TITLE: VERIFICATION OF LIFT POINT USING ULTRA STAR ASSIST DEVICE FOR THE MAIN STEAM SAFETY VALVES

APPROVED: [signature] 5-10-96 DATE 5-10-96 EFFECTIVE DATE

PROCEDURE CLASSIFICATION: QUALITY RELATED

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1.0 SCOPE

1.1 This procedure explains how lift point verification will be accomplished on the Main Steam Safety Valves using the Ultra Star System.

1.2 This procedure covers two plant conditions for testing.

1.2.1 Mode 1, power between 30% and 100%.

1.2.2 Mode 3, T_{av} at approximately 520°F (100 psig below the valve's expected lift point).

NOTE: Expected lift point is the setpoint of the valve being tested.

2.0 DISCUSSION

2.1 The Ultra Star System places an external pulling load on the safety valve stem. This overcomes the spring forces allowing the valve to lift off its seat. Once the lift point is reached, the safety valve closes. The lift point is then recorded and becomes a permanent record.

2.2 For this procedure, data may be rounded to the least significant digit in the Main Steam Safety Valve setpoint calculation.

2.2.1 Data for the calculation may have digits to the right of the decimal point and may or may not be used in determining the final answer. However, the final answer will be rounded off to the least significant digit (e.g., 1065.4 is 1065, 1065.5 is 1066, etc.).

3.0 RESPONSIBILITIES

3.1 Appointed Engineering Services (ES) Engineer, will serve as the person supervising the test, and shall ensure:

3.1.1 Notification of Technical Maintenance (TM) is made 24 hours prior to testing so that TM can be prepared and is "on standby" to reset power range NI channels to Tech Spec 3/4.7.1.1 values, IF one or more valves is determined to be inoperable (Mode 1 testing ONLY).

3.1.2 ES Engineer is present at all times during actual testing (not necessarily during setup, delays, or teardowns).

3.1.3 The steps of the procedure are followed.

3.1.4 The test results are signed and dated thereby verifying, to the best of his knowledge, their accuracy, and that the test was conducted in accordance with this procedure.

3.1.5 The instrumentation used in the test has not exceeded its calibration period.

3.1.6 The results of the testing are fully documented on Appendix 8.1 and are forwarded to Work Planners for Package/Surveillance Test Procedure closeout.

3.1.7 Summarizing in the Work Order, the results of the test, and recommendations relating to the test or equipment.

3.2 The assigned Maintenance Foreman is responsible for:

3.2.1 Direct supervision of his personnel involved in this test.

3.2.2 Prior to the scheduled start of the job, arranging a tailboard with the craftspersons, and persons supervising the test to ensure critical points of the test are understood by all involved.

3.2.3 Gathering all required equipment, gauges, fitting, hoses, etc., and assembling all test equipment prior to the scheduled start of this test.

3.3 The craftspersons are responsible for:

3.3.1 Obtaining an understanding of the intent of this procedure prior to the scheduled start time.

3.4 The Work Planners are responsible for:

3.4.1 Assembling a Work Order package for each valve to be tested and submitting it to the Maintenance General Foreman for his distribution.

3.4.2 Upon completion of the work, submitting the correctly indexed Work Order and Data Sheets to Records Management for microfilming.

4.0 REFERENCES

4.1 AD4.ID1, "Housekeeping."

4.2 OM7.ID1, "Problem Identification and Resolution - Action Requests."

4.3 RP1.ID9, "Radiation Work Permits."

4.4 STP M-77, "Safety and Relief Valve Testing."

4.5 ANSI/ASME PTC 25.3 1976.

5.0 PREREQUISITES

5.1 Test Supervisor to notify TM General Foreman 24 hours prior to testing, to be prepared and "on standby" to reset power range NI channels to Tech Spec 3/4.7.1.1 values, IF one or more valves is determined inoperable (Mode 1 testing ONLY).

5.2 Housekeeping requirements are established per AD4.ID1.

5.3 Suggested Tools and Equipment

		Used for:
5.3.1	3-1/2" Slugging wrench or "Blue Point"	Lock nut
5.3.2	2-1/2" Slugging wrench or "Blue Point"	Adjusting nut
5.3.3	8" Pliers	Cotter key removal
5.3.4	12" Adjustable end wrench	Miscellaneous
5.3.5	Needle nose pliers	Cotter keys

5.3.6	Diagonal wire cutters "Dykes"	Cotter keys
5.3.7	8" Screwdriver	Miscellaneous
5.3.8	12" Pinch bars (2)	Pry off cap
5.3.9	8" Adjustable end wrench	Miscellaneous
5.3.10	5 lb Hammer minimum	Slugging wrench
5.3.11	1/2" Diameter straight punch	Lifting lever pin
5.3.12	2-3/4" x 1/8" Stainless steel cotter pins (20), as required	Replacements
5.3.13	Electrical extension cords	Power supply for Ultra Star
5.3.14	Container for small parts	
5.3.15	Lead seals with wire	Sealing valve cover/cap
5.3.16	Vent and test gauge connection adapters	Main Steam header, Ultra Star pressure gauge connection
5.3.17	Hydraulic cylinders; (2) low profile (≤1-5/8"), 10 tons each	Compress Spring
5.3.18	Hydraulic pump; (2) 10'hose, "Y" "Y" for two low profile jacks	Compress Spring

5.3.19 At the start of testing two sets of calibrated test equipment shall be available.

5.4 Two-way communication between the test area and the Control Room.

5.5 Special Work Permit obtained per RP1.ID9, as required (required in the event of a Steam Generator tube rupture).

5.6 Notify Radiation Protection for any special restrictions on valve discharge before lifting safety valves (required in the event of a Steam Generator tube rupture).

5.7 Measurement and test equipment (M&TE) used to perform this procedure shall be in current calibration, as evidenced by an affixed calibration sticker or other suitable means.

NOTE: M&TE should be selected so that values to be measured fall in mid-range of instrument, IF applicable.

5.7.1 RECORD M&TE identification numbers and calibration due dates in Work Order.

5.8 Main Steam Safety Valve lift point verification in Mode 1 requires continuous communication capability with the Control Room.

5.8.1 Only one valve at a time can be tested on each Steam Generator header.

5.9 Tailboard briefing by the person supervising the test.

5.10 Problems identified in parts, materials, workmanship or in procedures, which cannot be corrected during the normal course of work, are reported and documented per OM7.ID1.

6.0 PRECAUTIONS

6.1 Locate the Ultra Star test equipment as far away as necessary from the valve being tested.

6.2 To avoid risk of damage to Ultra Star equipment, do not exceed the recommended working ranges or use it in situations for which it was not designed.

6.3 IF testing the Main Steam Safety Valves in Mode 1, THEN the following is required:

6.3.1 Communicate with the Control Room prior to and after testing each valve.

6.3.2 Permission to test given by the Control Room.

6.3.3 Testing for individual valve and resetting (IF applicable) must be completed within four (4) hours or power decrease may be required. Reference Tech Spec 3/4.7.1.1.

a. Shift Foreman to verify TM is prepared and "on standby" to reset power range NI channels to Tech Spec 3/4.7.1.1 values, IF one or more valves is determined to be inoperable (Mode 1 testing ONLY).

7.0 INSTRUCTIONS

7.1 Setting Up For Test

****
CAUTION 1: Main Steam pressure must be NO higher than 100 psig below the valve's expected lift point to ensure rapid closure of the safety valve after lifting.
****
****
CAUTION 2: IF system pressure is approaching a lift setpoint, THEN immediately close a lifted safety OR abort testing.
****

NOTE: Expected lift point is the setpoint of valve being tested.

7.1.1 RECORD following information on Appendix 8.1:

a. Valve and serial number

b. Setpoint

c. Acceptance Range (see Appendix 8.2)

d. Work Order number.

7.1.2 Ensure computer has been initially setup to test and record.

7.1.3 Attach load cell, pressure transducer, hydraulic lines, feedback and acoustic trigger cables to computer and assist device.

NOTE: Acoustic trigger is not placed on the valve at this time.

7.1.4 Perform scale and offset adjustment prior to testing as follows:

****
CAUTION 1: Ensure the pressure transducer is installed with no pressure applied to it.
****
****
CAUTION 2: IF a failure occurs, THEN do NOT proceed until it is resolved.
****

a. Select "Valve Test" (#1), from the main menu.

b. Select "Calibrate" on the menu screen.

c. Select "Scale/Offset Adjustment."

d. Adjust inlet and force offset to ensure inlet and force readout is zero "0."

7.1.5 Perform "Auto-Calibration Check" as follows:

****
CAUTION: IF a failure occurs, THEN do NOT proceed until it is resolved.
****

a. Select "Calibrate" on the main menu screen.

1. Select "Calibrate Transducers."

2. Press "F10" key.

7.1.6 Establish communications with Control Room.

****
CAUTION 1: There is a potential for a momentary bi-stable trip when valving in pressure transducers. Prior to installing or valving in pressure transducer to any pressure tap, notify the Control Room to verify that no coincident bi-stables are tripped.
****
****
CAUTION 2: Do NOT blow out lines when connecting pressure transducer.
****
****
CAUTION 3: Do NOT close root valves.
****

7.1.7 Connect pressure transducer adapters and pressure transducer to Main Steam header vent valve or test connection.

a. Unit 1

1. Header 1-1 - PT-515 Test Connection Valve 1-04P-12A

2. Header 1-2 - PT-524 Test Connection Valve 1-04P-100

3. Header 1-3 - MS-1-909

NOTE 1: This valve is a seal closed valve. Operations must break the seal.

NOTE 2: IF vent valve is not available, THEN use PT-536A.

4. Header 1-4 - MS-1-908

NOTE 1: This valve is a seal closed valve. Operations must break the seal.

NOTE 2: IF vent valve is not available, THEN use PT-546A.

b. Unit 2

1. Header 2-1 - PT-514 Test Connection Valve 2-04P-117

2. Header 2-2 - PT-524 Test Connection Valve 2-04P-117

3. Header 2-3 - MS-2-909

NOTE 1: This valve is a seal closed valve. Operations must break the seal.

NOTE 2: IF vent valve is not available, THEN use PT-536A.

4. Header 2-4 - MS-2-908

NOTE 1: This valve is a seal closed valve. Operations must break the seal.

NOTE 2: IF vent valve is not available, THEN use PT-546A.

7.2 Safety Valve Preparation

7.2.1 Remove valve cap and/or lifting lever.

7.2.2 Check spring and spindle area for any problems which could bind or interfere with valve operation.

7.2.3 Ensure no accumulation of rust, scale, or other foreign substance is on valve body or in vent piping, that could interfere with free operations of valve.

7.3 Ultra Star Testing Apparatus Setup

7.3.1 Attach spindle adapter to valve stem. Hand tighten to its fullest thread engagement.

7.3.2 Place lifting mechanism on valve.

a. Adjust gripper fingers so they are 1/8 - 1/4" below lip of spindle adapter.

7.3.3 Attach magnetic mount containing trigger transducer onto valve.

NOTE: Test supervisor will specify location.

7.4 Main Steam Safety Valve Testing

NOTE: AVK test results may require application of correction factors to assure an accurate correlation with setpoints established using steam. Two methods may be used to provide the AVK-Steam correlation.

1) Manual calculations using the data provided in Appendix 8.3 may be used after testing (reference Step 7.4.6) to convert AVK test data to steam setpoints.

2) The AVK software can be adjusted to provide a direct reading that includes the correction factor by adjustment of the Mean Seat Area (MSA). To use this option, enter MSA data provided in Appendix 8.3 using Step 5.10.2 of the AVK Ultrastar Operation Manual during Step 7.4.3.

7.4.1 Obtain permission to test from Shift Foreman.

NOTE: Communicate with the Control Room prior to and after testing each valve.

7.4.2 Notify Senior Control Operator (SCO) or Control Operator (CO) that test is ready to begin. Verify steam header pressure is within 5% of pressure transducer indication.

NOTE 1: Main Steam Relief Valve header range no higher than 100 psig below the valve's expected lift point.

NOTE 2: Expected lift point is the setpoint of the valve being tested.

7.4.3 Select "Recall Work Order" from "Files" menu screen.

a. Select correct Work Order for valve being tested.

b. Select F2. Enter the MSA, IF appropriate (default is 22.46).

c. Press "Enter."

7.4.4 Select "Test Valve" from menu screen.

a. Ensure correct valve file corresponding to valve being tested has been retrieved.

b. Press "F10."

7.4.5 Valve Test screen:

a. Click on the "Grip Close" or press F8.

b. Press F2. Testing is automatically started at this time.

****
CAUTION: IF the valve sticks open, THEN press F5 (manual trigger) or F6 Actuator Down or Main Power Switch "Off."
****

c. IF the valve sticks OR stays open after lifting, THEN STOP the test.

1. Inform Shift Foreman that valve remained open after lifting.

2. Obtain permission to continue with test from Shift Foreman.

7.4.6 Test results are displayed after each test. RECORD data from test on Appendix 8.1. See Note under Section 7.4.

7.4.7 IF valve test results are within acceptance range (see Appendix 8.2 for Acceptance range), THEN perform second test by repeating Step 7.4.5. IF NOT, THEN perform following steps:

NOTE: For valve to be acceptable, there must be at least two consecutive lifts made without any adjustments between lifts and test results must be within ± 1% of valve setpoint.

a. IF initial lift is outside the ± 3% tolerance range, for all valves except those with a setpoint of 1,065 psig, THEN make a note on Appendix 8.1 that an Action Request will be initiated, as soon as practical.

b. For valves with a setpoint of 1,065 psig, initial lift tolerance range is +3%, -2%. IF initial lift is outside this range, THEN make a note on Appendix 8.1 that an Action Request will be initiated, as soon as practical.

****

CAUTION: Prior to making adjustments to Main Steam Safety Valve, ensure test equipment and Main Steam Safety Valve are functioning properly.

****

c. IF test results become suspect indicating unusual behavior, THEN STOP the test and evaluate as follows:

1. Do NOT make excessive (more than five flats) adjustments without thoroughly verifying equipment and valve are functioning properly.

2. Based on prior "As Left" data, check that adjustments are reasonable and valve is responding in a predictable manner.

3. Verify test connections are correct and test equipment is responding correctly. IF suspect, THEN use backup test equipment to proceed with verification of test results.

d. Adjust valve as necessary.

NOTE: For the Main Steam Safety Valves, lift point changes approximately 10 - 12 psig per flat of adjustment.

e. Record adjustments on Adj/Comment Screen and Appendix 8.1.

NOTE: This screen is accessed from the test results screen by pressing F2 key.

f. Repeat Steps 7.4.1 through 7.4.7 until at least two consecutive tests are performed without any adjustments between tests and test results are within acceptance range.

NOTE: ES Engineer is to determine IF continued lifting of the valve will effect lift point setting OR valve is damaged, making lift point setting indeterminate.

7.4.8 Notify the SCO or CO that:

a. Setpoint has been verified/established.

b. Test is complete.

7.4.9 Remove Ultra Star equipment from valve.

7.4.10 Main Steam Safety Valves that leak after testing shall have their lift point setting reanalyzed by Test Supervisor and an Action Request is to be initiated.

NOTE: At the ES Engineer's discretion, leaking valve(s) may have their setpoint re-established to a higher value within acceptance range.

7.5 Main Steam Safety Valve Restoration

****
CAUTION 1: There is a potential for a momentary bi-stable trip when valving out test gauges. Prior to removing or valving out test gauges to any pressure tap, notify the Control Room to verify no coincident bi-stables are tripped.
****
****
CAUTION 2: Do NOT blow out lines when disconnecting pressure gauge.
****
****
CAUTION 3: Do NOT close root valves.
****

7.5.1 Disconnect test connections.

a. Obtain Independent Verification of pressure tap removal. RECORD on Appendix 8.1.

7.5.2 Check tightness of compression locknut.

7.5.3 Install valve cap and manual lifting lever (manual lifting lever installation is not required if deleted by AT-MM-AR).

7.5.4 Adjust drop lever until there is a minimum of 1" movement, from where lever contacts valve body, in upward direction, prior to engaging release nut.

7.5.5 Install a new stainless steel cotter key.

7.5.6 Install valve cap and seal cap, to ensure it will NOT be tampered with after set pressure adjustments are made.

NOTE: Sealing to be accomplished by PG&E.

7.5.7 Complete Main Steam Safety Valve Test Record and forward to ES Engineer for review.

7.5.8 Post calibration of Ultra Star test equipment is completed by TM, IF directed by Test Engineer.

8.0 APPENDICES

8.1 Main Steam Safety Valve Test Record

8.2 Setpoints and Acceptance Ranges

8.3 AVK-Steam Correction Factors

9.0 SPONSOR

Harry Machado

APPENDIX 8.1

MAIN STEAM SAFETY VALVE TEST RECORD

Unit: _____ Valve No.: RV - _____ Serial No.: _____ Setpoint: _____

As Found Acceptance Range: _____ - _____ Work Order No.: _____

As Left Acceptance Range: _____ - _____

7.0 INSTRUCTION STEPS

7.4 Valve Testing

NOTE: An Action Request must be written when the valve does not lift within the acceptance range on the first lift.

Test No.	Lift Point	Adjustment	Test No.	Lift Point	Adjustment
____	_____	_____	____	_____	_____
____	_____	_____	____	_____	_____
____	_____	_____	____	_____	_____
____	_____	_____	____	_____	_____
____	_____	_____	____	_____	_____
____	_____	_____	____	_____	_____
____	_____	_____	____	_____	_____
____	_____	_____	____	_____	_____
____	_____	_____	____	_____	_____
____	_____	_____	____	_____	_____
____	_____	_____	____	_____	_____
____	_____	_____	____	_____	_____
____	_____	_____	____	_____	_____

AR Required Yes___No___ As Left Setpoint: _____

7.5.1.a Independent Verification of pressure tap removal.

Valve No. _____

Removed By: _____ Date/Time _____/_____

Verified By: _____ Date/Time _____/_____

Performed By: _____ Date _____
Signature/Print Last Name

Approved By: _____ Date _____
ES Engineer Signature/Print Last Name

APPENDIX 8.2

SETPOINTS AND ACCEPTANCE RANGES

Main Steam Safety Valves

Valve	Setpoint (psig)	As Found Acceptance Range (psig)	As Left Acceptance Range (psig)
RV-3	1,065	1,044 - 1,097	1,054 - 1,076
RV-4	1,078	1,046 - 1,110	1,067 - 1,089
RV-5	1,090	1,057 - 1,123	1,079 - 1,101
RV-6	1,103	1,070 - 1,136	1,092 - 1,114
RV-7	1,065	1,044 - 1,097	1,054 - 1,076
RV-8	1,078	1,046 - 1,110	1,067 - 1,089
RV-9	1,090	1,057 - 1,123	1,079 - 1,101
RV-10	1,103	1,070 - 1,136	1,092 - 1,114
RV-11	1,065	1,044 - 1,097	1,054 - 1,076
RV-12	1,078	1,046 - 1,110	1,067 - 1,089
RV-13	1,090	1,057 - 1,123	1,079 - 1,101
RV-14	1,103	1,070 - 1,136	1,092 - 1,114
RV-58	1,065	1,044 - 1,097	1,054 - 1,076
RV-59	1,078	1,046 - 1,110	1,067 - 1,089
RV-60	1,090	1,057 - 1,123	1,079 - 1,101
RV-61	1,103	1,070 - 1,136	1,092 - 1,114
RV-222	1,115	1,082 - 1,148	1,104 - 1,126
RV-223	1,115	1,082 - 1,148	1,104 - 1,126
RV-224	1,115	1,082 - 1,148	1,104 - 1,126
RV-225	1,115	1,082 - 1,148	1,104 - 1,126

APPENDIX 8.3

AVK-STEAM CORRECTION FACTORS TABLE 1

Unit 1 Main Steam Safety Valve AVK-Steam Correction Factors

Reference Calc: File MSS, No. N202, Rev. 0

Use of Either Load Cell Correction Factor using manual calculation or Adjustment of Mean Seat Area using AVK software is acceptable.

MS-1-RV	LOAD CELL CORR FACTOR	ADJUSTED MSA (in^2)	NOTES
3	1.028	21.85	
4	0.993	22.62	1
5	0.936	23.99	
6	0.914	24.57	
7	1.058	21.23	
8	1.010	22.24	1
9	0.958	23.44	
10	1.012	22.19	1
11			2
12			2
13			2
14			2
58			2
59			2
60			2
61			2
222	1.036	21.68	
223			2
224			2
225			2

NOTE 1: Correction not required due to close association.
NOTE 2: Data has not been acquired for calculation.

Using the AVK Load Cell Correction Factor:

$$\text{Stm SP} = \frac{\text{AVK LC (CF)}}{\text{MSA}} + \text{AVK LP}$$

Alternately, IF the adjusted MSA from the Table above is input into the AVK program prior to the testing, THEN Stm SP equals the AVK data output setpoint.

Stm SP = AVK SP

Where Stm SP = Equivalent Steam Pressure
AVK LC = AVK Equipment Load Cell reading
CF = Correction Factor from Table above
MSA = Mean Seat Area, Defaults to 22.46 in2
AVK LP = AVK Equipment Line Pressure input
AVK SP = AVK readout set pressure

APPENDIX 8.3 (Continued)

AVK-STEAM CORRECTION FACTORS
TABLE 2

Unit 2 Main Steam Safety Valve AVK-Steam Correction Factors

Reference Calc: File MSS, No. N202, Rev. 0

Use of Either Load Cell Correction Factor using manual calculation or Adjustment of Mean Seat Area using AVK software is acceptable.

MS-2-RV	LOAD CELL CORR FACTOR	ADJUSTED MSA (in^2)	NOTES
3	0.976	23.01	
4	1.098	20.45	
5	0.982	22.87	
6	0.995	22.58	1
7	0.964	23.31	
8	1.113	20.18	
9	1.009	22.26	1
10	0.950	23.65	
11	1.037	21.65	
12	0.977	22.98	
13	1.040	21.60	
14	1.001	22.45	1
58	0.954	23.55	
59	1.037	21.66	
60	1.059	21.20	
61	0.925	24.27	
222	1.019	22.04	
223	1.001	22.44	1
224	1.096	20.48	
225	1.101	20.40	

NOTE 1: Correction not required due to close association.

Using the AVK Load Cell Correction Factor:

$$\text{Stm SP} = \frac{\text{AVK LC (CF)}}{\text{MSA}} + \text{AVK LP}$$

Alternately, IF the adjusted MSA from the Table above is input into the AVK program prior to the testing, THEN Stm SP equals the AVK data output setpoint.

Stm SP = AVK SP

Where Stm SP = Equivalent Steam Pressure
AVK LC = AVK Equipment Load Cell reading
CF = Correction Factor from Table above
MSA = Mean Seat Area, Defaults to 22.46 in2
AVK LP = AVK Equipment Line Pressure input
AVK SP = AVK readout set pressure