LENGTHS (IN L.F. EACH SIDE OF THE BEND)

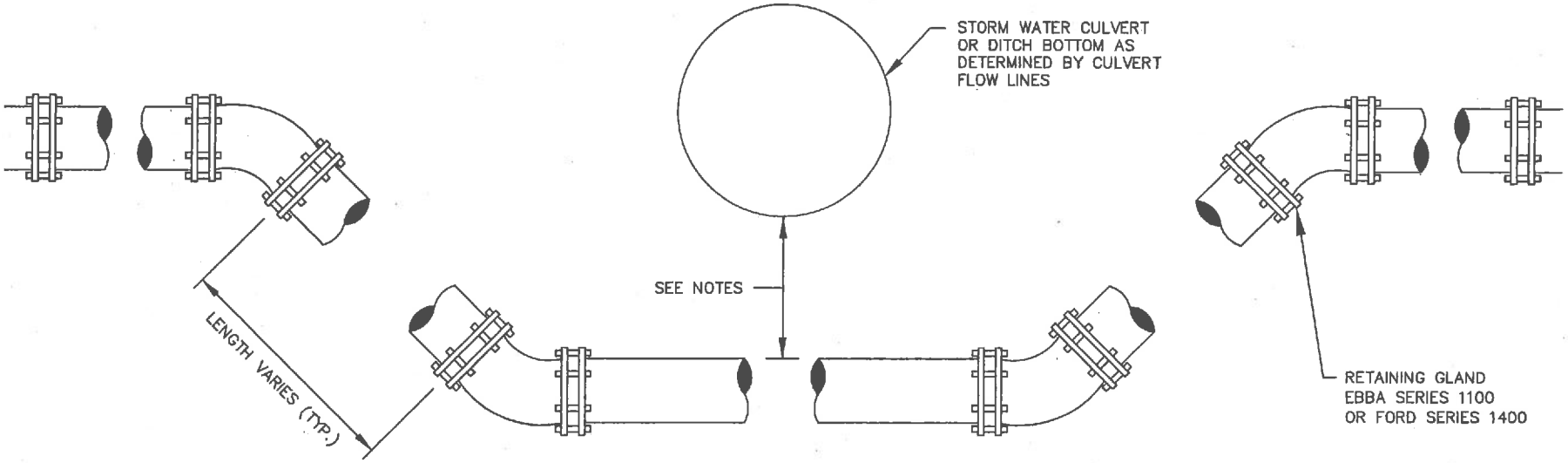
| SIZE | 11 1/4° | 22 1/2° | 45° | 90° | TEE BRANCH | DEAD END | REDUCER |
|---|---|---|---|---|---|---|---|
| 4" | 2 | 5 | 10 | 24 | 37 | 60 | 44 |
| 6" | 3 | 7 | 14 | 33 | 64 | 85 | 46 |
| 8" | 4 | 9 | 18 | 43 | 90 | 110 | 44 |
| 10" | 5 | 10 | 21 | 51 | 113 | 133 | 45 |
| 12" | 6 | 12 | 25 | 60 | 133 | 155 | 84 |
| 16" | 7 | 15 | 31 | 76 | 177 | 198 | 83 |
| 20" | 9 | 18 | 37 | 90 | 217 | 238 | 83 |
| 24" | 10 | 21 | 43 | 104 | 255 | 277 | 115 |




NOTE: CLAMP ASSEMBLY TO BE POLYWRAPPED AND TAPED.

BELL JOINT CLAMP

| RICHLAND COUNTY UTILITIES | |
|---|---|
| BELL JOINT CLAMP | DRAWING: GD-4.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |



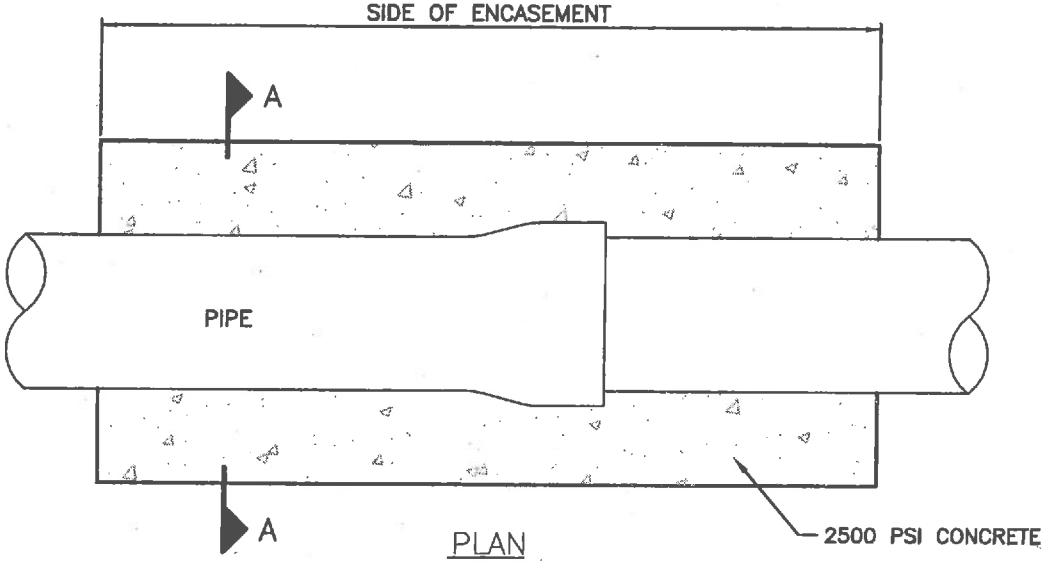

NOTES:

1. DO NOT PLACE STONE UNDER CULVERT IN DIRECT CONTACT WITH POLYWRAP ON WATER MAIN
2. 36" MINIMUM CLEARANCE PER PUBLIC AGENCY PERMITS. 18" CLEARANCE UNDER STORM DRAIN LINES ON PRIVATE PROPERTY.
3. MAIN SHALL BE IN 10 LF CASING WITH SPACERS WHEN UNDER ANY DRAIN LINES GREATER THAN 18" OR A DITCH DRAINING INTO AN 18" CULVERT OR STORM DRAIN LINE. NO JOINTS ARE ALLOWED IN CASING.

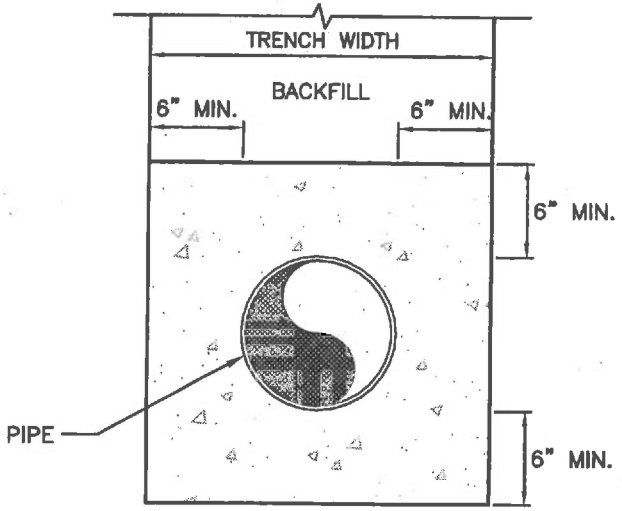
# VERTICAL OFFSET

| RICHLAND COUNTY UTILITIES | |
|---|---|
| VERTICAL OFFSET | DRAWING: GD-5.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

ENCASE PIPING WHERE INDICATED AND UNDER ROADS, STRUCTURES, AND WITHIN LAGOON OR POND DIKES TO A POINT 12" BEYOND PERMANENT OBJECT ON EACH SIDE OF ENCASEMENT




PLAN



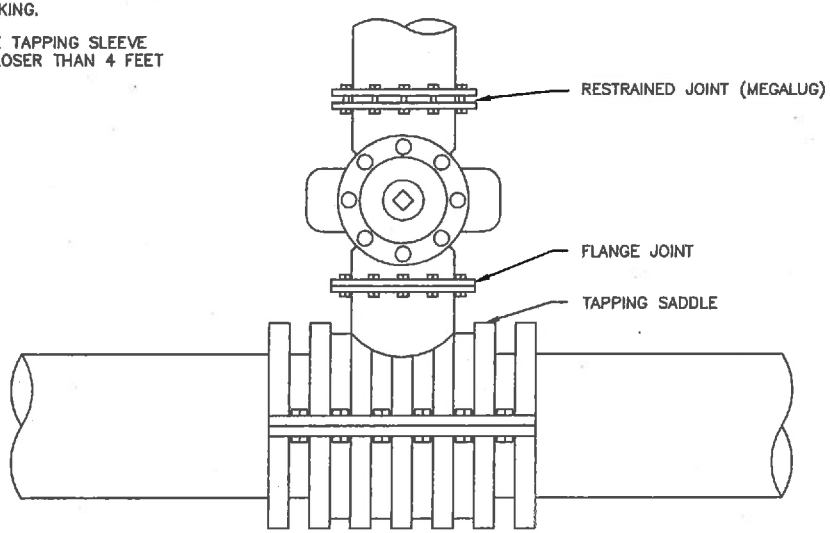

SECTION "A–A"

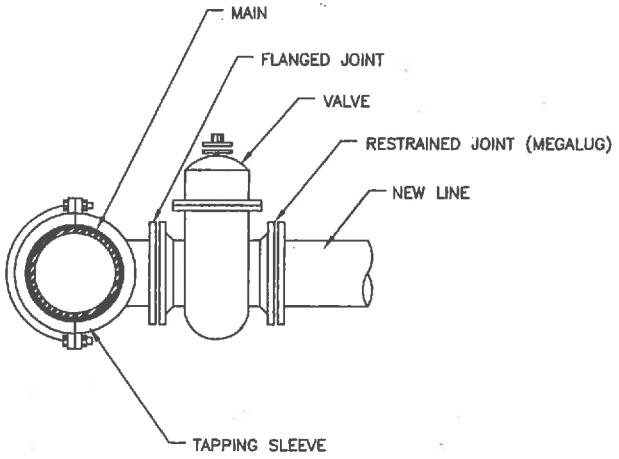
CONCRETE ENCASEMENT

| RICHLAND COUNTY UTILITIES | |
|---|---|
| CONCRETE ENCASEMENT | DRAWING: GD-6.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

NOTES:

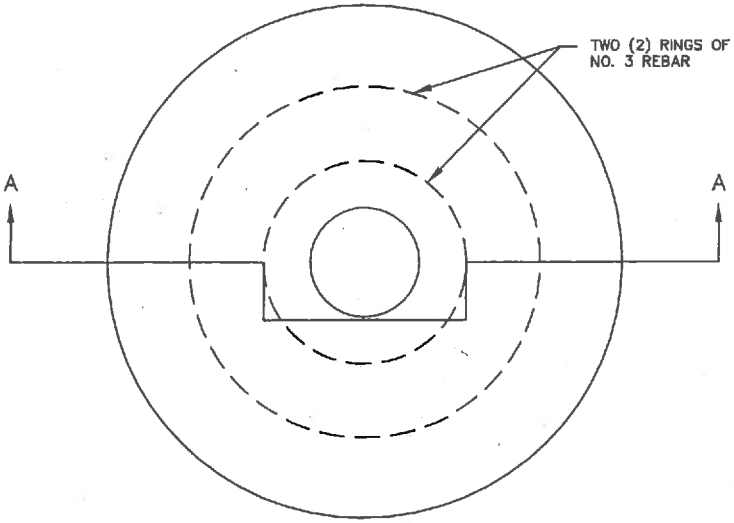
1. TAPPING SADDLES ARE NOT ALLOWED FOR MAIN-ON-MAIN TAPS.
2. USE MUELLER OR AMERICAN DARLING DUCTILE IRON OR 316 STAINLESS STEEL TAPPING SLEEVES FOR TAP SIZES 4" – 24". USE MUELLER T-2360-16 OR AVK 25/30081 TAPPING VALVES.
3. USE 316 STAINLESS STEEL TAPPING SLEEVES BY DRESSER OR CASCADE FOR TAPS ON MAINS 30" AND GREATER.
4. BOLTS AND NUTS FOR ALL TAPPING SLEEVES SHALL BE 316 SST.
5. USE THRUST BLOCKING ONLY FOR WET TAPS UNLESS OTHERWISE APPROVED BY RCU.
6. DEPTH FROM GROUND SURFACE TO TOP OF BLOCKING SHALL BE GREATER THAN HEIGHT OF BLOCKING.
7. THE END OF THE TAPPING SLEEVE SHALL BE NO CLOSER THAN 4 FEET TO A JOINT.



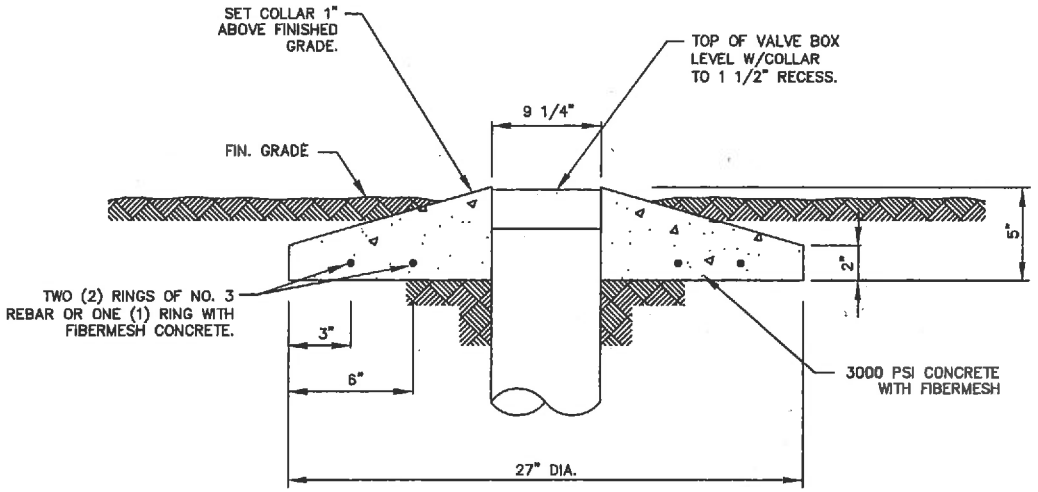




TYPICAL TAPPING SLEEVE

| RICHLAND COUNTY UTILITIES | |
|---|---|
| TAPPING SLEEVE AND VALVE | DRAWING: GD-7.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |



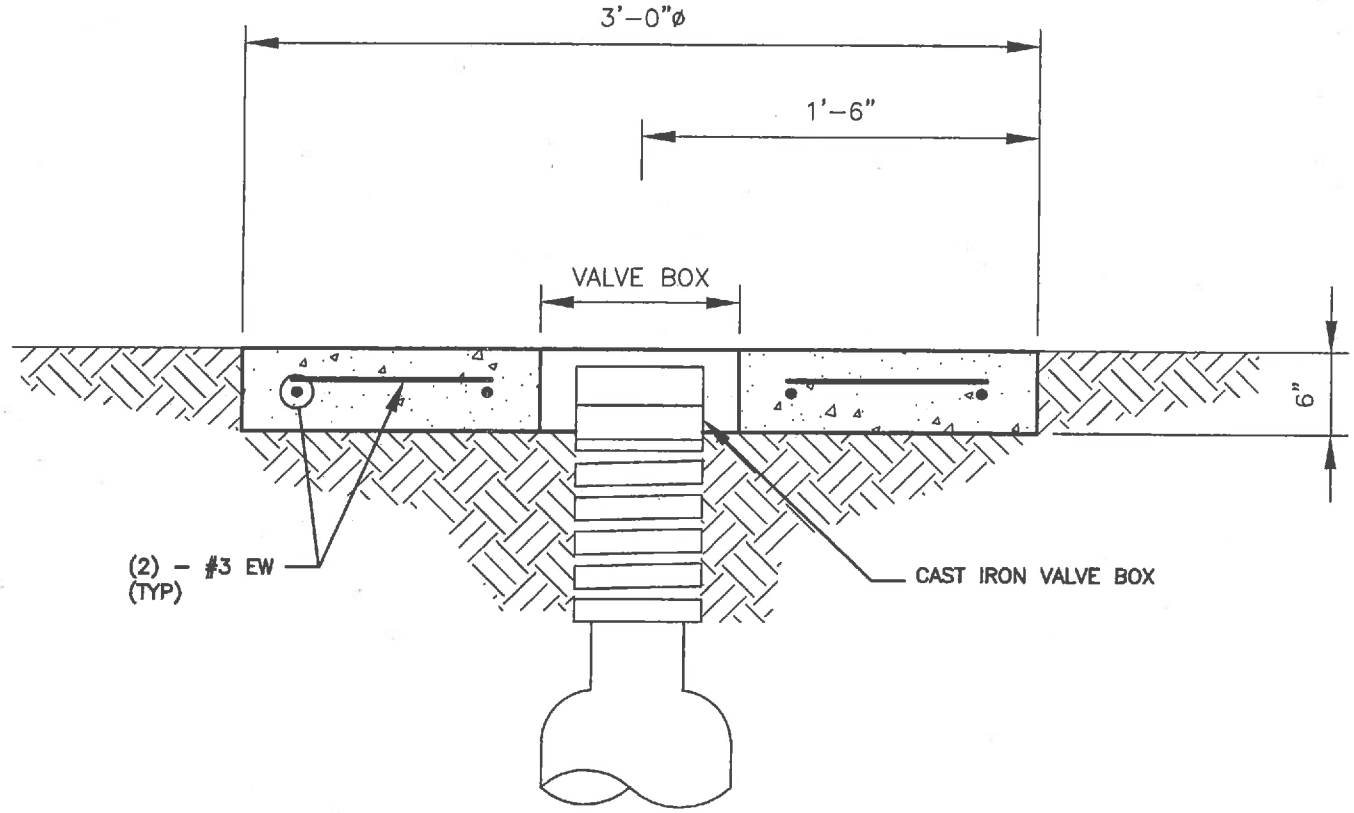

PLAN




SECTION A–A

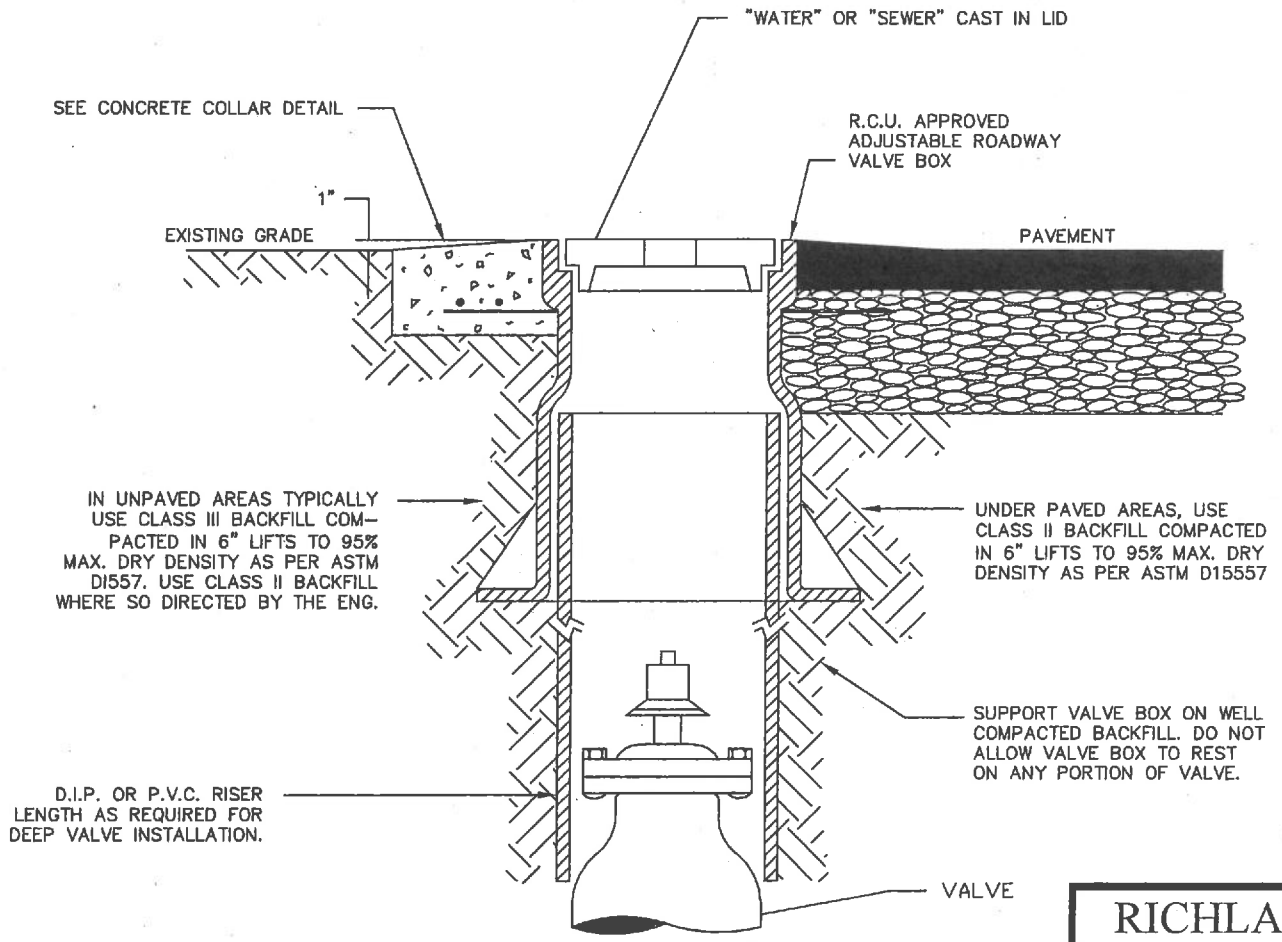
# PRECAST CONCRETE COLLAR

| RICHLAND COUNTY UTILITIES | |
|---|---|
| PRECAST CONCRETE COLLAR | DRAWING: GD-8.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




CONCRETE COLLAR

| RICHLAND COUNTY UTILITIES | |
|---|---|
| CONCRETE COLLAR | DRAWING: GD-9.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

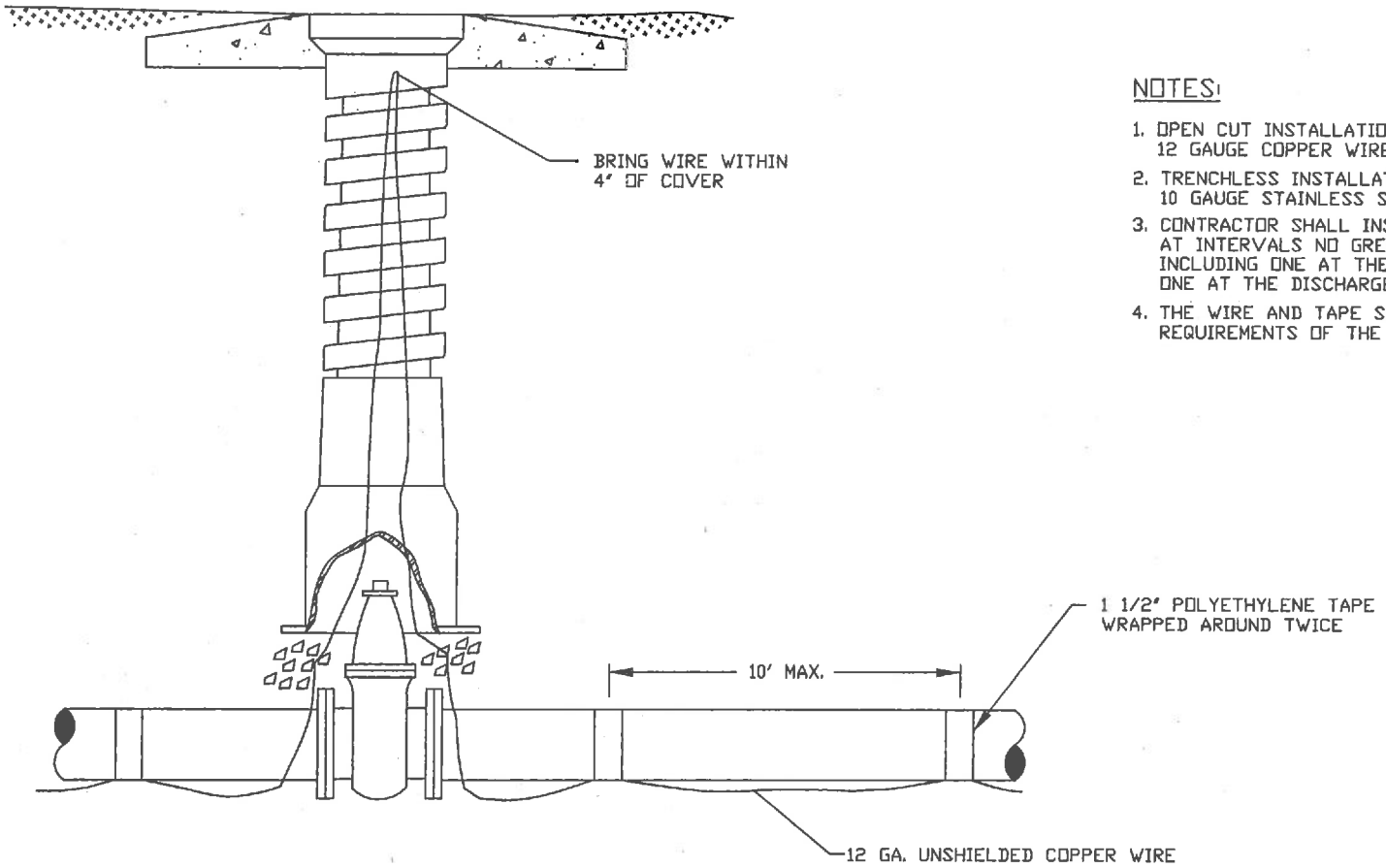



VALVE BOX

NOTES:

1. CENTER VALVE BOX OVER OPERATING NUT TO INSURE FREE VALVE OPERATION.
2. USE 6" RISER PIPE ON 4" & 6" VALVES.
3. USE 8" RISER PIPE ON 8" VALVES AND LARGER.
4. REFER TO MINIMUM STANDARDS FOR ACCEPTABLE MANUFACTURERS.

| RICHLAND COUNTY UTILITIES | |
|---|---|
| VALVE BOX | DRAWING: GD-10.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




NOTES:

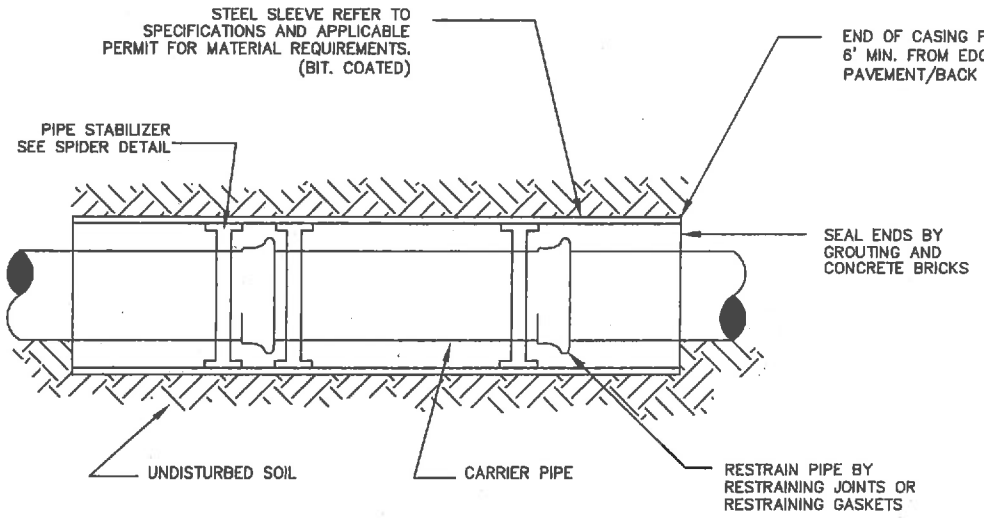
1. OPEN CUT INSTALLATIONS WILL REQUIRE 12 GAUGE COPPER WIRE.
2. TRENCHLESS INSTALLATIONS WILL REQUIRE 10 GAUGE STAINLESS STEEL WIRE.
3. CONTRACTOR SHALL INSTALL DUMMY VALVE BOXES AT INTERVALS NO GREATER THAN 1000 FEET, INCLUDING ONE AT THE PUMP STATION AND ONE AT THE DISCHARGE POINT.
4. THE WIRE AND TAPE SHALL MEET THE REQUIREMENTS OF THE RCU MINIMUM STANDARDS.

TRACER WIRE

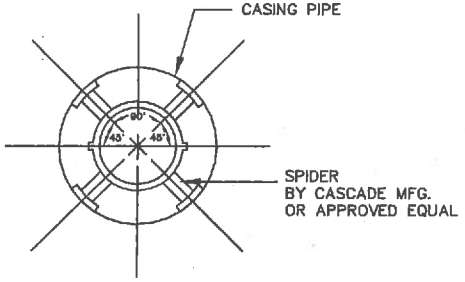
| RICHLAND COUNTY UTILITIES | |
|---|---|
| TRACER WIRE | DRAWING: GD-11.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

NOTES:

1. REFER TO APPLICABLE PERMIT FOR MINIMUM REQUIREMENTS GOVERNING HIGHWAY OR RAILROAD UNDERCROSSINGS.
2. THE INSIDE DIAMETER OF THE CASING PIPE SHALL BE A MINIMUM OF 4" LARGER THAN THE LARGEST OUTSIDE DIAMETER OF THE CARRIER PIPE (JOINTS OR COUPLINGS) IF THE CARRIER PIPE IS LESS THAN 6" IN DIAMETER. IF THE DIAMETER OF THE CARRIER PIPE IS 6" OR LARGER, THE DIAMETER OF THE CASING PIPE SHALL BE A MINIMUM OF 6" LARGER THAN THE LARGEST OUTSIDE DIAMETER OF CARRIER PIPE.
3. THE END OF THE CASING PIPE SHALL EXTEND A MINIMUM OF 25' FROM THE CENTERLINE OF RAIL.
4. THE TOP OF THE CASING PIPE SHALL BE A MINIMUM OF 5.6' BELOW THE BASE OF RAIL.
5. THE TOP OF THE CASING PIPE SHALL BE A MINIMUM OF 3' BELOW THE INVERT OF ROADSIDE DRAINAGE DITCHES.
6. USE SPIDER SUPPORTS (SEE DETAIL) TO MOVE CARRIER PIPE INTO CASING PIPE. SPACING OF SPIDERS WILL BE DICTATED BY THE LENGTH OF CASING PIPE AND NUMBER OF JOINTS OF CARRIER PIPE.
7. MINIMUM OF 2 SPACERS PER JOINT OF PIPE.
8. THERE SHALL BE NO WELDING OF CASING UNDER PAVEMENT.




JACK AND BORE PROFILE




SPIDER DETAIL

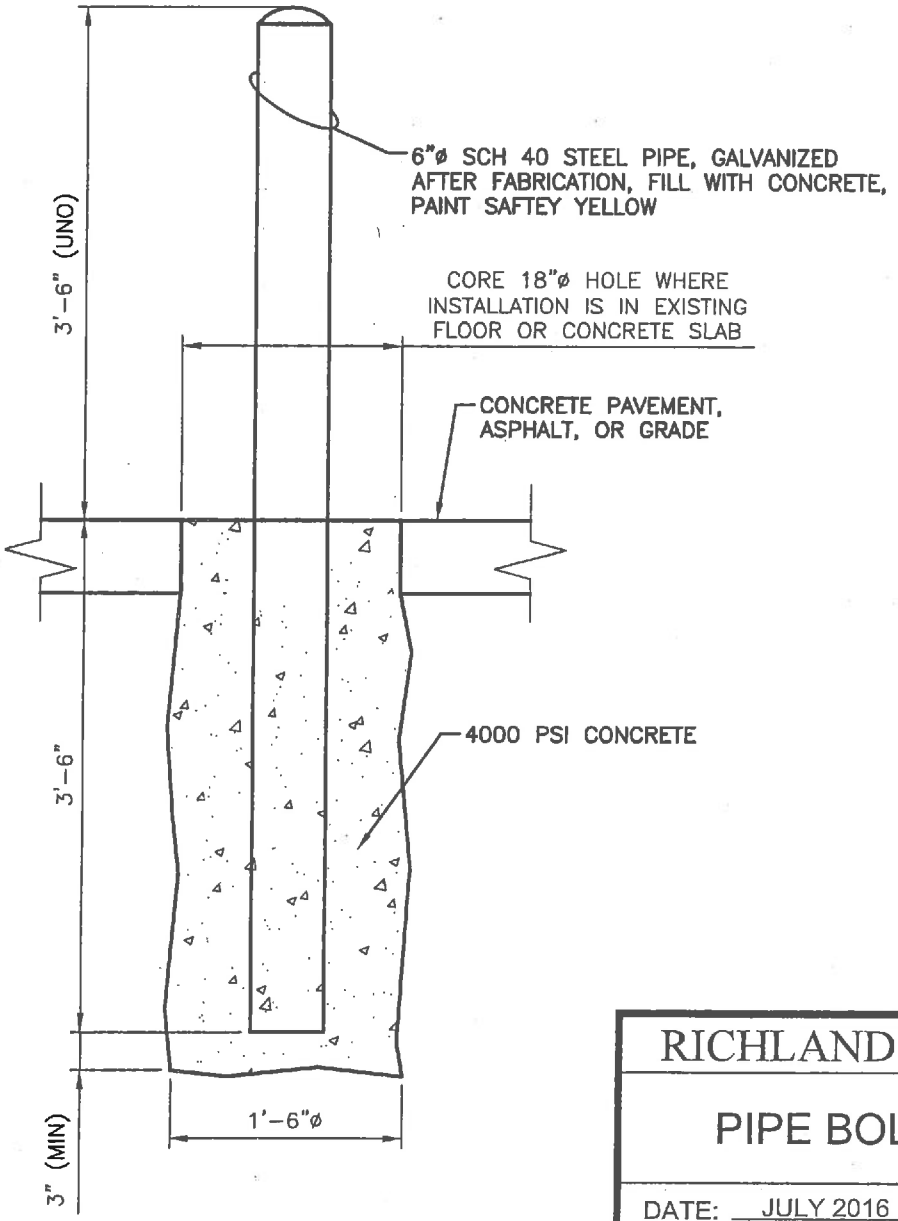
WALL THICKNESS FOR STEEL CASING PIPE

| | |
|---|---|
| UNDER 14" | 0.251" |
| 14" & 16" | 0.282" |
| 18" | 0.313" |
| 20" | 0.344" |
| 22" | 0.375" |
| 24" | 0.407" |
| 26" | 0.438" |
| 28" & 30" | 0.469" |
| 32" | 0.501" |
| 34" & 36" | 0.532" |
| 38" – 44" | 0.563" |
| 46" – 50" | 0.688" |
| 52" & 54" | 0.813" |
| 60" | 0.876" |
| 66" | 1.000" |

PIPE AND CASING JACK AND BORE

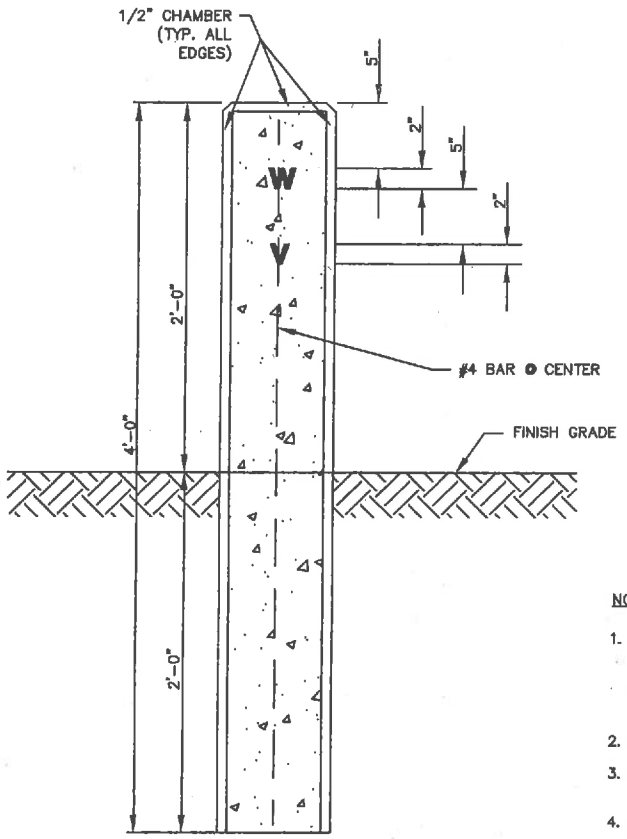
RICHLAND COUNTY UTILITIES

| | |
|---|---|
| PIPE AND CASING JACK AND BORE | DRAWING: GD-12.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

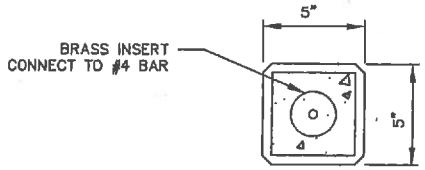



PIPE BOLLARD

| RICHLAND COUNTY UTILITIES | |
|---|---|
| PIPE BOLLARD | DRAWING: GD-13.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




SIDE



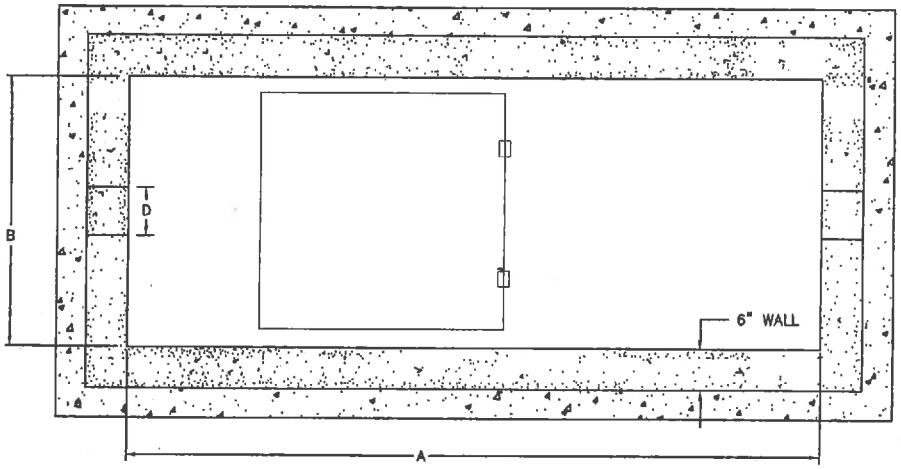

TOP

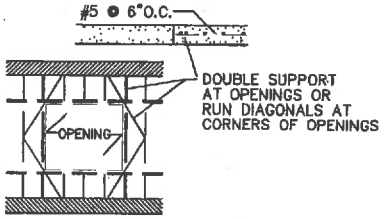
NOTES:

1. MARKER SHALL HAVE A 2" DIA. BRASS INSERT CAST IN TOP. PLACE MARKER 1'-0" INSIDE R/W WITH A DIRECTION ARROW & DISTANCE FROM MARKER TO VALVE STAMPED ON BRASS INSERT.
2. MARKER SHALL BE PAINTED WATER BLUE.
3. CAST THE LETTERS WV ON THE ROAD SIDE OF THE MARKER.
4. LOCATE AT ALL BURIED VALVES ON MAINS GREATER THAN 12".

VALVE MARKER

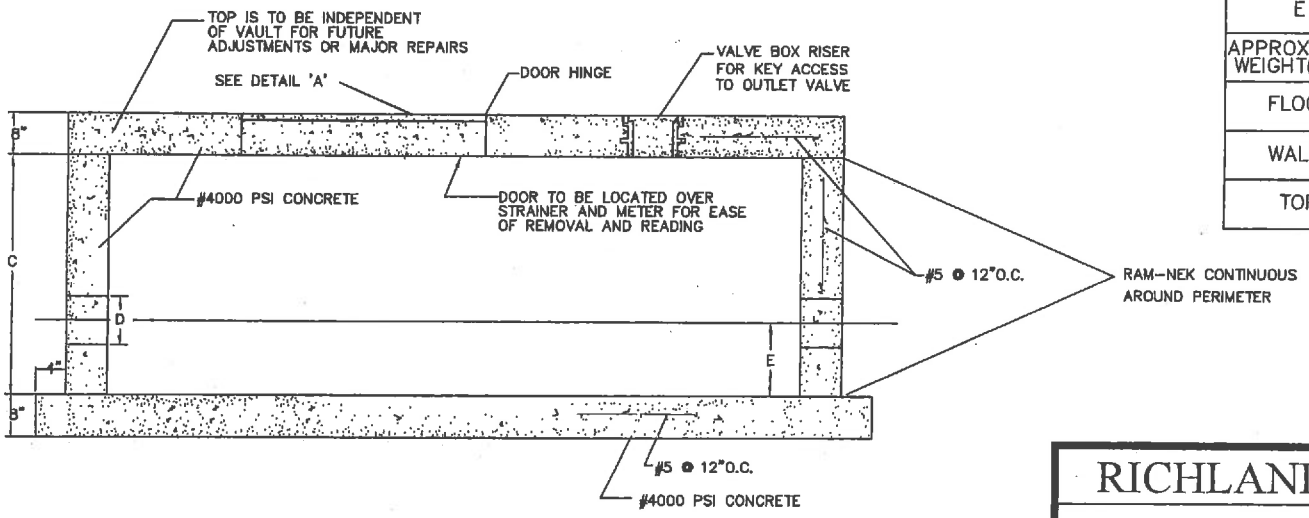
| RICHLAND COUNTY UTILITIES | |
|---|---|
| VALVE MARKER | DRAWING: GD-14.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |



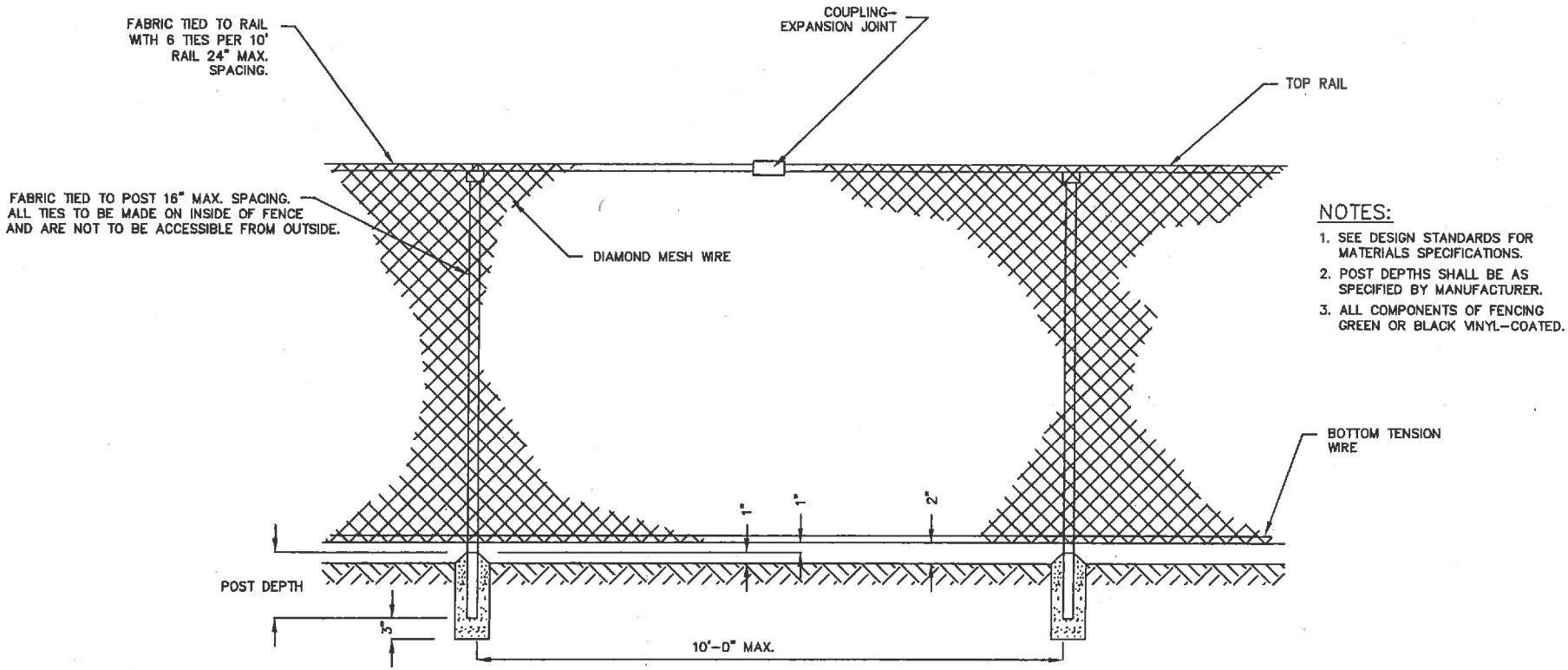

METER PIT DOOR
DETAIL A

| PIPE SIZE | 3" – 4" | 6" – 8" | 10" |
|---|---|---|---|
| A | 8'–6" | 11'–6" | 13'–6" |
| B | 4' | 5' | 5'–6" |
| C | 4' | 4'–6" | 5' |
| D | 8" | 13" | 16" |
| E | 14" | 19" | 20" |
| APPROXIMATE WEIGHT(LBS) | | | |
| FLOOR | 5800 | 8800 | 10900 |
| WALLS | 8100 | 11850 | 15000 |
| TOP | 3900 | 6300 | 7050 |




PRECAST VAULTS

| RICHLAND COUNTY UTILITIES | |
|---|---|
| PRECAST VAULTS | DRAWING: GD-15.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

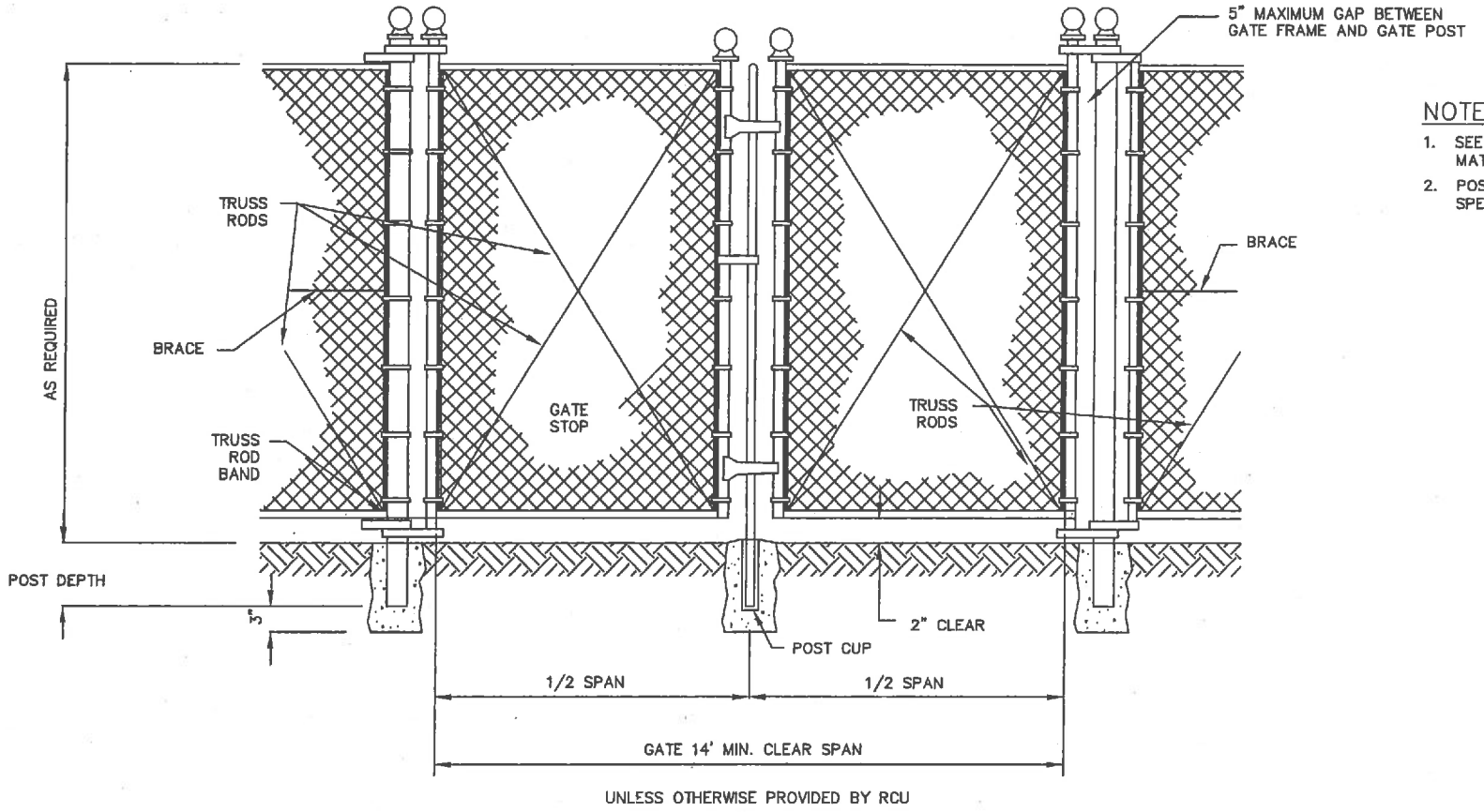



NOTES:

1. SEE DESIGN STANDARDS FOR MATERIALS SPECIFICATIONS.
2. POST DEPTHS SHALL BE AS SPECIFIED BY MANUFACTURER.
3. ALL COMPONENTS OF FENCING GREEN OR BLACK VINYL–COATED.

TYPICAL FENCE LINE SPAN

| RICHLAND COUNTY UTILITIES | |
|---|---|
| TYPICAL FENCE LINE SPAN | DRAWING: GD-16.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

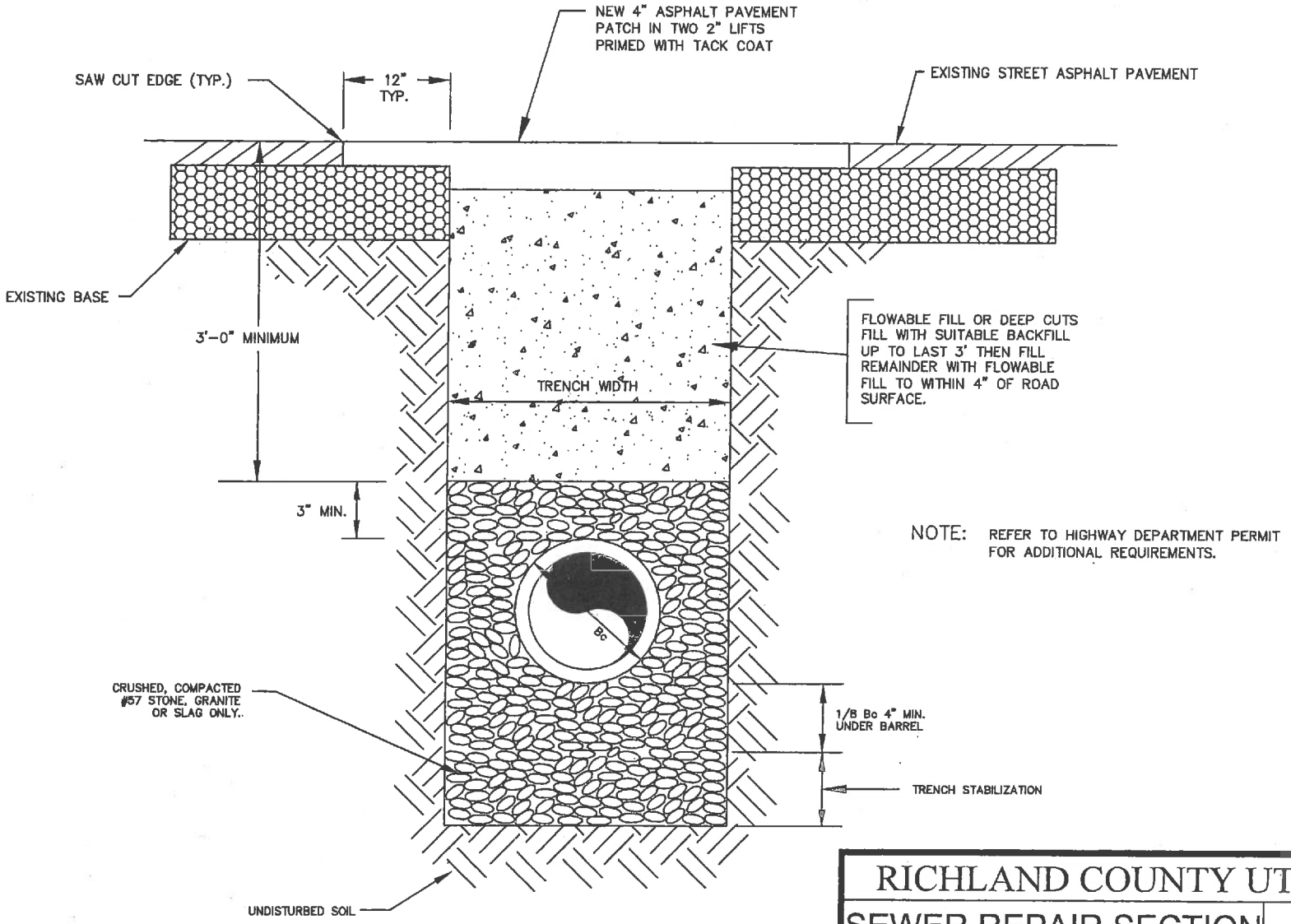



NOTES:

1. SEE DESIGN STANDARDS FOR MATERIALS SPECIFICATIONS.
2. POST DEPTHS SHALL BE AS SPECIFIED BY MANUFACTURER.

PUMP STATION VEHICLE GATE

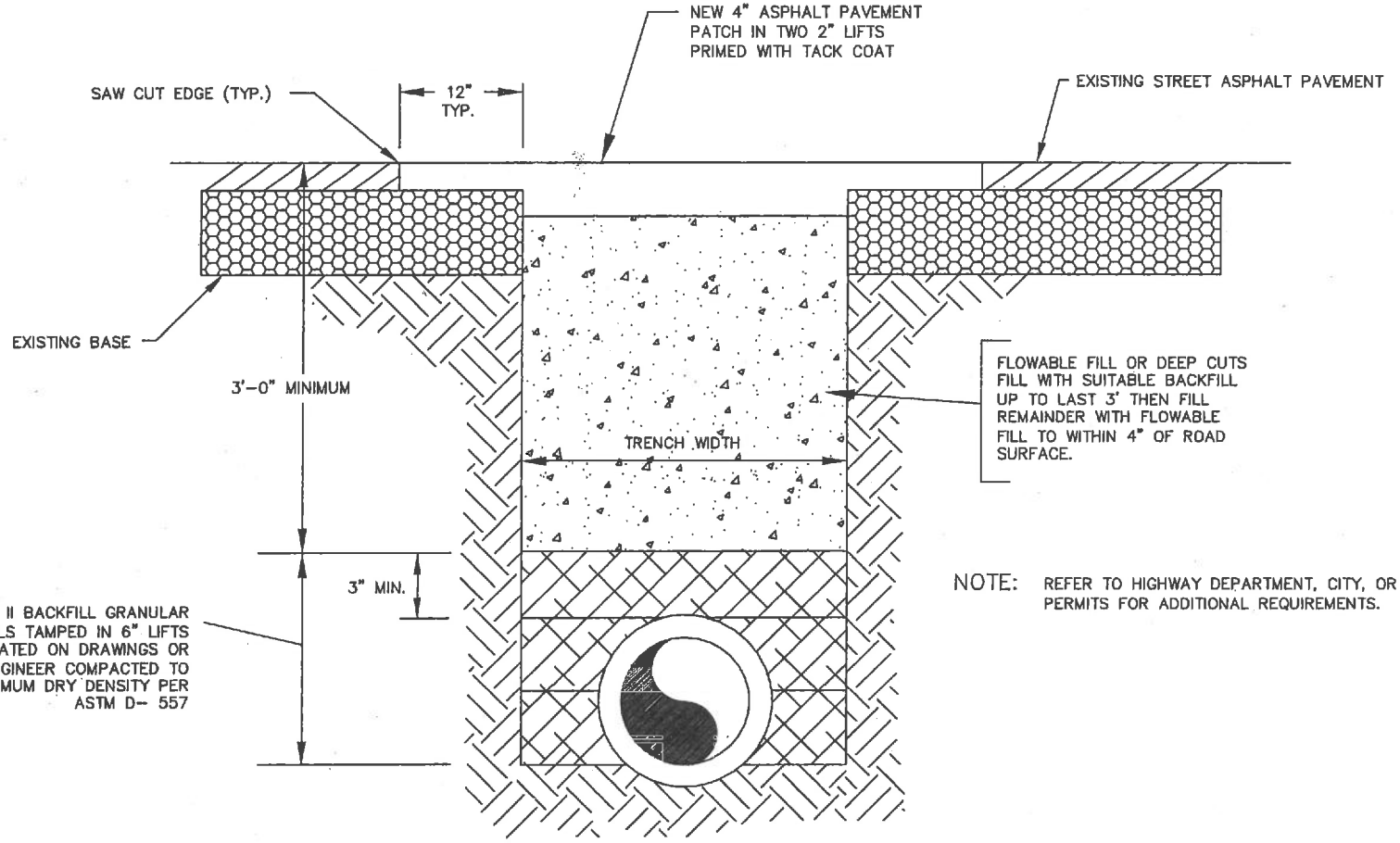
| RICHLAND COUNTY UTILITIES | |
|---|---|
| PUMP STATION VEHICLE GATE | DRAWING: GD-17.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




NOTE: REFER TO HIGHWAY DEPARTMENT PERMIT FOR ADDITIONAL REQUIREMENTS.

SEWER REPAIR SECTION MAIN ROAD CUT

| RICHLAND COUNTY UTILITIES | |
|---|---|
| SEWER REPAIR SECTION MAIN ROAD CUT | DRAWING: GD-18.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |



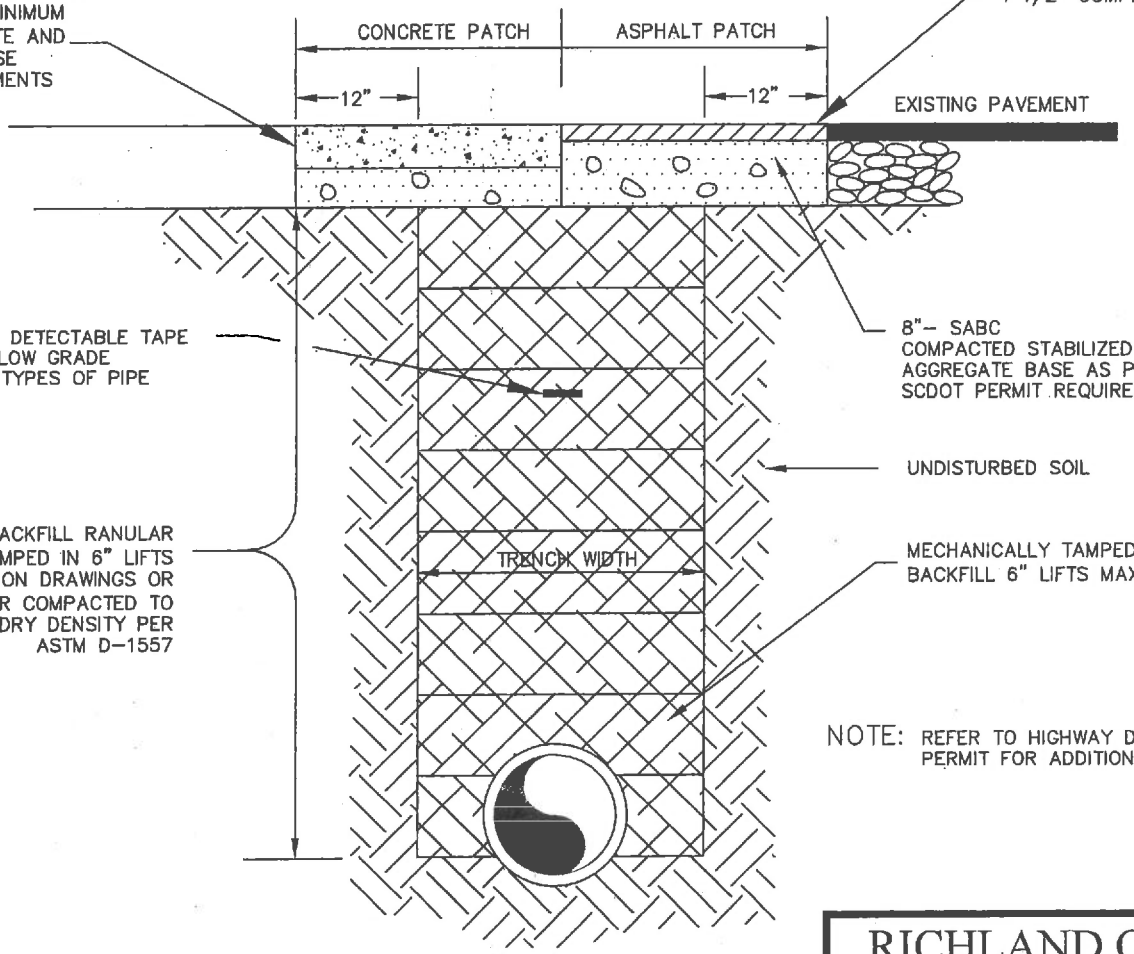

NOTE: REFER TO HIGHWAY DEPARTMENT, CITY, OR COUNTY PERMITS FOR ADDITIONAL REQUIREMENTS.

SEWER REPAIR SECTION
SECONDARY ROAD CUT

| RICHLAND COUNTY UTILITIES | |
|---|---|
| SEWER REPAIR SECTION<br>SECONDARY ROAD CUT | DRAWING:<br>GD-19.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

NOTE:
THICKNESS OF CONCRETE PATCH SHALL BE AS SPECIFIED IN SCDOT PERMIT REQUIREMENTS. MINIMUM 6" OF 3500 PSI CONCRETE AND 4" SABC COMPACTED BASE AS PER PERMIT REQUIREMENTS

NOTE:
THICKNESS OF ASPHALT PATCH SHALL BE AS SPECIFIED IN SCDOT PERMIT REQUIREMENTS. MINIMUM 1 1/2" COMPACTED ASPHALT

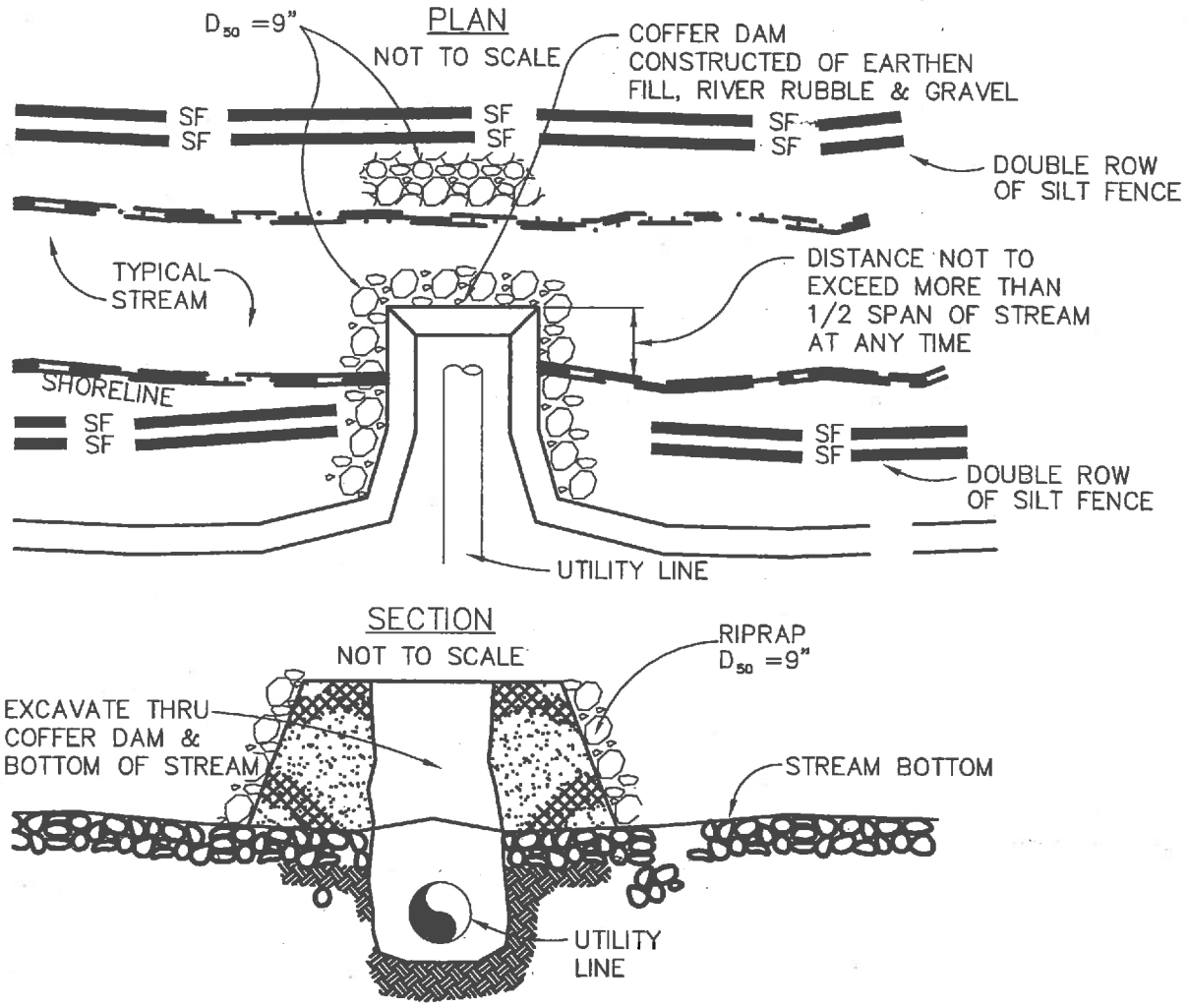



NOTE: REFER TO HIGHWAY DEPARTMENT, CITY, OR COUNTY PERMIT FOR ADDITIONAL REQUIREMENTS.

SEWER REPAIR SECTION
PAVED DRIVEWAY CUT

| RICHLAND COUNTY UTILITIES | |
|---|---|
| SEWER REPAIR SECTION PAVED DRIVEWAY CUT | DRAWING: GD-20.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

**SCDHEC Approved August 2016**




# STREAM CROSSING DETAIL

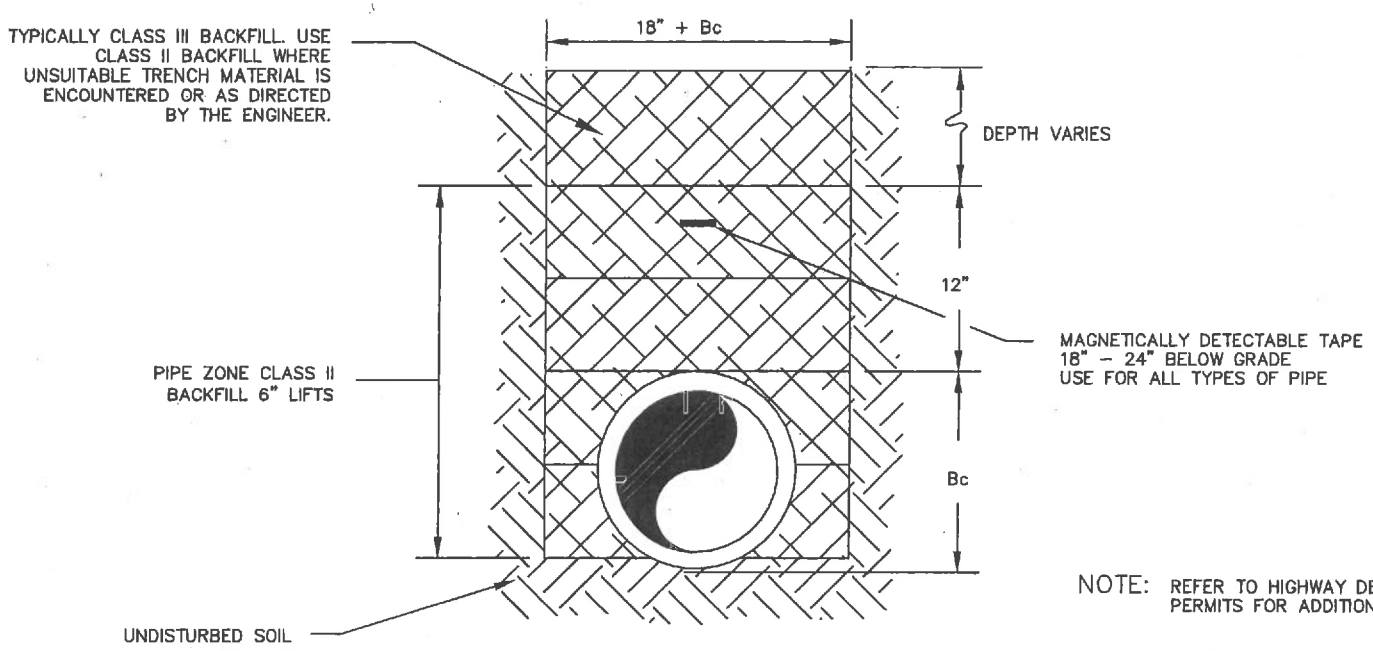
NOT TO SCALE

NOTE :
INSTALL A DOUBLE ROW OF SILT FENCE WHERE A 50' BUFFER CANNOT BE MAINTAINED BETWEEN THE WETLAND BOUNDARY AND THE DISTURBED UPLAND AREA. INSTALL SILT FENCE ON UPLAND SIDE OF WETLAND BOUNDARY.

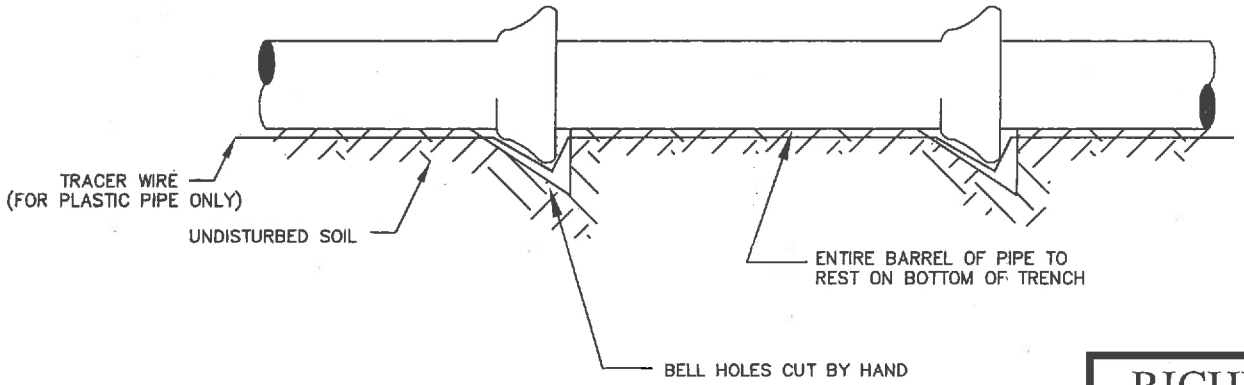
| RICHLAND COUNTY UTILITIES | |
|---|---|
| STREAM CROSSING DETAIL | DRAWING: GD-21.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

# 11.2
# Water Details

**SCDHEC Approved August 2016**

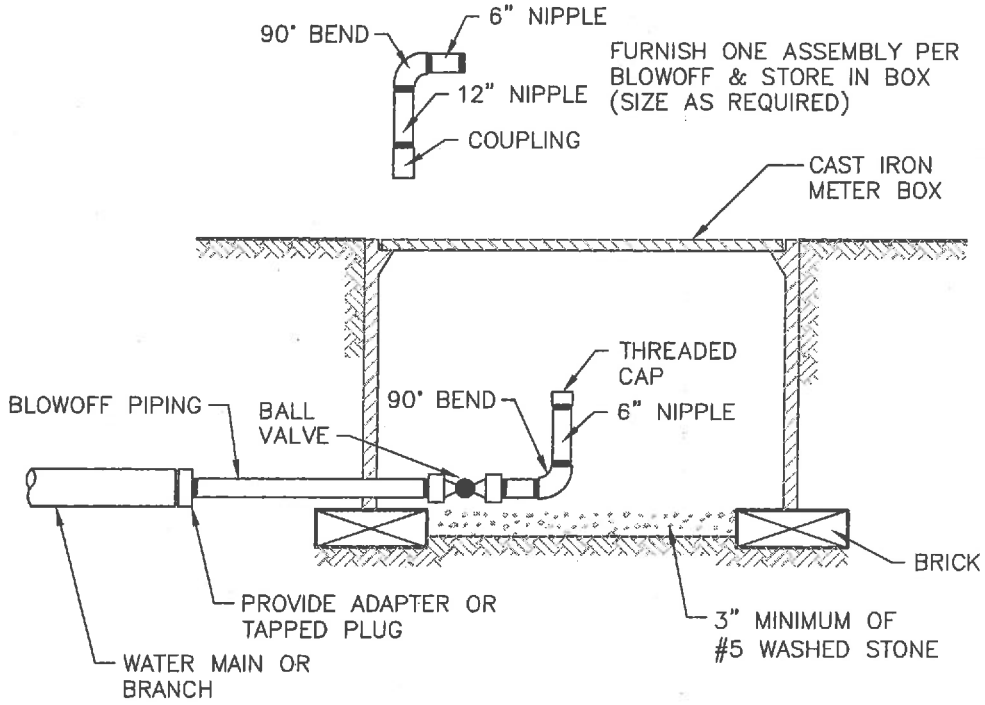



NOTE: REFER TO HIGHWAY DEPARTMENT, CITY, OR COUNTY PERMITS FOR ADDITIONAL REQUIREMENTS.




WATER MAIN BEDDING

| RICHLAND COUNTY UTILITIES | |
|---|---|
| WATER MAIN BEDDING | DRAWING: WA-1.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |



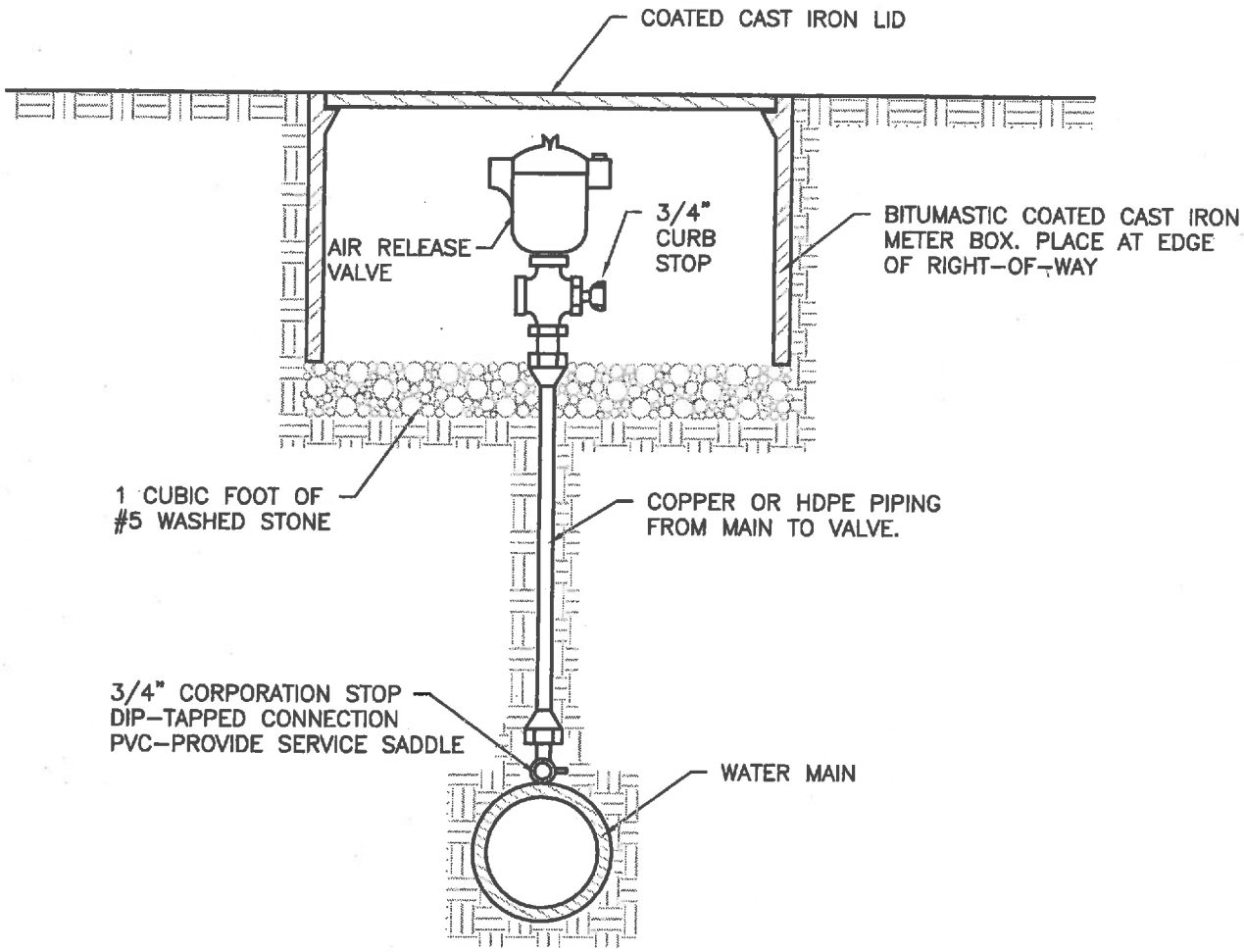

BLOWOFF

NOTES:

1. INSTALL AT END OF ALL DEAD–END LINES WHERE THE SYSTEM WILL NOT SUPPORT FIRE FLOW. LOCATE OUTSIDE OF TRAFFIC AREAS.
2. UNDER MOST SITUATIONS, THE ABOVE TABLE CAN BE USED. BUT, IN SOME AREA WHERE THE STATIC PRESSURES ARE EXCEEDINGLY HIGH, SMALLER BLOWOFFS MAY BE NECESSARY.
3. PROVIDE GALVANIZED BLOWOFF PIPING.
4. FOR LINES GREATER THAN 8"ø USE A FIRE HYDRANT FOR BLOWOFF.
5. BLOW–OFFS SHOULD NOT BE DIRECTED TOWARDS ROADS OR SO THAT THE WATER WILL FLOW INTO CREEKS, ETC. AT STREAM CROSSINGS DIRECT AWAY FROM STREAMS, OVER GROUND.

| DIA. OF MAIN (IN.) | FLOW REQUIRED (GPM) | MIN. ORIFICE SIZE (IN.) | BLOWOFF SIZE (IN.) |
|---|---|---|---|
| 2 | 25 | 0.56 | 3/4 |
| 2 1/2 | 40 | 0.71 | 1 |
| 3 | 60 | 0.87 | 1 1/4 |
| 4 | 100 | 1.10 | 1 1/2 |
| 6 | 220 | 1.65 | 2 |
| 8 | 400 | 2.21 | 2 1/2 |
| 10 | 612 | FIRE HYDRANT | |
| 12 | 882 | FIRE HYDRANT | |
| 14 | 1200 | SPECIAL BLOW–OFF | |
| 16 | 1570 | SPECIAL BLOW–OFF | |

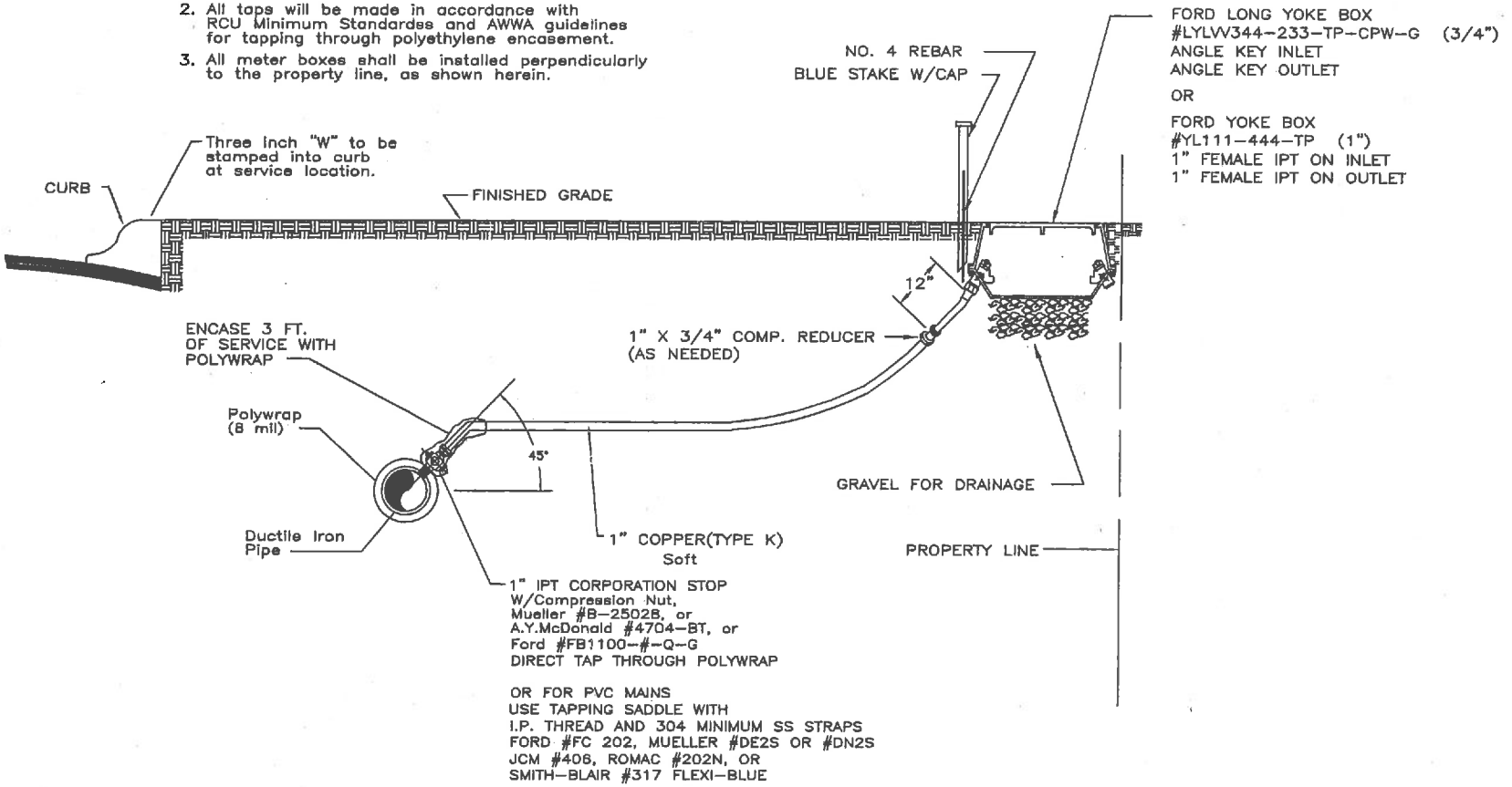
| RICHLAND COUNTY UTILITIES | |
|---|---|
| BLOWOFF ASSEMBLY | DRAWING: WA-2.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




WATER AIR RELEASE VALVE

| RICHLAND COUNTY UTILITIES | |
|---|---|
| WATER AIR RELEASE VALVE | DRAWING: WA-3.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

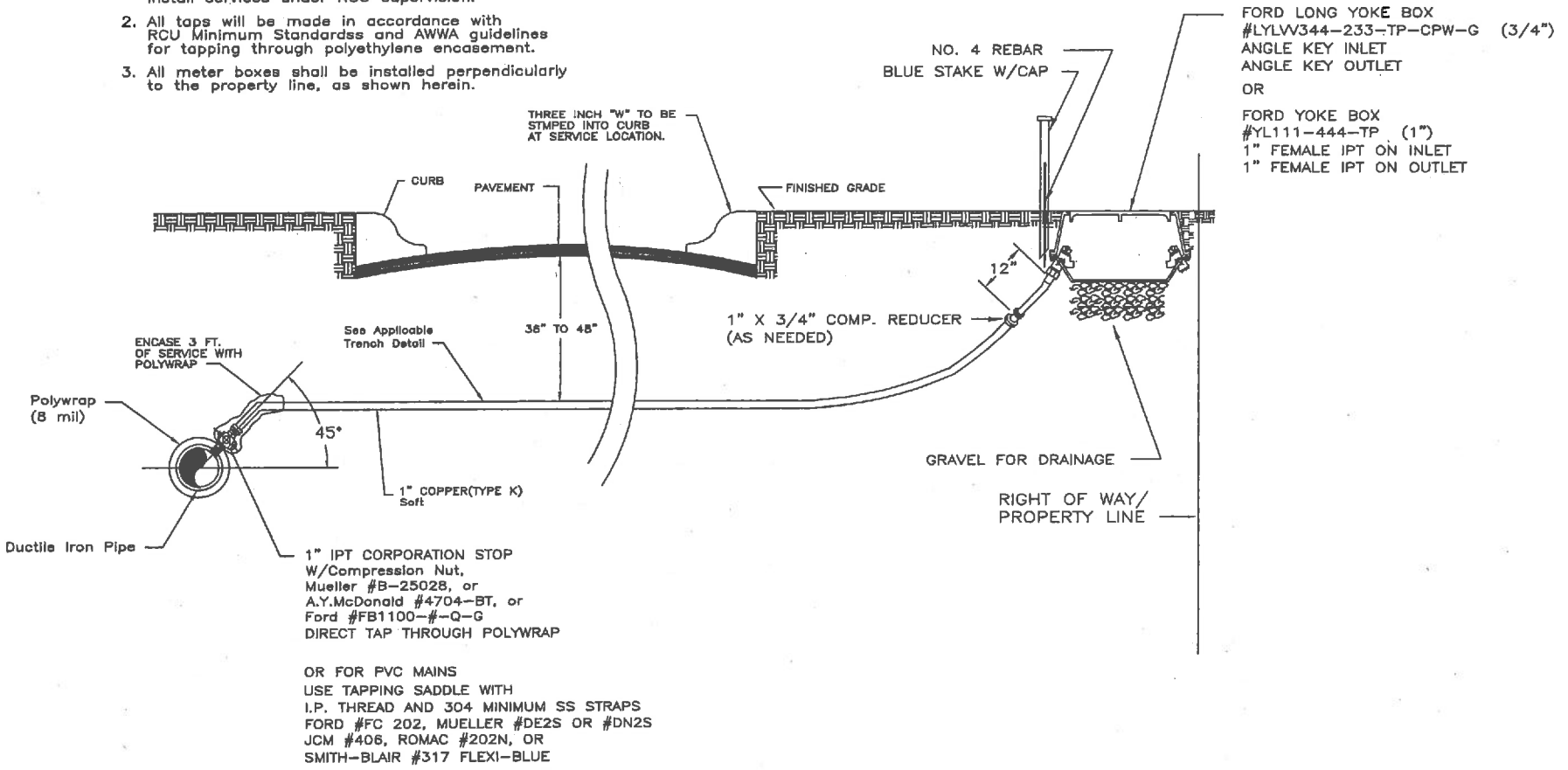
NOTES:
1. Contractor will provide all material and install services under RCU supervision.
2. All taps will be made in accordance with RCU Minimum Standardes and AWWA guidelines for tapping through polyethylene encasement.
3. All meter boxes shall be installed perpendicularly to the property line, as shown herein.




# 3/4" – 1" SINGLE WATER SERVICE NEAR SIDE

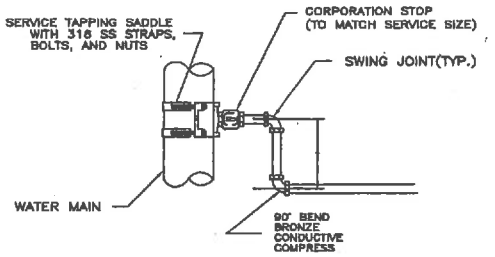
| RICHLAND COUNTY UTILITIES | |
|---|---|
| 3/4" - 1" SINGLE WATER SERVICE NEAR SIDE | DRAWING: WA-4.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

NOTES:
1. Contractor will provide all material and install services under RCU supervision.
2. All taps will be made in accordance with RCU Minimum Standardss and AWWA guidelines for tapping through polyethylene encasement.
3. All meter boxes shall be installed perpendicularly to the property line, as shown herein.

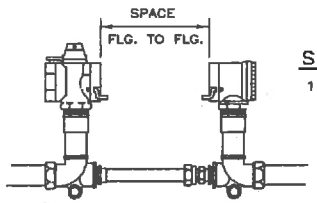



3/4" – 1" SINGLE WATER SERVICE
FAR SIDE

| RICHLAND COUNTY UTILITIES | |
|---|---|
| 3/4" - 1" SINGLE WATER SERVICE FAR SIDE | DRAWING: WA-5.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |



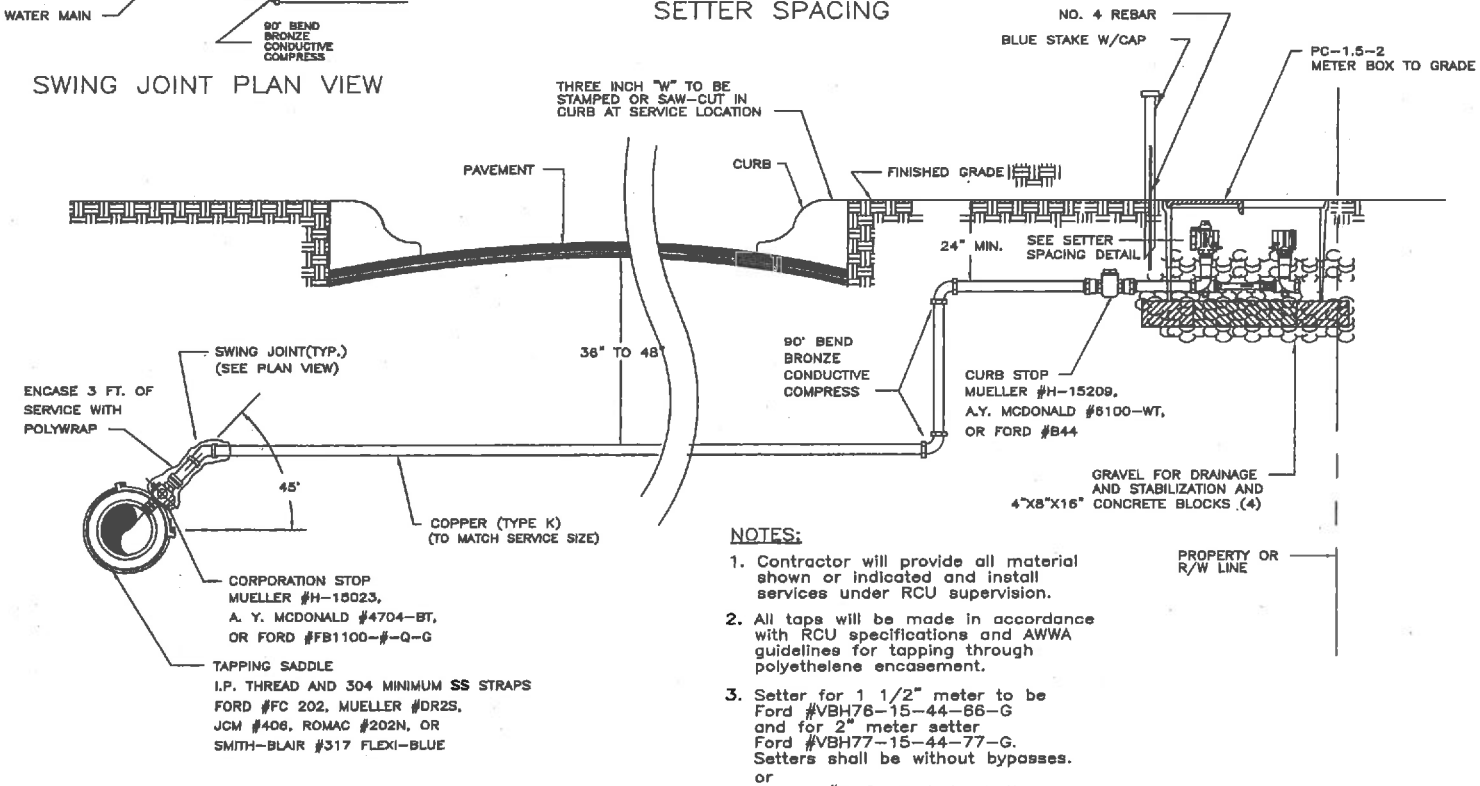

SWING JOINT PLAN VIEW




SETTER SPACING

SPACE REQ'D. BETWEEN FLANGES

1 1/2" METER: 13 1/4" – 13 3/8"
2" METER: 17 1/4" – 17 3/8"

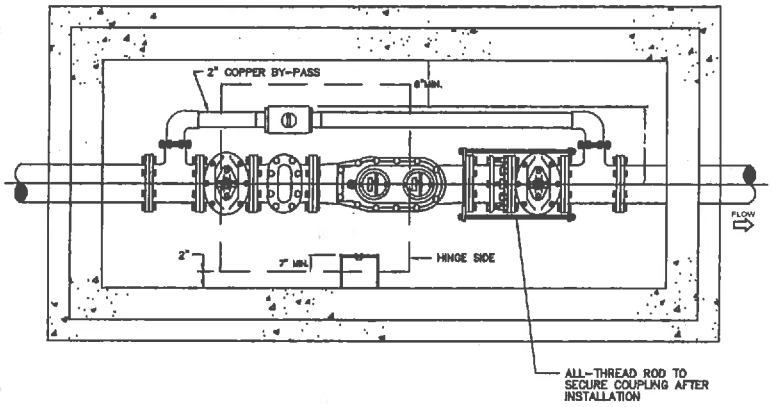


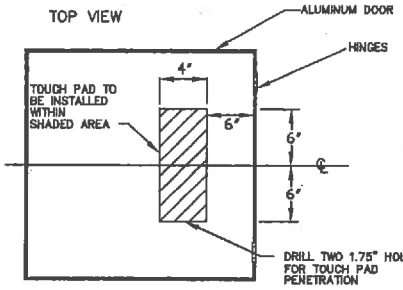

NOTES:

1. Contractor will provide all material shown or indicated and install services under RCU supervision.
2. All taps will be made in accordance with RCU specifications and AWWA guidelines for tapping through polyethelene encasement.
3. Setter for 1 1/2" meter to be Ford #VBH76–15–44–66–G and for 2" meter setter Ford #VBH77–15–44–77–G. Setters shall be without bypasses.
   or
   Mueller #B–2422–2 for both sizes with 15" riser and 110 compression connection

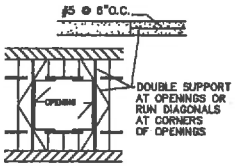
# 1 1/2" – 2" WATER SERVICE

| RICHLAND COUNTY UTILITIES | |
|---|---|
| 1 1/2" - 2" WATER SERVICE | DRAWING: WA-6.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

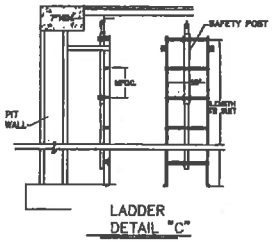


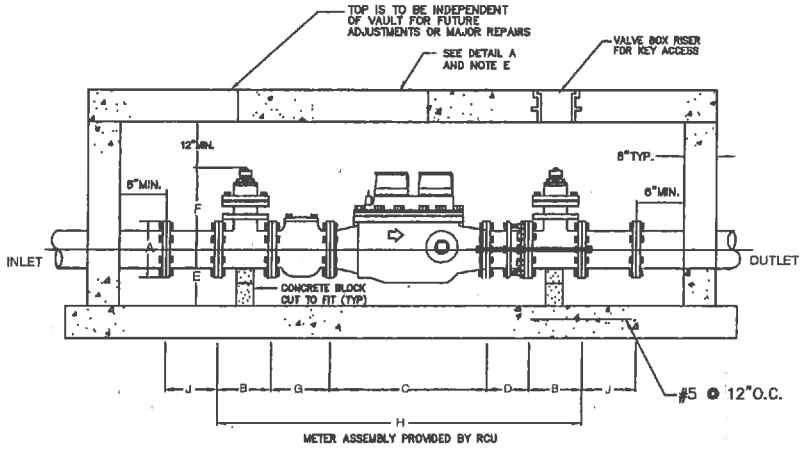

TOUCH PAD LOCATION DETAIL




METER PIT DOOR DETAIL A




DETAIL "C"




| DIMENSION | 3" |
|---|---|
| A | 7.5" |
| B | 8" |
| C | 17" |
| D | 11" |
| E | 8" |
| F | 12.4" |
| G | 6" |
| H | 50" |
| I | 8.5" |
| J | 11" |

NOTES:

A. DIMENSION"C" IS FOR NEPTUNE COMPOUND METERS. DIMENSIONS MAY VARY SLIGHTLY WITH TYPES OF FITTINGS USED.

B. THE VAULT SHALL BE CONSTRUCTED WITH 4000 PSI REINFORCED CONCRETE. USE OF BLOCK MUST BE APPROVED IN WRITING BY RCU BEFORE CONSTRUCTION.

C. IN NON-TRFFIC AREA USE ALUMINUM LIGHT TRAFFIC (300 PSI) DOOR. IN TRAFFIC AREA USE AASHTO-H20 LOAD RATING ALUMINUM DOOR.

D. DOORS ARE TO BE LOCATED SO METER CAN BE READ AND STRAINER CAN BE LIFTED STRAIGHT OUT. USE 3' X 3' DOOR. USE ONLY RCU APPROVED DOORS BY USF FABRICATION AND BILCO. HINGES SHALL BE LOCATED ON OUTLET SIDE OF DOOR OPENING.

E. ALUMINUM LADDER W/SAFETY POST SHALL BE USED IN VAULTS 5' DEEP OR DEEPER. LADDER SHALL BE PLACED ON OPPOSITE SIDE OF METER FROM BYPASS.

F. USE NON-SHRINKING HYDRAULIC CEMENT-WATER STOP AT VAULT PENETRATIONS.

G. ANY DEVIATION FROM THESE PLANS MUST BE APPROVED BY RCU PRIOR TO INSTALLATION.

H. VALVE AND DOOR STATUS AFTER INSTALLATION IS AS FOLLOWS:
- VALVE BETWEEN MAIN AND VAULT FULLY OPEN
- METER INLET VALVE FULLY CLOSED
- BYPASS GATE VALVE FULLY CLOSED
- METER OUTLET VALVE FULLY OPEN
- DOOR LOCKED USING STAR-SHAPED LOCKING BOLT

I. WALLS SHALL BE A SINGLE POUR. SEAL WITH RAM-NEK OR CONSEAL BETWEEN WALLS AND BOTTOM AND WALLS AND LID CONTINUOUS AROUND PERIMETER.

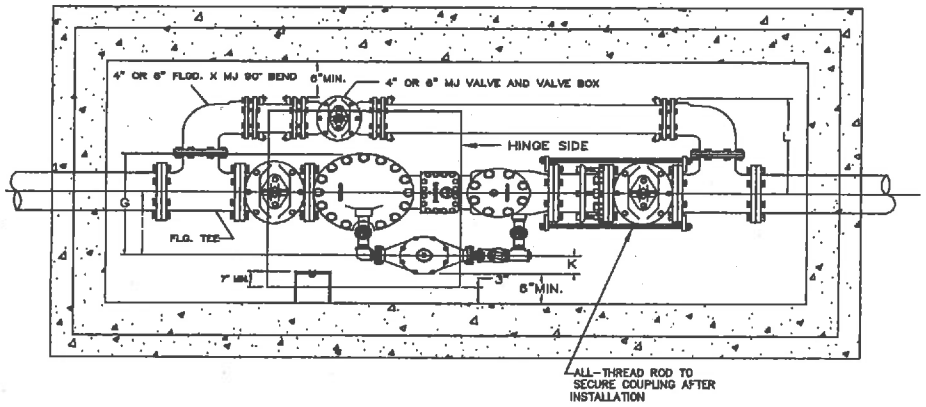
J. NO VAULT IS TO BE INSTALLED WITHOUT PRIOR APPROVAL OF RCU WATER DISTRIBUTION ENGINEER.

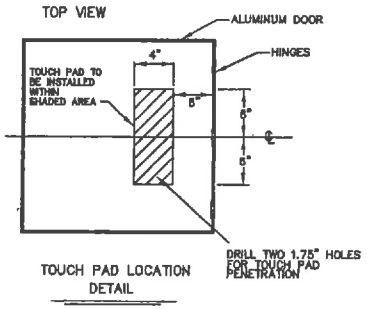
K. DOORS SHALL BE ISSUED BY RCU NEW INSTALLATION

3" COMPOUND METER WITH BYPASS

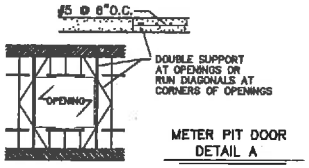
# RICHLAND COUNTY UTILITIES

| 3" COMPOUND METER WITH BYPASS | DRAWING: WA-7.0 |
|---|---|
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

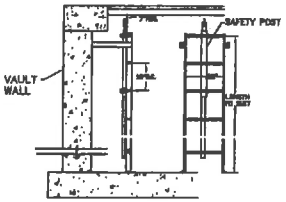


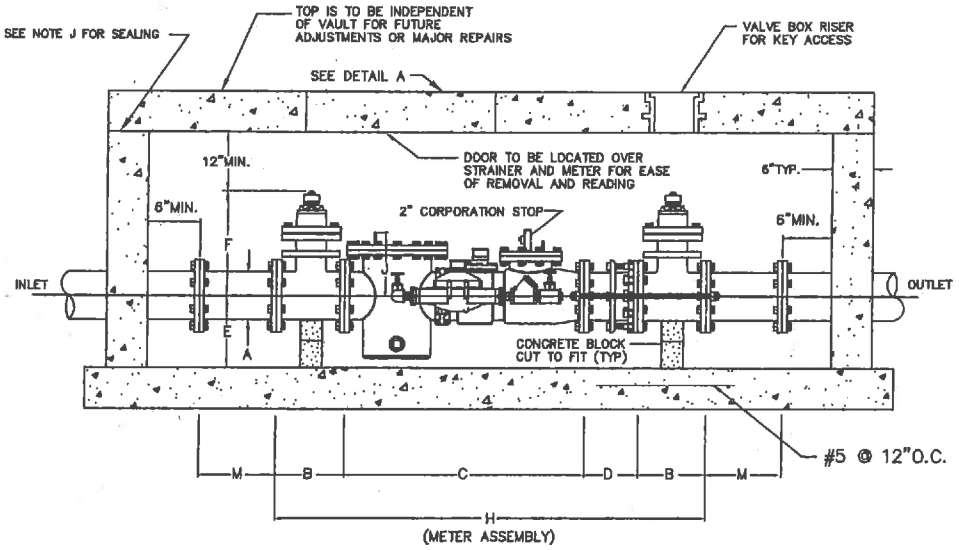

TOUCH PAD LOCATION DETAIL




METER PIT DOOR DETAIL A




DETAIL C




NOTES:

A. DIMENSION "G" IS FOR NEPTUNE PROTECTUS III FIRE LINE METERS. DIMENSIONS MAY VARY WITH TYPES OF FITTINGS USED.

B. VAULT SHALL BE CONSTRUCTED WITH 4000 PSI REINFORCED CONCRETE. USE OF BLOCK MUST BE APPROVED IN WRITING BY CPW BEFORE CONSTRUCTION.

C. USE ALUMINUM LIGHT TRAFFIC (300 PSI) DOOR IN NON-TRAFFIC AREAS. USE AASHTO-H20 LOAD RATING ALUMINUM DOOR IN ALL TRAFFIC AREAS. SEE DETAILS.

D. DOORS ARE TO BE LOCATED SO METER CAN BE READ AND STRAINER CAN BE LIFTED STRAIGHT OUT. HINGES SHALL BE LOCATED ON OUTLET SIDE OF DOOR OPENING.

E. USE ALUMINUM LADDER WITH SAFETY POST IN VAULTS 5' DEEP OR DEEPER. LADDER MUST BE PLACED ON OPPOSITE SIDE FROM BYPASS.

F. USE: 3' x 3' DOOR ON 4" METERS
3'-6" x 3'-6" DOOR ON 6" METERS
4' x 6' DOOR ON 8" AND 10" METERS
USE ONLY USF FABRICATION OR BILCO DOORS

G. VALVE AND DOOR STATUS AFTER INSTALLATION IS AS FOLLOWS:
- VALVE BETWEEN MAIN AND VAULT FULLY OPEN
- METER INLET VALVE FULLY CLOSED
- BYPASS METER BALL VALVES FULLY OPEN
- BYPASS GATE VALVE FULLY CLOSED
- METER OUTLET VALVE FULLY OPEN
- DOOR LOCKED USING STAR-SHAPED LOCKING BOLT

H. SEAL VAULT PENETRATIONS WITH NON-SHRINKING HYDRAULIC CEMENT-WATER STOP.

I. ANY DEVIATION FROM THESE PLANS MUST BE APPROVED BY RCU PRIOR TO INSTALLATION.

J. WALLS SHALL BE A SINGLE POUR. SEAL WITH RAM-NEK OR CONSEAL BETWEEN WALLS AND BOTTOM AND WALLS AND LID CONTINUOUS AROUND PERIMETER.

K. NO VAULT IS TO BE INSTALLED WITHOUT PRIOR CONSENT OF RCU WATER DISTRIBUTION ENGINEER.

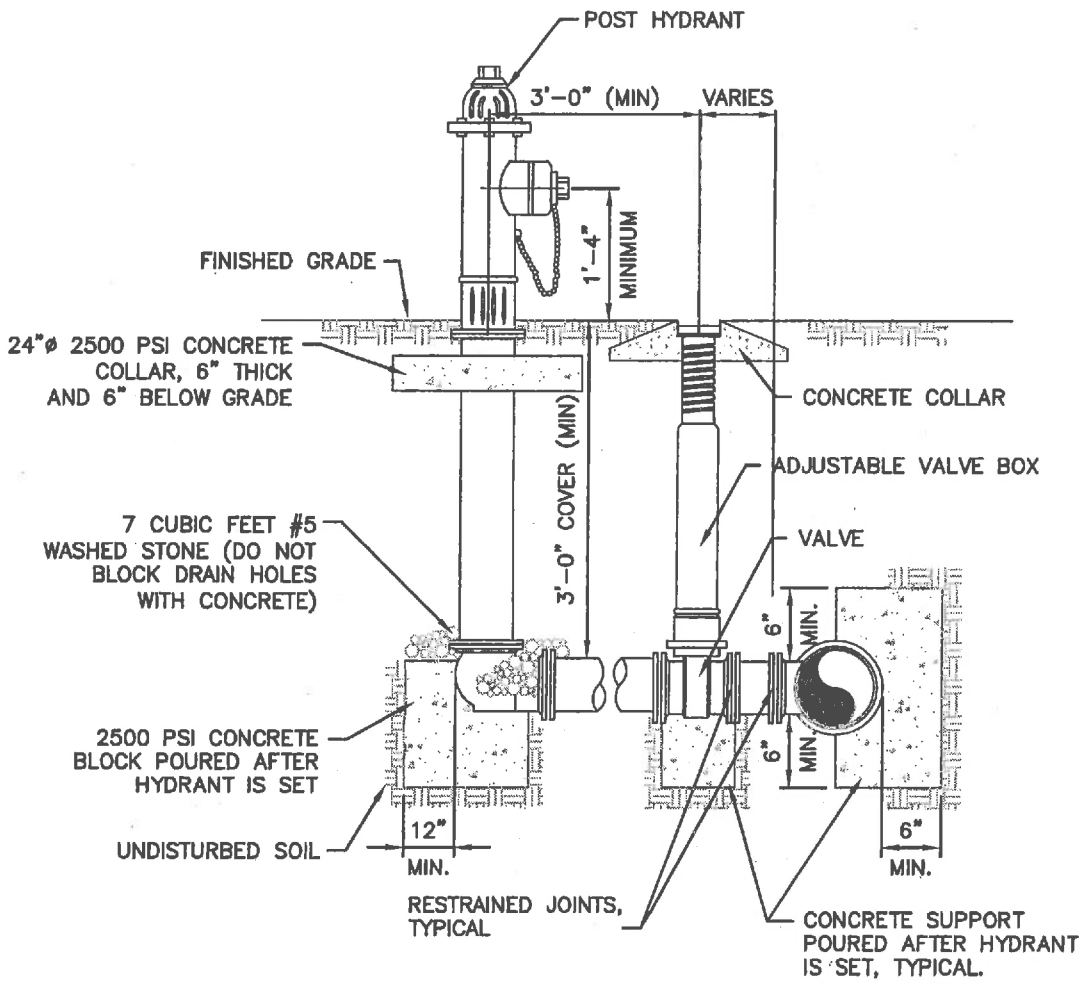
L. DOORS SHALL BE ISSUED BY RCU NEW INSTALLATION ENGINEERING REPRESENTATIVE.

| DIMENSION | 4" | 6" | 8" | 10" |
|---|---|---|---|---|
| A | 4.80" | 6.90" | 9.05" | 11.10" |
| B | 9" | 10.5" | 11.5" | 13" |
| C | 33" | 45" | 53" | 68" |
| D | 11" | 11" | 11" | 11" |
| E | 13" | 14" | 15" | 18" |
| F | 16.5" | 20.125" | 23.25" | 26.126" |
| G | 19" | 25.5" | 29.5" | 31.75" |
| H | 62" | 77" | 87" | 105" |
| I | 12" | 16" | 17" | 18" |
| J | 12.625" | 14.625" | 13.6825" | 13.5625" |
| K | 3.25" | 3.5" | 4.75" | 4.5" |
| L | 17.8" | 21.7" | 22.7" | 24.7" |
| M | 13" | 16" | 18" | 22" |

4" – 10" METER WITH BYPASS

RICHLAND COUNTY UTILITIES

| 4" - 10" METER WITH BYPASS | DRAWING: WA-8.0 |
|---|---|
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

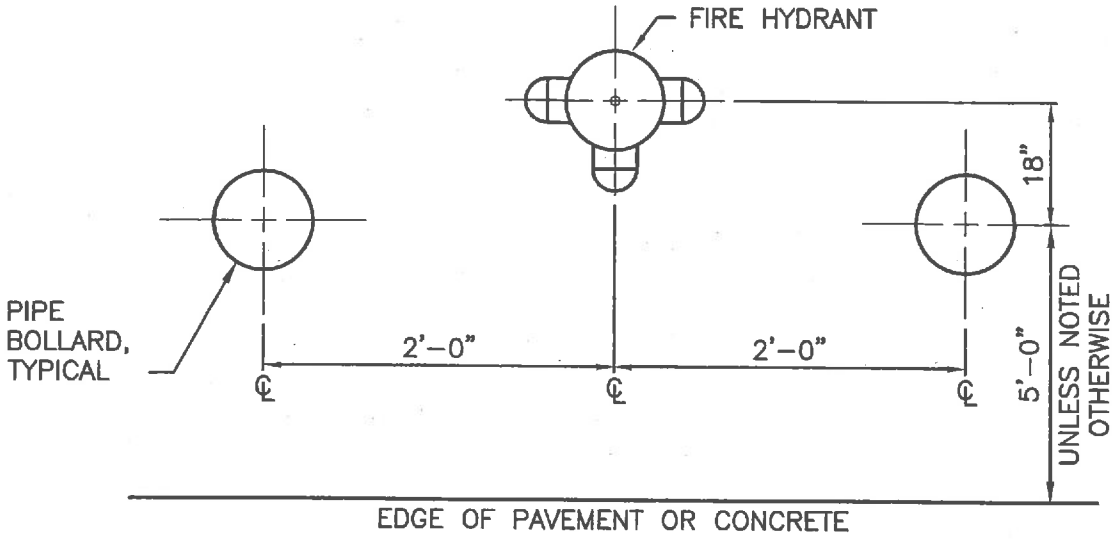



TYPICAL FIRE HYDRANT INSTALLATION

NOTES:

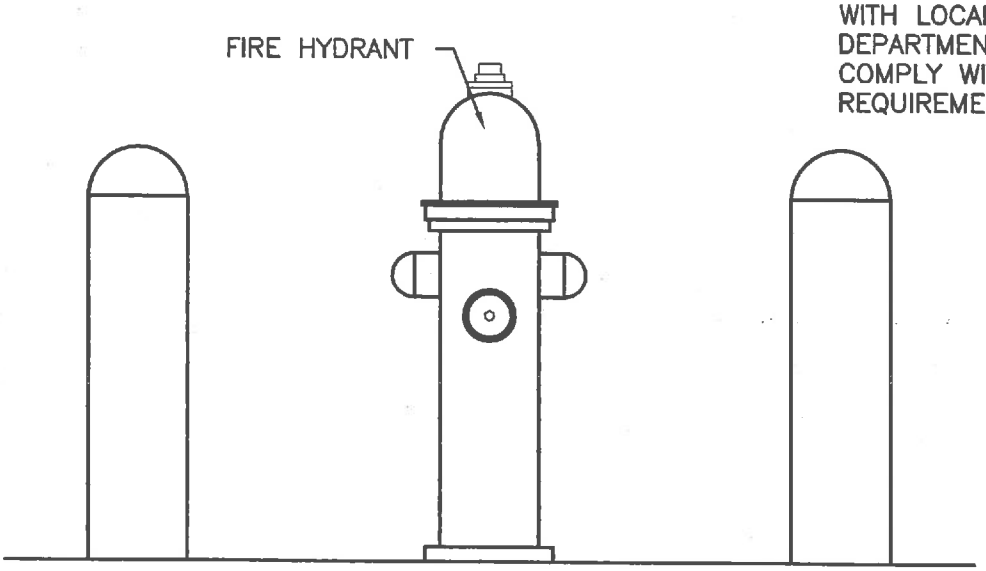
1. ALL JOINTS AND FITTINGS TO BE RESTRAINED MECHANICAL JOINTS.
2. LOCATE HYDRANTS NO LESS THAN 3' OR MORE THAN 10' FROM THE CURB OR THE EDGE OF A HARD SURFACE STREET OR ACCESS ROAD, OR 1' INSIDE RIGHT-OF-WAY AND ON PROPERTY LINE BETWEEN TWO LOTS. VERIFY LOCATION WITH RCU.
3. HYDRANT MUST BE LOCATED SO AS TO BE UN-OBSTRUCTED FOR 15'. THIS AREA MUST BE FREE OF GROWTH AND OTHER OBSTRUCTIONS WHICH WOULD HINDER ACCESS TO THE HYDRANT.
4. BENDS MAY BE USED IN HYDRANT LEG TO FACILITATE HYDRANT LOCATION.
5. HYDRANT VALVES TO OPEN TO THE RIGHT.
6. HYDRANT DRAINS SHALL NOT BE CONNECTED TO OR LOCATED WITHIN 10 FEET OF SEWER SYSTEMS.

| RICHLAND COUNTY UTILITIES | |
|---|---|
| TYPICAL FIRE HYDRANT INSTALLATION | DRAWING: WA-9.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




PLAN

NOTE:
VERIFY LOCATION OF FIRE HYDRANTS WITH LOCAL FIRE DEPARTMENT AND COMPLY WITH ALL REQUIREMENTS.



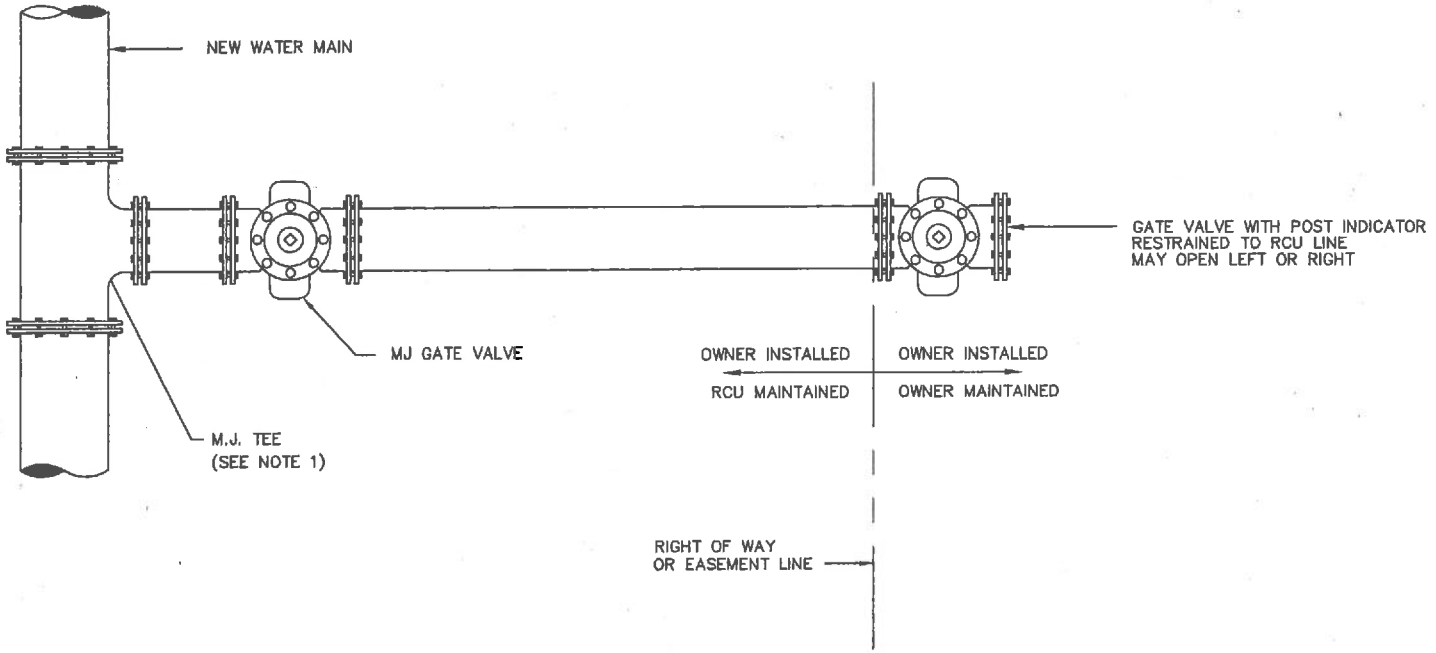

ELEVATION

# FIRE HYDRANT PROTECTION

| RICHLAND COUNTY UTILITIES | |
|---|---|
| FIRE HYDRANT PROTECTION | DRAWING: WA-10.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

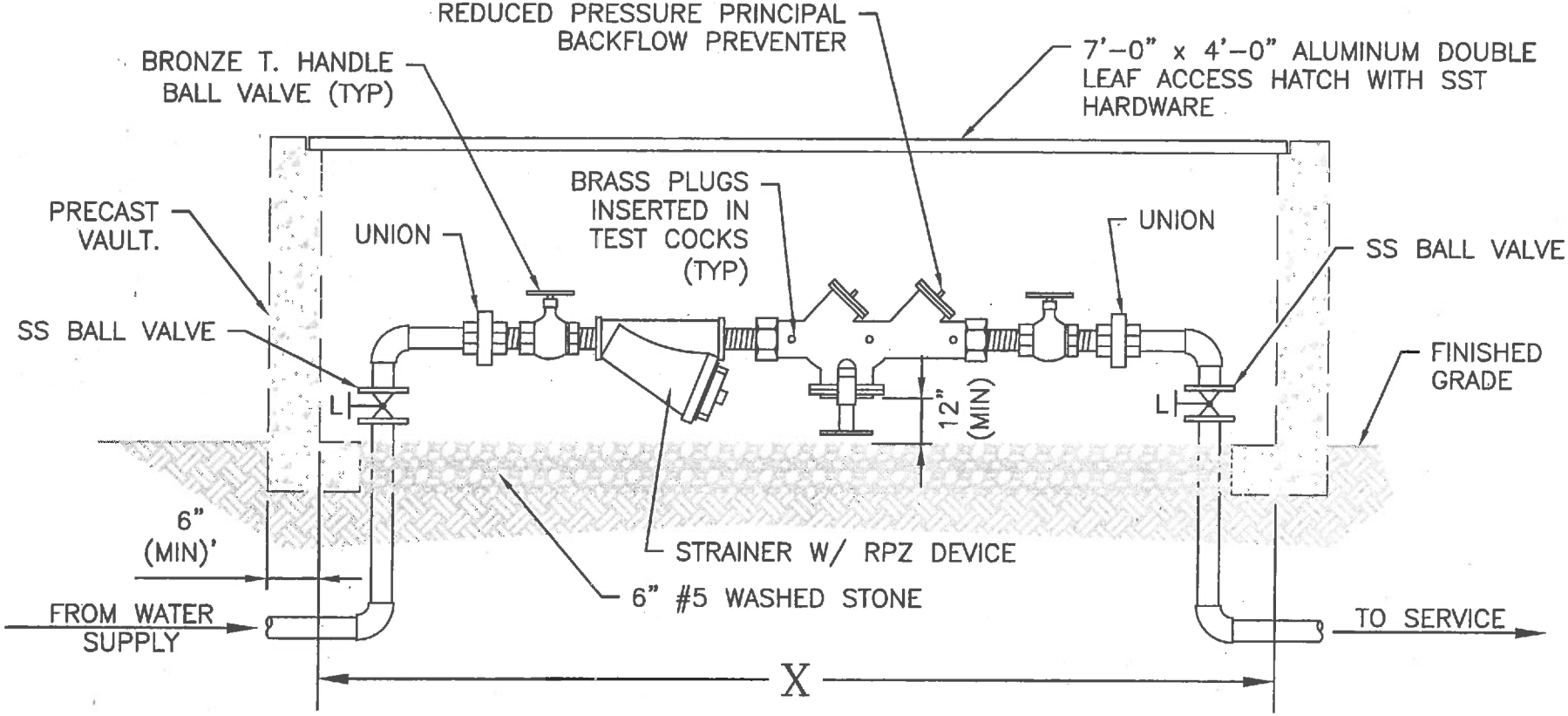
NOTES:

1. SEE TAPPING SLEEVE DETAIL FOR CONNECTING TO EXISTING MAINS.
2. OWNER SHALL BE RESPONSIBLE FOR ENCROACHMENT APPLICATIONS, CERTIFICATIONS, PERMITS, OR EASEMENTS WITH REGULATION AUTHORITIES.
3. THE RCU APPROVED CONTRACTOR SHALL NOTIFY RCU AT LEAST 72 WORKING HOURS IN ADVANCE OF COMMENCING WORK FOR INSPECTION BY CWS PERSONNEL.
4. THE LINE UP TO THE OWNER'S GATE VALVE SHALL BE DUCTILE IRON WITH A MINIMUM DIAMETER OF 4 INCHES.
5. ALL PIPE SHOWN IN THIS DETAIL SHALL BE RESTRAINED PER RCU MINIMUM STANDARDS.




# TYPICAL UNMETERED FIRE SERVICE LINE

| RICHLAND COUNTY UTILITIES | |
|---|---|
| TYPICAL UNMETERED FIRE SERVICE LINE | DRAWING: WA-11.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




# REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER – 2 1/2" AND SMALLER

## DETAIL

SCALE: NONE

0
00

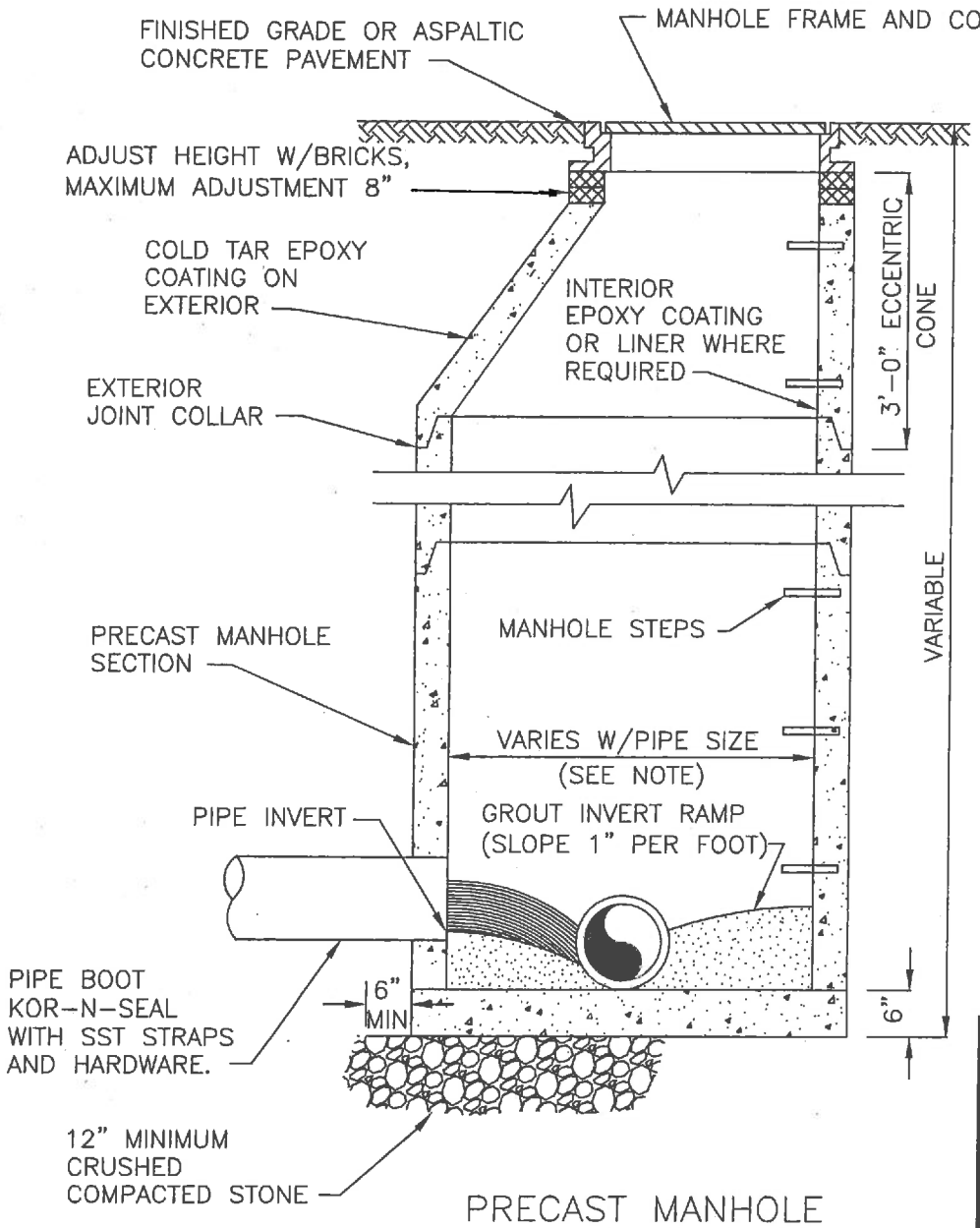
NOTES:

1. MINIMUM WIDTH OF VAULT 4'–0" INSIDE.
2. POURED CONCRETE OR PRECAST CONCRETE BOX, KNOCK–OUT TYPE IS NOT ACCEPTABLE
3. WHERE A POSITIVE DRAIN (NO SURCHARGING) IS AVAILABLE, A FLOOR DRAIN WITH A CLEANOUT AND BALL CHECK VALVE AND 2" SLOPED CONCRETE BOTTOM MAY BE USED AND THE VAULT CAN BE INSTALLED WITH THE TOP 2" ABOVE FINISHED GRADE.
4. IF NOTE 3 APPLIES AND THE VAULT IS SUBJECT TO TRAFFIC PROVIDE A H–20 TRAFFIC RATED HATCH.

| RICHLAND COUNTY UTILITIES | |
|---|---|
| REDUCED PRESSURE PRINCIPLE BACKFLOW PREVENTER - 2 1/2" AND SMALLER | DRAWING: WA-12.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

# 11.3
# Gravity Sewer Details

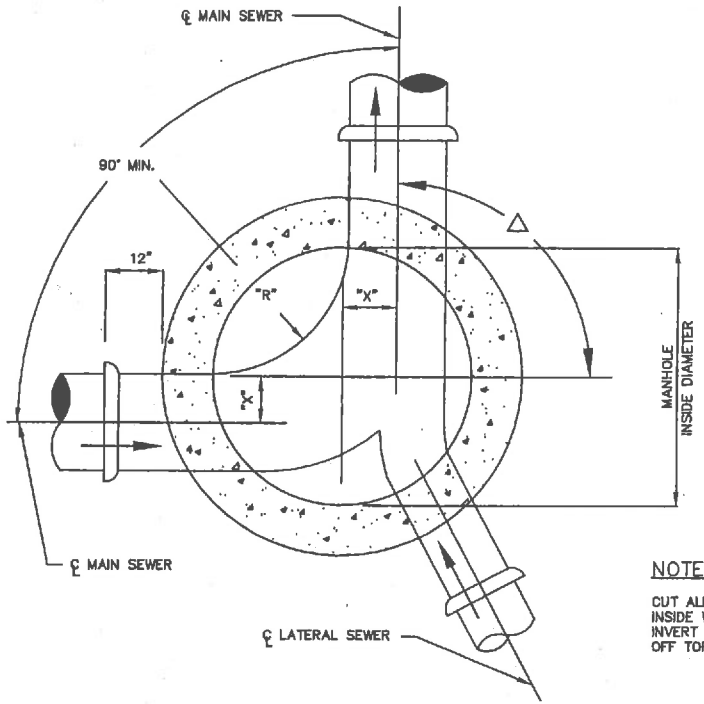
**SCDHEC Approved August 2016**




PRECAST MANHOLE

NOTE: MINIMUM MANHOLE DIAMETER 48" OR 60" WHERE DEPTH IS 8'-0" OR MORE

| RICHLAND COUNTY UTILITIES | |
|---|---|
| PRECAST MANHOLE | DRAWING: GS-1.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




NOTE:

CUT ALL PIPE FLUSH WITH INSIDE WALL OF MANHOLE FORM INVERT UNIFORM AND SMOOTH. CUT OFF TOP HALF OF PIPE AT WALL.

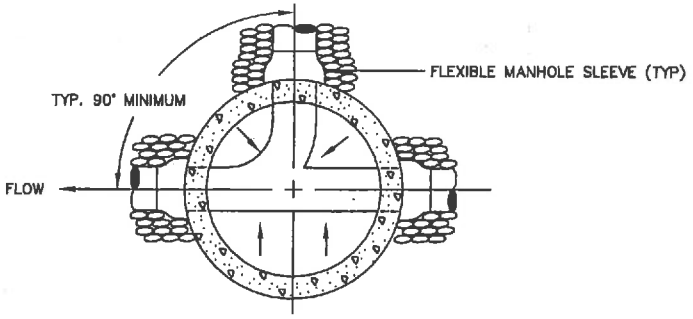
STANDARD MANHOLES
SCHEDULE OF GOVERNING DIMENSIONS

| PIPE SIZE | ANGLE △ | MANHOLE INSIDE DIA. | "R" | "X" |
|---|---|---|---|---|
| 8" TO 15" | 0° TO 90° | 4'-0" * | 2'-0" | 0" |
| 18" TO 30" | 0° TO 90° | 5'-0" | 2'-0" | 6" |
| 36" TO 42" | 0° TO 60° | 6'-0" | 3'-0" | 9" |
| 36" TO 42" | 60° TO 90° | 6'-0 | 3'-0" | 1'-2" |
| 48" OR LARGER | 0° TO 45° | 7'-0 | 4'-0" | 6" |
| 48" OR LARGER | 45° TO 90° | 8'-0 | 3'-0" | 1'-3" |

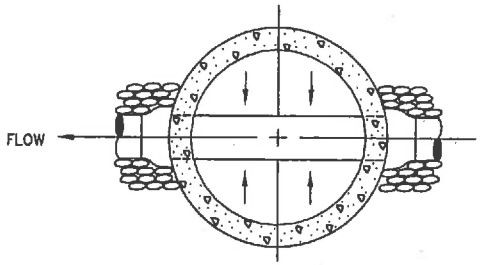
*MANHOLE DEEPER THAN 8' SHALL BE 5' MIN.

STANDARD MANHOLE INVERTS

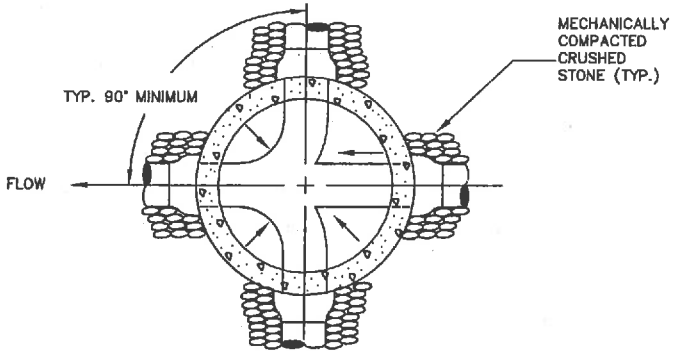
| RICHLAND COUNTY UTILITIES | |
|---|---|
| STANDARD MANHOLE INVERTS | DRAWING: GS-2.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |



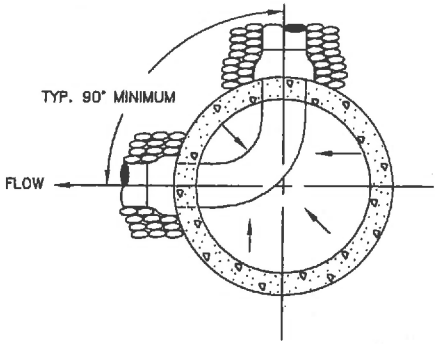

THREE–WAY INTERSECTION




STRAIGHT




FOUR–WAY INTERSECTION




TWO–WAY INTERSECTION

NOTES:

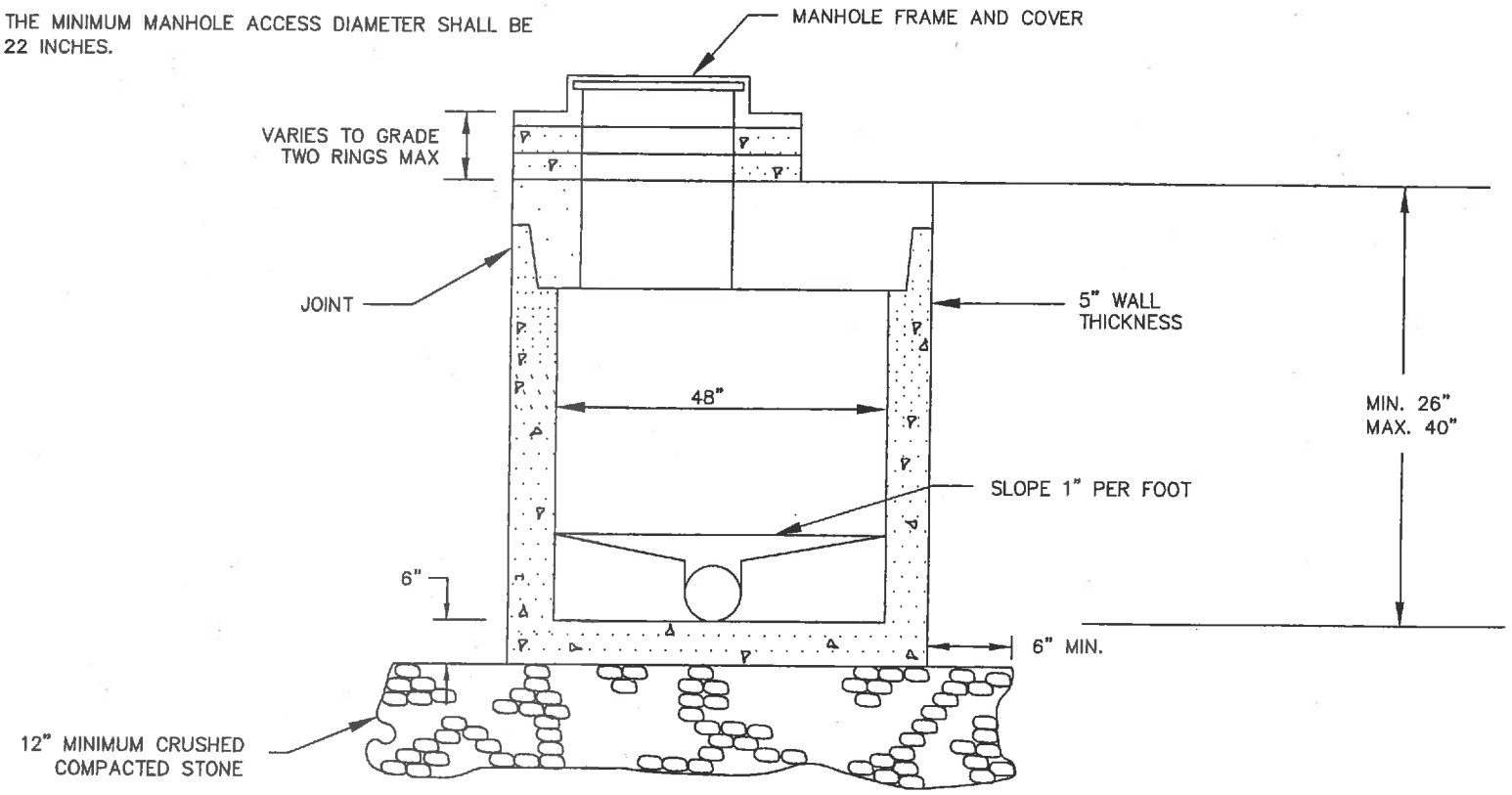
1. TROWEL SHAPE INVERTS TO BE UNIFORM AND SMOOTH.
2. ARROWS INDICATE DIRECTION OF SLOPE.
3. MINIMUM SLOPE OF INVERTS; 1"/FT

MANHOLE INVERTS

| RICHLAND COUNTY UTILITIES | |
|---|---|
| MANHOLE INVERTS | DRAWING: GS-3.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

NOTES:

1. THE MINIMUM MANHOLE ACCESS DIAMETER SHALL BE 22 INCHES.

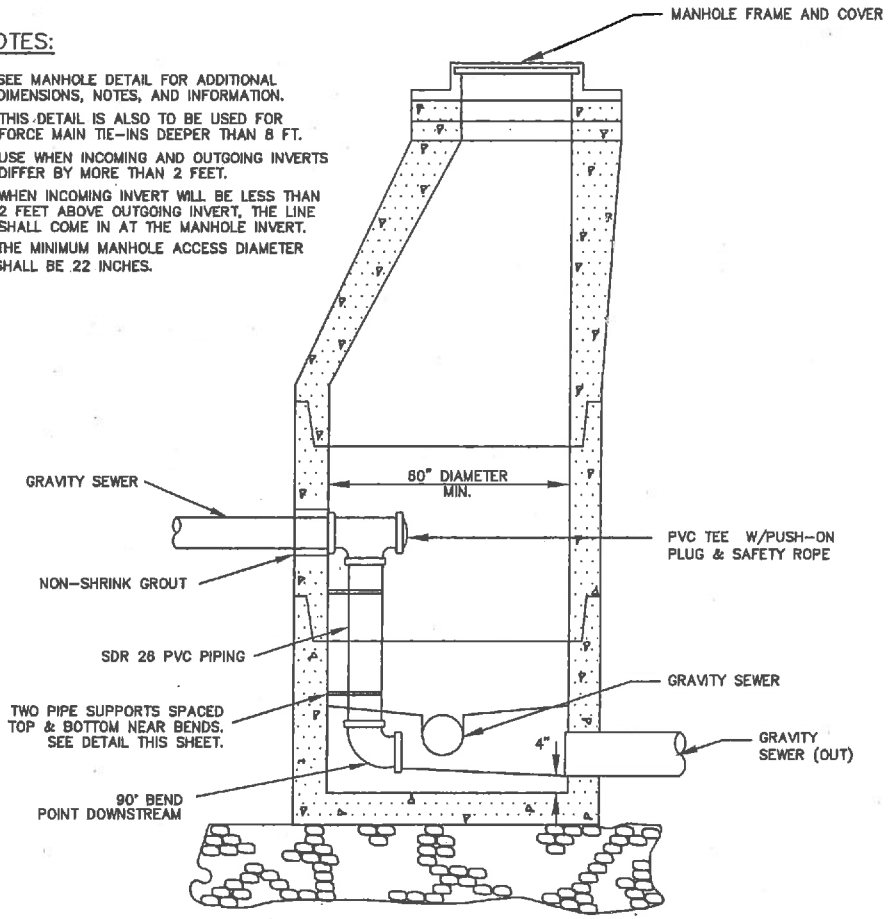



PRECAST SHALLOW MANHOLE

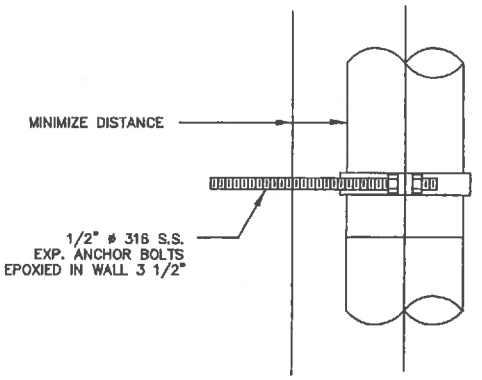
| RICHLAND COUNTY UTILITIES | |
|---|---|
| PRECAST SHALLOW MANHOLE | DRAWING: GS-4.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

NOTES:

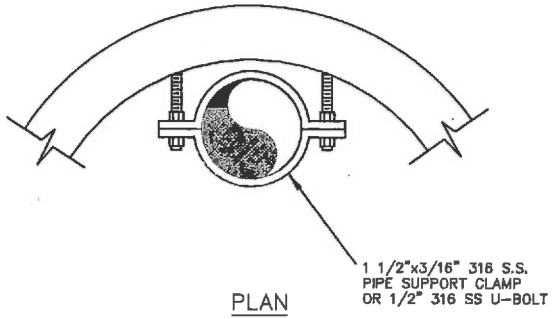
1. SEE MANHOLE DETAIL FOR ADDITIONAL DIMENSIONS, NOTES, AND INFORMATION.
2. THIS DETAIL IS ALSO TO BE USED FOR FORCE MAIN TIE-INS DEEPER THAN 8 FT.
3. USE WHEN INCOMING AND OUTGOING INVERTS DIFFER BY MORE THAN 2 FEET.
4. WHEN INCOMING INVERT WILL BE LESS THAN 2 FEET ABOVE OUTGOING INVERT, THE LINE SHALL COME IN AT THE MANHOLE INVERT.
5. THE MINIMUM MANHOLE ACCESS DIAMETER SHALL BE 22 INCHES.




INSIDE DROP MANHOLE



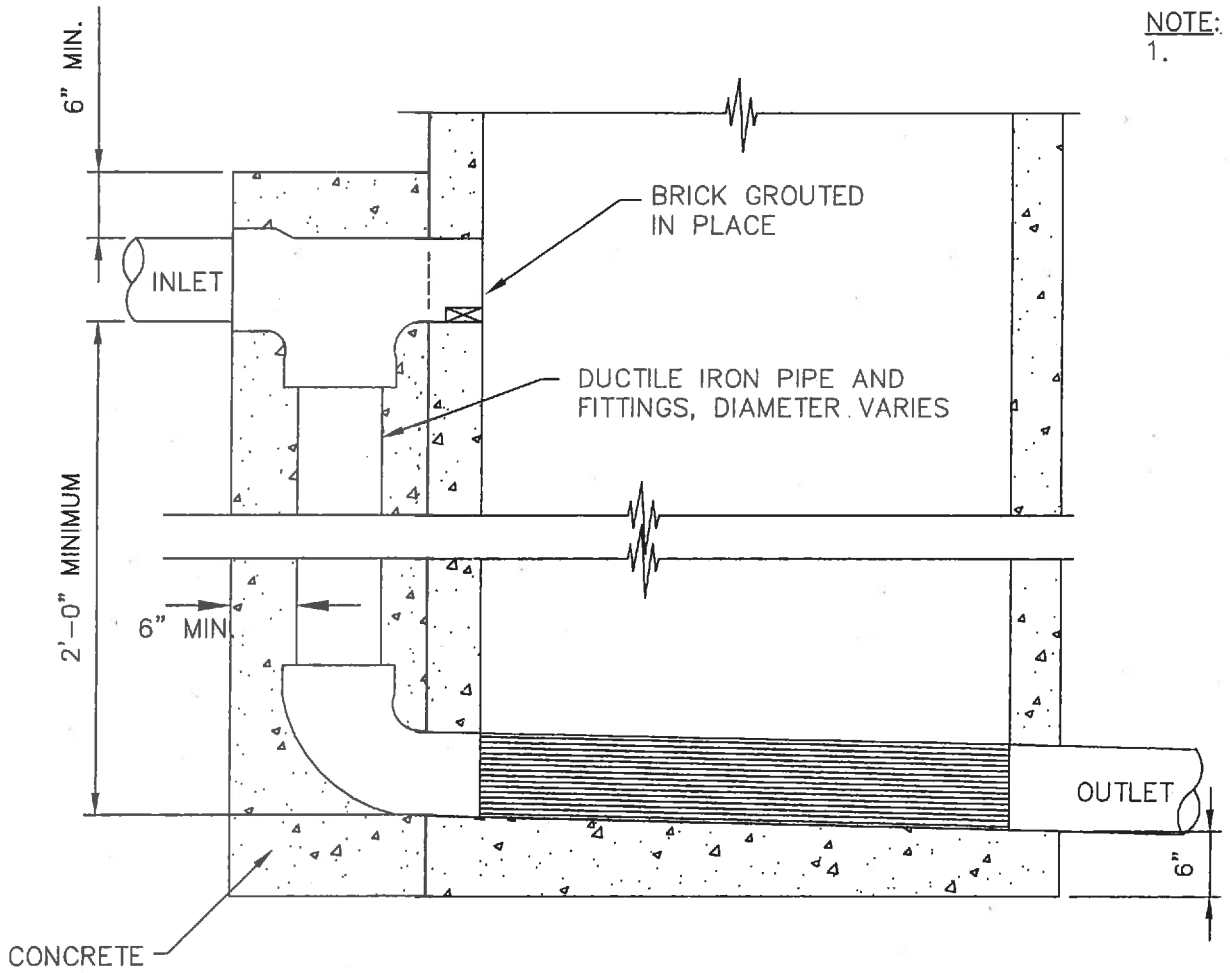

SECTION




PLAN

PIPE SUPPORT DETAILS

| RICHLAND COUNTY UTILITIES | |
|---|---|
| INSIDE DROP MANHOLE | DRAWING: GS-5.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |



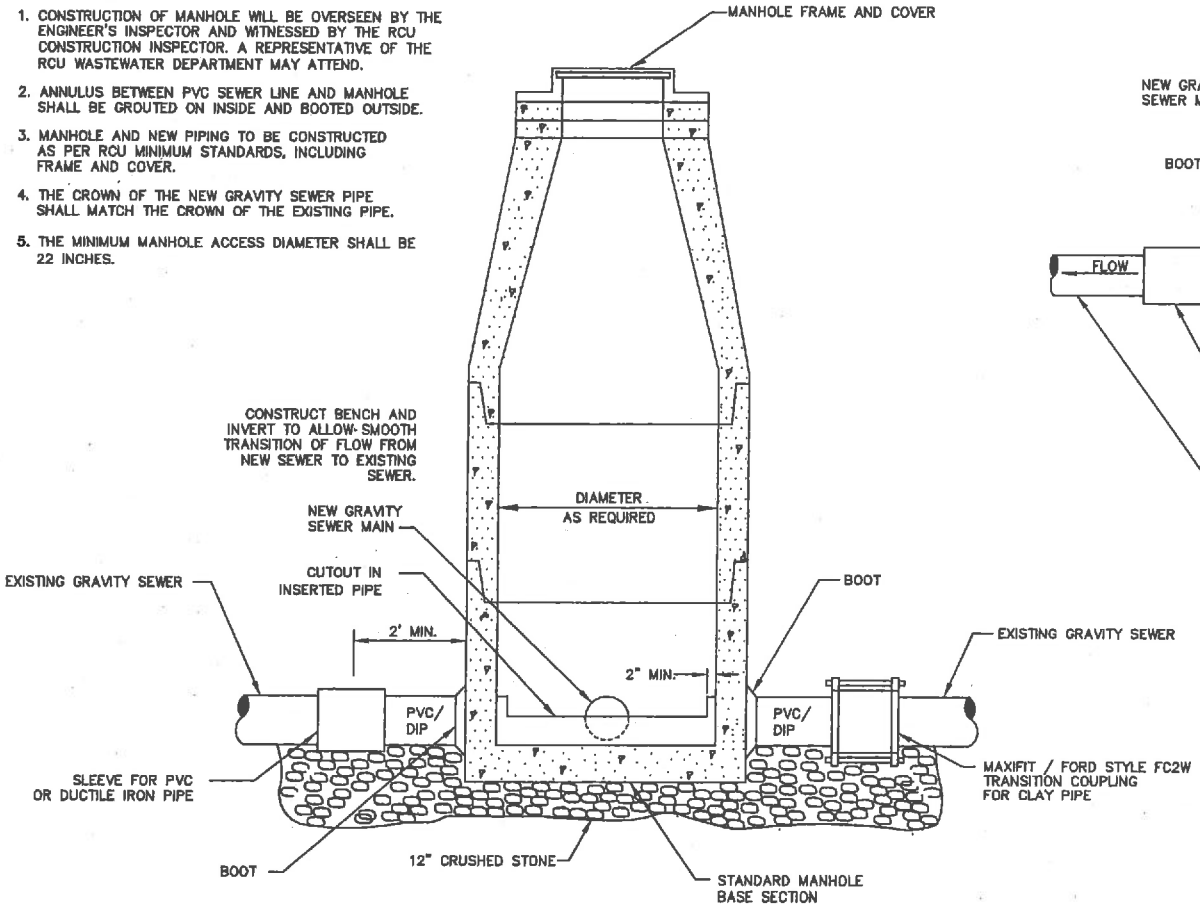

NOTE:
1. THE MINIMUM MANHOLE ACCESS DIAMETER SHALL BE 22 INCHES.

DROP MANHOLE

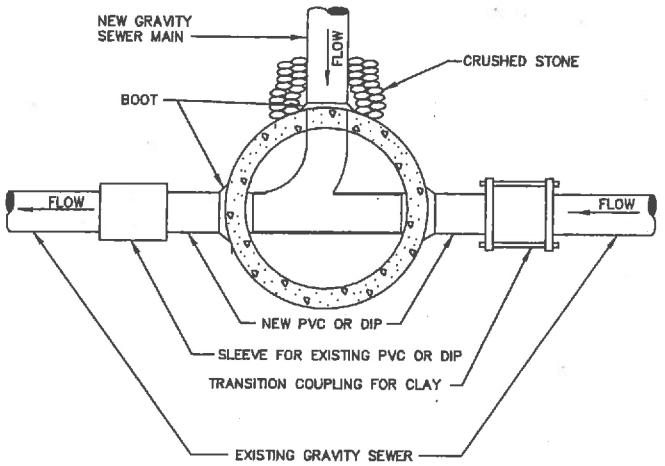
| RICHLAND COUNTY UTILITIES | |
|---|---|
| DROP MANHOLE | DRAWING: GS-6.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

NOTES:

1. CONSTRUCTION OF MANHOLE WILL BE OVERSEEN BY THE ENGINEER'S INSPECTOR AND WITNESSED BY THE RCU CONSTRUCTION INSPECTOR. A REPRESENTATIVE OF THE RCU WASTEWATER DEPARTMENT MAY ATTEND.
2. ANNULUS BETWEEN PVC SEWER LINE AND MANHOLE SHALL BE GROUTED ON INSIDE AND BOOTED OUTSIDE.
3. MANHOLE AND NEW PIPING TO BE CONSTRUCTED AS PER RCU MINIMUM STANDARDS, INCLUDING FRAME AND COVER.
4. THE CROWN OF THE NEW GRAVITY SEWER PIPE SHALL MATCH THE CROWN OF THE EXISTING PIPE.
5. THE MINIMUM MANHOLE ACCESS DIAMETER SHALL BE 22 INCHES.



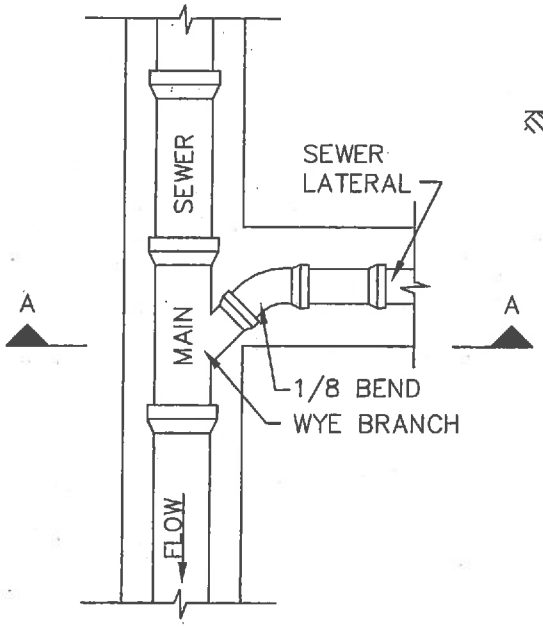

PROFILE VIEW



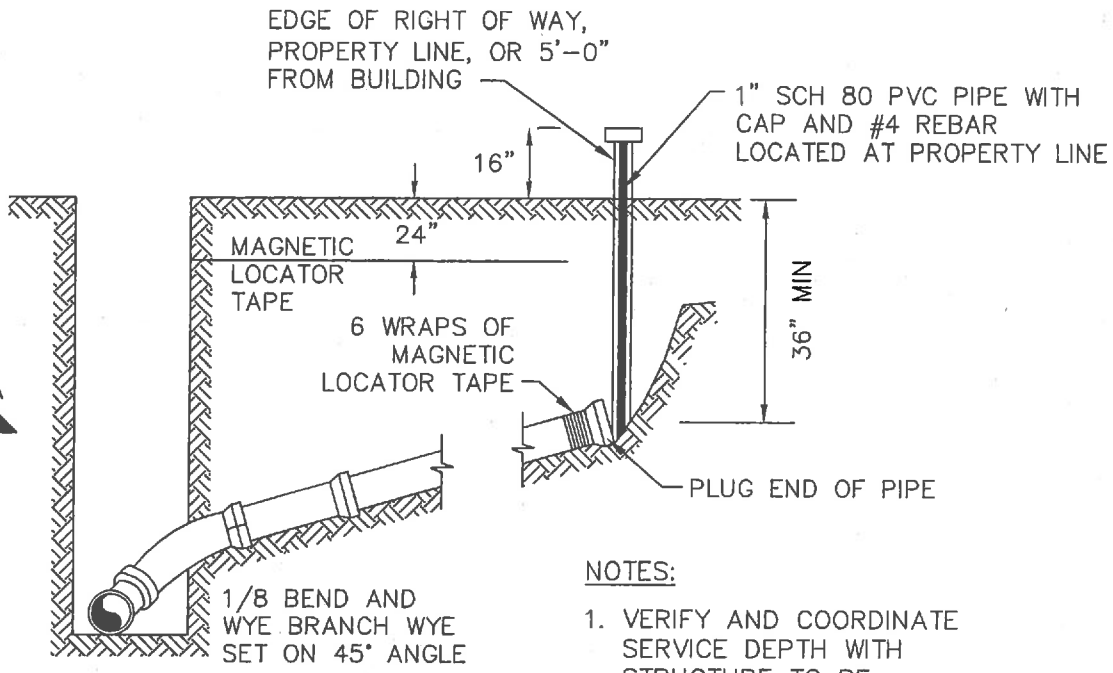

PLAN VIEW

CUT–IN MANHOLE

| RICHLAND COUNTY UTILITIES | |
|---|---|
| CUT-IN MANHOLE | DRAWING: GS-7.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




PLAN



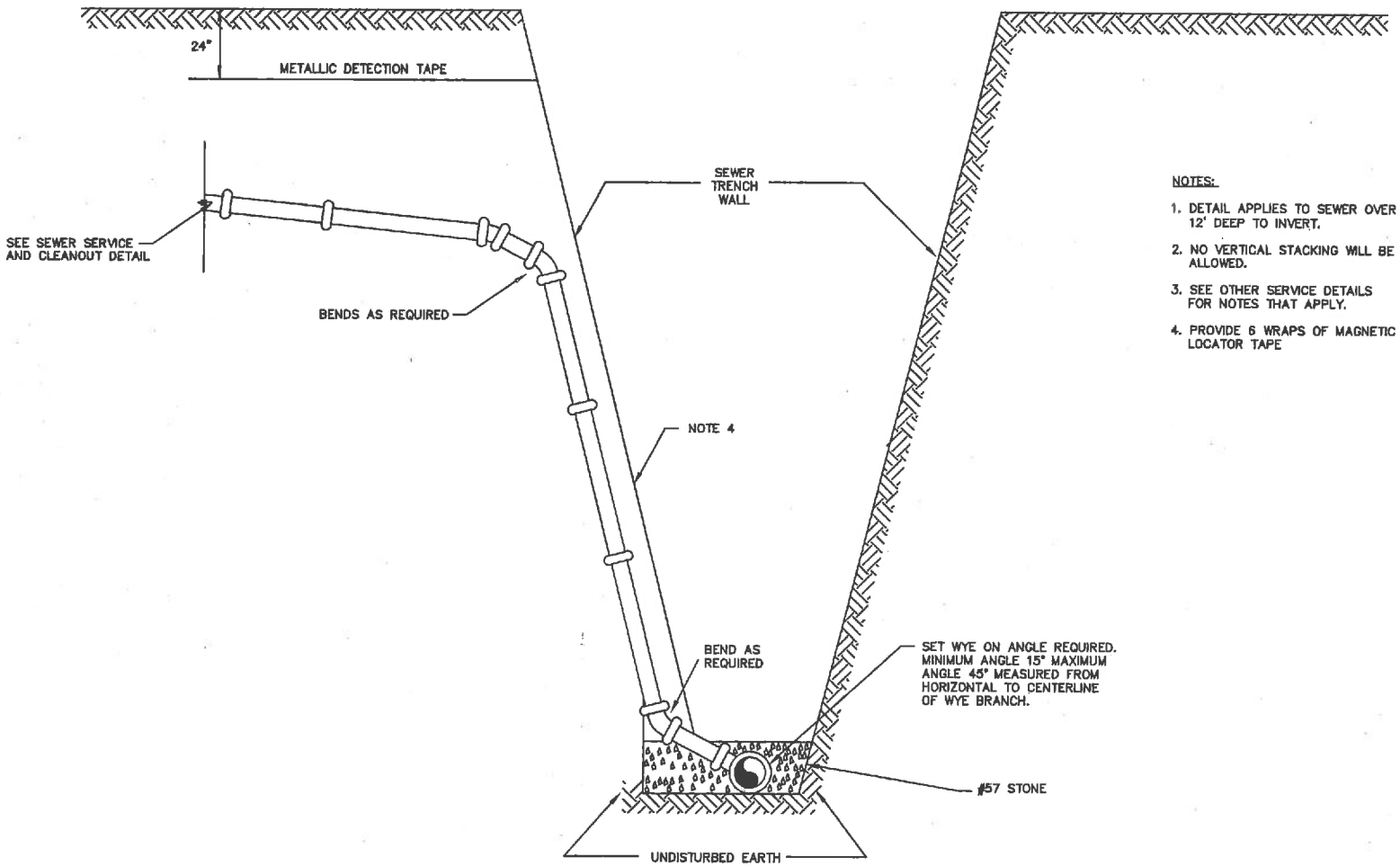

SECTION "A-A"

NOTES:

1. VERIFY AND COORDINATE SERVICE DEPTH WITH STRUCTURE TO BE CONNECTED.
2. CONSTRUCT SERVICE LINE ON A GRADE THAT WILL PERMIT SERVICE TO PROPERTY.
   MINIMUM GRADE SHALL BE 0.60%
   MAXIMUM GRADE SHALL BE 50%

# SEWER SERVICE CONNECTION

| RICHLAND COUNTY UTILITIES | |
|---|---|
| SEWER SERVICE CONNECTION | DRAWING: GS-8.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

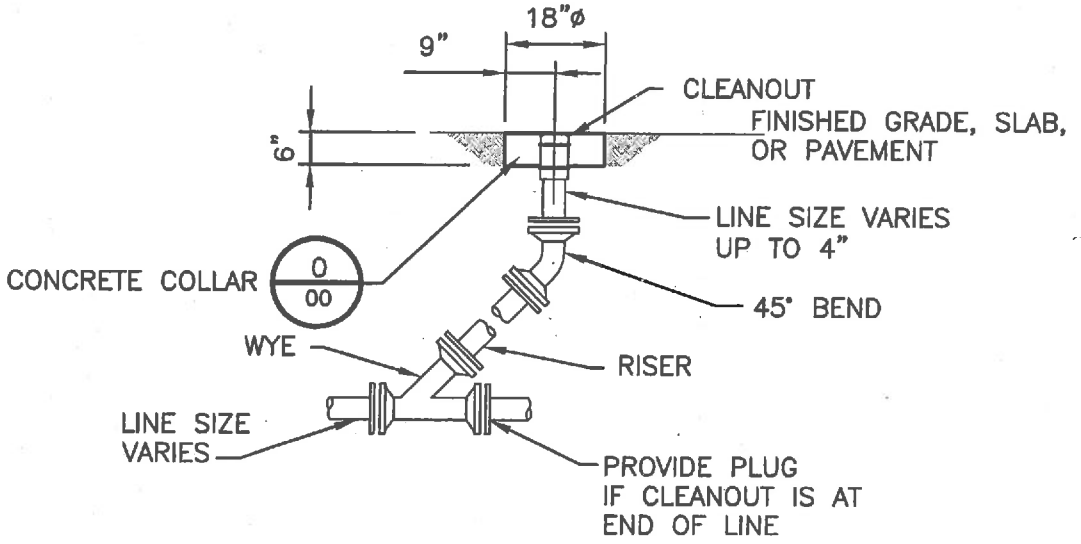



NOTES:

1. DETAIL APPLIES TO SEWER OVER 12' DEEP TO INVERT.
2. NO VERTICAL STACKING WILL BE ALLOWED.
3. SEE OTHER SERVICE DETAILS FOR NOTES THAT APPLY.
4. PROVIDE 6 WRAPS OF MAGNETIC LOCATOR TAPE

DEEP SEWER SERVICE DETAIL
CONNECTION TO MAIN

| RICHLAND COUNTY UTILITIES | |
|---|---|
| DEEP SERVICE CONNECTION ( PVC) | DRAWING: GS-9.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

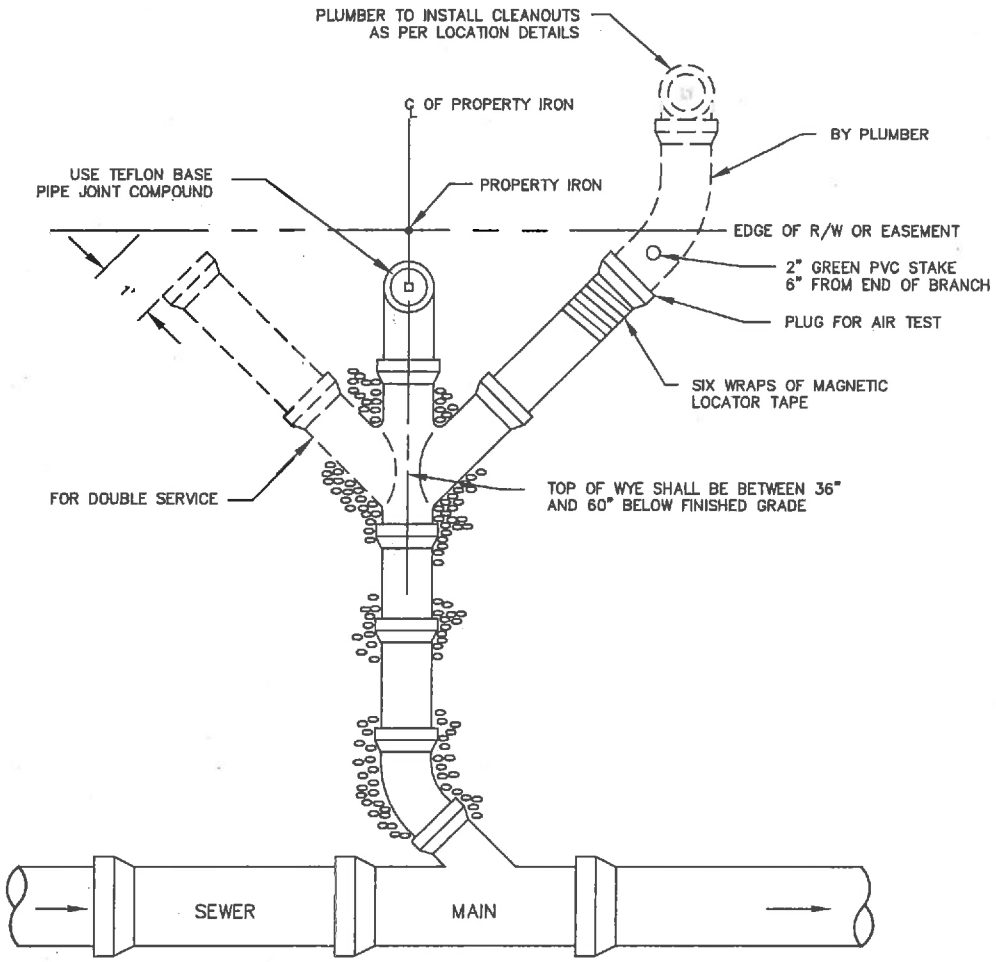



EXTERIOR GRAVITY CLEANOUT

NOTES:

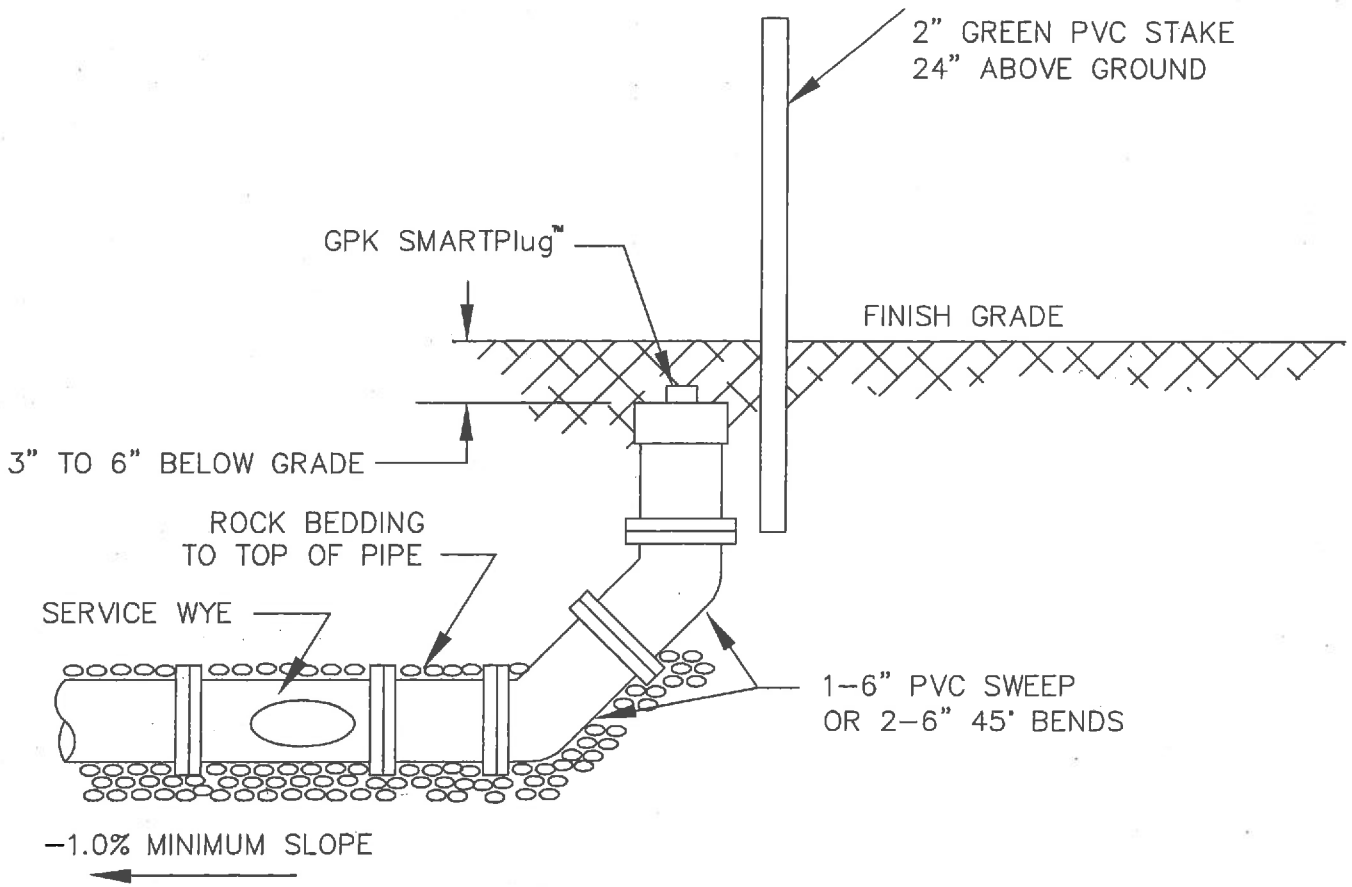
1. PROVIDE ADDITIONAL BENDS IN RISER IF REQUIRED TO AVOID CONFLICT WITH OTHER PIPING OR UTILITIES.
2. CLEANOUT AND PIPING MUST BE CAPABLE OF SUSTAINING AIR PRESSURE TEST.

| RICHLAND COUNTY UTILITIES | |
|---|---|
| EXTERIOR GRAVITY CLEANOUT | DRAWING: GS-10.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |



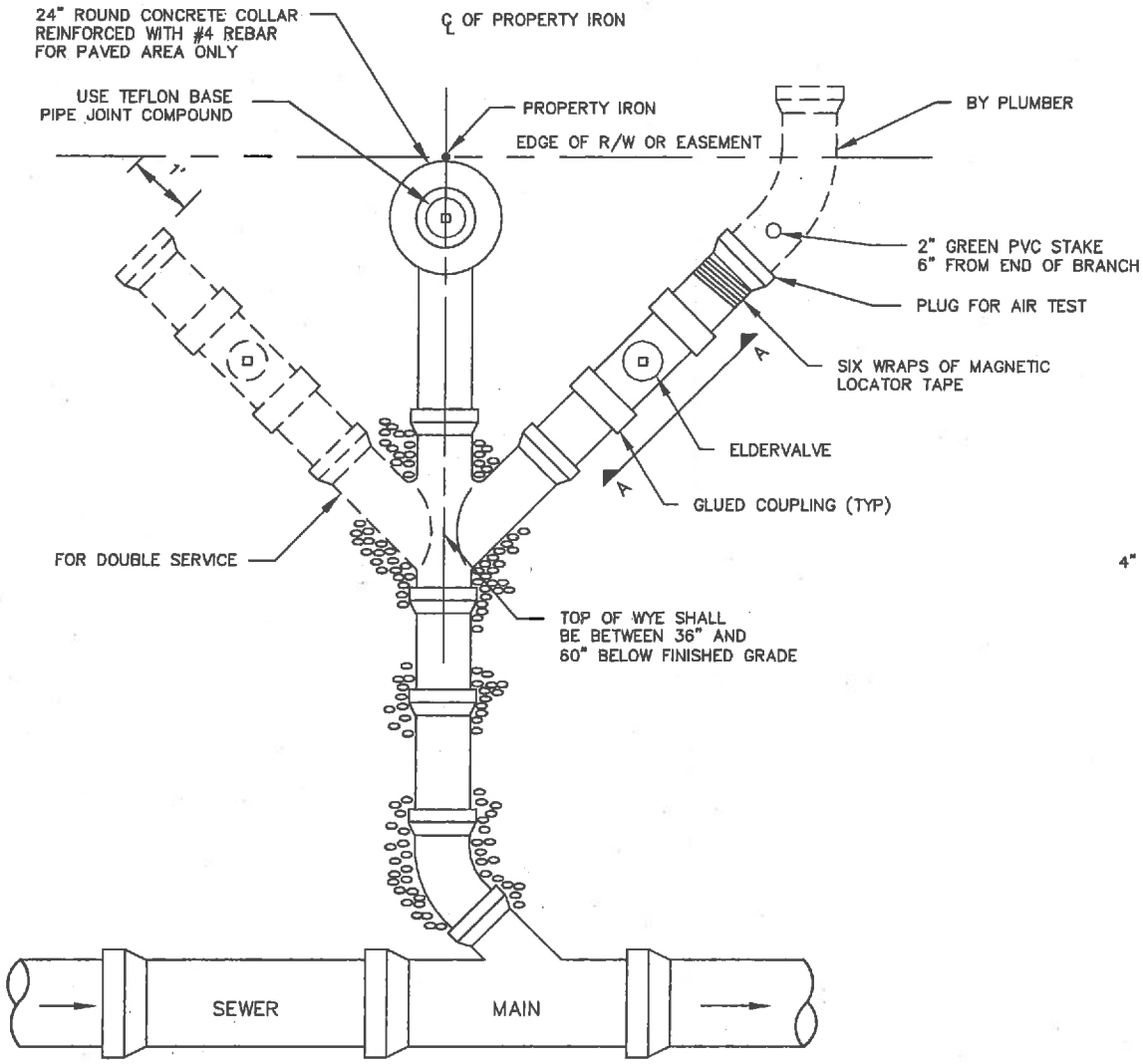

SEWER SERVICE AND
CLEANOUT INSTALLATION

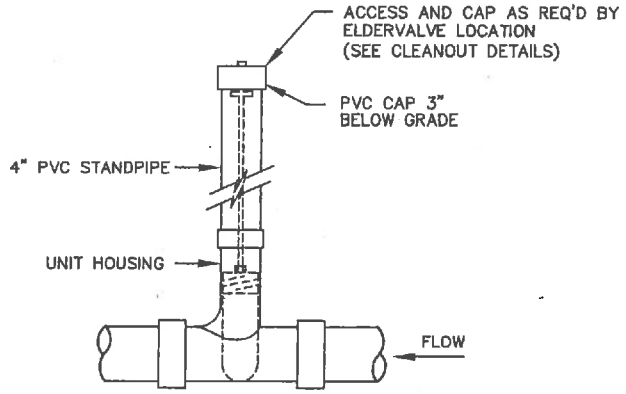
| RICHLAND COUNTY UTILITIES | | |
|---|---|---|
| SEWER SERVICE AND CLEANOUT | | DRAWING: GS-11.0 |
| DATE: JULY 2016 | DRAWN BY: BPB | |
| SCALE: NTS | APPROVED BY: | |




CLEANOUT IN LANDSCAPED AREA

| RICHLAND COUNTY UTILITIES | |
|---|---|
| CLEANOUT IN LANDSCAPED AREA | DRAWING: GS-12.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |



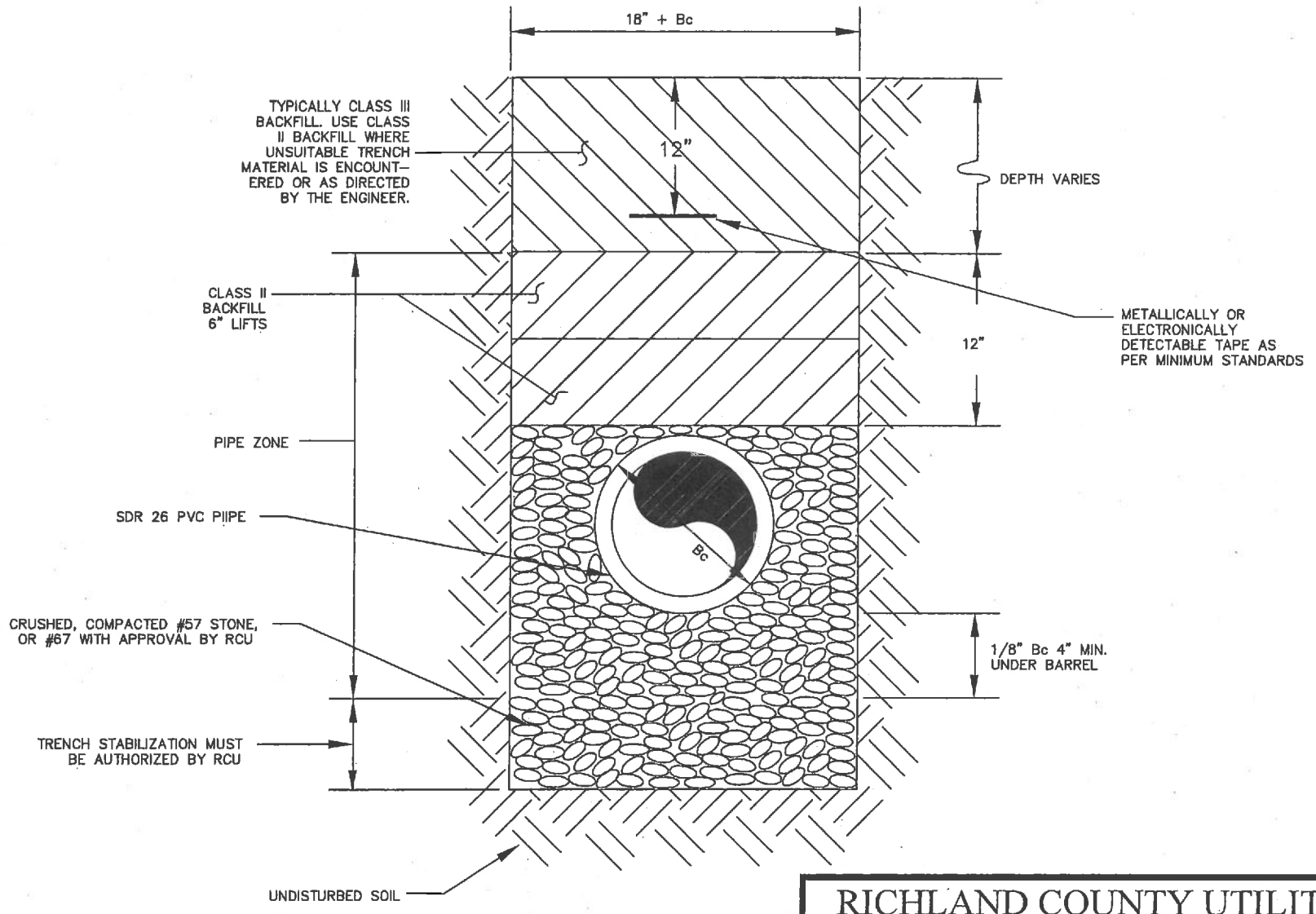

ELDERVALVE

SECTION "A–A"

# SEWER SERVICE AND CLEANOUT WITH ELDERVALVE

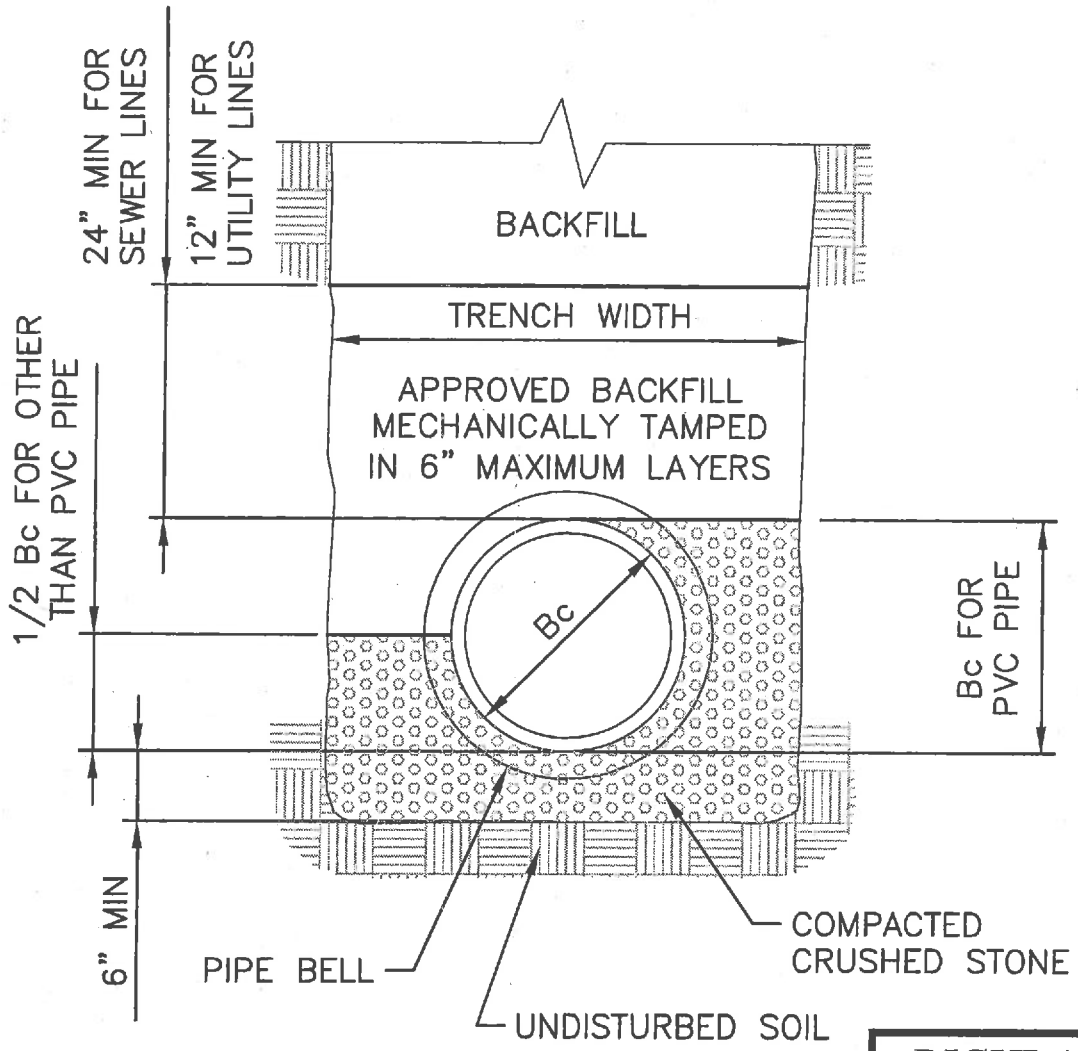
(USE ONLY FOR SEWER SERVICE WHERE RCU DOES NOT PROVIDE THE WATER SERVICE)

| RICHLAND COUNTY UTILITIES | |
|---|---|
| SEWER SERVICE AND CLEANOUT WITH ELDERVALVE | DRAWING: GS-13.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |



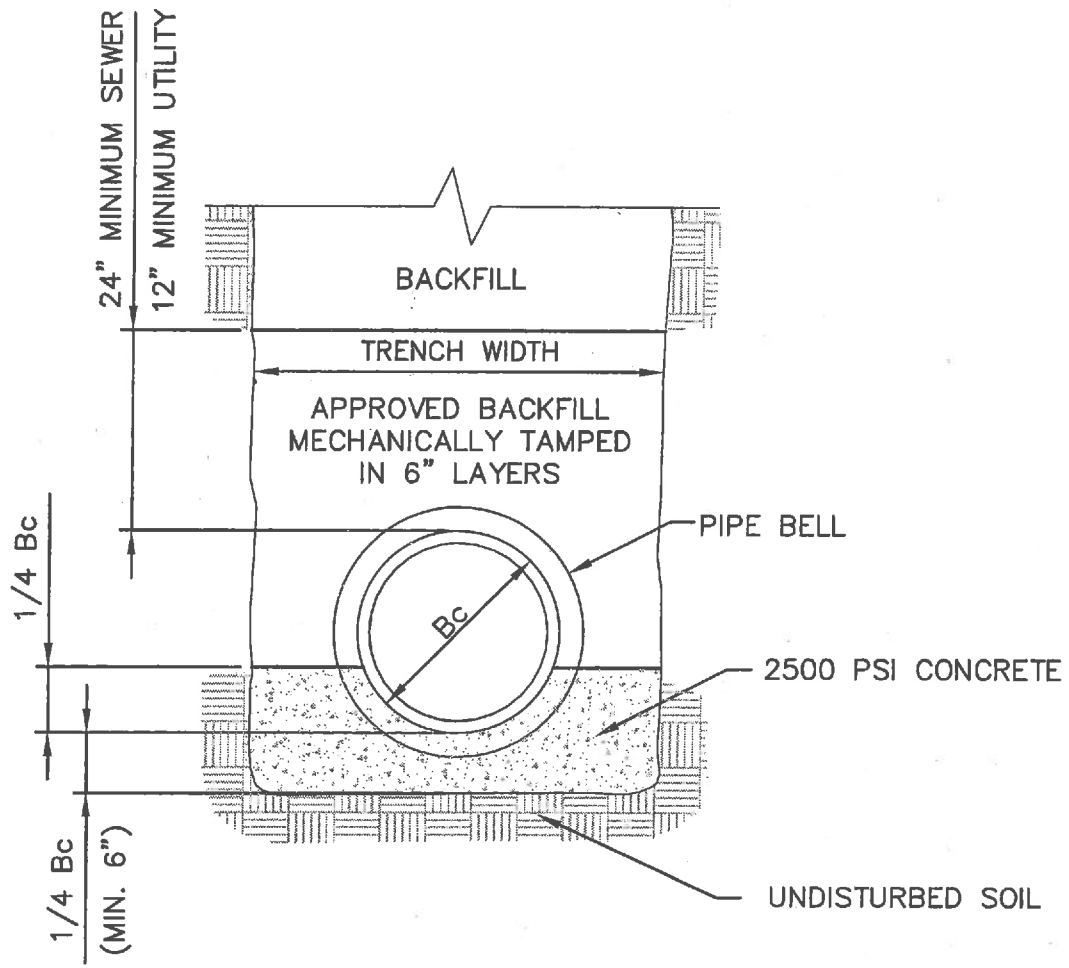

MINIMUM BEDDING FOR GRAVITY SEWER LINE

| RICHLAND COUNTY UTILITIES | |
|---|---|
| MINIMUM BEDDING FOR GRAVITY SEWER LINE | DRAWING: GS-14.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




GRANULAR CRADLE

| RICHLAND COUNTY UTILITIES | |
|---|---|
| GRANULAR CRADLE | DRAWING: GS-15.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




CONCRETE CRADLE

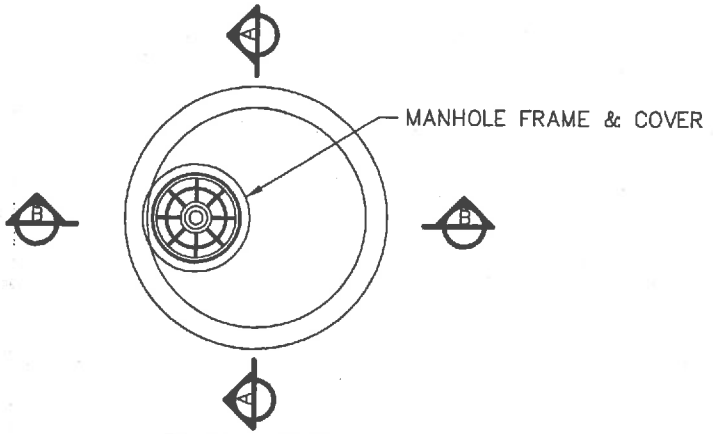
| RICHLAND COUNTY UTILITIES | |
|---|---|
| CONCRETE CRADLE | DRAWING: GS-16.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

# 11.4
# Force Main Details

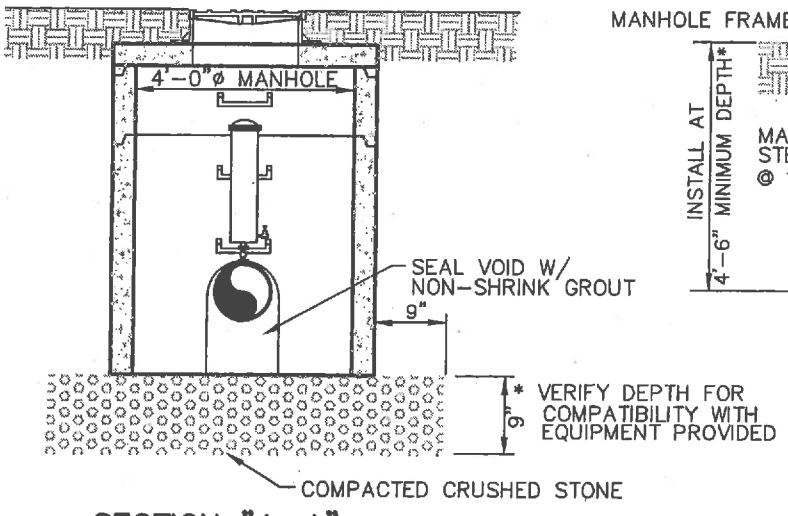
**SCDHEC Approved August 2016**

**NOTES:**

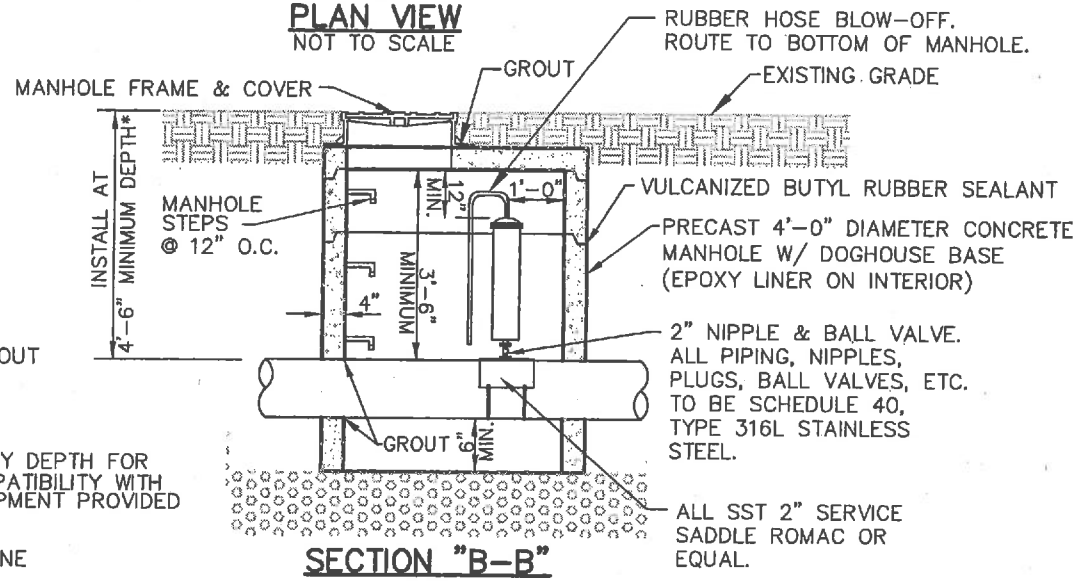
1. INSTALL 5"x5"x4'-0" CONCRETE VALVE MARKER AT EACH AIR RELEASE VALVE LOCATION.
2. PROVIDE CONCRETE VALVE MARKER WITH 2" DIAMETER BRASS INSERT CAST IN TOP. PLACE MARKER 1'-0" INSIDE R/W WITH DIRECTION ARROW & DISTANCE TO ARV STAMPED ON INSERT.
3. PAINT MARKER SEWER GREEN.
4. CAST LETTERS "AV" ON ROAD SIDE OF MARKER.
5. PROVIDE EPOXY COATING ON DIP.
6. USE FLANGE OUTLET BOSS FOR PIPES 16" ø OR LARGER.




PLAN VIEW
NOT TO SCALE



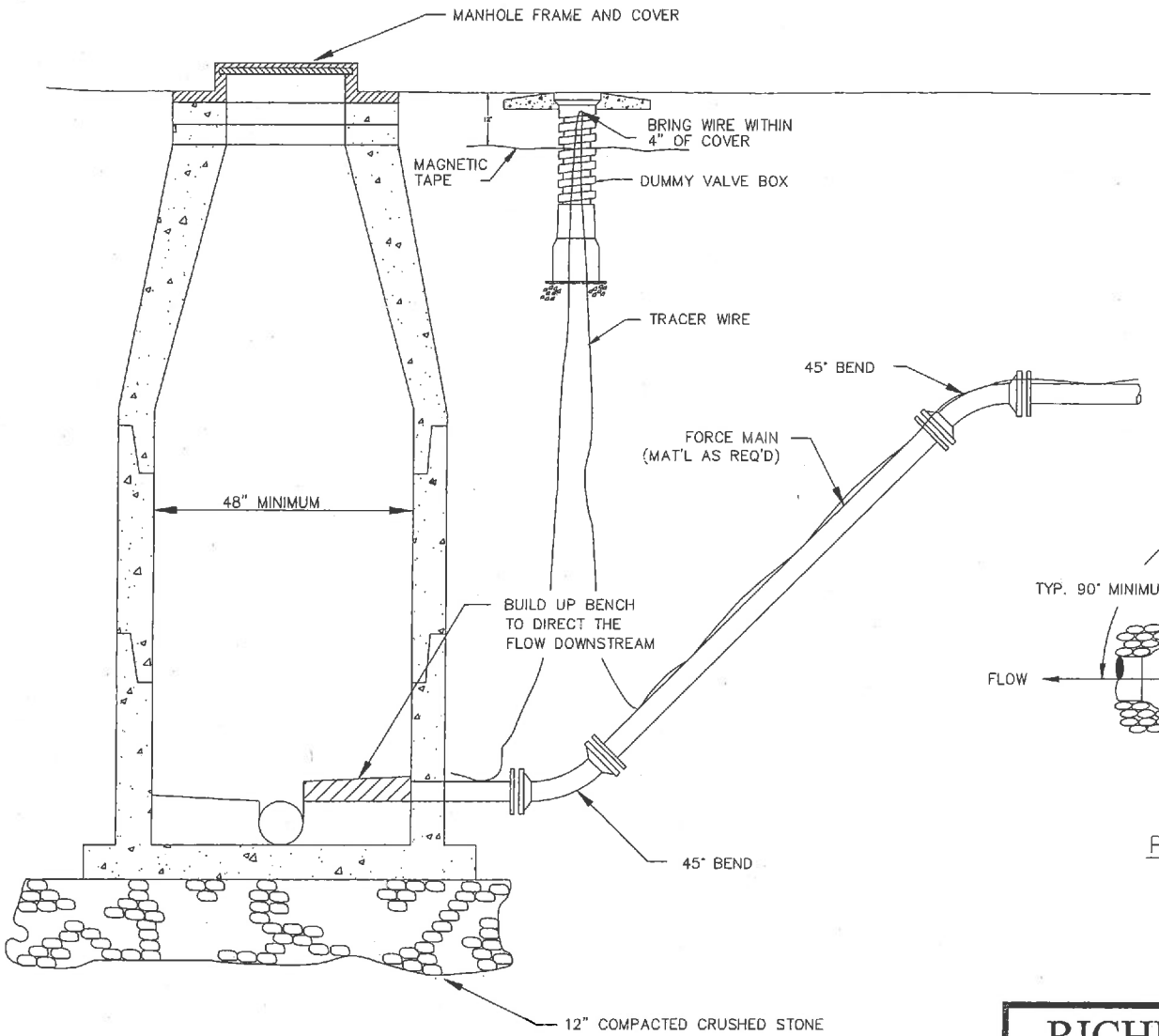

SECTION "A-A"




SECTION "B-B"

SEWAGE AIR RELEASE VALVE MANHOLE

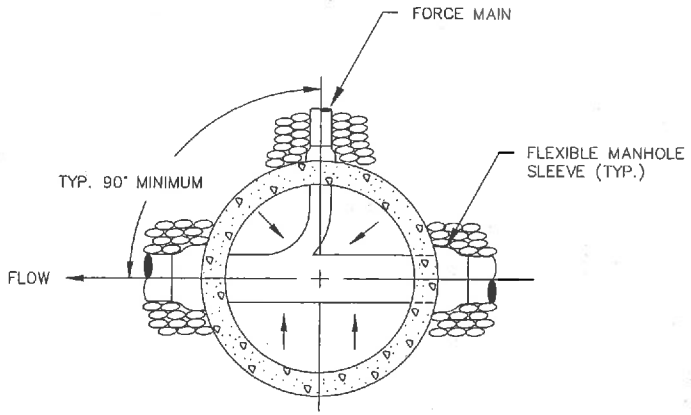
| RICHLAND COUNTY UTILITIES | |
|---|---|
| SEWAGE AIR RELEASE VALVE MANHOLE | DRAWING: FM-1.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |




FORCE MAIN TIE-IN AT MANHOLE

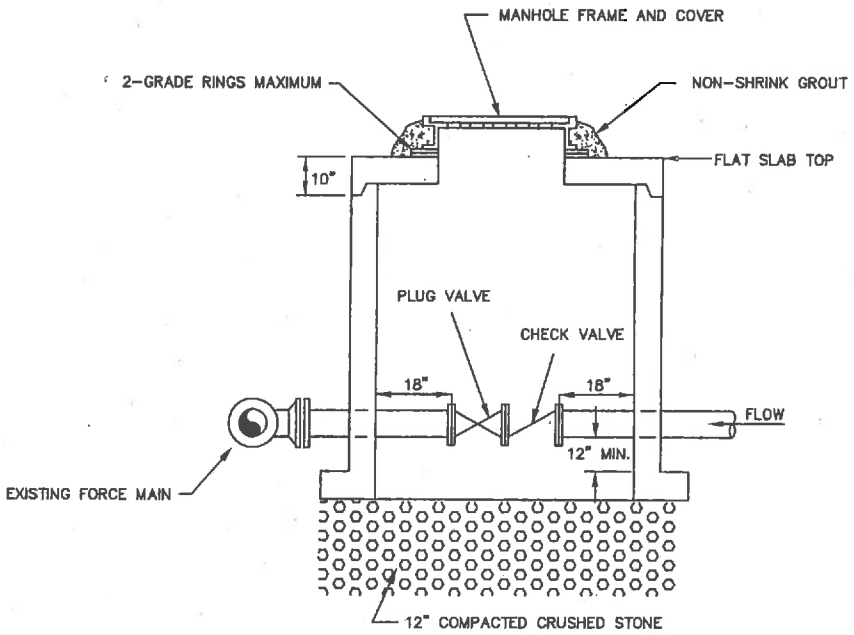
NOTES:

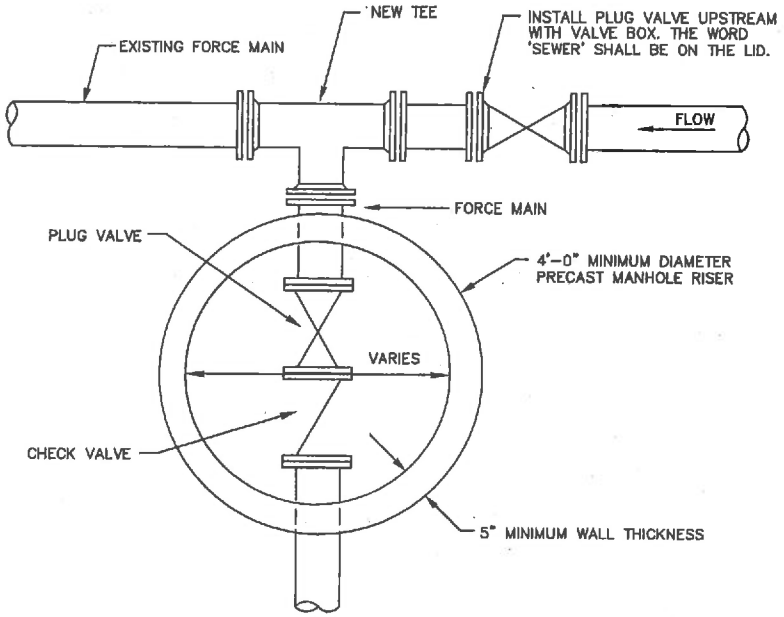
1. COAT INTERIOR OF RECEIVING AND NEXT DOWNSTREAM MANHOLES WITH EPOXY LINER.
2. SEE TRACER WIRE AND MAGNETIC TAPE DETAIL FOR ADDITIONAL INFORMATION.
3. FORCE MAINS TYING ONTO MANHOLES SHALL ENTER THE MANHOLE A VERTICAL DISTANCE OF NOT MORE THAN 2 FEET ABOVE THE FLOW LINE OF THE RECEIVING MANHOLE




PLAN VIEW OF INVERT

| RICHLAND COUNTY UTILITIES | |
|---|---|
| FORCE MAIN TIE-IN AT MANHOLE | DRAWING: FM-2.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

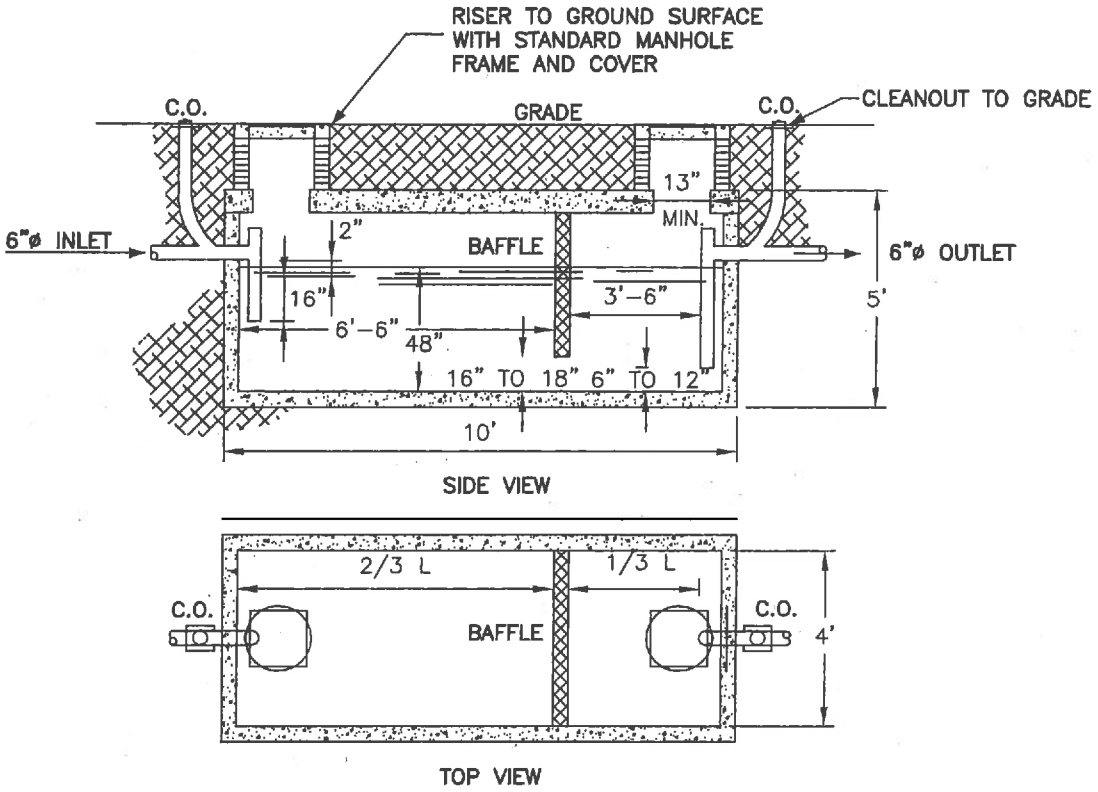



FORCE MAIN CONNECTION VALVE VAULT

| RICHLAND COUNTY UTILITIES | |
|---|---|
| FORCE MAIN CONNECTION VALVE VAULT | DRAWING: FM-3.0 |
| DATE: JULY 2016 | DRAWN BY: BPB |
| SCALE: NTS | APPROVED BY: |

# 11.5
# Grease Trap Detail




1,000 GALLON GREASE TRAP

| RICHLAND COUNTY UTILITIES | | |
|---|---|---|
| 1,000 GALLON GREASE TRAP | | DRAWING: GT-1.0 |
| DATE: JULY 2016 | DRAWN BY: BPB | |
| SCALE: NTS | APPROVED BY: | |

AECOM

AECOM
101 Research Drive
Columbia, SC 29203

803 254 4400 tel
803 771 6676 fax

26 October 2016

Mr. Shahid Khan, Director
Richland County Utilities
7525 Broad River Rd
Irmo, SC 29063

RE: Public Sanitary Sewer and Water Regulations and Specifications Manual
Project No.: 60494136

Dear Mr. Khan:

As discussed please find enclosed a bound copy of the updated Richland County Utilities Public Sanitary Sewer & Water Regulations and Specifications Manual as well as a CD with the electronic files. As noted in the enclosed, SCDHEC has approved the water distribution specifications and sewer specifications (i.e., gravity sewer, force mains, and details).

Section 1 of the enclosed includes administration procedures and policies, which are not approved by SCDHEC. In addition SCDHEC does not approve items listed in Section 8 Control of Fats, Oils and Grease, Section 9 Sewer Pump Station Design and Specifications, and Section 10 STEP System Design and Construction Specifications. Pump station specifications will be approved on a case-by-case basis.

Based on this SCDHEC approval, it is recommended Richland County Utilities review and approve the enclosed Specifications Manual to be utilized for future work in the Richland County Utilities systems.

Please do not hesitate to contact me at 803-254-4400 if you have any questions or need additional information.

Very Truly Yours,

Shelby Ozburn LeBron, P.E.
Senior Project Engineer
**AECOM Technical Services, Inc.**

Enclosures

AECOM

**About AECOM**

AECOM is built to deliver a better world. We design, build, finance and operate infrastructure assets for governments, businesses and organizations in more than 150 countries. As a fully integrated firm, we connect knowledge and experience across our global network of experts to help clients solve their most complex challenges. From high-performance buildings and infrastructure, to resilient communities and environments, to stable and secure nations, our work is transformative, differentiated and vital. A Fortune 500 firm, AECOM companies have annual revenue of approximately US$18 billion. See how we deliver what others can only imagine at aecom.com and @AECOM.