



CONTROLLED LOW STRENGTH MATERIAL (CLSM)

What is CLSM?

Controlled Low Strength Material [CLSM] is an easy to place, flowable material consisting of Coal Ash, Bottom Ash (clinker), cement, water and on occasion, sand.

CLSM provides engineers, contractors and builders with a highly versatile, easy to use, low cost material for projects requiring backfill, temporary slabs, slope stabilization and erosion protection plus many more similar applications.

CLSM is a slurry when placed and a low strength engineered material when hardened. It is self-leveling and so 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 strength of less than 1 MPa (150 psi), CLSM can be readily excavated.

- 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 and around embedded structures or components
- Reduced settlement and rutting under loading
- Allows narrower trenches: compaction equipment is not required
- Improved worker safety: placement can be done without entering the trench
- All-weather placement with proper site preparation
- Reduced equipment needs: placed without use of front-end loaders, rollers or tampers
- Requires no storage of backfill material on-site

Applications

The applications listed provide an overview of how CLSM can be used. CLSM's high versatility means it can be designed to meet a wide variety of needs.

- Sewer and utility backfill
- Building excavations
- Foundation subbase
- 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

Note that some of these are special applications and may require additional engineering consideration.

Cost Competitive

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

Environmental Aspects

Using CLSM will increase utilization of coal combustion products from coal fired power generating plants, preserve landfill space and save natural resources for future use.

Incorporating Fly Ash in a concrete mix design also enables cement and concrete producers to reduce the GHG emissions associated with the manufacture of Portland Cement and concrete.

Coal Ash as a component in CLSM is considered a recycled material, presents no environmental concern and is not subject to approval under Canada's Environmental Protection Act.

Advantages of Controlled Low Strength Material

- Easy to place by chute, conveyor, pump, or bucket
- Self-leveling: does not require compaction
- Less labour intensive than conventional back fill 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

CIRCA

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