

MEC 20-02-00
REVISED 8/98

Case 1a

TORQUING PROCEDURE - EXTENSOMETER STRESS CHECK

1. Refer to Page 11 (new bolts) or Page 12 (reused bolts) for the bolt size to be torqued. Fill in the blanks on the Job Data Sheet (Page 9, Item 16), showing 30% and 70% torque values to be used.
2. Prepare four studs for ultrasonic stress measurement (See Page 15 "Bolt Preparation"). Install these studs in the number 1 thru number 4 bolt positions as shown in the Exhibit 1 bolt circle layout.
3. First Pass: Set the torque wrench to the 30% torque value and apply the torque wrench in the criss-cross pattern shown in Exhibit I until all bolts have been tightened once.
4. Second Pass: Set the torque wrench to the 70% torque value and repeat Step 2.
5. Third Pass: Tighten the number 1 thru number 4 studs to 100% of desired tensile stress as measured by ultrasonic extensometer. Record the torque and gage pressure required to achieve design load on the Job Worksheet. Use the average of the four recorded torque / pressure readings to tighten the remaining bolts. Attach the completed Job Worksheet to the documentation of the job.
6. The results of the 100% Third Pass will be checked by returning to the No. 1, 2, 3, and 4 bolts and measuring stress ultrasonically to ensure that each bolt has maintained target stress. The final stress in each bolt should be within +/- 10% of the target stress.
7. If additional torque is required to bring No. 1, 2, 3, and 4 bolts up to target stress, use the average torque / pressure readings to accomplish a rotational pass around the flange.
8. A final bolt / gasket Relaxation Pass will be made with the torque wrench set at 100% torque value. This pass will be completed not less than 8 hours after the third pass is completed, except where ring-type joints or solid metal gaskets are used. Apply 100% torque values to all bolts in a clockwise rotational pattern. Look for nut movement during this pass. If nut movement does occur, continue with the rotational tightening of at least 1/4 of the flange studs until no further rotation of the nuts is observed.
9. Hot Bolting: If a high-temperature flange is being torqued due to past leakage problems and if a graphite-covered gasket (CMGC, GMGC styles) is being used, complete a final Hot Bolting pass as soon as possible after the exchanger comes up to temperature. Use the torque, rotational pattern and nut tightness criteria given in paragraph #8 above.