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PART 1 - GENERAL

- 1.1 Work Included .1 This Section contains performance specifications for the provision of design and construction of prefabricated wet cast or dry cast segmental concrete unit gravity retaining walls and associated appurtenances to the lines and levels indicated on the Project drawings.
- 1.2 Work Not Included .1 This section does not cover:
.1 Walls greater than 3.0m in height.
.2 Mechanically Stabilized Earth Walls requiring a designed tie back system.
- 1.3 Related Work .1 Metal Fabrications: Section 05 50 00
.2 Earthwork: Section 31 20 00
.3 Reinstatement: Section 32 98 00
- 1.4 References .1 ASTM D1557 (latest edition), Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (45,000 ft-lbf/ft³ - 2,700 KN-m/m³.
.2 ASTM C1372 (latest edition), Standard Specification for Dry-Cast Segmental Retaining Wall Units.
.3 ASTM C1262/C1262M (latest edition), Standard Test Method for Evaluating the Freeze-Thaw Durability of Dry-Cast Segmental Retaining Wall Units and Related Concrete Units.
.4 ASTM C1776/C1776M (latest edition), Standard Specification for Wet-Cast Precast Modular Retaining Wall Units.
.5 ASTM C94/C94M (latest edition), Standard Specification for Ready-Mixed Concrete.
.6 ASTM C143/C143M (latest edition), Standard Test Method for Slump of Hydraulic-Cement Concrete.
.7 CSA B1800 (latest edition), Thermoplastic Nonpressure Piping Compendium.
.8 CSA G164 (latest edition), Hot Dip Galvanizing of Irregularly Shaped Articles.

- .9 CSA S6-19 (latest edition), Canadian Highway Bridge Design Code.
- .10 National Concrete Masonry Association (NCMA) Design Manual for Segmental Retaining Walls, Third Edition.
- 1.5 Submittals
- .1 Submit designs and details of prefabricated segmental concrete retaining wall systems for review by the Engineer in accordance with Section 01 10 00.
- .2 For walls over 1.0m in height, as measured from the finished grade to the top of the wall, design and shop drawings must be stamped by a professional engineer licensed to practice in the Province of Nova Scotia.
- .3 Design wall system in accordance with the recommendations set forth in NCMA Design Manual for Segmental Retaining Walls and the requirements of CSA S6.
- .4 Designs to provide for level installation of precast unit courses and be of sufficient design to retain areas indicated, accommodate live load surcharge in retained area, support handrail where indicated, support snow windrow loading, and sustain minor impacts without prefabricated concrete unit failure. Submissions to include all necessary items to provide for installation of the required retaining wall systems including but not necessarily limited to:
- .1 Plans and elevations.
- .2 Cross-sectional details.
- .3 Slope above and below the wall
- .4 Miscellaneous details including anchoring, railings and drainage.
- .5 Soil strength design parameters for backfill, levelling pad, infill, and drainage layer.
- .6 Code references.
- .5 Where additional fill is needed, submit sample and specifications to the Engineer for review.
- 1.6 Protection
- .1 Prevent damage to landscaping, fences, adjacent property and all other items designated to remain.
- 1.7 Delivery And Storage
- .1 Check materials upon delivery to assure proper material has been received.

- .2 Prevent excessive mud, wet cement, and like material from coming in contact with the materials.
 - .3 Protect materials from damage. Do not incorporate damaged materials into the project. Promptly remove damaged units from the site.
 - .4 Do not stack units more than two high.
- 1.8 Allowable Tolerances
- .1 Finished top of wall surface to within 25mm of specified elevations and locations, and within a tolerance of 12mm for both top and face surfaces when measured under a 3.0m long straightedge.
- 1.9 Warranty
- .1 Provide a warranty that expressly states the retaining wall is covered for a period of two (2) years from the date of Substantial Completion against workmanship, heaving, or settlement and cracking, spalling or other product failure.

PART 2 - PRODUCTS

- 2.1 Materials
- .1 Provide a precast segmental retaining wall system complete with, but not necessarily limited to, the following:
 - .1 Block units:
 - .1 Wet cast segmental units:
 - .1 To ASTM C1776.
 - .2 Minimum compressive strength: 28 MPa.
 - .3 Free of water soluble chlorides and chloride based accelerator admixtures.
 - .4 6% +/- 1½% air-entrainment in conformance ASTM C94.
 - .5 Maximum slump of 125 mm +/- 40 mm per ASTM C143 for conventional concrete mix designs.
 - .2 Dry cast segmental units:
 - .1 To ASTM C1372.
 - .2 Passing freeze thaw tests as set forth in ASTM C1262/C1262M with an average absorption rate of 120kg/m3.
 - .3 Compressive strength range: 28-40 MPa in accordance with ASTM C1372.
 - .4 Infill rock/soil: as approved by the Engineer.

- .3 Block units may be mass concrete or designed to incorporate granular infill.
 - .2 Gravel levelling pad and/or concrete footing as required by design.
 - .3 Prefabricated concrete units including bottom, intermediate, end, top and cap units as required.
 - .4 Drainage tile: perforated pipe, polyvinyl chloride, diameter as indicated, to CSA B1800, capable of being tied into new storm system construction. Provide connection to existing storm system in accordance with Section 33 39 00.
 - .5 Geotextile: to Section 31 15 53.
 - .6 Metal fabrications: posts, handrails, anchors, and fasteners to Section 05 50 00, galvanized to CSA G164. Provide design details to accommodate anchorage of railing, including infill materials, infill concrete or grout, holes drilled in block units, fasteners, all in accordance with the railing design.
 - .7 Backfill Material:
 - .1 Free Draining Backfill material to be granular, well-draining stone placed to a minimum of 300 mm depth behind the back of the wall and shall extend vertically from the leveling pad or concrete footing to an elevation 100 mm below the top of wall.
 - .2 Backfill material must be approved by a geotechnical engineer licensed to practice in the Province of Nova Scotia. Site excavated soils may be used if approved, unless otherwise specified in the drawings. Do not use unsuitable soils as defined in Section 31 20 00, organic soils and frost susceptible soils within a 1 to 1 influence area.
 - .8 Anchored wall cap or top unit.
 - .9 Face texture: Cobblestone texture, gray in color, or as shown in the Tender Drawings.
- .2 Granular Fill: where required, use Type 1 gravel as specified in Section 31 20 00.

PART 3 - EXECUTION

- 3.1 Dewatering
 - .1 Perform dewatering in accordance with accepted method and in accordance with Section 31 20 00.

- 3.2 Soil Preparation
- .1 Complete excavations in accordance with approved submissions, Section 31 20 00 and as indicated on Drawings. Notify the Engineer of unsatisfactory conditions.
 - .2 Confirm site foundation soil strength meets or exceeds assumed design strength. Submit results to the Engineer for review.
 - .3 Remove and replace soil not meeting the required strength with acceptable material. Compact to a minimum 95% to ASTM D1557 Density.
 - .4 Place geotextile between the Free Draining Backfill and retained soil as required.
- 3.3 Installation and Review
- .1 Install retaining wall system in accordance with approved submission and manufacturer's recommendations including preparation of levelling pad, block unit, infill (where applicable), backfill and drainage layer, compaction, geotextile, railing, and associated work in accordance with the Engineer and the design requirements of the wall designer.
 - .2 Have contractor provide sealed drawings and certification of finished retaining wall construction, by a Professional Engineer (P.Eng.) licensed to practice in Nova Scotia.
- 3.4 Protection
- .1 Protect and maintain work of this Section including accessories, until acceptance of project work.
- 3.5 Adjustment and Cleaning
- .1 Replace entire units that are defective. Immediately remove from site defective and damaged materials. Replace, repair, re-finish, or otherwise make good to the Engineer's review.
- 3.6 Reinstatement
- .1 Reinstate any damaged surface adjacent to the Work area in accordance with Section 32 98 00.

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