CORPORATION OF THE CITY OF BURLINGTON

SPECIFICATIONS

INDEX FOR

ARCHITECTURAL CONCRETE STANDARDS

(SPEC NO. SS11)

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Part A - General

1) Quality Assurance

a) Execute work of this section using a *Trade Contractor* who has adequate plant, equipment and skilled workers to perform it expeditiously, and is known to have been responsible for satisfactory installations similar to that specified during a period of at least the immediate past 5 years.

b) Upon request, submit proof of qualification.

2) Architectural Concrete

a) Quality of Finish: The quality of finish shall be such that, when the forms are stripped, it meets the standards set out below, without further finishing work other that sandblasting as required, and clean-up. This requirement is waived for smooth concrete to receive a paint finish, in which case grinding of joints and filling of voids will be permitted.

b) Dense, concrete finishes free of defects such as deep or extreme honeycombing, inconsistencies in plane, cold joint lines and loss of fines. Minor imperfections may be acceptable. Major defects will necessitate replacement. The judgement as to what constitutes major or minor defects will be the *Contract Administrator*, but the repair shall match the colour and texture of the surrounding concrete.

c) Concrete finish shall be uniform in colour.

d) Concrete finishes shall exhibit sharp, accurate definition at corners, arrises, reglets and the like, generally free of chipped or spalled areas and within dimensional tolerances set out in CAN/CSA A23.1/A23.2-00. Members shall be visually straight.

e) Plane surfaces without protuberances, indentations, ridges or bulges.

f) Sandblasted surfaces shall have uniform depth of cut-back, distribution of aggregate and colour and texture matching the sample panel designated by the *Contract Administrator*.

g) Under no circumstances shall repair to any architectural concrete be undertaken without the *Contract Administrator's* written consent. Concrete members that are repaired without the *Contract Administrator's* consent will be classified as defective work and the *Contract Administrator* may require their removal and replacement.

3) Sample Panels Areas

a) Well in advance of constructing architectural concrete, to prove out the materials and procedures proposed, construct a sample section of each type of architectural concrete utilizing portions of the concrete structure not exposed to view in the finished building and including:

b) If the sample panels do not meet the minimum standards specified it may be necessary to construct additional samples, again utilizing portions of the structure to be concealed.

Part B - Products

1) Materials

a) Form panels:
   i) Use only new form panels.

ii) Coated or overlaid Douglas Fir plywood form panels, with face overlaid with resin impregnated surface under high heat and pressure, to CSA 0121-M1978 (R2003), 17 mm thick minimum, designed to minimize plywood grain transference to formed surfaces, and produce uniform glossy appearance to exposed concrete.

iii) Acceptable *Products:*
(1) AinsworthEngineered „Pourform HDO"
(2) Crown „Crown HDO"

b) Chamfers: wood, 45 cut from 20 x 20 mm (3/4 x ¾") nominal material, or plastic type.

c) Plastic cone ties: non-corroding, coil type, 25 mm (1") setback x 25 mm (1") diameter.

i) Acceptable *Products*
(1) Dayton Richmond B-29 Loose Plastic Cones (used with B-1 and B-2 Coil Ties)

d) Form release agent; architectural concrete formwork: semi-liquid, high viscosity release for high quality architectural surface, designed for use with the most intricate moulds and forms, especially with low draft for release, will not stain concrete or affect the adhesion of waterproofing or other coatings.

i) Acceptable *Products*
(1) Grace Construction *Products* „EuroWax"

e) Form release agent; architectural concrete formwork, marble-like appearance: non-staining release agent for void-free, and smooth release of concrete, produces high quality architectural concrete finishes with a marble-like appearance.

i) Acceptable *Products*
(1) Grace Construction Products „Marb-A-Like"

f) Joint tape: non-staining, water impermeable, self-release, reinforced to prevent fin formation.

Part C – Execution

1) Forms

a) The design procedures for the formwork shall follow the requirements of CSA Standard CAN/CSA-S269.3. Specific attention shall be paid to the requirements for deflection, freedom from defects in the form-facing material that will reflect into the finished surface, sealing of the vertical joints, and methods of tightening formwork at horizontal joints to prevent leakage. Deflection of facing materials between studs, as well as deflection of studs and wales, shall be limited to 0.0025 times the span.

b) Formwork joint locations: as indicated or directed by *Contract Administrator*.

c) Forms shall be designed to permit easy removal. Workers shall not pry against the finished surface or otherwise mark the surface.

d) Make joints of forms sufficiently tight to prevent leakage of concrete fines at corners of exposed beams, walls and columns or at the corners of exposed edges of slabs, and other concrete exposed to view.

e) *Provide* 25 mm chamfer strips at exposed edges of concrete and 18 mm v-joints at indicated locations.

f) Form panels for exposed concrete may be reused 3 times, providing the tie holes are reused and panels are not damaged in a way that will cause visual defects.

g) Forms shall not be reused if there is any evidence of surface wear and tear or defects that would impair the quality of the surface. Forms shall be thoroughly cleaned and properly coated before reuse.

h) Form ties: as indicated or directed by *Contract Administrator*. .

i) Vertical construction joints will only be permitted at locations indicated, and as approved by the *Contract Administrator*. Construct the bulkhead in a manner which will prevent leakage of concrete fines.

j) When erecting forms for the continuing concrete, use system where the forms, including reglets from the pour below remain in place, undisturbed for the pour above.

k) Coat surface of forms in contact with concrete with material which provides complete bond breaking action. Apply surface treatment strictly in accordance with manufacturer's instruction. Re coat surface of forms after use as necessary.

l) Forms for architectural concrete shall not be stripped until at least 7 days after concrete is poured. Take particular care when stripping to ensure that no damage occurs at corners, arises or the like.

m) Maintain minimal colour variation. Make length of time approximately the same for each portion of the work between pouring and stripping.

n) Clean forms to remove cementing materials and treat with the parting agent as required before re-use. .16 Forms may not be re-used if they will leave blemishes on the finished surface. Also, they may not be re-used if the original tie holes locations are not re-used.

o) Form vibration shall not be used unless the forms have been designed to withstand the additional stresses.

2) Construction Joints

a) Horizontal joints will be permitted at indicated locations and where approved by Contract Administrator. Build forms to finish flush with the top of construction joints to permit trowelling the surface to accurate alignment. Install and securely fix reglets as shown.

3) Placing of Concrete

a) Architectural concrete mixes shall not be contaminated with other mixes during mixing and conveying.

b) Uniform mixing and placing schedules shall be maintained to facilitate uniformity of appearance and to avoid cold joints.

c) oncrete shall be placed in a similar way to the approved mock-up field sample, and placing methods shall not be changed without constructing a new field sample for approval.

d) Architectural concrete shall be deposited in approximately horizontal layers to avoid any lateral movement from vibration, which may cause segregation. The thickness of the layers will depend on the configuration of the form and the amount of reinforcement, but shall normally not exceed 300 mm. When insertion vibrators are used, the insertion pattern shall be organized to provide uniform consolidation and a controlled time of insertion. Vibrators shall not touch the formwork surface.

e) When an architectural concrete mix is placed as a face mix with a standard backup mix, care shall be taken to ensure proper vibration without any penetration of the backup mix into the face mix. The thickness of this face mix shall be not less than 50 mm or twice the maximum size of the coarse aggregate in the face mix, whichever is the larger. If the face mix is contained by a close wire mesh or movable dividing plates, the backup mix shall be placed prior to the initial set of the face mix.

f) Before concrete is placed, thoroughly clean forms re-tighten as is necessary and saturate the surface of construction joints and form sides with water.

g) In walls or columns, except where these are to be sandblasted, begin the pour by depositing in the bottom of the form a 75 mm layer of cement sand mortar of the same mix as the concrete used for the work, except that the coarse aggregate is omitted. Pour concrete immediately after the grout is poured.

h) The maximum free drop of concrete shall not exceed 1.3 m.

i) Deposit concrete in as close to its final position as possible and do not allow to flow laterally more than 0.6 m.

j) For depositing concrete in walls provide suitably sized tapered pouring boxed to funnel the concrete into the forms. Provide sufficient boxes for each pour such that they can be placed simultaneously at approximately 2 m on centre for the entire length of the pour.

k) Top compact concrete use internal vibrators 25 mm to 50 mm in diameter as required. Apply vibrators at sufficiently short intervals (about 0.5 m to 1.0 m) of distance that vibrated areas overlap without omission of any part. Ensure that the vibrators are inserted through the layer being compacted but take care not to damage form sheathing. Leave vibrator in place from 5 to 15 seconds and withdraw slowly leaving the vibrator operating.

l) Arrange operations so that once a pour is started, concreting is carring on continuously and the concrete at the surface of the pour is maintained plastic until the completion of section. .13 Shortly after concrete is placed and compacted to the top of walls or columns or to the top of construction joints, rework the concrete with wooden chisels at the exposed faces to a depth of at least 0.6 m and then re-vibrate. .14 At the correct time provide a fine wood float surface to tops of walls, balustrades, retaining walls and the like. Remove laitance as necessary before finishing the concrete. After stripping, lightly rub corners with an emery stone to eliminate sharp edges. .15 Trowel the surface of construction joints adjacent to exposed faces, flush and level. Joints in walls shall be made at the top of reglet indicated otherwise.

4) Protection

a) Protect architectural members as required with polyethylene sheets or the like from staining or becoming coated with leakage, due to continuing concreting operations. Protect concrete from staining due to rusting of reinforcing steel.

5) Treatment of Formed Surfaces

a) After forms are stripped go over the surface carefully, removing loose concrete, lumber in reglets, minor fins and the like, leaving the surface clean. After the surfaces are cleaned the *Contract Administrator* will make an examination of them to determine their acceptability. If unacceptable, the *Trade Contractor* shall remove the members and replace them at no extra cost to the *Owner*.

b) As previously noted, patching will only be permitted where it is required to an insignificant extent. If the Contract Administrator permits patching, demonstrate to the Contract Administrator’ s satisfaction that the patch will accurately match the colour and texture of the surrounding concrete and will have satisfactory tenacity.

6) Sandblasting

a) Do not proceed with sandblasting operations until the Contract Administrator has reviewed and approved the surface to be sandblasted.

b) Protect adjacent surfaces not noted to be sandblasted.

c) Fill form tie holes prior to sandblasting. Add high strength cement to the grout as necessary so that it will match the parent concrete strength.

d) Sandblast surfaces within 28 days after concreting.

e) Individual concrete members shall be sandblasted at the same age to ensure reasonable colour uniformity. Protect adjacent surfaces not noted to be sandblasted.

f) Maintain reglet filler strips in place until sandblasting is complete.

g) Sandblast the exposed surface of concrete members as required to a depth sufficient to remove the surface skin and to just expose the coarse aggregate and to match the approved sample.

h) Medium sandblast the exposed surface of concrete members to a depth sufficient to remove the surface skin and to just expose the coarse aggregate and in any event to at least a depth of 4.5 mm.

7) Filling Form Tie Holes

a) On surfaces exposed to view seal the form tie holes with Mills Grout Plugs in accordance with manufacturer's instructions.

b) Fill the 40 mm (1") depth of the form tie hole with a grout containing an approved bonding agent which matches the parent concrete, except that the coarse aggregate shall be omitted and the proper amount of white cement and/or limestone screenings shall be used to adjust the colour of grout to match the parent concrete when cured.

c) When consistency of the grout shall be such as to be slightly damp to the touch (just short of "balling"), hammer the grout back from the surface of the surrounding concrete approximately 10 mm (3/8"). Leave the surface of the grout plug smooth and ensure that any excess grout is removed from the surface of surrounding concrete.

d) On surfaces exposed to view, where ties are to be exposed or accentuated, fill form tie holes with natural colour plastic, set-back plugs such as type RSP manufactured by Richmond Screw Anchor Company, Toronto, or approved equal in accordance with the manufacturer's instructions.

e) On surfaces exposed to view, but where ties are to be concealed, fill the 40 mm (1") depth of form tie holes to within 6 mm (1/4") of the surface with polyurethane sealant compound which matches the colour of the concrete and conforming to the requirements of Section 07900.

f) Seal form tie holes with plastic, set-back plug in accordance with the manufacturer's instructions.

g) On surfaces exposed to view, fill the 40 mm (1") depth of form tie holes with an approved polysulphide caulking compound which matches the colour of the concrete.

h) On surfaces exposed to view, where ties are to be exposed or accentuated, fill form tie holes with Coil Cone Concrete Plugs, No. B-54, as manufactured by Dayton/Superior, or approved equal in accordance with the manufacturer's instructions.

8) Cleaning Surfaces

a) As late as possible prior to turning the building over to the Owner, clean down concrete to remove surface discolouration, efflorescence and the like. Use a suitable cleaning agent which will not itself stain the surfaces or mar the texture through chemical reaction.