

SECTION _____
**CAST IN PLACE CONCRETE FOR FLOOR SLABS ON GRADE THAT
WILL RECEIVE SEMI-PERMEABLE OR IMPERMEABLE FLOOR
FINISHES**

PART 1 - SCOPE

1.01 WORK INCLUDED:

- 1.1.1** This guide covers the work necessary to furnish and install, complete, cast in place concrete for floor slabs on grade, and all necessary items in accordance with these specifications and drawings. This specification is intended to provide concrete of sufficient quality to allow for the successful installation of very low permeability floor finishes and reduce the incidence of floor finishes failures due to common moisture-related problems in slabs on grade. This specification will help to minimize shrinkage cracks.
- 1.1.2** See CONDITIONS OF CONTRACT, and Division 1, GENERAL REQUIREMENTS, which contain information and requirements that apply to the work specified herein.

1.2 SUBMITTALS:

- 1.2.1** Drawings showing location of construction joints
- 1.2.2** Provide technical data sheets, application instructions and a 12"X 12" sample of vapor retarder
- 1.2.3** Concrete mix design and trial mix laboratory reports to include:
- a. Water-Cement Ratio
 - b. Slump
 - c. Air Content per ASTM C 231 or ASTM C 173
 - d. Aggregate gradation ASTM C 33
 - e. Rapid Permeability test results per AASHTO T 277
 - f. Compressive Strength per ASTM C 39
 - g. Mix Proportions of all ingredients
- 1.2.4** Independent laboratory certification that aggregates to be used are non-reactive.
- 1.2.5** Schedule of placement sequence.

- 1.2.6** Proposed curing schedule to include method and duration
- 1.2.7** Provide certification from the admixture manufacturer that the admixtures provided contain no chlorides.
- 1.2.8** Provide certification that the concrete batch plant has been tested and that all equipment is within the tolerances as set forth in the National Bureau of Standards Handbook No. 44.

1.3 QUALITY ASSURANCE:

- 1.3.1** Materials and work shall conform to the requirements of the latest version of the following codes, specifications, and standards. Should conflicts arise between these codes, specifications and standards, the more stringent shall apply.

ACI 301	Specifications for Structural Concrete for Buildings
ACI 302.1	Guide for Concrete Floor and Slab Construction
ACI 318	Building code requirements for Reinforced Concrete
ACI 360	Design of Slabs On Grade Aggregates
AASHTO T 277	Standard Method of Test for Rapid Determination of the Chloride Permeability of Concrete
ASTM C 33	Standard Specification for Concrete
ASTM C 94	Standard Specification for Ready-Mixed Concrete
ASTM C 150	Standard Specification for Portland Cement
ASTM C 260	Standard Specification for Air-Entraining Admixtures for Concrete
ASTM C 494	Standard Specification for Chemical Admixtures for Concrete
ASTM C 171	Standard Specification for Sheet Materials for Curing Concrete
ASTM C 138	Standard Test Method for Unit Weights, Yield, and Air Content (Gravimetric) of Concrete
ASTM C 618	Standard Specification for Fly Ash as a Mineral Admixture for Concrete
ASTM C 1240	Standard Specification for Silica Fume as a Mineral Admixture for Concrete

- 1.3.2** Engage a testing laboratory acceptable to the architect to perform material evaluation tests and to design concrete mixes.
- 1.3.3** Materials and installed work may require testing and retesting at any time during the progress of work. Tests, including retesting or rejected materials for installed work, shall be done at the Contractor's expense.

1.4 RELATED WORK SPECIFIED IN OTHER SECTIONS:

<u>Section No.</u>	<u>Item</u>
03210	Reinforcing Steel
03251	Expansion and Construction joints
05500	Fabricated Metalwork and Castings (Embedded Items)
07194	Under slab Vapor Retarder
07900	Joint Sealant
09400	Terrazzo
09500	Wood Flooring
09650	Resilient Flooring
09800	Special Coatings
—	Other

PART 2 - CONCRETE MATERIALS

2.1 GENERAL:

Final concrete mix proportion requirements shall be determined from the trial mix laboratory results. The following requirements shall be met:

Cementitious Content (minimum)	517 lbs / yd ³
Water-Cement Ratio (by weight)	.40 - .45
Maximum size Coarse Aggregate	1 1/2"
Air Content	4-6%
Slump (without high-range water reducers)	3 inches
Slump (with high-range water reducers)	6-9 inches
Compressive Strength (28 day)	5,000 psi
Permeability	LOW
Density	140 lbs. / ft ³

2.2 CEMENT:

Portland Cement Type II or at Contractor's option, the combination of Type I with fly ash or Type II with Silica fume mineral admixture. Cement shall meet the requirements of ASTM C 150.

2.3 WATER:

Water shall be potable, clean and free from oil, acid, alkali, organic or other deleterious substances and shall conform for ASTM C 94.

2.4 CONCRETE AGGREGATES:

Natural aggregates conforming to ASTM C 33. Aggregates shall not be potentially reactive as defined in Appendix XI of ASTM C 33. The contractor shall be responsible for meeting these specifications and shall import non-reactive aggregates if local aggregates are reactive. Aggregate shall be thoroughly and uniformly washed before use.

2.5 AIR ENTRAINING ADMIXTURE:

Admixture shall conform for ASTM C 260 and shall contain no chlorides.

2.6 WATER REDUCING ADMIXTURES:

Admixtures shall conform to ASTM C 494, Type A or Type D and shall contain no chlorides.

2.7 HIGH RANGE WATER REDUCING ADMIXTURES:

Admixture shall conform to ASTM C 494, Type F or Type G and contain no chlorides.

2.8 POZZOLAN ADMIXTURES:

The pozzolan to be used in combination with cement as previously specified shall conform to ASTM C 618, Class C or Class F, or ASTM C 1240.

2.9 MINERAL ADMIXTURE:

If submitted by the contractor and approved by the engineer, the silica fume mineral admixture used in combination with cement as previously specified shall be the dry compacted form. The contractors shall provide certification from the silica fume manufacturer that the silica fume meets the following quality criteria:

SiO2	85% minimum
Chlorides	0.5% maximum
L.O.I.	4% maximum
Moisture	3% maximum
Specific Surface	20 m2 / gram minimum
Bulk Density	30 lbs. / ft ³ minimum

PART 3 - RELATED MATERIALS

3.1 SUB-GRADE AND GRANULAR BASE:

Contractor shall require and receive certification that sub-grade is level and compacted, that there is a minimum of 4 inches of coarse aggregate or crushed rock, covered with a minimum of 2 inches of coarse sand.

3.2 VAPOR RETARDER (Formerly Vapor Barrier):

After slab areas have been dried in and protected from the elements, provide vapor retarder cover over granular base where indicated below slabs on grade. Use only materials which are resistant to decay, are efficient water retarders and are in accordance with ASTM E 1745, Class "C" 0.3 Perms, as follows:

- "Moistop" by Fortifiber Corporation
- "Claymax" by Clem Environmental
- "Volclay" by American Colloid
- or Equal

3.3 COMPACTABLE FILL:

If aggregate is placed above the vapor retarder, it must be dry and compactable such as 3/8" crushed rock, decomposed granite (DG), etc.

3.4 FORM MATERIAL:

Plywood, lumber, metal, or other acceptable material. Provide lumber dressed on at least two edges and on side, for tight fit. Do not use form materials that are designed to be left in place.

PART 4- EXECUTION:

Coordinate the placement of vapor retarders, forms, reinforcing steel, and joint materials.

4.1 VAPOR RETARDER

Install vapor retarder over compacted granular base to a water tight condition in accordance with the manufacturers' application instructions. The vapor retarder shall be continuous under the entire slab and all concrete below grade in compliance with ACI 504.

4.2 JOINTS:

Coordinate all joints with the structural engineer. Consult the drawings for detail conditions at joints.

4.3.1 CONSTRUCTION JOINTS:

Locate and install construction joints as indicated. If not indicated, contractor will provide shop drawings as per Section 1.2 of these specifications.

4.3.2 ISOLATION JOINTS:

Construct isolation joints at points of contact between slab and on grade and vertical surfaces and elsewhere as indicated.

4.3.3 CONTRACTION (CONTROL) JOINTS:

Construct saw cut contraction joints in accordance with ACI 302.1. Contractor shall insure that the contraction joints are saw cut to one-fourth the slab thickness as soon as possible without dislodging the coarse aggregate or raveling the concrete surface. Contraction joints shall be constructed in a pattern such that spacing between joints of any type will not exceed thirty-six times the slab thickness.

4.4 PRE-PLACEMENT INSPECTION:

The contractor shall inspect and complete all form work, reinforcing steel, and items to be embedded or cast in place.

4.5 PLACING CONCRETE FLOOR SLABS:

Comply with ACI 304 "Guide for Measuring, Mixing, Transporting and Placing Concrete" and ACI 302.1 "Guide to Concrete Floor and Slab Construction."

4.6 CONSOLIDATING:

Consolidate concrete by mechanical vibrating equipment supplemented by hand-spading, rodding or tamping. Do not use vibrators to move concrete horizontally. Insert and withdraw vibrators vertically only.

4.7 LEVELING:

Bring slab surfaces to correct level with straightedge and strike off. Use bull floats or darbies to smooth surface, free of humps or hollows. Do not disturb slab surfaces prior to beginning finishing operations.

4.8 FINISHING:

Apply light steel trowel finish to slab surfaces. After leveling, begin first trowel finish operation using a power-driven trowel. Begin final troweling when surface produces a ringing sound as trowel is moved over surface. Finished surface is to be free of trowel marks, uniform in texture and appearance and with surface leveled to tolerances of F_F30 / F_L20 with no measurement $< F_F15 / F_L10$. Do not burnish trowel the surface.

4.9 CONCRETE CURING AND PROTECTION:

4.9.1 GENERAL:

Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Begin initial curing as soon as free water has disappeared from concrete surface after placing and finishing, and the surface will not be marred. Keep continuously moist for not less than 7 days by the following methods:

4.9.2 MOISTURE CURING:

Keep concrete continuously wet by covering with water, continuous fog spray, or covering the surface with burlap absorptive cover, thoroughly saturating cover with water and keeping continuously wet.

4.9.3 MOISTURE RETAINING COVER:

Protect the concrete from damage and wear during other phases of the construction using temporary coverings as necessary. Remove temporary coverings prior to final inspection.

-- END OF SECTION --