

SECTION 03 00 00 - CONCRETE

PART 1 - NEW CONSTRUCTION

1. SUB-BASE COMPACTION

- A. Engage a licensed geotechnical consultant to investigate subsurface conditions and develop soil parameters for design and construction of foundations, ground-supported slabs, and pavement.

2. UNDERSLAB VAPOR BARRIER

- A. Provide minimum 15 mil sheet vapor barrier system with fully sealed edges and penetrations under all new interior slabs on grade. Vapor barrier shall have a permeance of 0.01 perms or less when tested in accordance with ASTM E1745, Section 7.

3. MINIMUM CONCRETE STRENGTH

- A. Concrete 28-day compressive strength shall be selected as required for the particular application and shall meet or exceed minimum strengths for the member-specific exposure conditions outlined in ACI 318. In general, concrete shall meet or exceed the following minimum strengths (or greater, as required by design or exposure condition):

1. Spread footings: 3,500 psi.
2. Grade beams, piers, and foundation walls: 4,000 psi
3. Slabs on grade: 4,000 psi
4. Slabs on metal deck: 4,000 psi
5. Structural concrete columns, beams, and slabs: 5,000 psi
6. Post-tensioned concrete: 5,000 psi
7. Concrete exposed to freeze-thaw conditions: 4,500 psi.

- a. Note: concrete exposed to freeze-thaw conditions shall have a minimum entrained air content of 6 +/- 1.5 percent.

4. SLABS ON GRADE – GENERAL

- A. Slabs on grade shall be constructed in conformance with ACI 302.1R “Guide for Concrete Floor and Slab Construction.”
- B. Interior slabs on grade shall receive a hard steel troweled finish unless noted otherwise.
- C. Exterior slabs on grade exposed to weather shall receive a light broom finish unless noted otherwise.

5. SLABS ON GRADE – MINIMUM THICKNESS

- A. Slabs on grade thickness shall be designed based on the stiffness of supporting soils and the loads applied to the slab surface. In general, slab on grade thickness shall meet or exceed the following minimums (or greater, as required by design):
 - 1. Light duty slabs (offices, classrooms, corridors, etc.): 4”
 - 2. Moderate duty slabs (maintenance buildings, shop areas, slabs subject to moderate forklift or passenger vehicle traffic, etc.): 6”
 - 3. Heavy duty slabs (for specialty equipment such as large frame mills, machining equipment, etc.):
 - a. Slab thickness shall be as required by design
 - b. Slabs supporting rotating or reciprocating equipment shall be evaluated to determine if they should be isolated from adjacent slabs on grade to help avoid vibration transmission.

6. SLABS ON GRADE – REINFORCEMENT AND JOINTING FOR CRACK CONTROL

- A. Slabs under 6” thick: Minimum of 1.0 lbs/cyd synthetic micro-fiber additive. Protruding fibers shall be removed by the concrete contractor after the slab is cured and prior to placement of floor finishes (if any).
- B. Slabs 6” and thicker: Minimum of 0.18% steel reinforcement (reinforcing bars spaced not greater than 18” on center or minimum 0.226” diameter welded wire reinforcement chaired sufficiently to maintain proper position within the slab)
- C. Provide control/construction joints in conventional slabs on grade as follows:
 - 1. Joint spacing shall not exceed 30 times the slab thickness nor 12’
 - 2. Slab sections between joints shall not exceed a 1.5 to 1 aspect ratio
 - 3. Joint pattern shall eliminate re-entrant corners in the slab to the greatest extent possible
 - 4. Note: Specialized methods to increase spacing of slab joints (such as heavy reinforcement, steel fibers, shrinkage-compensating concrete, etc.) may be considered by the Design Professional but are generally unnecessary and/or cost-prohibitive for most situations

7. SLABS ON GRADE – FLATNESS AND LEVELNESS REQUIREMENTS

- A. Unless more stringent flatness/levelness values are required by floor finish materials or items supported by the slab, the following minimum values shall apply:
- B. All slabs on grade unless noted otherwise:
 - 1. Overall FF/FL = 25/20; Minimum Local FF/FL = 20/15

2. Exposed shop/maintenance/storage slabs on grade:
 - a. Overall FF/FL = 35/25; Minimum Local FF/FL = 25/15
3. Polished concrete slabs on grade:
 - a. Overall FF/FL = 45/35; Minimum Local FF/FL = 30/25

8. SLABS ON GRADE – POLISHED CONCRETE

- A. Inclusion of polished concrete slabs on grade in a project must be carefully considered. Successful placement of polished concrete slabs requires a collaborative effort by the design/construction team. Conventional concrete always cracks so attention to cracking mitigation is essential. The following strategies should be considered for polished concrete:
 1. Limiting water-cement ratio of the slab concrete.
 2. Using synthetic fiber reinforcement in the concrete mix.
 3. Using internal curing admixture in the concrete mix.
 4. Using shrinkage-reducing admixture in the concrete mix.
 5. Limiting spacing of control/construction joints to not exceed 24 times the slab thickness, nor 12 feet.
 6. Eliminating re-entrant corners in the slab to the greatest extent possible.
 - a. Always conduct a pre-construction conference well in advance of slab placement to determine best practices to be followed by the construction team. The conference should include at a minimum the Design Professional, General Contractor, Concrete Producer, Concrete Contractor, and Concrete Finisher.
 - b. Always require a mock-up section of polished concrete slab on grade to confirm the ability of the construction team to produce slabs of the intended quality and finish and to establish a quality baseline.

9. SLABS ON METAL DECK – MINIMUM REINFORCEMENT

- A. Slabs on metal deck shall be reinforced with synthetic macro-fiber reinforcement with a dosage rate not less than 4.0 lbs per cubic yard (or greater if required by latest Steel Deck Institute requirements). Protruding fibers shall be removed by the concrete contractor after the slab is cured and prior to placement of floor finishes (if any).
- B. Additional #4 x 5'-0" reinforcing bars at 12" on center shall be placed 1" clear below the top surface of the slab, centered over all beams and girders at column lines to help restrain cracks that typically form at these negative moment regions of slabs on metal deck.

10. SLABS ON METAL DECK – CONSTANT ELEVATION VS. CONSTANT THICKNESS

- A. Concrete slabs on metal deck should be designed and placed to achieve a constant elevation. The Design Professional shall evaluate the stiffness of supporting steel framing and include additional concrete weight in the framing design due to combined deflections of primary and secondary framing and the steel deck.

11. SLABS ON METAL DECK – FLATNESS REQUIREMENTS

- A. All slabs on metal deck unless noted otherwise:
 - 1. Overall FF 25; Minimum Local FF = 20
- B. Match existing finish at existing construction.

12. SITE CONCRETE – EMBEDDED TACTILE MATS

- A. Coordinate with the specific campus for required embedded ADA-compliant tactile mats/tiles to ensure consistency and durability for the particular campus.

13. CONCRETE CONSTRUCTION – STRUCTURAL SPECIAL INSPECTIONS

- A. Provide Special Inspections for concrete construction in accordance with provisions outlined in the International Building Code, Chapter 17.

PART 2 - CONCRETE RENOVATION/REPAIR

1. INFILL SLABS ON GRADE

- A. Where slabs on grade are removed/replaced, the following shall apply:
- B. Existing slabs shall be removed by saw-cutting perimeter extents with straight, vertical cuts, unless noted otherwise.
- C. Subgrade for new slab concrete shall match that for the existing adjacent slabs and shall be compacted to a dense, firm condition.
- D. Underslab vapor barrier/retarder shall match the existing slab condition.
- E. Infill slabs shall be doweled to existing adjacent slabs to prevent differential movement. Dowel sizes and spacing shall be determined by the Design Professional but shall generally be at least #4 rebar at 18” on center epoxy-grouted a minimum of 6 inches into the existing slab and extending not less than 12” into the new concrete infill slab.
 - 1. Exception: Small infills less than 2’-0” maximum dimension in any direction need not be doweled.