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28210-040-1M-1

DRAWING NO.

ALL DIMENSIONS ARE IN MILLIMETRES

ERECTION NOTES :

1. ELEVATION OF FINISHED FLOOR LEVEL (FFL) OF RO-DM BUILDING IS (+)0.00M. WHICH IS CONSIDERED AS REFERENCE FOR PIPE LINE ELEVATION.

2. ELEVATION SHOWN (IN METERS) IS FROM FINISHED FLOOR LEVEL (0.00M) TO ϕ OF PIPING UNLESS OTHER WISE SPECIFIED.

3. NECESSARY AIR RELEASE AND DRAIN TO BE PROVIDED. APPROXIMATE LOCATION IS PROVIDED IN THE DRAWING.

4. INSTRUMENT STUB FLANGE SHALL BE FIXED IN CONSULTATION WITH E,C&I SITE ENGINEER.

5. NECESSARY THRUST BLOCK TO BE PROVIDED FOR THE PIPING, IF REQUIRED.

6. ELEVATION OF PIPE LINE SHOWN AS MINUS VALUE IN THIS DRAWING INDICATES, THAT THE PIPE ROUTING IS BELOW FFL.

7. NECESSARY SUPPORT AND LOCATION REQUIRED FOR SUPPORTING GRP PIPE ARE TO BE DECIDED BY THE CONTRACTOR UNLESS OTHERWISE SPECIFIED IN THE SUPPORT DRAWING.

8. DIMENSIONS ARE GIVEN FOR REFERENCE, EXACT DIMENSION SHALL BE CHECKED FROM THE EQPT. NOZZLES ANY CHANGES SHALL BE MADE ACCORDING TO SITE CONDITION

9. 4 MM THICK NEOPRENE RUBBER GASKET SHALL BE PROVIDED FOR THE FLANGE TO FLANGE CONNECTION.

10. RUBBER SHEET OF 60 MM WIDTH SHALL BE WRAPPED AROUND THE GRP PIPE BEFORE FIXING THE SUPPORT.

12. FASTENERS AND GASKETS REQUIRED FOR GRP PIPING ARE SUPPLIED BY BHEL. VENDOR SHALL ERECT SUITABLE FASTENERS AND GASKETS MENTIONED IN THE ERECTION DRAWINGS.

13. AIR VENT, INSTRUMENT, DRAIN VALVE FIXING ARGT AFTER THE STUB FLANGE SHALL BE PROVIDED IN SEPARATE DRGS WHICH ARE IN THE SCOPE OF BHEL.

14. ERECTION OF VALVES INCLUDING ALIGNMENT, RUBBER BELLOWS, SUPPORT SADDLES, VALVE BRACKETS, U-BOLTS, GRIP TYPE FDN. BOLTS AND OTHER ACC. REQUIRED FOR PIPING SHALL BE ERECTED BY VENDOR.

15. ENTIRE PIPING INCLUDING STUB FLANGE AND VALVES SHALL BE HYDRO TESTED FOR A PRESSURE OF 1.5 TIMES THE WORKING PRESSURE FOR 30 MIN. DURATION. DETAILS OF EXACT VALUE WILL BE PROVIDED IN THE ERECTION DRAWINGS. HAND PUMP, PR. GAUGE, DUMMY FLANGES, GASKETS, FASTENERS, REQUIRED FOR HYDRO TEST SHALL BE IN THE SCOPE OF VENDOR.

16. ISOMETRIC PIPING DRAWINGS ARE PROVIDED IN DIFFERENT SHEETS FOR PLANNING AND ESTIMATION PURPOSE. HOWEVER, ERECTION DRAWINGS FOR PIPING AND SUPPORTS SHALL BE PROVIDED DURING CONTRACT STAGE.

17. APART FROM THE PIPING SHOWN IN THE ISOMETRIC PIPING, IF ANY PIPING REQUIRED FOR TO MAKE THE SYSTEM COMPLETE, IT SHALL BE DONE BY VENDOR.

VALVE AND MAGNETIC FLOW TRANSMITTER DETAILS

SUPPLY : BY BHEL

ERECTION (INCLUDING VALVE ALIGNMENT) : BY VENDOR

Manual Butterfly valves	size	TOTAL
	100	27
	150	6
	200	50
	250	8
	300	27
	350	14
	400	8
	450	11
	600	3
Pneumatic Butterfly valves		0
	150	9
	200	54
	250	13
	300	43
	350	4
	400	3
Swing Check valve		0
	200	10
	250	3
	350	5
Magnetic flow transmitters	Size	
	200	1
	300	9
	350	1
	500	1
	600	4

FASTENER (FOR FLANGE AND VALVE FIXING) DETAILS

SUPPLY : BY BHEL

ERECTION : BY VENDOR

SIZE	LENGTH	QTY
M16	120	208
M16	170	208
M20	120	112
M20	140	960
M20	150	1080
M20	170	96
M20	190	144
M20	200	920
M20	210	176
M20	230	828
M24	170	192
M24	180	288
M24	210	60
M24	240	228
M24	275	176
M28	200	432
M28	220	160
M28	310	176
M30	240	148
M30	390	80

RUBBER BELLOW DETAILS

SUPPLY : BY BHEL

ERECTION : BY VENDOR

SIZE	QTY
200	13
250	5
300	12
350	5
400	5
450	10

LEGEND

FFL – FINISHED FLOOR LEVEL

FGL – FINISHED GRADED LEVEL

PL –PAVED LEVEL

TOS –TOP OF STRUCTURE

TOC –TOP OF CONCRETE

BOC –BOTTOM OF CONCRETE

TOP –TOP OF PIPE

BOP – BOTTOM OF PIPE

ϕ – CENTRE LINE

IL – INVERT LEVEL

PIPE JOINT

PIPE PULL OUT

FLANGE

EXISTING FLANGE (PUMP, TANK ETC.)

ELBOW

EQUAL TEE

UNEQUAL TEE

CONC. REDUCER

ECC. REDUCER

FLGD.CONC. REDUCER

FLGD.ECC. REDUCER

MANUAL BUTTERFLY VALVE

PNEU. BUTTERFLY VALVE

CHECK VALVE

RUBBER EXPAN. BELLOW

MAGNETIC FLOW TRANSMITTER

BY VENDOR

BY BHEL

100

PROCESS PIPE

TYP. STUB FLANGE FIXING DETAIL

PIPING ISOMETRIC DRAWING DETAILS

DMF PIPE HEADERS ASSY.

: 1-WT-240-01282 SH. 02 OF 10

DMF FRONTAL PIPING ASSY

: 1-WT-240-01282 SH. 03 OF 10

UF PIPE HEADER ASSY

: 1-WT-240-01282 SH. 04 OF 10

UF FRONTAL PIPING ASSY

: 1-WT-240-01282 SH. 05 OF 10

RO-I FEED, FLUSHING AND RO-II

FEED PIPING ASSY

: 1-WT-240-01282 SH. 06 OF 10

SWRO PERMEATE AND BRINE PIPE ASSY

: 1-WT-240-01282 SH. 07 OF 10

SWRO CIP PIPING ASSY

: 1-WT-240-01282 SH. 08 OF 10

REMIN FILTER PIPE HEADERS ASSY

: 1-WT-240-01282 SH. 09 OF 10

REMIN FILTER FRONTAL PIPING ASSY

: 1-WT-240-01282 SH. 10 OF 10

FASTENERS

RUBBER SHEET

BOTTOM SADDLE

SUPPORT MEMBER

TOP COVER

TYPICAL PIPE SUPPORT DRAWINGS

SCOPE DIVISION DETAILS FOR PIPE SUPPORTS

SL NO	DESCRIPTION	SUPPLY SCOPE	ERECTION SCOPE
01	SUPPORT MEMBER, SADDLES, RUBBER SHEETS, FASTENERS	BHEL	---
02	FABRICATION AND ERECTION OF SUPPORT MEMBER AND BOTTOM SADDLE	BHEL	VENDOR
03	CUTTING AND WRAPPING OF RUBBER SHEETS	BHEL	VENDOR
04	FIXING OF TOP COVER AND FASTENERS	BHEL	VENDOR

FOR TENDER PURPOSE

CAUTION: THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY

PROJECT

2 X 660MW ENNORE SEZ SUPERCRITICAL TPP
AT ASH DYKE OF NCTPS, CHENNAI
PACKAGE : RO-DM
UF - 1600 M³ / Hr. ; RO - I (SWRO) - 580 M³ / Hr. ; RO - II (BWRO) - 114 M³ / Hr. ;
DM - 110 M³ / Hr. (Net)

EPC CONTRACTOR

BHARAT HEAVY ELECTRICALS LIMITED, NEW DELHI
PACKAGE : RO-DM
UNIT : BOILER AUXILIARIES PLANT ; RANIPET

TITLE

GRP PIPING ASSY. AND
GENERAL DETAILS

DRAWN
G B SAHU
Sd/-

CHECKED
G RAIJENDIRAN
Sd/-

APPROVED
M NATARAJAN
Sd/-

NAME

SIGN.

DATE

05.02.18
05.02.18
05.02.18

ALL DIMENSIONS ARE IN MILLIMETRES

BHEL DRAWING NO.

REV

PROJECTION
SCALE
N.T.S

1-WT-240-01282
SH. 01 OF 10

01

ZONE

REV
01

DATE
22.05.18

ALTD:
BBS

CHD:
GR

APPD:
MN

NO REVISION IN THIS SHEET

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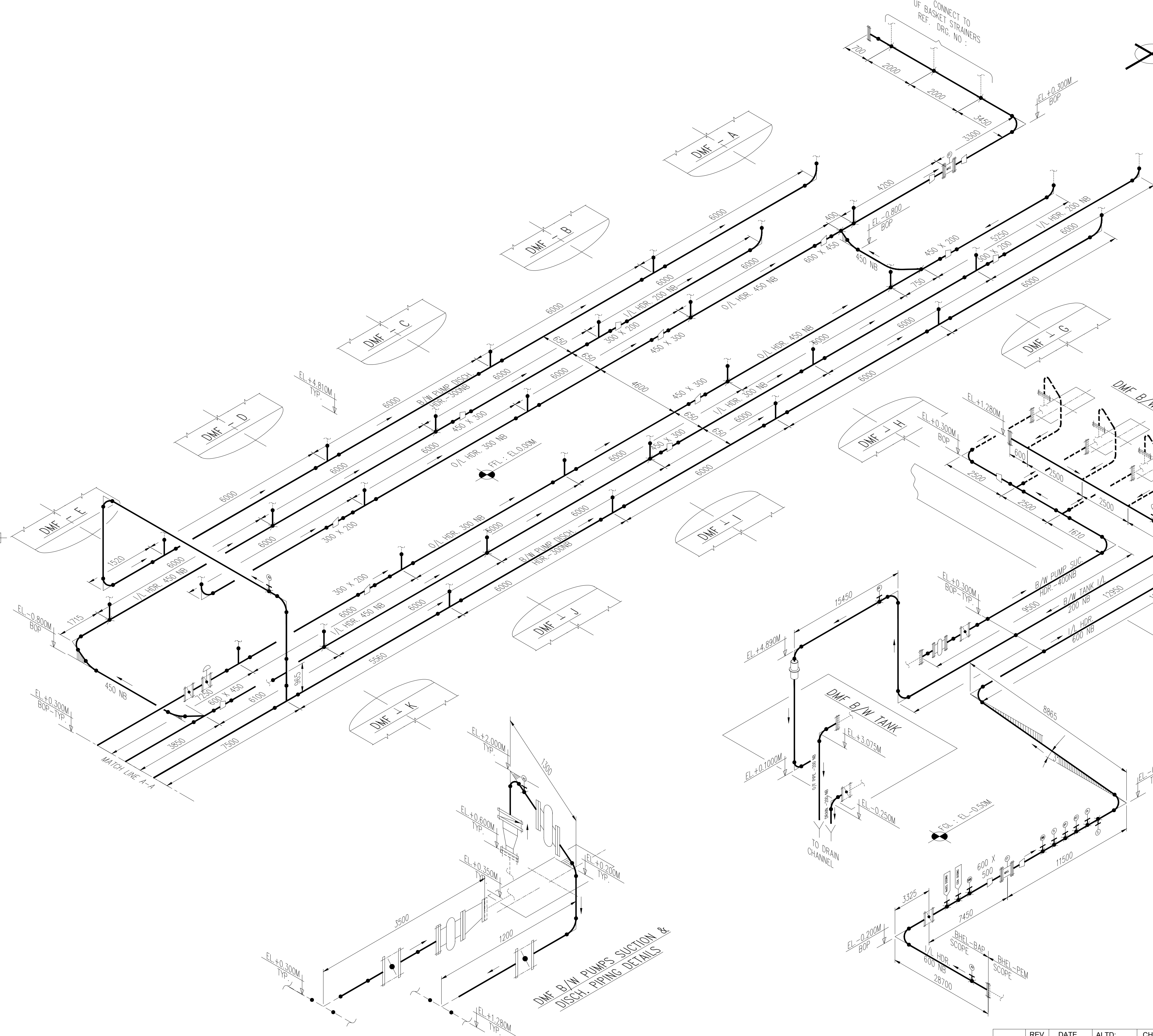
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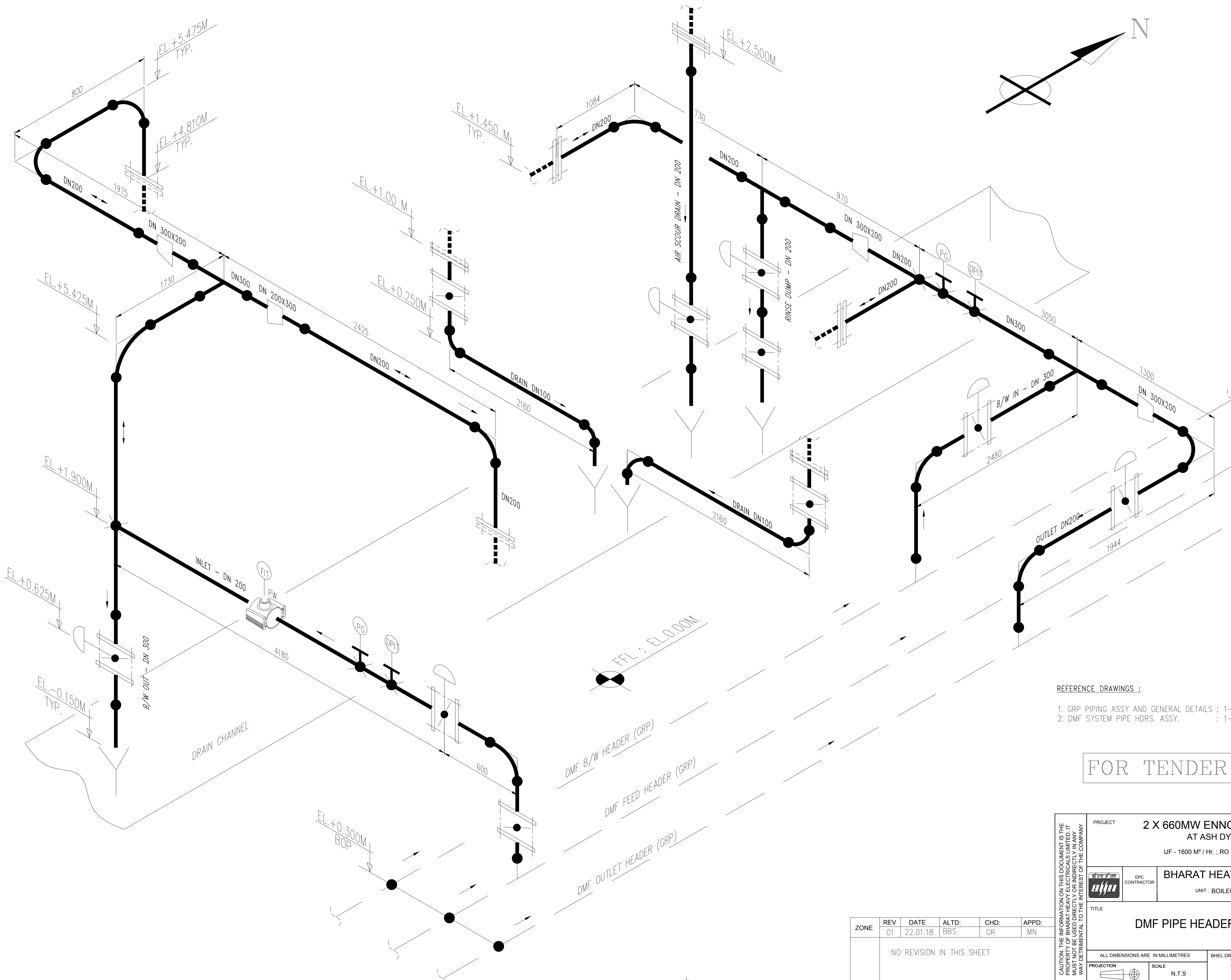


- REFERENCE DRAWINGS :
- 1. GRP PIPING ASSY. AND GENERAL DETAILS: 1-WT-240-01282 SH. 01 OF 10
 - 2. DMF FRONTAL PIPING ASSY. : 1-WT-240-01282 SH. 02 OF 10
 - 3. UF SYSTEM COMMON HEADER ASSY. : 1-WT-240-0282 SH. 03 OF 10

FOR TENDER PURPOSE

CAUTION: THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.	PROJECT 2 X 660MW ENNORE SEZ SUPERCRITICAL TPP AT ASH DYKE OF NCTPS, CHENNAI PACKAGE : RO-DM UF - 1600 M ³ / Hr. ; RO - I (SWRO) - 580 M ³ / Hr. ; RO - II (BWRO) - 114 M ³ / Hr. ; DM - 110 M ³ / Hr. (Net)			
	EPC CONTRACTOR BHARAT HEAVY ELECTRICALS LIMITED, NEW DELHI PACKAGE : RO-DM UNIT : BOILER AUXILIARIES PLANT ; RANIPET			
	TITLE DMF PIPE HEADERS ASSY.			
	DRAWN B B SAHU	NAME	SIGN.	DATE 05.02.18
	CHECKED G RAIJENDIRAN	NAME	SIGN.	DATE 05.02.18
APPROVED M NATARAJAN	NAME	SIGN.	DATE 05.02.18	
ALL DIMENSIONS ARE IN MILLIMETRES		BHTEL DRAWING NO.		
PROJECTION 	SCALE N.T.S	1-WT-240-01282 SH. 02 OF 10		

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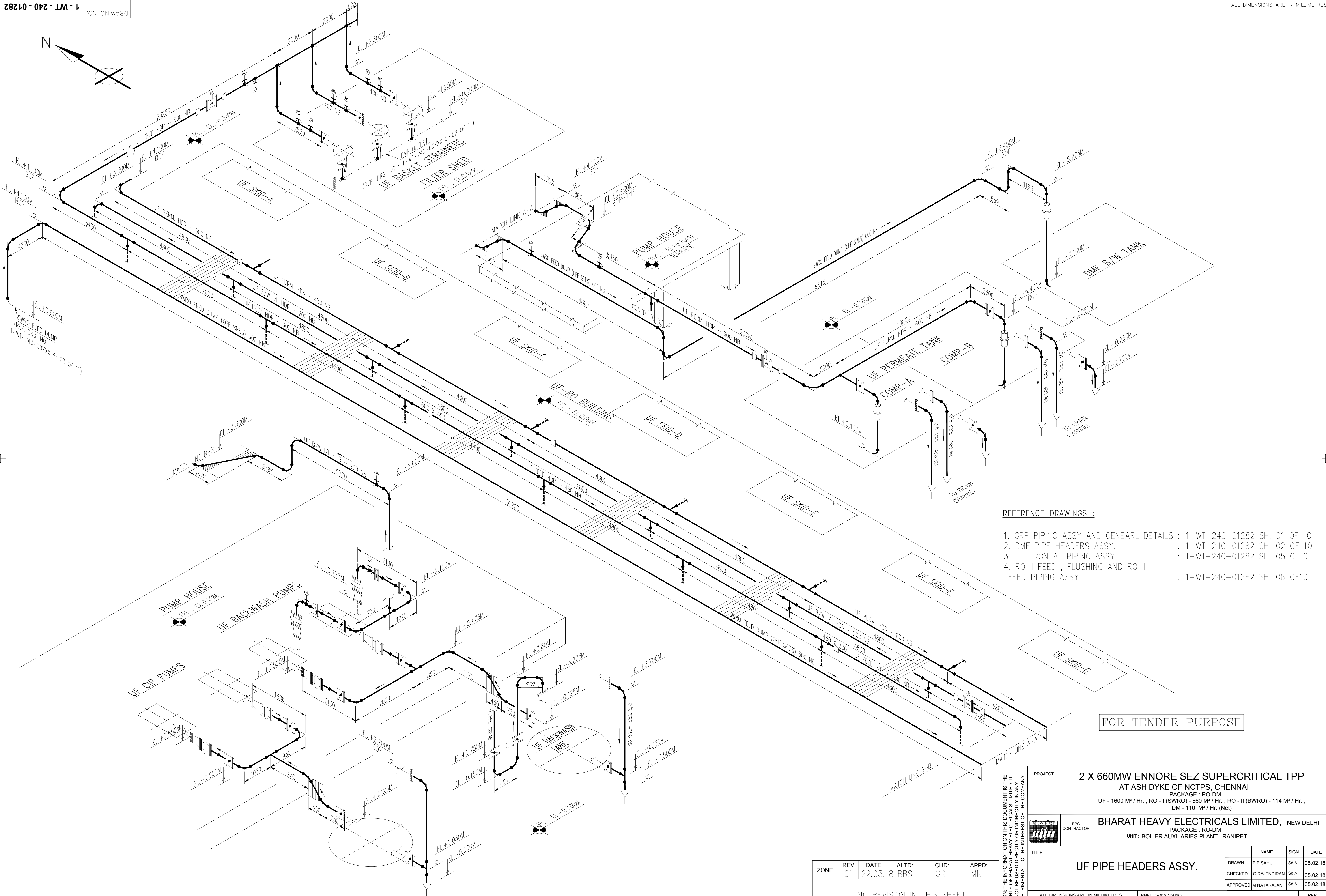
REFERENCE DRAWINGS :

- GRP PIPING ASSY AND GENERAL DETAILS : 1-WT-240-00XXX SH. 01 OF 10
- DMF SYSTEM PIPE HDRS. ASSY. : 1-WT-240-00XXX SH. 02 OF 10

FOR TENDER PURPOSE

CAUTION: THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHARAT HEAVY ELECTRICALS LIMITED. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY DETRIMENTAL TO THE INTEREST OF THE COMPANY.	PROJECT			
	2 X 660MW ENNORE SEZ SUPERCRITICAL TPP			
	AT ASH DYKE OF NCTPS, CHENNAI			
	PACKAGE : RO-DM			
	UF - 1600 M ³ / Hr. ; RO - I (SWRO) - 580 M ³ / Hr. ; RO - II (BWRO) - 114 M ³ / Hr. ; DM - 110 M ³ / Hr. (Net)			
EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED, NEW DELHI			
	PACKAGE : RO-DM			
	UNIT : BOILER AUXILIARIES PLANT ; RANIPET			
	TITLE			
	DMF PIPE HEADERS ASSY.			
PROJECTION	NAME		SIGN.	DATE
	DRAWN		Sd /	05.02.18
	CHECKED		Sd /	05.02.18
APPROVED		M NATARAJAN		Sd /
ALL DIMENSIONS ARE IN MILLIMETRES		BHHEL DRAWING NO.		REV
SCALE		1-WT-240-01282		01
N.T.S		SH. 03 OF 10		

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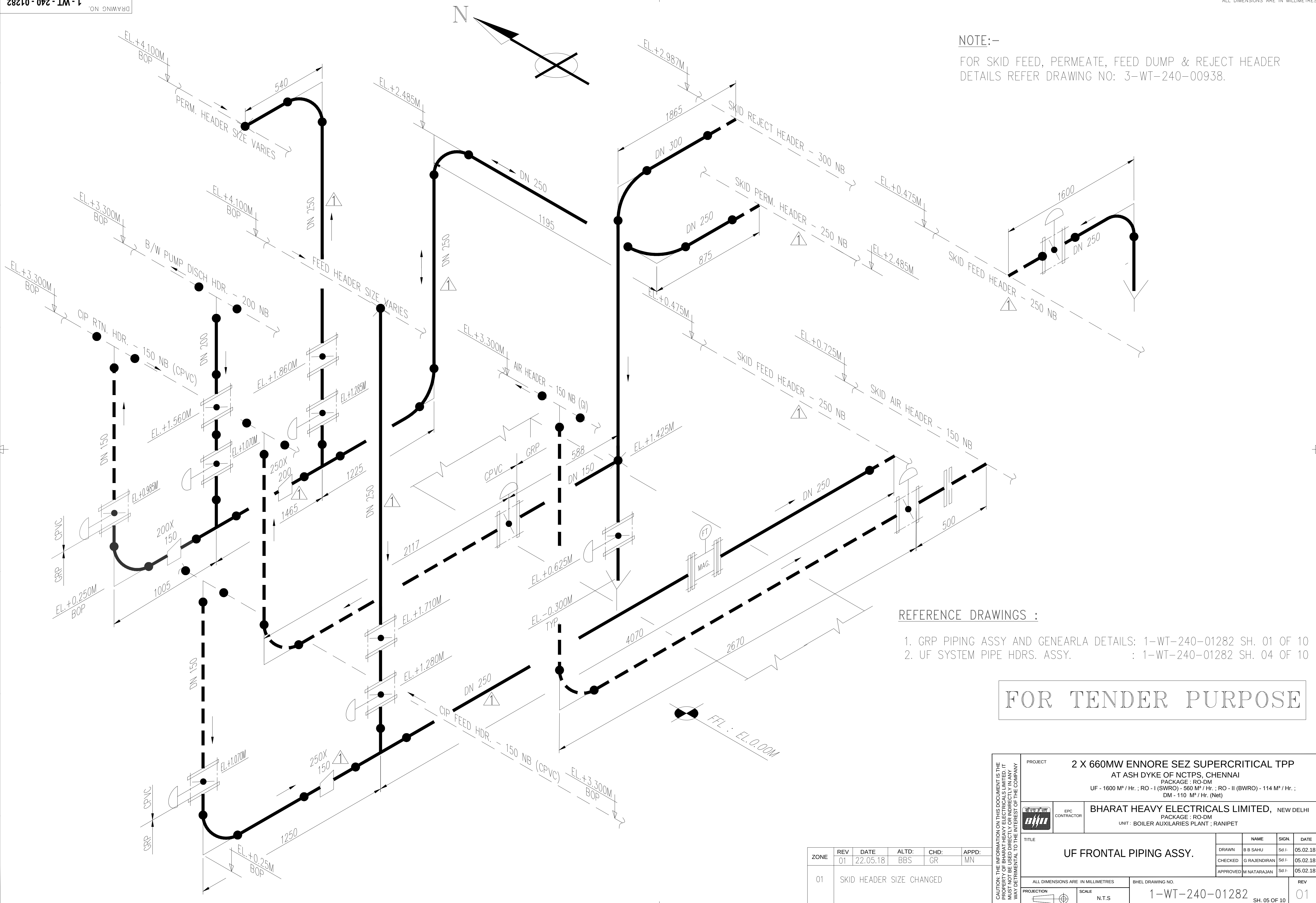


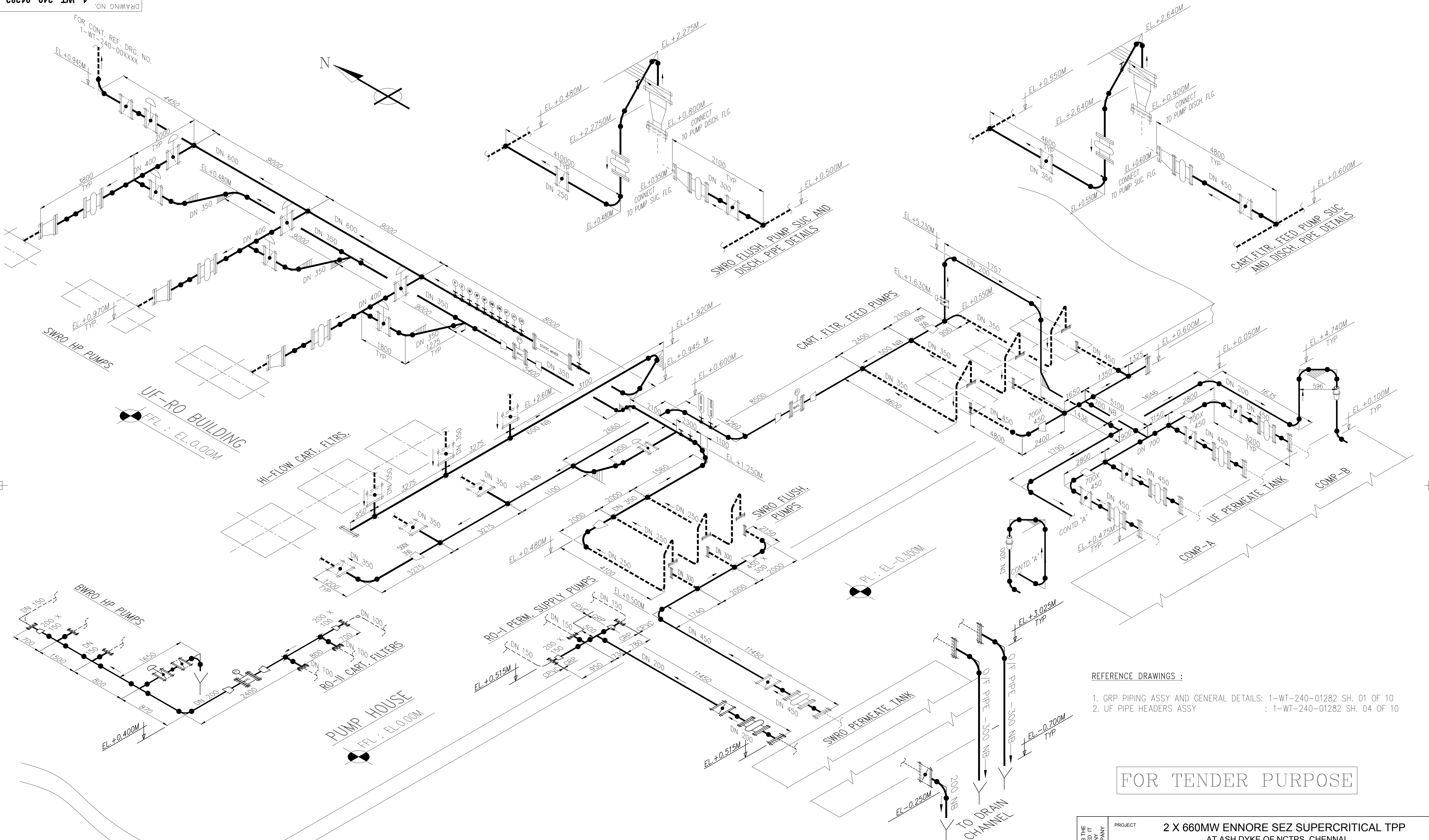
- REFERENCE DRAWINGS :
- 1. GRP PIPING ASSY AND GENEARL DETAILS : 1-WT-240-01282 SH. 01 OF 10
 - 2. DMF PIPE HEADERS ASSY. : 1-WT-240-01282 SH. 02 OF 10
 - 3. UF FRONTAL PIPING ASSY. : 1-WT-240-01282 SH. 05 OF 10
 - 4. RO-I FEED , FLUSHING AND RO-II FEED PIPING ASSY : 1-WT-240-01282 SH. 06 OF 10

FOR TENDER PURPOSE

ZONE	REV	DATE	ALTD:	CHD:	APPD:
	01	22.05.18	BBS	GR	MN
NO REVISION IN THIS SHEET					

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	2 X 660MW ENNORE SEZ SUPERCRITICAL TPP AT ASH DYKE OF NCTPS, CHENNAI PACKAGE : RO-DM UF - 1600 M ³ / Hr. ; RO - I (SWRO) - 580 M ³ / Hr. ; RO - II (BWRO) - 114 M ³ / Hr. ; DM - 110 M ³ / Hr. (Net)			
	BHARAT HEAVY ELECTRICALS LIMITED, NEW DELHI PACKAGE : RO-DM UNIT : BOILER AUXILIARIES PLANT ; RANIPET			
	TITLE			
	UF PIPE HEADERS ASSY.			
DRAWN		NAME	SIGN.	DATE
CHECKED		G. RAJENDIRAN	Sd/-	05.02.18
APPROVED		M. NATARAJAN	Sd/-	05.02.18
ALL DIMENSIONS ARE IN MILLIMETRES		BHHEL DRAWING NO.		REV
PROJECTION		SCALE		01
N.T.S		1-WT-240-01282		SH. 04 OF 10





REFERENCE DRAWINGS :

1. GRP PIPING ASSY AND GENERAL DETAILS: 1-WT-240-01282 SH. 01 OF 10
2. UF PIPE HEADERS ASSY : 1-WT-240-01282 SH. 04 OF 10

FOR TENDER PURPOSE

ZONE	REV	DATE	ALTD:	CHD:	APPD:
	01	22.05.18	BBS	GR	MN
	NO REVISION IN THIS SHEET				

CAUTION: THE INFORMATION ON THIS DOCUMENT IS THE PROPERTY OF BHEL. IT MUST NOT BE USED DIRECTLY OR INDIRECTLY IN ANY WAY THAT WOULD BE DETRIMENTAL TO THE INTEREST OF THE COMPANY.	PROJECT	2 X 660MW ENNORE SEZ SUPERCRITICAL TPP AT ASH DYKE OF NCTPS, CHENNAI PACKAGE : RO-DM UF - 1600 MP / Hr. ; RO - I (SWRO) - 560 MP / Hr. ; RO - II (BWRO) - 114 MP / Hr. ; DM - 110 MP / Hr. (Net)			
		EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED, NEW DELHI PACKAGE : RO-DM UNIT : BOILER AUXILIARIES PLANT ; RANIPET		
	TITLE				
	RO-I FEED , FLUSHING & RO-II FEED PIPING ASSY.				
ALL DIMENSIONS ARE IN MILLIMETRES		BHEL DRAWING NO.			REV
PROJECTION 	SCALE N.T.S	1-WT-240-01282			01
		SH. 06 OF 10			



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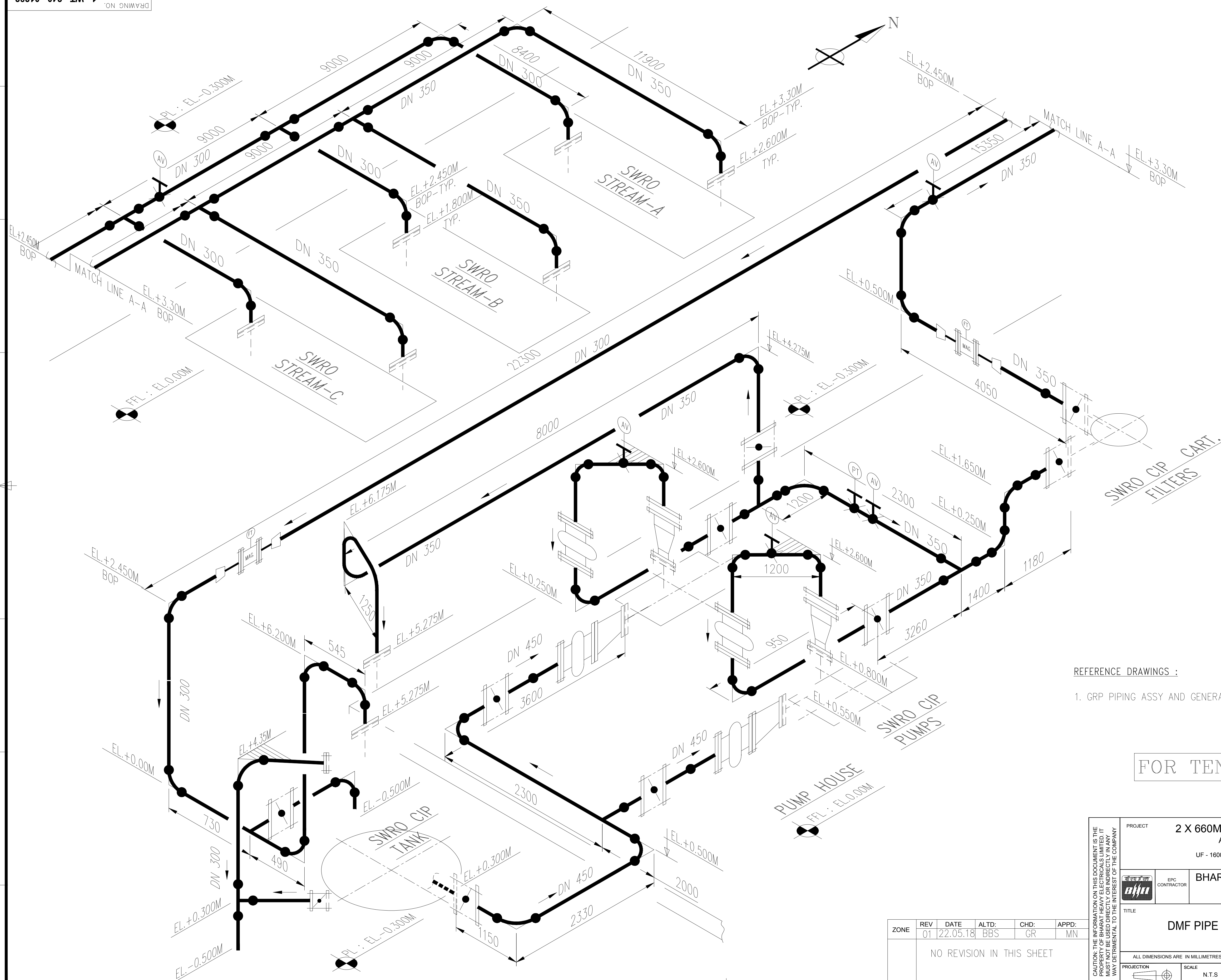
1. GRP PIPING ASSY AND GENERAL DETAILS : 1-WT-240-01282
SH. 01 OF 10

ZONE	REV	DATE	ALTD:	CHD:	APPD:
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	NO REVISION IN THIS SHEET				

PROJECT	2 X 660MW ENNORE SEZ SUPERCRITICAL TPP AT ASH DYKE OF NCTPS, CHENNAI PACKAGE : RO-DM UF - 1600 M ³ / Hr. ; RO - I (SWRO) - 560 M ³ / Hr. ; RO - II (BWRO) - 114 M ³ / Hr. ; DM - 110 M ³ / Hr. (Net)
 EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED, NEW DELHI PACKAGE : RO-DM UNIT : BOILER AUXILIARIES PLANT ; RANIPET

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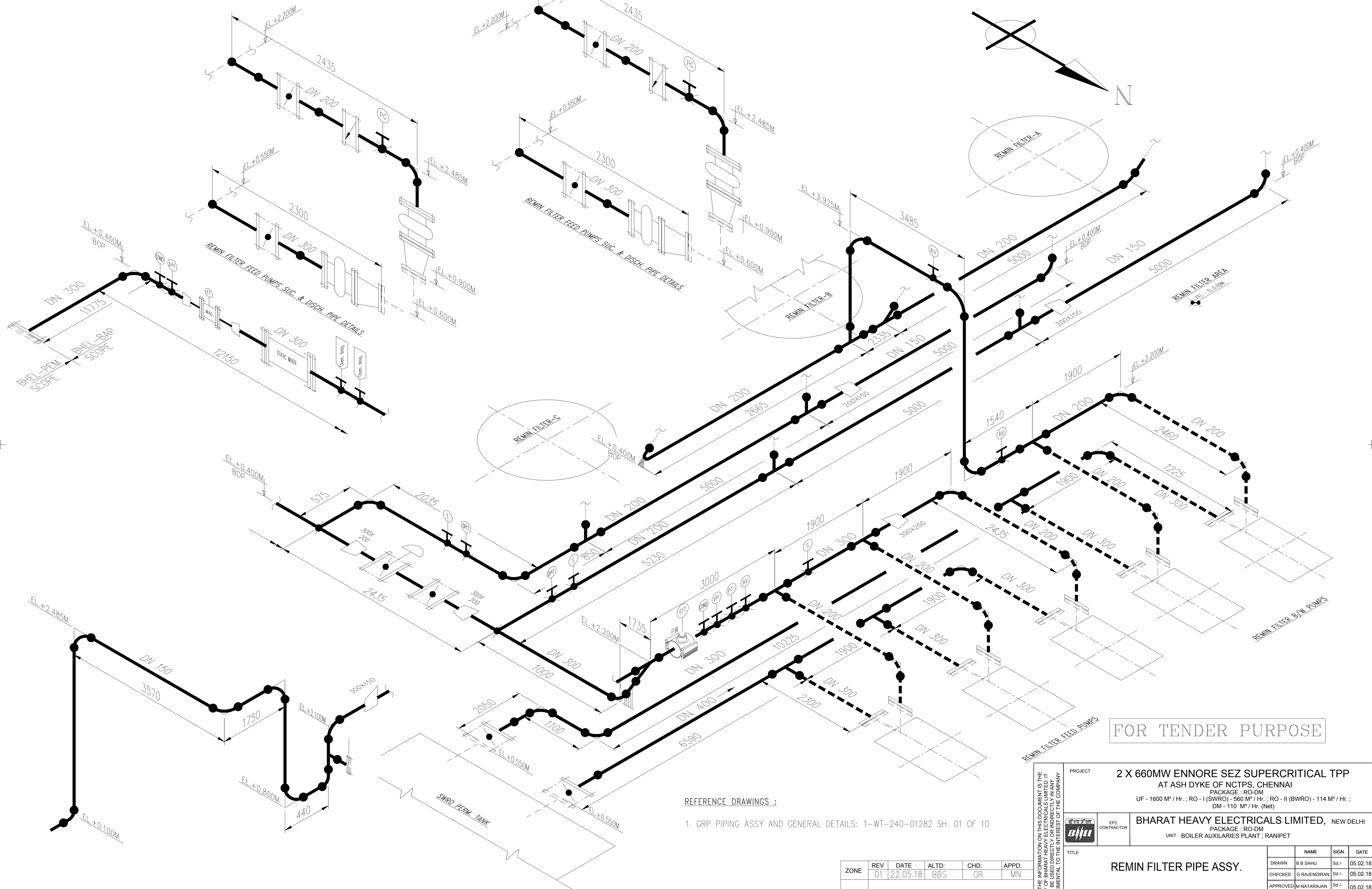
REFERENCE DRAWINGS :

1. GRP PIPING ASSY AND GENERAL DETAILS: 1-WT-240-01282 SH. 01 OF 10

FOR TENDER PURPOSE

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		EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED, NEW DELHI PACKAGE : RO-DM UNIT : BOILER AUXILIARIES PLANT ; RANIPET				
	TITLE		DMF PIPE HEADERS ASSY.				
			DRAWN		B B SAHU	Sd/-	05.02.18
			CHECKED		G RAJENDIRAN	Sd/-	05.02.18
		APPROVED		M NATARAJAN	Sd/-	05.02.18	
ALL DIMENSIONS ARE IN MILLIMETRES		BHEL DRAWING NO.				REV	
PROJECTION 	SCALE N.T.S	1-WT-240-01282				SH. 08 OF 10 01	

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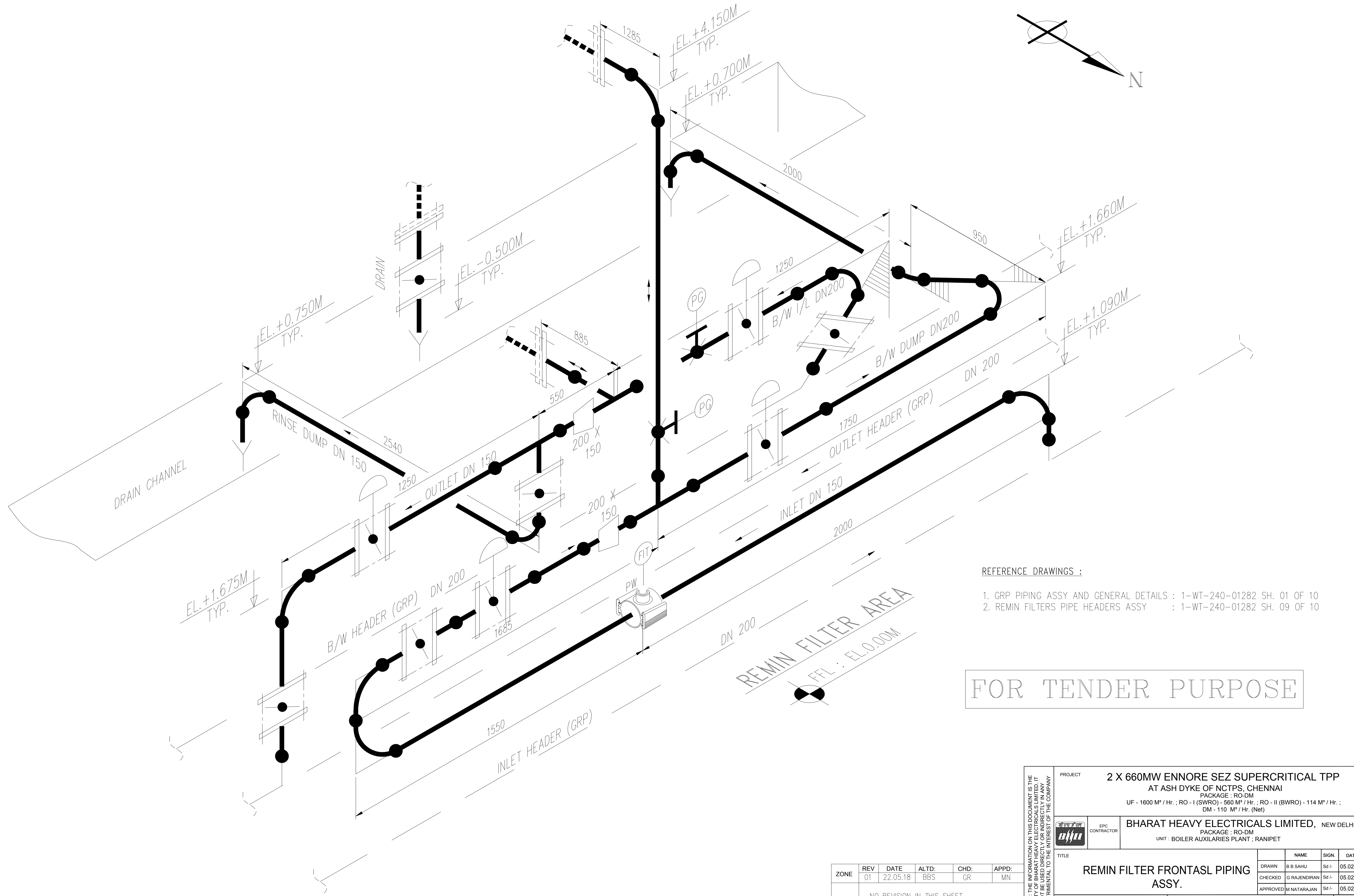


FOR TENDER PURPOSE

REFERENCE DRAWINGS :
1. GRP PIPING ASSY AND GENERAL DETAILS: 1-WT-240-01282 SH. 01 OF 10

ZONE	REV	DATE	ALTD:	CHD:	APPD:
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	EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED, NEW DELHI PACKAGE : RO-DM UNIT : BOILER AUXILIARIES PLANT ; RANIPET			
	TITLE	REMIN FILTER PIPE ASSY.			
	DRAWN	NAME	SIGN.	DATE	
	CHECKED	G. RAJENDIRAN	Sd/-	05.02.18	
ALL DIMENSIONS ARE IN MILLIMETRES		BHHEL DRAWING NO.		REV	
PROJECTION		SCALE		1-WT-240-00XXX SH. 09 OF 10	
N.T.S				01	



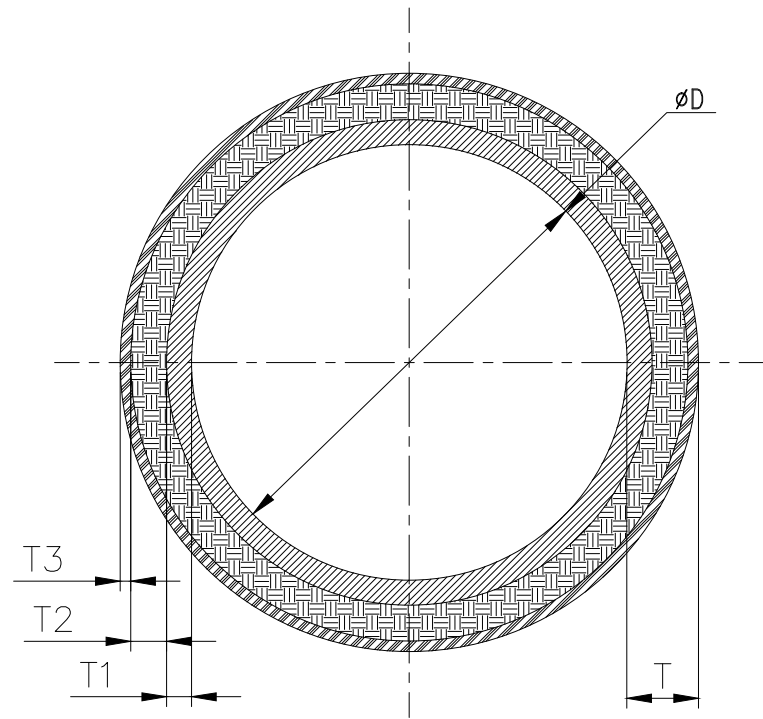
REFERENCE DRAWINGS :

- GRP PIPING ASSY AND GENERAL DETAILS : 1-WT-240-01282 SH. 01 OF 10
- REMIN FILTERS PIPE HEADERS ASSY : 1-WT-240-01282 SH. 09 OF 10

FOR TENDER PURPOSE

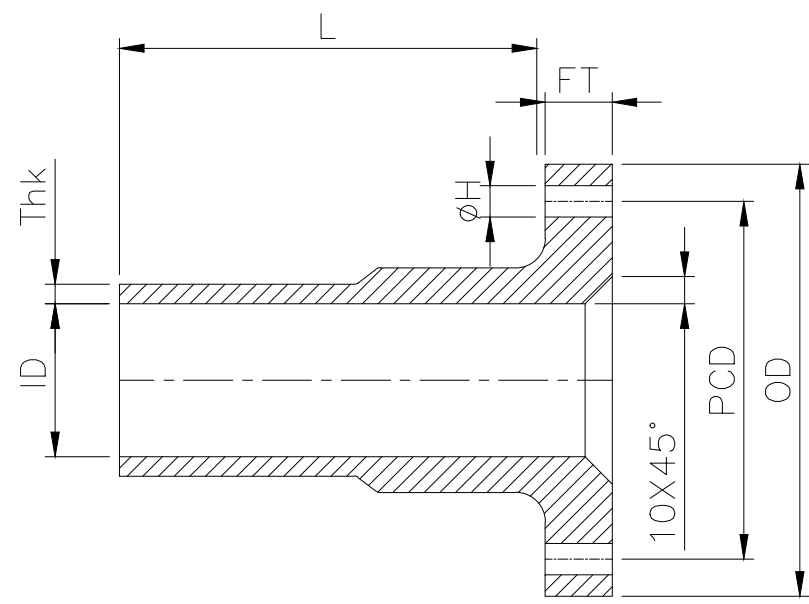
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	01	22.05.18	BBS	GR	MN
NO REVISION IN THIS SHEET					

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	 EPC CONTRACTOR	BHARAT HEAVY ELECTRICALS LIMITED, NEW DELHI PACKAGE : RO-DM UNIT : BOILER AUXILIARIES PLANT ; RANIPET		
	TITLE REMIN FILTER FRONTSAL PIPING ASSY.			
	ALL DIMENSIONS ARE IN MILLIMETRES		BHEL DRAWING NO.	
PROJECTION 	SCALE N.T.S.	1-WT-240-01282		REV
SH. 10 OF 10				01



PIPE

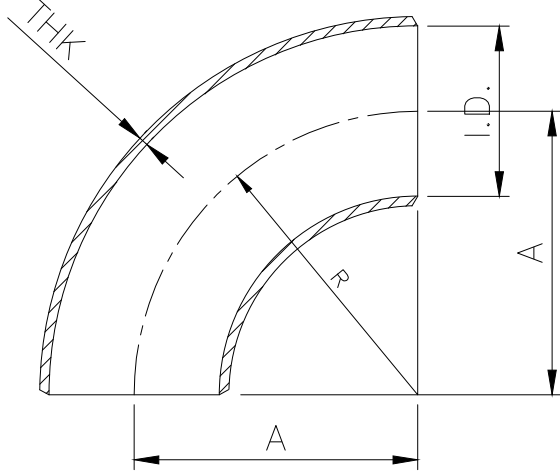
SL NO	DN SIZE	ØD	LENGTH	T1 INNER LAYER THICKNESS	T2 INNER LAYER THICKNESS	T3 OUTER LAYER THICKNESS	T WALL THICKNESS	Approx.UNIT WT IN Kg.
1	100	Ø100	6000					
2	150	Ø150	6000					
3	200	Ø200	6000					
4	250	Ø250	6000					
5	300	Ø300	6000					
6	350	Ø350	6000					
7	400	Ø400	6000					
8	450	Ø450	6000					
9	500	Ø500	6000					
10	600	Ø600	6000					
11	700	Ø700	6000					



FIXED FLANGE

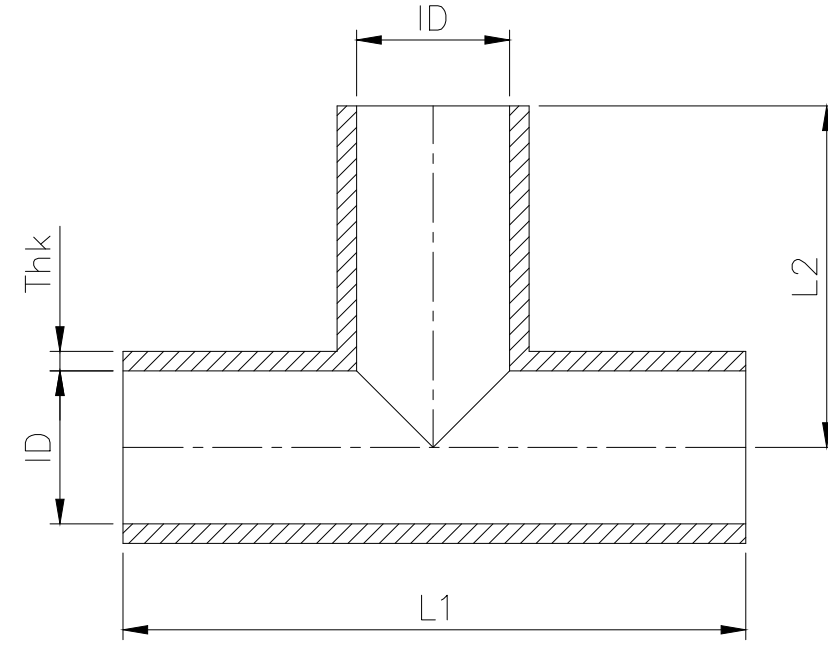
FLANGE DRILLING AS PER ANSI 16.5 B # CL 150 ONLY UPTO DN600
AND AS PER AWWA C207 ABOVE DN600

SL NO	DN SIZE	ID	OD	P.C.D	ØH	HOLE NOS.	FT	L	Thk	Approx.UNIT WT IN Kg.
1	15	15		60	16	4				
2	25	25		79	16	4				
3	50	50		120	19	4				
4	100	100		190	19	8				
5	150	150		241	22	8				
6	200	200		298	22	8				
7	250	250		362	25	12				
8	300	300		432	25	12				
9	350	350		476	28.5	12				
10	400	400		540	28.5	16				
11	450	450		578	32	16				
12	500	500		635	32	20				
13	600	600		749	35	20				
14	700	700		864	35	28				



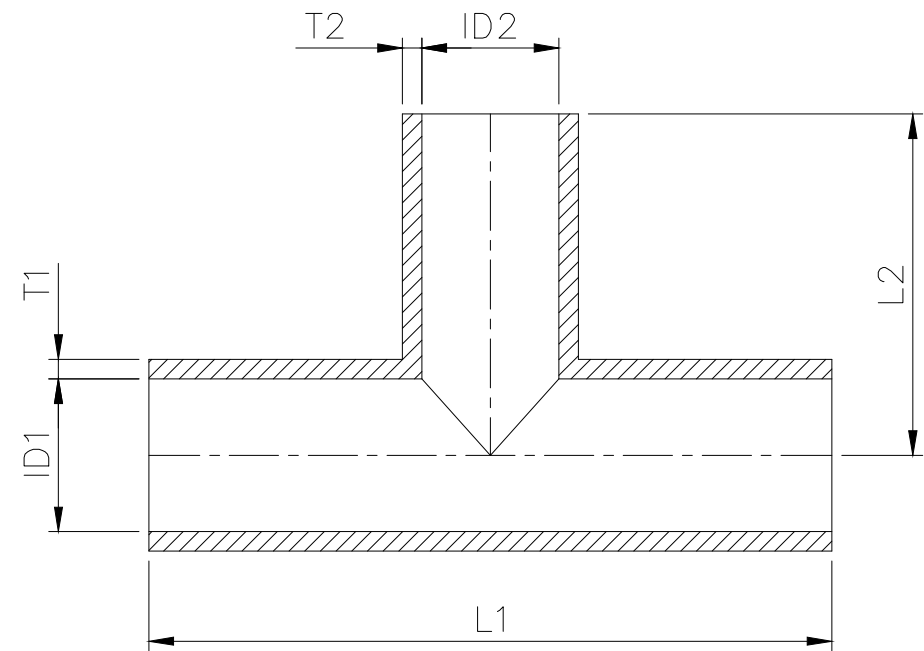
90° ELBOW

SL NO	DN SIZE	ID	Thk	A	Approx.UNIT WT IN Kg.
1	100	100			
2	150	150			
3	200	200			
4	250	250			
5	300	300			
6	350	350			
7	350	350			
8	400	400			
9	450	450			
10	600	600			
11	700	700			



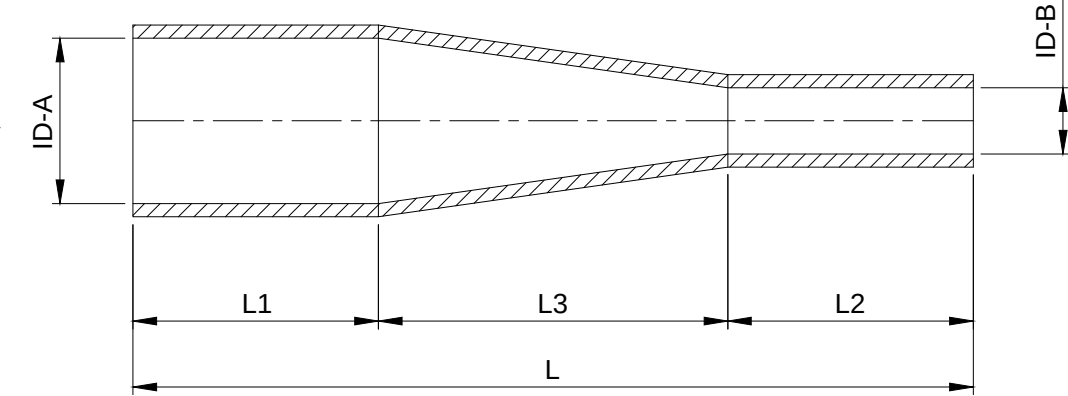
EQUAL TEE

SL NO	DN SIZE	ID	L1	L2	Thk	Approx.UNIT WT IN Kg.
1	100	100				
2	150	150				
3	200	200				
4	250	250				
5	300	300				
6	350	350				
7	400	400				
8	450	450				
9	600	600				
10	700	700				



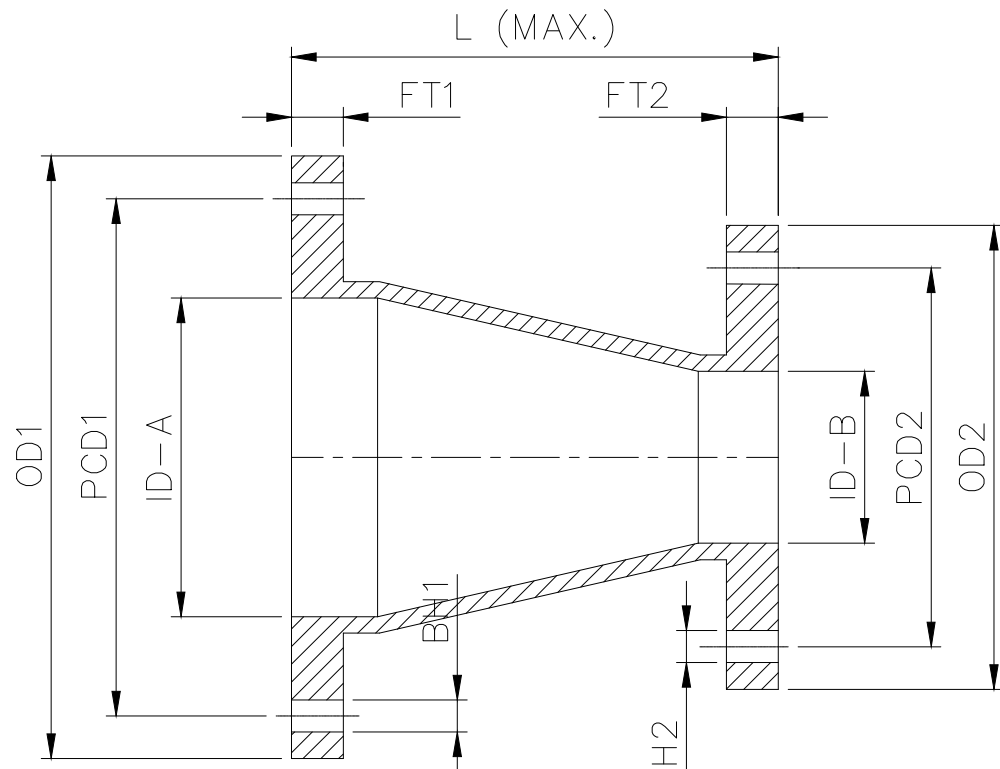
UNEQUAL TEE

SL NO	SIZE (ID1xID2) IN DN	L1	L2	T1	T2	Approx.UNIT WT IN Kg.
1	200 X 100					
2	200 X 150					
3	300 X 200					
4	400 X 350					
5	400 X 300					



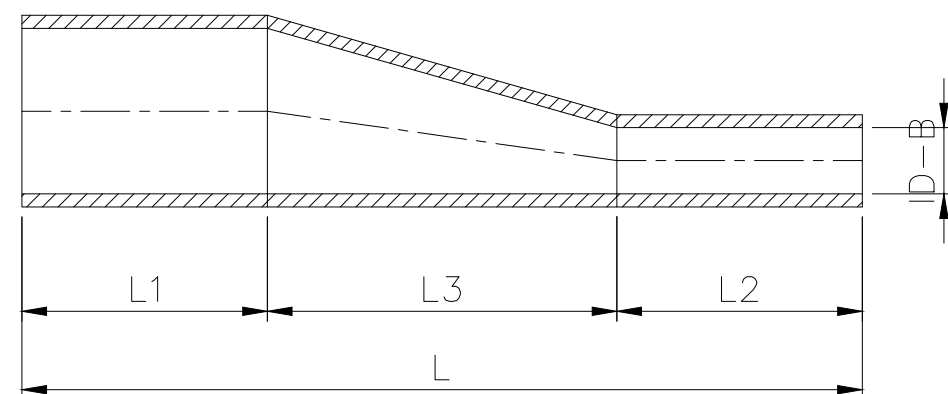
CONCENTRIC REDUCER

SL NO	ID-A (IN DN)	ID-B (IN DN)	L1	L2	L3	L	Approx.UNIT WT IN Kg.
1	200	150					
2	200	100					
3	300	250					
4	300	200					
5	350	250					
6	350	300					
7	400	300					
8	450	300					
9	500	400					
10	500	350					
11	600	500					
12	600	450					
13	700	600					



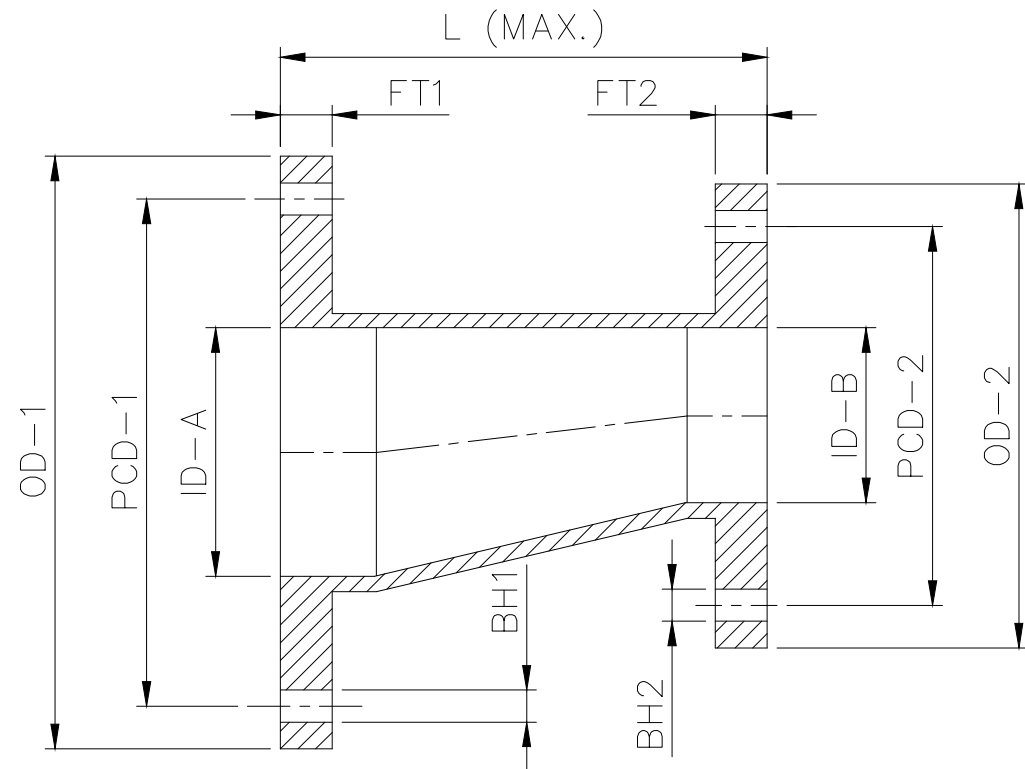
FLANGED CONC. REDUCER

SL NO	ID-A (IN DN)	OD-1	PCD-1	BH-1	NOS.	FT-1	ID-B (IN DN)	OD-2	PCD-2	BH-2	NOS.	FT-2	L (MAX.)	Approx.UNIT WT IN Kg.
1	100		190	19	8		65		140	22	4		300	
2	150		241	22	8		80		152	19	4		350	
3	150		241	22	8		50		120	19	4		350	
4	200		298	22	8		150		241	22	8		400	
5	200		298	22	8		125		216	22	8		400	
6	200		298	22	8		80		152	19	4		400	
7	250		362	25	12		150		241	22	8		450	
8	350		476	28.4	12		250		362	25	12		550	
9	350		476	28.4	12		150		241	22	8		550	



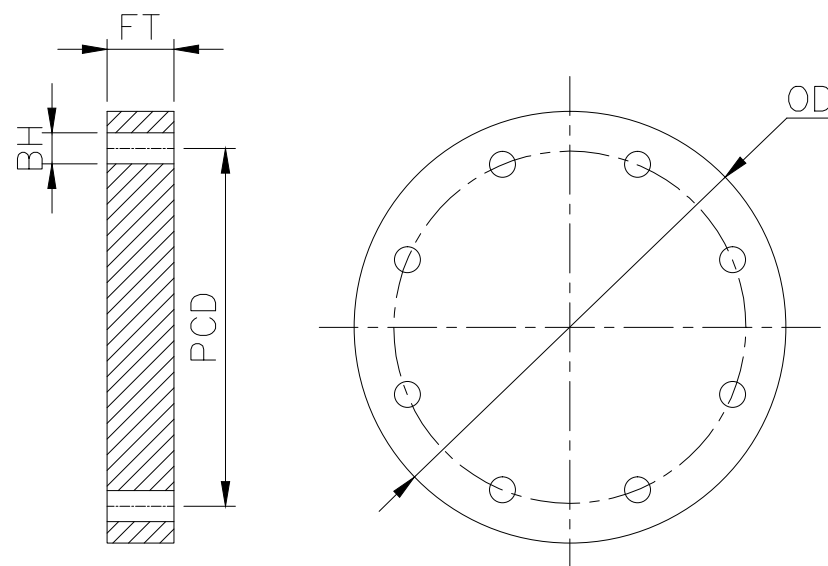
ECCENTRIC REDUCER

SL NO	ID-A (IN DN)	ID-B (IN DN)	L1	L2	L3	L	Approx.UNIT WT IN Kg.
1	200	150					
2	300	200					
3	300	150					
4	400	350					
5	450	300					
6	600	450					
7	700	600					



FLANGED ECC. REDUCER

SL NO	ID-A (IN DN)	OD-1	PCD-1	BH-1	NOS.	FT-1	ID-B (IN DN)	OD-2	PCD-2	BH-2	NOS.	FT-2	L (MAX.)	Approx.UNIT WT IN Kg.
1	150		241	22	8		80		152	19	4		350	
2	200		298	22	8		125		216	22	8		400	
3	250		362	25	12		125		216	22	8		450	
4	300		432	25	12		200		298	22	8		500	
5	300		432	25	12		125		216	22	8		500	
6	400		540	28.5	16		300		432	25	12		600	



BLIND FLANGE

FLANGE DRILLING AS PER ANSI 16.5 B # CL 150 ONLY UPTO DN600
AND AS PER AWWA C207 ABOVE DN600

SL NO	SIZE	OD	P.C.D	ØH	HOLE NOS.	FT	Approx.UNIT WT IN Kg.
1	50		120	19	4		
2	100		190	19	8		
3	200		298	22	8		
4	300		432	25	12		
5	400		540	28.5	16		
6	600		749	35	20		
7	700		864	35	28		

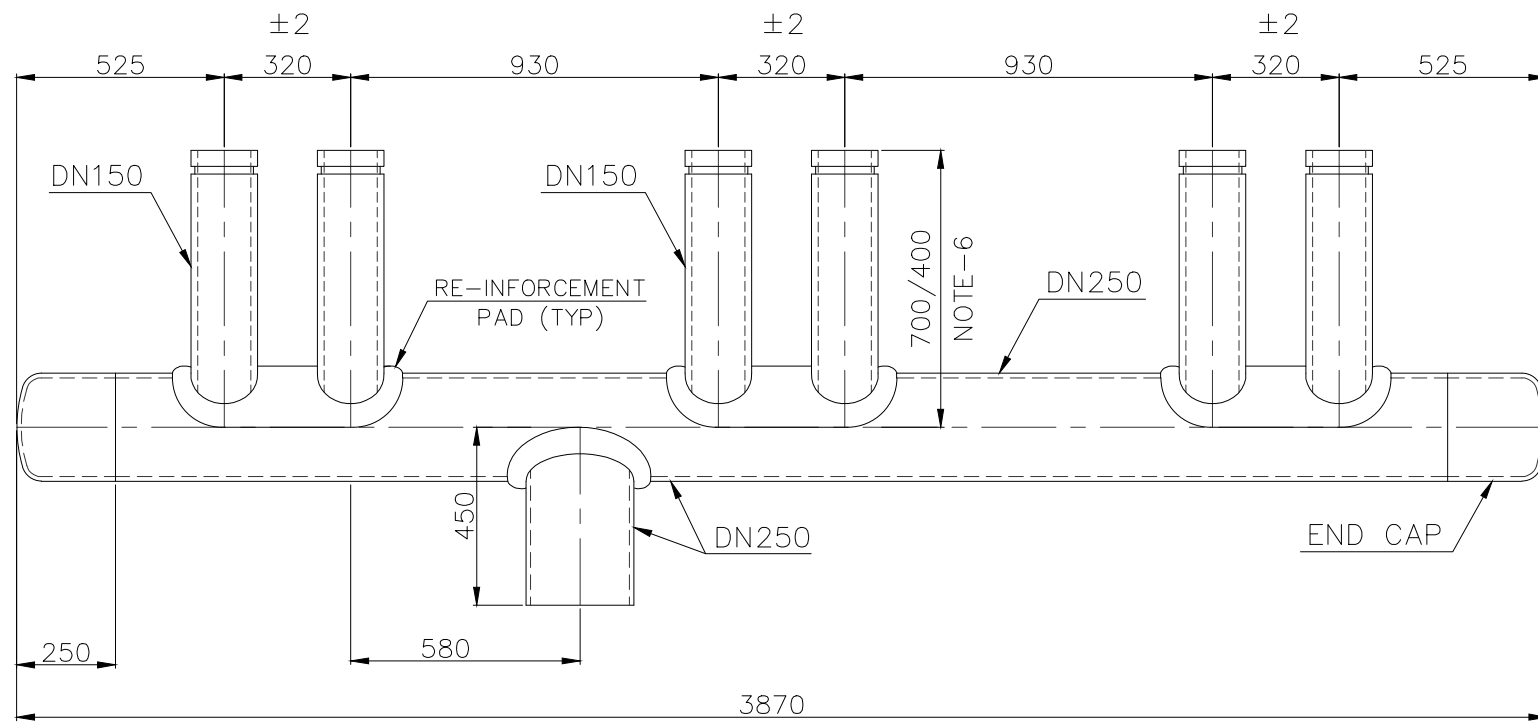
NOTES :

- THIS DRAWING IS FOR REFERENCE ONLY.
- BIDDER HAS TO SUPPLY GRP PIPES AND PIPE FITTINGS AS PER SPECIFICATION SOUGHT IN THE SPEC. NO. ROS.XXX
- BIDDER HAS TO FILL & SUBMIT THE DETAILS LEFT BLANK IN THIS DRAWING AS PART OF TECHNICAL OFFER.

REV	DATE	ALTD	CHD
REV	DATE	ALTD	CHD

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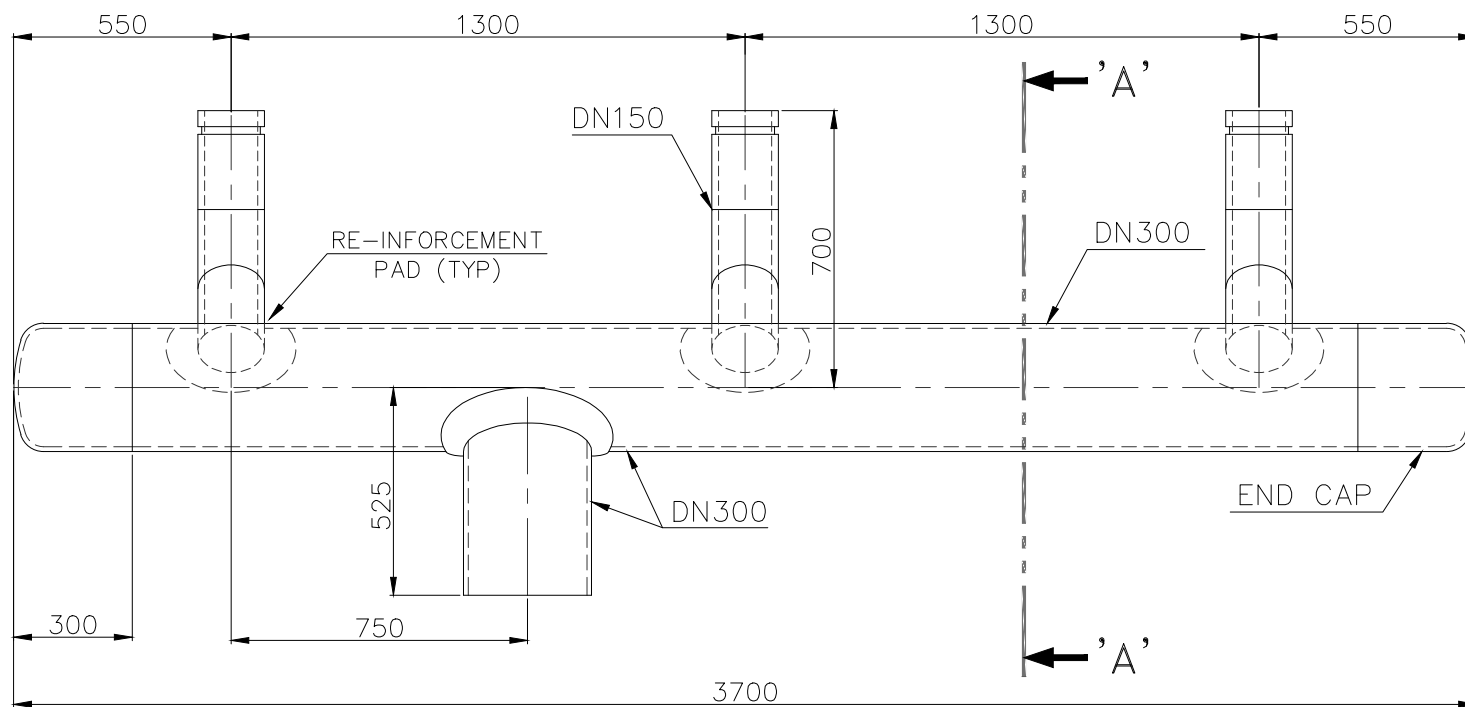
TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT				UF-RO-DM PLANT (110 M³/ Hr. Net DM OUTPUT)					
EPC CONTRACTOR				NAME		SIGN	DATE	NO.OF VAR.	
				DRN		B B SAHU	13.04.18		
				CHD		G RAJENDIRAN	13.04.18		
UNIT: BOILER AUXILIARIES PLANT, RANIPET - 632 406.				APPD		M NATRAJAN	13.04.18		
DEPT	GRADE OF	SCALE	WEIGHT (KG).	REF. TO ASSY/OLD DRG.				ITEM NO.	NO. OF ITEMS
NP/DES	UNTOL.DIM								
CODE	PR: QA: 500								
TITLE				CARD CODE		DRAWING NO.			REV
GRP PIPE AND FITTINGS DETAILS				U 01		2-WT-240-00277			00



PLAN

① PERMEATE & FEED HEADER

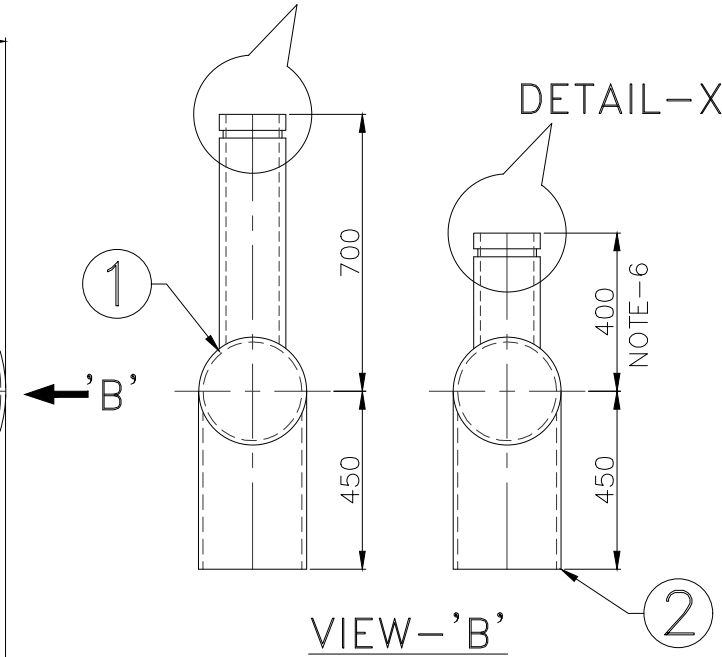
② FEED DUMP HEADER



PLAN

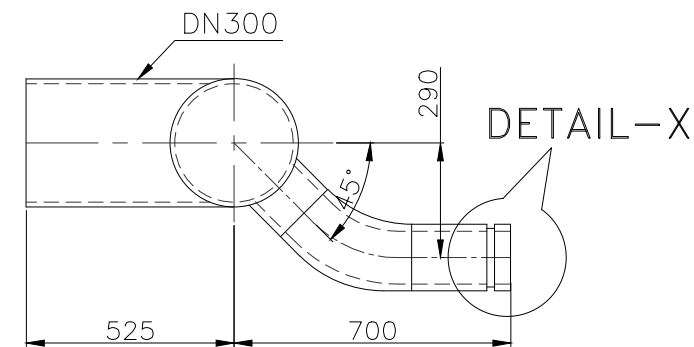
③ REJECT HEADER

DETAIL-X



NOTE:

1. THIS DRAWING IS FOR REFERENCE ONLY.
2. BIDDER HAS TO SUPPLY GRP PIPE HEADER AS PER SPECIFICATION NO ROS.6204
3. SUITABLE RE-INFORCEMENT PAD SHALL BE PROVIDED WHEREVER NECESSARY.
4. FINAL DIMENSION VARIATION SHALL BE AROUND $\pm 2\%$ WITH THE DRAWING DIMENSION.
5. ACTUAL DIMENSION WILL BE PROVIDED DURING MANUFACTURING DRAWING APPROVAL STAGE.
6. FOR FEED DUMP HEADER (ITEM NO. 02) DN 150 BRANCH PIPE LENGTH SHALL BE 400mm.



SECTION-AA

ITEM NO	DESCRIPTION	MOC	QTY (NOS)
1	FEED & PERMEATE HEADER	GRP	14
2	FEED DUMP HEADER	GRP	07
3	REJECT HEADER	GRP	07

FOR TENDER PURPOSE ONLY

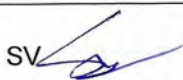
CAUTION: The information on this document is the property of BHARAT HEAVY ELECTRICALS LTD. It must not be used directly or indirectly in any way detrimental to the interest of the company

TYPE OF PRODUCT OR NAME OF CUSTOMER/PROJECT		UF-RO-DM PLANT (110 M ³ / Hr. Net DM OUTPUT)				
EPC CONTRACTOR		NAME		SIGN	DATE	NO.OF VAR.
 BHARAT HEAVY ELECTRICALS LTD.		DRN	BBS		22.05.18	
UNIT: BOILER AUXILIARIES PLANT, RANIPET - 632 406.		DESN	BBS /IMRL RAO		22.05.18	
		CHD	G RAJENDIRAN		22.05.18	
		APPD	M NATRAJAN		22.05.18	
DEPT	GRADE OF	SCALE		WEIGHT (KG).		
NP/DES	UNTOL.DIM			REF. TO ASSY/OLD DRG.		ITEM NO.
CODE	PR: QA: 500			PE-DG-362-M002 REV.03		
TITLE				DRAWING NO.		REV
UF PERMEATE, FEED, DUMP & REJECT HEADER ASSY.				CARD CODE		
				U 01		
		3-WT-240-00938				00

	GENERAL SPECIFICATION FOR GRP PIPING SYSTEM	SPEC.NO.ROS:6204
		REV: 01

BHARAT HEAVY ELECTRICALS LIMITED,
RANIPET- 632 406.

GENERAL SPECIFICATION FOR GRP PIPING SYSTEM

01	23 .05.18	SS 	SV 	GR 	Drawing revised	
00	12.04.18	SS	SV	GR	Fresh copy	
Rev No.	Date	Prepared	Checked	Approved	Remarks	

	GENERAL SPECIFICATION FOR GRP PIPING SYSTEM	SPEC.NO.ROS:6204
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PART-1: SUPPLY OF GRP PIPES & FITTINGS

1.0 SCOPE of WORK

This specification is intended for supply of Glass Fibre Reinforced Plastic (GRP) pipes and fittings, Erection and Installation (E&C). The E&C includes collection of materials, Laying, Joining by own supplied joining materials, fitting of BHEL supplied Valves, Rubber Expansion Bellows, Static Mixer, Fasteners, Gaskets, etc., and hydro testing of complete GRP piping with complete system to ensure to meet performance guarantee of system.

1.1 GENERAL

- | | |
|------------------------|---|
| a. Item | : GRP piping system |
| b. Application | : Conveying of Sea water, corrosive fluid at low pressure in RO-DM plant. |
| c. Surroundings | : Hot, dusty & humid atmosphere |
| d. Installation | : Indoor/Outdoor |
| e. Ambient Temperature | : 45 °C Maximum & 15 °C Minimum |
| f. Operation | : Continuous/Intermittent |

1.2 PROJECT INFORMATION

1.	Owner	:	TNGENCO
2.	Project Title	:	Ennore SEZ 2x660 MW TPS
3.	Location	:	BHEL Site Office, Ennore SEZ 2x660MW
4.	Nearest Railway Station/Access by Road	:	Attipattu Puthunagar, North Chennai

1.3 SCOPE OF SUPPLY

GRP Pipes & Pipe Fittings as per annexure of **Indent RWT70617 Rev latest**

1.3.1 FLUID DETAILS

- | | | |
|----|-----------------------|------------------------------|
| a. | Medium Handled | : Sea water, corrosive fluid |
| b. | pH of Fluid | : 2 to 12. |
| c. | Operating Temperature | : 20 – 40 °C. |

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1.3.2 GRP PIPES & FITTINGS DETAILS

- | | |
|--------------------------------|--|
| a) Pipe Design Data | : Refer drawing No. 2-WT-240-00277 R00 and Annexure-A |
| b) Pipe Type | : ID series pipe |
| c) Pipe Fittings | : Elbows, Tees, Reducers, Fixed Flanges, flange stub and blind flanges |
| d) Pipe Thickness | : Vendor to provide detailed calculation for Verification. |
| e) Outer Surface Finish | : Smooth and glassy finish |
| f) Inner Surface Finish | : Hazen-William flow coefficient, C = 150 |
| g) Pressure Rating | : PN10 |
| h) Tolerance on pipe ID | : as per standard IS12709 |
| i) Tolerance on Pipe Thickness | : 0 to + 0.5 mm. |
| j) Pipe Length | : 6m (Minimum) |

1.3.3 MARKING:

Marking shall be done in all pipes and fittings. In pipes, marking shall be done at intervals not more than 3 meters. The marking shall show the following:

- a) Manufacturer's name
- b) Pipe size and pressure rating
- c) Batch number

1.4.0 GENERAL REQUIREMENTS FOR PIPE SPECIFICATION

1.4.1 APPLICABLE STANDARDS

- | | |
|---------------|--|
| • AWWA C950 | : Fibre glass pressure pipe |
| • AWWA M-45 | : Fibre glass pipe design manual |
| • ASTM D 2996 | : Pipe wall thickness standards |
| • ASTM D 3567 | : Dimensional control |
| • ASTM D 5421 | : GRP flange dimension standards |
| • BS 5480 | : Hydrostatic pressure test/ pipe stiffness test |
| • IS 12709 | : GRP pipes and fittings for potable water |

1.4.2 MANUFACTURE

GRP pipes shall be manufactured by filament winding of continuous fibreglass strand roving in a dual helical predetermined pattern under controlled tension. All fittings such as Bends, Tees, Elbows, Flanges, Blind Flanges etc are to be manufactured using the same materials as that of pipe by contact moulding process. Standard GRP bends can be supplied factory made. GRP pipes shall be supplied in a standard length of 6 metre (minimum).

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The internal and external surfaces shall be clean and free from defects such as protruding fibres, voids, bubbles, pin holes, cracks, blisters, tackiness and foreign objects. Cut laminate surfaces are coated with liner resin and have a smooth finish.

The design shall be performed to meet the required pressure class, PN 10. A minimum pipe stiffness of 2500 N/m² shall be selected.

1.4.3 RESIN

The resin used for the internal liner of the pipes and fittings is of an unsaturated resin that can provide the required corrosive resistance. The resin in the structural wall of the pipes and fittings is of the unsaturated Polyester type incorporating styrene as the polymer monomer, but other resins may be used depending on the application. The vendor shall use only approved polyester resin system for which they can provide documented performance in this particular application.

1.4.4 PIPE LINER / PIPE STRUCTURE

- a) The inner surface of GRP Pipe shall have a resin rich chemical resistant barrier with a thickness of minimum 2.0 mm vinylester resin of ratio 90 % suitably reinforced with "C" glass fibre of 10%.
- b) Structural layer is made by filament winding of angle 54.7° consists of E- Glass Chopped roving strand Mat of 60% by weight.
- c) The outer surface of the GRP pipes shall be provided with UV stabilized barrier made of 70% of resin & outer surface of the GRP pipe shall be glassy finish.

1.4.5 JOINTS

GRP pipes for above ground applications shall be joined by butt & wrap or flanged joint. For connecting of equipment (pumps, tank etc.), valves & bellows flanges shall be used. For instrumentation, flanged stubs are to be used. Typical instrumentation branch details are indicated in the attached drawing.

1.4.6 FITTINGS

Fittings shall be supplied as per approved drawing. Only swept design shall be used for bends.

GRP flanges shall be contact mould in accordance with ASTM D 5421. Flange shall be flat faced and drilled as per ANSI B 16.5 # 150.

ID chamfered flanges shall be used for wherever Wafer type Butterfly valve & Check valve assembly with matched GRP flanges to facilitate Valve Disc full opening . Please refer typical flange ID chamfered in Drg. No. : 2-WT-240-00277 R00 and Annexure –C (Tentative list of BHEL supplied valves).

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Any rework arising out of this due to the interference of butterfly valve disc shall be carried out by vendor only without any financial/commercial implications.

1.5 DOCUMENTATION REQUIREMENTS

The documentation during bid and post order stage shall meet the following requirements.

- a. All documents and drawings shall be submitted in English.
- b. Hard copies of all documents and drawings during bid stage to be submitted in duplicate.
- c. Hard copies of all documents for approval to be submitted in triplicate.
- d. Hard copies of all final documents, drawings, manual etc., shall be submitted in bound folder in duplicate.
- e. Soft copies of all final documents in MS office/PDF shall be submitted through email.
- f. Soft copies of all fitting drawings in AUTOCAD/PDF, latest version shall submitted through email.

1.5.1 DOCUMENTS / DETAILS TO BE SUBMITTED ALONG WITH BID

- a. Duly filled up data sheet **Annexure-A** in the enclosed format.
- b. List of applicable standards for shop test.
- c. Applicable Quality plan for supply of the above piping system.
- d. Pipes & fittings Catalogues.
- e. Confirmation on the dimensional details for the GRP pipe and fittings as given in the enclosed drawing.
- f. Hydraulic test procedure & details for testing the pipes, fittings, joints etc. at site after installation.
- g. Any deviation to this specification shall be specifically mentioned in the enclosed deviation format **Annexure-B**.
- h. In case of any deviation, to this specification the Bidder shall indicate the deviation, clause by clause in the deviation format attached in **Annexure-B**. If there is no deviation "**NIL**" statement shall be furnished. In the absence of **Annexure-B**, it will be construed that the bid confirms strictly to this specification. Acceptance or rejection of the offer with or without deviations (either fully or partially) is sole discretion of the purchaser without seeking further clarification from the bidder.

NOTE: Bidders to note that failing to submit the above documents in **class 1.4**, the bid shall

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be considered as incomplete and may be liable for rejection. If required, suppliers may visit BAP, Ranipet before the submission of their techno commercial bid for a technical discussion.

1.5.2 DOCUMENTS / SERVICE AFTER ORDER

- i) The following documents is to be submitted for BHEL's approval.
 - Duly filled up data sheet in the enclosed format.
 - Dimensional drawing for pipes and fittings.
 - Cross-sectional drawing for pipe structure
 - GRP joining procedure
- ii) The following are to be submitted to BHEL's review and acceptance for the manufactured GRP items.
 - Material test certificate
 - Dimensional report for pipes and fittings
 - Hydraulic test certificates at shop.
 - Performance guarantee certificate.
 - GRP Pipe installation and supporting procedure.

1.6 INSPECTION & TESTING

All the stage checks shall be offered to BHEL for inspection. Each pipe shall be tested hydrostatically at 1.5 times the design pressure for the period of 30 minutes at Vendor's works. Necessary test certificates for all pipes to be presented to BHEL for review. BHEL will witness sample hydro testing. If the sample fails in the hydro test, the entire lot is liable for rejection.

No material shall be despatched without obtaining written clearance from BHEL. During inspection, the internal inspection reports shall be submitted to BHEL for information.

Product sample test for reputed laboratory shall be provided by bidder.

1.7 PACKING & DISPATCH

- a. All pipe and pipe fittings shall be suitably protected, coated, covered or boxed to prevent damage or deterioration during transit, handling and storage at site, till the time of erection. Each packing shall have necessary handling marks
- b. Each packing shall contain a packing slip indicating the details of item like item description, quantity, weight etc. Packing slip shall be submitted for BHEL approval for giving dispatch clearance by BHEL.

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- c. Details of handling & Storage instruction shall also be provided in each packing.
- d. All items shall be properly packed with adequate cushioning material to prevent rough handling and inland transport.
- e. Special care shall be given to prevent damage to the fragile components.

PART-2: INSTALLATION AND TESTING

2.0 SCOPE

Bidder shall carry out the installation and testing of GRP piping as per the BHEL erection drawings and manuals/documents.

2.1 SCOPE OF WORK

The vendor's scope of work in installation and testing comprises of the following:

- 1) The following materials are to be collected as per applicable procedure from BHEL stores:
 - i) Vendor supplied GRP pipes & pipe fittings.
 - ii) BHEL free supplied Piping components like Valves, Bellows, Static Mixers, pipe U-clamps, Fasteners, Rubber Gasket & other pipe line accessories etc.
- 2) Safe custody of above drawn materials
- 3) Laying, joining of GRP pipes and fittings with own joining material as per the enclosed tentative tender drawing no: 1-WT-240-01282 R01.
- 4) Erection of piping components along with Fasteners & Gaskets.
- 5) Hydro-testing & leakage rectification of piping system
- 6) Handing over of piping system after commissioning and trial operation
- 7) Reconciliation of drawn material from the store and material accounting for all the materials used.

GRP PIPING SYSTEM DETAILED WORK

- a. Erection of GRP pipes & fittings shall be carried out as per BHEL erection drawing which will be provided during post order. However preliminary isometric piping and support arrangement drawings (1-WT-240-01282 SH01 to 10 R01) and 3-WT-240-00938 are enclosed along with the specification for information. Suppliers are advised to go through the drawings to understand the scope of work. The drawing gives only tentative work content and any minor modification shall be carried out to meet the



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site requirement by the vendor without any additional commercial implication to BHEL.

- b. Temporary joints of pipes segments to be made as per erection drawings and shall be offered for stage inspection to BHEL. Final joining of piping shall be done after getting approval from BHEL.
- c. Assembly of valves, bellows, static mixers and other accessories along with gaskets are to be taken care during erection of pipe segment.
- d. All the fasteners and gaskets used for assembly of pipes, valves, bellows etc. will be issued by BHEL, but proper accounting and returning of surplus items after erection is bidder's responsibility.
- e. The piping system shall be installed at site as per the erection drawing provided by BHEL. After the completion of pipe installation at site, entire piping, including instrument tapings will be cleaned and flushed with water and tested for **hydrostatic testing at 1.5 times the working pressure (as per Drawing) for 30 minutes**. All pipe joints shall be watertight. Joints that are found to leak by observation or during testing shall be repaired and retested. Protocol for hydro-test shall be obtained from the customer by the contractor.

2.2 ERECTION, COMMISSIONING AND TESTING OF GRP PIPES AND FITTINGS

- a) Details furnished above cannot be considered as exhaustive. Contractor shall make all efforts to carry out piping works in total as per the specific requirements of the system and as per the good engineering practice to suit site conditions. All testing requirements as per the relevant and applicable standards are to be ensured by the Supplier.
- b) Vendors shall submit their price offer in two categories as under.
 - Part-1 Item wise price offer (unit rate) for the supply of the GRP pipes and pipe fittings shall be quoted. Any additional item required at site shall be supplied by the supplier at the same rate quoted.
 - Part-2 Price offer for the erection/installation of the GRP pipes and pipe fittings, pipeline accessories like valves, bellows, static mixer, etc. and pressure testing with the following split-up price :
 - 1). Pipe Laying, alignment, Joining & erection with under lay rubber sheet on the pipe support saddle, fixing of stubs for instruments, vents and drains.

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- 2). Assembly of BHEL supplied Valves, Bellows, Static Mixer, etc with fasteners and gaskets in the GRP piping system.
 - 3) Conducting Hydraulic Pressure testing of entire GRP piping as per the approved procedure.
- c) The Intent of this specification is to provide erection, commissioning services for execution of projects according to most modern and proven techniques and codes. It is not the intent to specify completely herein, all aspects of the entire system. Nevertheless, the entire system shall conform in all respects to high standards of engineering, design and workmanship and shall be capable of performing in continuous commercial operation. The contract services towards installation of the Plant shall not relieve the contractor of the responsibility of providing such services, facilities to complete the project of portion of project awarded to him. The quoted rate shall deem to be inclusive of all such contingencies.
- d) The Contractor shall carry out the work in accordance with instructions/ drawings/ specification/ standard practices supplied / approved by BHEL from time to time.
- e) Modification / Rectification / repair / replacement of defective components if any shall be under bidder's scope within specified time during execution.
- f) Bidder to submit the erection schedule along with stage checks list. For each and every stage, the bidder shall get clearance from the BHEL Engineer / Customer.
- g) All the supplied materials will be issued from BHEL stores and it shall be the responsibility of the contractor for identification of the consignment and to take delivery from BHEL stores, transport the same to site & kept in their safe custody for erection.
- h) Necessary site co-ordination and clearance for stage checks, hydraulic test, pre-commissioning tests, leak check etc., from the customer engineer shall be carried out by the bidder.
- i) All the piping systems, fittings and accessories supplied under this package shall be designed to operate without replacement and with normal maintenance for a plant service life of about 25 years and shall withstand the operating parameter fluctuations and cyclic fluctuation which can be normally expected during this period.
- j) All pipe system shall be properly designed to take care of hydraulic shocks and pressure surges which may arise in the system during operation.

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- k) Suitable slope shall be provided for all pipelines towards drain point. In addition to the system requirement, all low points in the pipe lines shall be provided with suitable draining arrangement and all high points shall be provided with air vent connections where air or gas pockets may occur. Vent for use during hydrostatic test shall be plugged after the completion of the test. Vent shall not be less than 15 mm size.
- l) Drain shall be provided at low points and at pockets in piping such that complete drainage of all system is possible. Drain shall not be less than 15 mm for line size up to 150 mm, not less than 20 mm up to 300 mm and not less than 25 mm for 350 mm to 600 mm pipes and not less than 50 mm for 600 mm and above pipes.
- m) All pipe work shall be designed to provide sufficient flexibility and to prevent development of undesirable forces or moment at points of connection to equipment.
- n) Extensive use of templates, gauges, plumb lines shall be made for laying, cutting fitting up of various piping components for fabrication.
- o) On completion of both shop and field fabrication, all subassemblies shall be cleaned for the inside and outside by suitable mechanical means ensuring that they are free from all loose foreign materials such as scales, sand, oil grease, cutting chips etc.
- p) Smooth glassy finish to be maintained for all field joints with the parent color of the pipes and fittings.
- q) All field joints shall be kept clean for detecting leaks during testing. Test pressure shall be maintained long enough to facilitate complete inspection of system. Minimum duration of test shall be 6 hrs unless otherwise specified. Pressurizing equipment shall be isolated immediately after the test pressure is attained.

2.3 EXCLUSIONS

The following are excluded from the scope of supplier and will be arranged by BHEL

- a. Storage of supplied items at BHEL store as of received condition
- b. All civil works pertaining to GRP piping system
- c. Service water at one point near RO-DM Plant
- d. Free Power supply at one point near RO-DM Plant for erection.
- e. Supply of service / instrument air at one point

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- f. Rubber bellows, valves, Instruments, Rubber sheet (Fasteners and Gaskets) etc. for the piping system
- g. Supply and Erection of pipe supports.

The requirement shall be specified by the bidder in their technical offer and the supply shall be limited to the specified quantities.

2.4 SPECIFICATION, STANDARDS & CODES

All pipe and pipe fittings shall be installed and tested as per the specification, relevant national / international standards & statutory codes.

2.5 TOOLS AND TACKLES

All the Tools & tackles required for the complete erection of components shall be arranged by the contractor at his cost. The bidder shall have & own a complete set of special tools and tackles required erection. The bidder shall also supply any special tools and tackles that may be required additionally during testing. All tools & tackles shall be reputed make acceptable to the Purchaser.

2.6 FLUSHING

- a. Completed piping systems shall be flushed by bidder with fresh water to clean the pipe of all dirt, debris, and foreign material. Bidder shall prepare a procedure for flushing of the system for approval of purchaser/consultant. Flushing shall not be commenced without approval of flushing procedure.
- b. Bidder shall perform all activities like dismantling and reinstalling of all strainers, in line instruments etc. before and after completion of flushing.
- c. Flushing shall be considered as complete only after inspection and approval by purchaser/consultant.
- d. Disposal of muck and flushing media shall be arranged by bidder as directed by purchaser/consultant, in such a manner that it does not spoil the adjacent installation. Bidder shall obtain purchaser consultant approval regarding the place and method to be adopted for disposal of debris.
- e. Record of flushing giving following details shall be submitted by bidder to purchaser/consultant for its approval and record:
 - a. Date of flushing
 - b. Identification of line : flushed line number

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2.7 DISPOSAL OF SCRAPS / UNUSED ITEMS

All the pipe scraps & materials are to be removed from the working area and transported to BHEL scrap area / as per the direction of customer. Un-used balance GRP pipes & materials are to be handed over at BHEL stores with acknowledgement.

2.8 INSPECTION

All the stage checks shall be offered to BHEL / Customer for inspection.

2.9 HYDROSTATIC TESTING

- a. Completed piping system as approved by purchaser/consultant shall be hydrostatically tested in the presence of purchaser/consultant. The general requirement for hydrostatic test shall be accordance with design requirement of this specification and standard codes specified here in.
- b. Bidder shall prepare hydrostatic test procedure based on specified codes. The hydrostatic test shall commence only after approval of procedure by purchaser/consultant.
- c. Site test pressure of GRP pipes and fittings for pressure application should be 1.5 times the working pressure as per drawing. For non-pressured line the site test pressure shall be 1.5 bar as per BS-8010-2.5-1989. Necessary test certificate for all pipes to be presented to BHEL for review BHEL will witness one of such tests. The duration of the holding time will be 10 minutes for all the cases.
- d. All equipment and instrument used for hydrostatic test shall be approved by purchaser/consultant before start of test.
- e. Pressure gauge shall be installed on line to measure test pressure. In case of longer lines two or more pressure gauge shall be installed as directed by purchaser/consultant. One gauge shall be installed at the discharge of the pressuring pump. Pressure gauge used for hydrostatic testing shall be calibrated with dead weight tester in the presence of engineer-in-charge. Range of pressure gauge shall generally be 1.5 times the test pressure.
- f. Orifice plates and restriction orifices shall not be installed until hydrostatic test is completed.

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- g. All equipment, lines instruments and relief valves shall be disconnected from piping system by means of blinds during testing. Control valves shall be replaced by spool pieces during testing, which is in the scope of vendor.
- h. High point vent and low point drain required for testing in addition to those marked in the drawings shall be provided by bidder at his own cost.
- i. Vendor shall arrange Gaskets & blind/dummy flanges required for Hydro testing of GRP Piping System.

2.10 TEST RECORDS

The records in duplicate shall be prepared and submitted by bidder as below:

- a. Date of test
- b. Identification of pipe tested – line number
- c. Test pressure and duration of holding the pressure.
- d. Initial test pressure and the final test pressure after the holding time.
- e. Test result
- f. Signature of bidder
- g. Approval signature by purchaser/consultant / customer.

2.11 ADDITIONAL REQUIREMENTS

During execution at site, pipe routing is susceptible to change. The bidder shall carryout these changes at site without any commercial implications to BHEL.

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2.12 GENERAL REQUIREMENTS TO THE BIDDER

- a. Vendor shall post experienced site engineers with skilled/adequate man power for execution of piping system. Vendor shall prepare a schedule for completion of the work before the commencement of work.
- b. Bidder shall quote for complete work specified in the document. Incomplete quotations for the part of the work will not be considered even if the quoted rates/price is lower.
- c. Bidder shall contact BHEL and obtain additional details/data if any required to submit proper quotation.
- d. The BHEL reserves the right to omit any one or more items of work at any time of the contract without assigning any reason what so ever.
- e. Adequate lighting facilities such as low volt hand lamps shall be arranged by the contractor at the site of construction etc. at his cost.
- f. All the lifting tackles including wire ropes, slings, shackles and electrically operated equipment shall be got approved by BHEL Engineer before they are actually put on use. Test certificates should be submitted before their usage. Test certificate obtained from the statutory authority should be submitted before their usage.
- g. All equipment so used by contractor shall be of proven quality and safe in operation as approved by BHEL site Engineers from time to time.
- h. At periodic / intervals of work, complete and detailed account of the equipment so erected shall be submitted to the BHEL Engineer.
- i. All equipment shall be handled very carefully to prevent any damage and loss. No bare wire ropes, slings etc., shall be used for unloading and / or handling for equipment without the specific written permission of the engineer. The equipment from the storage yard shall be moved to the actual site of erection / location at the appropriate time as per the direction of BHEL Engineer so as to avoid damage for such equipment at site.
- j. The work covered under this scope of work is of highly sophisticated nature requiring best quality / precision workmanship engineering and construction management. He should also ensure successful and timely commercial operation of

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equipment installed. The contractor must have adequate quantity of precision tools, construction aids in possession. Contractor must also have adequate trained qualified and experienced supervisory staff and skilled personnel.

- k. All the necessary certificates and licenses required to carry out his scope of work are to be arranged by the contractor then and there at no extra cost.
- l. When the work is temporarily suspended he shall protect all construction materials equipment and facilities from causing damage to existing property interfering with the operations of the station when it goes into services. The contractor shall comply with all applicable provisions of the safety regulations clean – up programme and other precautionary measures which the BHEL has in effect at the site .
- m. It will be the responsibility of the contractor to ensure the safe lifting of the piping system taking due precautions to avoid any accidents and damage to other piping system and personnel.
- n. All piping shall be adequately supported and protected to prevent damage during handling and erection.
- o. Sometimes it may become necessary for the contractor to handle certain un-required components in order to install the required materials. The contractor has to take this contingency also into account. No extra payment is payable for such contingencies.
- p. Due to atmospheric conditions erected support materials are likely to get rusted more frequently .It is the responsibility of the contractor to preserve the erection materials drawn from stores for erection till these are commissioned and handed over to customer. The required paint, thinner all other consumables like painting brush, emery paper, cotton waste, cloth etc., have to be arranged by the contractor at his cost. The contractor should ensure that the materials are not rusted on any account till they are handed over to customer. The decision of the BHEL Engineer is final with regard to frequency of application of paint.
- q. Final Material accounting shall be provided by vendor for final payment.

2.13 SITE CLEANLINESS AND SAFETY REQUIRMENTS

- a. Contractor shall strictly follow all safety regulations / conditions as per general conditions of contract booklet enclosed with this tender.

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- b. Non – conformity of safety rules and safety appliances will be viewed seriously.
- c. Contractors shall ensure that the quality is maintained in all the works connected with this contract at all stages of the requirement of BHEL.
- d. Contractor shall ensure that all Inspection, Measuring and Testing equipment that are used, whether owned by the contractor or used on loan, are calibrated by the authorized agencies and the valid calibration certificate will be available with them for verification by BHEL. A list of such instruments possessed by contractor at site with its calibration status is to be submitted to BHEL Engineer for control.
- e. Contractors shall arrange for the inspection of the works at various stages as required by BHEL. Immediate corrective action shall be taken by the contractor for the non-conformances if any, observed and pointed out by BHEL.

2.14 OTHER STATUTORY REQUIREMENTS

- a. The contractor shall submit a copy of labour license obtained from the licensing Officer (Form VI) u/r 25 read with u/s 12 of contract labour (R&A) Act 1970 & rules and valid WC Insurance copy or ESI Code (if applicable) and PF code no along with the first running bill.
- b. The contractor shall submit monthly running bills along with the copies of monthly wages (of the preceding month) u/r 78 (1) (a) (1) of contract labour rules, copies of monthly return of PF contribution with remittance challans under EPF Act 1952 and copy of renewed WC insurance policy or copies of monthly return of ESI contribution with challans under ESI Act 1948 (if applicable) in respect of the workmen engaged by them.
- c. The contractor should ensure compliance of Sec 21 of Contract Labour (R&A) act 1970 regarding responsibility of payment of wages. In case of “Non-compliance of sec 21 or non-payment of wages” to the workmen before the expiry of wage period by the contractor, BHEL will reserve its right to pay the workmen under the orders of appropriate authority at the risk and cost of the contractor.

2.15 TIME OF COMPLETION

- a. The time period for completion of GRP Piping System Installation & Testing shall be within 4 months from Purchase Order delivery date / site readiness date whichever is later. Site readiness will be informed by BHEL.

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- b. The entire work shall be completed by the contractor within the time schedule or within the such extended time as may be allowed under relevant clause.

2.16 ENGAGEMENT OF LABOUR

- a. The contractor will be directly responsible for provision of health and sanitary arrangements more particularly described in contract labour (regulations & Abolition) Act, safety precautions etc., as may be required for safe and satisfactory execution of the contract.
- b. The contractor shall be responsible for proper accommodation including adequate medical facilities & transportation to the work spot and back for the personnel employed by him.

2.17 COMPLIANCES WITH LABOUR LAWS & RULES

The contractor shall comply with all state and central Laws, statutory rules, regulation etc., relating to labour in respect of following acts and also as amended by the Government during the tenure of the contract and having in force or jurisdiction at site. Dimensions

- a. Payment of wages act, 1936
- b. Minimum wages act, 1948
- c. Workmen's Compensation act, 1923
- d. Industrial dispute act, 1947
- e. Employees Provident fund scheme, 1952
- f. Payment of Bonus act, 1965
- g. Payment of Gratuity act, 1972
- h. Contract Labour (Regulation & Abolition) Act, 1970

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Annexure-A

DATA SHEET FOR GRP PIPE AND FITTINGS				
S.NO		Description	BHEL's Requirement	Vendor to Specify
1	Design code		AWWA C950, AWWA M-45, ASTM D 2996, ASTM D 3567, BS 5480, IS12709	
2	Interior layer resin		Vinylester	
3	Interior layer glass		C-glass fibre	
4	Interior layer resin thickness	mm	2.0 (minimum)	
5	Interior layer surface ratio	(Mat: Resin)	10:90	
6	structural layer glass		E-glass fibre	
7	structural layer ratio	(Glass: Resin)	60:40	
8	Exterior layer resin		Isophthalic resin	
9	Exterior surface ratio	(Mat: Resin)	30:70	
10	Exterior surface		UV stabilized resin	
11	Winding method		Filament wound (Helical)	
12	Winding angle		54.7°	
13	Additives		Pigment, Dyes, Colouring Agent	
14	Stiffness	N/m ²	2500 (minimum)	
15	Pipe thickness		Vendor to provide calculation	
16	Design pressure	bar	10	
17	Hoop tensile modulus	Mpa	22000	
18	Axial tensile stress	Mpa	45	
19	Axial tensile modulus	Mpa	8000	
20	Hoop bending modulus	Mpa	22500	
21	Coefficient of linear expansion	m/m°C	18x10 ⁻⁶ mm/nm/°c	
22	Barcol hardness		Vendor to specify	
23	Hazen-William coefficient (C value)		150	
	FITTINGS			
24	Bend design		Swept	
25	Flange drilling standard		ANSI B16.5#150 ***	
26	Flange Thickness		ASTM D 5421	

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Annexure-B

TECHNICAL DEVIATIONS

SL.NO	SEC/CLAUSE NO	Specification	Statement of deviation/variations	Reason for deviation	Cost of withdrawal

Date:

Signature & Seal of the Bidder

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Annexure-C

List of BHEL supplied components to be assembled in the pipeline

Sl. No	Item Description	Size	Unit	Qty#	Approx. Unit Wt (kg)	Approx. Total Wt (kg)
Valves						
1.	Butterfly Valve (Pneumatic)	DN50	Set	1	2	2
2.	Butterfly Valve (Pneumatic)	DN65	Set	3	3	9
3.	Butterfly Valve (Manual)	DN80	Set	2	5	10
4.	Butterfly Valve (Manual)	DN100	Set	33	5	165
5.	Butterfly Valve (Pneumatic/Manual)	DN150	Set	49	8	392
6.	Butterfly Valve (Pneumatic/Manual)	DN200	Set	106	13	1368
7.	Butterfly Valve (Manual)	DN250	Set	6	25	150
8.	Butterfly Valve (Pneumatic/Manual)	DN 300	Set	35	50	1750
9.	Butterfly Valve (Pneumatic/Manual)	DN 350	Set	9	60	630
10.	Butterfly Valve (Manual)	DN400	Set	2	150	300
11.	Butterfly Valve (Manual)	DN450	Set	11	200	2200
12.	Butterfly Valve (Manual)	DN600	Set	3	600	1800
13.	Wafer Check Valve	AR*	Set	44	6	264
Approx. Sub-Total Weight (kg)						9040
Bellows						
1	Rubber expansion bellows	DN 450	No	12	6.5	78
2		DN 400	No	6	6	36
3		DN 350	No	6	5.5	33
4		DN 300	No	14	5	70
5		DN 250	No	6	4.5	27
6		DN 200	No	15	4	60
7		DN 150	No	14	3	42
8		DN 100	No	4	3	12
Approx. Sub-Total Weight (kg)						358
Other items						
1	Fasteners	-	Lot	1	-	2000
2	Gaskets & rubber sheets	-	Lot	1	-	150
Approx. Sub-Total Weight (kg)						2150

Note: -

* AR means As Required.

Qty variation shall be +/- 5% or minimum 1 No; whichever is large.

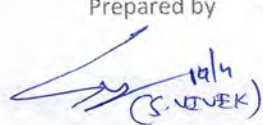
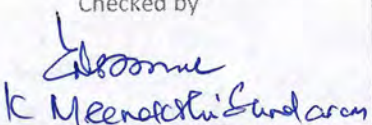
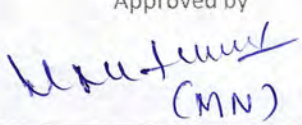
	BHEL: BAP: RANIPET Water Business Pre-Qualification requirement (PQR) for GRP Pipes & Fittings	Ref: RWT70617:GRPPQ
		Dt: 19.04.18
		Rev : 00

The Qualification requirements for GRP Pipes & Fittings are detailed below and Bidders should meet the same. Offers of bidders who do not meet qualification requirement will not be considered for evaluation.

1. Bidder should have designed, manufactured, supplied, erected & successfully hydro-tested the GRP Pipes & Fittings at site either directly or through authorized agency at least in two different water treatment plants for power plant / industrial / municipal application.
2. The reference piping systems shall be a combination of pipes, fittings (Flanges, Elbows, Equal Tee, Unequal Tee etc.) of size not less than DN100 of pressure rating not less than the PN 6. The referred piping system shall be for frontal piping in a process plant for filtration system (viz. Media filter system, Micro filtration system, Ultra Filtration System, Nano filtration system) / Demineralization system.
3. Bidder should submit the details of the reference plants. Laying of GRP Pipes in straight length (Running meters) will not be considered as a reference plant for meeting the PQR requirements.
4. The installed pipe & fittings should have been in successful operation for not less than one year as on date of techno commercial bid opening.
5. The bidder shall submit performance certificates obtained from two different end users. The performance certificate shall indicate scope of work, type of water treatment plant, pipe line size range, ratings, commissioning date as minimum.
6. Bidder shall furnish necessary documentary evidence in original / notarized (legible) copy as a proof of meeting the qualifying criteria for the review by BHEL. Acceptance of documentary evidence rests with BHEL

General Conditions:

1. Bidders who defaulted, in any of the previous tenders floated by BHEL are not permitted to respond. Such offers, if found later, will not be considered for evaluation.
2. After receipt of offers, during scrutiny, if any vendor found to have been banned by BHEL, then their offer will be summarily rejected at any stage.
3. Bidder to make provision in case BHEL decides to visit the reference plant furnished by the bidder for meeting the PQR requirements.

Prepared by  (S. VIVEK)	Checked by  K. Meenakshi Sundaram	Approved by  (MN)
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OK 1/3



BHEL: BAP: RANIPET
Water Business

Pre-Qualification requirement (PQR) for GRP Pipes & Fittings

Ref: RWT70617:GRPPQ

Dt: 19.04.18

Rev : 00

Reference plant-1

Reference plant-2

A. Customer details: -

- a. Name :
b. Designation :
c. Mobile :
d. Land line :
e. Fax :
f. Email id :
g. Address :

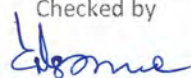
B. Reference Plant Details:-

Sl. No.	Parameters	Reference Plant #1	Reference Plant #2
01	Certificate Reference & Date		
02	MOC of Pipes & Fittings		
a)	- Pipe (Minimum & Maximum Size)		
b)	- Elbow (Minimum & Maximum Size)		
c)	- TEE (Minimum & Maximum Size)		
d)	- Flange (Minimum & Maximum Size)		
e)	- Any other Fittings		
03	Applicable Design Standards		
04	Design Pressure Rating (min.)		
05	Resin Utilized		
a)	Vinyl Ester		
b)	Isophthalic		
c)	Combination of Vinyl Ester + Isophthalic		
d)	Inner Protection Layer		

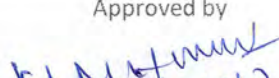
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(S. J. J. J.)

Checked by

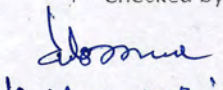
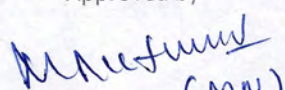

K. Meenakshi Sundaram

Approved by


(M. V.)

	BHEL: BAP: RANIPET Water Business Pre-Qualification requirement (PQR) for GRP Pipes & Fittings	Ref: RWT70617:GRPPQ
		Dt: 19.04.18
		Rev : 00

Sl. No.	Parameters	Reference Plant #1	Reference Plant #2
e)	Outer UV Protection Layer		
06	Layer content:		
a)	Interior layer surface ratio (Glass: Resin)		
b)	Structural layer ratio (Mat: Resin)		
c)	Exterior surface ratio (Mat: Resin)		
07	Testing Pressure		
08	Testing Standard		
09	End use		
10	Reference System P&ID , Drawings		
11	Applicable site photographs		
12	Date of supply		
13	Date of commissioning		

Prepared by  (S. VIVEK)	Checked by  K. Meenatchisundaram	Approved by  (M. N.)
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Slk 3/3