Part 1 General

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)

- .1 ASTM A185/A185M-05a, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
- .2 ASTM C260-01, Standard Specification for Air-Entraining Admixtures for Concrete.
- .3 ASTM A-123, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- .4 ASTM C494 / C494M - 15a, Standard Specification for Chemical Admixtures for Concrete.

.2 Ministère des Transports du Québec

- .1 3101 Standard, Volume VII, Chapter 3, standard concrete weight
- .2 3601 Standard, Volume VII, Chapter 3, Concrete waterproofing

.3 Canadian Standards Association (CSA International)

- .1 CSA-A23.1/A23.2-F2014, Béton-Constituants et exécution des travaux / Méthodes d'essai et pratiques normalisées pour le béton.
- .2 CAN3-A23.3-(R2010), Calcul des ouvrages en béton.
- .3 CSA-A23.4-F09, Béton préfabriqué : Constituants et exécution.
- .4 CAN/CSA-A3000-F13, Compendium de matériaux liants
- .5 CAN/CSA-A3001-F13, Liants utilisés dans le béton.
- .6 CAN/CSA-G30.18-FM92 (C2012), Barres d'acier en billettes pour l'armature du béton.
- .7 CAN/CSA-G40.20/G40.21-F2004, Exigences générales relatives à l'acier laminé ou soudé/acier de construction.
- .8 CAN/CSA-S6-F2014, Code canadien sur le calcul des ponts routiers.
- .9 CSA-W47.1-F03, Certification des compagnies de soudage par fusion de l'acier.
- .10 CAN/CSA W48-F014, Métaux d'apport et matériaux associés pour le soudage à l'arc (élaborée en collaboration avec le Bureau canadien de soudage).
- .11 CSA-W59-F03, Construction soudée en acier (soudage à l'arc) (unités métriques).
- .12 CSA-W186-FM1990 (C2012), Soudage des barres d'armature dans les constructions en béton armé.
- .13 CAN/CSA-S269.3-FM92 (C2013), Coffrages, Norme nationale du Canada.

1.2 DESIGN REQUIREMENTS

.1 Design precast elements to CSA-A23.3 and CSA-A23.4 to carry handling stresses.

.2 Design lifting lugs for handling of precast elements to be sure that they can withstand the loads during handling, in compliance with the applicable codes and, the plans and estimates.

.3 Design fittings and attachment system of precast concrete elements depending on the loads and forces specified by the Departmental Representative.

.4 Submit design drawings and detailed calculations required for precast concrete elements and the standard assembly elements in accordance with the requirements stated in section 1.7 - DOCUMENTS/SUBMITTALS, in PART 1.

1.3 PERFORMANCE REQUIREMENTS

.1 The allowances and gaps for structural precast concrete elements shall conform to CSA-A23.4 standards.

.2 The positive or negative deviation of the actual length and the nominal length of the precast elements shall not exceed 5 mm.

.3 The positive or negative deviation of the actual section and the nominal section of the precast elements shall not exceed 3 mm.

.4 The deviation from a straight line shall not exceed a length of 3 mm by 3 m.

.5 The positive or negative deviation (bias) between the horizontal rectangular form of precast elements and the rectangular reference shall not exceed 3 mm, as measured by the difference in the length across.

1.4 TARGETED ELEMENTS

.1 The main elements referred to in this section are, but shall not be limited to, the following:

.1 Precast crib slabs (different shapes).

.2 If application and implementation allow, the Contractor may provide, with the approval of the Departmental Representative, other structural precast concrete elements such as:

.1 Lighting base

.2 Bases for mooring bollards (different shapes)

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit WHMIS MSDS - Material Safety Data requested.

.3 Submit shop drawings in accordance with CSA-A23.3 and CSA-A23.4 and include following items:

.1 Design calculations for items designed by manufacturer.

.2 Details of prestressed and non-prestressed members, reinforcement and their connections.

.3 Camber.

.4 Finishing schedules.

.5 Methods of handling and erection.

.6 Openings, sleeves, inserts and related reinforcement.

.4 Submit, two (2) weeks before the start of production, one (1) soft copy of the design drawings and detailed calculations of standard precast and assembly elements for review by the Departmental Representative.

.5 Shop Drawings: submit drawings stamped and signed by qualified professional engineer registered or licensed in Province of Quebec, Canada.

.6 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.7 Send the implementation schedule to the Departmental Representative at least two (2) weeks in advance to ease for coordination at the plant.

1.6 QUALITY ASSURANCE

.1 Quality Control Plan: submit written report, as described in PART 3 - VERIFICATION, to Departmental Representative verifying compliance that concrete provided meets performance requirements of concrete as established in PART 2 - PRODUCTS.

.2 Replace, at no additional cost, damaged products to the satisfaction of the Departmental Representative

1.7 QUALIFICATIONS

.1 Fabricate and erect precast concrete elements by manufacturing plant certified in appropriate categories according to CSA-A23.4

.2 Precast concrete manufacturer to be certified in accordance with CSA's certification procedures for precast concrete plants prior to submitting tender, and to specifically verify as part of tender that plant is currently certified in appropriate category, which are precast structural concrete products.

.3 Only precast elements fabricated in such certified plants to be acceptable to Departmental Representative and plant certification to be maintained for duration of fabrication, erection until warranty expires.

.4 Welding companies certified to CSA-W47.1.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Deliver, handle and store precast/prestressed units according to manufacturer's instructions.

.2 Protect unit corners from contacting earth to prevent from staining.

.3 Waste Management and Disposal:

.1 Separate waste materials for reuse/recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.4 Untreated wood must be supplied during offloading on which the items will be placed so as to avoid any direct contact with the ground, or with each other.

.5 At least, evenly support, each element at a quarter (¼), half (½) or three-quarters (¾) length, or following the manufacturer's directives.

1.9 WARRANTY

.1 The Contractor hereby certifies that the precast elements are guaranteed against spalling and against any other obvious signs of cracks or corrosion of embedded steel elements, except normal hairline cracks due to shrinkage, except to what relates to the warranty period, which is two (2) years.

Part 2 Products

2.1 MATERIALS

.1 Cement to CAN/CSA-A3001, Type GUb-SF / GUb-F/SF.

.2 Water: to CSA-A23.1/A23.2.

.3 Reinforcing steel: to CAN/CSA-G30.18, and to specs and plans.

.4 Hardware and miscellaneous materials: to CSA-A23.1/A23.2.

.5 Forms: to CAN/CSA-S269.3-FM92 et CAN/CSA-A23.4.

.6 Anchors and supports: to CAN/CSA-G40.21 Type 300 W, galvanized.

.7 Welding materials: to CSA W48.

.8 Welding electrodes: to CSA W48certified by Canadian Welding Bureau.

.9 Galvanizing: hot dipped galvanizing with minimum zinc coating of 610 g/m^2 to ASTM A-123.

.10 Air entrainment admixtures: to ASTM C260.

.11 Chemical admixtures:

.1 Setting accelerators are not allowed

.2 It is forbidden to use calcium chloride or materials containing it.

.3 Super-plasticizer, water reducer, setting retarder in compliance with ASTM C494 standards.

.12 Shims: plastic.

2.2 MIXES

.1 Concrete

.1 Performance Method for specifying concrete: to meet Departmental Representative performance criteria in accordance with CAN/CSA-A23.1/A23.2.

.1 Ensure that the concrete supplied meets the performance criteria of the 3101 standard, Volume VII, Chapter 3, standard concrete weight, V-P type concrete.

.2 In the plastic state, the concrete mixture must comply with the following requirements.

.1 Water/cement ratio: less than 0.45

.2 Minimum cement content: 390-410 kg/m^3 (see Volume VII)

.3 Nominal size of coarse aggregate: 5-20 mm.

.4 Air content: 5-8 %

.5 Sagging before the addition of super-plasticizer: 80mm ± 30mm

.3 Provide concrete mix to meet following hard state requirements:

.1 Durability and class of exposure: C-1.

.2 Minimum compressive strength at 35 MPa – 28 days.

.3 Intended application: traffic of light to medium-sized vehicles and pedestrians.

.4 Surface Texture: slip resistant surface - brush finish.

.5 Geometrical requirements: 0% slope.

.6 Permeability to chlorine ions: 1500 Coulombs

.4 Provide quality management plan to ensure verification of concrete quality to specified performance.

.5 Concrete supplier's certification.

.2 Repair and sealer

.1 The manufacturer of precast elements must provide a procedure and a dosage formula for concrete/grout/mortar to fill the spaces left by the lifting equipment. The product offered by the manufacturer must adhere well to the elements, blend with the colour of the elements and have mechanical performance similar to that of the elements.

.2 Shrinkage compensated grout: complies with Section 03 30 00.01 - Concrete poured on site (abridged version).

2.3 MANUFACTURED UNITS

.1 Manufactured units in accordance with CSA-A23.4.

.2 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit not be exposed. These marks shall be placed on a section of the concealed item once the work is completed.

.3 Hardware such as lifting lugs embedded in the precast elements and suitable for handling precast elements must be supplied.

.4 The design of the lifting lugs must conform to CSA-A23.3 and CAN/CSA-S6 standards.

.5 After the shaping is done, the lifting equipment and steel parts to be embedded should be galvanized.

2.4 FINISHES

.1 Surface finishing should follow CAN/CSA-A23.4 standards.

.2 Crib slabs: The elements must have a commercial grade finish on all surfaces, except for the surface course (top surface) which requires slip resistant finish.

.1 Level finishing for flat surfaces, followed by wooden float finishing and light brushing to obtain a slip resistant finish by brush finish perpendicular to traffic, with maximum grooves of 2mm.

.2 Surfaces with rounded edges and seals made with spacers, using common tools.

.3 Bases for mooring terminals and floor lamp base: The items must have a commercial grade finish on all surfaces.

.1 Level finishing for flat surfaces, followed by wooden float finishing.

.2 Surfaces with rounded edges and joints made with spacers, using common tools.

2.5 CONCRETE WATERPROOFING

.1 Waterproofing of slip resistant concrete top surfaces should be made in the factory and comply with the 3601 standards, Volume VII, Chapter 3, Concrete waterproofing, Ministère des Transports du Québec.

2.6 SOURCE QUALITY CONTROL

.1 Provide Departmental Representative with certified copies of quality control tests related to this project as specified in CSA-A23.4.

.2 Provide records from in-house quality control program based upon plant certification requirements to Departmental Representative for inspection and review.

.3 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.

.4 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide to Departmental Representative for review upon request.

Part 3 Execution

3.1 ERECTION

.1 Do precast concrete work in accordance with CSA-A23.4, CSA-A23.3 et CAN/CSA-S6.

.2 Carry out welding work in accordance with CSA-W59 standards for welding lifting equipment.

.3 Erect precast elements within allowable tolerances as indicated.

.4 Erection tolerances to CSA-A23-4. Non-cumulative erection tolerances only.

.5 Set elevations and alignment between units to within allowable tolerances before connecting units.

.6 Grout underside of unit bearing plates with shrinkage compensating grout.

.7 Fasten precast units in place as indicated on approved shop drawings.

.8 Fit precast elements using lag screws fitted with lock washers.

3.2 VERIFICATION

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established in PART 2 - PRODUCTS, by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

3.3 PROTECTION

.1 Protect all installed materials and elements against damage during construction.

.2 Repair damages caused to adjacent materials and equipment by placing precast concrete elements.

3.4 CLEANING

.1 Use cleaning methods as approved by Departmental Representative before cleaning soiled precast concrete surfaces.

END OF SECTION