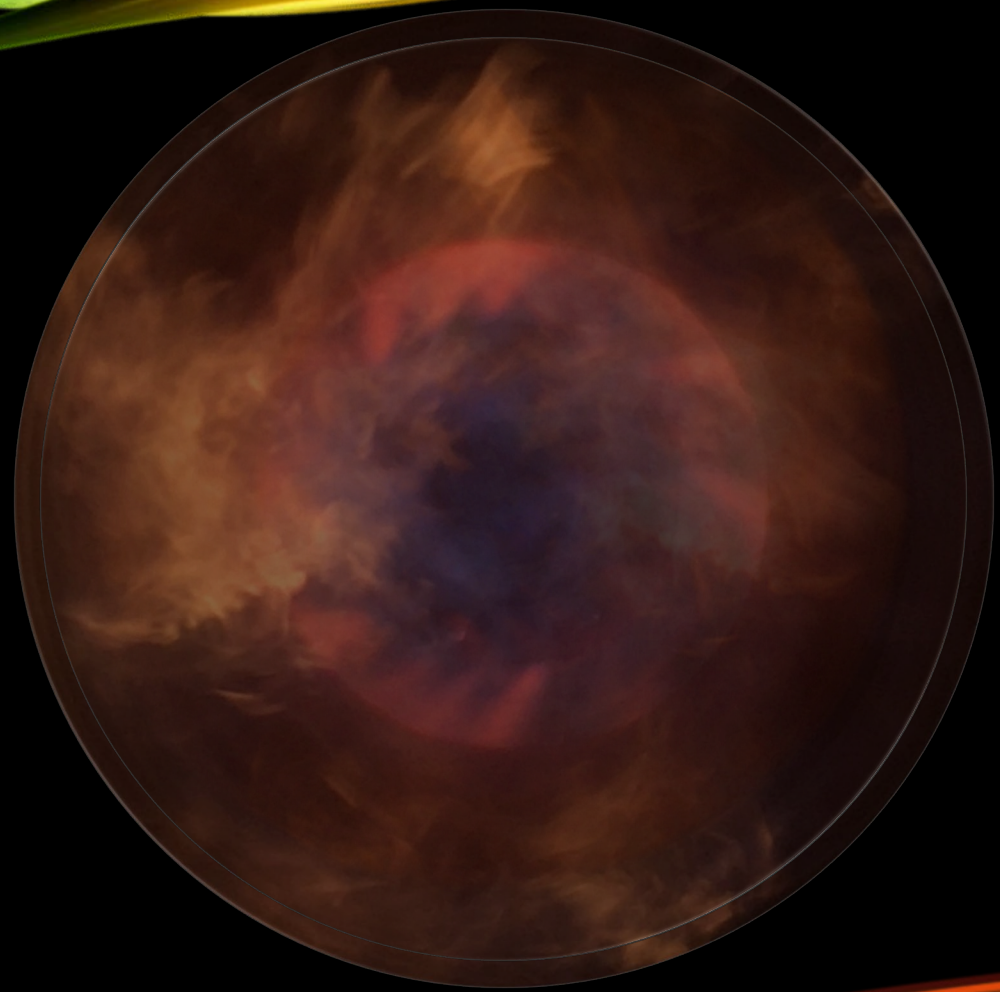
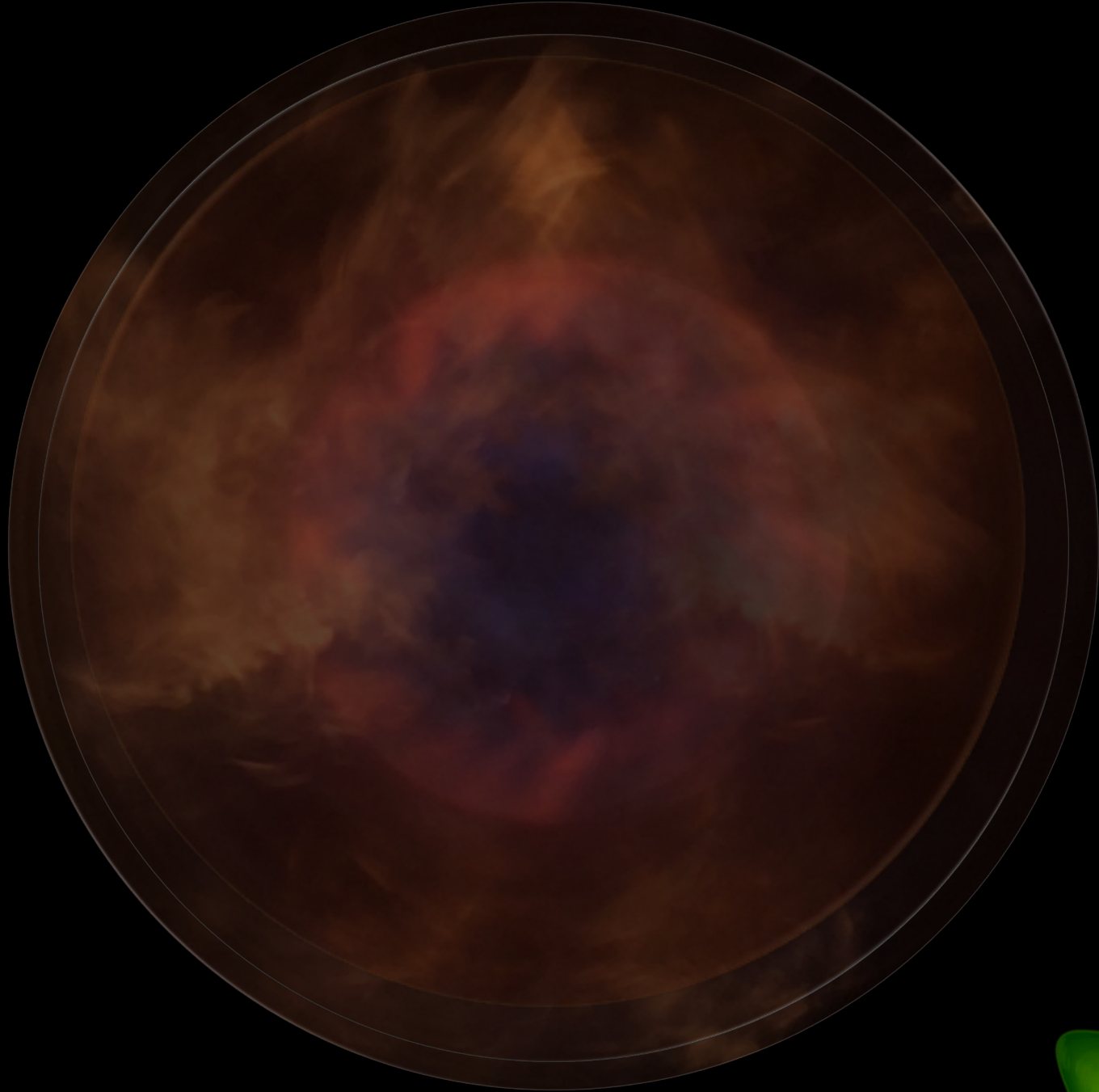


“WHAT IF...”





In a perfect world

- Boilers never alarm
- Controls never fail
- No PMs
- No catastrophic boiler failures
- No discrepancies noted
- And.....
- We probably would not be here today.

GOAL

Foster a positive perspective on documentation and inspire the practice and utilization of documentation to better protect.

- Clients
- Commissions
- Employers
- Ourselves, families, and careers.

How Can Documentation Protect?

Establish uniform, repeatable procedures and practices for conducting tasks safely.

- Lock out tag out (LOTO) and confined space entry (CSE) programs.
- Boiler start up and shut down procedures.
- Auxiliary fuel operation.
- Boiler PM and safety control testing/calibration programs.
- Boiler water chemistry.

How Can Documentation Protect?

Our Commissions...

- Documents what we do and provides a resource to go back and review our work. *
- Justify time.
- Help develop accurate Risk-Based Inspection (RBI) plans.

How Can Documentation Help?

Organization

- Improve resource management. *
- More accurate resource forecasting.

Engagement.

- Increases understanding and knowledge.
- Improve safety.
- Improves awareness.

What are some common documents at our disposal?

Lock Out Tag Out (LOTO)
And
Confined Space Entry Permit (CSE)



Lock Out Tag Out (LOTO)



[REDACTED] Boiler Lock out / Tag out Checklist
 Document Owner: Industrial Services Manager

Lock number	Description of task
<input checked="" type="checkbox"/> Done	Place boiler into manual operation and bring boiler to low fire.
<input checked="" type="checkbox"/> Done	Turn On/Off switch on control panel to the off position for boiler.
<input checked="" type="checkbox"/> 130	Lock out / Tag out Main power to boiler.
<input checked="" type="checkbox"/> 93	Lock out / Tag out power to boiler combustion fan.
<input checked="" type="checkbox"/> 105/62	Lock out / Tag out Main Natural gas supply line
<input checked="" type="checkbox"/> 105	Lock out / Tag out Natural gas pilot line to burner.
<input checked="" type="checkbox"/> 211/E2	Lock open and Tag open Natural gas vent line between Maxon valves.
<input checked="" type="checkbox"/> 132/411	Lock out / Tag out Main Propane gas supply line
<input checked="" type="checkbox"/> 729/E2	Lock open and Tag open Propane vent line between Maxon valves.
<input checked="" type="checkbox"/> 7/692	Lock out / Tag out boiler feed water supply line, double valve if possible.
<input checked="" type="checkbox"/> 113	Lock out / Tag out Steam header Non-return valve and steam stop valve.
<input checked="" type="checkbox"/> 113	Open condensate drain between Non-return valve and steam stop valve
<input checked="" type="checkbox"/> 134	Lock out / Tag out boiler continous blow down line. (two valves)
<input checked="" type="checkbox"/> 82	Drain boiler and lock closed the Manual bottom blow down valves.
<input checked="" type="checkbox"/> 3	Lock out / Tag out Chemical feed line for boiler
<input checked="" type="checkbox"/> 37	Lock out / Tag out steam drum manifold and mud drum heating loop
<input type="checkbox"/>	Isolate compressed air line to the flu gas valve to Condensing Economizer.
<input type="checkbox"/>	Check and make sure boiler stack damper is closed
<input checked="" type="checkbox"/> Removed	Isolate Heat Exchanger Supply line

Supervisor Signature: [REDACTED] Date: [REDACTED] 2

No physical locks on the valve or damper, but the air lines to the pneumatics are removed to prevent opening



Confined Space Entry Permit (CSE)

PRE-PERMIT MEASURES taken (e.g. checks of equipment, tools, preparatory works, PPE put in place and checked)		Yes	n/a	
Area demarcation	Work area demarcated with temporary barriers, and warning signs placed to signal access restrictions?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Lock-out/tag-out (LOTO)	All relevant equipment & services identified and withdrawn from operation?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	LOTO applied to all hazardous energy sources (e.g. liquids, gases, free-flowing solids, etc)? Zero energy confirmed?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Personal locks & tags applied by work team?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Space emptied of hazardous contents and cleaned of any residues?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Confined space ventilation	Air monitoring device "bump tested" per manufacturer's instructions (i.e. before each day's use)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Space ventilated & air tested? Specify limits and measurement taken below:	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Oxygen <u>20.8</u> % (19.5-23.0%)	Lower Explosive Limit <u>0</u> % of LEL (<10% of LEL)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Carbon Monoxide (CO) <u>0</u> ppm (<10 ppm)	Hydrogen Sulfide (H2S) <u>N/A</u> ppm (<10 ppm)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
	Adequate ventilation (natural or mechanical) installed and tested for proper operation?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Emergency	Rescue plan agreed and communicated, including how to call for help? (describe in "additional details" below)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	Appropriate entry & rescue equipment /services readily available onsite? (describe in "additional details" below)	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	Access/egress routes available to/from confined space?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Equipment & tools	Appropriate equipment and tools readily available for identified hazards?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Worker capability	Workers have appropriate up-to-date training and are familiar with the tools & equipment to be used?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Additional details and other pre-permit measures to be taken (e.g. illumination, emergency plan, communication routines, etc.): <u>use portable lights,</u>				
PRECAUTIONS required during job (e.g. safe way of working, use of PPE)		Yes	n/a	
Atmosphere	Continuous mechanical ventilation of confined space maintained? (describe in "additional details" below)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Ventilation equipment checked every <u>5</u> minutes? (specify duration)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Atmosphere inside confined space continuously monitored? (describe in "additional details" below)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Workers wear personal portable air monitoring devices? (describe in "additional details" below)	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Entry attendant	Trained attendant maintained outside confined space with constant visual or verbal communication with entrants?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
Non-entry rescue	Entrant wears full-body harness attached to a retrieval line?	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	
	Horizontal entry or Vertical entry (<5 feet): Entrant retrieval line attached to a mechanical retrieval device or fixed point outside the permit space?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Entry rescue	Vertical entry (>5 feet): Entrant retrieval line attached to a mechanical retrieval device?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Potential IDLH atmosphere: Rescue team capable of administering emergency care to the victim within 2-4 minutes?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
	Non-IDLH atmosphere: Rescue team capable of administering emergency care to the victim within 12-15 minutes?	<input checked="" type="checkbox"/>	<input type="checkbox"/>	
Additional details, precautions and PPE required: <u>use MSA^{Air} Meter to monitor all the time</u>				

Verified LOTO

Checked ventilation

Reviewed emergency plan

Check PPE

Check training

Check atmosphere

Review rescue plan

NB-6 Forms

Real World NB-6 Documentation

Boiler-Fired Pressure Vessel Report of Inspection.

**FORM NB-6 BOILER-FIRED PRESSURE VESSEL
REPORT OF INSPECTION**
Standard Form for Jurisdictions Operating Under the ASME Code

1	DATE INSPECTED MO DAY YEAR	CERT EXP DATE MO YEAR	CERTIFICATE POSTED <input type="checkbox"/> YES <input type="checkbox"/> NO	OWNER NO.	JURISDICTION NUMBER	<input type="checkbox"/> NAT'L BLD NO. <input type="checkbox"/> OTHER NO.	
	2 OWNER				NATURE OF BUSINESS	KIND OF INSPECTION <input type="checkbox"/> INT <input type="checkbox"/> EXT	CERTIFICATE INSPECTION <input type="checkbox"/> YES <input type="checkbox"/> NO
OWNER'S STREET ADDRESS NUMBER				OWNER'S CITY	STATE	ZIP	
3	USER'S NAME - OBJECT LOCATION			SPECIFIC LOCATION IN PLANT		OBJECT LOCATION - COUNTY	
	USER'S STREET ADDRESS NUMBER			OWNER'S CITY	STATE	ZIP	
4 CERTIFICATE COMPANY NAME				CERTIFICATE COMPANY CONTACT NAME		EMAIL	
CERTIFICATE COMPANY ADDRESS				CERTIFICATE COMPANY CITY	STATE	ZIP	
5	TYPE <input type="checkbox"/> FT <input type="checkbox"/> WT <input type="checkbox"/> G <input type="checkbox"/> OTHER _____			YEAR BUILT	MANUFACTURER		
	6 USE <input type="checkbox"/> POWER <input type="checkbox"/> PROCESS <input type="checkbox"/> STEAM HTG <input type="checkbox"/> HWH <input type="checkbox"/> HWS <input type="checkbox"/> OTHER _____				FUEL	METHOD OF FIRING	PRESSURE GAGE TESTED <input type="checkbox"/> YES <input type="checkbox"/> NO
7 PRESSURE ALLOWED MAWP _____ THIS INSPECTION _____ PREV INSPECTION _____				SAFETY-RELIEF VALVES SET AT _____ TOTAL CAPACITY _____		HEATING SURFACE OR BTU (INPUT/OUTPUT)	
8 IS CONDITION OF OBJECT SUCH THAT A CERTIFICATE MAY BE ISSUED? <input type="checkbox"/> YES <input type="checkbox"/> NO (IF NO, EXPLAIN FULLY UNDER CONDITIONS)					HYDRO TEST <input type="checkbox"/> YES _____ PSI DATE _____ <input type="checkbox"/> NO		
9 CONDITIONS: With respect to the internal surface, describe and state location of any scale, oil or other deposits. Give location and extent of any corrosion and state whether active or inactive. State location and extent of any erosion, grooving, bulging, warping, cracking or similar condition. Report on any defective rivets, bowed, loose or broken stays. State condition of all tubes, tube ends, coils, nipples, etc. Describe any adverse conditions with respect to pressure gage, water column, gage glass, gage cocks, safety valves, etc. Report condition of setting, linings, baffles, supports, etc. Describe any major changes or repairs made since last inspection.							
10 REQUIREMENTS: (LIST CODE VIOLATIONS)							
11 NAME AND TITLE OF PERSON TO WHOM REQUIREMENTS WERE EXPLAINED:							
I HEREBY CERTIFY THIS IS A TRUE REPORT OF MY INSPECTION				IDENT NO.	EMPLOYED BY	IDENT NO.	
SIGNATURE OF INSPECTOR							

This form may be obtained from The National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave., Columbus, OH 43229

NB-6 Rev. 6

Real World NB-6 Documentation

Boiler-Fired Pressure Vessel Report of Inspection.

**FORM NB-6 BOILER-FIRED PRESSURE VESSEL
REPORT OF INSPECTION**
Standard Form for Jurisdictions Operating Under the ASME Code

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9 **CONDITIONS:** With respect to the internal surface, describe and state location of any scale, oil or other deposits. Give location and extent of any corrosion and state whether active or inactive. State location and extent of any erosion, grooving, bulging, warping, cracking or similar condition. Report on any defective rivets, bowed, loose or broken stays. State condition of all tubes, tube ends, coils, nipples, etc. Describe any adverse conditions with respect to pressure gage, water column, gage glass, gage cocks, safety valves, etc. Report condition of setting, linings, baffles, supports, etc. Describe any major changes or repairs made since last inspection.

10 **REQUIREMENTS: (LIST CODE VIOLATIONS)**

SIGNATURE OF INSPECTOR			
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Real World NB-6 Documentation

Boiler-Fired Pressure Vessel Report of Inspection.

FORM NB-6 BOILER-FIRED PRESSURE VESSEL REPORT OF INSPECTION

Standard Form for Jurisdictions Operating Under the ASME Code

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2	OWNER			NATURE OF BUSINESS	KIND OF INSPECTION <input type="checkbox"/> INT <input type="checkbox"/> EXT	CERTIFICATE INSPECTION <input type="checkbox"/> YES <input type="checkbox"/> NO
OWNER'S STREET ADDRESS NUMBER				OWNER'S CITY	STATE	ZIP
3	USER'S NAME - OBJECT LOCATION			SPECIFIC LOCATION IN PLANT	OBJECT LOCATION - COUNTY	
USER'S STREET ADDRESS NUMBER				OWNER'S CITY	STATE	ZIP
4	CERTIFICATE COMPANY NAME			CERTIFICATE COMPANY CONTACT NAME	EMAIL	
CERTIFICATE COMPANY ADDRESS				CERTIFICATE COMPANY CITY	STATE	ZIP
5	TYPE <input type="checkbox"/> FT <input type="checkbox"/> WT <input type="checkbox"/> G <input type="checkbox"/> OTHER _____			YEAR BUILT	MANUFACTURER	
6	USE <input type="checkbox"/> POWER <input type="checkbox"/> PROCESS <input type="checkbox"/> STEAM HTG <input type="checkbox"/> HWH <input type="checkbox"/> HWS <input type="checkbox"/> OTHER _____			FUEL	METHOD OF FIRING	PRESSURE GAGE TESTED <input type="checkbox"/> YES <input type="checkbox"/> NO
7	PRESSURE ALLOWED MAWP _____ THIS INSPECTION _____			SAFETY-RELIEF VALVES SET AT _____ TOTAL CAPACITY _____		HEATING SURFACE OR BTU (INPUT/OUTPUT)

REMARKS:

The boiler was externally inspected while operating to evaluate the condition of its pressure parts and safety devices. The boiler was found to be in satisfactory condition. Protective devices were in good order and the maintenance of the vessel appeared to be adequate. LWCO tested. Mechanical room: adequately sized makeup air ventilation, housekeeping is good. Recommendation to issue a new LP boiler Permit to Operate.

11	NAME AND TITLE OF PERSON TO WHOM REQUIREMENTS WERE EXPLAINED:		
I HEREBY CERTIFY THIS IS A TRUE REPORT OF MY INSPECTION			
SIGNATURE OF INSPECTOR	IDENT NO.	EMPLOYED BY	IDENT NO.

This form may be obtained from The National Board of Boiler and Pressure Vessel Inspectors, 1055 Crupper Ave., Columbus, OH 43229

NB-6 Rev. 6

Real World NB-6 Documentation

Boiler-Fired Pressure Vessel Report of Inspection

Boiler Inspection Worksheet
(Not a Valid Permit)

Date Inspected	Certification Expiration Date	Carrier	Kind of Inspection External / Internal	Serial Number	National Board #
Name of Owner/User		Owner Contact Name		Owner Contact Phone	
Owner Street Address/Billing Address		City	State	Zip Code	
Owner Street Address / Billing Address 2		City	State	Zip Code + 4	
Party to be Invoiced:		Billing Contact Name		Billing Contact Phone	
Billing Address 1		City	State	Zip Code	
Billing Address 2		City	State	Zip Code + 4	
Location Name		Location Contact Name		Phone	
Physical Address of Boiler		City	State	Zip Code	
Physical Address of Boiler 2		City	State	Zip Code + 4	
Specific Location Main boiler room Boiler #1		County			
Type Fire Tube	Year Built	Manufacturer			
Use Process	Fuel Gas	Method of Firing Hand / Auto		Pressure PSIa / Lbs	
Boiler Capacity BTUs / Lbs 60243	Safety Valve Capacity BTUs / Lbs 86785	No Failures		Pressure PSIa / Lbs	
Pressure Allowed this Inspection 250	Safety Relief Valve Set Pressure 240				

Email Address Where Permit Should Be Sent: [Redacted]

COMMENTS:

- IR WALK around No Hot SPOTS
- No LEAKS
- GOOD FRAME QVAL
- EPO IS TESTED
- GAUGE GLASS OP
- L0
- SD
- LG
- HG ← FLAKE TESTER 3"Z VALVE
- CA
- FS
- HPL Raise OP set
- 1LWFCO
- 2LWFCO
- TEST Program IS PRVS UP TO DATE
- SLOW DRAIN Program is UP TO DATE & TEST WAS WITNESSED
- REMOVED SHEGALS FOR walk through FOR LOW EXPANSION PV AUDIT CALL [Redacted]

NB- 6 FORMS

Boiler-Fired Pressure Vessel Report of Inspection

FORM NB-6 BOILER-FIRED PRESSURE VESSEL
REPORT OF INSPECTION
Standard Form for Jurisdictions Operating Under the ASME Code

1	DATE INSPECTED MO DAY YEAR	CERT EXP DATE MO YEAR	CERTIFICATE POSTED <input type="checkbox"/> YES <input type="checkbox"/> NO	OWNER NO.	JURISDICTION NUMBER	<input type="checkbox"/> NAT'L BLD NO. <input type="checkbox"/> OTHER NO.
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Supplemental Report

Jurisdiction # [REDACTED]

Date Inspected [REDACTED]

Location Name [REDACTED]

Conditions

The boiler was assessed externally using the guidelines and requirements found in, but not limited to The State of [REDACTED] Boiler and Pressure Vessel Compliance Manual, [REDACTED] Codes Title [REDACTED] Chapter [REDACTED] Part [REDACTED] Boilers, Pressure Vessels, Rule [REDACTED] Boiler and Pressure Vessel Rule, NB-132 and the adopted ASME, NFPA, ANSI and National Board Codes and standards. The operations of the installed safety controls were asked to be demonstrated. The light off and shutdown sequences for the burner were observed and no discrepancies were noted. The operation of the low gas pressure supervisor, high gas pressure supervisor, combustion air proving switch, flame safety, high pressure limit switch, primary low water fuel cutout and auxiliary low water fuel cutout were all demonstrated. The operations of the combustion air proving switch and flame safety were both verified during the startup sequence and while the burner was under fire. The pressure relief valves are in a documented test and replacement programs that meet the jurisdictional requirements. A documented slow drain test program is in place and a test was successfully conducted during the assessment. The location has documented programs following the [REDACTED] Inspection and Test Frequencies for Thermal Equipment and [REDACTED] Inspection and Testing of Safety. The boiler testing program is compliant with the NFPA 85 requirements. The boiler appears to be in good operating condition and continues to be maintained by well trained and experienced personnel.

Requirements

Real World NB-6 Documentation

Boiler-Fired Pressure Vessel Report of Inspection

Boiler is at a hospital, but the representative and maintenance program referenced are for a different food processing facility

**FORM NB-6 BOILER-FIRED PRESSURE VESSEL
REPORT OF INSPECTION**
Standard Form for Jurisdictions Operating Under the ASME Code

1	DATE INSPECTED MO DAY YEAR	CERT EXP DATE MO YEAR	CERTIFICATE POSTED <input type="checkbox"/> YES <input type="checkbox"/> NO	OWNER NO.	JURISDICTION NUMBER	<input type="checkbox"/> NAT'L BLD NO. <input type="checkbox"/> OTHER NO.
2	OWNER			NATURE OF BUSINESS	KIND OF INSPECTION <input type="checkbox"/> INT <input type="checkbox"/> EXT	CERTIFICATE INSPECTION <input type="checkbox"/> YES <input type="checkbox"/> NO
	OWNER'S STREET ADDRESS NUMBER			OWNER'S CITY	STATE	ZIP
3	USER'S NAME - OBJECT LOCATION			SPECIFIC LOCATION IN PLANT	OBJECT LOCATION - COUNTY	
	USER'S STREET ADDRESS NUMBER			OWNER'S CITY	STATE	ZIP
4	CERTIFICATE COMPANY NAME			CERTIFICATE COMPANY CONTACT NAME		EMAIL
	CERTIFICATE COMPANY ADDRESS			CERTIFICATE COMPANY CITY	STATE	ZIP
5	TYPE	YEAR BUILT	MANUFACTURER			

Boiler was 31,000,000+ BTU

The following conditions were noted during the inspection of this equipment: The boiler was inspected in accordance with the NBIC/NFPA-85 Codes and checked for compliance with the [REDACTED] Boiler and Pressure Vessel Safety Laws. Boiler was internally and externally inspected for renewing the State operating permit. All accessible areas such as the shell, tube sheets, tubes and furnace were observed for indications of scale accumulation, corrosion, leakage, over-firing or other detrimental conditions. The protective devices, attachments, connections and controls were also observed for proper installation and code compliance. The water side had no scaling and showed no signs of leakage around tubes. The [REDACTED] representative is satisfied with the results of the water treatment program. The current water treatment regime will continue until next internal inspection and will be reviewed again at that time. Water treatment logs were reviewed and indicated proper care is being taken to control solids and treatment levels. The fire side had no sign of over-firing, soot or debris. The boiler room was found to be neat and orderly. Lockout/Tag out and confined space entry procedures were followed during the inspection. The maintenance program appears to be adequate at this time for the design and use of inspected equipment. There appears to be no changes in use of equipment from previous inspections. The boilers operate on an automated control

and rounds are made to monitor boiler operation during shifts. The safety valves were verified and ASME/NB certified and is appropriate for the object they are servicing. The safety valves will be replaced this year. All pressure gages are re-certified annually. Boiler logs were reviewed and the logs are being maintained in accordance with [REDACTED] maintenance program. Gas trains are inspected and tested in accordance with ASME/CSD-1 and annual maintenance is being completed by Boiler repair, R stamp shop.

For boilers under 12,500,000 BTU

Water Chemistry Logs



Water Chemistry Logs

Third Party Periodic Review

All measured parameters have specification ranges.

Measurements out of specification range should be notated.

Cooling & Boiler Water Chemistry Tests				
Item/Equip. Tested	Range Limits	Range Limits	Range Limits	Range Limits
RAW WATER	Conductivity: <150	-	-	-
	62	-	-	-
BOILER #1	Conductivity: 2000-2800	Alkalinity: 250-400 ppm	Sulfite: 30-60 ppm	Orthophosphate: 20-40 mL
	Offline	Offline	Offline	Offline

Chilled Loop/Hot Loop:
Chilled loop was almost at our recommended range of 600-1000ppm. Thank you. Might dose another 2 gallons in the pot feeder and you should be on spot. Hot loop needs to be dosed as well. Start with 3 gallons and I will test again next month and see where you are regarding the Molybdate level.

Boiler's #1 and #2:
Boiler #2 was online. See readings below. Alkalinity was a bit high at 670ppm. *Sulfite test showed a low reading at 15ppm. Please check your pump settings and feed process and adjust as necessary. *Thank you*

Feedwater / Condensate:
Feedwater and Condensate readings were showing slightly low pH levels. Please monitor via testing. *Mahalo*

Inventory:
I placed an order for (1) 15 gal. drum ea. of BC1011 (Sulfite) and 356 (Amine) on 2-24-21.

Equipment: Looks like you were able to obtain a new LMI pump for the sulfite product.

Note:
As always, please feel free to contact me anytime if I can be of help or answer any of your questions.

CONDENSATE	24.2	8.07	
Item/Equip. Tested	Conductivity: <150	pH: 8.5-9.2	
RAW WATER	107	7.7	
Item/Equip. Tested	Conductivity: <3000	pH: 8.5-10.0	Nitrite: 600-1000 ppm
CLOSED LOOP (COLD)	1568	9.98	520
Item/Equip. Tested	Conductivity: <3000	pH: 8.5-10.0	Molybdate: 150-200 mg/L
CLOSED LOOP (HOT)	555	10.0	Low

Water Chemistry Logs

In-House Test Program

Date month/day	Time am/pm	Taken by: "Name"	RAW	WATER SOFTENER			BOILER TESTS				CONDENSATE	
			Conductivity (500-700)	Conductivity (500-700)	Hardness (0-1)	Conductivity (3000-3500)	Alkalinity (250-500ppm)	Sulfite (30-60ppm)	OrthoPhosphate (20-40ppm)	Conductivity (50 or less)	Ph (8-9)	

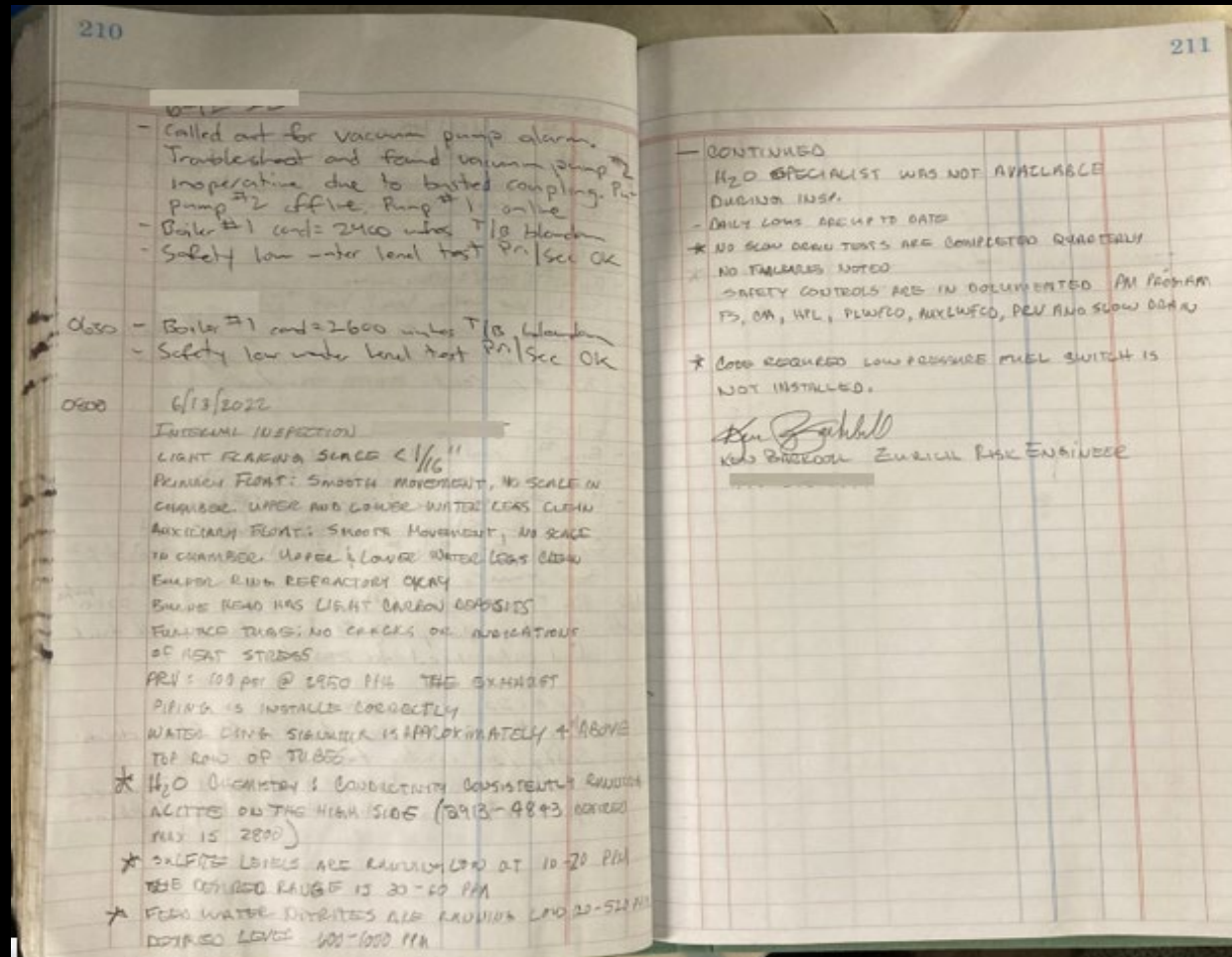
Date month/day	Time am/pm	Taken by: "Name"	RAW	WATER SOFTENER		BOILER TESTS				CONDENSATE	
			Conductivity (500-700)	Conductivity (500-700)	Hardness (0-1)	Conductivity (3000-3500)	Alkalinity (250-500ppm)	Sulfite (30-60ppm)	OrthoPhosphate (20-40ppm)	Conductivity (50 or less)	Ph (8-9)
1/27	4:00PM	K.K.	569	N/A	N/A	10,009	1730	10	20	N/A	N/A
2/12	2:16PM	R.B.	496	N/A	N/A	3,151	600	10	10	N/A	N/A
2/19	9:09AM	R.B.	532	N/A	N/A	9,676	1,560	10	10	N/A	N/A
2/22	3:45pm	K.K.	5010	N/A	N/A	12,009	2,040	25	20	N/A	N/A
3/2	2:16PM	R.B.	515	N/A	N/A	12,670	1,990	25	20	N/A	N/A
3/5	2:03PM	R.B.	537	N/A	N/A	17,340	3,220	10	20	N/A	N/A
3/15	2:30	K.K.	543	N/A	N/A	6856	1080	10	10	N/A	N/A
3/20	2:08pm	RB	553	N/A	N/A	5,124	70	10	10	N/A	N/A
3/26	12:22PM	R.B.	552	N/A	N/A	1,520	2,200	15	10	N/A	N/A
4/5	1:12PM	R.B.	552	N/A	N/A	1,501	70	15	10	N/A	N/A
4/23	8:04AM	RB	571	N/A	N/A	1,700	70	15	10	N/A	N/A

IMPORTANT: Please wear "PPE" (Personal Protective Equipment) when conducting any tests. This would include safety eyewear (Safety Glasses/Goggles), Nylon Gloves and hearing protection if necessary. If you have any questions or would like additional training please feel free to reach out to me anytime.

Boiler Operating and PM Logs

Boiler Operating Logs

Bound Logbooks



Boiler Logs

Combination Boiler Log and PM Log

HIGH PRESSURE STEAM BOILER

Maintenance • Testing • Inspection Log

BUILDING	ADDRESS	MONTH July	YEAR 2022	FUEL TYPE N/G	BOILER NO. 1
----------	---------	---------------	--------------	------------------	-----------------

DAILY MAINTENANCE INSPECTION CHECKS

DATES	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Checked by (please initial):	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD	AD			

1. Record Boiler Pressure	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/	/
---------------------------	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

MAINTENANCE INSPECTION CHECKS (Enter Date Checked)

	Item	Date Checked	Item	Date Checked
Review Condition of each item and/or Test each item	Low Gas Pressure Supervisor		Gage glass valves and seals	
	High Gas Pressure Supervisor		Floor Drains	
	Combustion Air Proving		Drain Valves	
	Flame Scanner		Pressure Relief Valves	
	High Pressure Limit Control			

Quarterly Checks Checked by (please initial):	Quarter 1	Quarter 2	Quarter 3	Quarter 4
2. Slow Drain Test				

Annual Checks (please initial):	Performed By	Notes:
3. Clean Level Control Probes/Check Level Control Linkages		
4. Internal Non-Certificate Boiler inspection		
5. External Operating Boiler Certificate Inspection		

Safety control checks are itemized



Boiler PM Logs

Service Records

Boiler Service Sheet

Customer: [REDACTED] B.I.M.C. Job #: [REDACTED]
 Contact: [REDACTED] Technician: [REDACTED]
 Signature: [REDACTED] Signature: [REDACTED]
 Boiler Brand: [REDACTED] Date of Service: [REDACTED]
 Boiler Model: [REDACTED] Type of Service: Quarterly
 Boiler Serial / NB: [REDACTED] Boiler Number: [REDACTED]

Quarterly Service:

Pilot Flame	/	Combo Air Sw.	✓ ok
Main Flame	80 - scanner	Discharge Pressure	68 psi
Primary L.W.C.O.	✓ ok auto reset	Fuel Oil Pressure	180 psig
Auxiliary L.W.C.O.	✓ ok manual reset	Fuel Oil Return Pressure	8" H ₂ O *
Operating Control	✓ ok 60-72 psi	Gas Pressure	#2 checked
High Limit Control	✓ ok 95 psi - manual	Type of Fuel - On line	#2 checked
Modulation Control	✓ ok 55 psi	Feed Water Pressure	70 psi
		Relief valve	✓ ok set 100 psi

Boiler Main Power	L-1 amps	L-2 amps	L-3 amps	L-1 volts	L-2 volts	L-3 volts
Boiler Control Power	1.6	11.6	11.3	479	1480	1479
Blower Motor	.2	1	1	126.3	1	1
Oil Pump	1.4	11.3	11.2	479	1480	1479
	coupled	1	1	1	1	1

Quarterly Service **Notes**

Fire Side	no leaks	* Fuel oil loop pressure rose 6 months ago from 3 psi (for years) up to 9 psi
Water Side	no leaks	Possibly displacement micron mesh in filter
Gaskets	no leaks	
Inspector	upre	

B.I.M.C. Job: _____
Date: _____

Customer: _____
 Location: _____
 Att: _____

Equipment Description: # 1 Boiler

Diagnosis: the linkage connecting the fuel valve ground up. broke linkage + checked w/ pipe

Service provided: took out Boiler #1 removed fuel valve Replaced broken w/ pipe + linkage. Re assembled. lowered water level + tested the boiler.

Final Outcome: Boiler #1 back on line.

Boiler PM Logs

Computer Spreadsheet Combination Supervisory Operation and PM Review Log

Boiler Safety Compliance Log

Week	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
Boiler #	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1	2	1
Date	3/17/20	3/24/20	3/31/20	4/7/20	4/14/20	4/21/20	4/28/20	5/5/20	5/12/20	5/19/20	5/26/20	6/2/20	6/9/20	6/16/20	6/23/20	6/30/20	7/7/20	7/14/20	7/21/20
Daily values are recorded in SWOT record - PSI and temp located on top of the boiler. PSI located on the lines above pump 7 and 8. visual inspection of burner flame, vent stack	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
TEMP GAUGE - turn down temp setting to low end. Unit should shut down. Return temp setting to original position. Press reset on temp unit.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS - Not working	LS	LS	LS	LS	LS	LS	LS	LS	LS
LOW GAS - close main gas valve. Verify burner stops and alarm sounds. Alarm reset located inside blue control box	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
LOW WATER CUT OFF - press and old test switch until red light illuminates. Release. Press reset	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
LOW GAS FLOW LIMIT - remove cover from small box on main gas supply line. Turn up above 5 wait for unit to trip the reset and burner to shut off. Verify unit does not refire. Replace cover hit reset.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
HIGH GAS FLOW LIMIT - remove cover from small box on burner assembly. Turn down below 5 wait for unit to trip the reset and burner to shut off. Verify unit does not refire. Replace cover hit reset.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
FIRE EYE, PILOT - if running close last large valve on the supply line closest to the burner unit. If not yet fired close small valve supplying gas to the pilot lighting system. Reset alarm in control box.	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
COMBUSTION AIR SENSOR - unscrew locking nut on small aluminum tube on right side of burner unit. remove tube. reset alarm in control box	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS	LS
SEMI ANN visual check piping and wiring of all interlocks and shutoff valves																			
ANNUAL flame failure detection system / pilot turndown test flame failure detection system / hot refractory hold in test leakage test on pilot and main valves test high-limit and operating temperature recondition or replace low water fuel cut off device test high-limit and operating temperature test safety relief valves																			

BOILER LOG 2019 BOILER LOG 2020 RECORD SHEET

PM Logs and The Digital Age

Enterprise Software Programs.

- e.g., ORACLE, SAP.

Maintenance Management Software Programs.

- Computerized Maintenance Management Information System (CMMIS)
- Computerized Maintenance Management System (CMMS)

Caution.

- PM completion rates are not always indicative of passing test results *
- Ask to see
 - Task specific information
 - Master PM list

Real World Boiler Log Review

Real World Boiler Log Review

0340 - Boiler 1 low water alarm, sight glass full, feed pump not running, cycled combustion switch, reset on third attempt

0415 - Boiler 3 shutdown for low water, let it fill back up and started

0435 - Boiler 1 shutdown for low water again, toggled combustion switch FAST, pushed start button and boiler restarted, water was a little low but not empty

0545 - Boiler 1 went down again, pump having a hard time keeping up on high fire, cleaned all strainers ahead of pump.

Note: boilers go into hi fire as follows #4, #1, #3, leave #2 in low fire.

189

2-18-18	0900	-121	2010
	1530	-81	1830
2-19-18	0030	-118	2424
	#3 in low fire - still running		
	0415 #3 shut down for low water		
	Let it fill back up and started again.		
	0900	-122	2857
	1830	-119	2046
2-20-18	0340		
	Bob came over to check on #2 called while was on a different dispatch and found PSI to be 65 and number 1 not running due to low water alarm. Sight glass was full and Feed Pump not running. Shut combustion switch off and back on and tried to start but fault would not clear. On third attempt it cleared. PSI back up to 100		
	0400 0400	-105	2468
	0435 Boiler #1 shut down for low water again so I turned the combustion switch off and back on FAST and pushed the start button and it is running again and the water was little low but not empty		
	0600	-117	2002
	0545 #1 went down on low water - pump having a hard time keeping up on Hi-Fire cleaned all the strainers ahead of the feed water pumps. The boilers go into high fire as follows		
	4, 1, 3 - leave #2 in low fire		
	1500	-116	2121

Real World Boiler Log Review

5 days later

0320 – Surge and DA tank went empty at 0800 for no reason #1 went down for low water, but water was good, might need to clean low water probes

0830 – Boiler #1 shut down for low water, restarted Boiler #1

2100 - Same as above

Date	Time	Pressure	Temperature
190			2379
			2463
			2572
2-21-18	0830	-122	
	0700	-119	
	1530	-111	2835
			2692
			2102
2-22-18	0210	-117	
	0800	-122	
	1530	-84	2200
			2300
2-23-18	0430	-120	
	0900	-113	2310
	1530	-109	2432
	2300	-124	
2-25-18	0320	-104	2475
Surge & D.A. Tank went empty at 0800, no reason that I can see. Everything for now is good. #1 went down for low water, but the water was good. Might need to clean the low water probes.			
	0900	-122	2030
	1500	-123	2115
1830 #1 was shut down due to low water. Plant steam dropped to just below 85. Restarted #1 and its coming back up. 2100 same as above.			
	2215	-117	2448
2-26-18	0040	-118	
	1405	-123	2647
	0900	-84	2654
	1500	-112	2766
Changed CBD in Boiler #4 in 4, 1, 3, 2 Pattern. Boiler are			

Real World Boiler Log Review

3 weeks later

1815 – Boiler #1 shutdown for low water *

Date	Time	Pressure	Water Level
3-6-18	06:30	2340	-114
3-7-18	09:00	2340	-123
	10:00		-125
	16:00		-114
3-8-18	03:05		-116
	06:00		-103
All is well - be back a week from Monday			
	17:30		-107
3-9-18	03:05		-124
	09:00		-101
	15:00		-112
3-10-18	01:30		-122
	04:35		-115
	09:00		-114
	13:00		-113
3-11-18	09:20		-106
	09:00		-131
	15:00		-111
1815			-112
Boiler #1 shut down for low water. (364)			
3-12-18	00:50		-114
	18:40		-107
	20:40		-106

Real World Boiler Log Review

Observations and recommendations

Observations	Recommendations
<ul style="list-style-type: none">Multiple occurrences of low water alarmsImproper response to low water alarms	Provide training on response to low water alarms: what to check, who to notify
<ul style="list-style-type: none">Primary and auxiliary low water fuel cutout tests were not occurring each shift	Conduct primary and auxiliary LWFCO testing each shift and document
<ul style="list-style-type: none">Low water alarms appear to be during the same time periods	Advised further investigation
<ul style="list-style-type: none">Boiler operating logs were not being reviewed.	Advised operating logs be periodically reviewed by operators and management.

Pressure Relief Device Testing Program Documentation

Pressure Relief Device Testing Program Documentation

No pre-test conducted?

Company Safety Valve Service Report

Customer: Rev: 1 Job # 2 Date: Site: Location:

Repair Nameplate Data		Original Nameplate Data	
SAP Number:	Protest Date:	Set Pressure: 50	Cold Set:
Tag Number: PSV-	Swan Number:	Capacity: 1567	% Over Pressure:
Manufacturer:	Orifice: J	Temp Corr:	Code Stamp: UV
Model No:	Set Press: 100	Model Number:	Code Case:
Serial No:	Cold Set: 0	Serial Number:	
Shop No:	Back Press: 0	Last Repair Nameplate Data	
Interval: 60	Capacity: 7869	Set Pressure: 100	Cold Set:
Units: PPH	Temp Corr: 0	Capacity: 7869	Units: PPH
Inlet: 2 / 150 / RF	Outlet: 3 / 150 / RF	Repair Company:	Unique ID:
		Last Repair Date:	VR: <input checked="" type="checkbox"/>

Work Order: Pre-Test Information By:

Pop PSIG: New Valve: No Pop: Fouled: Leaked At:

Probable Cause of Failure:

Conditions After Dismantling By:

Cleanliness Condition: All Parts Clean Mechanical Condition: Good condition

Parts	Pretest Conditions	Work Performed	Parts	Pretest Conditions	Work Performed
Bonnet Assembly Good	Polished	"O" Ring			

Field Location: Sulfur Condenser

Work Order: Pre-Test Information By:

Pop PSIG: New Valve: No Pop: Fouled: Leaked At:

Probable Cause of Failure:

Conditions After Dismantling By:

Cleanliness Condition: All Parts Clean Mechanical Condition: Good condition

Parts	Pretest Conditions	Work Performed	Parts	Pretest Conditions	Work Performed
Bonnet Assembly Good	Polished	"O" Ring			

Lock Nut Good	Polished		
Cap Good	Polished		
Top Lever & Pin Good	Polished		
Lower Lever & Pin			
Upper Adj Ring & Pin			
Lower Adj Ring & Pin Good	Polished		
Bellows			
Gaskets Broken	Replaced		

Critical Dimensions

Disc:	Min / Max:	.005	After Repair:	Material Left:	.028
Disc Holder:	Min / Max:		After Repair:	Material Left:	.550
Guide:	Min / Max:		After Repair:	Material Left:	.564

Ring Adjustment / Spring Info

Upper Ring:	As Found:		After Repair:	
Lower Ring:	As Found:	-11.00	After Repair:	
Compression Screw:	As Found:	2.205	After Repair:	

Valve was not in service, so no pre-test was conducted.

A reconditioned valve is being added to the program.

Special Instructions: Chg. set press. from 50 to 100 psf. & service chg. from scfm (air) to pph (steam)

Back Pressure Tested at PSIG | O2 Cleaning Required Repair as Required

Assembled By: AJM Mech/Lepp By: Final Test Information Cleaned By: Inspected By:

Test Specifications: Test Medium: Steam Test Type: Bench Set Pressure Definition: Code Stamp Applied: VR

Set Pressure: 100 Average Test: 102 Test 1: 102 Test 2: 102 Test 3: 102

Gauges Used: Primary: M21 Secondary: M22 Hold Time:

Misc Items: ID Tag: Paint: Seals: Flange Protector:

Final Test By: Sig: Final Test Date: 2021 Company:

QC Witnessed By: Sig: QC Date: 2021 Company:

VR Stamp Number: Install Verified By: Date: 2021

Pressure Relief Device Testing Program Documentation

Did the pre-test pass or fail?

The VR company was contacted to resolve the report information.

The valve was leaking at 1 psi but did not lift at set pressure due to fouling.

Safety Valve Service Report

Customer: [Redacted] Date: [Redacted] 2021 Site: [Redacted]
Rev: 0 Job #: [Redacted] Location: [Redacted]

Repair Nameplate Data By: [Redacted] Original Nameplate Data By: [Redacted]

SAP Number: [Redacted]	Pretest Date: [Redacted] 2021	Set Pressure: 360	Cold Set: [Redacted]	Back Press: [Redacted]
Tag Number: PSV [Redacted]	Swan Number: [Redacted]	Capacity: 49730	% Over Pressure: [Redacted]	Units: PPH
Manufacturer: Kunkie	Office: [Redacted]	Temp Corr: [Redacted]	Code Stamp: V	Code Case: [Redacted]
Model No: [Redacted]	Set Press: 360	Model Number: [Redacted]	Serial Number: [Redacted]	Code Case: [Redacted]
Serial No: [Redacted]	Cold Set: 0	Serial Number: [Redacted]	Serial Number: [Redacted]	Code Case: [Redacted]
Shop No: [Redacted]	Back Press: 0	Serial Number: [Redacted]	Serial Number: [Redacted]	Code Case: [Redacted]
Interval: 36	Capacity: 49730	Set Pressure: 360	Cold Set: [Redacted]	Code Case: [Redacted]

Last Repair Date: [Redacted] 2020 VR:

Field Location: Incinerator Boiler / B-378

Work Order: [Redacted] Pre-Test Information By: [Redacted]

Pop PSIG: 1 New Value: [Redacted] No Pop: Fouled: Leaked At: 1

Probable Cause of Failure: Damaged seats - leaked at 1 psi.

Cleanliness Condition: All Parts Clean Mechanical Condition: Good condition

Parts	Pretest Conditions	Work Performed	Parts	Pretest Conditions	Work Performed
Bonnet Assembly Good					
Inlet Flange	Good	Polished			
Outlet flange	Good	Polished			
Stem	Good	Polished			
Disc	Good	Lapped			
Disc Holder		Lapped/Machined	Qty	PO Number	Part Number
Nozzle	Good	Lapped			Description
Spindle	Good				
Overlap Adjustment					
Retaining Ring					
Flashing Washer					
Spindle Nut	Good	Polished			
Lock Nut	Good	Polished			
Cap	Good	Polished			
Top Lever & Pin	Good	Polished			
Lower Lever & Pin	Good	Polished			
Upper Adj Ring & Pin	Good	Polished			
Lower Adj Ring & Pin	Good	Polished			
Bellows					
Gaskets					

Critical Dimensions				Ring Adjustment / Spring Info			
Disc	Min / Max	563	After Repair:	Upper Ring	As Found	3.88	After Repair:
Disc Holder	Min / Max	3.633	After Repair:	Lower Ring	As Found	-16.00	After Repair:
Guide	Min / Max	3.650	After Repair:	Compression Screw	As Found	2.587	After Repair:
Nozzle	Min / Max	.045	After Repair:	Spindle / Stem	As Found	+-0.02	After Repair:
	Material Left	.597		Spring Number	000630N695	Spring Range	355 - 398

Special Instructions:

Back Pressure Tested at PSIG: [Redacted] O2 Cleaning Required Repair as Required Replace Soft Goods Cap / Lever

Seal Leakage Tested at: 90 Final Test Only Pull from SP Seals Intact Open

Replace Next Shut Down Repair Return to SP Build From SP / Tag No Seals Broken Packed

Add Face Seal Conn Pre-Test Return to SP Seals Missing Screwed

Change Set Pressure

Valve Repair Note:
FINAL TEST PASSED

Assembled By: [Redacted] MachLapp By: [Redacted] Final Test Information Cleaned By: [Redacted] Inspected By: [Redacted]

Test Specifications:	Test Medium: Steam	Test Type: Bench	Set Pressure Definition:	Code Stamp Applied: VR	
Set Pressure:	360	Average Test: 366	Test 1: 366	Test 2: 366	Test 3: 366
Gauges Used:	Primary: M21	Secondary: M22			
Misc Items:	ID Tag: <input checked="" type="checkbox"/>	Paint: <input checked="" type="checkbox"/>	Seals: <input checked="" type="checkbox"/>	Flange Protector: <input checked="" type="checkbox"/>	
Final Test By:	[Redacted]	Sig: [Redacted]	Final Test Date:	[Redacted] 2021	Company: [Redacted]
QC Witnessed By:	[Redacted]	Sig: [Redacted]	QC Date:	[Redacted] 2021	Company: [Redacted]
VR Stamp Numbers:	[Redacted]	Install Verified By:	[Redacted]	Date:	[Redacted] 2021

Pressure Relief Device Testing Program Documentation

In line hydraulic lift test passed

Valve Repair Order Report

CUSTOMER / LOCATION: [REDACTED] Shop Field DATE: [REDACTED] 19

JOB # [REDACTED] PO# [REDACTED] VRO #: [REDACTED]

EQUIP LOC: BOILER STEAM DRUM EQUIP. ID: [REDACTED] PSV #: 42-913

MANUFACTURERS TAG INFORMATION
MANUFACTURER: [REDACTED] MODEL #: [REDACTED] DUPLICATE PLATE NAME CODE SECTION: I VIII

PREVIOUS REPAIR INFORMATION REPAIR TEST ONLY RESET Company: [REDACTED] VR#: [REDACTED]

DATE: [REDACTED] 2018 UNIQUE ID: [REDACTED] SET PRESS. 400 VR STAMPED NO SEALS INTACT Y

MODEL #: [REDACTED] CAPACITY: [REDACTED] COLD SET: [REDACTED] psi BP: [REDACTED] psi

SERVICE PROVIDED TEST IN PLACE PRE-TEST TEST ONLY COMPLETE OVERHAUL CONVERSION

PRE-TESTED AT: 402.5, 402.6, 402.5 psi TIGHT AT: 304 PMS psi PASS FAIL

PRESSURE CHANGE: YES NO CHANGED TO: [REDACTED] MODEL #: [REDACTED]

SPRING CHANGE: YES NO CHANGED TO: [REDACTED] RANGE: [REDACTED] to [REDACTED]

VERIFICATION SPRING ID#: [REDACTED] RANGE: [REDACTED] to [REDACTED] COMP SCREW MEAS.: [REDACTED]

	UPPER RING	LOWER RING	LIFT MEASUREMENT	PILOT BLOWDOWN ADJ
AS FOUND	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]
AS LEFT	[REDACTED]	[REDACTED]	[REDACTED]	[REDACTED]

TECHNICIAN NOTES OF WORK PERFORMED:
TESTED PSV IN PLACE ONLINE WITH KISS LIFT ASSIST TESTER, (PASSED). TAGGED AND SEALED. CAP PAINTED ORANGE FOR THE [REDACTED] ANNUAL TESTING.

FINAL TEST INFORMATION:

TEARDOWN PERFORMED BY: [REDACTED]

REPAIR PERFORMED BY: [REDACTED]

PREASSEMBLY INSPECTION BY: [REDACTED]

SET PRESSURE / BP TESTED BY: [REDACTED]

QUALITY CONTROLLED BY: [REDACTED]

TEST GAUGES USED: [REDACTED]

FINAL SET POINT: 402.5 AVERAGE psi

VALVE RESEATS AT: [REDACTED] psi

TESTED TIGHT AT: 304 PMS psi

RERATED CAPACITY AT: [REDACTED] psi

BACK PRESSURE TEST AT: [REDACTED] psi

TEST EQUIP USED: HYDROSET AVK / Kiss FIELD TEST N2

TEST MEDIUM: NITROGEN AIR STEAM LIQUID OTHER

SEAT TIGHTNESS TEST: AUDIBLE VISIBLE API 527 OTHER

FINAL INSPECTION: REPAIR TEST ONLY RESET VR STAMPED NO VR#: [REDACTED]

TAGGED/SEALED READY TO SHIP T/O Applied: No

Q.C. FOREMAN: [REDACTED] DATE: [REDACTED] 19 CUSTOMER INSPECTOR IF REQ: [REDACTED]

Real World Benefit of Pressure Relief Device Documentation

Real World Benefit of Relief Device Documentation

Background

- Smelter 4493 HP Waste heat boiler.
- MAWP of 986 psi with a capacity of 155,000 PPH.
- Smelter waste heat input is controlled by a duct damper that takes 45 minutes to close.
- Drum pressure was controlled with two power valves.
- There were three relief devices with a combined relieving capacity of 202,757 PPH with documented lift tests 989 to 1015 psi.

Internal inspection PRD test documentation review. *

- All PRDs had failed annual lift tests. All 3 were stuck closed.
- Review of past annual test results were identical.
- Per NBIC guidelines, PRD test frequency was reduced 50% to 6 months.

Real World Benefit of Relief Device Documentation

PRD test documentation Review

- At 6-month follow-up, PRD test results all failed, all were stuck closed.
- The VR repair company was contacted and asked for specific failure causes.
- Per NBIC guidelines the test frequency was reduced again by 50% to 3 months.
- Same results at 3 months and VR repair company reported severe corrosion above the seats.
- Location conducted an audit on the PRD exhaust piping and found that a process line had been manifolded into the PRD exhaust line and corrosive gasses were back steaming to the valves causing corrosion.
- Process line was removed from exhaust manifold and the next PRD test results passed at 3 months, 4.5 months and 7 months.

Real World Benefit of Relief Device Documentation

A Very Close Call.

- Two years after, the boiler experienced two upsets months apart and even with the power valve open and all relief valves open the boiler pressure exceeded the MAWP by 10%.
- It was determined that due to the length of the PRD exhaust pipe runs and number of elbows, the resulting back pressure was reducing the relieving capacity of the PRDs.
- Air gaps and drip pans were installed at the relief devices and no more issues have been experienced.



So, back to my long night... *

What If there had been an injury or worse yet a fatality.

The unfortunate reality, is that we live in a very litigious society, and if it wasn't documented, it didn't happen... *

What If You Are The Next Person To Get That Call...



THANK YOU

