

**PART 1 - GENERAL**

**1.1 RELATED SECTIONS**

- .1 Section 03 30 00 - Cast-in-Place Concrete.
- .2 Section 33 05 14 - Manholes and Catch Basins.

**1.2 MEASUREMENT PROCEDURES**

- .1 Measure precast elements in units supplied, delivered, stored and erected.
- .2 Precast elements measured as individual units, will include cost, supply, delivery, storage, erection, bearing assemblies, connections, anchors, erection devices, load transfer devices, scaffolding, excavation, backfilling and field grouting.

**1.3 REFERENCES**

- .1 American Society for Testing and Materials (ASTM)
  - .1 ASTM A 775, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
  - .2 ASTM D 412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Rubbers and Thermoplastic Elastomers - Tension.
  - .3 ASTM D 2240, Standard Test Method for Rubber Property - Durometer Hardness.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.40, Anticorrosive Structural Steel Alkyd Primer.
  - .2 CAN/CGSB-1.181, Ready Mixed Organic Zinc-Rich Coating.
  - .3 CAN/CGSB-51.20, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .3 Canadian Standards Association (CSA)
  - .1 CAN/CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA-A23.3, Design of Concrete Structures.
  - .3 CSA-A23.4, Precast Concrete - Materials and Construction.
  - .4 CSA-A251, Qualification Code for Manufacturers of Architectural and Structural Precast Concrete.
  - .5 CSA-G30.15, Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
  - .6 CAN/CSA-G30.18, Billet-Steel Bars for Concrete Reinforcement.
  - .7 CAN/CSA-G40.20 Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

- .8 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
- .9 CSA-G279, Steel for Prestressed Concrete Tendons.
- .10 CAN/CSA-S6-06, Canadian Highway Bridge Design Code.
- .11 CAN/CSA-S6.1-00, Commentary on CAN/CSA S6-00, Canadian Highway Bridge Design Code
- .12 CSA-W47.1, Certification of Companies for Fusion Welding of Steel.
- .13 CSA-W48, Filler Metals and Allied Materials for Metal Arc Welding.
- .14 CSA-W59, Welded Steel Construction (Metal Arc Welding).
- .15 CSA-W186 Welding of Reinforcing Bars in Reinforced Concrete Construction.

#### 1.4 DESIGN REQUIREMENTS

- .1 Design precast elements to CAN-A23.3 and CAN-A23.4 to carry handling stresses.
- .2 Design precast elements to carry loads specified by the Owner's Representative or as indicated, in accordance with National Building Code of Canada (NBC) applicable codes.
- .3 Design connections/attachments of precast elements to load/forces and load transfer specified.
- .4 Submit six copies of detailed calculations and design drawings for typical precast elements and connections for the Owner's Representative for review two weeks prior to manufacture.

#### 1.5 PERFORMANCE REQUIREMENTS

- .1 Contractor is advised that tolerance of precast elements to CSA-A23.4, Section 10.

#### 1.6 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures, and in accordance with CSA-A23.3 and CSA-A23.4.
- .2 Include the following items:
  - .1 Design calculations for items designed by manufacturer.
  - .2 Details of prestressed and non-prestressed members, reinforcement and their connections.
  - .3 Camber.
- .3 Finishing schedules.
  - .1 Methods of handling and erection.
  - .2 Openings, sleeves, inserts and related

reinforcement.

.3 Method of anchoring and devices.

.4 Ensure each drawing submitted bears stamp and signature of qualified professional Owner's Representative registered or licensed in provinces of Ontario, Canada.

#### 1.7 SAMPLES

.1 The Contractor shall submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 The Contractor shall provide sample and sample number of each finish to be used on project to the Owner's Representative.

#### 1.8 QUALIFICATIONS

.1 Contractor shall provide only precast concrete elements which are fabricated and erected by manufacturing plant certified by Canadian Standards Association in appropriate categories according to CSA-A251.

.2 The precast concrete manufacturer engaged by the Contractor shall 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 categories, Structural and Architectural.

.3 Contractor is advised that only precast elements fabricated by CSA certified plants (as detailed above) will be acceptable to the Airport Authority, and further that the plant certification is to be maintained for duration of fabrication, erection and until warranty expires.

.4 Contractor shall only engage welding companies certified to CSA-W47.1.

#### 1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with waste management plan.

.2 Ensure emptied containers are sealed and stored safely for disposal away from public.

.3 Prevent plasticizers, water-reducing agents and air-entraining agents from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with an inert, noncombustible material and remove for disposal. Dispose of all waste in accordance with applicable local, provincial and national regulations

1.10 WARRANTY

- .1 Contractor hereby warrants that precast element will not spall or show visible evidence of corrosion of embedded steel and cracking, except for normal hairline shrinkage cracks for a duration of 5 years from the date of total performance of the Contract.

**PART 2 - PRODUCTS**

2.1 MATERIALS

- .1 Cement, aggregates, water, admixtures: to CAN/CSA-A23.1 and CSA-A23.4.
- .2 Reinforcing steel: to CAN/CSA-G30.18.
- .3 Prestressing steel tendons and bars: to CAN/CSA-S6 and CSA-G279.
- .4 Welded wire fabric: to CSA-G30.15.
- .5 Hardware and miscellaneous materials: to CAN/CSA-A23.1.
- .6 Forms: to CSA-A23.4.
- .7 Anchors and supports: to CAN/CSA G40.21 Type 300 W galvanized and/or epoxy coated after fabrication as indicated.
- .8 Welding materials: to CSA-W48.
- .9 Welding electrodes: to CSA-W48 and certified by Canadian Welding Bureau.
- .10 Galvanizing: hot dipped galvanizing with minimum zinc coating of 610 g/m<sup>2</sup> to CAN/CSA-G164.
- .11 Epoxy coating: to ASTM A 775/A 775M.
- .12 Steel primer: to CAN/CGSB-1.40.
- .13 Zinc-rich primer: to CAN/CGSB-1.181.
- .14 Post-tensioning ducts: to CAN/CSA-A23.1.
- .15 Bearing pads: smooth and as indicated on drawings.
- .16 Air entrainment admixtures: to ASTM C 260.
- .17 Chemical admixtures: to ASTM C 494.

2.2 MIXES

- .1 Concrete.
  - .1 Proportion concrete in accordance with CAN/CSA-A23.1, Alternative 1, to give following properties: for all concrete as indicated.
    - .1 Cement: use Type GU (ASTM Type 1) Portland cement unless otherwise approved for specific application
  - .2 Minimum compressive strength at 28 days: 35 MPa.

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- .3 Minimum cement content: 325 kg/m<sup>3</sup> of concrete.
- .4 Class of exposure: C-1.
- .5 Nominal size of coarse aggregate: 20 mm.
- .6 Water cement ratio: 0.43.
- .7 Air content: 4 to 7 %.
- .8 Chemical admixtures: as indicated or approved by the Owner's Representative for specific application.
- .2 Grout.
  - .1 Cement grout: one part Portland cement, three parts sand, and sufficient water for placement and hydration.
  - .2 Minimum compressive strength: 4.0 MPa.
  - .3 Shrinkage compensating grout: to Section 03 30 00 - Cast-in-Place Concrete.

### 2.3 FINISHES

- .1 The Contractor shall finish units to finished grade according to CAS-A23.4, Section 24

### 2.4 SOURCE QUALITY CONTROL

- .1 Provide the Owner's Representative with certified copies of quality control tests related to this project as specified in CSA-A23.4, CSA-A251 and CSA-G279.
- .2 Inspect prestressed concrete tendons in accordance with CSA-G279.
- .3 Provide records from in-house quality control program based upon plant certification requirements to the Owner's Representative for inspection and review.
- .4 Upon request, provide the Owner's Representative with certified copy of mill test report of reinforcing steel supplied, showing physical and chemical analysis.
- .5 Precast plants should keep complete records of supply source of concrete material, steel reinforcement, prestressing steel and provide to the Owner's 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 and CAN/CSA-S6.

- .2 Do welding in accordance with CSA-W59, for welding to steel structures and CSA-W186, for welding of reinforcement.
- .3 Erect precast elements within allowable tolerances as indicated and/or specified.
- .4 Non-cumulative erection tolerances in accordance with CSA-A23-4, Section 10.
- .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. Do not grout under elastomeric pads.
- .7 Grout under Portland cement concrete paving slabs.
- .8 Fasten precast units in place as indicated on reviewed shop drawings.
- .9 Secure with bolts using lock washers or tack-weld nut to bolt.
- .10 Uniformly tighten bolted connections with torque indicated.
- .11 Do not weld or secure bearing plates at sliding joints.
- .12 Install precast concrete closures between stems of flanged units where indicated.
- .13 Use grout to align elevations of surfaces at joints.
- .14 Slope grout not more than 1:12.
- .15 Clean field welds with wire brush and touch-up finish with zinc-rich primer.

### 3.2 CLEANING

- .1 The Contractor shall obtain approval of cleaning and touch-up methods from Owner's Representative before cleaning soiled precast concrete surfaces.

END OF SECTION