

## 100HP 3-stage cooler

R&R Engineering  
Model UI-48-7K  
S/N: M-415  
Built: 6/3/2008

Dimensions: 76.25" W x 61.625" H x 63.375" L  
Weight: 3,500 lbs.

EJW	TAW	IC #1	IC #2	AC
150#	N/A	1200#	1200#	1200#

This is a new-surplus 3-stage cooler built for a VRG-380 or F817 engine. The cooler will also work for a 3304NA engine as well.





Company: Ariel Corporation  
 Quote:  
 Case 1:

## Ariel Performance

Customer:  
 Inquiry:  
 Project:



7.7.6.0

### Compressor Data:

Elevation,ft:	50.00	Barmtr,psia:	14.669	Ambient,F:	100.00
Frame:	JGP/2	Stroke, in:	3.00	Rod Dia, in:	1.125
Max RL Tot, lbf:	12000	Max RL Tens, lbf:	6000	Max RL Comp, lbf:	7000
Rated RPM:	1800	Rated BHP:	170.0	Rated PS FPM:	900.0
Calc RPM:	1700.0	BHP:	75	Calc PS FPM:	850.0

### Driver Data:

Type:	Nat. Gas
Mfg:	Caterpillar
Model:	G3304-NA
BHP:	80 (10.00%)
Avail:	75 (6)

### Services

Gas Model

### Service 1

VMG-APRNGL2

### Stage Data:

	<b>1 (SG)</b>	<b>2</b>	<b>3</b>
Target Flow, MMSCFD	0.350	0.350	0.350
Flow Calc, MMSCFD	0.331	0.331	0.327
BHP per Stage	23.0	23.6	23.1
Specific Gravity	0.6500	0.6498	0.6362
Pres Suct Line, psig	25.00	N/A	N/A
Pres Suct Flg, psig	24.60	104.44	355.42
Pres Disch Flg, psig	108.04	362.73	1111.15
Pres Disch Line, psig	N/A	N/A	1100.00
Pres Ratio F/F	3.124	3.168	3.042
Temp Suct, F	80.00	120.00	120.00
Temp Disch Intl, F	241	285	298

### Cylinder Data:

	<b>Throw 1</b>	<b>Throw 2</b>	<b>Throw 2</b>
Cyl Model	5-3/4M	5-1/8P-HE	<u>2-3/4P-CE</u>
Cyl Bore, in	5.500	4.750	2.750
Cyl MAWP, psig	480.0	635.0	1270.0
Cyl Action	DBL	HE	CE
HE Spcrs Used/Max	0/2	0/2	N/A
HE Vol Pkt Avail	1.85+71.11	No Pkt	N/A
Vol Pkt Used	0.00 (V) %	No Pkt	N/A %
HE Total Clr, %	19.46	22.09	N/A
CE Spcrs Used/Max	0/2	N/A	0/2
CE Total Clr, %	19.04	N/A	20.16
Suct Vol Eff HE/CE, %	64.3/64.9	59.4/N/A	N/A/65.2
Disch Event HE/CE, ms	5.6/6.5	5.3/N/A	N/A/6.7
Suct Pseudo-Q HE/CE	8.0/7.4	3.6/N/A	N/A/3.7
Gas Rod Ld Comp, %	31.9 C	54.6 C	54.6 C
Gas Rod Ld Tens, %	34.9 T	88.0 T	88.0 T
Gas Rod Ld Total, %	36.1	75.8	75.8
Xhd Pin Deg/%RvrsI lbf	153/81.9	112/50.8	112/50.8



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Frame:	JGP/2	Stroke, in:	3.00	Rod Dia, in:	1.125
Max RL Tot, lbf:	12000	Max RL Tens, lbf:	6000	Max RL Comp, lbf:	7000
Rated RPM:	1800	Rated BHP:	170.0	Rated PS FPM:	900.0
Calc RPM:	1700.0	BHP:	73	Calc PS FPM:	850.0

### Driver Data:

Type:	Nat. Gas
Mfg:	Caterpillar
Model:	G3304-NA
BHP:	80 (10.00%)
Avail:	75 (6)

### Services

Gas Model

### Service 1

VMG-APRNGL2

### Stage Data:

	<b>1 (SG)</b>	<b>2</b>	<b>3</b>
Target Flow, MMSCFD	0.350	0.350	0.350
Flow Calc, MMSCFD	0.355	0.355	0.352
BHP per Stage	22.6	24.0	21.1
Specific Gravity	0.6500	0.6499	0.6412
Pres Suct Line, psig	30.00	N/A	N/A
Pres Suct Flg, psig	29.55	107.53	345.67
Pres Disch Flg, psig	111.17	352.34	910.00
Pres Disch Line, psig	N/A	N/A	900.00
Pres Ratio F/F	2.846	3.003	2.566
Temp Suct, F	80.00	120.00	120.00
Temp Disch Intl, F	228	276	271

### Cylinder Data:

	<b>Throw 1</b>	<b>Throw 2</b>	<b>Throw 2</b>
Cyl Model	5-3/4M	5-1/8P-HE	<u>2-3/4P-CE</u>
Cyl Bore, in	5.500	4.750	2.750
Cyl MAWP, psig	480.0	635.0	1270.0
Cyl Action	DBL	HE	CE
HE Spcrs Used/Max	0/2	0/2	N/A
HE Vol Pkt Avail	1.85+71.11	No Pkt	N/A
Vol Pkt Used	15.00 (V) %	No Pkt	N/A %
HE Total Clr, %	30.13	22.09	N/A
CE Spcrs Used/Max	0/2	N/A	0/2
CE Total Clr, %	19.04	N/A	20.16
Suct Vol Eff HE/CE, %	54.3/68.9	62.0/N/A	N/A/72.0
Disch Event HE/CE, ms	5.3/7.0	5.6/N/A	N/A/7.5
Suct Pseudo-Q HE/CE	8.1/7.4	3.6/N/A	N/A/3.8
Gas Rod Ld Comp, %	31.6 C	52.0 C	52.0 C
Gas Rod Ld Tens, %	34.3 T	70.4 T	70.4 T
Gas Rod Ld Total, %	35.6	65.6	65.6
Xhd Pin Deg/%RvrsI lbf	173/85.9	126/60.9	126/60.9

R & R ENGINEERING CO., INC.  
TULSA, OKLAHOMA

-----SPECIFICATION SHEET-----

CUSTOMER	COMPRESSOR & ENGINE	DATE	06/03/2008
REFERENCE	VRG380/F817	ITEM	06CE03(08)
MODEL	UI-48-7K	NUMBER REQUIRED:	ONE
R&R SERIAL NUMBER:	M-415	FILE:	M-415.DOC

-----PERFORMANCE OF ONE UNIT-----

FLUID	EJW	IC1	IC2	AC
FLOW, LBM/HR	29340.	722.	722.	722.
, GPM OR MMSCFD	57.098	0.350	0.350	0.350
PCT EG OR GAS SP.GR.	50.00	0.65	0.65	0.65
TEMPERATURE IN, DEG F	180.0	300.0	300.0	300.0
TEMPERATURE OUT, DEG F	165.0	120.0	120.0	120.0
INLET PRESSURE, PSIA	NOMINAL	100.0	400.0	900.0
PRESSURE DROP, PSI.	4.7	3.3	1.4	0.7
DUTY, BTU/HR	379000.	72428.	74886.	78805.
CORRECTED MTD, DEG F	49.4	66.0	65.0	64.7
BARE TUBE RATE	126.0	44.2	39.3	41.6
FOULING	0.00100	0.00100	0.00100	0.00100
BARE TUBE SURF., SQ.FT.	60	24	29	29
TOTAL SURFACE, SQ.FT.	974	396	468	468

-----CONSTRUCTION-----

NUMBER OF SECTIONS	1	1	1	1
TUBES/SECTION	54	22	26	26
LENGTH, FEET	7	7	7	7
ROWS - PASSES	4 - 3	4 - 3	4 - 4	4 - 4
TUBE O.D. AND BWG	0.625x16	0.625x16	0.625x16	0.625x16
TUBE MATERIAL	SA214	SA214	SA214	SA214
DESIGN PRESS., PSI.	150	1200	1200	1200
DESIGN TEMP. DEG.F	300	350	350	350
NOZZLES	3"150#RF	2"600#RF	2"600#RF	2"600#RF
HEADERS	CARBON STEEL, BOX TYPE WITH REMOVABLE PLUGS			
PLUG TYPE	TAPERED	SHOULDER	SHOULDER	SHOULDER
PLUG MATERIAL	STEEL	STEEL	STEEL	STEEL
FINS	ALUMINUM, ANGLE BASE, MECHANICALLY BONDED			
ASME CODE STAMP	NO	YES	YES	YES
NATIONAL BOARD	NO	NO	NO	NO
C.R.N.	NO	NO	NO	NO
GROOVED TUBEHOLES	NO	YES	YES	YES
CORROSION ALLOW., INCHES	0.000	0.000	0.000	0.000
SHUTTERS	NO	NO	NO	NO

-----AIR DATA-----

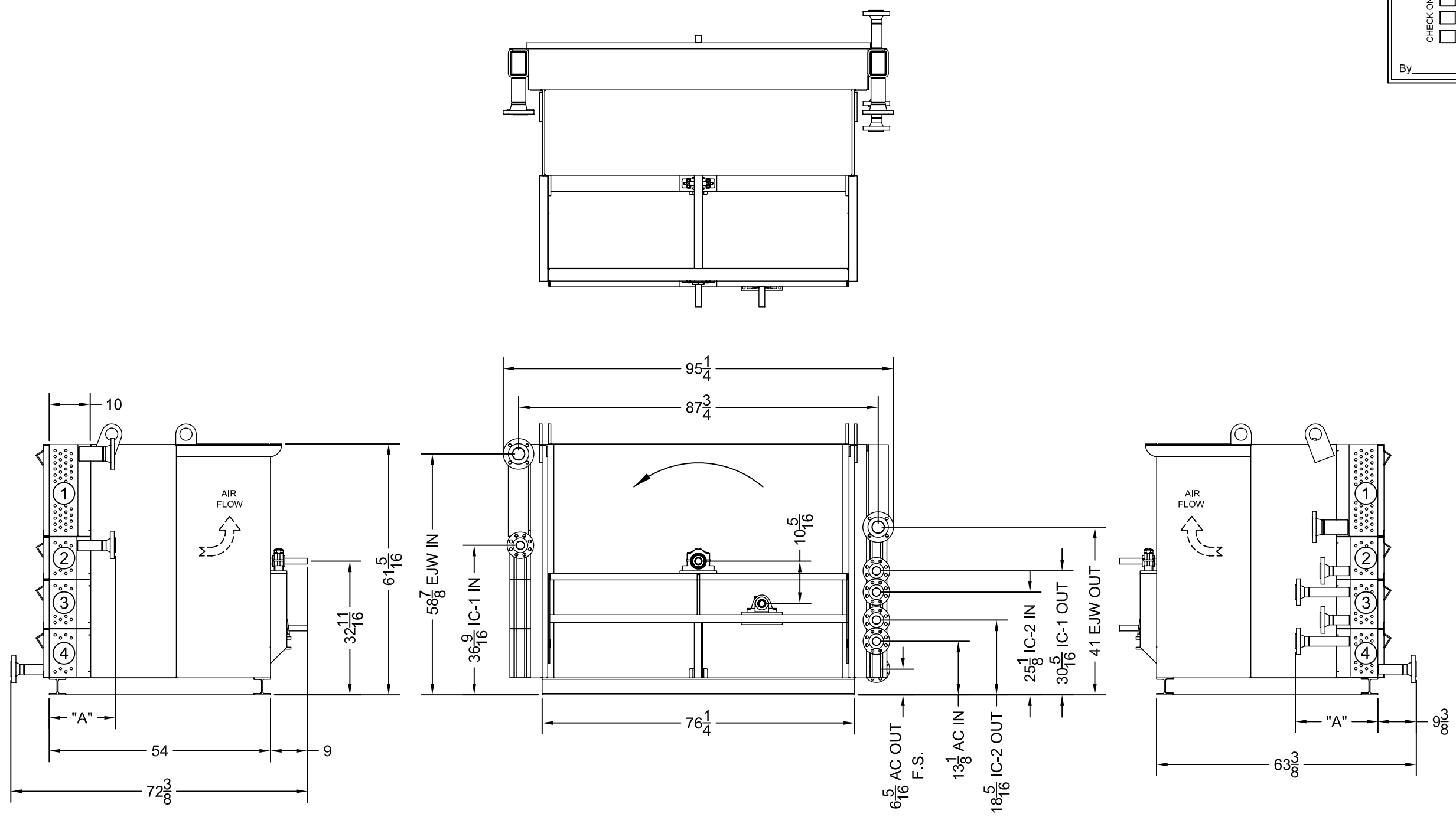
INLET AIR, DEG F	100.0	ELEVATION, FEET	200.
OUTLET AIR, DEG F	126.3	TOTAL SCFM REQUIRED	21171.

-----MECHANICAL EQUIPMENT-----

FAN	DRIVE	DRIVER
NUMBER ONE	V-BELT	TYPE
HP/FAN 9	SIZE	MAKE
RPM 1114	NUMBER	SIZE
DIAMETER 48"	LARGE SHV.	HP/DRIVER
BLADES 6	SMALL SHV.	RPM
PITCH 22°@ TIP	GEAR	ENCLOSURE
MAKE AEROVENT	RATIO	
MATERIAL ALUMINUM	AGMA HP	VOLTAGE
BORE 1 7/16"	COUPLING	PHASE
ROTATION LEFT		CYCLES
WEIGHT	REMARKS: MOUNTED IDLER	

CHECK ONE  APPROVED WITHOUT CHANGE  
 APPROVED WITH CHANGES  
 RESUBMIT WITH CHANGES

By \_\_\_\_\_ Date \_\_\_\_\_



NOTES:  
 1. COOLER TO BE PAINTED WITH STANDARD RED PRIMER

BEARING DATA		FAN DATA		REFERENCE DIMENSIONS			
FAN: 1 7/16" D.I. PILLOW BLOCK	TYPE: AEROVENT	COIL	DIM "A"	DIM "B"	DIM "C"	DIM "D"	REV
IDLER: 1 7/16" SCM PILLOW BLOCK	SERIES:	1	16.00"	87.75"			
	DIAMETER: 48"	2	(IN) 16.125" (OUT) 14.125"	86.875"			
	BLADES:	3	(IN) 20.125" (OUT) 14.125"	86.875"			
	RPM: 1114	4	20.125"	86.875"			
	PITCH:	5					
	HP: 9	6					

REVISIONS			
REV	DESCRIPTION	DATE	BY

COIL DATA					
COIL 1	COIL 2	COIL 3	COIL 4	COIL 5	COIL 6
SERVICE: EJW	SERVICE: IC-1	SERVICE: IC-2	SERVICE: AC	SERVICE:	SERVICE:
DESIGN/TEST PRES: 150/195 PSI	DESIGN/TEST PRES: 1200/1560 PSI	DESIGN/TEST PRES: 1200/1560 PSI	DESIGN/TEST PRES: 1200/1560 PSI	DESIGN/TEST PRES:	DESIGN/TEST PRES:
MDMT/DESIGN TEMP: --/300° F	MDMT/DESIGN TEMP: -20/350° F	MDMT/DESIGN TEMP: -20/350° F	MDMT/DESIGN TEMP: -20/350° F	MDMT/DESIGN TEMP:	MDMT/DESIGN TEMP:
ASME CODE STAMP: NO	ASME CODE STAMP: YES	ASME CODE STAMP: YES	ASME CODE STAMP: YES	ASME CODE STAMP:	ASME CODE STAMP:
NATIONAL BOARD: NO	NATIONAL BOARD: NO	NATIONAL BOARD: NO	NATIONAL BOARD: NO	NATIONAL BOARD:	NATIONAL BOARD:
<b>CONNECTIONS</b>	<b>CONNECTIONS</b>	<b>CONNECTIONS</b>	<b>CONNECTIONS</b>	<b>CONNECTIONS</b>	<b>CONNECTIONS</b>
INLET: (1) 3"-150 RF WN	INLET: (1) 2"-600 RF WN	INLET: (1) 2"-600 RF WN	INLET: (1) 2"-600 RF WN	INLET:	INLET:
OUTLET: (1) 3"-150 RF WN	OUTLET: (1) 2"-600 RF WN	OUTLET: (1) 2"-600 RF WN	OUTLET: (1) 2"-600 RF WN	OUTLET:	OUTLET:
AUX:	AUX:	AUX:	AUX:	AUX:	AUX:
AUX:	AUX:	AUX:	AUX:	AUX:	AUX:
<b>LOUVER / GUARD</b>	<b>LOUVER / GUARD</b>	<b>LOUVER / GUARD</b>	<b>LOUVER / GUARD</b>	<b>LOUVER / GUARD</b>	<b>LOUVER / GUARD</b>
CORE GUARD	CORE GUARD	CORE GUARD	CORE GUARD		

**R&R ENGINEERING CO., INC.**  
 P.O. Box 70005  
 Tulsa, Oklahoma 74170  
 (918) 252-2571  
 (918) 252-2574 Fax

CUSTOMER: COMPRESSOR & ENGINE SERVICES

BY: JWB DATE: 06-05-08

EST. SHIP WT: 3,500 LBS.

ONE MODEL: UI-48-7K

SPEC. SHEET: 06CE03  
 P.O. #: CES/060408-3  
 DRAWING REVISION #: 0  
 DRAWING NO.: M-415

**FORM U-1A MANUFACTURER'S DATA REPORT FOR PRESSURE VESSELS**  
**(Alternative Form for Single Chamber, Completely Shop or Field Fabricated Vessels Only)**  
**As Required by the Provisions of the ASME Code Rules, Section VIII, Division 1**

1. Manufactured and certified by: R & R Engineering Company, Inc., 12585 East 61st Street, Tulsa, OK 74012  
(Name and address of manufacturer)

2. Manufactured for: NATURAL GAS COMPRESSION 2480 AERO PARK DRIVE, TRAVERSE CITY, MI 49686  
(Name and address of purchaser)

3. Location of installation Unknown  
(Name and address)

4. Type: VERT. M-416.1 N/A M-416 N/A 2008  
(Horiz. or vert tank) (Mfg's serial No.) (CRN) (Drawing No.) (Nat'l Bd. No.) (Year built)

5. The chemical and physical properties of all parts meet the requirements of material specifications of the ASME BOILER AND PRESSURE VESSEL CODE The design, construction, and workmanship conform to ASME Rules, Section VIII, Div. 1 2004  
Year  
 to A06 None None  
Addenda (Date) Code Case Nos Special Service per UG-120 (d)

6. Shell N/A N/A N/A N/A N/A  
Matl (Spec. No. Grade) Nom. Thk (in.) Corr. Allow (in.) Diam., I.D. (ft. & in.) Length (overall) (ft. & in.)

7. Seams: Corner Joint N/A 100 N/A N/A N/A N/A N/A -- --  
Long (Welded, Dbl. Singl., Lap, Butt) R.T. (Spot or Full) Eff. (%) H.T. Temp. (°F) Time (hr) Girth (Welded, Dbl. Singl., Lap, Butt) R.T. (Spot or Full) Eff. (%) No. of Courses

8. Heads: (a) Matl SA516-70 (b) Matl SA516-70  
(Spec. No., Grade) (Spec. No., Grade)

	Location (Top, Bottom, Ends)	Minimum Thickness	Corrosion Allowance	Crown Radius	Knuckle Radius	Elliptical Ratio	Conical Apex Angle	Hemi-spherical Radius	Flat Diameter	Side to Pressure (Convex or Concave)
(a)	T & P Sheet	0.5"-0.75"	0"	Max	Span	6"-6.25"	--	--	7"	46.375"
(b)	Wrap & Ends	0.375"-0.5"	0"	Max	Span	5.75"	--	--	6"	52.375"-52.625"

If removable, bolts used (describe other fastenings) 236 PCS 3/4"X16 SHOULDER STEEL PLUGS SA105  
(Mat'l Spec. No., Grade, Size, No.)

9. MAWP 150 N/A psi at max temp. 300 N/A °F  
(internal) (external) (internal) (external)  
 Min. design metal temp. -20 °F at 150 psi. Hydro. pneu., or comb. test press. 195 psi

10. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain)	No.	Diam. or Size	Type	Matl	Nom. Thk	Reinforcement Material	How Attached	Location
Inlet	1	6" 150	RFWN	SA105	XH	Weld	WELDED	Head
Inlet	1	6"	PIPE	SA106-B	XH	Weld	UW-16.1(a)	Head
Outlet	1	6" 150	RFWN	SA105	XH	Weld	WELDED	Head
Outlet	1	6"	PIPE	SA106-B	XH	Weld	UW-16.1(a)	Head

11. Supports: Skirt NO Lugs N/A Legs N/A Others Channels Attached Welded to 1 Header  
(Yes or No) (No.) (No.) (Describe) (Where and How)

12. Remarks: Manufacturer's Partial Data Reports properly identified and signed by Commissioned Inspectors have been furnished for the following items of the report:

(Name of part, item number, Mfg's name and identifying stamp)  
118 Pcs 5/8"X16 Ga SA214 Steel Tubes 25'0" Long

Exempt from Impact Testing Per UG-20(f) and UCS-66. Constructed in conformance with Appendix 28

**CERTIFICATE OF SHOP/FIELD COMPLIANCE**

We certify that the statements made in this report are correct and that all details of design, material, construction and workmanship of this vessel conform to the ASME Code for Pressure Vessels, Section VIII, Division 1. U Certificate of Authorization No. 10139 Expires FEB. 28, 2009

Date \_\_\_\_\_ Co. Name R & R ENGINEERING CO., INC. Signed \_\_\_\_\_  
(Manufacturer) (Representative)

**CERTIFICATE OF SHOP/FIELD INSPECTION**

Vessel constructed by R & R ENGINEERING CO., INC. at Tulsa, Oklahoma  
 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 Oklahoma and employed by HSB CT

have inspected the component described in this Manufacturer's Data Report on \_\_\_\_\_, and state that, to the best of my knowledge and belief, the Manufacturer has constructed this pressure vessel in accordance with ASME Code, Section VIII, Division 1. By signing this certificate neither the inspector nor his employer makes any warranty, expressed or implied, concerning the pressure vessel described in this Manufacturer's Data Report. Furthermore, neither the inspector nor his 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) (Nat'l Board incl endorsements) State, Prov. and No