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## USE OF CONTROLLED LOW-STRENGTH MATERIAL (CLSM) AS CONTROLLED FILL

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# IR 18-1

References:

California Code of Regulations (CCR), Title 24, Part 2: California Building Code (CBC)  
2001/2007 CBC, Section 1803A.6  
2010 CBC, Section 1803A.5.9

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Discipline: Structural

This Interpretation of Regulations (IR) is intended for use by the Division of the State Architect (DSA) staff, and as a resource for design professionals, to promote more uniform statewide criteria for plan review and construction inspection of projects within the jurisdiction of DSA which includes State of California public elementary and secondary schools (grade K-12), community colleges, and state-owned or state-leased essential services buildings. This IR indicates an acceptable method for achieving compliance with applicable codes and regulations, although other methods proposed by design professionals may be considered by DSA.

This IR is reviewed on a regular basis and is subject to revision at any time. Please check the DSA web site for currently effective IRs. Only IRs listed in the document at [www.dgs.ca.gov/dsa/publications](http://www.dgs.ca.gov/dsa/publications) at the time of plan submittal to DSA are considered applicable.

\* Indicates alternative 2010 CBC section that may be used by community colleges, per 2010 CBC, Section 1.9.2.2.

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**Purpose:** This IR clarifies both the design and inspection/testing requirements for Controlled Low Strength Materials (CLSM).

**Scope:** The provisions of this IR are intended to apply to the use of CLSM as controlled fill (also referred to as engineered fill) in lieu of compacted soils, below foundations, within building pads and/or adjacent to retaining walls or other structures. This IR does not apply to the use of CLSM as trench backfill in locations remote from such structures.

**1. Definition:** CLSM is defined as a mixture of soils and/or aggregates, cementitious materials, water and sometimes admixtures that hardens into a material with a compressive strength between 50 and 1200psi. CLSM is not concrete.

**2. Soils Report:** The use of CLSM under or adjacent to foundations shall be addressed in the geotechnical engineering report for preparation of the site, prepared by a California registered geotechnical engineer. The effects of CLSM on the foundation design such as bearing capacity, friction coefficient, drainage, etc shall be clearly addressed.

If CLSM is proposed as an alternative to compacted fill during construction by change order or "field change document" (see *IR A-6: Construction Change Document Submittal and Approval Process*), a letter from the geotechnical engineer of record, shall accompany the change order or field change document approving CLSM as an alternative and stating any limitations that the geotechnical engineer feels are appropriate.

**3. General:** DSA approved documents shall describe the requirements for the use of CLSM including but not limited to locations, approximate depths, specifications for site preparation, specifications for CLSM materials and properties, and CLSM testing and inspection requirements.

**4. Specifications:** Specifications for CLSM shall include:

**4.1 Site Preparation.** Specifications for site preparation including, but not limited to minimum soils compaction underneath CLSM, minimum and maximum soil moisture content, etc., shall be approved by DSA.

**4.2 Required Properties.** Minimum compressive strength, consistency (including slump or flow), and any other relevant property requirements shall be specified. Relevant properties may include, but are not limited to, maximum particle size, unit

weight, and minimum strength within a specified time. If re-excavation is anticipated the compressive strength of CLSM should generally be limited to a maximum of 150 psi; see American Concrete Institute (ACI) 229R-99.

**4.3 Reinforcing.** CLSM used as controlled fill is not subject to the minimum reinforcing requirements of California Building Code (IBC) Chapter 19A (19\*) including Section 1907A.12 (1907.12\*).

**4.4 Mix Design.** Relative proportions by weight of cementitious materials, aggregates, water, and any admixtures required shall be specified.

Mix designs for CLSM shall be prepared and signed by a California registered civil engineer with experience in CLSM mix design.

**4.5 Mixing, Conveying, Placement and Curing.** Relevant requirements regarding mixing, conveying, placement and curing of the CLSM shall be specified. Leftover concrete from an earlier pour or other construction waste materials may not be used in place of CLSM.

**4.6 Sampling, Testing and Inspection.** Testing and inspection requirements shall be specified in accordance with Sections 6, 7, and 8 below.

**5. Drawings (or Sketches):** Location, approximate depth and dimensions (including minimum and maximum thickness) of CLSM placement shall be shown on DSA approved documents.

**6. Inspection:** Placement of CLSM shall be inspected by the project inspector. Inspection must also be performed by a qualified representative of the geotechnical engineer, in accordance with Section 1704A.7, unless waived. Also see *IR 17-7: Soils and Foundations Testing and Inspection*.

**7. Sampling:** When required, sampling of CLSM shall be performed in accordance with ASTM D 5971. A set of cylinders shall be sampled for each 150 cubic yards or fraction thereof of CLSM placed.

**8. Testing:** Compressive strength testing of CLSM shall be performed in accordance with ASTM D 4832, unless waived by DSA. Field testing for unit weight, air content, and/or other properties may also be required.