

**Part 1 General****1.1 DESCRIPTION**

- .1 The works contained in this section include the provision of all materials, equipment, supplies and services, labour and transportation necessary for the complete execution of the following tasks:
  - .1 Manufacture, supply and installation of all piles, including grouting and sand slurry.
  - .2 Manufacture, supply and installation of pile caps.

**1.2 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 ASTM A252-10, Standard Specification for Welded and Seamless Steel Pipe Piles.
- .2 CSA Group (CSA)
  - .1 CSA W47.1-03, Certification of Companies for Fusion Welding of Steel Structures.
  - .2 CAN/CSA-G30.18-09, Billet-Steel Bars for Concrete Reinforcement.
  - .3 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .4 CSA W59-03(R2008), Welded Steel Construction (Metal Arc Welding).
- .3 CANADIAN FOUNDATION DEPARTMENTAL REPRESENTATIVEING MANUAL. 2006. Fourth Edition. Canadian Geotechnical Society.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties for the following items:
    - .1 Tubing: provide mill tests.
    - .2 Arctic grout.
  - .2 The contractor must submit to the Departmental Representative for approval the manufacturer's installation procedure including a list of the required equipment.
    - .1 Provide details sufficient to evaluate performance of equipment.
    - .2 Include details of equipment for excavating, drilling, cleaning out piles and rock sockets, installation of anchor dowels and grouting of sockets.
  - .3 Shop Drawings:
    - .1 Shop and construction erection drawings shall be delivered to the Departmental Representative in a timely manner so that he may be provided with at least fifteen (15) working days to examine them.
    - .2 Shop and construction erection drawings must refer to contract number and related engineering drawing.
    - .3 The Contractor is authorized to use the engineering drawings issued for construction as construction erection drawings, however, the title box must be replaced by that of the Contractor and the Departmental Representative's stamp must be removed.
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- .4 Drawings, with or without annotations by the Departmental Representative, will be returned to the Contractor, who will review such drawings and resubmit them to the Departmental Representative for examination and comments. 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 Contractor to pay for the costs of the Departmental Representative's additional reviews.
- .5 The 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 previously examined by the Departmental Representative.

**Part 2            Products****2.1                MATERIALS**

- .1        Laminate or welded channels, plates and bars: to CSA-G40.20 and CSA-G40.21. Grade 350W, except angles (L) and channels (C) and plates that may be Grade 300W.
- .2        Material for piles: CSA-G40.20 and CSA-G40.21 or ASTM A500, Grade C of pipe sections. Non-Lacquered.
- .3        Grout: in accordance with manufacturer's recommendations, the minimum unconfined compressive strength of the grout should be at least 20 MPa.
- .4        An approved fast setting arctic grout, with accelerating and water reducing agents (satisfying compressive strength at sub-zero temperatures) should be poured in the socket immediately after cleaning. The procedure for mixing, handling and installing the grout should be in accordance with the manufacturer's recommendations.

**Part 3            Execution****3.1                MANUFACTURER'S INSTRUCTIONS**

- .1        Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

**3.2                PREPARATION/PILE CLEAN-OUT**

- .1        After the hole is bored down to bedrock, remove overburden inside pile down to the tip. Installation of the piles is expected to be more expedient when the active layer is frozen (February through April). If the piles are to be installed when the active layer is thawing or has thawed, accumulation of the groundwater in the pile holes may need to be pump out. The use of a casing may be required.
- .2        Clean out material the hole by high pressure airlifts.
- .3        Protect open hole from intrusion of foreign materials.

**3.3                INSTALLATION OF SOCKETS**

- .1        Secure equipment in position during drilling.
- .2        Drill sockets into sound bedrock as indicated on the plans.
- .3        Drill socket to minimum depth as indicated on plans.
- .4        After each drilling is completed, clean out socket.

**3.4                WELDING**

- .1        Weld in accordance with CSA W59.
- .2        Welding certification of companies in accordance with CSA W47.1.

**3.5                GROUTING**

- .1        Grout in accordance with manufacturer's instructions and procedures and the following requirements:
    - .1        Clean the pile: The portion of the pile to be grouted should be free of paint, lacquer, oil, dirt or excessive rust to ensure good bonding.
    - .2        Grout inside and around the piles, in the bedrock socket, as soon as possible after installing the pile. The socket must be exempt of water before proceeding.
    - .3        Use grout mix that has been demonstrated to produce required strength at temperature prevailing in socket and pile in specified time.
    - .4        Place grout in one continuous operation to fill socket and pile up to specified level.
  - .2        After a reasonable setting time for the grout, fill the annular space between the pile and the hole and the pile with a sand slurry made of fresh potable water and saline free sand. The fine content of the sand shall not exceed 12 percent and the maximum particle size shall be limited to 10mm.
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**3.6 FIELD QUALITY CONTROL**

- .1 Site Tests and inspection:
  - .1 It is imperative that the holes for the installation of the piles are cleaned properly so that the piles are set on the bedrock.
  - .2 An independent laboratory, contracted by the Contractor, shall perform visual inspections of the steel shell, joints and rock socket before placement of the grout. The contractor must factor this quality insurance procedure into his schedule.
  - .3 Under no circumstances shall grouting begin before the pile borings has been approved by the laboratory.
  - .4 The Laboratory must monitor the grouting pour and take the required samples for quality control tests.
  - .5 The Laboratory shall take one (1) sample of grout and cast four (4) standard cylinders used for strength tests at 7 and 28 days respectively. The Laboratory will never take less than one (1) sample per day.
  - .6 The testing Laboratory shall provide a complete report to the Departmental Representative demonstrating and certifying that each borehole was properly inspected before grouting. This report will be necessary before acceptance of work.
- .2 The contractor must provide, at his expense, the services of a surveyor. This surveyor will accurately locate, using tools such as a total station, the precise location of each pile. The correct placement of each pile must then be confirmed. An 'As Built' plan must be prepared and submitted to the Departmental Representative at the end of the installation in order to approve the pile placement.
- .3 If a pile is found to be placed at more than 35 mm off its planned location or inclined more than 2%, the general contractor must place, at his expense, a new adjacent pile, to fix the eccentricity created. In such case, the Departmental Representative must be informed and provide approval beforehand. Modifications to the pile caps required will be at no cost to the client.

**3.7 FIELD PAINTING**

- .1 All the pile and pile caps will be field must be primed and painted.

**3.8 CLEANING**

- .1 Final Cleaning: upon completion and verification of performance of installation, remove surplus materials, rubbish, tools and equipment

**END OF SECTION**