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Ideas & Opinions

Something fishy with failures?

High-density polyethylene pipe and reinforced concrete pipe are not interchangeable.

The April 2009 collapse of the plastic drainage system at a state-of-the-art fish hatchery in Jasper, Texas, should send shudders throughout the civil engineering community. Not only was the failure entirely avoidable, virtually everything that could go wrong, did go wrong:

Completion of the \$27 million Texas Parks and Wildlife Department project was delayed by more than a year, thanks to an improperly designed pipeline and inadequate installation, a resulting follow-up investigation, months of legal jockeying by various parties hoping to avoid or mitigate their liability and, finally, a complicated repair process.

After breaking ground in July 2008, the hatchery was scheduled to open in March 2010. Now, the department hopes to complete construction in June 2011.

HDR/FishPro, the design firm that managed the project, absorbed nearly 100% of the financial liability for the repairs. The Omaha, Neb.-based company eventually agreed to cover \$3.2 million of the \$3.3 million bill. That figure doesn't include the hefty legal tab the company surely incurred.

In the end, roughly 11,000 feet of high-density polyethylene (HDPE) pipe was replaced with 2 miles of reinforced concrete pipe (RCP) and polyvinyl chloride (PVC).

An avoidable failure

Designed to raise roughly 5 million Florida bass, blue catfish, and bluegill every year, the John D. Parker East Texas Fish Hatchery's construction was funded entirely by Texas anglers who bought millions of specially commissioned \$5 freshwater fishing stamps.

The failure was discovered in April 2009 when inspectors found sections of 60-inch and 48-inch HDPE pipe had collapsed under 10 to 17 feet of earth fill. An engineering firm hired to investigate the matter pinned the blame on the design firm. A replacement de-

Photo: Texas Parks and Wildlife Department



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sign determined that 60-inch and 48-inch corrugated HDPE pipe should be replaced with reinforced concrete pipe and more rigid PVC should be substituted for the smaller diameter, 30-inch HDPE drainage pipes.

As Todd Engeling, the parks and wildlife department's chief of inland hatcheries, says, "We came out of this deal with a drainage system that's much more rigid and robust than what we originally had, and that's a good thing."

That statement is undeniably true. Unfortunately, the lesson cost his department \$140,000 and a year of downtime.

It appears that the first and biggest mistake was in specifying HDPE for an application that was much more suited to reinforced concrete. It was an accident waiting to happen from the very beginning.

Corrugated HDPE pipe is flexible, so a successful installation is driven by the soil envelope that surrounds it. It's imperative that designers and engineers account for a wide range of pipe-soil variables ranging from material properties to installation conditions to external loads, any of which can lead to catastrophic failure. If design and installation aren't essentially perfect, the chances of failure at some stage are unacceptably high.

Reinforced concrete is load-bearing, rigid pipe designed, built, and tested as a structure before it arrives at the jobsite. As a result, it's almost universally backed by manufacturers' warranties. It's ideal for most ap-

plications, and successful installation isn't contingent on a plethora of complex environmental variables.

In short, there are vast engineering differences between the two materials, so engineers must understand that HDPE and RCP are not interchangeable.

Read the manufacturer's warranty

As the Jasper failure illustrates, when something goes wrong with an HDPE installation, the liability almost always rests with the designers and/or engineers, not the manufacturer. HDPE pipe warranties make it clear the manufacturer's not responsible when the product is specified for unintended purposes or is improperly installed. Disproving those two factors is extremely difficult when so many variables are in play onsite.

That explains why drainage designers and engineers need to research and analyze a number of factors and conditions for the intended application before specifying the type of pipe to be used, since it has now become standard practice in the industry and thus represents, as is required by, the industry's standard of care.

Don't rely on inspectors to ensure HDPE design and installation plans are correct. In many states, including Texas, budget belt-tightening has led to the dismissal of a large number of qualified inspectors, leaving those still employed with a heavier workload than they should be expected to effectively handle. Relying on these over-taxed profession-

als to identify one of the myriad issues that could negatively affect an installation's success is risky business.

While the fish hatchery debacle is just one of many similar cautionary tales, it should serve as a wake-up call to every civil engineer and drainage-pipe contractor for the stark lessons it offers.

First, engineers must recognize that the designs of HDPE and RCP piping systems are vastly different. Designing an HDPE system under the same conditions that would be perfectly acceptable for an RCP system invites the unacceptable risk that the plastic piping won't perform as intended or, worse, ultimately fail.

On top of that, because of the way HDPE pipe manufacturers have devised their warranties, liability often falls back on the engineer. Even if a legal judgment is averted, the damage to your professional reputation — not to mention your bank account — could be substantial.

Learning from the mistakes of others is much less expensive. **PW**



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