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| Version | Date | Description of Revisions |
| 1 | August 30, 2006 | Approved final document. |
| 2 | November 5, 2007 | Minor revisions by Legal Services. |
| 3 | November 13, 2009 | Modified ‘Related Section’ |
| 4 | June 5, 2012 | Added References and Replacement Parts Sections |
| 5 | June 29, 2012 | Reformatted to Remove White Space |
| 6 | April 24, 2015 | General formatting |
| 7 | August 19, 2015 | First draft review and update of specification (AV) |
| 6 | September 16, 2015 | Updated, Finalized Specification – Reference eDOCS #6263148-v3 (AV) |
| 7 | April 26, 2018 | 2.1.8 Removed manufacturers and products  2.1.9 Removed manufacturers and products  2.1.12.5 Removed manufacturers and products  2.2.10 Removed manufacturers and products (BM) |
| 8 | March 31, 2020 | References updated throughout  1.8 section added (BM) |

NOTE:

This is a CONTROLLED Document. Any documents appearing in paper form are not controlled and should be checked against the on-line file version prior to use.

**Notice:** This Document hardcopy must be used for reference purpose only.

**The on-line copy is the current version of the document.**

# General

## Summary

### This Section specifies the requirements for the supply of all labour, materials and equipment to complete the concrete Work as indicated on the Contract Drawings, as specified herein, and as required in order to complete the Work.

### Comply with the requirements of CSA 23.1-14 and CSA 23.2-14 except where noted otherwise in the Contract Documents. Do not use materials that are toxic in their installed condition.

## Related Sections

### *[Under "Related Sections", identify other Sections that are related to, and/or dependent on, the work results or information specified elsewhere. The list should be limited to Sections with specific information that the reader might expect to find in this Section, but is specified elsewhere. For example, if hardware for aluminum entrances is specified in the aluminum entrance Section, a cross-reference would be appropriate in the finish hardware Section. The purpose of this cross-referencing is for information only, to aid in finding those other requirements—not to define the scope of the Section.*

### *Cross-referencing here may also be used to coordinate assemblies or systems whose components may span multiple Sections and which must meet certain performance requirements as an assembly or system.*

### *Contractor is responsible for coordination of the Work.*

### *This Section is to be completed/updated during the design development by the Consultant. If it is not applicable to the section for the specific project it may be deleted.]*

### [List Sections specifying installation of products supplied but not installed under this Section and indicate specific items.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Execution requirements for ...[item]... specified under this Section.

### [List Sections specifying products installed but not supplied under this Section and indicate specific items.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: Product requirements for ...[item]... for installation under this Section.

### [List Sections specifying related requirements.]

### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: [Optional short phrase indicating relationship].

#### Section 01300 – Submittals

#### Section 03100 – Concrete Forms and Accessories.

#### Section 03200 – Concrete Reinforcement.

#### Section 03345 – Concrete Curing and Finishing.

#### Section 04051 – Masonry procedures

#### Section [\_\_\_\_\_\_ – \_\_\_\_\_\_\_\_\_\_\_\_]: [Optional short phrase indicating relationship].

## Measurement and Payment

*[Choose one of the following payment language provisions that best suits the individual project.*

*If this Section is not specifically referenced by an item in the Bid Form, please use the following language:*

.1 The work of this Section will not be measured separately for payment. All costs associated with the work of this Section shall be included in the Contract Price.

*OR If this Section is specifically referenced in the Bid Form, use the following language and identify the relevant item in the Bid Form:*

.1 All costs associated with the work of this Section shall be included in the price(s) for Item No(s). \_\_\_ in the Bid Form.

## *If the work of this Section is to be measured and paid for by several different methods, please amend the standard wording given above to reflect the different methods of measurement and payment.*]

### [*Consultant to determine whether the following payment items are relevant to the Contract Work. Delete items*

### *that are not applicable to the Contract]*

### .2 All costs associated with Cast in place concrete [shall be included in the price(s) for Item No(s). in the Bid Form][will not be measured separately for payment and shall be included in the Contract Price].

### .3 All costs associated with heating of water and aggregates and providing cold weather protection [shall be included in the price(s) for Item No(s). in the Bid Form][will not be measured separately for payment and shall be included in the Contract Price].

### .4 All costs associated with cooling of concrete and providing hot weather protection [shall be included in the price(s) for Item No(s). in the Bid Form][will not be measured separately for payment and shall be included in the Contract Price].

### .5 All costs associated with the supply and installation of anchor bolts, nuts and washers and bolt grouting [shall be included in the price(s) for Item No(s). in the Bid Form][will not be measured separately for payment and shall be included in the Contract Price].

### .6 All costs associated with the supply and installation of water stops [shall be included in the price(s) for Item No(s). in the Bid Form][will not be measured separately for payment and shall be included in the Contract Price].

## References

### American Society for Testing and Materials (ASTM)

#### ASTM C109/C109M-16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. [or 50 mm] Cube Specimens).

#### ASTM C157/C157M-17, Standard Test Method for Length Change of Hardened Hydraulic-Cement Mortar and Concrete.

#### ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.

#### ASTM C494/C494M-17, Standard Specification for Chemical Admixtures for Concrete.

#### ASTM C827/C827M-16, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.

#### ASTM C881/C881M-15, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.

#### ASTM C939/C939M-16a, Standard Test Method for Flow of Grout for Preplaced Aggregate Concrete (Flow Cone Method).

#### ASTM C1017/C1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.

#### ASTM D412-16, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers - Tension.

#### ASTM D624-00(2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.

#### ASTM D1751-18, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).

#### ASTM D1752-18, Standard Specification for Preformed Sponge Rubber, Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

### American Concrete Institute (ACI)

#### ACI 304.2R-17, Placing Concrete by Pumping Methods.

### Canadian General Standards Board (CGSB)

#### CGSB 51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

### Canadian Standards Association (CSA)

#### CSA A23.1-14, Concrete Materials and Methods of Concrete Construction.

#### CSA A23.2-14, Test Methods and Standard Practices for Concrete.

#### CSA A3002-18, Masonry and Mortar Cement.

#### CSA A3003-18, Chemical Test Methods for Cementitious Materials for Use in Concrete and Masonry.

#### CSA A3004-18, Test Methods and Standard Practices for Cementitious Materials for Use in Concrete and Masonry.

#### CSA A3005-18, Test Equipment and Materials for Cementitious Materials for Use in Concrete and Masonry.

### Ontario Provincial Standard Specifications (OPSS)

#### OPSS MUNI.904, Construction Specification for Concrete Structures

#### OPSS MUNI.1350, Specification for Concrete, Materials & Production

#### OPSS MUNI.1359, Material Specification for Unshrinkable Backfill

## Performance Requirements

#### Water tightness: Provide a water tight concrete structure. No visible leaks will be permitted for liquid holding structures, including roof structures subjected to rain water accumulation.

#### Coordinate a leakage test for liquid holding structures in accordance with Section 01750 - Disinfection and Testing of Water Retaining Structures and Process Piping.

#### 28 Day Compressive strength:

##### 30 MPa for structural concrete

##### 15 MPa for fill concrete

#### Class of Exposure S-2 / A-2 with moderate sulphate resisting cement.

#### Low Shrinkage concrete with 28 Days of drying not greater than 0.04% for concrete made with 40 mm aggregate and 0.055% for concrete made with 20 mm aggregate when tested in accordance with modified ASTM C157/C157M-17 as accepted by the Ready Mix Concrete Association of Ontario.

#### Normal density concrete unless specified otherwise in the Contract Documents.

#### Bond strength of 1.2 MPa for toppings.

#### Construction tolerances: Comply with Clause 6.4 of CSA A23.1-14 unless noted otherwise in the Contract Documents.

#### Addition of water at the site on the instruction of the concrete supplier shall be recorded on the delivery ticket.

## Submittals

### Submit samples in accordance with Section 01300 - Submittals.

### A minimum of 15 Working Days prior to commencing the Work, inform the Consultant of the proposed source of aggregates and provide access for sampling.

### A minimum of 15 Working Days prior to commencing the Work, submit to the Consultant samples of the following materials proposed for use:

#### 1 L of each admixture.

#### 1 L of curing compound.

#### 0.3 m length of each type of joint filler.

#### 0.3 m length of each type of water stops.

### Drying Shrinkage Tests:

#### Perform laboratory trial mixes of concrete used on the Contract. Make two sets of three specimens for each shrinkage test. Laboratories for testing of samples must be certified by the Canadian Council of Independent Laboratories.

#### Prism Specimen Size: 100 mm by 100 mm by approximately 285 mm with an effective gauge length of 250 mm.

#### Specimens: Fabricate, cure, dry and measure as specified in ASTM C157/C157M-17 and modified as follows:

##### Measure specimens at age 7 Days to determine expansion expressed as a percentage of the original length. The length at age 7 Days shall be the base length for drying shrinkage calculations (0 Days drying age).

##### Measure to determine shrinkage expressed as a percentage of the base length and report separately for 7, 14, 21, and 28 Days of drying after 7 Days of moist curing.

#### Computing Drying Shrinkage Deformation of Each Specimen:

##### Difference between base length (at 0 Days-drying age) and length after drying at each test age.

##### If the drying shrinkage of any specimen departs from the average of that test age by more than 0.004 percent, disregard the results obtained from that specimen.

#### Concrete Shrinkage at 28 Day Drying Age: 0.040% maximum for laboratory trial mixes of proposed concrete made with 40 mm aggregate and 0.055% maximum for 20 mm aggregate for construction. If shrinkage specimen tests for concrete exceed the shrinkage limits, modify the concrete mix to reduce shrinkage. Repeat the tests with the new mix.

#### Provide shrinkage tests for each type of structural concrete; two for 40 mm and two for 20 mm aggregate concrete mixes.

## Certificates

### A minimum of 15 Working Days prior to starting any concrete work, submit to the Consultant the manufacturer's test data and certification, by a qualified independent inspection and testing laboratory acceptable to the Region, that the following materials will meet the specified requirements:

#### Portland cement.

#### Blended hydraulic cement.

#### Grout

#### Admixtures.

#### Aggregates are not subject to deleterious expansion.

#### Water.

#### Water stops.

#### Water stop joints.

#### Joint filler.

#### For potable water retaining structures or concrete surfaces that may come in contact with potable water, the Contractor must submit documentation that any materials or admixtures to be used in the concrete; and/or coatings, concrete repair, or crack injection materials are NSF 61 compliant with the required certifications.

### Provide certification that the mix proportions selected will produce concrete of a quality, yield and strength as specified in the concrete mixes and shall comply with the requirements of CSA A23.1-14. Submit design mixes to the Consultant for review a minimum of twenty-eight (28) Days prior to starting any concrete work. Tabulate concrete mixes indicating the size of aggregates, water cementing material ratio, admixtures, air content, and location of use for each mix.

### Submit a detailed plan for cold weather concrete curing and protection of concrete placed and cured in weather below temperature of 5 oC.

### Submit a detailed plan for hot weather placements including curing and protection for concrete placed in ambient temperature over 27 oC.

## Quality Control

### Quality Control Plan

#### The Contractor shall develop a Quality Control Plan that outlines the quality control activities by defining items, such as sampling and testing frequency, and alerting or rejecting criteria for non-conformance a minimum of fifteen (15) Working Days prior to starting any concrete work.

#### The Quality Control Plan shall include the following elements:

##### Roles & responsibilities and Contractor personnel in charge of quality management for the project

##### Document management

##### Concrete construction processes, including placing, protection, finishing and curing (falsework erection, hot weather concrete, cold weather concrete, curing, finishing, topping and formwork removal)

##### Verification of concrete mixes and submittal process

##### Non-conformance management process including identification, reporting and procedure to correct and prevent re-occurrence

##### Quality control testing and inspection plan complete with test results reporting

##### Change management process (changes to the construction process or mix design)

##### Measures taken to address any action items from the Concrete Pre-Placement Meeting

### Quality Control Testing

#### The Contractor is responsible to arrange for and pay for all Quality Control sampling as required by the applicable ASTM and CSA standards, contract specifications, OPSS or structural design engineer requirements for temporary and permanent concrete structures.

#### The Contractor shall provide and maintain adequate facilities for safe storage and proper curing of concrete test specimens on the site for the initial curing period.

#### The Contractor shall pay for additional quality control testing required because of changes in material or the mix proportions, as well as any extra testing of the concrete or materials occasioned by the Contractor’s failure to meet the Specification Section requirements.

#### The Contractor shall submit all Quality Control testing results to the Consultant within 5 Working Days after receipt.

#### The Consultant will take additional test cylinders during any cold weather concreting and shall cure cylinders at the Site under the same conditions as the concrete which they represent.

#### Non-destructive methods for testing concrete shall be in accordance with CSA A23.2-14.

#### Inspection or testing by the Consultant will not augment or replace the Contractor’s quality control obligations nor will it relieve the Contractor of any of its responsibilities or obligations under the Contract.

### Submit to the Consultant the proposed quality control procedures for the following items:

#### Falsework and Formwork in accordance with Section 03100 - Concrete Forms and Accessories.

#### Hot weather concrete.

#### Cold weather concrete.

#### Curing and Finishing in accordance with Section 03345 - Concrete Curing and Finishing.

## Quality Assurance

### Quality Assurance testing of concrete for materials and compression will be arranged by the Consultant and done by agencies paid for by the Region. The Contractor shall provide material and general labour to assist with testing and sampling as requested.

### The use of testing services does not relieve the Contractor of its responsibility to provide materials, testing, sampling and construction in compliance with the Contract Documents.

### The Consultant will take additional test cylinders during any cold weather concreting and shall cure cylinders at the Site under the same conditions as the concrete which they represent.

## Pre-Placement Meeting

### Hold a meeting a minimum of four (4) weeks prior to the initial placement of concrete to review the detailed requirements for preparing the concrete design mixes, finishes, and procedures for concrete placement for the structures.

### Arrange for the attendance at the meeting of the Consultant, the Region, the concrete Subcontractors, manufacturers, and suppliers including, but not limited, to the following:

#### Contractor's superintendent.

#### Ready mix concrete producer.

#### Admixture manufacturer(s).

#### Concrete pumping and conveying equipment supplier.

#### Concrete formwork and finishing Subcontractors.

#### Geotechnical sub-consultant or designated qualified personnel who will be performing testing and sampling.

### Notify the Consultant a minimum of ten (10) Working Days prior to the scheduled date of the meeting.

### The Consultant will set an agenda for the meeting a minimum of five (5) Working Days prior to the scheduled date of the meeting.

## Site Conditions

### Cold Weather Requirements

#### The following requirements are in addition to the requirements of CSA A23.1-14, Clause 7.1.2 - Cold Weather Concreting. *[Consultant to confirm reference accuracy]*

#### Provide temperature-controlled enclosures for areas where concrete is to be placed whenever the ambient air temperature is 5 oC or lower.

#### Protect concrete from the adverse effects of space-heated enclosures including local overheating and combustion products.

#### Heat mix water and, if necessary, aggregates when the air temperature is at or below, or predicted to go below, 5 oC at any time during the next 24 hours.

#### Maintain the temperature of reinforcing bars and forms above 10 oC prior to placing the concrete.

#### Maintain the temperature of concrete, when deposited in forms, at a minimum of 15 oC and a maximum of 25 oC.

#### Maintain the temperature of concrete at surfaces a minimum of 10 oC for a minimum period of 7 Days after placing and achieving a minimum of 75 percent of the specified strength. The concrete temperature may then be lowered to ambient air temperature at a rate of 0.5 oC per hour or 10 oC per day

#### Use additional protection if full 28 Day compressive strength is required at an early age.

#### Keep concrete continuously moist during the curing period.

### High Temperature Control Requirements

#### The following requirements are in addition to the requirements of CSA A23.1-14, Clause 7.1.1 - Hot Weather Concreting. *[Consultant to confirm reference accuracy]*

#### Limit the peak temperature during the curing period to a maximum of 40oC. The placing temperature that will satisfy this requirement depends on the ambient temperature, humidity at the time of placing, thickness of the concrete, and curing methods employed.

#### Consider the use of retarders, low heat cement, slag replacement, ice in mixing water, pre-cooling of aggregates, cooling of concrete through continuous wet curing, and similar methods in order to prevent concrete temperatures from exceeding 40oC at any time.

#### Monitor concrete temperatures for walls and slabs 500 mm or more in thickness. After the concrete temperature has peaked, control the rate of cooling to ambient air temperature to 0.5°C per hour in order to prevent cracking.

#### Notwithstanding the requirements of the subsections above, do not place concrete with a temperature higher than 25oC. Concrete with a temperature in excess of 25oC upon arrival at the Site will be rejected. Remove all rejected concrete from the Site.

### Protection

#### Protect freshly placed concrete from damage due to construction operations and from cold, heat, rain, snow, running water, drying winds, and any other factors which would likely cause deterioration of concrete quality.

#### Use waterproof insulated covers or other suitable materials to enclose freshly placed concrete under these conditions.

### Frost Protection for Slabs on Grade

#### Provide continuous protection for slabs on grade to prevent the subgrade below from freezing during cold weather. Provide heated enclosures and insulation as required.

#### Subgrade below completed tanks may be protected against frost by filling with water to a minimum depth of 2,000 mm. Place log booms, 200 mm in diameter, at a maximum spacing of 5,000 mm in each direction to abate ice pressures on tank walls. Break ice on formation.

### Influence of Ambient Concrete Temperature on Concrete Crack Control

#### To minimize the formation of thermal cracks during placement and curing, maintain previously cured concrete and concrete that will be placed against it at the same temperature.

#### Failure to minimize temperature differential between adjacent pours will result in temperature induced cracking. Repair such cracks as specified in this Section.

### Ground Vibration Limitations

#### Do not allow compaction or other excessive vibration from construction activities to occur during placement or curing of concrete until it has attained the specified strength..

### Backfilling and Service Loads Restrictions

#### Verify that backfill is not higher than the finished grades indicated on the Contract Drawings.

#### Verify that the equipment for backfilling and compaction on top of slab will not impose loads greater than those indicated in the Contract Documents.

#### Verify that the concrete in walls, slabs, struts, and cross walls, which frame into the walls providing lateral stability, has been placed and has attained the specified compressive strength before backfilling against walls or subjecting walls to service loads.

#### Verify that the leakage test is successfully completed before backfilling.

#### Ensure no excessive loading above or lateral loads from heavy equipment or backfilling operations before concrete has attained the specified compressive strength

# PRODUCTS

## Materials

### *[Note: Alkali aggregate reactivity problems may occur under certain circumstances. Ensure that mix design is adjusted suitably to prevent such problems and modify project specification to suit.]*

### Portland cement: in accordance with CSA 23.1-14[GU – General Use] [MSb – Moderate Sulphate-resistant]

### Water: in accordance with CSA A23.1-14.

### Aggregates: in accordance with CSA A23.1-14. Coarse aggregates are to be rough and angular gravel or crushed stone of normal density.

### Air entraining admixtures: in accordance with ASTM C260/C260M-10a (2016).

### Chemical admixtures: in accordance with ASTM C494/C494M-17. The Consultant is to approve all accelerating or set retarding admixtures during cold and hot weather placing.

### Concrete retarders: in accordance with ASTM C494/C494M-17 water based. Do not allow moisture of any kind to come in contact with the retarder film.

### Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, cement, water reducing and plasticizing agents.

#### Compressive strength: 35 MPa at 28 Days.

#### Consistency:

##### Fluid: in accordance with ASTM C827/C827M-16. Time of efflux through flow cone (ASTM C939/C939M-16a), under 30 seconds.

##### Flowable: in accordance with ASTM C827/C827M-16. Flow table, 5 drops in 3 seconds, (ASTM C109/C109M-16a, applicable portion) 125 to 145%.

##### Plastic: in accordance with ASTM C827/C827M-16. Flow table, 5 drops in 3 seconds, (ASTM C109/C109M-16a, applicable portions) 100 to 125 %.

##### Dry pack to the manufacturer’s requirements.

#### Net shrinkage at 28 Days: maximum [\_\_\_\_\_\_] %.

### Dowelling grout in accordance with ASTM C881/C881M-15.

### Epoxy grouts in accordance with ASTM C881/C881M-15.

### 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 a compressive strength of 35 MPa at 28 Days.

### Cushion pads: tough, resilient, weather, moisture, and oil resistant material that will not corrode or cause corrosion, consisting of either layers of approved cotton duck saturated and bound together by approved rubber or synthetic compounds, or made from specially compounded synthetic materials.

### Ribbed waterstops: extruded PVC of the sizes indicated in the Contract Documents with shop welded corner and intersecting pieces with legs not less than 75 mm long:

#### Tensile strength: in accordance with ASTM D412-16, method A, Die"C". *[Consultant to confirm reference accuracy]*.

#### Elongation: in accordance with ASTM D412-16, method A, Die"C", minimum 275%. *[Consultant to confirm reference accuracy]*

#### Tear resistance: in accordance with ASTM D624-00(2012), method A, Die"B". *[Consultant to confirm reference accuracy]*

#### Type: Centre bulb with parallel ribs or protrusions on each side.

### Pre-moulded joint fillers:

#### Bituminous impregnated fiber board: in accordance with ASTM D1751-18.

#### Sponge rubber: in accordance with ASTM D1752-18, Type I, flexible grade. *[Consultant to confirm reference accuracy]*

#### Self expanding cork: in accordance with ASTM D1752-18, Type III. *[Consultant to confirm reference accuracy]*

### Damp-proof membrane: Kraft/polyethylene membrane:

#### Plain: 10 mm thick polyethylene film bonded to asphalt treated creped kraft.

#### Reinforced: two 0.10 mm thick polyethylene films bonded on each side of asphalt treated creped kraft paper, reinforced with 13 x 13 mm fibreglass scrim.

#### Membrane adhesive: as recommended by the membrane manufacturer.

### Damp-proofing:

#### Emulsified asphalt, mineral colloid type, unfilled: in accordance with CGSB 37.2. *[Consultant to amend given CGSB 37.2 has been withdrawn]*

#### Polyethylene film: 15 mm thickness in accordance with CGSB 51.34-M86.

## Mixes

### Proportion normal density concrete in accordance with CSA A23.1-14.

#### Cement:

##### Type GU10 Portland cement.

##### Type [\_\_\_MSb]blended hydraulic cement.

#### Minimum compressive strength at 28 Days: 30 MPa.

#### Maximum cement content: 300 kg/m3 of concrete.

#### Class of exposure: S-2/ A-2 with mild sulphate resisting cement.

#### Nominal size of coarse aggregate: 40 mm and 20 mm.

#### Water/cement ratio: 0.43 for water retaining structures and 0.50 for all other structures.

#### Air content: CSA 23.1-14

#### Chemical admixtures: following admixtures in accordance with ASTM C494/C494M-17 including type, quantity, water reducing, strength increasing, air entraining, super plasticizers, rust inhibitors.

#### Submit the mix design with test results to the Consultant for review a minimum of four (4) weeks prior to placing.

#### Wall concrete mixes shall include the use of a super plasticizer added at the plant, according to CAN3-A266.6-M85 *[Consultant to amend given CAN3-A266.6-M85 has been withdrawn]* The maximum slump is anticipated to be 25 mm to 40 mm prior to adding the super plasticizer and tests shall be in conformity with CSA Specification A23.2-14. The slump at the Site should not exceed 150 mm after the plasticizer is added to the concrete.

#### No amount of calcium chloride in any chemical form shall be used in any concrete mix or as a de-icing agent in the forms.

### Wall and Column Grout mix:

#### Minimum cementing material: 600 Kg/m3

#### Coarse aggregate: none

#### Maximum Water/Cement ratio: 0.43

# EXECUTION

## Preparation

### Obtain the Consultant’s approval before placing any concrete. Provide a minimum of 2 Working Days notice prior to the placing of concrete.

### Pumping of concrete is permitted only after the approval of equipment and mix has been obtained from the Consultant.

### Ensure that the reinforcement and inserts are not disturbed during concrete placement.

### Prior to placing of the concrete, obtain the Consultant’s approval of the proposed method for protection of the concrete during placing and curing in adverse weather.

### Maintain accurate records of poured concrete items indicating the date, location of pour, quality, air temperature and test samples taken. [In locations where new concrete is dowelled to existing work, drill holes in existing concrete. Place dowels of deformed steel reinforcing bars and pack solidly with dowelling grout or epoxy grout to anchor and hold dowels in position.] *[Consultant to delete this provision if dowelling is not to be used.]*

### Do not place loads upon new concrete until authorized by the Consultant.

## Concreting

### Perform cast in place concrete work in accordance with CSA A23.1-14.

### Vibrators

##### The use of mechanical vibrators is required.

##### A sufficient number of vibrators shall be employed to ensure complete compaction.

##### At least one (1) extra gasoline powered vibrator shall be on hand for emergency use.

##### Vibration shall not be continued to the extent that water forms a surface on the concrete.

##### Avoid any disturbance to concrete which has become too stiff to regain plasticity when vibrated.

##### Vibration shall not be applied directly to steel which extends into partially hardened concrete.

### Sleeves and inserts

#### No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated in the Contract Documents or where approved by the Consultant.

#### Where approved by the Consultant, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere in the Contract Documents. Sleeves and openings which are greater than 100 mm x 100 mm and which are not indicated in the Contract Documents must be approved by the Consultant.

#### Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of any modifications from the Consultant before placing the concrete.

#### Check the locations and sizes of the sleeves and openings shown on the Contract Drawings.

#### Set special inserts for strength testing, as indicated in the Contract Documents and as required by a non-destructive method of testing concrete.

### Anchor Bolts:

#### Set anchor bolts to the templates under the supervision of the appropriate Subcontractor prior to placing the concrete.

#### With the prior approval of the Consultant, grout anchor bolts in preformed holes or holes drilled after the concrete has set. Formed holes are to be a minimum of (100) mm in diameter. Drilled holes are to be in accordance with the manufacturers’ recommendations.

#### Protect anchor bolt holes from water accumulations, snow and ice build-ups.

#### Set bolts and fill holes with epoxy grout.

#### Locate the anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to the ambient temperature at the time of erection.

### Drainage Holes and Weep Holes:

#### Form weep holes and drainage holes in accordance with Section 03100 – Concrete Forms and Accessories. If wood forms are used, remove them after the concrete has set.

#### Install weep hole tubes and drains as indicated in the Contract Documents. *[Consultant to coordinate 3.2.6 with Section 04051 - Masonry Procedures and amend as required.]*

### Grouting:

#### Grout under base plates and/or machinery using procedures in accordance with the manufacturer's recommendations which result in 100 % contact over the entire grouted area.

#### Deposit 75 mm of wall and column grout evenly along the horizontal construction joint in the bottom of the form through an elephant truck immediately before placing wall or column concrete. After placing 300 mm of wall or column concrete vibrate concrete such that grout and concrete are well integrated.

### Finishing:

#### Finish in accordance with Section 03345 - Concrete Curing and Finishing.

### Toppings:

#### *[Indicate details of special concrete mix for topping]*

#### Topping mixture to meet following requirements: Monolithic, [\_\_\_\_\_\_] mm thick: [\_\_\_\_\_\_]. Bonded overlay, [\_\_\_\_\_\_] mm thick: [\_\_\_\_\_\_].

#### In pouring base course, make allowance for monolithic and bonded overlay topping thickness.

#### Place monolithic topping before base course has completely set in accordance with CSA A23.1-14 and the topping manufacturer's recommendations.

#### Place bonded topping over hardened base course in accordance with CSA A23.1-14 and the topping manufacturer's recommendations.

#### Follow the instructions of the Consultant if conflicting requirements arise between CSA A23.1-14 and the manufacturer's recommendations.

#### Apply cement/sand grout latex bonding agent modified cements and grout epoxy bonding agent to base course in accordance with CSA A23.1-14 and the manufacturer's recommendations before placing the bonded topping. Observe the manufacturer's safety recommendations.

#### Ensure that the joints in the topping are the same as those in the base course. Also ensure that their locations precisely match those in base course. Provide dividers edge strips reinforcing mesh as indicated in the Contract Documents.

### Water stops:

#### Install water stops to provide a continuous water seal. Do not distort or pierce the water stop in such a way as to hamper its performance. Do not displace reinforcement when installing water stops. Use equipment in accordance with the manufacturer’s requirements to field splice water stops. Tie water stops rigidly in place.

#### Use only straight heat sealed butt joints in the field. Use factory welded corners and intersections unless otherwise approved by the Consultant.

### Joint fillers:

#### Furnish filler for each joint in a single piece for the depth and width required for the joint, unless otherwise authorized by the Consultant. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.

#### Locate and form isolation construction expansion joints as indicated in the Contract Documents.

#### Install joint filler.

#### Use 12 mm thick joint filler to separate slabs on grade from vertical surfaces and extend joint filler from the bottom of the slab to within 12 mm of the finished slab surface unless indicated otherwise in the Contract Documents.

### Damp proof membrane:

#### Install damp proof membrane under concrete slabs on grade inside the building.

#### Lap damp proof membrane a minimum of 150 mm at joints and seal.

#### Seal any punctures in the damp proof membrane before placing concrete. Use patching material that is at least 150 mm larger than the puncture and seal.

### Repair of temperature and shrinkage induced cracks:

#### Repair cracks in the completed structure employing a suitable polyurethane injection technique to make such cracks completely water tight after the repair.

#### Remove surface injection material and finish areas to match surrounding concrete.

## Site Tolerance

### Concrete tolerance shall be in accordance with CSA A23.1-14 straight edge method location of floor: [Ff = \_\_\_\_\_\_: FI = \_\_\_\_\_\_ ] in accordance with the tolerance schedule as indicated in the Contract Documents.

**END OF SECTION**