Concrete and Flexible Pipe Installation Considerations
For Inspectors and Contractors

System Strength
There are fundamental differences between concrete pipe (rigid pipe) and plastic pipe (flexible pipe). One fundamental difference is that rigid pipe is a structure whereas flexible pipe is essentially a liner and the structure is built in the field.

Example: 36” concrete and plastic pipe installed in a trench with 6’ of cover over top of pipe.

How Critical is Installation?
Installation is critical to the strength of the flexible soil / pipe system. In this example HDPE pipe only contributes 5% whereas RCP contributes 90% of the structural strength of the soil/pipe system. Therefore, post installation inspection is imperative to ensure the constructed flexible soil / pipe system was properly built.

General Note to Inspectors
The Engineer of Record must approve any deviation from the requirements in the Contract Documents due to the high dependence of the HDPE pipe system strength on the compacted soil and other installation requirements. Examples would include, but not be limited to soil type, density requirements, trench width, use of trench boxes, water table or wet trench conditions, and minimum cover before allowing construction equipment to cross over the trench.

Plastic Pipe Trench Box Detail
"If it is necessary for a trench box to be dragged through a trench, do not raise the box more than 24" above the work surface. Another alternative for when the box will be dragged is to use a well-graded granular backfill material at least two diameters on either side of the pipe and compact it to a minimum of 90% standard Proctor density before moving the box." ADS Technical Note, TN 5.01, March 2009

Failure to adhere to these trench box requirements or other HDPE manufacturer recommended procedures could void the product’s warranty, increase the project’s risk of failure, and jeopardize your professional liability.
Different Design Considerations

- Rigid pipe (RCP) can provide the majority of the structural load carrying component of the pipe/soil system. Designers must understand and select proper pipe class for construction method.
- Soils placed around flexible pipe in flexible soil/pipe systems carry major load of the pipe. Designers must properly predict soil strength component in designs and must confirm construction of the soil structure does not change during construction.

AASHTO - Concrete Pipe Standard Installation

Different Installation Methods

- RCP installations (Type 1-3) require structural embedment materials placed only up to springline.
- RCP structural embedment materials may be in-situ materials in many cases.
- Placement of materials in haunch for RCP not as critical as flexible pipe.
- Flexible pipe structural embedment materials placed to a height of one foot above pipe.

Different Inspection Techniques

RCP (AASHTO Sect. 27.6.1) = Inspect for structural damage/defects (cracks, spalling, etc)
- Cracks ≤ 0.01" = no issue, no action
- Cracks > 0.01" and ≤ 0.10" = evaluation by PE
- Cracks > 0.10" = evaluation by PE for repair or replacement

HDPE (AASHTO Sect. 30.5.6) = inspect for control of deflection = structural confirmation of system
- Deflection ≤ 5% = no issue, no action
- Deflection > 5% but ≤ 7.5% = evaluation by PE
- Deflection exceeding 7.5% = evaluation by PE for repair or replacement

CMP (AASHTO Sect. 26.5.7) = inspect for control of deflection
- Deflection exceeding 7.5% evaluation for repair or replacement

Inspection methods include the following:
- Video combined with laser deflectometer = check deflection
- Mandrels also may be used for deflection testing
- Video + micrometer used to measure cracks, joint gaps for all types

Plastic Pipe National Standards

AASHTO Section 30

ASTM D2321