

PART I – GENERAL**WORK SPECIFIED HEREIN**

All labor, materials, equipment and services necessary to provide the Cast-In-Place Concrete work as indicated or specified including:

- Concrete, reinforcement and formwork for foundations, pilasters, slabs, sidewalks, stairs, etc.
- Installation of anchor bolts for steel columns, posts and other anchored work as may be required.
- Grouting of column bases.
- All embedded anchors, anchor slots, sleeves and other inserts as required.
- Vapor barrier and granular subbase beneath slabs on grade.
- All dowels from concrete into masonry walls or pilasters.
- All other items required to make the work of this Section.

SUBSTITUTIONS

In accordance with Section 01600.

SUBMITTALS

- Submit five copies of shop drawings showing fabrication dimensions and locations for placing reinforcing steel and accessories and details of steel reinforcement.
- Submit concrete mix design for each class of concrete for review well in advance of concrete placement. Concrete mix design shall include all strength data necessary to show compliance with the project specifications for either the trial batch or field experience method.
- Submit in accordance with Section 01340.

QUALITY ASSURANCE

- Provide Special Inspections for concrete as shown on the drawings and as required by Building Official.
- See Section 01400 for required testing.
- See Section 01400 for payment provisions for testing.

RELATED DOCUMENTS

- Unless otherwise shown or specified, the work shall conform to the following standards:
 1. CSA A23.1-04 Concrete Materials and Method of Concrete Construction.
 2. CSA A23.1/A23.2 Standard Specification for Cold Weather Concreting.
 3. CSA A23.3-04 Design of Concrete Structures
 4. RSIO Manual of Standard Practice (Latest Edition)

- Unless otherwise shown or specified, the work shall conform to the following standards of the Concrete Reinforcing Steel Institute:

1. Manual of Standard Practice, 2009

FIELD ACCEPTANCE OF CONCRETE

- Air-entrained concrete not within the specified limits of air-entrainment shall not be used in the work.
- Concrete not within the specified slump limits at the point of placement shall not be used in the work.
- Concrete not within the specified temperature limits shall not be used in the work.

ACCEPTANCE OF CONCRETE STRENGTH

- Test results for standard molded and cured test cylinders shall be evaluated separately for each specified concrete design mixture. Evaluation will be valid only if tests have been conducted in accordance with procedures specified. For evaluation, each specified design mixture shall be represented by at least five tests.
- The strength level of concrete shall be considered satisfactory when the average of all sets of three consecutive compressive strength test results equal or exceed the specified compressive strength, f'_c , and no individual strength test result falls below the specified compressive strength, f'_c , by more than 500 psi.
- The costs of any additional tests or analysis, including additional architectural or engineering services, performed to prove the adequacy of concrete strength, shall be borne by the contractor.

ACCEPTANCE OF STRUCTURE

- Completed concrete work shall conform to all applicable requirements of the Construction Documents.
- Concrete work that fails to meet one or more requirements of the Construction Documents but subsequently is repaired to bring the concrete into compliance may be accepted.
- Concrete work that does not meet the tolerances of ACI 117 will be rejected.
- Concrete with defects that adversely affect the appearance of the specified finish will be rejected.
- Concrete work that fails to meet one or more requirements of the Construction Documents and cannot be brought into compliance will be rejected.
- Repair rejected work by removing and replacing or by reinforcing with additional construction as required by the Owner.
- Contractor shall pay all costs to bring concrete work into compliance with requirements of the Construction Documents.

- The costs of any additional tests or analysis, including additional architectural or engineering services, performed to prove the adequacy of the structure, shall be borne by the contractor.

ACCEPTANCE OF FLOORS

- The slab shall be checked with a straight edge by the General Contractor (2) weeks after the slab is poured. Maximum tolerance of 1/4" over 10'-0" will be permitted and a total maximum of 3/8" over the entire slab.
- All exposed floors which are not within the specified tolerance shall be corrected by the removal and replacement of the defective slab. Removal shall be score to score, joint to joint. No other solution will be permitted.
- There will be no grinding any portion of the exposed slab.
- The exposed slab must be acceptable to PetSmart and in compliance with, but not limited to, the specifications contained within in regards to stains, abrasions, gouging, marring, etc. Any slab portion that is determined by PetSmart as unacceptable or defective shall be removed and replaced immediately.

MATERIALS DELIVERY STORAGE AND HANDLING

- Handle and store all reinforcement materials to prevent bending, coating with earth, oil or other material.
- Store cementitious materials in dry weathertight buildings, bins or silos, which will exclude contaminants.
- Store and handle aggregate in a manner that will avoid segregation and prevent contamination with other materials or other sizes of aggregates. Store aggregates to drain freely. Do not use aggregates that contain frozen lumps.
- Protect mixing water and ice from contamination during storage and delivery.

PROTECTION OF IN-PLACE CONCRETE

- Do not allow construction loads to exceed the capacity that the structure can safely support without damage.
- Protect all finished concrete surfaces from damage caused by construction equipment, materials or methods.
- During the curing period, protect concrete from damaging mechanical disturbances including load stresses, shock, and harmful vibration.
- Protect concrete surfaces from mechanical injury, damage by construction traffic, equipment, materials, rain or running water, and other adverse weather conditions.
- Protect all finished surfaces from stains, abrasions, etching, discoloration, gouging, scratches and marring. General Contractor will be responsible for any concrete replacement. Protect surfaces or edges by leaving forms in place, by providing temporary covers,

diapers, etc. to avoid marring, gouging, etc. Protect all concrete from rain, flowing water or mechanical injury. Areas that are to be replaced are at PetSmart's discretion. General Contractor is responsible for providing adequate protection of the exposed slab areas.

- Protect all exposed interior slabs at all times from the dropping of plaster, paint, dirt, etc.
- Equipment diapering shall be provided to protect exposed floor slabs from the dripping of oils, acid, rust marks, etc.

PART II – PRODUCTS

CONCRETE MATERIALS

- Portland Cement: Normal Type GU to CSA A3000-08.
- Coarse Aggregate: CSA A23.1/A23.2 and non-reactive.
- Fine Aggregate: CSA A23.1/A23.2 and non-reactive.
- Water and Ice: Mixing water for concrete and water used to make ice shall meet the requirements of CSA A23.1/A23.2.
- Admixtures: Water reducing, retarding, and accelerating admixtures: CSA A23.1-04.
- Air-entraining admixtures: CSA CAN3-A266.1, for all air-entrained concrete.
- Maximum chloride ion due to admixtures shall not exceed 0.1% by weight.
- The addition of calcium chloride is not permitted.
- All admixtures shall be used in accordance with the manufacturer's recommendations.

Reinforcement Materials

- Reinforcing Steel Bars: CSA G30.18-M1992 (R2007), Grade 400.
- Welded Wire Fabric: CSA G30.5-M1983 (R1998)
- Metal Accessories: Include all spacers, ties, chairs and other devices required to properly support and fasten reinforcing steel in place.

Form Materials

- Form-facing Materials: To CSA O121-08 COFI exterior grade, Douglas Fir plywood. Form facing material shall be plywood, tempered concrete-form-grade hardboard, metal, plastic, paper capable of producing a smooth, uniform texture on the concrete. Do not use form-facing material with raised grain, torn surfaces, worn edges, patches, dents, or other defects that will impair the texture of concrete surfaces.

Formwork Accessories: Use commercially manufactured accessories for formwork. Provide all necessary bracing, ties and accessories as necessary to support formwork.

Formwork Release Agent: Use commercially manufactured form release agents that will prevent formwork absorption of moisture, prevent bond with concrete, and not stain the concrete surfaces. Form release agent shall be compatible with finishes to be used on concrete surfaces.

RELATED MATERIALS

Curing Compound: Use L&M Cure as manufactured by L & M Construction Chemicals, Inc.

Sealer/Hardener: As manufactured by L&M Construction Chemicals, Inc. See drawings for types.

Non-Shrink Grout: N-S grout as manufactured by Euclid, or equal. 40 MPa minimum 28-day compressive strength

Vapor Barrier: See Drawings.

Granular Subbase: Granular subbase beneath slabs on grade shall conform to the requirements of the geotechnical report. Where no requirements are specified in the geotechnical report, granular subbase shall be fine graded granular material conforming to the following requirements:

- Maximum size: 1-1/4 "
- Passing No. 200 Sieve: 15% maximum
- Plasticity Index: 6 maximum
- Liquid Limit: 25 maximum

PART III – EXECUTION

CONCRETE PROPORTIONS

- The specified strength of concrete, f'_c , for each portion of the structure shall be as designated on the drawings. Strength requirements shall be based on 28-day compressive strength.
- The maximum size of coarse aggregate shall be not more than 3/4" crushed stone or gravel.
- Maximum water/cement ratio, by mass, shall be 0.40
- Cement content shall not be less than 320 kg/m³
- Concrete shall have a slump of 3" +/- 1"
- See Drawings for Concrete Proportions.

FORMWORK

- Forms shall be used, wherever necessary, to confine the concrete and shape it to the required dimensions. Forms shall have sufficient strength to withstand the pressure resulting from placement and vibration of the concrete, and shall have sufficient rigidity to maintain specified tolerances.
- The design and engineering of the formwork, as well as its construction, shall be the responsibility of the contractor.
- Forms shall be sufficiently tight to prevent loss of mortar from the concrete.
- Place required sleeves, inserts, anchors, and embedded items prior to concrete placement.
- Clean surfaces of formwork and embedded materials of mortar, grout, and foreign material before concrete is placed.
- Cover surfaces of formwork with formwork release agent before placing reinforcing steel and concrete. Do not allow formwork release agent to puddle in the forms or to contact reinforcing steel or hardened concrete against which fresh concrete is to be placed.
- Forms shall not be disturbed until the concrete has adequately hardened. Forms for walls shall remain in place for a minimum of 3 days after placement of concrete. Care shall be taken in removing forms to prevent any damage to the concrete.
- Unless noted otherwise, earth cuts may be used for forms for footings not exposed to view if soil conditions permit.

REINFORCEMENT

- Fabricate reinforcement in accordance with fabricating tolerances of A23.3-04. Bend all reinforcement cold.
- When concrete is placed, all reinforcement shall be free of materials deleterious to bond.
- Place, support, and fasten reinforcement as shown on the Drawings. Do not exceed the placing tolerances in ACI 117.
- Place reinforcement supported from the ground on precast concrete reinforcement supports. Place reinforcement supported from concrete or formwork on reinforcement supports made of metal or plastic. Secure reinforcement as necessary to prevent displacement during placement of concrete.
- Extend welded wire fabric for slabs on grade to within 2 inches of concrete edge. Lap edges and ends of fabric sheets a minimum of one mesh spacing. Support welded wire fabric during placing of concrete to assure required positioning in the slab.

MIXING AND DELIVERY OF CONCRETE

- All concrete shall be measured, batched and mixed in accordance with CSA A23.1/A32.2. Job site mixed concrete not permitted.

- Transport and deliver concrete in equipment conforming to CSA A23.1/A32.2. Batch tickets shall be provided indicating the batch weight of all materials, and indicating the amount of additional water that may be added without exceeding mixture proportions.
- Time for completion of discharge shall be as specified in CSA A23.1/A32.2, except discharge must be completed within 90 minutes of elapsed time since batching and before the drum has revolved 300 revolutions.

PLACEMENT OF CONCRETE

- Remove snow, ice, frost, water and other foreign material from surfaces, including reinforcement and embedded items, against which concrete will be placed.
- Do not begin to place concrete while rain, sleet, or snow is falling unless adequate protection is provided. Do not allow rain water to increase mixing water or to damage the surface of the concrete.
- In cold weather, when the average of the highest and lowest temperature during the period from midnight to midnight is expected to drop below 40 F for more than three successive days, concrete shall be delivered at a minimum temperature of 55 F.
- In hot weather, the temperature of concrete as placed shall not exceed 90 F. When temperature of steel reinforcement, embedments, or forms is greater than 120 F, fog steel reinforcement, embedments and forms with water immediately prior to placing concrete. Remove standing water prior to placing concrete.
- Convey concrete from mixer to the place of final deposit rapidly by methods that will prevent segregation or loss of ingredients and will assure the required quality of concrete. Do not use aluminum pipes or chutes. Colored concrete for interior slabs may not be pumped.
- Deposit concrete continuously in one layer or in layers to have fresh concrete deposited on in-place concrete that is still plastic. Do not deposit fresh concrete on concrete that has hardened sufficiently to cause formation of seams or planes of weakness within the section.
- Do not use concrete that has surface dried, partially hardened, or contains foreign material.
- Do not subject concrete to any procedure that will cause segregation. Deposit concrete as near as practicable to the final position to avoid segregation.
- Consolidate concrete by vibration. Concrete shall be thoroughly worked around reinforcement and embedded items and into corners of forms, eliminating all air and stone pockets that may cause honeycombing, pitting, or planes of weakness. Do not use vibrators to move concrete within the forms.
- Use ready mix concrete to give a 28-day compressive strength of:
 - 27.6 MPa for interior slab-on-grade

- 25 MPa (N Exposure) for footings and interior foundation walls
- 25 MPa (F-2 Exposure) for exterior foundation walls.
- 32 MPa (C-2 Exposure) for sidewalks and curbs.
- 35 MPa (C-1 Exposure) for exterior slabs-on-grade (i.e. loading docks)

- Use an air-entraining admixture for all concretes exposed to the exterior to give a total air content conforming to CSA A23.1/A23.2.

- The minimum concrete cover for steel reinforcement shall conform to CSA A23.1/A23.2

FINISHING FORMED SURFACES

- After forms are removed, patch tie holes and defects. Remove all fins completely.
- Finish formed surfaces no later than the day following form removal by wetting the surface of the concrete and rubbing carborundum brick or other abrasive until uniform color and texture are produced. Use no cement grout other than cement paste drawn from the concrete itself by the rubbing process.

FINISHING (FLATWORK)

- Move the concrete into place with square tipped shovels. Place concrete at a rate that allows spreading, straight edging, and darbying or bullfloating before bleed water disappears. Finish slab surfaces in accordance with one of the following finishes.
 - Floated finish: Place, consolidate, strike off, and level concrete, eliminating high spots and low spots. Do not work concrete further until it is ready for floating. Begin floating with a hand float, a bladed power float equipped with float shoes, or a powered disk float when the bleed water sheen has disappeared and the surface has stiffened sufficiently to permit the operation. Produce a finish that will meet conventional straightedge tolerance of 3/8 inch in 10 feet, then refloat the slab immediately to a uniform texture.
 - Troweled finish: Float concrete surface, then power trowel the surface. Hand trowel the surface smooth and free of trowel marks. Continue hand troweling until a ringing sound is produced as the floor is troweled. Produce a finish that will meet conventional straightedge tolerance of 1/4 inch in 10 feet.
 - Light/light brown finish (Interior): Immediately after concrete has received a troweled finish, give the concrete surface a light transverse texture (in the direction indicated on the drawings) by drawing a soft bristle broom across the surface.
 - Broom finish (Exterior): Immediately after concrete has received a floated finish, give the concrete surface a coarse transverse scored texture by drawing a broom across the surface.

- Interior flatwork to receive a troweled finish.
- Exterior flatwork to receive a broom finish.
- Sawcutting for joints at flatwork shall be coordinated with locations shown within the documents and shall be made as soft cuts. Joints are to be cut with the use of "soft-cut" blades as soon as finishing is complete. Joints shall be 1/8" wide and 1/3 depth of slab.

CURING

- Cure all concrete surfaces with the specified curing compound applied per manufacturer's instructions & as specified in CSA A23.1/A23.2.
- All interior slabs shall receive a cure coat of L&M Cure applied full strength in accordance with manufacturer's recommendations.

SEALING/HARDENER

- Apply sealer/hardener to all interior exposed concrete slabs.
- Prepare the surface in strict conformance with the manufacturer's printed recommendations.
- Apply in strict accordance with the manufacturer's printed application procedures. All installation of L&M materials shall be performed by an L&M approved applicator.
- Application rate shall be a maximum of 200 s.f. per gallon. Do not puddle.

INDEPENDENT INSPECTION AND TESTING

- The architect will appoint an independent inspection and testing agency to undertake concrete strength tests. Laboratory curing and testing of the samples will be carried out in accordance with CSA A23.1/A23.2.
- Strength tests will include air entrainment and slump tests will be required for each 40 cubic meters of concrete, but not less than one test for each class of concrete placed each day.
- Provide a group of three cylinders for each standard strength test. One specimen will be tested at 7 days and two at 28 days. Provide one additional field cured cylinder for testing at 7 days when concrete is placed under cold weather conditions. Results will be on form conforming to CSA A23.1/A23.2, stating the location of concrete to which tests relate and with comments on abnormal results and conditions, and will be reported to the architect, engineer and contractor.

END OF SECTION

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