

SECTION 207

LEAN FILL CONSTRUCTION

207.1 GENERAL

LEAN FILL CONSTRUCTION shall consist of filling shallow excavations, pipe zones in deep excavations and as authorized by the ENGINEER, with LEAN FILL, a flowable mixture of Portland cement, aggregates, admixtures and water. It shall be identified by a unique design mix number as defined by the supplier. A design mix shall not be used on a project without written authorization of the ENGINEER.

207.2 REFERENCES

207.2.1 ASTM:

C31	C33
C94	C150
C172	C173
C192	C231
C260	C558
C618	C685
D1633	D2922
C3017	

207.2.2 ACI:

- 211
- 340.2R

207.3 PORTLAND CEMENT

207.3.1 Portland cement to be either or furnished under this specification shall conform to the requirements of ASTM C150. The type of cement shall be either Type I or Type II. "low alkali;" (LA) cement.

207.3.2 The CONTRACTOR shall submit certification of compliance signed by the Type and source (plant location), stating the Portland cement furnished to the cement manufacturer, identifying the cement project, and or used in the concrete delivered to the project complies with this specification. If required, certification of the Portland cement used for each day's concrete placement, shall be submitted to the ENGINEER for each type of cement and each design mix used on the project.

207.3.3 Portland cement used in the manufacture of LEAN FILL for a project shall be of the same brand and type for all LEAN FILL batched and delivered to a project under the authorized design mix identification, unless authorized by the ENGINEER.

207.3 AGGREGATES

207.4.1 Aggregates shall be sampled and ASTM tested as prescribed in said specification. The CONTRACTOR shall obtain a certification of compliance identifying the aggregates, reporting test results, and stating the aggregates comply with this specification.

207.5 AGGREGATE GRADING

207.5.1 The maximum nominal aggregate size shall be one (1) inch.

207.6 WATER

207.6.1 Water shall conform to the Made by requirements of ASTM C94.

207.7 AIR ENTRAINING ADMIXTURES

207.7.1 Air entraining admixtures shall conform to the requirements of ASTM C260, as authorized by the ENGINEER.

207.8 MINERAL AOMIXTURES

207.8.1 Mineral admixtures shall be fly ash complying with the requirements of Class "F" fly ash as specified in ASTM C618 and Section 101 of this specification.

207.8.2 Mineral admixtures shall be proportioned by weight as required to improve pumpability.

207.9 PROPORTIONING

207.9.1 The CONTRACTOR shall be solely responsible for the LEAN FILL design mix proportions either batched at and/or delivered to the site. A design mix shall be prepared in a laboratory under the direct supervision of a Registered New Mexico Professional Engineer. The testing

equipment used in the design/development testing shall be calibrated annually with calibration standards traceable to the National Bureau of Standards. Certificates of calibration shall be maintained at the laboratory for review by the ENGINEER. A copy of the certificates shall be submitted to the ENGINEER upon request. The mix shall be certified that it complies with the requirements of this specification.

207.9.1.1 The materials shall be proportioned such that if placed at maximum slump, the laboratory dry density, as determined from molded specimens, at 24 (+/- 4) hours, is equal to or greater than 95 per cent of the maximum dry density of the blended cement and aggregate, determined in accordance with ASTM D558. The dry density of the laboratory molded LEAN FILL specimens shall be computed based on the average unit weight of the compressive strength specimens, corrected for the moisture content at the time of testing.

207.9.2 The Portland cement content shall be one-half (1/2) sack, 47 lbs., per cubic yard in all LEAN FILL produced under this specification, except as noted herein, or as specified in the Supplemental Specifications, or plans or as authorized by the ENGINEER.

207.9.3 The combined aggregate gradation shall comply with the following limits.

SCREEN SIZE	% PASSING
1 in.	100
¾ in.	95-100
3/8 in	82-100
no.4	70-100
no.8	55-85
no.16	38-60
no.50	6-30
no. 100	2-10

The mix gradation, when plotted on a US Bureau of Public Road 0.45 Power Gradation Chart. shall be similar to the plots of the specified gradation limits in the shape of the characteristic gradation curve.

207.9.4 Air-entraining admixtures shall conform to the requirements of ASTM C260. Air entraining admixtures shall be proportioned to provide air entrainment of not less than 2 per cent, as authorized by the ENGINEER.

207.9.5 Water shall be proportioned as required.

207.9.6 The design mix shall be proportioned to provide a slump of not less than 5 inches and not greater than 8 inches.

207.9.7 The compressive strength of the design mix shall not exceed 60 psi at 28 days when sampled and tested in accordance with ASTM C172 and D1633, and as specified in this section.

207.9.8 Laboratory compressive strength test specimens shall consist of cylinders molded by pouring a sample of the design mix in two equal lifts, into drained rigid molds, conforming to the dimensional requirements of ASTM 0558, having a capacity of 1/30, +/-0.0004, c.f., with an internal diameter of 4.0, +/- .016, inches (4" dia. x 4.5" ht., nominal dimensions). Molds cut from PVC (SCHD40) pipe having the specified internal dimensions and volume of that specified in ASTM 0558 may be used. Molds shall be free draining at the base. If molds complying with the requirements of ASTM 0558 are used, they shall not be clamped to the base. A free draining base may be accomplished by setting the molds on plywood for molding and initial curing. The cylinders shall be cured in the molds for the first 24 +/-4 hours. After 24 +/-4 hours curing in the molds, the cylinders shall be extruded and cured until testing.

207.9.9 Laboratory strength test specimens shall be cured in accordance with ASTM C192. Test specimens shall not be cured in a curing tank.

207.9.10 Four (4) specimens shall be weighed, measured and tested for compressive strength in accordance with the requirements of ASTM D558 at one (1) day, seven (7) days, and two (2) at 28 days, respectively.

207.9.11 An optimum moisture maximum density relationship for the combined aggregates and cement, proportioned by weight as defined by the proposed blends of the aggregates and cement, shall be determined in accordance with the requirements of ASTM D558.

207.9.12 The LEAN FILL design mix submittal shall include but not be limited to

the following information, as directed by the ENGINEER:

- a. Certification of compliance of the design mix under the requirements of this specification,
- b. Certification of the component materials used in the design mix,
- c. Plastic characteristics of the design mix to include temperature, slump, air entrainment, wet unit weight, yield and cement factor,
- d. Performance characteristics of the hardened LEAN FILL to include the compressive strength of all test specimens and the corresponding average compressive strength, compressive strength test shall be reported for 1 day, 7 days and 28 days laboratory cure,
- e. Dry unit weight and moisture content of the compressive strength specimens at the time of testing, average dry unit weight for each test series reported as a percent of the maximum dry density as determined by ASTM D 558,
- f. The optimum moisture maximum dry density relationship for the combined aggregates and cement and a graphical plot of the moisture density relationship as determined in accordance with ASTM D 558 in the laboratory.

207.10 BATCHING, MIXING AND DELIVERY

207.10.1 Batching, mixing and delivery shall conform to the requirements of either ASTM C94 or ASTM C685. The CONTRACTOR shall provide to the ENGINEER with each load of LEAN FILL batched and delivered to the job site, before unloading at the site, a delivery ticket on which the information specified in the following table is printed, stamped or written, certifying said LEAN FILL.

TABLE 207

Name of LEAN FILL Supplier
 Delivery Ticket Number
 Date of Delivery
 Contractor
 Project (optional)
 Design Mix Number

Volume of LEAN FILL in Load
 Time Loaded
 Batched Weight of Cement
 Batched Weight of Fine Aggregate
 Batched Weight of Coarse Aggregate
 Batched Weight or Volume of Admixtures
 Weight or volume (gal.) of water batched/ added at the plant
 Reading of Mixer Drum Revolution Counter at the Start of Mixing
 Certification that the materials delivered are the same brand, type and source as the materials defined in the reference Design Mix, as authorized by the ENGINEER.
 Design Mix Target Proportions
 Weight or Volume (gal.) of water added at the site
 Weight or Volume of Admixtures added at the Job Site
 Signature & name of person who authorized the addition of water at the site and affiliation to project

207.11 TESTS

207.11.1 Lean Fill material tests shall be performed in accordance with the requirements of this specification. The supplemental technical specifications, or as required by the ENGINEER. Testing equipment used in the performance of specified testing shall be calibrated annually with calibration standards traceable to the National Bureau of Standards. Certification records shall be maintained at the laboratory for review by the ENGINEER. A copy of the certifications shall be submitted upon request to the ENGINEER. A test sample shall be taken in the field for each 150 c.y. or each day's placement, whichever is greater. Field testing shall include standard tests for slump, air entrainment, unit weight, temperature, yield and cement factor. A minimum of four (4) compressive strength specimens shall be molded from a single sample. The samples shall be molded in accordance with the requirements, of paragraph 207.8. Compressive strength specimens shall not be molded with material used either for slump or air entrainment tests. The cylinders shall be allowed to set for 24 (+/-4) hours in a closed plastic bad and then transported in the molds to the laboratory. The cylinders should be extruded from the molds and moist cured until

compressive strength testing. The samples shall be tested for compressive strength in accordance with requirement of ASTM 01633. One specimen shall be tested for compressive strength at seven (7) days, two (2) samples shall be tested for compressive strength at 28 days. Test results shall be reported to the ENGINEER, CONTRACTOR, and SUPPLIER, in writing, within four (4) days of completion of a test. Non-complying test results shall be reported within one working day after completion of a test.

207.11.2 Curing of field strength specimens for acceptance tests shall be conducted in accordance with ASTM C31. Cylinders shall not be cured in a water bath.

207.11.3 Field density/compaction tests in accordance with the requirements of ASTM 02922 and ASTM D3017 shall be taken at the rate of two tests per 150 c.y. of material or fraction thereof placed, as directed by the ENGINEER. The material shall either have an in-place density equal to or greater than 95% of maximum dry density of the combined dry materials as determined under paragraph 207.8, or 24 hours cure, prior to placement of fill, subbase, base course, treated base, pavement or structure.

207.12 TEMPERATURE/ENVIRONMENTAL CONTROLS

207.12.1 When the ambient temperature at the time of placement is less than 40 degrees F, the temperature of the LEAN FILL placed shall not be less than 50 degrees F. The materials shall be cured at a minimum temperature of 40 degrees F for 24 hours after placement.

207.13 PLACEMENT

207.13.1 LEAN FILL shall be placed in lifts not exceeding four (4) feet in height, at time intervals of not less than 1 hour per lift, as authorized by the ENGINEER. Fill shall not be placed to a height above top of pipe exceeding two (2) feet when used to fill a pipe zone, nor placed full depth in a trench to finish subgrade elevation, unless authorized by the ENGINEER. Caution should be taken in placing material in the pipe zone to above the pipe. If the buoyancy of the pipe will result in flotation, the pipe should be anchored or filled with water to

counteract the buoy condition until the LEAN FILL densifies.

207.13.2 LEAN FILL shall not be placed in standing water and shall be protected from flooding for at least 12 hours after placement.

207.13.3 LEAN FILL shall not be placed on either frozen and/or saturated ground.

207.13.4 LEAN FILL shall only be vibrated after placement if required by the ENGINEER.

207.14 MEASUREMENT AND PAYMENT

207.14.1 Unless Lean Fill is specified in the specification or shown on the plans or required by the OWNER, the CONTRACTOR has the option of using Lean Fill in place of conventional backfill and compaction. The Lean Fill material, placement, and the disposal of the excess material generated by the use of the Lean Fill shall be considered incidental to the item of work in which it is used and no separate or direct payment will be made for Lean Fill.

207.14.2 When Lean Fill is specified in the specification or shown on the plans, it shall be measured by the cubic yard, complete in place. Payment for Lean Fill shall be at the contract unit price per cubic yard, complete in place, which shall include all labor, material and equipment required in placing the Lean Fill and removal and disposal of the excess material generated by the use of the Lean Fill.