



STANDARD OPERATING PROCEDURE

CONTROLLED LOW-STRENGTH MATERIAL FOR PIPES IN LEVEES

24 February 2020

The following mix (per cubic yard) provides an excavatable controlled low-strength material suitable for encasing pipes through levees.

MATERIAL	DOSAGE
Portland Cement (ASTM C150 - Type I or II)	80-100 lbs. (Air temp. >32° F) or 150-175 lbs. (Air temp. <32° F)
Fly Ash (ASTM C618 - Class F, C, or N)	200-400 lbs. (Air temp. >32° F) or 200-300 lbs. (Air temp. <32° F)
Sand (ASTM C33)	2000-3000 lbs. (Depends on air, water & cementitious materials)
Potable Water	Dosed to create a water-to-cement ratio of 1.0 to 1.3
Air Content (ASTM C260)	10% to 20%
Unit Weight	110 pcf to 126 pcf
Shrinkage Reducing Material	Bentonite dosed at half the weight of the Portland Cement used, -- or -- a Shrinkage Reducing Admixture dosed at a rate recommended by the admixture manufacturer.

Important Notes:

- The addition of a Shrinkage Reducing Material is not optional.
- The 28-day strength should be between 30 and 300 psi.
- The increased air content is obtained using an admixture according to ASTM C 260.
- Higher Fly Ash amounts will increase the long-term strength gain.
- Increasing the fly ash will typically lower the water demand.
- CLSM will set faster in warmer weather and slower in colder weather.
- The higher the air content the more excavatable the final product will be.
- In addition to traditional placement, the CLSM can be placed by belt or pump truck and is more easily pumped by increasing the air content.
- It is possible to ‘float’ the pipe when placing CLSM. Anchoring the pipe or placing the CLSM in lifts are ways to prevent floating the pipe.
- In cohesive soils, where the excess ‘bleed’ water cannot be absorbed by the surrounding soil, the water must be suctioned off the top or allowed to migrate off of the top of the CLSM pour.
- The 3, 5 or 7 day compressive breaks are not necessarily indicators of the 28 day breaks.
- CLSM consistency - The fresh mixture shall have a consistency similar to that of batter and not be thin and watery. It shall be tested by filling an open-ended 3-inch diameter, 6-inch high cylinder to the top with the mixture and immediately pulling the cylinder straight up. The correct consistency will produce an approximate 8-inch diameter circular-type spread with no segregation.
- Mixes with stiffer consistencies may require minor vibration to ensure the areas beneath the pipe and within the haunches are fully filled, but the vibration should not induce bleed water.

