3 Concrete

NOTE: Significant revisions or additions to the previous standards are highlighted in italics.

GENERAL
Designers shall verify that all applicable portions of these standards are incorporated into the project’s design, drawings, specifications and final construction. Requests for variances from these standards shall be submitted in writing to the DCM Project Manager, using the KU Standards Variance Request Form found in Appendix A1.1, for review and written approval or rejection as indicated on the form.

RELATED DOCUMENTS & REQUIREMENTS
Refer to the following for requirements that also apply to work of this section.

- **Division 1 - General Requirements:** Refer to sections regarding construction testing and field quality control requirements.
  - Quality Control Testing: Unless directed otherwise, the Owner shall separately contract for quality control testing during construction.
  - On smaller projects, concrete and geotechnical testing may be included as part of the Contractor's work, if approved by DCM.

- **Division 31 – Earthwork:** Includes sections regarding site clearing, excavation and backfill, and concrete piles or drilled concrete pier foundations.

- **Division 32 – Exterior Improvements:** Includes sections regarding concrete and asphalt paving, curbs and gutters; exterior concrete stairs and ramps.

- **Division 33 – Utilities:** Includes sections regarding utility tunnels and site utility systems.

CONCRETE STAIRS – DESIGN GUIDELINES
All concrete stairs shall comply with KU’s standard details and the following.

- Railings shall be detailed to maintain not less than 1” clear from edge of railing to side of concrete and shall be returned to the ground at their ends, to avoid protruding as a potential hazard to pedestrians.

- Riser faces shall have a continuously sloped face, projecting 1” out to nosing.

- Interior stairs with an exposed concrete finish shall have slip-resistant cast-in-place abrasive or grooved nosings.

- Exterior stairs:
  - Shall receive a broom finish and a ¼” radius nosing, but no cast nosings.
  - Stair treads shall be noted to slope to drain ¼” from rear to nosing.
CAST-IN-PLACE CONCRETE – 033000

Standards: Concrete work shall be specified to meet the latest requirements of the American Concrete Institute standards.

Quality Control: An independent testing lab shall test all concrete. Test cylinders shall be taken in accordance with American Concrete Institute standards.

- Specs shall require that one set of three cylinders shall be taken for every 50 cubic yards of concrete poured daily. One cylinder shall be broken at seven days, one at 28 days and one shall be held in reserve until project is complete.
- *Specs shall restrict or prohibit the addition of water to the concrete mix at the jobsite, and if water is allowed to be added in the field, the Contractor shall be required to take test cylinders on each such load, to verify that it does not exceed allowable slump or minimum strength limits.*
- *If a more fluid mix is desired by Contractors, Designers shall verify acceptable mixes or additives to achieve the desired jobsite characteristics and long-term performance. Special attention shall be paid to slabs and flatwork, since excessively wet or poorly cured concrete will tend to crack more.*

Concrete Mix – Exterior Slabs and Walks:

- 4,000 psi; slump between 3” and 4”; 6% entrained air, +/- 1%.
- The use of calcium chloride shall be prohibited.

Subgrade:

- The engineering geologist shall test and approve all subgrades for compliance with compaction and moisture content requirements, prior to placement of concrete. Contractor shall arrange for geologist to re-inspect any subgrades that may have changed due to weather conditions or traffic.
- Granular Bed: Require per geotechnical engineer’s recommendations, 2” minimum thickness for leveling.
  - Sand is NOT an acceptable underbed material, beneath slabs or walks.

Backfilling: Contractor shall backfill walls immediately after form removal, *and when adequate bracing of top of walls has been established.*

Vapor Barriers: Provide under all slabs-on-grade, 6 mil minimum thickness, 6” minimum laps, placed *beneath* granular bed.

Slab Reinforcing:

- Welded wire reinforcing shall be specified to be in flat sheets, not rolls.
  - Wire reinforcing shall be placed on concrete bricks or sand plate chairs or runners.
    - *Specs shall stipulate that clay bricks shall NOT be allowed, and wire reinforcing shall NOT be lifted into position only, in lieu of other supports."

Floor Sealers: All bare concrete not receiving another finish shall receive a clear sealer finish placed on it as a final maintenance surface.
The Contractor shall provide technical data and Material Safety Data Sheets (MSDS) for any seals or finishes applied as a final maintenance surface.

**Formwork:** Insulated concrete forming systems, such as "Blue Maxx", shall NOT be used unless specifically approved in advance by DCM.

**Joints:** Project Designers shall not leave the joint locations of formwork or sawcut/tooled joints to the Contractor's discretion, where exposed to view and where aesthetic qualities will be readily visible.

- Exposed formwork joints in walls shall be coordinated with the architectural elevations and shall be required to be as shown by the Designer. Rustication joints are encouraged to seal the formwork joints and to create an architectural effect.

- Expansion and control joints in slabs and walks shall be shown on the architectural drawings, and shall be per PCA recommendations and good standard practice, to maximize the effectiveness of crack control and the finished aesthetic product.

- Construction joints shall be required to occur on an expansion or control joint, or if an interior slab, shall be required to occur under a partition to the greatest extent feasible.

- Construction joints in areas that may be subject to mop water, spills or leaks shall be required to occur under partitions and/or be sealed to prevent water from leaking through the joint into spaces below.

**Finish:** All interior slabs shall receive a smooth trowel finish. All walls shall at least have all fins removed and air pockets exceeding ¼” and areas with honeycomb or paste voids shall be patched.

- Walls may be rubbed to achieve a uniform finish, but concrete paste may not be added beyond that created by the rubbing action on the wall. Excess paste that may delaminate in the future shall be removed and the wall shall be refinished until acceptable.

**Equipment Bases:** 3-1/2” high concrete bases shall be provided beneath all floor-mounted mechanical or electrical equipment, or where three or more conduit penetrate floor slabs.

- Show and note locations and approximate sizes of pads on floor plans in bid documents.

- Note that Mechanical & Electrical Contractors are to verify actual sizes required.

- Note that bases are to be provided by General Contractor, based upon actual sizes provided by others.

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**CAST-IN-PLACE ARCHITECTURAL CONCRETE – 033300**

**Standards:** Architectural concrete work shall be specified to meet the latest requirements of the American Concrete Institute (ACI) standards.

**Design Approval:** The use of architectural or precast concrete shall be discussed in detail with DCM regarding color and texture conformity with the campus building materials palette.

**Sample Walls:** Architectural concrete will require a sample to be constructed by the General Contractor and reviewed for approval by the Designer and DCM.
PRECAST STRUCTURAL CONCRETE – 034100

**Standards:** Structural precast concrete work shall be specified to meet the latest requirements of the Precast Concrete Institute (PCI) standards.

- Plants fabricating precast units shall be PCI-certified for the types of precast work to be done at each location. Certifications shall be documented and approved together with other submittals.

**Architectural Standards:** Structural precast concrete units that are to be left exposed to view as finished components of the building shall also be required to comply with the requirements of Precast Architectural Concrete – 034500.

PRECAST ARCHITECTURAL CONCRETE – 034500

**Standards:** Architectural precast concrete work shall be specified to meet the latest requirements of the Precast Concrete Institute (PCI) standards.

- Plants fabricating precast units shall be PCI-certified for the types of precast work to be done at each location. Certifications shall be documented and approved at time of other submittals.

**Design Approval:** The use of architectural precast concrete shall be discussed in detail with Office of Design and Construction Management regarding color and texture conformity to the campus building materials palette.

**Sample Walls:** Architectural precast concrete will require a full-scale sample of an appropriate size to be constructed by the General Contractor and reviewed for approval by the Designer and the Office of Design and Construction Management.

**Damaged Panels:** The Project Architect and DCM shall review all damaged precast concrete to determine appropriate corrective action.

- Damage that affects structural performance or aesthetics shall be rejected and replaced.
- Patching of imperfections or damaged areas or the use of paints or coatings to cover them is NOT acceptable.

**Storage:** Precast panels are not to be stored on the ground and are to be protected from staining, discoloration or damage as work progresses.