

Bolt Torque Control with Multi-Bolt Hardware

Background

RS Poles are hollow tubes manufactured from polyurethane resin and E-glass fibers using a filament winding process. Through bolts are used to attach many types of hardware and excessive bolt torque will ovalize the round section of a large diameter pole module enough to loosen the other bolts when more than three bolts are located in-line on the same face of rigid steel hardware.

The tensile strength of large diameter bolts is not important for hardware connections on FRP poles. FRP poles require large diameter bolts for bearing resistance on the thin wall and an excessive bolt torque condition occurs when 50 ft-lb [68 N-m] is exceeded. The proper bolt torque results in slight ovalization of the round FRP tube which acts like a spring washer and prevents fastener loosening as long as all bolts have uniform torque.

The use of perpendicular cross support (stiffening) through bolts or threaded rods located close to the connecting hardware bolts has been proven to assist in achieving bolt torque uniformity with multi-bolt hardware. These stiffening fasteners are located away from the hardware attachment bolts by 90° circumferentially and affect the torque of the inline bolts located within a ± 10 in [250 mm] vertical distance.

This bulletin discusses the procedure for achieving uniform bolt torque on multi-bolt hardware when located on large diameter RS pole modules.

Procedure

The following instructions will provide a uniform torque for all inline through bolts located on the same face of rigid hardware using 1 in [25.4 mm] diameter bolts with eight (8) threads per inch (TPI):

1. Assemble all through bolts hand tight or slightly snugged to ensure all the connecting hardware directly and evenly contacts the pole wall. This initial step is important as the nuts of each bolt will now be turned equal amounts to generate an even torque across all fasteners and any fastener slack will affect torque uniformity.
2. Install the perpendicular cross support (stiffening) bolts or threaded rods and hand tighten until the cross-support nut contacts the pole wall.
3. Apply one (1) full turn to the cross-support nut.
4. Return to the multiple through bolts located in the connecting hardware.



5. Beginning at one end of the inline bolts, apply one (1) full turn to the nut of the first bolt.
6. Working your way sequentially towards the last bolt in the line, apply one (1) full turn to the nut of each middle bolt.
7. Once the final bolt is reached, apply two (2) full turns to the final nut.
8. Work your way sequentially back to the first bolt in the line and apply one (1) full turn to each of the remaining bolts. Now each bolt will have two (2) full turns and the resulting torque value on each bolt will be close to 50 ft-lb [68N-m].

Conclusions and Discussion:

Uniform bolt torque with closely spaced inline bolts, depends on the following points:

1. All bolts in the connection need to be initially hand tightened and all hardware contacting the pole with no slack.
2. Perpendicularly installed cross support (stiffening) bolts will limit the amount that the hollow FRP pole will ovalize.
3. Using 1 in [25.4 mm] diameter bolts with eight (8) TPI and cross support bolts, 2 full turns on each nut will achieve the correct bolt torque. The circular section of the pole tube will only be ovalized by approximately $\frac{1}{4}$ in [6.3 mm] at the correct torque value. Other sized bolts with different thread pitch will need to have the number of turns calculated to compress the pole wall by the same amount to achieve the correct torque.

Achieving uniform bolt torque depends on correctly seating the connection hardware on the pole surface and then applying exactly two (2) full turns to each nut.

Completed by: Shawn van Hoek-Patterson// April 21, 2017
Name // Date

Title: Manger, Product Engineering

References:

1. Ternoey, G, RS Technical Project 17-004, Bolt Torque Analysis on Large Modules (Rev B)