A User's Guide:

Adhering to Federal Regulation 23CFR625 in the Design of Buried Culverts

Background: In 2013, following the passage of MAP-21 which contained language granting the states autonomy on the selection of culvert pipe material type, the FHWA issued language addressing the culvert design issue in their Final Rule which was published in the Federal Register on January 28, 2013. In that rule they wrote: ***"Although section 1525 gives the States the autonomy to determine culvert and storm sewer material types, section 1525 does not relieve the States of compliance with other applicable Federal requirements, such as Buy America, culvert design standards in 23 CFR part 625…"***

FHWA July 2016 Email: On July 20, 2016, the FHWA sent an email to all of their district offices reiterating the design requirement noting the following: ***"While these requirements are routinely and rigorously applied to bridges and bridge-sized culverts, I wanted to remind you that they also extend to other applications such as smaller culverts, structural supports for signs, luminaires, traffic signals and buried pipes."***

23CFR625: Currently, section 23CFR625 of the Federal Regulations refers to: "AASHTO LRFD Bridge Design Specifications, 7th Edition, AASHTO, 2014, with 2015 Interim Revisions" for use in designing buried structures, including culverts.

AASHTO LRFD Bridge Design Specifications: Section 12 of these specifications covers the designs of concrete pipe, metal pipe and plastic pipe.

Concrete Pipe Designs in Section 12 can be performed using either Indirect or Direct design. The Indirect design method can be used with the latest edition of ASTM Specification C 76 "Standard Specification for Reinforced Concrete Culvert, Storm Drain, and Sewer Pipe" and can be used in conjunction with ASTM Specification C-1479 "Standard Practice for Installation of Precast Concrete Sewer, Storm Drain, and Culvert Pipe Using Standard Installations".

Plastic and Metal Pipe designs, because they are highly dependent on the soil/pipe envelope for structural strength and support, must be direct designs as soil types and properties are different at virtually all installation locations. Additionally, plastic pipe designs rely heavily on the pipe wall profile which is different for every pipe manufacturer. **Consequently, the use of typical fill height tables as a substitute for pipe/soil structural design is not valid.**

Pipe Design Notes: A series of ePipe Design notes assist the engineer in some inconclusive areas of the plastic pipe design standard. The standard is silent on the use of trench boxes for construction. Without proper research into trench design arching factors, a question arises as to the accuracy of designs using trenches. Additionally, the use of sand backfills and water table levels, and resulting hydrostatic forces on plastic pipe need to be addressed by the designer beyond the guidelines in the specification.

Technical Information Resources:
The Importance of the Gradation of Sands With Respect to Structural Backfill Support for Plastic Pipe - Resource # e-020
Flexible and Rigid Pipe Installation Review and Discussion - Resource # e-022
Trust but Verify - Resource # e-023
Water Table Concerns for Storm Drains and Culverts - Resource # e-025
Plastic Fill Height Table Pitfalls - Resource # e-027
The Plastic Pipe Profile Predicament - Resource # e-028