

## Torque Test on 2 3/8" Backup Wrench

The results of torque test on the piper back-up tool at Stronghold Inc. August 2012

We used a 2 3/8" Piper Back-Up tool, on 1 1/2" bolts in a 4" 400 series flange. We performed 3 consecutive tests, all of which showed the piper back up tool to exceed torque specs for the appropriate sized bolt.

1. Our first test was on a horizontal flange, and we used a Hytorc 10 to torque down the nuts. Our goal was to exceed 100% torque yield for the bolt size we were using. Starting from loose we began to torque down on the nuts with the pump set to 3,000 psi. (3,430 ft. lbs.) The piper held at 3,000 psi which is 117% torque yield for that bolt. In an effort to really put the piper to the test, we then increased air pressure to 5,000 psi. (5,720 ft. lbs.) Upon reaching 5,000 psi the bolt sheared off and the piper fell to the ground along with it. At 195% yield the bolt broke but not the piper.
2. So for our second test we decided to create a break out scenario as opposed to a torquing scenario. We took the larger portion of remaining bolt and welded nuts onto either side of the outside flanges. We did not tighten the nuts against the flanges to ensure that all of the torque was being placed directly onto the piper back up tool. Again we set the air pump to 3,000 psi, and with direct torque on the piper, again the bolt sheared off. The piper tool once again held but this time the bolt broke at only 117% torque yield. This marked drop in sustainable torque could have been due in part to stress placed on the bolt from the previous test, or from the welding process. Either way the 2 3/8" piper tool withstood far beyond the torque specs for a bolt of equivalent size.
3. In our third test we wanted to minimize the amount of torque placed on the bolt in order to reach maximum percentage of torque directly on the piper. For this test we used a vertical flange setup with two nuts on the top side of the flange and one loosely attached on the bottom. The idea here was to tighten the two nuts on top of the flange against each other and see how much torque the piper could withstand. Once again we first set our pump to 3,000 psi and the piper held with no problem. Then we cranked up on the pressure to 5,000 psi and upon reaching 5720 ft. lbs. of torque the bolt again sheared off. The Piper once again held pressure up to 195% torque yield for the appropriate sized bolt.

We were not able to actually reach the break point of the 2 3/8" Piper Back-up tool today. Further tests in a more suitable environment need to be run to get those exact numbers. And of course this is only one size in the line and these tests can't speak for the entire set of Pipers. But our tests did conclude (at least for our customers) that **this back-up tool can hold up far greater force than would need to for field use. They feel very safe in selling and recommending this product to their customers.** Much thanks to Jose Perez at Stronghold for his help, he and his crew were instrumental in this testing process.

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