Axial Tensile Pile Load Testing
ASTM D 3689 – 07 (per ICC-ES AC358)

1. Scope:
   The following report details the apparatus description and test procedure for **field testing** of production **piles** for axial **tensile loading**.

2. Apparatus:
   2.1 Reaction Supports: Cribbing, if used as reaction supports, should have sufficient area to transfer the loads, without settling at a disruptive rate that would prevent maintaining the applied loads. The clear distance between the reaction supports and the test pile should be at least 5 times the butt diameter or diagonal dimension of the test pile, but not less than 8 ft.
   2.2 Hydraulic Jacks: The hydraulic jacks should conform to ANSI B30.1. The hydraulic jack(s), hydraulic pump, and pressure gauge should be calibrated as a single unit to an accuracy of not less than 5% of the applied load. If more than one jack is used; each should be of the same dimensions and connected to a common manifold operated by a single hydraulic pump.
   2.3 Bearing Plates: Steel bearing plates of appropriate thickness (based on loading) should be used at the top and bottom of the hydraulic jacks and between test beams and cribbing's. The size of the bearing plate should not be less than the area covered by the base of the hydraulic ram neither less than the total width of the test beams and reaction supports. Bearing plates between test beam and timber cribbing must have a side dimension that is 1 ft greater than the total flange width of the test beam or the overall width of double test beams.
   2.4 Measuring Apparatus: All reference beams and wires should be independently supported, with a minimum clear distance of 8 ft from the test pile and cribbing. The test pile movement should be measured through both a primary and secondary system. The primary system should consist of two Dial gauges on either side of the test pile with an accuracy of 0.001 in with a minimum travel of 2 inches. The secondary system may be a wire-mirror-scale (scale accuracy – 0.01 in.), surveyor's level, or other measuring apparatus.

3. Equipment set-up:
   3.1 If feasible, excavate the immediate area of the test pile to the proposed pile cut-off elevation
   3.2 Center over the test pile a test beam of appropriate size and strength with adequate space between the bottom flange of the test beam and top surface of the test pile to provide for the anticipated movement.
   3.3 Center over the test pile and on the test beam a hydraulic jack ram of sufficient capacity for the required loading. A bearing plate must be present between the test beam and the hydraulic ram.
   3.4 Center a reaction frame over the hydraulic ram with a bearing plate between the reaction frame and the hydraulic ram.
   3.5 Anchor the reaction frame to the test pile by means of bars welded to the pile or by bars or cables embedded in the pile.
   3.6 Provide reference beams on both sides of the test pile supported independently in the ground with a minimum clear distance of 8 ft from the test pile and reaction supports. Attach dial gauges with an accuracy of ±0.001 inches with a minimum travel of 2 inches on either side of the test pile

over the reference beams. Align the dial gauge stems parallel to the longitudinal axis of the test pile and bearing on lugs attached firmly to the sides of the test pile.

4 Loading Procedure:

4.1 Actuate the hydraulic ram so that the jack is flush against the reaction frame with no slack in the system. Measure the vertical position reading of the test pile from the dial gauge readings.

4.2 Apply load increments as shown in the following loading schedule. Record gauge pressure, elapsed time since initiation of load increment, and vertical position of the test pile at the beginning and end of each load increment and decrement. Hold each load for not less than 4 minutes or not more than 15 minutes before proceeding to the next load increment. Stop loading when continuous jacking is required to maintain the respective load (or) until the hydraulic ram reaches its specified capacity. It is recommended that the full test load be removed with 5 to 10 approximately equal decrements and not less than a 4 minute or not more than a 15 minute interval between decrements, using the same time interval for all unloading decrements.

Load Increment	% Ultimate Load
1	5
2	10
3	15
4	20
5	25
6	30
7	35
8	40
9	45
10	50
11	55
12	60
13	65
14	70
15	75
16	80
17	85
18	90
19	95
20	100
Load Decrement	%Ultimate Load
1	80
2	60
3	40
4	20
5	0

5. Report:
   5.1 Include in formal test reports the following information:
   5.2 Name of helical pile contractor, structural engineer, and geotechnical engineer if any.
   5.3 Project name.
   5.4 Descriptions and Catalog numbers of test pile components.
   5.5 Date of installation and name of pile contactor's supervisor during installation of test pile.
   5.6 Name of third party test agency, if any.
   5.7 Date, starting time, and duration of field load testing.
   5.8 Unique identifier of test pile and its location relative to structure.
   5.9 Type of test performed (proof test in axial tension)
   5.10 Description of test setup and test pile installation equipment.
   5.11 Pressure gauge readings, times, and vertical position of test pile for each loading increment and decrement
   5.12 Applied loads, durations, and cumulative head movement for each loading increment and decrement.
   5.13 Listing of the calibrated apparatus used in installing, loading, and movement monitoring of test pile.
   5.14 Boring log of nearest boring when available.
   5.15 Groundwater level if encountered.

6. Interpretation of Results:
   The acceptance criteria for these piles are based on ICC-ES Acceptance Criteria for Helical Foundation Systems and Devices (AC358) section 4.4.1.2. The maximum load capacity shall be that which achieved when plunging of the helical plate occurs or when net deflection exceeds 10 percent of the helix plate diameter, whichever occurs first. Net deflection shall be total deflection minus shaft elastic lengthening. For multiple helix configurations, the average helix diameter shall be used for this criterion. The allowable design capacity of the pile shall be taken as one-half the maximum load capacity of the pile.