

Evaluation Report CCMC 13059-R Techno Pieux™/Techno Metal Post™

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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 foundation system in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code 2015:

- Clause 1.2.1.1.(1)(b) of 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:
 - Clause 4.2.3.8.(1)(e), Steel Piles
 - Sentence 4.2.3.10.(1), Corrosion of Steel
 - Sentence 4.2.4.1.(1), Design Basis
 - Subclause 9.4.1.1.(1)(c)(i), General (structural requirements)

This opinion is based on CCMC's evaluation of the technical evidence in Section 4 provided by the Report Holder.

Ruling No. 03-06-95 (13059-R) authorizing the use of this product in Ontario, subject to the terms and conditions contained in the Ruling, was made by the Minister of Municipal Affairs and Housing on 2003-06-06 (revised 2018-03-07) pursuant to s.29 of the *Building Code Act*, 1992 (see Ruling for terms and conditions). This Ruling is subject to periodic revisions and updates.

2. Description

“Techno Pieux™/Techno Metal Post™” is an earth anchor constructed of single, double or triple helical-shaped, circular steel blades welded to a steel shaft.

The steel blades conform to CAN/CSA-G40.21-M98 and are available in diameters of 150 mm to 600 mm. They are constructed as a helix with a carefully controlled pitch. The diameter and number of blades are chosen based on the bearing capacity of the soil and the load that the auger-installed steel pile is designed to support.

The steel shaft conforms to ASTM A 500/A 500M-10a, grade C and is available in diameters of 47.6 mm, 60.3 mm, 88.9 mm, 101.6 mm, 141 mm and 168 mm, with a wall thickness of 3.7 mm, 3.9 mm, 5.5 mm or 7.6 mm, 5.7 mm, 6.6 mm and 7.1 mm, respectively. 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 central shaft is used to transmit torque during installation and to transfer axial loads to the helical blades. It also provides most of the resistance to lateral loading.

The foundation system comes with various accessories, such as support plates to adapt it to the building structure, extension shafts and connectors, which conform to CAN/CSA-G40.21-M98.

The piles are screwed into the ground using mechanized equipment. Sufficient downward pressure (crowd) is applied to advance the anchor one pitch distance per revolution until the applied torque 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. The piles are rapidly installed in a variety of soil formations and are immediately ready for loading after installation.

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

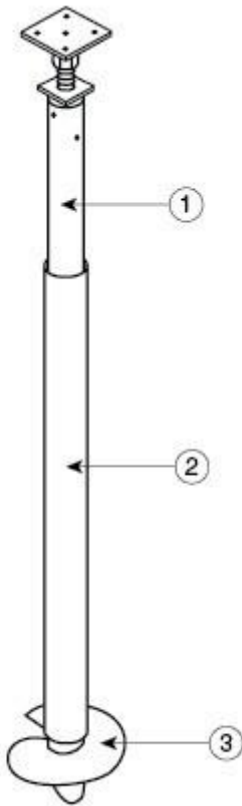


Figure 1. “Techno Pieux™/Techno Metal Post™”

1. shaft
2. sleeve
3. helical blade

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. A certificate attesting to the conformity of the installation and the allowable loads for the piles must be provided.
- Where the “Techno Pieux™/Techno Metal Post™” is installed in granular or cohesive soils or silt, there is a direct relationship between the applied torque and the allowable compressive and tensile loads, which are indicated in Table 1.
- Where the allowable compressive and tensile loads exceed those stated in Table 1, the capacity of the pile to resist those loads must be confirmed by on-site load tests 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 all the loads.

Table 1. Allowable Compressive and Tensile Loads for the “Techno Pieux™/Techno Metal Post™” Auger-installed Pile in Granular or Cohesive Soils or Silt⁽¹⁾

Applied Torque		Allowable Loads			
		Compression		Tension	
N·m	(ft-lbs)	kN	(lb)	kN	(lb)
678	500	10.0	2 250	5.0	1 125
1 017	750	15.0	3 375	7.5	1 688
1 356	1 000	20.0	4 500	10.0	2 250
1 695	1 250	25.0	5 625	12.5	2 813
2 034	1 500	30.0	6 750	15.0	3 375
2 373	1 750	35.0	7 875	17.5	3 938
2 712	2 000	40.0	9 000	20.0	4 500
3 051	2 250	45.0	10 125	22.5	5 063
3 390	2 500	50.0	11 250	25.0	5 625
3 729	2 750	55.0	12 375	27.5	6 188
4 067	3 000	60.0	13 500	30.0	6 750
4 406	3 250	65.1	14 625	32.5	7 313
4 745	3 500	70.1	15 750	35.0	7 875
5 084	3 750	75.1	16 875	37.5	8 438
5 423	4 000	80.1	18 000	40.0	9 000
5 762	4 250	85.1	19 125	42.5	9 563
6 101	4 500	90.1	20 250	45.0	10 125
6 440	4 750	95.1	21 375	47.5	10 688
6 779	5 000	100.1	22 500	50.0	11 250
7 118	5 250	105.1	23 625	52.5	11 813
7 457	5 500	110.1	24 750	55.0	12 375
7 796	5 750	115.1	25 875	57.5	12 938
8 135	6 000	120.1	27 000	60.0	13 500
8 474	6 250	124.6	28 021	62.3	14 011
8 813	6 500	127.5	28 672	63.8	14 336
9 152	6 750	130.3	29 287	65.1	14 643
9 491	7 000	132.8	29 865	66.4	14 933
9 830	7 250	135.3	30 407	67.6	15 204
10 169	7 500	137.5	30 913	68.8	15 457
10 508	7 750	139.6	31 383	69.8	15 692

Table 1. Allowable Compressive and Tensile Loads for the “Techno Pieux™/Techno Metal Post™” Auger-installed Pile in Granular or Cohesive Soils or Silt⁽¹⁾ (cont.)

Applied Torque		Allowable Loads			
		Compression		Tension	
N·m	(ft-lbs)	kN	(lb)	kN	(lb)
10 847	8 000	141.5	31 817	70.8	15 909
11 186	8 250	143.3	32 215	71.6	16 107
11 524	8 500	144.9	32 576	72.4	16 288
11 863	8 750	146.3	32 902	73.2	16 451
12 202	9 000	147.6	33 191	73.8	16 595
12 541	9 250	148.8	33 444	74.4	16 722
12 880	9 500	150.0	33 723	75.0	16 862
13 219	9 750	151.8	34 125	75.9	17 063
13 558	10 000	155.7	35 000	77.8	17 500
13 897	10 250	159.6	35 875	79.8	17 938
14 236	10 500	163.5	36 750	81.7	18 375
14 643	10 800	168.1	37 800	84.1	18 900
14 914	11 000	171.2	38 500	85.6	19 250
15 185	11 200	174.4	39 200	87.2	19 600
15 456	11 400	177.5	39 900	88.7	19 950
15 728	11 600	180.6	40 600	90.3	20 300
15 999	11 800	183.7	41 300	91.9	20 650
16 270	12 000	186.8	42 000	93.4	21 000
16 541	12 200	189.9	42 700	95.0	21 350
16 812	12 400	193.0	43 400	96.5	21 700
17 083	12 600	196.2	44 100	98.1	22 050
17 354	12 800	199.3	44 800	99.6	22 400
17 626	13 000	202.4	45 500	101.2	22 750
17 897	13 200	205.5	46 200	102.7	23 100
18 168	13 400	208.6	46 900	104.3	23 450
18 439	13 600	211.7	47 600	105.9	23 800
18 710	13 800	214.8	48 300	107.4	24 150
18 981	14 000	218.0	49 000	109.0	24 500
19 253	14 200	221.1	49 700	110.5	24 850
19 524	14 400	224.2	50 400	112.1	25 200

Note to Table 1:

1. The allowable loads identified in this Table are valid when the “Techno Pieux™/Techno Metal Post™” is installed in granular or cohesive soils 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. In these cases, Table 1 does not apply and the allowable loads need to be determined by on-site confirmatory testing.
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- Where conditions (soil and environmental) are determined to be corrosive to steel, protection of the steel shall be provided. The determination of the presence of corrosive conditions and the specification of the corrosion protection shall be carried out by a registered professional engineer licensed to practice under the appropriate provincial or territorial legislation”. If the determination of the presence of corrosive conditions is not completed before installation, the product, including all its accessories, is required to be hot-dipped galvanized, meeting the requirements of CAN/CSA-G164 (ASTM A123/A123M-17) with a minimum thickness of 610 g/m², or another method that provides an equivalent level of protection and abrasion resistance deemed acceptable by CCMC
 - 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 must carry a certification card bearing their signature and photograph.
 - Each “Techno Pieux™/Techno Metal Post™” auger-installed steel pile must be identified with a label containing the following information:
 - manufacturer’s identification; and
 - the phrase “CCMC 13059-R.”

4. Technical Evidence

The Report Holder has submitted technical documentation for CCMC’s evaluation. Testing was conducted at laboratories recognized by CCMC. The corresponding technical evidence for this product is summarized below.

4.1 Performance Requirements

4.11 NBC 2010 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/D 1143M-07, “Standard Test Methods for Deep Foundations Under Static Axial Compressive Load,” ASTM D 3689-07, “Standard Test Methods for Deep Foundations Under Static Axial Tensile Load,” and ASTM D 3966-07, “Standard Test Methods for Deep Foundations Under Lateral Load.”

A total of 66 tests were conducted at 12 different sites in Canada, the United States and France on a variety of granular, silt-based and cohesive soils. Of the 66 tests performed, 37 were in compression and 29 in tension. The intent of the testing was to determine a correlation between the torque applied during installation and the allowable loads.

The test results indicated a factor of safety greater than 2 for 61/66 of the cases. This safety factor was obtained for both the compressive and tensile loads and for all three types of soil. For the other 5 tests (5/66), the factor of safety was 1.8 to 1.9, which was deemed acceptable because the displacement associated with these allowable loads was minimal (1 mm to 8 mm).

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