ARC RESOURCES LTD.

PEMBINA - MIPA 8
2-13-48-8 W5M
2-13 POLYMER INJECTION SKID
MECHANICAL DRAWINGS
PROJECT # 2136

ISSUED FOR CONSTRUCTION

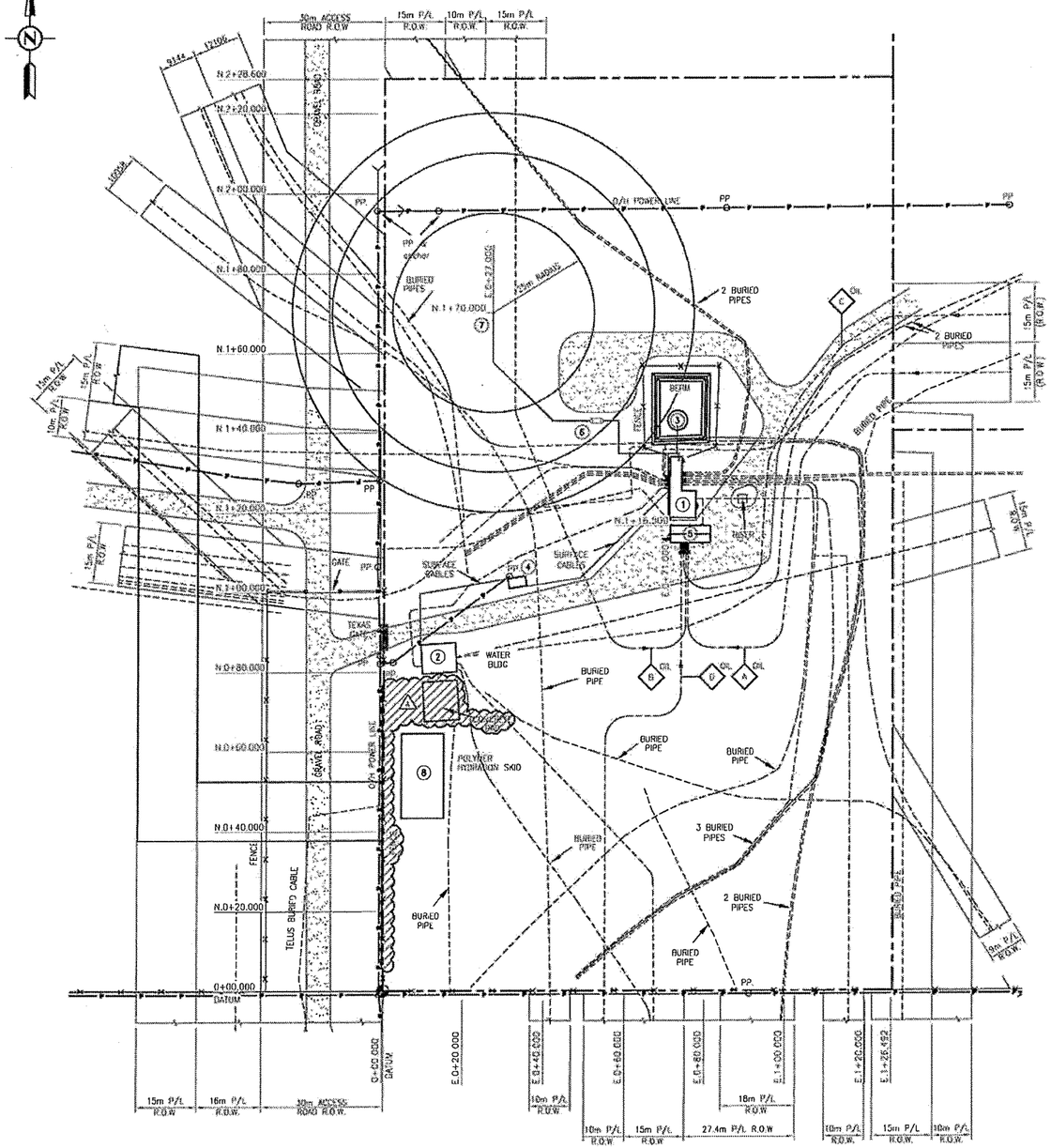
TNT Engineering Ltd.
TNT ENGINEERING LTD.
SUITE 600, 639 - 5TH AVE SW
CALGARY, AB, T2P 0M9
PHONE (403) 387-2500
FAX (403) 387-2535

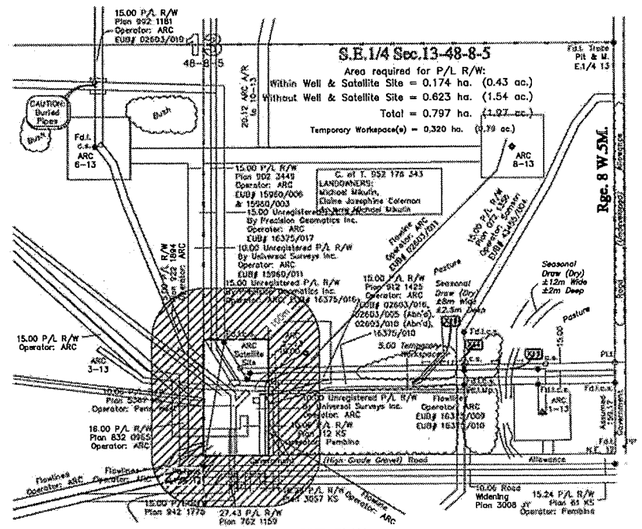
ARC RESOURCES LTD.

DRAWING INDEX

TNT Engineering Ltd.

STRIKE AREA	SURFACE LOCATION	BOTTOM HOLE LOCATION	DRAWING	DRAWING TYPE	COMMENTS	REV.
PEMBINA - MIPA 8	02-13-048-08 W5M	-	-	COVER PAGE	2-13 POLYMER INJECTION SKID	-
PEMBINA - MIPA 8	02-13-048-08 W5M	-	1723D-1000	PLOT PLAN	2-13 SATELLITE (DEMOLITION DRAWING)	A
PEMBINA - MIPA 8	02-13-048-08 W5M	-	1723-1000	PLOT PLAN	2-13 SATELLITE	6
-	-	-	-	ARC RESOURCES LTD. PIPING SPECIFICATION NOTES	ASME PIPING SPECIFICATIONS NOTES	01
-	-	-	-	ARC RESOURCES LTD. PIPING SPECIFICATION	ASME PIPING CLASS D	01
PEMBINA - MIPA 8	02-13-048-08 W5M	-	0213048085.1500/01	LINE LIST	ARC 2-13 POLYMER INJECTION SKID	A
-	-	-	-	TNT ENGINEERING LTD. SYMBOL SHEET	TYPICAL FLOW SHEET SYMBOLS AND STANDARDS	D
PEMBINA - MIPA 8	02-13-048-08 W5M	-	0213048085.2100/01	PIPING AND INSTRUMENTATION DIAGRAM	2-13 POLYMER INJECTION SOUTH HEADER	A
PEMBINA - MIPA 8	02-13-048-08 W5M	-	0213048085.2101D/01	PIPING AND INSTRUMENTATION DIAGRAM	2-13 POLYMER INJECTION NORTH HEADER (DEMOLITION DRAWING)	A
PEMBINA - MIPA 8	02-13-048-08 W5M	-	0213048085.2101/01	PIPING AND INSTRUMENTATION DIAGRAM	2-13 POLYMER INJECTION NORTH HEADER	0
PEMBINA - MIPA 8	02-13-048-08 W5M	-	0213048085.2102/01	PIPING AND INSTRUMENTATION DIAGRAM	2-13 CDG POLYMER SKID	0
-	-	-	TYP.PEMBINA.2010/02	TYPICAL WELLHEAD DRAWING	CDG WATER INJECTION WELLHEAD AREA	0
PEMBINA - MIPA 8	02-13-048-08 W5M	-	14103-200	VENDOR - FABTECH	ARC EOR FACILITIES	D
PEMBINA - MIPA 8	02-13-048-08 W5M	-	14103-201	VENDOR - FABTECH	ARC EOR FACILITIES	D
PEMBINA - MIPA 8	02-13-048-08 W5M	-	14103-202	VENDOR - FABTECH	ARC EOR FACILITIES	D
PEMBINA - MIPA 8	02-13-048-08 W5M	-	14103-203	VENDOR - FABTECH	ARC EOR FACILITIES	D
PEMBINA - MIPA 8	02-13-048-08 W5M	-	14103-204	VENDOR - FABTECH	ARC EOR FACILITIES	D
PEMBINA - MIPA 8	02-13-048-08 W5M	-	14103-100 SHEET 1 OF 8	VENDOR - FABTECH	POLYMER PILOT INJECTION PLANT - BUILDINGS & SKID ASSEMBLY	C
PEMBINA - MIPA 8	02-13-048-08 W5M	-	14103-100 SHEET 2 OF 8	VENDOR - FABTECH	POLYMER PILOT INJECTION PLANT - BUILDINGS & SKID ASSEMBLY	C
PEMBINA - MIPA 8	02-13-048-08 W5M	-	14103-100 SHEET 3 OF 8	VENDOR - FABTECH	POLYMER PILOT INJECTION PLANT - BUILDINGS & SKID ASSEMBLY	C
PEMBINA - MIPA 8	02-13-048-08 W5M	-	14103-600 SHEET 1 OF 3	VENDOR - FABTECH	POLYMER PILOT INJECTION PLANT - SKID	2
PEMBINA - MIPA 8	02-13-048-08 W5M	-	14103-600 SHEET 2 OF 3	VENDOR - FABTECH	POLYMER PILOT INJECTION PLANT - SKID	2
PEMBINA - MIPA 8	02-13-048-08 W5M	-	14103-600 SHEET 3 OF 3	VENDOR - FABTECH	POLYMER PILOT INJECTION PLANT - SKID	2
PEMBINA - MIPA 8	02-13-048-08 W5M	-	STR-001	VENDOR - BLACK BOX ENGINEERED SOLUTIONS	PEMBINA POLYMER BUILDING - PILE LOCATION PLAN	0
PEMBINA - MIPA 8	02-13-048-08 W5M	-	STR-002	VENDOR - BLACK BOX ENGINEERED SOLUTIONS	PEMBINA POLYMER BUILDING - PILING NOTES AND DETAILS	0





SITE PLAN
SCALE: 1:5000

DEMOLITION DWG

LEGEND

1. TEST/GROUP SEPARATOR BUILDING
2. WATER INJECTION BUILDING
3. STORAGE TANK
4. MCC BUILDING
5. NEW TEST/GROUP SEPARATOR BUILDING
6. NEW FLARE KNOCK OUT TANK
7. NEW FLARE STACK
8. POLYMER HYDRATION SKID

TAG	C O/L
OWNER	ARC RESOURCES
SIZE	88.9mm
W.T.	5.8mm
SPEC.	CSA Z662
MTRL	FRP 2000
M.O.P.	4960 kPag
FROM	15-07-048-07 W5M
TO	02-13-048-08 W5M
LICENSE	TBA
LINE NO.	TBA
HYDRO.	6200 kPa
X-RAY	NO
INT. CTG.	--
EXT. CTG	--
MIN. CVR	1500mm (NOTE 1)

TAG	D O/L
OWNER	ARC RESOURCES
SIZE	88.9mm
W.T	5.8mm
SPEC.	CSA Z662
MTRL	FRP 2000
M.O.P.	4960 kPag
FROM	13-12-048-08 W5M
TO	02-13-048-08 W5M
LICENSE	TBA
LINE NO.	TBA
HYDRO.	6200 kPa
X-RAY	NO
INT. CTG.	--
EXT. CTG	--
MIN. CVR	1500mm (NOTE 1)

TAG	A O/L
OWNER	ARC
SIZE	88.9mm
W.T	4.8mm
SPEC.	CSA Z662
MTRL	Z245.1 GR. 290 CAT. 1
M.O.P.	6900 kPag
FROM	01-13-048-08 W5M
TO	02-12-048-08 W5M
LICENSE	TBA
LINE NO.	TBA
HYDRO.	7750 kPag
X-RAY	15%
INT. CTG.	--
EXT. CTG	YJ1
MIN. CVR	1500mm

TAG	B O/L
OWNER	ARC
SIZE	88.9mm
W.T	4.0mm
SPEC.	CSA Z662
MTRL	Z245.1 GR. 290 CAT. 1
M.O.P.	6900 kPag
FROM	05-13-048-08 W5M
TO	02-12-048-08 W5M
LICENSE	TBA
LINE NO.	TBA
HYDRO.	7750 kPag
X-RAY	15%
INT. CTG.	--
EXT. CTG	YJ1
MIN. CVR	1500mm

"AS-BUILT" REVISION NUMBER 4 IS BASED ON MARK-UPS PROVIDED BY OTHERS. VERIFICATION THAT CONSTRUCTION IS IN ACCORDANCE WITH THE DRAWINGS HAS NOT BEEN DONE.

TNT IS RESPONSIBLE FOR LATEST REVISION AND CLOUDED AREAS ONLY

REFERENCE DRAWINGS	DWG. NO.

NOTES :

1. 1800mm MIN. COVER UNDER LEASE AREA, 1500mm MIN. COVER UNDER P/L R.O.W. EXCEPT WHEN P/L CROSSES UNDER LEASE ACCESS ROAD, THEN 2000mm MIN. COVER IS REQUIRED

NO.	DATE	REVISION / DESCRIPTION	BY	CHKD.	APPD.	JOB No.
A	14.07.28	ISSUED FOR DEMOLITION - REMOVE FENCE & CONC. SLAB (TNT #2139)	KF			2139

PERMIT STAMP

ENGINEER'S STAMP

PROFESSIONAL ENGINEER ALBERTA R. RAY CUMBERLAND Sept 12, 2014

IF SIGNED & DATED, PERMIT AND PROFESSIONAL STAMP AFFIXED ABOVE SHALL APPLY TO CURRENT REV. ONLY

ARC

BlackBox ENGINEERED SOLUTIONS

PEMBINA
LSD: 02-13-048-08 W5M
02-13 SATELLITE
PLOT PLAN

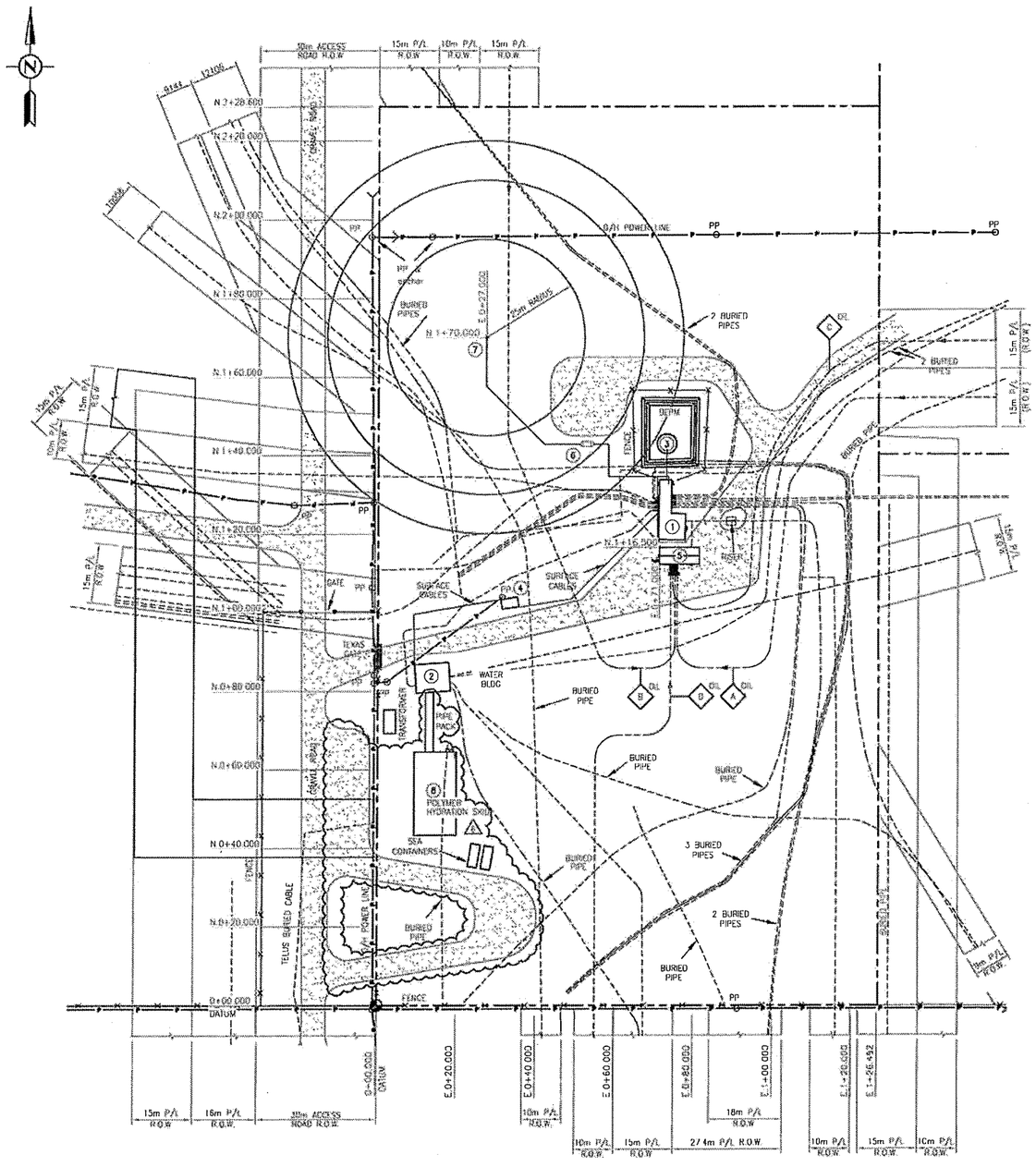
SCALE 1:800 (A1 Size)

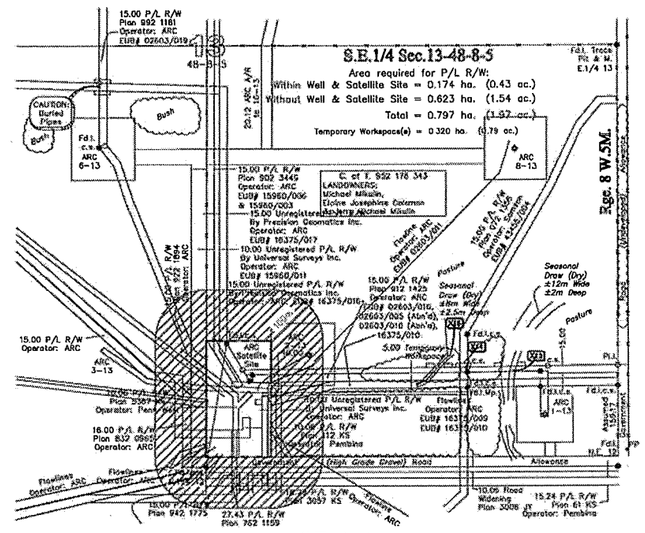
FILE NO. 1723D-1000 REV. A

DRAWING SHEET SIZE: 11" x 17"

Z:\DRAFTING\JOBS\ARC RESOURCES LTD\PEMBINA\MIPA 8\02-13-048-08 W5M\SITE PLAN\ARC 02-13-048-08W5 PLOT PLAN REV 6A.DWG

PLOT BY: GWONG, 8/28/2014, 5:12 PM





SITE PLAN
SCALE: 1:5000

LEGEND

1. TEST/GROUP SEPARATOR BUILDING
2. WATER INJECTION BUILDING
3. STORAGE TANK
4. NCC BUILDING
5. NEW TEST/GROUP SEPARATOR BUILDING
6. NEW FLARE KNOCK OUT TANK
7. NEW FLARE STACK
8. POLYMER HYDRATION SKID

TAG	C
OWNER	ARC RESOURCES
SIZE	88.9mm
W.T.	5.8mm
SPEC.	CSA Z662
MTRL	FRP 2000
M.O.P.	4960 kPag
FROM	15-07-048-07 W5M
TO	02-13-048-08 W5M
LICENSE	TBA
LINE NO.	TBA
HYDRO.	6200 kPa
X-RAY	NO
INT. CTG.	-
EXT. CTG.	-
MIN. CVR.	1500mm (NOTE 1)

TAG	D
OWNER	ARC RESOURCES
SIZE	88.9mm
W.T.	5.8mm
SPEC.	CSA Z662
MTRL	FRP 2000
M.O.P.	4960 kPag
FROM	13-12-048-08 W5M
TO	02-13-048-08 W5M
LICENSE	TBA
LINE NO.	TBA
HYDRO.	6200 kPa
X-RAY	NO
INT. CTG.	-
EXT. CTG.	-
MIN. CVR.	1500mm (NOTE 1)

TAG	A
OWNER	ARC
SIZE	88.9mm
W.T.	4.0mm
SPEC.	CSA Z662
MTRL	Z245.1 GR. 290 CAT. 1
M.O.P.	6900 kPag
FROM	01-13-048-08 W5M
TO	02-13-048-08 W5M
LICENSE	TBA
LINE NO.	TBA
HYDRO	7750 kPag
X-RAY	15%
INT. CTG.	-
EXT. CTG.	YJ1
MIN. CVR.	1500mm

TAG	B
OWNER	ARC
SIZE	88.9mm
W.T.	4.0mm
SPEC.	CSA Z662
MTRL	Z245.1 GR. 290 CAT. 1
M.O.P.	6900 kPag
FROM	05-13-048-08 W5M
TO	02-12-048-08 W5M
LICENSE	TBA
LINE NO.	TBA
HYDRO	7750 kPag
X-RAY	15%
INT. CTG.	-
EXT. CTG.	YJ1
MIN. CVR.	1500mm

"AS-BUILT" REVISION NUMBER 4 IS BASED ON MARK-UPS PROVIDED BY OTHERS. VERIFICATION THAT CONSTRUCTION IS IN ACCORDANCE WITH THE DRAWINGS HAS NOT BEEN DONE

TNT IS RESPONSIBLE FOR LATEST REVISION AND CLOUDED AREAS ONLY

REFERENCE DRAWINGS	DWG. NO.

NOTES :

3. 1800mm MIN. COVER UNDER LEASE AREA, 1500mm MIN. COVER UNDER P/L R.O.W. EXCEPT WHEN P/L CROSSES UNDER LEASE ACCESS ROAD, THEN 2000mm MIN. COVER IS REQUIRED.

NO.	DATE	REVISION / DESCRIPTION	BY	CHKD.	APPD.	JOB No.
A	07.08.23	ISSUED FOR APPROVAL	CD			1723
0	07.09.21	ISSUED FOR P/L CONSTRUCTION	CW			1723
1	07.10.12	ISSUED FOR CONSTRUCTION (SEPARATOR ADDITION)	CW			1723
2	08.02.14	ISSUED FOR CONSTRUCTION (15-07 WELL ADDITION)	SD			1925
3	08.02.14	ISSUED FOR CONSTRUCTION (13-12 WELL ADDITION)	SD			1924
4	08.08.11	AS-BUILT	CD			1723
5	14.01.27	CONCEPTUAL	SP			14050
6	14.09.10	ISSUED FOR CONSTRUCTION-RELOCATE POLY. HYD. SKID	BW			2138

PERMIT STAMP

ENGINEER'S STAMP
PROFESSIONAL ENGINEER
R. RAY CUMBERLAND
ALBERTA
Sept 12, 2014

IF SIGNED & DATED, PERMIT AND PROFESSIONAL STAMP AFFIXED ABOVE SHALL APPLY TO CURRENT REV. ONLY

ARC

BlackBox ENGINEERED SOLUTIONS

PEMBINA
LSD: 02-13-048-08 W5M
02-13 SATELLITE
PLOT PLAN

SCALE: 1:600 (A1 Size)

FILE NO. 1723-1000

REV. 6

SPEC N
REVISION 01
DATE July 18, 2007

ASME PIPING SPECIFICATIONS
NOTES

The following NOTES apply to all ASME Piping Specifications

1 corrosion allowances for threaded connections are reduced if utilizing minimum of Sch 80.
threaded connections not recommended in vibrating or sour service applications

2 short radius elbow and returns shall not be used unless they satisfy the specification of the pipe and pressure rating restrictions imposed by ASME B16.28, Paragraph 2 (derated to 80% max. allowable stress value)

3 forged steel fitting to ASME B16.11

4 buttwelding fitting to ASME B16.9

5 forged C.S. branch outlet fittings to MSS SP-97

6 swage(d) nipples and bull plugs to MSS SP-95

7 steel pipe unions to MSS SP-83

8 blanks to API Std. 590

9 all valves shall meet ASME B16.34 requirements

10 for > 1/2" all thickness pipe and fittings A 106 B / A 234 WPB require additional testing to meet ASME B31.3 requirements for MDMT. A 333 6 / A 420 WPL6 are acceptable alternatives (as applicable) to meet MDMT requirements

11 use PWHT for production welds if WPS was qualified with PWHT to control hardness. Evidence of hardness control consisting of third party inspections on sample welds shall be included in the contractor's quality control manual. In particular, all weld procedures for sour piping systems must demonstrate that the weld metal, heat affected zone and parent metal through-thickness hardness levels will not exceed 22 HRC or 200 HBW (at 500 kg) as defined in NACE MR0175.
Welds that do not comply with the above requirements or that do not have evidence of hardness control must be post-weld heat treated

12 on calculated pipe wall thicknessess, fitting wall thickness to match calculated pipe value

13 trunnion mounted ball valve

14 in sour service CSA Z662 applications, materials shall conform to the applicable CSA specification - that is: CSA Z245.1, Section 16 for linepipe - CSA Z245.11, Section 13 for fittings - CSA Z245.12, Section 13 for flanges - CSA Z245.15, Section 13 for valves - NACE approved fittings, flanges and valves meet the corresponding CSA code - it is acceptable to utilize NACE approved pipe provided that the microhardness is confirmed at a maximum of 248 Vickers

15 Low Temperature refers to systems based on A333-6 pipe (L and SL series) and is resrticted by the A352 LCB flanges on the valves .

16 SFRF= Slip-on Flange Raised Face, TFRF = Threaded Flange Raised Face To be used in "Sweet Service" 150 and 300 ANSI Only

17 Stud length must accommodate nut and at a minimum 2 exposed threads on each end

18 Consult Asset Integrity Group for correct material selection. Valves with specific corrosion resistant properties may be required

SPEC	ANSI Rating
A=	150
B=	300
C=	600
D=	900
E=	1500

SPEC D

REVISION 01

DATE July 18, 2007

ASME PIPING SPECIFICATIONS

SERVICE:	**SWEET HYDROCARBONS**			**ANSI CLASS:** 900 RTJ
DESIGN PRESSURE:	15,307 kPag (2,220 psig) @ 38 C (100 F)			**CODE:** ASME B31.3
TEST PRESSURE:	22,960 kPag (3,330 psig)			
TEMPERATURE LIMITS:	-29 to 149 C (-20 to 300 F)	**RATING:**	ASME/ANSI B16.5	
CORROSION ALLOWANCE:	1.6 mm	**PWHT:**	if pipe wall thickness > 19 mm - see Note 11 also	
NDT:	Visual, 100% of all buttwelds to be 100% radiographed			

GENERAL: see ASME PIPING SPECIFICATON 'N' for a description of relevant NOTES
PV&F Specs not to be used for amine, cryogenic, CO2, acid gas, caustic, HVP or LPG services.

PIPE

	NPS	RATING	CONN	DESCRIPTION	NOTES
	1/2 to 1 1/2	Sch 160	SW / Scrd	ASTM A 106 B (SMLS) PE / TBE	
	2, 3	Sch 80	BW	ASTM A 106 B (SMLS) BE	
	4 to 12	Sch 120 min. (calc WT & MDMT)	BW	ASTM A 106 B (SMLS) BE	10

FITTINGS

ITEM	NPS	RATING	CONN	DESCRIPTION	NOTES
CAP	1/2 to 1 1/2	Class 6000	Scrd	ASTM A 105	3
	2, 3	Sch 80	BW	ASTM A 234 WPB	4
	4 to 6	Sch 120 min.	BW	ASTM A 234 WPB	4, 10, 12
COUPLING	1/2 to 1 1/2	Class 6000	Scrd	ASTM A 105, full & half	3
CROSS	1/2 to 1 1/2	Class 6000	Scrd	ASTM A 105	3
ELBOW	1/2 to 1 1/2	Class 6000	Scrd	ASTM A 105, 45 & 90	3
	2, 3	Sch 80	LRBW	ASTM A 234 WPB, 45 & 90, straight & reducing	2, 4
	4 to 6	Sch 120 min.	LRBW	ASTM A 234 WPB, 45 & 90, straight & reducing	2, 4, 10, 12
ELBOLET	1/2 to 1 1/2	Class 6000	Scrd	ASTM A 105	5
FLANGE	2, 3	Class 900	RTJWN	ASTM A 105, bored to Sch 80 pipe	
	4 to 6	Class 900	RTJWN	ASTM A 105, bored to Sch 120 min. pipe	10, 12
NIPPLE	1/2 to 1 1/2	Sch 160	Scrd	ASTM A 106 B (SMLS), 100 mm long min, TBE	
REDUCER	2, 3	Sch 80	BW	ASTM A 234 WPB, concentric / eccentric	4
	4 to 3	Sch 120 min.	BW	ASTM A 234 WPB, concentric / eccentric	4, 10, 12
SOCKOLET	1/2 to 1 1/2	Class 6000	SW	ASTM A 105	5
SWAGE	1/2 to 1 1/2	Sch 160	Scrd or PE	ASTM A 105 or A 106 B (SMLS), match pipe & conn	6
TEE	1/2 to 1 1/2	Class 6000	Scrd	ASTM A 105	3
	2, 3	Sch 80	BW	ASTM A 234 WPB, straight & reducing	4
	4 to 6	Sch 120 min.	BW	ASTM A 234 WPB, straight & reducing	4, 10, 12
THREADOLET	1/2 to 1 1/2	Class 6000	Scrd	ASTM A 105	5
UNION	1/2 to 1 1/2	Class 6000	Scrd	ASTM A 105	7
WELDOLET	2, 3	Sch 80	BW	ASTM A 105	5
	4	Sch 120 min.	BW	ASTM A 105	5, 10, 12

VALVES

ITEM	NPS	RATING	CONN	DESCRIPTION	NOTES
BALL	≤ 1 1/2	WOG 4000	Scrd	A 105 body, cr. plated trim, 4000 # to API 607	9
	2	Class 900	RTJ	WCB body, cr. plated trim to API 607, lever op	9
	3 to 6	Class 900	RTJ	WCB body, cr. plated trim to API 607, gear op ≥ 3"	9, 13
CHECK	≤ 1 1/2	Class 1500	Scrd	A 105 body, trim No. 8 to API 602	9
	2 to 6	Class 900	RTJ	WCB body, trim No. 8 to API 600	9
GATE	≤ 1 1/2	Class 1500	Scrd	A 105 body, trim No. 8 to API 602, handwheel	9
	2 to 6	Class 900	RTJ	WCB body, trim No. 8 to API 600, gear op ≥ 4"	9
GLOBE	≤ 1 1/2	Class 1500	Scrd	A 105 body, trim No. 8 to API 602, handwheel	9
	2 to 6	Class 900	RTJ	WCB body, trim No. 8 to API 600, gear op ≥ 4"	9
NEEDLE	1/2 to 3/4	Class 6000	Scrd	A 105 body & 316 SS trim	9

MISCELLANEOUS

ITEM	NPS	RATING	CONN	DESCRIPTION	NOTES
BLIND	2 to 6	Class 900	RTJ	ASTM A 105	8
GASKET	2 to 6	Class 900	RTJ	soft iron oval ring, ANSI B16.20	
NUTS				ASTM A 194 2H, heavy hexagon	
STUD				ASTM A 193 B7, threaded full length	17
PLUG	1/2 to 1 1/2	Sch XXS	Scrd	Bull, ASTM A 105 or A 106 B (SMLS)	6
	1/2 to 1 1/2	Class 6000	Scrd	Hex Head, ASTM A 105	3

SIZE IDENT SPEC. NO.	FLUID	FROM	TO	CODE	PIPE SCH	C.A. (mm)	PIPE MATERIAL (smls)	DESIGN PRESS. (kPag)	DESIGN TEMP. (°C)	DESIGN MDMT (°C)	TEST PRESSURE (kPag)	OPERATING PRESS. (kPag)	OPERATING TEMP. (°C)	INSULATION THICK. (mm)	INSULATION HEAT TRACE	X RAY (min %)	STRESS RELIEF	HARDNESS TESTING (min %)	ASME FLUID SERVICE CATEGORY	RADIOGRAPHY CRITERIA	NOTES	P&ID NO.	LIST REV.
3 - PW - D - 100	PRODUCED WATER	T-08	Z-900 (WATER INLET)	ASME B31.3	80	1.6	A106 Gr. B	15307	38	-29	22960	12410	10	25H	ET	100	-	-	Normal	Normal	5,8	0213048085.2101/01	0
2 - PW - D - 101	PRODUCED WATER	Z-900 (Final Sol'n 1 Outlet)	P/L 6-13	ASME B31.3	80	1.6	A106 Gr. B	15307	38	-29	22960	12410	10	25H	ET	100	-	-	Normal	Normal	5,8	0213048085.2101/01	0
2 - PW - D - 102	PRODUCED WATER	Z-900 (Final Sol'n 2 Outlet)	P/L 10-12	ASME B31.3	80	1.6	A106 Gr. B	15307	38	-29	22960	12410	10	25H	ET	100	-	-	Normal	Normal	5,8	0213048085.2101/01	0
2 - PW - D - 103	PRODUCED WATER	Z-900 (Final Sol'n 3 Outlet)	T- 02	ASME B31.3	80	1.6	A106 Gr. B	15307	38	-29	22960	12410	10	25H	ET	100	-	-	Normal	Normal	5,8	0213048085.2101/01	0
2 - PW - D - 104	PRODUCED WATER	Z-900 (Final Sol'n 4 Outlet)	T- 03	ASME B31.3	80	1.6	A106 Gr. B	15307	38	-29	22960	12410	10	25H	ET	100	-	-	Normal	Normal	5,8	0213048085.2101/01	0
2 - PW - D - 105	PRODUCED WATER	Z-900 (Final Sol'n 5 Outlet)	T- 05	ASME B31.3	80	1.6	A106 Gr. B	15307	38	-29	22960	12410	10	25H	ET	100	-	-	Normal	Normal	5,8	0213048085.2101/01	0
2 - PW - D - 106	PRODUCED WATER	Z-900 (Final Sol'n 6 Outlet)	T - 07	ASME B31.3	80	1.6	A106 Gr. B	15307	38	-29	22960	12410	10	25H	ET	100	-	-	Normal	Normal	5,8	0213048085.2101/01	0

1. insulate pipe sections to first elbow below ground
2. insulate pipe sections outside building and utilidors
3. NPT piping
4. reduced corrosion allowance
5. insulate and electric heat trace pipe sections outside buildings and utilidors
6. no pressure test - atmospheric vent or drain
7. pipe sections underground to be coated with Shaw YJ1 or equal
8. internally coated pipe with Devoe Devchem 253, 3M Scotchkote 134, or equal
9. reduced design pressure to match pipeline MOP
10. CSA piping - test @ 1.5 x design pressure (ASME pressure test)
11. CSA pressure test 1.25 x design pressure
12. CSA pressure test 1.4 x design pressure
13. FRP materials
14. shrink sleeves installed after hydro-test
15. 600# MOP c/w 900# RF flanges and Fiberspar

REV	DESCRIPTION	BY	DATE	CHKD	APPD	JOB No.
0	ISSUED FOR CONSTRUCTION	MA	2014/09/11			2136

PERMIT

STAMP

PROFESSIONAL ENGINEER ALBERTA
R. RAY CUMBERLAND
Sept 11 2014

ARC RESOURCES LTD.

TNT Engineering Ltd.
SUITE 600, 639 - 5TH AVE SW
CALGARY, AB T2P 0M9
(403) 387-2500 PHONE
(403) 387-2535 FAX

ENGINEERING RECORD		
DRAWN:	M.Aalbers	DATE: 2014/09/11
CHECKED:		DATE:
APPROVED:		DATE:
ENGINEER:	R.CUMBERLAND	DATE: 2014/09/11

PEMBINA - MIPA 8
2-13-48-8 W5M
2-13 Injection North Header
LINE LIST

DWG. 0213048085.1500/01 REV. 0

PLOT BY: SKIM, 8/11/2014 4:50 PM

INSTRUMENTATION TABLE

FIRST LETTER	INITIATING OR MEASURED VARIABLE	CONTROLLERS			READOUT DEVICES			SWITCHES						ALARM DEVICES						TRANSMITTER			SOLENOID, RELAYS COMPUTING DEVICES	PRIMARY ELEMENT	TEST POINT	WELL OR PROBE	VIEW DEVICE. GLASS	SAFETY DEVICE	FINAL ELEMENT
		RECORDER	INDICATOR	BLIND	SELF ACTUATED CONTROL VALVE	RECORDER	INDICATOR	HIGH	HIGH HIGH (SHUTDOWN)	LOW	LOW LOW (SHUTDOWN)	COMBINATION	HIGH	HIGH HIGH (SHUTDOWN)	LOW	LOW LOW (SHUTDOWN)	COMBINATION	RECORDER	INDICATOR	BLIND									
A	ANALYSIS	ARC	AIC	AC		AR	AI	ASH	ASHH	ASL	ASLL	ASHL	AAH	AAHH	AAL	AALL	AAHL	ART	AIT	AT	AY	AE	AP	AW			AV
B	BURNER	BRC	BIC	BC		BR	BI	BSH	BSHH	BSL	BSLL	BSHL	BAH	BAHH	BAL	BALL	BAHL	BRT	BIT	BT	BY	BE		BW	BG		BZ
C	USERS CHOICE																											
D	USERS CHOICE																											
E	VOLTAGE	ERC	EIC	EC		ER	EI	ESH	ESHH	ESL	ESLL	ESHL	EAH	EAHH	EAL	EALL	EAHL	ERT	EIT	ET	EY	EE					EZ
F	FLOW	FRC	FIC	FC	FCV,FICV	FR	FI	FSH	FSHH	FSL	FSLL	FSHL	FAH	FAHH	FAL	FALL	FAHL	FRT	FIT	FT	FY	FE			FG		FV
FQ	FLOW QUANTITY	FQRC	FQIC	FQC		FQR	FQI	FQSH	FQSHH	FQSL	FQSLL	FQSHL	FQAH	FQAHH	FQAL	FQALL	FQAHL	FQRT	FQIT	FQT	FQY	FQE					FQV
FF	FLOW RATIO	FFRC	FFIC	FFC		FFR	FFI	FFSH	FFSHH	FFSL	FFSLL	FFSHL	FFAH	FFAHH	FFAL	FFALL	FFAHL	FFRT	FFIT	FFT	FFY						
G	USERS CHOICE																											
H	HAND		HIC	HC								HS					HA										HV
I	CURRENT	IRC	IIC			IR	II	ISH	ISHH	ISL	ISLL	ISHL	IAH	IAHH	IAL	IALL	IAHL	IRT	IIT	IT	IY	IE					IZ
J	POWER	JRC	JIC			JR	JI	JSH	JSHH	JSL	JSLL	JISHL	JAH	JAHH	JAL	JALL	JAHL	JRT	JIT	JT	JY	JE					JZ
K	TIME	KRC	KIC	KC	KCV	KR	KI	KSH	KSHH	KSL	KSLL	KSHL	KAH	KAHH	KAL	KALL	KAHL	KRT	KIT	KT	KY	KE					KV
L	LEVEL	LRC	LIC	LC	LCV	LR	LI	LSH	LSHH	LSL	LSLL	LSHL	LAH	LAHH	LAL	LALL	LAHL	LRT	LIT	LT	LY	LE			LG		LV
M	MOISTURE	MRC	MIC	MC		MR	MI	MSH	MSHH	MSL	MSLL	MSHL	MAH	MAHH	MAL	MALL	MAHL	MRT	MIT	MT	MY	ME	MP				
N	USERS CHOICE																											
O	USERS CHOICE																											
P	PRESSURE, VACUUM	PRC	PIC	PC	PCV	PR	PI	PSH	PSHH	PSL	PSLL	PSHL	PAH	PAHH	PAL	PALL	PAHL	PRT	PIT	PT	PY	PE	PP		PG	PSV,PSE	PV
PD	PRESSURE, DIFFERENTIAL	PDRC	PDIC	PDC	PDCV	PDR	PDI	PDSH	PDSHH	PDSL	PDSLL	PDSHL	PDAH	PDAHH	PDAL	PDALL	PDAHL	PDRT	PDIT	PDT	PDY							PDV
Q	QUANTITY	QRC	QIC	QC		QR	QI	QSH	QSHH	QSL	QSLL	QSHL	QAH	QAHH	QAL	QALL	QAHL	QRT	QIT	QT	QY							QZ
R	RADIATION	RRC	RIC	RC		RR	RI	RSH	RSHH	RSL	RSLL	RSHL	RAH	RAHH	RAL	RALL	RAHL	RRT	RIT	RT	RY			RW				RZ
S	SPEED	SRC	SIC	SC		SR	SI	SSH	SSHH	SSL	SSLL	SSHL	SAH	SAHH	SAL	SALL	SAHL	SRT	SIT	ST	SY	SE						
T	TEMPERATURE	TRC	TIC	TC	TCV	TR	TI	TSH	TSHH	TSL	TSLL	TSHL	TAH	TAHH	TAL	TALL	TAHL	TRT	TIT	TT	TY	TE		TW	TG	TSE	TV	
TD	TEMPERATURE, DIFFERENTIAL	TDRC	TDIC	TDC	TDCV	TDR	TDI	TDSH	TDSHH	TDSL	TDSLL	TDSHL	TDAH	TDAHH	TDAL	TDALL	TDAHL	TDRT	TDIT	TDT	TDY	TDE		TDW			TDV	
U	MULTI-VARIABLE																				UY						UV	
V	VIBRATION, MECH. ANALYSIS					VR	VI	VSH	VSHH	VSL	VSLL	VSHL	VAH	VAHH	VAL	VALL	VAHL	VRT	VIT	VT	VY	VE					VZ	
W	WEIGHT FORCE	WRC	WIC	WC		WR	WI	WSH	WSHH	WSL	WSLL	WSHL	WAH	WAHH	WAL	WALL	WAHL	WRT	WIT	WT	WY	WE					WZ	
WD	WEIGHT FORCE, DIFFERENTIAL	WDRC	WDIC	WDC		WDR	WDI	WDSH	WDSHH	WDSL	WDSLL	WDSHL	WDAH	WDAHH	WDAL	WDALL	WDAHL	WDRT	WDIT	WDT	WDY	WDE					WDZ	
X	UNCLASSIFIED																											
Y	EVENT STATE, PRESENCE		YIC	YC		YR	YI	YSH	YSHH	YSL	YSLL		YAH	YAHH	YAL	YALL	YAHL			YT	YY	YE						
Z	POSITION	ZRC	ZIC	ZC		ZR	ZI	ZSH	ZSHH	ZSL	ZSLL		ZAH	ZAHH	ZAL	ZALL	ZAHL	ZRT	ZIT	ZT	ZY	ZE						
ZD	GAUGING DEVIATION	ZDRC	ZDIC	ZDC		ZDR	ZDI	ZDSH	ZDSHH	ZDSL	ZDSLL		ZDAH	ZDAHH	ZDAL	ZDALL	ZDAHL	ZDRT	ZDIT	ZDT	ZDY	ZDE						

INSTRUMENT SYMBOLS

- DISCRETE INSTRUMENTS FIELD MOUNTED
- DISCRETE INSTRUMENTS PRIMARY LOCATION
- DISCRETE INSTRUMENTS AUXILIARY LOCATION
- DISTRIBUTED CONTROL FIELD MOUNTED
- DISTRIBUTED CONTROL PRIMARY LOCATION
- DISTRIBUTED CONTROL AUXILIARY LOCATION
- COMPUTER FUNCTION FIELD MOUNTED
- COMPUTER FUNCTION PRIMARY LOCATION
- COMPUTER FUNCTION AUXILIARY LOCATION
- INSTRUMENTS SHARING COMMON HOUSING
- INACCESSIBLE OR BEHIND THE PANEL DEVICES & FUNCTIONS USE THE SAME SYMBOL BUT WITH DASHED HORIZONTAL BARS
- PROGRAMMABLE LOGIC CONTROL (PLC) FIELD MOUNTED
- PROGRAMMABLE LOGIC CONTROL (PLC) PRIMARY LOCATION
- PROGRAMMABLE LOGIC CONTROL (PLC) AUXILIARY LOCATION
- PANEL MOUNTED PATCHBOARD POINT 12
- INTERLOCK
- PURGE
- RESET
- I.A. OR I.G. SUPPLY
- HORN
- CURRENT/ PNEUMATIC
- INDICATOR LIGHT
- BEACON

LINE NUMBERING

3-P-AS-001-38GT-IC

- 3 — SIZE (IMPERIAL NPS)
- P — INTERNAL COATING
- AS — COMMODITY
- 001 — SPECIFICATION NUMBER
- 38GT-IC — INSULATION THICKNESS AND DESIGNATION:
  - H — HEAT CONSERVATION
  - C — COLD CONSERVATION
  - PP — PERSONAL PROTECTION
  - ET — ELECTRICAL TRACE
  - GT — GLYCOL TRACE
  - HO — HOT OIL TRACE
  - J — JACKETED
  - ST — STEAM TRACE

FACILITY EQUIPMENT NUMBERING

EQUIPMENT NUMBERING STARTS WITH A LETTER CHOSEN FROM THE EQUIPMENT TAGS THAT BEST SUITS THE EQUIPMENT TO BE DESCRIBED. FOLLOWING THE EQUIPMENT TAG ARE THREE DIGIT CATEGORY NUMBER FROM THE EQUIPMENT NUMBERING LIST.

EXAMPLE: E-315

- E — EQUIPMENT (HEAT EXCHANGER)
- 315 — SERIAL NUMBERING (ASSIGNED TAG NUMBER)

EQUIPMENT TAGS

- A — AUXILIARY FACILITIES
- B — BLOWER OR FAN (PROCESS)
- BH — BUILDING HEATER
- C — CRUSHERS, MILLS & GRINDERS
- D — DRIVERS
- E — EXCHANGERS, AERIAL COOLERS, PLATE, SHELL & TUBE EXCH.
- F — FILTER SEPARATOR (PROCESS)
- FS — FLARE STACK
- G — GENERATOR, ELECTRIC, GAS OR TEG UNIT
- H — FIRED HEATER OR BOILER
- I — INCINERATOR
- J — CONVEYORS
- K — COMPRESSORS
- M — MIXERS & AGITATORS
- P — PUMPS
- R — REACTORS OR CONVERTER
- S — STORAGE
- T — TANKS
- V — VESSEL
- VS — VENT STACK
- Z — MISC. PACKAGES, METER SKIDS

EQUIPMENT NUMBERING

100 SERIES VESSELS
- SEPARATORS
- PROPANE TANKS
- F.G. SCRUBBERS
- CHILLERS
- CONTACTORS
- SPHERES
- BULLETS

200 SERIES PUMPS & COMPRESSORS
- SCREW COMP.
- RECIP. COMP.
- I.A. COMP.
- PUMPS

300 SERIES FIRED EQUIP. HEAT EXCHANGERS
- LINE HEATERS
- DEHY./AMINE REBOILERS
- FIN COOLERS
- SHELL & TUBE EXCHANGERS
- PLATE EXCHANGERS
- AERIAL COOLERS
- BUILDING HEATERS

400 SERIES TANKS
- WATER, OIL & DRAIN
- METHANOL
- CORROSION INHIBITOR
- CHEMICAL

500 SERIES POWER SYSTEM/DRIVERS
- TEG UNITS
- SOLAR
- GENERATORS
- GAS/ELECTRIC MOTORS

600 SERIES MISCELLANEOUS
- EXHAUST FANS
- METER SKIDS

700 SERIES FLARE SYSTEM
- FLARE STACK
- FLARE KNOCK OUT DRUM
- VENT STACK
- INCINERATOR

800 SERIES FILTERS

900 SERIES USERS CHOICE

PIPING SYMBOLS

- FLANGED POSITIVE DISPLACEMENT METER
- STRAIGHTENING VANES
- ROTAMETER
- VENTURI
- FLOW NOZZLE
- TURBINE METER
- POSITIVE DISPLACEMENT METER
- MAGNETIC FLOWMETER
- VORTEX METER
- CORIALIS METER
- PITOT TUBE (ANNUBAR)
- METER RUN
- METER RUN c/w STRAIGHTENING VANES
- EDUCTOR
- RUPTURE DISK
- BLEED RING
- PIG ENTRY TEE
- Y-STRAINER
- STEAM TRAP
- CONE STRAINER
- SPACER
- SPECTACLE BLIND OPEN
- SPECTACLE BLIND CLOSED
- FLAME ARRESTOR
- EXPANSION JOINT
- FLEX JOINT
- INLINE MIXER
- BOLT UP TIE-IN
- FIELD WELD TIE-IN
- TIE-IN POINT TAG. NO. (TP 01)
- DRESSER COUPLING
- OPEN DRAIN
- SPECIALTY ITEM (SP 001)
- SPECIFICATION BREAK (BSL | CSL)
- BARRED TEE
- CAMLOCK FITTING
- CHEMICAL INJECTION POINT (CH)

VALVES & CONNECTIONS

- FLANGED CONNECTION
- THREADED CONNECTION
- SOCKET WELD CONNECTION
- GATE VALVE
- GLOBE VALVE
- BALL VALVE
- SWING CHECK VALVE
- PISTON CHECK VALVE
- EXCESS FLOW VALVE
- BUTTERFLY VALVE
- NEEDLE VALVE
- 3-WAY VALVE
- PLUG VALVE
- PIGGING BALL VALVE
- DIAPHRAGM
- INLINE CHOKE
- ANGLE VALVE
- ANGLE CHOKE
- PRESSURE RELIEF
- PRESSURE & VACUUM RELIEF VALVE
- 3 WAY VALVE c/w PISTON ACTUATOR & RESET LATCH
- ROTARY MOTOR VALVE
- PRESSURE CONTROL VALVE (SELF-ACTUATED)
- PISTON ACTUATED CONTROL VALVE
- DIGITAL
- SOLENOID VALVE
- 3-WAY SOLENOID VALVE

LINE TYPES

- PROCESS PIPING
- SECONDARY PIPING
- PROCESS SKID LIMIT
- ELECTRIC SIGNAL
- HYDRAULIC SIGNAL
- CAPILLARY SIGNAL
- ELECTROMAGNETIC/SONIC SIGNAL (GUIDED)
- ELECTROMAGNETIC/SONIC SIGNAL (NOT GUIDED)
- PNEUMATIC BINARY SIGNAL
- PNEUMATIC SIGNAL
- SOFTWARE SIGNAL (DATA LINK)
- ELECTRIC BINARY SIGNAL
- MECHANICAL LINK
- UNDEFINED SIGNAL
- TUBING
- FUTURE

COMMODITY CODES

- AF — ACID GAS FLARE
- AM — AMINE
- B — BUTANE
- BA — BREATHING AIR
- BG — BLANKET GAS
- BD — BLOWDOWN
- BFW — BOILER FEED WATER
- C — CONDENSATE (C4-C8)
- CA — COMBUSTION AIR
- C — COOLING WATER
- D — DRAIN
- EX — EXHAUST GAS
- F — FLARE
- FG — FUEL GAS
- FO — FUEL OIL
- FW — FIRE WATER
- G — GAS
- GL — GLYCOL
- H — HYDROGEN
- HF — HIGH PRESSURE FLARE
- HM — HEAT MEDIUM
- IA — INSTRUMENT AIR
- IW — INJECTION WATER
- JW — JACKET WATER
- LF — LOW PRESSURE FLARE
- LO — LUBE OIL
- N — NITROGEN
- NGL — PETROLEUM LIQUIDS (C2-C4)
- O — SHIPPING OIL
- OE — OIL EMULSION
- OW — OIL & WATER
- PL — POLYMER
- PW — PRODUCED WATER
- R — RELIEF
- RF — REFRIGERANT
- RW — RAW WATER
- S — STEAM
- SC — STEAM CONDENSATE
- SU — SULPHUR
- SW — SOURCE WATER
- V — VENT
- UA — UTILITY AIR
- UG — UTILITY GAS
- UW — UTILITY WATER

LINE NUMBERING BY COMMODITY

LINES 100-299
MAIN PROCESS LINES
PROCESS GAS LINES

LINES 300-499
SECONDARY PROCESS LINES
(OIL AND CONDENSATE)

LINES 500-599
BLOWDOWNS, RELIEF AND DRAINS
(BD, D, HF, LF, R)

LINES 600-699
FUEL GAS (FG)
INSTRUMENT GAS (IG, UA)

LINES 700-899
UTILITIES
BLANKET GAS (BG)
CHEMICAL INJECTION (CH)
HEAT MEDIUM (HM)
INSTRUMENT AIR (IA)
STEAM (S, SC)

LINES 900-999
USERS CHOICE (EX, N, SU)

ABBREVIATIONS

- AC — AIR TO CLOSE
- AO — AIR TO OPEN
- CC — CORROSION COUPON
- CO — CLEAN OUT
- CP — CATHODIC PROTECTION
- CSC — CAR SEAL CLOSED
- CSO — CAR SEAL OPEN
- DBB — DOUBLE BLOCK & BLEED
- FC — FAIL CLOSED
- FL — FAIL LOCK
- FLP — FAIL LAST POSITION
- FO — FAIL OPEN
- FOB — FLAT ON BOTTOM
- FOT — FLAT ON TOP
- FP — FULL PORT
- HDPE — HIGH DENSITY POLYETHYLENE
- HOA — HAND OFF AUTO
- IK — INSULATING KIT
- LEL — LOWER EXPLOSIVE LIMIT
- MV — MANWAY
- MCC — MOTOR CONTROL CENTRE
- NC — NORMALLY CLOSED
- NO — NORMALLY OPEN
- SP — SAMPLE POINT
- S/S — SEAM TO SEAM
- T/T — TANGENT TO TANGENT
- TH — THIEF HATCH
- TSS — TEMPORARY SUCTION STRAINER
- WC — WAFER CHECK

OTHER POSSIBLE INSTRUMENTATION COMBINATIONS

- FO — RESTRICTION ORIFICE
- FRK — FLOW CONTROL STATION
- HIK — HAND CONTROL STATION
- FX — ACCESSORIES
- TJR — SCANNING RECORDER
- LLH — PILOT LIGHT
- PFR — RATIO
- KQI — RUNNING TIME INDICATOR
- QQI — INDICATING COUNTER
- WKIC — RATE OF WEIGHT LOSS CONTROLLER
- HMS — HAND MOMENTARY SWITCH
- ESDV — EMERGENCY SHUTDOWN VALVE

ARC RESOURCES LTD.

TNT Engineering Ltd.
SUITE 600, 639 - 5TH AVE SW
CALGARY, AB, T2P 0M9
(403) 387-2500 PHONE
(403) 387-2535 FAX

DRAWING NUMBERING

0408081166.0000/01
- 0408081166 — SURFACE LSD/NTS
- 0000 — DRAWING NO.
- 01 — SHEET NO.

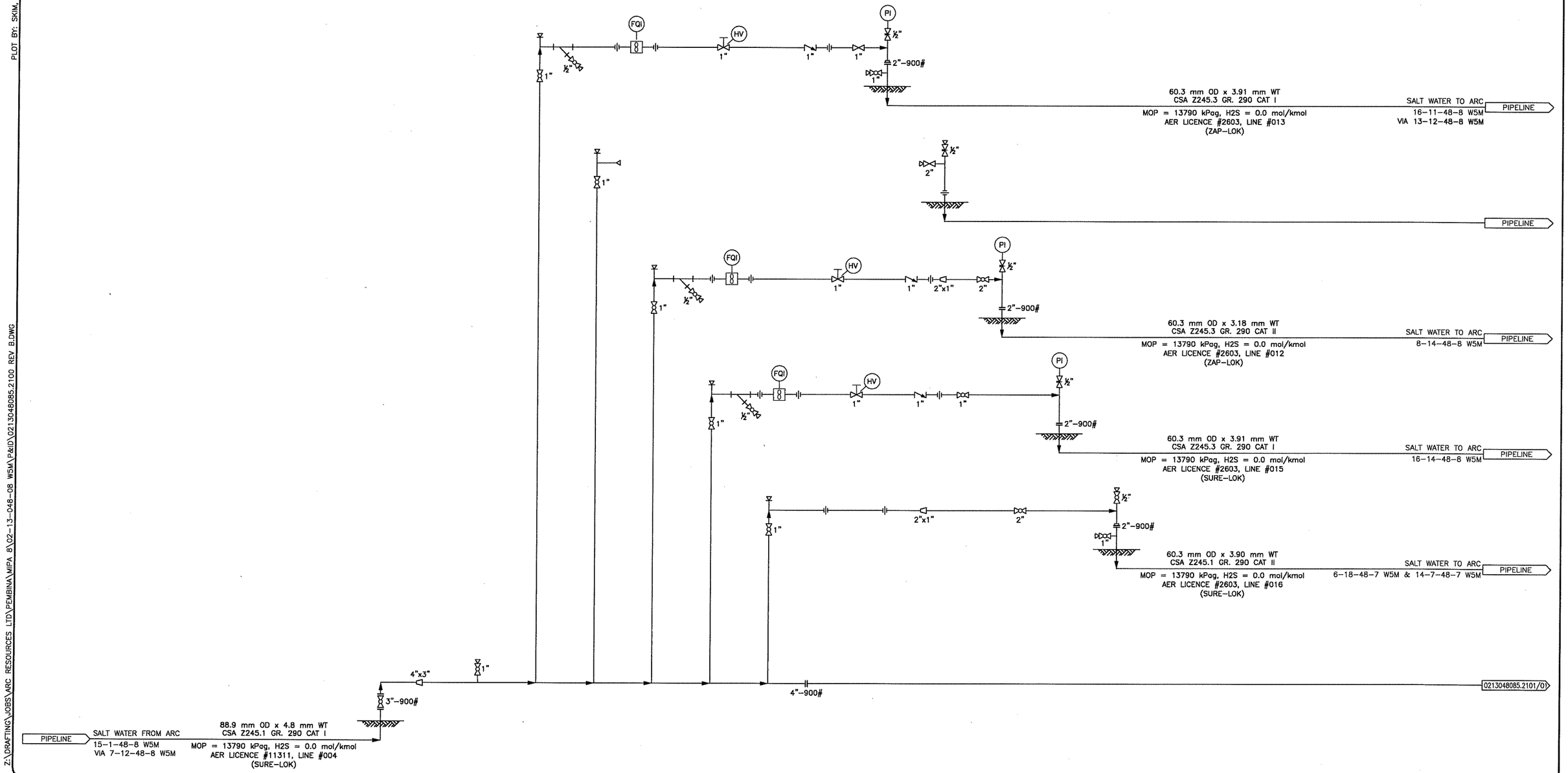
TYPICAL FLOW SHEET SYMBOLS AND STANDARDS

REV.	DATE	DWG	REV.
	06/05/2013	SYMBOL SHEET	D

DRAWING SHEET SIZE: 11" x 17"
Z:\DRAFTING\JOBS\ARC RESOURCES LTD\ARC SYMBOL SHEET REV D.DWG

PLOT BY: SKIM, 8/11/2014 5:05 PM

Z:\DRAFTING\JOBS\ARC RESOURCES LTD\PEMBINA\MIPA 8\02-13-048-08 W5M\P&ID\0213048085.2100 REV B.DWG



DRAWING SHEET SIZE: 11" x 17"

REV	DESCRIPTION	BY	MM/DD/YYYY	CHKD	APPD	JOB No.
A	AS–BUILT	EU	03/03/2014	KR		2136

PERMIT

STAMP

ARC RESOURCES LTD.

TNT Engineering Ltd.
SUITE 600, 639 - 5TH AVE SW
CALGARY, AB, T2P 0M9
(403) 387-2500 PHONE
(403) 387-2535 FAX

ENGINEERING RECORD			
DRAWN:	E. USON	DATE:	03/03/2014
CHECKED:	K. ROBERTS	DATE:	03/03/2014
ENGINEER:		DATE:	
PROJECT MANAGER:	R. CUMBERLAND	DATE:	03/03/2014

PEMBINA – MIPA 8
2–13–48–8 W5M
2–13 INJECTION SOUTH HEADER
PIPING AND INSTRUMENTATION DIAGRAM

SCALE	DWG	REV.
NTS	0213048085.2100/01	A

DEMOLITION DWG

1" ½" 2"x1/2" 2"x1" 2" 2"–900# 1"

60.3 mm OD x 3.9 mm WT
CSA Z245.1 GR. 290 CAT I
MOP = 13790 kPag, H2S = 0.0 mol/kmol
AER LICENCE #2603, LINE #020
(THRU–KOTE)

SALT WATER TO ARC 8–13–48–8 W5M PIPELINE 14–13–48–8 W5M

T 01 FQI HV PI ½" 1" 2"x1" 2" 3/4"x1/2" 2"x3/4" 2"–1500# FIELD TO CONFIRM T 02

90° FIBERSPAR RISER CHUTE

88.9 mm OD x 3.18 mm WT
2.5" FIBERSPAR 2500 LINER
MOP = 13790 kPag, H2S = 0.0 mol/kmol
AER LICENCE #2603, LINE #021

SALT WATER TO ARC 4–13–48–8 W5M PIPELINE

T 03 1" 2"–900#

SALT WATER TO ARC 8–14–48–8 W5M PIPELINE

T 04 FQI HV T 05 ½" 1" 1"

73.0 mm OD x 10.5 mm WT
FIBERSPAR 2500
MOP = 13790 kPag, H2S = 0.0 mol/kmol
AER LICENCE #11311, LINE #007

SALT WATER TO ARC 14–12–48–8 W5M PIPELINE

1" 2"–900#

SALT WATER TO ARC 8–13–48–8 W5M PIPELINE

AER LICENCE #2603, LINE #011
(DISCONTINUED)

T 06 FQI HV T 07 ½" 1" 1" 1" 1"

90° FIBERSPAR RISER CHUTE

73.0 mm OD x 10.5 mm WT
FIBERSPAR 2500
MOP = 13790 kPag, H2S = 0.0 mol/kmol
AER LICENCE #11311, LINE #008

SALT WATER TO ARC 15–12–48–8 W5M PIPELINE

2"–900#

UNKNOWN PIPELINE

(DISCONTINUED)

0213048085.2100/01 1" 4"x3" 3"–900# 1" ½"

88.9 mm OD x 4.8 mm WT
CSA Z245.1 GR. 290 CAT I
MOP = 13790 kPag, H2S = 0.0 mol/kmol
AER LICENCE #11311, LINE #004
(SURE–LOK)

SALT WATER FROM ARC 15–1–48–8 W5M VIA 7–12–48–8 W5M PIPELINE

DRAWING SHEET SIZE: 11" x 17"

REV	DESCRIPTION	BY	MM/DD/YYYY	CHKD	APPD	JOB No.
A	ISSUED FOR DEMOLITION – 2–13 POLYMER INJECTION SKID	SK	08/11/2014	KR	MA	2136

PERMIT

PROFESSIONAL ENGINEER ALBERTA R. RAY CUMBERLAND Sept 11 2014

ARC RESOURCES LTD.

TNT Engineering Ltd.
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CALGARY, AB, T2P 0M9
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ENGINEERING RECORD			
DRAWN:	S. KIM	DATE:	08/11/2014
CHECKED:	K. ROBERTS	DATE:	08/11/2014
ENGINEER:	M. AALBERS	DATE:	08/11/2014
PROJECT MANAGER:	R. CUMBERLAND	DATE:	08/11/2014

PEMBINA – MIPA 8
2–13–48–8 W5M
2–13 INJECTION NORTH HEADER
PIPING AND INSTRUMENTATION DIAGRAM

SCALE	DWG	REV.
NTS	0213048085.2101D/01	A

PLOT BY: KROBERTS, 9/12/2014 9:05 AM

Z:\DRAFTING\JOBS\ARC RESOURCES LTD\PEMBINA\MIPA 8\02-13-048-08 W5M\P&ID\0213048085.2100 REV 0.DWG

2"x1/2" 2"x1" 2" 2"-900# ½" 1"

0213048085.2102/01 CDG FROM ARC POLYMER HYDRATION SKID
6-13 LINE
(FINAL SOLUTION 1)
2-PW-D-101-25ET-IC
PI ½" ½" 2"-900# RTJ
90° FIBERSPAR RISER CHUTE
60.3 mm OD x 3.9 mm WT
CSA Z245.1 GR. 290 CAT I
MOP = 13790 kPag, H2S = 0.0 mol/kmol
AER LICENCE #2603, LINE #020
(THRU-KOTE)
SALT WATER TO ARC 14-13-48-8 W5M PIPELINE

0213048085.2102/01 CDG FROM ARC POLYMER HYDRATION SKID
10-12 LINE
(FINAL SOLUTION 2)
2-PW-D-102-25ET-IC
PI ½" ½" 2"-900# RTJ
90° FIBERSPAR RISER CHUTE
60.3 mm OD x 3.9 mm WT
1.75" FIBERSPAR 2500 LINER
MOP = 13790 kPag, H2S = 0.0 mol/kmol
AER LICENCE #2603, LINE #021
CDG TO ARC 6-13-48-8 W5M PIPELINE

0213048085.2102/01 CDG FROM ARC POLYMER HYDRATION SKID
4-13 LINE
(FINAL SOLUTION 3)
2-PW-D-103-25ET-IC
PI ½" ½" 2"-900# RTJ
0
T 02 2"-1500#
90° FIBERSPAR RISER CHUTE
88.9 mm OD x 3.18 mm WT
2.5" FIBERSPAR 2500 LINER
MOP = 13790 kPag, H2S = 0.0 mol/kmol
AER LICENCE #2603, LINE #021
CDG TO ARC 10-12-48-8 W5M PIPELINE

0213048085.2102/01 CDG FROM ARC POLYMER HYDRATION SKID
8-14 LINE
(FINAL SOLUTION 4)
2-PW-D-104-25ET-IC
PI ½" ½" 2"-900# RTJ
T 03 2"-900#
90° FIBERSPAR RISER CHUTE
88.9 mm OD x 3.18 mm WT
2.5" FIBERSPAR 2500 LINER
MOP = 13790 kPag, H2S = 0.0 mol/kmol
AER LICENCE #2603, LINE #021
0 CDG TO ARC 4-13-48-8 W5M PIPELINE

0213048085.2102/01 CDG FROM ARC POLYMER HYDRATION SKID
14-12 LINE
(FINAL SOLUTION 5)
2-PW-D-105-25ET-IC
PI ½" ½" 2"-900# RTJ
0
T 05
60.3 mm OD x 3.9 mm WT
CSA Z245.1 GR. 290 CAT I
MOP = 13790 kPag, H2S = 0.0 mol/kmol
0 CDG TO ARC 8-14-48-8 W5M PIPELINE

1" 2"-900#
73.0 mm OD x 10.5 mm WT
FIBERSPAR 2500
MOP = 13790 kPag, H2S = 0.0 mol/kmol
AER LICENCE #11311, LINE #007
0 CDG TO ARC 14-12-48-8 W5M PIPELINE

0213048085.2102/01 CDG FROM ARC POLYMER HYDRATION SKID
16-12 LINE
(FINAL SOLUTION 6)
2-PW-D-106-25ET-IC
PI ½" ½" 2"-900# RTJ
2"-1500# T 07 0
AER LICENCE #2603, LINE #011
(DISCONTINUED)
SALT WATER TO ARC 8-13-48-8 W5M PIPELINE

90° FIBERSPAR RISER CHUTE
73.0 mm OD x 10.5 mm WT
FIBERSPAR 2500
MOP = 13790 kPag, H2S = 0.0 mol/kmol
AER LICENCE #11311, LINE #008
0 CDG TO ARC 16-12-48-8 W5M PIPELINE

2"-900#
(DISCONTINUED)
UNKNOWN PIPELINE

0213048085.2100/01
0 HP SOURCE WATER TO ARC POLYMER HYDRATION SKID
3-PW-D-100-25ET-IC
3"-900# RTJ
T 08
T 01 0 1"
1"
T 04 0 1"
T 06 0 1"
4"x3"
3"-900#
1" ½"
88.9 mm OD x 4.8 mm WT
CSA Z245.1 GR. 290 CAT I
MOP = 13790 kPag, H2S = 0.0 mol/kmol
AER LICENCE #11311, LINE #004
(SURE-LOK)
SALT WATER FROM ARC 15-1-48-8 W5M VIA 7-12-48-8 W5M PIPELINE

DRAWING SHEET SIZE: 11" x 17"

REV	DESCRIPTION	BY	MM/DD/YYYY	CHKD	APPD	JOB No.
0	ISSUED FOR CONSTRUCTION – 2-13 POLYMER INJECTION SKID	BW	09/11/2014	KR		2136

PERMIT

PROFESSIONAL ENGINEER ALBERTA R. RAY CUMBERLAND Sept 12 2014

ARC RESOURCES LTD.

TNT Engineering Ltd.
SUITE 600, 639 - 5TH AVE SW
CALGARY, AB, T2P 0M9
(403) 387-2500 PHONE
(403) 387-2535 FAX

ENGINEERING RECORD			
DRAWN:	E. USON	DATE:	03/03/2014
CHECKED:	K. ROBERTS	DATE:	03/03/2014
ENGINEER:	M AALBERS	DATE:	08/11/2014
PROJECT MANAGER:	R. CUMBERLAND	DATE:	03/03/2014

PEMBINA – MIPA 8
2-13-48-8 W5M
2-13 INJECTION NORTH HEADER
PIPING AND INSTRUMENTATION DIAGRAM

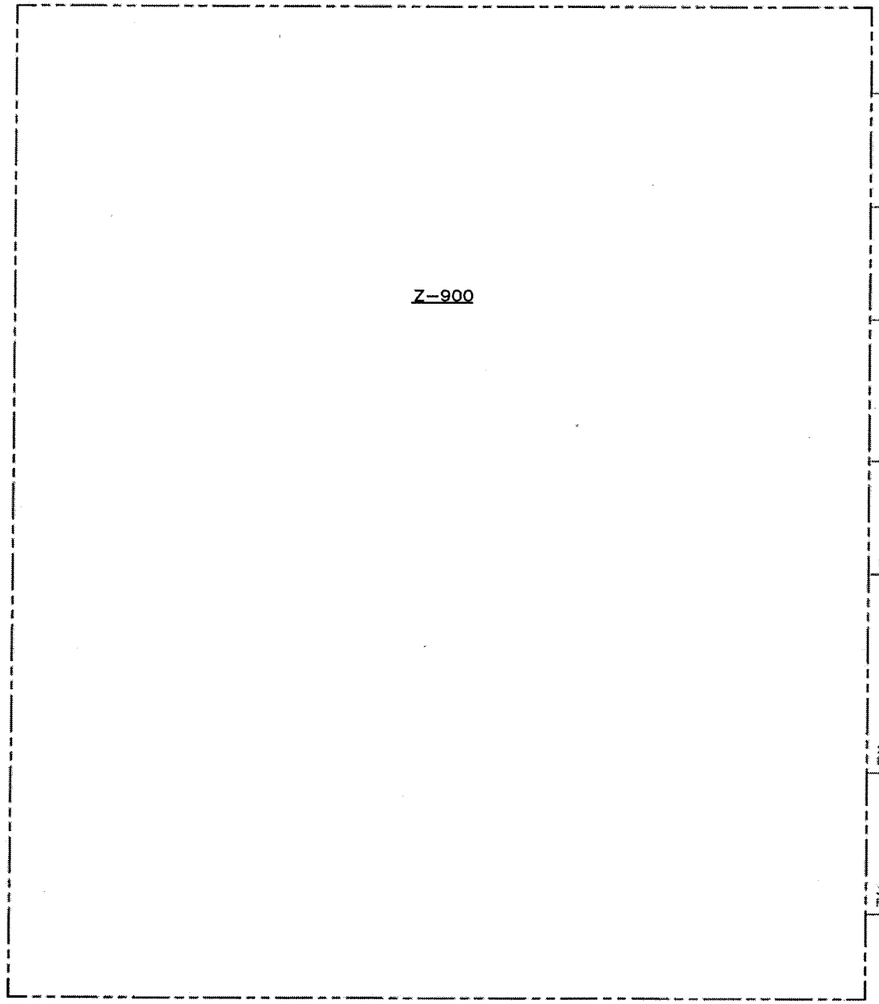
SCALE: NTS | DWG: 0213048085.2101/01 | REV: 0

PLOT BY: BWANG, 9/11/2014 2:48 PM

Z:\DRAFTING\JOBS\ARC RESOURCES LTD\PEMBINA\MIPA 8\02-13-048-08 W5M\PA&ID\0213048085.2100 REV 0.DWG

Z-900
POLYMER INJECTION PACKAGE

VENDOR: FABTECH – BLACK BOX
TYPE: CDG – CHROMIUM CROSS-LINKER
DATE: 2014



2"-900# RTJ — 2-PW-D-101-25ET-IC — CDG TO 2-13 HEADER 8-13 LINE — 0213048085.2101/01
(FINAL SOLUTION 1)

2"-900# RTJ — 2-PW-D-102-25ET-IC — CDG TO 2-13 HEADER 10-12 LINE — 0213048085.2101/01
(FINAL SOLUTION 2)

2"-900# RTJ — 2-PW-D-103-25ET-IC — CDG TO 2-13 HEADER 4-13 LINE — 0213048085.2101/01
(FINAL SOLUTION 3)

2"-900# RTJ — 2-PW-D-104-25ET-IC — CDG TO 2-13 HEADER 8-14 LINE — 0213048085.2101/01
(FINAL SOLUTION 4)

2"-900# RTJ — 2-PW-D-105-25ET-IC — CDG TO 2-13 HEADER 14-12 LINE — 0213048085.2101/01
(FINAL SOLUTION 5)

2"-900# RTJ — 2-PW-D-106-25ET-IC — CDG TO 2-13 HEADER 16-12 LINE — 0213048085.2101/01
(FINAL SOLUTION 6)

3"-900# RTJ — 3-PW-D-100-25ET-IC — HP SOURCE WATER FROM 2-13 HEADER — 0213048085.2101/01

DRAWING SHEET SIZE: 11" x 17"

REV	DESCRIPTION	BY	MM/DD/YYYY	CHKD	APPD	JOB No.
0	ISSUED FOR CONSTRUCTION – 2-13 POLYMER INJECTION SKID	BW	09/11/2014	KR	MA	2136

PERMIT

STAMP: PROFESSIONAL ENGINEER ALBERTA — R. RAY CUMBERLAND — SEP 12 2014

ARC RESOURCES LTD.

TNT Engineering Ltd.
SUITE 600, 639 - 5TH AVE SW
CALGARY, AB, T2P 0M9
(403) 387-2500 PHONE
(403) 387-2535 FAX

ENGINEERING RECORD			
DRAWN:	G. WONG	DATE:	08/28/2014
CHECKED:	K. ROBERTS	DATE:	08/28/2014
ENGINEER:	M AALBERS	DATE:	08/28/2014
PROJECT MANAGER:	R. CUMBERLAND	DATE:	08/28/2014

PEMBINA – MIPA 8
2-13-48-8 W5M
2-13 CDG POLYMER SKID
PIPING AND INSTRUMENTATION DIAGRAM

SCALE: NTS | DWG: 0213048085.2102/01 | REV. 0

PLOT BY: BWANG, 9/11/2014 2:48 PM

Z:\DRAFTING\JOBS\ARC RESOURCES LTD\PEMBINA\TYPICAL\F&ID\TYP-PEMBINA.2010 REV 0.DWG

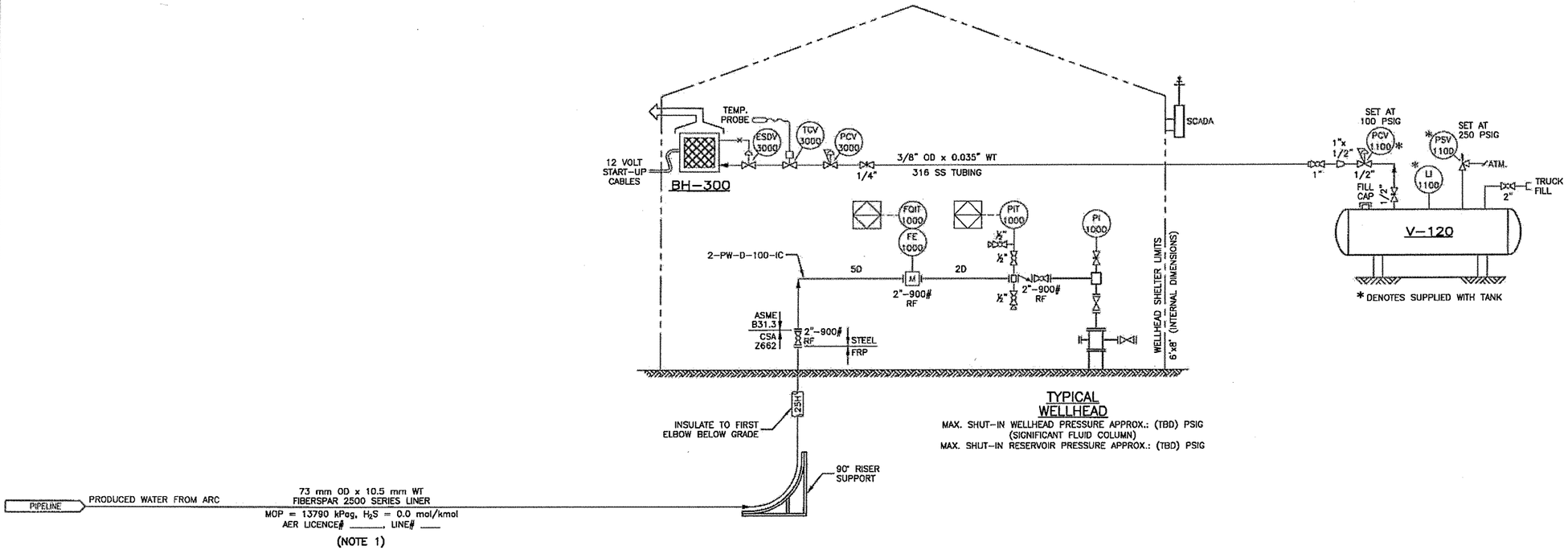
DRAWING SHEET SIZE: 11" x 17"

BH-300
BUILDING HEATER

V-120
PROPANE TANK

NOTE:

1. AS PER CSA Z662 SECTION 13.1.2.9 CYCLIC PRESSURE SERVICE FACTOR APPLIES WHEN NORMAL OPERATING PRESSURE REGULARLY CYCLES MORE THAN 20% OF MOP.



WELLS

100/10-12-48-8 W5M
100/14-12-48-8 W5M
100/16-12-48-8 W5M
100/4-13-48-8 W5M
100/6-13-48-8 W5M
100/8-14-48-8 W5M

REV	DESCRIPTION	BY	MM/DD/YYYY	CHKD	APPD	JOB No.
A	ISSUED FOR CONSTRUCTION – CDG PROJECT	BW	09/11/2014	RC		2136

PERMIT

PROFESSIONAL ENGINEER ALBERTA
R. RAY CUMBERLAND
PERMIT TO PRACTICE
STAMP

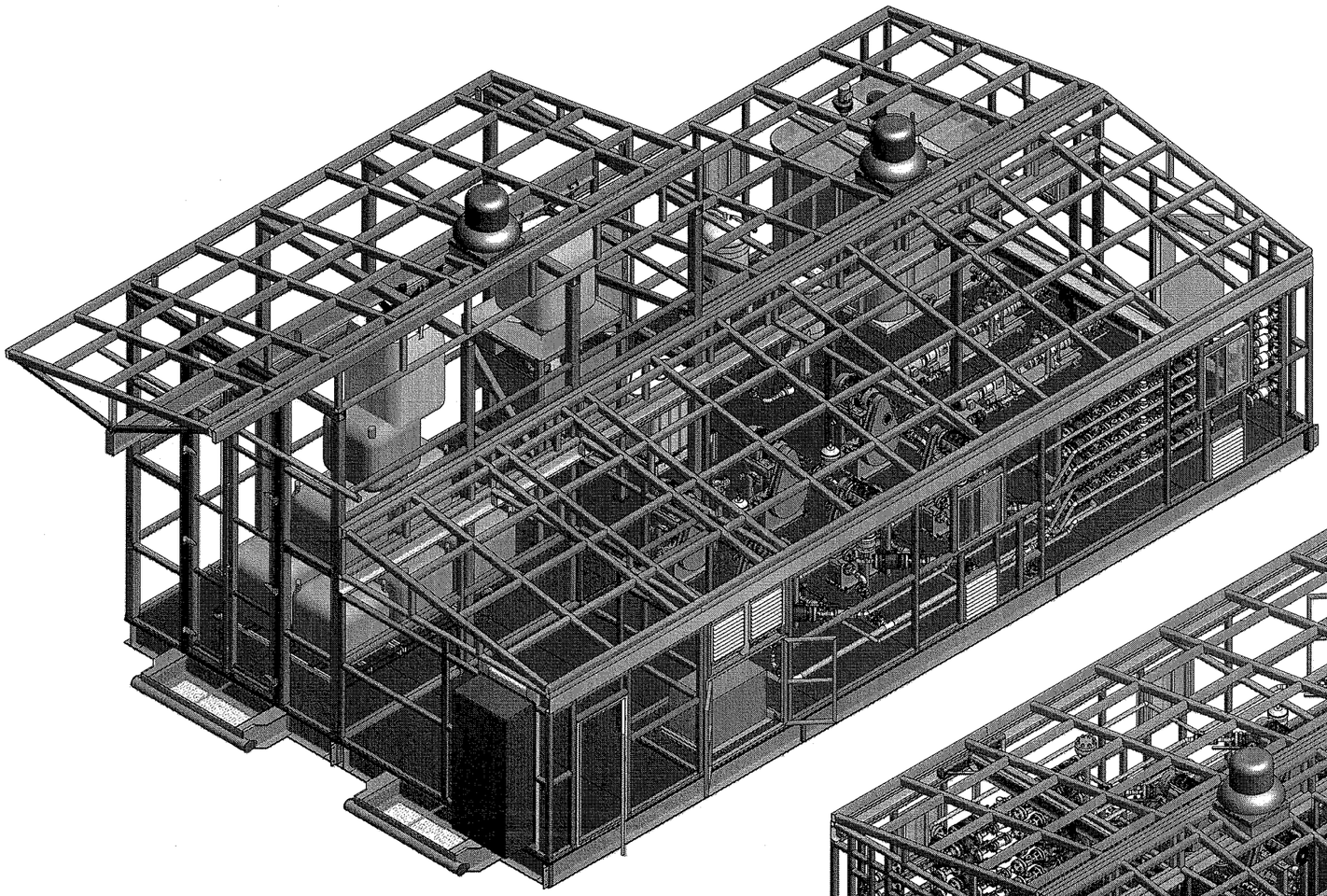
ARC RESOURCES LTD.

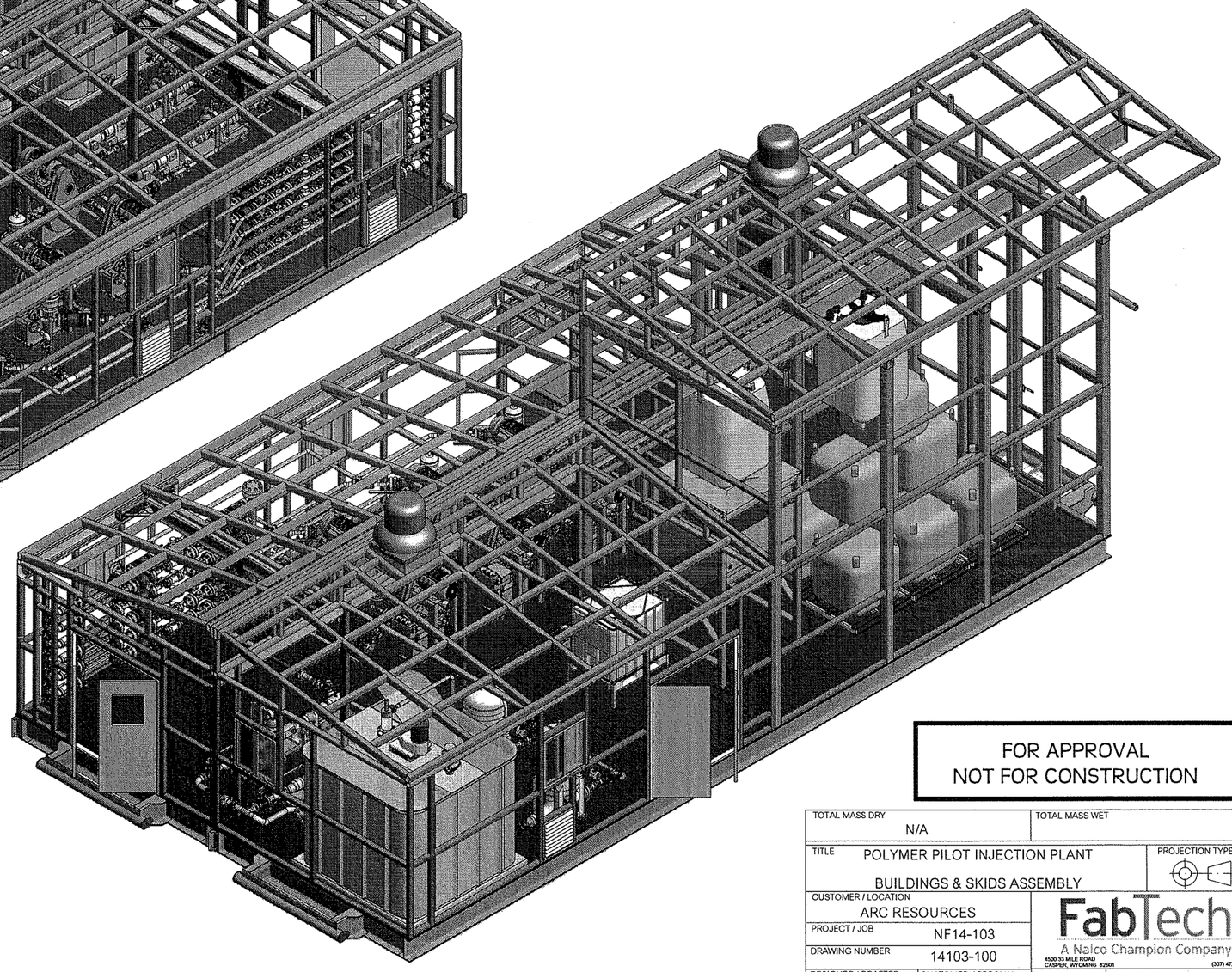
TNT Engineering Ltd.
SUITE 600, 639 - 5TH AVE SW
CALGARY, AB, T2P 0M9
(403) 387-2500 PHONE
(403) 387-2535 FAX

ENGINEERING RECORD			
DRAWN:	K. ROBERTS	DATE:	08/18/2014
CHECKED:		DATE:	
ENGINEER:		DATE:	
PROJECT MANAGER:	R. CUMBERLAND	DATE:	08/18/2014

PEMBINA
TYPICAL
CDG WATER INJECTION WELLHEAD AREA PIPING AND INSTRUMENTATION DIAGRAM

SCALE	DWG	REV.
NTS	TYP.PEMBINA.2010/02	0



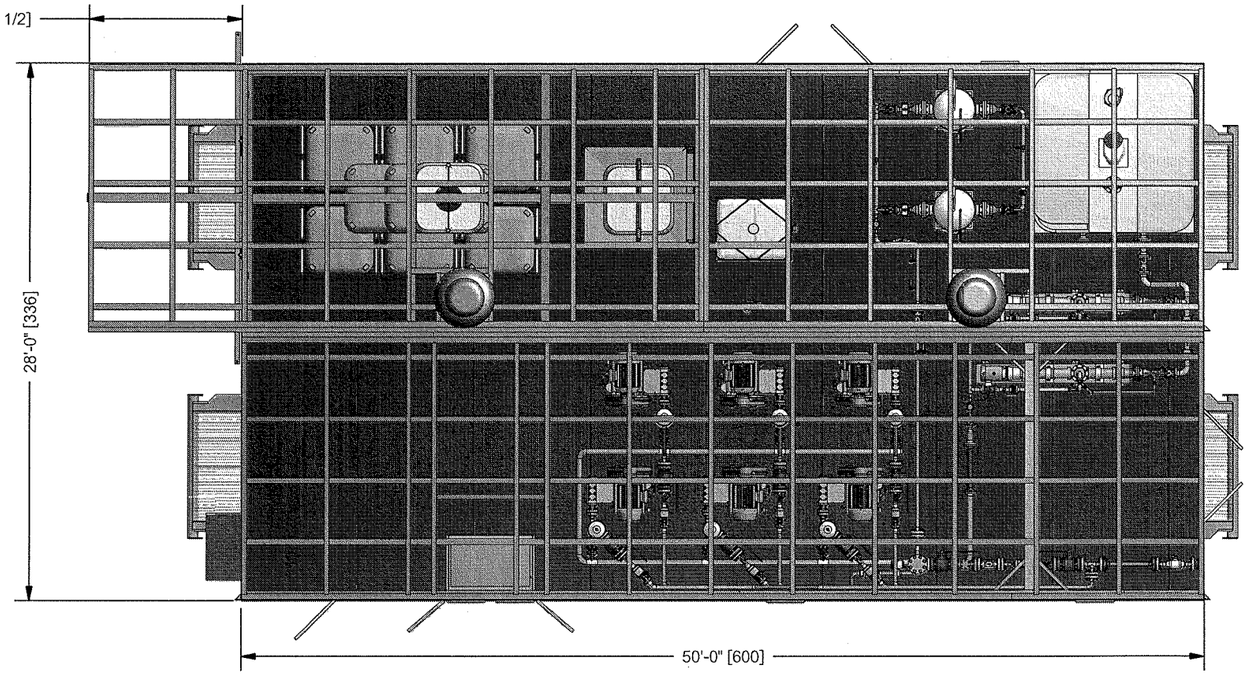


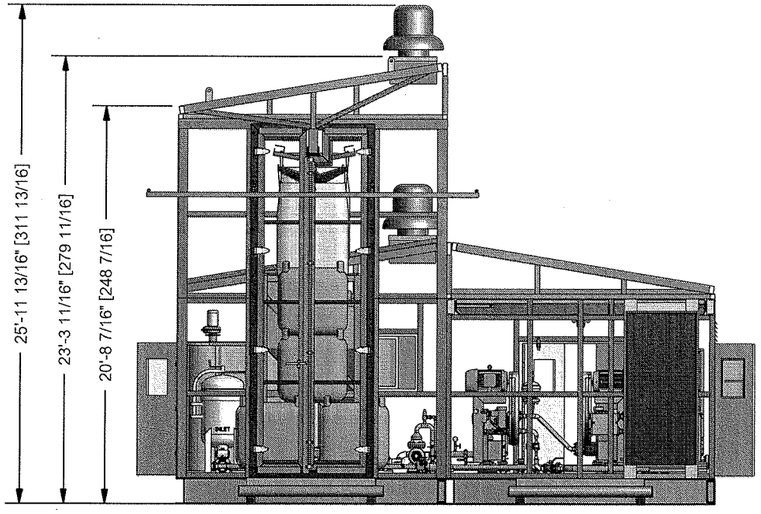
FOR APPROVAL
NOT FOR CONSTRUCTION

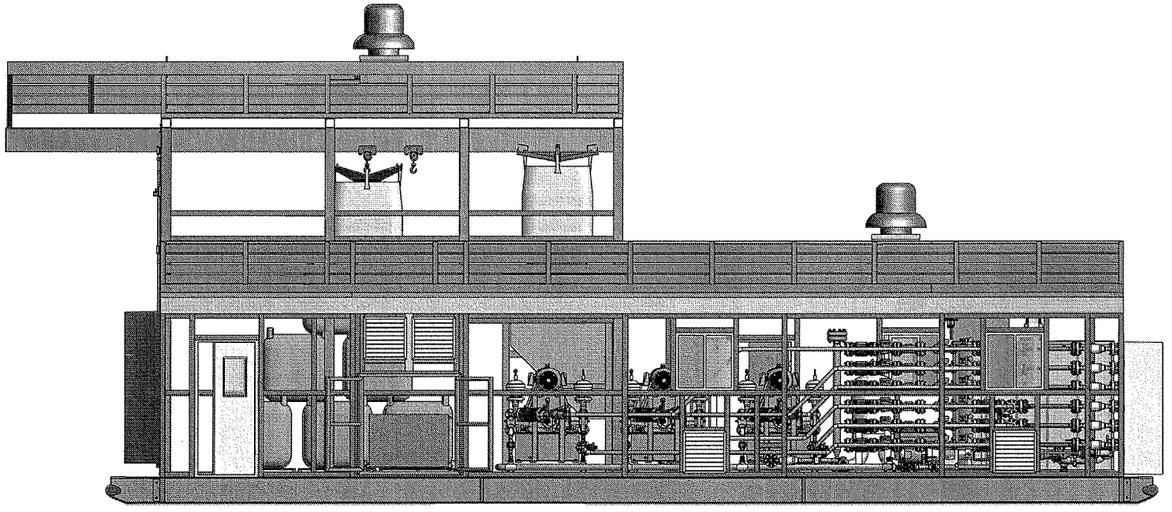
REV	REVISION	DATE	BY
C	PIPING & PUMP LAYOUT RE-WORK	8/13/2014	JDV
B	RE-WORK FROM MEETINGS	8/5/2014	JDV
A	INITIAL CONCEPT	7/14/2014	JDV

TOTAL MASS DRY: N/A		TOTAL MASS WET:	
TITLE: POLYMER PILOT INJECTION PLANT BUILDINGS & SKIDS ASSEMBLY		PROJECTION TYPE	
CUSTOMER / LOCATION: ARC RESOURCES		FabTech A Nalco Champion Company 4500 33 MILE ROAD CASPER, WYOMING 82601 (307) 472-9740	
PROJECT / JOB: NF14-103			
DRAWING NUMBER: 14103-100			
DESIGNER / DRAFTER: JDV	CUSTOMER APPROVAL:	DATE: 7/14/2014	JOB GROUP:
PROJ. MANAGER/ENGINEER: AM/DP	CHECKER:	SHEET SIZE: B	SHEET: 1 OF 8 / REV.: C

C:\NFT_Vault\NFT_2014\NF14-103; ARC RESOURCES_Drawings\14103-100.idw







FOR APPROVAL
NOT FOR CONSTRUCTION

TOTAL MASS DRY: N/A		TOTAL MASS WET:	
TITLE: POLYMER PILOT INJECTION PLANT BUILDINGS & SKIDS ASSEMBLY			PROJECTION TYPE
CUSTOMER / LOCATION: ARC RESOURCES		FabTech A Nalco Champion Company 4500 33 MILE ROAD CASPER, WYOMING 82601 (307) 472-9740	
PROJECT / JOB: NF14-103			
DRAWING NUMBER: 14103-100			
DESIGNER / DRAFTER: JDV	CUSTOMER APPROVAL	DATE: 7/14/2014	JOB GROUP
PROJ. MANAGER/ENGINEER: AM/DP	CHECKER	SHEET SIZE: B	SHEET: 2 OF 8 / REV.: C

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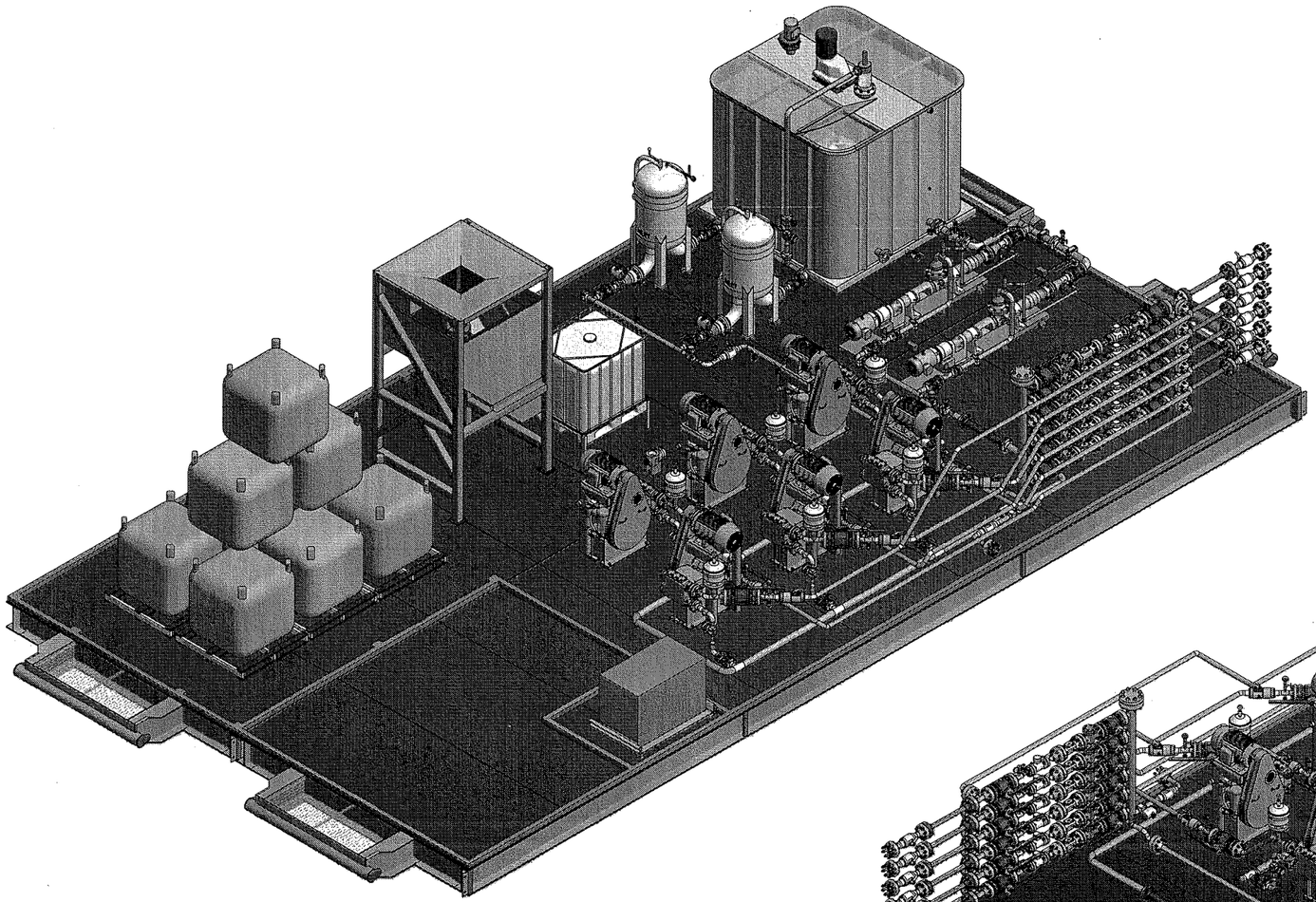
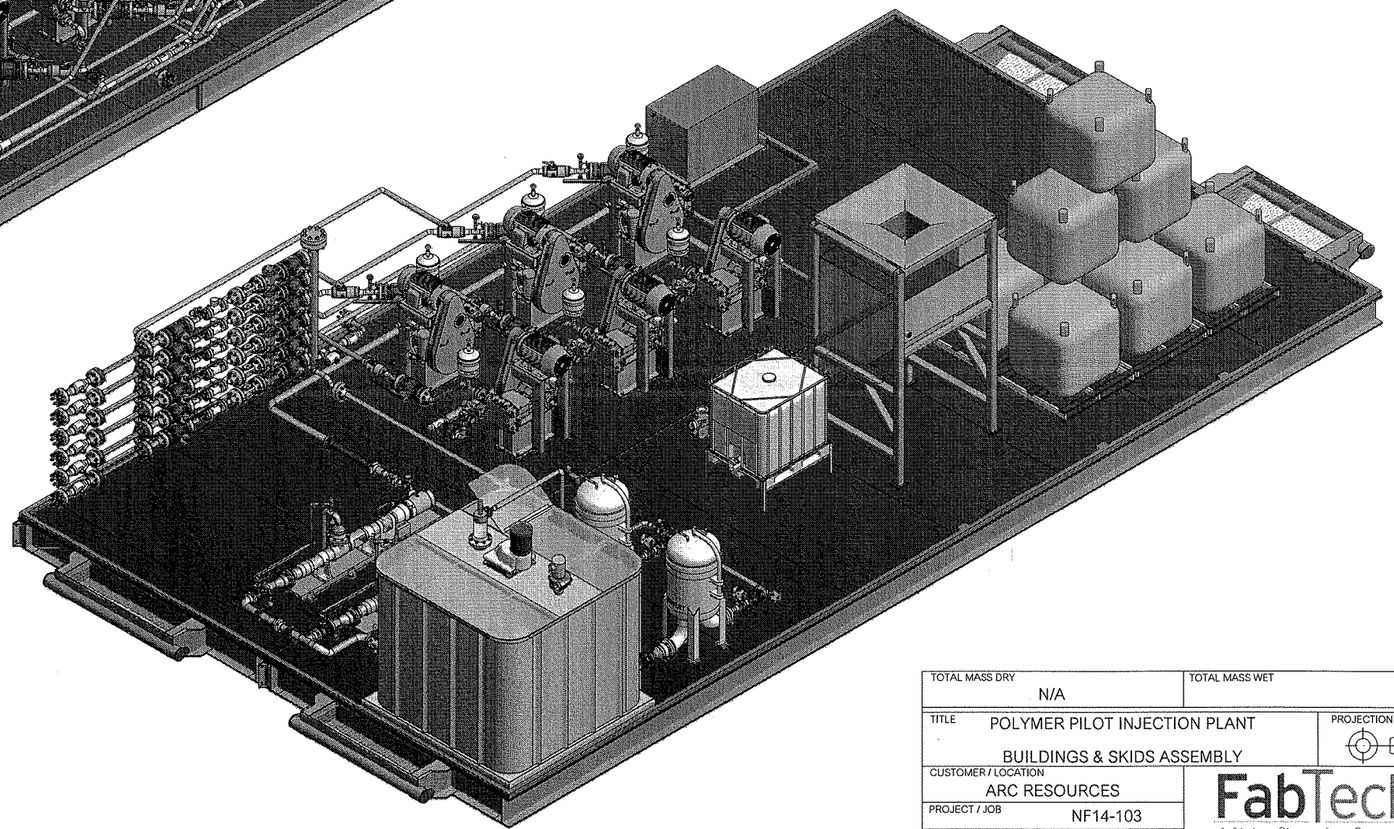




TOTAL MASS DRY: N/A	TOTAL MASS WET:
TITLE: POLYMER PILOT INJECTION PLANT BUILDINGS & SKIDS ASSEMBLY	PROJECTION TYPE
CUSTOMER / LOCATION: ARC RESOURCES	FabTech A Nalco Champion Company 4500 33 MILE ROAD CASPER, WYOMING 82601 (307) 472-9740
PROJECT / JOB: NF14-103	
DRAWING NUMBER: 14103-100	
DESIGNER / DRAFTER: JDV / CUSTOMER APPROVAL	DATE: 7/14/2014 / JOB GROUP
PROJ. MANAGER/ENGINEER: AM/DP / CHECKER	SHEET SIZE: B / SHEET: 3 OF 8 / REV.: C

C:\NFT_Vault\NFT_2014\NF14-103; ARC RESOURCES_Drawings\14103-100.idw

NOTES:

-WELD SIZE MINIMUM TO BE THE THINNER OF THE TWO MEMBERS UNLESS OTHERWISE NOTED

-MASS DOES NOT INCLUDE WELDS

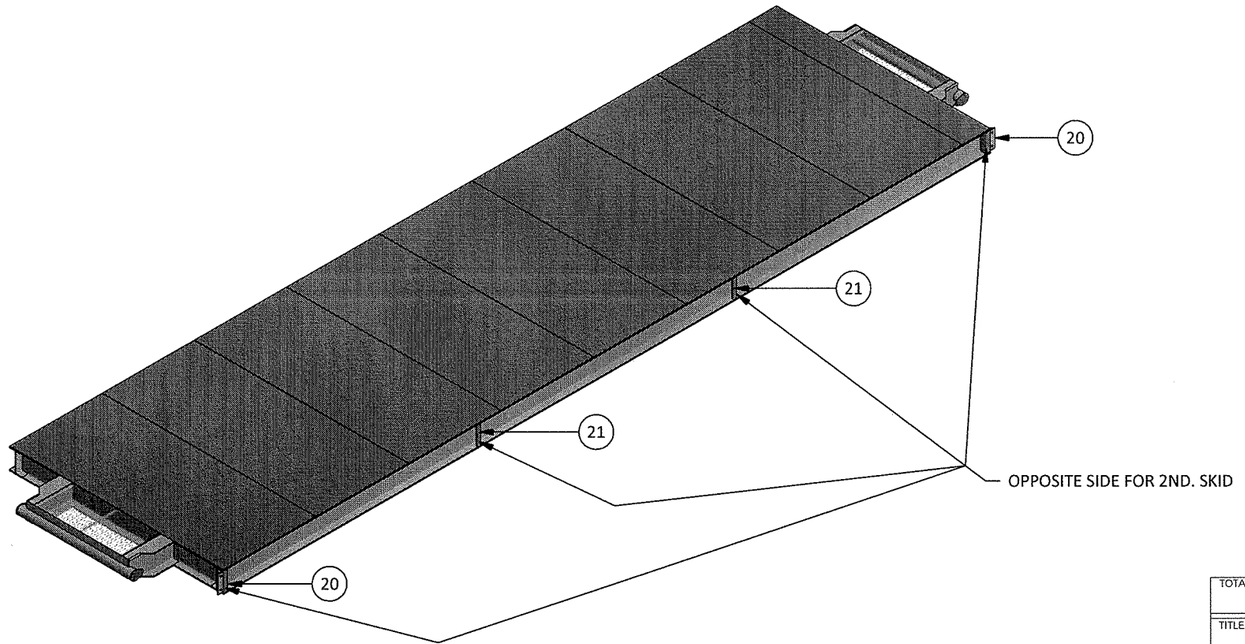
-THIS DRAWING REFLECTS ONE (1) UNIT

-TWO (2) UNITS REQUIRED PER JOB

-**WELD PROCEDURE:** FT-2-3

Parts List

CK	ITEM	QTY	DESCRIPTION	WIDTH	LENGTH	MATERIAL	CLENGTH (in)	WEIGHT
	1	2	ANGLE, EQUAL, 1 1/2" X 1 1/2" X 3/16"		18 in	A36	36.00 in	5.43
	2	2	ANGLE, EQUAL, 1 1/2" X 1 1/2" X 3/16"		30 in	A36	60.00 in	9.06
	3	1	ANGLE, EQUAL, 1 1/2" X 1 1/2" X 3/16"		34 15/16 in	A36	34.92 in	5.27
	4	6	BEAM, W12 X 45#		38 5/8 in	A992	231.75 in	828.86
	5	3	BEAM, W12 X 45#		79 3/8 in	A992	238.13 in	892.79
	6	4	BEAM, W16 X 67#		38 5/8 in	A992	154.50 in	785.94
	7	2	BEAM, W16 X 67#		79 3/8 in	A992	158.75 in	886.18
	8	2	BEAM, W16 X 67#		600 in	A992	1200.00 in	6699.07
	9	2	BEAM, W16 X 67#		652 in	A992	1304.00 in	7138.61
	10	26	BEAM, W8x18#		38 5/8 in	A992		1437.85
	11	13	BEAM, W8x18#		79 3/8 in	A992		1547.50
	12	1	GRATING, 19-W-4 (1 1/4" x 3/16")	18 in	68 3/4 in	SERRATED, RR-G-661b	68.75 in	439.25
	13	1	GRATING, 19-W-4 (1 1/4" x 3/16")	30 in	68 3/4 in	SERRATED, RR-G-661b	68.75 in	732.09
	14	4	PIPE, 1" s/80		9 1/4 in	A53B		3.35
	15	2	PIPE, 6" S/80		89 in	SA53B, WLD	178.00 in	424.29
	16	4	PLATE, 1/2"	6 7/8 in	9 9/16 in	A36, TAILROLL (USE TEMPLATE)	38.25 in	28.03
	17	2	PLATE, 1/4"	4 3/4 in	79 3/4 in	A36	159.50 in	53.78
	18	1	PLATE, DECK, 3/16	167 1/2 in	21 1/2 in	A786	21.50 in	191.47
	19	8	PLATE, DECK, 3/16	167 1/2 in	72 in	A786	576.00 in	5129.69
	20	2	SKID CONNECTION			SEE DWG. 11BCNH		48.61
	21	2	TUBE, 2x2x3/16x15		15 in	ASTM A500B CLEAN COAT		10.81

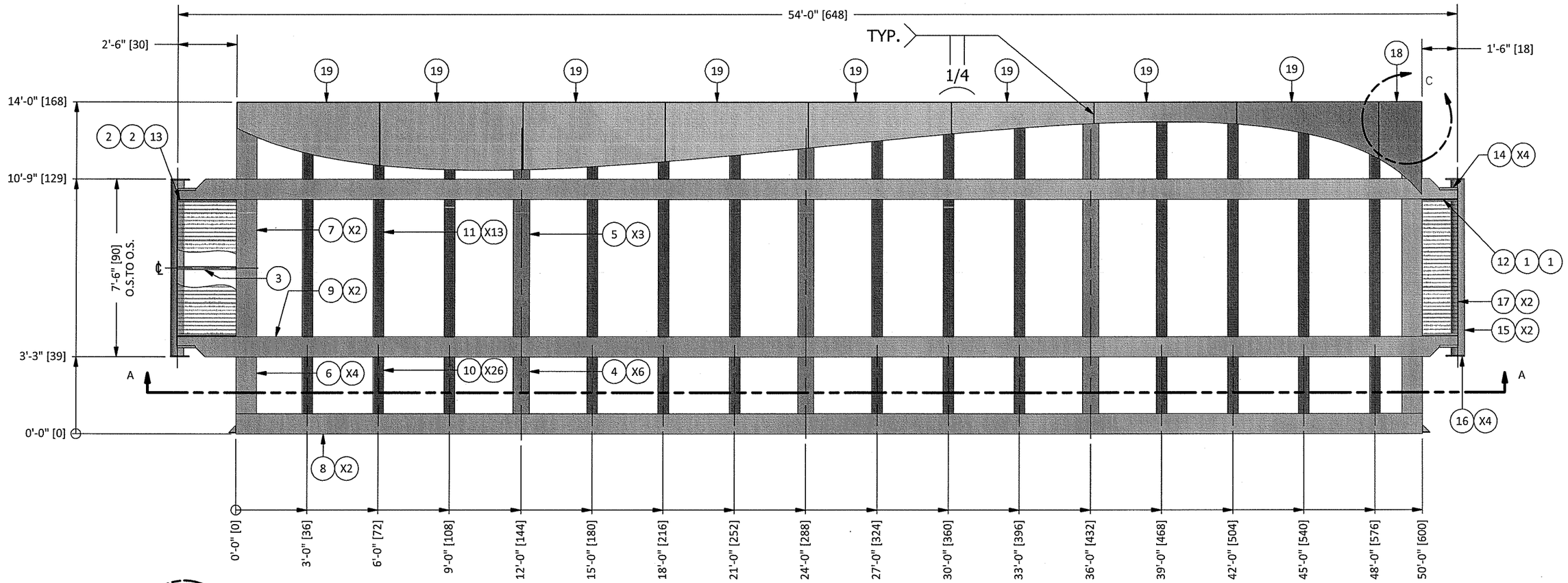


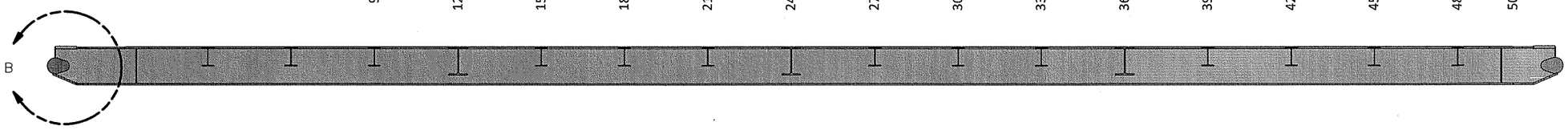
APPROVED FOR CONSTRUCTION CED

REV	REVISION	DATE	BY
2	REVISED TAILROLL	4/25/2014	JZL
1	CHANGED BEAM SIZE	4/17/2014	JZL
0	RELEASE FOR CONSTRUCTION	4/16/2014	JZL

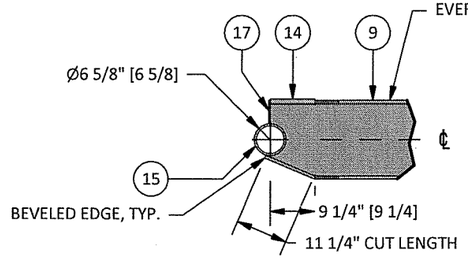
TOTAL MASS DRY: N/A	TOTAL MASS WET:
TITLE: POLYMER PILOT INJECTION PLANT SKID	PROJECTION TYPE
CUSTOMER / LOCATION: ARC RESOURCES	FabTech, A Naico Champion Company, 4500 33 MILE ROAD CASPER, WYOMING 82601, (307) 472-9740
PROJECT / JOB: NF14-103	
DRAWING NUMBER: 14103-600	
DESIGNER / DRAFTER: JZL	CUSTOMER APPROVAL:
DATE: 4/10/2014	JOB GROUP: G
PROJ. MANAGER/ENGINEER: AM	CHECKER: CED
SHEET SIZE: B	SHEET: 1 OF 3
REV.: 2	

Z:_2014 Jobs\NF14-103; ARC RESOURCES_Drawings\14103-600.dwg

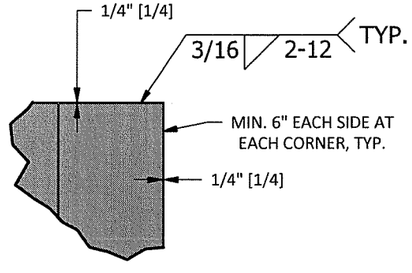




SECTION A-A



DETAIL B

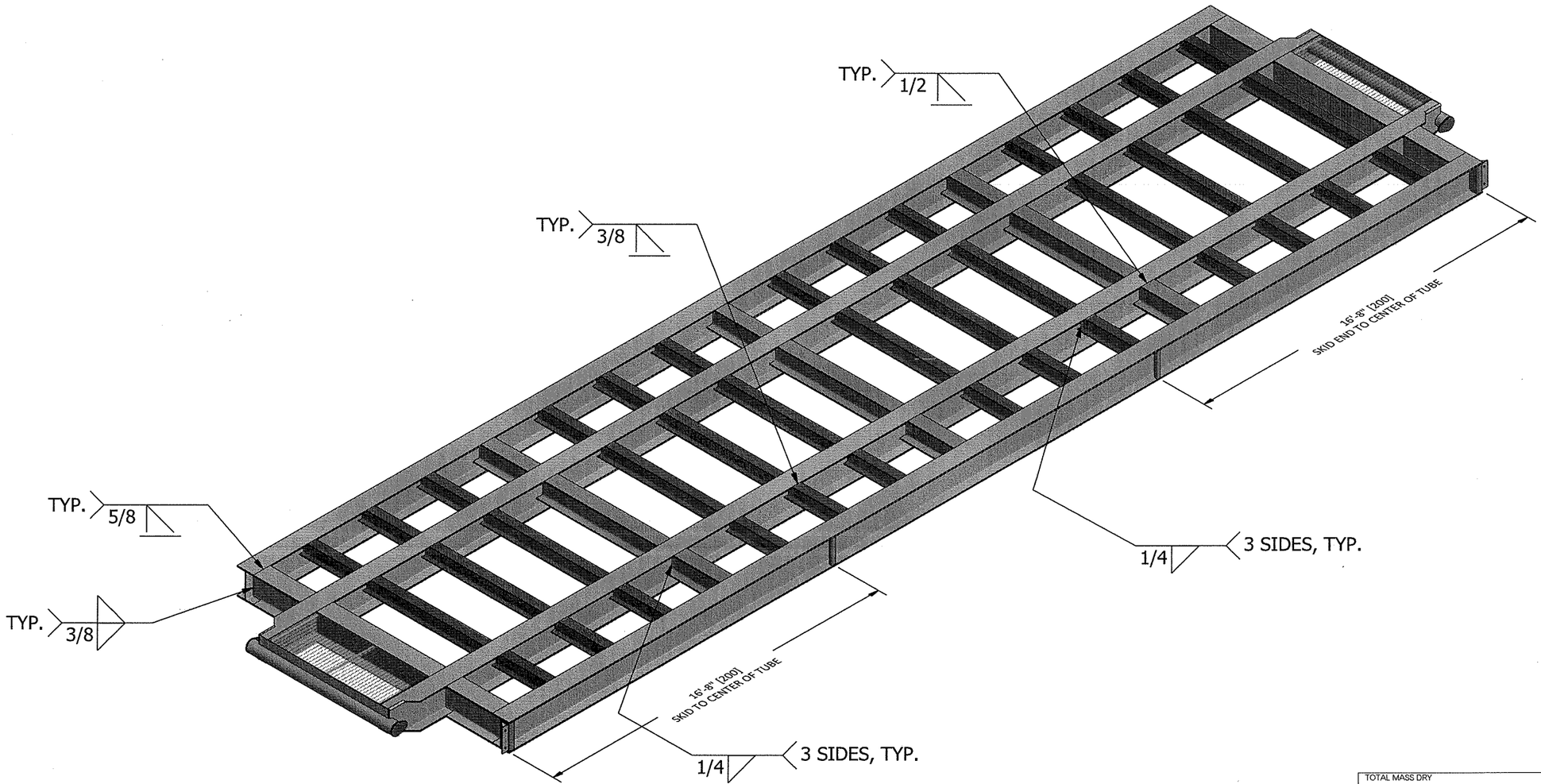


DETAIL C

APPROVED FOR CONSTRUCTION CED

TOTAL MASS DRY: N/A		TOTAL MASS WET:	
TITLE: POLYMER PILOT INJECTION PLANT SKID			PROJECTION TYPE
CUSTOMER / LOCATION: ARC RESOURCES		FabTech A Nalco Champion Company, 4500 33 MILE ROAD CASPER, WYOMING 82601 (307) 472-9740	
PROJECT / JOB: NF14-103			
DRAWING NUMBER: 14103-600			
DESIGNER / DRAFTER: JZL	CUSTOMER APPROVAL:	DATE: 4/10/2014	JOB GROUP: G
PROJ. MANAGER/ENGINEER: AM	CHECKER: CED	SHEET SIZE: B	SHEET: 2 OF 3 / REV.: 2

Z:_2014 Jobs\NF14-103; ARC RESOURCES_Drawings\14103-600.dwg



APPROVED FOR CONSTRUCTION CED

NOTE:
GRAY COLOR BEAMS ARE FULL DEPTH BEAMS

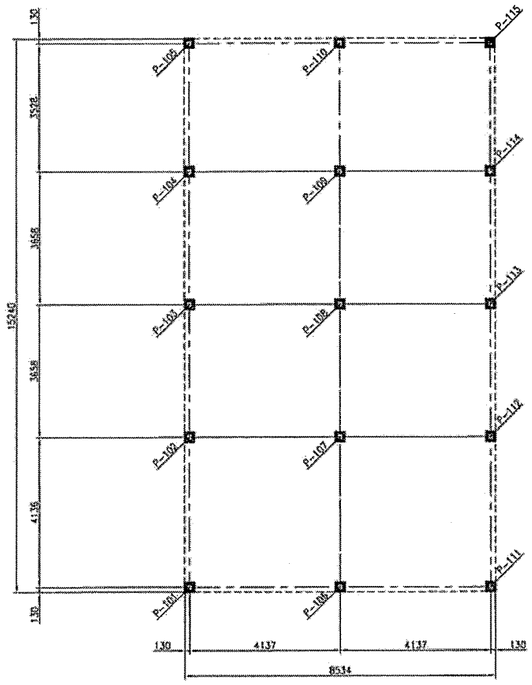
TOTAL MASS DRY: N/A		TOTAL MASS WET:	
TITLE: POLYMER PILOT INJECTION PLANT SKID			PROJECTION TYPE
CUSTOMER / LOCATION: ARC RESOURCES		FabTech A Nalco Champion Company 4500 33 MILE ROAD CASPER, WYOMING 82601 (307) 472-9740	
PROJECT / JOB: NF14-103			
DRAWING NUMBER: 14103-600			
DESIGNER / DRAFTER: JZL	CUSTOMER APPROVAL	DATE: 4/10/2014	JOB GROUP: G
PROJ. MANAGER/ENGINEER: AM	CHECKER: CED	SHEET SIZE: B	SHEET: 3 OF 3 / REV.: 2

Z:_2014 Jobs\NF14-103; ARC RESOURCES_Drawings\14103-600.dwg

PILE SCHEDULE								
PILE NO.	PIPE SUPPORT–EQUIPMENT	NO. PILE REQUIRED	PILE INFORMATION					REMARKS
			PILE TYPE	DIAMETER	CAP PLATE	EMBEDMENT LENGTH	TOTAL LENGTH	
P–101 THRU P–115	INJECTION BUILDING	15	TYPE B	219	PL 20x370x370	13500	14500	–

LEGEND

P–115 PILE NUMBER



NOTES:

1. FOR GENERAL PIPING NOTES SEE PILING NOTES AND DETAILS DRAWINGS.

PERMIT:

PROFESSIONAL ENGINEER PROVINCE OF ALBERTA CLUBB, DAVID ANDREW 2014 07

REV.	DESCRIPTION	BY	DATE	CHK	APP.	CLIENT
0	ISSUED FOR CONSTRUCTION	SP	2014–07–28			

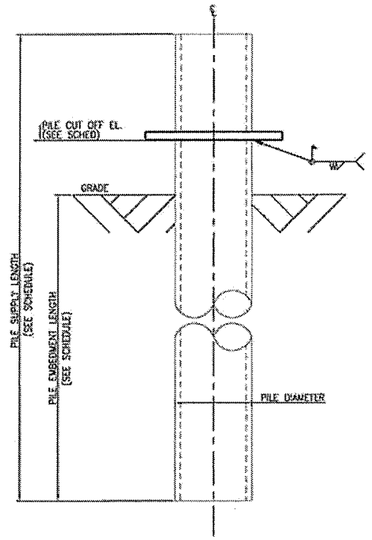
DRAWN BY: SP	DATE 2014–07–28
DESIGNED BY: OA	DATE 2014-07-28
CHECKED BY: OA	DATE 2014-07-28
APPROVED BY:	DATE
CLIENT BY:	DATE

BlackBox ENGINEERED SOLUTIONS

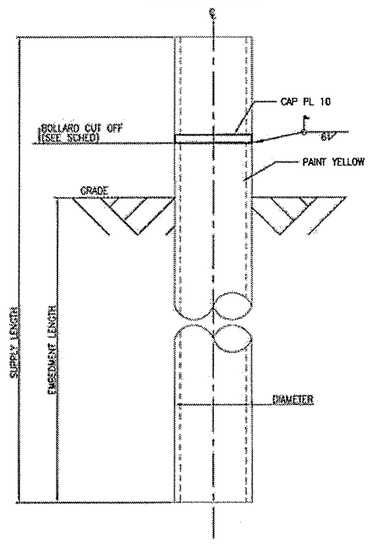
TITLE: PEMBINA POLYMER BUILDING
LSD

PILE LOCATION PLAN

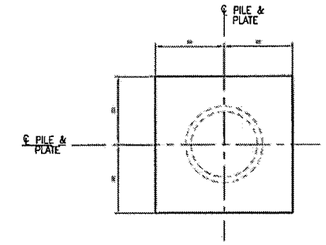
SCALE	JOB NO.	DRAWING NO.	REV.
1:75	14050	STR–001	0



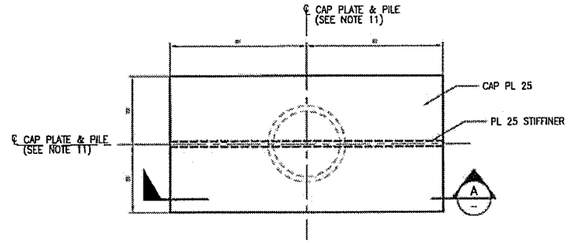
PILE ELEVATION



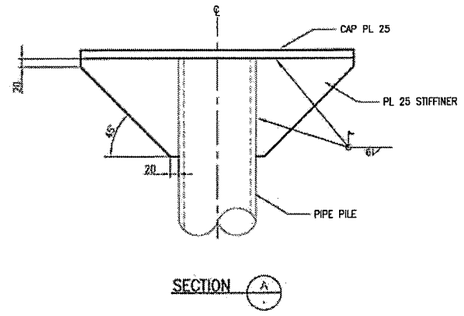
BOLLARD ELEVATION



TYPICAL PILE CAP PLATE
TYPE 'A'



TYPICAL CAP PLATE PLAN
TYPE 'B'



SECTION A

GENERAL PILING NOTES

1. ALL WORK SHALL CONFORM TO THE LATEST EDITIONS OF THE FOLLOWING CODES AND STANDARDS:
   –NATIONAL BUILDING CODE OF CANADA
   –APPLICABLE CSA STANDARDS
2. NO GEOTECHNICAL INVESTIGATION WAS CARRIED OUT BY OWNER, DESIGN IS BASED ON ENGINEER'S EXPERIENCE.
3. ALL UNDERGROUND AND OVERHEAD SERVICES SHALL BE LOCATED BEFORE PILING BEGINS. LOCATION OF ALL UNDERGROUND SERVICES SHALL BE COORDINATED BETWEEN THE CONTRACTOR AND OWNER. ALL UNDERGROUND SERVICES WITHIN 2000mm OF A PILE LOCATION SHALL BE EXPOSED BY HAND DIGGING OR WATER JET AS DIRECTED BY THE OWNER.
4. STEEL PIPE PILES SHALL BE OF NEW STOCK AND SHALL HAVE A MINIMUM WALL THICKNESS EQUIVALENT TO SCHEDULE 40 AND HAVE A MINIMUM YIELD STRESS OF 240 MPa. PILES SHALL BE CLEAN AND FREE OF ALL PROTECTIVE SURFACE COATINGS, OIL, GREASE AND SOIL.
5. WHEREVER PRACTICAL, THE PILES SHALL BE PLACED IN ONE UNSPLICED LENGTH. THERE SHALL BE A MAXIMUM OF TWO SPLICES PER PILE. WHEN NECESSARY, SPLICES FOR STEEL PILES SHALL BE WELDED AND SHALL BE BEVELLED BUTT WELDS CAPABLE OF DEVELOPING THE FULL STRENGTH OF THE PILE SECTION.
6. STEEL PILES SHALL BE PLACED TO A TOLERANCE OF 75mm LATERALLY, WITHIN 2 PERCENT OF PLUMB, SHALL NOT BE STRUCTURALLY DAMAGED AND SHALL NOT HEAVE MORE THAN 8mm DURING PLACING OF ADJACENT PILES.
7. PILES SHALL BE DRIVEN OPEN ENDED.
8. PILES SHALL BE DRIVEN CONTINUOUSLY WITHOUT INTERRUPTION TO THE DEPTHS SHOWN ON THE DRAWING AND, IF INDICATED IN THE PILE SCHEDULE, UNTIL THE MINIMUM BLOW COUNT(BLOWS PER 300mm OVER THE LAST 300mm) IS OBTAINED OR UNTIL REFUSAL. IF REFUSAL IS NOT DEFINED IN THE SOILS REPORT, IT SHALL BE DEFINED AS 20 BLOWS PER 25mm FOR THE LAST 300mm. IF REFUSAL IS MET BEFORE SPECIFIED DEPTH IS REACHED THE ENGINEER SHALL BE NOTIFIED TO PROVIDE ALTERNATIVE DESIGN.
9. PILES SHALL BE DRIVEN USING THE DRIVING ENERGIES SHOWN BELOW. A PROPER CUSHION SHALL BE PROVIDED BETWEEN THE HAMMER AND THE PILE.

PILE DIA (mm)	DRIVING ENERGY (JOULES)
168	25,000
219	30,000
273	35,000
324	45,000
406	60,000

10. THE SUBCONTRACTOR SHALL MAINTAIN COMPLETE PILE INSTALLATION RECORD FOR EACH PILE DRIVEN. ONE COPY OF THESE RECORDS SHALL BE SENT TO THE ENGINEER WITHIN ONE WEEK OF DRIVING.
11. PILE CAP PLATES SHALL BE LOCATED EXACTLY AS SHOWN IN THE PLAN. CENTERLINES OF PILE AND CAP PLATE SHALL BE WITHIN 75mm IN BOTH NORTH–SOUTH AND EAST–WEST DIRECTIONS.
12. IF BEDROCK IS ENCOUNTERED, PRE–BORING OF PILOT HOLES INTO THE BEDROCK SHALL BE REQUIRED FOR PIPE PILES TO ACHIEVE A REQUIRED EMBEDMENT DEPTH. THE DIAMETER OF THE PRE–BORE SHALL BE 95% OF THE PILE DIAMETER. PRE–BORE ONLY IF IT IS DEMONSTRATED THAT PREMATURE REFUSAL IS OCCURRING. IT MAY BE DIFFICULT TO EXTRACT A PILE DRIVEN TO PREMATURE REFUSAL IN PRE–BORED SHALE. THEREFORE, IT IS RECOMMENDED TO DRIVE A TEST PILE IN A NON CRITICAL LOCATION UNTIL SUITABLE PRE–BORE DIAMETER IS ESTABLISHED.
13. IF CONDITIONS PREVENT THE WORK FROM BEING PERFORMED IN ACCORDANCE WITH THE DRAWINGS AND SPECIFICATIONS, CONTRACTOR SHALL NOTIFY THE ENGINEER IMMEDIATELY.
14. SKID BEAMS MUST BE WELDED TO PERIMETER PILES WITH FULL LENGTH 6mm FILLET WELDS MIN. TWO SIDES. VRU SKID BEAMS ARE TO BE WELDED TO ALL PILES WITH 12mm WELD.
15. FINISHED GRADE AROUND ALL BUILDINGS MUST GENTLY SLOPE AWAY FROM BUILDINGS.
16. ALL BEAMS AND PILES BELOW GRADE MUST BE COATED WITH COAL TAR EPOXY.

NOTES:

PERMIT:

PROFESSIONAL ENGINEERS PROVINCE OF ALBERTA 2014 67878 APPROVED/APPROUVÉ

REV.	DESCRIPTION	BY	DATE	CHK	APP.	CLIENT
0	ISSUED FOR CONSTRUCTION	SP	2014–07–28			

DRAWN BY: SP	DATE 2014–07–28
DESIGNED BY: OA	DATE 2014-07-28
CHECKED BY: OA	DATE 2014-07-28
APPROVED BY:	DATE
CLIENT BY:	DATE

BlackBox ENGINEERED SOLUTIONS

TITLE: PEMBINA POLYMER BUILDING
LSD

PILING NOTES AND DETAILS

SCALE	JOB NO.	DRAWING NO.	REV.
N.T.S.	14050	STR–002	0