

### DESIGN DATA

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 <sup>2</sup> KPag	PWHT	YES
DESIGN TEMPERATURE	SHELLSIDE TUBE SIDE 102.6/FV* 85.4/FV* 10062/FV* 8375/FV*	RADIOGRAPHY	100%
HYDROTEST PRESSURE (SEE NOTE-33)	245 283	JOINT EFFICIENCY	1.0
DIFFERENTIAL DESIGN PRESSURE FOR TUBES/TS.	°C	POSITION	DEU
MIN HYDRO TEST TEMPERATURE	Kg/Cm <sup>2</sup> KPag	HORIZONTAL	TYPE
OPERATING PRESSURE	111.02 10887.5	DUTY	37.47x1.1
OPERATING TEMPERATURE (IN / OUT)	°C	EARTHQUAKE SPECIFICATION	IS 875
INSIDE DIAMETER	mm	WIND LOAD	NOZZLE LOADS
No. OF PASSES	Nos.	ADDITIONAL LOADING AS PER UG-22	YES 'U'
FLUID CIRCULATED	mm	CODE STAMPING REQUIRED	
INSULATION	mm	TOLERANCE	TEMA CLASS R & EIL STD. 7-15-0019 REV.1
CORRN. ALLOWANCE	mm		
MAWP FULLY CORRODED (AT DESIGN TEMP.)	°C		
MAWP FULLY CORRODED (AT AMBIENT TEMP.)	°C		
MAWP UNCORRODED (AT DESIGN TEMP.)	°C		
MAWP UNCORRODED (AT AMBIENT TEMP.)	°C		
MDMT	°C		

### MECHANICAL DATA OF EXCHANGER

EFFECTIVE SURFACE AREA	m <sup>2</sup>	582
TOTAL WEIGHT (EMPTY)	Kg.	51825
TUBE BUNDLE WEIGHT	Kg.	19000
HYDRO TEST WEIGHT	Kg.	75388
OPERATING WEIGHT	Kg.	71482
BUNDLE PULLING LOAD	Kg.	38000
No. OF 'U' TUBES	PITCH	32
TUBE OD	LAYOUT	◇ RT. SQUARE
TUBE THK. (Min.)		3.0
TUBE EFF. LENGTH	5774 (SHELL SIDE FACE OF T/SHT. TO FULL SUPP. PL. INSIDE FACE)	
IMPACT TESTED PART NO.	SEE NOTE No. 41	
	* @ 30 °C	

### NOZZLE SCHEDULE

ITEM DESCRIPTION	HEATING METHOD	TYPE OF HEAT TREATMENT	LOADING TEMP. (°C)	RATE OF HEATING (°C/HOUR)	SOAKING TIME	SOAKING TEMP. (°C)	RATE OF COOLING (°C/HOUR)	UNLOADING TEMP. (°C)
T2 CHANNEL OUTLET	IN CLOSED FURNACE	PWHT	300	80	2.30 Hours	620-640	80	300
T1 CHANNEL INLET	IN CLOSED FURNACE	PWHT	300	55	3.0 Hours	680-700	55	300
S2 SHELL OUTLET	IN CLOSED FURNACE	PWHT	300	55	4.5 Hours	680-700	55	300
S1 SHELL INLET	IN CLOSED FURNACE	SR	300	150	15 Min.	680-700	150	-
NOZZ. SERVICE	ELECTRICAL RESISTANCE	PWHT	300	55	2.0 Hours	680-700	55	300

### HEAT TREATMENT PROCEDURE :-

● AS PER GENERAL NOTE-35								
T2 CHANNEL OUTLET	400	80	21.44	600#	WN	RF		
T1 CHANNEL INLET	400	80	21.44	600#	WN	RF		
S2 SHELL OUTLET	350	FORG.	19.05	900#	WN	RTJ		
S1 SHELL INLET	350	FORG.	19.05	900#	WN	RTJ		
NOZZ. SERVICE	SIZE DN	SCH	THK	CLASS	TYPE	* FACE	REMARK	
NOZZLE SCHEDULE ASME B16.5 2003 FLANGES								

### TUBE SIDE ADDITIONAL CONDITIONS :-

DEPRESSURIZATION PRESSURE	73.0 Kg/cm <sup>2</sup> g
DEPRESSURIZATION TEMPERATURE	358 °C

ENGINEERS INDIA LTD. SURESH KUMAR EIL 172 INSPECTION FROM	REVIEWED 30/10/2009
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TRMA INDIA LTD. ACTING	30/10/2009
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REV.	DATE	DESCRIPTION	DRWN	CHKD	APPD
3	30.12.2009	AS BUILT DIMENSIONS ARE SHOWN IN BKT (-) AS MARKED AND OTHER CHANGES AS MARKED WITHUS.	AHS	VED	GDP
2A	21.02.2009	DRAWING IS REVISED AS PER EIL COMMENTS AS MKD. WITHUS.	BSB	VDP	GDP
2	08.01.2009	DRAWING IS REVISED AS PER EIL COMMENTS AS MKD. WITHUS.	BSB	VDP	GDP
1	06.09.2008	DRAWING IS REVISED AS PER EIL COMMENTS AS MKD. WITHUS.	BSB	VDP	GDP
0	15.04.2008	SUBMITTAL FOR APPROVAL	BSB	VDP	GDP

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

ENGINEERING & MANUFACTURER : **TEMA INDIA LTD.**  
 "AS BUILT DRAWING"  
 Factory Address: BHEL, Hyderabad-500001, India. Office: 8-607/882, Nehru Park, Hyderabad-500001

CONSULTANT : **ENGINEERS INDIA LIMITED**

CLIENT : **CPCL REFINERY III 339**

TITLE :	<b>FIRST REACTOR FEED / EFFLUENT EXCHANGER</b>	W.O. No.	<b>07-386</b>
JOB NO.	EIL 6879 TEMA T/E/071202	EQPT. NO.	<b>211-E-1D</b>
SCALE	NTS DWG. No.	P.O. No.	6879/6010/1008/018 DT. 27/02/2008
		PR No.	6879-211-EE-PR-6020/0018 Rev.0 DT. 03/04/2008
		SHT. NO.	Rev.
		SDB/E/071202	1 of 17



GENERAL NOTES:-

42] HELI HEAD NORMALIZED AT 930C FOR 42 MINUTES, COOLING IN STILL AIR.

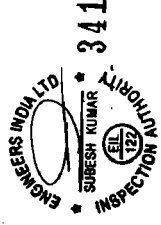
P.No	DESCRIPTION	SIZE	MATERIAL SPECIFIED.	QTY	REMARK
303	REF. P. No. 138				
302	SPACER	AS PER TABLE	SA213 T11	6-7	
301	'U' TUBES	OD25x3.0THKxL.G. (Min. x L.G.)	SA213 T11	6-7	
222	NOZZLE NECK FOR T2	OD406.4xID363.52x490LG.	SA182 Gr.F11 CL-2	1	
221	NOZZLE NECK FOR T1	OD406.4xID363.52x490LG.	SA182 Gr.F11 CL-2	1	
220	PULLING EYE BOLT	M-36 AS PER DETAIL	SA 105	4	
219	PLUG FOR PULLING EYE BOLT	M-36 AS PER DETAIL	SA387 Gr.11 CL-2	4	
218	SEAL RING FOR T2	70THK AS PER DETAIL	SA336 F11 CL-2	1	
217	ADDED STEEL (PROPRIETARY)			1	
216	INNER COMPRESSION RING	OD1388xID1324x35THK	SA336 F11 CL-2	1	
215	OUTER COMPRESSION RING	OD1574xID1516x39.6THK	SA336 F11 CL-2	1	
214	INTERNAL FLANGE	OD1526.5xID1324x18.1THK	SA336 F11 CL-2	1	
213	SPLIT RING	OD1552xID1504x38THK	SA336 F11 CL-2	1	
212	COMPANION NOZZ. FLG. FOR T2	400DNxSCH.80x600#WNRF	SA182 F11 CL-2	1	
211	COMPANION NOZZ. FLG. FOR T1	400DNxSCH.80x600#WNRF	SA182 F11 CL-2	1	
210	NOZZLE FLANGE FOR T2	400DNxSCH.80x600#WNRF	SA182 F11 CL-2	1	
209	NOZZLE FLANGE FOR T1	400DNxSCH.80x600#WNRF	SA182 F11 CL-2	1	
208	COMPANION NOZZ. FLG. FOR S1 & S2	350DNxSCH.80x900#WNRTU	SA 105	2	
207	NOZZLE FLANGE FOR S1 & S2	350DNxSCH.80x900#WNRTU	SA 105	2	
206	FORGE NECK FOR S2	OD493.5xID317.5x481LG.	SA266 Gr.4	1	
205	FORGE NECK FOR S1	OD493.5xID317.5x481LG.	SA266 Gr.4	1	
204	CHANNEL COVER	Ø1520.5x216THK	SA336 F11 CL-2	1	
203	THREADED LOCK RING	OD1612.21xID1468x289.81THK	SA336 F11 CL-2	1	
202	CHANNEL BARREL	AS PER DETAIL	SA336 F11 CL-2	1	
201	TUBE SHEET	OD1515x165THK	SA336 F11 CL-2	1	

P.No	DESCRIPTION	SIZE	MATERIAL SPECIFIED.	QTY	REMARK
138	SPOOL PIECE FOR S2	1023 <sup>9</sup> / <sub>16</sub> x500x30THK.	SA387 Gr.11 CL-2	1	
137	BEND PLATE FOR NOZZLE S2 (FOR HDR80)	102 <sup>9</sup> / <sub>16</sub> x50x27THK AS PER DETAIL	SA387 Gr.11 CL-2	1	
136	GUSSET PL. FOR INTERNAL CYLINDER	60x60x16THK AS PER DETAIL	SA387 Gr.11 CL-2	20	
135	WARNING PLATE BRACKET	8THK AS PER DETAIL	SA516 Gr.60	1	
134	NAME PLATE BRACKET	8THK AS PER DETAIL	SA516 Gr.60	1	
133	PL. FOR LIFTING DEVICE	30THK ASPER DETAIL(32THK.)	SA516 Gr.70	1	
132	PL. FOR LIFTING DEVICE	30THK ASPER DETAIL(32THK.)	SA516 Gr.70	1	
131	EARTHING CLEAT	100x75x10THK	SA516 Gr.60	2	
130	RIB PL. FOR FIXED SADD SUPP.	270x155x20THK	SA516 Gr.60	4	
129	RIB PL. FOR FIXED SADD SUPP.	482x155x20THK	SA516 Gr.60	4	
128	WEB PL. FOR FIXED SADD SUPP.	1470x660x20THK	SA516 Gr.60	1	
127	WEAR PL. FOR FIXED SADD SUPP.	1899 <sup>0</sup> / <sub>16</sub> x350x20THK	SA516 Gr.60	1	
126	BASE PL. FOR FIXED SADD. SUPP.	1500x350x30THK(32THK.)	SA516 Gr.60	1	
125	RIB PL. FOR SLIDING SADD SUPP.	139x155x20THK	SA387 Gr.11 CL-2	4	
124	RIB PL. FOR SLIDING SADD SUPP.	395x155x20THK	SA387 Gr.11 CL-2	4	
123	WEB PL. FOR SLIDING SADD SUPP.	1670x591x20THK	SA387 Gr.11 CL-2	1	
122	WEAR PL. FOR SLIDING SADD SUPP.	2172 <sup>0</sup> / <sub>16</sub> x350x20THK	SA387 Gr.11 CL-2	1	
121	BASE PL. FOR SLIDING SADD. SUPP.	1700x350x30THK	SA387 Gr.11 CL-2	1	
120	GASKET RETAINER	Ø1557x20THK	SA240 Gr.321	1+1	
119	INTERNAL SLEEVE	4260 <sup>0</sup> / <sub>16</sub> x87Wx32THK	SA387 Gr.11 CL-2	1	
118	RETAINING RING FOR T2	OD437.7xID413.7x3THK	SA240 Gr.321	1	
117	PARTITION COVER PLATE	30THK AS PER DETAIL	SA387 Gr.11 CL-2	1	
116	END PALTE	OD1515x22THK	SA387 Gr.11 CL-2	1	
115	PLATE FOR INTERNAL CYLINDER	4665 <sup>0</sup> / <sub>16</sub> x790x30THK	SA387 Gr.11 CL-2	1	
114	PASS PARTITION PLATE	1455x790x34THK	SA387 Gr.11 CL-2	1	
113	SEALING STRIP	5810x80Wx8THK	SA516 Gr.60	2	
112	SEALING STRIP	3666x150Wx8THK	SA516 Gr.60	2	
111	SEALING STRIP	4166x150Wx8THK	SA516 Gr.60	2	
110	SLIDING STRIP	5810x70Wx20THK	SA516 Gr.60	2	
109	SUPPORT PLATE 'C'	16THK AS PER DETAIL	SA516 Gr.60	1	
108	PARTIAL SUPPORT PLATE 'S1'	16THK AS PER DETAIL	SA516 Gr.60	1	
107	PARTIAL SUPPORT PLATE 'S'	16THK AS PER DETAIL	SA516 Gr.60	1	
106	BAFFLE PLATE 'D'	16THK AS PER DETAIL	SA516 Gr.60	1	
105	BAFFLE PLATE 'B'	16THK AS PER DETAIL	SA516 Gr.60	5	
104	BAFFLE PLATE 'A1'	16THK AS PER DETAIL	SA516 Gr.60	1	
103	BAFFLE PLATE 'A'	16THK AS PER DETAIL	SA516 Gr.60	4	
102	HEMI HEAD DISHED END	42THK Norm.	SA516 Gr.60	1	
101	MAIN SHELL	4860 <sup>0</sup> / <sub>16</sub> x584x72THK(75THK.)	SA516 Gr.60	1	

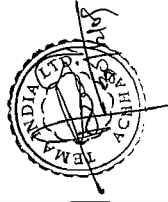
PLATES

BILL OF MATERIALS

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



341  
SURESH KUMAR  
INSPECTION AUTHORITY  
TEMA INDIA LTD  
4 CHH



SCALE	REV	SRT
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DWG No. SDB/E/071202		

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P.No.	DESCRIPTION	SIZE	MATERIAL SPECIFIED.	QTY	REMARK
<b>FITTING</b>					
701	CAP FOR S2 (FOR HYDRD)	450DN x SCH.80	SA234 Gr.WPB	1	
<b>MISCELLANEOUS</b>					
610	ASME NAME PLATE	175x120x2THK	AISI 304	1	
609	WARNING PLATE	155x155x2THK	AISI 304	1	
608	NAME PLATE	150x136x2THK	AISI 304	1	
607	HANDLE FOR PARTITION COVER	ø16x350LG.	SA387 Gr.11 CL-2	2	
606	SEAL ROD	ø25x4116LG.	IS 2062	46	
605	PUSH ROD	ø25x118LG.	SA193 Gr.B16	76+76	
604	PUSH ROD	ø22x275LG.	SA193 Gr.B16	92+92	
603	PUSH ROD	ø25x148LG.	SA453 Gr.660B	80+80	
602	IMPINGEMENT ROD	ø25x1201LG.	IS 2062	27	
601	TIE ROD	ø12x5838LG.	IS 2062	22	
<b>FASTENERS</b>					
511	STUD-2NUTS FOR T1 & T2 COMP. FLG.	1½" UN8x290 LG.	SA193 Gr.B16/SA194 Gr.16	40+8	
510	STUD-2NUTS FOR S1 & S2 COMP. FLG.	1½" UN8x315 LG.	SA193 Gr.B7/SA194 Gr.2H	40+8	
509	STUD FOR SEALING & SLIDING STRIP	M-12x38LG.	SA193 Gr.B7	4	
508	HEX. HD. BOLT FOR LIFTING DEVICE	M-24x68LG.	SA193 Gr.B7	4	
507	HEX. SOCKET SET SCREW	M-10x25 LG.	SA193 Gr.B8T	3	
506	HEX. HD. BOLT (SET SCREW)	1½" UN8x89 LG.	SA453 Gr 660B	80	
505	HEX. HD. BOLT (SET SCREW)	1" UN8x82 LG.	SA193 Gr B16	92	
504	HEX. HD. BOLT (SET SCREW)	1½" UN8x89 LG.	SA193 Gr. B16	76	
503	NUTS FOR TIE RODS	M-12 STD.	SA194 Gr. 8T	44	
502	STUD WITH 1NUT, 1-FLAT WASHER & 1-LOCK WASHER	M-12x75LG.	SA193 Gr.B8T CL.2+	52	
501	HEX. HD.SCREW WITH LOCKNUT	M-10x50LG.	SA194 Gr.8T	28	
<b>GASKETS</b>					
408	GASKET FOR T1 & T2 COMP. FLG.	400DNx600#x4.5THK	AISI 304 SPWD	2+8+4	
407	GASKET FOR S2 COMP. FLG.	350DNx900#ASME RING No.62	5 Cr.-1/2Mo	1+4+2	TEMPERS TORRENT LIG. (OCTAGONAL RING)
406	GASKET FOR S1 COMP. FLG.	350DNx900#ASME RING No.62	SOFT IRON	1+4+2	HARDNESS TORRENT LIG. (OCTAGONAL RING)
405	PACKING SEAL FOR T2	12.75Qx3000LG.	FIBER GLASS UJP-329	1+4+2	
404	GASKET FOR PARTITION PLATE	3THK (AS PER DETAIL)	NON ASBESTOS WHH	1+4+2	
403	RING GASKET	OD1558xID1538x3THK	ARAMIDE FIBRE	1+4+2	
402	GASKET	OD1515xID1456.8x1.6THK	SA240 Gr.321	1+4+2	
401	GASKET	OD1507xID1481x6.35THK	AISI 321 SPWD	1+4+2	SEE NOTE-16

**BILL OF MATERIALS**

W.O. No. : 07-386  
EQPT. NO. : 211-E-1D  
**342**

**TEMA INDIA LTD.**

SURESH KUMAR  
INSPECTION AUTHORITY

*Suresh Kumar*

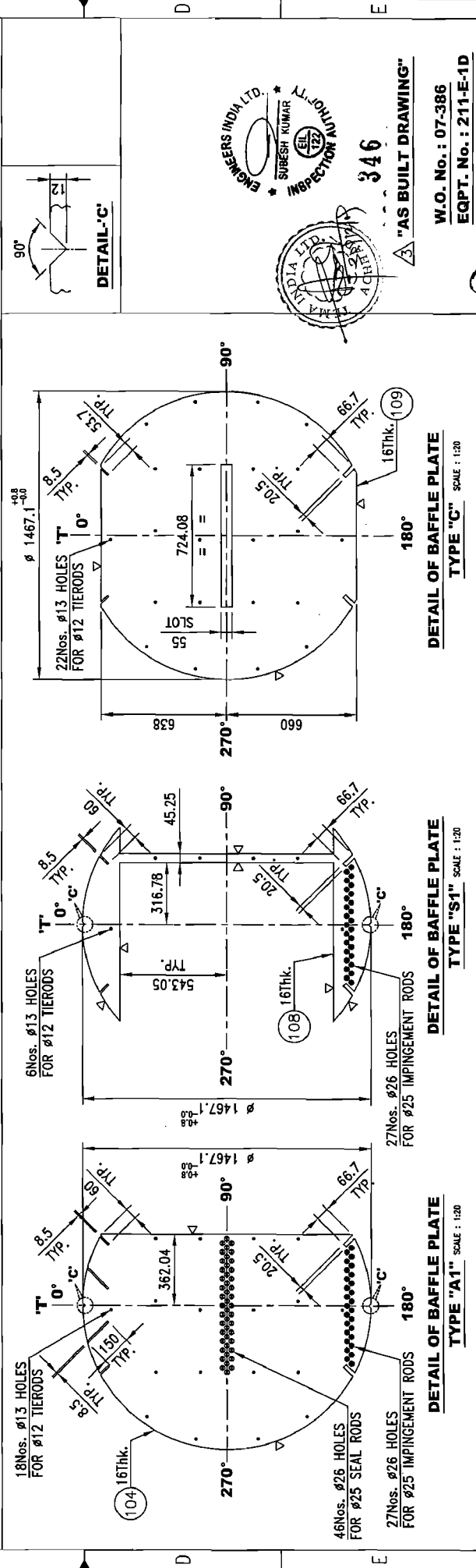
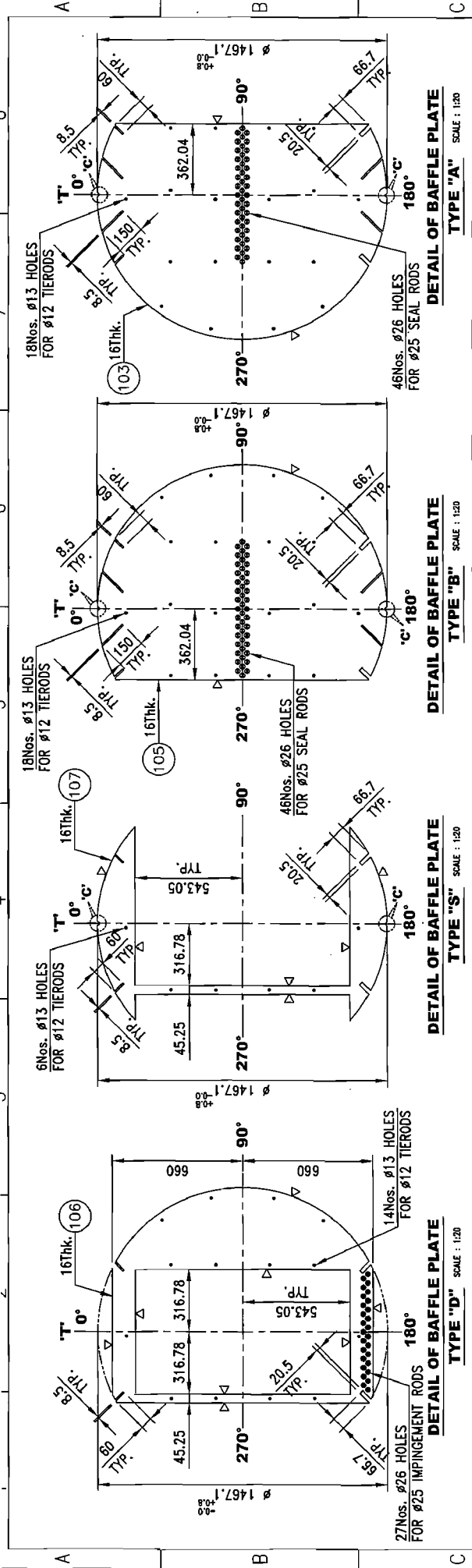
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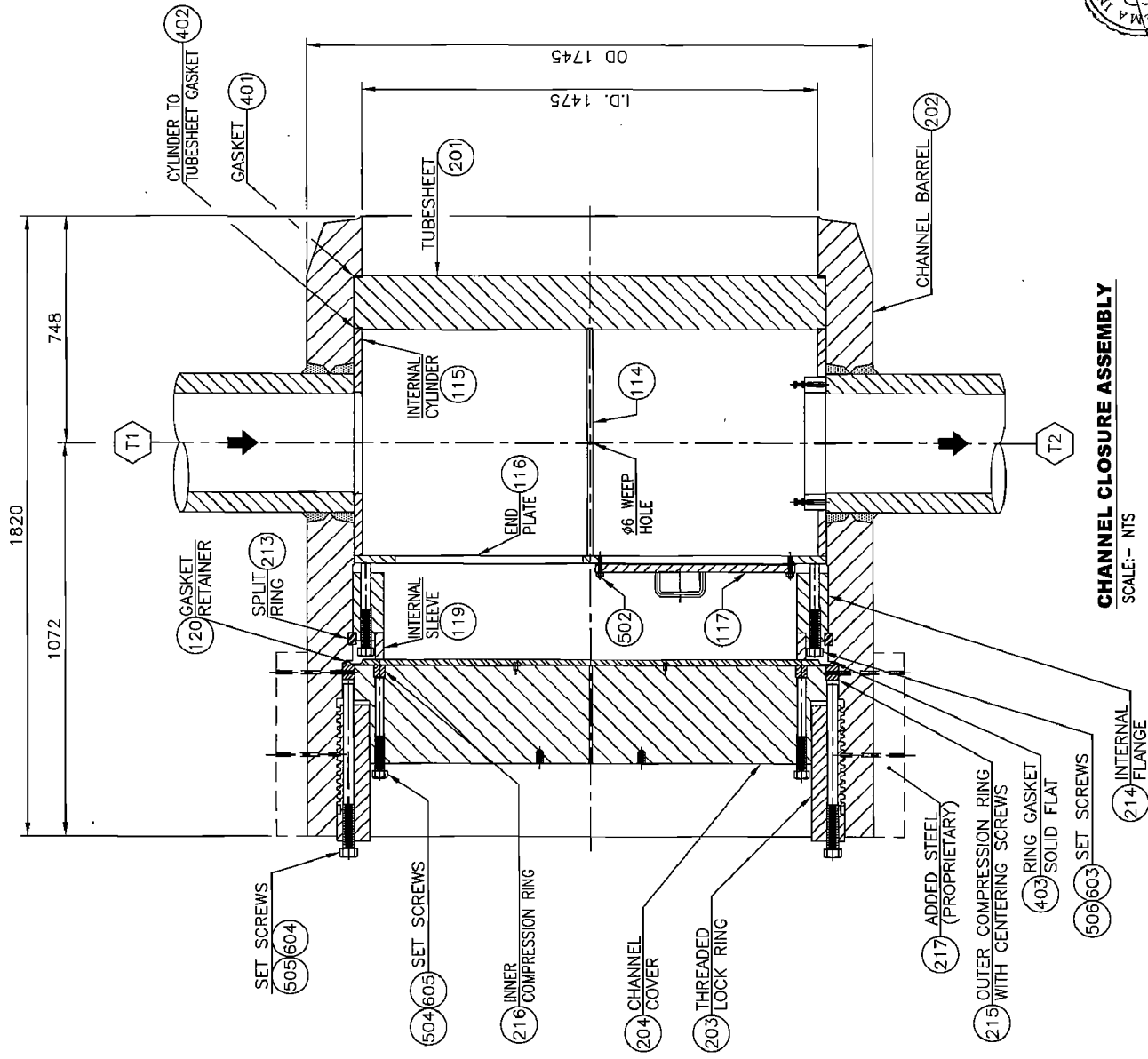
**NOTES :-**

- 1) TUBE HOLE  $\phi 25.4$  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.

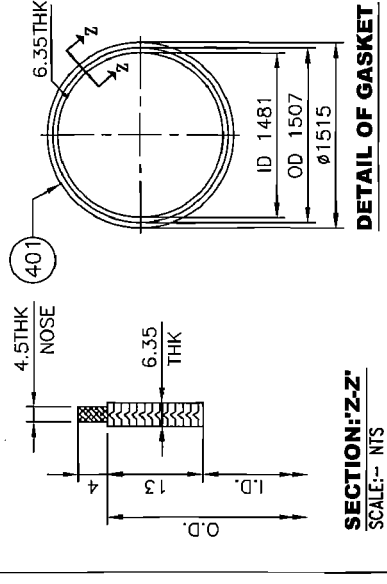
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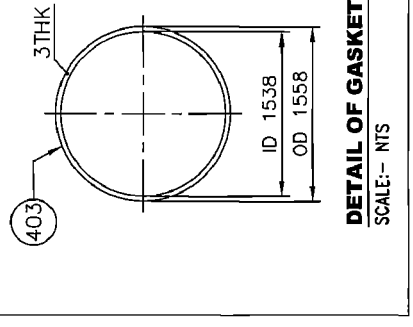




**CHANNEL CLOSURE ASSEMBLY**  
SCALE:- NTS



**DETAIL OF GASKET**  
SCALE:- NTS



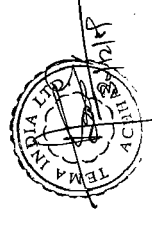
**DETAIL OF GASKET**  
SCALE:- NTS

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3 "AS BUILT DRAWING"

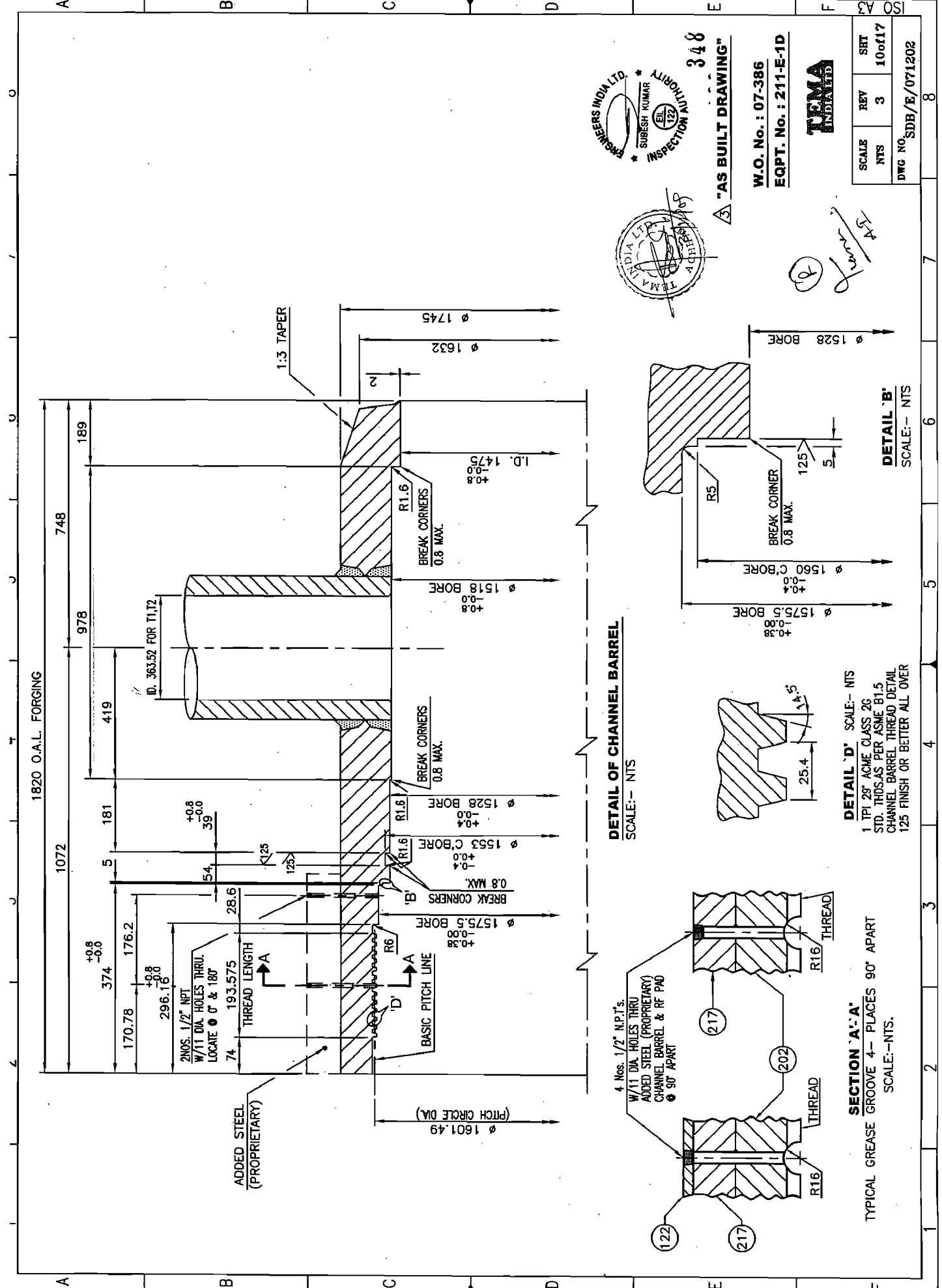
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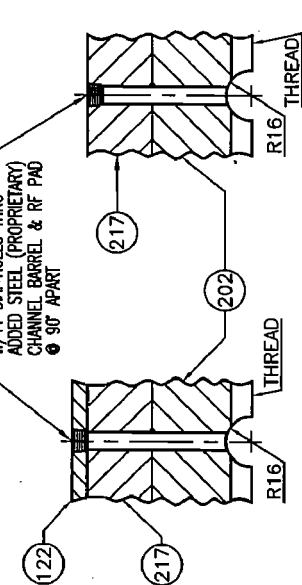
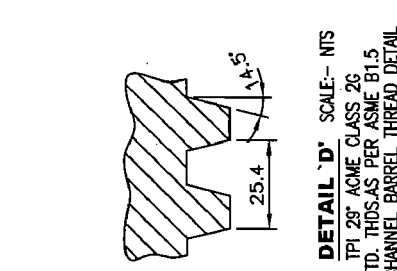
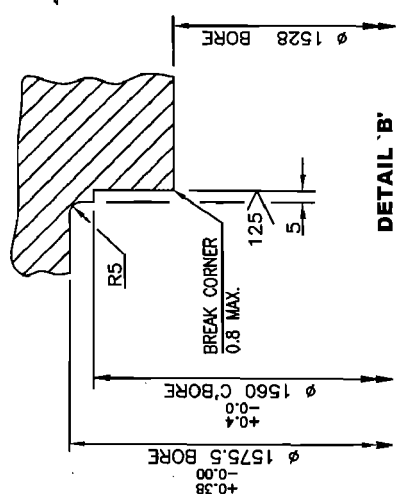


SCALE	REV	SHT
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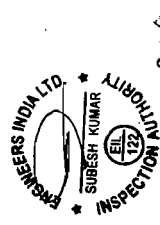
**DETAIL OF CHANNEL BARREL**  
SCALE:- NTS



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

**DETAIL 'D'** SCALE:- NTS  
1 TPI 28° ACME CLASS 2C  
STD. THDS. AS PER ASME B1.5  
CHANNEL BARREL THREAD DETAIL  
125 FINISH OR BETTER ALL OVER

**DETAIL 'B'**  
SCALE:- NTS



**"AS BUILT DRAWING"**  
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EQPT. No. : 211-E-1D



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A B C D E F

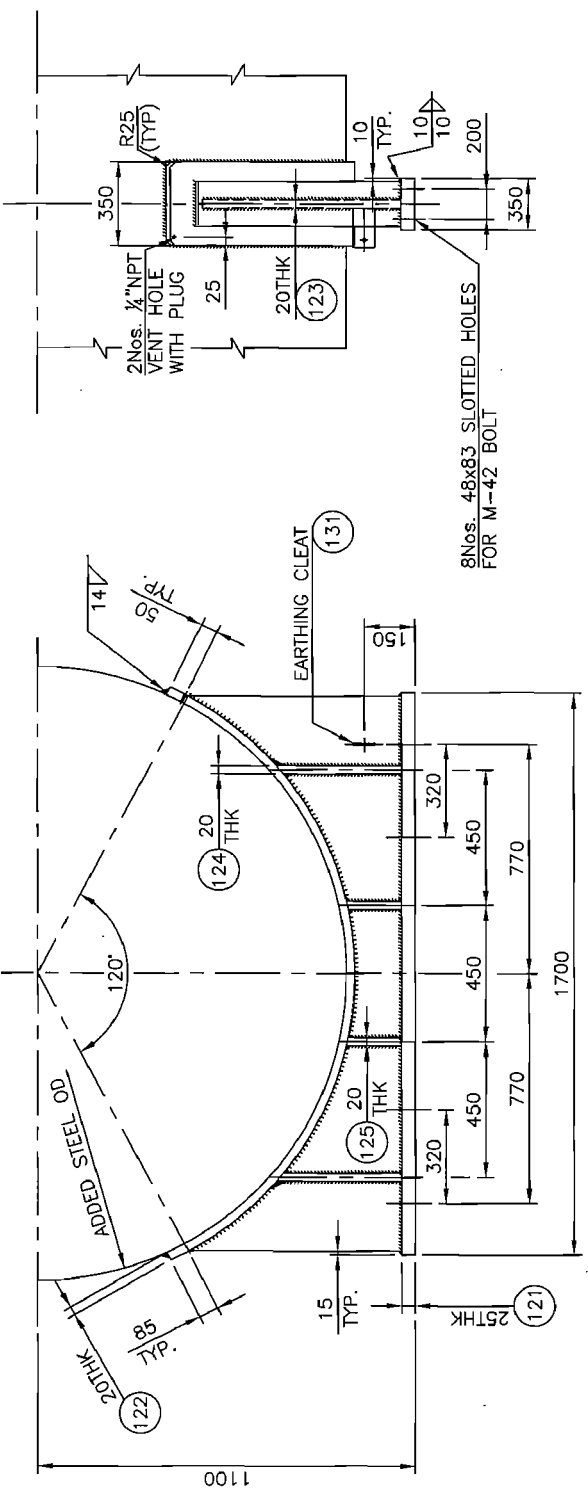
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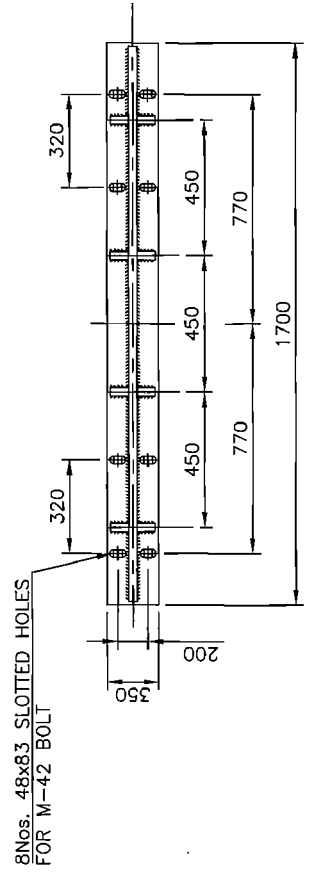




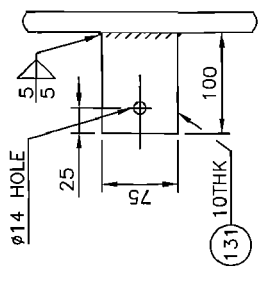


**DETAIL OF SLIDING SADDLE SUPPORT FOR CHANNEL SIDE**

NOTE :- ALL FILLET ARE 12mm



8Nos. 48x83 SLOTTED HOLES FOR M-42 BOLT



**DETAIL OF EARTHING CLEAT**



35%

"AS BUILT DRAWING"

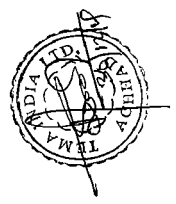
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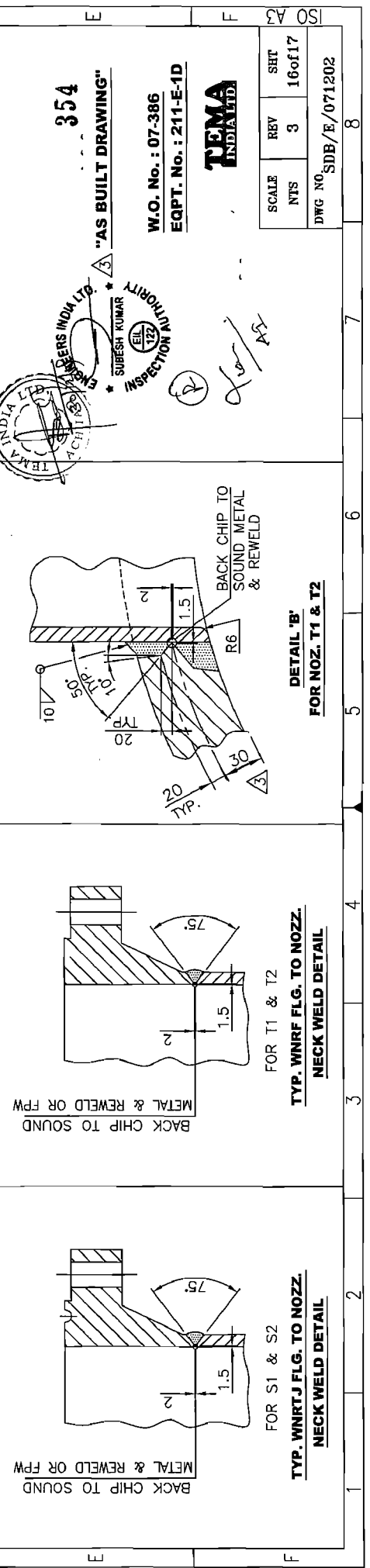
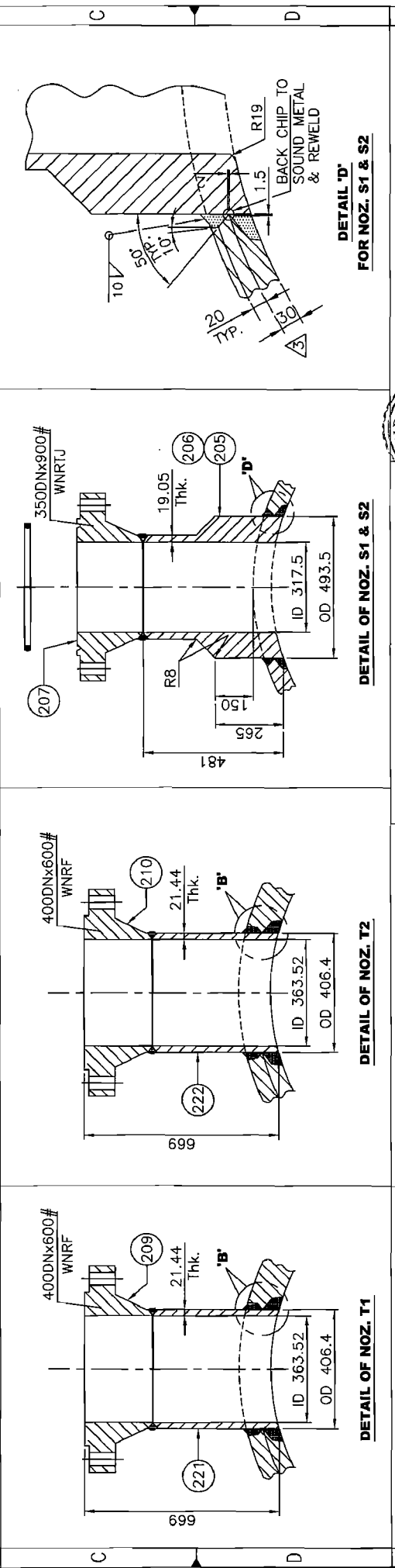
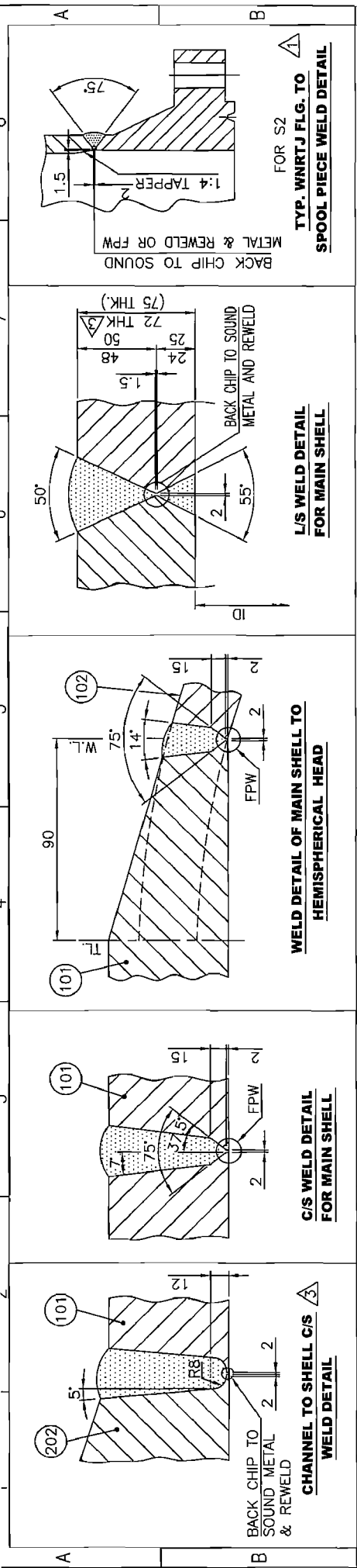
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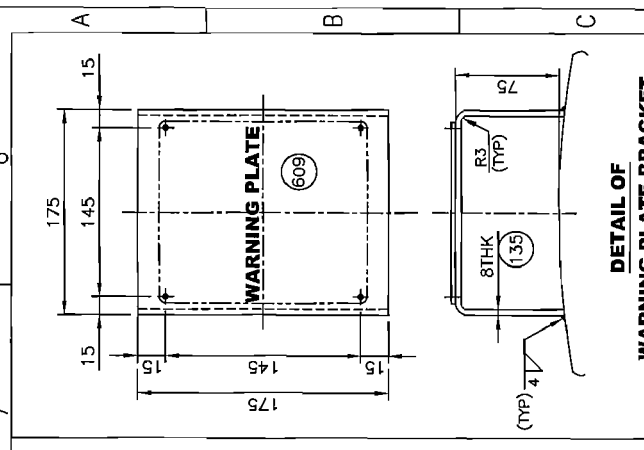
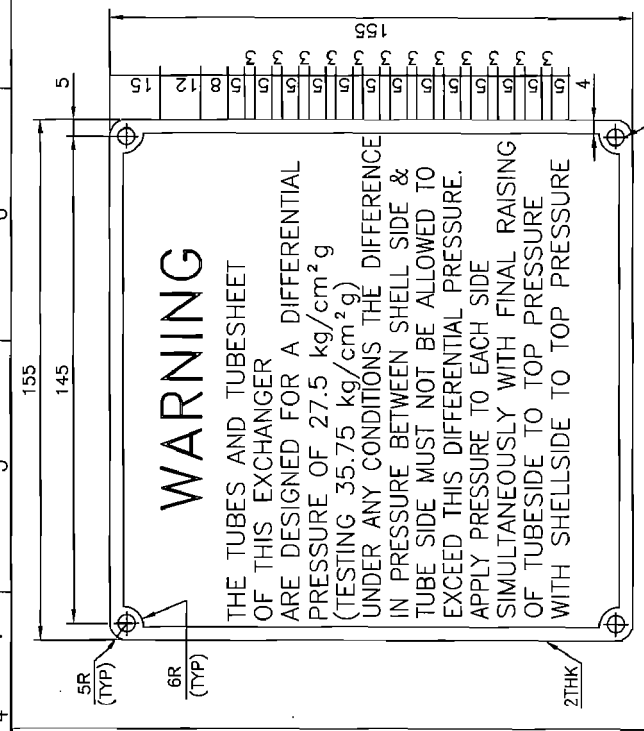


SCALE	REVISIONS	SHEET
NTS	3	16 of 17
DWG NO. SDB/E/071202		

1 2 3 4 5 6 7 8



4- $\phi$ 5.5 HOLES		TEMA INDIA LTD.		20	
MECH. DESIGN BY		TEMA INDIA LIMITED		52	
THERM. DESIGN BY		ENGINEERS INDIA LIMITED		78	
MANUFACTURED FOR		CPCL REFINERY III		150	
ITEM NO		211-E-1D			
MFR'S SERIAL NO		TA/2009/1010			
CODES		YEAR BUILT 2009			
INSPECTED BY		ASME SEC. VIII DIV. 1 2007 Edn. TEMA CLASS. R. 9th Ed. 2007.			
DESIGN PRESSURE		SHELL			
102.6 FV		85.4 FV		TUBES	
245		283		136	
TEST PRESSURE (HYD)		133.38			
DATE OF TEST		23/12/2009			
OPERATING FLUID		REACTOR EFFLUENT			
CORROSION ALLOW		3.0			
RADIOGRAPHY		100%			
HEAT TREATMENT		YES			
DUTY / SURFACE		37.47x1.1 MM. Kcal/hr		mm	
WMP FULLY CORRODED (AT DESIGN TEMP)		102.6 AT 245 °C		mm Z	
WMP FULLY CORRODED (AT AMBIENT TEMP)		85.4 AT 283 °C		582	
WMP UNCORRODED (AT DESIGN TEMP)		102.6 AT 30 °C		kg/cm <sup>2</sup> g	
WMP UNCORRODED (AT AMBIENT TEMP)		85.4 AT 283 °C		kg/cm <sup>2</sup> g	
WT. FULL OF WATER		75388		Kg	
TOTAL WT. EMPTY		51825		Kg	
BUNDLE WEIGHT		19000		Kg	



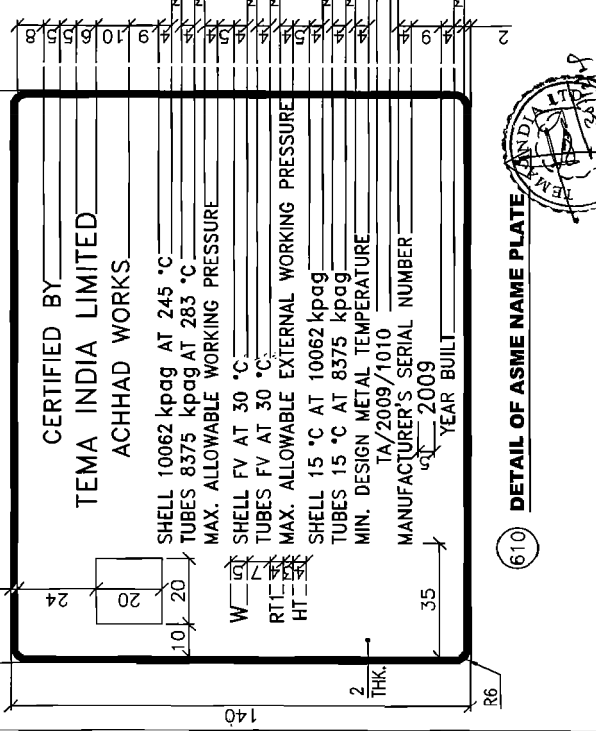
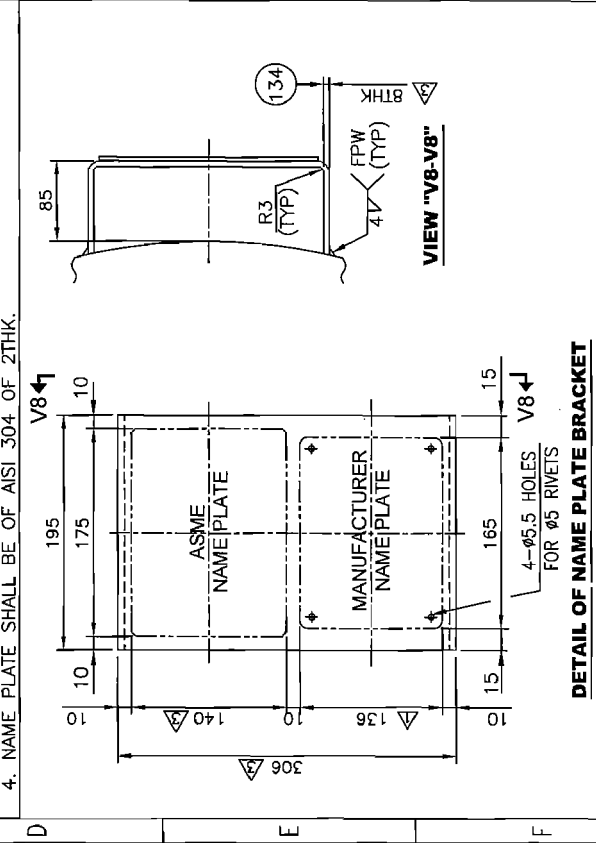
**NOTES:-**

- ALL DIMENSIONS ARE IN mm UNLESS OTHERWISE SPECIFIED.
- ALL LETTERS AND LETTER BLOCKS SHALL BE ENGRAVED IN BLACK.
- NAME PLATE SHALL BE RIVETED WITH  $\phi$ 5 ALUMINIUM RIVETS AND TACK WELDED TO BRACKET ON ALL FOUR SIDE.
- NAME PLATE SHALL BE OF AISI 304 OF 2THK.

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

**DETAIL OF WARNING PLATE (609)**

**DETAIL OF WARNING PLATE BRACKET**



**NOTES:-**

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

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**"AS BUILT DRAWING"**

ENGINEERS INDIA W.O. NO. : 07-386

Eqpt. NO. : 211-E-1D

SUBESH KUMAR

INSPECTION

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SCALE NTS 3

REV 3

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