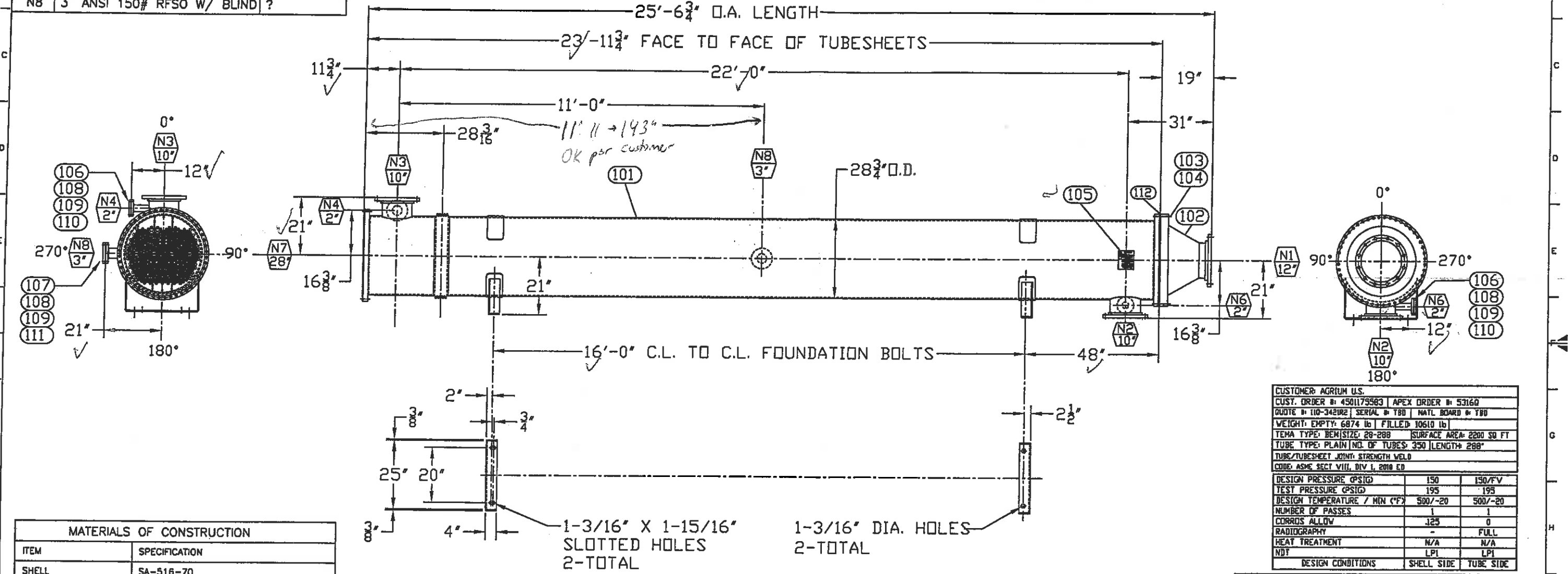


NOZZLE SCHEDULE		
ITEM	SIZE	DESCRIPTION
N1	12" ANSI 150# RFLJ	INLET
N2	10" ANSI 150# RFSO	OUTLET
N3	10" ANSI 150# RFSO	INLET
N4	2" ANSI 150# RFSO W/ BLIND ?	
N6	2" ANSI 150# RFSO W/ BLIND ?	
N7	28" 150# SPECIAL	OUTLET
N8	3" ANSI 150# RFSO W/ BLIND ?	

BILL OF MATERIALS					MTR
ITEM	QTY	MAT'L SPEC.	DESCRIPTION		Y / N
106	2	SA-105	BLIND FLANGE, 2" ANSI 150#		Y
107	1	SA-105	BLIND FLANGE, 3" ANSI 150#		Y
108	12	SA-193-B7	ALL THREAD, 3/4-10 X 8" LG		N
109	24	SA-194-2H	HEX NUT, 3/4-10		N
110	2	GYLON 3500	RING GASKET 2" ANSI 150#		N
111	1	GYLON 3500	RING GASKET 3" ANSI 150#		N
112	1	GYLON 3500	GASKET 5316Q10		N

BILL OF MATERIALS					MTR
ITEM	QTY	MAT'L SPEC.	DESCRIPTION		Y / N
101	1	SA-516-70	SHELL ASSEMBLY, 5316Q02		Y
102	1	SA-304/304L L.J. WITH ZIRCONIUM VANSTONE	CHANNEL ASSEMBLY, 5316Q03		Y
103	48	SA-193-B7	ALL THREAD, 3/4-10 X 8" LG		N
104	96	SA-194-2H	HEX NUT, 3/4-10		N
105	1	S.S.	APEXASME DATA PLATE		N



MATERIALS OF CONSTRUCTION	
ITEM	SPECIFICATION
SHELL	SA-516-70
EXP JOINT	SA-516-70
TUBES	ZIRCONIUM SB-523-702
TUBESHEET	SA-516-70 W/ZIRCONIUM SB-551-702 EXPLOSION BONDED CLADDING
CHANNEL	304L L.J. WITH ZIRCONIUM SB-551-702 VANSTONE
NOZZLES (SHELL)	SA-53-E/B
NOZZLES (CHANNEL)	ZIRCONIUM SB-658-702
NOZZLE FLG.(SHELL)	SA-105
NOZZLE FLG.(CHANNEL)	SA-182-F304
BAFFLES	SA-36
PAINT	CARBOZINC 11 ON C.S. ONLY
SUPPORT SADDLES	SA-36
GASKET	GYLON 3500

CUSTOMER: AGRUM U.S.		
CUST. ORDER #	4501175583	APEX ORDER #: 5316Q
QUOTE #	110-342UR2	SERIAL #: TBD
WEIGHT: EMPTY: 6874 lb		FILLED: 10610 lb
TEMA TYPE: BEH(SIZE: 28-288)	SURFACE AREA: 2200 SQ FT	
TUBE TYPE: PLAIN (NO. OF TUBES: 350)	LENGTH: 288"	
TUBE/TUBESHEET JOINT: STRENGTH WELD		
CODE: ASME SECT VIII, DIV 1, 2010 ED		
DESIGN PRESSURE (PSIG)	150	150/FV
TEST PRESSURE (PSIG)	195	195
DESIGN TEMPERATURE / MIN (°F)	500/-20	500/-20
NUMBER OF PASSES	1	1
CORROD ALLOW	.125	0
RADIOGRAPHY	-	FULL
HEAT TREATMENT	N/A	N/A
NDT	LPI	LPI
DESIGN CONDITIONS	SHELL SIDE	TUBE SIDE

CERTIFIED BY: ENGINEERED PRODUCTS

RT4

SHELL SIDE DATA:

MAWP 150 PSI AT 300 °F

MACWP 15 PSI AT 300 °F

MDMT -20 °F AT 150 PSI

TUBE SIDE DATA:

MAWP 150 PSI AT 300 °F

MACWP 15 PSI AT 300 °F

MDMT -20 °F AT 150 PSI

S/N T.B.B. YEAR 2012

APEX
Engineered Products

Premium Metal Fabricators

2659 LAKE ROAD
CLARK, PA 16113

PHONE 724-962-8717
FAX 724-962-8722

As Built

FINISH SYMBOLS		UNLESS OTHERWISE SPECIFIED	
1 POLISH	2 BOLD-FINE	1 BREAK ALL SHARP CORNERS	2 ALL 3 PLG. DIA. +/- .015
3 DRAG	4 MEDIUM	3 ALL 3 PLG. DIA. +/- .005	4 ALL FRACTIONAL DIA. +/- 1/8
5 FINE MACH.	6 ROUGH	5 ALL DIA. ARE IN ENGLISH MEASURE	
APEX ISSUES THIS DRAWING FOR ENGINEERING INFORMATION ONLY. IT MAY NOT BE REPRODUCED OR USED TO MANUFACTURE ANYTHING SHOWN HEREON WITHOUT THE WRITTEN PERMISSION FROM APEX TO THE USER. IT IS PROTECTED AS AN UNPUBLISHED WORK UNDER THE U.S. COPYRIGHT ACT OF 1976 AND INCORPORATING MATERIALS COMPILED IN THE YEARS OF DRAWING CREATION AND SUBSEQUENT REVISIONS ALL AS IDENTIFIED IN THE TITLE BLOCK HEREOF. UNAUTHORIZED USE OR REPRODUCTION MAY INVOLVE CIVIL AND/OR CRIMINAL SANCTIONS.			
APEX MODEL Zr-28-288-2200-CS ZIRCONIUM/CARBON STEEL S&T HEAT EXCHANGER GENERAL ARRANGEMENT		CUST. AGRUM U.S.	CUST. PO 4501175583
DATE 11-14-11	APPRO. JM	DATE 01.10.12	
SIZE D	JOB NO. 5316Q	DWG NO. 5316Q01	REV 1
SCALE		SHEET 1 OF 1	

1	ISSUED FOR CONSTRUCTION	JM 01.10.12	
2	REVISED, REISSUED FOR APPROVAL	JM 01.10.12	
3	ISSUED FOR APPROVAL	MJ 12.10.11	
NO.	REVISION	BY	DATE

ASME DATA PLATE
106
P.H.H.
2-13-12

FORM U-1 MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS
As Required by the Provisions of the ASME Boiler and Pressure Vessel Code Rules, Section VIII, Division 1

1. Manufactured and certified by: APEX ENGINEERED PRODUCTS 2659 LAKE RD CLARK, PA 16113
(Name and address of Manufacturer)

2. Manufactured for: AGRIUM US INC. 5000 STATION A CALGARY, ALBERTA CANADA
(Name and address of Purchaser)

3. Location of installation: WEST SACRAMENTO NITROGEN OPERATIONS 3981 CHANNEL DRIVE WEST SACRAMENTO CA 95691
(Name and address)

4. Type: HORIZONTAL HEAT EXCHANGER C-1112
(Horizontal, vertical, or sphere) (Tank, separator, jkt., vessel, heat exch., etc.) (Manufacturer's serial number)

N/A 5316Q01 111 2012
(CRN) (Drawing number) National Board number (Year built)

5. ASME Code Section VIII Div 1 2010 EDD N/A N/A
(Edition and Addenda (date)) (Code Case number) [Special Service per UG-120(d)]

Items 6-11 incl. to be completed for single wall vessels, jackets of jacketed vessels, shell of heat exchangers, or chamber of multi-chamber vessels.

6. Shell (a) Number of course (s): 5 (b) Overall Length : 283"

Course(s)			Material		Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B, & C)			Heat Treatment	
No.	Diameter	Length	Spec./Grade or Type		Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
1	28" ID	23.76"	SA-516-70		.375"	.125"	A	NONE	70%	B	NONE	70%	-	-
3	28" ID	72"	SA-516-70		.375"	.125"	A	NONE	70%	B	NONE	70%	-	-
1	28" ID	38.875"	SA-516-70		.375"	.125"	A	NONE	70%	B	NONE	70%	-	-

7. Heads: (a) N/A (b) N/A
(Material spec. number grade or type) (H.T. - time & temp) (Material spec. number grade or type) (H.T. - time & temp)

	Location (Top, Bottom, Ends)	Thickness		Radius		Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure		Category A		
		Min.	Corr.	Crown	Knuckle					Convex	Concave	Type	Full, Spot, None	Eff.
(a)														
(b)														

If removable, bolts used (describe other fastening) _____

8. Type of jacket _____ (Material spec. number grade, size, number)
Jacket closure _____
If bar, give dimensions _____ If bolted, describe or sketch _____

9. MAWP 150 PSI at max temp. 500°F Min. design metal temp. -20°F at 150 PSI
(Internal) (External) (Internal) (External)

10. Impact Test NO EXEMPT PER UG-20(f) at test temperature of _____
[Indicate yes or no and the component(s) impact tested]

11. Hydro., Pneu., or comb. test press. HYDRO 195 PSI Proof Test _____

Items 12 and 13 to be completed for tube sections.

12. Tubesheet SA-516-70N 33.38" 2.285" MIN .125" WELDED
[Stationary (Material spec. number)] [Diameter (subject to press.)] (Nominal thickness) (Corr. Allow.) [Attachment (welded or bolted)]
SA-516-70N 33.38" 2.285" MIN .125" WELDED
[Floating (Material spec. number)] (Diameter) (Nominal thickness) (Corr. Allow.) (Attachment)
13. Tubes SB-523-702 1" .035" AW 360 STRAIGHT
(Material spec. number, grade or type) (O.D.) (Nominal thickness) (Number) [Type (Straight or U)]

Items 14-18 incl. To be completed for inner chambers of jacketed vessels or channels of heat exchangers.

14. Shell (a) Number of course (s): 1 (b) Overall Length : 19"

Courses			Material		Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B, & C)			Heat Treatment	
No.	Diameter	Length	Spec./Grade or Type		Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
1	28" TO 12.25" ID	19"	SB-551-702		.375"	.000"	A	FULL	100%	B	FULL	100%	-	-

15. Heads: (a) N/A (b) N/A
(Material spec. number grade or type) (H.T. - time & temp) (Material spec. number grade or type) (H.T. - time & temp)

	Location (Top, Bottom, Ends)	Thickness		Radius		Elliptical Ratio	Conical Apex Angle	Hemispherical Radius	Flat Diameter	Side to Pressure		Category A		
		Min.	Corr.	Crown	Knuckle					Convex	Concave	Type	Full, Spot, None	Eff.
(a)														
(b)														

If removable, bolts used (describe other fastening) _____

(Material spec. number grade, size, number)

Form U-1 (Back)

16. MAWP 150 PSI 15 PSI at max temp. 500°F 500°F Min. design metal temp. -20°F at 150 PSI
 (Internal) (External) (Internal) (External)

17. Impact Test NO EXEMPT PER UNF-65 at test temperature of _____
 Indicate yes or no and the component(s) impact tested

18. Hydro., pneu., or comb. test press. HYDRO 195 PSI Proof Test _____

19. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc)	No.	Diameter or Size	Flange Type	Material		Nozzle Thickness		Reinforcement Material	How Attached		Location (Insp. Open.)
				Nozzle	Flange	Nom.	Corr.		Nozzle	Flange	
INLET	1	12" 150#	RFLJ	SB-551-702	SA-182-304	.375"	.260"	N/A	UW 18.1	RFLJ	CHANNEL
N3 INLET	1	12" 150#	RFSO	SA-53-E-B	SA-105	.500"	.125"	N/A	UW 18.1	RFSO	SHELL
N2 OUTLET	1	10" 150#	RFSO	SA-53-E-B	SA-105	.500"	.125"	N/A	UW 18.1	RFSO	SHELL
BLIND	1	3" 150#	RFSO	SA-53-E-B	SA-105	.300"	.125"	N/A	UW 18.1	RFSO	SHELL
BLIND	2	2" 150#	RFSO	SA-53-E-B	SA-105	.218"	.125"	N/A	UW 18.1	RFSO	N2/N3

20. Supports: Skirt NO Lugs 0 Legs 2 Others ** SEE REMARKS Attached SHELL / WELDED
 (Yes or No) (Number) (Number) (Describe) (Where and how)

21. Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report: (List the name of part, item number, Manufacturer's name and identifying number)

22. Remarks * TUBESHEETS EXPLOSION CLAD WITH SB-551-702 NOT CONSIDERED IN DESIGN CALCULATIONS

** (2) POISON PADS AND NAMEPLATE BRACKET

OVER PRESSURE PROTECTION PROVIDED BY OTHERS

CERTIFICATE OF SHOP COMPLIANCE

We certify that the statements in this report are correct and that all details of design, material, construction and workmanship of this vessel conform to the ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1.

U Certificate of Authorization 37,813 Expires AUGUST 8, 2014

Date 5/23/12 Name APEX ENGINEERED PRODUCTS Signed _____
 (Manufacturer) (Representative)

CERTIFICATE OF SHOP INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of _____ OH and employed by _____ HSBCT of _____ CT

have inspected the pressure vessel described in this Manufacturer's Data Report on 5-23-12, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. By signing this certificate neither the Inspector nor his/her employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his/her employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date 5-23-12 Signed [Signature] Commissions NBHQ66A OH1120
 (Authorized Inspector) (National Board (incl endorsements) State, Province and number)

CERTIFICATE OF FIELD ASSEMBLY COMPLIANCE

We certify that the statements on this report are correct and that the field assembly construction of all parts of this vessel conforms with the requirements of ASME BOILER AND PRESSURE VESSEL CODE Section VIII, Division 1. U Certificate of Authorization No. _____ Expires _____

Date _____ Name _____ Signed _____
 (Assembler) (Representative)

CERTIFICATE OF FIELD ASSEMBLY INSPECTION

I, the undersigned, holding a valid commission issued by the National Board of Boiler and Pressure Vessel Inspectors and/or the State or Province of _____ and employed by _____

of _____ have compared the statements in this Manufacturer's Data Report with the described pressure vessel and state that parts referred to as data items _____ not included in the certificate of shop inspection, have been inspected by me and to the best of my knowledge and belief, the Manufacturer has constructed and assembled this pressure vessel in accordance with the ASME BOILER AND PRESSURE VESSEL CODE, Section VIII, Division 1. The described vessel was inspected and subjected to a hydrostatic test of _____

By signing this certificate neither the Inspector nor his/her employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the Inspector nor his/her employer shall be liable in any manner for any personal injury or property damage or a loss of any kind arising from or connected with this inspection.

Date _____ Signed _____ Commissions _____
 (Authorized Inspector) (National Board (incl endorsements) State, Province and number)