Canadian Council of Independent Laboratories

CCIL CONCRETE TESTING LABORATORY
CONCRETE CERTIFICATION PROGRAM - CHECKLIST 2020

DATE:

FACILITIES AND PERSONNEL		**Y**	**N**	Notes
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Company Name:				
Laboratory Address:				
	Relocation since last inspection?			
Supervising professional:				
	Change of Supervising professional since last inspection?			
Category of Registration:				
Additional Tests: **Q**				
R				
S				
	Upgrade requested?			
	New Lab?			
Did you check that the lab records match the portal profile and the website?				
if there are any changes or discrepancies, was an application submitted thru the portal?				
did you notify Emily of the change or discrepancy and your inspection findings at ewordenkwok@ccil.com ?				
Did the lab submit an application for Annual Audit thru the portal?				
INSPECTION DOCUMENTS TO BE UPLOADED TO THE PORTAL		**Y**	**N**	
Letter of Undertaking (2020 version)				
CV - Supervising Professional				
CV - Laboratory Supervisor				
Organization Chart (hierarchy chart, dated with lab name & address)				
List of Certified Technicians, (using template provided)				
Logo Use Agreement (if applicable)				
Compression Machine Calibration Certificate				
Equipment List, (dated since last audit, ID for equipment, all equipment according to certification category)				
CCIL Concrete Checklist				
Signed CCIL Concrete Compliance Report (must be signed by the Supervising Professional)				
Technician Certification Documents (if applicable):				
File Names: **lab name, location, date and abbreviation** e.g. wood Burlington July 3 fta				
TTV Training Verification (Application & Authorization) Signed by Supervising Professional				
NVA Name Verification (Application & Authorization) Signed by Lab rep and Inspector				
FER Field Examination Record				
FEC FEC Field Exam Covers	Include 2nd page if used			
FPR Field Practical Results	Type Q - Basic Concrete			
TTC Technician Temporary Cards - **only for existing laboratory certification**				
LER Lab Examination Record				
LEC Laboratory Exam Covers	Include 2nd page if used			
LPR Lab Practical Results				
Technician documents emails to Gigi at gkermath@ccil.com within 2 days				

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

CCIL Inspector Name: _____ Signature: _____

ALL CONCRETE LABORATORIES				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements	Y	N
1	**CSA A283-19** Clause 5.1.1.2 b) Traceability	**a. Traceability** - **Lab has established Traceability** = ability to trace history and condition of a samples chain of custody, unique sample ID, unbroken records, CSA A283 (clause 5.1.1.2 b)) *Examples: Sample labels, use pen not pencil, no white out, legible, year on all records* *- Digital records traceable to data collection. (keep original copies unless direct entry)*		
2	**CSA A283-19** Clause 5.1 & 5.2 Training	**a. Training records** - **laboratory shall demonstrate that it has trained staff** Cl. 5.2.1.1 b) **Verify the competence of personnel to perform tests** ; Clause 5.1.1.2 a) & 5.2.1.4 *Example: Failed Tech Exams, observed deficiency during audit, or standard unavailable*		
3	**CSA A283-19** Clause 5.2 Supervising Professional's qualifications responsibilities	**a. Qualification** *(any issues to be reported to Emily)* -Resume includes **2 years concrete experience**, Cl5.2.1.2 (Supervising Professional role) *dates for experience, the word concrete, and current role as Supervising Professional* **-Full Time** Supervising Professional *-Cover Letter that details* **knowledge and understanding of concrete** Cl 5.2.2.3 b) and **working knowledge of the use of equipment and procedures** Clause 5.2.2.3 c) **b. Responsibilities** Clause 5.2.2.2 - **Log of Supervising Professional visits monthly**, emails, phone calls (a, c & d) - **Letter of Undertaking** & **Organizational Chart**, dated since last audit (b) & Cl 5.4.1 a) - List of Certified Technicians, Training Records**,** *signed by Supervising Professional* (e) - Internal Audit by SP **semi-yearly**, includes review procedures with staff (f) **ensure equipment is within tolerance and calibrated** (g) *(suggest using CCIL Checklist)* - **Reports reviewed by Supervising Professiona**l (h) (regularly signed or initialed) *(Not all reports require SP's signature just enough to show on going review)* - **Intra-lab** (within lab) **Proficiency** signed or initialed by SP **weekly** (i) & Cl 5.4.1 b) - **Non-Compliance**, must include section for investigation by Supervising Professional (j) include how issue addressed, who was impacted by and who notified (l) & (Clause 8.6) - Complaint forms, must include section for investigation by Supervising Professional (j) include how issue addressed, who was impacted by and who notified (l) - Copies of CCIL Compliance Reports signed by Supervising Professional (k) - Current membership card from applicable - Supervising Professional's **Monthly sign-off** for Clause 5.2.2.2. a) thru m) (n)		
4	**CSA A283-19** Cl 5.2.1.3 & 5.2.1.4 Organization Chart & List of Certified Technicians	**a. Organization Chart and List of Certified Technicians updated prior to audit** Cl 5.2.1.3 **-shall list all sampling and testing personnel,** **-shall list test methods for which they are certified** (separate lab and field) Cl 5.2.1.3 -**shall list expiry date** (lab and field) Clause 5.2.1.3 -laboratory has personnel certified to perform all tests listed on the Certification (Cl 6) *-records kept minimum five years (Technician Certification Results Letters and Cards)* **-testing only done by certified personnel** (Clause 5.2.1.4) *includes all certified tests*		
5	**CSA A283-19** Cl 5.2.1.5 & 6.1.2 Personnel	**a. Change in Personnel** -CCIL **advised of Supervising Professional or testing personnel change < 30 d** (Cl 5.2.1.5) - if ACI certified technician hired (Clause 6.1.2) copies to be available during audit - Obsolete field cards returned to CCIL (A283 Clause 8.3.3) *- Application filed on portal for transfer of technician certification, if applicable*		
6	**CSA A283-19** **Clause 5.3.1** Maintenance & Equipment	**a. Facility Maintenance** (Clause 5.3.1) -**Equipment and facilities maintained in a manner to ensure that all tests comply with CSA**. *Examples: contamination (dusty),* temp, ID of samples (over crowding, mixed) **b. Shared Equipment** (Clause 5.3.5) *to be included on Equipment list* - Does this lab share or use shared equipment? Calibration and COC records available?		
7	**CSA A283-19** **Clause 5.4.2 & 5.4.3** Deviations	**a. Specimens Prepared by Others** -Reports for specimens not prepared, handled or stored by laboratory shall indicate and identify deviations and the **b. Deviations** Known on any samples reported, (tested, handled, or stored) (Cl 5.4.3)		
8	***Document Control***	**a. Reference Documents** - CSA A23.2-19 *accessible to staff performing tests* - CSA A283-19 *accessible to staff performing tests* - Certificate displayed (Clause 8.3.1) *- Calibration records include method of calibration or reference to method*		
9	***CCIL Memorandum of Understanding***	**a. CCIL Logo Use Agreement** *-Logo use agreement with current SP signature provided, required by CCIL to use Logo.* *-Confirm proper use of Logo if used. Report issues to the program office*		

TYPE Q - BASIC CONCRETE				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements	Y	N
Q1	**CSA-A23.2-1C**	**a. Sampling** (sieve required *if large-sized aggregate concrete tested* (Cl 5.1, 5.2 & 7.9))		
		-Sampling container large enough to accommodate 20 L sample (Clause 7.5.1)		
	Sampling	-Shovel for remixing samples (Clause 7.6.2)		
		b. Report 3C & Cl 8 e) sampling location if other than point of discharge, g) sample tech		
Q2	**CSA-A23.2-3C**	**a. Site Curing Boxes:** rigid horizontal surface free from vibration/disturbance (Cl 9.3.2.1)		
		- initial curing temperatures of specimens, lab has method of achieving controlled		
	Making and Curing	environment that maintains **15 to 25 °C**, must include ambient temperature (Cl 9.3.2.1)		
	Concrete	- calibration of site curing boxes **semi-yearly**, summer & winter (A283 Table 1)		
	Compression	- **Records of the max & min temperatures** within curing enclosure (clause 9.3.2.1)		
	Test Specimens	**b. Single Use Moulds** (CSA A23.2-1D, Clauses 6 & 7):		
		- dimensional verification checks performed on **min 3 moulds/shipment** (A283 Table 1)		
	Item b includes	- if Cardboard moulds < 35 MPa - documentation of suitability (Clause 5.1. b))		
	CSA-A23.2-1D	**Reusable Moulds** (CSA A23.2-1D): Cl 7 avg diam <1%, diam <2%, avg h < 2%, perp 0.5°		
		- dimensional verification checks performed **upon purchase and then yearly** (A283 Tbl 1)		
		- limited-use moulds used a **maximum of 5 times** (1D Cl 6.5), *marked for each use*		
		-*Check condition to* confirm stored properly to **eliminate deformation** (1D Clause 6.5)		
		c. Tamping Rods (clause 5.3)		
	Item c also required	- 16mm ± 1mm dia. (450 to 600mm long) - 10 mm ± 1mm dia (450 to 600mm long)		
	for CSA-A23.2-4C	- dimensional verification (16 & 10mm) performed **every 3 months** (CSA A283 Table 1)		
	(Air Meters), and	**d. Strike-off Bar:** (3C Clause 5.7 "shall be provided")		
	5C (Slump Cones)	- steel, approx 6 x 25 x 450mm, *one time record , dimensions checked for compliance*		
		e. Vibrators: Clause 5.4 *internal required for certification*		
	Item e also required	- Internal, min 120 Hz, dia 20 to 40mm, min length of vibrating element (3C cl 5.4.1)		
	for CSA-A23.2-4C	50 mm less than height of mould. *one time record , dimensions checked for compliance*		
	(Air Meters)	- External, if required, min 60 Hz, secure clamping device (3C clause 5.4.2)		
		f. Specimen transport:		
		- protected during transport from shock or exposure to adverse conditions (Clause 9.4)		
		g. Water-storage Tanks (Clause 5.8):		
		- Constructed of non-corroding materials (Clause 5.8.1)		
		- Automatic control of water temperature (except in a room controlled at 23 ± 2°C)		
		- Temperature records: *continuous* recorder *checked weekly* or manual readings		
		twice daily, 5 days/week with accuracy of 0.5°C; *records since last audit available*		
		- Saturated with **high-calcium hydrated lime**, 3 g/L (Cl 5.8.1)		
		- Record of water tank being stirred monthly, (Cl 5.8.1)		
		- Record of cleaning and replacing at least **every 24 months** (Cl 5.8.1)		
		- no continuously running fresh water, re-circulating may be used (Clause 5.8.2)		
		h. Moist Cabinets (MC) and Moist Rooms (MR) (Clause 5.9)		
		-atmosphere maintained at temp 23 ± 2°C and relative humidity >95% (Cl 5.9.1.1)		
		-test specimens saturated, exposed surfaces appear & feel moist (Cl 5.9.1.1)		
		- Temperature records: *continuous* recorder *checked weekly* or manual readings		
		twice daily, 5 days/week with accuracy of 0.5°C; *records since last audit available*		
		- Thermostatic control: within MC or MR, or surrounding space (Clause 5.9.1.2)		
		- MC constructed from durable materials with tight-fitting doors and equipped with		
		fog sprays, water sprays or water curtains (Clause 5.9.2)		
		-MR constructed from durable materials with tight-fitting doors & windows; (Cl 5.9.3.1)		
		-specimens appear and feel moist but not exposed to dripping or running water (5.9.3.2)		
		i. Temperature Measuring Devices *for Curing* (Clause 5.10)		
		-Temperature measuring device with range 0°C to 50°C, accurate to 0.5°C (Cl 5.10.1)		
		-if Temperature recorder: accurate to 1°C, record min every 15 min, (Cl 5.10.2.1)		
		-Record temp recorder data evaluate **weekly,** in spec, include reviewer name (5.10.2.1)		
		-Temp recorder or manual verified **every six months** (Cl. 5.10.2.2 & A283 Tbl 1)		
		-Calibrated as described in 5.10.2.3, 5.10.2.4, and 5.10.2.5		
		-Reference device for calibration readable & accurate to 0.2°C, at min 2 temps (Cl 5.11)		
		-A certificate or report of calibration available for review. Traceable to NIST (Cl 5.11)		
		-liquid glass devices verified once, direct reading resistance devices semi annually (5.11)		

TYPE Q - BASIC CONCRETE (Continued)				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements	Y	N
Q2…	**CSA-A23.2-3C** Continued	**j. Report** (Cl 11.1) a) Mix, b) Source, c) Sampling date&time, d) Project, e) pour Location, f) Std/Field cure, g) Mould date&time, h) Mould type, i) Initial cure location, j) max/min k) Depart date&time, l) Lab Receipt date&time, m) demoulding mass, n) non-Std curing, o) cast tech, p) cast lab, q) test lab, r) Reviewer name and signature, s) and deviation.		
Q3	**CSA-A23.2-4C** Air Content by the Pressure Method	**a. Air Meters:** -measuring bowl, cylindrical metal, inside machined smooth (*not painted*) (Clause 5.2)		
		-Manufacturer's instruction for each air meter *available during audit* (Clause 8)		
		-direct reading to a minimum of 0.2% for air volumes in the range 0 to 8% (Clause 5.4)		
		-Maintained free of hardened concrete from interior & exterior of meter (A283 cl 5.3.1)		
		-Condition check, initial pressure, date of calibration, **monthly** (A283 Table 1)		
		-Calibration records clearly show when equipment is not in-use or lab not in operation		
		b. Report 3C info & Cl 11 e) air technician, if different f) time of test g) air content		
Q4	**CSA-A23.2-5C** Slump of Concrete *Item a also applies to additional test CSA A23.2-19C*	**a. Slump Cones:** - metal mould, >1.5 mm thick, 200 x 100 x 300 mm (Cl 6.1 & fig 1)		
		- maintained free of hardened concrete from interior & exterior of cone (A283 cl 5.3.1)		
		- slump cone dimensional verification, minimum of every **3 month**s (A283 Table 1)		
		b. Test Surface (Clause 6.3) - Rigid, flat and non-absorbent. Sealed plywood, plastic, or a steel plate Plywood, if used, min thickness 19mm and a medium density overlay (Clause 6.3)		
		- surface maintained to ensure test comply with requirements (CSA A283 cl 5.3.1)		
		c. Measuring Tape (Clause 6.4) -not less than 300mm in length with 1mm graduations		
		d. Report 3C info & Cl 10 d) test time f) slump to 5mm e) slump technician if different		
Q5	**CSA-A23.2-9C** Compressive Strength of Cylindrical Concrete Specimens	**a. Compression Machine:** - power operated conforming to ASTM E74 Model / SN: _____		
		- Certificate of Calibration by independent service provider, performed **yearly**, at current location, max every 13 months (CSA A283 Clause 5.3.3 & Table1)		
		- copy of calibration certificate provided conforms to 9C (Cl 4.1.4 & 4.1.5) & ASTM E4-16		
		-Testing machine parts in Clause 4.1: dimensions checked **yearly** (A283 Table 1)		
		-min diam of bearing surfaces 3% greater than cylinder diam (Cl 4.1.2.1)		
		-min thickness of bottom block 25 mm (Cl 4.1.2.2 c))		
		-upper bear block diam meets Tbl 1 (100d=165mm), sphere centered (Cl 4.1.2.3.1 a), b))		
		-if sphere radius < cylinder radius, overhang thickness > diff of radii (Cl 4.1.2.3.2 & Fig 1)		
		-if bearing diam > cylinder plus 13 mm, concentric rings (required on upper) (Cl 4.1.2.1)		
		-planeness verification of bearing surfaces <0.25mm **monthly** (Cl 4.1.2.1 & A283 Table 1)		
		-0.25 mm feeler gauge available during audit		
		- rate of loading verification **weekly** (A283 Table 1) for each size of specimen		
		b. Method of End Preparation: (Clause 7.1.1 other capping shall conform to ASTM C617) Select Method: sulphur capping ☐ grinding ☐ unbonded caps ☐		
		- Planeness/Perpendicularity/Diameter - checks performed **daily** (A283 Table 1) (one in ten cylinders tested, minimum of 3 cylinders per day) (Cl 6.1.1, 6.1.3, 6.1.4)		
		-Cylinders kept moist until testing (Clause 6.1.4)		
		c. Cylinder sulphur capping (Clause 4.2) (Clause 7.1.1 capping up to 70MPa the grinding)		
		- capping equipment dimensional verification **monthly when in use** (A283 Table 1)		
		- capping compound Temperature checks performed **daily when in use** (A283 Table 1)		
		- compressive strength of capping compound **weekly when in use** (A283 Table 1)		
		- melting pot thermostat checks performed **yearly** (A283 Table 1)		
		- capping compound time/temp strength correlation **yearly when in use** (A283 Tbl 1)		
		d. Unbonded Caps (ASTM C617-15, C1231-15 & C39-18) (C1231 1.1 for 10 and 80 MPa) - Dimension checks ***yearly***		
		- pad size, 13 ± 2mm thick, diam <2 mm smaller than ring (C1231 Clause 5.2.1)		
		- retainers, metal, 25 ± 3 mm height, diam 102 to 107% of cylinder (C1231 Clause 5.3)		
		- for 100mm cyl, base 8mm thick, wall 9mm thick, planeness <0.25mm (C1231 Cl 5.3)		
		- pad records include manufacturer's or supplier's name, Shore A hardness /durometer of the elastomer & applicable range of concrete compressive strength (C1231 Cl 5.2.4)		
		- Copy of qualification testing report, if applicable (ASTM C1231 Clauses 5.2.2 & 5.2.3)		
		- Records of date pads placed in service and the number of uses (C1231 Clause 5.2.5)		
		- Verification of alignment checked with 0 to 10% load (ASTM C39 clause 8.4.2)		

TYPE Q - BASIC CONCRETE (continued)				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item No.	Reference	Documentation/Equipment Calibration/verification requirements	**Y**	**N**
Q5…	**CSA-A23.2-9C** Continued	**e. Concrete Test Report** (Clause 9.1) a) Spec ID b) Lab name& address c) Cast date&time d) Min/max temp, e) Date&time if cored f) Test date g)Test age h) Age for Specified Mpa i) Non-std cure, j) Diam 0.5mm, k) Strength 0.1MPa, l) Failure type if not 1, m) Test tech, n) Reviewer name & signature o) Location in structure p) Deviations		
		f. Low Strength Cylinders and Abnormal Results (Clause 9.3) - records of appearance, defects of cylinder or capping, for strength less than specified		
		g. Inter-lab correlation: *participation in interlab correlation currently optional.*		
Q6	**CSA-A23.2-17C** Temperature of Fresh Concrete	**a. Temperature Measuring Device for Fresh Concrete** -temperature measuring device with 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) min 2 temps within range performed **yearly** (A283 Table 1)		
		b. Reference Temperature Measuring Device (Clause 4 (d)): - Readable and accurate to ± 0.2°C at two temperatures; traceable to NIST		
		- Certificate or report of calibration available (Clause 4 d)		
		- Liquid glass calibrated once, direct reading resistance device calibrated **yearly** (Cl 4 d)		
		c. Report 3C info & Cl 9 d) test time e) temperature reading e) temp tech if different		
Q7	All Basic Concrete	**k. Tech** with Type QF Name _____and Expiry _____		
		l. Tech with Type QL Name _____and Expiry _____		
Q8	**CSA A283-19** **Clause 7** Intra-Lab Proficiency	**a. Within Laboratory Proficiency:** - Records updated on a **weekly** basis & current?		
		- exclude results for cylinders cast by others (A283 clause 5.4.1 b))		
		- Compliance with Clauses 7.2.1, 7.2.2, V<10%, $\bar{V}$<5%, if not records of investigation 'findings and actions available for review (Clause 7.2.1 & 7.2.2)		
		-Raw data available for at least last 5 weeks of tests used, traceable (Clause 7.2.3)		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE Q ADDITIONAL TESTS - BASIC CONCRETE				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements	Y	N
Q9	**CSA A23.2-8A**	**a. <u>Equipment:</u>** (Clause 4 & CSA A3005-18)		
		-Cube molds, New must be acid resistant stainless steel, continued use of existing		
	REPEATED IN TYPE S	moulds permitted provided they meet requirements, (A3005 Cl 4.7.1)		
		-Cube 50 ±0.5mm or 2" ±0.02", 49.62 to 50.25 mm, planeness, 0.05mm, (A3005 Tbl 4)		
	Mortar Strength	-Cube base 10mm thick, gap between mold and base < 0.10 mm (A3005 Cl 4.7.2)		
	Properties of	-Mixer, 140±5 & 285±10 r/min, gap paddle to bowl 2.5 to >0.8mm (A3005 4.8.1 Fig 1)		
	Fine Aggregate	-Paddle, removable, stainless steel, basic design in Fig 2 (A3005 Cl 4.8.2)		
		-Bowl 4.5L, dimension in Fig 3, stainless, steel (A3005 Cl 4.8.3)		
		-Flow table, cast iron frame, circular brass top 254 ± 2.5 mm diam, 7.5 ± 1.25mm thick,		
		drop height 12.5 ± 0.375 mm, weigh 4.1 ± 0.05 kg (A3005 Cl 4.9.1 Fig 4)		
		-Flow table pedestal, cast inverted, bolted to cast iron plate >25 mm thick, and 250 cm^2,		
		top 250 to 280 cm^2, bottom 380 to 400 cm^2, height 650 to 750 mm,		
		cork pad 12.5mm thick, 100mm2 under corners (A3005 Cl 4.9.4) level checked (Cl 4.9.5)		
		-Mould, bronze/brass, top 70±1 mm inside diam, wall >5 mm thick (A3005 4.9.8 & fig 4)		
		-Flow table caliper, able to set zero at 100mm gap between jaws. (A3005 Cl 4.9.9)		
		-Calibration of flow table by use of suitable calibration material (A3005 Clause 4.9.7)		
		-Flow table dimension, weight & cube molds verification **yearly** (A283 Table 1)		
		-Upper bearing surface, only slightly > than cube or use centering device (A3005 4.12.1.3)		
		-Tamper non-absorptive 13 x 25 mm x 150 mm (8A, Clause 5 c))		
		b. <u>Report</u> (Clause 14.1) a) Source b) Sample id c) name of certified tech		
		d) Mix proportions e) flow results f) individual strength h) mean strength per set		
		i) name and address of certified lab j) any deviations		
		c. <u>Tech</u> with Additional QL 8A Name and Expiry_____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

Q10	**CSA A23.2-1B**	**a. Viscosity** (Clause 8):		
		- Flow cone conforming to Figure 1 (Clause 8.2 a))		
	Properties of	- Stop Watch accurate to ± 0.2 seconds (Clause 8.2 b))		
	Flowable Grout	- Calibration of flow cone to be performed **yearly** (A283 Table 1)		
		- <u>Report</u> (Clause 8.6) a) name & address of certified lab b) Sample id c) mix proportions		
		d) time of efflux e) avg time of efflux f) temperature of grout g) ambient temperature		
		h) name of certified tech i) name & signature of reviewer j) any deviations		
		b. Bleeding and Expansion (Clause 9)		
		-Cylinder, glass or plastic, graduated to 250mL in 2mL increments (Clause 9.2)		
		- <u>Report</u> (Clause 9.4) a) name & address of certified lab b) Sample id c) mix proportions		
		d) specified bleeding & expansion e) average bleeding & expansion f) temp of grout		
		g) ambient temp h) name of certified tech i) name & signature of reviewer j) deviations		
		c. Compressive Strength (Clause 10)		
		-Cube molds, New must be acid resistant stainless steel, continued use of existing		
		moulds permitted provided they meet requirements, (Cl 10.2.1 & A3005 Cl 4.7.1)		
		-Cube 50 ±0.5mm or 2" ±0.02", 49.62 to 50.25 mm, planeness, 0.05mm, (A3005 Tbl 4)		
		-Cube base 10mm thick, gap between mold and base < 0.10 mm (A3005 Cl 4.7.2)		
		- Dimensional verification of cube molds **yearly** (A283 Table 1)		
		- metal cover plate 6mm thick and a clamping device (expansive grouts only)		
		-Upper bearing surface, only slightly > than cube or use centering device (A3005 4.12.1.3)		
		- <u>Report</u> (Clause 10.5) a) name & address of certified lab b) Sample id c) mix proportions		
		d) specified strength e) individual and average strength f) age at test g) temp of grout		
		h) ambient temp i) name of certified tech j) name & signature of reviewer k) deviations		
		d. Tech with Additional QF 1B Name and Expiry _____		
		e. Tech with Additional QL 1B Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE Q ADDITIONAL TESTS - BASIC CONCRETE				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements	Y	N
Q11	**CSA A23.2-6B Procedure A** Bond Strength of Topping & Overlays and Tensile Strength of Concrete, Mortar, and Grout	**a. Pulloff Calibrated load cell, bourdon tube gauge, or a dynometer: (Clause 5.1.1)** - calibration to be performed **yearly** (A283 Table 1)		
		b. Mechanical or Hydraulic pullout device (Clause 5.1.1)		
		c. Rigid plate with pullout attachment, machined smooth and shoulder-cut (Cl 5.1.2)		
		d. Coring Drill, 3 times the maximum aggregate or >60 mm (clause 5.1.3)		
		e. Rapid-curing epoxy compound adhesive satisfies the tensile requirement (Cl 5.1.4)		
		f. Report (Clause 11) a) name & address of certified lab b) name of certified tech c) core diam, depth, and location on structure d) date and time of sampling e) max load f) area g) stress, location & mode of failure h) name & signature of reviewer i) deviations		
		g. Tech with Additional QF 6B(A) Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

Q12	**CSA A23.2-3C/8C** Flexural Strength of Concrete	**a. Moulds** (3C Clauses 5.2 and 10.1): Dimensional verification **yearly** (A283 Table 1) - rigid, watertight, non-absorbent, > 150 x 150mm, > 50mm longer than 3 x depth		
		b. Tamping rod & Vibrator - see Item 11 c & e in Basic concrete		
		c. Testing Machine (8C Clause 5(a)): - see Item 14 a in Basic concrete		
		Testing machine as described in item 14a or other conforming to 8C 5a)		
		Calibration of flexural strength testing apparatus **yearly** (A283 Table 1)		
		d. Third-point loading apparatus (Clause 5(b)) *one time record of dimensions*		
		e. Report (see item 11J & 8C Clause 11.1) a) name & address of lab b) sample id c) date and time casting d) min/max initial curing e) location in structure f) date received g) date tested h) age at test i) avg dimensions j) flexural strength k) specified strength m) curing if non-standard n) fracture location o) appearance of concrete if < specified p) defects q) name of certified tech r) name & signature of reviewer s) any deviation		
		f. Tech with Additional QF 3C (flexural) Name & Expiry _____		
		g. Tech with Additional QL 8C Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

Q13	**CSA A23.2-7C** Air Content by the Volumetric Method	**a. Air meter:** Conforming to 7C Clause 5:		
		- Calibration **yearly** (3 years if not used since last calibration) (A283 Table 1)		
		b. Defoaming Agent as described in Clause 5 k)		
		c. Report (Clause 11) a) source b) location in structure c) location and time of sampling d) name & address of lab e) name of certified tech f) age at test g) air content h) name & signature of reviewer i) any deviations		
		b. Tech with Additional QF 7C Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

Q14	**CSA A23.2-11C** Water Content, Density, Absorption, and Voids in Hardened Concrete, Grout, or Mortar *REPEATED IN TYPE S*	**a. Equipment:** (Clause 5) - Scale sensitive to 0.025% of mass of specimen or to 0.2g or less, see R 2a. for other balance, and R 2d for oven requirements		
		- Controlled humidity enclosure at 50 ± 5% RH and 23 ± 2°C		
		- Desiccator, container for immersing the specimens		
		- Boiling water tank conforming to CSA A23.2-10C		
		b. Report (Clause 10) a) location date & time of sampling b) sample id c) water content & absorption d) density e) volume permeable pore space f) tech name g) name & address of lab h) name & signature of reviewer i) any deviations		
		c. Tech with Additional QF 11C Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE Q ADDITIONAL TESTS - BASIC CONCRETE				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements	Y	N
Q15	**CSA A23.2-14C** Obtaining and Testing Drilled Cores for Compressive Strength	**a. Equipment:** - Core Drill and diamond tipped, thin-walled core drill bits (Clause 5 a)) - Saw for trimming (Clause 5 b)) -compression machine, curing, & end preparation conforming to CSA A23.2-9C (Cl 5 c)) **b. Report** (Clause 9) a) sample id b) sample date c) test age d) diameter e) tested length f) moisture condition at test g) abnormalities h) corrected strength i) certified tech name j) name & address of lab k) name & signature of reviewer l) any deviations **c. Tech** with Additional QF 14C(field) Name and Expiry_____ **d. Tech** with Additional QL 14C(lab) Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

Q16	**CSA A23.2-15C** In-place Concrete Strength Using the Pull-out	**a. Standard insert** (Clause 5.1) **b. Load test apparatus,** (Clause 5.2) -calibrated yearly (A283 Table 1) **c. Centering plate and hardware** (Clauses 5.3 and 5.4) **d. Correlation Curves** between pullout and compressive strengths (Clause 8) **e. Report** (Cl 10.1) a) location of insert b) number of inserts c) type of insert d) mix id e) equivalent strength f) placement date, start & end time g) test date, start & end time h) type of failure i) other curing info j) name of certified tech k) name & address of lab l) name & signature of reviewer m) any deviations **f. Tech** with Additional QF 15C Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

Q17	**CSA A23.2-16C** Steel or Synthetic Fibre Content in Plastic Concrete	**a. Scales** sensitive to 0.05kg and 1g, (cl 5 a)) calibration performed **yearly** (A283 Table 1) **b. 15L cylindrical bowl,** (Cl 5 c)) calibration **yearly or 3 years if not in use (A283 Table 1)** **c. Glass plate** (Clause 5(g)) **d. Tamping rod, strike-off bar, mallet** - conforming to CSA A23.2-3C **e. Report** (Cl 10.1) a) mix id b) source c) producer info d) project e) sampling date & time f) location in structure g) flooring contractor h) type of fibers and info i) fiber dosage j) certified tech k) name & address of lab l) name & signature of reviewer m) deviations **f. Tech** with Additional QF 16C Name and Expiry_____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

Q18	**CSA A23.2-19C** Slump Flow of Concrete	**a. Slump Flow Board** (Clause 6(c)): Condition check **on going during use** (A283 Table 1) - non-absorbent smooth plastic surface > 800mm square and 12mm thick, Dimension check **upon purchase** (A283 Tbl 1) clearly marked with 2 concentric circles 200mm and 500mm in diameter **b. Stopwatch** (Clause 6(d)) **c. Measuring Tape** graduated in mm (Clause 6(e)) **d. Report** (Clause 10) a) mix id b) source c) project info d) testing date & time e) slump flow f) VSI g) T50 h) certified tech i) name & address of lab j) name & signature of reviewer k) deviations **e. Tech** with Additional QF 19C Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

Q19	**CSA A23.2-20C** Passing Ability of Self-consolidating Concrete	**a. J-ring** (Clause 6(a) and Fig 1(c)) Check **yearly or 3 years when not in use** (A283 Tbl 1) **b. Rigid non-absorbent smooth plastic surface** not less than 800mm square (Cl 6d)) **c. Slump Cone** - conforming to CSA A23.2-5C (foot pieces optional) **d. Report** (Clause 10) a) mix id b) source c) project info d) sampling date & time e) name of certified tech f) J ring flow g) slump flow h) passing ability j) name & address of lab k) name & signature of reviewer l) deviations **e. Tech** with Additional QF 20C Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE R - CONCRETE AGGREGATE
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable

Item No.	Reference	Documentation/Equipment Calibration/verification requirements	Y	N
R1	**CSA A23.2-1A** Sampling	**a. Equipment:** *tools & containers to accommodate samples & prevent contamination*		
		b. Sample ID: (Clause 7.1) a) sampled by name b) submitted by name c) source d) proposed use e) sample ID f) sample date		
		c. Tech with Type RF Name and Expiry _____		
R2	**CSA A23.2-2A & 5A** Sieve Analysis of CA & FA *Item a applies all tests unless otherwise noted* *Item c includes CSA A23.2-2A to 5A, 9A, 10A, 12A & 13A* *Item d includes 2A to 6A &12A*	**a. Balances & Scales:** - balance or scale sensitive to 0.1% of sample mass (Clause 6 a))		
		- Calibration performed **yearly** (A283 Table 1)		
		- Standard weights if used calibrated **every five years** (A283 Table 1)		
		b. Sieve Shaker: - Coarse Aggregate Shakers *on equipment List*		
		- Fine Aggregate Shakers *on equipment List*		
		- CA & FA Sieve Shaker Efficiency Check (Clause 9.4) performed **yearly** (A283 Table 1)		
		c. Sieves: (Clause 6 b)) - Complete metric set as per A23.2 requirements i*nclude each sieve on equipment list*		
		- Sieve checks for embedded particles, slackness of fabric and damaged frames and/or sieve cloth - performed **ongoing during use** (A283 Table 1)		
		d. Ovens: - Ovens appropriate size (Clause 6 c), *on equipment list*		
		- Thermostat calibration (setting vs. actual), capable of maintaining 110 ± 5 °C performed **yearly** (Clause 6 c) & A283 Table 1) *once temperature is set record every 15 min for 2 hr show it is maintaining ± 5C*		
		- Rate of evaporation performed **yearly** (A283 Table 1)		
		e. Sample Splitter or suitable method of quartering: (Clause 8.1 b))		
		f. Report: (2A Cl 11.1) a) total % passing b) total % retained c) % retained between sieves (5A Cl 11.1) a) sample id b) % material finer than 80 um c c) name of tech d) name & address of lab e) name & signature of reviewer f) deviations		
		g. Tech with Type RL Name and Expiry _____		
R3	**CSA A23.2-3A** Clay Lumps	**a. sample container:** to permit spreading of the sample in a thin layer (Clause 6 b))		
		See R 2a. For scale, see R 2c. for sieve, see R 2d. For oven requirements as appropriate		
		b. Report: (Cl 11.1) a) source b) sample id c) sieve size and mass of test sample d) % of clay lumps per sieve size e) weighted average mass of clay lumps f) name of tech g) name & address of lab h) name & signature of reviewer i) deviations		
R4	**CSA A23.2-4A** Low Density Granular Material in Aggregate	**a. Skimmer:** - 315µm sieve cloth, containers (Clause 6 a) & b))		
		- Heavy liquid ZnCl2 with relative density 2.0 (Clause 7.1) *documented available source*		
		-Hydrometer or other apparatus, capable of measuring 2.0 ± 0.01 relative density (C 6 f))		
		See R 2a. For scale, see R 2c. for sieve, see R 2d. for oven requirements as appropriate		
		b. Report: (Cl 12.1) a) sample id b) nominal max size c) mass of test sample d) type and specific gravity of heavy liquid e) % light weight particles f) name of tech g) name & address of lab h) name & signature of reviewer i) deviations		
R5	**CSA A23.2-6A** Relative Density & Absorption of Fine Aggregate *(see 12A for CA)*	**a. Mould:** dimensional verifications documented **yearly** (A283 Table 1) - 40 ± 3mm top (inside) 90 ± 3mm bottom (inside) (Clause 5.3 a, b)		
		- 75 ± 3mm in height and 0.8 thick metal (Clause 5.3 c, d)		
		b. Tamper: dimensional verifications documented **yearly** (A283 Table 1)		
		- non-corroding metal; 325 g to 355g (Clause 5.4)		
		- Face 25 ± 3mm diameter (Clause 5.4)		
		c. Pycnometer 500 ml capacity, accurate to ± 0.1 mL, 50% > sample volume (Clause 5.2)		
		See R 2a. For scale, see R 2c. for sieve, see R 2d. for oven requirements as appropriate		
		d. Report: (Cl 10.1) a) sample id b) tech name c) test sample mass d) BRD e) BRD (SSD) f) apparent relative density g) absorption h) notation re moisture condition if required i) name of tech j) name & address of lab k) name & signature of reviewer l) deviations		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE R - CONCRETE AGGREGATE (Continued)

Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable

Item	Reference	Documentation/Equipment Calibration/verification requirements	Y	N
R6	**CSA A23.2-7A**	**a. Organic Impurities Kit:**		
		- Glass bottles - 300ml, with a rubber or other non-reactive stopper (Clause 4 a))		
	Organic Impurities in FA	-Reference Standard Colour Plate (Cl 4b)) check condition **ongoing during use** (A283 T1)		
		- Sodium Hydroxide Solution (3%) (Clause 5) *documented available source*		
		b Report: (Cl 9.1) a) color plate value b) source c) sample id		
		d) name of tech e) name & address of lab f) name & signature of reviewer g) deviations		
R7	**CSA A23.2-10A**	**a. Measure for Density** (dimensional checks **yearly / 3 yrs when not in use** (A283 Tbl 1)		
		- 7L, 15L and 30L measures (air meter bowl may be used as 7L measure) (10A Table 1)		
	Bulk Density of Aggregate	- Top rim to be plane to 0.25mm, parallel to bottom within 0.5° (Clause 6 d))		
		- 15L & 30L measures reinforced to >5mm thickness at top 40mm of the rim (Cl 6 d))		
		b. Tamping Rod - 16 ± 1mm diameter, 450 to 600mm long		
		See R 2a. For scale, see R 2c. for sieve, see R 2d. for oven requirements as appropriate		
		c. Report: (Cl 11.1) a) sample id b) bulk densities		
		c) name of tech d) name & address of lab e) name & signature of reviewer f) deviations		
R8	**CSA A23.2-12A**	**a. Scale:** balance or scale, capacity of 5 kg sensitive to 0.5 g (0.05%)of sample (Cl 5.1)		
		b. Wire Basket or Bucket: with < 2.5 mm mesh, Equal height and breadth with capacity		
	Relative Density and Absorption of CA	of 4-7L (maximum 0mmm aggregate) and 8-16L for larger size aggregate) (Clause 5.2)		
		c. Report: (Cl 10.1) a) sample id b) max size of test sample c) BRD d) BRD (SSD)		
		e) apparent relative density f) absorption g) individual & avg c, d, e if separate sizes		
	(see 6A for FA)	h) note if tested without dried i) note if avg determined without drying		
		j) name of tech k) name & address of lab l) name & signature of reviewer m) deviations		
R9	**CSA A23.2-13A**	**a. Equipment:**		
		-Suitable length to width equipment (caliper in Fig 1) dimension checks **yearly** (A283 T1)		
		-Thickness gauge (may be Fig 2) (Clause 5.3.3)		
	Flat and Elongated Particles	See R 2a. For scale, see R 2c. for sieve, see R 2d. for oven requirements as appropriate		
		b. Report: (Cl 7.1) a) sample id b) test date c) Procedure used d) length/width ratio used		
		e) % Flat, % elongated and % flat and elongated f) individual % of each size if required		
		g) name of tech h) name & address of lab i) name & signature of reviewer j) deviations		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE R ADDITIONAL TESTS - CONCRETE AGGREGATE				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements	Y	N

R10	**CSA A23.2-9A** Soundness of Fine & Coarse Aggregate by use of Magnesium Sulphate	**a. $MgSO_4$ Solution:** *documented available source* - Record of Solution ($MgSO_4$) maintained at 23 ± 2.0°C (Clause 7 d))		
		- Record of Specific Gravity of solution ($MgSO_4$) maintained at 1.295 to 1.308 (Cl 7 e, f))		
		b. Ovens: - Oven with rate of evaporation 25 g/h for 4 hr checked **yearly** - Clause 5(e))		
		-see R 2d. for other oven requirements		
		c. Baskets (wire mesh) and containers for immersing samples in solution (Clause 5 b))		
		d. Balances: FA capacity > 500 g sensitive to 0.1g, CA capacity > 5kg sensitivity 1 g		
		see R 2a. For other balance and see R 2c. for sieve requirements as appropriate		
		e. Report: (Cl 13.1) a) sample id b) mass /fraction before c) % loss except for ledge rock d) weighted average loss e) for >20mm number of particles before and number affected f) ledge rock % loss, & # affected g) characteristics of $MgSO_4$ solution *(temp, SG, color)* h) name of tech i) name & address of lab j) name & signature of reviewer k) deviations		
		f. Tech with Additional test RL 9A Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

R11	**CSA A23.2-11A** Surface Moisture in FA & CA	**a. Equipment :** **-Balance** >2kg sensitive to <0.5 g (clause 5 a) see R 2a. For other balance requirements		
		-suitable container, pycnometer or flask, graduated markings, accuracy 1.0 mL (Cl 5 b)) if alternate method, a special graduate flask in Fig 1 or volumetric flask (Cl 10.2.2 b))		
		b. Report: (Cl 11.1) a) sample id b) % moisture c) BRD (SSD) used d) name of tech e) name & address of lab f) name & signature of reviewer g) deviations		
		c. Tech with Additional test RL 11A Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

R12	**CSA A23.2 -16A & 17A** Los Angeles Abrasion Method	**a. Los Angeles Machine**: check all **every 3 month or 3 yrs when not is use** (A283 Tbl 1) - Steel shelf, full length projecting 89 ± 2 mm (16A Clause 6.1.1, Fig 1)		
		- Machine speed and revolution counter, 30 to 33 rev/min (17A Cl 9)		
		- Steel drum inside diam 711 ± 5 mm inside length 508 ± 5 mm (16A Clause 6.1.1, Fig 1)		
		see R 2a. For other balance and see R 2c. for sieve requirements as appropriate (6.2 & 6.3)		
		b. Steel Spheres: mass 390 to 445g, averaging approximately 47mm diam (16A Cl 6.4.1) - Individual weight and diameter check performed **every 3 months**		
		- Cumulative weights for 12, 11, 9, 8, & 6 spheres (A, B, C, D, E) (16A Clause 6.4.2 Tbl 1) (5000 ± 25g / 4584 ± 25g / 3750 ± 25g / 3330 ± 30g / 2500 ± 15g) for 17A 12 spheres having a total mass of 5000g ± 25g (17A Clause 6.4)		
		c. Report: (16A 11.1) a) sample id b) max aggregate size c) test grading d) % loss e) date f) name of tech g) name & address of lab h) name & signature of reviewer i) deviations		
		d. Tech with Additional test RL 16A & 17A Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE R ADDITIONAL TESTS - CONCRETE AGGREGATE				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements	**Y**	**N**
R13	**CSA A23.2**	**a. Rolling Mill:**		

	-23A & 29A Micro-Deval Abrasion Test for FA (23A) CA (29A)	- Rolling mill capable of rotating jar at 100 ± 5 rpm (Clause 6.1)		
		- Rolling mill rotation & counter check performed **every 3 months** (A283 Table 1)		
		b. Jars: 5L capacity, outside diam 194 - 202 mm, internal height 170 - 178 mm (Cl 6.2) - Visual assessment of jars performed **every 3 months** (A283 Table 1) - inside & outside of jar shall be smooth, no observable ridges or indentations (Cl 6.2)		
		c. Steel Balls: 9.5 ± 0.5mm Diameter (Clause 6.3) - Measurement of steel ball diameters performed **every 3 months** (A283 Table 1)		
		see R 2a. for balance, R 2c. sieve & R 2d. oven requirements (23A 6.4, 6.5 & 6.6, 29A 6.1)		
		d. Reference material: companion testing with calibration aggregate until last 10 samples show mean loss within tolerance, (23A Cl 6.7 & 11.1, 29A 6.2)		
		e. Calibration material: every 10 samples until 20, then 1/month (Cl 6.8 & 11.3, 29A 6.3)		
		- plotted on a trend chart (Clause 11.4)		
		f. Report: (23A 12.1) a) sample id b) prep information c) % loss d) % loss of control e) chart % loss of last 20 calibration agg (29A 12.1) a) max aggregate and grading used f) name of tech g) name & address of lab h) name & signature of reviewer i) deviations		
		g. Tech with Additional test RL 23A & 29A Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

R14	**CSA A23.2-24A** Resistance of Unconfined CA to Freezing and Thawing	**a. Freezing equipment:** -Freezer capable of maintaining temperature of -18 ± 2.0 °C & a fan for adequate air circulation to provide maximum variation of 2 °C within 25 mm (Clause 6 a))		
		- Calibration of freezer **yearly** (A283 Table 1)		
		- Record of freezer temperature at a min of two points (continuous Record) (Clause 6 a))		
		b. Autoclavable Plastic Containers: - With air tight screw-on caps that can withstand 110°C (Clause 6 d))		
		c. Thermometers: - Thermometer with range of -25 to 30°C readable to 0.5 °C (Clause 6 c))		
		- Calibration of thermometers yearly (A283 Table 1)		
		- Referenced calibrated thermometer		
		see R 2a. for balance, R 2c. sieve & R 2d. oven requirements **d. Reagents**: 3% Sodium chloride solution (Clause 7) *documented available source*		
		e. Reference Aggregate (from a stocked supply): (Clause 7.2) -companion testing with calibration aggregate until last 10 samples show mean loss variation is within tolerance		
		f.Calibration Aggregate: every 10 samples or 1/weeks until 20, then 1/mon (7.3 & 10.2)		
		- plotted on a trend chart (Clause 10.4)		
		g. Report: (13.1) a) sample id b) freeze-thaw % loss c) weighted loss d) plotted weighted loss of last 20 calibration aggregate e) name of tech f) name & address of lab g) name & signature of reviewer h) deviations		
		h. Tech with Additional test RL 24A Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE R ADDITIONAL TESTS - CONCRETE AGGREGATE				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements	**Y**	**N**
R15	**CSA A23.2-25A**	**a. Mixing Equipment: (Clause 5 b)) ASTM C305-14**		

		-Mixer, 140±5 & 285±10 r/min, gap paddle to bowl 2.5 to >0.8mm (ASTM C305 4.1, F1)		
		-Paddle, removable, stainless steel, basic design in Fig 2 (ASTM C305 Clause 4.2)		
		-Bowl 4.73L, dimension in Fig 3, stainless, steel (ASTM C305 Clause 4.3)		
		- space between paddle and the bottom of the bowl shall be 5.1 ± 0.3mm (Clause 5. b))		
		- dimensional verification **yearly** (A283 Table 1)		
		-**Tamper** non-absorptive 13 x 25 mm x 120 to 150 mm (ASTM C109, Clause 5 c))		
		b. Cement Supply of Type GU as CSA A3001, total alkali content 0.90% ±0.10% and		
		autoclave expansion less than 0.20% *verified specific to source not composite sample*		
		c. Solution 0.99N to 1.0N Sodium Hydroxide Solution *documented available source*		
	Alkali-Silica Reactive Aggregate by Accelerated Expansion of Mortar Bars	**- Containers t**hat have a tight fitting cover and can withstand prolonged exposure to 80°C and the 1 N NaOH solution (Clause 5 d))		
		d. Moulds: dimensional checks **yearly** (A283 Table 1) - Shall produce 25 x 25 x 285mm prisms, 250mm length with stainless steel studs, dimensional and condition checks **upon fabrication and ongoing during use** (A283 Tbl 1)		
		e. Length Change measuring device calibrated yearly (A283 Table 1)		
		f. Convection Oven: - Temperature control maintained at 80 ± 2.0°C - Recorded with max/min thermometer every 2 hr. or with automatic chart		
		see R 2a. for balance, R 2c. sieve & R 2d. Other oven requirements (Cl 5 a), e))		
		g. Control Aggregate (Clause 7.5 & 12.1) - to be conducted at time of tests or at least **every 6 months** (A283 Table 1)		
		h. Report: (13.1) a) sample id b) aggregate source type c) portal cement source type d) cement alkali content e) avg length change f) preparation information g) sample and solution info after test h) water to cement ratio i) length change graph j) length change graph of control aggregate k) expansion of Spratt aggregate samples l) name of tech m) name & address of lab n) name & signature of reviewer o) deviations		
		i. Tech with Additional test RL 25A Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

R16	**CSA A23.2-26A**	**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 chosen and qualified for such analysis (Clause 8.2.4) *documented available source*		
	Alkali-Carbonate Reactivity by Chemical Composition	**c. Qualification of method of analysis** (Clause 8.2)		
		d. Report: (9.1) a) sample id b) aggregate source type c) sample location description d) max agg size e) % mass of various oxides f) description of analytical method used and data to show that method used meets precision and accuracy limits g) name of tech h) name & address of lab i) name & signature of reviewer j) deviations		
		e. Tech with Additional test RL 26A Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

R17	**CSA A23.2-2B**	**a. Reagents** (Clause 7): *documented available source* - ammonia hydroxide (relative density of 0.9) (Clause 7 a))		
	Determination of Sulphate Ion Content in Ground Water	- barium chloride (100 g/L of $BaCl_2$) (Clause 7 b))		
		- hydrochloric acid (one volume of HCl and nine volumes of water) (Clause 7 c))		
		- hydrofluoric acid (48% to 51%) (Clause 7 d))		
		- methyl orange Indicator (1 g/L of methyl orange) (Clause 7 e))		
		- silver nitrate (0.1g $AgNO_3$/mL) (Clause 7 f))		
		- sulphuric acid (relative density 1.84) (Clause 7 g))		
		b. Equipment: Beakers (as required) see R2a. balance, R2c. sieve & R2d. oven requirmts		
		c. Report: (10) a) name & address of lab b) water sample id c) water sample source d) date of sampling e) date of testing f) % of water soluble sulphate ions g) name & signature of reviewer h) deviations		
		d. Tech with Additional test RL 2B Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE R ADDITIONAL TESTS - CONCRETE AGGREGATE				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements	**Y**	**N**
R18	**CSA A23.2-3B**	**a. Testing Equipment** (Clause 5):		

	Determination of Total or Water-Soluble Sulphate Ion Content of Soil	-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. Reagents** conforming to CSA A23.2-2B *documented available source* **c. Report:** (10.1) a) name & address of lab b) sample id c) test date d) % total sulphate content or water-soluble ions g) reviewer name & signature h) deviations **d. Tech** with Additional test RL 3B Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

R19	**CSA A23.2-4B** Determination of Water-Soluble Chloride Ion Content of Hardened Grout or Concrete	**a. Drill** (Clause 5.1): - rotary-impact or core drill **b. Testing Equipment** (Clause 5.2): - silver, chloride/sulphide selective electrode - potentiometer readable to 1 mV or better - burette, 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. Reagents** (Clause 7): *documented available source* - sodium chloride - silver nitrate - potassium chloride - reagent water conforming to ASTM D1193 Type 3 - ethyl alcohol **d. Report:** (12.1) a) name & address of lab b) sample id c) test age d) % water-soluble chloride ions e) reviewer name & signature f) deviations g) optional **e. Tech** with Additional test RL 4B Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

R20	**CSA A23.2-8B** Determination of Water-Soluble Sulphate Ion Content of Recycled Aggregates Containing Crushed Concrete	**a. Apparatus, Reagents and Materials** (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) **b. Report:** (1o) a) sample id b) source c) sampling date d) test date d) % water-soluble chloride ions e) name & address of lab f) name of tech g) reviewer name & signature h) deviations **c. Tech** with Additional test RL 8B Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE S - ADVANCED CONCRETE				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements	**Y**	**N**
S1	**CSA A23.2-8A**	**a. Equipment:** (Clause 4 & CSA A3005-18)		

	REPEATED IN Q ADDITIONAL	-Cube molds, New must be acid resistant stainless steel, continued use of existing moulds permitted provided they meet requirements, (A3005 Cl 4.7.1)		
		-Cube 50 ±0.5mm or 2" ±0.02", 49.62 to 50.25 mm, planeness, 0.05mm, (A3005 Tbl 4)		
		-Cube base 10mm thick, gap between mold and base < 0.10 mm (A3005 Cl 4.7.2)		
	Mortar Strength Properties of Fine Aggregate	-Mixer, 140±5 & 285±10 r/min, gap paddle to bowl 2.5 to >0.8mm (A3005 4.8.1 Fig 1)		
		-Paddle, removable, stainless steel, basic design in Fig 2 (A3005 Cl 4.8.2)		
		-Bowl 4.5L, dimension in Fig 3, stainless, steel (A3005 Cl 4.8.3)		
		-Flow table, cast iron frame, circular brass top 254 ± 2.5 mm diam, 7.5 ± 1.25mm thick, drop height 12.5 ± 0.375 mm, weigh 4.1 ± 0.05 kg (A3005 Cl 4.9.1 Fig 4)		
		-Flow table pedestal, cast inverted, bolted to cast iron plate >25 mm thick, and 250 cm^2, top 250 to 280 cm^2, bottom 380 to 400 cm^2, height 650 to 750 mm, cork pad 12.5mm thick, 100mm2 under corners (A3005 Cl 4.9.4) level checked (Cl 4.9.5)		
		-Mould, bronze/brass, top 70±1 mm inside diam, wall >5 mm thick (A3005 4.9.8 & fig 4)		
		-Flow table caliper, able to set zero at 100mm gap between jaws. (A3005 Cl 4.9.9)		
		-Calibration of flow table by use of suitable calibration material (A3005 Clause 4.9.7)		
		-Flow table dimension, weight & cube molds verification **yearly** (A283 Table 1)		
		-Upper bearing surface, only slightly >than cube or use centering device (A3005 4.12.1.3)		
		-Tamper non-absorptive 13 x 25 mm x 150 mm (8A, Clause 5 c))		
		b. Report (Clause 14.1) a) Source b) Sample id c) name of certified tech d) Mix proportions e) flow results f) individual strength h) mean strength per set i) name and address of certified lab j) any deviations		
		c. Tech with SL Name and Expiry_____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

S2	**CSA A23.2-2C**	**a. Concrete Mixer:** - Power driven, revolving drum, tilting mixer or pan mixer		
	Making Concrete Mixes in the Laboratory	- Sampling and mixing pan - heavy gauge metal, watertight see R 2a. for balance, R 2c. sieve & R 2d. oven requirements		
		b. Other Equipment: - Moulds and other equipment conforming to CSA A23.2-3C		
		c. Report (Clause 12.1) a) names & source of ingredients b) individual ingredients mass c) chemical admix dosage d) date & time of sampling e) BD of cementitious materials f) moisture content and absorption of aggregates g) slump h) air content i) plastic concrete temperature j) yield of mix m) converted mass of mix ingredients n) compressive strength o) chemical admixture dosage rates p) tech name who performed plastic concrete tests q) name of tech who prepared mix r) name and address of certified lab s) name & signature of reviewer t) any deviations		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE S - ADVANCED CONCRETE (continued)				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements	**Y**	**N**
S3	**CSA A23.2-6C**	**a. Container:** volume and dimension check yearly /every 3 yr if not in use (A283 Table 1)		

		- cylindrical, metal, rigid, watertight,		
	Density, and Yield, of Plastic Concrete	**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		
		see R 2a. for balance requirements		
		d. <u>Report</u> (Clause 11.1) a) name and address of certified lab b) name of tech**nician** c) source of sample d) sampling location, date & time e) location of concrete in structure f) test date & time g) density of concrete h) yield of concrete, if requested i) relative yield, if requested j) cementitious factor, if requested k) concrete type id l) mix ingredients and mass of each m) name & signature of reviewer n) any deviations		
		e. <u>Tech</u> with Type SF cert Name and Expiry_____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

S4	**CSA A23.2-11C** Water Content, Density, Absorption, and Voids in Hardened Concrete, Grout, or Mortar	**a. <u>Equipment:</u>** (Clause 5) - Scale sensitive to 0.025% of mass of specimen or to 0.2g or less, see R 2a. for other balance, and R 2d for oven requirements		
		- Controlled humidity enclosure at 50 ± 5% RH and 23 ± 2°C		
		- Desiccator, container for immersing the specimens		
		- Boiling water tank conforming to CSA A23.2-10C		
	REPEATED IN Q ADDITIONAL	**b. <u>Report</u>** (Clause 10) a) location date & time of sampling b) sample id c) water content & absorption d) density e) volume permeable pore space f) tech name g) name & address of lab h) name & signature of reviewer i) any deviations		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE S ADDITIONAL TESTS - ADVANCED CONCRETE				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements		
S5	**CSA A23.2-14A**	**a. <u>Equipment:</u>**		
		-moulds 75x75 ± 1 mm x (275 to 405) mm, (Cl 5.1 & Fig 1) checked **yearly** (A283 Tbl 1)		
	Potential Expansivity	-stainless steel studs 5 to 7 mm diam 25 ± 1mm, length comparator, (Cl 5.2)		

	of Aggregate Using Concrete Prisms	dimensional verification upon fabrication and ongoing during use (A283 Table 1)		
		b. Length Change comparator, reference bar and dial gauge/ micrometer 0.0002mm, (Clause 5.3) calibrated yearly (A283 Table 1) in accordance with ASTM C490 (Cl 13.1)		
		c. Storage Containers 22 to 25 L plastic pails, with airtight lids, perforated rack in the bottom 30 to 40 mm, water 20 ± 5 mm. a wick around the inside wall. (Clause 5.4)		
		d. 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, < 2.0 variation from top to bottom of space		
		- automatic recording of storage room temperature		
		see R 2a. for balance, R 2c. sieve & R 2d. oven requirements		
		e. Cement Supply of Type GU as CSA A3001, total alkali content 0.90% ±0.10%		
		determined by chemist of from manufacturer *specific to source not composite* (Cl 8.1)		
		f. Non-reactive aggregate as required, 25A < 0.1% @ 14 day & < 0.15% @ 1 year. (Cl 8.2) Record results of qualification test on control aggregate (Clause 12)		
		g. Known Reactive Aggregate (Clause 12.1) - to be conducted at time of tests or at least **every 6 months** (A283 Table 1)		
		h. Report: (15.1) a) sample id b) type of aggregate source c) location within source d) cement source e) cement's alkali content f) mix proportions g) amount of alkali added h) effective w/c ratio i) cast date j) average and individual length change at each reading k) significant features l) container type m) Spratt prism expansion n) tech name o) name and address of lab p) name & signature of reviewer q) deviations		
		e. Tech with Additional test SL 14A Name and Expiry _____		
S6	**CSA A23.2-6B Procedure B** Bond Strength of Toppings and Overlays & Tensile Strength of Concrete Mortar, and Grout	**a. Load Measuring Device** (Clause 5.2.1) - rate of loading (Clause 8.2.2)		
		- calibration ASTM E4 u**pon installation/relocation** (Cl 5.2.1 b)) and **yearly** (A283 Table 1)		
		b. Fastening Devices (Clause 5.2.2) - 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		
		c. Report (Clause 11) a) name & address of certified lab b) name of certified tech c) core diam, depth, and location on structure d) date and time of sampling e) max load f) area g) stress, location & mode of failure h) name & signature of reviewer i) deviations		
		d. Tech with Additional test RL 6B (B) Name and Expiry _____		
S7	**CSA A23.2-10C (A)** Accelerating Curing Boiling Test	**PROCEDURE A - BOILING METHOD:** **a. Boiling Water Tank:** (Clause 5.2 & Figure 1) - water temperature recorded continuously or periodically measured (Clause 8.1.1.2)		
	CSA A23.2-10C (B) Accelerating Curing Autogenous Curing	**PROCEDURE B - AUTOGENOUS METHOD:** **a. Autogenous Curing Container** (Clause 5.3.1): - able to withstand temperature s of -30 or 60 for 72 hr (Clause 5.3.3.1)		
		b. heat retention: water tight 150 mm diam x 300 mm high insert, sealable (Cl 5.3.2)		
		- Calibration yearly or 3 years when not use (A283 Table 1)		
		c. Max/Min Thermometer (Clause 8.2.1.2) **with temperature** recording (Clause 8.2.1.6)		
	CSA A23.2-10C (C) Accelerating Curing Warm Water Curing	**PROCEDURE C - WARM WATER METHOD:** ***Indicate which procedure lab is certified for*** **a. Warm Water Tank** (Clause 5.4 & Figure 1) - water temperature recorded continuously or periodically measured (Clause 8.3.1.3)		
	CSA A23.2- -10C (A, B or C)	**d. Report:** (9.1) a) specimen id b) sampling location, date & time c) lab name & address d) casting date & time e) test procedure used f) ambient or container temperature g) max/min curing temperatures for autogenous h) test date i) age at test j) tech name k) specified age to achieve specified strength l) curing history if non-standard m) sample diameter n) strength o) type of failure if not Type 1 p) name & signature of reviewer q) deviations		
		e. Tech with Additional test QL 10C Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE S ADDITIONAL TESTS - ADVANCED CONCRETE				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements		
S11	**CSA A23.2-12C includes CSA A23.2-18C**	**a. Reusable Cylindrical moulds:** (Clause 7 a) or b)) - metal 150 x 300mm with wall thickness not < 6mm thick & minimum metal base thickness of 10mm meeting CSA A23.2-1D requirements,verified **yearly** (A283 Table 1)		

	Making, Curing & Testing Compression Test Specimens of No Slump Concrete	**b. Compaction device:** - capable of producing concrete cylinder specimens with densities comparable to the mix design density specified by the concrete supplier (Clause 7 c))		
		c. Metal Compaction Plate: - For compacting the top thin layer to form a smooth cylinder finish (Clause 7 g))		
		d. Scales: - 50kg capacity, 0.05kg sensitivity (Clause 7 d))		
		- 5kg capacity, 1g sensitivity (Clause 7 e))		
		e. Other Equipment (Clause 7) -Pestle		
		- Hotplate or microwave oven plus fiberglass cloth see requirements for CSA A23.2-18C		
		f. Report: (13.1) a) mix id b) sampling source c) sampling date & time d) project e) specified target water content range f) cast date & time g) specimen id h) water content of field samples i) plastic density / cylinder j) specified target density k) avg plastic density l) age of tested specimen m) specified strength n) curing history if non-standard o) diam (& length if outside 1.8 to 2.2) p) strength q) type of failure if not Type 1 r) field tech name s) name & address of lab t) name & signature of reviewer u) deviations		
		g. Tech with Additional test SF 12C(field) Name and Expiry _____		
		h. Tech with Additional test SL 12C (lab) Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

S12	**CSA A23.2-13C**	**a. Compression Machine** detailed in Q5 except Cl 8.5 rate of loading (Clause 5 a)):		
	Splitting Tensile Strength of Cylindrical Concrete Specimens	**b. Bearing Bar or Plate** (Clause 5 b)): - 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 yearly or 3 years when not in use (A283 Tbl 1)		
		c. Bearing Strips: (Clause 5 c)): - 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)		
		d. Aligning Jig (Optional) (Clause 8.1 & Figure 1)		
		e. Report: (10.1) a) mix id b) sampling source c) sampling date & time d) project id e) structure location f) sampling location date & time g) sample id h) specimen type i) diameter & Length j) maximum load k) tensile strength l) % fracture coarse aggregate m) test age n) curing history o) defects p) type of fracture q) tech name r) name & address of lab s) name & signature of reviewer t) deviations		
		e. Tech with Additional test SL 13C Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE S ADDITIONAL TESTS - ADVANCED CONCRETE				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements		
S13	**CSA A23.2-18C**	**a. Scale** 5kg capacity, sensitive to 1g, (Clause 5) calibration **yearly** (A283 Table 1)		
		b. Pestle, 50mm dia porcelain grinding head (Clause 5)		
	Water Content of	**c. Heating Equipment**		

	Normal Weight Fresh Concrete	-Hotplate (Clause 5.1(d)) and shallow pan (Clause 5.1(b)) OR -for Microwave oven (Clause 5.2(a)), glass tray (Clause 5.2(b)) and fiberglass cloth (Clause 5.2(f)).		
		d. Report: (12.1) a) mix id b) sampling source c) project Id & Structure location d) total water content e) tech name f) name & address of lab g) reviewer name & signature h) deviations g) optional		
		e. Tech with Additional test SF 18C Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

S14	**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 (Clause 4.6)		
		b. Moulds and length comparator - conforming to CSA A23.2-14A except 21C Clause 6)		
		-moulds when aggregate passing 56 mm sieve prism 100mm x 100mm x 285 mm, aggregate passing 28 mm sieve 75 mm x 75 mm x 285 mm. (Clause 6) prism mould dimensional verification **yearly** (A283 Table 1)		
		-stainless steel studs 5 to 7 mm diam 25 ± 1mm, length comparator, (Cl 5.2) dimensional verification upon fabrication and ongoing during use (A283 Table 1)		
		b. Length Change comparator, reference bar and dial gauge/ micrometer 0.0002mm, (Clause 5.3) calibrated yearly (A283 Table 1) in accordance with ASTM C490 (Cl 13.1)		
		c. Tamping rod, strike-off bar and small tools (Clause 4)		
		d. Report: (12.1) a) mix id b) sampling source c) name & address of lab d) location in structure e) cast date f) slump or slump flow g) air content h) concrete and ambient temperature i) avg and individual strength j) specimen id k) avg and individual length change at each reading l) tech name m) reviewer name & signature n) deviations		
		e. Tech with Additional test SL 21C Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

S15	**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 (Clause 5.2) - maintained at 110 ± 5°C		
		-thermostat and rate of evaporation calibrated **yearly**		
		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 **yearly**		
		e. Other apparatus (Clause 5) conforming to applicable Standard		
		f. Reagents and Materials (Clause 6) *documented available source*		
		g. Inter-lab correlation: *participation in interlab correlation every 2 years.*		
		g. Report: (12.1) a) specimen id b) slump or slump flow c) type of surface treatment d) type of deicer e) curing history f) mass loss /reading g) visual rating / reading h) size and shape if cut i) photographs j) name & address of lab k) tech name l) field tech name m) reviewer name & signature n) deviations		
		h. Tech with Additional test SL 22C Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE S ADDITIONAL TESTS - ADVANCED CONCRETE				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements	**Y**	**N**
S16	**CSA A23.2-23C**	**a. Applied voltage cell** (Clause 5.1)		
		b. Voltage application and data readout apparatus (Clause 5.3)		

	Electrical Indication of Concrete to Resist Chloride Ion Penetration	calibrate voltage and current yearly		
		c. Vacuum saturation apparatus (Clause 5.4)		
		d. Coating apparatus and materials (Clause 5.5)		
		e. Reagents, materials and test cell (Clause 6) *documented available source*		
		f. Inter-lab correlation: *participation in interlab correlation every 2 years.*		
		g. Report: (11.1) a) specimen id b) location in structure c) type of specimen d) curing history e) specimen location in cylinder or core f) concrete and composition g) specimen prep h) test result, avg total charge i) qualitative chloride ion penetrability J) tech name k) name & address of lab l) reviewer name & signature m) deviations		
		h. Tech with Additional test SL 23C Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

S17	**CSA A23.2-26C**	**a. Bulk resistivity device:** (Clause 7 a)) with manufacture's instructions		
		-supplying voltage across cross section and measure electrical current and voltage drop		
	Bulk Electrical Resistivity of Concrete	-meet the verification requirements in Clause 10.4.3		
		-accuracy of measurements verified prior to testing on a given day. (Clause 10.4.1)		
		-verification cylinder with fixed values, switchable to cover expected range (Cl 10.4.2)		
		b. Electrically conductive plate electrodes: (Clause 7 b))		
		-non corroding, end diameter same or greater than sample		
		c. Other equipment: (Clause 7 c, d, e))		
		-sponges, plastic or non-conductive material specimen holder, non-conductive surface		
		d. Reagents: (Clause 8) *documented available source*		
		-conductive fluid as per the manufacture's instructions		
		e. Report: (13.1) a) source b) sample id c) type of concrete, mix proportions d) description of specimen, diameter, length, steel, overlay, surface treatment e) curing history and age f) test date g) bulk electrical resistivity h) type of device, current frequency i) name & address of lab j) tech name k) reviewer name & signature l) deviations		
		f. Tech with Additional test SL 26C Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

TYPE S ADDITIONAL TESTS - ADVANCED CONCRETE				
Y = Satisfactory/N = Not Satisfactory or N/A = Not Applicable				
Item	Reference	Documentation/Equipment Calibration/verification requirements	**Y**	**N**
S18	**ASTM C457**	**a. ASTM C457-16** copy of current standard		
	(A, B, & C)	**b. Apparatus & material for sample preparation** as per ASTM C856 (Clause 6.1.1)		
		-Diamond Saw large enough to make a 7-in. (175-mm) cut in one pass. (C457 6.2.1)		
	Microscopical	- Horizontal Lap Wheels, preferably at least 16 in. (400 mm) in diameter, large enough		

	Determination of Parameters of Air-Void System in Hardened Concrete	to grind at least a 4 by 6-in. (100 by 152-mm) area. (C457 6.2.3)		
		- Free Abrasive Machine, using abrasive grit in lubricant, with sample holders rotating on a rotating table. (C457 6.2.4)		
		-Polishing Wheel, at least 8 in. (200 mm) in diameter (C457 6.2.5)		
		-Abrasives—Silicon carbide grits, No. 100 (150-µm), No. 220 (63-µm), No. 320 (31-µm), No. 600 (16-µm), No. 800 (12-µm); optical finishing powders, as needed. (C457 6.2.8)		
		Participation in Correlation program at least every 2 years (results available for review)		
		c. Report: (18.1) .1 method used .2 sample id .3 Location and orientation .4 Surface orientation & position .5 length of traverse, area traversed, & for B # of stops .6 air content & if measured paste content, void frequency, specific surface spacing factor and paste-air ratio		
		d. Tech with Additional test SL C457 Name and Expiry _____		
	Procedure A	**Procedure A - Linear-Traverse Method:** **e. 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) (9.1.1) . Verification of distance travelled between stops - **yearly** (A283 Tabl1 1)		
		f. Stereoscopic microscope & support, magnification in the range of 50x to 125x (9.1.2)		
		g. Spotlight type microscope lamp & leveling device (9.1.3 & .5)		
		- rotation counter readable to 0.01 revolution & tally counter		
	Procedure B	**Procedure B - Modified Point-Count Method:** **h. 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 **- yearly**		
		i. Equipment f, g, & h in Procedure A		
		- At least four digital counters		
	Procedure C	**Procedure C—Contrast enhanced method** **j. Apparatus & material for sample preparation** (Clause 6.2) -opaque permanent black ink, white powder, light oil.		
		k. Specimen stage & Illumination Source (15.1.1 & 3)		
		l. Image capture, storage and processing devices (15.1.2. .4 & .5)		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)

S19	**ASTM C666**	**a. ASTM C666-15** copy of current standard		
		b. Freezing-and-thawing apparatus (Clause 4.1) -calibration of apparatus (Clause 5), yearly in use, every 3 years if not in use A283 (Tbl 1)		
		c. Temperature-Measuring Equipment (Clause 4.2) accuracy 1 ^{o}C		
	Rapid Freeze/ Thaw of Concrete	**d. Dynamic testing apparatus** - Forced resonance apparatus (Clause 6.1 of ASTM C215) calibration performed **yearly** OR - impact resonance apparatus (Clause 6.2 of ASTM C215), calibration performed **yearly**		
		e. Scales (Clause 4.5) capacity 50% > than mass accuracy 10% of specimen mass		
		f. Tempering Tank (Clause 4.6)		
		g. Report: (10.1) .1 mix proportions .2 admixture .3 air content (fresh) .4 density (fresh) .5 consistency (fresh) .6 air content (hardened) when available .7 type of samples (cut or cast) .8 curing period		
		e. Tech with Additional test SL C666 Name and Expiry _____		

COMMENTS: (include positive comments and details about what was observed and reviewed to confirm compliance)