CAST-IN-PLACE-CONCRETE

1. GENERAL

1.1 Work Included

.1 All plain and reinforced cast-in-place concrete shown on the Drawings unless specifically excluded, and includes, but is not limited to, equipment pads, curbs, pedestals, pilasters, pipe supports, and partial filling of equipment base plates.

.2 Restoration of floor and wall areas where floor hatch openings are to be closed up and at areas where equipment pads, stairs, and other items are to be removed.

.3 Installation of pipes, miscellaneous anchor bolts, conduits, inserts, and other accessories as required to accommodate the work of other Sections.

.4 Repairing concrete imperfections.

1.2 Quality Assurance

.1 Cast-in-place concrete to conform to CSA-A23.1.

1.3 Inspection & Testing

.1 Notify the Contract Administrator when complete formwork and concrete reinforcement is ready for inspection. Reinforcing in walls shall be inspected prior to closing forms.

.2 Allow ample time for notification, inspection and corrective work, if required, before scheduling concrete placement.

.3 Concrete sampling, inspection, and testing is to be performed by an inspection and testing firm appointed and paid for by the City.

.4 Provide unencumbered access to all portions of work and cooperate with appointed firm.

.5 Submit proposed mix design of each class of concrete to the Contract Administrator for review two (2) weeks prior to commencement of the work.

.6 Tests of cement and aggregates may be performed to ensure conformance with requirements stated herein.

.7 Notify the Contract Administrator at least 24 hours in advance of any concrete placement.

.8 Three concrete test cylinders will be taken for every 50 or less cubic meters of each class of concrete placed.

.9 At least three test cylinders will be taken daily for each class of concrete placed.

.10 One slump test and one air content test will be taken for each set of test cylinders taken.

.11 Additional slump and air content tests may be taken as necessary to verify quality of concrete.

.12 Testing of concrete will be performed in accordance with CSA-A23.2. Test results will be issued to the Contractor, the Contract Administrator, and the City.

.13 The Contractor is to pay costs for required retesting due to defective materials or workmanship.

.14 If accepted by the Contract Administrator, the Contractor may arrange and pay for additional tests for use as evidence to expedite construction.

2. PRODUCTS

2.1 Concrete Materials

.1 Cement: Normal Type 10 and Type 50 Portland Cement conforming to CSA A5.

.2 Fine Aggregate: Conforming to Normal Density Fine Aggregate.

.3 Coarse Aggregate: Conforming to Normal Density Coarse Aggregate, 20 mm to 5 mm.

.4 Ensure that no aggregates are used which may undergo volume change due to alkali reactivity, moisture retention, or other causes. Confirm suitability of aggregate with a petrographic analysis if deemed necessary by the Contract Administrator.

.5 Water: Potable, clean, and free from injurious amounts of oil, alkali, organic matter, or other deleterious matter.

.6 Calcium chloride or admixtures containing calcium chloride shall not be used in concrete.

.7 Materials are to be obtained from the same source of supply or manufacturer for the duration of the project.

.8 Pozzolans: Type C flyash, conforming to CSA-A23.5, source of material to be acceptable to the Contract Administrator.

.9 Epoxy grout – Sika Talygrout, CPD Epoxy Grout.

.10 Non-ferrous Grout: Pre-mixed, non-shrink, Master Builders 713, Sika M-Bed, CPD Non Shrink Grout, Steel C1 Grout, minimum 35 MPa compressive strength.

.11 Curing Compound: conforming to ASTM C309.

2.2 Concrete Mixes

.1 Pay all costs for mix design. Submit design to the Contract Administrator to review a minimum of two weeks prior to concrete pour.

.2 Provide concrete mixed in accordance with requirements of CSA-A23.1.

.3 Interior Concrete: minimum 28-day compressive strength 30 MPa, cement type 10, maximum water cement ratio 0.50, maximum coarse aggregate size 20 mm, and maximum slump 90 mm ±20 mm. Air entrainment is not required.

.4 Exterior Concrete: minimum 28-day compressive strength 30 MPa, cement type 50, maximum water cement ratio 0.45, maximum coarse aggregate size 20 mm, and maximum slump 90 mm ±20 mm, and air entrainment 4-7%.

.5 Maximum allowable substitution of cement with flyash material shall be 20% by weight and shall be used only when acceptable to the Contract Administrator.

3. EXECUTION

3.1 Examination

.1 Rectify all conditions, which would prejudice proper completion of this work.

3.2 Placing Concrete

.1 Place concrete in accordance with requirements of CSA-A23.1 and as indicated on the Drawings. Layout of the work and accuracy of same is the Contractor's sole responsibility.

.2 Notify the Contract Administrator a minimum of 24 hours prior to pouring concrete. Under no circumstances pour concrete without notifying Contract Administrator, or in his absence, arranging for review of the work and sampling of concrete.

.3 Ensure all anchor bolts, seats, plates, and other items to be cast into concrete are securely placed and will not interfere with concrete placement.

.4 Before placing concrete all equipment for transporting the concrete shall be cleaned of hardened concrete and foreign materials.

.5 Immediately before concrete is placed all forms shall be carefully inspected to ensure that they are properly placed, sufficiently rigid and tight, and that all reinforcing steel and embedded parts are in the correct position and secured against movement during the placing operation. All forms shall be thoroughly cleaned and material removed.

.6 Concrete shall be handled from the mixer to the place of final deposit as rapidly as practicable by methods, which will prevent the separation or loss of the ingredients. Concrete shall be deposited in the forms as nearly as practicable in its final position to avoid re-handling or flowing. Vibrators shall not be used to move concrete. Under no circumstances shall the concrete, which has partially hardened, be deposited in the forms.

.7 Concrete shall be thoroughly compacted by mechanical vibrators during placing operations. It shall be thoroughly worked around the reinforcement, embedded fixtures, and into the corners of the forms.

.8 Prepare set or existing concrete by removing all laitance and loose or unsound materials and apply bonding agent in accordance with manufacturer’s recommendations.

.9 Vibrate concrete using the appropriate size equipment as placing proceeds, in accordance with CSA-A23.1. Check frequency and amplitude of vibrations prior to use. Provide additional standby vibrators in the event of equipment failure.

.10 In locations where new concrete is dowelled to existing concrete, drill holes in existing concrete, insert steel dowels, and pack solidly with non-shrink grout.

.11 Honeycomb or embedded debris is not acceptable.

.12 Remove and replace defective concrete.

.13 Maintain accurate records of cast-in-place concrete items. Record date, location of pour, quantity, air temperature, and test samples taken.

3.3 Cold and Hot Weather Concreting

.1 Conform to requirements of CSA 23.1 for cold and hot weather concreting.

.2 Refer to Section 01300 for heating and hoarding requirements.

3.4 Concrete Protection for Reinforcement

.1 Ensure reinforcement is placed to provide minimum concrete cover in accordance with Section 03200 of these Specifications.

3.5 Construction Tolerance

.1 The work shall be carefully and accurately set out; true to the positioning, levels, slopes and dimensions shown on the Drawings and conforming to Sections 03100 and 03200.

.1 Sizes of Member or Thickness of Slabs: +6 mm - 0 mm.

.2 Cover of Concrete over Reinforcement: ±3 mm.

.3 Variations from Plumb: 6 mm in 3.0 m, 10 mm maximum.

.4 Variations from Flat: 3 mm in 3.0 m, 6 mm in maximum.

.2 If these tolerances are exceeded the Contractor may, at the discretion of the Contract Administrator, be required to remove and replace or to modify the placed concrete before acceptance. The cost incurred by the Contract Administrator for such investigation, testing or review of reconstruction and the cost of reconstruction shall be borne by the Contractor.

3.6 Equipment Pads and Pipe Supports

.1 Provide concrete pads and supports for equipment and pipes where and as indicated on Drawings. Adjust dimensions to reviewed equipment shop drawings.

.2 Insert bolts and sleeves and pack solidly with non-shrink grout, in accordance with setting details and templates.

.3 Steel trowel surface smooth. Chamfer exposed edges.

3.7 Curing and Protection

.1 Cure and protect freshly placed concrete in accordance with Clause 21 of CSA-A23.1.

.2 All concrete shall receive moist curing for a period of at least 7 days. One of the following methods shall be used as soon as the concrete has hardened sufficiently to prevent marring:

.1 Surface covered with canvas or other satisfactory material and kept thoroughly wet.

.2 Surface sealed with polyethylene sheeting at least 0.15 mm thick and the concrete kept thoroughly wet.

.3 Subject to the acceptance of the Contract Administrator or as specified, a liquid, membrane forming, curing compound supplied at the rate recommended by the manufacturer may be used. Curing compounds shall not be used on a surface where bond is required for the finishes.

.4 Surfaces of concrete, which are protected by formwork, which is left in place for seven days, shall not require any additional curing (except as specified for hot weather). If the formwork is removed in less than seven days, the concrete shall receive a moist curing as above or until seven days have elapsed since the concrete was placed, whichever occurs first.

.5 No concreting will be allowed until all materials required for the curing phase are on site and ready for use.

3.8 Formed Concrete

.1 Allow the Contract Administrator to review concrete surfaces immediately upon removal of the forms.

.2 Any imperfect joints, voids, stone pockets or other defective areas and tie holes, as specified, shall at once be patched before the concrete is thoroughly dry. Defective areas shall be chipped away to a depth of not less than 40 mm with the edges perpendicular to the surface. The area to be patched and a space at least 150 mm wide entirely surrounding it shall be wetted to prevent absorption of water from the patching mortar.

.3 The patch shall be made of the same material and of the same proportions as used for the concrete except that the coarse aggregate shall be omitted, and cement added to match the colour of the surrounding concrete. The amount of mixing water shall be as little as is consistent with the requirements.

.4 Modify or replace concrete not conforming to qualities, lines, details and elevations specified herein or indicated on the Drawings to the acceptance of the Contract Administrator.

3.9 Surfacing and Finishing

.1 Interior formed concrete surfaces.

.1 Finish exposed surfaces to Smooth Rubbed Finish conforming to CSA-A23.1, Clause 24.3.7.2.

.2 Finish non-exposed surfaces to Rough-Formed Finish conforming to CSA-A23.1, Clause 24.3.5.

.2 Existing concrete where concrete and other items have been removed.

.1 Prepare surfaces to be smooth without bumps or holes, patching as required to match adjacent existing surfaces, ready for painting.

.2 Remove reinforcing to 25 mm below the finish surface.

.3 Exterior formed concrete surfaces.

.1 Surfaces to receive roofing material are to be finished to Smooth-Formed Finish conforming to CSA-A23.1, Clause 24.3.6.

.2 Other surfaces to be finished to Rough-Formed Finish conforming to CSA-A23.1, Clause 24.3.5.

3.10 Grouting

.1 Grout all miscellaneous anchor bolts with non-ferrous or epoxy grout as specified using templates for accurate positioning.

.2 Grout between pipes and pipe supports as required to provide continuous support over the entire contact area.

.3 Grout under base plates and other items as required and shown on the Drawings.

.4 Grout dowels to existing concrete as indicated on the Drawings.

3.11 Clean-Up

.1 As work progresses and at the completion of work, remove from site all debris, excess materials, and equipment.

END OF SECTION