

February 13, 2009

Engineering Summary of the 2008 "Greenbook" (Standard Specifications for Public Works Construction) Changes for Plastic Pipe

The "Greenbook" is used throughout southern California for public works construction, and is often referred to by agencies and consulting engineers in other localities as a guide specification, has been changed significantly relative to contractor requirements for installation and deflection testing of plastic pipe. These changes should be carefully reviewed by Engineers and Contractors prior to specifying or using plastic pipe, as the new requirements could have significant cost impacts, as well as affecting considerations whether this flexible pipe is appropriate for the intended application. If the pipe shows more than the allowable deflection when tested 30 days after installation, it must be uncovered, inspected, and then reinstalled, or replaced if damaged.

1. A major change in Section of 207 of the Greenbook now limits the size of Corrugated HDPE pipe to 48". While it covers different types of plastic pipe materials, the Greenbook only allows Type S (annular) Corrugated HDPE pipe to be used.

*207-18.3 NOMINAL DIAMETER, WALL THICKNESS AND PIPE STIFFNESS. The inside diameter, wall thickness and minimum pipe stiffness shall be as specified in Table 207-18.3.1(A).*

**TABLE 207-18.3(A)**

| <u>Diameter mm (in)</u> | <u>Minimum Wall Thickness mm (in)</u> | <u>Minimum Pipe Stiffness kPa (psi)</u> |
|-------------------------|---------------------------------------|---|
| 300 (12)                | 0.89 (0.035)                          | 345 (50)                                |
| 375 (15)                | 1.00 (0.039)                          | 290 (42)                                |
| 450 (18)                | 1.27 (0.050)                          | 275 (40)                                |
| 600 (24)                | 1.50 (0.059)                          | 235 (34)                                |
| 750 (30)                | 1.50 (0.059)                          | 195 (28)                                |
| 900 (36)                | 1.70 (0.069)                          | 150 (22)                                |
| 1050 (42)               | 1.80 (0.070)                          | 140 (20)                                |
| 1200 (48)               | 1.80 (0.070)                          | 125 (18)                                |

2. Section 306-1.2.12 now has a requirement defining the actual as-supplied ID for Corrugated HDPE pipe: **"For CHDPE pipe and fittings, the ID for each lot (as defined in 207-18.5.1) shall be calculated by averaging the diameter at 8 equally spaced points around the circumference of a section of unloaded pipe. The Greenbook also requires "The Contractor shall be responsible for measuring, recording and providing the ID's to the Engineer prior to installation."** Previously, there had been a question as to how the base ID for measurement was determined for assessing deflection. This new requirement to

measure the actual pipe diameter at eight equally spaced positions around the circumference places additional responsibility on the contractor and emphasizes the importance of roundness before placing the pipe in the ditch and providing the critical side-support from compacted bedding that is required for this very flexible pipe.

The other very significant change in this section (now placed in a subsection numbered 306-1.2.12.5) is the deletion of “Unless otherwise permitted by the Engineer in conformance with 3-1” which had been in the previous editions of the Greenbook. The Greenbook now reads **“Any over deflected pipe shall be uncovered and, if not damaged, reinstalled. Damaged pipe shall not be reinstalled, but shall be removed from the Work site. Any pipe subjected to any method or process other than removal, which attempts, even successfully, to reduce or cure any over deflection, shall be uncovered, removed from the Work site, and replaced with new pipe.”**

3. A major change in Section 306 is that all plastic pipe fittings now requires 3250 psi **concrete bedding**, which is defined as a zone extending from 4” below the pipe barrel, 12” above the top of the pipe, and 8” to 18” and wider at each side of the pipe (these dimensions are shown in 306-1.2.1.3.) Just below Table 306-1.2.1.3 (B) is the new provision **“Bedding for fittings shall be Portland cement concrete, Class 330-C-23(560-C-3250), conforming to 201-1.1.2.”**

Straight lengths of plastic pipe require crushed rock bedding, and in order to ensure that the crushed rock bedding properly supports the pipe, a new provision was added to require the Contractor to shovel slice the rock into the haunch areas – Section 306-1.2.1.3 added **“The crushed rock shall be placed by slicing, shovel-spading, or shovel rodding to insure complete filling of the haunch areas below the pipe.”** The practice of just dumping the crushed rock without using a compactive effort to ensure complete filling of the haunch area is no longer allowed.

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**Deflection testing is mandatory** and must be performed 30 days after installation. A single instance of pipe being overdeflected (which is a common occurrence with Corrugated HDPE pipe) can result in a significant cost to the contractor and a delay in project acceptance.

**Note:** This document serves as an alert that there have been changes to the Greenbook Specifications. We encourage you to see the changes in context of the entire specifications. Information about the Greenbook can be found at: <http://www.greenbookspecs.org/index.asp>