### Procedure for Pop-A-Plug® CPI/Perma™ Near End Installation

#### WARNING

- Pop-A-Plug CPI/Perma plugs must be installed in the heat exchanger tube section where the tube has been expanded into the tubesheet. In cases where the heat exchanger tube has been removed, the Pop-A-Plug CPI/Perma can be installed directly into the tubesheet.
- Installed Pop-A-Plug CPI/Perma plugs should not project beyond the tubesheet face unless on the perimeter or in a thin tubesheet. In cases where the pin of an installed plug extends beyond the tubesheet, extra caution must be taken to ensure the pin is not struck by another object.
- Remove tube sleeves or shields prior to tube preparation and plugging.
- Never hit the Pop-A-Plug CPI/Perma Pin with a hammer or heavy object.
- Failure to remove weld droop prior to installing the Pop-A-Plug CPI/Perma plug will result in a false reading with the Go/No Go Gage. This false Go/No Go Gage reading will direct the user to install an undersized Pop-A-Plug CPI/Perma plug which will either leak initially or later.

Use the procedure outlined below to properly prep the tube ID and perform a near end installation with Pop-A-Plug CPI/Perma plugs.

<table>
<thead>
<tr>
<th>Step/Action</th>
<th>Additional Action/Information/Result</th>
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</table>
| 1. If tube is welded to sheet, remove any weld droop protruding into the tube ID with a Tapered Reamer. Removing weld droop is a fairly quick process and should only take 15 – 30 seconds to remove. Only remove the weld droop (burr) projecting into the tube ID. | ![Figure 1A - Standard Near End Install](image1)怡靠了受害者。Extended Tapered reamers are available for Air Cooled Heat Exchanger (ACHE or Fin-Fan) applications. Install tapered reamer in a variable speed drill and lightly lubricate. The small end of the reamer should fit into tube ID and large end should not. For Air Cooled Heat Exchanger (ACHE) applications, choose a reamer with an extension long enough to reach the tubesheet through the header box. The reamer should be operated in the following manner:  
- Keep reamer axis parallel to tube axis and lightly squeeze the trigger on the drill to a low rpm in short intervals.  
- Use slight forward pressure. If too much pressure is used the reamer may catch.  
- Never force the reamer into the tube ID. |
| 2. Service permitting, puncture both ends of the tube to be plugged just beyond the tubesheet to minimize the potential of trapped pressure. | ![Figure 1B - ACHE Near End Install](image2)怡靠了受害者。 |

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3. Take initial tube ID measurement with Go/No-Go Gage.
For ACHE applications, install the Threaded Go/No-Go Gage onto the Gage Extension Rod and take initial tube ID measurement with Go/No-Go Gage.

4. Select the smallest of the Tube Preparation Brushes furnished in the Brush Kit that interferes with the tube ID. For ACHE applications, the brush will need to be threaded onto the appropriate length Extension. Operate the brush with a power drill for at least 30 seconds (5 seconds for 90/10 Cu/Ni and Brass tubes) back and forth from the tube opening to the installation depth evenly to prevent a tapered condition. If as a result of uneven brushing the tube entrance is smaller, the installed plug may be undersized and leak.

5. Carefully inspect tube for scale, pitting or other defects. These conditions must be corrected for plug to seal properly.

6. Take a second measurement with Go/No-Go Gage to installation depth. For ACHE applications, the Extension will again be required to reach the tubesheet.

**Note:** If No-Go (larger) end of gage fits into tube to installation depth, the next larger plug size is needed.

7. Assemble the Hydraulic Ram Package to be used.

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8. Thread the Pop-A-Plug size that matches the correct Go/No-Go Gage size onto the appropriate Pull Rod Assembly. (See Documents DC1224 for CPI Application Data, and DC1066 for Installation Equipment.)

All arrows on Pull Rod Assembly parts should point toward the Pop-A-Plug. Channel head pull rod assemblies are to be used for ACHE applications, to acquire sufficient length to reach tubesheet through the header box.


Failure to correctly seat and tighten hydraulic fittings will cause ram piston to lock in extended position after activation.

10. Insert Pop-A-Plug into prepared tube to 1” (25.4 mm) installation depth. If the thickness of the tubesheet or the expanded length of the tube cannot accommodate a 1” (25.4 mm) installation depth, install the plug as deep as possible while keeping the Pop-A-Plug positioned within the tubesheet.

For ACHE Applications, it will be necessary to guide the pull rod assembly with the plug threaded into the tube from through the plug sheet. Thus, it is advised to set the Stand-Off Ring a measured distance to achieve an appropriate Installation Depth. Typically, this will be the 1” (25.4 mm) Installation Depth added to the header box depth.

11. Depress Hydraulic Pump pedal, Hydraulic Ram will stroke.

If plug does not "POP" and PsiG exceeds 7000 PsiG (483 BarG) on gage, STOP. Depress front of Hydraulic Pump pedal and Hydraulic Ram will retract. If the ring has not contacted the tube ID and plug can be removed from the tube on this first stroke you may have an UNDERSIZED PLUG. Otherwise tighten knurled nut and depress pump pedal. If plug does not "POP", on second stroke an UNDERSIZED PLUG has been installed, stop and contact EST Customer Service, or your local representative for assistance.

Questions? Contact EST Group Customer Service at any of the following locations.

**Table 1: Operator Troubleshooting Guide**

<table>
<thead>
<tr>
<th>Problem</th>
<th>Cause</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Imperfections such as pitting, gouges or scratches still exist within</td>
<td>Deep imperfections can exist from normal heat exchange operation or</td>
<td>Continue brushing with Tube Preparation Brush until little or no</td>
</tr>
<tr>
<td>the tube ID after brushing.</td>
<td>maintenance work.</td>
<td>resistance is encountered. If imperfections still exist, move up to</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the next Pop-A-Plug size and repeat tube preparation steps.</td>
</tr>
<tr>
<td>Plug Positioner flares or becomes stuck on installed plug.</td>
<td>Undersized Pop-A-Plug</td>
<td>Gage or measure tube ID at location where Pop-A-Plug will</td>
</tr>
<tr>
<td>Breakaway fractures on side opposite the undercut. (Normally the</td>
<td>The Pop-A-Plug was installed beyond the thickness of the tubesheet</td>
<td>be installed. Refer to heat exchanger datasheet to determine tubesheet</td>
</tr>
<tr>
<td>Breakaway fractures at the undercut) Pop-A-Plug does not “POP” after</td>
<td>Heat Exchanger tube is not expanded (rolled or similar) into the</td>
<td>thickness. Install Pop-A-Plug within the tubesheet length.</td>
</tr>
<tr>
<td>second stroke of hydraulic ram.</td>
<td>tubesheet.</td>
<td>Roller expand heat exchanger tube at Pop-A-Plug installation depth</td>
</tr>
<tr>
<td></td>
<td></td>
<td>otherwise contact EST for assistance.</td>
</tr>
<tr>
<td>Go/No-Go Gage indicates proper Pop-A-Plug size, but problems related</td>
<td>Weld droop has not been removed. Heat exchanger tube is only “soft</td>
<td>Remove weld droop using tapered reamer. Using Tube Preparation Brush,</td>
</tr>
<tr>
<td>to an undersized Pop-A-Plug occur.</td>
<td>rolled” for a short distance and is expanded to a larger tube ID</td>
<td>enlarge the heat exchanger tube so that the tube entrance and “soft roll”</td>
</tr>
<tr>
<td></td>
<td>beyond the “soft roll” length.</td>
<td>area has same ID as at the Pop-A-Plug installation depth.</td>
</tr>
<tr>
<td>Hydraulic Ram is stuck in extended position and will not retract.</td>
<td>Mating quick connects between Hydraulic Ram and hose or between</td>
<td>Using gripping pliers turn locking collar on female quick connect to</td>
</tr>
<tr>
<td></td>
<td>Hydraulic Pump and hose are not fully engaged and tightened. Piston</td>
<td>further engage connection. Continue tightening until Hydraulic Ram</td>
</tr>
<tr>
<td></td>
<td>within Hydraulic Ram has been damaged</td>
<td>retracts. Return Hydraulic Ram to EST for repair.</td>
</tr>
<tr>
<td>Stem of Tube Preparation Brush fractures</td>
<td>Brush size is too large</td>
<td>Gage the heat exchanger tube using Go/No-Go Gage and select</td>
</tr>
<tr>
<td></td>
<td>The brush was forced or advanced too quickly</td>
<td>corresponding brush size. Slowly feed the Tube Preparation Brush into</td>
</tr>
<tr>
<td></td>
<td></td>
<td>the heat exchanger tube if significant resistance is encountered.</td>
</tr>
<tr>
<td>Bristles fall out of Tube Preparation Brush</td>
<td>The brush was run counter-clockwise in the drill.</td>
<td>Obtain a new brush and operate brush clockwise.</td>
</tr>
<tr>
<td>Inadequate space to get plug into tube</td>
<td></td>
<td>Use EST’s Close Quarter Ram for Pop-A-Plug installation.</td>
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</tbody>
</table>

*Note: Weeping during hydro test indicates small surface imperfections in the tube that are difficult to see. A large leak indicates a surface imperfection in the tube such as scarring from a drill used to remove a sleeve or tapered pin that should have been seen in step 5. In either case, remove Pop-A-Plug using EST Group Plug Removal Tool and repeat procedure using next larger Tube Preparation Brush and Pop-A-Plug size.*