

Alfa Laval Inc.



Richmond, VA

Final Customer Documentation: Table of Contents

Doc. No.	Rev.
41276-10B	0
Date	
1/26/2012	
Page: 1 of 1	

Alfa Laval Order No.	Customer Name
41276 / 770013	Mississippi Power Company
Alfa Laval Serial No.	Customer Reference No.
30113-88709	MPC17837-0001
Alfa Laval Equipment Type	Customer Tag No.
TL35-BFD	HX1204

PLATE HEAT EXCHANGER DATABOOK

Section 1: Drawing / Plate Hanging List - Specifications

Section 2: ASME Data Report / Nameplate (Code Plate) Copy

Section 3: Calculations

- ASME Code Calculations
- Maximum Allowable Nozzle Loads

Section 4: Inspection and Test Plan

Section 5: Bill of Materials

Section 6: Material Reports –

- Frame & Pressure Plates
- Channel Plates
- Tightening Bolt / Nuts
- Stud Bolt Certificate of Conformance

Section 7: Testing

- Liquid Dye Penetrant Test Report
- Hydrostatic Test Procedure
- Hydrostatic Test Certificate

Section 8: Installation & Operating Instructions (Manual)

Southern Company Generation Kemper County
MM127388 0 Unit 1

ALFA LAVAL INC. PO: MPC17837
30113-88709 41276-10B Rev: 0
IGCC - COMBINED CYCLE - MULTIPAGE - VENTURI SCRUBBER PUMP AROUND

Approved

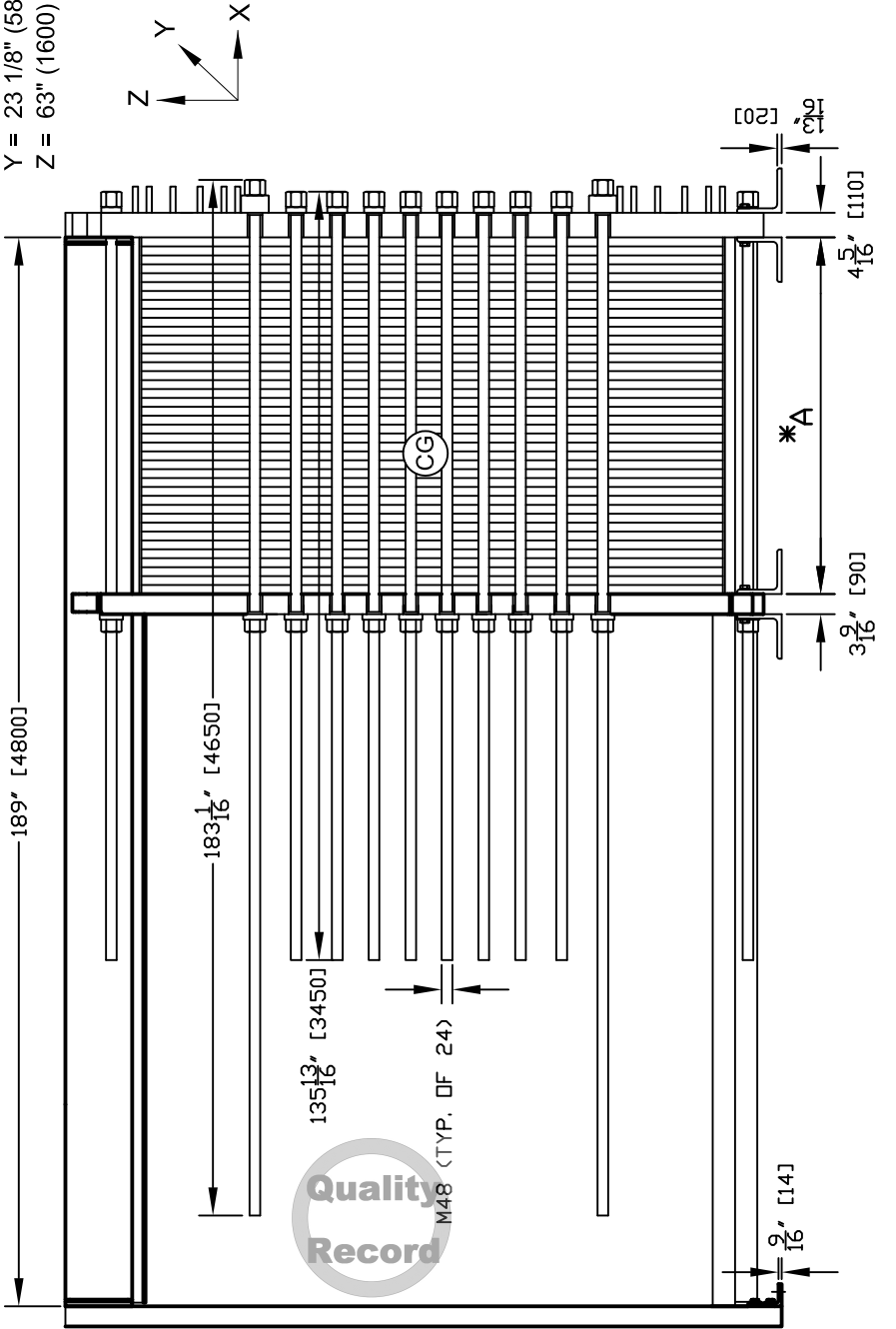


REMARKS:	SIDE 1	SIDE 2	GASKET	NBRP CLIP-ON
DESIGN PRESSURE	185 PSIG	185 PSIG	PLATE MATERIAL	TITANIUM
MAWP	185 PSIG	185 PSIG	PLATE THICKNESS	0.50 mm
TEST PRESSURE	241 PSIG	241 PSIG	HEATING SURFACE	12580 ft²
DESIGN TEMPERATURE	150 °F	150 °F	PLATE GROUPING	1*(256MH + 15L) / 1*(256ML + 15L) = 543 PLATES (811 MAX)
MDMT	-20 °F	-20 °F	OPERATING WEIGHT	28385 LBS
			NET WEIGHT	22000 LBS

SUPPLIER	ORDER NO.	
ALFA LAVAL INC.	J-41276 (408263)	
CUSTOMER	CUSTOMER P.O. NO.	PROJECT
MISSISSIPPI POWER COMPANY	MPC17837-0001	KEMPER COUNTY IGCC PROJECT
ITEM NO.	ITEM NAME	
HX1104, HX1204, HX1304, HX2104, HX2204, HX2304	VENTURI SCRUBBER PUMPAROUND COOLERS	
DRAWN BY	CHECKED BY	DATE
DMN	RMN	9-1-2011

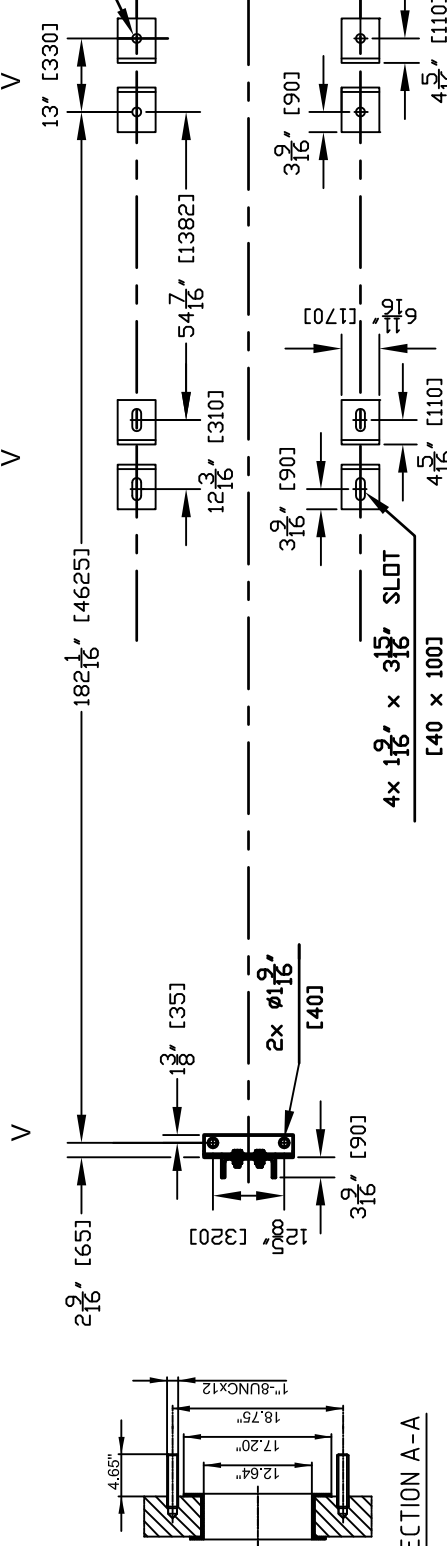
SIDE

CENTER OF GRAVITY
X = 42 1/2" (1080) FROM FRONT FACE
Y = 23 1/8" (587) FROM SIDE
Z = 63" (1600) FROM FLOOR



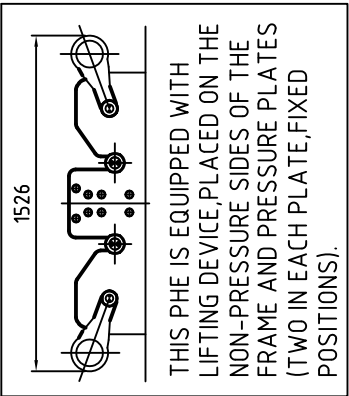
FOUNDATION LOADS

MAINTENANCE CONDITION	8500 LBF
FILLED CONDITION	0 LB-F



SECTION A-A

ANSI 14" CLASS 150
CONNECTION: S1, S2, S3, S4



MINIMUM ANCHOR BOLT
M30 DIA. ISO GRADE 8.8
(TYP. OF 10)

* PLATE PACK TIGHTENING DIMENSION
A = N x (2.45 + X) = 543 x (2.45 + 0.5) = 1602 mm = 63 1/16"

NOTES: PAINT: CARBOLINE 8832 ALIPHATIC POLYURETHANE, 3-5 MILS DFT, COLOR AL-BLUE.
DATA BOOK. CUSTOMER INSPECTION.

DIMENSIONS IN PARENTHESIS ARE MILLIMETERS (mm).

SIDE	MEDIA	CONNECTIONS	MATERIAL	INLET	TEMPERATURE	OUTLET	TEMPERATURE	FLOW RATE	PRESSURE DROP	LIQUID VOLUME
1	WATER	ANSI 14" CLASS 150	TITANIUM	S1	119.0 °F	S2	91.0 °F	3537000 lb/h	15.39 PSI	51.2 ft³
2	WATER	ANSI 14" CLASS 150	TITANIUM	S3	86.0 °F	S4	114.0 °F	3537000 lb/h	15.46 PSI	51.2 ft³

Alfa Laval, Plate Heat Exchanger Specification
Channel Plate Installation Description

Document: SPEC_30113-88708
Rev. 2

Date: 9-1-2011

Customer: Mississippi Power Company
P.O. No.: MPC17837-0001
Project: Kemper County IGCC Project
Item No.: HX1104, HX1204, HX1304,
HX2104, HX2204, HX2304

A/L Order No: J-41276 (408263)
Serial No: 30113-88708 to 30113-88713
Model Type: **TL35-BFD**

Plate material and Thickness: Titanium 0.50 mm

A Dimension: $A = N \times (2.45 + X)$
 $A = 543 \times (2.45 + 0.5) = 1602 \text{ mm}$

	Hot side	Cold side
Grouping:	1* (256MH+15L)	1* (256ML+15L)
Sealing material:	NBRP Clip-on	NBRP Clip-on
Port Locations:	S1 -> S2	S3 -> S4
Connection material:	Titanium	Titanium

Port hole with flow on the gasketed side: U
Port hole sealed with O-ring: O
Plates are assembled with the gasket side facing the frame plate.

Plate no.	Plate code no.	Plate Pattern		Punched corner of the plate				Flow direction on the gasket side of the plate
				upper right	lower right	lower left	upper left	
				S1	S2	S3	S4	
				=>=	=<=	=<=	=>=	
	FRAME PLATE							
1	39507591 83	TL35 B2	A	O	O	O	O	
2	39507540 03	TL35 B2	B	U --->--	U	O	O	Down
3	39507539 03	TL35 B1	A	O	O	U --->--	U	Up
4	39507540 03	TL35 B2	B	U --->--	U	O	O	Down
5	39507539 03	TL35 B1	A	O	O	U --->--	U	Up
6,	8, , 508	39507540 03	TL35 B2 B					
7,	9, , 509	39507539 03	TL35 B1 A					
510	39507540 03	TL35 B2	B	U --->--	U	O	O	Down
511	39507539 03	TL35 B1	A	O	O	U --->--	U	Up
512	39507540 03	TL35 B2	B	U --->--	U	O	O	Down
513	39507539 03	TL35 B1	A	O	O	U --->--	U	Up
514	39507539 03	TL35 B1	B	U --->--	U	O	O	Down
515	39507539 03	TL35 B1	A	O	O	U --->--	U	Up
516	39507539 03	TL35 B1	B	U --->--	U	O	O	Down
517,	519, , 537	39507539 03	TL35 B1 A					
518,	520, , 538	39507539 03	TL35 B1 B					
539	39507539 03	TL35 B1	A	O	O	U --->--	U	Up
540	39507539 03	TL35 B1	B	U --->--	U	O	O	Down
541	39507539 03	TL35 B1	A	O	O	U --->--	U	Up
542	39507539 03	TL35 B1	B	U --->--	U	O	O	Down
543	39507591 76	TL35 B2	A			---	---	Up
	PRESSURE PLATE							
				T1	T2	T3	T4	



Alfa Laval, Plate Heat Exchanger Specification
Channel Plate Installation Description

Document: SPEC_30113-88708
Rev. 2

Date: 9-1-2011

Plate Part No:	Quantity:	Total:
39507591 83	1	6
39507540 03	256	1536
39507539 03	285	1710
39507591 76	1	6
	<hr/> 543	<hr/> 3258



1. Manufactured and certified by Alfa Laval Inc., 5400 International Trade Drive, Richmond, Virginia, 23231

(Name and address of Manufacturer)

2. Manufactured for MISSISSIPPI POWER COMPANY, PO BOX 830727, BIRMINGHAM, 35283

(Name and address of Purchaser)

3. Location of installation Kemper County IGCC Generating Facility, 5835 Highway 493, De Kalb, 39328

(Name and address)

4. Type Vertical

(Horizontal, vertical, or sphere)

Plate Heat Exchanger

(Tank, separator, jkt. vessel, heat exch., etc.)

30113-88709

(Manufacturer's serial number)

N/A

(CRN)

30113-88709.2

(Drawing number)

31601

(National Board number)

2012

(Year built)

5. ASME Code, Section VIII, Div. 1

2010/ A11

Edition and Addenda (date)

N/A

Code Case number

N/A

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 multichamber vessels.*6. Shell: (a) Number of course(s) N/A(b) Overall length 0'

Course(s)			Material Spec./Grade or Type	Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B, & C)			Heat Treatment	
No.	Diameter	Length		Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>

7. Heads: (a)

SA-516-70

(Material spec. number, grade or type) (H.T. - time and temp.)

(b)

SA-516-70

(Material spec. number, grade or type) (H.T. - time and 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)	<u>Fixed</u>	<u>4.33"</u>	<u>0"</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>127" X 46"</u>			<u>N/A</u>	<u>N/A</u>	<u>N/A</u>
(b)	<u>Movable</u>	<u>3.54"</u>	<u>0"</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>127" X 46"</u>			<u>N/A</u>	<u>N/A</u>	<u>N/A</u>

If removable, bolts used (describe other fastening)

SA193-B7 (24) 1.89" (M48 actual) BOLTS

(Material spec. number, grade, size, number)

8. Type of jacket N/A

Jacket closure

N/A

(Describe as ogee & weld, bar, etc.)

If bar, give dimensions

N/A

If bolted, describe or sketch.

9. MAWP 185 psi N/A at max. temp. 150 °F N/A Min. design metal temp. -20 °F at 185 psi

(Internal)

(External)

(Internal)

(External)

10. Impact test NO (Impact Exemption UCS-66(a), (b), UHA-51, UNF-65, as applicable) at test temperature of N/A

(Indicate yes or no and the component(s) impact tested)

11. Hydro., pneu., or comb. test pressure 241 psi Proof test N/A*Items 12 and 13 to be completed for tube sections.*12. Tubesheet N/A N/A N/A N/A N/A

(Stationary (material spec. no.))

(Diameter (subject to press.))

(Nominal thickness)

(Corr. allow.)

Attachment (welded or bolted)

N/A

(Floating (material spec. no.))

N/A

(Diameter)

N/A

(Nominal thickness)

N/A

(Corr. allow.)

N/A

(Attachment)

13. Tubes N/A N/A N/A N/A N/A

(Material spec. no., 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 N/A (b) Overall length N/A

Course(s)			Material Spec./Grade or Type	Thickness		Long. Joint (Cat. A)			Circum. Joint (Cat. A, B, & C)			Heat Treatment	
No.	Diameter	Length		Nom.	Corr.	Type	Full, Spot, None	Eff.	Type	Full, Spot, None	Eff.	Temp.	Time
	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>

15. Heads: (a)

N/A

(Material spec. number, grade or type) (H.T. - time and temp.)

(b)

N/A

(Material spec. number, grade or type) (H.T. - time and 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)	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>			<u>N/A</u>	<u>N/A</u>	<u>N/A</u>

If removable, bolts used (describe other fastening)

N/A

(Material spec. number, grade, size, number)



16. MAWP N/A N/A at max. temp. N/A N/A Min. design metal temp. N/A at N/A.
(Internal) (External) (Internal) (External)

17. Impact test N/A at test temperature of N/A.
[Indicate yes or no and the component(s) impact tested]

18. Hydro., pneu., or comb. test pressure N/A Proof test N/A

19. Nozzles, inspection, and safety valve openings:

Purpose (Inlet, Outlet, Drain, etc.)	No.	Diameter or Size	Type	Material		Nozzle Thickness		Reinforcement Material	Attachment Details		Location (Insp. Open.)
				Nozzle	Flange	Nom.	Corr.		Nozzle	Flange	
Inlet	2	14"	STUDS	SA193-B7		1"					
Outlet	2	14"	STUDS	SA193-B7		1"					

20. Supports: Skirt Lugs N/A Legs N/A Others FEET Attached BOLTED
(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):

N/A

22. Remarks

(811) SB-265 Gr. 2 .02" Plates Maximum; Distance between Heads = 63.1188"; Customer PO#: MPC17837-0001; Tag #: HX1204; Owner to supply Safety Valve/Noncorrosive Service Only

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 Number 25017 Expires July 5, 2013

Date 01/25/2012 Name Alfa Laval Inc. Signed Aimee Bernard
(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 VA and employed by OneBeacon America Insurance Co. of Lynn, MA have inspected the pressure vessel described in this Manufacturer's Data Report on January 23, 2012, 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 01/25/2012 Signed [Signature] Commissions 10803A, VA951R
(Authorized Inspector) [National Board (incl. endorsements), State, Province, and number]

CERTIFICATE OF FIELD ASSEMBLY COMPLIANCE

We certify that the statements made in 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 Number 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]



NB 31601



Certified by
Alfa Laval - Richmond, VA

Single ratings apply to all described
Multiple ratings are indicated by / and

MAWP | 185 PSIG AT 150 F
MDMT | -20 F AT 185 PSIG
S/N | 30113-88709 | Year | 2012
Model | TL35-BFD
Area | 12580 SQ.FT.
A Dim | 1602MM W/543 0.50 MM PLTS
Order | J-41276

MISSISSIPPI POWER COMPANY
P.O. NO. MPC17837-0001
ITEM NO. HX1204
EMPTY WEIGHT 22000 LBS

Call Robert Coleman

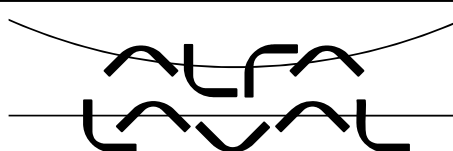
866-ALFALAVAL WWW.ALFALAVAL.COM



WARNING

READ INSTRUCTION MANUAL
BEFORE INSTALLATION,
OPERATION AND MAINTENANCE
TO AVOID INJURIES
OR DAMAGE.





Customer: Mississippi Power Company
P.O. No.: MPC17837-0001
Project: Kemper County IGCC Project
Item No.: HX1104, HX1204, HX1304,
HX2104, HX2204, HX2304
A/L Order No.: J-41276 (408263)
A/L Serial No.: 30113-88708 to 88713
Document: PVCalc_30113-88708



Pressure Vessel Calculation of Plate Heat Exchanger

Pressure vessel code ASME Boiler and Pressure Vessel
Code, Section VIII, Division 1

Code edition 2010 Edition and latest addenda

Calculation form version ASMEVIII-1.PHE.02.9

Standard version ASME

Calculation drawing⁽¹⁾ no Dwg_no = 3011388708

Heat Exchanger type PHE_type = "TL35-FD"

Additional pressure due to static head of liquid $p_{stat} = 0.3 \cdot \text{bar}$

⁽¹⁾ Design and Arrangement drawing.

Summary

For connection standard ASME B16.5 Class 150.

Design temp.	$T_{max}^{\circ C} = 65.56^{\circ C}$ ($T_{max}^{\circ F} = 150.0^{\circ F}$)
MDMT	$T_{min}^{\circ C} = -29^{\circ C}$ ($T_{min}^{\circ F} = -20^{\circ F}$) at MAWP
MAWP	$p_{design} = 1.28 \cdot \text{MPa}$ ($p_{design} = 12.759 \cdot \text{bar} / p_{design} = 185 \text{ psig}$)
Test pressure	$p_{test} = 1.66 \cdot \text{MPa}$ ($p_{test} = 16.587 \cdot \text{bar} / p_{test} = 241 \text{ psig}$)

2

9/1/2011

Randy Neagle

9/1/2011

Dean Middleton

Rev.

Date

Prepared

Date

Approved

1a Tightening bolts

Calculation drawing⁽¹⁾ item no.

No._{.tbolt} = "3"

The required bolt area is calculated according to appendix 2.

1a.1 Input parameters

Bolt material:

material_{.tbolt} = "ASME SA-193 Gr. B7"

Allowable stress (table UCS-23):

S_{.tbolt} = 172·MPa

Bolt size no. 1

Bolt size no. 2

Bolt size (threading):

size_{.tbolt.1} = "M48"

size_{.tbolt.2} = "M48"

Cross-sectional diam. of bolts at root of thread or section of least diameter under stress, if less :

d_{b.tbolt.1} = 41.5·mm

d_{b.tbolt.2} = 41.51·mm

Number of bolts:

n_{.tbolt.1} = 24

n_{.tbolt.2} = 0

Pressure load area:

A_{.press} = 2370705·mm²

Total gasket length:

L_{G.tbolt} = 12227·mm

Real gasket width:

N_{.tbolt} = 10.5·mm

Gasket material

gasketmaterial_{.tbolt} = "Elastomer"

Calculation pressure (incl static head of liquid):

p = 1.301·MPa

1a.2 Gasket parameters

Table 2-5.2 gives:

Basic gasket seating width:

$$b_{0.tbolt} := \frac{N_{.tbolt}}{2}$$

b_{0.tbolt} = 5.25·mm

Effective gasket seating width:

$$b_{.tbolt} := \begin{cases} b_{0.tbolt} & \text{if } b_{0.tbolt} \leq 6 \cdot \text{mm} \\ 2.5 \cdot \sqrt{\text{mm}} \cdot \sqrt{b_{0.tbolt}} & \text{otherwise} \end{cases}$$

b_{.tbolt} = 5.25·mm

Table 2-5.1 gives:

Gasket factor:

$$m_{\text{tbolt}} = 1.0$$

Min design seating stress:

$$y_{\text{tbolt}} = 1.4 \cdot \text{MPa}$$

1a.3 Total bolt load

Formulas 1 and 2 of 2-5 are rewritten to fit a noncircular shaped gasket line.

$$W_{m1.\text{tbolt}} := A_{\text{press}} \cdot p + 2 \cdot b_{\text{tbolt}} \cdot L_{G.\text{tbolt}} \cdot m_{\text{tbolt}} \cdot p$$

$$W_{m1.\text{tbolt}} = 3251520 \text{ N}$$

$$W_{m2.\text{tbolt}} := b_{\text{tbolt}} \cdot L_{G.\text{tbolt}} \cdot y_{\text{tbolt}}$$

$$W_{m2.\text{tbolt}} = 89868 \text{ N}$$

1a.4 Total required bolt area (2-5 (d))

$$S_{a.\text{tbolt}} := S_{\text{tbolt}}$$

$$S_{b.\text{tbolt}} := S_{\text{tbolt}}$$

$$A_{m1.\text{tbolt}} := \frac{W_{m1.\text{tbolt}}}{S_{b.\text{tbolt}}}$$

$$A_{m2.\text{tbolt}} := \frac{W_{m2.\text{tbolt}}}{S_{a.\text{tbolt}}}$$

$$A_{m1.\text{tbolt}} = 18904 \cdot \text{mm}^2$$

$$A_{m2.\text{tbolt}} = 522 \cdot \text{mm}^2$$

1a.5 Total actual bolt area

$$A_{b.\text{tbolt}} := n_{\text{tbolt}.1} \cdot \frac{\pi}{4} \cdot d_{b.\text{tbolt}.1}^2 + n_{\text{tbolt}.2} \cdot \frac{\pi}{4} \cdot d_{b.\text{tbolt}.2}^2$$

$$A_{b.\text{tbolt}} = 32479 \cdot \text{mm}^2$$

$A_{m1.\text{tbolt}}$ and $A_{m2.\text{tbolt}}$ shall be smaller than $A_{b.\text{tbolt}}$ (1=true, 0=false)

$$A_{m1.\text{tbolt}} < A_{b.\text{tbolt}} = 1$$

$$A_{m2.\text{tbolt}} < A_{b.\text{tbolt}} = 1$$



2a Frame and pressure plates

Calculation drawing⁽¹⁾ item No.

No._{plate} = "1 (Frame pl.), 2 (Press. pl.)"

The frame and pressure plate are calculated according to part U2 (g) of the code. A finite element analysis has been made for the weakest part of the covers. The results of typical analyses have been verified by means of strain gauge tests (report TD 8001-18).

2a.1 Results from finite element analysis

Finite element analysis no:

FEM_{no} = "T-T-0087"

Input data to the analysis:

FEM_{input} = "tl35fdasmefp_model.db"

Loading

Pressure used in the finite element analysis:

p_{b,plate} = 2.075 · MPa

Effective gasket width: (1.2 above)

b_{.tbolt} = 5.25 · mm

Gasket length: (1.1 above)

L_{G.tbolt} = 12227 · mm

Gasket factor: (1.2 above)

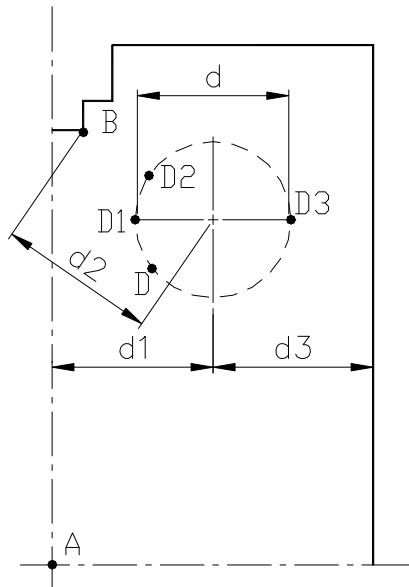
m_{.tbolt} = 1.0

Gasket line load:

$$H_{p,plate} := 2 \cdot b_{.tbolt} \cdot L_{G.tbolt} \cdot m_{.tbolt} \cdot p_{b,plate}$$



Schematic sketch of the upper quarter of the plate



$$d_{1,plate} = 289 \cdot \text{mm}$$

$$d_{2,plate} = 287 \cdot \text{mm}$$

$$d_{3,plate} = 298 \cdot \text{mm}$$

d_{plate} is the diameter of a supposed nozzle hole.

$$d_{plate} = 331 \cdot \text{mm}$$

$t_{b,plate}$ is the thickness used in the analysis.

$$t_{b,plate} = 109.7 \cdot \text{mm}$$

Stresses

at midpoint of plate:

$$\sigma_{A,plate} = 134.8 \cdot \text{MPa}$$

at outcut for carrying bar:

$$\sigma_{B,plate} = 0 \cdot \text{MPa}$$

at edge of supposed nozzle hole (max stress):

$$\sigma_{D,plate} = 89.1 \cdot \text{MPa}$$

at edge of supposed nozzle hole, in the inner horizontal section:

$$\sigma_{D1,plate} = 73 \cdot \text{MPa}$$

at edge of supposed nozzle hole, in the narrow section towards the outcut for the carrying bar:

$$\sigma_{D2,plate} = 0 \cdot \text{MPa}$$

at edge of supposed nozzle hole, in the outer horizontal section:

$$\sigma_{D3,plate} = 72.3 \cdot \text{MPa}$$



2a.2 Required thickness of plate without nozzle opening

Frame material:	$\text{material}_{\text{plate}} = \text{"SA516-70"}$
Allowable primary membrane stress (table UCS-23):	$S_{\text{plate}} = 138 \cdot \text{MPa}$
Allowable primary membrane plus bending stress (UG-23 (c)):	$1.5 \cdot S_{\text{plate}} = 207 \cdot \text{MPa}$
Calculation pressure (incl static head of liquid):	$p = 1.301 \cdot \text{MPa}$
Pressure used in finite element analysis:	$p_{b,\text{plate}} = 2.075 \cdot \text{MPa}$
The required thickness is:	
$\sigma_{\text{max,plate}} := \max(\sigma_{A,\text{plate}}, \sigma_{B,\text{plate}})$	$\sigma_{\text{max,plate}} = 134.8 \cdot \text{MPa}$
$t_{r,\text{plate}} := t_{b,\text{plate}} \cdot \sqrt{\frac{\sigma_{\text{max,plate}}}{1.5 \cdot S_{\text{plate}}} \cdot \frac{p}{p_{b,\text{plate}}}}$	$t_{r,\text{plate}} = 70.1 \cdot \text{mm}$
Actual thickness:	$t_{a,\text{plate}} = 109.7 \cdot \text{mm}$
$t_{r,\text{plate}}$ shall be smaller than $t_{a,\text{plate}}$ (1=true, 0=false)	$t_{r,\text{plate}} < t_{a,\text{plate}} = 1$



2a.3 Reinforcement of plate with nozzle opening

The nozzle opening is reinforced according to UG-39. The total reinforcement is taken from the material of the plate above the required thickness.

Four different cross sections which may be critical are investigated:

I / Section through area of max stress (point D in 2.1 above)

II / Section where the geometry may not permit full use of the allowed reinforcement diameter d:

II.a through point D1 in 2.1 above

II.b through point D2 in 2.1 above

II.c through point D3 in 2.1 above

a / Required thickness at critical locations

$$t_{rh,plate} = t_{b,plate} \cdot \sqrt{\frac{\sigma}{1.5 \cdot S_{,plate}} \cdot \frac{p}{p_{b,plate}}}$$

where σ is; $\sigma_{D,plate}$, $\sigma_{D1,plate}$, $\sigma_{D2,plate}$ and $\sigma_{D3,plate}$ for the different locations given in 2.1.

$t_{b,plate}$ is given in 2.1.

$S_{,plate}$, p and $p_{b,plate}$ are given in 2.2.

At the different locations:

$$t_{rhD,plate} := t_{b,plate} \cdot \sqrt{\frac{\sigma_{D,plate}}{1.5 \cdot S_{,plate}} \cdot \frac{p}{p_{b,plate}}}$$

$$t_{rhD,plate} = 57 \cdot \text{mm}$$

$$t_{rhD1,plate} := t_{b,plate} \cdot \sqrt{\frac{\sigma_{D1,plate}}{1.5 \cdot S_{,plate}} \cdot \frac{p}{p_{b,plate}}}$$

$$t_{rhD1,plate} = 51.6 \cdot \text{mm}$$

$$t_{rhD2,plate} := t_{b,plate} \cdot \sqrt{\frac{\sigma_{D2,plate}}{1.5 \cdot S_{,plate}} \cdot \frac{p}{p_{b,plate}}}$$

$$t_{rhD2,plate} = 0 \cdot \text{mm}$$

$$t_{rhD3,plate} := t_{b,plate} \cdot \sqrt{\frac{\sigma_{D3,plate}}{1.5 \cdot S_{,plate}} \cdot \frac{p}{p_{b,plate}}}$$

$$t_{rhD3,plate} = 51.3 \cdot \text{mm}$$

Quality
Record

b / Required reinforcement areas

$$A_{\text{.plate}} = 0.5 \cdot d_{\text{.plate}} \cdot t_{\text{rh,plate}} \quad (\text{UG-39})$$

where $d_{\text{.plate}}$ is the opening diameter given in 2.1.

$t_{\text{rh,plate}}$ for the different locations are calculated in a/ above.

At the different locations:

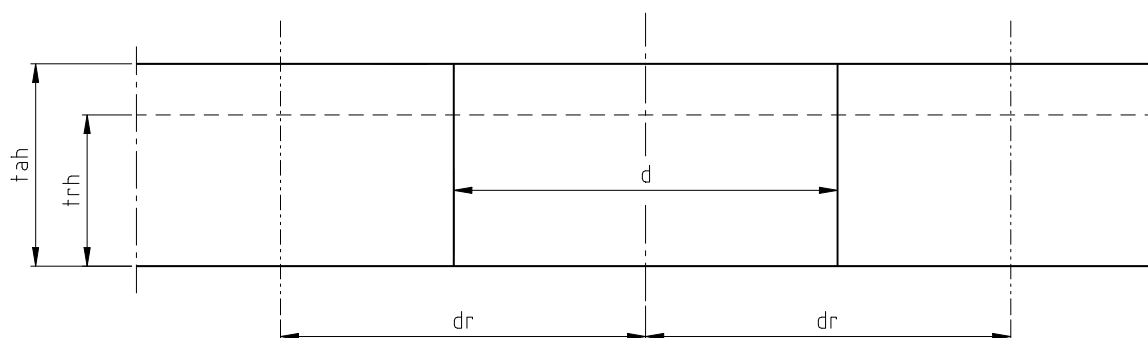
$$A_{\text{D,plate}} := 0.5 \cdot d_{\text{.plate}} \cdot t_{\text{rhD,plate}} \quad A_{\text{D,plate}} = 9432 \cdot \text{mm}^2$$

$$A_{\text{D1,plate}} := 0.5 \cdot d_{\text{.plate}} \cdot t_{\text{rhD1,plate}} \quad A_{\text{D1,plate}} = 8537.4 \cdot \text{mm}^2$$

$$A_{\text{D2,plate}} := 0.5 \cdot d_{\text{.plate}} \cdot t_{\text{rhD2,plate}} \quad A_{\text{D2,plate}} = 0 \cdot \text{mm}^2$$

$$A_{\text{D3,plate}} := 0.5 \cdot d_{\text{.plate}} \cdot t_{\text{rhD3,plate}} \quad A_{\text{D3,plate}} = 8496.3 \cdot \text{mm}^2$$

c / Actual reinforcement areas.
(The actual reinforcement area is calculated according to UG-40.)



The figure above shows the finished nozzle hole where:

$d_{\text{.plate}}$ is nozzle opening diameter given in 2.1

$d_{\text{r,plate}}$ is $d_{\text{.plate}}$ or the smallest of $d_{1,\text{plate}}$, $d_{2,\text{plate}}$, $d_{3,\text{plate}}$ for each of the different locations given in 2.1

$t_{\text{ah,plate}}$ is the actual thickness of a holed plate $t_{\text{ah,plate}} = 110 \cdot \text{mm}$

$t_{\text{rh,plate}}$ is the required thickness at the different locations given in 2.3 a /

Quality
Record

The actual reinforcement area is:

$$A'_{D,plate} = (t_{ah,plate} - t_{rh,plate}) \cdot (2 \cdot d_{r,plate} - d_{plate})$$

The calculation shall be made for all four locations, see 2.3 above.



Section D:

$$A'_{D,plate} = 17546.1 \cdot \text{mm}^2$$

Section D1:

$$A'_{D1,plate} = 14428.4 \cdot \text{mm}^2$$

Section D2:

$$A'_{D2,plate} = 26730 \cdot \text{mm}^2$$

Section D3:

$$A'_{D3,plate} = 15545.6 \cdot \text{mm}^2$$

d / Comparison between actual and required reinforcement areas
A' shall be greater than A for each of the four sections.

Actual (c / above):

Required (b / above):

(1=true, 0=false)

$$A'_{D,plate} = 17546.1 \cdot \text{mm}^2$$

$$A_{D,plate} = 9432 \cdot \text{mm}^2$$

$$A'_{D,plate} > A_{D,plate} = 1$$

$$A'_{D1,plate} = 14428.4 \cdot \text{mm}^2$$

$$A_{D1,plate} = 8537.4 \cdot \text{mm}^2$$

$$A'_{D1,plate} > A_{D1,plate} = 1$$

$$A'_{D2,plate} = 26730 \cdot \text{mm}^2$$

$$A_{D2,plate} = 0 \cdot \text{mm}^2$$

$$A'_{D2,plate} > A_{D2,plate} = 1$$

$$A'_{D3,plate} = 15545.6 \cdot \text{mm}^2$$

$$A_{D3,plate} = 8496.3 \cdot \text{mm}^2$$

$$A'_{D3,plate} > A_{D3,plate} = 1$$



3a Stud bolts

Calculation drawing⁽¹⁾ item no.

No._{sbolt} = "6"

The required bolt area is calculated according to appendix 2.

3a.1 Input parameters

Connection standard:

std_{conn} = "ASME B16.5 - CL. 150, 14 (DN350)""

Bolt material:

material_{sbolt} = "ASME SA-193 Gr.B7"

Allowable stress: (table UCS-23)

S_{sbolt} = 172·MPa

Frame, allowable stress: (2.2 above)

S_{plate} = 138·MPa

Bolt size (threading):

size_{sbolt} = "1-8 UNC"

Bolt nominal diameter:

d_{s, sbolt} = 25.4·mm

Min cross-sectional diameter:

d_{b, sbolt} = 21.28·mm

Number of bolts:

n_{sbolt} = 12

Real gasket width:

N_{sbolt} = 53·mm

Gasket outside diameter:

D_{o, sbolt} = 437·mm

Gasket material:

gasketmaterial_{sbolt} = "Non asbestos fibre gasket"

Calculation pressure (incl static head of liquid):

p = 1.301·MPa

3a.2 Gasket parameters

Table 2-5.2 gives:

Basic gasket seating width:

$$b_{0, sbolt} := \frac{N_{sbolt}}{2}$$

b_{0, sbolt} = 26.5·mm

Effective gasket seating width:

$$b_{sbolt} := \begin{cases} b_{0, sbolt} & \text{if } b_{0, sbolt} \leq 6 \cdot \text{mm} \\ 2.5 \sqrt{\text{mm} \cdot \sqrt{b_{0, sbolt}}} & \text{otherwise} \end{cases}$$

b_{sbolt} = 12.9·mm

Gasket load reaction:

$$G_{\text{sbolt}} := D_{\text{o.sbolt}} - 2 \cdot b_{\text{sbolt}}$$

$$G_{\text{sbolt}} = 411.3 \cdot \text{mm}$$

The factor/seating stress for a 1.6 mm thick mineral fiber gasket are used.

Table 2-5.1 gives:

Gasket factor:

$$m_{\text{sbolt}} = 2.75$$

Min design seating stress:

$$y_{\text{sbolt}} = 26 \cdot \text{MPa}$$

3a.3 Total stud bolt load

2-5 formula 1 and 2 give:

Formula 1 (operating condition):

$$W_{\text{m1.sbolt}} := 0.785 \cdot G_{\text{sbolt}}^2 \cdot p + 2 \cdot b_{\text{sbolt}} \cdot 3.14 \cdot G_{\text{sbolt}} \cdot m_{\text{sbolt}} \cdot p$$

$$W_{\text{m1.sbolt}} = 291673 \text{ N}$$

Formula 2 (gasket seating condition):

$$W_{\text{m2.sbolt}} := 3.14 \cdot b_{\text{sbolt}} \cdot G_{\text{sbolt}} \cdot y_{\text{sbolt}}$$

$$W_{\text{m2.sbolt}} = 432099 \text{ N}$$

3a.4 Required stud bolt area (2-5 (d))

$$S_{\text{a.sbolt}} := S_{\text{sbolt}}$$

$$S_{\text{b.sbolt}} := S_{\text{sbolt}}$$

$$A_{\text{m1.sbolt}} := \frac{W_{\text{m1.sbolt}}}{S_{\text{b.sbolt}}}$$

$$A_{\text{m2.sbolt}} := \frac{W_{\text{m2.sbolt}}}{S_{\text{a.sbolt}}}$$

$$A_{\text{m1.sbolt}} = 1696 \cdot \text{mm}^2$$

$$A_{\text{m2.sbolt}} = 2512 \cdot \text{mm}^2$$

3a.5 Total actual bolt area

$$A_{\text{b.sbolt}} := n_{\text{sbolt}} \cdot \frac{\pi}{4} \cdot d_{\text{b.sbolt}}^2$$

$$A_{\text{b.sbolt}} = 4268 \cdot \text{mm}^2$$

$A_{\text{m1.sbolt}}$ and $A_{\text{m2.sbolt}}$ shall be smaller than $A_{\text{b.sbolt}}$ (1=true, 0=false)

$$A_{\text{m1.sbolt}} < A_{\text{b.sbolt}} = 1$$

$$A_{\text{m2.sbolt}} < A_{\text{b.sbolt}} = 1$$

3a.6 Thread length in frame and pressure plate

according to UG-43(g) min thread length is:

$$L_{\text{t.sbolt}} := \min \left(\max \left(d_{\text{s.sbolt}}, 0.75 \cdot d_{\text{s.sbolt}} \cdot \frac{S_{\text{sbolt}}}{S_{\text{plate}}} \right), 1.5 \cdot d_{\text{s.sbolt}} \right)$$

$$L_{\text{t.sbolt}} = 25.4 \cdot \text{mm}$$

Actual thread length:

$$L_{\text{ta.sbolt}} = 32 \cdot \text{mm}$$

$L_{\text{t.sbolt}}$ shall be smaller than $L_{\text{ta.sbolt}}$ (1=true, 0=false)

$$L_{\text{ta.sbolt}} > L_{\text{t.sbolt}} = 1$$



Maximum Allowable Nozzle Loads for Plate Heat Exchangers

Document
MANL_30113-88708

Revision
2

Date
9-1-2011

This document specifies the maximum nozzle loads recommended by Alfa Laval for the Plate Heat Exchanger model listed below. As the Plate Heat Exchanger has at least four connections, the loads interact in a complex way. Therefore, if an individual value is exceeded it might be possible to increase that load component by decreasing another or simply defining the direction of the loads (+ or -).

PHE Data

Alfa Laval Model: TL35-BFD
No. of Channel Plates: 543
Material of Channel Plates: Titanium
Thickness of Channel Plates: 0.5 mm
Carrying Bar Length: 4800 mm

Order Information

Customer: Mississippi Power Company
PO No.: MPC17837-0001
Item No.: HX1104, HX1204, HX1304
HX2104, HX2204, HX2304
A/L Order No.: J-41276 (408263)
A/L Serial No.: 30113-88708 to 88713

The loads shown in the table below are for connections S1, S2, S3, S4 and are valid under only the following condition(s).

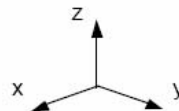
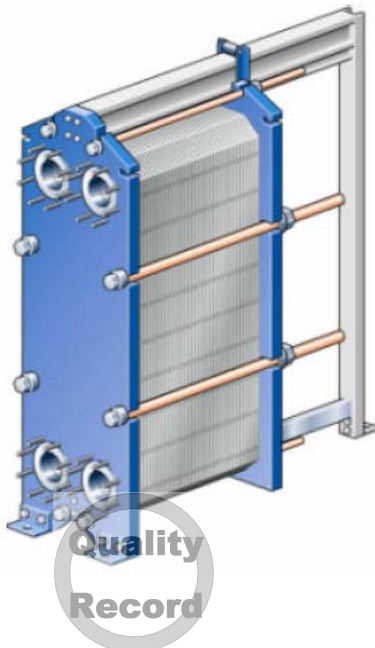
- No other external loads such as wind or seismic load exists.
- The connections are studded ports.


Deviations from these conditions will imply lower values.

A representative heat exchanger sketch, the directions of the coordinate system, and the table with the maximum recommended loads for the particular model are located below.

F_x [LBF] = ± 482
 F_y [LBF] = ± 482
 F_z [LBF] = ± 482

M_x [LBF-FT] = ± 2375
 M_y [LBF-FT] = ± 2375
 M_z [LBF-FT] = ± 2375



	Alfa Laval Inc. 5400 International Trade Dr. Richmond, VA 23231	
	Date: 12/2/11	Rev.: 2
Title: Inspection and Test Plan for PHE's	Doc. No.: ITP_30113-88708	Page 1 of 1

Customer Name: Mississippi Power PO No.: MPC17837-0001 Item No.: HX1104, HX1204, Item No.: HX1304, HX2104, HX2204, HX2304	Model: TL35-BFD AL Order No: J-41276 (408263) Serial No: 30113-88708 to 30113-88713	AL QA Contacts: Mike Pischke 804-236-1249 Aimee Barnard 804-236-1256					
Legend I - Inspection R - Review Point V - Verify O - Observation Point H - Hold Point W - Witness AL - Alfa Laval Inc. AI - ASME Authorized Inspector Cust. - Customer							
Activity Description	Specification/ Code Reference	Acceptance Criteria	Customer Submittal	Inspection Requirements			Comments
				AL	AI	Cust.	
Receipt of Components	ASME VIII	Component Drawing		I, V			
Receipt of Cover Plates	ASME II	ASME II	MTR	I, V	R		
Receipt of Tightening Bolts	ASME II	ASME II	MTR	I, V	R		
Receipt of Tightening Nuts	ASME II	ASME II	MTR	I, V	R		
Receipt of Channel Plate	ASME II	ASME II	MTR	I, V	R		
Receipt of Gaskets	AL Spec.	AL Spec.		I, V			
Sandblasting	SSPC	SSPC SP-10 WI 26900		I, V		W	
Painting	Manufacturers Recommendations	WI-26001		I, V		W	
Welding	ASME IX	ASME VIII		I, V		W	Port Liners
NDE - Dye Penetrant	AL Spec.	WI-29005	Report	I, V		W	Port Liners
Assembly	AL Spec.	WI-24601		I, V		W	
Hydrostatic Testing	ASME VIII	WI-25001	Certificate	H	H	H	
Air Dryng	AL Spec.	WI-24805		I, V			
Shroud	AL Spec.	Component Drawing		I, V			
Lifting Lugs	AL Spec.	AL Spec.		I, V			
Final Inspection	AL Spec.	Traveler		H		H	
Data Book	Cust. Spec.	AL and/or Cust. Spec.	Elec. Copy	R	R	R	
Shipment	AL Spec.	WI-28006	BOL	H		H	Shipping Release

Note: Customer witness/hold point notification required 10 days in advance to vendorqty@southernco.com

Prepared By: Dean Middleton	Approved By: Mike Pischke
Revision Description:	



Plate Heat Exchanger Bill of Materials

Subject: TL30-BFD

Document: BOM_30113-88708

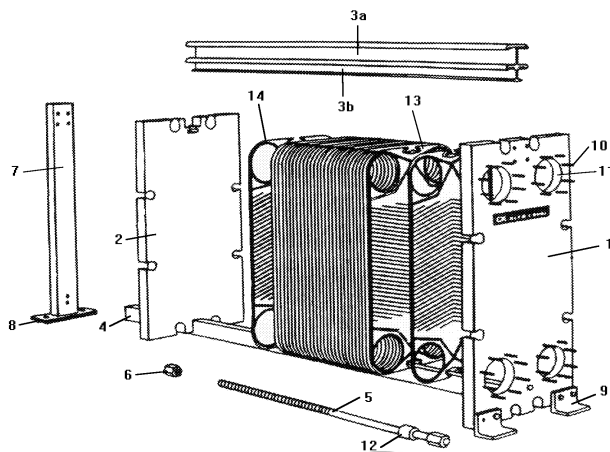
Given are standard ASME/ASTM materials of construction.

No.	Item	Quantity	Material	Notes	Dimensions
1.	Frame Plate	1	SA516-70	1	123 7/16" x 46 1/4"
2.	Pressure Plate	1	SA516-70	1	122 3/16" x 46 1/4"
3a.	Carrying Bar	1	Carbon Steel	1	4800 mm
3b.	T-Profile	1	SA479-304		
4.	Guide Bar	1	SA479-304		4800 mm
5.	Tightening Bolt	4	SA193-B7		M48 x 4650 mm
	Tightening Bolt	20	SA193-B7		M48 x 3450 mm
6.	Tightening Nut	4	SA194-2H	2	M48
	Tightening Nut	20	SA194-2H	2	M48
7.	Support Column	1	Carbon Steel	3	
8.	Support Foot	1	SA36	2	
9.	Frame Plate Foot	4	SA36	2	
	Pressure Plate Foot	4	SA36	2	
10.	Stud Bolt	48	SA193-B7	2	1" 8-UNC
11.	Connection Liner	4	SB265-Gr.1		
12.	Bearing Box	4	1017CS	2	
13.	Channel Plate Gasket	544	NBRP Clip-on		
14.	Channel Plate	543	SB265-Gr.1		88 1/4" x 39 1/8"

Not Shown

OSHA Shroud	1	Aluminum
Tightening Bolt Cover	24	Polyethylene
Lifting Lugs	4	Carbon Steel

Notes: (1) Painted. (2) Zinc Plated. (3) Hot Dip Galvanized.
Drawing is not an accurate depiction, see GA Drawing.



Customer: Mississippi Power Company
P.O. No.: MPC17837-0001
Project: Kemper County IGCC Project
Item No.: HX1104, HX1204, HX1304,
HX2104, HX2204, HX2304
A/L Order No.: J-41276 (408263)
A/L Serial No.: 30113-88708 to 88713



FRAME & PRESSURE PLATES



TEST CERTIFICATE

SHIP TO: ARCELORMITTAL PLATE LLC
ONEAL STEEL INC
1 BROAD ST
CLIFTON NJ 07011

PAGE NO: 01 OF 02
FILE NO: 5985-23-53
MILL ORDER NO: 67096-002
MELT NO: C1057
SLAB NO: 5
DATE: 11/04/11

SOLD TO:
O'NEAL STEEL, INC.
P.O. BOX 98
BIRMINGHAM AL 35201-0098

SEND TO:

01-C

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
1	4-3/8"	96"	255"	RECTANGLE	30374#

CUSTOMER INFORMATION

CUSTOMER PO: 2265350-OP-140

PART NO. 17945861

SPECIFICATION(S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

ASME SA516 REV ED YR 10 GR 70
SPEC MOD FOR CARBON SPEC MOD FOR CHEMISTRY ASTM
A516 10 GRADE 70 & UNS K02700
THE MANAGEMENT SYSTEMS FOR MANUFACTURE OF THIS PRODUCT ARE CERTIFIED
TO ISO 9001:2000 (CERTIFICATE NO. 30130) AND ISO 14001 (CERTIFICATE
NO. 009496).

CHEMICAL COMPOSITION

	C	MN	P	S	CU	SI	NI	CR	MO
MELT:C1057	.20	1.09	.015	.001	.17	.38	.10	.20	.05
	V	TI	B	AL	CB				
MELT:C1057	.001	.003	.0007	.035	.001				

MANUFACTURE

MCQUAID-EHN GRAIN SIZE PER E112 - 7-8

HEAT TREAT CONDITION

MATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	120	AIR COOL

Herbert
Wathan

Digitally signed by Herbert
Wathan
DN: cn=Herbert Wathan, o.ou,
email=herbert.wathan@alfalaval.
com, c=US
Date: 2011.12.12 10:10:14 -05'00'

WE HEREBY CERTIFY THE ABOVE
INFORMATION IS CORRECT:

ARCELORMITTAL PLATE LLC
QUALITY ASSURANCE LABORATORY
139 MODENA ROAD
COATESVILLE, PA 19320

Elinore Zaplitny
SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

Quality
Record

Approved

TEST CERTIFICATE

PAGE NO: 02 OF 02
 FILE NO: 5985-23-53
 MILL ORDER NO: 67096-002
 MELT NO: C1057
 SLAB NO: 5
 DATE: 11/04/11

TENSILE PROPERTIES

SLAB NO.	LOC	DIR	YIELD STRENGTH PSI X 100	TENSILE STRENGTH PSI X 100	ELONGATION GAGE LGTH %
5	BOT.	TRANS.	472	809	2.00" 28.0

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
 TEST CERTS. ARE PREPARED IN ACCORD. WITH PROCEDURES
 OUTLINED IN EN 10204:2004 TYPE 3.1.
 FOR MORE INFORMATION AND PROCESSING GUIDELINES, REFER TO
WWW.ARCELORMITTAL.COM/PLATEINFORMATION

B/L #56183 LIEDTKA TRUCKING INC.

WE HEREBY CERTIFY THE ABOVE
 INFORMATION IS CORRECT:

ARCELORMITTAL PLATE LLC
 QUALITY ASSURANCE LABORATORY
 139 MODENA ROAD
 COATESVILLE, PA 19320

Elinore Zaplitny
 SUPERVISOR - TEST REPORTING
 ELINORE ZAPLITNY

Quality
 Record

Approved

TEST CERTIFICATE

SHIP TO: ARCELORMITTAL PLATE LLC
O'NEAL STEEL INC
1 BROAD ST
CLIFTON NJ 07011

PAGE NO: 01 OF 02
FILE NO: 5985-23-53
MILL ORDER NO: 67696-004
MELT NO: C0696
SLAB NO: 5
DATE: 12/06/11

SOLD TO:
O'NEAL STEEL, INC.
P.O. BOX 98
BIRMINGHAM AL 35201-0098

SEND TO:

01-C

PLATE DIMENSIONS / DESCRIPTION

TOTAL QTY	GAUGE	WIDTH	LENGTH	DESCRIPTION	PIECE WEIGHT
1	3-9/16"	96"	255"	RECTANGLE	24733#

CUSTOMER INFORMATION

CUSTOMER PO: 2265350-OP-140
PART NO. 17978620

SPECIFICATION (S)

THIS MATERIAL HAS BEEN MANUFACTURED AND TESTED IN ACCORDANCE WITH PURCHASE ORDER REQUIREMENTS AND SPECIFICATION(S).

ASME SA516 REV ED YR 10 GR 70
SPEC MOD FOR CARBON SPEC MOD FOR CHEMISTRY ASTM
A516 10 GRADE 70 & UNS K02700
THE MANAGEMENT SYSTEMS FOR MANUFACTURE OF THIS PRODUCT ARE CERTIFIED
TO ISO 9001:2000 (CERTIFICATE NO. 30130) AND ISO 14001 (CERTIFICATE
NO. 009496).

CHEMICAL COMPOSITION

MELT: C0696	C	MN	P	S	CU	SI	NI	CR	MO
	.22	.94	.010	.007	.22	.20	.15	.10	.04
MELT: C0696	V	TI	B	AL	CB				
	.003	.002	.0006	.028	.001				

MANUFACTURE

MCQUAID-EHN GRAIN SIZE PER E112 - 7-8

HEAT TREAT CONDITION

MATL OR TEST	HEAT TREAT DESCRIPTION	NOM TEMP	HOLD MINS	COOL MTHD
PL/TEST	NORMALIZE	1650F	99	AIR COOL

Herbert
Wathan

Digitally signed by Herbert
Wathan
DN: cn=Herbert Wathan, o=ou,
email=herbert.wathan@alfalav
al.com, c=US
Date: 2011.12.12 10:09:34
+05'00'

WE HEREBY CERTIFY THE ABOVE
INFORMATION IS CORRECT:

ARCELORMITTAL PLATE LLC
QUALITY ASSURANCE LABORATORY
139 MODENA ROAD
COATESVILLE, PA 19320

Elinore Zaplitny
SUPERVISOR - TEST REPORTING
ELINORE ZAPLITNY

Quality
Record

Approved

TEST CERTIFICATE

PAGE NO: 02 OF 02
 FILE NO: 5985-23-53
 MILL ORDER NO: 67096-004
 MELT NO: C0696
 SLAB NO: 5
 DATE: 12/06/11

TENSILE PROPERTIES

SLAB NO.	LOC	DIR	YIELD STRENGTH PSI X 100	TENSILE STRENGTH PSI X 100	ELONGATION GAGE LGTH %
5	BOT.	TRANS.	451	772	2.00" 26.0

GENERAL INFORMATION

ALL STEEL HAS BEEN MELTED AND MANUFACTURED IN THE U.S.A.
 TEST CERTS. ARE PREPARED IN ACCORD. WITH PROCEDURES
 OUTLINED IN EN 10204:2004 TYPE 3.1.
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 WWW.ARCELORMITTAL.COM/PLATEINFORMATION

B/L #58476 LIEDTKA TRUCKING INC.

WE HEREBY CERTIFY THE ABOVE
 INFORMATION IS CORRECT:

ARCELORMITTAL PLATE LLC
 QUALITY ASSURANCE LABORATORY
 139 MODENA ROAD
 COATESVILLE, PA 19320

Elinore Zaplitny
 SUPERVISOR - TEST REPORTING
 ELINORE ZAPLITNY

Quality
 Record

Approved



CHANNEL PLATES



注 文 者: MITSUI BUSSAN METALS
SHIPPER CO., LTD.
注文者照合番号:
REFERENCE No. 519 -10419
契約番号:
CONTRACT No. 1-972-RR-5-9-4152
商 品 名:
COMMODITY TITANIUM SHEET
規 格: ASME SB265 GRADE1
SPECIFICATION AL111 4890-63RE10, AL1010310

仕 上: VACUUM ANNEALED
FINISH

製品検査証明書 INSPECTION CERTIFICATE

需 要 家: ALFA LAVAL
CUSTOMER
需要家管理番号: QMCP-95716
CUSTOMER'S CONTROL No.
特 記: EN10204 3.1 / APPROVED ACC. TO PED
NOTE

新日本製鐵株式会社
Nippon Steel Corporation

本 社: 〒100-8071 東京都千代田区丸の内二丁目6番1号
HEAD OFFICE: 6-1, MARUNOUCHI 2-CHOME, CHYODA-KU, TOKYO 100-8071, JAPAN
チタン事業部チタン管理グループ: 〒743-8510 山口県光市大字島田3434番地
TIKARI TITANIUM QUALITY CONTROL DEPT., TITANIUM DIVISION
HIKARI: 3434, SHIMATA, HIKARI-SHI, YAMAGUCHI, 743-8510, JAPAN

証明書番号: TC110891
CERTIFICATE No.
発行年月日: 2011-09-08
DATE OF ISSUE
頁: 1E
PAGE

行番 ITEM No.	寸 法 S I Z E MM	員 数 QUANTITY	質 量 M A S S N E T KG	管 理 番 号 C O N T R O L N o .			引 張 試 験 T E N S I L E T E S T (G L : 2 I N C H)						硬 さ H A R D - B E N D T E S T	曲 げ B E N D T E S T	結 晶 粒 度 G S N	エリクセン E R	化 学 成 分 C H E M I C A L C O M P O S I T I O N					Ti
				検査番号 I N S P E C T I O N N o .	溶解番号 H E A T N o .	コイル番号 C O I L N o .	耐 力 Y S	引張強さ T S	伸 び E L	HARD- NESS HV	H *9	O *10					N *10	Fe *10	C *10			
01	0.5X1000X2600			18-TT156	N14432	90-5428	TLA	181	321	4956	113	0	4		I	1	4	0	3	0	BAL.	
		96					TTA	206	307	3467					P	2						
		104			N14448	90-5440	TLA	180	317	4657	112	0	5		I	1	5	0	2	0	BAL.	
							TTA	200	304	3366					P	2						
	TOTAL	200	1.173																			
		200	1.173	18-TT157	N14448	90-5440	TLA	180	317	4657	112	0	5		I	1	5	0	2	0	BAL.	
							TTA	200	304	3366					P	2						
その他試験 DESCRIPTION OF TEST		寸法検査 DIMENSIONAL INSPECTION G		表面検査 SURFACE INSPECTION G		注 釈 NOTES		GL: 標点距離 Gauge Length (D: 4√So, E: 5.65√So), YR: Yield Ratio, GSN: Grain Size Number, ER: Erichsen, G: 合格 Good, T: 頂部 Top, M: 中央部 Middle, B: 底部 Bottom, L: 圧延方向 Longitudinal, T: 直角方向 Transverse, W: 両方向 L&T, JIS (5-No.5, B-No.13B), ASTM (A: 1/2"), Ingot Analysis, P: 製品分析 Product Analysis, 単位 unit: 1MPa=1N/mm ² AS PER SB265-1-A09														
上記注文品は、御指定の規格または仕様に従って製造され、その要求事項を満足していることを証明します。																						
WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE RULES OF THE CONTRACT.																						
I. Takayama																						
チタン事業部 チタン管理グループリーダー DEPARTMENT MANAGER, HIKARI TITANIUM QUALITY CONTROL DEPT., TITANIUM DIVISION																						

Approved

FINISH VACUUM ANNEALED

需要家: ALFA LAVAL
CUSTOMER : 0MCP-95716
機器管理番号 :
CUSTOMER'S CONTROL No.

特記:
NOTE: EN10204 3.1 / APPROVED ACC. TO PED

本社：〒100-8071 東京都千代田区丸の内二丁目6番1号
 HEAD OFFICE : 6-1, MARUNOUCHI 2-CHOME, CHIYODA-KU, TOKYO 100-8071 JAPAN
 チタン事業部チタン管理グループ：〒743-8510 山口県光市大字島田3434番地
 HIKARI TITANIUM QUALITY CONTROL DEPT., TITANIUM DIVISION
 : 3434 SHIMATA, HIKARI-SHI, YAMAGUCHI 743-8510 JAPAN

証明書番号: TC110875 頁: 1E
発行年月日: 2011-09-01

[illegible]

Approved

仕 上
FINISH VACUUM ANNEALED

需要家：ALFA LAYAL
CUSTOMER :
需要家管理番号：0MCP-87418
CUSTOMERS CONTROL NO.
特記：
NOTE :

本社 : 〒100-0071 東京都千代田区丸の内二丁目 6 番 1 号
 HEAD OFFICE : 6-1, MARUNOUCHI 2-CHOME, CHIYODA-KU, TOKYO 100-0071, JAPAN
 チタン事業部光チタン管理グループ : 〒743-8510 山口県光市大字島田 3 4 3 4 番地
 HIKARI TITANIUM QUALITY CONTROL DEPT., TITANIUM DIVISION
 : 3434, SHIMATA, HIKARI-SHI, YAMAGUCHI, 743-8510, JAPAN

証明書番号: CERTIFICATE No. TC101069
発行年月日: DATE OF ISSUE 2010-12-13

行番 ITEM No.	寸 法 S I Z E MM	員 数 QUANTITY	質 量 MASS NET KG	管 理 番 号 CONTROL No.			引 張 試 験 TENSILE TEST (GL: 2 INCH)				硬さ HARD- NESS HV	曲げ BEND TEST	結晶 粒度 イリケン G S N E R	化 学 成 分 CHEMICAL COMPOSITION						%	
				検査番号 INSPECTION No.	溶解番号 HEAT No.	コイル番号 COIL No.	耐 力 Y S MPA	引張強さ T S MPA	伸 び E L %	HARD- NESS HV				BEND TEST	G S N E R	H *9	O *10	N *10	Fe *10		C *10
01	0.6X1000X2600			0Y-TT123	N04714	90-4850TTA	206	306	3367				P	2							
		2			N04716	90-4836TTA	185	321	4458	121	G 5		I	0	5	0	3	0		BAL.	
						TTA	210	309	3568				P	4							
	TOTAL	217	1.527																		
		217	1.527	0Y-TT124	N04714	90-4850TTA	175	318	4655	116	G 6		I	1	5	0	3	0		BAL.	
						TTA	206	306	3367				P	2							
		217	1.527	0Y-TT125	N04714	90-4850TTA	175	318	4655	116	G 6		I	1	5	0	3	0		BAL.	
						TTA	206	306	3367				P	2							
その他試験 DESCRIPTION OF TEST		寸法検査 DIMENSIONAL INSPECTION G	表面検査 SURFACE INSPECTION G	注 釈 NOTES			GL:標点距離 Gauge Length (D:4√So, E:5.65√So), YR: Yield Ratio, GSN: Grain Size Number, ER: Erichsen, G:合格 Good, ① T:頂部 Top, M:中央部 Middle, B:底部 Bottom, ② L:圧延方向 Longitudinal, T:直角方向 Transverse, W:両方向 L&T, ③ JIS (5-No.5, B:No.13B), ASTM (A:12"), ④ I:インゴット分析 Ingot Analysis, P:製品分析 Product Analysis, 単位 unit: 1MPa=1N/mm² *9:X1000 *10:X100														
				上記注文品は、御指定の規格または仕様に従って製造され、その要求事項を満足していることを証明します。 WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE RULES OF THE CONTRACT.																	
				E07 I-H. Harada チタン事業部 光チタン管理グループリーダー DEPARTMENT MANAGER, HIKARI TITANIUM QUALITY CONTROL DEPT., TITANIUM DIVISION																	

Approved

注文者: MITSUI BUSSAN METALS
SHIPPER SALES CO., LTD.
注文者照合番号: 519 -10354
契約番号: 1-972-RR-5-1-4117
商品名: TITANIUM SHEET
規格: ASME SB265 GRADE1
SPECIFICATION: AL111 4890-63RE10, AL1010310

仕上: VACUUM ANNEALED

製品検査証明書 INSPECTION CERTIFICATE

需要家: ALFA LAVAL
CUSTOMER: ALFA LAVAL
需要家管理番号: 0MCP-87418

特記:
NOTE

新日本製鐵株式会社
Nippon Steel Corporation

本社: 〒100-8071 東京都千代田区丸の内二丁目6番1号
HEAD OFFICE: 〒6-1 MARUNOUCHI-2 CHOME, CHIYODA-KU, TOKYO 100-8071 JAPAN
チタン事業部チタン管理グループ: 〒743-8510 山口県光市大字島田3434番地
HIKARI TITANIUM QUALITY CONTROL DEPT., TITANIUM DIVISION
〒743-8510 SHIMATA, HIKARI-SHI, YAMAGUCHI, 743-8510 JAPAN

証明書番号: TC101054
CERTIFICATE No.: TC101054
発行年月日: 2010-12-09
DATE OF ISSUE: 2010-12-09

頁: 1E
PAGE: 1E

行番 ITEM No.	寸 法 S I Z E MM	員 数 QUANTITY	質 量 MASS NET KG	管 理 番 号 CONTROL No.			引 張 試 験 TENSILE TEST (GL: 2 INCH)						硬 さ HARD- MESS HV	曲 げ BEND TEST	結 晶 粒 度 G S N	エリクセン E R	化 学 成 分 CHEMICAL COMPOSITION						%																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																
				検査番号 INSPECTION No.	溶解番号 HEAT No.	コイル番号 COIL No.	耐 力 Y S MPA	引張強さ T S	伸 び E L %	Y R	H	O					N	Fe	C	Ti																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																			
01	0.6X1000X2600			0Y-TT113	N04517	90-4760	TLA	205	329	4662	121	G 5																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																											

Approved

仕 上: VACUUM ANNEALED

需要家：ALFA LAVAL
需要家管理番号：0MCP-87418

特 記：
NOTE：

本社 : 〒100-8071 東京都千代田区丸の内二丁目6番1号
 HEAD OFFICE : 6-1, MARUNOUCHI2-CHOME, CHIYODA-KU, TOKYO 100-8071 JAPAN
 テタン事業部光テタン管理グループ : 〒743-8510 山口県光市大字島田3434番地
 HIKARI TITANIUM QUALITY CONTROL DEPT., TITANIUM DIVISION
 : 3434 SHIMATA, HIKARI-SHI, YAMAGUCHI 743-8510 JAPAN

証明書番号 : TC101054
CERTIFICATE No. : TC101054
発行年月日 : 2010-12-09
DATE OF ISSUE : 2010-12-09

行番 ITEM No.	寸 法 S I Z E NM	員 数 QUANTITY	質 量 MASS NET KG	管 理 番 号 CONTROL No.			引 張 試 験 TENSILE TEST (GL: 2 INCH)					硬さ HARD- NESS HV	曲げ BEND- TEST	結晶 粒度 GSN	エリクセン ER	化 学 成 分 CHEMICAL COMPOSITION					%				
				検査番号 INSPECTION No.	溶解番号 HEAT No.	コイル番号 COIL No.	耐 力 YS MPA	引張強さ TS	伸 び EL %	YR	H					O	N	Fe	C						
																				*** 1 2 3		MPA	%	%	HV
01	0.6X1000X2600																								
		3		0Y-TT113	N04517	90-4760	TLA	205	329	466	2	121	G 5				I	1	4	0	3	0	BAL		
							TTA	212	322	336	6						P	2							
		214			N04723	90-4799	TLA	184	322	475	7	117	G 6				I	0	4	0	3	0	BAL		
							TTA	206	309	356	7						P	1							
	TOTAL	217	1.527																						
		217	1.527	0Y-TT114	N04723	90-4799	TLA	184	322	475	7	117	G 6				I	0	4	0	3	0	BAL		
							TTA	206	309	356	7						P	1							
		217	1.527	0Y-TT115	N04723	90-4799	TLA	184	322	475	7	117	G 6				I	0	4	0	3	0	BAL		
							TTA	206	309	356	7						P	1							
		217	1.527	0Y-TT116	N04723	90-4799	TLA	184	322	475	7	117	G 6				I	0	4	0	3	0	BAL		
							TTA	206	309	356	7						P	1							
その他試験 DESCRIPTION OF TEST		寸法検査 DIMENSIONAL INSPECTION G		表面検査 SURFACE INSPECTION G				注 釈 NOTES		GL:標点距離 Gauge Length (D:4√So, E:5.65√So), YR: Yield Ratio, GSN: Grain Size Number, ER: Erichsen, G:合格 Good, [x-1] T:頂部 Top, M:中央部 Middle, B:底部 Bottom, [x-2] L:圧延方向 Longitudinal, T:直角方向 Transverse, W:両方向 L&T, [x-3] J I S (5:No.5, B:No.13B), ASTM (A:1/2"), [x-4] I:インゴット分析 Ingots Analysis, P:製品分析 Product Analysis, 単位 unit: 1MPa=1N/mm² *9:X1000 *10:X100															
										上記注文品は、御指定の規格または仕様に従って製造され、その要求事項を満足していることを証明します。 WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MADE IN ACCORDANCE WITH THE RULES OF THE CONTRACT.															
										E07 H. Harada チタン事業部 光チタン管理グループリーダー DEPARTMENT MANAGER, HIKARI TITANIUM QUALITY CONTROL DEPT., TITANIUM DIVISION															

Approved

注文者 : ALCONIX CORPORATION
TRADER

製作番号 : 10-37C10-0 01
KSL CONTRACT No.

商品名 : TITANIUM SHEET
COMMODITY

規格名 : AL111 4890-63 REV.10 G1
SPECIFICATION

仕上げ : ANNEALED AND PICKLED
FINISH

チタン製品検査証明書
TITANIUM INSPECTION CERTIFICATE

需要家 : ALFA LAVAL AB
CUSTOMER

需要家注文番号 : OMCP-92580
CUSTOMER'S P.O. No.

注文仕様書 No. : AL111 4890-63R10
PURCHASE SPECIFICATION No.

神戸製鋼所
加古川製鉄所加古川市金沢町1番地
KOBELSTEEL, LTD.
KAKOGAWA WORKS
1, Kanazawa-cho, Kakogawa-city, Japan

証明書番号 : KT09844 頁: 1
CERTIFICATE No. PAGE
発行年月日 : 2011-05-02
DATE OF ISSUE

ITEM No.	寸法 SIZE 単位 UNIT INCH, FEET, mm, SPACE	員数 QUAN- TITY	質量 MASS ACTUAL KG	管理番号 CONTROL No.		ITEM No.	※2	※3	引張試験 TENSILE TEST				硬さ HARDNESS		曲げ BEND TEST R=1.0T (S)※5 105°	結晶 粒度 GSN ※6 A	エリクセン ER	寸法 Dimensional	外観 Visual
				現品番号 Product No. [コイル番号] COIL No.	耐力 Y.S. 0.2% MPA				引張強さ T.S. MPA	引張比 YR %	伸び EL %	(H)※4 HV 5KG	※4						
1	0.6 x 1000 x 2600	8	56	AT3367 014 (13552000)		1	T B	L L	MIN. MAX. 170 290 187 180		240 390 300 301	75 62 60	25 48 49	140 111 112		4.0 7.0 6.5 6.5		G G	G G
CHEMICAL COMPOSITION																			
ITEM No.	※2	H ※7 x 1000	O x 100	N x 100	Fe x 100	C x 100	Other				Ti	備考 Remarks							
							Each	Total											
1	MIN. MAX. T B	13 2 2	6 3 4	3 1 1	6 2 2	5 1 1													
上記の注文品は御指定の規格または仕様に従って製造され、その要求事項を満足していることを証明します。 WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN MADE TO THE APPLICABLE SPECIFICATION AND TESTED IN ACCORDANCE WITH THE REQUIREMENTS OF THE RULES WITH SATISFACTORY RESULTS.										THIS MATERIAL IS EQUIVALENT TO ASME SB265-2010 G1									

NOTES : YR:Yield/Tensile Ratio, ER:Erichsen, G:合格Good.

※1:標点距離 Gauge Length...A:50.0mm, B:50.8mm, C:5.65√Smm, D:11.3√Smm.

※2 T: 頂部Top, M: 中央部Middle, B: 底部Bottom. ※3 L: 圧延方向Longitudinal, T: 直角方向Transverse.

※4:測定位置 Measuring Point D:断面Center of cross section,

S:表層Surface of cross section, H:表面Surface.

※5:表裏区分 Surface or Backface S:表Surface, B:裏Backface, W:表裏Both surface and backface.

※6:GSN Grain Size Number A:ASTMNo, H:比較法Comparison, J:実測Actual, N:NFNo. ※7 製品分析Product Analysis.

T. Shirashi
品質保証課長
MANAGER OF QUALITY SYSTEM SECTION

Approved

注文者 : ALCONIX CORPORATION
TRADER

製作番号 : 10-37C10-0 01
KSL CONTRACT No.

商品名 : TITANIUM SHEET
COMMODITY

規格名 : AL111 4890-63 REV.10 G1
SPECIFICATION

仕上 げ : ANNEALED AND PICKLED
FINISH

チタン製品検査証明書
TITANIUM INSPECTION CERTIFICATE

需要家 : ALFA LAVAL AB
CUSTOMER

需要家注文番号 : OMCP-92580
CUSTOMER'S P.O. No.

注文仕様書 No. : AL111 4890-63R10
PURCHASE SPECIFICATION No.

神戸製鋼所
加古川製鉄所加古川市金沢町1番地
KOBEL STEEL, LTD.
KAKOGAWA WORKS
1, Kanazawa-cho, Kakogawa-city, Japan

証明書番号 : KT09945 頁: 1
CERTIFICATE No. PAGE
発行年月日 : 2011-05-02
DATE OF ISSUE

ITEM No.	寸 法 SIZE 単位 UNIT INCH, FEET, mm, SPACE	員数 QUAN- TITY	質 量 MASS ACTUAL KG	管 理 番 号	ITEM No.	※ 2	※ 3	引 張 試 験 TENSILE TEST ※1(GL:A)	硬 さ HARDNESS ※4	曲 げ BEND TEST R=1.0T (S)※5 105°	結 晶 粒 度 GSN ※6 A	エリクセン ER	寸 法 Dimensional	外 観 Visual	
				管 理 番 号											
				現 品 番 号 Product No. [コ イ ル 番 号] COIL No.											
1	0.6 x 1000 x 2600	424 29	2,971 202	AT3367 001-004 AT3367 021-022 (T3652000)	1	T	L	170 290 175 179	240 390 296 304	75 59 59	25 49 49	140 105 117	G G	G G	
	TOTAL	453	3,173		1	T	T	190 290 231 229	240 390 291 298	79 37 77	25 38				
ITEM No.	化 学 成 分 % CHEMICAL COMPOSITION								備考 Remarks THIS MATERIAL IS EQUIVALENT TO ASME SB265-2010 G1						
	※2	H ×1000	O ×100	N ×100	Fe ×100	C ×100	Other								Ti
							Each	Total							
1	MIN. MAX. T B	13 2 3	6 3 4	3 1 1	6 2 2	5 1 1								RE. RE.	

上記の注文品は御指定の規格または仕様に従って製造され、その要求事項を満足していることを証明します。
WE HEREBY CERTIFY THAT THE MATERIAL DESCRIBED HEREIN HAS BEEN
MADE TO THE APPLICABLE SPECIFICATION AND TESTED IN ACCORDANCE
WITH THE REQUIREMENTS OF THE RULES WITH SATISFACTORY RESULTS.

品質保証部長
T. Shirai
MANAGER OF QUALITY SYSTEM SECTION

NOTES: YR:Yield/Tensile Ratio, ER:Erichsen, G:合格Good.

※1:標点距離 Gauge Length...A:50.0mm, B:50.8mm, C:5.65√Somm, D:11.3√Somm.

※2 T: 頂部Top, M: 中央部Middle, B: 底部Bottom, ※3 L: 圧延方向Longitudinal, T: 直角方向Transverse.

※4:測定位置 Measuring Point D:断面Center of cross section,

S:表面Surface of cross section, H:表面Surface.

※5:表裏区分 Surface or Backface S:表Surface, B:裏Backface, W:表裏Both surface and backface.

※6:GSN Grain Size Number A:ASTMNo, H:比較法Comparison, J:実測Actual, N:JFNo. ※7 製品分析Product Analysis.

Approved



TIGHTENING BOLTS/NUTS



**Certificat d'essais / Test Certificate NFEN 10204.3.1**

NR 11098/37 - 2004/159 - 16184

ALFA LAVAL AB VMI

RUDEBOKSVAGEN

P O BOX 74

SE-221 00 LUND (SWEDEN)

VOTRE/YOUR REF N° OMCF-147994/10

Poste/item	1	NUT M48 (80X70)ASME SA194 2H ENISO
Qte/Qty	500	898-2 CL8 ADW7
		COAT:ZN 20 MICRONS
		Plan 323242001-02 REV08

NUTS M48

Coulée : 1093310

Normes/Standard : ASME SA194 GRADE 2H ED. 98+ADD07/99+07/2000**ANALYSE/HEAT ANALYSIS**

C	Mn	Si	S	P		
0.45	0.55	0.18	0.019	0.008		

CARACTERISTIQUES MECANIQUES/MECHANICAL TEST

REV. T° C	HB-24H 540°C	HB/ HB				
575	241/241	241/269				

Delivery state : quenched and tempered

Proof load test : not required

Visual and dimensional control : conform

Marks on nuts : BC- 2H - 8 + Heat code GAC + STAMP TUV

We the undersigned, BECK CRESPEL, hereby certify that the supplied products are fully in accordance with the requirements of the order.

This test certificate applies only the items, designation and quantities as described above.

EN ISO 9001:2008 LRQA CERTIFICATION N°9105038300

BP 69 59427 ARMENTIERES CEDEX FRANCE TEL 03 20 77 78 88 FAX 03 20 77 82 39



**Certificat d'essais / Test Certificate NFEN 10204.3.1**

NR 11098/37 - 2004/159 - 16185

ALFA LAVAL AB VMI
RUDEBOKSVAGEN
P.O. BOX 74
SE-221 00 LUND (SWEDEN)

VOTRE/YOUR REF N° OMCF-147994/10

Poste/item	1	NUT M48 (80X70)ASME SA194 2H ENISO
Qte/Qty	500	898-2 CL8 ADW7
		COAT:ZN 20 MICRONS
		Plan 323242001-02 REV08

NUTS M48

Coulée : 1093310

Normes/Standard : EN ISO 898-2 CLASSE 8 ADW7**ANALYSE/HEAT ANALYSIS**

C	Mn	Si	S	P		
0.45	0.55	0.18	0.019	0.008		

CARACTERISTIQUES MECANIKES/MECHANICAL TEST

HB/ HB						
241/269						

Delivery state : Quenched and Tempered

Proof load test : Not required

Drift test : Not required

Visual and dimensional control : conform

Marks on nuts : BC 2H 8 : Heat code GAC + STAMP TUV

SEE PV 3 2 N°11001/58/5-a

We the undersigned, BECK CRESPEL, hereby certify that the supplied products are fully in accordance with the requirements of the order

This test certificate applies only the items, designation and quantities as described above

EN ISO 9001:2008 LRQA CERTIFICATION N°9105038300

BP 69 59427 ARMENTIERES CEDEX FRANCE TEL 03 20 77 78 88 FAX 03 20 77 82 39




BECK-CRESPEL

Serrer la performance • Tightening up on performance

Certificat d'essais / Test certificate

EN 10204.3.2

NR 11001/58/5-a

TUV RHEINLAND FRANCE

VOTRE/YOUR REF. N° : STOCK BC

MATIÈRES NORMES / MATERIAL SPECIFICATION :
 STEEL EN ISO898/2 CLASSE 8 ADW7

DÉSIGNATION / DESCRIPTION :

2757 NUTS M48

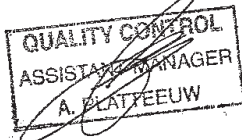
Drawing 323242001-02/8

ANALYSE / HEAT ANALYSIS

Dimensions	coulée					
Section	Heat	C	Si	Mn	S	P
NUTS M48	1093310	,450	,180	,550	,019	,008
BACHT N°	GAC					

RÉSULTATS DES ESSAIS / TEST RESULTS

Dimensions	Hardness	Proof load	DRIFT TEST
Section	<u>Delivery condition</u>	<u>test</u>	<u>6%</u>
	on 20 nuts		
NUTS M48	241/269HB	NOT REQUIRED	NOT REQUIRED

 Delivery state : Quenched and tempered
 Visual and dimensional control : Conform
 marks : BC-8-2H-GAC + STAMP TUV


R. KARRENBAUER

73060408/10001/58/5a

We the undersigned, BECK CRESPEL, hereby certify that the supplied products are fully in accordance with the requirements of the order.

This test certificate applies only to the items, designation and quantities as described above. The original certificate carries a green stamp.

BP 69 59427 ARMENTIERES CEDEX FRANCE TEL. 03.20.77.78.88 FAX 03.20.77.82.39



Certificat de Réception 3.1 / EN 10204

N° 154231

SWISS STEEL

Providing special steel solutions



Client: Cousin Malicet SA

Imprimé le

26.01.2010

Rue Bernissieux 23
FR-08120 Bogny sur Meuse

ACTIVE
QUALITY

Données du client:			Données de la commande:			Données acier:		
N° Article			N° bon de livraison	25175556		N° matière SWST	2645	
Nuance	C45		Date de livraison	bon de livraison		N° coulée	1093310	
Commande	6668/5		N° client	00025972		Ordre de production	30411473	
Destinataire			N° commande	11115062		N° article	61063541	
ARDENACIER Dépôt			Poids	14132 KG		Diamètre / mm:	64 000	
Analyse chimique			Essai de traction traité Nr. 1			Spéciale		
C	0.45	%	Rp02	758	MPa	HB (calc)	269	
Si	0.18	%	Rm	855	MPa	HB (calc)	199	
Mn	0.55	%	A5	16.3	%			
P	0.008	%	Essai de traction traité Nr. 2					
S	0.019	%	Rp02	532	MPa			
Ni	0.07	%	Rm	635	MPa			
Cr	0.08	%	A5	24.6	%			
Mo	0.01	%	Résilience ISO-V traité Nr. 1 -20 °C					
Cu	0.14	%	KV1	68.00	J			
Sn	0.01	%	KV2	70.00	J			
Al	0.002	%	KV3	83.00	J			
V	0.00	%	KV-avg	74.00	J			
N	0.010	%	Résilience ISO-V traité Nr. 2 -20 °C					
			KV1	117.00	J			
			KV2	118.00	J			
			KV3	115.00	J			
			KV-avg	117.00	J			

Conventions d'ordre:

Nous certifions que ces produits livrés sont conformes aux prescriptions de la commande.

Imprimé électroniquement sans signature conforme EN 10204:2004

Remarque:

Nr 1: 850°C/30°W/600°C/60° et résiliences KV1 à -20°C
Nr 2: 850°C/30°W/700°C/60° et résiliences KV2 à -20°C

Démarche qualité: Dr R. Saggau

Fin de document

Anlage 1 zum Zertifikat
Prüf/Fabr. Nr. 73060408/11001/58/5a
vom 11-05-2011
TÜV Rheinland Industrie Service



January 23, 2012



Alfa Laval Inc.
5400 International Trade Drive
Richmond, VA 23232
USA
Tel: +1 804-222-5300
www.alfalaval.com

Reference:	Alfa Laval Order:	41276 / 408263
	Serial Number:	30113-88709
	Model No.	TL35-BFD
	Customer PO Number	MPC17837-0001
	Cust. Item No	HX1204 Venturi Scrubber Pumparound Coolers

THREADED ROD CERTIFICATE OF CONFORMANCE

Alfa Laval hereby states that the threaded rod used to fabricate tightening bolts for the plate heat exchanger(s) referenced in the above P.O. have been verified to be of B7 carbon steel material. Additionally, if an ASME code stamp has been applied to the equipment, we hereby state that the threaded rod meets the applicable requirements of ASME Section VIII, Div.1.

Sincerely,

A handwritten signature in cursive script that reads "A. Barnard".

Aimee Barnard
Quality Assurance
Alfa Laval



Approved



PORT CONNECTIONS



January 23, 2012



Alfa Laval Inc.
5400 International Trade Drive
Richmond, VA 23232
USA
Tel: +1 804-222-5300
www.alfalaval.com

Reference:	Alfa Laval Order:	41276 / 408263
	Serial Number:	30113-88709
	Customer PO Number	MPC17837-0001
	Model No.	TL35-BFD
	Cust. Item No	HX1204

PORT STUD CERTIFICATE OF CONFORMANCE

Alfa Laval hereby states that the port studs used to fabricate the plate heat exchanger(s) referenced in the above P.O. have been verified to be of B7 carbon steel material. Additionally, if an ASME code stamp has been applied to the equipment, we hereby state that the threaded rod meets the applicable requirements of ASME Section VIII, Div.1.

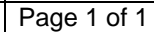
Sincerely,

A handwritten signature in black ink that reads "A. Barnard".

Aimee Barnard
Quality Assurance
Alfa Laval



Approved



Item or Tag Number HX 1204

Date/Time 1/11/12 7:45 AM

Date

	Alfa Laval Inc. 5400 International Trade Dr. Richmond, VA 23231	
	Date: 5/24/2006	Rev.: 8
Title: Standard Hydrostatic Pressure Test	Doc. No.: WI 25001	Page 1 of 1

Scope

This instruction describes the standard testing of all plate heat exchangers to meet the requirements of ASME Section VIII, Div.1 UG 99.

IMPORTANT: Failure to follow this procedure may cause permanent damage of the pressure vessel being tested and may result in injury.

Responsibilities

It is the responsibility of the Quality Designee to assure that this instruction is followed. The Authorized Inspector or Designated Inspector verifies the testing of U-Stamped vessels.

Definitions

MAWP – Maximum Allowable Working Pressure

Test Pressure – 1.3x MAWP

Step-by-Step Instructions


1. Install test flanges or plugs at the appropriate inlet and outlet connections; refer to the GA drawing if needed. Some models are parallel flow, others are diagonal flow. As an option, flanges may be installed on all 4 ports. **IMPORTANT: All necessary nuts, bolts, washers, gauges, and fittings must be attached to the vessel and properly tightened prior to testing.**
2. Verify test gauges are in calibration. Record gauge numbers on the Traveler. NOTE: Dial indicating pressure gauges used in testing shall be graduated over a range of about double the intended maximum test pressure, in no case shall the range be less than 1.5 nor more than 4 times the maximum test pressure.
3. Refer to the Traveler for the MAWP and Test Pressure.
4. Fill single side of vessel with water, purge air, and pressurize to water supply pressure. As an option, if flanges are installed on the untested sides, fill that side with water, purge air and verify that the pressure is zero.
5. For U-1 vessels, notify the Authorized Inspector prior to the start of the hydrostatic test.
6. **BEGIN HYDROSTATIC TEST**
 - a. Slowly pressurize the **first single** side of the PHE to **Test Pressure**.
 - b. Maintain Test Pressure on the first side **until verified** by the AI or Designated Inspector for U-Stamped Units or the Quality Designee for UM Stamped vessels.
 - c. When directed, reduce pressure on the first side to **MAWP** and inspect vessel for leaks. Maintain MAWP for a minimum of **10 minutes** and until completion of the visual inspection.
 - d. Release pressure on the first side until it reaches zero.
 - e. If required, remove test flanges or plugs from the first side and install these test flanges or plugs on the second side of the PHE.
 - f. Fill second single side of PHE with water, purge air, and pressurize to water supply pressure.
 - g. **Repeat** steps a through d for the **second single** side.
 - h. Release the pressure and drain PHE.


HYDROSTATIC TEST ENDS HERE
7. Upon completion of a successful test, the Quality Designee shall complete the hydrostatic test portion of the traveler. The Authorized Inspector will show acceptance by signing off the traveler. The ASME Data Report will reference design and test pressures.

Forms/Records

Traveler

ASME Data Report

Prepared By: Tommy Cashin	Approved By: Mike Pischke
	

		Alfa Laval Inc. 5400 International Trade Dr. Richmond, VA 23231	
		Date: 1/6/12	Rev.: 7
Title: Hydrostatic Test Certificate		Doc. No.: Form 25002	Page 1 of 1

CUSTOMER	Mississippi Power
P.O. NO.	MPC17837-0001
ALFA LAVAL NO.	J-41276 / 770013
SERIAL NO.	30113-88709
ITEM NO. or MODEL TYPE	HX1204

ASME Hydrostatic Test No.	Revision No.
WI 25001	8

	Test Pressure	Holding Time	A.I. Witness
Single	195 PSI / 150 PSI	2 min / 10 min	Herb Wathan
Single	195 PSI / 150 PSI	2 min / 10 min	Herb Wathan

C.I. Hydrostatic Test No.	Revision No.
WI 25001	8

	Test Pressure	Holding Time	A.I. Witness
Single	195 PSI / 150 PSI	2 min / 10 min	Dan Sloan
Single	195 PSI / 150 PSI	2 min / 10 min	Dan Sloan

This hydrostatic pressure test was performed successfully with no visible internal or external leakage from the heat exchanger. Testing was witnessed as noted above.

APPROVED BY: Aimee Barnard

DATE OF ASME CODE TEST: 1/13/2012

DATE OF CUSTOMER WITNESS: 1/24/2012

Prepared By: Jason Gunnoe	Approved By: Mike Pischke
Revision Description: Rev 7: Add sign off for CI inspection.	



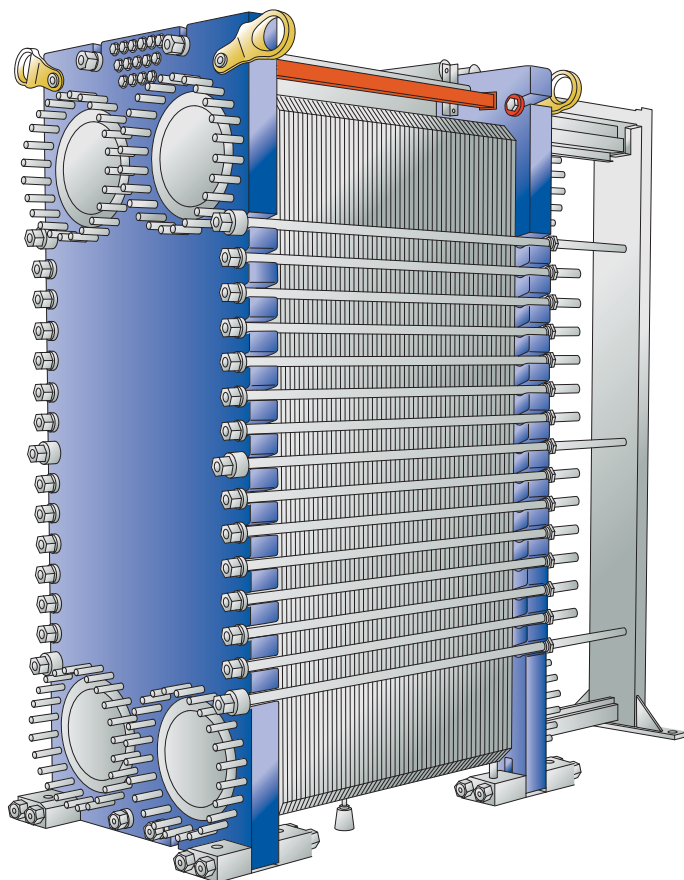


EN

Customer: Mississippi Power Company
P.O. No.: MPC17837-0001
Project: Kemper County IGCC Project
Item No.: HX1104, HX1204, HX1304,
HX2104, HX2204, HX2304
A/L Order No.: J-41276 (408263)
A/L Serial No.: 30113-88708 to 88713

Instruction Manual Plate Heat Exchangers

TL35



Part number 34505491-01
2010-11



Approved



Table of Contents

EN

Description	5
Main components	5
Function	6
Identification of plate side	6
Installation	7
Before installation	7
Requirements	7
Lifting	9
Operation	11
Start-up ..	11
Unit in operation	12
Shut-down	12
Maintenance	13
Cleaning-In-Place (CIP)	13
Manual cleaning	14
Closing ...	19
Pressure test after maintenance	21
Regasketing	21

Original instructions
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EN Preface

This manual provides information needed to install, operate and carry out the maintenance of the Plate Heat Exchanger (PHE).

Safety considerations

The Plate Heat Exchanger shall be used and maintained in accordance with Alfa Laval's instructions in this manual. Faulty handling of the Plate Heat Exchanger may result in serious consequences with injuries to persons and/or property damage. Alfa Laval will not accept responsibility for any damage or injury that has resulted from not following the instructions in this manual.

The Plate Heat Exchanger shall be used in accordance with the specified configuration of material, media types, temperatures and pressure for the specific Plate Heat Exchanger.

The following models are covered in this manual:

- TL35

Warranty conditions

The warranty conditions are usually included in the signed sales contract prior to the order of the delivered PHE. Alternatively, the warranty conditions are included in the sales offer documentation or with a reference to the document specifying the valid conditions. If faults occur during the specified warranty period, always consult your local Alfa Laval Representative for advice.

Report the date when the Plate Heat Exchanger was put into operation to the local Alfa Laval Representative.

Advice

Always consult your local Alfa Laval Representative for advice on:

- New plate pack dimensions if you intend to change the number of plates
- Selection of gasket material if operating temperatures and pressures are permanently changed, or if another medium is to be processed in the PHE.

Definitions of expressions

**Warning!**

Type of hazard
WARNING indicates a potentially hazardous situation that, if not avoided, could result in death or serious injury.

**Caution!**

Type of hazard
CAUTION indicates a potentially hazardous situation that, if not avoided, may result in minor or moderate injury.

**Note!**

NOTE indicates a potentially hazardous situation that, if not avoided, may result in property damage.

PHE drawings

The PHE drawings mentioned in the manual are the drawings included in the delivery of the Plate Heat Exchanger.

Storage of the PHE

Alfa Laval delivers the PHE ready to be put into service upon arrival if nothing else has been agreed.

Regarding storage for longer periods of time, one month or more, certain precautions should be made to avoid unnecessary damage to the PHE.

Note!

Alfa Laval and its representatives reserve the right to inspect the storage space and/or equipment whenever necessary until the date of expiry of the warranty period stipulated in the contract. Notification has to be given 10 days prior to the date of inspection.

If there is any uncertainty about the storage of the PHE, consult an Alfa Laval Representative.

Storage

If the nature of storage after the delivery of the PHE is known in advance, inform Alfa Laval when ordering the PHE to ensure that it will be properly prepared for storage.

Indoor storage

- Store inside a room with the temperature between 15 and 20°C (60 - 70°F) and humidity around 70%. For outdoor storage read [“Outdoor storage” on this page](#).
- To prevent damage to the gaskets, there should not be any ozone-producing equipment in the room such as electric motors or welding equipment.
- To prevent damage to the gaskets, do not store organic solvents or acids in the room and avoid direct sunlight, intensive heat radiation or ultraviolet radiation.
- The tightening bolts should be well covered with light grease coating.

Outdoor storage

If the PHE has to be stored outdoors, all the precautions mentioned in the section [“Indoor storage” on this page](#) should be taken. Also, protection against climate is very important.

The stored PHE shall be visually checked every third month. The check includes:

- Greasing of the tightening bolts
- Port covers
- Protection of the plate pack and gaskets

Taken out of service

If, for any reason, the PHE is shut down and taken out of service for a long period of time, follow the same advice as in the previous section [“Indoor storage” on this page](#). Although before storage following actions has to be done.

- Check the measurement of the plate pack (measure between frame and pressure plate, A dimension).
- Drain both media sides of the PHE.
- Depending on the media, the PHE should be rinsed and then dried.
- The connection should be covered if the piping system is not connected. Use a plastic or plywood cover for the connection.
- Cover the plate pack with non-transparent plastic film.

Installation after long-term storage

In cases when the PHE has been taken out of service for an extensive period of time, i.e. longer than one year, the risk of leakage when starting up increases. To avoid this problem it is recommended to let the gasket rubber rest and regain most of its elasticity.

1. If the PHE is not in position, follow the instructions [“Installation” on page 7](#).
2. Note the measurement between frame and pressure plate (A dimension).
3. Remove feet attached to the pressure plate.
4. Loosen the tightening bolts. Follow the instructions [“Opening” on page 14](#). Open the PHE until the measure is 1.25A.
5. Leave the PHE between 24-48 hours, the longer the better, for gaskets to relax.
6. Re-tighten according to the instructions [“Closing” on page 19](#).
7. Alfa Laval recommends a hydraulic test to be carried out. The media, usually water, should be entered at intervals to avoid sudden shocks to the PHE. It is recommended to test up to the Design Pressure, refer to PHE drawing.

EN



EN Environmental compliance

Alfa Laval endeavours to perform its own operations as cleanly and efficiently as possible, and to take environmental aspects into consideration when developing, designing, manufacturing, servicing and marketing its products.

Unpacking

Packing material consists of wood, plastics, cardboard boxes and, in some cases, metal straps.

- Wood and cardboard boxes can be reused, recycled or used for energy recovery.
- Plastics should be recycled or burnt at a licensed waste incineration plant.
- Metal straps should be sent for material recycling.

Maintenance

- All metal parts should be sent for material recycling.
- Oil and all non-metal wear parts must be taken care of in agreement with local regulations.

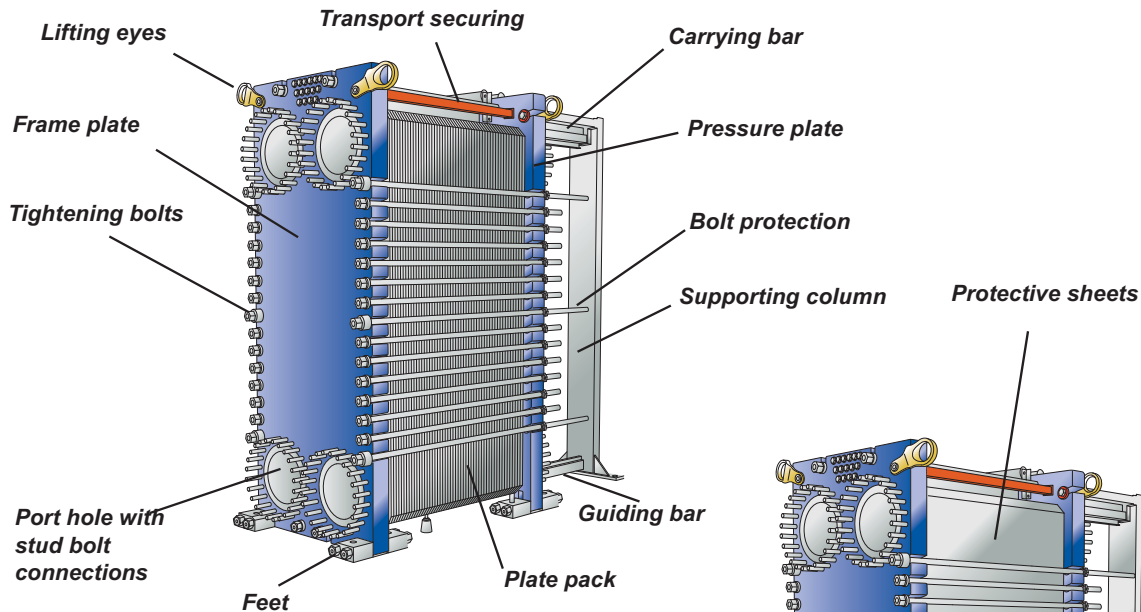
Scrapping

At end of use, the equipment shall be recycled according to relevant, local regulations. Besides the equipment itself, any hazardous residues from the process liquid must be considered and dealt with in a proper manner. When in doubt or in absence of local regulations, please contact the local AlfaLaval sales company.

Description

EN

Main components



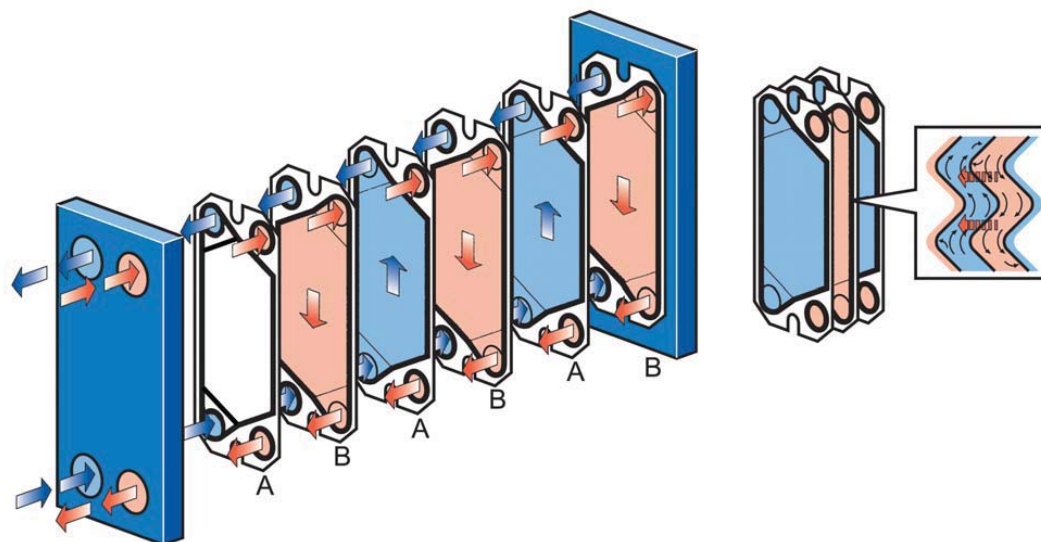
Bolt protection	Plastic tubes that protect the threads of the tightening bolts.
Carrying bar	Carries the plate pack and the pressure plate.
Frame plate	Fixed steel plate with a number of port holes for the connection of the piping system. The carrying and guiding bars are supported by the frame plate.
Guiding bar	Keeps the channel plates and the pressure plate in line at their lower end.
Plate pack	Heat is transferred from one medium to the other through the plates. The plate pack consists of channel plates, end plates, gaskets and, in some cases, transition plates. The measure of the plate pack is the A dimension, i.e the measurement between frame and pressure plate. Refer to PHE drawing.
Port holes with stud bolt connections	Port holes through the frame plate allow the media to enter into or exit from the Plate Heat Exchanger. Different types of connections can be used to connect the piping system to the apparatus. Threaded stud bolts around the port holes secure the connections to the apparatus. The port holes may be protected against corrosion by metal or rubber linings. The PHE can be equipped with different connection types. For details refer to PHE drawings.
Pressure plate	Moveable steel plate that can contain a number of port holes for the connection of the piping system.
Protective sheets	Cover the plate pack. Mandatory in the USA. Optional in other countries.
Supporting column	Supports carrying and guiding bars.
Tightening bolts	Compress the plate pack between the frame and pressure plate.
Lifting eyes	Used for lifting and transport securing.
Transport securing	Locking device fastened between the frame and the pressure plate.



EN Function

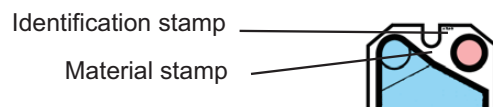
The Plate Heat Exchanger (PHE) consists of a pack of corrugated metal plates with port holes for input and output for the two separate fluids. The heat transfer between the two fluids will take place through the plates.

The plate pack is assembled between a frame plate and a pressure plate and compressed by tightening bolts. The plates are fitted with a gasket that seals the channel and directs the fluids into alternate channels. The plate corrugation promotes fluid turbulence and supports the plates against differential pressure.



Principle of plate pack arrangement

Identification of plate side



The A side of the plate is identified by the stamp with the letter A, the model name or material identification, in some cases all three, at the top of the plate.

Installation

EN

Before installation

To consider before installation

- Before connecting any piping, make sure all foreign objects have been flushed out of the piping system that should be connected to the PHE.
- Before start-up, check that all tightening bolts are firmly tightened and that the correct measurements of the plate pack are used. Refer to PHE drawing.
- When connecting the piping system make sure the pipes do not subject the PHE to stress or strain.
- To avoid water hammer, do not use fast-closing valves.
- Safety valves should be installed according to current pressure vessel regulations.
- If the PHE surface temperature is expected to be hot or cold, the PHE should be insulated.
- It is recommended that protective sheets are used to cover the plate pack.
- For each model, design pressures and temperatures are marked on the identification plate. These must not be exceeded.

Requirements

Space

Please refer to the delivered drawing for actual measurements.

- A minimum free space (1) is needed for lifting plates in and out.
- A free space (2) is needed underneath lower tightening bolts for maintenance (a free space equal to the minimum length of the tightening bolts is an alternative).
- The maximum height (3) of the foundation bolts at the pressure plate may be limited.
- Supports (4) for the guiding bar may be needed.

Foundation

Install on a foundation giving enough support to the frame.

Elbow

To make it easier to disconnect the PHE, an elbow should be flanged to the connection in the pressure plate, directed upwards or sideways, and with another flange located just outside the contour of the Plate Heat Exchanger.

Shut-off valve

To be able to open the PHE, shut-off valves should be provided in all connections.

Drip tray (optional)

Depending on the type of fluid in the PHE and the type of installation, a drip tray (drainage box) may be

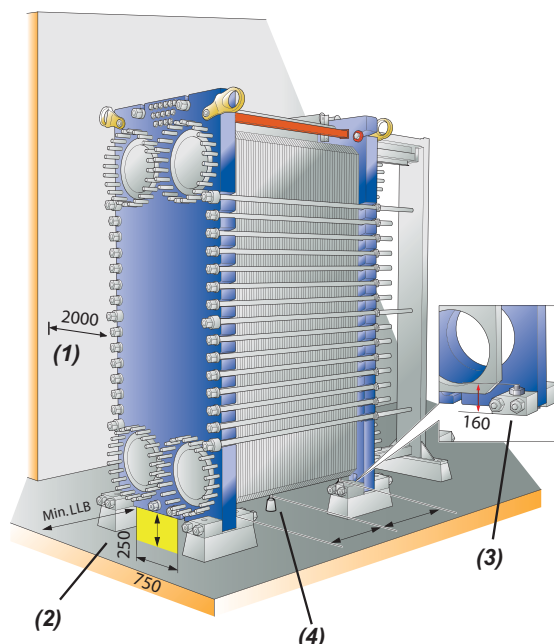
necessary to avoid injury to personnel and damage to equipment.

Note!

Put the drip tray in place before positioning the PHE.

Connections in the pressure plate

It is important that the plate pack has been tightened to the correct dimension A (check against PHE drawing) before the piping system is connected.



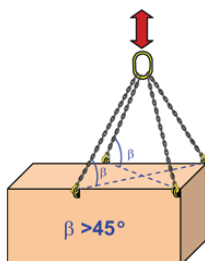
Lifting

EN

Straps should be used when lifting the PHE. Place straps according to picture.

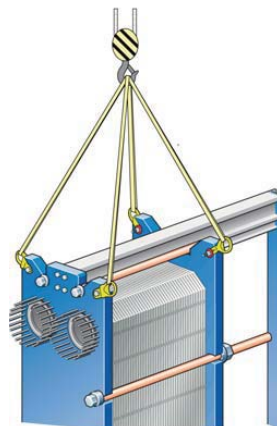
Lifting device TL35 PHE.

The straps shall be attached according to the figures and with a minimum angle of 45° . Refer to the figure below.



Warning!

Never lift by the connections or the studs around them.



For detailed information, contact an Alfa Laval Sales Representative for the document "Cargo Securing Instructions" (3490003791, 3490003792, 3490003793).

Operation

EN

Start-up

During start-up, check that no visible leakages appear from the plate pack, valves or piping system.

Note!

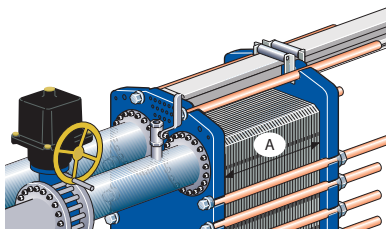
If several pumps are included in the system, make sure you know which one should be activated first.

Note!

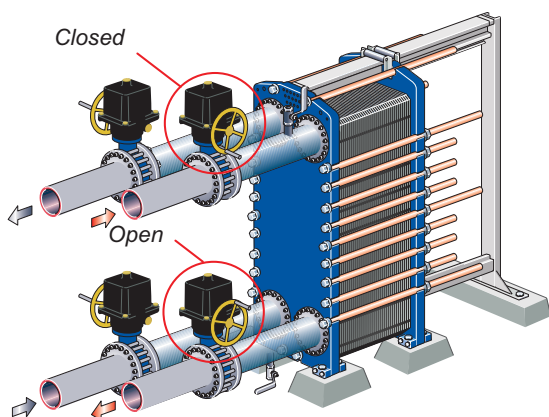
Adjustments of flow rates should be made slowly in order to avoid the risk of **pressure surge (water hammer)**.

Water hammer is a short-lasting pressure peak that can appear during start-up, or shut-down of a system, causing liquids to travel along a pipe as a wave at the speed of sound. This can cause considerable damage to the equipment.

- 1 Before start-up check that all tightening bolts are firmly tightened and that the dimension A is correct. Refer to PHE drawing.

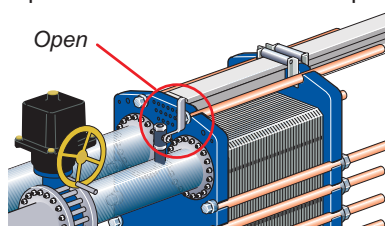


- 2 Check that the valve is closed between the pump and the unit controlling the system flow rate.

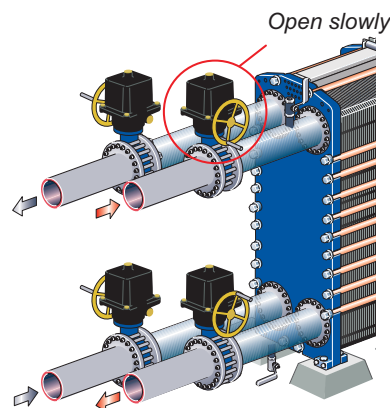


- 3 If there is a valve at the exit, make sure it is fully open.

- 4 Open the air vent and start the pump.



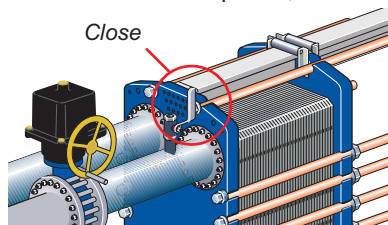
- 5 Open the valve slowly.



Note!

Avoid rapid temperature changes in the PHE. With media temperatures over 100°C, slowly increase the temperature preferably at least for one hour.

- 6 When all air is expelled, close the air vent.



- 7 Repeat steps 1– 6 for the second media.

EN Unit in operation

Adjustments of flow rates should be made slowly in order to protect the system against sudden and extreme variations of temperature and pressure.

During operation, check that media temperatures and pressures are within the limits stated on the PHE-drawing and identification plate.

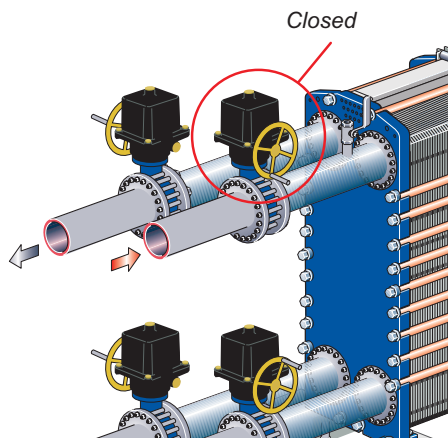
Shut-down

Note!

If several pumps are included in the system, make sure you know which one should be stopped first.

1

Slowly close the valve controlling the flow rate of the pump you are about to stop.



2

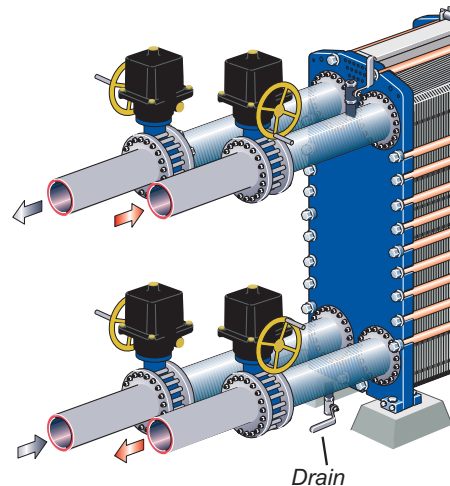
When the valve is closed, stop the pump.

3

Repeat steps 1–2 for the other side for the second media.

4

If the PHE is shut down for several days or longer, it should be drained. Draining should also be done if the process is shut down and the ambient temperature is below the freezing temperature of the media. Depending on the media processed, it is also recommended to rinse and dry the PHE plates and connections.



Maintenance

EN

To keep the Plate Heat Exchanger in good condition regular maintenance is required.

The plates need to be cleaned on a regular basis. The frequency depends on several factors such as type of media and temperatures. Three methods can be used to perform cleaning. Refer to “[Cleaning-In-Place \(CIP\)](#)” on page 13, “[Manual cleaning](#)” on page 14 or a reconditioning at an Alfa Laval service center.

After a longer period of use, it may be required to re-gasket the PHE by exchanging the gaskets. Refer to “[Regasketing](#)” on page 21.

Other maintenance that should be performed regularly:

- Keep carrying bar and guiding bar cleaned and greased
- Keep the tightening bolts cleaned and greased.

Cleaning-In-Place (CIP)

The Cleaning-In-Place (CIP) equipment permits cleaning of the PHE without opening it. The results of cleaning with CIP are as follows:

- Cleaning of fouling and descaling of lime deposits
- Passivation of cleaned surfaces to reduce susceptibility to corrosion
- Neutralization of cleaning liquids before draining.

Follow the instructions of the CIP equipment.



Warning!

Use proper protective equipment, such as safety boots, safety gloves and eye protection, when using the cleaning agents.



Warning!

Corrosive cleaning liquids can cause serious injuries to skin and eyes!

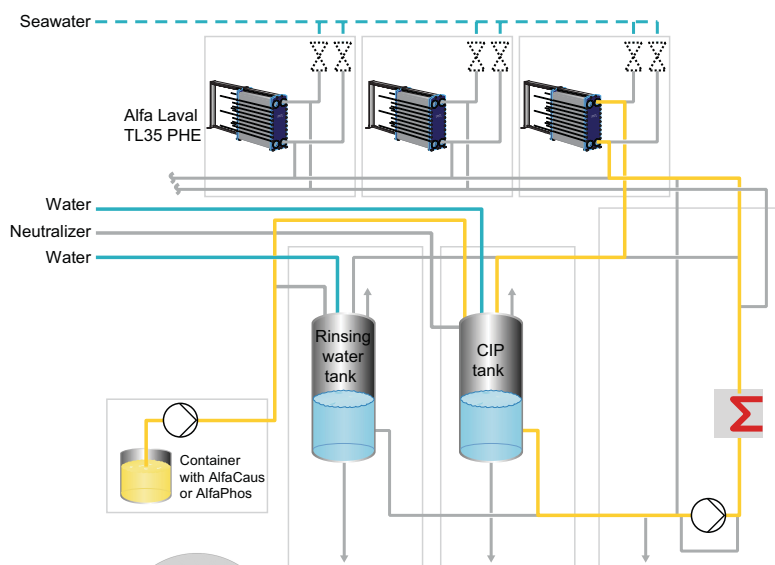


Alfa Laval guarantees that plates, gaskets or glue are not damaged if the procedures given and cleaning agents prescribed are followed.

The CIP equipment will be specifically engineered for each individual set of process. Contact your local Alfa laval representative for firm quotation.

A general view of the main CIP-process is shown in the picture below.

If CIP cannot be done, cleaning must be done manually. Refer to section “[Manual cleaning](#)” on page 14.





EN

Cleaning liquids

Liquids	Description
AlfaCaus	A strong alkaline liquid, for removing paint, fat, oil and biological deposits.
AlfaPhos	An acid cleaning liquid for removing metallic oxides, rust, lime and other inorganic scale. Contains repassivation inhibitor.
AlfaNeutra	A strong alkaline liquid for the neutralization of AlfaPhos before drainage.
Alfa P-Neutra	For the neutralization of Alfa P-Scale.

Liquids	Description
Alfa P-Scale	An acidic powder cleaner for the removal of primary carbonate scale but also other inorganic scale.
AlfaDescalent	A non-hazardous acidic cleaning agent for the removal of inorganic scale.
AlfaDegreaser	A non-hazardous cleaning agent for the removal of oil, grease or wax deposits. Additionally prevents foaming when using Alfacon Descaler.

Manual cleaning

To perform manual cleaning it is required to open the PHE and lift out the plates to clean them.

1

Drain the Plate Heat Exchanger.

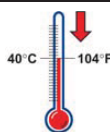
Opening

Note!

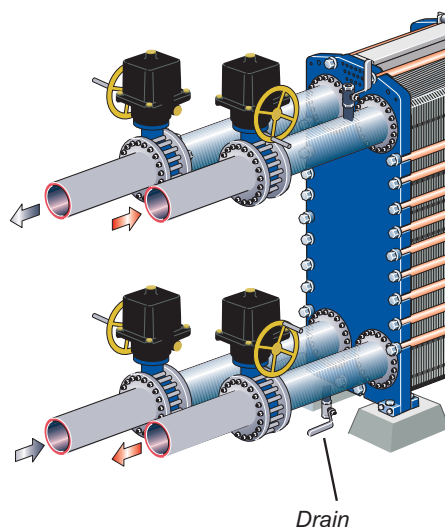
Before opening the PHE check the warranty conditions. If in any doubt, contact an Alfa Laval sales representative. Refer to "Warranty conditions" on page 2.


Warning!

If the Plate Heat Exchanger is hot, wait until it has cooled down to about 40°C (104°F).

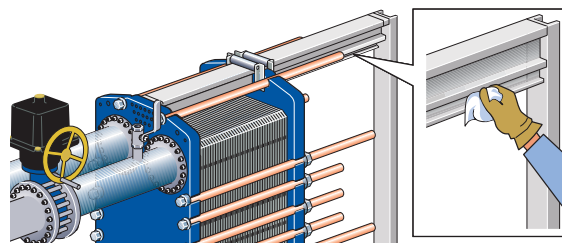

Warning!

If necessary, use proper protective equipment, such as safety boots, safety gloves and eye protection, depending on type of media in the PHE.

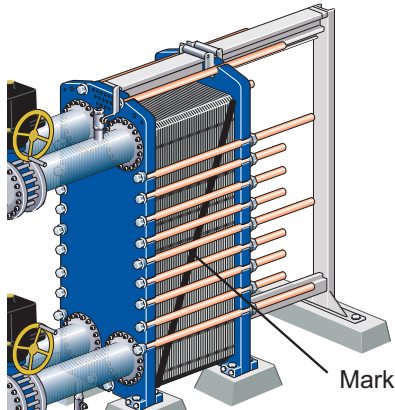


2

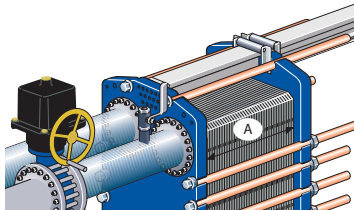
Inspect the sliding surfaces of the carrying bar and clean and grease it.



- 3** Mark the plate assembly on the outside with a diagonal line (alternative wait for the plate pack to be opened and then mark each plate at the top end area in numerical order).



- 4** Measure and note the dimension A.



Note!

Brush the threads of the tightening bolts with a steel wire brush and then grease before loosening them.

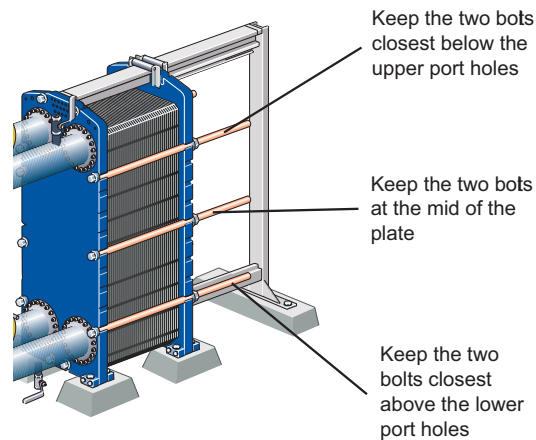
5

- 6** For loosen and remove the feet of the pressure plate refer to: "Procedure of opening and removing of the TL35, pressure plate" on page 16

7

Keep the six bolts in position, according to the figure below. Loosen the other bolts and remove them.

EN



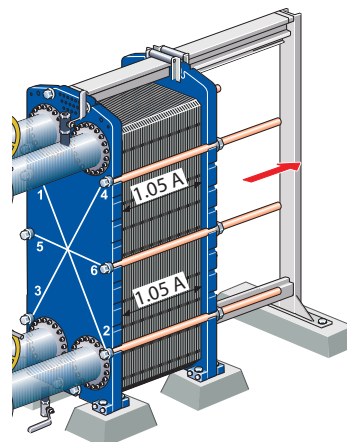
8

The remaining six bolts are opened alternately and diagonally in two steps, see figures below.

Be careful to ensure that the frame plate and pressure plate are always in parallel. Skewing of the pressure plate during opening must not exceed 10 mm (**2 turns per bolt**) across the width and 25 mm (**5 turns per bolt**) vertically.

Step	Bolt No.	To dimension
1	1 - 2 - 3 - 4 - 5 - 6	1.05A
2	1 - 2 or 3 - 4	Opening

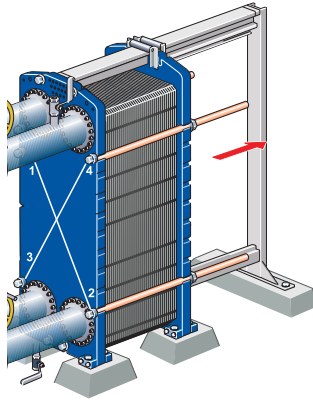
Step 1: Loosen the six bolts alternately and diagonally until the plate package measures 1.05A.





EN

Step 2: Remove bolt 5 and 6 completely. Loosen the two diagonal pairs of bolts alternately, as shown in the figure below.

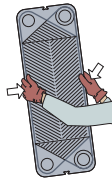


9

Open the plate pack by letting the pressure plate glide on the carrying bar.

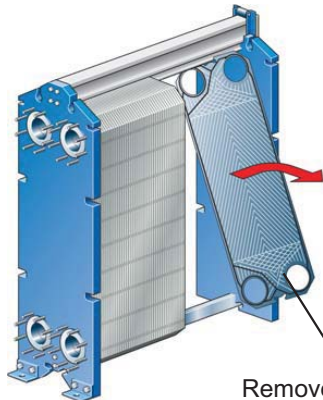
**Caution!**

To avoid hand injuries from sharp edges, protective gloves should always be worn when handling plates and protective sheets.

**Note!**

Plates should be numbered, do this before removing the plates.

Plates do not need to be removed if cleaning is done using only water, i.e. without cleaning agent.



Remove the plates

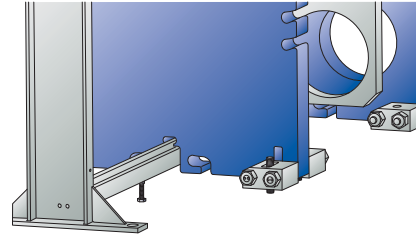
**Warning!**

The plate pack may still contain a small residual amount of liquid after draining. Depending on the type of product and type of installation, special arrangements, e.g. drainage box, may be necessary to avoid injury to personnel and damage to equipment.

Procedure of opening and removing of the TL35 pressure plate

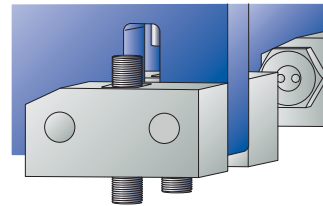
1

Remove the nuts of the foundation bolts located at the outside



2

Remove the nut / the bolt that connected the feet against the pressure plate



3

Remove the outer feet.

4

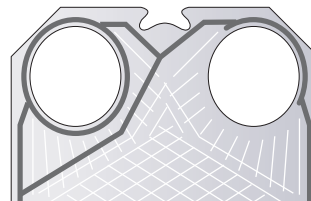
Continue at step 7 in the instruction "Opening" on page 14.

2

Lifting of a single plate shall be in a controlled way.

EN

Insert the plates with the herring bone pattern positioned in alternate directions and with the gaskets turned towards the frame plate.



Removal, lifting and insertion of plates in the field

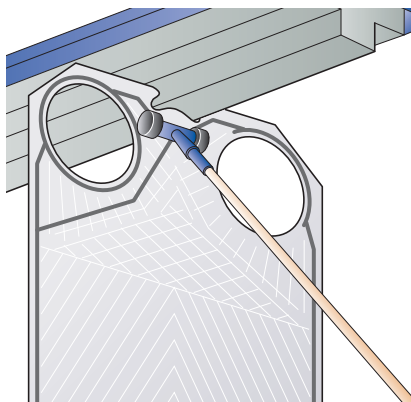
1

Open the plate pack by letting the pressure plate glide on the carrying bar.

Each plate shall be removed one by one, preferably by one person on each side of the plate.

3

The plate package shall be pressed towards the frame plate in steps, preferably by using a Pusher towards the upper part of the plate.



Warning!

If hard winds or risk of contamination of the plates the removal shall be made in restricted and safe environment.

To avoid sharp edges protective gloves should always be worn.

Lifting in edges around the ports shall be avoided.

EN

Manual cleaning of opened units



Caution!

Never use hydrochloric acid with stainless steel plates. Water of more than 330 ppm Cl may not be used for the preparation of cleaning solutions. It is very important that carrying bars and support columns in aluminium are protected against chemicals.

Note!

Be careful not to damage the gasket during manual cleaning.

Deposits removable with water and brush

Plates do not need to be removed from the PHE during cleaning.



Warning!

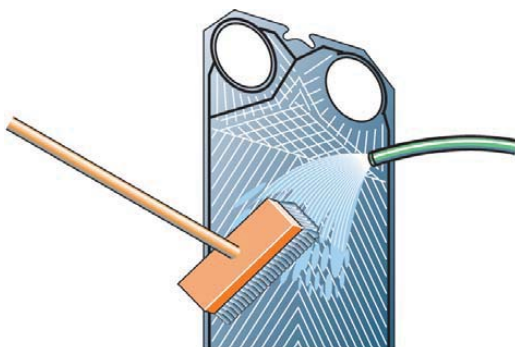
If necessary, use proper protective equipment. Consider risks like loose particles and what kind of media has been used in the PHE.

1

Start cleaning when the heating surface is still wet and the plates are hanging in the frame.

2

Remove deposits using a soft brush and running water.



3

Rinse with water using a high pressure hose.



Deposits not removable with water and brush

Plates must be removed from the PHE during cleaning. For a choice of cleaning agents, refer to "Cleaning liquids" on page 14.



Warning!

Use proper protective equipment, such as safety boots, safety gloves and eye protection, when using the cleaning agents.



Warning!

Corrosive cleaning liquids can cause serious injuries to skin and eyes!



1

Brush with cleaning agent.



2

Rinse immediately with water.



Note!

Long exposure to the cleaning agents can damage the gasket glue.

Closing

EN

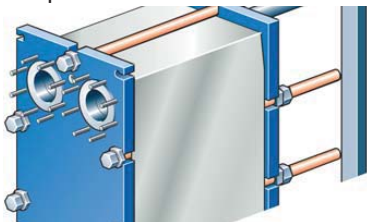
Follow the instructions below to ensure that the Plate Heat Exchanger will be properly closed.

1

Check that all the sealing surfaces are clean.

2

Brush the threads of the bolts clean, using a steel wire brush or the Alfa Laval thread cleaner. Lubricate the threads with a thin layer of grease, e.g. Gleitmo 800 Lubriplate or equivalent.



3

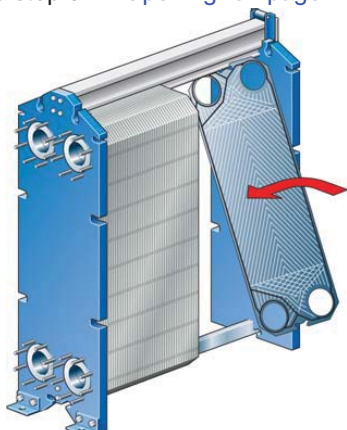
Attach gaskets to the plates or check that all the gaskets are properly attached.

Note!

If the gasket is wrongly positioned, it will show by the fact that it rises out of the gasket groove or that it is positioned outside the groove.

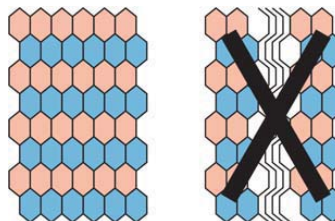
4

Insert the plates in alternate directions and with the gaskets turned towards the frame plate or pressure plate as specified on the plate hanging list. Use the marked line that was done when the PHE was opened (alternative use the numbers that was marked when the PHE was opened). Refer to step 3 in "Opening" on page 14.



5

If the plates are correctly assembled, the edges form a "honeycomb" pattern, see picture below.



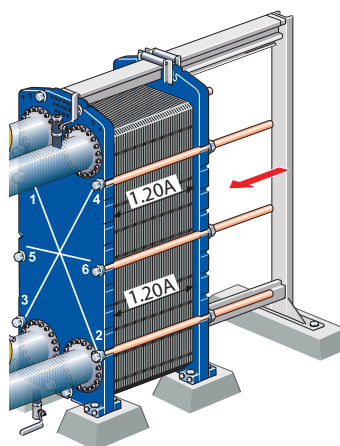
6

Press the plate assembly together. Tightening is done in three steps, see figures below. Be careful to ensure that the frame plate and the pressure plate are always in parallel.

Step	Bolt No.	To dimension
1	1 - 2 - 3 - 4	1.20A
2	1 - 2 - 3 - 4	1.10A
3	1 - 2 - 3 - 4 - 5 - 6	A

Step 1: Tighten the two diagonal pairs of bolts alternately until the plate package measures 1.20A.

Be careful to ensure that the frame plate and pressure plate are always in parallel. Skewing of the pressure plate during opening must not exceed 10 mm (**2 turns per bolt**) across the width and 20 mm (**4 turns per bolt**) vertically.

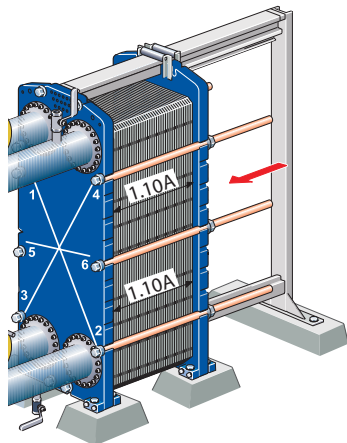




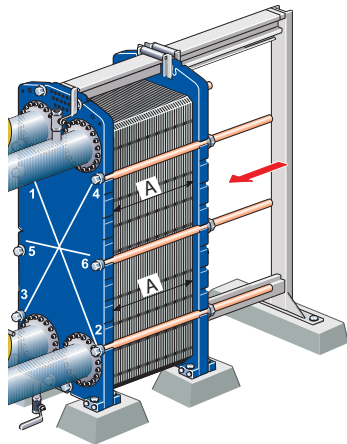
EN

Step 2: Tighten the two diagonal pairs of bolts alternately until the plate package measures 1.10A.

Be careful to ensure that the frame plate and pressure plate are always in parallel. Skewing of the pressure plate during opening must not exceed 10 mm (**2 turns per bolt**) across the width and 20 mm (**4 turns per bolt**) vertically.



Step 3: After that, bolts are tightened alternately and diagonally, as shown in the figure below. Check the dimension A during tightening at the positions of the bolts that are being used.



Note!

The final tightening to reach dimension A is recommended to be divided into steps.

Max tightening torque

When a pneumatic tightening device is used, see table below for maximum torque. Measure dimension A during tightening.

Bolt size	Bolt with bearing box		Bolt with washers	
	N·m	kpm	N·m	kpm
M39	1300	130	2000	200
M48	2100	210	3300	330
M52	2100	210	3300	330

For manual tightening, the tightening torque has to be estimated.

If dimension A cannot be reached

- Check the number of plates and the dimension A.
- Check that all the nuts and bearing boxes are running freely. If not, clean and lubricate, or replace.

7

Place the other bolts in position.

- Inspect the washers.
- When fully tightened, the bolts should all be equally tensioned.

8

Assembly the feet to the pressure plate.

Pressure test after maintenance

EN

Before start-up of production, whenever plates or gaskets have been removed, inserted or exchanged, it is strongly recommended to perform a pressure test to confirm the internal and external sealing function of the PHE. During this test, one media side at a time must be tested with the other side open to the ambient pressure.



Caution!

The pressure testing shall be performed at a pressure equal to the operating pressure of the actual unit, but never above the design pressure as stated on the nameplate.

The recommended test time is 10 minutes for each media.

Please note that PHE units for refrigeration applications and units with media not mixable with water must be dried after hydrostatic pressure testing.

Please consult the local office/representative of the supplier for advice on the pressure testing procedure.

Regasketing

The procedures below relate to Field gaskets, Ring gaskets and End gaskets.



Note!

Before removing the old gaskets check how they are attached.

Clip-on

1

Open the PHE, [refer to “Opening” on page 14] and remove the plate that is to have a new gasket.



Note!

Before opening the PHE check the warranty conditions. If in any doubt, contact an Alfa Laval sales representative. Refer to “Warranty conditions” on page 2.

2

Remove the old gasket.

3

Ensure that all sealing surfaces are dry, clean and free of foreign matter such as fat, grease or similar.

4

Check the gasket and remove rubber residual before attaching it.

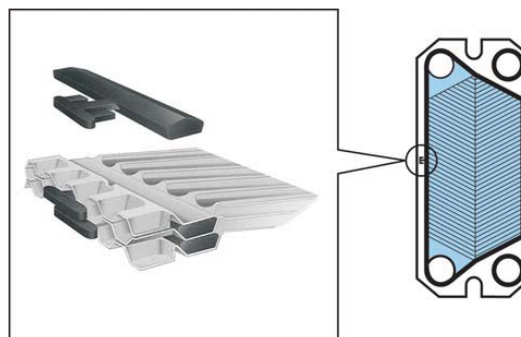


Note!

Especially the end plate gasket!

5

Attach the clip-on gasket to the plate. Slip the gasket prongs under the edge of the plate.



Note!

Make sure the two gasket prongs are in the correct position.

6

Repeat the procedure until all plates that are needed to be regasketed are done. Close the PHE according to “Closing” on page 19.


REMARKS:	SIDE 1	SIDE 2	GASKET	NBRP CLIP-ON
DESIGN PRESSURE	185 PSIG	185 PSIG	PLATE MATERIAL	TITANIUM
MAWP	185 PSIG	185 PSIG	PLATE THICKNESS	0.50 mm
TEST PRESSURE	241 PSIG	241 PSIG	HEATING SURFACE	12580 ft²
DESIGN TEMPERATURE	150 °F	150 °F	PLATE GROUPING	1*(256MH + 15L) / 1*(256ML + 15L) = 543 PLATES (811 MAX)
MDMT	-20 °F	-20 °F	OPERATING WEIGHT	28385 LBS
			NET WEIGHT	22000 LBS

SUPPLIER ALFA LAVAL INC.	ORDER NO. J-41276 (408263)	
CUSTOMER MISSISSIPPI POWER COMPANY	CUSTOMER P.O. NO. MPC17837-0001	PROJECT KEMPER COUNTY IGCC PROJECT
ITEM NO. HX1104, HX1204, HX1304, HX2104, HX2204, HX2304	ITEM NAME VENTURI SCRUBBER PUMPAROUND COOLERS	
DRAWN BY DMN	CHECKED BY RMN	DATE 9-1-2011

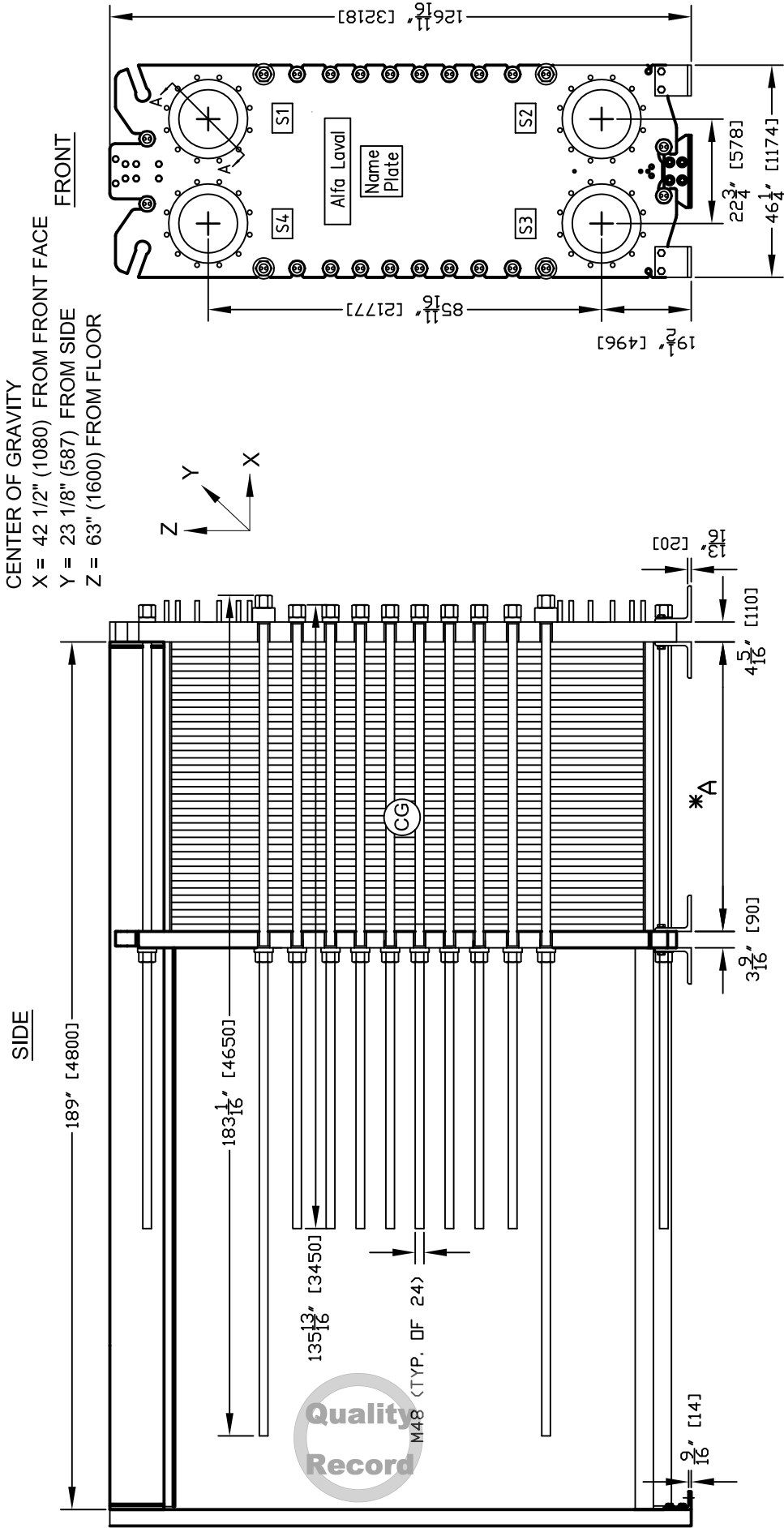
PLATE HEAT EXCHANGER

TL35-BFD

ASME

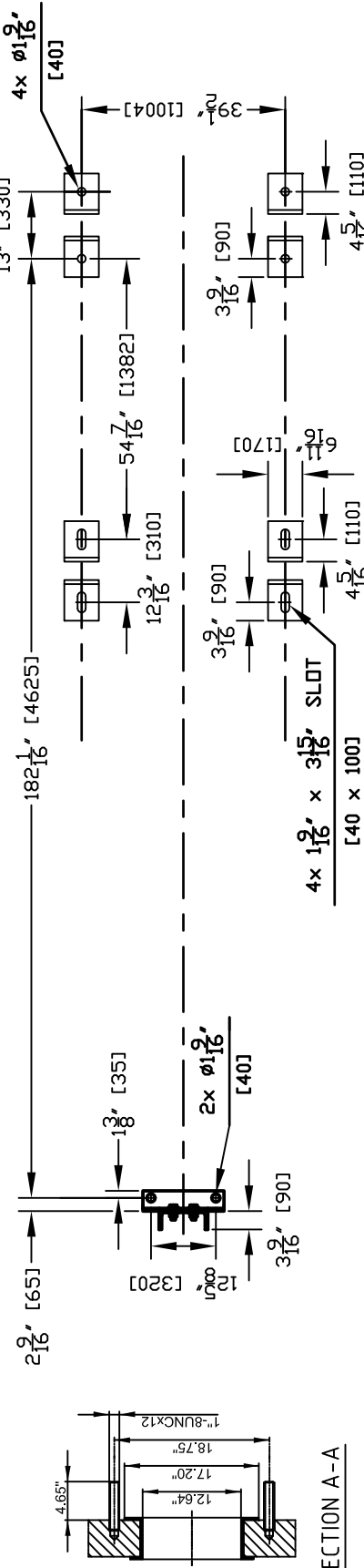
	
SERIAL NO.	
30113-88708 TO 88713	
	REVISION NO. 2

SIDE	MEDIA	CONNECTIONS	MATERIAL	INLET	TEMPERATURE	OUTLET	TEMPERATURE	FLOW RATE	PRESSURE DROP	LIQUID VOLUME
1	WATER	ANSI 14" CLASS 150	TITANIUM	S1	119.0 °F	S2	91.0 °F	3537000 lb/h	15.39 PSI	51.2 ft³
2	WATER	ANSI 14" CLASS 150	TITANIUM	S3	86.0 °F	S4	114.0 °F	3537000 lb/h	15.46 PSI	51.2 ft³



FOUNDATION LOADS

MAINTENANCE CONDITION	8500 LBF
FILLED CONDITION	0 LB-F
	V



ANSI 14" CLASS 150
CONNECTION: S1, S2, S3, S4

MINIMUM ANCHOR BOLT
M30 DIA. ISO GRADE 8.8
(TYP. OF 10)

*** PLATE PACK TIGHTENING DIMENSION**
 $A = N \times (2.45 + X) = 543 \times (2.45 + 0.5) = 1602 \text{ mm} = 63 \frac{1}{16}"$

NOTES: PAINT: CARBOLINE 8832 ALIPHATIC
DATA BOOK. CUSTOMER INSPECTION.

DIMENSIONS IN PARENTHESIS ARE MILLIMETERS (mm).

CENTER OF GRAVITY
X = 42 1/2" (1080) FROM
Y = 23 1/8" (587) FROM
Z = 63" (1600) FROM

SIDE

CERTIFIED
APPROVED FOR FABRICATION
BY DM DATE 9-1-2011

REMARKS:	SIDE 1	SIDE 2
DESIGN PRESSURE	185 PSIG	185 PSIG
MAWP	185 PSIG	185 PSIG
TEST PRESSURE	241 PSIG	241 PSIG
DESIGN TEMPERATURE	150 °F	150 °F
MDMT	-20 °F	-20 °F

GASKET	NBRP CLIP-ON
PLATE MATERIAL	TITANIUM
PLATE THICKNESS	0.50 mm
HEATING SURFACE	12580 ft²
PLATE GROUPING	1*(256MH + 15L)
OPERATING WEIGHT	28385 LBS
NET WEIGHT	22000 LBS

THIS PHE IS EQUIPPED WITH LIFTING DEVICE, PLACED ON THE NON-PRESSURE SIDES OF THE FRAME AND PRESSURE PLATES (TWO IN EACH PLATE, FIXED POSITIONS).

Approved

REV. 1 - APPROVAL COMMENTS INCORPORATED.
REV. 2 - PORT LINER CONNECTION MATERIAL CORRECTED TO TITANIUM.

☐ Only to the extent expressly agreed by us this document may constitute a contractual obligation on our part.



Certified by
Alfa Laval - Richmond, VA

Single ratings apply to all chambers
Multiple ratings are listed as Hot/Cold

|MAWP |185 PSIG AT 150 F

MDMT	-20 F AT 185 PSI
------	------------------

S/N	30113-88708	Year	2012
-----	-------------	------	------

Model	<i>TL35-BFD</i>
-------	-----------------

Area	12580 Sq.Ft.
------	--------------

A-Dim	1602mm w/543 0.5mm PLTS
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Order	J-41276
-------	---------

MISSISSIPPI POWER COMPANY

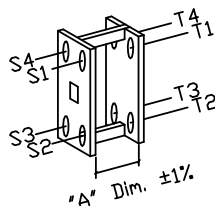
P.O. NO. MPC17837-0001

ITEM NO. HX1104

EMPTY WEIGHT 22000 LBS

Parts and Service



866-ALFALAVAL WWW.ALFALAVAL.COM



SERSKILDA KRAV SPEC. REQUIREMENTS		
Kanter brutna Grader avlåsna Ytj\mnet Ra Edges broken Burrs removed Surface rough. in Ra		
Toleranser dir ej annat angetts. Avser s\pnavskilj. bearbetn. klippta eller stan- sade ytor. Tolerances where not stated. Chip cutting, shearing or punching.		
Bas\ytt	Tol.	
Basic size		
(1)	6	± 0.2
(6)	30	± 0.5
(30)	120	± 0.8
(120)	315	± 1.2
(315)	1000	± 2
(1000)	2000	± 3
(2000)	4000	± 4

*** 30113-88709**
30113-88710
30113-88711
30113-88712
30113-88713

****HX1204**
HX1304
HX2104
HX2204
HX2304

Rev.	32380175-01	ASME NAME PLATE		SA240-316			
Qty	Item	Article No.		Name/Designation		Material (Final condition)/Blank	Note
Description	Assembly No.	Dept. Product Engineering	Date 1/16/12	Scale NTS	Title ASME NAME PLATE		
		Drawn <i>DM</i>	Approved <i>RM</i>	Third angle projection ISO method E			
		DESIGN NOTIFICATION Project No.: Change Level: Text:				 Alfa Laval Alfa Laval Thermal AB Richmond, VA	Drawing No. NP-88708
by							
CK							
date							



**Quality
Record**

Approved

Plate Heat Exchanger Bill of Materials

Subject: TL30-BFD

Document: BOM_30113-88708

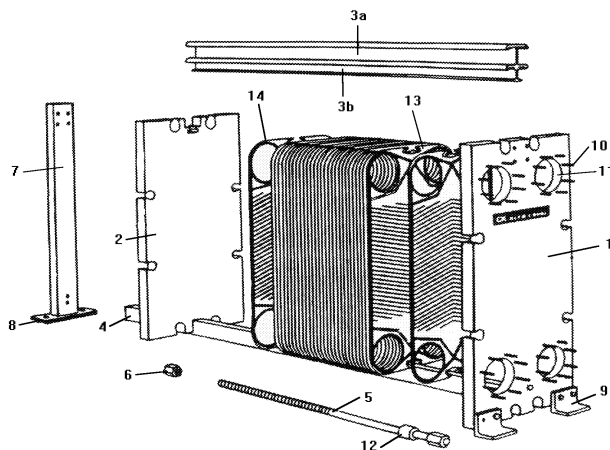
Given are standard ASME/ASTM materials of construction.

No.	Item	Quantity	Material	Notes	Dimensions
1.	Frame Plate	1	SA516-70	1	123 7/16" x 46 1/4"
2.	Pressure Plate	1	SA516-70	1	122 3/16" x 46 1/4"
3a.	Carrying Bar	1	Carbon Steel	1	4800 mm
3b.	T-Profile	1	SA479-304		
4.	Guide Bar	1	SA479-304		4800 mm
5.	Tightening Bolt	4	SA193-B7		M48 x 4650 mm
	Tightening Bolt	20	SA193-B7		M48 x 3450 mm
6.	Tightening Nut	4	SA194-2H	2	M48
	Tightening Nut	20	SA194-2H	2	M48
7.	Support Column	1	Carbon Steel	3	
8.	Support Foot	1	SA36	2	
9.	Frame Plate Foot	4	SA36	2	
	Pressure Plate Foot	4	SA36	2	
10.	Stud Bolt	48	SA193-B7	2	1" 8-UNC
11.	Connection Liner	4	SB265-Gr.1		
12.	Bearing Box	4	1017CS	2	
13.	Channel Plate Gasket	544	NBRP Clip-on		
14.	Channel Plate	543	SB265-Gr.1		88 1/4" x 39 1/8"

Not Shown

OSHA Shroud	1	Aluminum
Tightening Bolt Cover	24	Polyethylene
Lifting Lugs	4	Carbon Steel

Notes: (1) Painted. (2) Zinc Plated. (3) Hot Dip Galvanized.
Drawing is not an accurate depiction, see GA Drawing.



Customer: Mississippi Power Company
P.O. No.: MPC17837-0001
Project: Kemper County IGCC Project
Item No.: HX1104, HX1204, HX1304,
HX2104, HX2204, HX2304
A/L Order No.: J-41276 (408263)
A/L Serial No.: 30113-88708 to 88713

Alfa Laval, Plate Heat Exchanger Specification
Channel Plate Installation Description

Document: SPEC_30113-88708
Rev. 2

Date: 9-1-2011

Customer:	Mississippi Power Company	A/L Order No:	J-41276 (408263)
P.O. No.:	MPC17837-0001	Serial No:	30113-88708 to 30113-88713
Project:	Kemper County IGCC Project	Model Type:	TL35-BFD
Item No.:	HX1104, HX1204, HX1304, HX2104, HX2204, HX2304		

Plate material and Thickness: Titanium 0.50 mm

A Dimension: $A = N \times (2.45 + X)$
 $A = 543 \times (2.45 + 0.5) = 1602 \text{ mm}$

	Hot side	Cold side
Grouping:	1* (256MH+15L)	1* (256ML+15L)
Sealing material:	NBRP Clip-on	NBRP Clip-on
Port Locations:	S1 -> S2	S3 -> S4
Connection material:	Titanium	Titanium

Port hole with flow on the gasketed side: U
Port hole sealed with O-ring: O
Plates are assembled with the gasket side facing the frame plate.

Plate no.	Plate code no.	Plate Pattern		Punched corner of the plate				Flow direction on the gasket side of the plate
				upper right	lower right	lower left	upper left	
				S1	S2	S3	S4	
				=>=	=<=	=<=	=>=	
FRAME PLATE								
1	39507591 83	TL35 B2	A	O	O	O	O	
2	39507540 03	TL35 B2	B	U --->--	U	O	O	Down
3	39507539 03	TL35 B1	A	O	O	U --->--	U	Up
4	39507540 03	TL35 B2	B	U --->--	U	O	O	Down
5	39507539 03	TL35 B1	A	O	O	U --->--	U	Up
6,	8, , 508	39507540 03	TL35 B2 B					
7,	9, , 509	39507539 03	TL35 B1 A					
510	39507540 03	TL35 B2	B	U --->--	U	O	O	Down
511	39507539 03	TL35 B1	A	O	O	U --->--	U	Up
512	39507540 03	TL35 B2	B	U --->--	U	O	O	Down
513	39507539 03	TL35 B1	A	O	O	U --->--	U	Up
514	39507539 03	TL35 B1	B	U --->--	U	O	O	Down
515	39507539 03	TL35 B1	A	O	O	U --->--	U	Up
516	39507539 03	TL35 B1	B	U --->--	U	O	O	Down
517,	519, , 537	39507539 03	TL35 B1 A					
518,	520, , 538	39507539 03	TL35 B1 B					
539	39507539 03	TL35 B1	A	O	O	U --->--	U	Up
540	39507539 03	TL35 B1	B	U --->--	U	O	O	Down
541	39507539 03	TL35 B1	A	O	O	U --->--	U	Up
542	39507539 03	TL35 B1	B	U --->--	U	O	O	Down
543	39507591 76	TL35 B2	A			---	---	Up
PRESSURE PLATE								
				T1	T2	T3	T4	



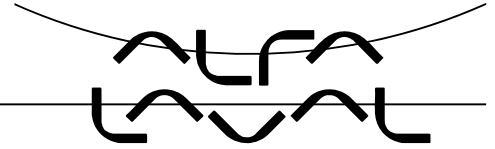
Alfa Laval, Plate Heat Exchanger Specification
Channel Plate Installation Description

Document: SPEC_30113-88708
Rev. 2

Date: 9-1-2011

Plate Part No:	Quantity:	Total:
39507591 83	1	6
39507540 03	256	1536
39507539 03	285	1710
39507591 76	1	6
	<hr/> 543	<hr/> 3258





Customer: Mississippi Power Company
P.O. No.: MPC17837-0001
Project: Kemper County IGCC Project
Item No.: HX1104, HX1204, HX1304
HX2104, HX2204, HX2304

PHE Model: TL35-BFD
Serial No.: 30113-88708 to 88713
Order No.: J-41276 (408263)

Date: 7/11/2011

ALFA LAVAL INC.
PLATE HEAT EXCHANGER
SPARE PARTS LIST

Document: SPL_30113-88708
Revision: 1

Part Description	Part Number	Total Qty. Per Unit	Cost Each
NBRP Clip-on Channel Plate Gasket	39007015 06	544	\$110.00 USD

Alfa-Laval recommends 5% to 10% extra gaskets be kept as spare parts for startup and commissioning and two years of operation. Prices shown are valid for thirty days from the date above.

If you wish to order special tools at a later date, please contact one of our After-Sales Service Centers.

Alfa-Laval Inc.
Richmond Service Center
5400 International Trade Drive
Richmond, VA 23231
Phone: 804-236-1273
Fax : 804-236-1360

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