American Concrete Pipe Association
Professional Product Proficiency
A Technical and Sales/Marketing Training Program

ACPA Technical Series

Module I: Basic RCP
Course 3: Storm Water Pipeline Installation Using Reinforced Concrete Pipe

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Required Reading:

Pipeline Installation by Amster Howard (available at Amsterhoward.com/book)
Standard Installations Brochure ACPA #07-126
Concrete Pipe and Box Culvert Installation Manual ACPA #01-103
ASTM C 1479 - Standard Practice for Installation of Precast Concrete Sewer, Storm Drain and Culvert Pipe Using Standard Installations
ASTM C 443 - Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets
Concrete Pipe Joints, Your Best Choice, ACPA #07-124

Storm Water Pipeline Installation
A buried pipeline is a system that incorporates both the properties of the pipe and the properties of the soil surrounding the pipe. Generally, rigid pipe must be supported on the bottom of the pipe and flexible pipe must be supported on the sides of the pipe. Proper soil support is critical to the performance of all types of pipe, and proper inspection is essential in obtaining proper installation. The scope of this first training module will concentrate on reinforced concrete pipe. Later modules will investigate the particular demands and installation requirements for flexible pipe systems. With all pipe systems, four factors in the installation are critical:

- adequacy of soil in the trench walls and foundation
- type of soil used for bedding, embedment and backfill
- distribution of soil around the pipe
- density of soil around the pipe

Fundamentals
Pipeline Installation (1-1 thru 1-30)
ASTM C1479
Standard Installations
Concrete Pipe Installation (p.1 - p.7; p.62 - p.68)

Become familiar with the components of a pipeline trench cross-section:

- foundation
- trench walls
- bedding
- embedment
- haunch area
- backfill
- cover and fill height
in situ (soil)

Understand the major properties and distinctions between trench installation and embankment installation.

Become familiar with the various pipe shapes and types of pipe wall used in storm sewer construction.

Become familiar with the various components of storm water pipe.

Become familiar with the various terms and components and storm water pipe joints.

Become familiar with soil terminology, especially as it relates to the Unified Soil Classification System (USCS); pay particular attention to the terms listed below:
- fines
- sand
- gravel
- cobbles
- boulders
- clay
- silt
- poorly graded / well graded

Understand the major characteristics and differences between rigid and flexible storm water pipe, including:
- the major types of rigid storm water pipe
- the major types of flexible storm water pipe
- principal characteristics of rigid pipe and their impact on pipeline design
- three-edge bearing test and the significance of the .01 inch crack
- soil strength, as measured by the bedding factor (three component factors)
- relationship: bedding factor, field maximum load, three-edge bearing load
- five major soil and installation factors that contribute to RCP failure
- principal characteristics of flexible pipe and their impact on pipeline design
- relationship: percent deflection and performance of flexible pipe / pipe joint
- relationship: flexible pipe deflection, pipe stiffness, soil stiffness
- relationship: flexible pipe deflection, local deformation, deflection over time

**Trench Excavation**

*Pipeline Installation (3-1 thru 3-10)*

ASTM C1479

*Concrete Pipe Installation* (p.8 - p.15)

Understand the importance of excavating the pipeline trench properly the first time

Factors determining trench width and steepness of the trench wall

Factors in handling the spoil pile and related OSHA regulations
Trench wall support - intersecting trenches - shoring and sheeting - trench boxes

Groundwater control - surface water control

**Foundation**

*Pipeline Installation* (4-1 thru 4-10)

ASTM C1479

Function and importance of pipeline foundation

Hard, soft, and expansive soil foundations and construction remediation for each

Design and construction considerations for transition from hard to soft foundation

**Trench Walls**

*Pipeline Installation* (5-5 thru 5-6)

ASTM C1479

Importance of trench walls in assuring 'lower side' can adequately support overfill

**Bedding**

*Pipeline Installation* (6-1 thru 6-8; Appendix A)

ASTM C1479

*Standard Installations*

*Concrete Pipe Installation* (p.15 - p.35)

Bedding materials and the purpose of bedding in RCP installation

Placement, thickness and compaction of bedding for RCP

Construction considerations for bedding design and installation

Importance of the bell hole in RCP installation

**Joining Pipe**

*Pipeline Installation* (7-1 thru 7-20)

ASTM C1479

ASTM C443

*Standard Installations*

*Concrete Pipe Joints, Your Best Choice*

*Concrete Pipe Installation* (p.36 - p.47)

Joints used in construction of reinforced concrete storm sewers, and their characteristics

Procedures in installing reinforced concrete pipe joints

Pulled joints - what are they, how are they made, what is the maximum pull
Embedment
Pipeline Installation (8-1 thru 8-14; Appendix A)
ASTM C1479
Standard Installations
Concrete Pipe Installation p.15 - p.35

Embedment, its purpose, and how it differs from bedding
Required soil support - rigid pipe
Soil strength and soil stiffness
Embedment materials, their placement and compaction or reinforced concrete pipe
Embedment construction considerations
Migration of fines in the embedment material, in the trench wall, and its prevention

Backfill
Pipeline Installation (9-1 thru 9-8)
ASTM C1479)
Standard Installations
Concrete Pipe Installation (p.48 - p.50)

Backfill and its purpose in RCP storm sewer installation

Backfill soil types and maximum particle size

Backfill construction considerations and compaction requirements for RCP