

DESIGN DATA

A	CODE OF CONSTRUCTION	ASME SEC. VIII DIV.1 2007 Edn. TEMA CLASS-R 9th Edition, 2007	SHELL	CHANNEL
	DESIGN PRESSURE (SEE NOTE-32)	UNIT: Kg/Cm ² 98.1/Fv@30C 87.5/Fv@30C 8581@30C	PWHT	YES
	DESIGN TEMPERATURE	°C 361	RADIOGRAPHY	100%
	HYDROTEST PRESSURE (SEE NOTE-33)	Kg/Cm ² 128.83	JOINT EFFICIENCY	1.0
	DIFFERENTIAL DESIGN PRESSURE FOR TUBES/TS.	Kg/Cm ² 21.5	INSPECTION BY	A/E/EL
B	MIN. HYDRO TEST TEMPERATURE	°C 20	POSITION	HORIZONTAL
	OPERATING PRESSURE	Kg/Cm ² 84.7	DUTY	MM Kcal/hr
	OPERATING TEMPERATURE (IN / OUT)	°C 282/328	EARTHQUAKE SPECIFICATION	EL 9TC-6079-9-2554-0145
	INSIDE DIAMETER	mm 1400	WIND LOAD	IS 875
	No. OF PASSES	Nos. ONE	ADDITIONAL LOADING AS PER UG-22	NOZZLE LOADS
C	FLUID CIRCULATED	REACTOR FEED EFLUENT	CODE STAMPING REQUIRED	YES 'U'
	INSULATION	mm 95	TOLERANCE	TEMA CLASS R & EL STD. 7-15-0019 REV.1
	CORRN. ALLOWANCE	mm SEE NOTE-26	MECHANICAL DATA OF EXCHANGER	
	MAWP FULLY CORRODED (AT DESIGN TEMP.)	9718.5 kPag AT 361 °C SHELL SIDE	EFFECTIVE SURFACE AREA	m ² 518
	MAWP FULLY CORRODED (AT AMBIENT TEMP.)	9718.5 kPag AT 414 °C TUBE SIDE	TOTAL WEIGHT (EMPTY)	Kg 44480
	MAWP UNCORRODED (AT AMBIENT TEMP.)	9718.5 kPag AT 30 °C SHELL SIDE	TUBE BUNDLE WEIGHT	Kg 16500
	MDMT	15 °C AT 9718.5 kPag SHELL SIDE 15 °C AT 8581 kPag TUBE SIDE	HYDRO TEST WEIGHT	Kg 65356

*AS PER GENERAL NOTE-35

T2	CHANNEL OUTLET	450	60	19.05+5W.D.	900#	WN	RTJ
T1	CHANNEL INLET	450	60	19.05+5W.D.	900#	WN	RTJ
S2	SHELL OUTLET	400	FORG.	16.66+5W.D.	900#	WN	RTJ
S1	SHELL INLET	350	FORG.	15.09+5W.D.	900#	WN	RTJ
NOZZ. No.	SERVICE	SIZE DN	SCH	THK	CLASS	TYPE	REMARK
						*FACE	
						ASME B16.5 2003	FLANGES

NOZZLE SCHEDULE

TUBE SIDE ADDITIONAL CONDITIONS :-

DEPRESSURIZATION PRESSURE	74.8 Kg/cm ²
DEPRESSURIZATION TEMPERATURE	417 °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) / HOUR)
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	305 Minutes	55
MAIN SHELL TO BARREL JOINT	BY HEAT RESISTANCE COIL	SR	300	55	680-700	180 Minutes	55
'U' TUBE AFTER FORMING 'U' BEND+300mm FROM TL (RT TO RA)	IN CLOSED FURNACE	SR	300	150	685-685	15 Minutes	150

AS BUILT

Stamp: ENGINEERS INDIA LTD. SUBESH KUMAR EIL (I) INSPECTION AUTHORITY

Handwritten notes: "Start of signing head to be in accordance with..."

Signature: [Signature]

Date: 12/01/2010

REV.	DATE	DESCRIPTION	DRWN	CHKD	APPD
3	19.01.2010	AS BUILT DIMENSIONS ARE SHOWN IN BKT (---) AS MARKED AND OTHER CHANGES AS MARKED (Δ) THUS.	PRASHANT	VED	GDP
2	08.01.2009	DRAWING IS REVISED AS PER EIL COMMENTS AS MKD. (Δ) THUS.	BSB	VDP	GDP
1	08.09.2008	DRAWING IS REVISED AS PER EIL COMMENTS AS MKD. (Δ) THUS.	BSB	VDP	GDP
0	15.04.2008	SUBMITTAL FOR APPROVAL	BSB	VDP	GDP

PROJECT NAME: **DHDT, EURO-IV**

ENGINEERING & MANUFACTURER: **TEMA INDIA LTD.**

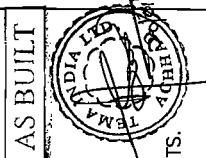
CONSULTANT: **ENGINEERS INDIA LIMITED**

CLIENT: **CPCL REFINERY III**

TITLE: SECOND REACTOR FEED / EFFLUENT EXCHANGER	W.O. No. 07-386
EIL No. 6879	P.O. No. 6879/6010/1008/018
TEMA T/E/071205	PR. No. 6879-211EE-PR-6020/0018
NTS DWG. No.	DT. 27/02/2008
SDB/E/071205	Rev. 1 of 17

JOB NO.	EIL	6879	P.O. No.	6879/6010/1008/018	DT.	27/02/2008
SCALE	NTS	DWG. No.	SDB/E/071205	SHT. NO.	1 of 17	Rev. 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 SHEET 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.
- 19] REFER PARA 2.1.2 OF 6-15-0001 REV.3.
- 20] DELETED. Δ
- 20] THE HEAT EXCHANGER SHALL BE PROVIDED WITH PRESSURE GAUGE TO MONITOR N^2 PRESSURE (0.25 Kg/cm²) AND 1/2" NON RETURN VALVE AS PER 6-15-0001 REV.3. PARA 9.1.
- 21] EQPT. SHALL BE DRIED & THOROUGHLY CLEANED BOTH INSIDE AND OUTSIDE AND ALL WATER, DIRT, SAND, WELD METAL, SPATTER, ETC. ELECTRODES, STUB & FOREIGN MATERIALS SHALL BE REMOVED.
- 22] FOR CONSTRUCTIONAL DETAILS AND NOMENCLATURES REFER EIL STANDARDS.
EIL PR NO. 6879-211-EE-MR-020 REV.B 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, 7-15-0004 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 OVERLAD WITH STAINLESS STEEL SHALL BE MACHINED. SHELL SIDE STAINLESS STEEL OVERLAD 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 2.5 SWEDISH STANDARD (SIS-05-5900)]. SHOP PRIMER SHALL BE ORGANIC ZINC SILICATE COAT 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 NIL
CHANNEL NIL
- 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 RCB-2.31.
- 32] THE DIFFERENTIAL DESIGN PRESSURE FOR EXCHANGER = 21.5 Kg/cm².
PERMITTED EXTERNAL HYDROTEST PRESSURE FOR TUBES 27.95 Kg/cm² AT NEW CONDITION & 27.95 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 27.95 Kg/cm².
B) AFTER COMPLETE ASSEMBLY :- (i) FROM TUBE SIDE AT A PRESSURE OF 27.95 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 27.95 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 PWHT OPERATION.
- 38] ALL FABRICATION TOLERANCES SHOULD BE AS PER TL-MFG-WI-26 REV.0 PAGE 1 TO 10. UNLESS OTHERWISE SPECIFIED.
- 39] 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.
- 40] TORQUE TABLE (MAX. ALLOWABLE TORQUE)

ITEM No.	kgf.cm	lbf.ft.
504	43.707	316.1
505	72.306	523
506	41.349	300.5

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- 41] IMPACT TEST SHALL BE CARRIED OUT FOR PART NO.- 101, 102, 202, 203, 204, 205, 206, 207, PART NO.- 208, 209, 210, 211, 212, 215, 216 & 221 -18 °C.
- 42] HEMI HEAD NORMALISED AT 930°C FOR 30 MINUTES AND TEMPERED AT 730°C FOR 30 MINUTES.

SCALE	REV	SHT
NTS	3	2 of 17

DWG NO. SDB/E/071205

TEMA
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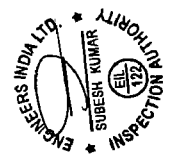
Reviewed

P.No	DESCRIPTION	SIZE	MATERIAL SPECIFIED.	QTY	REMARK
141	BEND PLATE FOR HYDRO -T1 & T2	1515°x50x25THK.	SA240 Gr.321	1	
140	BEND PLATE FOR HYDRO -S2	1354°x50x24.61THK.	SA240 Gr.321	1	
139	GUSST FOR INTERNAL CYLINDER	60x60x16THK	SA240 Gr.321	20	
138	SPOOL PIECE FOR T1	1367°x370x22THK	SA240 Gr.321	1	OD457.2xID413.2
137	SPOOL PIECE FOR S2	1217°x500x19THK	SA240 Gr.321	1	OD406.4xID368.4
136	SPOOL PIECE FOR T2	1367°x500x22THK	SA240 Gr.321	1	OD457.2xID413.2
135	WARNING PLATE BRACKET	8THK AS PER DETAIL	SA387 Gr.11 CL-2	1	
134	NAME PLATE BRACKET	8THK AS PER DETAIL	SA387 Gr.11 CL-2	1	
133	PL. FOR LIFTING DEVICE	30THK AS PER DETAIL (30THK)	SA516 Gr.70	1	
132	PL. FOR LIFTING DEVICE	30THK AS PER DETAIL (30THK)	SA516 Gr.70	1	
131	EARTHING CLEAT	100x75x10THK	SA387 Gr.11 CL-2	2	
130	RIB PL. FOR FIXED SADD SUPP.	317x155x20THK	SA387 Gr.11 CL-2	4	
129	RIB PL. FOR FIXED SADD SUPP.	509x155x20THK	SA387 Gr.11 CL-2	4	
128	WEB PL. FOR FIXED SADD SUPP.	1370x683x20THK	SA387 Gr.11 CL-2	1	
127	WEAR PL. FOR FIXED SADD SUPP.	1775°x350x20THK	SA387 Gr.11 CL-2	1	
126	BASE PL. FOR FIXED SADD SUPP.	1400x350x30THK	SA387 Gr.11 CL-2	1	
125	RIB PL. FOR SLIDING SADD SUPP.	134x155x20THK	SA387 Gr.11 CL-2	4	
124	RIB PL. FOR SLIDING SADD SUPP.	390x155x20THK	SA387 Gr.11 CL-2	4	
123	WEB PL. FOR SLIDING SADD SUPP.	1670x586x20THK	SA387 Gr.11 CL-2	1	
122	WEAR PL. FOR SLIDING SADD SUPP.	2172°x350x20THK	SA387 Gr.11 CL-2	1	
121	BASE PL. FOR SLIDING SADD SUPP.	1700x350x30THK	SA387 Gr.11 CL-2	1	
120	GASKET RETAINER	Ø148x2x20THK	SA240 Gr.321	1+1	
119	INTERNAL SLEEVE	4119°x88x16THK	SA240 Gr.321	1	
118	RETAINING RING FOR T2	OD483xID459x3THK	SA240 Gr.321	1	
117	PARTITION COVER PLATE	16THK AS PER DETAIL	SA240 Gr.321	1	
116	END PALTE	OD1440x16THK	SA240 Gr.321	1	
115	PLATE FOR INTERNAL CYLINDER	4474°x807x16THK	SA240 Gr.321	1	
114	PASS PARTITION PLATE	1440x807x16THK	SA240 Gr.321	1	
113	SEALING STRIP	580x85x8THK (10THK)	SA240 Gr.321	2	
112	SEALING STRIP	3671x160x8THK (10THK)	SA240 Gr.321	2	
111	SEALING STRIP	4186x160x8THK (10THK)	SA240 Gr.321	2	
110	SLIDING STRIP	580x70x20THK	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	4	
104	BAFFLE PLATE 'A1'	16THK AS PER DETAIL	SA240 Gr.321	1	
103	BAFFLE PLATE 'A'	16THK AS PER DETAIL	SA240 Gr.321	3	
102	HEMI HEAD DISHED END	(30+5)THK. Norm.	SA387 Gr.11 CL-2 SA516 Gr.70	1	
101	MAIN SHELL	4571°x5695x(52+3)THK.	SA516 Gr.70	1	

PLATES

BILL OF MATERIALS

AS BUILT



AS BUILT DRAWING"
W.O. No. : 07-386
ECP. NO. : 211-E-2



SCALE	REV	SHEET
NTS	3	3 of 17

DWG NO. SDB/E/071205

Reviewed
Suresh Kumar

P.No	DESCRIPTION	SIZE	MATERIAL SPECIFIED.	QTY	REMARK
302	SPACER	ØD25x2.5THKx4L.G.	SA213 TP321	574	
301	'U' TUBES	ØD25x2.5THK(Min.)x4L.G.	SA213 TP321	574	
221	FORGE NECK FOR T1 & T2	OD457.2xID409.1x465L.G.	SA182 F11 CL-2+ 5THK ANSI 347 W.D.	2	
220	PULLING EYE BOLT	M-36 AS PER DETAIL	SA 105	4	
219	PLUG FOR PULLING EYE BOLT	M-36 AS PER DETAIL	SA240 GR 321	4	
218	SEAL RING FOR T2	67THK AS PER DETAIL	SA965 F321	1	
217	ADDED STEEL (PROPRIETARY)	-	-	1	
216	INNER COMPRESSION RING	OD1340xID1282x31THK	SA336 F11 CL-2	1	
215	OUTER COMPRESSION RING	OD1499xID1441x39.6THK	SA336 F11 CL-2	1	
214	INTERNAL FLANGE	OD1451.5xID1295x168THK	SA965 F321	1	
213	SPLIT RING	OD1447xID1429x38THK	SA965 F321	1	
212	COMPANION NOZZ. FLG. FOR T1 & T2	450DNxSCH.60x900#WNRTJ	SA182 F11 CL-2+ 5THK ANSI 347 W.D.	2	
211	NOZZLE FLANGE FOR T1 & T2	450DNxSCH.60x900#WNRTJ	SA182 F11 CL-2+ 5THK ANSI 347 W.D.	2	
210	COMPANION NOZZ. FLG. FOR S2	400DNxSCH.60x900#WNRTJ	SA182 F11 CL-2+ 5THK ANSI 347 W.D.	1	
209	NOZZLE FLANGE FOR S2	400DNxSCH.60x900#WNRTJ	SA182 F11 CL-2+ 5THK ANSI 347 W.D.	1	
208	COMPANION NOZZ. FLG. FOR S1	350DNxSCH.60x900#WNRTJ	SA182 F11 CL-2+ 5THK ANSI 347 W.D.	1	
207	NOZZLE FLANGE FOR S1	350DNxSCH.60x900#WNRTJ	SA182 F11 CL-2+ 5THK ANSI 347 W.D.	1	
206	FORGE NECK FOR S2	O569.08xID363.08x525L.G.	SA182 F11 CL-2+ 5THK ANSI 347 W.D.	1	
205	FORGE NECK FOR S1	OD501.4xID315.4x514L.G.	SA182 F11 CL-2+ 5THK ANSI 347 W.D.	1	
204	CHANNEL COVER	Ø1445.5x210THK	SA336 F11 CL-2	1	
203	THREADED LOCK RING	ØD1537.2xID1393x278.6THK	SA336 F11 CL-2	1	
202	CHANNEL BARREL	AS PER DETAIL	SA336 F11 CL-2+ 5THK ANSI 347 W.D.	1	
201	TUBE SHEET	OD1440x176THK	SA965 F321	1	


FORGING

P.No.	DESCRIPTION	SIZE	MATERIAL SPECIFIED.	QTY	REMARK
702	CAP FOR HYDROTEST -T1 & T2	500DN x SCH. 80	SA 234 Gr.WPB	1	
701	CAP FOR HYDROTEST -S2	500DN x SCH. 80	SA 234 Gr.WPB	1	
FITTING					
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	ø16x350LG.	SAI 321	2	
606	SEAL ROD	ø25x4186LG.	SAI 321	40	
605	PUSH ROD	ø22x123LG.	SA193 Gr.B16	80+80	
604	PUSH ROD	ø22x263LG.	SA193 Gr.B16	88+88	
603	PUSH ROD	ø22x142LG.	SA453 Gr.660B	84+84	
602	IMPINGEMENT ROD	ø25x666LG.	SAI 321	23	
601	TIE ROD	ø12x5827LG.	SAI 321	22	
511	STUD-2NUTS FOR T1 & T2 COMP. FLG.	1 1/8" UN8x390 LG.		40+8	
510	STUD-2NUTS FOR S2 COMP. FLG.	1 1/8" UN8x340 LG.	SA193 Gr.B16	20+4	
509	STUD-2NUTS FOR S1 COMP. FLG.	1 1/2" UN8x325 LG.	SA194 Gr.16	20+4	
508	HEX. HD. BOLT FOR LIFTING DEVICE	M-24x68LG.	SA193 Gr.B7	4	
507	HEX. SOCKET SET SCREW	M-10x25 LG.	SA193 Gr.BB1 CL2	3	
506	HEX. HD. BOLT (SET SCREW)	1" UNCx82 LG.	SA453 Gr. 660B	84	
505	HEX. HD. BOLT (SET SCREW)	1" UNCx82 LG.	SA193 Gr. B16	88	
504	HEX. HD. BOLT (SET SCREW)	1" UNCx82 LG.	SA193 Gr. B16	80	
503	NUTS FOR TIE RODS	M-12 STD.	SA194 Gr. 8T	44	
502	STUD WITH NUT+1-FLAT WASHER & 1-LOCK WASHER	M-12x55LG.	SA193 Gr.BB1 CL2+	48	
501	HEX. HD.SCREW WITH LOCKNUT	M-10x45 LG.	SA194 Gr.8T	28	
408	GASKET FOR T1 & T2 COMP. FLG.	450DNx900# ASME RING No.70	SAI 347	2+8+4	ADDRESS CORRU MEX (OCTAGONAL RING)
407	GASKET FOR S2 COMP. FLG.	400DNx900# ASME RING No.66	SAI 347	1+4+2	ADDRESS CORRU MEX (OCTAGONAL RING)
406	GASKET FOR S1 COMP. FLG.	350DNx900# ASME RING No.62	5 Cr. 1/2 Mo.	1+4+2	ADDRESS CORRU MEX (OCTAGONAL RING)
405	PACKING SEAL FOR T2	12.750x3000LG.	FIBER GLASS UIP-329	1+4+2	
404	GASKET FOR PARTITION PLATE	3THK (AS PER DETAIL)	NON-ASBESTOS WHT ARAMIDE FIBRE	1+4+2	
403	RING GASKET	OD1483xD1463x3THK	SA240 Gr.321	1+4+2	
402	GASKET	OD1440xD1409.8x1.6THK	SA240 Gr.321	1+4+2	
401	GASKET	OD1432xD1406x6.35THK	SAI 321 SPWD	1+4+2	SEE NOTE-16


BILL OF MATERIALS

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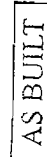
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W.O. No. : 07-386
EQPT. NO. : 211-E-2



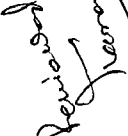
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AS BUILT



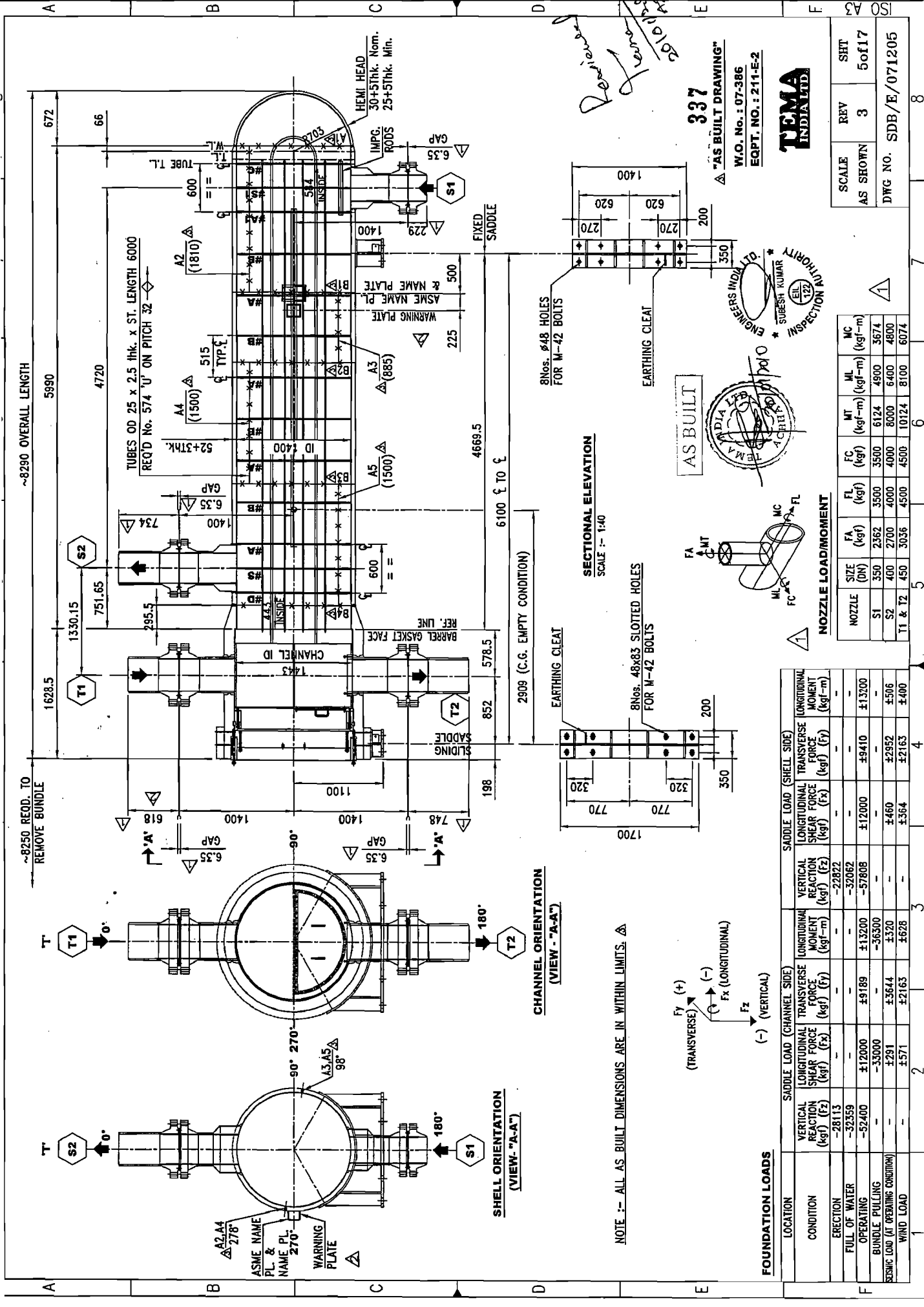
Perinorad



Perinorad

SCALE	REV	SHT
NTS	3	4 of 17

DWG NO. SDB/E/071205



Revision

337

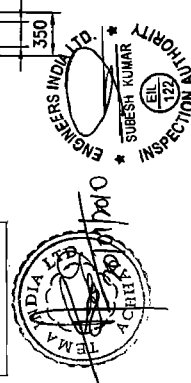
"AS BUILT DRAWING"

W.O. No. : 07-386

EQPT. NO. : 211-E-2

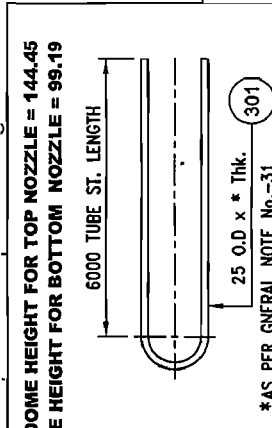
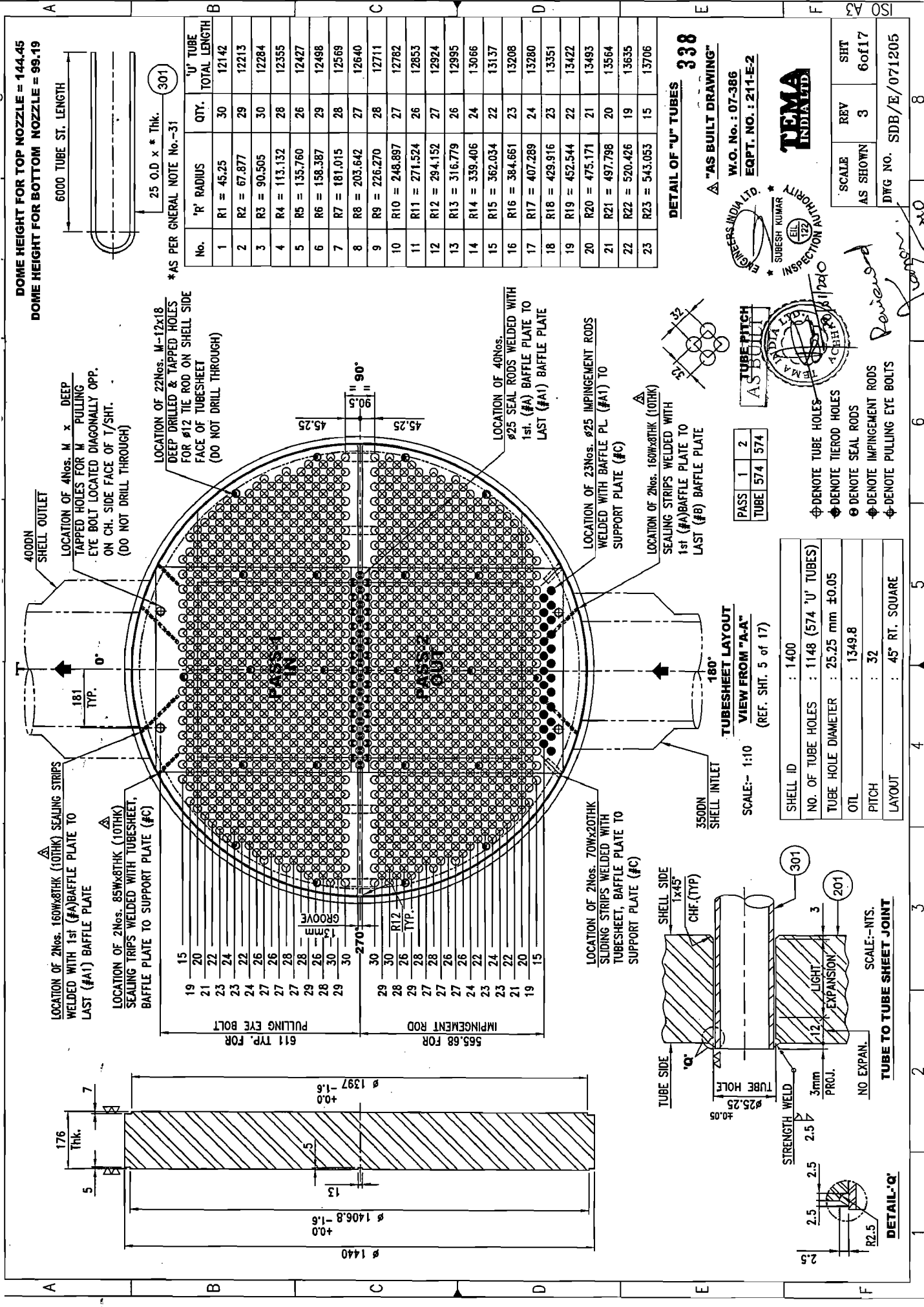
SCALE	REV	SHT
AS SHOWN	3	5 of 17

DWG NO. SDB/E/071205



NOZZLE	SIZE (DN)	FA (kgf)	FL (kgf)	FC (kgf)	MT (kgf-m)	ML (kgf-m)	MC (kgf-m)
S1	350	2362	3500	6124	4900	3674	
S2	400	2700	4000	4000	8000	6400	4800
T1 & T2	450	3036	4500	4500	10724	8100	6074

LOCATION	SADDLE LOAD (CHANNEL SIDE)			SADDLE LOAD (SHELL SIDE)		
	VERTICAL REACTION (kgf) (Fz)	LONGITUDINAL FORCE (kgf) (Fx)	TRANSVERSE FORCE (kgf) (Fy)	LONGITUDINAL MOMENT (kgf-m)	TRANSVERSE MOMENT (kgf-m)	LONGITUDINAL SHEAR (kgf) (Fz)
ERECTION	-32359	-28113	-	-	-	-
FULL OF WATER	-52400	±12000	±9189	±13200	-57808	±9410
BUNDLE PULLING	-	±291	±3644	±320	-	±506
SEISMIC LOAD (AT OPERATING CONDITION)	-	±571	±2163	±628	-	±400
WIND LOAD	-	-	-	-	-	-



No.	'R' RADIUS	QTY.	'U' TUBE TOTAL LENGTH
1	R1 = 45.25	30	12142
2	R2 = 67.877	29	12213
3	R3 = 90.505	30	12284
4	R4 = 113.132	28	12355
5	R5 = 135.760	26	12427
6	R6 = 158.387	29	12498
7	R7 = 181.015	28	12569
8	R8 = 203.642	27	12640
9	R9 = 226.270	28	12711
10	R10 = 248.897	27	12782
11	R11 = 271.524	26	12853
12	R12 = 294.152	27	12924
13	R13 = 316.779	26	12995
14	R14 = 339.406	24	13066
15	R15 = 362.034	22	13137
16	R16 = 384.661	23	13208
17	R17 = 407.289	24	13280
18	R18 = 429.916	23	13351
19	R19 = 452.544	22	13422
20	R20 = 475.171	21	13493
21	R21 = 497.798	20	13564
22	R22 = 520.426	19	13635
23	R23 = 543.053	15	13706

DETAIL OF "U" TUBES
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"AS BUILT DRAWING"
 W.O. No.: 07-386
 EQPT. NO.: 211-E-2

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 (IIT)

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 SURESH KUMAR
 (IIT)

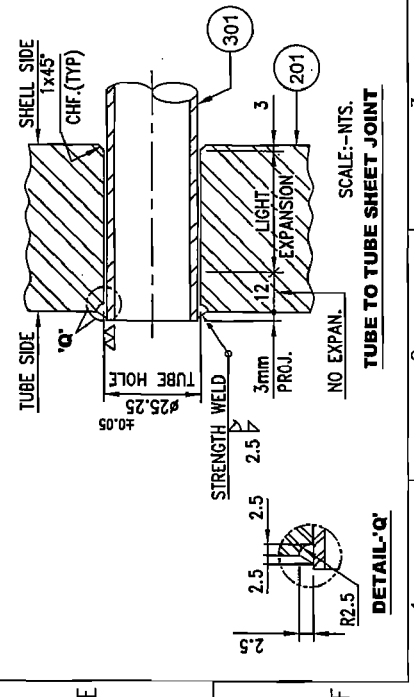
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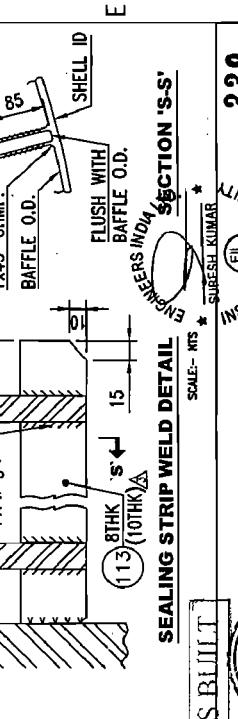
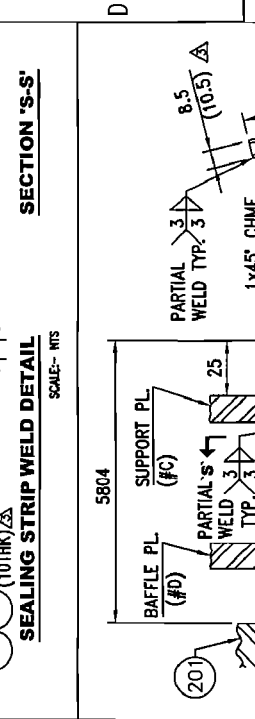
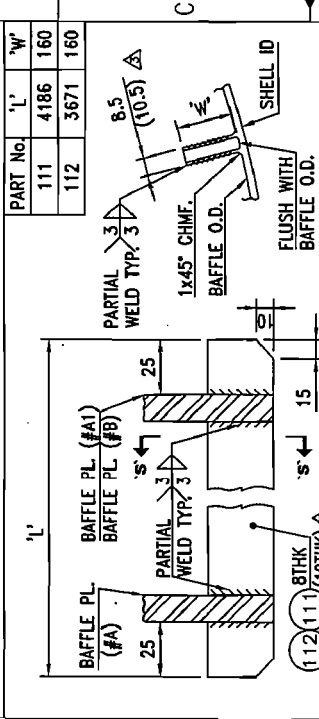
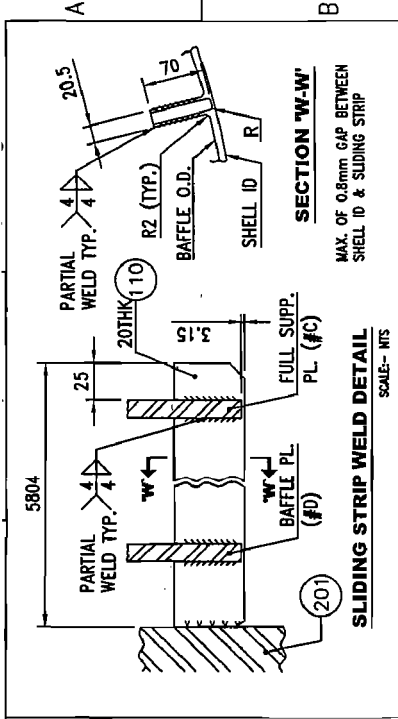
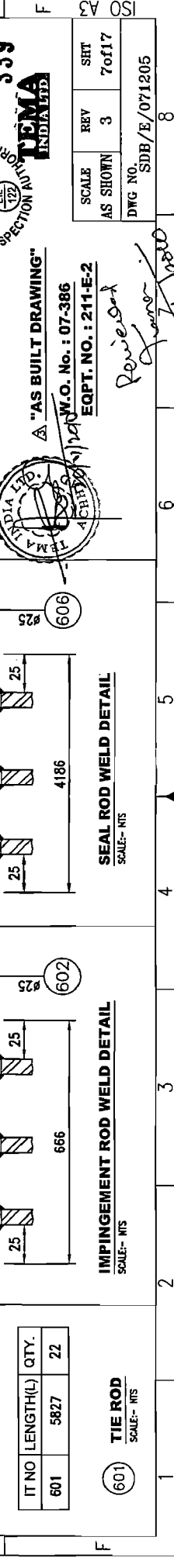
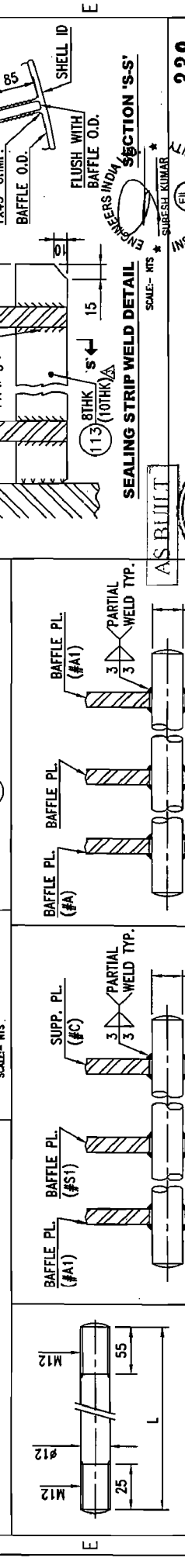
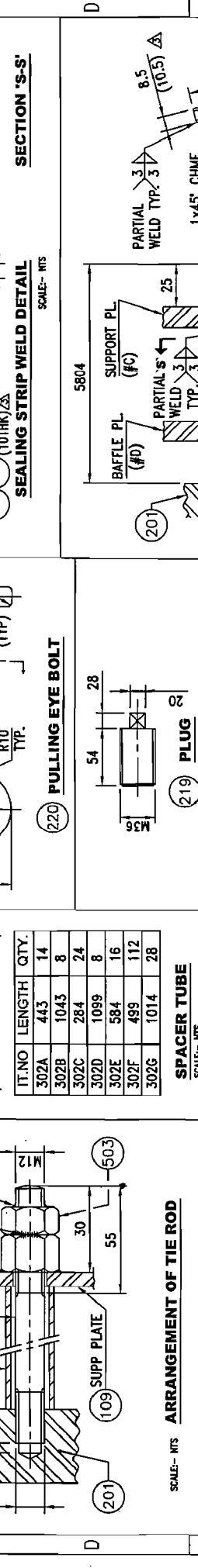
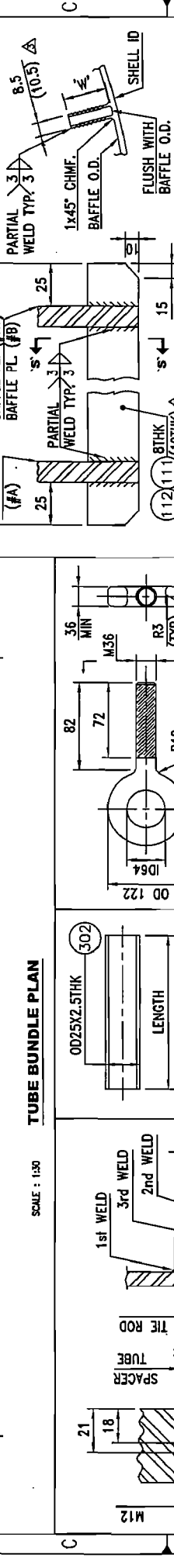
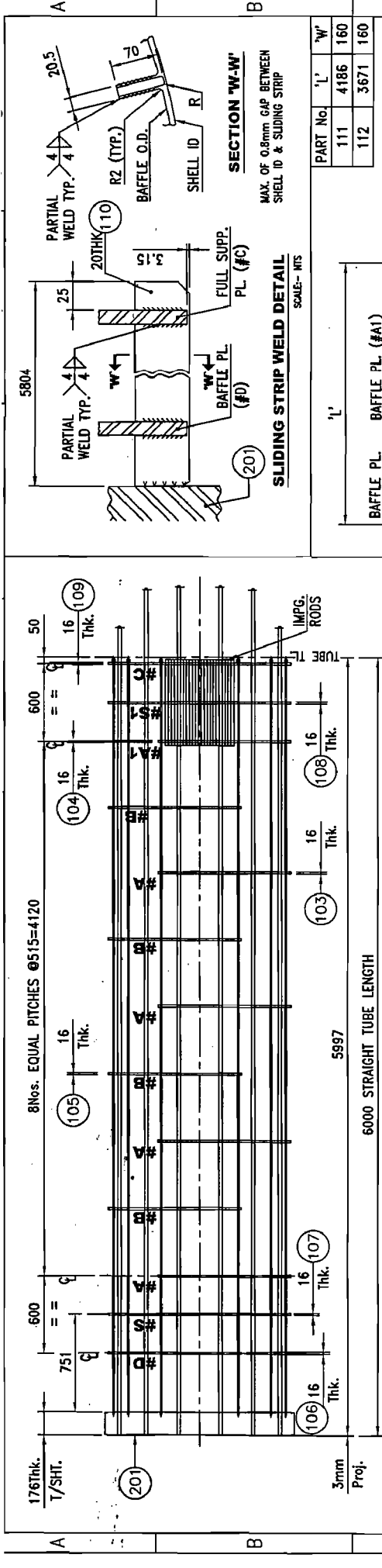
SCALE AS SHOWN
REV 3
SHT 6 of 17
DWG NO. SDB/E/071205

Revisited
 Approved

PASS	1	2
TUBE	574	574

DENOTE TUBE HOLES
 DENOTE TIRED HOLES
 DENOTE SEAL RODS
 DENOTE IMPINGEMENT RODS
 DENOTE PULLING EYE BOLTS





"AS BUILT DRAWING"

W.O. No. : 07-386
EPT. NO. : 211-E-2

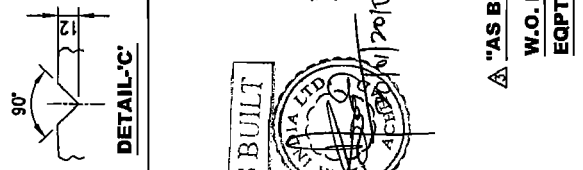
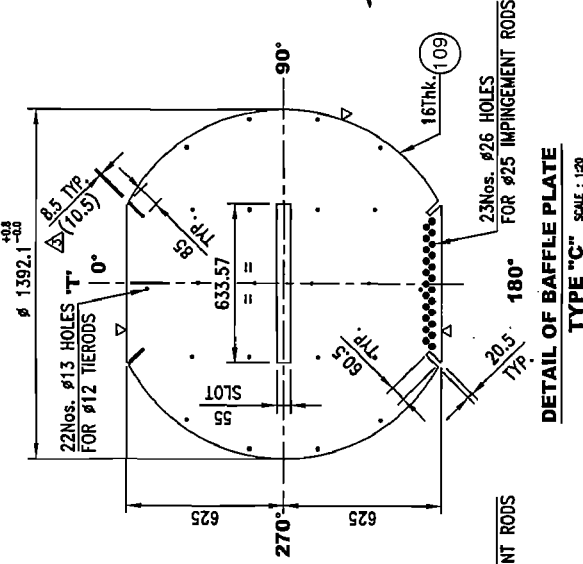
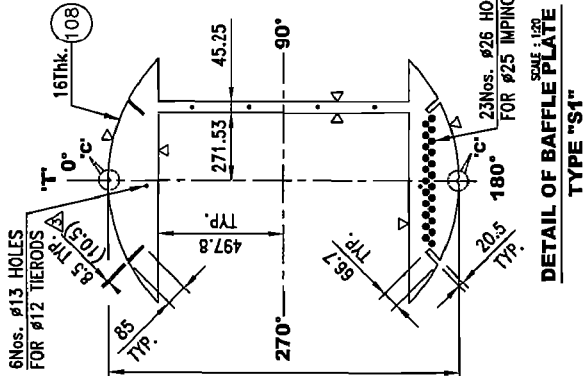
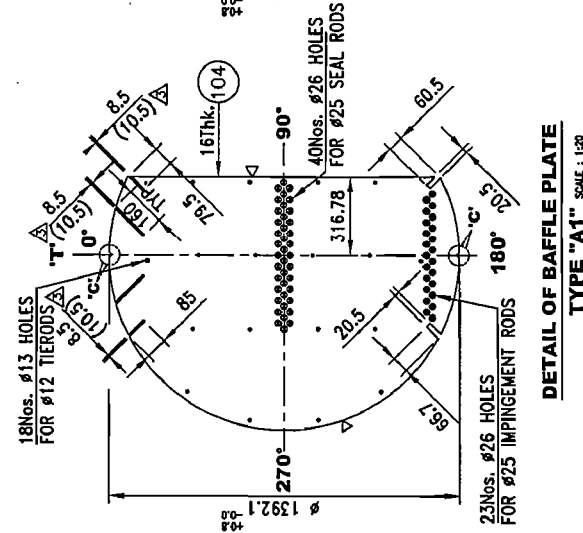
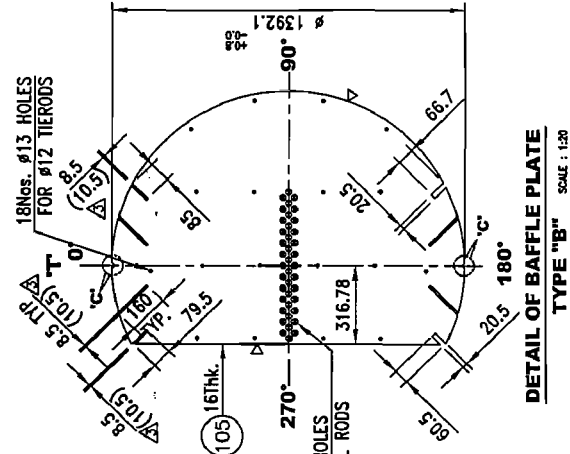
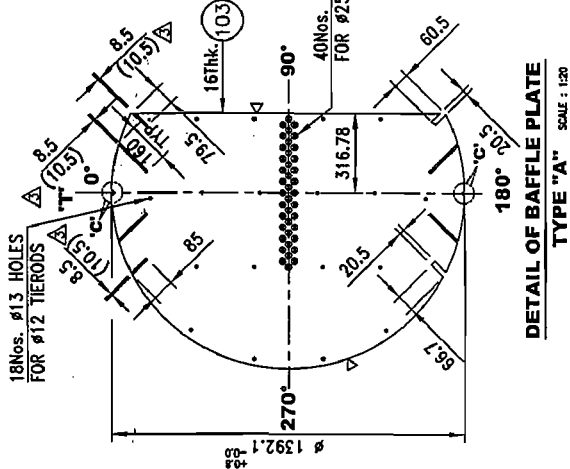
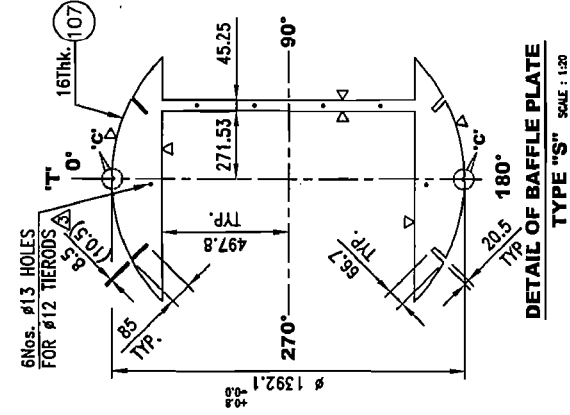
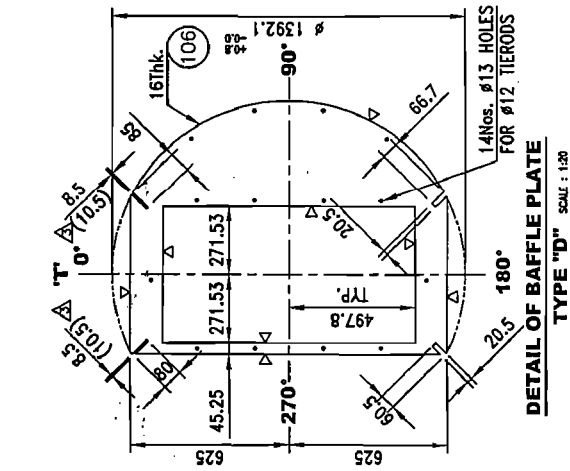
REVIEWED: *Review*

DATE: *17/10/20*

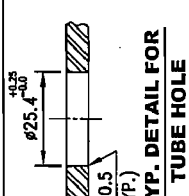
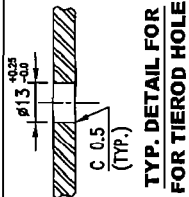
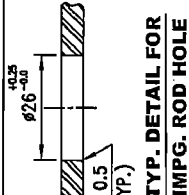
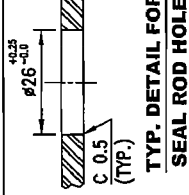
339

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SCALE AS SHOWN 3
REV 7 of 17
SDB/E/071205
DWG NO. 8



- 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

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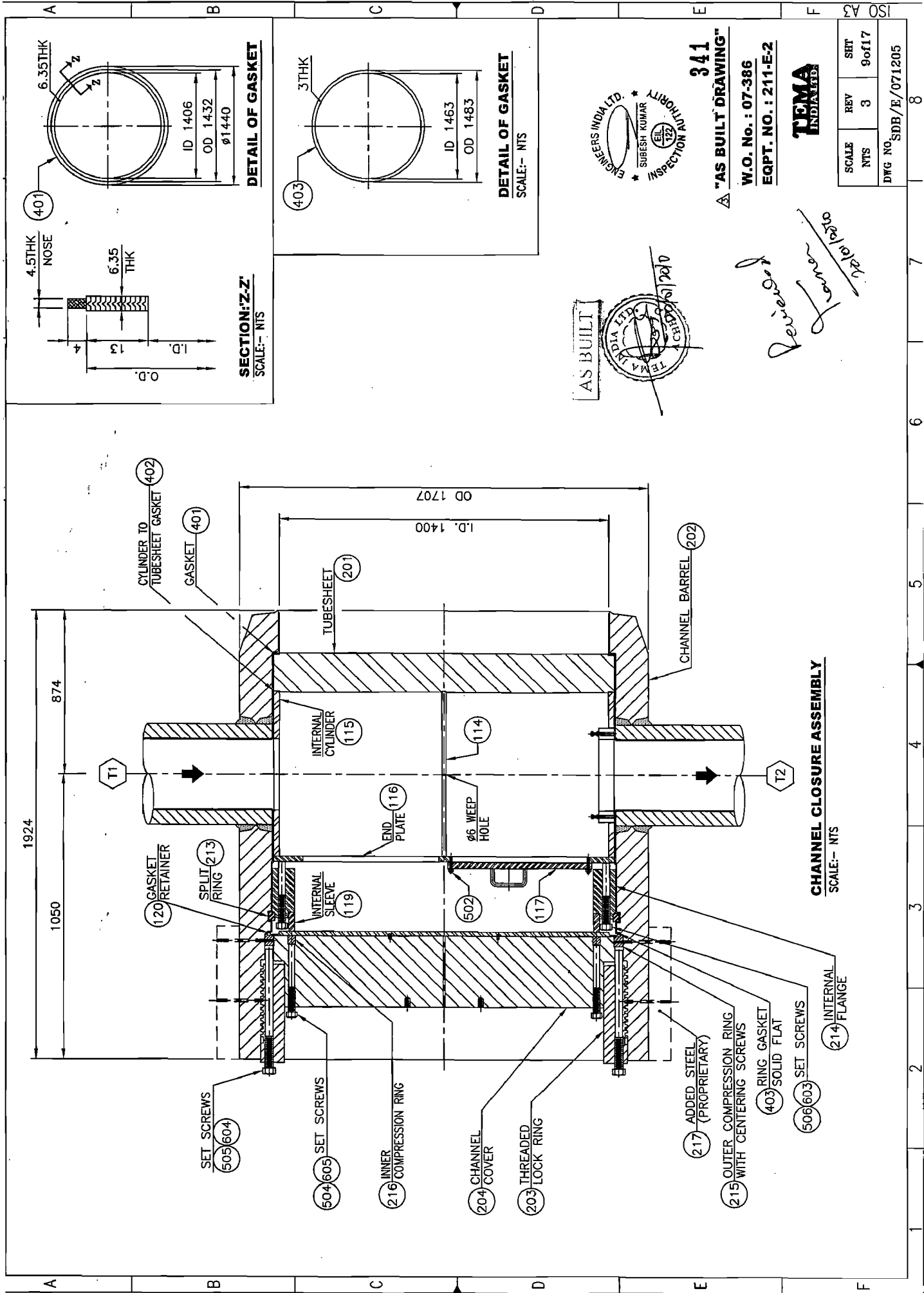
"AS BUILT DRAWING"
W.O. No. : 07-386
EQPT. NO. : 214-E-2

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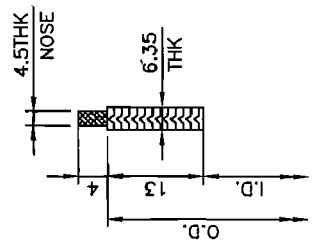
SCALE AS SHOWN
REV 3
SHT 8 of 17

DWG NO. SDB/E/071205

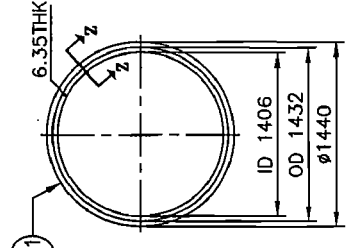
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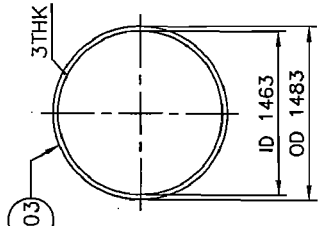
CHANNEL CLOSURE ASSEMBLY
SCALE:- NTS



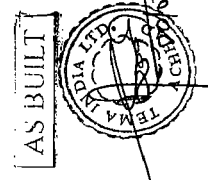
SECTION:-'Z-Z'
SCALE:- NTS



DETAIL OF GASKET
SCALE:- NTS



DETAIL OF GASKET
SCALE:- NTS



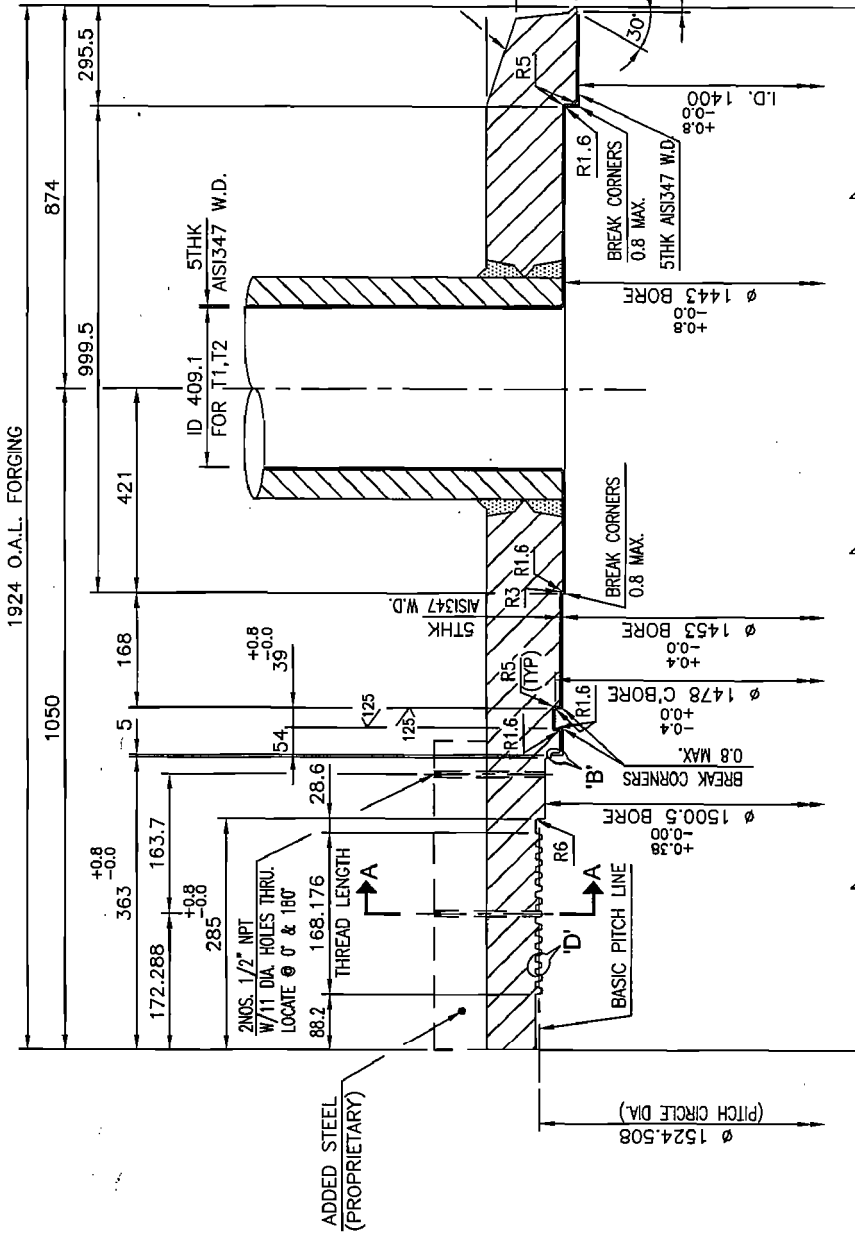
341
"AS BUILT DRAWING"
W.O. No. : 07-386
EQPT. NO. : 211-E-2



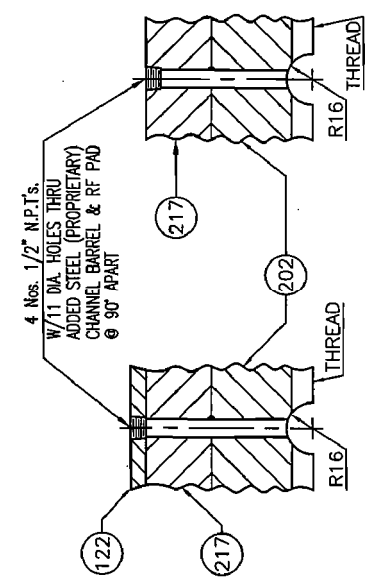
Reviewed
19/11/2010

SCALE	REV	SET
NTS	3	9 of 17
DWG NO.		SDB/E/071205

1924 O.A.L. FORGING

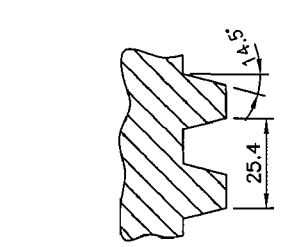


DETAIL OF CHANNEL BARREL
SCALE: - NTS



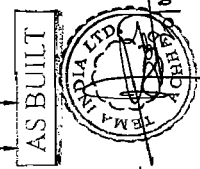
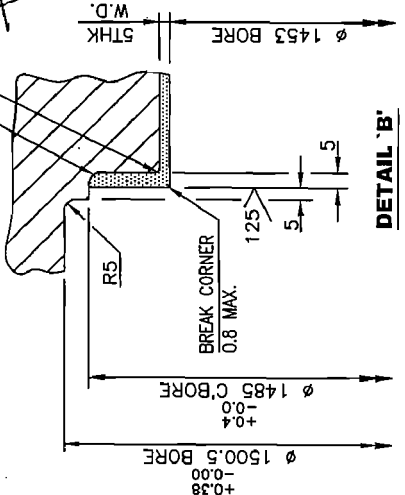
SECTION A-A'
TYPICAL GREASE GROOVE 4- PLACES 90° APART
SCALE: -NTS.

DETAIL 'D' SCALE: - NIS



DETAIL 'D' SCALE: - NIS
1 1/2" 29° ACME CLASS 2G
STD. THDS. AS PER ASME B1.5
CHANNEL BARREL THREAD DETAIL
125 FINISH OR BETTER ALL OVER

DETAIL 'B'
SCALE: - NTS



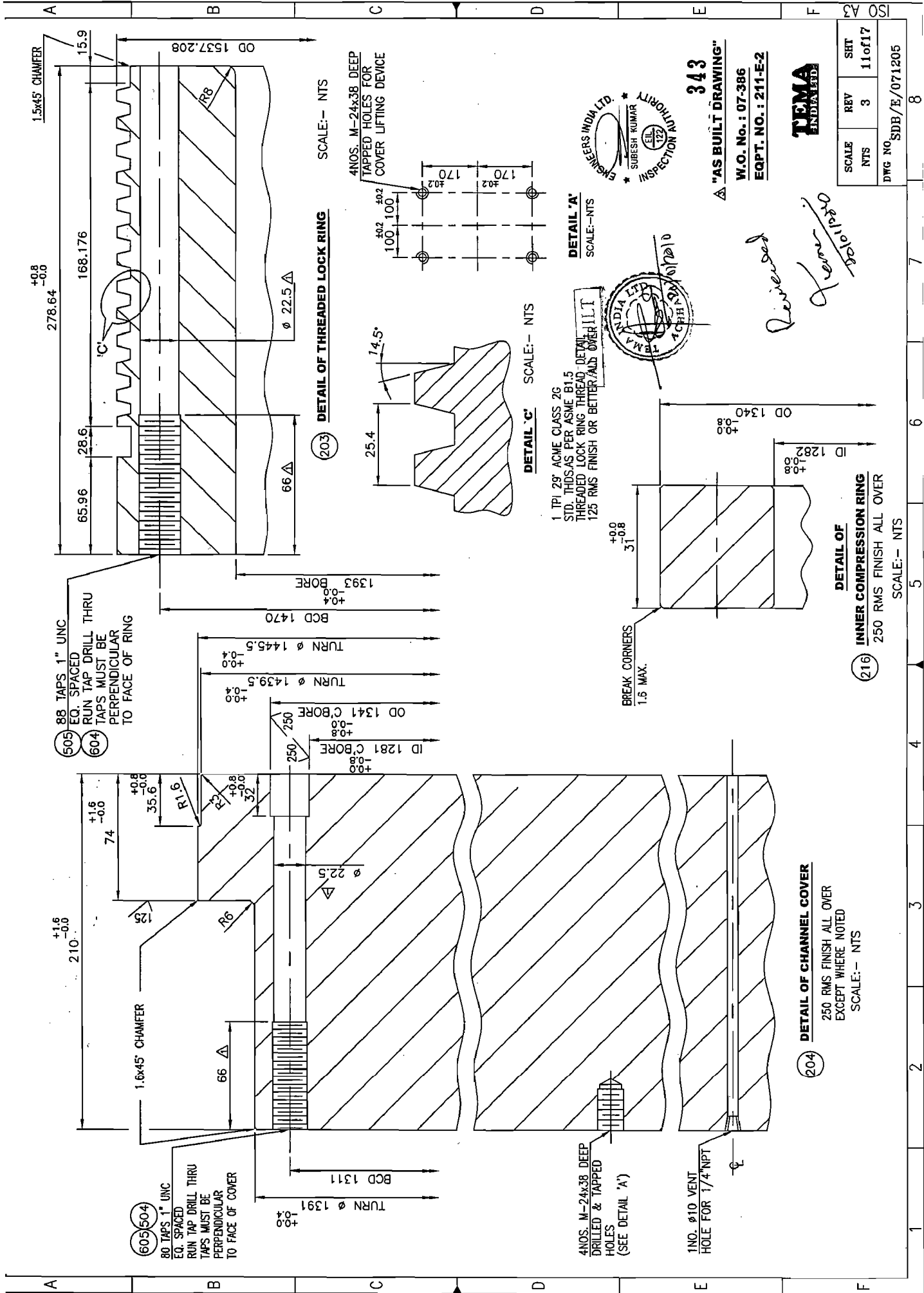
342

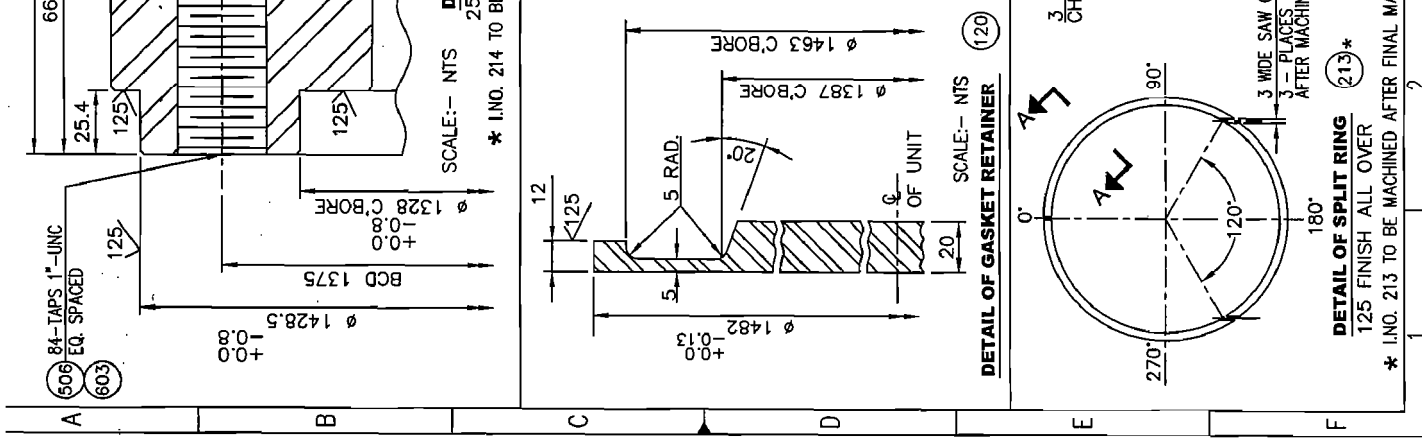
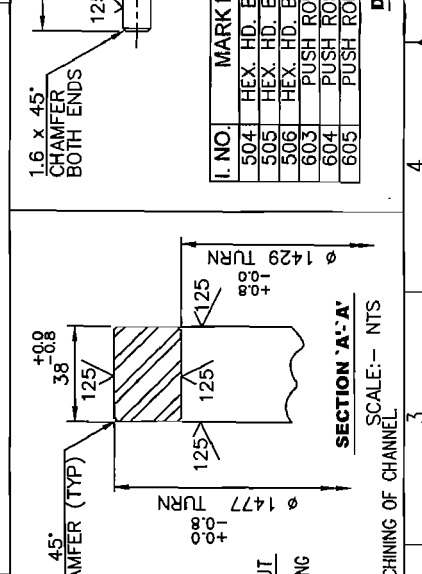
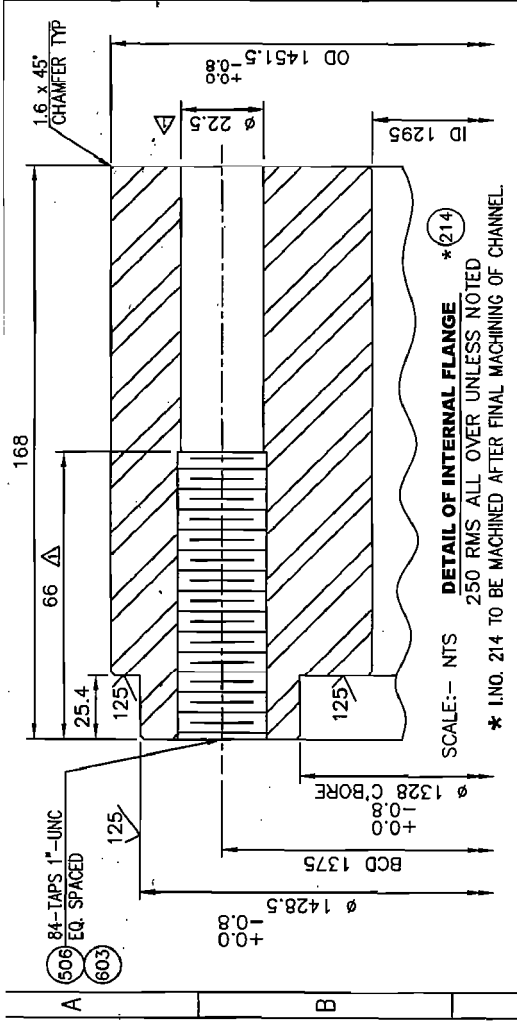
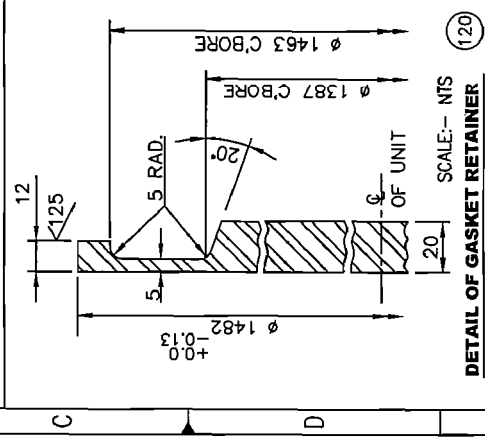
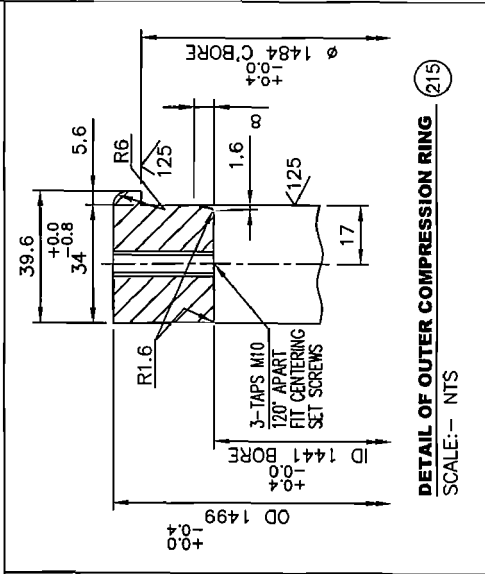
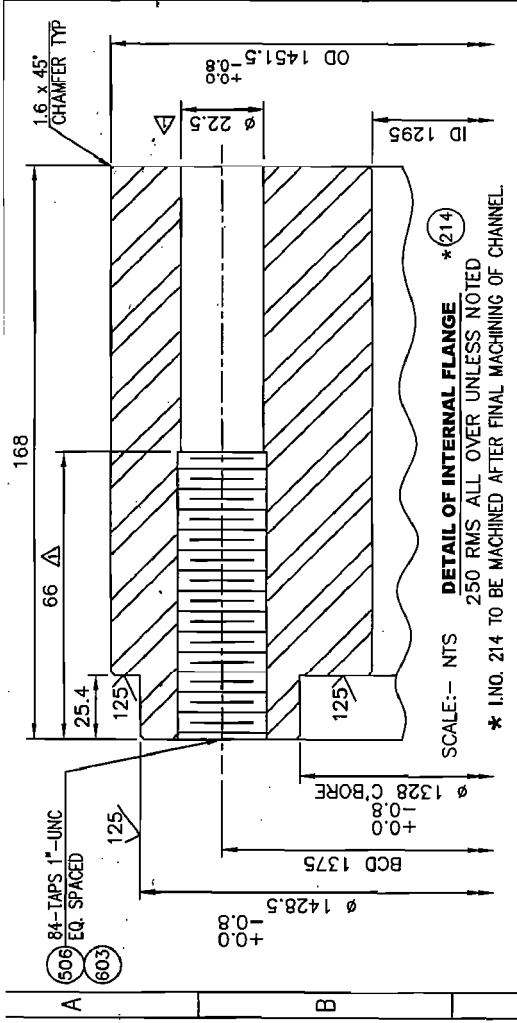
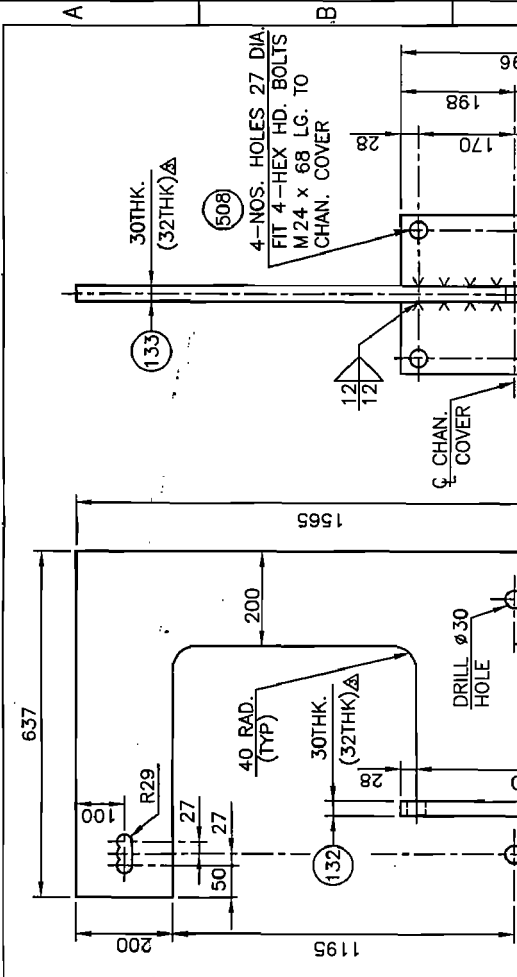
"AS BUILT DRAWING"
W.O. No.: 07-386
EQPT. NO.: 211-E-2



SCALE	REV	SET
NTS	3	10 of 17
DWG NO.		SDB/E/071205

Signature
Date: 12/12/20





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 W.O. No. : 07-386
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REMA INDIA
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 SCALE NTS
 REV 3
 SHEET 12 OF 17
 DRWG. NO. SDB/E/071205

DETAIL OF SET SCREWS & PUSH RODS
 SCALE:- NTS

I. NO.	MARK NO.	SIZE	QTY	'L1'	'B'	'A'	'D'	'L2'	'C'
504	HEX. HD. BOLT	1"-UNC	80	82	19.05	33.35	-	38.51	-
505	HEX. HD. BOLT	1"-UNC	88	82	19.05	33.35	-	38.51	-
506	HEX. HD. BOLT	1"-UNC	84	82	19.05	33.35	-	38.51	-
603	PUSH RODS	-	84	-	-	-	-	22 1/4	-
604	PUSH RODS	-	88	-	-	-	-	22 26/3	-
605	PUSH RODS	-	80	-	-	-	-	22 12/3	-

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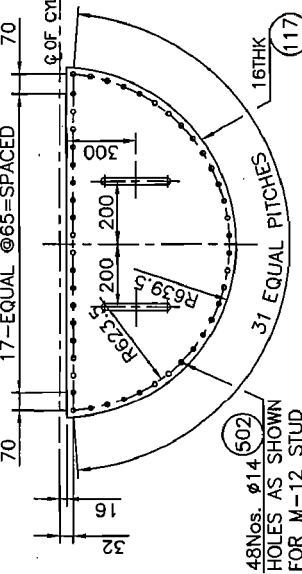
AS BUILT

ENGINEERS INDIA LTD. AS BUILT DRAWING
W.O. No.: 07-386
EQPT. NO.: 211-E-2

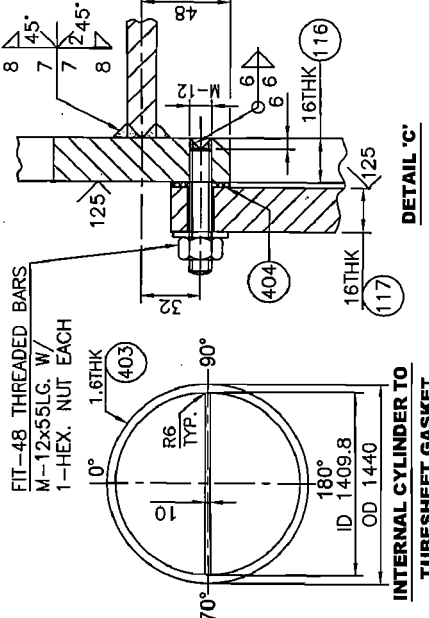
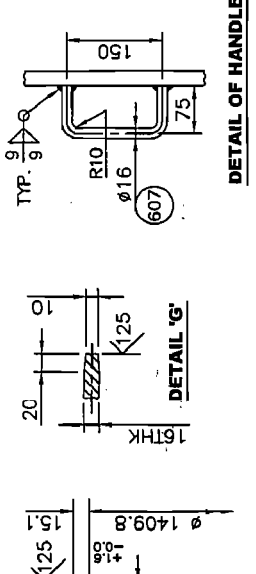
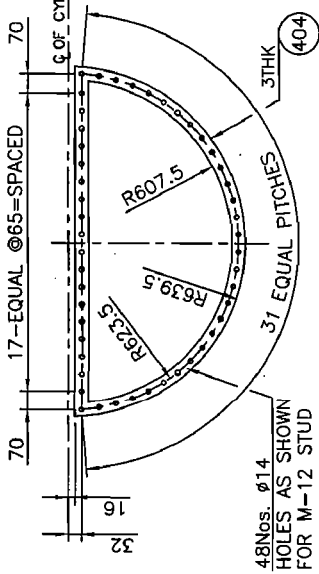
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DETAIL OF PARTITION COVER



DETAIL OF PARTITION COVER GASKET

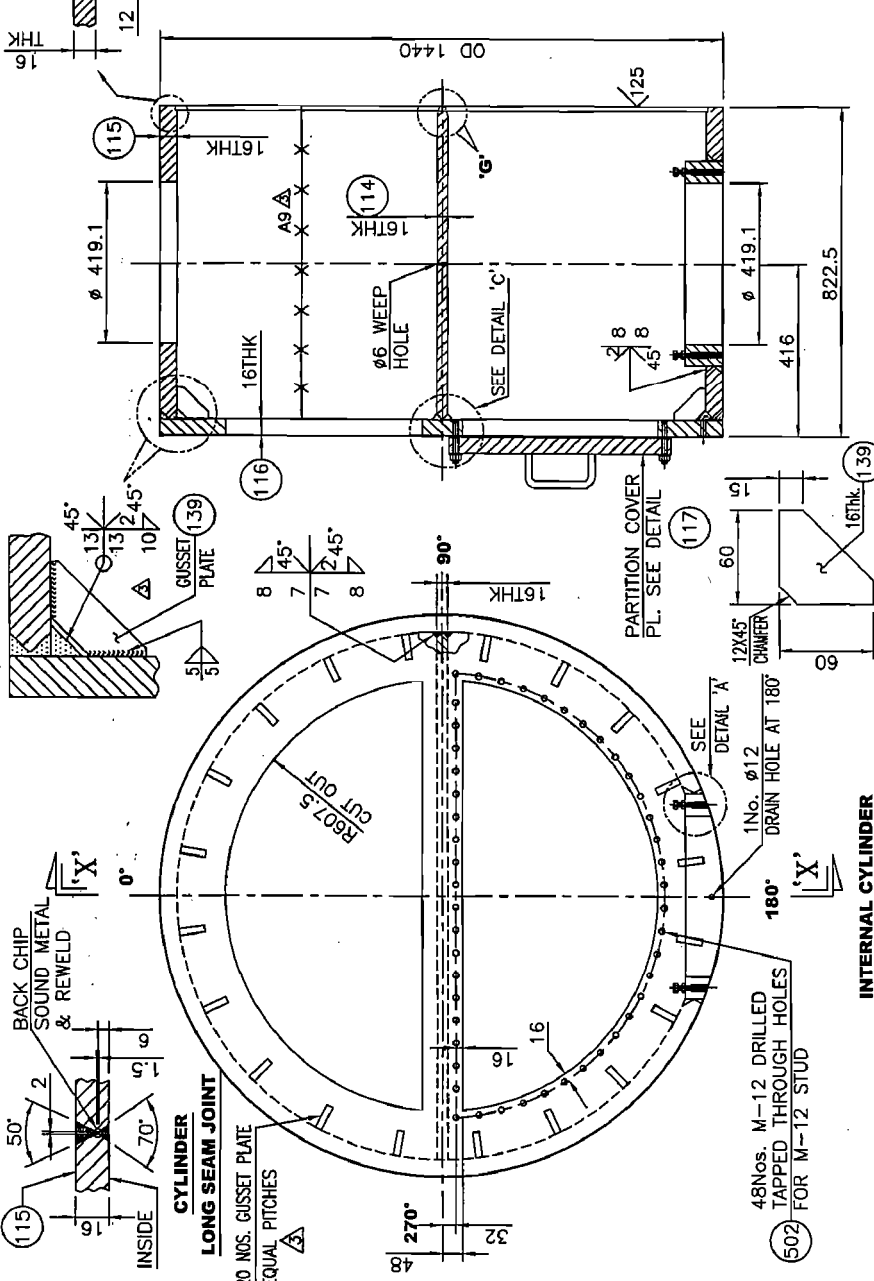


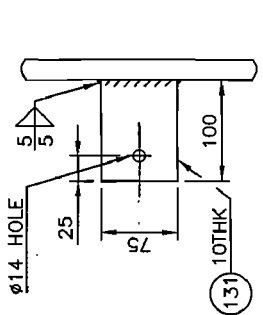
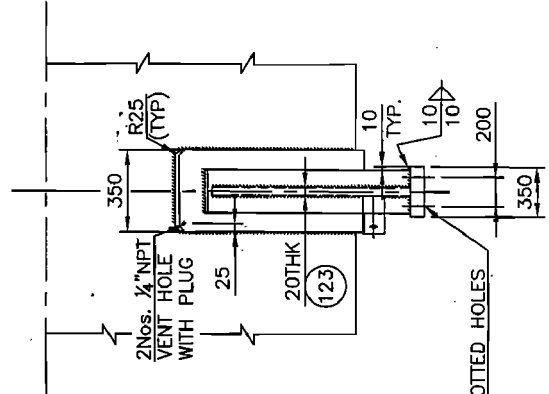
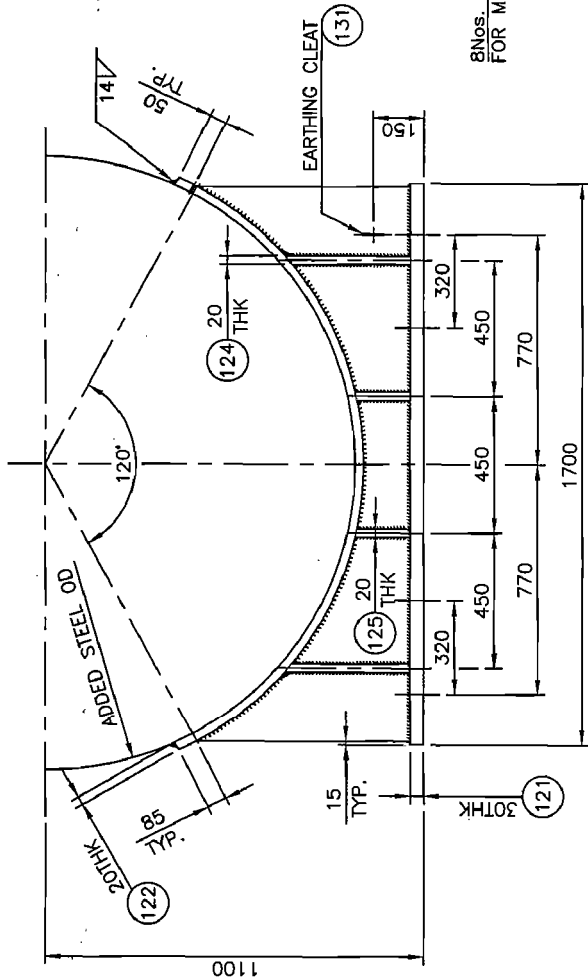
SECTION 'X-X'

GUSSET DETAIL 'A'

INTERNAL CYLINDER

OVERALL MACHINING AFTER ASSEMBLY

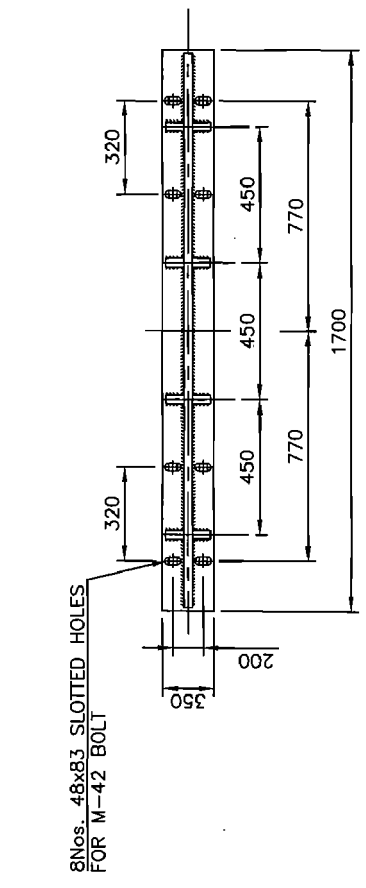




**DETAIL OF
EARTHING CLEAT**

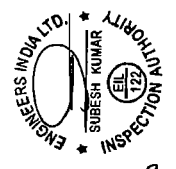
DETAIL OF SLIDING SADDLE SUPPORT FOR CHANNEL SIDE

NOTE :- ALL FILLET ARE 12mm



HYDROTEST ARRANGEMENT DETAIL

NOZZLE No. S2 (16")



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"AS BUILT DRAWING"

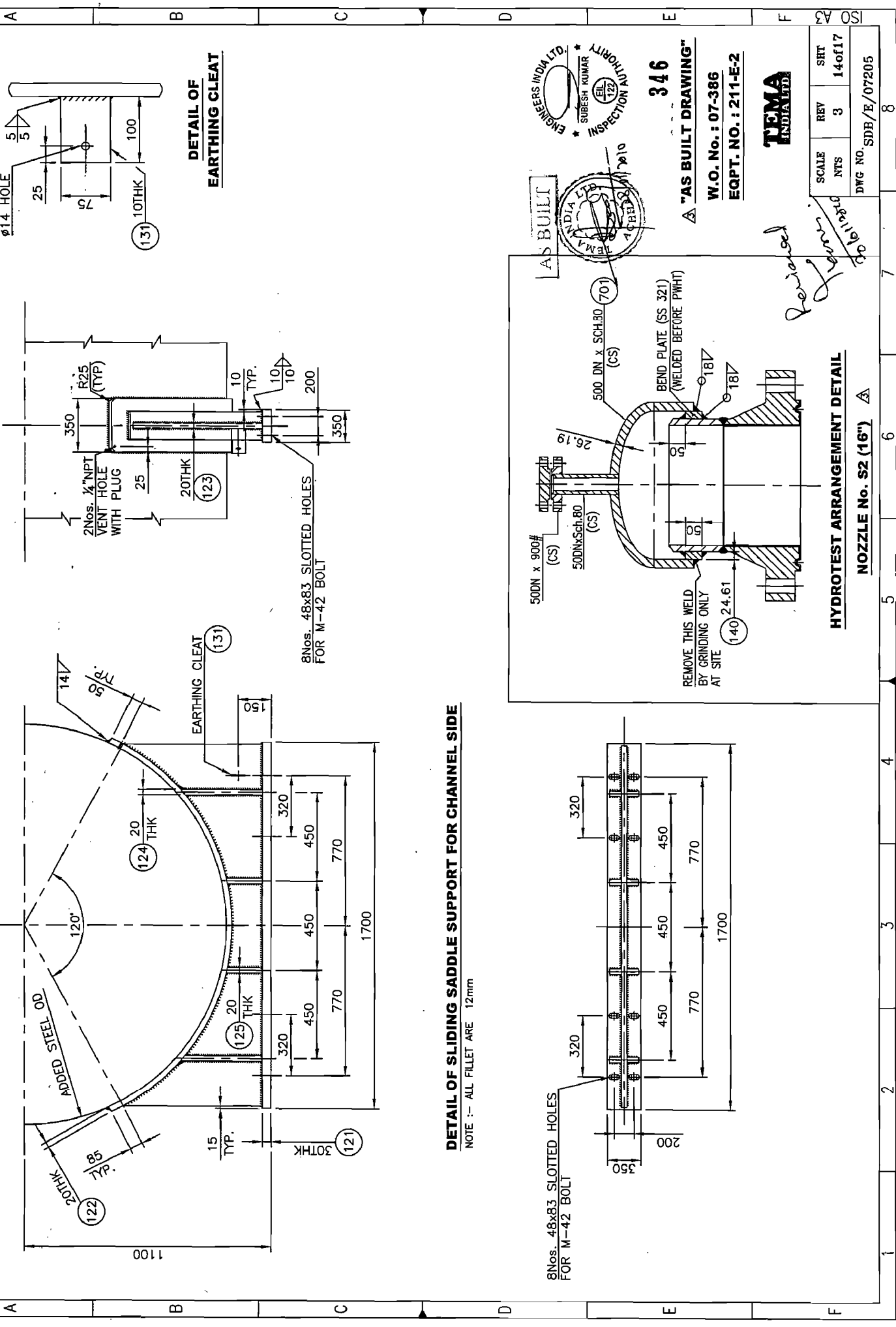
W.O. No. : 07-386

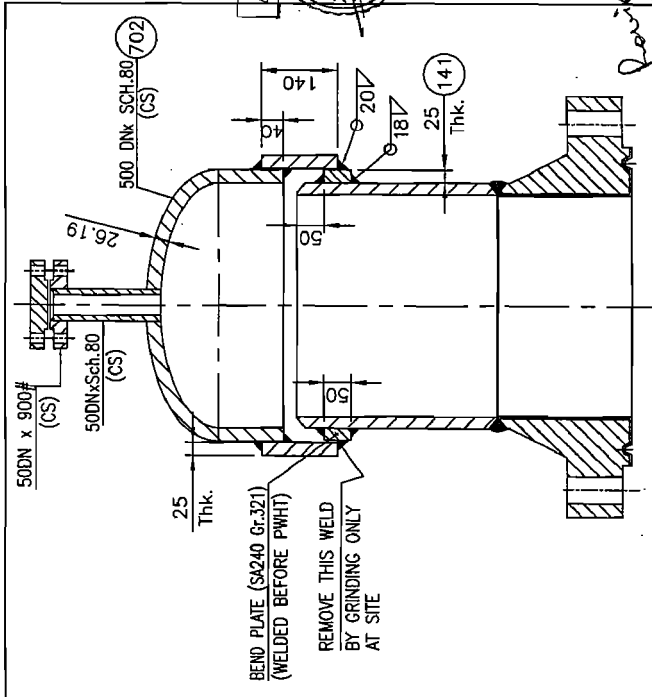
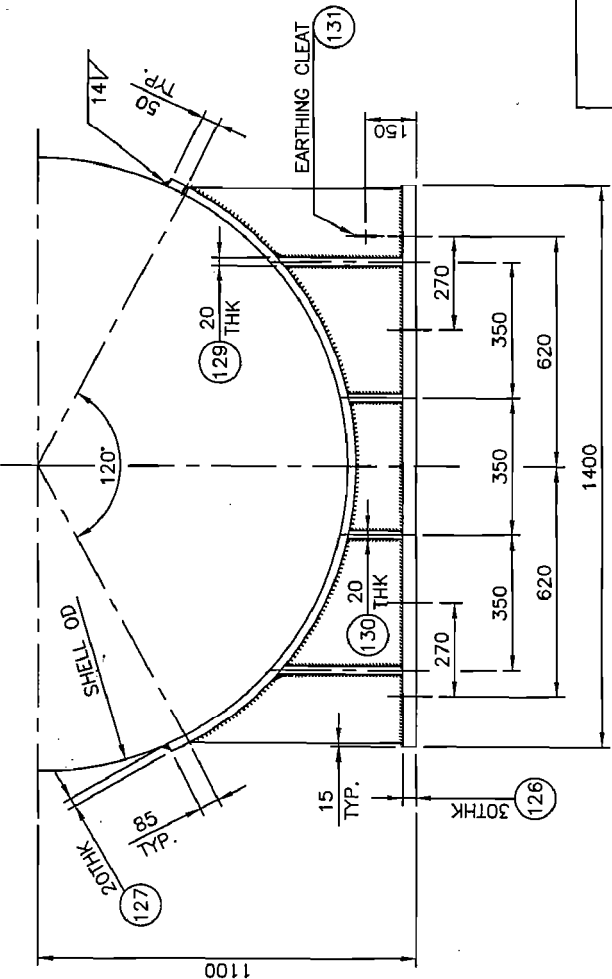
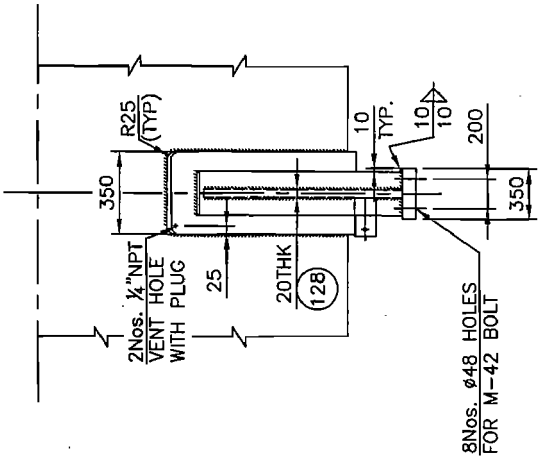
EQPT. NO. : 211-E-2



SCALE	REV	SHT
NTS	3	14 of 17
DWG NO.	SDB/E/07205	

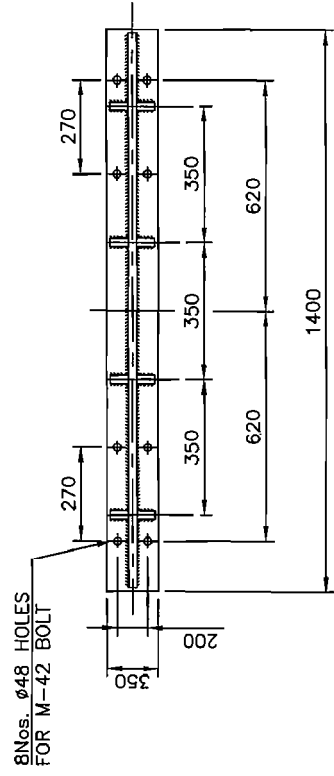
Revised
Signature



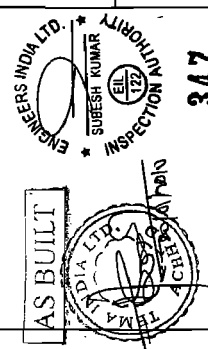


DETAIL OF FIXED SADDLE SUPPORT FOR SHELL SIDE

NOTE :- ALL FILLET ARE 12mm



HYDROTEST ARRANGEMENT DETAIL
NOZZLE No. T1 & T2 (18")

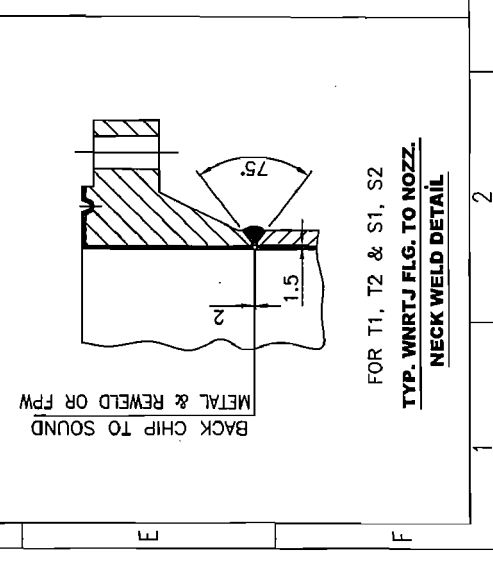
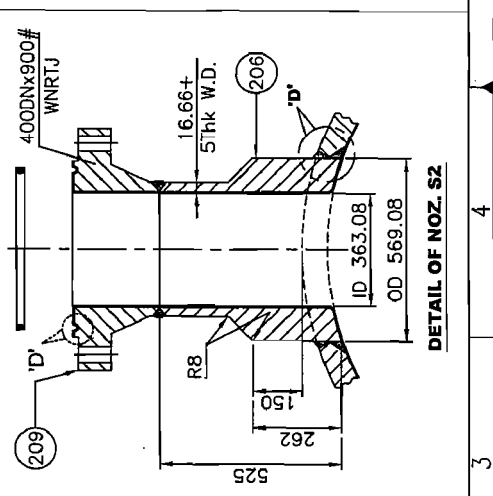
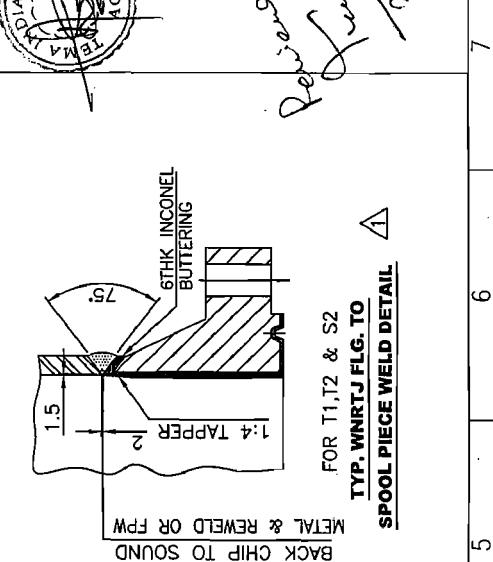
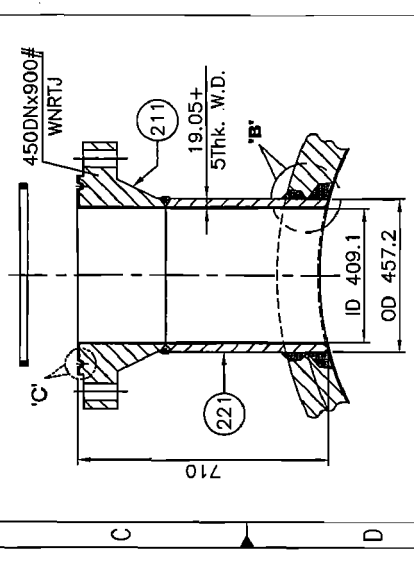
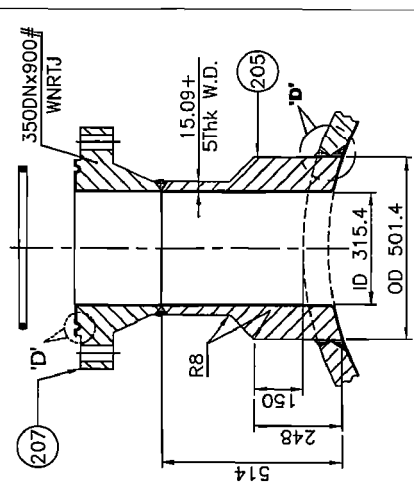
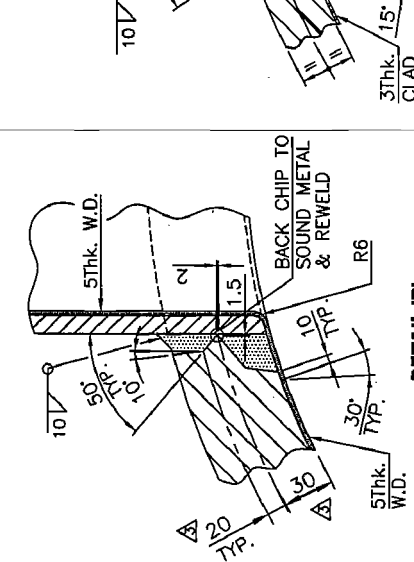
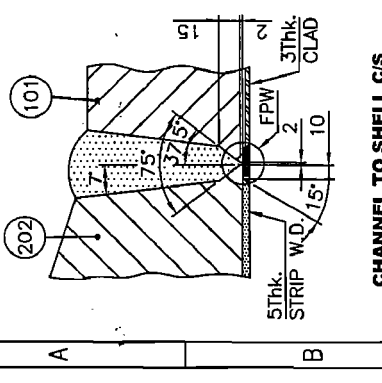
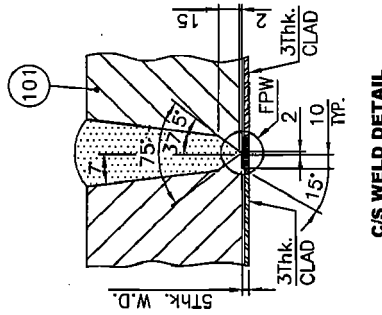
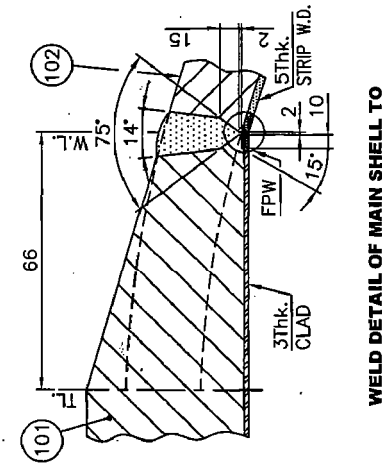
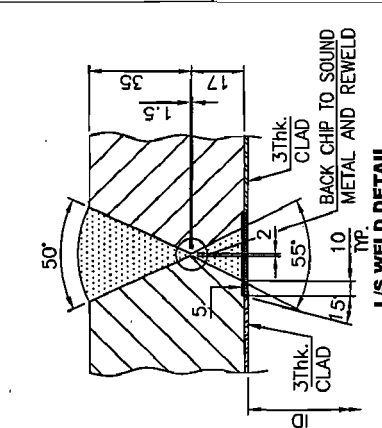
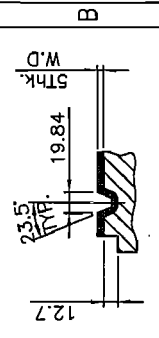
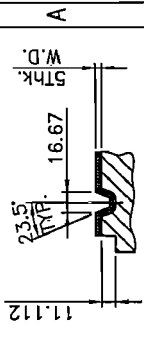
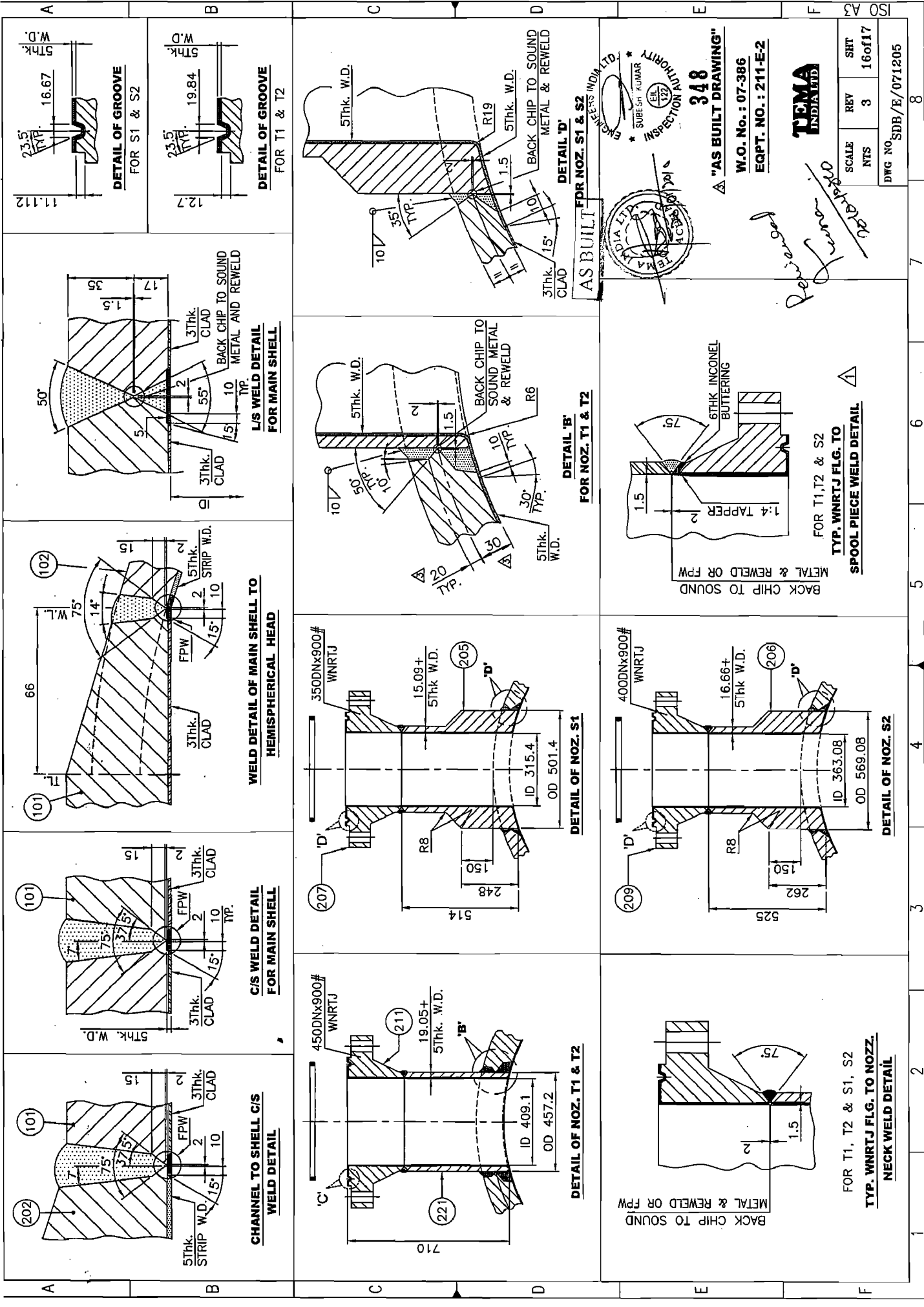


"AS BUILT DRAWING"
W.O. No. : 07-386
EQPT. NO. : 211-E-2



SCALE	REV	SHT
1:1	3	15 of 17
NTS		
DWG NO.	SDB/E/071205	

Handwritten signature and notes:
SDB/E/071205
15 of 17



AS BUILT

TEMA INDIA LTD. (Stamp)

348

"AS BUILT DRAWING"

W.O. No.: 07-386
EQPT. NO.: 211-E-2

PKM SEVES INDIA LTD. (Stamp)

SURESH KUMAR (Stamp)

SCALE	REV	SHT
NTS	3	16of17

DWG NO. SDB/E/071205

Review

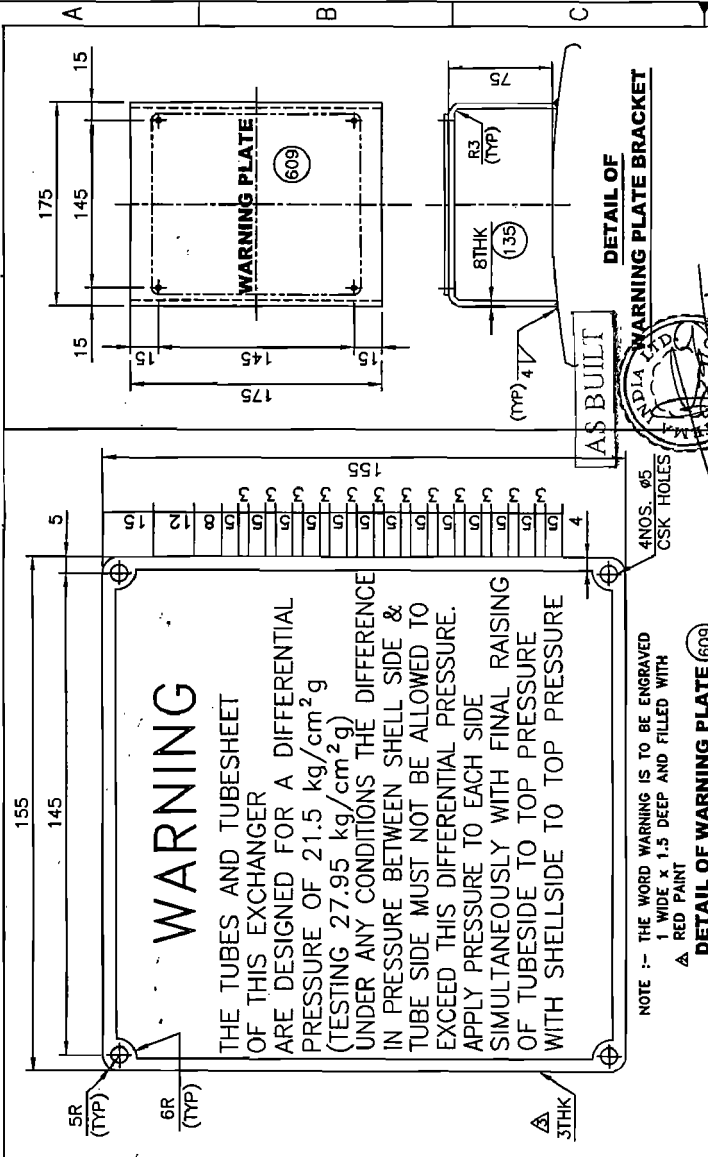
SPOOL PIECE WELD DETAIL

FOR T1, T2 & S2 TYP. WNRTJ FLG. TO NOZZ.

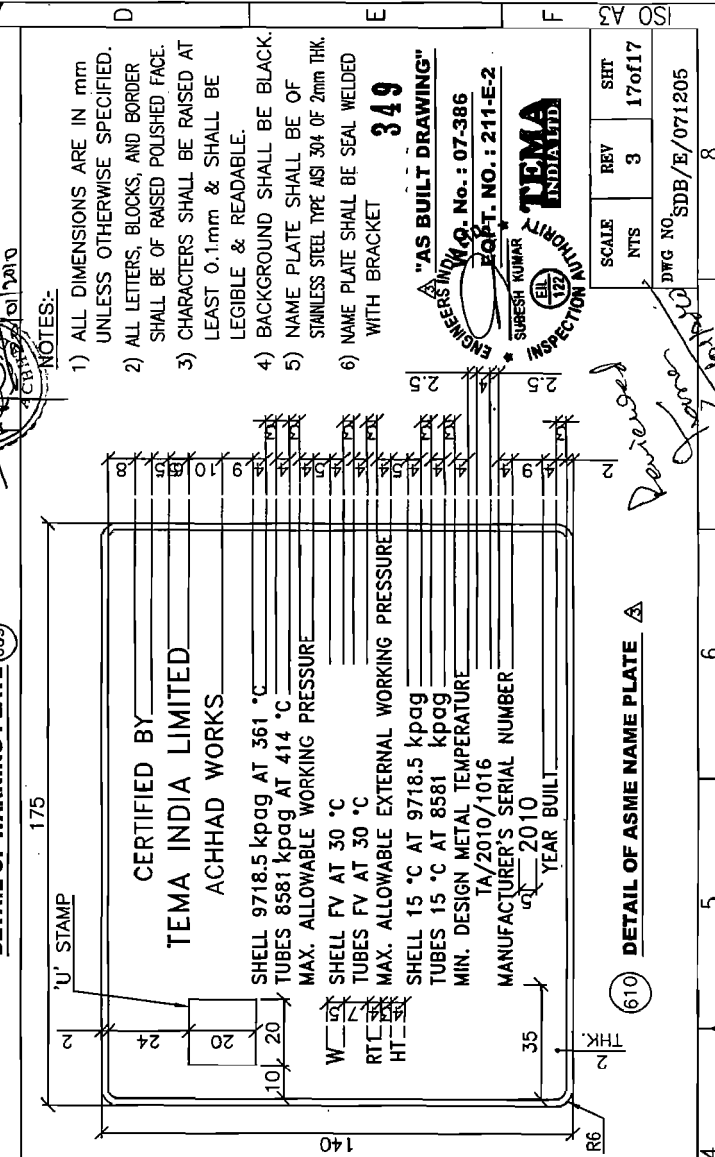
BACK CHIP TO SOUND METAL & REWELD OR FPW

1.5
1.4 TAPPER
2

6THK INCONEL BUTTERING



4-φ5.5 HOLES		TEMA INDIA LTD.		6R	
MECH. DESIGN BY		TEMA INDIA LIMITED		136	
THERM. DESIGN BY		ENGINEERS INDIA LIMITED		135	
MANUFACTURED FOR		CPCL REFINERY III		134	
ITEM NO		211-E-2		133	
MFR'S SERIAL NO		TA/2010/1016		132	
CODES		YEAR BUILT 2010		131	
INSPECTED BY		A/ZEIL		130	
DESIGN PRESSURE		SHELL 99.17/FV		129	
DESIGN TEMPERATURE		361		128	
TEST PRESSURE (HYD)		128.83		127	
DATE OF TEST		3.01.2010		126	
OPERATING FLUID		REACTOR EFFLUENT		125	
CORROSION ALLOW		NIL		124	
RADIOGRAPHY		100%		123	
HEAT TREATMENT		YES		122	
DUTY / SURFACE		9.95x1.1 MM Kevlar/Alr		121	
WMP FULLY CORRODED (AT DESIGN TEMP)		99.1 AT 361 °C		120	
WMP FULLY CORRODED (AT AMBIENT TEMP)		87.5 AT 414 °C		119	
WMP UNCORRODED (AT DESIGN TEMP)		99.1 AT 30 °C		118	
WMP UNCORRODED (AT AMBIENT TEMP)		87.5 AT 30 °C		117	
WT. FULL OF WATER		65.356		116	
TOTAL WT. EMPTY		44.480		115	
BUNDLE WEIGHT		18500		114	
		52		113	
		78		112	
		150		111	
		20		110	



NOTE :- THE WORD WARNING IS TO BE ENGRAVED 1. WIDE x 1.5 DEEP AND FILLED WITH A. RED PAINT

DETAIL OF WARNING PLATE (609)

4 NOS. φ5 CSK HOLES

AS BUILT

INDIA LTD

DATE: 2010/01/20

NOTES:-

- 1) ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
- 2) ALL LETTERS, BLOCKS, AND BORDER SHALL BE OF RAISED POLISHED FACE.
- 3) CHARACTERS SHALL BE RAISED AT LEAST 0.1mm & SHALL BE LEGIBLE & READABLE.
- 4) BACKGROUND SHALL BE BLACK.
- 5) NAME PLATE SHALL BE OF STAINLESS STEEL TYPE AISI 304 OF 2mm THK.
- 6) NAME PLATE SHALL BE SEAL WELDED WITH BRACKET

DETAIL OF ASME NAME PLATE (610)

U' STAMP

CERTIFIED BY

TEMA INDIA LIMITED

ACHHAD WORKS

SHELL 9718.5 kpag AT 361 °C

TUBES 8581 kpag AT 414 °C

MAX. ALLOWABLE WORKING PRESSURE

SHELL FV AT 30 °C

TUBES FV AT 30 °C

MAX. ALLOWABLE EXTERNAL WORKING PRESSURE

SHELL 15 °C AT 9718.5 kpag

TUBES 15 °C AT 8581 kpag

MIN. DESIGN METAL TEMPERATURE

TA/2010/1016

MANUFACTURER'S SERIAL NUMBER

2010

YEAR BUILT

W 10, 20

RTCL

HT II

35

R6

140

2.5

2.5

2

610

DETAIL OF ASME NAME PLATE

