



## Evaluation Report CCMC 13353-R Pieux Xtreme

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### 1. Opinion

It is the opinion of the Canadian Construction Materials Centre (CCMC) that “Pieux Xtreme,” when used as an auger-installed steel pile in a foundation system in accordance with the conditions and limitations stated in Section 3 of this Report, complies with the National Building Code (NBC) of Canada 2015:

- Clause 1.2.1.1.(1)(a), Division A, as an acceptable solution from Division B in the areas defined by the objectives and functional statements attributed to the following:
  - 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 the CCMC evaluation of the technical evidence in Section 4 provided by the Report Holder.

Ruling No. 15-02-323 (13353-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 2015-01-05 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.

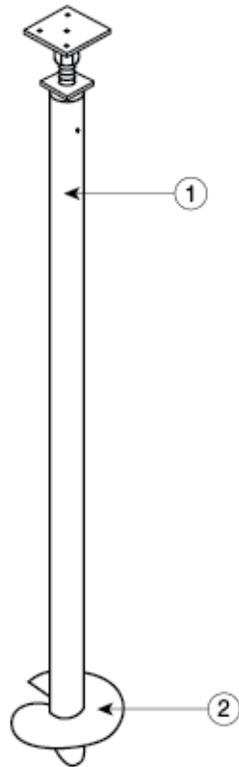
### 2. Description

The product is an earth anchor constructed of helical-shaped circular steel blades that are welded to a steel shaft. The blades are constructed as a helix with a carefully controlled pitch.

The product is available in blade diameters of 175 mm with a thickness of 6.3 mm, and in diameters of 200 mm, 250 mm and 300 mm with a thickness of 8.0 mm. The anchors come with a single helical blade. The diameter of the blade is chosen based on the bearing capacity of the soil and the load that 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 blades. The central shaft also provides most of the resistance to lateral loading. The diameter of the shaft is either 48 mm or 60 mm with a wall thickness of 4.8 mm. The foundation system comes with other accessories such as support plates to adapt to the building structure, extension shafts and connectors.

The steel shaft, blades and accessories of the product conform to CSA-G40.21-04(R2009), “General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.” They also have a galvanic coating of 610 g/m<sup>3</sup> that meets the requirements of CAN/CSA-G164-M92(R2003), “Hot Dip Galvanizing of Irregularly Shaped Articles.”

Figure 1 shows a typical auger installed steel pile with a single helical blade.



**Figure 1. “Pieux Xtreme”**

1. shaft
2. helical blade

### 3. Conditions and Limitations

The CCMC compliance opinion in Section 1 is bound by the “Pieux Xtreme” being used in accordance with the conditions and limitations set out below:

- The product may be used as part of a foundation system to support various structures and must be installed according to the manufacturer’s current instructions.
- The structural application of this product must be in strict accordance with the design analysis as prepared for Pro Pieux Inc. by Labo S.M. Inc. and included in Report No. 02465 (N/Ref. F098278-001), February 2010, from which Table 4.1.1 is reproduced.
- When the product is installed in granular soil or silt, there is a direct relationship between the applied torque and the allowable compressive load. Table 4.1.1 indicates the allowable compressive 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 load is not predictable. As a result, the allowable compressive loads have to be confirmed by on-site load tests. These load tests are also required if the allowable loads need to be greater than those stated in Table 4.1.1. The tests must be conducted under the direct supervision of a professional 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.
- The installation of the auger-installed steel pile must be carried out as per the manufacturer’s instructions. The anchors must be screwed into the ground using mechanized equipment. The anchor must be rotated into the ground with sufficient applied downward pressure (crowd) to advance the anchor one pitch distance per revolution. The anchor must be advanced until the applied torque value attains a specified value. Extensions must be 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 the product is installed in soil conditions that are corrosive to steel, adequate protection to the exposed steel must be provided.
- To be permitted to install “Pieux Xtreme” auger-installed steel piles, the installer must be certified by Pieux Xtreme Foundation Inc. Using approved equipment the installer must follow the manufacturer’s installation instructions and heed the conditions and limitations specified in this Report. Each installer must carry a certification card with their signature and photograph.
- Each “Pieux Xtreme” auger-installed steel pile must be identified with a label that contains the manufacturer’s identification and the phrase “CCMC 13353-R.”

## 4. Technical Evidence

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

### 4.1 Performance Requirements

“Pieux Xtreme” auger-installed steel piles were tested in accordance with the requirements of ASTM D 1143/D 1143M-07, “Standard Test Methods for Deep Foundations Under Static Axial Compressive Load” and to ASTM D 3689/D 3689-08, “Standard Test Methods for Deep Foundations Under Static Axial Tensile Load.” A series of 17 tests were conducted on two different sites, one with granular soil and the other cohesive soil. The intent of the testing was to determine a correlation between the torque applied during installation and the allowable compressive and tensile loads. The results showed that in granular soils there was a correlation between the torque applied during installation and the allowable load. For the compressive loads noted in Table 4.1.1, the factor of safety varied from 2.0 to 3.2. For the tensile loads, the factor of safety varied from 1.8 to 3.2.

**Table 4.1.1 Allowable Compressive Loads and Tensile Loads<sup>1</sup> for the “Pieux Xtreme” Auger-installed Pile in Granular Soil<sup>2</sup> or Silt<sup>3</sup>**

| Applied Torque |       | Allowable Loads |        |         |       |
|----------------|-------|-----------------|--------|---------|-------|
|                |       | Compression     |        | Tension |       |
| Nm             | lbf   | kN              | lb     | kN      | lb    |
| 678            | 500   | 12              | 2 700  | 5       | 1 125 |
| 1 017          | 750   | 16              | 3 600  | 8       | 1 800 |
| 1 356          | 1 000 | 22              | 4 950  | 10      | 2 250 |
| 1 695          | 1 250 | 26              | 5 850  | 13      | 2 925 |
| 2 034          | 1 500 | 30              | 6 750  | 15      | 3 375 |
| 2 373          | 1 750 | 34              | 7 650  | 18      | 4 050 |
| 2 712          | 2 000 | 38              | 8 550  | 20      | 4 500 |
| 3 051          | 2 250 | 42              | 9 450  | 22      | 4 950 |
| 3 390          | 2 500 | 48              | 10 800 | 25      | 5 625 |
| 3 728          | 2 750 | 50              | 11 250 | 28      | 6 300 |
| 4 067          | 3 000 | 54              | 12 150 | 30      | 6 750 |
| 4 406          | 3 250 | 58              | 13 050 | 32      | 7 200 |
| 4 745          | 3 500 | 62              | 13 950 | 35      | 7 875 |
| 5 084          | 3 750 | 66              | 14 850 | 38      | 8 550 |
| 5 424          | 4 000 | 70              | 15 750 | 40      | 9 000 |

#### Notes to Table 4.1.1:

1. The allowable loads are only valid when the product is installed in granular soil or silt. Special attention is required when the auger-installed steel piles are installed in a recently backfilled site or where the granular material exceeds 200 mm in diameter or in cohesive soils. In these cases, Table 4.1.1 does not apply and the allowable loads need to be determined by on-site confirmatory testing.
2. Granular soils (coarse grained soil) are non-cohesive soils; for example, sand, gravel or silt with little or no clay content and little to no cohesive strength.
3. Silt is that portion of soil material passing through a 200 (75- $\mu$ m) U.S. standard sieve that is non-plastic or very slightly plastic and exhibits little or no strength when air-dried.

## Report Holder

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## Plant(s)

Danville, QC

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**Date modified:**

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