NOTE TO CONSULTANTS: Edit with Track Changes turned on, any text in this section that appears in bold and italics then turn off the bold and italics for the final approved version. (Remove this Note).

PART 1 - GENERAL

1.01 Regulations: Conform to requirements of the IBC and the Seattle Building Code as it pertains to structural cast-in-place concrete, except as supplemented and modified here

1.02 Reference Standards: Conform to requirements of the following Reference Standards or as modified and supplemented hereinafter:

A. American Concrete Institute (ACI) Specifications for Structural Concrete for Buildings, ACI 301.

B. ACI Recommended Practice for Selecting Proportions for Concrete, ACI 613.

C. ACI Recommended practices for Cold Weather Concreting, ACI 306.

D. ACI Recommended Practice for Hot Weather Concreting, ACI 605.

1.03 Related Work:

Section 03 10 13 - Concrete Formwork for Skate Parks
Section 03 20 13 - Concrete Reinforcing for Skate Parks
Section 03 35 13 - Concrete Finishing for Skate Parks

1.04 Quality Assurance:

A. Special Inspection: Notify the Engineer at least 48 hours before inspection. Inspection shall be required immediately prior to any intended pours or placement of concrete.

B. Concrete Work: Concrete work, where indicated, shall be exposed, as finished. Special care must be taken to provide specified, finished surfaces without gravel pockets, and other defacements.

1.05 Submittals:

A. Submit, for approval, all layout drawings for all cast-in-place concrete work. Show joint locations and other pertinent information.

B. Records: Maintain records of all concrete placements; indicate exact mix proportions, list time, date, location in the project, weather conditions at the time of placement, and the source of the concrete supply. Make records available to Engineer at any time during the course of construction and submit at end of concrete placement phase of project for the purposes of preparing record documents.

C. Certificates: Submit certification of previously tested mix designs.

PART 2 - PRODUCTS

2.01 Concrete Materials:

A. Aggregates: Standard: ASTM C33

B. Cements:

1. Provide cements obtained from same source or of same brand for concrete in same element or portion of the work.
2. Standard Portland Cement: Columbia, Ideal, Kaiser, Lone Star, or approved. Standard gray Portland cement, ASTM C150; uses type I or type III.

C. Cementious Materials: Fly ash, ASTM C618 type F, except that the maximum allowable loss on ignition shall be 0.75%. Use for all concrete.

D. Admixtures:

1. Use only one brand of admixtures.
2. Water-Reducing Admixture: Master Builders Pozzolith 300-N, or approved. Chemical admixture conforming to requirements of ASTM C494, Type A.
3. Retarder-Densifying Admixture: Master Builders Retarding Pozzolith, or approved; ASTM C494, Type B.
4. Accelerator: Chemical admixture designed to accelerate set on concrete but not corrode reinforcing steel; ASTM C494, Type C.
5. Air Entraining Agent: Conform to requirements of ASTM C260.
6. Color additive: LampBlack per Section 02520.

E. Other Ingredients: Provide other ingredients as indicated or as required by Code or Reference Standards

2.02 Concrete Mix: Concrete mix shall be Class 5 (3/4), per City of Seattle Standard Specifications (most recent edition, and have characteristics as follows:

28 day compressive strength	4000 psi
Sacks Cement	(6) per Cubic Yard - (see "Cement", below)
Fine Aggregate (Type 2)	(291 lbs.) per Sack. - (see "Aggregates", below)
Coarse Aggregate (Type 5)	(387 lbs.) per Sack, - (see "Aggregates", below)
Max. Water,	(6.5 Gal.) per Sack
Fibrous Reinforcing	(1.5 lbs.) per CY
Slump (inches)	(2 - 3.5) per ASTM C143

2.03 Portland Cement: Use only Type II Portland Cement, as specified in City of Seattle Standard Specifications (most recent edition), and AASHTO M 85.

2.04 Aggregates:

A. Fine Aggregates: Mineral Aggregate #2 per City of Seattle Standard Specifications (most recent edition), Section 9-03.1(2) C. Fine Aggregates shall consist of sand or other inert materials, or combinations thereof, having hard, strong, durable particles free from an adherent coating. Fine Aggregate shall be washed thoroughly to remove clay, loam, alkali, organic matter, or other deleterious matter. Fine Aggregate #1 Particle Gradation is as follows:

Sieve Size	% Passing
#4	95 - 100
#8	68 - 86
#16	47 - 65
#30	27 - 42
#50	9 - 20
#100	0 - 7
#200 (wet)	0 - 2

B. Coarse Aggregates: Mineral Aggregate (Type 5) per City of Seattle Standard Specifications (most recent edition), Coarse Aggregate shall consist of gravel, crushed stone, or other inert material or combination thereof having hard, strong, and durable pieces free from adherent coatings. Coarse Aggregate shall be washed to thoroughly remove clay, silt, bark, sticks, alkali, organic matter, or other deleterious material. Mineral Aggregate #5 Particle Gradation is as follows:

Sieve Size	% Passing
1-1/2" Square	100
3/4" Square	80 - 100
3/8" Square	10 - 40
#4	0 - 4
#200	0 - 0.5

2.05 Bonding Agents and Adhesives:

A. Bonding Agents as required.

B. Primers and Sealers: As recommended by the adhesive and bonding agent manufacturers.

2.06 Expansion Joints in Slabs**: No Expansion Joints shall be allowed in cast-in-place skate park concrete.**

2.07 Control Joints: ***Control joints in skate park area are Optional, as directed***.

2.08 Shotcrete**:** This Section covers the mixing, placing, finishing and curing of shotcrete. Shotcrete shall be composed of Portland Cement, sand, 3/8” minus aggregate and water as specified or approved. The required proportions shall be assembled, well mixed, placed, finished and cured as hereinafter specified. It shall be uniformly dense and sound.

A. Definitions:

1. Shotcrete is a mixed mortar of cement, sand, 3/8" minus mineral aggregate, and water projected at high velocity onto a surface. The force of the jet impacting on the surface shall compact the material. A relatively dry mixture is used so that the material supports itself minimizing sagging or sloughing, even when used for vertical and overhead applications. The cement, sand, aggregate, and water are mixed by suitable means, and then pumped through a hose by a specially designed mortar pump. The high velocity impact is developed pneumatically by injecting compressed air at the nozzle.

2. Rebound is defined as aggregate mixed with some cement which ricochets off the surface.

B. Materials:

1. Portland cement shall meet the requirements of Type I, II, III, IV or V as specified by Portland Cement Association. Type used to be as required by job usually I or II.
2. Sand shall meet the requirements set as previously specified in this section and shall meet the following gradation requirement: Well-graded sand shall be used for shotcrete applications. Sand shall generally consist of the following gradation:

Sieve Size	% Passing by Weight
No. 4	100 %
No. 8	90 %
No. 16	85 %
No. 30	60 %
No. 50	30 %
No. 100	10 %

The fineness modulus shall fall between 2.70 and 3.00

3. Aggregate shall be 3/8" minus aggregate and should make up 10% to 30% of the mix design. Aggregate may be left out of final finish coat for a smoother surface.

4. Proportioning:

a. General: The mix shall under no circumstance be leaner than 752 lbs. of Portland cement to each cubic yard of concrete, (100 lbs. of cement may be substituted with 100 lbs. of fly ash).
b. Shotcrete Strength: Shotcrete strengths of 28 days shall be no less than 3000 psi.

2.08 Concrete Mixes:

A. Quality of Concrete: Assumed compressive strengths and locations of same are noted on drawings.

B. The fly ash content shall not exceed 7% by weight of the total cementious material.

C. Admixtures:

1. Add in accordance with manufacturer's directions.
2. If approved, water-reducing retardant may be used when the temperature of the concrete, as placed, exceeds 65 degrees F.
3. If approved, accelerator may be used when temperature of concrete is less than 40 degrees F.
4. No calcium chloride or other water-soluble chloride ion admixtures will be permitted, unless otherwise approved by Engineer.
5. Use retarder/densifier when placing other concrete in warm weather conditions or when ambient temperature exceeds 65 degrees F.
6. Use air-entraining agent in concrete subjected to freezing temperatures after curing. Total air content shall be in accordance with Table 26-B of UBC.

D. Mix Design: The Contractor shall use a mix design adapted for use with local sand and aggregates, and which has been proven pumpable.

E. Shotcrete Placement: To prevent the accumulation of rebound pockets at the base of transitions, shotcrete shooter’s assistant shall use pressurized air to remove rebound during shotcreting. Sloughs must be removed and re-shot.

2.08 Mixing Concrete: Standard Concrete - Ready-Mixed Concrete: Mix and transport in accordance with ASTM C94.

PART 3 - EXECUTION

3.01 Concrete Placement:

A. Inspection: Before placing concrete, inspect and complete any unfinished formwork, reinforcing steel, and items to be embedded or cast in. Notify other trades to permit installation of their work.

B. General: Comply with ACI 304, "Guide for Measuring, Mixing, Transporting, and Placing Concrete", and as specified.

C. Deposit concrete continuously or in layers of such thickness that no new concrete will be placed on concrete that has hardened sufficiently to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as specified. Deposit concrete to avoid segregation at its final location.

D. Placing Concrete in Forms: Deposit concrete in forms in horizontal layers no deeper than 24 inches and in a manner to avoid inclined construction joints. Where placement consists of several layers, place each layer while preceding layer is still plastic to avoid cold joints.

1. Consolidate placed concrete by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping. Use equipment and procedures for consolidation of concrete complying with ACI 309.
2. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations no farther than the visible effectiveness of the machine. Place vibrators to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to set. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mix to segregate.

E. Cold Weather Placement: Comply with provisions of ACI 306 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing action, or low temperatures.

F. When air temperature has fallen to or is expected to fall below, 40 degrees F (4 degrees C), uniformly heat water and aggregates before mixing, to obtain a concrete mixture temperature of not less than 50 degrees F (10 degrees C) and not more than 80 degrees F (27 degrees C), at point of placement.

1. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen sub-grade or on sub-grade containing frozen materials.
2. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise accepted in mix designs.

G. Hot Weather Placement: When hot weather conditions exist that would impair quality and strength of concrete, place concrete complying with ACI 305 and as specified.

1. Cool ingredients before mixing to maintain concrete temperature at time of placement to below 90 degrees F (32 deg C). Mixing water may be chilled or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
2. Cover reinforcing steel with water soaked burlap if it becomes too hot, so that steel temperature will not exceed the ambient air temperature immediately before embedding in concrete.
3. Fog spray forms, reinforcing steel, and sub-grade just before placing concrete. Keep sub-grade moisture uniform without puddles or dry areas.
4. Use water reducing retarding admixture when required by high temperatures, low humidity, or other adverse placing conditions, as acceptable to Engineer.

3.02 Construction Joints:

A. Form all joints perpendicular to main reinforcement. Continue reinforcing across joints, unless otherwise indicated; provide longitudinal keys at least 1-1/2 inch deep

at all joints in walls between walls and slabs or footings. Remove key forming wood inserts and thoroughly clean surface of concrete at all joints before placing next lift.

B. Roughen surface of concrete at joints and remove laitance to obtain bond before placing next lift; if use of keys is impractical due to congestion or inaccessibility or if it is inadvisable to disturb surface before it has hardened, use only wet sandblast method for preparing surface.

C. Dampen hardened concrete of joints between footings and walls, joints in unexposed walls, and all others not specifically mentioned here in after and roughen by air water cutting.

D. Dampen hardened concrete joints in exposed work and roughens by air/water cutting. Thoroughly cover joint surfaces with neat cement mortar of similar proportions to mortar in concrete; apply mortar as thick as practicable on vertical surfaces and a minimum of 1/2 inch thick on horizontal surfaces; place next lift before mortar has reached its initial set.

E. For bonding new concrete to existing concrete use bonding agent. For grouting dowels and reinforcing bars use specified adhesives in accordance with manufacturer's instructions.

F. Provide key forming wood inserts strips in walls; pour concrete to 1/2 inch above lower edge or strip.

3.03 Expansion Joints: **No Expansion Joints shall be allowed in cast-in-place skate park concrete.**

3.04 Control Joints: ***Control joints in skate park area are Optional, as directed***. In slabs on grade, tool or saw-cut control joints to true, straight lines, with maximum variance from true line of 1/2 inch in 10 feet and no irregularities across joint in excess of 1/8 inch. Extend reinforcing steel through and lap beyond joints.

3.05 Cleaning: Leave premises clean and free of residue from work in this section.

END OF SECTION