

LOAD POINT	EMPTY LOAD		OPER. LOAD		WIND LOAD (±)					SEISMIC LOAD (±)					THERMAL LOAD (±)		REMARK
	FZ [kgf]	FX [kgf]	FZ [kgf]	FX [kgf]	FX [kgf]	FZ due to MY [kgf]	FY [kgf]	FZ due to MX [kgf]	MX [kgf-m]	MY [kgf-m]	FX [kgf]	FZ due to MY [kgf]	FY [kgf]	FZ due to MX [kgf]	MX [kgf-m]	MY [kgf-m]	
COMBINATION OF THERMAL REACTOR AND WHB & STEAM DRUM FOR THERMAL REACTOR																	
S1	33,496	33,496	0	0	1,009	2,060	1,476	0	0	0	3,094	6,316	4,526	0	0	0	3,350
S2	33,496	33,496	0	0	1,009	2,060	1,476	0	0	0	3,094	6,316	4,526	0	0	0	3,350
S3	23,530	30,862	1,778	1,517	1,262	4,649	2,495	3,389	11,889	9,089	2,851	10,427	5,596	20,244	3,613	0	3,613
S4	23,530	30,862	0	0	1,262	4,649	2,495	0	0	0	2,851	10,427	5,596	0	0	0	3,086
TOTAL	114,052	128,715	1,778	1,517	4,542	7,943	3,389	11,889	11,889	11,889	11,889	20,244	20,244	13,398	0	0	13,398
THERMAL REACTOR (* IN CASE OF BEING INDIVIDUALLY INSTALLED)																	
S1	33,496	33,496	362	241	1,009	2,060	1,476	530	3,094	2,057	3,094	6,316	4,526	4,526	0	0	3,350
S2	33,496	33,496	362	241	1,009	2,060	1,476	530	3,094	2,057	3,094	6,316	4,526	4,526	0	0	3,350
TOTAL	66,992	66,992	724	482	2,018	2,953	1,059	6,188	6,188	6,188	6,188	9,053	9,053	6,699	0	0	6,699
WHB & STEAM DRUM FOR THERMAL REACTOR (* IN CASE OF BEING INDIVIDUALLY INSTALLED)																	
S3	23,530	30,862	527	518	1,262	4,649	2,495	1,165	2,851	2,487	2,851	10,427	5,596	5,596	0	0	3,086
S4	23,530	30,862	527	518	1,262	4,649	2,495	1,165	2,851	2,487	2,851	10,427	5,596	5,596	0	0	3,086
TOTAL	47,060	61,723	1,054	1,036	2,524	4,990	2,330	5,701	5,701	5,701	5,701	11,191	11,191	11,191	0	0	6,172
THERMAL REACTOR STEAM DRUM STRUCTURE																	
S5	3,771	3,996	91	272	258	836	1,045	367	369	1,107	369	1,195	1,494	1,494	0	0	0
S6	3,771	3,996	91	272	258	836	1,045	367	369	1,107	369	1,195	1,494	1,494	0	0	0
S7	3,771	3,996	91	272	258	836	1,045	367	369	1,107	369	1,195	1,494	1,494	0	0	0
S8	3,771	3,996	91	272	258	836	1,045	367	369	1,107	369	1,195	1,494	1,494	0	0	0
TOTAL	15,083	15,982	362	1,033	1,033	4,180	1,466	1,476	1,476	1,476	1,476	5,976	5,976	5,976	0	0	0

NOTE

- WIND DESIGN : CODE - ASCE 7-05, BASIC WIND SPEED - 40 m/sec (144 km/h)
- SEISMIC DESIGN : CODE - UBC 97, ZONE - 1
- F : FORCE, M : MOMENT
- X : LONGITUDINAL, Y : TRANSVERSE, Z : VERTICAL DIRECTION + DOWNWARD, - UPWARD
- FX/MY AND FY/MX NEED NOT BE APPLIED SIMULTANEOUSLY.

D	26.MAY.'14	FOR APPROVAL	K.C LEE	W.S YANG	H. KANG	S.M HONG
C	28.MAR.'14	FOR APPROVAL	K.C LEE	W.S YANG	H. KANG	S.M HONG
B	25.NOV.'13	FOR APPROVAL	K.C LEE	W.S YANG	H. KANG	S.M HONG
A	10.OCT.'13	FOR APPROVAL	K.C LEE	W.S YANG	H. KANG	S.M HONG
REV.	DATE	DESCRIPTION	PRPD	CHKD	REVD	APPD

IRPC IRPC Public Company Limited
RAYONG, THAILAND

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FW FOSTER WHEELER INTERNATIONAL CORPORATION.

GSE&C **SK E & C**
CONSORTIUM OF GS E&C AND SK E&C

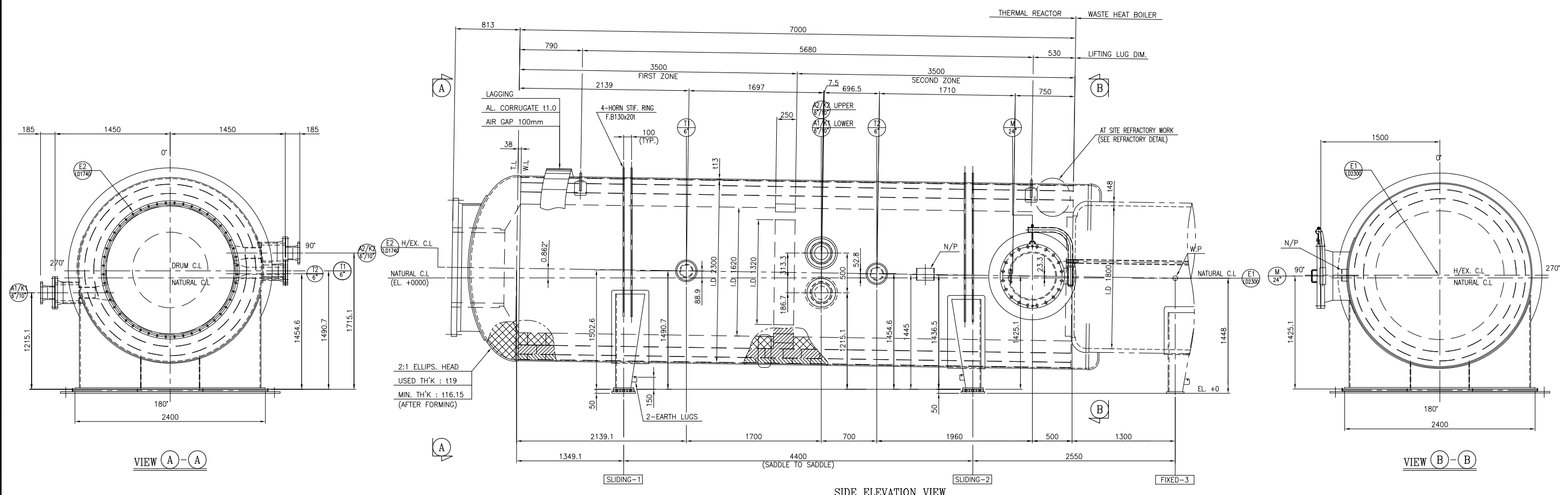
UHV PLANT PROJECT

**GENERAL ARRANGEMENT
THERMAL REACTOR PACKAGE**

JOHN ZINK
JOHN ZINK COMPANY LLC
PARTS AND SERVICE, PHONE 1-800-755-4252, FAX (918) 234-5705

DWG. No:	130087-72B101/201/301-VP-0001	SHEET	1	OF	1	REV.	D
SCALE:	1/30	JOB NO.	14640	CONTRACT NO.	12151D		

Appr'd:	Date:
FOR:	IRPC PUBLIC CO LTD
USER:	GS E&C AND SK E&C
JOB SITE:	RAYONG, THAILAND
S.D. NO.:	-
P.O. NO.:	-
JZ DRAWING NO.:	-



NOTE

- CONSTRUCTION ACCORDING TO: ASME SECTION I. LOCAL CODES, LAWS AND STANDARDS.
- INSULATION IS REQUESTED FOR AIR BURNER BOX ONLY. NO INSULATION SHALL BE ERECTED ON THE THERMAL REACTOR SHELL UNDERNEATH THE ALUMINIUM LAGGING (SEE TYPICAL ARRANGEMENTS FOR ALUMINIUM LAGGING AT SHEET)
- ORIENTATION OF PYROMETERS AND RELEVANT FACILITIES TO BE DEFINED BY VENDOR.
- CARBON STEEL USED FOR ALL PRESSURE PARTS SHALL BE FULLY KILLED WITH THE FOLLOWING MINIMUM RESTRICTIONS IN COMPOSITIONS:

PLATE/WELDED PIPE	
C CONTENT % MAX.	0.23
S CONTENT % MAX.	0.005
P CONTENT % MAX.	0.015
NI CONTENT % MAX.	1.0

HARDNESS OF CARBON STEEL BASE MATERIAL, WELDS AND HAZ SHALL BE 200 HB MAXIMUM PWHT REQUIRED FOR CARBON STEEL.
- HYDRAULIC TEST TO BE CARRIED OUT AFTER HAVING WELDED THE WASTE HEAT BOILER TO THE THERMAL REACTOR AND BEFORE REFRACTORY MATERIAL APPLICATION. CONNECTION WELDINGS TO BE FULLY RADIOGRAPHED AND POST WELD HEAT TREATED.
- 25μ LAYER OF THERMOSENSITIVE PAINT CAPABLE TO DETECT TEMPERATURE HOT SPOTS HIGHER THAN 300°C TO BE APPLIED ON EXTERNAL SHELL.
- NUMBER, TYPE AND POSITION OF SADDLES TO BE DEFINED DURING DETAILED ENGINEERING STEP. ANALYSIS OF THE STRESS INDUCED IN THE SHELL BY SADDLES TO BE DEVELOPED DURING DETAILED ENGINEERING STEP.
- LIFTING LUGS TO BE PROVIDED.
- SUPPORTS, BRACKETS AND LIFTING LUGS TO BE WELDED BEFORE STRESS RELIEVING.
- NOZZLE FOR PYROMETERS (NOZZLE T1/T2) AND FOR ACID GAS INLET TO 2 ZONE (NOZZLE K1/K2) SHALL BE LINED WITH INSULATING CASTABLE, CONFORM TO ASTM C401, WITH THE FOLLOWING CHARACTERISTICS:

MAXIMUM OPERATING TEMPERATURE	: 1450 °C
DENSITY	: 1200 Kg/m ³ min.
Fe ₂ O ₃ CONTENT	: 1 % max.
THERMAL CONDUCTIVITY AT 600°C	: 0.38 kcal/m ² C +/- 10%
PERMANENT LINEAR AT 1650°C	: 1 % max.
MATERIALS	: K27L-SIRC OR PULCAST L-W-1-27 OF PULBRICO OR FIRELITE 2700 LI OF THERMAL CERAMICS.

- EXPANSION JOINTS BETWEEN HOT FACE AND INSULATING BRICKS TO BE FREE OF MORTAR OR THE OTHER SOLID AND TO BE FILLED WITH LOOSELY PACKED CERACHEM FIBER WITH 1425 MINIMUM TEMPERATURE. TO BE CHECKED/CONFIRMED BY REFRACTORY VENDOR.
- ACID GAS INJECTION NOZZLE (POS. A1/A2 AND K1/K2) TO BE PROVIDED WITH CERAMIC FERRULE WITH THE FOLLOWING CHARACTERISTICS:

MAXIMUM OPERATING TEMPERATURE(SC 37/38)	: 1760 °C
Al ₂ O ₃ CONTENT	: 85 % min.
Fe ₂ O ₃ CONTENT	: 0.5 % max.
ALKALIES	: 0.5 % max.
REFRACTORINESS UBDR LOAD	: 1670 °C max.
APPARENT POROSITY	: 20 %
COLD CRUSHING STRENGTH	: > 300 Kg/cm ²
SUGGESTED FERRULES VENDOR	: INDUSTRIAL CERMIC-851 NIPISSING ROAD MILTON- ONTARIO (CANADA)

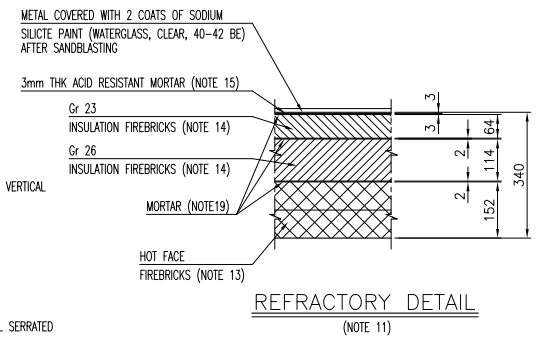
FERRULE TO BE WRAPPED WITH 1 MM CERAPAPER (J. MANVILLE OR EQUIVALENT) WITH OPERATING TEMPERATURE OF 1260°C AND 0.5 MM THICKNESS, SO TO PROVIDE A "PUSH-FIT" INSERTION IN THE NOZZLE.
- HOT FACE FIRE BRICKS OF THE THERMAL REACTOR EITHER FOR HIGH AND NORMAL TEMPERATURE SERVICE SHALL BE SINTERED ALUMINA TYPE ACCORDING TO ASTM C27 (HIGH ALUMINA 90%), WITH THE FOLLOWING CHARACTERISTICS:

Al ₂ O ₃ CONTENT	: 88 % min.
Fe ₂ O ₃ CONTENT	: 0.5 % max.
P ₂ O ₅ + Cr ₂ O ₃ CONTENT	: 0.2 % max.
ALKALIES	: 0.5 % max.
LOAD DEFORMATION TEST @1650°C (ASTM C16)	: 1.5 % max.
REFRACTORINESS	: 1980 °C (SC42)
REFRACTORINESS UBDR LOAD	: >1750 °C
APPARENT POROSITY	: 17 %
COLD CRUSHING STRENGTH	: 600 Kg/cm ² min.
PERMANENT LINEAR CHANGE (1700°C)	: 0.5 % max.
TYPICAL DENSITY (ASTM <20)	: 300 about kg/m ³

TYPICAL ACCEPTABLE MATERIALS: A91P-SIRC OF EQUIVALENT. PLASTIC OR CASTABLE REFRACTORY OF EQUIVALENT GRADE (HIGH DENSITY, HIGH ALUMINA, LOW IRON) MAY BE USED FOR IRREGULAR SECTIONS ONLY WHEN UNAVOIDABLE. PLASTIC OR CASTABLE REFRACTORY SHALL CONFORM TO ASTM C-401 WITH THE FOLLOWING CHARACTERISTIC:

Al ₂ O ₃ CONTENT	: 92 % min.
Fe ₂ O ₃ CONTENT	: 0.3 % max.
ALKALIES CONTENT	: 0.4 % max.
CaO CONTENT	: 4-6 %
OPERATING TEMPERATURE	: 1760 °C
TYPICAL DENSITY (ASTM <20)	: 2500 kg/m ³
THERMAL CONDUCTIVITY AT 600°C	: 0.44 kcal/h ² Cm ± 10%
COMPR. STRENGTH (FIRED AT 815°C)	: 6 MPa min.
PERMANENT LINEAR CHANGE (1700°C)	: 0.5 % max.

- EXTERNAL - 25μ LAYER OF THERMOSENSITIVE PAINT. INTERNAL - METAL COVERED WITH 2 COATS OF SODIUM SILICATE PAINT. (WATER GLASS, CLEAR 40, 42BE) AFTER SAND BLASTING.
- FLANGE BOLT HOLES SHALL STRADDLE THE NORTH-SOUTH OR NATURAL HORIZONTAL AND VERTICAL CENTER LINE OF VESSEL UNLESS OTHERWISE NOTED.
- GASKET MATERIAL: SPIRAL WOUND GASKET
 - FILLER: GRAPHITE, -HOOP: 316 S.S., - INNER RING: 316 S.S.
 - OUTER RING: C.S
- FLANGE
 - ASME B16.5: UP TO 24"
 - ASME B16.47 A SERIES: OVER 24"
- GASKET CONTACT SURFACE OF NOZZLE FLANGE SHALL HAVE 125-250 ARRH WITH SPIRAL SERRATED AS PER ASME B16.5



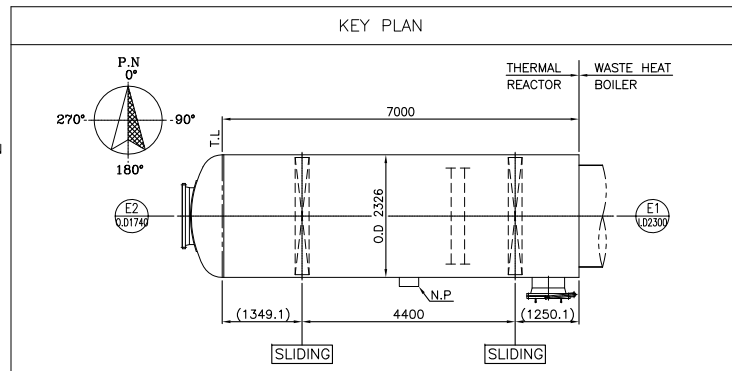
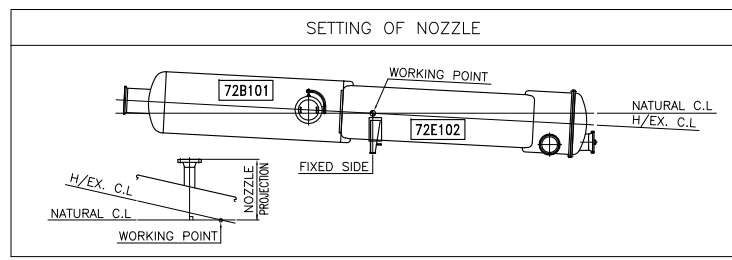
FOR:	IRPC PUBLIC CO LTD
USER:	GS E&C AND SK E&C
JOB SITE:	RAYONG, THAILAND
S.O. NO.:	-
P.O. NO.:	-
JZ DRAWING NO.:	-



CL. OF WELD	PIPE SIZE	FL (N) (KG)	Fφ (N) (KG)	FR (N) (KG)	FA (N) (KG)	ML (Nm) (KGm)	Mφ (Nm) (KGm)	MB (Nm) (KGm)	MT (Nm) (KGm)
FA	6"	9,000	6,750	11,250	9,000	3,510	2,700	4,428	4,050
	#150	918	689	1,148	918	358	276	452	413
MT	10"	15,000	11,250	18,750	15,000	9,750	7,500	12,300	11,250
	#150	1,531	1,148	1,913	1,531	995	765	1,255	1,148
FL	24"	36,000	27,000	45,000	36,000	56,160	43,200	70,848	64,800
	#150	3,673	2,755	4,592	3,673	5,731	4,408	7,229	6,612

TYPE	HORIZONTAL
DESIGN CODE	ASME SEC. I (2010 ED. 2011ADD)
WIND DESIGN	ASCE-7-2005, 40m/s
SEISMIC DESIGN	UBC-97, ZONE 1
CAPACITY	-
DESIGN PRESS	5 barg
DESIGN TEMP (SHELL/REFRACTORY)	350 / 1760 °C
M.A.W.P. (HOT & COLD)	(S) / (D) Bar G
OPERATING PRESS.	0.52 barg
OPERATING TEMP (SHELL/REFRACTORY)	300 / 1450 °C
HYDRO/C TEST PRESS.	7.5 barg
PNEUM/C TEST PRESS.	N/A barg
P.W.H.T.	YES
RADIOGRAPH (SHELL/HEAD)	FULL / FULL
JOINT EFFICIENCY	100 / 100 %
CORROSION ALLOWANCE	3 (C.S) mm
M.D.M.T	(1) / (Δ) °C

OUT SIDE	SEE NOTE 16	WEIGHT	SHELL
REFRACTORY		48,691 Kg	SA516-60N
EMPTY		58,902 Kg	SA516-60N
OPERATING		58,908 Kg	SA105N
TEST (EXCL. REFRACTORY)		41,303 Kg	SA106-B
STUD BOLTS / NUT			SA193-B7/SA194-2H
SADDLES & SUPPORT			SA283-C



REV.	DATE	DESCRIPTION	PRPD	CHKD	REVD	APPD
Da	01.JUL'14	FOR APPROVAL	K.C LEE	W.S YANG	H. KANG	S.M HONG
C	20.MAR'14	FOR APPROVAL	K.C LEE	W.S YANG	H. KANG	S.M HONG
B	25.NOV'13	FOR APPROVAL	K.C LEE	W.S YANG	H. KANG	S.M HONG
A	10.OCT'13	FOR APPROVAL	K.C LEE	W.S YANG	H. KANG	S.M HONG

IRPC Public Company Limited
RAYONG, THAILAND

FOSTER WHEELER INTERNATIONAL CORPORATION.

GSE&C CONSORTIUM OF GS E&C AND SK E&C

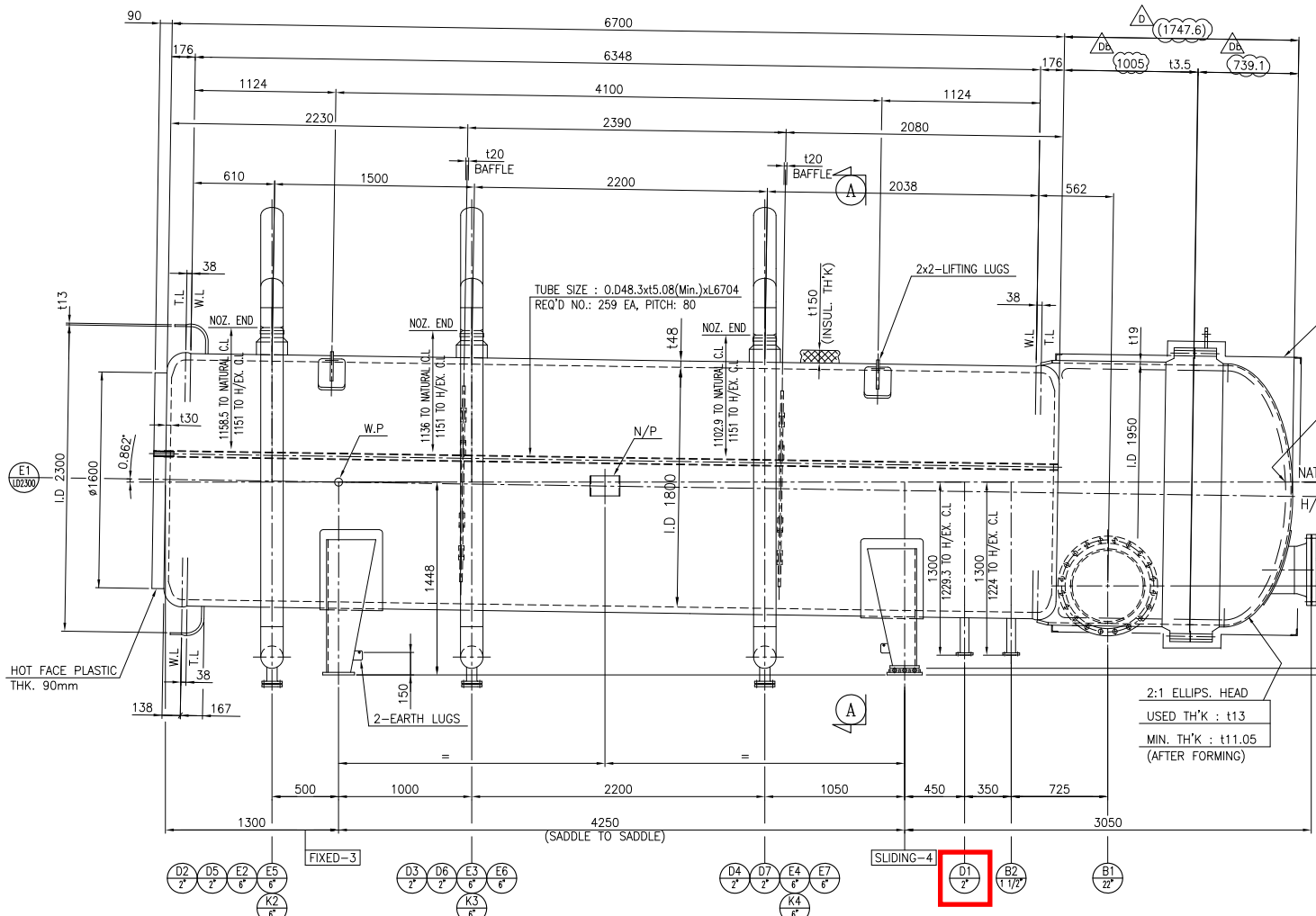
UHV PLANT PROJECT

GENERAL ASSEMBLY DRAWING (72B101/201/301) THERMAL REACTOR

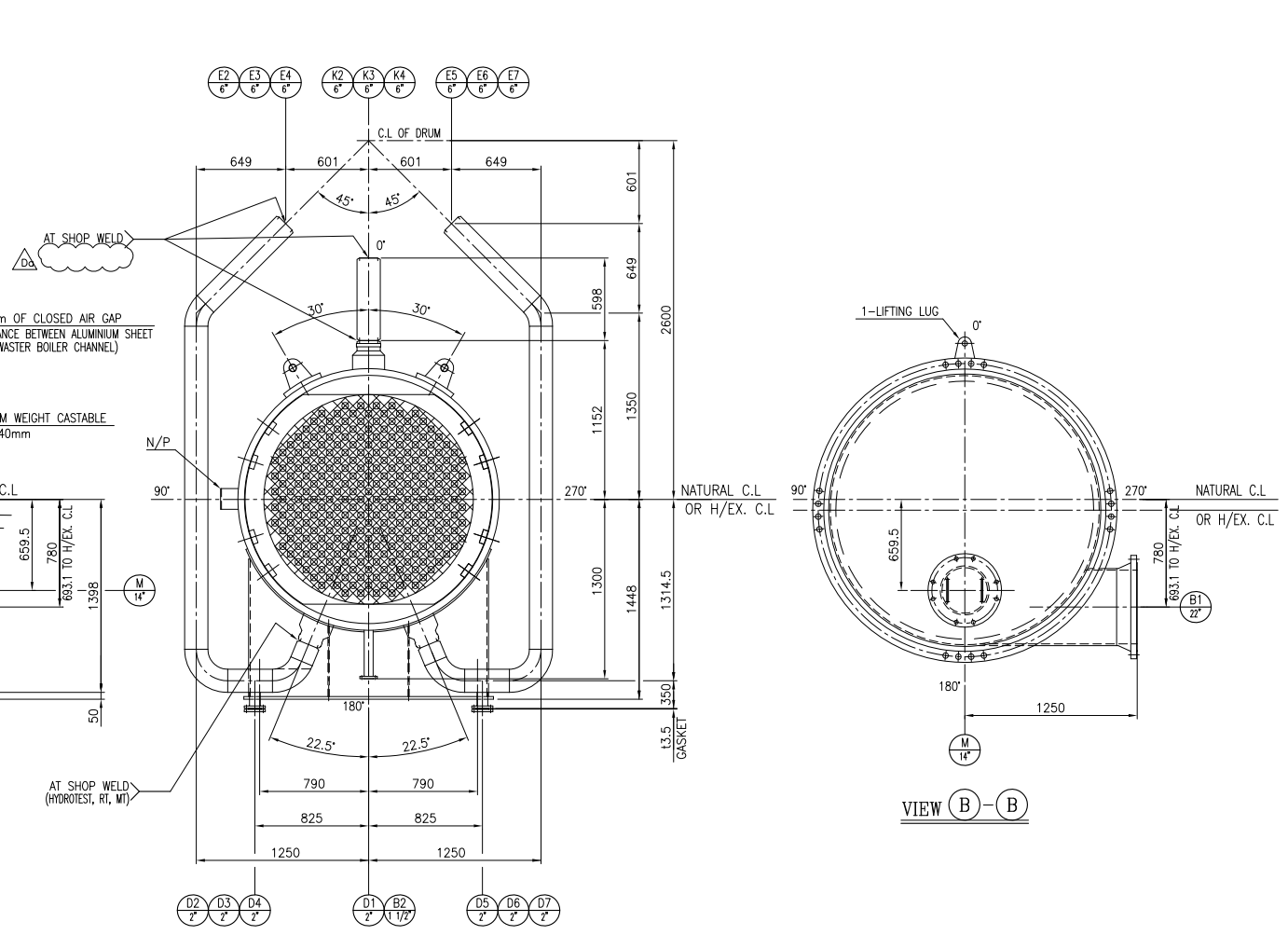
JOHN ZINK COMPANY LLC
PARTS AND SERVICE, PHONE 1-800-755-4252, FAX (918) 234-5705

DWG. No: 130087-72B101/201/301-VP-0010 SHEET 1 OF 1 Da

SCALE: 1/25 JOB NO. 14640 CONTRACT NO. 12151D



SIDE ELEVATION VIEW



SECTION A-A

NOTE

- CARBON STEEL USED FOR ALL PRESSURE PARTS SHALL BE FULLY KILLED WITH THE FOLLOWING MINIMUM RESTRICTIONS IN COMPOSITIONS :

C	CONTENT	% MAX.	0.23
S	CONTENT	% MAX.	0.005
P	CONTENT	% MAX.	0.015
Ni	CONTENT	% MAX.	1.0
- HARDNESS OF CARBON STEEL BASE MATERIAL, WELDS AND HAZ SHALL BE 200 HB MAXIMUM. PWHT REQUIRED FOR CARBON STEEL.
- HYDRAULIC TEST TO BE CARRIED OUT AFTER HAVING WELDED THE WASTE HEAT BOILER TO THE THERMAL REACTOR AND BEFORE REFRACTORY MATERIAL APPLICATION. CONNECTION WELDINGS TO BE FULLY RADIOGRAPHED AND POST WELD HEAT TREATED.
- ANALYSIS OF THE STRESS INDUCED IN THE SHELL BY SADDLES TO BE DEVELOPED BY VENDOR.
- GASKETS OF THE OUTLET HEAD SHALL BE AISI 316 METAL, DOUBLE JACKETED GRAPHOL FILLED.
- TUBES SHALL BE STRENGTH WELDED TO THE TUBESHEET. TUBE TO TUBESHEET WELDS SHALL BE IN ACCORDANCE WITH ASME I FIG. PET 12.1(g). TUBES SHALL BE LIGHT ROLLED AFTER WELDING.
- JACK SCREWS SHALL BE PROVIDED AROUND THE CHANNEL FLANGE.
- TUBESHEET THICKNESS TO BE MINIMIZED TO ALLOW EXPANSIONS AND CONTRACTIONS OF SHELL AND THERMAL REACTOR.
- NO CORROSION ALLOWANCE IS REQUIRED FOR HEAT EXCHANGE TUBES.
- SHELL SIDE TO BE DESIGNED ALSO FOR FULL VACUUM AT 100°C
- LIFTING LUGS TO BE PROVIDED FOR WHB AND CHANNEL COVER. LIFTING LUGS, INSULATION SUPPORTS AND PLATFORM BRACKETS TO BE WELDED BEFORE STRESS RELIEVING

- CONSTRUCT TO ACCORDING TO:
 ASME SECTION I
 LOCAL CODES, LAWS AND STANDARDS.
- HOT TUBESHEET TO BE DESIGNED FOR THE MAX TEMPERATURE CALCULATED BY A THERMAL ANALYSIS OF THE HOT TUBESHEET(+20) INCLUDING INSULATION EFFECT DUE TO THE TUBESHEET LINING, FERRULES, CERAPAPER AND GASKETS. IF THE TEMPERATURE, CALCULATED BY THE THERMAL ANALYSIS, IN THE HOTTEST POINT OF THE TUBESHEET EXCEEDS 320°C, THE TUBESHEET SHALL BE ALUMINIZED BY PLASMA FLAME SPRAYING PROCEDURE.
- THE SPACE BETWEEN THE FERRULES PLACED ON THE HOT TUBESHEET AND THE REFRACTORY BRICKS SHALL BE LINED WITH ONE LAYER OF HOT PLASTIC REFRACTORY WITH THE FOLLOWING CHARACTERISTICS:

MAXIMUM OPERATING TEMPERATURE	: 1700 °C
Al ₂ O ₃	: 90 % min.
Fe ₂ O ₃	: 0.5 % max.
ALKALIES	: 1 % max.
PERMANENT LINER AT 1650°C	: 1 % max.
TYPICAL DENSITY	: 3200 Kg/m ³
MATERIALS	: (90 RAM HS OF NUOVA SIRMA)
EQUIVALENT MATERIAL CAN BE USED	: PLIRAM 90 OF PLIBRICO
AISI 310 ANCHORS SHALL BE USED FOR THE REFRACTORY MATERIAL HOLDING.	
IN CASE OF CONVENTIONAL TYPE FERRULES THE HOT TUBESHEET SHALL BE LINED WITH ONE LAYER OF THE ABOVE HOT PLASTIC REFRACTORY (90mm THICKNESS TYPICAL)	
- STEAM SIDE INSULATION THICKNESS : 150mm
 OUTLET CHANNEL AND COVER HEAD : 50mm OF CLOSED AIR GAP IN ALUMINIUM SHEET
 OUTLET CHANNEL AIR GAP TO BE PROVIDED WITH 2 REGULABLE AT THE BOTTOM AND ONE RAIN SHIELDED OPENING ON THE TOP (200mm WIDTH).
- FLANGE BOLT HEADS SHALL STRADDLE THE NORTH-SOUTH OR NATURAL HORIZONTAL AND VERTICAL CENTER LINE OF VESSEL UNLESS OTHERWISE NOTED.
- GASKET MATERIAL : SPIRAL WOUND GASKET
 - FILLER : GRAPHITE, -HOOP : 316 S.S
 - INNER RING : 316SS - OUTER RING : C.S
- FLANGE
 - ASME B16.5: UP TO 24"
 - ASME B16.47 A SERIES: OVER 24"
- FERRULES
 EACH EXCHANGE PIPE ENTRANCE TO THE WHB SHALL BE PROTECTED BY FERRULES ; SIZE OF SQUIRE HEAD FERRULES ARE AS PER THE WHB DATA-SHEET. FOR PROTECTION OF TUBESHEET, CERAMIC SQUIRE HEAD TYPE (2 PIECE CONSTRUCTION) ARE PREFERRED INSTEAD OF CONVENTIONAL TYPE FERRULES.
 FERRULES CYLINDRICAL PARTS TO BE WRAPPED WITH 1.59MM OF KNOXWOL 3000 CERAMIC FIBRE SLEEVE WITH MAXIMUM TEMPERATURE 1540°C, SO THAT THE FIBRE FILLS THE ANNULUS BETWEEN THE OUTER SIDE OF THE FERRULE AND THE INNER SIDE OF THE TUBE, SO PROVIDING A "PUSH-FIT"; THE SQUIRE HEAD SHALL BE WRAPPED WITH 0.8MM THICKNESS OF THE SAME CERAMIC FIBRE SLEEVE. IN THE SPACE BETWEEN TUBESHEET AND SQUIRE HEADS A 6.35MM THICKNESS OF CERAMIC FIBRE SQUIRE GASKET SHALL BE PLACED. FERRULES MATERIAL SHALL HAVE FOLLOWING CHARACTERISTICS:

MAXIMUM OPERATING TEMPERATURE	: 1760 °C
ALUMINA	: 94 %
Fe ₂ O ₃	: 0.5 % MAX.
ALKALIES	: 0.5 % MAX.

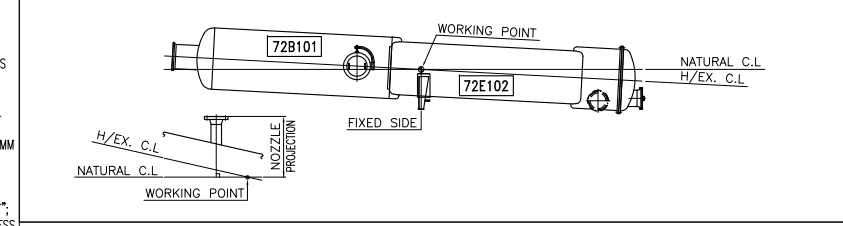
 DUE TO THE CRITICAL SIZE OF FERRULES, THE WHB EXCHANGE TUBES SHALL BE CALIBRATED; THE POSSIBILITY TO INSERT FERRULES IN THE TUBESHEET BEFORE AND AFTER WELDING SHALL BE VERIFIED IN SHOP.
 SUGGESTED FERRULES ERECTION SPARES 10%;
 START-UP SPARES 25%
 FILL GAP BETWEEN SQUIRE HEADS WITH FULL DEPTH MORTAR JOINT.

- CORROSION ALLOWANCE FOR TUBESHEET : 4.5mm
 (3mm PROCESS SIDE +1.5mm SHELL SIDE).

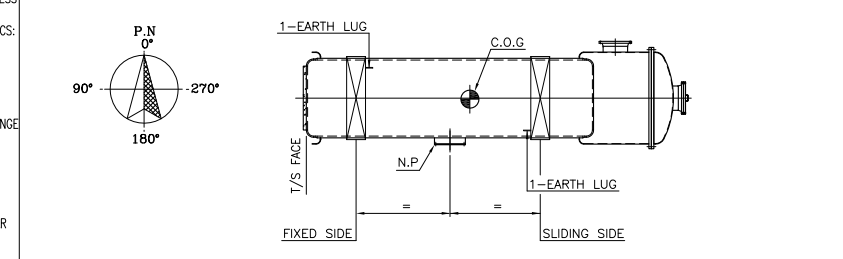
EXTERNAL FORCES AND MOMENTS ON NOZZLE

PIPE SIZE	FL (N) (KG)	Fø (N) (KG)	FR (N) (KG)	FA (N) (KG)	ML (Nm) (KGm)	Mø (Nm) (KGm)	MB (Nm) (KGm)	MT (Nm) (KGm)
1 1/2"	3,750	2,813	4,688	3,750	366	281	461	422
#600	383	287	478	383	37	29	47	43
2"	5,000	3,750	6,250	5,000	650	500	820	750
#600	510	383	638	510	66	51	84	77
6"	15,000	11,250	18,750	15,000	5,850	4,500	7,380	6,750
#600	1,531	1,148	1,913	1,531	597	459	753	689
14"	21,000	15,750	26,250	21,000	19,110	14,700	24,108	22,050
#150	2,143	1,607	2,679	2,143	1,950	1,500	2,460	2,250
22"	33,000	24,750	41,250	33,000	47,190	36,300	59,532	54,450
#150	3,367	2,526	4,209	3,367	4,815	3,704	6,075	5,556

SETTING OF NOZZLE



KEY PLAN



MATERIAL SPECIFICATIONS

SHELL	SAS16-60N
HEADS	SAS16-60N
NOZZLE FLANGES	SA105N
NOZZLE NECKS	SA106-B
GASKETS	316 SS SPIRAL WOUND
STUD BOLTS / NUT	SA193-B7/SA194-2H
SADDLES & SUPPORT	SA283-C
TUBE SHEET	SA286 2
TUBE	SA210-A1
PAD & WEAR PLATE	SAS16-60N

MARK	Q'TY	SIZE	SCH.	RATING	FACING	SERVICE	REMARKS	ORIENTATION	NOZZLE AND CONNECTIONS
B2	1	1 1/2"	-	ASME #600	LWN, RF	DISCONTINUOUS BLOW DOWN	SEE DWG.	SEE DWG.	
M	1	14"	40	ASME #150	WN, RF	INSPECTION HOLE (WITH BLIND FLANGE)	SEE DWG.	SEE DWG.	
D2-7	6	2"	160	ASME #600	WN, RF	DRAIN WITH BLIND FLANGE	SEE DWG.	SEE DWG.	
D1	1	2"	160	ASME #600	WN, RF	DRAIN	SEE DWG.	SEE DWG.	
E2-7	6	6"	-	FORGED	B.W	DOWNCOMERS	SEE DWG.	SEE DWG.	
K2-4	3	6"	-	FORGED	B.W	RISERS	SEE DWG.	SEE DWG.	
B1	1	22"	t13	ASME #150	WN, RF	PROCESS GAS OUTLET	SEE DWG.	SEE DWG.	
E1	1	1.02300	-	-	-	THERMAL REACTOR CONNECTION	SEE DWG.	SEE DWG.	
MARK	Q'TY	SIZE	SCH.	RATING	FACING	SERVICE	REMARKS	ORIENTATION	NOZZLE AND CONNECTIONS

DESIGN DATA

CODE	ASME SEC. I, (2010 ED. 2011 ADD.)	TYPE	YES	NO	
FLUID	SHLL SIDE TUBE SIDE	WIND DESIGN	ASCE-7-2005, 40m/s		
DESIGN	PRESS.(INT./EXT.) (bar g)	52/F.V	5/-	SEISMIC DESIGN	UBC-97, ZONE 1
OPER.	TEMP.(INT./EXT.) (°C)	295	350(WALL)	Sp. Gr.	(N./OUT.)
	PRESS. (bar g)	48	0.520	INSULATION (mm)	SEE NOTE 14.
	TEMP.(IN./OUT.) (°C)	154/263	1246/334	FIRE PROOFING (mm)	NO
CORROSION ALLOWANCE(mm)	3	NOTE 8		PAINTING	SEE SPEC.
JOINT EFFICIENCY (S/H)	1.0/-	1.0/-		M.D.M.T	(°C) (1) (1)
RADIOGRAPHY (S/H)	FULL/-	FULL/-		NO. OF PASS	1 (ONE) 1 (ONE)
P.W.H.T.	YES	YES		SURFACE AREA/SHELL (M ²)	-
STRESS RELIEVE	YES	YES		WEIGHT	
HYDRO. TEST PRESS. (bar g)	78	7.5			
PNEUM. TEST PRESS. (bar g)	-	-		ERECTION	(KG) 35172
M.A.W.(HOT & COLD) (bar g)	52	5		EMPTY	(KG) 35172
M.A.P.(NEW & COLD) (bar g)	-	-		OPER.	(KG) 45885
VOLUME (M ³)	-	-		FULL WATER	(KG) 48918
				REFRACTORY	(KG) 1510

FOR:	IRPC PUBLIC CO LTD
USER:	GS E&C AND SK E&C
JOB SITE:	RAYONG, THAILAND
S.O. NO.:	9139652
P.O. NO.:	130087-PO-M-B-502
JZ DRAWING NO.:	9139652-V51-300-0001



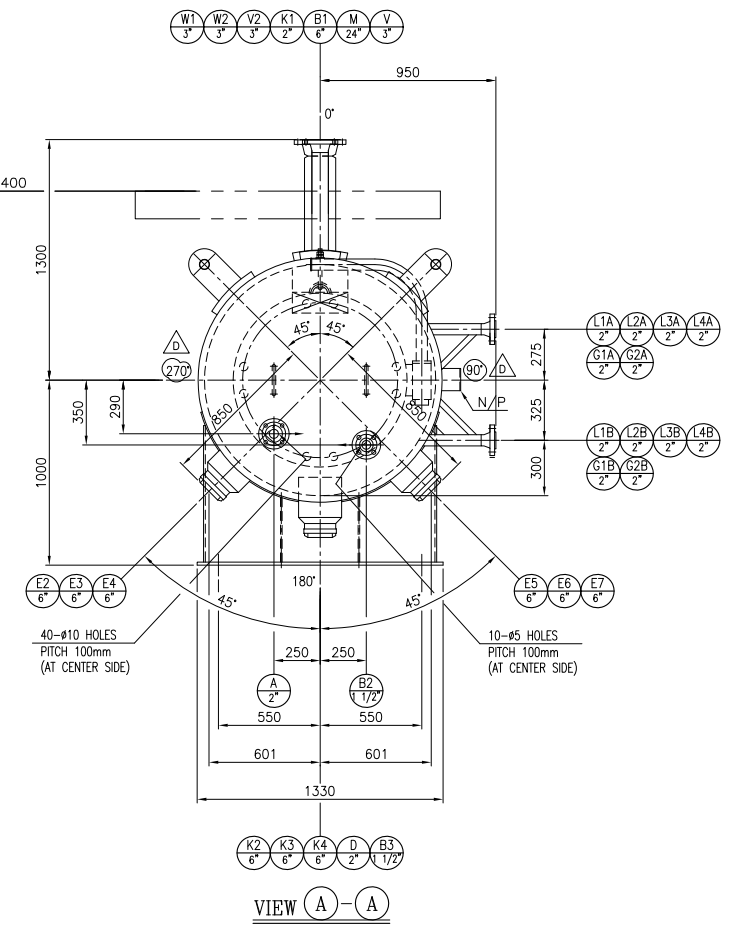
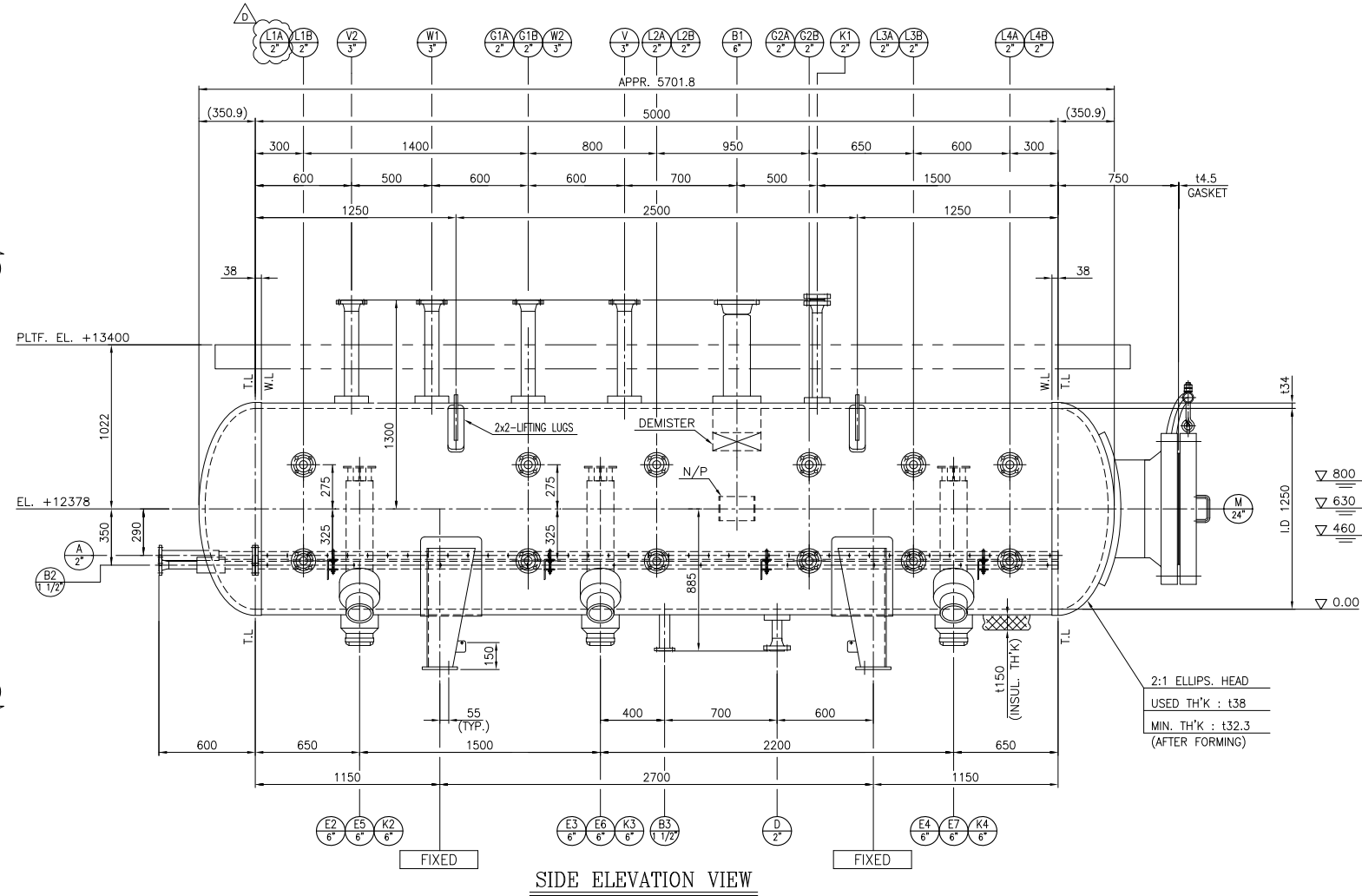
REV.	DATE	DESCRIPTION	PRPD	CHKD	REVD	APPD
Db	26.JUN.'14	FOR APPROVAL	K.C LEE	W.S YANG	H. KANG	S.M HONG
D	26.MAY.'14	FOR APPROVAL	K.C LEE	W.S YANG	H. KANG	S.M HONG
C	20.MAR.'14	FOR APPROVAL	K.C LEE	W.S YANG	H. KANG	S.M HONG
B	25.NOV.'13	FOR APPROVAL	K.C LEE	W.S YANG	H. KANG	S.M HONG

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UHV PLANT PROJECT
 GENERAL ASSEMBLY DRAWING
 (72E102/202/302)
 WASTE HEAT BOILER FOR THERMAL REACTOR

DWG. No.:	130087-72E102/202/302-VP-0011	SHEET	1 OF 1	Db	
SCALE:	1/25	JOB NO.:	14640	CONTRACT NO.:	12151D



NOTE

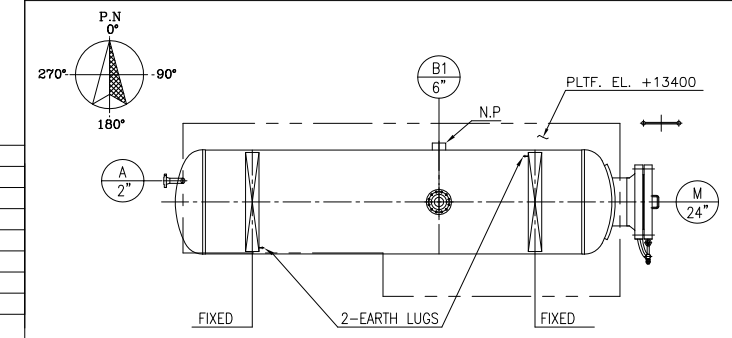
- CARBON STEEL USED ON ALL PRESSURE PARTS TO BE WITH CARBON CONTENT OF 0.23% MAXIMUM.
- ANALYSIS OF THE STRESS INDUCED IN RISERS AND DOWNCOMERS TO BE DEVELOPED.
- TO BE DESIGNED ALSO FOR FULL VACUUM AT 100°C
- STEAM PRODUCTION : 7857 Kg/h
STEAM RATES : 2593 Kg/m³h VAPOUR SPACE AT NLL
: 905 Kg/m²h EVAPORATION SURFACE AT NLL
- HOLD UP TIMES :
- BETWEEN LAH AND LAHH : 3 MINUTES
- BETWEEN NOL AND HLL : 3 MINUTES
- BETWEEN LLL AND NOL : 3 MINUTES
- BETWEEN LALL AND LLL : 3 MINUTES
- BETWEEN EMPTY AND LALL : 12 MINUTES
- MIST ELIMINATOR SIZE TO BE CONFIRMED BY VENDOR.
MIST ELIMINATOR EFFICIENCY 99.9%. MIST ELIMINATOR VENDOR TO STATE IF AN IMPINGEMENT PLATE HAS TO BE INSTALLED UNDERNEATH THE MIST ELIMINATOR.
- INTERNALS TO BE DISMANTABLE AND REMOVABLE THROUGH MANHOLE FOR INSPECTION AND MAINTENANCE.
POSITION OF BOILER FEED WATER INLET NOZZLE TO BE CONFIRMED.
BOILER FEED WATER INLET NOZZLE SHALL BE EQUIPPED WITH DISTRIBUTOR (TO BE CHECKED/BY VENDOR).
FEED CHARACTERISTICS:
- DESIGN OF INTERNALS TO BE DEFINED BY VENDOR.
- INSULATION TO BE PROVIDED FOR HEAT CONSERVATION. INSULATION THICKNES: 150mm
- LIFTING LUGS TO BE PROVIDED.
LIFTING LUGS, PLATFORM BRACKETS AND INSULATION SUPPORTS TO BE WELDED BEFORE STRESS RELIEVING.
- DELETED-
- GUIDED WAVE RADAR TYPE LEVEL TRANSMITTER BY OTHERS.
- CONSTRUCTION ACCORDING TO:
ASME SECTION I AS PER DATA SHEET
LOCAL CODES, LAWS AND STANDARDS.
- FLANGE BOLT HOLES SHALL STRADDLE THE NORTH-SOUTH OR NATURAL HORIZONTAL AND VERTICAL CENTER LINE OF VESSEL UNLESS OTHERWISE NOTED.
- GASKET MATERIAL : SPIRAL WOUND GASKET
- FILLER : GRAPHITE, -HOOP : 316 S.S., - INNER RING : 316 S.S
- OUTER RING : C.S
- FLANGE
- ASME B16.5: UP TO 24"
- ASME B16.47 A SERIES: OVER 24"
- GASKET CONTACT SURFACE OF NOZZLE FLANGE SHALL HAVE 125-250 AARH WITH SPIRAL SERRATED AS PER ASME B16.5

NOZZLE	PHASE	FLOWRATE (Kg/h)	FLEXIBILITY	DENSITY (Kg/m ³)
A	LIQUID	8120	20-100%	915.7 @154°C

EXTERNAL FORCES AND MOMENTS ON NOZZLE

PIPE SIZE	FL (N) (KG)	Fø (N) (KG)	FR (N) (KG)	FA (N) (KG)	ML (Nm) (KGm)	Mø (Nm) (KGm)	MB (Nm) (KGm)	MT (Nm) (KGm)
1 1/2"	3,750	2,813	4,688	3,750	366	281	461	422
#600	383	287	478	383	37	29	47	43
2"	5,000	3,750	6,250	5,000	650	500	820	750
#600	510	383	638	510	66	51	84	77
3"	7,500	5,625	9,375	7,500	1,463	1,125	1,845	1,688
#600	765	574	957	765	149	115	188	172
6"	15,000	11,250	18,750	15,000	5,850	4,500	7,380	6,750
#600	1,531	1,148	1,913	1,531	597	459	753	689
24"	60,000	45,000	75,000	60,000	93,600	72,000	118,080	108,000
#600	6,122	4,592	7,653	6,122	9,551	7,347	12,049	11,020

KEY PLAN



NOZZLE AND CONNECTIONS										DESIGN DATA				MATERIAL SPECIFICATIONS					
V2	1	3"	S.160	ASME #600	WN, RF	VENT													
M	1	24"	t20	ASME #600	WN, RF	MANHOLE	/W DAVIT	SEE DWG.	SEE DWG.										
V	1	3"	S.160	ASME #600	WN, RF	VENT		SEE DWG.	SEE DWG.										
K2-4	3	6"	-	FORGED	B.W	RISERS		SEE DWG.	SEE DWG.										
K1	1	2"	S.160	ASME #600	WN, RF	SPARE with BLND.		SEE DWG.	SEE DWG.										
W12	2	3"	S.160	ASME #600	WN, RF	PSV		SEE DWG.	SEE DWG.										
LH-4 A/B	8	2"	S.160	ASME #600	WN, RF	LEVEL TRANSMITTER	SEE NOTE NO.12	SEE DWG.	SEE DWG.										
G1-G2 A/B	4	2"	S.160	ASME #600	WN, RF	LEVEL GAUGE		SEE DWG.	SEE DWG.										
E2-7	6	6"	-	FORGED	B.W	DOWNCOMER		SEE DWG.	SEE DWG.										
D	1	2"	S.160	ASME #600	WN, RF	DRAIN		SEE DWG.	SEE DWG.										
B3	1	1 1/2"	-	ASME #600	LWN, RF	DIS. CONTINUOUS		SEE DWG.	SEE DWG.										
B2	1	1 1/2"	-	ASME #600	HB, RF	CONT. B/D		SEE DWG.	SEE DWG.										
B1	1	6"	S.80	ASME #600	WN, RF	HP STEAM OUT		SEE DWG.	SEE DWG.										
A	1	2"	S.80	ASME #600	WN, RF	BFW INLET		SEE DWG.	SEE DWG.										
MARK	Q'TY	SIZE	SCH.	RATING	FACING	SERVICE	REMARKS	ORIENTATION	FACE										

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DATE	DESCRIPTION	PRPD	CHKD	REVD	APPD
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IRPC Public Company Limited
RAYONG, THAILAND

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FOSTER WHEELER INTERNATIONAL CORPORATION.

GSE&C SK E & C
CONSORTIUM OF GS E&C AND SK E&C

UHV PLANT PROJECT
GENERAL ASSEMBLY DRAWING
(72D101/201/301)
STEAM DRUM FOR THERMAL REACTOR

JOHN ZINK
JOHN ZINK COMPANY LLC
PARTS AND SERVICE, PHONE 1-800-755-4252, FAX (918) 234-5705

DWG. No: 130087-72D101/201/301-VP-0012 SHEET 1 OF 1 Dα
SCALE: 1/20 JOB NO. 14640 CONTRACT NO. 12151D