Rowan Rig 0082,
EXL III

BOP Control System

Operation and Maintenance Manual

TC8212

Cameron International Corporation ("Cameron")
P.O. Box 1212, Houston, TX 77251-1212, 713-939-2211, http://www.c-a-m.com

Chapter 7 - Rowan BOP Unit

I. Introduction

While design, installation, operation, and maintenance of most Cameron BOP Control Systems are similar, there is additional information that is unique to each specific project. Noteworthy information pertinent to the Rowan Tarzan unit is contained in this chapter.

II. Accumulator Unit Assembly

This BOP Control System is a modular system. That is rather than everything being mounted on a master skid, the pumps and reservoir are mounted on one skid and the accumulators and hydraulic control manifold are mounted on other separate skids. This unit is to be filled with Aquamarine 32, as per section 2.C.

III. Installation

A. Prepare Electric Pumps

This unit is equipped with a selector switch to determine which triplex pump will be primary and which will be secondary. While the selector is in the pump #1 position, go through the “Prepare Electric Pumps” procedure (2.II,F). When complete, move selector to pump #2 position and repeat procedure.

B. Start Pumps

As in (7.III.A), ensure that the “Start Pumps” procedure (2.II.J) and “Check Pressure Switches” procedure (2.II.K) is followed for both triplex pumps. The #1 electrical pressure switch is set to cut out at 3000 psi and restart at 2700 psi. The #2 electrical pressure switch is set to cut out at 3000 psi and restart at 2600 psi. With the selector switch in the #1 position, the #1

pump is the primary pump, and should restart when the pressure in the accumulator manifold falls to 2700 psi. The #2 pump, as secondary, should then restart when the accumulator manifold pressure falls to 2600 psi. At this point, both pumps should be running. Moving the selector switch in the #2 position will reverse the above. The #2 pump will now be the primary pump, and should restart when the pressure in the accumulator manifold falls to 2700 psi. The #1 pump, as secondary, should then restart when the accumulator manifold pressure falls to 2600 psi. At this point, both pumps should be running.

C. Circulating Pump

This unit is equipped with a manually operated circulating pump. The purpose of this pump is to circulate and filter the hydraulic fluid. This pump can only be operated from the Hydraulic Power Unit; remote operation is not possible. The pump should be operated by rig personnel on a weekly basis. Filter visual indicators should be checked and elements replaced as required.

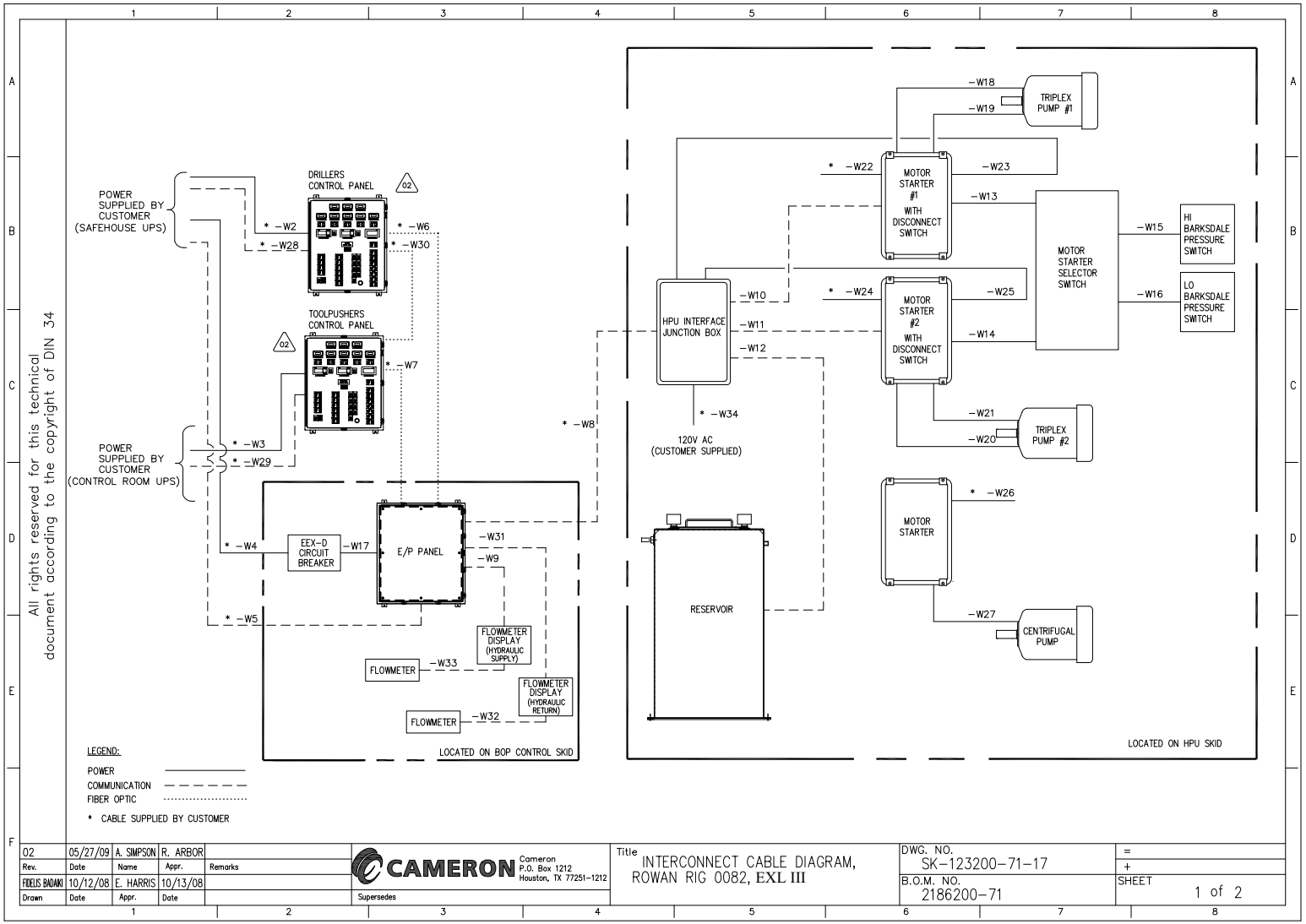
Alarms

Audio alarm systems (horn) and visual alarm systems (flashing light) can be added to the BOP control system. The alarms include use of the lamp test/acknowledge button, which deactivates the horn alarm. The light continues flashing until the system is restored to normal operating conditions. The alarms are activated by pressure switches.

1. The low accumulator pressure alarm pressure switch is activated when the system pressure drops to 2500 psi.
2. The low fluid alarm pressure switch is activated by a float switch in the reservoir. When fluid level is low, the float switch vents the air supply to the pressure switch.
3. The low air pressure alarm pressure switch is activated when the rig air supply drops to 60 psi.

Part Number: 2186200-71 Revision: 01
Description: BOP Diverter Control System

ITEM	REV	COMPONENT	QTY	UNIT	DESCRIPTION
1	4	2186213-71	1	Ea	Hydraulic Control Manifold
2	1	2186214-71	4	Ea	Accumulator Rack, With Twenty (20) Fifteen (15) Gallon, 3 Ksi, Accumulators
3	1	2186215-71	1	Ea	Hydraulic Power Unit, 2x 100 Hp Triplex Pumps, 1100 Gallon Reservoir And Electric Motor Starters
4	4	2186203-71	1	Ea	Driller's Control Panel
5	4	2186207-71	1	Ea	Toolpusher's Control Panel
7	1	2186200-71-66	1	Ea	Commissioning Spares
8	1	2186200-71-88	1	Ea	1 Year Spares
9		2725649-01	1	Ea	Nitrogen Charging Kit, For Oilair 3000 Psi Accumulators Q/20 Ft & 50 Ft Hose, Gauge Assy, Nitrogen Adapter & 2" Extension (Tcg-3015)
10		2725649-02	1	Ea	Spanner Wrench F/ Accumulator
11		2725649-03	1	Ea	Extension 2" F/Nitrogen Charging Kit Cg-3000-Cam
0	2	SK-123200-71-17	1	Ea	Interconnect Cable Diagram


POWER SUPPLIED BY CUSTOMER (SAFEHOUSE UPS)
DRILLERS CONTROL PANEL
02
* -W2
* -W28
* -W6
* -W30
TOOLPUSHERS CONTROL PANEL
02
* -W7
POWER SUPPLIED BY CUSTOMER (CONTROL ROOM UPS)
* -W3
* -W29
* -W8
* -W4
EEX-D CIRCUIT BREAKER
-W17
E/P PANEL
-W31
-W9
* -W5
FLOWMETER DISPLAY (HYDRAULIC SUPPLY)
FLOWMETER
-W33
FLOWMETER DISPLAY (HYDRAULIC RETURN)
FLOWMETER
-W32
LOCATED ON BOP CONTROL SKID
HPU INTERFACE JUNCTION BOX
-W10
-W11
-W12
* -W34
120V AC (CUSTOMER SUPPLIED)
RESERVOIR
-W18
-W19
TRIPLEX PUMP #1
* -W22
-W23
MOTOR STARTER #1 WITH DISCONNECT SWITCH
-W13
MOTOR STARTER SELECTOR SWITCH
-W15
HI BARKSDALE PRESSURE SWITCH
-W16
LO BARKSDALE PRESSURE SWITCH
* -W24
-W25
MOTOR STARTER #2 WITH DISCONNECT SWITCH
-W14
-W21
-W20
TRIPLEX PUMP #2
* -W26
MOTOR STARTER
-W27
CENTRIFUGAL PUMP
LOCATED ON HPU SKID
LEGEND:
POWER
COMMUNICATION
FIBER OPTIC
* CABLE SUPPLIED BY CUSTOMER
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02 | 05/27/09 | A. SIMPSON | R. ARBOR | Remarks
Rev. | Date | Name | Appr.
FIDELIS BADANO | 10/12/08 | E. HARRIS | 10/13/08
Drawn | Date | Appr. | Date
CAMERON
Cameron
P.O. Box 1212
Houston, TX 77251-1212
Supersedes
Title
INTERCONNECT CABLE DIAGRAM, ROWAN RIG 0082, EXL III
DWG. NO.
SK-123200-71-17
B.O.M. NO.
2186200-71
SHEET
1 of 2

CAMERON

CABLE INTERCONNECTIONS

CABLE NO.	CONDUCTOR QTY/SIZE	OVERALL OD (IN.)	PWR/SIG	FROM	TO	LENGTH (FT)	MFG	MFG. PART NO.	CAMERON PART NO.
						— —	— —	— —	— —
• -W2	3(C) #14 AWG	ø0.580	POWER (120VAC 1PH)	CUSTOMER SUPPLIED UPS	DRILLERS CONTROL PANEL	— —	ROCKEBESTOS SURPRENANT	03C14BN	— —
• -W3	3(C) #14 AWG	ø0.580	POWER (120VAC 1PH)	CUSTOMER SUPPLIED UPS	TOOLPUSHERS CONTROL PANEL	— —	ROCKEBESTOS SURPRENANT	03C14BN	— —
• -W4	3(C) #12 AWG	ø0.620	POWER (120VAC 1PH)	CUSTOMER SUPPLIED UPS	EEX-D CIRCUIT BRKR (BOP CNTRL SKID)	— —	ROCKEBESTOS SURPRENANT	03C12BN	— —
• -W5	01P16I/S-OSBS	ø0.454	COMM (LOSS OF MAIN POWER)	CUSTOMER SUPPLIED UPS	E/P PANEL	— —	ROCKEBESTOS SURPRENANT	01P16I/S-OSBN	— —
• -W6	200/230 UM F/O	ø0.551	FIBER OPTIC	DRILLERS CONTROL PANEL	E/P PANEL	— —	DRAKA COMTEQ	07C14BN	— —
• -W7	200/230 UM F/O	ø0.551	FIBER OPTIC	TOOLPUSHERS CONTROL PANEL	E/P PANEL	— —	DRAKA COMTEQ	— —	— —
• -W8	7(C) #14 AWG	ø0.688	COMM (24VDC-SIGNAL PUMP RUNNING #1,#2/LVL SWITCH)	E/P PANEL	HPU INTERFACE JUNCTION BOX	— —	ROCKEBESTOS SURPRENANT	— —	— —
-W9	2(PR) #16 AWG	ø0.560	COMM (FLOWMETER)	E/P PANEL	FLOWMETER DISPLAY	40	BOSTON INSUL. WIRE & CABLE	TP(I/S)16PN-2	2710589-10
-W10	7(C) #16 AWG	ø0.675	COMM (24VDC-SIGNAL PUMP RUNNING #1)	HPU INTERFACE JUNCTION BOX	MOTOR STARTER NO. 1	30	AMERCABLE	37-102-505BS	2710955-07-16
-W11	7(C) #16 AWG	ø0.675	COMM (24VDC-SIGNAL PUMP RUNNING #2)	HPU INTERFACE JUNCTION BOX	MOTOR STARTER NO. 2	30	AMERCABLE	37-102-505BS	2710955-07-16
-W12	3(C) #14 AWG	ø0.605	COMM (24VDC-SIGNAL LEVEL SWITCH)	HPU INTERFACE JUNCTION BOX	HPU RESERVOIR	60	AMERCABLE	37-102-508BS	2710955-07-16
-W13	7(C) #16 AWG	ø0.675	POWER (120VAC 1PH)	MOTOR STARTER NO. 1	MOTOR STARTER SELECTOR SWITCH	12	AMERCABLE	37-102-505BS	2710955-07-16
-W14	7(C) #16 AWG	ø0.675	POWER (120VAC 1PH)	MOTOR STARTER NO. 2	MOTOR STARTER SELECTOR SWITCH	12	AMERCABLE	37-102-505BS	2710955-07-16
-W15	7(C) #16 AWG	ø0.675	POWER (120VAC 1PH)	MOTOR STARTER SELECTOR SWITCH	HI BARKSDALE PRESSURE SWITCH	10	AMERCABLE	37-102-505BS	2710955-07-16
-W16	7(C) #16 AWG	ø0.675	POWER (120VAC 1PH)	MOTOR STARTER SELECTOR SWITCH	LO BARKSDALE PRESSURE SWITCH	10	AMERCABLE	37-102-505BS	2710955-07-16
-W17	3(C) #14 AWG	ø0.605	POWER (120VAC 1PH)	EEX-D CRKT BRKR (BOP CONTROL SKID)	E/P PANEL	30	AMERCABLE	37-102-508BS	2710955-03-14
-W18	4/2/0 AWG	ø1.920	POWER (460VAC 3PH)	MOTOR STARTER NO. 1	TRIPLEX PUMP #1	30	BOSTON WIRE	FPNBS-2/0	2710589-08
-W19	3(C) #14 AWG	ø0.605	POWER (120VAC 1PH)	MOTOR STARTER NO. 1	TRIPLEX PUMP #1 HEATER	30	AMERCABLE	37-102-508BS	2710955-07-16
-W20	4/2/0 AWG	ø1.920	POWER (460VAC 3PH)	MOTOR STARTER NO. 2	TRIPLEX PUMP #2	30	BOSTON WIRE	FPNBS-2/0	2710589-08
-W21	3(C) #14 AWG	ø0.605	POWER (120VAC 1PH)	MOTOR STARTER NO. 2	TRIPLEX PUMP #2 HEATER	30	AMERCABLE	37-102-508BS	2710955-07-16
• -W22	3(C) #2/0 AWG	ø1.765	POWER (460VAC 3PH)	CUSTOMER SUPPLIED	MOTOR STARTER NO. 1	— —	ROCKEBESTOS SURPRENANT	03C2/0BN	— —
-W23	3(C) #14 AWG	ø0.605	POWER (120VAC 1PH)	HPU INTERFACE JUNCTION BOX	MOTOR STARTER NO. 1	30	AMERCABLE	37-102-508BS	2710955-07-16
• -W24	3(C) #2/0 AWG	ø1.765	POWER (460VAC 3PH)	CUSTOMER SUPPLIED	MOTOR STARTER NO. 2	— —	ROCKEBESTOS SURPRENANT	03C2/0BN	— —
-W25	3(C) #14 AWG	ø0.605	POWER (120VAC 1PH)	HPU INTERFACE JUNCTION BOX	MOTOR STARTER NO. 2	30	AMERCABLE	37-102-508BS	2710955-07-16
• -W26	4(C) #14 AWG	ø0.613	POWER (460VAC 3PH)	CUSTOMER SUPPLIED	MOTOR STARTER	— —	ROCKEBESTOS SURPRENANT	04C14BN	— —
-W27	4(C) #12 AWG	ø0.664	POWER (460VAC 3PH)	MOTOR STARTER	CENTRIFUGAL PUMP	40	AMERCABLE	37-102-517BS	2710955-04-12
• -W28	1(PR) #16 AWG	ø0.454	COMM (LOSS OF MAIN POWER)	CUSTOMER SUPPLIED UPS	DRILLERS CONTROL PANEL	— —	ROCKEBESTOS SURPRENANT	01P16I/S-OSBN	— —
• -W29	1(PR) 1.5MM	ø0.531	COMM (LOSS OF MAIN POWER)	CUSTOMER SUPPLIED UPS	TOOLPUSHERS CONTROL PANEL	— —	DCI	XI-1X2X1.5MM	— —
• -W30	200/230 UM F/O	ø0.551	FIBER OPTIC COMM	DRILLERS CONTROL PANEL	TOOLPUSHERS CONTROL PANEL	— —	DRAKA COMTEQ	— —	— —
-W31	2(PR) #16 AWG	ø0.560	COMM (FLOWMETER)	E/P PANEL	FLOWMETER DISPLAY	40	BOSTON INSUL. WIRE & CABLE	TP(I/S)16PN-2	2710589-10
-W32	2(PR) #16 AWG	ø0.560	COMM (FLOWMETER)	FLOWMETER DISPLAY	FLOWMETER	40	BOSTON INSUL. WIRE & CABLE	TP(I/S)16PN-2	2710589-10
-W33	2(PR) #16 AWG	ø0.560	COMM (FLOWMETER)	FLOWMETER DISPLAY	FLOWMETER	40	BOSTON INSUL. WIRE & CABLE	TP(I/S)16PN-2	2710589-10
• -W34	3(C) #14 AWG	ø0.580	POWER (120VAC 1PH	CUSTOMER SUPPLIED LOAD CENTER	HPU INTERFACE JUNCTION BOX	— —	ROCKBESTOS SURPRENANT	01P16I/S-OSBN	— —

• CABLE SUPPLIED BY CUSTOMER.

Rev.	Date	Name	Appr.	Remarks
02	05/27/09	A. SIMPSON	R. ARBOR	
FIDELIS BADAKI	10/12/08	E. HARRIS	10/13/08	
Drawn	Date	Appr.	Date	

CAMERON Cameron P.O. Box 1212 Houston, TX 77251-1212

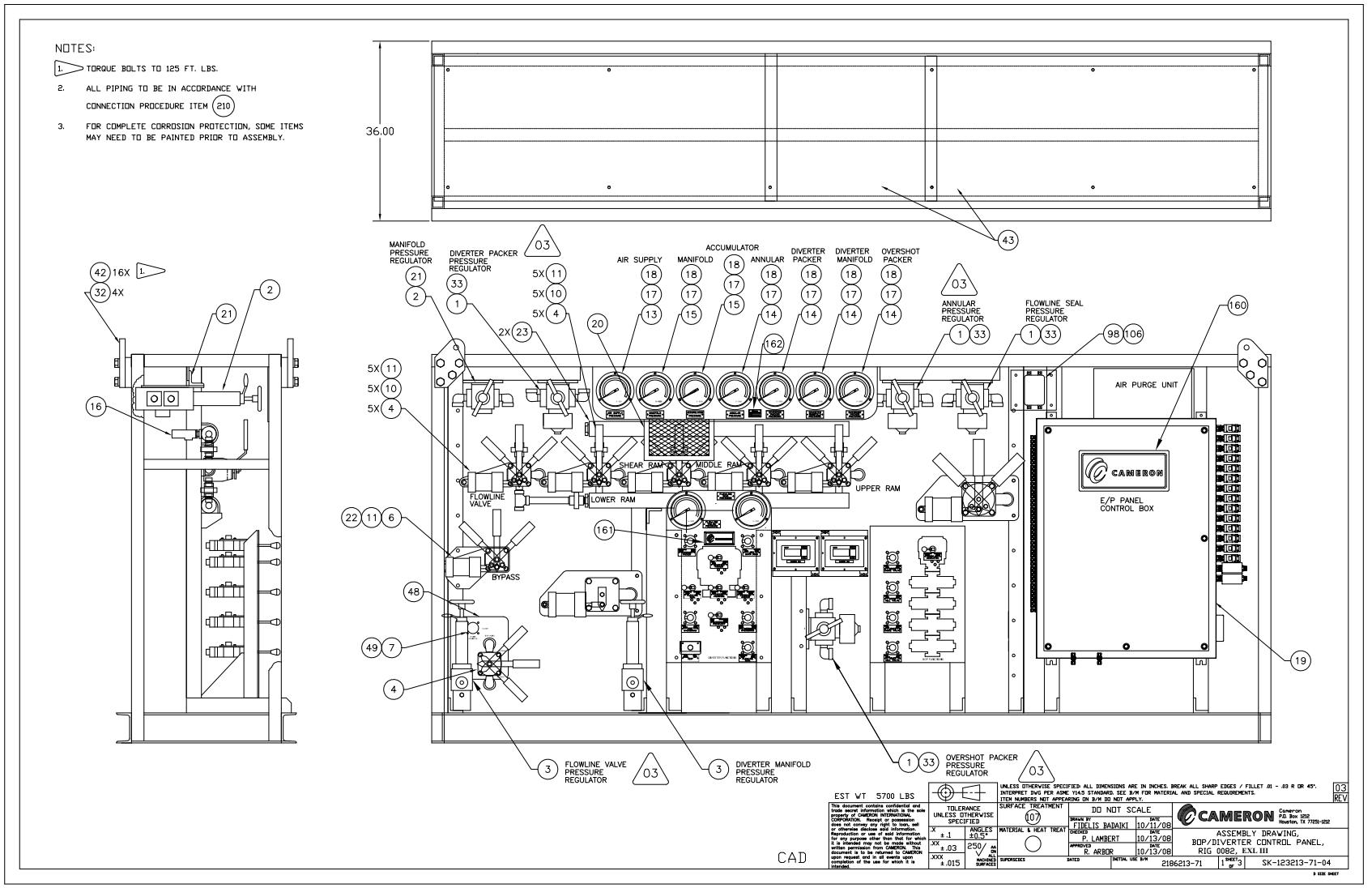
Supersedes

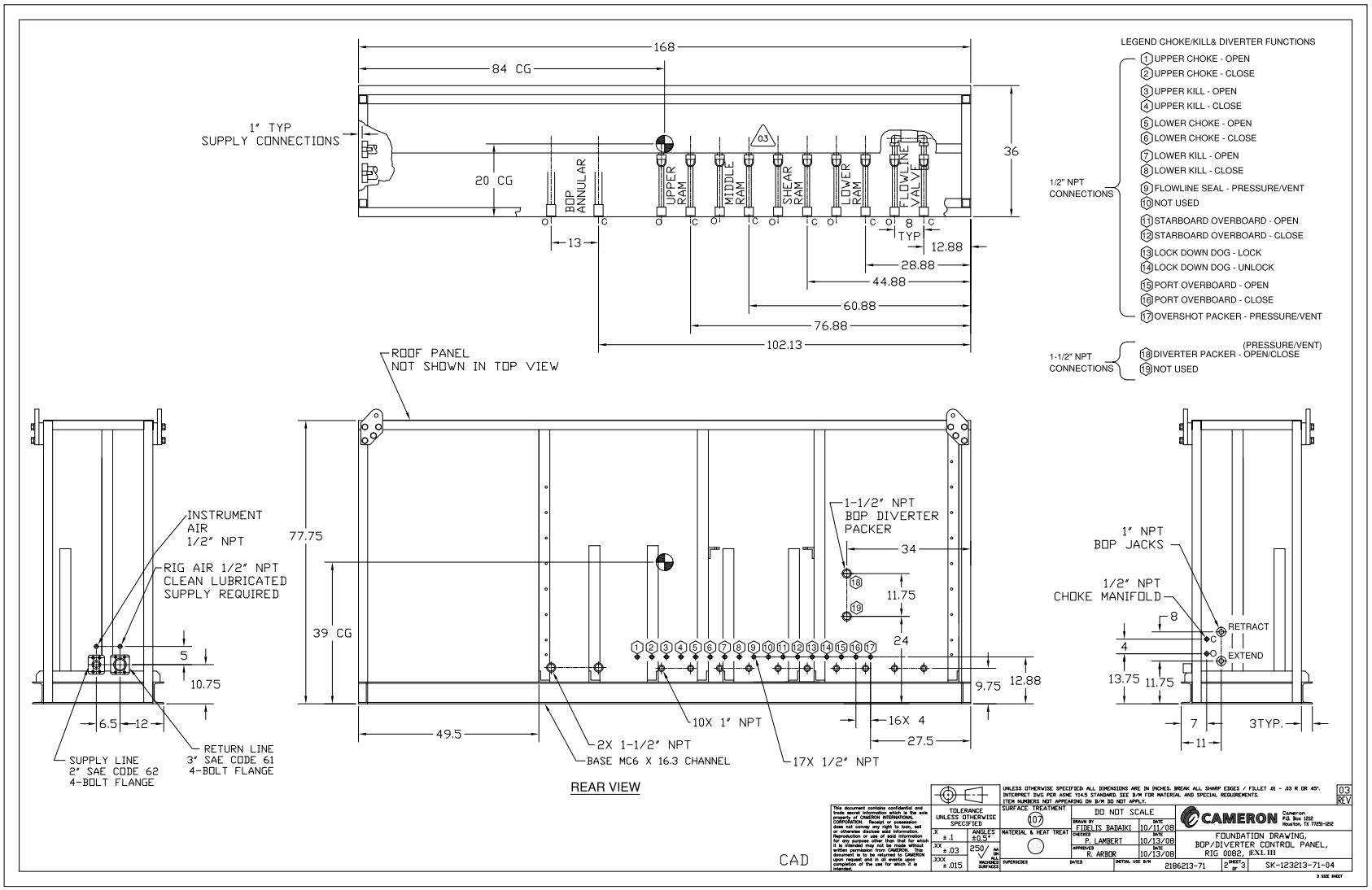
Title: INTERCONNECT CABLE DIAGRAM, ROWAN RIG 0082, EXL III

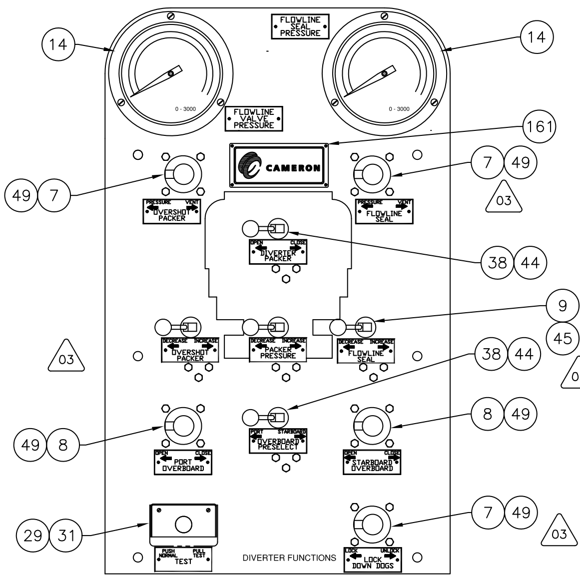
DWG. NO. SK-123200-71-17

B.O.M. NO. 2186200-71

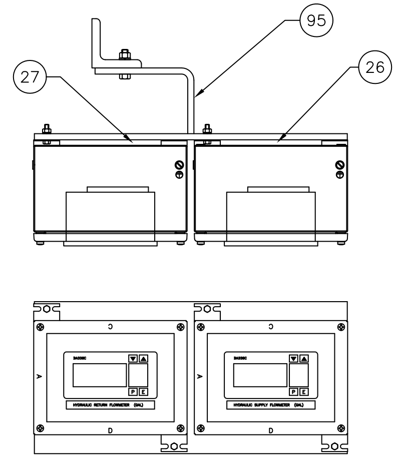
SHEET 2 of 2


NOTES:
1. TORQUE BOLTS TO 125 FT. LBS.
2. ALL PIPING TO BE IN ACCORDANCE WITH CONNECTION PROCEDURE ITEM 210
3. FOR COMPLETE CORROSION PROTECTION, SOME ITEMS MAY NEED TO BE PAINTED PRIOR TO ASSEMBLY.
36.00
MANIFOLD PRESSURE REGULATOR
DIVERTER PACKER PRESSURE REGULATOR
AIR SUPPLY
ACCUMULATOR MANIFOLD
ACCUMULATOR ANNULAR
DIVERTER PACKER
DIVERTER MANIFOLD
OVERSHOT PACKER
ANNULAR PRESSURE REGULATOR
FLOWLINE SEAL PRESSURE REGULATOR
AIR PURGE UNIT
CAMERON
E/P PANEL CONTROL BOX
SHEAR RAM
MIDDLE RAM
UPPER RAM
LOWER RAM
FLOWLINE VALVE
BYPASS
3 FLOWLINE VALVE PRESSURE REGULATOR
3 DIVERTER MANIFOLD PRESSURE REGULATOR
1 33 OVERSHOT PACKER PRESSURE REGULATOR
CAD
EST WT 5700 LBS
DO NOT SCALE
ASSEMBLY DRAWING, BOP/DIVERTER CONTROL PANEL, RIG 0082, EXL III
2186213-71
SK-123213-71-04

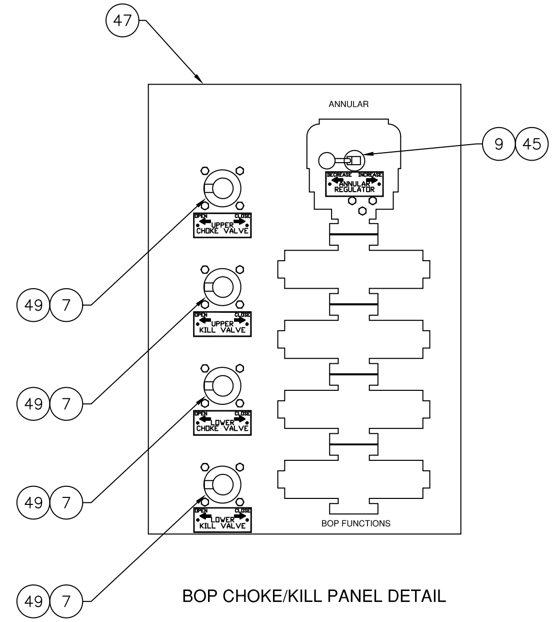

168
84 CG
1" TYP
SUPPLY CONNECTIONS
20 CG
36
BOP ANNULAR
UPPER RAM
MIDDLE RAM
SHEAR RAM
LOWER RAM
FLOWLINE VALVE
03
8 TYP
13
12.88
28.88
44.88
60.88
76.88
102.13
LEGEND CHOKE/KILL& DIVERTER FUNCTIONS
1/2" NPT CONNECTIONS
1 UPPER CHOKE - OPEN
2 UPPER CHOKE - CLOSE
3 UPPER KILL - OPEN
4 UPPER KILL - CLOSE
5 LOWER CHOKE - OPEN
6 LOWER CHOKE - CLOSE
7 LOWER KILL - OPEN
8 LOWER KILL - CLOSE
9 FLOWLINE SEAL - PRESSURE/VENT
10 NOT USED
11 STARBOARD OVERBOARD - OPEN
12 STARBOARD OVERBOARD - CLOSE
13 LOCK DOWN DOG - LOCK
14 LOCK DOWN DOG - UNLOCK
15 PORT OVERBOARD - OPEN
16 PORT OVERBOARD - CLOSE
17 OVERSHOT PACKER - PRESSURE/VENT
1-1/2" NPT CONNECTIONS
(PRESSURE/VENT)
18 DIVERTER PACKER - OPEN/CLOSE
19 NOT USED
ROOF PANEL
NOT SHOWN IN TOP VIEW
INSTRUMENT AIR 1/2" NPT
RIG AIR 1/2" NPT CLEAN LUBRICATED SUPPLY REQUIRED
5
10.75
6.5
12
SUPPLY LINE 2" SAE CODE 62 4-BOLT FLANGE
RETURN LINE 3" SAE CODE 61 4-BOLT FLANGE
77.75
39 CG
1-1/2" NPT BOP DIVERTER PACKER
34
11.75
24
9.75
12.88
49.5
2X 1-1/2" NPT
BASE MC6 X 16.3 CHANNEL
10X 1" NPT
17X 1/2" NPT
16X 4
27.5
REAR VIEW
1" NPT BOP JACKS
1/2" NPT CHOKE MANIFOLD
8
RETRACT
4
EXTEND
13.75
11.75
7
11
3TYP.
CAD
UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 - .03 R OR 45°. INTERPRET DWG PER ASME Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS.
ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.
03 REV
TOLERANCE UNLESS OTHERWISE SPECIFIED
X ±.1
XX ±.03
XXX ±.015
ANGLES ±0.5°
250/ MACHINED SURFACES
SURFACE TREATMENT 107
MATERIAL & HEAT TREAT
DO NOT SCALE
DRAWN BY FIDELIS BADAIKI 10/11/08
CHECKED P. LAMBERT 10/13/08
APPROVED R. ARBOR 10/13/08
CAMERON Cameron P.O. Box 1212 Houston, TX 77251-1212
FOUNDATION DRAWING, BOP/DIVERTER CONTROL PANEL, RIG 0082, EXL III
SUPERSEDES DATED INITIAL USE B/M 2186213-71
SHEET 2 OF 3
SK-123213-71-04
A SIZE SHEET



DIVERTER PANEL DETAIL 03



FLOWMETER DISPLAY DETAIL



BOP CHOKE/KILL PANEL DETAIL

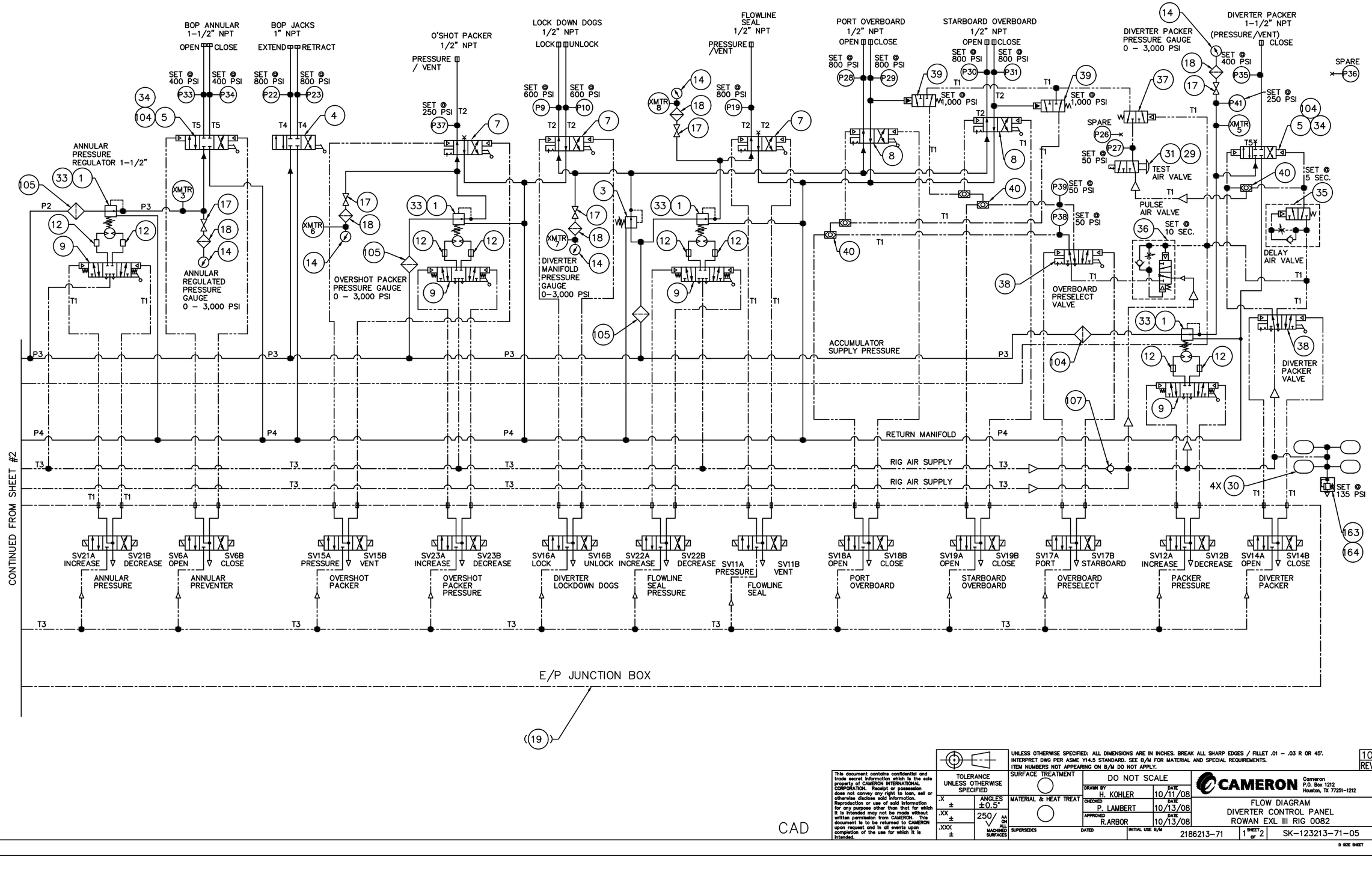
CAD

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 - .03 R OR 45°. INTERPRET DWG PER ASME Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS. ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

03 REV

TOLERANCE UNLESS OTHERWISE SPECIFIED		SURFACE TREATMENT 107	DO NOT SCALE	CAMERON Cameron P.O. Box 1212 Houston, TX 77251-1212
.X ±.1	ANGLES ±0.5°	MATERIAL & HEAT TREAT	DRAWN BY FEDELIS BADAIKI DATE 10/11/08	ASSEMBLY DRAWING, BOP/DIVERTER CONTROL PANEL, RIG 0082, EXL III
.XX ±.03	250 AA ON ALL MACHINED SURFACES		CHECKED P. LAMBERT DATE 10/13/08	
.XXX ±.015			APPROVED R. ARBOR DATE 10/13/08	
SUPERSEDES	DATED	INITIAL USE B/M 2186213-71	SHEET 3 OF 3	SK-123213-71-04

D SIZE SHEET



UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 - .03 R OR 45°. INTERPRET DWG PER ASME Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS. ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

REV 10

TOLERANCE UNLESS OTHERWISE SPECIFIED
.X ± ANGLES ±0.5°
.XX ±
.XXX ±
250 AA ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT

DO NOT SCALE

DRAWN BY	H. KOHLER	DATE 10/11/08
CHECKED	P. LAMBERT	DATE 10/13/08
APPROVED	R.ARBOR	DATE 10/13/08

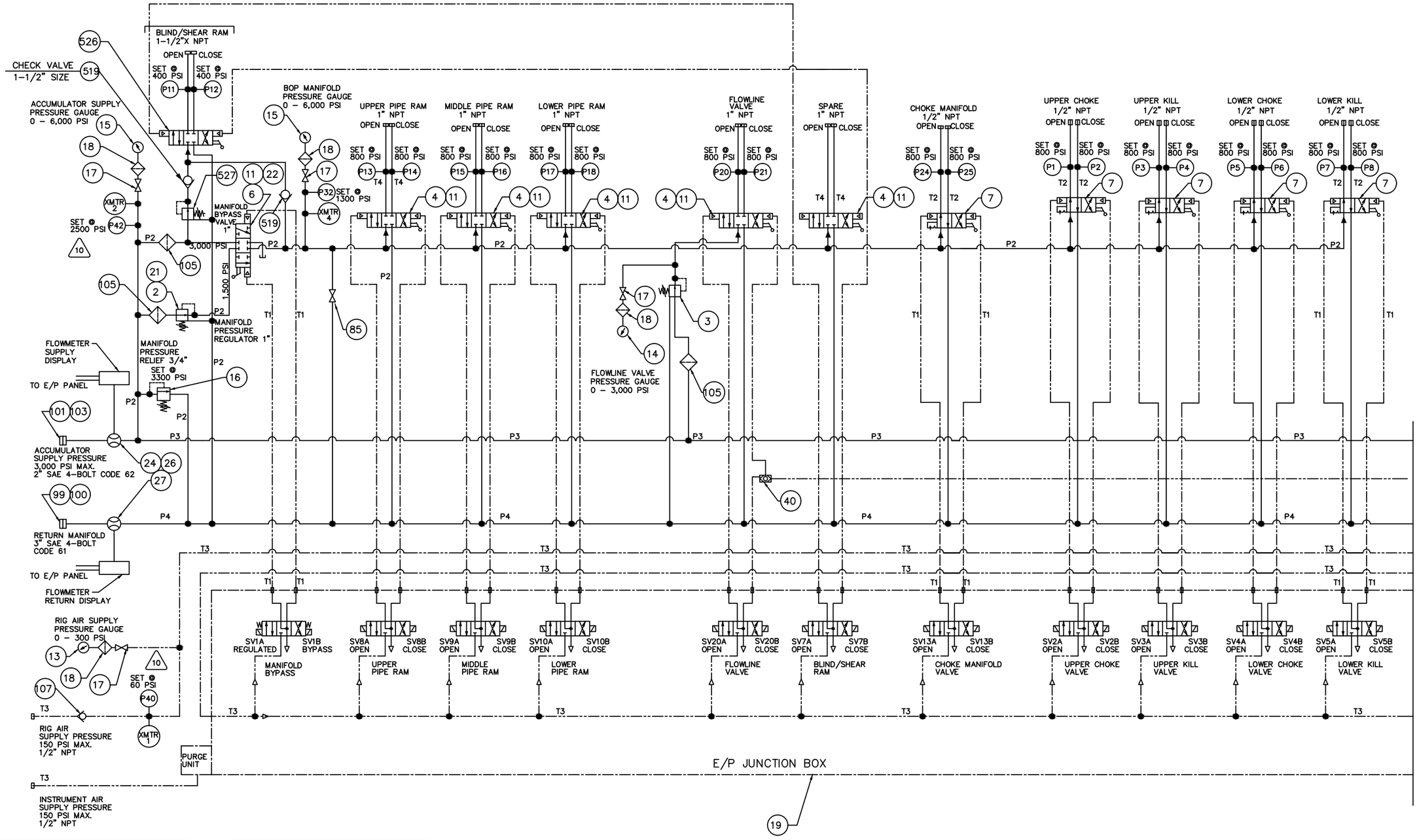
SUPERSEDES DATED INITIAL USE B/M 2186213-71

CAMERON
Cameron
P.O. Box 1212
Houston, TX 77251-1212

FLOW DIAGRAM
DIVERTER CONTROL PANEL
ROWAN EXL III RIG 0082

SHEET 1 OF 2 SK-123213-71-05

D SIZE SHEET



T1	.25"X.035" WALL A213/A269 TUBING
T2	.38"X.035" WALL A213/A269 TUBING
T3	.5"X.049" WALL A213/A269 TUBING
T4	1" X .095 WALL A213/A269 TUBING
T5	1.5" X .120 WALL A213/A269 TUBING

P1	1/2" SCH 80 A106 GRB
P2	1" SCH 160 A106 GRB
P3	1 1/2" SCH 160 A106 GRB
P4	3" SCH 40 A106 GRB
P5	1" SCH 40 A106 GRB

CAD

TOLERANCE UNLESS OTHERWISE SPECIFIED
.X ± ANGLES ±0.5°
.XX ±
.XXX ±
250 AA ON ALL MACHINED SURFACES

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 – .03 R OR 45°.
INTERPRET DWG PER ASME Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS.
ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

10 REV

SURFACE TREATMENT
MATERIAL & HEAT TREAT
DO NOT SCALE

DRAWN BY FIDELIS BADAIKI DATE 10/11/08
CHECKED P. LAMBERT DATE 10/13/08
APPROVED R. ARBOR DATE 10/13/08

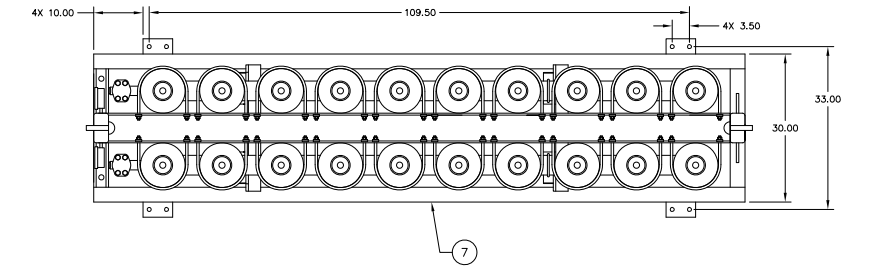
SUPERSEDES DATED INITIAL USE B/M 2186213-71

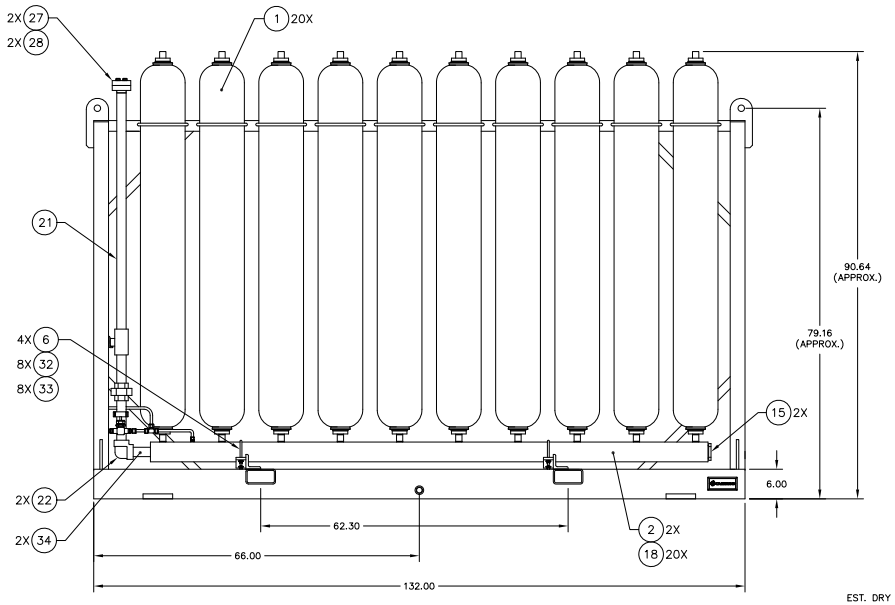
CAMERON Cameron P.O. Box 1212 Houston, TX 77251-1212

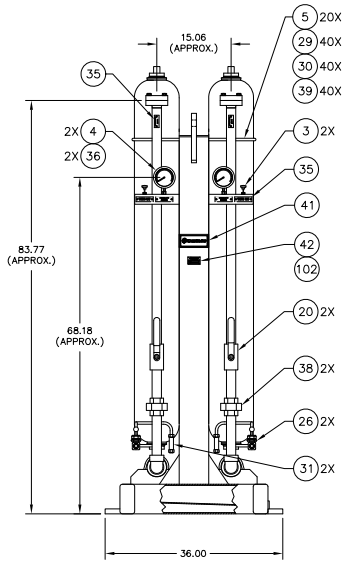
FLOW DIAGRAM
DIVERTER CONTROL PANEL
ROWAN EXL III RIG 0082

2 SHEET OF 2 SK-123213-71-05

D SIZE SHEET







EST. DRY WT. = 7500 LBS
EST. WET WT. = 8161 LBS

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 – .03 R OR 45°. INTERPRET DWG PER ASME Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS. ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

01 REV

CAD

TOLERANCE UNLESS OTHERWISE SPECIFIED	X ± ANGLES ±0.5° / XX ± 250 / XXX ± AA MACHINED SURFACES
SURFACE TREATMENT	107
MATERIAL & HEAT TREAT	
SUPERSEDES	
DO NOT SCALE	
DRAWN BY	FIDELIS BADAIKI 10/11/08
CHECKED	P. LAMBERT 10/13/08
APPROVED	RAY ARBOR 10/13/08
DATED	
INITIAL USE B/M	2186214-71

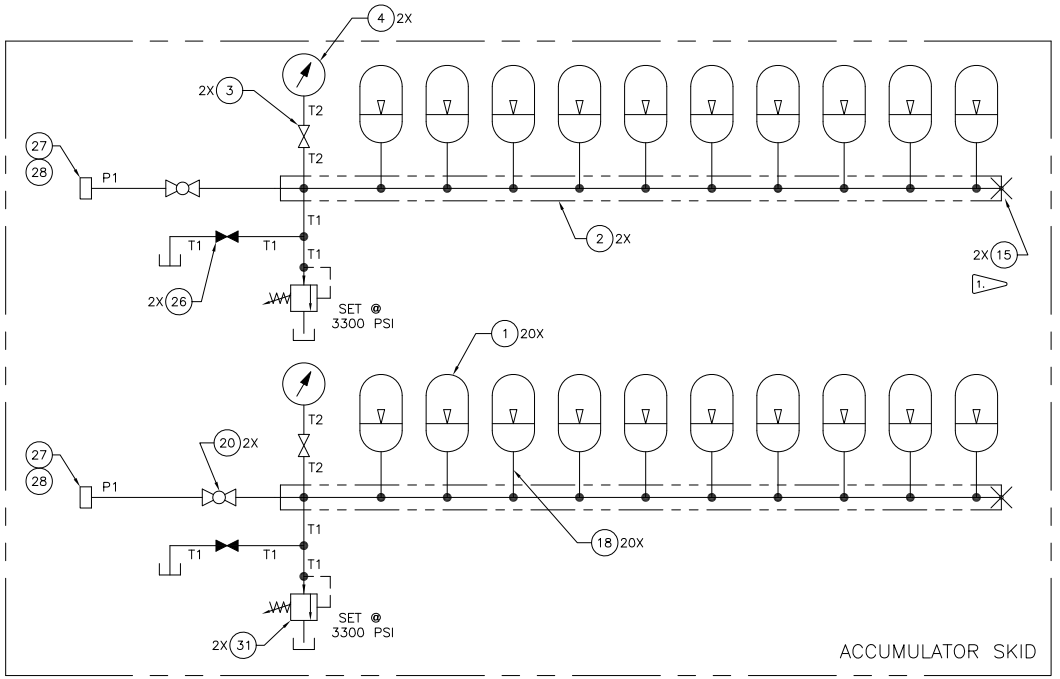
CAMERON Cameron P.O. Box 1212 Houston, TX 77251-1212

ASSY, ACCUMULTOR RACK, TWENTY FIFTEEN GALLON 3000 PSI ACCUMULATORS RIG 0082, EXL III

SK-123214-71-04

SHEET 1 OF 1

T1	.500" X .065" WALL, 316 SST TUBING	24
T2	.250" X .035" WALL, 316 SST TUBING	25
P1	PIPE, 1-1/2" SCH 160, A106 GR B	21



NOTE:

1. PRECHARGE ACCUMULATORS TO 2000 PSI WITH DRY NITROGEN.

CAD

TOLERANCE UNLESS OTHERWISE SPECIFIED
X ±
XX ±
XXX ±
ANGLES ±0.5°
250/ MACHINED SURFACES

UNLESS OTHERWISE SPECIFIED ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 - .03 R OR 45°. INTERPRET DWG PER ASME Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS. ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

SURFACE TREATMENT
MATERIAL & HEAT TREAT

DO NOT SCALE

DRAWN BY	FIDELIS BADAIKI	DATE 10/11/08
CHECKED	P. LAMBERT	DATE 10/13/08
APPROVED	E. HARRIS	DATE 10/13/08

CAMERON Cameron P.O. Box 1212 Houston, TX 77251-1212

F/D, ACCUMULATOR RACK, TWENTY, FIFTEEN GALLON 3K PSI ACCUMULATORS
RIG 0082, EXL III

SUPERSEDES | DATED | INITIAL USE B/M 2186214-71 | SHEET 1 OF 1 | SK-123214-71-05

REV 01

NITROGEN PRECHARGE = 2000 PSI

INTERSKID CONNECTION PIPING BY CUSTOMER

10 – 15 GAL ACCUMULATORS

10 – 15 GAL ACCUMULATORS

10 – 15 GAL ACCUMULATORS

10 – 15 GAL ACCUMULATORS

10 – 15 GAL ACCUMULATORS

10 – 15 GAL ACCUMULATORS

10 – 15 GAL ACCUMULATORS

ELECTRIC POWER SUPPLY FROM RIG GENERATOR 460/480 V, 60 Hz, 3 Ph CENTRIFUGAL PUMP

ELECTRIC POWER SUPPLY FROM "EMERGENCY BUS" 460/480 V, 60 Hz, 3 Ph PUMP #2

ELECTRIC POWER SUPPLY FROM RIG GENERATOR 460/480 V, 60 Hz, 3 Ph PUMP #1

HYDRAULIC FLUID RETURN BACK TO HPU

HYDRAULIC SUPPLY PRESSURE

2" SAE CODE 62 FLANGE, 2" NPT

CABLE CONNECTION TO # 2 PUMP

CABLE CONNECTION TO # 1 PUMP

FLUID RETURN LINE

HYDRAULIC FLUID RETURN LINE FROM B.O.P. & DIVERTER CONTROL VALVES MANIFOLD, PRESS. GAUGES, REGULATORS & RELIEF VALVES,

BREATHER

BREATHER–FILTER

MANHOLE

HYDRAULIC FLUID RESERVOIR MAX. CAPACITY 1100 US GALLONS

LOW FLUID LEVEL SWITCH VALVE ELECTRIC AND MECHANICAL INDICATOR

1"NPT RESERVOIR DRAIN VALVE

TRIPLEX PUMP # 2

TRIPLEX PUMP # 1

MOTOR STARTER # 2

MOTOR STARTER # 1

MOTOR STARTERS SELECTOR SWITCH ENCLOSURE

PUMP #2 #1

MOTOR STARTER

CENTRIFUGAL PUMP MANIFOLD

ACCUMULATOR 1 QUART PRECHARGE TO 1740 PSI

ACCUMULATOR 1 QUART PRECHARGE TO 1740 PSI

CHECK VALVE 1–1/2" SIZE

CHECK VALVE 1–1/2" SIZE

RELIEF VALVE 1–1/2" SIZE (SELF–RESETTING) SET @ 3,300 PSI

RELIEF VALVE 1–1/2" SIZE (SELF–RESETTING) SET @ 3,300 PSI

BYPASS MODE INDICATION

BALL VALVE 2–WAY 1–1/2" SIZE

#2 ELECTRIC PRESSURE SWITCH SET @ STOP – 3000 PSI RESTART– 2600 PSI

#1 ELECTRIC PRESSURE SWITCH SET @ STOP – 3000 PSI RESTART– 2700 PSI

04

HPU INTERFACE JBOX

2 PUMP RUNNING INDICATION

1 PUMP RUNNING INDICATION

RESERVOIR LOW FLUID LEVEL INDICATION

24 VDC POWER SUPPLY AND SIGNAL PICK–UP FOR FOLLOWING:
LOW FLUID RESERVOIR LEVEL
1 TRIPLEX PUMP RUNNING
2 TRIPLEX PUMP RUNNING

HYDRAULIC FLUID RETURN BACK TO HPU

BOP / DIVERTER HYDRAULIC CONTROL MANIFOLD

PLC E / P J. BOX

LEGEND:

◄—	HYDRAULIC PRESSURE FLUID LINE
—E—	ELECTRIC CONNECTING LINE
T1	TUBING, .25"OD x .035" WALL, A213/A269 S.S.
T2	TUBING, .38"OD x .035" WALL, A213/A269 S.S.
T3	TUBING, .50"OD x .049" WALL, A213/A269 S.S.
T4	TUBING, 1.0"OD x .065" WALL,A213/A269 S.S 316,
P1	PIPE, 1.25" SCH. 80, A106 GR. B, STEEL
P2	PIPE, 1.50" SCH. 80, A106 GR. B, STEEL
P3	PIPE, 3.00" SCH. 80, A106 GR. B, STEEL
P4	PIPE, 1.50" SCH. 160, A106 GR. B, STEEL
H1	HOSE–SUCTION, 3" I.D., 150 PSI W.P.,

HPU–HYDRAULIC POWER UNIT

CAD

TOLERANCE UNLESS OTHERWISE SPECIFIED
.X ± ANGLES ±0.5°
.XX ±
.XXX ±
250 √ AA ON ALL MACHINED SURFACES

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 – .03 R OR 45°. INTERPRET DWG PER ASME Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS. ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

04 REV

SURFACE TREATMENT

MATERIAL & HEAT TREAT

DO NOT SCALE

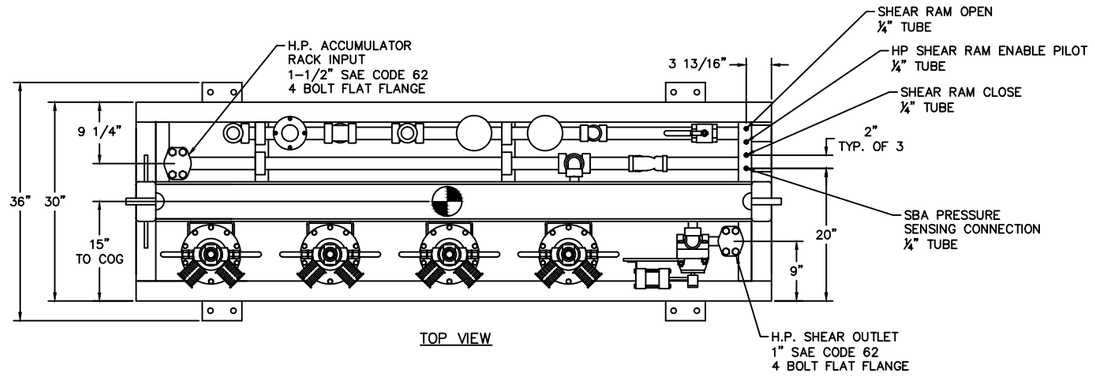
DRAWN BY	FIDELIS BADAIKI	DATE 10/11/08
CHECKED	P. LAMBERT	DATE 10/13/08
APPROVED	E. HARRIS	DATE 10/13/08

CAMERON
Cameron
P.O. Box 1212
Houston, TX 77251–1212

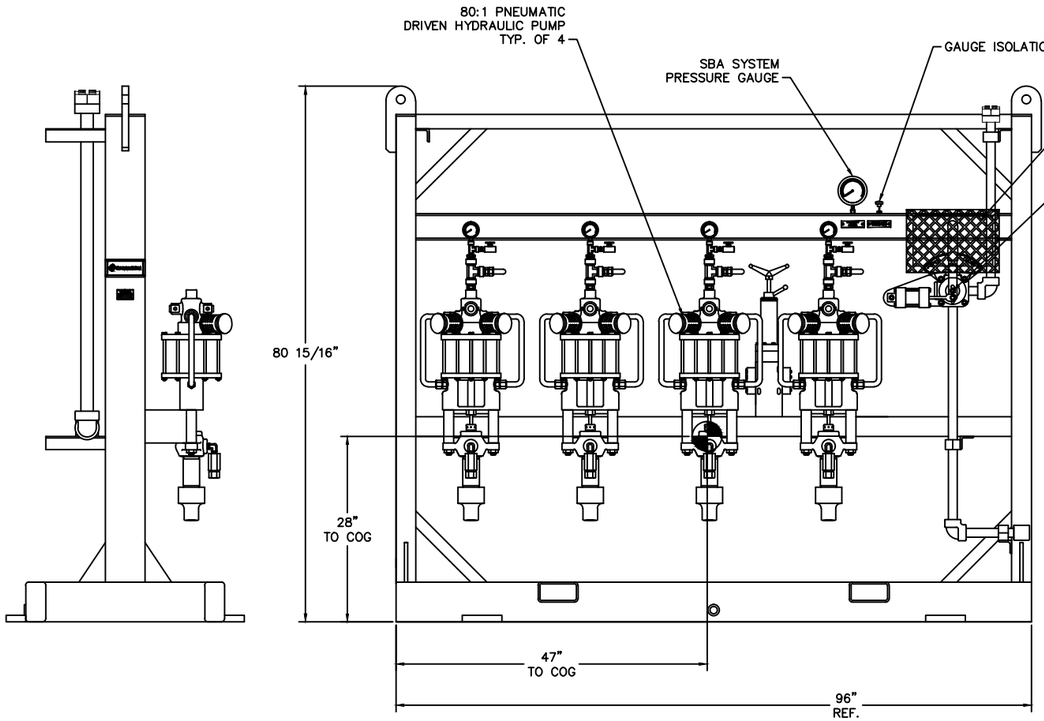
F/D, HYDRAULIC POWER UNIT, 2X 100 HP TRIPLEX PUMPS, 1100 GAL. RESERVOIR
ROWAN EXL III RIG 0082

SUPERSEDES | DATED | INITIAL USE B/M 2186215–71 | SHEET 1 OF 1 | SK–123215–71–05

D SIZE SHEET

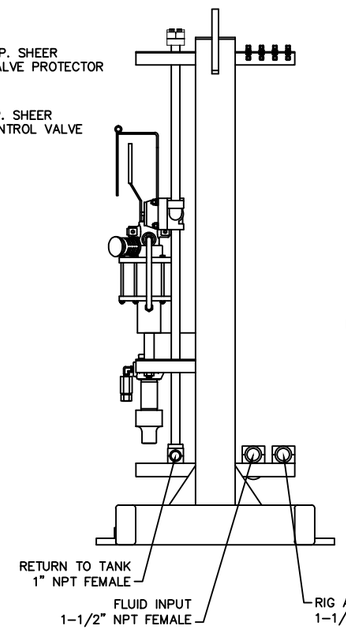


TOP VIEW

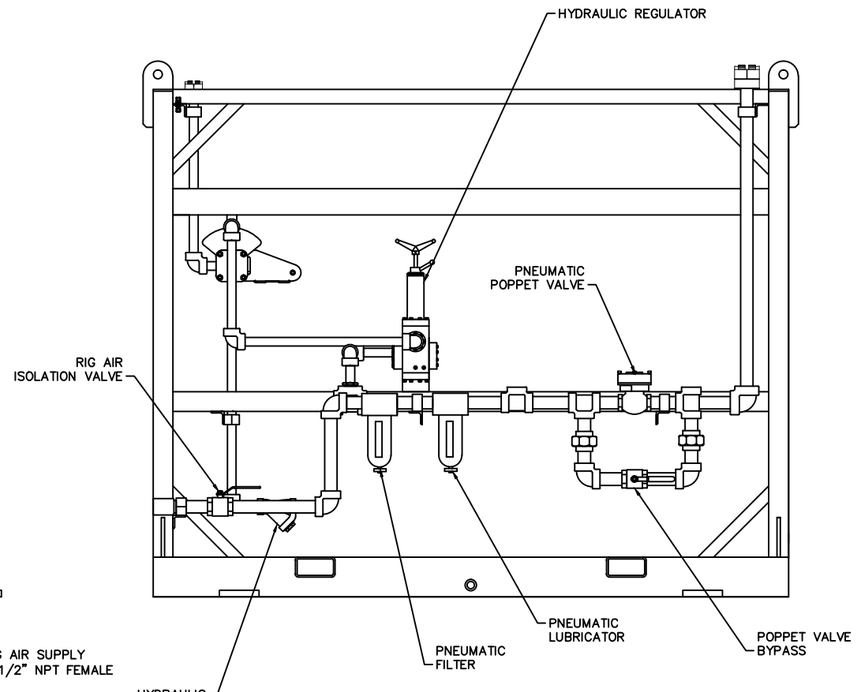


LEFT SIDE VIEW

FRONT VIEW



RIGHT SIDE VIEW



REAR VIEW

REFERENCE STELLA MARIS DRAWING CAM–913–SBA–05

ESTIMATED WEIGHT:
DRY 1,850 LB
WET 1,900 LB

CAD

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 – .03 R OR 45°.
INTERPRET DWG PER ANSI Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS.
ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

02 REV

TOLERANCE UNLESS OTHERMISE SPECIFIED
.X ±.1
.XX ±.03
.XXX ±.015
ANGLES ±5°
250 AA ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

DO NOT SCALE

DRAWN BY	FIDELIS BADAIKI	DATE 06/03/11
CHECKED	BILL JONES	DATE 06/03/11
APPROVED	RAY ARBOR	DATE 06/03/11

SUPERSEDES | DATED | INITIAL USE B/M

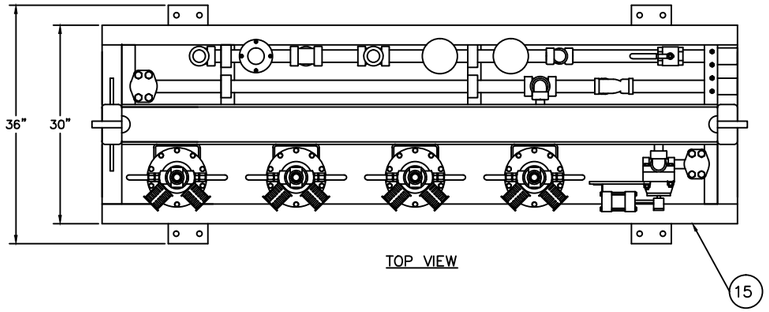
Cooper Cameron Corp.
Cameron Division
P.O. Box 1212
Houston, TX 77251-1212

G/A, 5000 PSI, MOTOR–PUMP ASSEMBLY
ROWAN EXL III RIG 0082

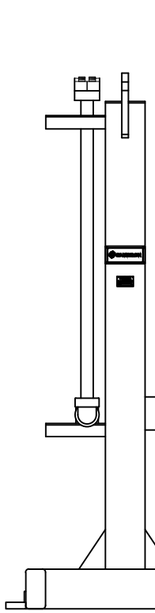
2184208-48 | SHEET 1 OF 1 | SK–124208–48–03

COT-21-K

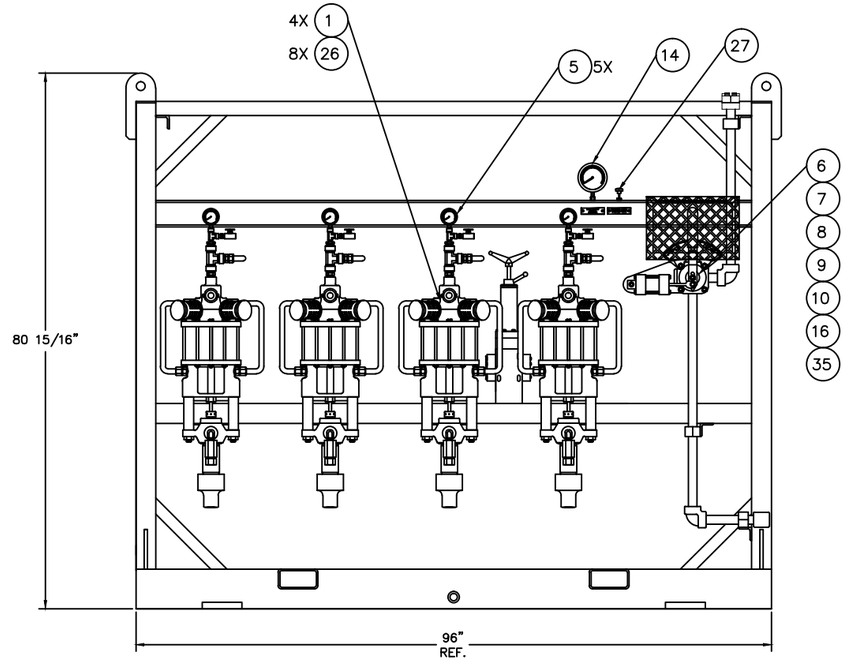
D SIZE SHEET SMH



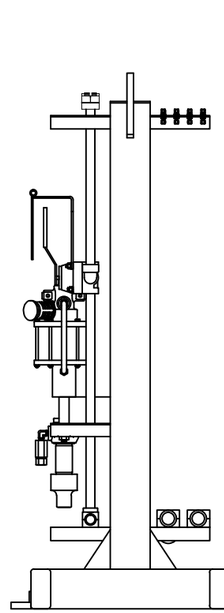
TOP VIEW



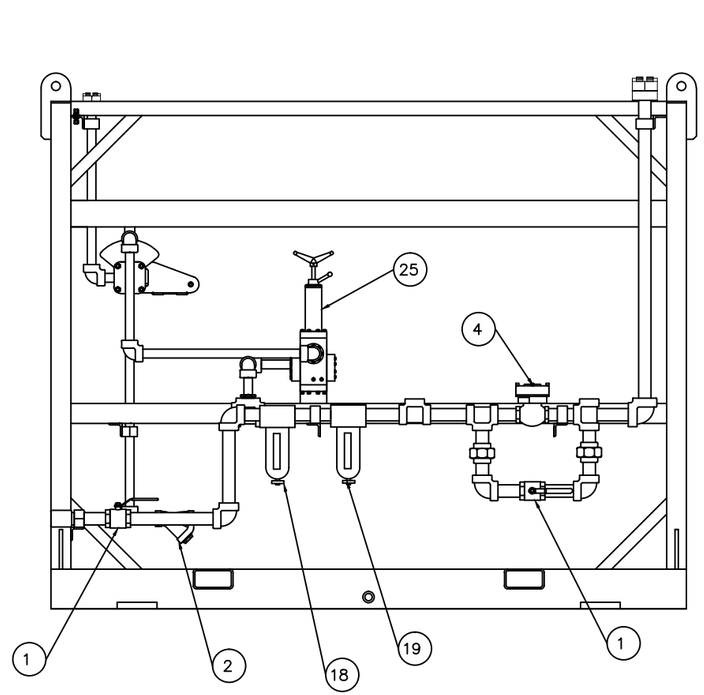
LEFT SIDE VIEW



FRONT VIEW



RIGHT SIDE VIEW



REAR VIEW

REFERENCE STELLA MARIS DRAWING CAM-913-SBA-06

ESTIMATED WEIGHT:
DRY 1,850 LB
WET 1,900 LB

CAD

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 - .03 R OR 45°.
INTERPRET DWG PER ANSI Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS.
ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

02 REV

TOLERANCE UNLESS OTHERWISE SPECIFIED
.X ±.1
.XX ±.03
.XXX ±.015
ANGLES ±5°
250 AA ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT

DO NOT SCALE

DRAWN BY	HARRY KOHLER	DATE 06/03/11
CHECKED	BILL JONES	DATE 06/03/11
APPROVED	RAY ARBOR	DATE 06/03/11

SUPERSEDES DATED INITIAL USE B/M 2184208-48

Cooper Cameron Corp.
Cameron Division
P.O. Box 1212
Houston, TX 77251-1212

ASSEMBLY, MOTOR-PUMP,
5,000 PSI
ROWAN EXL III RIG 0082

SHEET 1 OF 1 SK-124208-48-04

COT-21-K

D SIZE SHEET SMH

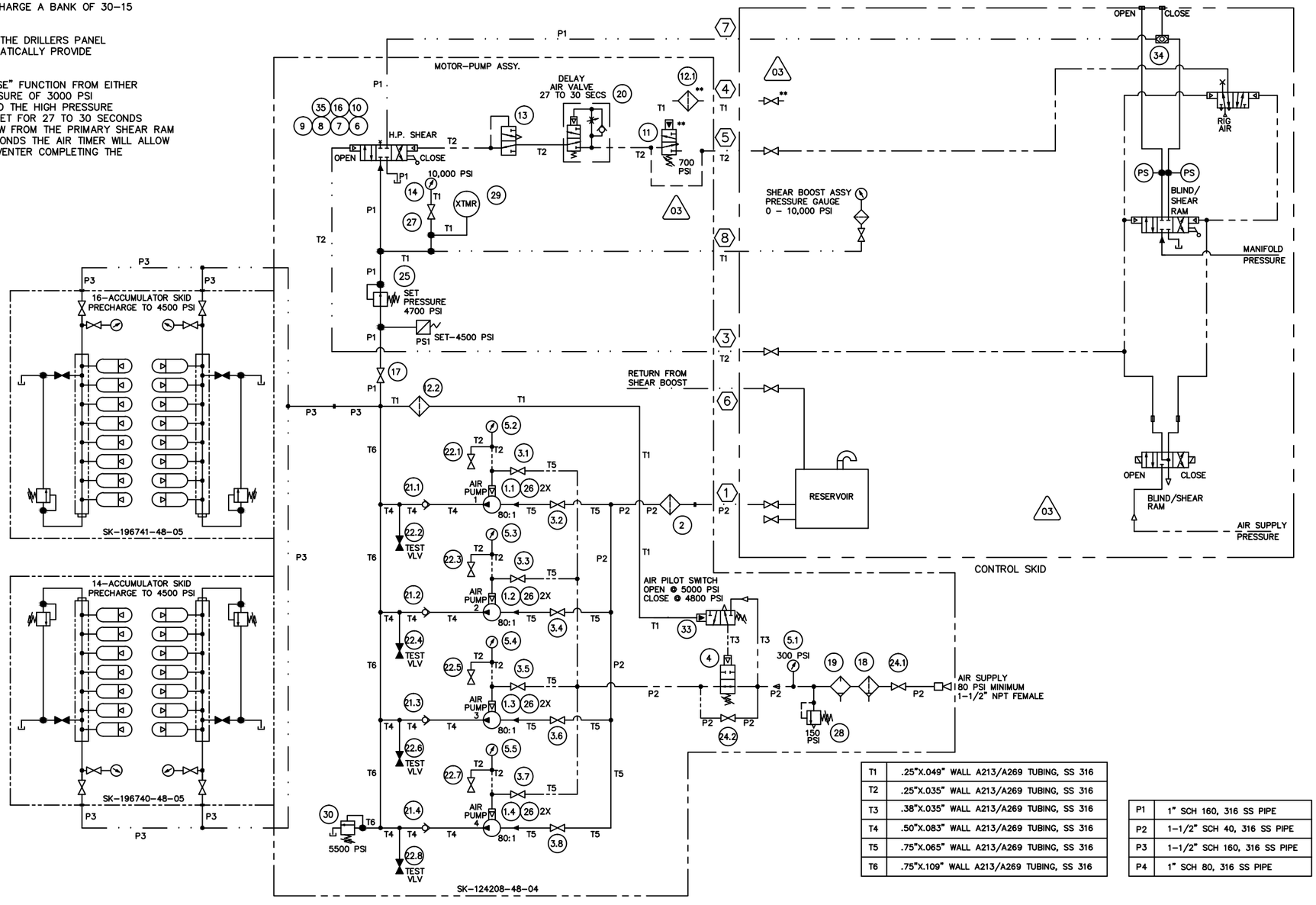
HIGH PRESSURE SHEAR BOOST SYSTEM OPERATION

THE PURPOSE OF THE SYSTEM IS TO PROVIDE 5000 PSI PRESSURE ASSIST TO SHEAR THE DRILL PIPE.

THE SYSTEM INCLUDES FOUR 80:1 RATIO AIR PUMPS THAT WILL CHARGE A BANK OF 30–15 GALLON ACCUMULATORS TO 5000 PSI.

03 1) PRESSING THE BLIND SHEAR RAM "CLOSE" BUTTON ON EITHER THE DRILLERS PANEL OR THE TOOLPUSHERS PANEL WILL ALLOW THE SYSTEM TO AUTOMATICALLY PROVIDE 5000 PSI TO THE SHEAR RAM.

2) IF NEEDED TO SHEAR; EXECUTE THE BLIND/SHEAR RAM "CLOSE" FUNCTION FROM EITHER PANEL. THE FUNCTION VALVE WILL SHIFT SENDING NORMAL PRESSURE OF 3000 PSI TO THE SHEAR RAM. AT THE SAME TIME AN AIR SIGNAL GOES TO THE HIGH PRESSURE SHEAR FUNCTION VALVE. THIS SIGNAL IS STOPPED BY A TIMER SET FOR 27 TO 30 SECONDS PREVENTING THE VALVE FROM SHIFTING ALLOWING, FLUID TO FLOW FROM THE PRIMARY SHEAR RAM FUNCTION VALVE FOR 27 TO 30 SECONDS. AFTER 27 TO 30 SECONDS THE AIR TIMER WILL ALLOW THE H.P. SHEAR VALVE TO SHIFT SENDING 5000 PSI TO THE PREVENTER COMPLETING THE SHEARING OF THE DRILL PIPE.



T1	.25"X.049" WALL A213/A269 TUBING, SS 316
T2	.25"X.035" WALL A213/A269 TUBING, SS 316
T3	.38"X.035" WALL A213/A269 TUBING, SS 316
T4	.50"X.083" WALL A213/A269 TUBING, SS 316
T5	.75"X.065" WALL A213/A269 TUBING, SS 316
T6	.75"X.109" WALL A213/A269 TUBING, SS 316

P1	1" SCH 160, 316 SS PIPE
P2	1–1/2" SCH 40, 316 SS PIPE
P3	1–1/2" SCH 160, 316 SS PIPE
P4	1" SCH 80, 316 SS PIPE

REFERENCE STELLA MARIS DRAWING CAM–913–SBA–02

NOTES:
CUSTOMER SUPPLIED PIPING ___ . . ___ . . ___

** ITEM PRESENT ON SKID HOWEVER CURRENTLY NOT BEING USED.

CAD

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 – .03 R OR 45°. INTERPRET DWG PER ASME Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS. ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

03 REV

TOLERANCE UNLESS OTHERWISE SPECIFIED
.X ±
.XX ±
.XXX ±
ANGLES ±0.5°
250/ AA ON ALL MACHINED SURFACES

SURFACE TREATMENT
MATERIAL & HEAT TREAT

DO NOT SCALE

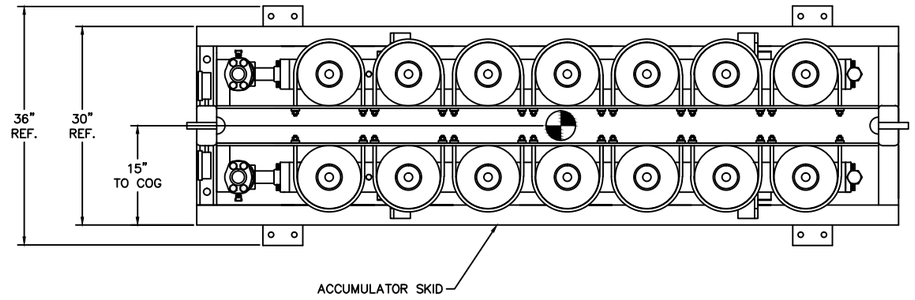
DRAWN BY	A. SIMPSON	DATE 06/02/11
CHECKED	P. YANG	DATE 06/02/11
APPROVED	R. ARBOR	DATE 06/03/11

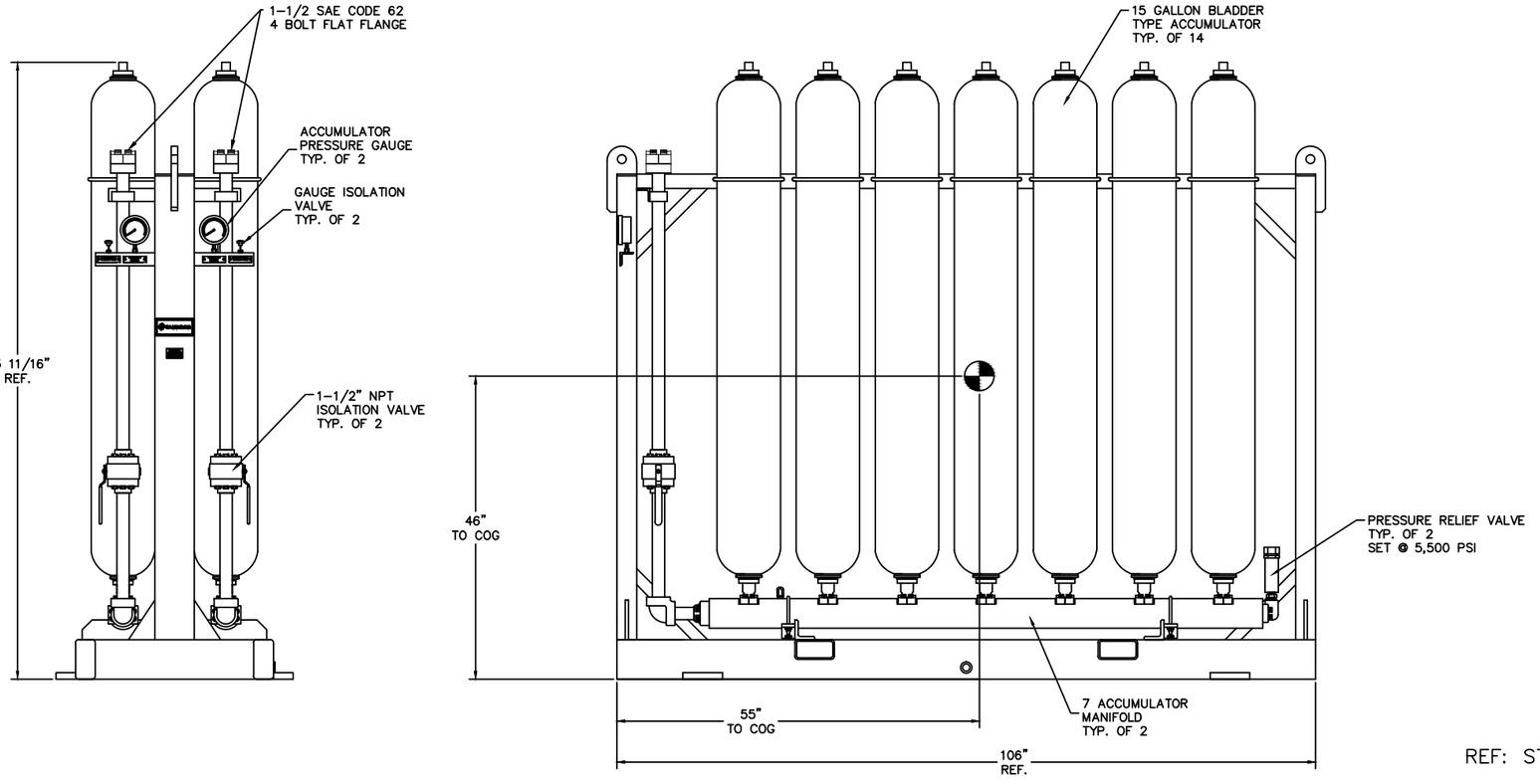
CAMERON Cameron P.O. Box 1212 Houston, TX 77251–1212

F/D, 5,000 PSI, THIRTY (30) ACCUMULATOR SHEAR BOOST ROWAN EXL III RIG 0082

SUPERSEDES | DATED | INITIAL USE B/M 2184208–48 | SHEET 1 OF 1 | SK–124208–48–05

D SIZE SHEET





REF: STELLA MARIS # CAM-913-ACC14-05

ESTIMATED WEIGHT:
DRY 10,070 LB
WET 10,406 LB

CAD

TOLERANCE UNLESS OTHERWISE SPECIFIED
.X ±.1 ANGLES ±5°
.XX ±.03
.XXX ±.015
250 AA OR ALL MACHINED SURFACES

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 - .03 R OR 45°.
INTERPRET DWG PER ANSI Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS.
ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

02 REV

SURFACE TREATMENT
MATERIAL & HEAT TREAT
DO NOT SCALE

DRAWN BY	FIDELIS BADAIKI	DATE 06/03/11
CHECKED	BILL JONES	DATE 06/03/11
APPROVED	RAY ARBOR	DATE 06/03/11

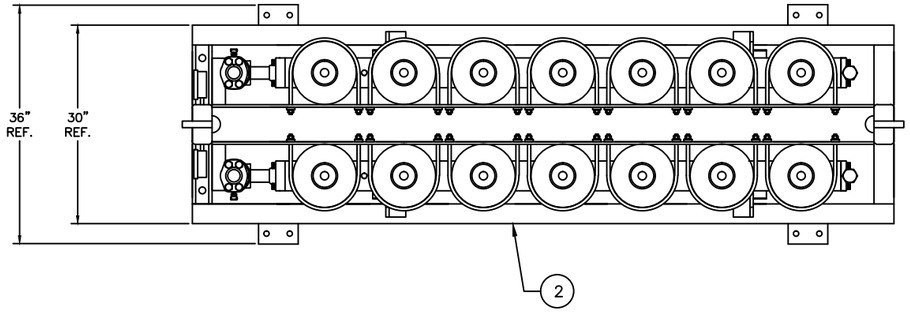
CAMERON
Cooper Cameron Corp.
Cameron Division
P.O. Box 1212
Houston, TX 77251-1212

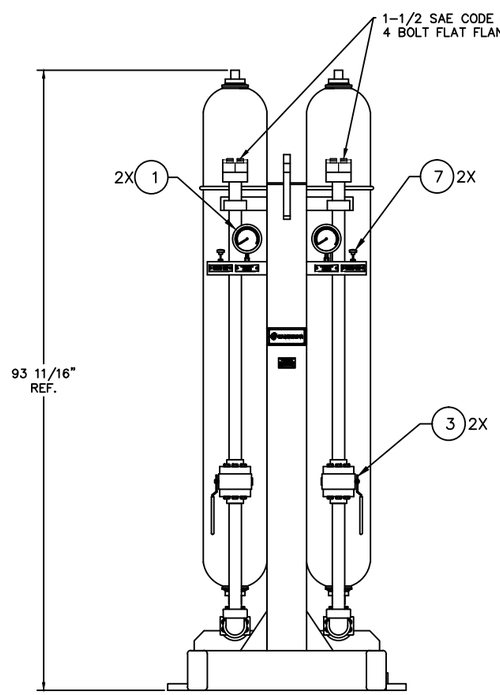
G/A, ACCUMULATOR RACK,
14-15 GAL, 5000 PSI
ROWAN EXL III RIG 0082

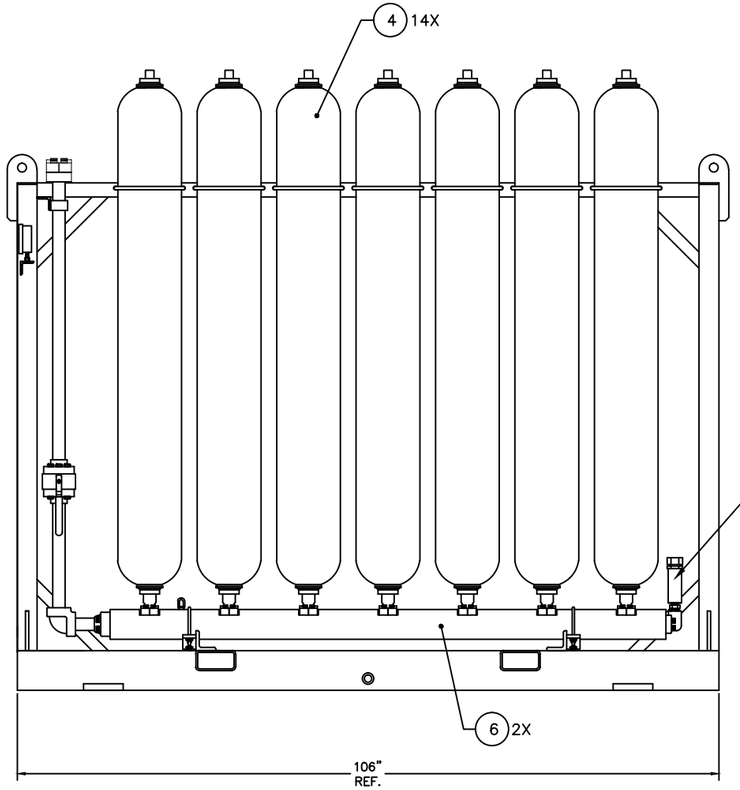
SUPERSEDES | DATED | INITIAL USE B/M 2186214-48-01 | SHEET 1 OF 1 | SK-196740-48-03

COT-21-K

D SIZE SHEET SMH







REF: STELLA MARIS # CAM-913-ACC14-06

ESTIMATED WEIGHT:
DRY 10,070 LB
WET 10,406 LB

CAD

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 - .03 R OR 45°.
INTERPRET DWG PER ANSI Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS.
ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

02 REV

TOLERANCE UNLESS OTHERWISE SPECIFIED
.X ±.1 ANGLES ±5°
.XX ±.03 250 AA ON ALL MACHINED SURFACES
.XXX ±.015

SURFACE TREATMENT
MATERIAL & HEAT TREAT

DO NOT SCALE

DRAWN BY	FIDELIS BADAIKI	DATE 06/03/11
CHECKED	BILL JONES	DATE 06/03/11
APPROVED	RAY ARBOR	DATE 06/03/11

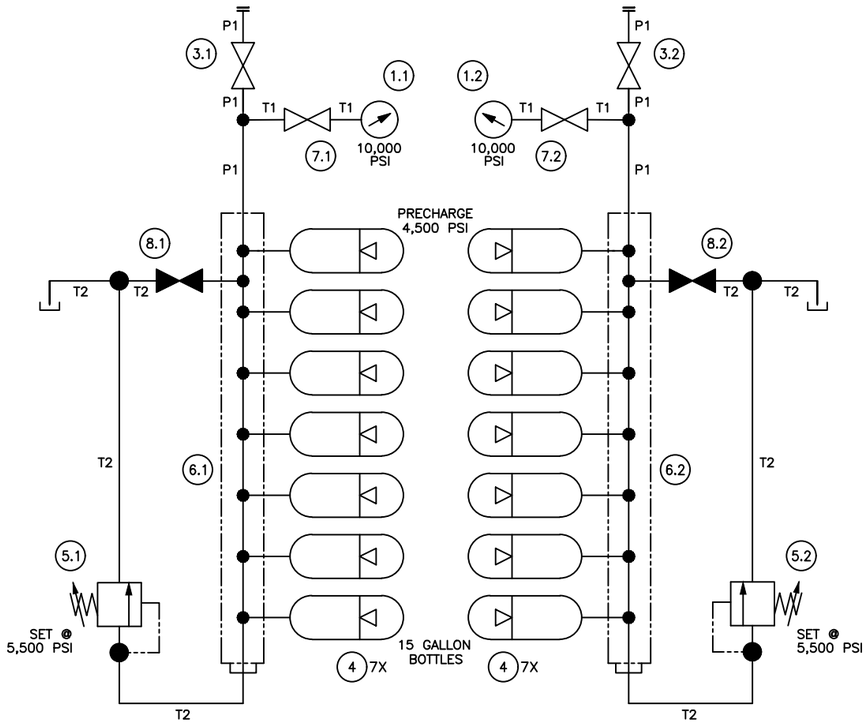
CAMERON
Cooper Cameron Corp.
Cameron Division
P.O. Box 1212
Houston, TX 77251-1212

ASSEMBLY, ACCUMULATOR RACK,
14-15 GAL, 5000 PSI
ROWAN EXL III RIG 0082

SUPERSEDES | DATED | INITIAL USE B/M: 2186214-48-01 | SHEET 1 OF 1 | SK-196740-48-04

D SIZE SHEET SWH

COT-21-K



T1	.25"X.049" WALL A213/A269 TUBING, SS 316
T2	.50"X.083" WALL A213/A269 TUBING, SS 316

P1	1-1/2" SCH 160, 316 SS PIPE

REFERENCE STELLA MARIS DRAWING CAM-913-ACC14-02

CAD

TOLERANCE UNLESS OTHERWISE SPECIFIED
.X ± ANGLES ±0.5°
.XX ±
.XXX ±
250 AA OR ALL MACHINED SURFACES

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 - .03 R OR 45°.
INTERPRET DWG PER ASME Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS.
ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

02 REV

SURFACE TREATMENT
MATERIAL & HEAT TREAT
DO NOT SCALE

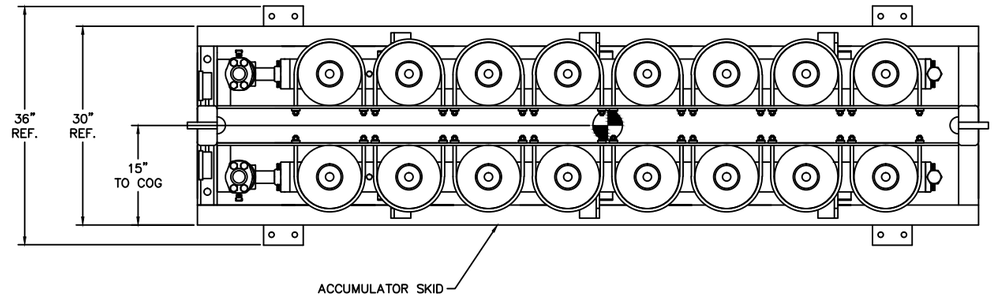
DRAWN BY	A. SIMPSON	DATE 06/02/11
CHECKED	P. YANG	DATE 06/02/11
APPROVED	R. ARBOR	DATE 06/03/11

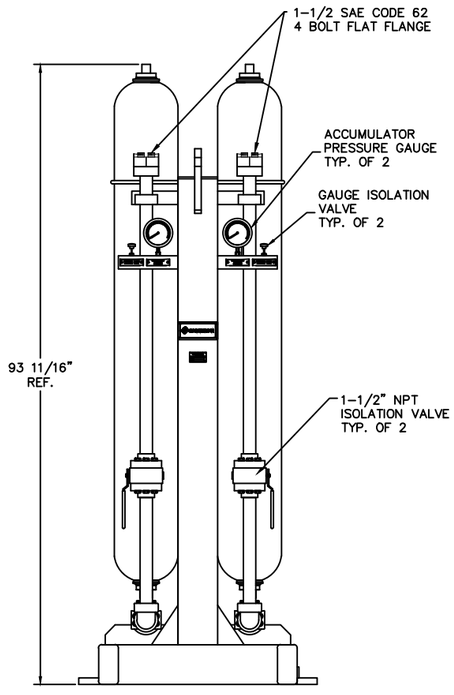
CAMERON
Cameron
P.O. Box 1212
Houston, TX 77251-1212

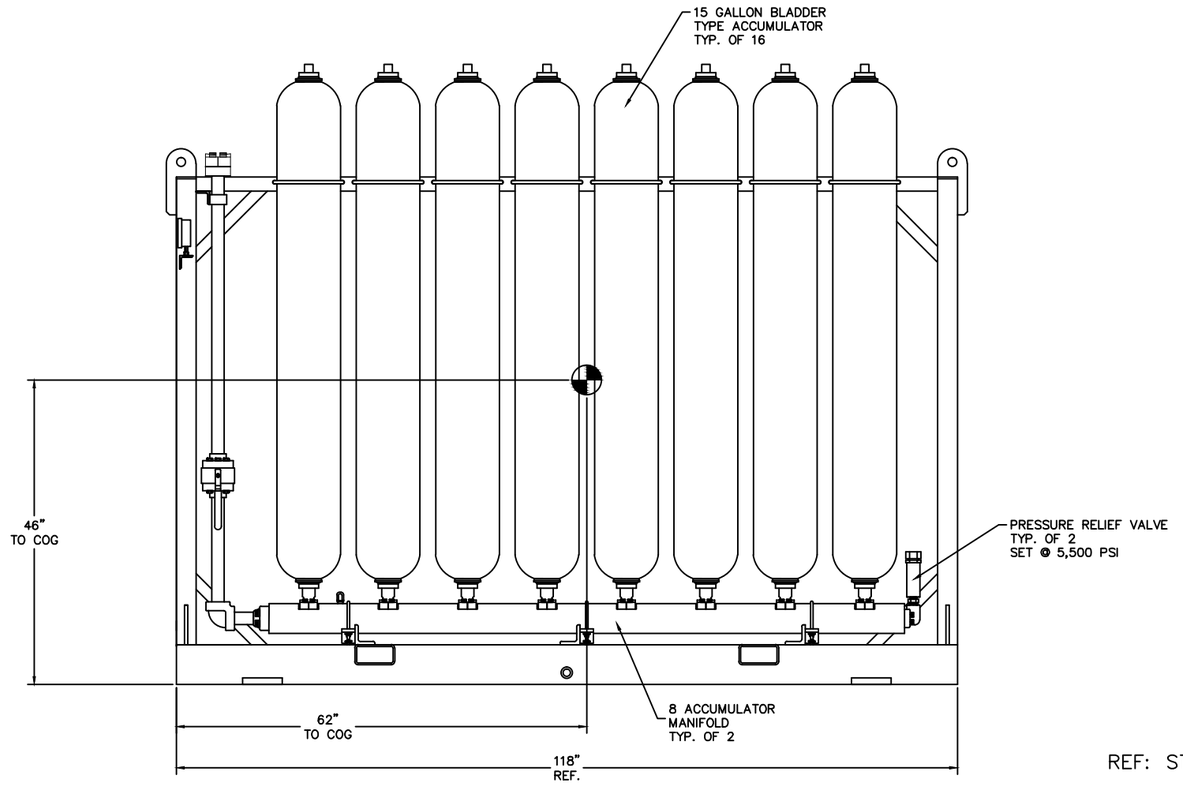
F/D, ACCUMULATOR RACK, 14
15 GALLON, 5K PSI ACCUMULATORS
ROWAN EXL III RIG 0082

SUPERSEDES | DATED | INITIAL USE B/M 2186214-48-01 | SHEET 1 OF 1 | SK-196740-48-05

D SIZE SHEET







REF: STELLA MARIS # CAM-913-ACC16-05

ESTIMATED WEIGHT:
DRY 11,375 LB
WET 11,759 LB

CAD

TOLERANCE UNLESS OTHERWISE SPECIFIED
.X ±.1 ANGLES ±5°
.XX ±.03
.XXX ±.015
250 AA ON ALL MACHINED SURFACES

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 - .03 R OR 45°.
INTERPRET DWG PER ANSI Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS.
ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

02 REV

SURFACE TREATMENT
MATERIAL & HEAT TREAT
DO NOT SCALE

DRAWN BY	FIDELIS BADAIKI	DATE 06/03/11
CHECKED	BILL JONES	DATE 06/03/11
APPROVED	RAY ARBOR	DATE 06/03/11

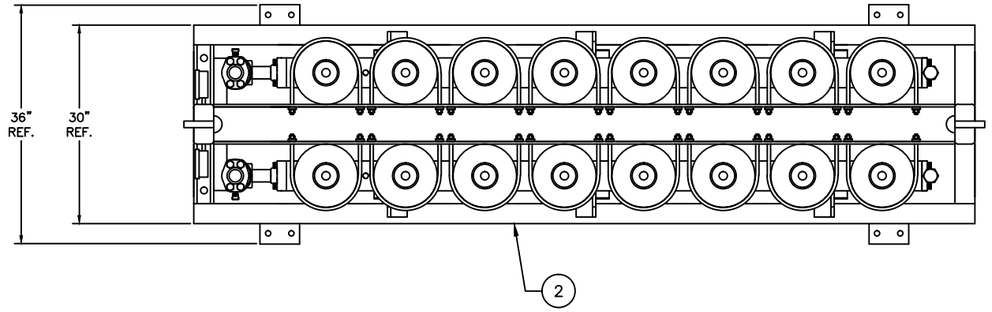
CAMERON
Cooper Cameron Corp.
Cameron Division
P.O. Box 1212
Houston, TX 77251-1212

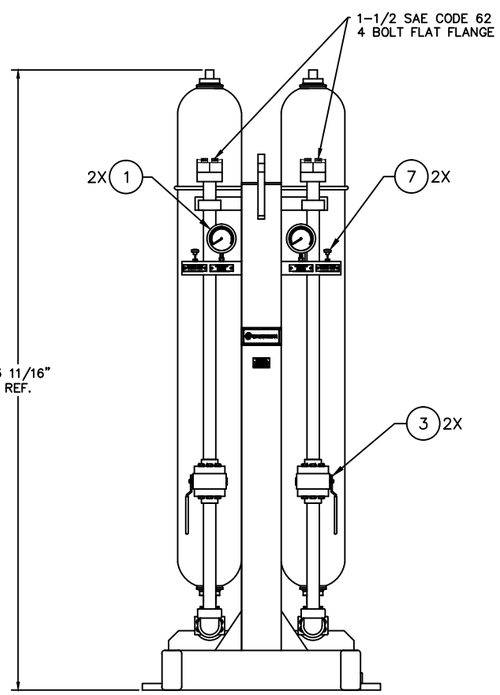
G/A, ACCUMULATOR RACK,
16 BOTTLES -15 GAL, 5000 PSI
ROWAN EXL III RIG 0082

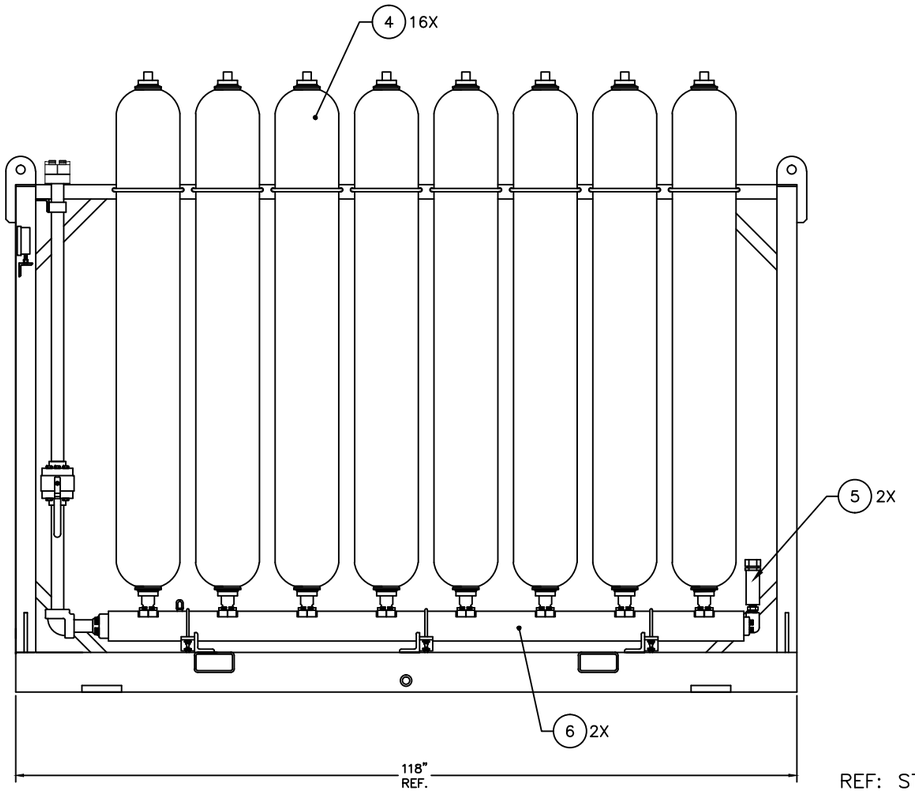
SUPERSEDES | DATED | INITIAL USE B/M 2186214-48-02 | SHEET 1 OF 1 | SK-196741-48-03

COT-21-K

D SIZE SHEET SHN







REF: STELLA MARIS # CAM-913-ACC16-06

ESTIMATED WEIGHT:
DRY 11,375 LB
WET 11,759 LB

CAD

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 - .03 R OR 45°.
INTERPRET DWG PER ANSI Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS.
ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

02 REV

TOLERANCE UNLESS OTHERWISE SPECIFIED
.X ±.1 ANGLES ±5°
.XX ±.03
.XXX ±.015
250 AA ON ALL MACHINED SURFACES

SURFACE TREATMENT

MATERIAL & HEAT TREAT

DO NOT SCALE

DRAWN BY	FIDELIS BADAIKI	DATE 06/13/11
CHECKED	BILL JONES	DATE 06/13/11
APPROVED	RAY ARBOR	DATE 06/13/11

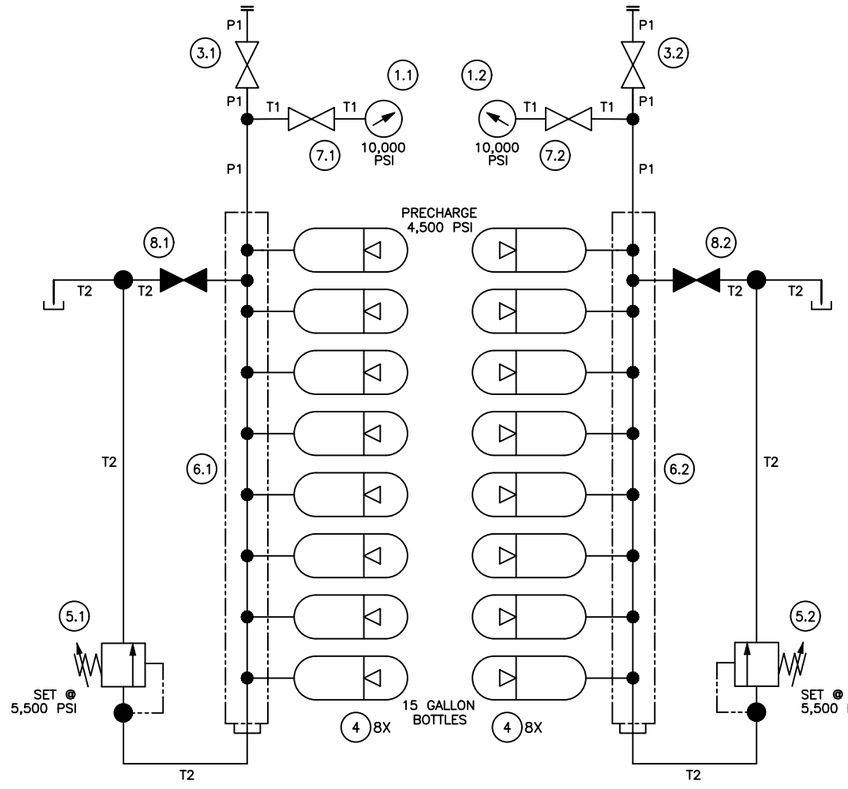
CAMERON
Cooper Cameron Corp.
Cameron Division
P.O. Box 1212
Houston, TX 77251-1212

ASSEMBLY, ACCUMULATOR RACK,
16 BOTTLES -15 GAL, 5000 PSI
ROWAN EXL III RIG 0082

SUPERSEDES | DATED | INITIAL USE B/M: 2186214-48-02 | SHEET 1 OF 1 | SK-196741-48-04

COT-21-K

D SIZE SHEET SMH



T1	.25"X.049" WALL A213/A269 TUBING, SS 316
T2	.50"X.083" WALL A213/A269 TUBING, SS 316

P1	1-1/2" SCH 160, 316 SS PIPE

REFERENCE STELLA MARIS DRAWING CAM-913-ACC16-02

CAD

UNLESS OTHERWISE SPECIFIED: ALL DIMENSIONS ARE IN INCHES. BREAK ALL SHARP EDGES / FILLET .01 - .03 R OR 45°.
INTERPRET DWG PER ASME Y14.5 STANDARD. SEE B/M FOR MATERIAL AND SPECIAL REQUIREMENTS.
ITEM NUMBERS NOT APPEARING ON B/M DO NOT APPLY.

02 REV

TOLERANCE UNLESS OTHERWISE SPECIFIED
.X ± ANGLES ±0.5°
.XX ±
.XXX ±
250 MACHINED SURFACES

SURFACE TREATMENT: DO NOT SCALE
MATERIAL & HEAT TREAT:
DRAWN BY: A. SIMPSON DATE: 06/02/11
CHECKED: P. YANG DATE: 06/02/11
APPROVED: R. ARBOR DATE: 06/03/11
SUPERSEDES: DATED: INITIAL USE B/M: 2186214-48-02

CAMERON
Cameron
P.O. Box 1212
Houston, TX 77251-1212

F/D, ACCUMULATOR RACK, 16
15 GALLON, 5K PSI ACCUMULATORS
ROWAN EXL III RIG 0082

SHEET 1 OF 1 | SK-196741-48-05

D SIZE SHEET

4-Feb-14

25K BOP Fluid Requirements

Ref: 25K BOP Operations and Maintenance Manual, TC 9183 Rev 02 04/12, page 44 and 65

	Rams (One set)			
	Open	**Close**		
	Gallons	Gallons		
13-5/8" 10K Annular	17.0	19.0		
Upper Double Upper Rams (4" or 3-1/2" Rams)	4.6	25.5		
Upper Double Lower Rams (Blind/Shear Rams)	4.6	25.5		
Lower Double Upper Rams (2-7/8" Rams)	4.6	25.5		
Lower Double Lower Rams (4" or 3-1/2" Rams)	4.6	25.5		

Total Volume to Open (gals)	**35.4**	
Total Volume to Close (gals)		**121.0**

Total Volume for 1.5 times Volume to Close 13-5/8" 25K BOP **181.5** **gals**

Fluid Reservoir Capacity	80	bottles of 15 gal each
Gas Volume per 15 gal accumulator bottle	13.7	gals
Bottle Pre-Charge Pressure	1815	psia
Bottle Pre-Charge Pressure + 200 psi	2015	psia
Fully Charged Pressure	3015	psia
Capacity of One 15 gal Accumulator on 13-5/8" 25K BOP Controls	4.1	gals

Volume 80 bottles of Accumulator on 13-5/8" 25K BOP Controls **327** **gals**

13-5/8" 25,000 PSI WP EVO BLOWOUT PREVENTER

I. PHYSICAL DATA

A. Lubricants

1. Ram lubricant, Cameron P/N 713878 or water-resistant non-petroleum base grease.
2. Thread lubricant, Cameron P/N 705444 or per the latest revision of API Bulletin 5A.
3. Multi-purpose lubricant or grease.
4. Multi-purpose lubricant or grease for cold weather operation.
5. Hydraulic operating system:
   a. Storage: Cameron P/N 718100 preservation fluid.
   b. Standard operation: Use a fresh water lubricant that forms a true solution rather than an emulsion when mixed with water and/or antifreeze.
6. Seals and sealing surfaces: SAE 30 Weight Oil.

B. Thread Sealants And Adhesives

1. Thread sealant Loctite 567, Cameron P/N 711706
2. Removable thread adhesive Loctite 242, Cameron P/N 597197-02
3. Permanent thread adhesive Loctite 277, Cameron P/N 707741
4. Permanent thread adhesive primer Loctite 7471, Cameron P/N 2724153-01

C. Dimensions

(i) Height:
Double Studded X Flanged – 95.38"
Single Studded X Flanged – 64.38"
Length:
Standard Bonnets Closed – 217.33"
Standard Bonnets Opened – 262.33"

D. Weights

1. 13-5/8" 25,000 psi EVO single , studded top X flanged bottom – 65,593 lb (29,752 kg).
2. 13-5/8" 25,000 psi EVO double, studded top X flanged bottom – 111,950 lb (50,780 kg).
3. EVO Bonnet Assembly 13-5/8" 25,000 psi WP – 11,245 lb (5101 kg).
4. Average pipe ram assembly 898 lb (407 kg) each.

2. Lift ram assemblies by installing a lifting eye in the threaded preparation in the ram.
3. Handle all other subassemblies using appropriately rated slings.

F. External Thread Connections for the EVO Bonnet Assembly

EVO Bonnet Assembly	Description	Size	Location
	Open Ports	1.25" SAE Flange Prep	Bonnet Body, Side
	Close Ports	1.25" SAE Flange Prep	Bonnet Body, Side

G. Hydraulic Operating System Requirements

1. Use a fresh water lubricant in the hydraulic system that forms a true solution rather than an emulsion when mixed with water and/or antifreeze.
2. Fluid requirement:

Rams (One Set)				Rams	
Open		Close		Closing Ratio	Opening Ratio
Gallons	Litres	Gallons	Litres		
4.6	17.4	25.5	96.5	9.16:1	1.66:1

3. Fluid Requirement: Wedgelocks

Rams (One Set)			
Unlock		Lock	
Gallons	Litres	Gallons	Litres
6.0	22.7	0.3	1.1

4. Fluid Requirement: Ram Change Piston

Ram Change Piston (One Set)			
Open		Close	
Gallons	Litres	Gallons	Litres
1.7	6.4	1.3	4.9

5. Torque Values

Location	Nut Hex Size Across Flats	Stud Size	Torque (API 6A Thread Compound at .13 COF)	Torque (Moly 503 at .07 COF)	Ring Gasket
End Connection	5.375"	3.500"	26,585 ft-lb	14,717 ft-lb	BX-159
Outlet Connection	2.188"	1.375"	1281 ft-lb	739 ft-lb	BX-154
Bonnet Bolts/Caps	5.750"	N/A	5000 ft-lb	5000 ft-lb	N/A

CAMERON

13-5/8" 10,000 PSI WP DL ANNULAR BLOWOUT PREVENTER

I. PHYSICAL DATA

A. Lubricants:

1. Thread lubricant – API-5A-Lub, Fel-Pro Paste #670, or SLECT-A-TORQ Paste #503 (4 lb can P/N 705444).
2. Multi-purpose lubricant or grease.
3. Multi-purpose lubricant or grease for cold weather operation.
4. Hydraulic operating system:
   a. Storage – P/N 718100 (Marston Bentley Preservation Fluid).
   b. Standard Operation – Use a fresh water lubricant that forms a true solution rather than an emulsion when mixed with water and/or antifreeze.

B. Dimensional Drawings

1. SK-196677-01, 13-5/8"-10,000 psi WP DL Annular BOP

C. Bills of Material

1. 13-5/8" 10,000 psi WP DL Annular BOP

D. Weights and external dimensions

1. Total estimated weight: 35,486 lb.
2. Lifting Lug capacity for each lug: 35 tons
3. Maximum capacity of all four lugs used together: 140 tons

E. Lifting and Handling

1. Lift BOP assemblies only with slings appropriately rated for the maximum weight of the BOP.
2. Handle all other sub-assemblies using appropriately rated slings.

F. External Thread Connections

NPT Fitting Size for Open and Close Ports: 1"-11-1/2 NPT

G. Hydraulic Operating System Requirements

US Gallons to Open	17.00
US Gallons to Close	19.00

1. Normal pressure for the hydraulic operating system is 1500 psi.
2. Maximum pressure for the hydraulic operating system is 3000 psi.

H. Torque Specifications

1. Inner Cylinder Nuts (Item #31): 2220 ft-lb.
2. Pusher Plate Screws (Item #36): 68 ft-lb.

I. API Drift

1. API drift for 13-5/8"-10,000 psi is 13.595".

J. Service Tools and Equipment

Item No.	Description	Wrench Size
11	Actuator Screw Assembly	1-7/16" Socket
31	Inner Cylinder Nut	2" Socket
33	Flange Nut	2-15/16" Wrench
34	Lock Ring Access Port Plug	2" Wrench
35	Hydraulic Port Plug	1-7/16" Wrench
36	Pusher Plate Screw	5/8" Allen
37	Actuator Ring Stop Screw	1" Allen
45	Insert Retaining Screw	3/8" Allen
46	Oil Injection Fitting	7/16" Socket

K. Temperature Rating of Annular BOP Packers:

1. Continuous Service – 70 – 180 deg. F (21 - 82 deg. C)
2. Extreme Service – 30 – 200 deg. F (-1 - 93 deg. C)

Note: *There is no industry accepted method of establishing BOP temperature ratings at this time. These are estimates based on lab testing and field performance. Temperature ratings for rubber components must take into account the environmental exposure history, the chemical environment while at temperature, and other factors. Therefore, a single number rating can be misleading if all conditions are not understood.*

II. APPLICABLE OPERATING CHARACTERISTICS AND PRINCIPLES OF OPERATION

A. Packer/Donut Assembly

1. The packer is a cylinder of molded rubber combined with sixteen steel reinforcing inserts.
2. The donut is made of homogeneous molded rubber that surrounds the packer.
3. The packer inserts are flanged on the top and bottom.
4. The shape of the flanges have been designed to maintain an unbroken barrier of steel above and below the packer rubber as the packer is closed, regardless of the size or shape of the pipe or tool in the bore.

RIG EQUIPMENT LIST (IADC FORMAT)

H_2S services	- yes/no	Yes
Side outlets	- number	8
- Size	- in	3-1/16"
- Working pressure	- psi	15,000 psi
- Studded	- yes/no	Yes
- Blind flanges		
Bottom connection		18 3/4 15m
Top connection		18 3/4 15m
Shear ram boosters	- yes/no	Yes,TB/5K, 30 Bottle 5K
E3.2 Available Rams (Installed and Spare)		
Quantity	- number	6
Type		Ram, subassembly, TL
Size	- in	3.5, 2 X 5,5.5,6 5/8, 2 7/8, 3 .5 X 7 5/8 VAR,10 ¾, blind/shear
E3.3 BOP Ram Configuration (Normal)		
Upper		Pipe Rams
Middle upper		Pipe rams
Middle lower		Blind shear
Lower		Pipe Rams
E3.4 Annular Preventer		
Quantity	- number	1
Make/type		Hydril GX
Size	- in	13 5/8"
Working pressure	- psi	10,000 psi
Bottom connection		13 5/8 15m
Top connection		13 5/8 10m
E3.5 Kill Line Valves		
Quantity	- number	4
Make/type		
Size	- in	3-1/16"
Working pressure	- psi	15,000 psi
Gasket type		BX-154
Hydraulic/manual/non-return		2 ea Hydraulic, 2ea manual
E3.6 Choke Line Valves		
Quantity	- number	4
Make/type		Cameron
Size	- in	3-1/16"
Working pressure	- psi	15,000 psi
Gasket type		BX-154
Hydraulic/manual/non-return		2 ea Hydraulic, 2ea manual
E4 Other Blowout Preventers		
E5 BOP Control System		
E5.1 Accumulator Unit		
Make/model		Cameron
Location		Inside Port Cantilever beam
Fluid reservoir capacity	- US gal	1100 gal (80 bottles) @ 15 gal ea (30 ea 15 gal bottles 5000 psi) for Blind Shear
Oil/water mix rate	- US gpm	
Glycol reservoir capacity	- US gal	N/A
Total accumulator capacity (w/o pressure)	- US gal	
System working pressure	- psi	3000 psi
Control manifold model		Cameron
Regulator type		Air
Total useful accumulator volume equals all preventer opening and closing volumes	- yes/no	
- Plus percent additional volume	- %	
E5.2 Accumulator Hydraulic Pumps		

RIG EQUIPMENT LIST (IADC FORMAT)

Electric driven:		
- Quantity	- number	2
- Make/model		Triplex Pumps
- Each driven by motor of power rating	- hp	100 hp
- Flow rate of each pump	- US gpm	48 US gpm
- At operating pressure	- psi	3000 psi
- Operable off emergency generator	- yes/no	
Air driven:		
- Quantity	- number	
- Make/model		
- Flow rate of each pump	- US gpm	
- At operating pressure	- psi	
E5.3 Primary Control Panel		
Control panel make/model		Cameron/Hoffman Nema 4X
Location		Drillers Cabin
Panel controls for the following functions:		
- All annular BOPs	- yes/no	Yes
- All ram BOPs	- yes/no	Yes
- Lock for ram BOPs	- yes/no	No-----Manual
- Diverter system	- yes/no	Yes
- Kill and choke line valves	- yes/no	Yes
- Low accumulator pressure warning	- yes/no	Yes
- Low reservoir level warning	- yes/no	Yes
- Low rig air pressure warning	- yes/no	Yes
- System pressure regulator	- yes/no	Yes
- Pressure regulator for annular	- yes/no	Yes
- Flow meter	- yes/no	Yes
- Quantity of pressure gauges	- number	
- Other control functions	- yes/no	
- Spare control function	- number	
E5.4 Remote Control Panels		
Make/model		
Location		Main unit under cantalever
Location		Control Room
Ability to operate main closing unit valves directly	- yes/no	Yes
System routing (direct or through panel)		
Remote control of system pressure regulator	- yes/no	Yes
Remote control of annular pressure regulator	- yes/no	Yes
E6 Choke Manifold		
All appropriate components H_2S rated	- yes/no	Yes
E6.1 Choke Manifold (for Instrumentation, see H.3)		
Nominal size	- in	3-1/16"
Minimum ID	- in	3-1/16"
Maximum working pressure	- psi	15,000 psi
Quantity of fixed chokes	- number	2
- Make/model		Cameron
- Size (ID)	- in	3 1/16"
Quantity of adjustable chokes	- number	2
- Make/model		Cameron-H2
- Size (ID)	- in	3-1/16"
Quantity of power chokes	- number	2
- Make/model		Cameron 3 1/16"
- Size (ID)	- in	
Power choke remote control panel	- number	1
- Make/model		
- Location		Rig Floor, drillers cabin
Glycol injection	- yes/no	No
E7 Flexible Choke and Kill Lines (BOP to Manifold)		
Quantity	- number	3
Make/type		Phoenix Beattie
ID	- in	3"
Working pressure	- psi	15,000 psi

27-Jan-14

25K BOP Wedgelocks Fluid Requirements

Ref: 25K BOP Operations and Maintenance Manual, TC 9183 Rev 02 04/12, page 44

	Rams (One set)		Rams (Two sets)	
	Unlock	**Lock**	**Unlock**	**Lock**
	Gallons	Gallons	Gallons	Gallons
Upper Double Upper Rams (4" or 3-1/2" Rams)	6.0	0.3	12.0	0.6
Upper Double Lower Rams (Blind/Shear Rams)	6.0	0.3	12.0	0.6
Lower Double Upper Rams (2-7/8" Rams)	6.0	0.3	12.0	0.6
Lower Double Lower Rams (4" or 3-1/2" Rams)	6.0	0.3	12.0	0.6

Total Volume to Unlock (gals)	**48.0**	
Total Volume to Lock (gals)		**2.4**

Volume Needed to Unlock and Lock Wedgelocks **50.4** gals

Total Volume for 1.5 times Volume to Unlock and Lock Wedgelocks **75.6** **gals**

Capacity of Accumulator System on Wedgelocks Controls (1/2 of 160 gals) **80** **gals**

Ref: Calculation of Accumulator Size for 3,000 psi System, BOP Controls Inc., 27-Jan-2014

25K BOP Wedgelocks Accumulator Start and Stop Pressure

Ref: Accumulator Process for Ready Line, No. ACC-1.1F Rev 02, BOP Controls Inc.

Air Motor Starts at	**2,300 psi**
Air Motor Shuts Down at	**2,700 psi**
Diesel Motor Starts at	**2,500 psi**
Diesel Motor Shuts Down at	**3,000 psi**

13-5/8" 25,000 PSI WP EVO BLOWOUT PREVENTER

I. PHYSICAL DATA

A. Lubricants

1. Ram lubricant, Cameron P/N 713878 or water-resistant non-petroleum base grease.
2. Thread lubricant, Cameron P/N 705444 or per the latest revision of API Bulletin 5A.
3. Multi-purpose lubricant or grease.
4. Multi-purpose lubricant or grease for cold weather operation.
5. Hydraulic operating system:
   a. Storage: Cameron P/N 718100 preservation fluid.
   b. Standard operation: Use a fresh water lubricant that forms a true solution rather than an emulsion when mixed with water and/or antifreeze.
6. Seals and sealing surfaces: SAE 30 Weight Oil.

B. Thread Sealants And Adhesives

1. Thread sealant Loctite 567, Cameron P/N 711706
2. Removable thread adhesive Loctite 242, Cameron P/N 597197-02
3. Permanent thread adhesive Loctite 277, Cameron P/N 707741
4. Permanent thread adhesive primer Loctite 7471, Cameron P/N 2724153-01

C. Dimensions

(i) Height:
Double Studded X Flanged – 95.38"
Single Studded X Flanged – 64.38"
Length:
Standard Bonnets Closed – 217.33"
Standard Bonnets Opened – 262.33"

D. Weights

1. 13-5/8" 25,000 psi EVO single , studded top X flanged bottom – 65,593 lb (29,752 kg).
2. 13-5/8" 25,000 psi EVO double, studded top X flanged bottom – 111,950 lb (50,780 kg).
3. EVO Bonnet Assembly 13-5/8" 25,000 psi WP – 11,245 lb (5101 kg).
4. Average pipe ram assembly 898 lb (407 kg) each.

2. Lift ram assemblies by installing a lifting eye in the threaded preparation in the ram.
3. Handle all other subassemblies using appropriately rated slings.

F. External Thread Connections for the EVO Bonnet Assembly

EVO Bonnet Assembly	Description	Size	Location
	Open Ports	1.25" SAE Flange Prep	Bonnet Body, Side
	Close Ports	1.25" SAE Flange Prep	Bonnet Body, Side

G. Hydraulic Operating System Requirements

1. Use a fresh water lubricant in the hydraulic system that forms a true solution rather than an emulsion when mixed with water and/or antifreeze.
2. Fluid requirement:

Rams (One Set)				Rams	
Open		Close		Closing Ratio	Opening Ratio
Gallons	Litres	Gallons	Litres		
4.6	17.4	25.5	96.5	9.16:1	1.66:1

3. Fluid Requirement: Wedgelocks

Rams (One Set)			
Unlock		Lock	
Gallons	Litres	Gallons	Litres
6.0	22.7	0.3	1.1

4. Fluid Requirement: Ram Change Piston

Ram Change Piston (One Set)			
Open		Close	
Gallons	Litres	Gallons	Litres
1.7	6.4	1.3	4.9

5. Torque Values

Location	Nut Hex Size Across Flats	Stud Size	Torque (API 6A Thread Compound at .13 COF)	Torque (Moly 503 at .07 COF)	Ring Gasket
End Connection	5.375"	3.500"	26,585 ft-lb	14,717 ft-lb	BX-159
Outlet Connection	2.188"	1.375"	1281 ft-lb	739 ft-lb	BX-154
Bonnet Bolts/Caps	5.750"	N/A	5000 ft-lb	5000 ft-lb	N/A

B.O.P. CONTROLS INC.	SUBJECT: Accumulator Process for Ready Line RENTAL	NO. ACC-1.1F REV. 02 PAGE 1 of 2

1057-03

DATE: 10-10-13 CUSTOMER: Pioneer Energy UNIT #: 1001

- ✓ 1. STEAM CLEAN COMPLETE UNIT AND REMOTE
- ✓ 2. INSPECT UNIT AND REMOTE FOR DAMAGE LIST ALL DAMAGES
- ✓ 3. CHECK FLUID IN TANK, MUST HAVE GOOD CLEAN FLUID, NO SLUDGE (MAKE SURE TANK IS FULL)
- ✓ 4. CLEAN FLUID STRAINERS OPEN AND CLOSE ALL VALVES MAKE SURE STEMS ARE CLEAN , FREE OF RUST AND PAINT
- ✓ 5. OIL IN LUBRICATOR 10 WT. ONLY FOR UNIT AND REMOTE PANEL
- ✓ 6. RUN HOURS ON ENGINE 0.0 .CHECK OIL / AIR FILTER/ FUEL FILTER/ FUEL BOWL
- ✓ 7. FILL DIESEL TANK
- ✓ 8. CLEAN UNLOADER VALVE

- ✓ 9. OIL IN TRI PLEX POWER END 30 WT (DO NOT OVERFILL)
- N/A 10. OIL IN CHAIN GUARD 90 WT (DO NOT OVERFILL)
- ✓ 11. BELT OR CHAIN TIGHTNESS AND ALIGNMENT
- ✓ 12. Check for loose wires, check for loose mounting bolts on pump and motor, Grease hinges on Battery box and Remote cylinders.
- ✓ 13. INSPECT REMOTE PANEL AND HOSE FOR DAMAGE, CONNECT AIR LINE, BLOW THROUGH HOSE BEFORE HOOKING TO UNIT MAKE SURE THAT LUBRICATOR WORKS 6 DROPS PER MINUTE ALSO BLOW THROUGH SHUTTLE VALVES IF APPLICABLE.
- ✓ 14. Pull a load test on battery for DIESEL MOTOR.
- ✓ 15. RUN AIR MOTOR 1 AT A TIME, CHECK LUBRICATOR DROPS 20 to 30 per minute, make sure pump is billing pressure on unit, look for air and hydraulic leaks.
- ✓ 16. START DIESEL MOTOR
- ✓ 17. MAKE SURE ACCUMULATOR GAUGE GOES TO 1000# FOR PRECHARGE
- ✓ 18. CHECK ALTERNATOR CHARGING 13.5 - 14 VOLTS
- ✓ 19. Check Battery charger and extension cord, make sure that the charger works.
- ✓ 20. ALLOW TO PRESSURE UP TO 3000#
- ✓ 21. LOOK FOR LEAKS IN TANK AND PLUMBING
- ✓ 22. BLEED DOWN UNIT FOR START UP, AIR MOTOR STARTS AT 2300 SHUT DOWN 2700 DIESEL MOTOR STARTS AT 2500# AND SHUTS DOWN AT 3000#
- ✓ 23. PRESSURE UNIT UP TO 3000#/ ALLOW TO SIT FOR 15 TO 30 MINUTES CHECK FOR LEAKS, OPEN/CLOSE EACH VALVE FROM REMOTE PANEL (REGULATED AND HIGH PRESSURE) ALSO MOVE HANDLES MANUALLY, ADJUST REGULATORS 0 TO MAX PRESSURE THEN RESET TO NORMAL PRESSURE, CHECK
- ✓ 24. BLEED UNIT DOWN
- ✓ 25. Close bleeder valve
- ✓ 26. Turn on/off switch to OFF.
- ✓ 27. Check for two spare fuses in the Murphy box.
- ✓ 28. MAKE SURE ALL TAGS AND SIGNS ARE CORRECT AND IN GOOD CONDITION ALSO CHECK SHACKLES FOR PINS
- ✓ 29. LIST ALL REPAIRS AND COMMENTS ON THIS FORM
- ✓ 30. BEFORE MOVING TO PAINT AREA, GET SUPERVISOR TO CHECK

B.O.P CONTROLS INC.	SUBJECT: Accumulator Process for Ready Line RENTAL	NO. ACC-1.1F REV. 02 PAGE 2 of 2

X 31. CLEAN AND MASK FOR PAINTING
X 32. PAINT AND COLOR CODE

✓ 33. AFTER UNIT IS PAINTED AND COMPLETE GET SUPERVISOR TO DO FINAL INSPECTION
✓ 34. CHECK DATE ON SLING 4-12-14 CERT # 13-04564
MAKE SURE ALL COTTER PINS ON SLINGS ARE IN GOOD CONDITION AND IN PLACE
✓ 35. CHECK FOR REMOTE GASKET ON UNIT AND REMOTE PANEL DO NOT BOLT TO FIXED PLATE USE TIE WRAPS TO SECURE TO UNIT OR REMOTE

FINAL Q.C. INSPECTION _____ DATE 10/22/13

REPAIR AND DAMAGE LIST

Pipe rams, HCR and Kill 4 ways leaking; right air motor leaking tight alt. belt; 3 leaks in plumming at manifold reg.; accumulator gauge off by 300#; air xpc for HCR hanging up; ele. pressure switch reading off; check valve on right air motor bleeding out; no fuses

TECH SIGNATURE _____
PAINTER SIGNATURE _____
SUPERVISOR SIGNATURE _____
DATE 10/22/13

B.O.P.
B.O.P. CONTROLS INC.
1113-A RIDGE RD. • DUSON, LA 70529
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WATS: 800-633-8264 Fed. ID #: 72-0877440

ISO 9001-2008
APIQR 0368

Q1-0090

CALCULATION OF ACCUMULATOR SIZE FOR 3,000 PSI SYSTEM

Usable Fluid Calculation: $P_1V_1 = P_2V_2 = P_3V_3$

Where P = Pressure (psi) in absolute units (gauge reading plus 15 psi)
V = Volume of Nitrogen

Subscripts: $_1$ = Precharge Condition (1000 psi)

$_2$ = Fully Charged condition (3000 psi)

$_3$ = Discharged or Used (1200 psi)

Volume of fluid stored in each 11-gallon accumulator bottle:
(10 gallons nominal capacity)

$$V_2 = \frac{P_1V_1}{P_2}$$

$$V_2 = \frac{(1015)\ (10)}{(3015)}$$

V_2 = 3.4 Gallons of Nitrogen
10 --- 3.4 = 6.6 Gallons of Control Fluid
Stored in Each Accumulator

Usable Fluid
To 1200 psi: $V_3 = \frac{(1015)\ (10)}{(1215)}$

V_3 = 8.4 Gallons of Nitrogen
10 --- 8.4 = 1.6 Gallons of Control Fluid Remaining

Therefore, by subtracting the remaining control fluid from the stored fluid:
6.6 --- 1.6 = 5.0 Gallons of Usable Fluid

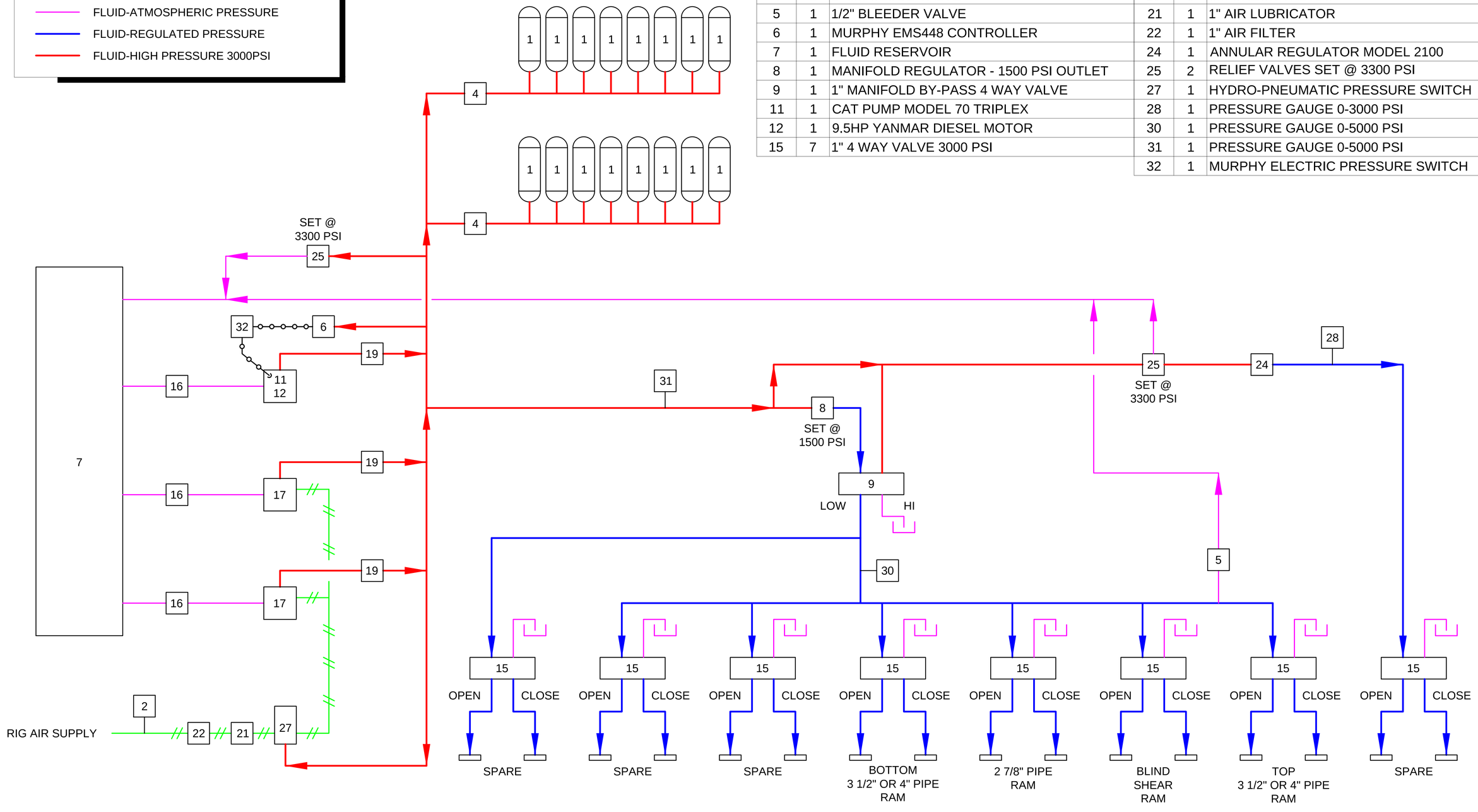
By noting that the 5 gallons of fluid is ½ the total volume, a simple method for calculations can be used.

KEY:

- RIG AIR PRESSURE
- CONTROL SIGNAL
- FLUID-ATMOSPHERIC PRESSURE
- FLUID-REGULATED PRESSURE
- FLUID-HIGH PRESSURE 3000PSI

BILL OF MATERIALS

ITEM	QTY	DESCRIPTION	ITEM	QTY	DESCRIPTION
1	16	11 GALLON ACCUMULATOR BOTTLES	16	3	"Y" STRAINER
2	1	PRESSURE GAUGE 0-300 PSI	17	2	AIR OPERATED HYDRAULIC PUMP
4	2	1" 5M GLOBE VALVE	19	3	5M CHECK VALVES
5	1	1/2" BLEEDER VALVE	21	1	1" AIR LUBRICATOR
6	1	MURPHY EMS448 CONTROLLER	22	1	1" AIR FILTER
7	1	FLUID RESERVOIR	24	1	ANNULAR REGULATOR MODEL 2100
8	1	MANIFOLD REGULATOR - 1500 PSI OUTLET	25	2	RELIEF VALVES SET @ 3300 PSI
9	1	1" MANIFOLD BY-PASS 4 WAY VALVE	27	1	HYDRO-PNEUMATIC PRESSURE SWITCH
11	1	CAT PUMP MODEL 70 TRIPLEX	28	1	PRESSURE GAUGE 0-3000 PSI
12	1	9.5HP YANMAR DIESEL MOTOR	30	1	PRESSURE GAUGE 0-5000 PSI
15	7	1" 4 WAY VALVE 3000 PSI	31	1	PRESSURE GAUGE 0-5000 PSI
			32	1	MURPHY ELECTRIC PRESSURE SWITCH



REVISIONS				
REV.	DESCRIPTION	DRWN	CHKD	DATE
1	IFA – BSEE APPROVAL	BOP	N. Goel	1/28/2014

APPROVED: DAVID LAW

BOP CONTROL UNIT 1001
7 STATION 160 GALLON
ACCUMULATOR