

## Heat Transfer Calculation By:

**ENERTECH**

17321 - 106 Ave  
Edmonton, Alberta  
T5S 1E7  
p (780) 483-0141  
f (780) 489-4302

Rev: 5 - Revised System Description  
Date: 2013-03-14

For: **Cenovus Osprey CSS Pilot Project**  
c/o Genivar  
Multiphase Pump Building  
**ELECTRICAL ROOM**  
HVAC System Design

**Design Conditions:** Latitude 55 Time 4 00 PM

**Indoor:**

Summer temperature 75 F ( 24 C)  
Winter temperature 64 F ( 18 C)  
Hum Ratio ΔW 0.00253

**U-Values (1/R):**

Floor R 30 = 1 / 30 = 0.033  
Walls R 12 = 1 / 12 = 0.083  
Roof R 24 = 1 / 24 = 0.042  
Windows R 2 = 1 / 2 = 0.500  
Doors R 7 = 1 / 7 = 0.143

**Outdoor**

Summer temperature dB 82 F ( 28 C)  
WB 64 F ( 18 C)  
Winter temperature -40 F ( -40 C)  
Summer grains of moisture 82 gr/lb  
Daily temperature range 20 F ( 11 C)

**Room Volume:**

measured from drawings 2,279 ft³ ( 64 534 m³)

**Building Components:**

	Area, Length CFM or BTUH	Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Floor	157 sqft	33	0	33	544
N Wall	170 sqft	68	0	68	1,473
S Wall	209 sqft	318	0	318	1,811
W Wall	174 sqft	120	0	120	1,508
Window Area	4 sqft	334	0	334	208
2 Man Doors	17 sqft	41	0	41	253
Partition Wall (R12)	174 sqft	327	0	327	0
Roof	162 sqft	551	0	551	702
People	2 ppl	500	400	900	-
Ventilation	160 CFM	1,232	1,959	3,191	18,354
Winter Infiltr (2ACH)	76 CFM	-	-	-	8,714
Given Heat Gain	7.50 kW	25,589	0	25,589	-
Lighting (1W/sqft)	157 W	536	0	536	-
		<b>29,648</b>	<b>2,359</b>	<b>32,007</b>	<b>33,568</b>

**Summary:****Heat Loss:**

Ventilation Loss 18,354 BTUH ( 5.4 kW)  
Building Loss 15,214 BTUH ( 4.5 kW)  
**Total Heat Loss 33,568 BTUH ( 9.8 kW)**

**Heat Gain:**

Given Heat Gain 25,589 BTUH ( 7.5 kW)  
Building Gain (+10%) 7,061 BTUH ( 2.1 kW)  
**Total Heat Gain 32,649 BTUH ( 9.6 kW)**

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Date: 2013-03-14

For: **Cenovus Osprey CSS Pilot Project**  
c/o Genivar  
Multiphase Pump Building  
**ELECTRICAL ROOM**  
HVAC System Design

**System Description:**

The HVAC equipment required for this system is one 732L/s [1550CFM] 4ton cooling / 9kW heating wall mounted unit with minimum 75L/s [160CFM] outdoor air. Wall mounted unit has 2" pleated filter and remote mounted heat/cool thermostat. All equipment shall be rated for use in a general purpose area. Refer to EL Room supplementary calc for emergency summer cooling supply fan sizing.

**Summer (cooling):**

During the cooling season, the HVAC unit shall maintain the cooling set point of 24C [75F] during peak loading.

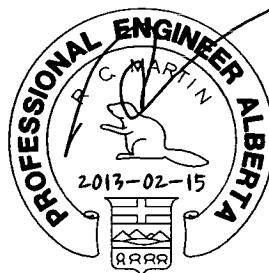
**Winter (heating):**


During the heating season, the HVAC unit shall maintain the room at 13C [55F] during peak loading.

**Notes.**

- 1 HVAC system is based on the information and the project specs which were available at the time of design.
- 2 No winter infiltration allowed for due to room pressure. Building assumed to be constructed to an average tightness rating.
- 3 Heating requirements are based on building losses with no internal equipment heat gains present.
- 4 Room volume is measured from the architectural drawings provided and represents the volume when the room is empty.
- 5 Heat gains given by Bommernann Inc.

Calculation reviewed by



PERMIT TO PRACTICE	
Signature	
Date	2013-02-15
PERMIT NUMBER P 2487	
The Association of Professional Engineers, Geologists and Geophysicists of Alberta	

## Heat Transfer Calculation By:

**ENERTECH**

17321 - 106 Ave  
Edmonton, Alberta  
T5S 1E7  
p (780) 483-0141  
f (780) 489-4302

Rev: 2 - Issued for Construction  
Date: 2013-02-15

For: Cenovus Osprey CSS Pilot Project  
c/o Genivar  
Multiphase Pump Building  
ELECTRICAL ROOM - Supply Fan Sizing  
HVAC System Design

Design Conditions: Latitude 55 Time 4 00 PM

**Indoor:**

Summer temperature 95 F ( 35 C)  
Winter temperature 64 F ( 18 C)  
Hum Ratio ΔW 0 00253

**U-Values (1/R):**

Floor R 30 = 1 / 30 = 0 033  
Walls R 12 = 1 / 12 = 0 083  
Roof R 24 = 1 / 24 = 0 042  
Windows R 2 = 1 / 2 = 0 500  
Doors R 7 = 1 / 7 = 0 143

**Outdoor:**

Summer temperature dB 82 F ( 28 C)  
WB 64 F ( 18 C)  
Winter temperature -40 F ( -40 C)  
Summer grains of moisture 82 gr/lb  
Daily temperature range 20 F ( 11 C)

**Room Volume:**

measured from drawings 2,279 ft<sup>3</sup> ( 64 534 m<sup>3</sup>)

**Building Components:**

	Area, Length CFM or BTUH	Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Floor	157 sqft	61	0	61	-
N Wall	170 sqft	0	0	0	-
S Wall	209 sqft	0	0	0	-
W Wall	174 sqft	0	0	0	-
Window Area	4 sqft	305	0	305	-
2 Man Doors	17 sqft	0	0	0	-
Partition Wall (R12)	174 sqft	0	0	0	-
Roof	162 sqft	389	0	389	-
People	2 ppl	500	400	900	-
Ventilation	0 CFM	-	-	-	0
Winter Infill (2ACH)	76 CFM	-	-	-	-
Given Heat Gain	7 50 kW	25,589	0	25,589	-
Lighting (1W/sqft)	157 W	536	0	536	-
		27,379	400	27,779	0

**Summary:****Heat Loss:**

Ventilation Loss 0 BTUH ( 0 0 kW)  
Building Loss 0 BTUH ( 0 0 kW)  
Total Heat Loss 0 BTUH ( 0 0 kW)

**Heat Gain:**

Given Heat Gain 25,589 BTUH ( 7 5 kW)  
Building Gain (+10%) 2,410 BTUH ( 0 7 kW)  
Total Heat Gain 27,998 BTUH ( 8.2 kW)

In case of HVAC unit failure, install one 1,086L/s [2,300CFM] supply fan for emergency summer cooling of the electrical room. Install one 508x508 [20x20] outlet louver with weatherhood. Fan shall start only when HVAC unit fails and the room temperature is above 76F [24C].

Heat Transfer Calculation By:

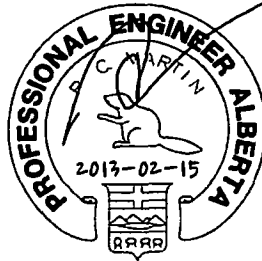
**ENERTECH**

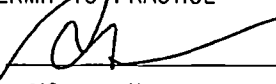
17321 - 106 Ave  
Edmonton, Alberta  
T5S 1E7  
p (780) 483-0141  
f (780) 489-4302

Rev: 2 - Issued for Construction  
Date: 2013-02-15

For: Cenovus Osprey CSS Pilot Project  
c/o Genivar  
Multiphase Pump Building  
**ELECTRICAL ROOM - Supply Fan Sizing**  
HVAC System Design

Calculation reviewed by



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Signature	
Date	2013-02-15
PERMIT NUMBER P 2487	
The Association of Professional Engineers, Geologists and Geophysicists of Alberta	

## Heat Transfer Calculation By:

**ENERTECH**

17321 - 106 Ave  
Edmonton, Alberta  
T5S 1E7  
p (780) 483-0141  
f (780) 489-4302

Rev: 4 - Issued for Construction  
Date: 2013-02-15

For: Cenovus Osprey CSS Pilot Project  
c/o Genivar  
Multiphase Pump Building  
PUMP ROOM  
HVAC System Design

Design Conditions: Latitude 55 Time 4:00 PM

**Indoor:**

Summer temperature 95 F ( 35 C)  
Winter temperature 64 F ( 18 C)  
Hum. Ratio ΔW n/a

**Outdoor:**

Summer temperature dB 82 F ( 28 C)  
WB 64 F ( 18 C)  
Winter temperature -40 F ( -40 C)  
Summer grains of moisture 82 gr/lb  
Daily temperature range 20 F ( 11 C)

**U-Values (1/R):**

Floor R 30 = 1 / 30 = 0.033  
Walls R 12 = 1 / 12 = 0.083  
Roof R 24 = 1 / 24 = 0.042  
Windows R 2 = 1 / 2 = 0.500  
Doors R 7 = 1 / 7 = 0.143

**Room Volume:**

measured from drawings 3,776 ft<sup>3</sup> ( 106.92 m<sup>3</sup>)

**Building Components:**

	Area, Length CFM or BTUH	Sensible Gain (BTUH)	Latent Gain (BTUH)	Total Heat Gain (BTUH)	Total Heat Loss (BTUH)
Floor	264 sqft	103	0	103	915
N Wall	240 sqft	0	0	0	2,080
Window Area	8 sqft	173	0	173	416
2 Man Doors	34 sqft	0	0	0	505
E Wall	174 sqft	84	0	84	1,508
S Wall	347 sqft	0	0	0	3,007
Partition Wall	174 sqft	0	0	0	557
Roof	268 sqft	643	0	643	1,161
People	2 ppl	500	400	900	-
Ventilation	0 CFM	0	0	0	0
Winter Infiltr (2ACH)	126 CFM	-	-	-	14,438
Given Eq Ht Gain	7.50 kW	25,589	0	25,589	-
Lighting (1W/sqft)	264 W	901	0	901	-
		27,992	400	28,392	24,588

**Summary:****Heat Loss:**

Ventilation Loss 0 BTUH ( 0.0 kW)  
Building Loss 24,588 BTUH ( 7.2 kW)  
Total Heat Loss 24,588 BTUH ( 7.2 kW)

**Heat Gain:**

Given Heat Gain 25,589 BTUH ( 7.5 kW)  
Building Gain (+10%) 3,084 BTUH ( 0.9 kW)  
Total Heat Gain 28,673 BTUH ( 8.4 kW)

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Rev: 4 - Issued for Construction  
Date: 2013-02-15

For: **Cenovus Osprey CSS Pilot Project**  
c/o Genivar  
Multiphase Pump Building  
**PUMP ROOM**  
HVAC System Design

**System Description:**

The heating and ventilation equipment required for this system is: one 1,086L/s [2,300CFM] exhaust fan for summer cooling and emergency operation with thermostat (gas detection by others). One 635x813 [25x32] inlet louvre with barometric damper and filters. One 10kW electric unit heater with built-in thermostat. All equipment shall be rated for use in a Class 1, Div 2 area with 575/3/60 and 120VAC power supplied.

**Summer (cooling):**

During the cooling season, the exhaust fan energizes upon reaching its thermostat's set point initially set at 24C [75F]. Outdoor air is drawn in through the filtered inlet louvre/damper. Fan is sized to maintain the indoor room temp below 35C [95F].

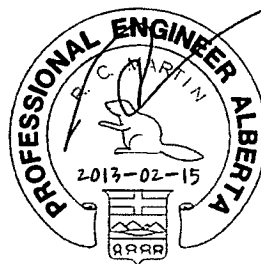
**Winter (heating):**

During the heating season, the unit heater shall energize upon reaching its thermostat's set point initially set at 18C [64F]. The unit heater is sized to cover the losses through the building envelope and maintain the room temperature during peak loading. Normally the exhaust fan does not operate but should a gas detection signal arise calling for the exhaust fan to energize, the unit heater will operate as required to keep the room at set point. Note that the unit heater is not sized to maintain the room temp set point during a gas detection signal at peak loading.

**Notes:**

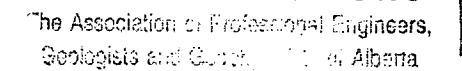
1. HVAC system is based on the information and the project specs which were available at the time of design.
2. Winter infiltration is estimated based on 2ACH. Building assumed to be constructed to an average tightness rating.
3. Heating requirements are based on building losses with no internal equipment heat gains present.
4. Room volume is measured from the architectural drawings provided and represents the volume when the room is empty.

Calculation reviewed by :



PERMIT TO PRACTICE	
Signature	
Date	2013-02-15
PERMIT NUMBER: P 2487	
The Association of Professional Engineers, Geologists and Geophysicists of Alberta	

EF-401  
BUILDING EXHAUST FANS  
model: 194 PF-S  
19", 3/4HP, 575V, 3 phases, 60 Hz.  
motor frame 56, 1750 rpm  
c/w Filters, Bird screen and hood.  
enclosure TEFC  
S/N #:






PROFESSIONAL ENGINEER  
SCOTT PATTINSON  
STATE OF ARIZONA  
Scott Pattinson  
MAR 21, 2013

PROJECT: MULTIPHASE PUMP PACKAGE- CENOVUS - OSPREY CSS PILOT			
CUSTOMER: CENOVUS c/o GENIVAR			
DATE: 2013-03-12	DRAWN BY: MC	CHECKED BY: JT	APPROVED BY: LM
SCALE: N.T.S	DRAWING NO: QT01140-I-GIO-B-DW-001		REV.: 4

BORNEMANN INC.

OSPREY CENOVUS PILOT PROJECT , ALBERTA , CANADA - MULTIPHASE PUMP - Package Line List

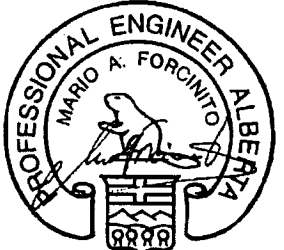
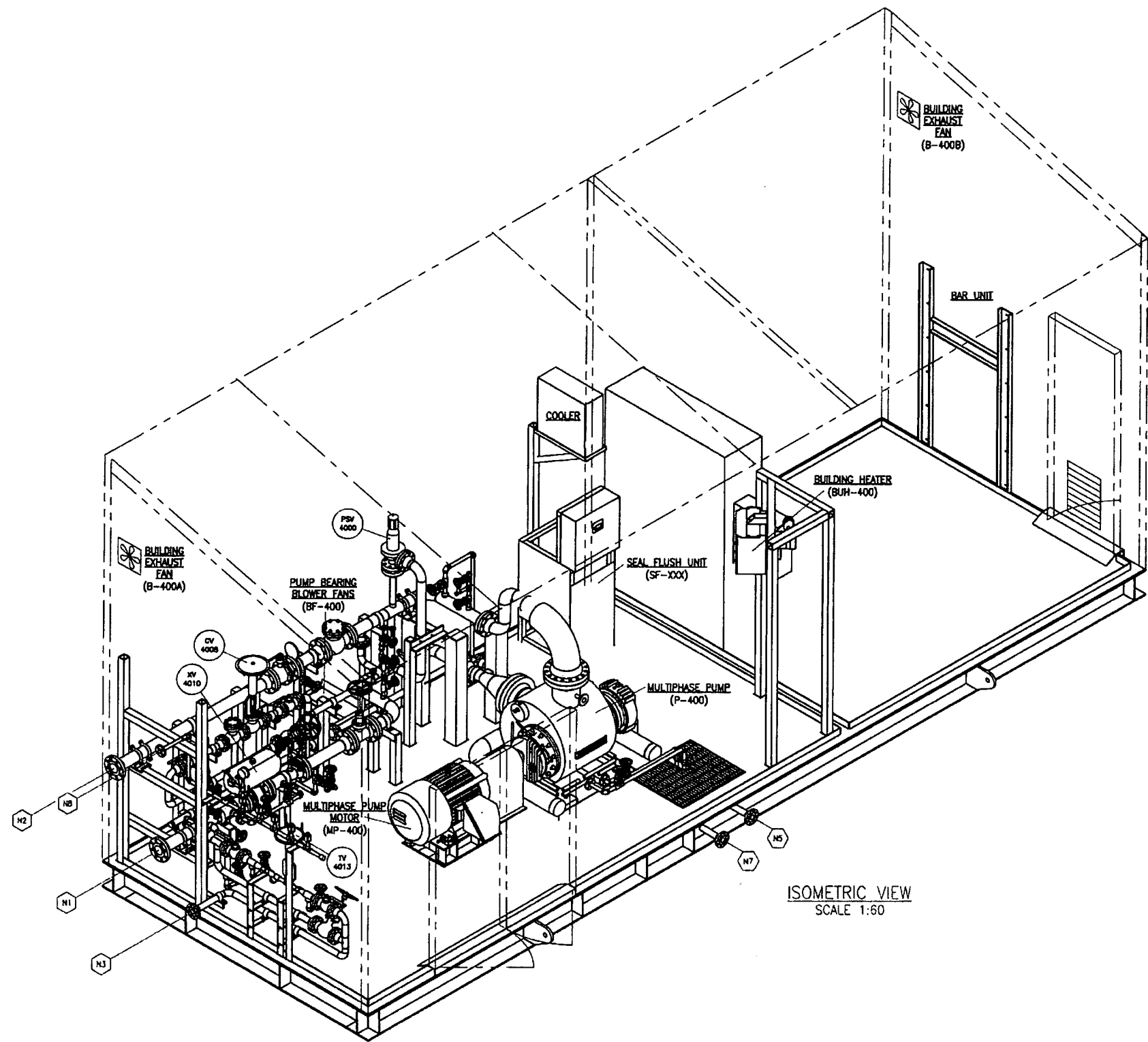
SHEET	LINE DESIGNATION												REFERENCE		CONDITION		DESIGN CONDITIONS				COMMODITY	REVISION								
	SIZE	SERVICE	LINE NO	PIPING CLASS	INSULATION		TRACING		SCHEDULE	COAT/LINE	X-RAY	PWMT	HARDNESS TESTING	CLEANING	DESIGN CODE	ORIGIN	TERMINATION	P&ID DRAWING NO	NOTES	PRESSURE, kPag			TEMP, DEG C	CODE		TEST				
					THICK, mm	TYPE	TYPE	HOLD TEMP 0C																PRESSURE, kPag	MDMT, DEG. C	TEMP, DEG. C	MIN PRESSURE, kPag	MEDIUM		
007-1 A/B/C/D	4"	BS	1	BSA	38	PP	-	-	XS, BE	-	100%	NO	5%	***	B31.3	Pump Discharge	N2	BIC QT0114-I-GIO-B-DW-001		2100	135	4368	-29	200	7653					
007-2 A/B/C/D/E	4"	BS	2	BSA	38	PP	-	-	XS, BE	-	100%	NO	5%	***	B31.3	N1	Suction Pump	BIC QT0114-I-GIO-B-DW-001		575	150	4368	-29	200	7653					
007-3	1"	BS	3	BSA	25	PP	-	-	160,PE	-	100%	NO	5%	***	B31.3	Line 0001	Line 0005	BIC QT0114-I-GIO-B-DW-001		2100	135	4368	-29	200	7653					
007-4 A/B	1"	BS	4	BSA	25	PP	-	-	160,PE	-	100%	NO	5%	***	B31.3	Line 0001	Line 0005	BIC QT0114-I-GIO-B-DW-001		2100	135	4368	-29	200	7653					
007-5 A/B/C	2"	BS	5	BSA	25	PP	-	-	XS, BE	-	100%	NO	5%	***	B31.3	Line 0010	N5	BIC QT0114-I-GIO-B-DW-001		2100	135	4368	-29	200	7653					
007-6	2"	BS	6	BSA	38	PP	-	-	XS, BE	-	100%	NO	5%	***	B31.3	Line 0001	PSV-4000	BIC QT0114-I-GIO-B-DW-001		2100	135	4368	-29	200	7653					
007-7	3"	BS	7	BSA	38	PP	-	-	XS, BE	-	100%	NO	5%	***	B31.3	PSV-4000	Line 0002	BIC QT0114-I-GIO-B-DW-001		575	135	4368	-29	200	7653					
007-8 A/B/C	2"	BS	8	BSA	25	PP	-	-	XS, BE	-	100%	NO	5%	***	B31.3	Line 0001	Line 0013	BIC QT0114-I-GIO-B-DW-001		2100	135	4368	-29	200	7653					
007-9	1"	BS	9	BSA	25	PP	-	-	160,PE	-	100%	NO	5%	***	B31.3	Line 0002	Line 0005	BIC QT0114-I-GIO-B-DW-001		575	120	4368	-29	200	7653					
007-10	1"	BS	10	BSA	25	PP	-	-	160,PE	-	100%	NO	5%	***	B31.3	Line 0002	Line 0005	BIC QT0114-I-GIO-B-DW-001		575	120	4368	-29	200	7653					
007-11 A/B/C	2"	W	11	BSA	25	PP	-	-	XS, BE	-	100%	NO	5%	***	B31.3	N3	Line 0012	BIC QT0114-I-GIO-B-DW-001		2500	60	4368	-29	200	7653					
007-12	2"	W	12	BSA	25	PP	-	-	XS, BE	-	100%	NO	5%	***	B31.3	Line 0011	Line 0002	BIC QT0114-I-GIO-B-DW-001		575	60	4368	-29	200	7653					
007-13	2"	BS	13	BSA	25	PP	-	-	XS, BE	-	100%	NO	5%	***	B31.3	Line 0008	Line 0002	BIC QT0114-I-GIO-B-DW-001		575	135	4368	-29	200	7653					
007-14	1"	BS	14	BSA	25	PP	-	-	160,PE	-	100%	NO	5%	***	B31.3	Pump Drain	Line 0005	BIC QT0114-I-GIO-B-DW-001		2100	135	4368	-29	200	7653					
007-15	1"	BS	15	BSA	25	PP	-	-	160,PE	-	100%	NO	5%	***	B31.3	Pump Drain	Line 0005	BIC QT0114-I-GIO-B-DW-001		2100	135	4368	-29	200	7653					
No.	REVISION				BY		DATE		CHECKED						PROJECT No. 2013				 Twin Screw & Multiphase Boosting				LINE LIST				OSPREY CENOVUS CSS PILOT PROJECT , ALBERTA CANADA MULTIPHASE PUMP MW-7T.3-339 LSD# 11-02-070-04-W4M		QTO1140-LL-0001-01	rev. 3
3	As built				JT		MARCH 12TH		SP						JOB #: QTO1140-LL-0001-00															
Notes: * Hardness testing for B31.3 code system shall be in accordance with ASTM A1038. Base material and weld hardness control in accordance with NACE MR0175/ISO 15156, NACE SP0472. Base material and /or weld hardness values exceeding the limit prescribed in NACE MR0175/ISO 15156 and NACE SP0742 are non-conformances. Vendor will propose corrective action to Bornemann for review and approval. ** NDE Category VII in accordance with TR-SPC-00-001-01 (Appendix 2, Non-Destructive Examination) *** All proposals for cleaning procedures must be submitted to Bornemann for approval prior to application. The cleaning contractor must keep a log which identifies all aspects of the cleaning operation for each piping system. The logs will be submitted to Bornemann upon completion of the cleaning operation.																														



PERMIT TO PRACTICE  
PATTINSON ENGINEERING LTD.  
Signature *Scott Pattinson*  
Date MAR 21, 2013  
PERMIT NUMBER: P 5478  
The Association of Professional Engineers,  
Geologists and Geophysicists of Alberta



CUSTOMER TIE POINTS			
MARK	SERVICE	SIZE	TYPE
N1	VENT GAS INLET	4"	300# RF
N2	PUMP DISCHARGE	4"	300# RF
N3	WATER INJECTION	2"	300# RF
N5	TRUCK OUT CONNECTION	2"	300# RF
N7	SUMP TANK TRUCK OUT	2"	300# RF
N8	INSTRUMENT AIR	1"	300# RF



22.Mar.2013

DRAWING NO.	REFERENCE DRAWINGS	REV.	DESCRIPTION	BY	DATE	CHK	APP	CLIENT
		1	AS BUILT	FO	13/03	-	-	CENOVUS
		0	ISSUED FOR CONSTRUCTION	FO	10/01	-	-	CENOVUS



Twin Screw & Multiphase Boosting

Bornemann Inc. 110 441 5th Avenue S.W. Calgary Alberta T2P 2V1  
Phone: 403-294-0777 Fax: 403-267-6073 www.bornemann.com

The information contained herein is confidential property of Bornemann Inc. and is not for publication. The information is issued on the understanding that no part thereof shall be copied or communicated to a third party without authorization in writing from Bornemann Inc.

PROJECT: CENOVUS OSPREY CSS PILOT PROJECT  
GENERAL ARRANGEMENT - ISOMETRIC VIEW

CUSTOMER:  
CENOVUS/CENOVUS

DATE:  
MARCH 13/2013

DRAWN BY:  
FO

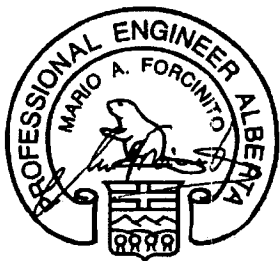
CHECKED BY:  
-

APPROVED BY:  
-

SCALE:  
1:60 UNO

DRAWING NO.  
OT:140-U-DW-003-5

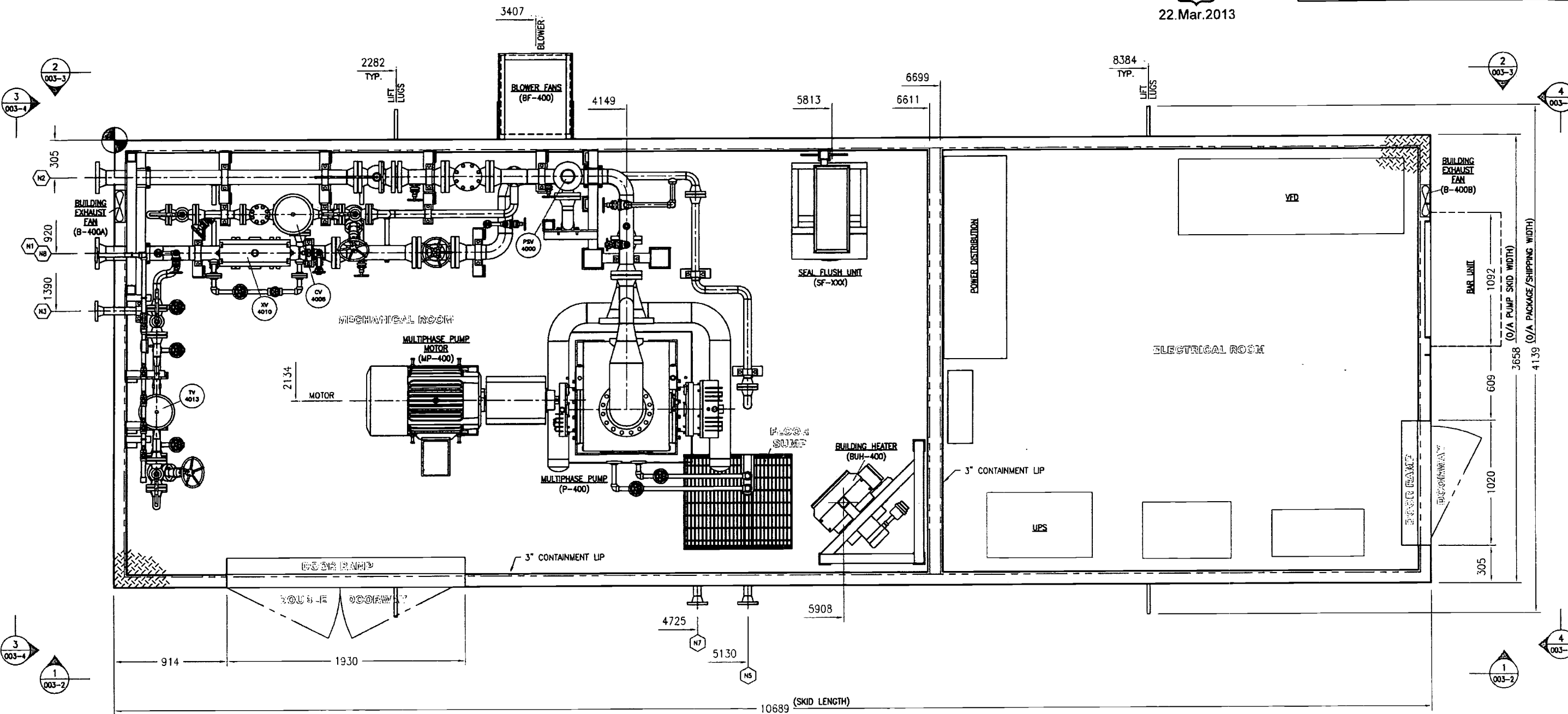
REV.  
1



22.Mar.2013

CUSTOMER TIE POINTS

MARK	SERVICE	SIZE	TYPE
N1	VENT GAS INLET	4"	300# RF
N2	PUMP DISCHARGE	4"	300# RF
N3	WATER INJECTION	2"	300# RF
N5	TRUCK OUT CONNECTION	2"	300# RF
N7	SUMP TANK TRUCK OUT	2"	300# RF
N8	INSTRUMENT AIR	1"	300# RF



PLAN VIEW  
SCALE 1:40  
(REFER ALL TAIL DIMENSIONS TO SKID DATUM)

DRAWING NO.	REFERENCE DRAWINGS	REV.	DESCRIPTION	BY	DATE	CHK.	APP.	CLIENT
		1	AS BUILT	FO	03/13	-	-	CENOVUS
		0	ISSUED FOR CONSTRUCTION	FO	10/01	-	-	CENOVUS
		A	ISSUED FOR APPROVAL / REVIEW	FO	09/25	-	-	CENOVUS

**Bornemann Pumps**

Twin Screw & Multiphase Boosting

Bornemann Inc. 120 441 5th Avenue S.W. Calgary Alberta T2P 2V1  
Phone: 403-294-0777 Fax: 403-262-4071 www.bornemann.com

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PROJECT: CENOVUS OSPREY CSS PILOT PROJECT  
GENERAL ARRANGEMENT - PLAN VIEW

CUSTOMER:  
GENIVER/CENOVUS

DATE:  
MARCH 13/2013

SCALE:  
1:40 UNO

DRAWN BY:  
FO

CHECKED BY:  
-

APPROVED BY:  
-

DRAWING NO:  
QT1140-U-DW-003-1

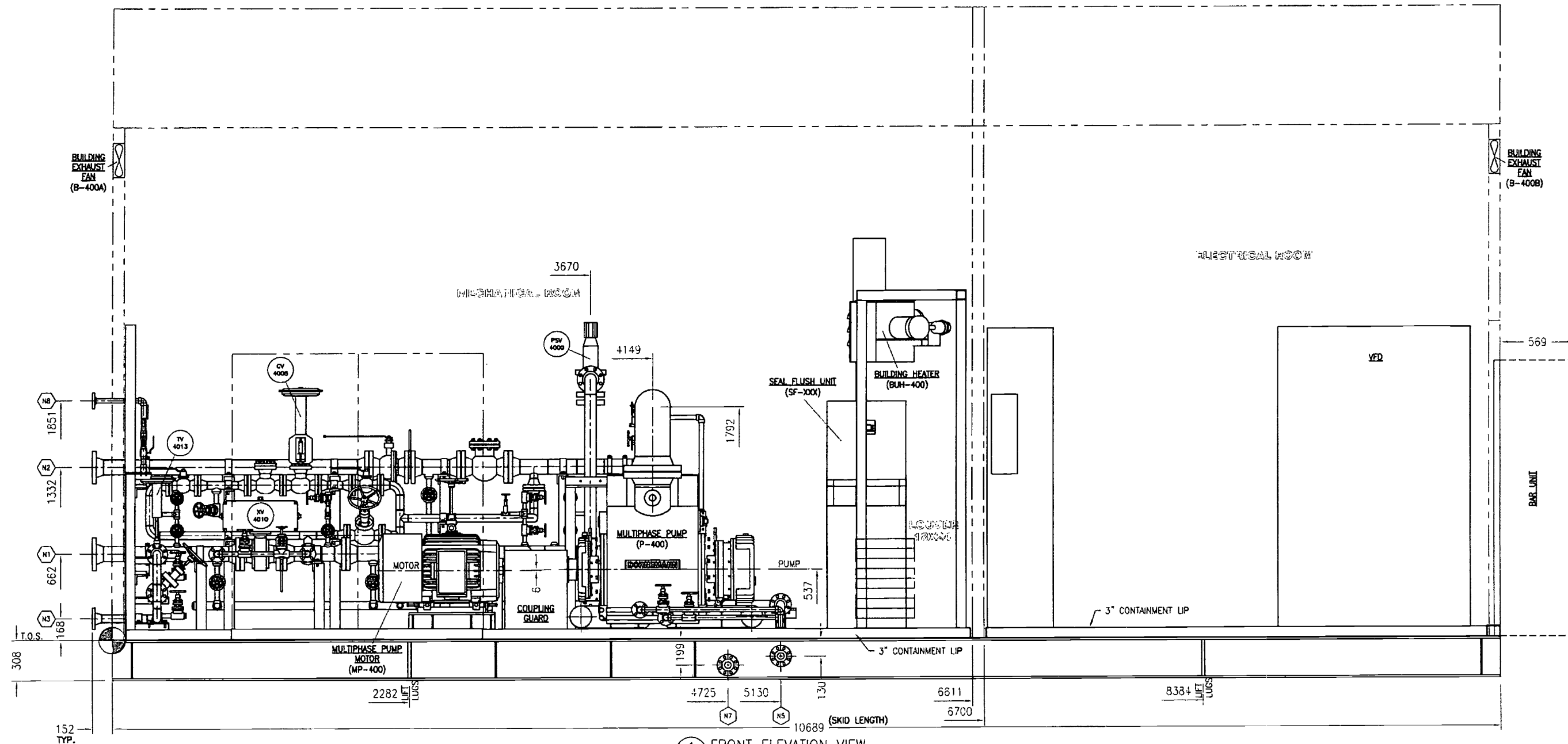
REV:  
1



22.Mar.2013

# CUSTOMER TIE POINTS

MARK	SERVICE	SIZE	TYPE
N1	VENT GAS INLET	4"	300# RF
N2	PUMP DISCHARGE	4"	300# RF
N3	WATER INJECTION	2"	300# RF
N5	TRUCK OUT CONNECTION	2"	300# RF
N7	SUMP TANK TRUCK OUT	2"	300# RF
N8	INSTRUMENT AIR	1"	300# RF



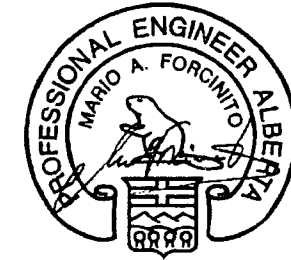
1 FRONT ELEVATION VIEW  
SCALE 1:40  
(REFER ALL TAIL DIMENSIONS TO SKID DATUM)

DRAWING NO.		REFERENCE DRAWINGS		REV.	DESCRIPTION	BY	DATE	CHK	APP	CLIENT
				1	AS BUILT	FO	03/13	-	-	CENOVUS
				0	ISSUED FOR CONSTRUCTION	FO	10/01	-	-	CENOVUS

**Bornemann Pumps**  
Twin Screw & Multiphase Boosting  
Bornemann Inc. 120 441 5th Avenue S.W. Calgary Alberta T2P 2Y1  
Phone: 403-214-2117, Fax: 403-292-4071, www.bornemann.com

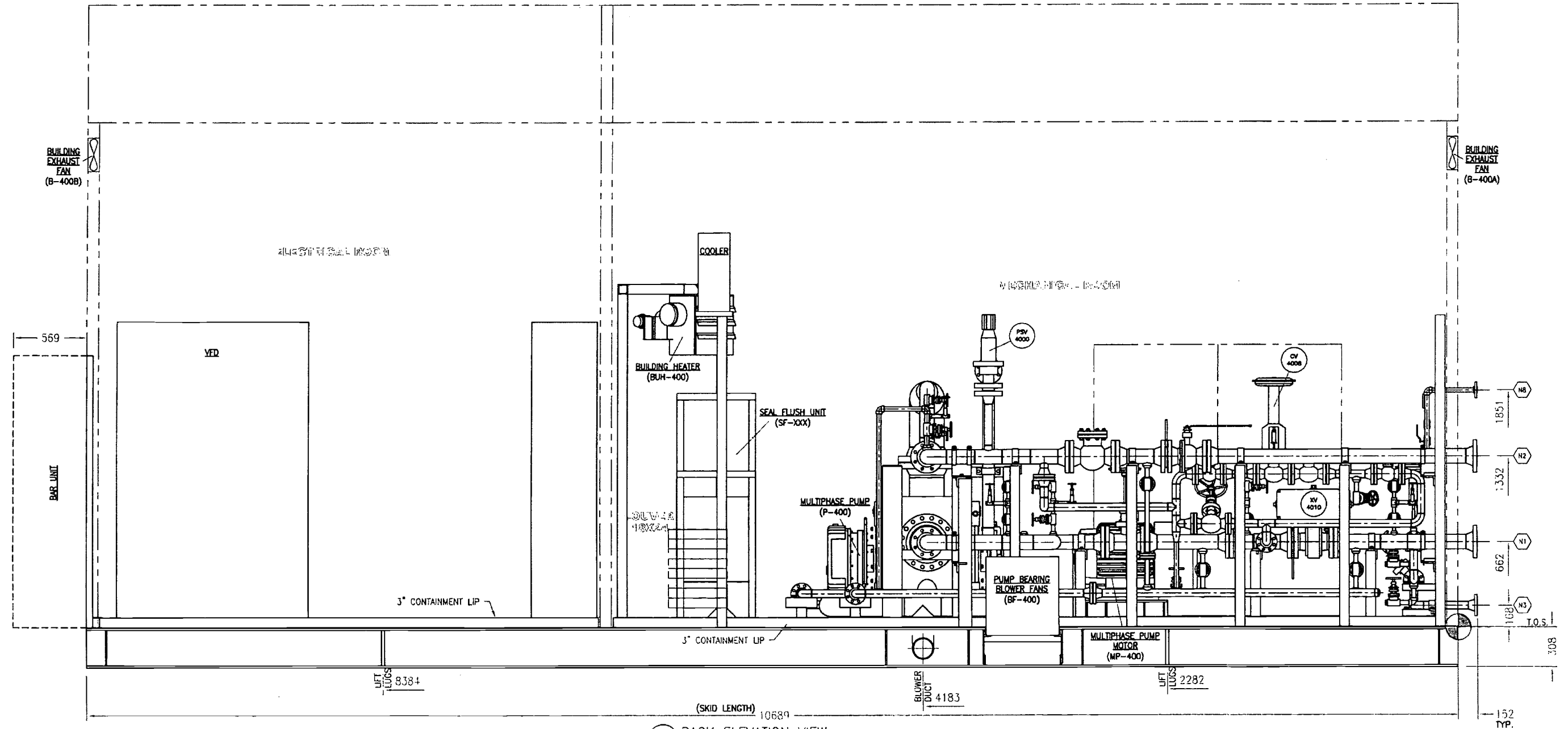
PROJECT: CENOVUS OSPREY CSS PILOT PROJECT  
GENERAL ARRANGEMENT - FRONT ELEVATION VIEW 1  
CUSTOMER: CENIVER/CENOVUS  
DATE: MARCH 13/2013  
SCALE: 1:40 UNO

DRAWN BY: FO  
CHECKED BY: -  
APPROVED BY: -  
DRAWING NO: QT1140-U-DW-003-2  
REV: 1



22.Mar.2013

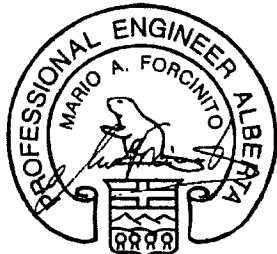
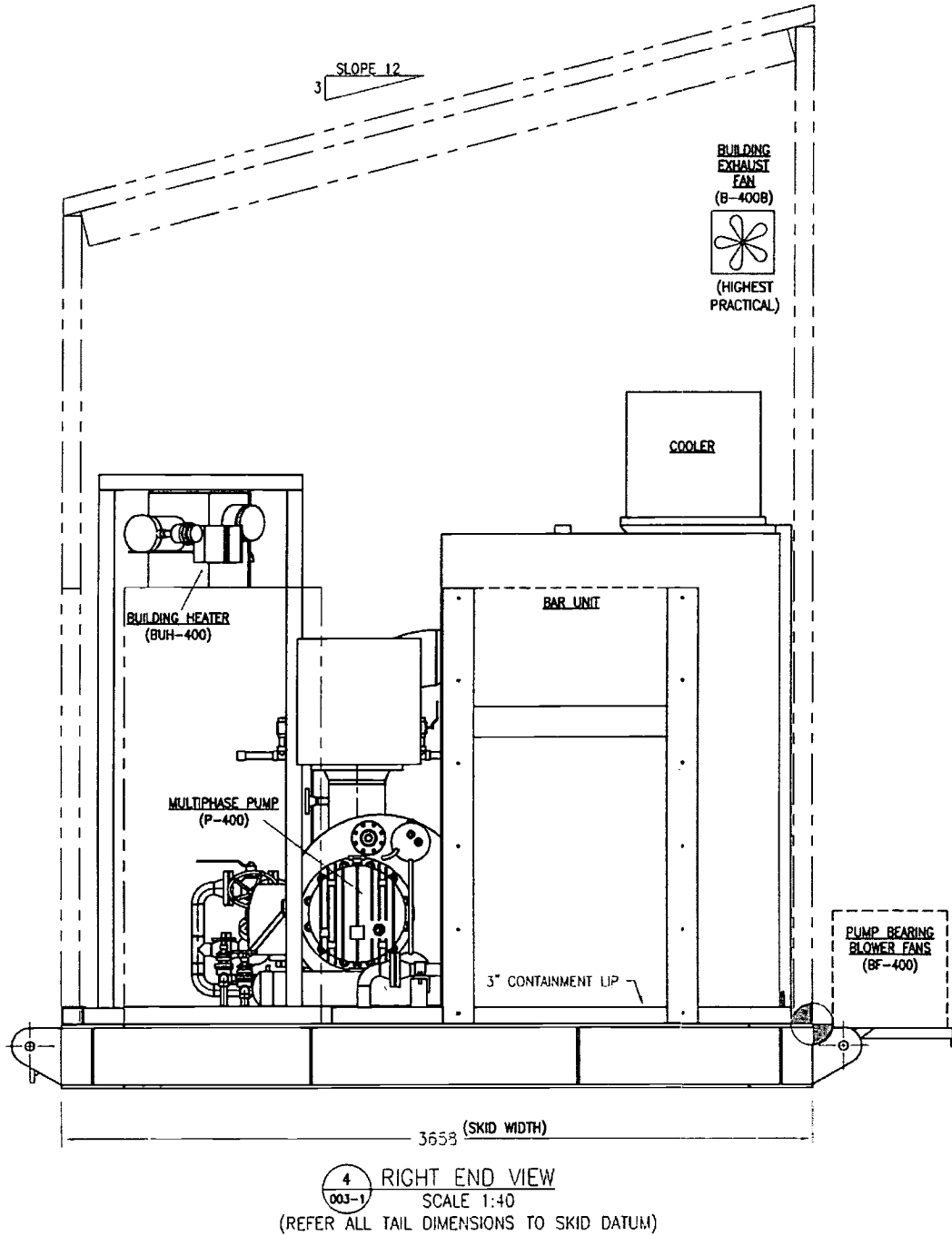
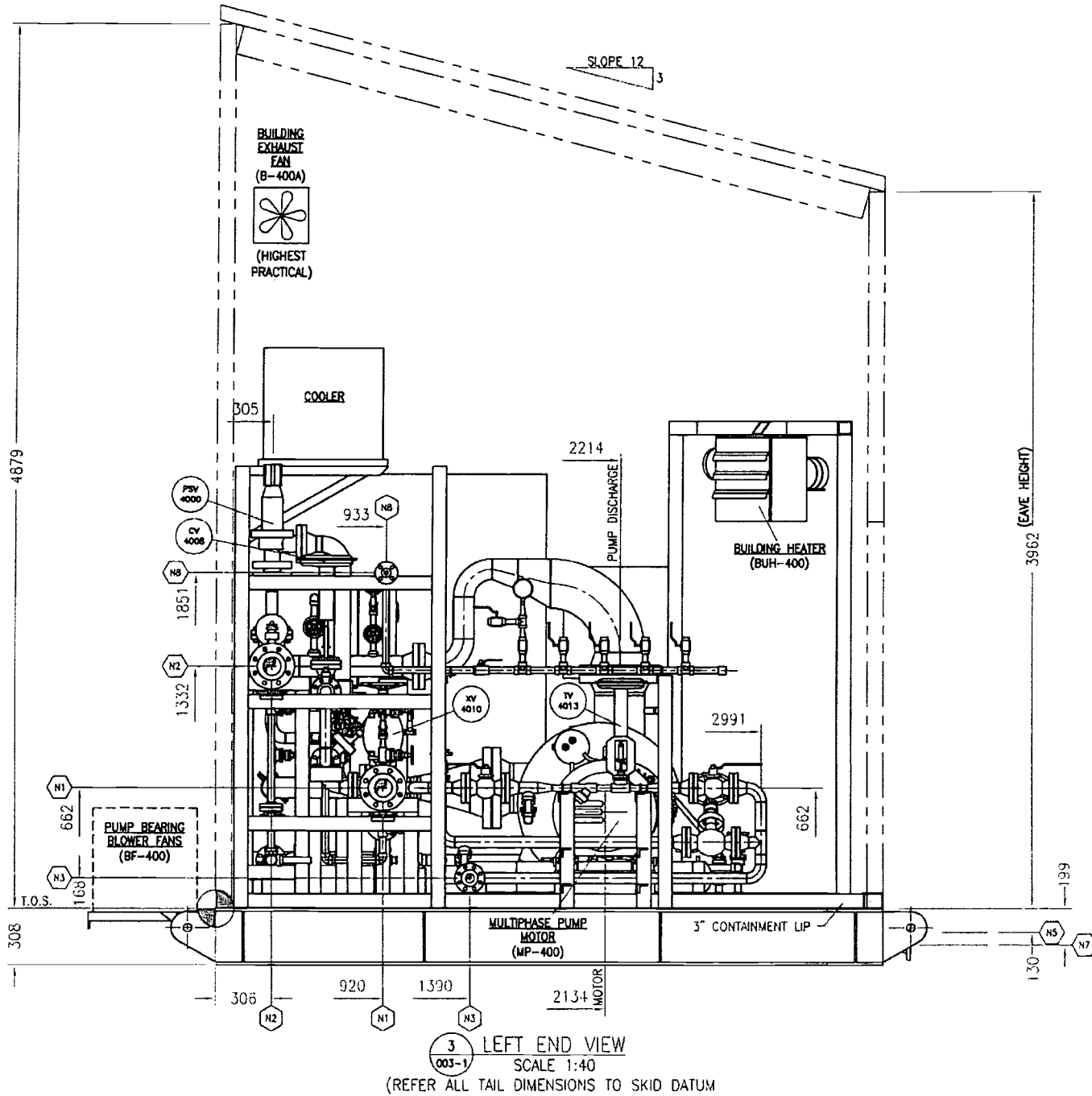
CUSTOMER TIE POINTS			
MARK	SERVICE	SIZE	TYPE
N1	VENT GAS INLET	4"	300# RF
N2	PUMP DISCHARGE	4"	300# RF
N3	WATER INJECTION	2"	300# RF
N5	TRUCK OUT CONNECTION	2"	300# RF
N7	SUMP TANK TRUCK OUT	2"	300# RF
N8	INSTRUMENT AIR	1"	300# RF



2 BACK ELEVATION VIEW  
SCALE 1:40  
(REFER ALL TAIL DIMENSIONS TO SKID DATUM)

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CUSTOMER TIE POINTS			
MARK	SERVICE	SIZE	TYPE
N1	VENT GAS INLET	4"	300# RF
N2	PUMP DISCHARGE	4"	300# RF
N3	WATER INJECTION	2"	300# RF
N5	TRUCK OUT CONNECTION	2"	300# RF
N7	SUMP TANK TRUCK OUT	2"	300# RF
N8	INSTRUMENT AIR	1"	300# RF



22.Mar.2013

DRAWING NO.	REFERENCE DRAWINGS	REV.	DESCRIPTION	BY	DATE	CHK	APP	CLIENT
		1	AS BUILT	FO	13/03	-	-	CENOVUS
		0	ISSUED FOR CONSTRUCTION	FO	10/01	-	-	CENOVUS

**Bornemann  
Pumps**

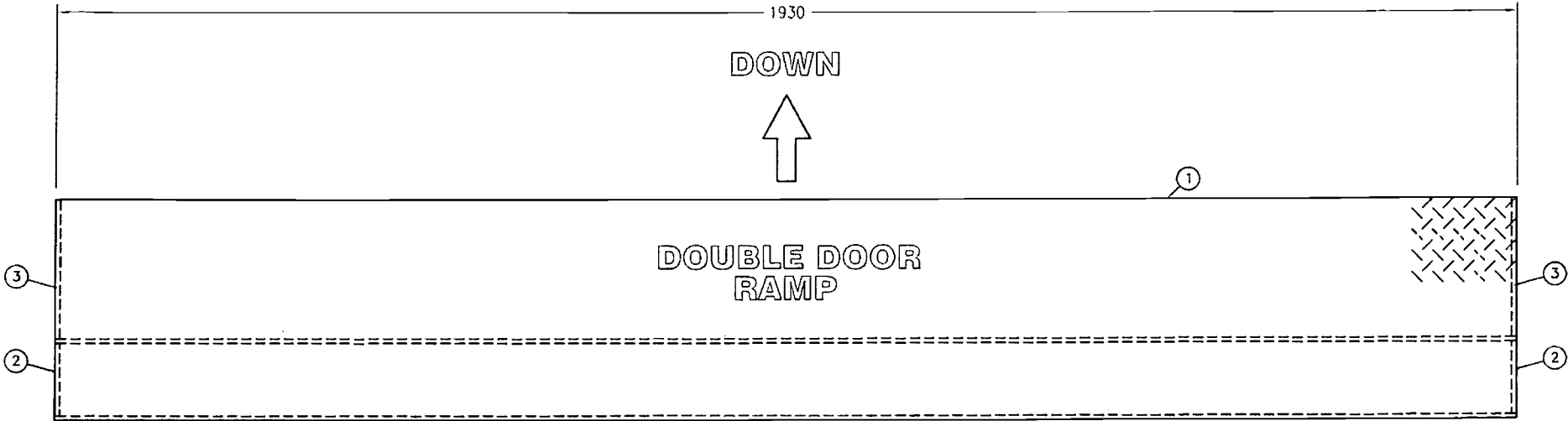
Twin Screw & Multiphase Boosting

Bornemann Inc. 320 441 5th Avenue S.W. Calgary Alberta T2P 2V1  
Phone: 403-244-0777 Fax: 403-242-4073 www.bornemann.ca

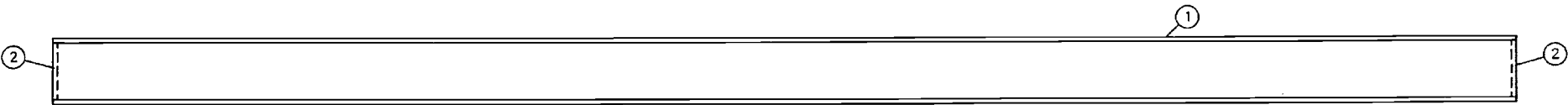
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PROJECT: CENOVUS OSPREY CSS PILOT PROJECT GENERAL ARRANGEMENT - LEFT & RIGHT END VIEW			
CUSTOMER: GENIVER/CENOVUS			
DATE: MARCH 13/2013	DRAWN BY: FO	CHECKED BY: -	APPROVED BY: -
SCALE: 1:40 UNO	DRAWING NO: QT1140-U-DW-003-4	REV: 1	

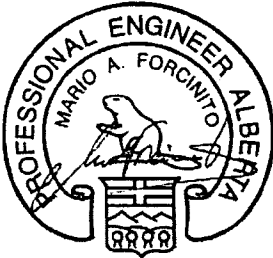
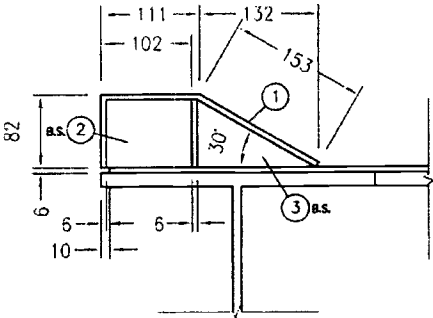
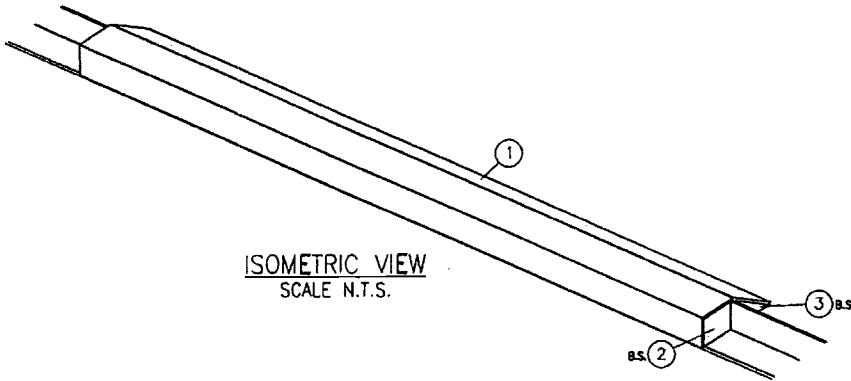
BILL OF MATERIAL				
ITEM	QTY	DESCRIPTION	MATERIAL	LENGTH
1	1	1/4" CHECKER PLATE (DOUBLE DOOR RAMP) 338 mm WD x 1930 mm LG (BEND TO SUIT)	G40.21M/300W	1930
2	2	1/4" CHECKER PLATE (THRESHOLD CAPS) x 76 WD	G40.21M/300W	96
3	1	1/4" CHECKER PLATE (RAMP CAPS) x 76 WD (CUT DIAGONALLY)	G40.21M/300W	132



DOUBLE DOOR RAMP  
PLAN VIEW  
SCALE 1:10



DOUBLE DOOR RAMP  
ELEVATION VIEW  
SCALE 1:10



22.Mar.2013

DRAWING NO.	REFERENCE DRAWINGS	REV.	DESCRIPTION	BY	DATE	CHK.	APP.	CLIENT
		1	AS BUILT	FC	03/13	-	-	CENOVUS
		0	ISSUED FOR CONSTRUCTION	FC	09/30	-	-	CENOVUS
		A	ISSUED FOR APPROVAL / REVIEW	FC	09/30	-	-	CENOVUS



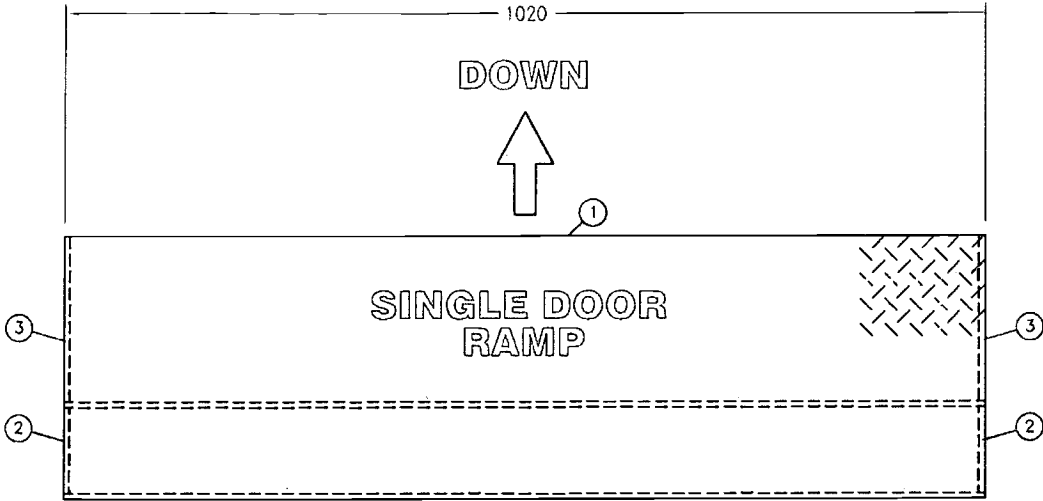
Twin Screw & Multiphase Boosting

Bornemann Inc. 120 441 5th Avenue S.W. Calgary Alberta T2P 0V1  
Phone: 403-294-0272 Fax: 403-267-4073 www.bornemann.com

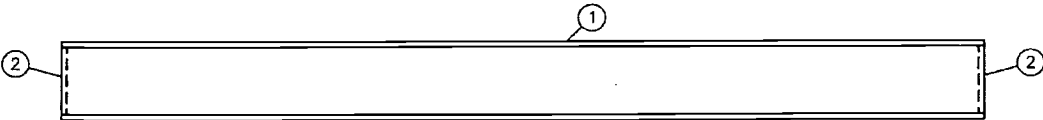
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PROJECT: CENOVUS OSPREY CSS PILOT PROJECT SKID BASE DOUBLE DOOR RAMP ASSEMBLY			
CUSTOMER: GENIVER/CENOVUS			
DATE: MARCH 13/2013	DRAWN BY: FC	CHECKED BY: -	APPROVED BY: -
SCALE:	DRAWING NO: QT1140-U-DW-005-2	REV.: 1	

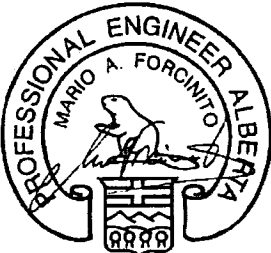
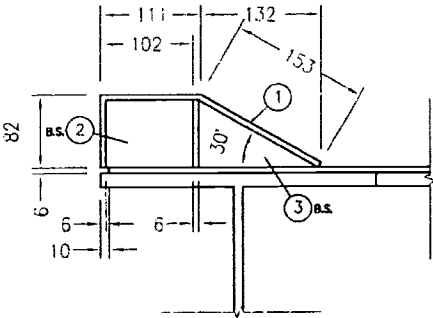
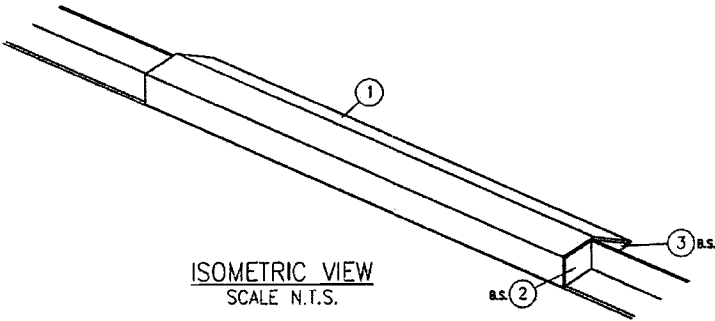
BILL OF MATERIAL				
ITEM	QTY	DESCRIPTION	MATERIAL	LENGTH
1	1	1/4" CHECKER PLATE (SINGLE DOOR RAMP) 338 mm WD x 1020 mm LG (BEND TO SUIT)	G40.21M/300W	1020
2	2	1/4" CHECKER PLATE (THRESHOLD CAPS) x 76 WD	G40.21M/300W	96
3	1	1/4" CHECKER PLATE (RAMP CAPS) x 76 WD (CUT DIAGONALLY)	G40.21M/300W	132



SINGLE DOOR RAMP  
PLAN VIEW  
SCALE 1:10

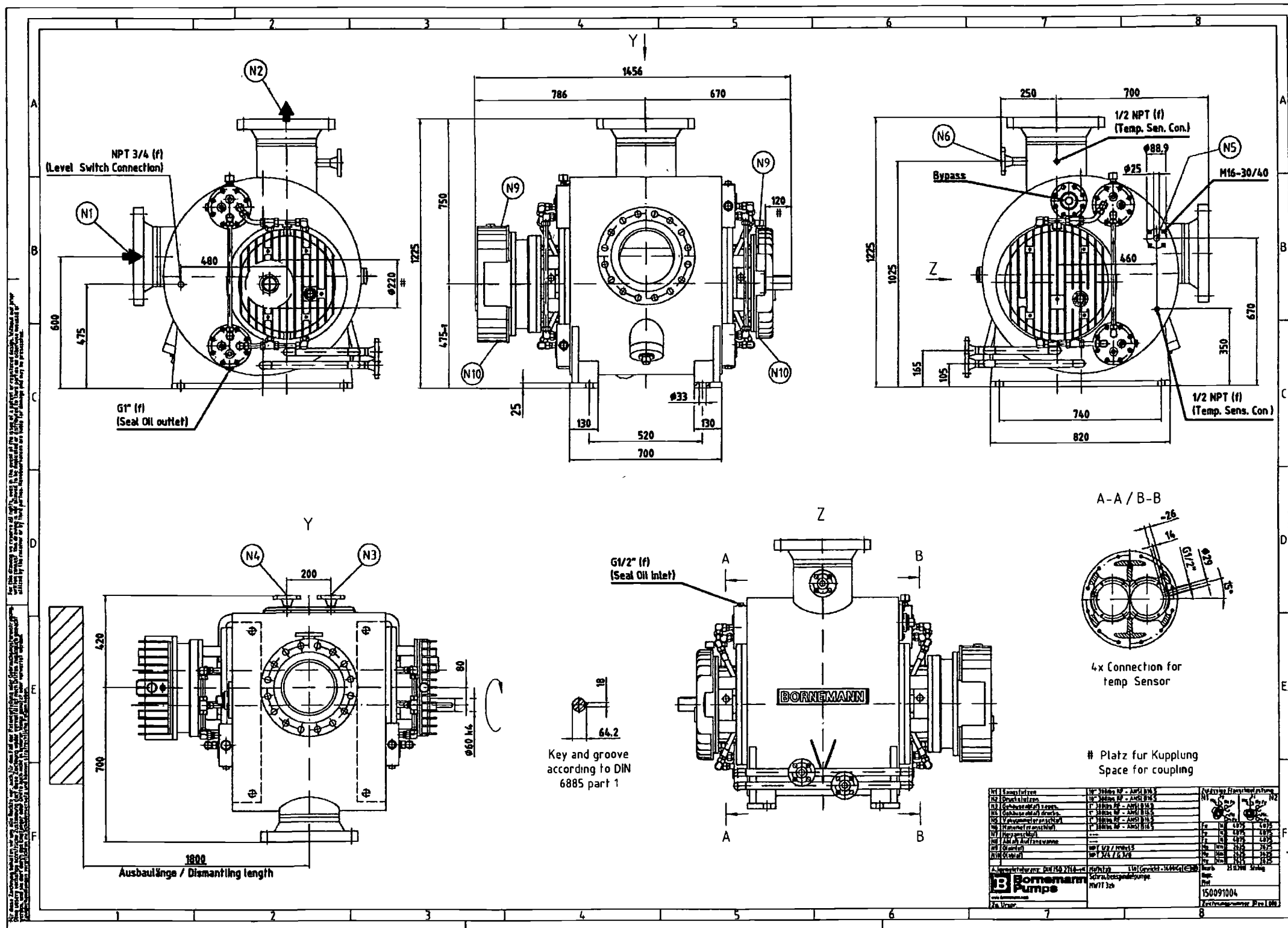


SINGLE DOOR RAMP  
ELEVATION VIEW  
SCALE 1:10



22.Mar.2013

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CIRCULATION STAMP			
Discipline	Name	Review Date	Initial
Proj. Manager/GL			
Proj. Engineer	Kenneth B	Aug 24/12	K.O
Mechanical			
Process			
Electrical			
Instrumentation			
Controls			
Civil			
Design/Drafting	Gary P	AUG 20/12	GP

This review shall NOT mean that GENIVAR approves the detailed design inherent in the drawing, responsibility for which shall remain with the Vendor submitting same. Such review shall not relieve Vendor of his responsibility for errors or omissions in drawings or for meeting all the requirements of the specifications and purchase orders.

☒ Reviewed - Proceed with Mfg.  
☐ Reviewed as Noted - Revise and Resubmit.  
☐ Revise And Resubmit - Do Not Proceed With Mfg.

By K.O  
Date Aug 24/12

2013.00  
21561  
Receipt Date Aug 15/12  
Y



Joh. Heinr. Bornemann GmbH  
Postfach 1162 , D-31676 Obernkirchen  
Phone: +49 5724 390-0 Fax +49 5724 390 290



**Parts - List for Type: MW7T.3zk**

**Job No.: NU 81200545**

issued 06 12 2012 / AN

**Project No.:**

**Serial No.: 111189**

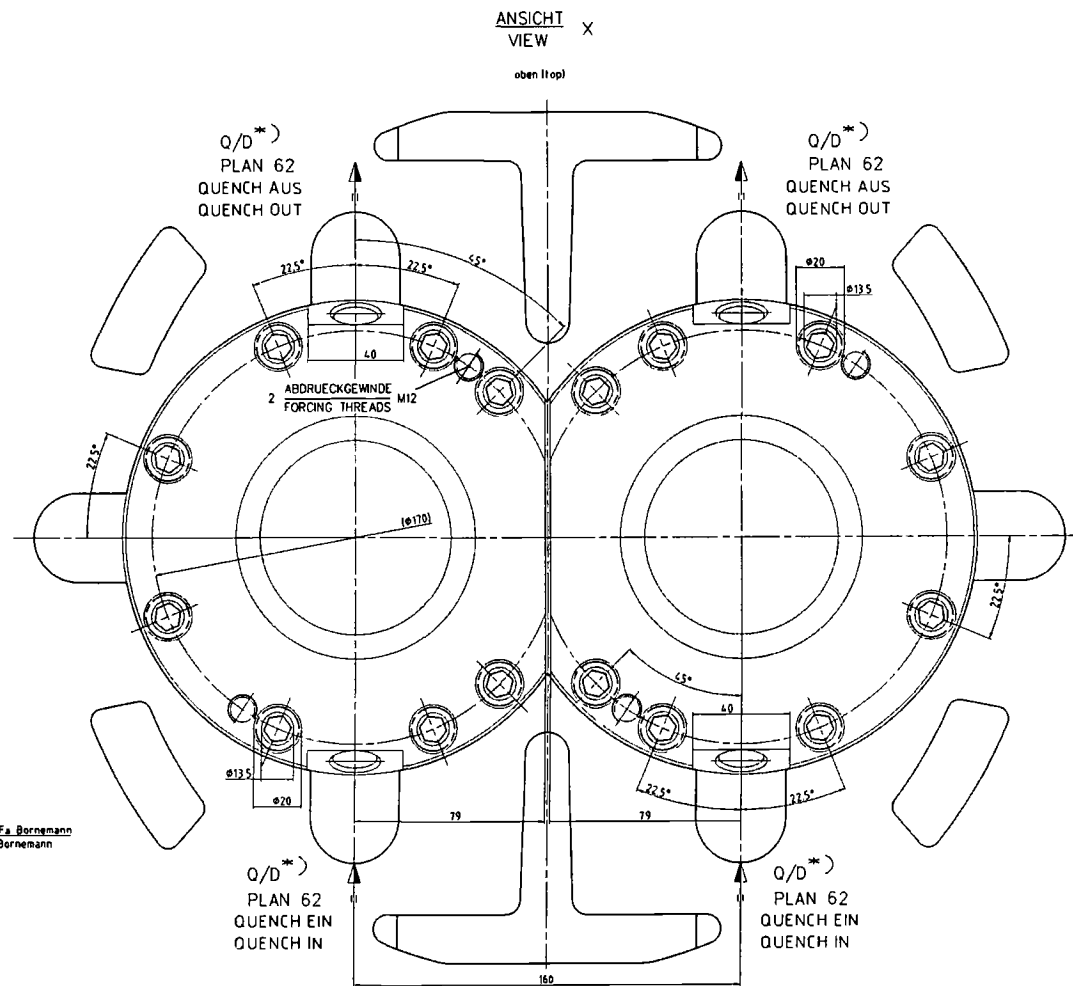
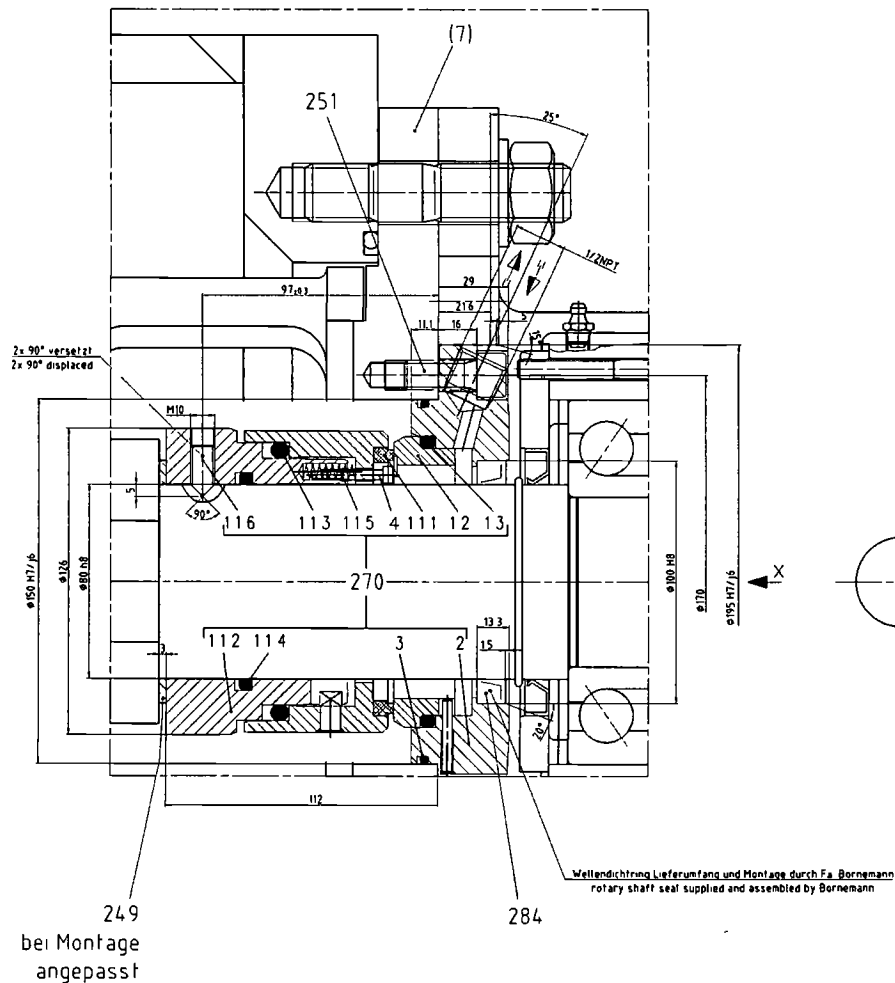
**Document No.: 81200545-A-DR-115-00**

**P.O.No.: BIC2390**

**Customer: Bornemann Inc.**

Item-No	Qty	Ident-No.	Description			Material	
	1	1500 520 9003	mechanical seal				
249	4	0003 823 5065	spacer bush			1 4462	
251	32	1500 999 8561	hexagon socket			1 7709 ( 21CrMov57 )	
270	4	1500 999 9076	mechanical seal			AQ1K17MG1	
284	4	1501 999 9224	shaft seal ring			FPM/PTFE-coated	
	1	1500 003 07	assembly drawing				

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Hersteller / Hersteller: BORNEMANN PUMPS		Medium / Fluid: H2O / THERMAL OIL / SCHWACH 1-20 ppm H2S		Temp. / Temp. max. 150 °C		Visk. / Visk. max. 1 mm²/s		Dichte / Dichte max. 1 kg/dm³		Druck / Druck max. 10 bar	
Machine type / Maschine Typ: HSH 326		Temp. / Temp. max. 150 °C		Visk. / Visk. max. 1 mm²/s		Dichte / Dichte max. 1 kg/dm³		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar	
Machine no. / Maschine Nr.: 015 061 01		Dichte / Dichte max. 1 kg/dm³		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar	
Operator / Betreiber: Ultimate user		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar	
Location / Ort: 510-1547		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar	
Pressure / Druck: 10 bar		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar		Druck / Druck max. 10 bar	

ALLE SCHRAUBEN UND GEWINDE-STIFTE ENFETTET UND MIT LOCTITE Nr. 243 GESICHERT!  
ALL SCREWS AND SET SCREWS DEGREASED AND FIXED WITH LOCTITE No 243!

Vor Inbetriebnahme die Betriebsanleitung und die Sicherheitshinweise lesen!  
Before startup the operating manual and the safety notes have to be read and observed!

max. zul. Axialversatz der Welle zum Gehäuse ± 2 mm  
max. allowed axial movement of the shaft to the housing ± 2 mm (± inches)

Anschlüsse durch entsprechende Beschriftung gekennzeichnet  
Pipe connections marked correspondingly

Pos. / Item	Bezeichnung / Description	Material / Material	Pos. / Item	Bezeichnung / Description	Material / Material
1	MSH CAP SCREW	A4-70	1	MSH CAP SCREW	A4-70
2	O-RING	240/240	2	O-RING	240/240
3	COVER	1 4462	3	COVER	1 4462
4	O-RING	240/240	4	O-RING	240/240
5	SEAL	240/240	5	SEAL	240/240
6	SET SCREW	2 4610 (HAST CA)	6	SET SCREW	2 4610 (HAST CA)
7	SPRING	2 4610 (HAST CA)	7	SPRING	2 4610 (HAST CA)
8	O-RING	240/240	8	O-RING	240/240
9	O-RING	240/240	9	O-RING	240/240
10	DRIVER	1 4462	10	DRIVER	1 4462
11	SEAL FACE	240/240	11	SEAL FACE	240/240
12	SPRING LOADED UNIT	240/240	12	SPRING LOADED UNIT	240/240
13	MECHANICAL SEAL	240/240	13	MECHANICAL SEAL	240/240

Produktions- und Montage-Nummer / Production and Assembly No.	Produktions- und Montage-Nummer / Production and Assembly No.	Produktions- und Montage-Nummer / Production and Assembly No.	Produktions- und Montage-Nummer / Production and Assembly No.	Produktions- und Montage-Nummer / Production and Assembly No.	Produktions- und Montage-Nummer / Production and Assembly No.
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36
37	38	39	40	41	42
43	44	45	46	47	48
49	50	51	52	53	54
55	56	57	58	59	60
61	62	63	64	65	66
67	68	69	70	71	72
73	74	75	76	77	78
79	80	81	82	83	84
85	86	87	88	89	90
91	92	93	94	95	96
97	98	99	100	101	102

EagleBurgmann

EagleBurgmann - GLEITRINGDICHTUNG  
EagleBurgmann - MECHANICAL SEAL

HSHJ4256/80-E5

Einbauzeichnung  
Burgmann HSHJ4256/80-E5

1500 003 07

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21.01.2012

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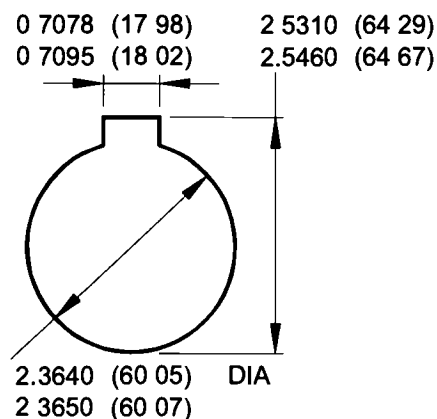
Drawing/BOM Number	Rev
TSCS0135-00782540-02	B

REF	PART NAME	PART NUMBER	MATERIAL	QTY
1	TRANSMISSION UNIT	TSCS-0135-0000-2540	AISI-301/AISI-1018	1 *
2	STANDARD HUB	HC8030-0135-60MA2	AISI-1040	1
3	LARGE HUB	HC8031-0135-54A2	AISI-1040	1
4	STANDARD BOLT	HC929-0015	ALLOY STEEL/NYLON	6 *
5	LARGE BOLT	HC929-0050	ALLOY STEEL/NYLON	6 *

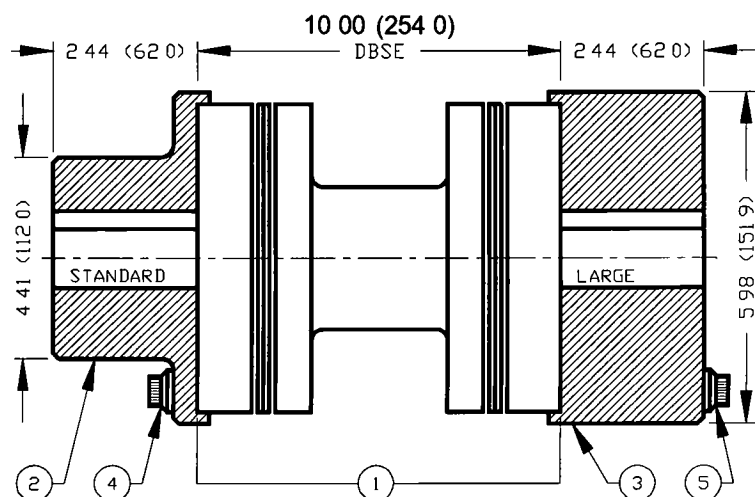
**NOTES:**

\*=RECOMMENDED SPARES

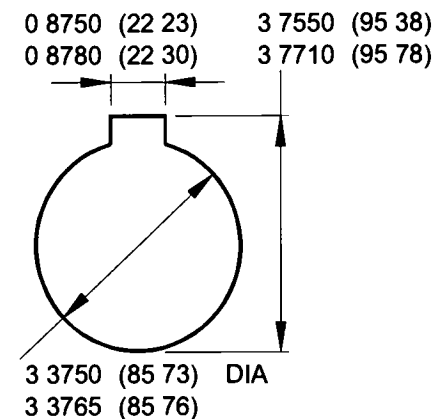
REF 4 & 5 TO BE TIGHTENED TO      35      (47)  
Lbs ft      Nm



- ☒ STRAIGHT
- ☒ SETSCREW OVER KEYWAY      0 50-13
- ☒ SETSCREW AT 90°
- ☒ PULLER HOLES (0 38-16 UNC)



TU WEIGHT [Lb (kg)] = 23 53 (10 67)  
STANDARD HUB WEIGHT [Lb (kg)] = 9 15 (4 15)  
LARGE HUB WEIGHT [Lb (kg)] = 13 19 (5 98)



- ☒ STRAIGHT
- ☒ SETSCREW OVER KEYWAY      0 625-11
- ☒ SETSCREW AT 90°
- ☒ PULLER HOLES (0 38-16 UNC)

TORSIONAL STIFFNESS [x10<sup>6</sup> Lb in/rad (x10<sup>6</sup> Nm/rad)]

2 41 (0 27)

TOTAL INERTIA [Lb in<sup>2</sup> (x10<sup>-3</sup> kg m<sup>2</sup>)]

224 28 (65 63)

TOTAL WEIGHT [Lb (kg)]

45 86 (20 80)

B	CB	8 24 12	JOHN CRANE CANADA INC.
A	JMH	8 26 10	423 Green Road North,
REV	BY	APP	DATE
			Stoney Creek ON L8E 3A1

Coupling Designation: 10.000	
<b>TSCS-0135-0078-2540</b>	
Drawing/BOM Number	Rev.
TSCS0135-00782540-02	B

THIS DRAWING AND THE DESIGN IT COVERS ARE CONFIDENTIAL AND THE PROPERTY OF KILOWATTS DESIGN COMPANY INC. AND SHALL NOT BE DISCLOSED TO OTHERS OR REPRODUCED IN ANY MANNER OR USED FOR ANY PURPOSE WHATSOEVER EXCEPT BY WRITTEN CONSENT OF THE OWNER

BOM MATERIAL LIST						
NO	QTY	DESCRIPTION	MANUFACTURER	MODEL NO	SIZE	SUPPLIER
1	1	BORNEMANN MULTIPHASE PUMP	BORNEMANN	MSL-180-80	-	BORNEMANN
2	1	ELECTRIC MOTOR	TECO	AEHH88	150HP	BORNEMANN
3	1	VARIABLE FREQUENCY DRIVE	TOSHIBA	VFA51-6132KPC-H1	-	KILOWATTS
4	1	GUARDIAN PANEL	KILOWATTS	GM 400	-	KILOWATTS
5	3	PRESSURE TRANSMITTER	HONEYWELL	STR17G-11A-100 KJGJBCDSK-H6	-	BORNEMANN
6	2	TEMPERATURE TRANSMITTER	HONEYWELL	ST125H-D-ENE-M00-DDC-00-2J	-	BORNEMANN
7	1	225 AMP ENCLOSED CIRCUIT BREAKER	EATON	SNFD3225L	-	KILOWATTS
8	1	GENERAL PURPOSE SINGLE POLE SWITCH	OPEN	-	-	KILOWATTS
9	1	GENERAL PURPOSE RECEPTACLE	OPEN	-	-	KILOWATTS
10	1	4 TONNE HVAC WITH 9KW HEATER	BARD	208-230/3/60	-	BUILDING CONTRACTOR
11	1	20AMP BATTERY CHARGER	HAYLEY	CCE24A20R19H17	-	KILOWATTS
12	2	150W HPS CEILING MOUNT FIXTURE C/W LAMP	KILLARK	HBKVM3S150X2GLGMR/67516	-	KILOWATTS
13	2	150W HPS EXT WALL MOUNT FIX C/W LAMP	KILLARK	HBKKWPS150/67516	-	KILOWATTS
14	3	RED STROBE BEACON	FEDERAL SIGNAL	225SXST-1-024R	-	KILOWATTS
15	3	4' FLUORESCENT LIGHT C/W LAMPS AND WIRE GUARDS	LITHONIA	L232MVOLTGE10IS/LTH-WGL	-	KILOWATTS
16	3	LEL DETECTOR	NET SAFETY	MLP-A-SC 1100-SEP C/W CCS-1 SPLASH GUARD & CALIBRATION CUP	-	KILOWATTS
17	2	ESD PUSHBUTTON	CROUSE HINDS	GHG432KLM00SGT531211/2726	-	KILOWATTS
18	1	THERMOSTAT	RUFFNECK	FX-311	-	KILOWATTS
19	8	R10 S	-	-	-	BORNEMANN
20	1	VIBRATION TRANSMITTER	METRIX	ST5484E-123-020-00	-	BORNEMANN
21	1	EXHAUST FAN L-5004A-C	-	575VAC 3ø	1/2HP	BUILDING CONTRACTOR
22	1	10KW HEATER	RUFFNECK	FX5600 360 100	-	BORNEMANN
23	1	JUNCTION BOX	HOFFMAN	E504020PPG C/W P5040S	-	KILOWATTS
24	1	JUNCTION BOX	HOFFMAN	A14128CHQRF C/W A14P12	-	KILOWATTS
25	2	STATUS SWITCHES	TOPWORKS	-	-	BORNEMANN
26	3	SOLENOID	ASCO	-	-	BORNEMANN
27	2	FIRE DETECTOR	NET SAFETY	UV/IRS-A	-	KILOWATTS
28	3	BLUE STROBE BEACON	FEDERAL SIGNAL	225SXST-1-024-B	-	KILOWATTS
29	0	AMBER STROBE BEACON	FEDERAL SIGNAL	-	-	KILOWATTS
30	2	ALARM HORN C/W TONE MODEL	FEDERAL SIGNAL	300GCX-024 C/W CTM	-	KILOWATTS
31	3	H2S DETECTOR	NET SAFETY	MLP-A-ST 1200-SEP C/W CCS-1 SPLASH & CALIBRATION CUP	-	KILOWATTS
32A	1	SMOKE DETECTOR	NOTIFER	1451(NOTE1) 2451 (NOTE2) 3C4WTAR-BA	-	KILOWATTS
32B	1	HEAT/RATE OF RISE DETECTOR	THERMO FLEX	CR-135-C	-	KILOWATTS
33	2	FIELD VUE POSITIONER/CONTROL VALVE	FISHER	DVC 6200 (1" AND 2" 300RF FISHER D-BODY-657-DVC CONTROL VALVE)	-	BORNEMANN
34	1	LEVEL SWITCH	KAYDEN	812-RAA-123A-10040-C1G0A1E	-	KILOWATTS
35	1	30AMP ENCLOSED CIRCUIT BREAKER	EATON	SNFD3030L	-	KILOWATTS
36	1	30KVA TRANSFORMER	EATON	30KVA 600-120/208V	-	KILOWATTS
37	1	FVNR 2HP	EATON	ECN0501ADADA-A30	-	KILOWATTS
38	1	FVNR 1HP	EATON	ECN0501ADADA-A30	-	KILOWATTS
39	1	POW-R LINE DISTRIBUTION PANEL ASSEMBLY	EATON	30 CCT DISTRIBUTION PANEL C/W BREAKERS	-	KILOWATTS
40	1	400AMP 48" SPLITTER	EATON	AST 4404R	-	KILOWATTS
41	1	400AMP ENCLOSED CIRCUIT BREAKER	EATON	SNK03400	-	KILOWATTS
42	1	EXHAUST FAN	-	-	3/4HP	BUILDING CONTRACTOR
43	1	40 AMP ENCLOSED CIRCUIT BREAKER	EATON	SNFD3040L	-	KILOWATTS

AS BUILT  
2013.02.28

NOTES:

- 1 NOTIFER 400 SERIES INCLUDING THE "1451" IONIZATION SMOKE DETECTOR ARE NO LONGER AVAILABLE  
2 THE "2451" MODEL HAS BEEN REPLACED BY THE "13" SERIES OF DEVICES

2012-322	1	AS BUILT	MKM	13.02.28	MM	
2012-322	0	ISSUED FOR BUILDING CONSTRUCTION	HJ	12.11.15	MM	
2012-322	B	ISSUED FOR BID	HJ	12.11.05	MM	
2012-322	A	ISSUED FOR APPROVAL	HJ	12.10.24	MM	
Project No	No	Revision	By	Date	Chk	App

Prepared By



KILOWATTS  
DESIGN COMPANY INC

Prepared For



Bornemann  
Pumps

Multiphase Boosting

CENOVUS OSPREY CSS PILOT

150HP PUMP PACKAGE  
BILL OF MATERIALS

Drawn By	Scale	Drawing Number	Rev
HJIANG	1:15	A1-ELC-2012322-1000	1

THE SCALE SHOWN IS FOR A1 (0) SIZE ONLY