1. **GENERAL**
	1. **SECTION INCLUDES**
		1. Cast‑in‑place concrete.
		2. Floors and slabs on grade.
		3. Control, expansion and contraction joint devices associated with concrete work including joint sealants.
		4. Concrete fill for steel pan stairs.
		5. Concrete for curbs, gutter, sidewalks and other site-related concrete is specified in Section 03 30 53 Sitework Concrete.
		6. Under slab termite control as specified in Section 31 31 16.
	2. **REFERENCES**
		1. ACI 301 - Structural Concrete for Buildings.
		2. ACI 318 ‑ Building Code Requirements for Reinforced Concrete.
		3. ASTM C33 - Concrete Aggregate.
		4. ASTM C150 ‑ Portland Cement.
		5. ASTM C171 ‑ Sheet Materials for Curing Concrete.
		6. ASTM C330 - Lightweight Aggregates for Structural Concrete.
		7. ASTM C1107 - Packaged Dry, Hydraulic - Cement Grout (Non-Shrink).
		8. ASTM D1751 ‑ Preformed Expansion Joint Filler for Concrete (Bituminous Type).
		9. Chapter 19A, California Building Code.
		10. UBC Standard No. 19-1 - Portland Cement and Blended Hydraulic Cements.
		11. UBC Standard No. 19-4 - Concrete made by Volumetric Batching and Continuous Mixing.
	3. **SUBMITTALS**
		1. Placement Schedule: Submit for approval details and/or sketches showing location of each proposed construction joint. Do not deviate from locations of horizontal joints indicated on drawings.
		2. Submit product data for each type of manufactured material and product included.
		3. Submit design mix for each concrete mix.
		4. Submit steel reinforcement shop drawings, including material, grade bar schedules, spacing, bent bar diagrams, arrangement and supports.
	4. **PROJECT RECORD DOCUMENTS**
		1. Accurately record actual locations of embedded utilities and components which are concealed from view.
		2. Maintain an accurate record showing date and time of concrete placement in each portion of structure. Correlate placing record for test cylinders made by testing laboratory. Maintain a separate record giving date of removal of forms, shoring, including first and second halves and re-shoring, if used. Keep records available for inspection at site. Upon completion, deliver two copies of each to Architect in approved form.
	5. **QUALITY ASSURANCE**
		1. Perform Work in accordance with Section 1905A, California Building Code, and ACI 318.
		2. Maintain one copy of all records.
		3. Acquire cement and aggregate from same source for all work.
		4. Conform to Section 1905A, California Building Code, when concreting during hot weather. No concrete placement permitted above 90 degrees Fahrenheit.
		5. Conform to Section 1905A, California Building Code, when concreting during cold weather. No concrete placement permitted below 50 degrees Fahrenheit.
	6. **COORDINATION**
		1. Coordinate the placement of joint devices with erection of concrete formwork and placement of form accessories.
2. **PRODUCTS**
	1. **CONCRETE MATERIALS**
		1. Cement: ASTM C150, Type I or II. Portland Type, conforming to Section 1903A, California Building Code and UBC Standard No. 19-1.
		2. Aggregates:
			1. Aggregate for Stone Concrete: ASTM C33.
			2. Combined Aggregate for Stone Concrete: Table 19A-J, California Building Code.
			3. Aggregate for Lightweight Concrete: ASTM C330.
		3. Conform to requirements specified herein for maximum size of aggregate permitted in individual applications.
		4. Water: Clean and not detrimental to concrete from domestic source.
	2. **ACCESSORIES**
		1. Bonding Agent: Polyvinyl Acetate Latex emulsion; HIBOND, manufactured by Lambert Corporation, Orlando FL, LOCK BOND NO. 906, manufactured by Macklanburg‑Duncan Co., City of Industry, CA, or equal as approved in accordance with Section 01600 for substitutions.
		2. Curing Film: ASTM C171; 4 mil thick, clear polyethylene film, single sheet, manufactured from virgin resin with no scrap or additives, free of visible defects, uniform in appearance, conforming to the following:
			1. Moisture Loss: 0.055 g per sq. cm.
			2. Tensile Strength: 1700 psi longitudinal, 1200 psi transverse.
			3. Elongation: 225 percent longitudinal, 350 percent transverse.
		3. Non‑Shrink Grout: Premixed compound consisting of non‑metallic aggregate, cement, water reducing and plasticizing agents; capable of developing minimum compressive strength of 5,000 psi in 24 hours and 8,000 psi in 7 days; of consistency for application and a 30 minute working time.
		4. Reinforced Vapor Barrier: Griffolyn Vaporguard as manufactured by Reef Industries, Inc., Houston, TX., use appropriate tape and pipe boots, or equal as approved in accordance with Section 01600 for substitutions.
	3. **JOINT DEVICES AND FILLER MATERIALS**
		1. Expansion Joint Filler: ASTM D1751; Closed cell, bituminous saturated fiberboard; 1/2 inch thick, FIBER EXPANSION JOINT manufactured by The Burke Company, or equal as approved in accordance with Section 01600 for substitutions.
		2. Expansion Joint Top: Integral extruded polystyrene plastic; 1/2 inch thick, with removable top strip exposing sealant trough, JOINT CAPS manufactured by The Burke Company, or equal as approved in accordance with Section 01600 for substitutions.
		3. Sealant: Polyurethane multi‑component type, non‑sagging or self leveling at flatwork, as specified in section 07900.
		4. Primer: As recommended by sealant manufacturer.
		5. Saw-Cut Joint Filler: Two-component epoxy resin, gray color, non-hardening, self-leveling, SIKADUR 51 (SL), by Sikacorp., Lyndhurst, NJ, or equal as approved in accordance with Section 01600 for substitutions.
	4. **CONCRETE MIX**
		1. Mix and deliver concrete in accordance with Section 1905A, California Building Code and UBC Standard No. 19-4. Deliver concrete in transit mixers only. Discharge loads in less than 1‑1/2 hours after water is first added.
			1. Design Mix: Method B, by an approved Testing Laboratory, certified by a registered Professional Engineer licensed in California.
			2. Do not exceed 0.45 water-cement ratio by weight for floor slabs and 0.49 for other concrete.
		2. Select proportions for concrete in accordance with the approved design mix.
			1. Required Strength: As noted on the structural drawings and below.
			2. Grout Mix: 1:3:2 Portland Cement to pea gravel, to sand, minimum 3000 psi at 28 days.
			3. Fill for Steel Pan Stairs: Same as grout mix, except add minimum amount of water to provide a low slump mix. Minimum 28 day strength: 2,000 psi. Install ASTM A185 6 x 6 ‑ W1.4 x W1.4 welded wire reinforcing at landing pans and install in tread pans KEYDECK mesh as manufactured by Keystone Steel and Wire Peoria, IL., or equal as approved in accordance with Section 01600 for substitutions.
		3. Provide concrete to the following criteria:

Min 28 day Max Max Size

Element Strength PSI Slump Aggregate

Grade Beams

and

Foundations 3,000 4 inch 1‑1/2 inch

(N.W. Conc)

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Flr. Slabs

on grade 3,000 4 inch 1 inch

(N.W. Conc)

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* + 1. Miscellaneous Sitework Concrete: Specified in Section 03 30 53, Sitework Concrete.
		2. Do not use admixtures containing chlorides for floor slabs.
1. **EXECUTION**
	1. **EXAMINATION**
		1. Verify site conditions.
		2. Verify requirements for concrete cover over reinforcement.
		3. Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely and will not cause hardship in placing concrete.
	2. **PREPARATION**
		1. Prepare previously placed concrete by cleaning with sandblasting to remove laitance and expose clean aggregate.
		2. In locations where new concrete is doweled to existing work, drill holes in existing concrete, insert steel dowels and pack solid with approved epoxy.
		3. When approved by the Architect, clean previously placed concrete with steel brush and apply bonding agent in accordance with manufacturer's instructions.
		4. Under interior slab on grade, unless otherwise noted on the drawings, install 4 inches of sand, place reinforced vapor barrier, and cover vapor barrier with 2 inches of sand, install #3 rebar 18” o.c. each way at mid depth of slab, prior to concrete placement.
		5. Seal all penetrations of vapor barrier and joints as recommended by manufacturer.
	3. **PLACING CONCRETE**
		1. Place concrete in accordance with Section 1905A, California Building Code. Remove loose dirt from excavations.
		2. Notify Architect and Project Inspector a minimum of 24 hours prior to commencement of operations. All excavations, forms and reinforcing shall be inspected and approved by the Project Inspector prior to placement.
		3. Ensure reinforcement, inserts, embedded parts, formed joint fillers, joint devices and accessories are not disturbed during concrete placement.
		4. Install joint fillers, primer and sealant in accordance with manufacturer's instructions.
		5. When detailed on the drawings, separate slabs on grade from vertical surfaces with 1/2 inch thick joint filler.
		6. Extend joint filler from bottom of slab to within 1/2 inch of finished slab surface using two‑component polyurethane sealant as specified in Section 07900.
		7. Install joint devices in accordance with manufacturer's instructions as detailed.
		8. Install construction joint device in coordination with floor slab pattern placement sequence. Set top to required elevations. Secure to resist movement by wet concrete.
		9. Maintain joint device in correct position to allow joint cover flush with finish.
		10. Install joint covers in longest practical length.
		11. Place concrete continuously between predetermined expansion, control and construction joints.
		12. Do not interrupt successive placement; do not permit cold joints to occur.
		13. Avoid segregation of materials. Perform tamping and vibrating so as to produce a dense, smooth application free of rock pockets and voids. Do not use vibrators to move concrete horizontally.
		14. Provide special mix prepared by the Testing Laboratory and approved by the Architect utilizing smaller aggregates in areas of reinforcing congestion to prevent the formation of rock pockets.
		15. Do not allow concrete to fall free from any height which will cause materials to segregate. Maximum height of free fall permitted in any case: 5 feet. Utilize trunks or additional chutes where doubt occurs.
		16. Construction Joints: Wash surface of each joint shortly after pouring to expose clean, sound aggregate. Sandblast surface to remove laitance remaining or loose aggregate as approved by the Architect. Conform to Section 1906A, California Building Code.
		17. Screed floors and slabs on grade level, maintaining surface flatness of maximum 1/8 inch in 10 ft. Slope floors for drains.
		18. Saw-cut slabs as approved by the Architect at 15 ft oc, maximum 225 sf, within 24 hours after placing, with 3/16 inch thick blade. Cut no deeper than 1/4 depth of slab thickness. Fill cuts with specified non-hardening epoxy. Completely fill cuts to surface of slab.
	4. **SEPARATE FLOOR TOPPINGS**
		1. Prior to placing floor topping, roughen substrate concrete surface and remove deleterious material. Broom and vacuum clean.
		2. Place required dividers, edge strips, reinforcing and other items to be cast in.
		3. Apply bonding agent to substrate in accordance with manufacturer's instructions.
		4. Place concrete floor toppings to required lines and levels. Place topping in checkerboard panels, maximum dimension not to exceed 20 ft.
		5. Screed toppings level, maintaining surface flatness of maximum 1/8 inch in 10 ft.
	5. **CONCRETE FINISHING**
		1. Provide formed concrete surfaces to be left exposed with smooth rubbed finish, as scheduled.
		2. Finish all slab on grade/floor surfaces to requirements of Section 03350.
	6. **CURING AND PROTECTION**
		1. Immediately after placement, protect concrete from premature drying, excessively hot or cold temperatures and mechanical injury.
		2. Maintain concrete with minimal moisture loss at above 50 degrees F temperature for period necessary for hydration of cement and hardening of concrete. Dusting with dry cement to absorb excess water is prohibited.
		3. Cure floor surfaces only as specified herein and in accordance with Section 1905A, California Building Code. Membrane curing compound method not permitted for interior cast‑in‑place concrete slabs.
		4. Moisture Cure: Keep surface of floor slabs moist. Spray water over floor slab areas and maintain wet for minimum of seven (7) days or spread polyethylene film over floor slab areas, lapping edges and sides, minimum 6 inches and sealing with pressure sensitive tape; cover with plywood or otherwise protect film from damage; maintain in place for minimum of seven (7) days. Do not permit traffic over floor slabs during the seven (7) day curing period.
		5. Vertical Surfaces: Spray water over surfaces and maintain wet for 10 days.
		6. Quality Control: Proper curing of concrete surfaces shall be the responsibility of the Contractor under this section.
	7. **FIELD QUALITY CONTROL**
		1. Provide free access to Work and cooperate with Testing Laboratory.
		2. Proposed mix design of each class of concrete shall conform to Section 1905A, California Building Code and shall be approved by the Architect prior to commencement of work.
	8. **PATCHING**
		1. Architect will inspect concrete surfaces and determine imperfections, if any.
		2. Patch imperfections as approved and in accordance with ACI 301.
			1. Clean all exposed concrete surfaces and all adjoining work stained by leakage of concrete. Remove all fins, butts and projections by grinding. Patch voids, rock pockets, holes, cracks and similar imperfections by chipping loose concrete and exposing clean, sound aggregate.
			2. Fill cone form tie recesses with Portland cement mortar flush to finish surface.
	9. **DEFECTIVE CONCRETE**
		1. Defective Concrete: Remove concrete not conforming to required lines, details, dimensions, tolerances or specified requirements.
		2. Repair or replacement of defective concrete will be determined by the Architect.
		3. Do not patch, fill, touch‑up, repair or replace exposed concrete except upon express approval of Architect for each individual area.
	10. **MOISTURE TEST FOR CONCRETE FLOORS**
		1. It shall be the General Contractor’s responsibility to provide a concrete floor slab meeting the maximum moisture vapor emissions here-in specified and the contractor shall exercise care in all aspects of mixing, placing, and curing the concrete floor slabs so that a minimum of mitigation treatment will be required.
		2. Prior to ordering floor materials that are adhesive applied, contractor shall conduct Calcium-Chloride “Dome” tests to verify that concrete floor slabs are dry with maximum moisture vapor emissions of three lbs. per 1,000 s.f. in 24 hours and that slabs exhibit negative alkalinity, carbonization or dusting. Apply the moisture test in four (4) different areas of each floor location, with at least one test for each 1,000 s.f. of floor area.
		3. Should the moisture emissions exceed three lbs. per 1,000 s.f. in 24 hours as specified here-in at the time of installation of adhesive applied floor coverings, and the Petrographic Analysis, ASTM C856, confirms that the placement of concrete slabs was not in conformance with requirements of this section and that the water cement ratio exceeded 0.45 or the concrete was cured less than 7 days, the General Contractor, at no additional cost to the Owner, shall reduce the moisture emission level to that specified by use of a vapor emission treatment system as specified in Section 09 61 05.

**END OF SECTION**