ATTACHMENT A807.A.

External Combustion

Natural Gas Usage and Rolling 12-Month Total

2016 Small Boilers Data Entry / Gas Use

		Metered Boilers			Total Gas Use for all Small Boilers[a]		Non-Metered Gas Use	12-Month Rolling Total for all Small Boilers (MMscf)[c]
		TA-55 Boiler Gas Use (Mscf)[b]		CMRR-RLUOB Gas Use (Mscf)				
	Month	BHW-1B (B-602) ID (B-0016)	BHW-2B (B-603) ID (B-0017)	All 3 Boilers NMED IDs 90, 104, and 105	(Mscf)	(MMscf)	(MMscf)	
Data Entry	January	380	2884	311	66,709	66.71	63.13	409.79
	February	664	1658	306	50,061	50.06	47.43	404.44
	March	1256	630	260	43,979	43.98	41.83	404.40
	April	1460	188	223	37,184	37.18	35.31	405.51
	May	193	1391	189	25,049	25.05	23.28	405.34
	June	5	1197	127	9,385	9.39	8.06	405.42
	July	280	910	117	5,779	5.78	4.47	401.84
	August	872	711	169	8,930	8.93	7.18	402.39
	September	473	1013	143	13,861	13.86	12.23	404.60
	October	1	1827	135	15,242	15.24	13.28	393.67
	November	1	2189	256	37,944	37.94	35.50	379.39
	December	0.0	1882	464	65,554	65.55	63.21	379.68
	TOTAL	5585	16480	2700	379,677	379.68	354.91	
	Reviewed by: Margie Stockton, 1/30/2017					12 Month Limit (MMscf) =		**870**

ATTACHMENT A807.B.

External Combustion

RLUOB Boilers Natural Gas and Fuel Oil Usage

LANL Operating Permit P100-R2 | Monitoring Period July–December 2016

Attachment A807.B. – External Combustion

RLUOB Natural Gas and Fuel Oil Usage

Boilers at the RLUOB did not use fuel oil during this certification period. Attachment A807.A. includes natural gas use by the RLUOB boilers

ATTACHMENT A807.C. & D.

External Combustion

Fuel Oil Sulfur Content

LANL Operating Permit P100-R2 | Monitoring Period July–December 2016

Attachment A807.C. & D. – External Combustion

Fuel Oil Sulfur Content

LANL purchases only fuel oil with ultra-low sulfur content; fuel oil was not used during this certification period

ATTACHMENT A807.E.

External Combustion

Initial Compliance Testing (Unit RLUOB-BHW-4)

LANL Operating Permit P100-R2 | Monitoring Period July–December 2016

Attachment A807.E. – External Combustion

Initial Compliance Testing (unit RLUOB-BHW-4)

Unit RLUOB-BHW-4 has not been installed.

ATTACHMENT A807.F.

External Combustion

Operational Inspection for Sources listed in Table 800.A.

Facility : F08 **Unit :** **Proj :**
Task Title : ST 1Y TA16 STEAM PLANT WATERSIDE/ FIRESIDE PM
W/O Type : PM **W/O Group :** UTIL **Task Priority :** 4
Planner : 189099 LOPEZ THERESA M
W/O Title : ST 1Y TA16-1484 STEAM PLANT WATERSIDE/ FIRESIDE PM
Written To : TA16-1484 STEAM PLANT BOILERS
Task Dspln : FTTR **Due Date :** 10/31/2016
Superintendant :
Hazard : MODERATE **IWD Reqmt :** TASK SPECIFC

Work Order Task

00547830 01

MASTER

Date: 04/26/2016

Work Order Task Written To

Facility : F08 **Unit :** **Op Sys :**
Room : **Area :** **Sys/Cls :**
Equipment : **Component :**
Location :
Job Type : PM
Tag 1 : **Tag 2 :**
Work Item : TA16-1484 STM BOILER **Ops Review Reqd :**

Authorization

Start Permission : **Start Date :**

Complete Notice : Glenn Martinez **Complete Date :** 10-20-16

Work Order Task Instructions

PERFORM PM PER 76-28-010 WATERSIDE/ FIRESIDE CHECKLIST

ENGINEERING TO PROVIDE MAINTENANCE WITH SUPPORT, OVERSIGHT & TRAINING THROUGHOUT PM
.

QC Requirements / Comments

Facility : F08 **Unit :** **Proj :**
Task Title : ST 1Y TA16 STEAM PLANT WATERSIDE/ FIRESIDE PM
W/O Type : PM **W/O Group :** UTIL **Task Priority :** 4
Planner : 189099 LOPEZ THERESA M
W/O Title : ST 1Y TA16-1484 STEAM PLANT WATERSIDE/ FIRESIDE PM
Written To : TA16-1484 STEAM PLANT BOILERS
Task Dspln : FTTR **Due Date :** 10/31/2016
Superintendant :
Hazard : MODERATE **IWD Reqmt :** TASK SPECIFC

Work Order Task

00547830 01

MASTER

Date: 04/26/2016

Work Completion Signatures

Name	Function/Dept.	Date
Jason Sparks	fitter/mssui	10-20-16

Comments

(rework?)

Cost Accounting

Cost Center : P2030A **Activity :** 640CL000

Percentage : 100 **Acct No :** XU5000 **Sub Acct :** 7E2P0016

Facility : F08 **Unit :** **Proj :**
Task Title : ST 1Y TA16 STEAM PLANT WATERSIDE/ FIRESIDE PM
W/O Type : PM **W/O Group :** UTIL **Task Priority :** 4
Planner : 189099 LOPEZ THERESA M
W/O Title : ST 1Y TA16-1484 STEAM PLANT WATERSIDE/ FIRESIDE PM
Written To : TA16-1484 STEAM PLANT BOILERS
Task Dspln : FTTR **Due Date :** 10/31/2016
Superintendant :
Hazard : MODERATE **IWD Reqmt :** TASK SPECIFC

Work Order Task

00547830 01

MASTER

Date: 04/26/2016

Form 2103

Los Alamos NATIONAL LABORATORY EST.1943

Integrated Work Document (IWD) Part 3, Validation and Work Release

IWD #: _____ Revision #: _____ **Work Release**

By signing below, I verify this activity is compatible with current facility configuration and operating conditions.

FOD designated Ops Mgr or other facility point-of-contact for work area

Signature/Z#/Date **(If required by FOD)**: _____

Note: For Standing IWD, release may be given concurrently with signatures on Part 2.

By signing below, I have verified the following:

- I have verified authorization by ensuring approval signatures of the RLM and FOD.
- I have jointly conducted a validation walkdown with workers to confirm the IWD can be performed as written, required initial conditions and other prerequisites are in-place.
- The assigned workers are authorized and are qualified to perform the work in a safe, secure, and environmentally responsible manner.
- I have conducted the pre-job briefing, and all workers have been briefed.
- I have ensured coordination with any required FOD work-area representatives (*e.g., area work coordinators*).

Primary PIC (Signature/Z#/Date) **Required**: _____

Alternate PIC Signatures **acknowledges** PIC authority is assumed for the first time *(Note: Alternate PICs are required to sign only once, but formal handoff includes conferring with previous PIC to obtain all required information associated with the handoff)*.

Alternate PIC (Signature/Z#/Date) **Required**: _____

Alternate PIC (Signature/Z#/Date) **Required**: _____

Pre-Job Brief Content

- What are the critical steps or phases of this activity?
- How can we make a mistake at that point?
- What is the worst thing that can go wrong?
- What controls, preventive measures, and bounding conditions are needed?
- What work permits are required and how will we meet their requirements?
- What are the handoffs and coordination requirements among workers and multiple PICs?
- Are there hold-points including those that require sign-offs?
- What are the pause/stop work responsibilities and expectations (e.g. for unanticipated conditions or hazards)?
- How would we respond to alarms and emergencies?
- Are there lessons learned from previous similar work?
- Is other information needed to perform this activity in a safe, secure, and environmentally responsible manner?
- Does everyone agree to the work tasks/steps, hazards, and controls and commit to follow them?

Pre-Job Brief Attendance Roster

By signing below **as required**, I agree to the following:

- I agree to follow the work steps and implement the controls as written as applicable to my work assignments.
- I agree to pause/stop work when conditions or hazards change or when I encounter unexpected conditions during the execution of work, or when work cannot be performed as written, or instructions become unclear during execution.
- I confirm that I am authorized, qualified, and fit to perform the work.

Worker (Signature/Z#/Date)	**Worker** (Signature/Z#/Date)
Worker (Signature/Z#/Date)	**Worker** (Signature/Z#/Date)
Worker (Signature/Z#/Date)	**Worker** (Signature/Z#/Date)
Worker (Signature/Z#/Date)	**Worker** (Signature/Z#/Date)

AP-WORK-002: Attachment 11
Maintenance and Site Services Work Completion Form

Work Order/Task: _____

Start Date:	Completion Date:
SUMMARIZE THE WORK PERFORMED	
Date	
FOR CORRECTIVE WORK – WHAT FAILED AND WHAT WAS FIXED	
FOR PMs – SUMMARIZE AS FOUND AND AS LEFT CONDITIONS BELOW	
As found	
As left	
Parts/Repairs	
Read/meas.	
Post test info.	
Problems Encountered (delays, safety, etc.):	
Lessons Learned/Recommendations:	
Name:	**Signature:** **Date:**

AP-WORK-002: Attachment 11
Maintenance and Site Services Work Completion Form

PIC/SUPT

☐ PM has been completed in its entirety and ready for closure.

IF A PM COULD NOT BE COMPLETED:

☐ Percentage complete is _____%

☐ Sections that did not work and need to be rescheduled

_____

Reasons why:

MAINTENANCE COORDINATOR/AREA WORK COORDINATOR

Work Package is Complete and may be closed out: YES ☐ NO ☐

IF no: State Reason

Additional Work Needed? ☐ YES ☐ NO

Document UP/WO/FSR Number:_____

ENGINEERING (FOR MD and CD Work Orders)

IF a configuration baseline has been changed, THEN indicate the changes are to be incorporated into the following documents and/or configuration baseline:

☐ Drawings ☐ FDD/SDD

☐ Procedures ☐ Master Equipment List

☐ Permits ☐ Checklists

SE Name: Signature: Date:

WORK CONTROL

Moderate/High Hazard – WMC/Planner reviewed for Lessons Learned/Feedback

☐ YES ☐ NO N/A ☐

☐ Review of the completed work package is complete per AP-WORK-005, and the work package is ready to be set to complete in CMMS.

UTILITIES AND INSTITUTIONAL FACILITIES

Los Alamos NATIONAL LABORATORY

UI-PROC-71-10-211-R2

Operations Procedure

Calibration of Level Transmitters

Review frequency: 1 yr ☐ 2 yr ☐ 3 yr ☑

Process Owner	Signature	Date
Jeff Sisneros		10/15/14
I&C Technician		

Reviewed by	Signature	Date
Carlos Chacon		10/21/14
Electrical Foreman		

Reviewed by	Signature	Date
Phil Romero		11/7/14
ESH Manager		

Approved by	Signature	Date
Lawrence Chavez		11/10/14
Operations Manager		

Reviewed by	Signature	Date
Harold Salazar		11-10-14
Derivative Classifier	Unclassified	

UNCLASSIFIED

History of Revisions

Document Number	Issue Date	Action
UI-PROC-71-10-211-R2	11-10-14	Review and reissue. Minor changes.
UI-PROC-71-10-211-R1	10/05/11	Convert to new UI template. Minor revisions from one process owner.
UI-PROC-71-10-211-R0	2/01/11	Convert to Utilities & Institutional Facilities (UI) procedure. Minor changes to organization and formatting.
71-10-211 Rev. 1	07/20/06	Converted to KSL template. Format change.

Table of Contents

1 Purpose 5
2 Scope/Applicability 5
3 Prerequisites 5
4 Precautions and Limitations 6
5 Equipment, Supplies, etc. 6
6 Responsibilities 7
7 Procedural Steps 7
7.1 General 7
7.2 Preliminary Steps 8
7.3 Manual Calibration 8
7.3.1 As-Found Data 8
7.3.2 Adjust Zero and Span 9
7.3.3 Calibration Data 9
7.4 Acceptance Criteria 10
7.5 Follow-on Tasks 11
8 Records 11
9 Abbreviations, Acronyms, and Terms 11
10 References 12
11 Appendices and Attachments 12
Attachment 1. Level Pressure Transmitter Calibration Form 13

This page intentionally left blank.

Utilities & Institutional Facilities
Operations Procedure

Calibration of Level Transmitters

1 Purpose

The purpose of this procedure is to provide instructions for the calibration of electronic Level Transmitters.

2 Scope/Applicability

1. The procedure includes Level Transmitters with current output (4 to 20 mA) and voltage output.
2. The procedure applies only to Level Transmitters used for water and other non-flammable liquids at or near room temperature. The procedure may NOT be used for liquefied gasses or flammable liquids unless such use is reviewed and approved by Instrumentation and Controls (I&C) Superintendent.
3. The procedure covers “manual” calibration of Level Transmitters, i.e., when collection and instrument adjustment are performed manually.
    a. The optional Beamex Calibrator described below provides “semi-automatic” manual calibration.
    b. The Beamex Calibrator can also be operated in “automatic” mode, in which the Beamex collects calibration data automatically, thus relieving Operator of data collection tasks. This procedure does not cover automatic mode.
4. Affected personnel: Utilities & Institutional Facilities (UI) Instrumentation & Controls (I&C) System Specialists, Instrument Specialists, Electricians, System Engineer

3 Prerequisites

1. Required training and qualifications:
    a. Utilities & Institutional Facilities (UI) procedures and work control processes
    b. Occupational Safety and Health Administration (OSHA) regulations
    c. Understanding of this procedure, equipment, supplies, etc.
    d. On-the-job training (OJT) in the procedure
2. Pre-job briefing

4 Precautions and Limitations

1. Required Personal Protective Equipment (PPE):
   - Safety glasses with side shields
2. All hazards, both task specific and site specific, must be addressed in accordance with governing work control processes.
3. Before using this procedure, its applicability to the instrument to be calibrated must be reviewed and verbally approved by Calibration Coordinator or I&C Superintendent.
4. The procedure must be performed in an atmosphere free of combustible gases.

5 Equipment, Supplies, etc.

Equipment, tools, instruments

1. Calibration Pressure Standard (Pressure Standard) with current National Institute of Standards and Technology (NIST)-traceable calibration appropriate to the range of Level Transmitter being calibrated (Test Article).
   a. Pressure Standard must have an accuracy at least 4 times better than Test Article.
2. Multimeter or other device with current calibration status to accurately measure Pressure Standard transmitter output signal.
3. Optional: Beamex MC5 Calibrator with current calibration status. This instrument is used in place of items 1 and 2.
   a. The Beamex system provides semi-automatic calibration of the Level Transmitter and integrated measurement of output signal.
   b. The Beamex system includes the capability to act as a Pressure Standard over certain level ranges, as follows:
      - Port P1: 0 to 40 inches of water column (0 to 1.44 psig)
      - Port P2: −160 to 160 inches of water column (0 to 5.7 psig)
      - Port P3: −14.5 to 300 psig
   c. Additional level ranges, up to 900 psig, are available using external modules that connect to the Beamex MC5 Calibrator.

Supplies, materials, parts

1. Tubing, valves, and test rig to allow application of level to both Pressure Standard and Test Article.
2. Teflon tape or other pipe thread sealant aids.

6 Responsibilities

1. Persons performing this procedure are responsible for—
   - Complying with its requirements
   - Notifying Foreman or Superintendent of equipment damage or other conditions that could require corrective action
   - Issuing a PAUSE/STOP WORK order whenever warranted by conditions related to health or safety in accordance with P101-18, Procedure for Pause/Stop Work
2. Managers are responsible for ensuring procedure compliance.
3. If an instrument is left inoperable or cannot be calibrated, place a REJECTED (black on red) label or equivalent on instrument.

7 Procedural Steps

7.1 General

1. Most Pressure Standards actually measure liquid level using the static head pressure of the liquid. This procedure is therefore very similar to pressure sensor calibration.
2. Calibrations can be performed using air or water as the working fluid, but water is generally used.
3. To collect calibration data, pressures are applied at 5 selected points across the range of the Test Article. These points are 0%, 25%, 50%, 75%, and 100% of scale.
   a. Data may be collected on increasing or decreasing pressure, at the discretion of Calibration Technician or Electrician.
4. Working fluid is applied to Pressure Standard and Test Article at the same time.
5. Data are collected as follows:
   a. “As-Found” data are collected first to document existing accuracy.
   b. Adjustments are then made to Test Article if applicable (most Pressure Transmitters can be adjusted).
   c. Finally, after adjustment, “As-Left” calibration data are collected.
6. Use Level Pressure Transmitter Calibration Form 71-10-211.1 (Attachment 1).

7.2 Preliminary Steps

1. Inspect Test Article—including fitting connections and general condition—and verify that it appears to be in good working condition.
2. Verify that Pressure Standard is in current calibration, as determined by the Calibration Coordinator.
3. Verify that the multimeter is in current calibration, as determined by the Calibration Coordinator.
4. If using Beamex Calibrator, verify that it is in current calibration, as determined by Calibration Coordinator.
5. Record Test Article information on Calibration Form:
    a. Manufacturer
    b. Model or style number
    c. Identification number (serial number)
    d. I&C file number (if present)
6. Record Pressure Standard information on Calibration Form:
    a. Manufacturer
    b. Model or style number
    c. Identification number (serial number)
    d. Last calibration date
    e. Calibration due date
    f. Calibration organization

7.3 Manual Calibration

7.3.1 As-Found Data

1. Open vent valve on test rig to ensure all parts of system are at atmospheric level.
2. Connect Test Article to test rig so that it is connected in parallel with Pressure Standard.
3. Record Test Article reading and Pressure Standard reading on Calibration Form under “As-Found,” 0% reading.
4. Apply 25% of scale pressure to Test Article and Pressure Standard. Read Pressure Standard to adjust pressure.

5. Record Test Article reading and Pressure Standard reading on Calibration Form under “As-Found,” 25% reading.
6. Apply 50% of scale pressure to Test Article and Pressure Standard. Read Pressure Standard to adjust pressure.
7. Record Test Article reading and Pressure Standard reading on Calibration Form under “As-Found,” 50% reading.
8. Apply 75% of scale pressure to Test Article and Pressure Standard. Read Pressure Standard to adjust pressure.
9. Record Test Article reading and Pressure Standard reading on Calibration Form under “As-Found,” 75% reading.
10. Apply 100% of scale pressure to Test Article and Pressure Standard. Read Pressure Standard to adjust pressure.
11. Record Test Article reading and Pressure Standard reading on Calibration Form under “As-Found,” 100% reading.
12. Release pressure on Pressure Standard and Test Article.
13. Verify that Test Article reading returns to ZERO.

7.3.2 Adjust Zero and Span

1. Adjust Test Article so that proper readings are obtained at 0% and 100% scale.
   a. Most Pressure (Level) Transmitters have ZERO and SPAN adjustments, which are made at this time.
   b. ZERO and SPAN adjustments interact with each other, so multiple iterations may be required.
2. Verify proper reading at 0% and 100% of Test Article scale.

7.3.3 Calibration Data

1. Apply 0% scale to Test Article.
2. Record Test Article reading and Pressure Standard reading on Calibration Form under “Calibration Data,” 0% reading.
3. Apply 25% of scale pressure to Test Article and Pressure Standard. Read Pressure Standard to adjust pressure.
4. Record Test article reading and Pressure Standard reading on Calibration Form under “Calibration Data,” 25% reading.

5. Apply 50% of scale pressure to Test Article and Pressure Standard. Read Pressure Standard to adjust pressure.
6. Record Test article reading and Pressure Standard reading on Calibration Form under “Calibration Data,” 50% reading.
7. Apply 75% of scale pressure to Test Article and Pressure Standard. Read Pressure Standard to adjust pressure.
8. Record Test article reading and Pressure Standard reading on Calibration Form under “Calibration Data,” 75% reading.
9. Apply 100% of scale pressure to Test Article and Pressure Standard. Read Pressure Standard to adjust pressure.
10. Record Test Article reading and Pressure Standard reading on Calibration Form under “Calibration Data,” 100% reading.
11. Release pressure on Pressure Standard and Test Article.
12. Verify that Test Article reading returns to ZERO.

7.4 Acceptance Criteria

1. Test Article has passed calibration if the difference between Pressure Standard and Test Article readings is equal to or less than ± 1% of Test Article scale range at all calibration points.

   Note: Other accuracy requirements may be in effect for a particular instrument. An item is considered calibrated if the difference between Pressure Standard and Test Article is equal to or less than acceptance criteria defined by Engineering (using Calibration Form) at all calibration points. Contact Calibration Coordinator if you are uncertain about the applicable acceptance criteria.

2. If Test Article passes calibration, fill out a VERIFIED sticker and affix it to Test Article. The sticker may be applied to any location, but the front is preferred.
3. If Test Article fails calibration, affix a REJECTED sticker to it. The sticker may be applied to any location, but the front is preferred.
   a. Do not return instrument to Requester.
   b. Deliver instrument and calibration data to Calibration Coordinator for disposition.

7.5 Follow-on Tasks

1. If problems are found, immediately notify appropriate personnel so corrective action can be taken.

   Will corrective action be required?

   ❑ Yes ❑ No

2. ❑ All tasks in this procedure have been completed.

_____ _____
Signature *Z-number*

_____ _____
Print name *Date*

This procedure is complete. Include the procedure number on the Work Documentation Form and attach signed copies of procedure and forms to the Work Package.

8 Records

Records generated as a result of implementing this procedure are maintained in accordance with the UI records program.

9 Abbreviations, Acronyms, and Terms

Abbreviation, Acronym, or Term	Definition
ESH	Environment, Safety, and Health
I&C	Instrumentation and Controls
NIST	National Institute of Standards and Technology

Abbreviation, Acronym, or Term	Definition
mA	milliamperes
OJT	On-the-job-training
OSHA	Occupational Safety and Health Administration
PPE	Personal Protective Equipment
Pressure Standard	Calibration Pressure Standard used in procedure
psig	pounds per square inch - gauge
Test Article	Level Transmitter being calibrated
UI	Utilities & Institutional Facilities

10 References

P 101-18, Procedure for Pause/Stop Work

UI-PLAN-029, User-Performed Calibration Program Plan

11 Appendices and Attachments

Attachment 1. Level Pressure Transmitter Calibration Form

Utilities & Institutional Facilities Operations Procedure Calibration of Level Transmitters	UI-PROC-71-10-211-R2

Attachment 1. Level Pressure Transmitter Calibration Form

Transmitter Data:

Application:	Level Transmitter	Date:	
ID Number:	LIT-101	Serial Number:	
Location:	Pajarito Road Tank 590014	Model:	
Specific Location:	In Pit	Manufacturer:	
		Range:	

Specific Procedure:

_____ Inform the operator that you will be calibrating transmitter
_____ Reminder: Gas pressure will be giving false indications
_____ Notify the operator that the operation is completed

Use General Procedure: UI-PROC-71-10-211

Calibration Range	0.00	psig	20.00	psig

Input Signal		Process	Value
0%	scale	0.00	psig
25%	scale	5.00	psig
50%	scale	10.00	psig
75%	scale	15.00	psig
100%	scale	20.00	psig

Xmitter	Output
4.00	mA
8.00	mA
12.00	mA
16.00	mA
20.00	mA

As Found Value		mA	MAX ±	As Left Value		mA
0.00	psig		0.08	0.00	psig	
5.00	psig		0.08	5.00	psig	
10.00	psig		0.08	10.00	psig	
15.00	psig		0.08	15.00	psig	
20.00	psig		0.08	20.00	psig	

Accuracy: ± 0.5% of full scale (16 MA)

Employee Name: _____ Z # _____

Test Equipment Calibration Expiration Date:

Inst. Name		Inst. Ser. #		Due Date	
Inst. Name		Inst. Ser. #		Due Date	
Inst. Name		Inst. Ser. #		Due Date	
Inst. Name		Inst. Ser. #		Due Date	
Inst. Name		Inst. Ser. #		Due Date	

Comments: _____

Form # 71-10-211.1 Page 1 of 1

UTILITIES AND INSTITUTIONAL FACILITIES

Los Alamos NATIONAL LABORATORY

UI-PROC-71-10-201-R1

Maintenance Procedure

Manual Calibration of DP Flow Transmitters

Review frequency: 1 yr ☐ 2 yr ☐ 3 yr ☑ N/A ☐

Process Owner	Signature	Date
Jeff Sisneros	Jeff Sisneros	5/1/13
Calibration Coordinator		

	Signature	Date
Gary Blauert		5/1/13
Engineering Manager		

Reviewed by	Signature	Date
Phil Romero	Phil Romero	5/6/13
ESH Manager		

Approved by	Signature	Date
Martin Aguilera		5/7/13
Maintenance Manager		

Reviewed by	Signature	Date
Harold Sorrows		5/8/13
Derivative Classifier	Unclassified	

UNCLASSIFIED

History of Revisions

Document Number	Issue Date	Action
UI-PROC-71-10-201-R1	5-8-13	Review and reissue. Convert to Utilities & Institutional Facilities (UI) procedure. Minor changes.
UI-PROC-71-10-201-R0	08/25/10	Convert from KSL to U&I format. Add "Manual" to title. Minor changes.
71-10-201 Rev. 1	07/20/06	Format change.

Table of Contents

1 Purpose 5
2 Scope/Applicability 5
3 Prerequisites 5
4 Precautions and Limitations 6
5 Equipment, Supplies, Etc. 6
6 Responsibilities 6
7. Procedural Steps 7
7.1 Methodology 7
7.2 Verify Instrument Calibrations 8
7.3 Calibration Steps 8
7.3.1 As-found Data 8
7.3.2 Adjust Zero and Span 9
7.3.3 As-left Data 9
7.4 Acceptance Criteria 10
7.5 Follow-on Tasks 11
8. Records 11
9. Abbreviations, Acronyms, and Terms 11
10. References 12
11. Appendices and Attachments 12

Utilities & Infrastructure
Maintenance Procedure

Manual Calibration of DP Flow Transmitters

1 Purpose

The purpose of this procedure is to provide instructions for manual calibration of differential pressure (DP) flow transmitters.

2 Scope/Applicability

1. The procedure does not provide instructions for collecting calibration data automatically, as through the use of a Beamex Calibrator.
2. The procedure applies to the following types of transmitters:
   a. DP transmitters with voltage output devices and current output devices (4–20 mA)
   b. DP flow transmitters used for water, air, and steam
      - It does not apply to transmitters for liquified gasses or flammable liquids unless this use is reviewed and approved by the Instrumentation and Control (I&C) Superintendent.
3. Affected personnel: I&C personnel.

3 Prerequisites

1. Qualifications/training/experience:
   a. Understanding of UI procedures and work processes
   b. Current on UI training
   c. Understanding of this procedure
   d. Familiarity with operations, equipment, tools, parts, supplies, etc, used in this procedure
   e. On-the-job training (OJT) as appropriate
   f. Familiarity with the following procedures:
      - UI-PROC-60-10-110, Calibration Program
      - UI-PROC-71-10-255, Calibration of Pressure Indicators
2. Training decision: process briefing with roster prior to performance of work

3. Prior to performance of work under this procedure, the Calibration Coordinator or I&C Superintendent must review and verbally approve its applicability to the DP flow transmitter to be calibrated (Test Article).

4 Precautions and Limitations

1. All hazards, both task specific and site specific, must be addressed with the governing work control process.
2. Personal Protective Equipment (PPE):
   - Safety glasses with side shields
3. This procedure may be performed only in an atmosphere free of combustible gases.

5 Equipment, Supplies, Etc.

1. Calibration Pressure Standard
   a. NIST-traceable calibration appropriate to the range of Test Article
   b. Precision at least 4 times precision of Test Article
2. Calibrated multimeter of other device suitable for accurately measuring Test Article output signal

   Note: Instruments without current calibration are to be returned to Calibration Coordinator.
3. Test Rig used to introduce specified pressures to Calibration Pressure Standard and Test Article
4. Tubing, valves, and fixtures needed to connect Pressure Standard and Test Article to Test Rig
   a. Teflon tape or other pipe-thread sealant

6 Responsibilities

1. Personnel performing work under this procedure are responsible for complying with its requirements.
2. Foremen, supervisors, and/or other appropriate personnel are responsible for ensuring such compliance.
3. Personnel performing work under this procedure are responsible for notifying foremen, supervisors, and/or other appropriate personnel whenever problems such as unsafe conditions and/or damaged facilities, equipment, components, etc. are found, so corrective action may be taken.
4. All personnel performing work under this procedure are responsible for issuing a STOP/PAUSE WORK order if warranted by unsafe conditions in accordance with P 101-18, Procedure for Pause/Stop Work.

7. Procedural Steps

7.1 Methodology

1. DP flow transmitters measure flow rate using differential pressure across a flow element (such as an orifice plate or annubar element). The procedure is similar to UI-PROC-71-10-231, Calibration of Pressure Transmitters.
2. Calibration may be performed using air or water as the working fluid but is generally performed using air.
3. The air or water is applied at the same time to Pressure Standard and Test Article.
4. Data collected include the pressures applied to perform a 5-point calibration across the range of the pressure transmitter.
   a. Calibration points are selected at 0%, 25%, 50%, 75%, and 100% of scale.
   b. Data may be collected by increasing or decreasing pressure, at the discretion of the calibration technician or electrician.
5. Data are recorded on Form 60-10-110.2, Calibration Data Sheet. (See UI-PROC-60-10-110, Calibration Program.)
6. Calibration sequence:
   a. “As-found” calibration data are collected to determine existing accuracy of the DP flow transmitter.
   b. Adjustments are made to the flow transmitter as necessary.
   c. “As-left” calibration data are collected.
7. If Test Article is inoperable or cannot be calibrated, place a REJECTED (black on red) or equivalent label on it.

   Note: The Beamex Calibrator System (not covered by this procedure) provides semi-automatic calibration of the transmitter and integrated measurement of the output signal. It can act as a level standard for the following level ranges:

   - Port P1: 0 to 40 inches of water column (WC) (0 to 1.44 psig)
   - Port P2: -160 to 160 inches of water column (WC) (0 to 5.7 psig)
   - Port P3: -14.5 to 300 psig

   Additional ranges up to 900 psig are available using external modules that connect to the Beamex MC5 Calibrator, which may be used only when in current calibration, as verified by Calibration Coordinator.

7.2 Verify Instrument Calibrations

1. Verify that Pressure Standard is in current calibration and its calibration interval has not elapsed.
2. Verify that the multimeter is in current calibration and its calibration interval has not elapsed.

7.3 Calibration Steps

7.3.1 As-found Data

1. Inspect Test Article, and verify the following:
   a. Good general condition
   b. Good operating condition
   c. Undamaged fitting threads, etc.
2. Record the following information on Calibration Data Sheet :
   a. Manufacturer
   b. Model or style number
   c. Identification number (e.g., serial number)
   d. I&C file number if present
3. Record Pressure Standard information on Calibration Data Sheet :
   a. Manufacturer
   b. Model or style number
   c. Identification number (e.g., serial number)
   d. Last calibration date
   e. Calibration due date
   f. Calibration organization
4. Open the vent valve on the test rig to ensure that all parts of the system are at atmospheric pressure.
5. Connect the “high side” of Test Article to the calibration rig in such a way that it is in parallel with Pressure Standard. Vent the “low side” of the flow transmitter to atmosphere.
6. Collect data:
   a. Record Test Article reading and Pressure Standard reading on Calibration Data Sheet under “As-found,” 0% reading.

b. Apply 25% of scale pressure to Test Article and Pressure Standard. Read Pressure Standard to adjust the pressure.

c. Record Test Article reading and Pressure Standard reading on Calibration Data Sheet under “As-found,” 25% reading.

d. Apply 50% of scale level to Test Article and Pressure Standard. Read Pressure Standard to adjust the level

e. Record Test Article reading and Pressure Standard reading on Calibration Data Sheet under “As-found,” 50% reading.

f. Apply 75% of scale level to Test Article and Pressure Standard. Read Pressure Standard to adjust the level.

g. Record Test Article reading and Pressure Standard reading on Calibration Data Sheet under “As-found,” 75% reading.

h. Apply 100% of scale level to Test Article and Pressure Standard. Read Pressure Standard to adjust pressure.

k. Record Test Article reading and Pressure Standard reading on Calibration Data Sheet under “As-found,” 100% reading.

7. Release pressure on Pressure Standard and Test Article.

8. Verify that Test Article reading returns to zero.

7.3.2 Adjust Zero and Span

This section applies to pressure (level) transmitters that have zero and span adjustments, as most do.

1. Adjust Test Article so that correct readings are obtained at 0 and 100% scale. Zero and span adjustments interact with each other, so multiple iterations may be required.

   Note: DP flow meters have non-linear scales on engineering units displays. Control Room indications will therefore match applied pressures only at the 0 and 100% data points. The current or voltage output at the transmitter, however, will follow applied pressure.

2. Before proceeding to next section, recheck Test Article scale readings at 0% and 100% to verify that they are correct.

7.3.3 As-left Data

1. Apply 0% scale to Test Article.

2. Collect data:

   a. Record Test Article reading and Pressure Standard reading on Calibration Data Sheet under “As-left Data,” 0% reading.

b. Apply 25% of scale level to Test Article and Pressure Standard. Read Pressure Standard to adjust the pressure.

c. Record Test Article reading and Pressure Standard reading on Calibration Data Sheet under “As-left Data,” 25% reading.

d. Apply 50% of scale level to Test Article and Pressure Standard. Read Pressure Standard to adjust the pressure.

e. Record Test Article reading and Pressure Standard reading on Calibration Data Sheet under “As-left Data,” 50% reading.

f. Apply 75% of scale level to Test Article and Pressure Standard. Read Pressure Standard to adjust the pressure.

g. Record Test Article reading and Pressure Standard reading on Calibration Data Sheet under “As-left Data,” 75% reading.

h. Apply 100% of scale level to Test Article and Pressure Standard. Read Pressure Standard to adjust the pressure.

k. Record Test Article reading and Pressure Standard reading on Calibration Data Sheet under “As-left Data,” 100% reading.

3. Release pressure on Pressure Standard and Test Article.

4. Verify that Test Article reading returns to zero.

7.4 Acceptance Criteria

1. In general, the Test Article has passed calibration if the difference between the level Pressure Standard and Test Article is equal to or less than plus or minus one percent (+/- 1%) of Test Article full scale range at all calibration points.

2. Other accuracy requirements may be in effect for a particular instrument.

   a. For instance, an item may be considered calibrated if the difference between Pressure Standard and Test Article is equal to or less than specific acceptance criteria defined by engineering staff at all calibration points (using Form 60-10-110.1, Calibration Program Form).

3. Contact Calibration Coordinator if you are uncertain about applicable acceptance criteria.

4. If Test Article passes calibration, fill out a VERIFIED sticker, and affix the sticker to Test Article.

   a. The sticker may be applied to any location, but the front is preferred.

5. If Test Article fails calibration, affix a REJECTED sticker to Test Article.

   a. The sticker may be applied to any location, but the front is preferred.

   b. Do not return the instrument to the requestor. Deliver the instrument and calibration data to Calibration Coordinator for disposition.

7.5 Follow-on Tasks

1. If problems are found, immediately notify appropriate personnel so corrective action can be taken.

   Will corrective action be required?

   ❑ Yes ❑ No

2. ❑ All tasks in this work instruction have been completed.

Signature _____ Print name _____

Date _____ Z-number _____

This procedure is complete. Include the procedure number on the Work Documentation Form and attach copies of the signed procedure and any forms to the Work Package. Deliver calibration records to Calibration Coordinator.

8. Records

Records generated as a result of implementing this procedure are maintained in accordance with the UI records program.

9. Abbreviations, Acronyms, and Terms

Abbreviation, Acronym, or Term	Definition
DP	differential pressure
ESH	Environment, Safety & Health
I&C	Instrumentation and Controls
NIST	National Institute of Standards and Technology
OJT	on-the-job-training
psig	pounds per square inch, gauge

Abbreviation, Acronym, or Term	Definition
Test Article	DP flow transmitter to be calibrated
UI	Utilities & Institutional Facilities
WC	water column

10. References

P 101-18, Procedure for Pause/Stop Work

UI-PROC-60-10-110, Calibration Program

UI-PROC-71-10-231, Calibration of Pressure Transmitters

UI-PROC-71-10-255, Calibration of Pressure Indicators

11. Appendices and Attachments

None

ANNUAL WATERSIDE/FIRESIDE CHECKLIST for TA-09/16 STEAM PLANTS

Sellers Boilers Technical Description

The boilers at TA-09 & TA -16 are located in eight (8) boiler plants: Plant 1 (TA-16-1480), Plant 4 (TA-16-1483), Plant 5 (TA-16-1484), Plant 8 (TA-16-1487), Plant 11 (TA-16-1490), Plant 12 (TA-16-1491), Plant 13 (TA-09-0282), and Plant 14(TA-16-1492). They are Sellers brand firetube boilers manufactured in 1995. They all have a maximum allowable working pressure (MAWP) of 150 psig. The supply gas pressure is 5 psig. Attachment 1 and Attachment 2 have technical information for each boiler.

The inspection and maintenance will consist of replacement, or testing, of all the pressure relief safety valves, a waterside and fireside boiler inspection, cleaning of any debris or scaling inside the boiler, inspection of various plant components, steam gauge calibration, steam/gas pressure switch set point verification and an internal and external inspection by a qualified boiler inspector.

Follow the checklists in Attachment 3 before the boiler is released by UI Engineering for operations. The Attachment 3 checklist is to be completed for each boiler. The U&I system engineer must be alerted for inspection of boiler components, specifically the hold points as seen in the text below.

A calibrated flue gas analyzer will be needed for two scenarios: light off and low-NOx boiler settings. Record the O2, CO and NOx levels. Include the calibration date of the flue gas analyzer in Attachment 3. The boilers are to be run in the low-NOx mode.

The boiler output pressure will be 80 psig, with special exception to the two boilers at Plant # 12 which will operate at 40 psig.

There are three pressure switches on top of each boiler: the high pressure steam limit (High Limit) switch, the operating pressure control (OPC) switch, and the low NOx steam setting (CSLC) switch. For all boilers except for Plant #12: set the high pressure steam limit (High Limit) switch to 90 psig; set the operating pressure control (OPC) switch to 80 psig; set the low NOx steam setting (CSLC) switch to 80 psig. For the two boilers at Plant # 12: set the high pressure steam limit (High Limit) switch to 45 psig; set the operating pressure control (OPC) switch to 40 psig; set the low NOx steam setting (CSLC) switch to 40 psig. All steam pressure set point verification must be performed with a calibrated gauge. All gauges used for pressure switch set points must have calibration dates and those are to be recorded on the checklist in Attachment 3. **All pressure switches shall be verified that they perform the intended function.**

There are four pressure switches at the steam header: the lead, lag, and two low pressure switches. For all boilers except Plant #12: set the lead to 80 psig; set the lag to 75 psig; and set the two low pressure switches to 30 psig. For the two boilers at Plant #12: set the lead to 40 psig; set the lag to 35 psig; and set the two low pressure switches to 20 psig. **All pressure switches shall be verified that they perform the intended function.**

The high and low limit gas pressure switches should also be verified that they shutdown the boiler and set to the correct values. The high limit gas pressure switch should be set at 17" wc, and the low limit gas pressure switch should be set at 4" wc. All gas pressure settings shall be performed with a calibrated gauge. All gauges shall have calibration dates and those are to be recorded on the checklist in Attachment 3.

Training requirements include all pertinent training for Los Alamos National Laboratory and the site specific training (TA-09 & TA-16). It is also required that the boiler maintenance crew performing Low NOx verification receives boiler training from either the manufacturer (Sellers) or the local manufacturer's representative.

Inspection/Maintenance Procedures

1) Remove safety relief valves and replace with Kunkle model 6010 relief valves if they are not the valves referenced in Attachment 2. If new valves are not installed test and repair safety relief valves in accordance with the Engineering Standard Manual Chapter 17. Refer to Attachment 2 for ordering information.

2) Lubricate motor bearings as follows:

a) Grundfos boiler feed pumps- lubricate the Baldor motor with Polyrex EM (Mobil) grease.
b) Baldor blower motor – lubricate with Polyrex EM (Mobil) grease.

3) Clean any debris accumulated on the Neptune/Leeson chemical feed pumps and the GE/Neptune chemical mixing motors.

Waterside Inspection

1) Open flue door and inspect tube sheets for water leakage. The narrow ligaments between tube holes are subject to tremendous stresses and should be watched for any sign of cracking mainly due to overheating.

2) Drain boiler and remove all hand hole and manhole covers, where applicable, to allow a visual check of all internal accessible areas. Example: shell, tubes and tube sheets.

Hold Point: U&I system engineer and chemical treatment company representative are required for waterside inspection. Give at least 7 days advance notice and coordinate with U&I system engineer.

3) Carefully examine waterside surfaces using a strong light and mirror where required. Look for evidence of scale, corrosion, blisters, or pitting, indicating adequacy of water treatment.

4) Use a high pressure hose to wash sediment out of the bottom and other internals of the boiler.

Hold Point: U&I system engineer and qualified boiler inspector needed for boiler internal inspection. Give at least 7 days advance notice and coordinate with U&I system engineer.

5) Remove both head covers from the bodies of the two float operated low water cut-offs (LWC). The float-assembly and mercury switches are located on these heads. Flush out both LWC bodies. Inspect floats and replace if necessary. Reinstall head

covers. Remove caps from the inspection crosses associated with both LWCs and flush out piping connected to boiler. Reinstall caps.

Fireside Inspection

1) Check gas burners for presence of dirt, lint, or foreign matter. Be sure of ports, gas passages and air passages are free of obstructions.

2) Check the fireside of furnace and firetubes for any evidence of soot formation or corrosion. Evidence of soot formation is a sign of improperly adjusted combustion. Brush and vacuum furnace and firetubes if such conditions exist.

3) Check condition of all heat extractors. These devices can be pulled out individually from each of the firetubes and cleaned if necessary. Repair or replace if necessary.

4) Check flue door gaskets and other gaskets to make sure that they are in good condition and that they are properly secured. Replace, if required, the flue door gaskets. An ineffective seal may allow flue gases to escape into the boiler room and result in burned gaskets and warped flue doors.

5) Verify the settings for the following steam switches: lead, lag, low boiler pressure (2). Set to the aforementioned values.

6) Verify the Low-NOx switch. Set to the aforementioned values.

7) Verify the gas low and high limit switches. Set to the aforementioned values.

8) After the fireside and waterside surfaces have been inspected by the U&I system engineer and by the qualified boiler inspector, and work is completed, close and secure front and rear flue doors. Reinstall hand hole and manifold covers if applicable; hook up all associated piping and refill boiler to proper level.

9) Clean out all Y-strainers and steam traps.

10) Open up condensate return tank. Inspect for deposits and clean, if necessary.

11) Grease plug valves on gas supply line.

Post Maintenance

1) Complete checklist in Attachment 3.

2) Check pilot burners and ignition equipment for proper condition and adjustment.

3) Visually check burner for proper combustion. Combustion analysis is verifiable only with a flue gas analyzer and is performed mainly on boilers with power burners. Adjust fuel/air mixture as needed. Refer to Attachment 1 for commissioning flue gas analysis results.

4) Complete the functional checklist on page 3 of Attachment 3.

Hold Point: U&I system engineer and qualified boiler inspector needed for external boiler inspection. Give at least 7 days advance notice and coordinate with U&I system engineer.

5) Before the boiler is released to operations the U&I System engineer is to review and sign off on Attachment 3.

ATTACHMENT 1: Baseline Settings

							Lightoff Readings						Low NOx readings					
Plant #	Location	Serial #	Boiler HP	High Pilot "wc	Low Pilot "wc	Blower Pressure "wc	Manifold Pressure "wc	Combustion Chamber Pressure "wc	Main Gas Pressure "wc	O2 %	CO ppm	NOx ppm	Manifold Pressure "wc	Combustion Chamber Pressure "wc	Main Gas Pressure "wc	O2 %	CO ppm	NOx ppm
1	16-1480-A	100852-B	98	10	10	7.3	5.4	2.1	11.6	3.4	8	52	5.4	1.7	12.5	6.3	18	21
1	16-1480-B	100852-A	98	10	6	7.3	5.3	2.3	9.7	4	29	50	5.3	2	10.5	6.3	6	27
4	16-1483-A	100850-B	128	10.2	5	7.5	5.8	2.4	10.8	3.6	7	51	5.8	2.1	12.5	5.9	8	25
4	16-1483-B	100850-A	128	11	5.5	7.5	5.6	2.3	13.5	3.4	6	51	5.6	2	15	6.5	18	22
5	16-1484-A	100848-A	183	11	6.8	7.9	5.2	2.3	14	3.7	7	46	5.2	2	16	6	41	24
5	16-1484-B	100848-B	183	11.5	7	8	5.5	2.3	15	3.4	11	53	5.5	2	16	6	10	21
8	16-1487-A	100857-B	56	10	5	7.8	5.8	2.5	8.3	3.5	125	50	5.5	1.9	8.7	6.6	82	17
8	16-1487-B	100857-A	56	11	5	7.8	5.6	2.7	7	3.6	18	47	5.6	2.3	7.3	6.3	26	21
11	16-1490-A	100856-A	95	9.5	6.8	7.2	5	2.1	10.6	2.6	49	59	5	1.8	11.1	5.8	8	28
11	16-1490-B	100856-B	95	9.4	6	7.1	4.9	2	8.6	3.4	9	59	4.9	1.8	9.3	5.7	6	28
12	16-1491-A	100859-A	24	10	9	6.4	5.4	3	6.2	5.3	56	43	5.4	2.7	6.8	5.4	66	40
12	16-1491-B	100859-B	24	10	9	7.8	5.6	3.5	8.2	5.3	95	39	5.6	2.7	8.5	7	22	29
14	16-1492-A	100855-B	85	10	9	10	5.2	2.3	8.5	3	7	53	5.2	2	10.7	6.4	24	24
14	16-1492-B	100860-A	70	10	8.5	8.3	5.3	2.5	8.5	3.1	46	51	5.3	2.1	9.2	5.6	28	26
13	9-282-A	100849-A	153	10.5	10	8	5.1	2.2	13.6	3.7	11	57	5.1	1.9	15	6.4	6	27
13	9-282-B	100849-B	153	10.5	6	8.4	5.6	2.4	11.3	3.8	12	52	5.6	2.1	12.5	5.9	8	26

Attachment 2: Approved Steam Safety Valves

Plant #	Location	Serial #	ASME #	Nat'L Board #	Capacity (#/HR)	Safety Valve Inlet	Safety Valve Brand	Safety Valve to Order
1	16-1480-A	100852-B	10158	8365	3381	2" H.Coup.	Kunkle	6010HHM01-AM0100
1	16-1480-B	100852-A	10022	8359	3381	2" H.Coup.	Kunkle	6010HHM01-AM0100
4	16-1483-A	100850-B	10324	8375	4416	2" H.Coup.	Kunkle	6010HHM01-AM0100
4	16-1483-B	100850-A	10323	8386	4416	2" H.Coup.	Kunkle	6010HHM01-AM0100
5	16-1484-A	100848-A	10291	8334	6313	2" H.Coup	Kunkle	6010HHM01-AM0100
						1 1/2" H. Coup	Kunkle	6010GGM01-AM0100
5	16-1484-B	100848-B	10290	8333	6313	2" H.Coup	Kunkle	6010HHM01-AM0100
						1 1/2" H. Coup	Kunkle	6010GGM01-AM0100
8	16-1487-A	100857-B	10314	8355	1932	2" H.Coup.	Kunkle	6010HHM01-AM0100
8	16-1487-B	100857-A	10313	8354	1932	2" H.Coup.	Kunkle	6010HHM01-AM0100
11	16-1490-A	100856-A	10328	8395	3278	2" H.Coup.	Kunkle	6010HHM01-AM0100
11	16-1490-B	100856-B	10329	8388	3278	2" H.Coup.	Kunkle	6010HHM01-AM0100
12	16-1491-A	100859-A	10330	8380	828	1 1/2" H.C. 3000#	Kunkle	6010GGM01-AM0050
12	16-1491-B	100859-B	10331	8381	828	1 1/2" H.C. 3000#	Kunkle	6010GGM01-AM0050
14	16-1492-A	100855-B	10327	8387	2933	2" F. Coup	Kunkle	6010HHM01-AM0100
14	16-1492-B	100860-A	10317	8361	2415	2" F. Coup	Kunkle	6010HHM01-AM0100
13	9-282-A	100849-A	10292	8338	5278	2" H.Coup	Kunkle	6010HHM01-AM0100
						1 1/2" H. Coup	Kunkle	6010GGM01-AM0100
13	9-282-B	100849-B	10293	8342	5278	2" H.Coup	Kunkle	6010HHM01-AM0100
						1 1/2" H. Coup	Kunkle	6010GGM01-AM0100

ATTACHMENT 3: BOILER CHECKLIST

Boiler SN_____

Boiler Location_____

Date(s) Performed_____

Safety valves replaced?_____ Model #_____

Boiler Pressure (psig)_____ Fireside inspection:_____

Supply gas pressure (psig)_____ Waterside inspection:_____

Low water cut-offs operational?____ Flue door gaskets replaced?_____

Verify steam switches (4):_____ Lead set point_____

Calibrate Boiler Pressure Gauge___ Lag set point_____

Low boiler pressure set points_____

Verify gas pressure switches (2):_____ Low set point_____

High set point_____

Calibration date on steam pressure gauge_____

Calibration date on gas pressure gauge_____

Calibration date on flue gas analyzer_____

Boiler set in low NOx setting?_____ Low NOx set point_____

MSS Rep_____ Date_____

Released for Operations by U&I System Engineer_____ Date_____

Work Control: Send copy of this completed form to TA-09/TA-16 System Engineer.
Copy sent to Engineer by WCS _____ Date _____

Pressure and Flue Gas Analysis

	" wc
High Pilot Pressure	
Low Pilot Pressure	
Blower Pressure	

	Lightoff Readings	Low NOx Readings
Manifold Pressure ("wc)		
Combustion Chamber Pressure ("wc)		
Main Gas Pressure (psig)		
O2 (%)		
CO (ppm)		
NOx (ppm)		

MSS Rep_____ Date_____

Released for Operations by U&I System Engineer_____ Date_____

Work Control: Send copy of this completed form to TA-09/TA-16 System Engineer.
Copy sent to Engineer by WCS _____ Date _____

FUNCTIONAL CHECKLIST

Verify that the following systems are functional and provide comments below.

- ☐ Steam system
  - o Traps
  - o Y- strainers
- ☐ Condensate return system
- ☐ Gas system
- ☐ Motors operational
- ☐ Pumps operational
- ☐ Feed water system
- ☐ Chemical feed system
- ☐ Blowdown system
  - o Valve controlling continuous blowdown
- ☐ Electrical system
- ☐ Safety shutdown
- ☐ Building
  - o Lights operational
  - o Heating system
  - o Life safety

COMMENTS:_____

_____

_____

_____

_____

_____

MSS Rep_____ Date_____

Released for Operations by U&I System Engineer_____ Date_____

Work Control: Send copy of this completed form to TA-09/TA-16 System Engineer.
Copy sent to Engineer by WCS _____ Date _____

Boilers on Summer Lay-Up
TA-09 and TA-16

Boiler	Description	Boiler Elec. LO/TO	Feed Water Control	Alternator	Feed Water Panel	Steam Header	Make-Up Water	Quick Fill	Cont. Blow Down Valve	Drain Valves on Oper. Boiler	Gas Valve
16-1483	BS-A Fire/Water	PPA CKT 5	LP1 CKT 7	LP1 CKT 7.5	PPA CKT 9?	N/A	Yes	Yes	Yes	4	Yes
16-1483	BS-B Fire/Water	PPA CKT 11	LP1 CKT 7	LP1 CKT 7.5	PPA CKT 9?	N/A	Yes	Yes	Yes	4	Yes
16-1484	BS-A Fire/Water	PPA CKT 4	LP1 CKT 7	LP1 CKT 7.5	PPA CKT 9?	N/A	Yes	Yes	Yes	4	Yes
16-1484	BS-B Fire/Water	PPA CKT 10	LP1 CKT 7	LP1 CKT 7.5	PPA CKT 9?	N/A	Yes	Yes	Yes	4	Yes
16-1490	BS-A Fire/Water	PPA CKT 4	LP1 CKT 7	LP1 CKT 7.5	PPA CKT 9?	N/A	Yes	Yes	Yes	4	Yes
16-1490	BS-B Fire/Water	PPA CKT 10	LP1 CKT 7	LP1 CKT 7.5	PPA CKT 9?	N/A	Yes	Yes	Yes	4	Yes

Los Alamos	Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)		
Revision # 0			**Activity/Task Title: ST 1Y STEAM PLANT WATERSIDE / FIRESIDE**
Work Document #: (WO # / Task)			**Planner/Preparer (Name/Z#/Date)** **Justin Maestas / 177550 / 4/18/16**
TA: **9 &16**	**Building:**	**Room:** **ALL**	**Additional Location Description:** **Steam Boiler Houses**

1.0 Work Scope

Perform annual Waterside / Fireside PM and boiler inspections on boilers per UI Checklist / PMI. Engineering will provide support, oversight and training.

POC: Jason Sparks 500-6436

2.0 Entry Conditions

2.1 PAUSE/STOP WORK if steps cannot be completed as described, or if unforeseen situations occur. Stabilize the situation if safe, contact your supervisor or Person-In-Charge (PIC), and await further instructions before proceeding

2.2 Ensure activity is on appropriate Plan(s) of the Day

2.3 Check-in with ops prior to performing work

2.4 Steps in this procedure may be worked out of sequence as directed by supervisor/PIC

2.5 Ensure permits required for the work have been approved and posted, as required

2.6 PIC will be available while work is being conducted

2.7 PIC will review site specific hazards noted on IWD Part 2, Form 2101 with all workers

2.8 All hold points will be discussed on a daily basis

2.9 Verify all identified hazards have been eliminated, mitigated or minimized

3.0 Hazard Identification and Mitigation

3.1 General PPE Requirements

- Safety glasses with side shields (ANSI Z87 Approved)
- Safety shoes
- Hard hat (if overhead hazards exist)
- Work gloves

3.2 Mechanical Hazards

- Ensure all guards are in place before accessing equipment
- Relieve all stored energy before performing maintenance activities

Los Alamos NATIONAL LABORATORY	Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)		
Revision # 0			**Activity/Task Title: ST 1Y STEAM PLANT WATERSIDE / FIRESIDE**
Work Document #: (WO # / Task)			**Planner/Preparer (Name/Z#/Date)** **Justin Maestas / 177550 / 4/18/16**
TA: **9 &16**	**Building:**	**Room:** **ALL**	**Additional Location Description:** **Steam Boiler Houses**

3.3 Hot Surfaces

- Wear long sleeve shirts or Ansell sleeves when working near hot surfaces
- Utilize insulating blankets to protect against hot surfaces

3.4 Slips, Trips and Falls

- Be aware of ground and floor conditions
- Ensure housekeeping is performed as work progresses

3.5 Chemical Hazards:

- Consult IH&S for PPE requirements.
- Place a catch pan under chemical and collect all residual chemicals. Deposit chemical in the day tank.
- Review the safety data sheets for all chemical and oil products.
- An eyewash station and safety shower must be within 10 seconds of where the chemicals are being used. Verify eyewash and safety shower have a current inspection.

3.6 Back Strains

- Use proper lifting and bending techniques at all times
- Use mechanical means or team lift if needed

3.7 Working with hand tools, cuts and abrasions

- Inspect all tools prior to use
- Wear proper work gloves as determined by the job scope
- Use all tools properly and only for intended purpose
- Use GFCI protection for corded tools

3.8 Pinching or crushing / hand injury

- Be aware of hand / foot / body position
- Avoid pinch / crush points
- Be aware of line of fire

3.9 Welding

- Use appropriate welding procedure checklist
- Keep combustible materials clear or protect surrounding
- Wear welding hood with appropriate lens for welding operation performed. Wear welding gloves.
- Ensure adequate ventilation or use welding fume extractor

Los Alamos NATIONAL LABORATORY	Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)		
Revision # 0			**Activity/Task Title: ST 1Y STEAM PLANT WATERSIDE / FIRESIDE**
Work Document #: (WO # / Task)			**Planner/Preparer (Name/Z#/Date)** **Justin Maestas / 177550 / 4/18/16**
TA: **9 &16**	**Building:**	**Room:** **ALL**	**Additional Location Description:** **Steam Boiler Houses**

3.10 Lock Out / Tag Out (LO/TO)

- Utilize LO/TO Attachments per P101-3
- Verify zero energy prior to performing work

3.11 Approach Boundary Information for 301 to 750 Volts

- Limited Approach 3'-6" (fixed circuits/parts)
- Restricted Approach 1'-0"
- Prohibited Approach 0'-1"

3.12 240V to 600V Zero Voltage Check requirements

- Mode 1, Class 1.3B
- Wear CAL 8+ PPE: Double layer switching hood
- Wear Class 0 Dielectric Gloves
- Wear AR coveralls with an arc rating of 8 or more, hardhat, and safety glasses underneath hood
- 2-man rule applies
- Use NRTL approved voltage meter rated for voltage being tested. Test meter on a known live circuit before and after zero voltage
- Remove all metallic objects or jewelry
- Ensure no uninsulated body part enters prohibited space
- Use voltage rated tools

3.13 Less than 240V Zero Voltage Check requirements

- Mode 1
- Wear CAL 4+ PPE: Long sleeve shirt/pants or coveralls, and face shield
- Wear Class 0 Dielectric Gloves
- 2-man rule applies
- Use NRTL approved voltage meter rated for voltage being tested. Test meter on a known live circuit before and after zero voltage
- Remove all metallic objects or jewelry
- Ensure no uninsulated body part enters prohibited space
- Use voltage rated tools

Los Alamos	Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)		
Revision # 0			Activity/Task Title: ST 1Y STEAM PLANT WATERSIDE / FIRESIDE
Work Document #: (WO # / Task)			Planner/Preparer (Name/Z#/Date) Justin Maestas / 177550 / 4/18/16
TA: 9 &16	Building:	Room: ALL	Additional Location Description: Steam Boiler Houses

4.0 Training Requirements

4.1 MSS Maintenance Worker, TP 10968

4.2 Lock Out / Tag Out, TP 127

4.3 Pipefitters, Curriculum 647

4.4 Pressure Safety

4.5 Qualified Welder

4.6 Qualified Electrician

4.7 Site Specific Training

5.0 Work Execution

5.1 **Notes**

- Permits required for this work: LO/TO Attachment, Spark and Flame Permit, Weld Checklist
- LO/TO devices ~~shall~~ will be applied in accordance with P101-3. "Lockout/Tagout for Hazardous Energy Control" per 4-25-16
- Discuss emergency evacuation procedures and muster areas
- Discuss possible error situations and mitigations

5.2 **Prerequisites**

- VERIFY pre-job briefing has been performed for all affected personnel
- VERIFY all personnel have the appropriate PPE for job execution
- BARRICADE work area to protect against inadvertent access
- USE robust barriers and flagging to clearly define execution area
- VERIFY all required permits are approved and posted as required

5.3 **Execution**

1. **VERIFY** boiler is ready to be taken out of service
   - NOTIFY operations
2. **PERFORM** external boiler inspection
   - USE National Boiler Inspection Code (NBIC) standards
   - Inspector must be certified to NBIC

Los Alamos	Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)		
Revision # 0			Activity/Task Title: ST 1Y STEAM PLANT WATERSIDE / FIRESIDE
Work Document #: (WO # / Task)			Planner/Preparer (Name/Z#/Date) Justin Maestas / 177550 / 4/18/16
TA: 9 &16	Building:	Room: ALL	Additional Location Description: Steam Boiler Houses

3. **DE-ENERGIZE** boiler
   - CLOSE valves
   - TURN OFF breakers
   - APPLY LO/TO
   - VERIFY zero voltage / energy
   - WEAR PPE for appropriate voltage above
   - BLEED residual pressures
   - UTILIZE PMI or UI Procedures
   - VERIFY unit will not re-start
   - VERIFY boiler is completely shutdown
4. **OPEN** access covers and doors
5. **REMOVE** wiring from pressure and control switches
3. **PERFORM** annual boiler maintenance
   - UTILIZE checklists, PMIs and procedures
   - NOTIFY engineering to provide support if required
   - CALIBRATE gauges
   - DOCUMENT maintenance performed (PMI Card)
4. **PERFORM** internal boiler inspection
   - NBIC
5. **CLOSE** removed / opened access covers and doors
   - REPLACE gaskets on doors as needed
6. **RECONNECT** removed control and switch wiring
7. **VERIFY** boiler is ready to be placed back into service
   - INSPECT work for proper installation
8. **REMOVE** applied LO/TO
   - RE-ENERGIZE boiler
9. **VERIFY** proper operation of boiler
10. **PERFORM** post maintenance tests as required by the System Engineer
11. **NOTIFY** operations of status
12. **CLEAN** Work area
    - SEGREGATE waste as required by WMC
    - DISPOSE of all generated waste properly
    - REMOVE all tools, equipment and barricades

6.0 Closeout

6.1 Contact OMC (MC) and inform them work is complete.

6.2 Complete all required documentation and return Work Package

Los Alamos NATIONAL LABORATORY	Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)		
Revision # 0			**Activity/Task Title: ST 1Y STEAM PLANT WATERSIDE / FIRESIDE**
Work Document #: (WO # / Task)			**Planner/Preparer (Name/Z#/Date)** Justin Maestas / 177550 / 4/18/16
TA: 9 &16	**Building:**	**Room:** ALL	**Additional Location Description:** Steam Boiler Houses

Insert Rows above for additional Tasks/Steps or attach pages to clearly communicate ESH&Q/S&S hazards and associated controls.	The RLM and FOD or FOD Representative (if required or Recommended by RLM, e.g. high hazard) approval indicates IWM has been applied appropriately, work is authorized , workers are qualified, work will be performed in accordance with ESH&Q/S&S requirements and the IWD, and facility safety basis, aggregate hazards, and collocated hazards were appropriately included in the hazard analysis and acknowledges completion of a peer review	**RLM** (Signature/Z#/Date) **Required** 4-19-16 Laura Valy 166425 **FOD or Representative** (Signature/Z#/Date) **Required** 090206 4-25-16 **SME Review** (Signature/Z#/Date) **If Required** N/A **ESO Review** (Signature/Z#/Date) **If Required** 088524 4/25/2016 **ESH Safety Review** (Signature/Z#/Date) 168908 4/19/2016 **Peer RLM /Work Execution Manager/Maintenance Manager** (Signature/Z#/Date) **Required** Robert Simpson 240725 4/19/16

0IWD Type ☒ Moderate-Hazard ☐ High-Hazard/Complex ☐ Standing IWD	Date when RLM re-approval is required_____ Other Conditions for RE-Approval_____ (Print) Name of Primary PIC _____ Name of Alternate PIC_____ Name of Alternate PIC_____	Classification review completed, if required. N/A Reviewer Signature/Z#/Date

UTILITIES AND INSTITUTIONAL FACILITIES

Los Alamos NATIONAL LABORATORY

UI-PROC-71-10-231-R1

Maintenance Procedure

Calibration of Pressure Transmitters

Review frequency: 1 yr ☐ 2 yr ☐ 3 yr ☑

Process Owner	Signature	Date
Jeff Sisneros		1/5/15
Calibration Coordinator		

Reviewed by	Signature	Date
Phil Romero		1/7/15
ESH Manager		

Approved by	Signature	Date
Scott McBride	By Direction of:	1/28/15
Maintenance Manager		

Reviewed by	Signature	Date
Henry Vigil		2/2/15
Derivative Classifier	Unclassified	

UNCLASSIFIED

History of Revisions

Document Number	Issue Date	Action
UI-PROC-71-10-231-R1	2-2-15	Review and reissue. Minor changes.
UI-PROC-71-10-231-R0	01/20/12	Convert to Utilities & Institutional Facilities (UI) procedure. Minor changes to organization and formatting.
71-10-231 Rev. 1		Converted to KSL template. Format change.

Table of Contents

1 Purpose 5
2 Scope/Applicability 5
3 Prerequisites 5
4 Precautions and Limitations 6
5 Equipment, Supplies, etc. 6
6 Responsibilities 7
7 Procedural Steps 7
7.1 General 7
7.2 Manual Calibration 8
7.2.1 As-Found Data 8
7.2.2 Adjust Zero and Span 9
7.2.3 Calibration Data 9
7.3 Acceptance Criteria 10
7.4 Follow-on Tasks 10
8 Records 11
9 Abbreviations, Acronyms, and Terms 11
10 References 12
11 Appendices and Attachments 12
Appendix A. Pressure Transmitter Calibration Form 13
Appendix B. Pressure Transmitter Calibration Form – Sample 15

This page intentionally left blank.

Utilities & Institutional Facilities
Maintenance Procedure

Calibration of Pressure Transmitters

1 Purpose

The purpose of this procedure is to provide instructions for calibration of electronic pressure transmitters. This includes transmitters with current output (4 to 20 mA) and voltage output devices.

2 Scope/Applicability

1. This procedure applies only to pressure transmitters used for water, air, steam, or nitrogen service. This instruction is NOT to be used for combustible gas pressure transmitters or pressure transmitters used for oxygen service.
2. The procedure may only be worked in conjunction with a work control package that has been processed in accordance with the requirements contained in AP-WORK-002 R10, Work Planning. The procedure may not be used as a stand-alone work control document.
3. Affected personnel: Instrumentation and Controls System Specialist, Instrument Specialist, Electricians, and System Engineer

3 Prerequisites

1. Required training and qualifications:
   a. Utilities & Institutional Facilities (UI) procedures and work control processes
   b. Current on UI training
   c. The current procedure, equipment, tools, etc.
   d. On-the-job training (OJT)
   e. P101-3, Lockout/Tagout for Hazardous Energy Control
2. Pre-job briefing

4 Precautions and Limitations

1. Required Personal Protection Equipment (PPE):
   - Hardhat
   - Safety glasses with side shields
     – Must be worn for all pressure transmitter calibration activities.
   - Steel toe safety shoes
   - Ear protection
   - Gloves
2. Before using this procedure to calibrate an instrument, the applicability of the instruction to the instrument must be reviewed and verbally approved by the Calibration Coordinator.
3. Pressure transmitter calibrations must be calibrated in an atmosphere free of combustible gases.
4. All hazards, both task specific and site specific, must be addressed in accordance with governing work control processes.

5 Equipment, Supplies, etc.

1. Equipment, tools, instruments:
   - Calibration pressure standard, with National Institute of Standards and Technology (NIST) Traceable Calibration appropriate to the range of the test article to be calibrated. This standard must have an accuracy better than the test article being calibrated.
   - Tubing, valves and fixture to allow application of pressure to both the standard and the test article (pressure transmitter being calibrated). This may include Teflon tape or other sealant aids for pipe threads.
   - A calibrated multimeter or other device to accurately measure the output signal of the pressure transmitter.
   - A Beamex calibrator may be used in place of the items in the first and third bullets above. The Beamex system provides semi-automatic calibration of a transmitter and provides integrated measurement of the output signal. Use only Beamex calibrators that have current calibration status, as verified by the Calibration Coordinator.

     The Beamex system includes a capability to act as a pressure standard for some ranges of pressures. Those pressure ranges are as follows:

     - Port P1: 0 to 40 inches of Water Column (0 to 1.44 psig)
     - Port P2: -160 to 160 inches of Water Column (0 to 5.7 psig)
     - Port P3: -14.5 to 300 psig

     Additional ranges up to 900 psig are available using external modules that connect to the Beamex MC5 calibrator.

6 Responsibilities

1. Persons performing this procedure are responsible for—
   - Complying with its requirements
   - Notifying appropriate supervisory personnel of equipment damage or other conditions that could require corrective action
   - Issuing a PAUSE/STOP WORK order whenever warranted by conditions related to health or safety in accordance with P101-18, Procedure for Pause/Stop Work
2. Managers are responsible for ensuring procedure compliance.
3. If instrument is left inoperable or cannot be calibrated, place a REJECTED (black on red) label or equivalent label on instrument.
4. Calibration records created during the calibration must be delivered to the Calibration Coordinator for submittal to the Calibration Records System.

7 Procedural Steps

This section provides instructions for pressure transmitter calibration. “As-Found” data are first collected to document the existing accuracy. Then adjustments may be made to the pressure transmitter. Finally, “As-Left” calibration data are collected.

Data are the application of pressure to perform a 5-point calibration across the range of the transmitter. Calibration points are selected at 0%, 25%, 50%, 75%, and 100% of scale.

The working fluid is generally air for low pressures and water for higher pressures. The fluid is applied to the Pressure Standard and the test article at the same time and data are collected. The first set of data is collected before any adjustments and is referred to as the “As-Found” data. Adjustments are then made to the test article if applicable (most Pressure Transmitters can be adjusted). Final data after adjustment are referred to as “As-Left” calibration data.

Data may be collected on increasing or decreasing pressure at the discretion of the Calibration Technician or Electrician.

7.1 General

1. Use Pressure Transmitter Calibration Form 71-10-231.1 (Appendix A) to record data.
2. Verify the calibration interval of the Pressure Standard has not elapsed and the Pressure Standard is in current calibration.
3. Verify the calibration interval of the Multimeter has not elapsed and the Multimeter is in current calibration.

4. This procedure provides steps for “Manual” methods. In Manual methods, the adjustment of the standard, data collection, etc. is performed by the calibrating staff. The Beamex can be operated in “Automatic mode,” where the Beamex collects all calibration data. Operation in Automatic mode relieves the Operator from data collection duties. The Automatic process will be added to this instruction at a later date.

7.2 Manual Calibration

7.2.1 As-Found Data

1. Inspect the test article and verify that it appears to be in good working condition. Inspect fitting connections and general condition of the test article. If the test article was in water service, remove water using low pressure air (less than 50% of test article maximum pressure).
2. Record the test article information on Calibration Form:
   a. Manufacturer
   b. Model or style number
   c. Identification number (serial number)
   d. Instrumentation and Controls File number (if present)
3. Record the Pressure Standard information on Calibration Form:
   a. Manufacturer
   b. Model or style number
   c. Identification number (serial number)
   d. Last calibration date
   e. Calibration due date
   f. Calibration organization
4. Open the vent valve on the test rig to ensure all parts of the system are at atmospheric pressure.
5. Connect the test article to the calibration rig, such that it is in parallel connection with the Pressure standard.
6. Record test article reading and standard reading on Calibration Form under “As-Found,” 0% reading.

   Note: On some test articles, the “zero” marking is a marked width of acceptable “zero” reading, as shown below. In this case, if the pointer is within the limits of these markings, the data may be recorded as “zero.”

7. Apply 25% of scale pressure to the test article and the standard. Read the standard to adjust the pressure.
8. Record test article reading and standard reading on Calibration Form under “As-Found,” 25% reading.
9. Apply 50% of scale pressure to the test article and the standard. Read the standard to adjust the pressure.
10. Record test article reading and standard reading on Calibration Form under “As-Found,” 50% reading.
11. Apply 75% of scale pressure to the test article and the standard. Read the standard to adjust the pressure.
12. Record test article reading and standard reading on Calibration Form under “As-Found,” 75% reading.
13. Apply 100% of scale pressure to the test article and the standard. Read the standard to adjust pressure.
14. Record test article reading and standard reading on Calibration Form under “As-Found,” 100% reading.
15. Release the pressure on the standard and the test article.
16. Verify that the test article reading returns to “zero.”

7.2.2 Adjust Zero and Span

1. If applicable, adjust the test article so that proper readings are obtained at 0% and 100% scale. Most pressure transmitters have ZERO and SPAN adjustments, and these adjustments are made at this time. Note that ZERO and SPAN adjustments are interactive, multiple iterations may be required.
2. Verify proper reading at 0% and 100% of test article scale.

7.2.3 Calibration Data

1. Apply 0% scale to the test article.
2. Record test article reading and standard reading on Calibration Form under “Calibration data,” 0% reading.
3. Apply 25% of scale pressure to the test article and the standard. Read the standard to adjust the pressure.
4. Record Test article reading and standard reading on Calibration Form under “Calibration data,” 25% reading.
5. Apply 50% of scale pressure to the test article and the standard. Read the standard to adjust the pressure.

6. Record Test article reading and standard reading on Calibration Form under “Calibration data,” 50% reading.
7. Apply 75% of scale pressure to the test article and the standard. Read the standard to adjust the pressure.
8. Record Test article reading and standard reading on Calibration Form under “Calibration data,” 75% reading.
9. Apply 100% of scale pressure to the test article and the standard. Read the standard to adjust the pressure.
10. Record test article reading and standard reading on Calibration Form under “Calibration data,” 100% reading.
11. Release the pressure on the standard and the test article.
12. Verify that the test article reading returns to “zero.”

7.3 Acceptance Criteria

1. The test article has passed calibration if the difference between the Pressure Standard and the test article is equal to or less than ± 1% of the test article scale range at all calibration points.

   Note: Other accuracy requirements may be in effect for a particular instrument. An item is considered calibrated if the difference between the Pressure Standard and the test article is equal to or less than acceptance criteria defined by engineering staff (using Calibration Form 71-10-231.1) at all calibration points. Contact the Calibration Coordinator if you are uncertain regarding the applicable acceptance criteria.
2. If the test article passed calibration, fill out a “verified” sticker, and affix the sticker to the test article. The sticker may be applied to any location, although the front is preferred.
3. If the test article fails calibration, affix a “REJECTED” sticker to the test article. The sticker may be applied to any location, although the front is preferred. Do not return the instrument to the requestor. Deliver the instrument and calibration data to the Calibration Coordinator for disposition.

7.4 Follow-on Tasks

1. If problems are found, immediately notify appropriate personnel so corrective action can be taken.

   Will corrective action be required?

   ❑ Yes ❑ No

2. ❑ All tasks in this work instruction have been completed.

_____ _____
Signature *Z-number*

_____ _____
Print name *Date*

This procedure is complete. Include the procedure number on the Work Documentation Form and attach copies of signed procedure and forms to the Work Package.

8 Records

Records generated as a result of implementing this procedure are maintained in accordance with the UI records program.

9 Abbreviations, Acronyms, and Terms

Abbreviation, Acronym, or Term	Definition
ESH	Environment, Safety, and Health
LO/TO	Lockout/Tagout
mA	milliampere
NIST	National Institute of Standards and Technology
OJT	On-the-job-training
PPE	Personal Protection Equipment
psig	pounds per square inch-gauge
UI	Utilities & Institutional Facilities

10 References

AP-WORK-002 R10, Work Planning

P101-3, Lockout/Tagout for Hazardous Energy Control

P101-18, Procedure for Pause/Stop Work

UI-PLAN-029, User Performed Calibration Program Plan

11 Appendices and Attachments

Appendix A. Pressure Transmitter Calibration Form (71-10-231.1)

Appendix B. Pressure Transmitter Calibration Form (71-10-231.1) – Sample

Appendix A. Pressure Transmitter Calibration Form

Application: _____ Date: _____

ID Number: _____ Serial Number: _____

Location: _____ Model: _____

Specific Location: _____ Manufacturer: _____

Range: _____

Specific Procedure:

_____ Inform the operator that you will be calibrating the transmitter

_____ Reminder: Gas pressure will be giving false indications

_____ Notify the operator that the operation is completed

Calibration Range		psig		psig

Input Signal		Process	Value
0%	scale		psig
25%	scale		psig
50%	scale		psig
75%	scale		psig
100%	scale		psig

Xmitter	Output
	mA
	mA
	mA
	mA
	mA

As Found Value		mA	MAX ±	As Left Value		mA
	psig		0.08		psig	
	psig		0.08		psig	
	psig		0.08		psig	
	psig		0.08		psig	
	psig		0.08		psig	

Accuracy: ± 0.5% of full scale (16 mA)

Employee Name: _____ Z # _____

Test Equipment Calibration Expiration Date:

Inst. Name _____ Inst. Ser. # _____ Due Date _____
Inst. Name _____ Inst. Ser. # _____ Due Date _____
Inst. Name _____ Inst. Ser. # _____ Due Date _____
Inst. Name _____ Inst. Ser. # _____ Due Date _____
Inst. Name _____ Inst. Ser. # _____ Due Date _____

Comments: _____

Form 71-10-231.1

This page intentionally left blank.

Appendix B. Pressure Transmitter Calibration Form – Sample

Application: Low Pressure Gas
ID Number: PIT-101
Location: TA-3-22 Power Plant
Specific Location: _____
Date: _____
Serial Number: _____
Model: _____
Manufacturer: _____
Range: _____

Specific Procedure:

_____ Inform the operator that you will be calibrating the transmitter
_____ Reminder: Gas pressure will be giving false indications
_____ Notify the operator that the operation is completed

Calibration Range	0.00	psig	20.00	psig

Input Signal		Process	Value
0%	scale	0.00	psig
25%	scale	5.00	psig
50%	scale	10.00	psig
75%	scale	15.00	psig
100%	scale	20.00	psig

Xmitter	Output
4.00	mA
8.00	mA
12.00	mA
16.00	mA
20.00	mA

As Found Value		mA	MAX ±	As Left Value		mA
0.00	psig		0.08	0.00	psig	
5.00	psig		0.08	5.00	psig	
10.00	psig		0.08	10.00	psig	
15.00	psig		0.08	15.00	psig	
20.00	psig		0.08	20.00	psig	

Accuracy: ± 0.5% of full scale (16 mA)

Employee Name: _____ Z # _____

Test Equipment Calibration Expiration Date:

Inst. Name	_____	Inst. Ser. #	_____	Due Date	_____
Inst. Name	_____	Inst. Ser. #	_____	Due Date	_____
Inst. Name	_____	Inst. Ser. #	_____	Due Date	_____
Inst. Name	_____	Inst. Ser. #	_____	Due Date	_____
Inst. Name	_____	Inst. Ser. #	_____	Due Date	_____

Comments: _____

Form 71-10-231.1

Mandatory Questions for All Pre-Job Briefs

The purpose of this document is to demonstrate compliance with the Release of Craft requirements directed by MSS-DO on 17 June 15. Until a formal document is institutionalized by the Work Control Group this document will be included in **all** work control packages (CM, PM, Planned, Unplanned, etc). Each of the questions listed below will be discussed at each Pre Job Brief with all affected personnel. Compliance will be demonstrated by the signature from the person performing the Pre Job Brief on the bottom of this document. This document is a permanent part of **all** work packages until further notice.

Topic	Completed (X)
Assume we are going to have an accident on this job. How did it happen? How can we prevent it?	✓ X
What is the worst thing that can happen on this job? How can we keep it from happening?	✓ X
What hazards will you encounter in performing this work?	✓ X
Is there a better way to address the hazards you will encounter?	✓ X
Have all safety issues concerning this task been addressed to your satisfaction?	✓ X

Carlos Chacon 6.10.16

Signature (Person Performing Pre-Job) Date

R2 Donnelly 171352 6/23/16

Boiler Rooms In-Service
TA-09 and TA-16

Boiler	Description	Boiler Elec. LO/TO	Feed Water Control	Alternator	Feed Water Panel	Steam Header	Make-Up Water	Quick Fill	Cont. Blow Down Valve	Drain Valves on Oper. Boiler	Gas Valve
16-1480	BS-A Fire/Water	PPA CKT 4	N/A	N/A	N/A	Yes	Yes	Yes	Yes	4	Yes
16-1480	BS-B Fire/Water	PPA CKT 10	N/A	N/A	N/A	Yes	Yes	Yes	Yes	4	Yes
16-1487	BS-A Fire/Water	PPA CKT 10	N/A	N/A	N/A	Yes	Yes	Yes	Yes	4	Yes
16-1487	BS-B Fire/Water	PPA CKT 4	N/A	N/A	N/A	Yes	Yes	Yes	Yes	4	Yes
16-1491	BS-A Fire/Water	PPA CKT 4	N/A	N/A	N/A	Yes	Yes	Yes	Yes	4	Yes
16-1491	BS-B Fire/Water	PPA CKT 10	N/A	N/A	N/A	Yes	Yes	Yes	Yes	4	Yes
16-1492	BS-A Fire/Water	PPA CKT 4	N/A	N/A	N/A	Yes	Yes	Yes	Yes	4	Yes
16-1492	BS-B Fire/Water	PPA CKT 10	N/A	N/A	N/A	Yes	Yes	Yes	Yes	4	Yes
09-0282	BS-A Fire/Water	PPA CKT 4	N/A	N/A	N/A	Yes	Yes	Yes	Yes	4	Yes
09-0282	BS-B Fire/Water	PPA CKT 10	N/A	N/A	N/A	Yes	Yes	Yes	Yes	4	Yes

UTILITIES AND INSTITUTIONAL FACILITIES

Los Alamos NATIONAL LABORATORY

UI-PROC-76-28-010-R0

Maintenance Procedure

TA-09/16 Steam Plants – Annual Boiler Waterside/Fireside Checklist

Review frequency: 1 yr ☐ 2 yr ☐ 3 yr ☒

Issue date 5-13-15 Next review 5-13-18

Process Owner

Armond Standley	Maintenance Engineer	
Armond Standley	Z-# 179793	Date 5-12-2015

Reviewed by

Art Sparks	Maintenance Superintendent	
	Z-# 104341	Date 5-12-15

ESH Review

Phil Romero	ESH Manager	
Phil Romero	Z-# 102459	Date 5-13-15

Approved by

Scott McBride	Maintenance Manager	
	Z-# 264556	Date 5/13/15

Derivative Classifier Review

	Classification: "Unclassified"	
Henry Vigil	Z-# 089717	Date 5-13-15

History of Revisions

Document Number	Issue Date	Action
UI-PROC-76-28-010-R0	5-13-15	New procedure.

Table of Contents

1 Purpose 5
2 Scope/Applicability 5
3 Prerequisites 5
4 Precautions and Limitations 6
5 Equipment, Supplies, etc. 6
6 Responsibilities 6
7 Work Steps 6
7.1 Introduction 6
7.2 Inspection/Maintenance 8
7.3 Waterside Inspection 8
7.4 Fireside Inspection 9
7.5 Post-Maintenance 9
8 Records 11
9 Abbreviations, Acronyms, and Terms 11
10 References 12
11 Appendices and Attachments 12
Attachment 1. Boiler Checklist 13
Attachment 2. Baseline Settings 17
Attachment 3. Approved Steam Safety Valves 18

This page intentionally left blank.

Utilities & Institutional Facilities
Maintenance Procedure

TA-09/16 Steam Plants – Annual Boiler Waterside/Fireside Checklist

1 Purpose

The purpose of this procedure is to provide instructions for performance of the Annual Boiler Waterside/Fireside Checklist at the TA-09/16 Steam Plants.

2 Scope/Applicability

1. TA-09/16 Steam Plant Boilers are located at the following eight boiler plants: Plant 1 (TA-16-1480), Plant 4 (TA-16-1483), Plant 5 (TA-16-1484), Plant 8 (TA-16-1487), Plant 11 (TA-16-1490), Plant 12 (TA-16-1491), Plant 13 (TA-09-0282), and Plant 14 (TA-16-1492).
2. The procedure may only be worked in conjunction with a work control package that has been processed in accordance with the requirements contained in AP-WORK-002, Work Planning. The procedure may not be used as a stand-alone work control document.
3. Affected personnel: UI Maintenance Manager, Maintenance Engineer, Maintenance Superintendent

3 Prerequisites

1. Required training and qualifications:
   a. Utilities & Institutional Facilities (UI) procedures and work control processes
   b. The current procedure, operations, equipment, etc.
   c. LANL and TA-09/16 site-specific training
   d. On-the-job training (OJT)
   e. Boiler Operator: New Mexico Construction Industries Journey Classification as a Journeyman Boiler Operator – High Pressure BO2 (NMAC 14.6.6)

      Note: Boiler Operator Trainee: may not operate any boiler devices except under the direct observation of a Journeyman Boiler Operator (NMAC 14.9.4.29).

   f. Pressure Safety Orientation – Course #769 (LANL P101-34)
   g. Pressure Safety Advanced – Course #11459 (LANL P101-34)
   h. Boiler Maintenance Crew performing Low-NO_X verification: boiler training from Sellers Engineering Company or local manufacturer's representative
2. Pre-job briefing

4 Precautions and Limitations

1. Required Personal Protection Equipment (PPE):
   - PPE as specified in the Work Authorization IWD

5 Equipment, Supplies, etc.

1. Equipment, tools, instruments:
   - Flue gas analyzer
   - Calibrated boiler pressure gauge

   Record calibration dates on Attachment 1 checklist.
2. Supplies, materials, parts:
   - Mobil Polyrex EM grease
   - Slowserve grease

6 Responsibilities

1. Persons performing this procedure are responsible for—
   - Complying with its requirements
   - Notifying appropriate supervisory personnel of equipment damage or other conditions that could require corrective action
   - Issuing a PAUSE/STOP Work Order whenever warranted by conditions related to health or safety in accordance with P101-18, Procedure for Pause/Stop Work
2. Managers are responsible for ensuring procedure compliance.

7 Work Steps

7.1 Introduction

1. Boilers are Sellers Engineering Company Fire Tube Boilers, manufactured in 1995. Each has a Maximum Allowable Working Pressure (MAWP) of 150 psig. Supply natural gas pressure is nominally 5 psig. Attachments 2 and 3 contain boiler technical information.

2. Inspection and maintenance consists of the following:
   a. Testing or replacing pressure relief safety valves
   b. Waterside and fireside boiler inspection
   c. Cleaning of debris or scaling found inside the boiler
   d. Inspection of various plant components
   e. Steam gauge calibration
   f. Internal and external inspection by a National Board Inspection Code (NBIC) Boiler Inspector
3. Boiler output pressure: 80 psig

   Exception: Boiler output pressure for two boilers at Plant 12 (TA-16-1491): 40 psig
4. There are three pressure switches on top of each boiler: high pressure steam shutdown (High Limit) switch; operating pressure control (OPC) switch; Low-NO_X cold start limit control (CSLC) switch.
5. Final settings for all boilers except two at Plant 12 (TA-16-1491):
   a. High pressure steam shutdown (High Limit) switch: 90 psig
   b. Operating pressure control (OPC) switch: 80 psig
   c. Low-NO_X steam pressure (CSLC) switch: 40 psig

   Exception: Final settings for two boilers at Plant 12 (TA-16-1491):
   a. High pressure steam shutdown (High Limit) switch: 45 psig
   b. Operating pressure control (OPC) switch: 40 psig
   c. Low-NO_X steam pressure (CSLC) switch: 20 psig
6. All steam pressure switch setpoint verification must be performed with a calibrated boiler pressure gauge.
   - All gauges used for pressure switch setpoints must have calibration dates, which are to be recorded on Attachment 1 checklist.
7. There are four pressure switches at the steam header: the lead, the lag, and the two low-pressure switches.
8. For all boilers, set the switches to control the lead/lag feature of the boiler.
9. Verify that all pressure switches perform their intended function.
   - If the pressure setting on a switch varies by more than 20% of the boiler pressure gauge, the switch must be replaced.
10. After final tuning of the boiler parameters, adjust the air flow proving switch to about 2 inches water column below the blower pressure setting.

11. Flue gas analyzer will be needed for two scenarios: light off and Low-NO_X boiler settings. Record the O_2, CO, NO_X, temperature, and efficiency. The boilers are to be run in the Low-NO_X mode to be compliant with manufacturer's instructions.
12. Complete the checklists in Attachment 1 before the boiler is released by UI Engineering to UI Operations. The UI System Engineer must be alerted for inspection of boiler components—specifically the Hold Points below.

7.2 Inspection/Maintenance

1. Remove and replace the Kunkle pressure relief valves. New pressure relief valves can be purchased and Attachment 2 identifies the pressure relief valves to order. If new valves are not purchased, test and repair the pressure relief valves in accordance with the Engineering Standard Manual Chapter 17.
2. Lubricate motor bearings as follows:
   a. Grundfos boiler feed pumps: lubricate the Baldor motor with Polyrex EM (Mobil) grease.
   b. Baldor blower motor: lubricate with Polyrex EM (Mobil) grease.
3. Clean any debris accumulated on the Neptune/Leeson chemical feed pumps and the GE/Neptune chemical mixing motors.
4. Clean out each main burner with a bottle washer.
5. Check the Low-NO_X solenoid for proper operation.
6. Drill the pilot manifolds with a #53 drill bit and adjust the pilot manifold position in accordance with the Seller's Owners' Manual.

7.3 Waterside Inspection

1. Open flue door and inspect tube sheets for water leakage. It tube leakage is suspected call the system engineer for further evaluation. The narrow ligaments between tube holes are subject to tremendous stresses and should be watched for any sign of cracking mainly due to overheating.
2. Drain boiler and remove all hand hole and manhole covers, where applicable, to allow a visual check of all internal accessible areas. Example: shell, tubes and tube sheets.

   HOLD POINT:

   UI System Engineer and Chemical Treatment Company Representative are needed for external boiler inspection. Give at least 7 days advance notice and coordinate with UI System Engineer.
3. Carefully examine waterside surfaces using a strong light and mirror where required. Look for evidence of scale, corrosion, blisters, or pitting, indicating adequacy of water treatment.

4. Use a high pressure hose to wash sediment out of the bottom and other internals of the boiler.

   HOLD POINT:

   UI System Engineer and NBIC Boiler Inspector are needed for internal boiler inspection. Give at least 7 days advance notice and coordinate with UI System Engineer.

5. Remove both head covers from the bodies of the two float operated low water cut-offs (LWCs). The float-assembly and mercury switches are located on these heads. Flush out both LWC bodies. Inspect floats and replace if necessary. Reinstall head covers. Remove caps from the inspection crosses associated with both LWCs and flush out piping connected to boiler. Reinstall caps.

7.4 Fireside Inspection

1. Check gas burners for presence of dirt, lint, or foreign matter. Be sure of ports, gas passages and air passages are free of obstructions.
2. Check the fireside of furnace and fire tubes for any evidence of soot formation or corrosion. Evidence of soot formation is a sign of improperly adjusted combustion. Brush and vacuum the furnace and fire tubes, if such conditions exist.
3. Check condition of all heat extractors. These devices can be pulled out individually from each of the fire tubes and cleaned if necessary. Repair or replace if necessary.
4. Check flue door gaskets and other gaskets to make sure that they are in good condition and that they are properly secured. Replace, if required, the flue door gaskets. An ineffective seal may allow flue gases to escape into the boiler room and result in burned gaskets and warped flue doors.
5. Verify the gas low and high limit switches. Record values in Attachment 1.
6. After the fireside and waterside surfaces have been inspected by the UI system engineer and by the NBIC boiler inspector, and work is completed, close and secure front and rear flue doors. Reinstall hand hole and manifold covers if applicable; hook up all associated piping and refill boiler to proper level.
7. Clean out all Y-strainers and steam traps.
8. Open up condensate return tank. Inspect for deposits and clean, if necessary.
9. Grease plug valves on gas supply line. Use Slowserve for Nordstrom Valves Type 555 (-10°F to 500°F).

7.5 Post-Maintenance

1. Complete checklist in Attachment 1.
2. Verify the settings for the following steam switches: lead, lag, low boiler pressure.
3. There are three pressure switches on top of each boiler: the high pressure steam shutdown (High Limit) switch, the operating pressure control (OPC) switch, and Low-NO_X Cold Start Limit Control (CSLC) switch.

4. Upon initial startup the CSLC switch is adjusted to a pressure above the OPC switch until the initial boiler parameters have been adjusted.
5. Final setpoint configurations:
   a. For all boilers [except two boilers at Plant 12 (16-1491)]:
      - High pressure steam shutdown (High Limit) switch: 90 psig
      - Operating pressure control (OPC) switch: 80 psig
      - Low-NO_X Cold Start Limit Control (CSLC) switch: 40 psig

   b. For the two boilers at Plant 12 (16-1491):
      - High pressure steam shutdown (High Limit) switch: 45 psig
      - Operating pressure control (OPC) switch: 40 psig
      - Low-NO_X Cold Start Limit Control (CSLC) switch: 20 psig

   All steam pressure switch setpoint verification must be performed with a calibrated boiler pressure gauge.
6. Verify the Low-NO_X Cold Start Limit Control switch.
   a. Set to the values above.
   b. Verification of this switch is performed after the initial settings.
   c. Verify that the Low-NO_X damper control motor is operating, and that the auxiliary solenoid valve on the main gas valve line de-energizes (closes).
7. Check pilot burners and ignition equipment for proper condition and adjustment.
8. Visually check burner for proper combustion.
   a. Combustion analysis is verifiable only with a flue gas analyzer and is performed mainly on boilers with power burners.
   b. Adjust fuel/air mixture as needed.
   c. Refer to Attachment 2 for commissioning flue gas analysis results.
9. Complete the functional checklist on page 3 of Attachment 1.

   HOLD POINT:

   UI System Engineer and NBIC Boiler Inspector are needed for external boiler inspection. Give at least 7 days advance notice and coordinate with UI System Engineer.
10. ***Before the boiler is released to Operations, UI System Engineer must review and sign off on Attachment 1.***

8 Records

Records generated as a result of implementing this procedure are maintained in accordance with the UI records program.

9 Abbreviations, Acronyms, and Terms

Abbreviation, Acronym, or Term	Definition
CSLC	Cold Start Limit Control (switch)
ESH	Environment, Safety, and Health
IWD	Integrated Work Document
LWC	low water cut-off
MAWP	Maximum Allowable Working Pressure
NBIC	National Board Inspection Code (Boiler Inspector)
OJT	On-the-job-training
OPC	Operating Pressure Control (switch)
PPE	Personal Protection Equipment
psig	pounds per square inch - gauge
UI	Utilities & Institutional Facilities

10 References

AP-WORK-002, Work Planning

P101-18, Procedure for Pause/Stop Work

Sellers Engineering Company:

Owners Manual, Immersion Fired Steam Boiler

Owners Manual, Model 15 Commodore & 77 Commodore Steam Boilers and Model 15 Senior Model 105 E Steam Boilers

UI-PROC-76-28-001, TA-09/16 Boilers Shutdown – Dry and Wet Lay-Up Process

UI-PROC-76-28-002, TA-09/16 Steam Plants – Boiler Draining

UI-PROC-76-28-004, TA-09/16 Steam Plants – Boiler Blowdown

UI-PROC-76-28-008, TA-09/16 Steam Plants – Boiler Startup

11 Appendices and Attachments

Attachment 1. Boiler Checklist

Attachment 2. Baseline Settings

Attachment 3. Approved Steam Safety Valves

Attachment 1. Boiler Checklist

Boiler NB #_____

Boiler Location_____

Date(s) Performed_____

Safety valves replaced?_____ S/N #_____

Boiler Pressure (psig)_____ Fireside inspection:_____

Supply gas pressure (psig)_____ Waterside inspection:_____

Flue door gaskets replaced?_____

Verify shutdown switches:

High Limit_____ High Limit set point_____

High Gas_____ High Gas set point_____

Low Gas_____ Low Gas set point_____

OPC_____ OPC set point_____

LWC 1_____

LWC 2_____

Air Proving Switch_____

Boiler set in low NOx setting?_____ CSLC set point_____

Lag set point_____ Lead set point_____

Calibration date on steam boiler pressure gauge_____

Work Control: Send copy of this completed form to TA-09/16 System Engineer.

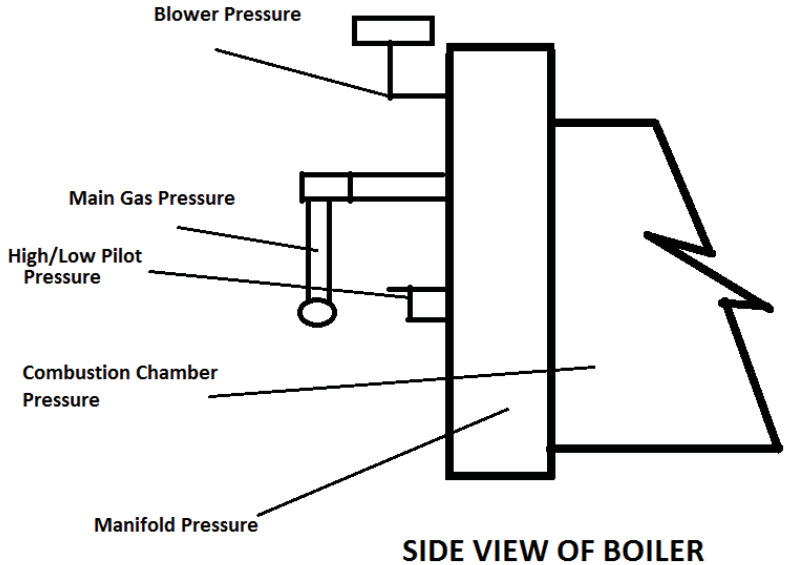
Copy sent to TA-09/16 System Engineer by WCS _____ *Date* _____

MSS Rep _____ *Date* _____

Released for Operations by UI System Engineer _____ ***Date*** _____

Pressure and Flue Gas Analysis: The original boiler commissioning settings are captured in Attachment 2.

	Lightoff Readings	Low NOx Readings
Manifold Pressure (“wc)		
High Pilot Pressure(“wc)		
Low Pilot Pressure (“wc)		
Blower Pressure (“wc)		
Main Gas Pressure (psig)		
O2 (%)		
CO (ppm)		
NOx (ppm)		



SIDE VIEW OF BOILER

The original boiler commissioning settings are captured in Attachment 2.

Work Control: Send copy of this completed form to TA-09/16 System Engineer.

Copy sent to TA-09/16 System Engineer by WCS _____ *Date* _____

MSS Rep _____ *Date* _____

Released for Operations by UI System Engineer _____ ***Date*** _____

FUNCTIONAL CHECKLIST

- ☐ Steam system
  - o Traps
  - o Y- strainers
- ☐ Condensate return system
- ☐ Gas system
- ☐ Motors operational
- ☐ Pumps operational
- ☐ Feed water system
- ☐ Chemical feed system
- ☐ Blowdown system
  - o Valve controlling continuous blowdown
- ☐ Electrical system
- ☐ Safety shutdown
- ☐ Building
  - o Lights operational
  - o Heating system
  - o Life safety

COMMENTS:_____
_____
_____
_____
_____
_____

Work Control: Send copy of this completed form to TA-09/16 System Engineer.

Copy sent to TA-09/16 System Engineer by WCS _____ *Date* _____

MSS Rep _____ *Date* _____

Released for Operations by UI System Engineer _____ ***Date*** _____

This page intentionally left blank.

Attachment 2. Baseline Settings

							Lightoff Readings						Low NOx readings					
Plant #	Location	Serial #	Boiler HP	High Pilot "wc	Low Pilot "wc	Blower Pressure "wc	Manifold Pressure "wc	Combustion Chamber Pressure "wc	Main Gas Pressure "wc	O2 %	CO ppm	NOx ppm	Manifold Pressure "wc	Combustion Chamber Pressure "wc	Main Gas Pressure "wc	O2 %	CO ppm	NOx ppm
1	16-1480-A	100852-B	98	10	10	7.3	5.4	2.1	11.6	3.4	8	52	5.4	1.7	12.5	6.3	18	21
1	16-1480-B	100852-A	98	10	6	7.3	5.3	2.3	9.7	4	29	50	5.3	2	10.5	6.3	6	27
4	16-1483-A	100850-B	128	10.2	5	7.5	5.8	2.4	10.8	3.6	7	51	5.8	2.1	12.5	5.9	8	25
4	16-1483-B	100850-A	128	11	5.5	7.5	5.6	2.3	13.5	3.4	6	51	5.6	2	15	6.5	18	22
5	16-1484-A	100848-A	183	11	6.8	7.9	5.2	2.3	14	3.7	7	46	5.2	2	16	6	41	24
5	16-1484-B	100848-B	183	11.5	7	8	5.5	2.3	15	3.4	11	53	5.5	2	16	6	10	21
8	16-1487-A	100857-B	56	10	5	7.8	5.8	2.5	8.3	3.5	125	50	5.5	1.9	8.7	6.6	82	17
8	16-1487-B	100857-A	56	11	5	7.8	5.6	2.7	7	3.6	18	47	5.6	2.3	7.3	6.3	26	21
11	16-1490-A	100856-A	95	9.5	6.8	7.2	5	2.1	10.6	2.6	49	59	5	1.8	11.1	5.8	8	28
11	16-1490-B	100856-B	95	9.4	6	7.1	4.9	2	8.6	3.4	9	59	4.9	1.8	9.3	5.7	6	28
12	16-1491-A	100859-A	24	10	9	6.4	5.4	3	6.2	5.3	56	43	5.4	2.7	6.8	5.4	66	40
12	16-1491-B	100859-B	24	10	9	7.8	5.6	3.5	8.2	5.3	95	39	5.6	2.7	8.5	7	22	29
14	16-1492-A	100855-B	85	10	9	10	5.2	2.3	8.5	3	7	53	5.2	2	10.7	6.4	24	24
14	16-1492-B	100860-A	70	10	8.5	8.3	5.3	2.5	8.5	3.1	46	51	5.3	2.1	9.2	5.6	28	26
13	9-282-A	100849-A	153	10.5	10	8	5.1	2.2	13.6	3.7	11	57	5.1	1.9	15	6.4	6	27
13	9-282-B	100849-B	153	10.5	6	8.4	5.6	2.4	11.3	3.8	12	52	5.6	2.1	12.5	5.9	8	26

Attachment 3. Approved Steam Safety Valves

Plant #	Location	Serial #	ASME #	Nat'L Board #	Capacity (#/HR)	Safety Valve Inlet	Safety Valve Brand	Safety Valve to Order
1	16-1480-A	100852-B	10158	8365	3381	2" H.Coup.	Kunkle	6010HHM01-AM0100
1	16-1480-B	100852-A	10022	8359	3381	2" H.Coup.	Kunkle	6010HHM01-AM0100
4	16-1483-A	100850-B	10324	8375	4416	2" H.Coup.	Kunkle	6010HHM01-AM0100
4	16-1483-B	100850-A	10323	8386	4416	2" H.Coup.	Kunkle	6010HHM01-AM0100
5	16-1484-A	100848-A	10291	8334	6313	2" H.Coup	Kunkle	6010HHM01-AM0100
						1 1/2" H. Coup	Kunkle	6010GGM01-AM0100
5	16-1484-B	100848-B	10290	8333	6313	2" H.Coup	Kunkle	6010HHM01-AM0100
						1 1/2" H. Coup	Kunkle	6010GGM01-AM0100
8	16-1487-A	100857-B	10314	8355	1932	2" H.Coup.	Kunkle	6010HHM01-AM0100
8	16-1487-B	100857-A	10313	8354	1932	2" H.Coup.	Kunkle	6010HHM01-AM0100
11	16-1490-A	100856-A	10328	8395	3278	2" H.Coup.	Kunkle	6010HHM01-AM0100
11	16-1490-B	100856-B	10329	8388	3278	2" H.Coup.	Kunkle	6010HHM01-AM0100
12	16-1491-A	100859-A	10330	8380	828	1 1/2" H.C. 3000#	Kunkle	6010GGM01-AM0050
12	16-1491-B	100859-B	10331	8381	828	1 1/2" H.C. 3000#	Kunkle	6010GGM01-AM0050
14	16-1492-A	100855-B	10327	8387	2933	2" F. Coup	Kunkle	6010HHM01-AM0100
14	16-1492-B	100860-A	10317	8361	2415	2" F. Coup	Kunkle	6010HHM01-AM0100
13	9-282-A	100849-A	10292	8338	5278	2" H.Coup	Kunkle	6010HHM01-AM0100
						1 1/2" H. Coup	Kunkle	6010GGM01-AM0100
13	9-282-B	100849-B	10293	8342	5278	2" H.Coup	Kunkle	6010HHM01-AM0100
						1 1/2" H. Coup	Kunkle	6010GGM01-AM0100

UTILITIES AND INSTITUTIONAL FACILITIES

Los Alamos NATIONAL LABORATORY

UI-PROC-71-10-232-R1

Maintenance Procedure

Calibration of Pressure Switches

Review frequency: 1 yr ☐ 2 yr ☐ 3 yr ☑

Process Owner	Signature	Date
Art Sparks		12-11-13
Water/Gas Superintendent		

Reviewed by	Signature	Date
Phil Romero	Phil Romero	12/13/13
ESH Manager		

Approved by	Signature	Date
Scott McBride		12/24/13
Maintenance Manager		

Reviewed by	Signature	Date
Harold Salazar		12-16-13
Derivative Classifier	Unclassified	

UNCLASSIFIED

History of Revisions

Document Number	Issue Date	Action
UI-PROC-71-10-232-R1	12-24-13	Review and reissue as Utilities & Institutional Facilities (UI) procedure. Minor changes
UI-PROC-71-10-232-R0	02/11/11	Convert from KSL to UI procedure. Minor changes.
71-10-232 Rev. 1	07/20/06	Format change

Table of Contents

1 Purpose 5
2 Scope/Applicability 5
3 Prerequisites 5
4 Precautions and Limitations 5
5 Equipment, Supplies, etc. 6
6 Responsibilities 6
7 Procedural Steps 6
7.1 General 6
7.2 Initial Steps 7
7.3 As-found Data Collection 7
7.4 Switch Adjustment 8
7.5 As-left Data Collection 8
7.6 Return Switch to Service 8
7.7 Follow-on Tasks 8
8 Records 9
9 Abbreviations, Acronyms, and Terms 9
10 References 10
11 Appendices and Attachments 10
Attachment 1. Switch Calibration Form 11

This page intentionally left blank.

Utilities & Institutional Facilities
Maintenance Procedure

Calibration of Pressure Switches

1 Purpose

The purpose of this procedure is to provide general guidelines for performing routine calibration of pressure switches.

2 Scope/Applicability

1. Before using this calibration procedure, its applicability to the pressure switch in question must be reviewed and verbally approved by I&C Calibration Coordinator or Superintendent.
2. There are many types of pressure switches in service at LANL, so it is essential to review all work-request documentation, in addition to this procedure, to ensure a firm understanding of the task at hand.
3. Affected personnel: Instrumentation and Controls (I&C) personnel

3 Prerequisites

1. Required training and qualifications:
   a. Utilities & Institutional Facilities (UI) procedures and work control processes
   b. The current procedure
   c. On-the-job training (OJT)
   d. P101-3, Lockout/Tagout for Hazardous Energy Control
   e. P101-18, Procedure for Pause/Stop Work
   f. P101-27, Confined Spaces
2. Training decision: process briefing with roster before performance of work

4 Precautions and Limitations

1. Required Personal Protective Equipment (PPE):
   - Gloves – dielectric for voltage checks
   - Eye protection

   Other PPE may be required, depending on equipment and facility.

5 Equipment, Supplies, etc.

- Calibrated digital volt/ohm meter (DVM)
- Calibrated pressure standard
- Standard tool kit

6 Responsibilities

1. Persons performing this procedure are responsible for—
    - Complying with its requirements
    - Notifying Foreman or Superintendent of equipment damage or other conditions that could require corrective action
    - Issuing a PAUSE/STOP Work Order whenever warranted by conditions related to health or safety in accordance with P101-18, Procedure for Pause/Stop Work
2. Managers are responsible for ensuring procedure compliance.

7 Procedural Steps

7.1 General

1. Calibration of a pressure switch is accomplished by applying a known pressure below the trip point of the switch and slowly changing the pressure until the switch trips. The pressure is then changed slowly in the opposite direction until the switch resets.
    - Switches can trip on increasing or decreasing pressure.
    - Trip and reset pressure are generally not the same, due to hysteresis in the switch.
2. Obtain the range, setpoint, direction, and tolerance for a given calibration from I&C Calibration Coordinator.
    - This information will have been previously defined by UI Engineering.
3. Lockout/tagout (LO/TO) and/or Confined Space Permit may be required for some equipment.
    - These operations are not covered in this procedure. Refer to P101-3, Lockout/Tagout for Hazardous Energy Control, and P101-27, Confined Spaces.
4. Contact with and notification of Operations personnel may be required.
    - Contact and notification requirements vary; follow the requirements specific to the equipment and the facility.

5. If the pressure switch is inoperable or cannot be calibrated, place a REJECTED (black on red) or equivalent label on instrument.
6. Use Form 71-10-232.1, Switch Calibration Form (Attachment 1), to record information and data during this procedure.

7.2 Initial Steps

1. Obtain proper switch calibration data specific to the switch to be calibrated from I&C Calibration Coordinator.
2. Obtain a calibrated DVM.
3. Obtain calibrated pressure standard. Record information onto the Switch Calibration Form.
4. Perform notification as required to remove switch from service.
5. Determine if hazardous voltage (greater than 50 volts) or pressure is present at the switch to be calibrated, and take appropriate measures to mitigate the hazard through LO/TO.
   - Optionally, the switch may be removed from the system and bench calibrated if desired.
6. Disconnect switch leads from process and connect the switch to DVM.
7. Set DVM to measure resistance or continuity.
8. Attach pressure source and calibration pressure standard to switch.
9. Determine if switch operates on increasing or decreasing pressure.

7.3 As-found Data Collection

1. Using DVM, determine whether switch is open or closed.
2. Note the result (whether switch is open or closed) and whether the DVM indication matches the switch condition.
3. Attach Calibrator to switch and adjust Calibrator to put switch in its normal operating position.
4. Note reading of the DVM, and make sure it shows proper indication.
5. Slowly adjust Calibrator to cause switch to trip.
6. Record actual trip pressure and direction on Switch Calibration Form.
7. Slowly adjust Calibrator to cause switch to reset.
8. Record actual reset pressure and direction on Switch Calibration Form.

7.4 Switch Adjustment

1. Using calibrated pressure standard, adjust switch point of the switch to required calibration parameters as provided by the I&C Calibration Coordinator.
2. Note that the trip point may be adjustable, but the reset point may not be, due to hysteresis.

7.5 As-left Data Collection

1. Using DVM, determine whether switch is open or closed.
2. Note the result (whether switch is open or closed) and whether the DVM indication matches the switch condition.
3. Attach Calibrator to switch and adjust Calibrator to put switch in its normal operating position.
4. Note reading of the DVM, and make sure it shows the proper indication.
5. Slowly adjust Calibrator to cause switch to trip.
6. Record actual trip pressure and direction on Switch Calibration Form.
7. Slowly adjust Calibrator to cause switch to reset.
8. Record actual reset pressure and direction on Switch Calibration Form.

7.6 Return Switch to Service

1. Disconnect calibration pressure source from switch and reconnect system piping.
2. Remove DVM from switch and reconnect switch leads back to the proper places on the terminal strip.
3. Return switch to normal service.
4. Notify facility that the switch is back in service.

7.7 Follow-on Tasks

1. Ensure proper operation of the pressure switch. If any problem is found, notify Foreman and Superintendent so corrective action can be taken..

   Will corrective action be required?

   ❑ Yes ❑ No

2. ❑ All tasks in this procedure have been completed.

_____ _____
Signature *Z-number*

_____ _____
Print name *Date*

This procedure is complete. Include the procedure number on the Work Documentation Form and attach signed copies of the procedure and form to the Work Package.

8 Records

Records generated as a result of implementing this procedure are maintained in accordance with the UI records program.

9 Abbreviations, Acronyms, and Terms

Abbreviation, Acronym, or Term	Definition
DVM	digital volt/ohm meter
ESH	Environment, Safety, and Health
I&C	Instruments & Controls
OJT	On-the-job training
UI	Utilities & Institutional Facilities

10 References

P101-3, Lockout/Tagout for Hazardous Energy Control

P101-18, Procedure for Pause/Stop Work

P101-27, Confined Spaces

11 Appendices and Attachments

Attachment 1. Switch Calibration Form

Attachment 1. Switch Calibration Form

SWITCH DATA

Location		Manufacturer	
Service type		Type/Model #	
TAG #		Range	
Specific location		Serial #	
Switched voltage		Sensor type	

CALIBRATION DATA

Setpoint : _____ increasing / decreasing (circle one)

Reset : _____ increasing / decreasing (circle one)

Tolerance: _____

Input signal		Tolerance	As-found		As-left	
OPEN			INC/DEC		INC/DEC	
CLOSE			INC/DEC		INC/DEC	

TEST EQUIPMENT USED

Manufacturer		Manufacturer	
Model		Model	
Serial #		Serial #	
Cal due date		Cal due date	

Comments: _____
_____
_____

_____ _____
Signature *Z-number*

_____ _____
Print name *Date*

Work Control: Send copy of this completed form to I&C System Engineer.

Copy sent to I&C System Engineer by WCS _____ *Date* _____

Form 71-10-232.1

UTILITIES AND INSTITUTIONAL FACILITIES

Los Alamos NATIONAL LABORATORY

UI-PROC-71-10-221-R1

Maintenance Procedure

Calibration of Thermocouple Temperature Transmitters

Review frequency: 1 yr ☐ 2 yr ☐ 3 yr ☑

Process Owner	Signature	Date
Jeff Sisneros	J Sisneros	4/9/14
Calibration Coordinator		

Reviewed by	Signature	Date
Carlos Chacon	Carlos Chacon	4-9-14
Instrument & Controls Superintendent		

Reviewed by	Signature	Date
Phil Romero	Phil Romero	4/10/14
ESH Manager		

Approved by	Signature	Date
Scott McBride	Scott McBride	4/23/14
Maintenance Manager		

Reviewed by	Signature	Date
Harold Salazar	H Salazar	4-24-14
Derivative Classifier	UNCLASSIFIED	

UNCLASSIFIED

History of Revisions

Document Number	Issue Date	Action
UI-PROC-71-10-221-R1	4-24-14	Review and reissue. Minor changes.
UI-PROC-71-10-221-R0		Review complete.
71-10-221 Rev. 1	07/20/06	Format change.

Table of Contents

1 Purpose 5
2 Scope/Applicability 5
3 Prerequisites 5
4 Precautions and Limitations 6
5 Equipment, Supplies, etc. 6
6 Responsibilities 6
7 Procedural Steps 7
7.1 General 7
7.2 Preliminary Steps 7
7.3 Manual Calibration 8
7.3.1 As-Found Data 8
7.3.2 Adjust Zero and Span 9
7.3.3 Calibration Data 9
7.4 Acceptance Criteria 10
8 Records 10
9 Abbreviations, Acronyms, and Terms 10
10 References 11
11 Appendices and Attachments 11

This page intentionally left blank.

Utilities & Institutional Facilities
Maintenance Procedure

Calibration of Thermocouple Temperature Transmitters

1 Purpose

The purpose of this procedure is to provide instructions for calibration of Thermocouple Temperature Transmitters.

2 Scope/Applicability

1. The procedure applies to Thermocouple Temperature Transmitters with current output (4 to 20 mA) and voltage output.
2. The procedure applies to Thermocouple Temperature Transmitters with Type J and Type K thermocouples.
3. The procedure covers “manual” calibration of Thermocouple Temperature Transmitters, i.e., when data collection and instrument adjustment are performed manually.
    a. The optional Beamex Calibrator described below provides “semi-automatic” manual calibration.
    b. The Beamex Calibrator can also be operated in “automatic” mode, in which the Beamex collects calibration data automatically, thus relieving the Operator of data collection tasks. This procedure does not cover automatic mode.
4. This preventive maintenance procedure, UI-PROC-71-10-221-R1, Calibration of Thermocouple Temperature Transmitters, may only be worked in conjunction with a work control package that has been processed in accordance with the requirements contained in AP-WORK-002 R10, Work Planning. This procedure may not be used as a stand-alone work control document.
5. Affected Personnel: UI Instrumentation and Controls (I&C) System Specialists, Instrument Specialists, and Electricians.

3 Prerequisites

1. Required training and qualifications:
    a. Utilities & Institutional Facilities (UI) procedures and work control processes
    b. The current procedure, equipment, and supplies

c. On-the-job training (OJT)

d. P101-18, Procedure for Pause/Stop Work

2. Pre-job briefing

4 Precautions and Limitations

1. Required Personal Protective Equipment (PPE):
   - Safety glasses with side shields
2. Before using this procedure to calibrate an instrument, the applicability of the instruction to the instrument must be reviewed and verbally approved by the Calibration Coordinator or I&C Superintendent.

5 Equipment, Supplies, etc.

Equipment, tools, instruments

1. Thermocouple-Simulator Calibrator (Calibration Standard) with National Institute of Standards and Technology (NIST)-traceable calibration appropriate to the range of Thermocouple Temperature Transmitter being calibrated (Test Article).
   a. Calibration Standard must have an accuracy at least four times better than the Test Article.
2. Multimeter or other device with current calibration to accurately measure output signal of Thermocouple Temperature Transmitter.
3. Optional: Beamex MC5 Calibrator with current calibration. This instrument is used in place of items 1 and 2.
   a. The Beamex system provides semi-automatic calibration of the Thermocouple Temperature Transmitter and integrated measurement of the output signal.
   b. The Beamex system includes the capability to act as Calibration Standard for both Type J and Type K thermocouples.

Supplies, materials, parts

1. Thermocouple extension wire to connect Calibration Standard to the Test Article.
   a. Note that this wire must be of the appropriate type for the instrument (Type J or Type K thermocouple extension wire).

6 Responsibilities

1. Persons performing this procedure are responsible for—

- Notifying Foreman or Superintendent of equipment damage or other conditions that could require corrective action
- Issuing a STOP/PAUSE WORK order whenever warranted by conditions related to health or safety in accordance with P101-18, Procedure for Pause/Stop Work

2. Managers and Superintendents are responsible for ensuring procedure compliance.

7 Procedural Steps

7.1 General

1. To collect the calibration data, thermocouple signals are applied at 5 selected points across the range of the Thermocouple Temperature Transmitter (Test Article). These points are 0%, 25%, 50%, 75%, and 100% of scale.
   a. Data may be collected on increasing or decreasing signals of the Test Article, at the discretion of the Calibration Technician or Electrician.
2. Data are collected as follows:
   a. “As-Found” data are collected first to document existing accuracy.
   b. Adjustments are then made to the Test Article.
   c. Finally, after adjustment, “As-Left” calibration data are collected.
3. Refer to UI-PROC-60-10-110, Calibration Program – Utilities Division, for current Calibration Form.

7.2 Preliminary Steps

1. Inspect Thermocouple Temperature Transmitter—including fitting connections and general condition—and verify that it appears to be in good working condition.
2. Verify that the Thermocouple-Simulator Calibrator is in current calibration, as determined by Calibration Coordinator.
3. Verify that the Multimeter is in current calibration, as determined by Calibration Coordinator.
4. If using Beamex Calibrator, verify that the instrument is in current calibration, as determined by Calibration Coordinator.
5. Record the Thermocouple Temperature Transmitter (Test Article) information on Calibration Form:
   a. Manufacturer

b. Model or style number

c. Identification number (serial number)

d. I&C file number (if present)

6. Record the Thermocouple-Simulator Calibrator (Calibration Standard) information on Calibration Form:

   a. Manufacturer

   b. Model or style number

   c. Identification number (serial number)

   d. Last calibration date

   e. Calibration due date

   f. Calibration organization

7.3 Manual Calibration

7.3.1 As-Found Data

1. Connect Test Article input to output of Calibration Standard. Note that the RED lead of thermocouples is NEGATIVE.
2. Turn on Calibration Standard and adjust output to 0% of transmitter range.
3. Record Test Article reading and Calibration Standard reading on Calibration Form under “As-Found,” 0% reading.
4. Adjust output of Calibration Standard to 25% of transmitter range.
5. Record Test Article reading and Calibration Standard reading on Calibration Form under “As-Found,” 25% reading.
6. Adjust output of Calibration Standard to 50% of transmitter range.
7. Record Test Article reading and Calibration Standard reading on Calibration Form under “As-Found,” 50% reading.
8. Adjust output of Calibration Standard to 75% of transmitter range.
9. Record Test Article reading and Calibration Standard reading on Calibration Form under “As-Found,” 75% reading.
10. Adjust output of Calibration Standard to 100% of transmitter range.
11. Record Test Article reading and Calibration Standard reading on Calibration Form under “As-Found,” 100% reading.

12. Adjust output of Calibration Standard to 0% of Test Article range.
13. Verify that Test Article reading returns to 0%.

7.3.2 Adjust Zero and Span

1. Adjust the Thermocouple Temperature Transmitter (Test Article) so that proper readings are obtained at 0% and 100% scale.
   a. Most Thermocouple Temperature Transmitters have ZERO and SPAN adjustments, which are made at this time.
   b. ZERO and SPAN adjustments interact with each other, so multiple iterations may be required.
2. Verify proper reading at 0% and 100% of Test Article scale.

7.3.3 Calibration Data

1. Adjust output of Calibration Standard to 0% of Test Article range.
2. Record Test Article reading and Calibration Standard reading on Calibration Form under “Calibration data,” 0% reading.
3. Adjust output of Calibration Standard to 25% of Test Article range.
4. Record Test Article reading and Calibration Standard reading on Calibration Form under “Calibration data,” 25% reading.
5. Adjust output of Calibration Standard to 50% of Test Article range.
6. Record Test Article reading and Calibration Standard reading on Calibration Form under “Calibration data,” 50% reading.
7. Adjust output of Calibration Standard to 75% of Test Article range.
8. Record Test Article reading and Calibration Standard reading on Calibration Form under “Calibration data,” 75% reading.
9. Adjust output of Calibration Standard to 100% of Test Article range.
10. Record Test Article reading and Calibration Standard reading on Calibration Form under “Calibration data,” 100% reading.
11. Adjust output of Calibration Standard to 0% of Test Article range.
12. Verify that Test Article reading returns to 0%.

7.4 Acceptance Criteria

1. The Thermocouple Temperature Transmitter (Test Article) has passed calibration if the difference between Thermocouple-Simulator Calibrator and Thermocouple Temperature Transmitter readings is equal to or less than +/- one (1) percent of the Thermocouple Temperature Transmitter scale range at all calibration points.

   Note: Other accuracy requirements may be in effect for a particular instrument. An item is considered calibrated if the difference between the Calibration Standard and the Test Article is equal to or less than acceptance criteria defined by Engineering (using Form 60-10-110.1, Utilities Calibration Program Form) at all calibration points. Contact Calibration Coordinator if you are uncertain about the applicable acceptance criteria.

2. If Test Article passes calibration, fill out a VERIFIED sticker and affix it to the Test Article. The sticker may be applied to any location, but the front is preferred.

3. If Test Article fails calibration, affix a REJECTED sticker to it. The sticker may be applied to any location, but the front is preferred.

   a. Do not return instrument to Requester.

   b. Deliver instrument and calibration data to Calibration Coordinator for disposition.

8 Records

Records generated as a result of implementing this procedure are maintained in accordance with the UI records program.

9 Abbreviations, Acronyms, and Terms

Abbreviation, Acronym, or Term	Definition
Calibration Standard	Thermocouple-Simulator Calibrator used in procedure
ESH	Environment, Safety, and Health

Abbreviation, Acronym, or Term	Definition
I&C	Instrumentation and Controls
mA	milliampere
NIST	National Institute of Standards and Technology
OJT	On-the-job training
PPE	Personal Protective Equipment
Test Article	Thermocouple Temperature Transmitter being calibrated
UI	Utilities & Institutional Facilities

10 References

P101-18, Procedure for Pause/Stop Work

UI-PROC-60-10-110, Calibration Program – Utilities Division

11 Appendices and Attachments

None

ATTACHMENT 3: BOILER CHECKLIST

Boiler NB # 16-1484-~~B~~A

Boiler Location 16-1484

Date(s) Performed 9/28/16

Safety valves replaced? Y Boiler S/N # 100848-B

Boiler Pressure (psig) 150

Internal ~~Fireside~~ inspection: 4/14/16

Supply gas pressure (psig) 5

External ~~Waterside~~ inspection: 9/11/16

Flue door gaskets replaced? Y

Safety value test Y

Verify shutdown switches:

High Limit Y

High Limit set point 9~~8~~9 psi

High Gas Y

High Gas set point 16 in wc

Low Gas Yes

Low Gas set point 6 in wc

OPC Y

OPC set point 84 psi

LWC 1 Y

LWC 2 Y

Air Proving Switch Y

Boiler set in low NOx setting? Y

CSLC set point 25 psig

Lag set point 60 psig

Lead set point 80 psig

Calibration date on steam boiler pressure gauge 6/13/16

Work Control: Send copy of this completed form to TA-09/TA-16 System Engineer.

Copy sent to Engineer by WCS _____ Date _____

MSS Rep _____ Date 9-28-16

Released for Operations by U&I System Engineer _____ Date 9/28/16

ATTACHMENT 3: BOILER CHECKLIST

Boiler NB #_____

Boiler Location 16-1484

Date(s) Performed 9/28/16

Safety valves replaced? Y Boiler S/N # 100848-A

Boiler Pressure (psig) 150

Internal ~~Fireside~~ inspection: 4/14/16

Supply gas pressure (psig) 5

External ~~Waterside~~ inspection: 7/11/16

Flue door gaskets replaced? Y

Safety value test Y

Verify shutdown switches:

High Limit Y

High Limit set point ~~85~~ 90 psi

High Gas Y

High Gas set point 17 in wc

Low Gas Y

Low Gas set point 5 in wc

OPC Y

OPC set point 85 psi

LWC 1 Y

LWC 2 Y

Air Proving Switch Y

Boiler set in low NOx setting? Y

CSLC set point 25 psig

Lag set point 80 psig

Lead set point 80 psig

Calibration date on steam boiler pressure gauge 6/13/16

Work Control: Send copy of this completed form to TA-09/TA-16 System Engineer.

Copy sent to Engineer by WCS _____ Date _____

MSS Rep _____ Date 9-28-16

Released for Operations by U&I System Engineer _____ Date 9/28/16

BSB Hi fire

V1.10 testo 340
60213143/USA

Folder
SITE
Start: 09/28/16 10:58:32

3.26 % Oxygen
16 ppm CO
334.4 °F T stack
45.7 ppm NOx

Fuel: Natural gas
O2ref.: 3.0%
CO2max: 0.0%
Heat transf. °F: - °F

BS # Hi fire

V1.10 testo 340
60213143/USA

Folder
SITE
Start: 09/28/16 10:39:27

3.63 % Oxygen
25 ppm CO
335.1 °F T stack
44.2 ppm NOx

Fuel: Natural gas
O2ref.: 3.0%
CO2max: 0.0%
Heat transf. °F: - °F

BSB Low

V1.10 testo 340
60213143/USA

Folder
SITE
Start: 09/28/16 11:03:00

6.18 % Oxygen
7 ppm CO
338.3 °F T stack
13.3 ppm NOx

Fuel: Natural gas
O2ref.: 3.0%
CO2max: 0.0%
Heat transf. °F: - °F

BSB Low LN

V1.10 testo 340
60213143/USA

Folder
SITE
Start: 09/28/16 10:43:41

6.17 % Oxygen
8 ppm CO
346.8 °F T stack
38.5 ppm NOx

Fuel: Natural gas
O2ref.: 3.0%
CO2max: 0.0%
Heat transf. °F: - °F

				Pilot Readings		Lightoff Readings							Low NOx readings					
BOILER	Location	Serial #	Boiler HP	High Pilot	Low Pilot	Blower Pressure	Manifold Pressure	Combustion Chamber Pressure	Main Gas Pressure	O2 %	CO ppm	NOx ppm	Manifold Pressure	Combustion Chamber Pressure	Main Gas Pressure	O2 %	CO ppm	NOx ppm
BS-A	16-1480-A	100852-B	98	10	10	7.3	5.4	2.1	11.6	3.4	8	52	5.4	1.7	12.5	6.3	18	21
BS-B	16-1480-B	100852-A	98	10	6	7.3	5.3	2.3	9.7	4	29	50	5.3	2	10.5	6.3	6	27
BS-A	16-1483-A	100850-B	128	10	5	7.5	5.8	2.4	10.8	3.6	7	51	5.8	2.1	12.5	5.9	8	25
BS-B	16-1483-B	100850-A	128	11	5.5	7.5	5.6	2.3	13.5	3.4	6	51	5.6	2	15	6.5	18	22
BS-A	16-1484-A	100848-A	183	11	6.8	7.9	5.2	2.3	14	3.7	7	46	5.2	2	16	6	41	24
BS-B	16-1484-B	100848-B	183	12	7	8	5.5	2.3	15	3.4	11	53	5.5	2	16	6	10	21
BS-A	16-1487-A	100857-B	56	10	5	7.8	5.8	2.5	8.3	3.5	125	50	5.5	1.9	8.7	6.6	82	17
BS-B	16-1487-B	100857-A	56	11	5	7.8	5.6	2.7	7	3.6	18	47	5.6	2.3	7.3	6.3	26	21
BS-A	16-1490-A	100856-A	95	9.5	6.8	7.2	5	2.1	10.6	2.6	49	59	5	1.8	11.1	5.8	8	28
BS-B	16-1490-B	100856-B	95	9.4	6	7.1	4.9	2	8.6	3.4	9	59	4.9	1.8	9.3	5.7	6	28
BS-A	16-1491-A	100859-A	24	10	9	6.4	5.4	3	6.2	5.3	56	43	5.4	2.7	6.8	5.4	66	40
BS-B	16-1491-B	100859-B	24	10	9	7.8	5.6	3.5	8.2	5.3	95	39	5.6	2.7	8.5	7	22	29
BS-A	16-1492-A	100855-B	85	10	9	10	5.2	2.3	10	3	7	53	5.2	2	10.7	6.4	24	24
BS-B	16-1492-B	100860-A	70	10	8.5	8.3	5.3	2.5	8.5	3.1	46	51	5.3	2.1	9.2	5.6	28	26
BS-A	9-282-A	100849-A	153	11	10	8	5.1	2.2	13.6	3.7	11	57	5.1	1.9	15	6.4	6	27
BS-B	9-282-B	100849-B	153	11	6	8.4	5.6	2.4	11.3	3.8	12	52	5.6	2.1	12.5	5.9	8	26

		Pilot Readings		Lightoff Readings						Low NOx readings				
BOILER	TA 16 BLD 1484	High Pilot	Low Pilot	Blower Pressure	Main Gas Pressure at Low Gas Switch	Main Gas Pressure at High Gas Switch	O2 %	CO ppm	NOx ppm	Main Gas Pressure at Low Gas Switch	Main Gas Pressure at High Gas Switch	O2 %	CO ppm	NOx ppm
A	DATE: 9.15.16	11	6.6	6.6	14	11.5	3.8	25	45	14	12	6.3	7	37
B	DATE: 9.15.16	12	7	7.7	15	12.5	~~3.4~~	13 ~~7~~	46.7	14.8	13	6.4	4	17
	DATE:													
B	DATE: 9.16.16											6.17	7	15
	DATE:													
	DATE:													
	DATE:													
	DATE:													

Ordered on
WO# 547830-01
TA16-1484
SN#

I-60627-3A

Installed on TA 16 Bld 1484 BS A

ADESH-17-015

2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments

LA-UR-17-20687

ASME Assemblers Certificate of Conformance for Pressure Relief Valves
Form P-8 (Section I)

1.) Manufactured (or assembled) by Lam Valves Inc. 1502 Lombardy St Houston, TX 77023
2.) Table of Code symbol stamped items:

ID (serial No)	Year Built	NB Cert #	QTY	Type	Size, (NPS)	Set Pressure, psig (nameplate)	Capacity	Test Fluid	Date	CI Name	CI Signature
1 70627	2016	LMV A76704	4	60216701	1½	100@15	3948 LB/H	S-1m	4-7-16	L. CASTILLO	Luis Castillo

3.) Remarks:

CERTIFICATE OF SHOP COMPLIANCE

By the signature of the Certified Individual (CI) noted above, we certify that the statements made in this report are correct and that all details for design, material, construction and workmanship of the pressure relief devices conform with the requirements of Section I of the ASME Boiler and Pressure Vessel Code.

V Certificate of Authorization No. 18513 Expires January 8, 2019

Date: 4-7-16 Signed: Luis Castillo (Responsible representative) Name: Lam Valves Inc. (Assembler)

Ordered on
WO# 547830-01
TA16-1484
SN#

I-80627-26

Installed at TA 16 Bld 1464 BS A

ASME Assemblers Certificate of Conformance for Pressure Relief Valves
Form P-8 (Section I)

1.) Manufactured (or assembled) by Lam Valves Inc. 1502 Lombardy St Houston, TX 77023
2.) Table of Code symbol stamped items:

ID (serial No)	Year Built	NB Cert #	QTY	Type	Size, (NPS)	Set Pressure, psig (nameplate)	Capacity	Test Fluid	Date	CI Name	CI Signature
I-80627	2016	LMV 13632	15	6031111701	2"	100PSI	4593 LB/HR	Stm	4-8-16	L. CASTILLO	Luis Castillo

3.) Remarks:

CERTIFICATE OF SHOP COMPLIANCE

By the signature of the Certified Individual (CI) noted above, we certify that the statements made in this report are correct and that all details for design, material, construction and workmanship of the pressure relief devices conform with the requirements of Section I of the ASME Boiler and Pressure Vessel Code.

V Certificate of Authorization No. 18513 Expires January 8, 2019

Date: 4-8-16 Signed: Luis Castillo (Responsible representative) Name: Lam Valves Inc. (Assembler)

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Package Page 1252 of 2096

Ordered on
WO # 547830-01
TA16-1484
SN #

I-80627-2K

Installed at TA 16 Bld 1488 BS B

ASME Assemblers Certificate of Conformance for Pressure Relief Valves
Form P-8 (Section I)

1.) Manufactured (or assembled) by Lam Valves Inc. 1502 Lombardy St Houston, TX 77023
2.) Table of Code symbol stamped items:

ID (serial No)	Year Built	NB Cert #	QTY	Type	Size, (NPS)	Set Pressure, psig (nameplate)	Capacity	Test Fluid	Date	CI Name	CI Signature
I-80627	2016	LAM V 16324	15	6021111701 J	1	100PSI	4593 LB/HR	SIM	4-8-16	L. CASTILLO	Luis Castillo

3.) Remarks:

CERTIFICATE OF SHOP COMPLIANCE

By the signature of the Certified Individual (CI) noted above, we certify that the statements made in this report are correct and that all details for design, material, construction and workmanship of the pressure relief devices conform with the requirements of Section I of the ASME Boiler and Pressure Vessel Code.

V Certificate of Authorization No. 18513 Expires January 8, 2019

Date: 4-8-16 Signed: Luis Castillo (Responsible representative) Name: Lam Valves Inc. (Assembler)

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Package Page 1253 of 2096

Ordered on
WO# 5417830-01
TA16-1484
SN#

I-80627-3D

Installed at TA 16 BID 1484 BS B

ASME Assemblers Certificate of Conformance for Pressure Relief Valves
Form P-8 (Section I)

1.) Manufactured (or assembled) by Lam Valves Inc. 1502 Lombardy St Houston, TX 77023
2.) Table of Code symbol stamped items:

ID (serial No)	Year Built	NB Cert #	QTY	Type	Size, (NPS)	Set Pressure, psig (nameplate)	Capacity	Test Fluid	Date	CI Name	CI Signature
I 80627	2016	LMV A76704	4	6D1666701	1"x2"	100PSI	9948 SCFM CB1K		4.7-16	L. CASTILLO	Luis Castillo

3.) Remarks:

CERTIFICATE OF SHOP COMPLIANCE

By the signature of the Certified Individual (CI) noted above, we certify that the statements made in this report are correct and that all details for design, material, construction and workmanship of the pressure relief devices conform with the requirements of Section I of the ASME Boiler and Pressure Vessel Code.

V Certificate of Authorization No. 18513 Expires January 8, 2019

Date: 4-7-16 Signed: Luis Castillo (Responsible representative) Name: Lam Valves Inc. (Assembler)

Attachment B, LO/TO Orders

Michael Pacish 094113 7-4842 — Paul A. Montoya 089771 7-4842

Lock Coordinator Name / Z#:	Phone #:	Alternate Lock Coordinator Name / Z#:	Phone #:

Section 1: General Information

1. Work Document Number (i.e., Package/Procedure #): 547830-01
2. LO/TO (Parent) Record #: 47183

Location of Equipment to be Isolated

3. TA: 16 | 4. Bldg: 1484 | 5. Rm: n/a | 6. Equipment Description (e.g. Machinery/Name/CMMS Number): Complete steam outage BS-A, BS-B, & Feed water tank

7. Name of Equipment Owner/Operator: Glenn Martinez z#190429 cell# 231-8341

8. Reason for LO/TO: Annual fireside / waterside PM

9. Energy Type to be Isolated (check all that apply):
☒ Electrical ☒ Mechanical ☐ Hydraulic ☐ Pneumatic ☐ Steam ☐ Capacitors ☐ Compressed Energy ☐ Gravity ☐ Other (specify):

10. Verification required for LO/TO:
☑ Installation ☑ Removal ☐ N/A (Verification Not Required)

11. Verification Type:
☑ Peer ☐ Independent ☐ N/A

12. Specific Sequencing of LO/TO devices required for:
☐ Installation ☐ Removal ☑ N/A (Sequencing Not Required)

13. LO/TO Orders Addendum with Operational Instructions/Procedures attached?
☐ Yes ☒ No

Equipment Owner/Operator Comments:
Boilers are already isolated. Follow U.I. procedures for startup and burner control

Section 2: LO/TO Installation & Removal Details

14. Group LO/TO? ☒ Yes ☐ No
Name of Lead Authorized Worker: Brandon Davis 268587

15. Group Lock Box used? ☒ Yes ☐ No
If yes, enter ID# of Lock Box: 1484

LO/TO Installation

16. Approval to Install LO/TO
Signature: [signature] Z#: 190429
NOTE: Approver must ensure Affected Workers are notified prior to Authorized Workers performing LO/TO

LO/TO Removal / Return to Service

23. Approval to Remove LO/TO Call #: _____ ☒ N/A
Signature Z#:
NOTE: Approver must ensure Affected Workers are notified of LO/TO Removal / Return to Service

17. Energy Isolation Device (use Specific ID)	18. Location of Energy Isolation Device	19. LO/TO Installation Sequence	20. Required LO/TO Position or Alignment	24. LO/TO Removal Sequence	25. Required Position/Alignment following Removal	26. As-Left Position
PPA ckt# 4 JKS	boiler room	N/A	Off/ open	N/A	Off/ open	Off/ open
PPA ckt# 10 JKS	boiler room	N/A	Off/ open	N/A	Off/ open	Off/ open
PPA ckt# 9 JKS	boiler room	N/A	Off/ open	N/A	Off/ open	Off/ open
LP1 ckt# 7 JKS	boiler room	N/A	Off/ open	N/A	Off/ open	Off/ open

☑ See continuation page for additional Energy Isolation Devices (continuation page must also be signed if applicable)

21. Energy Isolation Devices Positioned, Lock(s) and Tag(s) installed, and Zero Energy Checks Performed:
Signature: [signature] Z#: 268587 Date: 6-3-14

27. LO/TO has been Removed & Isolation Devices Positioned:
Signature: [signature] Z#: 268587 Date: 9.28.16

22. LO/TO verified by: ☐ N/A
Signature: [signature] Z#: 122080 Date: 6-3-16

28. Removal and Positioning verified by: ☐ NA
Signature: [signature] Z#: 122080 Date: 9/28/16

9 locks + Tags

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Package Page 1255 of 2096

Attachment B, LO/TO Orders

Attachment B, LO/TO Orders (Cont.)			
1. Work Document Number (i.e., Package/Procedure #): 547830-01		2. LO/TO (Parent) Record #: 47183	
Section 3: All Authorized Workers (anyone applying a lock for this activity)			
29. Authorized Workers Name(s)	Z#	30. Date worker's lock is hung	31. Date worker's lock is removed
1. Alejandro Alvarez JAS	282921	6.3.16	9/28/16
2. Brandon Davis JAK	268587	6.3.16	9/28/16
3. Daniel Ortiz JAS	283014	6.3.16	9/28/16
4. Joe Sweeney JAS	297205	6.3.16	9/28/16
5. Eric Brown	305382	10 June 16	10 June 16
6. Micheal Jaramillo	196359	10 June 16	10 June 16
7. Carlos Chacon	120931	10 June 16	10 June 16
8. Jorcelo Martinez	173426	6/17-16	" "
9. Mike Jaramillo	196359	6-17-16	" "
10. Greg Donnelly	179352	6/23-16	" "
11. Derrick Roybal	294277	7/25/16	9/28/16
12. Bos Estes	151776	9/7/16	9/28/16
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
Section 4: Return of Lock(s)/Tag(s) and Locking Devices			
All Lock(s)/Tag(s) and Locking Devices have been removed and returned to the Lock Coordinator:			
32. Signature of Lock Coordinator:	Z#: 202748	Date: 10-3-16	

*Instructions for completing this form (by numbered steps) appear on the last two pages of this document. Take the completed forms back to the Lock Coordinator for closeout.

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1256 of 2096

Attachment B, LO/TO Orders

Continuation Page (print as needed)

Attachment B, LO/TO Orders (Cont.)

1. Work Document Number (i.e., Package/Procedure #): 547830-01

2. LO/TO (Parent) Record #: 47183

LO/TO Installation				LO/TO Removal / Return to Service		
17. Energy Isolation Device (Specific ID)	18. Location of Energy Isolation Device	19. LO/TO Installation Sequence	20. Required LO/TO Position or Alignment	24. LO/TO Removal Sequence	25. Required Position/Alignment following Removal	26. As-Left Position
Main Gas supply Valve #1	outside on gas reg. station	N/A	closed	N/A	closed	closed
Lock Box 1484	in boiler room	N/A	Locked	NA	N/A	N/A

21. Energy Isolation Devices Positioned, Lock(s) and Tag(s) installed, and Zero Energy Checks Performed:
Signature: Z#: 268587 Date: 6-3-16

22. LO/TO verified by: ☐ N/A
Signature: Z#: 122085 Date: 6-3-16

27. LO/TO has been Removed & Isolation Devices Positioned:
Signature: Z#: 268587 Date: 9-28-16

28. Removal and Positioning verified by: ☐ NA
Signature: Z#: 122085 Date: 9-28-16

Attachment B, LO/TO Orders

Instructions by Numbered Steps

Lock Coordinator (Header): Identify the individual who will issue Red Locks to persons performing LO/TO (individual[s] identified by the FOD).

1. Enter the Work Document Number. This will be the number from the IWD or the procedure number (i.e., TA88-DOP-0001).
2. Enter the LO/TO Parent Record number. This is obtained from the Lock Coordinator when the lock(s) are issued. The Remedy LO/TO database generates this number.
3. Enter the TA where the equipment is located.
4. Enter the Building number where the equipment is located.
5. Enter the Room number where the equipment is located.

   NOTE: Responses to steps 3 through 5 need to match information, identically, within both the LO/TO Orders and the tag (Attachment A).

6. Enter the Equipment/Machinery/Name/Number (example, HVA-001 [NOTE: LOG is to follow nomenclature contained within CMMS/MEL]).
7. Enter the Name of the Equipment Owner/Operator. The Equipment Owner/Operator is designated by the FOD. There may be both programmatic and facility Equipment Owner/Operators.
8. Write a brief description of the reason for LO/TO (example, removing and replacing exhaust fan belts).
9. Check the appropriate energy type to be isolated (check all that apply). Make sure you have considered all energy sources; if "Other" is checked, specify what "Other" is.
10. Is verification of the energy isolation configuration required for this LO/TO for installation and/or removal? Check the appropriate box(es).
    NOTE: Contact the FOD/Designee regarding verification requirements. Additionally, verification may be required by the Equipment Owner/Operator.
11. If verification is required, check the appropriate box (either "Peer" or "Independent"). If verification is NOT required, check the "N/A" box.
    NOTE: Independent verification may be required per ***P315, Conduct of Operations Manual,*** as determined by the FOD/Designee.
12. When installing the lock(s)/tag(s), is there a specific sequence in which the isolation devices are to be positioned? If a specific sequence must be followed for Installation and/or Removal, check the appropriate box(es) and subsequently identify the sequence order in column numbers 19 and/or 24, accordingly. If there is not a specific sequence to follow, check the "N/A" box and place N/A in columns 19 and/or 24.
13. If an operating procedure/instruction/etc. is to be used in conjunction with the LO/TO Orders, check the "Yes" box and attach the pertinent document as an addendum. Additionally, a space is provided for Equipment Owner/Operator comments, if applicable.
14. Check either "Yes" or "No" to indicate if a Group LO/TO is applicable. A Group LO/TO is where two or more authorized workers, regardless of their occupation or craft, lock out and tag out the same equipment to perform servicing or maintenance. Enter the name of the Lead Authorized Worker.
15. Check either "Yes" or "No" to indicate if a Group Lock Box is to be used. If "Yes", enter the lock box ID#. Each organization that issues locks will be required to uniquely number and track lock boxes in their possession.
16. The FOD-designated Equipment Owner/Operator signs and enters their Z#, authorizing the installation of the LO/TO. The Approver is responsible to notify all Affected Workers prior to the Authorized Workers performing LO/TO ("Affected Workers" are those who either may work with the equipment or are affected by LO/TO activities).
17. Enter the specific energy isolation device/ID (e.g., MCC-A, A4). The ID used in the LO/TO orders must match information used on tag (Attachment A).
18. Location of energy isolation device (TA, Bldg, Rm, etc.). The location used in the LO/TO orders must match information used on tag (Attachment A).

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1258 of 2096

19. If the LO/TO needs to be installed in a particular order (refer to Step #12), number the sequence in which the locks need to be installed. If sequencing is not applicable, then place N/A in this column.
20. Required Position/Alignment for LO/TO (open, closed, connected, disconnected, on, off, etc.). Follow the nomenclature on the piece of equipment (e.g., if a service disconnect has "ON"/"OFF" posted, ensure the position/alignment entered on this form matches the piece of equipment ["ON" or "OFF"]).
21. The Lead Authorized Worker documents (signature) that the energy isolation devices have been positioned correctly, that locks and tags have been installed on those energy isolation devices and a Zero Energy Check has been performed.
    NOTE: The Lead Authorized Worker may also be designated as the Person-in-Charge (PIC).
22. Is verification required (see #10)? If verification is required, the person who performs the verification signs, and places their Z# and the date here. If verification is not required, check the "N/A" box.
23. Documentation of Approval to Remove LO/TO. Equipment Owner/Operator or FOD Designee signs and places his/her Z# in this box. Alternatively, authorization per telecommunication may be performed via a phone number identified for the Lead Authorized Worker to call the Equipment Owner/Operator or FOD Designee. Once verbal authorization is given, the Lead Authorized Worker documents the authorization as "per telecom" and enters his/her initials. Example: John Smith per telecom, JS. By checking the "N/A" box, a phone call is NOT REQUIRED by the Lead Authorized Worker to the Equipment Owner/Operator or FOD Designee.
    NOTE: The Equipment Owner/Operator or FOD Designee is responsible to notify all Affected Workers after the LO/TO removal and of the equipment/machine's return to service.
24. If the LO/TO needs to be removed in a particular sequence (as per Step #12), number the sequence in which the locks need to be removed. If the "N/A" box is checked in #12, then place N/A in this column.
    NOTE: Often the sequence for removal is opposite the sequence for installation. For example, if the order specified for installation Column #19 is "1,2,3,4", the order specified for removal in Column #24 could be "4,3,2,1". The intention of the LO/TO Orders is to have the entries in Column #s 19 and 24 correspond with the energy isolation devices specified in Column #17.
25. Identify the required position/alignment in which the system/component is to be placed following the removal of the lock(s). Follow the nomenclature as listed on the piece of equipment ("On", "Off", etc.).
26. Enter the As-Left Position.
27. The Lead Authorized Worker documents (signature, Z# and date) that the locks and tags have been removed from the energy isolation devices and the energy isolation devices have been configured as per Equipment Owner/Operator specifications.
    NOTE: The Lead Authorized Worker may also be designated as the Person-in-Charge (PIC).
28. If verification is required for the positioning, the person who performs the verification signs here. Otherwise, check N/A.
29. All authorized workers applying a lock for this activity (names/Z#) must be documented. If more than 20 authorized workers are involved in a Group LO/TO, document the required information with an attached list.
30. Enter the date the authorized worker attaches his/her lock.
31. Enter the date the authorized worker removes his/her lock.
32. The Lock Coordinator or designee signs once locks, tags, and locking devices have been removed and returned. If a lock and/or tag are found to be contaminated, the lock and/or tag will be disposed of in accordance with local procedures and a verbal notification will be made to the Lock Coordinator to close out the record within Remedy.

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1259 of 2096

Los Alamos NATIONAL LABORATORY EST.1943

IWD Part 2
FOD Requirements and Approval for Entry and Area Hazards and Controls

Non-Tenant Activity Form

IWD No./Work Request No: _____ Revision #: _____

FOD must determine the facility entry and coordination requirements and identify the ESH/S&S hazards and controls associated with the activity location.

FOD UI	TA 9/16	Bldg. All 9/16 UI Steam Boiler Plants (TA-09 / 282, / TA16 - 1480,1483,1484,1487,1490,1491,1492)	Room All	Other Location Inside Boiler Plants
FOD Designated Facility Point-of-Contact	Name Pablo C de Vaca	Phone 699-8226	Pager N/A	Email pfc@lanl.gov

Entry and Coordination Requirements (*Check one or more of the following*)

- ☐ No Entry/Coordination Requirements
- ☐ FOD designated facility point-of-contact must sign IWD Part 3
- ☒ POTD/POTW
- ☒ Check in at Start of Work
- ☒ Work-Area Training Required
- ☒ Security Clearance Requirements
- ☒ Work must be Scheduled
- ☐ Check in Daily
- ☐ Escort Required
- ☐ Other Security Requirements
- ☐ Co-located Hazards/Concerns
- ☒ Check out at End of Work
- ☐ Quality Issues
- ☐ Review under AB/Safety Basis/USQ
- ☐ Check out Daily
- ☐ Other Bounding Conditions _____

Additional Comments (refer to JHA Tool Facility Notes)

Activities must be on the UI POD/POTW. If activities involve potential exposure to Water Treatment Chemicals consult with UI Safety/IH representatives to identify proper PPE. Be aware of pipe or any components on floors for tripping hazards, label or tape to create visual awareness. If insect or pests are excessive contact pest control to address.

Instructions: In the block below, identify work-area hazards that could potentially affect the worker(s) or others. Specify the facility controls and preventive measures that must be implemented by the worker(s) to protect against the site hazards as well as any special training required.

ESH/S&S WORK AREA HAZARDS & CONTROLS

Work Area Hazards/Concerns Identify site hazards and concerns that could potentially affect the worker(s) or others.	**Work Area Hazard Present**	**Facility Controls/ Preventive Measures/ Bounding Conditions** Specify preventive measures, controls and bounding conditions for each site hazard	**Reference Documents** List permits, operating manuals, and other reference procedures	**Training and Qualification** List training requirements
☐ **No Work Area Hazards**				
Ionizing Radiation Work in posted radiological areas, work with radioactive materials, or work on or near radiation producing devices. **Specify Hazard:**	☐ Yes ☒ No			

ADESH-17-015

2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments

LA-UR-17-20687

Attachment Packgage Page 1260 of 2096

ESH/S&S WORK AREA HAZARDS & CONTROLS				
Work Area Hazards/Concerns Identify site hazards and concerns that could potentially affect the worker(s) or others.	**Work Area Hazard Present**	**Facility Controls/ Preventive Measures/ Bounding Conditions** Specify preventive measures, controls and bounding conditions for each site hazard	**Reference Documents** List permits, operating manuals, and other reference procedures	**Training and Qualification** List training requirements
Worker Exposure Working near non-ionizing radiation, beryllium, noise, chemicals, hazardous biological materials, lead, asbestos, temperature/humidity extremes, or high explosives. **Specify Hazards: Hot Piping, Potential Hot Water/Steam from pipe/fitting openings, Boiler Water Treatment Chemicals, Asbestos.**	☒ Yes ☐ No	Required PPE: Hard hat, safety shoes, safety glasses, hearing protection (if noise > 85 dba), long sleeve shirt or Ansell sleeves or coveralls. Gloves when operating valves or contacting pipe. Avoid hot surfaces and piping and pipe/fitting openings where there is potential for hot water/steam release. Be aware of chemical containers, piping, associated systems and any leaks. If chemical leak or liquid found of 5 gal. or less contact IH&S Rep for cleanup process and PPE required. Over 5 gallon chemical spill leave area, call EM&R, and control access. Follow LANL Asbestos program/rqmts if PACM identified outside containment. For after-hours contact the UI Duty Officer, 699-7452 to re-assess any abnormal situation.	P101-6 PPE P101-31 Hearing Conservation/Noise program HAZCOM (Chemical Hazard Communication) Course # 25418 Chemical MSDS's	• LANL PPE or equivalent • Hearing protection • Hazcom • Read Chemical MSDSs • LANL Asbestos Awareness.
Energized and Operative Systems Working near energized electrical parts, pressure systems, steam lines; near unprotected belts, pulleys, chains or rotating equipment; fuel fired equipment other than vehicles; or spark or flame producing operations. **Specify Hazards: Energized/rotating equipment, hot pressurized water/steam lines from open**	☒ Yes ☐ No	Stay within established walking areas. Observe safety signage and floor markings. When performing operations or maintenance evaluate for steam/hot water hazards from pipe or fitting openings and establish proper configuration control to prevent hazard exposure (per P315 or P101-3). **Note: boiler cold water drain valves must be closed and yellow locked/tagged per P315 after draining complete and prior to performing blowdowns.** If questions consult with UI system engineer, Operation Mgr. Designee, or Safety rep.	P101-3 LOTO P101-34 Pressure, Safety P315 P101-23 Asbestos	• LOTO • Pressure Safety Awareness • Read P315 admin lock/tag.
Confined Spaces Entry into tanks, manholes, cooling towers, sumps, or any other area with potentially low oxygen concentration or other hazards such as toxic vapors or engulfment. **Specify Hazards:**	☒ Yes ☐ No	Observe confined space signs or markings and follow LANL Confined Space Requirements if task requires confined space entry.	P101-27 Confined Space	Confined Space Training
Elevated Work Surface Elevated work when fall protection is not provided by conventional handrail systems or required per P101-20, *Fall Protection Program* Have U&I Safety representative evaluate elevated work.	☒ Yes ☐ No	Follow LANL Fall Protection Requirements if task work above 4 feet.	P101-20-0	Fall Protection
Environmental Impact Activities conducted in areas containing potential release site,	☐ Yes ☒ No			

ADESH-17-015

2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments

LA-UR-17-20687

Attachment Packgage Page 1261 of 2096

contaminated soil, sensitive species, watercourse wetlands, floodplain, historical/archeological sites, or other work area condition that can be impacted by or can impact the environment. **Specify Hazards:**				
Security or Other Hazard **Specify Hazards:**	☒ Yes ☐ No	Uncleared must have Q or L escort and must sign in/out @ 16-0969 Access Control. Meet WFO access requirements.	P200-2 Physical Security	Escort Training LANL Course # 18366

I have verified that the hazards identified above adequately identify the area hazards and that the IWM process has been applied appropriately.

FOD or Representative (Signature/Z #/Date) **Approval Required** Robert Cole Ora 090208 10-20-14 Date Approval Expires 09/30/2017

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1262 of 2096

From: Martinez, Glenn Timothy
To: Sparks, Jason Keith
Cc: C De Vaca, Pablo F
Subject: FW: Summer Boiler outage
Date: Wednesday, June 01, 2016 11:57:36 AM

Jason scan this into MWP plz

Glenn Martinez
Maintenance Superintendent
Work cell: 231-8341
Email: glennm@lanl.gov

From: C De Vaca, Pablo F
Sent: Wednesday, June 01, 2016 11:54 AM
To: Martinez, Glenn Timothy
Cc: Maestas, Justin M
Subject: FW: Summer Boiler outage

Please save this response.

From: Lopez, Christian David
Sent: Wednesday, June 01, 2016 10:04 AM
To: C De Vaca, Pablo F; Sparks, Jason Keith
Cc: Martinez, Glenn Timothy; Sisneros, Thomas A
Subject: RE: Summer Boiler outage

Concurred.

Sent from I Phone

From: C De Vaca, Pablo F
Sent: Wednesday, June 1, 2016 10:02:25 AM
To: Lopez, Christian David; Sparks, Jason Keith
Cc: Martinez, Glenn Timothy
Subject: RE: Summer Boiler outage

Christian, per our conversation you agreed operations could secure TA-16-1480,1483,1484,1490 & 1491 so start our annual maintenance can commence. Please concur.

From: C De Vaca, Pablo F
Sent: Wednesday, May 25, 2016 2:34 PM

To: Lopez, Christian David (cdlopez@lanl.gov)
Cc: Sparks, Jason K (jksparks@lanl.gov); Martinez, Glenn Timothy
Subject: Summer Boiler outage

Christian Lopez, can we shut down TA-16-1480,1483,1484,1490 & 1491, Please let us know when will be the best time we could shut these boilers down so we can start our annual maintenance.

Facility: F04 **Unit:** 530365 **Proj:**
Task Title: BHW ANNUAL FIRESIDE/WATERSIDE PM

W/O Type: PM W/O Group: Task Priority: 3
Planner : 112527 PADILLA B A
W/O Title: 530365-BHW-010 FIRESIDE/WATERSIDE PM
Written To: BOILER, HOT WATER
Task Dspln: F Due Date: 10/31/2016

Hazard: MODERATE IWD Reqmt: TASK SPECIFC

Los Alamos NATIONAL LABORATORY EST. 1943

Work Order Task

00558780 01

MASTER

Date: 07/27/2016
Page: 1

Work Order Task Written To

Facility : F04 **Unit :** 530365 **Op Sys :** HW
Room : 403ER **Area :** **Sys/Cls:** R ML4
Equipment : BOILER BHW-010 **Component:**
Location : S-53-0365-403ER
Job Type : PM
Tag 1 : 35834 Tag 2 :
Work Item : Ops Review Reqd: N

Authorization

Start Permission :	K. MARALD		Start Date:	10-20-16	
Complete Notice :	K. MARALD		Complete Date:	11-23-16	

NOTE:

*** Refer to attached Form 2101 - Non-Tenant Activity Form - or Form 2102- Tenant Activity Form - for a description of site specific training or escort and access requirements.**

Work Order Task Instructions

PERFORM ANNUAL INSPECTION, MAINTENANCE, AND FALL STARTUP PER UNIT
.
CONTACT: FACILITY COORDINATOR
PHONE: PAGER:
COORDINATION MEETING: NO[ ] YES[ ]
.
NOTIFY COORDINATOR PRIOR TO STARTING PROCEDURE.
FILL OUT ATTACHED CHECKLISTS & REPORT ANY DEFICIENCIES FOUND
TO FACILITY COORDINATOR AS SOON AS PRACTICAL.

QC Requirements/Comments

Facility: F04 **Unit:** 530365 **Proj:**
Task Title: BHW ANNUAL FIRESIDE/WATERSIDE PM

W/O Type: PM W/O Group: Task Priority: 3
Planner : 112527 PADILLA B A
W/O Title: 530365-BHW-010 FIRESIDE/WATERSIDE PM
Written To: BOILER, HOT WATER
Task Dspln: F Due Date: 10/31/2016

Hazard: MODERATE IWD Reqmt: TASK SPECIFC

Los Alamos NATIONAL LABORATORY EST. 1943

Work Order Task

00558780 01

MASTER

Date: 07/27/2016
Page: 2

Rework Reason/Cause

		(Y/N)
CDSG	CUSTOMER DESIGN	
IMCW	IMPROPER CONSTRUCTION/WORKMANSHIP	
IMDN	IMPROPER DESIGN	
PDMS	PARTS/MATERIAL DID NOT MEET SPECIFICATIONS	
WR	WARRANTY REWORK/REPAIR	

Date: Hours: Crew: Shift:
Comments:

Rework/Approval

Deficiency Tag No.: Loc: Tag Removed:
ReWork Job : N Comments:

Trouble Found/Work Performed

SWD

Continued on Additional Sheets? : ____

Work Delay Reason

		(Y/N)
A	ACCESS	
EQPT	EQUIPMENT	
MISC	MISCELLANEOUS	
OPS	OPERATIONS	
P	POOR PLANNING	
S	SAFETY	

Date: Hours: Crew: Shift:

Facility: F04 **Unit:** 530365 **Proj:**
Task Title: BHW ANNUAL FIRESIDE/WATERSIDE PM

W/O Type: PM W/O Group: Task Priority: 3
Planner : 112527 PADILLA B A
W/O Title: 530365-BHW-010 FIRESIDE/WATERSIDE PM
Written To: BOILER, HOT WATER
Task Dspln: F Due Date: 10/31/2016

Hazard: MODERATE IWD Reqmt: TASK SPECIFC

Los Alamos NATIONAL LABORATORY EST. 1943

Work Order Task

00558780 01

MASTER

Date: 07/27/2016
Page: 3

SCH SCHEDULING
Date: Hours: Crew: Shift:
T TRAVEL
Date: Hours: Crew: Shift:
W WEATHER
Date: Hours: Crew: Shift:
Comments:

Major Failure/Action Taken

Major Failure :
Deficiency Tag Loc:
Deficiency Tag No.:
Action Taken :
Removed (Y/N):
Limited Cond Operation:

Work Completion Signatures

Name	Function/Dept.	Date
[signature]	BOZ/OR CREW/LOG-CS	10-26-16

Comments:
(rework?)

Cost Center: P2070A Activity : 640CL000 User Def:
Percentage : 100.000 Acct No : XFM400 1G530365

Facility: F04 Unit: 530365 Proj:
Task Title: BHW ANNUAL FIRESIDE/WATERSIDE PM

W/O Type: PM W/O Group: Task Priority: 3
Planner : 112527 PADILLA B A
W/O Title: 530365-BHW-010 FIRESIDE/WATERSIDE PM
Written To: BOILER, HOT WATER
Task Dspln: F Due Date: 10/31/2016

Hazard: MODERATE IWD Reqmt: TASK SPECIFC

Los Alamos NATIONAL LABORATORY EST. 1943

Work Order Task

00558780 01

MASTER

Date: 07/27/2016
Page: 4

Work Order Task Written To

Facility : F04 **Unit : 530365** **Op Sys : HW**
Room : 403ER **Area :** **Sys/Cls: R ML4**
Equipment : BOILER BHW-010 **Component:**
Location : S-53-0365-403ER
Job Type : PM
Tag 1 : 35834 Tag 2 :
Work Item : Ops Review Reqd: N

Print Request - Work Order Documents

Facility	Type/Subtype	Document Number	Sheet	Image Addr
LNL	PROC STD	403-A.001 HOT WATER BOILER STARTUP AFTER LAY-UP		
LNL	PROC STD	403-A.006 HOT WATER BOILERS ANNUAL FIRESIDE/WATERSIDE		

References/Document Information

Type/Subtyp: PROC STD Number: 403-A.001 Sheet:
Title/Desc : HOT WATER BOILER STARTUP AFTER LAY-UP Image: N
Type/Subtyp: PROC STD Number: 403-A.006 Sheet:
Title/Desc : HOT WATER BOILERS ANNUAL FIRESIDE/WATERSIDE Image: N

Form 2101

Los Alamos NATIONAL LABORATORY EST.1943

IWD Part 2
FOD Requirements and Approval for Entry and Area Hazards and Controls

Non-Tenant Activity Form

IWD No./Work Request No: 555780-21 Revision #: _

Facility Operation Director (FOD) must determine the facility entry and coordination requirements and identify the Environment, Safety, Health (ESH)/Security and Safeguards (S&S) hazards and controls associated with the activity location.

FOD	TA	Bldg.	Room	Other Location
4	53	365	403	
FOD Designated Facility Point-of-Contact	Name: K. Mumo	Phone: 665-0944	Pager: 104-8327	Email

Entry and Coordination Requirements (*Check one or more of the following*)

- ☐ No Entry/Coordination Requirements
- ☑ Plan of the Day/Plan of the Week (POTD/POTW)
- ☐ Security Clearance Requirements
- ☐ Co-located Hazards/Concerns
- ☑ Check out at End of Work
- ☐ Escort Required
- ☐ Other Bounding Conditions _____
- ☐ FOD-designated facility Point-of-Contact must sign IWD Part 3
- ☑ Check in at Start of Work
- ☑ Work must be Scheduled
- ☐ Other Security Requirements (ex.: Cellphone, No Foreign Nationals, etc.)
- ☐ Quality Issues
- ☑ Work-Area Training Required
- ☐ Check in Daily
- ☐ Check out Daily
- ☐ Review under Authorization Basis (AB)/Safety Basis/Unreviewed Safety Question (USQ)

Additional Comments (refer to Job Hazard Analysis [JHA] Tool Facility Notes)

Instructions: In the block below, identify work-area hazards that could potentially affect the worker(s) or others. Specify the facility controls and preventive measures that must be implemented by the worker(s) to protect against the site hazards as well as any special training required.

ESH/S&S WORK AREA HAZARDS & CONTROLS

Work Area Hazards/Concerns Identify site hazards and concerns that could potentially affect the worker(s) or others.	**Work Area Hazard Present**	**Facility Controls/ Preventive Measures/ Bounding Conditions** Specify preventive measures, controls and bounding conditions for each site hazard	**Reference Documents** List permits, operating manuals, and other reference procedures	**Training and Qualification** List training requirements (P300, Integretated Work Management, Section 6.1)
☐ **No Work Area Hazards**				
Ionizing Radiation Work in posted radiological areas, work with radioactive materials, or work on or near radiation producing devices. **Specify Hazard:**	☐ Yes ☑ No			

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1269 of 2096

IWD No./Work Request No: 557Y0-01 Revision #: _

ESH/S&S WORK AREA HAZARDS & CONTROLS				
Work Area Hazards/Concerns Identify site hazards and concerns that could potentially affect the worker(s) or others.	**Work Area Hazard Present**	**Facility Controls/ Preventive Measures/ Bounding Conditions** Specify preventive measures, controls and bounding conditions for each site hazard	**Reference Documents** List permits, operating manuals, and other reference procedures	**Training and Qualification** List training requirements (P300, Integretated Work Management, Section 6.1)
Worker Exposure Working near non-ionizing radiation, beryllium, noise, chemicals, hazardous biological materials, lead, asbestos, temperature/humidity extremes, or high explosives. **Specify Hazards:**	☐ Yes ☑ No			
Energized and Operative Systems Working near energized electrical parts, pressure systems, steam lines; near unprotected belts, pulleys, chains or rotating equipment; fuel fired equipment other than vehicles; or spark or flame producing operations. **Specify Hazards:** Boilers = fuel fired units	☑ Yes ☐ No	use caution around Hot Surfaces		
Confined Spaces Entry into tanks, manholes, cooling towers, sumps, or any other area with potentially low oxygen concentration or other hazards such as toxic vapors or engulfment. **Specify Hazards:**	☐ Yes ☑ No			
Elevated Work Surface Elevated work when fall protection is not provided by conventional handrail systems or required per P101-20, *Fall Protection Program*	☐ Yes ☑ No			
Environmental Impact Activities conducted in areas containing potential release site, contaminated soil, sensitive species, watercourse wetlands, floodplain, historical/archeological sites, or other work area condition that can be impacted by or can impact the environment. **Specify Hazards:**	☐ Yes ☑ No			
Security Requirements **Specify:**	☐ Yes ☑ No			
Other Hazards **Specify:**	☐ Yes ☑ No			

I have verified that the hazards identified above adequately identify the area hazards and that the IWM process has been applied appropriately.

FOD or Representative (Signature/Z #/Date) **Approval Required** [signature] 112777 10/21/16

Date Approval Expires 11/30/16

2101 (6/12)

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1270 of 2096

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.001: Hot Water Boiler Startup After Lay-Up

Work Order No.: 558280-01 Equipment ID No.: BHW-10

Instructions: Enter the requested information. All items marked **S** or **Y** are satisfactory. Document all items marked **U**, **N**, or **N/A** in the Remarks section below, noting the step number and reason. Notify the foreman or supervisor of problems involving imminent danger.

TA: 53 Building: 365 Room: 403

Date Inspected: 10 / 26 / 16 Inspectors:

1.0 PRE-MAINTENANCE ACTIVITIES

NOTE Pre-operational and pre-maintenance activities shall be conducted per the work order package, e.g., lockout/tagout, permits, special instructions, etc.

! WARNING If purging of gas lines will be required during this maintenance, ensure that the purging activity is addressed in the Integrated Work Document (IWD). The following must be addressed (see Master Specification 23 1123):

1. Purged fuel gases shall be directly vented to a safe location outdoors, away from personnel and ignition sources. This may be accomplished through permanent piping or temporary piping or hosing.
2. If it is not possible to vent purged gases outdoors, the following conditions must be met:
   a. Purging activity must be approved by the LANL Fire Marshal based on a documented justification detailing why outdoor venting is not possible and IWD.
   b. Gas concentration in the space to which the purge is vented shall be maintained at no more than 25% of the Lower Explosive Limit (LEL). For natural gas, the LEL is a concentration of 5% in air or 50,000 ppm. Therefore a maximum concentration of 12,500 ppm is allowed for natural gas. The concentration may be controlled by providing adequate ventilation or by limiting the amount of purge gas.
   c. Combustible gas detectors shall be used during the purging operation to monitor the gas concentration.
   d. Nonessential personnel shall be evacuated from the vicinity (including adjacent spaces) during the purging operation.
   e. Ignition sources in the purging space shall be controlled or eliminated.

1.1	Notify maintenance coordinator (MC) that work will be in progress on the boiler system.	Initials:
1.2	Review manufacturer's recommendations for startup of burner and boiler.	Initials:

Remarks:

Los Alamos NATIONAL LABORATORY EST.1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.001: Hot Water Boiler Startup After Lay-Up

Work Order No.: 558280-01 Equipment ID No.: BHW-10

2.0	MAINTENANCE		
2.1	Fill boiler and system, if not already full.		Initials:
2.2	Vent air at high point in system.		Initials:
2.3	Check pressure/altitude gauge and expansion tank to ensure system is properly filled.	Circle one: (S) U N/A	Initials:
NOTE	If expansion tank is waterlogged, drain and refill the tank. If tank does not hold air, report it to the MC for repair or replacement.		
2.4	Set control switch to the Off position.		Initials:
2.5	Make sure fresh air to boiler room is unobstructed and manual dampers are open.		Initials:
2.6	Check availability of fuel.	Circle one: (S) U N/A	Initials:
2.7	Vent combustion chamber to remove unburned gases.		Initials:
2.8	Clean glass on fire scanner, if provided.		Initials:
2.9	Observe proper functioning of water pressure regulator.	Circle one: (S) U N/A	Initials:
2.10	Turn circulator pumps on electrically.	Circle one: (S) U N/A	Initials:
2.11	Check temperature control(s) for proper setting.	Circle one: (S) U N/A	Initials:
2.12	Check manual reset button on low-water fuel cutoff and high-limit temperature control.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST.1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.001: Hot Water Boiler Startup After Lay-Up

Work Order No.: 358780-01 Equipment ID No.: BHW-10

2.13 Set manual fuel oil supply or manual gas valve to the Open position.		Initials:
2.14 Place circuit breaker or fuse disconnect in the On position.		Initials:
2.15 Place all boiler emergency switches in the On position.		Initials:
2.16 Place boiler control starting switch in the On or Start position.		Initials:
! WARNING Boiler should fire at this point. Do NOT stand in front of boiler doors or breeching!		
2.17 Do not leave the boiler until it reaches the established cutout point to make sure the controls shut off the boiler.	Circle one: (S) U N/A	Initials:
NOTE If any abnormal conditions occur during light-off or temperature buildup, immediately open emergency switch. Do not attempt to restart unit until difficulties have been identified and corrected.		
2.18 During the temperature and pressure buildup period, walk around the boiler frequently to observe that all associated equipment and piping are functioning properly.	Circle one: (S) U N/A	Initials:
2.19 Visually check burner for proper combustion.	Circle one: (S) U N/A	Initials:
NOTE Combustion analysis is verifiable only with a flue gas analyzer and is performed mainly on boilers with power burners.		
2.20 Immediately after burner shuts off, inspect water pressure.	Circle one: (S) U N/A	Initials:
2.21 Open the highest vent to determine that system is completely full of water.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST.1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.001: Hot Water Boiler Startup After Lay-Up

Work Order No.: 55878001 Equipment ID No.: BHW-10

3.0 POST-MAINTENANCE ACTIVITIES

NOTE Post-maintenance activities shall be conducted in accordance with the work order package instructions (e.g., lockout/tagout, special instructions, etc.).

3.1 Enter the following information in boiler logbook:		Initials:
3.1.1 Date and time of startup. Date: 10-28-16 Time: 2:10		Initials:
3.1.2 Any irregularities observed and corrective action taken.		Initials:
3.1.3 Time when controls shut off burner at the established temperature. 2:43		Initials:
3.1.4 Tests performed.		Initials:
3.1.5 Signature of operator.		Initials:
3.2 Check safety relief valve for evidence of leaking.	Circle one: (S) U N/A	Initials:

NOTE A try lever test of the safety relief valve should be conducted every 30 days during the heating season, after any prolonged period of inactivity, and prior to the annual safety relief valve test.

3.3 Perform try lever test in accordance with the following steps (from ASME Section VI, Appendix I, I.03 Exhibit C).	Circle one: (S) U N/A	Initials:
3.3.1 Check the safety relief valve discharge piping to determine that it is properly installed and supported.	Circle one: (S) U N/A	Initials:
3.3.2 Check and log the system operating pressure and temperature.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.001: Hot Water Boiler Startup After Lay-Up

Work Order No.: 558780-01 Equipment ID No.: BHW-10

3.3.3	Lift the try lever on the safety relief valve to the full open position and hold it for at least 5 sec or until clean water is discharged.		Initials:
3.3.4	Release the try lever and allow the spring to snap to the closed position.		Initials:
3.3.5	IF the valve leaks, THEN operate the try lever two or three times to clear the seat of any foreign matter that is preventing proper seating. As safety relief valves are normally piped to the floor or near a floor drain, it may take some time to determine if the valve has shut completely.		Initials:
3.3.6	IF the safety relief valve continues to leak, THEN it must be replaced before the boiler is returned to operation.		Initials:
3.3.7	Check that system operating pressure and temperature have returned to normal.	Circle one: (S) U N/A	Initials:
3.3.8	Check again to assure the safety relief valve has closed completely and is not leaking.	Circle one: (S) U N/A	Initials:
3.4	Once boilers have been checked out and put into service, contact the MC.		Initials:

Name of Craft Worker: _____ Z Number: _____

Signature: _____ Date: ____/____/____

Name of Craft Worker: _____ Z Number: _____

Signature: _____ Date: ____/____/____

Foreman Verification: DENNIS BERNAL Z Number: 197843

Signature: _____ Date: 10 / 26 / 16

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 558280-01 Equipment ID No.: BHW-10

Instructions: Enter the requested information. All items marked **S** or **Y** are satisfactory. Document all items marked **U**, **N**, or **N/A** in the Remarks section below, noting the step number and reason. Notify the foreman or supervisor of problems involving imminent danger.

TA: 53 Building: 365 Room: 403

Date Inspected: 10 / 26 / 16 Inspectors: [illegible]

1.0 PRE-MAINTENANCE ACTIVITIES

NOTE Preoperational and pre-maintenance activities shall be conducted per the work order package, e.g., lockout/tagout, permits, special instructions, etc.

! WARNING If purging of gas lines will be required during this maintenance, ensure that the purging activity is addressed in the Integrated Work Document (IWD). The following must be addressed (see Master Specification 23 1123):

1. Purged fuel gases shall be directly vented to a safe location outdoors, away from personnel and ignition sources. This may be accomplished through permanent piping or temporary piping or hosing.
2. If it is not possible to vent purged gases outdoors, the following conditions must be met:
   a. Purging activity must be approved by the LANL Fire Marshal based on a documented justification detailing why outdoor venting is not possible and IWD.
   b. Gas concentration in the space to which the purge is vented shall be maintained at no more than 25% of the Lower Explosive Limit (LEL). For natural gas, the LEL is a concentration of 5% in air or 50,000 ppm. Therefore a maximum concentration of 12,500 ppm is allowed for natural gas. The concentration may be controlled by providing adequate ventilation or by limiting the amount of purge gas.
   c. Combustible gas detectors shall be used during the purging operation to monitor the gas concentration.
   d. Nonessential personnel shall be evacuated from the vicinity (including adjacent spaces) during the purging operation.
   e. Ignition sources in the purging space shall be controlled or eliminated.

NOTE All repair work, adjustments, or the replacement of parts shall be done in accordance with the manufacturer's procedures, specifications, recommendations, and instructions.

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: SS8780-01 Equipment ID No.: BHW-1

1.1	Notify maintenance coordinator (MC) that work will be in progress on the boiler system.		Initials:

2.0 MAINTENANCE

NOTE These selected hot water boilers are mainly boilers with power burners that have refractory in front and rear flue doors or have heat extractors in the fire-tubes as are found in most one-pass boilers (Sellers). Hot water heating boilers with atmospheric burners generally require minimal fireside preventative maintenance. Contact the MSS-MP Boiler subject matter expert (SME) at 7-8550 with questions or concerns.

2.1	Lock and tag out electrical and all associated valves on boiler and shut off gas supply.		Initials:
2.2	Cool boiler, open air cock, and drain the boiler.		Initials:
2.3	Perform an internal and external inspection after thorough cleaning.	Circle one: (S) U N/A	Initials:
2.3.1	Check the fireside furnace and fire-tubes for any evidence of soot formation or corrosion.	Circle one: (S) U N/A	Initials:
2.3.2	Brush and vacuum furnace and fire-tubes if such conditions exist.		Initials:
2.3.3	Perform hydrostatic test based on the boiler's Maximum Allowable Working Pressure and/or facility potable water pressure as long as the potable water pressure is at least 30 psi over boiler operating pressure.	Circle one: (S) U N/A	Initials:
2.3.4	Note if any boiler tubes and/or fittings are leaking, and repair as required. For any major repairs (determined by the SME), request a work order for the repairs from the MC.		Initials:
2.3.5	On one-pass boilers (Sellers), check condition of all heat extractors.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 558280-01 Equipment ID No.: Bhw-10

2.3.6 Check refractory materials.	Circle one: (S) U N/A	Initials:
2.3.7 Replace if needed.		Initials:
2.4 Perform routine burner maintenance.		Initials:
2.4.1 Observe temperature and operating pressure and general conditions.	Circle one: (S) U N/A	Initials:
2.4.2 Fire and cycle the burner.		Initials:
2.5 Perform routine maintenance of circulating pump and expansion pump equipment.		Initials:
2.5.1 Observe condition of expansion tank.	Circle one: (S) U N/A	Initials:
2.5.2 Drain expansion tank if it is of a non-bladder type and refill to reestablish an air cushion.	Circle one: (S) U N/A	Initials:
2.5.3 Check the air pressure on the bladder-type expansion tanks.	Circle one: (S) U N/A	Initials:
2.5.4 Observe operation of circulating pumps.	Circle one: (S) U N/A	Initials:
2.5.5 Lubricate pump motors.		Initials:
2.6 Perform routine maintenance of entire combustion control equipment.		Initials:
2.6.1 Check gas/air linkages and moving parts (on power burners that modulate) for positioning, tightness, and binding.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: SS8780-01 Equipment ID No.: BHW-10

2.6.2	Adjust air/fuel mixture as needed.		Initials:
2.6.3	Test flame detection devices on boilers with flame scanners.	Circle one: (S) U N/A	Initials:
2.6.4	Remove the flame scanner with the burner firing.		Initials:
NOTE	The burner should shut off as a flame failure condition.		
2.6.5	Clean the flame scanner, reinstall and test programmer.		Initials:
2.6.6	Check for proper operation as boiler goes through a firing cycle and light-off.	Circle one: (S) U N/A	Initials:
2.6.7	Check all electrical control and circuitry.	Circle one: (S) U N/A	Initials:
2.6.8	Inspect for cracked mercury tubes, separation of mercury, cracked insulators (probe type), jumper tube conditions, loose connections, poor or deteriorated wiring, improperly used bypass switches, cutoff switches wired in parallel, shut-offs installed at improper levels, wedges behind mercury tubes.	Circle one: (S) U N/A	Initials:
2.6.9	Observe operation of forced draft fan motors on boilers with power burners and induced draft fan motors on horizontal breeching where applicable.	Circle one: (S) U N/A	Initials:
2.6.10	Lubricate fan motors where necessary.		Initials:
2.7	Perform combustion and draft tests.		Initials:
2.7.1	Visually inspect combustion.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 558780-01 Equipment ID No.: BHW-10

NOTE Changes in flame shape, color, and sound are among early indicators of potential combustion-related problems. Changes may be due to changes in fuel pressure or gas/air linkage movement.		
2.8 Perform safety relief valve(s) pop test.	Circle one: (S) U N/A	Initials:
2.8.1 Check pressure-reducing valve.	Circle one: (S) U N/A	Initials:
2.8.2 Replace the strainer in the valve if needed.		Initials:
2.9 Perform slow drain test of low-water cutoff.	Circle one: (S) U N/A	Initials:
2.10 Inspect gas piping for proper support and tightness.	Circle one: (S) U N/A	Initials:
2.10.1 Inspect fuel supply system and gas controls.	Circle one: (S) U N/A	Initials:
2.10.2 Leak check gas controls and associated gas piping with a gas detector or soap suds.	Circle one: (S) U N/A	Initials:
2.11 Inspect boiler room ventilation louvers and intake.	Circle one: (S) U N/A	Initials:
2.11.1 Listen for any unusual noises or conditions and correct as necessary.	Circle one: (S) U N/A	Initials:
2.11.2 Report any needed corrections to the MC for corrective maintenance.		Initials:
2.11.3 Check combustion air supply openings to ensure that they are not closed or stopped up.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 558780-01 Equipment ID No.: BHW-16

2.11.4 Inspect conditions of stacks and rain caps.	Circle one: (S) U N/A	Initials:
2.11.5 Inspect flue door gaskets to ensure they are in good condition, and properly secured.	Circle one: (S) U N/A	Initials:
2.11.6 Replace if necessary.		Initials:

3.0 POST-MAINTENANCE ACTIVITIES

NOTE Post-maintenance activities shall be conducted in accordance with the work order package instructions (e.g., lockout/tagout, special instructions, etc.).

3.1 Close and secure front and rear flue doors.		Initials:
3.2 Hook up all associated piping and refill boiler.		Initials:
3.3 Fire up boiler and check for air, gas, and water leaks.	Circle one: (S) U N/A	Initials:
3.4 Check gas/air linkages and moving parts (on power burners that modulate) for positioning, tightness, and binding.	Circle one: S U (N/A)	Initials:
3.5 Check pilot burners and ignition equipment for proper condition and adjustment.	Circle one: (S) U N/A	Initials:
3.6 Visually check burner for proper combustion.	Circle one: (S) U N/A	Initials:
3.7 Record all mechanical maintenance data, testing data, and other notable items.		Initials:

NOTE Combustion analysis is verifiable only with a flue gas analyzer and is performed mainly on boilers with power burners.

Remarks: _____

Los Alamos NATIONAL LABORATORY EST.1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 558780-01 Equipment ID No.: BHW-10

3.8	Test water for proper chemical levels. Test and treat water as defined on Datasheet 403-A.002.	Circle one: (S) U N/A	Initials:
3.9	Record all mechanical maintenance data, testing data, and other notable items.		Initials:
3.10	Notify MC that work on the boiler system is complete.		Initials:

Name of Craft Worker: _____ Z Number: _____

Signature: _____ Date: ____/____/____

Name of Craft Worker: _____ Z Number: _____

Signature: _____ Date: ____/____/____

Foreman Verification: DENNIS BERNAL Z Number: 197845

Signature: _____ Date: 10/26/16

Remarks: _____

Form 2103

Los Alamos NATIONAL LABORATORY EST. 1943

Integrated Work Document (IWD) Part 3, Validation and Work Release

IWD #: 358-8001 Revision #: [redacted] **Work Release**

By signing below, I verify this activity is compatible with current facility configuration and operating conditions.

FOD designated Ops Mgr or other facility point-of-contact for work area

Signature/Z#/Date **(If required by FOD)**: _____

Note: For Standing IWD, release may be given concurrently with signatures on Part 2.

By signing below, I have verified the following:

- I have verified authorization by ensuring approval signatures of the RLM and FOD.
- I have jointly conducted a validation walkdown with workers to confirm the IWD can be performed as written, required initial conditions and other prerequisites are in-place.
- The assigned workers are authorized and are qualified to perform the work in a safe, secure, and environmentally responsible manner.
- I have conducted the pre-job briefing, and all workers have been briefed.
- I have ensured coordination with any required FOD work-area representatives (*e.g., area work coordinators*).

Primary PIC (Signature/Z#/Date) **Required**: [redacted] 197845 10-26-16

Alternate PIC Signatures **acknowledges** PIC authority is assumed for the first time *(Note: Alternate PICs are required to sign only once, but formal handoff includes conferring with previous PIC to obtain all required information associated with the handoff).*

Alternate PIC (Signature/Z#/Date) **Required**: _____

Alternate PIC (Signature/Z#/Date) **Required**: _____

Pre-Job Brief Content

- What are the critical steps or phases of this activity?
- How can we make a mistake at that point?
- What is the worst thing that can go wrong?
- What controls, preventive measures, and bounding conditions are needed?
- What work permits are required and how will we meet their requirements?
- What are the handoffs and coordination requirements among workers and multiple PICs?
- Are there hold-points including those that require sign-offs?
- What are the pause/stop work responsibilities and expectations (e.g. for unanticipated conditions or hazards)?
- How would we respond to alarms and emergencies?
- Are there lessons learned from previous similar work?
- Is other information needed to perform this activity in a safe, secure, and environmentally responsible manner?
- Does everyone agree to the work tasks/steps, hazards, and controls and commit to follow them?

Pre-Job Brief Attendance Roster

By signing below **as required**, I agree to the following:

- I agree to follow the work steps and implement the controls as written as applicable to my work assignments.
- I agree to pause/stop work when conditions or hazards change or when I encounter unexpected conditions during the execution of work, or when work cannot be performed as written, or instructions become unclear during execution.
- I confirm that I am authorized, qualified, and fit to perform the work.

Worker (Signature/Z#/Date) Charles Wylie 303121 10-26-16	**Worker** (Signature/Z#/Date)
Worker (Signature/Z#/Date)	**Worker** (Signature/Z#/Date)
Worker (Signature/Z#/Date)	**Worker** (Signature/Z#/Date)
Worker (Signature/Z#/Date)	**Worker** (Signature/Z#/Date)

Mandatory Questions for All Pre-Job Briefs

The purpose of this document is to demonstrate compliance with the Release of Craft requirements directed by MSS-DO on 17 June 15. Until a formal document is institutionalized by the Work Control Group this document will be included in **all** work control packages (CM, PM, Planned, Unplanned, etc). Each of the questions listed below will be discussed at each Pre Job Brief with all affected personnel. Compliance will be demonstrated by the signature from the person performing the Pre Job Brief on the bottom of this document. This document is a permanent part of **all** work packages until further notice.

Topic	Completed (X)
Assume we are going to have an accident on this job. How did it happen? How can we prevent it?	X
What is the worst thing that can happen on this job? How can we keep it from happening?	X
What hazards will you encounter in performing this work?	X
Is there a better way to address the hazards you will encounter?	X
Have all safety issues concerning this task been addressed to your satisfaction?	X

Signature (Person Performing Pre-Job)

10-26-16

Date

AP-WORK-002: Attachment 15 FORM 2100-WC

Los Alamos NATIONAL LABORATORY

Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)

Revision # -0-			**Activity/Task Title:** 53 0365 BHW-10 FIRESIDE / WATERSIDE
Work Document #: (WO # / Task) 558780 -01			**Planner/Preparer (Name/Z#/Date)** Troy Calloway #186163 9/14/16
TA: 53	**Building:** 0365	**Room:** 403	**Additional Location Description:** Equip Room

Activity Description/Overview:

NOTIFY COORDINATOR PRIOR TO STARTING PROCEDURE.
FILL OUT ATTACHED CHECKLISTS.
REPORT ANY DEFICIENCIES FOUND TO FACILITY COORDINATOR AS SOON AS PRACTICAL.

Power Source:
CDD by MCC-B / C1 53-752 3000 kva

MC: Randy King 795-1138

NOTE: Maintenance Coordinator requests notification of progress at the end of each day and on completion of the job.

List Names of Hazard Analysis (HA) Team: Troy Calloway, Tommy Martinez, Lewis Mondragon

Date HA Performed: 8/23/16, 9/13/16

PRECAUTIONS/LIMITATIONS/PREREQUISITES:

- If steps cannot be completed as described, or if unforeseen situations occur, **PAUSE WORK**, stabilize the situation, contact your supervisor, and await further instructions before proceeding.
  ASK YOURSELF –
  - ***WHAT NON-RELATED ACTIVITIES / HAZARDS / PERSONNEL ARE OCCURRING IN THE VICINITY OF MY REQUIRED WORK AREA?***
    HOW CAN THEY AFFECT ME AND MY WORK?
  - **AM I READY AND COMFORTABLE TO PERFORM THIS WORK?**
  - **WHERE IS THE NEAREST AED / PULL STATION / FIRE EXTINGUISHER LOCATED?**
  - **WHAT IS THE *WORST* THING THAT CAN HAPPEN? HOW CAN I PREVENT IT?**

- Craft will review all postings for entry, work and exit of area.
  Be aware of any alarms that may be in area and what the procedure is if alarm sounds.
  Locate and identify nearest fire extinguisher and emergency pull station, eyewash/shower station.
  Locate and identify nearest phone capabilities and contact numbers in case of emergency.

- The following trainings are required of ALL craft for the General Hazard Section:
  - Core training (#10968)
  - TA53 Facility Specific (#57262)

- Training for tasks - **Fitters**
  - Journeyman craftsman – Boiler Specifc
  - LOTO training – TP #127
  - Energized electrical training - #2908 (non-electricians)
  - HAZCOM - #25418
  - Pressure Safety Orientation - #769

Los Alamos NATIONAL LABORATORY

Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)

Revision #	Activity/Task Title:		
-0-	53 0365 BHW-10 FIRESIDE / WATERSIDE		
Work Document #: (WO # / Task)	Planner/Preparer (Name/Z#/Date)		
558780 -01	Troy Calloway #186163 9/14/16		
TA: 53	Building: 0365	Room: 403	Additional Location Description: Equip Room

Core Training (#10968) covers use of tools and general PPE.

The following PPE is required **at a minimum**; Task specific PPE listed within task:

- Safety Shoes
- Safety Glasses with Side shields
- Leather or Light Duty High Dexterity, Cut Resistant Gloves
- Reflective Vests:
  - All employees working on a construction or maintenance project outdoors are required to wear reflective vests **unless** working around rotating equipment, performing spark/flame producing operations, or are performing Mode 1 or 2 electrical work.
- Minimize exposure to noise. Wear hearing protection as applicable.
  - If questions or concerns arise regarding noise levels contact LANSCE IH for a Hazard Assessment. **Bob Brennecke 665-9391 or 695-6231**
- Hard Hats:
  - PICs will consider adjusting when bump hats might be more suitable
  - Areas posted "Hard Hats Required."
  - Work areas where falling or flying objects, overhead structures, energized conductors, or where equipment or other materials create an overhead hazard.

HOLD POINT

- **Erect** and set in place barricades / demarcation at room entrances
  - ✓ Signage shall be sufficiently legible and noticeable
  - ✓ Set barricade at sufficient distance to allow safe working area
  - ✓ NO non-essential personnel are to enter work area without authorization and proper PPE
  - ✓ Ensure barricades are sufficiently secured to not fall over
- **Remove** barricades at end of project

- **REVIEW O&M** manual as necessary for specified steps

- **CYCLE** boiler and inspect operations
  - Only qualified personnel to perform operation of boiler
  - Coordinate efforts with facility coordinator

To be discussed during the pre-job brief:

If any previously unknown or potentially unknown electrical hazard is suspected, PAUSE work and bring in an SME (facility electrician or Electrical Safety Officer) to assess the potentially unknown electrical hazard. If necessary, modify the IWD to include the previously unanticipated electrical hazard.

Los Alamos NATIONAL LABORATORY

Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)

Revision #	Activity/Task Title:		
-0-	53 0365 BHW-10 FIRESIDE / WATERSIDE		
Work Document #: (WO # / Task)	Planner/Preparer (Name/Z#/Date)		
558780 -01	Troy Calloway #186163 9/14/16		
TA: 53	Building: 0365	Room: 403	Additional Location Description: Equip Room

NOTE:

PMI Steps may be worked out of sequence to facilitate ease of job – so long as doing so does not create additional hazards or tasks not covered by this IWD.

ANY time a worker may be exposed to energy (gas, electrical, stored) LOTO procedures MUST be put in place PRIOR to possible exposure.

EXCEPT: Performing Mode 1 or 2 Electrical Work

- **Purge** system (if necessary) per Page 1 of **PMI**
  - NO spark or flame within area
  - HAZCOM training
  - Purge gas to outside – IF NOT possible contact LANSCE IH for air quality monitoring and LANL Fire Marshall.
    - 670-1958

PAUSE POINT

Craft shall check panel front at LOTO point for arc flash calculations provided by engineering.
Panel labeling shall override requirements in this IWD for PPE.

IF panel is properly labeled, craft shall follow label requirements.
IF panel is NOT labeled, craft shall proceed with PPE and approach limits listed in this IWD.

NOTE:

Calculations by engineering

Designator: Maintenance Coordinator

Power Source: CDD by MCC-B / C1 Voltage: 480v
Transformer: 53-0752 3000 kVa

⚠WARNING

FLASH HAZARD
EQUIPMENT OPERATION CLASS 1.3

- **Contact** equipment owner for energy assessment of all energy sources
  - **Each energy source shall be identified, physically located and marked / labelled.**
  - **If source not labelled, Owner shall identify with plain manila tag with unique identifier.**
- **Verify** Disconnect / Breaker controls unit power
  - Ensure unit runs/starts
  - Don PPE

Long sleeve FR shirt and FR pants (**8** cal/cm arc rated) **OR** FR coveralls (**8** cal/cm arc rated)

Los Alamos NATIONAL LABORATORY

Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)

Revision #	Activity/Task Title:		
-0-	53 0365 BHW-10 FIRESIDE / WATERSIDE		
Work Document #: (WO # / Task)	Planner/Preparer (Name/Z#/Date)		
558780 -01	Troy Calloway #186163 9/14/16		
TA: 53	Building: 0365	Room: 403	Additional Location Description: Equip Room

over non-melting daily wear, short sleeve 100% cotton shirt, hardhat, safety glasses, hearing protection, arc rated face shield with wrap around face guard **OR** flash suit hood (**8** cal/cm arc rated). Leather work gloves.

- Open Disconnect / Breaker and verify the unit stops or will not start

Repeat process:

- Close Disconnect / Breaker and ensure unit starts
- Open Disconnect / Breaker and verify the unit stops or will not start

CAUTION: If unit does not start AND stop by operation of breaker, PAUSE work and contact MC. LOTO point may be incorrect OR power may not be supplied to unit.

❖ **Turn** off and apply **LOTO**
- Obtain locks and tags from FOD Designated Lock Coordinator
- Make necessary notifications per Simple LOTO procedure – (ONLY 1 LOTO point) OR Attachment B – (multiple LOTO points)
- Determine all sources of power
- Check applicable drawings/diagrams/ID tags
- Turn off EQ
- Open disconnecting device(s)
- IF possible, visually verify devices are open/removed/disconnected
- LOTO devices/tags shall be applied in accordance with P101-3R8

IF Necessary:

❖ **Turn off** and apply LOTO to gas supply and at pilot valve(s)
- Obtain locks and tags from FOD
- Make necessary notifications per Attachment B LOTO orders
- Determine all sources of power
- Check applicable drawings/diagrams/ID tags
- Turn off EQ
- Close valves.
- LOTO devices/tags shall be applied in accordance with P101-3R8
- PPE and hand tool use per core training

⚠ DANGER

DO NOT stand in front of boiler doors or breeching when firing boiler.

❖ **Perform maintenance per PMI section 2**
❖ **Remove** and replace defective components per PMI
- Ensure all components are sufficiently cool before contact with skin
- PPE per core training

Working with simple hand tools, Cuts and Abrasions:

Los Alamos NATIONAL LABORATORY

Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)

Revision #	Activity/Task Title:		
-0-	53 0365 BHW-10 FIRESIDE / WATERSIDE		
Work Document #: (WO # / Task)	Planner/Preparer (Name/Z#/Date)		
558780 -01	Troy Calloway #186163 9/14/16		
TA: 53	Building: 0365	Room: 403	Additional Location Description: Equip Room

- Inspect all tools prior to use
- Wear leather gloves and safety glasses

Working with battery powered/electrical tools:

- GFCI protection for all cords and electric devices
- Inspect all cords, plugs and electric tools for damage – remove and tag if found defective
- Minimize exposure to noise. Wear hearing protection as applicable.

⚠WARNING

Soldering and Brazing Hazards:
Fire Hazard
Inhalation Hazard
Eye and Dermal Burn Hazard

NOTE: Must have approved and signed spark and flame permit in package prior to working

❖ **Low temp soldering – IF necessary**

- Review current LANL fire danger rating, follow appropriate cautions
- Review spark and flame permit
- Provide fire watch if permit deems necessary
- Ensure adequate ventilation in work area
- Wear leather gloves, long sleeve shirt and tinted goggles
- Have a 5lb (minimum) ABC fire extinguisher present
- Scope area for possible flammable material within spark/flame range
- Verify NEAREST eyewash capabilities

⚠WARNING

ELECTRIC ARC FLASH
BREAKER OPERATION CLASS 1.3

❖ **Remove** LOTO

- Check equipment and area
- Don PPE
  Long sleeve FR shirt and FR pants (**8** cal/cm arc rated) **OR** FR coveralls (**8** cal/cm arc rated) over non-melting daily wear, short sleeve 100% cotton shirt, hardhat, safety glasses, hearing protection, arc rated face shield with wrap around face guard **OR** flash suit hood (**8** cal/cm arc rated). Leather work gloves.
- Verify equipment controls are in OFF position
- Make necessary notifications
- LOTO devices/tags shall be removed in accordance with the requirements of P101-3, Chapter 1 – Lockout/Tagout for Safety.
- Close disconnecting device(s)
- Re-energize system
- Notify MC and return locks

Los Alamos NATIONAL LABORATORY

Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)

Revision #	Activity/Task Title:		
-0-	53 0365 BHW-10 FIRESIDE / WATERSIDE		
Work Document #: (WO # / Task)	Planner/Preparer (Name/Z#/Date)		
558780 -01	Troy Calloway #186163 9/14/16		
TA: 53	Building: 0365	Room: 403	Additional Location Description: Equip Room

- **Remove** LOTO at gas
  - Check equipment and area
  - Verify valves are in correct position (should be OFF)
  - Make necessary notifications
  - LOTO devices/tags shall be removed in accordance with the requirements of P101-3, Chapter 1 – Lockout/Tagout for Safety.
  - Open valve(s)
  - Re-energize system
  - Notify MC and return locks
- **Return** system to normal operation

- **PERFORM** combustion analyzer test (if required for testing or requested by MC)
- **PERFORM** post-maintenance activities per **PMI Section 3**
- **FIRE** unit and verify proper operation
  - Qualified personnel to operate unit
  - Verify proper operation of boiler
  - Verify boiler starts and fires properly.
  - Verify boiler stays operational for extended amount of time
  - Verify proper operation of flame rod
  - Verify no gas leakage
  - Verify proper operation of gauges and valves
  - Verify that the support or auxiliary systems related to the component are functioning properly.

NOTE: **Only Certified Personnel to Operate Equipment**

- **Start** unit, observe and check for proper operation
- **Ensure** all panels, doors and/or guards are re-installed and secured.
  - No additional controls

- **Clean** the work area and dispose of all work generated debris and remove any barricades.
  - Dispose of debris in accordance with LANL waste generation
  - Coordinate disposal of chemicals, oils and/or lubes with Area Waste Coordinator
  - **BRETT CUMMINS: 5-2876 or 412-9996**

- **CONTACT the MC and inform them the work is completed.**
- **Complete** all the required documentation and return the Master Work Package to the Area Work Control Office.

AP-WORK-002: Attachment 15 FORM 2100-WC

Los Alamos NATIONAL LABORATORY

Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)

Revision #	Activity/Task Title:		
-0-	53 0365 BHW-10 FIRESIDE / WATERSIDE		
Work Document #: (WO # / Task)	**Planner/Preparer (Name/Z#/Date)**		
558780 -01	Troy Calloway #186163 9/14/16		
TA: 53	**Building:** 0365	**Room:** 403	**Additional Location Description:** Equip Room

***Insert Rows above** for additional Tasks/Steps or attach pages to clearly communicate ESH&Q/S&S hazards and associated controls.*	The RLM, and FOD or FOD Representative (if required or recommended by RLM, e.g. high hazard) approval indicates IWM has been applied appropriately, work is authorized, workers are qualified, work will be performed in accordance with ESH&Q/S&S requirements and the IWD, and facility safety basis, aggregate hazards, and collocated hazards were appropriately included in the hazard analysis and acknowledges completion of a peer review.	**RLM** (Signature/Z#/Date) **Required** 112529 10/26/16 **FOD or Representative** (Signature/Z#/Date) **If Required or Recommended by RLM** 112877 10/21/16 **SME Review** (Signature/Z#/Date) **If Required** NA **ESO Review** (Signature/Z#/Date) **If Required** NA

IWD Type ☒ Moderate-Hazard ☐ High-Hazard/Complex ☐ Standing IWD	Date when RLM re-approval is required: 11/1/16 Other Conditions for Re- Approval: Slope Change or New Head (Print) Name of Primary PIC: Dennis Beard Name of Alternate PIC: _____ Name of Alternate PIC: _____	Classification review completed, if required. NA Reviewer Signature/Z#/Date

Los Alamos NATIONAL LABORATORY EST. 1943

AP-WORK-002: Attachment 11
Maintenance and Site Services
Work Completion Form

Work Order/Task: SS8780-01

Start Date: 10-26-16	Completion Date: 10-26-16

SUMMARIZE THE WORK PERFORMED	
Date 10-26-16	PERFORMED PM ACCORDING TO CHECKLIST. WE LOTO BHW-10 DRAINED AND CLEANED AS PER PMI ALSO PERFORMED START-UP
FOR CORRECTIVE WORK – WHAT FAILED AND WHAT WAS FIXED	
FOR PMs – SUMMARIZE AS FOUND AND AS LEFT CONDITIONS BELOW	
As found	
As left	
Parts/Repairs	
Read/meas.	
Post test info.	
Problems Encountered (delays, safety, etc.):	
Lessons Learned/Recommendations:	
Name:	**Signature:** **Date:**

Los Alamos NATIONAL LABORATORY EST. 1943

AP-WORK-002: Attachment 11
Maintenance and Site Services
Work Completion Form

SS8280-01

PIC/SUPT

☐ PM has been completed in its entirety and ready for closure.

IF A PM COULD NOT BE COMPLETED:

☐ Percentage complete is _____%

☐ Sections that did not work and need to be rescheduled

_____

Reasons why:

MAINTENANCE COORDINATOR/AREA WORK COORDINATOR

Work Package is Complete and may be closed out: YES ☐ NO ☐

IF no: State Reason

Additional Work Needed? YES ☐ NO ☐

Document UP/WO/FSR Number:_ _____

ENGINEERING (FOR MD and CD Work Orders)

IF a configuration baseline has been changed, THEN indicate the changes are to be incorporated into the following documents and/or configuration baseline:

☐ Drawings ☐ FDD/SDD

☐ Procedures ☐ Master Equipment List

☐ Permits ☐ Checklists

SE Name: Signature: Date:

WORK CONTROL

Moderate/High Hazard – WMC/Planner reviewed for Lessons Learned/Feedback

☐ YES ☐ NO ☐ N/A

☐ Review of the completed work package is complete per AP-WORK-005, and the work package is ready to be set to complete in CMMS.

Attachment B, LO/TO Orders

Lock Coordinator Name / Z#	Phone #	Alternate Lock Coordinator Name / Z#	Phone #
K MUDRICH 117813	5-0944		

Section 1: General Information

1. Work Document Number (i.e., Package/Procedure #): 558786-01
2. LO/TO (Parent) Record #: 52531

Location of Equipment to be Isolated

3. TA: 53 | 4. Bldg: 365 | 5. Rm: 403 | 6. Equipment Description (e.g. Machinery/Name/CMMS Number):

7. Name of Equipment Owner/Operator: K MUDRICH

8. Reason for LO/TO: BOILER PM

9. Energy Type to be Isolated (check all that apply):
☑ Electrical ☑ Mechanical ☐ Hydraulic ☐ Pneumatic ☐ Steam ☐ Capacitors ☐ Compressed Energy ☐ Gravity ☐ Other (specify):

10. Verification required for LO/TO: K.M.
☑ Installation ☐ Removal ☑ N/A (Verification Not Required)

11. Verification Type:
☑ Peer ☐ Independent ☑ N/A K.M

12. Specific Sequencing of LO/TO devices required for:
☐ Installation ☐ Removal ☑ N/A (Sequencing Not Required)

13. LO/TO Orders Addendum with Operational Instructions/Procedures attached?
☐ Yes ☑ No

Equipment Owner/Operator Comments: RETURN locks/tags TO: Bldg 31 RM125 - DOOR BASKET

Section 2: LO/TO Installation & Removal Details

14. Group LO/TO? ☑ Yes ☐ No
Name of Lead Authorized Worker:

15. Group Lock Box used? ☑ Yes ☐ No
If yes, enter ID# of Lock Box: 1

LO/TO Installation

16. Approval to Install LO/TO
Signature: K MUDRICH 117813 Z#:
NOTE: Approver must ensure Affected Workers are notified prior to Authorized Workers performing LO/TO

LO/TO Removal / Return to Service

23. Approval to Remove LO/TO
Signature K MUDRICH Call #: 231-0289 ☐ N/A
Z#: 117813
NOTE: Approver must ensure Affected Workers are notified of LO/TO Removal / Return to Service

17. Energy Isolation Device (use Specific ID)	18. Location of Energy Isolation Device	19. LO/TO Installation Sequence	20. Required LO/TO Position or Alignment	24. LO/TO Removal Sequence	25. Required Position/Alignment following Removal	26. As-Left Position
LOCAL DISC.	403	N/A	OFF/OPEN	N/A	ON / OPEN	~~OFF~~ OFF
GAS VALVE	403	N/A	SHUT	N/A	OPEN	OPEN
MAKE UP VALVE	403	N/A	SHUT	N/A	OPEN	OPEN
Lock Box	403	N/A	locked	N/A	OPEN	OPEN

☐ See continuation page for additional Energy Isolation Devices (continuation page must also be signed if applicable)

21. Energy Isolation Devices Positioned, Lock(s) and Tag(s) installed, and Zero Energy Checks Performed:
Signature: [signature] Z#: 197845 Date: 10-26-16

27. LO/TO has been Removed & Isolation Devices Positioned:
Signature: [signature] Z#: 197845 Date: 10-26-16

22. LO/TO verified by: ☐ N/A
Signature: Charles Wylie Z#: 303121 Date: 10-26-16

28. Removal and Positioning verified by: ☐ NA
Signature: Charles Wylie Z#: 303121 Date: 10-26-16

ADESH-17-015 2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments LA-UR-17-20687
Attachment Package Page 1294 of 2096

Attachment B, LO/TO Orders

Attachment B, LO/TO Orders (Cont.)

1. Work Document Number (i.e., Package/Procedure #): 555780 -01

2. LO/TO (Parent) Record #: 52531

Section 3: All Authorized Workers (anyone applying a lock for this activity)

29. Authorized Workers Name(s)	Z#	30. Date worker's lock is hung	31. Date worker's lock is removed
1. DENNIS BERNAL	197845	10-26-16	
2. Charles Wylie	303121	10-26-16	
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

Section 4: Return of Lock(s)/Tag(s) and Locking Devices

All Lock(s)/Tag(s) and Locking Devices have been removed and returned to the Lock Coordinator:

32. Signature of Lock Coordinator: [signature] 117813 Z#: 10/26/16 Date:

*Instructions for completing this form (by numbered steps) appear on the last two pages of this document. Take the completed forms back to the Lock Coordinator for closeout.

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1295 of 2096

Continuation Page (print as needed)

Attachment B, LO/TO Orders (Cont.)						
1. Work Document Number (i.e., Package/Procedure #):				2. LO/TO (Parent) Record #:		
LO/TO Installation				**LO/TO Removal / Return to Service**		
17. Energy Isolation Device (Specific ID)	18. Location of Energy Isolation Device	19. LO/TO Installation Sequence	20. Required LO/TO Position or Alignment	24. LO/TO Removal Sequence	25. Required Position/Alignment following Removal	26. As-Left Position
21. Energy Isolation Devices Positioned, Lock(s) and Tag(s) installed, and Zero Energy Checks Performed:				27. LO/TO has been Removed & Isolation Devices Positioned:		
Signature:	Z#:	Date:		Signature:	Z#:	Date:
22. LO/TO verified by: ☐ N/A				28. Removal and Positioning verified by: ☐ NA		
Signature:	Z#:	Date:		Signature:	Z#:	Date:

ADESH-17-015 2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments LA-UR-17-20687

Attachment B, LO/TO Orders

Instructions by Numbered Steps

Lock Coordinator (Header): Identify the individual who will issue Red Locks to persons performing LO/TO (individual[s] identified by the FOD).

1. Enter the Work Document Number. This will be the number from the IWD or the procedure number (i.e., TA88-DOP-0001).
2. Enter the LO/TO Parent Record number. This is obtained from the Lock Coordinator when the lock(s) are issued. The Remedy LO/TO database generates this number.
3. Enter the TA where the equipment is located.
4. Enter the Building number where the equipment is located.
5. Enter the Room number where the equipment is located.

   NOTE: Responses to steps 3 through 5 need to match information, identically, within both the LO/TO Orders and the tag (Attachment A).

6. Enter the Equipment/Machinery/Name/Number (example, HVA-001 [NOTE: LOG is to follow nomenclature contained within CMMS/MEL]).
7. Enter the Name of the Equipment Owner/Operator. The Equipment Owner/Operator is designated by the FOD. There may be both programmatic and facility Equipment Owner/Operators.
8. Write a brief description of the reason for LO/TO (example, removing and replacing exhaust fan belts).
9. Check the appropriate energy type to be isolated (check all that apply). Make sure you have considered all energy sources; if "Other" is checked, specify what "Other" is.
10. Is verification of the energy isolation configuration required for this LO/TO for installation and/or removal? Check the appropriate box(es).
    NOTE: Contact the FOD/Designee regarding verification requirements. Additionally, verification may be required by the Equipment Owner/Operator.
11. If verification is required, check the appropriate box (either "Peer" or "Independent"). If verification is NOT required, check the "N/A" box.
    NOTE: Independent verification may be required per ***P315, Conduct of Operations Manual,*** as determined by the FOD/Designee.
12. When installing the lock(s)/tag(s), is there a specific sequence in which the isolation devices are to be positioned? If a specific sequence must be followed for Installation and/or Removal, check the appropriate box(es) and subsequently identify the sequence order in column numbers 19 and/or 24, accordingly. If there is not a specific sequence to follow, check the "N/A" box and place N/A in columns 19 and/or 24.
13. If an operating procedure/instruction/etc. is to be used in conjunction with the LO/TO Orders, check the "Yes" box and attach the pertinent document as an addendum. Additionally, a space is provided for Equipment Owner/Operator comments, if applicable.
14. Check either "Yes" or "No" to indicate if a Group LO/TO is applicable. A Group LO/TO is where two or more authorized workers, regardless of their occupation or craft, lock out and tag out the same equipment to perform servicing or maintenance. Enter the name of the Lead Authorized Worker.
15. Check either "Yes" or "No" to indicate if a Group Lock Box is to be used. If "Yes", enter the lock box ID#. Each organization that issues locks will be required to uniquely number and track lock boxes in their possession.
16. The FOD-designated Equipment Owner/Operator signs and enters their Z#, authorizing the installation of the LO/TO. The Approver is responsible to notify all Affected Workers prior to the Authorized Workers performing LO/TO ("Affected Workers" are those who either may work with the equipment or are affected by LO/TO activities).
17. Enter the specific energy isolation device/ID (e.g., MCC-A, A4). The ID used in the LO/TO orders must match information used on tag (Attachment A).
18. Location of energy isolation device (TA, Bldg, Rm, etc.). The location used in the LO/TO orders must match information used on tag (Attachment A).

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1297 of 2096

19. If the LO/TO needs to be installed in a particular order (refer to Step #12), number the sequence in which the locks need to be installed. If sequencing is not applicable, then place N/A in this column.
20. Required Position/Alignment for LO/TO (open, closed, connected, disconnected, on, off, etc.). Follow the nomenclature on the piece of equipment (e.g., if a service disconnect has "ON"/"OFF" posted, ensure the position/alignment entered on this form matches the piece of equipment ["ON" or "OFF"]).
21. The Lead Authorized Worker documents (signature) that the energy isolation devices have been positioned correctly, that locks and tags have been installed on those energy isolation devices and a Zero Energy Check has been performed.
    NOTE: The Lead Authorized Worker may also be designated as the Person-in-Charge (PIC).
22. Is verification required (see #10)? If verification is required, the person who performs the verification signs, and places their Z# and the date here. If verification is not required, check the "N/A" box.
23. Documentation of Approval to Remove LO/TO. Equipment Owner/Operator or FOD Designee signs and places his/her Z# in this box. Alternatively, authorization per telecommunication may be performed via a phone number identified for the Lead Authorized Worker to call the Equipment Owner/Operator or FOD Designee. Once verbal authorization is given, the Lead Authorized Worker documents the authorization as "per telecom" and enters his/her initials. Example: John Smith per telecom, JS. By checking the "N/A" box, a phone call is NOT REQUIRED by the Lead Authorized Worker to the Equipment Owner/Operator or FOD Designee.
    NOTE: The Equipment Owner/Operator or FOD Designee is responsible to notify all Affected Workers after the LO/TO removal and of the equipment/machine's return to service.
24. If the LO/TO needs to be removed in a particular sequence (as per Step #12), number the sequence in which the locks need to be removed. If the "N/A" box is checked in #12, then place N/A in this column.
    NOTE: Often the sequence for removal is opposite the sequence for installation. For example, if the order specified for installation Column #19 is "1,2,3,4", the order specified for removal in Column #24 could be "4,3,2,1". The intention of the LO/TO Orders is to have the entries in Column #s 19 and 24 correspond with the energy isolation devices specified in Column #17.
25. Identify the required position/alignment in which the system/component is to be placed following the removal of the lock(s). Follow the nomenclature as listed on the piece of equipment ("On", "Off", etc.).
26. Enter the As-Left Position.
27. The Lead Authorized Worker documents (signature, Z# and date) that the locks and tags have been removed from the energy isolation devices and the energy isolation devices have been configured as per Equipment Owner/Operator specifications.
    NOTE: The Lead Authorized Worker may also be designated as the Person-in-Charge (PIC).
28. If verification is required for the positioning, the person who performs the verification signs here. Otherwise, check N/A.
29. All authorized workers applying a lock for this activity (names/Z#) must be documented. If more than 20 authorized workers are involved in a Group LO/TO, document the required information with an attached list.
30. Enter the date the authorized worker attaches his/her lock.
31. Enter the date the authorized worker removes his/her lock.
32. The Lock Coordinator or designee signs once locks, tags, and locking devices have been removed and returned. If a lock and/or tag are found to be contaminated, the lock and/or tag will be disposed of in accordance with local procedures and a verbal notification will be made to the Lock Coordinator to close out the record within Remedy.

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1298 of 2096

Work

Time

Facility	Work Order	WO Task	Task Title	WO	Task Status	Status Date	Unit	Trans. Type	Est. Hrs.	Est. Cost	Act. Hrs.	Act. Cost	Work Group
F04	00558780	01	BHW ANNUAL FIRESIDE/WATERSIDE PM	PM	FINISHED	10/31/16	530365	LABOR	4.50	272.58	16.50	1,032.64	
F04	00558780	01	BHW ANNUAL FIRESIDE/WATERSIDE PM	PM	FINISHED	10/31/16	530365	MATL	0.00	0.00	0.00	692.60	
Grand									**4.50**	**272.58**	**16.50**	**1,725.24**	

Facility: F04 **Unit:** 530365 **Proj:**
Task Title: BHW ANNUAL FIRESIDE/WATERSIDE PM

W/O Type: PM W/O Group: Task Priority: 3
Planner : 112527 PADILLA B A
W/O Title: 530365-BHW-011 FIRESIDE/WATERSIDE PM
Written To: BOILER,HOT WATER
Task Dspln: F Due Date: 10/31/2016

Hazard: MODERATE IWD Reqmt: TASK SPECIFC

Los Alamos NATIONAL LABORATORY EST. 1943

Work Order Task

00558781 01

MASTER

Date: 07/27/2016
Page: 1

Work Order Task Written To

Facility : F04 **Unit : 530365** **Op Sys : HW**
Room : 403ER **Area :** **Sys/Cls: R ML4**
Equipment : BOILER BHW-011 **Component:**
Location : S-53-0365-403ER
Job Type : PM
Tag 1 : 35835 Tag 2 :
Work Item : Ops Review Reqd: N

Authorization

Start Permission : K. MADRID
Complete Notice : J. Mumaw
Start Date: 10-20-16
Complete Date: 11-23-16

NOTE:

*** Refer to attached Form 2101 - Non-Tenant Activity Form - or Form 2102- Tenant Activity Form - for a description of site specific training or escort and access requirements.**

Work Order Task Instructions

PERFORM ANNUAL INSPECTION, MAINTENANCE, AND FALL STARTUP PER UNIT
.
CONTACT: FACILITY COORDINATOR
PHONE: PAGER:
COORDINATION MEETING: NO[ ] YES[ ]
.
NOTIFY COORDINATOR PRIOR TO STARTING PROCEDURE.
FILL OUT ATTACHED CHECKLISTS & REPORT ANY DEFICIENCIES FOUND
TO FACILITY COORDINATOR AS SOON AS PRACTICAL.

QC Requirements/Comments

Facility: F04 **Unit:** 530365 **Proj:**
Task Title: BHW ANNUAL FIRESIDE/WATERSIDE PM

W/O Type: PM W/O Group: Task Priority: 3
Planner : 112527 PADILLA B A
W/O Title: 530365-BHW-011 FIRESIDE/WATERSIDE PM
Written To: BOILER,HOT WATER
Task Dspln: F Due Date: 10/31/2016

Hazard: MODERATE IWD Reqmt: TASK SPECIFC

Los Alamos NATIONAL LABORATORY EST. 1943

Work Order Task

00558781 01

MASTER

Date: 07/27/2016
Page: 2

Rework Reason/Cause

		(Y/N)
CDSG	CUSTOMER DESIGN	
IMCW	IMPROPER CONSTRUCTION/WORKMANSHIP	
IMDN	IMPROPER DESIGN	
PDMS	PARTS/MATERIAL DID NOT MEET SPECIFICATIONS	
WR	WARRANTY REWORK/REPAIR	

Date: Hours: Crew: Shift:
Comments:

Rework/Approval

Deficiency Tag No.: Loc: Tag Removed:
ReWork Job : N Comments:

Trouble Found/Work Performed

5 WD

Continued on Additional Sheets? : ____

Work Delay Reason

					(Y/N)
A	ACCESS	Date:	Hours:	Crew:	Shift:
EQPT	EQUIPMENT	Date:	Hours:	Crew:	Shift:
MISC	MISCELLANEOUS	Date:	Hours:	Crew:	Shift:
OPS	OPERATIONS	Date:	Hours:	Crew:	Shift:
P	POOR PLANNING	Date:	Hours:	Crew:	Shift:
S	SAFETY				

Facility: F04 Unit: 530365 Proj:
Task Title: BHW ANNUAL FIRESIDE/WATERSIDE PM

W/O Type: PM W/O Group: Task Priority: 3
Planner : 112527 PADILLA B A
W/O Title: 530365-BHW-011 FIRESIDE/WATERSIDE PM
Written To: BOILER,HOT WATER
Task Dspln: F Due Date: 10/31/2016

Hazard: MODERATE IWD Reqmt: TASK SPECIFC

Los Alamos NATIONAL LABORATORY EST. 1943

Work Order Task

00558781 01

MASTER

Date: 07/27/2016
Page: 3

SCH SCHEDULING
Date: Hours: Crew: Shift:
T TRAVEL
Date: Hours: Crew: Shift:
W WEATHER
Date: Hours: Crew: Shift:
Comments:

Major Failure/Action Taken

Major Failure :
Deficiency Tag Loc:
Deficiency Tag No.:
Action Taken :
Removed (Y/N):
Limited Cond Operation:

Work Completion Signatures

Name	Function/Dept.	Date
[signature]	BOILER CREW/CGC-CS	10-27-16

Comments:
(rework?)

Cost Center: P2070A Activity : 640CL000 User Def:
Percentage : 100.000 Acct No : XFM400 1G530365

Facility: F04 Unit: 530365 Proj:
Task Title: BHW ANNUAL FIRESIDE/WATERSIDE PM

W/O Type: PM W/O Group: Task Priority: 3
Planner : 112527 PADILLA B A
W/O Title: 530365-BHW-011 FIRESIDE/WATERSIDE PM
Written To: BOILER,HOT WATER
Task Dspln: F Due Date: 10/31/2016

Hazard: MODERATE IWD Reqmt: TASK SPECIFC

Los Alamos NATIONAL LABORATORY EST. 1943

Work Order Task

00558781 01

MASTER

Date: 07/27/2016
Page: 4

Work Order Task Written To

Facility : F04 **Unit : 530365** **Op Sys : HW**
Room : 403ER **Area :** **Sys/Cls: R ML4**
Equipment : BOILER BHW-011 **Component:**
Location : S-53-0365-403ER
Job Type : PM
Tag 1 : 35835 Tag 2 :
Work Item : Ops Review Reqd: N

Print Request - Work Order Documents

Facility	Type/Subtype	Document Number	Sheet	Image Addr
LNL	PROC STD	403-A.001 HOT WATER BOILER STARTUP AFTER LAY-UP		
LNL	PROC STD	403-A.006 HOT WATER BOILERS ANNUAL FIRESIDE/WATERSIDE		

References/Document Information

Type/Subtyp: PROC STD Number: 403-A.001 Sheet:
Title/Desc : HOT WATER BOILER STARTUP AFTER LAY-UP Image: N
Type/Subtyp: PROC STD Number: 403-A.006 Sheet:
Title/Desc : HOT WATER BOILERS ANNUAL FIRESIDE/WATERSIDE Image: N

Los Alamos NATIONAL LABORATORY EST.1943

Form 2101

IWD Part 2
FOD Requirements and Approval for Entry and Area Hazards and Controls

Non-Tenant Activity Form

IWD No./Work Request No: 558781-01 Revision #: _

Facility Operation Director (FOD) must determine the facility entry and coordination requirements and identify the Environment, Safety, Health (ESH)/Security and Safeguards (S&S) hazards and controls associated with the activity location.

FOD	TA	Bldg.	Room	Other Location
4	53	365	403	
FOD Designated Facility Point-of-Contact	Name	Phone	Pager	Email
	K Mahoney	665-0944	104-8327	

Entry and Coordination Requirements (*Check one or more of the following*)

- ☐ No Entry/Coordination Requirements
- ☑ Plan of the Day/Plan of the Week (POTD/POTW)
- ☐ Security Clearance Requirements
- ☐ Co-located Hazards/Concerns
- ☑ Check out at End of Work
- ☐ Escort Required
- ☐ Other Bounding Conditions _____
- ☐ FOD-designated facility Point-of-Contact must sign IWD Part 3
- ☑ Check in at Start of Work
- ☑ Work must be Scheduled
- ☐ Other Security Requirements (ex.: Cellphone, No Foreign Nationals, etc.)
- ☐ Quality Issues
- ☑ Work-Area Training Required
- ☐ Check in Daily
- ☐ Check out Daily
- ☐ Review under Authorization Basis (AB)/Safety Basis/Unreviewed Safety Question (USQ)

Additional Comments (refer to Job Hazard Analysis [JHA] Tool Facility Notes)

Instructions: In the block below, identify work-area hazards that could potentially affect the worker(s) or others. Specify the facility controls and preventive measures that must be implemented by the worker(s) to protect against the site hazards as well as any special training required.

ESH/S&S WORK AREA HAZARDS & CONTROLS				
Work Area Hazards/Concerns Identify site hazards and concerns that could potentially affect the worker(s) or others.	**Work Area Hazard Present**	**Facility Controls/ Preventive Measures/ Bounding Conditions** Specify preventive measures, controls and bounding conditions for each site hazard	**Reference Documents** List permits, operating manuals, and other reference procedures	**Training and Qualification** List training requirements (P300, Integretated Work Management, Section 6.1)
☐ **No Work Area Hazards**				
Ionizing Radiation Work in posted radiological areas, work with radioactive materials, or work on or near radiation producing devices. **Specify Hazard:**	☐ Yes ☑ No			

ADESH-17-015 2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments LA-UR-17-20687 Attachment Packgage Page 1304 of 2096

IWD No./Work Request No: 558781-01 Revision #: _

ESH/S&S WORK AREA HAZARDS & CONTROLS				
Work Area Hazards/Concerns Identify site hazards and concerns that could potentially affect the worker(s) or others.	**Work Area Hazard Present**	**Facility Controls/ Preventive Measures/ Bounding Conditions** Specify preventive measures, controls and bounding conditions for each site hazard	**Reference Documents** List permits, operating manuals, and other reference procedures	**Training and Qualification** List training requirements (P300, Integretated Work Management, Section 6.1)
Worker Exposure Working near non-ionizing radiation, beryllium, noise, chemicals, hazardous biological materials, lead, asbestos, temperature/humidity extremes, or high explosives. **Specify Hazards:**	☐ Yes ☑ No			
Energized and Operative Systems Working near energized electrical parts, pressure systems, steam lines; near unprotected belts, pulleys, chains or rotating equipment; fuel fired equipment other than vehicles; or spark or flame producing operations. **Specify Hazards:** boilers= fuel fired units	☑ Yes ☐ No	use caution around Hot Surfaces		
Confined Spaces Entry into tanks, manholes, cooling towers, sumps, or any other area with potentially low oxygen concentration or other hazards such as toxic vapors or engulfment. **Specify Hazards:**	☐ Yes ☑ No			
Elevated Work Surface Elevated work when fall protection is not provided by conventional handrail systems or required per P101-20, *Fall Protection Program*	☐ Yes ☑ No			
Environmental Impact Activities conducted in areas containing potential release site, contaminated soil, sensitive species, watercourse wetlands, floodplain, historical/archeological sites, or other work area condition that can be impacted by or can impact the environment. **Specify Hazards:**	☐ Yes ☑ No			
Security Requirements **Specify:**	☐ Yes ☑ No			
Other Hazards **Specify:**	☐ Yes ☑ No			

I have verified that the hazards identified above adequately identify the area hazards and that the IWM process has been applied appropriately.

FOD or Representative (Signature/Z #/Date) **Approval Required** [signature] 112477 10/21/16

Date Approval Expires 10/31/16

2101 (6/12)

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1305 of 2096

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.001: Hot Water Boiler Startup After Lay-Up

Work Order No.: 558781-01 Equipment ID No.: BHW-11

Instructions: Enter the requested information. All items marked **S** or **Y** are satisfactory. Document all items marked **U**, **N**, or **N/A** in the Remarks section below, noting the step number and reason. Notify the foreman or supervisor of problems involving imminent danger.

TA: 53 Building: 365 Room: 403

Date Inspected: 10/27/16 Inspectors: [signature]

1.0 PRE-MAINTENANCE ACTIVITIES

NOTE Pre-operational and pre-maintenance activities shall be conducted per the work order package, e.g., lockout/tagout, permits, special instructions, etc.

! WARNING If purging of gas lines will be required during this maintenance, ensure that the purging activity is addressed in the Integrated Work Document (IWD). The following must be addressed (see Master Specification 23 1123):

1. Purged fuel gases shall be directly vented to a safe location outdoors, away from personnel and ignition sources. This may be accomplished through permanent piping or temporary piping or hosing.
2. If it is not possible to vent purged gases outdoors, the following conditions must be met:
   a. Purging activity must be approved by the LANL Fire Marshal based on a documented justification detailing why outdoor venting is not possible and IWD.
   b. Gas concentration in the space to which the purge is vented shall be maintained at no more than 25% of the Lower Explosive Limit (LEL). For natural gas, the LEL is a concentration of 5% in air or 50,000 ppm. Therefore a maximum concentration of 12,500 ppm is allowed for natural gas. The concentration may be controlled by providing adequate ventilation or by limiting the amount of purge gas.
   c. Combustible gas detectors shall be used during the purging operation to monitor the gas concentration.
   d. Nonessential personnel shall be evacuated from the vicinity (including adjacent spaces) during the purging operation.
   e. Ignition sources in the purging space shall be controlled or eliminated.

1.1	Notify maintenance coordinator (MC) that work will be in progress on the boiler system.	Initials: [initials]
1.2	Review manufacturer's recommendations for startup of burner and boiler.	Initials: [initials]

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.001: Hot Water Boiler Startup After Lay-Up

Work Order No.: 538281-01 Equipment ID No.: BHW-11

2.0	**MAINTENANCE**		
2.1	Fill boiler and system, if not already full.		Initials:
2.2	Vent air at high point in system.		Initials:
2.3	Check pressure/altitude gauge and expansion tank to ensure system is properly filled.	Circle one: (S) U N/A	Initials:
NOTE	If expansion tank is waterlogged, drain and refill the tank. If tank does not hold air, report it to the MC for repair or replacement.		
2.4	Set control switch to the Off position.		Initials:
2.5	Make sure fresh air to boiler room is unobstructed and manual dampers are open.		Initials:
2.6	Check availability of fuel.	Circle one: (S) U N/A	Initials:
2.7	Vent combustion chamber to remove unburned gases.		Initials:
2.8	Clean glass on fire scanner, if provided.		Initials:
2.9	Observe proper functioning of water pressure regulator.	Circle one: (S) U N/A	Initials:
2.10	Turn circulator pumps on electrically.	Circle one: (S) U N/A	Initials:
2.11	Check temperature control(s) for proper setting.	Circle one: (S) U N/A	Initials:
2.12	Check manual reset button on low-water fuel cutoff and high-limit temperature control.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.001: Hot Water Boiler Startup After Lay-Up

Work Order No.: 558781-01 Equipment ID No.: DHW-11

2.13 Set manual ~~fuel oil~~ NATRUL GAS supply or manual gas valve to the Open position.		Initials:
2.14 Place circuit breaker or fuse disconnect in the On position.		Initials:
2.15 Place all boiler emergency switches in the On position.		Initials:
2.16 Place boiler control starting switch in the On or Start position.		Initials:
! WARNING Boiler should fire at this point. Do NOT stand in front of boiler doors or breeching!		
2.17 Do not leave the boiler until it reaches the established cutout point to make sure the controls shut off the boiler.	Circle one: (S) U N/A	Initials:
NOTE If any abnormal conditions occur during light-off or temperature buildup, immediately open emergency switch. Do not attempt to restart unit until difficulties have been identified and corrected.		
2.18 During the temperature and pressure buildup period, walk around the boiler frequently to observe that all associated equipment and piping are functioning properly.	Circle one: (S) U N/A	Initials:
2.19 Visually check burner for proper combustion.	Circle one: (S) U N/A	Initials:
NOTE Combustion analysis is verifiable only with a flue gas analyzer and is performed mainly on boilers with power burners.		
2.20 Immediately after burner shuts off, inspect water pressure.	Circle one: (S) U N/A	Initials:
2.21 Open the highest vent to determine that system is completely full of water.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST.1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.001: Hot Water Boiler Startup After Lay-Up

Work Order No.: SS8781-01 Equipment ID No.: BHW-1

3.0 POST-MAINTENANCE ACTIVITIES

NOTE Post-maintenance activities shall be conducted in accordance with the work order package instructions (e.g., lockout/tagout, special instructions, etc.).

3.1	Enter the following information in boiler logbook:		Initials:
3.1.1	Date and time of startup. Date: 10·27·16 Time: 1:08 PM		Initials:
3.1.2	Any irregularities observed and corrective action taken.		Initials:
3.1.3	Time when controls shut off burner at the established temperature. 1:35		Initials:
3.1.4	Tests performed.		Initials:
3.1.5	Signature of operator.		Initials:
3.2	Check safety relief valve for evidence of leaking.	Circle one: (S) U N/A	Initials:

NOTE A try lever test of the safety relief valve should be conducted every 30 days during the heating season, after any prolonged period of inactivity, and prior to the annual safety relief valve test.

3.3	Perform try lever test in accordance with the following steps (from ASME Section VI, Appendix I, I.03 Exhibit C).	Circle one: (S) U N/A	Initials:
3.3.1	Check the safety relief valve discharge piping to determine that it is properly installed and supported.	Circle one: (S) U N/A	Initials:
3.3.2	Check and log the system operating pressure and temperature.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.001: Hot Water Boiler Startup After Lay-Up

Work Order No.: 558781-01 Equipment ID No.: BHW-11

3.3.3	Lift the try lever on the safety relief valve to the full open position and hold it for at least 5 sec or until clean water is discharged.		Initials:
3.3.4	Release the try lever and allow the spring to snap to the closed position.		Initials:
3.3.5	IF the valve leaks, THEN operate the try lever two or three times to clear the seat of any foreign matter that is preventing proper seating. As safety relief valves are normally piped to the floor or near a floor drain, it may take some time to determine if the valve has shut completely.		Initials:
3.3.6	IF the safety relief valve continues to leak, THEN it must be replaced before the boiler is returned to operation.		Initials:
3.3.7	Check that system operating pressure and temperature have returned to normal.	Circle one: (S) U N/A	Initials:
3.3.8	Check again to assure the safety relief valve has closed completely and is not leaking.	Circle one: (S) U N/A	Initials:
3.4	Once boilers have been checked out and put into service, contact the MC.		Initials:

Name of Craft Worker: Charles Wylie Z Number: 303121

Signature: Charles Wylie Date: 10 / 27 / 16

Name of Craft Worker: _____ Z Number: _____

Signature: _____ Date: ___ / ___ / ___

Foreman Verification: DENNIS BERNAL Z Number: 197845

Signature: _____ Date: 10 / 27 / 16

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 558781-01 Equipment ID No.: BHW-11

Instructions: Enter the requested information. All items marked **S** or **Y** are satisfactory. Document all items marked **U**, **N**, or **N/A** in the Remarks section below, noting the step number and reason. Notify the foreman or supervisor of problems involving imminent danger.

TA: 53 Building: 365 Room: BHW-11

Date Inspected: 10 / 27 / 16 Inspectors:

1.0 PRE-MAINTENANCE ACTIVITIES

NOTE Preoperational and pre-maintenance activities shall be conducted per the work order package, e.g., lockout/tagout, permits, special instructions, etc.

! WARNING If purging of gas lines will be required during this maintenance, ensure that the purging activity is addressed in the Integrated Work Document (IWD). The following must be addressed (see Master Specification 23 1123):

1. Purged fuel gases shall be directly vented to a safe location outdoors, away from personnel and ignition sources. This may be accomplished through permanent piping or temporary piping or hosing.
2. If it is not possible to vent purged gases outdoors, the following conditions must be met:
   a. Purging activity must be approved by the LANL Fire Marshal based on a documented justification detailing why outdoor venting is not possible and IWD.
   b. Gas concentration in the space to which the purge is vented shall be maintained at no more than 25% of the Lower Explosive Limit (LEL). For natural gas, the LEL is a concentration of 5% in air or 50,000 ppm. Therefore a maximum concentration of 12,500 ppm is allowed for natural gas. The concentration may be controlled by providing adequate ventilation or by limiting the amount of purge gas.
   c. Combustible gas detectors shall be used during the purging operation to monitor the gas concentration.
   d. Nonessential personnel shall be evacuated from the vicinity (including adjacent spaces) during the purging operation.
   e. Ignition sources in the purging space shall be controlled or eliminated.

NOTE All repair work, adjustments, or the replacement of parts shall be done in accordance with the manufacturer's procedures, specifications, recommendations, and instructions.

Remarks:

Los Alamos NATIONAL LABORATORY EST.1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: SS8781-01 Equipment ID No.: BHW-11

1.1	Notify maintenance coordinator (MC) that work will be in progress on the boiler system.		Initials:

2.0 MAINTENANCE

NOTE These selected hot water boilers are mainly boilers with power burners that have refractory in front and rear flue doors or have heat extractors in the fire-tubes as are found in most one-pass boilers (Sellers). Hot water heating boilers with atmospheric burners generally require minimal fireside preventative maintenance. Contact the MSS-MP Boiler subject matter expert (SME) at 7-8550 with questions or concerns.

2.1	Lock and tag out electrical and all associated valves on boiler and shut off gas supply.		Initials:
2.2	Cool boiler, open air cock, and drain the boiler.		Initials:
2.3	Perform an internal and external inspection after thorough cleaning.	Circle one: (S) U N/A	Initials:
2.3.1	Check the fireside furnace and fire-tubes for any evidence of soot formation or corrosion.	Circle one: (S) U N/A	Initials:
2.3.2	Brush and vacuum furnace and fire-tubes if such conditions exist.		Initials:
2.3.3	Perform hydrostatic test based on the boiler's Maximum Allowable Working Pressure and/or facility potable water pressure as long as the potable water pressure is at least 30 psi over boiler operating pressure.	Circle one: (S) U N/A	Initials:
2.3.4	Note if any boiler tubes and/or fittings are leaking, and repair as required. For any major repairs (determined by the SME), request a work order for the repairs from the MC.		Initials:
2.3.5	On one-pass boilers (Sellers), check condition of all heat extractors.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 558781-01 Equipment ID No.: BHW-11

2.3.6 Check refractory materials.	Circle one: (S) U N/A	Initials:
2.3.7 Replace if needed.		Initials:
2.4 Perform routine burner maintenance.		Initials:
2.4.1 Observe temperature and operating pressure and general conditions.	Circle one: (S) U N/A	Initials:
2.4.2 Fire and cycle the burner.		Initials:
2.5 Perform routine maintenance of circulating pump and expansion pump equipment.		Initials:
2.5.1 Observe condition of expansion tank.	Circle one: (S) U N/A	Initials:
2.5.2 Drain expansion tank if it is of a non-bladder type and refill to reestablish an air cushion.	Circle one: (S) U N/A	Initials:
2.5.3 Check the air pressure on the bladder-type expansion tanks.	Circle one: (S) U N/A	Initials:
2.5.4 Observe operation of circulating pumps.	Circle one: (S) U N/A	Initials:
2.5.5 Lubricate pump motors.		Initials:
2.6 Perform routine maintenance of entire combustion control equipment.		Initials:
2.6.1 Check gas/air linkages and moving parts (on power burners that modulate) for positioning, tightness, and binding.	Circle one: S U (N/A)	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 5558981-01 Equipment ID No.: BHW-11

2.6.2	Adjust air/fuel mixture as needed.		Initials:
2.6.3	Test flame detection devices on boilers with flame scanners.	Circle one: S U N/A	Initials:
2.6.4	Remove the flame scanner with the burner firing.		Initials:
NOTE	The burner should shut off as a flame failure condition.		
2.6.5	Clean the flame scanner, reinstall and test programmer.		Initials:
2.6.6	Check for proper operation as boiler goes through a firing cycle and light-off.	Circle one: S U N/A	Initials:
2.6.7	Check all electrical control and circuitry.	Circle one: S U N/A	Initials:
2.6.8	Inspect for cracked mercury tubes, separation of mercury, cracked insulators (probe type), jumper tube conditions, loose connections, poor or deteriorated wiring, improperly used bypass switches, cutoff switches wired in parallel, shut-offs installed at improper levels, wedges behind mercury tubes.	Circle one: S U N/A	Initials:
2.6.9	Observe operation of forced draft fan motors on boilers with power burners and induced draft fan motors on horizontal breeching where applicable.	Circle one: S U N/A	Initials:
2.6.10	Lubricate fan motors where necessary.		Initials:
2.7	Perform combustion and draft tests.		Initials:
2.7.1	Visually inspect combustion.	Circle one: S U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 55 8781-01 Equipment ID No.: BHW-11

NOTE Changes in flame shape, color, and sound are among early indicators of potential combustion-related problems. Changes may be due to changes in fuel pressure or gas/air linkage movement.

2.8 Perform safety relief valve(s) pop test.	Circle one: (S) U N/A	Initials:
2.8.1 Check pressure-reducing valve.	Circle one: (S) U N/A	Initials:
2.8.2 Replace the strainer in the valve if needed.		Initials:
2.9 Perform slow drain test of low-water cutoff.	Circle one: (S) U N/A	Initials:
2.10 Inspect gas piping for proper support and tightness.	Circle one: (S) U N/A	Initials:
2.10.1 Inspect fuel supply system and gas controls.	Circle one: (S) U N/A	Initials:
2.10.2 Leak check gas controls and associated gas piping with a gas detector or soap suds.	Circle one: (S) U N/A	Initials:
2.11 Inspect boiler room ventilation louvers and intake.	Circle one: (S) U N/A	Initials:
2.11.1 Listen for any unusual noises or conditions and correct as necessary.	Circle one: (S) U N/A	Initials:
2.11.2 Report any needed corrections to the MC for corrective maintenance.		Initials:
2.11.3 Check combustion air supply openings to ensure that they are not closed or stopped up.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 558781-01 Equipment ID No.: BHW-11

2.11.4 Inspect conditions of stacks and rain caps.	Circle one: (S) U N/A	Initials:
2.11.5 Inspect flue door gaskets to ensure they are in good condition, and properly secured.	Circle one: (S) U N/A	Initials:
2.11.6 Replace if necessary.		Initials:

3.0 POST-MAINTENANCE ACTIVITIES

NOTE Post-maintenance activities shall be conducted in accordance with the work order package instructions (e.g., lockout/tagout, special instructions, etc.).

3.1 Close and secure front and rear flue doors.		Initials:
3.2 Hook up all associated piping and refill boiler.		Initials:
3.3 Fire up boiler and check for air, gas, and water leaks.	Circle one: (S) U N/A	Initials:
3.4 Check gas/air linkages and moving parts (on power burners that modulate) for positioning, tightness, and binding.	Circle one: S U (N/A)	Initials:
3.5 Check pilot burners and ignition equipment for proper condition and adjustment.	Circle one: (S) U N/A	Initials:
3.6 Visually check burner for proper combustion.	Circle one: (S) U N/A	Initials:
3.7 Record all mechanical maintenance data, testing data, and other notable items.		Initials:

NOTE Combustion analysis is verifiable only with a flue gas analyzer and is performed mainly on boilers with power burners.

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 558781-01 Equipment ID No.: BHW-11

3.8	Test water for proper chemical levels. Test and treat water as defined on Datasheet 403-A.002.	Circle one: (S) U N/A	Initials:
3.9	Record all mechanical maintenance data, testing data, and other notable items.		Initials:
3.10	Notify MC that work on the boiler system is complete.		Initials:

Name of Craft Worker: Charles Wylie Z Number: 303121

Signature: Charles Wylie Date: 10 / 27 / 16

Name of Craft Worker: _____ Z Number: _____

Signature: _____ Date: ____ / ____ / ____

Foreman Verification: DENNIS BERNAL Z Number: 197845

Signature: _____ Date: 10 / 27 / 16

Remarks: _____

Form 2103

Los Alamos NATIONAL LABORATORY EST. 1943

Integrated Work Document (IWD) Part 3, Validation and Work Release

IWD #: 558781-01 Revision #: [redacted] **Work Release**

By signing below, I verify this activity is compatible with current facility configuration and operating conditions.

FOD designated Ops Mgr or other facility point-of-contact for work area

Signature/Z#/Date **(If required by FOD)**: _____

Note: For Standing IWD, release may be given concurrently with signatures on Part 2.

By signing below, I have verified the following:

- I have verified authorization by ensuring approval signatures of the RLM and FOD.
- I have jointly conducted a validation walkdown with workers to confirm the IWD can be performed as written, required initial conditions and other prerequisites are in-place.
- The assigned workers are authorized and are qualified to perform the work in a safe, secure, and environmentally responsible manner.
- I have conducted the pre-job briefing, and all workers have been briefed.
- I have ensured coordination with any required FOD work-area representatives (*e.g., area work coordinators*).

Primary PIC (Signature/Z#/Date) **Required**: [redacted] 197845 10-27-16

Alternate PIC Signatures **acknowledges** PIC authority is assumed for the first time *(Note: Alternate PICs are required to sign only once, but formal handoff includes conferring with previous PIC to obtain all required information associated with the handoff).*

Alternate PIC (Signature/Z#/Date) **Required**: _____

Alternate PIC (Signature/Z#/Date) **Required**: _____

Pre-Job Brief Content

- What are the critical steps or phases of this activity?
- How can we make a mistake at that point?
- What is the worst thing that can go wrong?
- What controls, preventive measures, and bounding conditions are needed?
- What work permits are required and how will we meet their requirements?
- What are the handoffs and coordination requirements among workers and multiple PICs?
- Are there hold-points including those that require sign-offs?
- What are the pause/stop work responsibilities and expectations (e.g. for unanticipated conditions or hazards)?
- How would we respond to alarms and emergencies?
- Are there lessons learned from previous similar work?
- Is other information needed to perform this activity in a safe, secure, and environmentally responsible manner?
- Does everyone agree to the work tasks/steps, hazards, and controls and commit to follow them?

Pre-Job Brief Attendance Roster

By signing below **as required**, I agree to the following:

- I agree to follow the work steps and implement the controls as written as applicable to my work assignments.
- I agree to pause/stop work when conditions or hazards change or when I encounter unexpected conditions during the execution of work, or when work cannot be performed as written, or instructions become unclear during execution.
- I confirm that I am authorized, qualified, and fit to perform the work.

Worker (Signature/Z#/Date) Charles McKee 303121 10/27/16	**Worker** (Signature/Z#/Date)
Worker (Signature/Z#/Date)	**Worker** (Signature/Z#/Date)
Worker (Signature/Z#/Date)	**Worker** (Signature/Z#/Date)
Worker (Signature/Z#/Date)	**Worker** (Signature/Z#/Date)

Mandatory Questions for All Pre-Job Briefs

The purpose of this document is to demonstrate compliance with the Release of Craft requirements directed by MSS-DO on 17 June 15. Until a formal document is institutionalized by the Work Control Group this document will be included in **all** work control packages (CM, PM, Planned, Unplanned, etc). Each of the questions listed below will be discussed at each Pre Job Brief with all affected personnel. Compliance will be demonstrated by the signature from the person performing the Pre Job Brief on the bottom of this document. This document is a permanent part of **all** work packages until further notice.

Topic	Completed (X)
Assume we are going to have an accident on this job. How did it happen? How can we prevent it?	X
What is the worst thing that can happen on this job? How can we keep it from happening?	X
What hazards will you encounter in performing this work?	X
Is there a better way to address the hazards you will encounter?	X
Have all safety issues concerning this task been addressed to your satisfaction?	X

Signature (Person Performing Pre-Job)

10-27-16

Date

Los Alamos NATIONAL LABORATORY EST. 1943

AP-WORK-002: Attachment 11
Maintenance and Site Services
Work Completion Form

Work Order/Task: SS8781-01

Start Date: 10-27-16	Completion Date: 10-27-16

SUMMARIZE THE WORK PERFORMED

Date 10-27-16	PERFORMED PM ACCORDING TO CHECKLIST. START UP AND FIRESIDE/WATERSIDE. LOTO BHW-11 DRAINED BOILER AND OPEN FIRER BOX AND WATER HAND HOLES CLEANED AND INSPECTED. NOTICED THAT BACK DOOR DRAIN IS CLOGGED TRYED TO UNCLOGG BUT NOT ABLE TO PIPE NEEDS TO BE REMOVED AND RE-PLACED. STARTED UP BHW-11 PER CHECKLIST.

FOR CORRECTIVE WORK – WHAT FAILED AND WHAT WAS FIXED

	NEED TO REMOVE BACK DOOR DRAIN AND REPIPE.

FOR PMs – SUMMARIZE AS FOUND AND AS LEFT CONDITIONS BELOW

As found	OFF
As left	ON
Parts/Repairs	N/A
Read/meas.	N/A
Post test info.	PASSED

Problems Encountered (delays, safety, etc.):

	N/A

Lessons Learned/Recommendations:

	N/A

Name:	Signature:	Date:
DENNIS BERNAL		10-27-16

Los Alamos NATIONAL LABORATORY EST. 1943

AP-WORK-002: Attachment 11
Maintenance and Site Services
Work Completion Form

55878/-01

PIC/SUPT

☑ PM has been completed in its entirety and ready for closure.

IF A PM COULD NOT BE COMPLETED:

☑ Percentage complete is 100 %

☐ Sections that did not work and need to be rescheduled

Reasons why:

Q-1 Mel 197845 10-27-16

MAINTENANCE COORDINATOR/AREA WORK COORDINATOR

Work Package is Complete and may be closed out: YES ☐ NO ☐

IF no: State Reason

Additional Work Needed? YES ☐ NO ☐

Document UP/WO/FSR Number: _____

ENGINEERING (FOR MD and CD Work Orders)

IF a configuration baseline has been changed, THEN indicate the changes are to be incorporated into the following documents and/or configuration baseline:

☐ Drawings ☐ FDD/SDD

☐ Procedures ☐ Master Equipment List

☐ Permits ☐ Checklists

SE Name: Signature: Date:

WORK CONTROL

Moderate/High Hazard – WMC/Planner reviewed for Lessons Learned/Feedback

☐ YES ☐ NO ☐ N/A

☐ Review of the completed work package is complete per AP-WORK-005, and the work package is ready to be set to complete in CMMS.

Attachment B, LO/TO Orders

Lock Coordinator Name: K-HARRELD Z#: 117813	Phone #:	Alternate Lock Coordinator Name Z#:	Phone #:

Section 1: General Information

1. Work Document Number (i.e., Package/Procedure #): 558781-01 | 2. LO/TO (Parent) Record #: 52544

Location of Equipment to be Isolated

3. TA: 53 | 4. Bldg: 365 | 5. Rm: 403 | 6. Equipment Description (e.g. Machinery/Name/CMMS Number): BHW-11

7. Name of Equipment Owner/Operator: K-HARRELD

8. Reason for LO/TO: BOILER PM

9. Energy Type to be Isolated (check all that apply):
☑ Electrical ☑ Mechanical ☐ Hydraulic ☐ Pneumatic ☐ Steam ☐ Capacitors ☐ Compressed Energy ☐ Gravity ☐ Other (specify):

10. Verification required for LO/TO:
☑ Installation ☐ Removal ☐ N/A (Verification Not Required)

11. Verification Type:
☑ Peer ☐ Independent ☐ N/A

12. Specific Sequencing of LO/TO devices required for:
☐ Installation ☐ Removal ☑ N/A (Sequencing Not Required)

13. LO/TO Orders Addendum with Operational Instructions/Procedures attached?
☐ Yes ☑ No

Equipment Owner/Operator Comments:
RETURN LOCKS TO: Bldg 31, RM 125, DOOR lock box

Section 2: LO/TO Installation & Removal Details

14. Group LO/TO? ☑ Yes ☐ No
Name of Lead Authorized Worker: K-HARRELD

15. Group Lock Box used? ☐ Yes ☐ No
If yes, enter ID# of Lock Box:

LO/TO Installation

16. Approval to Install LO/TO
Signature: K-HARRELD Z#: 117813
NOTE: Approver must ensure Affected Workers are notified prior to Authorized Workers performing LO/TO

LO/TO Removal / Return to Service

23. Approval to Remove LO/TO
Signature: K-HARRELD Call #: 231-0299 ☐ N/A Z#: 117813
NOTE: Approver must ensure Affected Workers are notified of LO/TO Removal / Return to Service

17. Energy Isolation Device (use Specific ID)	18. Location of Energy Isolation Device	19. LO/TO Installation Sequence	20. Required LO/TO Position or Alignment	24. LO/TO Removal Sequence	25. Required Position/Alignment following Removal	26. As-Left Position
LOCAL DISC.	403	N/A	OFF/OPEN	N/A	ON	ON
GAS VALVE	403	N/A	SHUT	N/A	OPEN	OPEN
MAKE-UP VALVE	403	N/A	SHUT	N/A	OPEN	OPEN
LOCK BOX	403	N/A	SHUT	N/A	OPEN	OPEN

☐ See continuation page for additional Energy Isolation Devices (continuation page must also be signed if applicable)

21. Energy Isolation Devices Positioned, Lock(s) and Tag(s) installed, and Zero Energy Checks Performed:
Signature: [signature] Z#: 197845 Date: 10-27-16

27. LO/TO has been Removed & Isolation Devices Positioned:
Signature: [signature] Z#: 197845 Date: 10-27-16

22. LO/TO verified by: ☐ N/A
Signature: Charles Wylie Z#: 303121 Date: 10-27-16

28. Removal and Positioning verified by: ☐ NA
Signature: Charles Wylie Z#: 303121 Date: 10-27-16

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1322 of 2096

Attachment B, LO/TO Orders

Attachment B, LO/TO Orders (Cont.)			
1. Work Document Number (i.e., Package/Procedure #): 518781-01		2. LO/TO (Parent) Record #: 52544	
Section 3: All Authorized Workers (anyone applying a lock for this activity)			
29. Authorized Workers Name(s)	Z#	30. Date worker's lock is hung	31. Date worker's lock is removed
1. Charles Wylie			
2. Dennis Barnes	197845	10-27-16	
3. Charles Wylie	303121	10-27-16	
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			
Section 4: Return of Lock(s)/Tag(s) and Locking Devices			
All Lock(s)/Tag(s) and Locking Devices have been removed and returned to the Lock Coordinator:			
32. Signature of Lock Coordinator: 10/27/15		Z#:	Date:

*Instructions for completing this form (by numbered steps) appear on the last two pages of this document. Take the completed forms back to the Lock Coordinator for closeout.

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1323 of 2096

Attachment B, LO/TO Orders

Continuation Page (print as needed)

Attachment B, LO/TO Orders (Cont.)						
1. Work Document Number (i.e., Package/Procedure #):				2. LO/TO (Parent) Record #:		
LO/TO Installation				**LO/TO Removal / Return to Service**		
17. Energy Isolation Device (Specific ID)	18. Location of Energy Isolation Device	19. LO/TO Installation Sequence	20. Required LO/TO Position or Alignment	24. LO/TO Removal Sequence	25. Required Position/Alignment following Removal	26. As-Left Position
21. Energy Isolation Devices Positioned, Lock(s) and Tag(s) installed, and Zero Energy Checks Performed: Signature: Z#: Date:				27. LO/TO has been Removed & Isolation Devices Positioned: Signature: Z#: Date:		
22. LO/TO verified by: ☐ N/A Signature: Z#: Date:				28. Removal and Positioning verified by: ☐ NA Signature: Z#: Date:		

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1324 of 2096

Attachment B, LO/TO Orders

Instructions by Numbered Steps

Lock Coordinator (Header): Identify the individual who will issue Red Locks to persons performing LO/TO (individual[s] identified by the FOD).

1. Enter the Work Document Number. This will be the number from the IWD or the procedure number (i.e., TA88-DOP-0001).
2. Enter the LO/TO Parent Record number. This is obtained from the Lock Coordinator when the lock(s) are issued. The Remedy LO/TO database generates this number.
3. Enter the TA where the equipment is located.
4. Enter the Building number where the equipment is located.
5. Enter the Room number where the equipment is located.

   NOTE: Responses to steps 3 through 5 need to match information, identically, within both the LO/TO Orders and the tag (Attachment A).

6. Enter the Equipment/Machinery/Name/Number (example, HVA-001 [NOTE: LOG is to follow nomenclature contained within CMMS/MEL]).
7. Enter the Name of the Equipment Owner/Operator. The Equipment Owner/Operator is designated by the FOD. There may be both programmatic and facility Equipment Owner/Operators.
8. Write a brief description of the reason for LO/TO (example, removing and replacing exhaust fan belts).
9. Check the appropriate energy type to be isolated (check all that apply). Make sure you have considered all energy sources; if "Other" is checked, specify what "Other" is.
10. Is verification of the energy isolation configuration required for this LO/TO for installation and/or removal? Check the appropriate box(es).
    NOTE: Contact the FOD/Designee regarding verification requirements. Additionally, verification may be required by the Equipment Owner/Operator.
11. If verification is required, check the appropriate box (either "Peer" or "Independent"). If verification is NOT required, check the "N/A" box.
    NOTE: Independent verification may be required per ***P315, Conduct of Operations Manual,*** as determined by the FOD/Designee.
12. When installing the lock(s)/tag(s), is there a specific sequence in which the isolation devices are to be positioned? If a specific sequence must be followed for Installation and/or Removal, check the appropriate box(es) and subsequently identify the sequence order in column numbers 19 and/or 24, accordingly. If there is not a specific sequence to follow, check the "N/A" box and place N/A in columns 19 and/or 24.
13. If an operating procedure/instruction/etc. is to be used in conjunction with the LO/TO Orders, check the "Yes" box and attach the pertinent document as an addendum. Additionally, a space is provided for Equipment Owner/Operator comments, if applicable.
14. Check either "Yes" or "No" to indicate if a Group LO/TO is applicable. A Group LO/TO is where two or more authorized workers, regardless of their occupation or craft, lock out and tag out the same equipment to perform servicing or maintenance. Enter the name of the Lead Authorized Worker.
15. Check either "Yes" or "No" to indicate if a Group Lock Box is to be used. If "Yes", enter the lock box ID#. Each organization that issues locks will be required to uniquely number and track lock boxes in their possession.
16. The FOD-designated Equipment Owner/Operator signs and enters their Z#, authorizing the installation of the LO/TO. The Approver is responsible to notify all Affected Workers prior to the Authorized Workers performing LO/TO ("Affected Workers" are those who either may work with the equipment or are affected by LO/TO activities).
17. Enter the specific energy isolation device/ID (e.g., MCC-A, A4). The ID used in the LO/TO orders must match information used on tag (Attachment A).
18. Location of energy isolation device (TA, Bldg, Rm, etc.). The location used in the LO/TO orders must match information used on tag (Attachment A).

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1325 of 2096

19. If the LO/TO needs to be installed in a particular order (refer to Step #12), number the sequence in which the locks need to be installed. If sequencing is not applicable, then place N/A in this column.
20. Required Position/Alignment for LO/TO (open, closed, connected, disconnected, on, off, etc.). Follow the nomenclature on the piece of equipment (e.g., if a service disconnect has "ON"/"OFF" posted, ensure the position/alignment entered on this form matches the piece of equipment ["ON" or "OFF"]).
21. The Lead Authorized Worker documents (signature) that the energy isolation devices have been positioned correctly, that locks and tags have been installed on those energy isolation devices and a Zero Energy Check has been performed.
    NOTE: The Lead Authorized Worker may also be designated as the Person-in-Charge (PIC).
22. Is verification required (see #10)? If verification is required, the person who performs the verification signs, and places their Z# and the date here. If verification is not required, check the "N/A" box.
23. Documentation of Approval to Remove LO/TO. Equipment Owner/Operator or FOD Designee signs and places his/her Z# in this box. Alternatively, authorization per telecommunication may be performed via a phone number identified for the Lead Authorized Worker to call the Equipment Owner/Operator or FOD Designee. Once verbal authorization is given, the Lead Authorized Worker documents the authorization as "per telecom" and enters his/her initials. Example: John Smith per telecom, JS. By checking the "N/A" box, a phone call is NOT REQUIRED by the Lead Authorized Worker to the Equipment Owner/Operator or FOD Designee.
    NOTE: The Equipment Owner/Operator or FOD Designee is responsible to notify all Affected Workers after the LO/TO removal and of the equipment/machine's return to service.
24. If the LO/TO needs to be removed in a particular sequence (as per Step #12), number the sequence in which the locks need to be removed. If the "N/A" box is checked in #12, then place N/A in this column.
    NOTE: Often the sequence for removal is opposite the sequence for installation. For example, if the order specified for installation Column #19 is "1,2,3,4", the order specified for removal in Column #24 could be "4,3,2,1". The intention of the LO/TO Orders is to have the entries in Column #s 19 and 24 correspond with the energy isolation devices specified in Column #17.
25. Identify the required position/alignment in which the system/component is to be placed following the removal of the lock(s). Follow the nomenclature as listed on the piece of equipment ("On", "Off", etc.).
26. Enter the As-Left Position.
27. The Lead Authorized Worker documents (signature, Z# and date) that the locks and tags have been removed from the energy isolation devices and the energy isolation devices have been configured as per Equipment Owner/Operator specifications.
    NOTE: The Lead Authorized Worker may also be designated as the Person-in-Charge (PIC).
28. If verification is required for the positioning, the person who performs the verification signs here. Otherwise, check N/A.
29. All authorized workers applying a lock for this activity (names/Z#) must be documented. If more than 20 authorized workers are involved in a Group LO/TO, document the required information with an attached list.
30. Enter the date the authorized worker attaches his/her lock.
31. Enter the date the authorized worker removes his/her lock.
32. The Lock Coordinator or designee signs once locks, tags, and locking devices have been removed and returned. If a lock and/or tag are found to be contaminated, the lock and/or tag will be disposed of in accordance with local procedures and a verbal notification will be made to the Lock Coordinator to close out the record within Remedy.

ADESH-17-015
2016H2, Title V P100-R2, Semi-Annual Monitoring Report | Attachments
LA-UR-17-20687
Attachment Packgage Page 1326 of 2096

Los Alamos NATIONAL LABORATORY

Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)

Revision # -0-			**Activity/Task Title:** 53 0365 BHW-11 FIRESIDE / WATERSIDE
Work Document #: (WO # / Task) 558781 -01			**Planner/Preparer (Name/Z#/Date)** Troy Calloway #186163 9/14/16
TA: 53	**Building:** 0365	**Room:** 403	**Additional Location Description:** Equip Room

Activity Description/Overview:

NOTIFY COORDINATOR PRIOR TO STARTING PROCEDURE.
FILL OUT ATTACHED CHECKLISTS.
REPORT ANY DEFICIENCIES FOUND TO FACILITY COORDINATOR AS SOON AS PRACTICAL.

Power Source:
CDD by MCC-B / D6 53-752 3000 kva

MC: Randy King 795-1138

NOTE: Maintenance Coordinator requests notification of progress at the end of each day and on completion of the job.

List Names of Hazard Analysis (HA) Team: Troy Calloway, Tommy Martinez, Lewis Mondragon

Date HA Performed: 8/23/16, 9/13/16

PRECAUTIONS/LIMITATIONS/PREREQUISITES:

- If steps cannot be completed as described, or if unforeseen situations occur, **PAUSE WORK**, stabilize the situation, contact your supervisor, and await further instructions before proceeding.
  ASK YOURSELF –
  - ***WHAT NON-RELATED ACTIVITIES / HAZARDS / PERSONNEL ARE OCCURRING IN THE VICINITY OF MY REQUIRED WORK AREA?***
    HOW CAN THEY AFFECT ME AND MY WORK?
  - **AM I READY AND COMFORTABLE TO PERFORM THIS WORK?**
  - **WHERE IS THE NEAREST AED / PULL STATION / FIRE EXTINGUISHER LOCATED?**
  - **WHAT IS THE *WORST* THING THAT CAN HAPPEN? HOW CAN I PREVENT IT?**

- Craft will review all postings for entry, work and exit of area.
  Be aware of any alarms that may be in area and what the procedure is if alarm sounds.
  Locate and identify nearest fire extinguisher and emergency pull station, eyewash/shower station.
  Locate and identify nearest phone capabilities and contact numbers in case of emergency.

- The following trainings are required of ALL craft for the General Hazard Section:
  - Core training (#10968)
  - TA53 Facility Specific (#57262)

- Training for tasks - **Fitters**
  - Journeyman craftsman – Boiler Specifc
  - LOTO training – TP #127
  - Energized electrical training - #2908 (non-electricians)
  - HAZCOM - #25418
  - Pressure Safety Orientation - #769

Los Alamos NATIONAL LABORATORY

Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)

Revision #	Activity/Task Title:
-0-	53 0365 BHW-11 FIRESIDE / WATERSIDE
Work Document #: (WO # / Task)	**Planner/Preparer (Name/Z#/Date)**
558781 -01	Troy Calloway #186163 9/14/16

TA:	Building:	Room:	Additional Location Description:
53	0365	403	Equip Room

Core Training (#10968) covers use of tools and general PPE.

The following PPE is required **at a minimum**; Task specific PPE listed within task:

- Safety Shoes
- Safety Glasses with Side shields
- Leather or Light Duty High Dexterity, Cut Resistant Gloves
- Reflective Vests:
  - All employees working on a construction or maintenance project outdoors are required to wear reflective vests **unless** working around rotating equipment, performing spark/flame producing operations, or are performing Mode 1 or 2 electrical work.
- Minimize exposure to noise. Wear hearing protection as applicable.
  - If questions or concerns arise regarding noise levels contact LANSCE IH for a Hazard Assessment. **Bob Brennecke 665-9391 or 695-6231**
- Hard Hats:
  - PICs will consider adjusting when bump hats might be more suitable
  - Areas posted "Hard Hats Required."
  - Work areas where falling or flying objects, overhead structures, energized conductors, or where equipment or other materials create an overhead hazard.

HOLD POINT

- **Erect** and set in place barricades / demarcation at room entrances
  - ✓ Signage shall be sufficiently legible and noticeable
  - ✓ Set barricade at sufficient distance to allow safe working area
  - ✓ NO non-essential personnel are to enter work area without authorization and proper PPE
  - ✓ Ensure barricades are sufficiently secured to not fall over
- **Remove** barricades at end of project

- **REVIEW O&M** manual as necessary for specified steps

- **CYCLE** boiler and inspect operations
  - Only qualified personnel to perform operation of boiler
  - Coordinate efforts with facility coordinator

To be discussed during the pre-job brief:

If any previously unknown or potentially unknown electrical hazard is suspected, PAUSE work and bring in an SME (facility electrician or Electrical Safety Officer) to assess the potentially unknown electrical hazard. If necessary, modify the IWD to include the previously unanticipated electrical hazard.

Los Alamos NATIONAL LABORATORY

Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)

Revision #	Activity/Task Title:		
-0-	53 0365 BHW-11 FIRESIDE / WATERSIDE		
Work Document #: (WO # / Task)	Planner/Preparer (Name/Z#/Date)		
558781 -01	Troy Calloway #186163 9/14/16		
TA: 53	Building: 0365	Room: 403	Additional Location Description: Equip Room

NOTE:

PMI Steps may be worked out of sequence to facilitate ease of job – so long as doing so does not create additional hazards or tasks not covered by this IWD.

ANY time a worker may be exposed to energy (gas, electrical, stored) LOTO procedures MUST be put in place PRIOR to possible exposure.

EXCEPT: Performing Mode 1 or 2 Electrical Work

- **Purge** system (if necessary) per Page 1 of **PMI**
  - NO spark or flame within area
  - HAZCOM training
  - Purge gas to outside – IF NOT possible contact LANSCE IH for air quality monitoring and LANL Fire Marshall.
    - 670-1958

PAUSE POINT

Craft shall check panel front at LOTO point for arc flash calculations provided by engineering.
Panel labeling shall override requirements in this IWD for PPE.

IF panel is properly labeled, craft shall follow label requirements.
IF panel is NOT labeled, craft shall proceed with PPE and approach limits listed in this IWD.

NOTE:

Calculations by engineering

Designator: Maintenance Coordinator

Power Source: CDD by MCC-B / D6 Voltage: 480v
Transformer: 53-0752 3000 kVa

⚠WARNING

FLASH HAZARD
EQUIPMENT OPERATION CLASS 1.3

- **Contact** equipment owner for energy assessment of all energy sources
  - **Each energy source shall be identified, physically located and marked / labelled.**
  - **If source not labelled, Owner shall identify with plain manila tag with unique identifier.**
- **Verify** Disconnect / Breaker controls unit power
  - Ensure unit runs/starts
  - Don PPE
    Long sleeve FR shirt and FR pants (**8** cal/cm arc rated) **OR** FR coveralls (**8** cal/cm arc rated)

Los Alamos NATIONAL LABORATORY	**Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)**		
Revision # -0-			**Activity/Task Title:** **53 0365 BHW-11 FIRESIDE / WATERSIDE**
Work Document #: (WO # / Task) **558781 -01**			**Planner/Preparer (Name/Z#/Date)** **Troy Calloway #186163 9/14/16**
TA: **53**	**Building:** **0365**	**Room:** **403**	**Additional Location Description:** **Equip Room**

over non-melting daily wear, short sleeve 100% cotton shirt, hardhat, safety glasses, hearing protection, arc rated face shield with wrap around face guard **OR** flash suit hood (**8** cal/cm arc rated). Leather work gloves.

- Open Disconnect / Breaker and verify the unit stops or will not start

Repeat process:

- Close Disconnect / Breaker and ensure unit starts
- Open Disconnect / Breaker and verify the unit stops or will not start

CAUTION: If unit does not start AND stop by operation of breaker, PAUSE work and contact MC. LOTO point may be incorrect OR power may not be supplied to unit.

❖ **Turn** off and apply **LOTO**

- Obtain locks and tags from FOD Designated Lock Coordinator
- Make necessary notifications per Simple LOTO procedure – (ONLY 1 LOTO point) OR Attachment B – (multiple LOTO points)
- Determine all sources of power
- Check applicable drawings/diagrams/ID tags
- Turn off EQ
- Open disconnecting device(s)
- IF possible, visually verify devices are open/removed/disconnected
- LOTO devices/tags shall be applied in accordance with P101-3R8

IF Necessary:

❖ **Turn off** and apply LOTO to gas supply and at pilot valve(s)

- Obtain locks and tags from FOD
- Make necessary notifications per Attachment B LOTO orders
- Determine all sources of power
- Check applicable drawings/diagrams/ID tags
- Turn off EQ
- Close valves.
- LOTO devices/tags shall be applied in accordance with P101-3R8
- PPE and hand tool use per core training

⚠ DANGER

DO NOT stand in front of boiler doors or breeching when firing boiler.

❖ **Perform maintenance per PMI section 2**

❖ **Remove** and replace defective components per PMI

- Ensure all components are sufficiently cool before contact with skin
- PPE per core training

Working with simple hand tools, Cuts and Abrasions:

Los Alamos NATIONAL LABORATORY

Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)

Revision #	Activity/Task Title:		
-0-	53 0365 BHW-11 FIRESIDE / WATERSIDE		
Work Document #: (WO # / Task)	Planner/Preparer (Name/Z#/Date)		
558781 -01	Troy Calloway #186163 9/14/16		
TA: 53	Building: 0365	Room: 403	Additional Location Description: Equip Room

- Inspect all tools prior to use
- Wear leather gloves and safety glasses

Working with battery powered/electrical tools:

- GFCI protection for all cords and electric devices
- Inspect all cords, plugs and electric tools for damage – remove and tag if found defective
- Minimize exposure to noise. Wear hearing protection as applicable.

⚠WARNING

Soldering and Brazing Hazards:
Fire Hazard
Inhalation Hazard
Eye and Dermal Burn Hazard

NOTE: Must have approved and signed spark and flame permit in package prior to working

❖ **Low temp soldering – IF necessary**

- Review current LANL fire danger rating, follow appropriate cautions
- Review spark and flame permit
- Provide fire watch if permit deems necessary
- Ensure adequate ventilation in work area
- Wear leather gloves, long sleeve shirt and tinted goggles
- Have a 5lb (minimum) ABC fire extinguisher present
- Scope area for possible flammable material within spark/flame range
- Verify NEAREST eyewash capabilities

⚠WARNING

ELECTRIC ARC FLASH
BREAKER OPERATION CLASS 1.3

❖ **Remove** LOTO

- Check equipment and area
- Don PPE
  Long sleeve FR shirt and FR pants (**8** cal/cm arc rated) **OR** FR coveralls (**8** cal/cm arc rated) over non-melting daily wear, short sleeve 100% cotton shirt, hardhat, safety glasses, hearing protection, arc rated face shield with wrap around face guard **OR** flash suit hood (**8** cal/cm arc rated). Leather work gloves.
- Verify equipment controls are in OFF position
- Make necessary notifications
- LOTO devices/tags shall be removed in accordance with the requirements of P101-3, Chapter 1 – Lockout/Tagout for Safety.
- Close disconnecting device(s)
- Re-energize system
- Notify MC and return locks

Los Alamos NATIONAL LABORATORY

Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)

Revision #	Activity/Task Title:		
-0-	53 0365 BHW-11 FIRESIDE / WATERSIDE		
Work Document #: (WO # / Task)	Planner/Preparer (Name/Z#/Date)		
558781 -01	Troy Calloway #186163 9/14/16		
TA: 53	Building: 0365	Room: 403	Additional Location Description: Equip Room

- **Remove** LOTO at gas
  - Check equipment and area
  - Verify valves are in correct position (should be OFF)
  - Make necessary notifications
  - LOTO devices/tags shall be removed in accordance with the requirements of P101-3, Chapter 1 – Lockout/Tagout for Safety.
  - Open valve(s)
  - Re-energize system
  - Notify MC and return locks
- **Return** system to normal operation

- **PERFORM** combustion analyzer test (if required for testing or requested by MC)
- **PERFORM** post-maintenance activities per **PMI Section 3**
- **FIRE** unit and verify proper operation
  - Qualified personnel to operate unit
  - Verify proper operation of boiler
  - Verify boiler starts and fires properly.
  - Verify boiler stays operational for extended amount of time
  - Verify proper operation of flame rod
  - Verify no gas leakage
  - Verify proper operation of gauges and valves
  - Verify that the support or auxiliary systems related to the component are functioning properly.

NOTE:	**Only Certified Personnel to Operate Equipment**

- **Start** unit, observe and check for proper operation
- **Ensure** all panels, doors and/or guards are re-installed and secured.
  - No additional controls

- **Clean** the work area and dispose of all work generated debris and remove any barricades.
  - Dispose of debris in accordance with LANL waste generation
  - Coordinate disposal of chemicals, oils and/or lubes with Area Waste Coordinator
  - **BRETT CUMMINS: 5-2876 or 412-9996**

- **CONTACT the MC and inform them the work is completed.**
- **Complete** all the required documentation and return the Master Work Package to the Area Work Control Office.

Los Alamos NATIONAL LABORATORY

Facilities Maintenance IWD – (Facility Maintenance Activity Specific Information)

Revision #	Activity/Task Title:		
-0-	53 0365 BHW-11 FIRESIDE / WATERSIDE		
Work Document #: (WO # / Task)	Planner/Preparer (Name/Z#/Date)		
558781 -01	Troy Calloway #186163 9/14/16		
TA: 53	Building: 0365	Room: 403	Additional Location Description: Equip Room

***Insert Rows above** for additional Tasks/Steps or attach pages to clearly communicate ESH&Q/S&S hazards and associated controls.*	The RLM, and FOD or FOD Representative (if required or recommended by RLM, e.g. high hazard) approval indicates IWM has been applied appropriately, work is authorized, workers are qualified, work will be performed in accordance with ESH&Q/S&S requirements and the IWD, and facility safety basis, aggregate hazards, and collocated hazards were appropriately included in the hazard analysis and acknowledges completion of a peer review.	**RLM** (Signature/Z#/Date) **Required** 112529 10/21/16 **FOD or Representative** (Signature/Z#/Date) **If Required or Recommended by RLM** 112077 10/21/16 **SME Review** (Signature/Z#/Date) **If Required** N/A **ESO Review** (Signature/Z#/Date) **If Required** N/A

IWD Type		
☒ Moderate-Hazard ☐ High-Hazard/Complex ☐ Standing IWD	Date when RLM re-approval is required: 11/1/16 Other Conditions for Re- Approval: Scope Changes or New Hazard (Print) Name of Primary PIC: Mark Ramirez Name of Alternate PIC: Dennis Serna Name of Alternate PIC: Ralph Padilla	Classification review completed, if required. N/A Reviewer Signature/Z#/Date

Facility: F10 Unit: 550440 Proj:
Task Title: 550440: HW BOILER FS/WS (A) PM

W/O Type: PM W/O Group: RLUOB PM Task Priority: 4
Planner : 234905 OLSON R M
W/O Title: 550440: HW BOILER (A) FS/WS PM
Written To: 550440 HOT WATER BOILERS
Task Dspln: F Due Date: 09/30/2016

Hazard: MODERATE IWD Reqmt: STANDING

Los Alamos NATIONAL LABORATORY EST. 1943

Work Order Task

00556608 01

MASTER

Date: 07/18/2016
Page: 1

Work Order Task Written To

Facility :	**F10**	**Unit** :	**550440**	**Op Sys** :	**HW**
Room :		**Area** :		**Sys/Cls**:	**HW**
Equipment :		**Component**:			
Location :					
Job Type :	**PM**				
Tag 1 :		Tag 2 :			
Work Item :	CUB BOILERS	Ops Review Reqd:	N		

Authorization

Start Permission : [signature] Start Date: 9/21/16
Complete Notice : Complete Date: 9.28.16

NOTE:

*** Refer to attached Form 2101 - Non-Tenant Activity Form - or Form 2102- Tenant Activity Form - for a description of site specific training or escort and access requirements.**

Work Order Task Instructions

ML4:
CRAFT: Pipefitters
*
Perform Annual Boiler PM in accordance with O&M Criterion 403 and PMI 403-A Boiler Inspection and Testing.
*
Perform work by completing the following Checklists:
PMI Checklist 403-A.002 Hot Water Boilers Water Treatment
PMI Checklist 403-A.006 Hot Water Boilers Annual FS/WS Inspection & Maint.
.
Calibrated tool required (✓) yes ( ) No If yes, fill in below:
File No:
Expiration Date:
Date Checked Out:

Facility: F10 Unit: 550440 Proj:
Task Title: 550440: HW BOILER FS/WS (A) PM

W/O Type: PM W/O Group: RLUOB PM Task Priority: 4
Planner : 234905 OLSON R M
W/O Title: 550440: HW BOILER (A) FS/WS PM
Written To: 550440 HOT WATER BOILERS
Task Dspln: F Due Date: 09/30/2016

Hazard: MODERATE IWD Reqmt: STANDING

Los Alamos NATIONAL LABORATORY EST. 1943

Work Order Task

00556608 01

MASTER

Date: 07/18/2016
Page: 2

QC Requirements/Comments

Rework Reason/Cause

		(Y/N)
CDSG	CUSTOMER DESIGN	
IMCW	IMPROPER CONSTRUCTION/WORKMANSHIP	
IMDN	IMPROPER DESIGN	
PDMS	PARTS/MATERIAL DID NOT MEET SPECIFICATIONS	
WR	WARRANTY REWORK/REPAIR	

Date: Hours: Crew: Shift:
Comments:

Rework/Approval

Deficiency Tag No.: Loc: Tag Removed:
ReWork Job : N Comments:

Trouble Found/Work Performed

SWD

Continued on Additional Sheets? : ____

Work Delay Reason

					(Y/N)
A	ACCESS	Date:	Hours:	Crew:	Shift:
EQPT	EQUIPMENT	Date:	Hours:	Crew:	Shift:
MISC	MISCELLANEOUS	Date:	Hours:	Crew:	Shift:

Facility: F10 Unit: 550440 Proj:
Task Title: 550440: HW BOILER FS/WS (A) PM

W/O Type: PM W/O Group: RLUOB PM Task Priority: 4
Planner : 234905 OLSON R M
W/O Title: 550440: HW BOILER (A) FS/WS PM
Written To: 550440 HOT WATER BOILERS
Task Dspln: F Due Date: 09/30/2016

Hazard: MODERATE IWD Reqmt: STANDING

Los Alamos NATIONAL LABORATORY EST. 1943

Work Order Task

00556608 01

MASTER

Date: 07/18/2016
Page: 3

OPS	OPERATIONS						
	Date:		Hours:		Crew:	Shift:	
P	POOR PLANNING						
	Date:		Hours:		Crew:	Shift:	
S	SAFETY						
	Date:		Hours:		Crew:	Shift:	
SCH	SCHEDULING						
	Date:		Hours:		Crew:	Shift:	
T	TRAVEL						
	Date:		Hours:		Crew:	Shift:	
W	WEATHER						
	Date:		Hours:		Crew:	Shift:	

Comments:

Major Failure/Action Taken

Major Failure :
Deficiency Tag Loc:
Deficiency Tag No.:
Action Taken :
Removed (Y/N):
Limited Cond Operation:

Work Completion Signatures

Name	Function/Dept.	Date
	BOILERMAN/LEC-CS	9/23/16
	BOILERMAN/LEC-CS	9/23/16
	SUP/LEC	9-26-16

Comments:
(rework?)

Facility: F10 Unit: 550440 Proj:
Task Title: 550440: HW BOILER FS/WS (A) PM

W/O Type: PM W/O Group: RLUOB PM Task Priority: 4
Planner : 234905 OLSON R M
W/O Title: 550440: HW BOILER (A) FS/WS PM
Written To: 550440 HOT WATER BOILERS
Task Dspln: F Due Date: 09/30/2016

Hazard: MODERATE IWD Reqmt: STANDING

Los Alamos NATIONAL LABORATORY EST. 1943

Work Order Task

00556608 01

MASTER

Date: 07/18/2016
Page: 4

Equipment List Exceptions

Equip List	Rev	Equip List Description
CUB-BOILER	000	550440: CUB BOILERS

Fac	Unit	Op Sys	Division	Area	System	Class
F10	550440	HW	U209		HW	ML4

Equipment: BOILER BHW-01 Ok Complete
Name : BOILER 1
Equip Tag:
Loc Desc : U209
Exception Reason:

Fac	Unit	Op Sys	Division	Area	System	Class
F10	550440	HW	U209		HW	ML4

Equipment: BOILER BHW-02 Ok Complete
Name : BOILER 2
Equip Tag:
Loc Desc : U209
Exception Reason:

Fac	Unit	Op Sys	Division	Area	System	Class
F10	550440	HW	U209		HW	ML4

Equipment: BOILER BHW-03 Ok Complete
Name : BOILER 3
Equip Tag:
Loc Desc : U209
Exception Reason:

Cost Center: P2200A Activity : 640CL000 User Def:
Percentage : 100.000 Acct No : KGRB00 1G550440

Facility: F10 Unit: 550440 Proj:
Task Title: 550440: HW BOILER FS/WS (A) PM

W/O Type: PM W/O Group: RLUOB PM Task Priority: 4
Planner : 234905 OLSON R M
W/O Title: 550440: HW BOILER (A) FS/WS PM
Written To: 550440 HOT WATER BOILERS
Task Dspln: F Due Date: 09/30/2016

Hazard: MODERATE IWD Reqmt: STANDING

Los Alamos NATIONAL LABORATORY EST. 1943

Work Order Task

00556608 01

MASTER

Date: 07/18/2016
Page: 5

Work Order Task Written To

Facility	: **F10**	**Unit**	: **550440**	**Op Sys**	: **HW**
Room	:	**Area**	:	**Sys/Cls**	: **HW**
Equipment	:	**Component**	:		
Location	:				
Job Type	: **PM**				

Tag 1 : Tag 2 :
Work Item : CUB BOILERS Ops Review Reqd: N

Print Request - Work Order Documents

Facility	Type/Subtype	Document Number	Sheet	Image Addr
LNL	PROC STD	403-A.002		
		HOT WATER BOILERS WATER TREATMENT		
LNL	PROC STD	403-A.006		
		HOT WATER BOILERS ANNUAL FIRESIDE/WATERSIDE		

References/Document Information

Type/Subtyp: PROC STD Number: 403-A.002 Sheet:
Title/Desc : HOT WATER BOILERS WATER TREATMENT Image: N
Type/Subtyp: PROC STD Number: 403-A.006 Sheet:
Title/Desc : HOT WATER BOILERS ANNUAL FIRESIDE/WATERSIDE Image: N

***** E N D O F R E P O R T *****

Los Alamos NATIONAL LABORATORY EST.1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**
Work Order No.: 556608-01	Equipment ID No.: BHW-1

Instructions: Enter the requested information. All items marked **S** or **Y** are satisfactory. Document all items marked **U**, **N**, or **N/A** in the Remarks section below, noting the step number and reason. Notify the foreman or supervisor of problems involving imminent danger.

TA: 55 Building: 440 Room: U209	
Date Inspected: 9/21/16	Inspectors: 301408

1.0 PRE-MAINTENANCE ACTIVITIES

NOTE Preoperational and pre-maintenance activities shall be conducted per the work order package, e.g., lockout/tagout, permits, special instructions, etc.

! WARNING If purging of gas lines will be required during this maintenance, ensure that the purging activity is addressed in the Integrated Work Document (IWD). The following must be addressed (see Master Specification 23 1123):

1. Purged fuel gases shall be directly vented to a safe location outdoors, away from personnel and ignition sources. This may be accomplished through permanent piping or temporary piping or hosing.
2. If it is not possible to vent purged gases outdoors, the following conditions must be met:
   a. Purging activity must be approved by the LANL Fire Marshal based on a documented justification detailing why outdoor venting is not possible and IWD.
   b. Gas concentration in the space to which the purge is vented shall be maintained at no more than 25% of the Lower Explosive Limit (LEL). For natural gas, the LEL is a concentration of 5% in air or 50,000 ppm. Therefore a maximum concentration of 12,500 ppm is allowed for natural gas. The concentration may be controlled by providing adequate ventilation or by limiting the amount of purge gas.
   c. Combustible gas detectors shall be used during the purging operation to monitor the gas concentration.
   d. Nonessential personnel shall be evacuated from the vicinity (including adjacent spaces) during the purging operation.
   e. Ignition sources in the purging space shall be controlled or eliminated.

NOTE All repair work, adjustments, or the replacement of parts shall be done in accordance with the manufacturer's procedures, specifications, recommendations, and instructions.

Remarks: OPENED up Back Burner door found boiler in bad to poor condition in Burner chamber. Soot is present to a point of real concern to boiler operation. Recommend clean out burner chamber with high pressure wash

Los Alamos NATIONAL LABORATORY EST.1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: 556608-01 Equipment ID No.: BHW. 1

1.1	Notify maintenance coordinator (MC) that work will be in progress on the boiler system.		Initials:

2.0 MAINTENANCE

NOTE These selected hot water boilers are mainly boilers with power burners that have refractory in front and rear flue doors or have heat extractors in the fire-tubes as are found in most one-pass boilers (Sellers). Hot water heating boilers with atmospheric burners generally require minimal fireside preventative maintenance. Contact the MSS-MP Boiler subject matter expert (SME) at 7-8550 with questions or concerns.

2.1	Lock and tag out electrical and all associated valves on boiler and shut off gas supply.		Initials:
2.2	Cool boiler, open air cock, and drain the boiler.		Initials:
2.3	Perform an internal and external inspection after thorough cleaning.	Circle one: (S) U N/A	Initials:
2.3.1	Check the fireside furnace and fire-tubes for any evidence of soot formation or corrosion.	Circle one: (S) U N/A	Initials:
2.3.2	Brush and vacuum furnace and fire-tubes if such conditions exist.		Initials:
2.3.3	Perform hydrostatic test based on the boiler's Maximum Allowable Working Pressure and/or facility potable water pressure as long as the potable water pressure is at least 30 psi over boiler operating pressure.	Circle one: (S) U N/A	Initials:
2.3.4	Note if any boiler tubes and/or fittings are leaking, and repair as required. For any major repairs (determined by the SME), request a work order for the repairs from the MC.		Initials:
2.3.5	On one-pass boilers (Sellers), check condition of all heat extractors.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: 556608-01 Equipment ID No.: BHW-1

2.3.6 Check refractory materials.	Circle one: S U N/A	Initials:
2.3.7 Replace if needed.		Initials:
2.4 Perform routine burner maintenance.		Initials:
2.4.1 Observe temperature and operating pressure and general conditions.	Circle one: S U N/A	Initials:
2.4.2 Fire and cycle the burner.		Initials:
2.5 Perform routine maintenance of circulating pump and expansion pump equipment.		Initials:
2.5.1 Observe condition of expansion tank.	Circle one: S U N/A	Initials:
2.5.2 Drain expansion tank if it is of a non-bladder type and refill to reestablish an air cushion.	Circle one: S U N/A	Initials:
2.5.3 Check the air pressure on the bladder-type expansion tanks.	Circle one: S U N/A	Initials:
2.5.4 Observe operation of circulating pumps.	Circle one: S U N/A	Initials:
2.5.5 Lubricate pump motors.		Initials:
2.6 Perform routine maintenance of entire combustion control equipment.		Initials:
2.6.1 Check gas/air linkages and moving parts (on power burners that modulate) for positioning, tightness, and binding.	Circle one: S U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST.1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 556608-01 Equipment ID No.: Bhw. 1

2.6.2	Adjust air/fuel mixture as needed.		Initials:
2.6.3	Test flame detection devices on boilers with flame scanners.	Circle one: (S) U N/A	Initials:
2.6.4	Remove the flame scanner with the burner firing.		Initials:
NOTE	The burner should shut off as a flame failure condition.		
2.6.5	Clean the flame scanner, reinstall and test programmer.		Initials:
2.6.6	Check for proper operation as boiler goes through a firing cycle and light-off.	Circle one: (S) U N/A	Initials:
2.6.7	Check all electrical control and circuitry.	Circle one: (S) U N/A	Initials:
2.6.8	Inspect for cracked mercury tubes, separation of mercury, cracked insulators (probe type), jumper tube conditions, loose connections, poor or deteriorated wiring, improperly used bypass switches, cutoff switches wired in parallel, shut-offs installed at improper levels, wedges behind mercury tubes.	Circle one: (S) U N/A	Initials:
2.6.9	Observe operation of forced draft fan motors on boilers with power burners and induced draft fan motors on horizontal breeching where applicable.	Circle one: (S) U N/A	Initials:
2.6.10	Lubricate fan motors where necessary.		Initials:
2.7	Perform combustion and draft tests.		Initials:
2.7.1	Visually inspect combustion.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: 556085-01 Equipment ID No.: Bldg. 1

NOTE Changes in flame shape, color, and sound are among early indicators of potential combustion-related problems. Changes may be due to changes in fuel pressure or gas/air linkage movement.

2.8 Perform safety relief valve(s) pop test.	Circle one: (S) U N/A	Initials:
2.8.1 Check pressure-reducing valve.	Circle one: (S) U N/A	Initials:
2.8.2 Replace the strainer in the valve if needed.		Initials:
2.9 Perform slow drain test of low-water cutoff.	Circle one: (S) U N/A	Initials:
2.10 Inspect gas piping for proper support and tightness.	Circle one: (S) U N/A	Initials:
2.10.1 Inspect fuel supply system and gas controls.	Circle one: (S) U N/A	Initials:
2.10.2 Leak check gas controls and associated gas piping with a gas detector or soap suds.	Circle one: (S) U N/A	Initials:
2.11 Inspect boiler room ventilation louvers and intake.	Circle one: (S) U N/A	Initials:
2.11.1 Listen for any unusual noises or conditions and correct as necessary.	Circle one: (S) U N/A	Initials:
2.11.2 Report any needed corrections to the MC for corrective maintenance.		Initials:
2.11.3 Check combustion air supply openings to ensure that they are not closed or stopped up.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: 356608-01 Equipment ID No.: BHW-1

2.11.4	Inspect conditions of stacks and rain caps.	Circle one: (S) U N/A	Initials:
2.11.5	Inspect flue door gaskets to ensure they are in good condition, and properly secured.	Circle one: (S) U N/A	Initials:
2.11.6	Replace if necessary.		Initials:

3.0 POST-MAINTENANCE ACTIVITIES

NOTE Post-maintenance activities shall be conducted in accordance with the work order package instructions (e.g., lockout/tagout, special instructions, etc.).

3.1	Close and secure front and rear flue doors.		Initials:
3.2	Hook up all associated piping and refill boiler.		Initials:
3.3	Fire up boiler and check for air, gas, and water leaks.	Circle one: (S) U N/A	Initials:
3.4	Check gas/air linkages and moving parts (on power burners that modulate) for positioning, tightness, and binding.	Circle one: (S) U N/A	Initials:
3.5	Check pilot burners and ignition equipment for proper condition and adjustment.	Circle one: (S) U N/A	Initials:
3.6	Visually check burner for proper combustion.	Circle one: (S) U N/A	Initials:
3.7	Record all mechanical maintenance data, testing data, and other notable items.		Initials:

NOTE Combustion analysis is verifiable only with a flue gas analyzer and is performed mainly on boilers with power burners.

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: 556008-01 Equipment ID No.: BHW-1

3.8	Test water for proper chemical levels. Test and treat water as defined on Datasheet 403-A.002.	Circle one: (S) U N/A	Initials:
3.9	Record all mechanical maintenance data, testing data, and other notable items.		Initials:
3.10	Notify MC that work on the boiler system is complete.		Initials:

Name of Craft Worker: Joe Vigil Z Number: 30408

Signature: [signature] Date: 9/21/16

Name of Craft Worker: _____ Z Number: _____

Signature: _____ Date: ___/___/___

Foreman Verification: DENNIS BRAC Z Number: 197845

Signature: [signature] Date: 9/23/16

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.002: Hot Water Boiler Water Treatment**
Work Order No.: _____	Equipment ID No.: _____

Instructions: Enter the requested information. All items marked **S** or **Y** are satisfactory. Document all items marked **U**, **N**, or **N/A** in the Remarks section below, noting the step number and reason. Notify the foreman or supervisor of problems involving imminent danger.

TA: _____ Building: _____ Room: _____

Date Inspected: _____/_____/_____ Inspectors: _____

1.0 PRE-MAINTENANCE ACTIVITIES

NOTE Preoperational and pre-maintenance activities shall be conducted per the work order package, e.g., lockout/tagout, permits, special instructions, etc.

1.1	Notify maintenance coordinator (MC) that work will be in progress on the boiler system.		Initials: _____

2.0 MAINTENANCE

2.1	Obtain a water sample from the boiler drain or an accessible point on the hot water loop system.		Initials: _____
2.2	Check sample water for boiler water treatment chemical concentration and pH. Use orthophosphate ($O\text{-}PO_4$) field test kit. Boiler water treatment chemical concentration should be 8 to 10 ppm. PO_4 _____ pH_____ PO_4 _____ pH_____	Circle one: **S U N/A**	Initials: _____
2.3	If required, add Garrett-Callahan Formula 1015L or equivalent to the pot feeder.		Initials: _____

NOTE Not all boiler systems have pot feeders.

2.4	If the boiler does not have a pot feeder, isolate and drain the boiler and add boiler water treatment chemical directly into the boiler using the vent or other accessible fitting.		Initials: _____

Remarks: _____

Los Alamos NATIONAL LABORATORY EST.1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.002: Hot Water Boiler Water Treatment**

Work Order No.: _____ Equipment ID No.: _____

2.5 After addition of boiler water treatment chemical, circulate the system for a minimum of 72 hours. Boilers without pot feeders must be refilled before recirculation. Obtain a sample of the boiler water and use the orthophosphate (O PO_4) kit to test the sample for PO_4 and pH. Boiler water treatment chemical concentration should be 8 to 10 ppm. PO_4 _____ pH_____ PO_4 _____ pH_____	Circle one: **S U N/A**	Initials: _____

3.0 POST-MAINTENANCE ACTIVITIES

NOTE Post-maintenance activities shall be conducted in accordance with the work order package instructions (e.g., lockout/tagout, special instructions, etc.).

3.1 Notify MC that work on the boiler system is complete.	Initials: _____

Name of Craft Worker: _____ Z Number: _____

Signature: _____ Date: _____/_____/_____

Name of Craft Worker: _____ Z Number: _____

Signature: _____ Date: _____/_____/_____

Foreman Verification: _____ Z Number: _____

Signature: _____ Date: _____/_____/_____

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: 556608-01 Equipment ID No.: BHW-2

Instructions: Enter the requested information. All items marked **S** or **Y** are satisfactory. Document all items marked **U**, **N**, or **N/A** in the Remarks section below, noting the step number and reason. Notify the foreman or supervisor of problems involving imminent danger.

TA: 55 Building: 440 Room: U209

Date Inspected: 9/22/16 Inspectors: D. Gund

1.0 PRE-MAINTENANCE ACTIVITIES

NOTE Preoperational and pre-maintenance activities shall be conducted per the work order package, e.g., lockout/tagout, permits, special instructions, etc.

! WARNING If purging of gas lines will be required during this maintenance, ensure that the purging activity is addressed in the Integrated Work Document (IWD). The following must be addressed (see Master Specification 23 1123):

1. Purged fuel gases shall be directly vented to a safe location outdoors, away from personnel and ignition sources. This may be accomplished through permanent piping or temporary piping or hosing.
2. If it is not possible to vent purged gases outdoors, the following conditions must be met:
   a. Purging activity must be approved by the LANL Fire Marshal based on a documented justification detailing why outdoor venting is not possible and IWD.
   b. Gas concentration in the space to which the purge is vented shall be maintained at no more than 25% of the Lower Explosive Limit (LEL). For natural gas, the LEL is a concentration of 5% in air or 50,000 ppm. Therefore a maximum concentration of 12,500 ppm is allowed for natural gas. The concentration may be controlled by providing adequate ventilation or by limiting the amount of purge gas.
   c. Combustible gas detectors shall be used during the purging operation to monitor the gas concentration.
   d. Nonessential personnel shall be evacuated from the vicinity (including adjacent spaces) during the purging operation.
   e. Ignition sources in the purging space shall be controlled or eliminated.

NOTE All repair work, adjustments, or the replacement of parts shall be done in accordance with the manufacturer's procedures, specifications, recommendations, and instructions.

Remarks:

Los Alamos NATIONAL LABORATORY EST.1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 556608-61 Equipment ID No.: BHW-2

1.1	Notify maintenance coordinator (MC) that work will be in progress on the boiler system.		Initials:

2.0 MAINTENANCE

NOTE These selected hot water boilers are mainly boilers with power burners that have refractory in front and rear flue doors or have heat extractors in the fire-tubes as are found in most one-pass boilers (Sellers). Hot water heating boilers with atmospheric burners generally require minimal fireside preventative maintenance. Contact the MSS-MP Boiler subject matter expert (SME) at 7-8550 with questions or concerns.

2.1	Lock and tag out electrical and all associated valves on boiler and shut off gas supply.		Initials:
2.2	Cool boiler, open air cock, and drain the boiler.		Initials:
2.3	Perform an internal and external inspection after thorough cleaning.	Circle one: (S) U N/A	Initials:
2.3.1	Check the fireside furnace and fire-tubes for any evidence of soot formation or corrosion.	Circle one: (S) U N/A	Initials:
2.3.2	Brush and vacuum furnace and fire-tubes if such conditions exist.		Initials:
2.3.3	Perform hydrostatic test based on the boiler's Maximum Allowable Working Pressure and/or facility potable water pressure as long as the potable water pressure is at least 30 psi over boiler operating pressure.	Circle one: (S) U N/A	Initials:
2.3.4	Note if any boiler tubes and/or fittings are leaking, and repair as required. For any major repairs (determined by the SME), request a work order for the repairs from the MC.		Initials:
2.3.5	On one-pass boilers (Sellers), check condition of all heat extractors.	Circle one: S U (N/A)	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 556608-01 Equipment ID No.: B-HW-2

2.3.6 Check refractory materials.	Circle one: (S) U N/A	Initials:
2.3.7 Replace if needed.		Initials:
2.4 Perform routine burner maintenance.		Initials:
2.4.1 Observe temperature and operating pressure and general conditions.	Circle one: (S) U N/A	Initials:
2.4.2 Fire and cycle the burner.		Initials:
2.5 Perform routine maintenance of circulating pump and expansion pump equipment.		Initials:
2.5.1 Observe condition of expansion tank.	Circle one: (S) U N/A	Initials:
2.5.2 Drain expansion tank if it is of a non-bladder type and refill to reestablish an air cushion.	Circle one: S U (N/A)	Initials:
2.5.3 Check the air pressure on the bladder-type expansion tanks.	Circle one: (S) U N/A	Initials:
2.5.4 Observe operation of circulating pumps.	Circle one: (S) U N/A	Initials:
2.5.5 Lubricate pump motors.		Initials:
2.6 Perform routine maintenance of entire combustion control equipment.		Initials:
2.6.1 Check gas/air linkages and moving parts (on power burners that modulate) for positioning, tightness, and binding.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 556608-01 Equipment ID No.: BHW-2

2.6.2	Adjust air/fuel mixture as needed.		Initials:
2.6.3	Test flame detection devices on boilers with flame scanners.	Circle one: (S) U N/A	Initials:
2.6.4	Remove the flame scanner with the burner firing.		Initials:
NOTE	The burner should shut off as a flame failure condition.		
2.6.5	Clean the flame scanner, reinstall and test programmer.		Initials:
2.6.6	Check for proper operation as boiler goes through a firing cycle and light-off.	Circle one: (S) U N/A	Initials:
2.6.7	Check all electrical control and circuitry.	Circle one: (S) U N/A	Initials:
2.6.8	Inspect for cracked mercury tubes, separation of mercury, cracked insulators (probe type), jumper tube conditions, loose connections, poor or deteriorated wiring, improperly used bypass switches, cutoff switches wired in parallel, shut-offs installed at improper levels, wedges behind mercury tubes.	Circle one: (S) U N/A	Initials:
2.6.9	Observe operation of forced draft fan motors on boilers with power burners and induced draft fan motors on horizontal breeching where applicable.	Circle one: (S) U N/A	Initials:
2.6.10	Lubricate fan motors where necessary.		Initials:
2.7	Perform combustion and draft tests.		Initials:
2.7.1	Visually inspect combustion.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: 556608-01 Equipment ID No.: BHW-2

NOTE Changes in flame shape, color, and sound are among early indicators of potential combustion-related problems. Changes may be due to changes in fuel pressure or gas/air linkage movement.

2.8 Perform safety relief valve(s) pop test.	Circle one: (S) U N/A	Initials:
2.8.1 Check pressure-reducing valve.	Circle one: (S) U N/A	Initials:
2.8.2 Replace the strainer in the valve if needed.		Initials:
2.9 Perform slow drain test of low-water cutoff.	Circle one: (S) U N/A	Initials:
2.10 Inspect gas piping for proper support and tightness.	Circle one: (S) U N/A	Initials:
2.10.1 Inspect fuel supply system and gas controls.	Circle one: (S) U N/A	Initials:
2.10.2 Leak check gas controls and associated gas piping with a gas detector or soap suds.	Circle one: (S) U N/A	Initials:
2.11 Inspect boiler room ventilation louvers and intake.	Circle one: (S) U N/A	Initials:
2.11.1 Listen for any unusual noises or conditions and correct as necessary.	Circle one: (S) U N/A	Initials:
2.11.2 Report any needed corrections to the MC for corrective maintenance.		Initials:
2.11.3 Check combustion air supply openings to ensure that they are not closed or stopped up.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 556608-01 Equipment ID No.: BHW-2

2.11.4 Inspect conditions of stacks and rain caps.	Circle one: (S) U N/A	Initials:
2.11.5 Inspect flue door gaskets to ensure they are in good condition, and properly secured.	Circle one: (S) U N/A	Initials:
2.11.6 Replace if necessary.		Initials:

3.0 POST-MAINTENANCE ACTIVITIES

NOTE Post-maintenance activities shall be conducted in accordance with the work order package instructions (e.g., lockout/tagout, special instructions, etc.).

3.1 Close and secure front and rear flue doors.		Initials:
3.2 Hook up all associated piping and refill boiler.		Initials:
3.3 Fire up boiler and check for air, gas, and water leaks.	Circle one: (S) U N/A	Initials:
3.4 Check gas/air linkages and moving parts (on power burners that modulate) for positioning, tightness, and binding.	Circle one: (S) U N/A	Initials:
3.5 Check pilot burners and ignition equipment for proper condition and adjustment.	Circle one: (S) U N/A	Initials:
3.6 Visually check burner for proper combustion.	Circle one: (S) U N/A	Initials:
3.7 Record all mechanical maintenance data, testing data, and other notable items.		Initials:

NOTE Combustion analysis is verifiable only with a flue gas analyzer and is performed mainly on boilers with power burners.

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: 556608-01 Equipment ID No.: BHW-2

3.8	Test water for proper chemical levels. Test and treat water as defined on Datasheet 403-A.002.	Circle one: (S) U N/A	Initials:
3.9	Record all mechanical maintenance data, testing data, and other notable items.		Initials:
3.10	Notify MC that work on the boiler system is complete.		Initials:

Name of Craft Worker: DENNIS BERARD Z Number: 197845

Signature: Date: 9/23/16

Name of Craft Worker: Z Number: 30408

Signature: Date: 9/22/16

Foreman Verification: DENNIS BERARD Z Number: 197845

Signature: Date: 9/23/16

Remarks:

Los Alamos NATIONAL LABORATORY EST. 1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.002: Hot Water Boiler Water Treatment**

Work Order No.: 556608-01 Equipment ID No.: BHW-3

Instructions: Enter the requested information. All items marked **S** or **Y** are satisfactory. Document all items marked **U**, **N**, or **N/A** in the Remarks section below, noting the step number and reason. Notify the foreman or supervisor of problems involving imminent danger.

TA: 55 Building: 440 Room: U209

Date Inspected: 9/23/16 Inspectors: Q-1.0

1.0 PRE-MAINTENANCE ACTIVITIES

NOTE Preoperational and pre-maintenance activities shall be conducted per the work order package, e.g., lockout/tagout, permits, special instructions, etc.

1.1	Notify maintenance coordinator (MC) that work will be in progress on the boiler system.		Initials:

2.0 MAINTENANCE

2.1	Obtain a water sample from the boiler drain or an accessible point on the hot water loop system.		Initials:
2.2	Check sample water for boiler water treatment chemical concentration and pH. Use orthophosphate ($O\text{-}PO_4$) field test kit. Boiler water treatment chemical concentration should be 8 to 10 ppm. PO_4 7.1 pH 8.0 PO_4 _____ pH _____	Circle one: S (U) N/A	Initials:
2.3	If required, add Garrett-Callahan Formula 1015L or equivalent to the pot feeder.		Initials:

NOTE Not all boiler systems have pot feeders.

2.4	If the boiler does not have a pot feeder, isolate and drain the boiler and add boiler water treatment chemical directly into the boiler using the vent or other accessible fitting.		Initials:

Remarks: ADDED 1½ GALLONS OF 1015L NEED TO RETEST IN 72 HRS.

Los Alamos NATIONAL LABORATORY EST.1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.002: Hot Water Boiler Water Treatment**

Work Order No.: _____ Equipment ID No.: _____

2.5	After addition of boiler water treatment chemical, circulate the system for a minimum of 72 hours. Boilers without pot feeders must be refilled before recirculation. Obtain a sample of the boiler water and use the orthophosphate (O PO_4) kit to test the sample for PO_4 and pH. Boiler water treatment chemical concentration should be 8 to 10 ppm. PO_4 _____ pH_____ PO_4 _____ pH_____	Circle one: **S U N/A**	Initials: _____

3.0 POST-MAINTENANCE ACTIVITIES

NOTE Post-maintenance activities shall be conducted in accordance with the work order package instructions (e.g., lockout/tagout, special instructions, etc.).

3.1	Notify MC that work on the boiler system is complete.	Initials: _____

Name of Craft Worker: DENNIS BERNAL Z Number: 197845

Signature: _____ Date: 9/23/16

Name of Craft Worker: Jeff Vidgen Z Number: 30145

Signature: _____ Date: 9/23/16

Foreman Verification: _____ Z Number: _____

Signature: _____ Date: ____/____/____

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: 556608-01 Equipment ID No.: BHW-3

Instructions: Enter the requested information. All items marked **S** or **Y** are satisfactory. Document all items marked **U**, **N**, or **N/A** in the Remarks section below, noting the step number and reason. Notify the foreman or supervisor of problems involving imminent danger.

TA: 55 Building: 440 Room: 1205

Date Inspected: 9/23/16 Inspectors:

1.0 PRE-MAINTENANCE ACTIVITIES

NOTE Preoperational and pre-maintenance activities shall be conducted per the work order package, e.g., lockout/tagout, permits, special instructions, etc.

! WARNING If purging of gas lines will be required during this maintenance, ensure that the purging activity is addressed in the Integrated Work Document (IWD). The following must be addressed (see Master Specification 23 1123):

1. Purged fuel gases shall be directly vented to a safe location outdoors, away from personnel and ignition sources. This may be accomplished through permanent piping or temporary piping or hosing.
2. If it is not possible to vent purged gases outdoors, the following conditions must be met:
   a. Purging activity must be approved by the LANL Fire Marshal based on a documented justification detailing why outdoor venting is not possible and IWD.
   b. Gas concentration in the space to which the purge is vented shall be maintained at no more than 25% of the Lower Explosive Limit (LEL). For natural gas, the LEL is a concentration of 5% in air or 50,000 ppm. Therefore a maximum concentration of 12,500 ppm is allowed for natural gas. The concentration may be controlled by providing adequate ventilation or by limiting the amount of purge gas.
   c. Combustible gas detectors shall be used during the purging operation to monitor the gas concentration.
   d. Nonessential personnel shall be evacuated from the vicinity (including adjacent spaces) during the purging operation.
   e. Ignition sources in the purging space shall be controlled or eliminated.

NOTE All repair work, adjustments, or the replacement of parts shall be done in accordance with the manufacturer's procedures, specifications, recommendations, and instructions.

Remarks:

Los Alamos NATIONAL LABORATORY EST. 1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: 556608-01 Equipment ID No.: BHW-3

1.1	Notify maintenance coordinator (MC) that work will be in progress on the boiler system.		Initials:

2.0 MAINTENANCE

NOTE These selected hot water boilers are mainly boilers with power burners that have refractory in front and rear flue doors or have heat extractors in the fire-tubes as are found in most one-pass boilers (Sellers). Hot water heating boilers with atmospheric burners generally require minimal fireside preventative maintenance. Contact the MSS-MP Boiler subject matter expert (SME) at 7-8550 with questions or concerns.

2.1	Lock and tag out electrical and all associated valves on boiler and shut off gas supply.		Initials:
2.2	Cool boiler, open air cock, and drain the boiler.		Initials:
2.3	Perform an internal and external inspection after thorough cleaning.	Circle one: (S) U N/A	Initials:
2.3.1	Check the fireside furnace and fire-tubes for any evidence of soot formation or corrosion.	Circle one: (S) U N/A	Initials:
2.3.2	Brush and vacuum furnace and fire-tubes if such conditions exist.		Initials:
2.3.3	Perform hydrostatic test based on the boiler's Maximum Allowable Working Pressure and/or facility potable water pressure as long as the potable water pressure is at least 30 psi over boiler operating pressure.	Circle one: (S) U N/A	Initials:
2.3.4	Note if any boiler tubes and/or fittings are leaking, and repair as required. For any major repairs (determined by the SME), request a work order for the repairs from the MC.		Initials:
2.3.5	On one-pass boilers (Sellers), check condition of all heat extractors.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: 556608-01 Equipment ID No.: BHW-3

2.3.6 Check refractory materials.	Circle one: (S) U N/A	Initials:
2.3.7 Replace if needed.		Initials:
2.4 Perform routine burner maintenance.		Initials:
2.4.1 Observe temperature and operating pressure and general conditions.	Circle one: (S) U N/A	Initials:
2.4.2 Fire and cycle the burner.		Initials:
2.5 Perform routine maintenance of circulating pump and expansion pump equipment.		Initials:
2.5.1 Observe condition of expansion tank.	Circle one: (S) U N/A	Initials:
2.5.2 Drain expansion tank if it is of a non-bladder type and refill to reestablish an air cushion.	Circle one: S U (N/A)	Initials:
2.5.3 Check the air pressure on the bladder-type expansion tanks.	Circle one: (S) U N/A	Initials:
2.5.4 Observe operation of circulating pumps.	Circle one: (S) U N/A	Initials:
2.5.5 Lubricate pump motors.		Initials:
2.6 Perform routine maintenance of entire combustion control equipment.		Initials:
2.6.1 Check gas/air linkages and moving parts (on power burners that modulate) for positioning, tightness, and binding.	Circle one: (S) U N/A	Initials:

Remarks: MODE MOTOR STICKS IN HIGH FIRE DROPS INTO LOW PURGE WHEN BOILER TURNS ON.

Los Alamos NATIONAL LABORATORY EST. 1943

Preventive Maintenance Instruction

Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance

403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance

Work Order No.: 556608-01 Equipment ID No.: BHW-3

2.6.2	Adjust air/fuel mixture as needed.		Initials: AP
2.6.3	Test flame detection devices on boilers with flame scanners.	Circle one: S U N/A	Initials: AP
2.6.4	Remove the flame scanner with the burner firing.		Initials: AP
NOTE	The burner should shut off as a flame failure condition.		
2.6.5	Clean the flame scanner, reinstall and test programmer.		Initials: AP
2.6.6	Check for proper operation as boiler goes through a firing cycle and light-off.	Circle one: S U N/A	Initials: AP
2.6.7	Check all electrical control and circuitry.	Circle one: S U N/A	Initials: CT
2.6.8	Inspect for cracked mercury tubes, separation of mercury, cracked insulators (probe type), jumper tube conditions, loose connections, poor or deteriorated wiring, improperly used bypass switches, cutoff switches wired in parallel, shut-offs installed at improper levels, wedges behind mercury tubes.	Circle one: S U N/A	Initials: CT
2.6.9	Observe operation of forced draft fan motors on boilers with power burners and induced draft fan motors on horizontal breeching where applicable.	Circle one: S U N/A	Initials: CT
2.6.10	Lubricate fan motors where necessary.		Initials: CT
2.7	Perform combustion and draft tests.		Initials: CT
2.7.1	Visually inspect combustion.	Circle one: S U N/A	Initials: CT

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: 556608-01 Equipment ID No.: BHW-3

NOTE Changes in flame shape, color, and sound are among early indicators of potential combustion-related problems. Changes may be due to changes in fuel pressure or gas/air linkage movement.

2.8 Perform safety relief valve(s) pop test.	Circle one: (S) U N/A	Initials:
2.8.1 Check pressure-reducing valve.	Circle one: (S) U N/A	Initials:
2.8.2 Replace the strainer in the valve if needed.		Initials:
2.9 Perform slow drain test of low-water cutoff.	Circle one: (S) U N/A	Initials:
2.10 Inspect gas piping for proper support and tightness.	Circle one: (S) U N/A	Initials:
2.10.1 Inspect fuel supply system and gas controls.	Circle one: (S) U N/A	Initials:
2.10.2 Leak check gas controls and associated gas piping with a gas detector or soap suds.	Circle one: (S) U N/A	Initials:
2.11 Inspect boiler room ventilation louvers and intake.	Circle one: (S) U N/A	Initials:
2.11.1 Listen for any unusual noises or conditions and correct as necessary.	Circle one: (S) U N/A	Initials:
2.11.2 Report any needed corrections to the MC for corrective maintenance.		Initials:
2.11.3 Check combustion air supply openings to ensure that they are not closed or stopped up.	Circle one: (S) U N/A	Initials:

Remarks: _____

Los Alamos NATIONAL LABORATORY EST.1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: 556608-01 Equipment ID No.: BHW-3

2.11.4	Inspect conditions of stacks and rain caps.	Circle one: (S) U N/A	Initials:
2.11.5	Inspect flue door gaskets to ensure they are in good condition, and properly secured.	Circle one: (S) U N/A	Initials:
2.11.6	Replace if necessary.		Initials:

3.0 POST-MAINTENANCE ACTIVITIES

NOTE Post-maintenance activities shall be conducted in accordance with the work order package instructions (e.g., lockout/tagout, special instructions, etc.).

3.1	Close and secure front and rear flue doors.		Initials:
3.2	Hook up all associated piping and refill boiler.		Initials:
3.3	Fire up boiler and check for air, gas, and water leaks.	Circle one: (S) U N/A	Initials:
3.4	Check gas/air linkages and moving parts (on power burners that modulate) for positioning, tightness, and binding.	Circle one: (S) U N/A	Initials:
3.5	Check pilot burners and ignition equipment for proper condition and adjustment.	Circle one: (S) U N/A	Initials:
3.6	Visually check burner for proper combustion.	Circle one: (S) U N/A	Initials:
3.7	Record all mechanical maintenance data, testing data, and other notable items.		Initials:

NOTE Combustion analysis is verifiable only with a flue gas analyzer and is performed mainly on boilers with power burners.

Remarks: _____

Los Alamos NATIONAL LABORATORY EST. 1943	*Preventive Maintenance Instruction* Low- and High-Pressure Steam Boiler and Low-Temperature Water Heating Boiler Inspection, Testing, and Maintenance **403-A.006: Hot Water Boiler Yearly Fireside/Waterside Inspection and Maintenance**

Work Order No.: 556608-01 Equipment ID No.: BHW-3

3.8	Test water for proper chemical levels. Test and treat water as defined on Datasheet 403-A.002.	Circle one: S U N/A	Initials:
3.9	Record all mechanical maintenance data, testing data, and other notable items.		Initials:
3.10	Notify MC that work on the boiler system is complete.		Initials:

Name of Craft Worker: DENNIS BERNAL Z Number: 197845

Signature: _____ Date: 9/23/16

Name of Craft Worker: _____ Z Number: 301408

Signature: _____ Date: 9/23/16

Foreman Verification: DENNIS BERNAL Z Number: 197845

Signature: _____ Date: 9/23/16

Remarks: _____