SECTION 31 66 00

SPECIAL FOUNDATIONS - STEEL GROUND SCREW SYSTEMS

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\*\* NOTE TO SPECIFIER \*\* American Ground Screw, Inc.; Ground screw systems.
This section is based on the products of American Ground Screw, Inc., which is located at:512 Tuttle St.Des Moines, IA 50309Tel: 515-288-9800Email: [request info (info@americangroundscrew.com)](https://arcat.com/rfi?action=email&company=American%252BGround%252BScrew%252C%252BInc.&message=RE%253A%2520Spec%2520Question%2520(02481cgs)%253A%2520&coid=52607&spec=02481cgs&rep=&fax=)
Web: <https://www.americangroundscrew.com>
 [ [Click Here](https://arcat.com/company/american-ground-screw-inc-52607) ] for additional information.
American Ground Screw was established in Des Moines, Iowa, by the founders of a family-owned global manufacturer of ground screw systems. With our national sales and distribution network, American Ground Screw brings those high-quality products to North American customers with manufacturer-direct pricing as well as technical and customer support.
American Ground Screw's manufacturing facilities have been at the forefront of ground screw manufacturing since 2006. AGS is now one of the world's largest producers of ground screws, serving demanding wholesale and retail customers across North America and the globe. Our manufacturing facilities employ over 150 workers and cover 200,000 square feet of steel welding, coating, and packaging workshops. With a monthly production capacity of 95,000 cubic feet, manufacturing facilities with close proximity to sea ports, AGS can assure customers prompt production and delivery of any order.

1. GENERAL
	1. SECTION INCLUDES

\*\* NOTE TO SPECIFIER \*\* Delete items below not required for project. Please note that while welded flange ground screws are available, they are not stocked in inventory and often not necessary. If you feel welded flange versions of the ground screw designs would be preferable, contact the Manufacturer for lead times and more detailed technical information.

* + 1. Ground screws with insertable flanges.
		2. Ground screws without insertable flanges.
	1. RELATED SECTIONS

\*\* NOTE TO SPECIFIER \*\* Delete any sections below not relevant to this project; add others as required.

* + 1. Section 31 62 16.19 - Unfilled Tubular Steel Piles
		2. Section 31 66 00 - Special Foundations.
	1. REFERENCES

\*\* NOTE TO SPECIFIER \*\* Delete references from the list below that are not actually required by the text of the edited section.

* + 1. American Institute of Steel Construction (AISC):
			1. AISC 360 - Specification for Structural Steel Buildings.
		2. ASTM International (ASTM):
			1. ASTM A123 - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
			2. ASTM A153 - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
		3. California Building Code (CBC).
		4. International Building Code (IBC).
		5. International Code Council - Evaluation Service (ICC ES):
			1. ICC-ES 4226 - Evaluation Report.
		6. National Institute of Standards and Technology (NIST)
		7. National Standard of the Peoples Republic of China (GB/T):
			1. GB/T 700 Q235B carbon steel specification.
		8. Residential Building Code (RBC).
	1. SUBMITTALS
		1. Submit under provisions of Section 01 30 00 - Administrative Requirements.
		2. Product Data:
			1. Manufacturer's data sheets on each product to be used.
			2. Preparation instructions and recommendations.
			3. Storage and handling requirements and recommendations.
			4. Typical installation methods.
		3. Shop Drawings: Include details of materials, construction, and finish. Include relationship with adjacent construction.
	2. QUALITY ASSURANCE
		1. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.
		2. Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.
		3. Additional technical support and materials regarding installation are available upon request from the manufacturer.
		4. Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

\*\* NOTE TO SPECIFIER \*\* Include mock-up if the project size or quality warrant the expense. The following is one example of how a mock-up on might be specified. When deciding on the extent of the mock-up, consider all the major different types of work on the project.

* + 1. Mock-Up: Construct a mock-up with actual materials in sufficient time for Architect's review and to not delay construction progress. Locate mock-up as acceptable to Architect and provide temporary foundations and support.
			1. Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
			2. If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
			3. Retain mock-up during construction as a standard for comparison with completed work.
			4. Do not alter or remove mock-up until work is completed or removal is authorized.
	1. PRE-INSTALLATION CONFERENCE
		1. Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include Architect, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.
	2. DELIVERY, STORAGE, AND HANDLING
		1. Upon Delivery: Visually inspect the ground screws.
			1. The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-4226) along with the name, registered trademark, or registered logo of the report holder must be included in the product label.
			2. In addition, 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.
			3. The report holder's contact information is the following:
				1. AMERICAN GROUND SCREW, INC.
				2. 512 TUTTLE STREET
				3. DES MOINES, IOWA 50309
				4. (833) 359-9475
				5. www.americangroundsccrew.com
		2. Store and handle in strict compliance with manufacturer's written instructions and recommendations.
		3. Protect from damage due to weather, excessive temperature, and construction operations.
	3. PROJECT CONDITIONS
		1. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.
	4. WARRANTY
		1. Manufacturer's standard limited warranty unless indicated otherwise.
1. PRODUCTS
	1. MANUFACTURERS
		1. Acceptable Manufacturer: American Ground Screw, Inc., which is located at:512 Tuttle St.Des Moines, IA 50309Tel: 515-288-9800Email: [request info (info@americangroundscrew.com)](https://arcat.com/rfi?action=email&company=American%252BGround%252BScrew%252C%252BInc.&message=RE%253A%2520Spec%2520Question%2520(02481cgs)%253A%2520&coid=52607&spec=02481cgs&rep=&fax=);Web: <https://www.americangroundscrew.com>

\*\* NOTE TO SPECIFIER \*\* Delete one of the following two paragraphs; coordinate with requirements of Division 1 section on product options and substitutions.

* + 1. Substitutions: Not permitted.
		2. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

\*\* NOTE TO SPECIFIER \*\* AGS Ground Screw Systems are used to either underpin foundations of existing structures or to form foundations for new structures. They are designed to transfer axial compression, axial tension, and lateral loads from the supported structures to the surrounding soil. The surrounding soil is displaced upon installation.

* 1. GROUND SCREWS
		1. Basis of Design: Ground Screws as manufactured by American Ground Screw Inc.
			1. AGS Ground Screw Systems: Consist of steel screw shafts, with one end formed into a cone, with a single continuous helical-shaped screw thread, extending along the entirety of the coned-tip up on to screw shaft. Screw shafts are screwed into the ground by application of torsion and simultaneously applied downward pressure until the desired depth is reached.

\*\* NOTE TO SPECIFIER \*\* Delete configuration option not required.

* + - 1. Configuration: Top connection. Inserted flange.
		1. System Components:

\*\* NOTE TO SPECIFIER \*\* The products listed below are those AGS products that are ICC-certified and are maintained as standard inventory items. Larger and smaller custom sizes, as well as welded flange options, are available in addition to these listed. Contact the Manufacturer for more detailed information. For products listed delete shaft outside diameter and length options not required.

* + - 1. Screw Shafts: A round tubular steel shaft with bottom end formed into a cone and a single factory welded steel screw thread.
				1. Screw Shaft Outside Diameter: 3 inches (76 mm).
				2. Screw Shaft Outside Diameter: 4.5 inches (114 mm).
				3. Length: 63 inches (1600 mm).
				4. Length: 79 inches (2000 mm)
				5. Finish: Hot-Dipped Galvanized: ASTM A123.
				6. Minimum Wall Thickness: 0.148 inch (3.75 mm).
				7. Minimum Screw Thread Thickness: 0.079 inch (2 mm).

\*\* NOTE TO SPECIFIER \*\* American Ground Screw offers a variety of flange options to connect your project's structure to the ground screws. American Ground Screw flanges are designed to be inserted into the ground screw and secured with three bolts. Whether you are using posts, beams, piping, or other structural surfaces, AGS insertable flanges allow for a reliable connection. Delete options not required.

* + - * 1. Top Connection; Inserted Flanges, Open Top: Three factory welded steel nuts for three friction bolts, used to connect flange inserts.

Flange Inserts: Round steel sleeve (collar) factory welded to a flange plate or steel channel.

Flange Plates or Steel Channels: Come with predrilled holes used to connect to the supported structural elements.

Model 44 4x4 Flange.

Model 5 Six Hole Circle Flange.

Model 6 Square Flange.

Model 66 6x6 Flange.

Model 7 Flex Circle Flange.

Model 8 Six Hole Hexagonal Flange.

Model 9. Three Hole Triangular Flange

Model 135 Degree Flange.

Model 3-inch Beam Flange.

Finish: Hot-dipped galvanized in accordance with ASTM A123.

* + - * 1. Friction Bolts: 0.63 inch (16 mm) diameter by 1.18 inch (30 mm) long hex head bolts complying with DIN 933, Property Class 4.8.

Finish: Hot-dipped galvanized in accordance with ASTM A153.

* + 1. Material Specifications:
			1. Screw Shafts and Screw Threads: Carbon steel complying with GB/T 700 Q235B carbon steel specification.
				1. Minimum Yield Strength: 36 ksi (248 MPa).
				2. Minimum Ultimate Tensile Strength: 58 ksi (400 MPa).
				3. Hot-Dipped Galvanized: In accordance with ASTM A123. 785 Microns.
			2. Welded Flanges and Flange Inserts: Carbon steel complying with GB/T 700 Q235B carbon steel specification.
				1. Minimum Yield Strength: 36 ksi (248 MPa).
				2. Minimum Ultimate Tensile Strength: 58 ksi (400 MPa).
				3. Hot-Dipped Galvanized: In accordance with ASTM A123.
		2. Performance and Design Requirements: Ground screw systems are for supporting steel or wood structures only.
			1. Standards Compliance:
				1. California Building Code.
				2. International Building Code.
				3. International Residential Code.
				4. ICC-ES Evaluation Report No. ESR-4226.
			2. Engineering Analysis and Design Calculations and Drawings:
				1. Prepared by a registered design professional.
				2. Based on engineering principles described in IBC Section 1604.4.
				3. Submitted to and approved by the governing code official for project location.
				4. Address ground screw system performance related to structural and geotechnical requirements.
				5. 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.
				6. Design Method for Steel Components:

Allowable Strength Design, described in 2021 and 2018 IBC Section 202 (2015 IBC Section 1602) and AISC 360 Section B3.

* + - * 1. Design Method for Soils:

Allowable Strength Design, as prescribed in 2021 and 2018 IBC Sections 202 and 1802.1 (2015 IBC Sections 1602 and 1801.2).

* + - * 1. Structural Analysis Considerations:

Applicable Internal Forces: Axial, shears, bending moments, and torsional moments due to applied loads.

Eccentricity between applied loads and reactions acting on the screw-supported structure.

Loading exerted on supported structure by the top connection devices; and the design spans between ground screws.

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 plus or minus 1 degree.

Use analysis results and structural capacities to select a ground screw system.

* + - * 1. Ground Screw Soil Embedment: Based on the ground screw length and selected based on the project specific requirements.
				2. Combined Lateral and Axial, Compression or Tension, Loads: Determine allowable shaft strength under combined loads using the interaction prescribed in Chapter H of AISC 360.
				3. Geotechnical Analysis:

Address suitability of ground screw system for the specific project.

Address center-to-center spacing of ground screws, considering effects on the supported structure and group effects on the screw-soil capacity.

Include estimates of 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.

* + - * 1. Site-Specific Geotechnical Report: Required for application of ground screw systems unless exempted by the building official in accordance with IBC Section 1803.2.

Geotechnical Investigations: Conduct in accordance with IBC Section 1803.2. Report in accordance with IBC Section 1803.6. The report must include, but not be limited to, the following:

Plot showing location of soil investigation.

Complete record of soil boring and penetration test logs and soil samples.

Record of soil profile.

Information on groundwater table, frost depth and corrosion-related parameters.

Soil design parameters.

Confirmation of the suitability of ground screw systems for the specific project.

Recommendations for design criteria, including but not limited to, mitigation of effects of differential settlement and varying soil strength; and effects of adjacent loads.

Center-to-Center Ground Screw Spacing:

To avoid group effects on lateral load behavior:

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.

To avoid group effects on axial load behavior:

Center-to-center spacings of the ground screws must be at least three times the ground screw shaft outside diameter.

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.

Field inspection and reporting procedures (to include procedures for verification of the installed bearing capacity, when required).

Load test requirements.

Any questionable soil characteristics and special design provisions, as necessary.

Expected total and differential settlement.

The axial compression, axial tension, and lateral load soil capacities if values cannot be determined from this evaluation report.

* + - 1. Ground Screw Shaft Capacity: Allowable load capacities.
				1. Elastic shortening of the pile shaft: 0.009 in/ft (0.750 mm/m) of shaft.
				2. Elastic lengthening of the pile shaft: 0.007 in/ft (0.583 mm/m of shaft.
				3. Flange Insert Screw Shaft Allowable Capacity: The capacities listed below are based on the capacities of the metal itself, and does not reflect the total load capacity of the ground screw when it is installed. The total load capacity of the ground screw plus flange is dependent on the soil capacity as well,

Ground Screw Length: 63 inches (1600 mm).

Axial Tension: 9 kips (40.034 kN).

Axial compression: 25.3 kips (112.540 kN).

Lateral Bending: 1.83 kips-ft (2481 nm).

Lateral Shear: 7.6 kips (33.806 kN).

Maximum Torque: 4829 ft-lbs (6547.2 nm).

Ground Screw Length: 70.9 inches (1800 mm).

Axial Tension: 9 kips (40.034 kN).

Axial compression: 25.3 kips (112.540 kN).

Lateral Bending: 1.83 kips-ft (2481 nm).

Lateral Shear: 7.6 kips (33.806 kN).

Maximum Torque: 4829 ft-lbs (6547.2 nm).

Ground Screw Length: 78.7 inches (2000 mm).

Axial Tension: 9 kips (40.034 kN).

Axial compression: 25.3 kips (112.540 kN).

Lateral Bending: 1.83 kips-ft (2481 nm).

Lateral Shear: 7.6 kips (33.806 kN).

Maximum Torque: 4829 ft-lbs (6547.2 nm).

* + - * 1. Ground Screw Diameter: 4.5 inches (114 mm).

Ground Screw Length: 63 inches (1600 mm).

Axial Tension: 9 kips (40.034 kN).

Axial compression: 38.7 kips (172.146 kN).

Lateral Bending: 4.36 kips-ft (5911.36 nm).

Lateral Shear: 11.5 kips (51.154 kN).

Maximum Torque: 6687 ft-lbs (9066 nm).

Ground Screw Length: 70.9 inches (1800 mm).

Axial Tension: 9 kips (40.034 kN).

Axial compression: 38.7 kips (172.146 kN).

Lateral Bending: 4.36 kips-ft (5911.36 nm).

Lateral Shear: 11.5 kips (51.154 kN).

Maximum Torque: 6687 ft-lbs (9066 nm).

Ground Screw Length: 78.7 inches (2000 mm).

Axial Tension: 9 kips (40.034 kN).

Axial compression: 38.7 kips (172.146 kN).

Lateral Bending: 4.36 kips-ft (5911.36 nm).

Lateral Shear: 11.5 kips (51.154 kN).

Maximum Torque: 6687 ft-lbs (9066 nm).

* + - 1. Ground Screw Thread Capacity: Allowable load capacities. The capacities listed below are based on the capacities of the metal itself, and does not reflect the total load capacity of the ground screw when it is installed. The total load capacity of the ground screw plus flange is dependent on the soil capacity as well,
				1. Ground Screw Diameter: 3 inches (76 mm).

Maximum Allowable Torsion: 4829 ft-lbs (6547.2 nm).

Axial Tension/Compression Thread Capacity: 39.2 kips (174.37 kN).

* + - * 1. Ground Screw Diameter: 4.54 inches (115 mm).

Maximum Allowable Torsion: 6687 ft-lbs (9066 nm).

Axial Tension/Compression Thread Capacity: 47.7 kips (212.180 kN).

* + - 1. Allowable Load Capacities: Top connection devices.
				1. The capacities listed below are based on the capacities of the metal itself, and does not reflect the total load capacity of the ground screw when it is installed. The total load capacity of the ground screw plus flange is dependent on the soil capacity as well,
				2. 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 these values.
				3. Flange Inserts:

Model 4x4: Ground Screw Diameter: 3 inches (76 mm).

Axial Tension: 0.660 kips (2.936 kN).

Axial Compression: 37.96 kips (168.854 kN).

Lateral: 3.08 kips (13.700 kN).

Model 6x6: Ground Screw Diameter: 3 inches (76 mm).

Axial Tension: 0.286 kips (1.272 kN).

Axial Compression: 37.96 kips (168.854 kN).

Lateral: 3.08 kips (13.700 kN).

Model 6x6: Ground Screw Diameter: 4.5 inches (114 mm).

Axial Tension: 0.451 kips (2.006 kN).

Axial Compression: 57.85 kips (2357.330 kN).

Lateral: 5.28 kips (2.3.487 kN).

Model 135 Degree: Ground Screw Diameter: 3 inches (76 mm).

Axial Tension: 0.501 kips (2.229 kN).

Axial Compression: 37.96 kips (168.854 kN).

Lateral: 3.08 kips (13.700 kN).

Model 3-inch Beam: Ground Screw Diameter: 3 inches (76 mm).

Axial Tension: 0.921 kips (4.097 kN).

Axial Compression: 37.96 kips (168.854 kN).

Lateral: 3.08 kips (13.700 kN).

Model 5: Ground Screw Diameter: 3 inches (76 mm).

Axial Tension: 1.445 kips (6.428 kN).

Axial Compression: 37.96 kips (168.854 kN).

Lateral: 3.08 kips (13.700 kN).

Model 5: Ground Screw Diameter: 4.5 inches (114 mm).

Axial Tension: 4.004 kips (17.811 kN).

Axial Compression: 57.85 kips (2357.330 kN).

Lateral: 5.28 kips (2.3.487 kN).

Model 6: Ground Screw Diameter: 3 inches (76 mm).

Axial Tension: 1.618 kips (7.197 kN).

Axial Compression: 37.96 kips (168.854 kN).

Lateral: 3.08 kips (13.700 kN).

Model 6: Ground Screw Diameter: 4.5 inches (114 mm).

Axial Tension: 4.029 kips (17.922 kN).

Axial Compression: 57.85 kips (2357.330 kN).

Lateral: 5.28 kips (2.3.487 kN).

Model 7: Ground Screw Diameter: 3 inches (76 mm).

Axial Tension: 1.247 kips (5.547 kN).

Axial Compression: 37.96 kips (168.854 kN).

Lateral: 3.08 kips (13.700 kN).

Model 7: Ground Screw Diameter: 4.5 inches (114 mm).

Axial Tension: 1.767 kips (7.860 kN).

Axial Compression: 57.85 kips (2357.330 kN).

Lateral: 5.28 kips (2.3.487 kN).

Model 8: Ground Screw Diameter: 3 inches (76 mm).

Axial Tension: 1.618 kips (7.197 kN).

Axial Compression: 37.96 kips (168.854 kN).

Lateral: 3.08 kips (13.700 kN).

Model 8: Ground Screw Diameter: 4.5 inches (114 mm).

Axial Tension: 4.029 kips (17.922 kN).

Axial Compression: 57.85 kips (2357.330 kN).

Lateral: 5.28 kips (2.3.487 kN).

Model 9: Ground Screw Diameter: 3 inches (76 mm).

Axial Tension: 1.618 kips (7.197 kN).

Axial Compression: 37.96 kips (168.854 kN).

Lateral: 3.08 kips (13.700 kN).

Model 9: Ground Screw Diameter: 4.5 inches (114 mm).

Axial Tension: 2.663 kips (11.846 kN).

Axial Compression: 57.85 kips (2357.330 kN).

Lateral: 5.08 kips (22.597 kN).

* + - 1. Soil Capacity: Allowable load capacity of ground screws installed in specified soils. For soil conditions that substantially differ from those shown, a registered design professional must determine ground screw soil capacity. Soil conditions are to be determined by a site-specific geotechnical report, as defined in this specification.
				1. Model 3 Ground Screw Allowable Soil Capacity:

Soil Classification: Silty sand.

Blow Count: 13

Soil Classification: Sandy clay.

Blow Count: 25

Plasticity Index: 30

Ground Screw Diameter: 3 inches (76 mm).

Ground Screw Length: 63 inches (1600 mm).

Soil Embedment Depth: 60 inches (1524 mm).

Axial Tension, Silty Sand: 1700 lbf (7562 N).

Axial Tension, Sandy Clay: 6321 lbf (28117 N).

Axial Compression, Silty Sand: 2450 lbf (10898 N).

Axial Compression, Sandy Clay: 8129 lbf (36150 N).

Lateral, Silty Sand: 1774 lbf (7891 N).

Lateral, Sandy Clay: 2360 lbf (10498 N).

Ground Screw Length: 70.9 inches (1800 mm).

Soil Embedment Depth: 67.9 inches (1725 mm).

Axial Tension, Silty Sand: 1700 lbf (7562 N).

Axial Tension, Sandy Clay: 6321 lbf (28117 N).

Axial Compression, Silty Sand: 2450 lbf (10898 N).

Axial Compression, Sandy Clay: 8129 lbf (36150 N).

Lateral, Silty Sand: 1774 lbf (7891 N).

Lateral, Sandy Clay: 2360 lbf (10498 N).

Ground Screw Length: 78.7 inches (2000 mm).

Soil Embedment Depth: 75.7 inches (1923 mm).

Axial Tension, Silty Sand: 1700 lbf (7562 N).

Axial Tension, Sandy Clay: 6321 lbf (28117 N).

Axial Compression, Silty Sand: 2450 lbf (10898 N).

Axial Compression, Sandy Clay: 8129 lbf (36150 N).

Lateral, Silty Sand: 1774 lbf (7891 N).

Lateral, Sandy Clay: 2360 lbf (10498 N).

Ground Screw Diameter: 4.5 inches (114 mm).

Ground Screw Length: 63 inches (1600 mm).

Soil Embedment Depth: 60 inches (1524 mm).

Axial Tension, Silty Sand: 3400 lbf (15124 N).

Axial Tension, Sandy Clay: 9644 lbf (42899 N).

Axial Compression, Silty Sand: 4977 lbf (22139 N).

Axial Compression, Sandy Clay: 12823 lbf (57039 N).

Lateral, Silty Sand: 3519 lbf (15653 N).

Lateral, Sandy Clay: 4394 lbf (19545 N).

Ground Screw Length: 70.9 inches (1800 mm).

Soil Embedment Depth: 67.9 inches (1725 mm).

Axial Tension, Silty Sand: 3400 lbf (15124 N).

Axial Tension, Sandy Clay: 9644 lbf (42899 N).

Axial Compression, Silty Sand: 4977 lbf (22139 N).

Axial Compression, Sandy Clay: 12823 lbf (57039 N).

Lateral, Silty Sand: 3519 lbf (15653 N).

Lateral, Sandy Clay: 4394 lbf (19545 N).

Ground Screw Length: 78.7 inches (2000 mm).

Soil Embedment Depth: 75.7 inches (1923 mm),

Axial Tension, Silty Sand: 3400 lbf (15124 N),

Axial Tension, Sandy Clay: 9644 lbf (42899 N),

Axial Compression, Silty Sand: 4977 lbf (22139 N),

Axial Compression, Sandy Clay: 12823 lbf (57039 N),

Lateral, Silty Sand: 3519 lbf (15653 N),

Lateral, Sandy Clay: 4394 lbf (19545 N),

* + - 1. .Overall Allowable Load Capacity of Ground Screw Systems:
				1. Determined upon analysis of interaction of top connection devices, ground screw shafts, ground screw threads, and ground screw soil capacity.
				2. 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.
				3. The applied load from the supported structure must not exceed the overall allowable load capacity of the Ground Screw System.
			2. Seismic Design Categories: A and B. Site Classes: A, B, C, and D. Per IBC Section 1613.
				1. Other seismic design categories or site classes are subject to approval by the code official based upon submission of a design in accordance with the code by a registered design professional.
			3. Soil Exposure Limitations:
				1. Resistivity: Less than 1,000 ohm-cm.
				2. pH: Less than 5.5.
				3. High organic content.
				4. Sulfate concentrations greater than 1,000 ppm.
				5. Soils located in a landfill.
				6. Soils containing mine waste.
			4. Supported Steel Structures: In contact with top connections.
				1. Zinc-coated steel in accordance with ASTM A123 or ASTM A153.
				2. Fasteners used to connect supported structures to top connection devices must be corrosion resistant.
				3. The adequacy of supported structures connected to flanges must be verified by a registered design professional in accordance with applicable code provisions and subjected to the approval of the code official.
1. EXECUTION
	1. EXAMINATION
		1. The approved construction documents, i.e. engineering drawings and specifications, and the manufacturer's written installation instructions, must always be available at the jobsite during installation. In case of a conflict, the most stringent requirement governs.
		2. Do not begin installation until the substrates have been properly prepared.
		3. If substrate preparation is the responsibility of another installer, notify Architect in writing of unsatisfactory preparation before proceeding.
	2. PREPARATION
		1. Clean surfaces thoroughly prior to installation.
		2. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
	3. INSTALLATION
		1. Ground Screw Systems must be installed in accordance with site-specific approved construction documents; engineering plans and specifications, and the manufacturer's written installation instructions. In case of conflict, the most stringent requirement governs.
		2. Ground Screws:
			1. The equipment used to install the ground screws must be in accordance with the manufacturer's published installation instructions.
			2. During installation the clockwise rotation of the ground screw must be accompanied by downward pressure to advance the screw one thread pitch per rotation.
				1. The force must not exceed 5 percent of the allowable axial compression load of the ground screw shaft or ground screw threads as applicable, whichever is lower.
			3. Ground screws must be installed vertically plumb into the ground with a plus or minus 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 cannot be exceeded during ground screw installation.
			4. 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 the National Institute of Standards and Technology (NIST).
			5. 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.
			6. 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).
			7. 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).
			8. 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.
		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 a registered design professional.
			1. The flange insert installation must comply with the following requirements:
				1. Flange must be fully seated, bearing on top of the ground screw, and must be centered to the screw shaft diameter body.
				2. Three friction bolts 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 1/4 turn.
			2. Installation Inspections: Per Section 1705.1.1 of the IBC, must be performed during ground screw systems installation; screw shafts and top connection devices.
				1. Items to be recorded and confirmed but are not limited to, the following:

Verification of the product manufacturer.

Product configuration and identification, including catalog numbers, for ground screws and top connection devices.

Installation equipment used.

Written installation procedures.

Friction bolts as specified in the approved construction documents and this evaluation report.

Inclination and position of ground screws.

Verification that the maximum installation torque is not exceeded. Verification that the ground screw soil embedment complies the specifications, as applicable.

Verification that top flange bracket is installed in accordance with the specifications.

Compliance of the installation with the approved construction documents.

* 1. CLEANING AND PROTECTION
		1. Clean products in accordance with the manufacturers recommendations.
		2. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION