SECTION 31 66 15

HELICAL FOUNDATION PILES

PART.1. GENERAL

1.01 PURPOSE AND SCOPE OF WORK

The purpose of this document is to detail the equipment, labor and installation techniques necessary to install Helical Piles as specified on the construction/contractual Drawings and the connection details.

The Work shall consist of the Certified Pile Installer furnishing all labor, tools, equipment, materials and supervision to install Helical Piles according to the specifications contained herein and shown on the Construction Drawings.

The Certified Pile Installer shall install Helical Piles that will develop the load capacities as detailed on the Drawings. This may also include provisions for load testing to verify Helical Pile capacity and deflections, if specified in the Contract documents.

The Owner will provide suitable access to the construction site for the Certified Pile Installer's personnel and equipment. The Owner will be responsible for overall construction oversight to preclude the development of unsafe conditions.

The Work does not include any post-construction monitoring of pile performance unless specifically noted otherwise in the Contract documents.

1.02 RELATED SECTIONS

Section 31 23 33 Trenching, Backfilling and Compacting

Section 31 23 00 Excavation and Fill

1.03 CODES AND STANDARDS

The Standards and Codes listed below including revisions by issuing authority, form a part of this specification section. The latest publication as of the issue of this specification shall govern, unless indicated otherwise.

A. ASTM - American Society for Testing and Materials (ASTM):

1. ASTM A36/A36M Structural Steel.
2. ASTM A153 Zinc Coating (Hot Dip) on Iron and Steel Hardware.

3. ASTM A123 Zinc Coating (Hot Dip) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
4. ASTM A500 Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
5. ASTM D1143 Method of Testing Piles Under Static Axial Compressive Load.
6. ASTM D3689 Method of Testing Individual Piles Under Static Axial Tensile Load.
7. ASTM D3966 Method of Testing Individual Piles Under Static Lateral Load.

B. Canadian Standards organization

1. CSA Standard W59-03 Welded Steel Constructions.
2. CSA Standard W47.1-03 Certification of companies for fusion welding of Steel.
3. CSA Standard G40.21 50W General Requirements for Rolled or Welded structural Quality Steel.
4. CSA Standard G30.18-09 Carbon steel bars for concrete reinforcement

C. Society of Automotive Engineers (SAE):

1. SAE J429 Mechanical and Material Requirements for Externally Threaded Fasteners

D. Occupational Safety and Health Administration (OSHA):

1. Occupational Safety and Health Administration

E. ICC-Evaluation Services, Inc.:

1. AC358 Acceptance Criteria for Helical Foundation Systems and Devices

F. International Organization for Standardization (ISO)

1. ISO 9001:2015 Quality management systems.
2. ISO 14001:2015 Environmental management systems.

1.04 Definitions

Some of the terms used in this specification may be unfamiliar to the reader or may be used with a specific meaning not commonly known outside the Helical Pile industry. In determining the meaning of any term used herein, a definition contained in the following list shall take precedence.

A. Certified Pile Installer: Installer shall be an authorized GoliathTech Installer and shall have completed training from GoliathTech Inc. in the proper methods of installation of Helical Piles.

B. Construction Drawings: Helical Pile drawing prepared by the Helical Pile Professional.

C. Contractual Documents: Project Drawings and documents prepared and transmitted by the Owner.

D. Crowd: Axial compressive force or pressure applied to the Helical Pile as needed during installation to ensure the pile progresses into the ground a distance approximately equal to the helix pitch per revolution.

E. Extension Section: Helical Pile component installed between the lead section and the Mounting bracket to advance the helix plates to such depths as may be necessary to attain the required load and the bearing stratum.

F. Helical Pile/Anchor: Consists of a central shaft with one or more helix-shaped bearing plates and a Mounting bracket that allows attachment to structures.

G. Helical Pile Professional: Individual or firm responsible for the design of Helical Piles and Mounting brackets.

H. Helical Plate (Helix): Round steel plate formed into a helical spiral and welded to the central steel shaft.

I. Lead Section: The first Helical Pile component installed into the soil. It consists of one or more helical plates welded to the central steel shaft.

J. Owner: Person or entity that owns the building/structure or will own the building/structure once it is completed. The Owner may have contractual agreements with, and be represented by, other parties such as engineers, architects or contractors that perform services under the direction of the Owner. Where Owner is used in this specification, it refers to the owner or the owner's contracted representatives separate from the Certified Pile Installer.

K. Shop Drawings: Helical Pile drawings done by the GoliathTech Helical Pile manufacturer.

1.05 SUBMITTALS

A. The shop Drawings and design calculations for the Helical Piles shall be prepared and submitted to the Owner for review and approval for use at least 14 calendar days prior to planned start of the installation.

B. The Certified Pile installer shall submit a detailed description of the construction procedures proposed for use to the Owner for review. This shall include a list of major equipment to be used.

C. In case the contractual documents do not include the Helical Pile design, a~~n~~ Helical Pile Professional shall design and submit the Construction Drawings including the following:

1. Helical Pile number, location and pattern by assigned identification number
2. Helical Pile Design Load (compression, tension, lateral, bendings)
3. Type and size of central steel shaft
4. Helix configuration (diameter of helix plates and the number of helices)
5. Minimum effective installation torque
6. Minimum overall length
7. Minimum embedded depth
8. Inclination angle of Helical Pile if any
9. Cut-off elevation
10. Maximum installation torque of pile.
11. Material type, strength.
12. Protection from corrosion

13. Helical Pile attachment to structure relative to grade beam, column pad, pile cap, etc.

D. The Certified Pile Installer shall submit Shop Drawings for all Helical Pile components, including corrosion protection and pile top attachment to the Owner for review and approval.

E. If required, the Certified Pile Installer shall submit certified mill test reports for the central steel shaft, as the material is delivered, to the Owner for record purposes. The ultimate strength, yield strength, % elongation, and chemistry composition shall be provided.

F. The Certified Pile Installer shall submit plans for production testing for the Helical Piles to the Owner for review and acceptance prior to beginning load tests. The purpose of the test is to determine the load versus displacement response of the Helical Pile and provide an estimation of ultimate capacity.

G. After completion of the pile tests when required, the Certified Pile Installer shall submit the results to the Owner for approval to begin production/installation of piles.Copies of certified calibration reports for all hydraulic gauges. The calibrations shall have been performed within one (1) year of the proposed starting date of the pile installation.

H. Installation Records: The installation record shall clearly indicate the pile identification number or mark, pile diameter, helix configuration, installation depth, installation torque, ultimate and allowable capacity of pile.

I. The Certified Pile Installer shall allow the Owner a reasonable time to review, comment, and return the submittal package after a complete set has been received.

J. Work shall not begin until all the submittals, except installation records, have been received and approved by the Owner.

1.06 QUALITY ASSURANCE

A. The Certified Pile Installer shall be experienced in performing the installation of Helical Piles and shall provide all materials, labor, and supervision to perform the Work. The Certified Pile Installer shall be trained and certified by GoliathTech Inc. in the proper methods of installation of Helical Piles.

B. Helical Piles shall be installed by an authorized GoliathTech Certified Pile Installer.

C. Design of the Helical Piles shall be performed by a professional engineer licensed in the state/province of the project in accordance with existing building code requirements.

D. Helical Pile components as specified therein shall be manufactured by a facility whose quality systems comply with ISO (International Organization of Standards) 9001 & 14001 requirements. Certificates of Registration denoting ISO Standards Number shall be presented upon request to the Owner or their representative.

1.07 DELIVERY, STORAGE AND HANDLING

All Helical Piles Helical Anchor, and Mounting Brackets shall be free of structural defects and protected from damage. Store Helical Piles, Helical Anchors, and Mounting Bracket on wood pallets or supports to keep from contacting the ground and/or snow. Damage to materials shall be cause for rejection.

1.08 WARRANTY

For GoliathTech Inc. warranty policy, refer to the link below:

https://www.goliathtechpiles.com/warranty/

PART.2. PROCUCT AND MATERIAL SPECIFICATIONS

2.01 MATERIAL

A. Manufacturer

GoliathTech Inc.
175B, rue Péladeau
Magog, Québec (Canada) J1X 5G9
819-843-4777
Toll Free: 1-855-743-4777
info@goliathtechpiles.com

B. Central Steel Shaft (Lead and Extension Sections)

The central steel shaft, consisting of Lead Sections and extensions if present, shall be manufactured by GoliathTech Inc. per ASTM A500 Grade C.

Helical Piles diameter: 1.875” to 3.500” Yield Strength Fy = 60 ksi, Ultimate strength Fu = 70 ksi.
Helical Piles diameter: 4.500” to 12.750” Yield Strength Fy = 55 ksi, Ultimate strength Fu = 65 ksi.

Type	Exterior pile diameter	Pile wall thickness	Available helix diameter	Helix thickness
Pile 1 7/8"	48 mm / 1,875"	3,9 mm / ,154"	From 203 mm / 8" to 431 mm / 17"	9,5 mm / ,375"
Pile 2 3/8"	60 mm / 2,375"	3,9 mm / ,154"	From 228 mm / 9" to 431 mm / 17"	9,5 mm / ,375"
			482 mm / 19 "	12,7 mm / ,500"
Pile 2 7/8"	73 mm / 2,875"	6,4 mm / ,250"	From 228 mm / 9" to 431 mm / 17"	9,5 mm / ,375"
			From 482 mm / 19" to 787 mm / 31"	12,7 mm / ,500"
Pile 3 1/2"	89 mm / 3,5"	6,4 mm / ,250"	From 228 mm / 9" to 431 mm / 17"	9.5 mm / ,375"
			From 482 mm / 19" to 787 mm / 31"	12,7 mm / ,500"
Pile 4 1/2"	114 mm / 4,5"	6,4 mm / ,250"	From 228 mm / 9" to 431 mm / 17"	9.5 mm / ,375"
			From 482 mm / 19" to 787 mm / 31"	12,7 mm / ,500"
Pile 5 9/16"	141 mm / 5,5625"	6,4 mm / ,250"	From 333 mm / 13" to 431 mm / 17"	9.5 mm / ,375"
			From 482 mm / 19" to 787 mm / 31"	12,7 mm / ,500"
	141 mm / 5,5625"	9,5 mm / ,375"	From 333 mm / 13" to 431 mm / 17"	9.5 mm / ,375"
			From 482 mm / 19" to 787 mm / 31"	12,7 mm / ,500"

Type	Exterior pile diameter	Pile wall thickness	Available helix diameter	Helix thickness
Pile 6 5/8"	168 mm / 6,625"	6,4 mm / ,250"	From 381 mm / 15" to 431 mm / 17"	9.5 mm / ,375"
			From 482 mm / 19" to 787 mm / 31"	12,7 mm / ,500"
	168 mm / 6,625"	9,5 mm / ,375"	From 381 mm / 15" to 431 mm / 17"	9.5 mm / ,375"
			From 482 mm / 19" to 787 mm / 31"	12,7 mm / ,500"
Pile 8 5/8"	219 mm / 8,625"	6,4 mm / ,250"	431 mm / 17"	9.5 mm / ,375"
			From 482 mm / 19" to 787 mm / 31"	12,7 mm / ,500"
	219 mm / 8,625"	9,5 mm / ,375"	431 mm / 17"	9.5 mm / ,375"
			From 482 mm / 19" to 787 mm / 31"	12,7 mm / ,500"
Pile 10 3/4"	254 mm / 10,75"	6,4 mm / ,250"	431 mm / 17"	9.5 mm / ,375"
			From 482 mm / 19" to 990 mm / 39"	12,7 mm / ,500"
	254 mm / 10,75"	9,5 mm / ,375"	431 mm / 17"	9.5 mm / ,375"
			From 482 mm / 19" to 990 mm / 39"	12,7 mm / ,500"
Pile 12 3/4"	324 mm / 12,75"	9,5 mm / ,375"	From 533 mm / 21" to 990 mm / 39"	12,7 mm / ,500"

C. Helix Bearing Plate

1. Shall be hot rolled carbon steel sheet or plate formed on matching metal dies to true helical shape and uniform pitch.
2. Helix plate per CSA G40.21 50W, Yield Strength Fy = 60 ksi, Ultimate strength Fu = 70 ksi.

D. Bolts

The size and type of bolts used to connect the central steel shaft sections together shall conform to the following specifications.

1. Coupling Bolts: 1/2" to 1 1/2” diameter bolts (2 or more per coupling) SAE J429 Grade 5.
2. Cap Locking Bolts: 9/16” Steel (2 or more) SAE J429 Grade 5.

E. Couplings

1. All coupling welds shall comply with CSA W47.1 and CSA W59.
2. Connection to the central section shall be 2 or more bolts per SAE J429 Grade 5.

F. Adjustable Pile Head and Mounting Plate

1. Adjustable head pile shall be a welded assembly consisting of a threaded rod, nut and welded plate per CSA W47.1 and CSA W59.
2. Threaded rod should have minimum yield stress of 90 ksi or higher.
3. Head will have adjusting height capability and a locking mechanism consisting of 2 or more bolts.

G. Non-Adjustable Pile Head and Mounting Plate

Non-adjustable pile head (fixed) shall be a welded assembly consisting of an HSS shaft sleeve and welded head (plate, U bracket, etc.) per CSA W47.1 and CSA W59.

H. Corrosion Protection

All parts shall be hot dipped galvanized per ASTM A123 or ASTM A153.

2.02 PERFORMANCE REQUIREMENTS

A. All Helical Piles shall be designed to support the design load(s) as shown on the Contractual and/or Construction Drawings.

B. Except where noted on the plans, all Helical Pile components shall be selected to provide a minimum factor of safety of two (2).

C. The Helical Pile design shall take into account pile spacing, soil stratification and strain compatibility issues as are present for the project. A copy of the project geotechnical report shall be provided to and reviewed by the Helical Pile Professional prior to bid submittal.

D. Where Helical Piles are subjected to lateral or base shear loads as indicated on the Contractual and/or Construction Drawings, the bending moment and stress from said loads shall be determined using a lateral load analysis program such as LPILE or equal commercially available software. The required soil parameters (c, Ø, and ks) for use with LPILE or equal shall be provided in the geotechnical report(s). The allowable lateral deflection of the Helical Pile shall be limited to 1/2” inch unless noted otherwise on the Drawings.

E. Helical Piles shall be designed by a licensed professional engineer in accordance with the current Building Code adopted by the local jurisdiction.

PART.3. EXECUTION

3.01 SITE CONDITIONS

A. The Owner shall verify that all Helical Piles may be installed in accordance with all pertinent codes and regulations regarding such items as underground obstructions, right-of way limitations, utilities, etc.

B. In the event of a discrepancy, the Certified Pile Installer shall notify the Owner.

C. The Certified Pile Installer shall not proceed with Helical Pile installation until the discrepancies are resolved.

3.02 INSTALLATION EQUIPMENT

A. Shall be rotary type, hydraulic power-driven torque motor with clockwise and counter clockwise rotation capabilities. The torque motor shall be capable of continuous adjustment to revolutions per minute (RPM’s) during installation.

B. Helical Piles should be installed with high torque, low RPM torque motors, which allow the helical screw plates to advance with minimal soil disturbance.

C. Equipment shall be capable of applying adequate down pressure (crowd) and torque simultaneously to suit

project soil conditions and load requirements. The equipment shall be capable of continuous position adjustment to maintain proper Helical Pile alignment.

3.03 INSTALLATION TOOLING

A. Shall consist of an adapter and driving pins as manufactured by GoliathTech Inc. and used in accordance with the manufacturer's written installation instructions.

B. A torque indicator shall be used during Helical Pile installation. The torque indicator can be an integral part of the installation equipment or externally mounted in-line with the installation tooling.

C. The torque indicator shall be capable of providing continuous measurement of applied torque throughout the installation.

D. Torque indicators which are an integral part of the installation equipment shall be calibrated prior to pre-production testing or start of work

E. Torque indicators which are mounted in-line with the installation tooling, shall be calibrated at an appropriately equipped testing facility. Indicators that measure torque as a function of hydraulic pressure shall be calibrated at normal operating temperatures.

3.04 INSTALLATION PROCEDURES

A. Mark all pile installation locations as shown on the plans or approved Construction/Contractual Drawings. The Owner shall be notified if the piles are relocated from the locations shown on the Construction/Contractual Drawings. Relocation of the piles will not be allowed unless approved by the Owner and Helical Pile Professional.

B. A torque indicator shall be used during Helical Pile/anchor installation. The torque indicator can be an integral part of the installation system or externally mounted in-line with the installation tooling.

C. The Lead Section pile shall be positioned at the location as shown on the Construction Drawings.

D. The Helical Pile sections shall be engaged and advanced into the soil in a smooth, continuous manner at a rate of rotation of 5 to 20 RPM's. Extension sections shall be provided to obtain the required minimum overall length and installation torque as shown on the Construction Drawings. Connect sections together using coupling bolts and nut torqued to the appropriate torque.

E. Sufficient down pressure shall be applied to uniformly advance the Helical Pile sections approximately 3 inches per revolution. The rate of rotation and magnitude of down pressure shall be adjusted for different soil conditions and depths.

F. The torque as measured during the installation shall not exceed the torsion strength rating of the central steel shaft. The minimum installation torque and minimum overall length criteria as specified shall be satisfied prior to terminating the Helical Pile installation.

3.05 TERMINATION CRITERIA

A. If the maximum torque of the central steel shaft and/or installation equipment has been reached prior to achieving the minimum overall length required, the Certified Pile Installer shall have the following options:

1. Terminate the installation at the depth obtained subject to the review and acceptance of the Owner and the Helical Pile Professional, or:
2. Remove the existing Helical Pile and install a new one with smaller diameter helix plates. The new helix configuration shall be subject to review and acceptance of the Owner and the Helical Pile Professional. If re-installing in the same location, the top-most helix of the new Helical Pile shall be terminated at least (3) three feet beyond the terminating depth of the original Helical Pile.

B. If the minimum installation torque as shown on the construction drawings is not achieved at the minimum overall length, and there is no maximum length constraint, the Certified Pile Installer shall have the following options:

1. Install the Helical Pile deeper using additional extension sections, or:
2. Remove the existing Helical Pile and install a new one with additional and/or larger diameter helix plates. The new helix configuration shall be subject to review and acceptance of the Owner and the Helical Pile Professional. If re-installing in the same location, the top-most helix of the new Helical Pile shall be terminated at least (3) three feet beyond the terminating depth of the original Helical Pile.
3. De-rate the load capacity of the Helical Pile and install additional Helical Pile(s). The de-rated capacity and additional Helical Pile location shall be subject to the review and acceptance of the Owner and the Helical Pile Professional.

C. If the Helical Pile is refused or deflected by a subsurface obstruction, the installation shall be terminated, and the pile removed. The obstruction shall be removed, if feasible, and the Helical Pile re-installed. If the obstruction can't be removed, the Helical Pile shall be installed at an adjacent location, subject to review and acceptance of the Owner and the Helical Pile Professional.

D. The average torque for the last three feet of penetration shall be used as the basis of comparison with the minimum installation torque as shown on the Construction Drawings. The average torque shall be defined as the average of the last three readings recorded at one-foot intervals.

E. The Certified Pile Installer shall conduct his construction operations in a manner to insure the safety of persons and property in the vicinity of the Work. The Certified Pile Installer's personnel shall comply with safety procedures in accordance with OSHA standards and/or ISO 45001.

3.06 FIELD QUALITY CONTROL

A. The Certified Pile Installer shall furnish and install all Helical Piles per the plans and approved pile design documentation. In the event of conflict between the plans and approved pile design documentation, the Certified Pile Installer shall not begin construction on any affected items until such conflict has been resolved.

B. Helical Piles shall be installed within 3" inches of the indicated plan location.

C. Helical Pile shaft alignment shall be within 2 degrees of the inclination angle shown on the plans.

D. Top elevation of Helical Piles shall be within 2" inches of the design vertical elevation.

3.07 LOAD TESTING

A. Prior to the start of production/installation of piles, the Certified Pile Installer shall have the ability of installing test piles in locations selected by the Owner for static pile load testing.

B. Location, load tests type and number of tests as per the Owner specifications or as mentioned in the Construction/Contractual Drawings.

C. Load testing to be done after 5 days following the installation in certain soil types. Refer to Drawings and Helical Pile Professional.

D. The tested piles shall have the same configuration as those used for the project.

E. Load test shall be performed only in the presence of a qualified and trained technician.

F. If required, the pile tests are to be done in accordance with:

- Compression test ASTM D-1143, Quick Test Method.
- Tension test to ASTM D-3689,
- Lateral ASTM D-3966.

G. Load Test Equipment for compression and tension

1. The load test equipment shall be capable of increasing or decreasing the applied load incrementally. The incremental control shall allow for small adjustments, which may be necessary to maintain the applied load for a sustained, hold period. The reaction system shall be designed to have enough strength and capacity to distribute the test loads to the ground. It should also be designed to minimize its movement under load and to prevent applying an eccentric load to the pile head. The direction of the applied load shall always be co-linear with the Helical Pile.
2. Dial gauge(s) shall be used to measure Helical Pile movement. The dial gauge shall be positioned so its stem is parallel with the axis of the Helical Pile. The stem may rest on a smooth plate located at the pile head. The plate shall be positioned perpendicular to the axis of the Helical Pile. The dial gauge shall be supported by a reference apparatus to provide an independent fixed reference point. The reference apparatus shall be independent of the reaction system and shall not be affected by any movement of the reaction system.
3. The load test equipment shall be re-calibrated, if in the opinion of the Owner and/or Certified Pile Installer reasonable doubt exists as to the accuracy of the load or deflection measurements.

H. Testing Program

1. The hydraulic jack shall be positioned at the beginning of the test such that the unloading and repositioning of the jack during the test shall not be required. The jack shall also be positioned co-axial with respect to the pile Mounting Bracket to minimize eccentric loading. The hydraulic jack shall be capable of applying a load not less than two times the proposed design load (DL).
2. An alignment load (AL) shall be applied to the Helical Pile prior to setting the deflection measuring equipment to zero or a reference position. The AL shall be no more than 10% of the design load (i.e., 0.1 DL). After AL is applied, the test set-up shall be inspected carefully to ensure it is safe to

proceed.

3. Axial compression or tension load tests shall be conducted by loading the Helical Pile in stepwise fashion as shown to the extent practical. Pile Mounting Bracket deflection shall be recorded at the beginning of each step and after the end of the hold time. The beginning of the hold time shall be defined as the moment when the load equipment achieves the required load step.
4. Test loads shall be applied until continuous jacking is required to maintain the load step or until the test load increment equals 200% of the design load (DL), whichever occurs first. The observation period for this last load increment shall be 10 minutes. Displacement readings shall be recorded at 1, 2, 3, 4, 5 and 10 minutes (load increment maxima only).
5. The applied test load shall be removed in four approximately equal decrements. The hold time for these load decrements shall be 1 minute, except for the last decrement, which shall be held for 5 minutes.

I. Acceptance Criteria

Both of the following criteria must be met for approval:

1. The Helical Pile shall sustain the compression and tension design capacities (1.0 DL) with no more than 1(25) in. (mm) total vertical movement of the pile-head as measured relative to the top of the Helical Pile prior to the start of testing
2. Failure does not occur at the 2.0 DL maximum compression and tension test loads. The failure load shall be defined by the following definitions:

    a. The Certified Pile Installer shall provide the Owner copies of field test reports confirming Helical Pile configuration and construction details within 48 hours after completion of the load tests.

    b. This written documentation will either confirm the load capacity as required on the working drawings or proposed changes based upon the results of the pre-production tests.

    c. When a Helical Pile fails to meet the acceptance criteria, modifications shall be made to the design, the construction procedures, or both. These modifications include, but are not limited to, de-rating the Helical Pile load capacity, modifying the installation methods and equipment, increasing the minimum effective installation torque, changing the helix configuration, or changing the Helical Pile material.

    d. Modifications that require changes to the structure shall have prior review and acceptance of the Owner. The cause for any modifications of design or construction procedures shall be decided to determine any additional cost implications.

J. Lateral Testing

If required, lateral load tests shall be conducted in accordance with ASTM D3966. The acceptance criteria as selected by the Owner, typically expressed as a maximum total movement at a specific.

3.08 CLEAN UP

A. Within seven (7) days of completion of the work. The Certified Pile Installer shall remove any and all material, equipment, tools, building materials, debris or other items belonging to the Certified Pile installer or used under the Owner's direction.

PART.4. MEASUREMENT AND PAYMENT

4.01 HELICAL PILES, HELICAL ANCHORS, AND MOUNTING BRACKETS (AND PILES TESTS)

The Payment is determined by the GoliathTech Certified Installer by one of the following:

A. Per contract price:

- Unit price including labour and materials
- Unit price separate from labour and materials.
- Transportation fees may apply.
- Minimum installation fees for smaller projects may apply.
- Additional fees may apply if rocks or other obstacles are encountered during installation.

B. Per Load Test: Payment will be at a per unit price with one unit consisting of the labor, equipment, and materials required to perform each required load test.

END OF SPECIFICATION

NOTE: GoliathTech Inc. reserves the right to upgrade product designs, pricing, and make product improvements without notice.