



CLIENT:	<b>INCHEON TOTAL ENERGY COMPANY</b>
PROJECT:	<b>SONGDO Combined Heat and Power Plant Project</b>
P.O NO.	PO-060353-1300-107
ITEM NO.	111-M-HE-001~003, 228-M-CW-001, 228-M-PP-003/004
ITEM DESCRIPTION	DH HEATER, DRAIN COOLER, DRAIN PUMP
DOCUMENT TITLE	DATA SHEET
DOCUMENT NO.	VP-100-1-M-DS-111-003

DOCUMENT TITLE : DATA SHEET

Daelim Industrial Co., Ltd.	
Job No.	060353
	A - APPROVED
	AAN - APPROVED AS NOTED
	WC - WITH COMMENT
	R - REJECTED
SIGNED BY :	DATE
DIC'S PERMISSION TO PROCEED OR REVIEW TAKEN ON VENDOR PRINTS SHALL NOT RELIEVE VENDOR FROM ITS RESPONSIBILITIES OR LIABILITIES UNDER THE PURCHASE ORDER.	

TOTAL 25 PAGES

1	May /21 /09	FOR CONSTRUCTION	M.S.KANG	W.K.AHN	K.D.LEE
0	Jan /20 /09	FOR CONSTRUCTION	M.S.KANG	W.K.AHN	K.D.LEE
B	Jun /02 /08	REV. AS OWNER COMMENT	M.S.KANG	T.H.KIM	K.D.LEE
A	Apr /01 /08	FOR APPROVAL	M.S.KANG	T.H.KIM	K.D.LEE
REV.	DATE	DESCRIPTION	PREPARED	REVIEWED	APPROVED

VENDOR:



**Power Hx Tech Co., Ltd.**

## FEEDWATER HEATER SPECIFICATION SHEET

Project	Job No. <b>060353</b>
Client	Doc. No. VP-100-1-M-DS-111-003
Contractor /	Date <b>2008. 6. 2.</b>
Code/Standard <b>ASME / HEI</b>	ASME Stamp <b>No</b> Revision <b>B</b>
Service of Unit <b>DH Heater #1</b>	Load <b>Design Point 2</b> Item No. <b>111-M-HE-001</b>
Size Shell 2200 ID x 7800 SETL	Type 1 Zone
Surface Per Shell	Effective 1,594.5 m <sup>2</sup> Total 1626.1 m <sup>2</sup>
No. of Shells Per Unit <b>1</b>	No. of Units <b>1</b> Installation Horizontal

### PERFORMANCE OF ONE SHELL

		Shell Side				Tube Side		
Fluid Circulated		<b>Steam</b>		<b>Drain from DH Heater #2</b>		<b>DH Water</b>		
Total Fluid Entering	kg/h	<b>92,110</b>		<b>116,780</b>		<b>2,039,600</b>		
Inlet Pressure	kg/cm2.a /kg/cm2.g	<b>0.87</b>	-0.16	<b>2.35</b>	1.31	<b>12</b>	10.97	
Inlet Enthalpy	kcal/kg	609.6		125.08		65.2		
Outlet Enthalpy	kcal/kg	95.23				90.1		
Inlet Temperature		<b>95.25</b>	( 95.25 sat. )	124.71		<b>65</b>		
Outlet Temperature		<b>95.17</b>				<b>89.91</b>		
Operating Pressure	kg/cm2.g	-0.16	( 95.25 sat. )					
No. of Passes		<b>1 Zone</b>				<b>2</b>		
Velocity	m/sec	DSH ***	CD - N/A -	DC ***		1.68	1.69	1.70
Pressure Drop	kg/cm2	DSH ***	CD 0.01	DC ***		Allow. <b>0.6</b>	Cal'd	0.36
Fouling Resistance	m <sup>2</sup> h /kcal DSH >	<b>0</b>	CD	<b>0.000045</b>	DC	<b>0</b>	<b>0.00003</b>	

	Heat Exchanged	Surface	LMTD	Transfer Rate	Baffle	Reference
	kcal/h	m2		kcal/m <sup>2</sup> h	Spacing	Temperature
		Effective			mm	Difference
Desuperheating Zn	***	***	***	***	<b>0</b>	TTD 5.3
Condensing Zone	50,877,342	1,594.5	14.27	2289.3	<b>770</b>	DCA 30.2
Drain Subcooling Z	***	***	***	***	<b>0</b>	
<b>Total</b>	<b>50,877,342</b>	<b>1,594.5</b>				

### CONSTRUCTION - EACH SHELL

		Shell Side				Tube Side		
Design Pressure	kg/cm2.g	<b>3.5</b>		& F/V		<b>16</b>		
Test Pressure	kg/cm2.g	5.25				<b>24</b>		
Design Temperature		<b>SHELL</b>	<b>200</b>	<b>SKIR1</b>	<b>200</b>	<b>150</b>		
Corrosion Allowance	mm	<b>1.6</b>				<b>1.6</b>		
Tubes	A 213 TP304	No. <b>1600</b>	U's	O.D. <b>19.05</b>	t, mm Avg. <b>1.245</b>	SETL <b>7,800</b>	Pitch	<b>25.4</b> mm
Shell	A 516-70	Steel Thick	15	I.D. <b>2,200</b>	Pitch Pattern → □			
Shell Cover	A 516-70	Steel - Welded to Shell			Shell Skirt	A 516-70	Thick	15
Bonnet	A 516-70	Steel Thick	17	I.D. <b>2,200</b>	Bonnet Cover	A 516-70	Thick	17
Tubesheet	A 266 4	Steel Thick	165	Tubesheet Cladding		A 240 304	tmin.	4.8
Support Plates-Steel	A 240 304	Air Baffle	***	Zone Baffle-Steel		***		
Shrouds:	DSH ***	DC	***	Impingement Baffles		A 240 304		
Type Joints - Shell Side	Welded			Tube Side	Bolted			
Gasket - Shell	Non-asbestos			Channel	Non-asbestos			
Connections:	Steam -Inlet	48"	Butt W.	Q'ty <b>1</b>	Drain from DI -Inlet	14"	Flanged	
	Drain -Outle	16"	Flanged					
	DH Water -Inlet	24"	Flanged		Outlet	24"	Flanged	
Code Requirements:	ASME							
Weights-Shell & Bundle	<b>36,250</b>		Bundle	<b>21,370</b>		Flooded	<b>53,100</b> kg	
Accessories: Shell Relief Valve	- N/A -			Tube Side Relief Valve	Provided			
	Shell Gage Glass	by Others		Insulation	by Others			
Method of Tube Attachment	Expanded			TEMA Class	<b>C</b>			

#### Remarks

- \*1) Max. overload feedwater flowrate : **150** % design flow.
- \*2) Relief Valve Sizing : Shell Side **N/A** Tube Side acc. to HEI
- \*3)
- \*4)
- \*5)

## VESSEL SPECIFICATION SHEET

1	Project	Doc. No.	VP-100-1-M-DS-111-003
2	Client	Date	2008. 6. 2.
3	Contractor /	Revision	B
4	Code/Standard <b>ASME</b>	ASME Stamp <b>No</b>	Sheet No. 1 of 1
5	Service of Unit <b>Hotwell for DH Heater #1</b>	Type <b>Cylindrical</b>	Item No. <b>111-M-TK-001</b>
6	Size ID 1350 x TL 7000	Installation <b>Horizontal</b>	No. of Units <b>1</b> set(s)
7	Location Indoor	Volume, LSL ~ NWL 7.53	Full 10.66 m3

### DESIGN DATA

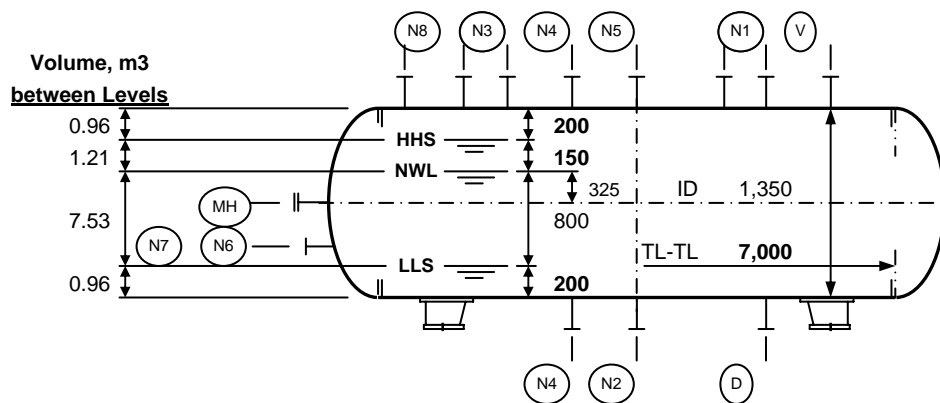
Fluid Name	Condensate		Shell	Head
	<b>Pressure</b>	<b>Temperature</b>	R.T.	Spot
	kg/cm2.g		Joint Efficiency	1
Design	<b>3.5</b>	<b>200</b>	PWHT	No
Vacuum	F/V		Corrosion Allowance	<b>1.6</b>
Operating	-0.2	95.3	Liquid Level	Yes
Test / Metohd	5.25	Hydro.		
Liquid Density	961.5	kg/m3		

### MATERIALS

### NOZZLE LIST

Item	Material	Weight	MK	Service	Q'ty	Size	Type	Rating
18	Shell A 516-70	11 t	MK					
19	Head A 516-70 2:1 Ellipsoidal	11 t	N1	Condensate Inlet	2	12"	Flanged	150 lb
20	Support A 283-C		N2	Condensate Outlet	1	14"	Flanged	150 lb
21	Nozzle Neck A 106-B		N3	Equalizer	2	6"	Flanged	150 lb
22	Nozzle Flange A 105		N4	Bridle	2	2"	Flanged	150 lb
23	Bolts / Nuts A 193-B7, <=2.5"		N5	Pump Min. Flow Return	1	4"	Flanged	150 lb
24	Gasket Non-asbestos		N6	TI	1	1 1/2"	Flanged	150 lb
25			N7	TIT	1	1 1/2"	Flanged	150 lb
26			N8	Initial Filling	1	2"	Flanged	150 lb
<b>ACCESSORIES</b>								
27	Manhole 20"							
28	Ladder - N/A -							
29	Platform - N/A -		V	Vent	***			
30	Lifting Lug Provided		D	Drain	1	2"	Flanged	150 lb
31	Earth Lug Provided		MH	Manhole	1	20"	Flanged	150 lb
32	Name Plate Provided							
33	Anchor B/N Provided	SS 400, <= 4 M20 0 L						

### SCHEMATIC DIMENSIONAL OUTLINE



Surf. Prep.	Inside - N/A -	Outside Sand Blasting	<b>LOADING DATA</b>	
Painting	Inside - N/A -	Outside Primer	Weight, Empty	<b>4,540</b> kg
Insulation	by Others ***	*** t	Weight, Operating	<b>12,130</b> kg
Lagging	by Others ***	*** t	Weight, Full Water	<b>15,110</b> kg

#### Remarks :

58	1.
59	2.
60	3.

PHX

## FEEDWATER HEATER SPECIFICATION SHEET

Project	Job No. <b>060353</b>
Client	Doc. No. VP-100-1-M-DS-111-003
Contractor /	Date <b>2008. 6. 2.</b>
Code/Standard <b>ASME / HEI</b>	ASME Stamp <b>No</b> Revision <b>B</b>
Service of Unit <b>DH Heater #2</b>	Load <b>Design Point 1</b> Item No. <b>111-M-HE-002</b>
Size Shell 2200 ID x 7800 SETL	Type 1 Zone
Surface Per Shell	Effective 1,747.5 m <sup>2</sup> Total 1786.3 m <sup>2</sup>
No. of Shells Per Unit <b>1</b>	No. of Units <b>1</b> Installation Horizontal

### PERFORMANCE OF ONE SHELL

	Shell Side				Tube Side		
	Steam		Drain		DH Water		
Total Fluid Entering kg/h	<b>117,220</b>		<b>0</b>		<b>2,012,500</b>		
Inlet Pressure kg/cm2.a /kg/cm2.g	<b>2.34</b>	1.31	<b>0</b>	***	<b>12</b>	10.97	
Inlet Enthalpy kcal/kg	654.17		0.0		89.7		
Outlet Enthalpy kcal/kg	125.09				120.5		
Inlet Temperature	<b>136.96</b>	( 124.70 sat. )	0.00		<b>89.42</b>		
Outlet Temperature	<b>124.70</b>				<b>120</b>		
Operating Pressure kg/cm2.g	1.31 ( 124.70 sat. )						
No. of Passes	<b>1</b> Zone				<b>2</b>		
Velocity m/sec	DSH ***	CD - N/A -	DC ***		1.54	1.55	1.57
Pressure Drop kg/cm2	DSH ***	CD 0.01	DC ***		Allow. <b>0.6</b>	Cal'd	0.29
Fouling Resistance m <sup>2</sup> h /kcal DSH >	<b>0</b>	CD <b>0.000045</b>	DC <b>0</b>		<b>0.00003</b>		

	Heat Exchanged kcal/h	Surface m2 Effective	LMTD	Transfer Rate kcal/m <sup>2</sup> h	Baffle Spacing mm	Reference Temperature Difference
Desuperheating Zn	***	***	***	***	<b>0</b>	TTD 4.7
Condensing Zone	62,031,402	1,747.5	15.12	2424.6	<b>770</b>	DCA 35.3
Drain Subcooling Z	***	***	***	***	<b>0</b>	
<b>Total</b>	<b>62,031,402</b>	<b>1,747.5</b>				

### CONSTRUCTION - EACH SHELL

	Shell Side				Tube Side			
Design Pressure kg/cm2.g	<b>8</b>		& F/V		<b>16</b>			
Test Pressure kg/cm2.g			12		<b>24</b>			
Design Temperature	<b>SHELL 360</b>		<b>SKIR1 360</b>		<b>190</b>			
Corrosion Allowance mm	<b>1.6</b>				<b>1.6</b>			
Tubes A 213 TP304	No. <b>1750</b>	U's	O.D. <b>19.05</b>	t, mm Avg. <b>1.245</b>	SETL <b>7,800</b>	Pitch	<b>25.4</b> mm	
Shell A 516-70	Steel Thick 17	I.D. 2,200	Pitch Pattern → □					
Shell Cover A 516-70	Steel - Welded to Shell				Shell Skirt A 516-70	Thick 17		
Bonnet A 516-70	Steel Thick 17	I.D. 2,200	Bonnet Cover A 516-70		Thick 17			
Tubesheet A 266 4	Steel Thick 185	Tubesheet Cladding		A 240 304	tmin. 4.8			
Support Plates-Steel A 240 304	Air Baffle ***	Zone Baffle-Steel ***						
Shrouds: DSH ***	DC ***	Impingement Baffles		A 240 304				
Type Joints - Shell Side	Welded			Tube Side	Bolted			
Gasket - Shell	Non-asbestos			Channel	Non-asbestos			
Connections: Steam -Inlet 32"	Butt W.	Q'ty <b>1</b>	Drain -Inlet ***	***				
Drain -Outlet 14"	Flanged							
DH Water -Inlet 24"	Flanged		Outlet	24"	Flanged			
Code Requirements:	ASME							
Weights-Shell & Bundle	<b>39,410</b>		Bundle	<b>23,310</b>		Flooded	<b>56,360</b> kg	
Accessories: Shell Relief Valve	- N/A -			Tube Side Relief Valve	Provided			
Shell Gage Glass	by Others			Insulation	by Others			
Method of Tube Attachment	Expanded			TEMA Class	<b>C</b>			

#### Remarks

- \*1) Max. overload feedwater flowrate : **150** % design flow.
- \*2) Relief Valve Sizing : Shell Side **N/A** Tube Side acc. to HEI
- \*3)
- \*4)
- \*5)

## FEEDWATER HEATER SPECIFICATION SHEET

Project	Job No. <b>060353</b>
Client	Doc. No. VP-100-1-M-DS-111-003
Contractor /	Date <b>2008. 6. 2.</b>
Code/Standard <b>ASME / HEI</b>	ASME Stamp <b>No</b> Revision <b>B</b>
Service of Unit <b>DH Heater #3</b>	Load <b>Design Point 1</b> Item No. <b>111-M-HE-003</b>
Size Shell 2200 ID x 6000 SETL	Type <b>2 Zone</b>
Surface Per Shell	Effective 1,255.8 m <sup>2</sup> Total 1287.4 m <sup>2</sup>
No. of Shells Per Unit <b>1</b>	No. of Units <b>1</b> Installation <b>Horizontal</b>

### PERFORMANCE OF ONE SHELL

	Shell Side				Tube Side		
Fluid Circulated	<b>Steam</b>		<b>Drain</b>		<b>DH Water</b>		
Total Fluid Entering kg/h	<b>283,690</b>		<b>0</b>		<b>2,802,000</b>		
Inlet Pressure kg/cm <sup>2</sup> .a /kg/cm <sup>2</sup> .g	<b>4.75</b>	3.72	<b>0</b>	***	<b>12</b>	10.97	
Inlet Enthalpy kcal/kg	661.10		0.0		65.2		
Outlet Enthalpy kcal/kg	115.24				120.5		
Inlet Temperature	<b>159.46</b>	( 149.20 sat. )	0.00		<b>65</b>		
Outlet Temperature	<b>115.00</b>				<b>120</b>		
Operating Pressure kg/cm <sup>2</sup> .g	3.72	( 149.20 sat. )					
No. of Passes	<b>2 Zone</b>				<b>2</b>		
Velocity m/sec	DSH ***	CD - N/A -	DC 0.48	2.30		2.34	2.39
Pressure Drop kg/cm <sup>2</sup>	DSH ***	CD 0.02	DC 0.06	Allow. <b>0.75</b>		Cal'd 0.51	
Fouling Resistance m <sup>2</sup> h /kcal DSH >	<b>0</b>	CD <b>0.000045</b>	DC <b>0.0000615</b>	<b>0.00003</b>			

	Heat Exchanged kcal/h	Surface m <sup>2</sup> Effective	LMTD	Transfer Rate kcal/m <sup>2</sup> h	Baffle Spacing mm	Reference Temperature Difference
Desuperheating Zn	***	***	***	***	<b>0</b>	TTD 29.2
Condensing Zone	144,978,688	1,160.0	50.60	2547.3	<b>770</b>	DCA 50.0
Drain Subcooling Z	9,904,707	95.8	64.08	1962.3	<b>500</b>	
<b>Total</b>	<b>154,883,395</b>	<b>1,255.8</b>				

### CONSTRUCTION - EACH SHELL

	Shell Side				Tube Side		
Design Pressure kg/cm <sup>2</sup> .g	<b>7.5</b>		& F/V		<b>16</b>		
Test Pressure kg/cm <sup>2</sup> .g	11.25				<b>24</b>		
Design Temperature	<b>SHELL</b>	<b>200</b>	<b>SKIR1</b>	<b>200</b>	<b>170</b>		
Corrosion Allowance mm	<b>1.6</b>				<b>1.6</b>		
Tubes A 213 TP304	No. <b>1600</b>	U's O.D. <b>19.05</b>	t, mm Avg. <b>1.245</b>	SETL <b>6,000</b>	Pitch <b>25.4</b>	mm	
Shell A 516-70	Steel Thick 15	I.D. 2,200	Pitch Pattern → □				
Shell Cover A 516-70	Steel - Welded to Shell			Shell Skirt A 516-70	Thick 15		
Bonnet A 516-70	Steel Thick 17	I.D. 2,200	Bonnet Cover A 516-70	Thick 17			
Tubesheet A 266 4	Steel Thick 165	Tubesheet Cladding A 240 304			tmin. 4.8		
Support Plates-Steel A 240 304	Air Baffle ***	Zone Baffle-Steel A 240 304					
Shrouds: DSH ***	DC A 283-C	Impingement Baffles A 240 304					
Type Joints - Shell Side	Welded			Tube Side	Bolted		
Gasket - Shell	Non-asbestos			Channel	Non-asbestos		
Connections: Steam -Inlet 24"	Butt W. Q'ty <b>2</b>	Drain -Inlet ***	***				
Drain -Outlet 12"	Flanged						
DH Water -Inlet 24"	Flanged			Outlet 24"	Flanged		
Code Requirements:	ASME						
Weights-Shell & Bundle <b>30,380</b>	Bundle <b>21,370</b>		Flooded <b>44,800</b>		kg		
Accessories: Shell Relief Valve	Provided			Tube Side Relief Valve	Provided		
Shell Gage Glass	by Others			Insulation	by Others		
Method of Tube Attachment	Expanded			TEMA Class <b>C</b>			

#### Remarks

- \*1) Max. overload feedwater flowrate : **100** % design flow.
- \*2) Relief Valve Sizing : Shell Side **N/A** Tube Side acc. to HEI
- \*3)
- \*4)
- \*5)

## VESSEL SPECIFICATION SHEET

1	Project	Doc. No.	VP-100-1-M-DS-111-003
2	Client	Date	2008. 6. 2.
3	Contractor /	Revision	B
4	Code/Standard <b>ASME</b>	ASME Stamp <b>No</b>	Sheet No. 1 of 1
5	Service of Unit <b>Hotwell for DH Heater #3</b>	Type <b>Cylindrical</b>	Item No. <b>111-M-TK-003</b>
6	Size ID 1500 x TL 7000	Installation <b>Horizontal</b>	No. of Units <b>1</b> set(s)
7	Location Indoor	Volume, LSL ~ NWL 10.27	Full 13.25 m3

### DESIGN DATA

Fluid Name	Drain	Shell	Head
	<b>Pressure</b>	R.T.	Spot
	<b>Temperature</b>	Joint Efficiency	No
	kg/cm2.g	0.85	1
Design	<b>7.5</b>	<b>200</b>	PWHT No
Vacuum	F/V	Corrosion Allowance	<b>1.6</b> <b>1.6</b>
Operating	-0.2	95.3	Liquid Level Yes
Test / Metohd	11.25	Hydro.	
Liquid Density	961.5	kg/m3	

### MATERIALS

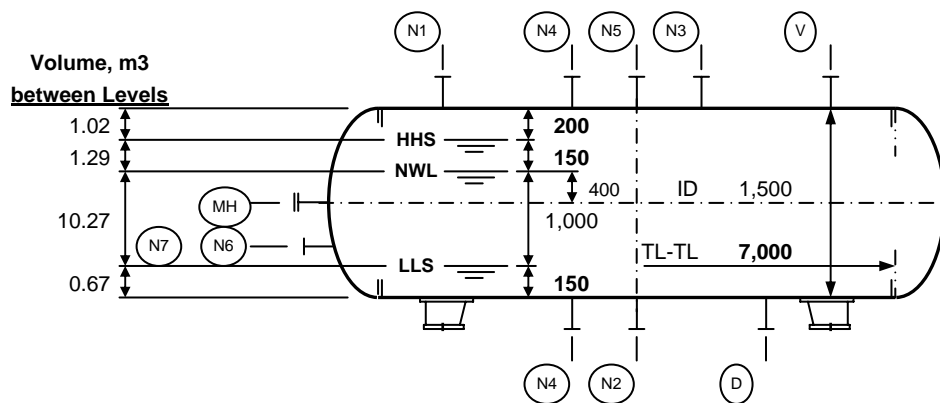
### NOZZLE LIST

Shell	A 516-70	11 t	MK	Service	Q'ty	Size	Type	Rating
Head	A 516-70	2:1 Ellipsoidal	11 t	N1	Drain Inlet	1	12"	Flanged 150 lb
Support	A 283-C			N2	Drain Outlet	1	16"	Flanged 150 lb
Nozzle Neck	A 106-B			N3	Equalizer	1	6"	Flanged 150 lb
Nozzle Flange	A 105			N4	Bridle	2	2"	Flanged 150 lb
Bolts / Nuts	A 193-B7, <=2.5"			N5	Pump Min. Flow Return	1	4"	Flanged 150 lb
Gasket	Non-asbestos			N6	TI	1	1 1/2"	Flanged 150 lb
				N7	TIT	1	1 1/2"	Flanged 150 lb

### ACCESSORIES

Manhole	20"							
Ladder	- N/A -							
Platform	- N/A -			V	Vent	***		
Lifting Lug	Provided			D	Drain	1	2"	Flanged 150 lb
Earth Lug	Provided			MH	Manhole	1	20"	Flanged 150 lb
Name Plate	Provided							
Anchor B/N	Provided	SS 400, <= 4	M20	0	L			

### SCHEMATIC DIMENSIONAL OUTLINE



Surf. Prep.	Inside - N/A -	Outside Sand Blasting	Weight, Empty	LOADING DATA
Painting	Inside - N/A -	Outside Primer		5,060 kg
Insulation	by Others	*** t		14,840 kg
Lagging	by Others	*** t		18,200 kg

#### Remarks :

58	1.
59	2.
60	3.

PHX