

PART 1 - GENERAL

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| 1.1 | <u>Work Included</u>       | .1  | This section specifies the requirements for furnishing all materials, labour, tools and equipment, and performing all operations necessary to complete all miscellaneous metal and fabricated items, as shown on the Project Drawings and specified in this section. |
| 1.2 | <u>Related Sections</u>    | .1  | Concrete: Section 03 30 00   |
| 1.3 | <u>Reference Standards</u> | .1  | ASTM A53/A53M-12, Pipe, Steel, Black and Hot-Dipped, Zinc-coated Welded and Seamless.  |
|     |                            | .2  | ASTM A123/A123M-15, Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.   |
|     |                            | .3  | ASTM A307-14, Carbon Steel Bolts, Studs, and Threaded Rod 60,000 psi Tensile Strength.   |
|     |                            | .4  | ASTM A325M-14, Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric).  |
|     |                            | .5  | ASTM A480/A480M-15, General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.   |
|     |                            | .6  | ASTM A484/A484M-15, General Requirements for Stainless Steel Bars, Billets, and Forgings.  |
|     |                            | .7  | ASTM A615/A615M-16, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.  |
|     |                            | .8  | ASTM B209-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate   |
|     |                            | .9  | ASTM B221-14, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes  |
|     |                            | .10 | CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.   |

- .11 CAN/CSA-S16.1-14, Limit States Design of Steel Structures.
  - .12 CSA-W59-13, Welded Steel Construction (Metal-arc Welding).
  - .13 CAN/CGSB-85.10-99, Protective Coatings for Metals.
- 1.4 Shop Drawings
- .1 Submit shop drawings in accordance with Section 01 33 00.
  - .2 Shop Drawings:
    - .1 Clearly indicate the following items:
      - .1 General arrangements, dimensions, clearance locations and directions of assemblies as installed on structures.
      - .2 Locations, sizes and installation tolerances of anchor bolts, eye bolts and embedded parts.
      - .3 Types of materials used, finishes and core thickness.
      - .4 All other pertinent details and accessories.
  - .3 Test Results:
    - .1 Provide test results for any galvanized items.
    - .2 Provide manufacturer mill certificates for threaded bars and H-piles with material shipped to site and have submitted for review.

## PART 2 - PRODUCTS

- 2.1 Materials
- .1 Steel sections: to CAN G40.21, Grade 350W.
  - .2 Steel rod, plates channels and angles: to CSA G40.21, Grade 300W.
  - .3 Rolled steel sections: to CSA G40.21, Grade 350W and Class C for hollow structural sections.
  - .4 Steel pipe: to ASTM A53, Schedule 40, standard weight.

- .5 Threaded bars: continuous threaded bar to ASTM A615 MPa yield strength. Anchor nuts and couplers to be capable of developing 125% of the yield tensile strength of the bar. Acceptable product Dywidag 75 grade threadbar.
  - .1 All threaded bar hexagonal nuts shall develop a minimum of 125% of the guaranteed yield strength of the threaded bar.
- .6 Welding materials: to CSA W59.
- .7 Bolts and anchor bolts: to ASTM A307.
- .8 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m<sup>2</sup> to ASTM A123/A123M.
- .9 Zinc primer: zinc rich, ready mix to CGSB 1-GP-181.
- .10 Do not use items manufactured or fabricated from scrap steel of unknown chemical composition or physical properties.
- .11 For adhesive anchors see Cast-in-Place Concrete, Section 03 30 00.
  - .1 Acceptable product as noted on Project Drawings, or approved equivalent.
  - .2 Embedment as indicated on the Project Drawing or minimum embedment equal to the manufacturer's standard recommendations.
- .12 Stair treads to be forge welded, standard mesh, galvanized steel grating, standard Tru-weld type 19-4 by Fisher and Ludlow or approved equal.
  - .1 32 mm deep x 5 mm thick bearing bars @30 mm C/C.
  - .2 Cross bars at 102 mm C/C.
  - .3 Edges: banded.
- .13 Steel studs: to ASTM A307.

## 2.2 Fabrication

- .1 Workmanship and finish must be equal to the best practice of modern shops for each item of work.

- .2 Build work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
  - .3 Provide exposed surfaces with a smooth finish and sharp, well defined lines and arises. Form sections to shape and size shown with sharp lines and angles.
  - .4 Confirm castings have sharp corners and edges, and are clean, smooth and true to pattern.
  - .5 Make exposed welds continuous for length of each joint. File or grind exposed welds smooth and flush.
  - .6 Where possible, fit and shop assemble work, ready for installation.
  - .7 Fabricate miscellaneous steel in accordance with CAN/CSA-S16 and in accordance with reviewed shop Drawings.
- 2.3 Miscellaneous Metal Work Items
- .1 Anchors, adhesive anchors, bolts and inserts:
    - .1 Provide as required to fasten miscellaneous metal items to concrete.
    - .2 Where sizes, kinds and spacing of anchors are not indicated or specified, provide as necessary for the purpose as approved by the Departmental Representative.
    - .3 Hot-dip galvanize all anchors, bolts and inserts.

### PART 3 - EXECUTION

- 3.1 Installation
- .1 Install miscellaneous metal items in the locations shown on the Drawings.
  - .2 Install metalwork square, plumb and true using welded connections wherever possible to provide rigid structures. Provide anchor bolts, bolts and plates as necessary for connecting to structure of types acceptable to the Departmental Representative.

- .3 Hand over items for casting into concrete to appropriate trades together with setting templates.
  - .4 Exposed fastening devices to match finish, and to be compatible with material thorough which they pass.
  - .5 Touch-up field welds, bolts, and burnt or scratched surfaces with primer after installation.
  - .6 Touch-up galvanized surfaces with zinc-rich primer.
- 3.2 Connection to Existing Work
  - .1 Verify dimensions and condition of existing work, report any discrepancy and potential problem areas to Departmental Representative for direction before commencing fabrication.
- 3.3 Threaded Bar System
  - .1 The steel H-piling will be tied back with steel threaded bars as located and dimensioned on the drawings. All threaded bars will have the dimensions shown on the drawings.
  - .2 Each bar will be provided with two heavy-duty hexagonal nuts, plate washers, bearing plates and connector as shown on the drawings. All nuts will bear evenly and truly on the washers.
  - .3 The Contractor will provide suitable support to the threaded bars to prevent sagging during construction and filling. All threads which are damaged during shipment or installation, will be rejected and replaced by new ones of full length and thread dimensions, as directed by the Departmental Representative.
  - .4 The threaded bars must be straight and true to dimensions over their full length. Bent bars will be cause for their rejection unless straightened to the satisfaction of the Departmental Representative.
  - .5 Care must be exercised in tightening the threaded bars so that the tension in each bar

will be approximately equal when the work is completed.

- .6 Fix and adjust threaded bar system so that connections at each end of the threaded bars are tight before backfilling.
- .7 Provide minimum of 500 mm compacted fill thickness above existing tie rods prior to operating heavy construction equipment over the existing tie rods.