CCIL CONCRETE TESTING LABORATORY
CERTIFICATION PROGRAM - CHECKLIST

DATE: _____

FACILITIES AND PERSONNEL	
Company Name:	
Mailing Address:	
Location of Laboratory:	
Phone:	Fax:
Email Address:	
Supervising Engineer:	
Title:	
Person in Charge of Lab	
Title:	

Category of Registration:	Additional Tests:

Technicians successful in the practical and written Field Exams (show Category):

Technicians successful in completing the Laboratory Exam (show Category):

Technicians successful in completing the examination for Additional Tests (show test methods):

Signature:

Name: _____
CCIL Inspector

CATEGORY 0 - BASIC TESTS				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Available or P/A = Provisional Acceptance				
Item No.	Reference	Equipment calibration/verification requirements	Y	N
1	**CSA-A23.2-3C** ***Making and Curing Concrete Compression Test Specimens***	**a. Site Curing Boxes:** - initial curing temperatures of specimens, method of achieving it, and ambient temperature on field records; - calibration of field boxes performed **annually** (maintained between 15 to 25°C)		
		b. Single Use Moulds (CSA A23.2-1D, Clauses 6 & 7): - dimensional verification - checks performed on 3 moulds (minimum) from each new shipment (Table 1). - Cardboard moulds - documentation of suitability (Clause 5.1.2)		
		Reusable Moulds (CSA A23.2-1D): - dimensional verification - checks performed **monthly,** or **annually** when not in use. note: limited-use moulds shall be used a maximum of 5 times, they shall be marked after every use, and stored properly to eliminate deformation (Clause 3.5).		
	Item "c" includes CSA-A23.2-4C (Air Meters), and 5C & 19C (Slump Cones)	**c. Tamping Rods:** - 16mm ± 1mm dia. (450 to 600mm long) - 10 mm ± 1mm dia (450 to 600mm long) - dimensional verification (16 & 10mm) performed **every 3 months** (Table 1)		
		d. Strike-off Bar: - steel, approx 6 x 25 x 450mm (Clause 5.7)		
	Item "e" includes CSA-A23.2-4C (Air Meters)	**e. Vibrators:** - Internal - min 120 Hz, dia 20 to 40mm, min length of vibrating element 50 mm less than height of mould (Clause 5.4.1) - External - min 60 Hz, secure clamping device (Clause 5.4.2)		
		f. Specimen transport containers: - provided (must prevent shock and exposure to adverse conditions) (Clause 9.4)		
		g. Water-storage Tanks (Clause 5.8): - Constructed of non-corroding materials - Automatic control of temperature (except in a room controlled at 23 ± 2°C) - Temperature records: continuous recorder or manual records **twice daily** with accuracy of 0.5°C; records available over an extended period of time (also MC and MR) (Clause 5.12) - Saturated with high-calcium hydrated lime, stirred **monthly**, replaced **every 24 months**		
		h. Moist Cabinets (MC) and Moist Rooms (MR) (Clause 5.9) - Temperature 23 ± 2°C and relative humidity not less than 95% - Exposed surfaces of specimens look and feel moist - Thermostatic control within MC or MR, or surrounding space - MC constructed from durable materials with tight-fitting doors and equipped with fog sprays, water sprays or water curtains - MR constructed from durable materials with tight-fitting doors and windows; specimens not exposed to dripping or running water		
		i. Temperature Measuring Devices (Clause 5.10) - Device with range 0°C to 50°C, accurate to 0.5°C - Temperature recorder accurate to 1°C, record every 15 min, evaluated and documented **weekly** - Automatic and manual devices to be calibrated **yearly** (Table 1) - Traceable reference temperature device readable and accurate to 0.2°C; liquid in glass devices to be verified once, direct reading resistance devices **every six months** (Clause 5.11)		
		j. Report Form (Clause 11.1)		

CATEGORY 0 - BASIC TESTS				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Available or P/A = Provisional Acceptance				
Item No.	Reference	Equipment calibration/verification requirements	Y	N
2	**CSA-A23.2-4C** ***Air Content by the Pressure Method***	**a. <u>Air Meters</u>:** - Manufacturer's instruction for its operation - initial pressure and date of calibration to be shown on the meter - direct reading to a minimum of 0.2% for air volumes in the range 0 to 8% - removed hardened concrete from interior & exterior of air meter - condition check, initial pressure, and date of calibration - checks performed **monthly** (Table 1)		
		b. <u>Test Report</u> (Clause 11.1)		
3	**CSA-A23.2-5C** ***Slump of Concrete*** ***Item "a" also applies to CSA A23.2-19C***	**a. <u>Slump Cones:</u>** - metal mould, not out of shape - removed hardened concrete from interior & exterior of cone - slump cone dimensional verification - checks performed a minimum of **every 3 months** (Table 1)		
		b. <u>Test Surface</u> (Clause 6.3) - Rigid, flat and non-absorbent - Plywood, if used, min thickness 19mm and a medium density overlay		
		c. <u>Measuring Tape</u> (Clause 6.4) -not less than 300mm in length with 1mm graduations		
		d. <u>Report Form</u> (Clause 10.1)		
4	**CSA-A23.2-9C** ***Compressive Strength of Cylindrical Concrete Specimens***	**a. <u>Compression Machine:</u>** - Model _____ SN_____ - Certificate of Calibration by independent service provider - performed **annually** (CSA A283 Clause 5.3.3 & Table1) - copy of calibration certificate provided - certificate conforms to A23.2-9C and ASTM E4 - sizes of bearing faces (Clause 4.1.2) - concentric rings (upper bearing block) (Clause 4.1.2.1) - rate of loading verification (100 & 150mm dia. cylinders) performed **weekly** (Table 1) - dimensional verification - planeness of bearing faces performed **monthly** (Clause 4.1.2.1 & Table 1) - dimensional verification - testing machine parts performed **annually** (Clause 4.1 & Table 1)		
		b. <u>Method of End Preparation:</u> capping, grinding, unbonded caps (circle as appropriate)		
		c. <u>Cylinder capping/End grinding:</u> - capping equipment dimensional verification performed **monthly** - capping compound temperature checks performed **daily** - compressive strength of capping compound performed **weekly** or **monthly** (Refer to A283 Table 1 for monthly criteria) - melting pot thermostat checks performed **annually** - capping compound time/temperature strength correlation performed **annually** - Planeness/Perpendicularity/Diameter - checks performed **<u>daily</u>** (one in ten cylinders tested, with a minimum of 3 cylinders per day) - if capped cylinders are to be tested in a moist condition - they shall be kept moist between capping and testing		
		d. <u>Unbonded Caps</u> (ASTM C617 & ASTM C1231) - Dimensions - pad size (Clause 5.2.1) - retainers (Clause 5.3) - base plate thickness and planeness (Clause 5.3) - The manufacturer's or supplier's name, the Shore A hardness of the elastomer, and the applicable range of concrete compressive strength (ASTM C1231 Clause 5.2.4) - The date pads are placed in service, the pad durometer and the number of uses (ASTM C1231 Clause 5.2.5) - Copy of qualification testing report, if applicable (ASTM C1231 Clauses 5.2.2 & 5.2.3)		
		e. <u>Concrete Test Report Form</u> (Clause 9.1)		

CATEGORY 0 - BASIC TESTS				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Available or P/A = Provisional Acceptance				
Item No.	Reference	Equipment calibration/verification requirements	Y	N
5	**CSA-A23.2-17C** ***Temperature of Fresh Concrete***	**a. <u>Temperature Measuring Device:</u>** - Range between 0.5 to 50°C, accurate to ± 0.5°C and provide immersion to at least 75mm (Clause 4 (b)) -Calibration of Temperature Measuring Devices(Clause 7.1) performed **annually**		
		b. <u>Reference Temperature Measuring Device</u> (Clause 4 (d))**:** - Readable and accurate to ± 0.2°C; traceable to NIST - Liquid in Glass/Calibration **once** prior to use - Direct Reading Resistance Devices/performed **annually**		
		c. <u>Report Form</u> (Clause 9.1)		
6.	**CSA A23.2-19C** ***Slump Flow of Concrete***	**a. <u>Slump Flow Board</u>** (Clause 6(c)): - non-absorbent smooth plastic surface not less than 800mm square and 12mm thick clearly marked with 2 concentric circles 200mm and 500mm in diameter		
		b. <u>Stopwatch</u> (Clause 6(d)) **c. <u>Measuring Tape</u>** graduated in mm (Clause 6(e)) **d. <u>Report Form</u>** (Clause 10.1)		
7.	**CSA A283-06** ***Within Lab Proficiency***	**a. <u>Within Laboratory Proficiency:</u>** - Set-up - Records updated on a **weekly** basis - Records current up to _____ - Compliance with Clauses 7.2.1, 7.2.2 & 7.2.3		
8	**CSA A283-06** **Clause 5.4.2 & 5.4.3** ***Deviations***	**a. <u>Specimens Prepared by Others</u>** - Specimens not prepared, handled or stored by laboratory are reported (Clause 5.4.2) **b. <u>Deviations</u>** - Known deviations are reported (Clause 5.4.3)		
9	**CSA A283-06** **Clause 5.2.3** ***Organization Chart***	**a. <u>Organization Chart</u>** (and attachments) - names, and expiry date of the certification of all laboratory and field personnel, and their duties - laboratory has personnel certified to perform all tests listed on the Laboratory Certificate		
10	**CSA A283-06** **Clause 5.2.4** ***Personnel***	**a. <u>Certified Personnel</u>** - all laboratory and field testing is done by certified personnel		
11	**CSA A283-06** **Clause 5.2.5 & 6.1.2** ***Personnel***	**a. <u>Change in Personnel</u>** - Change in Supervising Engineer or testing personnel (Clause 5.2.5) - CCIL notified within 30 days (Clause 5.2.5) - ACI certified technician hired (Clause 6.1.2) - Copy of ACI certificate provided to CCIL within 30 days - CCIL field card issued (new hires); obsolete field cards returned to CCIL		
12	**CCIL Memorandum of Understanding**	**a. <u>CCIL Logo Use Agreement</u>** - Laboratory uses CCIL Logo - copy of MOU with current signature		

COMMENTS:

CATEGORY I - INTERMEDIATE TESTS				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Available or P/A = Provisional Acceptance				
Item No.	Reference	Equipment calibration/verification requirements	Y	N
1.	**CSA A23.2-2A** ***Sieve Analysis of CA & FA*** ***Item a includes CSA A23.2-3A to 6A, 10 to 13A & 6C*** ***Item c includes CSA A23.2-2A to 5A, 9A, 10A, 12A & 13A*** ***Item d includes CSA A23.2-2A to 6A &12A*** ***Item e includes all Category 1 test methods***	**a. <u>Balances & Scales:</u>** - Calibration performed **annually** using standard weights (calibrated every five years) **b. <u>Sieve Shaker:</u>** - Coarse Aggregate Shakers (on file - Equipment List) - Fine Aggregate Shakers (on file - Equipment List) - CA & FA Mechanical Efficiency Check (Clause 9.4) performed **annually** **c. <u>Sieves:</u>** - Complete metric set as per A23.2 requirements - Sieve checks for embedded particles, slackness of fabric and damaged frames and/or sieve cloth - performed **ongoing during use** **d. <u>Ovens:</u>** - Ovens (on file - Equipment List) - Thermostat calibration (setting vs. actual) - performed **annually** **e. Test <u>Report Form</u>**		
2.	**CSA A23.2-4A** ***Low Density Granular Material in Aggregate***	**a. <u>Skimmer:</u>** - 315µm sieve cloth - Heavy liquid - $ZnCl_2$ - relative density 2.0 - Hydrometer, or other apparatus, capable of measuring a relative density of 2.0 ± 0.01		
3.	**CSA A23.2-6A** ***Relative Density & Absorption of Fine Aggregate***	**a. <u>Mould</u>** (dimensional verifications documented **annually):** - 40 ± 3mm top (inside) 90 ± 3mm bottom (inside) - 75 ± 3mm in height and 0.8 thick metal **b. <u>Tamper</u>** (dimensional verifications documented **annually**): - non-corroding metal; 325 g to 355g - Face 25 ± 3mm dia. **c. <u>Balance</u>** capacity 1 kg or more, sensitive to 0.1 g **d. <u>Pycnometer</u>** 500 ml capacity, accurate to ± 0.1 mL		
4.	**CSA A23.2-7A** ***Organic Impurities in FA***	**a. <u>Organic Impurities Kit:</u>** - Glass bottles - 300ml, with a rubber or other non-reactive stopper - Sodium Hydroxide Solution (3%) - Reference Standard Colour Plates		
5.	**CSA A23.2-10A** ***Bulk Density of Aggregate***	**a. <u>Measure for Density</u>** (dimensional verifications documented): - 7L, 15L and 30L measures (air meter bowl may be used as 7L measure) - Top rim to be plane to 0.25mm, parallel to bottom within 0.5° - 15L & 30L measures reinforced at top 40mm of the rim - (total minimum wall thickness 5mm). Calibrate **annually** (3 years if not used since last calibration) **b. <u>Balance</u>** - Sensitive to 0.1% **c. <u>Tamping Rod</u>** - 16 ± 1mm diameter, 450 to 600mm long		
6.	**CSA A23.2-11A** ***Surface Moisture in FA & CA***	**a. <u>Equipment for Surface Moisture:</u>** - Hot plate or stove; pycnometer or suitable container with graduation markings (accuracy 1.0 mL)		
7.	**CSA A23.2-12A** ***Relative Density and Absorption of CA***	**a. <u>Wire Basket or Bucket:</u>** - Equal height and breadth with a capacity of 4-7L (maximum 40mmm aggregate) and 8-16L for larger size aggregate)		
8.	**CSA A23.2-13A** ***Flat and Elongated Particles***	**a. <u>Flat & Elongate Particles in Coarse Aggregate:</u>** - Caliper or other suitable equipment - dimensions verified **annually**		

CATEGORY I - INTERMEDIATE TESTS				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Available or P/A = Provisional Acceptance				
Item No.	Reference	Equipment calibration/verification requirements	Y	N
9.	**CSA A23.2-6C** ***Density, and Yield, of Plastic Concrete***	**a. <u>Container:</u>** - cylindrical, metal, rigid, watertight **b. <u>Glass or Acrylic Plate</u>** (Clause 5(g)): - of required dimensions with straight and smooth edges within a tolerance of 1.5mm **c. <u>Other Equipment:</u>** - tamping rod, strike-off bar and vibrators conforming to CSA A23.2-3C		
10.	**CSA A23.2-14C** ***Obtaining and Testing Drilled Cores for Compressive Strength***	**a. <u>Equipment:</u>** - Core Drill and diamond tipped, thin-walled core drill bits - Saw for trimming - compression machine, curing, and capping or grinding equipment conforming to CSA A23.2-9C		

COMMENTS:

CATEGORY II - ADVANCED TESTS				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Available or P/A = Provisional Acceptance				
Item No.	Reference	Equipment calibration/verification requirements	Y	N
1.	**CSA A23.2-8A** ***Mortar Strength Properties of Fine Aggregate***	**a. <u>Equipment:</u>** - Flow table, flow mould, caliper and cube moulds conforming to CSA A3005 - Flow table dimension & weight verification **annually** - Mixer, bowl and paddles as described in CSA A3005 - Non-absorptive tamper 13mm x 25mm in cross section and about 150mm long with flat and square tamping face		
2.	**CSA A23.2-2C** ***Making Concrete Mixes in the Laboratory***	**a. <u>Concrete Mixer:</u>** - Power driven, revolving drum, tilting mixer or pan mixer - Sampling and mixing pan - heavy gauge metal, watertight - Scales - calibrated **annually** as per CSA A23.2-2A **b. <u>Other Equipment:</u>** - Moulds and other equipment conforming to CSA A23.2-3C		
3.	**CSA A23.2-11C** ***Water Content, Density, Absorption, and Voids in Hardened Concrete, Grout, or Mortar***	**a. <u>Equipment:</u>** - Scale sensitive to 0.025% of mass of specimen or to 0.2g or less (calibrated **annually** as per CSA A23.2-2A) - Controlled humidity enclosure at 50 ± 5% RH and 23 ± 2°C - Dessicator, container for immersing the specimens - Boiling water tank conforming to CSA A23.2-10C		
4.	**CSA A23.2-12C includes CSA A23.2 -18C** ***Making, Curing & Testing Compression Test Specimens of No Slump Concrete*** ***Item f includes all Category 2 test methods***	**a. <u>Reusable Cylindrical moulds:</u>** - 150 x 300mm with wall thickness not less than 6mm thick & minimum metal base thickness of 10mm meeting the requirements of CSA A23.2-1D, dimension verified **annually** **b. <u>Compaction device:</u>** - capable of producing concrete cylinder specimens with densities comparable to the mix design density specified by the concrete supplier **c. <u>Metal Compaction Plate:</u>** - For compacting the top thin layer to form a smooth cylinder finish **d. <u>Scales:</u>** - 50kg capacity, 0.05kg sensitivity - 5kg capacity, 1g sensitivity **e. <u>Other Equipment</u>** -Pestle - Hotplate or microwave oven plus fiberglass cloth see requirements for CSA A23.2-18C **f. <u>Test Report Form</u>**		

COMMENTS:

ADDITIONAL TESTS				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Available or P/A = Provisional Acceptance				
Item No.	Reference	Equipment calibration/verification requirements	Y	N
1.	**CSA A23.2-9A** ***Soundness of Fine and Coarse Aggregate by use of Magnesium Sulphate*** ***Item e includes all Additional Tests***	**a. $MgSO_4$ Tank:** - Solution ($MgSO_4$) maintained at 23 ± 2.0°C - Specific Gravity of solution ($MgSO_4$) maintained at 1.295 to 1.308 **b. Ovens:** - Oven thermostat calibration performed **annually** - Oven rate of evaporation performed **annually** - Clause 5(e)) **c. Baskets** (wire mesh) and containers for immersing samples in solution **d. Sieves** - conforming to CSA A23.2-2A **e. Test Report Form**		
2.	**CSA A23.2-14A** ***Potential Expansivity of Aggregate Using Concrete Prisms***	**a. Storage Environment** (Clause 5.5): - Sealed space insulated to minimize heat loss and with fan to provide heat distribution - temperature maintained at 38 ± 2.0°C - automatic recording of storage room temperature **b. Equipment:** - moulds, stainless steel studs, length comparator, reference bar and storage containers (Clause 5) **c.** Record temperature of demoulding and measurement room (23 ± 2.0°C) **d.** Record results of qualification test on control aggregate (Clause 12)		
3.	**CSA A23.2 -16A & 17A** ***Los Angeles Abrasion Method***	**a. Los Angeles Machine** (Clause 6.1): - Steel shelf condition check performed **every 3 months** - Machine speed and revolution counter check performed **every 3 months** - Steel drum & shelf dimensional verification performed **every 3 months** **b. Steel Spheres** (390 to 445g/approx 47mm): - Individual weight and diameter check performed **every 3 months** - Cumulative weights for 12, 11, 8 & 6 spheres reported - (5500 ± 25g/4584 ± 25g/3330 ± 20g/2500 ± 15g)		
4.	**CSA A23.2-23A** ***Micro-Deval Apparatus Abrasion Test for FA*** ***also applies to CSA A23.2-29A***	**a. Rolling Mill:** - Rolling mill capable of rotating jar at 100 ± 5rpm - Rolling mill rotation & counter check performed **every 3 months** **b. Jars:** - Visual assessment of jars performed **every 3 months** - inside & outside of jar shall be smooth, no observable ridges or indentations **c. Steel Balls** (9.5 ± 0.5mm Diameter): - Measurement of steel ball diameters performed **every 3 months** **d.** Frequency of testing and mean loss of reference aggregate within acceptable limits - plotted on trend chart		
5.	**CSA A23.2-24A** ***Resistance of Unconfined CA to Freezing and Thawing***	**a. Freezer:** - Chest, stand-up or walk-in type capable of maintaining temperature of -18 ± 2°C & having a fan for adequate air circulation conforming to Clause 6(a) - Calibration to show that freezer complies with Clause 6(a) - performed **yearly** - Record of freezer temperature at a minimum of two points (continuous record) **b. Mechanical Convection Oven:** - oven thermostat calibration performed **annually**		

ADDITIONAL TESTS				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Available or P/A = Provisional Acceptance				
Item No.	Reference	Equipment calibration/verification requirements	Y	N
5. con't		**c. Autoclavable Plastic Containers:** - With air tight screw-on caps that can withstand 110°C **d. Thermometers:** - With a range of -25 to 30°C accuracy referenced to a calibrated thermometer **e. Calibration Aggregate** (from a stocked supply): Frequency of testing and mean loss of calibration and reference aggregates within acceptable limits - plotted on a trend chart		
6.	**CSA A23.2-25A** ***Alkali-Silica Reactive Aggregate by Accelerated Expansion of Mortar Bars***	**a. Mixing Equipment:** - Mixer, paddle and mixing bowl as per ASTM C305, except that the space between paddle and the bottom of the bowl shall be 5.1 ± 0.3mm - require dimensional verification **annually** **b.** Containers that have a tight fitting cover and can withstand prolonged exposure to 80°C and the solution **c. Moulds:** - Shall produce 25 x 25 x 285mm prisms having a 250mm length with stainless steel studs **d. Convection Oven:** - Temperature control maintained at 80 ± 2.0°C - Recorded with max/min thermometer every 2 hr. or with automatic chart recorder - Oven thermostat calibration performed **annually** **e.** 0.99N to 1.0N Sodium Hydroxide Solution **f. Control Aggregate** (Clause 7.5) - to be conducted at the same time regular tests are done or at least **every 6 months**		
7.	**CSA A23.2-26A** ***Alkali-Carbonate Reactivity by Chemical Composition***	**a. Jaw crusher and a shatter box** or other suitable grinding equipment (Clause 4) **b. Reagents,** supplies, equipment and instruments applied to the analytic method as specified in ASTM C25 or other test method **c. Qualification of method of analysis** (Clause 8.2)		
8.	**CSA A23.2-1B** ***Properties of Flowable Grout***	**a. Flow Cone** (Clause 8.2): - Calibration of flow cone to be performed **annually** **b. Stop Watch:** - Accurate to ± 0.2 seconds **c. Cylinder** (Clause 9.2) - glass or plastic, graduated to 250mL in 2mL increments **d. Cube Moulds and Testing Machine** (Clause 10.2.1 & 10.2.2) - conforming to CSA A3005 - metal cover plate 6mm thick and a clamping device (expansive grouts only)		
9.	**CSA A23.2-2B** ***Determination of Sulphate Ion Content in Ground Water***	**a. Reagents** (Clause 7): - ammonia hydroxide (relative density of 0.9) - barium chloride (100 g/L of $BaCl_2$) - hydrochloric acid (one volume of HCl and nine volumes of water) - hydrofluoric acid (48% to 51%) - methyl orange Indicator (1 g/L of methyl orange) - silver nitrate (0.1g $AgNO_3$/mL) - sulphuric acid (relative density 1.84) **b. Beakers** (as required)		

ADDITIONAL TESTS				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Available or P/A = Provisional Acceptance				
Item No.	Reference	Equipment calibration/verification requirements	Y	N
10.	**CSA A23.2-3B** ***Determination of Total or Water-Soluble Sulphate Ion Content of Soil***	**a. <u>Testing Equipment</u>** (Clause 5): -315 µm sieve -hotplate - magnetic stirrer and TFE-coated stirring bar - Whatman Nos 40 or 41 filter paper, or equivalent -balance, sensitive to 0.1% of mass of sample - agate mortar and pestle **b. <u>Reagents</u>** conforming to CSA A23.2-2B		
11.	**CSA A23.2-4B** ***Determination of Water-Soluble Chloride Ion Content of Hardened Grout or Concrete***	**a. <u>Drill</u>** (Clause 5.1): - rotary-impact or core drill **b. <u>Testing Equipment</u>** (Clause 5.2): - silver, chloride/sulphide selective electrode - potentiometer readable to 1 mV or better - buret, 10mL capacity with 0.05mL divisions - magnetic stirrer and TFE-coated stirring bar - hotplate - agate mortar and pestle - 315 µm and 160 µm sieves - Whatman Nos 40 or 41 filter paper, or equivalent - balance, 100g capacity sensitive to 100 µg **c. <u>Reagents</u>** (Clause 7): - sodium chloride - silver nitrate - potassium chloride - reagent water conforming to ASTM D1193 Type 3 - ethyl alcohol		
12A.	**CSA A23.2-6B** **Procedure A** ***Bond Strength of Toppings and Overlays & the Tensile Strength of Concrete, Mortar, and Grout***	**a. <u>Calibrated load cell, bourdon tube gauge, or a dynometer:</u>** - calibration to be performed **annually** **b. <u>Mechanical or Hydraulic pullout device</u>** **c. <u>Rigid plate with pullout attachment,</u>** machined smooth and shoulder-cut **d. <u>Coring Drill</u>** **e. <u>Rapid-curing epoxy compound adhesive</u>** that satisfies the tensile requirement		
12B.	**CSA A23.2-6B** **Procedure B** ***Bond Strength of Toppings and Overlays & the Tensile Strength of Concrete, Mortar, and Grout***	**a. <u>Load Measuring Device</u>** - rate of loading (Clause 8.2.2) - calibration to be performed **annually** **b. <u>Fastening Devices</u>** - grips or epoxy-bonded caps - linkage system at each end at least twice the diameter of the end caps or grips - no bending or torsional stresses on specimen		
13.	**CSA A23.2-8B** ***Determination of Water-Soluble Sulphate Ion Content of Recycled Aggregates Containing Crushed Concrete***	**a. <u>Apparatus, Reagents and Materials</u>** (Clause 5): - 5mm sieve - scale, 1kg capacity accurate to 0.1g - hotplate to maintain water temperature 60 ± 5°C and a magnetic stirrer - pH measuring device - nitric acid - glassware (as required)		
14.	**CSA A23.2-3C/8C** ***Flexural Strength of Concrete***	**a. <u>Moulds</u>** (Clauses 5.2 and 10.1): - rigid, watertight, non-absorbent, and not less than 150mm x 150mm and at least 50mm greater than 3 times the depth Dimensional verification (Clause 5.2) **monthly**, or yearly when not in use (Table 1) **b. <u>Tamping rod or vibrator</u>** - see Item 1 in Category 0 requirements **c. <u>Testing Machine</u>** Clause 5(a)): Calibration of testing machine; certificate of calibration of load cell or proving rings **annually** (Table 1) **d. <u>Third-point loading apparatus</u>** (Clause 5(b))		

ADDITIONAL TESTS				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Available or P/A = Provisional Acceptance				
Item No.	Reference	Equipment calibration/verification requirements	Y	N
15.	**CSA A23.2-7C** ***Air Content by the Volumetric Method***	**a. Air meter** (Clause 5): - Calibration **annually** (3 years if not used since last calibration)		
16.	**CSA A23.2-10C** ***Accelerating the Curing of Concrete Cylinders & Determining their Compressive Strength***	**BOILING METHOD:** **a. Boiling Water Tank** (Clause 5.2): - water temperature recorded continuously or periodically **b. Temperature measuring device** **AUTOGENOUS METHOD:** **a. Autogenous Curing Container** (Clause 5.3): - heat retention record (Clause 5.3.2) - Calibration **annually** (3 years if not used since last calibration) **WARM WATER METHOD:** **a. Warm Water Tank** (Clause 5.4)		
17.	**CSA A23.2-13C** ***Splitting Tensile Strength of Cylindrical Concrete Specimens***	**a. Bearing Bar or Plate** (Clause 5.2): - machined to ± 0.025mm of planeness and of dimensions that cover the length of the cylinder, at least 50mm wide and thickness of not less than the distance from end of cylinder to edge of the bearing block - dimensional verification to be performed **annually** (3 years if not used since last calibration) **b. Bearing Strips:** - two 3mm thick; approximately 25mm wide; length equal to, or slightly longer than that of the specimen and free from imperfections (not to be reused) **c. Aligning Jig** (Optional)		
18.	**CSA A23.2-15C** ***In-place Concrete Strength Using the Pull-out Test***	**a. Standard insert** (Clause 5.1) **b. Load test apparatus,** (Clause 5.2) calibrated **annually** **c. Centering plate and hardware** (Clauses 5.3 and 5.4) **d.** Correlation Curves (Clause 8)		
19.	**CSA A23.2-16C** ***Steel or Synthetic Fibre Content in Plastic Concrete***	**a. Scales** sensitive to 0.05kg and 1g, calibration performed **annually** **b. 15L cylindrical bowl,** calibration performed **monthly** **c. Glass plate** (Clause 5(g)) **d. Tamping rod, strike-off bar, mallet** - conforming to CSA A23.2-3C		
20.	**CSA A23.2-18C** ***Water Content of Normal Weight Fresh Concrete***	**a. Scale** 5kg capacity and sensitive to 1g, calibration performed **annually** **b. Pestle,** 50mm dia porcelain grinding head **c. Heating Equipment** Hotplate (Clause 5.1(d)) and shallow pan (Clause 5.1(b)) OR Microwave oven (Clause 5.2(a)), glass tray (Clause 5.2(b)) and fiberglass cloth (Clause 5.2(f)).		
21.	**CSA A23.2-20C** ***Passing Ability of Self-consolidating Concrete***	**a. J-ring** (Clause 6(a) and Figure 1(c)) **b. Rigid non-absorbent smooth plastic surface** not less than 800mm square **c. Slump Cone** - conforming to CSA A23.2-5C (foot pieces optional)		
22.	**CSA A23.2-21C** ***Length Change of Hardened Concrete***	**a. Drying Room** maintained at 23°C ± 2°C, RH of 50% ± 4% and rate of evaporation 13mL ± 5mL/24h. Temperature and RH measured **twice daily**, evaporation measured **daily** using Griffin low form beaker **b. Moulds and length comparator** - conforming to CSA A23.2-14A **c. Tamping rod, strike-off bar and small tools** (Clause 4)		
23.	**CSA A23.2-22C** ***Scaling Resistance of Concrete Exposed to Deicing Chemicals***	**a. Cold Room or Cabinet** (Clause 5.1) -maintained at -18 ± 3°C and 23 ± 2°C OR two distinct apparatus - record of temperature at saline solution/concrete interface **b**. **Oven or other device** - maintained at 110 ± 5°C -thermostat and rate of evaporation calibrated **annually** **c**. **Moulds** (Clause 5.3) min depth 75mm and surface area min 0.045 m² excluding dyke **d**. **Balance** 500g capacity, accuracy 0.1g calibrated **annually** **e. Other apparatus** (Clause 5) conforming to applicable Standard **f. Reagents and Materials** (Clause 6)		

ADDITIONAL TESTS				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Available or P/A = Provisional Acceptance				
Item No.	Reference	Equipment calibration/verification requirements	Y	N
24.	**CSA A23.2-23C** ***Electrical Indication of Concrete to Resist Chloride Ion Penetration***	**a. Applied voltage cell** (Clause 5.1) **b. Voltage application and data readout apparatus** (Clause 5.3) calibrate voltage, current and frequency **annually** **c. Vacuum saturation apparatus** (Clause 5.4) **d. Coating apparatus and materials** (Clause 5.5) **e. Reagents, materials and test cell** (Clause 6)		
25.	**ASTM C457** ***Microscopical Determination of Parameters of the Air-Void System in Hardened Concrete***	**a. Saw** with diamond or silicon carbide cutting edge for cutting specimens **b. Carbide abrasives** with nominal grit sizes ranging from 150 µm to 12.5 µm and cosmetic brush **c. Linear-Traverse Method:** - Linear-Traverse Device: A platform that can carry specimen with lead screws for movement in the N-S direction (with a capacity of at least 75mm) the E-W (capacity of at least 100mm for the main lead screw and 65mm for the other lead screw). Verification of distance travelled - **annually** - rotation counter readable to 0.01 revolution - Tally counter **d. Modified Point-Count Method:** - Point-count Device: a stage or platform connected to E-W and N-S lead screws for turning specimen smoothly and uniformly through equal distance. Total translation of the stage is at least 100mm in each direction. Verification of distance travelled - **annually** - At least four digital counters **e. Leveling device** **f. Stereoscopic microscope and support,** magnification in the range of 50x to 125x **g. Spotlight type microscope lamp**		
26.	**ASTM C666** ***Rapid Freeze/ Thaw of Concrete***	**a. Freezing-and-thawing apparatus** (Clause 4.1) - calibration of apparatus (Clause 5), **annually** in use, every 3 years if not used since last calibration (Table 1) **b. Dynamic testing apparatus** - Forced resonance apparatus (Clause 6.1 of ASTM C215)/ calibration performed **annually** OR - impact resonance apparatus (Clause 6.2 of ASTM C215)/ calibration performed **annually** **c. Length change comparator** (optional) - conforming to CSA A23.2-14A		

COMMENTS: