

REINFORCED CONCRETE PIPE AND FLOWABLE FILL

Flowable fill, also known as controlled low strength material (CLSM), flowable mortar, or controlled density fill (CDF) results from a mixture of sand with a minimal amount of cementitious material such as fly ash and Portland cement mixed with high concentrations of water to produce a back fill material of 80 – 150 psi.

Flowable fill material can be useful for buried pipe installations where proper compaction of soil in the haunch area around the pipe is a concern. Concerns regarding compaction can result from minimal room available in the trench for compaction, poor soil qualities in backfill material, or simply lack of capability to adequately compact the soil.

Some questions that arise from time to time relative to the use of Flowable Fill for Reinforced Concrete Pipe installations are addressed below:

In general, is Flowable Fill recommended for Reinforced Concrete Pipe (RCP) installations?

NO

Reinforced Concrete Pipe can be designed to perform in many different installation conditions without the need for expensive flowable fill products. Standard installation types have been defined in the American Concrete Pipe Association Design Data 9 document titled "Standard Installations and Bedding Factors for the Indirect Design Method".

By selecting a standard installation type, the engineer can determine the appropriate bedding factor for the pipe and calculate the required reinforced concrete pipe strength for the installation. Consequently, the design process takes advantage of the versatility of RCP to perform in a multitude of installation types.

Therefore, if the pipe installations are a concern, the pipe can be designed to provide a pipe strength based on a lesser quality installation. For example, one may design and specify the pipe for a Type 3 or Type 4 installation to accommodate anticipated poor installation or lack of inspection, instead of a Type 1 or Type 2 installation.

Does the use of Flowable Fill in RCP installations create a more conservative design?

NO

When using these standard installations, a flowable fill installation gains very little over a Type 1 installation which is 95% standard Proctor using a SW material (sand & gravel). All of the standard installations and the bedding factors for those installations are conservatively based on voids and soft inclusions occurring on each side of the invert from 15° to 40°.

When developing the standard installations and corresponding bedding factors, it was recognized the haunch areas of the pipe are difficult to compact and therefore, built into the design. This conservative approach to RCP design assures performance without the use of flowable fill materials.

Any exceptional situations where Flowable Fill should be considered for RCP installations?

In instances where a project is using the Direct Design Method for RCP, such as in special projects involving unusually large loading conditions on the pipe, one may implement the use of flowable fill type material to assure the potential of high stresses in the pipe are minimized which may govern the design.

If Flowable Fill were to be used in a RCP installation does it need to be placed up to the springline (1/2 the diameter) of the pipe?

NO

Being that the primary reason for using the flowable fill is to assure compacted material in the haunch area, it need only be placed to a height of ¼ of the pipe diameter. This would be equivalent to a 120° bedding angle.

The question of using flowable fill materials for RCP come about primarily since the use of flexible pipes became an option for some storm drain applications. A key point relative to RCP is that it can be designed to the strength required to fit the installation, whether it be poor or very good, without having to use flowable fill. Flexible pipe, however, typically have only one strength and have to change the bedding to fit the installation. RCP has high inherent strength whereas flexible pipe has very little inherent strength.