

COMANCHE PEAK NUCLEAR POWER PLANT

UNIT COMMON, 1 & 2

MAINTENANCE SECTION - MAINTENANCE MANUAL

FOR EMPLOYEE USE:

DATE VERIFIED/INITIALS

/

LATEST PCN/EFFECTIVE DATE

PCN 9

/

11-08-12

LEVEL OF USE:
REFERENCE USE

QUALITY RELATED

HEAT EXCHANGER TUBE PLUGGING

PROCEDURE NO. MSM-G0-5870

REVISION NO. 0

EFFECTIVE DATE: August 29, 2002

PREPARED BY (Print): Roger L. Barckhoff Ext: 5034

TECHNICAL REVIEW BY (Print): Darron Jones Ext: 5619

APPROVED BY: R. Gill Date: 8-22-02

SMART TEAM MANAGER

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL		UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING		REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 3 OF <u>18</u>

1.0 PURPOSE

The purpose of this procedure is to describe methods of tube plugging for the following heat exchangers:

CP1/2-CCAHHX-01/02 CP1/2-MECCJW-01/02 CP1/2-MECCLO-01/02

CP1/2-COHTFH-01 through 08 CP1/2-FWHTFH-01 through 04

CP1/2-COCNAC-01/02 CP1/2-TWAHHX-01

CP1/2-COCNMC-01/02 CP1/2-GSCNGS-01/02 CP1/2-COHTDC-01/02

2.0 ACCEPTANCE CRITERIA

This procedure contains in-process inspections. The acceptance criteria is the satisfactory completion of all applicable instructions.

3.0 DEFINITIONS/ACRONYMS

3.1 HX - Heat Exchanger

3.2 Pop-~~a~~-A-Plug - a brand name of plug featuring a separating tube plug with an expanding seal ring. May be either Pop-A-Plug II (P2) High Pressure or Perma Plug medium pressure model.

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 4 OF 18

4.0 REFERENCES

- 4.1 CP-0049-001, Component Cooling Water Heat Exchanger
- 4.2 2323-MS-49, CPSES Specification, Component Cooling Water Heat Exchanger
- 4.3 Trane Company Manual for Retubing
- 4.4 CP-0024-001 and CP-0024-002, Closed Feedwater Heaters and External Drain Coolers, Struthers Wells (Units 1 and 2) respectively
- 4.5 STA-606, "Control of Maintenance and Work Activities"
- 4.6 EPG-731, ASME Section XI Repair/Replacement Activities
- 4.7 Technical Evaluation No. SE-90-2691
- 4.8 MSM-G0-0907, "Installation and Removal of Anti-Sweat and Thermal Insulation"

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 5 OF 18

- 4.9 American Power Services, Inc., Explosive Plugging Procedure HPS-EP-021, Rev. 2
- 4.10 EPG-6.01, ASME VIII Pressure Vessel Repair and Alteration@
- 4.11 CR-2010-003052 - adding external drain coolers
- 4.12 CR-2010-004394 - changing brush use limit to no more than 50 times
- 4.13 CP-0023-002, AHeat Exchange Equipment Surface Condenser@ (Main Condenser)
- 4.14 CP-0060-001, ASurface Condenser and Auxiliary Equipment@ (Aux. Condenser)
- 4.15 CP-0052-001, ATurbine Plant Cooling Water Heat Exchanger@
- 4.16 CP-0034-001C, AAssociated Publications Volume III BK 1,2, & 3 (Diesel Generator Jacket Water Cooler)
- 4.17 CP-0003-002, ASteam Turbine Generator- Volume I@ (Main Turbine Gland Steam Condenser)
- 4.17 CP-0003-004, ARelated Equipment Manuals Volume II - 2" (Main Turbine Gland Steam Condenser)

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL		UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING		REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 6 OF <u>18</u>

4.18 CP-0005-002, ASteam Turbine Feed Pump Drive@ (Auxiliary Gland Steam Condenser)

4.19 EV-CR-2012-011647-5, Pop-A-Plug Insertion Depth

5.0 PRECAUTIONS, LIMITATIONS AND NOTES

5.1 Discrepancies or unsatisfactory results should reported to Responsible Maintenance Supervisor for follow-up actions in accordance with STA-606 and documented in the ARemarks@ section of this procedure.

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 7 OF 18

- 5.2 The components listed below are under jurisdiction of ASME Section VIII and Section III (XI). The work order will indicate as to what ASME section work is to be performed. Prior to any repairs, replacements, tube plugging alterations, or reratings being performed on pressure vessels Engineering Programs shall be notified of scope of work to be performed. ANII shall be notified and afforded opportunity to review work packages containing ASME Section XI activities and establish hold points prior to beginning work.

CP1/2-CCAHHX-01/02

CP1/2-MECCJW-01/02

CP1/2-MECCLO-01/02

- 5.3 The following tag numbers are ASME Section VIII components (not under jurisdiction of Section III or XI).

CP1/2-COHTFH-01 through 08

CP1/2-FWHTFH-01 through
04

CP1/2-COCNAC-01/02

CP1/2-TWAHHX-01

CP1/2-COCNMC-01/02

CP1/2-GSCNGS-01/02

CP1/2-COHTDC-01/02

- 5.4 Independent/concurrent verifications have been reviewed and are in compliance with STA-694.

- 5.5 IF welded plugs are to be installed, THEN ENSURE an approved weld data

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 8 OF 18

record has been issued.

6.0 PREREQUISITES

6.1 ENTER the following information:

Work Order No. _____

Component Tag No. _____

Unit No. _____

6.2 _____ / _____ For AMSE components, CONTACT AI / ANII (Circle as appropriate) Inspector for review of work package for any reviews or hold points prior to any repairs, alterations, or reratings.

Person Contacted _____

Date/Time _____ / _____

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 9 OF 18

NOTE: Step 6.3 may be worked concurrently with preparation to install pop-a-plug.

6.3 _____ / _____ IF Pop-A-Plugs are to be installed in CCW Heat Exchangers, Diesel Generator Jacket Water Heat Exchangers, Diesel Generator Lube Oil Heat Exchangers, Auxiliary Gland Steam Condensers or Main Gland Steam Condensers, THEN CONTACT Equipment Reliability Engineer to determine proper plug insertion depth.

Component Location Number _____ Insertion Depth _____

Equipment Reliability

Engineer: _____ / _____

Name

Date

7.0 TEST EQUIPMENT

7.1 Recommended Tools and Materials List

Drill Bit w/pilot

Tube Rolling Tool

Bit for Counterboring

Tapered Pin

Swagging Tool

Stub Removal Tool

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL		UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING		REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 10 OF <u>18</u>

Pop-A-Plug Go-No-go gauge

Pop-A-Plug Kits – either P2 or Perma Plugs

Explosive Plugs (CMAR 96-000153-00-00 for American Power)

Tube cleaning brushes

7.2 Measuring and Test Equipment List

Snap gauge

Outside micrometer

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 11 OF <u>18</u>

8.0 INSTRUCTIONS

1.1 General

1.1.1 For equipment that is Section XI any repair, replacement, tube plugging modification of pressure boundary part(s) or bolting materials shall be performed in accordance with instructions on work order and procedure EPG-731.

Table of Contents	
General	<u>6</u>
Tube Plugging Preliminaries	<u>6</u>
Driven Plugs	<u>7</u>
Welded Plugs	<u>7</u>
Pop-A-Plug	<u>10</u>

1.2 Tube Plugging Preliminaries

NOTE: If the component being worked on is under jurisdiction of EPG-6.01 OR ASME Section XI or III, the work order will indicate as to what ASME section work is to be performed. Prior to any repairs/replacements, welded tube plugging, sleeving, tube replacement, alterations, or reratings being performed on pressure vessels, Engineering Programs Manager shall be notified of scope of work to be performed. For ASME III heat exchangers the ANII Inspector shall be notified and afforded opportunity to review and establish hold points for packages prior to beginning work.

NOTE: Mechanical plugs installed in ASME components are considered a Maintenance Activity^o in accordance with EPG-731. Welded plugs, sleeves and tube replacements are Repair/Replacement Activities.

- 1.2.1 DETERMINE AND MARK tube to be plugged at each end of bundle.
- 1.2.2 CLEAN tube to be plugged at both ends.
- 1.2.3 REVIEW Attachment 10.1, THEN INDICATE method of plugging:

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL		UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING		REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 12 OF 18

Driven plugs per Step 8.3	Welded plugs 9 per Step 8.4.	Pop-A-Plug 9 Per Step 8.5	Explosive plugs 9 (Per reference 4.9)
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THEN RECORD material information as applicable in Table 1. Material does not need to be ASME for mechanical plugs.

Table 1	
<u>Material Identification, as available</u>	
Material A- _____	RIR/RR * _____
Heat No. _____	Lot No. _____ TSN _____
(Also for plug material)	

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 13 OF 18

QC HOLD POINT - Deleted

ENGINEERING VERIFICATION

[IV] _____ / _____ VERIFY plug material (either manufactured or contractor supplied, as applicable) is correct.

1.3 Driven Plugs

1.3.1 MEASURE I.D. of tube to be plugged at both ends AND HAVE plugs made in accordance with Attachment 10.1.

1.3.2 INSTALL proper size plug in each end of tube AND SET.

1.3.3 _____ / _____ ENSURE all tubes identified to be plugged have been plugged.

1.4 Welded Plugs

On High Pressure Feedwater Heaters only (CP1/2-FWHTFH- 01, 02, 03, 04), IF tube to be plugged is inaccessible for drilling and rolling due to being located too close to waterbox wall or partition plate, THEN PROCEED to Attachment 10.2 for alternate instruction.

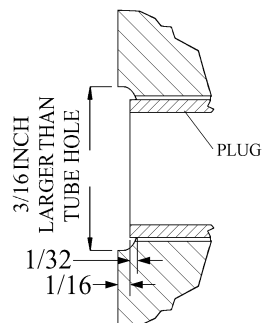
1.4.1 SELECT a drill bit with pilot, as near as possible, but not exceeding

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL		UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
	HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0	PAGE 14 OF 18
		<u>REFERENCE USE</u>	

O.D. of tube end to be plugged.

- 1.4.2 REMOVE tube to a depth of three inches using proper sized bit and pilot.
- 1.4.3 REMOVE any thin shell of tubing left in hole.
- 1.4.4 REMOVE all burrs from end of tube.
- 1.4.5 ROLL tube end 1-1/2 inches or within 1/8 inch of back of tube sheet, whichever is less.

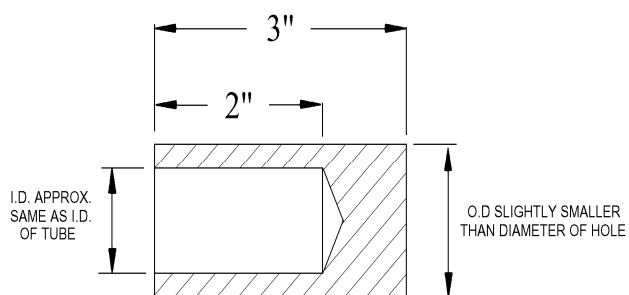
CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 15 OF 18



1.4.6 COUNTERBORE hole with a bit 3/16 inch larger than O.D. of tube. REFER to Figure 1.

1.4.7 CLEAN AND DEGREASE hole.

1.4.8 MEASURE diameter of hole and have a plug prepared from 304 or



316SS in accordance with Figure 2.

1.4.9 EXPAND I.D. of plug using a tapered pin or swaging tool to ensure a tight fit.

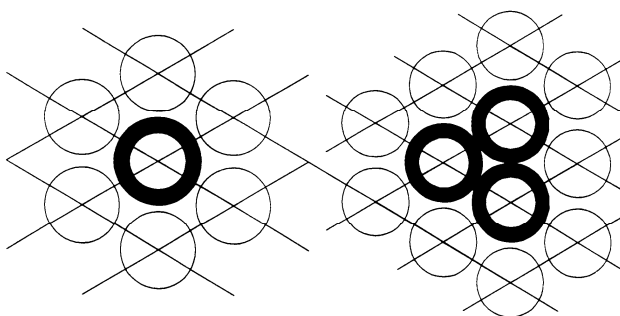
1.4.10 INSTALL plug into hole flush to 1/32 inch above bottom of

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL		UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING		REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 16 OF <u>18</u>

counterbore. REFER to Figure 1.

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 17 OF 18

1.4.11 WELD plug to tube sheet in accordance with site welding procedures



and work order instructions. REFER to Figure 3.

Welder _____ I.D. _____ Date _____

1.4.12 _____/_____ ENSURE all tubes identified to be plugged have been plugged.

1.4.13 _____/_____ ROLL all tubes around plugged tubes for a minimum of three rows.

CPSSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 18 OF 18

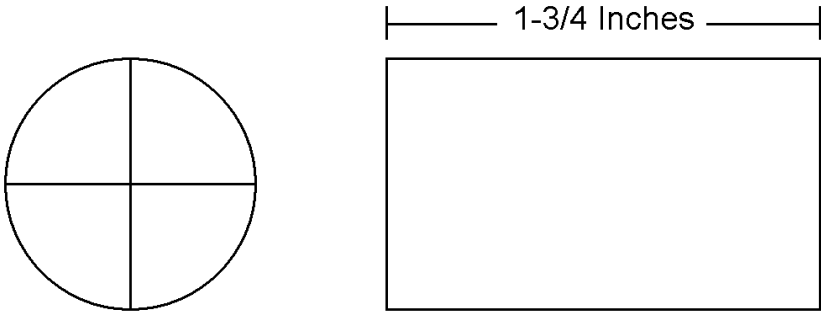
1.5 **Pop-A-Plug.** May be either a Pop-A-Plug II (P2) high pressure plug or medium pressure Perma Plug. General plug sizing, tube preparation and plug installation procedures will be similar for both plug types. Where different the plug type will be specifically identified.

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NOTE: Correct size of Pop-A-Plug II (P2) must be 0.001" to 0.020" smaller than actual tube I.D. in position where plug is to be installed. A correctly sized Perma Plug must be within at least 0.001" to 0.050" smaller than the tube ID depending on the nominal plug size and material.

1.5.1 **Sizing**

1.5.1.1 Determine the tube sheet thickness for the HX. Refer to Attachment 10.1 for the correct installation depth. Tube sizing and tube end preparation need only occur from the tube end through 1/2" beyond the prescribed installation depth.



1.5.1.1.5.1.2 TAKE measurements both horizontally and vertically of each tube I.D. to a depth of 1-3/4 inches at the prescribed installation depth AND RECORD. Larger of measurements will denote tube I.D.

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Horizontal _____ Inches
Vertical _____ Inches

1.5.1.21.5.1.3 IF tube measurement cannot can be performed, THEN consult HX Manufacturer=s tube data sheet. From data sheet DETERMINE if tubes have been rolled or expanded.

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1.5.2 **Preparation and Size Verification (Must be done for each tube being plugged.)**

1.5.2.1 IF applicable, USE a tapered reamer AND REMOVE any weld droop or eyebrow from I.D. of tube. Remove any chips or debris after

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL		UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING		REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 19 OF <u>18</u>

|

reaming.

CPSSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 20 OF 18

NOTE: A dedicated Go/No-Go Gage and tube brush are supplied with each Pop-A-Plug II kit.
A dedicated Go/No-Go Gage is supplied with each Perma Plug Kit.

1.5.2.2 INSERT Go end of Go/No-Go Gage into tube end through the desired installation depth determined from Attachment 10.1. If gage does not fit, kit selected is too large and a smaller kit should be selected and this step repeated.

1.5.2.3 IF Go end of gage fits, THEN ATTEMPT to fit No-Go end into tube.

1.5.2.4 IF No-Go end fits then kit chosen is too small. SELECT a larger kit and repeat step 81.5.2.2.

1.5.2.5 If GO end gage fits into tube to 1-3/4" minimum and No-Go end does not fit, THEN kit selected is proper size.

1.5.2.6 ENSURE tube brush and Pop-A-Plug ~~II~~ going to be used are marked with same size as on correct Go/No-Go Gage.

CAUTION: Excessive brushing can remove too much material and require using next larger size plug. Brushing for 30 seconds in harder tube materials can remove approximately 0.005" 0.010" of material.

NOTE: Do not use brush more than 50-30 times before replacement on Perma-~~Plugs~~ and not more than 10 times for other Pop-~~aA~~-Plug II (P-2s).

1.5.2.7 SELECT the smallest tube brush that interferes with the tube AND BRUSH tube as follows:

1.5.2.7.1 Do not use an oversized brush, force the brush into the tube, bend the stem or reverse rotation.

1.5.2.7.2 BRUSH using a back and forth motion from the tube opening to the plug installation depth to prevent tapered condition.

1.5.2.7.3 BRUSH a minimum of 30 seconds.

1.5.2.7.4 Do not use brush more than 50-30 times for Perma-Plugs and not more than 10 times for Pop-~~aA~~-Plugs II (P-2).

1.5.2.8 INSPECT tube AND ENSURE tube is free from scale, pitting or other defects.

1.5.2.9 RE-GAUGE tube, IF No-Go end now fits into tube, THEN next larger Pop-A-Plug ~~II~~ must be used and steps 81.5.2.2 through 81.5.2.8 must be repeated.

CPSSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 21 OF 18

1.5.3 **Hydraulic Installation**

- 1.5.3.1 CHECK pump oil level.
- 1.5.3.2 CONNECT hose from pump to ram.
- 1.5.3.3 CONNECT air supply.
- 1.5.3.4 TEST ram/pump assembly.
- 1.5.3.5 OBTAIN proper pull rod assembly based on size of plug being installed.
- 1.5.3.6 VERIFY pull rod is assembled correctly. Directional arrows on pull rod assembly components should always point towards Pull Rod end where plug will be attached.

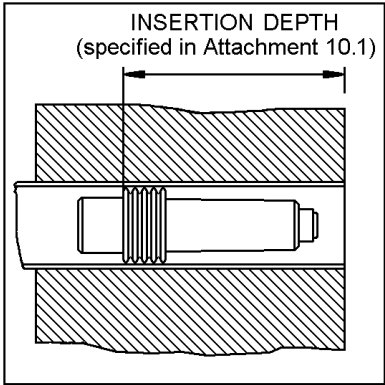
CAUTION: If pPop-aA-pPlug sealing ring is inserted too far (e.g., behind tube sheet) it will not seal properly and make repairs very difficult.

- 1.5.3.7 **Channel Head Pull Rod only:** ADJUST Stand-off ring to allow each plug to be installed to proper insertion depth. See Figure 5 and Attachment 10.1 for proper insertion depth.
- 1.5.3.8 THREAD selected Pop-A-Plug onto Pull Rod, ENSURE Breakaway thread is fully engaged into Pull Rod Assembly or stripping may occur.
- 1.5.3.9 INSERT Pull Rod into Ram with arrow pointing towards Pop-A-Plug.

NOTE: Knurled Nut for Pop-A-Plug II (P2) sizes 0.400-0.860 and Perma Plug sizes 0.491-0.735 is stepped. Smaller diameter step should be installed towards ram.

- 1.5.3.10 INSTALL Knurled Nut onto Pull Rod until tight against large black nut on back of Ram.
- 1.5.3.11 ENSURE there is no play between parts of assembled Pull Rod and Plug Position and Plug Positioner is should be tight against ring of Pop-A-Plug.
- 1.5.3.12 Install Safety Cable from ram over the end of the Pull Rod. Secure with Lock nut. Tighten finger tight.

CPSSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 22 OF 18



~~1.5.3.13~~~~1.5.3.13~~ HOLD Ram AND INSERT Pop-A-Plug ~~H~~ into tube to the Pop-a-Plug insertion depth specified in Attachment 10.1 as measured in Figure 5.

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CAUTION: When using hydraulic ram, keep all personal and extremities clear from rear of ram. Always install safety cable then lock nut onto pull rod prior to ~~operating ram to installing a Pop-A-P~~plug.

NOTE: The hydraulic ram on PAP-6600 Ram Package has a maximum stroke of 1". When ram bottoms out, pressure shown on gauge will dramatically increase ~~but the plug will not "pop"~~.

~~1.5.3.13~~~~1.5.3.14~~ GUIDE ram with hands to avoid cocking AND ACTIVATE Hydraulic Pump by stepping on pedal marked APump@.

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~~1.5.3.14~~~~1.5.3.15~~ CONTINUE to operate pump until plug APops@ or stroke of ram bottoms out and pressure gauge on pump reaches 7000 psi.

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~~1.5.3.15~~~~1.5.3.16~~ IF after one full stroke of ram, Pop-A-Plug ~~H~~ has not

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CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL		UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING		REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 23 OF <u>18</u>

contacted tube I.D., Pop-A-Plug II is too small. REMOVE plug AND
REPEAT sizing steps of this procedure.

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 REFERENCE USE	PAGE 24 OF 18

~~1.5.3.16~~1.5.3.17 IF a second stroke is needed THEN :

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~~1.5.3.16.1~~1.5.3.17.1 CONTINUE to support weight of ram.

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~~1.5.3.16.2~~1.5.3.17.2 STEP on ARelease@ pedal on hydraulic pump.

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~~1.5.3.16.3~~1.5.3.17.3 REMOVE slack in Pull Rod by tightening knurled nut until there is no play between parts of assembled Pull Rod.

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~~1.5.3.16.4~~1.5.3.17.4 IF Pop-A-Plug ~~it~~ does not APOP@ on second stroke or if pressure gauge reaches 7000 psi before plug APOPS@, plug is too small. REMOVE, RESIZE and REPLUG.

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~~1.5.3.17~~1.5.3.18 RELEASE pump pressure. THEN REMOVE knurled nut and broken breakaway section from Pull Rod. DISCARD breakaway section.

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CAUTION: Care should be taken to ensure the plug remains seated in-place (undisturbed) when removing the breakaway stub.

~~1.5.3.19~~1.5.3.181.5.3.12 / Carefully, REMOVE breakaway stub from plug. ENSURE plug does not get hit and breakaway stub is not forced when removing breakaway stub from plug. DISCARD breakaway stub.

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~~1.5.3.19~~1.5.3.20 RETURN to applicable component procedure.

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1.5.4 / ENSURE all tubes identified to be plugged have been plugged.

IV

/ VERIFY that all breakaway stubs have been removed from all plugs installed on this Work Order.

CPSES MAINTENANCE SECTION - MAINTENANCE MANUAL	UNIT COMMON, 1 & 2	PROCEDURE NO. MSM-G0-5870
HEAT EXCHANGER TUBE PLUGGING	REVISION NO. 0 <u>REFERENCE USE</u>	PAGE 25 OF 18

1.6 Post Maintenance Activities

- 1.6.1 ATTACH MSM-G0-5870 documentation and any other applicable documentation, forms, etc. to the Work Order AND PROCESS in accordance with STA-606.

9.0 RESTORATION/POST WORK ACTIVITIES

None

10.0 ATTACHMENTS/FORMS

10.1 Tube Plugging Data

10.2 Installing Welded Plug in Inaccessible Tube Location (High Pressure Feedwater Heaters (CP1/2-FWHTFH- 01, 02, 03, 04 ONLY)

ATTACHMENT 10.1

Page 1 of 1

TUBE PLUGGING DATA

	Plugging Methodology								
	Low Pressure Feedwater Heaters and External Drain Coolers***	High Pressure Feedwater Heaters**	CCW Heat Exchangers	DG JW/LO Heat Exchangers	TPCW Heat Exchangers	Aux Cndsr	Main Cndsr	Aux Gland Steam Cndsr	Main Gland Steam Cndsr
Driven	X		X	X				X	X
Welded	X	X							
Pop-a-Plug*	X	X	X	X	X	X	X	X	X
Pop-a-Plug Insertion Depth (Plug Type)	1-3/4 inch (P2)	1-3/4 inch (P2)	**** (Perma Plug)	**** (Perma Plug)	1-3/8 inch (Perma Plug)	3/4 inch (Perma Plug)	1 inch (Perma Plug)	**** (Perma Plug)	**** (Perma Plug)
Explosive	X	X							
	Driven Plug Specifications								
Material	Stainless	N/A	Brass	Brass	N/A	N/A	N/A	Stainless	Stainless
Length	1.5 Inch	N/A	1.5 Inch	1.5 Inch	N/A	N/A	N/A	1.5 Inch	1.5 Inch
Taper	See note below	N/A	0.010 in./in.	0.010 in./in.	N/A	N/A	N/A	See note below	See note below
* - Preferred method ** - High Pressure Feedwater Heaters are location numbers: CP1/2-FWHTFH- 01, 02, 03, 04									

*** - External drain Coolers are location numbers: CP1/2-COHTDC- 01, 02

*** - Contact Equipment Reliability Engineer for proper insertion depth.

Note: One end of plug to be 0.015 to 0.020 inch larger than tube I.D. and the other end 0.015 to 0.020 inch smaller than tube I.D.