

1 PART 1 – GENERAL

1.1 WORK INCLUDED

- 1.1.1 Comply with Division 1, General Requirements and all documents referred therein.
- 1.1.2 Provide all labour, materials, plant and equipment to complete the steel reinforcement work indicated on the drawings and specified herein.

1.2 RELATED SECTIONS

- 1.2.1 Cast-in-place Concrete , Section 03 30 00.

1.3 REFERENCE STANDARDS, CODES AND ACTS

- 1.3.1 Conform to the Alberta Building Code and any applicable acts of any authority having jurisdiction.
- 1.3.1.1 CSA A23.1-09/ CSA A23.2-09 Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete
- 1.3.1.2 CSA A23.3-04 Design of Concrete Structures.
- 1.3.1.3 CAN/CSA G30.18-09 Carbon Steel Bars for Concrete Reinforcement.
- 1.3.1.4 CAN/CSA G40.20-04/G40.21-04 General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- 1.3.1.5 RSIC (Reinforcing Steel Institute of Canada) – Manual of Standard Practice (2004).
- 1.3.2 Where there are differences between the specifications and drawings and the codes, standards, or acts, the most stringent shall govern.
- 1.3.3 Standards referenced by the Standards noted above are to apply even if they are not included in the list. Where such reference is made, it shall be to the latest edition and revision published.

1.4 SUBMITTALS

- 1.4.1 Shop Drawings for Reinforcement
- 1.4.1.1 Prepare reinforcement shop drawings and bar lists taking into account all sleeves, curbs, and thickenings shown on the structural, mechanical and electrical drawings.
- 1.4.1.2 Shop drawings shall be clear and complete and shall allow placement of reinforcement without reference to contract documents.
- 1.4.1.3 Detail reinforcement in accordance with the contract documents, CSA A23.1, and detailing standards in RSIC Manual of Standard Practice.

- 1.4.1.4 As a minimum, the shop drawings shall show the following:
 - 1.4.1.4.1 Bar sizes, spacing, location and quantities of reinforcement.
 - 1.4.1.4.2 Placing sequence for areas with multiple layers of reinforcement.
 - 1.4.1.4.3 Minimum clearances between reinforcement and minimum concrete cover.
 - 1.4.1.4.4 Location, number and type of support accessories, including support bars suitably sized and spaced to rigidly support the weight of reinforcement and imposed loads during construction.

1.4.2 Certificates

- 1.4.2.1 Reinforcement from Canadian Manufacture: Provide Owner with a certified copy of the mill test reports for reinforcing steel showing physical and chemical analysis, if requested.

2 **PART 2 – MATERIALS**

2.1 **REINFORCEMENT**

- 2.1.1 Reinforcing Steel, Deformed: Canadian manufacture to CAN/CSA-G30.18, billet steel, Grade 400R (400W may be substituted) regular bars.

2.2 **ACCESSORIES**

- 2.2.1 Minimum gauge as required for support of stability of steel reinforcement during reinforcement placement and concreting operation.
- 2.2.2 Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions
- 2.2.3 Use precast concrete supports for exposed concrete cast against soil or rock. Precast concrete supports shall be made of concrete quality and strength at least equal to that specified for the member in which they are used.

3 **PART 3 – EXECUTION**

3.1 **TOLERANCES**

- 3.1.1 Perform fabrication and setting so that completed work will be within the tolerances set out in CSA A23.1.

3.2 **FABRICATION**

- 3.2.1 Fabricate concrete reinforcement in accordance with:
 - 3.2.1.1 CSA A23.1.
 - 3.2.1.2 RSIC - Reinforcing Steel Manual of Standard Practice.

- 3.2.2 Bend reinforcement one only and at room temperature of 18°C. Do not straighten or rebend reinforcement. Do not field bend reinforcement. Do not use bars with kinks or bends not shown on the drawings. Replace bars which develop cracks or splits.

3.3 **PLACEMENT**

- 3.3.1 Place, support and secure reinforcement against displacement to CSA 23.1.

- 3.3.2 Maintain concrete cover as noted on the contract documents.

3.4 **QUALITY CONTROL**

- 3.4.1 Provide a system of quality control to ensure that the minimum standards specified in the Contract Documents are attained.

- 3.4.2 Bring to the attention of the Department Representative any defects in the work or departures from the Contract Documents which may occur during Construction. The Department Representative will decide upon corrective action and give recommendations in writing.

- 3.4.3 The Department Representative's general review during construction is undertaken to inform the Owner of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of their contractual responsibilities with respect to quality control

- 3.4.4 Prior to commencing significant segments of the work, give the Department Representative appropriate notification so as to afford them reasonable opportunity to review the work. Failure to meet this requirement may be cause for the Department Representative to classify the work as defective.

END OF SECTION 03 20 00

1 **PART 1 - GENERAL**

1.1 **WORK INCLUDED**

1.1.1 Comply with Division 1, General Requirements and all documents referred to therein.

1.1.2 Provide all labour, materials, plant and equipment to complete the cast-in-place concrete work indicated on the drawings and specified herein.

1.2 **RELATED WORK SPECIFIED ELSEWHERE**

1.2.1 Concrete Reinforcement, Section 03 20 00.

1.3 **REFERENCE STANDARDS, CODES AND ACTS**

1.3.1 Conform to the Alberta Building Code 2006 and any applicable acts of any authority having jurisdiction.

1.3.1.1 CSA A23.1-09/ CSA A23.2-09 Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete

1.3.1.2 CSA A23.3-04 Design of Concrete Structures

1.3.2 Where there are differences between the specifications and drawings and the codes, standards or acts, the most stringent shall govern.

1.3.3 Standards referenced by the Standards noted above are to apply even if they are not included in the list. Where such reference is made, it shall be to the latest edition and revision published.

1.4 **TOLERANCES**

1.4.1 Perform placing operations so that completed work will be within the tolerances set out in CSA A23.1.

1.5 **QUALIFICATIONS**

1.5.1 The concrete supplier shall be certified by the Ready Mixed Concrete Association of Alberta (RMCAA) and shall hold a current "Certificate of Ready Mixed (or Mobile Mix) Concrete Production Facilities" as issued by the RMCAA.

1.6 **CONCRETE MIX DESIGN**

1.6.1 Design of Concrete Mixes

1.6.1.1 Concrete mixes are to be designed in accordance with the Performance Alternative outlined in CSA A23.1. The mixes are to be designed such that they will be homogeneous, uniformly workable, readily placeable into corners and angles of forms and around reinforcement by methods of placing and consolidation employed on the work, but without permitting materials to segregate or

excessive free water to collect on the surface. The concrete, when hardened, shall have the qualities specified.

1.6.1.2 When designing the concrete mixes, the supplier shall be cognizant of the curing requirements outlined in the contract documents and CSA A23.1. If a particular concrete mix requires curing in addition to that specified, the contractor shall be responsible for providing this additional curing.

1.6.1.3 Specified Strength and Exposure Class: As called for on drawings.

1.6.1.4 Slump and Air Content: As called for on the drawings or as required by the Standard.

1.6.1.5 Use of calcium chloride is not permitted.

1.7 **SAMPLES AND ASSISTANCE**

1.7.1 Supply materials for the following, the cost of which shall be paid for by this trade:

1.7.1.1 Concrete Test Cylinders;

1.7.1.1.1 Cooperate in the execution of the concrete quality testing program. Furnish concrete required, protect specimens against injury and loss, assist in the sampling and storage of specimens, as required.

1.7.1.2 Sample concrete, cast cylinders and store in accordance with CSA A23.1;

1.7.1.3 For all concrete compressive strength tests, 100 x 200mm (4" x 8") cylinders shall be used;

1.7.2 Soil Inspection

1.7.2.1 Assist the geotechnical Department Representative in making their inspections or tests throughout foundation construction.

1.8 **SUBMITTALS**

1.8.1 Certificates

1.8.1.1 The concrete supplier shall submit a current "Certificate of Ready Mixed (or Mobile Mix) Concrete Production Facilities," as issued by the RMCAA, if requested by the Department Representative.

1.8.2 Concrete Mix Designs

1.8.2.1 Well in advance of the supply of concrete to the project submit the concrete mix design for review. The mix design shall include, as a minimum the following information:

- concrete strength
- exposure class
- water-cement ratio
- maximum aggregate size
- maximum SCM replacement

- additional durability and architectural requirements
- slump range
- plastic air range
- method of placement
- other specific information regarding the source and type of all materials being proposed
- source of Supplementary Cementing Materials (SCM's)

2 PART 2 - PRODUCTS

2.1 MATERIALS

- 2.1.1 Concrete: Normal density concrete with an air dry density between 2350 and 2450 kg/m³. Conform to CSA A23.1.
- 2.1.2 Cement Type: HS (High Sulphate Resistant) Portland Cement.
- 2.1.3 Supplementary Cementing Materials: Conform to CSA.A3001.
- 2.1.4 Water: Clean and not detrimental to concrete.
- 2.1.5 Nominal Size of Coarse Aggregate: 20 mm, except as noted by the Standard.
- 2.1.6 Admixtures: conform to CSA A23.1.

3 PART 3 - EXECUTION

3.1 ON-GRADE PAD

- 3.1.1 During cold weather conditions, carefully protect sub-grade from frost.
- 3.1.2 Found on-grade pad on naturally consolidated undisturbed soil.
- 3.1.3 If, upon excavating, 'soft' or deleterious soil is found, inform the Department Representative who will provide instructions as to how to proceed.
- 3.1.4 Remove water, disturbed soil and foreign matter from excavation before placing concrete. Do not permit the soil to soften due to the presence of water in the excavations or construction activity.
- 3.1.5 During cold weather, prevent soil adjacent to and beneath the on-grade pad from freezing. Do not pour concrete on frozen soil or soil which has been allowed to freeze and thaw.
- 3.1.6 Do not place concrete on-grade until the specified sub-floor material has been placed, inspected and approved.
- 3.1.7 Place clear crushed stone over the sub-base, to depths shown or specified. Thoroughly roll and consolidate to the lines and levels required, with a maximum surface variation of +/- 10mm ($\frac{3}{8}$ ").

3.2 INTERIOR HOUSEKEEPING PADS

- 3.2.1 Where shown or referenced in the Contract Documents, provide concrete housekeeping pads under mechanical and electrical equipment.
- 3.2.2 Housekeeping pads are to be 100 mm thick and reinforced with WWR 152 x 152 – MW25.8 x MW 25.8, chaired at mid-depth of pad.
- 3.2.3 For pads cast on existing concrete slab-on-grade, provide 10M hooked dowels at 200 mm o/c around perimeter of the housekeeping pad, inserted into the existing concrete 50 mm using HILTI HY-150 epoxy adhesive system (or approved equal).
- 3.2.4 Concrete for interior housekeeping pads is to have a compressive strength of 25 MPa at 28 days and exposure class 'N'.

3.3 PLACING CONCRETE

- 3.3.1 Place all concrete in accordance with CSA A23.1, the concrete supplier's requirements and as specified herein.
- 3.3.2 Immediately before placing concrete, clean forms and reinforcement of foreign matter.
- 3.3.3 Do not use concrete mixed more than 2 hours after the introduction of mixing water.
- 3.3.4 Pumping Concrete
 - 3.3.4.1 Pumping or pneumatic placing of concrete shall only be used if the velocity of discharge is reduced to a point where no separation or scattering of the concrete occurs, and the consistency of the mix has been designed to allow such a system with no adverse effects on the quality of concrete.
 - 3.3.4.2 Excess grout or mortar used to lubricate pipelines, or washout water, must not be discharged into the forms.

3.4 CURING CONCRETE

- 3.4.1 Cure all concrete in accordance with CSA A23.1, the concrete supplier's requirements and as specified herein.

3.5 PROTECTION

- 3.5.1 Protect all concrete in accordance with CSA A23.1, the concrete supplier's requirements and as specified herein; to prevent freshly deposited concrete from freezing, being exposed to abnormally high temperatures or temperature differentials, premature drying, and moisture loss for a period of time necessary to develop the specified properties of the concrete.
- 3.5.2 Cold Weather Concreting
 - 3.5.2.1 Provide on hand and ready for use all equipment necessary for adequate cold weather protection and curing before concrete placement is begun.

- 3.5.2.2 Insulate, or enclose within the protective housing, tie rods, reinforcement or metal which projects from the concrete being protected.
- 3.5.2.3 Maintain housing, enclosures and supplementary heat in place for entire period of protection, except that sections may be temporarily removed as required to permit placing additional forms or concrete provided the uncovered concrete is not permitted to freeze. Make up time lost from the required period of protection at the required temperature before protection is discontinued and removed.
- 3.5.2.4 Locate heating units to avoid heating concrete locally or drying it excessively. Avoid high temperature and dry heating within enclosures.
- 3.5.2.5 Take particular care to maintain edges and corners of concrete at the required temperature owing to their greater vulnerability to freezing.
- 3.5.2.6 Provide sufficient insulation, and heat as necessary, to prevent freezing of frost susceptible soil which lies against structural elements; in particular protect soil beneath footings and behind foundation walls until the building is completed.

3.6 **QUALITY CONTROL**

- 3.6.1 Implement a system of quality control to ensure that the minimum standards specified herein are attained.
- 3.6.2 Bring to the attention of the Department Representative any defects in the work or departures from the Contract Documents which may occur during Construction. The Department Representative will decide upon corrective action and give his recommendations in writing.
- 3.6.3 The Department Representative's general review during construction and inspection and testing by independent inspection and testing agencies reporting to the Department Representative are both undertaken to inform the Department Representative of the Contractor's performance and shall in no way augment the Contractor's quality control or relieve the Contractor of contractual responsibility.

3.7 **INSPECTION AND TESTING**

- 3.7.1 Appointment of Independent Inspection and Testing Companies
 - 3.7.1.1 The Department Representative will appoint the Independent Inspection and Testing Companies to make inspections or perform tests as specified by the Standard. The Independent Inspection and Testing Companies shall be responsible only to the Department Representative.
 - 3.7.1.2 When defects are revealed, the Department Representative may request, at the Contractor's expense, additional inspection or testing to ascertain the full extent of the defect.
- 3.7.2 Concrete Quality Tests
 - 3.7.2.1 Concrete quality tests shall be carried out in accordance with CSA A23.1 and shall include the following:

- Slump
- Air content of fresh concrete
- Temperature of fresh concrete
- Compressive strength

3.7.2.2 Compressive Strength Tests: Compressive cylinder testing will be carried out in accordance with CSA A23.1 and as follows: Three (3) companion laboratory cured concrete standard compression test cylinders; one tested at 7 days and two tested at 28 days, constitute a strength test. During the placing of concrete in cold weather one additional field cured test cylinder will be made and tested at 7 days.

3.7.3 Inspection of Soil

3.7.3.1 Soil at founding elevations will be inspected.

END OF SECTION 03 30 00