

ICC-ES Evaluation Report

ESR-4226

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DIVISION: 31 00 00—EARTHWORK
Section: 31 63 00—Bored Piles

REPORT HOLDER:**AMERICAN GROUND SCREW, INC.****EVALUATION SUBJECT:****GROUND SCREW SYSTEMS****1.0 EVALUATION SCOPE****Compliance with the following codes:**

- 2018 and 2015 *International Building Code®* (IBC)
- 2018 and 2015 *International Residential Code®* (IRC)

Properties evaluated:

- Structural
- Geotechnical

2.0 USES

The Ground Screw Systems are used to transfer axial compression, axial tension and lateral loads from the supported structures to the surrounding soil. When the Ground Screw Systems are installed under the IRC, an engineered design is required in accordance with IRC R301.1.3.

3.0 DESCRIPTION**3.1 General:**

The Ground Screw Systems consist of a steel screw shaft with helical-shaped screw threads; the screw shafts are screwed into the ground by application of torsion and simultaneously-applied downward pressure until the desired depth is reached. The ground screws come in two configurations depending on the top connection device; a ground screw with a welded flange as described in Section 3.2.2.2 of this report and the Model 3 ground screw which uses flange inserts described in Section 3.2.2.3 of this report.

3.2 System Components:

3.2.1 Screw Shafts: The screw shafts are composed of a central tubular shaft with factory welded steel screw threads. The screw shafts come in 3 and 4.5-inch (76 and 114 mm) outside diameter and 63, 70.9 and 78.7 inches (1600, 1800 and 2000 mm) lengths. The screw shaft diameter tapers to a pointed tip at the bottom of the screw

shaft. The top of the screw shafts on the welded flange configuration and the three welded nuts on the Model 3 ground screws are used to connect the driver head for ground screw installation. The Model 3 ground screws come with factory welded steel nuts that are used to connect to the flange inserts described in Section 3.2.2.3 of this report. See Figure 3 for typical ground screws configurations. The screw shafts are made from round tubular steel having a minimum wall thickness of 0.148-inch (3.75 mm). The steel screw threads have a minimum thickness of 0.079-inch (2 mm). The screw shafts are hot-dipped galvanized in accordance with ASTM A123.

3.2.2 Top Connection Devices:

3.2.2.1 General: The top connection devices come in different flange configurations, such as welded flange and flange inserts. The welded flange is factory welded to the top of the ground screws. The flange inserts are composed of factory welded steel tube and flange plate that is inserted into the top of the ground screw shaft and connected using three friction bolts as described in Section 3.2.2.4 of this report. See Figures 1 and 2 for typical configurations.

3.2.2.2 Welded Flanges: The welded flanges are available in the configurations described in Table 1B of this report. The welded flanges also come with predrilled holes, which are used to connect to the supported structural element. The welded flanges are hot-dipped galvanized in accordance with ASTM A123. See Table 1B for welded flanges dimensions and configurations.

3.2.2.3 Flange Inserts: The flange inserts consist of a steel round sleeve (collar) factory welded to a flange plate or steel channel. The flange plate or steel channel come with predrilled holes. The connection between the flange insert and the ground screw is made by the use of three friction bolts complying with Section 3.2.2.4 of this report. The flange inserts are hot-dipped galvanized in accordance with ASTM A123. See Table 1A for flange insert dimensions and configurations.

3.2.2.4 Friction Bolts: The friction bolts used to connect the flange collar to the screw shaft must be 0.63-inch-diameter by 1.18-inch-long (16 x 30 mm) hex head bolts complying with DIN 933, Property Class 4.8. The friction bolts must be hot-dipped galvanized in accordance with ASTM A153.

3.3 Material Specifications:

3.3.1 Screw Shafts and Screw Threads: The screw shafts and screw threads comply with GB/T 700 Q235B carbon steel specification having a minimum yield strength

of 36 ksi (248 MPa) and a minimum ultimate tensile strength of 58 ksi (400 MPa). The screw shaft and screw threads are hot-dipped galvanized in accordance with ASTM A123.

3.3.2 Welded Flanges and Flange Inserts: The welded flanges and flange inserts are made from carbon steel complying with GB/T 700 Q235B carbon steel specification having a minimum yield strength of 36 ksi (248 MPa) and a minimum ultimate tensile strength of 58 ksi (400 MPa). The flanges are hot-dipped galvanized as assemblies in accordance with ASTM A123.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: Engineering calculations (analysis and design) and drawings, prepared by a registered design professional, must be submitted to and approved by the code official for each project, and must be based on accepted engineering principles as described in IBC Section 1604.4. The engineering analysis must address ground screw system performance related to structural and geotechnical requirements. The calculations must address the ability (considering strength and stiffness) of the supported structure to transmit the applied loads to the Ground Screw System and the ability of the ground screws and surrounding soils to support the loads applied by the supported structure. The design method for the steel components is Allowable Strength Design (ASD), described in IBC Section 1602 and AISC 360 Section B3. The design method for soils is ASD as prescribed in IBC Sections 1801.2 and 1602.

The structural analysis must consider all applicable internal forces (axial forces, shears, bending moments and torsional moments, if applicable) due to applied loads; eccentricity between applied loads and reactions acting on the screw-supported structure; the loading exerted on the supported structure by the top connection devices; and the design span(s) between ground screws. The loading exerted on the supported structure by the top connection device should be equal in magnitude and opposite in direction to the force in the ground screw. A small lateral force is developed at the supported structure if the ground screw is not perfectly plumb but within the permitted inclination from vertical of ± 1 degree. The result of this analysis and the structural capacities must be used to select a ground screw system.

The ground screw embedment into the soil is based on the ground screw length and must be selected based on the project specific requirements.

For Ground Screw Systems subject to combined lateral and axial (compression or tension) loads, the allowable strength of the shaft under combined loads must be determined using the interaction prescribed in Chapter H of AISC 360.

The geotechnical analysis must address the suitability of the ground screw system for the specific project. It must also address the center-to-center spacing of the ground screws, considering both effects on the supported structure and group effects on the screw-soil capacity. The analysis must include estimates of the axial tension, axial compression and lateral capacities of the ground screws, whatever is relevant for the project, and the expected total and differential screw movements due to single screw or screw group, as applicable.

A site-specific geotechnical report is required for proper application of ground screw systems, unless exempted by the building official in accordance with IBC Section 1803.2.

When required, geotechnical investigations shall be conducted in accordance with IBC Section 1803.2 and reported in accordance with IBC Section 1803.6. The geotechnical report must include, but not be limited to, the following information:

1. A plot showing the location of the soil investigation.
2. A complete record of the soil boring and penetration test logs and soil samples.
3. A record of the soil profile.
4. Information on groundwater table, frost depth and corrosion-related parameters, as described in Section 5.0 of this report.
5. Soil design parameters as shown in Table 5 of this report.
6. Confirmation of the suitability of ground screw systems for the specific project.
7. Recommendations for design criteria, including but not limited to, mitigation of effects of differential settlement and varying soil strength; and effects of adjacent loads.
8. Recommended center-to-center spacing of ground screws, if different from spacing noted in Section 5.0 of this report; and reduction of allowable loads due to the group action, if necessary.
9. Field inspection and reporting procedures (to include procedures for verification of the installed bearing capacity, when required).
10. Load test requirements.
11. Any questionable soil characteristics and special design provisions, as necessary.
12. Expected total and differential settlement.
13. The axial compression, axial tension and lateral load soil capacities if values cannot be determined from this evaluation report.

There are four primary structural/geotechnical elements associated with the ground system: top connection device capacity, ground screw shaft capacity, ground screw thread capacity and ground screw soil capacity, which are described in Sections 4.1.2, 4.1.3, 4.1.4, and 4.1.5, respectively. The allowable capacity of overall ground screw system is described in Section 4.1.6.

4.1.2 Top Connection Devices:

The allowable load capacities of the welded flanges are shown in Table 2A and flange inserts is shown in Table 2B of this report. The supported structural element and its connection to the top connection device of the ground screw system must be designed by a registered design professional and must not exceed the published values in Tables 2A and 2B of this report.

4.1.3 Ground Screw Shaft Capacity: The allowable load capacities of the screw shafts are shown in Tables 3A and 3B of this report.

The elastic shortening of the pile shaft will be 0.009 in/ft of shaft and the elastic lengthening will be 0.007 in/ft of shaft.

4.1.4 Ground Screw Thread Capacity: The allowable load capacities of the ground screw threads are shown in Table 4 of this report.

4.1.5 Soil Capacity: The allowable load capacity of the ground screws installed in specified soils is shown in Table 5 of this report. The soil capacity of the ground screws shall be determined by a registered design professional for soil

conditions that substantially differ from those shown in the table. Soil conditions shall be determined by a site-specific geotechnical report, as described in Section 4.1.1.

4.1.6 Ground Screw System: The overall allowable load capacity of the Ground Screw System depends upon the analysis of interaction of top connection devices (Section 4.1.2), ground screw shafts (Section 4.1.3), ground screw threads (Section 4.1.4) and ground screw soil capacity (Section 4.1.5), and must be based on the lowest value of those for top connection device capacity, ground screw shaft capacity, ground screw thread capacity and ground screw soil capacity. The applied load from the supported structure must not exceed the overall allowable load capacity of the Ground Screw System.

4.2 Installation:

4.2.1 General: The Ground Screw Systems must be installed in accordance with this section (Section 4.2), the site-specific approved construction documents (engineering plans and specifications), and the manufacturer's written installation instructions. In case of a conflict, the most stringent requirement governs.

4.2.2 Ground Screw Installation:

1. The ground screws must be located and installed in accordance with the site-specific approved construction documents.
2. The equipment used to install the ground screws must be in accordance with the manufacturer's published installation instructions.
3. The ground screws must be installed in a clockwise rotation.
4. During installation the rotation of the ground screw must be accompanied by downward pressure (crowd) to advance the screw one thread pitch per rotation. The crowd force must not exceed 5 percent of the allowable axial compression load of the ground screw shaft or ground screw threads reported in Tables 3 or 4, as applicable, whichever is lower.
5. Ground screws must be installed vertically plumb into the ground with a ± 1 degree of tolerance. The torque induced within the ground screws depends on the density of surrounding soils. The ground screw shaft maximum installation torque capacities are provided in Tables 3A and 3B and cannot be exceeded during ground screw installation.
6. Torque must be measured with a calibrated in-line indicator or calibrated hydraulic torque motor via differential pressure. Calibration of torque motors and/or torque indicators must be performed on equipment whose calibration is traceable back to NIST (National Institute of Standards and Technology)
7. The final depth must equal the length of the ground screws, except for 3 inches (76 mm) protruding from the ground surface. The length of the ground screw chosen must meet the minimum depth required for frost protection.
8. In order to avoid group effect for lateral loading, the center-to-center spacing of ground screws in the direction of lateral force must be at least eight times the ground screw outside diameter (76 or 114 mm).
9. In order to avoid group effect for axial loading, the center-to-center spacing of ground screws must be at least three times the ground screw outside diameter (76 or 114 mm).

10. The eccentricity between the applied vertical load by supported structures and the center of the ground screw shaft must not exceed 5 percent of the shaft maximum diameter.
11. The field cutting, bolting and welding must be in accordance with the most restrictive requirements described in this evaluation report, IBC, AISC 360, and the manufacturer's written instructions.

4.2.3 Top Connection Devices: Once the ground screw has been installed, the supported structure must be connected to the top connection device (welded flange or flange insert) in accordance with the approved plans as determined by registered design professional. In addition to requirements in Section 4.2.2, the flange insert installation must comply with the following requirements:

1. The flange must be fully seated (bearing) on top of the ground screw and must be centered to the screw shaft diameter body.
2. Three (3) friction bolts as described in Section 3.2.2.4 of this report must be used to connect the ground screw to the flange insert collar. The bolts must be installed through the factory-welded nuts by hand tightening until contact with the flange insert collar is made and ensuring that the flange collar is centered to the screws shaft inside diameter body.
3. The friction bolts must be installed in a snug-tight condition until contact has been made with the friction bolt hex head and the factory-welded nuts plus $\frac{1}{4}$ turn.

4.3 Special Inspections:

Special inspection in accordance with Section 1705.1.1 of the IBC must be performed during the installation of the Ground Screw Systems (screw shafts and top connection devices). Where jobsite cutting, bolting or welding of steel elements is required, inspection in accordance with IBC Section 1705.2 is also required. Items to be recorded and confirmed by the special inspector include, but are not limited to, the following:

1. Verification of the product manufacturer.
2. Product configuration and identification (including catalog numbers) for ground screws and top connection devices.
3. Installation equipment used.
4. Written installation procedures.
5. Friction bolts as specified in the approved construction documents and this evaluation report.
6. Inclination and position of ground screws.
7. Verification that the maximum installation torque noted in Tables 3A and 3B, as applicable, is not exceeded. Verification that the ground screw soil embedment complies with Table 5, as applicable.
8. Verification that top flange bracket is installed in accordance with Section 4.2.3 of this report.
9. Compliance of the installation with the approved construction documents and this evaluation report, including conditions and limitations described in the footnotes to the tables in this report.

5.0 CONDITIONS OF USE

The American Ground Screw Ground Screw Systems described in this report comply with, or are suitable

alternatives to what is specified in, those codes noted in Section 1.0 of this report, subject to the following conditions:

- 5.1** The American Ground Screw Ground Screw Systems are manufactured, identified and installed in accordance with this report, the approved construction documents (engineering drawings and specifications), and the manufacturer's written installation instructions, which must be available at the jobsite at all times during installation. In case of a conflict, the most stringent requirement governs.
- 5.2** The American Ground Screw Ground Screw Systems have been evaluated for support of structures assigned to Seismic Design Categories A and B and Site Classes A through D in accordance with IBC Section 1613. Ground screw systems that support structures assigned to Seismic Design Category C, D, E or F, or that are located in Site Class E or F, are outside the scope of this report, and are subject to the approval of the code official based upon submission of a design in accordance with the code by a registered design professional.
- 5.3** Ground screw systems are limited to support structures constructed from steel or wood materials.
- 5.4** Use of the ground screw systems in exposure conditions that are indicative of potential pile deterioration or corrosion situations as defined by the following: (1) soil resistivity less than 1,000 ohm-cm; (2) soil pH less than 5.5; (3) soils with high organic content; (4) soil sulfate concentrations greater than 1,000 ppm; (5) soils located in a landfill, or (6) soil containing mine waste is beyond the scope of the evaluation report.
- 5.5** Supported steel structures in contact with top connection devices must be zinc-coated steel in accordance with ASTM A123 or ASTM A153. Fasteners used to connect supported structure elements to top connection devices must be corrosion resistant.
- 5.6** The ground screws must be installed vertically into the ground, with a maximum allowable angle of inclination of ± 1 degree.
- 5.7** Special inspection is provided in accordance with Section 4.3 of this report.
- 5.8** Engineering calculations and drawings, in accordance with recognized engineering principles as described in IBC Section 1604.4, and complying with Section 4.1 of this report, are prepared by a registered design professional and approved by the code official.
- 5.9** The adequacy of the supported structures that are connected to the brackets must be verified by a registered design professional in accordance with applicable code provisions and subjected to the approval of the code official.

5.10 A geotechnical investigation report for each project site must be provided to the code official for approval in accordance with Section 4.1.1 of this report.

5.11 The load combinations prescribed in IBC Section 1605.3.1 or 1605.3.2 must be used to determine the applied loads. When using the alternative basic load combinations prescribed in IBC Section 1605.3.2, the allowable stress increases permitted by material chapters of the IBC or the referenced standards are prohibited.

5.12 In order to avoid the group effects on lateral load behavior, the minimum center-to-center spacing of ground screws in the direction of lateral force must be at least eight times the ground screw shaft outside diameter; and to avoid the group effects on axial load behavior, the center-to-center spacings of the ground screws must be at least three times the ground screw shaft outside diameter.

5.13 Settlement of helical piles is beyond the scope of this evaluation report and must be determined by a registered design professional.

5.14 The applied loads must not exceed the allowable capacities described in Section 4.1 of this report.

5.15 The ground screw systems are manufactured in Huanghua City, Hebei Province, China under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Screw Foundation Systems (SFSs) (AC443), dated June 2012 (editorially revised October 2019).

7.0 IDENTIFICATION

7.1 The ground screw products described in this report must be identified with a tag or label with the following information: report holder name and address; product model number and batch number and the ICC-ES evaluation report number (ESR-4226).

7.2 The report holder's contact information is the following:

**AMERICAN GROUND SCREW, INC.
512 TUTTLE STREET
DES MOINES, IOWA 50309
(833) 359-9475
www.americangroundscscrew.com**

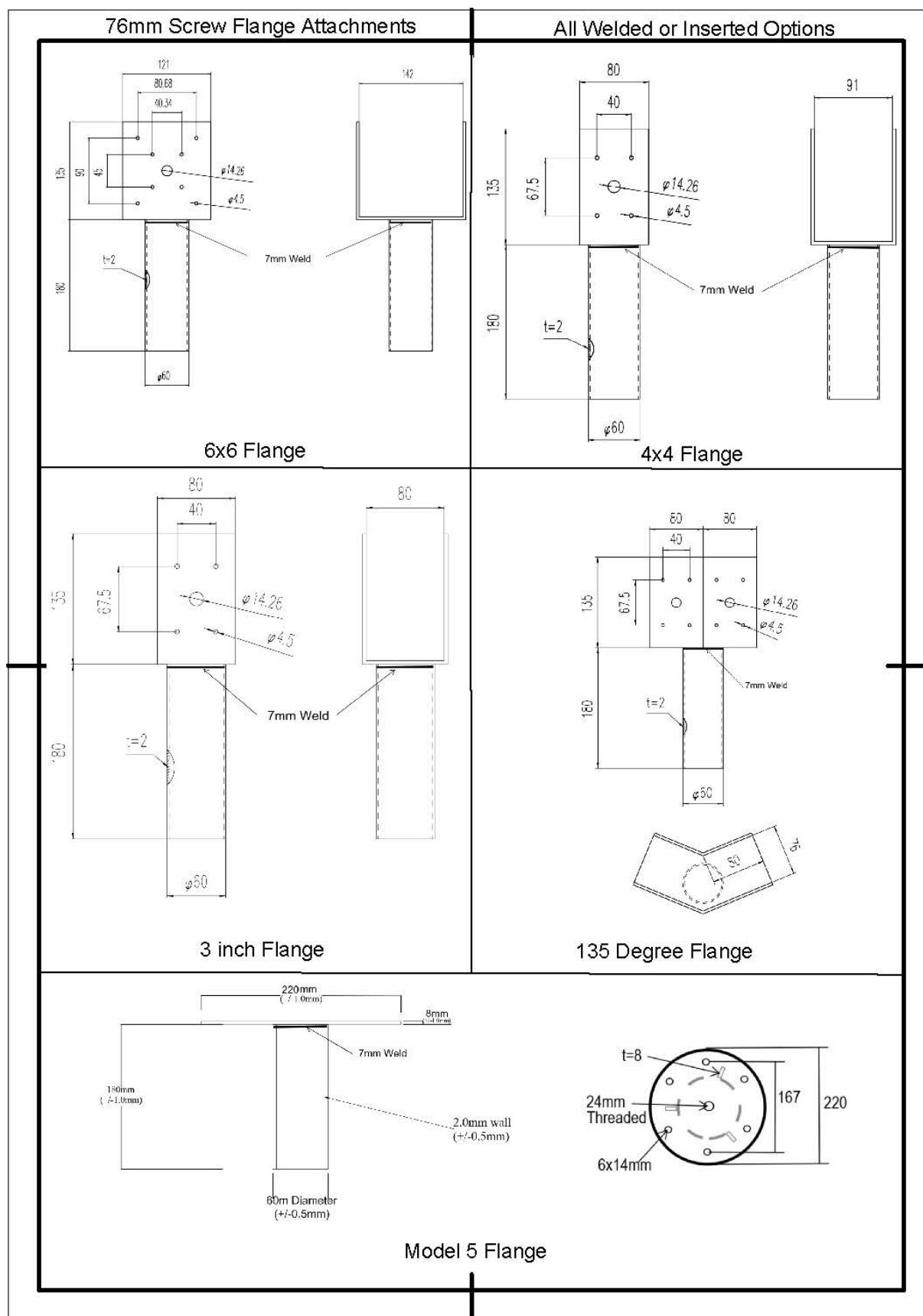


FIGURE 1—3-INCH DIAMETER MODEL 3 AND WELDED FLANGE GROUND SCREWS FLANGES (units shown in metric)

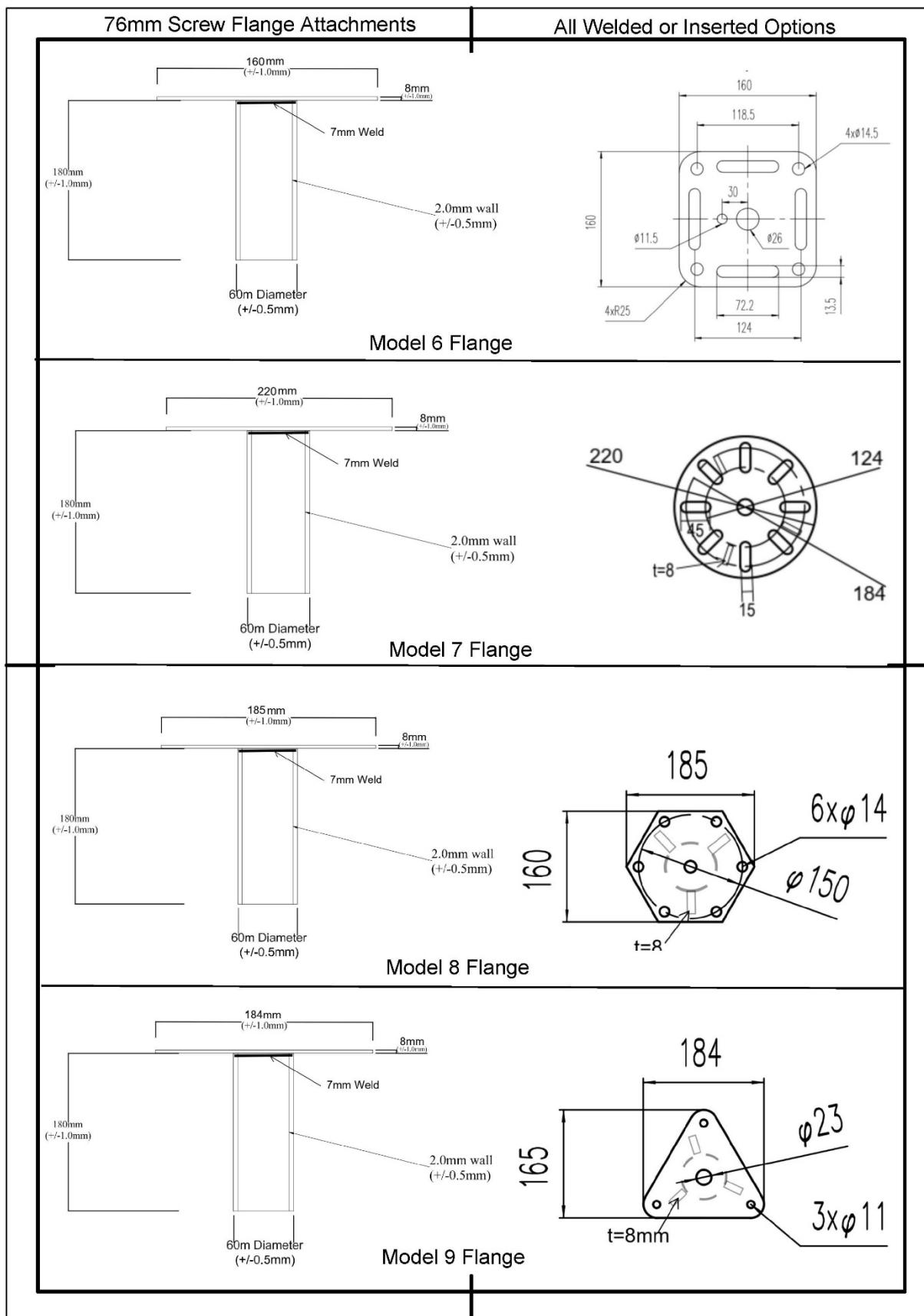


FIGURE 1—3-INCH DIAMETER MODEL 3 AND WELDED FLANGE GROUND SCREWS FLANGES (units shown in metric) (continued)

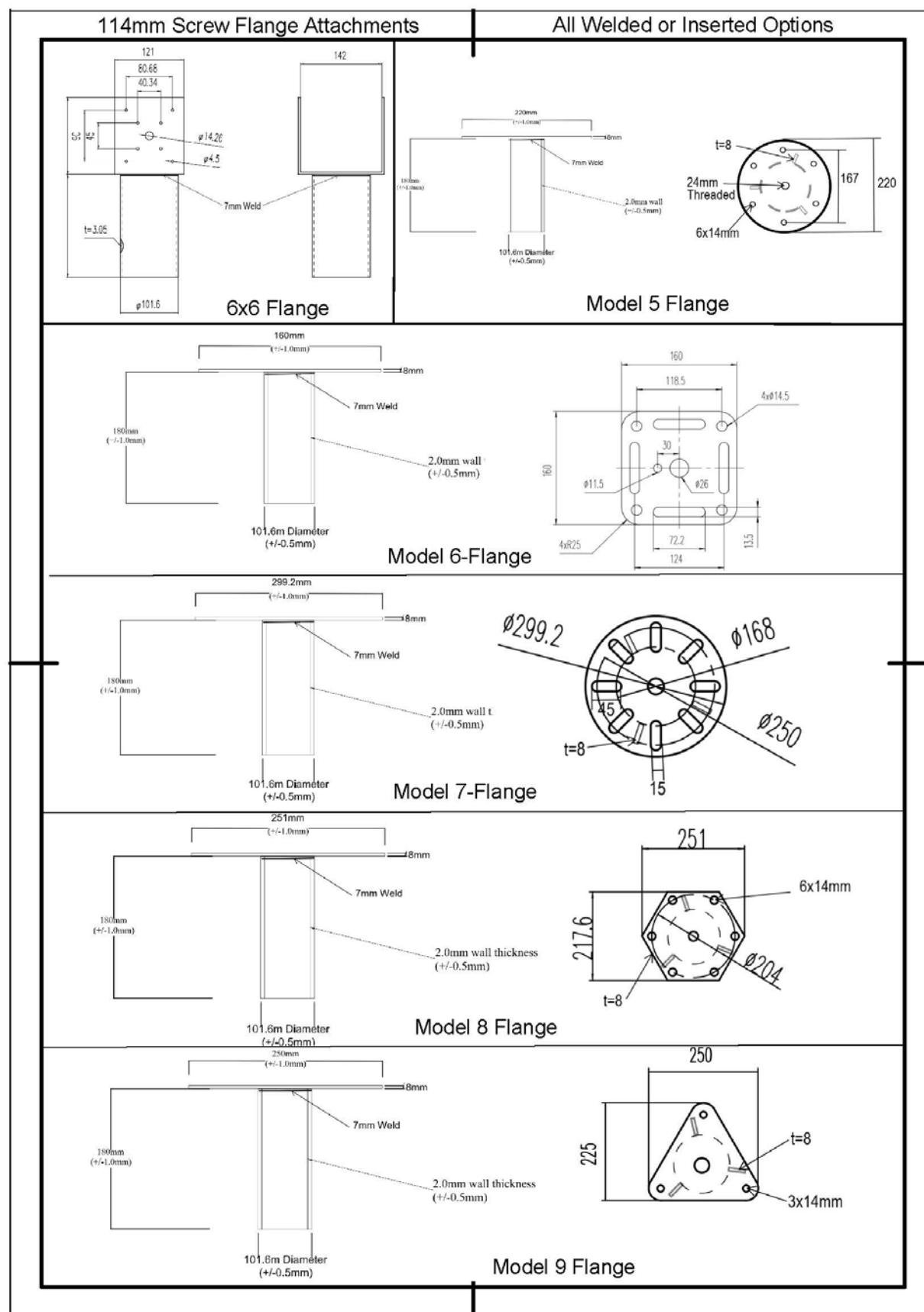


FIGURE 2—4.5-INCH DIAMETER MODEL 3 AND WELDED FLANGE GROUND SCREWS FLANGES (units shown in metric)

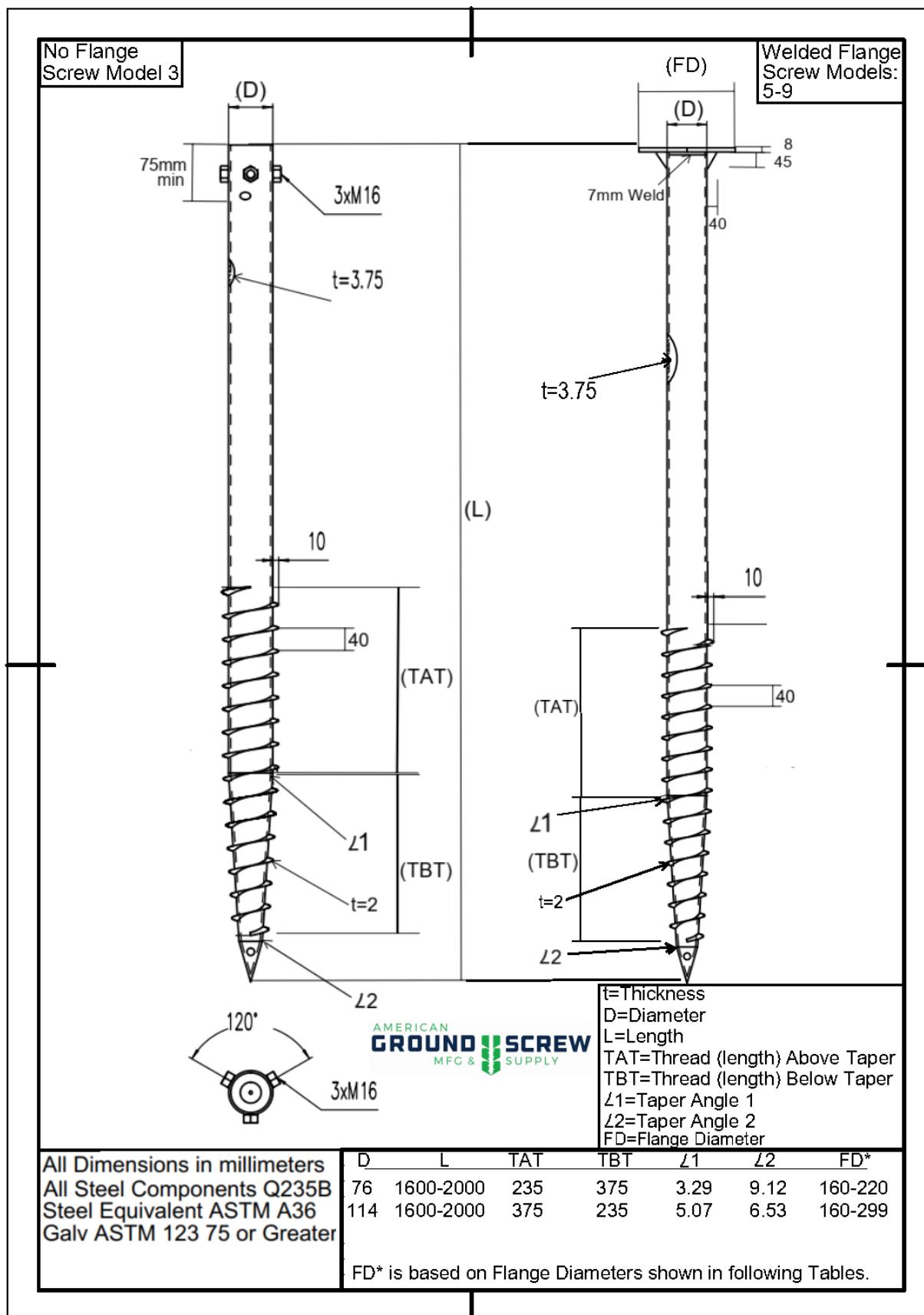


FIGURE 3—MODEL 3 AND WELDED FLANGE GROUND SCREWS (units in metric)

TABLE 1A—MODEL 3 GROUND SCREW MODELS

GROUND SCREW MODEL No.	Ground Screw Diameter (inches)	Flange Inserts ¹							
		6x6 Flange	4x4 Flange ²	3-inch Flange ²	135 Degree Flange ²	Model 5 Flange	Model 6 Flange	Model 7 Flange	Model 8 Flange
Model 3	3	See Figure 1 for product description and dimensional details							
	4.5	See Figure 2 for product description and dimensional details							

For SI: 1 inch= 25.4 mm.

¹Flange inserts must be used with Model 3 ground screws shown in Figure 3.

²Available only for 3-inch (76 mm) ground screw shaft.

TABLE 1B—WELDED FLANGE GROUND SCREW MODELS

GROUND SCREW MODEL	Ground Screw Diameter (inches)	Welded Flanges ^{1,2}							
		6x6 Flange	4x4 Flange ³	3-inch Flange ³	Model 5 Flange	Model 6 Flange	Model 7 Flange	Model 8 Flange	Model 9 Flange
Welded Flange	3	See Figure 1 for product description and dimensional details ²							
	4.5	See Figure 2 for product description and dimensional details ²							

For SI: 1 inch=25.4 mm.

¹ Welded flanges are only available with Welded Flange Screw Model shown in Figure 3.

²Welded flanges do not include the welded sleeve shown in Figure 1 or Figure 2.

³Available only for 3-inch-diameter (76 mm) ground screw shaft.

TABLE 2A—WELDED FLANGE GROUND SCREWS TOP CONNECTION ALLOWABLE CAPACITY^{1,2}

Welded Flange	Ground Screw Diameter (inches)	Allowable Load Capacity (kips)		
		Axial Tension	Axial Compression ³	Lateral
Model 5	3	2.153	37.96	13.66
Model 5	4.5	5.540	57.85	20.50
Model 6	3	2.563	37.96	13.66
Model 6	4.5	8.143	57.85	20.50
Model 7	3	1.814	37.96	13.66
Model 7	4.5	2.164	57.85	20.50
Model 8	3	2.646	37.96	13.66
Model 8	4.5	8.141	57.85	20.50
Model 9	3	2.563	37.96	13.66
Model 9	4.5	3.419	57.85	20.50
6x6	3	0.286	37.96	13.66
6x6	4.5	0.451	57.85	20.50
4x4	3	0.660	37.96	13.66
3-inch	3	0.921	37.96	13.66

For SI: 1 inch= 25.4 mm; 1 kip=1000 lbf= 4.45 kN.

¹ Tabulated allowable load capacities include corrosion losses of 0.013-inch over a 50-year service life.

²Tabulated allowable load values are based on internal strength properties of welded flanges. Connection capacity of flange to supported structural element must be determined by registered design professional.

³Tabulated allowabled axial compression capacity is based on welded flange bearing on top of ground screw shaft based on the assumption that the supported structure will transfer the load to the top of the ground screw shaft through direct bearing. Other applicable limit states must be determined by registered design professional.

TABLE 2B—MODEL 3 GROUND SCREW FLANGE INSERTS TOP CONNECTION ALLOWABLE CAPACITY^{1,2}

Flange Inserts	Ground Screw Diameter (inches)	Allowable Load Capacity (kips)		
		Axial Tension	Axial Compression ³	Lateral
4 x 4	3	0.660	37.96	3.08
6 x 6	3	0.286	37.96	3.08
6 x 6	4.5	0.451	57.85	5.28
135 Degree	3	0.501	37.96	3.08
3-inch Beam	3	0.921	37.96	3.08
Model 5	3	1.445	37.96	3.08
Model 5	4.5	4.004	57.85	5.28
Model 6	3	1.618	37.96	3.08
Model 6	4.5	4.029	57.85	5.28
Model 7	3	1.247	37.96	3.08
Model 7	4.5	1.767	57.85	5.28
Model 8	3	1.618	37.96	3.08
Model 8	4.5	4.029	57.85	5.28
Model 9	3	1.618	37.96	3.08
Model 9	4.5	2.663	57.85	5.28

For SI: 1 inch= 25.4 mm; 1 kip=1000 lbf= 4.45 kN.

¹Tabulated allowable load capacities include corrosion losses of 0.013-inch over a 50-year service life.

²Tabulated allowable load values are based on internal strength properties of welded flanges. Connection capacity of flange to supported structural element must be determined by registered design professional.

³Tabulated allowable axial compression capacity is based on welded flange bearing on top of ground screw shaft based on the assumption that the supported structure will transfer the load to the top of the ground screw shaft through direct bearing. Other applicable limit states must be determined by registered design professional.

TABLE 3A—WELDED FLANGE GROUND SCREW MODEL SHAFT ALLOWABLE CAPACITY

Ground Screw Diameter (inches)	Ground Screw Length (mm)	Allowable Load Shaft Capacities ¹				Maximum Torque (ft-lbf)	
		Axial Tension (kips)	Axial Compression ² (kips)	Lateral			
				Bending (kip-ft)	Shear (kips)		
3	63	20.4	25.3	1.69	7.6	4829	
	70.9	20.4	25.3	1.69	7.6	4829	
	78.7	20.4	25.3	1.69	7.6	4829	
4.5	63	25.7	38.7	3.75	11.5	6687	
	70.9	25.7	38.7	3.75	11.5	6687	
	78.7	25.7	38.7	3.75	11.5	6687	

For SI: 1 inch= 25.4 mm; 1 kip=1000 lbf= 4.45 kN; 1 ft-lb= 1.36 N-m.

¹Tabulated allowable load capacities include corrosion losses of 0.013-inch over a 50-year service life.

²Allowable axial compression capacity of the shaft is based on the ground screw installed in a fully braced condition.

TABLE 3B—MODEL 3 GROUND SCREW MODEL SHAFT ALLOWABLE CAPACITY

Ground Screw Diameter (inches)	Ground Screw Length (mm)	Allowable Load Shaft Capacities ¹				Maximum Torque (ft-lbf)	
		Axial Tension (kips)	Axial Compression ² (kips)	Lateral			
				Bending (kip-ft)	Shear (kips)		
3	63	9	25.3	1.83	7.6	4829	
	70.9	9	25.3	1.83	7.6	4829	
	78.7	9	25.3	1.83	7.6	4829	
4.5	63	9	38.7	4.36	11.5	6687	
	70.9	9	38.7	4.36	11.5	6687	
	78.7	9	38.7	4.36	11.5	6687	

For SI: 1 inch= 25.4 mm; 1 kip=1000 lbf= 4.45 kN; 1 ft-lb= 1.36 N-m.

¹Tabulated allowable load capacities include corrosion losses of 0.013-inch over a 50-year service life.

²Allowable axial compression capacity of the shaft is based on the ground screw installed in a fully braced condition.

TABLE 4—WELDED FLANGE AND MODEL 3 GROUND SCREWS SCREW THREADS ALLOWABLE CAPACITY¹

Ground Screw Diameter (inches)	Maximum Allowable Torsion (ft-lb)	Axial Tension/Compression Thread Capacity (kips)
3	4829	39.2
4.5	6687	47.7

For SI: 1 inch= 25.4 mm; 1 kip=1000 lbf= 4.45 kN; 1 ft-lb= 1.36 N-m.

¹Tabulated allowable load capacities include corrosion losses of 0.013-inch over a 50-year service life.

TABLE 5—WELDED FLANGE AND MODEL 3 GROUND SCREWS ALLOWABLE SOIL CAPACITY⁴

Ground Screw Diameter (inches)	Ground Screw Length (inches)	Ground Screw Soil Embedment Depth (inches)	Axial Tension (lbf)		Axial Compression (lbf)		Lateral (lbf) ³	
			Soil Classification					
			Silty Sand ¹	Sandy Clay ²	Silty Sand ¹	Sandy Clay ²	Silty Sand ¹	Sandy Clay ²
3	63	60	1700	6321	2450	8129	1774	2360
	70.9	67.9	1700	6321	2450	8129	1774	2360
	78.7	75.7	1700	6321	2450	8129	1774	2360
4.5	63	60	3400	9644	4977	12823	3519	4394
	70.9	67.9	3400	9644	4977	12823	3519	4394
	78.7	75.7	3400	9644	4977	12823	3519	4394

For SI: 1 inch= 25.4 mm; 1 lbf= 4.45 N.

¹Silty sand classified soil has a blow count of 13.

²Sandy clay classified soil has a blow count of 25 and a plasticity index of 30.

³Lateral load applied 12 inches above ground surface.

⁴Maximum installation torque must not exceed the maximum torque values in Table 3A and 3B of this report.

ICC-ES Evaluation Report

ESR-4226 CBC and CRC Supplement

Issued March 2020

This report is subject to renewal March 2021.

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A Subsidiary of the International Code Council®

DIVISION: 31 00 00—EARTHWORK

Section: 31 63 00—Bored Piles

REPORT HOLDER:

AMERICAN GROUND SCREW, INC.

EVALUATION SUBJECT:

GROUND SCREW SYSTEMS

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Ground Screw Systems, recognized in ICC-ES report ESR-4226, has also been evaluated for compliance with the codes noted below.

Applicable code edition(s):

- 2019 California Building Code (CBC)

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) and Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

- 2019 California Residential Code (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The Ground Screw Systems, described in Sections 2.0 through 7.0 of the evaluation report ESR-4226, comply with CBC Chapters 18, provided the design and installation are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report and the additional inspection requirements of CBC Chapters 16 and 17, as applicable.

2.1.1 OSHPD: OSHPD requirements as indicated in the CBC are beyond the scope of this supplement.

2.1.2 DSA: DSA requirements as indicated in the CBC are beyond the scope of this supplement.

2.2 CRC:

The Ground Screw Systems, described in Sections 2.0 through 7.0 of the master evaluation report ESR-4226, comply with CRC Chapter 3, provided the design and installation are in accordance with the *International Residential Code*® (IRC) provisions noted in the evaluation report.

This supplement expires concurrently with the evaluation report issued March 2020.