

Maintenance Procedure for Job Ticket  
TMI Nuclear Station Unit 1

This form outlines the format and acts as a guide for a maintenance procedure. Due to the limited size of the form, additional pages may be attached as required. AP 1001D Enclosure 5 Work Request procedure should be used as a guide in preparing the maintenance procedure.

1. **Purpose** Job Ticket CE843  
Procedure to re-roll Westinghouse tube plugs and perform pull testing on RC-H-1A/B as directed by Plant Engineering.
2. **Description of system or component to be worked on**  
Once Through Steam Generator RC-H-1A/B
3. **References**  
See attached.
4. **Special Tools, Materials and/or Qualifications Required**  
See attached.
5. **Limits and Precautions**  
See attached.

Manager - Plant Maintenance TMI-1

Approval

*RR Hansen*

Date

*9-22-84*

Safety Review (PRG)

Approval

*McKelvey*

Date

*9/24/84*

Operation and Maintenance Director

Approval

*MF Rose*

Date

*9/22/84*

Quality Control

Approval

*QF Marsden*

Date

*9/23/84*

### 3.0 REFERENCES

- 3.1 AP 1002
- 3.2 AP 1020
- 3.3 AP 1030
- 3.4 Radiation Protection Plan
- 3.5 Met-Ed Safety Manual
- 3.6 SP-1101-22-019 - Westinghouse OTSG Rolled Plug Pull Testing  
Technical Specification
- 3.7 SE 123094-002 - Westinghouse OTSG Rolled Plug Testing Safety  
Evaluation
- 3.8 SAE-SGSE-FP-68 (84) - Westinghouse Roll Plug Pull Test Procedure (Attached)
- 3.9 SP-1101-12-039 - Acceptance Criteria for OTSG Repair Tools and  
Materials
- 3.10 GPUNC Operational Quality Assurance Plan
- 3.11 FTS-FP-1460 (84) - Westinghouse Re-Roll of TMI-1 Roll Plugs -  
Hands-On Procedure (Attached)
- 3.12 B. Elam memo MC-84-2781, dated Sept. 22, 1984. } 28  
Subject: OTSG Rolled Plug Repair Program (Attached) } 9-22-84  
Revised 9-23-84. 22W

### 4.0 SPECIAL TOOLS; MATERIALS AND/OR QUALIFICATIONS REQUIRED

- 4.1 Appropriate Handtools and Consumable Items.
- 4.2 Westinghouse Pull Test Equipment if required (provided by Westinghouse)
- 4.3 OTSG Lights and Communications Equipment
- 4.4 OTSG Ventilation Systems
- 4.5 OTSG Cold Leg Covers
- 4.6 OTSG Cameras and Monitoring Equipment
- 4.7 Tube and Plug Markers
- 4.8 Expandable Plugs for Sealing Leaking Tubes
- 4.9 Westinghouse Plug Rolling Equipment (provided by Westinghouse)

## 5.0 LIMITS AND PRECAUTIONS

- 5.1 The primary side of both OTSG's shall be drained and the upper and lower manway covers removed to provide access as required during testing.
- 5.2 The secondary side of both OTSG's shall be maintained in full wet layup for the duration of testing, or in a partial wet layup with the level at approximately 400 inches with nitrogen overpressure upon approval of Plant Engineering Director.
- 5.3 All testing operations shall proceed within the restraints imposed by AP 1030.
- 5.4 Cleanliness during and after testing shall be maintained per the requirements of SP-1101-12-039.
- 5.5 Westinghouse tools and equipment shall be received, inspected, and accepted for use under the requirements of SP-1101-12-039.
- 5.6 Copies of all applicable procedures are to be available, of current date and revisions, and verified as conforming to applicable specifications prior to operations.
- 5.7 All ALARA and RWP requirements shall be met.
- 5.8 All instruments and gauges used in the testing shall be calibrated and have calibration documentation traceable to NBS standards.
- 5.9 A ventilation system (air moving equipment) shall be attached as a suction device to the upper heads of the OTSG's.
- 5.10 Prior to entry into the OTSG heads, ensure the Safety and Health Department obtains air and explosive gas samples and certifies the heads are safe for entry.
- 5.11 Ensure ample tube plug markers are obtained to facilitate plug/tube identification.

- 5.12 Ensure an air supply (85 psig minimum @ 40 SCFM) is available at each OTSG tent.
- 5.13 Ensure 120 V, 60 Hz power is available at each OTSG tent.
- 5.14 Ensure a communications system (headsets) are available for use while performing OTSG tests.
- 5.15 Ensure OTSG cold leg covers are installed while working in the lower heads.
- 5.16 Ensure all equipment is checked and prepared in accordance with Westinghouse procedure FTS-FP-1460 (84).
- 5.17 Ensure all personnel associated with the OTSG plug rerolling and pull-testing are trained in accordance with Westinghouse procedures SAE-SGSE-FP-68 (84), and FTS-FP-1460 (84).
- 5.18 Plant Engineering will provide plug tracking sheet detailing plugs to be re-rolled and tested.
- 5.19 Westinghouse has provided two ENERPAC hydraulic jacks for use at TMI-1. The ENERPAC jack painted purple is to be used during plug testing. This jack has an internal relief set at 900 lbs. equivalent pulling force. This internal relief prevents an excessive pulling force from being placed on the plugs.
- 5.20 When using the purple Enerpac pump, do not exceed 875 lbs. indicated force.



- 5.21 Presently, several tubes in the A OTSG lower head and B OTSG lower head are identified by B&W type markers. These identified tubes are those from which "W" plugs were ejected. The location of these markers is to be noted, but these markers are not to be disturbed or removed from the head.
- 5.22 Exhaust air from the "W" tooling is to be vented outside the tent and away from the OTSG head.
- 5.23 QC shall ensure that the training requirements specified in Sect. 5.17 have been satisfied and documented on the appropriate training forms. These completed forms shall be made a part of the Job Ticket package.
- 5.24 Westinghouse pull test tooling is to be inspected daily for indications of lubricant leakage. Any leakage is to be evaluated by the Shift Engineer or Westinghouse personell.
- 5.25 Prior to starting work in each OTSG head, applicable MNCRs will be satisfactorily dispositioned.

Sequence of Operation: The context of this procedure assumes one tube/plug is worked at a time. Small clusters or groupings of tubes may be worked in any sequence as directed by Shift Engineer provided tube/plug identity is maintained.

## 6.0 PROCEDURE

### 6.1 Operational Check of Equipment

#### 6.1.1 Perform an operational check of the Westinghouse Plug Pull

Test equipment in accordance with SAE-SGSE-FP-68 (84), Step 8.1.

CAUTION: A new mandrel will be installed in the roll plug pull-test tool prior to shipment of the equipment to the job site. The tool mandrel can then be used for 200 cycles of applied load. A new serialized mandrel will be used prior to start of work in each OTSG. Used mandrels are to be identified and placed in Hot Machine Shop.

### 6.2 Setup Equipment

#### 6.2.1 Setup Westinghouse roll plug-pull test equipment in accordance with SAE-SGSE-FP-68 (84), Step 8.2.

### 6.3 Calibration and Frequency of Calibration (If Required)

#### 6.3.1 Calibrate Westinghouse Plug Pull Test equipment in accordance with SAE-SGSE-FP-68 (84), step 8.3. This step also governs the frequency of calibration. Utility QC to verify calibration.

### 6.4 Plug Stickout Gauging

#### 6.4.1 CHW identifies plug to be worked. A B&W type marker may be used to maintain plug identity.

6.4.2 CHW visually examines plug. If plug stickout is questionable, ( $\approx 3/8$ " stickout), gauge plug using stickout gauge.

6.4.3 If stickout is  $> 3/8$ ", identify plug to Control Station, mark the plug, and proceed to next plug.

6.4.4 Record all plug stickout inspections on Data Sheet 1.

#### 6.5 Plug End Wire Brushing

NOTE:	Maintain cleanliness by vacuuming head interiors periodically to minimize the spread of contaminants from the plug end.
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6.5.1 Set up equipment and wire brush plug end using Chicago pneumatic Model CP-9288 brush drive in accordance with FTS-FP-1460 (84). Ensure that each plug end is brushed for 15 to 20 seconds.

The stainless steel wire brush will be replaced after a maximum of 5 plug ends have been brushed. Use Data Sheet #2 to track brush usage. Used brushes will be discarded.

6.5.2 If water is known of (as indicated by water being ejected by the brushing) or suspected in the plug, remove the wire brush and vigorously swab the plug. Remove the swab. Identify the plug with a hairpin marker. Allow the plug to dry for several minutes. This is to be noted on the comments section of the Data Sheet.

## 6.6 Reroll Plugs

<p><u>NOTE:</u> Re-rolling of tube plugs (plugs that failed pull test and plugs that passed pull test) may be re-rolled in any sequence as directed by the Shift Engineer provided plug identity is maintained and applicable data sheet is filled out.</p>
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6.6.1 Set up plug rolling equipment in FTS-FP-1460 (84).

6.6.2 Ensure torque gun has been calibrated in accordance with FTS-FP-1460 (84). The torque guns shall be calibrated to  $90 \pm 5$  in-lbs at the beginning and end of shift and after every hour of operation. QC to verify on Data Sheet #3. Shift Engineer to note this in comments section on Data Sheet 1.

6.6.3 Verify (2) plug expanders, exhibit current acceptance stickers.

Roller height:  $1.612 \begin{smallmatrix} +.020 \\ -.040 \end{smallmatrix}$  inch. QC to verify on Data Sheet #4.



6.6.4 Utility QC is to verify serial number and color code to allow tracking of expander use. Shift Engineer shall notify platform supervisor when reverification of roll expanders are required. Expander acceptance verification is required after every 25 plugs rolled. Expander to be discarded after a maximum 50 operations.

NOTE:	Westinghouse QA at their own discretion, shall inspect the plug expanders for wear due to boric acid crystals.
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- 6.6.5 Worker enters the head and is handed a torque gun, (2) Airetool plug expanders 1 black, 1 silver. An expander coolant box containing Isopropyl alcohol for plug expander cooling shall be available. Do not over fill coolant box so that expander thrust bearings contact alcohol. Insure the torque gun exhaust hose is routed outside the tent and away from the steam generator.
- 6.6.6 Platform supervisor directs the worker(s) to the appropriate area of the tubesheet and indicates the premarked (previously wire brushed) plug ends are to be rerolled.
- 6.6.7 Move gun air supply slide valve to "off" position.
- 6.6.8 Manually raise the expander collar to uppermost position to insure rolls are at their smallest diameter. Insert the expander into the plug open end until the thrust collar touches the plug end. Gently push in on the torque gun body while holding the expander thrust collar to advance the expander mandrel and insure roller/plug contact.

CAUTION: Keep the plug expander perpendicular to the tubesheet.  
Do not place a side load or bend on the plug expander.

6.6.9 Move torque gun air supply slide valve to "on" position and depress the handle of gun to the forward position. The combined rotary and self-feeding lateral motion will cause the mandrel to be driven forward, forcing the roller outward. Continue operation until the torque gun "stalls" (approximately 3 seconds). Withdraw the expander/gun assembly by pulling back on the gun handle which will allow retraction of the rolls.

NOTE: If the torque gun does not "stall" in approximately 12 seconds, stop the torque gun and notify the Platform Supervisor. The worker is to exit the Channel Head with the torque gun. The following items will then be checked;

- a.) Check roller and cage assembly for wear.
- b.) Check torque output of gun.
- c.) Determine if operator error has occurred.
- d.) Operationally check gun outside head in test block. Identify the plug.

Forward the results of this investigation for Plant Engineering to establish a course of action for the plug.

6.6.10 Proceed to the next plug to be rerolled and repeat steps 6.6.5 through 6.6.9.

6.6.11 After every 5th rolled plug reroll, alternate the plug expander in use with the spare. Place the used plug expander in the Isopropyl alcohol roller box for cooling. Notify platform supervisor and utility QC of expander change out by calling out the color code of the expander. Use Data Sheet #2 to track usage.

6.6.12 Worker(s) exit the head when directed to do so by platform supervisor or Health Physics personnel.

## 6.7 Plug Pull Testing Initial Conditions and Prerequisites

- 6.7.1 Ensure all initial conditions and prerequisites of SAE-SGSE-FP68 (84) Step 9.1 are met prior to starting pull test.

## 6.8 Roll Plug Pull Testing (If Required)

NOTES:	1. For abbreviations/acronyms used below, see Section 3.0 for SAE-SGSE-FP-68 (84).
	2. The following steps are a combination of Westinghouse and TMI-1 requirements

- 6.8.1 CSO gives instructions to CHW over communications system.
- 6.8.2 CSO verifies that the Roll Plug Pull Testing System is ready for operation, pushes the control console reset button and notifies MWO and CHW to standby.
- 6.8.3 CSO signals CHW "OK to proceed".
- 6.8.4 Site HP gives "OK to proceed to MWO and CHW".
- 6.8.5 CHW enters channel head.
- 6.8.6 CHW locates plug to be tested. QC and Shift Engineer verify plug ID using video equipment.
- 6.8.7 MWO transfers pull-test tool to CHW.
- 6.8.8 CHW inserts mandrel into designated plug, locates contact spacer guide between two adjacent tubes and informs CSO that it is OK to activate nut runner.
- 6.8.9 CSO activates the nut runner to screw the mandrel into the plug.
- 6.8.10 CHW verifies that the tubesheet contact spacer legs are properly seated on tube sheet, releases the tool and informs the CSO that it is OK to apply pull-test force.

6.8.11 CSO or QC records the distance, force and pressure readings from the control console meters and verifies that the X-Y recorder functions properly and that the plug location is noted on the chart (Row - Tube, C.H., OTSG) Record on Data Sheet #1.

6.8.12 CSO pressurizes the system to 800-875 lbs. and the CSO or QC records the distance force and pressure readings from the control console meters. Maintain constant pressure in 800-875 range for about 5 to 10 seconds.

6.8.13 CSO lifts the X-Y recorder pen from the paper.

6.8.14 CSO releases the pressure, pushes the reset button and verifies that all meters and X-Y recorder pen return to zero (within the calibration tolerances).

NOTE:	If the meters and recorders are not zeroed (within the calibration tolerances) even after the reset button is pushed, CSO instructs CHW to push the distance transducer plate against the hydraulic cylinder to cause the poston and transducer rod to retract fully. If the zero setting cannot be obtained by pushing the plate, re-calibration of the system shall be required.
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6.8.15 If the plug is acceptable (See 7.0), CSO informs the MWO and CHW that it is OK to move to next plug to be tested. If the plug is not acceptable after tool is removed, insert marker in plug.



6.8.16 CSO inserts new sheet of paper in the recorder, activates the paper hold switch and lowers the pen.

6.8.17 CSO tells the CHW to prepare for tool removal and reverses the nut runner to unscrew the mandrel from the plug.

6.8.18 Repeat Steps 6.8.6 to 6.8.17 until all plugs are tested, mandrel requires replacement or the HP representative stops the operation and orders the CHW out of the channel head.

6.8.19 If the plug pull tests are unacceptable, (see Section 7.0, Acceptance Criteria), the plug shall be marked as indicated in Step 6.8.15 for corrective action and the plug pull testing shall continue.

: CAUTION: The CHW shall insure that the pull tool is not disturbed :  
: during application of the pull force. :

6.8.20 Pull data from all plugs tested shall be forwarded to Plant Engineering for evaluation.

6.9 At completion of work, all unnecessary equipment, as determined by Plant Maintenance and Plant Engineering, will be removed from the OTSG head and work area.

7.0 ACCEPTANCE CRITERIA

- 7.1 All plugs which require rerolling only have been rerolled in accordance with the requirements of this procedure.
- 7.2 All roll plug which failed initial testing have been rerolled and pull tested if required by Reference 3.12 satisfactorily in accordance with the requirements of this procedure.
- 7.3 All roll plugs which do not pass the pull test will be evaluated by Plant Engineering.

[illegible]

WIRE BRUSH/ROLLER TRACKING SHEET

Data Sheet 2

WIRE BRUSH TRACKING: WIRE BRUSHES ARE TO BE DISCARDED AFTER FIVE (5) USES.


ROLLER TRACKING SHEET

- 1.) Rollers are to be cooled after each 5 uses.
- 2.) Rollers are to be examined after each 25 uses.
- 3.) Rollers are to be discarded after each 50 uses.

Roller Ser. No.: \_\_\_\_\_

Roller Ser. No.: \_\_\_\_\_

Color Code: \_\_\_\_\_

Color Code: \_\_\_\_\_

COMMENTS:

COMMENTS:

					Change Roller
					Change Roller
					Change Roller
					Change Roller
					Examine Rollers

Rollers Checked SAT: \_\_\_\_\_  
Y/N

					Change Rollers
					Change Rollers
					Change Rollers
					Change Rollers
					Discard Rollers

Rollers Discarded: \_\_\_\_\_  
Shift Engineer/Date

Utility QC/Date: \_\_\_\_\_

					Change Roller
					Change Roller
					Change Roller
					Change Roller
					Examine Rollers

Rollers Checked SAT: \_\_\_\_\_  
Y/N

					Change Rollers
					Change Rollers
					Change Rollers
					Change Rollers
					Discard Rollers

Rollers Discarded: \_\_\_\_\_  
Shift Engineer/Date

Utility QC/Date: \_\_\_\_\_



DATA SHEET NO.3  
TORQUE GUN DATA SHEET

Site: \_\_\_\_\_ Unit: \_\_\_\_\_

S/G: \_\_\_\_\_ Head: \_\_\_\_\_

Page \_ of \_

### TORQUE VERIFICATION

[illegible]

DATA SHEET 4  
TUBE/PLUG EXPANDER DATA SHEET

SITE \_\_\_\_\_

Page \_\_\_\_ of \_\_\_\_

Expander Type (Airetool) \_\_\_\_\_

Expander Serial No. \_\_\_\_\_

Color Code \_\_\_\_\_

Acceptance Sticker Date \_\_\_\_\_

W Eng/QA: \_\_\_\_\_

Utility QC: \_\_\_\_\_

25  
Expansion cycles  
(multiples of 5)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Acceptance Sticker Date, \_\_\_\_\_

Shift Engr.: \_\_\_\_\_

Utility QC: \_\_\_\_\_

(Assembly Discard) QC: \_\_\_\_\_

25  
Expansion cycles  
(multiples of 5)

\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Acceptance Sticker Removed Date \_\_\_\_\_

(Assembly Discard) QC: \_\_\_\_\_

Discard plug expander after 50 operations.

Subject: OTSG Rolled Plug Repair Program

Date: September 22, 1984  
MC-84-2781

REVISED 9-23-84  
B.W.P.

From: B. D. Elam  
Manager, Mechanical Components

Location: Parsippany-CHB

To: J. J. Colitz  
Plant Engineering Director, TMI-1

Ref: Memo MC-84-2766, 9/14/84

1. "Master Plan"

The attachment replaces the reference memo as a summary statement of the recommended actions for the plug repair program.

2. Status of Qualification Program

As of this date, the program as defined by Westinghouse Procedure FSP-QP-131(84) is complete with the exception of the thermal cycling and metallurgical test portions. Although we do not have any written results in hand yet, we have followed the testing in detail and have been involved in the detail conception of the test procedures. The test results to date indicate that the proposed reroll operation will not adversely affect existing satisfactory plugs and will produce satisfactory joints by improving the integrity of the plugs which failed the pull test.

Regarding the open items, I received the following information by telecon this date from Bob Burack (Westinghouse):

Thermal Cycling: 20 of 30 required cycles complete. Zero accumulated leakage observed.

Metallurgy: All testing complete. Results satisfactory. Results support performance of five rolls on a single plug.

Mechanical Components recommends that reroll begin, even though the final thermal cycling results are not available.

3. Field Procedure for Reroll, FTS-FP-1460(84), Rev. 1

Mechanical Components has reviewed the field procedure and, to the best of our knowledge, feel it meets the program objectives and addresses, from a QA standpoint, the key process parameters. The key areas for QA/QC surveillance were reviewed with N. Kazanas on 9/21/84.

September 22, 1984

4. Technical Functions Specification of General QA Requirements for Field Effort.

The QA requirements for field installation of rolled plugs as specified in Para. 6.2 of GPUN SP-1101-12-046, Rev. <sup>5</sup>X shall be invoked for the rerolling.

CHNG. REV. TO REV. 5 PER TELECON  
B. ELAM, J. MARSDEN, F. PAULEWICZ

*F. Paulewicz*  
9-23-84

5. Training Program for Reroll Personnel

GPUN has elected to prepare a written training program and not to implement the Westinghouse approved training program provided.

Written Westinghouse approval of use of the GPUN program in lieu of the Westinghouse approved program is required prior to start of field reroll.

Should you have any questions, please call us.

*H. Capodanno for*  
B. D. Elam, Manager  
Mechanical Components

BDE/mcr  
Attachment

cc: D. K. Croneberger - Director, Engineering & Design  
G. R. Capodanno - Fluid Systems Director  
R. O. Barley - Lead Mechanical Engineer, TMI-1  
B. E. Ballard, Sr. - Manager, TMI QA Mod/OPS  
J. F. Marsden - QA Engineering Manager  
T. A. Richter - Heat Exch. & Press. Vessel Group Manager  
C. K. Lee - Engineer, Mechanical Components  
H. C. Jung - Corp. S. P. P. Engrg., Manager  
N. C. Kazanas - Director, Quality Assurance



<u>ISSUE</u>	<u>RECOMMENDATION</u>	<u>REMARKS</u>
1. Repair of plugs which moved during pull testing	Reroll plugs including brushing and cleaning the plug I. D. prior to reroll. Repeat pull test on all of these plugs in OTSG "B" UTS only. Do not repeat pull test on balance of plugs in this category.	Repair program qualification testing results reported by W indicate establishment of adequate plug performance parameters, i.e., leaking plugs reduced to no leakage at 3750 psi and plug ejection tests indicate retention capability up to 9000 to 10,000 psi. Pull testing of plugs in "B" UTS will provide field confirmation of laboratory work.
2. Disposition of plugs which passed pull test	Reroll plugs, including brushing and cleaning prior to reroll. Do <u>not</u> repeat pull test.	Reroll will provide additional assurance of plug performance consistent with original qualification program. Repeat pull test not required because these plugs already passed a pull test. Reroll qualification testing to date indicates no degradation of plug performance due to reroll. Rerolling always improved plug performance. Qualification testing is still in process as of 9/22/84. However, no negative results have been demonstrated to date.
3. Installation of new plugs in locations where: a) plugs came out during pull test, b) plugs were purposely removed by pulling or drilling, c) plugs were ejected during previous operation.	In lower tubesheet install W mechanical ribbed plug.          In upper tubesheet install W rolled plug, or B&W weld cap, or B&W welded taper plug.	Recommended by Westinghouse as being state-of-the-art plug. Successfully installed at Oconee and Arkansas 1 plant. Review of W qualification test results indicates improved performance under secondary hydrostatic pressure (zero leakage up to 10,000 psi pressure). W recommendation of GPUN comments on plug qualification program is a required prerequisite for use of this plug.    In locations where defective rolled plugs are removed by drilling, use weld cap instead to potential damage to tube by drilling. Visually inspect seal weld prior to weld cap installation. If seal weld condition unacceptable, use welded taper plug.   Where rolled plug used, dilatometer test tube I.D. and plug I. D. (after roll) to confirm proper actual wall thinning. Substitute weld cap for rolled plug if an installation advantage is indicated.