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## Section 1

### *Design and Operation*

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**THIS INSTALLATION AND OPERATION OUTLINE IS INTENDED TO SUPPLEMENT AND REINFORCE THE KNOWLEDGE OF AN EXPERIENCED OWNER/OPERATOR FAMILIAR WITH NATURAL GAS COMPRESSOR EQUIPMENT. IT IS NOT TO BE USED AS A TRAINING MANUAL FOR INEXPERIENCED PERSONNEL.**

#### **UNIT INSTALLATION**

This compressor package has been designed with a structural steel base that is to be installed on a suitably engineered and constructed steel pile, compacted gravel or concrete pad foundation. The foundation must be designed to adequately support the unit and absorb normally occurring unbalance forces and is the responsibility of the owner.

#### **UNIT OPERATION**

By nature of operation, natural gas compression equipment have numerous hazards: high pressure, flammable and toxic gases; high speed rotating equipment; high noise level; hot surface; tripping falling hazards; etc. It is the owner/operator's responsibility to have in place proper safe work procedures and ensure that personnel are trained and capable of operating and maintaining this equipment.

**ONLY ADEQUATELY TRAINED AND EXPERIENCED PERSONNEL ARE PERMITTED TO COMMISSION, OPERATE AND SERVICE THIS EQUIPMENT.**

#### **PRE-COMMISSION CHECKS**

1. Unit installation as whole needs to be checked: Gravel or concrete pad installation is level and provides uniform support. Steel pile installation is as per engineered specification.
2. External interconnecting piping verified as installed correctly.
3. Atmospheric vents for air and gas, engine intake and exhaust, breathers, tank vents etc. are open to atmosphere.
4. Aerial coolers are unobstructed.
5. Correct fluids have been installed and levels are within their proper operating range.
6. Unit control system and shutdown systems have been confirmed to be functional with set points as per shutdown key, PID or other relevant design documentation supplied with the unit.
7. Pressure piping system and vessels require that all connection be checked for tightness and proper torque. It is recommended that nitrogen or another inert gas be used to pressurize the package to a safe pressure to check for leaks.
8. All rotating equipment is to have had an alignment done after all foundation installation work is complete. While a shop alignment will have been performed during construction, transporting, lifting, setting, installing can upset the alignment and it must consequently be confirmed and adjusted after installation.
9. Belts need be checked for proper tension using a belt tension gauge.
10. All guards and personnel protective devices in place.
11. Pressure relief device are set to the design point as confirmed with PID or other design document with inlet and outlet piping unobstructed. Any isolating valves should be in the locked open position.
12. All personnel in the immediate area should be made aware of the imminent unit start up.

## START-UP

1. If the pressure piping system has been exposed to air during shutdown a purge with either nitrogen or the process gas needs to be performed to sweep the air from the system. Purge gas can be brought in through the purge gas supply (if so equipped) or bled in under a controlled manner through the low pressure gas inlet connection, sweeping through all stages of compression and out through the final stage discharge, releasing to vent header through the blowdown valve.
2. After purge, the unit blowdown valve should be closed.
3. Process gas can be introduced via the purge gas or gas inlet in a slow controlled manner until an adequate system pressure for start-up is achieved.
4. Recycle valve (manual or automatic) should be in the open position to allow the skid to equalize and permit the unit to start under minimum differential.
5. All faults at the control panel should be clear and no shutdowns bypassed.
6. When ready and all clear, unit start can be sequence initiated.
7. Upon successful unit start the unit shall be run in a closed recycle loop under light load to warm up the equipment. The recycle can be throttled to control discharge pressure and the suction block or control valve can be throttled to control suction pressure.
8. After warm-up time/permissive has been cleared the recycle valve can be closed, suction valve opened (throttling as operating conditions dictate), discharge valve opened, hence moving gas through the compressor package, bringing it on line.
9. Operating parameters need to be monitored to ensure they are within the expected norms.
10. Process conditions (pressures, temperatures) should be compared to the predicted performance runs as provided in the manual to confirm proper operation. **If the unit is operating outside of the parameters provided within the performance guidelines the equipment should be shut down and a request made for revised compressor performance to be verified.**
11. A walk around of the unit, inside and out, is to be performed checking for any unusual noises or vibration concerns.
12. Unit shall be run under close supervision until it is at a consistent operating temperature. Unit can then be shutdown, depressurized and a hot alignment performed on rotating equipment.

For Technical Assistance  
Contact:

Optimized Oilfield Inc.  
Calgary, Alberta, Canada

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operations@optimizedoilfield.com



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operations@optimizedoilfield.com  
optimizedoilfield.com

## 30 HP Electric Blackmer HDS612



E30RB-112

**Compressor:** Blackmer HDS612C, 2-Stage Reciprocating

**Cylinders:** 6.00" x 3.25"

**Driver:** Teco-WH Optim, 30 HP @ 1800 RPM, 460/3/60, VFD compatible

**Service:** Sour Natural Gas

**Control Panel:** Shutdown

**Skid and Building:** Skidded, suitcase-style enclosure c/w thermal acoustic insulation, louvered vent, operator access panel

**Additional Components:** Electric HC liquids pump, electric heater, ESD, suction/interstage/discharge PSV's, finned tube aftercooler, skid edge JB

**Installation Requirements:** 460VAC

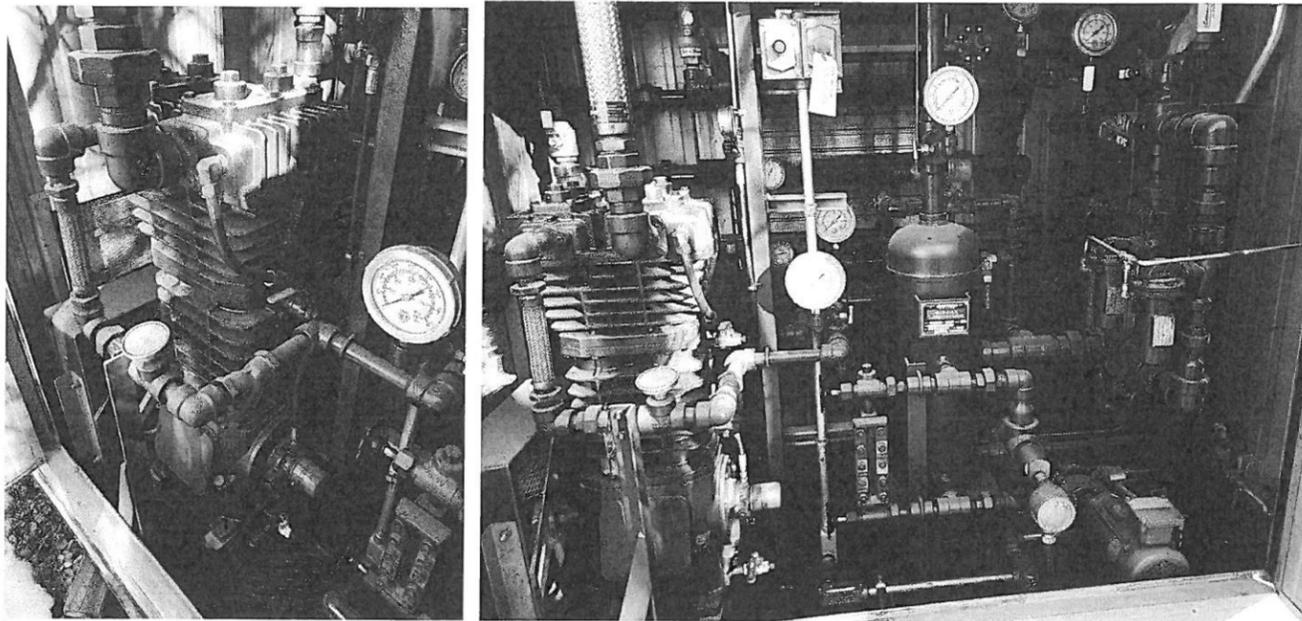


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# 30 HP Electric Blackmer HDS612

E30RB-112

Blackmer HDS612 Flow Table (e3m3/d)							
	Discharge (psig)						
Suction (psig)	75	100	150	200	250	300	350
0	1.5	1.5	1.5				
10			2.5	2.5	2.5		
20				3.6	3.5	3.5	3.5
30					4.6	4.6	4.5
40						5.7	5.6



**V-1000**  
**SUCTION SCRUBBER**  
 SIZE: 10.750" O.D. X 32" OAL  
 M.A.W.P.: 300 PSIG AT 650 °F  
 M.D.M.T.: -20 °F AT 300 PSIG  
 C.R.N.: OH09036.213  
 S.N.: 103.56

**KC-1100/1200**  
**COMPRESSOR CYLINDERS**  
 MFG: BLACKMER  
 MODEL: HDS612C  
 BORE & STROKE: 6.00" x 3.25" & 4.00"  
 M.A.W.P.: 400 PSIG  
 S/N: 860399  
 WEIGHT: 775 LBS

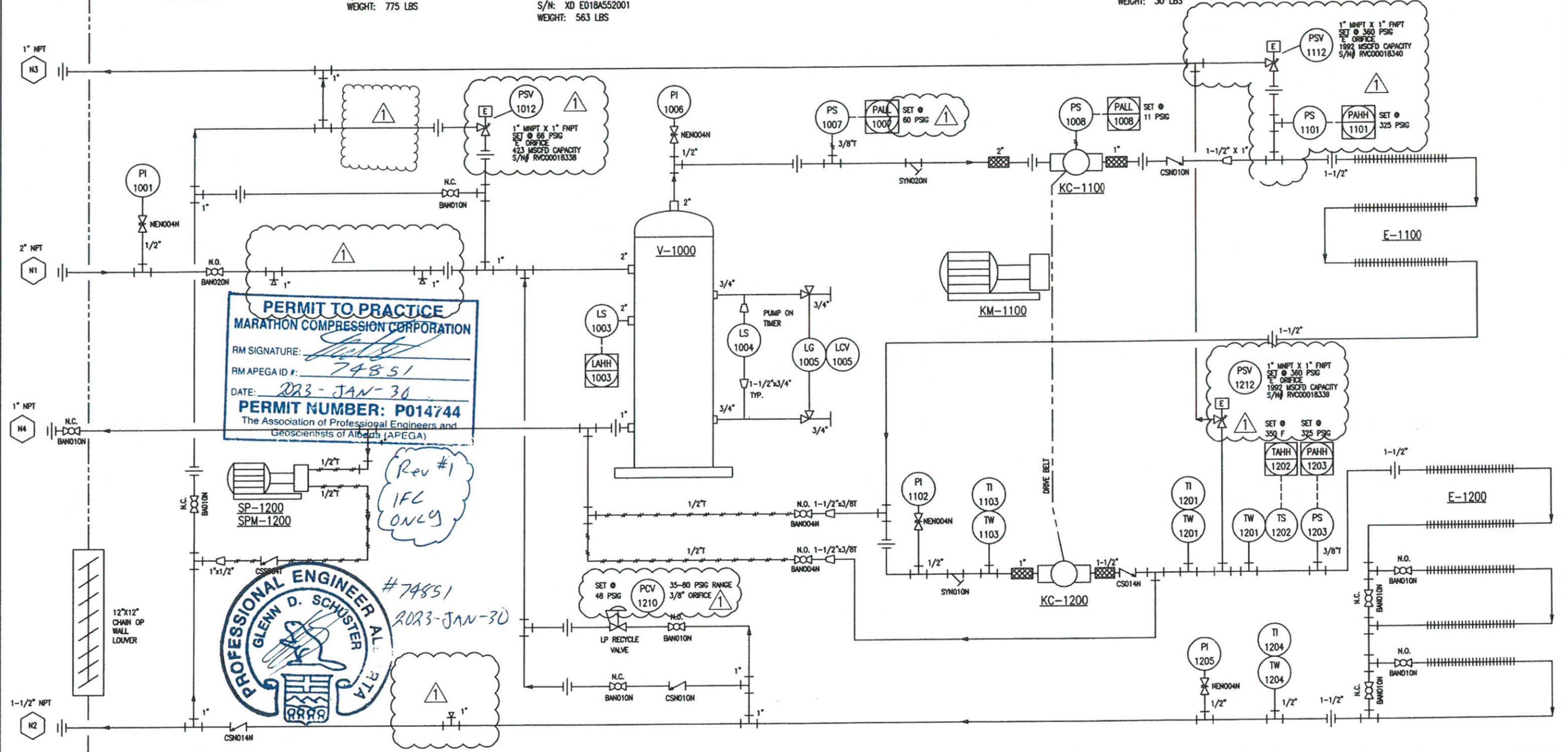
**KM-1100**  
**COMPRESSOR MOTOR**  
 MFG: TECO-WESTINGHOUSE  
 TYPE: AEHXU TEFC-XP  
 POWER REQ.: 230-460/1/60 VAC  
 OUTPUT: 30 HP AT 1775 RPM  
 DUTY: CONTINUOUS, 1.15 SF SW, 1.0 SF VFD  
 S/N: XD E018A552001  
 WEIGHT: 563 LBS

**E-1100/1200**  
**IC & AC FINNED COOLING TUBES**  
 MFG: TEX-FIN  
 SIZE: 1-1/2" NPT X 38 F/F  
 FINN: 7 FINS/IN, 2-3/4" O.D.

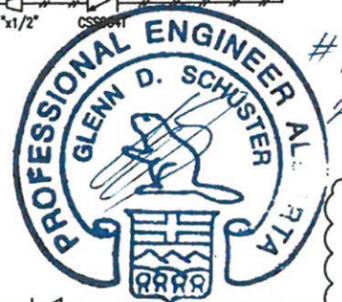
**SP-1200**  
**SCRUBBER PUMP**  
 MFG: HYDRACELL  
 MODEL: F20XASGHFECG  
 M.A.W.P.: 1000 PSIG AT 250 F  
 S/N: 380075  
 WEIGHT: 12 LBS

**SPM-1200**  
**SCRUBBER PUMP MOTOR**  
 MFG: BALDOR ELECTRIC CO  
 MODEL: CC50694  
 POWER REQ.: 115-230/1/60  
 OUTPUT: 1/3 HP AT 1725 RPM  
 S/N: TBD  
 WEIGHT: 30 LBS

**HX-5000**  
**BUILDING HEATER**  
 MFG: NORSEMAN  
 CAT: XB1-3075T2D11T  
 POWER REQ.: 115-230/1/60  
 OUTPUT: 750 W  
 S/N: NE073032228



**PERMIT TO PRACTICE**  
**MARATHON COMPRESSION CORPORATION**  
 RM SIGNATURE: *[Signature]*  
 RM APEGA ID #: 74851  
 DATE: 2023-JAN-30  
**PERMIT NUMBER: P014744**  
 The Association of Professional Engineers and Geoscientists of Alberta (APEGA)



Rev #1  
 IFC ONLY

CUSTOMER CONNECTIONS			
TAG	DESCRIPTION	SIZE	TYPE
N1	SUCTION	2"	NPT
N2	DISCHARGE	1-1/2"	NPT
N3	HIGH PRESSURE VENT HEADER	1"	NPT
N4	SCRUBBER DRAIN HEADER	1"	NPT
N5	-	-	-
N6	-	-	-
N7	-	-	-

REVISIONS			
NO.	BY	DATE	DESCRIPTION
1	NB	27-JAN-23	IFC: INTERSTAGE PRESSURE SWITCH & PSV
0	BB	14-MAR-18	AS-BUILT FOR CUSTOMER
A	ABW	31-AUG-15	FOR CONSTRUCTION

OPTIMIZED OILFIELD INC.			
NO.	DATE	DESCRIPTION	REVISION
1	12-AUG-15	30 HP ELECTRIC BLACKMER 612 PROCESS & INSTRUMENTATION DIAGRAM	1

Customer IRONLINE COMPRESSION	DWG. NO. E30RB-112-PID-UID	SHT. 1 OF 1	REV 1
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**V-1000**  
**SUCTION SCRUBBER**  
 SIZE: 10.750" O.D. X 32" OAL  
 M.A.W.P.: 300 PSIG AT 650 °F  
 M.D.M.T.: -20 °F AT 300 PSIG  
 C.R.N.: OH09036.213  
 S.N.: 103.56

**KC-1100/1200**  
**COMPRESSOR CYLINDERS**  
 MFG: BLACKMER  
 MODEL: HDS612C  
 BORE & STROKE: 6.00" x 3.25" & 4.00"  
 M.A.W.P.: 400 PSIG  
 S/N: 860399  
 WEIGHT: 775 LBS

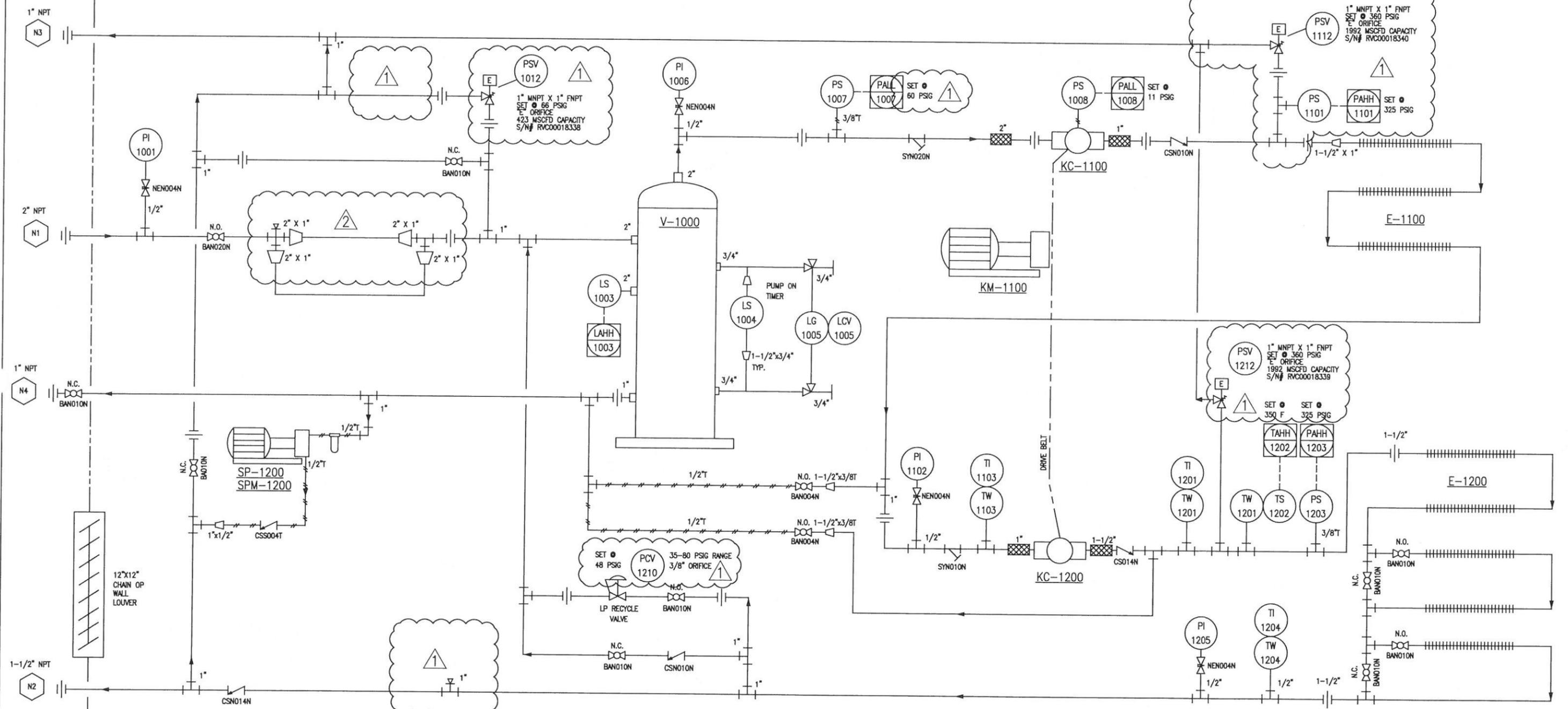
**KM-1100**  
**COMPRESSOR MOTOR**  
 MFG: TECO-WESTINGHOUSE  
 TYPE: AEHXU TEFC-XP  
 POWER REQ.: 230-460/1/60 VAC  
 OUTPUT: 30 HP AT 1775 RPM  
 DUTY: CONTINUOUS, 1.15 SF SW, 1.0 SF VFD  
 S/N: XD E018A552001  
 WEIGHT: 563 LBS

**E-1100/1200**  
**IC & AC FINNED COOLING TUBES**  
 MFG: TEX-FIN  
 SIZE: 1-1/2" NPT X 38 F/F  
 FINS: 7 FINS/IN, 2-3/4" O.D.

**SP-1200**  
**SCRUBBER PUMP**  
 MFG: HYDRACELL  
 MODEL: F20XASGHFECG  
 M.A.W.P.: 1000 PSIG AT 250 F  
 S/N: 380075  
 WEIGHT: 12 LBS

**SPM-1200**  
**SCRUBBER PUMP MOTOR**  
 MFG: BALDOR ELECTRIC CO  
 MODEL: CC50694  
 POWER REQ.: 115-230/1/60  
 OUTPUT: 1/3 HP AT 1725 RPM  
 S/N: TBD  
 WEIGHT: 30 LBS

**HX-5000**  
**BUILDING HEATER**  
 MFG: NORSEMAN  
 CAT: XB1-3075T2D11T  
 POWER REQ.: 115-230/1/60  
 OUTPUT: 750 W  
 S/N: NE073032228



CUSTOMER CONNECTIONS			
TAG	DESCRIPTION	SIZE	TYPE
N1	SUCTION	2"	NPT
N2	DISCHARGE	1-1/2"	NPT
N3	HIGH PRESSURE VENT HEADER	1"	NPT
N4	SCRUBBER DRAIN HEADER	1"	NPT
N5	-	-	-
N6	-	-	-
N7	-	-	-

REVISIONS			
NO.	BY	DATE	DESCRIPTION
2	NB	31-JAN-23	AS BUILT
1	NB	27-JAN-23	IFC: INTERSTAGE PRESSURE SWITCH & PSV
0	BB	14-MAR-18	AS-BUILT FOR CUSTOMER
A	ABW	31-AUG-15	FOR CONSTRUCTION

DRAWN A.WILSON		30 HP ELECTRIC BLACKMER 612 PROCESS & INSTRUMENTATION DIAGRAM		
CHK'D -	APP'D -	DWG. NO. E30RB-112-PID-UID	SHT. 1 OF 1	REV 2

**BILL OF MATERIALS**

Assembly List  
Client  
IronLine

Unit Number  
E30RB-112

Project Description  
Sour 30 HP VFD Blackmer 612  
Project Reference  
22087

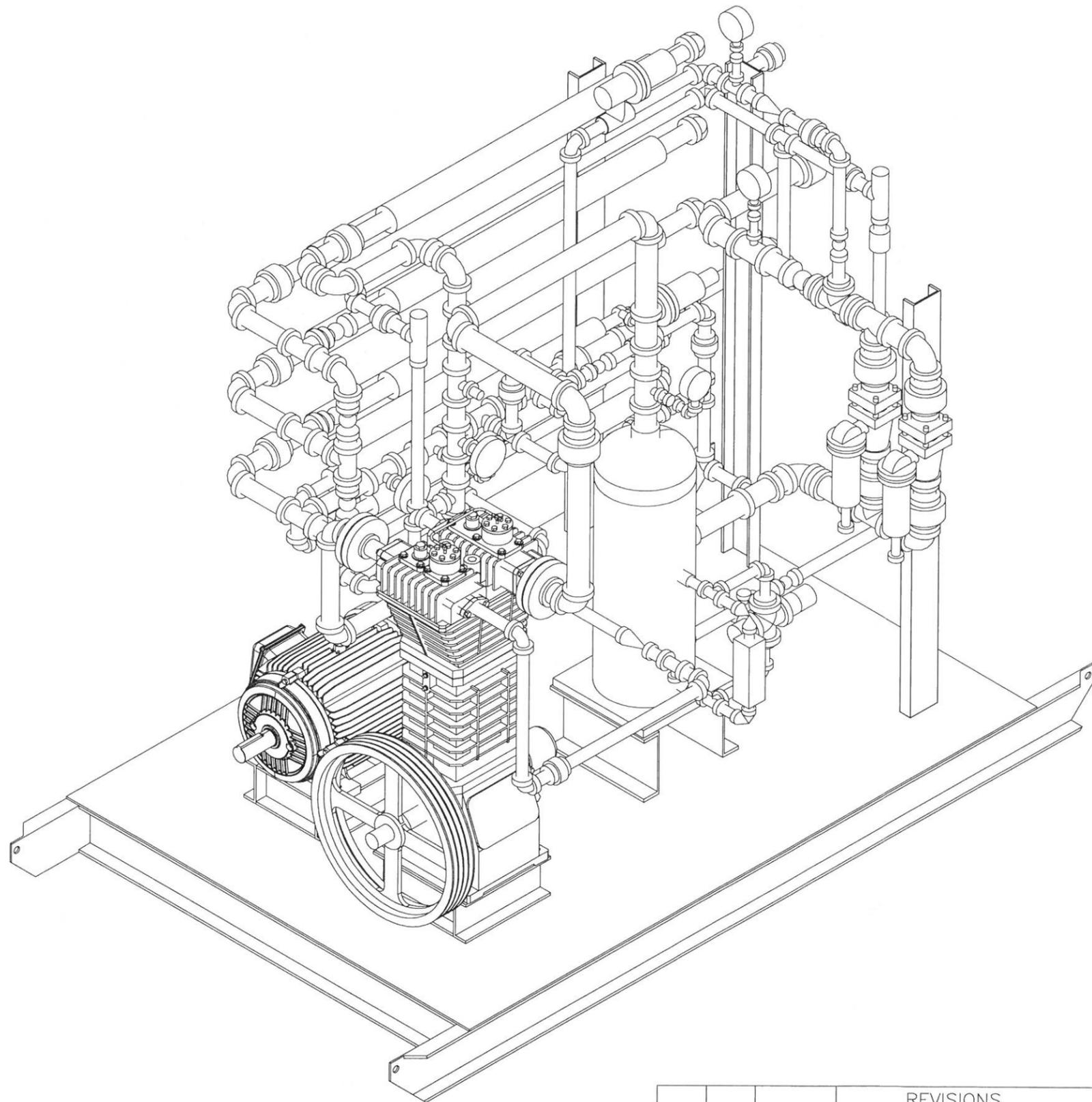
Date Issued  
February 1, 2023  
Issued For  
As Built

Rev. (All)

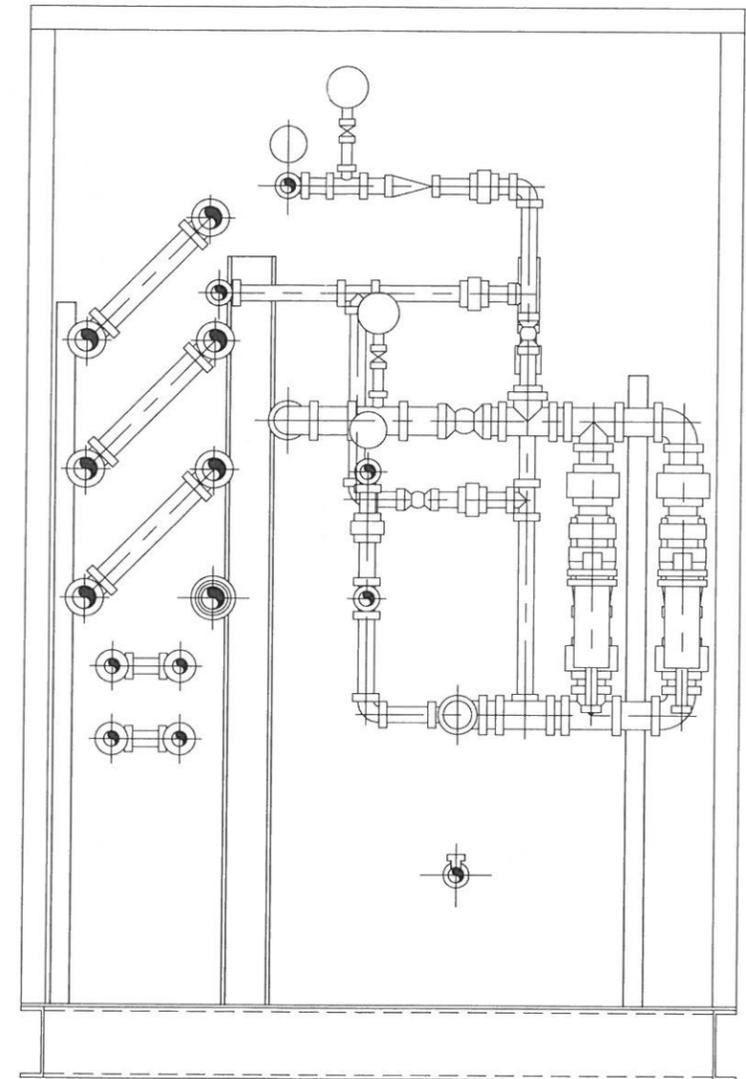
Tag	BOM	Item Group	Make	Description	Part Number	Quantity
E	1100/1200	Cooling Tubes	TEX-FIN	Finned Cooling Tubes 1-1/2" steel pipe with circular fin radiator, 38" long, 7 fins per inch, 2-3/4" fin Dia.	NPN	8
H	5000	Building Heater	Norseman	Electric Building Heater 120V 1 phase 750W 50/60 Hz Temp code T2D S/N: NEO73032228	XB1-3075T2D11T	1
K	1100/1200	Compressor	Blackmer	Blackmer HD612C Compressor, 2 Stage Bore: 6.00" x 3.25" Stroke: 4.00" Service: Sour <5% MAWP: 400 PSIG SN: 860399	HDS612C	1
KM	1100	Compressor Motor	Teco Westinghouse	Electric Compressor Motor TecoWH Optim Prime 30 HP @ 1775 rpm, 460/3/60 Type: AEHHXU TEFC HE Continuous Duty, 1.15 SF SW, 1.0 SF VFD Flywheel: 8" Weight: 563 LBS SN: XD E018A522001	AEHHXU	1
LG/LCV	1005	Level Gauge Valve, Set	Quest-Tec	Level Gauge & Valve 1950 PSI 600 F 2630 PSI 100 F MFG IN ACCORDANCE WITH NACE MR-01-75 FOR USE IN SOUR SERVICE Globe shutoffs to tank	TBD	1
LS	1003	Level Switch	LINC	High Level Shutdown Switch, 2" NPT, Standard operation, 316 SS body, 0.50 SG 316 SS float, 1/2" conduit conn., (1) SPDT switch, c/w 1" float ext., 303 SS, 12-24 UNC threads. Rating: 1500 psig, -40 to 400 F, 3 Amp at 100 VAC, 100W DC CSA/US C1, D1, Gr. B, C, D, NACE MR0175, ANSI Single Seal. Certified div 1 SN: TBD	L-471-11	1
	1004	Level Switch	LINC	Pump-On Level Switch, 2" NPT, Standard operation, 316 SS body, 0.50 SG 316 SS float, 1/2" conduit conn., (1) SPDT switch, c/w 1" float ext., 303 SS, 12-24 UNC threads. Rating: 1500 psig, -40 to 400 F, 3 Amp at 100 VAC, 100W DC CSA/US C1, D1, Gr. B, C, D, NACE MR0175, ANSI Single Seal. Certified div 1 SN: 3456778-1	L-471-11	1
PCV	1210	Pressure Control Valve	BelGas	Recycle Valve Model P627 Control Valve, 1" port 35-80 PSI range, 3/8" orifice SS Trim	P627080200N4012	1

Tag	BOM	Item Group	Make	Description	Part Number	Quantity
PI	1001	Pressure Indicator	CPW	Suction Pressure Indicator CPW, 4" face, 0-600 psig, bottom mounted	(blank)	1
	1006	Pressure Indicator	CPW	Suction Pressure Indicator CPW, 4" face, 0-300 psig, bottom mounted	(blank)	1
	1102	Pressure Indicator	CPW	Interstage Pressure Indicator CPW, 4" face, 0-600 psig, bottom mounted	(blank)	1
	1205	Pressure Indicator	CPW	Interstage Pressure Indicator CPW, 4" face, 0-600 psig, bottom mounted	(blank)	1
PS	1007	Pressure Switch	CCS	Suction Pressure Switch 1/2" process connection, stainless steel and viton wetted parts, 9-75 psi rising, 3-69 psi falling, 6 psi deadband. Rating: 500 psi MAWP, 750 psi proof, NACE, CSA/EUL in C1, D2 area in a non-incendive circuit.	6900GZE14	1
	1008	Pressure Switch	CCS	SET @ 60 PSIG INCREASING Compressor Oil Low Pressure Switch 1/2" process connection, stainless steel and viton wetted parts, 3-20 psi rising, 1-18 psi falling, 2 psi deadband. Rating: 500 psi MAWP, 750 psi proof, NACE, CSA/EUL in C1, D2 area in a non-incendive circuit.	6900GZE12	1
	1101	Pressure Switch	CCS	SET @ 11 PSIG DECREASING Interstage High Pressure Switch 1/2" process connection, stainless steel and viton wetted parts, 300-1000 psi rising, 225-925 psi falling, 75 psi deadband. Rating: 2000 psi MAWP, 3000 psi proof, NACE, CSA/EUL in C1, D2 area in a non-incendive circuit.	6900GZE20	1
	1203	Pressure Switch	CCS	SET @ 325 PSIG INCREASING Discharge High Pressure Switch 1/2" process connection, stainless steel and viton wetted parts, 300-1000 psi rising, 225-925 psi falling, 75 psi deadband. Rating: 2000 psi MAWP, 3000 psi proof, NACE, CSA/EUL in C1, D2 area in a non-incendive circuit.	6900GZE20	1
PSV	1012	Pressure Safety Valve	Mercer	SET @ 325 PSIG INCREASING SUCTION PSV SET @ 66 PSIG Series 8500 Set @ 66 PSI / 60 F Capacity 294 SCFM (423 MSCFD) 1" MNPT x 1" FNPT, "E" orifice, PTFE SEAT FKM/BUANA SEALS SOUR GAS SERVICE CRN: 0G8841.SCLADD3 SN: RVC00018338	85-17151V07N11	1
	1112	Pressure Safety Valve	Mercer	INTERSTAGE PSV SET @ 360 PSIG Series 8500 Set @ 360 PSI / 280 F Capacity 1384 SCFM (1992 MSCFD) 1" MNPT x 1" FNPT, "E" orifice, PTFE SEAT FKM/BUANA SEALS SOUR GAS SERVICE CRN: 0G8841.SCLADD3 SN: RVC00018340	85-17151T11N11	1

Tag	BOM	Item Group	Make	Description	Part Number	Quantity
PSV	1212	Pressure Safety Valve	Mercer	DISCHARGE PSV SET @ 360 PSIG Series 8500 Set @ 360 PSI / 280 F Capacity 1384 SCFM (1992 MSCFD) 1" MNPT x 1" FNPT, "E" orifice, PTFE SEAT FKM/BUNA SEALS SOUR GAS SERVICE CRN: 068841.SCLADD3 SN: RVC00018339	85-17151T11N11	1
SP	1200	Scrubber Pump	Hydra-Cell	Electric Scrubber Pump F20: Close-coupled to NEMA 56C footed motor (NPT Ports) X: Max 1.01 GPM @ 1750RPM A: NPT Ports S: 316L SS pump head G: FKM O-ring and diaphragm H: 17-4 SS valve seat F: 17-4 SS valves E: Elgiloy valve springs C: Celcon valve spring retainers G: 5W30 cold-temp severe duty synthetic oil MAWP 1000 psig at 250F, max inlet pressure 250 psig SN: TBD	F20XASGHHFEGG	1
SPM	1200	Scrubber Pump Motor	Baldor	Electric Scrubber Pump Motor 1/3 HP @ 1725 RPM, 115-230/3/60 Cat: CL5001A Weight: 30 LBS SN: TBD	CC90694	1
TI/TW	1103	Temperature Indicator & Thermowell	Trend	Interstage Temperature Indicator Trend, 2.5" face, 0-500 F, back mounted Thermowell TBD	(blank)	1
	1201	Temperature Indicator & Thermowell	Trend	Discharge Temperature Indicator Trend, 2.5" face, 0-500 F, back mounted Thermowell TBD	(blank)	1
	1204	Temperature Indicator & Thermowell	Trend	Aftercooler Temperature Indicator Trend, 2.5" face, 0-250 F, back mounted Thermowell TBD	(blank)	1
TS/TW	1202	Temperature Switch & Thermowell CCS		Discharge High Temperature Switch 1/2" process connection, stainless steel and viton wetted parts, 280-405 F rising, 260-398 F falling. Rating: 500 F MAWP, 1500 psi proof, NACE, CSA/EUL in C1, D2 area in a non-incendive circuit. SET @ 350 F INCREASING	6900TUE18	1

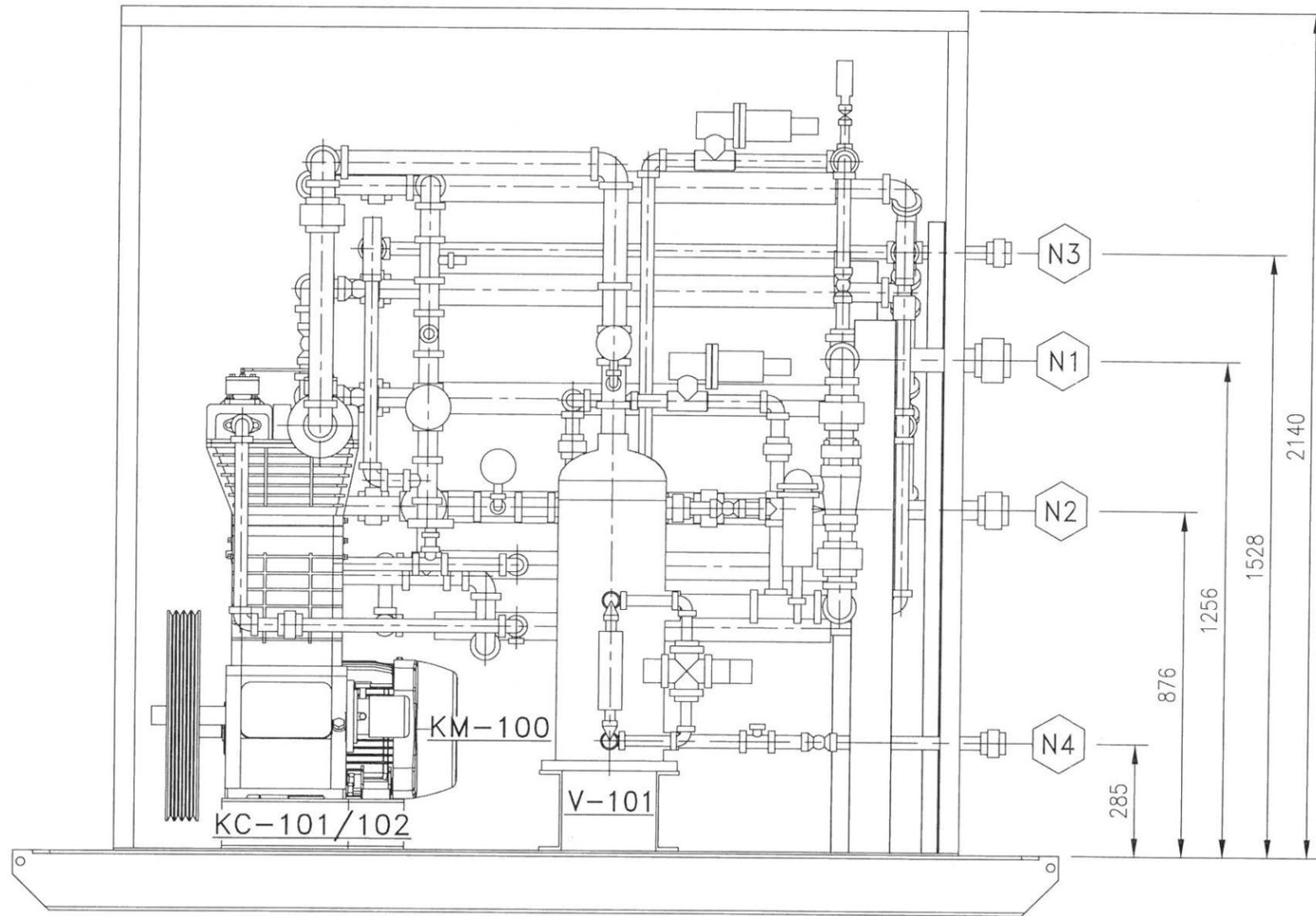


**SW ISOMETRIC**  
SCALE N.T.S.

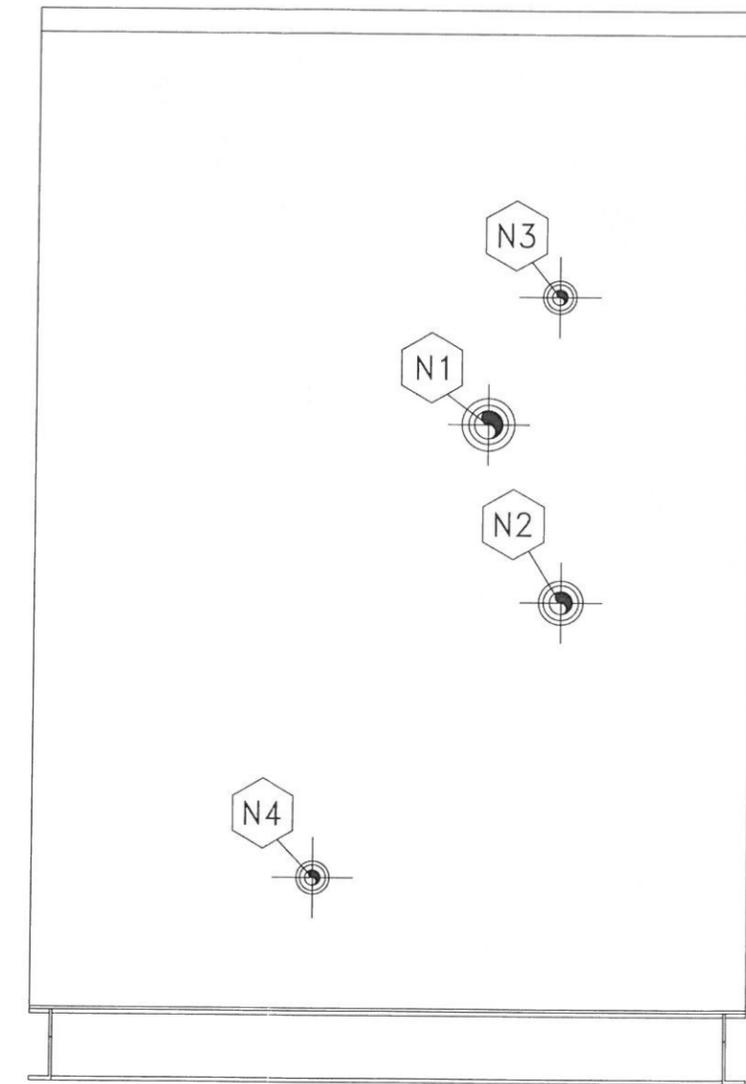


**B** SECTION  
GA-01 SCALE 1:16

REVISIONS				OPTIMIZED OILFIELD (OOI) INC.					
NO.	BY	DATE	DESCRIPTION	DRAWN	A.WILSON	30 H.P. COMPRESSOR PACKAGE PIPING G.A.			
				DATE	AUG 20/15				
				SCALE	AS SHOWN				
				CHK'D	G.SCHUSTER			Customer	
A	ABW	AUG 31/15	REFERENCE FOR UNITS BUILT PRIOR TO SEPT. 1, 2015	APP'D	.	T.B.A.	DWG NO. KLR30-99-GA-03	REV. A	



**ELEVATION**  
SCALE 1:16



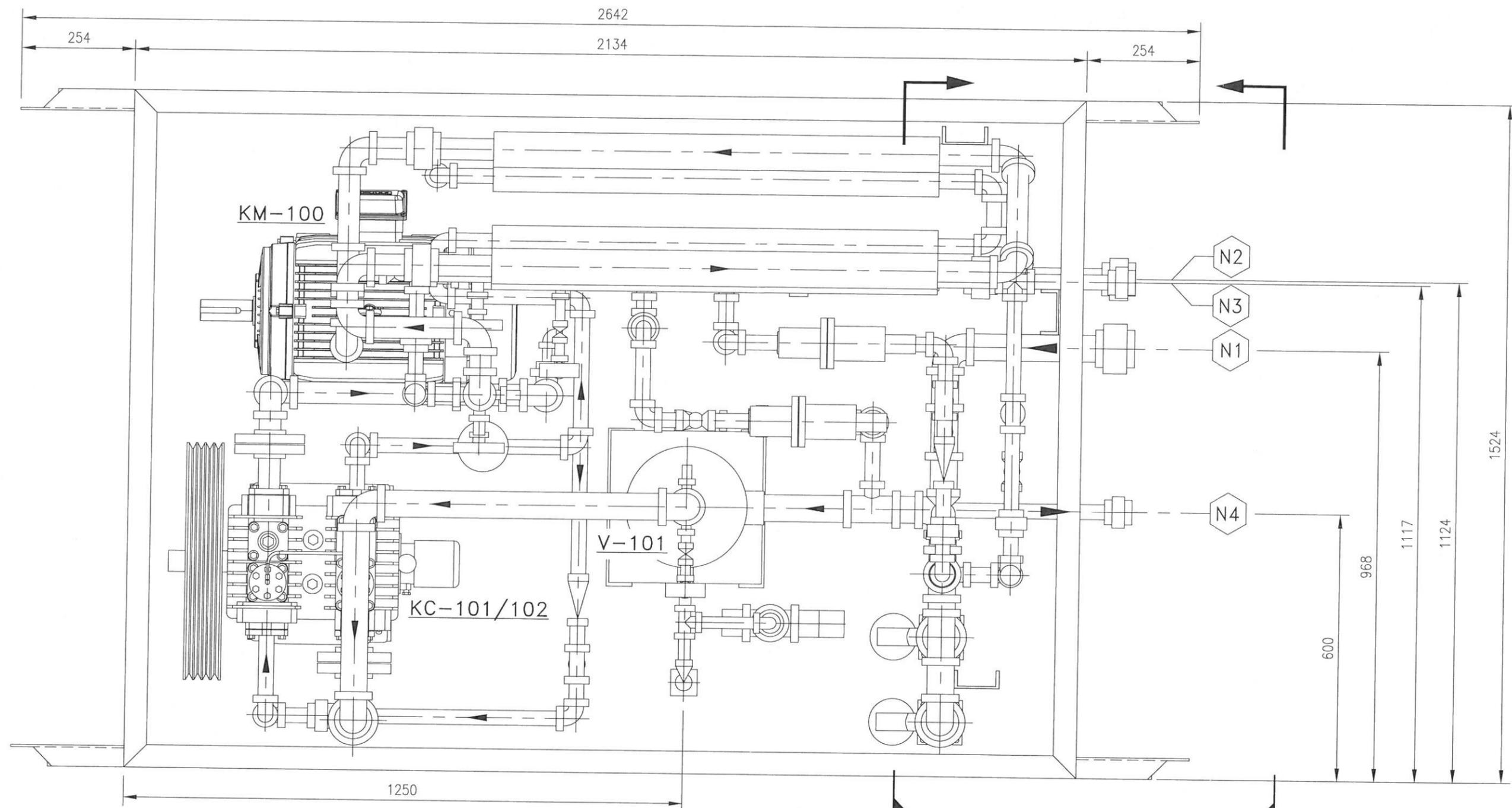
**A SECTION**  
GA-01 SCALE 1:16

CUSTOMER CONNECTIONS							REVISIONS	
TAG	DESCRIPTION	SIZE	TYPE	NO.	BY	DATE	DESCRIPTION	
N1	SUCTION	2"	NPT					
N2	DISCHARGE	1-1/2"	NPT					
N3	HIGH PRESSURE VENT HEADER	1"	NPT					
N4	SCRUBBER DRAIN HEADER	1"	NPT					
N5	-	-	-					
N6	-	-	-	A	ABW	AUG 31/15	REFERENCE FOR UNITS BUILT PRIOR TO SEPT. 1, 2015	

OPTIMIZED OILFIELD (OOI) INC.

DRAWN	A.WILSON
DATE	AUG 20/15
SCALE	1:16
CHK'D	G.SCHUSTER
APP'D	

30 H.P. COMPRESSOR PACKAGE PIPING G.A.		DWG NO.	REV.
		KLR30-99-GA-02	A
Customer	T.B.A.		



**PLAN**  
SCALE 1:10

CUSTOMER CONNECTIONS							REVISIONS	
TAG	DESCRIPTION	SIZE	TYPE	NO.	BY	DATE	DESCRIPTION	
N1	SUCTION	2"	NPT					
N2	DISCHARGE	1-1/2"	NPT					
N3	HIGH PRESSURE VENT HEADER	1"	NPT					
N4	SCRUBBER DRAIN HEADER	1"	NPT					
N5	-	-	-					
N6	-	-	-	A	ABW	AUG 31/15	REFERENCE FOR UNITS BUILT PRIOR TO SEPT. 1, 2015	

OPTIMIZED OILFIELD (OOI) INC.			
DRAWN	A.WILSON	30 H.P. COMPRESSOR PACKAGE PIPING G.A.	
DATE	AUG 20/15		
SCALE	1:10		
CHK'D	G.SCHUSTER	Customer	T.B.A.
APP'D			
		DWG NO.	REV.
		KLR30-99-GA-01	A