

PART 1 - GENERAL**1.1 DESCRIPTION**

- .1 Provide all the expertise, labour, materials, products, equipment and services needed to supply, detail, manufacture and install all the reinforcement steel shear heads, dowels, metallic wires that must be incorporated in the concrete components indicated in the structural drawings.

1.2 RELATED SECTIONS

- .1 The specialized Contractor is responsible for obtaining a copy of all the sections of these specifications even if they do not appear to pertain to his speciality. If he does not, it shall be understood that he agrees to the clauses and requirements of all sections in these specifications. The specialized Contractor must consult the table of contents of these specifications to have knowledge of the complete list of the specifications sections.

1.3 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 315-99, Manual of Engineering and Placing Drawings for Reinforced Concrete Structure.
- .2 American National Standards Institute/American Concrete Institute (ANSI/ACI)
 - .1 ANSI/ACI 315-99, Details and Detailing of Concrete Reinforcement.
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM A 775/A 775M-07b, Specification for Epoxy-Coated Reinforcing Steel Bars.
- .4 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction / Methods for Test and Standard Practices for Concrete.
 - .2 CSA-A23.3-04, Design of Concrete Structures for Buildings.
 - .3 CSA G30.3-M1983 (R1998), Cold-Drawn Steel Wire for Concrete Reinforcement.
 - .4 CSA G30.5-M1983 (R1998), Welded Steel Wire Fabric for Concrete Reinforcement.
 - .5 CSA G30.14-M1983 (R1998), Deformed Steel Wire for Concrete Reinforcement.
 - .6 CSA G30.15-M1983 (R1998), Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
 - .7 CAN/CSA-G30.18-M92 (R1998), Billet-Steel Bars for Concrete Reinforcement.
 - .8 CAN/CSA-G40.21-04, Structural Quality Steels.

- .9 CAN/CSA-G164-M92 (R1998), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .10 CSA W186-M1990 (R1998), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .5 Institut d'acier d'armature du Québec
 - .1 Manuel des normes recommandées, most recent edition.
- .6 Quebec Construction Code - Chapter I, Building and National Building Code of Canada (amended)
 - .1 Code de Construction du Québec - Chapter I, Building, and National Building Code - Canada 2010 (amended) as well as the User's Guide - NBC 2010: Comments on the calculation of structures (Part 4 of Division B).

1.4 SAMPLING, TRIALS AND INSPECTION

- .1 Provide the Departmental Representative with free access to the plant and the construction site at all times to enable him to verify, examine and supervise the quality of materials and their manufacture, and if required, take samples for testing, trial and analytical purposes.
- .2 Pouring of the concrete is not authorized before the Departmental Representative has inspected and approved the reinforcement in place.
- .3 At his request, send the Departmental Representative one (1) copy of the certificates issued by the steel mill attesting to the chemical composition and physical properties of the steel used to manufacture the reinforcement.
- .4 Upon request, inform the Departmental Representative regarding the proposed source of supply for the materials to be provided.

1.5 SHOP DRAWINGS

- .1 Submit for review and comments by the Departmental Representative, all shop drawings for all steel reinforcement for the work in compliance with the following requirements.
- .2 The format of the reinforcement drawings shall be the same as that of the drawings upon which they are based. The full project title and the name Departmental Representative, Professionals and the specialized Contractors shall appear on each drawing.
- .3 The drawings submitted shall include three (3) copies of each reinforcement drawing. The drawings shall be accompanied by three (3) photocopies of each purchase order. One (1) corrected copy of the shop drawings shall be returned to the Contractor. The Contractor shall be responsible for making any additional copies he requires.
- .4 The reinforcement drawing shall clearly indicate:
 - .1 The number, nominal diameter, length, position, spacing and bending details of each type of bar shown on the drawings.

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- .2 The bar-supports, separators, additional bars and other accessories required to support and fasten the reinforcements while the concrete is being poured.
- .5 When not specified in the plans:
 - .1 Reinforcement overlap and sealing lengths shall comply with the requirements of Articles 7 and 12 of the CAN/CSA-A23.3 standard. Unless otherwise indicated on the drawings, all overlaps shall be Class B (1.3 Lc), in compliance with Table 17b: pre-stressed overlapping requirements for upper reinforcement in the Reinforcing Steel Institute of Canada's manual of standard practice.
 - .2 Overall dimensions of hangers, ties and coils shall comply with the minimum concrete cover thicknesses stipulated in Article 6.6.2 of the CSA-CSA A23.1/A23.2 standard.
- .6 Unless otherwise indicated in the drawings, the hooks required at the end of certain bars, including hangers, ties and spirals are all "standard hooks", which shall comply with the description provided in Articles 6.6.2 of the CSA A23.1/A23.2 standard.
- .7 The reinforcement shall be marked so that it is quick and easy to find on the purchase orders.
- .8 The Contractor shall provide shop drawings so the Departmental Representative has at least ten (10) working days to examine and comment on the shop drawings, which are submitted at each phase of the concrete work.
- .9 The reviewed shop drawings, which may or may not be annotated by the Departmental Representative, shall be returned to the specialized Contractor, who shall revise these drawings and resubmit them to the Departmental Representative for review and comment, if required. However, if the Departmental Representative finds that too many revisions are required, he shall return the drawings without annotating them; in addition, if the drawings need to be submitted more than twice, the Departmental Representative shall withhold funds from the specialized Contractor to pay for the cost of the Departmental Representative's additional reviews.
- .10 The specialized Contractor is solely responsible for the accuracy of his drawings; he cannot claim any supplement for delays caused by the discovery, on site, of errors or omissions on his own drawings, even if they have been reviewed by the Departmental Representative.
- .11 Unless otherwise indicated, use steel reinforcement details that comply with the most recent edition of the "Manuel des normes recommandées" published by the Institut d'acier d'armature du Québec.
- .12 Wait for final approval of the shop drawings before cutting and bending the rebar.
- .13 Submit the steel schedules that match the various shop drawings at the same time as the shop drawings.

PART 2 - PRODUCTS**2.1 MATERIALS**

Description	Standards
▪ High adherence billet-steel reinforcement bars, regular category (R).	CAN/CSA G30.18 Grade 400
▪ Weldable high adherence steel reinforcement bars made of low alloy weldable steel, weldable category (W).	CAN/CSA G30.18 Grade 400
▪ Tie wire, annealed cold-drawn steel wire	CSA G30.3
▪ High adherence steel wire for concrete reinforcement, 16 gauge	CSA G30.14
▪ Welded steel wire fabric provided in flat sheets only	CSA G30.5
▪ High adherence welded steel wire fabric in flat sheets only	CSA G30.15
▪ Non-prestressed galvanized reinforcement	CAN/CSA G164
▪ Chairs, bar chairs, bar supports, spacers (rustproof)	CSA A23.1/A23.2
▪ Metal coupling	Reinforcement steel, "recommended standards manual" subject to the Departmental Representative's approval
▪ Steel fibres	ASTM A820/A820M, C-1116 NOVOCON 1050 (FE) type of SI Concrete Systems

2.2 SUBSTITUTES

- .1 Obtain the Departmental Representative's written approval to substitute specified bars with bars of different dimensions, and to change spacing, overlapping or bending specified on the drawings.

2.3 FORMING

- .1 Form the bars at the factory, in compliance with requirements of the CAN/CSA-A23.1/A23.2 standard.
- .2 Unless otherwise indicated, forming tolerances are those indicated in Chapter 6 of the "Manuel des normes recommandées" published by the Institut d'acier d'armature du Québec. Bars that do not comply with these tolerances shall be rejected.

2.4 IDENTIFICATION

- .1 Clearly identify bar and wire fabric lots to conform to the shop drawings and steel schedules before shipping them to the construction site.

- .2 Use factory-labelled reinforcement bars. The label identifies the size, quality and manufacturer of the bar. All unlabelled bars shall be rejected.

PART 3 - PERFORMANCE

3.1 ON-SITE BENDING

- .1 Unless otherwise expressly indicated or authorized by the Departmental Representative, do not bend steel reinforcement bars on the construction site.
- .2 It is forbidden to bend rebar partially embedded in hardened concrete on site unless the Departmental Representative has authorized this procedure.

3.2 MANUFACTURE OF REINFORCEMENT

- .1 The manufacture of the reinforcement shall not start until the Departmental Representative has reviewed the drawings of this reinforcement.
- .2 Cut and bend the bar in strict compliance with the details shown on the drawings and in accordance with the requirements of the CAN/CSA-A23.1/A23.2 standard.
- .3 No substitution of the bars shown on the reinforcement drawing shall be allowed without the Departmental Representative's authorization.
- .4 Take every precaution to avoid deforming or dirtying the reinforcement during transportation, handling and storage.

3.3 REINFORCEMENT INSTALLATION

- .1 Assemble and install the rebar with care and tie them with black annealed drawn steel wire. Use a pattern and number of supports that comply with Section 6.6.8 of the CAN/CSA-A23.1/A23.2 standard.
- .2 Install the rebar and keep them in place during the pouring of the concrete in compliance with the tolerances stipulated in Section 6.6.8 of the CAN/CSA-A23.1/A23.2 standard.
- .3 Unless otherwise indicated on the drawings or in Section 3.6 of these specifications, the minimum concrete cover thickness around reinforcement bars is that stipulated for each of the various structural components in Article 6.6.6 of the CAN/CSA A23.1/A23.2 standard.
- .4 If required, before placing the rebar in the formwork, remove all excess rust, scale, mud, oil and any other dirt likely to reduce the concrete's adherence.
- .5 Use an adequate number of support bars of the height and rigidity required to ensure all concrete coverage of the rebar complies with the thicknesses stipulated on the drawings and in the standards.
- .6 Have the Departmental Representative approve the rebar and its installation, before pouring the concrete. The Departmental Representative shall have 48 hours to approve the steel reinforcement before the concrete is poured.

3.4 OVERLAPS

- .1 Overlap the reinforcement as indicated on the drawings and typical details.
- .2 Overlapping lengths and extension lengths of bars beyond critical points shall comply with the CSA-A23.3 standard. Unless otherwise indicated on the drawings, all overlaps shall be Class B (1.3 Lc), in compliance with Table 17b: tension overlapping requirements for upper reinforcement in the Reinforcing Steel Institute of Canada's manual of standard practice.
- .3 Obtain the Departmental Representative's approval for the locations of reinforcement overlaps other than those shown on the drawings.
- .4 Overlap at least 10% of the surface of the wire fabric sheets, but never less than one mesh width.

3.5 WELDING

- .1 Do not weld steel rebar unless authorized in writing by the Departmental Representative.
- .2 Where permitted by the Departmental Representative, perform the rebar welding work in compliance with Section 6.6.10. of the CAN/CSA-A23.1/A23.2 standard and the requirements of the CSA W186 standard. When welding is performed, the use of category W weldable bars is mandatory.
- .3 All welding work shall be assigned to a company accredited by the Canadian Welding Bureau and shall be performed in compliance with the requirements of the most recent version of the CSA W186 standard. Prior to starting any welding work, submit to the Departmental Representative for verification, all details regarding the welds to be performed. In this case, the steel reinforcement to be welded shall comply with the requirements of the most recent version of the CSA G30.16 standard. Pre-heat all steel reinforcement as required by these standards.

3.6 REINFORCEMENT COVERAGE

- .1 Unless otherwise indicated on the drawings, the reinforcement bars shall be installed at the following specific distances from the surface of the concrete:

	Coverage
A) Concrete poured directly on the ground	75 mm
B) Concrete exposed to the ground or the weather	
a) Bars larger than 15 M in walls and slabs or main bars in beams and columns	50 mm
b) Bars 15 M or smaller	
c) Ties, hangers and spiral reinforcement	40 mm 40 mm
C) Concrete not exposed to the weather Class N	
a) Slabs (other):	25 mm

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	Coverage
- top steel rebar	25 mm
- bottom steel rebar	50 mm
b) Curbs and coping	40 mm
c) Beams (main steel rebar)	50 mm
d) Columns (main steel rebar)	25 mm
e) Walls	30 mm
f) Ties, hangers and spiral reinforcement	
D) Concrete exposed to chlorine (exposure classes C-1, C-XL, C-3 and C-4)	<p>The reinforcement coverage shall not be less than any of the following values;</p> <ul style="list-style-type: none"> - 60 mm - twice the nominal diameter of the reinforcement - twice the maximum nominal diameter of aggregate

- .2 For conditions A-B-C of the preceding table, the ratio between coverage and the maximum size of the aggregate as well as the ratio between the coverage and the nominal diameter of the bars shall be at least 1.5 for concrete exposed to the ground and weather, and 1.0 for concrete not exposed to the ground and weather.

3.7 STORAGE AND DELIVERY

- .1 Deliver the reinforcement and wire fabric to the construction site in clearly identified lots.
- .2 Handle the reinforcement and wire fabric with care to avoid deforming them.
- .3 As soon as they are delivered on site, properly stack the steel reinforcement and wire fabric on wood skids to protect them against rust and keep them off the ground.
- .4 When there is snow, cover all stored steel with a woven tarp to protect it from the weather.
- .5 During transportation and handling, use a covering to protect the parts of the bars coated with epoxy and paint.

3.8 CLEANING

- .1 In order for the pouring of the concrete to take place, the condition of the reinforcement bars shall comply with Section 6.1.5 of the CAN/CSA A23.1/A23.2 standard.
- .2 If required, clean the reinforcement immediately before the concrete is poured.

3.9 REINFORCEMENT DOWELLING

- .1 The installation of reinforcement dowels in concrete that has already been poured shall be performed using a Hilti HIT, HY-150 epoxy-based system.
- .2 The sealing length of the dowels is that indicated in the sealing lengths table provided on the drawings.
- .3 Certain types of dowels shall have conical threads designed to work with "Terminator" type anchors by Lenton equipped with conical threads.

3.10 ON-SITE TOUCH-UPS

- .1 Using a compatible finishing product, touch up damaged or cut ends of galvanized or epoxy-coated reinforcement to provide a continuous coat.

END OF SECTION