

## Evaluation Report

### CCMC 13059-R

**MASTERFORMAT DIVISION**

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# ***Techno Pieux™/Techno Metal Post***

## 1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that “Techno Pieux™/Techno Metal Post” when used as an auger-installed steel pile as a foundation system in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code of Canada (NBC) 2005:

- Clause 1.2.1.1.(1)(b), Division A, as an alternative solution that achieves at least the minimum level of performance required by Division B in the areas defined by the objectives and functional statements attributed to the following applicable acceptable solutions:
  - Subclause 9.4.1.1.(1)(c)(i)
  - Clause 4.2.3.8.(1)(e)
  - Sentence 4.2.3.10.(1)
  - Sentence 4.2.4.1.(1)

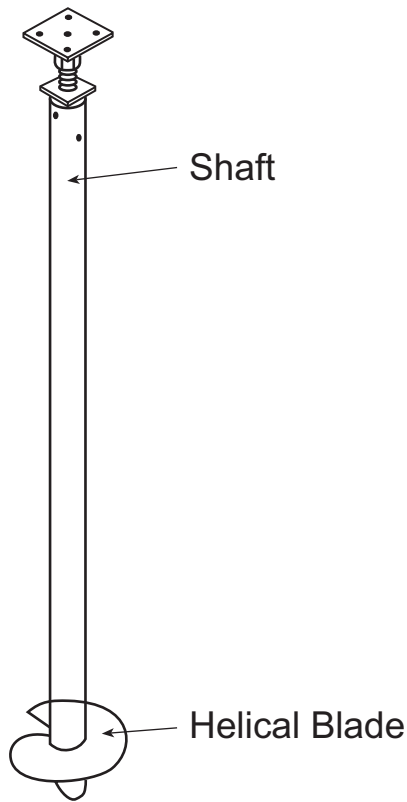
This opinion is based on CCMC’s evaluation of the technical evidence in Section 4.1 provided by the Report holder.

## 2. Description

“Techno Pieux™/Techno Metal Post” is an earth anchor constructed of helical-shaped, circular steel blades welded to a steel shaft. The blades are constructed as a helix with a carefully controlled pitch. The helix blades are available in diameters of 150 mm to 600 mm. The anchors come with single, double or triple helical blades. The diameter and number of blades are chosen based on the bearing capacity of the soil and the load the auger-installed steel pile is designed to support. The central shaft is used to transmit torque during installation and to transfer axial loads to the helical plates. The central shaft also provides most of the resistance to lateral loading. The shaft is available in diameters of 47.6 mm, 60.3 mm, 88.9 mm and 101.6 mm, and wall thicknesses of 3.7 mm, 3.9 mm, 5.5 mm and 5.7 mm respectively. The foundation system comes with various other accessories such as support plates to adapt to the building structure, extension shafts and connectors. The shaft is covered with a ribbed polyethylene pipe, which acts as a frost sleeve to isolate the pile from being jacked up by annual frost heave in the surrounding soil.

The steel shaft conforms to ASTM A 500, grade C, and the blades and accessories conform to CAN/CSA-G40.21-M98.

Figure 1 shows a typical steel pile with a single helix.



**Figure 1. “Techno Pieux™/Techno Metal Post”**

### **3. Conditions and Limitations**

CCMC’s compliance opinion in Section 1 is bound by the “Techno Pieux™/Techno Metal Post” being used in accordance with the conditions and limitations set out below.

- “Techno Pieux™/Techno Metal Post” may be used as a foundation system to support various constructions, provided that it is installed according to the manufacturer’s current instructions and within the scope of this Evaluation Report.
- When the “Techno Pieux™/Techno Metal Post” is installed in granular soil or silt, there is a direct relationship between the applied torque and the allowable compressive and tensile loads. Table 1 indicates the allowable compressive and tensile loads as a function of the applied torque.
- When the auger-installed steel pile is installed in a cohesive soil such as clay, the relationship between the applied torque and the allowable compressive and tensile loads is not as predictable. When it is installed in such soils the allowable compressive and tensile loads have to be confirmed by agreed-upon theoretical calculations and onsite load tests. These load tests are also required if the allowable loads need to be greater than those stated in Table 1. The tests need to be conducted under the direct supervision of a professional registered geotechnical engineer skilled in such design and licensed to practice under the appropriate provincial or territorial legislation.
- In all cases, a registered professional engineer skilled in such design and licensed to practice under the appropriate provincial or territorial legislation must determine the number and spacing of the auger-installed steel piles required to carry the load. A certificate attesting to the conformity of the installation and the allowable loads for the piles must be provided.

**Table 1. Allowable Compressive and Tensile Loads for the “Techno Pieux™/Techno Metal Post” Auger-Installed Pile in Granular Soil or Silt<sup>(1)</sup>**

Applied Torque		Allowable Loads			
		Compression		Tension	
Nm	(lbf)	kN	(lb)	kN	(lb)
678	500	10	2250	5.0	1125
1017	750	15	3375	7.5	1688
1356	1000	20	4500	10.0	2250
1695	1250	25	5625	12.5	2813
2034	1500	30	6750	15.0	3375
2373	1750	35	7875	17.5	3938
2712	2000	40	9000	20.0	4500
3051	2250	45	10125	22.5	5063
3390	2500	50	11250	25.0	5625
3728	2750	55	12375	27.5	6188
4067	3000	60	13500	30.0	6750
4406	3250	65	14625	32.5	7313
4745	3500	70	15750	35.0	7875

**Note to Table 1:**

(1) The allowable loads identified in this Table are only valid when the “Techno Pieux™/Techno Metal Post” is installed in granular soil or silt. The applied torque is the average of the values attained within the last 600 mm of installation. Special attention is required when the auger-installed steel piles are installed in a recently backfilled site or in cohesive soils. In these cases, Table 1 does not apply and the allowable loads need to be determined by on-site confirmatory testing.

- The installation of the auger-installed steel pile shall be carried out as per the manufacturer’s instructions. The anchors are screwed into the ground using mechanized equipment. The anchor is rotated into the ground with sufficient applied downward pressure (crowd) to advance the anchor one pitch distance per revolution. The anchor is advanced until the applied torque value attains a specified value. Extensions are added to the central shaft as needed. The applied loads may be tensile (uplift), compressive (bearing), shear (lateral), or a combination thereof. Helical anchors are rapidly installed in a wide variety of soil formations using a variety of readily available equipment. They are immediately ready for loading after installation.
- When “Techno Pieux™/Techno Metal Post” is installed in a soil where the conditions are corrosive to steel, adequate protection to the exposed steel shall be provided.
- The installer of the “Techno Pieux™/Techno Metal Post” auger-installed steel piles must be certified by Techno Pieux Inc. Using approved equipment, the installer must follow the manufacturer’s installation instructions and the uses and limitations specified in this Report. Each installer shall carry a certification card bearing their signature and photograph.
- Each “Techno Pieux™/Techno Metal Post” auger-installed steel pile shall be identified with a label containing the following information:
  - manufacturer’s identification; and
  - the phrase “CCMC 13059-R.”

## 4. Technical Evidence

CCMC's Technical Guide for "Augered-Installed Steel Piles" sets out the nature of the technical evidence required by CCMC to enable it to evaluate a product as an acceptable or alternative solution in compliance with the NBC 2005. The Report holder has submitted test results and engineering analysis for CCMC's evaluation. Testing was conducted at an independent laboratory recognized by CCMC. The corresponding test results for "Techno Pieux™/Techno Metal Post" are summarized below.

### 4.1 NBC 2005 Compliance Data for "Techno Pieux™/Techno Metal Post" on which CCMC Based its Opinion in Section 1

"Techno Pieux™/Techno Metal Post" auger-installed steel piles were tested to ASTM D 1143-81 (1994)e1, "Standard Test Method for Piles Under Static Axial Compressive Load," ASTM D 3689-90 (1995), "Standard Test Method for Individual Piles Under Static Axial Tensile Load," and ASTM D 3966-90, "Standard Test Method for Piles Under Lateral Loads."

Testing was conducted on three different sites. The first site had granular soil, the second had clay and the third was silt. A series of 14 tests were performed. The intent of the testing was to determine a correlation between the torque applied during installation and the allowable loads. In the granular and silt-based soils, there was a good correlation between the torque applied during installation and the allowable loads. For the compressive loads noted in Table 1, the factor of safety varied from 1.93 to 2.6. For the tensile loads, the factor of safety varied from 2.1 to 3.1. For the lateral loads no correlation was possible. For the testing that was conducted on the auger-installed steel pile in a cohesive soil such as clay, the correlation between the applied torque and the allowable loads was not as predictable.

Report Holder: Techno Pieux Inc.  
1895, boul. Frontenac Est  
Thetford Mines (Québec)  
G6G 5M6

Tel.: (418) 332-2139  
Fax: (418) 332-4330

Plant: Thetford Mines (Québec)

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