

## 4. Selection of Pipe Material.

### a. General.

- 1) Allowable water pipe material for routine projects in accordance with the Specifications are as follows:
  - a) Water Pipelines:
    - (1) DIP or PVC for pipelines 12-inch diameter and smaller.
    - (2) DIP for pipelines larger than 12-inch diameter.
  - b) Water services:
    - (1) Copper tubing for water house services 2-inch diameter and smaller.
    - (2) DIP for 4-inches to 12-inch diameter.
- 2) In the General Notes indicate the minimum pipe class designation.
  - a) On the profiles when required, indicate the change in pipe class designation and give stations to show the limits of pipe class designation.
- 3) For special projects, when pipe diameters exceed 54-inch or for special applications, the WSSC may require a special pipe material, such as steel.

### b. Determining Pipeline Cover.

- 1) Determine the maximum pipeline cover using the largest differential between the profile grade or ground line shown on profile and the pipe crown.

### c. Selection of Pipe Class and Wall Thickness.

- 1) Copper tubing. The copper tubing indicated in the Specifications is suitable for normal WSSC water system pressures and earth cover.
- 2) DIP in accordance with AWWA C151. The design for DIP shall be based on the allowable cover over the pipeline and the following:
  - a) Class of DIP, in accordance with AWWA C151 as specified as Special Pipe Classes.
    - (1) In the General Notes on the drawings, indicate the minimum class of pipe for DIP required for the project.
    - (2) On the profile indicate by pipeline stations any changes to the class of pipe.
    - (3) **Minimum class 54 for all pipe size. For determining actual class of pipe higher than the minimum class 54, see the following:**
      - (a) Class of pipe (i.e. wall thickness) is indicated in Standard Detail W/6.0 and differs for various depths of cover. Use Standard Detail W/6.0 for determining allowable earth cover



over DIP. Standard Detail W/6.0 assumes that bedding and backfill are in accordance with the Specifications and the classes of pipe are adequate for all operating pressures in the WSSC's water distribution system. For depth of cover greater than Standard Detail W/6.0, see "Depth of Cover for DIP Greater Than WSSC Requirements" in this section.

- (b) Larger than 48-inch diameter may not be manufactured in accordance with the Specifications. Verify with the pipe manufacturers that the material specified can be produced. Example: Larger size DIP may be available in Pressure Class instead of Class of Pipe. The pipeline design must be reviewed for allowable working pressure and cover over the pipe, and Special Provisions for Pressure Class must be added to the Specifications, see requirements under Part Three, Section 6, (Modifications to Specifications and Standard Details).
  - (c) Pipelines with welded-on connections see Part One, Section 7 (Allowable Fittings).
  - (d) Flanged pipe, minimum class 54, in accordance with AWWA C115.
  - (e) Pipelines designed within MSHA right of way, see Wall Thickness of DIP for Special Applications, in this section.
- (3) Pipeline crossing under a railroad, verify with the railroad authority the requirements for crossing its property or right of way.
- (a) When crossing under Maryland Transit Administration (MTA) Rail Lines, see Part Three, Section 3 (Pipeline Crossings and Clearances).
- (5) Pipelines within tunnels and casing pipes see Part One, Section 17 (Tunnels or Casing Pipes) and Part Three, Section 26 (Tunnels Design Criteria)
- 3) PVC pipe in accordance with AWWA C900. The design for PVC pipe shall be based on the operating pressure and cover over the pipeline.
- a) PVC for design of water pipelines must be approved by WSSC as an alternate pipeline material.
  - b) Pipe dimension ratio for PVC AWWA C900.
    - (1) For 4-inch through 12-inch diameter:
      - (b) Use only AWWA C900 DR14 Pipe Dimension Ratio (DR).
      - (c) Maximum operating pressure is one hundred sixty (160) psi.
  - c) Allowable cover for PVC Pipe AWWA C900.
    - (1) For allowable cover over PVC pipe use Standard Detail W/6.1. Allowable cover differs for varying DRs and trench backfill. Standard Detail W/6.1 assumes bedding and backfill are in accordance with the Specifications.
  - d) Design limitations.
    - (1) PVC pipe has a strict limitation on joint deflections; see Part One, Section 12 (Allowable



Joint Deflections).

- (2) PVC pipe do not be used for fire hydrant lead piping and for water house connections 3-inch and larger.

e) Information required on the Drawings.

- (1) In the General Notes on the drawings, indicate the pipe dimension ratio of DR 14 for PVC Pipe.
- (2) If granular material bedding is required due to the depth of cover, see "Allowable cover for PVC (AWWA C900)" in this section. Show on the profile by pipeline stations the required limits of granular material bedding and provide a note for borrow aggregate within the pipe embedment zone for Standard Detail M/8.1a.
- (3) PVC water mains require a tracer wire on top of the PVC pipe, in accordance with the Specifications.
  - (a) The tracer wire shall be connected to all valves, fittings and fire hydrants, see Standard Details W/2.2, W/8.0 and W/8.1.
  - (b) If connecting a PVC water main to an existing CIP or DIP water main, provide a note on the drawings to connect to the existing pipe with a MJ Solid Sleeve. Connect the tracer wire to the MJ Solid Sleeve in a way similar to gate valves, see Standard Detail W/2.2.
- (4) PVC Insulating Spool, if the operating pressure, pipe dimension ratio and allowable cover are within the limits allowed. Include a note on the drawings that the Contractor has the option of using the PVC insulating spool vs. the insulating flange. Include a reference to Standard Detail C/3.2a and indicate the required PVC dimension ratio (DR).

**d. Depth of Cover for DIP Greater Than WSSC Requirements.**

- 1) For depths of cover greater than shown in Standard Detail W/6.0, or for other special conditions, the wall thickness for DIP must be calculated in accordance with the method in AWWA Standard C150/ANSI A.21.50. Use the assumption of Laying Condition Type 1 for pipe sizes 24-inch and smaller and Laying Condition Type 3 for pipe sizes larger than 24-inch.
- 2) Based on the calculated thickness, select a class of pipe. The thickness of the selected class must be equal to, or greater than, the calculated thickness.

**e. Wall Thickness of DIP for Special Applications.**

- 1) Wall thickness criteria for DIP for the following special applications are not covered in the Standard Details and additional consideration/calculations are required in the following situations:
  - a) Pipe on supports or hangers, e.g. bridge crossings.
  - b) Shallow cover, less than two and one half (2-1/2) feet.
  - c) Vehicular or equipment loading greater than AASHTO H-20 or HS-20 loads configuration.
  - d) Operating pressures greater than those found in the WSSC's water distribution system.



- c) Surges exceeding allowances given in the Specifications and under Part One, Section 5 (Total Internal and Transient Pressures).
- d) Certain vacuum conditions, see Part One, Section 6 (Buckling Design).
- e) When the pipeline crosses under a railroad, verify with the Railroad Authority, the requirements for crossing its property or right of way.
- h) When pipelines are to be designed within MSHA right of way for highways, design the pipeline as follows:
  - (1) MSHA definition for types of highways (from MSHA Utility Policy, dated March 1998). Contact the MSHA for current guidelines.
    - (a) Expressways are divided highways, with full control of access, on which all crossroads are grade separations and all entrance and exit maneuvers are via interchange ramps. Expressways are primarily designed for high speed, long distance travel with unrestricted movement of traffic and no direct access to abutting properties.
    - (b) Controlled Access Highways are a higher class of highway and usually incorporate access control. Controlled access designations severely restrict the use of highway right of way for any purpose other than its primary function. Controlled access limits are denoted on MSHA drawings and plats by the words "Right of Way of Through Highway".
  - (2) Requirements stated below are only for pipelines within MSHA's right of ways and are only general guidelines. Verify additional requirements with MSHA.
  - (3) Pipelines passing through MSHA's highways.
    - (a) All pipelines crossings must be in a sleeve, tunnel or have the class of DIP increased to the next higher class of pipe.
  - (4) Longitudinal occupancy by pipelines within MSHA's right of way for highways.
    - (a) Expressways. No longitudinal occupancy by new pipelines is permitted.
    - (b) Controlled Access Highways. Longitudinal occupancy is permitted by special exemption. During the design, obtain written exemption from MSHA.
    - (c) Roadways other than Expressways and Controlled Access Highways. Longitudinal occupancy is permitted; see MSHA Utility Policy, dated March 1998.
- i) When pipelines are to be designed near or within Maryland Transit Administration (MTA) Rail Lines, see Part Three, Section 3 (Pipeline Crossings and Clearances) and Part Three, Section 26 (Tunnels Design Criteria).

