

ISLE OF WIGHT COUNTY

Department of Public Utilities



CONSTRUCTION SPECIFICATIONS AND STANDARDS

FOR

WATERWORKS AND

SANITARY SEWERAGE FACILITIES

Revised November 2004

List of Revisions

Table of Contents

Add Plate WXII to 4.2

Add 5.9 Sampling Station to section 5

Section 1 - General Conditions

1.1 Introduction – Paragraph 2: Revise address to *P.O. Box 108* and *add e-mail address*

1.2 Validity- Paragraph 4: Revise effective date to *November 1, 2004*

1.4 Policy- Add paragraph G: *All water and sewer infrastructure shall be complete and record drawings received/approved by Isle of Wight Public Utilities prior to the issuance of any Building Permits.*

1.5 Notification- Revised minimum notification time from 24 hours to *48 hours*

Section 2 – General Requirements

2.1 General- Paragraph A- Delete adopted June 1993,add *latest edition.*

Section 3 - Construction Specifications

3.2 Installation – E - Pipe Installation - Paragraph 6 and 8: Delete Director add Department

3.3 Fittings and Accessories – Paragraph B: Replace Director with *Department.*

3.4 Valves and Hydrants - Paragraph B: Add “*and valve box adapters*”, Paragraph B2- Replace Director with *Department.*

3.5 Underwater Crossings – Paragraph 1: Add *Directionally Drilled HDPE casing may be utilized underwater with prior approval from Isle of Wight Public Utilities.*

3.6 Road Crossings- Paragraph 1: Add Paragraph 4: *Directionally Drilled HDPE or PVC casing may be utilized under roadways with prior approval from VDOT and Isle of Wight Public Utilities.*

Section 4 – Construction Standards

4.2 Standard Details

Plate W VIII-Change meter type from Schlumberger(Neptune Pro Read ARB) to *Sensus Radio Read*, Change copper setter type from Ford V- 172-9 to *Ford VHH- 72-7W-4433*,Add *Touch Read Covers*.

Plate W X – Add *Valve Box Adapter*

Add Plate W XII – Detector check valve and vault for fire protection service

Section 5 – Materials

5.1 General – Replace Director with *Department*.

5.2 Water Main Service Pipe- Paragraph B2: Add *PVC Water Main shall have a plastic coated 10 Gage copper tracer wire*.

5.3 Corporation and Curb Stops - Replace Director of his authorized representative with *Department*.

5.5 Air Release valve and blow off assemblies - Replace Director with *Department*, Paragraph 1 Manual- Replace- one inch corporation stop and one inch gate valve with *two inch corporation stop and two inch gate valve* Delete Subsection 7-04,article C, add *Plate W in Section 4*.

5.6 Hydrants – Paragraph A. Add *Hydrant make shall be consistent throughout projects as to avoid mixed match types within an approved development area*.

5.7 Meters, Meter boxes, and Copper setters- Paragraph A- Delete *with cast iron bottom*. Change meter type to *Sensus Radio Read*. Paragraph B- Add-and be outfitted for touch read pads. Paragraph C- Change coppersetter type to *Ford VHH- 72 –7W-4433*.

5.8 Service Connections- Paragraph A: Add *"or blue service tubing"*, Replace Director with *Department*. Paragraph B: Delete last sentence.

Add Section 5.9 -Sampling Stations- *Owner/ Developer shall provide sampling stations to Isle of Wight Public Utilities for installation. Number of sampling stations and type shall be determined by the Department*.

Section 6 – Test and Disinfection

6.1 Tests-Change minimum notification time from 24 hours to *48 hours*, Replace *County with Department*, Add Paragraph 6: *Piping smaller than 3" shall be tested to 1 1/2 times the system operational pressure or a minimum 100 psi for 2 hours*.

6.2 Disinfection – Paragraph 6 –Delete: *"After at least 16 hours final flushing and"*. Paragraph 9 –Replace: Department of Public Utilities with *Virginia Dept. of Health*.

Section 7 – Wells

7.1 General Requirements- Add: *and Virginia Department of Environmental Quality, Owner shall provide the County with a minimum 20 KW portable trailer mounted generator for emergency operations.*

7.2 Testing- Replace County with *Department* in paragraphs A,B, and D.

7.3 Alarm systems – Delete old language and functions, Add new language, description, and functions.

7.4 Start up and Demonstrations – Replace County, Director with *Department* In paragraphs C and E. Replace County with *Department* in Paragraph I.

7.5 Operation and Maintenance Manuals - Replace County with *Department* in Paragraph A and D.

Section 8 General Requirements

8.1 General – Delete effective February 1977, supplemented in 1989,

Section 9 Construction Specifications

9.1 General Procedures- Replace Board or its designated representative with *Department* in Paragraph 1 and 3. Replace Director with *Department* in paragraph E. 4.

9.2 Installation- Replace Director with *Department*

9.3 Manholes, Cleanouts and Accessories – Subsection A-4 paragraph 2: Replace Director with *Department*. Subsection B- paragraph 2: Replace Director or his authorized representative with *Department*.

9.4 Special Crossings- Paragraph A3: Replace Director with *Department*, Paragraph B2- Add: *Directionally Drilling* , Delete: upon written , Replace Director with *Department*, Paragraph B4 - Replace Director or his authorized representative with *Department*.

9.5 Service Connections - Paragraph 2: Replace Director with *Department*.

Section 10 Construction Standards

10.2 Standard Details – Add Force Main Connection Detail Plate X

Section 11 Materials

11.1 General – Replace Engineer with *Department*.

11.2 Sewer Line and Service Pipe -Paragraph B – Change SDR 35 to *SDR 26*. Delete Paragraph C and E.

11.3 Manholes, Cleanouts, and Accessories - Paragraph C - Delete whenever the tops may be subject to flooding. As a minimum, watertight covers are to be used below the elevation of the 25 year flood/wave action.

Section 12 Field Test

12.1 Gravity Sewer A. General-Paragraph 1&2- Replace: Director with *Department*.

12.2 Force Main- A. General – Paragraph 2 – Replace: Director or his authorized representative with *Department*.

Section 13 Pumping Stations

13.1 General – Paragraph 2 – Replace County with *Department*.

13. 2 Wet well/Dry well stations – Paragraph 11- Replace County with *Department*

13.3 Submersible Pump – Paragraph 1- Delete hydromatic pumps and shall be, Paragraph 2 – Delete- sole, Replace Director with *Department*.

13. 5 Alarm Systems – Add frequency – *453.175*

13.6 Emergency Pump – Change may be to *will be*, Add: *portable , portable emergency pump, portable diesel generator, as determined by the Department, Portable emergency pump shall be a Godwin with Murphy gage or an approved equal. Portable emergency pump size shall be determined by the Department. Portable diesel generator shall be a minimum Godwin 26 kw Diesel Generator or an approved equal.*

TABLE OF CONTENTS

**CONSTRUCTION SPECIFICATIONS AND
STANDARDS FOR WATERWORKS
AND SANITARY SEWERAGE FACILITIES**

**PART I
GENERAL CONDITIONS**

| SECTION | 1 | <u>GENERAL CONDITIONS</u> | <u>Page</u> |
|----------------|----------|--|-------------|
| | 1.1 | INTRODUCTION | 1- 1 |
| | 1.2 | VALIDITY | 1- 1 |
| | 1.3 | DEFINITIONS | 1- 1 |
| | 1.4 | POLICY | 1- 3 |
| | 1.5 | NOTIFICATION..... | 1- 4 |
| | 1.6 | CROSS-CONNECTION AND BACKFLOW PREVENTION CONTROL IN WATERWORKS..... | 1- 4 |
| | 1.7 | RECORD DRAWINGS | 1- 4 |

PART II

**CONSTRUCTION SPECIFICATIONS
AND STANDARDS
FOR WATER FACILITIES**

| SECTION | 2 | <u>GENERAL REQUIREMENTS</u> | <u>Page</u> |
|----------------|----------|--|-------------|
| | 2.1 | GENERAL | 2- 1 |
| | 2.2 | MINIMUM SIZES..... | 2- 1 |
| | 2.3 | FIRE PROTECTION | 2- 1 |
| | 2.4 | MINIMUM COVER | 2- 2 |
| | 2.5 | SEPARATION OF WATER MAINS AND SANITARY SEWERS..... | 2- 2 |
| | | A. GENERAL | 2- 2 |
| | | B. PARALLEL INSTALLATION..... | 2- 2 |
| | | C. CROSSING | 2- 2 |
| | 2.6 | LOCATION OF WATER LINES..... | 2- 3 |
| SECTION | 3 | <u>CONSTRUCTION SPECIFICATIONS</u> | |
| | 3.1 | GENERAL PROCEDURES | 3- 1 |
| | 3.2 | INSTALLATION | 3- 1 |
| | | A. EXCAVATION..... | 3- 1 |
| | | B. TRENCHING..... | 3- 1 |
| | | C. DRAINAGE | 3- 2 |
| | | D. BACKFILL | 3- 2 |
| | | E. PIPE INSTALLATION..... | 3- 2 |

| | | |
|------------------|---|-------------|
| 3.3 | FITTINGS AND ACCESSORIES..... | 3- 3 |
| | | <u>Page</u> |
| 3.4 | VALVES AND HYDRANTS | 3- 4 |
| | A. GENERAL..... | 3- 4 |
| | B. VALVES AND VALVE BOXES | 3- 4 |
| | C. HYDRANTS | 3- 4 |
| 3.5 | SURFACE WATER CROSSINGS..... | 3- 4 |
| | A. ABOVE WATER CROSSINGS..... | 3- 4 |
| | B. UNDER WATER CROSSINGS | 3- 5 |
| 3.6 | ROAD CROSSINGS..... | 3- 5 |
| SECTION 4 | <u>CONSTRUCTION STANDARDS</u> | |
| 4.1 | GENERAL REQUIREMENTS..... | 4- 1 |
| 4.2 | STANDARD DETAILS | 4- 1 |
| | PLATE W I AIR RELEASE ASSEMBLY..... | 4- 2 |
| | PLATE W II CONCRETE ENCASEMENT AND GRANULAR BEDDING AND BACKFILL MATERIAL..... | 4- 3 |
| | PLATE W III BLOW-OFF ASSEMBLY TYPE 1 | 4- 4 |
| | PLATE W IV LINE TERMINATION AND BLOW-OFF ASSEMBLY ... | 4- 5 |
| | PLATE W V PIPE SKID AND BORED CROSSING | 4- 6 |
| | PLATE W VI SPECIAL ROAD CROSSING | 4- 7 |
| | PLATE W VII FIRE HYDRANT SETTING..... | 4- 8 |
| | PLATE W VIII SERVICE CONNECTION AND METER BOX..... | 4- 9 |
| | PLATE W IX THRUST BLOCKS..... | 4-10 |
| | PLATE W X VALVE BOX INSTALLATION AND VALVE SETTING. | 4-11 |
| | PLATE W XI AUTOMATIC AIR RELEASE ASSEMBLY | 4-12 |
| | PLATE W XII DETECTOR CHECK VALVE AND VAULT..... | 4-13 |
| SECTION 5 | <u>MATERIALS</u> | |
| 5.1 | GENERAL..... | 5- 1 |
| 5.2 | WATER MAIN SERVICE PIPE..... | 5- 1 |
| | A. DUCTILE IRON PIPE | 5- 1 |
| | B. AWWA POLYVINYLCHLORIDE PIPE | 5- 1 |
| | C. COPPER PIPE..... | 5- 2 |
| 5.3 | CORPORATION AND CURB STOPS..... | 5- 2 |
| 5.4 | VALVES AND VALVE BOXES | 5- 2 |
| | A. BUTTERFLY VALVES | 5- 2 |
| | B. CHECK VALVES | 5- 2 |
| | C. GATE VALVES | 5- 2 |
| | D. VALVE BOXES | 5- 2 |
| 5.5 | AIR RELEASE VALVE AND BLOW-OFF ASSEMBLIES | 5- 2 |
| | A. AIR RELEASE VALVE ASSEMBLIES..... | 5- 2 |
| | B. BLOW-OFF ASSEMBLIES..... | 5- 3 |
| 5.6 | HYDRANTS | 5- 3 |

| | | |
|------------------|---|-------------|
| 5.7 | METERS, METER BOXES, AND COPPERSETTERS..... | 5- 3 |
| | A. METERS | 5- 3 |
| | B. METER BOXES | 5- 4 |
| | | <u>Page</u> |
| | C. COPPERSETTERS | 5- 4 |
| 5.8 | SERVICE CONNECTIONS | 5- 4 |
| | A. SERVICE PIPE | 5- 4 |
| | B. SERVICE INSTALLATION | 5- 4 |
| 5.9 | SAMPLING STATIONS..... | 5-4 |
| SECTION 6 | <u>TESTS AND DISINFECTION</u> | |
| 6.1 | TESTS..... | 6- 1 |
| 6.2 | DISINFECTION..... | 6- 1 |
| SECTION 7 | <u>WELLS</u> | |
| 7.1 | GENERAL..... | 7- 1 |
| 7.2 | TESTING..... | 7- 1 |
| 7.3 | ALARM SYSTEMS..... | 7- 1 |
| 7.4 | STARTUP AND DEMONSTRATION..... | 7- 2 |
| 7.5 | OPERATION AND MAINTENANCE MANUALS | 7- 3 |

PART III

**CONSTRUCTION SPECIFICATIONS
AND STANDARDS FOR
SANITARY SEWERAGE FACILITIES**

| | | |
|------------------|---|-------------|
| | | <u>Page</u> |
| SECTION 8 | <u>GENERAL REQUIREMENTS</u> | |
| 8.1 | GENERAL..... | 8- 1 |
| 8.2 | MINIMUM SIZES, SLOPES AND VELOCITY | 8- 1 |
| | A. SIZES | 8- 1 |
| | B. SLOPES AND VELOCITIES..... | 8- 1 |
| 8.3 | MINIMUM AND MAXIMUM COVER | 8- 2 |
| 8.4 | MANHOLE AND CLEANOUT LOCATIONS..... | 8- 2 |
| 8.5 | LOCATION OF SEWER LINES..... | 8- 2 |
| SECTION 9 | <u>CONSTRUCTION SPECIFICATIONS</u> | |
| 9.1 | GENERAL PROCEDURES | 9- 1 |
| 9.2 | INSTALLATION | 9- 1 |
| | A. EXCAVATION | 9- 1 |
| | B. TRENCHING..... | 9- 1 |
| | C. DRAINAGE | 9- 1 |
| | D. BACKFILL | 9- 2 |

| | | | |
|-----|----|---|-------------|
| | E. | PIPE INSTALLATION | 9- 2 |
| 9.3 | | MANHOLES, CLEANOUTS, AND ACCESSORIES..... | 9- 3 |
| | A. | MANHOLES | 9- 3 |
| | B. | ACCESSORIES | 9- 4 |
| | | | <u>Page</u> |
| 9.4 | | SPECIAL CROSSINGS | 9- 5 |
| | A. | STREAM CROSSINGS | 9- 5 |
| | B. | HIGHWAY AND RAILROAD CROSSINGS..... | 9- 5 |
| 9.5 | | SERVICE CONNECTIONS | 9- 5 |

SECTION 10 CONSTRUCTION STANDARDS

| | | | |
|------|---------------|--|-------|
| 10.1 | | GENERAL REQUIREMENTS..... | 10- 1 |
| 10.2 | | STANDARD DETAILS | 10- 1 |
| | PLATE S I | AUTOMATIC AIR RELEASE ASSEMBLY | 10- 2 |
| | PLATE S II | MANUAL AIR VENT | 10- 3 |
| | PLATE S III | STANDARD BEDDING..... | 10- 4 |
| | PLATE S III A | STANDARD BEDDING..... | 10- 5 |
| | PLATE S IV | CONCRETE ENCASEMENT AND CONCRETE CAP | 10- 6 |
| | PLATE S V | LATERAL | 10- 7 |
| | PLATE S VI | STANDARD AND WATERTIGHT MANHOLE FRAME AND COVER | 10- 8 |
| | PLATE S VII | STANDARD MANHOLES..... | 10- 9 |
| | PLATE S VIII | EMERGENCY PUMP CONNECTION | 10-10 |
| | PLATE S IX | SAXAPHONE RAISED OR DEPRESSED SECTIONS AT FORCE MAIN TERMINATIONS | 10-11 |
| | PLATE S X | FORCE MAIN CONNECTION..... | 10-12 |

SECTION 11 MATERIALS

| | | | |
|------|----|---|-------|
| 11.1 | | GENERAL | 11- 1 |
| 11.2 | | SEWER LINE AND SERVICE PIPE..... | 11- 1 |
| | A. | DUCTILE IRON PIPE | 11- 1 |
| | B. | POLYVINYLCHLORIDE PIPE | 11- 1 |
| | C. | ACRYLONITRILE-BUTADIENE-STYRENE (ABS) COMPOSITE TRUSS PIPE | 11- 2 |
| | D. | POLYVINYLCHLORIDE COMPOSITE TRUSS PIPE | 11- 2 |
| | E. | PVC CORRUGATED SEWER PIPE | 11- 2 |
| 11.3 | | MANHOLES, CLEANOUTS AND ACCESSORIES..... | 11- 2 |
| | A. | GENERAL | 11- 2 |
| | B. | CONCRETE | 11- 2 |
| | C. | FRAMES, COVERS AND STEPS | 11- 2 |
| | D. | PRECAST CONCRETE MANHOLES | 11- 2 |
| 11.4 | | CONCRETE | 11- 3 |
| | A. | GENERAL REQUIREMENTS..... | 11- 3 |
| | B. | MATERIALS..... | 11- 3 |

| | | |
|----|---------------------------------------|-------------|
| C. | SLUMP | 11- 3 |
| D. | TESTING..... | 11- 3 |
| E. | FORMS | 11- 4 |
| F. | CONSTRUCTION JOINTS..... | 11- 4 |
| G. | PLACEMENT OF REINFORCEMENT | 11- 4 |
| H. | DELIVERY OF CONCRETE..... | 11- 4 |
| I. | PLACEMENT OF CONCRETE..... | 11- 5 |
| | | <u>Page</u> |
| J. | VIBRATION..... | 11- 5 |
| K. | PLACING CONCRETE IN COLD WEATHER..... | 11- 5 |
| L. | REPAIR OF SURFACE DEFECTS | 11- 5 |
| M. | SURFACE FINISH | 11- 5 |
| N. | PROTECTION AND CURING | 11- 6 |

SECTION 12

FIELD TESTS

| | | |
|------|---|-------|
| 12.1 | GRAVITY SEWERS | 12- 1 |
| | A. GENERAL..... | 12- 1 |
| | B. INFILTRATION TEST | 12- 1 |
| | C. EXFILTRATION TEST | 12- 1 |
| | D. AIR TEST | 12- 1 |
| | E. DEFLECTION TEST FOR PVC AND ABS PIPE | 12- 2 |
| 12.2 | FORCE MAINS | 12- 2 |
| | A. GENERAL..... | 12- 2 |
| | B. ANCHORAGE..... | 12- 2 |
| | C. AIR RELIEF VALVE..... | 12- 2 |
| | D. TERMINATION | 12- 3 |

SECTION 13

PUMPING STATIONS

| | | |
|------|--|-------|
| 13.1 | GENERAL..... | 13- 1 |
| 13.2 | WET WELL/DRY WELL STATIONS..... | 13- 1 |
| 13.3 | SUBMERSIBLE PUMPS..... | 13- 2 |
| 13.4 | CONTROLS | 13- 2 |
| 13.5 | ALARM SYSTEMS..... | 13- 2 |
| 13.6 | EMERGENCY PUMP..... | 13- 3 |
| 13.7 | STARTUP AND DEMONSTRATION..... | 13- 3 |
| 13.8 | OPERATION AND MAINTENANCE MANUALS..... | 13- 3 |

**PART I
GENERAL CONDITIONS**

SECTION 1 GENERAL CONDITIONS.

1.1 INTRODUCTION.

The purpose of this publication is to establish and furnish information on the construction requirements which have been adopted by the Isle of Wight County Board of Supervisors in accordance with Sections 15.1-292 through 15.1-335 inclusive of the Code of Virginia of 1950, as amended, which are applicable to the public water and sanitary sewerage facilities now existing or which may, in the future, be under the jurisdiction of Isle of Wight County. This publication provides the standards and specifications to which all planning, construction, and connection of these utilities shall conform when such utilities are proposed for use for residential, business, commercial, or industrial purposes within Isle of Wight County, Virginia.

Inquiries for information or clarification of any item herein pertinent to other matters concerning these facilities shall be directed to the Utilities Director, Isle of Wight County Department of Public Utilities, *P.O. Box 108*, Isle of Wight, Virginia 23397 or to _____ @isleofwightus.net.

1.2 VALIDITY.

If any section, subsection, sentence, clause, or phrase of these construction specifications and standards is for any reason held to be invalid, such decision shall not affect the validity of any other part of the construction specifications and standards which can be given effect without such invalid part or parts.

No statement or obligation contained in this publication shall be construed to interfere with any additional requirements which may be imposed by County Ordinances or rules, regulations and specifications of responsible State agencies such as the Department of Health or the Department of Environmental Quality. In accordance with applicable statutes of the Code of Virginia a majority vote of the Board of Supervisors will be necessary to revise these construction specifications and standards as may be required.

In the event of any variance between the specifications in this publication and applicable rules, regulations, and specifications of the State Department of Health or the Department of Environmental Quality, it shall be understood that any such rules, regulations, and specifications of said State agencies shall prevail unless more rigid requirements are dictated by these regulations.

These construction specifications and standards shall take effect and be in full force from and after November 1, 2004.

1.3 DEFINITIONS. Unless the context specifically indicates otherwise the meaning of terms used herein shall be as follows:

A. "Applicant" shall mean any person or entity requesting water and/or sewer service from the Department.

B. "Board" shall mean the Board of Supervisors, the governing body of

Isle of Wight County, Virginia.

- C. "County" shall mean the County of Isle of Wight, Virginia.
- D. "Department of Public Utilities" or "Department" shall mean the Isle of Wight County Department of Public Utilities or its authorized and/or delegated representative, who represents the County in matters of review and approval.
- E. "Domestic wastes" shall mean the water-carried liquid or solid wastes which are derived principally from residential dwellings and commercial buildings.
- F. "Engineer" shall mean the professional engineer, registered in the State of Virginia, retained by the County of Isle of Wight, who is responsible for the design of any facilities to be under the jurisdiction of the County.
- G. "Facilities of the County" shall mean any and all component and pertinent parts of the entire utility system of the water and sanitary sewerage facilities under the jurisdiction of Isle of Wight County, including but not limited to the County, its Sanitary Districts, or any public agency of Isle of Wight County, such as waterworks and sanitary sewerage facilities, including these items and others now constructed, installed, leased, operated or maintained by the Department, or any which may be approved and accepted in the future as additions or extensions of the systems.
- H. "Industrial wastes" shall mean the water-carried liquid or solid wastes from institutional establishments and industrial plant processes as distinct from domestic wastes.
- I. "Non-potable or raw water" shall mean water classified as unsuitable for human consumption.
- J. "Owner, developer, or subdivider" shall mean any person, firm, partnership, corporation, association, society or group owning or having an interest, whether legal or equitable, sole or partial, in any premise or tract, lot or parcel of land which is or may be in the future developed or subdivided.
- K. "Person" shall mean any individual, firm, partnership, corporation, association, society, group, and unit of local, state or federal government.
- L. "Potable or finished water" shall mean water classified as suitable for human consumption.
- M. "Premise" shall mean any building or group of buildings, or any tract, lot or parcel of land upon which buildings are to be constructed and which is or may be served by the facilities of the County.
- N. "Residential equivalents" or "single family residential equivalents" shall provide a basis of water consumption or sewage discharge to which all other classes of users are to be compared.
- O. "Sanitary sewerage facilities" shall mean all facilities for the collection, pumping, transmission, treatment, and disposal of sewage or wastewaters.
- P. "Sewer" shall mean a pipe or conduit for the collection and

transmission of sewage or wastewater.

Q. "Shall" is mandatory; "may" is permissive, or conditional.

R. "Total Project Cost" shall mean the grand total of design, land, right-of-way, easements, materials, construction, legal, administrative, and interim financing costs associated with a water or sewer facility project. It does not include ongoing operating and maintenance costs of the facility.

S. "Utilities Director" or "Director" shall mean the Director of the Department of Public Utilities, and/or his authorized agents and assistants.

T. "Wastewater" or "sewage" shall mean any combination of domestic and industrial water-carried wastes together with any groundwater, surface water or storm water that may be present.

U. "Wastewater treatment plant" or "sewage treatment plant" shall mean any arrangement of devices and structures used for the treatment of sewage or wastewaters.

V. "Water filtration plant" or "water treatment plant" shall mean any arrangement of devices and structures used for the treatment and/or purification of non-potable or raw water.

W. "Water main or water line" shall mean a pipe or conduit for transmission or distribution of potable or finished water.

X. "Waterworks" or "water facilities improvements" shall mean all facilities for the treatment and/or purification of non-potable or raw water and the transmission, pumping, and distribution of potable or finished water.

1.4 **POLICY**

A. With regard to facilities to be approved and accepted by the County, as provided or to be provided in the Construction specifications and standards for Waterworks and Sanitary Sewerage Facilities of the County of Isle of Wight, Virginia it shall be the responsibility of the owner to reimburse the County for the cost of certain services. These services shall include any and all services performed by the County in preparation for approval and acceptance into the utility system of the County of facilities constructed by the owner.

B. These costs shall include, but not necessarily be limited to, plan review and approval costs, fees and charges for permits required by the County or another jurisdictional body, construction inspection costs, cost of bacteriological samples, cost of soils and/or concrete tests, and administrative overhead.

C. Approval of any plans for a project by the County or its designated agent shall not relieve the Owner or its Engineer of record of the responsibility for errors or omissions contained in said plans. By its approval, the County does not certify as to the correctness or completeness of said plans.

D. It shall be the sole responsibility of the Owner to secure all regulatory agency approvals and permits required for the prosecution of work associated with a project.

E. The Owner agrees to indemnify and hold harmless the County of Isle of Wight and its agent(s) from and against all claims, damages, losses and expenses arising out of or resulting from the performance of work included in the scope of any project.

F. General policies regarding the water and sewerage facilities now constructed, installed, leased, operated, or maintained by the County are set out in the Construction Specifications and Standards.

G. *All water and sewer infrastructure shall be complete and record drawings received/approved by Isle of Wight Public Utilities prior to the issuance of any building permits.*

1.5 **NOTIFICATION.** The Department of Public Utilities of Isle of Wight County must be notified a minimum of *48 hours* prior to the commencement of work, of any nature, on a project which requires inspection by the County.

Failure to provide proper notification may result in rejection of the work.

1.6 **CROSS-CONNECTION AND BACKFLOW PREVENTION CONTROL IN WATERWORKS.** All facilities and operations of the Owner must comply with 12VAC 5-590-580 through 12 VAC 5-590-630: Cross-Connection and Backflow Prevention Control in Waterworks of the Waterworks Regulations of the Department of Health under the authority of Title 32.1, Article 2, of the Code of Virginia, as amended. All facilities and operations must also comply with any cross-connection and backflow prevention provisions in the Construction specifications and standards.

1.7 **RECORD DRAWINGS.** After completion of construction of the facilities from approved plans and/or specifications the developer or owner responsible for the construction shall prepare record drawings, based on accurate, field-obtained information, to show actual conditions of the finished construction. The record plans shall be revisions to, and permanently indicated changes on the original tracings or master sheets from which were made the plans and/or specifications. The owner shall furnish the County a complete set of mylar reproducible drawings and AUTOCAD 12.0 electronic files showing the record locations and dimensions. The content of the record drawings shall be as listed in the Construction Specifications and Standards, construction requirements section.

**PART II
CONSTRUCTION SPECIFICATIONS
AND STANDARDS
FOR WATER FACILITIES**

SECTION 2 GENERAL REQUIREMENTS.

2.1 GENERAL.

A. All installations shall be in strict accordance with the Building Officials Code Administrators (BOCA) codes, the Virginia Department of Health, Water Works Regulations, *latest edition*, and the Department of Public Utilities Construction Specifications and Standards for Waterworks and Sanitary Sewerage Facilities, Isle of Wight County, Virginia.

B. No deviation from the construction specifications and standards and construction details approved by the Department shall be allowed, unless specifically authorized in writing by the Director.

C. Although constructed as parcels or sub-systems, all water mains and related facilities of all proposed developments shall be approved on the basis of their functional integration with the Department's water system master plan.

D. In cases where owners are required to extend water service, the owners shall extend the distribution main longitudinal to the appropriate property line and to within five (5) feet of the furthest extremity of such property.

2.2 MINIMUM SIZES.

A. The minimum size of transmission mains shall be in accordance with the current Master Plan. The minimum size of water mains where fire protection is to be provided or required shall be six inch interior diameter. Water mains not sized to carry fire flows shall not be connected to fire hydrants.

B. All water distribution piping shall be capable of providing an instantaneous demand flow of three gallons per minute per connection at a minimum pressure of twenty pounds per square inch. The Department reserves the right to determine the size and material of any proposed water main that will be accepted into the system.

2.3 FIRE PROTECTION. Where the source of water is a central community well system serving 15 or more customers, fire protection shall be provided. The well system shall be capable of providing a flow of 500 gallons per minute (GPM) for a duration as designated on the table below; provided, however, that if it is assured that the exposure distances for customers of the system in every case exceed 100 feet, the required duration shall be 30 minutes.

REQUIRED DURATION OF 500 GPM FLOW

| Number of Customers | Duration (Minutes) |
|---------------------|--------------------|
| 15 - 99 | 30 |
| 100 -199 | 60 |
| 200 -299 | 90 |
| 300+ | 120 |

Where the source of water is a central community well system serving 14 or fewer customers, the system may be required to provide water storage facilities for adequate fire protection.

2.4 **MINIMUM COVER.**

All water mains shall be provided with a minimum of not less than 36 inches of earth cover measured from established finished grade to the top of the pipe to prevent freezing.

2.5 **SEPARATION OF WATER MAINS AND SANITARY SEWERS.**

A. **GENERAL.** There shall be no physical connection between a public or private potable water supply system and a sewer, or appurtenance thereto which would permit the passage of any sewage or polluted water into the potable water supply. No water supply or distribution pipe shall pass through or come in contact with any part of a sewer manhole. Further, no water supply line shall be installed closer than ten feet horizontally to septic tanks and 30 feet to septic tank tile lines. It shall be well recognized that water supply lines and structures shall be kept remote from any existing sewers.

B. **PARALLEL INSTALLATION.** Under normal conditions water lines shall be laid at least ten feet horizontally from any existing sewer line or sewer manhole wherever possible. The distance shall be measured edge-to-edge.

When local conditions prevent a horizontal separation of ten feet, the water line may be laid closer to a sewer provided that the invert of the water line is at least 18 inches above the top of the sewer and installed on an undisturbed earth shelf. Where this vertical separation cannot be obtained, the sewer shall be constructed of AWWA approved water pipe, pressure tested in place to 150 PSI without leakage prior to backfilling. The sewer manhole shall be of watertight construction and tested in place.

C. **CROSSING.** Under normal conditions water lines crossing over sewers shall be constructed to provide a separation of at least 18 inches between the invert of the water line and the top of the sewer wherever possible.

When local conditions prevent a vertical separation as described above, sewers passing over or under water lines shall be constructed of AWWA approved water pipe. Water lines passing under sewers shall have a vertical separation of at least 18 inches between the invert of the sewer and the top of the water line and be installed centering the water line and sewer line at the point of crossing so that the joints are equidistant and as far as possible from the sewer. Adequate structural support shall be provided to prevent excessive deflection of the joints and settling on and breaking of the waterline.

2.6 **LOCATION OF WATER LINES.** As a general rule, water lines shall be placed in the street right-of-way. Water lines may be constructed on private property if it is the only feasible way to serve properties included in the system. In these cases a utility easement of not less than fifteen (15) feet shall be provided for all lines on private property.

SECTION 3 CONSTRUCTION SPECIFICATIONS.

3.1 GENERAL PROCEDURES.

A. All water mains shall be looped whenever possible. All systems and sub-systems shall be designed to eliminate cross connections and back siphonage. Where unavoidable dead ends occur, they shall be provided with a fire hydrant or an adequate sized blow-off assembly for flushing purposes. No flushing device shall be directly connected to any sewer or non-approved piping system.

B. Pipe, fittings, valves, hydrants and accessories shall be loaded and unloaded by lifting with hoists to avoid shock or damage. Under no circumstances shall they be dropped. Pipe shall not be skidded or rolled against pipe already on the ground. Pipe shall be handled so that the coating and lining shall not be damaged. Damaged items shall be either repaired or replaced at the discretion of the Department.

The water main shall be laid and maintained to the required lines and grades with fittings, valves, hydrants and accessories set at the required locations as indicated on the approved plans for the project. All valve and hydrant stems shall be set plumb. Wherever obstructions not shown on the plans are encountered during progress of the work and which interfere to such an extent that an alteration in the plans is required, the Department or its authorized representative shall be advised and approval given before such alterations are put into effect.

C. All pipe shall be installed according to the manufacturer's recommendations as approved by the Department. No pipe shall be laid in water, or when, in the opinion of the Director or his authorized representative, trench conditions are unsuitable.

D. Those pipe materials as approved by AWWA shall be used, except that Asbestos-Cement shall not be used.

3.2 INSTALLATION.

A. **EXCAVATION.** Excavation of whatever substance may be encountered shall be performed to the dimensions and depths specified or shown on the applicant's approved drawings. Ledge rock, boulders and large stones shall be removed to provide a clearance at least six inches below and on each side of all pipe, valves and fittings for pipes 24 inches in diameter or less, and nine inches for pipe larger than 24 inches in diameter. The specified minimum clearances are the minimum clear distances which will be permitted between any part, projection or joint of such rock, boulder or stone.

In the event that unstable material is encountered at or below the excavation depth, the Department shall be notified. Such materials shall be removed and replaced with suitable materials which shall be furnished as an ordinary and integral part of excavation and backfill. If excavation of any nature has been made deeper than necessary, then a layer of suitable backfill shall be placed to secure a firm foundation for the pipe.

B. **TRENCHING.** The trench shall be dug so that the pipe can be laid to the alignment and depth required and it shall be excavated not more than 200 feet in advance of the complete pipe laying operation. The width of the trench shall be ample to permit the pipe to be laid and jointed properly and the backfill to be placed and thoroughly compacted in accordance with the

plans and specifications. Trenches shall be of such extra widths when required as will permit the convenient placing of timber supports, sheeting and bracing and handling of special fittings. Bell holes shall be provided at each joint to permit proper joint construction and inspection. In no case shall the pipe bells be used to support the body of the pipe.

C. **DRAINAGE.** Grading shall be controlled in the vicinity of excavations so that the surface of the ground will be properly sloped to prevent water from running into trenches or other excavated areas. Any water which accumulates in the excavations shall be removed promptly in such manner as to not create a nuisance to adjacent property or public thoroughfare. Trenches shall be kept dry while pipe is being laid.

D. **BACKFILL.** Clean earth, sand, crushed stone or other material approved by the Department shall be used for backfill. Material suitable for backfill shall be selected, deposited and compacted to eliminate the possibility of lateral displacement of the pipe. Backfill material shall be solidly hand tamped around the pipe in 6 inch layers up to a level at least one foot above the top of the pipe. Backfilling shall be carried out simultaneously on both sides of the pipe.

The remainder of the backfill shall be deposited and compacted by mechanical tampers except in areas where paving is to be placed over the backfilled trench. In these areas compaction shall achieve a density of at least 95 percent of the maximum density as determined by the American Association of State Highway and Transportation Officials' (A.A.S.H.T.O.) Method T-18O.

E. **PIPE INSTALLATION.** Stockpiled pipe materials shall be handled by mechanical equipment and placed to avoid interference with traffic and the trenching operation.

Adequate supports shall be provided for all pipes. The bottom of the trench shall be carefully shaped to the curvature of both the bell and barrel of the pipe. A continuous and uniform bedding shall be provided in the trench for all pipe so that the pipe barrel bears on and is supported by undisturbed ground at every point between bell holes. Trenching below the specified grade shall be backfilled with approved material and thoroughly compacted. The finished subgrade shall be prepared accurately by means of hand tools. Where excavation is made in rock or boulders the subgrade shall be made by backfilling with crushed stone or clean selected soil which shall be thoroughly compacted.

Before the pipe is lowered into the trench, each section of pipe shall be thoroughly inspected for defects and shall be swabbed or brushed out to insure that no dirt or foreign material gets into the finished main. Every precaution shall be taken to prevent foreign material from entering the pipe while it is being placed in line.

When installing pipe in the trench, proper implements, tools and facilities satisfactory to the Department and as recommended by the material manufacturer shall be provided and used by the contractor for the safe and convenient prosecution of the work. All pipe, valves, fittings and hydrants and accessories shall be carefully lowered into the trench piece by piece by means of derricks, ropes, slings, or other suitable tools or equipment in such a manner as to prevent damage to water main materials and any protective coatings and linings. Lifting equipment shall be satisfactorily rated to handle the pipe and fittings required. Under no circumstances shall water main materials be dropped or dumped into the trench.

During the laying operation no debris, tools, clothing or other materials shall be placed in the pipe and the trench shall be kept free of water. Before joining the pipe, all

lumps, blisters, excess coating material, oil or foreign material shall be removed from the bell and spigot ends of the pipe and fittings shall be kept fully closed by a test plug to prevent earth, water, or other substances from entering the pipe.

Pipe shall be laid true to line and grade and shall be joined together such that the completed pipe will have a smooth invert. After placing a length of pipe in the trench, the spigot end shall be centered in the open bell of the pipeline and the pipe pushed home with a bar. THE USE OF LIFTING AND HYDRAULIC EQUIPMENT TO MAKE PIPE JOINTS SHALL BE SPECIFICALLY PROHIBITED.

All joints shall be watertight and any leaks or defects discovered shall be immediately repaired to the satisfaction of the *Department*. Any pipe which has been disturbed after being laid shall be taken up, the joints cleaned and the pipe properly re-laid. Any superfluous material inside the pipe shall be flushed or removed by means of an approved follower or scraper after joints are made. Installation of fittings and pipe joints shall be in strict accordance with the manufacturer's recommendations.

The cutting of pipe for inserting valves, fittings or closure pieces shall be done in a neat and workmanlike manner without damage to the pipe or lining and so as to leave a smooth end at right angles to the axis of the pipe. Only qualified and experienced workmen shall be used on this work. The flame cutting of pipe by means of an oxyacetylene torch shall not be allowed.

Wherever it is necessary to deflect pipe from a straight line either in the vertical or horizontal plane to avoid obstructions or plumb stems, or where long-radius curves are permitted, the amount of deflection allowed shall not exceed that required for satisfactory joining of the pipes, as specified by American Water Works Association (AWWA) Specification and the manufacturer's recommendations. If the specified or required alignment requires deflections exceeding those recommended, the developer or contractor shall provide bends as approved by the *Department*.

Road crossings shall be installed in accordance with the requirements of the Virginia Department of Transportation, which governs the method and materials of such construction. The owner shall obtain the necessary permit prior to actual installation.

Roadways and driveways, grass plots, sod, shrubbery, ornamental trees, signs, fences, or other improvements on public or private property which have been damaged or removed in excavating, shall be restored to conditions equal to or better than existed prior to construction.

Materials for roadways, alleys, or driveways shall be compacted to at least 95 percent of the maximum density as determined by the A.A.S.H.T.O. Method T-180. The cost of this compaction and furnishing new materials shall be at the expense of the owner or developer.

The site restoration of the entire construction area shall be finished in a neat and uniform condition acceptable to the Department.

3.3 **FITTINGS AND ACCESSORIES.**

- A. All tees, bends, plugs, caps and fire hydrants shall be substantially

anchored to prevent any movement by providing adequate thrust restraint.

B. Thrust restraint shall be "restrained joints" as standard, with thrust blocks only when permitted by *Department*. The design of the thrust restraint shall consider the type of fitting, maximum pressures and type of soil in the thrust area and shall be subject to the review and approval of the *Department*.

3.4 **VALVES AND HYDRANTS.**

A. **GENERAL.** Hydrants and valves shall have the interiors cleaned of all foreign matter before installation. Stuffing boxes shall be tightened and the hydrants or valve shall be inspected in opened and closed positions to see that all parts are in working condition.

B. **VALVES AND VALVE BOXES.** All valves shall be provided with valve boxes *and valve box adapters*. Extension stems for buried valves shall be of sufficient length so that the operating nut will not be lower than 15" below grade. Valves and valve boxes shall be set plumb with the valve boxes centered directly over the valve operators. After being correctly positioned, earth fill shall be carefully tamped around the valve box to a distance of at least four feet on all sides of the box or to the undisturbed trench face if less than four feet. Before installing any valve, care shall be taken to see that all foreign material is removed from the interior of the barrel and the valve operated to see that all parts are in working condition. Valves shall be installed at 1,000 foot maximum spacing along the pipeline and at all intersections of streets and roads for controlling the flow in the pipe network.

If possible, valves and valve boxes shall be located outside the area of existing or proposed paved roads and streets. In off-street areas, they shall be set and adjusted so that the covers are exposed and flush with the finished grade. Where valves and valve boxes are or will be located within paved areas, they shall be set and adjusted so that the cover is exposed and flush with the finished surface. If the paved surfaces are renewed or replaced by the developer or owner after the related water system has been approved and accepted by the *Department* , but while such paved areas or streets are still the obligation of the developer or owner, the valve boxes therein shall be re-adjusted relative to the elevation of the finished surface.

No water main shall terminate under a concrete gutter, and, wherever possible to avoid, no valves shall be located under a concrete gutter.

C. **HYDRANTS.** In general, fire hydrants shall be a minimum of 4-1/2 inches in size and shall be located at street intersections and at the ends of long dead-end streets. The maximum distance between fire hydrants shall be 800 feet. Unless the location of hydrants is specifically indicated otherwise, they shall be located so that their center is not less than two nor more than six feet from the back of the curb or adjacent street.

The hydrant shall be set upon a slab of stone or concrete not less than four inches thick and fifteen inches square. Retainer glands shall be provided on all hydrant installations and shall be from tee to hydrant. Not less than seven cubic feet of crushed stone shall be placed around the base of the hydrant to insure proper drainage.

The pipe connecting the hydrant to the water main shall be a nominal size of 6 inches and equipped with a valve and valve box. Hydrants shall be set with the invert of the pumper connection 18 inches above finished grade, with the pumper connection facing the street. The connecting pipe will have the same depth of cover as the distributing mains. The backfill around hydrants shall be thoroughly compacted to the grade line.

3.5 **SURFACE WATER CROSSINGS.**

A. **ABOVE WATER CROSSING.** Where a water main crosses above surface water, the pipe shall be adequately supported, completely insulated to protect it against damage from freezing, accessible for repair or replacement, with adequate provision for expansion/contraction, and above the level of a 100 year flood and any floating debris it may carry.

B. **UNDER WATER CROSSING.**

1. The water main pipe shall be of special construction, having flexible watertight joints. The pipe material used shall be subject to the *Department* approval. In some instances, the owner or developer may be required to install the pipe in a concrete encasement as graphically indicated in the construction standards. *Directionally Drilled HDPE casing may be utilized underwater with prior approval from Isle of Wight Public Utilities.*

2. Valves shall be provided at both ends of the water crossing so that the section can be isolated for tests or repair. The valves shall be easily accessible and not subject to flooding.

3. Sample taps shall be available at each end of the crossing and at a reasonable distance from each side of the crossing. Permanent taps shall be made for testing and locating leaks.

3.6 **ROAD CROSSINGS.** Crossings under roads shall be installed in accordance with the details shown and with the requirements of the Virginia Department of Transportation. Crossings of railroads shall be installed in accordance with the requirements of the railroad company. Crossings shall be accomplished prior to construction of adjacent sections of the project.

Steel pipe casings shall be installed by either boring or jacking the casing beneath the roadbed of primary roads. The contractor should make every effort to insure successful completion of bored road crossings through the use of test holes, pilot drill holes, etc.

Casing pipe required for bored installations shall be uncoated steel with 3/8 inch (minimum) walls and 36,000 psi yield strength. Casing pipe sections shall be continuously welded at joints as the casing is advanced. Where open-cut crossings are permitted, casing pipe, if required, shall be reinforced concrete. Casing pipe for service connections shall be a minimum of Schedule 40 steel.

Directionally drilled HDPE or PVC casing may be utilized with prior approval from VDOT and Isle of Wight Public Utilities.

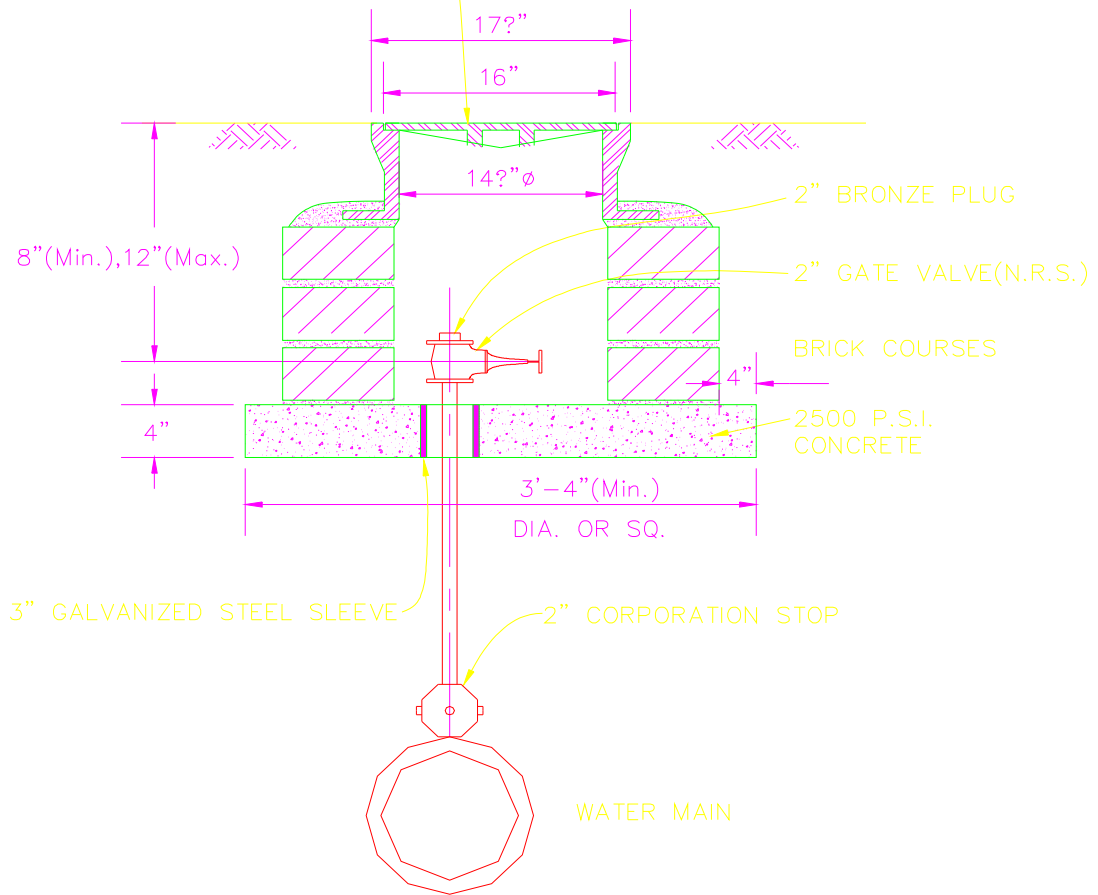
SECTION 4 CONSTRUCTION STANDARDS

4.1 **GENERAL REQUIREMENTS.** The following standards delineated by graphical details shall be applicable to the construction of all water facilities improvements within the County. Deviations from these standards shall require written approval from the Department.

4.2 **STANDARD DETAILS.**

- PLATE W I AIR RELEASE ASSEMBLY
- PLATE W II CONCRETE ENCASEMENT AND GRANULAR
 BEDDING AND BACKFILL MATERIAL
- PLATE W III BLOW-OFF ASSEMBLY TYPE I
- PLATE W IV LINE TERMINATION AND BLOW-OFF ASSEMBLY
- PLATE W V CASING SPACER AND BORED CROSSING
- PLATE W VI SPECIAL ROAD CROSSING
- PLATE W VII FIRE HYDRANT SETTING
- PLATE W VIII SERVICE CONNECTION AND METER BOX
- PLATE W IX THRUST BLOCKS
- PLATE W X VALVE BOX INSTALLATION AND VALVE
 SETTING
- PLATE W XI AUTOMATIC AIR RELEASE ASSEMBLY
- PLATE W XII DETECTOR CHECK VALVE AND VAULT

FRAME AND COVER
DEWEY BROTHERS MODEL B-1200

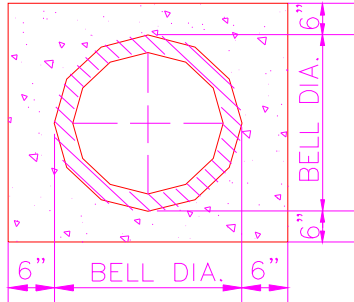


AIR RELEASE ASSEMBLY

NOT TO SCALE

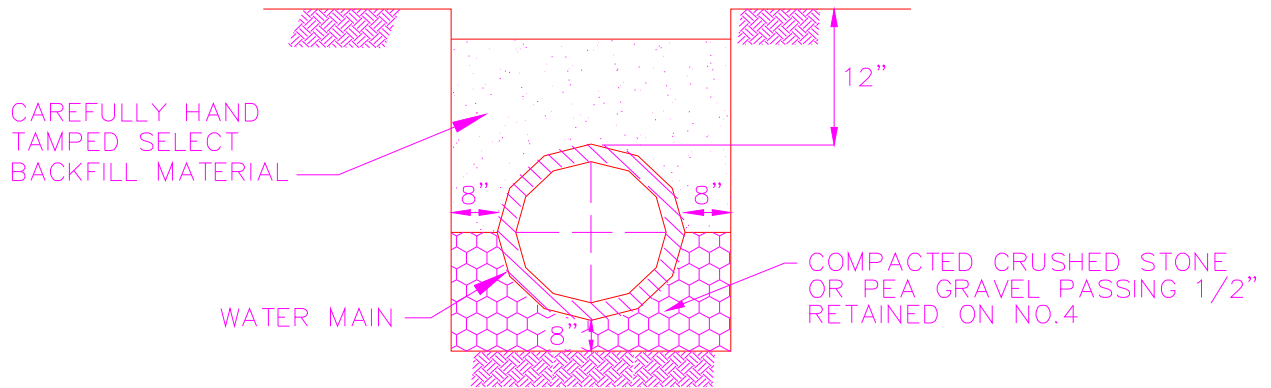
PLATE W1

NOTE
REINFORCING MAY BE REQUIRED
IN SOME LOCATIONS.



CONCRETE ENCASEMENT

USE ONLY WHEN AUTHORIZED BY THE DIRECTOR OF PUBLIC UTILITIES



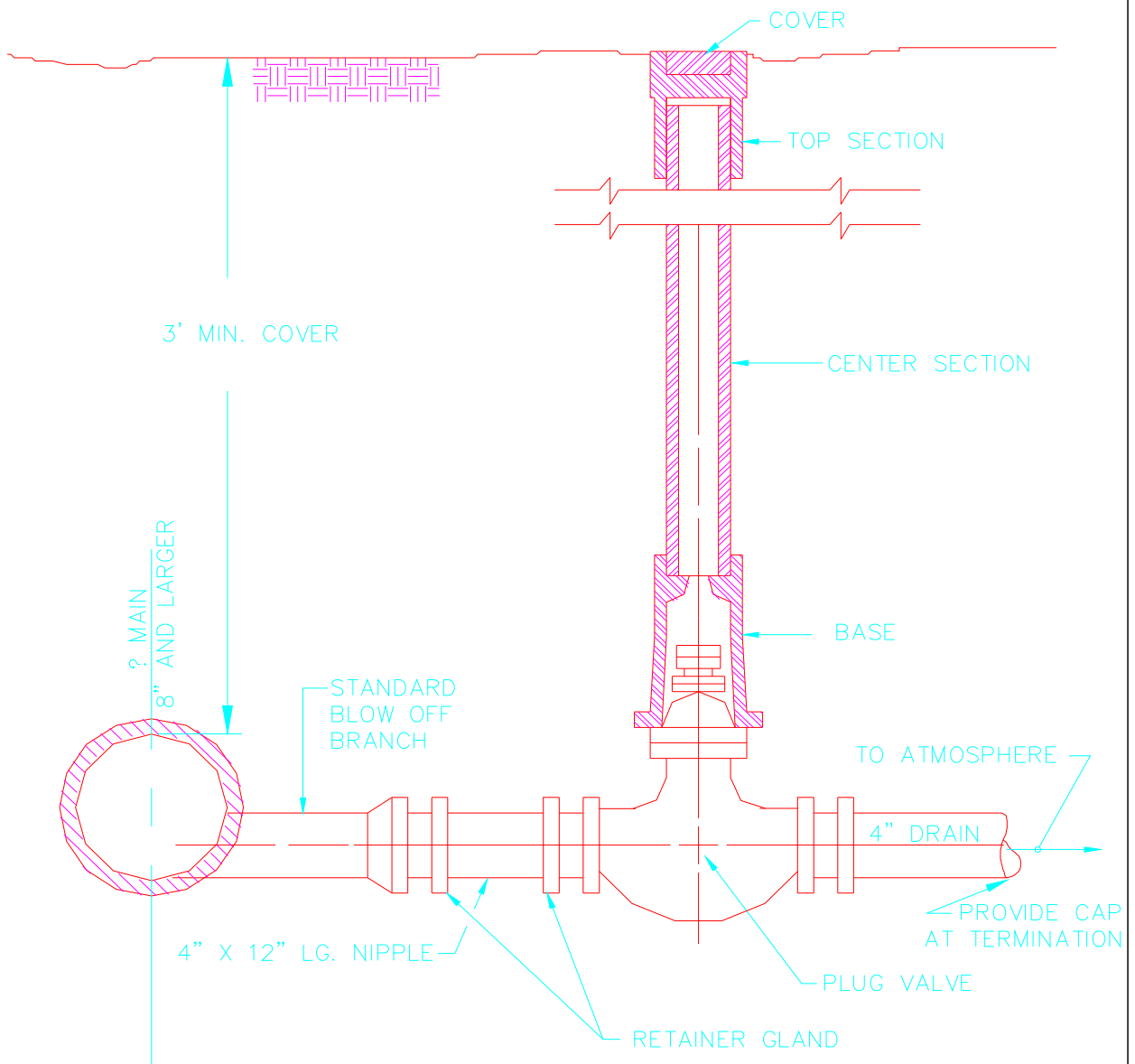
GRANULAR BEDDING AND BACKFILL MATERIAL

USE WHERE DIRECTED BY THE ENGINEER

DETAILS

NOT TO SCALE

PLATE W II

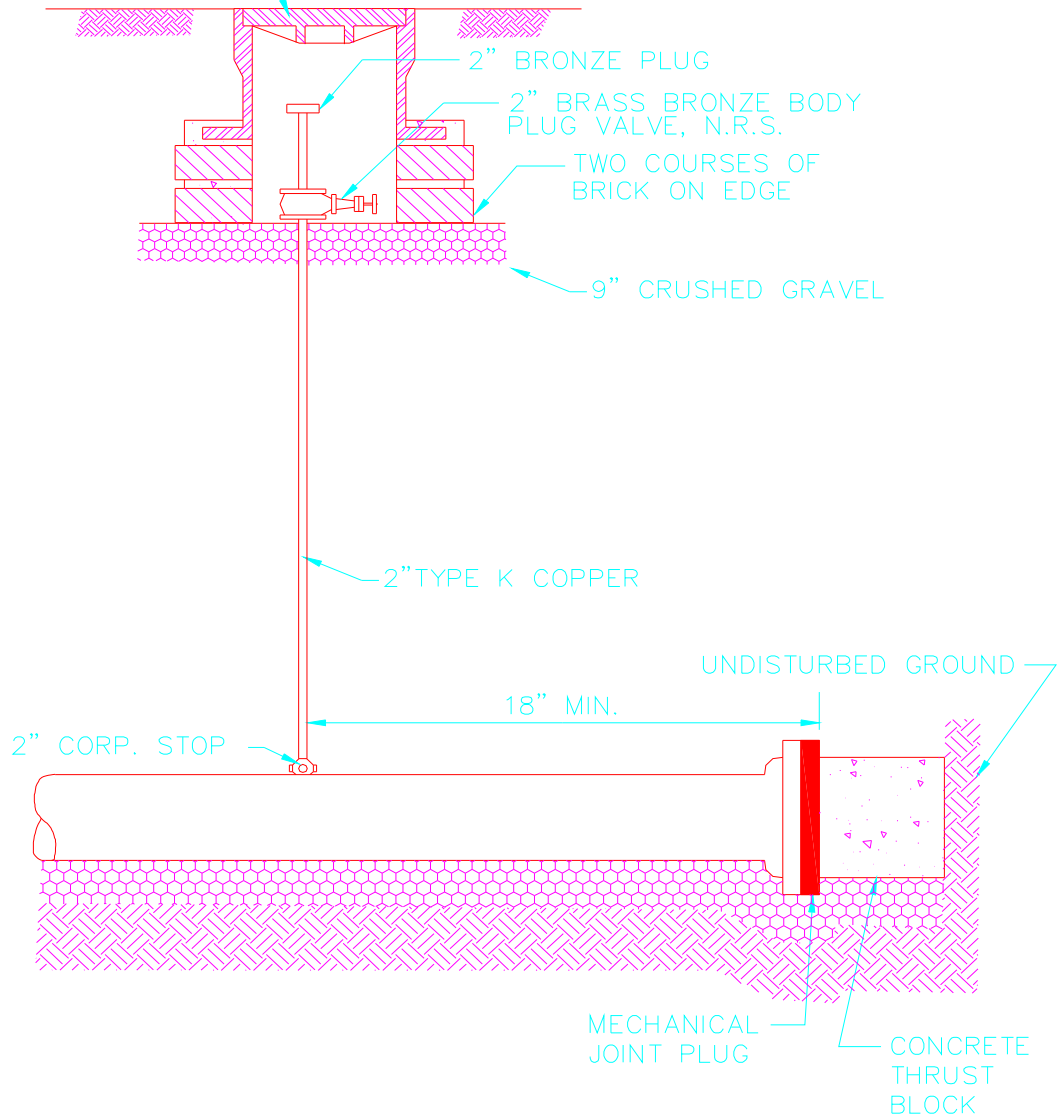


BLOW-OFF ASSEMBLY TYPE I

NOT TO SCALE

PLATE W III

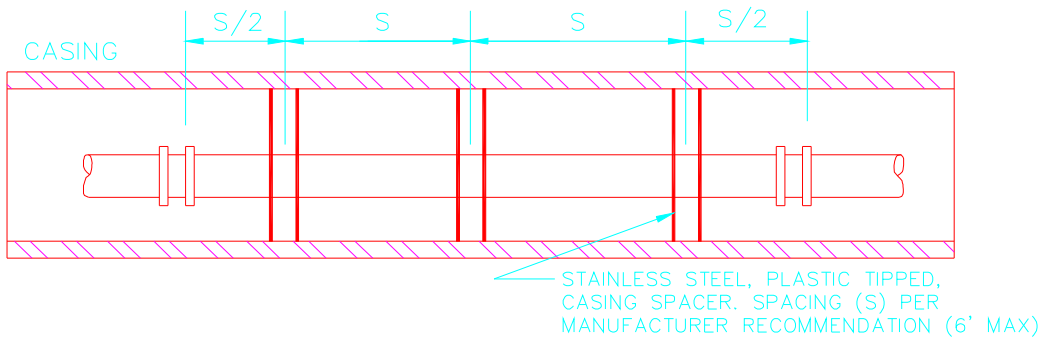
FRAME AND COVER
DEWEY BROTHERS
NO. B-1200 AND COVER TO
BE MARKED "W"



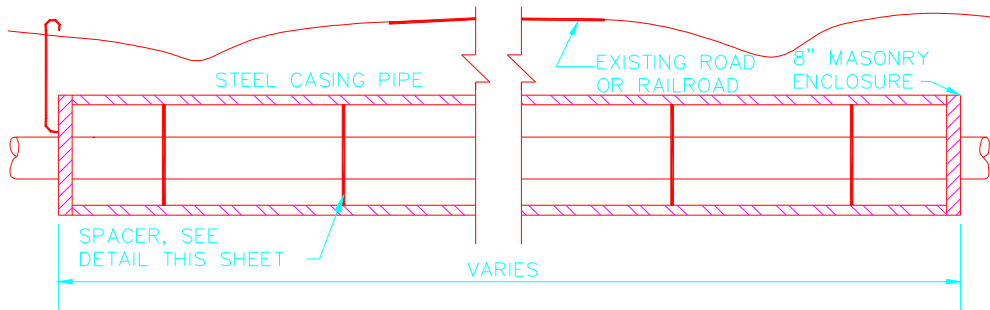
LINE TERMINATION AND BLOWOFF ASSEMBLY

NOT TO SCALE

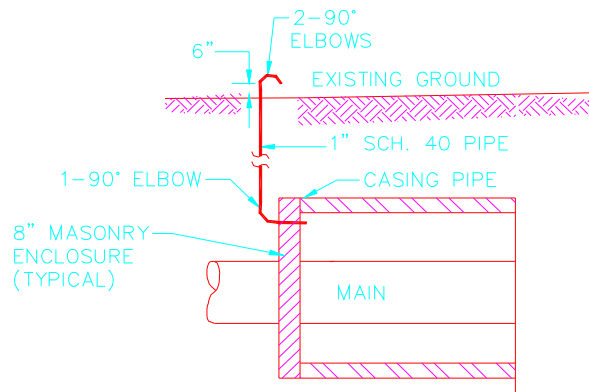
PLATE W IV



CASING SPACER



BORED CROSSING

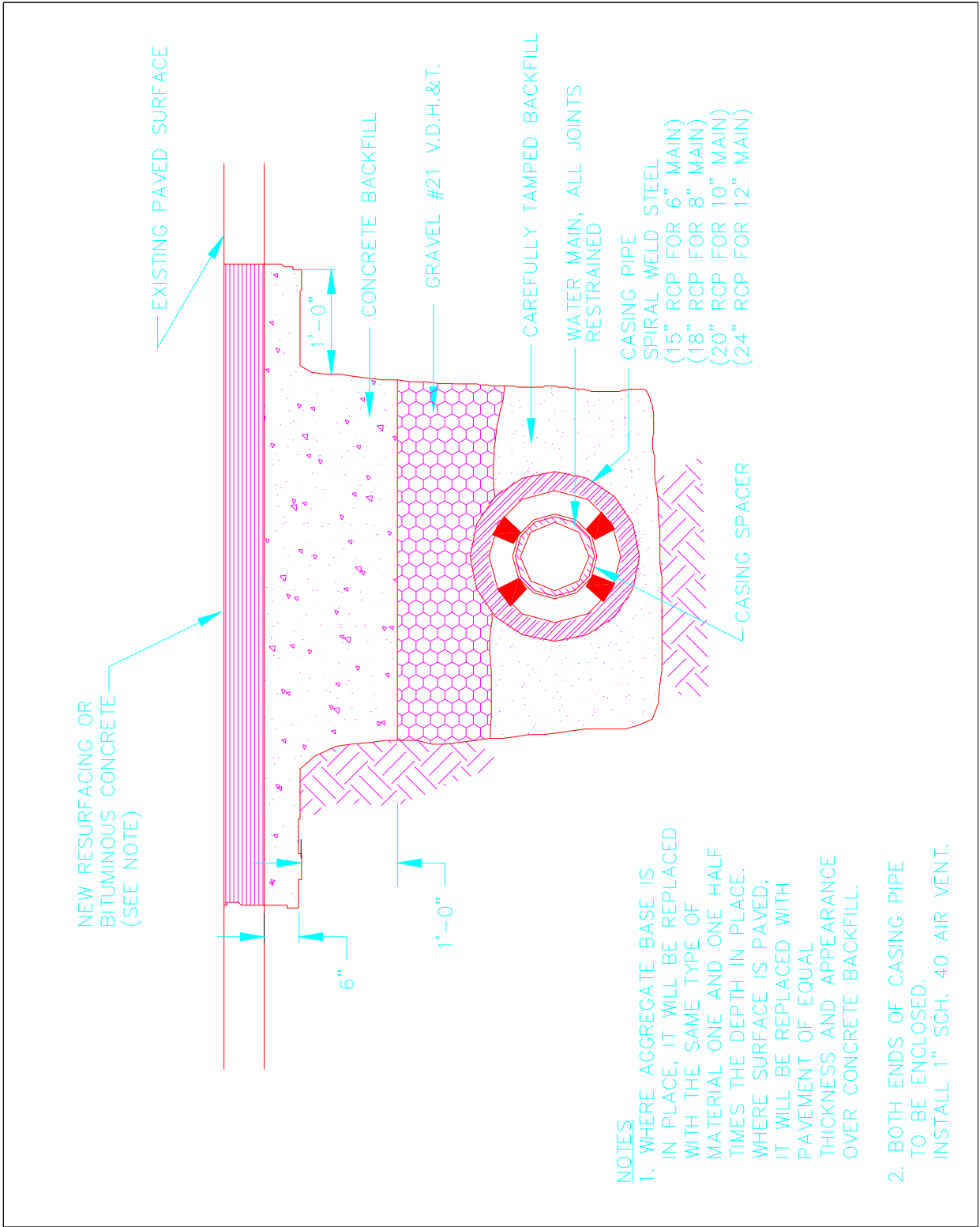


DETAIL A

DETAILS

NOT TO SCALE

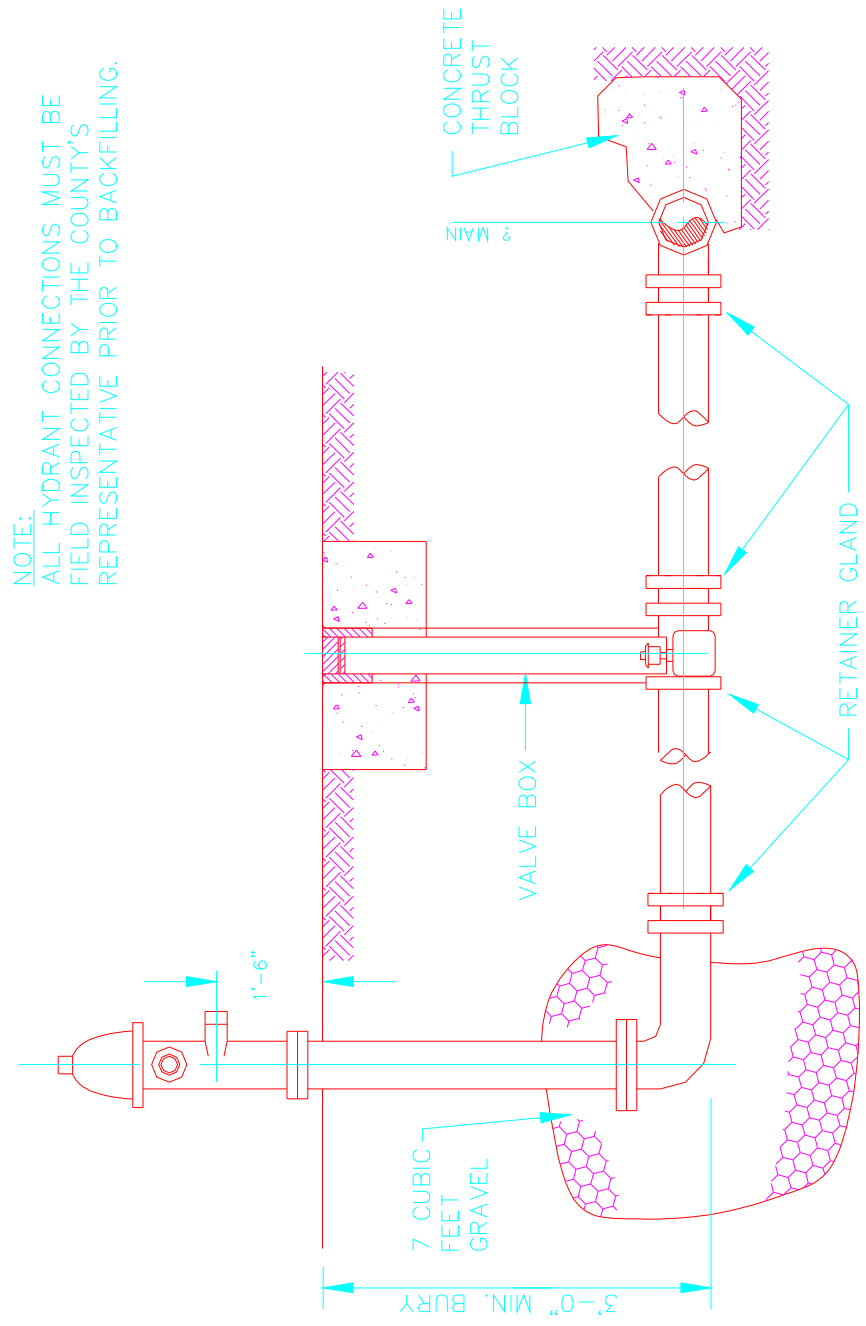
PLATE W V



SPECIAL ROAD CROSSING

NOT TO SCALE

PLATE W VI

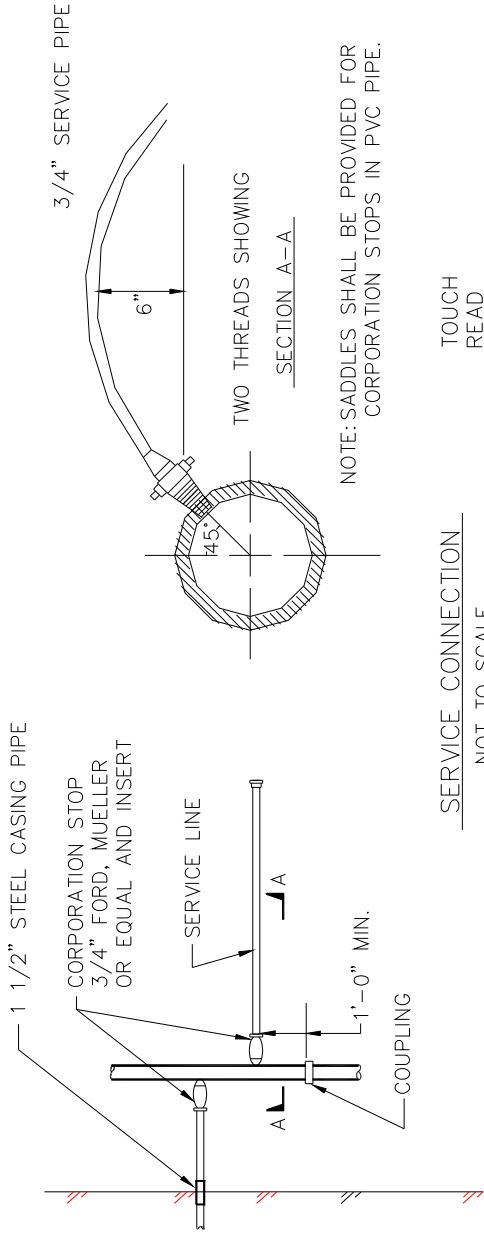


NOTE:
 ALL HYDRANT CONNECTIONS MUST BE
 FIELD INSPECTED BY THE COUNTY'S
 REPRESENTATIVE PRIOR TO BACKFILLING.

FIRE HYDRANT SETTING

NOT TO SCALE

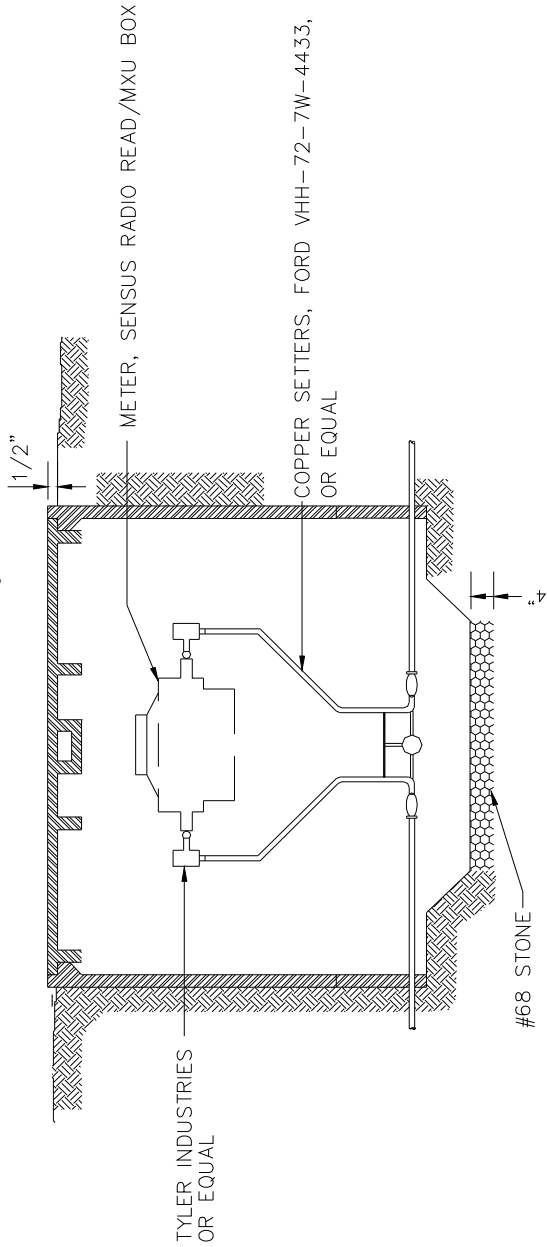
PLATE W VII



NOTE: SADDLES SHALL BE PROVIDED FOR CORPORATION STOPS IN PVC PIPE.

SERVICE CONNECTION
NOT TO SCALE

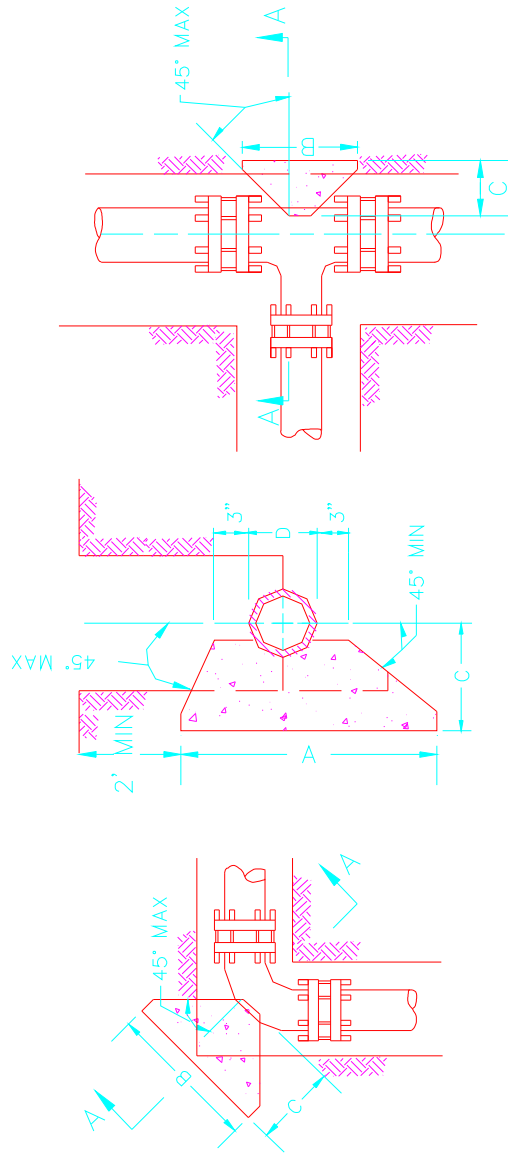
TOUCH
READ
COVERS



METER BOX
NOT TO SCALE

SERVICE CONNECTION

NOT TO SCALE



SECTION A - A

| PIPE SIZE | TEE OR DEAD END | | | 90° BEND | | | 45° BEND | | | 22 1/2° & 11 1/4° BENDS | | |
|-----------|-----------------|-------|-------|----------|-------|-------|----------|-------|-------|-------------------------|-------|-------|
| | A | B | C | A | B | C | A | B | C | A | B | C |
| 6" | 1'-6" | 2'-0" | 1'-6" | 2'-0" | 2'-0" | 2'-0" | 1'-0" | 2'-0" | 1'-0" | 1'-0" | 1'-0" | 1'-0" |
| 8" | 2'-0" | 2'-6" | 1'-6" | 2'-6" | 3'-0" | 2'-0" | 2'-0" | 2'-0" | 2'-0" | 1'-0" | 2'-0" | 1'-0" |
| 10" | 2'-0" | 4'-0" | 2'-0" | 3'-0" | 4'-0" | 2'-0" | 2'-0" | 3'-0" | 2'-0" | 1'-6" | 2'-0" | 1'-6" |
| 12" | 3'-0" | 4'-0" | 2'-0" | 3'-0" | 5'-0" | 2'-6" | 2'-6" | 3'-6" | 2'-0" | 2'-0" | 2'-6" | 1'-6" |

NOTE:
 VERTICAL BENDS WILL REQUIRE BLOCKS TO BE TIED TO FITTINGS
 USE ONLY WHEN AUTHORIZED BY DIRECTOR OF PUBLIC UTILITIES
 DIMENSIONS SHOWN ARE MINIMUM

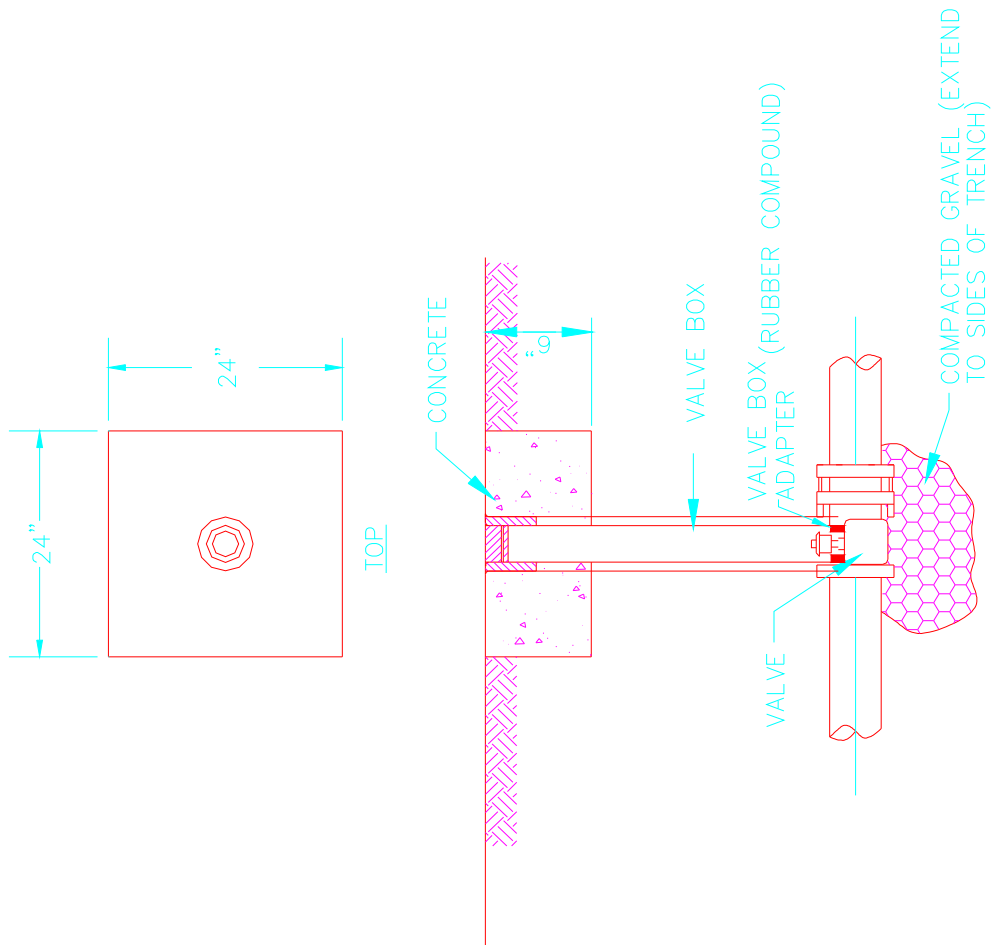
NOTE:
 CONCRETE SHALL NOT BE PLACED ON JOINTS, LIMITING FLEXIBILITY.

CONCRETE SHALL NOT ENGAGE M.J. PIPE FASTENINGS OR GLANDS AT JOINTS

THRUST BLOCKS

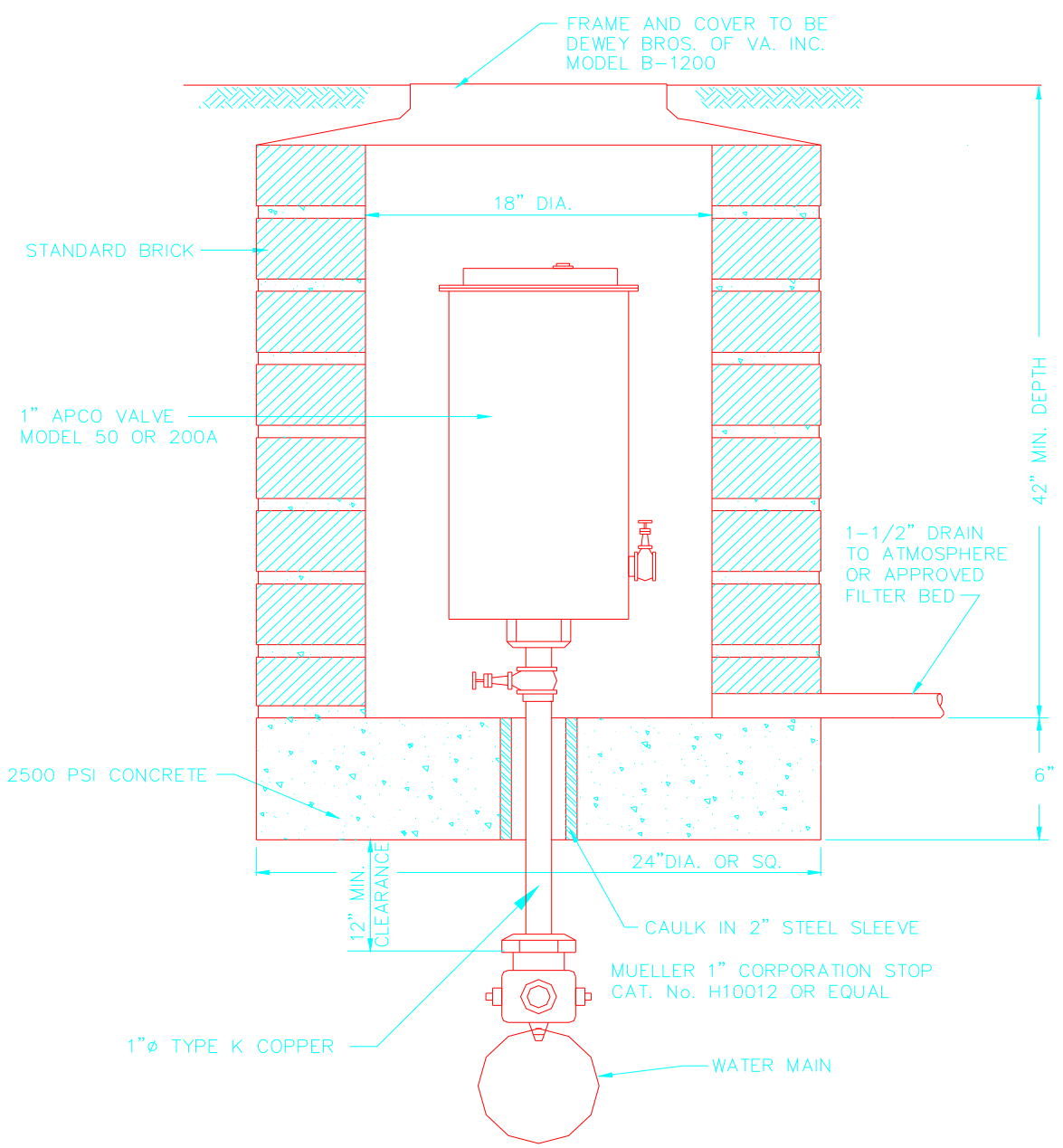
NOT TO SCALE

PLATE W IX



VALVE BOX INSTALLATION
AND VALVE SETTING

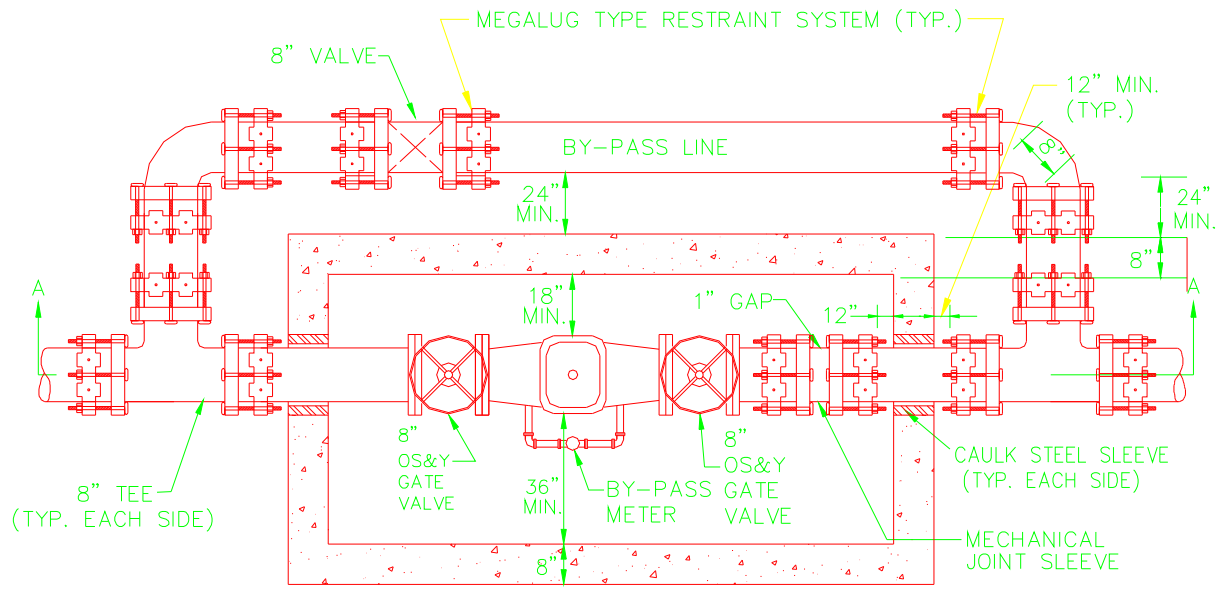
PLATE W X



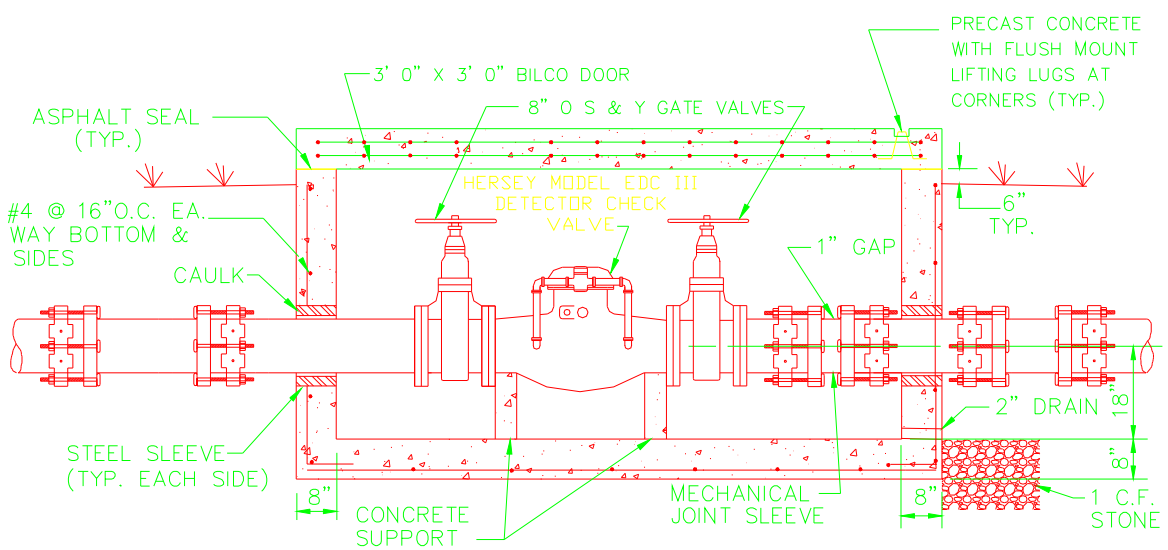
AUTOMATIC AIR RELEASE ASSEMBLY

NOT TO SCALE

PLATE W XI



PLAN VIEW – CHECK VALVE VAULT
NTS



NOTE: BY-PASS METER TO BE INVENSYS OR APPROVED EQUAL READING IN GALLONS.

SECTION A-A CHECK VALVE VAULT
NTS

PLATE W XII

DETECTOR CHECK VALVE AND VAULT
FOR FIRE PROTECTION SERVICE

SECTION 5 MATERIALS.

5.1 **GENERAL.** Pipe size, type, joint, and class shall be designated on the plans or specified elsewhere. Unless otherwise approved in writing by the *Department*, or as specifically indicated on plans approved by the *Department*, all pipe, fittings, and accessories shall be as delineated in this section.

5.2 **WATER MAIN SERVICE PIPE.**

A. **DUCTILE IRON PIPE.** Ductile iron pipe shall be centrifugally cast pipe manufactured in accordance with ANSI Specification A21.51. Ductile iron pipe shall be cement-mortar lined inside in accordance with ANSI Specification A21.4-90. Cement for the mortar shall be Type II Portland Cement, The standard seal coat of bituminous material shall be applied to the exterior and interior of the pipe. Ductile Iron Pipe shall be thickness Class 50 (minimum).

Joints for ductile iron pipe shall be one of the following:

1. Rubber Gasket (Push-On) Type Joint. Rubber gasket type joints shall be manufactured in accordance with ANSI Specification A21.11-90 and designed to lock against displacement without caulking. The gasket shall be a resilient rubber of heavy section, high durometer, and single molded and shall be installed in accordance with the pipe manufacturer's recommendations. The gasket lubricant shall be a non-toxic, tasteless, odorless grease that will not support bacteria. Each gasket lubricant container shall be labeled with the trade name and the pipe manufacturer's name.

2. Mechanical Joint. Standard mechanical joints shall be manufactured in accordance with ANSI Specification A21.11-90 (AWWA Specification C111-90). The mechanical joint bolts shall be a U.S. Standard size, high strength, corrosion resistant steel alloy with hexagon nuts.

Mechanical joints shall be used for the connection of all fittings, valves, and hydrants.

Fittings shall be manufactured of cast iron and shall be in accordance with the requirements of ANSI Specification A21.10-93 (AWWA Specification C110-93) or ANSI Specification A21.53-88 (AWWA Specification C153-88). Fittings shall be compatible with the pipe and shall provide at least equal resistance to internal and external loads on the pipe. Fittings shall be bituminous coated on the outside and cement mortar lined on the inside according to ANSI Specification A21.4-90 (AWWA Specification C104-90).

B. **AWWA POLYVINYL-CHLORIDE PIPE.** Pipe shall be manufactured in accordance with AWWA Specification C900-81 to cast iron pipe outside diameter dimensions and be approved by Underwriters Laboratories. Class 150 pipe shall meet the requirements of DR 18. Joints shall consist of an integral wall section with solid cross section rubber gasket conforming to ASTM Designation 0-1869. Pipe shall be clearly marked to show class, size, manufacturer's name and NSF-PW symbol. Fittings for polyvinyl-chloride pipe shall be mechanical joint cast iron.

PVC Water Mains shall have a plastic coated 10 gage copper tracer wire. Detectable tape identifying with the words "CAUTION: WATER LINE BURIED BELOW" shall be installed 6 to 12 inches above the pipe in the same trench for purposes of positive identification and location. The tape shall be Terra Tape D (Blue) as manufactured by Griffolyn Co., Inc. or approved equal.

C. **COPPER PIPE.** Copper pipe for service connections shall be Type K and shall be used with standard water works fittings.

5.3 **CORPORATION AND CURB STOPS.** At each service connection and where directed by the *Department*, corporation stops of sufficient size with straight couplings as manufactured by Mueller Company, Ford Meter Box Company, Inc., or approved equal, shall be furnished and installed. The corporation stop shall be tapped into the main at an approximate angle of 45 from vertical. The materials and installation of corporation stops shall comply with all the applicable AWWA Specifications. The corporation stops shall be as graphically indicated in the construction standards.

5.4 **VALVES AND VALVE BOXES.**

A. **BUTTERFLY VALVES.** Butterfly valves shall be cast iron, rubber seated, tight-closing type and shall be in accordance with AWWA Specification C504-94, Class 150B. The valves shall be suitable for buried service. All valve ends shall be mechanical joint conforming to ANSI Specification A21.11-90. (AWWA Specification C111-90). All valves above 12-inches shall be butterfly valves.

All valves shall use full Class 150B underground service operator torque rating throughout entire travel. Butterfly valves shall include travelling nut or worm gear operator with standard AWWA operating nut opening by turning left. The valve operator shall be sealed, gasketed, lubricated for underground service and completely suitable for its particular application.

B. **CHECK VALVES.** Check valves larger than 1-1/2 inches shall be the swing-check type, designated for 150 psi working pressure with a suitable opening for cleaning without disconnecting from the pipeline. The valve shall be all bronze or cast iron body with bronze or brass trim and a disc face of bronze or brass. Check valves 1-1/2 inches or smaller shall conform to AWWA Specification C506-69.

C. **GATE VALVES.** Gate valves two inches and smaller shall be inside screw, solid bronze, tapered seat, and double disc construction for 250 psi working pressure. The valves shall be suitable for the service required. Two-inch through 12-inch valves shall be Resilient Wedge Gate Valves meeting all requirements of AWWA Specification C509-94 and designed for bubble-tight closure at 200 psi working pressure, The valves shall be the non-rising stem type. Valves for buried service shall be mechanical joint with a standard AWWA operating nut opening by turning left, All valve requirements above 12-inches shall be butterfly valves as described in 5.4.A.

D. **VALVE BOXES.** Valve boxes shall be installed for all valves which are buried beneath finished grade elevation. Valve boxes shall be an adjustable cast iron enclosure with a flared base and of a suitable size for the applicable valve, The cover or head shall be round and shall have the word "WATER" cast upon it.

5.5 **AIR RELEASE VALVE AND BLOW-OFF ASSEMBLIES.**

A. **AIR RELEASE VALVE ASSEMBLIES.** Air release valve assemblies shall be installed at high points in the line or where required otherwise. Each assembly shall be one of the following types as directed by the *Department*.

1. Manual. Each assembly shall consist of an approved *two inch corporation stop*, a riser pipe of suitable length, a *two inch gate valve* in accordance with Plate W1 in Section 4.

2. Automatic. Each assembly shall consist of an approved one inch corporation stop, a riser pipe of suitable length, and a one inch air release valve equal to Valve and Primer Corporation, APCO Model No. 50 or 200A. A one inch ball valve shall be installed as shown in the construction standards to allow servicing of the air release valve.

The air release valve assembly enclosure or chamber shall have a cast iron frame and cover equal to Dewey Brothers of Virginia, Inc., Model B-1200.

B. **BLOW-OFF ASSEMBLIES**. Blow-off assemblies shall be installed at all pipe dead ends and low points in the line or where otherwise required. The blow-off assembly pipework and valving shall be appropriately sized and shall conform in all respects to the applicable portions of these construction specifications.

The blow-off assembly enclosure or chamber shall have a cast iron frame and cover equal to Dewey Brothers of Virginia, Inc., Model 8-1200. The two types of assembly enclosures shall be as graphically indicated in the construction standards. In no instance shall the drain or the outlet be connected to a sanitary sewer.

C. Neither the air release valve assembly nor the blow-off assembly shall be installed under pavement subject to vehicular traffic.

5.6 **HYDRANTS**.

A. Hydrant assemblies shall conform to AWWA Specification C502 for valves and traffic model hydrants shall be approved by the National Board of Fire Underwriters, and shall be equal to or better than the existing hydrants on the system. *Hydrant make shall be consistent throughout projects as to avoid mixed match types within an approved development area.*

B. The hydrants shall be dry barrel, non-flooding, traffic model, frost-proof and AWWA Compression type with waste orifices for draining the hydrant when the valve is closed. The hydrant shall be equipped with a barrel safety flange and a valve stem safety coupling so that neither the barrel nor the stem will break if struck by a vehicle or other object. The hydrants shall be designed for 150 psi working pressure and 300 psi test pressure. The main valve shall be removable from above ground.

C. Hydrants shall be preceded in line by an approved valve. The hydrants shall have a six inch mechanical joint inlet and main valve opening of 4-1/2 inches minimum. Hydrants shall be equipped with two 2-1/2 inch hose connections and one 4-1/2 inch pumper connection with National Standard threads. Hose nipples shall be bronze or non-corrosive metal and the nipple caps shall be securely chained to the barrel. The direction of opening shall be left and be cast on the head of the hydrant. The hydrant shall be painted with one coat of zinc chromate primer and two finishing coats of a paint and color approved by the Department.

5.7 **METERS, METER BOXES AND COPPERSETTERS**.

A. **METERS**. All services shall be metered for the indication of water consumption in gallons. Each register shall be completely encased, hermetically sealed, and of a

frost-protective design. Each meter shall have an arrow on it to indicate the direction of flow and shall have the manufacturer's serial number stamped on the register lid.

The meter shall be a *Sensus(Radio Read)* with MXU box or approved equal, and shall conform to AWWA Specification C700-90, and shall be sized as follows:

| | | | | | | | |
|-------------------------|-------------|----|--------|-----|-----|-----|------|
| Peak Rate of Flow (GPM) | 20 | 50 | 100 | 160 | 320 | 500 | 1000 |
| Size of Meter | 5/8" x 3/4" | 1" | 1-1/2" | 2" | 3" | 4" | 6" |

Unless otherwise instructed, the Owner shall furnish and install all water meters necessary to completely serve his development.

B. **METER BOXES.** Standard boxes of appropriate size, complete with covers as manufactured by Tyler Industries or approved equal shall be furnished and installed around all coppersettlers and meters. Boxes shall have a plastic body outside of paved areas and a cast-iron body in pavement. Covers shall have cast-iron reading lids.

C. **COPPERSETTLERS.** Coppersettlers shall be model *VHH-72-7W-4433* as manufactured by Ford Meter Box Company or approved equal. Coppersettlers shall have an inlet shut off valve and shall be installed with a stabilizing bar or rod.

5.8 **SERVICE CONNECTIONS**

A. **SERVICE PIPE.** Type K copper pipe or *polyethylene tubing* as manufactured by Silver - Line *ULTRA-PURE* and adapters shall be furnished and installed between the corporation stops and water meters at locations indicated on the plans and where directed. Service connections larger than one inch shall be of material approved and directed by the *Department*.

B. **SERVICE INSTALLATION.** One meter and meter box shall be installed on each service connection at the locations indicated and in accordance with all applicable plans and specifications. Where conditions warrant and as directed, the service connections shall be jacked by an approved method. Otherwise, service connections shall be open cut.

5.9 **SAMPLING STATION** – *Owner/ Developer shall provide sampling stations to Isle of Wight Public Utilities for installation. Number of sampling stations and type shall be determined by the Department.*

SECTION 6 **TESTS AND DISINFECTION.**

6.1 **TESTS.** The Owner shall notify the *Department*. at least 48 hours prior to the commencement of testing. Tests shall be made on all sections of pipe throughout the entire project and shall be conducted only in the presence of the County or its authorized agent. Tests shall be made after the corporation stops have been installed. Tests shall be made between adjacent valves.

Care shall be taken to insure that the entire test run of pipe is securely braced and blocked against thrust when pressure is applied. All thrust restraint must be completely set and approved. All pipe must be firmly supported and weighted down by partial backfill soil on top.

All water for testing purposes shall be potable water and procured and paid for by the Owner. Prior to testing, the pipe shall be filled slowly and carefully with water from the nearest practical source, or by other approved methods. Under normal atmospheric pressure the pipe shall be allowed to soak for a minimum period of 24 hours. All entrapped air shall be expelled. The owner shall provide all the apparatus or other accessories necessary to conduct the tests.

The completed piping shall be subjected to a hydrostatic pressure of 150 psig. This pressure shall be maintained for two hours. Leakage shall not exceed the amount given by Table 6 AWWA C600-93.

All pipe, joints, valves and fittings in the test section shall be examined. Defective material disclosed as a consequence of the tests shall be removed and replaced by sound material at the Owner's expense. Any joint showing visible leakage shall be made airtight. The test shall be repeated until its results are satisfactory to the *Department*.

Piping smaller than 3" shall be tested to 1 ½ times the system operational pressure or a minimum 100 psi for 2hours.

6.2 **DISINFECTION.** During the course of the work, all reasonable precautions shall be taken to protect the pipe interiors, fittings and valves against contamination. When pipe laying is not in progress all openings in the pipe line shall be closed by watertight plugs.

The water main shall be closed and flushed prior to disinfection with a sufficient flow to produce a flushing velocity of at least 2.5 feet per second. Finished water shall be flushed through the system until no traces of foreign matter are visible. This water shall be discharged or wasted only at points specifically designated by the *Department*.

The new pipe line shall be disinfected by chlorination in accordance with AWWA Specification C651-92. The disinfection agent of the chlorine solution shall be sodium hypochlorite solution, Grade D, conforming to Federal Specification 0-S-602b, dry hypochlorite equal to "HTH" as manufactured by Olin Chemical Co., or liquid chlorine. Liquid chlorine shall be used only when suitable equipment is available and only under the direct supervision of a properly trained and equipped specialist approved by the Department.

The chlorine solution at any point in the line, shall have a minimum concentration of 50 parts per million (ppm) or 50 milligrams per liter (mg/l) and shall be applied to the system at a constant, measured rate by pumping in accordance with the continuous feed method, AWWA Specification C651-92, Sub-section 5.2. Finished water from an approved source

shall be made to flow at a constant, measured rate into the new pipeline. The two rates shall be properly proportioned so that the chlorine concentration in the pipeline is maintained at a minimum of 50 ppm available chlorine. To insure that this concentration is maintained, the chlorine residual shall be measured at regular intervals in accordance with procedures described in the current edition of Standard Methods and AWWA Specification M12.

Chlorine application shall not cease until the entire main is completely filled with solution. The chlorinated water shall be retained in the system for at least 24 hours, during which time all valves and hydrants shall be operated in order to disinfect the appurtenances. At the end of the 24 hour period, the pipeline water shall contain not less than 25 parts per million chlorine throughout the entire pipeline. After the specified retention period, the chlorinated water shall be flushed from the main until the residual chlorine concentration is no higher than that prevailing in the existing system or less than .20 parts per million.

Before the water main is placed in service, not less than two consecutive, negative samples taken 24 hours apart, from each 2,000 feet of new line are required. No hose or fire hydrant shall be used in the collection of samples. The samples shall be forwarded to a qualified laboratory currently certified by the Virginia Department of General Services for bacterial examination. If this examination indicates the presence of coliform organisms, the entire disinfection process shall be repeated or continued until the examination indicates the absence of such pollution. Standard plate counts may be required on retest.

Pipe, taps and fittings used at connections to the existing system shall be thoroughly disinfected before installation. Excavation for such connections shall be kept free from water until the connection is completed, and extreme care shall be exercised to prevent contamination of the pipe and connection fittings. The inside of the existing pipe within 3 feet of the point of connection shall be disinfected by spraying with a solution containing not less than 200 ppm of chlorine immediately before connection is made. If at any time the water in the existing piping becomes contaminated, this piping shall be disinfected as specified for new piping, back to the nearest gate valve or valves, or beyond those points as necessary to include all contaminated piping.

The complete disinfection process and methods followed, especially if materially different from those specified, shall be in accordance with the directives of the Virginia Department of Health, and all methods employed shall meet with this approval. Final approval of the bacterial examination shall be received from the *Virginia Department of Health* prior to placing the new pipeline into operation.

SECTION 7 WELLS

7.1 **GENERAL REQUIREMENTS.** Where wells are required as a source of water supply, such shall be of sufficient size and capacity as determined by the State Health Department and the County and shall be developed in accordance with the *Virginia Department of Health Waterworks and Virginia Department of Environmental Quality Regulations*. Aside from the normal controls and appurtenances, provisions shall be provided for an alarm system, stand by power connection and a *minimum 20 KW portable trailer mounted generator for emergency operations*. The well building shall include a wooden roof, shingles, brick, mortar, trim, landscaping, etc., as directed by the *Department*.

7.2 **TESTING.** Upon completion of the well the Owner shall conduct tests of the well in accordance with the following specifications.

A. The Owner shall furnish and install a temporary vertical turbine type test pump having a capacity of at least 300 gpm and equipment, approved by the *Department*, for measuring the rate of flow and the water level in the well, After measuring the static water level in the well, tests shall begin at a rate of 30 gpm and the drawdown determined at fifteen (15) minute intervals until the level becomes stabilized. Pumping shall then be continued at the same rate for one (1) hour and the water level determined at fifteen (15) minute intervals. The rate of pumping shall then be increased to 40 gpm and the procedure above repeated, followed by similar tests at rates increased in increments of 10 gpm until the full capacity and/or yield of the well is determined.

B. After the above test has been completed and the safe maximum yield of the well determined by the Owner and approved by the *Department*, a continuous 48 hour test shall be run and the drawdown recorded at hourly intervals to confirm that the safe maximum yield as determined above can be produced continuously.

C. Water levels and rates of pumping shall be determined and recorded at all tests and the Owner shall submit, after testing has been completed, a characteristics curve in triplicate showing the drawdown level in feet for various rates of pumping in gpm.

D. During the final hours of the continuous 48- hour yield and drawdown test, the Owner shall secure samples of water in suitable containers and of quantity stated in the Virginia Department of Health Waterworks Regulations and have both bacteriological and chemical analyses performed by a qualified laboratory currently certified by the Department of Health. The results of the analyses shall be submitted to the *Department*. The standard Water Well Completion Report shall be submitted to the *Department* with all information completed.

7.3 **ALARM SYSTEMS.** A transmitter which will signal failure of critical functions in wells will be required at each well installed in the County. The alarm transmitter shall be Motorola MOSCAD Remote Terminal Unit (RTU), Model F6974 with a V115 16DI input module, operating on a frequency of 453.175. The RTU shall be equipped with a 20 watt UHF transmitter, receiver, all logic circuits and required relays, input AC power failure alarm, nominal 15"x15"x8" NEMA-4 housing, 115/230 volt AC power supply, rechargeable battery backup operation with charger, tamper alarm V224 on RTU housing, FIN8573 lock and key assembly for housing door, Beldin 9913 or equal coax with connectors and a YA2-450PL gain Yagi antenna.

The functions to be monitored by this alarm are as follows:

1. Commercial Power Fail
2. Pump 1

- 3. Pump2
- 5. Well Mode
- 6. Pump 1 Auto
- 8. Communication
- 10. Module Fail
- 12. System Pressure

- 4. Well Pump
- 5. Tank Mode
- 7. Pump 2 Auto
- 9. RTU AC
- 11. Station Door
- 13. System Flow (Gallons)

or as directed by the Department.

A 15A dedicated circuit shall be provided for each RTU. Outdoor installations shall be hardwired to the RTU. Indoor installations shall have a 115 Vac 60 Hz duplex receptacle mounted adjacent to the housing.

The battery backup system shall be provided with an automatic switchover feature for the alarm system so that a failure of primary power source will not disable the system.

Contractor shall provide a one year maintenance contract with an authorized service center.

Alarms shall be transmitted to the central receiver located at Isle of Wight Court House, Isle of Wight, Virginia.

7.4 **STARTUP AND DEMONSTRATION.** The Owner shall:

- A. Insure that all work has been satisfactorily completed before startup of any unit or system.
- B. Insure systems are tested hydraulically, mechanically and electrically. Insure systems which require calibration, etc. are fully operational in strict accordance with the project specifications.
- C. Schedule startup a minimum of 14 days in advance with written notice to the *Department*, Subcontractors and regulatory agencies if applicable.
- D. Provide all supervision, labor, equipment, vehicles, utilities and any other items required to startup, operate and demonstrate the facility.
- E. Startup, operate and demonstrate specified performance of each item of equipment to the complete satisfaction of the *Department*, if applicable.
- F. During startup, with equipment in operation, have manufacturer's representative instruct *Department*'s designated personnel in operation and maintenance of each system in detail.
- G. Have manufacturer's representative certify, in writing, as to the correctness and completeness of the facility, its installation and the startup and demonstration.
- H. Immediately correct any deficiencies observed and noted during the demonstration period and satisfactorily redemonstrate the system or systems involved.
- I. After successful completion of startup and demonstration, and

correction of all deficiencies, the Owner will be responsible for the shutdown and protection of the facility until final acceptance of the total project by the *Department*.

7.5 **OPERATION AND MAINTENANCE MANUALS**

A. Owner shall provide three complete copies of operation and maintenance manuals for the facility and all appurtenances thereto. Manuals shall be delivered to the *Department* for review and approval prior to final acceptance of the entire project.

B. Manuals shall be printed on 8-1/2 inch x 11 inch size heavy, first quality bond paper with standard three hole punching and bound in steel metal hinged binders, three post style bearing suitable identification including Contractor's name, project location, project number and date of installation. Reduced drawings or diagrams shall be bound in manuals to a 8-1/2 inch x 11 inch or 11 inch x 17 inch size. Where reduction is not practicable, fold larger drawings separately and place in envelopes which are bound into manuals. Identify contents on outside of each envelope. All reproductions and reductions shall be clear and completely legible.

C. Information indicated in the manuals shall include, but not be limited to, the following detailed information for each type of equipment:

- (1) Manufacturer's name, model designation and serial number.
- (2) Equipment function, normal operating characteristics and limiting conditions.
- (3) Test data and performance curves, where applicable.
- (4) Assembly, installation, alignment, adjustment and checking instructions.
- (5) Operating instructions for startup, routine and normal operation, regulation and control, shutdown and emergency conditions.
- (6) Lubrication and maintenance instructions and recommended schedule or frequency of service. Include special requirements for oil, lubricants, etc.
- (7) Guide to "troubleshooting" equipment.
- (8) Complete and comprehensive parts lists with names and addresses of sources for same.
- (9) Electrical diagrams, including elementary diagrams, wiring diagrams, connection diagrams and interconnection diagrams where applicable.

D. Final acceptance shall not be made until operation and maintenance manuals have been submitted as specified and accepted by the *Department*.

**PART III
CONSTRUCTION SPECIFICATIONS
AND STANDARDS FOR
SANITARY SEWERAGE FACILITIES**

SECTION 8 GENERAL REQUIREMENTS.

8.1 **GENERAL.**

All installations shall be in strict accordance with the Building Officials Code Administrators (BOCA) codes, the Virginia Department of Health and State Water Control Board, Sewerage Regulations, and Isle of Wight County Department of Public Utilities, Construction Specifications and Standards, as amended.

A. No deviation from the construction specifications and standards approved by the Department shall be allowed, unless specifically authorized in writing by the *Department*.

B. Sewers shall be designed and constructed to achieve total containment. Sewers shall be designed for the estimated ultimate tributary population with an upper limit consisting of the 50-year population growth projection, except when considering parts of the line that can be readily increased in capacity.

C. Sewers shall remain fully operational during 25-year flood/wave action. Sewers and their appurtenances located along streams shall be protected against the normal range of high and low water conditions, including the 100-year flood/wave action.

D. Although constructed as parcels or sub-systems, all sewers and related facilities of all proposed developers shall be approved on the basis of their functional integration with the Department's sanitary sewer Master Plan.

E. In cases where owners are required to extend sewer service, the owners shall extend the collection main longitudinal to the appropriate property line and to within five (5) feet of the furthest extremity of such property.

8.2 **MINIMUM SIZES, SLOPES AND VELOCITY.**

A. **SIZES.** The minimum size of gravity sewers shall be eight inches interior diameter, except for service laterals which shall be four inches interior diameter.

The minimum size of sewer force mains shall be four inches interior diameter, except for grinder pumps.

B. **SLOPES AND VELOCITIES.** All gravity sewers shall be designed and constructed with uniform slope between manholes and to give mean velocities when flowing full, of not less than two feet per second, based on Manning's Formula using a "n" value of 0.013. The following are the minimum slopes which shall be provided, however, slopes greater than these are desirable:

| | | | | | | | | | | | | |
|-----------------------------|------|------|------|------|------|------|------|------|------|-------|-------|-------|
| Minimum Size (Inches) | 8 | 10 | 12 | 14 | 15 | 16 | 18 | 21 | 24 | 27 | 30 | 36 |
| Minimum Slope (Ft./100 Ft.) | 0.40 | 0.28 | 0.22 | 0.17 | 0.15 | 0.14 | 0.12 | 0.10 | 0.08 | 0.067 | 0.058 | 0.046 |

For force mains at pumping capacity, a minimum self-scouring velocity of two feet per second shall be maintained, unless otherwise approved in writing by the *Department*. A velocity of eight feet per second shall not be exceeded.

Gravity sewers and force mains on 20 percent slope or greater shall be anchored securely with concrete anchors or approved equal. Minimum anchorage shall be as follows: (a) not over 36 feet center to center on grades from 20 percent to 35 percent; (b) not over 24 feet center to center on grades from 35 percent to 50 percent; and, (c) not over 16 feet center to center on grades exceeding 50 percent.

8.3 **MINIMUM AND MAXIMUM COVER.** All gravity sewers and force mains shall be provided with a minimum cover of not less than thirty-six inches of earth cover, measured from established finished grades to the top of the pipe.

Any sewer having less than three feet or more than 12 feet of cover from finished grade to top of pipe shall be ductile iron, minimum thickness Class 50.

Maximum cover shall not exceed that recommended by the pipe manufacturer for the specific installation requirements.

8.4 **MANHOLE AND CLEANOUT LOCATIONS.** A manhole shall be constructed at every change in alignment, grade, or pipe size. The maximum distance between manholes shall be 400 feet for sewers 15 inches or less and 500 feet for sewers 18 inches to 30 inches. No house connection shall be made into any manhole. A cleanout shall be constructed at the end of every lateral, except when said lateral exceeds 150 feet in length in which case a manhole shall be constructed. All sewer lines 8 inches or larger shall terminate with a manhole.

8.5 **LOCATION OF SEWER LINES.** As a general rule, sewer lines shall be placed in the street right-of-way. Sewer lines may be constructed on private property if it is the only feasible way to serve isolated properties, low lots, or to make necessary connection to another sewer. In this case, a utility easement of not less than fifteen (15) feet shall be provided for all lines on private property.

Separation of sewers from water line shall adhere to the conditions of Part II Section 2.5. of these construction standards with the additional provision that no sewer may be located within 50 feet of a drinking water well Class I and II. Where wells of a lesser class are encountered in addition to the required 50 foot separation any sewer line installed between 50 and 100 feet of the well shall be constructed of AWWA-approved water pipe and no manholes can be located within 100 feet of these wells.

SECTION 9 CONSTRUCTION SPECIFICATIONS.

9.1 **GENERAL PROCEDURES.** Construction of all sanitary sewers and appurtenances shall be in accordance with these specifications and standards, unless specific deviation therefrom is authorized, in writing by the *Department*. Construction shall also conform to the plans and specification data submitted by the owner or developer and approved by the Department. The Department shall insist that good workmanship and standard sewer construction principles apply in the work so that the finished project may qualify for final inspection and acceptance into the overall sewerage system.

Prior to the construction of any sanitary sewer, the owner or developer shall submit to the Department for review and approval four sets of all necessary construction data. All pipe shall be installed in accordance with the manufacturer's recommendations as approved by the Department. No pipe shall be laid in water, or when, in the opinion of the *Department*, trench conditions are unsuitable.

If any deviation is contemplated in location, line, or grade of any sewer, masonry structure, or accessory from that shown on the plans approved by the *Department*, details of the proposed deviation shall be submitted to the *Department* for review and approval before the changes are constructed.

9.2 **INSTALLATION.**

A. **EXCAVATION.** Excavation of whatever substance may be encountered shall be performed to the dimensions and depths specified or shown on the Applicant's approved drawings. Ledge rock, boulders, and large stones shall be removed to provide a clearance at least six inches below and on each side of all pipe and fittings for pipes 24 inches in diameter or less, and twelve inches for pipe larger than 24 inches in diameter. The specified minimum clearances are the minimum clear distances which will be permitted between any part, projection, or joint of such rock, boulder, or stone.

In the event that unstable material is encountered at or below the excavation depth, the Department shall be notified. Such materials shall be removed and replaced with suitable materials which shall be furnished as an ordinary and integral part of excavation and backfill. If excavation of any nature has been made deeper than necessary, then a layer of suitable backfill shall be placed to insure a firm foundation for the pipe.

Excavated material shall not interfere with public travel. Rock or other materials undesirable for backfill shall be removed from the construction site and properly disposed of by the owner or developer.

B. **TRENCHING.** The trench shall be dug so that the pipe can be laid to the alignment and depth required and it shall be excavated not more than 200 feet in advance of the complete pipe laying operation. The width of the trench shall be ample to permit the pipe to be laid and jointed properly and the backfill to be placed and thoroughly compacted in accordance with the plans and specifications. Trenches shall be of such extra widths when required as will permit the convenient placing of timber supports, sheeting and bracing, and handling of special fittings. Bell holes shall be provided at each joint to permit proper joint construction and inspection. In no case shall the pipe bells be used to support the body of the pipe.

C. **DRAINAGE.** Grading shall be controlled in the vicinity of excavations so that the surface of the ground will be properly sloped to prevent water from running into trenches or other excavated areas. Any water which accumulates in the excavations shall be removed promptly in such manner as to not create a nuisance to adjacent property or public thoroughfare. Trenches shall be kept dry while pipe is being laid.

D. **BACKFILL.** Clean earth, sand, crushed stone, or other material approved by the Department shall be used for backfill. Material suitable for backfill shall be stockpiled near the construction site. Backfill material shall be selected, deposited, and compacted to eliminate the possibility of lateral displacement of the pipe. Backfill material shall be solidly hand tamped around the pipe in 6 inch layers up to a level at least one foot above the top of the pipe. Backfilling shall be carried out simultaneously on both sides of the pipe.

The remainder of the backfill shall be deposited and compacted by mechanical tampers except in areas where paving is to be placed over the backfilled trench. In these areas the backfill shall consist of mechanically compacted materials as directed by the Department. Compaction shall achieve a density of at least 95 percent of the maximum density as determined by the American Association-of State Highways and Transportation Officials (A.A.S.H.T.O.) Method T-180.

E. **PIPE INSTALLATION.** Pipe and fittings for underground piping shall be strung out along the route of construction. The pipe shall be placed to avoid interference with traffic and the trenching operation. The pipe shall be handled by mechanical equipment.

Adequate support shall be provided for all pipes. A continuous and uniform bedding shall be provided in the trench for all buried pipe so that the pipe barrel bears on and is supported on undisturbed ground at every point between bell holes. Trenching below the specified grade shall be backfilled with approved material and thoroughly compacted. The finished subgrade shall be prepared accurately by means of hand tools. Where excavation is made in rock or boulders the subgrade shall be made by backfilling with stone or clean selected soil which shall be thoroughly compacted. Only Class A, B or C bedding as specified in WPCF Manual of Practice No. 9 shall be permitted.

When installing pipe in the trench, proper implements, tools, and facilities satisfactory to the Department and as recommended by the material manufacturer shall be provided and used by the contractor for the safe and convenient prosecution of the work. All pipe, fittings, and accessories shall be carefully lowered into the trench piece by piece by means of a derrick, ropes, slings or other suitable tools or equipment in such a manner as to prevent damage to the materials and any protective coatings and linings. Under no circumstances shall such materials be dropped or dumped into the trench.

The method of pipe laying and jointing shall be in accordance with the manufacturer's recommendations and shall be approved by the *Department*. Damaged or unsound pipe or fittings shall not be accepted. Gravity sewers 24 inches or less shall be constructed with straight alignment between manholes.

Rubber gasket, "O" ring type, joints shall be laid true to line and grade and shall be jointed together such that the completed pipe will have a smooth invert. After placing a length of pipe in the trench, the spigot end shall be centered in the open bell of the pipe previously laid and the pipe pushed home with a bar. THE USE OF LIFTING AND HYDRAULIC EQUIPMENT TO MAKE PIPE JOINTS SHALL BE SPECIFICALLY PROHIBITED. The trench pipe interface shall

be shaped to the curvature of both the bell and barrel of the pipe. The trench shall be kept free of water while the work is in progress. The ends of the pipe shall be brushed clean so that proper joints can be made. As the work progresses the interior of the pipe shall be kept clean of dirt, cement, or other superfluous material. The exposed end of all pipe shall be fully closed to prevent earth, water, or other substances from entering the pipe at all times. Should dirt or other materials enter the previously installed pipe, the pipe shall be immediately cleaned with care taken to preserve any coatings. Gravity sewer pipe shall be laid on standard bedding in accordance with the standard details. Where mechanical joints are specified for ductile or cast iron pipe and fittings, the joint shall be thoroughly coated with lubricant, the gasket and gland properly positioned, bolts inserted and diametrically opposite bolts drawn up until all bolts are tight. All bolts shall be tightened with a torque wrench set in accordance with AWWA C600.

Pipe cutting shall be accomplished with a mechanical cutter or a saw in a manner that will not damage the pipe. Ends of cut pipe shall be beveled to prevent damage to gaskets, fittings, etc.

All bends, tees, plugs and dead ends of pipe for force mains or gravity sewers shall be substantially braced or blocked in the direction of the flow and/or anchored to prevent any movement by providing adequate thrust restraint, in accordance with Section 3 of these Specifications.

Materials for roadways, alleys, or driveways shall be compacted to at least 95 percent of the maximum density as determined by A.A.S.H.T.O. Method T-180.

The site restoration of the entire construction area shall be finished in a neat and uniform condition acceptable to the Department.

9.3 **MANHOLES, CLEANOUTS AND ACCESSORIES.**

A. **MANHOLES.**

1. **General.** Prior to the construction of any sanitary sewer, the owner or developer shall place adequate line and grade stakes and shall also set stakes and furnish grades so that all manhole tops can be set to finish grade, all in accordance with the approved plans.

All manholes shall have an extended concrete base slab constructed of Class A4 reinforced concrete with a minimum compressive strength of 4000 psi at 28 days and shall be in accordance with Section 11 of these specifications. The base slab shall be a minimum of 12 inches thick. The manhole shall have a minimum wall thickness of five inches.

Invert channels shall be constructed in all manholes. Invert channels shall be smooth and semicircular and shall conform to the inside of the adjacent sewer section. Changes in channel size shall be gradual. The floor of the manhole outside the invert shall be smooth and shall slope toward the channel at one to two inches per foot.

Manholes that receive a force main shall do so with the force main centerline horizontal and with an invert elevation which will ensure a smooth flow transition to the gravity section. In no case shall the force main enter the manhole more than one foot above the flow line. The interior of the manhole shall be coated with a bituminous finish.

2. Precast Concrete Manholes. Precast concrete manholes shall be of the extended base type and be constructed in accordance with these specifications and standards and in conformance with the approved plans. The walls of the manholes shall have a minimum thickness of 5 inches and be constructed of Class A4 reinforced concrete with a minimum compressive strength of 4000 psi at 28 days in accordance with Section 11. Manhole sections shall be tongue and groove with butyl resin joint sealer, Conseal CS-102 or approved equal.

The lowest manhole section shall be placed in the precast base slab in such a manner to provide the greatest amount of bond and to prevent infiltration and exfiltration. The interior of all the joints shall be completely filled with an approved cement mortar. Insert holes for the required sewers shall be made in the manhole sections during the manufacturing operation and shall conform to the actual minimum diameters required to properly seal the connection. Flexible connectors comprised of rubber boots and stainless steel straps shall be furnished and installed at each insert hole, as manufactured by Kor-N-Seal, Interpace, or approved equal.

Manholes shall be carefully made and shall have no honeycombs or other deteriorated surfaces. All surfaces shall be smooth. All lifting holes shall be filled flush with an approved mortar upon completion of the setting. Standard manhole steps shall be securely placed in position in the manhole sections during the manufacturing of the sections.

The uppermost section of the precast manhole shall be tapered to a minimum interior diameter of two feet as indicated in the standard details. The intermediate straight sections shall be either three or four feet in length. The minimum length of the lower sections shall be three times the wall section, and in no case shall it be less than two feet.

3. Drop Pipe Connections. A drop pipe shall be provided for a sewer entering a manhole at an elevation of 24 inches or more above the manhole invert or as may otherwise be required to conform to the use of standard fittings in the dropping construction. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches, the invert shall be filleted to prevent solids deposition.

4. Frames and Covers. All frames and covers shall be Dewey Brothers of Virginia, Inc. Model B-1800. The top shall have the word "SEWER" cast in raised letters. All frames shall be securely anchored to the related structures and shall be installed so that the cover shall be exposed and flush with the street surface. If street surfaces are renewed or replaced by the developer or owner after the sewer system has been approved and accepted by the *Department*, but while such streets are still the obligation of the developer or owner, the frames and covers therein shall be re-adjusted to proper location relative to new street surfacing. The frame and cover of manholes or cleanouts located in sodded or other off-street areas shall be so installed that the covers shall be exposed and either flush or above the immediate surface as deemed advisable by the *Department*.

Pursuant to Section 21.07.06 of the Virginia Sewerage Regulations, watertight manhole covers shall be provided and installed where required, and on all manholes whose rim is below the designated elevation of the 25-year flood/wave action. In addition thereto, adequate ventilation shall be provided when such a watertight section of gravity sewer exceeds 1,000 feet in length.

5. Connections to Existing Manholes. Pipe connections to existing manholes shall be made in such manner that the finished work will conform as nearly as

practical to the essential, applicable requirements for new manholes, including all necessary concrete work, cutting and sloping.

B. **ACCESSORIES.** Air relief valves shall be constructed at the necessary high points in the force main to relieve air locking, as deemed necessary by the Department and as indicated in the construction standards. Automatic air relief valves shall be provided where directed by the Department.

Any other sewerage structures or appurtenances necessary for the proper completion of the project shall be constructed as directed by the *Department*.

9.4 **SPECIAL CROSSINGS.**

A. **STREAM CROSSINGS.** Where stream crossings are required in sewer construction, the pipe shall be ductile iron, mechanical joint pipe, with restrained joints, of the same size interior diameter as the pertinent sewer, or the next larger in ductile iron if an equal size pipe is not available. A minimum of one foot of cover over the crown of the sewer shall be provided where the natural bottom of the stream is rock and three feet of cover where the bottom is other materials.

Aerial stream crossings shall be installed within steel casing of a size sufficient to freely slide the carrier pipe. Casing pipe shall be bituminous coated steel with 3/8-inch walls and 36,000 psi yield. Casing pipe sections shall be continuously welded at joints and supported by concrete piers embedded within the stream banks. The casing pipe shall be above the level of a 100 year flood and any floating debris it may carry.

All stream crossings shall be installed in accordance with the recommendations of the *Department* and the approved plans for the construction project. Stream crossings must be tested in place and show zero leakage. Provisions for such test shall be incorporated in the design.

B. **HIGHWAY AND RAILROAD CROSSINGS.** Where required, crossings under highways shall be installed in accordance with the requirements of the Virginia Department of Transportation. Crossings of railroads shall be installed in accordance with the requirements of the railroad company. Encased crossings shall be accomplished prior to the construction of adjacent sections of the project. Safety precautions will be required while performing the crossing work.

Directionally drilling, horizontal boring, jacking of pipe or tunneling under pavement shall be done only upon approval by the *Department*. The owner or developer shall submit a detailed schedule of operation indicating the exact method and equipment to be used. Only workmen skilled in this class of work shall be employed on it.

Casing pipe or tunnel liner, as required, shall be installed beneath the roadbed. If obstructions require relocation of the casing, the unfinished cavity shall be filled with 2500 psi concrete placed by pneumatic pump. The cavity between the casing and the fill shall be pneumatically grouted.

The sewer pipe shall be installed in the casing with proper care exercised to insure that the pipe sections remain completely joined. Upon completion and testing of the sewer, the ends of the casing shall be closed as directed by the Director or his authorized

representative.

9.5 **SERVICE CONNECTIONS.** Pipe between the sewer and the property line shall conform to the applicable sections of these specifications and standards and in no case shall be less than four inches inside diameter.

All connections and wyes which are for future use shall be capped as directed by the *Department*. No pipe shall be cut for service connections except as approved by the *Department*. The ends of pipe which enter sewer lines shall be neatly cut to fit the inner face of the pipe. When directed, such cutting shall be done before the pipes are built in. No service connections shall be made into any manholes.

Wyes for service connections shall be installed where indicated on the approved plans. Wye and service connections shall be installed in conformance with these construction standards. Each service lateral shall terminate at the property line with a standard cleanout.

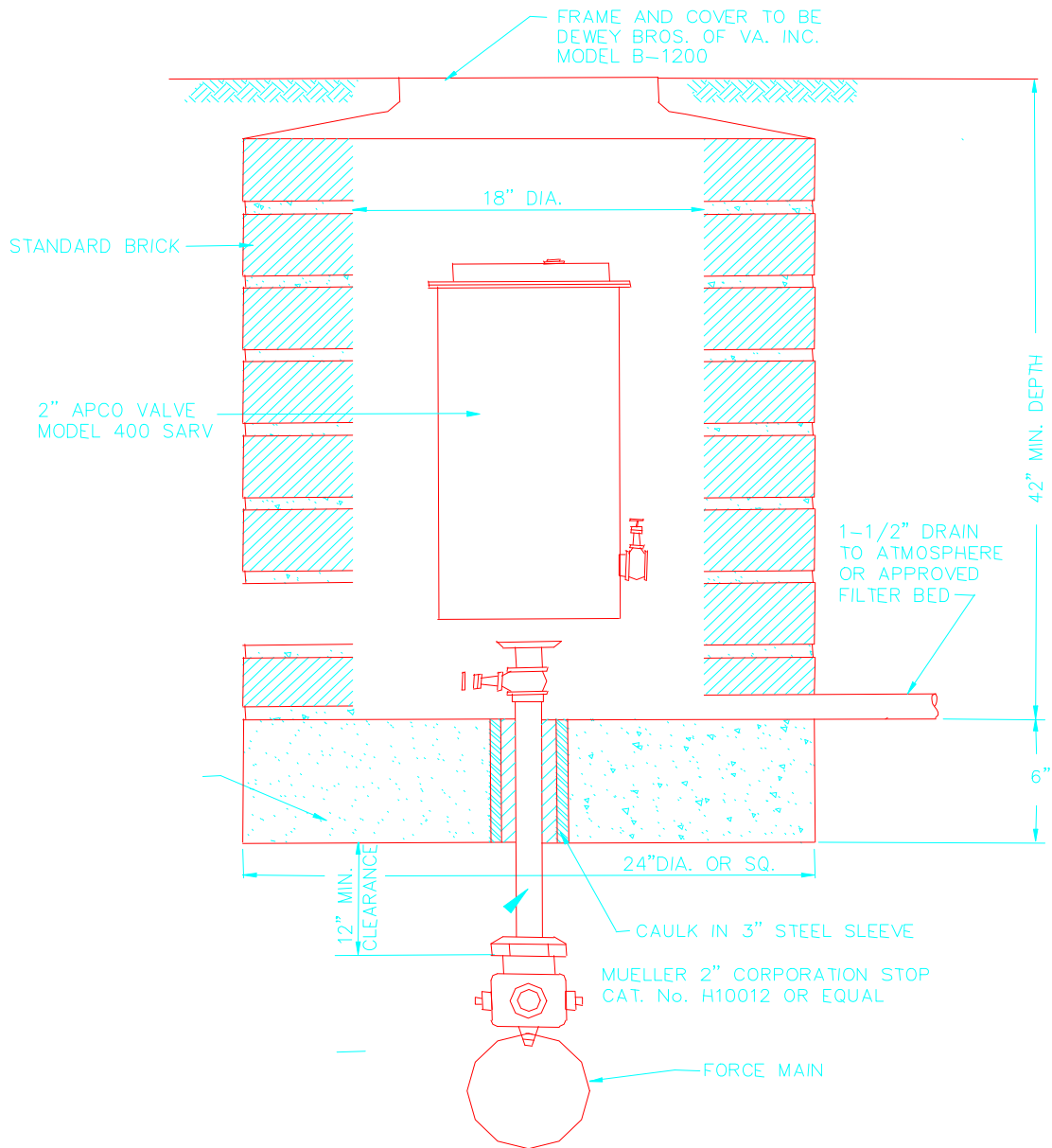
Where dissimilar materials exist between the service connection and the house sewer a satisfactory adapter shall be provided in order to insure a tight joint. If no adapter is available a concrete encasement shall be provided to joint the dissimilar materials.

SECTION 10 CONSTRUCTION STANDARDS.

10.1 **GENERAL REQUIREMENTS.** The following standards delineated by graphical details shall be applicable to the construction of all sanitary sewerage facilities improvements within the County. Deviations from these standards shall require written approval from the Department.

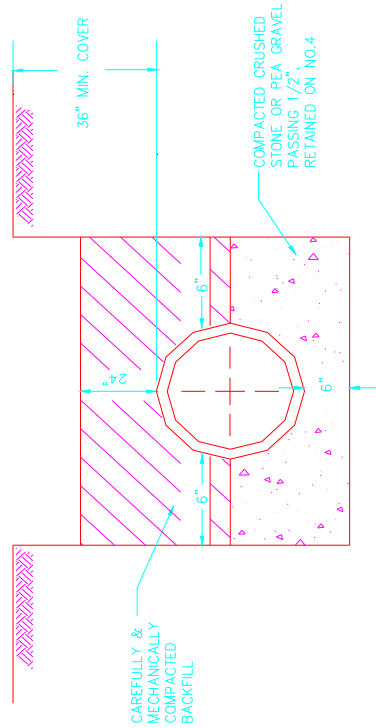
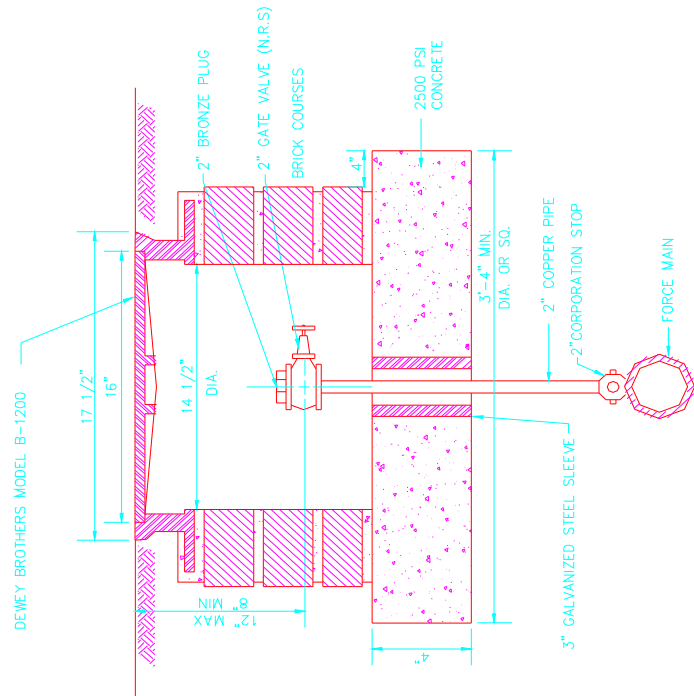
10.2 **STANDARD DETAILS.**

| | |
|---------------|--|
| PLATE S I | AUTOMATIC AIR RELEASE ASSEMBLY |
| PLATE S II | MANUAL AIR VENT |
| PLATE S III | STANDARD BEDDING |
| PLATE S III A | STANDARD BEDDING |
| PLATE S IV | CONCRETE ENCASEMENT AND CONCRETE CAP |
| PLATE S V | LATERAL |
| PLATE S VI | STANDARD AND WATERTIGHT MANHOLE FRAME AND COVER |
| PLATE S VII | STANDARD MANHOLES |
| PLATE S VIII | EMERGENCY PUMP CONNECTION |
| PLATE S IX | SAXAPHONE RAISED OR DEPRESSED SECTIONS AT FORCE MAIN TERMINATIONS |



AUTOMATIC AIR RELEASE ASSEMBLY

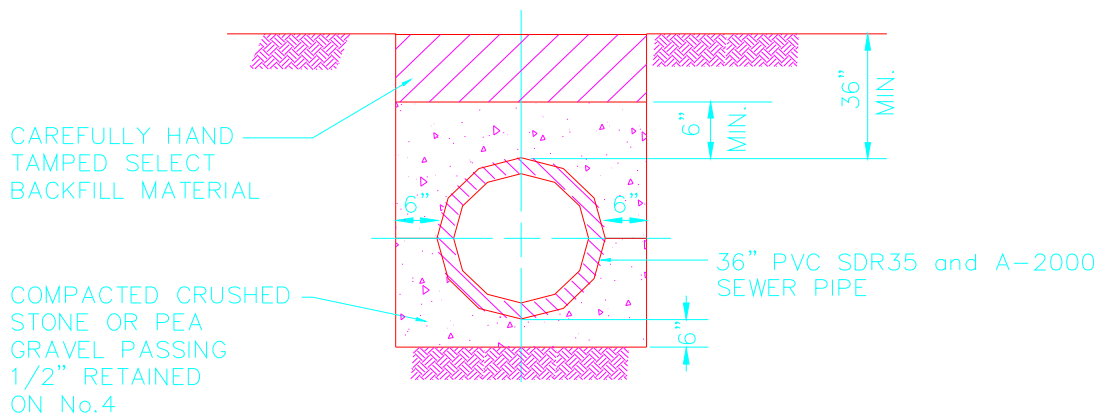
PLATE S I



MANUAL AIR VENT

NOT TO SCALE

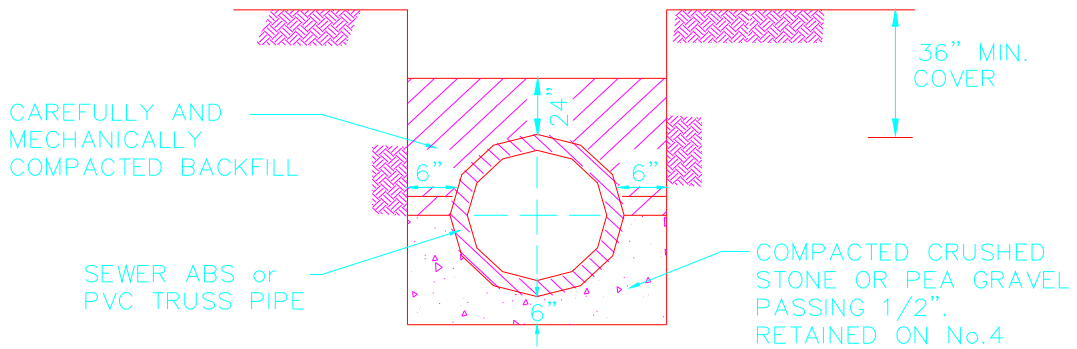
PLATE S II



STANDARD BEDDING

FOR PVC GRAVITY SEWER PIPE
SDR 35 AND A-2000

PLATE S III

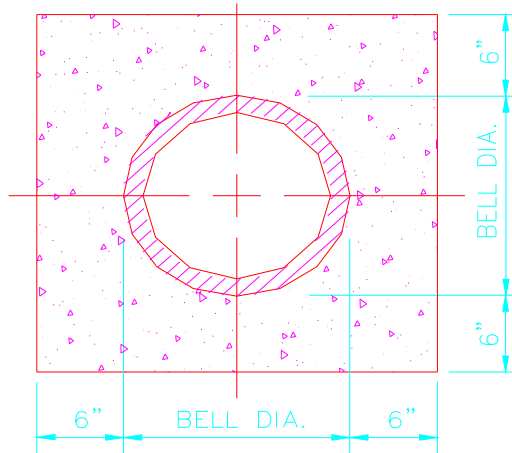


STANDARD BEDDING

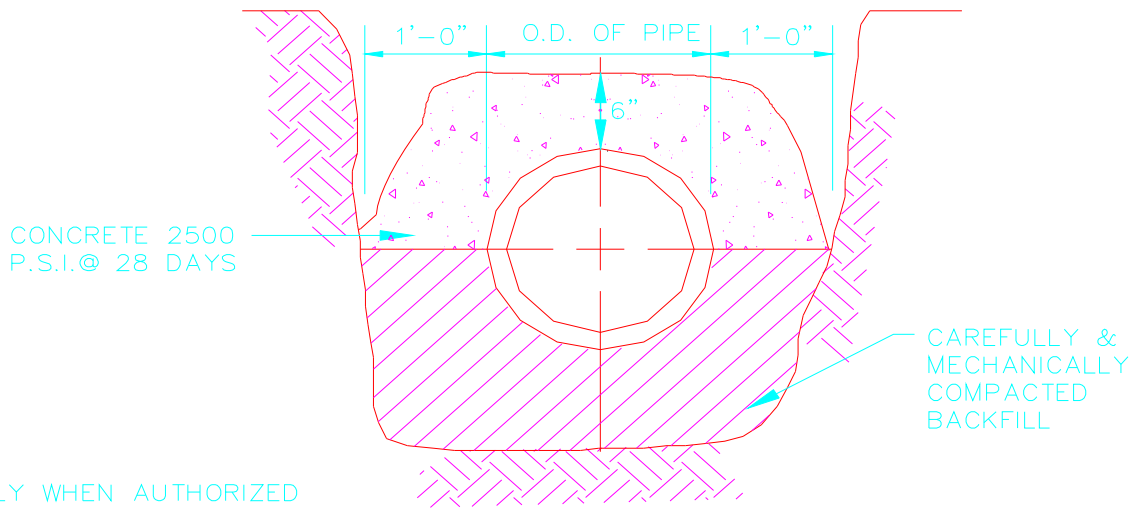
FOR ABS OR PVC TRUSS PIPE
GRAVITY SEWER

PLATE S IIIA

NOTE:
REINFORCING MAY BE REQUIRED
IN SOME LOCATIONS



CONCRETE ENCASEMENT



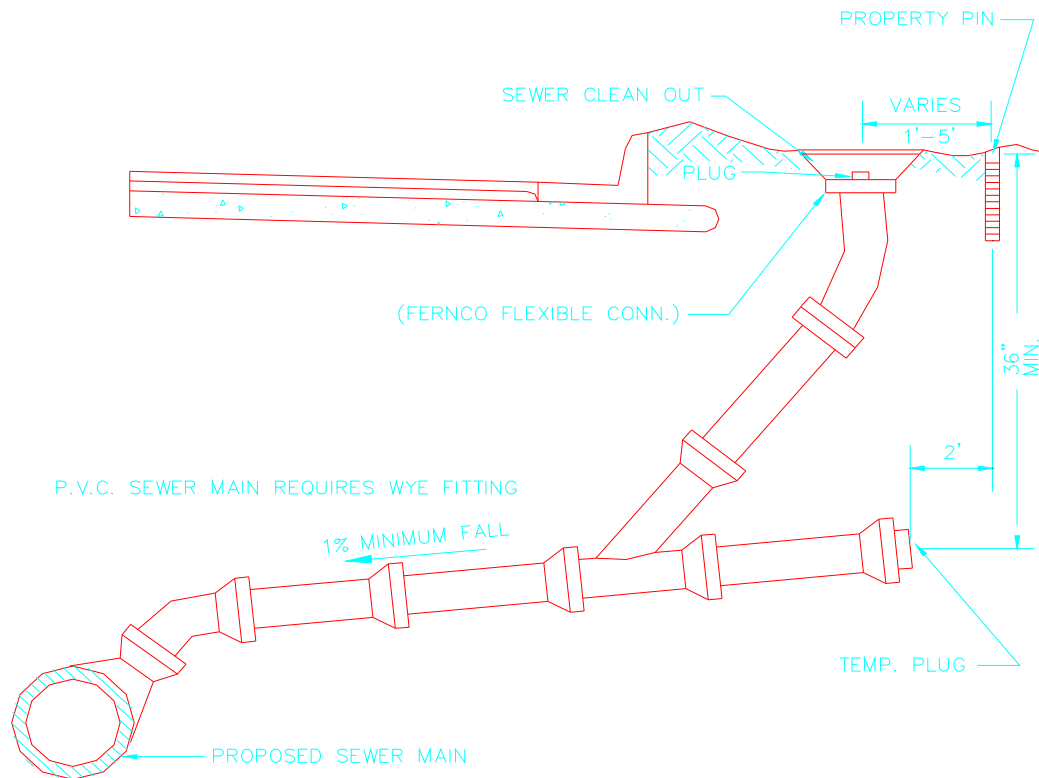
NOTE:
USE ONLY WHEN AUTHORIZED
IN WRITING BY DIRECTOR OF
PUBLIC UTILITIES

CONCRETE CAP

DETAILS

NOT TO SCALE

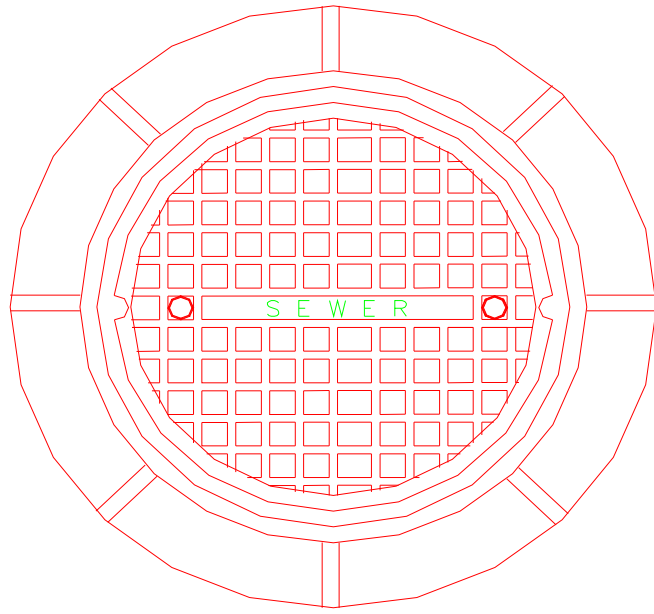
PLATE S IV



SINGLE CLEANOUT (CHARLOTTE PIPE AND FOUNDRY CO. FIGURE L-242 OR EQUAL) WITH LID MARKED "S" AND WING NUT EXPANSION PLUG. CLEANOUT CASTING TO BE CONNECTED TO 4" RISER PIPE WITH FERNCO FLEXIBLE COUPLING OR APPROVED EQUAL.

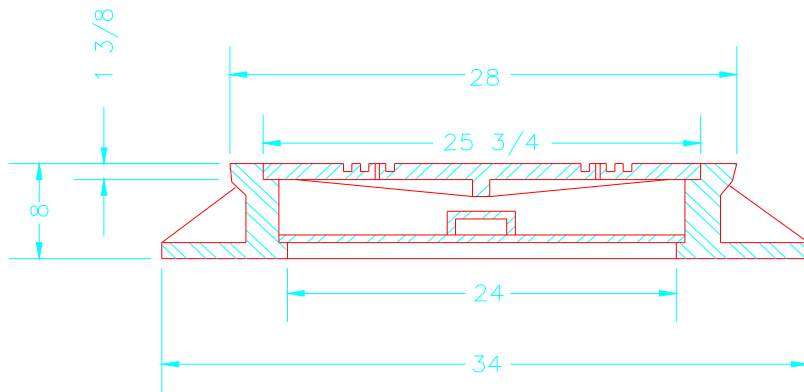
LATERAL

PLATE S V



NOTE:

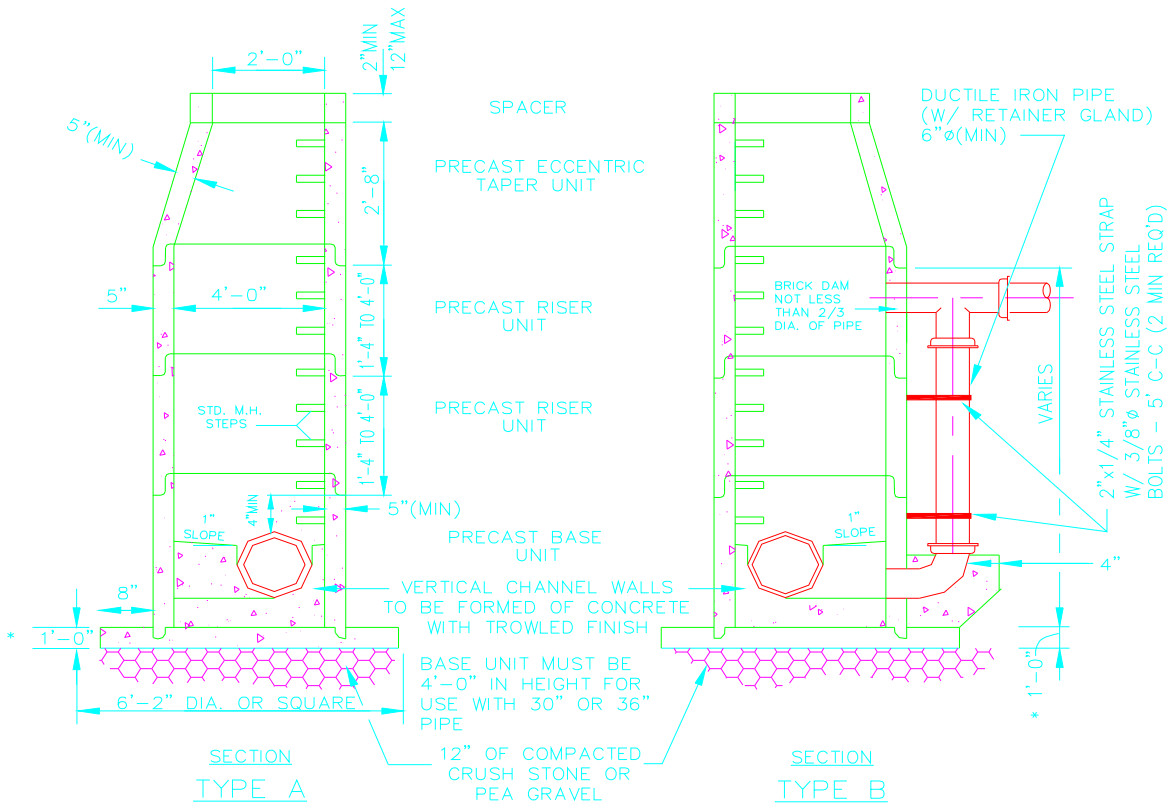
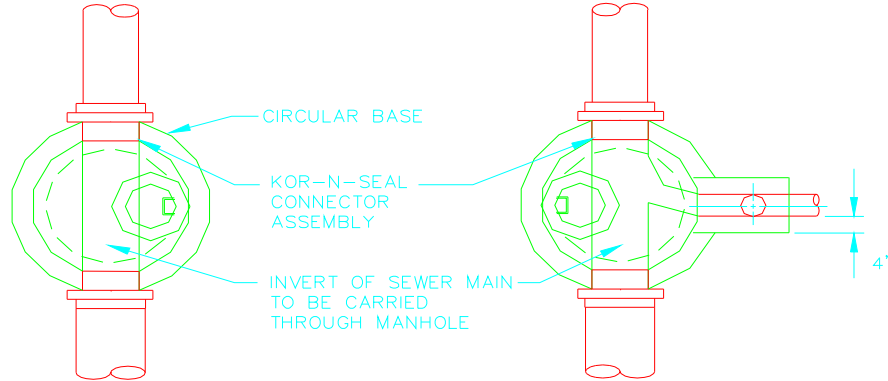
DESIGN NO. B-1800 BLOCK TYPE COVER



STANDARD & WATERTIGHT MANHOLE
FRAME & COVER

PLATE S VI

NOTE:
 MANHOLE SHALL BE DESIGNED AND
 CONSTRUCTED IN ACCORDANCE WITH
 ASTM C-478

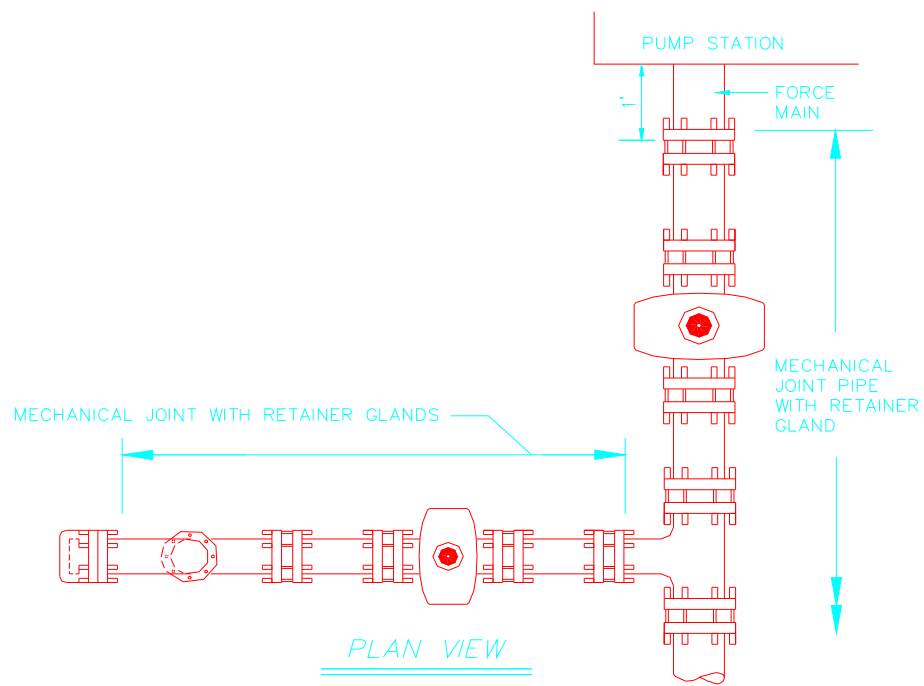
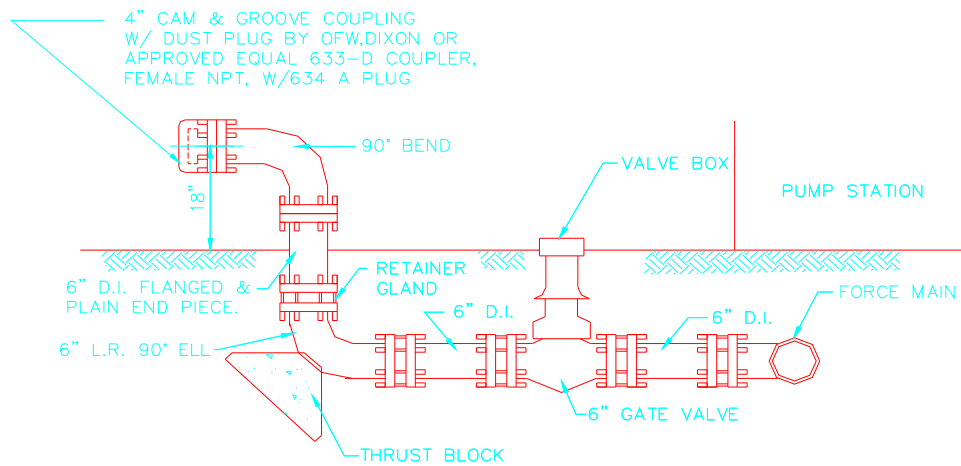


* 8" FOR MONOLITHIC SLAB & BASE UNIT

STANDARD MANHOLES

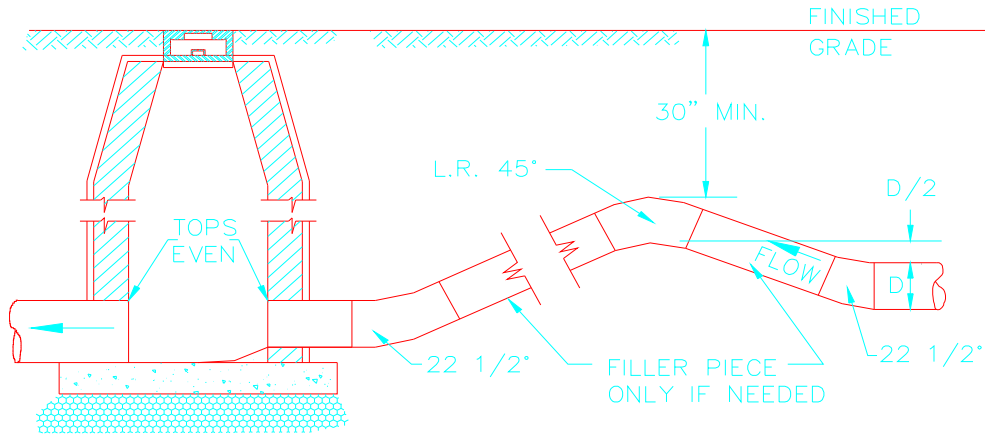
NOT TO SCALE

PLATE S VII

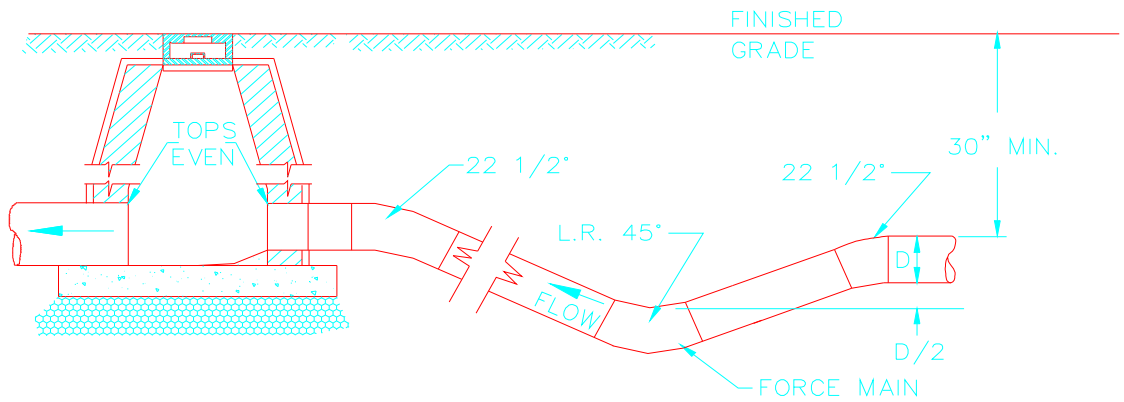


EMERGENCY PUMP CONNECTION

PLATE SVIII



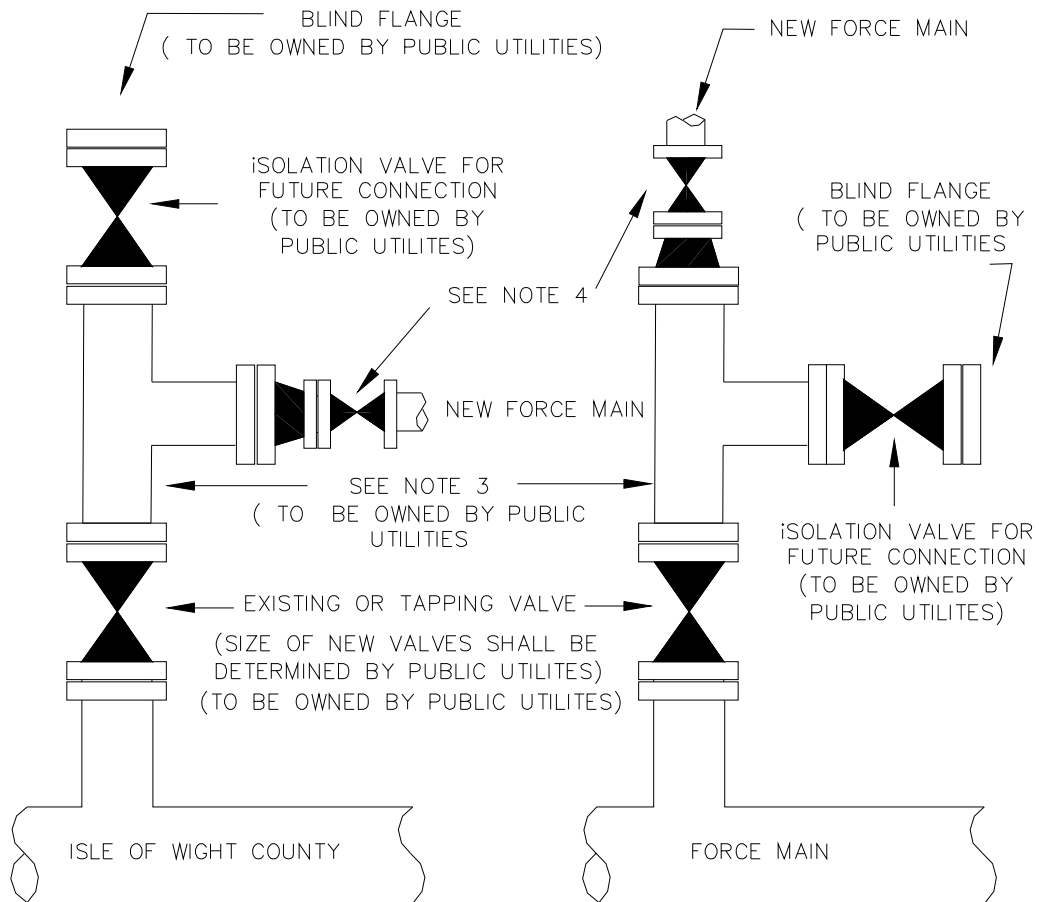
FOR DISCHARGE INTO DEEP MANHOLE



FOR DISCHARGE INTO SHALLOW MANHOLE

SAXAPHONE RAISED OR DEPRESSED
SECTIONS AT FORCE MAIN TERMINATIONS

PLATE S IX



CONNECTION METHOD 1

CONNECTION METHOD 2

1. DIRECTION OF TEE BRANCH TO BE DETERMINED BY PUBLIC UTILITIES
2. TEE AND VALVE TO BE FLANGED.
3. TEE TO BE SAME SIZE AS EXISTING VALVE OR TAPPING VALVE.
4. MINIMUM SIZE VALVE TO BE USED IS 3" WITH NON-RISING STEM AND 2" SQUAREWRENCH NUT.

FORCE MAIN CONNECTION TO COUNTY FORCE MAIN

PLATE SX

SECTION 11 MATERIALS.

11.1 **GENERAL.** Pipe size, type, joint and class shall be designated on the plans or specified elsewhere. Unless otherwise approved in writing by the *Department*, or as specifically indicated on the plans approved by the *Department*, all pipe, fittings, and accessories shall be as delineated in this section.

All pipe used for force mains shall be of the pressure type with pressure type joints.

11.2 **SEWER LINE AND SERVICE PIPE.** All pipe shall be one of the following:

A. **DUCTILE IRON PIPE.** Ductile iron pipe shall be centrifugally cast pipe manufactured in accordance with ANSI Specification A21.51 Ductile iron pipe shall be cement-mortar lined inside in accordance with ANSI Specification A21.4-90. Cement for the mortar shall be Type II Portland Cement. The standard seal coat of bituminous material shall be applied to the exterior and interior of the pipe. Ductile Iron Pipe shall be thickness Class 50 (minimum).

Joints for ductile iron pipe shall be one of the following:

1. Rubber Gasket (Push-On) Type Joint. Rubber gasket type joints shall be manufactured in accordance with ANSI Specification A21.11-90 and designed to lock against displacement without caulking. The gasket shall be a resilient rubber of heavy section, high durometer, and singly molded and shall be installed in accordance with the pipe manufacturer's recommendations. The gasket lubricant shall be a non-toxic, tasteless, odorless grease that will not support bacteria. Each gasket lubricant container shall be labeled with the trade name and the pipe manufacturer's name.

2. Mechanical Joint. Standard mechanical joints shall be manufactured in accordance with ANSI Specification A21.11-90 (AWWA Specification C111-90). The mechanical joint bolts shall be a U.S. Standard size, high-strength, corrosion resistant steel alloy with hexagon nuts.

Mechanical joints shall be used for the connection of all fittings, valves, and hydrants.

Fittings shall be manufactured of cast iron and shall be in accordance with the requirements of ANSI Specification A21.10-93 (AWWA Specification C110-93) or ANSI Specification A21.53-88 (AWWA Specification C153-88). Fittings shall be compatible with the pipe and shall provide at least equal resistance to internal and external loads on the pipe. Fittings shall be bituminous coated on the outside and cement mortar lined on the inside according to ANSI Specification A21.4-90 (AWWA Specification C104-90).

B. **POLYVINYLCHLORIDE PIPE.** Pipe for gravity sewers of 8 inch to 15 inch diameter shall be manufactured in accordance with ASTM Designation D3034 and shall meet the requirements for SDR 26. Pipe shall be manufactured from material meeting the requirements of ASTM D1784 Cell Class 12454B. Joints shall consist of an integral wall section with a solid cross section rubber gasket conforming to ASTM Designation F477-90. Minimum "Pipe Stiffness" (F/ _ Y) at 5 percent deflection shall be 46 psi when tested in accordance with ASTM D-2412. The maximum allowable deflection shall be 5 percent after backfill has reached 95 percent compaction. All service pipes in sizes 4 inch and 6 inch shall conform to ASTM D3034, SDR 23.5 only. PVC pipe for force mains shall be in accordance with AWWA C900.

C. **POLYVINYLCHLORIDE COMPOSITE TRUSS PIPE.** Pipe and fittings shall conform to the requirements of ASTM D2680 for sizes 8 inch through 15 inch. All service pipes in sizes 4 inch and 6 inch shall conform to ASTM D3034, SDR 23.5 only. Joints shall be Type SC solvent cemented joints conforming to ASTM D2564 and D3138 or gasket O-ring coupling per ASTM D3212. The gaskets shall meet the standard specification ASTM F477. Pipe fittings shall meet the same requirements as set forth for the pipe material.

11.3 **MANHOLES, CLEANOUTS, AND ACCESSORIES.**

A. **GENERAL.** All manholes on one project shall be constructed of the same materials; all cleanouts on one project shall be constructed of the same materials.

B. **CONCRETE.** Structural concrete shall be used for the construction of foundation slabs and special structures. All concrete shall be in accordance with Sub-section 11.4 of these specifications.

C. **FRAMES, COVERS, AND STEPS.** Frames and covers shall be the best quality gray iron, cast in accordance with ASTM Designation A48-56. Castings shall be sound, true to form and thickness, sand blasted clean and machined on all bearing surfaces. Castings shall receive one coat of black asphaltum paint prior to delivery to the job site. Steps shall be polypropylene coated smooth steel rod. Watertight manhole covers are to be used.

D. **PRECAST CONCRETE MANHOLES.** Precast concrete manholes shall be the extended base type and shall be constructed of reinforced concrete.

Joint sealer shall be Conseal CS-102 or approved equal.

Flexible connections for pipe jointing at the manhole shall be comprised of rubber boots and stainless steel straps equal to the connectors manufactured of Kor-N-Seal, Interpace, or approved equal.

11.4 **CONCRETE.**

A. **GENERAL REQUIREMENTS.** All work shall comply with the "Building Code Requirements for Reinforced Concrete", ACI 318, latest edition.

B. **MATERIALS.**

1. **Concrete.** Unless otherwise indicated on the drawings, concrete for structures shall be proportioned and mixed in accordance with the Road and Bridge Specifications, Virginia Department of Highways and Transportation dated January 1991, General Use Concrete, Class A-3, Table 11-17, Section 217. Concrete for miscellaneous purposes, such as fill concrete, thrust blocks, concrete encasement, etc., shall have a 28-day strength of 2500 psi., The mix proportions and test data for this concrete shall be submitted by the contractor for approval by the Director. All concrete shall be made with Type II Portland Cement manufactured in

accordance with ASTM C-150.

2. Steel Reinforcement. All reinforcement bars shall be deformed new billet steel conforming to ASTM A615-60. Bars shall be formed to the dimensions indicated by the drawings.

3. Wire Reinforcement. Welded wire fabric shall conform to ASTM Designation A185.

4. Curing Compound. Curing compound shall conform to ASTM Designation C309, Type 2.

5. Joint Filler. Expansion joint material shall be preformed and shall conform to AASHTO M213.

6. Joint Sealant. All concrete joints shall be prepared and sealed with "Colma Joint Sealer" as manufactured by Sika Chemical Corporation, W. R. Grace Joint Sealer, or equal.

7. Waterstops. Flexible waterstops shall be manufactured from virgin polyvinylchloride plastic compound. Properties of polyvinylchloride used shall conform to Corps of Engineers Specification CRD-C572. All waterstops shall be capable of withstanding a head of water equal to the depth of installation or 30 feet, whichever is greater.

C. **SLUMP.** Slump shall be from two to four inches and will be determined in accordance with ASTM Method C143. Samples for slump determination will be taken from the concrete during placement in the forms.

D. **TESTING.** The 28-day concrete compressive strengths will be verified during the progress of the work by testing standard concrete cylinders, The owner shall furnish the necessary labor, molds, and facilities for taking the samples and handling and storing the cylinder at the site of the work. The making, curing, and testing of specimens will be in accordance with ASTM Method C31 and C39. For the first 24 hours after molding, the cylinders shall be kept moist in a storage box constructed and located so that its interior air temperature will be between 60 and 80 degrees F. At least three cylinders will be required for each 50 cubic yards of concrete placed or for each item of work. Should the cylinder specimens fail to meet the specified strength, sample cores may be cut from the suspect concrete at the Director's direction. Concrete shall be deemed acceptable if these cores test at 85 percent design strength, If not, a load test shall be performed as outlined by ACI 318. All core testing shall be performed at the owner's expense. If still unsatisfactory, any necessary support and remedial work shall be furnished by the owner's contractor.

E. **FORMS.** All concrete shall be formed unless directed otherwise. Forms shall be true to line and grade and shall be mortar tight. All exposed joints, edges, and external corners shall have 3/4 inch chamfer. Forms shall be of wood, plywood, or steel. Form design shall be subject to approval, but the adequacy of ties, supports, bracing and shoring to support the imposed live and dead loads, etc., shall remain the responsibility of the developer. Embedded wall ties shall be set 1-1/2 inches from exposed concrete surfaces. The heights of form for each vertical lift shall not exceed ten feet unless indicated on the drawings. Forms for continuous surfaces shall be fitted over the completed surface to assure alignment and to prevent leakage of mortar. Before placing reinforcement steel the contact surfaces of forms shall be cleaned and coated with a non-staining form oil. Temporary openings shall be provided at the base of column

and wall forms to facilitate cleaning just prior to concrete placement.

Embedded items such as anchor bolts, frames, curb angle, conduit, pipe sleeves, and openings shall be carefully located and securely anchored in the forms.

Forms for columns, walls, sides of beams, and other members not supporting the weight of the concrete may be removed 36 hours after placing of concrete. Supporting forms for beams, girders, and slabs shall remain in place until the concrete has reached its 28-day strength.

F. **CONSTRUCTION JOINTS.** Construction joint surfaces shall be thoroughly cleaned before placement of concrete. All laitance, coatings, stains, debris, and other foreign material shall be removed from the surface before the new concrete is deposited. Waterstops and shear keys shall be provided at construction joints. Joints in metal waterstops shall be brazed, welded or soldered. Joints in rubber waterstops shall be vulcanized. Waterstops shall be installed so as to form a continuous watertight seal in each joint. Construction joints will not be permitted within two feet of design water level on wetted surfaces. Shear keys shall be installed for ease of removal of the form. Blockouts for pipe sleeves, if approved by the *Department*, shall be provided with keyway and waterstops and shall be detailed as a plug.

G. **PLACEMENT OF REINFORCEMENT.** Steel reinforcement bars shall be placed in accordance with the approved detail drawings and shall be supported by concrete blocks or galvanized metal bar chairs. Reinforcement shall be free from loose rust, mill scale, oil, grease, and other coatings that would destroy bond. Reinforcement shall be held securely in place to prevent dislocation during concrete placement.

H. **DELIVERY OF CONCRETE.** Concrete mixing equipment and methods shall be subject to approval. Each load shall be accompanied by a ticket showing mix design, mix starting time, and batch weights. The maximum time between introduction of cement into the concrete ready-mix truck and discharge into the forms shall be two hours where the temperature is less than 80° F and 1-1/2 hours above 80° F. Any deviation from the mixing time and the truck ticket information required shall be cause for return of the concrete without use in the forms.

Concrete manufactured at the job site shall be subject to the requirements of the VDOT Road and Bridge Specifications.

I. **PLACEMENT OF CONCRETE.** Concrete placing equipment and methods shall be subject to approval. All surfaces, forms, etc., shall be thoroughly cleaned of debris, dirt, wood chips, etc., and shall be thoroughly dampened prior to placement. Concrete shall not be placed under water. Cement-sand grout in mix proportions of one to three by weight shall be placed to a depth of one inch at all contact surfaces between old and new concrete. The maximum free fall of concrete during placement shall be six feet. Placement at greater heights than six feet shall be accomplished by chutes, slides, or other approved methods. Concrete shall be placed so as to avoid formation of cold joints between successively deposited layers. Concrete shall be placed in the dry and placement will not be permitted during adverse weather conditions. To prevent segregation, the concrete should be deposited in approximately horizontal layers of twelve to eighteen inches as near as possible to its final position.

J. **VIBRATION.** All concrete shall be consolidated with high frequency, internal, mechanical vibrating equipment supplemented by hand spading and tamping. Vibrators

shall be designed to operate with the vibratory element submerged in the concrete and shall have a frequency of not less than 7,000 impulses per minute when submerged. Adequate numbers of sufficiently powered vibratory units shall be furnished at all times to properly consolidate the concrete. Vibration of forms and reinforcement shall not be permitted. Vibrators shall not be used to transport the concrete in the forms. Where concrete is placed in more than one lift, the vibrator shall penetrate the previous lift to prevent the formation of cold joints.

K. **PLACING CONCRETE IN COLD WEATHER.** Except on specific authorization, concrete shall not be placed when the atmospheric temperature is below 40° F. Requests for permission to place concrete at less than 40° F shall include the method to be used to provide concrete at 55° and to maintain a temperature of 60° during the seven-day curing period. Placing and curing of concrete during cold weather shall conform to ACI 306. Materials for heating concrete shall be on site and in proper working order prior to placing concrete.

L. **REPAIR OF SURFACE DEFECTS.** Surface defects shall be repaired immediately after form removal. Honeycombed and other defective concrete shall be removed down to sound concrete. A 1:1 sand-cement bonding grout shall be brushed into the surface; then a stiff patching mixture of the same proportions as the concrete, except coarse aggregate, shall be applied to the defective area. The patching mixture shall be thoroughly consolidated and struck off slightly higher to allow for shrinkage, then finally finished one hour later. The patch shall be kept damp for seven days.

Tie holes shall be cleaned, thoroughly dampened and filled solid with patching mortar.

M. **SURFACE FINISH.** Concrete surfaces not treated architecturally shall be finished as follows. Exposed wall surfaces shall be rubbed immediately after form removal and completion of all patching. Surfaces shall be wetted and rubbed with carborundum brick or other abrasive until a uniform color and texture are produced. No additional cement grout shall be used other than that paste drawn from the green concrete by the rubbing process.

Floor slabs shall receive a steel trowel finish, The surface shall be initially float finished after the mix has hardened sufficiently to permit proper operation of a power-driven float. Power troweling and hand troweling shall complete the slab finish which shall be free of trowel marks, uniform in texture and appearance and shall be true within 1/4 inch in ten feet, determined by a ten-foot straight-edge placed anywhere on the slab. All concrete floors, unless noted otherwise, shall be treated with a floor hardener of Masterplate, as manufactured by Master Products Company, or Hydroment as manufactured by USM Corporation, or approved equal.

Stair treads and other surfaces requiring a nonslip finish shall be finished with a wood float. Aluminum oxide abrasive aggregate particles shall be spread on the surface at a rate of 1.25 pounds per square foot and floated to a uniform granular finish.

N. **PROTECTION AND CURING.** Concrete shall be protected adequately from injurious action by the sun; rain, flowing water, frost and mechanical injury, and shall not be allowed to dry out for seven days after placing. Curing shall be accomplished by water curing or by application of curing compound, except that compound shall not be used on surfaces to be rubbed, or where its appearance would be objectionable or where additional concrete is to be placed. Vertical wall forms shall be kept continuously wet while the forms are in place.

SECTION 12 FIELD TESTS.

12.1 **GRAVITY SEWERS.**

A. **GENERAL.** The owner or developer shall conduct infiltration, exfiltration, and/or air tests as directed by the *Department*. Tests shall be performed on each completed segment of the sewer, not to exceed one thousand feet in length. All labor, equipment and material for the tests shall be furnished by the owner or developer. Tests shall be conducted only in the presence of the Department's authorized representative.

Leakage shall not exceed 100 gallons per inch of nominal diameter per day per mile for any section including manholes and never exceed 4,800 gpd/mile. In the event that leakage exceeds the stated allowance in any section tested, the owner or developer shall make such repairs to the line, manholes or appurtenances as may be necessary to comply with the leakage allowance and to satisfy the *Department*.

B. **INFILTRATION TEST.** The owner or developer shall thoroughly saturate the trench or excavation with water, after placement of backfill and shall carefully measure the flow of water at the nearest downgrade manhole. Three series of measurements shall be made at not less than one hour intervals, and the results shall be reduced to an average infiltration rate, and then applied to the 24 hour period. The infiltration test shall be allowed only when it can be proven that the hydrostatic head outside the pipe is a minimum of four feet above the pipe for the entire test length.

C. **EXFILTRATION TEST.** The owner or developer shall plug the inlet to the lower manhole and shall fill the pipe at the upper manhole with water. Exfiltration shall be determined by measuring the amount of water added to keep the upper manhole filled to a depth of four feet above the barrel of the pipe. Three series of measurements shall be made at not less than one hour intervals, and the results shall be reduced to an average exfiltration rate, and then applied to the 24 hour period. Manholes shall be tested in a similar manner.

D. **AIR TEST.** The owner or developer shall plug the pipe and shall conduct a low pressure air test to determine the acceptability of the completed work. The air testing equipment shall be Air-Lock, as manufactured by Cherne Industrial, Incorporated, or approved equal. All air used shall pass through a single control panel. Individual air hoses shall be used from control panel to pneumatic plugs; from control panel to sealed line for introducing low pressure air; and, from sealed line to control panel for continually monitoring the air pressure rise in the sealed line.

Pneumatic plugs shall have a sealing length equal to or greater than the diameter of the pipe tested. The plug shall resist internal test pressures without requiring external bracing or blocking. Plugs shall be tested prior to installation in the pipe run. A joint of pipe shall be sealed at both ends with the plugs at 25 psig. The sealed pipe shall then be pressurized to 5 psig. The plugs shall withstand this pressure without bracing or movement.

The tested pneumatic plugs shall be placed in the pipe at each manhole and inflated to 25 psig. Low pressure air shall be introduced into this sealed pipe until a pressure of 4 psig plus the pressure of the ground water over the pipe is registered. This pressure shall stabilize for two minutes. After stabilization to a minimum pressure of 3.5 psig (plus water pressure, if any), the air hose from the control panel to the air supply shall be disconnected. The portion of sewer tests shall be deemed acceptable if the time required for the pressure to fall one

pound is not less than that shown in the following tabulation for the respective pipe sizes.

| | | | | | | | | | |
|-----------------------|---|---|---|----|-------|-------|-------|----|--------|
| Pipe Dia. (Inches) | 4 | 6 | 8 | 10 | 12 | 15 | 18 | 21 | 24 |
| Time (Minutes) | 2 | 3 | 4 | 5 | 5-1/2 | 7-1/2 | 8-1/2 | 10 | 11-1/2 |

If air testing is employed, the manholes shall be tested by exfiltration not to exceed 1/2 gallon per hour.

E. **DEFLECTION TEST FOR PVC AND ABS PIPE.** Should PVC or ABS pipe be utilized in the work, the Contractor shall also test the entire length of pipe by means of a GO, NO-GO mandrel to assure that a deflection of 5 percent has not been exceeded. The mandrel, one for each size of pipe, shall be a nine arm mandrel, with proving ring, sized at 5 percent less than the ASTM average I.D. dimension for the pipe and in accordance with the following table:

| Nominal Diameter | L | Avg. I.D. | ASTM F949 PVC-SDR 35 ASTM 03034 | Avg. I.D. | ABS & PVC TRUSS PIPE ASTM 02680 |
|---------------------|-----|--------------|---------------------------------------|--------------|---------------------------------------|
| | | | D | min. | D |
| 8" | 8" | 7.891 | 7.28" | 7.75 | 7.40" |
| 10" | 10" | 9.864 | 9.09" | 9.75 | 9.31" |
| 12" | 12" | 11.737 | 10.79" | 11.75 | 11.22" |
| 15" | 15" | 14.374 | 13.20" | 14.75 | 14.09" |

L = Mandrel Arm Length
D = I.D. of Proving Ring

The mandrel shall be manually pulled through the sewer. The test shall be performed no sooner than 30 days after backfill of the pipe is completed. All pipe that fails the deflection test shall be removed and replaced at the expense of the Contractor.

12.2 **FORCE MAINS.**

A. **GENERAL.** The completed piping shall be subjected to a hydrostatic pressure of 150 psig. This pressure shall be maintained for two hours. All pipe, joints, valves and fittings in the test section shall be examined. Allowable leakage shall not exceed limits set in AWWA Standard C600-93, Table 6.

Defective material disclosed as a consequence of the tests shall be removed and replaced by sound material at the owner's or developer's expense. Any leakage shall be corrected. The test shall be repeated until its results are satisfactory to the *Department*.

Procedures as outlined in Sub-Section 6.1 shall be adhered to in testing the force main.

B. **ANCHORAGE.** Force mains shall be sufficiently anchored within the pump station and throughout the line length. The number of bends shall be as few as possible. Restrained joints or other approved thrust restraint shall be provided where restraint is needed.

C. **AIR RELIEF VALVE.** An air relief valve shall be placed at the necessary high points in the force main to relieve air locking.

D. **TERMINATION.** The force main should enter the receiving manhole with its centerline horizontal and with an invert elevation which will ensure a smooth flow transition to the gravity flow section. In no case shall the force main enter the manhole at a point more than one foot above the flow line. The design shall especially prevent turbulence at this point.

Attention should be given to the use of inert materials or protective coatings for the receiving manhole to prevent deterioration as a result of hydrogen sulfide or other chemicals.

SECTION 13 PUMPING STATIONS

13.1 **GENERAL.** Prior to construction of pumping stations, a building permit shall be obtained. Technical specifications, pump curves, pump cycles and structural and hydraulic design calculations shall be provided with pumping station plans. Specifications shall include a painting schedule and requirements for erosion and sedimentation control procedures.

Sewage pump stations should be located as far as practicable from present or proposed built-up residential-areas, and a hard surface driveway approved by the *Department* shall be provided.

The station's operational components shall be located above, or adequately protected against, the 100-year flood/wave action. The stations shall be designed to remain fully operational during the 25-year flood-wave action.

13.2 **WET WELL/DRY WELL STATIONS.** Pumps shall be located so as to have a positive suction head at the start of the pumping cycle. Pump motors and controls shall be located above grade. Pumps shall be capable of passing 3 inch solids, shall be in duplicate and capable of pumping an influent of 2-1/2 times the average rate of flow against the maximum TDH. Motors shall have sufficient horsepower to meet maximum power requirements including possible impeller changes, and including both maximum and minimum head conditions where connected to a closed force main or interceptor system. Pump motors shall be three phase, 60 cycle with speeds of 860 through 1750 RPM. Pumps using "bladeless" impellers may be used where discharge heads are to be always constant, but otherwise shall not be specified. Pumps shall be designed to permit installation of larger impellers in the event of future increases in flow or high head conditions, and smaller impellers in event of low head conditions or cavitation, as approved by the Department.

Discharge piping shall be designed for a minimum of 2 FPS velocity and a maximum of 8 FPS and suction piping for 2 FPS minimum with suction inlet velocity of 6 FPS maximum. Piping shall be manufactured, installed and have joints and fittings in accordance with force main requirements with flanged fittings, as per Table 10.26 ANSI A21.10-71 and 125 lb. ANSI B16.1-67 flanges.

Gate valves shall be provided on the suction side of pumps and gate and check valves on the discharge side. The influent sewer shall be provided with a gate valve inside the station and with a bar screen with drained accessible concrete floor with adequate trash storage capacity. Gate valves shall be cast iron body, bronze mounted, solid wedge type with rising stems, conforming to AWWA Specification C500-80, as manufactured by M & H Valve and Fittings Company, Clow Corporation or an approved equal. Gate valves shall be operated as shown on the drawings and have flanged ends.

Check valves shall be the swing-check type, iron body, bronze disc with rubber face, full port opening valves with outside spring and lever. Valves shall have flanged ends, shall be suitable for operation at 175 psi and shall be manufactured by M & H Valve and Fittings Company, Mueller Company or an approved equal.

No butterfly valves shall be permitted.

A maximum detention time of 10 minutes based on average flow shall be provided in the wet well. Both the wet well and pump pit shall be provided with adequate mechanical ventilation and a heater shall be provided in the motor room. A minimum of 1 foot freeboard shall be

provided between the influent invert and high water level.

All electric service to the building shall be underground and meters shall be located inside the building.

A heavy duty circuit breaking receptacle assembly, rated at 400 ampere, shall be provided for connection of auxiliary power generating equipment.

A sump pump shall be provided in the pump pit. It shall be pedestal type with non-submersible motor. Potable water shall be furnished in the control room by means of a hose bib with vacuum breaker. Emergency pump connections, in accordance with Plate SVIII, shall be provided on the force main and pump station so located as to permit a portable pump to take suction from the wet well and discharge into the emergency pump connection with a gate valve between this connection and the station.

Construction of the station shall be of structurally sound reinforced concrete, with masonry superstructure, and of sufficient weight to prevent flotation and generally designed in accordance with the aforesaid ACI 318 and good engineering practice. Concrete for the structure shall be proportioned and mixed in accordance with VDOT Road and Bridge Specifications.

All exterior walls below grade and the wet well interior walls and ceilings shall be painted with two coats of Sea-Tar #1010 or equal. All miscellaneous metal in the wet well shall be hot-dipped galvanized steel or aluminum designed for use in sewage structures. All bolts in wet well shall be 316 stainless steel. The pump pit shall be provided with a railed stairway which shall have an angle of 50° or less with the horizontal or be circular.

The superstructure of the pumping station shall also include a wooden roof, shingles, brick, mortar, trim, landscaping, etc. . . . as directed by the *Department*.

13.3 **SUBMERSIBLE PUMPS.** Submersible pump station installation shall meet the applicable requirements under Sub-section 13.2 of these construction standards. Submersible pumps shall be provided with equipment for disconnecting, removal and reconnection of the pumps without requiring personnel to enter the wet well.

Fiberglass wet wells will be acceptable at the sole discretion of the *Department*.

Submersible pumping facilities shall be provided with a hoist and accessories for removing the pumps from the wet well.

13.4 **CONTROLS.** Alarm floats shall be so located as not to be affected by the flows entering the wet well or by the suction of the pumps. Air operated pneumatic controls shall be provided for all sewage pump stations. Provisions shall be made to automatically alternate the pumps in use. Pump stations with motors and/or controls below grade shall be equipped with a securable external disconnect switch.

13.5 **ALARM SYSTEMS.** A transmitter which will signal failure of critical functions in pump stations will be required at each pump station installed in the County. The alarm transmitter shall be Motorola MOSCAD Remote Terminal Unit (RTU), Model F6974 with a V115 16DI input module, operating on a frequency of 453.175. The RTU shall be equipped with a 20 watt UHF transmitter, receiver, all logic circuits and required relays, input AC power failure alarm, nominal

15"x15"x8" NEMA-4 housing, 115/230 volt AC power supply, rechargeable battery backup operation with charger, tamper alarm V224 on RTU housing, FIN8573 lock and key assembly for housing door, Beldin 9913 or equal coax with connectors and a YA2-450PL gain Yagi antenna.

The functions to be monitored by this alarm are as follows:

- | | | | |
|----|--|-----|--|
| 1. | High Water (Wet Well) | 9. | Pump 2 Not in Auto |
| 2. | High Water (Dry Well) | 10. | Pump 3 Not in Auto |
| 3. | Commercial Power Failure | 11. | Generator Run |
| 4. | Pump 1 Fail | 12. | Generator Fail |
| 5. | Pump 2 Fail | 13. | Air Compressor Fail |
| 6. | Pump 3 Fail | 14. | Smoke/Heat |
| 7. | Door Open (Includes Wet Well Hatches) | 15. | Pump 1 Running (accumulate run time also) |
| 8. | Pump 1 Not in Auto | 16. | Pump 2 Running (accumulate run time also) |

or as directed by the Department.

A 15A dedicated circuit shall be provided for each RTU. Outdoor installations shall be hardwired to the RTU. Indoor installations shall have a 115 Vac 60 Hz duplex receptacle mounted adjacent to the housing.

The battery backup system shall be provided with an automatic switchover feature for the alarm system so that a failure of primary power source will not disable the system.

Contractor shall provide a one year maintenance contract with an authorized service center.

Alarms shall be transmitted to the central receiver located at Isle of Wight Court House, Isle of Wight, Virginia.

13.6 **EMERGENCY PUMP/ EMERGENCY GENERATOR.** The Owner will be required to supply a *portable* emergency pump or *portable diesel generator*, as determined by the Department, for emergency operation during station outages. *Portable emergency pump shall be a Godwin with Murphy gage or an approved equal. . Portable emergency pump size shall be determined by the Department. Portable diesel generator shall be a minimum Godwin 26 kw Diesel Generator or an approved equal.*

13.7 **STARTUP AND DEMONSTRATION.** Refer to requirements of Section 7.4, Part II, Construction Standards and Specifications for Water Facilities, this manual.

13.8 **OPERATION AND MAINTENANCE.** Refer to requirements of Section 7.5, Part II, Construction Standards and Specifications for Water Facilities, this manual.