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4.1 General

PART 1 - GENERAL

1.1 Work Included

.1 This section specifies requirements for constructing precast concrete. Work includes supply, placing, and finishing of Portland Cement concrete.

1.2 Reference Standards

The latest editions of all the following references shall apply to this specification.

.1 Joint Committee on Contract Documents Standard Specification for Municipal Services.

.2 ASTM C1610/C1610M, Standard Test Method for Static Segregation of Self-Consolidating Concrete Using Column Technique.

.3 ASTM A933-14, Standard Specification for vinyl Coated Steel Wire and Welded Wire Reinforcement.

.4 ASTM C260-10A (R2016), Standard Specification for Air-Entraining Admixtures for Concrete.

.5 ASTM C309-19, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.

.6 ASTM C494/C494M-19, Standard Specification for Chemical Admixtures for Concrete.

.7 ASTM C1017-13E1, Standard Specification for Chemical Admixtures for Use in Producing Flooring Concrete.

.8 CSA A3000-23, Cementitious materials compendium.

.9 CSA A23.1:24/A23.2:24, Concrete materials and methods of concrete construction/methods of test and standard practices for concrete.

.10 CSA A23.4-16(R2021), Precast concrete – materials and construction.

.11 CSA A283:24, Qualification code for concrete testing laboratories.

.12 CSA G30.18-09 (R2019), Billet-steel bars for concrete reinforcement.

.13 CSA S269.1-16, Falsework and formwork.

1.3 Related Sections

.1	Concrete	Section S-11, Part A
.2	Precast Manholes, Catch Basins, and Structures	Section 33 39 00
.3	Walks, Curbs, and Gutters	Section S-11, Part B
.4	Interlocking Concrete Pavers	Section S-12

1.4 Submittals

.1 Contractor to submit production schedule to the Engineer.

.2 Contractor to provide the Engineer with copies of QC records prior to approval of delivery of products to site. QC records shall contain at minimum all pertinent and CSA-mandated supplementary information related to the plastic and hardened properties such as air content, temperature, slump/slump flow, and compressive strength as outlined in CSA A23.2:24-24C and test specific specifications.

.3 If not included in the Contractor's Comprehensive QMP submission, the Contractor shall submit a supplementary QMP to the Engineer (TPW.TIM@halifax.ca) for review, a minimum of 15 working days prior to commencement of any precast concrete work as part of the project(s). The supplementary QMP shall be prepared to fit the criteria of the unique project. The Engineer will provide a Contractor QMP Approval Letter in a timely manner, prior to commencement of this work.

If the Engineer deems the supplementary QMP unacceptable, the Contractor shall provide iterations in a timely manner until the QMP is considered adequate by the Engineer. Construction related to precast concrete work as part of a project(s) shall not commence without the Contractor's QMP Approval Letter for the project.

Note, if deemed necessary by the Contractor, an amended QMP can be submitted to the Engineer for review and approval at any point throughout the construction season (ends December 30th of the calendar year).

An outline for a QMP, based on ISO 10005, is provided for reference in Attachment A.

.4 Contractor to submit shop drawings for each precast culvert containing the following information:

- Station of culvert, name of watercourse, with HRM project number and description;
- General layout showing all culvert sections and appurtenances;
- Length and weight (mass) of individual sections;
- Joint details (including gap, gasket, connection plates, and waterproofing);
- Proposed construction joints (if sections not cast monolithically);
- Location and type of inserts and list devices (including location where rebar and/or mesh will be cut for life anchors);
- Location of reinforcing steel (including additional reinforcement around large openings);
- Bar schedules for all reinforcing steel;
- Itemized supply list;
- Detail showing year of fabrication embedded in headwalls;
- Concrete design strength, age of test, form removal strength, and shipping strength;
- One set of design calculations; and
- Location of manufacturing plant;

.5 Contractor to submit documentation for each precast catch basin as/if outlined in latest edition of Halifax Water specification.

.6 Certification and Membership

.1 Precast concrete manufacturer shall be certified by the Canadian Precast Concrete Quality Assurance Certification Program in accordance with CSA A23.4, latest edition prior to tender. Proof of certification shall be provided prior to award of the contract. The certification shall also indicate for what category the plant is certified for as described in CSA A23.4:16 Clause 4.1.

.2 Quality control technicians must possess at least the basic certification recognized by CSA for concrete testing procedures performed such as CCIL Type Q or an equivalent certification. Technicians may require additional certifications, such as CSA A23.2:24-19C for specialized testing.

.3 The concrete testing laboratory must hold certification for concrete testing from a recognized authority, such as CCIL Type Q or an equivalent certification following CSA A23.2:24 standards. The laboratory must maintain current certification and demonstrate compliance with testing standards for accuracy and reliability as specified in CSA A283:24.

.4 Upon written request from HRM, the Contractor shall

coordinate with the precast concrete manufacturer(s) to allow for HRM (or its representative) to perform an inspection at the precast concrete manufacturer's location (facility) for any precast concrete being manufactured for the project, *if requested* by HRM. For clarity, it is the responsibility of the Contractor, and not HRM, to coordinate this inspection and such inspection is to occur during the period set forth in the written notification or during another period agreed to by HRM in writing. The inspection conducted by HRM (or its representative) will verify compliance with certification requirements, testing standards, and quality control procedures.

.7 Prior to use of any proposed self-consolidating concrete (SCC) mixture, a trial batch must be produced and tested to demonstrate mix design meets the performance requirements following CSA A23-1:24 Table 22 for Flow, T- 50 cm time and VSI value. If component has reinforcement a J-ring test shall be performed. ASTM C1610/C1610M Column Segregation shall be used for pre-qualification of mix design.

.8 If requested by HRM, the precast concrete manufacturer shall provide documentation that the facility, materials, and products selected for use on a project address any of the following:

.1 Compliance with latest Nova Scotia Environmental Act and regulations pertaining to Industrial facilities. All facilities shall comply with water taking permits, air and noise pollution, discharge of process water and waste generation regulations.

PART 2 – PRODUCTS

2.1 Materials

.1 Materials in accordance with Concrete Section S-11, Part A.

2.2 Concrete Mix

.1 Concrete in accordance with Section S-11, Part A and as specified herein.

.1 Concrete for culverts and related structures to be of minimum class C-1 as outlined in CSA A23.1:24 Table 1 and to follow latest Halifax Water Specifications.

.2 Concrete for Halifax Water manholes or catch basins to follow latest Halifax Water specifications.

.3 Structural elements shall have calcium nitrate corrosion inhibitor added, at a rate of 15 L per cubic metre containing between 30 % and 36 % calcium nitrate by weight of solution. Batch water in concrete mix design shall be reduced to account for water in corrosion inhibitor.

PART 3 – EXECUTION

3.1 Concrete Quality

.1 Precast concrete manufacturer responsible for QC of their product.

.2 Precast concrete manufacturers shall perform sampling and testing in accordance with CSA A23.2:24, including casting test specimens, air content, temperature, and slump testing.

.1 For both dry-cast and wet-cast manufacturing, at least two (2) strength test specimens shall be cast for every production run per day.

.2 Strength test specimens shall be tested at the specified age for the exposure class according to CSA A23.1:24 Table 2, typically 28 days unless otherwise noted.

.3 All testing, including air content, temperature, slump, and strength, shall be conducted after the addition and incorporation of all materials, including admixtures.

.3 QA testing to be conducted by HRM or its representative. QA testing shall include verification of the quality management plan and records submitted by the Manufacturer as well as access to all phases of product manufacture including:

- Pre-stressing operations, where applicable;
- Installation of reinforcing steel and support, inserts;
- Aggregate testing;
- Concrete production, placement, and curing;
- De-tensioning operations, where applicable;
- Finishing of members;
- Dimensions and tolerances;
- Handling and storage; and,
- Transportation and delivery.

.4 QA testing may be waived at the Engineer’s discretion so long as required QC report submittals are maintained.

3.2 Defective Work

.1 Defective work shall be in accordance with Concrete Section S-11 Part A. In addition, precast concrete infrastructure may be inspected and accepted by HRM's representative prior to installation, and repair work, if required, to the satisfaction of HRM.

PART 3 - MEASUREMENT & PAYMENT

3.1 General

.1 Payment for all works carried out in accordance with this specification will be paid for per the payment items detailed in Section 01 22 00 – Measurement and Payment, of the Contract.

****** END PART C, END S-11 ******