

SECTION 03100
CONCRETE FORMWORK

PART 1 GENERAL

1.01 SUMMARY

- A. Comply with Division 1, General Requirements.
 - 1. The NEWPCC facility is a major wastewater treatment plant with limitations and restrictions to access and service disruptions. Work within this Division must be planned and coordinated as further described in Division 1, Section 01040.
- B. This Section forms part of Section 03300, Cast-in-Place Concrete.

1.02 REFERENCES

- 1. Comply with the latest edition of the following statutes codes and standards and all amendments thereto. American Concrete Institute (ACI):
 - a. 347, Guide to Formwork for Concrete.
- 2. Canadian Standards Association (CSA):
 - a. A23.1, Concrete Materials and Methods of Concrete Construction.
 - b. S269.1 Falsework for Construction Purposes.
 - c. S269.2-M, Access Scaffolding for Construction Purposes.
 - d. S269.3-M, Concrete Formwork
- 3. National Lumber Grades Authority (NLGA):
 - a. Standard Grading Rules for Canadian Lumber.

1.03 DESIGN REQUIREMENTS

- A. Design formwork in accordance with CSA S269.1, S269.2-M, and S269.3-M and CSA A 23.1-04 Clause 6.4 Formwork to provide specified finishes.
- B. Make joints in forms watertight.

1.04 SUBMITTALS

- A. Shop Drawings:
 - 1. Submit formwork and falsework drawings bearing seal and signature of a professional engineer for record purpose.
 - 2. Formwork and falsework shop drawings will not be reviewed for structural adequacy.
 - 3. Be fully responsible for the design, construction, and maintenance of formwork and falsework.
 - a. Show design criteria as specified in CSA A23.1-04 Clause 6.5.2.1.

4. Indicate:
 - a. For walls and columns on top of slabs and beams
 - 1) Shoring left in place until concrete in walls and columns above has reached specified strength.
 - 2) Lateral bracing system.
5. Layout of panel joints , form liners, and tie hole pattern. Method of sealing form tie hole. Coordinate with details where shown.
6. Two unstamped copies of the shop drawings will be returned with Contract Administrator's comments.

1.05 QUALIFICATIONS

- A. Formwork, Falsework, and Shoring Designer: An engineer licensed in the province of Project.

PART 2 PRODUCTS

2.01 FORM MATERIALS

- A. General:
 1. Materials:
 - a. Lumber for Formwork and Falsework: Grade-marked sawn lumber graded in accordance with NLGA.
 - b. Plywood for Formwork: CSA A23.1; high density overlay (plastic overlay) grade plywood.
- B. Form Release Agent:
 1. Use form release agent on all cast in place concrete except where form liners is used.
 2. Material: Release agent that does not bond with, leave residue on, stain, or adversely affect concrete surfaces, and does not impair subsequent treatments of concrete surfaces when applied to forms
 3. Freezing point: -15 degrees C or lower.
 4. Manufacturers and Products:
 - a. Master Builders, Inc.; Rheofinish.
 - b. Cresset Chemical Company; Crete-Lease 20-VOC.
 - c. NCA/Acrow-Richmond Ltd.; RICH-COTE.
- C. Form Ties:
 1. Material: Steel.
 2. Water Stop Ties: For water-holding structures, below grade structures, pipe galleries, and accessible spaces below finish grade, furnish one of the following:
 - a. Integral steel water stop 2.6 mm thick and 16 mm in diameter tightly and continuously welded to tie.

- b. Neoprene water stop 5 mm thick and 24 mm diameter whose center hole is 1/2-diameter of tie, or molded plastic water stop of comparable size.
- c. Orient water stop perpendicular to tie and symmetrical about center of tie.
- d. Design ties to prevent rotation or disturbance of center portion of tie during removal of ends and to prevent water leaking along tie.
- e. Through bolt ties are not permitted for water-holding structures.

PART 3 EXECUTION

3.01 FORM SURFACE PREPARATION

- A. Remove water, snow, ice, laitance, curing compound, loose soil, and other debris and thoroughly clean form surfaces that will be in contact with concrete or that have been in contact with previously cast concrete, dirt, and other surface contaminants prior to coating surface.
- B. Exposed Wood Forms in Contact with Concrete: Apply form release agent as recommended by the manufacturer.

3.02 ERECTION

- A. General:
 - 1. Unless specified otherwise, follow applicable recommendations of CSA S269.1, S269.2-M and S269.3-M.
 - 2. Align form joints and make watertight. Keep number of joints to a minimum.
 - 3. Laterally brace formwork and falsework and prevent displacement during concrete placement.
 - 4. Form chases, openings, projections, recesses, expansion joints and construction joints.
 - 5. Form around pipes, mechanical, and electrical equipment which penetrate the concrete structure.
- B. Wall Forms:
 - 1. Locate form ties and joints in an uninterrupted uniform pattern.
 - 2. Inspect form surfaces prior to installation to assure conformance with specified tolerances.
 - 3. Do not use through-the-wall removable form ties for walls of liquid holding structures and exterior walls below grade.
- C. Form Tolerances: Comply to tolerances of CSA A23.1.
- D. Fasteners: Use only galvanized nails and fasteners when such fasteners will be left in place in the permanent structure.

- E. Lateral Supports: Where required, brace walls until permanent lateral supports are in place.
- F. Formwork at Construction and Expansion Joints: Provide formwork incorporating water stop in joint.

3.03 FORM REMOVAL

- A. Remove wall and column formwork as soon as possible after concrete has attained adequate strength to support its own weight and superimposed loads, without cracking or deflecting excessively in order to facilitate effective finishing, but not earlier than 30 hours after concrete placement if:
 - 1. Concrete is sufficiently hard so as not to sustain damage by form removal operations, and
 - 2. Curing and protection operations are maintained.
- B. Elevated Structural Slabs, and Beams: Remove formwork after concrete has reached 75 percent of its specified 28-day compressive strength as determined by field cure test cylinders.
- C. Remove nails, fasteners, tie wire and similar items at the surface.

END OF SECTION

**SECTION 03210
REINFORCING STEEL**

PART 1 GENERAL

1.01 SUMMARY

- A. Products supplied but not installed under this section:
 - 1. Reinforcing bars for grouted in dowels.

1.02 REFERENCES

- A. Comply with the latest edition of the following statutes codes and standards and all amendments thereto.
 - 1. Canadian Standards Association (CSA)
 - a. A23.1 Concrete Materials and Method of Concrete Construction
 - b. A23.3 Design of Concrete Structures for Buildings
 - 1) G30-18 Billet-Steel Bars for Concrete Reinforcement
 - 2. Reinforcing Steel Institute of Canada (RSIC):
 - a. Reinforcement Steel Manual of Standard Practice.

1.03 SUBMITTALS

- A. Shop Drawings:
 - 1. Reinforcing Bars:
 - a. Submit reinforcing bar placement drawings prepared in accordance with Reinforcement Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada and as specified below.

1.04 DELIVERY, STORAGE, AND HANDLING

- A. Ship bundles of reinforcing bars identified by tags containing bar marks along with bar list.
- B. Store materials to prevent deterioration or contamination. Deteriorated or contaminated materials will be rejected and must be removed from site.

PART 2 PRODUCTS

2.01 MATERIALS

A. Reinforcing Bars:

1. Deformed steel bars: CAN/CSA-G30.18-M; Grade 400R.

2.02 ACCESSORIES

A. Tie Wire:

1. Black, soft-annealed 1.6 mm diameter wire.
2. Nylon-, epoxy-, or plastic-coated wire.

B. Bar Supports and Spacers:

1. Adequate for accurate placing and as required for construction loads.
2. Provide non-conductive bar supports in contact with exposed surfaces that has geometry and bond characteristics that prevents moisture movement from the surface to the reinforcement.
3. Precast Concrete Support: Total Bond Precast high performance concrete bar supports as supplied by Con Sys Inc Pinawa, Manitoba, Canada.

2.03 FABRICATION

A. Reinforcing Bars

1. Comply with CSA A23.1 and CSA A23.3.
2. Tolerances:
 - a. Length: ± 25 mm.
 - b. Height of truss bar: +0 to -10 mm.
 - c. Outside dimensions of stirrups, ties, and spirals: ± 10 mm.
 - d. Other bends: ± 25 mm.
3. Use longest bar possible.
4. Keep number of splices to a minimum.
5. Do not weld chairs, bolsters, bar supports, or spacers to reinforcing bars.

B. Reinforcing Splices:

1. Lap Splices:
 - a. Splice by lapping reinforcing bars, unless specified otherwise.

PART 3 EXECUTION

3.01 PREPARATION

- A. Notify Contract Administrator when reinforcing is ready for inspection and allow sufficient time for inspection prior to placing concrete.
- B. Clean reinforcing bars of loose rust, mill scale, dried cement paste, mud, oil, or other coatings that will affect adhesion in accordance with CSA A23.1-04, Clause 6.1.5 Surface Conditions of Reinforcement, prior to placing concrete.

3.02 REINFORCING BAR INSTALLATION

- A. Place reinforcement within tolerances specified in CSA A23.1- 04 Clause 6.6.8 Tolerances for location of reinforcement.

END OF SECTION

SECTION 03251
CONCRETE JOINTS AND ACCESSORIES

PART 1 GENERAL

1.01 SUMMARY

- A. This Section forms part of Section 03300, Cast-in-Place Concrete.

- B. Products Installed But Not Supplied Under the Work of This Section:
 - 1. Location and installation affect the work of this Section. List is not guaranteed as being complete.
 - a. Anchor bolts.
 - b. Frames for covers and openings.
 - c. Equipment castings and pipe fittings.

1.02 REFERENCES

- A. Comply with the latest edition of the following statutes codes and standards and all amendments thereto.
 - 1. Canadian Standards Association (CSA):
 - a. A23.1, Concrete Materials and Methods of Concrete Construction.
 - b. A123.3, Asphalt Saturated Organic Roofing Felt
 - c. G30.18-M, Billet-Steel Bars for Concrete Reinforcement
 - d. G40.20/21, General Requirements For Rolled or Welded Structural Quality Steels / Structural Quality.
 - e. G164-M, Hot Dip Galvanizing of Irregularly Shaped Articles.

1.03 SUBMITTALS

- A. Shop Drawings:
 - 1. Joints: Construction
 - a. Submit detailed shop drawings of each joints type. Submit an elevation or section taken through the plane of the joint showing the walls and slabs at the joint.
 - 2. Injection Waterstop Systems
 - a. Details of water stop system, sizes, types, splices, method of securing and supporting waterstop to maintain proper orientation and location during concrete placement.
 - 3. Construction Joints Layout and location for each type.
 - 4. Inserts
 - a. Detail location, size, and type of concrete inserts
 - b. Indicate coatings, galvanizing, or surface treatments.

B. Samples:

1. Injection waterstop system.

C. Product Data Sheets

1. Submit three copies of manufacturer's product data sheets including installation, application, and maintenance instructions for:
 - a. Injection waterstop system.
 - b. Concrete inserts.

PART 2 PRODUCTS

2.01 INJECTION WATER STOP SYSTEM

A. Manufacturers and Products:

1. De Neef Construction Chemicals Inc.; Injecto Water Stop System consisting of Injecto tube with accessories and Hydro Active Flex LV Grout.
2. Multiurethanes Ltd., DWIN Injectable Tubing System consisting of DWIN injection tubing with accessories and Flexible Water – Reactive Polyurethane Resin.

PART 3 EXECUTION

3.01 GENERAL

- A. Commence concrete placement after joint preparation is complete.

3.02 SURFACE PREPARATION

A. Construction joint with Injection Water Stop System:

1. Cut key in concrete.
2. Remove splatter from reinforcing steel and dowels.
3. Roughen surface in accordance with CSA A23.1.

3.03 INSTALLATION OF WATER STOPS

A. Injection Water Stop System:

1. Prepare surfaces, and install water stop system in construction joint in accordance with manufacturer's printed instructions.
2. Fasten tube to concrete at a spacing of 300 mm.
3. Limit length of grout tube to a maximum of 8000 mm.

4. Inject grout in the tube to completely seal the joint and make the joint watertight. Cut ends of tube recessed into concrete surface and plug with cementitious mortar.

3.04 FRAMES FOR COVERS AND OPENINGS

- A. Set frames at locations and required elevations.

3.05 EQUIPMENT CASTINGS AND PIPE FITTINGS

- A. Set castings and pipe fittings at locations and elevations required.
- B. Repair hot-dip galvanized surfaces damaged by welding, cutting, handling during shipping or erection, or otherwise, in accordance with ASTM A780 using a zinc-rich coating. Dry film thickness on repairs to exceed original coating thickness by 25% minimum.

END OF SECTION

SECTION 03300
CAST-IN-PLACE CONCRETE

PART 1 GENERAL

1.01 SUMMARY

- A. Comply with Division 1, General Requirements.
 - 1. The NEWPCC facility is a major wastewater treatment plant with limitations and restrictions to access and service disruptions. Work within this Division must be planned and coordinated as further described in Division 1, Section 01040.
- B. Comply with requirements of CSA A23.1 and A23.2, except where noted otherwise in this Specification.
- C. The following sections form part of this Section:
 - 1. Section 03100, Concrete Formwork
 - 2. Section 03210, Reinforcing Steel
 - 3. Section 03251, Concrete Joints and Accessories
 - 4. Section 03345, Concrete Curing and Finishing
- D. Section Includes:
 - 1. Normal-density concrete.
 - 2. Repair of cracks that develop in concrete.

1.02 DEFINITIONS

- A. Defective Areas: Surface defects that include honeycomb, rock pockets, indentations greater than 5 mm, cracks 0.1 mm wide and larger as well as any crack that leaks for liquid containment basins and below grade habitable spaces; cracks 0.25 mm wide and larger in non liquid holding structures, spalls, chips, air bubbles greater than 20 mm in diameter, pinholes, bug holes, embedded debris, lift lines, sand lines, bleed lines, leakage from form joints, fins and other projections, form pop outs, texture irregularities, and stains and other color variations that cannot be removed by cleaning.

1.03 REFERENCES

- A. Comply with the latest edition of the following statutes codes and standards and all amendments thereto.
 - 1. American Concrete Institute (ACI):
 - a. 304.2R, Placing Concrete by Pumping Methods.
 - 2. American Society for Testing and Materials International (ASTM):

- a. C260 Specifications for Air-Entraining Admixtures for Concrete.
- b. C494/C494M Standard Specifications for Chemical Admixtures for concrete
- c. C900, Test Method for Pullout Strength of Hardened Concrete.
- 3. Canadian Standards Association (CSA):
 - a. A23.1, Concrete Materials and Methods of Concrete Construction.
 - b. A23.2 Methods of Test and Standard Practices for Concrete.
 - c. A3001, Cementitious Materials for Use in Concrete.
 - d. A3002, Masonry and Mortar Cement.
 - e. A3003, Chemical Test Methods for Cementitious Materials for Use in Concrete and Masonry.
 - f. A3004, Physical Test Methods for Cementitious Materials for Use in Concrete and Masonry.
 - g. A3005, Test Equipment and Materials for Cementitious Materials for Use in Concrete and Masonry.

1.04 PERFORMANCE REQUIREMENTS

- A. Watertightness
 - 1. Provide watertight concrete structures. No visible leaks will be permitted.
- B. 28-day Concrete Compressive Strengths.
 - 1. Normal-density concrete:
 - a. Type A: 30 MPa.
- C. Density.
 - 1. Normal density : $2350 \pm 50 \text{ kg/m}^3$.
- D. Construction Tolerances:
 - 1. Comply with CSA A23.1-04 Clause 6.4 unless noted otherwise.

1.05 SUBMITTALS

- A. Product Data Sheets:
 - 1. Submit three copies of manufacturer's product data sheets including installation, application, and maintenance instructions for:
 - a. Chemical admixtures.
 - b. Bonding agent.
 - c. Crack injection material.
 - d. Repair materials.

B. Concrete Mix Design:

1. Submit proposed performance mix, and supplier's applicable standard deviations.
2. Submit detailed plan for cold weather curing and protection of concrete placed and cured in weather below 5 degrees C.
3. Concrete mix designs will be reviewed for conformance with requirements of the Specifications and will be returned with Contract Administrator's comments.

C. Source Quality Control Submittals:

1. Provide certification that source for fine and coarse aggregates are not subject to deleterious expansion.

D. Concrete Placing Schedule:

1. Submit concrete placing schedule.

E. Certificates:

1. Submit certification that proposed performance mix will produce concrete meeting the requirements of Specifications.
2. Submit certification that crack injection materials are suitable for continuous submersion and that they will not release toxic materials into the water.

1.06 QUALITY ASSURANCE

A. Ready Mixed Concrete Producer: Certified member in good standing of the local Ready Mixed Concrete Association.

B. Concrete Testing:

1. Testing of concrete for materials and compression will be done by agencies paid for by the Owner

1.07 DELIVERY, STORAGE, AND HANDLING

A. Comply with manufacturers' recommendations for delivery, storage, and handling.

B. Store materials in a manner that will prevent deterioration or contamination. Deteriorated or contaminated materials will be rejected and must be removed from site.

1.08 SITE CONDITIONS

A. Cold Weather Requirements:

1. The following requirements are in addition to CSA A23.1 -04, Clause 7.4.2.5 - Cold Weather.

B. Protection:

1. Protect freshly placed concrete from damage due to construction operations and from cold, heat, rain, snow, running water, drying winds, and any other circumstances which would likely cause deterioration of concrete quality.
2. Use waterproof insulated covers or other suitable materials to enclose freshly placed concrete under these conditions.

C. Backfilling and Service Loads Restrictions:

1. Verify that backfill is not higher than the finished grades indicated.
2. Verify that equipment for backfilling and compaction on top of slab will not impose loads greater than those indicated.
3. Verify that concrete in slabs, and support components have reached specified compressive strengths before backfilling or subjecting slabs to service loads.

PART 2 PRODUCTS

2.01 MATERIALS

A. Portland Cements/ Blended Hydraulic Cements:

1. CSA A23.1: Type: MSb

B. Aggregates:

1. Normal-density Concrete:
 - a. Coarse aggregate: CSA A23.1; rough and angular gravel or crushed stone.
 - b. Fine aggregate: CSA A23.1; natural sand.

C. Admixtures:

1. Compatible with each other and with other concrete materials.
2. Calcium chloride, thio-cyanates, or admixtures containing more than 0.05% chloride ions are not permitted.
3. Air-entraining admixture: ASTM C260; non-detergent type.
4. Water-reducing admixtures: ASTM C494; Type A.

- D. Water: CSA A23.1; clear and free from oil, acid, alkali, organic matter, or other deleterious substances with a maximum soluble chloride ion content of 0.10 percent by weight.
- E. Bonding agent: Suitable for conditions of service and performance requirements of this Section
- F. Polyurethane injection resin for sealing cracks, single-component Diphenylmethane Diisocyanate (MDI) based, water-activated, hydrophobic type resin:
 - 1. Flexible Resin by Multiurethanes Limited.
 - 2. Hydro Active Flex LV by DeNeef Construction Chemicals (U.S.) Inc.

2.02 CONCRETE MIXES

- A. General:
 - 1. Establish proportions of cementing materials, aggregates, water, and admixtures required to produce consistent workable concrete that is watertight, durable concrete with strength and other properties specified. Comply with -CSA A23.1-04 clause 4.3.6 Volume Stability Considerations.
 - 2. Comply with and allow for the supplier's Standard Deviation as specified in CSA A23.1--04 Clause 4.4.6.7- Compressive Strength Requirements. If the concrete supplier has no established Standard Deviations for concrete of the specified strengths, use a value of 4 MPa minimum.
- B. Types of Normal-density Concrete:
 - 1. Type A: Concrete for structures, containing reinforcing bars, unless specified otherwise.
- C. Mixes for Normal-density Concrete:
 - 1. Cementing Materials Content:
 - a. Except where higher quantities are needed to meet strength or other requirements, provide the following minimum cementing materials contents:
 - 1) Type A: 330 kg/m³, for nominal 20 mm to 5 mm coarse aggregate.
 - 2. Coarse Aggregates:
 - a. Nominal size 20 mm to 5 mm
 - 3. Water/Cementing Materials Ratio (W/C):
 - a. Unless specified otherwise: 0.43 maximum.

4. Slump:
 - a. Provide slump consistent with placement, consolidation methods equipment and site conditions. Ensure concrete do not segregate during placement.
5. Air Content:
 - a. Comply with CSA A23.1-04, Table 4 - Requirements for the Air Content Categories.
 - b. Provide air content category 2, unless noted otherwise.
 - c. Provide air content category 1 for loading bays, parking areas, and liquid holding structures sidewalks curbs and gutters. .
6. Admixtures:
 - a. Use water-reducing admixture as necessary.
 - b. Use superplasticizing admixture with a retarder when requirements of CSA A23.1, -04 Clause 7.4.1.8.1 - Hot-Weather Curing are applicable.

D. Mix for Wall and Column Grout:

1. Minimum content of cementing materials: 600 kg/m³.
2. Coarse aggregate: None.
3. Fine aggregate: CSA A23.1; natural sand.
4. Water/cementing materials ratio (W/C): 0.43 maximum.
5. Slump: Matching Type A concrete.
6. Air content: Matching Type A concrete.
7. Admixtures: Use water-reducing admixture.

E. Mix for Pumped Concrete:

1. Comply with ACI 304.2R and this Specification.
2. Fine aggregate with uniform grading curve and fineness modulus of 2.65 ± 0.20 .
3. Use coarse aggregate with uniform grading curve.
4. Superplasticizing admixture may be used for pumped concrete.
5. Do not use admixtures which promote bleeding.

PART 3 EXECUTION

3.01 PREPARATION

A. General:

1. Determine requirements of other trades, inform concerned trades, and assume responsibility for location, installation, and quality of items which affect the work of this Section.

B. Preparation of Surfaces:

1. Remove water, snow, ice, loose soil, laitance, curing compound, wood, and other debris from surfaces on or against which new concrete will be placed.
2. Roughen and clean surfaces of previously placed concrete against which subsequent concrete will be placed.

3.02 PLACING CONCRETE

A. General:

1. Verify that cast-in-place accessories, inserts, and reinforcement are set correctly and are not disturbed during concrete placement.
2. Place concrete on dry and clean substrate.

B. Depositing:

1. Deposit concrete in a manner that prevents segregation in accordance with CSA A23.1-04 Clause 7.2.4 - Depositing.

C. Time Limitations on Concrete Placement:

1. Do not use concrete after a period of two hours has passed since first mixing of ingredients.

D. Adverse Weather Conditions:

1. Make suitable arrangements to prevent damage to fresh concrete, under adverse weather conditions.

E. Wall and Column Grout:

1. Deposit 75 mm of wall and column grout evenly along horizontal construction joints in bottom of form through an elephant trunk immediately before placing wall or column concrete.

F. Consolidation:

1. Consolidate the concrete during and immediately after depositing, thoroughly and uniformly by means of tamping, hand tools, finishing machines, and vibrators in order to obtain dense, watertight, homogeneous concrete well bonded to reinforcing bars.
2. Carefully vibrate concrete around the waterstops, to make sure thorough contact.
3. Vibration consolidation not to exceed distance of 1 m from point of placement.

G. Repair cracks in the completed structures employing a suitable polyurethane injection technique to make such cracks completely watertight after repair.

- H. Remove surface injection materials following completion of work and finish affected areas to match surrounding concrete.

3.03 CONCRETE BONDING

A. To Existing Concrete:

1. Thoroughly clean and mechanically roughen existing concrete surfaces to roughness profile of 6 mm.
2. Saturate surface with water for 24 hours prior to placing new concrete.

3.04 FIELD QUALITY CONTROL

A. General:

1. Tests will be made throughout progress of the Work and will be paid for by the Owner to determine concrete quality. Tests will be in accordance with CSA A23.1 and A23.2. Provide labour, concrete, and other facilities for making the test specimens.
2. The testing laboratory shall provide the test results to the Owner, Contract Administrator, Contractor and material supplier within 5 days of availability. For test that fails to meet the Specification inform Contract Administrator, Contractor and material supplier within 48 hours of the test.

B. Standard Strength Tests:

1. Provide concrete for one standard strength test consisting of 3 cylinders for each type placed in any day. One cylinder will be tested at 7 days and two at 28 days.

C. Concrete Temperature Monitoring:

1. Provide and keep in working order sufficient Taylor Instrument pocket biotherm thermometers model 6097-1 to monitor concrete temperatures in each pour.
2. Install 12 mm diameter by 150 mm deep copper tubes crimped at bottom end into concrete at each monitoring location. Fill tube with water.

D. Air Content Tests:

1. Testing agency will carry out air content tests in accordance with CSA A23.1 and A23.2.

E. Slump Tests:

1. Testing agency will carry out slump tests in accordance with CSA A23.1 and A23.2.

F. Uniformity of Mixed Concrete

1. If the results of slump, slump flow, air content or density for any mix design do not comply with CSA A23.1-04, Table 13 - Determination of Within-Batch Uniformity, alter mixing operations and equipment until tests indicate that the requirements are satisfied.

G. Concrete Delivery Records:

1. Submit with each batch of concrete before unloading, a typed delivery ticket prepared at the ready mix plant containing following information:
 - a. Name of ready-mix batch plant.
 - b. Serial number of ticket.
 - c. Date and truck number.
 - d. Name of Contractor.
 - e. Name of Job.
 - f. Specified 28-day strength of concrete with identifying mix number.
 - g. Time loaded or of first mixing of cement and aggregates.
 - h. Temperature of fresh concrete
2. Keep records of the time when each load arrives at the site and when discharge is completed.

END OF SECTION

SECTION 03345
CONCRETE CURING AND FINISHING

PART 1 GENERAL

1.01 SUMMARY

- A. Comply with Division 1, General Requirements.
- B. This Section forms part of Section 03300, Cast-In-Place Concrete.

1.02 REFERENCES

- A. The following is a list of standards which may be referenced in this section:
 - 1. American Society for Testing and Materials International (ASTM):
 - a. C109/C109M, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
 - b. C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - c. C1315, Standard Specification for Liquid Membrane-Forming Compounds having Special Properties for Curing and Sealing Concrete.
 - 2. Canadian Standards Association (CSA):
 - a. A23.1 -04, Concrete Materials and Methods of Concrete Construction.

1.03 SUBMITTALS

- A. Product Data Sheets
 - 1. Submit three copies of manufacturer's product data sheets including installation, application, and maintenance instructions for:
 - a. Curing compound.
- B. Shop Drawings
 - 1. Submit shop drawings detailing finishes for floors and walls.
 - 2. Curing methods proposed.
 - 3. Manufacturers' data for the following products:
 - 1) Curing compound.

1.04 QUALITY ASSURANCE

- A. Concrete finishers: Skilled personnel with a minimum of five years proven satisfactory experience finishing concrete of comparable size and scope.

1.05 DELIVERY, STORAGE, AND HANDLING

- A. Prevent deterioration or contamination of stored materials. Deteriorated or contaminated materials will be rejected and must be removed from site.

1.06 SITE CONDITIONS

- A. Comply with special requirements of Section 03300, Cast-in-Place Concrete for work under cold weather and high temperature conditions.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Curing compound: ASTM C309
 - 1. Type 1

PART 3 EXECUTION

3.01 PREPARATION

- A. Determine requirements for applied finishes.

3.02 TOLERANCES

- A. General
 - 1. Comply with CSA A23.1-04, Clause 7.5.1 – Surface Tolerances for slabs and floor.

3.03 CONCRETE FINISHING

- A. General:
 - 1. Concrete finishing effort is directly dependent on forming, concrete placing, and curing techniques. Perform finishing procedures until specified finishes are achieved.
- B. Formed Surfaces
 - 1. Provided smooth form finish in accordance with CSA 23.1 clause 7.7.3.6
- C. Slabs and Floor Surface

1. Provide steel trowel finish in accordance with CSA 2.3.1 Clause 7.5.4.3

3.04 CURING CONCRETE

- A. Begin curing immediately following placing and finishing in accordance with CSA A23.1-04 clause 7.4 except as noted below.
- B. Rate of evaporation is depend on relative humidity, concrete temperature and winds velocity; for rate of evaporation of moisture from concrete surface covered with water see CSA A23.1 appendix D Guidelines for curing and protection.
- C. Wet cure for 10 consecutive days at a minimum temperature of 10°C. This requirement supersede CSA23.1 -04 Table 20 Allowable curing regimes
- D. Establish the requirements of specified finishes for concrete surfaces before applying curing compound. Verify that curing compound is compatible with applied finishes.
- E. Formed Surfaces (Walls and Columns)
 1. Wet cure as specified by pouring water between the formwork and concrete surface where possible.
 2. As an alternative, cure as specified above until formwork is removed. Immediately after removal of formwork, provide 24 hours saturation followed by application of curing compound in accordance with manufacturer's printed instructions.

3.05 PROTECTION

- A. Keep traffic which would affect or disturb the curing procedures off the finished surfaces for a period of seven days.
- B. Protect exposed concrete finishes against damage until acceptance of the work by the Owner. Do not allow rain, sleet, or snow to increase mixing water or damage surface finish.
- C. Protect items set into floors from damage. Verify that alignment is not disturbed.

END OF SECTION