CONSTRUCTION STANDARDS

Note: The buildings on the UCCS campus are divided into two categories: General Fund and Auxiliaries. General Fund Buildings include academic and administrative functions. Auxiliary buildings include residence halls, athletic, and dining facilities. In some cases, construction standards differ depending on the building category. Confirm building category with Facilities Services Project Manager.

DIVISION 3 – CONCRETE

- **Concrete Formwork**
- **Concrete Testing**
- **Cast-In-Place Concrete**
- **Architectural Precast Concrete**
- **Miscellaneous Cast-In-Place Concrete**
- **Grout**

A. CONCRETE FORMWORK

The purpose of this standard is to identify the submittal requirements for concrete formwork and joint patterns for architectural cast-in-place concrete.

1. SUBMITTALS

A. Submit shop drawings for concrete formwork for architectural cast-in-place concrete. Include construction joints, sizes, shapes, materials, gauging information, architectural detailing, openings, clean outs, ties and other elements affecting appearance.

2. QUALITY ASSURANCE

A. Field Samples: Provide forms for field mock-ups and samples as requested by Owner.

3. PRODUCTS

A. Form Materials: Use new plywood for the project for exposed surfaces.

B. Tubular Column: Round, of spirally wound, seamless, laminated fiber type; surface treated with release agent.

C. Formwork Accessories:

i. Fillets for Chamfered Corners: Wood strips or rigid plastic, 45 degrees, ¾ inch wing size; maximum possible lengths. Install 45 degree chamfer strips at exposed outside corners, beams, joists and columns.

A. CONCRETE TESTING AND INSPECTIONS

Owner will engage a special inspector and/or qualified testing and inspecting agency to perform field tests, inspections and prepare test reports. In the event that an inspection or test fails, Contractor shall pay for all follow-up inspections and/or tests.

B. CAST-IN-PLACE CONCRETE

Section Includes Cast-In-Place Concrete for the following:

- Footings

- Foundation Walls
- Slabs-on Grade
- Suspended Slabs
- Concrete Toppings
- Building Frame Members
- Building Walls

Miscellaneous Concrete Items:

i. Filling In: Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place.
ii. Curbs: Provide monolithic finish to interior curbs. Monolithic curb and sidewalk is not allowed.
iii. Sidewalks: Sidewalks that are four feet (4') in width shall be six inches (6") in thickness, unless otherwise specified. Sidewalks that are greater than four feet (4') in width shall be six inches (6") in thickness, unless otherwise specified. Sidewalks shall have a minimum thickness of six inches (6") for the full width of all driveway approaches, unless otherwise specified. Sidewalks shall have a minimum slope of one-quarter inch (1/4") per foot toward the top of the curb when present.
iv. Contraction joints shall be installed at intervals specified on the plans. Contraction joints shall be tooled by insertion of a one-eighth inch (1/8") thick steel template and one and one-half inch (1 ½") in depth. Sawcutting shall not be permitted to create contraction joints. In the event sawcutting is the only option, the contraction joint shall be cut with a beveled edge to prevent crumbling of the joint edges.
v. Expansion joints shall be one-half inch (1/2") pre-molded and placed where sidewalks end at curb returns, against fixed objects, at points of sharp radius, and between sidewalk and all driveway slabs. Expansion joints shall be placed a maximum of every fifty feet (50').
vi. Pedestrian Ramps: Pedestrian ramps shall be six inches (6") in thickness.
vii. Crosspans: Crosspans shall be sloped from each edge to the middle at the slope rate of one quarter inch (1/4") per foot maximum. The depth of concrete shall be eight inches (8") using 6x6-4, 4 wire welded fabric or #4 @ 18" E.W., unless otherwise specified. One inch (1") smooth steel dowels with sleeves or caps shall be installed at expansion joints, and when pouring half pans, spacing shall be at one foot (1') o.c., unless otherwise specified. Expansion joints shall be placed completely through the section at fifty foot (50') intervals and at curb returns, unless otherwise specified. One inch (1") smooth steel dowels with sleeves or caps at two (2') foot centers shall be placed in the joint, unless otherwise specified.

Sawcutting

i. Concrete saws shall be water equipped for dust control. Contractor shall take the necessary precautions to prevent cut material and saw cutting runoff from entering the storm drain system. The Contractor shall take all necessary steps to control dust arising from operations. When ordered by the Project Manager, the contractor shall dustproof the construction area

by using power sweepers and water. Handheld flush cutting concrete saw shall have a dust abatement vacuum hood with a HEPA type filter. Air borne concrete dust resulting from the cutting process shall be controlled with saw-mounted vacuum hoods. Remaining debris, cuttings, and concrete dust shall be cleaned from the sidewalk surface as well as surrounding rails, sidewalks, driveways, landscaping or other objects in the vicinity of the work. Surface dust and debris must be swept and removed immediately. Debris, concrete dust and any wash-water or associated litter shall be cleaned from the sidewalk surface as well as surrounding roadway, rails, sidewalks, driveways, landscaping and other objects in the vicinity of the work. Excess concrete, debris, dust or residue left from sawcutting operations including on adjacent sidewalks and/or property shall be removed immediately. Any underground structures found with debris in flowlines or bench due to work under this contract shall be cleaned by the contractor at his expense. If debris is not removed within 24 hours of notification, the University shall have the material removed. Cost of labor and equipment, plus an additional mobilization fee per incident shall be charged to the Contractor.

Concrete Surface Repairs

i. Defective Concrete: Repair and patch defective areas when approved by the Project Manager. Remove and replace concrete that cannot be repaired and patched to the Project Manager's approval.

C. <u>ARCHITECTURAL PRECAST CONCRETE</u>

Section Includes Cast-In-Place Concrete for the following:

- Architectural Precast Concrete
- Embedded plates, sleeves and hangers in precast panels for all mechanical equipment
- Conduit, rough-in boxes, panels, plates, sleeves and hangers in precast concrete for all electrical equipment

1. DESIGN CRITERIA

B. Design of precast units shall be under the direct supervision of a Professional Engineer registered in the State of Colorado and shall bear his seal and signature.

C. Design and fabrication of all precast members shall be in accordance with ACI "Building Code Requirements for Reinforced Concrete" and the Uniform Building Code.

D. Where not detailed in the Contract Documents, it shall be the responsibility of the precast manufacturer that all precast units are designed to support their own weight, resist any gravity and lateral loads and distribute those loads into the supporting structure.

E. Where not detailed in the Contract Documents responsibility for the determination of adequate and proper anchorage of precast units shall rest with the precast manufacturer and shall be fully detailed on the shop drawings.

2. SUBMITTALS

A. Shop Drawings

1) Include connection anchorage and insert details.

2) Size and location of reinforcing steel.
3) Member identification marks, and plan layout location.

B. Samples
1) Submit samples of all specified finishes for approval.
2) Samples shall include sealer coat.

C. Design Calculations
1) Submit design calculations for each type, shape and span of precast unit and connection.
2) Design shall include camber and deflection calculations.

3. QUALITY ASSURANCE

A. Mock-up
1) Prior to beginning work, erect an architectural precast concrete sample panel at a location on the site agreed upon by the Project Manager.
2) Protect panel to prevent damage during duration of work.
3) Make such modifications as necessary to achieve a panel satisfactory to the Project Manager.
4) Approved panel shall serve as a standard for all remaining work.
5) Remove panel only after completion of architectural precast concrete work.
6) Mock-up panel shall consist of the following as applicable:
i. Wall panel including finishes and colors required.
ii. Typical horizontal and vertical joint treatment. Include one joint to receive sealant.
iii. Grouted, packed joint including color and tooling technique.
iv. Cast-in samples – Decorative bands, rustications, typical cut-outs and fenestrations, surface texturing.
7) Temporary wood or metal frame and bracing to support sample for duration of precast concrete work.

D. MISCELLANEOUS CAST-IN-PLACE CONCRETE

Section Includes Cast-In-Place Concrete for the following:

- Drainage Structures
- Retaining Walls
- Box Base Manholes

1. SUBMITTALS

1. Mix Design:
a. Product Data: For each type of product.
b. Design Mixtures: For each concrete mixture
c. Steel Reinforcement Shop Drawings if not indicated on design drawings.
d. Samples: Submit samples for all requested materials/products.
e. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

Aggregates: Include service record data indicating absence of deleterious expansion of concrete due to alkali aggregate reactivity.

2. PRODUCTS

A. Steel Reinforcement & Accessories
   i. Reinforcing bars shall be supplied per design drawings.
   ii. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place shall be manufactured from steel wire, plastic, or precast concrete.

B. Concrete Materials
   i. Use the same cementitious materials, of the same type, brand, and source, throughout the Project.

C. Waterstops
   i. Flexible PVC Waterstops for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.

D. Expansion and Isolation Joint Filler Strips
   i. Asphalt-saturated cellulosic fiber-1/2 inch thick or as otherwise specified.

E. Skate Stoppers
   i. G135SS Model 316 Stainless Steel Skate Stopper or approved equal
   ii. Where low concrete walls are located adjacent to concrete walking surfaces, provide skatestoppers at approximately 5 feet on center. Review locations with project manager prior to installation.

E. GROUT

Section includes the following:

- Non-shrink grout under steel column bearing plates.
- Non-shrink grout under steel beam bearings.
- Non-shrink grout under elevator door sills
- Non-shrink grout in erection block outs, connection block outs or pockets.
- Non-shrink grout under site lighting pole base plates.

1. PRODUCTS

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and non-staining, mixed with water to consistency suitable for application and a 30-minute working time. Minimum compressive strength of 6000 psi.

B. Metallic, Shrink-Resistant Grout: ASTM C 1107, factory-packaged, metallic and quartz aggregate grout, noncorrosive and non-staining, mixed to a consistency suitable for application and working time. Use where covered by earth, concrete or masonry, or otherwise concealed from view.