



Transmittal #: 2  
Transmittal Date: 8/29/2025  
Transmittal Type: Electronic

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CB Project #: SP-4889  
Customer Purchase Order #: XX

Client Name: UT KNOXVILLE  
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## PROJECT TRIM LIST

CUSTOMER : University of Tennessee Knoxville  
END USER : University of Tennessee Knoxville  
LOCATION : Knoxville, TN

PROJECT MANAGER	: Jason Grieser
PHONE NUMBER	: 402-434-2089
EMAIL ADDRESS	: <a href="mailto:jgrieser@cleaverbrooks.com">jgrieser@cleaverbrooks.com</a>
PROJECT ENGINEER	: Josh Donahue
PHONE NUMBER	: 402-434-2001
EMAIL ADDRESS	: <a href="mailto:jdonahue@cleaverbrooks.com">jdonahue@cleaverbrooks.com</a>

CB JOB REF.	: SP-4889
BOILER MODEL NUMBER	: NB-300D-65-250-HC-RH-EZ--NAT
ARRANGEMENT	: D Type, Right Hand
CUSTOMER UNIT NUMBER(S)	:
BOILER SERIAL NUMBER(S)	: SP-4889
BOILER CAPACITY	: 80,000 lbs/hr.
BOILER DESIGN PRESSURE	: 250 psig
STEAM DRUM OPER. PRESSURE	: 130 psig (approx.)
STEAM OUTLET OPER. PRESSURE	: 125 psig
STEAM TEMPERATURE	: Saturated
FEEDWATER SUPPLY TEMPERATURE	: 227 °F to Econ.

**NOTES:** 1. To determine the ship loose items, please refer to the Product Structure column on the following pages. The last three digits of the Product Structure number signify the following shipping categories -

-000 This item will be shop mounted on and shipped with the Boiler.

-007 This item will be part of a subassembly which will be shipped loose and mounted by others, at the job site.

-008 This item will be shipped loose and mounted by others, at the job site.

-009 This item will be shipped loose and mounted by others, at the job site.

2. An X in the "SP" column indicates that the item itself should be purchased as a spare part.

3. An X in the "RSP" column indicates that a spare parts kit should be purchased for this item.

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SPECIFICATION REQUIREMENTS RELATED TO DUCTING & STRUCTURAL ITEMS												REVISION
1	Design per International Building Code 2006											
2	All structures, ducts, platforms, etc. to be prepped and painted per page 2 of Project Data Sheets (PDS).											
3	Platform framing & handrails to be Angle Iron. Platform walking surfaces to be Flat Bar Grating.											
4												
Allowable Boiler nozzle Loads, Bending Moments and Thermal movements		Size (Inches)	Allowable Loads (Lbf)			Allowable Bending Moments (Ft-Lbf)			Thermal Movements (inches)			
			Fx	Fy	Fz	Mx	My	Mz	δx	δy	δz	
Drum Connections	Main Steam Outlet	10" LWN	±2500	±2500	±2500	±3000	±3000	±3000	0	3/4	1/2	A
	Feedwater	3" RFSO	±1000	±1000	±1000	±1200	±1200	±1200	0	5/8	-3/16	A
X : Positive going right to left when facing Burner End, Y : Positive UP, Z : Positive from Burner End to Target End												
DUCTING, EXPANSION JOINTS & STACKS												
Tag Number	Description	Part Number	Product Structure	Hot or Cold	Indoors/Outdoors	Material	Supplied By	Insulation Needed	Instrument Connections	Additional Notes		
X2020	Duct - FGR Mixing Box	Included with Burner	643-02423-009	Hot	Indoors	Carbon Steel	by NatCom		No	See NatCom documents for details.		
X2150	Duct - FGR	426-11971-000	643-02423-009	Hot	Indoors	Carbon Steel	CB	Required (by others)	No	18" ID, 2 Pieces		
X2151	Expansion Joint - for FGR Duct	426-11972-000	643-02423-009	Hot	Indoors	Fabric	CB	No	No	18" ID		
X2550	Expansion Joint - for Boiler Outlet	426-11970-000	643-02423-009	Hot	Indoors	Fabric	CB	No	No	-		
X2551	Duct - Boiler Flue Gas Outlet	426-12034-000	643-02423-009	Hot	Indoors	Carbon Steel	CB	Required (by others)	(Qty 4) 1" FNPT (Qty 1) 2"-150# FF Flanged (Qty 1) 3"-150# FF Flanged	1/4" thick. One 18" x18" access door. Paint per paint notes on PDS.		
X2552	Duct - Boiler Flue Gas Outlet to Economizer	426-11968-000	643-02423-009	Hot	Indoors	Carbon Steel	CB	Required (by others)				
X2648	Duct - Economizer to Stack	426-11969-000	643-02423-009	Hot	Indoors	Carbon Steel	CB	Required (by others)	(Qty 4) 1" FNPT	1/4" thick. One 18" x18" access door. Paint per paint notes on PDS.		
X2650	Stack	634-01225-000	643-02423-009	Hot	Indoors	ASTM-A-242 Corten	Chimney	Required (by others)	(Qty 2) 4"FLG EPA Ports	3/16" thick min. Include rain shield. 42" DIA. Terminate 72'-4" above boiler base. Lateral support supplied at 45' above boiler base (roof line). EPA Ports at 50'-6" above boiler base.		

SUPPORT STRUCTURES									
Tag Number	Description	Part Number	Product Structure	Windload	Indoors/Outdoors	Material	Supplied By	ADDITIONAL NOTES	
X2006	Structure, Inlet Air Handling	446-01112-000	643-02423-009	N/A	Indoors	Carbon Steel	CB	To be painted per page 2 of PDS	A
X2597	Structure, Economizer Support	446-01113-000	643-02423-009	N/A	Indoors	Carbon Steel	CB	To be painted per page 2 of PDS	A
PLATFORMS AND LADDERS									
Tag Number	Description	Part Number	Product Structure	Handrail	Grating	Material	Supplied By	ADDITIONAL NOTES	
X2801	Platform & Ladder, Burner End	264-02042-000	643-02423-009	Angle Iron	Flat Bar	Carbon Steel	CB	Prepped and painted per page 2 of PDS. Safety chains across the top of ladder.	A
X2802	Platform & Ladder, Target End	264-02041-000	643-02423-009	Angle Iron	Flat Bar	Carbon Steel	CB	Prepped and painted per page 2 of PDS. Safety chains across the top of ladder.	A
X2803	Platform & Ladder, Boiler Roof	264-02043-000	643-02423-009	Angle Iron	Flat Bar	Carbon Steel	CB	Prepped and painted per page 2 of PDS. Safety chains across the top of ladder.	A

TAG	NUMBER	CUSTOMER TAG NUMBER	FUNCTION / EQUIPMENT	PART NUMBER	PRODUCT STRUCTURE	SIZE	TYPE	ENDS	CLASS	MATERIAL	MANUF.	MODEL #	ADDITIONAL NOTES	REVISION
<b>BURNER, FD FAN, &amp; ASSOCIATED EQUIPMENT</b>														
B-	X1300		Burner Assembly	829-11045-000	643-02423-009	-	Burner	Flanged	-	-	NatCom		See Natcom documents for details, N20163	A
	X2200		BMS / CCS	829-11047-000 829-11048-000	643-02423-009	-	-	-	-	-	by CB-NatCom	-	See Natcom documents for details, N20163	A
	X2196		DAMPER - FGR Flow Control	Included with 829-11046-000	643-02423-009	18" Dia	Butterfly	-	-	-	by CB-NatCom	-	See Natcom documents for details, N20163	A
PRV-	X1295		Observation Port Air Regulator	918-00819-000	504-11520-000	1/4"	-	NPT	-	Aluminum	Fisher	67CFR	Filter regulator; to be used to regulate instrument air line down to 5 psig for air cooled observation ports.	A
OP-	X1296		Furnace Observation Port	851-878	504-11520-000	1-1/2"	-	NPT	-	-	SIP, Inc.	CIPBG 1.5	Left, with 1/4" NPT cooling air connection	A
OP-	X1297		Furnace Observation Port	851-878	504-11520-000	1-1/2"	-	NPT	-	-	SIP, Inc.	CIPBG 1.5	Middle, with 1/4" NPT cooling air connection	A
OP-	X1298		Furnace Observation Port	851-878	504-11520-000	1-1/2"	-	NPT	-	-	SIP, Inc.	CIPBG 1.5	Right, with 1/4" NPT cooling air connection	A
<b>FLUE GAS OUTLET INSTRUMENTATION &amp; ASSOCIATED EQUIPMENT</b>														
PSHH-	X2400		Furnace Pressure Switch	836-08634-000	648-01236-008	1/8"	Indicator	FNPT	N/A	304SS	Dwyer	1950-20-2F	SWITCH, DIFFERENTIAL AIR PRESSURE, 1SPDT 15 AMP 125/250/480 VAC, 1/8" FNPT, RANGE 20" OF W.C., CE, UL, CSA, FM APPROVED <i>Set @ 9.5" H2O, Increasing</i>	A
TW-	X2500		Economizer Flue Gas Inlet Thermowell	937-00871-000	648-01236-008	3/4"	Thermowell	NPT	-	316SS	Ashcroft	26-88-17-811Z,(Z350)	THERMOWELL .260 BORE 3/4" NPT EXTERNAL 1/2" NPT INTERNAL, 18" STEM LENGTH, 316SS	A
TI-	X2505		Economizer Flue Gas Inlet Temperature Indicator	937-00977-000	648-01236-008	1/2"	Indicator	NPT	N/A	304SS	Ashcroft	50EI60E180 100/800F	THERMOMETER, 18" STEM, 100-800 F, 5" DIAL "EI" STYLE, EVERY ANGLE, 10F/DIVISION 1/2" NPT PROCESS CONNECTION	A
TW-	X2505		Economizer Flue Gas Inlet Thermowell	937-00871-000	648-01236-008	3/4"	Thermowell	NPT	-	316SS	Ashcroft	26-88-17-811Z,(Z350)	THERMOWELL .260 BORE 3/4" NPT EXTERNAL 1/2" NPT INTERNAL, 18" STEM LENGTH, 316SS	A
HV-	X2509		Draft Control Pressure Transmitter Root Valve	941-02414-000	648-01236-008	1/2"	Gate	NPT	800	SA105	Vogt	12111		A
PT-	X2510		Draft Control Pressure Transmitter	817-04612-000	648-01236-008	1/2"	Transmitter	FNPT	-	316L SST	Rosemount	2051CG1A02A1AKB SSQ4	TRANSMITTER,SMART GP,RANGE -25 TO 25" H2O,4-20MA HART,W/COPLANAR 2 VALVE 316SS MANIFOLD & BRACKET <i>Calibrated 0-15" H2O</i>	A
HV-	X2510		Draft Control Pressure Transmitter 2-Valve Manifold	Part of transmitter	648-01236-008	1/2"	Manifold	FNPT	-	316SS	Rosemount	0305RC22B11B4	MANIFOLD, INTEGRAL COPLANAR, 2-VALVE, 316 SST CONSTRUCTION, 1/2" FNPT PROCESS CONNECTION, PTFE PACKING, INTEGRAL SEAT, 2" SST PIPE MOUNTING BRACKET	A
AE	X2520		Oxygen Probe	985-00324-000	648-01236-008	2"	O2 Probe	RFF	-	316SS	Yokogawa	ZR22G-070-S-A-E-T-T-E-A/Z	OXYGEN ANALYZER,SEPERATE TYPE PROBE 2"-150# RF FLG,316SS, EXTERNAL REFERENCE AIR CONNECTION, 0.7 METER LENGTH PROBE	A
AT-	X2520	AT-501-A2(A3)	Oxygen Analyzer	985-00322-000	648-01236-008	-	Analyzer	-	-	-	Yokogawa	ZR402G-T-E-E-A	OXYGEN ANALYZER, SEPERATE TYPE ZIRCONIA CONVERTER, W/ LCD TOUCH SCREEN, 100-240VAC4-20MA OUTPUT, PANEL, WALL OR PIPE MOUNT	A
	X2520		Oxygen Analyzer Interconnection Wire	826-00151-000 826-00152-000	648-01236-008	-	Conductor Cable	-	-	-	Yokogawa	WZ-H-3H050 WZ-H-6S050	3 CONDUCTOR SHIELDED CABLE, 50ft. FOR ZIRCONIA HEATER, 6 CONDUCTOR SHIELDED CABLE, 50ft. FOR O2 SIGNAL	A
TW-	X2600		Economizer Flue Gas Exit Thermowell	937-00871-000	648-01236-008	3/4"	Thermowell	NPT	-	316SS	Ashcroft	26-88-17-811Z,(Z350)	THERMOWELL .260 BORE 3/4" NPT EXTERNAL 1/2" NPT INTERNAL, 18" STEM LENGTH, 316SS	A
TI-	X2605		Economizer Flue Gas Exit Temperature Indicator	937-00979-000	648-01236-008	1/2"	Indicator	NPT	N/A	316SS	Ashcroft	50EI60E180 50/550F	THERMOMETER, 18" STEM, 50-550 F, 5" DIAL "EI" STYLE, EVERY ANGLE, 10F/DIVISION 1/2" NPT PROCESS CONNECTION	A
TW-	X2605		Economizer Flue Gas Exit Thermowell	937-00871-000	648-01236-008	3/4"	Thermowell	NPT	-	316SS	Ashcroft	26-88-17-811Z,(Z350)	THERMOWELL .260 BORE 3/4" NPT EXTERNAL 1/2" NPT INTERNAL, 18" STEM LENGTH, 316SS	A
FV-	X2620		DAMPER - Draft Control	427-00691-000	648-01236-008	42" Dia.	Louver	Flanged	-	Carbon Steel	CB-Natcom		See Natcom documents for details, N20163 Flange to Flange 18"	A

TAG	NUMBER	CUSTOMER TAG NUMBER	FUNCTION / EQUIPMENT	PART NUMBER	PRODUCT STRUCTURE	SIZE	TYPE	ENDS	CLASS	MATERIAL	MANUF.	MODEL #	ADDITIONAL NOTES	REVISION
<b>FEEDWATER FLOW CONTROL VALVE TO ECONOMIZER</b>														
X-3-BFW-30-30C2-H		Feedwater Piping	900-01000-000	504-17222-007	3"	Pipe	RFF	Sch 40	SA106-B	Cleaver Brooks	-			A
HV-X3041		FWCV Isolation Valve	941-02306-000	504-17222-008	3"	Gate	RFF	300	SA216-WCB	Crane	33XUF	Before FWCV		A
HV-X3044		FW Control Station Drain Valve	941-02383-000	504-17222-007	1/2"	Gate	SW	800	SA105	Vogt	SW12111	Before FWCV		A
HV-X3045		FW Control Station Drain Valve	941-02383-000	504-17222-007	1/2"	Gate	SW	800	SA105	Vogt	SW12111	After FWCV		A
FV-X3000	FCV-201-A2(A3)	Feedwater Control Valve (FWCV)	915-00407-000	504-17222-008	3"	Control	RFF	300	SA216-WCC	Fisher	ET	667-ET		A
FY-X3000		Feedwater Control Positioner (FWCV)	Part of 915-00407-000	504-17222-008	-	Positioner	-	-	SA216-WCC	Fisher	-	DVC-6200 Size 40 4-20mA Output included		A
X-3-BFW-31-30C2-H		Feedwater Piping	900-01000-000	504-17222-007	3"	Pipe	BW	Sch 40	SA106-B	Cleaver Brooks	-			A
HV-X3142		FWCV Isolation Valve	941-02306-000	504-17222-008	3"	Gate	RFF	300	SA216-WCB	Crane	33XUF	After FWCV		A
HV-X3143		FWCV Bypass Valve	941-02291-000	504-17222-008	2-1/2"	Globe	RFF	300	SA216-WCB	Crane	151XU	-		A
<b>ECONOMIZER AND ATTACHMENTS</b>														
FV-X3117		Feedwater Check Valve	227-00005-000	504-17222-008	3"	Check	RFF	300	SA216-WCB	Crane	159XU	-		A
TI-X3130		Economizer Feedwater Inlet Temperature Indicator	937-00915-000	504-17222-008	1/2"	Indicator	NPT	-	304SS	Ashcroft	50E160E060 50/400F	THERMOMETER, 6" STEM, 50-400 F, 5" DIAL "EI" STYLE, EVERY ANGLE, 5F/DIVISION, 1/2" NPT PROCESS CONNECTION		A
TW-X3130		Economizer Feedwater Inlet Thermowell	096-00111-000 (096-00125-000)	504-17222-007	3/4"	Thermowell and couplet	NPT	-	304SS	Pyromation	H4D0609T2.5"S	THERMOWELL, HEAVY DUTY THREADED, 0.26" BORE, 3/4" NPT PROCESS CONNECTION, 304SS, 6" STEM LENGTH, 2" IMMERSION LENGTH, 2.5" LAG		A
HV-X3121		Economizer Isolation	941-02306-000	504-17222-008	3"	Gate	RFF	300	SA216-WCB	Crane	33XUF	-		A
HV-X3122		Economizer Bypass	941-02306-000	504-17222-008	3"	Gate	RFF	300	SA216-WCB	Crane	33XUF	-		A
X-3-BFW-32-30C2-H		Feedwater Piping	900-01000-000	504-17222-007	3"	Pipe	BW	Sch 40	SA106-B	Cleaver Brooks	-			A
	X3299	Economizer	611-00801-000	504-17222-008	-	Counter flow	RFF	300	-	AHR	-	See economizer documents for details DWG D-1172025-1r1 & DWG D-1142025-2r1		A
PSV-X3204		Economizer Safety Relief Valve	210-03072-000	504-17222-008	1"	Safety	NPT	-	SA351-CF8M	Kunkle	911BFEM06AJE	-		A
HV-X3230		Economizer Inlet Header Vent Valve	941-02384-000	504-17222-007	3/4"	Gate	SW	800	SA105	Vogt	SW12111	-		A
HV-X3250		Economizer Outlet Header Drain Valve	941-02384-000	504-17222-007	3/4"	Gate	SW	800	SA105	Vogt	SW12111	-		A
HV-X3251		Economizer Outlet Header Drain Valve	941-02384-000	504-17222-007	3/4"	Gate	SW	800	SA105	Vogt	SW12111	-		A

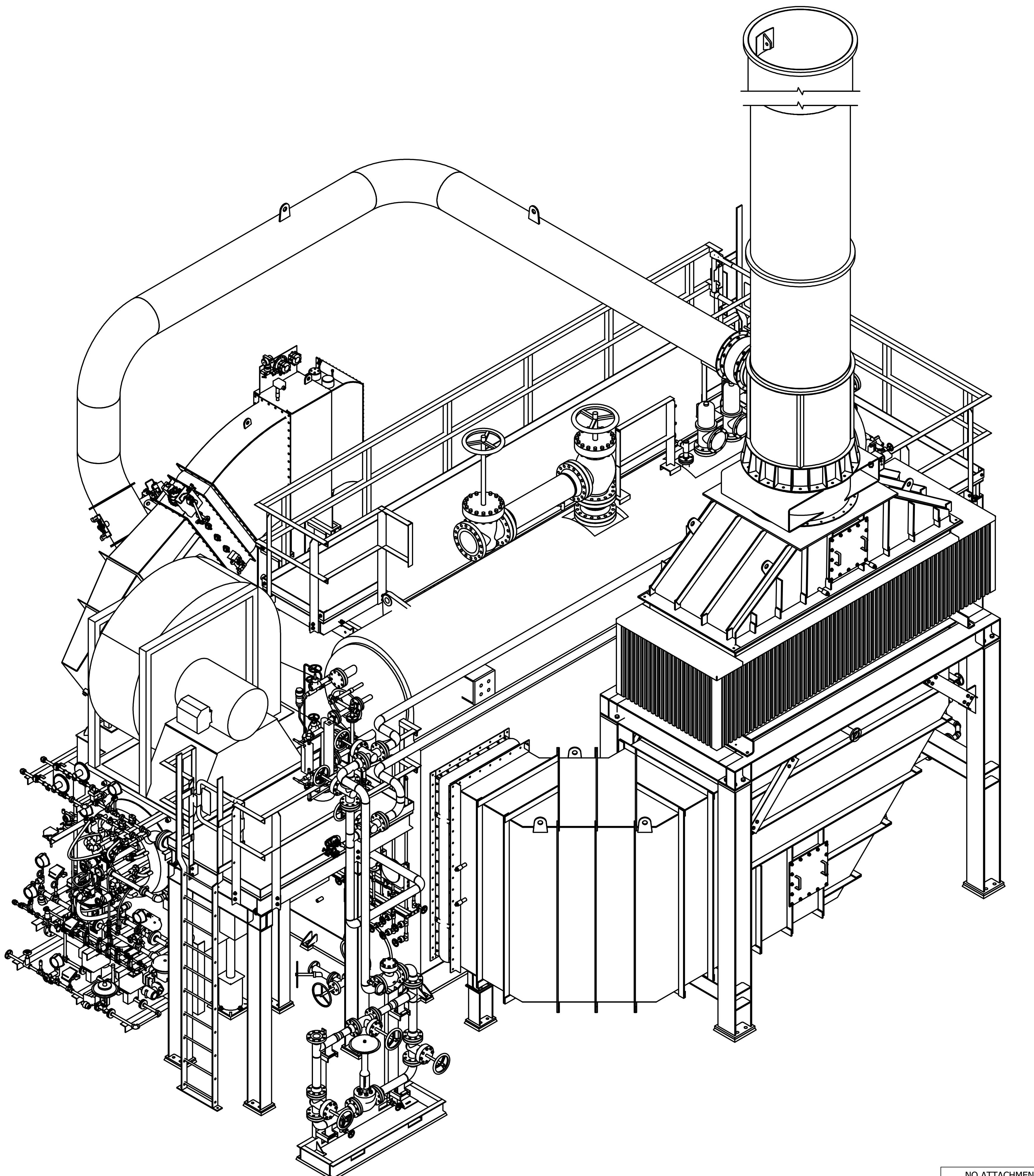
TAG	NUMBER	CUSTOMER TAG NUMBER	FUNCTION / EQUIPMENT	PART NUMBER	PRODUCT STRUCTURE	SIZE	TYPE	ENDS	CLASS	MATERIAL	MANUF.	MODEL #	ADDITIONAL NOTES	REVISION
<b>FEEDWATER SYSTEM AFTER ECONOMIZER TO BOILER</b>														
X-3-BFW-33-30C2-H		Feedwater Piping	900-01000-000	504-17222-007	3"	Pipe	BW	Sch 40	SA106B	Cleaver Brooks	-	After economizer	A	
HV-X3323		Economizer Isolation	941-02306-000	504-17222-008	3"	Gate	RFF	300	SA216-WCB	Crane	33XUF	Economizer Outlet	A	
TW-X3330		Economizer Feedwater Outlet Thermowell	096-00111-000 (096-00125-000)	504-17222-007	3/4"	Thermowell and coupler	NPT	-	304SS	Pyromation	H4D0609T2.5"S	THERMOWELL, HEAVY DUTY THREADED, 0.26" BORE, 3/4" NPT PROCESS CONNECTION, 304SS, 6" STEM LENGTH, 2" IMMERSION LENGTH, 2.5" LAG	A	
TI-X3330		Economizer Water Outlet Temperature Indicator	937-00897-000	504-17222-008	1/2"	Indicator	NPT	N/A	316SS	Ashcroft	50EI60E060 50/550F	THERMOMETER, 6" STEM, 50-550 F, 5" DIAL "EI" STYLE, EVERY ANGLE, 5F/DIVISION 1/2" NPT PROCESS CONNECTION	A	
HV-X3300		Feedwater Piping Drain Valve	941-02383-000	504-17222-007	1/2"	Gate	SW	800	SA105	Vogt	SW12111		A	
<b>DRUM ATTACHMENTS</b>														
HS-L-X3415		Low Water Cut-Off Shunt Pushbutton W/ Status Light	848-01319-000 836-01152-000 881-00665-000	504-17221-007	-	Switch	-	-	-	Allen Bradley	800T-2TZ 800T-A2D1 800T-QH2R	2 PUSH BUTTON DIE CAST ALUMINUM ENCLOSURE, NEMA 4/13, ONE FLUSH MOUNTED BLACK MOMENTARY PUSHBUTTON W/ 1 NO CONTACT, AND ONE 12-130 VAC/DC RED PILOT LIGHT	A	
PSV-X3480		Drum Safety #1	940-06990-000	504-17221-008	4" x 6"	Safety	RFF	250	A126 CL.A	Kunkle	6252 KNM	Set at 150 psig. Capacity = 36,525 pph. 125# flanged outlet.	A	
PSV-X3481		Drum Safety #2	940-06991-000	504-17221-008	4" x 6"	Safety	RFF	250	A126 CL.A	Kunkle	6252 KPM	Set at 155 psig. Capacity = 55,327 pph. 125# flanged outlet.	A	
HV-X3483		Drum Vent	941-02387-007	504-17221-007	1-1/2"	Gate	SW	800	SA105	Vogt	SW12111	-	A	
<b>STEAM DRUM LEVEL</b>														
X-1.5-BLR-34-30C2-P		Water Column Connection Piping	900-00292-000	504-17221-000	1-1/2"	Pipe	SW	Sch 80	SA106B	Cleaver Brooks	-	-	A	
LE-X3400		Yarway Drum Level Indicator	100-XTBDX-000	504-17221-007	1-1/2"	Level Indicator	RFF	300	SA106B	Yarway	3200	Yarway Water Column SA106 GR B 2000 psig @ 700°F 1" SCH160 STUB DRUM CONNECTIONS 1-1/2" x 1" SW reducing inset (welded to flanges) 1-1/2" CL 300RF Flanges 21" CENTERS 3/4" SCH160 STUB DRAIN CONNECTION 3/4" Coupling welded to drain PREWIRED COLUMN MOUNTED JUNCTION BOX. INCLUDES 12 HIGH PRESSURE PROBES, 1/2" SWAGED CONNECTION, STAINLESS STEEL/CERAMIC CONSTRUCTION. YARWAY MODEL 3200-12 LEVEL DETECTION & VERIFICATION ELECTRONICS NEMA 4X ENCLOSURE 110-120Vac 50-60Hz SERVICE FOR USE WITH UP TO 12 PROBES STANDARD ELECTRICAL FAULT (POWER SUPPLY AND INTERNAL CLOCK) DETECTION AND LEVEL FAULT DETECTION YARWAY 12-LED FULL-SIZE REMOTE DISPLAY FOR MODEL 3200	A	
HV-X3405		Yarway Drain Valve	941-02384-000	504-17221-000	3/4"	Gate	SW	800	SA105	Vogt	SW12111	-	A	
HV-X3406		Yarway Drain Valve	941-02384-000	504-17221-000	3/4"	Gate	SW	800	SA105	Vogt	SW12111	-	A	
LG-X3400		Gauge Glass	851-266	504-17221-008	3/4"	Level Indicator	-	250	Glass	Clark Reliance	C9	Vertical, prismatic, 12-1/2" visibility	A	
HV-X3401		Gauge Glass Isolation Valve	825-141	504-17221-007	3/4"	Globe	NPT	250	BRZ	Clark Reliance	403-RS	Upper, with Chain for floor level operation	A	

TAG	NUMBER	CUSTOMER TAG NUMBER	FUNCTION / EQUIPMENT	PART NUMBER	PRODUCT STRUCTURE	SIZE	TYPE	ENDS	CLASS	MATERIAL	MANUF.	MODEL #	ADDITIONAL NOTES	REVISION
HV-	X3402		Gauge Glass Isolation Valve	(Valve set)	504-17221-007	3/4"	Globe	NPT	250	BRZ	Clark Reliance	403-RS	Lower, with Chain for floor level operation.	A
HV-	X3403		Gauge Glass Drain Valve	941-02383-000	504-17221-007	1/2"	Gate	SW	800	SA105	Vogt	SW12111	-	A
HV-	X3404		Gauge Glass Drain Valve	941-02383-000	504-17221-007	1/2"	Gate	SW	800	SA105	Vogt	SW12111	-	A
<b>X-1-BLR-34-30C2-P</b>			ALWCO Piping	900-00320-000	504-17221-000	1"	Pipe	SW	Sch 80	SA106B	Cleaver Brooks	-	Drum connection 1-1/2"	A
LSSL-	X3410		Aux Low-Water Cut-Out (ALWCO)	817-1548	504-17221-000	1"	Switch	NPT	350	A216-WCB	Clark Reliance	EA-100D	Float Type	A
HV-	X3411		ALWCO Drain Valve	941-02384-000	504-17221-007	3/4"	Gate	SW	800	SA105	Vogt	SW12111	-	A
HV-	X3412		ALWCO Drain Valve	941-02384-000	504-17221-007	3/4"	Gate	SW	800	SA105	Vogt	SW12111	-	A
<b>X-1-BLR-34-30C2-P</b>			Drum Level Transmitter Piping	900-00320-000	504-17221-000	1"	Pipe	SW	Sch 80	SA106B	Cleaver Brooks	-	-	A
HV-	X3421		Drum Level Transmitter Isolation Valve	941-02385-000	504-17221-000	1"	Gate	SW	800	SA105	Vogt	SW12111	Steam Leg.	A
HV-	X3422		Drum Level Transmitter Isolation Valve	941-02385-000	504-17221-000	1"	Gate	SW	800	SA105	Vogt	SW12111	Water Leg.	A
LT-		LT-201-A2(A3)	Drum Level Transmitter	817-04642-000	504-17221-008	-	Control	-	-	-	ROSEMOUNT	2051CD1A02A1AKB S5M5Q4Q8/0305RC8 2B21B4		A
HV-			Drum Level Transmitter 3-Valve Manifold	Included with 817-04642-000	-	1/2"	Manifold	FNPT	-	-	-	-	-	A
HV-	X3425		Drum Level Transmitter Drain Valve	941-02383-000	504-17221-000	1/2"	Gate	SW	800	SA105	Vogt	SW12111	-	A
HV-	X3426		Drum Level Transmitter Drain Valve	941-02383-000	504-17221-000	1/2"	Gate	SW	800	SA105	Vogt	SW12111	-	A
HV-	X3448		Steam Drum Pressure Transmitter Root Valve	941-02414-000	504-17221-007	1/2"	Gate	NPT	800	SA105	Vogt	12111		A
PT-	X3450	PT-205-A2(A3)	Steam Drum Pressure Transmitter	817-04777-000	504-17221-007	1/2"	Transmitter	FNPT	-	316L SST	Rosemount	2051TG3A2B21AB4 KBS5Q4	TRANSMITTER, SMART GP, RANGE -14.7 TO 800 PSI, 4-20 MA, 2 VALVE 316 SS B31.1 MANIFOLD & BRACKET, FM/CSA <b>Calibrated 0 - 200 PSIG</b>	A
HV-	X3450		Steam Drum Pressure Transmitter Manifold	Part of transmitter	-	1/2"	Manifold	FNPT		316SS	Rosemount	0306RT32BA21	MANIFOLD, 2-VALVE B31.1 RATED BLOCK & BLEED, 316 SS BODY MATERIAL, 1/2" FNPT INLET X 1/2" MNPT OUTLET, GRAPHITE-BASED PACKING, INTEGRAL VALVE SEAT	A
HV-	X3448		Steam Drum Pressure Gauge Isolation Valve	941-02414-000	504-17221-007	1/2"	Gate	NPT	800	SA105	Vogt	12111		A
PI-	X3460		Steam Drum Pressure Gauge	850-02245-000	504-17221-007	8-1/2"	Indicator	NPT	-	316SS	Ashcroft	85-1010-S-04L 0/300 PSI	GAUGE, PRESS, 8-1/2", 0-300 PSI, 1/2" NPT LOWER CONN., SS BOURDON TUBE	A
HV-	X3460		2-Valve Manifold for Steam Drum Pressure Gauge	330-00954-000	504-17221-007	1/2"	Manifold	NPT	800	SA105	Anderson Greenwood	M25HPS-44F-XP	MANIFOLD, 2 VALVE, AGCO, GAUGE VALVE. 1/2" FNPT X MNPT, B21.1 GRAFOIL PACKING, 1/2" FNPT PROCESS CONNS.	A
HV-	X3463		Pressure Gauge Test Valve	941-02383-000	504-17221-007	1/2"	Gate	SW	800	SA105	Vogt	SW12111		A
PSHH-	X3471		Steam Drum Pressure Switch	836-01227-000	504-17221-008	1/2"	Indicator	NPT	-	316SS	Ashcroft	B432S-XFS-FM-200 PSIG	SWITCH, PRESSURE, 0-200 PSI, SS DIAPHRAGM 1/4" FNPT, HERM. SEALED SWITCH, GEN. PURPOSE NEMA 4X/IP66, FACTORY SET, UL, CSA, FM <b>Set @ 142 PSIG, Increasing</b>	A
<b>X-1.5-BLR-08-30C2-P</b>			Atomizing Steam Supply Piping	900-292	504-17221-000	1-1/2"	Pipe	SW	Sch 80	SA106B	Cleaver Brooks	-	-	A
HV-	X0800		Atomizing Steam Isolation Valve	941-02387-000	504-17221-000	1-1/2"	Gate	SW	800	SA105	Vogt	SW12111		A

TAG	NUMBER	CUSTOMER TAG NUMBER	FUNCTION / EQUIPMENT	PART NUMBER	PRODUCT STRUCTURE	SIZE	TYPE	ENDS	CLASS	MATERIAL	MANUF.	MODEL #	ADDITIONAL NOTES	REVISION
<b>BLOWDOWN</b>														
X-1-BBS-35-30C2-P		Continuous Blowdown Piping	900-00320-000	504-17221-000	1"	Pipe	SW	Sch 80	SA106B	Cleaver Brooks	-	Drum connection 1-1/2"	A	
HV-X3500		Continuous Blowdown Stop Valve	941-02375-000	504-17221-000	1"	Angle Globe	NPT	800	SA105	Edward	849Y	-	A	
HV-X3501		Continuous Blowdown Metering Valve	941-02393-000	504-17221-000	1"	Globe Needle	SW	800	SA105	Vogt	SW12443	-	A	
X-1.5-BBS-35-30C2-P		Bottom Blowoff Piping	900-00292-000	504-17221-000	1-1/2"	Pipe	SW	Sch 80	SA106B	Cleaver Brooks	-	-	A	
HV-X6510		Bottom Blowoff Valve	941-02396-000	504-17221-008	1-1/2"	Angle Globe	RFF	300	A105	Edward	1443	Burner End, Quick Opening	A	
HV-X6511		Bottom Blowoff Valve	941-02395-000	504-17221-008	1-1/2"	Globe	RFF	300	A105	Edward	1441	Burner End, Quick Opening	A	
HV-X6520		Bottom Blowoff Valve	941-02395-000	504-17221-008	1-1/2"	Angle Globe	RFF	300	A105	Edward	1441	Target End, Quick Opening	A	
HV-X6521		Bottom Blowoff Valve	941-02395-000	504-17221-008	1-1/2"	Globe	RFF	300	A105	Edward	1441	Target End, Quick Opening	A	
HV-X6523		Bottom Blowoff Valve	941-02395-000	504-17221-008	1-1/2"	Globe	RFF	300	A105	Edward	1441	Target End, Quick Opening, Gravity Drain Line	A	
HV-X6524		Bottom Blowoff Valve	941-02395-000	504-17221-008	1-1/2"	Globe	RFF	300	A105	Edward	1441	Target End, Quick Opening, Gravity Drain Line	A	
HV-X6522		Boiler Circulating Valve	941-02387-000	504-17221-007	1-1/2"	Gate	SW	800	SA105	Vogt	SW12111	Target End, Quick Opening	A	
<b>LOWER DRUM HEATING COIL</b>														
X-1-SHP-36-30C2-H		Lower Drum Heating Coil - External Piping	900-00320-000	504-17223-007	1"	Pipe	SW	Sch 80	SA106B	Cleaver Brooks	-	-	A	
HV-X3600		LDHC Steam Control Valve	941-02380-000	504-17223-007	1"	Globe	SW	800	SA105	Vogt	SW12141	-	A	
HV-X3601		LDHC Steam Isolation Valve	941-02385-000	504-17223-007	1"	Gate	SW	800	SA105	Vogt	SW12111	-	A	
HV-X3602		LDHC Piping Drain Valve	941-02383-000	504-17223-007	1/2"	Gate	SW	800	SA105	Vogt	SW12111	-	A	
HV-X3606		Condensate Return Strainer Isolation Valve	941-02385-000	504-17223-007	1"	Gate	SW	800	SA105	Vogt	SW12111	-	A	
NX-X3607		Condensate Return Strainer	923-768	504-17223-007	1"	Strainer	RFF	300	A216	Keckley	SA-7	Y Type	A	
MX-X3608		LDHC Steam Trap	934-276	504-17223-007	1"	Trap	NPT	250	A105	Armstrong	813	Integral Strainer, 3/16" orifice	A	
HV-X3609		Condensate Return Strainer Isolation Valve	941-02385-000	504-17223-007	1"	Gate	SW	800	SA105	Vogt	SW12111	-	A	
HV-X3611		Condensate Return Strainer Bypass Valve	941-02380-000	504-17223-007	1"	Globe	SW	800	SA105	Vogt	SW12141	-	A	
HV-X3612		Condensate Return Drain Valve	941-02383-000	504-17223-007	1/2"	Gate	SW	800	SA105	Vogt	SW12111	-	A	

TAG	NUMBER	CUSTOMER TAG NUMBER	FUNCTION / EQUIPMENT	PART NUMBER	PRODUCT STRUCTURE	SIZE	TYPE	ENDS	CLASS	MATERIAL	MANUF.	MODEL #	ADDITIONAL NOTES	REVISION
<b>STEAM OUTLET PIPING</b>														
X-10-SHP-43-30C2-H		Main Steam Line	900-00380-000	504-17221-000	10"	Pipe	BW	Sch 40	SA106-B	Cleaver Brooks	-			A
FV-X4300		Main Steam Non-Return Valve	941-02726-000	504-17223-007	10"	Gate	RFF	300	SA216-WCB	Edward	303K	-		A
X-10-SHP-43-30C2-H		Main Steam Spool Piece between Stop Valves	900-00380-000	504-17223-007	10"	Pipe	RFF	Sch 40	SA106-B	Cleaver Brooks	-	-		A
HV-X4302		Main Steam Spool Piece Drain Valve	941-02384-000	504-17223-007	3/4"	Gate	SW	800	SA105	Vogt	SW12111	-		A
HV-X4301A		Main Steam Stop Valve	941-02298-000	504-17223-007	10"	Gate	RFF	300	SA216-WCB	Crane	33XUF	-		A
HV-X4301B		Warm-Up ByPass Valve	941-02385-000	504-17223-007	1"	Gate	SW	800	SA105	Vogt	SW12111	-		A
HV-X4304		Warm-Up ByPass Drain Valve	941-02384-000	504-17223-007	3/4"	Gate	SW	800	SA105	Vogt	SW12111	-		A
AX-X4370		Saturated Steam Sample Nozzle	504-09256-000	504-17221-008	3/4"	Nozzle	-	Sch 80	SA106-B	Cleaver Brooks	-	For customer to install in downstream piping.		A
HV-X4371		Saturated Steam Sample Nozzle Isolation Valve	941-02384-000	504-17221-008	3/4"	Gate	SW	800	SA105	Vogt	SW12111	-		A
HV-X4372		Saturated Steam Sample Nozzle Isolation Valve	941-02384-000	504-17221-008	3/4"	Gate	SW	800	SA105	Vogt	SW12111	-		A
<b>SOOTBLOWERS</b>														
X4400		Sootblower Wallboxes and Bearings	916-84	643-02423-000	-	-	-	FFF	-	Cleaver Brooks	-	Target end: Sootblower wallboxes and bearings (support brackets). Low pressure. Suitable for use with Diamond sootblowers.		A
X4420		Sootblower Wallboxes and Bearings	916-84	643-02423-000	-	-	-	FFF	-	Cleaver Brooks	-	Burner end: Sootblower wallboxes and bearings (support brackets). Low pressure. Suitable for use with Diamond sootblowers.		A
<b>CHEMICAL FEED</b>														
X-1-CEM-56-30C2-P		Chemical Feed Supply Line	900-320	504-17221-000	1"	Pipe	SW	Sch 80	SA106B	Cleaver Brooks	-	-		A
HV-X5601		Chemical Feed Stop Valve	941-02375-000	504-17221-000	1"	Angle Globe	SW	800	SA105	Edward	849Y	-		A
FV-X5600		Chemical Feed Check Valve	940-04411-000	504-17221-000	1"	Check	SW	800	SA105	Edward	838Y	-		A
<b>START-UP SPARES &amp; MISC.</b>														
		Manway Gaskets	853-02132-000	880-15000-000	12" x 16"	-	-	-	-	Black-Max	-	12, for spare		A
		Gauge Glasses, Tubular Type	851-00393-000	880-15000-000	3/4"	Indicator	-	-	Glass	Clark Reliance	-	One. Spares for boil-out. Tubular type. Cut Length = 20.25"		A
		Tubular Gage Glass Packing	789-01075-000	880-15000-000	3/4"	Packing/Gasket	-	-	Rubber	Clark Reliance	-	One set. Spare for boil-out or operation		A
		Furnace Observation Port/Lens Gaskets	853-01218-000	880-15000-000	1-1/2"	-	-	-	-	Sip, Inc	-	Two, for spare		A
		Furnace Observation Port Lens	851-00879-000	880-15000-000	1-1/2"	Lenz	-	-	Glass	Sip, Inc	-	One, for spare		A

TRIM LIST REVISION LOG							
REV. #	DESCRIPTION OF CHANGE	RFEC #	PE	CD	CE	PEM	DATE ISSUED
A	Initial release	-	JMD			MSV	August 12, 2025



NOTES:

GENERAL ARRANGEMENT

1. REFER TO PDS/PTL 4889 FOR DESIGN DATA, PAINT NOTES  
AND COMPLETE DESCRIPTION OF EQUIPMENT & COMPONENTS.

2. FIELD WELDS WILL BE REQUIRED TO ASSEMBLE THIS EQUIPMENT.  
AT THE TIME THIS DRAWING IS MADE, THE LOCATION OF ALL FIELD  
WELDS MAY NOT BE KNOWN. PLEASE REFER TO DETAILED ASSEMBLY  
AND PIPING DRAWINGS, ISSUED IN 'AS BUILT' REVISION FOR THE  
LOCATION OF ALL FIELD WELDS.

- ASSEMBLY OF THE EQUIPMENT MUST BE DONE BY A QUALIFIED  
INSTALLER WITH ASME "A" OR "S" STAMP. CUSTOMERS NEED TO  
CHECK WITH LOCAL JURISDICTION FOR COMPLIANCE AND REQUIREMENTS.

- DRUM HEADS, NOZZLES, PIPING, BLOW DOWN TANKS, DEAERATORS AND  
HOT DUCTS ARE NOT INSULATED IN THE SHOP UNLESS SPECIALLY NOTED  
AND HAVE TO BE FIELD INSULATED OR HAVE TO BE PROVIDED WITH  
Adequate Personal Protection by others.

3. DRAWING IS USED FOR GENERAL LAYOUT PURPOSES.

4. PIPING SUPPORTS AND ANALYSIS DONE BY OTHERS.

5. ALL VENTS AND DRAINS SHALL BE PIPED TO A SAFE AND VISIBLE  
LOCATION BY OTHERS.

BASE LOADING

1. ALL DIMENSIONS ARE SHOWN IN COLD POSITION.

2. ALL CONCRETE WORK, REINFORCEMENT RODS,  
ANCHOR BOLTS, NUTS, WASHERS, ETC., ARE NOT  
DESIGNED NOR SUPPLIED BY CLEAVER BROOKS.

3. ALL LOADS ARE UNFACTORED LOADS.

4. THE ANCHOR BOLTS IN THE FIXED BOILER BASE BEAM TO  
BE SNUG TIGHT.

5. THE ANCHOR BOLTS IN THE FIXED BOILER BASE BEAM TO  
BE SNUG TIGHT THEN HALF TURN BACK AND TACK WELD.

**CleaverBrooks®**

ENGINEERED BOILER SYSTEMS

NEBRASKA BOILER, CLEAVER-BROOKS, AND ENERGY RECOVERY INTERNATIONAL

WITH ADDITIONAL ENGINEERING SYSTEMS

GENERAL ARRANGEMENTS (SUBMITTAL 2)

SERIES: SP-NB-300D-65-250-HC-RH

F.M. SLYVAN, INC.

UNIVERSITY OF TENNESSEE KNOXVILLE

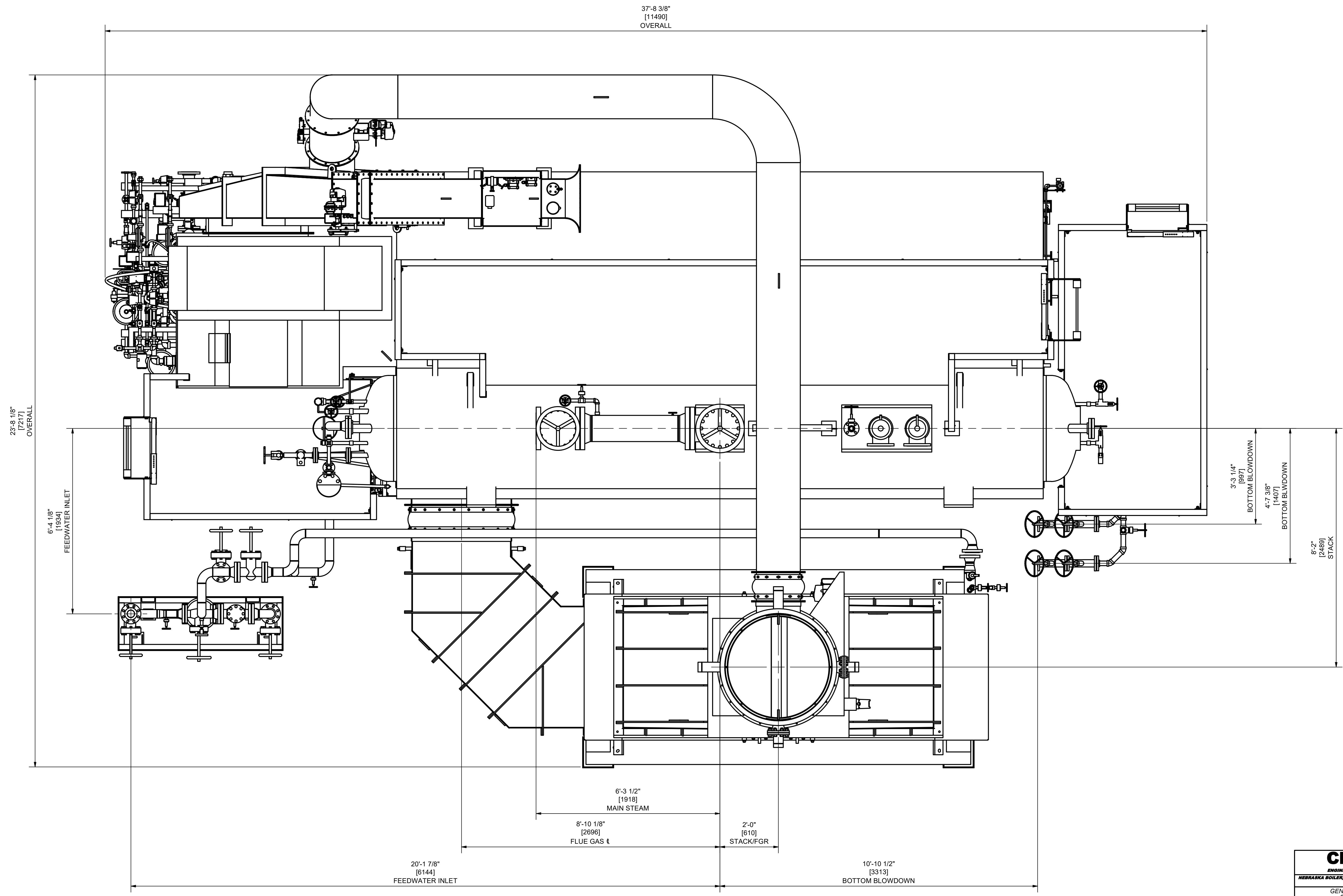
KNOXVILLE, TN

NO ATTACHMENTS TO CLEAVER-BROOKS SUPPLIED  
EQUIPMENT WITHOUT PRIOR WRITTEN AUTHORIZATION

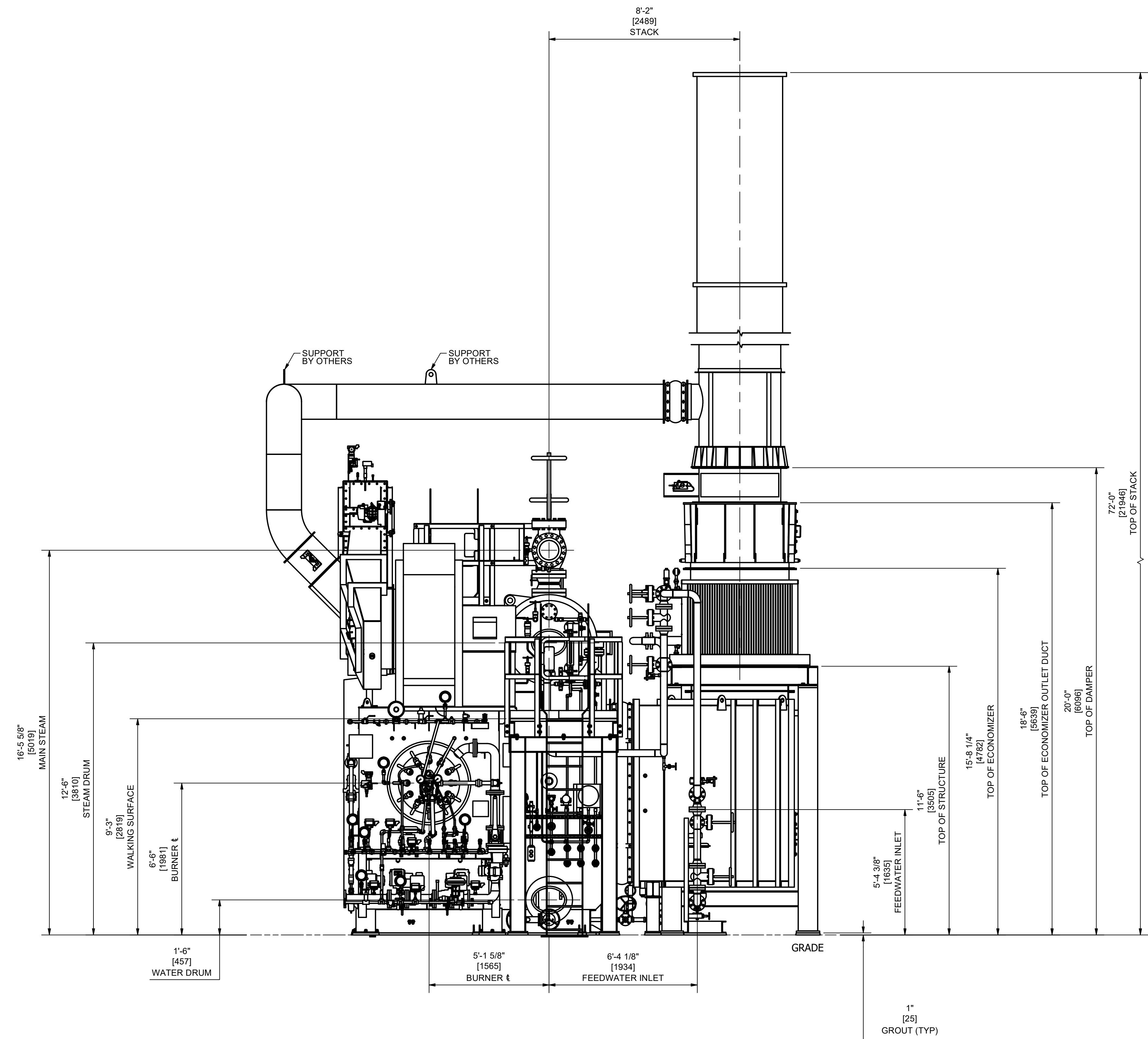
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HAND: RIGHT HAND DRAWING NO.: 1 OF 6  
722-09570

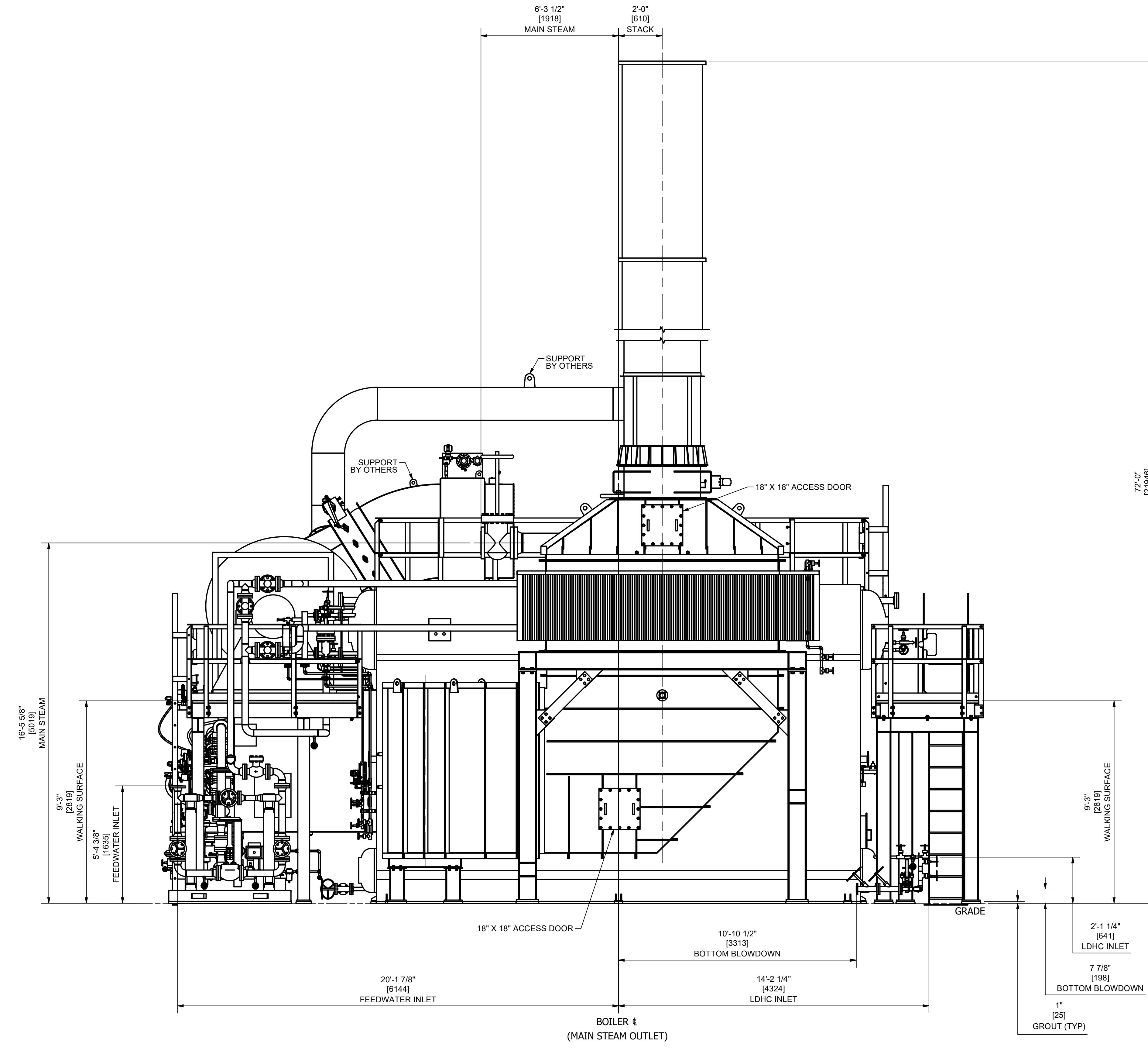
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<b>CleaverBrooks®</b>	
ENGINEERED BOILER SYSTEMS	
NEBRASKA BOILER, CLEAVER-BROOKS, AND ENERGY RECOVERY INTERNATIONAL	
PART OF THE F.M. SLYVAN GROUP OF COMPANIES	
GENERAL ARRANGEMENTS (SUBMITTAL 2)	
SERIES: SP-NB-300D-65-250-HC-RH	
F.M. SLYVAN, INC.	
UNIVERSITY OF TENNESSEE KNOXVILLE	
KNOXVILLE, TN	
SCALE:	
JOB NO.:	SP-4889
HAND:	RIGHT HAND
SERIAL NO.:	SP-4889
DRAWING NO.:	2 OF 6
REV A	

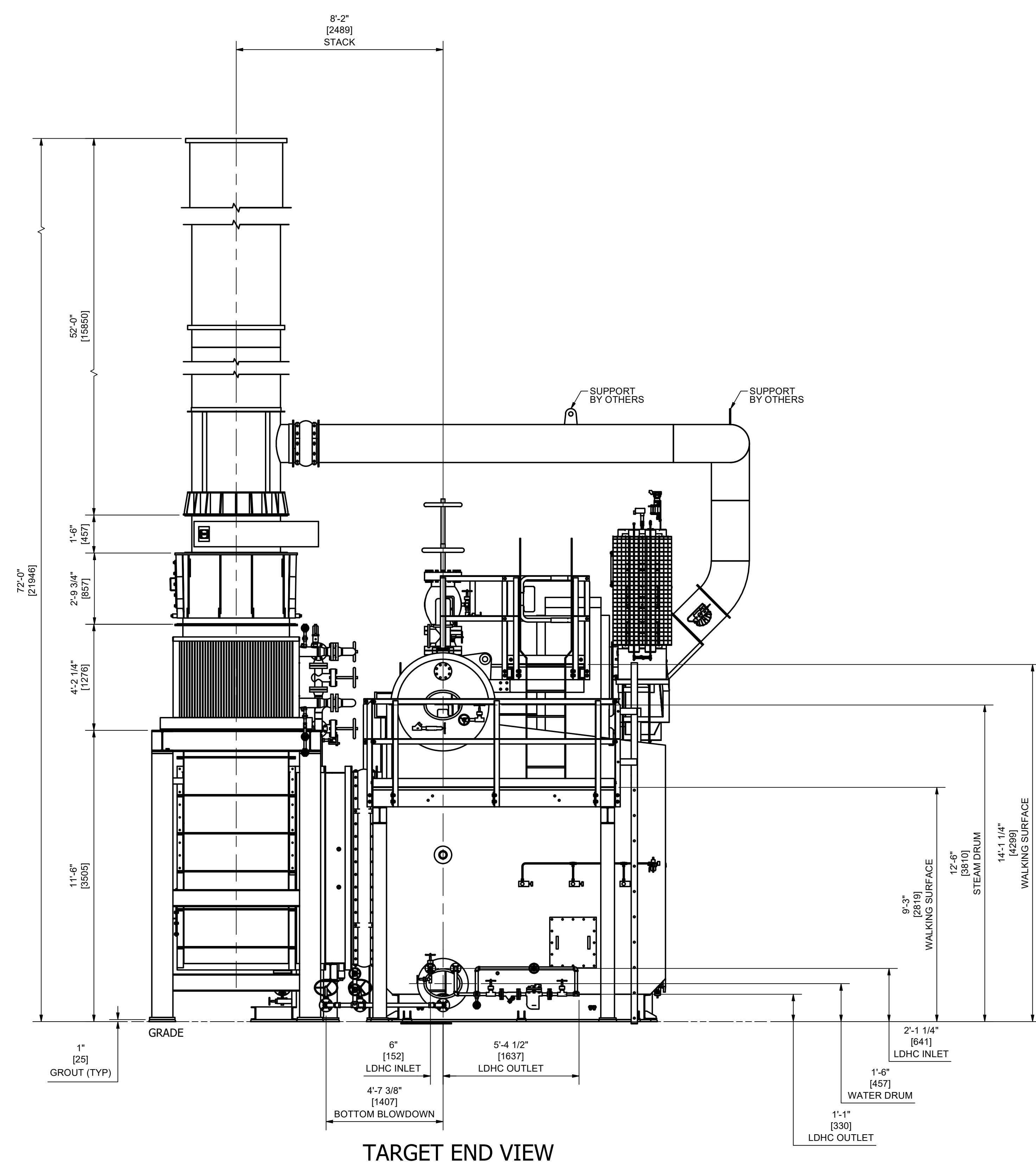


BURNER END VIEW

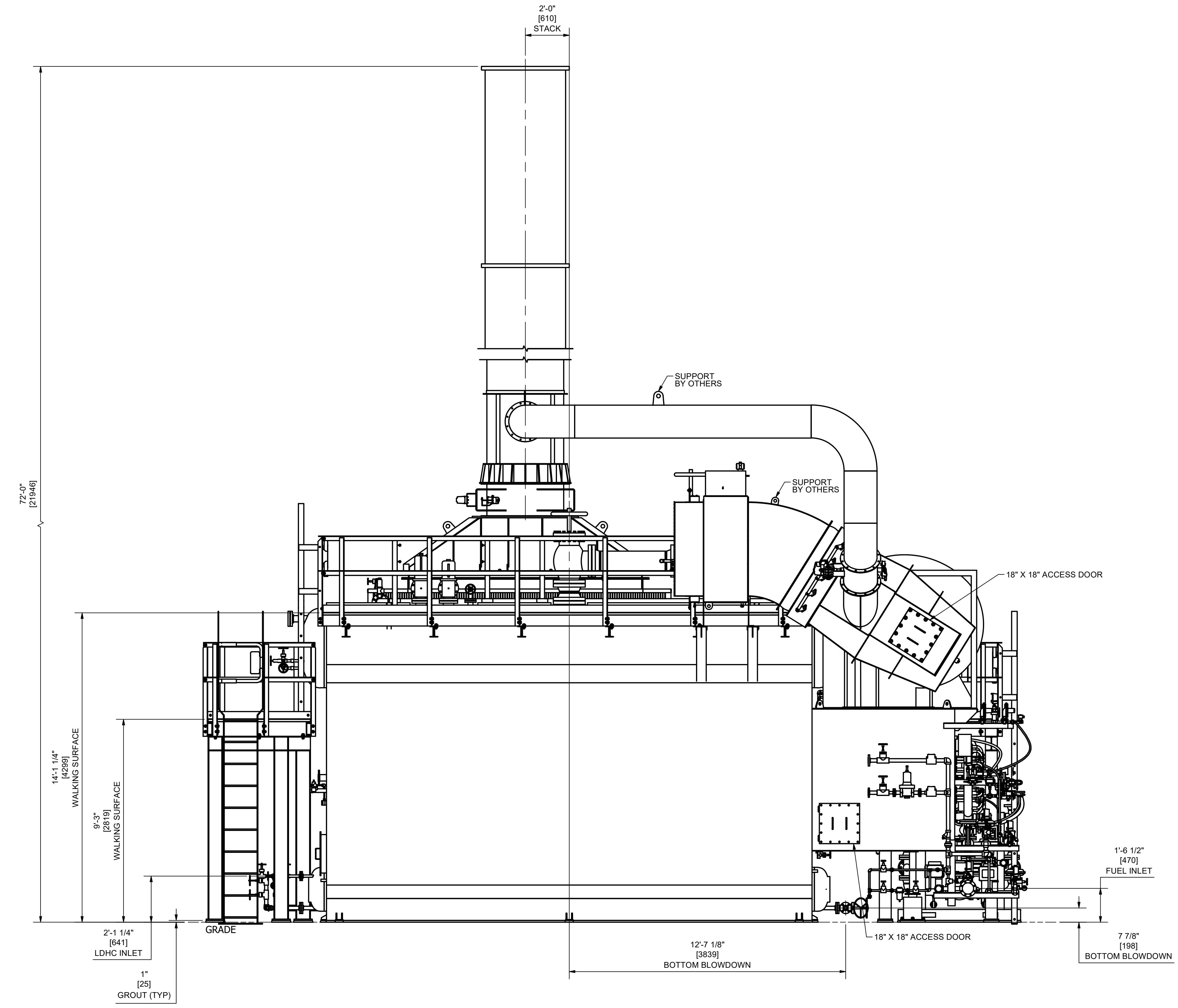


CONVECTION SIDE VIEW

CleaverBrooks®		
ENGINEERED BOILER SYSTEMS		
NEBRASKA BOILER, CLEAVER-BROOKS AND ENERGY RECOVERY INTERNATIONAL		
WITH ENGINEERED SYSTEMS		
GENERAL ARRANGEMENTS (SUBMITTAL 2)		
SERIES: SP-NB-300D-65-250-HC-RH		
F.M.SYLVAN, INC.		
UNIVERSITY OF TENNESSEE KNOXVILLE		
KNOXVILLE, TN		
SCALE:	SERIAL NO.: SP-4889	DRAWING NO.: 4889-A
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		722-09570

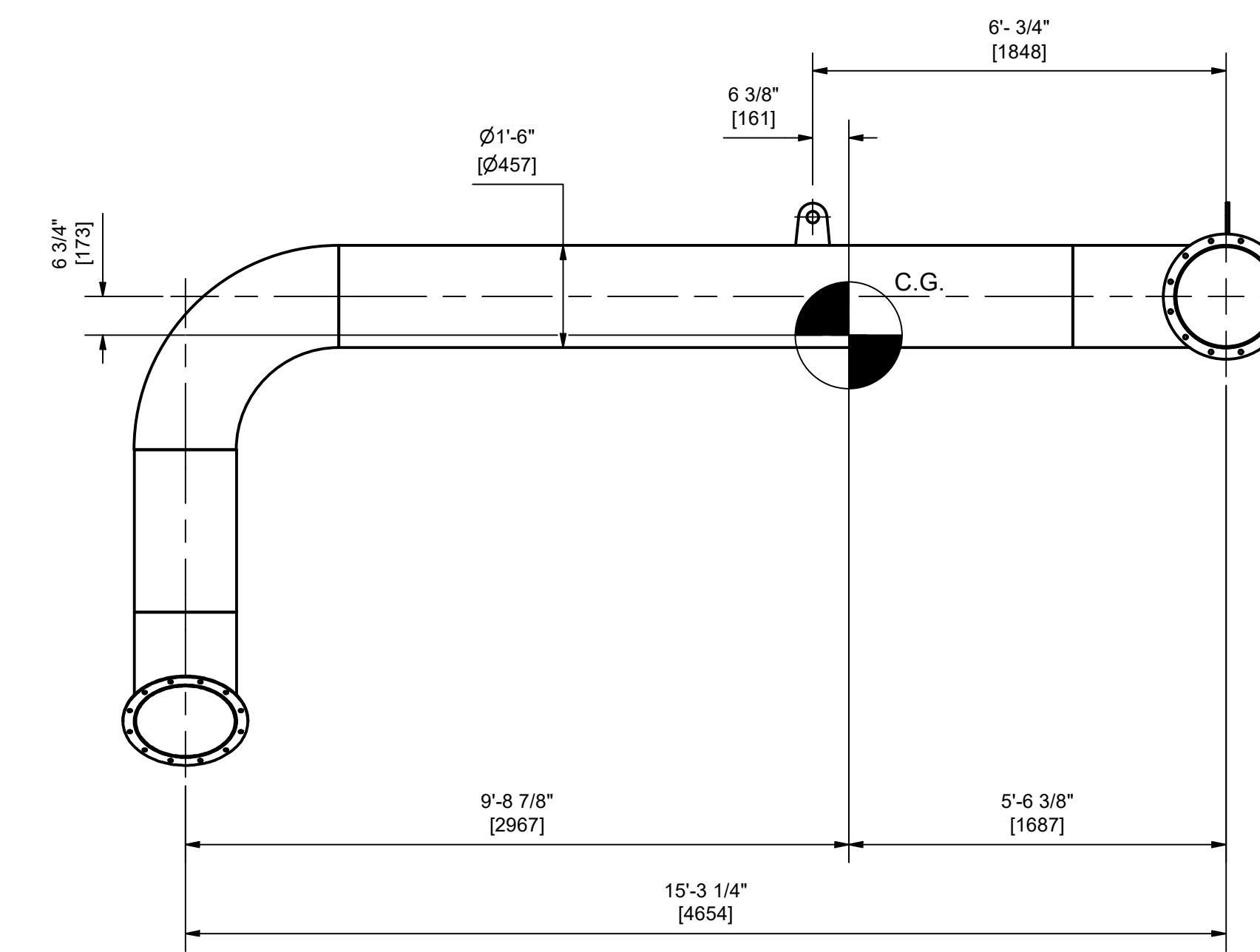
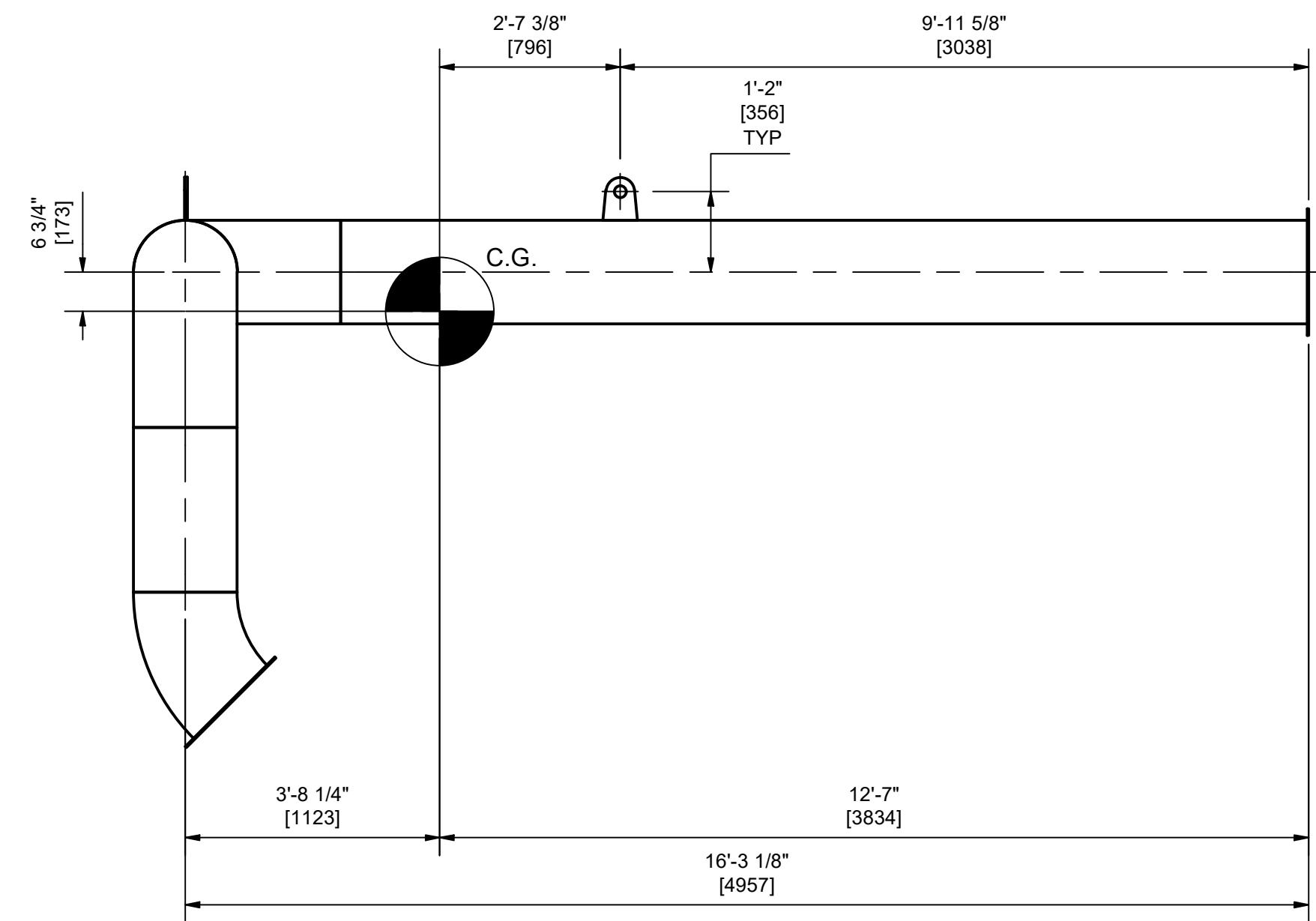
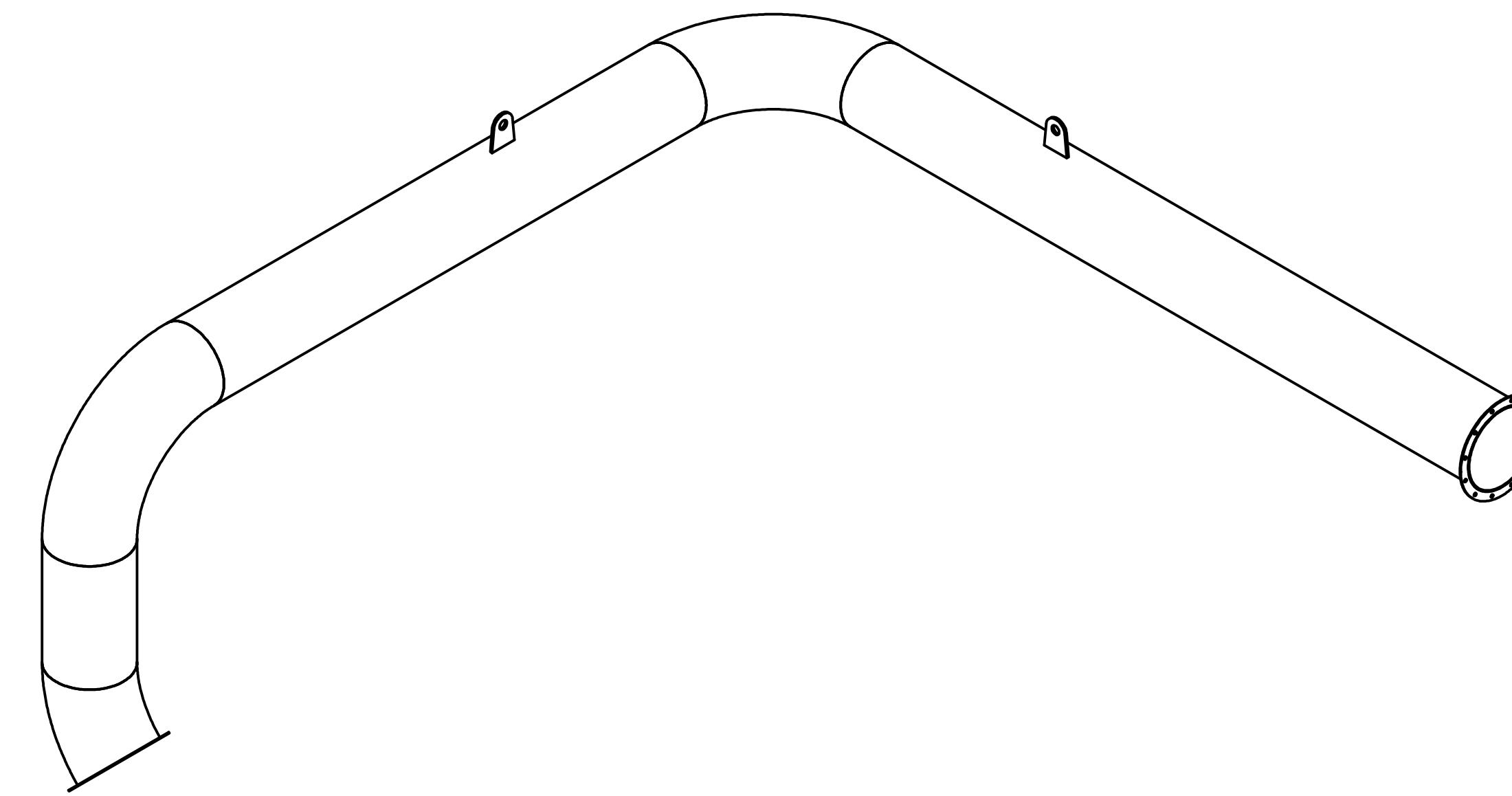
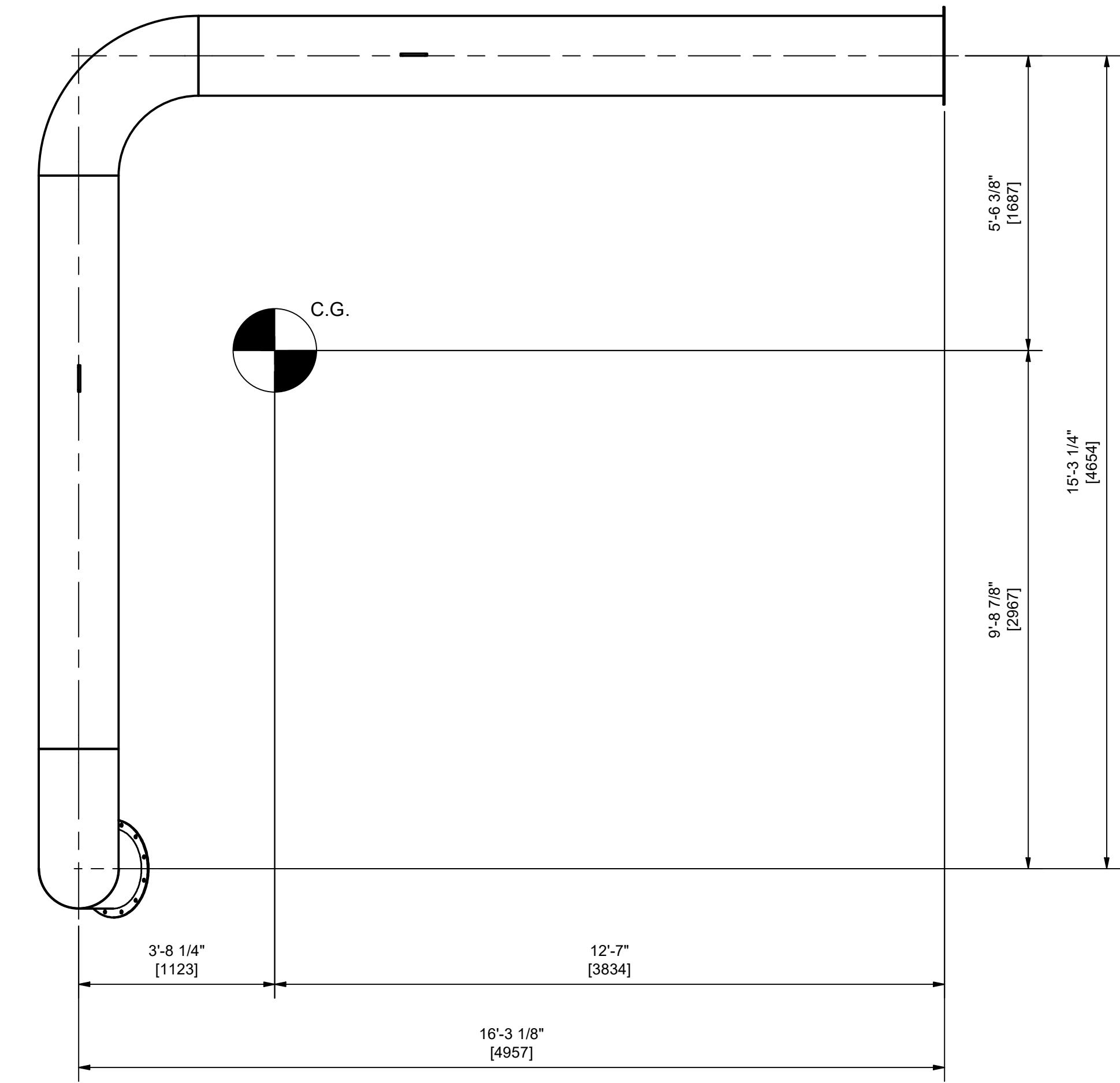


TARGET END VIEW



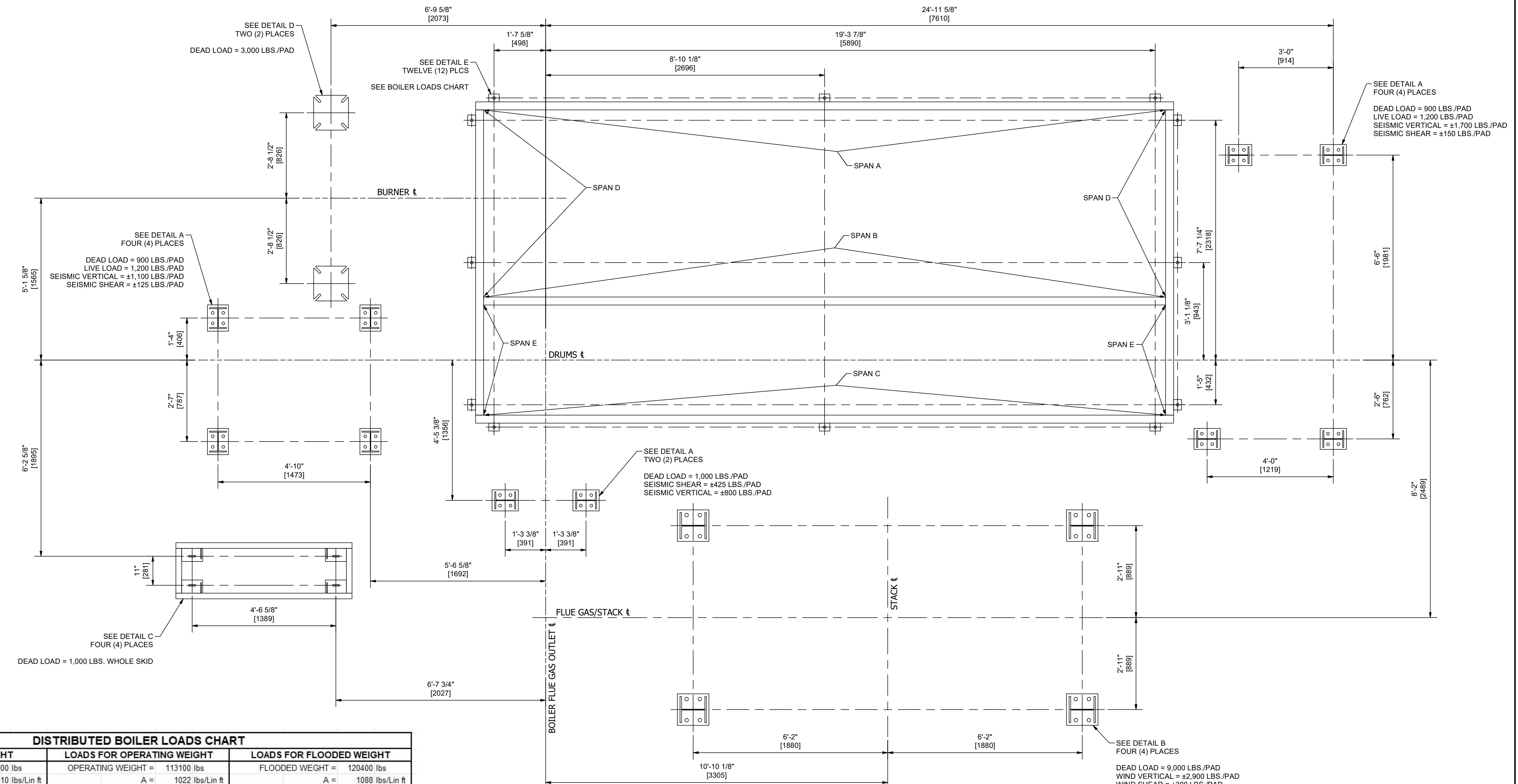
FURNACE SIDE VIEW

CleaverBrooks®	
ENGINEERED BOILER SYSTEMS	
NEBRASKA BOILER, CLEAVER-BROOKS AND ENERGY RECOVERY INTERNATIONAL	
WITH ENGINEERED BOILER SYSTEMS	
GENERAL ARRANGEMENTS (SUBMITTAL 2)	
SERIES: SP-NB-300D-65-250-HC-RH	
F.M.SYLVAN, INC.	
UNIVERSITY OF TENNESSEE KNOXVILLE	
KNOXVILLE, TN	
SCALE:	
JOB NO.: SP-4889	SERIAL NO.: SP-4889
HAND: RIGHT HAND	DRAWING NO.: 6 OF 6
	REV: A



**FGR DUCT SUSPENSION LUG LAYOUT**  
WEIGHT = 1,800 LBS.

<b>CleaverBrooks®</b>	
ENGINEERED BOILER SYSTEMS	
NEBRASKA BOILER, CLEAVER-BROOKS, AND ENERGY RECOVERY INTERNATIONAL	WITH ENGINEERED SYSTEMS
GENERAL ARRANGEMENTS (SUBMITTAL 2)	SERIES: SP-NB-300D-65-250-HC-RH
F.M. S.Y. VAN, INC.	UNIVERSITY OF TENNESSEE KNOXVILLE
	KNOXVILLE, TN
SCALE: JOB NO.: SP-4889 SERIAL NO.: SP-4889	DRAWING NO.: 7 OF 6
HAND: RIGHT HAND	REV: 722-0950



#### DISTRIBUTED BOILER LOADS CHART

LOADS FOR DRY WEIGHT		LOADS FOR OPERATING WEIGHT	LOADS FOR FLOODED WEIGHT
DRY WEIGHT =	89700 lbs	OPERATING WEIGHT =	113100 lbs
A =	810 lbs/Lin ft	A =	1022 lbs/Lin ft
B =	1216 lbs/Lin ft	B =	1533 lbs/Lin ft
C =	1216 lbs/Lin ft	C =	1533 lbs/Lin ft
D =	2906 lbs/Lin ft	D =	3664 lbs/Lin ft
E =	6724 lbs/Lin ft	E =	8478 lbs/Lin ft

SEISMIC	
A =	1001 lbs/Lin ft
B =	500 lbs/Lin ft
C =	500 lbs/Lin ft
D =	804 lbs/Lin ft
E =	804 lbs/Lin ft



TOTAL SEISMIC SHEAR = 26900 lbs

TOTAL SEISMIC SHEAR = 26900 lbs

**CleaverBrooks®**

ENGINEERED BOILER SYSTEMS

NEBRASKA BOILER, CLEAVER-BROOKS, AND ENERGY RECOVERY INTERNATIONAL

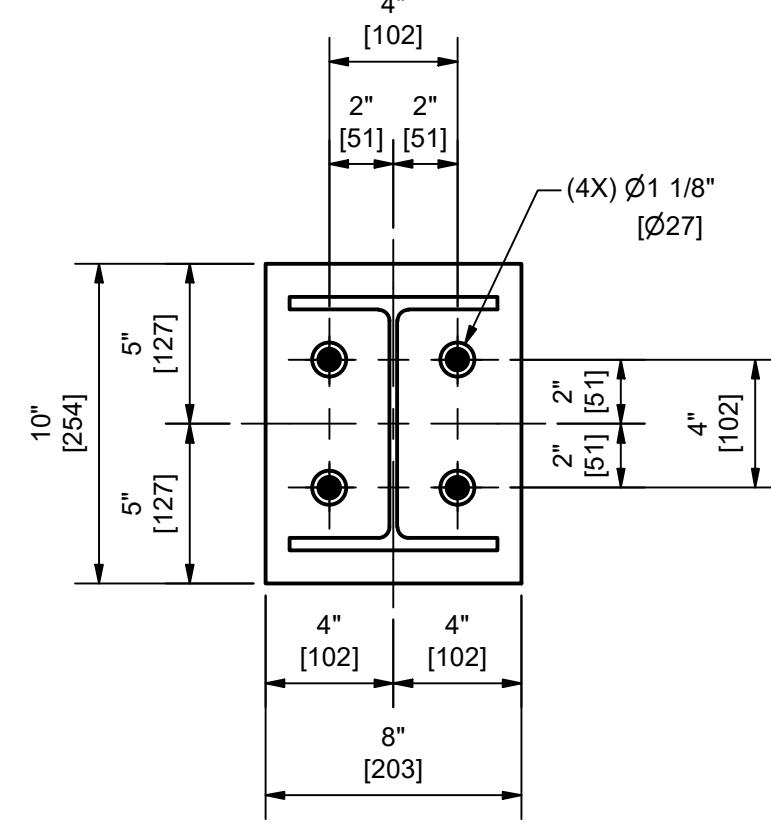
GENERAL ARRANGEMENTS (SUBMITTAL 2)

SERIES: SP-NB-300D-65-250-HC-RH

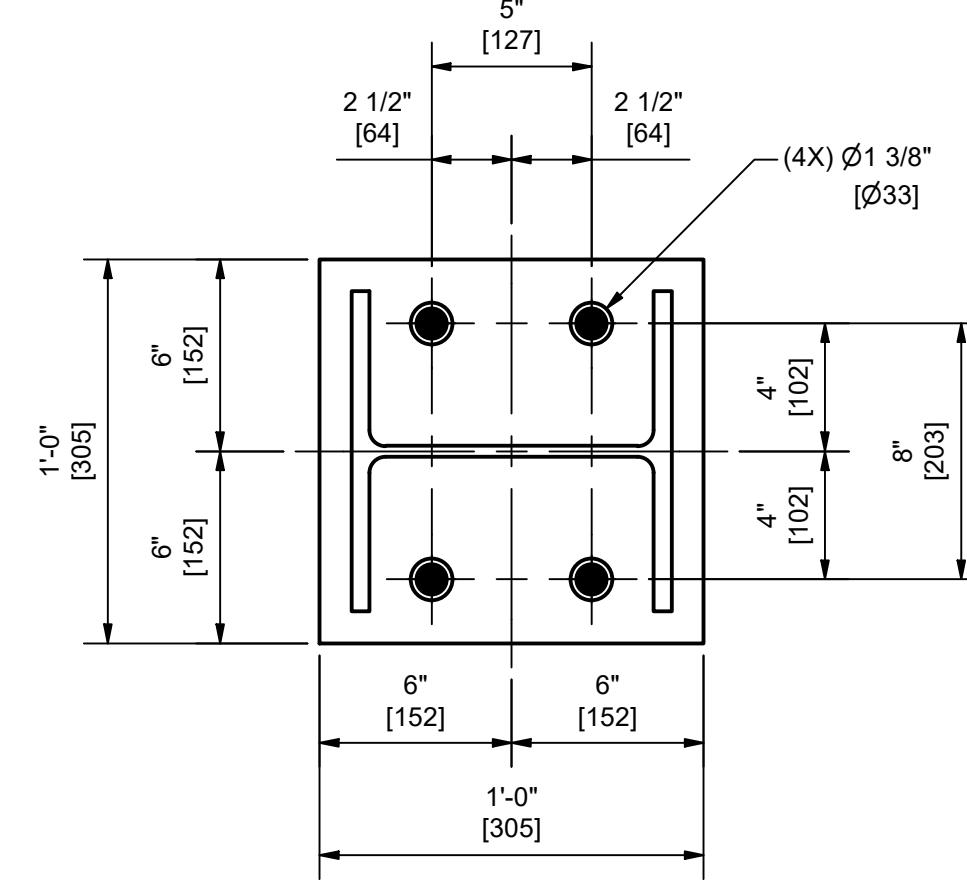
F.M. S.Y. VAN, INC.  
UNIVERSITY OF TENNESSEE KNOXVILLE  
KNOXVILLE, TN

SCALE: JOB NO.: SP-4889 SERIAL NO.: SP-4889  
A REV: DRAWING NO.: 046  
HAND: RIGHT HAND

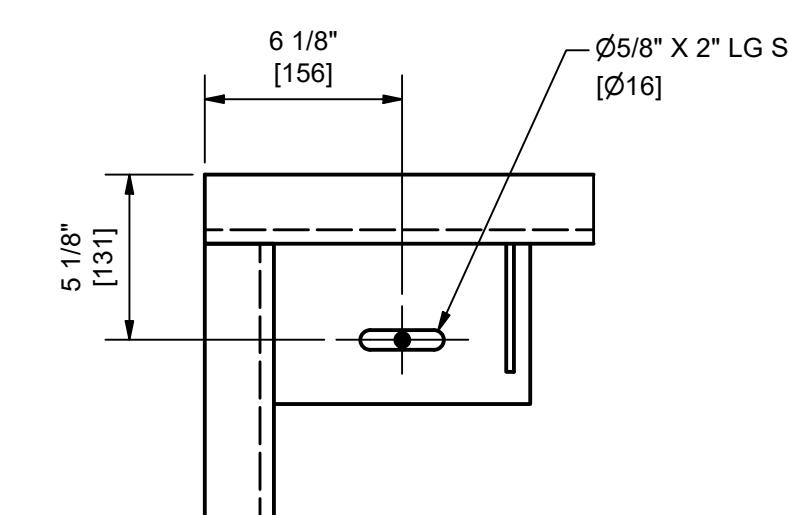
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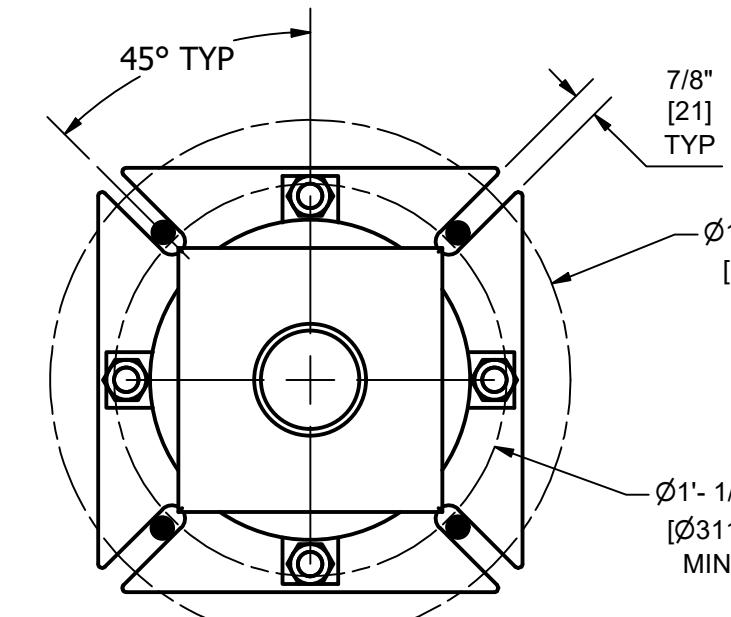
**DETAIL A**  
TEN (10) PLCS



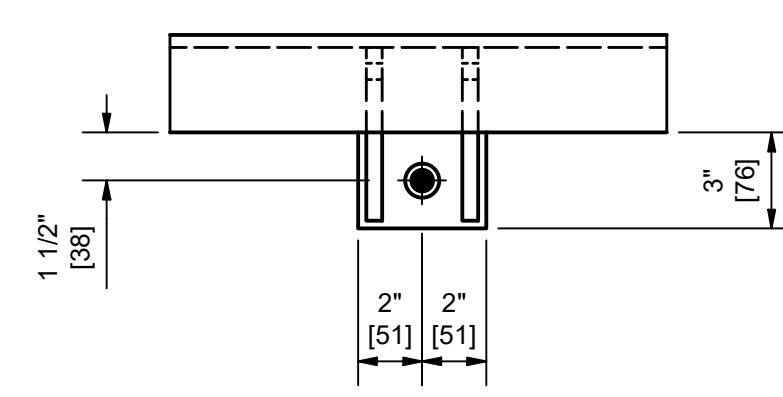
**DETAIL B**  
FOUR (4) PLCS



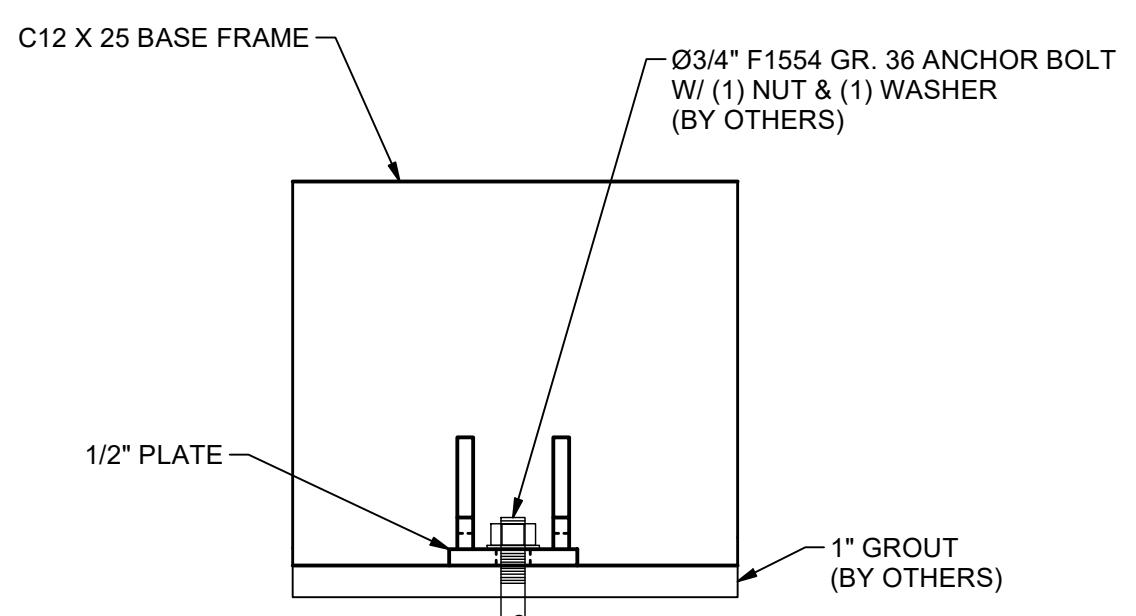
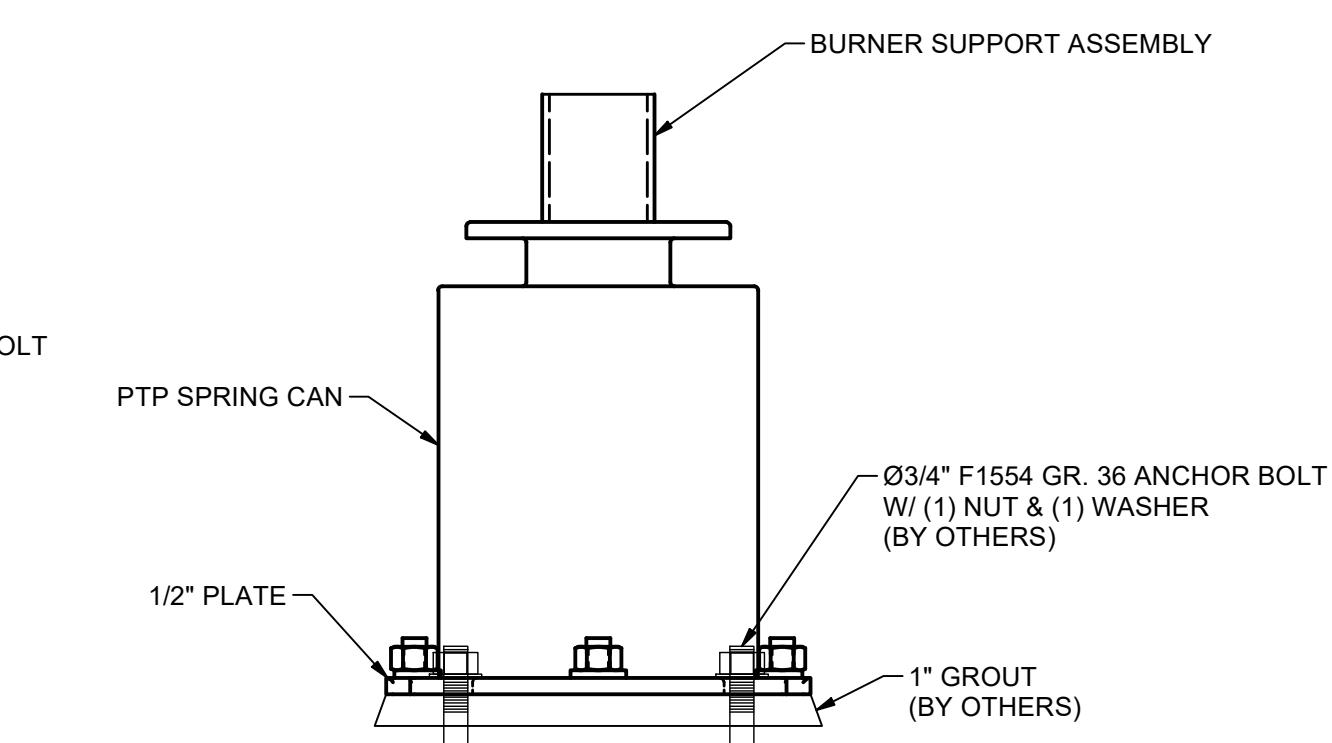
**DETAIL C**  
FOUR (4) PLCS



**DETAIL D**  
TWO (2) PLCS

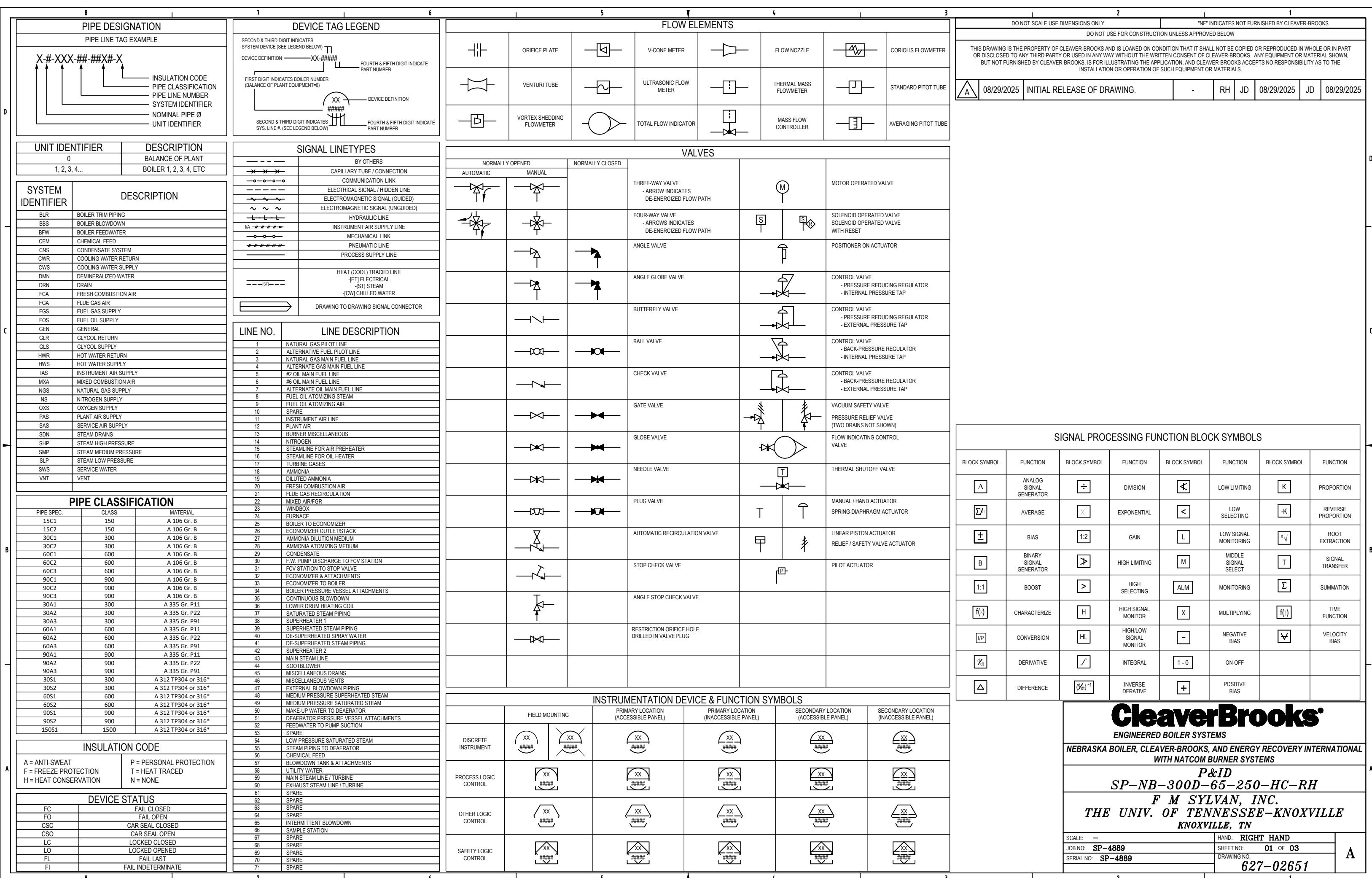


**DETAIL E**  
TWELVE (12) PLCS



### DOCUMENTS USED

ITEM	DOCUMENT	REVISION
PVGA	722-09539	A
PTL	PTL-4889	A
P&ID	627-02651	A
ECONOMIZER	D-1172025-1	1



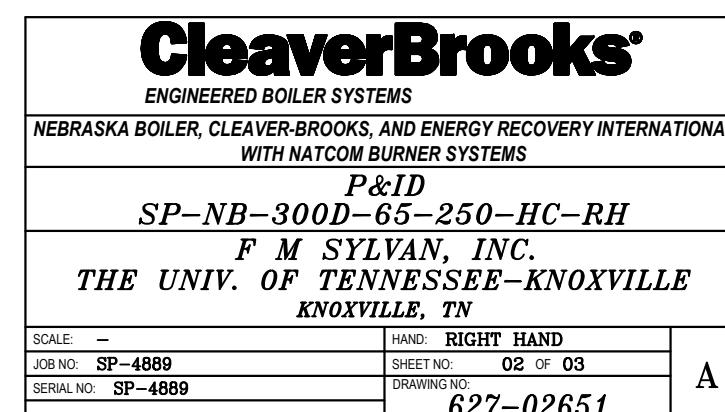
DEVICE IDENTIFICATION LETTERS					MISCELLANEOUS INSTRUMENTS										
FIRST LETTERS		SUCCEEDING LETTERS													
COLUMN 1	COLUMN 2	COLUMN 3	COLUMN 4	COLUMN 5											
MEASURED OR INITIATING VARIABLE	VARIABLE MODIFIER	READOUT OR PASSIVE FUNCTION	OUTPUT OR ACTIVE FUNCTION	FUNCTION MODIFIER											
A ANALYSIS		ALARM													
B BURNER, COMBUSTION		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE											
C USER'S CHOICE			CONTROL	CLOSE											
D USER'S CHOICE	DIFFERENCE, DIFFERENTIAL			DEVIATION											
E VOLTAGE		SENSOR, PRIMARY ELEMENT													
F FLOW, FLOW RATE	RATIO														
G USER'S CHOICE		GLASS, GAUGE, VIEWING DEVICE													
H HAND				HIGH											
I CURRENT		INDICATE													
J POWER		SCAN													
K TIME, SCHEDULE	TIME RATE OF CHANGE		CONTROL STATION												
L LEVEL		LIGHT		LOW											
M USER'S CHOICE				MIDDLE, INTERMEDIATE											
N USER'S CHOICE		USER'S CHOICE	USER'S CHOICE	USER'S CHOICE											
O USER'S CHOICE		ORIFICE, RESTRICTION													
P PRESSURE		POINT (TEST CONNECTION)													
Q QUANTITY	INTEGRATE, TOTALIZE	INTEGRATE, TOTALIZE													
R RADIATION		RECORD		RUN											
S SPEED, FREQUENCY	SAFETY		SWITCH	STOP											
T TEMPERATURE			TRANSMIT												
U MULTIVARIABLE		MULTIFUNCTION	MULTIFUNCTION												
V VIBRATION, MECHANICAL ANALYSIS				VALVE, DAMPER, LOUVER											
W WEIGHT, FORCE		WELL, PROBE													
X UNCLASSIFIED	X-AXIS	ACCESSORY DEVICES, UNCLASSIFIED	UNCLASSIFIED	UNCLASSIFIED											
Y EVENT, STATE, PRESENCE	Y-AXIS		AUXILIARY DEVICES												
Z POSITION, DIMENSION	Z-AXIS, SAFETY INSTRUMENTED SYSTEM		DRIVER, ACTUATOR, UNCLASSIFIED FINAL CONTROL ELEMENT												

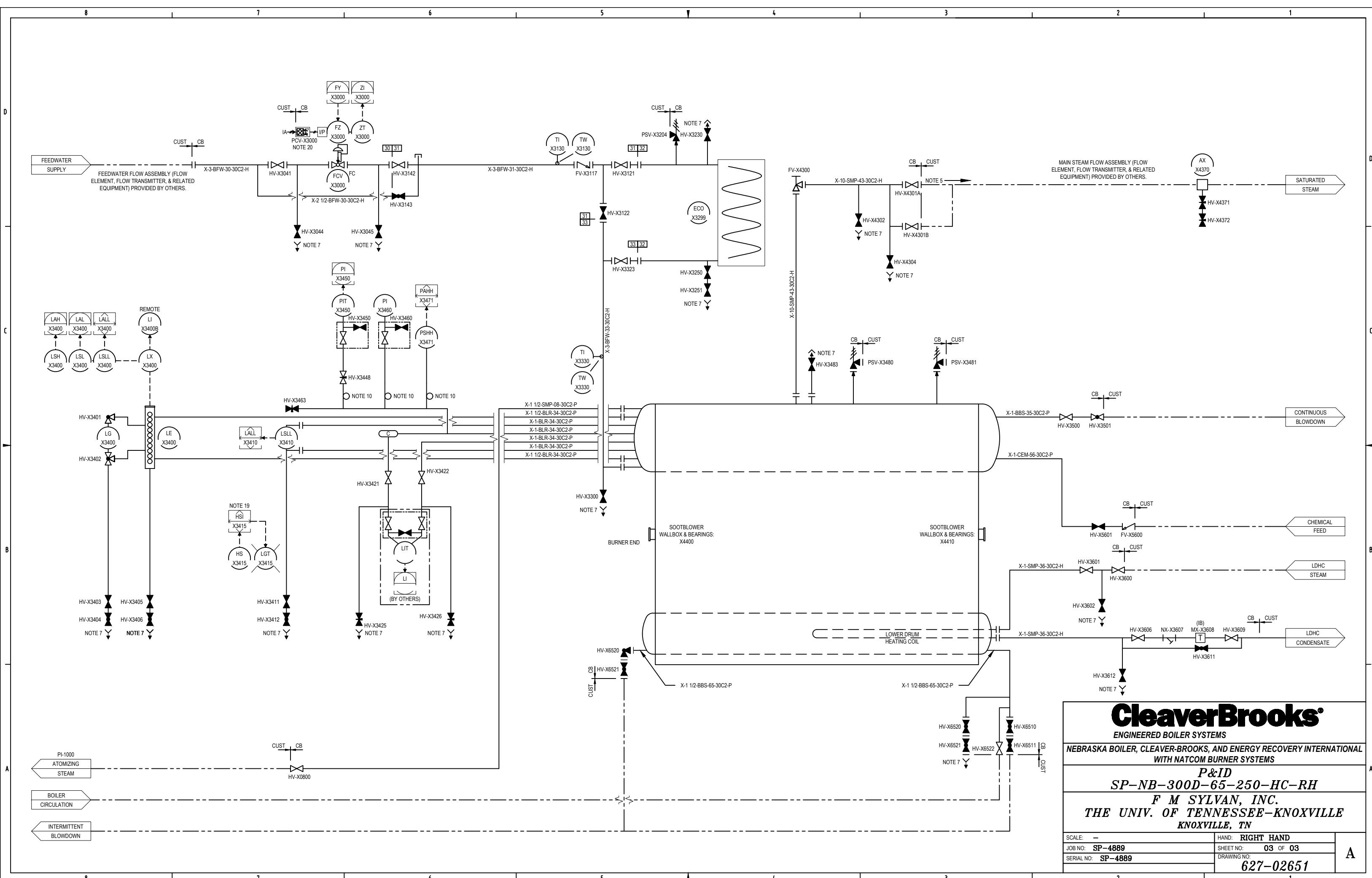
#### EQUIPMENT SYMBOLS

	SILENCER		
	BLOWER, FAN		
	PUMP		
	STEAM TURBINE		
	HEAT EXCHANGER - FINNED TUBE		
	RAIN HOOD		
	HEAT EXCHANGER		
	SAMPLE COOLER		
	MOTOR		

#### NOTES:

1. PIPING, EQUIPMENT, AND TRIM COMPONENTS THAT MAY CONTAIN WATER (IN ANY PHASE), AND THAT MAY BE EXPOSED TO TEMPERATURES NEAR, OR BELOW FREEZING, SHALL BE PROTECTED FROM FREEZING. SUCH PROTECTION IS TO BE DESIGNED AND INSTALLED BY OTHERS.
2. PIPING, DUCTING, EQUIPMENT, AND TRIM COMPONENTS THAT MAY CAUSE PERSONNEL HARM IF CONTACTED SHALL BE INSULATED FOR PERSONAL PROTECTION. PIPING, DUCTING, EQUIPMENT, AND TRIM COMPONENTS THAT TRANSPORT A PROCESS FLUID ABOVE AMBIENT AIR TEMPERATURE SHALL BE INSULATED FOR HEAT CONSERVATION. IN BOTH OF THESE CASES, ADDITIONAL PROTECTION OR INSULATION IS TO BE DESIGNED AND INSTALLED BY OTHERS.
3. PIPING AND INSTRUMENT IMPULSE LINES OUTSIDE CLEAVER BROOKS SCOPE, AS INDICATED BY EITHER A SCOPE BREAK SYMBOL OR THE LINE STYLE, SHALL BE PROVIDED AND ROUTED BY OTHERS.
4. LOW POINTS IN PIPING INDICATED BY "NOTE 4" THAT WOULD ALLOW UNDESIRABLE ACCUMULATION OF WATER, OR PREVENT THE COMPLETE EVACUATION OF WATER FROM THE SYSTEM SHALL BE DESIGNED WITH A MEANS TO DRAIN THE LINE. SUCH DRAINAGE TO BE PROVIDED BY OTHERS.
5. EQUIPMENT AND TRIM COMPONENTS TAGGED WITH A TAG NUMBER AND LOCATED IN PIPING INDICATED BY "NOTE 5" WILL BE SHIPPED LOOSE, AND INSTALLED BY OTHERS.
6. WHEN FLOW METERS ARE LOCATED IN PIPING OR DUCTING INDICATED BY "NOTE 6", OTHERS ARE RESPONSIBLE FOR ENSURING THAT UPSTREAM AND DOWNSTREAM PIPE DIAMETER STRAIGHT PIPE LENGTH REQUIREMENTS ARE MET. FOR FURTHER DETAILS SEE DRAWING 656-10270. FLOW METERS ARE SIZED TO MOUNT IN SAME SIZE PIPE AS CLEAVER-BROOK'S SCOPE. PLEASE ADVISE IF CUSTOMER PIPE SIZE IS DIFFERENT.
7. VENTS AND DRAINS INCLUDING, BUT NOT LIMITED TO PRESSURE SAFETY VALVE OUTLETS AND BLOWDOWN VALVE OUTLETS SHALL BE ROUTED TO A SAFE AND VISIBLE LOCATION BY OTHERS AND IN ACCORDANCE WITH LOCAL CODE REQUIREMENTS.
8. PIPE ROUTING, EQUIPMENT AND TRIM LOCATIONS AS INDICATED IN THIS DRAWING ARE NOT INTENDED TO BE A PROPORTIONALLY ACCURATE REPRESENTATION OF THE FINAL INSTALLED PRODUCT. THIS DOCUMENT IS NOT TO BE USED FOR MANUFACTURING.
9. "+" AND "-" RESPECTIVELY INDICATE THE INSTRUMENTS HIGH SIDE AND LOW SIDE PROCESS CONNECTIONS.
10. INSTRUMENT IMPULSE LINES FOR STEAM PIPING REQUIRE A CONDENSATE SEAL TO PROTECT THE INSTRUMENT FROM THE PROCESS TEMPERATURE. INSTRUMENT IMPULSE LINES FOR ALL OTHER INSTRUMENTS SHALL BE OF SUFFICIENT LENGTH TO PROTECT THE INSTRUMENT FROM PROCESS TEMPERATURES.
11. FOR SAFETY REASONS, ISOLATION VALVES MUST NOT BE INSTALLED IN THE PIPING BETWEEN THE INSTRUMENT AIR HEADER AND ACTUATORS/POSITIONERS. ALL MAINTENANCE ON THE EQUIPMENT MUST BE PERFORMED BY CLOSING THE HEADER SUPPLY ISOLATION VALVE.
12. CLEAVER-BROOKS RECOMMENDS THE USE OF REFERENCE AIR WITH THE OXYGEN ANALYZER, REFERENCE GASES, BOTTLES AND REGULATORS BY OTHERS. FOR FURTHER DETAILS SEE DRAWING 656-10441.
13. VALVE TO BE USED FOR LEAKAGE TEST (MUST BE SUPPLIED WITH PLUG). THIS VALVE IS USED FOR LEAKAGE TEST ONLY AND MUST BE LOCKED IN THE OPEN POSITION DURING NORMAL OPERATION.
14. THE EQUIVALENT LENGTH OF INTERCONNECTING PIPE BETWEEN THE FUEL RACK AND THE BURNER SHALL NOT EXCEED 40 FT.
15. PRESSURE REGULATOR TO BE INSTALLED AS CLOSE AS POSSIBLE TO THE FUEL RACK BUT NOT MORE THAN 40' EQUIVALENT LENGTH.
16. MAXIMUM FRESH AIR TEMPERATURE OF 100 F. HIGHER TEMPERATURES WILL CAUSE THE FAN TO OPERATE WITHIN ITS TEST BLOCK MARGIN.
17. MINIMUM FRESH AIR OPERATING TEMPERATURE OF 50 F. LOWER TEMPERATURES MAY REQUIRE THE INSTALLATION OF INLET AIR HEATER (SUPPLIED BY OTHERS).
18. FOR FURTHER DETAILS REGARDING THE BURNER SYSTEM AND RELATED ASSEMBLIES, REFER TO THE BURNER P&ID PROVIDED BY CLEAVER-BROOKS-NATCOM.
19. PUSH BUTTON AND LIGHT OPERATED DURING BLOWDOWN OF BMS LEVEL INSTRUMENTATION.
20. INSTRUMENT TUBING NOT PROVIDED BY CLEAVER-BROOKS. SEE PI-1000 FOR FURTHER DETAILS.





Printed: 2025-08-29



## Mechanical Bill of Material

NATCOM Project Number: **4889**

Customer: **F M Sylvan, Inc. Knoxville, TN**

Customer PO Number: **SP-4889**

End User: The University of Tennessee Knoxville

Boiler **BOILER MODEL# NB-300D-65**

Location: **Knoxville, TN**

Quantity of Units: 1

  
0104 5086065 2025-08-29

Q10# 6006065

2025-08-29

This document identifies the recommended spare parts for commissioning and to maintain the supplied equipment in operation.

Having all recommended spare parts in hand during the commissioning of the equipment will ensure the good commissioning of equipment and prevent a costly delay.

A failure of one of these recommended parts will prevent operation of the equipment. It is the responsibility of the end user to maintain an inventory of recommended spare parts to ensure continuous operation of the system.

NATCOM Document Number: 4889\_BM-1000

## **REVISION:**

A

4889\_BM-1000\_REV-A



SPARE PARTS - BILL OF MATERIAL - DOCUMENT BM-1000

**Bill of material Rev # :**

NATCOM Project : 4889

CUSTOMER : F M Sylva

CUSTOMER P.O. # : SP-4889

ND USER : The University of Tennessee Km

Quantities listed here are on a per train basis

Quantity of trains required :

Piping Code : B31.3

Mills test for piping required

REQUISITIONED [ DAY / MONTH ]		RECOMMENDED SPARE PARTS COMMISSIONING [ C ]		DEVIATIONS AND CLARIFICATIONS TWO YEARS [ T ]		PILOT LINE TRAIN - BILL OF MATERIAL - DOCUMENT BM-1000						Bill of material Rev # : A			
Line #	Service	Tag #	Cust Tag #	Qty	Description		Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location		
					NATCOM Project # : 4889 CUSTOMER : F M Sylvan, Inc. Knoxville, TN CUSTOMER P.O. # : SP-4889 END USER : The University of Tennessee Knoxville BOILER : BOILER MODEL# NB-300D-65		Quantities listed here are on a per train basis Quantity of trains required : 1 Piping Code : B31.3 Mills test for piping required								
		10	Natural Gas Pilot Line Inlet Manual Shutoff Valve	HV-X0100		1	Manual shut-off ball valve. Full bore, brass body, cap, stem and gland, Chrome plated brass ball, PTFE seat and packing, Blow-out proof stem, 1/4 turn lever operated, comes with handle. Listing: FM, UL, CSA Pressure Rating: 600 PSIG @ 200 F Temperature Rating: -20 to 366 F	Apollo	77F-104-01	223-00036-075	3/4"	NPT		WM	
		20	Natural Gas Pilot Line Strainer	NX-X0105		1	'Y' Strainer, Cast iron (A126-B) body, cap, cover and plug, 304SS screen, 3/8" NPT blowdown connection. Pressure Rating: 250 PSIG @ 406 F Temperature Rating: -20 to 406 F Mesh Size: 0.032"	IFC	Y250TIT	923-00619-075	3/4"	NPT		WM	
	CT	30	Natural Gas Pilot Line Pressure Regulator	PCV-X0110		1	Pressure regulator w/ cast iron body, nitrile gasket, Nitrile diaphragm. HSR - Model type B - 3/4" inlet x 3/4" outlet C - 3/16" orifice J - 1.25 to 2.2 PSIG spring range A - 3/4" vent, no closing cap wire M - 3P vent position Y - Internal relief valve N - No approvals Temperature Rating: -20 to 160 F Maximum Inlet Pressure: 100 PSIG Field Adjusted, See P&ID for Setpoint. Delivery : 1 week	Fisher	HSR-BCJAMYN cv max : 0.51	918-01035-000	3/4"	NPT		WM	
		40	Natural Gas Pilot Line 3-way Diverter Valve	HV-X0115		1	Manually operated 3-way ball valve, 316 SS body. RTFE seats and seals, L-port, full port, 1/4 turn lever operated, comes with handle. Pressure Rating: 400 psi @ 300 F Temperature Rating: -30 to 400 F Delivery : 4-6 weeks	Triac	38-TH-0075-XXX-L	223-00224-075	3/4"	NPT		WM	
	CT	50	Pilot Line Position Limit Switch for Natural Gas and Propane Firing	ZS-X0115-A (Natural Gas) ZS-X0115-B (Propane)		1	Limit switch IP67, two SPDT contact, visual indicator Design: plunger Listing: UL/CSA Rating : NEMA 4, 4X Temperature Rating: -40 to 185 F	Triac	APL210L	NPN	N/A	N/A		WM	

			Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
			60	Natural Gas/Propane Pilot Line Pressure Gauge Isolation Valve	HV-X0135		1	Manual shut-off ball valve. Full bore, brass body, cap, stem and gland. Chrome plated brass ball. PTFE seat and packing. Blow-out proof stem. 1/4 turn lever operated, comes with handle. Listing: FM, UL, CSA Pressure Rating: 600 PSIG @ 200 F Temperature Rating: -20 to 366 F	Apollo	77F-103-01	223-00036-050	1/2"	NPT		WM
	T		70	Natural Gas/Propane Pilot Line Pressure Gauge	PI-X0135		1	Pressure gauge, 4 1/2" dial, Phenolic case, SS bellows and socket. Dry w/lower connection, ASME Grade A (2-1/2%) precision, Temperature Rating: -20 to 150 F Pressure Range: 0-5 PSIG	Ashcroft	45-1188-SS-04L	850-04860-000	1/2"	NPT		SL / WM
	CT		80	Natural Gas/Propane Pilot Line Upstream Safety Shutoff Valve	BSV-X0140		1	Normally closed solenoid valve. Aluminum body with Buna N seating. 120VAC/ 1 Ph / 60 Hz. Red Hat II enclosure. Listing: UL, FM, CSA Rating: NEMA 1, 2, 3, 3S, 4, 4X Pressure Rating: 0-50 PSID Temperature Rating: 32 to 125 F	Asco	L8215G030	235-00184-075	3/4"	NPT		WM
	CT		90	Natural Gas/Propane Pilot Line Vent Valve	BSV-X0150		1	Normally opened solenoid valve. Aluminum body with Buna N seating. 120VAC/ 1 Ph / 60 Hz. Red Hat II enclosure. Listing: UL, CSA Rating: NEMA 1, 2, 3, 3S, 4, 4X Pressure Rating: 0-125 PSID Temperature Rating: 32 to 104 F	Asco	L8215G033	235-00185-075	3/4"	NPT		WM
			100	Natural Gas/Propane Pilot Line Downstream Safety Shutoff Valve	BSV-X0160		1	Normally closed solenoid valve. Aluminum body with Buna N seating. 120VAC/ 1 Ph / 60 Hz. Red Hat II enclosure. Listing: UL, FM, CSA Rating: NEMA 1, 2, 3, 3S, 4, 4X Pressure Rating: 0-50 PSID Temperature Rating: 32 to 125 F	Asco	L8215G030	235-00184-075	3/4"	NPT		WM
	T		110	Natural Gas/Propane Pilot Line Burner Flexible Hose	BH-X0190		1	Stainless steel flexible hose. Annular corrugated design. Double braid construction. Pressure Rating: 1612 PSIG @ 70 F Temperature Rating: -20 to 800 F	Flex Pressure	FLX-050-066-MM-SS2B	861-00582-065	1/2"	NPT		WM
			120	Propane Gas Pilot Line Inlet Manual Shutoff Valve	HV-X0200		1	Manual shut-off ball valve. Full bore, brass body, cap, stem and gland. Chrome plated brass ball. PTFE seat and packing. Blow-out proof stem. 1/4 turn lever operated, comes with handle. Listing: FM, UL, CSA Pressure Rating: 600 PSIG @ 200 F Temperature Rating: -20 to 366 F	Apollo	77F-104-01	223-00036-075	3/4"	NPT		WM

			Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
			130	Propane Gas Pilot Line Strainer	NX-X0205		1	Y Strainer, Cast iron (A126-B) body, cap, cover and plug. 304SS screen. 3/8" NPT blowdown connection. Pressure Rating: 250 PSIG @ 406 F Temperature Rating: -20 to 406 F Mesh Size: 0.032"	IFC	Y250TIT	923-00619-075	3/4"	NPT		WM
	CT		140	Propane Gas Pilot Line Pressure Regulator	PCV-X0210		1	Pressure regulator w/ cast iron body, nitrile gasket, Nitrile diaphragm, HSR - Model type B - 3/4" inlet x 3/4" outlet C - 3/16" orifice J - 1.25 to 2.2 psig spring range A - 3/4" vent, no closing cap wire M - 3F vent position N - No Approval Temperature Rating: -20 to 160 F Maximum Inlet Pressure: 150 PSIG Field Adjusted, See P&ID for Setpoint, Delivery : 1 week	Fisher	HSR-BCJAMYN cv max : 0.51	918-01035-000	3/4"	NPT		WM

REQUISITIONNED [ DAY / MONTH ]		RECOMMENDED SPARE PARTS COMMISSIONING [C]		DEVIATIONS AND CLARIFICATIONS		GAS VALVE TRAIN - BILL OF MATERIAL - DOCUMENT BM-1000					Bill of material Rev # : A							
						NATCOM Project # : 4889 CUSTOMER : F M Sylvan, Inc, Knoxville, TN CUSTOMER P.O. # : SP-4889 END USER : The University of Tennessee Knoxville BOILER : BOILER MODEL# NB-300D-65					Quantities listed here are on a per train basis Quantity of trains required : 1 Piping Code : B31.3 Mills test for piping required							
						Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
						10	Natural Gas Main Line Inlet Manual Shutoff Valve	HV-X0300		1	Manual shut-off lubricated plug valve, Cast iron body and plug, PTFE thrust washer, 1/4 turn lever operated, comes with handle, Listing: CGA, UL Pressure Rating: 253 PSIG @ 500 F Temperature Rating: -23 to 500 F	Homestead	612	232-00013-400	4"	125# F.F. Flanged		SL
						20	Natural Gas Main Line Inlet Manual Shutoff Valve handle			1	Manual shut-off lubricated plug valve handle	Homestead	L Wrench	232-00013-401	N/A	N/A		SL
						30	Natural Gas Main Line Strainer	NX-X0305		1	Y Strainer, cast iron (A126-B) body, cover and plug. 304SS screen, graphite gasket, A307-B bolt / stud, A563 nuts, 1" NPT blowdown connection. Pressure Rating: 200 PSIG @ 100 F Temperature Rating: -20 to 450 F Mesh Size: 0.125"	IFC	Y125FIB	923-00617-400	4"	125# F.F. Flanged		SL
	CT					40	Natural Gas Main Line Pressure Regulator	PCV-X0310		1	Pressure regulator w/ cast iron body, SS plug and seat ring, Nitrile diaphragm, seals and seats. Actuator size 40 and pilot model 6351. Temperature Rating: -20 to 150 F Maximum Inlet Pressure: 80 PSIG Outlet Pressure: 3 to 20 PSIG. Field adjusted, see P&ID for setpoint. Delivery : 8 weeks	Fisher	1098EGR-6351 cv max:132	918-00920-202	3"	125# F.F. Flanged		SL
						50	Natural Gas Main Line Pressure Gauge Isolation Valve	HV-X0330		1	Manual shut-off ball valve. Full bore, brass body, cap, stem and gland, Chrome plated brass ball. PTFE seat and packing, Blow-out proof stem, 1/4 turn lever operated, comes with handle. Listing: FM, UL, CSA Pressure Rating: 600 PSIG @ 200 F Temperature Rating: -20 to 366 F	Apollo	77F-103-01	223-00036-050	1/2"	NPT		WM
	T					60	Natural Gas Main Line Pressure Gauge	PI-X0330		1	Pressure gauge w/ 4 1/2" dial, phenolic case. Glass lens, 316 SS bourdon tube, tip and socket, Dry, bottom connection, ASME Grade 2A (0.5%) precision. Temperature Rating: -40 to 350 F Pressure Range: 0-60 PSIG	Ashcroft	Duragauge 45-1279-SS-04L	850-04712-062	1/2"	NPT		SL / WM

			Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
	CT		70	Natural Gas Main Line Low Pressure Switch	PSLL-X0330		1	Pressure switch, Buna N diaphragm and o-ring, die cast aluminum enclosure. Aluminum connection. One SPDT, 15 amp 125/250/480 VAC. Listing: UL, FM, CSA Rating: NEMA 4X Pressure Rating: 225 PSIG @ 160 F Temperature Rating:-40 to 160 F Pressure Range: 0-20 PSIG Factory Set on Decrease, See P&ID for Setpoint.	United Electric	J400-453 M201-M444	836-08655-000	1/4"	NPT		WM
	CT		80	Natural Gas Main Line Upstream Safety Shutoff Valve	BSV-X0340 ZSC-X0340 ZSO-X0340		1	Automatic Shutoff valve 400 - 4" C - CP Flow MA - Maxon Automatic Valve 1 - Shutoff Valve 1 - Area classification : general purpose B - ANSI Flanged A - BunaN O-rings and bumper 1 - Cast Iron body 1 - 1 internal trim package B - Solenoid voltage : 115V 60Hz B - Motor voltage : 115V 60Hz 2 - Motor timing : 6 second 3 - VOS2/CS1 A - NEMA 4 0 - English instruction Listing: FM, UL, CSA, GAD Rating: NEMA 1, 3, 3S, 4 Pressure Rating: 40 PSIG @140 F Temperature Rating: -20 to 140 F Top Assembly Position: "TBA" Delivery : 5-7 weeks	Maxon	400CMA11-BA11-BB23A0	229-80129-400	4"	125# F.F. Flanged		WM
			90	Natural Gas Main Line Manual Shutoff Valve For Leakage Testing	HV-X0340		1	Manual shut-off ball valve. Full bore, brass body, cap, stem and gland. Chrome plated brass ball. PTFE seat and packing. Blow-out proof stem. 1/4 turn lever operated, comes with handle. Listing: FM, UL, CSA Pressure Rating: 600 PSIG @ 200 F Temperature Rating: -20 to 366 F	Apollo	77F-103-01	223-00036-050	1/2"	NPT		WM
			100	Natural Gas Vent Line Manual Shutoff Valve For Leakage Testing	HV-X0350		1	Manual shut-off ball valve. Full bore, brass body, cap, stem and gland. Chrome plated brass ball. PTFE seat and packing. Blow-out proof stem. 1/4 turn lever operated, comes with std handle. Listing: FM, UL, CSA Pressure Rating: 600 PSIG @ 200 F Temperature Rating: -20 to 366 F	Apollo	77F-108-01	223-00036-200	2"	NPT		WM
			101	Natural Gas Vent Line Manual Shutoff Valve For Leakage Testing Locking Device			1	Locking Device for ball valve Apollo 2"	Apollo	W252700	046-00101-000	N/A	N/A	WM	

		Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
	CT	110	Natural Gas Main Line Vent Valve	BSV-X0350 ZSO-X0350 ZSC-X0350		1	Automatic Shutoff valve 200 - 2" S - STD Flow MA - Maxon Automatic Valve 2 - Vent Valve 1 - Area classification : general purpose A - NPT Connection A - BunaN O-rings and bumper 1 - Cast Iron body 1 - 1 internal trim package B - Solenoid voltage : 115V 60Hz B - Motor voltage : 115V 60Hz 1 - Motor timing : 2.5 second 3 - VCS2/VOS1 A - NEMA 4 0 - English instruction Listing: FM, UL, CSA, GAD Rating: NEMA 1, 3, 3S, 4 Pressure Rating: 70 PSIG @140 F Temperature Rating: -20 to 140 F Top Assembly Position: " <u>TBA</u> " <u>Delivery : 5-7 weeks</u>	Maxon	200SMA21-AA11-BB13A0	229-80169-200	2"	NPT		WM
		120	Natural Gas Main Line Downstream Safety Shutoff Valve	BSV-X0360 ZSC-X0360 ZSO-X0360		1	Automatic Shutoff valve 400 - 4" C - CP Flow MA - Maxon Automatic Valve 1 - Shutoff Valve 1 - Area classification : general purpose B - ANSI Flanged A - BunaN O-rings and bumper 1 - Cast Iron body 1 - 1 internal trim package B - Solenoid voltage : 115V 60Hz B - Motor voltage : 115V 60Hz 2 - Motor timing : 6 second 3 - VOS2/VCS1 A - NEMA 4 0 - English instruction Listing: FM, UL, CSA, GAD Rating: NEMA 1, 3, 3S, 4 Pressure Rating: 40 PSIG @140 F Temperature Rating: -20 to 140 F Top Assembly Position: " <u>TBA</u> " <u>Delivery : 5-7 weeks</u>	Maxon	400CMA11-BA11-BB23A0	229-80129-400	4"	125# F.F. Flanged		WM
		130	Natural Gas Main Line Manual Shutoff Valve for Leakage Testing	HV-X0360		1	Manual shut-off ball valve. Full bore, brass body, cap, stem and gland. Chrome plated brass ball. PTFE seat and packing. Blow-out proof stem. 1/4 turn lever operated, comes with handle. Listing: FM, UL, CSA Pressure Rating: 600 PSIG @ 200 F Temperature Rating: -20 to 366 F	Apollo	77F-103-01	223-00036-050	1/2"	NPT		WM

		Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
	CT	140	Natural Gas Main Line High Pressure Switch	PSHH-X0365		1	Pressure switch, Buna N diaphragm and o-ring, die cast aluminum enclosure. Aluminum connection. One SPDT, 15 amp 125/250/480 VAC. Listing: UL, FM, CSA Rating: NEMA 4X Pressure Rating: 225 PSIG @ 160 F Temperature Rating:-40 to 160 F Pressure Range: 0-30 PSIG Factory Set on Increase, See P&ID for Setpoint.	United Electric	J400-454 M201-M444	836-08656-000	1/4"	NPT		WM

		Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location	
	T	150	Natural Gas Main Line Flow Control Valve	FCV-X0370		1	Fisher segmented V-Ball valve model V150, Size 3", Carbon steel body (WCC), Class 150 RF end, TCM PLUS teflon seat, PTFE V-ring packing . Rating: ASME B16.34 Pressure Rating: 285 PSIG @ 100 F Temperature Rating: -20 to 450 F <b>Delivery : 8 weeks</b>	Fisher	V150-3-WCC-150RF-TCM-TA cv max : 321.0	230-00355-304	3"	150# R.F. Flanged		WM	
	T	160	Natural Gas Main Line Flow Control Valve Actuator	FZ-X0370		1	Spring & diaphragm actuator size 1, fail safe closed position 1, style B. Installed with Instrument air filter / regulator and mechanical down stop. Temperature Rating: -40 to 180 F	Fisher	2052-1-FC	NPN	N/A	N/A		WM	
	CT	170	Natural Gas Main Line Flow Control Valve Positioner	ZT-X0370		1	Smart positioner, Hart protocol, 4-20mA input signal, SS tubing with SS fittings, Performance Diagnostic, c/w Position Feedback Listing: N/A Rating: IP66, FM and CSA intrinsically safe / non incendiive, Dust Ignition proof (CL I, DIV 2 Gr D) Supply Pressure: 145 PSIG maximum Air Consumption: 49 CFH @ 58 PSIG Temperature Rating: -40 to 176 F	Fisher	DVC6200-604/HC	NPN	N/A	N/A			WM
	CT	180	Natural Gas Main Line Flow Control Valve Switch	ZSL-X0370		1	Low fire position limit switch, SPDT, Cast aluminum cover, polyurethane cover with beacon monitor, Listing: UL, FM, CSA Rating: NEMA 4, 4x, 7, 9, Explosion proof Class I Div II Groups A,B,C,D Temperature Rating: -40 to 185 F	Topworx	DXP-M21GSEB	NPN	N/A	N/A		WM	
	CT	190	Natural Gas Main Line Flow Control Valve Air Regulator			1	Pilot line pressure regulator w/ integral low capacity internal relief valve. Pressure Rating: 250 PSIG at 100 F Temperature Rating: -40 to 180 F	Fisher	67-CFR-SST-swag	NPN	N/A	N/A		WM	
		200	Natural Gas Main Line Burner Manual Shutoff Valve	HV-X0385		1	Manual shut-off lubricated plug valve. Cast iron body and plug, PTFE thrust washer, 1/4 turn lever operated. Listing: CGA, UL Pressure Rating: 253 PSIG @ 500 F Temperature Rating: -23 to 500 F	Homestead	612	232-00013-400	4"	125# F.F. Flanged		WM	
		210	Natural Gas Main Line Inlet Manual Shutoff Valve handle			1	Manual shut-off lubricated plug valve handle	Homestead	L Wrench	232-00013-401	N/A	N/A		WM	
		220	Natural Gas Main Line Burner Flexible Hose	BH-X0390		1	Stainless steel flexible hose, Annular corrugated design, Double braid construction, Pressure Rating: 275 PSIG @ 70 F Temperature Rating: -20 to 800 F	Hebdraulique	FLX-400-018-FLG/FLG-SS2B	861-00578-017	4"	150# F.F. Flanged		WM	

		Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location	
		230	Natural Gas Line Pressure Gauge Isolating Valve	HV-X0395		1	Manual shut-off ball valve. Full bore, brass body, cap, stem and gland. Chrome plated brass ball. PTFE seat and packing. Blow-out proof stem. 1/4 turn lever operated, comes with handle. Listing: FM, UL, CSA Pressure Rating: 600 PSIG @ 200 F Temperature Rating: -20 to 366 F	Apollo	77F-103-01	223-00036-050	1/2"	NPT		WM	
	T	240	Natural Gas Main Line Pressure Gauge	PI-X0395		1	Pressure gauge w/ 4 1/2" dial, phenolic case. Glass lens, 316 SS bourdon tube, tip and socket, Dry, bottom connection, ASME Grade 2A (0.5%) precision. Temperature Rating: -40 to 350 F Pressure Range: 0-30 PSIG	Ashcroft	Duragauge 45-1279-SS-04L	850-04863-030	1/2"	NPT		SL / WM	
	T	250	Natural Gas Stabilizing Line Flexible Hose	BH-X0396		1	Stainless steel flexible hose, Annular corrugated design. Double braid construction. Pressure Rating: 608 PSIG @ 70 F Temperature Rating: -20 to 800 F	Hebdraulique	FLX-150-018-MM-SS2B	861-00588-017	1 1/2"	NPT		WM	
		260	Natural Gas Stabilizing Line Flow Orifice Valve	HOV-X0396		1	Adjustable limiting orifice valve, Carbon steel body, 4B - Full Port, NPT connection B - ANSI B16.34, B31.1, B31.3 and 31.4 22 - Carbon steel body 36 - 316 Stainless steel ball XT - Xtreme seat, TFM & Graphite seal B1 - ASTM A193 Gr. B7 bolts Pressure rating: 1200 PSIG @ 100 F Temperature rating: -20 to 500 F	Jamesbury	4BB-2236-XTB1	223-00075-150	1 1/2"	NPT			WM
		270	Natural Gas Stabilizing Line Flow Orifice Valve Locking Device			1	LOCKING DEVICE, JAMESBURY BALL VALVE (4000 Series ø1½" & 1½" Full Port)	NATCOM	046-00115-000	046-00115-000	N/A	N/A		WM	

REQUISITIONED [ DAY / MONTH ]	RECOMMENDED SPARE PARTS COMMISSIONING [ C ]	DEVIATIONS AND CLARIFICATIONS	#2 FUEL OIL VALVE TRAIN - BILL OF MATERIAL - DOCUMENT BM-1000							Bill of material Rev # : A					
			NATCOM Project # : 4889 CUSTOMER : F M Sylvan, Inc. Knoxville, TN CUSTOMER P.O. # : SP-4889 END USER : The University of Tennessee Knoxville BOILER : BOILER MODEL# NB-300D-65							Quantities listed here are on a per train basis Quantity of trains required : 1 Piping Code : B31.3 Mills test for piping required					
			Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
			10	#2 Oil Main Line Inlet Manual Shutoff Valve	HV-X0500		1	Manual shutoff gate valve, Conventional port, forged steel body (A105-WCB), CA15 wedge / disc seating surface, Stellite 6 seat surface, Class 800#. Pressure Rating: 1975 PSIG @ 100 F Temperature Rating: -20 to 800 F	Velan	W2054B02TY	225-00235-075	3/4"	SW		WM
			20	#2 Oil Main Line Strainer	NX-X0505		1	Y Strainer, carbon steel (A216-WCB) body and cap, 304SS screen, A105 plug, teflon gasket, 1/4" NPT blowdown connection. Pressure Rating: 740 PSIG @ 100 F Temperature Rating: -20 to 400 F Mesh Size: 0.032"	IFC	Y300SWST	923-00620-075	3/4"	SW		WM
			30	#2 Oil Main Line Pressure Gauge Isolation Valve	HV-X0530		1	Manual shutoff gate valve, Conventional port, forged steel body (A105-WCB), CA15 wedge / disc seating surface, Stellite 6 seat surface, Class 800#. Pressure Rating: 1975 PSIG @ 100 F Temperature Rating: -20 to 800 F	Velan	C2054B02TY	225-00236-000	1/2"	SW/NPT		WM
	T		40	#2 Oil Main Line Pressure Gauge	PI-X0530		1	Pressure gauge w/ 4 1/2" dial, phenolic case, Glass lens, 316 SS bourdon tube, tip and socket, Dry, bottom connection, ASME Grade 2A (0.5%) precision. Temperature Rating: -40 to 350 F Pressure Range: 0-160 PSIG	Ashcroft	Duragauge 45-1279-SS-04L	850-04757-001	1/2"	NPT		SL / WM
	CT		50	#2 Oil Main Line Low Pressure Switch	PSLL-X0530		1	Pressure switch with SS bellows and pressure connection, One SPDT, 15A, 125/250/480 VAC, Listing: UL, FM, CSA Rating: NEMA 4X Pressure Rating: 250 PSIG @ 160 F Temperature Rating: -40 to 160 F Pressure Range: 0-200 PSIG Factory Set on Decrease, See P&ID for Setpoint.	United Electric	J400-358 M201-M44	836-08644-000	1/4"	NPT		WM

		Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
	T	60	#2 Oil Main Line Flow Control Valve	FCV-X0570		1	Carbon Steel Globe Valve, 316SS seat or seal, PTFE V-ring packing, SS tubing and fittings. Mechanical down stop. Listing: N/A Rating: N/A Pressure Rating: 285 PSIG @ 100 F Temperature Rating: -20 to 450 F <b>Delivery : 6 weeks</b>	Fisher	24000CVF-0.75-WCC-150RF-316SST-TA cv max : 9.8	230-00437-076	3/4"	150# R.F. Flanged		WM
	T	70	#2 Oil Main Line Flow Control Valve Actuator	FZ-X0570		1	Spring return pneumatic actuator, fail safe closed position. Installed with Instrument air filter / regulator and mechanical down stop. Temperature Rating: -40 to 180 F	Fisher	32-FC	NPN	N/A	N/A		WM
	CT	80	#2 Oil Main Line Flow Control Valve Positioner	ZT-X0570		1	Smart positioner, Hart protocol and 4-20mA input signal. SS tubing with SS fittings. c/w Position feedback Listing: N/A Rating: IP66, FM and CSA intrinsically safe / non incendive Supply Pressure: 101 PSIG maximum Temperature Rating: -40 to 185 F	Fisher	DVC2000-604/HC	NPN	N/A	N/A		WM
		90	#2 Oil Main Line Flow Control Valve Limit switch	ZSL-X0570		1	Low fire position limit switch, SPDT. Cast aluminum cover. Listing: UL, CSA Rating: NEMA 1, 3, 4, 4x, 7, 9 Explosion proof Class I Div I Groups E,F,G Temperature Rating: -25 to 85 F	Honeywell	11CX12	NPN	N/A	N/A		WM
	CT	100	#2 Oil Main Line Flow Control Valve Air Regulator			1	Pilot line pressure regulator w/ integral low capacity internal relief valve. Pressure Rating: 250 PSIG at 100 F Temperature Rating: -40 to 180 F	Fisher	67CFR-SST-swag	NPN	N/A	N/A		WM
	CT	110	#2 Oil Main Line Upstream Safety Shutoff Valve	BSV-X0540 ZSC-X0540 ZSO-X0540		1	Automatic safety shutoff valve, normally closed and motorized, Carbon steel body, comes with proof of opened and closure position limit switch. Motor Voltage : 115V 60Hz Motor timing : 6 second Listing: UL, FM, CSA Rating: NEMA 1, 3, 3S, 4, 12 Pressure Rating: 245 PSIG @ 250 F Temperature Rating: -20 to 125 F ambient, -20 to 250 F fluid Mounting Orientation: " <u>TBA</u> " <b>Delivery: 5-7 weeks</b>	Maxon	8760S VOS-2, VCS-1	229-80164-075	3/4"	150# R.F. Flanged		WM

		Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
		120	#2 Oil Main Line Downstream Safety Shutoff Valve	BSV-X0560 ZSC-X0560 ZSO-X0560		1	Automatic safety shutoff valve, normally closed and motorized. Carbon steel body, comes with proof of opened and closure position limit switch. Motor Voltage : 115V 60Hz Motor timing : 6 second Listing: UL, FM, CSA Rating: NEMA 1, 3, 3S, 4, 12 Pressure Rating: 245 PSIG @ 250 F Temperature Rating: -20 to 125 F ambient, -20 to 250 F fluid Mounting Orientation: <b>"TBA"</b> <b>Delivery: 5-7 weeks</b>	Maxon	8760S VOS-2, VCS-1	229-80164-075	3/4"	150# R.F. Flanged		WM
	T	130	#2 Oil Main Line Burner Flexible Hose	BH-X0590		1	Stainless steel flexible hose. Annular corrugated design. Double braid construction. Pressure Rating: 1575 PSIG @ 70 F Temperature Rating: -20 to 800 F	Flex Pressure	FLX-075-036-MM- SS2B	861-00584-035	3/4"	NPT		WM
	T	140	#2 Oil Main Line Pressure Gauge	PI-X0595		1	Pressure gauge w/ 2 1/2" dial, Stainless steel case. Soldered brass socket and bronze tube design. Glycerine filled. ASME B40.1 Grade B. Temperature Rating: 20 to 150 F Pressure Range: 0-160 PSIG	Ashcroft	63-1008AL-02L- 0/160PSI	850-90370-027	1/4"	NPT		SL / WM
		150	#2 Oil Main Line Pressure Gauge Pigtall			1	Pigtall for gauge / switch isolation. Schedule 80, A-106, 180 degree siphon.	NATCOM	PIGTAILC80025	220-00012-000	1/4"	NPT		WM

ATOMIZING VALVE TRAIN - BILL OF MATERIAL - DOCUMENT BM-1000											Bill of material Rev # : A				
REQUISITIONED [ DAY / MONTH ]	RECOMMENDED SPARE PARTS COMMISSIONING [ C ]	DEVIATIONS AND CLARIFICATIONS													
			Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn Size	Conn. Type	Rev #	Location
			10	Atomizing Steam Line Inlet Manual Shutoff Valve	HV-X0800		1	Manual shutoff gate valve. Conventional port, forged steel body (A105-WCB), CA15 wedge / disc seating surface. Stellite 6 seat surface, Class 800#. Pressure Rating: 1975 PSIG @ 100 F Temperature Rating: -20 to 800 F	Velan	W2054B02TY	225-00235-150	1 1/2"	SW		WM
			20	Atomizing Steam Line Check Valve	FV-X0815		1	Swing check valve. Carbon steel body (A105-WCB) with 800# rating. Vertically bolted, forged bonnet. CA15 wedge/disk seating, stellite 6 seat surface and 410 SS stem. Pressure Rating: 1975 PSIG @ 100 F Temperature Rating: -20 to 800 F	Velan	W2114B02TSA	227-00025-150	1 1/2"	SW		WM
			30	Atomizing Steam Line Strainer	NX-X0820		1	Y Strainer, carbon steel (A216-WCB) body and cap. 304SS screen, A105 plug, teflon gasket. 1/2" NPT blowdown connection. Pressure Rating: 740 PSIG @ 100 F Temperature Rating: -20 to 400 F Mesh Size: 0.032"	IFC	Y300SWST	923-00620-150	1 1/2"	SW		WM
			40	Atomizing Steam Line Pressure Gauge Isolation Valve	HV-X0830		1	Manual shutoff gate valve. Conventional port, forged steel body (A105-WCB), CA15 wedge / disc seating surface. Stellite 6 seat surface, Class 800#. Pressure Rating: 1975 PSIG @ 100 F Temperature Rating: -20 to 800 F	Velan	C2054B02TY	225-00236-000	1/2"	SW/NPT		WM
T			50	Atomizing Steam Line Pressure Gauge	PI-X0830		1	Pressure gauge w/ 4 1/2" dial, phenolic case. Glass lens, 316 SS bourdon tube, tip and socket. Dry, bottom connection. ASME Grade 2A (0.5%) precision. Temperature Rating: -20 to 150 F Pressure Range: 0-300 PSIG	Ashcroft	Duragauge 45-1279-SS-04L	850-04686-301	1/2"	NPT		SL / WM
			60	Atomizing Steam Line Pressure Gauge Pigtail			1	Pigtail for gauge / switch isolation, Schedule 80, A-106, 180 degree siphon.	NATCOM	PIGTAIIC80025	220-00012-000	1/4"	NPT		WM

			Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
	CT		70	Atomizing Steam Line Low Pressure Switch	PSL-X0830		1	Pressure switch with SS bellows and pressure connection. One SPDT, 15A, 125/250/480 VAC. Listing: UL, FM, CSA Rating: NEMA 4X Pressure Rating: 250 PSIG @ 160 F Temperature Rating: -40 to 160 F Pressure Range: 0-200 PSIG Factory Set on Decrease, See P&ID for Setpoint.	United Electric	J400-358 M201-M444	836-08644-000	1/4"	NPT		WM
			80	Atomizing Steam Line Low Pressure Switch Pigtail			1	Pigtail for gauge / switch isolation, Schedule 80, A-106, 180 degree siphon,	NATCOM	PIGTAILC80025	220-00012-000	1/4"	NPT		WM
	CT		90	Atomizing Steam Line Differential Pressure Control Valve	PDCV-X0870		1	Carbon Steel body Globe Valve, 316SS seat or seal, PTFE V-ring packing, SS tubing and fittings. Mechanical down stop. Listing: N/A Rating: N/A Pressure Rating: 285 PSIG @ 100 F Temperature Rating: -20 to 450 F Delivery : 6 weeks	Fisher	24000CVF-1-WCC-300RF-316SST-TA cv max : 11.8	230-00106-101	1"	300#R,F Flanged		WM
	CT		100	Atomizing Steam Line Differential Pressure Control Valve Actuator	PZ-X0870		1	Spring return pneumatic actuator, fail safe closed position. Installed with Instrument air filter / regulator and mechanical down stop. Temperature Rating: -40 to 180 F	Fisher	32-FC	NPN	N/A	N/A		WM
	CT		110	Atomizing Steam Line Flow Control Valve Positioner	ZT-X0870		1	Smart positioner, Hart protocol and 4-20mA input signal, SS tubing with SS fittings. Listing: N/A Rating: IP66, FM and CSA intrinsically safe / non incendive Supply Pressure: 101 PSIG maximum Temperature Rating: -40 to 185 F	Fisher	DVC2000-604/HC	NPN	N/A	N/A		WM
			120	Atomizing Steam Line Flow Control Valve Air Regulator			1	Pilot line pressure regulator w/ integral low capacity internal relief valve. Pressure Rating: 250 PSIG at 100 F Temperature Rating: -40 to 180 F	Fisher	67CFR-SST-swag	NPN	N/A	N/A		WM
	CT		130	Atomizing Steam Line Safety Shutoff Valve	BSV-X0840		1	Automatic safety shutoff short design ball valve, fail safe closed. Std. bore. Carbon Steel body, stainless steel ball and stem, Xtreme seat. Listing: API 607 Fire-Tite Pressure Rating: Temperature Rating:	Jamesbury	730S-31-2236XTZ1	230-00287-150	1 1/2"	300# R,F, Flanged		WM
	CT		140	Atomizing Steam Line Safety Shutoff Valve Actuator			1	Pneumatic actuator, spring return, 60 PSIG instrument air requirement. Pressure Rating: 116 PSIG maximum supply Temperature Rating: -40 to 175 F ambient	Jamesbury	VPVL300SR4/5BD	NPN	N/A	N/A		WM
	CT		150	Atomizing Steam Line Safety Shutoff Valve Solenoid	EV-X0840		1	120 VAC solenoid. Aluminum body black anodized. Rating: Explosion proof, Class 1, div. 2, groups B,C,D, NEMA 3, 3S, 4, 4X, 6, 6P, 7, 9 Listing: UL, CSA Temperature Rating: 5 to 104 F Pressure Rating: 0 to 120 PSIG	ASCO	EF8551A001MS	NPN	N/A	N/A		WM

			Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location	
			160	Atomizing Steam Line Pressure Gauge Isolation Valve	HV-X0865		1	Manual shutoff gate valve, Conventional port, forged steel body (A105-WCB), CA15 wedge / disc seating surface, Stellite 6 seat surface. Class 800#. Pressure Rating: 1975 PSIG @ 100 F Temperature Rating: -20 to 800 F	Velan	C2054B02TY	225-00236-000	1/2"	SW/NPT		WM	
	T		170	Atomizing Steam Line Pressure Gauge	PFX0865		1	Pressure gauge w/ 4 1/2" dia, phenolic case, Glass lens, 316 SS bourdon tube, tip and socket, Dry, bottom connection, ASME Grade 2A (0.5%) precision. Temperature Rating: -20 to 150 F Pressure Range: 0-300 PSIG	Ashcroft	Duragauge 45-1279-SS-04L	850-04686-301	1/2"	NPT		SL / WM	
			180	Atomizing Steam Line Pressure Gauge Pigtail			1	Pigtail for gauge / switch isolation, Schedule 80, A-106, 180 degree siphon,	NATCOM	PIGTAILC80025	220-00012-000	1/4"	NPT		WM	
	CT		190	Atomizing Steam Line Differential Pressure Transmitter	PDT-X0870		1	Differential pressure transmitter Rosemount Model 3051CD 4 - Range : -300 to 300 psi. Minimum span : 3 psi A - Output : 4-20 mA dc with HART Protocol 0 - Process flange type : Alternate Flange 2 - Isolating Diaphragm : 316L SST A - O-ring : Glass-filled TFE 1 - Silicone filled A - Housing Material : Polyurethane-covered aluminum. Conduit entry size : 1/2" - 14 NPT S5 - Factory assembled to model 305 integral manifold K5 - FM Explosion-proof and intrinsic safety approval Q4 - Calibration Certificate Delivery : 4-5 weeks	Rosemount	3051CD4A02A1AS 5K5Q4	834-00247-000	N/A	N/A			WM
			200	Atomizing Steam Line Differential Pressure Transmitter Manifold	HV-X0870		1	Integral Manifold Model 0305R C - Coplanar 3 - 3-valve manifold 2 - 316SST body, bonnet, stem, drain/vent B - Process connection : 1/2" - 14 NPT 1 - Packing Material : Teflon 1 - Valve seat : Integral (316SST) Delivery : 4-5 weeks	Rosemount	0305RC32B11	257-90401-050	1/2"	NPT		WM	
			210	Atomizing Steam Line Differential Pressure			2	Pigtail for gauge / switch isolation, Schedule 80, A-106, 180 degree siphon.	NATCOM	PIGTAILC80025	220-00012-000	1/4"	NPT		WM	
	T		220	Atomizing Steam Line Burner Flexible Hose	BH-X0890		1	Stainless steel flexible hose, Annular corrugated design, Double braid construction, Pressure Rating: 975 PSIG @ 70 F Temperature Rating: -20 to 800 F	Flex Pressure	FLX-125-032-MM-SS2B	861-00587-038	1 1/4"	NPT		WM	
	T	1	230	Atomizing Steam Line Pressure Gauge	PFX0895		1	Pressure gauge w/ 2 1/2" dia, Stainless steel case, Soldered brass socket and bronze tube design. Glycerine filled, ASME B40.1 Grade B. Temperature Rating: 20 to 150 F Pressure Range: 0-200 PSIG	Ashcroft	63-1008AL-02L-0/200PSI	850-90370-024	1/4"	NPT		SL / WM	

			Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
			240	Atomizing Steam Line Pressure Gauge Pigtail			1	Pigtail for gauge / switch isolation, Schedule 80, A-106, 180 degree siphon.	NATCOM	PIGTAIIC80025	220-00012-000	1/4"	NPT		WM
	CT		250	Atomizing Steam Flow Low Pressure Switch	PSLL-X0895		1	Pressure switch with SS bellows and pressure connection. One SPDT, 15A, 125/250/480 VAC. Listing: UL, FM, CSA Rating: NEMA 4X Pressure Rating: 250 PSIG @ 160 F Temperature Rating: -40 to 160 F Pressure Range: 0-200 PSIG Factory Set on Decrease, See P&ID for Setpoint.	United Electric	J400-358 M201-M444	836-08644-000	1/4"	NPT		WM
			260	Atomizing Steam Flow Low Pressure Switch Pigtail			1	Pigtail for gauge / switch isolation, Schedule 80, A-106, 180 degree siphon.	NATCOM	PIGTAIIC80025	220-00012-000	1/4"	NPT		WM
			270	Atomizing Steam Trap Drain Gate Valve	HV-X0825		1	Manual shutoff gate valve. Conventional port, forged steel body (A105-WCB), CA15 wedge / disc seating surface, Stellite 6 seat surface. Class 800#. Pressure Rating: 1975 PSIG @ 100 F Temperature Rating: -20 to 800 F	Velan	C2054B02TY	225-00236-000	1/2"	SW/NPT		WM
			280	Atomizing Steam Trap Inlet Manual Shutoff Valve	HV-X0826		1	Manual shutoff gate valve. Conventional port, forged steel body (A105-WCB), CA15 wedge / disc seating surface, Stellite 6 seat surface. Class 800#. Pressure Rating: 1975 PSIG @ 100 F Temperature Rating: -20 to 800 F	Velan	W2054B02TY	225-00235-050	1/2"	SW		WM
	CT		290	Atomizing Steam Trap	MX-X0827		1	Inverted bucket steam trap, stainless steel, 5/64 orifice. Pressure Rating: 400 PSIG @ 800 F Temperature Rating: -20 to 800 F	Armstrong	2011 - 5/64 B2311C-1	934-00416-000 934-00416-001	1/2"	NPT		WM
			300	Atomizing Steam Trap Outlet Manual Shutoff Valve	HV-X0828		1	Manual shutoff gate valve. Conventional port, forged steel body (A105-WCB), CA15 wedge / disc seating surface, Stellite 6 seat surface. Class 800#. Pressure Rating: 1975 PSIG @ 100 F Temperature Rating: -20 to 800 F	Velan	W2054B02TY	225-00235-050	1/2"	SW		WM
			310	Atomizing Steam Trap Bypass Manual Hand Control Valve	HV-X0829		1	Manual hand control valve, forged steel globe valve, class 800#. Pressure Rating: 1975 PSIG @ 100 F Temperature Rating: -20 to 800 F	Velan	W2074B02TY	224-00038-050	1/2"	SW		WM
								<b>ATOMIZING AIR FOR COLD START-UP</b>							
			320	Atomizing Air Line Inlet Manual Shutoff Valve	HV-X0900		1	Manual shutoff gate valve. Conventional port, forged steel body (A105-WCB), CA15 wedge / disc seating surface, Stellite 6 seat surface. Class 800#. Pressure Rating: 1975 PSIG @ 100 F Temperature Rating: -20 to 800 F	Velan	W2054B02TY	225-00235-150	1 1/2"	SW		WM

			Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
	CT		330	Atomizing Air Line Pressure Regulator	PCV-X0910		1	Pressure regulator, Carbon steel body, Neoprene diaphragm, SS416 seat ring, orifice size : 9/16" Adjustable range : 70-150 psig Max inlet pressure : 265 psig Temperature rating : -20 to 450 F Delivery : 8 weeks	Fisher	95H cv max : 3.5	918-01114-100	1"	150# R.F., Flanged		WM
			340	Atomizing Air Line Check Valve	FV-X0915		1	Swing check valve, Carbon steel body (A105-WCB) with 800# rating. Vertically bolted, forged bonnet, CA15 wedge/disk seating, stellite 6 seat surface and 410 SS stem. Pressure Rating: 1975 PSIG @ 100 F Temperature Rating: -20 to 800 F	Velan	W2114B02TSA	227-00025-150	1 1/2"	SW		WM
	CT		350	Atomizing Air Line Low Pressure Switch	PSLL-X0930		1	Pressure switch with SS bellows and pressure connection. One SPDT, 15A, 125/250/480 VAC. Listing: UL, FM, CSA Rating: NEMA 4X Pressure Rating: 250 PSIG @ 160 F Temperature Rating: -40 to 160 F Pressure Range: 0-200 PSIG Factory Set on Decrease, See P&ID for Setpoint.	United Electric	J400-358 M201-M444	836-08644-000	1/4"	NPT		WM

INSTRUMENT AIR VALVE TRAIN - BILL OF MATERIAL - DOCUMENT BM-1000											Bill of material Rev # : A				
REQUISITIONED [ DAY / MONTH ]	RECOMMENDED SPARE PARTS COMMISSIONING [ C ]	DEVIATIONS AND CLARIFICATIONS	NATCOM Project # : 4889 CUSTOMER : F M Sylvan, Inc. Knoxville, TN CUSTOMER P.O. # : SP-4889 END USER : The University of Tennessee Knoxville BOILER : BOILER MODEL# NB-300D-65						Quantities listed here are on a per train basis Quantity of trains required : 1 Piping Code : B31.3 Mills test for piping required						
			Line#	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
			10	Instrument Air Line Inlet Manual Shutoff Valve	HV-X1100		1	Manual shut-off ball valve. Full bore, brass body, cap, stem and gland, Chrome plated brass ball, PTFE seat and packing. Blow-out proof stem, 1/4 turn lever operated, comes with handle. Listing: FM, UL, CSA Pressure Rating: 600 PSIG @ 200 F Temperature Rating: -20 to 366 F	Apollo	77F-103-01	223-00036-050	1/2"	NPT		WM
			20	Instrument Air Line Pressure Gauge Isolation Valve	HV-X1105		1	Manual shut-off ball valve. Full bore, brass body, cap, stem and gland, Chrome plated brass ball, PTFE seat and packing. Blow-out proof stem, 1/4 turn lever operated, comes with handle. Listing: FM, UL, CSA Pressure Rating: 600 PSIG @ 200 F Temperature Rating: -20 to 366 F	Apollo	77F-103-01	223-00036-050	1/2"	NPT		WM
	T		30	Instrument Air Line Pressure Gauge	PI-X1105		1	Pressure gauge w/ 4 1/2" dial, phenolic case. Glass lens, 316 SS bourdon tube, tip and socket. Dry, bottom connection, ASME Grade 2A (0.5%) precision. Temperature Rating: -40 to 350 F Pressure Range: 0-160 PSIG	Ashcroft	Duragauge 45-1279-SS-04L	850-04757-001	1/2"	NPT		SL / WM
	CT		40	Instrument Air Line Pressure Regulator	PCV-X1110		1	Compressed air regulator. AR - Air Regulator 40 - Body size N - NPT connection 04 - 1/2" port, 1/2" connection H - Assembly complete with set nut Z - Pressure gauge connection Pressure Range: 7-125 PSIG Pressure Rating: 150 PSIG @ 100 F Temperature Rating: 23 to 140 F Field Adjusted, See P&ID for Setpoint.	SMC	AR40-N04H-Z	918-01033-000	1/2"	NPT		WM

		Line#	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
		50	Instrument Air Line Pressure Relief Valve	PSV-X1110		1	Pressure relief valve. 918 - Bronze bodied valve B - MNPT inlet and FNPT outlet D - Orifice Size C - 1/2" Inlet Size B - BUNA-N Seat 01- Threaded cap K - Air/Gas ASME VIII E - SS spring material 0090 = 90 PSIG set point	Kunkle	918-BDCB01-KE0090	210-02634-050	1/2" inlet x 3/4" outlet	NPT		WM
	T	60	Instrument Air Line Regulator Pressure Gauge	PI-X1110		1	Pressure gauge w/ 2 1/2" dial, Stainless steel case. Soldered brass socket and bronze tube design. Glycerine filled, ASME B40.1 Grade B. Temperature Rating: 20 to 150 F Pressure Range: 0-160 PSIG	Ashcroft	63-1008AL-02B-0/160PSI	850-90370-026	1/4"	NPT		SL / WM
	CT	70	Instrument Air Line Low Pressure Switch	PSLL-X1130		1	Pressure switch, Teflon diaphragm and o-ring with SST, die cast aluminum enclosure. Aluminum connection. One SPDT, 15 amp 125/250/480 VAC. Listing: UL, FM, CSA Rating: NEMA 4X Pressure Rating: 225 PSIG @ 160 F Temperature Rating: -40 to 160 F Pressure Range: 0-100 PSI Factory Set on Decrease, See P&ID for Setpoint.	United Electric	J400-572 M201-M44	836-91074-000	1/4"	NPT		WM
		80	Instrument Air Supply Line Manual Shutoff Valve	HV-X1140		6	Manual shut-off ball valve. Full bore, brass body, cap, stem and gland, Chrome plated brass ball, PTFE seat and packing, Blow-out proof stem, 1/4 turn lever operated, comes with handle. Listing: FM, UL, CSA Pressure Rating: 600 PSIG @ 200 F Temperature Rating: -20 to 366 F	Apollo	77F-103-01	223-00036-050	1/2"	NPT		WM
		90	Instrument Air Supply Line Spare Manual Shutoff Valve	HV-X1150		1	Manual shut-off ball valve. Full bore, brass body, cap, stem and gland, Chrome plated brass ball, PTFE seat and packing, Blow-out proof stem, 1/4 turn lever operated, comes with handle. Listing: FM, UL, CSA Pressure Rating: 600 PSIG @ 200 F Temperature Rating: -20 to 366 F	Apollo	77F-103-01	223-00036-050	1/2"	NPT		WM
		100	Instrument Air Line Primary Flow Orifice	FO-X1180		1	Union orifice to provide Instrument air to ignitor for cooling purposes during normal operation of the burner. Bore diameter: 1/32"	NATCOM	ORIBLANK050	217-00006-000	1/2"	NPT		WM
	T	110	Instrument Air Line Ignitor Flexible Hose	BH-X1180		1	Stainless steel flexible hose. Annular corrugated design. Double braid construction. Pressure Rating: 1612 PSIG @ 70 F Temperature Rating: -20 to 800 F	Flex Pressure	FLX-050-054-MM-SS2B	861-00582-053	1/2"	NPT		WM

		Line#	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
		120	Instrument Air Line Scanner Cooling Flow Orifice	FO-X1190		2	Union orifice to provide Instrument air to scanners for cooling. Bore diameter with 1 Scanner: 1/16"	NATCOM	ORIBLANK050	048-00726-116	1/2"	NPT		WM
	T	130	Instrument Air Line Scanner Cooling Flexible Hose	BH-X1190		1	Stainless steel flexible hose. Annular corrugated design. Double braid construction. Pressure Rating: 2512 PSIG @ 70 F Temperature Rating: -20 to 800 F	Flex Pressure	FLX-037-036-MM-SS2B	861-00619-037	3/8"	NPT		WM
	T	140	Instrument Air Line Scanner Cooling Flexible Hose	BH-X1191		1	Stainless steel flexible hose. Annular corrugated design. Double braid construction. Pressure Rating: 2512 PSIG @ 70 F Temperature Rating: -20 to 800 F	Flex Pressure	FLX-037-024-MM-SS2B	861-00619-023	3/8"	NPT		WM

REQUISITIONED [ DAY / MONTH ]	RECOMMENDED SPARE PARTS COMMISSIONING [ C ]	DEVIATIONS AND CLARIFICATIONS [ T ]	BURNER - BILL OF MATERIAL - DOCUMENT BM-1000							Bill of material Rev # : A							
NATCOM Project # : 4889 CUSTOMER : F M Sylvan, Inc. Knoxville, TN CUSTOMER P.O. # : SP-4889 END USER : The University of Tennessee Knoxville BOILER : BOILER MODEL# NB-300D-65							Quantities listed here are on a per train basis Quantity of trains required : 1 Piping Code : B31.3										
Line #	Service	Tag #	Cust Tag #	Qty	Description			Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location			
		10	Natural Gas Fired and #2 Oil Fired Burner	BURNER	1	NAT-COM LOW Nox BURNER Natural gas : 96.1,MMBTU/Hr #2 Oil : 92 MMBTU/Hr			NATCOM	SEE DWG GA-1000	NPN	N/A	N/A	BM			
		20	Component Tagging		as Req	Lamicoid tags: 2" x 3/4" (White TAGS with Black Letters)			NATCOM	N/A	NPN						
		30	Hand Held Hart Interface Device		1	475 Field Communicator. Includes Field communicator unit with backlit color LCD display, System card, leadset with connectors, carrying case. H - HART communication protocol P - Rechargeable Lithium ion battery pack allowing up to 20 hours of use between charges. 1 - Power supply/Charger (90-240VAC, 50/60 Hz, US/UK/EU connection types included) E - English language KL - ATEX, FM, CSA Intrinsically Safe (includes FISCO as applicable) U - Easy Upgrade Option (includes unlimited upgrades to System Card for 3 year period) To download most recent HART instruments Device Drivers. GM - Device Configuration Management & EDDL Enhanced Graphics Capabilities. T - Bluetooth Communication - allows 2x faster communication with EasyUpgrade and AMS Softwares compared to the standard JDA port. S - Protective Rubber Boot with Stand. <b>Delivery : 5 weeks</b>			Emerson	475HP1EKLUGMT S	833-09211-090	N/A	N/A		SL		
		40	Oil Atomizing Gun Tool Kit		1	Oil gun tool kit with all the required equipment for service.			NATCOM	SEE DWG TL041-TBA	NPN	N/A	N/A	SL			
CT		50	#2 Oil Gun Proof of Insertion Switch	ZS-X1300	1	Limit switch, one SPDT contact. Design: plunger, spring return Listing: UL, CSA Rating: NEMA 1, 3, 4 Temperature Rating: 14 to 176 F			Allen-Bradley	802B-PSABBSX	836-08627-000	N/A	N/A	BM			

		Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
		60	Flame Scanner and Flame Safeguard Relay	BE-X1300 BS-X1300 BE-X1301 BS-X1301		2	SEE ELECTRICAL BILL OF MATERIAL							
		70	Ignition Transformer	EX-X1300		1	SEE ELECTRICAL BILL OF MATERIAL							
	T	80	Guide Tube Cooling Air Flexible Hose	BH-X1300		1	Stainless steel flexible hose, Annular corrugated design, Double braid construction, Pressure Rating: 1200 PSIG @ 70 F Temperature Rating: -20 to 800 F	Flex Pressure	FLX-100-042-MM-SS2B	861-00586-044	1"	NPT		BM

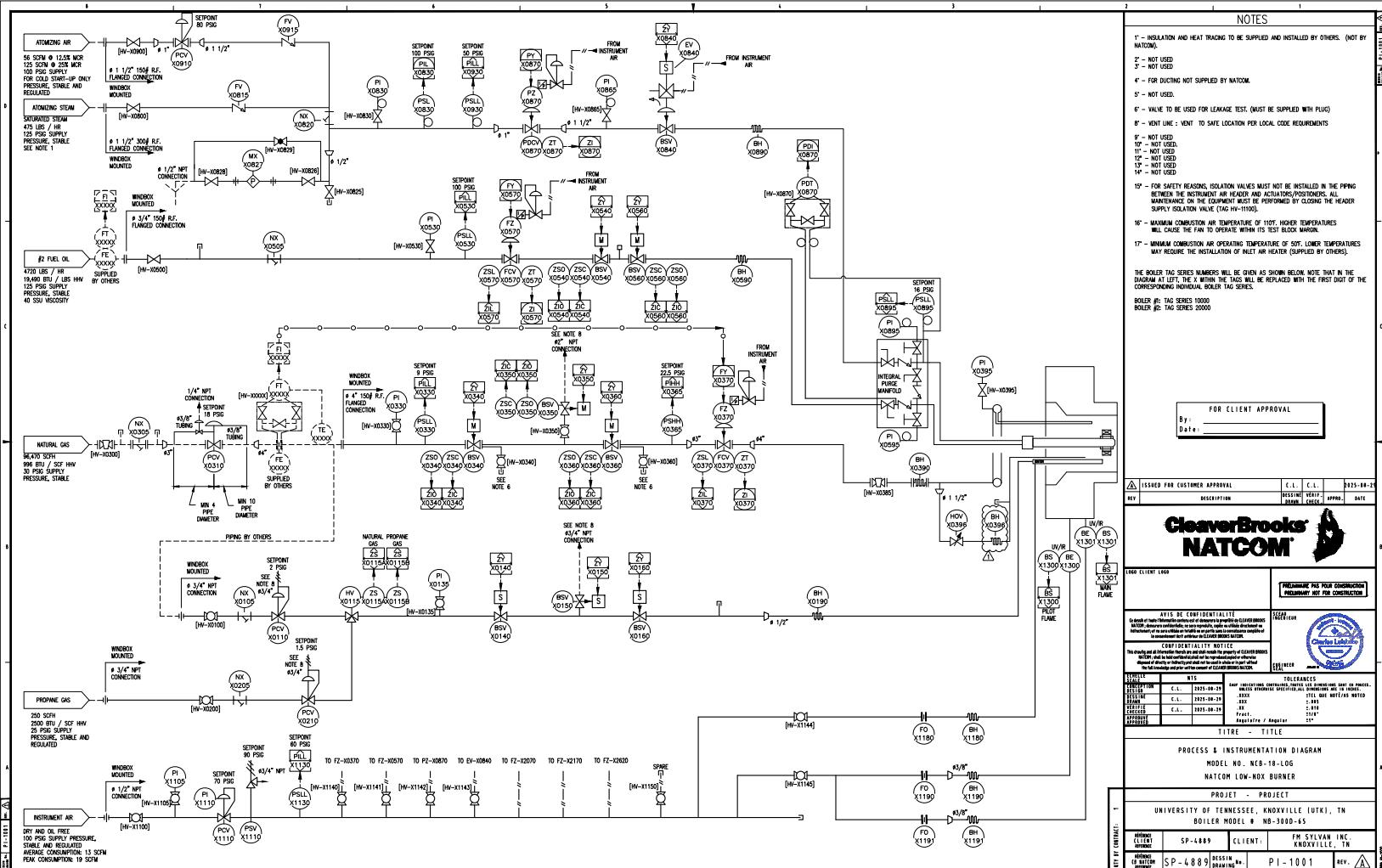
REQUISITIONED [ DAY / MONTH ]		RECOMMENDED SPARE PARTS COMMISSIONING [ C ]		DEVIATIONS AND CLARIFICATIONS TWO YEARS [ T ]		COMBUSTION AIR - BILL OF MATERIAL - DOCUMENT BM-1000						Bill of material Rev # : A				
Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #					
		10	Combustion Air Forced Draft Fan	FD FAN	1 Combustion Air Fan High Efficiency Industrial Backward Curved Fans Size : 4450 Percent Width : 70% SWSI Arrangement : 4S Rotation : CW Discharge : DB Inlet Connection: Flanged Outlet Connection: Flanged Hinged Quick Open Access Door	Northern Blower	Design : 5730 Size : 4450	813-02610-003	N/A	N/A					AFC	
		20	Combustion Air Forced Draft Fan Motor	MOTOR	1 Direct drive motor coupled directly to fan shaft. Horsepower : 125 HP Rotation Speed : 1800 RPM Power Requirements : 3/60/460v Motor frame : 444T	Teco-Westinghouse	AEHH8N	NPN	N/A	N/A					AFC	
	CT	30	Minimum Combustion Air Low Differential Pressure Switch	FSLL-X2030	1 Differential air pressure switch, one SPDT- NC (single pole, double-throw snap action switch; contacts are in normally closed position before pressure is applied to the diaphragm.) 125/250 VAC contact, 14-gauge grey hammertone enameled steel with neoprene gasketed clamped cover hinged on the left side. Mount the AFS-951 with the silicone diaphragm in any vertical plane. Listing: UL listed, CE and CSA approved Rating: NEMA 7 & 9 Pressure Range: 0.03 to 12" w.c. Deadband: + 0.02" wc/ -0.00" wc Pressure Rating: ½ psi (0.03 bar). Temperature Rating: -40 °F to 180 °F (-40 °C to 82 °C)  Power consumption: 4.5 watts at 120V ac	Hays-Cleveland	AFS-951-2	836-08630-101	1/4" 1/4"	NPT						AFC

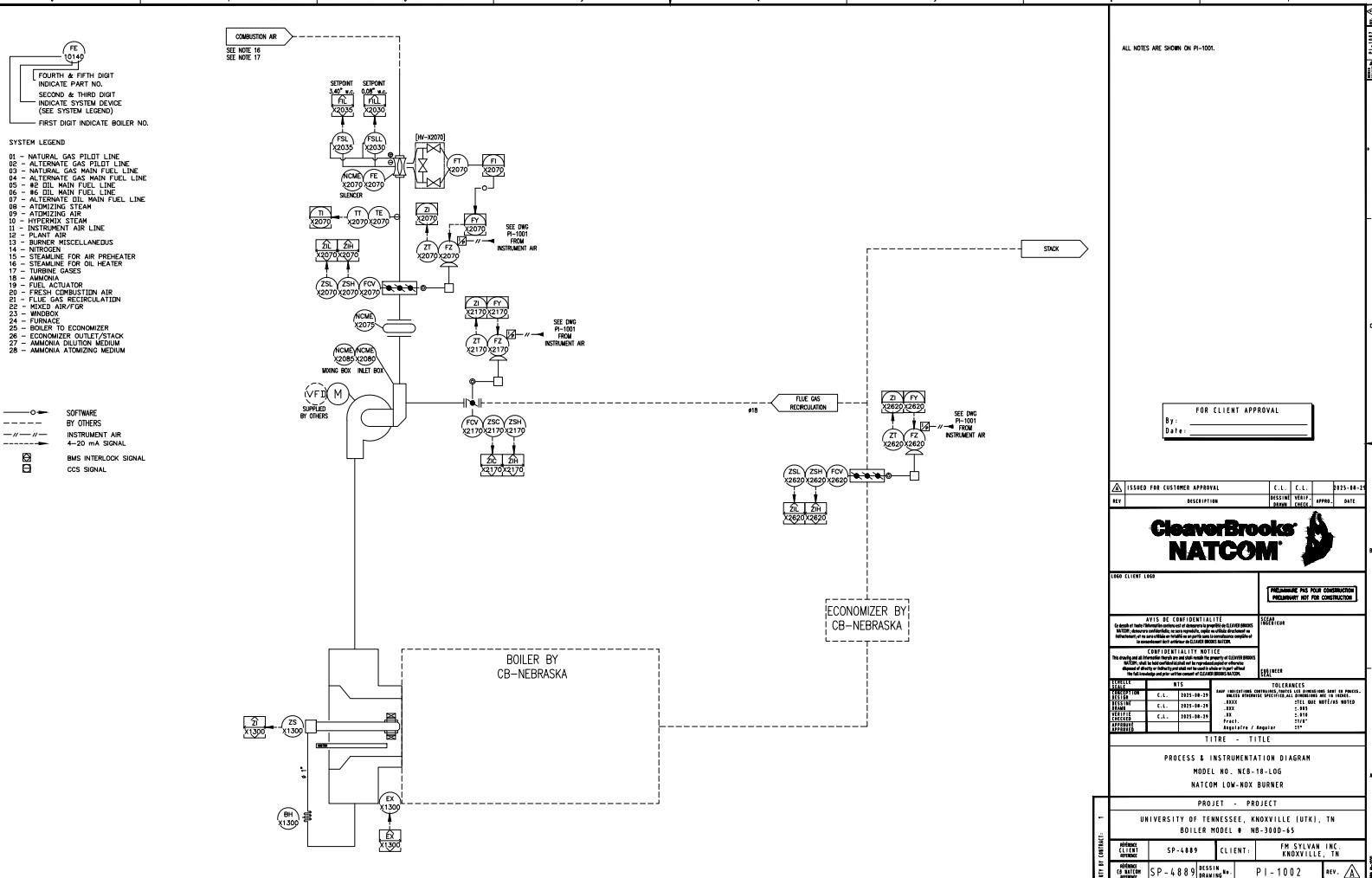
		Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
	CT	40	Minimum Purge Air Low Differential Pressure Switch	FSL-X2035		1	Differential air pressure switch, one SPDT 15 amp 125/250/480 VAC contact, anodized cast aluminum housing, molded fluorosilicone rubber diaphragm. Listing: UL, CSA, FM Rating: NEMA 7, 9, Weatherproof, Explosion Proof Cl. I, Div. I, Grp. C&D Pressure Range: 1.4 to 5.5" w.c. Pressure Rating: 10 PSIG @ 140 F Temperature Rating: -40 to 140 F Field Adjusted, See P&ID for Setpoint.	Dwyer	1950-5-2F	836-08635-000	1/8" 1/8"	NPT		AFC
		50	Combustion Air Flow Element & Silencer	FE-X2070 NCME-X2070		1	Venturi type air flow element, including insulation to reduce fan sound emission level. Silencer attached to flowmeter	NATCOM	N/A	NPN	N/A	N/A		AFC
	CT	60	Combustion Air Flow Transmitter	FT-X2070		1	Differential pressure transmitter Rosemount model 3051CD 1 - Range : -25 to 25 in wc, Minimum span : 0.5 in wc A - Output : 4-20 mA dc with HART Protocol 0 - Alternate flange 2 - Isolating diaphragm : 316L SST A - O-ring : Glass-filled TFE 1 - Silicone filled A - Housing Material : Polyurethane-covered aluminum. Conduit entry size : 1/2"-14NPT S5 - Factory assembled to model 305 integral manifold K5 - FM explosion proof and intrinsic safety approval Q4 - Calibration certificate <i>Delivery : 4-5 weeks</i>	Rosemount	3051CD1A02A1AS 5K5Q4  Calibration : 4 mA: 0 in wc 20 mA: 25 in wc  Squared root enabled	834-00210-001	N/A	N/A		AFC
		70	Combustion Air Differential Pressure Transmitter Manifold	HV-X2070		1	Integral Manifold Model 0305R C - Coplanar 3 - 3-valve manifold 2 - 316SST body, bonnet, stem, drain/vent B - Process connection : 1/2" - 14 NPT 1 - Packing Material : Teflon 1 - Valve seat : Integral (316SST) <i>Delivery : 4-5 weeks</i>	Rosemount	0305RC32B11	257-90401-050	1/2"	NPT		AFC
	CT	80	Combustion Air Temperature Element	TE-X2070		1	Series 68 platinum temperature sensors N = Sensor with 6", Teflon-insulated, 22-gauge lead wires 21 - Spring loaded style. Temperature range : -58 to 752 F N00 - No extension supplied A - Thermowell material : 316 Stainless Steel 090 : Immersion length : 9" T26 - Thermowell process connection : 3/4" - 14 NPT. Stem type : tapered E5 - FM approval XA - Assemble connection head or transmitter to a sensor assembly <i>Delivery : 4-5 weeks</i>	Rosemount	0068N21N00A090T 26E5XA	834-00438-001	3/4"	NPT		SL

			Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
	CT		90	Combustion Air Temperature Transmitter	TT-X2070		1	Smart temperature transmitter of model 3144P Rosemount D1 - Field Mount housing A - Output : 4-20 mA dc with HART Protocol 1 - Measurement type : Single sensor input K5 - Fm Intrinsic safety and explosion-proof and Non-incendive approval combination Q4 - Calibration certificate XA - Sensor specified separately and assembled to transmitter <b>Delivery : 4-5 weeks</b>	Rosemount	3144PD1A1K5Q4X A  Calibration: 4mA: 0 F 20mA: 150 F	834-00187-001	N/A	N/A		SL
			100	Combustion Air Flow Control Damper	FCV-X2070		1	Parallel blade air flow control damper.	NATCOM	N/A	NPN	N/A	N/A		AFC
	CT		110	Combustion Air Flow Control Damper Actuator	FZ-X2070		1	Pneumatic actuator. 097 - Size 9 actuator, 1280 in-lbs torque @ 60 PSIG 100 - No positioner included L - Std Low temperature seals <b>TBA</b> on increasing signal to open Temperature Rating: -4 to 160 F Air Flow Rate: 3.3 SCFM	KINETROL	097-100L	269-00130-097	N/A	N/A		AFC
	CT		120	Combustion Air Flow Control Damper Positioner	ZT-X2070		1	ABB TZID-C Smart Positioner, cw rotation 18345 - Electro-pneumatic positionneur 4-20mA 2 - Mechanic indicator 02- Hart Protocol 2 - FM / CSA rating, Div 2 5 - Double acting, fail freeze 2 - 1/2-14 NPT electric connection 1 - Retraction module 0 - No limit switches 01 - Std design AL cover IP65/NEMA 4X, FM Rating: CSA IS CL 1,2,3 Div 1,2 Gr A-G c/w ABB Namur Adaptor	ABB	18345-2022521001	836-08650-000	N/A	N/A		AFC
			130	Combustion Air Flow Variable Inlet Vane Control Damper Low Position Switch	ZSL-X2070		1	Limit switch, one SPDT contact. Design: plunger roller, spring return Listing: UL, CSA Rating: NEMA 1, 3, 4 Temperature Rating: 14 to 176 F	Allen-Bradley	802B-PSARBSX	836-08628-000	N/A	N/A		AFC
			140	Combustion Air Flow Variable Inlet Vane Control Damper High Position Switch	ZSH-X2070		1	Limit switch, one SPDT contact. Design: plunger roller, spring return Listing: UL, CSA Rating: NEMA 1, 3, 4 Temperature Rating: 14 to 176 F	Allen-Bradley	802B-PSARBSX	836-08628-000	N/A	N/A		AFC

			Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
			141	Combustion Air Expansion joint	NCME-X2075		1	Size (ID): 15.75" W x 51.125" H Face to face (F/F): 6" Duct orientation : Horizontal Type : 1B (BOLT-IN) MOLDED "U" Shaped flexible element Pressure design : 28" W.C. Norm. Operating: 12" W.C. Design Temperature : 180° F Operating Temperature : 153° F Belt material : FC643 PTFE-Coated woven fiberglass fabric Finish : Cleaned per SSPC SP-1, 2, 3 A/R & 1 Coat Std primer c/w Flow liner		EJ-15.75" x 51.125" x 6" F/F		N/A	N/A		AFC
			150	FGR Flow Control Damper	FCV-X2170		1	Butterfly designed damper.	NATCOM	N/A	NPN	N/A	N/A		AFC
	CT		160	FGR Flow Control Damper Actuator	FZ-X2170		1	Pneumatic actuator. 097 - Size 9 actuator, 1280 in-lbs torque @ 60 PSIG 100 - No Electro-pneumatic positioner included Air Flow Rate: 3.3 SCFM Temperature Rating: -4 to 160 F	KINETROL	097-100L	269-00130-097	N/A	N/A		AFC
	CT		170	FGR Flow Control Damper Positioner	ZT-X2170		1	ABB TZID-C Smart Positioner, cw rotation 18345 - Electro-pneumatic positionneur 4-20mA 2 - Mechanic indicator 02- Hart Protocol 2 - FM CSA rating, Div 2 4 - Double acting, fail Closed 2 - 1/2-14 NPT electric connection 1 - Retraction module 0 - No limit switches 01 - Std design AL cover IP65/NEMA 4X, FM Rating: CSA IS CL 1,2,3 Div 1,2 Gr A-G c/w ABB Namur Adaptor	ABB	18345-2022421001	836-91038-000	N/A	N/A		AFC
	CT		180	FGR Flow Variable Inlet Vane Control Damper Closed Position Switch	ZSC-X2170		1	Limit switch, one SPDT contact. Design: plunger roller, spring return Listing: UL, CSA Rating: NEMA 1, 3, 4 Temperature Rating: 14 to 176 F	Allen-Bradley	802B-PSARBSX	836-08628-000	N/A	N/A		AFC
			190	FGR Flow Variable Inlet Vane Control Damper High Position Switch	ZSH-X2170		1	Limit switch, one SPDT contact. Design: plunger roller, spring return Listing: UL, CSA Rating: NEMA 1, 3, 4 Temperature Rating: 14 to 176 F	Allen-Bradley	802B-PSARBSX	836-08628-000	N/A	N/A		AFC
			200	FD Fan Inlet Box & Mixing Box	NCME-X2080 NCME-X2085		1	Forced draft fan Inlet box and mixing box	NATCOM	N/A	NPN	N/A	N/A		AFC
			210	Stack Damper	FCV-X2620		1	Cylindrical Opposed blade stack damper, opposed blades, Carbon Steel, 42" ID x 18" high.	NATCOM	427-00100-420	427-00100-420	42"			AFC

			Line #	Service	Tag #	Cust Tag #	Qty	Description	Manufacturer	Model #	CB Part No.	Conn. Size	Conn. Type	Rev #	Location
	CT		220	Stack Damper Actuator	FZ-X2620		1	Pneumatic actuator, 107 - Size 10 actuator, 2130 in-lbs torque @ 60 PSIG 100 - No Electro-pneumatic positioner included L- Low temperature seal Temperature Rating: -4 to 160 F	KINETROL	107-100L	269-00130-107	N/A	N/A		AFC
			230	Stack Damper Positioner	ZT-X2620		1	ABB TZID-C Smart Positioner, cw rotation 18345 - Electro-pneumatic positionneur 4-20mA 2 - Mechanic indicator 02- Hart Protocol 2 - FM /CSA rating, Div 2 4 - Double acting, fail Open 2 - 1/2-14 NPT electric connection 1 - Retraction module 0 - No limit switches 01 - Std design AL cover IP65/NEMA 4X, FM Rating: CSA IS CL 1,2,3 Div 1,2 Gr A-G c/w ABB Namur Adaptor	ABB	18345-2022421001	836-91038-000	N/A	N/A		AFC
			240	Stack Damper Low Position Switch	ZSL-X2620		1	Limit switch, one SPDT contact. Design: plunger roller, spring return Listing: UL, CSA Rating: NEMA 1, 3, 4 Temperature Rating: 14 to 176 F	Allen-Bradley	802B-PSARBSX	836-08628-000	N/A	N/A		AFC
			250	Stack Damper High Position Switch	ZSH-X2620		1	Limit switch, one SPDT contact. Design: plunger roller, spring return Listing: UL, CSA Rating: NEMA 1, 3, 4 Temperature Rating: 14 to 176 F	Allen-Bradley	802B-PSARBSX	836-08628-000	N/A	N/A		AFC







## **UTILITY REQUIREMENTS**

Natcom Project Number: **4889**

Customer: **FM SYLVAN INC**

Customer PO Number: **SP-4889**

End User: UNIVERSITY OF TENNESSEE, KNOXVILLE (UTK), TN

Site location: **BOILER MODEL # NB-300D-65**

Quantity of Units: 1

  
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ing  
2025-08-29

Natcom Document Number: 4889 UR-1000

REVISION A

# UTILITY REQUIREMENTS - DOCUMENT UR-1000

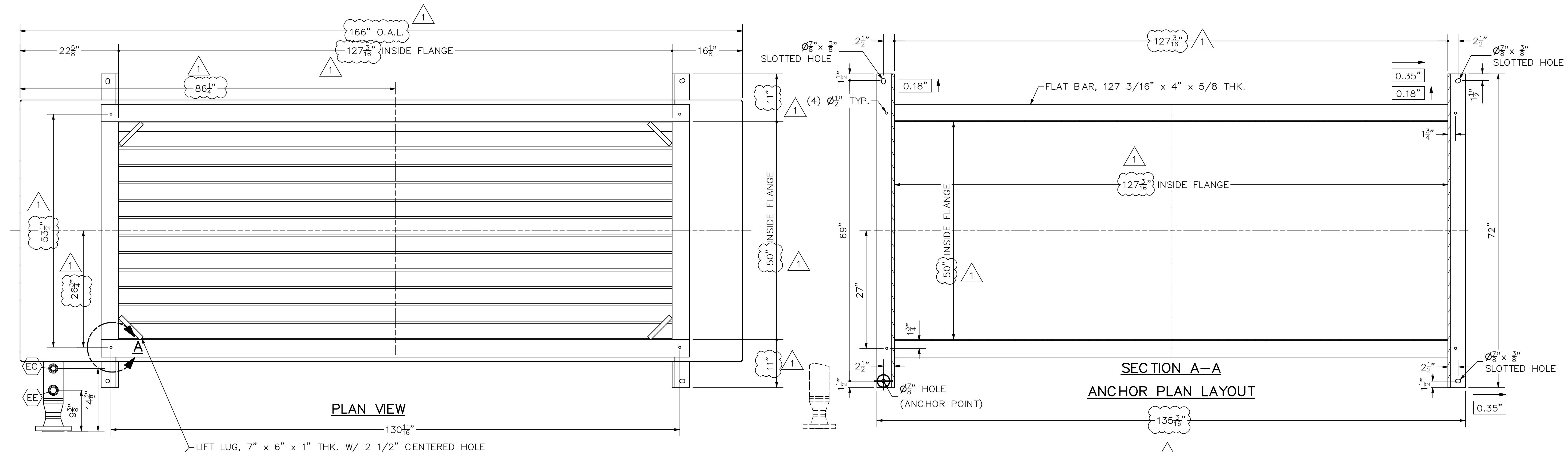
Customer: FM SYLVAN INC NAT-COM Project # : 4889  
Customer PO Number: SP-4889 Revision # : A  
End User: UNIVERSITY OF TENNESSEE, KNOXVILLE (UTK), TN  
Site location: BOILER MODEL # NB-300D-65

#	Line Description	Flow	Pressure	Revision	Comments
1	Natural Gas Pilot	500 SCFH	18 PSIG		
2	Propane Gas Pilot	250 SCFH	25 PSIG (max)		
3	Main Natural Gas	96,470 SCFH	30 PSIG		
4	#2 Oil	4720 LBS/HR	125 PSIG		
5	Atomizing Steam	475 LBS/HR	125 PSIG		
6	Atomizing Air	56 SCFM @ 12.5% MCR 125 SCFM @ 25% MCR	100 PSIG		
7	Instrument Air	Average Consumption : 13 SCFM Peak Consumption : 19 SCFM	100 PSIG		

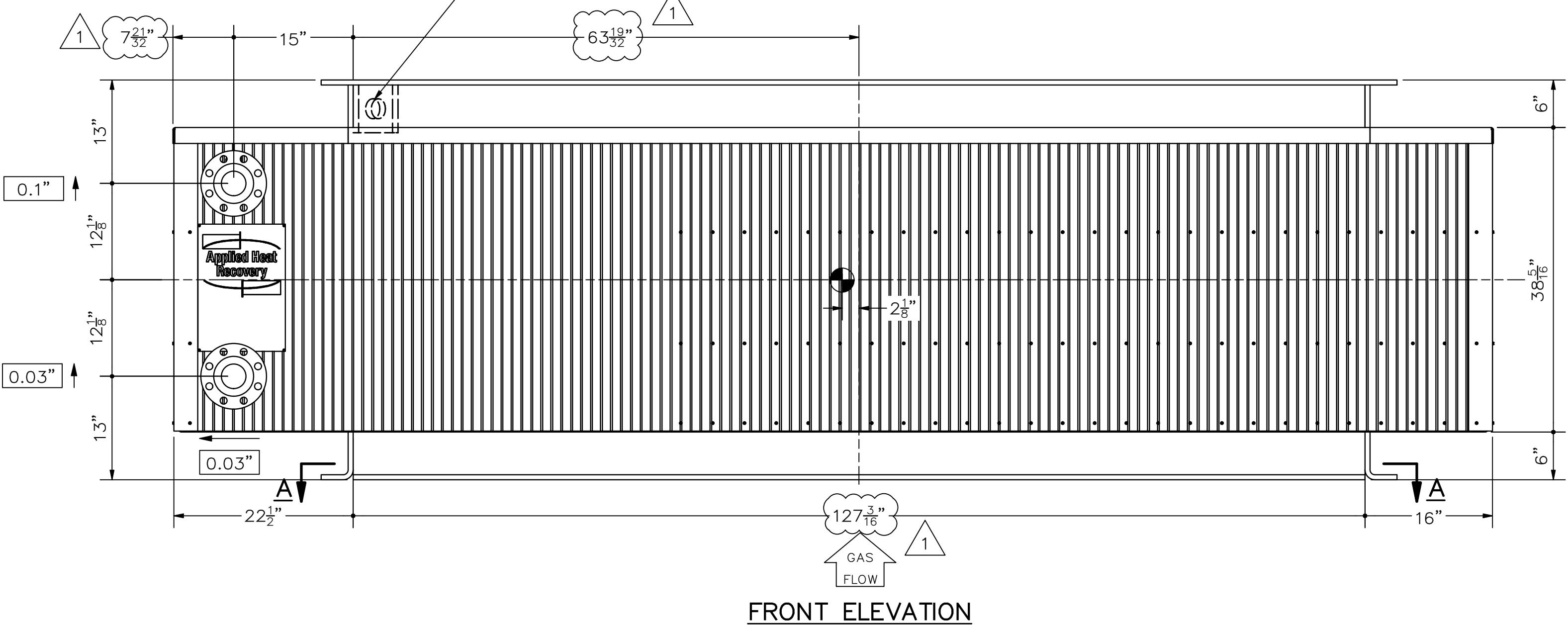
#	Line Description	Voltage / Frequency	Power	Revision	Comments
8	BMS Control Panel Power Supply	120 / 1Ø / 60Hz	2500 VA		
9	FD Fan Motor	460 / 3Ø / 60Hz Frame size : 445T FLA : 146.1 A	125 HP		

**Note:**

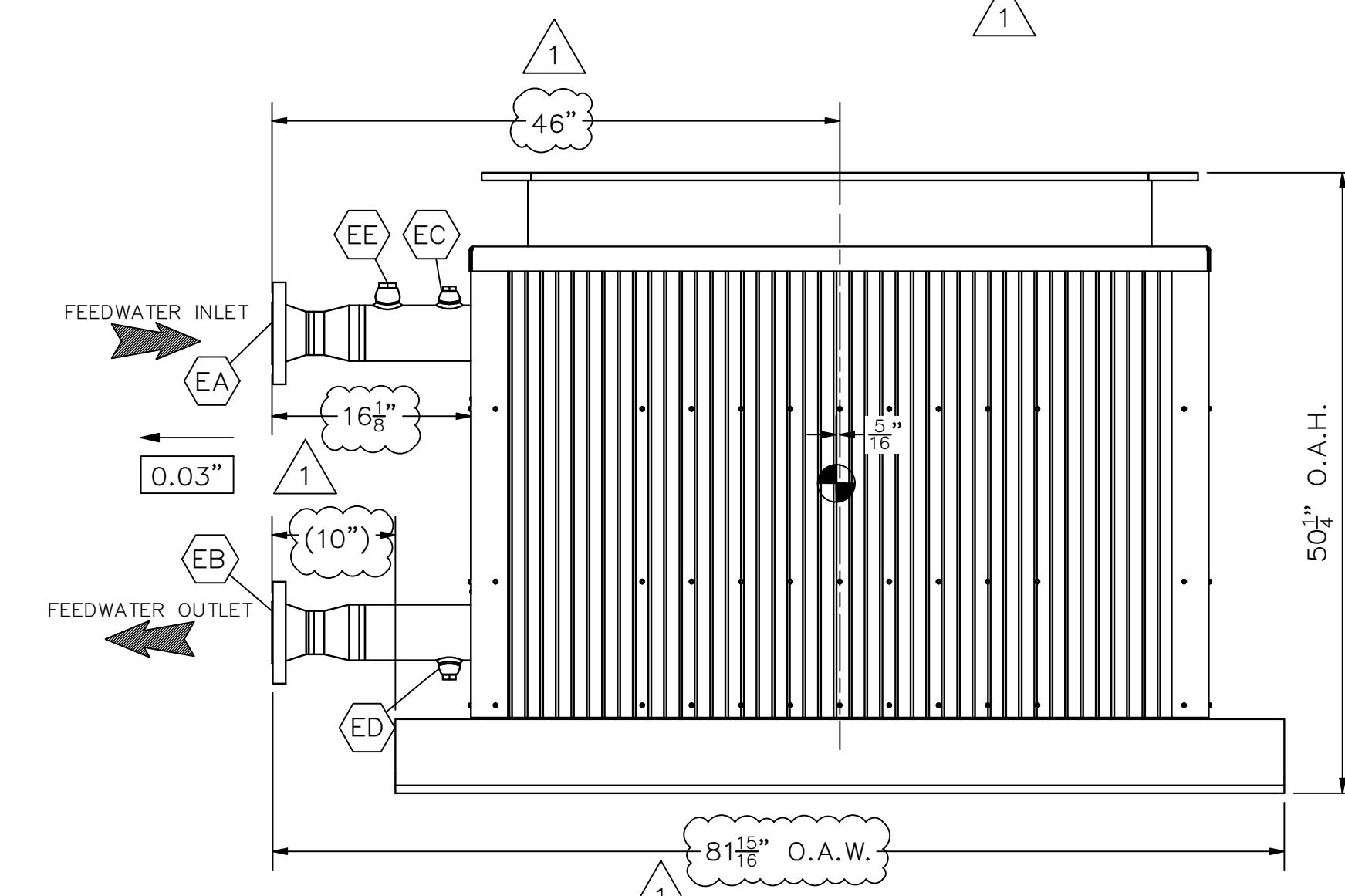
Above utility requirements are design conditions at 100% M.C.R.  
Client should allow a safety margin above these numbers when designing supply systems to this equipment.



SECTION A-A  
ANCHOR PLAN LAYOUT



FRONT ELEVATION



RETURN END ELEVATION

LEGEND:

- THERMAL MOVEMENT ANCHOR POINT:
- THERMAL MOVEMENT DATA:
- CENTER OF GRAVITY:

DESIGN NOTES:

1. COIL IS DESIGNED AND STAMPED PER ASME CODE SECTION VIII, DIV. 1, 2023 EDITION AND REGISTERED WITH THE NATIONAL BOARD
2. DESIGN PRESSURE: 400 PSIG
3. DESIGN TEMPERATURE: 600° F
4. HYDROSTATIC TEST PRESSURE: 620 PSIG
5. HEAT RECOVERED (NC): 6.27 MMBTU/HR
6. HEATING SURFACE: 4,923 FT<sup>2</sup>
7. MDMT: -20° F@400 PSIG

MATERIALS OF CONSTRUCTION:

1. TUBES: 2" O.D. x 0.109" A.W. SA-249-TP316L-S31603 SS TUBING OR 1 1/2" SCH 10 SA-312-TP316L-S31603 SS PIPE (TO BE CONFIRMED AT RELEASE) WITH 0.06"THICK x 0.750"H, TP409 SS SERRATED FINS @ 4 FPI
2. RETURN BENDS ARE COLD BENT
3. HEADERS: 4" SCH 40 PIPE, SA-312-TP316L-S31603 WELDED SS PIPE
4. PAINT: EXPOSED C.S. SURFACES WILL BE PREPARED BY SSPC-SP3 & PAINTED WITH HI-TEMP. BLACK PAINT
5. ESTIMATED WEIGHTS: (~10,300# DRY ~11,630# WET)
6. INTERNAL CASING IS 3/16" CARBON STEEL COVERED WITH 4" OF MINERAL FIBER INSULATION AND CORRUGATED GALVANIZED LAGGING

REV	DATE	BY	CHK'D	DESCRIPTION
REVISION HISTORY				

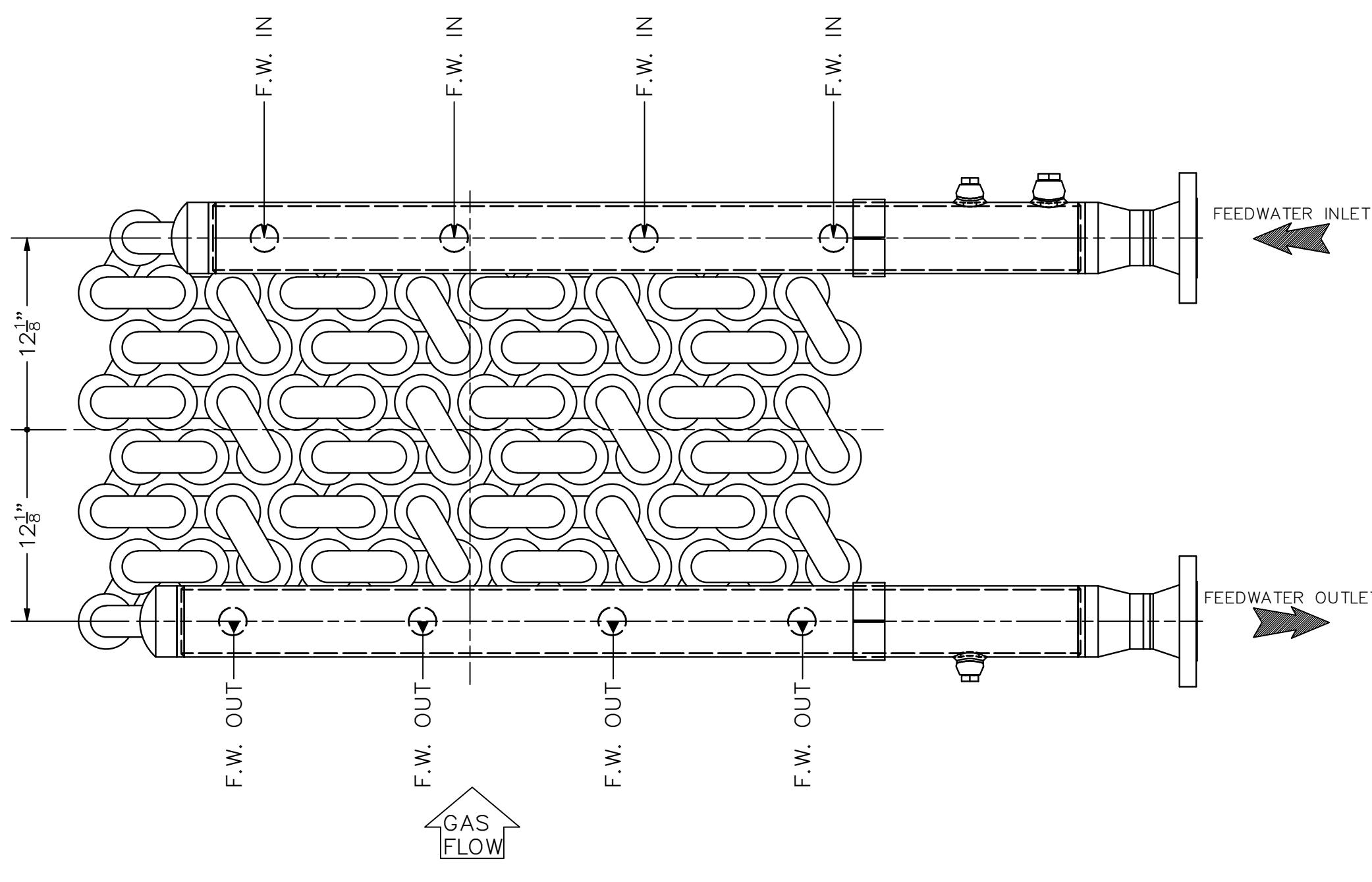


DRAWN BY	REVIEWED BY	APPROVED BY	REV.
NM			
DATE: 08/11/2025			
SCALE: NTS			
CHECKED: JM			
JOB NO.: 1172025	DRAWING NO.: D-1172025-1		
KW			

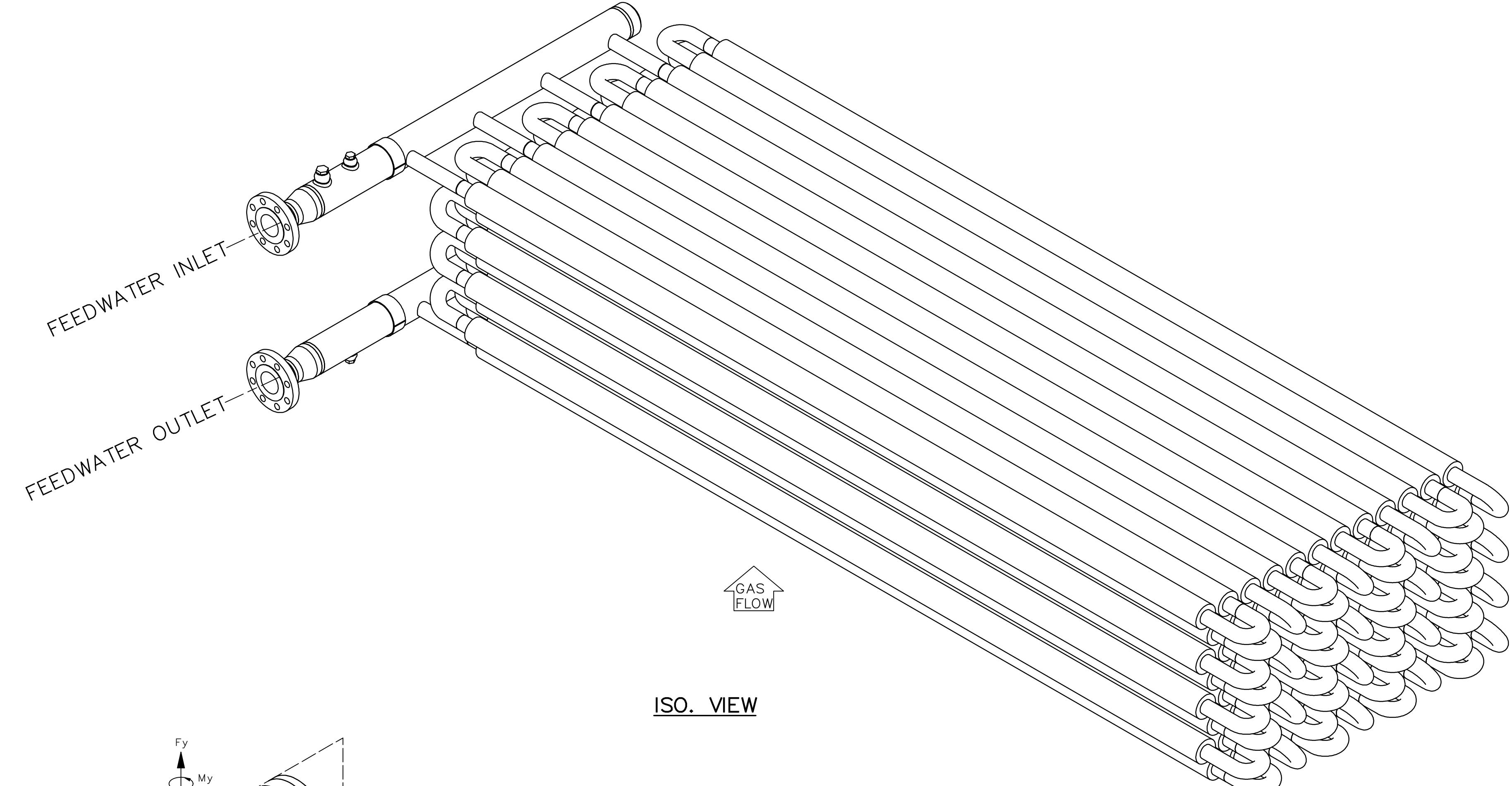
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CLEAVER-BROOKS  
PO L225754 | UNIV OF TN | SP4889  
ECONOMIZER GENERAL ARRANGEMENT

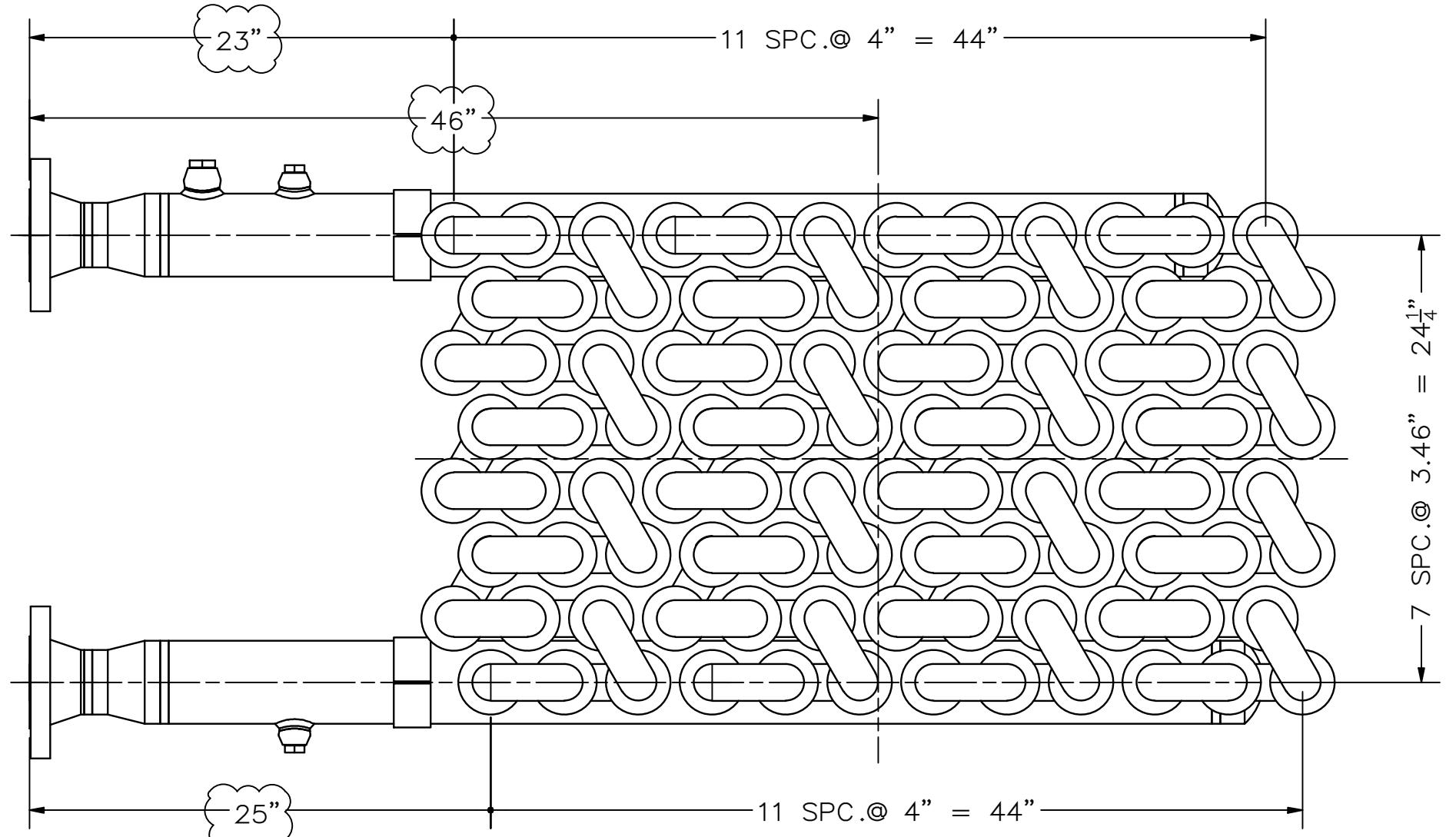
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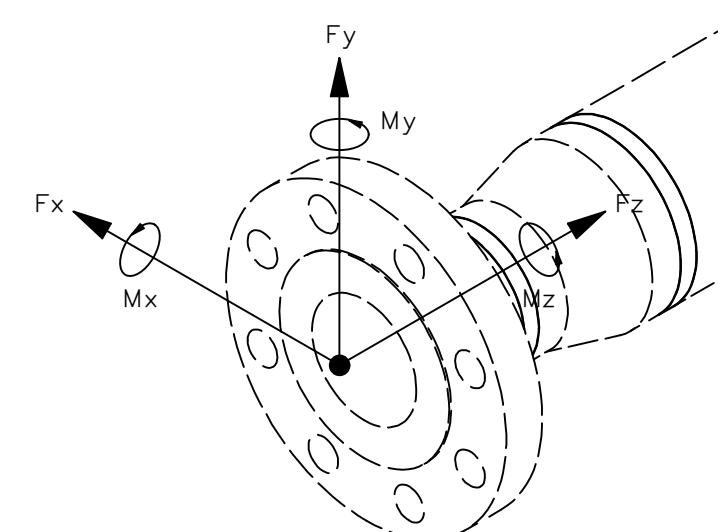
TERMINAL END ELEVATION



ISO. VIEW



RETURN END ELEVATION



NDT REQUIREMENTS			
VT, RT 100% OF 10% OF ALL TUBE-TO-TUBE WELDS			

ALLOWABLE NOZZLE LOADS			
NOZZLE SIZE (INCHES)	AXIAL LOADS Mz, My (LBS)	TANGENTIAL LOADS Fx (LBS)	BENDING MOMENTS Mx, Mz, My (FOOT-LBS)
3	708	326	1,087

REV	DATE	BY	CHK'D	DESCRIPTION
1	08/26/2025	NM	KW	REVISED PER CUSTOMER REQUEST
0	08/18/2025	NM	KW	ISSUED FOR APPROVAL
				REVISION HISTORY