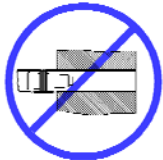
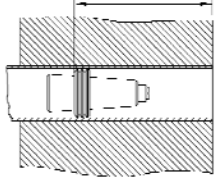


CPI/PERMA PLUG™ CLOSE QUARTER RAM INSTALLATION INSTRUCTIONS

IF TUBESHEET THICKNESS ALLOWS.
INSTALLATION DEPTH = 1" MIN



- ◆ **CPI/PERMA PLUGS MUST BE INSTALLED IN THE ROLLED SECTION WITHIN THE TUBESHEET. IF THE TUBE IS NOT EXPANDED INTO THE TUBESHEET, MAXIMUM TUBE ID LIMITS ARE REDUCED BY 0.020" (0.51MM).**
- ◆ **THE INSTALLED PLUG SHOULD NEVER PROJECT BEYOND TUBESHEET FACE UNLESS IT IS ON THE PERIMETER OR IN A THIN TUBESHEET.**
- ◆ **REMOVE TUBE SLEEVES OR SHIELDS PRIOR TO TUBE PREPARATION AND PLUGGING.**
- ◆ **NEVER HIT THE PIN WITH A HAMMER OR HEAVY OBJECT**

INSTALLATION INSTRUCTIONS

1. Follow the first five steps of CPI/Perma Plug instructions DC1220 for proper methods of tube preparation and plug sizing.
2. Remove any tapered plugs that will prohibit the ram from installing the plug to the desired depth within the tube sheet.
3. Slide the pull rod through the pivot. See Figure A.

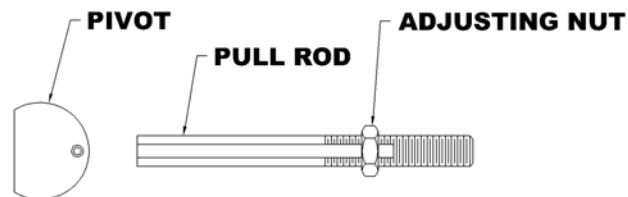


Figure A.

4. Place the positioner over the pull rod (arrow on the plug positioner points to the plug). Thread the plug into the pull rod. Hand-tighten the adjusting nut against the pivot. See Figure B. **Lubricate rounded surface of pivot and mating surface of ram with antiseize prior to operation.**

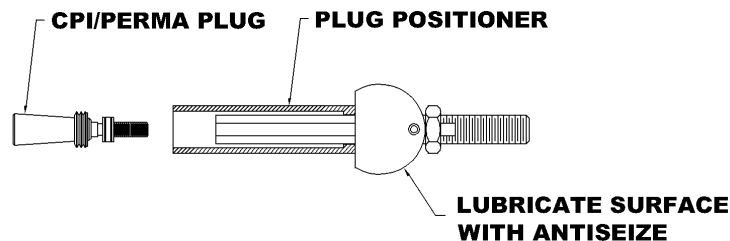
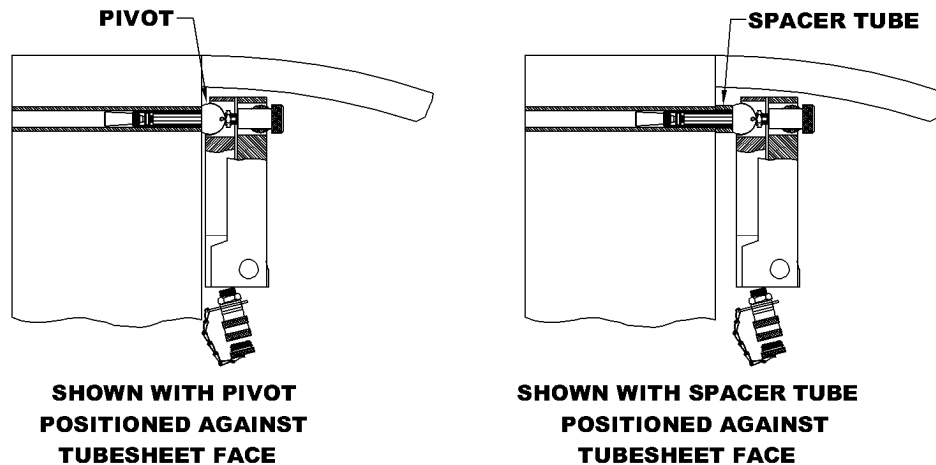


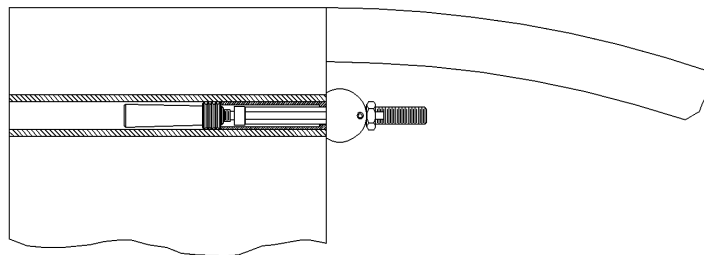
Figure B.

**Figure C.**

5. If clearance within the heat exchanger allows, mate the pull rod with ram by inserting the pull rod into the ram and hand tightening the knurled nut. Insert plug into the tube to desired depth. See Figure C.

WARNING!

THE CQ RAM MUST REST AGAINST THE TUBESHEET FACE OR THE USE OF A SPACER (NOT SUPPLIED) THAT WILL ELIMINATE ALL SPACE BETWEEN THE CQ RAM AND THE TUBESHEET FACE, DURING PLUG INSTALLATION, WILL BE REQUIRED. SEE FIGURE C. THE SPACER IS REQUIRED SO THAT DURING INSTALLATION, ANY RECOIL OF THE RAM WILL BE TRANSMITTED TO THE TUBESHEET RATHER THAN TO THE INSTALLED PLUG. PLEASE OBSERVE AND FOLLOW THE SUGGESTED INSTALLATION DEPTH GUIDELINES AND MAKE ANY SPACER WITH THE REQUIRED CPI/PERMA PLUG INSTALLATION DEPTH IN MIND. CONTACT EST SHOULD YOU HAVE ANY QUESTIONS.

**Figure D.**

6. Restricted access applications: Insert the plug end of the assembly into the prepared tube, resting the flat side against the tube sheet face. See figure D. Couple the ram to the pull rod assembly, seating the pivot into the ram. Thread the knurled nut onto the pull rod removing all slack from the assembly. See Figure C.
7. Be sure air and hydraulic hoses are properly connected. Failure to correctly seal and tighten the hydraulic fittings will cause the ram to lock in open position after activation.

8. Never stand directly behind the ram. Guide ram with hands to avoid cocking the plug. Ram should be gripped at the hydraulic connection.
9. Hold the ram so the flat face of the pivot or the spacer tube (if required) rests flat against the tube sheet face. Do not cock the ram. Insure there is intimate contact between the tube sheet face and the pivot or spacer tube.
10. Depress pump pedal, and the ram will stroke. See Figure E. As ram strokes, allow the ram to pivot away from the tube sheet. If the ram is rigidly held and not allowed to pivot, the Breakaway, pull rod, or ram may malfunction resulting in an improper plug installation. When plug "pops" immediately stop hydraulic pump. If the plug does not "pop" and the ram is fully opened, the plug is not properly installed. Stop and call E.S.T or your local representative for assistance. Close Quarters Ram will recoil when plug "pops". The recoil, in some cases, may cause the breakaway to fracture where it threads into the pull rod.

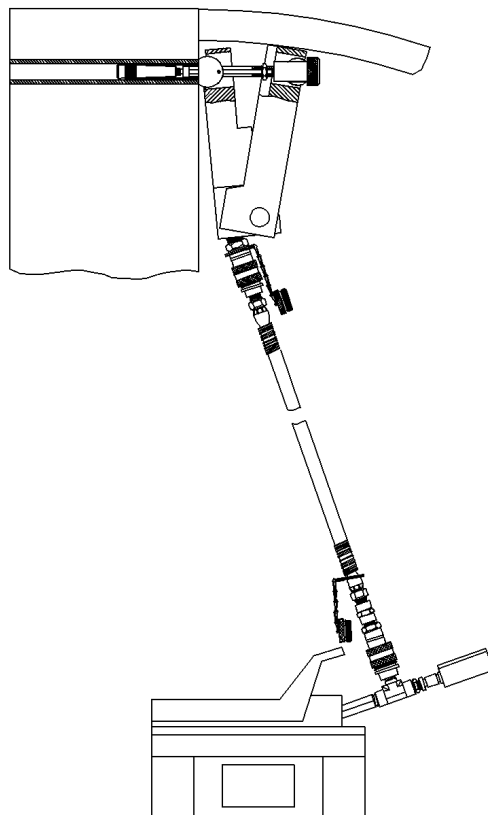
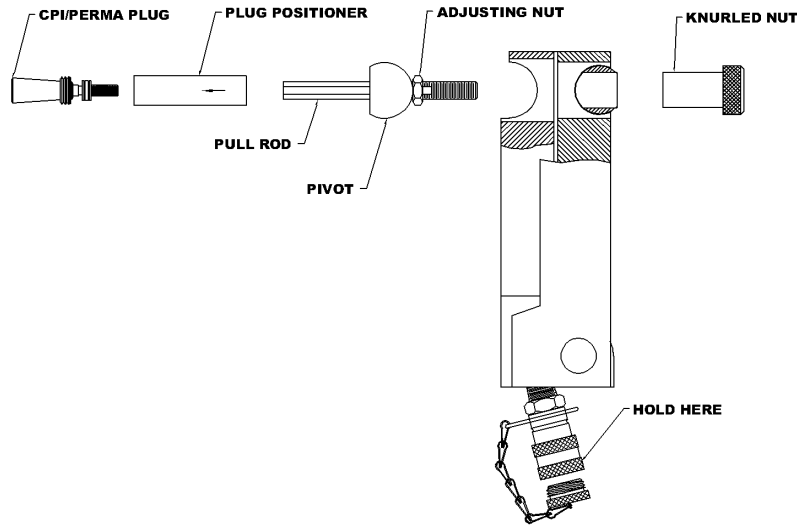


Figure E.

11. Depress front of hydraulic pump pedal, ram will retract
12. Remove knurled nut from pull rod assembly. Remove ram, remove pull rod assembly, and loosen adjusting nut. Although experience indicates that the breakaway stub will not unthread during normal heat exchanger operating conditions, the best practice is to remove the breakaway stub after plug installation. Thread next plug into pull rod assembly.



THE CLOSE QUARTERS RAM PULL ROD ASSEMBLY IS COMPRISED OF A POSITIONER, PULL ROD, PIVOT, ADJUSTING NUT, AND A KNURLED NUT.

CPI PLUGS COVERED BY PULL ROD ASSEMBLY	CLOSE QUARTER PULL ROD ASSEMBLY (1) (CQP)	CLOSE QUARTER CPI PLUG POSITIONER
V-471 (ALL MATERIALS)	CQP-471	CPP-471
V-491 (ALL MATERIALS)	CQP-491	CPP-491
V-512 (ALL MATERIALS)	CQP-512	CPP-512
V-524 (ALL MATERIALS)	CQP-524	CPP-524
V-555 (ALL MATERIALS)	CQP-555	CPP-555
V-584 (ALL MATERIALS)	CQP-584	CPP-584
V-621 (ALL MATERIALS)	CQP-621	CPP-621
V-649 (ALL MATERIALS)	CQP-649	CPP-649
V-670 (ALL MATERIALS)	CQP-670	CPP-670
V-712 (ALL MATERIALS)	CQP-712	CPP-712
V-735 (ALL MATERIALS)	CQP-735	CPP-735
V-774 (BRASS ONLY)	CQP-774	P-774
V-837 (BRASS ONLY)	CQP-837	P-837
V-899 (BRASS ONLY)	CQP-899	P-899
V-962 (BRASS ONLY)	CQP-962	P-962
V-1024 (BRASS ONLY)	CQP-1024	P-1024
V-1087 (BRASS ONLY)	CQP-1087	P-1087
V-1149 (BRASS ONLY)	CQP-1149	P-1149

NOTE: FOR 774 AND LARGER CPI / PERMA PLUG SIZES, ONLY BRASS PLUGS CAN BE INSTALLED AS THE INSTALLATION LOAD IS BEYOND THE CQ RAM'S CAPABILITIES.

QUESTIONS? Contact EST Group Customer Service at any of the following locations with questions.

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In Asia: tel: +65-6745-8560, fax: +65-6742-8700, e-mail: est-asia@curtisswright.com

On the Internet: <http://estgroup.cwfc.com>

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