



Know the Risks and Specifications for Using Plastic Drainage Pipe

Proper Specifications – When designing high density polyethylene (HDPE) or polypropylene (PP) storm pipe systems, do not use rigid concrete pipe installation specifications or trench details. Rather, use the appropriate ASTM D2321 and AASHTO LRFD Bridge Construction Specifications (Section 30) to ensure a proper installation and minimize risk.

Groundwater – When groundwater elevation is above the plastic pipe invert, there is risk of flotation or hydrostatic buckling. Many DOT's and ADS Tech Note 2.01 cover height tables assume "pipes will be installed at or above the established water table." In July, FDOT stated that "it is the responsibility of the Engineer of Record to make sure the pipe has the minimum design cover to prevent flotation."

Minimum Cover – Plastic pipe has a density less than water and is therefore buoyant. Plastic pipe needs to be installed deep enough to provide sufficient soil weight to counter buoyancy and to distribute construction loads and other heavy vehicle loads. ASTM D2321 Sec. 7.6 directs the Engineer to require 36 inches or one pipe diameter, whichever is greater, for Class II embedment. Alternatively, anchoring systems may be used.

Flammability – Thermoplastic pipe is flammable. In 2017, sections of an HDPE storm drainage system melted during the Santa Rosa, CA fires. In 2008, a HDPE storm pipe stockpile on a construction site at Veterans Memorial Park in Beacon Hill, FL burned. Following the I-85 bridge collapse, GDOT prohibits storage of plastic pipe under bridges. Fire risks should be considered in drainage designs, just as for above-ground structures.

Resilient Connections – When a flexible pipe deflects, a rigid grout connection to a precast structure can fracture thereby compromising the seal. ASTM D2321 Sec. 7.10 requires the use of flexible water stops, resilient connectors, or other flexible systems approved by the Engineer.

Trench Width – A properly sized trench width is critical to constructing the engineered soil structure embedment for plastic pipe. Too narrow of a trench – especially in cases of low blow count in-situ soils – can compromise the lateral soil resistance, leading to excessive deformation. At a minimum, AASHTO instructs the Engineer to require a trench width of $1.5 \times (\text{Pipe O.D.}) + 12$ inches. In the case of low blow count in-situ soils with poor lateral resistance, ASTM D2321 instructs a trench width of $3 \times (\text{Pipe O.D.})$.

Trench Box Risks – The movement of a trench box disturbs the pipe backfill and compromises the soil structure. ADS Technical Note 5.01 recommends a trench width of $5 \times (\text{Pipe O.D.})$ if using a trench box.

Backfill / Trench Zones – Plastic pipe should not be installed the same as concrete pipe. AASHTO and ASTM D2321 require compacted backfill to at least 6 inches above the plastic pipe crown. Concrete pipe installation specifications require compacted fill only to the pipe springline.

Backfill Materials – Since the soil structure accounts for approximately 90% of the composite strength in a plastic pipe-soil system, the quality of backfill soils is critical and may exclude the use of native soils. Specifying ASTM D2321 Class I (crushed rock) and Class II (A1/A3/GW/SW) materials is advised.

Inspection and Certification – No sooner than 30 days following installation, plastic pipe systems should be internally inspected using visual/video and shape profiling technology. Concrete pipe systems should also be visually/video inspection upon installation. AASHTO Section 30 states for plastic pipe "deflections that exceed 5% of the initial inside diameter may indicate that the installation was substandard". AASHTO goes on to say "Installed pipe deflections that exceed 7.5% of the initial inside diameter will require remediation or replacement of the pipe." The final inspection may be the only "insurance" of a properly installed and structurally durable pipe system.



Know the Full Cost of Installing Plastic Pipe

System Strength

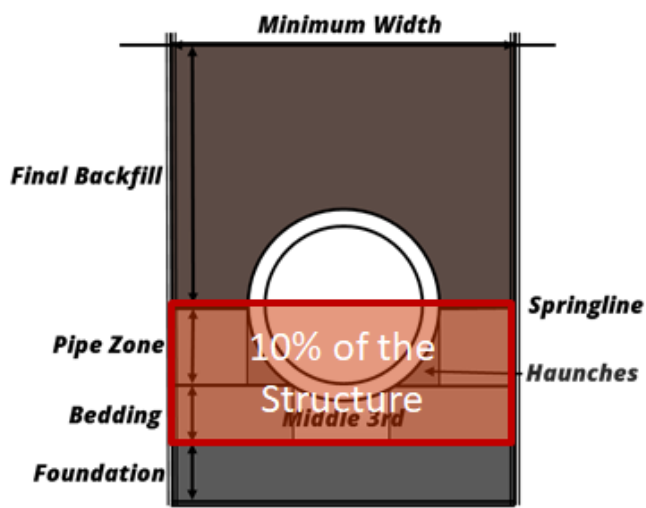
There are fundamental differences between concrete pipe (rigid pipe) and plastic pipe (flexible pipe). One fundamental difference is that rigid pipe is inherently structural whereas flexible pipe is essentially a liner and the structure is built in the field (i.e. the soil embedment).

Example: 36" concrete and plastic pipe installed in a trench with 10' of cover over top of pipe.

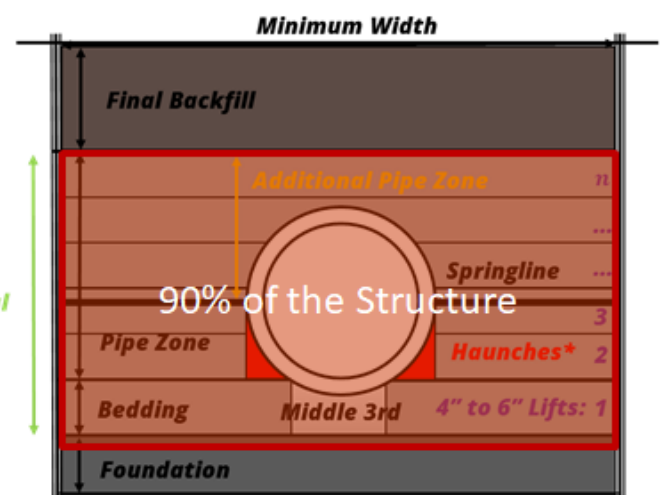
Can they be designed and constructed the same way?

Rigid

Flexible



Structural



***Knifing required in haunches and corrugations**



3 ft³/linear ft. Granular Backfill



10 ft³/linear ft. Granular Backfill

Installation Specifications

- RCP: ASTM 1479 and AASHTO LRFD Bridge Construction Specifications Section 27
- Plastic: ASTM D2321 and AASHTO LRFD Bridge Construction Specifications Section 30
- Trench Width: RCP O.D. +24", plastic 1.5 (O.D.) +12"
- Structural Embedment: RCP to Springline, Plastic 12" above crown of pipe
- RCP specifications allow a wide range of backfill materials (A-1 thru A-6), possibly eliminating the need to import fill
- Plastic pipe generally requires more compaction lifts, select material, and more density testing, all added costs to the owner.
- Plastic pipe should be deflection tested with a mandrel or laser profiler

Installed Concrete Pipe is more Economical!