

## CONTROLLED LOW STRENGTH MATERIAL

**(CLSM)**, an easy-to-place, flowable material consisting of fly ash, cement, sand, water, and 8-25% entrained air, is a slurry when placed and a low-strength engineered material when hardened. It is self-leveling, so it requires no compaction or vibration. The compressive strength can be designed to range from 0.35 MPa (50 psi) to 8 MPa (1200 psi). With compressive strengths of less than 1 MPa (150 psi), CLSM can be readily excavated.

CLSM provides engineers, contractors and builders with a highly versatile, easy-to-use, low-cost material for projects including:

- Sewer and utility backfill
- Building excavations
- Foundation sub-base
- Temporary slabs
- Bridge abutment backfill
- Abandoned manhole fill
- Underground tank backfill
- Filling voids under concrete slabs
- Pipe bedding
- Culvert backfill
- Abandoned tank fill
- Retaining wall backfill
- Road base
- Slope stabilization
- Soil erosion protection

*(Some of these are specialty applications and may require additional engineering consideration.)*

### Cost Considerations

When used appropriately, CLSM is very cost competitive, and may reduce project time with fast and easy placement of materials, less equipment, and fewer people.

### Environmental Advantages

Using CLSM will increase utilization of coal combustion products from coal-fired power plants, which preserves landfill space and saves natural resources for future use. Incorporating fly ash in a concrete mix design also enables cement and concrete producers to reduce the greenhouse gas emissions associated with the manufacture of portland cement and concrete.

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## Advantages of Controlled Low Strength Material

- Easy to place by chute, conveyor, pump or bucket
- Self-leveling; does not require compaction
- Less labor-intensive than conventional backfill methods
- Allows for faster placement
- Eliminates excavation for underground backfill (i.e., abandoned sewer pipes, viaducts, etc.)
- Versatile mix designs adjust to meet specific project requirements
- More durable than compacted soil or granular fill
- Less permeable and more erosion-resistant than compacted soil or granular fill
- Excavatable using conventional equipment
- Requires less field inspection than soil backfills
- Rapid bearing strength allows faster return of traffic loads
- No voids are formed during placement or around embedded structures or components



- Reduced settlement and rutting under loading
- Allows narrower trenches because compaction equipment is not necessary
- Improved worker safety, since placement can be accomplished without entering trenches
- All-weather placement with proper site preparation
- Reduced equipment needs – no front-end loaders, rollers, or tampers
- No on-site storage of backfill materials necessary