

PART 1 GENERAL

1.1 Related Work

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| .1 | Section 31 23 10 | Excavating, Trenching and Backfilling |
| .2 | Section 03 20 00 | Concrete Reinforcing |
| .3 | Section 03 30 00 | Cast-In-Place Concrete |

1.2 References

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| .1 | Canadian Standards Association (CSA International) |
| .1 | CSA-A23.1-09/A23.2-09 (R2014), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete. |
| .2 | CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-14, Engineering Design in Wood. |
| .3 | CSA O121-M2008 (R2013), Douglas Fir Plywood. |
| .4 | CSA O151-09 (R2014), Canadian Softwood Plywood. |
| .5 | CSA O153-13, Poplar Plywood. |
| .6 | CAN/CSA-O325-07 (R2012), Construction Sheathing. |
| .7 | CSA O437 Series-93 (R2011), Standards for OSB and Waferboard. |
| .8 | CSA S269.1-1975 (R2003), Falsework for Construction Purposes. |
| .9 | CAN/CSA-S269.3-M92 (R2013), Concrete Formwork, National Standard of Canada |
| .2 | Underwriters' Laboratories of Canada (ULC) |
| .1 | CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering. |

1.3 Submittals

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| .1 | Submittals in accordance with Section 01 33 00 – Shop Drawings, Product Data and Samples. |
| .2 | Submit shop drawings for formwork and falsework. |
| .1 | Submit drawings stamped and signed by professional engineer registered or licensed in Province of British Columbia, Canada. |
| .3 | Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 33 – Health and Safety Requirements. |
| | Co-ordinate submittal requirements and provide submittals required by Section 01 33 00. |
| .5 | Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, |

liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings and Comply with CAN/CSA-S269.3 for formwork drawings.

- .6 Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
- .7 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.

1.4 Delivery, Storage and Handling

- .1 Store and manage hazardous materials in accordance with Section 01 51 00 – Temporary Facilities.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .2 Place materials defined as hazardous or toxic in designated containers.
 - .3 Divert wood materials from landfill to a recycling, reuse, composting facility as approved by Departmental Representative.
 - .4 Divert plastic materials from landfill to a recycling, reuse, composting facility as approved by Departmental Representative.
 - .5 Divert unused form release material from landfill to an official hazardous material collections site as approved by the Departmental Representative.

PART 2 PRODUCTS

2.1 Materials

- .1 Materials and resources in accordance with Section 01 61 00 – Requirements.
- .2 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121, CAN/CSA-O86, CSA O437 Series, CSA-O153.
 - .2 Rigid insulation board: to CAN/ULC-S701.SPEC NOTE: Drawings should designate areas requiring special architectural concrete features.
- .3 Form ties:
 - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
- .4 Form liners:
 - .1 Plywood: high density overlay, medium density overlay, Douglas Fir to CSA O121, Canadian Softwood Plywood to CSA O151 or Poplar to CSA O153 grade, square edge, 20 mm thick.

- .5 Form release agent: non-toxic, biodegradable, low VOC.
- .6 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal 15 to 24 mm²/s at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .7 Falsework materials: to CSA-S269.1.
- .8 Sealant: to Section 07 90 00 – Sealants.

PART 3 EXECUTION

3.1 Fabrication and Erection

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .8 Align form joints and make watertight.
 - .1 Keep form joints to minimum.
- .9 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .11 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
 - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .12 Line forms for following surfaces:

- .1 Outer face of outside girders beams and vertical edge of sidewalk slab.
- .2 Soffit of girders and underside of bridge decks if exposed.
- .3 Exposed faces of abutments, wingwalls, piers and pylons: do not stagger joints of form lining material and align joints to obtain uniform pattern. Secure lining taut to formwork to prevent folds.
- .4 Pull down lining over edges of formwork panels.
- .5 Ensure lining is new and not reused material.
- .6 Ensure lining is dry and free of oil when concrete is poured.
- .7 Application of form release agents on formwork surface is prohibited where drainage lining is used.
- .8 If concrete surfaces require cleaning after form removal, use only pressurized water stream so as not to alter concrete's smooth finish.
- .9 Cost of textile lining is included in price of concrete for corresponding portion of Work.
- .13 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.2 Removal and Shoring

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 Three days for walls and sides of beams.
 - .2 Three days for columns.
 - .3 Three days for beam soffits, slabs, decks and other structural members, or one days when replaced immediately with adequate shoring to standard specified for falsework.
 - .4 One days for footings and abutments.
- .2 Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .4 Space reshoring in each principal direction at not more than 3000 mm apart.
- .5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23

END OF SECTION 03 10 00

PART 1 GENERAL

1.1 Related Work

- .1 Section 03 10 00 Concrete Forming and Accessories
- .2 Section 03 30 00 Cast-In-Place Concrete

1.2 Measurement Procedures

- .1 Measure reinforcing steel in kilograms tonnes of steel incorporated into Work, computed from theoretical unit mass specified in CAN/CSA-G30.18 for lengths and sizes of bars as indicated or authorized in writing by Departmental Representative.
- .2 No measurement will be made under this Section.
 - .1 Include reinforcement costs in items of concrete work in Section 03 30 00 - Cast-In-Place Concrete.

1.3 References

- .1 American Concrete Institute (ACI)
 - .1 SP-66-04, ACI Detailing Manual 2004.
 - .1 ACI 315-99, Details and Detailing of Concrete Reinforcement.
 - .2 ACI 315R-04, Manual of Engineering and Placing Drawings for Reinforced Concrete Structures.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A143/A143M-07 (R2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - .2 ASTM A1064/A1064M-09, Standard Specification for Carbon-Steel wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - .3 ASTM A775/A775M-07b (R2014), Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-04/A23.2-09 (R2014), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-A23.3-04 (R2010), Design of Concrete Structures.
 - .3 CAN/CSA-G30.18-09, Billet-Steel Bars for Concrete Reinforcement, A National Standard of Canada.
 - .4 CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CAN/CSA-G164-M92 (R2013), Hot Dip Galvanizing of Irregularly Shaped Articles, A National Standard of Canada.

CSA W186-M1990 (R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction.

.4 Reinforcing Steel Institute of Canada (RSIC)

.1 RSIC-2011, Reinforcing Steel Manual of Standard Practice.

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1.4 Submittals

.1 Submittals in accordance with Section 01 33 00 – Shop Drawings, Product Data and Samples.

.2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315.

.3 Submit shop drawings including placing of reinforcement and indicate:

.1 Bar bending details.

.2 Lists.

.3 Quantities of reinforcement.

.4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.

.5 Indicate sizes, spacings and locations of chairs, spacers and hangers.

.4 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.

.1 Provide type A tension lap splices where indicated unless otherwise indicated.

When Chromate solution is used as replacement for galvanizing non-prestressed reinforcement, provide product description for review by Departmental Representative prior to its use.

.5 Quality Assurance: Provide the following to the Departmental Representative.

.1 Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.

Upon request submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.

1.5 Delivery, Storage and Handling

.1 Store and manage hazardous materials in accordance with Section 01 51 00 – Temporary Facilities.

.2 Waste Management and Disposal:

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

- .2 Place materials defined as hazardous or toxic in designated containers.

PART 2 PRODUCTS

2.1 Materials

- .1 Materials and resources in accordance with Section 01 61 10- Product Requirements.
- .2 Substitute different size bars only if permitted in writing by Departmental Representative.
- .3 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .4 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-G30.18.
- .5 Cold-drawn annealed steel wire ties: to ASTM A497/A497M.
- .6 Deformed steel wire for concrete reinforcement: to ASTM A497/A497M.
- .7 Welded steel wire fabric: to ASTM A185/A185M.
 - .1 Provide in flat sheets only.
- .8 Welded deformed steel wire fabric: to ASTM A497/A497M.
 - .1 Provide in flat sheets only.
- .9 Galvanizing of non-prestressed reinforcement: to CAN/CSA-G164, minimum zinc coating 610 g/m².
 - .1 Protect galvanized reinforcing steel with chromate treatment to prevent reaction with Portland cement paste.
 - .2 If chromate treatment is carried out immediately after galvanizing, soak steel in aqueous solution containing minimum 0.2% by weight sodium dichromate or 0.2% chromic acid.
 - .1 Temperature of solution equal to or greater than 32 degrees and galvanized steels immersed for minimum 20 seconds.
 - .3 If galvanized steels are at ambient temperature, add sulphuric acid as bonding agent at concentration of 0.5% to 1%.
 - .1 In this case, no restriction applies to temperature of solution.
 - .4 Chromate solution sold for this purpose may replace solution described above, provided it is of equivalent effectiveness.
 - .1 Provide product description as described in PART 1 - SUBMITTALS
- .10 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .11 Mechanical splices: subject to approval of Departmental Representative.

- .12 Plain round bars: to CSA-G40.20/G40.21.

2.2 Fabrication

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, ACI 315 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
 - .1 ACI 315R unless indicated otherwise.
- .3 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on placing drawings.
- .4 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
- .5 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

2.3 Source Quality Control

- .1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
- .2 Upon request inform Departmental Representative of proposed source of material to be supplied.

PART 3 EXECUTION

3.1 Preparation

- .1 Galvanizing to include chromate treatment.
 - .1 Duration of treatment to be 1 hour per 25 mm of bar diameter.
- .2 Conduct bending tests to verify galvanized bar fragility in accordance with ASTM A143/A143M.

3.2 Field Bending

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
- .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
- .3 Replace bars, which develop cracks or splits.

3.3 Placing Reinforcement

- .1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.
- .2 Use plain round bars as slip dowels in concrete.
 - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
 - .2 When paint is dry, apply thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.

3.4 Field Touch-Up

- .1 Touch up damaged and cut ends of galvanized reinforcing steel with compatible finish to provide continuous coating.

END OF SECTION 03 20 00

PART 1 GENERAL

1.1 Related Work

- .1 Section 03 10 00 Concrete Forming and Accessories
- .2 Section 03 20 00 Concrete Reinforcing

1.2 References

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A1064/A1064M-09, Standard Specification for Carbon-Steel wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - .2 ASTM D1751-04 (R2013), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1/A23.2-2004 (R2014), Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014) & Update No. 2 (2014).
 - .1 CSA-A3001-13, Cementitious Materials for Use in Concrete.
 - .2 CAN/CSA-G30.18-09, Billet-Steel Bars for Concrete Reinforcement.

1.3 Design Requirements

Alternative 2 – Provide Performance Specification in accordance with CSA-A23.1/A23.2, and as described in Mixes of PART 2 - PRODUCTS.

1.4 Submittals

- .1 Submittals in accordance with Section 01 33 00 – Shop Drawings, Product Data and Samples.
- .2 At least 4 weeks prior to beginning Work, inform Departmental Representative source of fly ash and submit samples to Departmental Representative.
 - .1 Do not change source of Fly Ash without written approval of Departmental Representative.
- .3 At least 4 weeks prior to beginning Work, submit to Departmental Representative samples of following materials proposed for use: curing compound.

- .4 Submit samples of materials to be used in concrete mix for testing:
 - .1 Supplementary cementing materials.
 - .2 Blended hydraulic cement.
 - .3 Admixture.
- .5 Submit testing inspection results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .6 Concrete hauling time: submit for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

1.5 Quality Assurance

- .1 Submit to Departmental Representative, minimum 4 weeks prior to starting concrete work, valid and recognized certificate from plant delivering concrete.

Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 33 - Health and Safety Requirements.

1.6 Delivery, Storage and Handling

- .1 Concrete hauling time: maximum allowable time limit for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.
 - .1 Modifications to maximum time limit must be agreed to by the Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
 - .2 Deviations to be submitted for review by the Departmental Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

1.7 Waste Management and Disposal

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
- .2 Ensure emptied containers are sealed and stored safely.
- .3 Use excess concrete for footing bottom.
- .4 Divert unused concrete materials from landfill to local facility as reviewed by Departmental Representative.
- .5 Provide appropriate area on job site where concrete trucks and be safely washed.

- .6 Divert admixtures and additive materials from landfill to approved official hazardous material collections site as reviewed by Departmental Representative.
- .7 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

PART 2 PRODUCTS

2.1 Materials

- .1 Cement: to CAN/CSA-A3001, Type GU.
- .2 Blended hydraulic cement: Type GUb to CAN/CSA-A3001.
- .3 Supplementary cementing materials: with minimum 10% Type F fly ash replacement, by mass of total cementitious materials to CAN/CSA A3001. Water: to CSA-A23.1/A23.2.
- .4 Air entraining admixture: to CAN/CSA-23.1
- .5 Chemical admixtures: to CAN/CSA-A23.1 as approved by Departmental Representative.
- .6 Reinforcing bars: to CAN/CSA-G30.18, Grade 400.
- .7 Welded steel wire fabric: to ASTM A1064/A1064M
- .8 Premoulded joint filler:
 - .1 Bituminous impregnated fibreboard: to ASTM D1751.
- .8 Joint sealer/filler: grey to CAN/CGSB-19.24, Type 1, Class B.
- .9 Sealer: boiled linseed oil to ASTM D260, mixed with mineral spirits 1:1 proprietary poly-siloxane resin blend. Exterior pavement areas : to ASTM C309 Liquid Membrane-Forming compound for Curing Concrete, Type 1.
- .10 Other concrete materials: to CSA-A23.1/A23.2.

2.2 Mixes

- .1 Proportion normal density concrete in accordance with CAN/CSA-A23.1, Alternative 1 to give the following properties:

.1 Cement: Type GU Portland cement

.2 Minimum compressive strength at 28 days, class of exposure and nominal size of coarse aggregate:

Member	minimum 28-days strength (MPa)	maximum aggregate size (mm)	exposure class Category	air content
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Foundation Walls/Footings	30	20	F-2	2
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Slab on Grade (Exterior)	32	20	C-2	1
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- .3 Slump at time and point of discharge: To CSA-A23.1 Clause 4.3.2.3. When super plasticizers are used, the slump may be increased by shall kept below the point where segregation will occur. The cost of super plasticizers shall be included in the cost of the concrete. Smaller aggregate size may be used where necessary to increase slump.
- .4 Air content: To CSA-A23.1 Table 2 & 4 to suit appropriate exposure class.
- .5 Chemical admixtures: following admixtures in accordance with to ASTM C494M. Admixtures shall contain no salts or acids.
- .6 Concrete mix designs shall be submitted to a material consultant for approval and to Departmental representative for review prior to any concrete work.

PART 3 EXECUTION

3.1 Preparation

- .1 Provide Departmental Representative 48 hours notice before each concrete pour.
- .2 Place concrete to CAN/CSA A23.1, Clause 19; Adhere strictly to CSA A23.1 for proper preparation of Cold Weather Concrete.
- .3 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.

- .4 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.
- .5 Protect previous Work from staining.
- .6 Clean and remove stains prior to application of concrete finishes.

3.2 Construction

- .1 Perform cast-in-place concrete work in accordance with CSA-A23.1/A23.2.

3.3 Inserts

- .1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built-in.
 - .1 Sleeves and openings greater than 100 mm x 100 mm not indicated, must be reviewed by Departmental Representative.

3.4 Finishes

- .1 Formed surfaces exposed to view: sack rubbed finish in accordance with CSA-A23.1/A23.2.
- .2 Interior floor slabs to be left exposed to receive epoxy, carpet, sheet vinyl, other covering requiring smooth surface: initial finishing operations followed by final finishing comprising mechanical floating and steel trowelling as specified in CSA-A23.1/A23.2 to produce hard, smooth, dense trowelled surface free from blemishes.
- .3 Floor slabs to receive mortar bed for ceramic or quarry tile: screed to correct grade to provide broomed texture.
- .4 Equipment pads: provide smooth trowelled surface.
- .5 Pavements, walks, curbs and exposed site concrete:
 - .2 Screed to plane surfaces and use [aluminum] [magnesium] [wood] floats.
 - .3 Provide round edges and joint spacings using standard tools.
 - .4 Trowel smooth to provide lightly brushed non-slip finish.

3.5 Control Joints

- .1 Cut and form control joints in interior and exterior slabs on grade at locations indicated, in accordance with CSA-A23.1/A23.2 and install specified joint sealer/filler.
- .2 Provide saw cuts details as follows:

- .1 Exterior Slab on grade:
 - .1 Install 35mm deep saw cut control joint @ 2000mm grid maximum for 150 thick concrete slab.

3.5 Expansion and Isolation Joints

- .1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA-A23.1/A23.2.

3.6 Curing

- .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and in accordance with CSA-A23.1/A23.2.

3.7 Sealing

- .1 Following curing, apply two even coats of linseed oil mixture to clean dry surfaces, each at 8 m²/L. Allow first coat to dry before applying second coat. Apply poly-siloxane resin blend sealer at 4 m²/L.

3.8 Site Tolerances

- .1 Concrete floor slab finishing tolerance in accordance with CSA-A23.1/A23.2.

3.9 Field Quality Control

- .1 Concrete testing: to CSA-A23.1/A23.2 by testing laboratory designated and paid for by Contractor. Accelerated test methods will apply.

3.10 Verification

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 - PRODUCTS, by Departmental Representative and provide verification of compliance.

3.11 Cleaning

- .1 Use trigger operated spray nozzles for water hoses.
- .2 Designate cleaning area for tools to limit water use and runoff.
- .3 Cleaning of concrete equipment to be done in accordance with Section 01 35 43: Environmental Procedures.

END OF SECTION 03 30 00

1.0 GENERAL

1.1 RELATED WORK

- .1 Cast-In-Place Concrete Section 03 30 00

1.2 REFERENCES

- .1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.40-97, Anti-corrosive Structural Steel Alkyd Primer.
.2 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .2 CSA International
- .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .3 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1168-A2005, Adhesive & Sealants Applications.

1.3 QUALITY ASSURANCE

- .1 Standards: Conform to CAN/CSA-A23.1, for concrete finishes.
- .2 Installer Qualifications:
- .1 Work shall be carried out by personnel who has a minimum of 5 years related experience in similar floor treatment. The installer to provide a list of a minimum of 3 projects performed within 3 years of equivalent complexity and scope as this contract.
- .3 Pre-installation Meeting:
- .1 Prior to commencement of Work on site, convene a pre-installation conference to be attended by the Contractor, Coating Subcontractor, Manufacturer's Technical Representative, Consultant and Owner to review:
- .1 Convey proper installation and placement of concrete slabs to ensure proper concrete finishing requirements in order to achieve adequate floor polishing application.
- .2 Convey to Contractor Requirements for protection of concrete slabs to receive concrete floor polishing and to coordinate sequence of work and application during construction.

1.4 SUBMITTALS

- .1 Submittals to be in accordance with 01 33 00 Submittal Procedures.
- .2 Product Data:
- .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.
- .1 Provide two copies of WHMIS MSDS in accordance with Section 01 35 33- Health & Safety Requirements. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content in g/L.

- .2 Include application instructions for concrete floor treatments.
- .3 Submit maintenance instructions for insertion in operations and maintenance manuals. Instructions shall give specific warning of maintenance or cleaning practices or materials, which may damage installed work.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and acceptance and storage requirements:
 - .1 Deliver materials to site in manufacturer's original factory packaging, labelled with manufacturer's name and address.
 - .2 Store materials in a clean dry area in accordance with manufacturer's instructions.
 - .3 Keep product from freezing.
 - .4 Avoid direct contact with this product as it may cause mild to moderate irritation of the eyes and/or skin.
 - .5 Protect materials during handling and application to prevent damage or contamination.
- .3 Dispense special concrete finish material from sealed containers.
- .4 Packaging Waste Management: Comply with requirements of Section 01 74 19 Waste Management and Disposal.
- .5 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials, and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Labour Canada.

1.6 ENVIRONMENTAL REQUIREMENTS / PROJECT CONDITIONS

- 1. Do not apply product when air, surface, or material temperature is below 35°F (2°C) or above 135°F (57°C).
- 2. Do not apply to frozen concrete.
- 3. Do not use on highly dense or non-porous surfaces.
- 4. Allow concrete to cure a minimum of 45 days, or as otherwise acceptable by product manufacturer before commencement of work.
- 5. Do not commence with polishing until Work has been sufficiently advanced, whereby Work yet to be performed will not adversely affect polished concrete floors. Application of products shall take place a minimum of 21 days prior to fixture and trim installation and Substantial Performance of Work.
- 6. Limit and control dust generated by grinding and polishing procedures in order to prevent potential damage to adjacent surfaces and equipment.
- 7. Control the use of water. Remove standing water from completed floor surfaces.
- 8. Ensure that penetrating sealers are not applied to concrete floors that are to be polished.

1.7 EXTENDED WARRANTY

- 1. Provide two (2) year manufacturer's warranty on products and installation against fading and delamination of finished surfaces.

2.0 PRODUCTS

2.1 MATERIALS

- .1 Concrete materials shall conform to requirements of Section 03 30 00-Cast-In-Place Concrete Short Form and CAN/CSA-A23.1.
- .2 Slip-Resistant Additive:
 - .1 Finely ground polymer material for addition to concrete sealers.
 - .2 Compatible with the applied acrylic sealer.
 - .3 Polymer suspended in a sealer material.
 - .4 Sure-Step by WR Meadows or approved equal.
- .3 Bonding Agent: Formulated for bonding new concrete to cured concrete. Acceptable Products:
 - .1 "Polymer Bonding Agent" by Target Products Ltd.
 - .2 "710 Flex-Con" by Else Construction Products.
 - .3 "K-710 Krystobond" by Kryton International Inc.
 - .4 "Fabribond-A" by Fabrikem Manufacturing Ltd.
 - .5 Or approved equal.
- .4 Curing and Sealing Compound:
 - .1 Conforms to ASTM C309-11, Type 1, Class B.
 - .2 ASTM C1315, Type 1, Class A.
 - .3 30% solid concrete curing and sealing compound formulated of acrylic polymers in true water base carrier.
 - .4 Compound dries clear to provide a transparent sheer finish.
 - .5 Provide impermeable seal for maximum moisture protection.
 - .6 VOC Content < 50g/L
 - .7 VOCOMP-30 water-based, acrylic concrete curing and sealing compound or approved equal.
- .5 Natural Hardener: Premixed, abrasion resistant non-metallic hardener (Type 1). Acceptable Products:
 - .1 "Mastercron" by Master Builders Company Limited.
 - .2 "Diamag 7" by Sternson Limited.
 - .3 "Non-Metallic Floor Hardener" by Target Products Ltd.
 - .4 "785 Genflor Non-Metallic Floor Hardener" by Elsro Construction Products.
 - .5 Or approved equal.
- .6 Non-Shrink Grout (for patching): Acceptable Products:
 - .1 "Embeco Mortar" by Master Builders Company Limited.
 - .2 Pre-mixed "Fast-Set Patching Concrete" by Target Products Ltd
 - .3 "810 Gengrout" by Elsro Construction Products.
 - .4 "K-510 Krystol Patch/Grout" by Kryton International Inc.
 - .5 Or approved equal.
- .7 Densifier: Non-flammable non-toxic, water-based formulation used on Portland Cement materials utilizing Quartz-Litium based products. Acceptable Products:
 - .1 "Crenz Protect" by Crenz Concrete.
 - .2 "Pentra Sil" by Convergent Concrete.
 - .3 "Euco Diamond Hard" by The Euclid Chemical Company.
 - .4 "Liquihard Ultra" Surface Hardener
 - .5 Or approved equal.

- .8 Seeding Aggregates: Aggregate shall be small round, brown pebbles size around 10 mm and be hard, sand, durable and free of all deleterious materials and staining quality.
- .9 Aggregate for Polished Concrete: 10 mm pea gravel in salt and pepper color.

2.2 FINISHES

- .1 Trowelled finish for all concrete floor with surface hardener.

3.0 EXECUTION

3.1 FINISHING-GENERAL

- .1 Do concrete finishing work in accordance with CAN/CSA-A23.1-M01, unless otherwise indicated.
- .2 Tops of Walls and Columns to be level and true. Allowable tolerance 6 mm in 3,000 mm.

3.2 FORMED SURFACES

- .1 Inspect concrete surfaces for defects immediately after removal of formwork.
- .2 Remove or cut back to a depth of 3/4" (19 mm) from the surface of the concrete all bolts, ties, nails, or other metal that is not required and repair immediately. Patch all cone and sleeve holes flush with concrete surface in strict accordance with manufacture's printed instructions. Grout all steel inserts in strict conformance with grout manufacturer's printed instructions.
- .3 Remove imperfections such as bulges, fins, lips, and stains to permanently exposed surfaces as directed by Departmental Representative by chipping or grinding and patch to match adjacent surfaces. Do not proceed with grinding until the concrete has sufficiently hardened to prevent dislodgment of coarse aggregate particles. Allowable limits of grinding to be 1/16" so as to not expose aggregate.
- .4 Repair to exposed surfaces or surfaces to receive paint type finishes: Repairs to be carried out under the direction of the Departmental Representative. Blend cement and aggregate so that, when dry, patching mortar will match colour of surrounding. Provide test areas at inconspicuous location to verify mixture and colour match before proceeding with patching. Compact mortar in place and strike-off slightly higher than surrounding surface. Patch and fill all concrete imperfections such as "blow holes", "honeycomb" and voids as directed.
- .5 Strike off smooth and finish tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces with a texture matching the adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces, unless otherwise shown.

3.3 HORIZONTAL SURFACES

- .1 Where floor drains occur, floors to be level around walls and have a minimum 1:50 uniform pitch to drains, unless indicated otherwise. Stairs and landings shall have positive slopes to provide complete water drainage with no ponding.
- .2 Finish horizontal concrete surfaces as follows:
 - .1 Exposed horizontal surfaces not intended to receive additional concrete: Smooth steel trowel finish or as indicated on the drawings.
 - .2 Horizontal concrete surfaces intended to receive waterproofing membrane or applied floor finishes: Smooth, steel trowel finish. Floors to be finished flat, free from defects which would telegraph through finish material.

- .3 Horizontal concrete surfaces intended to receive additional concrete toppings, quarry tile or ceramic tile: Screeded off to true lines and levels shown, roughened to an amplitude of 3/16" (5 mm), cleaned of laitance and loose concrete and left ready to receive finish. Depress slabs to accommodate finish where indicated.
- .4 Broom Finish: After completion of floating and when excess moisture of surface sheen has disappeared, complete surface finishing by drawing a fine-hair broom across concrete surface, perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Consultant.

3.4 PLAIN FLOOR FINISH (TROWELED)

- .1 Roll or tamp 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 to smooth and even surface.
- .4 Follow with second steel trowelling to produces smooth burnished surface to within tolerance described in CAN/CSA-A23.1-M90, Cause 22.1.2-Straight-Edge Method for Very Flat Classification Finish 1/8" (3 mm) in 10'-0" (3000 mm) to all floors receiving carpet, resilient flooring, liquid applied flooring, thin-set ceramic tile. All other floors shall be finished to Flat Classification Finish 3/16" (5 mm) in 10'-0" (3000 mm). Floors shall be true to plane as determined by a 10'-0" (3.0 meter) straight-edge placed anywhere on the surfaces in any direction. Check conformance to tolerance limits at any time after the curing period. Where this Section conflicts with other Sections in Division 3, this Section shall govern.
- .5 Sprinkling of dry cement or dry cement and sand mixture over concrete surfaces is not acceptable.
- .6 Apply curing compound in accordance with manufacturer's instructions to all areas not scheduled to receive further floor finish.
- .7 Protect surfaces which will be exposed to direct sunlight during the curing period in accordance with manufacturer's instructions.

3.5 HARDENED FLOOR FINISH

- .1 Roll or tamp concrete to force coarse aggregate into concrete mix and then screed and apply non-metallic hardener to manufacturer's instructions.
- .2 Apply first shake of aggregate (one half of amount) after floating.
- .3 Float first shake and apply second shake.
- .4 Float second shake.
- .5 Flat steel trowel to produce fine texture non-slip finish.
- .6 Apply two coats of curing and sealing compound in accordance with manufacturer's directions.

3.6 BONDING AGENT

- .1 Apply bonding agent to all concrete when new concrete will be applied against it under the following conditions:
 - .1 Patching.
 - .2 Feathering.
 - .3 Construction joints.
 - .4 Bonding of topping slabs.

3.7 DEFECTIVE WORK

- .1 Repair honeycombing, rock packets, chips, spalls and other voids in exposed concrete surfaces, using patching materials as specified to provide a smooth surface. Remove fins and other protrusions in concrete surfaces. Maximum allowable depth of grinding to be 1/16".
- .2 Consult with Departmental Representative on the repair of defective concrete surfaces prior to execution of the work.
- .3 Patch form tie holes in all exposed concrete surfaces and surfaces designated to receive waterproofing unless otherwise directed.
- .4 Where in the opinion of Departmental Representative, material or workmanship fails to meet the requirements of the specification, such work may be rejected. Work rejected shall be replaced or repaired to the approval of the consultant at no additional cost to the owner.

3.8 PROTECTION

- .1 Take every precaution to protect finished surfaces from stains and abrasions. Surfaces and edges likely to be damaged during the construction period shall be especially protected.
- .2 Protect work of other sections from damage resulting from work of this Section.
- .3 Provide suitable enclosures for collecting grit and dust from sandblasting operation.
- .4 Erect barricades to prevent traffic on newly finished surfaces.
- .5 Suggested protection in high traffic areas after the sealer has been applied is as follows:
 - .1 Place cheap colourfast carpet that is breathable (not rubber backed), fuzzy side down or
Protect CP board.
 - .2 Masonite or plywood may then be applied over the carpet/cardboard for further protection.

3.9 ADJUSTING & CLEANING

- .1 Progress Cleaning: Clean during progress of the Work in accordance with Section 01 74 11- Cleaning.
- .2 Final Cleaning: Upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Repair, remove and clean all drips or smears resulting from the work of this section on exposed, finished surfaces or surfaces to be subsequently finished.
- .4 Engage a concrete finish manufacturer's authorized representative to train Owner's maintenance personnel on proper maintenance procedures.

END OF SECTION 03 35 00