



Saturday, January 11, 2003

## Hancor Design Aids Section

### 4-4 WEATHERING FACTORS

#### Cyclical Freeze/Thaw Conditions

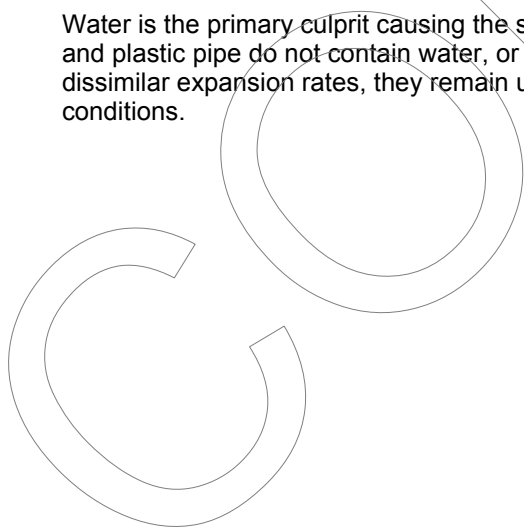


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Reinforced and nonreinforced concrete pipe suffers during freeze/thaw conditions. While pipes primarily expand or contract in the longitudinal direction, concrete must also be able to withstand a substantial amount of movement within the wall itself. This is partly due to the thickness of the wall and partly to the fact the concrete is not a homogeneous material.

The different components of reinforced concrete pipe, including steel, cement, water, aggregate, and admixtures, have different rates of thermal expansion. Admixtures help to buffer these effects, although cracking and crumbling are nearly unavoidable in repeated freeze/thaw conditions. This deterioration permits additional water to seep into the pipe wall and when freezing occurs again, cracking and crumbling can take place. The process proceeds at a faster and faster rate until the reinforcement is exposed. At that time, galvanic corrosion will begin on the steel while the concrete will continue to spall.

Water is the primary culprit causing the spalling conditions. Because metal and plastic pipe do not contain water, or a combination of materials with dissimilar expansion rates, they remain unaffected by freeze/thaw conditions.



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