

DESIGN DATA

A CODE OF CONSTRUCTION ASME SEC. VIII DIV.1 2007 Edn. TEMA CLASS-R 9th EDITION, 2007		CHANNEL YES	
DESIGN PRESSURE (SEE NOTE-32)		SHELL YES	
UNIT: 102.6 / FV030C KPa/g: 10062 / FV030C		PWMT: RADIOGRAPHY JOINT EFFICIENCY: 1.0	
DESIGN TEMPERATURE		POSITION: HORIZONTAL DUTY: MM Kg/hr	
°C: 296 KPa/g: 10062 / FV030C		TYPE: DEU 37.47x1.1	
HYDRO TEST PRESSURE (SEE NOTE-33)		EARTHQUAKE SPECIFICATION: IS 875	
°C: 133.38 KPa/g: 13080.6		WIND LOAD: NOZZLE LOADS	
DIFFERENTIAL DESIGN PRESSURE FOR TUBES/TS		ADDITIONAL LOADING AS PER UG-22	
KPa/g: 27.5		CODE STAMPING REQUIRED: YES 'U'	
MIN. HYDRO TEST TEMPERATURE		TOLERANCE: TEMA CLASS R & EL. STD. 7-15-0019 REV.1	
°C: 20		MECHANICAL DATA OF EXCHANGER	
OPERATING PRESSURE		EFFECTIVE SURFACE AREA: 582 m ²	
KPa/g: 87.7		TOTAL WEIGHT (EMPTY): 53700 Kg	
OPERATING TEMPERATURE (IN / OUT)		TUBE BUNDLE WEIGHT: 20500 Kg	
°C: 227.1 / 256		HYDRO TEST WEIGHT: 67000 Kg	
mm: 1475		OPERATING WEIGHT: 63700 Kg	
Nos.: ONE		BUNDLE PULLING LOAD: 41000 Kg	
REACTOR FEED PRESENT		No. OF 'U' TUBES: 647	
INSULATION: 75		TUBE OD: 25	
CORR. ALLOWANCE: SEE NOTE-26		TUBE THK. (Min.): 2.5	
MAWP FULLY CORRODED (AT DESIGN TEMP.): 10062 kPa/g AT 296 °C SHELL SIDE		LAYOUT: ◊ RT. SQUARE	
MAWP FULLY CORRODED (AT AMBIENT TEMP.): 10062 kPa/g AT 30 °C SHELL SIDE		TUBE EFF. LENGTH: 5769 (SHELL SIDE FACE OF 1/SHT. TO FULL SUPP. PL. INSIDE FACE)	
MAWP UNCORRODED (AT DESIGN TEMP.): 8375 kPa/g AT 323 °C TUBE SIDE		IMPACT TESTED PART NO.: SEE NOTE NO. 42	
MAWP UNCORRODED (AT AMBIENT TEMP.): 8375 kPa/g AT 30 °C TUBE SIDE		NOZZLE SCHEDULE: ASME B16.5 2003 FLANGES	
MDMT: 15 °C AT 10062 kPa/g SHELL SIDE 15 °C AT 8375 kPa/g TUBE SIDE		NOZZLE SCHEDULE	
* AS PER GENERAL NOTE-35		TUBE SIDE ADDITIONAL CONDITIONS :-	
CHANNEL OUTLET: 400		DEPRESSURIZATION PRESSURE: 73.0 Kg/cm ² g	
CHANNEL INLET: 400		DEPRESSURIZATION TEMPERATURE: 398 °C	
SHELL OUTLET: 350		CATALYST REGENERATION PRESSURE: 25.2 Kg/cm ² g	
SHELL INLET: 350		CATALYST REGENERATION TEMPERATURE: 360 °C	

HEAT TREATMENT PROCEDURE :-

ITEM DESCRIPTION	HEATING METHOD	TYPE OF HEAT TREATMENT	LOADING TEMP. (°C)	RATE OF HEATING (°C/HOUR)	SOAKING TEMP. (°C)	SOAKING TIME	RATE OF COOLING UNLOADING TEMP. (°C)
MAIN SHELL ASSEMBLY	IN CLOSED FURNACE	SR	300	55	680-700	180 Minutes	55
CHANNEL BARREL ASSEMBLY	IN CLOSED FURNACE	SR	300	55	680-700	280 Minutes	55
MAIN SHELL TO BARREL JOINT COMPANION NOZZLE FLANGE AFTER W.D. FOR T2B	BY HEAT RESISTANCE COIL	SR	300	55	680-700	180 Minutes	55
'U' TUBE AFTER FORMING 'U' BEND+300mm FROM TL (R1 TO R4)	IN CLOSED FURNACE	SR	300	150	685-685	15 Minutes	150

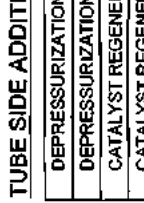
AS BUILT DIMENSIONS ARE SHOWN IN RKT (---) AS MARKED Δ AND OTHER CHANGES AS MARKED Δ THUS.
 DRAWING IS REVISED AS PER EIL COMMENTS
 DRAWING IS REVISED AS PER EIL COMMENTS
 DRAWING IS REVISED AS PER EIL COMMENTS
 DRAWING IS REVISED AS PER EIL COMMENTS
 SUBMITTAL FOR APPROVAL

REV. DATE DESCRIPTION DRWN CHKD APPD
 3 18.01.2010 AS BUILT DIMENSIONS ARE SHOWN IN RKT (---) AS MARKED Δ AND OTHER CHANGES AS MARKED Δ THUS. PRASHANT VED GDP
 2A 20.02.09 AS MKD. Δ THUS. BSB VDP GDP
 2 08.01.09 DRAWING IS REVISED AS PER EIL COMMENTS BSB VDP GDP
 1 06.09.08 DRAWING IS REVISED AS PER EIL COMMENTS BSB VDP GDP
 0 15.04.08 SUBMITTAL FOR APPROVAL BSB VDP GDP



PROJECT NAME: DHDT, EURO-IV

ENGINEERING & MANUFACTURER: "AS BUILT DRAWING" ENGINEERS INDIA LIMITED
 CONSULTANT: ENGINEERS INDIA LIMITED
 CLIENT: CPCL REFINERY III 325

TITLE: FIRST REACTOR FEED / EFFLUENT EXCHANGER
 W.O. No. 07-386
 EQPT. NO. 211-E-1B
 JOB NO. EL 6879 P.O. No. 6879/6010/1008/018 DT. 27/02/2006
 TEMA T/E/071200 PR No. 6879-211-EE-PR-60200018 Rev.0 DT. 03/04/2008
 SCALE NTS DWG. No. SDB/E/071200 SHT. NO. Rev. 1 of 18 1/2/3



GENERAL NOTES :-

- 1] ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
- 2] ALL BOLT HOLES SHALL STRADDLE THE PRINCIPAL CENTRE LINE.
- 3] ALL SHARP CORNERS SHALL BE ROUNDED OFF TO MINIMUM RADIUS.
- 4] IF BACK CHIPPING IS NOT POSSIBLE THEN ROOT RUN SHALL BE DONE BY TIG.
ALL ACCESSIBLE WELDS TO BE BACK CHIPPED & WELDED FROM OTHER SIDE.
- 5] STANDOUTS FOR NOZZLES WELDED ON SHELL & CHANNEL SHALL BE MEASURED FROM THE CENTRE LINE OF THE EXCHANGER.
- 6] ALL INTERNAL WELDS IN THE SHELL SHALL BE GROUND FLUSH IN ORDER TO INSERT AND REMOVE TUBE BUNDLE. ALSO ALL INTERNAL WELDS SHALL BE GROUND FLUSH TO THE EXTENT OF FACILITATING DRAINING OF COMPLETE EQUIPMENT. ALL OTHER WELD MAY BE LEFT IN THE DESCALED CONDITION ONLY.
- 7] ALL WELDS SHALL BE D.P. CHECKED OR MAGNETIC PARTICLE (MT) TESTED AFTER BACK CHIPPING.
- 8] ALL FORGINGS SHALL BE ULTRASONICALLY EXAMINED AS PER ASME Sec. II, SA-388. ACCEPTANCE STANDARD SHALL BE IN ACCORDANCE WITH PARA 3.3.4 OF ASME Sec. VIII Div. 2 CODE. SCANNING SHALL BE 100%.
- 9] ALL FORGINGS SHALL BE IN NORMALISED AND TEMPERED CONDITION.
- 10] INSIDE EDGES OF TUBE HOLES IN TUBESHEET SHALL BE FREE OF BURRS TO PREVENT CUTTING OF THE TUBES.
- 11] ALL FABRICATION, INSPECTION & TESTING REQUIREMENT SHALL BE AS PER PR & APPROVED QAP. PROJECT SPECIFICATION & ASME. CODE
- 12] SUPPORT PLATE & BAFFLE PLATE DISTANCES ARE GIVEN FROM CENTER TO CENTER.
- 13] HEMI SPHERICAL HEAD SHALL BE IN SINGLE PIECE CONSTRUCTION
HEMISPHERICAL HEADS SHALL BE SUBJECTED TO DYE PENETRANT TEST (BOTH INSIDE & OUTSIDE) AFTER HEAT TREATMENT.
- 14] APPROVAL ON WPS AND PQR SHALL BE OBTAINED PRIOR TO FABRICATION.
- 15] ALL GASKET SHALL BE MADE IN SINGLE PIECE CONSTRUCTION. 
- 16] ALL SPIRAL WOUND GASKET FOR SHELL SIDE SHALL BE 6.35 MM THK AISI 321 WITH GRAFOIL FILLER AND 4.5 THK AISI 321 OUTER RING.
- 17] 'T' DENOTES MATCH MARK FOR ASSEMBLY AND SHALL BE PUNCHED ON ALL MATING PARTS.
- 18] ALL MATERIALS SHALL BE SUPPLIED WITH MILL TEST CERTIFICATE DULY CERTIFIED BY TPI.
REFER PARA 2.1.2 OF 6-15-0001 REV.3.
- 19] DELETED. 
- 20] THE HEAT EXCHANGER SHALL BE PROVIDED WITH PRESSURE GAUGE TO MONITOR N² PRESSURE (0.25 Kg/cm²) AND 1/2" NON RETURN VALVE AS PER 6-15-0001 REV.3. PARA 3.1.
- 21] EQPT. SHALL BE DRIED & THOROUGHLY CLEANED BOTH INSIDE AND OUTSIDE AND ALL WATER, DIRT, SAND, WELD METAL, SPATTER, WELD ELECTRODES, STUB & FOREIGN MATERIALS SHALL BE REMOVED.
- 22] FOR CONSTRUCTIONAL DETAILS AND NOMENCLATURES REFER EIL STANDARDS.
EIL PR NO. 6879-211-EE-MR-6020 REV.8 EIL THERMAL DATASHEET 6879-211-05-45-DS-001 REV.2, GENERAL SPEC. 6-15-0001 REV.3, 6-15-0003 REV.2, 6-15-0006 REV.3, 6-15-0021 REV.3, 6-15-91 REV.1, 6-12-0018 REV.2, 6-81-0001 REV.0 & 6-81-009 REV.1
7-15-0001 REV.2, 7-15-0002 REV.2, 7-15-0005 REV.2, 7-15-0007 TO 0009 REV-2,
7-15-0016 REV.2, 7-15-0017 REV.2, 7-15-0018 REV.2, 7-15-0019 REV.2, 7-76-0101 REV.3.
- 23] ALL OF THE REMOVABLE PARTS SHALL BE STAMPED WITH THE ITEM NUMBER.
- 24] a) ALL CHANNEL SURFACES INTERNAL OVERLAP WITH STAINLESS STEEL SHALL BE MACHINED. SHELL SIDE STAINLESS STEEL OVERLAP INTERNAL SURFACES SHALL BE MACHINED ONLY AT TUBE SHEET SIDE.
OVER A LENGTH OF 4 INCHES BEYOND THE GASKET FACE, EXCEPT IF INDICATED OTHERWISE.
b) PAINTING (SHOP PRIMER) OF EXCHANGERS SHALL BE AS FOLLOWS. :-
THE EXTERNAL SURFACE SHALL BE PREPARED FOR PAINTING BY BLAST CLEANING TO NEAR WHITE FINISH AS PER SSPC-SP-10 [SA 2 1/2 SWEDISH STANDARD (SIS-05-5900)]. SHOP PRIMER SHALL BE ORGANIC ZINC SILICATE COATING 65-75 MICRONS DFT.
c) GASKET CONTACT SURFACES SHALL BE PROTECTED WITH RUST PREVENTIVE COMPOUND.

- 25] SPARE PARTS :- MANDATORY SPARES
STUD BOLTS/NUTS :- (ONE SET OF EACH SIZE OF NOZZLE WITH BLIND FLG.)
GASKET :- 400% (EACH NOZZLE WITH BLIND FLG. & GIRTH JOINTS)
GASKET RETAINER :- 100% (DIAPHRAGMS)
PUSH RODS :- 100%
SPARE PARTS :- COMMISSIONING SPARES
GASKET :- 200% (EACH NOZZLE WITH BLIND FLG. & GIRTH JOINTS)

- 26] CORROSION ALLOWANCE
SHELL, SHELL COVER 6mm
- 27] ANCHOR BOLT MATERIAL HAVE BEEN DESIGNED CONSIDERING A SHEAR STRESS OF 865 Kg/cm² (SCOPE OF SUPPLY BY OTHERS)
- 28] ALL BOLTING AND THREADS ON THE BARREL SHALL BE LUBRICATED WITH HIGH TEMPERATURE THREAD LUBRICANT VZ. NI-GRAPHITE COMPOUND TO PREVENT SEIZURE.
- 29] REQUIREMENTS OF ALL PR SPECIFICATION DOCUMENTS SHALL BE COMPLIED WITH UNLESS OTHERWISE AGREED BETWEEN EIL & TEMA.
- 30] CHANNEL BARREL THREADS AND LOCK RING THREADS SHALL BE 100% DP EXAMINED.
- 31] THE MINIMUM TUBE WALL THICKNESS AT THE BEND PORTION AS PER TEMA CLAUSE RC8-2.31.
- 32] THE DIFFERENTIAL DESIGN PRESSURE FOR EXCHANGER = 27.8 Kg/cm²
PERMITTED EXTERNAL HYDROTEST PRESSURE FOR TUBES 35.75 Kg/cm² AT NEW CONDITION & 35.75 Kg/cm² AT OLD CONDITION.

- 33] HYDRO TEST SHALL BE CARRIED OUT AS FOLLOWS :-
A) PRIOR TO ASSEMBLY OF CHANNEL COVER : FROM SHELL SIDE AT A PRESSURE OF 35.75 Kg/cm².
B) AFTER COMPLETE ASSEMBLY : I) FROM TUBE SIDE AT A PRESSURE OF 35.75 Kg/cm²
II) SIMULTANEOUSLY FROM SHELL SIDE & TUBE SIDE AT A PRESSURE INDICATED IN DESIGN DATA.
CAUTION :- THE DIFFERENTIAL HYDRO TEST PRESSURE BETWEEN SHELL SIDE & TUBE SIDE SHALL NOT BE ALLOWED TO EXCEED MORE THAN 35.75 Kg/cm² AT ANY TIME DURING HYDROTEST.

- 34] SHELL SIDE AND TUBE SIDE WILL BE SUBJECTED TO STEAMING OUT AT 0.5 Kg/cm² & 190°C.
- 35] WRTU NOZZLE FLANGES GASKET FINISH SHALL BE 63-125 AARH.
- 36] GASKET FACE TO BE MACHINED AFTER FINAL HEAT TREATMENT.
- 37] NO WELDING OR HEATING IS PERMITTED AFTER PWHM OPERATION.

- 38] STACKED EXCHANGERS (211-E-1A & 211-E-1B) SHALL BE HYDROTESTED IN STACKED CONDITION.
- 39] ALL FABRICATION TOLERANCES SHOULD BE AS PER TIL-WFO-WI-26 REV.0 PAGE 1 TO 10.
UNLESS OTHERWISE SPECIFIED.
- 40] ALL MATERIAL AND FABRICATION REQUIREMENTS SPECIFIED IN AXEN'S SPECIFICATION IN 42.1 SHALL BE COMPLIED WITH. THIS INCLUDES REQUIREMENTS SPECIFIED FOR CLAD MATERIALS, WELDING CONSUMABLES AND WELDING ETC.

41] TORQUE TABLE (MAX. ALLOWABLE TORQUE)

ITEM No.	Kgf.m	Ibf.ft.
504	54.54	394.5
505	72.306	523
506	51.331	371.3

AS BUILT stamp: 

WELDERS FROM LTD. 

W.O. No. 1 07-386
EQPT. NO. : 211-E-1B

- 42] IMPACT TEST SHALL BE CARRIED OUT FOR
PART NO.- 101, 102, 202, 203, 204, 205, 206, 207,
PART NO.- 208, 209, 210, 213, 214 & 219 --18 °C.
43] HEMI HEAD NORMALISED AT 930°C, FOR 30 MINUTES
AND TEMPERED AT 730°C FOR 30 MINUTES.

326 TEMA
INDUSTRIAL

SCALE	REV	SRT
NTS	3	20618

DWG No. SDB/E/071200

A	148	BEND PLATE FOR HYDRO	135° x 50x24.61THK.	SA240 Gr.321	1	
	147	GUSSET FOR INTERNAL CYLINDER	60x60x16THK	SA240 Gr.321	20	00408.4x0368.4
	146	SPOOL PIECE FOR T2B	1217° x 150x19THK	SA240 Gr.321	1	
	145	WARNING PLATE BRACKET	8THK AS PER DETAIL	SA387 Gr.11 CL-2	1	
B	144	NAME PLATE BRACKET	8THK AS PER DETAIL	SA387 Gr.11 CL-2	1	
	143	PL. FOR LIFTING DEVICE	30THK ASPER DETAL (30THK)	SA516 Gr.70	1	
	142	PL. FOR LIFTING DEVICE	30THK ASPER DETAL (30THK)	SA516 Gr.70	1	
	141	EARTHING CLEAT	100x75x10THK	SA387 Gr.11 CL-2	2	
	140	SHIM PLATE FOR FIXED SAOD. SIDE	1790x350x10THK TO SUIT	SAI 304	1	
	139	SHIM PLATE FOR SLIDING SAOD. SIDE	2090x350x10THK TO SUIT	SAI 304	1	
	138	RIB PL. FOR SLIDING SAOD. SUPP.	2432x330x20THK	SA387 Gr.11 CL-2	2	
	137	RIB PL. FOR SLIDING SAOD. SUPP. FOR TOP	574x155x20THK	SA387 Gr.11 CL-2	4	
	136	RIB PL. FOR SLIDING SAOD. SUPP. FOR TOP	752x155x20THK	SA387 Gr.11 CL-2	4	
	135	RIB PL. FOR SLIDING SAOD. SUPP. FOR B.M.	262x155x20THK	SA387 Gr.11 CL-2	4	
	134	RIB PL. FOR SLIDING SAOD. SUPP. FOR B.M.	439x155x20THK	SA387 Gr.11 CL-2	4	
	133	WEB PL. FOR FIXED SAOD. SUPP.	1720x2432x20THK	SA387 Gr.11 CL-2	1	
	132	WEAR PL. FOR FIXED SAOD. SUPP.	5086° x350x20THK	SA387 Gr.11 CL-2	1	
	131	BASE PL. FOR FIXED SAOD. SUPP. FOR TOP	1790x350x25THK (20THK)	SA387 Gr.11 CL-2	1	
130	BASE PL. FOR FIXED SAOD. SUPP. FOR B.M.	1790x350x40THK	SA387 Gr.11 CL-2	1		
C	129	RIB PL. FOR SLIDING SAOD. SUPP.	2432x330x20THK	SA387 Gr.11 CL-2	2	
	128	RIB PL. FOR SLIDING SAOD. SUPP. FOR TOP	436x155x20THK	SA387 Gr.11 CL-2	4	
	127	RIB PL. FOR SLIDING SAOD. SUPP. FOR TOP	693x155x20THK	SA387 Gr.11 CL-2	4	
	126	RIB PL. FOR SLIDING SAOD. SUPP. FOR B.M.	124x155x20THK	SA387 Gr.11 CL-2	4	
	125	RIB PL. FOR SLIDING SAOD. SUPP. FOR B.M.	380x155x20THK	SA387 Gr.11 CL-2	4	
	124	WEB PL. FOR SLIDING SAOD. SUPP.	2020x2432x20THK	SA387 Gr.11 CL-2	1	
	123	WEAR PL. FOR SLIDING SAOD. SUPP.	6000° x350x20THK	SA387 Gr.11 CL-2	1	
	122	BASE PL. FOR SLIDING SAOD. SUPP. FOR TOP	2090x350x25THK (20THK)	SA387 Gr.11 CL-2	1	
	121	BASE PL. FOR SLIDING SAOD. SUPP. FOR B.M.	2090x350x40THK	SA387 Gr.11 CL-2	1	
	120	GASKET RETAINER	ø1557x20THK	SA240 Gr.321/1+1	1+1	
	119	INTERNAL SLEEVE	4298° x 671x20THK	SA240 Gr.321	1	
	118	RETAINING RING FOR T2B	004377x10413.7x3THK	SA240 Gr.321	1	
	117	PARTITION COVER PLATE	18THK AS PER DETAIL	SA240 Gr.321	1	
	116	END PALTE	001515x18THK	SA240 Gr.321	1	
	115	PLATE FOR INTERNAL CYLINDER	4703° x713x18THK	SA240 Gr.321	1	
	114	PASS PARTITION PLATE	1479x713x24THK	SA240 Gr.321	1	
	113	SEALING STRIP	5810x60x8THK (10THK)	SA240 Gr.321	2	
	112	SEALING STRIP	3666x150x8THK (10THK)	SA240 Gr.321	2	
	111	SEALING STRIP	4166x150x8THK (10THK)	SA240 Gr.321	2	
	110	SLIDING STRIP	5810x70x20THK	SA240 Gr.321	2	
	109	SUPPORT PLATE 'C'	16THK AS PER DETAIL	SA240 Gr.321	1	
	108	PARTIAL SUPPORT PLATE 'S1'	16THK AS PER DETAIL	SA240 Gr.321	1	
	107	PARTIAL SUPPORT PLATE 'S'	16THK AS PER DETAIL	SA240 Gr.321	1	
	106	BAFFLE PLATE 'D'	16THK AS PER DETAIL	SA240 Gr.321	1	
105	BAFFLE PLATE 'B'	16THK AS PER DETAIL	SA240 Gr.321	5		
104	BAFFLE PLATE 'A1'	16THK AS PER DETAIL	SA240 Gr.321	1		
103	BAFFLE PLATE 'A'	16THK AS PER DETAIL	SA240 Gr.321	4		
102	HEMI HEAD DISHED END	38THK Norm.	SA387 Gr.11 CL-2	1		
101	MAIN SHELL	4829° x5026x62THK	SA387 Gr.11 CL-2	1		

P-NO BILL OF MATERIALS

A	302	SPACER	0025x2.5THKx16L.G.	AS PER DETAIL	SA213 TP321				
	301	'U' TUBES	0025x2.5THKx(Min.)xL.G.	AS PER DETAIL	SA213 TP321	647			
B	219	FORGE NECK FOR T1B & T2B	00406.4xID368.3.08x43BLG.		SA182 F11 CL-2	2			
	218	PULLING EYE BOLT	M-36 AS PER DETAIL		SA 105	4			
	217	PLUG FOR PULLING EYE BOLT	M-36 AS PER DETAIL		SA240 GR 321	4			
	216	SEAL RING FOR T2B	58THK AS PER DETAIL		SA985 F321	1			
	215	ADDED STEEL (PROPRIETARY)			-				
	214	INNER COMPRESSION RING	001400xID1336x35THK		SA336 F11 CL-2	1			
	213	OUTER COMPRESSION RING	001574xID1516x39.6THK		SA336 F11 CL-2	1			
	212	INTERNAL FLANGE	001526.5xID1348x183THK		SA985 F321	1			
	211	SPLIT RING	001592xID1504x38THK		SA985 F321	1			
	210	COMPANION NOZZ. FLG. FOR T2B	400DNxSCH.60x900#WNR1J		SA182 F11 CL-2	1			
C	209	NOZZLE FLANGE FOR T1B & T2B	400DNxSCH.60x900#WNR1J		SA182 F11 CL-2	2			
	208	COMPANION NOZZ. FLG. FOR S1B	350DNxSCH.100x800#WNR1J		SA182 F11 CL-2	1			
	207	NOZZLE FLANGE FOR S1B & S2B	350DNxSCH.100x800#WNR1J		SA182 F11 CL-2	2			
	206	FORGE NECK FOR S2B	00483.94xID307.94x480LG.		SA182 F11 CL-2	1			
D	205	FORGE NECK FOR S1B	00483.94xID307.94x480LG.		SA182 F11 CL-2	1			
	204	CHANNEL COVER	ø1520.5x216THK		SA336 F11 CL-2	1			
	203	THREADED LOCK RING	001612.21xID1488x289.81THK		SA336 F11 CL-2	1			
	202	CHANNEL BARREL	AS PER DETAIL		SA336 F11 CL-2	1			
E	201	TUBE SHEET	001515x185THK		SA985 F321	1			

AS BUILT

327

TEMA INDIA LTD

W.O. No. : 07-386
EQPT. NO. : 214-E-1B

AS BUILT DRAWING

INSPECTION

REVISIONS



SCALE: NTS 3
REV 3
SHT 3 of 18

DWG NO. SDB/E/071200

DATE: 6

P.No.	DESCRIPTION	SIZE	MATERIAL SPECIFIED.	QTY	REMARK
MISCELLANEOUS					
701	CAP FOR HYDROTEST	400DN x SCH. 80	SA 234 Gr. WPB	1	
610	ASME NAME PLATE	175x120x2THK	SAI 304	1	
609	WARNING PLATE	155x155x3THK	SAI 304	1	
608	NAME PLATE	150x136x2THK	SAI 304	1	
607	HANDLE FOR PARTITION COVER	#16x350LG.	SAI 321	2	
606	SEAL ROD	#25x4116LG.	SAI 321	46	
605	PUSH ROD	#25x118LG.	SA193 Gr. B16	7678	
604	PUSH ROD	#22x275LG.	SA193 Gr. B16	9242	
603	PUSH ROD	#25x150LG.	SA453 Gr. 860B	8080	
602	IMPINGEMENT ROD	#25x1196LG.	SAI 321	27	
601	TIE ROD	#12x5833LG.	SAI 321	22	
FASTENERS					
513	STUD-2NUTS FOR T2B COMP. FLG.	1 1/2" UNBx340 LG.	SA193 Gr. B16	20	
512	STUD-2NUTS FOR SIB COMP. FLG.	1 1/2" UNBx315 LG.	SA194 Gr. 16	20	
511	BOLT WITH NUT & WASHER FOR SADDLE SUPP.	M-42x130LG.	SA193 Gr. B7/SA194 Gr. 2H	16	
510	STUD-2NUTS FOR NOZZ. T2A & T1B	1 1/2" UNBx340 LG.	SA193 Gr. B16	20	
509	STUD-2NUTS FOR NOZZ. S1A & S2B	1 1/2" UNBx315 LG.	SA194 Gr. 16	20	
508	HEX. HD. BOLT FOR LIFTING DEVICE	M-24x68LG.	SA193 Gr. B7	4	
507	HEX. SOCKET SET SCREW	M-10x25 LG.	SA193 Gr. BBT CL2	3	
506	HEX. HD. BOLT (SET SCREW)	1 1/2" UNBx89 LG.	SA453 Gr. 680B	80	
505	HEX. HD. BOLT (SET SCREW)	1" UNBx82 LG.	SA193 Gr. B16	92	
504	HEX. HD. BOLT (SET SCREW)	1 1/2" UNBx89 LG.	SA193 Gr. B16	76	
503	NUTS FOR TIE RODS	M-12 STD.	SA194 Gr. 6T	44	
502	STD WITH MULTI-RAT WASHER & 1-LOCK WASHER	M-12x55LG.	SA193 Gr. BBT CL2+	52	
501	HEX. HD. SCREW WITH LOCKNUT	M-10x45 LG.	SA194 Gr. 6T	26	
GASKETS					
409	GASKET FOR T2B COMP. FLG.	400DNx900# ASME RING No. 82	SAI 347	1442	WASHER 100MM Dia OCTAGONAL RINGS
408	GASKET FOR SIB COMP. FLG.	350DNx900# ASME RING No. 82	5 Cr. -1/2Mo	1442	WASHER 100MM Dia OCTAGONAL RINGS
407	GASKET FOR T2A & T1B	400DNx900# ASME RING No. 82	SAI 347	1442	WASHER 100MM Dia OCTAGONAL RINGS
406	GASKET FOR S1A & S2B	350DNx900# ASME RING No. 82	5 Cr. -1/2Mo	1442	WASHER 100MM Dia OCTAGONAL RINGS
405	PACKING SEAL FOR T2B	12.750x3000LG.	FIBER GLASS UP-329	1442	NON-ASBESTOS WITH WOODEN FRAME
404	GASKET FOR PARTITION PLATE	3THK (AS PER DETAIL)		1442	
403	RING GASKET	001558x101338x3THK	SA240 Gr. 321	1442	
402	GASKET	001515x101480.8x1.6THK	SA240 Gr. 321	1442	
401	GASKET	001507x101481x0.35THK	SAI 321 SPWD	1442	SEE NOTE-16

BILL OF MATERIALS

"AS BUILT DRAWING"
W.O. No. : 07-386
EOPT. NO. : 211-E-1B

328 **TEMA**
INDIA LTD.

SCALE: NTS

REV: 3

SHEET: 4 of 18

DRG NO. SDB/E/071200

8

7

6

5

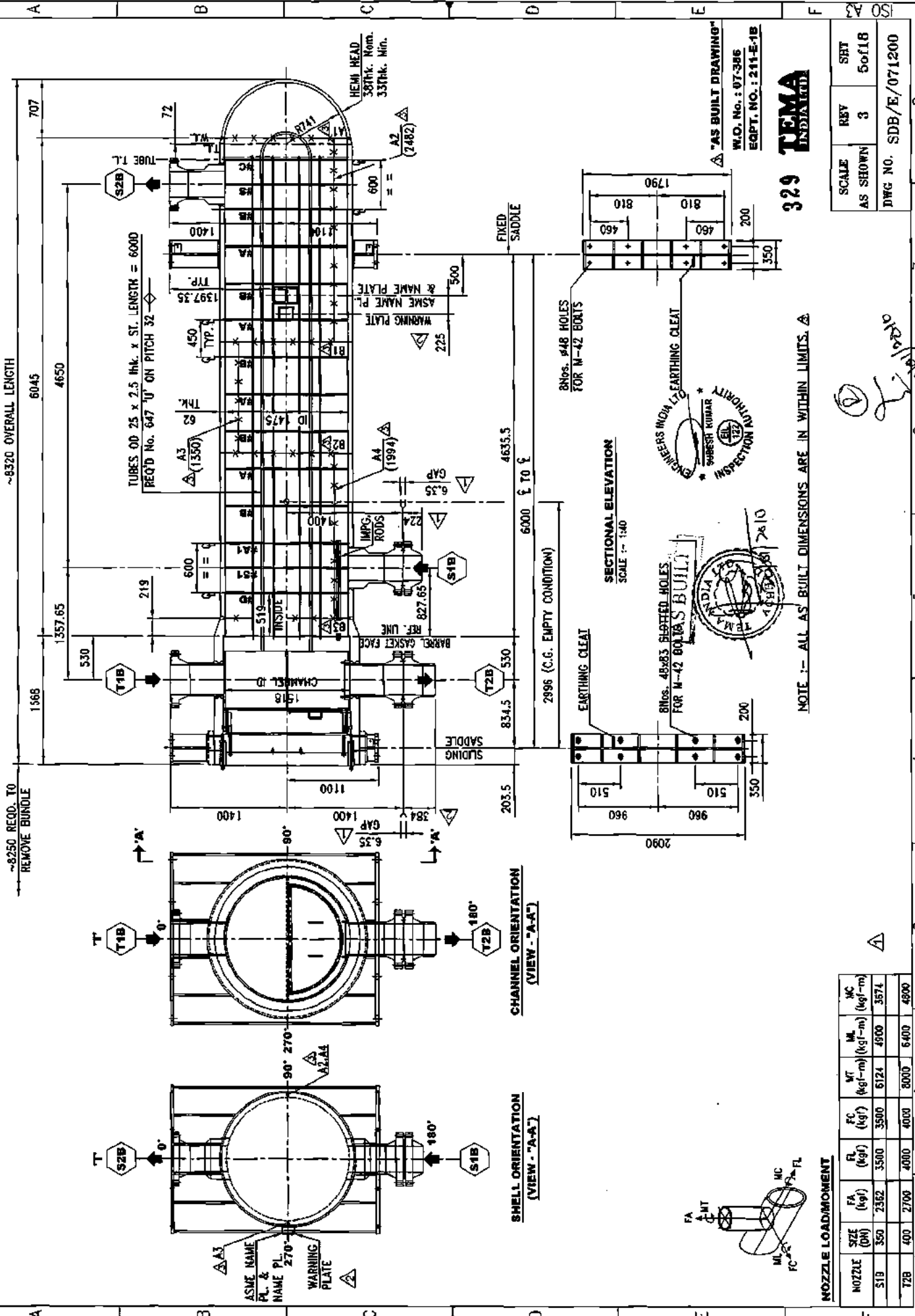
4

3

2

1

A		
B		
C		
D		
E		
F		



SCALE AS SHOWN	REV 3	SRT 5of18
DWG NO. SDB/E/071200		

3

4

5

6

7

8

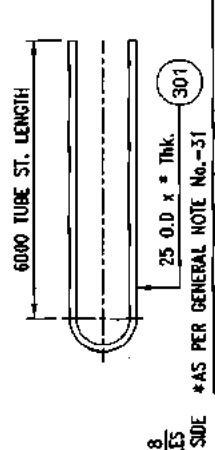
9

10

NOZZLE LOAD/MOMENT

NOZZLE	SIZE (DN)	FA (kgf)	FL (kgf)	FC (kgf)	MT (kgf-m)	ML (kgf-m)	MC (kgf-m)
S1B	350	2362	3500	3500	6124	4900	3874
T2B	400	2700	4000	4000	8000	6400	4900

DOMIE HEIGHT FOR TOP NOZZLE = 136.69
DOMIE HEIGHT FOR BOTTOM NOZZLE = 91.43



25 O.D. x THK. (301)
 *AS PER GENERAL NOTE No.-31

No.	'R' RADUS	QTY.	'U' TUBE TOTAL LENGTH
1	R1 = 45.25	30	12142
2	R2 = 67.877	31	12213
3	R3 = 90.505	30	12284
4	R4 = 113.132	31	12355
5	R5 = 135.760	27	12427
6	R6 = 158.387	29	12498
7	R7 = 181.015	30	12569
8	R8 = 203.642	29	12640
9	R9 = 226.270	30	12711
10	R10 = 248.897	29	12782
11	R11 = 271.524	28	12853
12	R12 = 294.152	29	12924
13	R13 = 316.779	28	12995
14	R14 = 339.406	27	13066
15	R15 = 362.034	23	13137
16	R16 = 384.661	25	13208
17	R17 = 407.289	24	13280
18	R18 = 429.916	25	13351
19	R19 = 452.544	24	13422
20	R20 = 475.171	23	13493
21	R21 = 497.798	22	13564
22	R22 = 520.426	21	13635
23	R23 = 543.053	20	13706
24	R24 = 565.681	19	13777
25	R25 = 588.308	13	13848

DETAIL OF 'U' TUBES

330 TEMA
INDIA LTD

SCALE	REV	SHT
AS SHOWN	3	6 of 18
DWG NO. SDB/E/071.200		

3500N SHELL OUTLET
 TAPPED HOLES FOR M36 PULLING EYE BOLT LOCATED DIAGONALLY OFF ON CH. SIDE FACE OF T/SHT. (DO NOT DRILL THROUGH)

LOCATION OF 22Nos. M-12x18. DEEP DRILLED & TAPPED HOLES FOR #12 TIE ROD ON SHELL SIDE FACE OF TUBESHEET (DO NOT DRILL THROUGH)

90°
 45.25

LOCATION OF 48Nos. #25 SEAL RODS WELDED WITH 1st. (#A1) BAFFLE PLATE TO LAST (#B) BAFFLE PLATE

LOCATION OF 27Nos. M24x36 DEEP TAPPED HOLES FOR #25 IMPINGEMENT RODS WELDED WITH BAFFLE PL. (#D) TO BAFFLE PLATE (#A1)

LOCATION OF 2Nos. 150Wx8THK (10THK) SEALING STRIPS WELDED WITH 1st (#B) BAFFLE PLATE TO LAST (#B) BAFFLE PLATE

ADJUSTABLE TUBE PITCH

PASS	1	2
TUBE	647	648

W.O. No. : 07-386
 EQPT. NO. : 21500/115.1B



- ◇ DENOTE TUBE HOLES
- ◇ DENOTE TIEROD HOLES
- ◇ DENOTE SEAL RODS
- ◇ DENOTE IMPINGEMENT RODS
- ◇ DENOTE PULLING EYE BOLTS

LOCATION OF 2Nos. 150Wx8THK (10THK) SEALING STRIPS WELDED WITH 1st (#A1) BAFFLE PLATE TO LAST (#B) BAFFLE PLATE

LOCATION OF 2Nos. 60Wx8THK (10THK) SEALING STRIPS WELDED WITH TUBESHEET, BAFFLE PLATE TO SUPPORT PLATE

656.19 TYP FOR PULLING EYE BOLTS

270°
 GROOVE 3mm 15mm

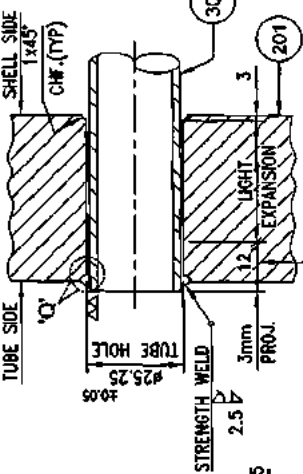
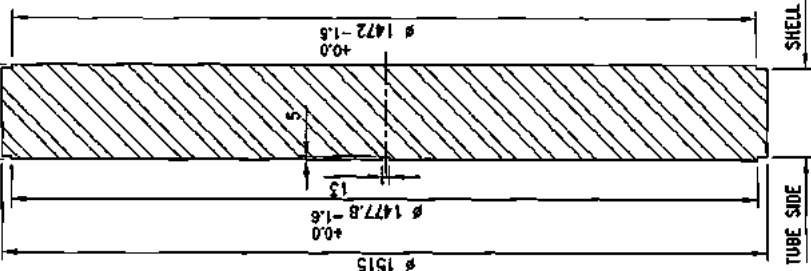
610.94 FOR IMPINGEMENT ROD

LOCATION OF 2Nos. 70Wx20THK SLIDING STRIPS WELDED WITH TUBESHEET, BAFFLE PLATE TO SUPPORT PLATE (#C)

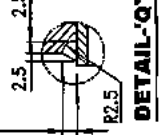
TUBESHEET LAYOUT
VIEW FROM 'A-A'
 (REF. SHT. 5 of 18)
 SCALE:- 1:10

SHELL ID	: 1475
NO. OF TUBE HOLES	: 1294 (647 'U' TUBES)
TUBE HOLE DIAMETER	: 25.25 mm ±0.05
OTL	: 1422.04
PITCH	: 32
LAYOUT	: 45° RT. SQUARE

185 Tnk.



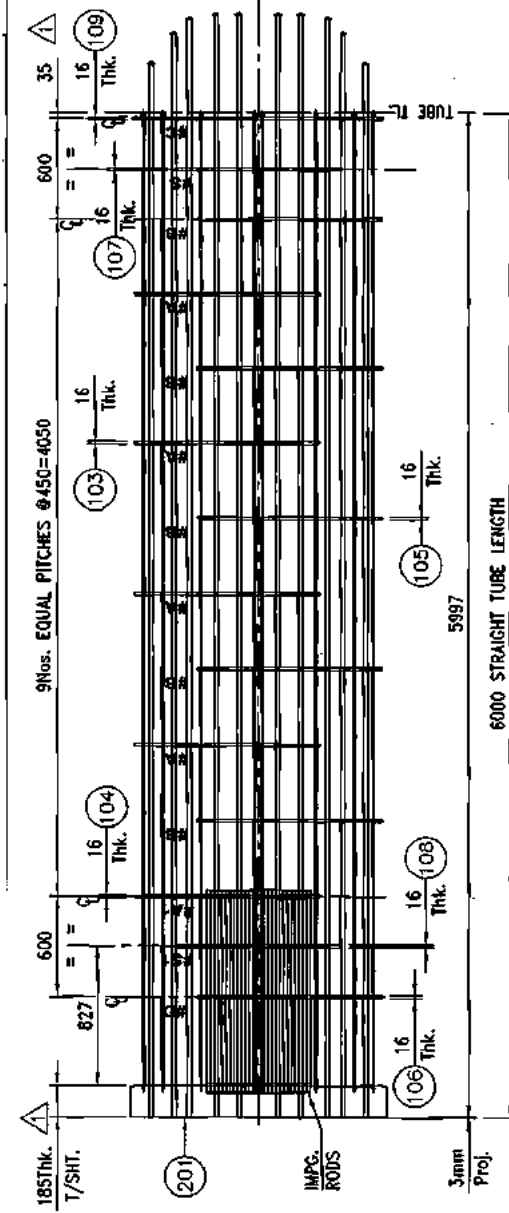
TUBE TO TUBE SHEET JOINT
 SCALE:- NTS.



DETAIL-Q'

A B C D E F
 1 2 3 4 5 6 7 R

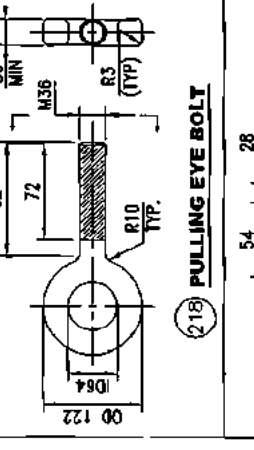
9 Nos. EQUAL PITCHES @ 450=4050



TUBE BUNDLE PLAN
SCALE: 1:30

6000 STRAIGHT TUBE LENGTH

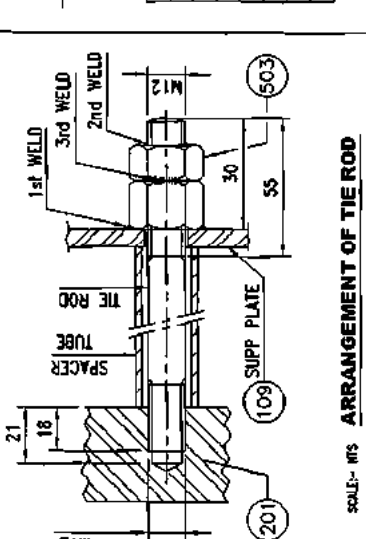
IT NO	519	1119	8
QTY	14	8	24



PULLING EYE BOLT
SCALE: NTS

IT NO	LENGTH	QTY.
302A	519	14
302B	1119	8
302C	284	24
302D	434	126
302E	864	32
302F	584	16
302G	1034	8

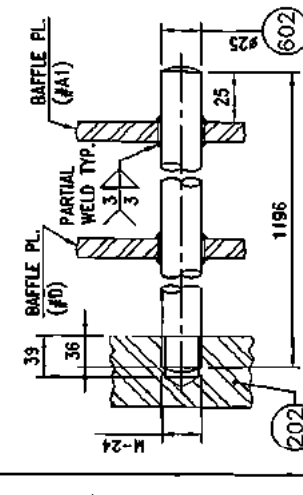
SPACER TUBE
SCALE: NTS



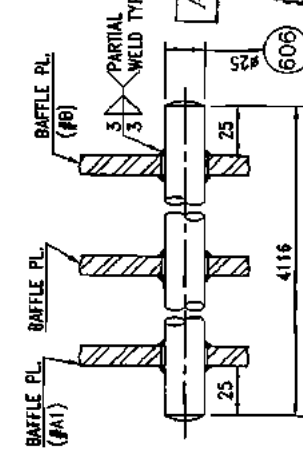
ARRANGEMENT OF TIE ROD
SCALE: NTS

IT NO	LENGTH(L)	QTY.
601	5833	22

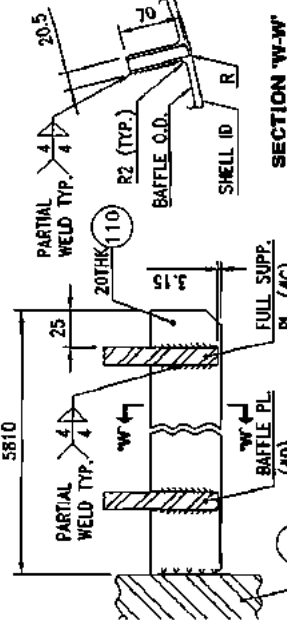
TIE ROD
SCALE: NTS



IMPINGEMENT ROD WELD DETAIL
SCALE: NTS



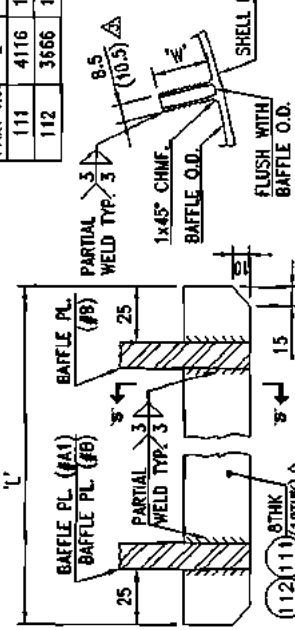
SEAL ROD WELD DETAIL
SCALE: NTS



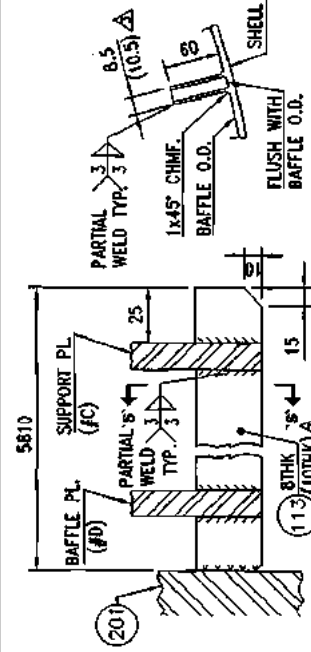
SLIDING STRIP WELD DETAIL
SCALE: NTS

PART No.	L'	W'
111	4116	150
112	3666	150

SECTION 'W-W'
MAX. OF 0.8mm GAP BETWEEN SHELL ID & SLIDING STRIP



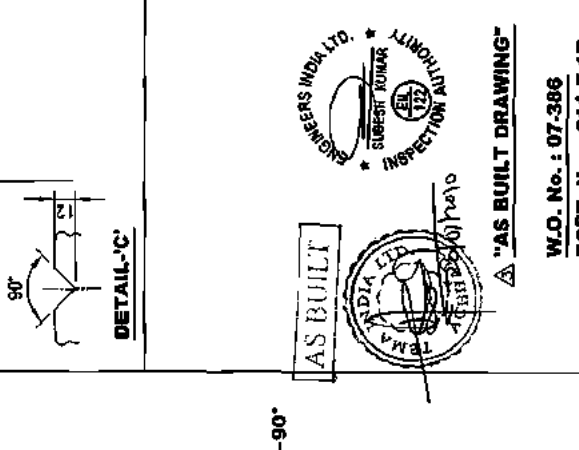
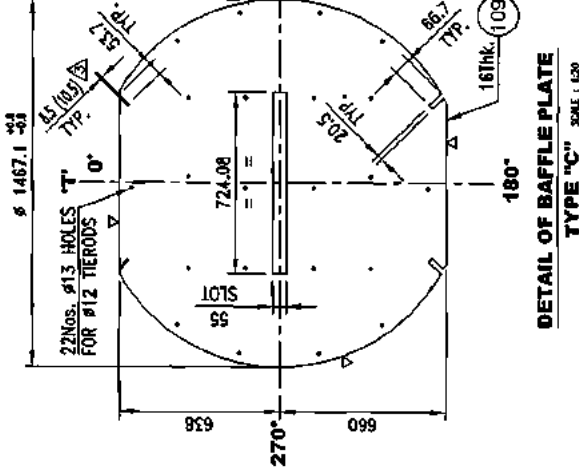
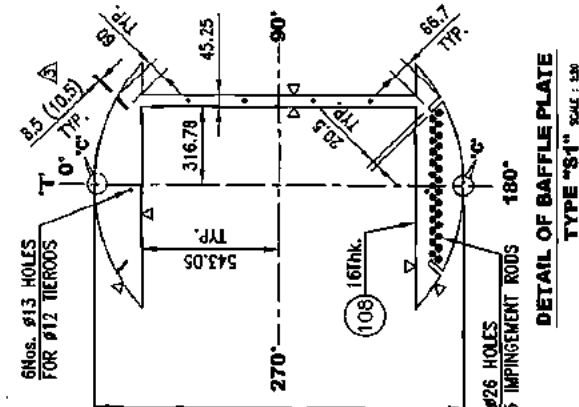
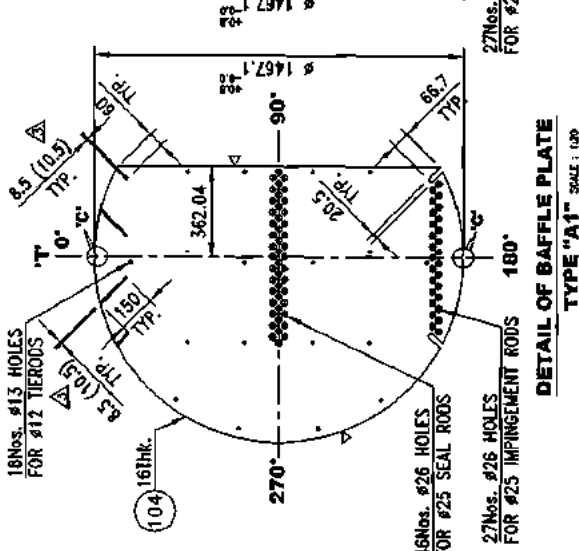
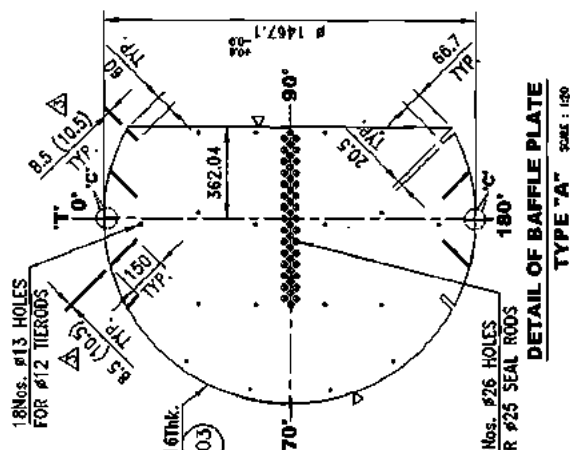
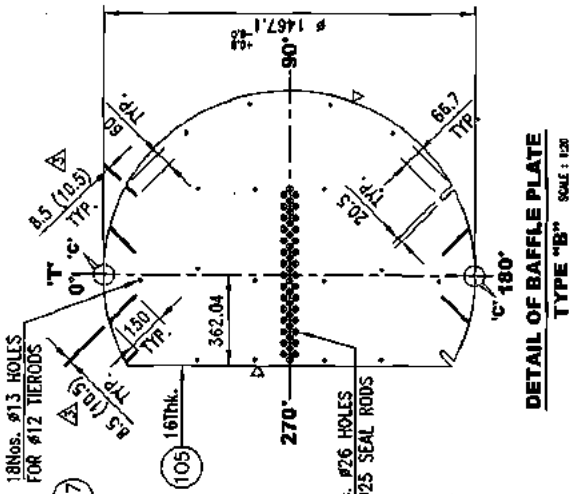
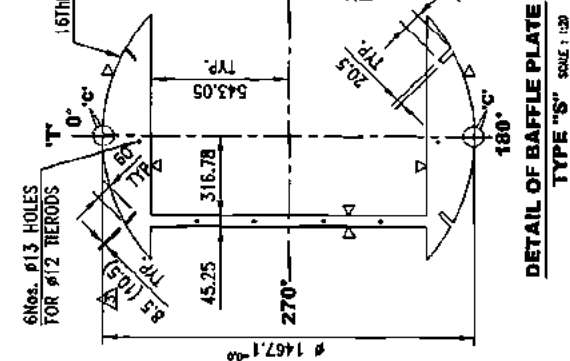
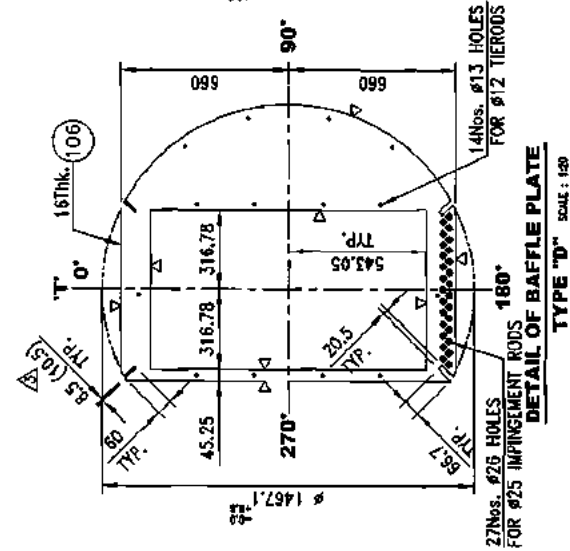
SEALING STRIP WELD DETAIL
SCALE: NTS



SEALING STRIP WELD DETAIL
SCALE: NTS

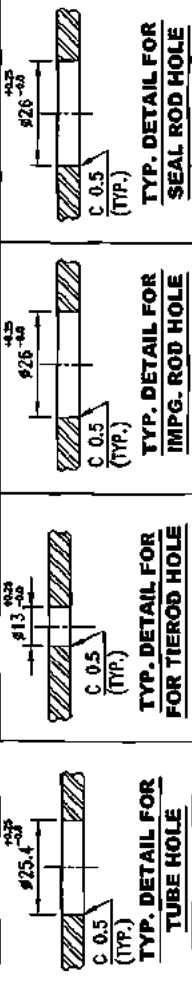
AS BUILT
"AS BUILT DRAWING"
W.O. No. : 07-396
EQPT. No. : 211-E-1B
4 APR 2012

331
INSPECTION
SURESH KUMAR
T.M.A. INDIA LTD.
PUNE
DWG NO. SDB/E/071200



NOTES:

- 1) TUBE HOLE #25.4 TO BE DRILLED AS PER T/SHT. LAYOUT IN THE BAFFLE & SUPP. PLATES.
- 2) SEALING & SLIDING STRIPS LOCATION AS PER T/SHT. LAYOUT.
- 3) TIEROD & IMPINGEMENT ROD LOCATION AS PER T/SHT. LAYOUT.
- 4) SEAL ROD LOCATION AS PER T/SHT. LAYOUT.



AS BUILT

ENGINEERS INDIA LTD.
INDIA
SURESH KUMAR
ARCHITECT

AS BUILT DRAWING

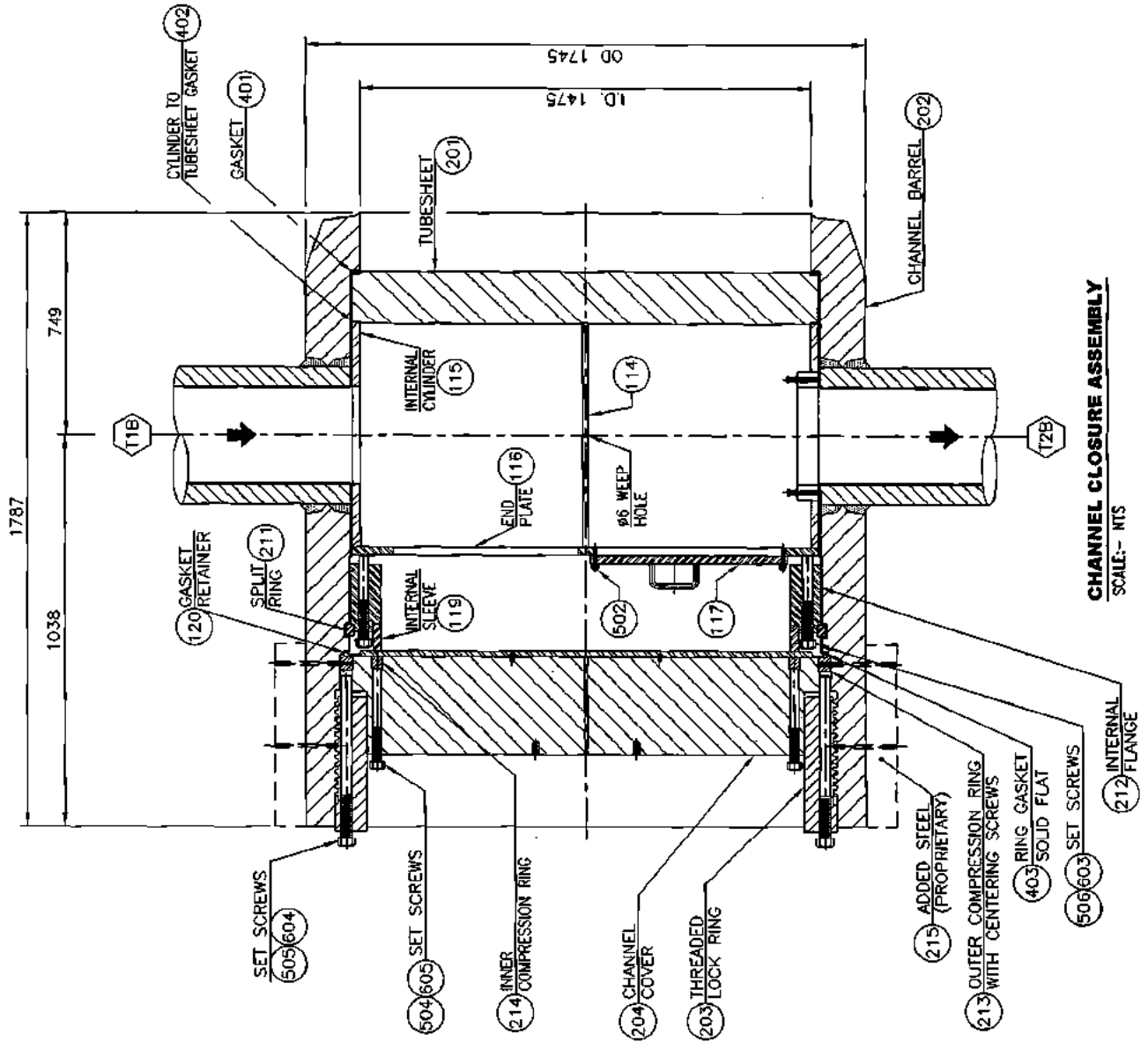
W.O. No. : 07-366
EQPT. No. : 211-E-1B

332

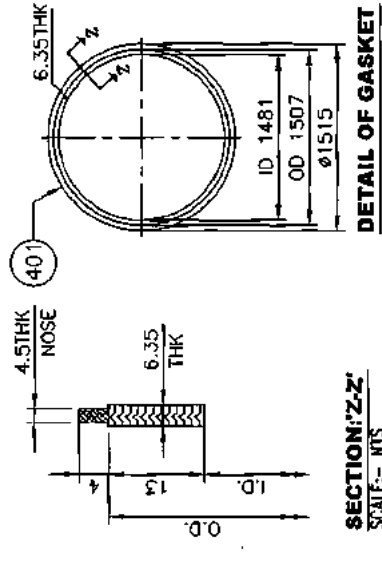
SCALE AS SHOWN 3 8of18

SHT 8of18

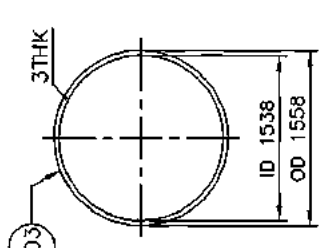
DWG NO. SDB/E/07/1200



CHANNEL CLOSURE ASSEMBLY
SCALE:- NTS



SECTION 'Z-Z'
SCALE:- NTS



DETAIL OF GASKET
SCALE:- NTS



"AS BUILT DRAWING"
W.O. No. : 07-386
EQPT. No. : 211-E-1B

333 TEMA
INDIA LTD

SCALE	REV	SHT
NTS	3	9 of 18
DWG NO.		SDB/E/071200

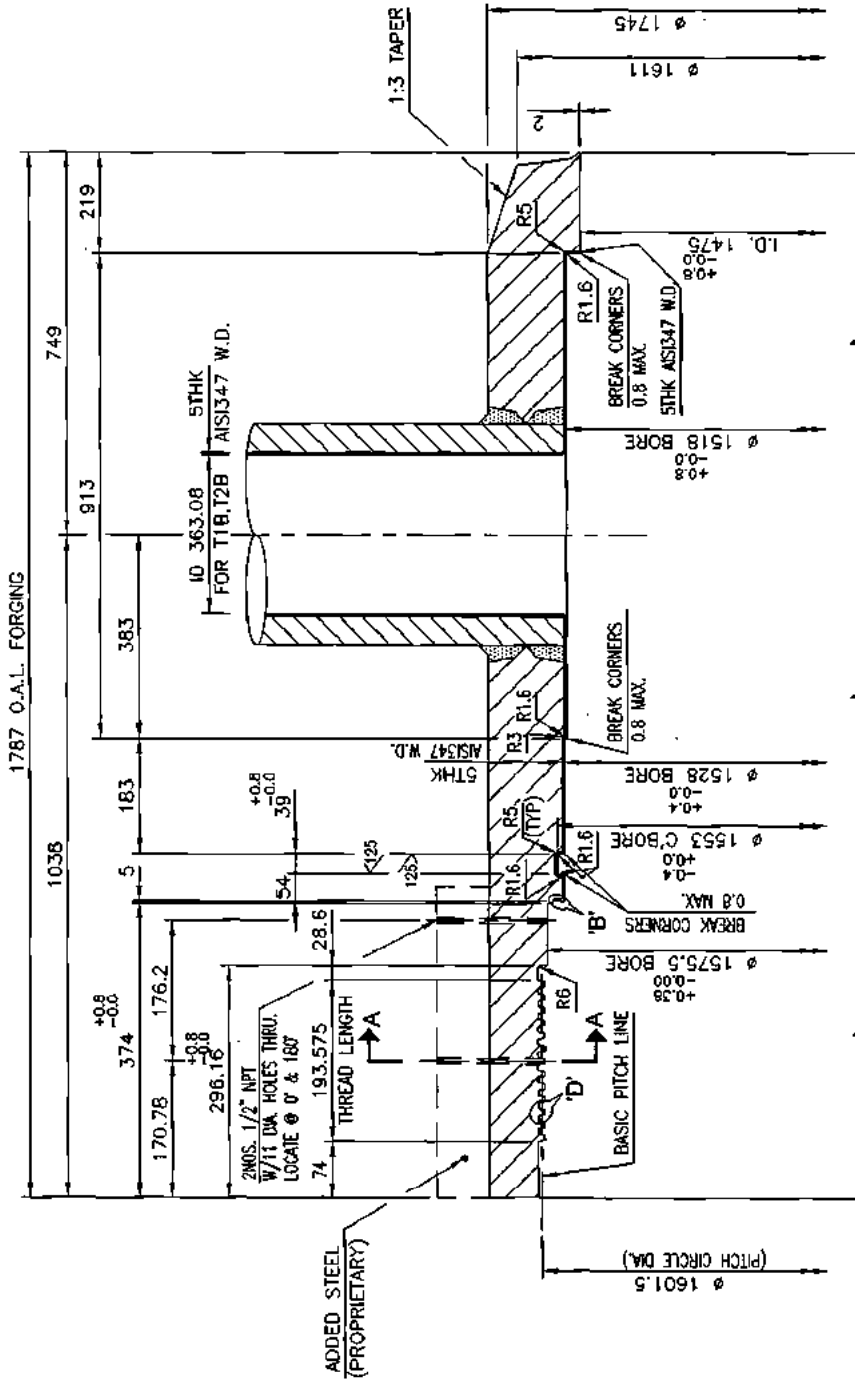
Handwritten signature and date: 21/10/20

A B C D E F

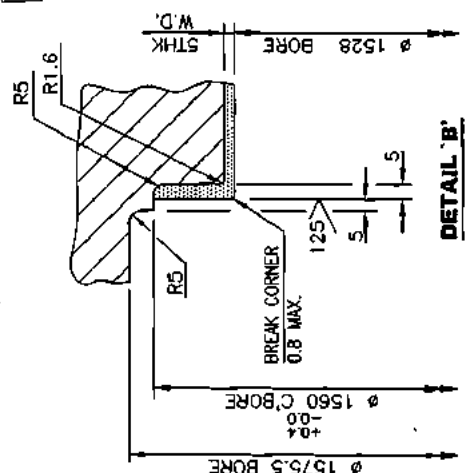
A B C D E F

1 2 3 4 5 6 7 8 R

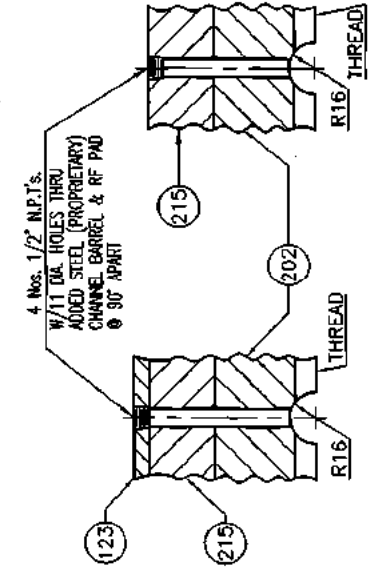
1787 O.A.L. FORGING



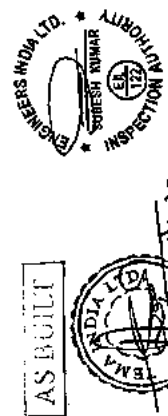
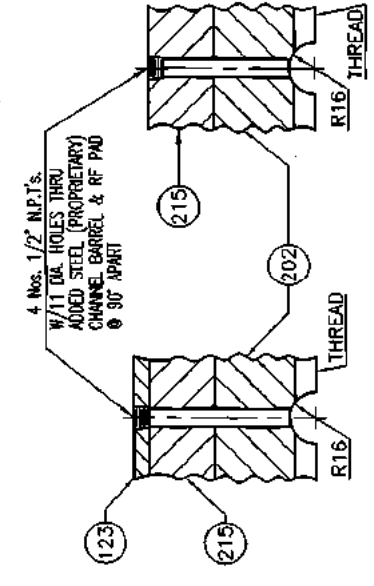
DETAIL 'D'
SCALE: - NTS



DETAIL 'B'
SCALE: - NTS



SECTION 'A-A'
TYPICAL GREASE GROOVE 4- PLACES 90° APART
SCALE: -NTS.

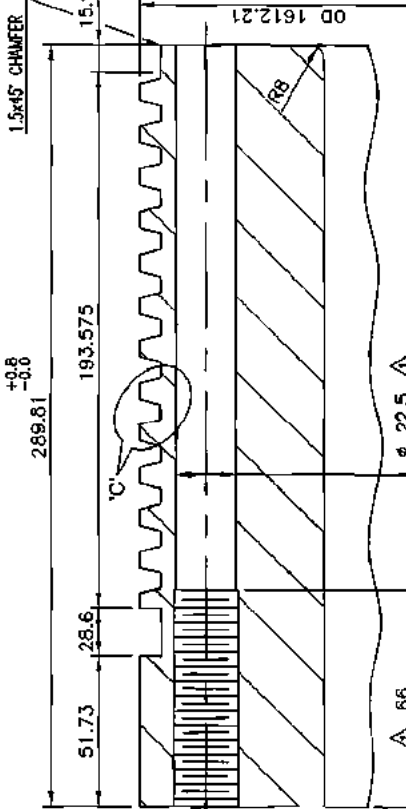


"AS BUILT DRAWING"
W.O. No. : 07-386
EQPT. No. : 211-E-1B

334 TEMA
INDIA LTD.

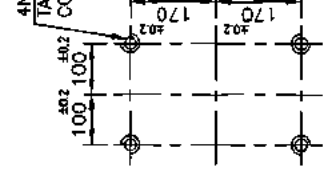
SCALE	REV	SRT
NTS	3	10 of 18
DWG NO.	SDB/E/071200	

Handwritten signature and date: 20/11/2010

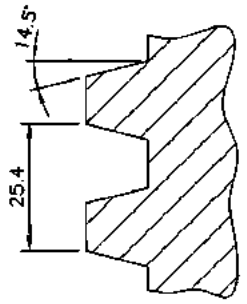


203 **DETAIL OF THREADED LOCK RING**
SCALE:- NTS

4NOS. M-24x38 DEEP TAPPED HOLES FOR COVER LIFTING DEVICE



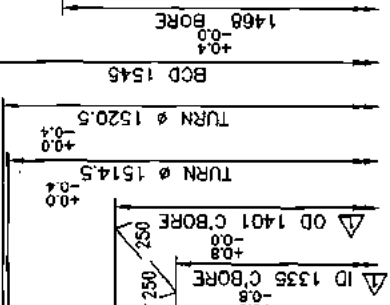
DETAIL 'A'
SCALE:- NTS
AS BUILT



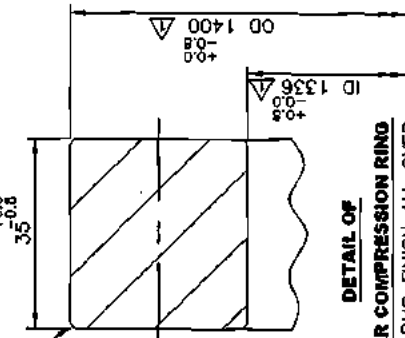
DETAIL 'C' SCALE:- NTS

1 TPI 29° ACME CLASS 2G STD. THDS AS PER ASME B1.5 THREADED LOCK RING THREAD DETAIL 125 RMS FINISH OR BETTER ALL OVER

505 92 TAPS 1" UNC EQ. SPACED RUN TAP DRILL THRU TAPS MUST BE PERPENDICULAR TO FACE OF RING

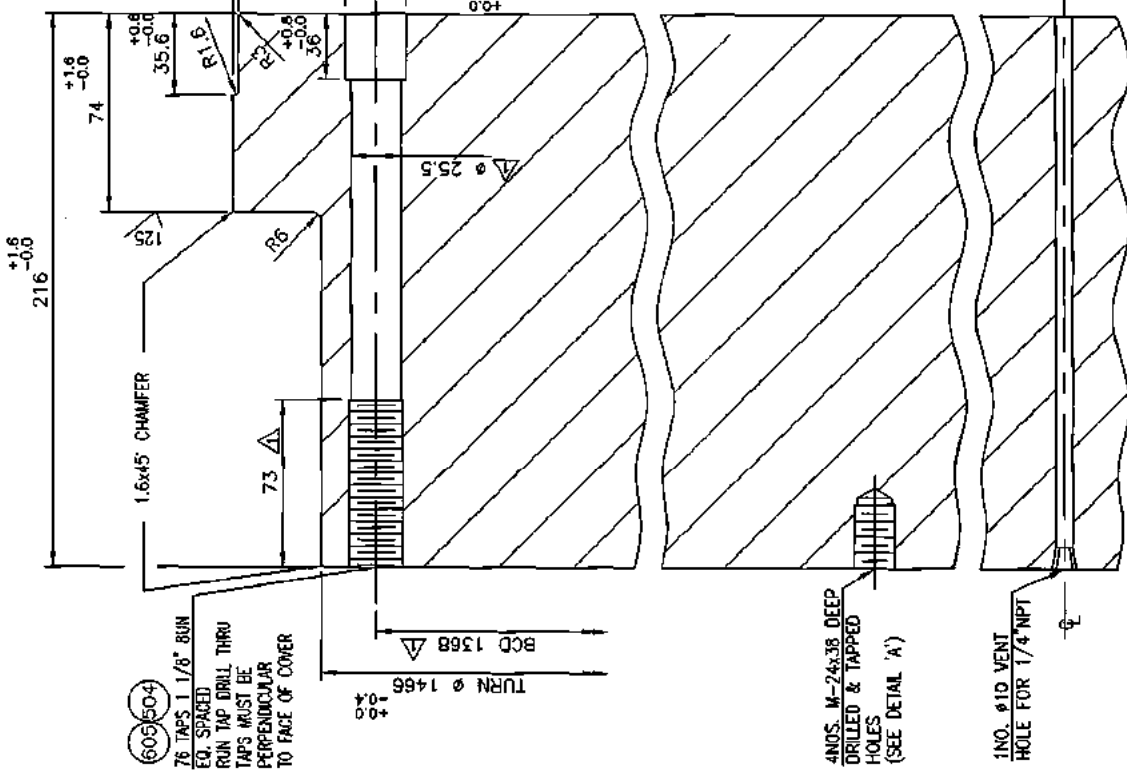


214 **INNER COMPRESSION RING**
250 RMS FINISH ALL OVER
SCALE:- NTS



BREAK CORNERS 1.5 MAX.

204 **DETAIL OF CHANNEL COVER**
250 RMS FINISH ALL OVER EXCEPT WHERE NOTED
SCALE:- NTS



504 76 TAPS 1 1/8" RUN EQ. SPACED RUN TAP DRILL THRU TAPS MUST BE PERPENDICULAR TO FACE OF COVER

4NOS. M-24x38 DEEP DRILLED & TAPPED HOLES (SEE DETAIL 'A')

1NO. #10 VENT HOLE FOR 1/4" NPT



"AS BUILT DRAWING"

W.O. No. : 07-388
EQPT. No. : 211-E-1B

335 **TEMA**
INDIA LTD.

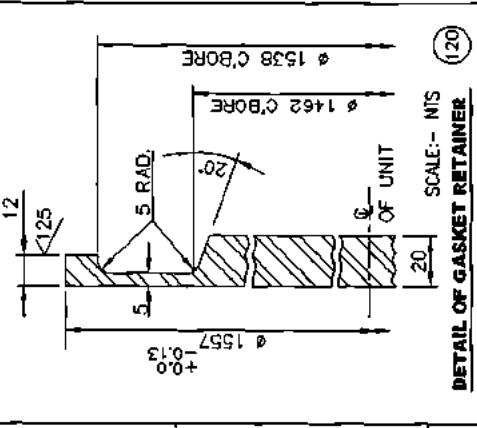
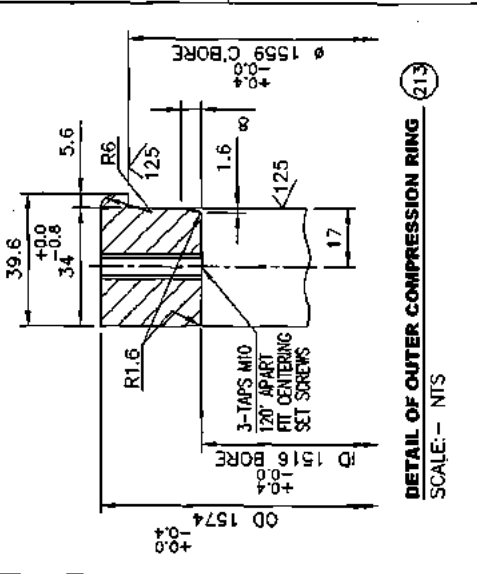
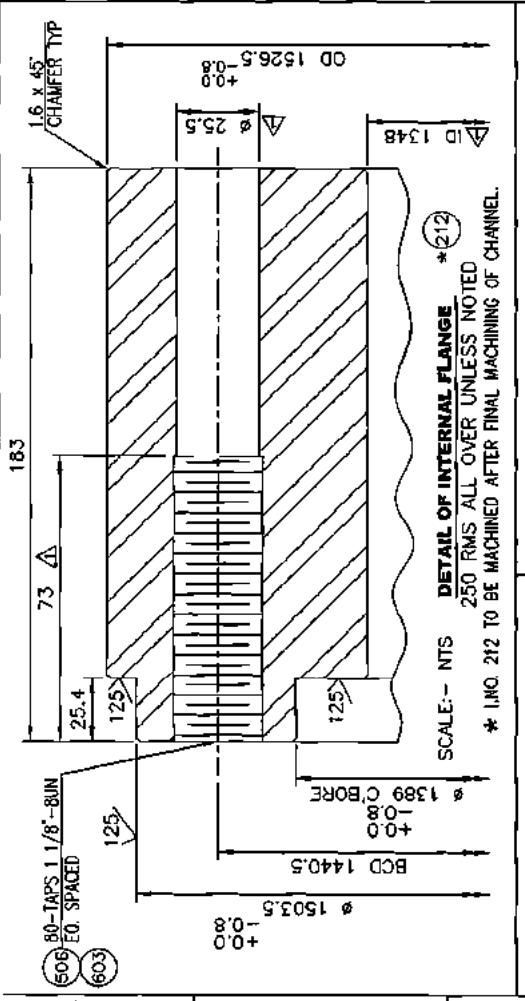
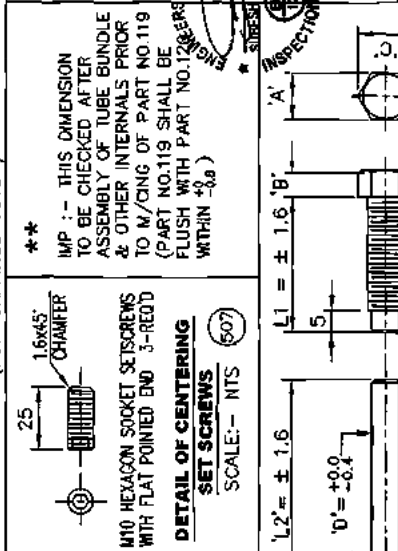
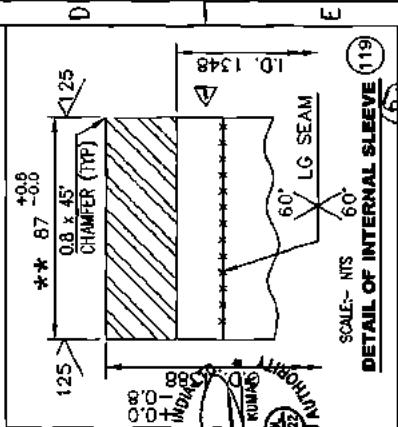
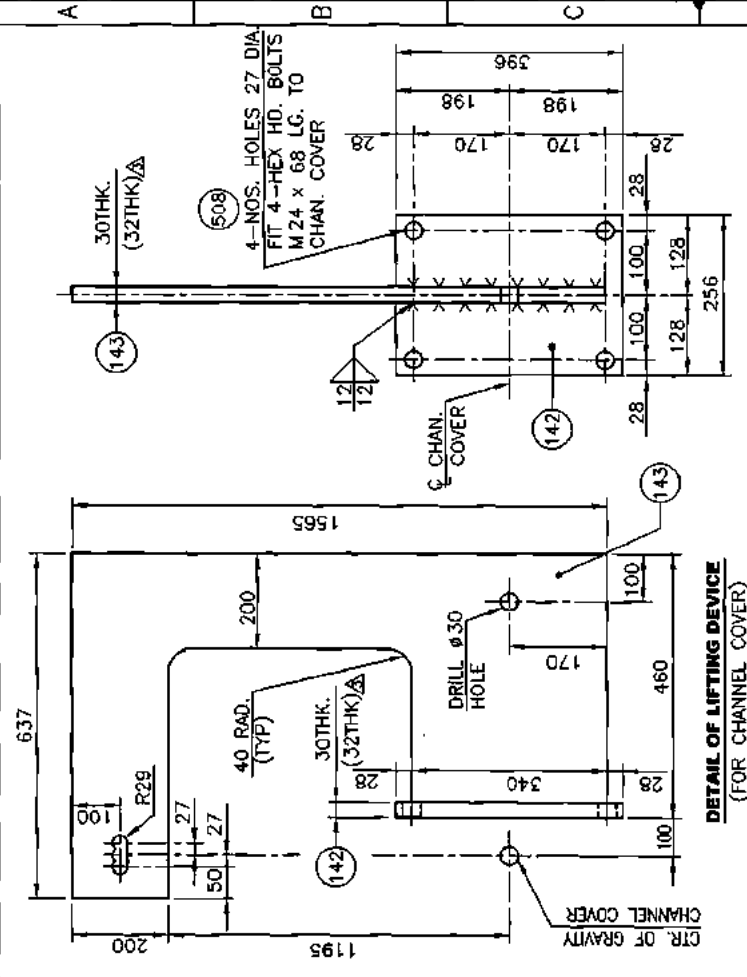
SCALE	REV	SET
NTS	3	11 of 18

DWG NO. SDR/E/071200

Handwritten signature and initials

A B C D E F

1 2 3 4 5 6 7 8



W.O. No. : 07-386

EOP.T. No. : 241-E-18

AS BUILT

336

SCALE: NTS

REV 3

SHT 12 of 18

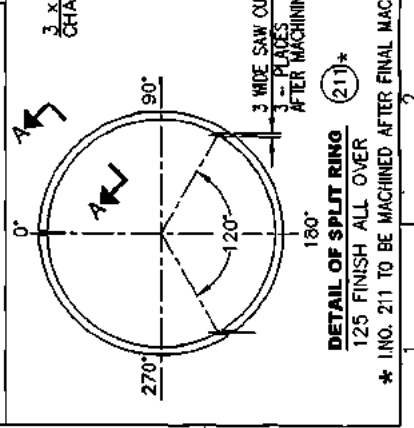
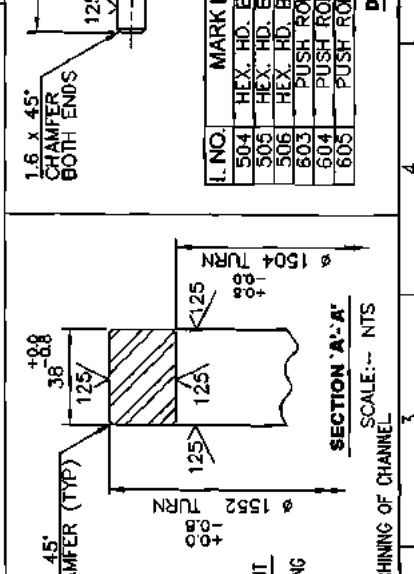
DATE 07/18/00

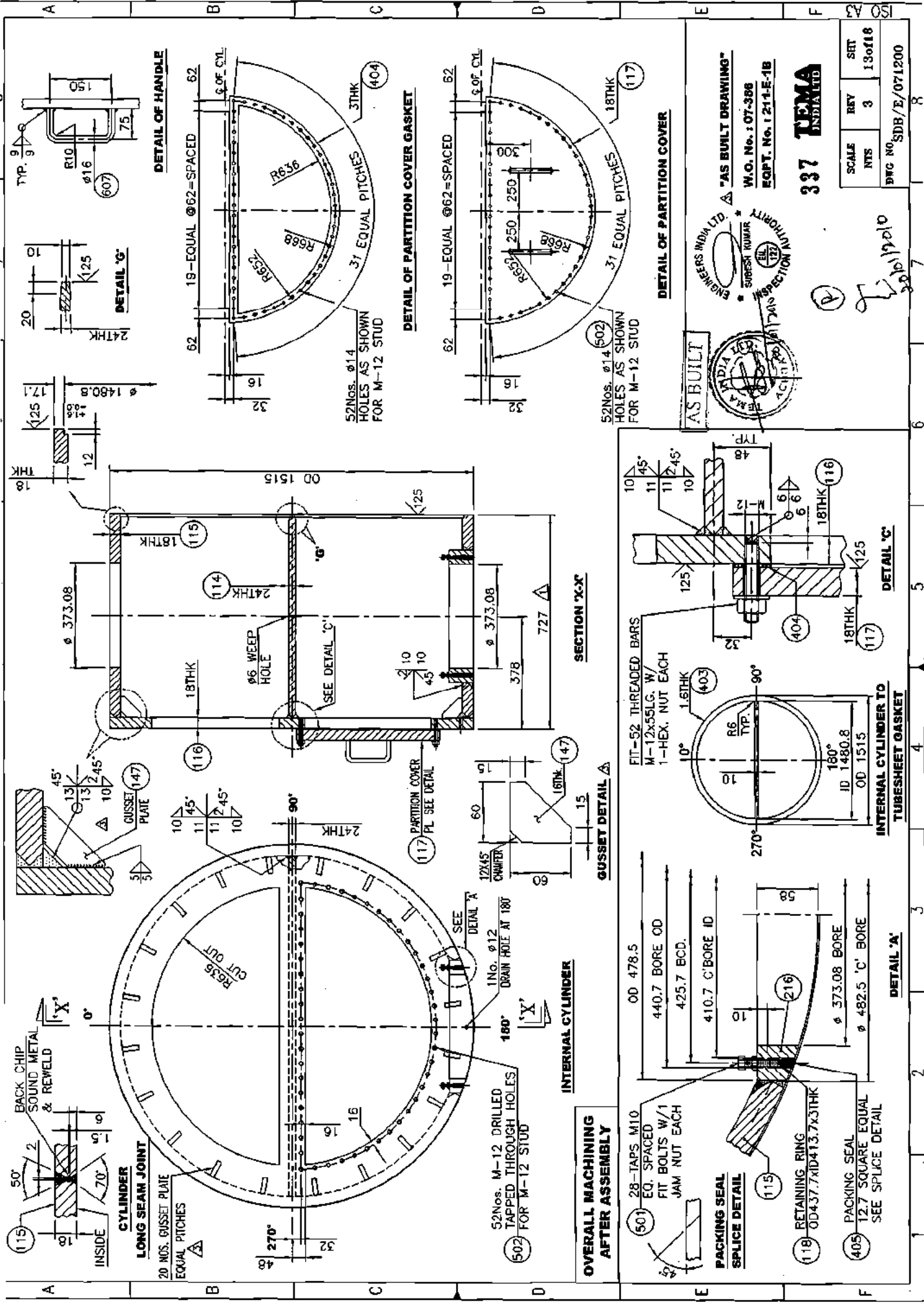
SDB/E/071800

T.E.M.A. INDIA LTD.

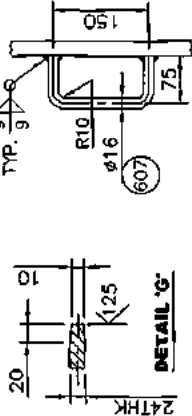
I. NO.	MARK NO.	SIZE	QTY	A'	B'	A'	D'	12° C'
504	HEX. HD. BOLT	M10-BUN	76	89	21.4	38.1	-	43.99
505	HEX. HD. BOLT	M10-UNC	92	82	19.05	33.35	-	38.31
506	HEX. HD. BOLT	M10-BUN	80	88	21.4	38.1	-	43.99
603	PUSH RODS	-	80	-	-	-	25	150
604	PUSH RODS	-	92	-	-	-	22	275
605	PUSH RODS	-	76	-	-	-	25	118

DETAIL OF SET SCREWS & PUSH RODS

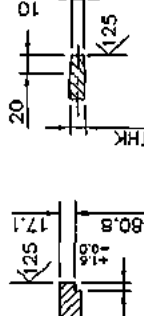




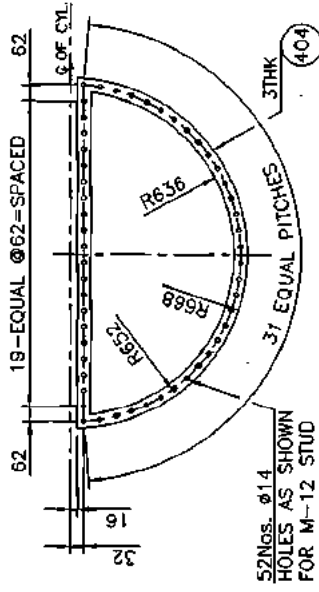
DETAIL OF HANDLE



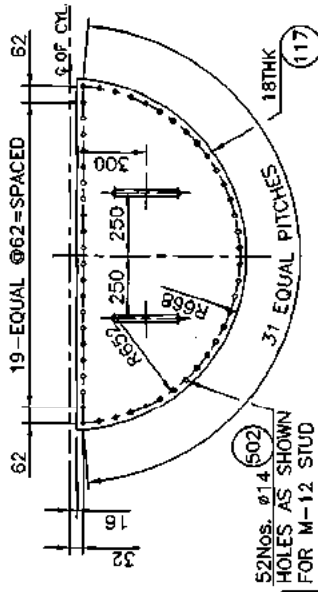
DETAIL 'G'



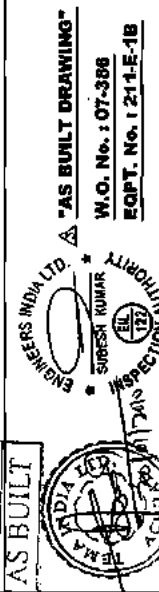
DETAIL OF PARTITION COVER GASKET



DETAIL OF PARTITION COVER GASKET



DETAIL OF PARTITION COVER

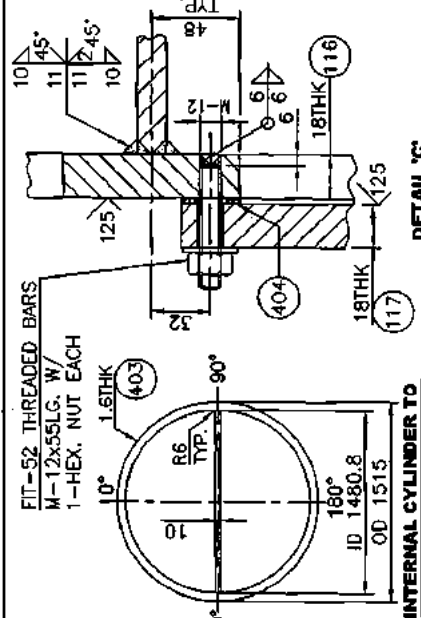


337 TEMA
INDIA LTD

"JAS BUILT DRAWING"
W.O. No. 07-388
E.O.P.T. No. 121-1-E-18

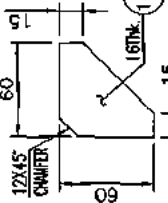
SCALE	REV	SET
NTS	3	13 of 18
DWG NO. SDB/E/071200		

SECTION 'X-X'

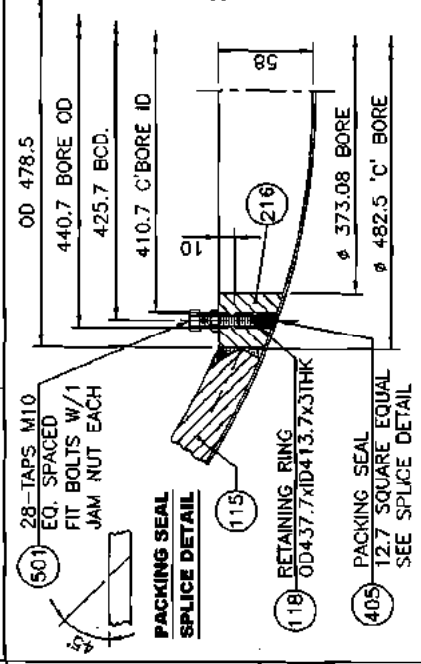


DETAIL 'C'

GUSSET DETAIL 'A'



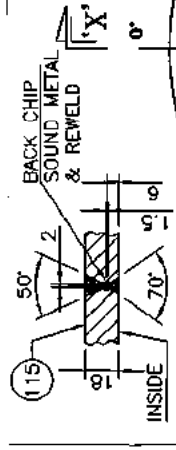
INTERNAL CYLINDER



DETAIL 'A'

CYLINDER LONG SEAM JOINT

20 NOS. GUSSET PLATE EQUAL PITCHES



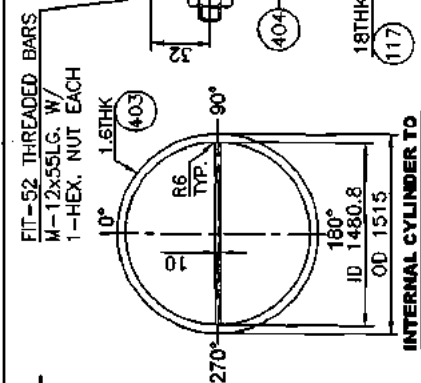
INTERNAL CYLINDER

52 NOS. M-12 DRILLED TAPPED THROUGH HOLES FOR M-12 STUD
180°
1 No. ø12 DRAIN HOLE AT 180°
16THK 147

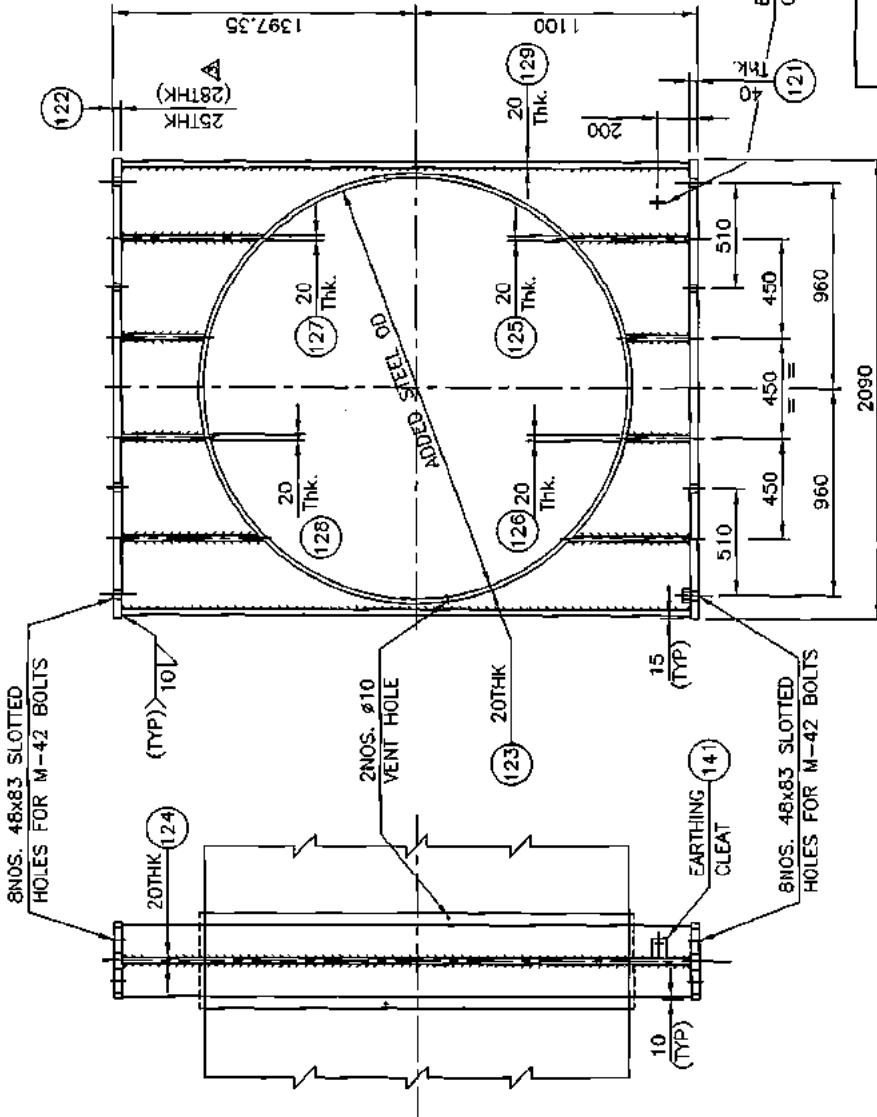
OVERALL MACHINING AFTER ASSEMBLY

- 501 28-TAPS. M10 EQ. SPACED FIT BOLTS W/1 JAM NUT EACH
- 115 PACKING SEAL SPLICE DETAIL
- 118 RETAINING RING OD437.7xD413.7x3THK
- 405 PACKING SEAL 12.7 SQUARE EQUAL SEE SPLICE DETAIL

INTERNAL CYLINDER TO TUBESHEET GASKET

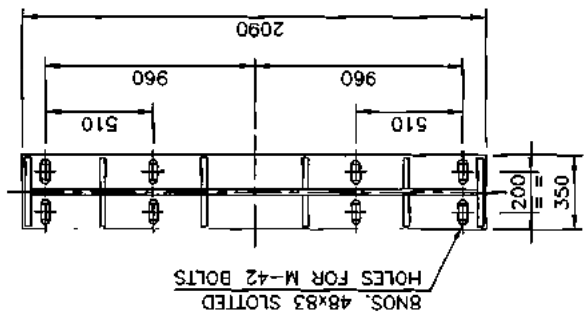
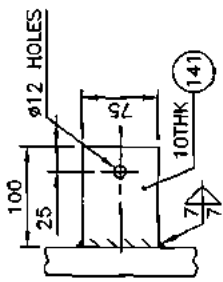
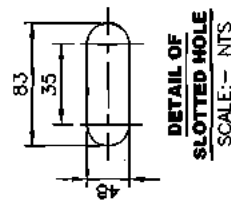


DETAIL 'A'

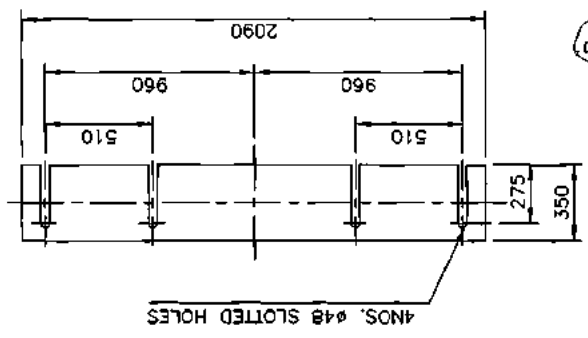


NOTE :-
ALL FILLETS ARE 14 mm.

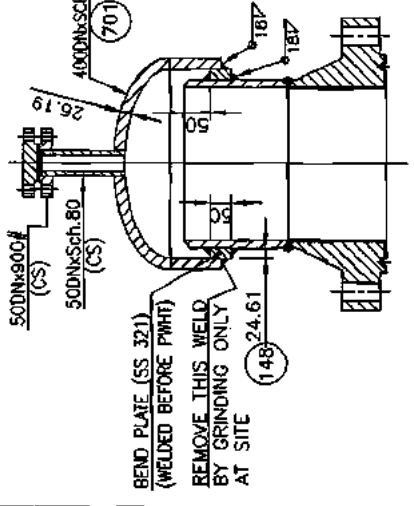
**DETAIL OF SADDLE SUPPORT
FOR CHANNEL SIDE** SCALE:- NTS



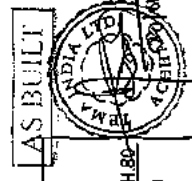
DETAIL OF BASE PLATE
SCALE:- NTS



DETAIL OF SHIM PLATE
SCALE:- NTS



HYDROTEST ARRANGEMENT DETAIL
SCALE:- NTS

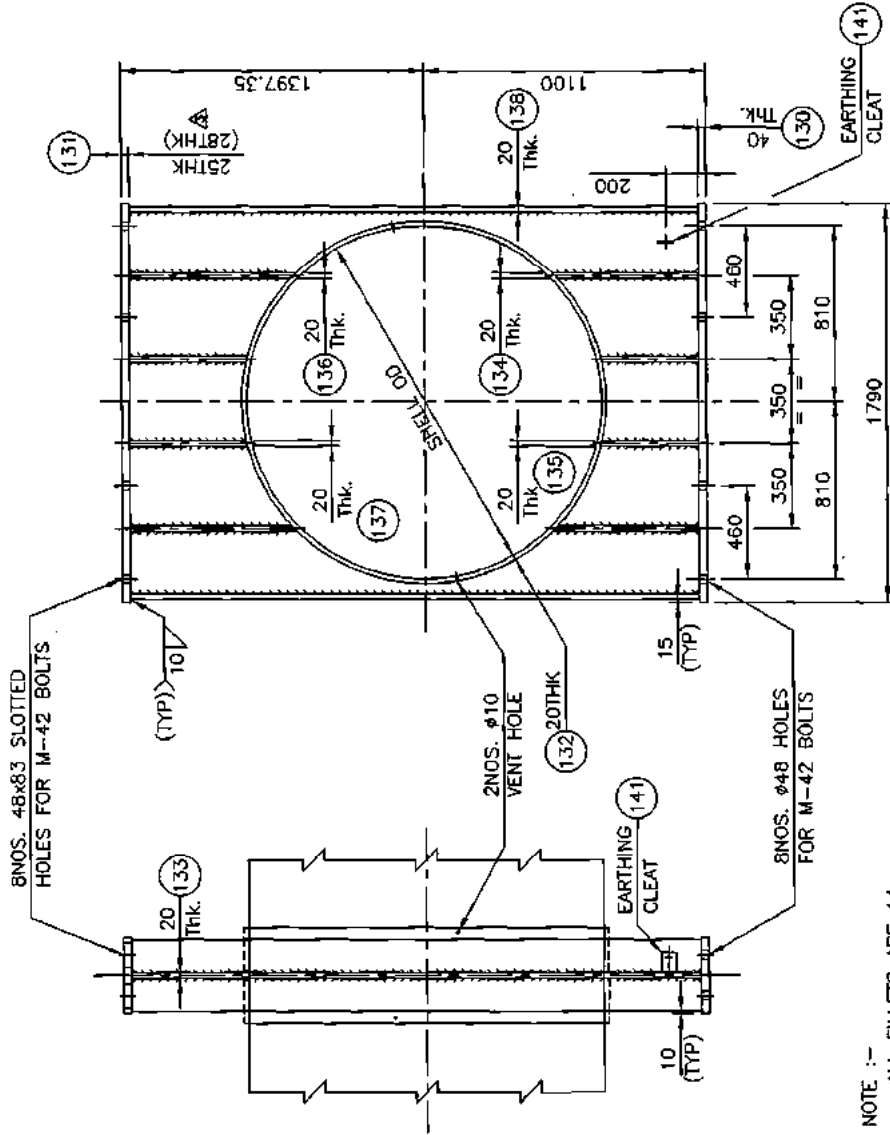


"AS BUILT DRAWING"
W.O. No. : 07-386
EOPT. NO. : 211E-1B

338 TEMA INDIA LTD

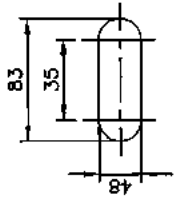
SCALE	REV	SET
NTS	3	14 of 18
DWG NO. SDB/E/071200		

Handwritten notes and signatures.

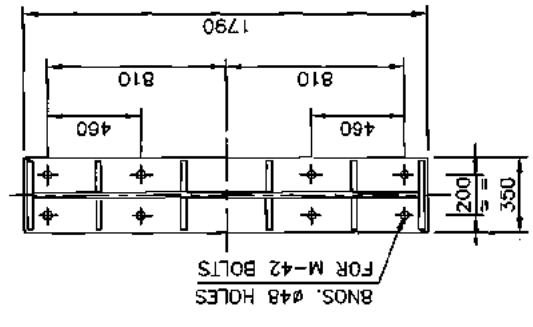


DETAIL OF SADDLE SUPPORT FOR SHELL SIDE SCALE:- NTS

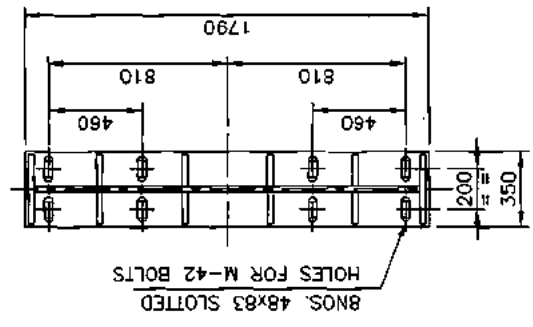
NOTE :- ALL FILLETS ARE 14 mm.



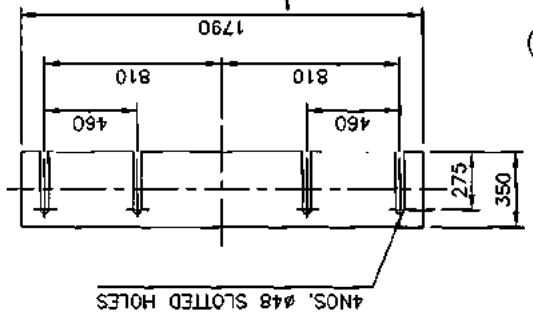
DETAIL OF SLOTTED HOLE SCALE:- NTS



DETAIL OF BASE PLATE FOR FIXED SADDLE (130)



DETAIL OF BASE PLATE FOR SLIDING SADDLE (131)



DETAIL OF SHIM PLATE (140)



"AS BUILT DRAWING"
W.O. No. 1 07-386
EQPT. NO. : 211-E-1B

339 TEMA INDIA LTD.

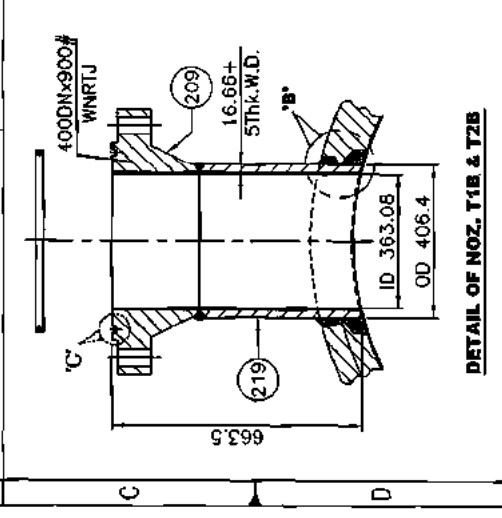
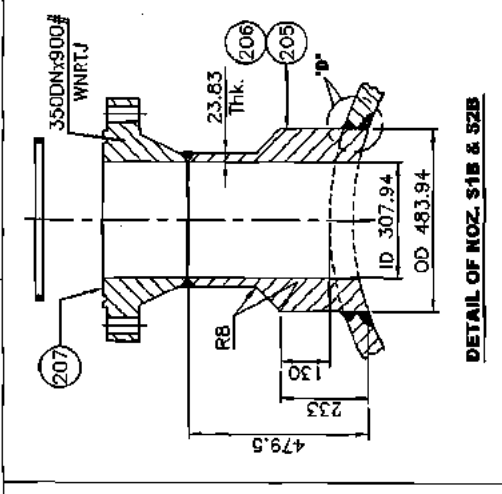
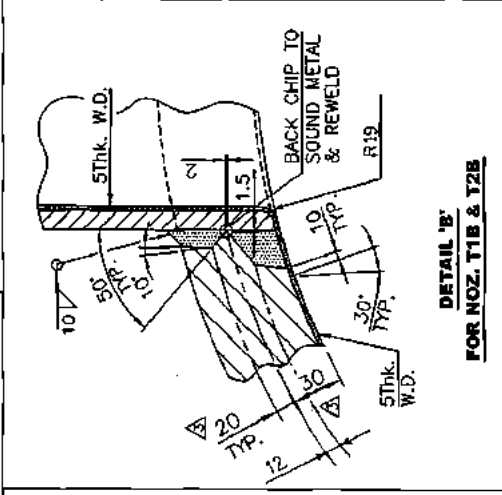
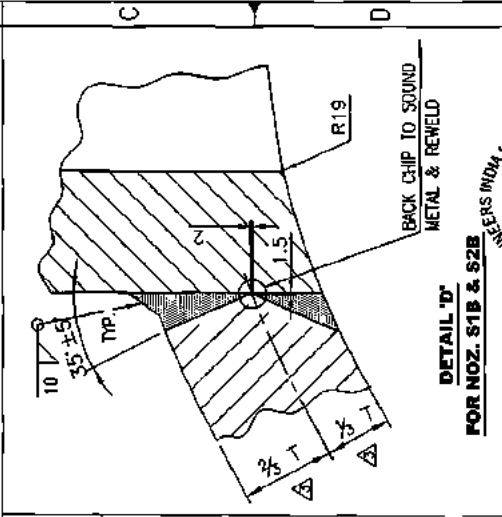
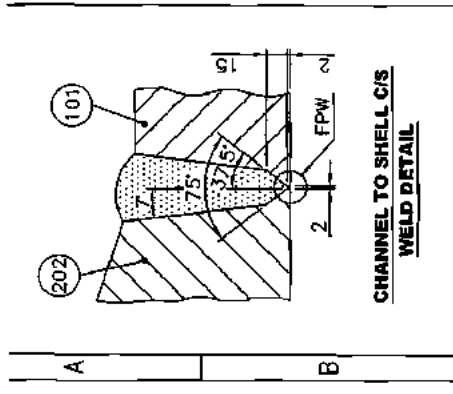
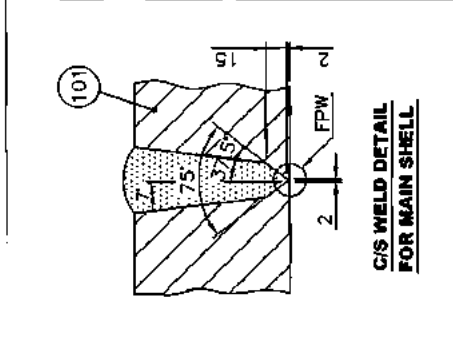
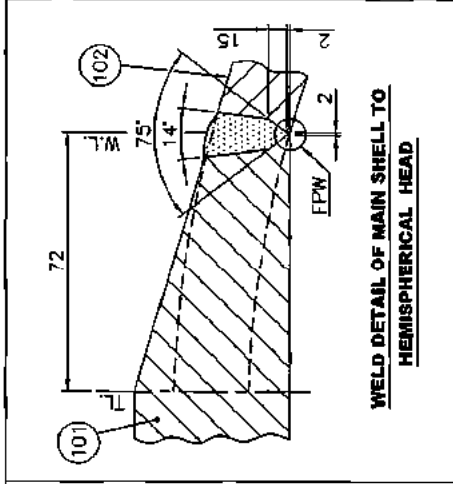
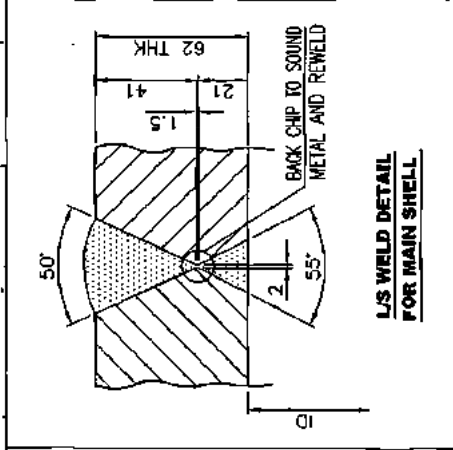
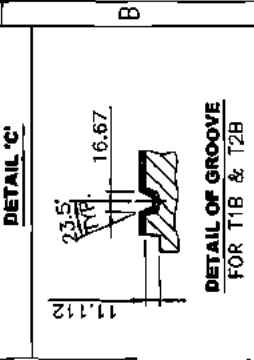
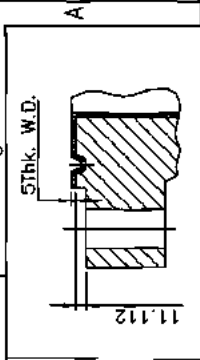
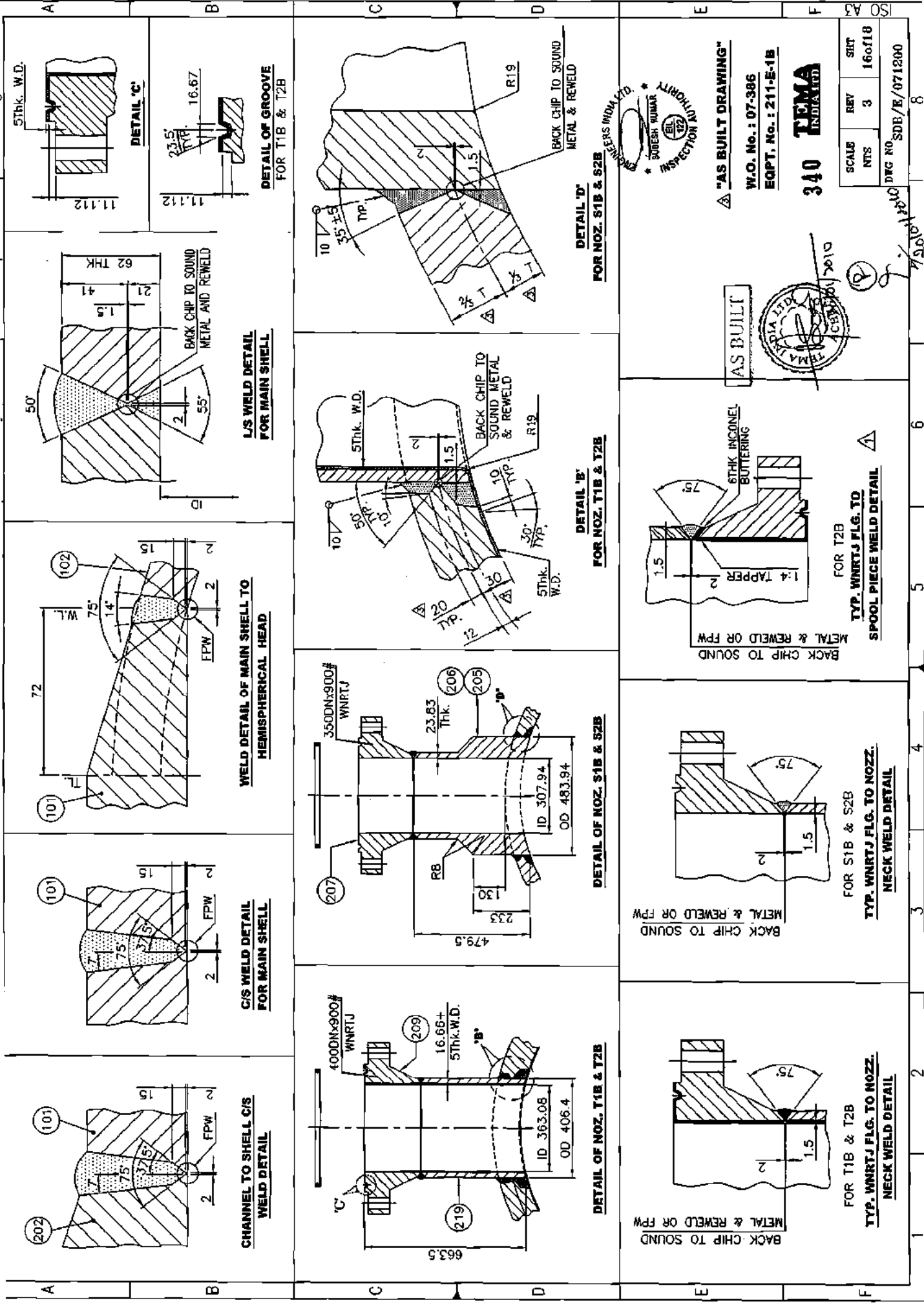
SCALE	REV	SRT
NTS	3	150t18

DWG NO. SDB/E/071200

A B C D E F ISO A3

A B C D E F

1 2 3 4 5 6 7 8



"AS BUILT DRAWING"

W.O. No. : 07-386

EQPT. No. : 211-E-1B

340 TEMA
INDIA

SCALE NTS 3 16of18

REV 3

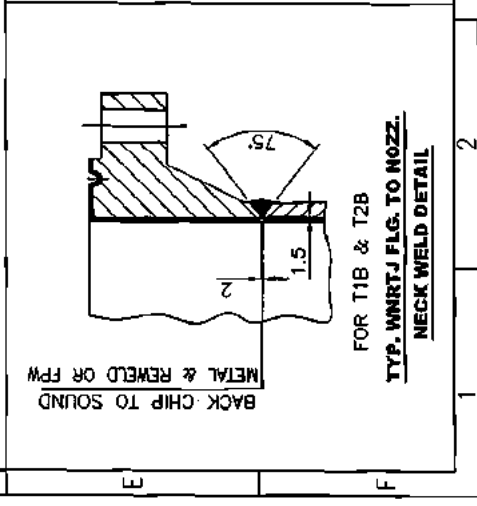
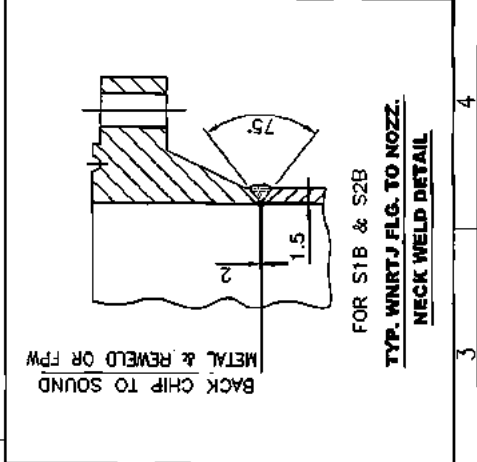
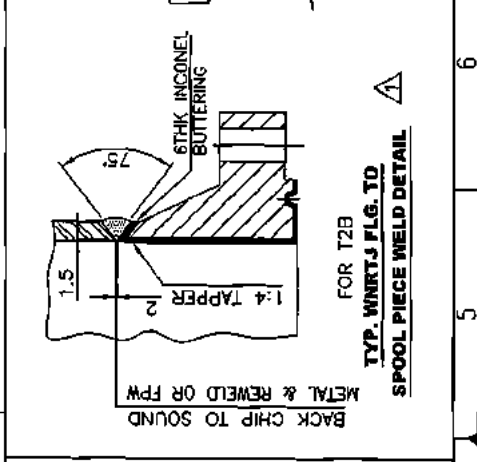
SRT 16of18

DWG NO. SDE/E/071200

INSPECTION

APPROVED

DATE



8

6

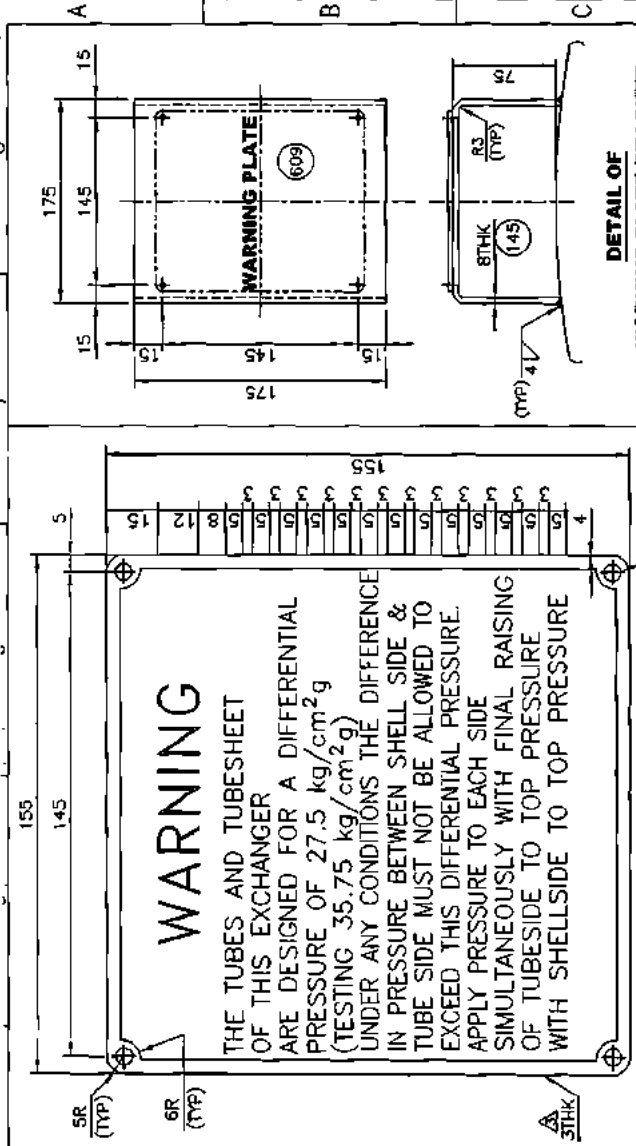
5

4

3

2

1



WARNING PLATE BRACKET

NOTE: THE WORD WARNING IS TO BE ENGRAVED 1 WIDE X 1.5 DEEP AND FILLED WITH RED PAINT

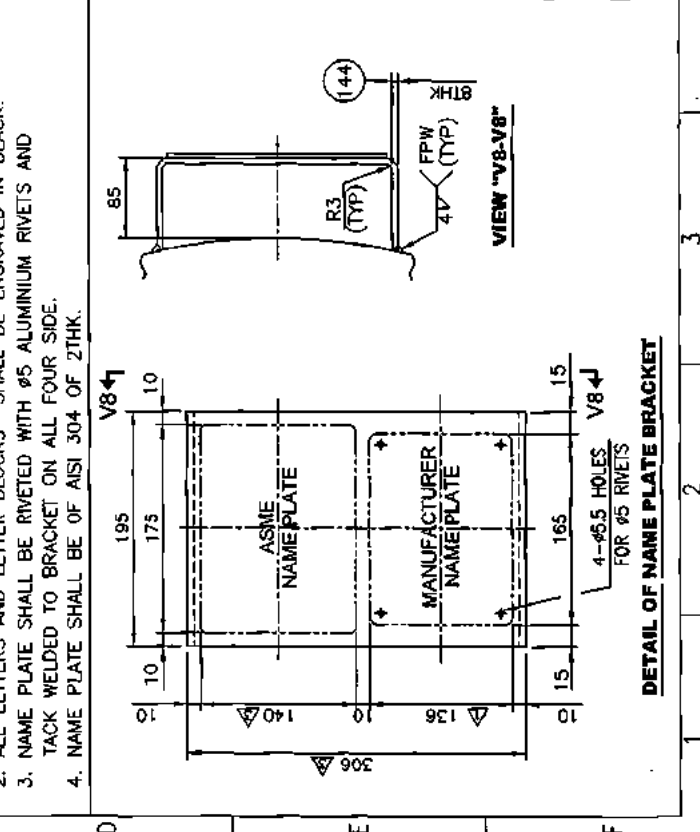
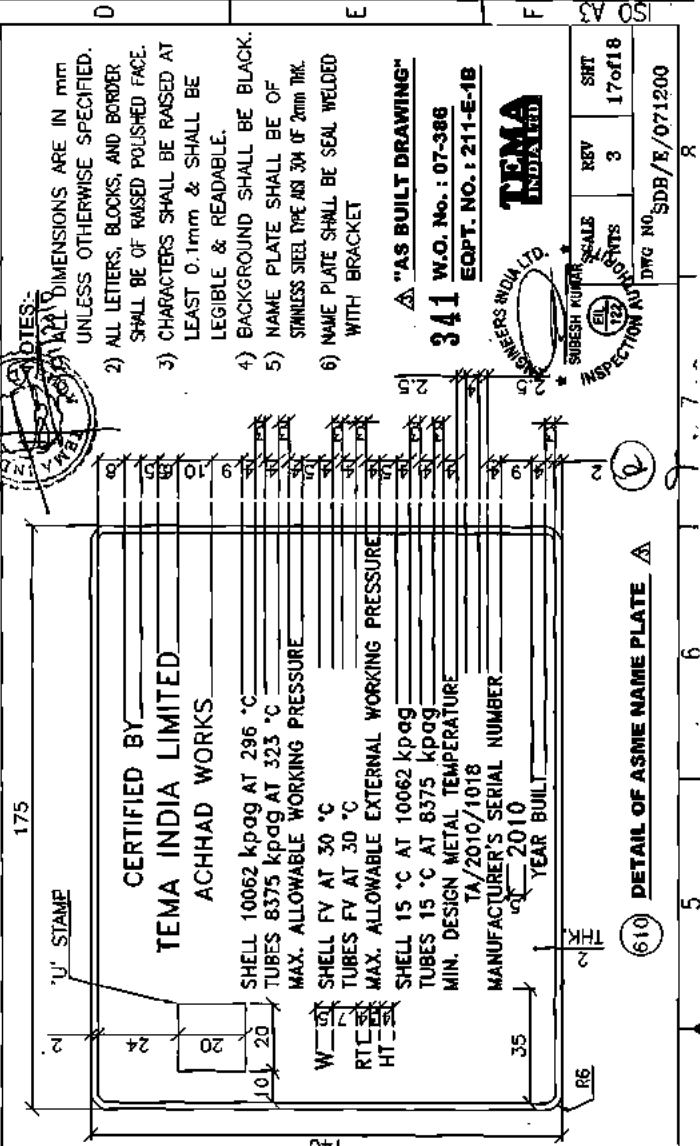
DETAIL OF WARNING PLATE (609)

TEMA INDIA LTD.		6	20
MECH. DESIGN BY		78	
TEMA INDIA LIMITED		150	
THERM. DESIGN BY			
ENGINEERS INDIA LIMITED			
MANUFACTURED FOR			
CPCL REFINERY IN			
ITEM NO			
211-E-1B			
MFR'S SERIAL NO			
TA/2010/1018			
YEAR BUILT 2010			
INSPECTED BY			
A/TEL			
DESIGN PRESSURE			
102.6/FV			
DESIGN TEMPERATURE			
296			
TEST PRESSURE (HYD)			
133.36			
DATE OF TEST			
13.01.2010			
OPERATING FLUID			
REACTOR FEED			
CORROSION ALLOW			
100%			
RADIOGRAPHY			
YES			
HEAT TREATMENT			
YES			
DUTY / SURFACE			
37.42x1.1 MM (600/20)			
SWP FULL CHECKED (AT DESIG. TEMP)			
102.6 AT 296 °C			
SWP FULL CHECKED (AT MAX. TEMP)			
102.6 AT 30 °C			
SWP FULL CHECKED (AT DESIGN PRESS.)			
102.6 AT 296 °C			
SWP FULL CHECKED (AT AMBIENT TEMP)			
102.6 AT 30 °C			
WT. FULL OF WATER			
67000			
TOTAL WT. EMPTY			
53700			
BUNDLE WEIGHT			
20500			

NAME PLATE

NOTES:-

1. ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
2. ALL LETTERS AND LETTER BLOCKS SHALL BE ENGRAVED IN BLACK.
3. NAME PLATE SHALL BE RIVETED WITH Ø5 ALUMINIUM RIVETS AND TACK WELDED TO BRACKET ON ALL FOUR SIDES.
4. NAME PLATE SHALL BE OF AISI 304 OF 2THK.



DETAIL OF NAME PLATE BRACKET

4-Ø5.5 HOLES V8

FOR Ø5 RIVETS

