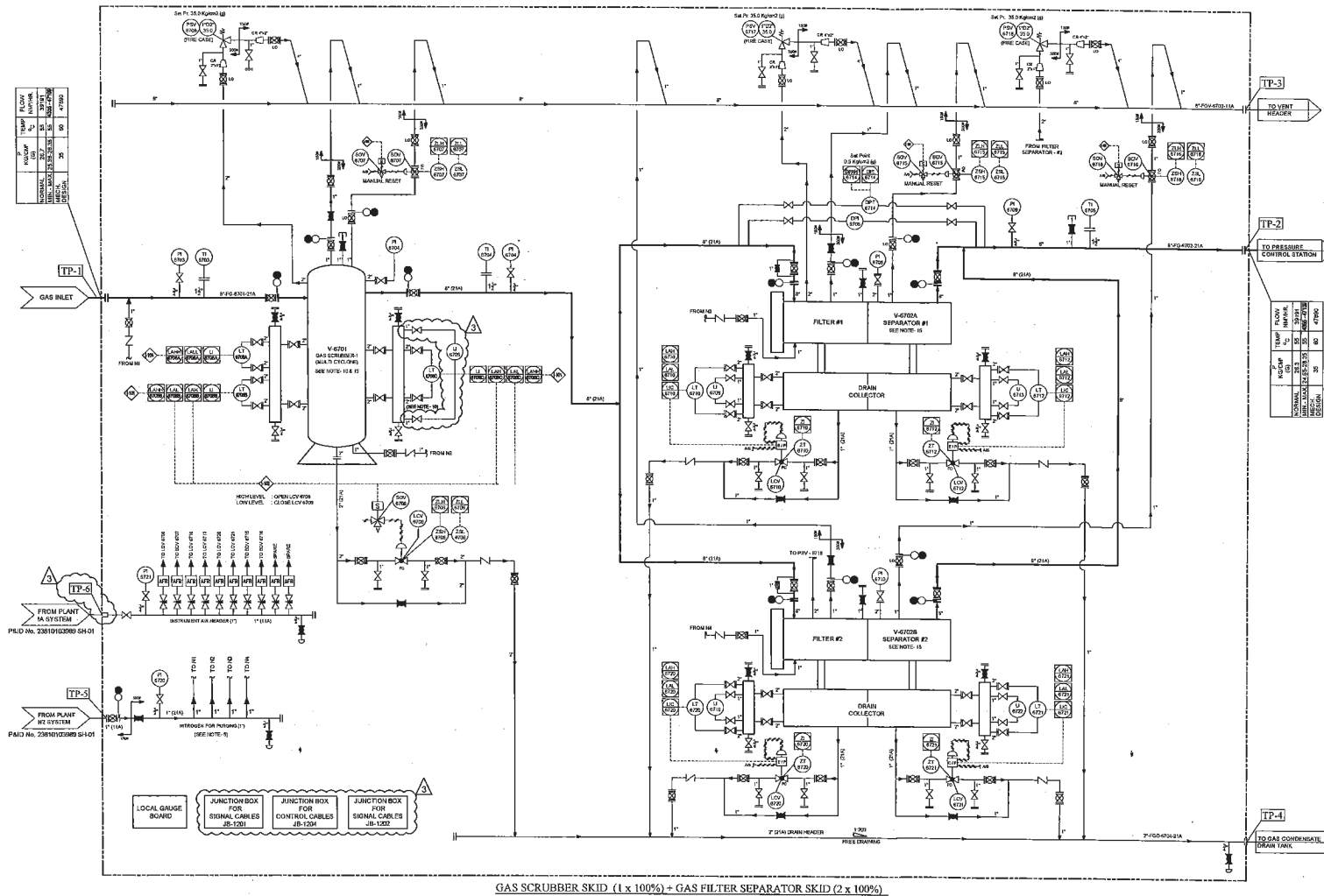


Annexure 20


Technical Details of Scrubber cum Filter Separator (Ramgarh Project)

DO NOT SCALE- IF IN DOUBT ASK









LEGENDS

1.0 INSTRUMENT LINE SYMBOLS



















	PROCESS/ UTILITY
	ELECTRICAL SIGNAL
	PNEUMATIC SIGNAL

2.0 FUNCTIONAL SYMBOLS

	FIELD MOUNTED INSTRUMENTS
	INDICATES LOCAL PANEL/ LOCAL GAUGE BOARD
	INDICATES DCS INSTRUMENT (CLIENT SCOPE)
	INDICATES PLC
	INTERLOCK REPRESENTATION EXECUTION IN PLC SYSTEM
	GRAND PRIX SCOPE

TP-1	INLET
TP-2	OUTLET
TP-3	VENT HEADER
TP-4	DRAIN HEADER
TP-5	NITROGEN PURGING
TP-6	INST. AIR HEADER

3.0 VALVES & INST. SYMBOLS

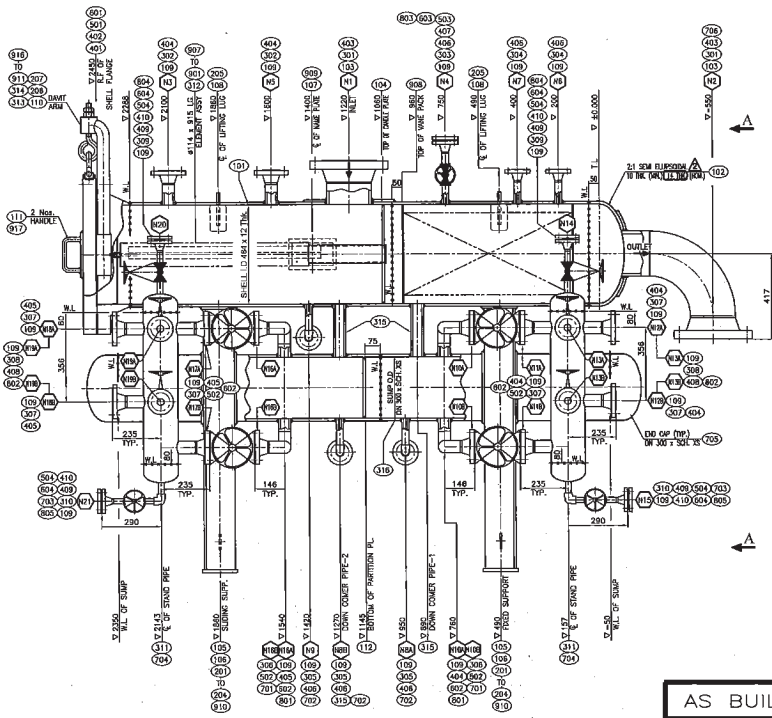
-  BALL VALVE
-  GLOBE VALVE
-  GATE VALVE
-  CHECK VALVE
-  NEEDLE VALVE
-  3-WAY SOLENOID VALVE
-   SPECTACLE BLIND OPEN
-   SPECTACLE BLIND CLOSED
-  PRESSURE GAUGE
-  TEMPERATURE GAUGE
-  LEVEL GAUGE
-  LEVEL TRANSMITTER
-  POSITIONER TRANSMITTER
-  PRESSURE SAFETY VALVE
-  CONTROL VALVE GLOBE TYPE
-  BLOW DOWN VALVE BALL TYPE

REFERENCE DRAWING OF BHEL

DRG. NO. : 1-38101-05360, REV.01
P & ID FOR OFF-BASE FUEL GAS SYSTEM FOR GT

AS BUILT

DO NOT SCALE- IF IN DOUBT ASK



ELEVATION

AS BUILT

NOTES

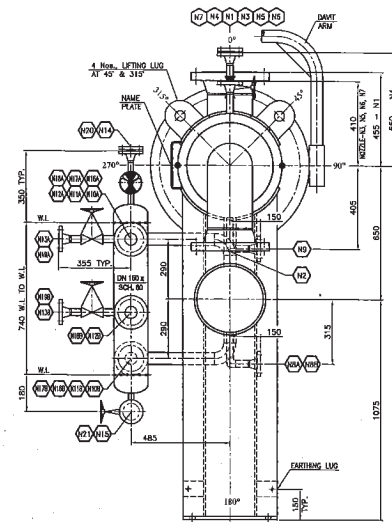
- GENERAL:
 - ALL DIMENSIONS ARE IN MM, UNLESS OTHERWISE STATED.
 - ALL PRESSURE ARE GAUGE (g) PRESSURE UNLESS OTHERWISE SPECIFIED
 - STRUCTURAL QUALITY MATERIAL SHALL NOT BE DIRECTLY WELDED TO ANY PRESSURE RETAINING PART.
 - ALL SHARP CORNERS SHALL BE ROUNDED OFF TO SMOOTH RADII (SEE MIN).
 - AS PER UG-90(b), FOOTNOTE-34 THE MAXIMUM ALLOWABLE WORKING PRESSURE IS ASSUMED TO BE THE SAME AS THE DESIGN PRESSURE SINCE CALCULATIONS ARE NOT MADE TO DETERMINE THE MAXIMUM ALLOWABLE WORKING PRESSURE.
 - ALL FLANGE BOLT HOLES SHALL BE STRADDLE TO THE MAIN CENTER LINE OF EQUIPMENT.
 - ALL MACHINED SURFACES AND THREADED CONNECTION TO BE PROTECTED WITH RUST PREVENTIVE.
 - NOZZLE UP TO 50 MM DIA. SIZE IS TO BE STIFFENED WITH 2 Nos. OF 40mm WIDEx8mm THK FLATS WELDED AT 90° APART.
 - PROJECTIONS:
 - FOR NOZZLES ON SHELL, PROJECTIONS ARE REFERRED FROM VESSEL CENTER LINE TO FLANGE CONTACT FACE.
 - FOR NOZZLES ON HEAD, PROJECTIONS ARE REFERRED FROM HEAD T/L TO FLANGE CONTACT FACE.
 - ALL FLANGE FACE SHALL BE FINISHED TO 125-250 AARH.
 - THE ROLLING OF PLATE FOR MAKING SHELL SHALL BE LENGTHWISE.
 - EARTHING CLEAT SHALL NOT BE PAINTED.
- MATERIALS:
 - PLATES FOR PRESSURE PARTS SHALL BE IN NORMALIZED CONDITION. STEEL SHALL BE FULLY KILLED AND CONFORMING TO FINE AUSTENITIC GRAIN SIZE AS PER SA 20. PLATE SHALL HAVE $\leq 60.23\% \pm C.E. \leq 0.43\%$.
 - ALL FLANGES SHALL BE PROCURED IN NORMALIZED CONDITION WITH CARBON CONTENT $\leq 0.23\% \pm C.E. \leq 0.43\%$, HARDNESS ≤ 187 BHN.
 - ALL NOZZLE PIPES SHALL BE SEAMLESS AND SHALL HAVE CARBON CONTENT $\leq 0.23\% \pm C.E. \leq 0.43\%$, HARDNESS ≤ 200 BHN.
 - PIPE SHALL BE PROCURED EITHER HOT FINISHED OR IF COLD DRAWN, THEN IN NORMALIZED CONDITION.
 - MATERIAL CERTIFICATE FOR PRESSURE PARTS SHALL BE EN10204-3.1
- WELDING & HEAT TREATMENT:
 - ALL WELDING EDGES SURFACES SHALL BE GROUND TO BRIGHT METAL (AFTER FLAME CUTTING) TO REMOVE SURFACE OXIDES AND SHALL BE D.P. EXAMINED FOR INDICATION OF CRACKING OR LAMINATION.

- ALL BUTT WELD SHALL BE FULL PENETRATION (TYPE-1) AS PER ASME TABLE UW-12, SHALL BE BACK CHIPPED TO SOUND METAL & REWELDED FROM THE SECOND SIDE, IF BACK CHIP TO SOUND METAL IS NOT POSSIBLE THEN ROOT RUN BY OTAWALL WELDS TO BE D.P. TESTED.
- NOZZLE GROOVE WELD ATTACHMENT SHALL BE FULL PENETRATION AS PER ASME UW-16, SHALL BE BACK CHIPPED TO SOUND METAL AND REWELDED FROM THE SECOND SIDE AND IF THE BACK CHIP IS NOT PRACTICAL, THEN ROOT PASS SHALL BY OTAW.
- FILLET WELD SIZES SHOWN IN THE DRAWING ARE MINIMUM.
- ANY OFFSET WITHIN THE ALLOWABLE TOLERANCE PROVIDED SHALL BE TAPERED AT A 3:1 TAPER OVER THE WIDTH OF FINISHED WELD.
- INSPECTION & TESTING:
 - ALL NOZZLES TO SHELL WELDS (ROOT RUN & FINAL RUN) SHALL BE D.P. EXAMINED.
 - ALL WELD JOINTS TO BE D.P. TESTED ON ROOT RUN AND AFTER FINAL WELDING AS PER ASME SEC. VIII DIV1 ACCEPTANCE CRITERIA SHALL BE AS PER APPENDIX B OF ASME SEC. VIII DIV1.
 - MAGNETIC PARTICLE/DYE PENETRANT EXAMINATION SHALL BE CARRIED OUT ON THE OUTSIDE AND INSIDE SURFACE INCLUDING EDGES OF ELIPTICAL HEADS IN KNUCKLE ZONE, AFTER FORMING, FOR DETECTION OF CRACKS.
 - EACH PAD SHALL HAVE 2 NOS. #3 NPT T.T. HOLE LOCATED AT 45° OFF OF THE LONGITUDINAL AXIS OF THE VESSEL AND TESTED AT 1.05 KG/CM²(G) WITH AIR SOAP SOLUTION AND THE HOLE SHALL BE FLUGHED WITH HEAVY GREASE AFTER TESTING.
 - IMPACT TESTING CONDUCTED AS PER (D) (LARGE UCS-HWC) FOR STD. FLANGES, (D) UCS-66 NOTE (C) FOR FASTENERS (II) AS PER UG-20(1) FOR SHELL, HEAD, RF PADS, NOZZLE NECKS & FOR OTHER ITEMS.
 - HYDROSTATIC TEST SHALL BE CONDUCTED AS PER FOLLOWING:
 - VESSEL SHALL BE THOROUGHLY CLEANED INSIDE & OUTSIDE AND SHALL BE FREE OF DIRT, DEBRIS AND ALL LOOSE FOREIGN MATTER.
 - DURING HYDROTEST, PRESSURE GAUGE SHALL BE MOUNTED ON TOP OF THE VESSEL.
 - EQUIPMENT SHALL DRIED WITH HOT AIR.
 - TOLERANCES:
 - VESSEL TOLERANCES SHALL BE AS PER EFL STANDARD 7-12-0001 REV.5.
 - TOLERANCE ON DSH END SHALL BE AS PER UG-81.
 - PERMISSIBLE OUT-OF-ROUNDNESS OF CYLINDRICAL SHELL AS PER UG-80.
 - TOLERANCES ON FILLET WELD SIZE ± 2.0 .
 - TOLERANCES ON ROOT GAP & ROOT FACE SHALL BE $\pm 1mm$.

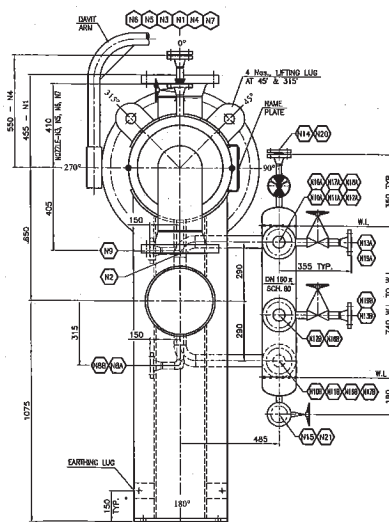
S.No.	DESCRIPTION	APPLICABLE CODES AND STANDARD
10	ASME B16.11 (2011)	FORGED FITTING, SOCKET-WELDING AND WELDED
9	ASME B16.9 (2012)	FACTORY MADE WROUGHT BUTT WELDING FITTINGS
8	ASME B36.10M (2004)	WELDED AND SEAMLESS WROUGHT STEEL PIPE
7	ASME/ANSI B1.1 (2003)	UNITED NUTS AND SCREW THREADS
6	ASME B16.2.2 (2010)	SQUARE AND HEX NUTS (NUT SERIES)
5	ASME B16.20 (2012)	WELDING CARBON FOR PIPE FLANGES SPIN WELD
4	ASME B16.5 (2013)	PIPE FLANGES AND FLANGE FITTINGS
3	ASME SEC. II PART D : EDITION 2010, AND 2010a	
2	ASME SEC. II PART A : EDITION 2010, AND 2010a	
1	ASME SEC. VIII DIV. 1 : EDITION 2010, AND 2010a	

S.No.	TITLE	SPEC. No.
4	P & ID FOR OFF-SITE TAIL GAS SYSTEM FOR P1	1-38101-05380
3	GENERAL SPECIFICATION OF GAS CONDENSING SYSTEM	GT 57251
2	PAPING MATERIAL SPECIFICATION	ANORME-4 IF OF 0508
1	JOB SPECIFICATION FOR GAS COND. SYSTEM	GT 57551

APPLICABLE PURCHASER'S SPECIFICATION



VIEW FROM A-A
NOZZLE ORIENTATION FOR ITEM No. : V6702 A



VIEW FROM A-A
NOZZLE ORIENTATION FOR ITEM No. : V6702 B

NOZZLE SCHEDULE (PER EQPT.)

MARK	QTY.	DN	INCH	THICK.	STD.	FLANGING	TYPE	PLATE	SERVICE	PROJECTION	REF. NOTE	PAD REQ.
N1	1	200	80	12.70	816.5	300A	WN	RF	INLET	SEE DRAWING		0.8 440 x 10 223 x 12 T6
N2	1	200	80	12.70	816.5	300A	WN	RF	OUTLET	SEE DRAWING		0.8 440 x 10 223 x 12 T6
N3	1	50	180	8.74	816.5	300A	WN	RF	PRESSURE GAUGE	SEE DRAWING		
N4	1	25	XOS	9.09	816.5	300A	WN	RF	VENT+GLOBE VALVE+BLRF	SEE DRAWING		
N5	1	50	180	8.74	816.5	300A	WN	RF	PSV	SEE DRAWING		
N6	1	25	XOS	9.09	816.5	300A	WN	RF	VENT TO HEADER	SEE DRAWING		
N7	1	25	XOS	9.09	816.5	300A	WN	RF	BBV	SEE DRAWING		
N8A/B	2	25	XOS	9.09	816.5	300A	WN	RF	DRAIN	SEE DRAWING		
N9	1	25	XOS	9.09	816.5	300A	WN	RF	PURGING	SEE DRAWING		
N10A/B	2	50	180	8.74	816.5	300A	WN	RF	STAND PIPE+GATE VALVE	SEE DRAWING		
N11A/B	2	50	180	8.74	816.5	300A	WN	RF	STAND PIPE	SEE DRAWING		
N12A/B	2	50	180	8.74	816.5	300A	WN	RF	LT	SEE DRAWING		
N13A/B	2	25	XOS	9.09	816.5	300A	WN	RF	LH-GATE VALVE	SEE DRAWING		
N14	1	20	XOS	7.82	816.5	300A	WN	RF	VENT+GLOBE VALVE+BLRF	SEE DRAWING		
N15	1	20	XOS	7.82	816.5	300A	WN	RF	DRAIN+GATE VALVE+BLRF	SEE DRAWING		
N16A/B	2	50	180	8.74	816.5	300A	WN	RF	STAND PIPE+GATE VALVE	SEE DRAWING		
N17A/B	2	50	180	8.74	816.5	300A	WN	RF	STAND PIPE	SEE DRAWING		
N18A/B	2	50	180	8.74	816.5	300A	WN	RF	LT	SEE DRAWING		
N19A/B	2	25	XOS	9.09	816.5	300A	WN	RF	LH-GATE VALVE	SEE DRAWING		
N20	1	20	XOS	7.82	816.5	300A	WN	RF	VENT+GLOBE VALVE+BLRF	SEE DRAWING		
N21	1	20	XOS	7.82	816.5	300A	WN	RF	DRAIN+GATE VALVE+BLRF	SEE DRAWING		

DESIGN DATA :

- CODE OF CONSTRUCTION : ASME SEC. VIII DIV.-1, ED. 2010 ADD. 2010a
- ASME CERTIFICATION MARK : NO
- NATIONAL BOARD REGS. : NO
- APPLICABLE LOADING : Only classes a, b, d, f and j of UG-22
- DESIGN PRESSURE (INTERNAL) : 35 Kg/Cm² (g)
- DESIGN PRESSURE (EXTERNAL) : NIL
- WAMP (INTERNAL) : 35 Kg/Cm² (g) (SEE NOTE - A5)
- HYDROSTATIC TEST PRESSURE : 45.50 Kg/Cm² (g)
- HYDROSTATIC AT : 60 °C
- DESIGN TEMPERATURE : 2 °C (AMBIENT) AT 35 Kg/Cm² (g)
- MINIAT : 2 °C (AMBIENT) AT 35 Kg/Cm² (g)
- INTERSTIC TEST TEMPERATURE : > 17 °C NOT TO EXCEED 48 °C
- SEALANT : NATURAL GAS (NON LETHAL)
- RETENTION CAPACITY : 166 LITERS
- RADIOGRAPHY (RT) : 100% (RT-1) - ALL BUTT WELDS
- JOINT EFFICIENCY : 1
- PAINT - VESSEL : NIL (AS PER CODE)
- PAINT - DISHED END : SW AFTER COLD FORMING (SEE TABLE-A)
- IMPACT TESTING REQ. : NO (SEE NOTE - 05)
- WIND SPECIFICATION : AS PER IS 875 (47 m/s)
- SDS/MC : AS PER IS 1883 PART-4 (ZONE-II)
- INSULATION : NO
- INSULATION CLAYS : NA
- FIRE PROOFING : NO

PROCESS DATA :

- OPERATING MEDIUM : NATURAL GAS
- FLOW RATE (MM/HR/MS) : 4355/39191/47109 Nm³/hr.
- PRESSURE DROP (BAR/MT) : 0.168 / 0.5 Kg/Cm² (g)
- SEPARATOR EFFICIENCY : 100% FOR 8 MICRONS & LARGER - LIQUID REMOVAL
- SEPARATOR EFFICIENCY : 100% FOR 3 MICRONS & LARGER - SOLID REMOVAL
- SEPARATOR EFFICIENCY : 99.5% FOR 0.5 TO 2 MICRONS

OPERATING DATA :

- OPERATING PR. (MM/HR/MS) : 25.35/26.7/28.35 Kg/Cm² (g)
- OPERATING TEMP. : 55 °C
- RETENTION CAPACITY : 166 LITERS
- EMPTY WEIGHT : 2215 Kgs. (APPROX.)
- OPERATING WEIGHT : 2431 Kgs. (APPROX.)
- NET WEIGHT (SHIP) : 2896 Kgs. (APPROX.)

ELEMENT DATA :

- TYPE OF ELEMENT : COALESCENT TYPE (CARTRIDGE)
- ELEMENT SIZE : #114 x 915 Lg.
- ELEMENT MATERIAL : FIBER GLASS
- ELEMENT MAKE : JUNAL
- ELEMENT WEIGHT (Nls.) : 1.6 Kg (APPROX.)
- NO OF ELEMENT : 08 Nos.
- COLLAPSE PLE DROP : 2.0 Kg/Cm² (g)

SURFACE PREPARATION & PAINTING

SURFACE FINISH

- BURST CLEANING TO Sa 2 1/2.

PAINTING

- PRIMER : ONE COAT OF INORGANIC ZINC SILICATE PRIMER @ 65-75 µ DFT / COAT
- INTERMEDIATE PAINT : TWO COAT OF EPOXY HIGH BUILD PAINT @ 100 µ DFT/COAT.
- FINISH PAINT : TWO COATS OF ACRYLIC POLY URETHANE PAINT @ 40 µ DFT / COAT. TOTAL DFT 355 µ. DFT (Nls.)
- FINISH PAINT COLOUR SHADE : CANNERY YELLOW RAL No. : 1018

INSPECTION

- BHEL

QUANTITY

- 1 No. FOR ITEM No. V-6702A
- 1 No. FOR ITEM No. V-6702B

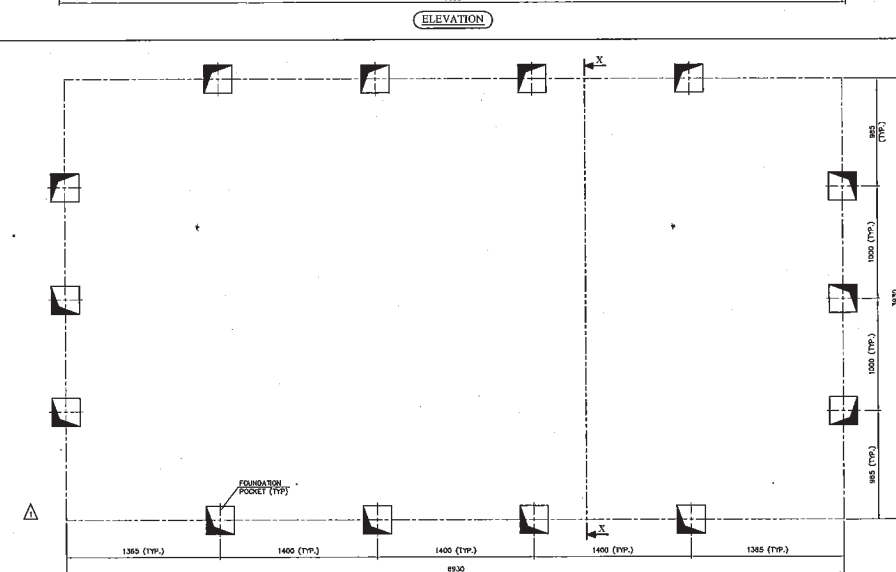
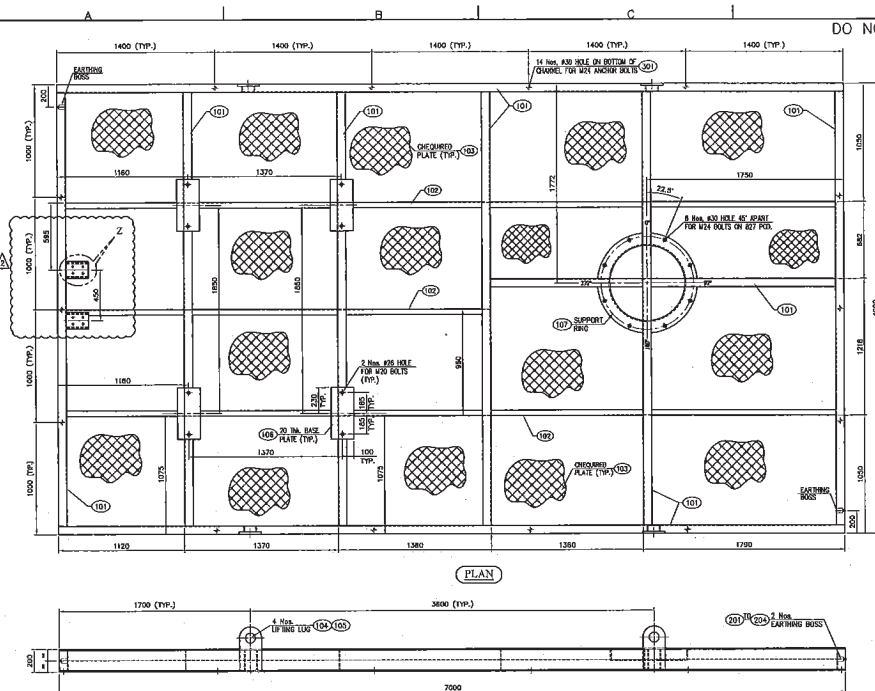
P.No.	QTY.	DESCRIPTION
903	8	ELEMENT

MATERIAL OF CONSTRUCTION

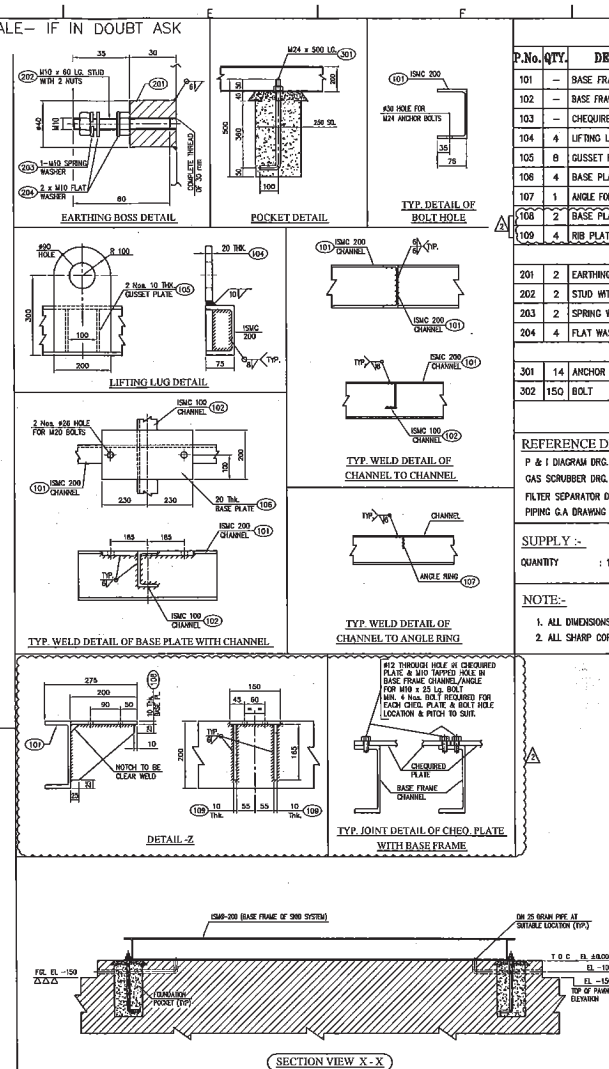
DESCRIPTION	MATERIAL
SHELL/D-END	SA 516 Gr. 70
RF PAD/PLATE	SA 516 Gr. 70
NOZZLE/PIPE	SA 106 Gr. B
NOZZLE FLANGE	SA 105
GASKETS	SS 304 SPIN WELD GRAFVLE FILLER
	WH 35 FLARE OUTER RING & WINDUT
	NBR RING
STUD	SA193 Gr. B7
NUTS	SA194 Gr. 2H
SUPPORT	IS 3062
CYCLONE	SS 316L
INTERNAL (WELDED)	SA 516 Gr. 70
FITTINGS SW	SA 105
FITTINGS BW	SA 234 Gr. WPS

TABLE-A

DESCRIPTION	STRESS RELFING
HEAT TREATMENT CYCLE OF DISHED END	
RATE OF HEATING (Max.)	120°C/Hr.
RATE OF COOLING (Max.)	120°C/Hr.
SOAKING TEMP.	610°C ± 10°C
SOAKING TIME (Min.)	35 MINUTES
LOADING/UNLOADING TEMP. (Max.)	300°C



DETAIL OF FOUNDATION POCKET



BILL OF MATERIAL (PER EQUIPT.)						
P.No.	QTY.	DESCRIPTION	MATERIAL	SIZE	WEIGHT (Kg)	REMARKS
101	—	BASE FRAME MEMBERS	IS 2082	ISM-C- 200 x 40175 Lg.	888.00	STPL CO-STEEL
102	—	BASE FRAME SUPPORT CHANNEL	IS 2082	ISM-C- 100 x 17470 Lg.	161.00	
103	—	CHEQUERED PLATE	MS	6 THK x 4000 WIDE x 7000 Lg.	1319.00	
104	4	LIFTING LUG	IS 2082	20 THK x 200 WIDE x 360 Lg.	45.00	
105	8	GUSSET FOR LIFTING LUG	IS 2082	10 THK x 45 WIDE x 177 Lg.	5.50	
106	4	BASE PLATE	IS 2082	20 THK x 200 WIDE x 460 Lg.	57.60	
107	1	ANGLE FOR SUPPORT RING	IS 2082	ISA- 110 x 10 THK x 2451 Lg.	40.00	
108	2	BASE PLATE	IS 2082	10 THK x 150 WIDE x 200 Lg.	6.71	
109	4	RIB PLATE	IS 2082	10 THK x 165 WIDE x 190 Lg.	4.12	

201	2	EARTHING ROSS ASSY.	IS 2082	0/0 40 x 30 Lg.	0.40	EARTHING ROSS
202	2	STUD WITH 2 NUTS	SS 304	M 10 x 60 Lg.	0.10	
203	2	SPRING WASHER	SS 304	3 thk.	0.02	
204	4	FLAT WASHER	SS 304	3 thk.	-0.04	
301	14	ANCHOR BOLT	IS 2062	M 24 x 550 Lg.	42.00	FASTENER
302	150	BOLT	IS 1387	M 10 x 25 Lg.	—	

REFERENCE DRAWINGS:-		WEIGHT:-	
P & I DIAGRAM DRG. NO.	: 1-CP1484-2392	EMPTY WEIGHT OF SKID	: LATER
GAS SCRUBBER DRG. NO.	: 1-CP1484-2393	HYDRO TEST WEIGHT OF SKID	: LATER
FILTER SEPARATOR DRG. NO.	: 1-CP1484-2394	WEIGHT OF BASE FRAME	: 2875 KG. (APPROX.)
PIPING G.A. DRAWING	: 1-CP1484-2396		

<u>SUPPLY :-</u>	<u>PAINTING:-</u>
QUANTITY : 1 No.	REFER SKID PIPING G.A DRAWING OF FUEL GAS SYSTEM SKID

NOTE:-

1. ALL DIMENSIONS ARE IN MM UNLESS OTHERWISE SPECIFIED.
2. ALL SHARP CORNERS SHALL BE ROUNDED OFF.