

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-In-Place Concrete
- .2 Section 03 20 00 – Concrete Reinforcing
- .3 Section 03 35 00 – Concrete Finishing

1.2 WORK INCLUDED

- .1 Provide all labour, Materials, equipment and services necessary to supply, erect, and strip all formwork and falsework for poured-in-place concrete shown or indicated on the Contract Drawings and specifications.

1.3 REFERENCE STANDARDS

- .1 Do concrete formwork and falsework to:
 - .1 Provincial Building Code - current edition.
 - .2 CSA Standard CSA-A23.1-94 (CONCRETE MATERIALS AND METHODS OF CONCRETE CONSTRUCTION).
 - .3 CSA Standard CSA-A23.2-94 (METHODS OF TEST FOR CONCRETE).
 - .4 CSA Standards S269.1 - 1975 (FALSEWORK FOR CONSTRUCTION PURPOSES).
 - .5 ACI SP4 Chapter 5 (FORMWORK FOR CONCRETE).
 - .6 ACI Standard 347 (RECOMMENDED PRACTICE FOR CONCRETE FORMWORK).

1.4 TOLERANCES

- .1 The tolerances for all concrete Work shall conform to the requirements of CSA Standard CSA-A23.1-94 Section 10.

1.5 PRODUCT HANDLING

- .1 Protect formwork Materials before, during and after installation and protect installed Work and Materials of other trades.
- .2 In the event of damage, immediately make required repairs or replacements necessary to the approval of the Contract Administrator at no extra cost to the City.

Part 2 Products

2.1 MATERIALS

- .1 Form Material:
 - .1 Exposed surfaces - metal, plywood or plywood lined. Plywood to CSA Standard O121-M1978 or CSA Standard O153-M1980.
 - .2 Unexposed surfaces - metal, plywood to CSA Standard O121-M1978 or CSA Standard O153-M1980, or wood lumber to CSA Standard CAN/CSA O86.1-94 (ENGINEERING DESIGN IN WOOD - LIMIT STATES DESIGN).
 - .3 Plywood and wood formwork Materials shall conform to CSA Standard S269.1, be free from warp and sawn straight so that lines and shapes will be accurately retained.
 - .4 Unlined forms for unexposed surfaces shall be made with a good grade of lumber or plywood and fitted so that there will be no leakage of mortar.

- .5 Use metal forms, plywood lined forms or plywood forms of sufficient structural strength for exposed surfaces. Plywood for lining shall be GIS exterior grade fir plywood with a waterproof glue.
- .2 Ties and Spreaders:
 - .1 Use metal form ties which are adjustable in length to permit tightening of forms. Use only the snap-off type of form which will permit no metal within 25mm of the concrete surface after removal. Twisted wire form ties will not be accepted.
- .3 Form Release Agent:
 - .1 Form release agent shall be a pre-approved chemical agent, not an oil.
- .4 Void Form:
 - .1 Void form shall be of a deteriorating Material that will result in a total void thickness as noted on the Drawings. If a non-biodegradable Material is used the thickness must be adjusted to insure the required void volume is achieved. Contractor to submit technical data on void Material for approval by the Contract Administrator.

Part 3 Execution

3.1 FORMWORK

- .1 Lines and Levels:
 - .1 Verify lines, levels and column centres before proceeding with Work and ensure that dimensions agree with Drawings.
 - .2 Coordinate and cooperate with all other trades in forming and setting of recesses, chases, sleeves, inserts, bolts and hangers.
- .2 Design:
 - .1 Build forms sufficiently strong and rigid to sustain the weight or fluid pressure of the concrete without noticeable deflection. Ensure forms are sufficiently tight to prevent leakage or mortar.
 - .2 The Contractor shall be responsible for design and construction of falsework. The method and scheduling of reshoring shall be submitted to the Structural Contract Administrator for review prior to fabrication.
- .3 Construction:
 - .1 Construct forms so that the finished concrete will conform to the shape and dimensions specified.
 - .2 Construct forms so that they may be dismantled and removed without damaging the concrete.
 - .3 Set shores on wedges or use adjustable shores so they may be removed without causing undue strains in the concrete.
 - .4 Provide temporary openings at the bottom of column and wall forms to facilitate cleaning and inspection. Use water to flush out debris and close the openings with patch, flush on the inside.
- .4 Treatment of Forms:
 - .1 Use a non-staining form release agent free from volatile constituents for treating forms.
 - .2 Place form release agent prior to placing metal reinforcement.
 - .3 Untreated forms shall be kept wetted down to prevent shrinkage prior to placing concrete and shall be surface wetted at time of placing.
- .5 Alignment:

- .1 Provide suitable means for checking the alignment and elevation of forms during placing. Check these items frequently during placing.
- .2 Carry out corrective wedging as required until concrete is in place.
- .3 The Contract Administrator shall have the right to order concrete removed which has become misaligned during placing.
- .4 Align forms to ensure that movements and deflections of the finished product are confined within the following specifications and tolerances.
 - .1 The tolerances for all concrete Work shall conform to the requirements of CSA Standard CSA-A23.1-94.
 - .2 Variation in sizes and locations of sleeves, floor openings and wall openings -- 10mm.
 - .3 Variation for steps in a flight of stairs - rise 4mm, tread 8mm in consecutive steps - rise 2mm, tread 4mm.
- .5 Formwork for slabs and beams shall be cambered as shown on the Drawings. For calculation of such cambers, allowance for settlement, closure of form joints, elastic shortening of forms and shoring, must be made and added to camber requirements.
- .6 Stripping:
 - .1 Formwork shall not be removed until the concrete has gained sufficient strength to carry dead loads and all possible construction loads liable to be imposed upon it. Notify the Contract Administrator before removing any formwork.
 - .2 Remove forms in a manner to prevent spalling and other damage to the concrete surface. Forms shall be removed without hammering or prying against the concrete. Completely remove the forms from under steps and similar spaces, through temporary openings if necessary.
 - .3 Remove metal spreader ties on exposed concrete by removing or snapping off inside the wall surface and pointing up and rubbing the resulting pockets to match the surrounding areas.
- .7 Re-use of Formwork:
 - .1 Forms may be re-used after adequate cleaning, providing the faces have not cracked or become roughened. Such formwork shall be trimmed and properly patched.

3.2 INSERTS

- .1 All sleeves, openings, etc., shown on structural Drawings must be checked with the Architectural, Mechanical and Electrical Drawings. Sleeves, openings, etc., not shown on the structural Drawings must be approved by the Contract Administrator.
- .2 Set ties, anchor bolts, pipe hangers and other inserts, openings and sleeves, in concrete floors and walls, as required by other trades.
- .3 No sleeves, ducts, pipes or other openings shall pass through beams or columns, except where detailed on the structural Drawings.

END OF SECTION

Part 1

General

1.1

SECTION INCLUDES

- .1 Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

1.2

RELATED SECTIONS

- .1 Section 03 10 00 – Concrete Formwork
- .2 Section 03 30 00 – Cast-in-place Concrete
- .3 Section 03 35 00 – Concrete Finishing

1.3

REFERENCES

- .1 ACI 301 - Structural Concrete.
- .2 ACI 318 - Building Code Requirements For Structural Concrete and Commentary.
- .3 ACI SP-66 - American Concrete Institute - Detailing Manual.
- .4 ASTM A82 - Steel Wire, Plain, for Concrete Reinforcement.
- .5 ASTM A184/A184M - Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
- .6 ASTM A185 - Steel Welded Wire Reinforcement, Plain, for Concrete.
- .7 ASTM A496 - Steel Wire, Deformed, for Concrete Reinforcement.
- .8 ASTM A497/A497M - Steel Welded Wire Reinforcement, Deformed, for Concrete.
- .9 ASTM A615/A615M - Deformed and Plain Billet-Steel Bars for Concrete Reinforcement.
- .10 ASTM A704/A704M - Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
- .11 ASTM A706/A706M - Low-Alloy Steel Deformed and Plain Bars for Concrete Reinforcement.
- .12 ASTM A767/A767M - Zinc-Coated (Galvanized) Bars for Concrete Reinforcement.
- .13 ASTM A775/A775M - Epoxy-Coated Reinforcing Steel Bars.
- .14 ASTM D3963D3963M - Fabrication and jobsite handling of Epoxy-Coated Steel Reinforcing Bars.
- .15 AWS (American Welding Society) D1.1 - Structural Welding Code -Steel.
- .16 AWS (American Welding Society) D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.
- .17 CRSI - Concrete Reinforcing Steel Institute - Manual of Practice.
- .18 CRSI 63 - Recommended Practice For Placing Reinforcing Bars.
- .19 CRSI 65 - Recommended Practice For Placing Bar Supports, Specifications and Nomenclature.
- .20 CAN/CSA-A23.1 - Concrete Materials and Methods of Concrete Construction.
- .21 CAN3-A23.3 - Design of Concrete Structures.
- .22 CSA G30.3 - Cold-Drawn Steel Wire for Concrete Reinforcement.
- .23 CSA G30.5 - Welded Steel Wire Fabric for Concrete Reinforcement.
- .24 CSA G30.14 - Deformed Steel Wire for Concrete Reinforcement.

- .25 CSA G30.15 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- .26 CAN/CSA-G30.18 - Billet-Steel Bars for Concrete Reinforcement.

- .27 CAN/CSA-G40.21 - Structural Quality Steels.
- .28 CAN/CSA-G164 - Hot Dip Galvanizing of Irregularly Shaped Articles.
- .29 CSA W186 - Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .30 RSIC (Reinforcing Steel Institute of Canada) - Reinforcing Steel Manual of Standard Practice.

- 1.4 SUBMITTALS FOR REVIEW
 - .1 01 33 00 – Submittal Procedures
 - .2 Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric, bending and cutting schedules.
 - .3 Prepare reinforcement drawings in accordance with [Reinforcing Steel Manual of Standard Practice - by Reinforcing Steel Institute of Canada,] [ACI 315 and ACI 315R, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure].
 - .4 Detail lap lengths and bar development lengths to CAN3-A23.3. Provide Type [A] [B] [C] tension lap splices.

- 1.5 SUBMITTALS FOR INFORMATION
 - .1 Section 01 33 00 – Submittal Procedures
 - .2 Submit certified copies of mill test report of reinforcement materials analysis.

- 1.6 QUALITY ASSURANCE
 - .1 Perform Work in accordance with ACI 318.
 - .2 Design reinforcement under direct supervision of a Professional experienced in design of this work and licensed at the place where the Project is located.
 - .3 Welders' Certificates: Submit to Section 01 45 00 – Quality Control, certifying welders employed on the Work, verifying CSA qualification within the previous 12 months.

- Part 2** **Products**
- 2.1 REINFORCEMENT
 - .1 Reinforcing Steel: CAN/CSA-G30.18, billet steel, Grade 400, deformed bars, weldable low alloy bars,
 - .2 Reinforcing Steel Mat: ASTM A704, ASTM A615, 414 MPa yield grade; steel bars or rods, unfinished.
 - .3 Stirrup Steel: ASTM A82, unfinished.
 - .4 Welded Steel Wire Fabric: CSA G30.14 - Deformed steel wire.

- 2.2 ACCESSORIES
 - .1 Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions

- .2 Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Stainless steel] type; size and shape as required.

2.3 FABRICATION

- .1 Fabricate concrete reinforcing in accordance with:
 - .1 CAN/CSA-A23.1.
 - .2 Weld reinforcement in accordance with CSA W59
 - .3 Galvanized Reinforcement: Clean surfaces, weld and re-protect welded joint in accordance with manufacturer's instructions.
 - .4 Locate reinforcing splices not indicated on drawings, at point of minimum stress.

Part 3 Execution

3.1 PLACEMENT

- .1 Place, support and secure reinforcement against displacement. Do not deviate from required position to CAN/CSA A23.1.
- .2 Do not displace or damage vapour barrier.
- .3 Accommodate placement of formed openings.
- .4 Maintain concrete cover around reinforcing as per structural notes.

3.2 FIELD QUALITY CONTROL

- .1 Section 01 45 00 – Quality Control for field inspection and testing. Provide a schedule when differing reinforcement types or finishes are required.
- .2 Reinforcement For Foundation Wall Framing Members and Slab-on-Grade: Deformed bars and wire fabric, galvanized finish.

END OF SECTION

Part 1

General

1.1

RELATED SECTIONS

- .1 Section 03 10 00 – Concrete Formwork
- .2 Section 03 20 00 – Concrete Reinforcing
- .3 Section 03 35 00 – Concrete Finishing
- .4 Section 03 35 43 – Polished Concrete Floor
- .5 Section 07 13 00 – Sheet Waterproofing

1.2

REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C109/C109M-95, Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50-mm Cube Specimens) or latest.
 - .2 ASTM C260-94, Specification for Air-Entraining Admixtures for Concrete or latest.
 - .3 ASTM C309-94, Specification for Liquid Membrane-Forming Compounds for Curing Concrete or latest.
 - .4 ASTM C332-87(1991), Specification for Lightweight Aggregates for Insulating Concrete or latest.
 - .5 ASTM C494-92, Specification for Chemical Admixtures for Concrete or latest.
 - .6 ASTM C827-95a, Test Method for Change in Height at Early Ages of Cylindrical Specimens from Cementitious Mixtures or latest.
 - .7 ASTM C939-94a, Test Method for Flow of Grout for Preplaced-Aggregate Concrete or latest.
 - .8 ASTM D412-92, Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers-Tension or latest.
 - .9 ASTM D624-91 Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer or latest.
 - .10 ASTM D1751-83(1991), Specification for Preformed Expansion Joint Fillers for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types) or latest.
 - .11 ASTM D1752-84(1992), Specification for Preformed Sponge Rubber and Cork Expansion Joint Fillers for Concrete Paving and Structural Construction or latest.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings or latest.
 - .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction or latest.
 - .3 CGSB 81-GP-1M-77, Flooring, Conductive and Spark Resistant or latest.
- .3 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A5-93, Portland Cement or latest.

- .2 CAN/CSA-A23.1-94, Concrete Materials and Methods of Concrete Construction or latest.
- .3 CAN/CSA-A23.2-94, Methods of Test for Concrete or latest.
- .4 CAN/CSA-A23.5-M86(R1992), Supplementary Cementing Materials or latest.
- .5 CAN/CSA A363-M88(R1996), Cementitious Hydraulic Slag or latest.

1.3 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 At least 4 weeks prior to commencing Work, inform Contract Administrator of proposed source of aggregates and provide access for sampling.

1.4 CERTIFICATES

- .1 Submit certificates in accordance with Section 01 33 00 - Submittal Procedures
- .2 A Minimum 4 weeks prior to starting concrete Work, submit manufacturer's test data and certification by qualified independent inspection and testing laboratory that following materials will meet specified requirements:
 - .1 Portland cement.
 - .2 Blended hydraulic cement.
 - .3 Supplementary cementing materials.
 - .4 Grout.
 - .5 Admixtures.
 - .6 Aggregates.
 - .7 Water.
 - .8 Waterstops.
 - .9 Waterstop joints.
 - .10 Joint filler.
- .3 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CAN/CSA-A23.1 or latest.
- .4 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CAN/CSA-A23.1 or latest.

1.5 QUALITY ASSURANCE

- .1 Minimum 4 weeks prior to starting concrete Work, submit proposed quality control procedures in accordance with Section 01 45 00 - Quality Control for approval for following items:
 - .1 Falsework erection.
 - .2 Hot weather concrete.
 - .3 Cold weather concrete.
 - .4 Curing.
 - .5 Finishes.

.6 Formwork removal.

.7 Joints.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Use excess concrete for: additional paving, post footing anchorage, flowable fill, retaining wall footing ballast, storm structure covers, underground utility pipe kickers, storm pipe flared end section, toe wash protection.
- .2 Use trigger operated spray nozzles for water hoses.
- .3 Designate a cleaning area for tools to limit water use and runoff.
- .4 Carefully coordinate the specified concrete Work with weather conditions.
- .5 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .6 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, non-combustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations.
- .7 Choose the least harmful, most appropriate cleaning method, which will perform adequately.

Part 2 Products

2.1 MATERIALS

- .1 Portland cement: to CAN/CSA-A5 or latest.
- .2 Supplementary cementing materials: to CAN/CSA-A23.5 or latest.
- .3 In order to contribute to the LEED standing of the building, Replace a minimum of 30% of the cement content with Supplementary Cement Materials such as fly ash. Fly ash contents that produce a high volume of supplementary cementing materials (HVSCM) as defined in CSA-A23.1, section 8.8 or latest, shall not be permitted unless the Contractor meets the following requirements:
 - .1 The Materials, and mix shall conform to CSA-A23.1, section 8.8 or latest.
 - .2 The Contractor shall submit a curing plan for approval as per CSA A23.1, section 8.8 or latest. The plan shall provide details for the protection and curing of the HVSCM, including:
 - .3 The method for protecting the concrete from evaporation of surface moisture from the fresh concrete;
 - .4 The type of curing material to be used;
 - .5 How the surface will be kept moist, and the quality control requirements for keeping the surface moist;
 - .6 The time of initiation and duration of curing;
 - .7 Provisions to address potential problems such as high winds and hot and cold weather; and
 - .8 The limitations of access, if any, to the surfaces being cured.
 - .9 The curing type shall conform to CSA-A23.1 or latest, Table 2, and shall depend on the volume of supplementary cementing materials.

- .4 Water: to CAN/CSA-A23.1 or latest.
- .5 Aggregates: to CAN/CSA-A23.1 or latest. Coarse aggregates to be high density. All aggregate to be used in concrete mix for concrete slabs that are to receive a polished concrete floor finish are to be from one supplier and one batch.
- .6 Air entraining admixture: to CAN3-A266.1 or latest.
- .7 Chemical admixtures: to CAN3-A266.2 or latest. Obtain approval for accelerating or set retarding admixtures during cold and hot weather placing.
- .8 Concrete retarders: to ASTM C494 or latest water based, low VOC, solvent free. Do not allow moisture of any kind to come in contact with the retarder film.
- .9 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents.
 - .1 Compressive strength: 50 MPa at 28 days.
- .10 Non premixed dry pack grout: composition of non metallic aggregate Portland cement with sufficient water for the mixture to retain its shape when made into a ball by hand and capable of developing compressive strength of 50 MPa at 28 days.
- .11 Curing compound: to CAN/CSA A23.1 or latest. white and to ASTM C309 or latest, Type 1 chlorinated rubber.
- .12 Premoulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751 or latest.
- .13 Dovetail anchor slots: minimum 0.6 mm thick galvanized steel with insulation filled slots.
- .14 Ribbed waterstops: extruded PVC of sizes indicated:
 - .1 Tensile strength: to ASTM D412 or latest, method A, Die "C", minimum 11.4 MPa.
 - .2 Elongation: to ASTM D412 or latest, method A, Die "C", minimum 275%.
 - .3 Tear resistance: to ASTM D624 or latest, method A, Die "B", minimum 48 kN/m.

2.2 MIXES

- .1 Cement:
 - .1 Type 10 Portland cement unless noted.
- .2 Minimum compressive strength at 28 days: as indicated on drawings.
- .3 Nominal size of coarse aggregate: 20 mm.
- .4 Slump at time and point of discharge: 90 to 110 mm.
- .5 Air content: 5 to 7 % all exterior locations and where indicated.
- .6 Chemical admixtures: following admixtures in accordance with ASTM C494, type, quantity, water reducing strength increasing, air entraining, super plasticizers.

Part 3 Execution

3.1 PREPARATION

- .1 Obtain approval before placing concrete. Provide 24 hours notice prior to placing of concrete.

- .2 Pumping of concrete is permitted only after approval of equipment and mix.
- .3 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .4 Prior to placing concrete, obtain approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .5 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .6 In locations where new concrete is dowelled to existing Work, drill holes in existing concrete. Place steel dowels of deformed steel reinforcing bars and pack solidly with shrinkage compensating grout or epoxy grout to anchor and hold dowels in positions as indicated.
- .7 Do not place load upon new concrete until authorized.

3.2 CONSTRUCTION

- .1 Do cast-in-place concrete Work in accordance with CAN/CSA-A23.1.
- .2 Sleeves and inserts.
 - .1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved.
 - .2 Where approved, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Approval must be obtained for sleeves and openings greater than 100 x 100 mm not indicated on drawings.
 - .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications before placing of concrete.
 - .4 Check locations and sizes of sleeves and openings shown on drawings.
 - .5 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor bolts.
 - .1 Set anchor bolts to templates under supervision of appropriate trade prior to placing concrete.
 - .2 With approval, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 100 mm diameter. Drilled holes to be to manufacturers' recommendations.
 - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
 - .4 Set bolts and fill holes with epoxy grout.
 - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .4 Drainage holes and weep holes:
 - .1 Form weep holes and drainage holes in accordance with Section 03 10 00 – Concrete Formwork. If wood forms are used, remove them after concrete has set.
 - .2 Install weep hole tubes and drains as indicated.
- .5 Dovetail anchor slots:

- .1 Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.
- .2 Install continuous vertical anchor slots at 800 mm oc where concrete walls are masonry faced.
- .6 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100 % contact over grouted area.
- .7 Finishing: refer to Section 03 35 00 – Concrete Finishing for requirements above and beyond those listed below.
 - .1 Finish concrete in accordance with CAN/CSA-A23.1 or latest.
 - .2 Use procedures acceptable and those noted in CAN/CSA-A23.1 or latest to remove excess bleed water. Ensure surface is not damaged.
 - .3 Use curing compounds compatible with applied finish on concrete surfaces. Provide written declaration that any compounds used are compatible.
 - .4 Finish concrete floors to CGSB 81-GP-1M Class A or latest.
 - .5 Provide swirl-trowelled finish where floor tile is to be applied.
 - .6 Provide smooth, swirl-trowelled finish for interior floor surfaces, unless otherwise noted.
 - .7 Provide light broom finish for exterior slab surfaces, unless otherwise noted.
 - .8 Rub exposed sharp edges of concrete with carborundum to produce 3mm radius edges, unless otherwise noted.
- .8 Waterstops.
 - .1 Install waterstops to provide continuous water seal. Do not distort or pierce waterstop in such a way as to hamper performance. Do not displace reinforcement when installing waterstops. Use equipment to manufacturer's requirements to field splice waterstops. Tie waterstops rigidly in place.
 - .2 Use only straight heat-sealed butt joints in field. Use factory welded corners and intersections unless otherwise approved.
- .9 Joint fillers.
 - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - .2 Locate and form isolation, construction, expansion joints as indicated on the drawings. Install joint filler.
 - .3 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.
- 3.3 SITE TOLERANCE
 - .1 Concrete tolerance in accordance with CAN/CSA-A23.1 or latest straight edge method

3.4 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated in accordance with CAN/CSA-A23.1 or latest and Section 01 45 00 - Quality Control.
- .2 The City will pay for costs of tests as specified.
- .3 Testing Laboratory may take additional test cylinders during cold weather concreting. Cure cylinders on Site under same conditions as concrete in which they represent.
- .4 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2 or latest.
- .5 Inspection or testing by registered professional will not augment or replace Contractor quality control nor relieve the Contractor's contractual responsibility.

3.5 PRE-INSTALLATION CONFERENCE – CONCRETE SLABS WITH POLISHED CONCRETE FLOOR FINISH

- .1 A pre-installation conference will be held **prior to concrete slab placement** for those concrete slabs that are to receive a polished concrete floor finish, as per Room Finish Schedule, and Section 03 35 00 – Concrete Finishing. This conference will be attended by the following individuals:

- .1 Polished Concrete Floor Finish Applicator
- .2 The City and Contract Administrator
- .3 Contractor
- .4 Subcontractor who will be pouring and finishing the concrete slab

Procedures for placement, 7-day wet curing, finishing, and protecting the concrete slab will be reviewed, and measures implemented to provide the appropriate surface conditions for the polishing of the floor, and to maintain quality control expectations. The Contractor is to provide a minimum of 72 hours notice for the pre-installation conference, and the conference is to be held a minimum of 48 hours prior to the placement of the slab.

END OF SECTION

Part 1 General

1.1 RELATED WORK

- .1 Section 01 45 00 – Quality Control
- .2 Section 03 30 00 – Cast-In-Place Concrete

1.2 REFERENCES

- .1 American Society for Testing and Materials:
 - .1 ASTM-C779, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces or latest.
 - .2 ASTM G23-81, Ultraviolet Light & Water Spray or latest.
 - .3 ASTM C805, Impact Strength or latest.
 - .4 Curing compounds shall conform to ASTM C309 – “Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete”.
- .2 American Concrete Institute
 - .1 ACI 302. 1R-89, Guide for Concrete Floor and Slab Construction or latest.
- .3 CAN/CSA
 - .1 Do concrete floor finishing to CAN/CSA-A23.1, except where specified otherwise.
 - .2 Concrete curing shall comply with CAN/CSA-A23.1, except where specified otherwise.

1.3 SUBMITTALS

- .1 Comply with pertinent provisions of Section 01 60 00 - Basic Product Requirements.
 - .1 Provide submittal information within 35 calendar days after the Contractor has received the City's notice to proceed.
- .2 Product data:
 - .1 Submit concrete finishes manufacturer's specifications and test data.
 - .2 Submit concrete finishes describing product to be provided, giving manufacturer's name and product name for the specified Material proposed to be provided under this section.
 - .3 Submit special concrete finishes technical data sheet giving descriptive data, curing time, and application requirements.
 - .4 Submit concrete finishes manufacturer's Material Safety Data Sheet (MSDS) and other safety requirements.

Part 2 Products

2.1 MATERIALS AND MANUFACTURERS

- .1 Curing: use clean, potable water, which shall not contain impurities, which would cause staining.

- .2 Curing compounds: AR-30 by Meadows, Ritecure by Sternson, CPD Clear Cure, and Elsro #705 Clear Curing Compound.
- .3 Cure and seal: SealTight CS-309 by Meadows, Florseal by Sternson, CPD Acrylic Cure and Seal, Elsro #702 Clear Acrylic Sealer.
- .4 Bonding agent: Daraweld "C" by Grace, or SCP AcriStix latex bonding agent.

Part 3 Execution

3.1 WORKMANSHIP

- .1 Concrete slabs, which are to receive bonded toppings, shall be cleaned free of dirt, oil, loose Material and laitance.
- .2 Concrete slabs to receive toppings, quarry tile, or ceramic tile, to be screeded off to true lines and levels shown and left ready to receive finish. Depress slabs to accommodate finish.
- .3 Steel trowel all concrete slabs to be left exposed, or receiving carpeting, resilient flooring and applied floor finishes.

3.2 FLOOR DRAINS

- .1 In area where floor drains are installed, grade the entire floor surface (or as indicated on plans) towards the drain.
- .2 Floors to be level around walls and have a minimum 5mm/m uniform pitch to drains, unless indicated otherwise.
- .3 The slope shall be such that water on all areas of the floor surface will drain by gravity, without leaving pools or puddles on the floor surface.

3.3 PLAIN FLOOR FINISH

- .1 Spread and vibrate concrete to force coarse aggregate into concrete mix, and then screed.
- .2 Float surface with wood or metal floats, or with power finishing machine, and bring surface to true grade.
- .3 Steel trowel in accordance with CAN/CSA-A23.1. Trowel to level, even surface, to within 6mm (1/4") tolerance when measured in any direction using a 3m (10ft) straight edge.
- .4 Continue steel trowelling to produce smooth burnished surface.
- .5 Sprinkling of dry cement, or dry cement and sand mixture over concrete surfaces is not acceptable.
- .6 Apply cure and seal compound to all interior floor surfaces, unless specified otherwise. Do not apply cure and seal to concrete receiving epoxy finishes.
- .7 Apply curing compound to all exterior concrete such as exterior paving, curbs and sidewalks. Note: Cure and seal compounds may not be used until twenty-eight (28) days after placement.
- .8 Wet curing: wet cure exposed concrete floors using polyethylene sheeting and wet burlap over entire floor area, weighted down and taped on all edges for total sealing of wetted down concrete, and keep in place a minimum of seven (7) days. Protect the surface from direct sunlight to avoid overheating.

3.4 SIDEWALK PAVINGS

- .1 Use full depth pre-molded isolation joints at building, stairs, ramps, changes in paving thickness, at existing paving, and at property lines.
- .2 Place sidewalks to provide a slope for drainage of 6mm/300mm (1/8"/12") minimum, in direction of Site drainage and in conformance with the instructions describing the Work on the Drawings.
- .3 Spread and vibrate concrete to force coarse aggregate into concrete mix, and then screed.
- .4 Level concrete with straight edge. Darby or bull-float immediately.
- .5 Float surface, then apply slightly roughened surface by means of a light stiff broom stroke in one direction across width of sidewalk.
- .6 Saw cut 5mm (0.2") saw cut to depth of 1/5 paving thickness at intervals shown but not more than 2500mm (8'-4") each way, once the concrete has set or as identified by Drawings which will be read to supersede this instruction.
- .7 Thickness: refer to Drawings
- .8 In addition to the above requirements, sidewalks on Municipal property shall also meet the Municipal requirements.

END OF SECTION

- Part 1 General**
- 1.1 SUMMARY
- .1 Section Includes: Products and procedures for bonded abrasive polishing concrete floors using multi-step wet/dry mechanical process, and accessories indicated, specified, or required to complete polishing.
- 1.2 DEFINITIONS
- .1 Terminology: As defined by CPAA.
- .2 Polished Concrete: The act of changing a concrete floor surface, with or without aggregate exposure, to achieve a specified level of gloss.
- .3 Bonded Abrasive Polished Concrete: The multi-step operation of mechanically grinding, honing, polishing of a concrete floor surface with bonded abrasives to cut a concrete floor surface and to refine each cut to the maximum potential to achieve a specified level of finished gloss as defined by the CPAA. This yields the most durable finish and requires the least amount of maintenance.
- 1.3 SUBMITTALS
- .1 Product Data: Manufacturer's technical literature for each product indicated, specified, or required. Include manufacturer's technical data, application instructions, and recommendations.
- .2 Installer Qualifications: Data for company, principal personnel, experience, and training specified in PART 1 "Quality Assurance" Article.
- .3 Field Quality Control- Dynamic Coefficient of Friction Test Reports: Reports of testing specified in PART 3 "Field Quality Control" Article.
- .4 Field Quality Control -Static Coefficient of friction test reports: report of testing specified in Part 3 "Field Quality Control" article.
- .5 Maintenance Data: For inclusion in maintenance manual required by Division 01.
- .1 Include instructions for maintenance of installed Work, including methods and frequency recommended for maintaining optimum condition under anticipated use.
- .2 Include precautions against cleaning products and methods which may be detrimental to finishes and performance.
- 1.4 QUALITY ASSURANCE
- .1 Polisher Qualifications:
- .1 Experience: Company experienced in performing specified Work similar in design, products, and extent to scope of this Project; with a record of successful in-service performance with similar floor assembly; and with sufficient production capability, facilities, and personnel to produce specified Work.
- .2 Supervision: Maintain competent supervisor who is at Project during times specified Work is in progress, and is currently certified as Craftsman - Level I or higher by CPAA.
- .3 Manufacturer Qualification: Approved by manufacturer to apply liquid applied products.
- .2 Walkway Auditor: Certified by CPAA or NFSI to test bonded abrasive polished concrete floors for dynamic and static coefficient of friction according to ANSI B101.1 and B101.3.
- .3 Coefficient of Friction: Achieve following coefficient of friction by field quality control testing in accordance to the following standards:

- .1 ANSI B101.1 Static Coefficient of Friction- Achieve a minimum of .42 for level floor surfaces.
- .2 ANSI B101.3 Dynamic Coefficient of Friction- Achieve a minimum of .35 for level floor surfaces.
- .4 Field Mock-up: Before performing Work of this Section, provide following field mock- up to verify selections made under submittals and to demonstrate aesthetic effects of polishing. Approval does not constitute approval of deviations from Contract Documents, unless Contract Administrator specifically approves deviations in writing.
 - .1 Form, reinforce, and cast concrete slab for 10 foot square field mock-up.
 - .2 Concrete shall be same mix design as scheduled for Project.
 - .3 Placement and finishing Work shall be performed by same personnel as will place and finish concrete for Project.
 - .4 Mock-up shall be representative of Work to be expected.
 - .5 Perform grinding, honing, and polishing Work as scheduled for Project using same personnel as will perform Work for Project.
 - .6 Approval is for following aesthetic qualities:
 - .1 Compliance with approved submittals.
 - .2 Compliance with specified aggregate exposure.
 - .3 Compliance with specified finished gloss level.
 - .7 Obtain Contract Administrator's approval before starting Work on Project.
 - .8 Protect and maintain approved field mock-ups during construction in an undisturbed condition as a standard for judging completed Work.
- .5 Pre-Installation of Concrete Conference: Prior to placing concrete for areas scheduled for polishing, conduct conference at Project to comply with requirements of applicable Division 01 Sections.
 - .1 Required Attendees:
 - .1 The City
 - .2 Contract Administrator.
 - .3 Contractor, including supervisor.
 - .4 Concrete producer.
 - .5 Concrete finisher, including supervisor.
 - .6 Concrete polisher, including supervisor.
 - .7 Technical representative of liquid applied product manufacturers.
 - .8 Walkway auditor.
 - .2 Minimum Agenda: Polisher shall demonstrate understanding of Work required by reviewing and discussing procedures for, but not limited to, following:
 - .1 Tour field mock-up and representative areas of required Work, discuss and evaluate for compliance with Contract Documents, including substrate conditions, surface preparations, temporary shoring as required, sequence of procedures, and other preparatory Work performed by other installers.
 - .2 Review Contract Document requirements.
 - .3 Review approved submittals and field mock-up.
 - .4 Review procedures, including, but not limited to:
 - .1 Applicable Section 03 30 00 – Cast-in-Place Concrete
 - .1 Specific mix design.
 - .2 Specified curing methods/procedures.

- .3 Projected 3, 10, and 28 day compression strength test related to specified aggregates exposure for finished floor and project phasing.
 - .4 Protection of concrete substrate during construction and prior to polishing process
 - .5 Project phasing and scheduling for each step of grinding, honing and polishing operations including, but not limited to:
 - .1 Quality of qualified personnel committed to project.
 - .2 Quality and size of grinders committed to project.
 - .3 Proper disposal of concrete slurry and/or concrete dust.
 - .6 Details of each step of grinding, honing, and polishing operations.
 - .3 Reports: Record discussions, including decisions and agreements reached, and furnish copy of record to each party attending.
- 1.5 FIELD CONDITIONS
- .1 Damage and Stain Prevention: Take precautions to prevent damage and staining of concrete surfaces to be polished.
 - .1 Prohibit use of markers, spray paint, and soapstone.
 - .2 Prohibit improper application of liquid membrane film forming curing compounds.
 - .3 Prohibit vehicle parking over concrete surfaces.
 - .4 Prohibit pipe-cutting operations over concrete surfaces.
 - .5 Prohibit storage of any items over concrete surfaces for not less than 28 days after concrete placement.
 - .6 Prohibit ferrous metals storage over concrete surfaces.
 - .7 Protect from petroleum, oil, hydraulic fluid, or other liquid dripping from equipment Working over concrete surfaces.
 - .8 Protect from acids and acidic detergents contacting concrete surfaces.
 - .9 Protect from painting activities over concrete surfaces.
 - .2 Environmental Limitations: Comply with manufacturer's written instructions for substrate temperature, ambient temperature, moisture, ventilation, and other conditions affecting liquid applied product application.
- Part 2 Products**
- 2.1 LIQUID APPLIED PRODUCTS
- .1 Liquid Densifier: An Aqueous solution of Silicon Dioxide dissolved in one of the following Hydroxides that penetrates into the concrete surface and reacts with the Calcium Hydroxide to provide a permanent chemical reaction that hardens and densifies the wear surface of the cementitious portion of the concrete. All of the following have the same chemistry varying only by the alkali used for solubility of the Silicon Dioxide.
 - .1 Sodium Silicate
 - .2 Potassium Silicate
 - .3 Lithium Silicate
 - .4 Alkalis solution of Colloidal Silicates or Silica

- .2 Water-based silicate solution that penetrates concrete and reacts with calcium hydroxide to lock in color particles.
- 2.2 ACCESSORIES
- .1 Repair Material: A product that is designed to repair cracks and surface imperfections. The specified Material must have sufficient bonding capabilities to adhere after the polishing to the concrete surface and provide abrasion resistance equal to or greater than the surrounding concrete substrate.
 - .2 Grout Material: A thin mortar used for filling spaces. Acceptable products shall be:
 - .1 Epoxy, urethane, polyurea, or polyaspartic resins.
 - .2 Latex or acrylic binders mixed with cement dust from previous grinding steps.
 - .3 Silicate binders mixed with cement dust from previous grinding steps.
 - .3 Protective Cover: Non-woven, puncture and tear resistant, polypropylene fibers laminated with a multi-ply, textured membrane, not less than 18 mils in thickness.
- 2.3 POLISHING EQUIPMENT
- .1 Field Grinding and Polishing Equipment:
 - .1 A multiple head, counter rotating, walk behind or ride on machine, of various size and weights, with diamond tooling affixed to the head for the purpose of grinding concrete. Excludes janitorial maintenance equipment.
 - .2 If dry grinding, honing, or polishing, use dust extraction equipment with flow rate suitable for dust generated, with squeegee attachments.
 - .3 If wet grinding, honing, or polishing, use slurry extraction equipment suitable for slurry removal and containment prior to proper disposal.
 - .2 Edge Grinding and Polishing Equipment: Hand-held or walk-behind machines which produces same results, without noticeable differences, as field grinding and polishing equipment.
 - .3 Burnishing Equipment: High speed walk-behind or ride-on machines capable of generating 1000 to 2000 revolutions per minute and with sufficient head pressure of not less than 20 pounds to raise floor temperature by 20 degrees F.
 - .4 Diamond Tooling: Abrasive tools that contain industrial grade diamonds within a bonded matrix (such as metallic, resinous, ceramic, etc) that are attached to rotating heads to refine the concrete substrate.
 - .1 Bonded Abrasive: Abrasive medium that is held within a bonding that erodes away to expose new abrasive medium as it is used.
 - .2 Metal Bond Tooling: Diamond tooling that contains industrial grade diamonds with a metallic bonded matrix that is attached to rotating heads to refine the concrete substrate. These tools are available in levels of soft, medium, and hard metallic matrices that are matched with contrasting concrete substrates (i.e. hard matrix/soft concrete, medium matrix/medium concrete, soft matrix/hard concrete) and are typically used in the grinding and early honing stages of the polishing process.
 - .3 Resin Bond Tooling: Diamond tooling that contains industrial grade diamonds within a resinous bonded matrix (poly-phenolic, ester-phenolic, thermoplastic-phenolic) that is attached to rotating heads to refine the concrete substrate. Resin bond tooling does not have the soft/medium/hard characteristics of metal bond tooling and are typically used for the later honing and polishing stages of the polishing process.
 - .4 Hybrid Tooling: Diamond tooling that combines metal bond and resin bond that has the characteristics of both types of tooling. These types of tools are typically used

as either transitional tooling from metal bond tools to resin bond tools or as a first cut tool on smooth concrete surfaces.

- .5 Transitional Tooling: Diamond tooling that is used to refine the scratch pattern of metal bond tooling prior to the application of resin bond tooling in an effort to extend the life of resin bond tooling and to create a better foundation for the polishing process.
- .6 Abrasive Pad: An abrasive pad, resembling a typical floor maintenance burnishing pad, that has the capability of refining the concrete surface on a microscopic level that may or may not contain industrial grade diamonds. These pads are typically used for the maintenance and/or restoration of previously installed polished concrete flooring.

Part 3 Execution

3.1 EXAMINATION

- .1 Acceptance of Surfaces and Conditions:
 - .1 Examine substrates to be polished for compliance with requirements and other conditions affecting performance.
 - .1 Concrete Finished Floor Flatness according to applicable Section 03 30 00 – Cast-in-Place Concrete.
 - .2 Concrete curing methods according to applicable Section 03 30 00 – Cast-in-Place Concrete.
 - .3 Concrete Compression strength per according to Section 03 30 00 – Cast-in-Place Concrete.
 - .2 Proceed only when unsatisfactory conditions have been corrected in a manner complying with Contract Documents.
 - .3 Starting Work within a particular area will be construed as acceptance of surface conditions.

3.2 PREPARATION

- .1 Cleaning New Concrete Surfaces:
 - .1 Prepare and clean concrete surfaces.
 - .2 Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, paint splatter, and other contaminants incompatible with liquid applied products and polishing.
 - .3 Temporary shore floor assembly as required to complete grinding and polishing Work.

3.3 POLISHING CONCRETE FLOORS

- .1 Perform all polishing procedures to ensure a consistent appearance from wall to wall.
- .2 Initial Grinding:
 - .1 Use grinding equipment with metal or semi-metal bonded tooling.
 - .2 Begin grinding in one direction using sufficient size equipment and diamond tooling to meet specified aggregate exposure class.
 - .3 Make sequential passes with each pass perpendicular to previous pass using finer grit tool with each pass, up to 100 grit metal bonded tooling.
 - .4 Achieve maximum refinement with each pass before proceeding to finer grit tools.

- .5 Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
- .6 Continue grinding until aggregate exposure matches approved field mock-ups.
- .3 Treating Surface Imperfections:
 - .1 Mix patching compound or grout Material with dust created by grinding operations, manufacturer's tint, or sand to match color of adjacent concrete surfaces.
 - .2 Fill surface imperfections including, but not limited to, holes, surface damage, small and micro cracks, air holes, pop-outs, and voids with grout to eliminate micro pitting in finished Work.
 - .3 Work compound and treatment until color differences between concrete surface and filled surface imperfections are not reasonably noticeable when viewed from 10 feet away under lighting conditions that will be present after construction.
- .4 Liquid Densifier Application: Apply undiluted to point of rejection, remove excess liquid, and allow curing according to manufacturers instructions.
- .5 Grout Grinding:
 - .1 Use grinding equipment and appropriate grit and bond diamond tooling.
 - .2 Apply grout, forced into the pore structure of the concrete substrate, to fill surface imperfections.
 - .3 Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
- .6 Honing:
 - .1 Use grinding equipment with hybrid or resin bonded tooling.
 - .2 Hone concrete in one direction starting with a 100 grit tooling and make as many sequential passes as required to remove scratches, each pass perpendicular to previous pass, up to 400 grit tooling reaching maximum refinement with each pass before proceeding to finer grit tooling.
 - .3 Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
- .7 Polishing:
 - .1 Use polishing equipment with resin-bonded tooling.
 - .2 Begin polishing in one direction starting with 800 grit tooling.
 - .3 Make sequential passes with each pass perpendicular to previous pass using finer grit tooling with each pass until the specified level of gloss has been achieved.
 - .4 Achieve maximum refinement with each pass before proceeding to finer grit pads.
 - .5 Clean floor thoroughly after each pass using dust extraction equipment properly fitted with squeegee attachment or walk behind auto scrubber suitable to remove all visible loose debris and dust.
 - .6 Stain Protection: Uniformly apply and remove excessive liquid according to manufacturer's instructions. Final film thickness should be less than .05 mils after cure.
 - .7 Final Polish: Using burnishing equipment and finest grit abrasive pads, burnish to uniform reflective sheen matching approved field mock-up.
- .8 Final Polished Concrete Floor Finish:
 - .1 Aggregate Exposure Class D - Large Aggregate Finish: Remove not more than 1/4 inch of concrete surface by grinding and polishing resulting in majority of exposure

displaying large aggregate with no, or small amount of, fine aggregate at random locations

- .2 Finished Gloss Level 3- High Gloss Appearance:
 - .1 Procedure: Recommended not less than 4 steps with full refinement of each diamond tool with one application of densifier
 - .2 Gloss Measurement: Determine the specular gloss by incorporating the following:
 - .1 Reflective Clarity Reading: Not less than 65 according to ASTM D5767 prior to the application of sealers.
 - .2 Reflective Sheen Reading: Not less than 35 according to ASTM D523 prior to the application of sealers.
- .2 Finished Gloss Level 4 -Very High Gloss Appearance:
 - .1 Procedure: Recommended not less than 4 steps with full refinement of each diamond tool with one application of densifier.
 - .2 Gloss Measurement: Determine the specular gloss by incorporating the following:
 - .1 Reflective Clarity Reading: Not less than 85 according to ASTM D5767 prior to the application of sealers.
 - .2 Reflective Sheen Reading: Not less than 50 according to ASTM D523 prior to the application of sealers.

3.6 FIELD QUALITY CONTROL

- .1 Field Testing: Engage a qualified walkway auditor to perform field testing to determine if polished concrete floor finish complies with specified coefficient of friction;
 - .1 ANSI 8101.1 for static coefficient of friction
 - .2 ANSI 8101.3 for dynamic coefficient of friction

3.7 CLOSEOUT ACTIVITIES

- .1 Maintenance Training: CPAA Craftsman shall train the City's designated personnel in proper procedures for maintaining polished concrete floor.

3.8 PROTECTION

- .1 Covering: After completion of polishing, protect polished floors from subsequent construction activities with protective covering.

END OF SECTION