

K You Should **Know**



A Message from the American Concrete Pipe Association

Bulletin No. 117

DOT's Take ACTION Regarding Flexible Pipe

Texas DOT

The Texas DOT (TxDOT) allowed a field change "Special Specification" to use 18" through 36" corrugated polyethylene (PE) pipe with an interior liner in lieu of concrete pipe on a large project when the contractor claimed to provide TxDOT with a \$15,000 savings. The TxDOT approval included proper installation for the PE pipe with "flowable fill" backfill under the roadways. The contractor then withdrew the \$15,000 savings but PE pipe was still chosen at the same cost as concrete pipe.

Investigation of the completed project revealed excessive deflection, cracking, joint separation, seam splitting and buckling of the PE pipe. These problems occurred even though the pipe was installed properly. The poor performance of the PE pipe resulted in extra cost which was over and above the original bid for concrete pipe.

The TxDOT contracted to have the PE pipe monitored. Based on the results, TxDOT rescinded the "Special Specification" which had allowed thermoplastic (PE and PVC) pipe. A memorandum requires TxDOT engineers who desire to use thermoplastic pipe to furnish design submittals for review on a case-by-case basis.

Florida DOT

Recent investigations of installations using corrugated polyethylene pipe with an interior liner revealed the defects of excessive deflection, cracking and buckling. A Florida DOT memorandum states "the need for closer inspections during handling and installation of flexible pipes, including measurement of deflection of the pipe during and after installation". The inspections, which are to be documented, are "to insure that the structural aspects of flexible pipe are not compromised" and to "verify that the deflection of the pipe does not exceed 5% of the nominal diameter of the pipe". The memorandum states that "of most importance is the integrity of the soil envelope which is a critical component of the structural performance of the flexible pipe design".

In addition, the standard specifications are being revised to include requirements for the manufacture and quality assurance of metal and plastic drainage products. The City of Orlando has already adopted these Florida DOT guidelines and other cities and counties are expected to follow suit.

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Illinois DOT

After a comprehensive three year evaluation, a committee of Illinois DOT officials restricted the use of flexible pipe (corrugated metal, polyvinyl chloride, and polyethylene) to least critical applications on low volume roads. At the same time, the committee recommended no restrictions on the use of concrete pipe. Therefore, only concrete pipe is allowed on high volume roadways and in the most critical applications.

The committee found "...the Department has historically considered concrete pipe as the most reliable material for both pipe culverts and storm sewers, due to its inherent strength and rigidity..." They recommended no restrictions on its use (from diameters of 12 through 108 inches). Conversely, they found that corrugated metal pipes (CMP's) "...have not been allowed in higher type uses because of their lack of long term durability" and recommended that CMP's continue to be allowed only for less critical pipe culverts. The committee's investigation of plastic pipe revealed "...for plastic pipes, most of the load carrying capacity of the soil/pipe envelope is provided by the soil envelope. Therefore, if the pipe is not back-filled properly, the pipe may fail."

The committee had the following comments on the subject of risk. "There is an element of risk involved when a piping system is dependent upon backfill materials and procedures. The committee feels it is appropriate to mitigate this risk by differentiating where rigid and flexible pipes are allowed. This approach is not to say that flexible pipes are expected to fail. Rather, it is a means to address the risks, system wide, associated with a piping material that is very dependent upon proper construction procedures for its performance, in the case of plastic pipes; and as a means to address the differences in long-term durability, in the case of CMP's."

Other restrictions placed on all flexible pipe are as follows:

- Pipe shall be backfilled with aggregate to one foot over the top of the pipe.
- Pipe and its embedment shall not be disturbed when using movable trench boxes and shields.

Additional restrictions on polyvinyl chloride and polyethylene pipe are:

- Diameters are limited to 12" through 36".
- Pipe will be tested for deflection not less than 30 days after installation.