Distribution Review

Distribution Piping

Distribution Piping Training Objectives

To gain an understanding of:
- The four main pipe selection considerations
- The construction material and construction characteristics of common pipe
- The different pipe joints and their applications

Pipe Selection Considerations

Four main considerations:
- Corrosion resistance
- Wall smoothness
- Compatibility
- Installation conditions
Pipe Selection Considerations

Corrosion Resistance
- Plastic pipe will not corrode
- Concrete pipe is resistant to corrosion under most soil conditions
- Ductile iron and steel require coatings to minimize corrosion

Wall smoothness
- C value or C factor is the measure of a pipe wall’s smoothness
- The higher the C value, the less resistance
- The higher the C value, the higher the flow capacity

Pipe Material | C Value
---|---
Asbestos Cement | 140+
Cast-iron (old) | 100
Cast-iron (badly tuberculated) | <100
Concrete pressure pipe | 140+
Ductile iron – cement lined | 140+
Plastic | 140+
Steel | 140+
Pipe Selection Considerations

Compatibility
Are the new materials compatible with existing distribution system materials?
Will there be a need for different fittings or repair parts?

Installation Conditions
High water table may require mechanical joints rather than push joints
Uneven terrain requires pipe with maximum deflection at joints and restrained joints
Sun and Weather exposure are also conditions to be considered

Pipe Materials
Asbestos–Cement
Ductile–Iron
Concrete
Steel
Polyvinyl Chloride (PVC)
Polyethylene
Fiberglass
Pipe Materials

Asbestos-Cement Pipe (A-C Pipe)

Advantages:
- good flow characteristics
- light weight and easy to handle

Disadvantages:
- easily damaged
- difficult to locate when buried
- requires special care when tapping

Made from Asbestos fibers, silica sand, Portland cement
Not good for carrying soft water

Working lengths 10 ft - 13 ft
Diameter range 4 in – 42 in

Pipe Materials

Ductile-Iron (cement lined)

Advantages:
- durable and strong
- flexural strength (resists breaking when bent)
- thinner wall than A-C or PVC
- good interior pipe corrosion resistance

Disadvantages:
- very heavy - hard to handle
- requires plastic wrap or cathodic protection
Pipe Materials

Ductile-Iron (cement lined)
Can be bent slightly without breaking due to magnesium added during manufacturing process
Not subject to beam breakage like cast-iron pipe

- Working lengths: 18 ft - 20 ft
- Diameter range: 4 in – 64 in

Concrete Pipe (pre-stressed concrete)
Advantages:
- Durable and requires little maintenance
- Good internal and external corrosion resistance
- Minimal bedding and backfilling requirements
- High external load capacity

Disadvantages:
- Very heavy – requires large handling equipment
- Requires external protection if soil contains chlorides

Concrete Pipe
Combines high strength of steel and corrosion resistance of concrete
Steel pipe is lined with concrete and coated with concrete

- Working lengths: 12 ft - 40 ft
- Diameter range: 10 in – 252 in
Pipe Materials

Steel Pipe
Advantages:
- Light weight makes installation easy
- High tensile strength
- Very flexible
Disadvantages:
- Poor corrosion resistance both inside and out
- Susceptible to collapse under vacuum conditions

Commonly used for high pressure applications
Commonly cement or epoxy lined for corrosion resistance
Exterior coated with plastic or bituminous materials
Used in large diameter applications

Working lengths: 20 ft - 45 ft
Diameter range: 4 in – 120 in

Pipe Materials

Polyvinyl Chloride (PVC)
Advantages:
- Lightweight and easy to install
- Excellent corrosion resistance
- High impact strength
Disadvantages:
- Difficult to locate when buried
- Special care required during tapping
- Damaged if exposed to sunlight
- Petroleum and organic compounds may permeate
Pipe Materials

Polyvinyl Chloride (PVC)
Pipe sizes between 4 and 12 inches are compatible with ductile-iron fitting sizes

Diameter range 4 in – 36 in

Polyethylene
Advantages:
- lightweight and easy to install
- excellent corrosion resistance
- flexible - moves with ground movements
Disadvantages:
- similar to those of PVC

Fiberglass Pipe
Advantages:
- good corrosion resistance
- lightweight
- low installation cost and ease of repair
- High C Value
Disadvantages:
- susceptible to mechanical damage
- not very flexible
- no standard joining system
Type of joints:
- butt joints wrapped with fiberglass and resin
- bell and spigot
Pipe Joints

<table>
<thead>
<tr>
<th>Material</th>
<th>Type of Joint</th>
<th>Application</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asbestos cement</td>
<td>Coupling w/rubber ring gasket</td>
<td>All locations</td>
</tr>
<tr>
<td>Ductile iron</td>
<td>Push-on or mechanical</td>
<td>General use where flexibility is required</td>
</tr>
<tr>
<td></td>
<td>Bell and spigot</td>
<td>No longer installed</td>
</tr>
<tr>
<td></td>
<td>Flanged</td>
<td>Where valves or fittings are installed in vaults or above grade</td>
</tr>
<tr>
<td></td>
<td>Flexible ball</td>
<td>River crossings or in very rugged terrain</td>
</tr>
<tr>
<td></td>
<td>Restrained</td>
<td>Installed in unstable soil to resist thrust forces</td>
</tr>
<tr>
<td>Concrete</td>
<td>Galvanized steel ring, bell and spigot w/rubber gasket</td>
<td>All locations</td>
</tr>
</tbody>
</table>

Pipe Joints

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<th>Material</th>
<th>Type of Joint</th>
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</thead>
<tbody>
<tr>
<td>Plastic</td>
<td>Heat fusion</td>
<td>Used for polyolefin pipe</td>
</tr>
<tr>
<td></td>
<td>Solvent weld</td>
<td>Small diameter lines</td>
</tr>
<tr>
<td></td>
<td>Bell and spigot w/rubber o-ring</td>
<td>Large diameter lines</td>
</tr>
<tr>
<td>Steel</td>
<td>Mechanical sleeve coupling</td>
<td>All diameters, especially small</td>
</tr>
<tr>
<td></td>
<td>Rubber gasket joints</td>
<td>Low pressure applications</td>
</tr>
<tr>
<td></td>
<td>Welded joints</td>
<td>High pressure applications</td>
</tr>
<tr>
<td></td>
<td>Flanged joints</td>
<td>Where valves or fittings are attached</td>
</tr>
<tr>
<td></td>
<td>Expansion joints</td>
<td>Where pipe expansion or ground movement is likely</td>
</tr>
</tbody>
</table>

Review the lecture handout and then complete the quiz. This will help you remember the information we just covered.