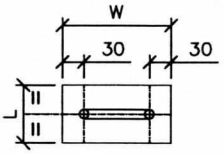
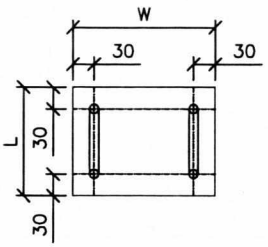
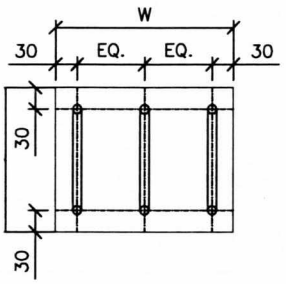
T DESIGNATES



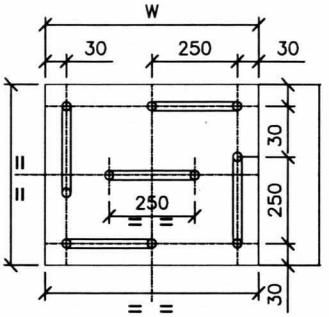
TYPE T1



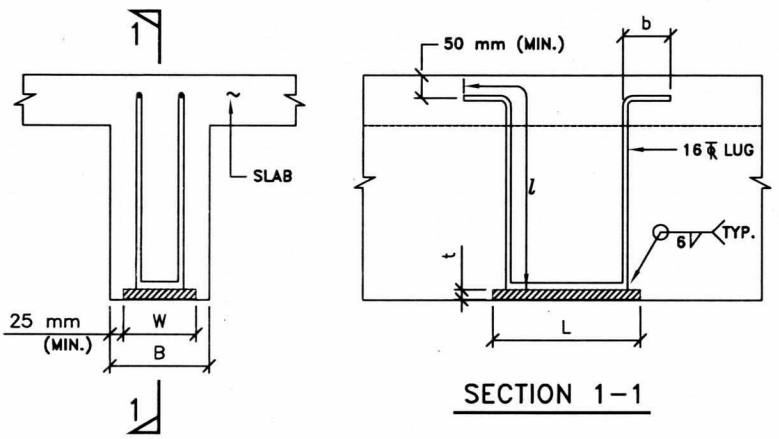
TYPE T2, T3 & T4



TYPE T5 & T6



TYPE T7



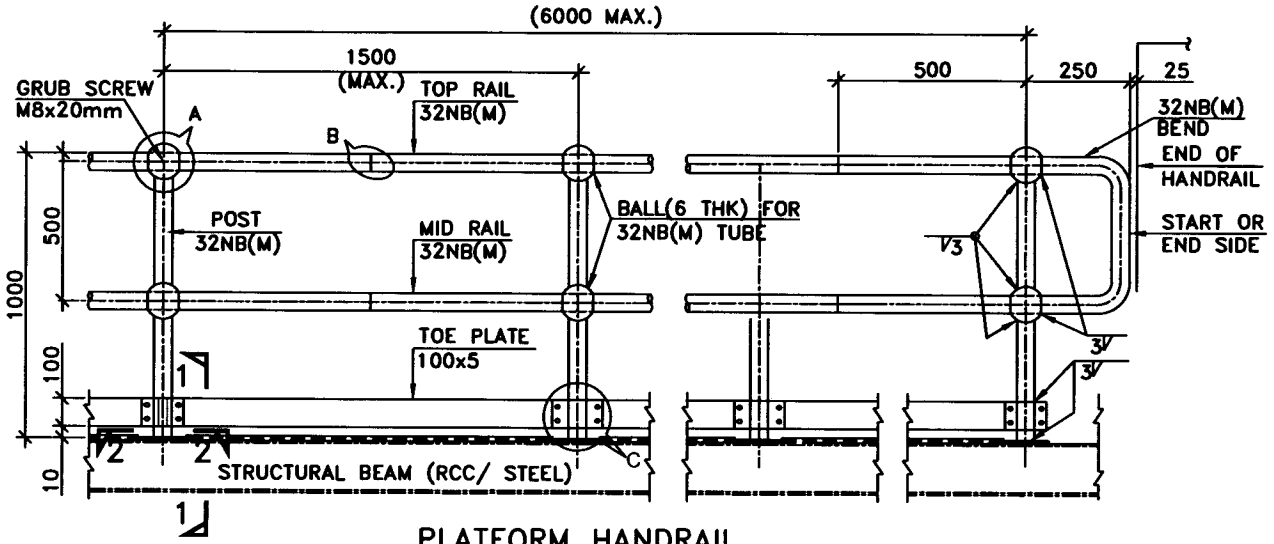
SECTION 1–1

TYPICAL FIXING DETAIL

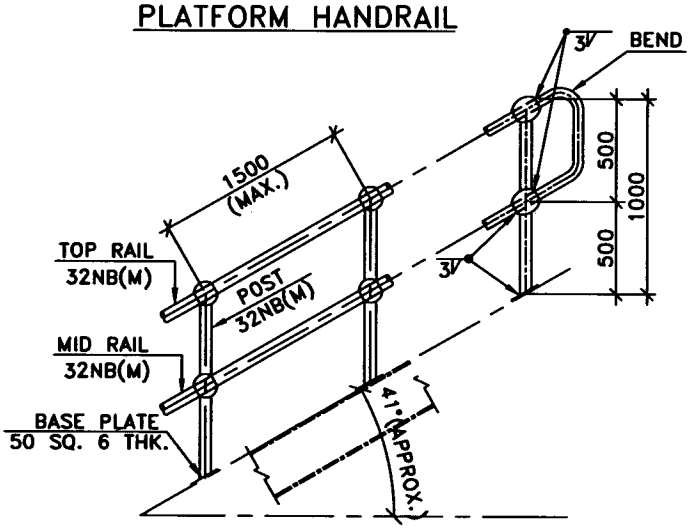
S.NO.	TYPE OF INSERT	WIDTH OF BEAM 'B' (mm)	MAXIMUM WIDTH OF PLATE 'W' (mm)	LENGTH OF PLATE 'L' (mm)	MAXIMUM 'b' (mm)	THICKNESS OF PLATE 't' (mm)	TOTAL ANCHORAGE LENGTH 'l' (mm)
1.	T1	230	180	180	110	16	350
2.	T2	300	220	250	110	20	350
3.	T3	350	270	250	110	20	350
4.	T4	400	320	250	110	20	350
5.	T5	450	370	300	110	32	350
6.	T6	500	420	300	110	32	350
7.	T7	500	420	400	110	32	350

NOTES :-

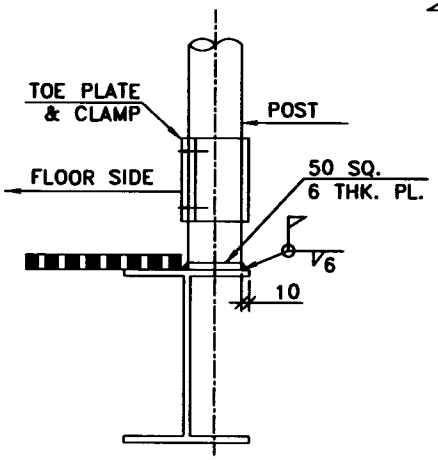
1. ALL DIMENSIONS ARE IN mm.
2. ALL M.S. TUBES SHALL CONFIRM TO IS : 1161/1239 & PLATE SHALL CONFIRM TO IS:2062.
3. PAINTING AND GALVANIZATION OF HANDRAIL SHALL BE AS PER JOB SPECIFICATION.



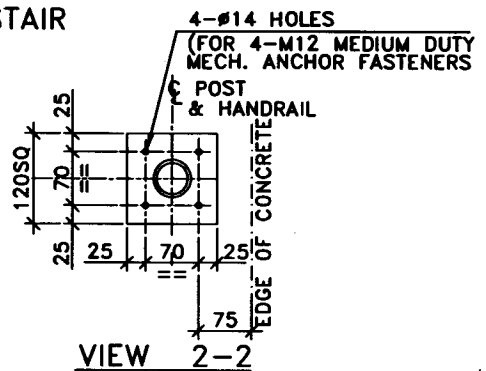
PLATFORM HANDRAIL



STAIR HANDRAIL
INCLINED RAILING
ON STEEL STAIR



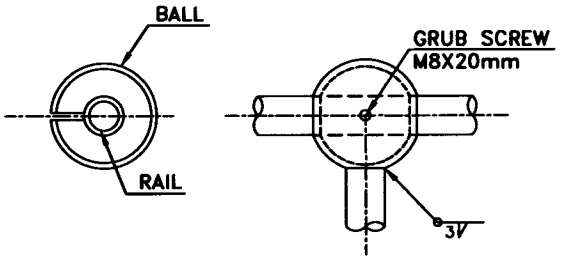
VIEW 1-1
HORIZONTAL RAILING
ON STEEL PLATFORM



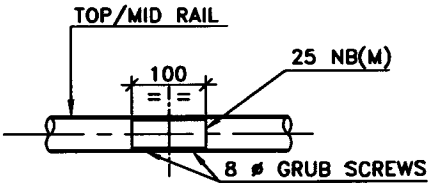
VIEW 2-2
BASE PLATE DETAIL
FOR VERTICAL POST
ON RCC BEAM/SLAB

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
1	23.02.2021	REAFFIRMED & REISSUED AS STANDARD	AK	SG/AS	AS	S.MAZUMDAR
0	15.10.2015	ISSUED AS STANDARD	KKS	SG/AS	RS	SC

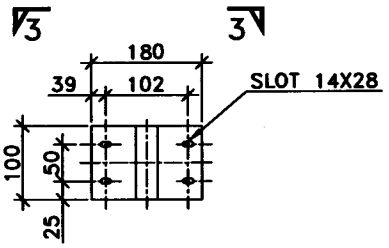
Approved by



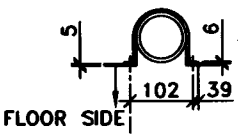
DETAIL– Ⓐ



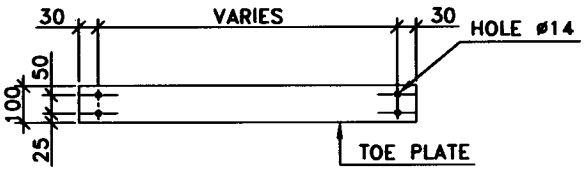
DETAIL – Ⓑ
DETAIL OF SPLICE



DETAIL – Ⓒ



VIEW 3–3
TOE PLATE CLAMP



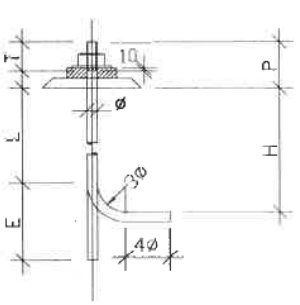
TOE PLATE DETAIL

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
1	23.02.2021	REAFFIRMED & REISSUED AS STANDARD	AK	RBS	AS	S.MAZUMDAR
0	15.10.2015	ISSUED AS STANDARD	KKS	SG/AS	RS	SC

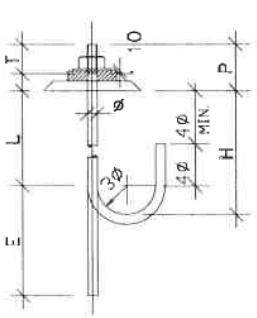
GRADE OF CONC.	BOLT TYPE	DIMENSIONS MM		BOLT DIA (ø) IN MM											
				10	12	16	18	20	22	24	27	30	33	36	39
M20	I & III	L		250	300	450	450	550	600	650	750	850	950	1000	1100
		E		95	115	155	170	190	210	230	255	285	315	345	370
		H	TYPE–I	280	336	498	504	610	666	722	831	940	1049	1108	1217
			TYPE–III	430	486	648	654	910	966	1022	1281	1390	1499	1558	1667
	II & IV	L		200	200	300	350	400	450	450	550	600	700	700	800
		E		150	180	240	270	300	330	380	405	450	495	540	585
		H	TYPE–II	230	236	348	404	460	516	522	631	690	799	808	917
			TYPE–IV	380	386	498	554	760	816	822	1081	1140	1249	1258	1367
M25	I & III	L		200	250	400	400	450	550	550	650	700	800	850	950
		E		95	115	155	170	190	210	230	255	285	315	345	370
		H	TYPE–I	230	286	448	454	510	616	622	731	790	899	958	1067
			TYPE–III	380	436	598	604	810	916	922	1181	1240	1349	1408	1517
	II & IV	L		150	150	250	250	300	350	350	450	500	550	600	650
		E		150	180	240	270	300	330	360	405	450	495	540	585
		H	TYPE II	180	186	298	304	360	416	422	531	590	649	708	767
			TYPE–IV	330	336	440	454	660	716	722	981	1040	1099	1158	1217
M30	I & III	L		180	220	315	335	390	445	470	550	600	680	735	815
		E		95	115	155	170	190	210	230	255	285	315	345	370
		H	TYPE–I	210	260	365	390	450	515	545	635	690	780	845	935
			TYPE–III	360	410	515	540	750	815	845	1085	1140	1230	1295	1385
	II & IV	L		150	150	200	200	250	275	300	350	375	425	450	500
		E		150	180	240	270	300	330	360	405	450	495	540	585
		H	TYPE–II	180	190	250	255	310	345	375	435	465	525	560	620
			TYPE–IV	330	340	400	405	610	645	675	885	915	975	1010	1070

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
9	06.06.24	REVISED AND ISSUED AS STANDARD	ANNU AHUJA	VIKRAM GUPTA	ANURAG SINHA	MANAK NANDI
8	27.03.19	REVISED AND ISSUED AS STANDARD	JITENDER GUPTA	AMARJEET	RAJANJI SRIVASTAVA	R.K.TRIVEDI
7	26.11.13	REVISED AND ISSUED AS STANDARD	A.K. SHARMA	AMARJEET	P.K.MITTAL	S.CHANDA

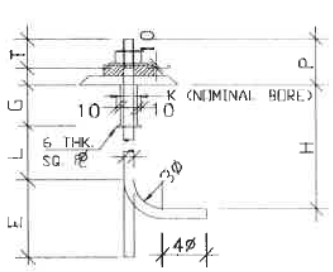
GRADE OF CONC.	BOLT TYPE	DIMENSIONS MM		BOLT DIA (ø) IN MM											
				10	12	16	18	20	22	24	27	30	33	36	39
M35	I & III	L		160	190	275	295	340	390	410	480	525	595	640	710
		E		95	115	155	170	190	210	230	255	285	315	345	370
		H	TYPE-I	190	230	325	350	400	460	485	565	615	695	750	830
			TYPE-III	340	380	475	500	700	760	785	1015	1065	1145	1200	1280
	II & IV	L		150	150	150	150	180	225	225	275	300	350	350	400
		E		150	180	240	270	300	330	360	405	450	495	540	585
		H	TYPE-II	180	190	200	205	240	290	300	360	390	450	460	520
			TYPE-IV	330	340	350	355	540	590	600	810	840	900	910	970
M40	I & III	L		150	170	240	255	300	340	360	425	460	525	565	625
		E		95	115	155	170	190	210	230	255	285	315	345	370
		H	TYPE-I	180	210	290	310	360	410	435	510	550	625	675	745
			TYPE-III	330	360	440	460	660	710	735	960	1000	1075	1125	1195
	II & IV	L		150	150	150	150	175	200	200	225	250	275	300	325
		E		150	180	240	270	300	330	360	405	450	495	540	585
		H	TYPE-II	180	190	200	205	235	270	275	310	340	375	410	445
			TYPE-IV	330	340	350	355	535	570	575	760	790	825	860	895



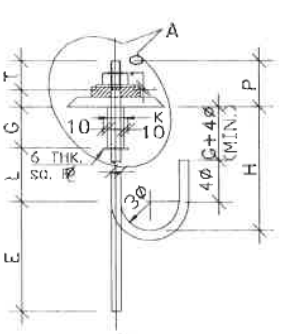
TYPE – I



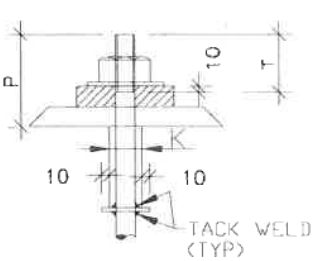
TYPE – II



TYPE – III



TYPE – IV



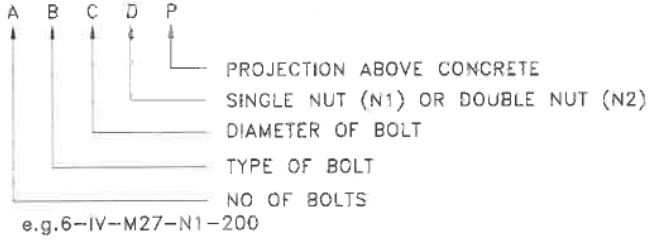
DETAIL–A (TYP)

GRADE OF CONC.	BOLT TYPE	DIMENSIONS MM			BOLT DIA (ø) IN MM																										
					10	12	16	18	20	22	24	27	30	33	36	39	42	45	48	52	56	60	64								
M20,M25, M30,M35 & M40	III & IV	SLEEVE	G		150	150	150	150	300	300	300	450	450	450	450	450															
			K		50	50	50	50	50	80	80	80	80	80	80	100															
	I TO IV IX & XII	THREADED (T) LENGTH	SINGLE NUT		40	45	55	60	60	65	70	75	80	90	95	100															
			DOUBLE NUT		50	60	70	75	80	90	95	105	110	120	130	140															
M20 & M25	V		G		150	150	150	200	300	300	300	450	450	450	450	550	600	650	700	750	800	900	900								
			H		210	222	234	291	398	410	417	580	585	598	608	722	786	841	905	975	1035	1150	1171								
	V & VI		W		80	80	90	100	100	130	130	140	150	170	180	200	210	220	230	260	270	290	320								
			t3		10	12	16	16	20	20	25	25	25	28	32	36	36	36	40	45	45	50	56								
	VII		L						350	400	400	500	550	600	750	950	1050	1100	1200	1350	1500	1750	1900								
	VIII		L												350	400	450	500	550	600	650	700	750								
			C												160	200	200	200	240	240	240	260	280								
M30	V		G		150	150	150	200	300	300	300	450	450	450	450	500	500	550	600	650	750	800	800								
			H		210	225	235	290	400	410	415	580	585	600	610	675	690	745	805	875	985	1050	1075								
	V & VI		W		80	80	90	100	100	100	100	110	110	140	160	200	210	220	230	260	270	290	320								
			t3		10	12	16	16	20	20	20	25	25	28	32	36	36	36	40	45	45	50	56								
	VII		L						275	325	325	375	425	500	600	750	850	975	1000	1075	1225	1375	1525								
	VIII		L												300	350	400	450	500	550	600	650	700								
			C												125	160	160	160	185	185	200	240	240								

GRADE OF CONC.	BOLT TYPE	DIMENSIONS MM		BOLT DIA (ø) IN MM																		
				10	12	16	18	20	22	24	27	30	33	36	39	42	45	48	52	56	60	64
M35 & M40	V	G		150	150	150	200	300	300	300	450	450	450	450	450	500	550	600	600	700	750	750
		H		210	225	235	290	400	410	415	580	585	600	610	625	690	745	805	825	935	1000	1025
	V & VI	W		80	80	90	100	100	100	100	110	110	140	160	200	210	220	230	260	270	290	320
		t3		10	12	16	16	20	20	20	25	25	28	32	36	36	36	40	45	45	50	56
	VII	L						250	275	300	350	400	450	550	675	775	875	900	975	1100	1250	1375
	VIII	L												300	350	400	450	500	550	600	650	700
		C												125	160	160	160	185	185	200	240	240
M20, M25, M30, M35, & M40	V & VI	E		50	60	70	75	80	90	95	105	110	120	130	140	150	155	165	180	190	200	215
	V , VI , VII & VIII	K		50	50	50	50	50	80	80	80	80	80	80	100	100	100	100	125	125	125	150
		THREADED (T) LENGTH	SINGLE NUT	40	45	55	60	60	65	70	75	80	90	95	100	105	110	120	125	135	140	150
			DOUBLE NUT	50	60	70	75	80	90	95	105	110	120	130	140	150	155	165	180	190	200	215
	VII	t3						16	16	16	16	16	16	16	16	16	16	20	20	20	20	20
	VIII	t3												16	20	20	20	25	25	25	28	32
	VII & VIII	G		150	150	150	150	300	300	300	450	450	450	450	450	450	450	450	450	450	450	600
	IX	L		80	100	150	170	200														
M20&25	XII	L		185	220	310	335	385	435	460	535	590	660	720								
M30		L		150	150	200	225	250	275	300	350	375	425	450								
M35&M40		L		150	150	175	200	225	250	275	300	350	375	400								

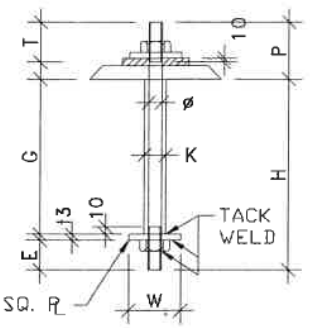
NOTES :-

1. BOLTS SHALL BE MARKED ON THE DRAWING AS UNDER :

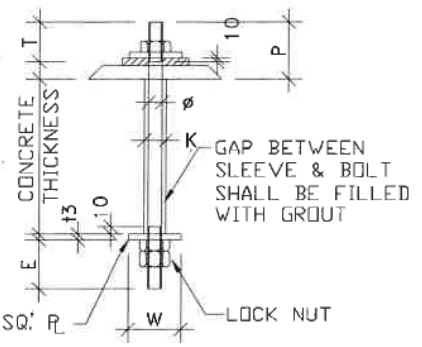


e.g.6-IV-M27-N1-200

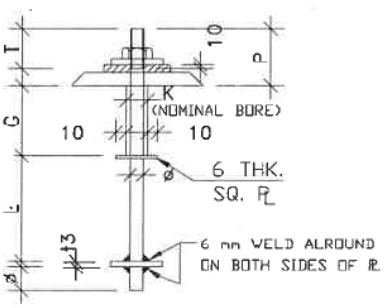
2. BOLTS SHALL BE TURNED FROM M.S. ROUNDS CONFORMING TO IS:2062 GRADE-E250 QUALITY A/BR/BO.
3. NUTS AND WASHERS SHALL CONFORM TO IS:1363.
4. THREADING SHALL BE COARSE CONFORMING TO IS:1367 AND IS:4218.
5. ANCHOR BOLTS SHALL BE SET ACCURATELY AND HELD IN POSITION BY TEMPLATE BEFORE CONCRETING.
6. 6 THK. SQ. PLATE AT THE BOTTOM OF SLEEVE SHALL BE TACK WELDED WITH BOLT AND SLEEVE FOR BOLT TYPE III, IV, VII AND VIII.
7. SLEEVE SHALL BE M.S. TUBES (MEDIUM) AS PER IS:1239.
8. REFER DESIGN DRAWINGS FOR PROJECTION (P) OF BOLT ABOVE TOP OF ROUGH CONCRETE AND NUMBER (A) OF BOLTS.
9. ANCHOR BOLTS SHALL BE TEMPERED BEFORE MACHINING IF MADE BY FORGING. THE FORGING TEMPERATURE SHALL BE ABOVE 900° C BUT LOWER THAN SUPER HEATING TEMPERATURE.

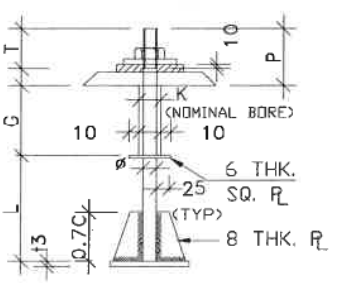


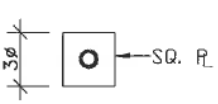
TYPE – V



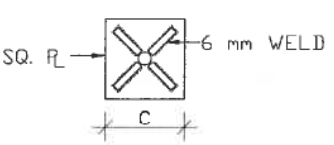
TYPE – VI



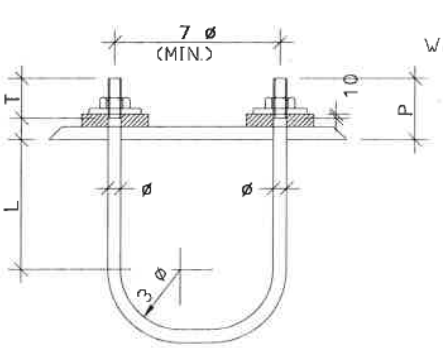




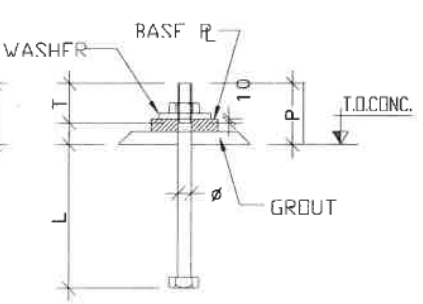
TYPE – VII



TYPE – VIII

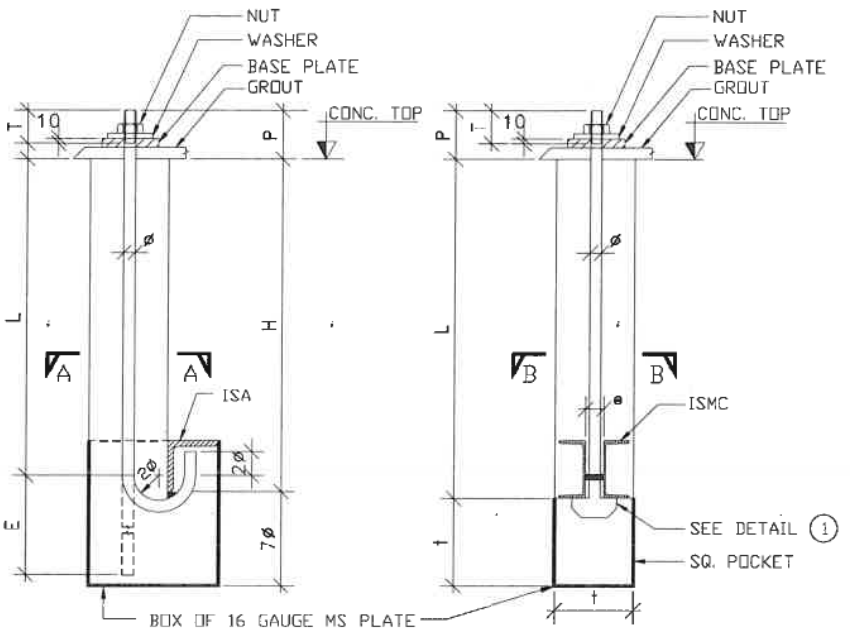


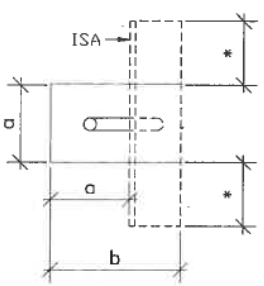
TYPE – IX



TYPE – XII

GRADE OF CONC.	BOLT TYPE	DIMENSIONS MM		BOLT DIA (ø) IN MM																				
				20	22	24	27	30	33	36	39	42	45	48	52	56	60	64						
M20, M25, M30, M35 & M40	X	a		150	160	180	200	220	240	260	280	300												
		b		250	290	310	330	370	390	460	480	500												
		L		600	700	800	900	1000	1100	1200	1300	1400												
		E		220	220	240	270	300	330	360	390	420												
		H		640	744	848	954	1060	1166	1272	1378	1484												
		ISA		100x100 X10	130X130X10			150X150X12		200X200X16														
		THREADED LENGTH (T)	SINGLE NUT	60	65	70	75	80	90	95	100	105												
			DOUBLE NUT	80	90	95	105	110	120	130	140	150												
	XI	h				18		20		25		30		30		30		30						
		k				18		22		25		30		35		40		50						
		c				24		30		36		42		48		56		64						
		q				65		75		85		95		110		125		140						
		r				1.6		1.6		2.0		2.0		2.0		3.0		3.0						
		f				140		150		170		190		210		220		240						
		e				30		35		42		50		58		65		75						
		L				800		1000		1200		1400		1600		1800		2000						
		ISMC				75x40		75x40		100x50		125x65		150x75		150x75		175x75						
		THREADED LENGTH (T)	SINGLE NUT			70		80		95		105		120		135		150						
			DOUBLE NUT			95		110		130		150		165		190		215						

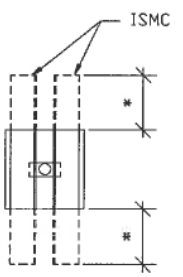




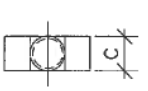
VIEW A – A

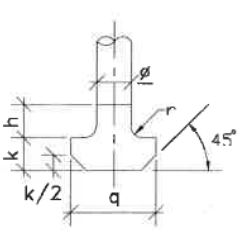
TYPE – X

(* AS PER DESIGN REQUIREMENT)



VIEW B – B





DETAIL – (1)

(FOR FORGED BOLT HEAD)

TYPE – XI

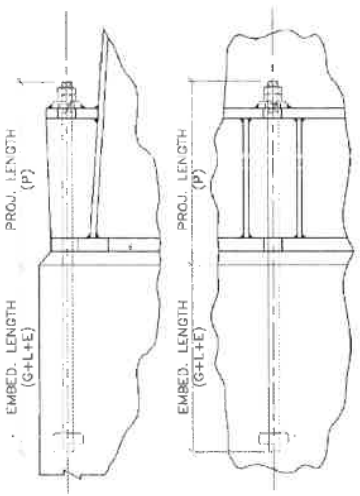


FIGURE 1: ANCHOR BOLT WITH ANCHOR CHAIR
(VERTICAL VESSELS ON SKIRT, STORAGE TANKS, ETC.)

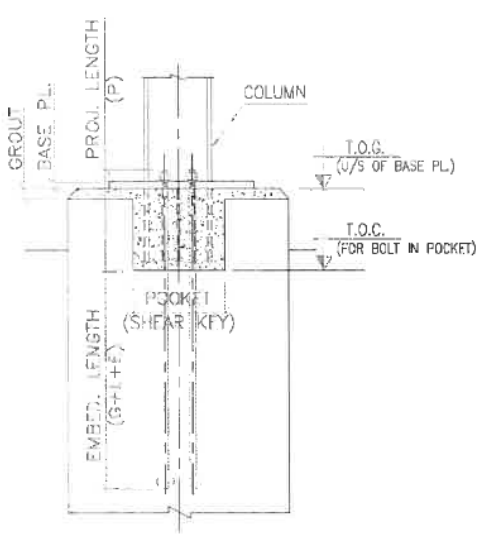


FIGURE 2: ANCHOR BOLT WITH POCKET IN PEDESTAL

NOTES:-

1. ALL HANDRAILS AND UPRIGHT SHALL BE AS PER RESPECTIVE TYPE.
2. ALL FILLET WELDS OF 3mm (MINIMUM) THICKNESS SHALL BE CONTINUOUS UNLESS NOTED OTHERWISE.
3. JOINTS IN HANDRAILS SHALL BE PROVIDED AT SUITABLE LOCATIONS, WELDED AND GROUND FLUSH.
4. FOR ADDITIONAL TYPE OF UPRIGHT FIXING DETAILS REFER EIL STD. 7-68-0061.
5. ALL M.S. TUBES SHALL CONFORM TO IS:1239.
6. FABRICATION OF TOP RAIL, INTERMEDIATE FLAT AND TOE PLATE SHALL ONLY BE STARTED AFTER TAKING ACTUAL DIMENSIONS AT SITE.
7. ADJUSTMENT IN SPACING OF VERTICAL POST SHALL BE DONE AT EITHER END OF PLATFORM.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
8	28.09.2020	REAFFIRMED & ISSUED AS STANDARD	JG	AVM	AS	SM
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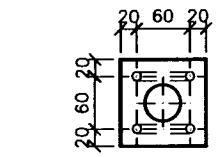
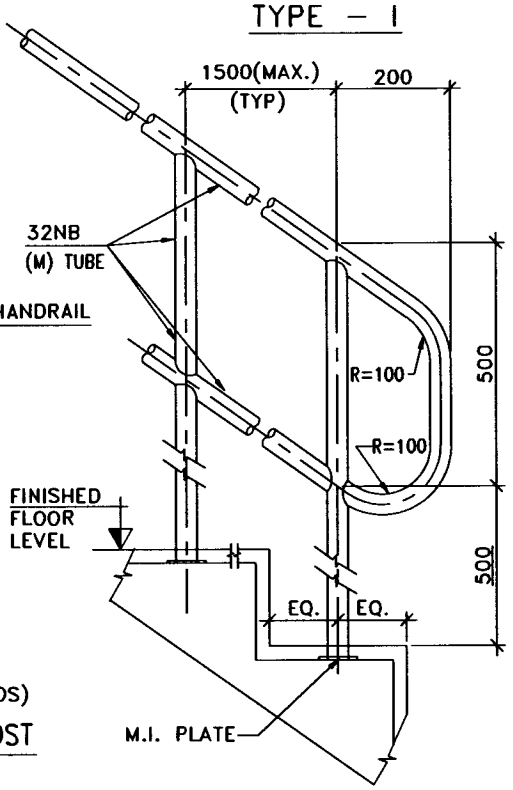
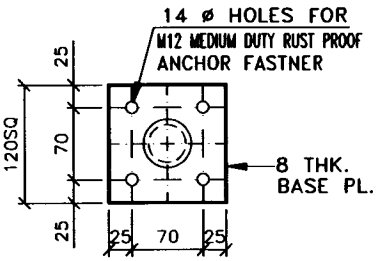
TYPE – I

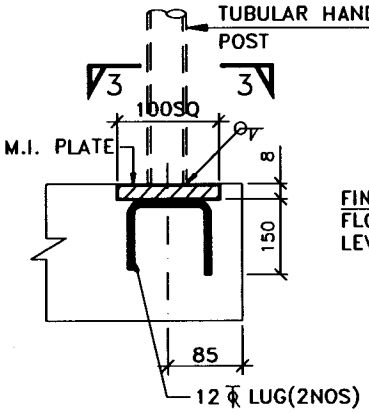


VIEW 3–3

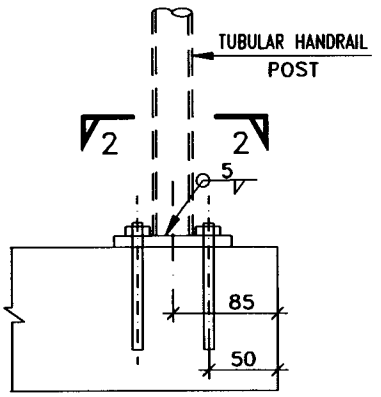




VIEW 2–2

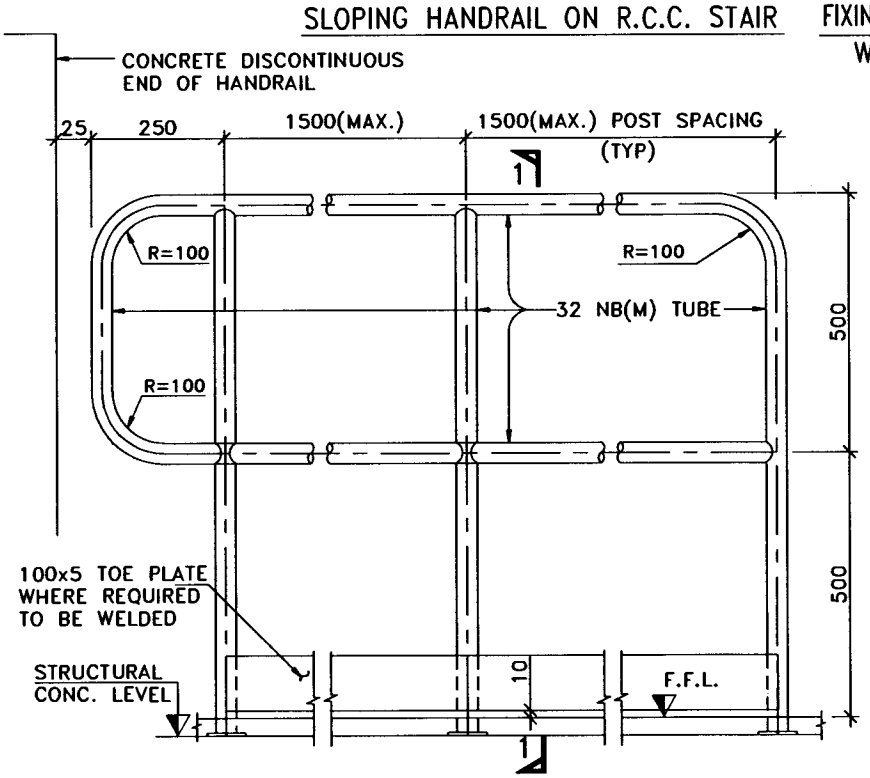


FIXING DET OF TUB. POST
WITH M.I.PLATE (ALT–I)

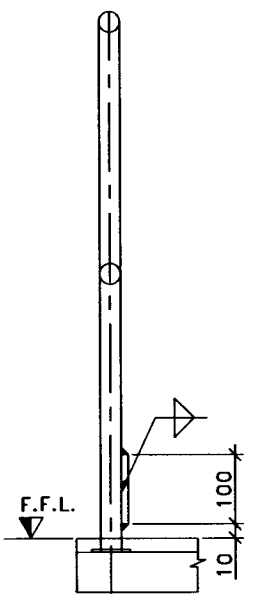


FIXING DET OF TUBULAR POST
WITH ANCHOR FASTNER
ALT–II

SLOPING HANDRAIL ON R.C.C. STAIR



HORIZONTAL HANDRAIL ON R.C.C. PLATFORM



SEC. 1–1

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
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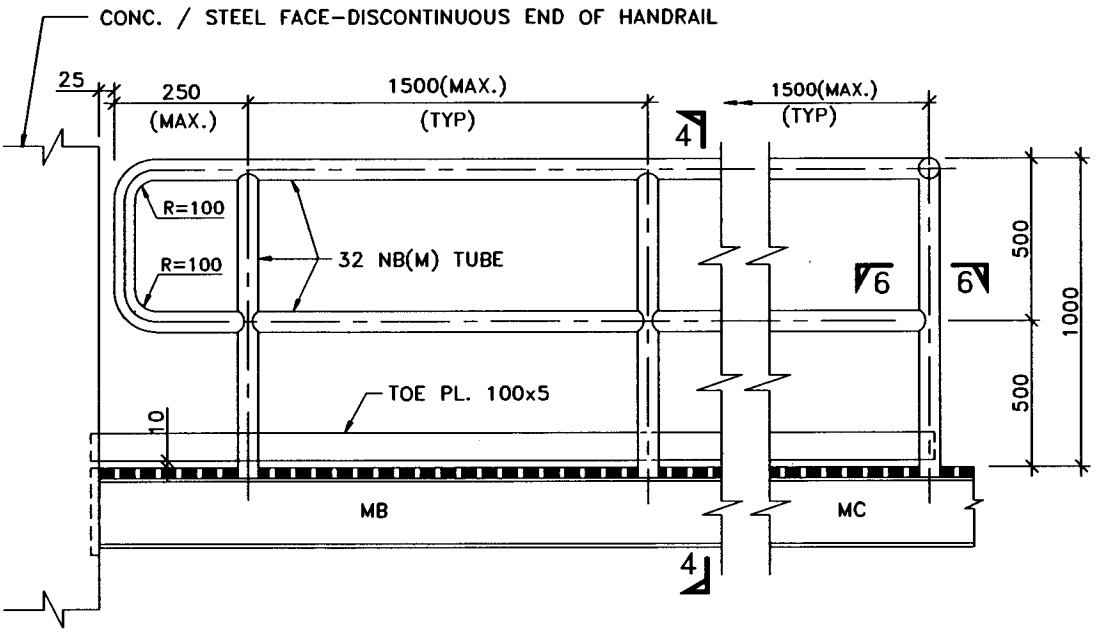
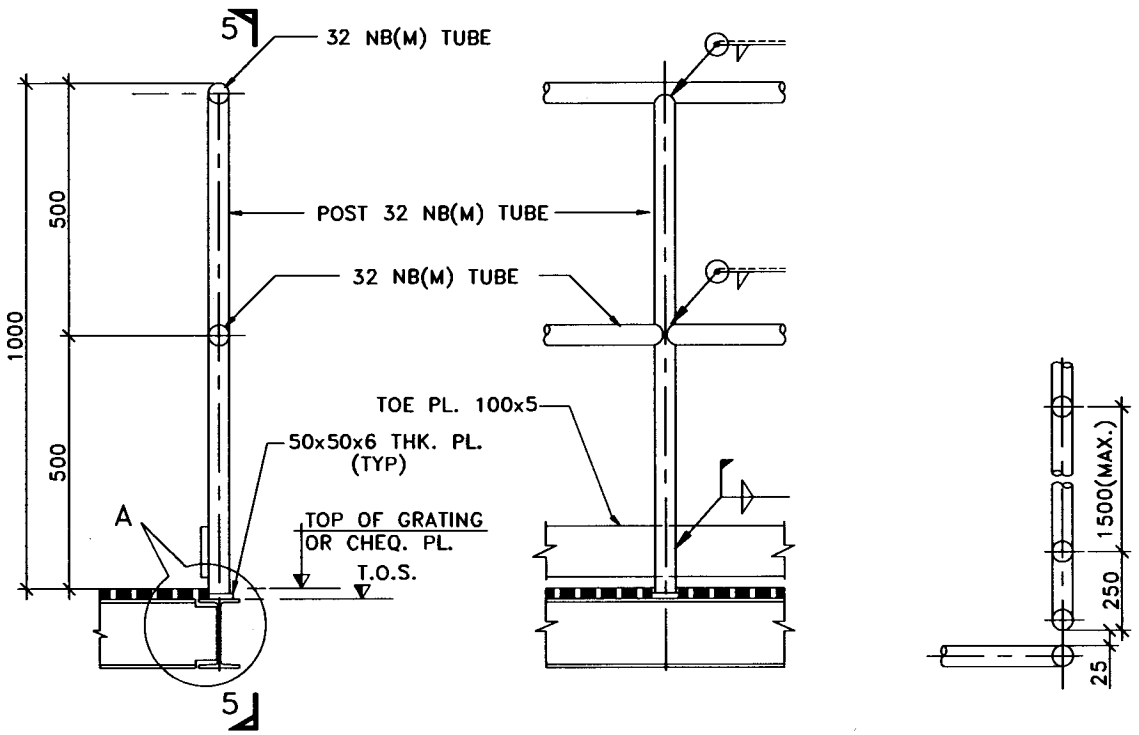
8	28.09.2020	REAFFIRMED & ISSUED AS STANDARD	JG	AVM	AS	SM
7	16.12.2014	REVISED & ISSUED AS STANDARD	V.P.SINGH	V GOEL	PK MITTAL	S CHANDA

TYPE – II



HORIZONTAL HANDRAIL ON STEEL PLATFORM



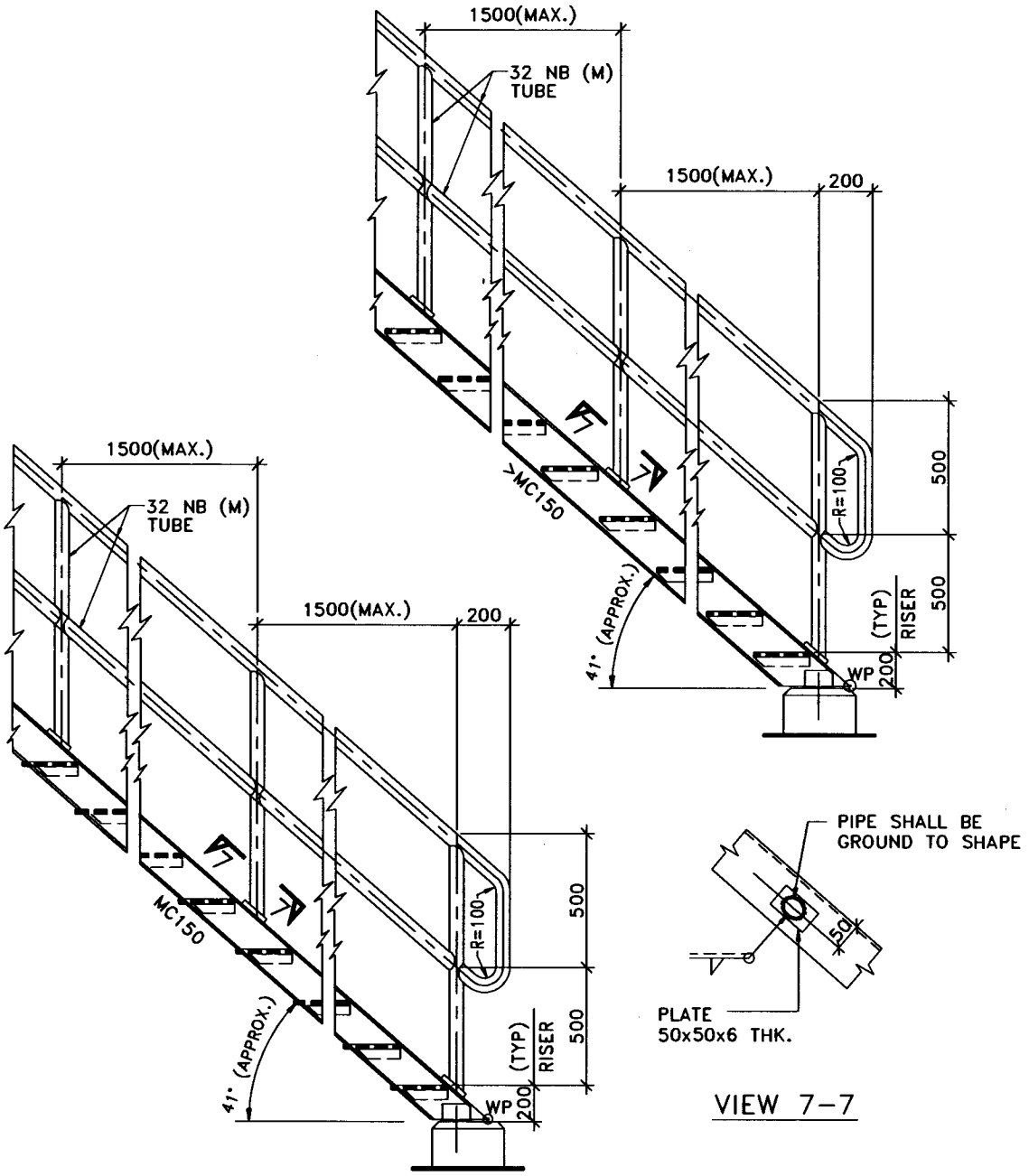
SECTION 4–4
(FOR DETAIL (A) REFER PAGE 8 OF 8)

VIEW 5–5

VIEW 6–6
(AT CORNER)

Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by: Stds. Committee Convenor	Approved by: Stds. Bureau Chairman
8	28.09.2020	REAFFIRMED & ISSUED AS STANDARD	JG	AVM	AS	SM
7	16.12.2014	REVISED & ISSUED AS STANDARD	V.P.SINGH	V GOEL	PK MITTAL	S CHANDA

TYPE – II



VIEW 7–7

SLOPING HANDRAIL ON STEEL STAIR

WHEREVER HIGHER SIZE OF STRINGER BEAMS ARE REQUIRED AS PER DESIGN SIMILAR G.A. BE FOLLOWED FOR THE SAME.

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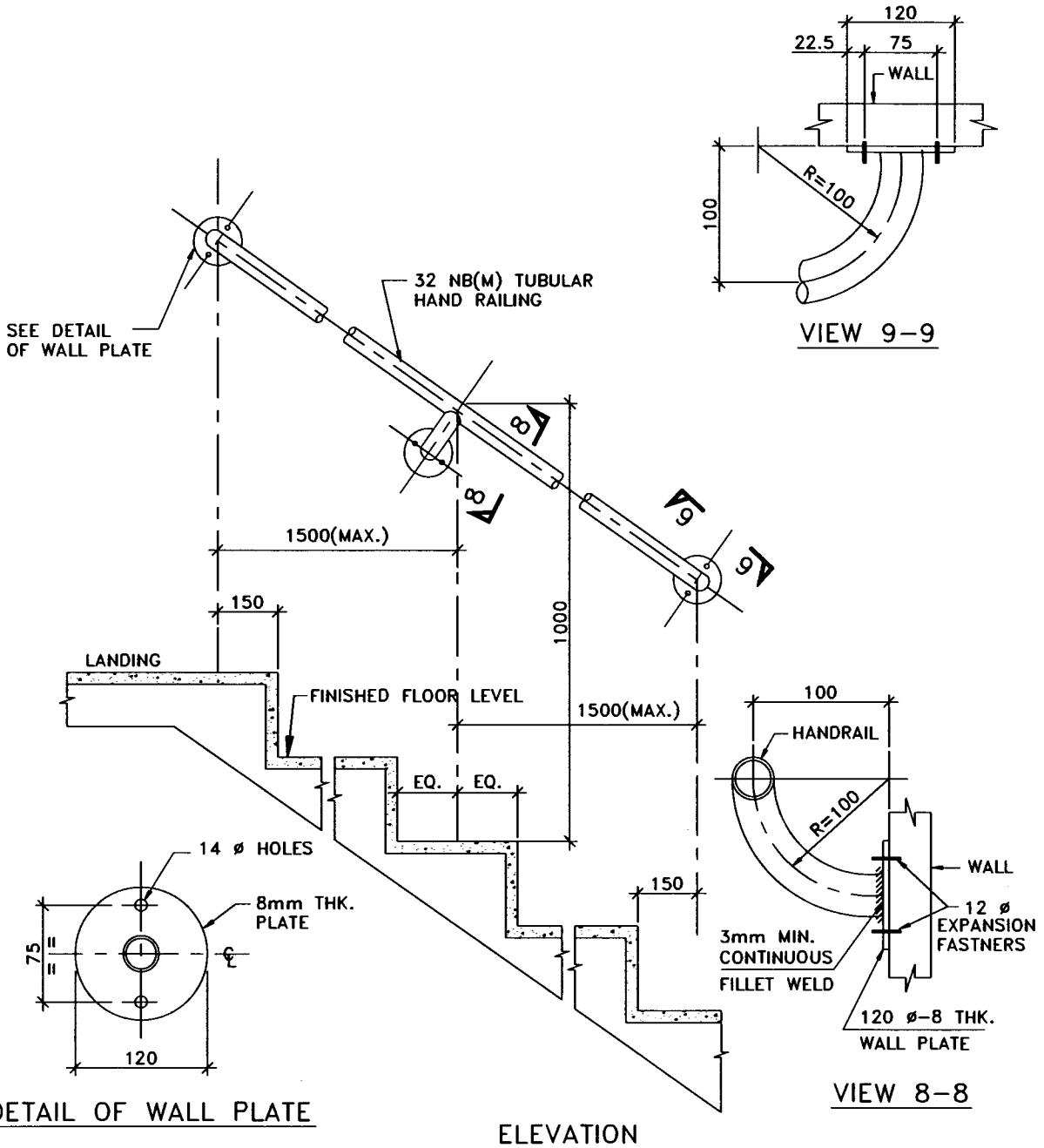
8	28.09.2020	REAFFIRMED & ISSUED AS STANDARD	JG	AVM	AS	SM
7	16.12.2014	REVISED & ISSUED AS STANDARD	V.P.SINGH	V GOEL	PK MITTAL	S CHANDA

TYPE – III



HANDRAIL FIXED TO WALL DIRECT

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
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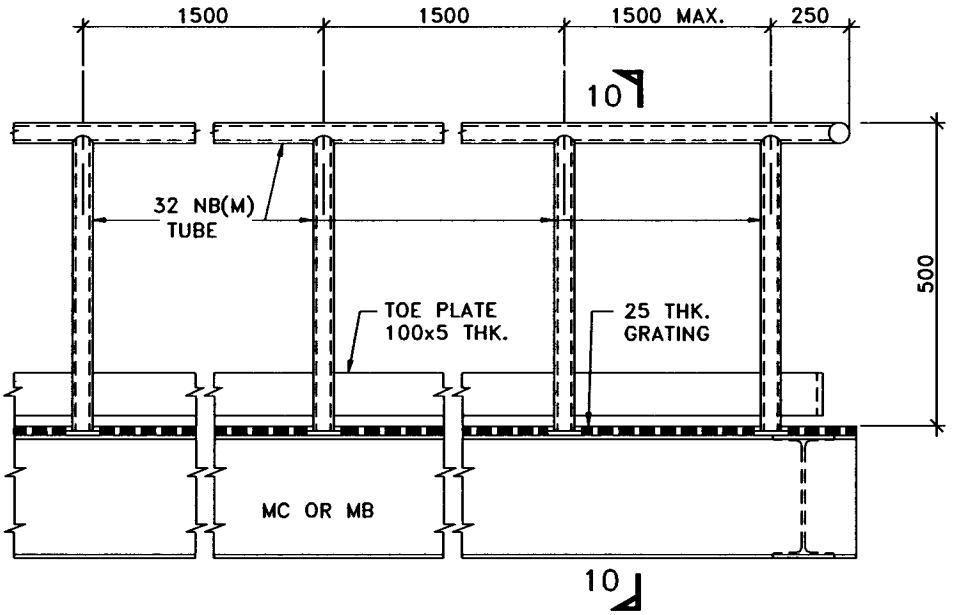
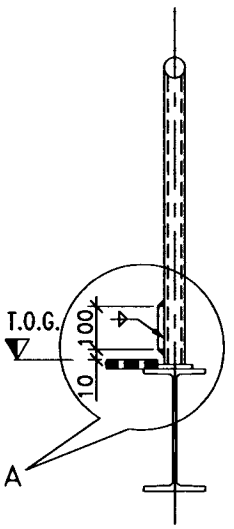
8	28.09.2020	REAFFIRMED & ISSUED AS STANDARD	JG	AVM	AS	SM
7	16.12.2014	REVISED & ISSUED AS STANDARD	V.P.SINGH	V GOEL	PK MITTAL	S CHANDA

TYPE – IV



HANDRAIL ON HORIZONTAL PLATFORM (STEEL)



SEC. 10–10

NOTE : HANDRAIL TYPE–IV SHALL BE USED OVER PIPE CROSS OVER AND LOW LEVEL PLATFORMS SUCH AS FOR VALVE OPERATION ETC. AS MENTIONED IN STD 7–68–0562 & 0563.

(FOR DETAILS Ⓐ REFER PAGE 8 OF 8)

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
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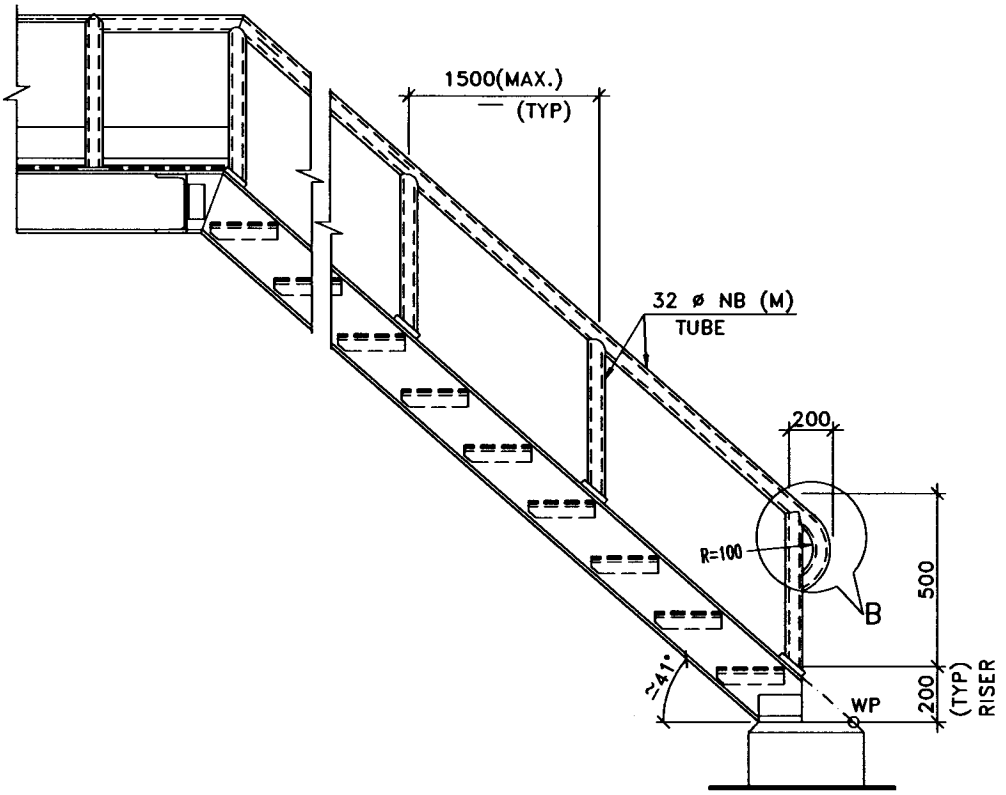
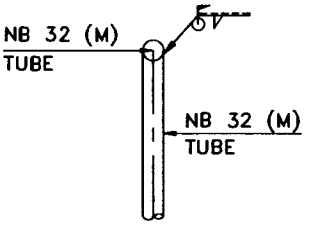
8	28.09.2020	REAFFIRMED & ISSUED AS STANDARD	JG	AVM	AS	SM
7	16.12.2014	REVISED & ISSUED AS STANDARD	V.P.SINGH	V.P.SINGH	PK MITTAL	S CHANDA

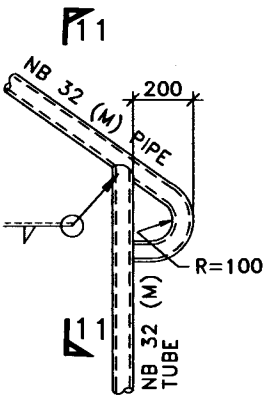
TYPE – IV



SLOPING HALF HANDRAIL ON STEEL STAIR

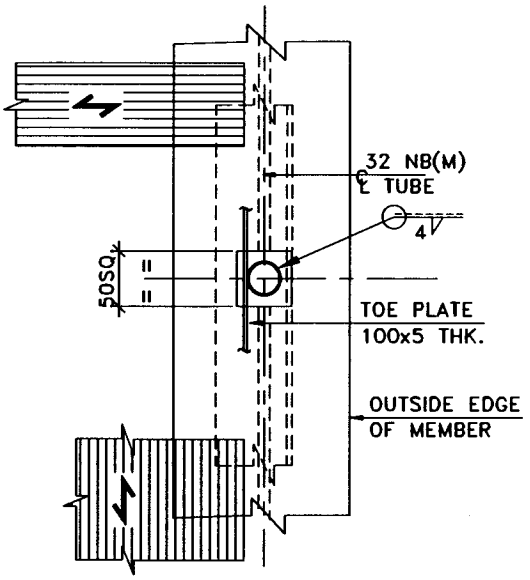


SEC. 11–11

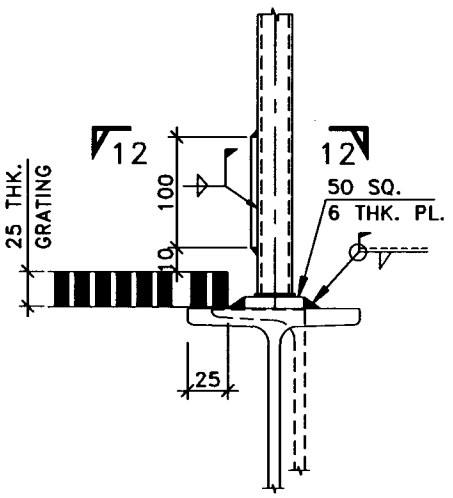


DETAIL – (B)

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
8	28.09.2020	REAFFIRMED & ISSUED AS STANDARD	JG	AVM	AS	SM
7	16.12.2014	REVISED & ISSUED AS STANDARD	V.P.SINGH	V GOEL	PK MITTAL	S CHANDA



VIEW 12–12



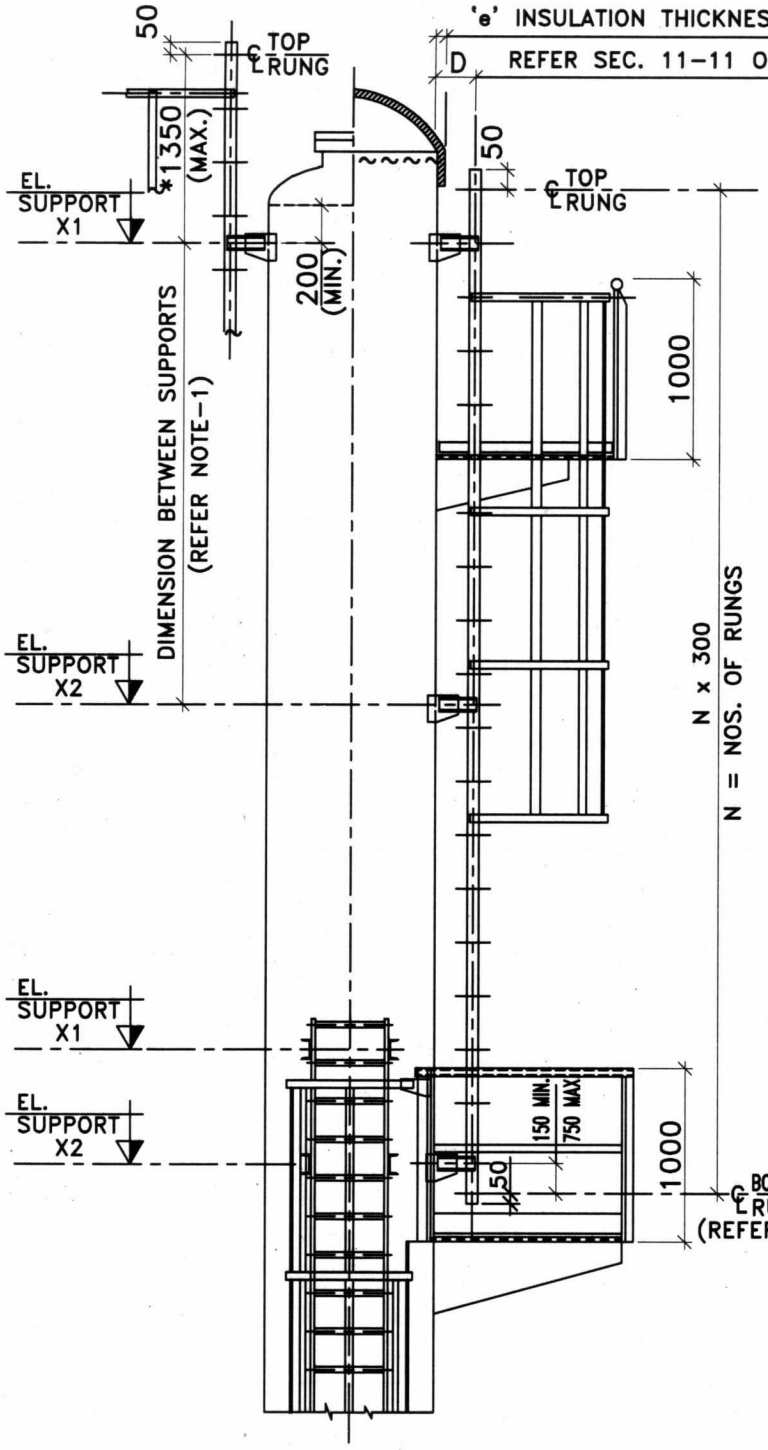
DETAIL – (A)

CONNECTION DETAILS
(FOR TYPE II & IV)

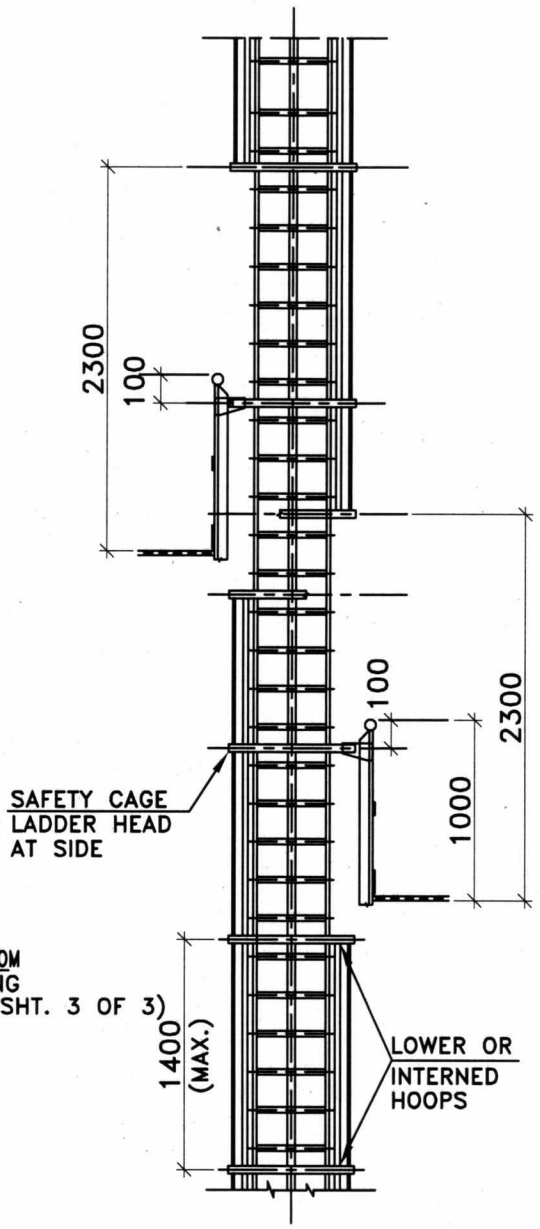
NOTE : CHEQUERED PLATES / GRATINGS SHALL BE SUITABLY NOTCHED TO ACCOMMODATE THE TUBE IN CASE OF BEAM MC100 OR MC125.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
8	28.09.2020	REAFFIRMED & ISSUED AS STANDARD	JG	AVM	AS	SM
7	16.12.2014	REVISED & ISSUED AS STANDARD	V.P.SINGH	V GOEL	PK MITTAL	S CHANDA

DETAILS OF STEEL LADDER



LADDER FOR SIDE ENTRY



LADDER FOR SIDE ENTRY

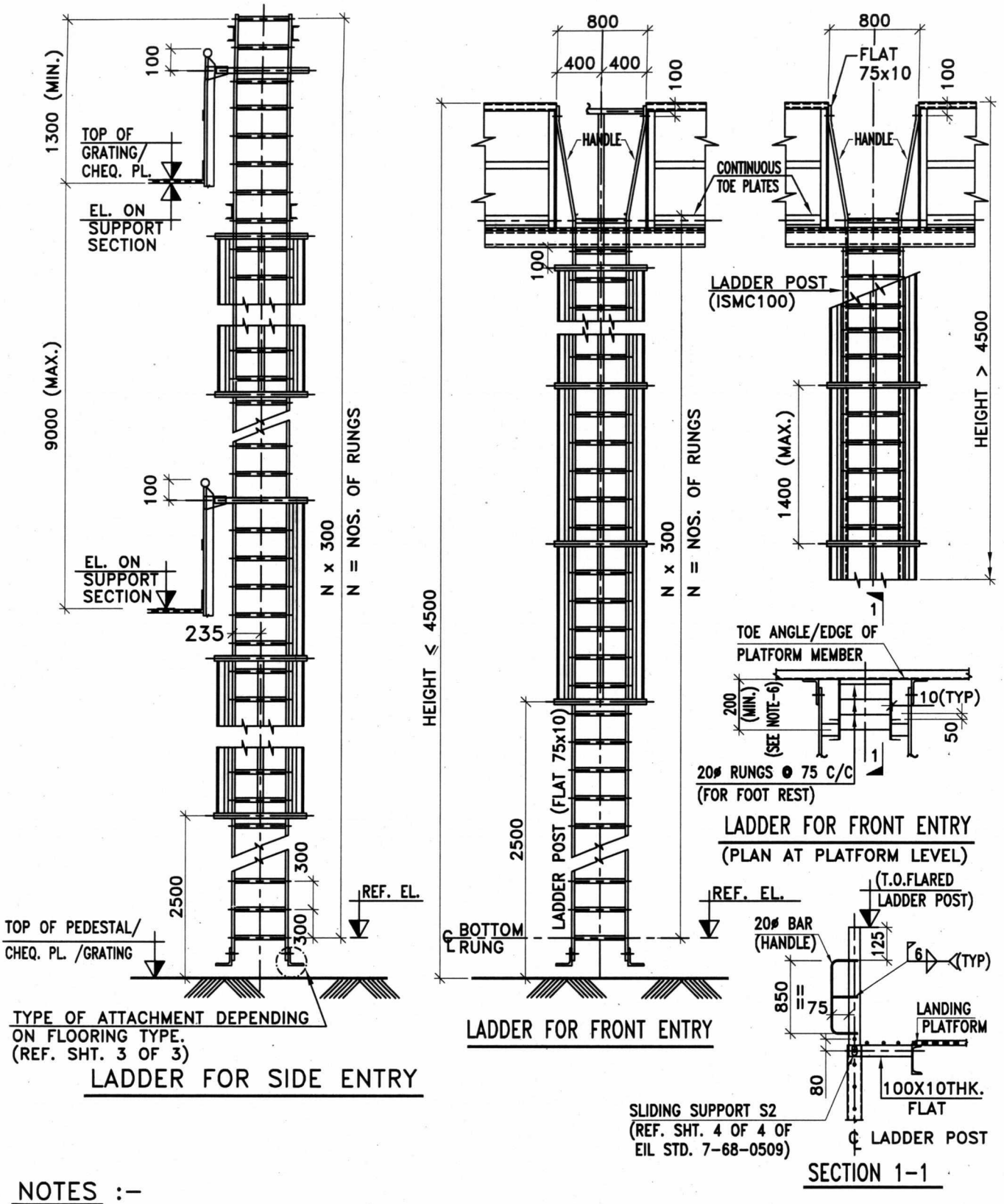
VESSEL DIA (mm)	DISTANCE 'D' (mm)
UPTO 800	200 + e
> 800 ⩽ 3200	260 + e
> 3200 ⩽ 8000	275 + e

* MC100 SHALL BE ADOPTED FOR DISTANCE MORE THAN 1350 UPTO 2000

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
9	14.12.23	REVISED AND ISSUED AS STANDARD	JITENDER GUPTA	AMARJEET	ANURAG SINHA	MAINAK NANDI
8	01.08.19	REAFFIRMED AND ISSUED AS STANDARD	JG	AVM	RAJANJI SRIVASTAVA	S.CHANDA

Approved by

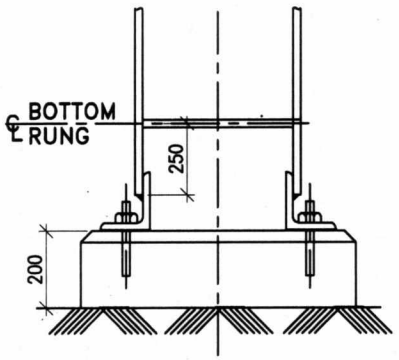
DETAILS OF STEEL LADDER



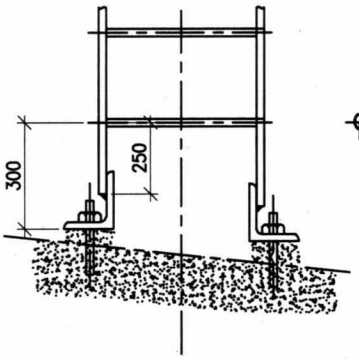
NOTES :-

1. LADDER POSTS SHALL BE OF FLAT (75x10) UPTO 3.60m (MAX.) BETWEEN SUPPORTS AND ISMC 100 UPTO 7.0m (MAX.) BETWEEN SUPPORTS.
2. RUNGS SHALL BE 20 ø. FOR STEEL LADDER JOINT DETAILS, REFER EIL STD. 7-68-0509.
3. SUPPORT TYPE 'X1' CORRESPONDS TO FIXED SUPPORT AND 'S2/X2' CORRESPONDS TO SLIDING SUPPORT. FOR EACH LADDER, ONLY ONE FIXED SUPPORT SHALL BE PROVIDED. REMAINING SUPPORT(S) SHALL BE OF SLIDING TYPE.
4. SUPPORT ELEVATION X1, X2 CORRESPOND TO ℄ OF BOLT HOLES.
5. SUPPORTS 'X1' IS CAPABLE TO SUSTAIN A LOAD FOR 9000 mm LONG LADDER ONLY.
6. LADDER SHALL BE GIVEN SUITABLE SLOPE (MAX.6°),IF NECESSARY,TO AVOID FOULING WITH ANCHOR CHAIRS.

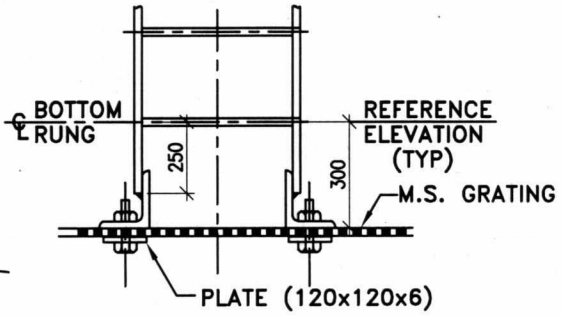
TYPE OF ATTACHMENT	NATURE OF SUPPORT SECTION	REMARKS
A1, A2	SITE WITHOUT PAVING	
B1, B2	CONCRETE FLOOR	A1, B1, C1, D1 : FIXED TYPE
C1, C2, D1, D2	CHEQUERED PLATE / GRATING FLOORING	A2, B2, C2, D2 : SLIDING TYPE



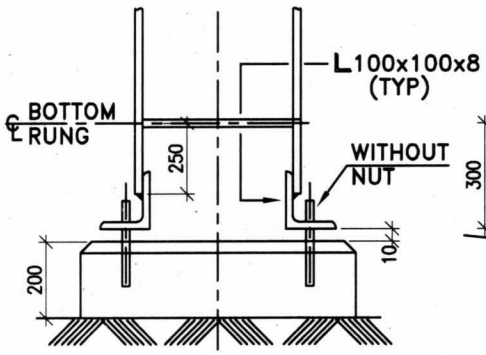
TYPE – A1



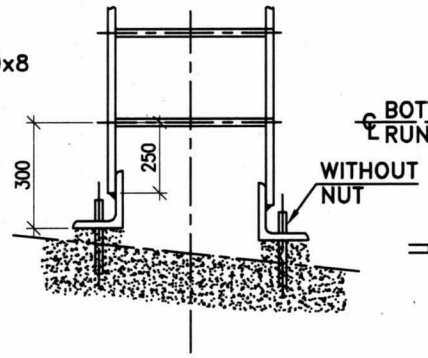
TYPE – B1



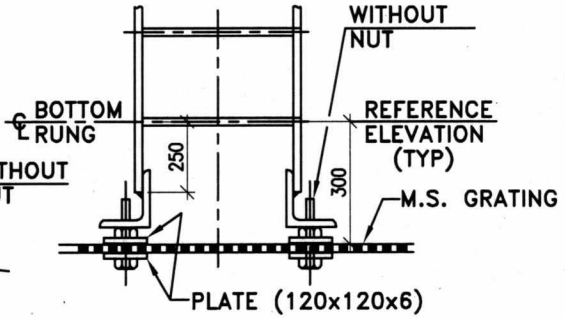
TYPE – C1



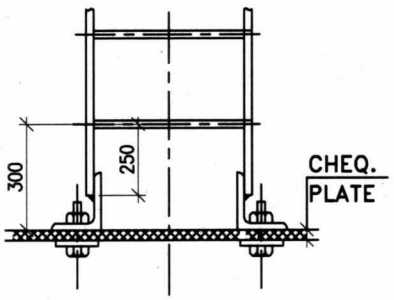
TYPE – A2



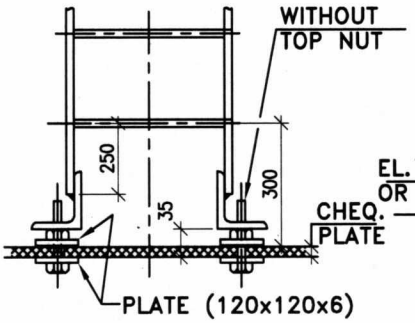
TYPE – B2



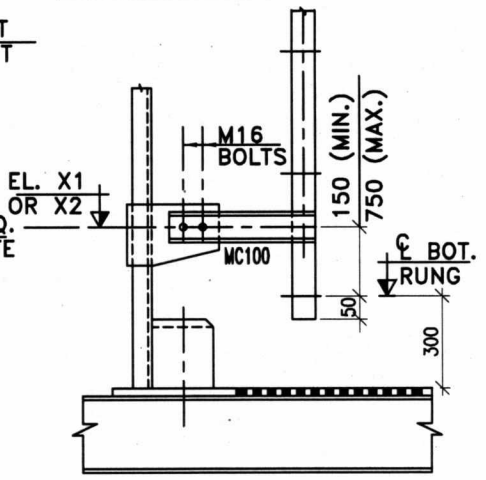
TYPE – C2



TYPE – D1

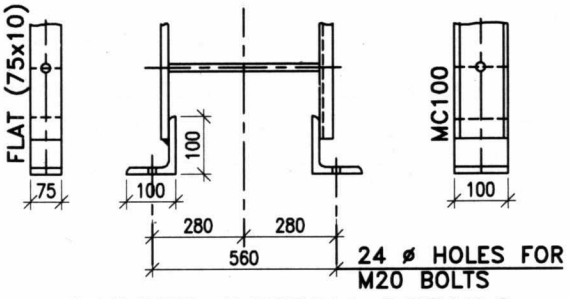


TYPE – D2



TYPE – E

(FREE)



LADDER BOTTOM DETAILS

NOTE :-

IN CASE OF TOWERS BOTTOM RUNG SHALL BE 300 mm FROM FGL /HPP.

TYPE OF ATTACHMENT AT BASE

NOTES :–

1. ALL DIMENSIONS ARE IN mm.
2. THE TYPE OF GRATING TO BE USED SHALL BE CALLED OUT ON THE DESIGN DRAWING.
3. MATERIAL FOR THE GRATING SHALL CONFORM TO FOLLOWING STANDARDS:

		CARBON STEEL (CS) GRATING	STAINLESS STEEL (SS) GRATING
(a)	MAIN MEMBER & END FLAT	IS 2062 (GRADE E250) SUB QUALITY–A/BR/BO	GRADE 409M CONFORMING TO ASTM 240/480 (UNS S40977)
(b)	CROSS MEMBER (SQ.TWISTED ACROSS BAR)	IS 7887	GRADE 409M CONFORMING TO ASTM 240/480 (UNS S40977) OR DESIGNATION X12Cr13 CONFORMING TO IS 6527/6528
(c)	FLAT FOR CLAMP	IS 513	GRADE 409M CONFORMING TO ASTM 240/480 (UNS S40977) OR DESIGNATION X12Cr12 CONFORMING TO IS 6603
(d)	DISC	CS 1038 GRADE	GRADE 1.4404 CONFORMING TO DIN EN 1.4404 OR GRADE 316/316L CONFORMING TO ASTM 240/480
(e)	STUD	CS 1038 GRADE	GRADE 1.4462 CONFORMING TO DIN EN 1.4462 OR GRADE F51 CONFORMING TO ASTM A182

4. ALL GRATINGS SHALL BE MANUFACTURED BY ELECTRO–FORGING PROCESS.
5. CARBON STEEL GRATINGS INCLUDING TOE PLATES & FLATS (AROUND OPENINGS) AND CLAMPS SHALL BE HOT DIP GALVANISED IN ACCORDANCE WITH IS 2629 AND TESTED AS PER IS 2633 & IS 6745. QUANTITY OF ZINC COATING SHALL BE MINIMUM 900 gm/sqm OF SURFACE AREA (0.12 mm MINIMUM AVERAGE THICKNESS). CLAMP BOLTS & NUTS SHALL HAVE MINIMUM AVERAGE ZINC COATING OF 375 gm/sqm (0.054 mm MINIMUM AVERAGE THICKNESS).
6. THE PANEL WIDTH SHOWN ON SUBSEQUENT SHEETS IS INDICATIVE. IT MAY BE INCREASED OR DECREASED AS REQUIRED TO SUIT THE GEOMETRY OF PLATFORM & CONVENIENCE OF HANDLING.
7. GRATINGS SHALL NOT BE USED FOR SUPPORTING THE PIPES DIRECTLY. ADDITIONAL MEMBERS (MINIMUM MC125) SHALL BE PROVIDED UNDER THE GRATING FOR SUPPORTING THE PIPE HAVING A MAXIMUM LOAD OF 500 Kg. THIS MEMBER SHALL SPAN IN SAME DIRECTION AS GRATING.
8. GRATING PANEL SHALL BE ALIGNED AND TACK WELDED TO THE SUPPORTING MEMBERS. FIXING OF GRATING PANEL WITH SUPPORTING MEMBERS SHALL EITHER BE DONE BY CLAMPS/ DISC (WITHOUT REMOVING TACK WELD) OR ALTERNATIVELY BY INTERMITTENT/STITCH WELDING 50(50).

   REMOVABLE GRATING PANEL AS SHOWN IN DRAWINGS SHALL BE FIXED BY CLAMPS/ DISC ONLY.
9. FOR GRATING PANELS WITH CUTOUTS/ OPENINGS; STRENGTHENING SHALL BE CARRIED OUT AS PER THE DETAILS GIVEN ON SHEET 6. ADDITIONAL MEMBERS WHEREVER SHOWN SHALL BE PROVIDED IN THE STRUCTURE.
10. THE FABRICATED GRATING SHALL FULFILL THE FOLLOWING MINIMUM REQUIREMENTS:
    (a) UNFUSED JOINTS ARE NOT IN EXCESS OF 5% OF TOTAL JOINTS AND ARE WELDED BY SMAW/GMAW PROCESS.
    (b) THE JOINTS ARE ABLE TO SUSTAIN A MINIMUM PULL OUT LOAD OF 1.2 TIMES THE SHEAR CAPACITY OF THE CROSS MEMBER.
11. EVERY FIFTH MAIN MEMBER SHALL NECESSARILY BE WELDED TO THE END FLAT FROM ONE SIDE. HOWEVER, THE END MAIN MEMBER SHALL ALWAYS BE WELDED TO THE END FLATS.
12. OPENINGS UP TO 200 mm DIA ARE NOT SHOWN ON THE DRAWING. THE SAME SHALL BE MADE AT SITE DURING ERECTION OF PIPING.
13. FOR CARBON STEEL GRATING, REPAIR TO THE DAMAGED AREA OF GALVANIZED COATING DUE TO WELDING AFTER ERECTION SHALL BE CARRIED OUT AS PER RECOMMENDED PRACTICE OF IS 11759 USING COLD GALVANIZING SPRAY PROCESS. ORGANIC PAINT SYSTEM IS NOT ACCEPTABLE.
14. MAXIMUM LENGTH OF SINGLE CONTINUOUSLY SUPPORTED GRATING SHALL BE FIXED ON THE BASIS OF HANDLING. HOWEVER PREFERABLY LENGTH OF GRATING SHALL BE RESTRICTED TO 6 M.
15. GRATING FASTENER DISC AND THREADED STUDS SHALL BE CERTIFIED BY EOTA (EUROPEAN ORGANIZATION FOR TECHNICAL ASSESSMENT). FOR INSTALLATION, PILOT HOLE SHALL BE DRILLED WITHOUT SELF–TAPPING. THE STUD WITH PRE–MOUNTED NEOPRENE (FOR CS)/ CHLOROPRENE (FOR SS) WASHER SHALL BE FASTENED INTO THE PILOT HOLE WITH PREDEFINED TORQUE VALUE BASED ON THE MANUFACTURER'S GUIDELINES. THE GRATING DISC SHALL THEN BE FIXED WITH ALLEN–TYPE BIT. VENDOR SHALL PROVIDE THE ENTIRE ARRANGEMENT INCLUDING THE SPECIALIZED TOOLS WITH INSTALLATION INSTRUCTIONS. VENDOR SHALL CARRY OUT PULL OUT LOAD TEST (WITH A LOAD VALUE SPECIFIED FOR THE GRATING PANEL) ON A SAMPLE STUD. THE VENDOR SHALL ALSO PROVIDE INSTALLATION TRAINING TO THE SITE WORKERS. HOT WORK PERMIT (NON–OPEN FLAME TYPE) MAY BE REQUIRED FOR INSTALLATION OF GRATING WITH DISC MECHANISM BASED ON HEAT DISSIPATION REPORT PROVIDED BY THE VENDOR.

    CARBON STEEL STUDS & DISC SHALL BE HOT DIP GALVANIZED (MIN. 900 gm/sqm FOR DISC & MIN. AVERAGE 375 gm/sqm FOR STUDS) OR SHALL HAVE A COATING THAT CAN WITHSTAND NEUTRAL SALT SPRAY TEST OF 2000H AS PER DIN EN ISO 9227.
16. STAINLESS STEEL GRATINGS INCLUDING LOCALIZED WELDING AREAS SHALL BE CHEMICALLY TREATED AS PER ASTM A380/A380M.
17. FOR STAINLESS STEEL GRATINGS, ELECTRODE OF GRADE E309L SHALL BE USED.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
6	04.07.24	REVISED & ISSUED AS STANDARD	JITENDER	AMARJEET	ANURAG SINHA	MAINAK NANDI
5	29.12.22	REVISED & ISSUED AS STANDARD	JITENDER	AMARJEET	ANURAG SINHA	S.MAZUMDAR

TABLE–1

USE OF GRATING TYPE AT VARIOUS LOCATIONS & NET SAFE WORKING LOADS FOR GRATING TYPE–I & II

TYPE	APPLICATION	l	500 TO 800	900	1000	1100	1250	1400
		EITHER OF w(UDL IN KN/SQM) OR P(LINEAR LOAD IN KN/M)						
I	1. EQUIPMENT PLATFORM 2. WALKWAY FOR CABLE TRAY IN PIPE RACK 3. OPERATING PLATFORM FROM GRADE/SUPER STRUCTURE 4. APPROACHES	w	19.60	14.80	10.80	8.10	5.30	3.40
		P	9.00	8.00	6.60	5.40	4.00	2.70
II	1. STAIRS 2. FLOOR GRATING FOR a) COMPRESSOR HOUSE b) TECHNOLOGICAL STRUCTURE c) PIPE RACK WITH VALVE / PIPE SUPPORTS d) MAINTENANCE PLATFORM	w	19.60		17.60	13.20	8.70	5.50
		P	14.60	13.00	10.70	8.80	6.30	4.40

NOTE:– THE NET SAFE WORKING LOADS GIVEN ON TABLE–1 ARE BASED ON LIMITING VERTICAL DEFLECTION OF SPAN/200 OR 6mm, WHICHEVER IS LESS.

SYMBOLS :–

l = EFFECTIVE SPAN IN mm

b = BEARING WIDTH IN mm

w = UDL IN KN/SQM

P = LINEAR LOAD IN KN/M AT MID SPAN ALONG PANEL WIDTH.

 = GRATING SPAN DIRECTION

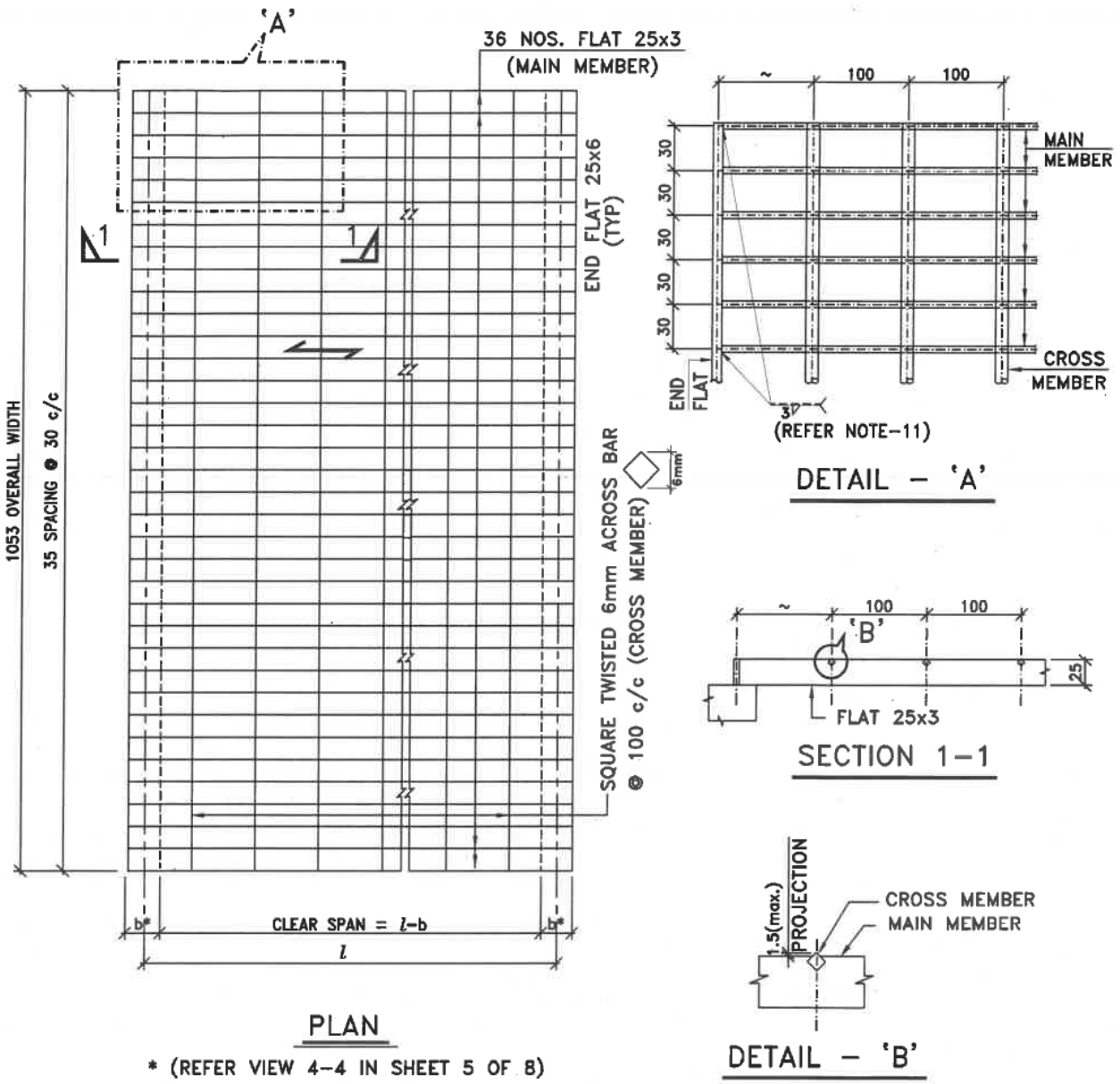


TABLE-2

WT. OF GRATING IN kg/m² (INDICATIVE ONLY, NOT FOR PAYMENT)				PROPERTIES WIDTH = 1053mm			REMARKS
FLAT 25x6	FLAT 25x3	SQUARE TWISTED 6mm ACROSS BAR	TOTAL	Ixx cm^4	Zxx cm^3	MR kgm	WEIGHT OF WELD, CLAMPS/DISC, GALVANISATION, ETC. NOT CONSIDERED
2.35	19.89	1.80	24.04	14.84	11.87	195.94	

GRATING TYPE - I

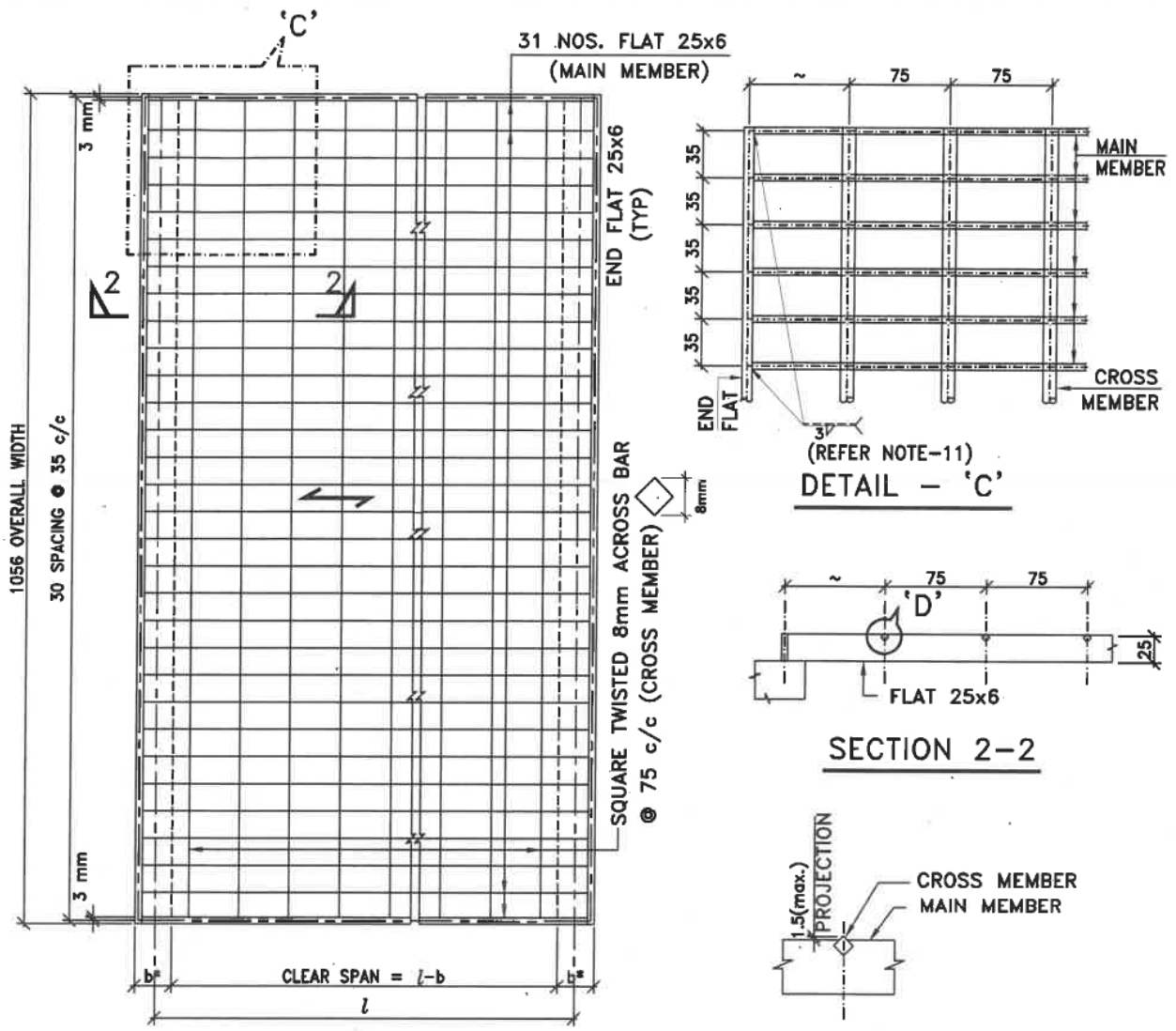
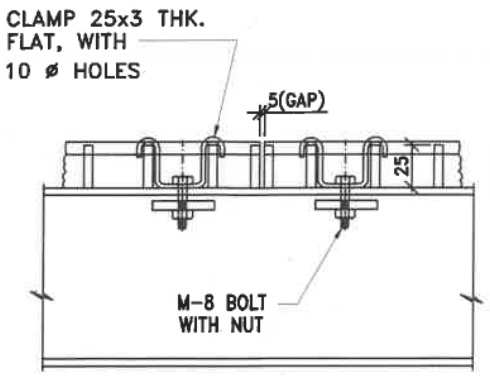


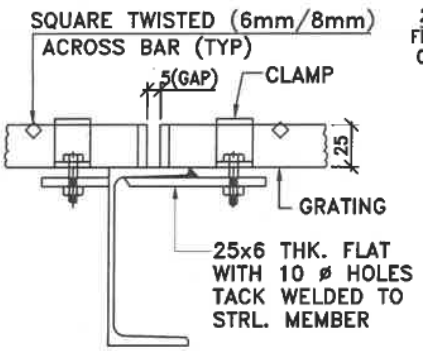
TABLE-3

WT. OF GRATING IN kg/sqm (INDICATIVE ONLY, NOT FOR PAYMENT)			PROPERTIES WIDTH = 1056mm			REMARKS
FLAT 25x6	SQUARE TWISTED 8mm ACROSS BAR	TOTAL	Ixx cm^4	Zxx cm^3	MR kgm	WEIGHT OF WELD, CLAMPS/DISC, GALVANISATION, ETC. NOT CONSIDERED
36.49	3.23	39.72	24.2	19.4	319.69	

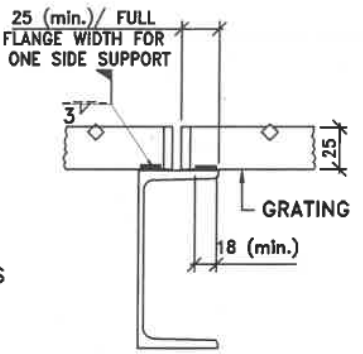
GRATING TYPE – II



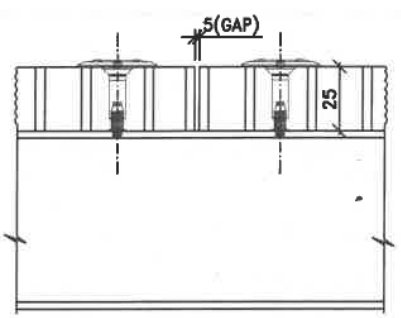
VIEW 3-3
GRATING FIXED WITH CLAMP



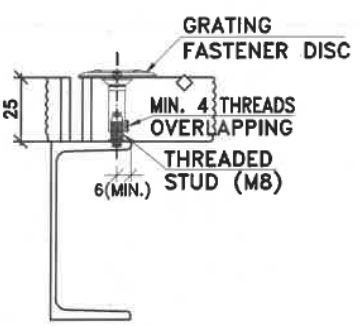
VIEW 4-4
GRATING FIXED WITH CLAMP
(REFER NOTE-8, 13 & 16)



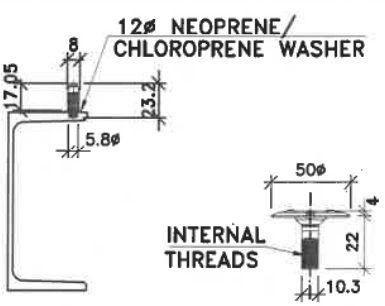
VIEW 4-4/VIEW 4B-4B
GRATING FIXED WITH WELDING
(REFER NOTE-8, 13 & 16)



VIEW 4A-4A
GRATING FIXED WITH DISC

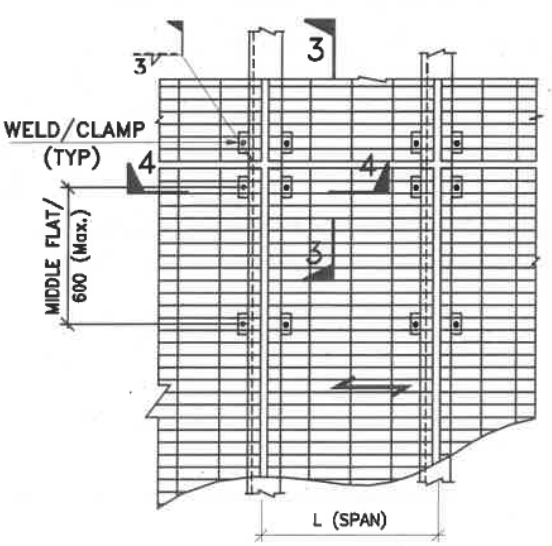


VIEW 4B-4B
GRATING FIXED WITH DISC
(REFER NOTE-8, 13, 15 & 16)

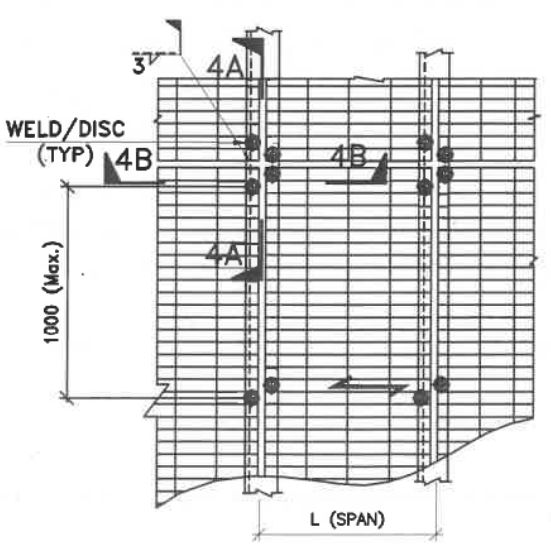


THREADED STUD FIXING DETAILS
(REFER NOTE-15)

GRATING FASTENER DISC DETAILS
(REFER NOTE-15)

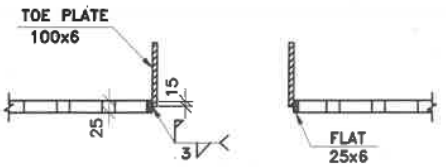


OPTION-1
(WITH CLAMP)



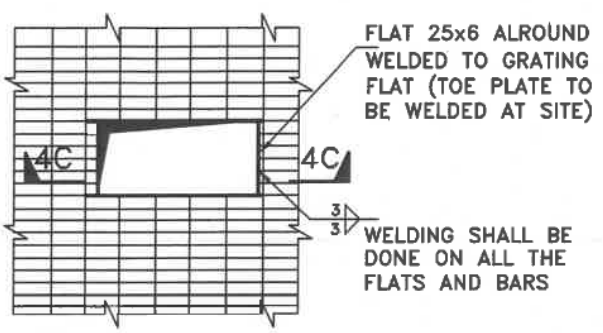
OPTION-2
(WITH DISC)

FIXING DETAIL OF GRATING PANELS

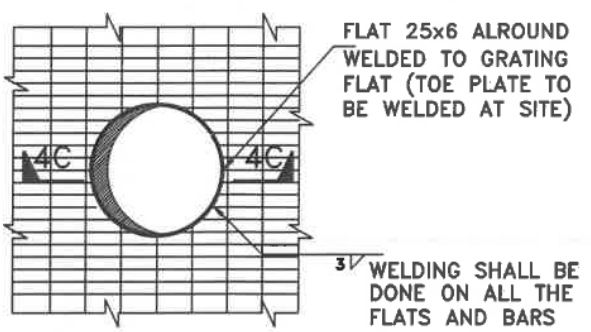


SEC. 4C–4C

(REFER NOTE–5, 13 & 16)



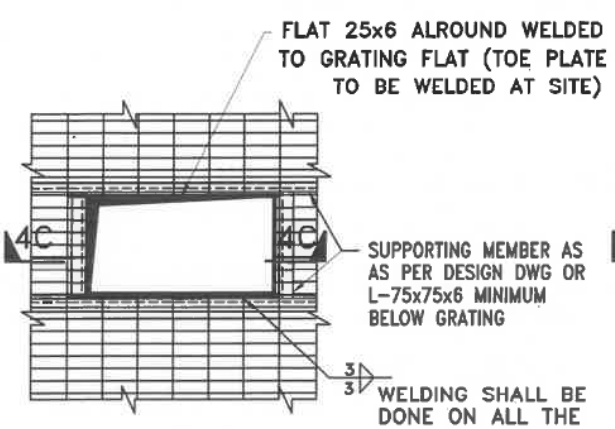
RECTANGULAR



CIRCULAR

(SIZE OF OPENING >200 & UP TO 400 mm)

(FOR OPENING UP TO 200 MM REFER NOTE–12)



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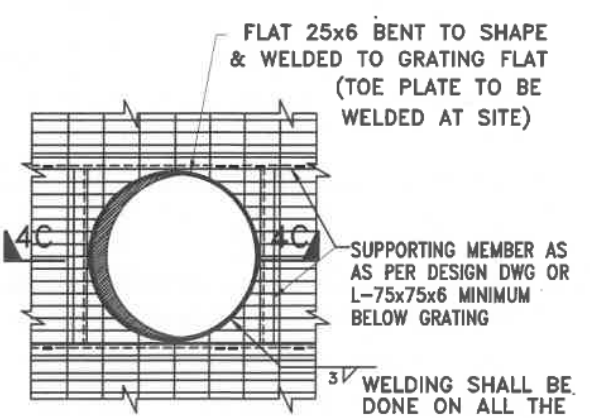


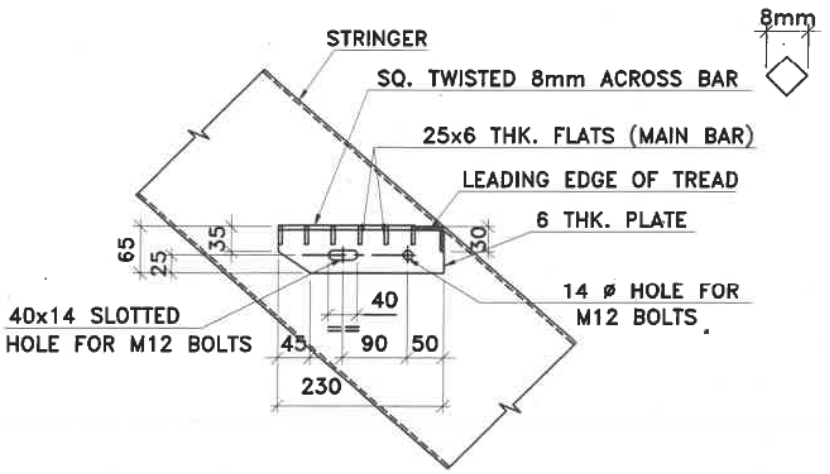
CIRCULAR

SIZE OF OPENING GREATER THAN 400 mm

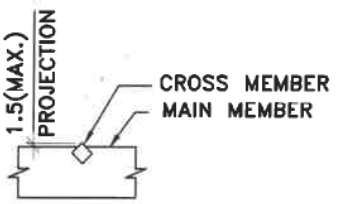
TYPICAL DETAIL OF GRATING STRENGTHENING AT OPENINGS

(REFER NOTE–9)

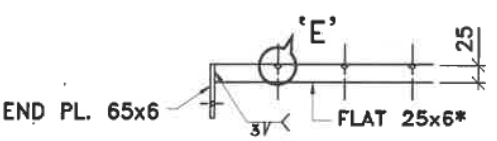
DET. OF 25 THK. GRATING STAIRCASE TREAD FOR 750 & 1000 WIDE STAIR



VIEW 6–6

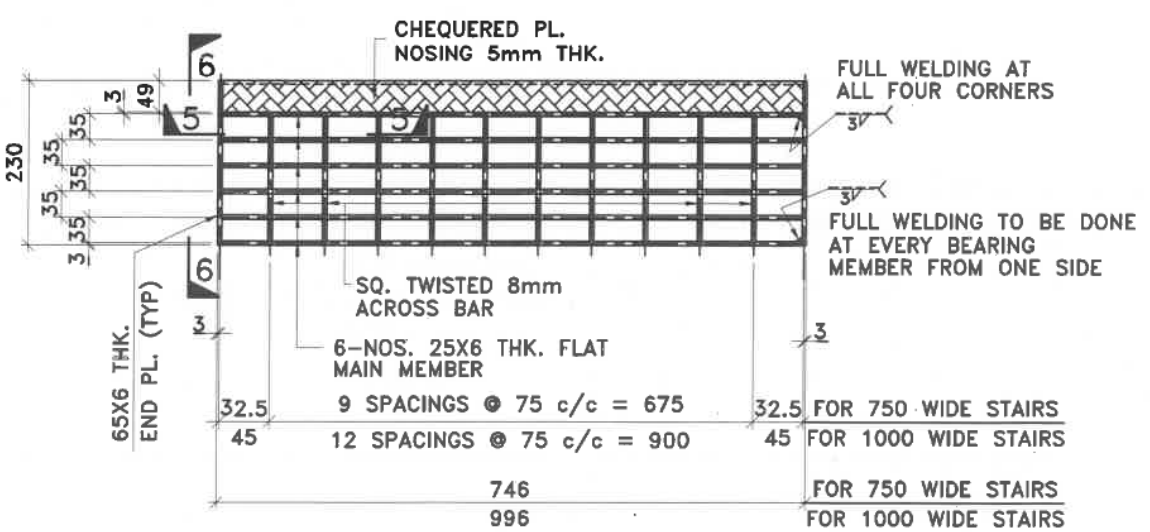


DETAIL– 'E'



SECTION 5–5

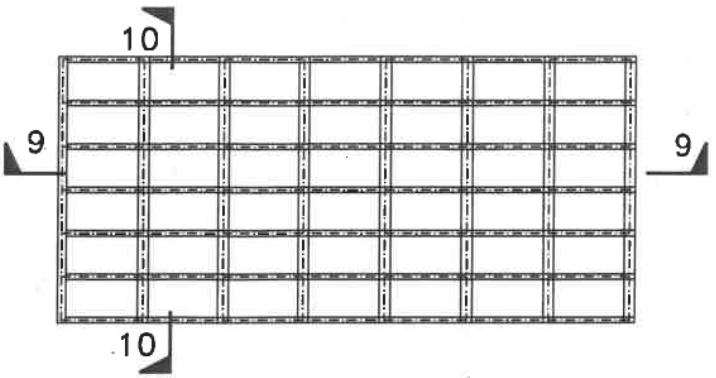
*ALL THE FLATS TO BE WELDED TO THE END FLATS

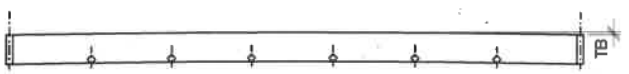


PLAN

(REFER NOTE–13 & 16)

TYP. DETAIL OF GRATING TO BE USED AS TREAD FOR 750/1000 WIDE STAIRS





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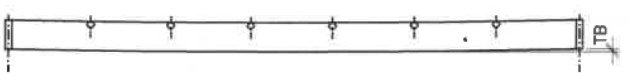
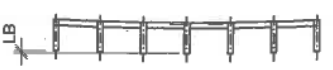


SECTION 9–9
(TB=TRANSVERSE BOW)

OR

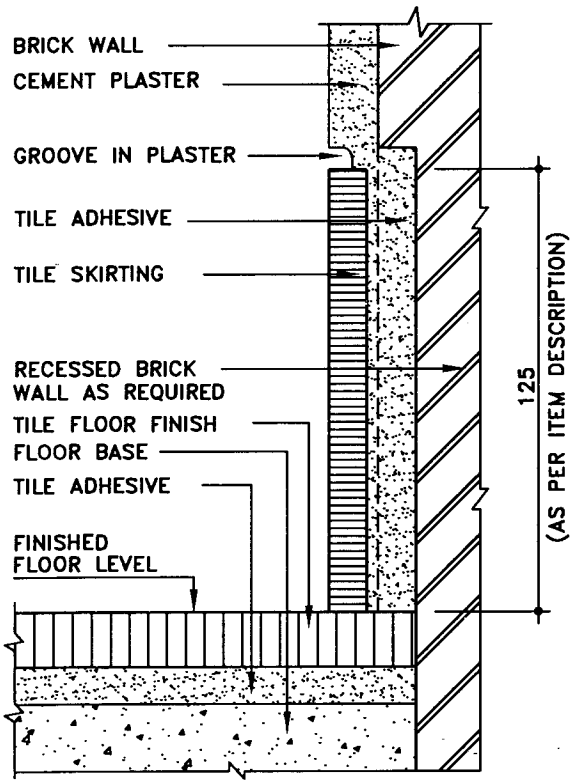


SECTION 10–10
(LB=LONGITUDINAL BOW)

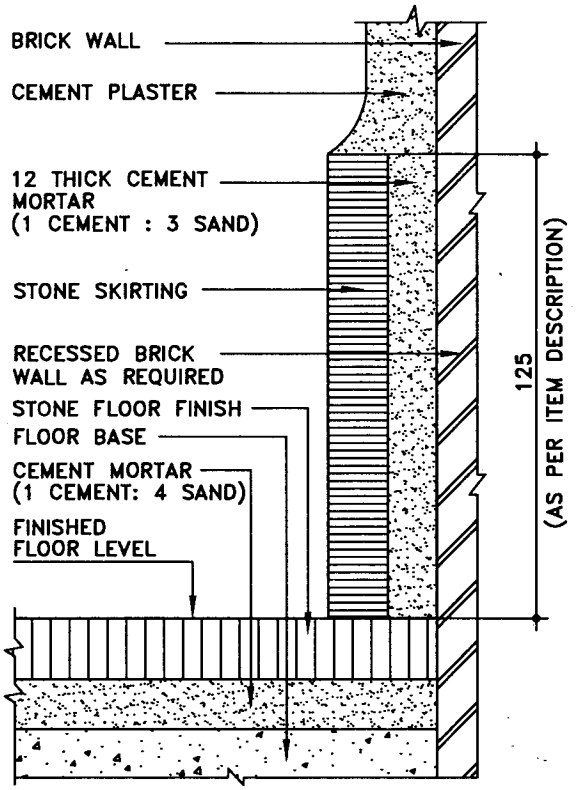
TABLE–4 (PERMISSIBLE AND MANUFACTURER TOLERANCES)

PERMISSIBLE TOLERANCES LOCATION	TOLERANCE (MM)
LENGTH OF GRATING PANEL OR INDIVIDUAL BEARING BAR	+0 / –5
WIDTH OF GRATING	+0 / –5
DEPTH OF BEARING BAR: FOR 25MM	+1 / –0.5
THICKNESS OF BEARING BAR:	±0.4
BINDING: TOP OF CROSS BAR ABOVE MAIN BAR	+0.5 / –0.5
MANUFACTURING TOLERANCES LOCATION	TOLERANCE (MM)
DIFFERENCE BETWEEN THE LENGTH OF DIAGONALS	±5 (OUT OF SQUARENESS OF GRATING PANEL)
CROSS BARS IN EITHER DIRECTION FROM PERPENDICULAR ALIGNMENT WITH MAIN BARS	1:100
CROSS BAR SPACING	±5 PER 1500 LENGTH OF BEARING BARS
BEARING BAR LEAN	1:10
TRANSVERSE BOW (TB) OF PANEL BEFORE FASTENING TO SUPPORTS	1:100
LONGITUDINAL BOW (LB) OF PANEL BEFORE FASTENING TO SUPPORTS	1:200

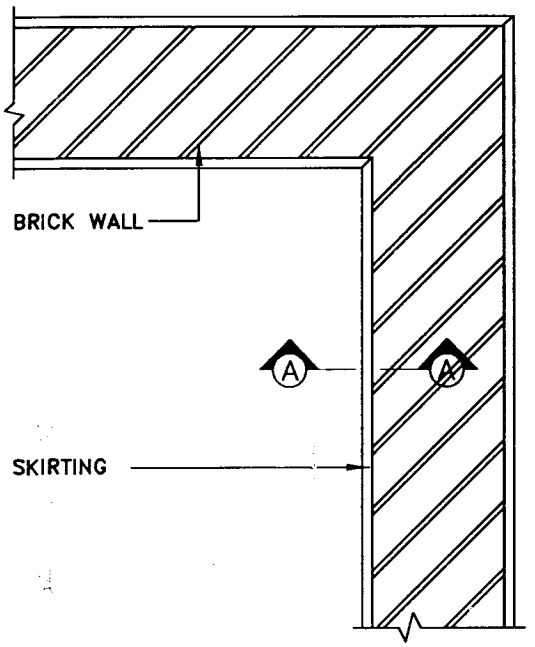
SKIRTING DETAIL (WITH BRICK WALL)



SECTION A–A
(TILE FLOORING–FLUSH SKIRTING)

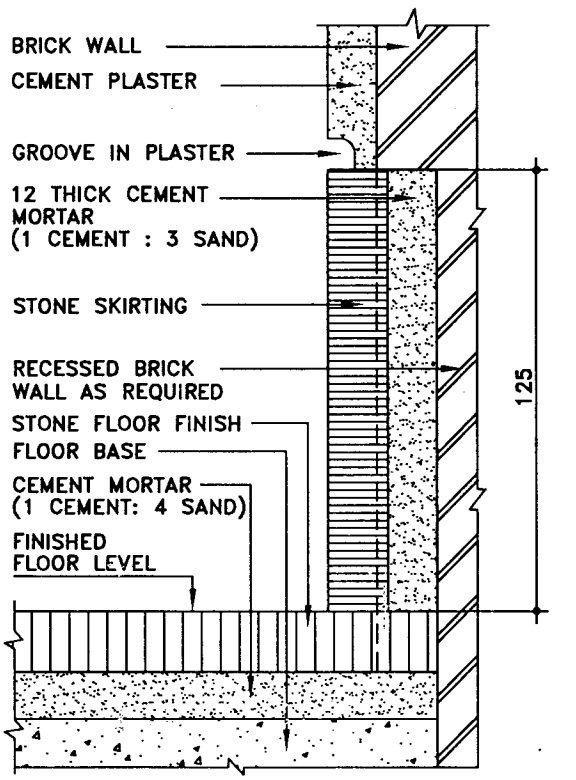


SECTION A–A
(STONE FLOORING–RAISED SKIRTING)



PLAN

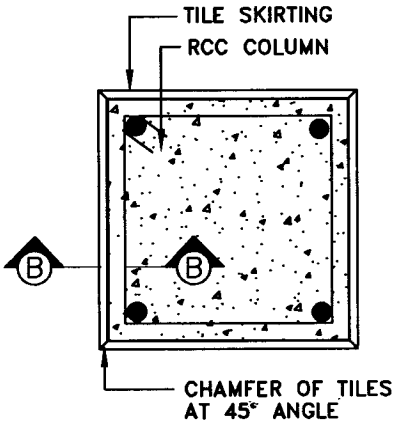
NOTE: ALL DIMENSIONS ARE IN MM



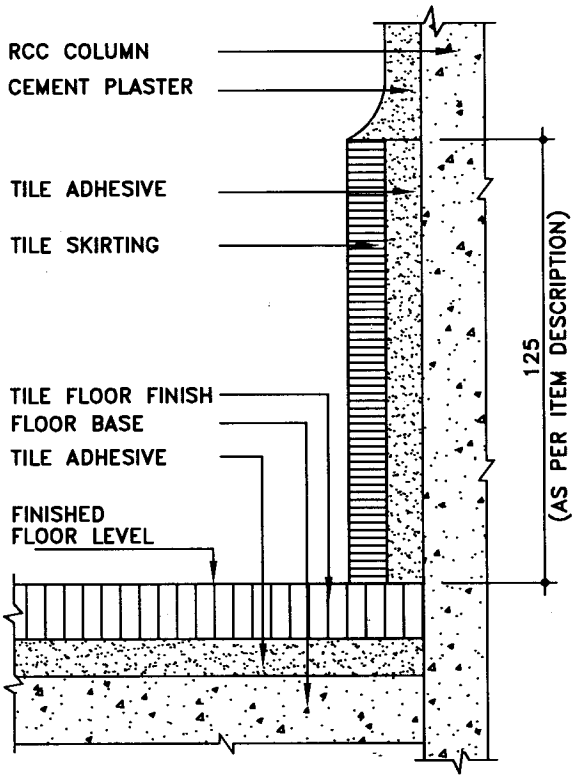
SECTION A–A
(STONE FLOORING–FLUSH SKIRTING)

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	11.02.22	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	ANISH MAHALA	SAMIR DAS	SANJAY MAZUMDAR
5	07.11.16	REAFFIRMED & ISSUED AS STANDARD	DK	JS/JKB	RAJANJI SRIVASTAVA	R. NANDA

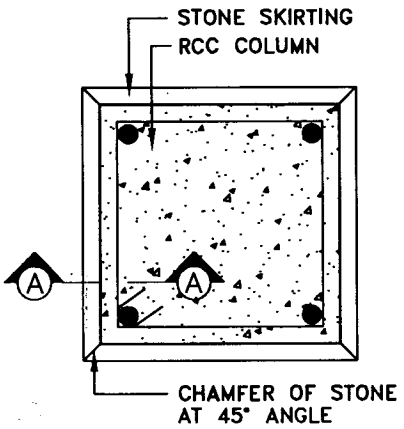
Approved by



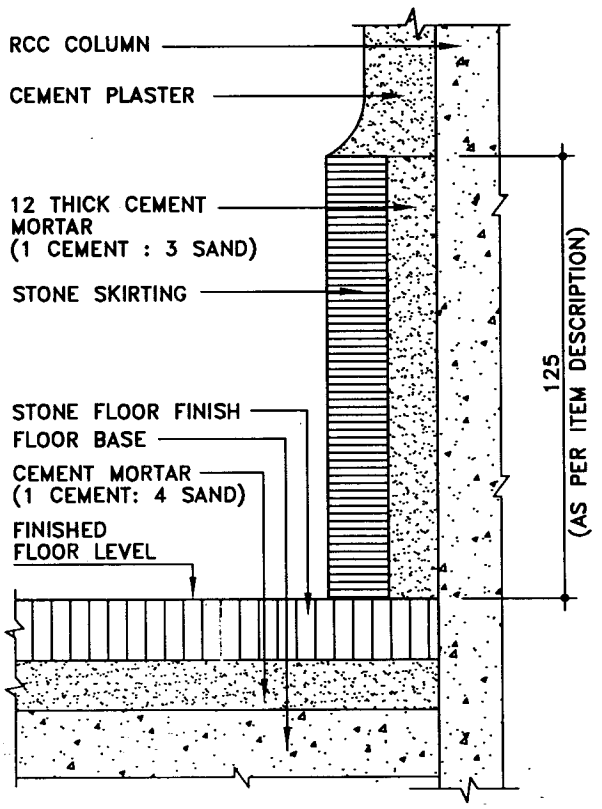
PLAN
(TILE SKIRTING)



SECTION B–B



PLAN
(STONE SKIRTING)



SECTION A–A

NOTE: ALL DIMENSIONS ARE IN MM

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
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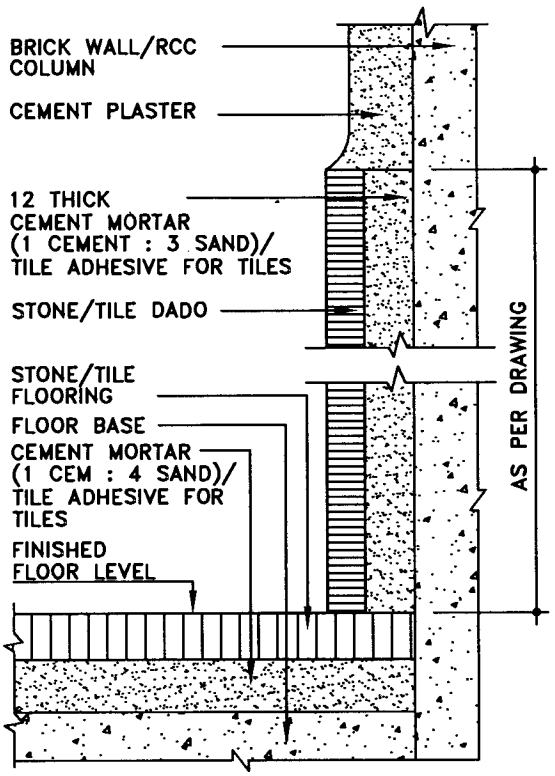
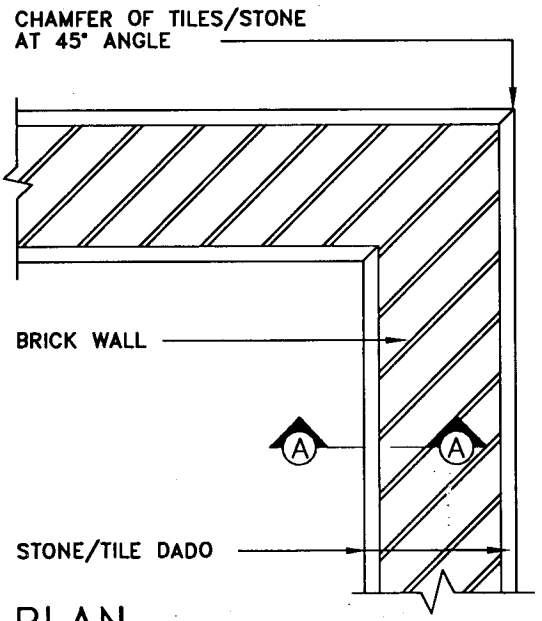
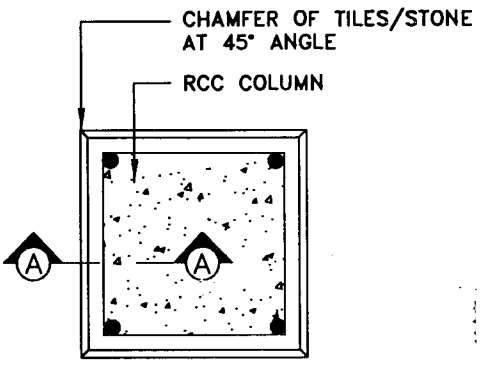
6	11.02.22	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	ANISH MAHALA	SAMIR DAS	SANJAY MAZUMDAR
5	07.11.16	REAFFIRMED & ISSUED AS STANDARD	DK	JS/JKB	RAJANJI SRIVASTAVA	R. NANDA



SECTION A–A



PLAN
(DADO ON BRICK WALL)



PLAN
(DADO ON RCC COLUMN)

NOTE: ALL DIMENSIONS ARE IN MM

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
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6	11.02.22	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	ANISH MAHALA	SAMIR DAS	SANJAY MAZUMDAR
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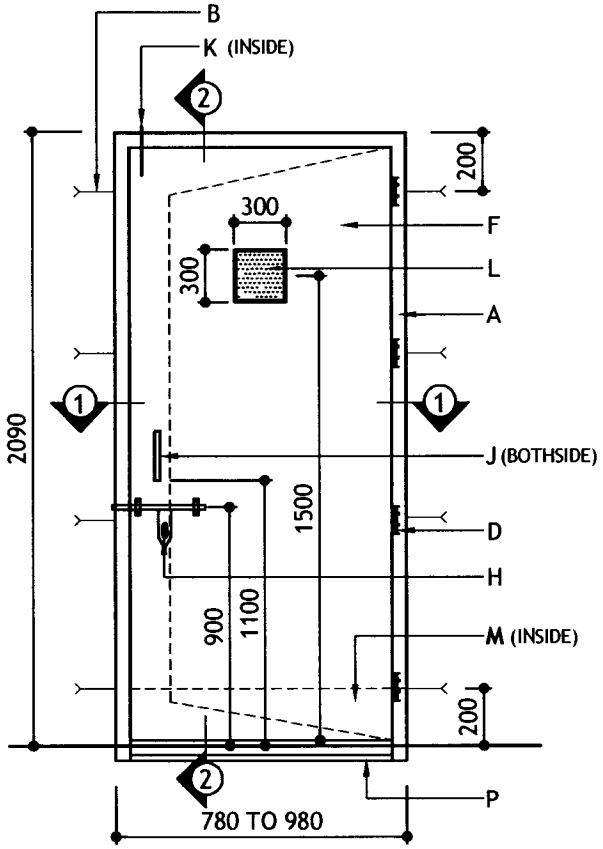
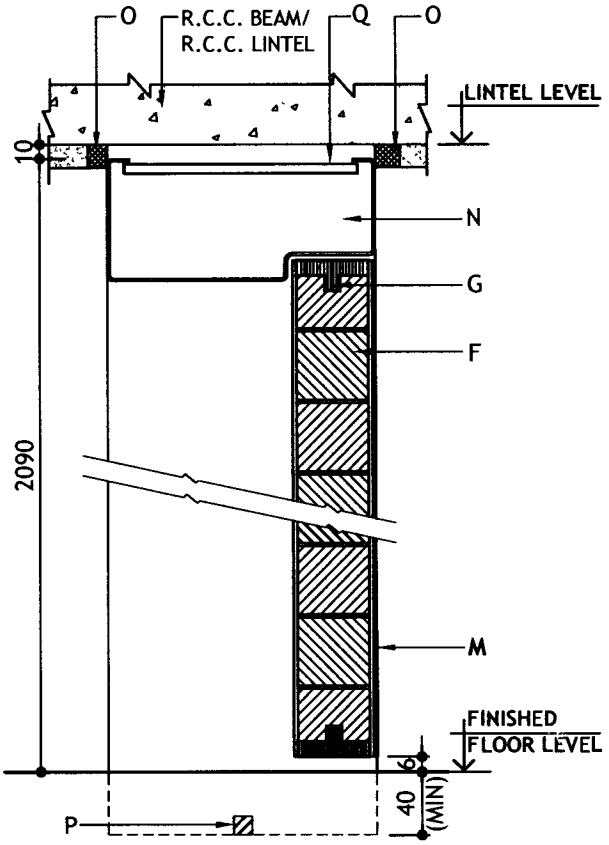
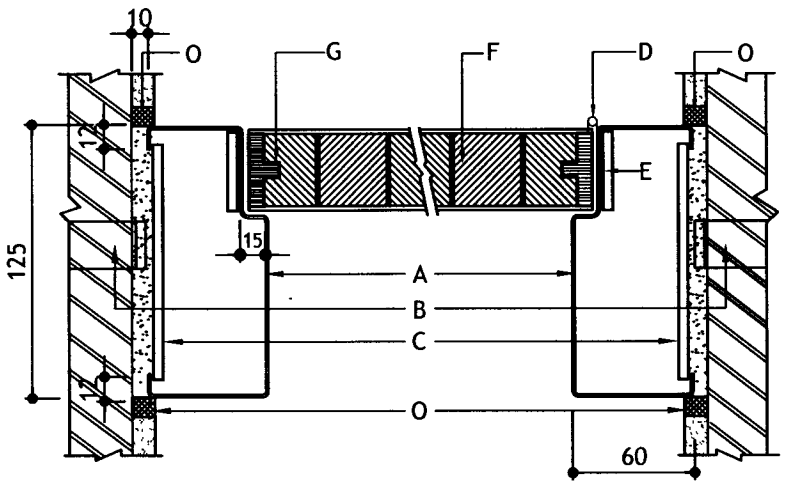
WOODEN FLUSH DOOR
(WITH PRESSED STEEL FRAME)



ELEVATION



SECTION 2-2



SECTION 1-1

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. FOR SHUTTER FINISH REFER TO DRAWINGS AS/TENDER ITEM.
3. DOOR CLOSER & DOOR STOPPER SHALL BE PROVIDED AS PER TENDER ITEM.

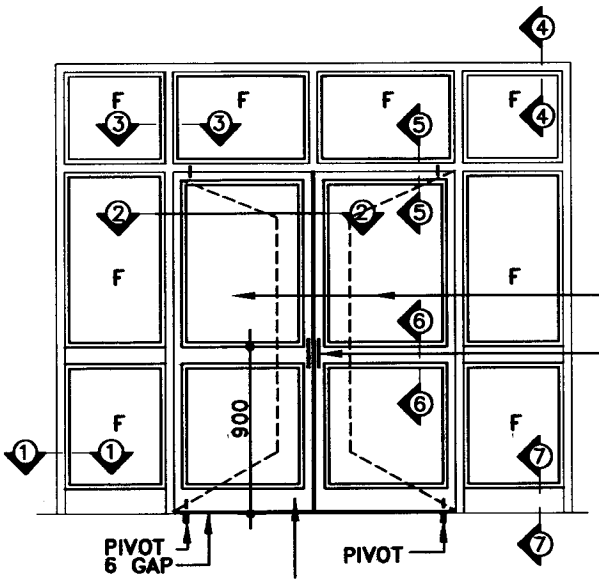
LEGEND :

A : 16 SWG PRESSED STEEL FRAME FINISHED AS PER TENDER ITEMS.
B : 25x6-300 LONG M.S. HOLDFAST/FASTENER @ MAXIMUM 600 C/C WELDED TO FRAME SPACER.
C : 50x6 THICK M.S. FLAT SPACER WELDED TO FRAME AT HOLD FAST LOCATIONS.
D : 150 LONG M.S. BUTT HINGE @ MAXIMUM 600 C/C SCREWED TO FRAME AND SHUTTER.
E : 40x3-150 LONG M.S PAD WELDED TO FRAME AT ALL HINGE & LOCK LOCATIONS.
F : 35 THICK FLUSH DOOR SHUTTER (AS PER ITEM / SPECIFICATION).
G : TEAK WOOD LIPPING
H : ALDROP/MORTICE LOCK (AS PER REQUIREMENT)
J : HANDLE BOTHSIDE (AS PER REQUIREMENT).
K : 10 DIA x 250 LONG ALUMINIUM TOWER BOLT INSIDE.
L : VISION PANEL WITH 4mm THK GLASS WITH 15x15 TEAK WOOD BEADING (AS PER REQUIREMENT).
M : 200x3 PLASTIC KICK PLATES FIXED WITH STEEL SCREWS (AS REQUIRED).
N : CAVITY FILLED WITH CONCRETE OR PHENOLIC FOAM.
O : 12X10 GROOVE IN PLASTER FILLED WITH POLYSULPHIDE SEALANT.
P : 12mm M.S. SQUARE BAR (TIE) WELDED TO BOTH ENDS OF VERTICAL MEMBER OF FRAME.
Q : 25x3 THICK M.S. FLAT SPACER @500 C/C MAXIMUM.

Rev. No	Date	Purpose	Prepared by	Checked by	Stds Committee Convenor	Stds. Bureau Chairman
6	12.04.21	REVISED & ISSUED AS STANDARD	M L THAKUR	SAMIR DAS	ANURAG SINHA	SANJAY MAZUMDAR
5	19.10.15	REVISED & ISSUED AS STANDARD	BABITA/GJK	SD/JKB	RAJANJI SRIVASTAVA	S. CHANDA

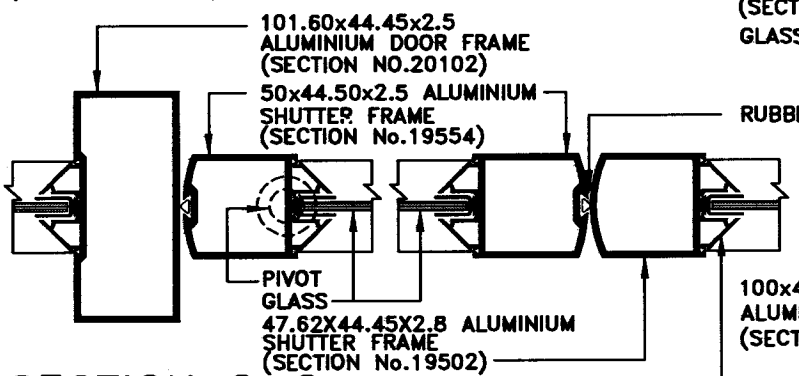
Approved by

GLAZED ALUMINIUM DOOR

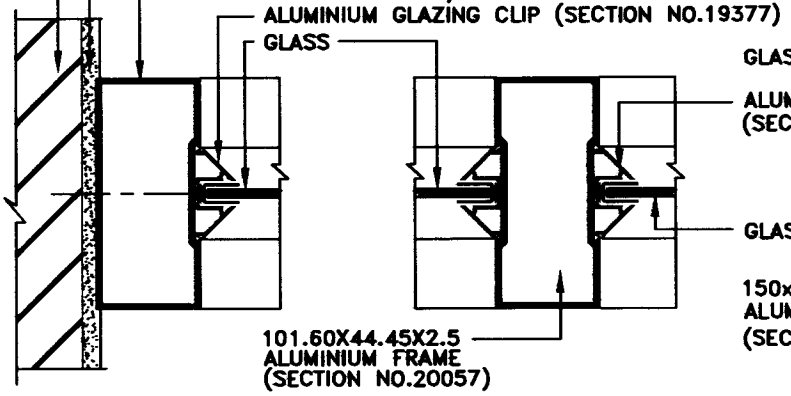


ELEVATION
(F-FIXED GLAZING)

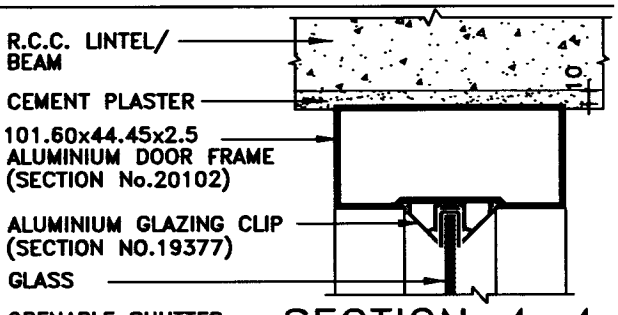
ALUMINIUM BOTTOM RAIL
(SECTION NO.19584)



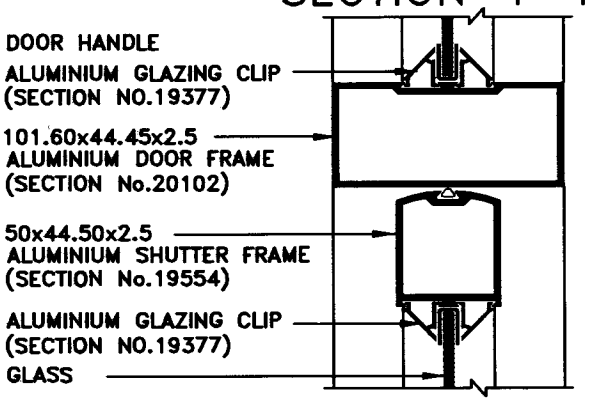
SECTION 2-2



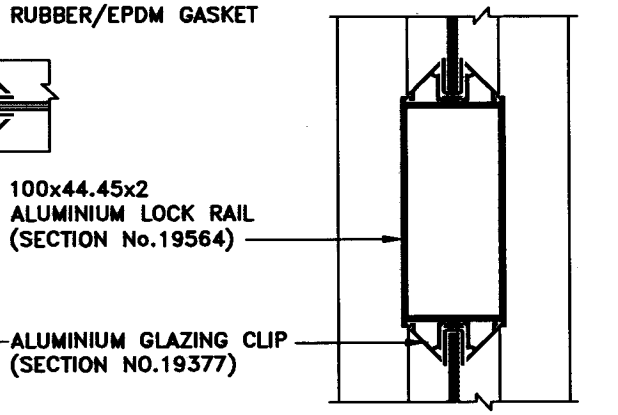
SECTION 1-1 SECTION 3-3



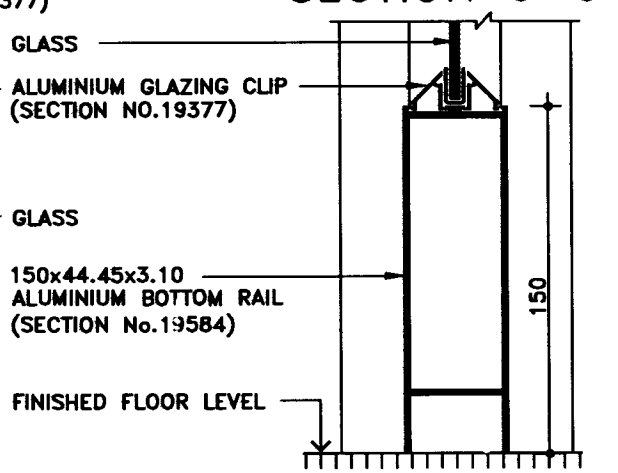
SECTION 4-4



SECTION 5-5



SECTION 6-6



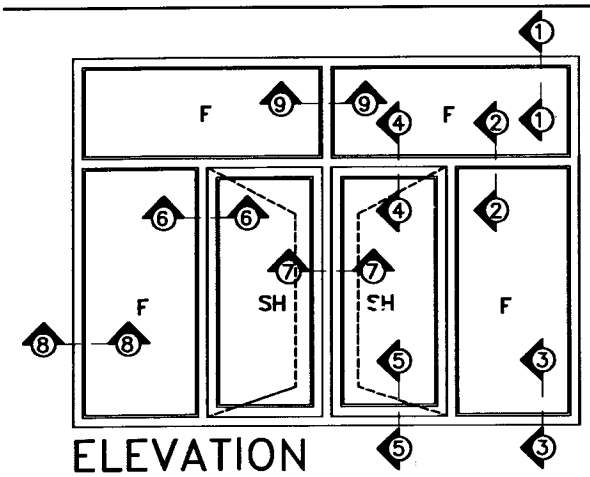
SECTION 7-7

NOTES:

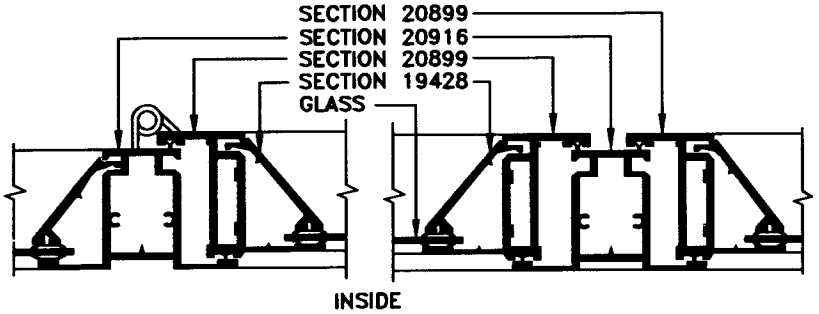
1. ALL DIMENSIONS ARE IN MM.
2. THE SECTION DESIGNATION NOS. PERTAIN TO EXTRUDED ALUMINIUM SECTIONS OF "JINDAL ALUMINIUM LTD." AND ARE INDICATED FOR REFERENCE. EQUIVALANT SECTIONS OF OTHER APPROVED MANUFACTURERS CAN ALSO BE USED.
3. FOR FINISHING OF ALUMINIUM SECTION (ANODISED/POWDER COATING) REFER BID/TENDER.
4. RUBBER/EPDM GASKET SHALL BE USED FOR FIXING OF GLASS.
5. HARDWARE SHALL BE AS PER BID/TENDER.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	02.02.22	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	ANISH MAHALA	SAMIR DAS	SANJAY MAZUMDAR
5	21.03.17	REAFFIRMED & ISSUED AS STANDARD	DK	JS/JKB	RAJANJI SRIVASTAVA	R. NANDA

Approved by

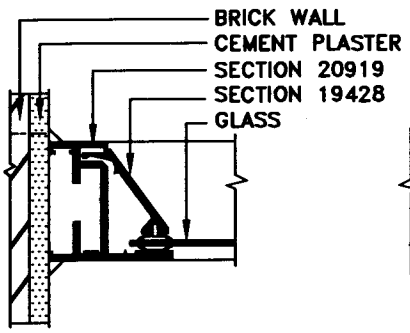


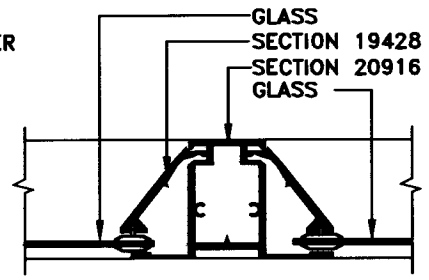
ELEVATION
(F–FIXED GLAZING)
(SH–SIDE HUNG SHUTTER)



SECTION 6–6

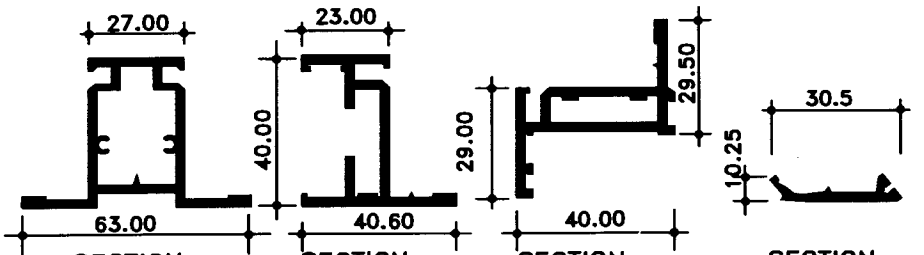
SECTION 7–7



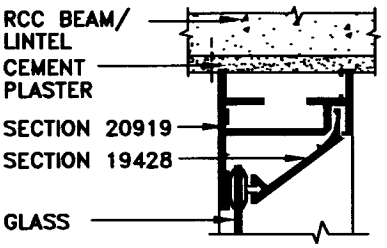


SECTION 8–8

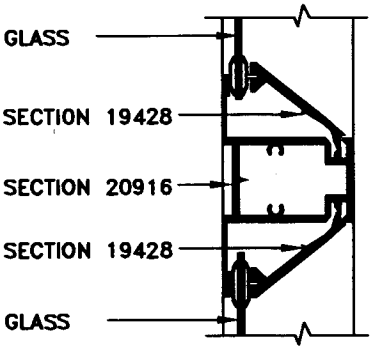
SECTION 9–9



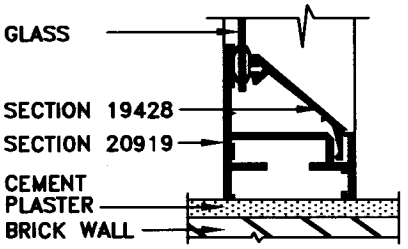
NOTE:
1. ALL DIMENSIONS ARE IN MM.
2. THE SECTION DESIGNATION NOS. PERTAIN TO EXTRUDED ALUMINIUM SECTIONS OF "JINDAL ALUMINIUM LTD." AND ARE INDICATED FOR REFERENCE. EQUIVALANT SECTIONS OF OTHER APPROVED MANUFACTURERS CAN ALSO BE USED.
3. FOR FINISHING OF ALUMINIUM SECTION (ANODISED/POWDER COATING REFER BID/TENDER.
4. RUBBER/EPDM GASKET SHALL BE USED FOR FIXING OF GLASS.
5. HARDWARE AND GLASS SHALL BE AS PER BID/TENDER.



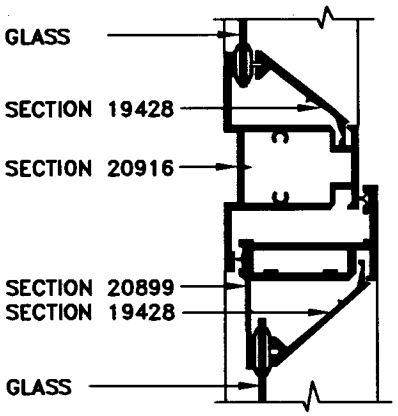
SECTION 1–1



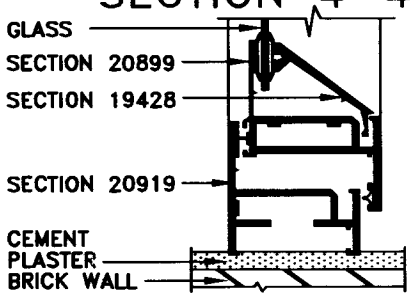
SECTION 2–2



SECTION 3–3



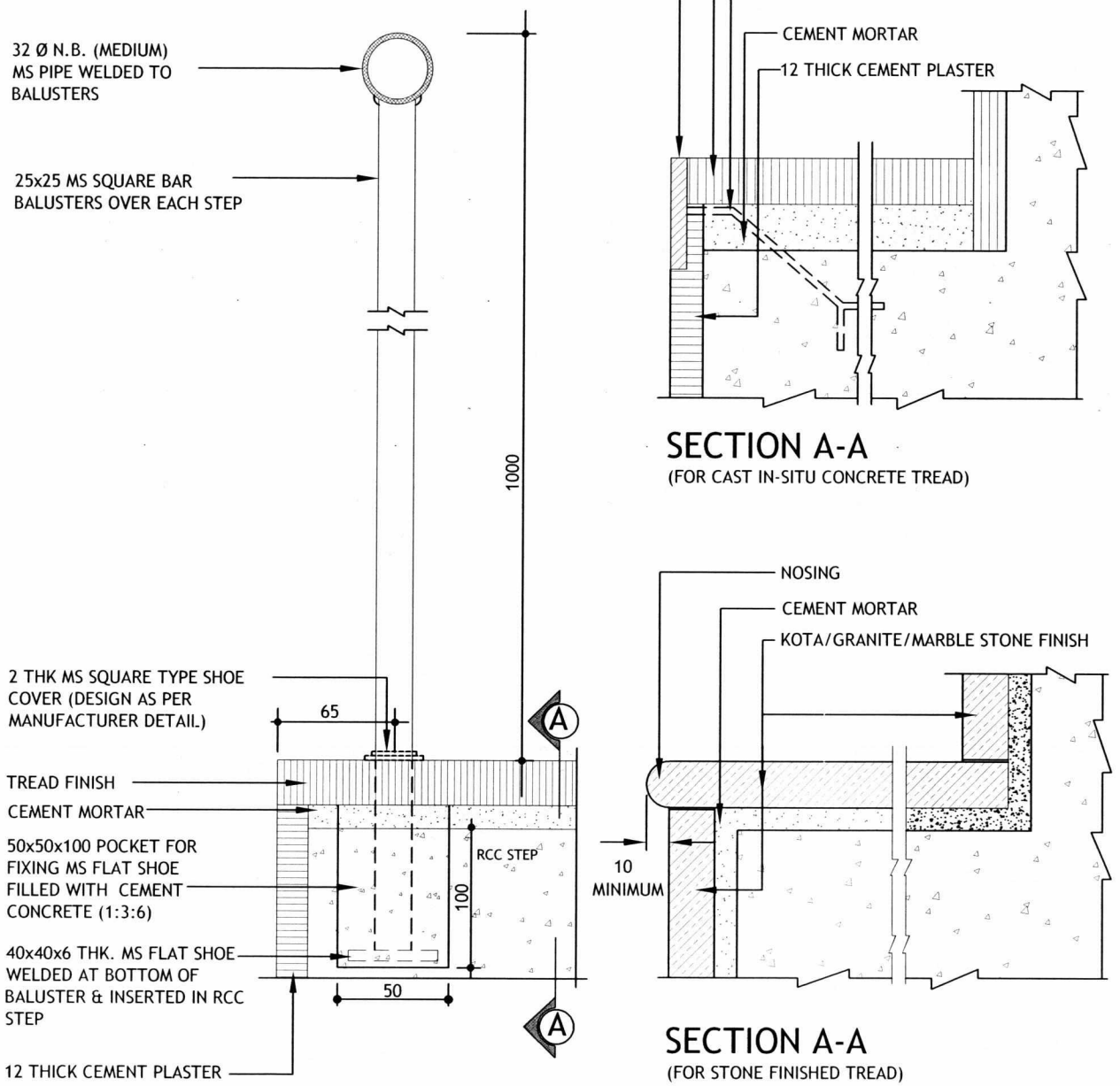
SECTION 4–4



SECTION 5–5

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	02.02.22	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	ANISH MAHALA	SAMIR DAS	SANJAY MAZUMDAR
5	21.03.17	REAFFIRMED & ISSUED AS STANDARD	DK	JS/JRB	RAJANJI SRIVASTAVA	R. NANDA

Approved by

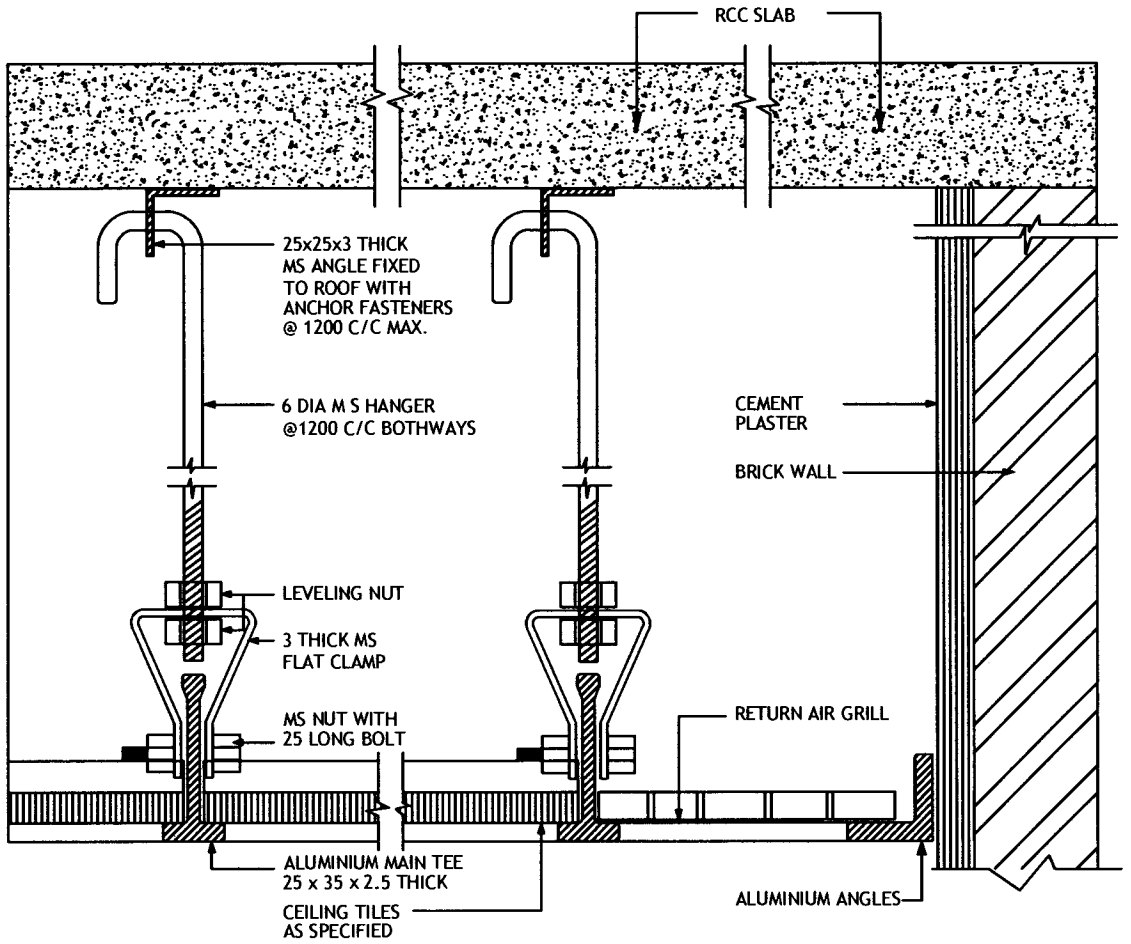


DETAIL OF HANDRAIL

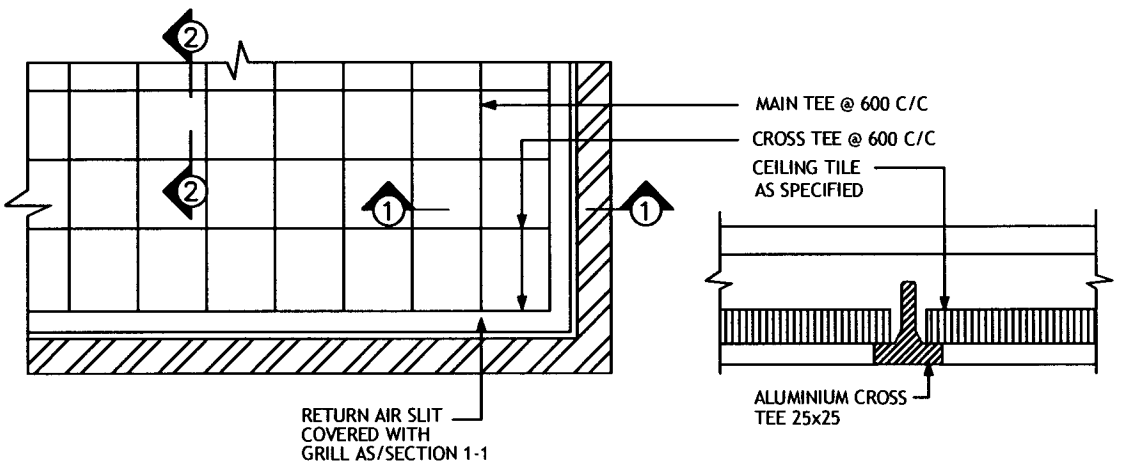
NOTE: 1. ALL DIMENSIONS ARE IN MM.
2. RISER, TREAD AND SKIRTING SHALL BE OF SAME FINISH

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
7	16.10.23	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	SANDEEP	SAMIR DAS	SANJAY MAZUMDAR
6	02.01.19	ISSUED AS STANDARD	SG	SD	RS	R K TRIVEDI

Approved by



SECTION AT 1-1



PLAN (PART)

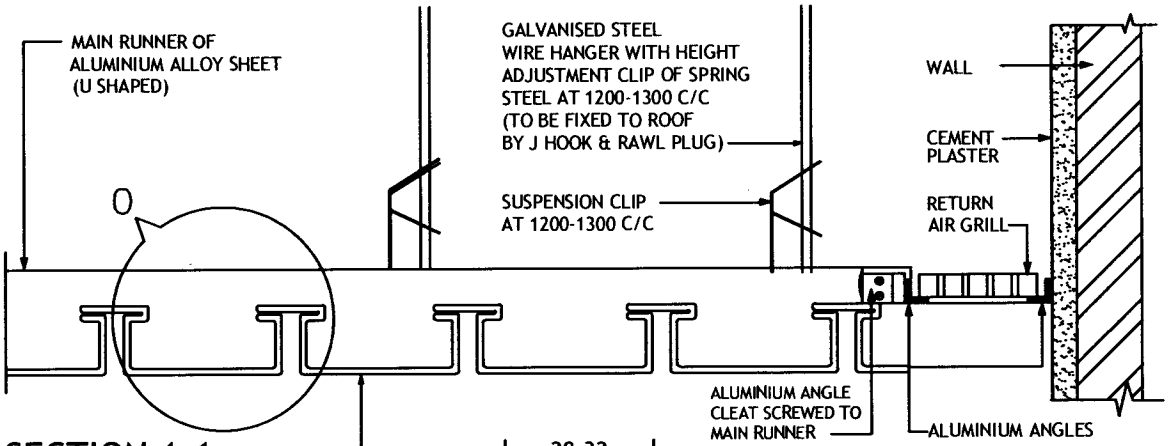
SECTION AT 2-2

(ELECTRICAL, A/C FIXTURE LOCATIONS SHALL BE AS PER DETAIL DRAWING)

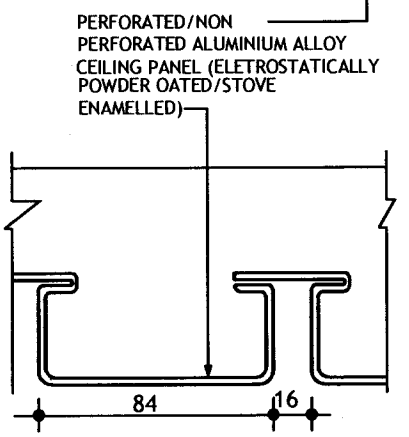
NOTE: ALL DIMENSIONS ARE IN MILLIMETRES.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	30.03.21	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	SAMIR DAS	ANURAG SINHA	SANJAY MAZUMDAR
5	02.03.16	REVISED & ISSUED AS STANDARD	DK	SD/JKB	RAJANJI SRIVASTAVA	S. CHANDA

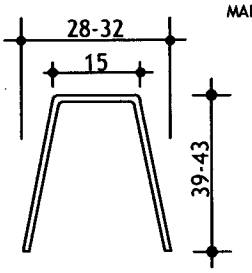
Approved by



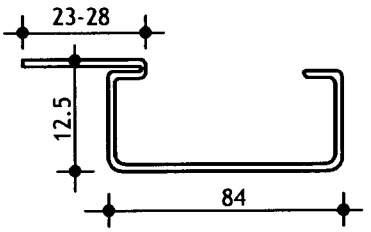
SECTION 1-1



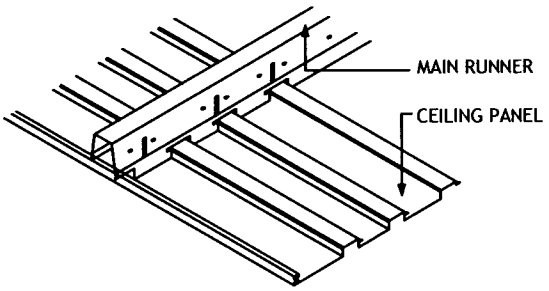
DETAIL AT 'O'



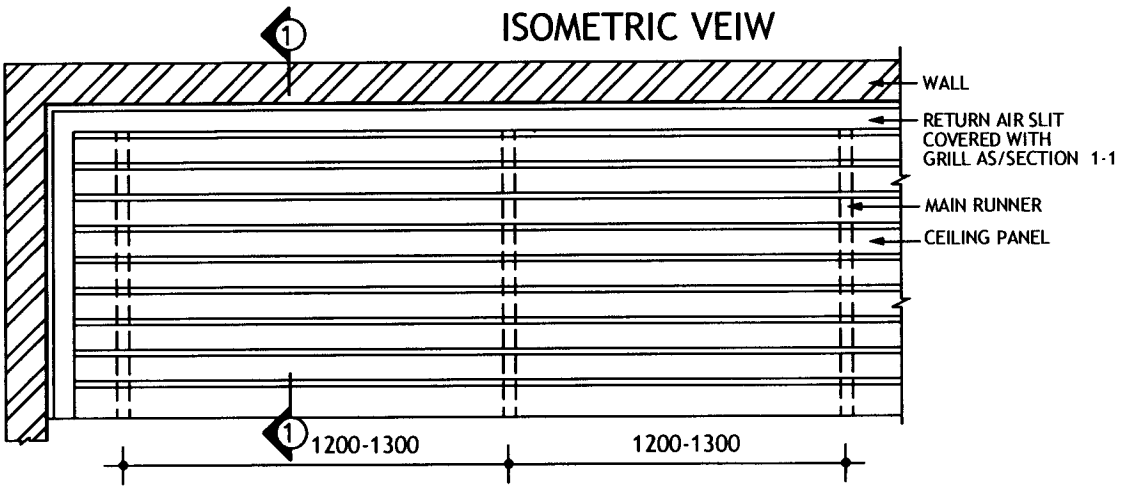
SECTION
(MAIN RUNNER)



SECTION
(PANEL)



ISOMETRIC VEIW

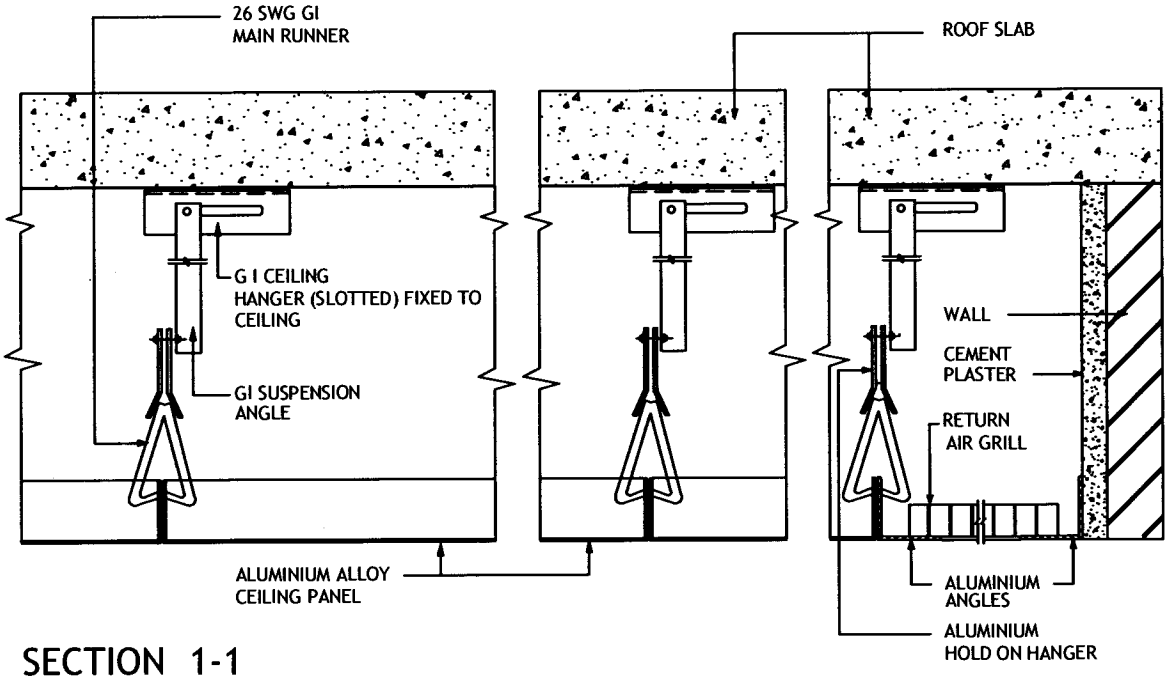


REFLECTED CEILING PLAN (PART)

(ELECTRICAL, A/C FIXTURE LOCATIONS SHALL BE AS PER DETAIL DRAWING)

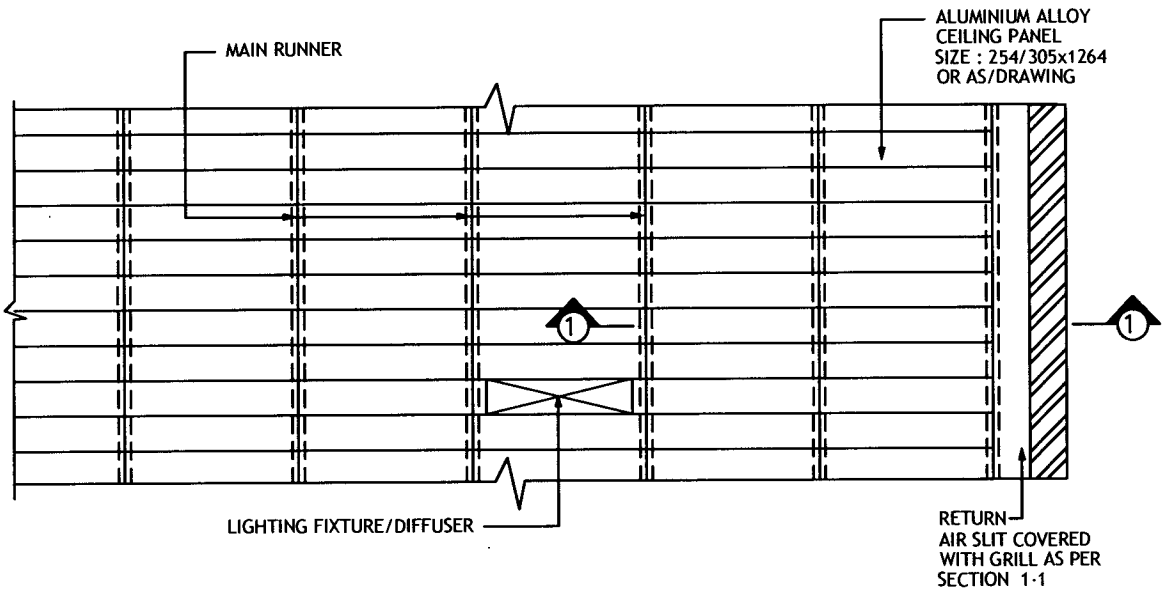
NOTE: ALL DIMENSIONS ARE IN MILLIMETRES.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
6	30.03.21	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	SAMIR DAS	ANURAG SINHA	SANJAY MAZUMDAR
5	02.03.16	REVISED & ISSUED AS STANDARD	DK	SD/JKB	RAJANJI SRIVASTAVA	S. CHANDA



SECTION 1-1

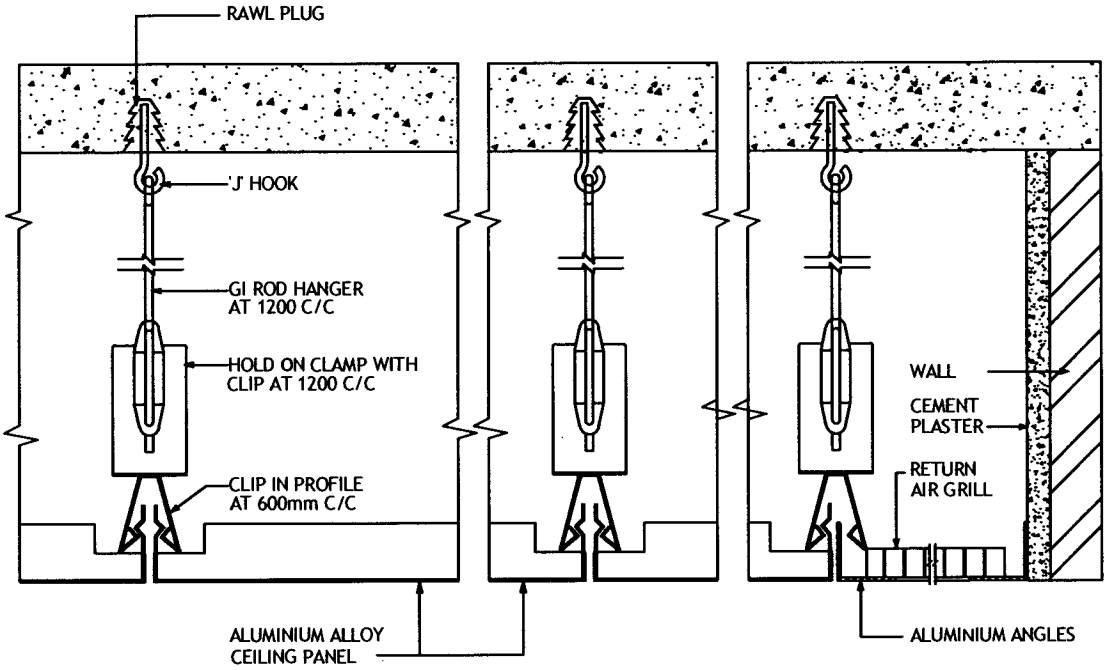
(HANGING/SUSPENSION ARRANGEMENT CAN VARY FROM VENDOR TO VENDOR)



REFLECTED CEILING PLAN (PART) (LINEAR PANEL)

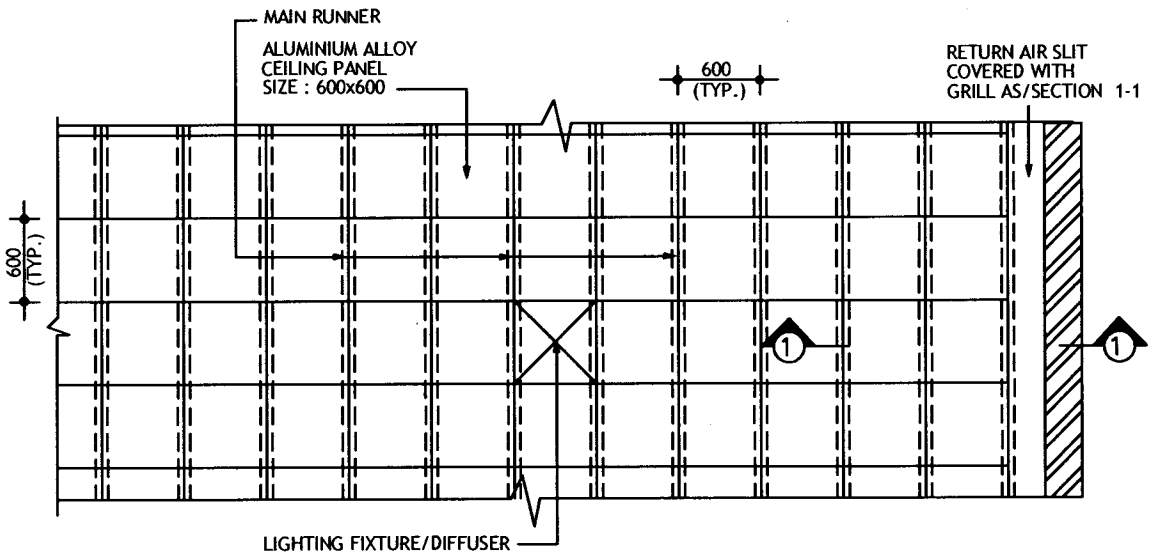
(ELECTRICAL, A/C FIXTURE LOCATIONS SHALL BE AS PER DETAIL DRAWING)
NOTE: ALL DIMENSIONS ARE IN MILLIMETRES.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
6	30.03.21	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	SAMIR DAS	ANURAG SINHA	SANJAY MAZUMDAR
5	02.03.16	REVISED & ISSUED AS STANDARD	DK	SD/JKB	RAJANJI SRIVASTAVA	S. CHANDA



SECTION 1-1

(HANGING/SUSPENSION ARRANGEMENT CAN VARY FROM VENDOR TO VENDOR)

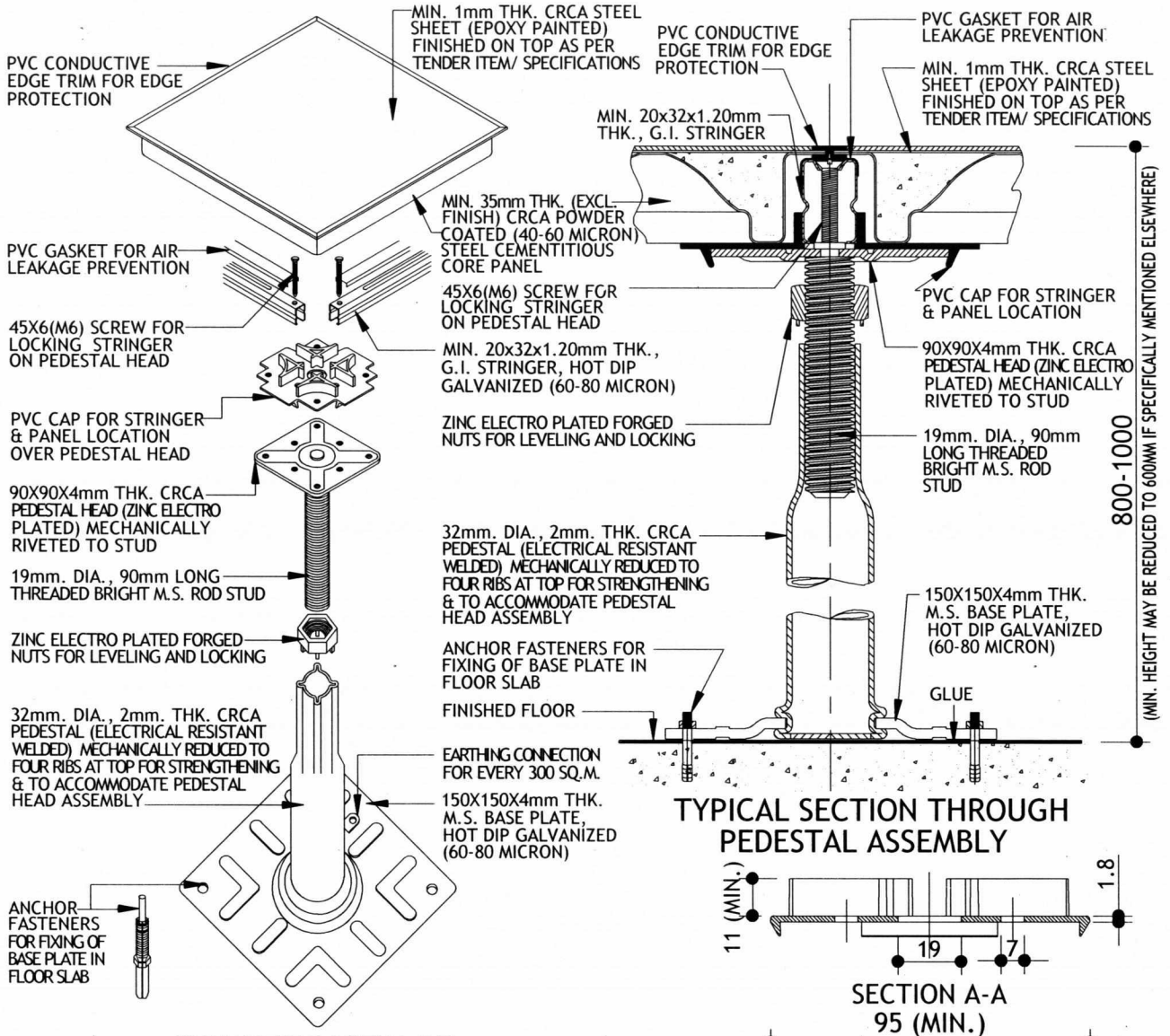


REFLECTED CEILING PLAN (PART) (600mm X 600mm PANELS)

(ELECTRICAL, A/C FIXTURE LOCATIONS SHALL BE AS PER DETAIL DRAWING)

NOTE: ALL DIMENSIONS ARE IN MILLIMETRES.

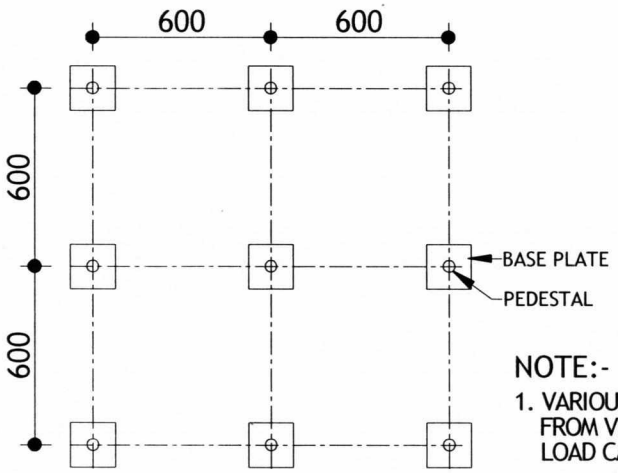
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
6	30.03.21	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	SAMIR DAS	ANURAG SINHA	SANJAY MAZUMDAR
5	02.03.16	REVISED & ISSUED AS STANDARD	DK	SD/JKB	RAJANJI SRIVASTAVA	S. CHANDA



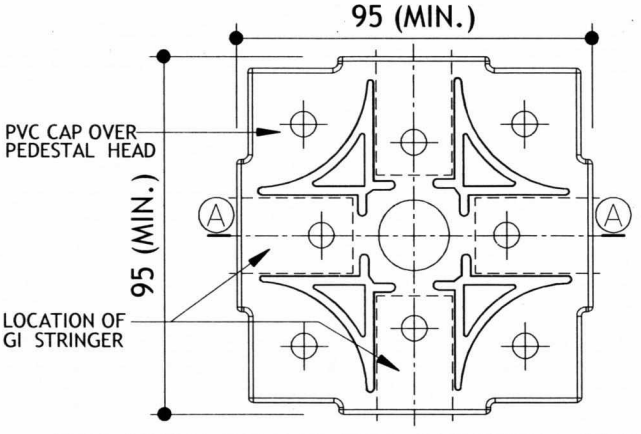
ISOMETRIC VIEW OF PEDESTAL ASSEMBLY

TYPICAL SECTION THROUGH PEDESTAL ASSEMBLY

SECTION A-A



PART GRID PLAN (PEDESTALS)



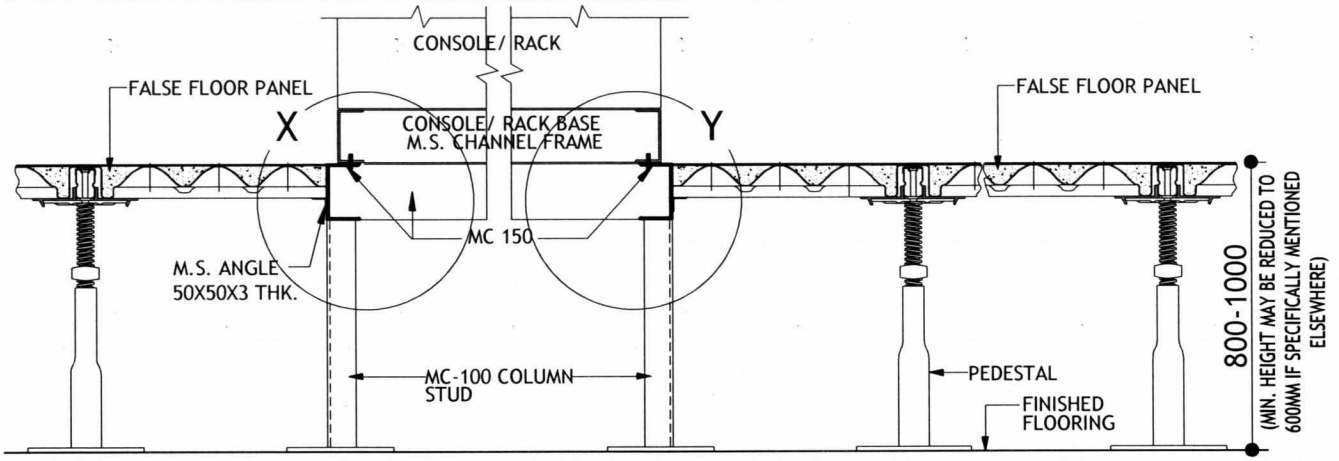
TOP VIEW OF CAP FOR PEDESTAL HEAD

NOTE:-

1. VARIOUS COMPONENTS' DIMENSIONS, SHAPES ETC. MAY VARY SLIGHTLY FROM VENDOR TO VENDOR. HOWEVER THE SYSTEM SHALL HAVE THE LOAD CARRYING CAPACITY AS PER ITEM DESCRIPTION & SPECIFICATIONS.
2. THE BASE FLOOR AND WALL PORTION UNDERNEATH THE FALSE FLOOR SHALL BE PROVIDED ONE COMPONENT POLYURETHANE COATING.

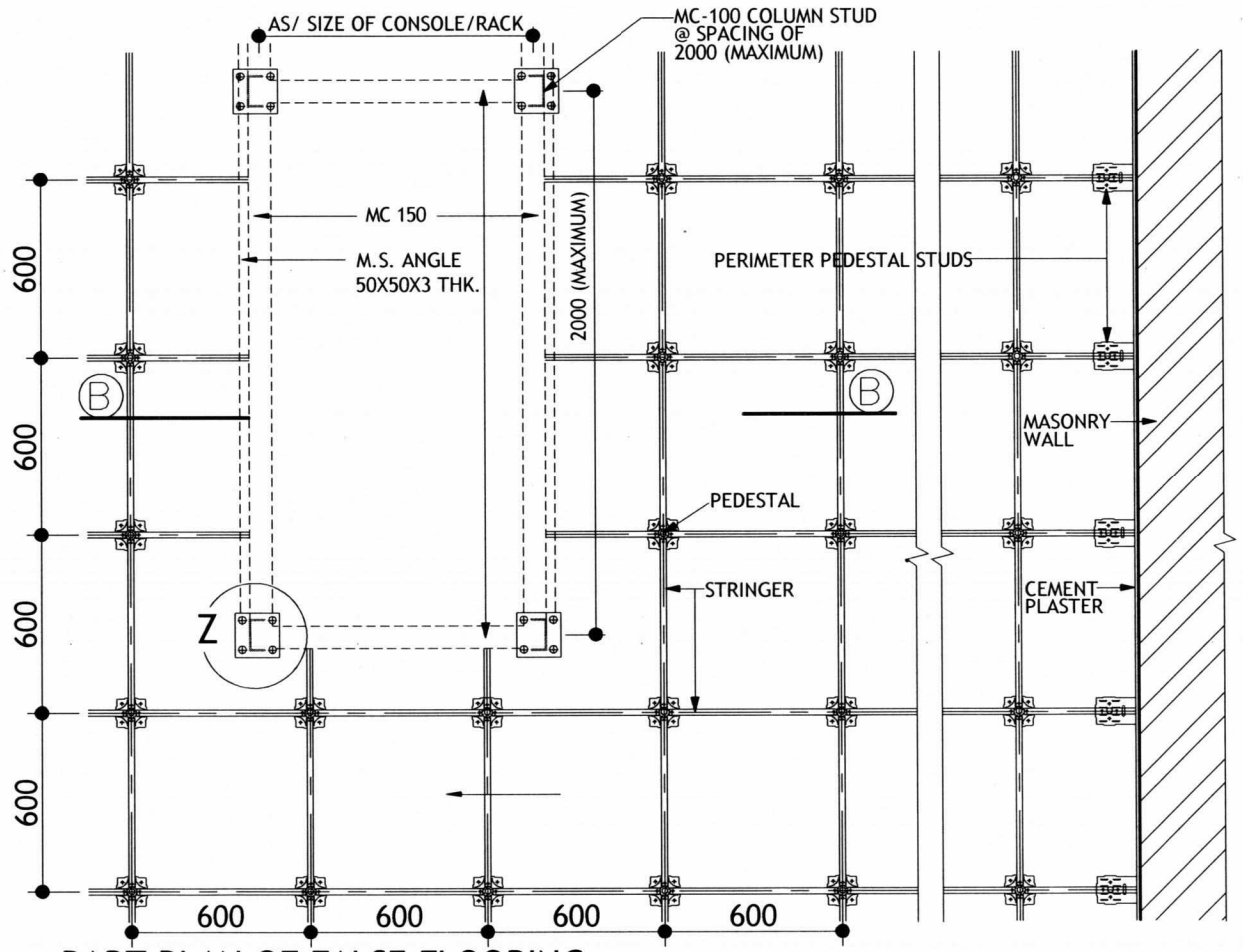
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
3	22.09.22	REVISED & ISSUED AS STANDARD	BABITA SHARMA	ATUL GUPTA	SAMIR DAS	SANJAY MAZUMDAR
2	11.02.22	REAFFIRMED & ISSUED AS STANDARD	ATUL GUPTA	SAMIR DAS	ANURAG SINHA	SANJAY MAZUMDAR

Approved by

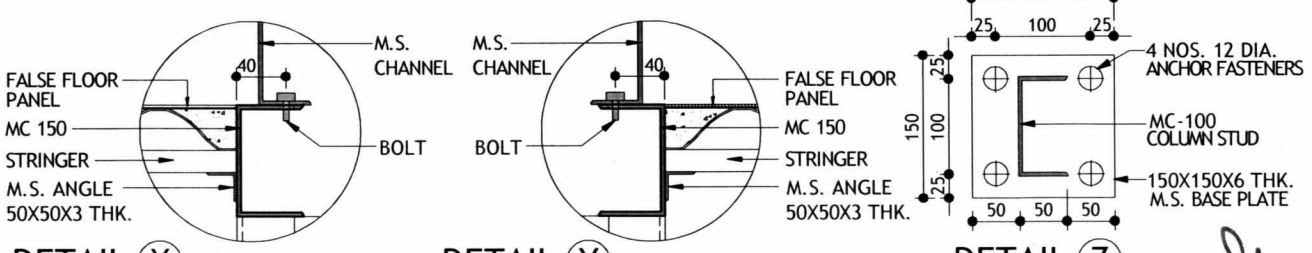


SECTION B-B

AS/ SIZE OF CONSOLE/ RACK

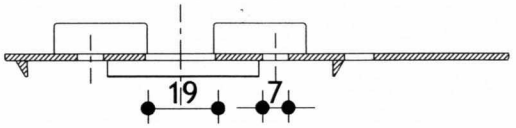


PART PLAN OF FALSE FLOORING

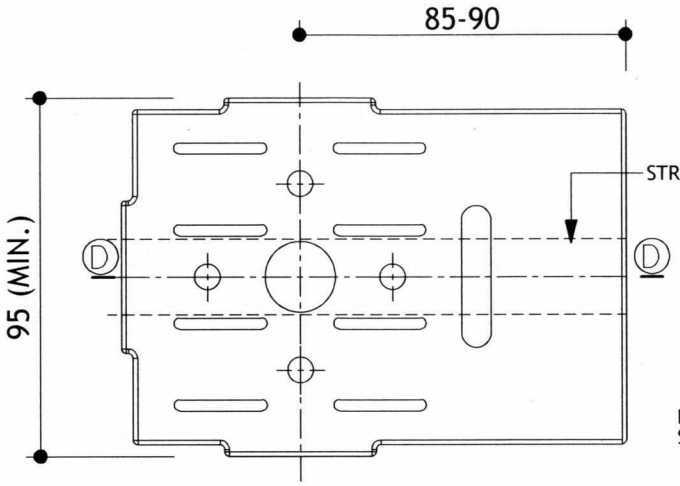


DETAIL (X) DETAIL (Y) DETAIL (Z)

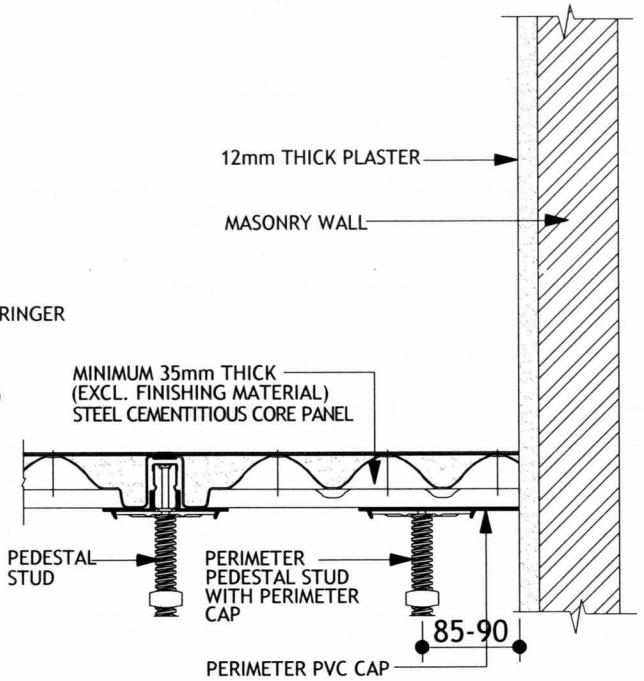
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
3	22.09.22	REVISED & ISSUED AS STANDARD	BABITA SHARMA	ATUL GUPTA	SAMIR DAS	SANJAY MAZUMDAR
2	11.02.22	REAFFIRMED & ISSUED AS STANDARD	BABITA SHARMA	ATUL GUPTA	SAMIR DAS	SANJAY MAZUMDAR



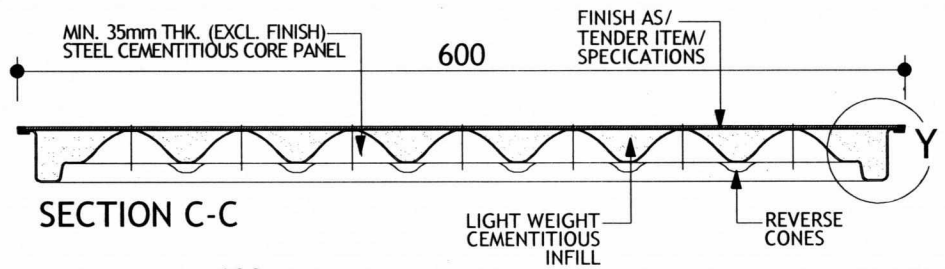
SECTION D-D



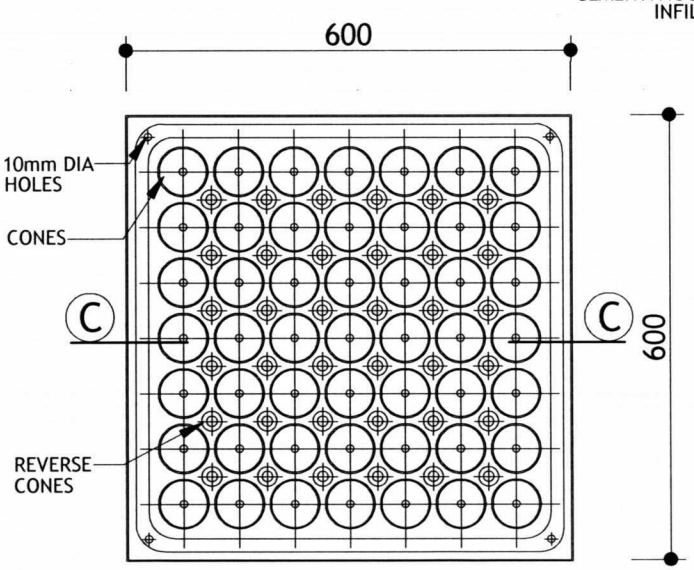
TOP VIEW OF PERIMETER PVC CAP



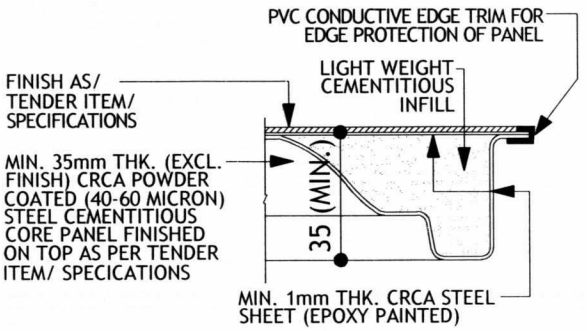
DETAIL OF JUNCTION WITH WALL



SECTION C-C



PLAN OF FALSE FLOOR PANEL
(UPSIDE DOWN)



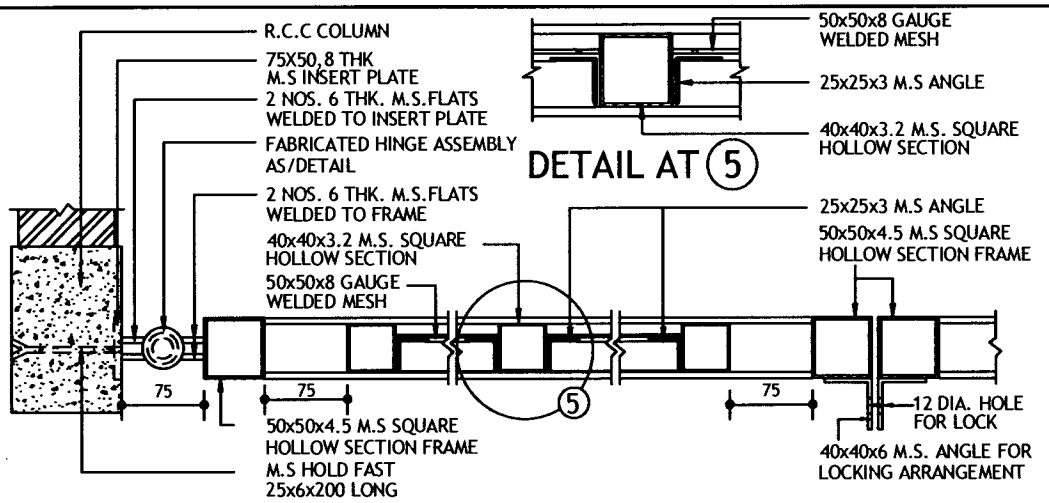
DETAIL (Y)

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
3	22.09.22	REVISED & ISSUED AS STANDARD	BABITA SHARMA	ATUL GUPTA	SAMIR DAS	SANJAY MAZUMDAR
2	11.02.22	REAFFIRMED & ISSUED AS STANDARD	ATUL GUPTA	SAMIR DAS	ANURAG SINHA	SANJAY MAZUMDAR

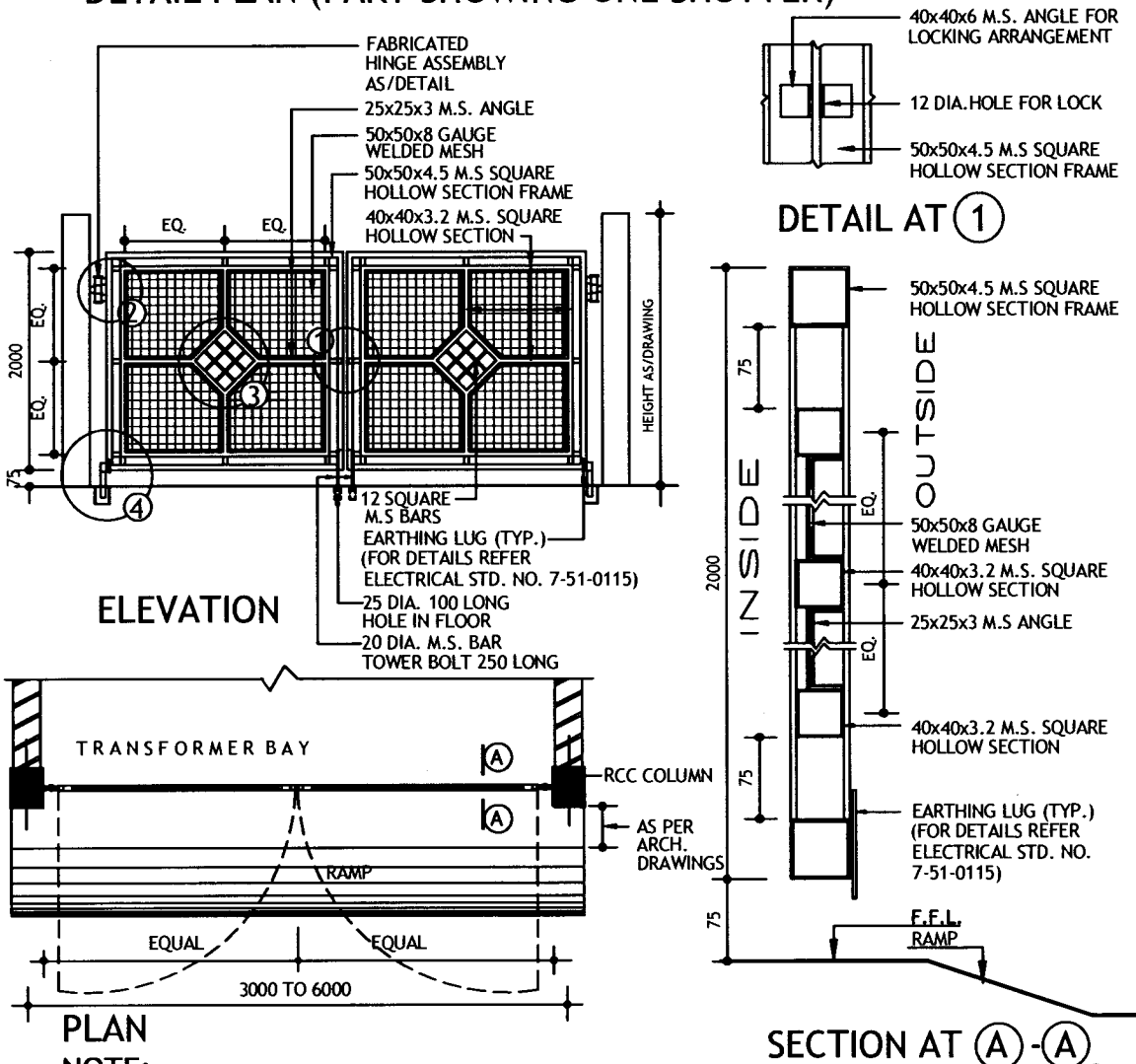
ENGINEERS INDIA LIMITED
(A Govt. of India Undertaking)

TRANSFORMER GATE DETAILS
(UPTO 6000mm. WIDTH)

STANDARD No.
7-75-0051 Rev. 6



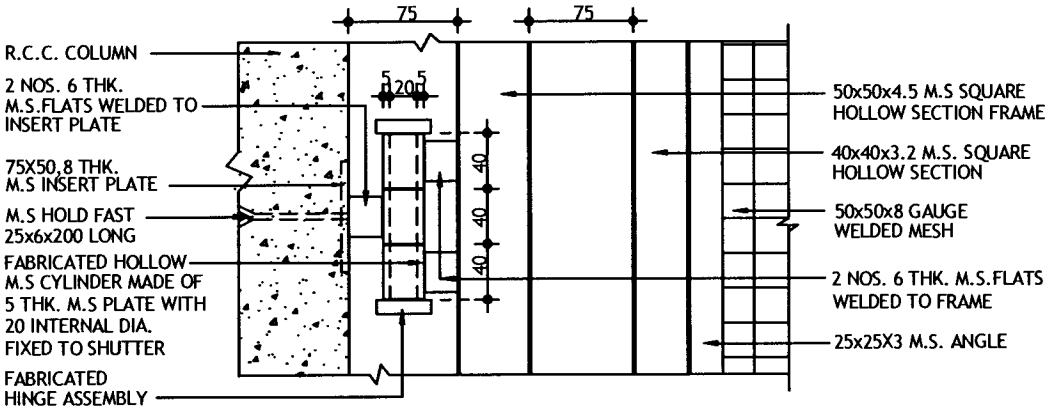
DETAIL PLAN (PART SHOWING ONE SHUTTER)



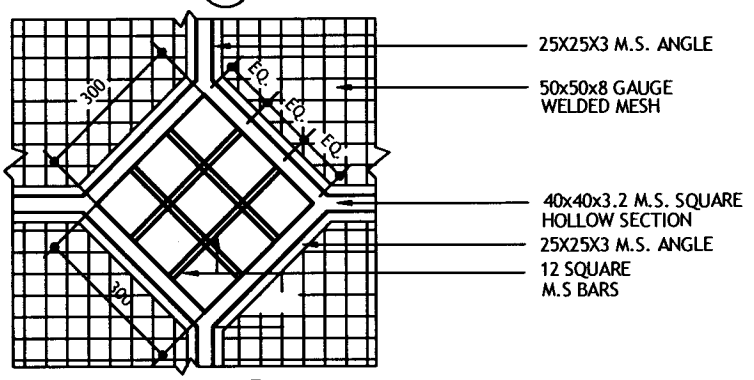
NOTE:
ALL STEEL MEMBERS SHALL CONFORM TO RELEVANT B.I.S. CODES AS APPLICABLE.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	30.03.21	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	SAMIR DAS	ANURAG SINHA	SANJAY MAZUMDAR
5	14.12.15	REVISED & ISSUED AS STANDARD	DK	SD/JKB	RAJANJI SRIVASTAVA	S. CHANDA

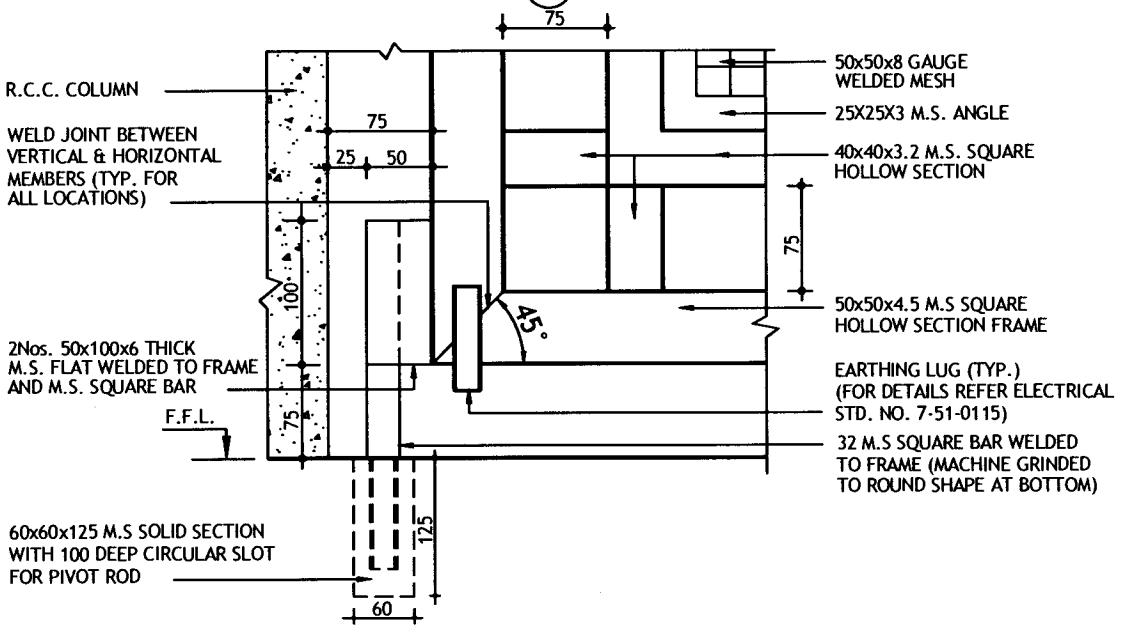
Approved by



DETAIL AT (2)



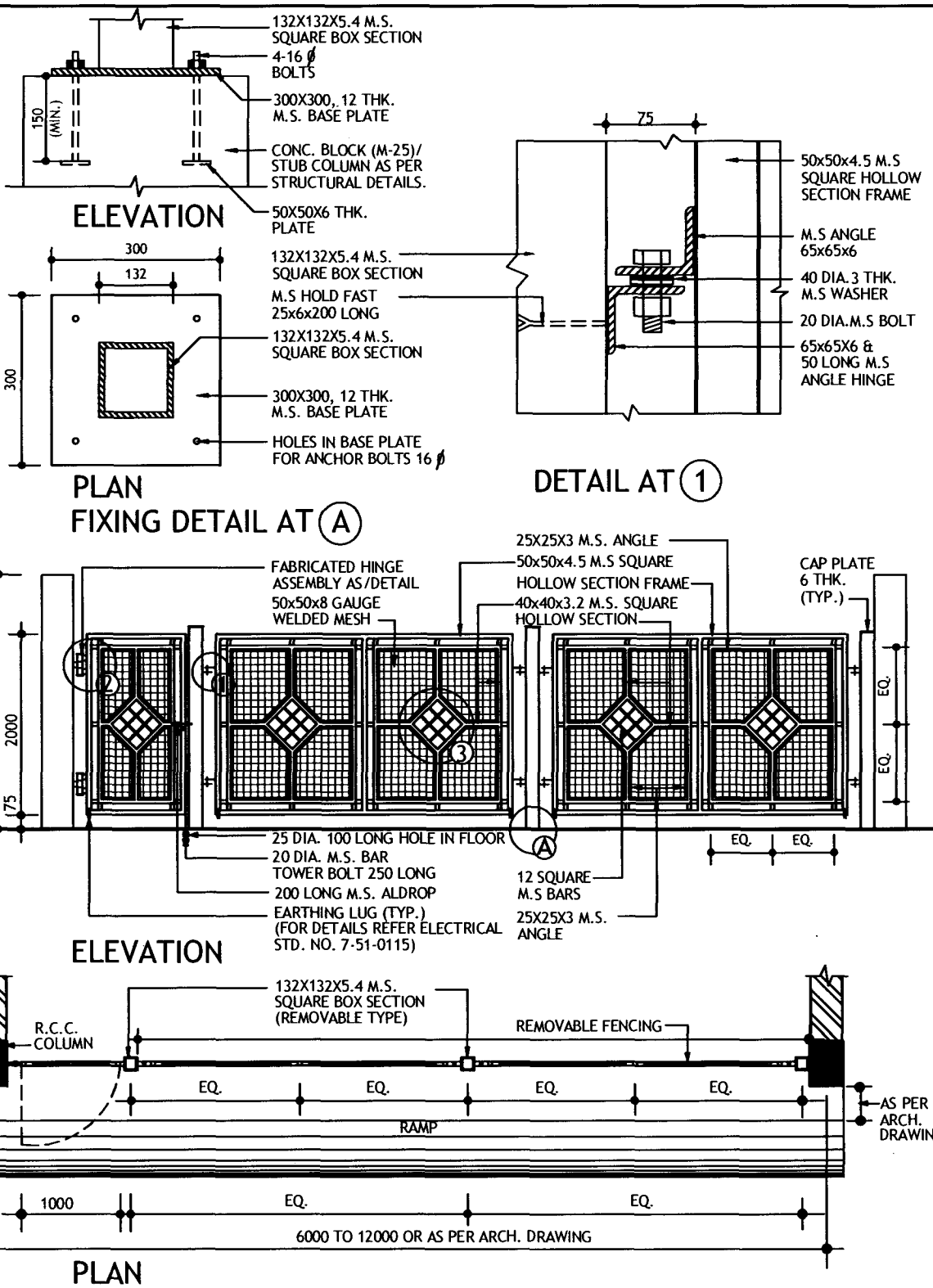
DETAIL AT (3)



DETAIL AT (4)

NOTE:
ALL STEEL MEMBERS SHALL CONFORM TO RELEVANT B.I.S. CODES AS APPLICABLE.

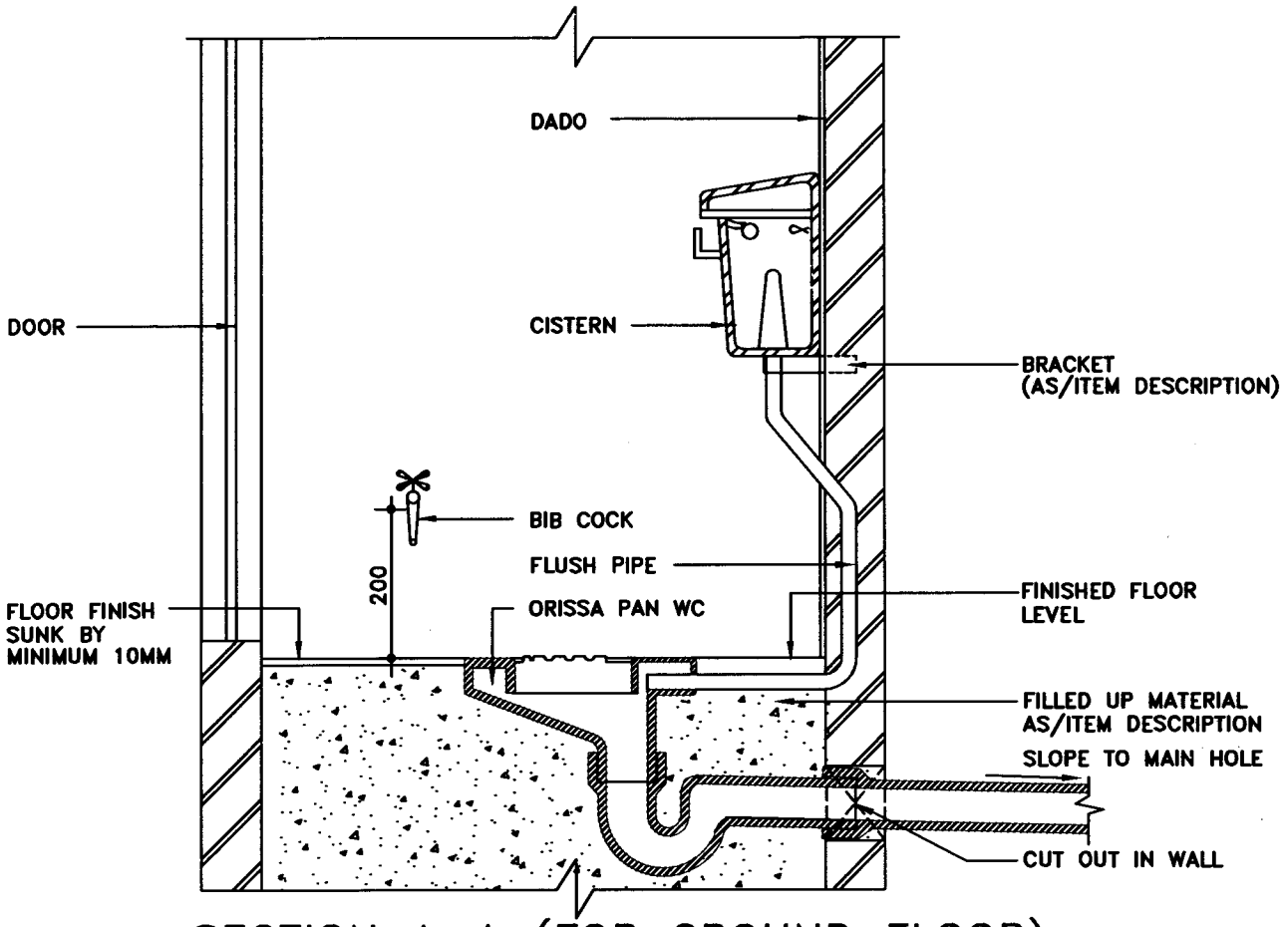
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
6	30.03.21	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	SAMIR DAS	ANURAG SINHA	SANJAY MAZUMDAR
5	14.12.15	REVISED & ISSUED AS STANDARD	DK	SD/JKB	RAJANJI SRIVASTAVA	S. CHANDA



NOTES:

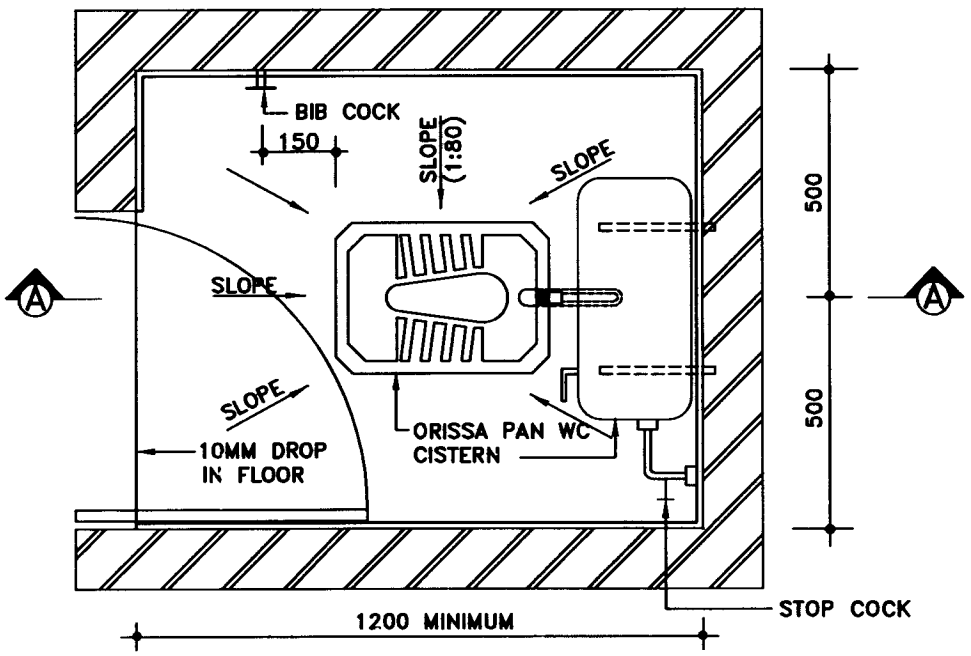
1. FOR DETAILS (2) & (3) REFER STANDARD NO. 7-75-0051
2. ALL STEEL MEMBERS SHALL CONFORM TO RELEVANT B.I.S. CODES AS APPLICABLE.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
5	30.03.21	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	SAMIR DAS	ANURAG SINHA	SANJAY MAZUMDAR
4	14.12.15	REVISED & ISSUED AS STANDARD	DK	SD/JKB	RAJANJI SRIVASTAVA	S. CHANDA



SECTION A–A (FOR GROUND FLOOR)

(REFER SHEET 2 OF 2 FOR SECTION A–A APPLICABLE TO UPPER FLOORS WITH SUNK SLAB)

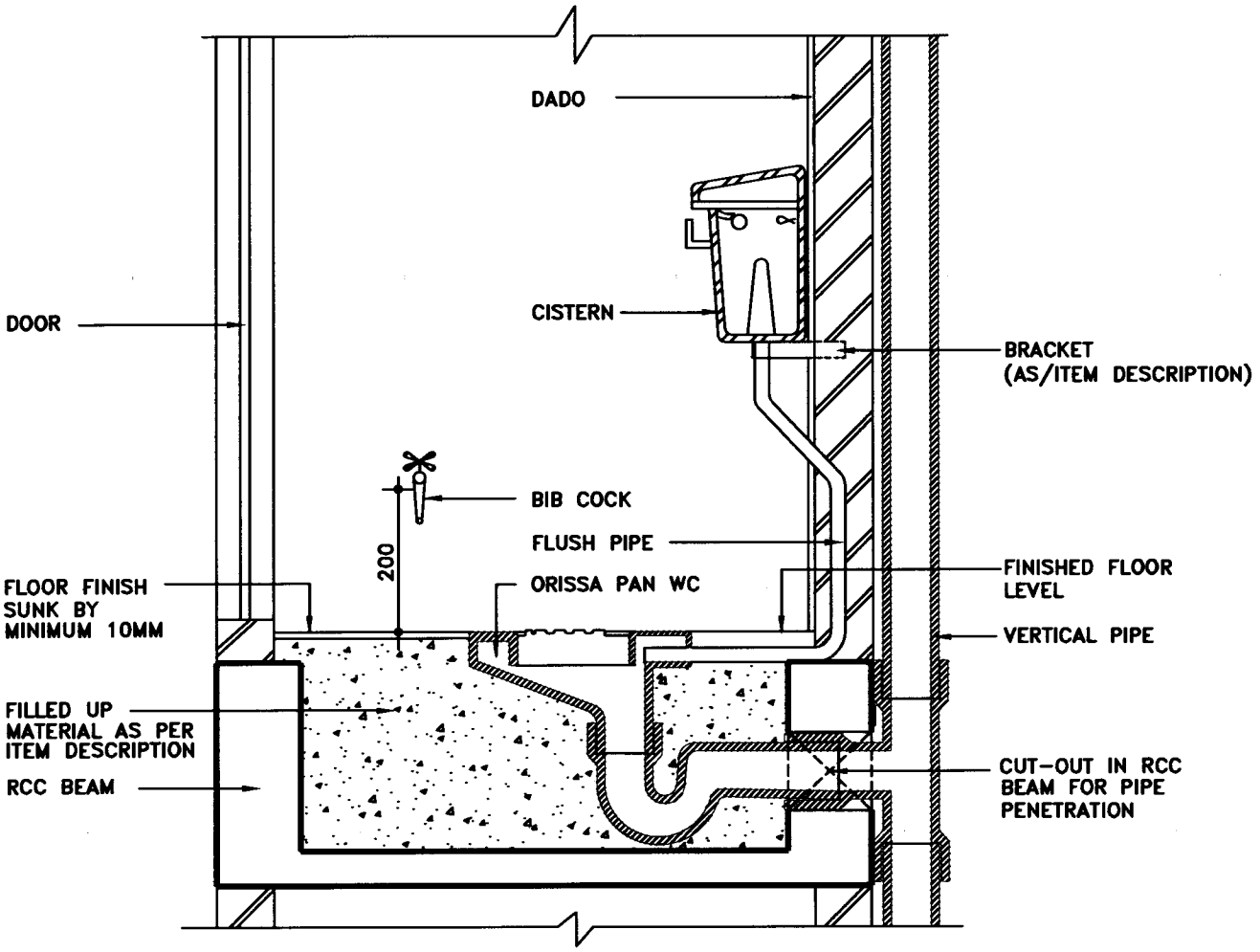


PLAN

NOTE: REFER SHEET 2 OF 2.

Rev. No.	Date	Description	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	02.02.22	REAFFIRMED & REISSUED AS STANDARD	NAVEEN	AKHILESH	SAMIR DAS	SANJAY MAZUMDAR
5	07.11.16	REVISED & REISSUED AS STANDARD	DK	SD/JKB	RAJANJI SRIVASTAVA	R. NANDA
4	09.11.11	REVISED & REISSUED	DK	SD	JKB	D.MALHOTRA

Approved by



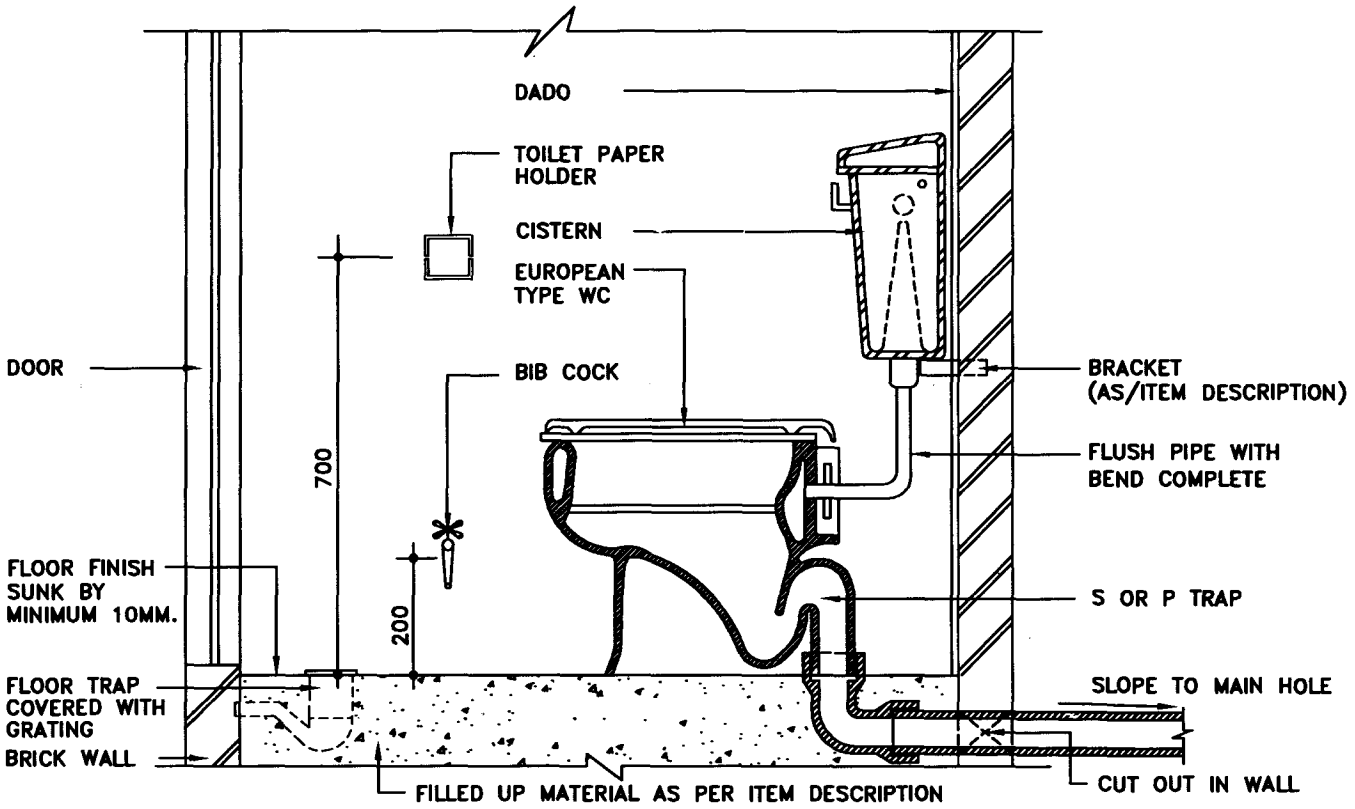
SECTION A-A
(FOR UPPER FLOOR WITH SUNK SLAB)

(REFER SHEET 1 OF 2 FOR SECTION A-A APPLICABLE TO GROUND FLOOR)

NOTES:

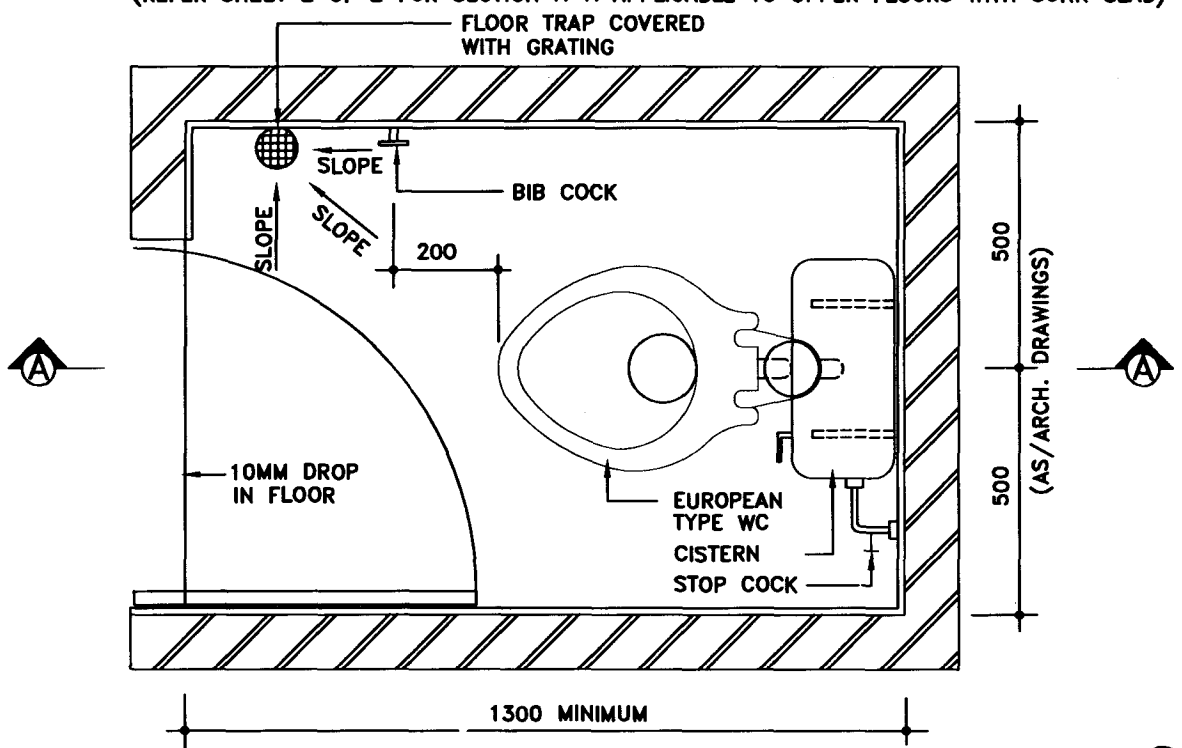
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. ALL FLOOR FINISH LEVEL INSIDE THE W.C. CUBICLE SHALL BE 10 TO 15MM LOWER THAN OUTSIDE.
3. PROVISION FOR NECCESSARY CUT-OUT IN THE R.C.C. STRUCTURAL BEAM SHALL BE KEPT (FOR DISPOSAL PIPE PENETRATION). THE LOCATION ANGLE, GRADIENT ETC. OF THE CUT-OUT SHALL BE AS PER SITE REQUIREMENTS.
4. REFER RELEVANT ARCHITECTURAL DRAWINGS FOR ACTUAL SIZE OF THE CUBICLE.

Rev. No.			Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
6	02.02.22	REAFFIRMED & REISSUED AS STANDARD	NAVEEN	AKHILESH	SAMIR DAS	SANJAY MAZUMDAR
5	07.11.16	REVISED & REISSUED AS STANDARD	DK	SD/JKB	RAJANJI SRIVASTAVA	R. NANDA
4	09.11.11	REVISED & REISSUED	DK	SD	JKB	D.MALHOTRA



SECTION A–A (FOR GROUND FLOOR)

(REFER SHEET 2 OF 2 FOR SECTION A–A APPLICABLE TO UPPER FLOORS WITH SUNK SLAB)

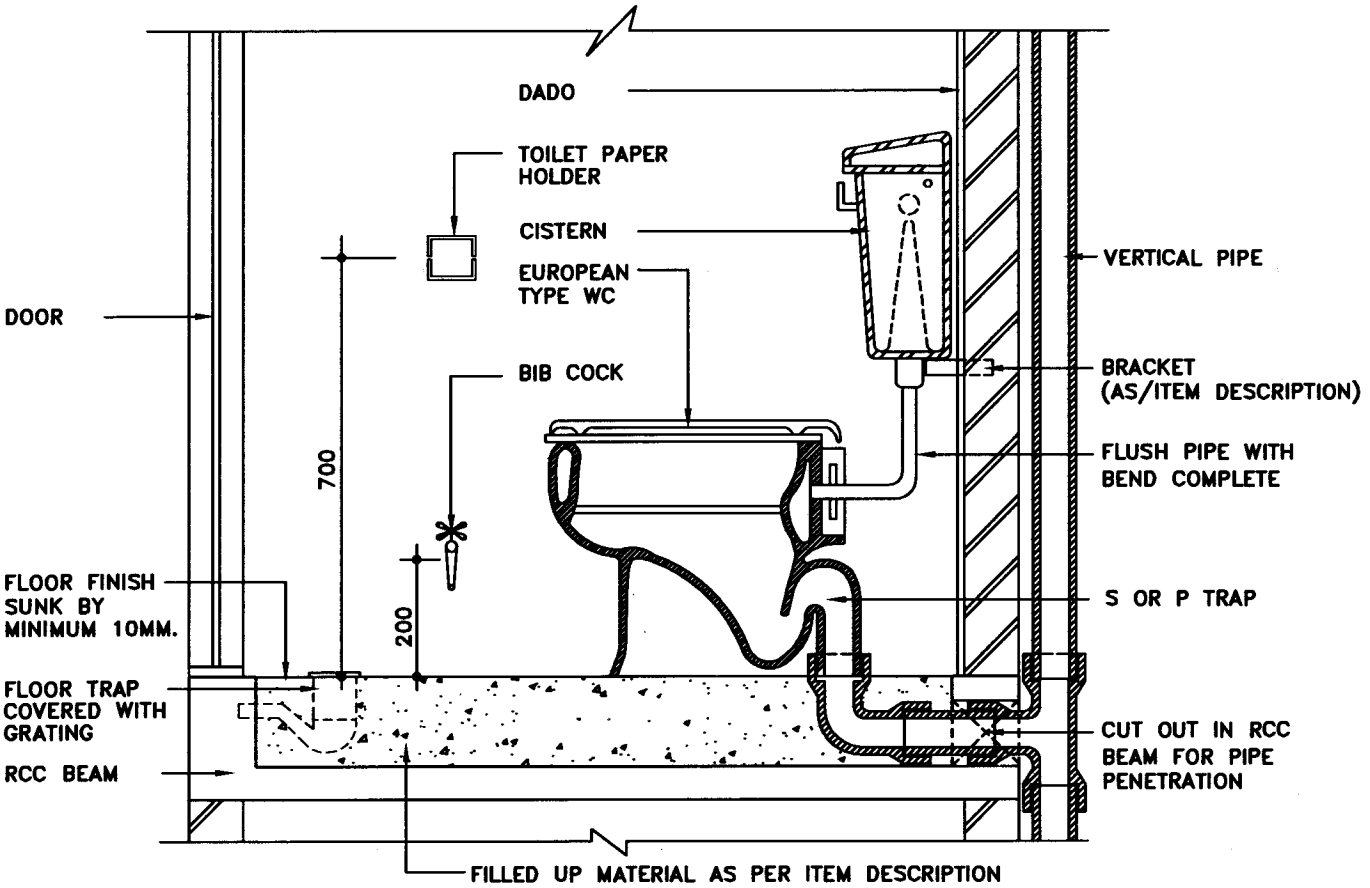


PLAN

NOTE: REFER SHEET 2 OF 2.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	02.02.22	REAFFIRMED & REISSUED AS STANDARD	NAVEEN	AKHILESH	SAMIR DAS	SANJAY MAZUMDAR
5	07.11.16	REVISED & REISSUED AS STANDARD	DK	JS/JKB	RAJANJI SRIVASTAVA	R. NANDA
4	09.11.11	REVISED & REISSUED	DK	SD	JKB	D.MALHOTRA

Approved by



SECTION A–A
(FOR UPPER FLOOR WITH SUNK SLAB)

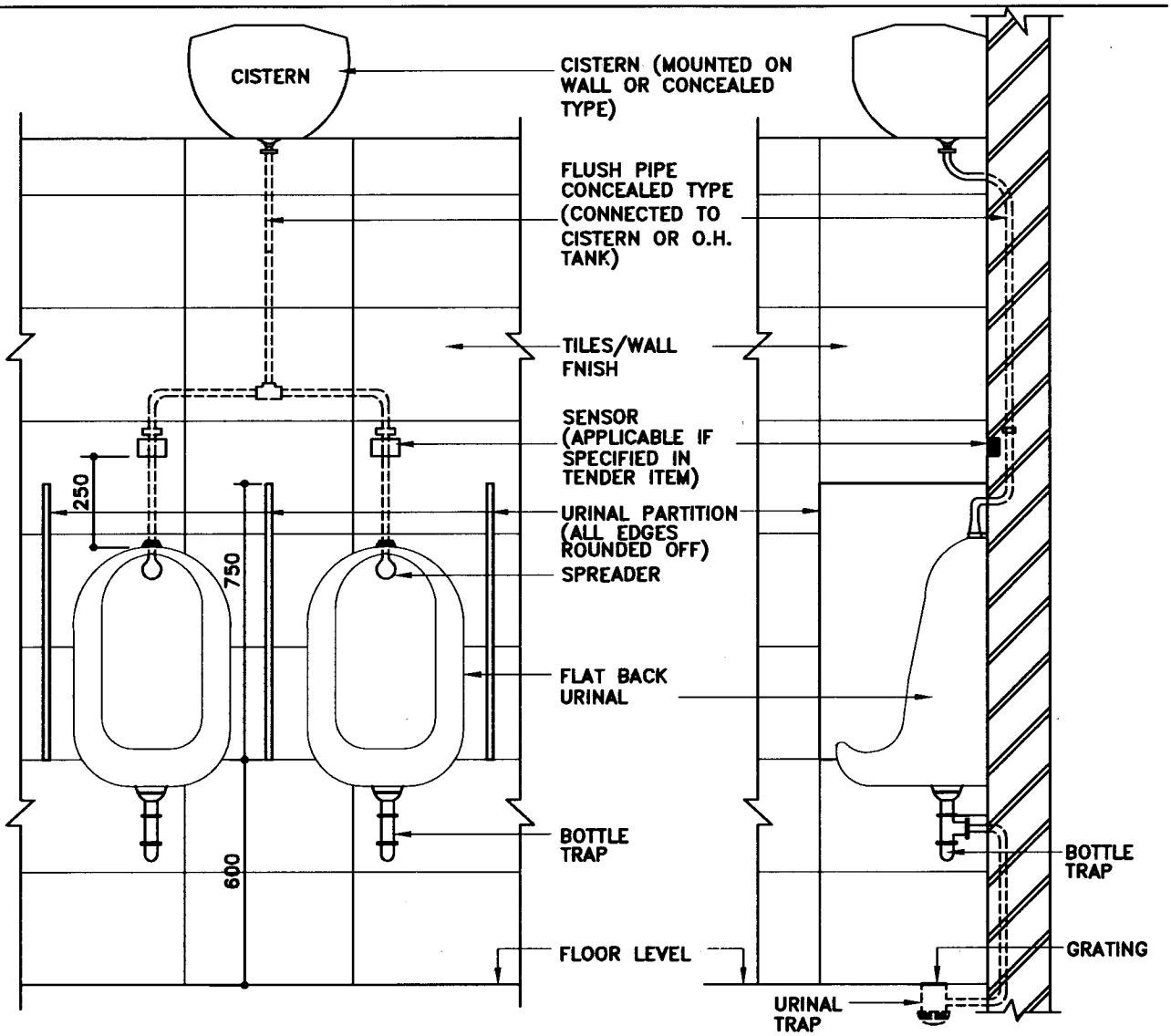
(REFER SHEET 1 OF 2 FOR SECTION A–A APPLICABLE TO GROUND FLOOR)

NOTES:

1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. ALL FLOOR FINISH LEVEL INSIDE THE W.C. CUBICLE SHALL BE 10 TO 15MM LOWER THAN OUTSIDE.
3. PROVISION FOR NECCESSARY CUT–OUT IN THE R.C.C. STRUCTURAL BEAM SHALL BE KEPT (FOR DISPOSAL PIPE PENETRATION). THE LOCATION ANGLE, GRADIENT ETC. OF THE CUT–OUT SHALL BE AS PER SITE REQUIREMENTS.
4. REFER RELEVANT ARCHITECTURAL DRAWINGS FOR ACTUAL SIZE OF THE CUBICLE.

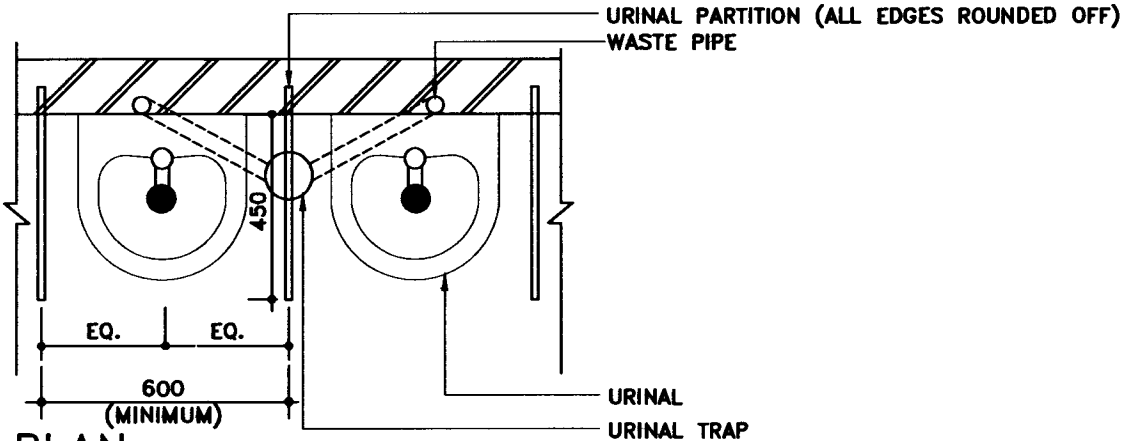
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
6	18.01.22	REAFFIRMED & REISSUED AS STANDARD	NAVEEN	AKHILESH	SAMIR DAS	SANJAY MAZUMDAR
5	07.11.16	REVISED & REISSUED AS STANDARD	DK	JS/JKB	RAJANJI SRIVASTAVA	R. NANDA
4	09.11.11	REVISED & REISSUED	DK	SD	JKB	D.MALHOTRA

URINALS FIXING DETAIL



ELEVATION

SIDE ELEVATION



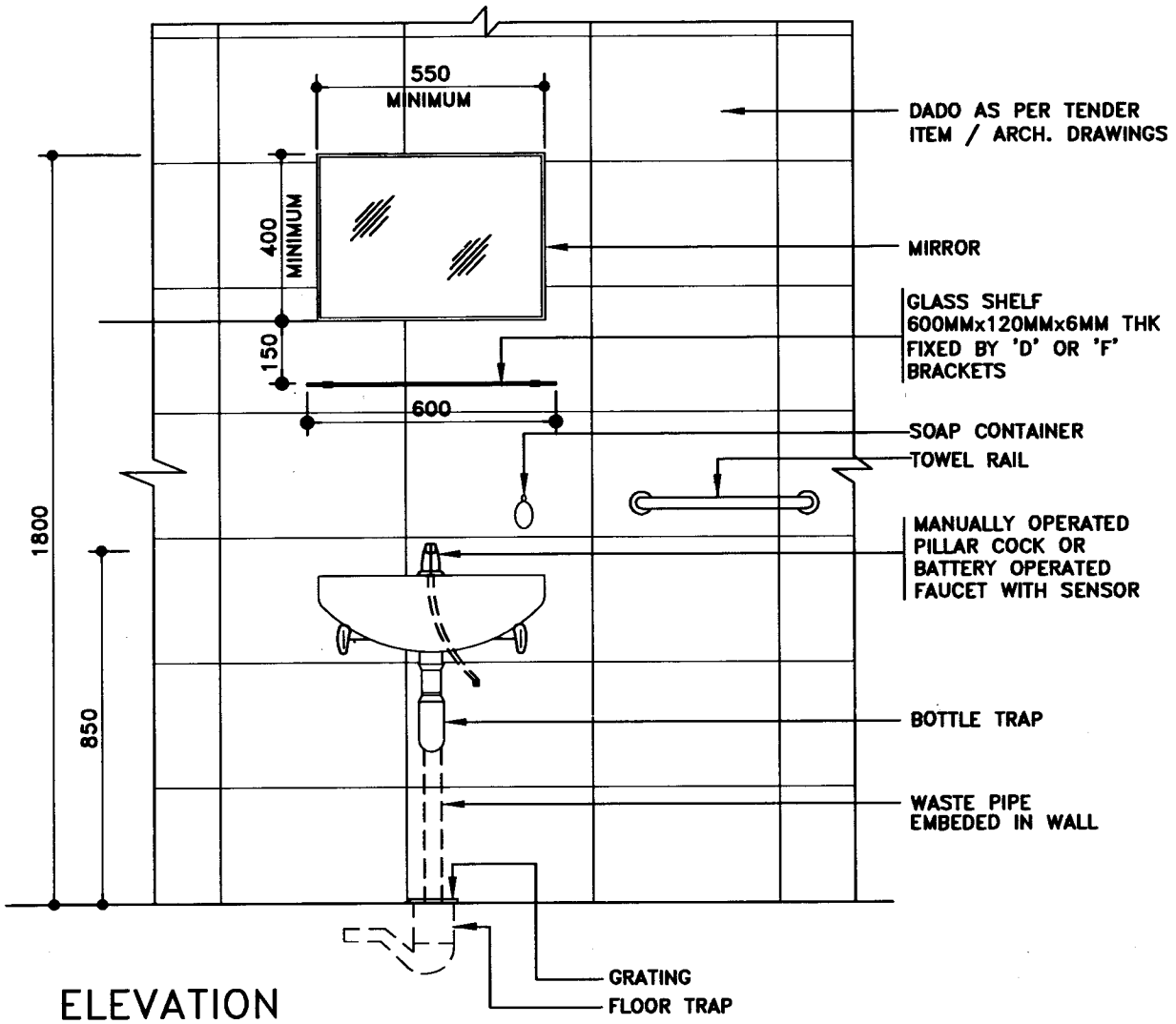
PLAN

NOTES:

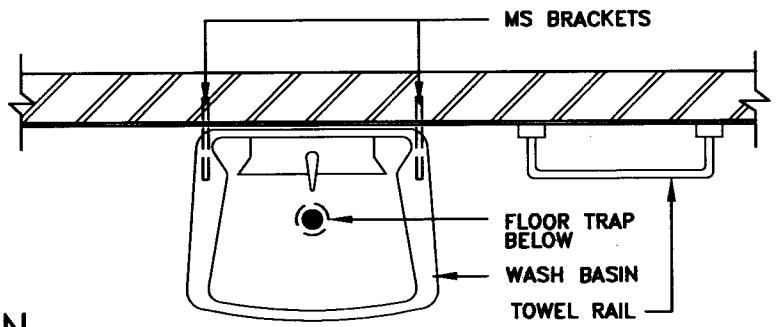
1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. THIS STANDARD IS INDICATIVE. TYPE AND NO. OF URINAL FIXTURES, FLUSHING ARRANGENT ETC. SHALL BE AS PER ARCHITECTURAL DRAWINGS & TENDER ITEM.
3. SENSORS SHOWN SHALL BE PROVIDED ONLY IN CASE THE SAME ARE SPECIFIED IN TENDER ITEM.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	02.02.22	REVISED & REISSUED AS STANDARD	NAVEEN	AKHILESH	SAMIR DAS	SANJAY MAZUMDAR
5	01.12.16	REVISED & REISSUED AS STANDARD	DK	JS/JKB	RAJANJI SRIVASTAVA	R. NANDA
4	09.11.11	REVISED & REISSUED	DK	SD	JKB	D.MALHOTRA

Approved by



ELEVATION



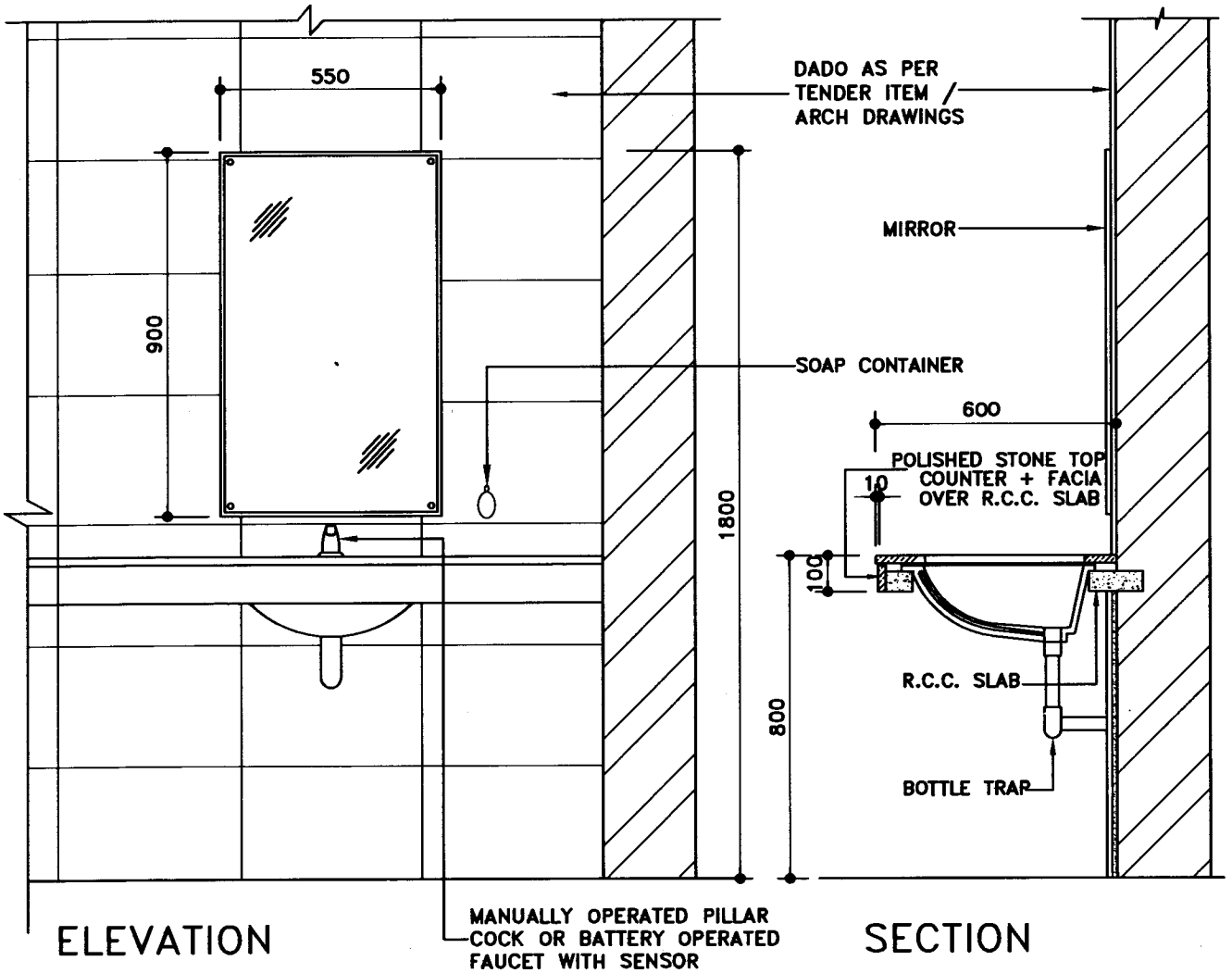
PLAN
(FOR WALL HUNG TYPE WASH BASIN)

NOTES:–

1. ALL DIMENSIONS IN MILLIMETRES.
2. THE SIZE OF MIRROR SHOWN IS INDICATIVE. ACTUAL SIZE SHALL BE AS PER ARCHITECTURAL DRAWINGS/ ITEMS DESCRIPTION.
3. THE ARRANGEMENT AND DETAIL OF WASH BASIN SHOWN (HERE AND IN SHEET–2) IS TYPICAL. FOR 2 OR MORE WASH BASIN, REFER RELEVANT ARCHITECTURAL DRAWING (FOR LOCATION & CONFIGURATION) WHICH SHALL BE READ IN CONJUNCTION WITH THIS STANDARD.
4. LOCATION & TOWEL RAIL IS INDICATIVE. REFER RELEVANT ARCHITECTURAL DRAWING FOR EXACT LOCATION.

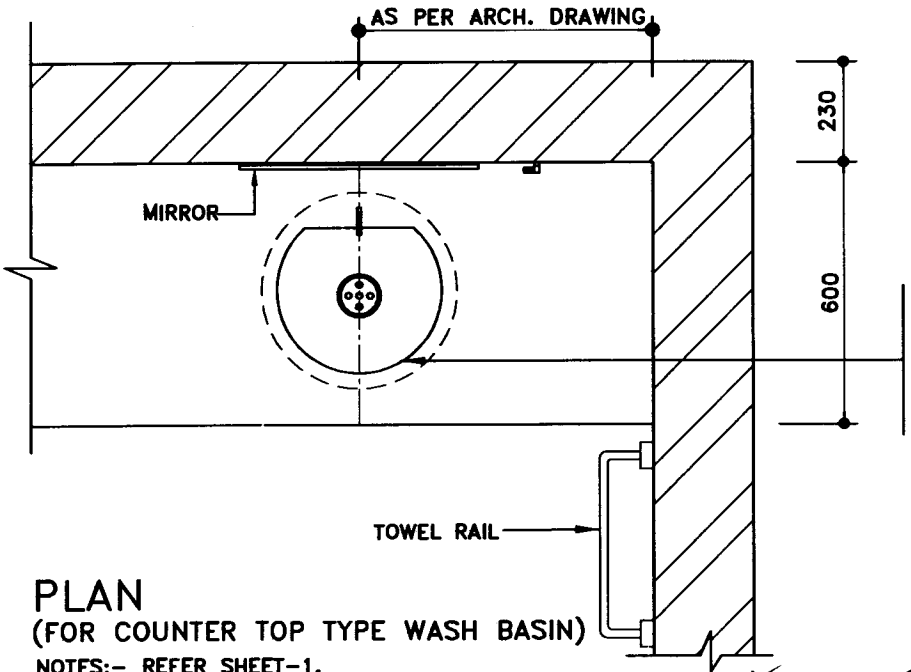
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	02.02.22	REAFFIRMED & REISSUED AS STANDARD	NAVEEN	AKHILESH	SAMIR DAS	SANJAY MAZUMDAR
5	21.11.16	REVISED & REISSUED AS STANDARD	MLT	JS/JKB	RAJANJI SRIVASTAVA	R. NANDA
4	09.11.11	REVISED & REISSUED	DK	SD	JKB	D.MALHOTRA

Approved by



ELEVATION

SECTION



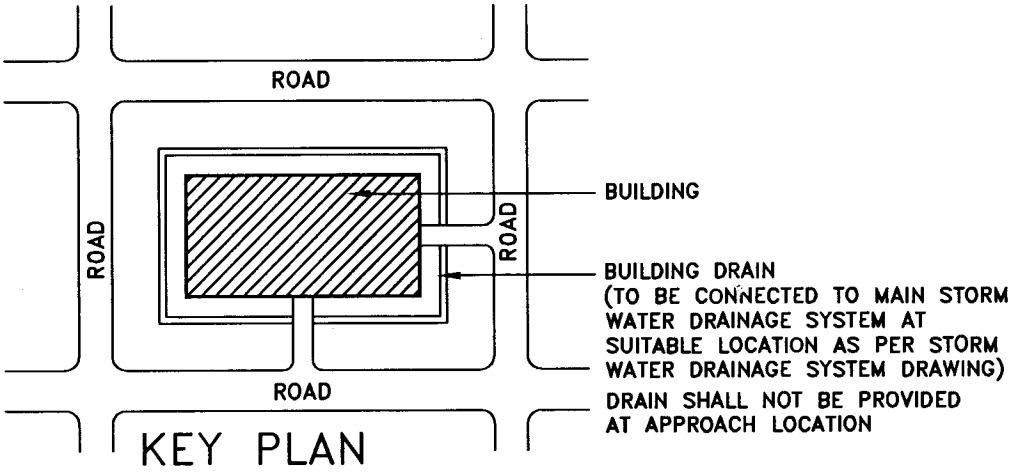
PLAN
(FOR COUNTER TOP TYPE WASH BASIN)

NOTES:- REFER SHEET-1.

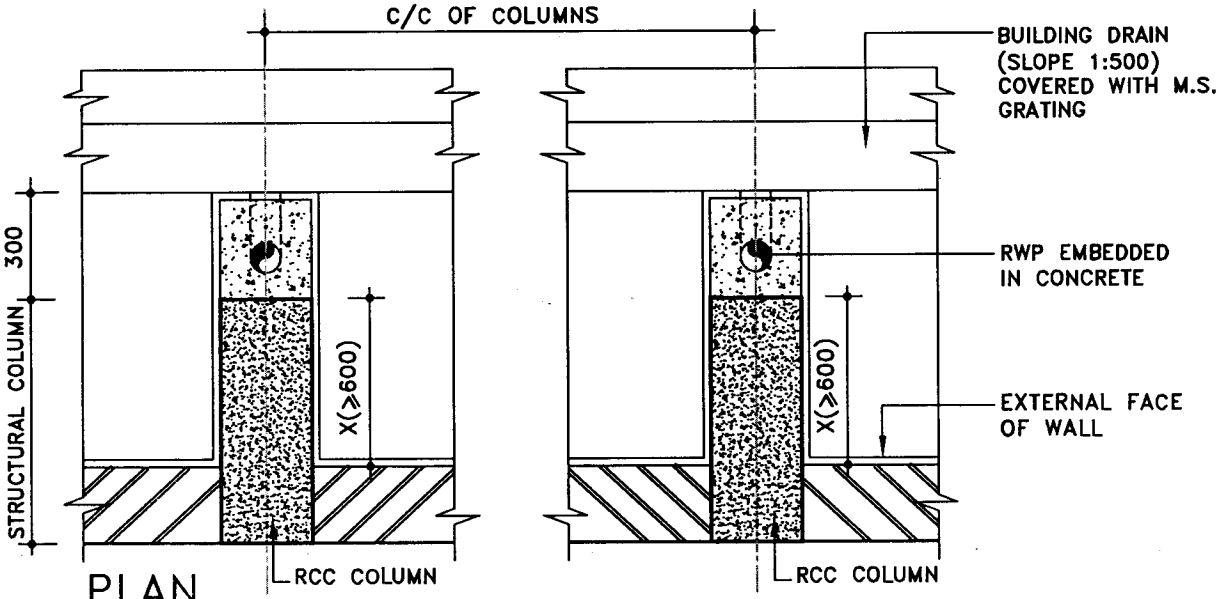
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	02.02.22	REAFFIRMED & REISSUED AS STANDARD	NAVEEN	AKHILESH	SAMIR DAS	SANJAY MAZUMDAR
5	21.11.16	REVISED & REISSUED AS STANDARD	MLT	JS/JKB	RAJANJI SRIVASTAVA	R. NANDA
4	09.11.11	REVISED & REISSUED	DK	SD	JKB	D.MALHOTRA

Approved by

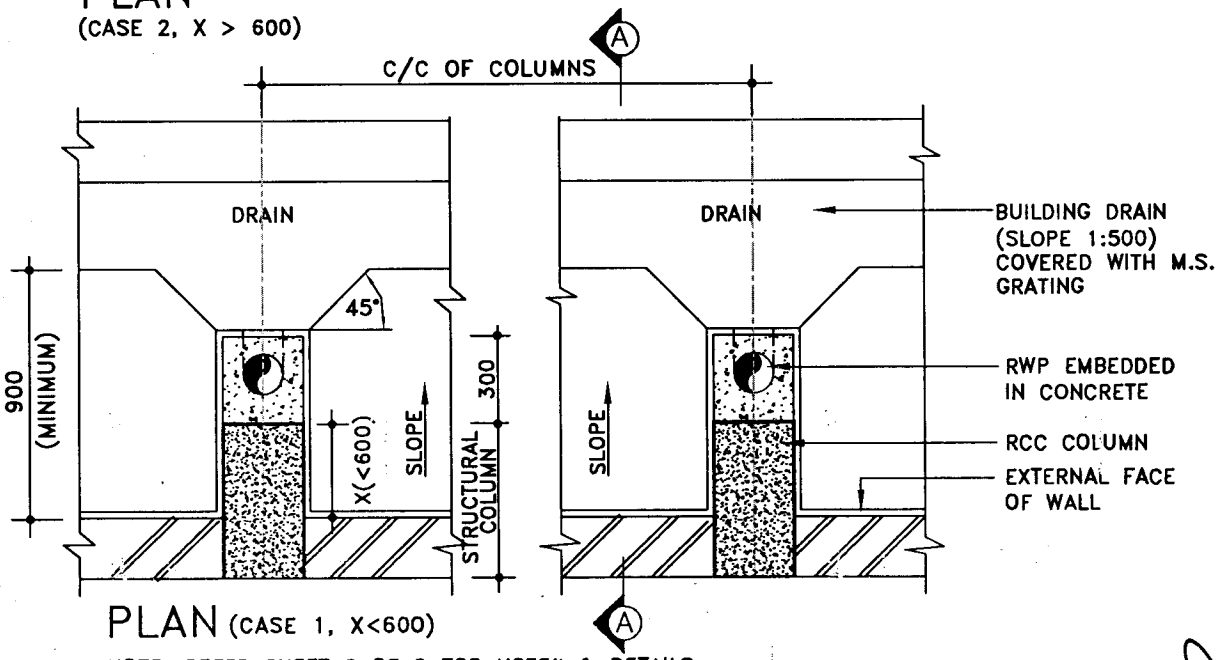
PLINTH PROTECTION
(WITH BUILDING DRAIN)



KEY PLAN



PLAN
(CASE 2, X > 600)

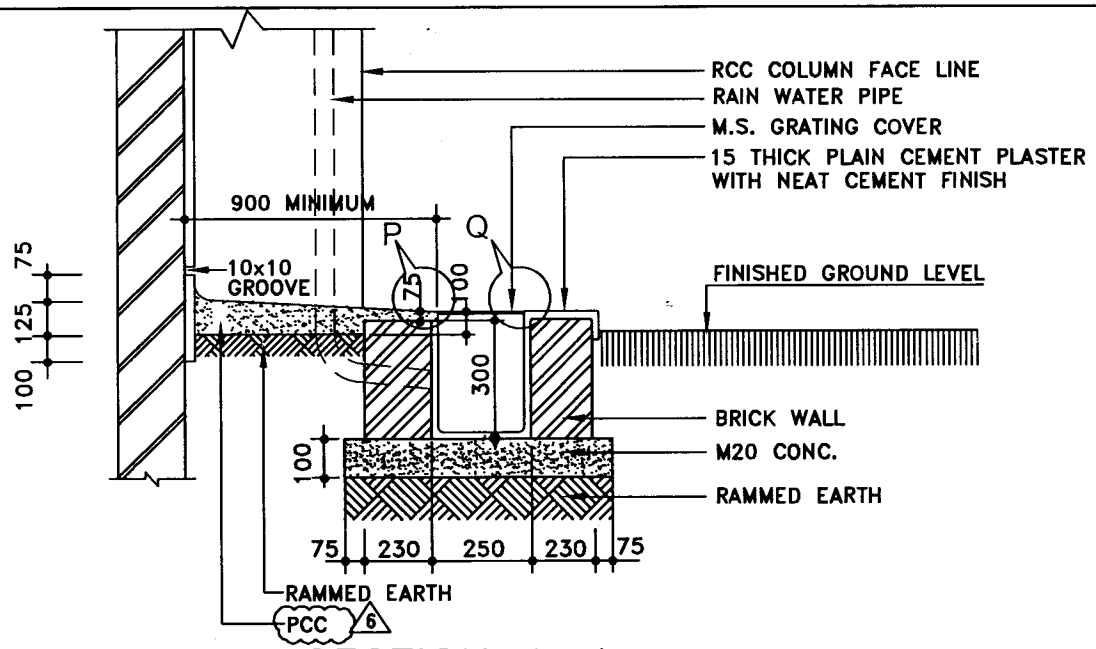


PLAN (CASE 1, X<600)

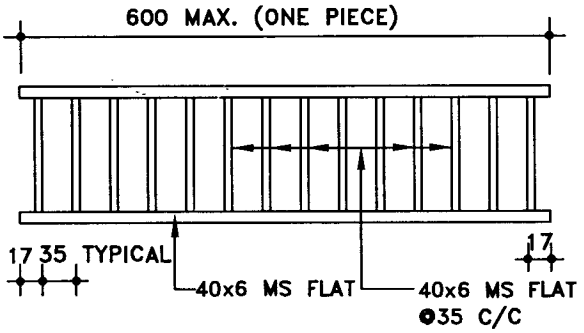
NOTE: REFER SHEET 2 OF 2 FOR NOTES & DETAILS

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	11.02.22	REVISED AND REISSUED AS STANDARD	NG	JS	SAMIR DAS	SANJAY MAZUMDAR
5	09.11.16	REVISED AND REISSUED AS STANDARD	BR	JS/JKB	RAJANJI SRIVASTAVA	R.NANDA
4	25.10.11	REVISED & REISSUED	DK	SD	JKB	D.MALHOTRA

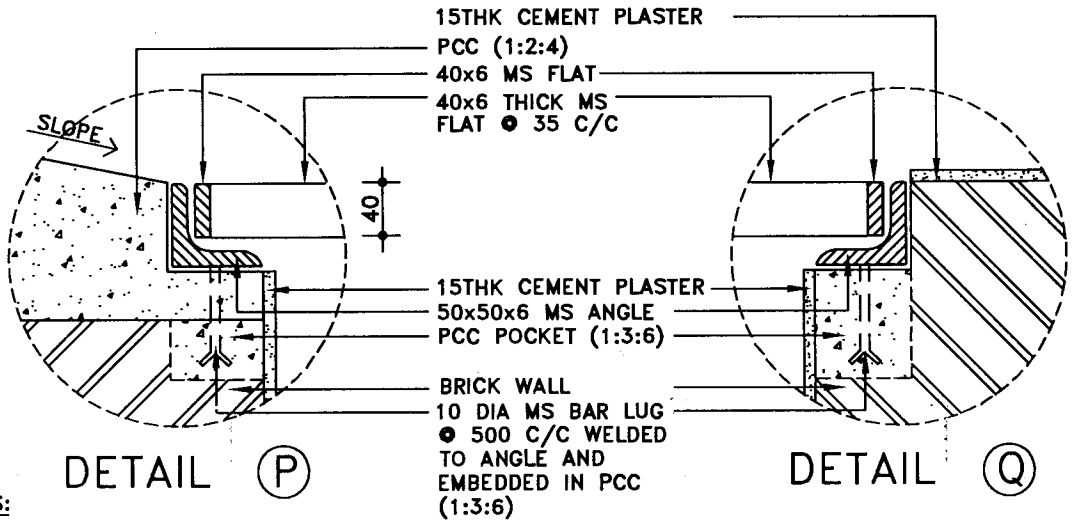
Approved by



SECTION A–A



M.S. GRATING DETAIL



DETAIL (P) DETAIL (Q)

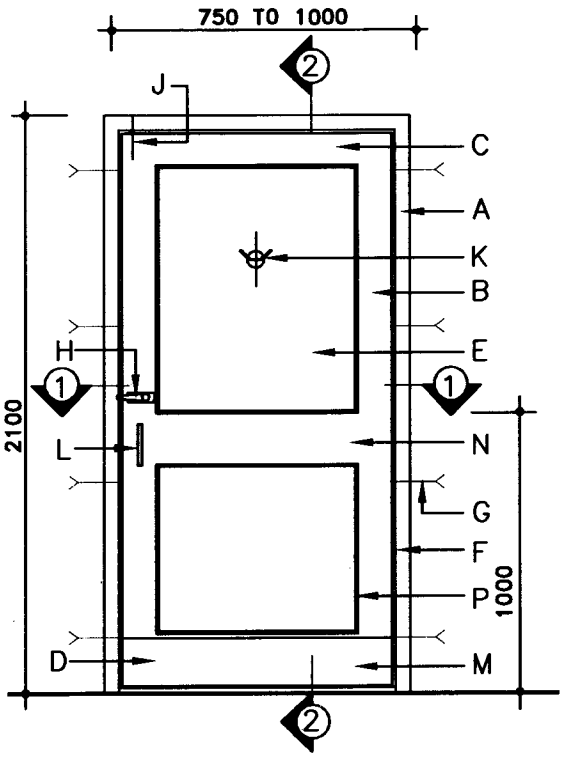
NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. WIDTH OF THE PLINTH PROTECTION SHALL BE MINIMUM 900mm AND X+300 MAXIMUM UNLESS OTHERWISE MENTIONED IN BUILDING DRAWING.
3. PLINTH PROTECTION ALONG ANY PARTICULAR SIDE OF THE BUILDING SHALL BE OF CONSTANT WIDTH FOLLOWING THE EXTERNAL WALL ALIGNEMENT IF NOT SPECIFICALLY MENTIONED/INDICATED IN BUILDING DRAWING.
4. M.S. DRAIN COVER GRATING SHALL BE PROVIDED OVER BUILDING DRAIN UNLESS OTHERWISE MENTIONED/ INDICATED IN BUILDING DRAWING.

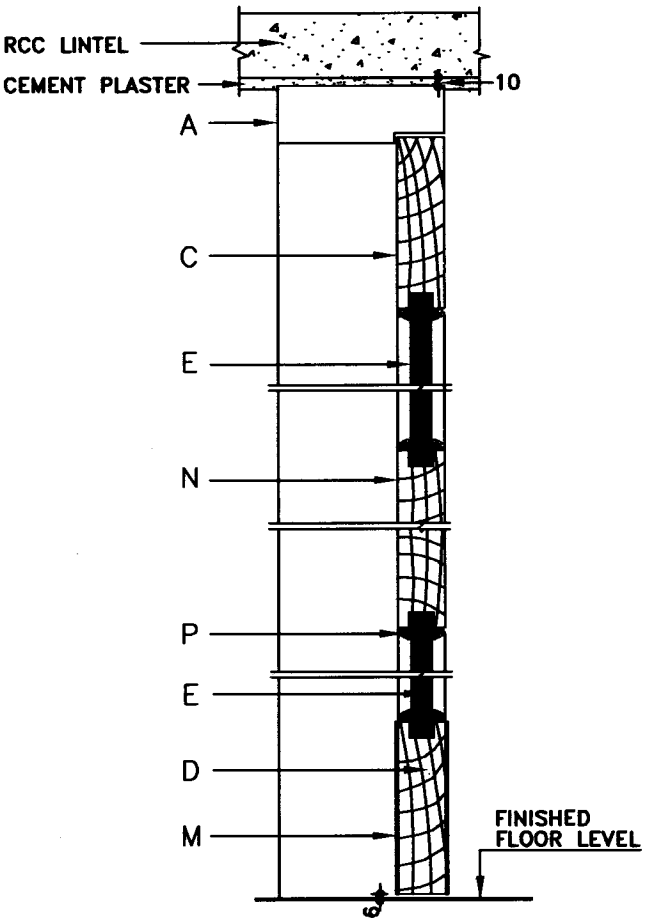
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	11.02.22	REVISED AND REISSUED AS STANDARD	NG	JS	SAMIR DAS	SANJAY MAZUMDAR
5	09.11.16	REVISED AND REISSUED AS STANDARD	BR	JS/JKB	RAJANJI SRIVASTAVA	R.NANDA
4	25.10.11	REVISED & REISSUED	DK	SD	JKB	D.MALHOTRA

Approved by

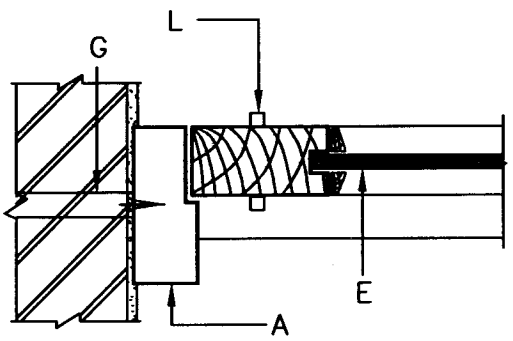
WOODEN PANEL DOOR (TOILET DOOR)



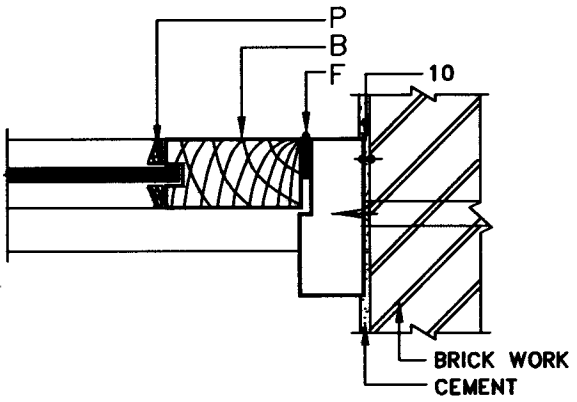
ELEVATION



SECTION 2–2



SECTIONAL PLAN 1–1



LEGEND:

A: DOOR FRAME AS SPECIFIED
B: TEAK WOOD STYLE 100x35
C: TEAK WOOD TOP RAIL 100x35
D: TEAK WOOD BOTTOM RAIL 200x35
E: 12 THK. PARTICLE BOARD/MARINE PLY INFILL PANEL WITH SPECIFIED FACING.
F: 150 LONG BUTT HINGES @ MAX. 600 C/C.
G: MS HOLD FAST EMBEDDED IN CONCRETE/FASTENER

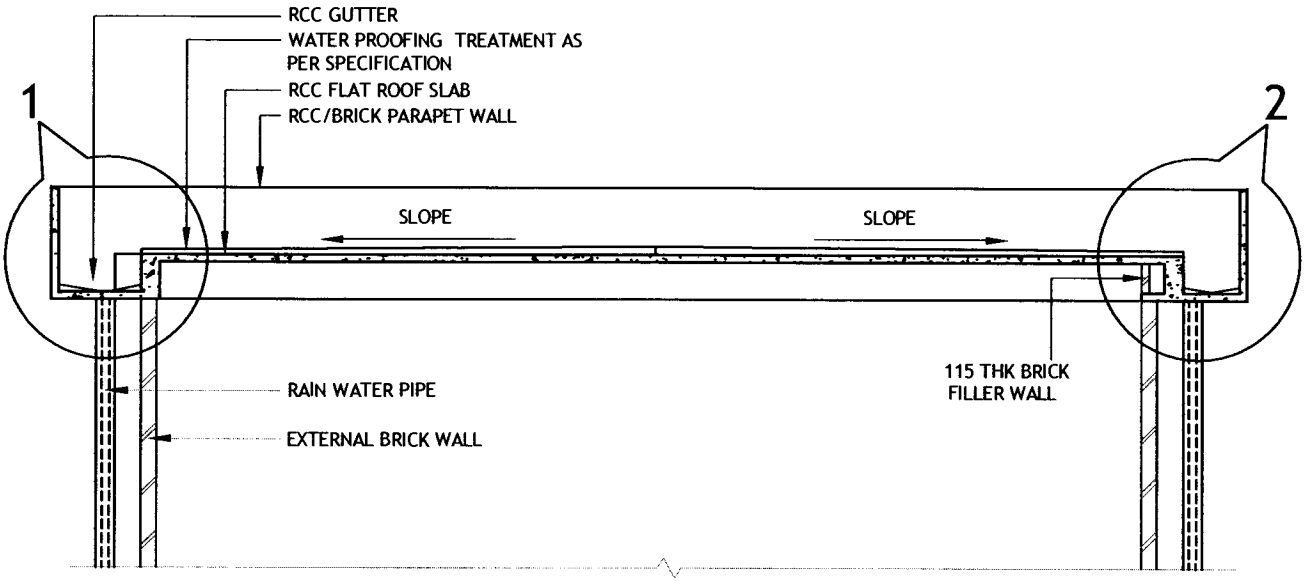
H: TOILET DOOR LATCH
J: TOWER BOLT
K: COAT AND HAT HOOK
} (INTERNAL SIDE OF THE DOOR)

L: DOOR HANDLE (BOTH SIDE OF THE DOOR)
M: ACRYLIC KICK PLATE 200X3 THICK.
N: TEAK WOOD LOCK RAIL 150x35
P: TEAK WOOD BEADING

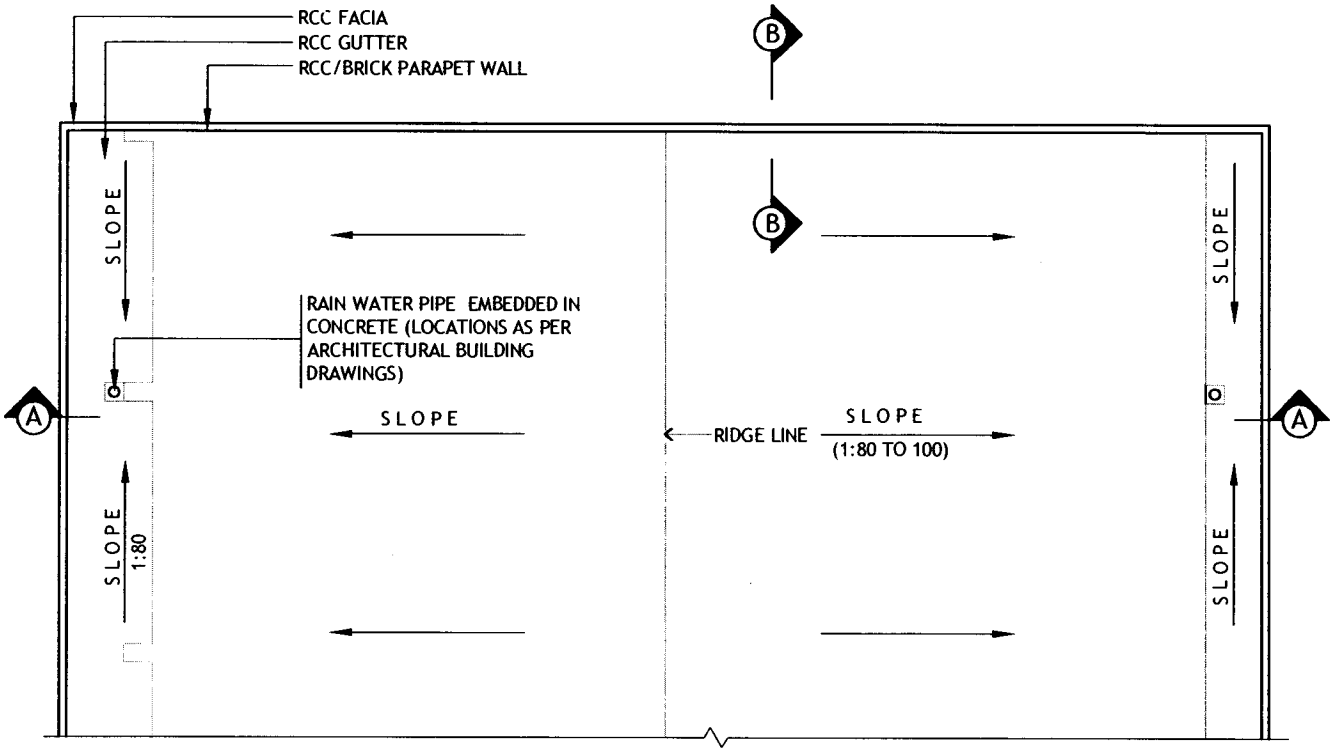
NOTE: ALL DIMENSIONS ARE IN MM

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	02.02.22	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	ANISH MAHALA	SAMIR DAS	SANJAY MAZUMDAR
5	21.11.16	REAFFIRMED & ISSUED AS STANDARD	DK	JS/JKB	RAJANJI SRIVASTAVA	R. NANDA

Approved by



SECTION A-A

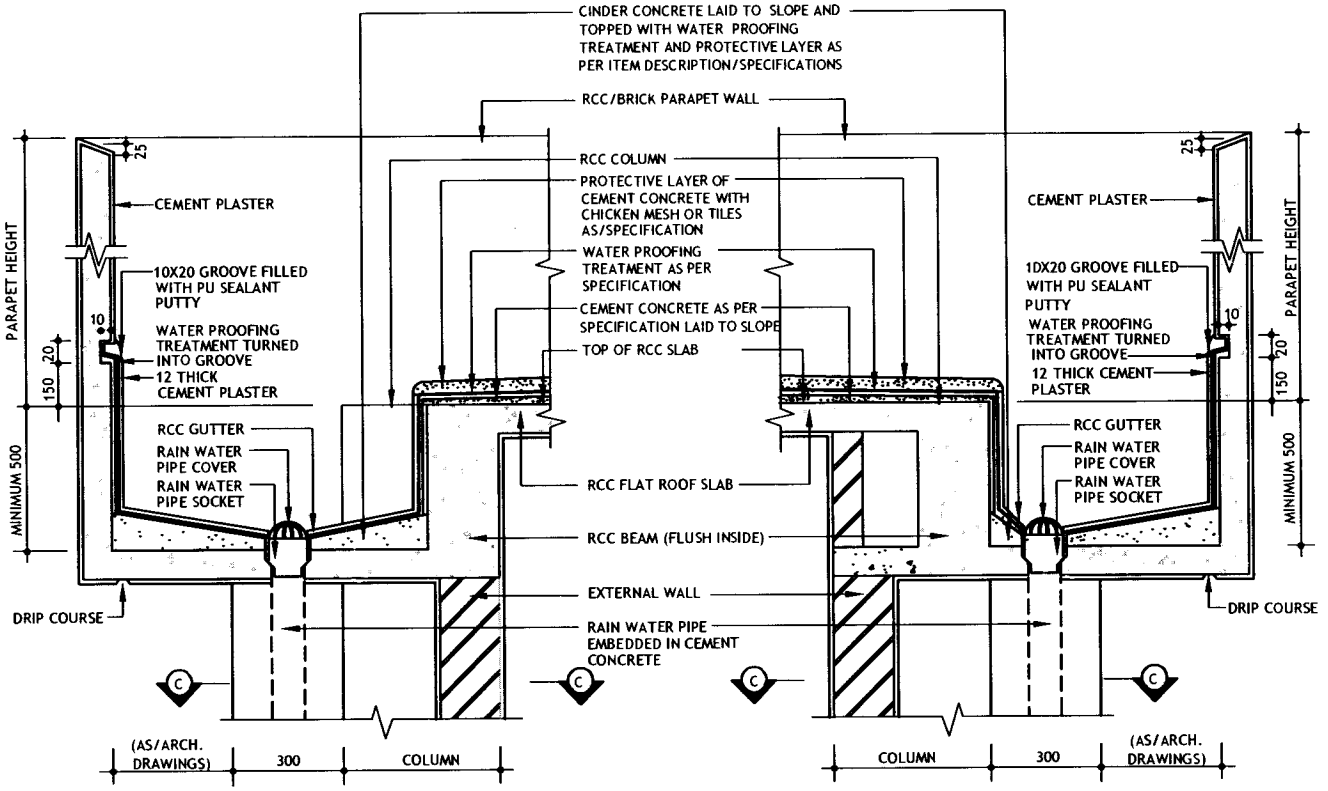


PART TERRACE PLAN

NOTES:

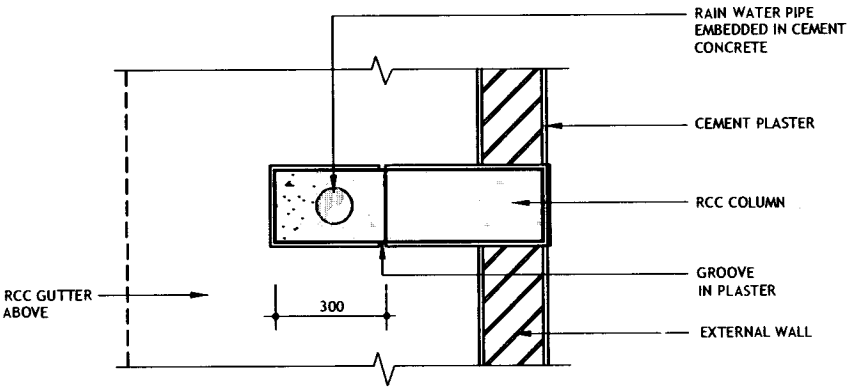
1. ALL DIMENSIONS ARE IN MM
2. SECTION A-A INDICATES RCC BEAM INSIDE ON ONE SIDE AND FLUSH OUTSIDE ON OTHER SIDE. THE LOCATION OF BEAM SHALL BE AS PER ARCHITECTURAL AND STRUCTURAL DRAWINGS.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
6	07.03.22	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	PIYALEE DAS	SAMIR DAS	SANJAY MAZUMDAR
5	07.03.17	REAFFIRMED & ISSUED AS STANDARD	VK/DK	JKB	RAJANJI SRIVASTAVA	R. NANDA



DETAIL - 1

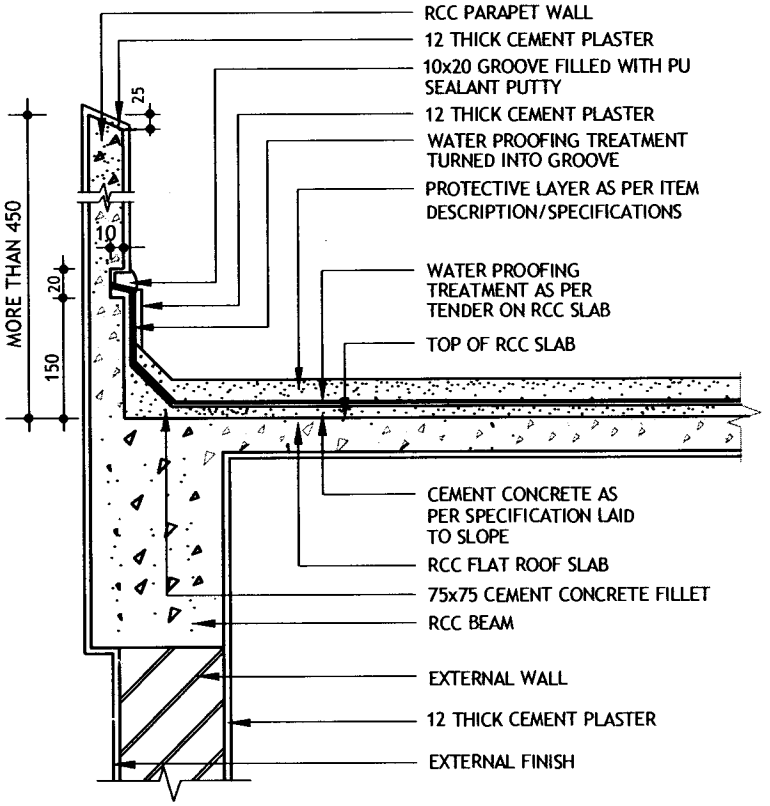
DETAIL - 2



SECTIONAL PLAN C-C

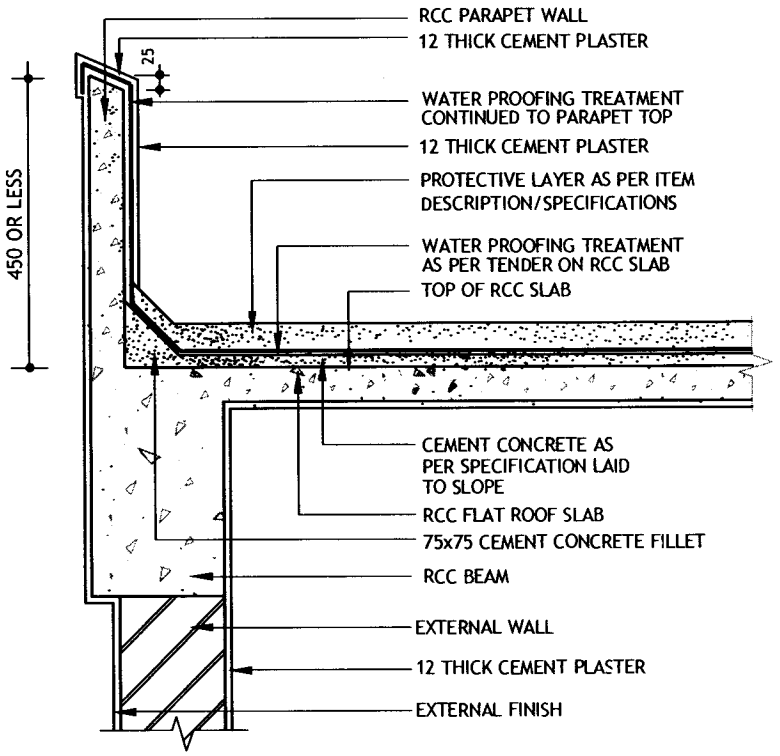
NOTE: REFER SHEET 1 OF 3

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
6	07.03.22	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	PIYALEE DAS	SAMIR DAS	SANJAY MAZUMDAR
5	07.03.17	REAFFIRMED & ISSUED AS STANDARD	VK/DK	JKB	RAJANJI SRIVASTAVA	R. NANDA



SECTION B-B

(PARAPET HEIGHT MORE THAN 450)



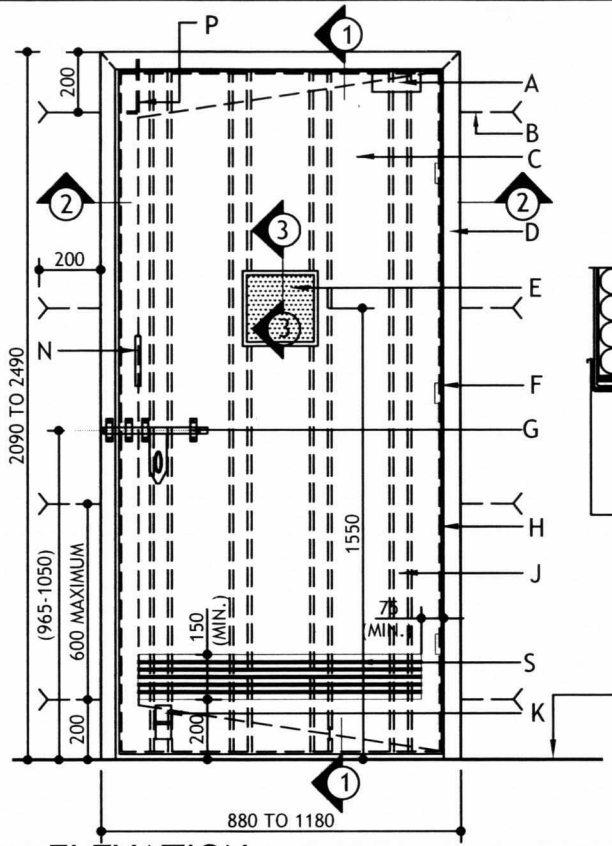
SECTION B-B

(PARAPET HEIGHT UP TO 450)

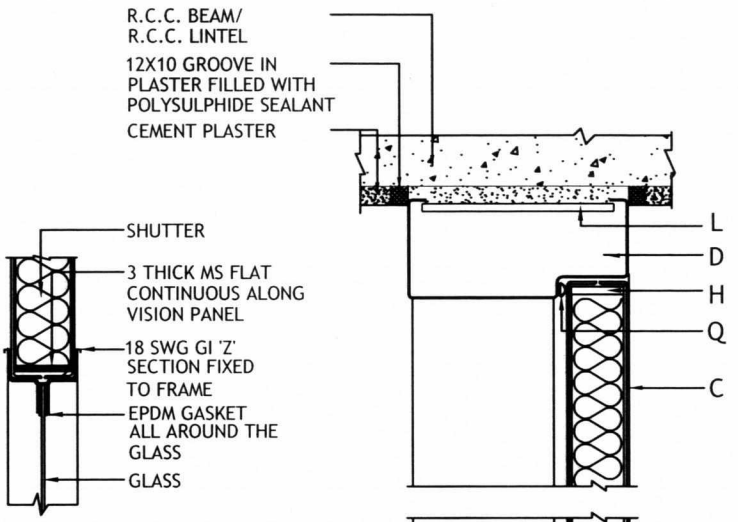
NOTE : ALL DIMENSIONS ARE IN MM

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
6	07.03.22	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	PIYALEE DAS	SAMIR DAS	SANJAY MAZUMDAR
5	07.03.17	REAFFIRMED & ISSUED AS STANDARD	VK/DK	JKB	RAJANJI SRIVASTAVA	R. NANDA

STEEL DOOR (PRESSED STEEL) SINGLE SHUTTER



ELEVATION

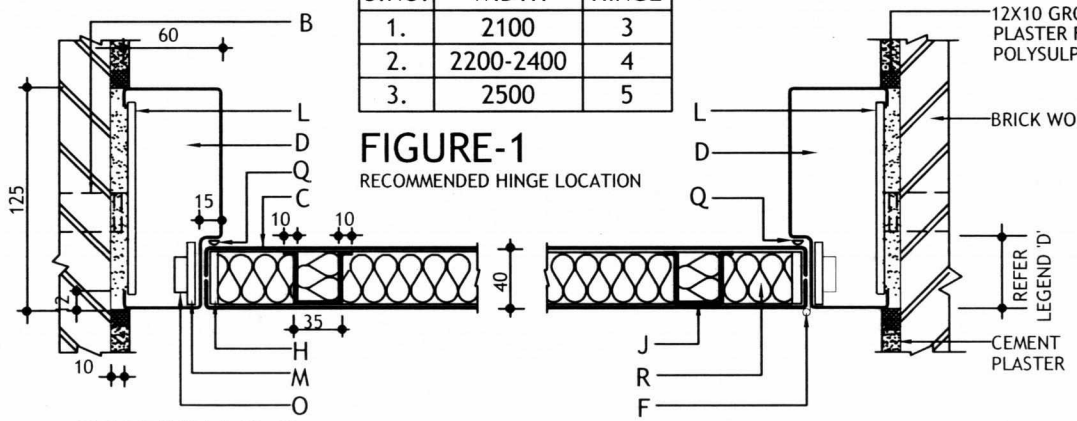


SECTION 3-3

SECTION 1-1

S.NO.	WIDTH	HINGE
1.	2100	3
2.	2200-2400	4
3.	2500	5

FIGURE-1
RECOMMENDED HINGE LOCATION



SECTION 2-2

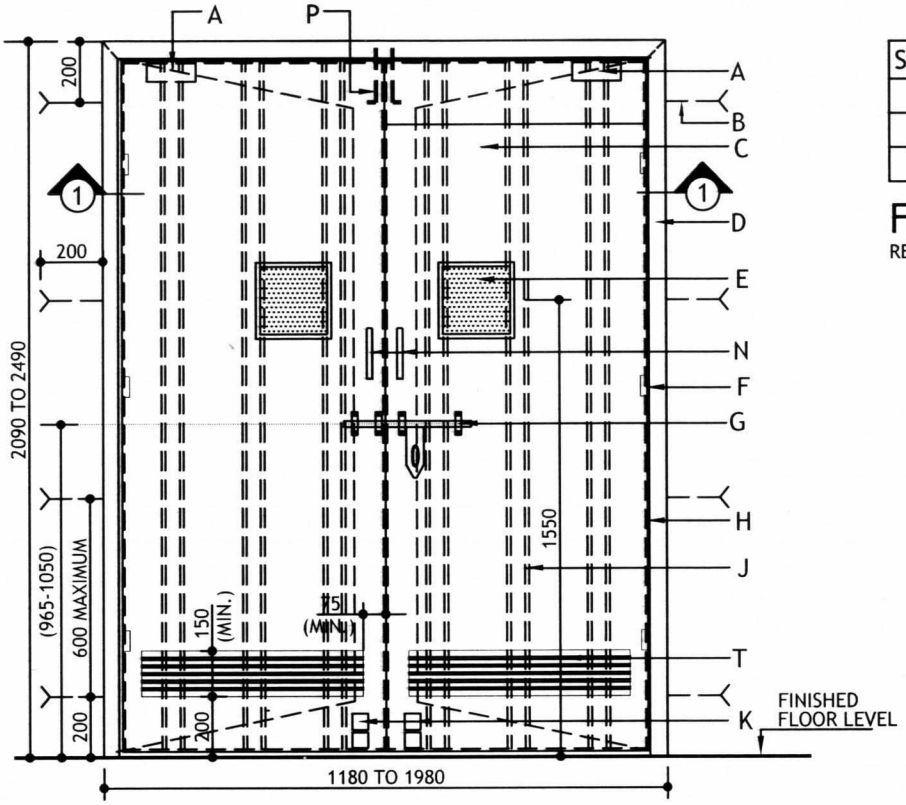
LEGEND :

A. OVER HEAD HYDRAULIC DOOR CLOSER (HEAVY DUTY).
B. MS HOLDFAST 200x25x6 THICK @ MAXIMUM 600 C/C WELDED TO FRAME SPACER (L).
C. 40 THICK (OVER ALL) 18 SWG GALVANIZED PRESSED STEEL SHUTTER FILLED WITH MINERAL WOOL (48Kg/cum).
D. 16 SWG GALVANIZED PRESSED STEEL FRAME OUT OF 125X60 PROFILE FILLED WITH CONCRETE (REBATE DIMENSION TO BE SUITABLY ADJUSTED FOR ACCOMMODATING GASKET FOR AIR TIGHT DOOR).
E. VISION PANEL (AS PER PROJECT DRAWING).
F. 100 LONG SS 304 GRADE HEAVY DUTY BALL BEARING HINGE AS PER FIGURE 1.
G. SS 304 GRADE 16 DIA 300 LONG ALDROP ON BOTH SIDES.
H. 3 THICK MS FLAT CONTINUOUS ALONG PERIMETER OF OF SHUTTER.
J. 18 SWG GI VERTICAL STIFFNER @ 200 C/C (SPACING TO BE ADJUSTED FOR VISION PANEL).
K. SPRING LOADED HEAVY DUTY DOOR STOPPER.
L. 3 THICK MS FLAT SPACER WELDED TO FRAME AT @ 500 C/C.
M. 40x150x3 THICK MS PAD WELDED TO FRAME AT ALL HINGE & LOCK LOCATIONS.
N. SS 304 GRADE 19 DIA, 200 LONG HANDLE ON BOTH SIDES.
O. 18 SWG GI MORTAR GUARD AT THE BACK OF HINGES & LOCK.
P. 10 DIA SS 304 TOWER BOLT (250 LONG FOR 2100 HT. & 600 LONG FOR 2500 HT.).
Q. 'D' PROFILE EPDM GASKET ALONG FRAME REBATE (FOR AIR TIGHT DOOR ONLY).
R. INSULATION AS PER ITEM DESCRIPTION.
S. LOUVER (SIZE AS PER PROJECT DRAWING) MADE 18 SWG GI (NOT REQUIRED FOR AC AND PRESSURISED AREA

NOTE: 1. ALL DIMENSIONS ARE IN MM

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
6	17.01.23	REVISED & ISSUED AS STANDARD	BABITA SHARMA	PIYALEE DAS	SAMIR DAS	SANJAY MAZUMDAR
5	24.04.17	REVISED & ISSUED AS STANDARD	DK	JS/JKB	RAJANJI SRIVASTAVA	R. NANDA

Approved by

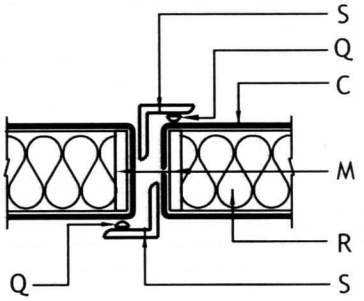


ELEVATION

S.NO.	WIDTH	HINGE
1.	2100	3
2.	2200-2400	4
3.	2500	5

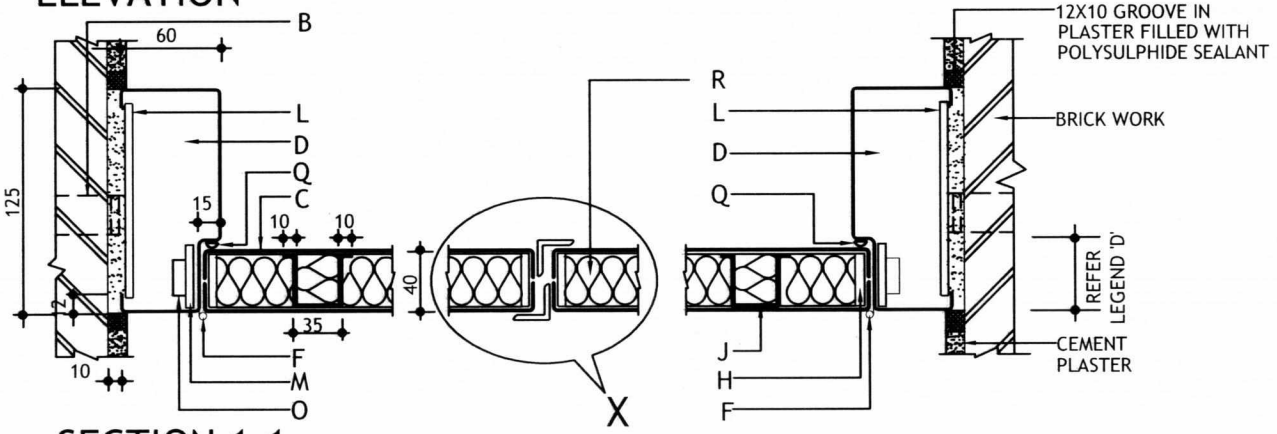
FIGURE-1

RECOMMENDED HINGE LOCATION



DETAIL X

NOTE: IN PLACE OF GI ANGLES (S) SUITABLE PROFILING/ DETAILING FOR CLOSURE OF SHUTTERS IS ALSO ACCEPTABLE.



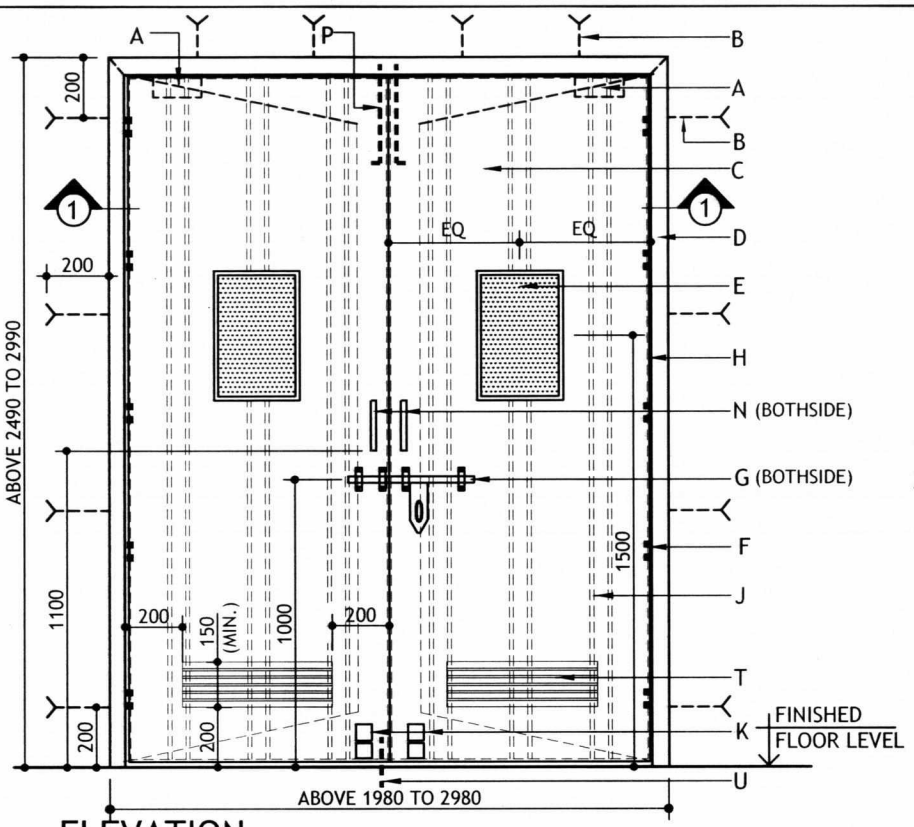
SECTION 1-1

LEGEND :

A. OVER HEAD HYDRAULIC DOOR CLOSER (HEAVY DUTY).
B. MS HOLDFAST 200x25x6 THICK @ MAXIMUM 600 C/C WELDED TO FRAME SPACER (L).
C. 40 THICK (OVER ALL) 18 SWG GALVANIZED PRESSED STEEL SHUTTER FILLED WITH MINERAL WOOL (48Kg/cum).
D. 16 SWG GALVANIZED PRESSED STEEL FRAME OUT OF 125X60 PROFILE FILLED WITH CONCRETE (REBATE DIMENSION TO BE SUITABLY ADJUSTED FOR ACCOMMODATING GASKET FOR AIR TIGHT DOOR).
E. VISION PANEL (AS PER PROJECT DRAWING).
F. 100 LONG SS 304 GRADE HEAVY DUTY BALL BEARING HINGE AS PER FIGURE 1.
G. SS 304 GRADE 16 DIA 300 LONG ALDROP ON BOTH SIDES.
H. 3 THICK MS FLAT CONTINUOUS ALONG PERIMETER OF OF SHUTTER.
J. 18 SWG GI VERTICAL STIFFNER @ 200 C/C (SPACING TO BE ADJUSTED FOR VISION PANEL).
K. SPRING LOADED HEAVY DUTY DOOR STOPPER.
L. 3 THICK MS FLAT SPACER WELDED TO FRAME AT @ 500 C/C.
M. 40x150x3 THICK MS PAD WELDED TO FRAME AT ALL HINGE & LOCK LOCATIONS.
N. SS 304 GRADE 19 DIA, 200 LONG HANDLE ON BOTH SIDES.
O. 18 SWG GI MORTAR GUARD AT THE BACK OF HINGES & LOCK.
P. 10 DIA SS 304 TOWER BOLT (250 LONG FOR 2100 HT. & 600 LONG FOR 2500 HT.).
Q. 'D' PROFILE EPDM GASKET ALONG FRAME REBATE (FOR AIR TIGHT DOOR ONLY).
R. INSULATION AS PER ITEM DESCRIPTION.
S. 2 THICK 25X25 GI ANGLE (VERTICAL) EACH WELDED TO ONE SHUTTER.
T. LOUVER (SIZE AS PER PROJECT DRAWING) MADE 18 SWG GI (NOT REQUIRED FOR AC AND PRESSURISED AREA

NOTE: 1. ALL DIMENSIONS ARE IN MM.
2. FOR OTHER DETAILS REFER STANDARD NO. 7-75-0070.

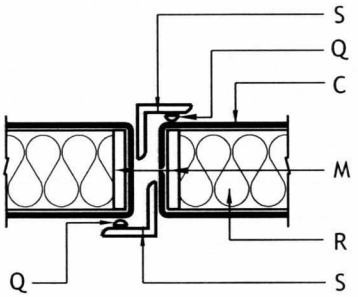
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
6	17.01.23	REVISED & ISSUED AS STANDARD	BABITA SHARMA	PIYALEE DAS	SAMIR DAS	SANJAY MAZUMDAR
5	24.04.17	REVISED & ISSUED AS STANDARD	DK	JS/JKB	RAJANJI SRIVASTAVA	R. NANDA



ELEVATION

S.NO.	WIDTH	HINGES
1.	2500-2700	5
2.	2800-3000	6

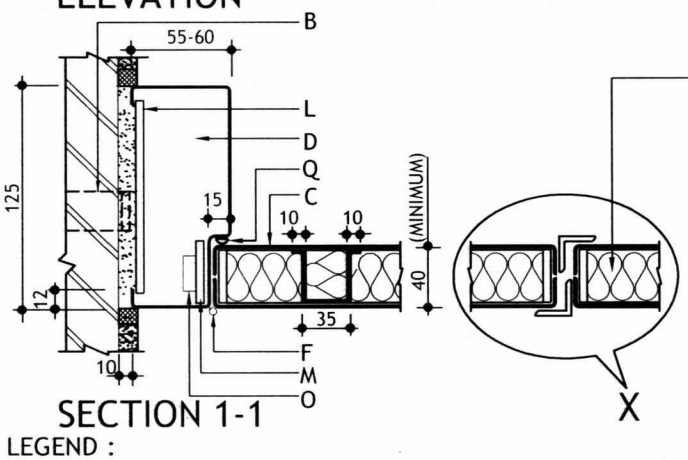
FIGURE-1
RECOMMENDED HINGE NUMBERS (MINIMUM)



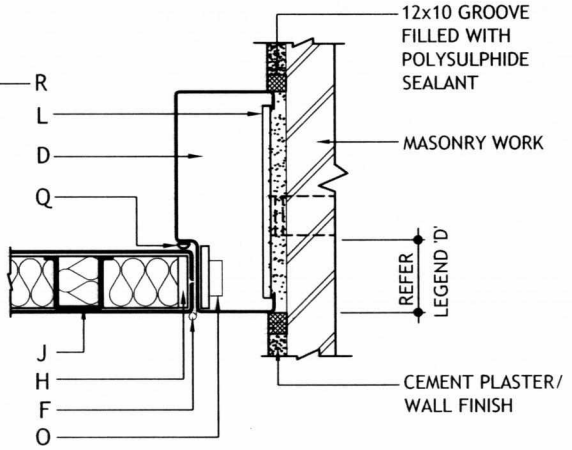
DETAIL X

NOTE :

IN PLACE OF GI ANGLES (S), SUITABLE PROFILING / DETAILING FOR CLOSURE OF SHUTTERS IS ALSO ACCEPTABLE.



SECTION 1-1



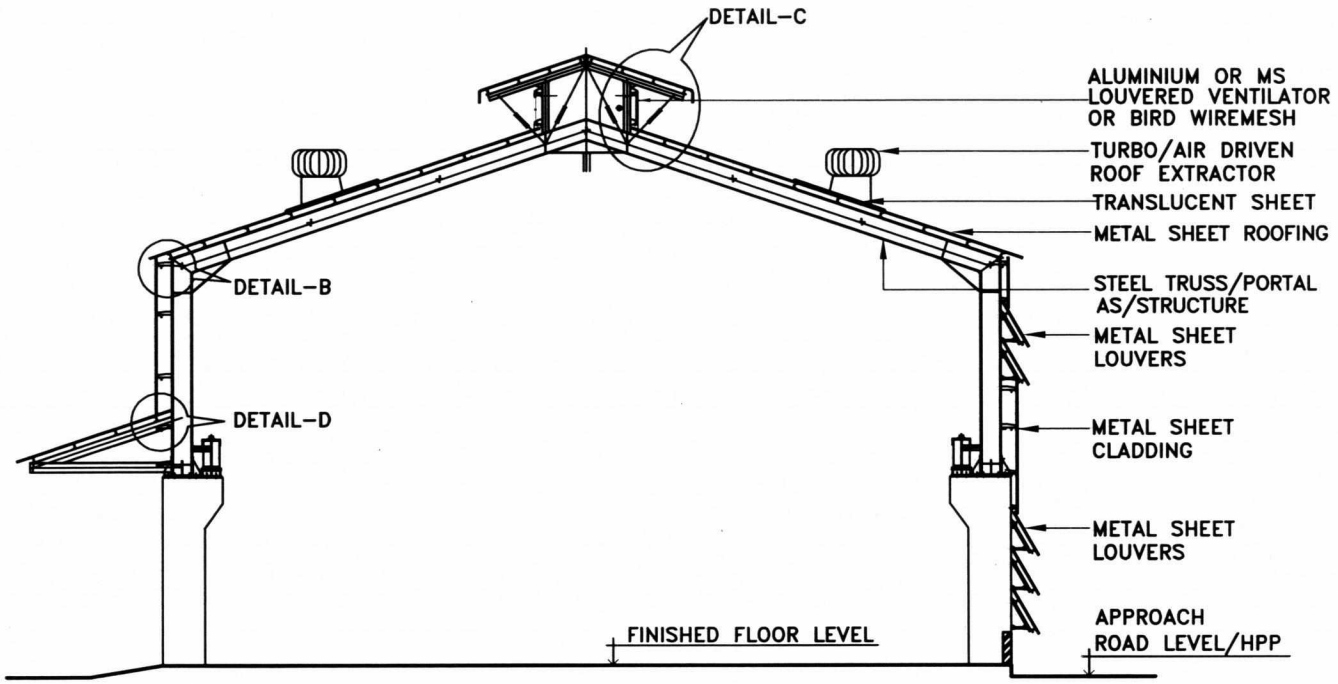
LEGEND :

A. OVER HEAD HYDRAULIC DOOR CLOSER (HEAVY DUTY) ON BOTH SHUTTERS.
B. MS HOLDFAST 200X25X6 THICK OR 10X100 FRAME ANCHOR FASTENERS @ MAXIMUM 600 C/C WELDED TO FRAME SPACER (L).
C. 18 SWG GALVANIZED PRESSED STEEL SHUTTER FILLED WITH MINERAL WOOL (48KG/CUM) OR OTHER APPROVED MATERIAL SUCH AS HONEY COMB.
D. 16 SWG GALVANIZED PRESSED STEEL FRAME OUT OF (MIN) 125X55-60 PROFILE FILLED WITH CONCRETE (REBATE DIMENSION TO BE SUITABLY ADJUSTED FOR ACCOMODATING GASKET FOR AIR TIGHT DOOR).
E. VISION PANEL (300X450).
F. 100 LONG SS 304 GRADE HEAVY DUTY SS BALL BEARING HINGE AS PER FIGURE 1.
G. SS 304 GRADE 16 DIA 400 LONG SS ALDROP ON BOTH SIDES.
H. 3 THICK MS FLAT CONTINUOUS ALONG PERIMETER OF SHUTTER.
J. 18 SWG GI VERTICAL STIFFNER @ 200 C/C (SPACING TO BE ADJUSTED FOR VISION PANEL / LOUVERS).
K. SPRING LOADED HEAVY DUTY DOOR STOPPER.
L. 3 THICK MS FLAT SPACER WELDED TO FRAME AT @ 500 C/C.
M. 40x150x3 THICK MS PAD WELDED TO FRAME AT ALL HINGE & LOCK LOCATIONS.
N. SS 304 GRADE 19 DIA, 300 LONG SS HANDLE ON BOTH SIDES (THE HANDLES SHALL NOT BE INTERCONNECTED BY THROUGH BOLTING).
O. 18 SWG GI MORTAR GUARD AT THE BACK OF HINGES & LOCK.
P. SS-304 GRADE, SURFACE MOUNTED OR CONCEALED SS FLUSH BOLT, LENGTH UPTO 1400MM ON OUTER SIDE.
Q. 'D' PROFILE EPDM GASKET ALONG FRAME REBATE (FOR AIR TIGHT DOOR ONLY).
R. SHUTTER FILLER (REFER 'C').
S. 2 THICK 25X25 GI ANGLE (VERTICAL) WELDED TO EACH SHUTTER.
T. LOUVER MADE 18 SWG GI (NOT REQUIRED FOR AC AND PRESSURIZED AREA.
U. SS 304, 300 LONG SURFACE MOUNTED OR CONCEALED FLUSH BOLT ON INACTIVE LEAF.

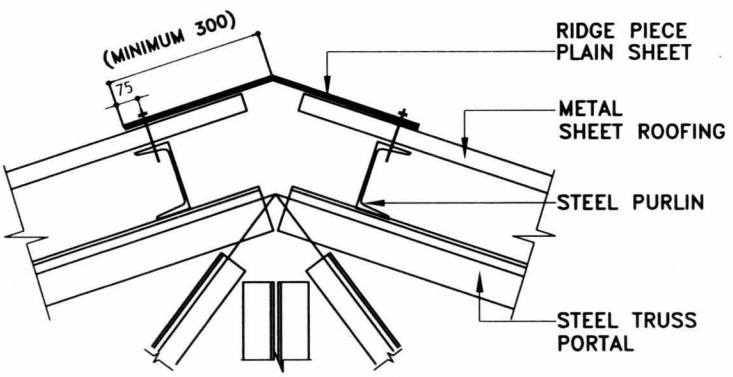
NOTE: 1. ALL DIMENSIONS ARE IN MM.
2. FOR OTHER DETAILS REFER STANDARD NO. 7-75-0070, 7-75-0071

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
1	17.01.23	REVISED & ISSUED AS STANDARD	BABITA SHARMA	PIYALEE DAS	SAMIR DAS	SANJAY MAZUMDAR
0	01.06.20	ISSUED AS STANDARD	M L THAKUR	SAMIR DAS	RAJANJI SRIVASTAVA	S K SAXENA

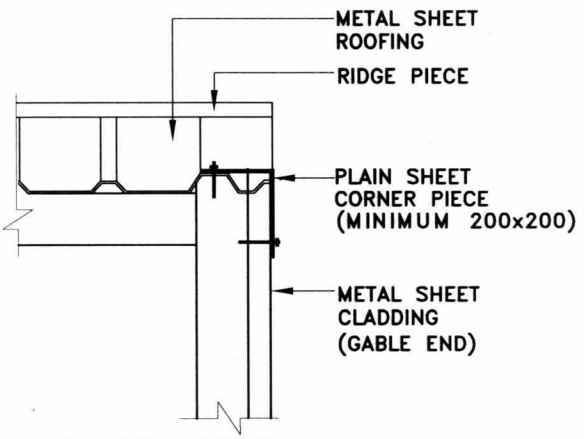
Approved by



TYPICAL SECTION



DETAIL–A
(RIDGE FLASHING DETAIL)

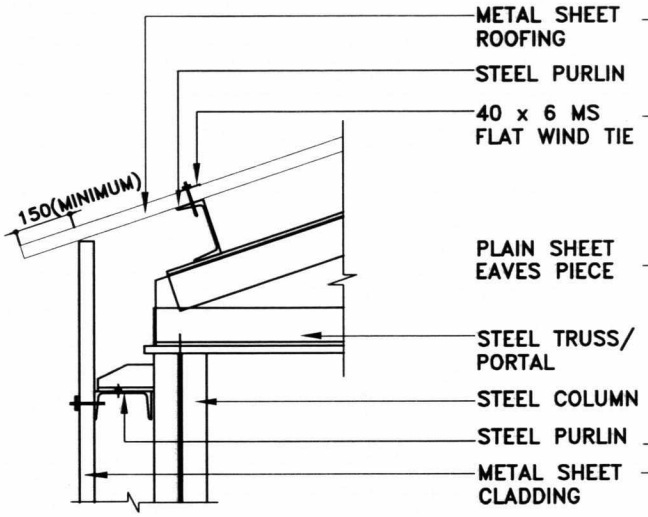


CORNER PIECE
FLASHING DETAIL
(ROOF AND GABLE END CLADDING)

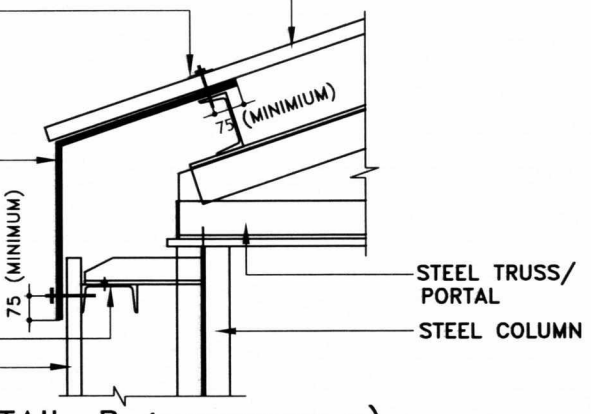
NOTES:

1. ALL DIMENSIONS ARE IN MM.
2. THIS STANDARD INDICATES VARIOUS ARCHITECTURAL FEATURES AND FLASHING DETAILS OF SHEDS. PROVISION OF FEATURES (ROOF MONITOR, ROOF EXTRACTOR, TRANSLUCENT SHEET, LOUVERS) AND THEIR SIZES, LOCATION ETC SHALL BE AS PER PROJECT DRAWINGS.
3. MATERIAL, THICKNESS AND OTHER DETAILS OF ROOFING, CLADDING, ACCESORIES (RIDGE FLASHING, CORNER PIECE, EAVES PIECE, APRON PIECE AND OTHER FLASHING) AND BIRD MESH SHALL BE AS PER PROJECT SPECIFICATION.

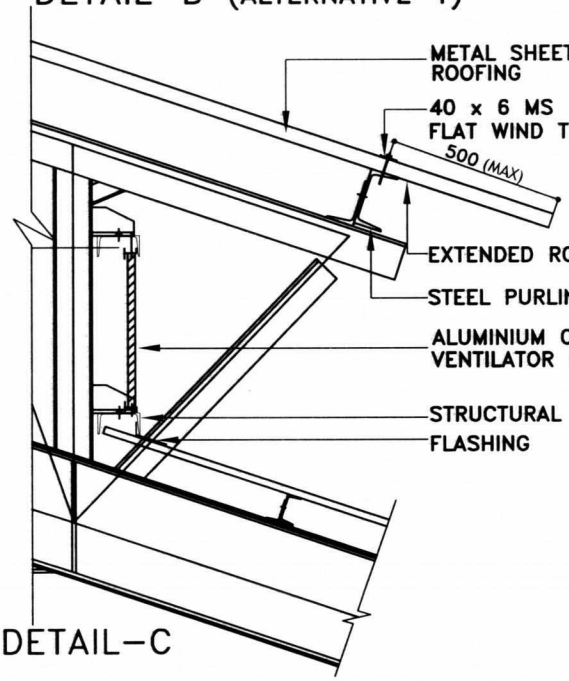
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
2	17.01.23	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	PIYALEE DAS	SAMIR DAS	SANJAY MAZUMDAR
1	16.01.18	REVISED & REISSUED AS STANDARD	RS	JS/SD	R. SRIVASTAVA	R. NANDA



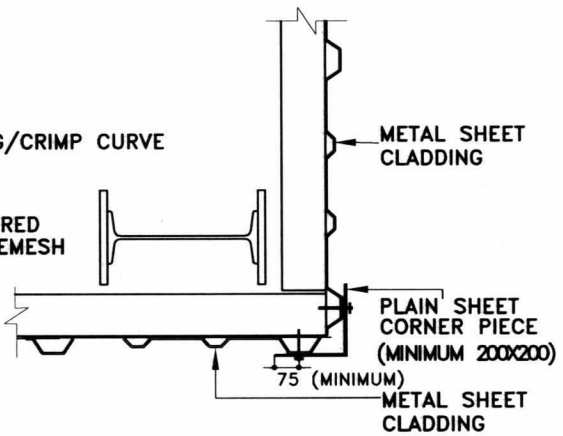
DETAIL–B (ALTERNATIVE–1)



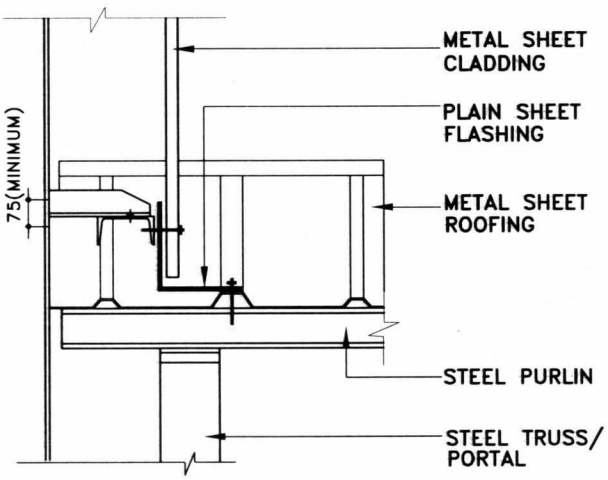
DETAIL–B (ALTERNATIVE–2)
EAVES FLASHING DETAIL



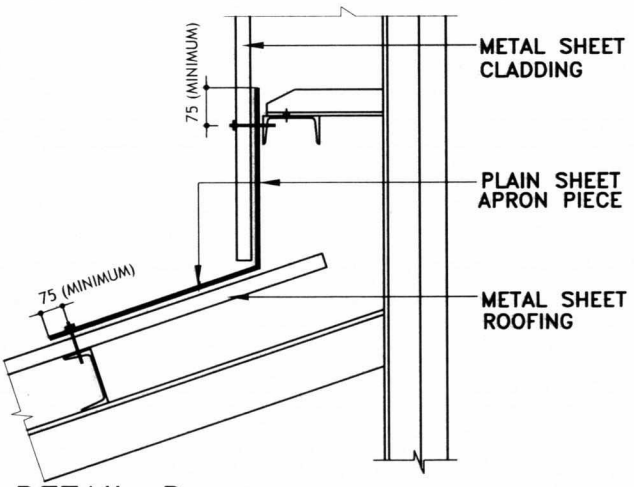
DETAIL–C



CORNER PIECE FLASHING DETAIL
(SIDE AND GABLE END CLADDING)

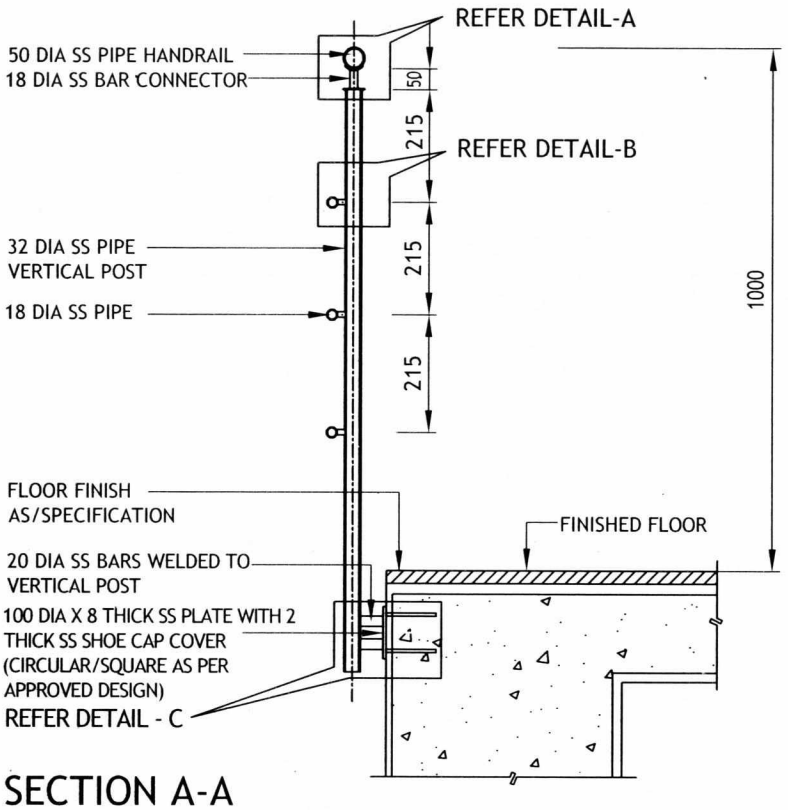


FLASHING DETAIL
(VERTICAL CLADDING AND ROOF)

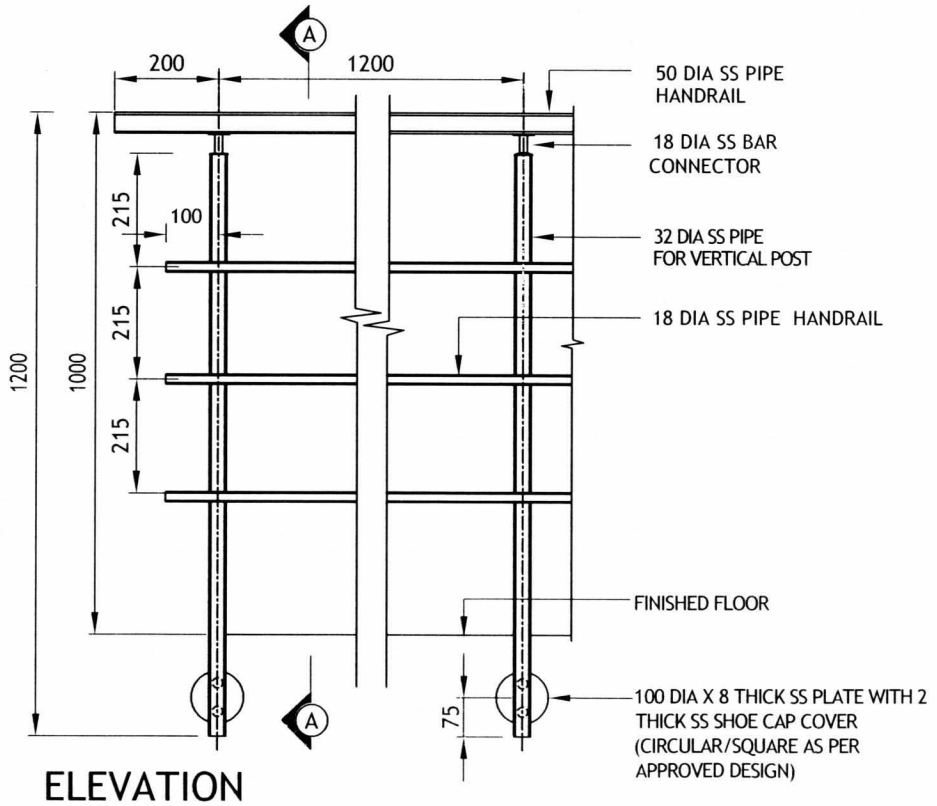


DETAIL–D
(APRON FLASHING DETAIL)

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
2	17.01.23	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	PIYALEE DAS	SAMIR DAS	SANJAY MAZUMDAR
1	16.01.18	REVISED & REISSUED AS STANDARD	RS	JS/SD	R. SRIVASTAVA	R. NANDA



SECTION A-A

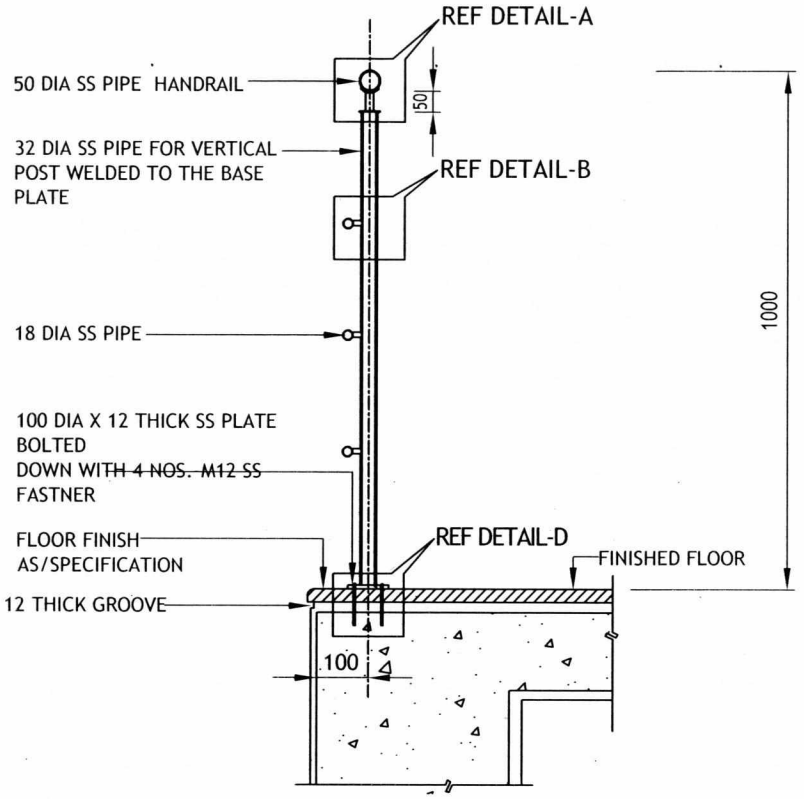


ELEVATION

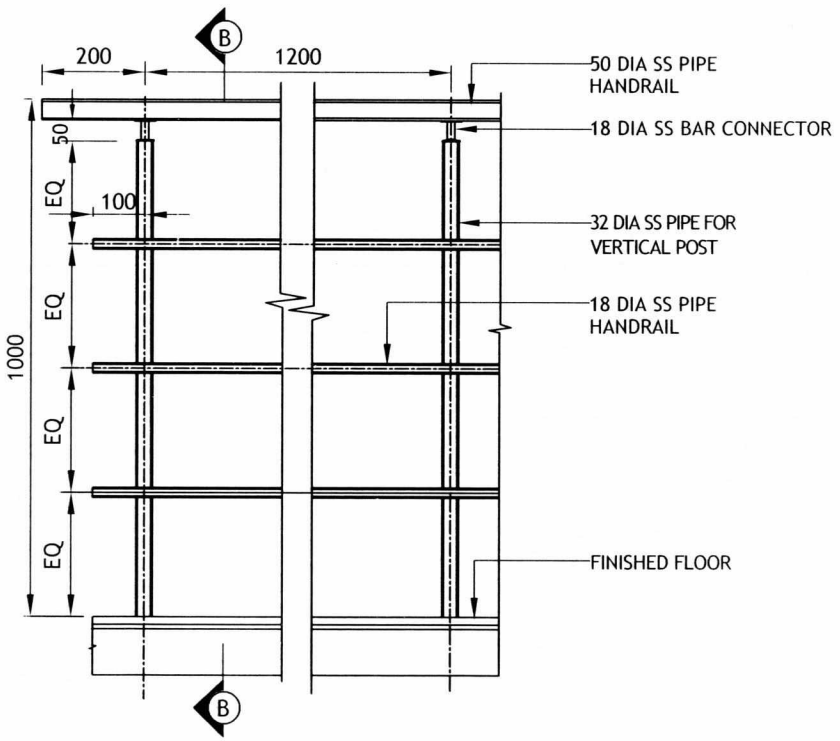
STAINLESS STEEL HANDRAIL FIXED ON SIDE OF SLAB & STAIRS (TYPE-A)

NOTE: 1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. 50 & 32 DIA (OUTER) PIPES SHALL BE OF 16 GAUGE. ALL OTHER MEMBERS SHALL BE OF 18 GUAGE/ APPLICABLE.
3. GRADE OF STEEL IS S/S 304 (SATIN FINISH).

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
2	16.10.23	REVISED & ISSUED AS STANDARD	M L THAKUR	SANDEEP	SAMIR DAS	SANJAY MAZUMDAR
1	30.03.21	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	SAMIR DAS	ANURAG SINHA	SANJAY MAZUMDAR



SECTION B-B



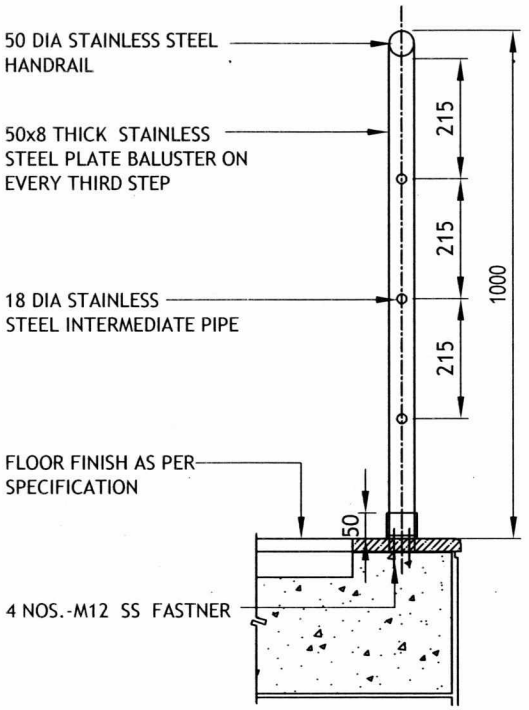
ELEVATION

STAINLESS STEEL HANDRAIL FIXED OVER THE SLAB & STAIRS (TYPE-B)

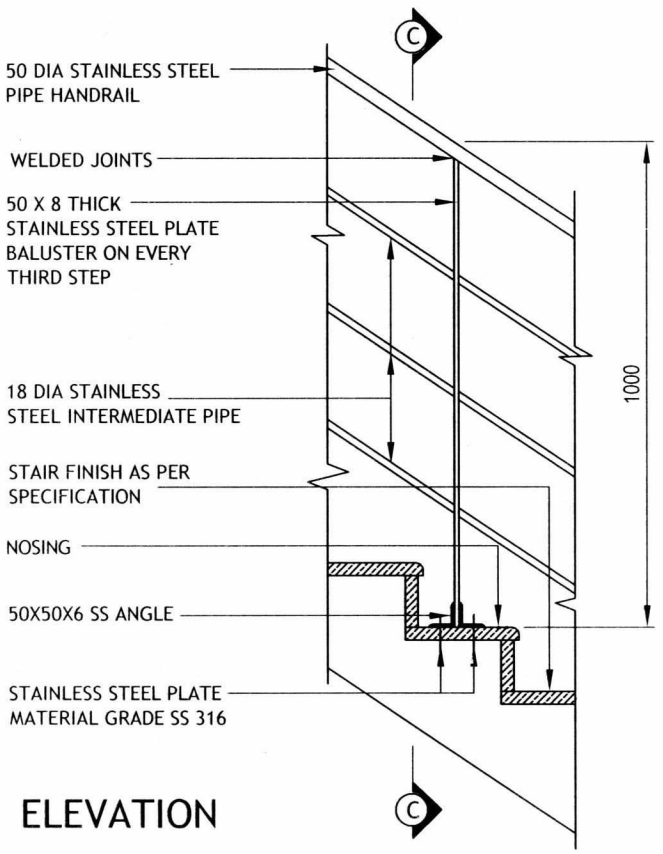
NOTE: 1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. GRADE OF STEEL IS S/S 304 (SATIN FINISH).

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
2	16.10.23	REVISED & ISSUED AS STANDARD	M L THAKUR	SANDEEP	SAMIR DAS	SANJAY MAZUMDAR
1	30.03.21	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	SAMIR DAS	ANURAG SINHA	SANJAY MAZUMDAR

Approved by



SECTION C-C



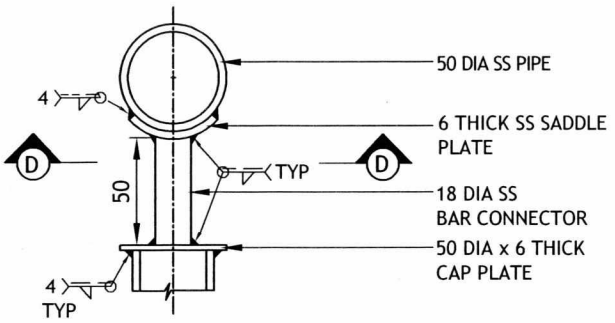
ELEVATION

STAINLESS STEEL HANDRAIL FOR SLAB & STAIRS (TYPE-C)

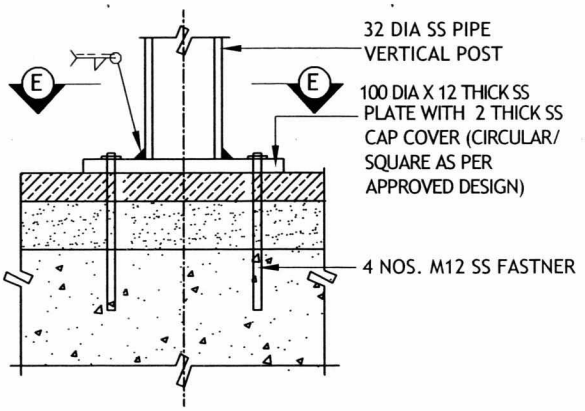
NOTE: 1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. GRADE OF STEEL IS S/S 304 (SATIN FINISH).

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
2	16.10.23	REVISED & ISSUED AS STANDARD	M L THAKUR	SANDEEP	SAMIR DAS	SANJAY MAZUMDAR
1	30.03.21	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	SAMIR DAS	ANURAG-SINHA	SANJAY MAZUMDAR

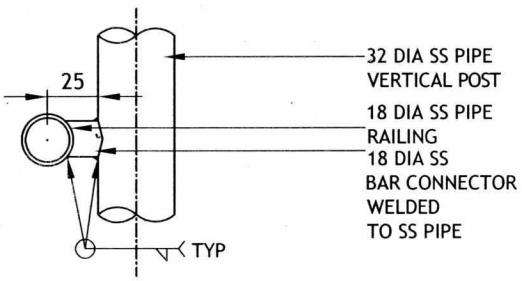
Approved by



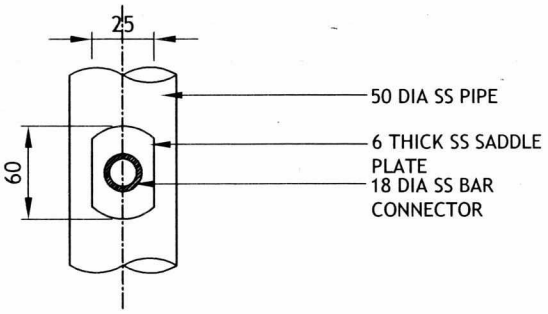
DETAIL A



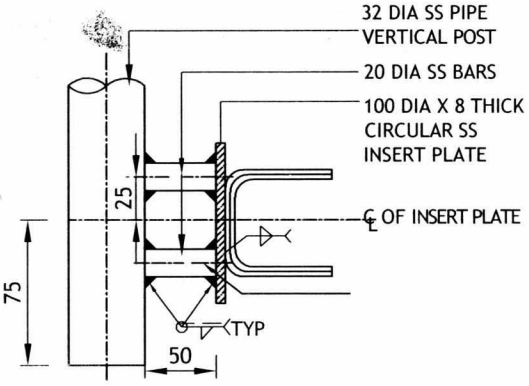
DETAIL D



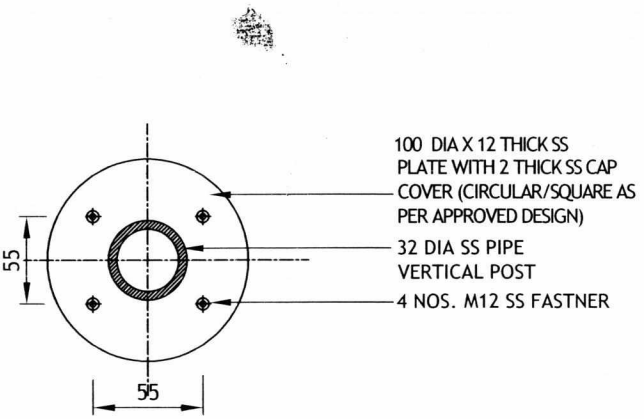
DETAIL B



SECTION D-D



DETAIL C
(TYPICAL DETAILS)

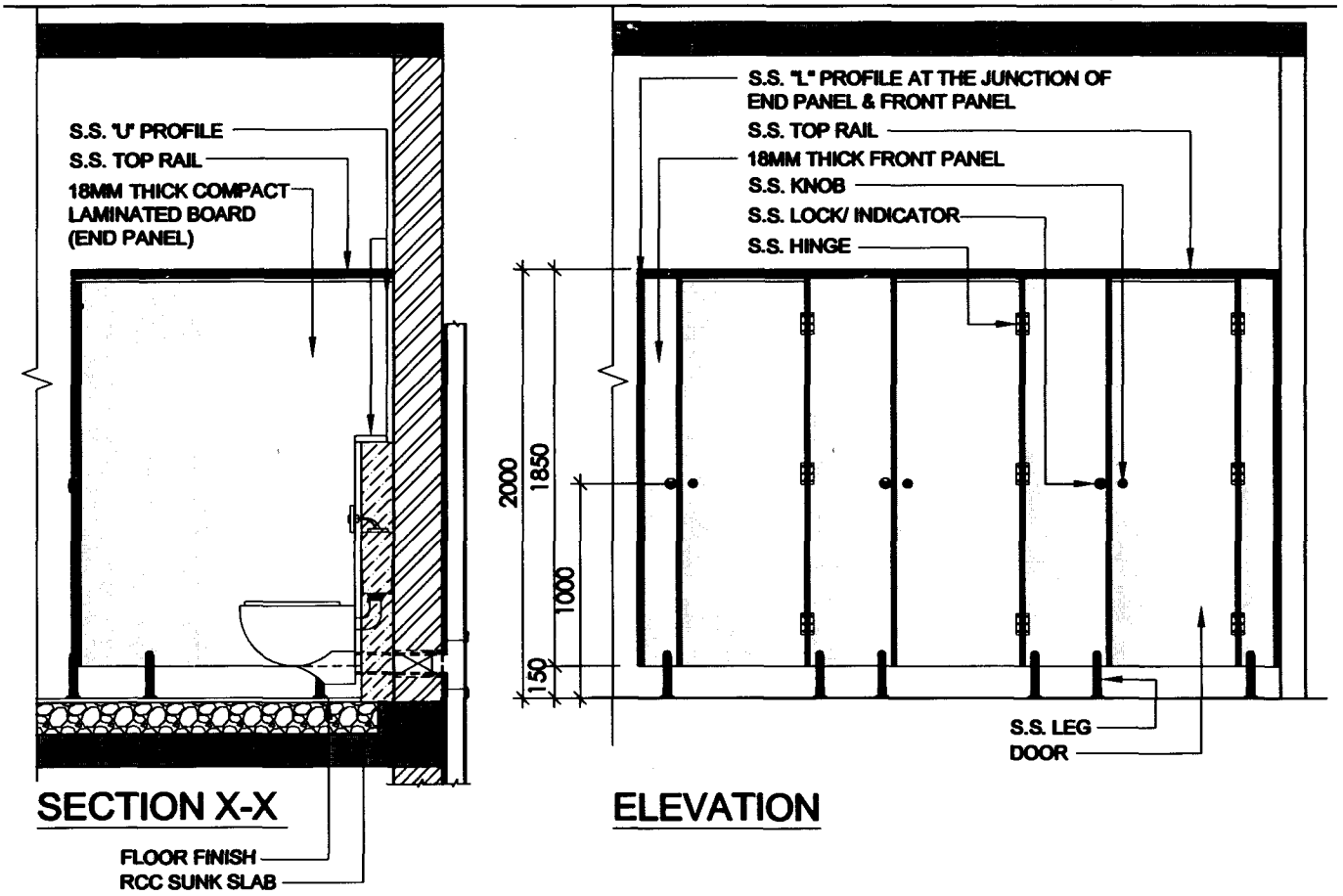


SECTION E-E

NOTE: 1. ALL DIMENSIONS ARE IN MILLIMETRES.
2. GRADE OF STEEL IS S/S 304 (SATIN FINISH).

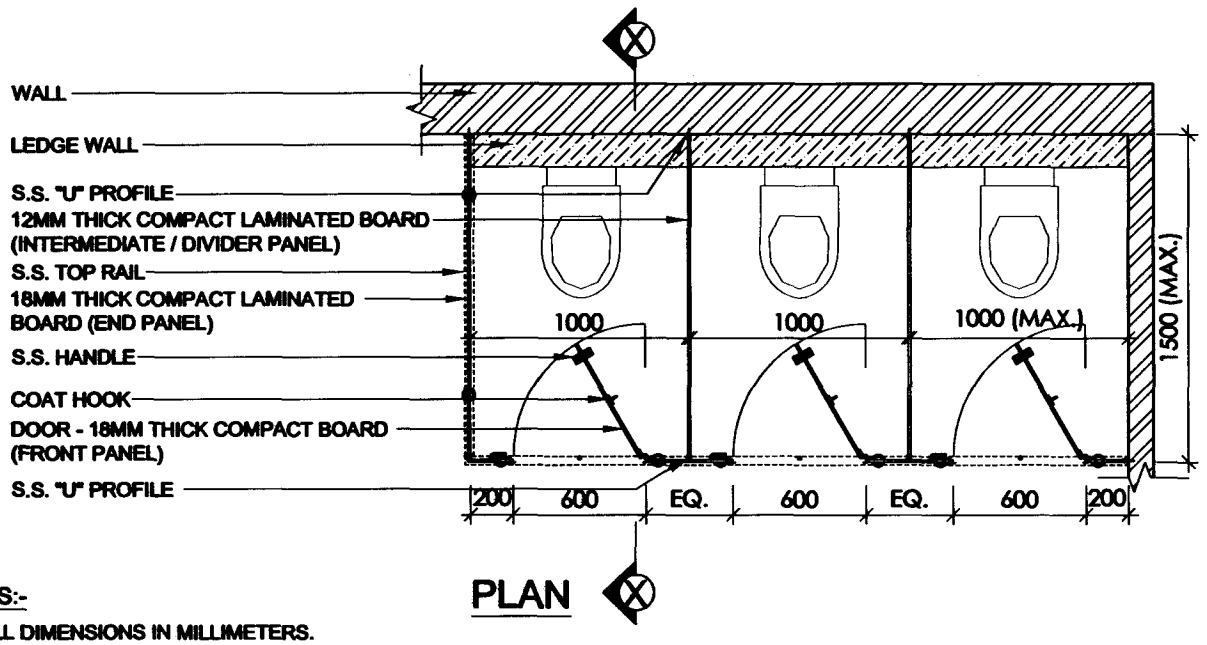
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
2	16.10.23	REVISED & ISSUED AS STANDARD	M L THAKUR	SANDEEP	SAMIR DAS	SANJAY MAZUMDAR
1	30.03.21	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	SAMIR DAS	ANURAG SINHA	SANJAY MAZUMDAR

TOILET CUBICLES DETAILS



SECTION X-X

ELEVATION



PLAN

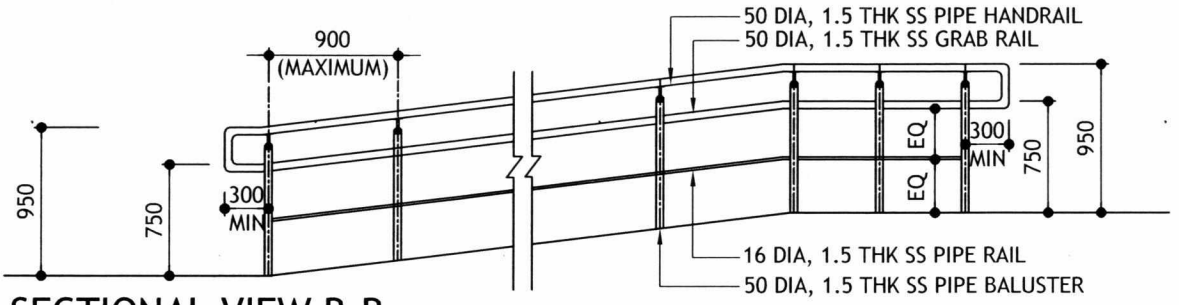
NOTES:-

1. ALL DIMENSIONS IN MILLIMETERS.
2. THIS STANDARD IS INDICATIVE AND TYPICAL CONSIDERING 3NO. OF W.C. CUBICLES. REFER RELEVANT ARCHITECTURAL DRAWING FOR EXACT NO. AND SIZES OF CUBICLES AND THEIR CONFIGURATION.
3. W.C. SEAT SHOWN IS INDICATIVE, EXACT TYPE OF SEAT (FLOOR MOUNTED OR WALL MOUNTED) SHALL BE AS PER TENDER ITEM.
4. ALL S.S. FITTINGS/ FIXTURES SHALL BE OF GRADE SS-316.
5. R.C.C. SUNK SLAB SHOWN IN SECTION X-X IS APPLICABLE FOR FIRST & HIGHER FLOORS ONLY (AND NOT FOR GROUND FLOOR).
6. FILLING MATERIAL FOR R.C.C. SUNK SLAB SHALL BE AS/ TENDER ITEM.

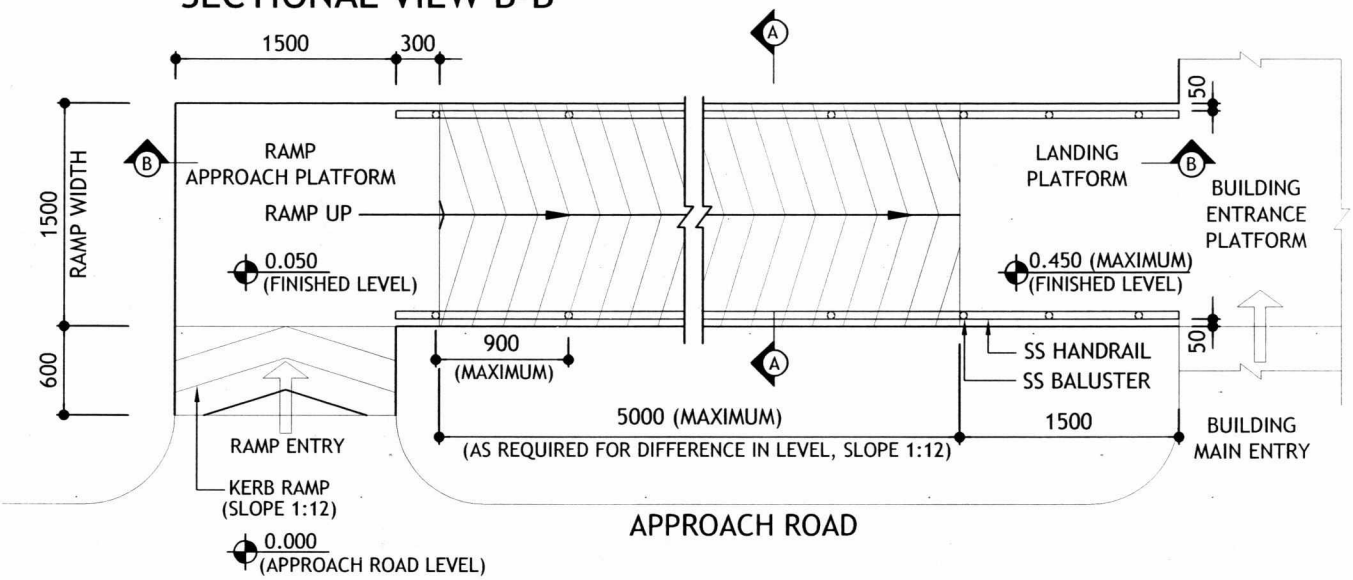
LEGEND:

S.S. = STAINLESS STEEL

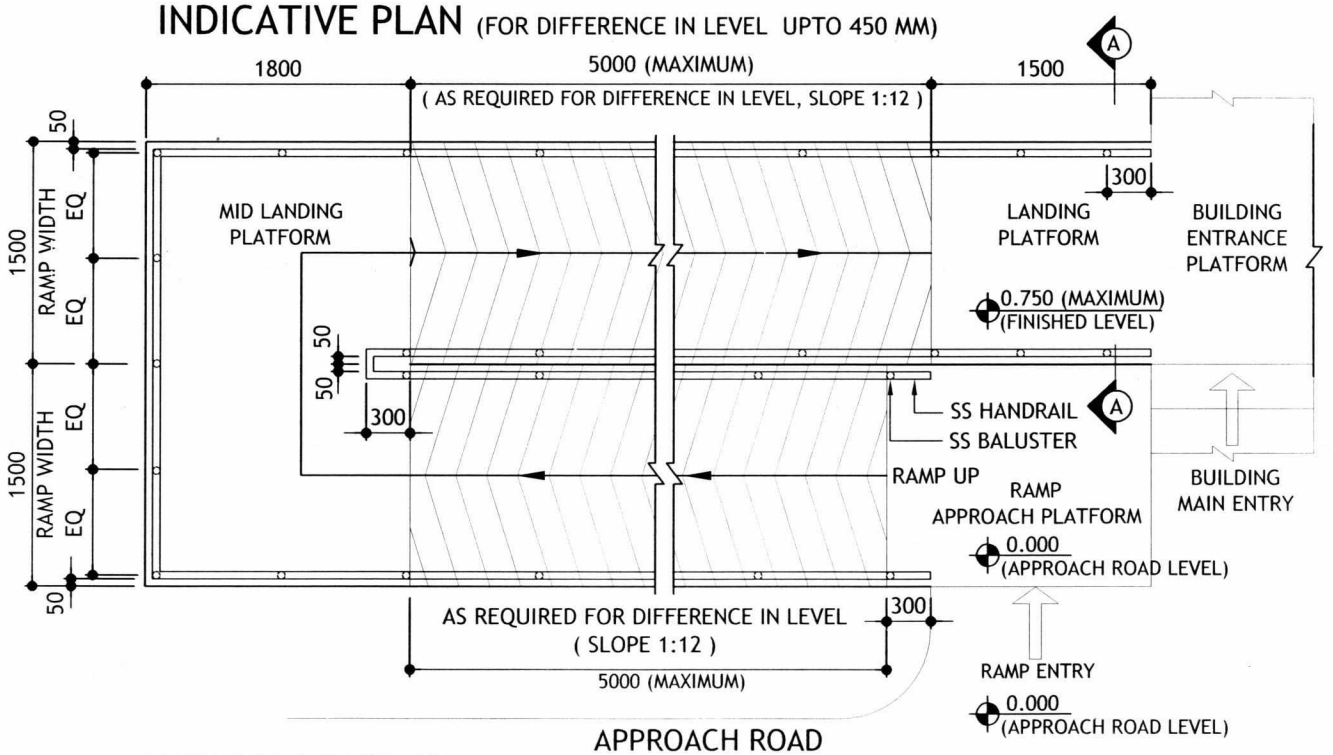
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
1	02.02.22	REVISED & ISSUED AS STANDARD	BABITA SHARMA	PIYALEE DAS	SAMIR DAS	SANJAY MAZUMDAR
0	09.12.16	ISSUED AS STANDARD	DK	JS/JKB	RAJANJI SRIVASTAVA	R. NANDA



SECTIONAL VIEW B-B



INDICATIVE PLAN (FOR DIFFERENCE IN LEVEL UPTO 450 MM)

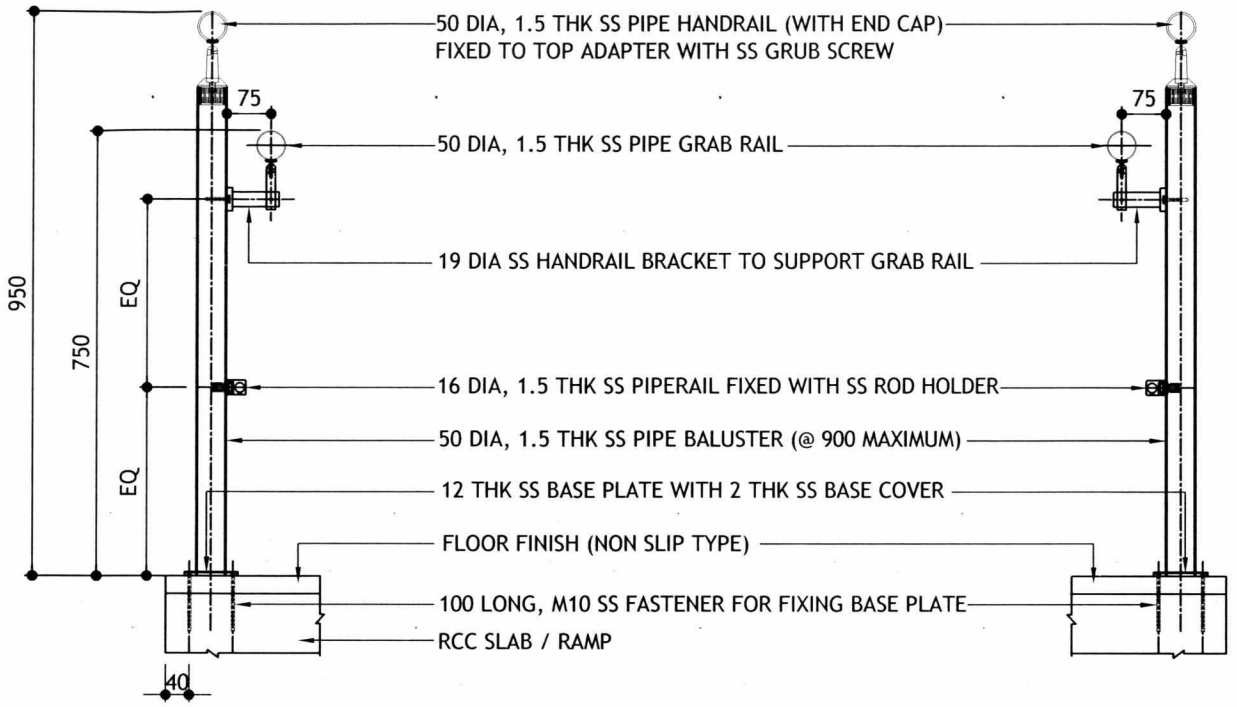


INDICATIVE PLAN (FOR DIFFERENCE IN LEVEL 451 TO 750 MM)

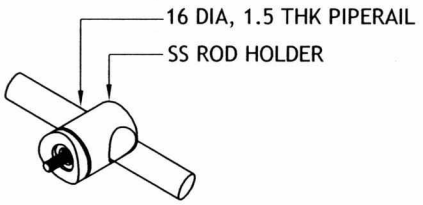
NOTE :

1. ALL DIMENSIONS ARE IN MM
2. SS - STAINLESS STEEL (GRADE-304)
3. ALL SS MEMBERS/FITTING SHALL BE OF SATIN FINISH.
4. THE RAMP ARRANGEMENT IS INDICATIVE. THE ARRANGEMENT SHALL BE AS PER ARCHITECTURAL DWG. BUT RAILING, LANDING DETAILS SHALL BE AS PER THIS STANDARD.

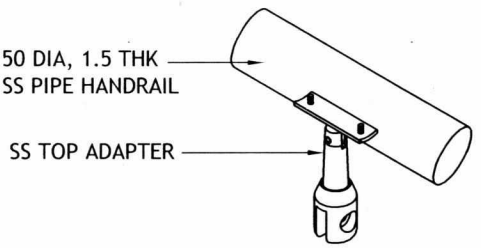
Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
1	16.10.23	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	SANDEEP	SAMIR DAS	SANJAY MAZUMDAR
0	04.06.18	ISSUED AS STANDARD	MLT	SD	RS	R K TRIVEDI



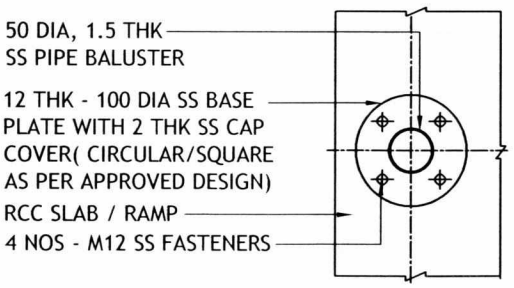
SECTION A-A



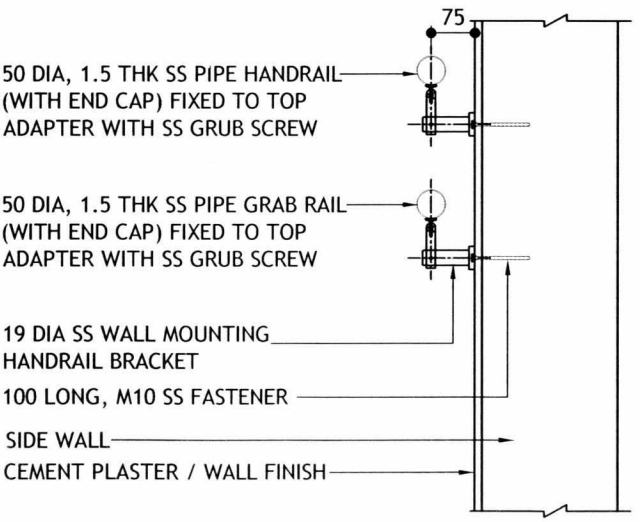
ROD HOLDER
(INDICATIVE VIEW)



TOP ADAPTER
(INDICATIVE VIEW)



BASE PLATE DETAIL (PLAN)



DETAIL OF GRAB RAIL
(ALONG WALL)

NOTE :
5. IN PLACE OF TOP ADAPTER & GRUB SCREW, WELDING USING SUITABLE SS MEMBER IS ACCEPTABLE IF SPECIFIED.

Rev. No.	Date	Purpose	Prepared by	Checked by	Stds. Committee Convenor	Stds. Bureau Chairman
					Approved by	
1	16.10.23	REAFFIRMED & ISSUED AS STANDARD	M L THAKUR	SANDEEP	SAMIR DAS	SANJAY MAZUMDAR
0	04.06.18	ISSUED AS STANDARD	MLT	SD	RS	R K TRIVEDI

पैकेज इकाइयों के लिए साइट निष्पादन गारंटी अपेक्षाएँ तैयार करने हेतु विक्रेता को अनुदेश

INSTRUCTIONS TO VENDOR FOR SITE PERFORMANCE GUARANTEE REQUIREMENTS FOR PACKAGE UNITS

Rev. No	Date	Purpose	Prepared by	Checked by	Standards Committee Convenor	Standards Bureau Chairman
					Approved by	
2	30.03.2019	Reaffirmed & Reissued	RRS	PPP	RP	RKT
1	30.05.2008	Revised & Reissued	SMA	PKR	AA	VC
0	10.11.2003	ISSUED AS STANDARD	PKR	PM	VC	SKG

Abbreviations:

LSTK	:	Lumpsum Turnkey
PG	:	Performance Guarantee

General Engg. Standards Committee

Convenor : Ms R Priyamvada (Convenor)

Members :
Mr BR Bhogal (Elect.)
Mr Rajan Srivastava (Strl.)
Mr RB Bhutda (EWS)
Mr Amrendra Kumar (Piping)
Ms NP Guha (Projects)
Mr Amit Prakash (FEM)
Mr KJ Harinarayanan (SME)
Mr VK Tonger (Process-1)
Mr Satyabrata Biswas (Process-2)

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2.0 PURPOSE 4

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1.0 INTRODUCTION

As a part of engineering services, EIL procures different types of Package Units for various Projects, for and on behalf of the Owner/Purchaser. The vendor is required to design, engineer, manufacture/ procure, inspect, test and supply to site, and also in many cases construct/erect, commission and Performance test the Package Units before handing over the same to Owner/Purchaser, based on Process and Technical requirements defined in the Inquiry/Order document.

2.0 PURPOSE

This document provides instructions to Vendor for Site Performance Guarantee (PG) Requirements for Package Units and shall form a part of the contract, wherever site performance guarantee test is specified in the Inquiry/Order document. The aim is to provide clarity to the Vendor as well as the Commissioning team on site performance guarantee parameters, their measurements during PG Test, and the acceptance of the Package Unit by the Owner/Purchaser after the successful PG Test.

3.0 SCOPE

The requirements of this standard are applicable for all Package Units including LSTK Bid Packages, which require Performance Guarantee Test, after installation and commissioning of the unit at site.

4.0 DEFINITIONS

4.1 "Vendor" means the person(s), company, organization from whom EIL procures products/services as a part of services rendered to the Owner/Purchaser. "Contractor", "Supplier" are considered synonymous to "Vendor".

4.2 "Owner" means the person(s), company, organization to whom EIL is rendering services for the Project.

4.3 "Purchaser" means the person(s), company, organization which awards order for the Package Unit on the Vendor.

5.0 PERFORMANCE GUARANTEE TESTING AT SITE

5.1 General

5.1.1 The overall performance testing of the completely assembled/erected Package unit as a whole shall be carried out at site to establish the performance guarantee parameters specified in Inquiry/Order document. In addition, certain critical equipment/sub-packages may also be performance tested at site if so specified in Inquiry/Order document. The duration of site performance guarantee run shall be as defined in the Inquiry/order document.

The measured parameters, where necessary, shall be adjusted to account for the variation in ambient/operating conditions actually prevailing at site during performance testing, before comparing it with the guaranteed value.

5.1.2 Performance test shall be carried out as per relevant Codes, Standards and Specifications. The Vendor shall submit the following during detail engineering and the same shall be subject to Owner/Purchaser's approval:

- Detailed Test procedure including measurement tolerances, if applicable, calculations/ correction curves for changes in ambient/ operating conditions, and complete test layout, etc.

- Site Performance Guarantee Test Proforma completed in line with enclosed format 7-76-0103-F1.

- Vendor shall list out parameters to be measured and corresponding installed instrument type and tag no. to be used for measurements. Any instrument/measurement device, (required for testing) not installed at site, shall be arranged by vendor. Vendor shall furnish list of such instruments alongwith instrument details.

- Log sheets indicating all parameters that are to be recorded.

- Method of computation of test results including interpretation of test results.

5.2 Test Instruments

All necessary test instruments required for measuring the performance guarantee parameters shall be arranged by the vendor free of charge. These instruments shall be tested & calibrated from reputed test houses like National Physical Laboratories (NPL), Institute for Design of Electrical Measuring Instruments (IDEMI), Electronics Regional Test Laboratories (ERTL) or any other test house approved by the Owner. All test instruments shall have valid calibration reports. The Vendor shall furnish calibration certificates before putting them to use and also, wherever applicable, after completion of the PG test.

5.3 Performance Guarantee Parameters

Guarantee performance parameters shall be as defined in the Process/Mechanical data sheets, Specification, etc. included in the Inquiry/Order document.

5.4 Repair/Rectification/Modification

5.4.1 In case the unit fails to meet the guaranteed parameters, the Vendor shall carryout, necessary repair, rectification and modification within the time frame defined in the contract or as mutually agreed with the Owner/Purchaser, at his own risk and cost to establish the guaranteed parameters in the final performance test. All costs involved for above activities i.e. supply of manpower, materials, consumables and machines etc. shall be to Vendor's account.

5.4.2 Inspite of repair/rectification, incase the guaranteed performance parameters are not met, penalty/rejection as defined in the contract document for shortfall from guaranteed performance parameters shall be applied.

6.0 SITE PERFORMANCE GUARANTEE TEST PROFORMA

Typical Proforma shown in enclosed Format 7-76-0103-F1, shall be used for assessment of Performance guarantee parameters during site PG test.

7.0 ATTACHMENTS

Format No. 7-76-0103-F1	:	SITE PERFORMANCE GUARANTEE TEST PROFORMA.

SITE PERFORMANCE GUARANTEE TEST PROFORMA

Client : *
Package Unit/System: *

Project/Location : *
Order No. : *

EIL Job No. : *
Vendor : *

1. **PACKAGE OPERATING CONDITION (FOR GUARANTEE):**

Operating Parameter	Values as per Inquiry/Order	Value (Actual at site)
*	*	

2. **PERFORMANCE :**

SITE PERFORMANCE TEST PROCEDURE DOC. NO: *

TEST PERIOD:

Parameter (1) *	Measuring Unit (2) *	Guaranteed Value (3) *	Permissible Tolerance (4) *	Measured Value at site (5)	Value after correction for site conditions (6)	Deviation (6) w.r.t.- (3)	Remarks (Acceptable-Y/N) (7)
a)							
b)							
c)							
d)							
e)							

Vendor's Representative
Date

Owner's Commissioning Incharge
Date

Owner
Date

* TO BE FILLED-UP AND/OR DEVELOPED BY VENDOR & SUBMITTED ALONGWITH PERFORMANCE TEST PROCEDURE.

3. OBSERVATIONS:

4. CONCLUSIONS :

Vendor's Representative	**Owner's Commissioning Incharge**	**Owner**
Date	Date	Date

Copy : Engineer-In-Charge.

ENGINEERS INDIA LTD NEW DELHI	**OWS PUMP** PROCESS DATASHEET	Document No. B895-999-81-45-8048 SHEET 1 OF 2	REV A

PROJECT: **PP PROJECT KOCHI** **CLIENT:** **M/S BPCL**

UNIT: **OFFSITE** **JOB NO** **B895**

ITEM NO	999-P-9905 A/B	SERVICE	OILY WASTE WATER (OWS)
NOS. OF PUMPS:	(1W + 1S)	TYPE OF PUMP	CENTRIFUGAL, SUBMERSIBLE TYPE

PROPERTIES OF LIQUID			
LIQUID HANDLED			OILY WASTE WATER (OWS)
PUMPING TEMPERATURE		DEG C	AMBIENT
VISCOSITY AT 0°C - 50°C TEMPERATURE		CS	1.73 - 0.55
VAPOUR PRESSURE AT 0°C - 50°C TEMPERATURE		kg/cm2 abs	0.006 - 0.125
LIQUID DENSITY AT PUMPING TEMPERATURE		Kg/m3	~ 900 to 1000
PRESENCE OF CORROSIVE / TOXIC COMPONENTS			YES
SOLIDS IN SUSPENSION			YES
SIZE OF SOLID PARTICLES (MAX)			(3MM -5MM)
OPERATING CONDITIONS FOR ONE PUMP			
FLOW RATE	NORMAL	M3/HR	15
	MAXIMUM	M3/HR	15
	MINIMUM	M3/HR	15
SUCTION PRESSURE		Kg/cm2 g	ATM. (FLOODED)
DISCHARGE PRESSURE		Kg/cm2 g	7 AT DISCH. PIPE FLANGE
DIFFERENTIAL PRESSURE		Kg/cm2 g	7 (BY PUMP VENDOR)
DIFFERENTIAL HEAD		METRES	70 AT DISCH. PIPE FLANGE
NPSH AVAILABLE		METRES	NOT APPLICABLE
NO. OF PUMPS			2
CAPACITY CONTROL FOR VOLUMETRIC PUMPS			
METHOD OF CONTROL			AUTOMATIC START/ STOP
TYPE OF CONTROL			NA
CONTROL RANGE			NA
PRECISION AT MINIMUM RATE			NA
MECHANICAL DATA			
DESIGN PRESSURE		Kg/cm2 g	10.50 (BY PUMP VENDOR)
DESIGN TEMPERATURE		DEG C	65.0
MATERIAL OF CONSTRUCTION			
CASING			SS316
IMPELLER			SS316
SHAFT			SS410
HYDRAULIC FASTENERS SET			SS316
SEAL TYPE			MECHANICAL
LINE RATING			SUCTION 150# / DISCHARGE 150#
DRIVER			ELECTRIC MOTOR
MOTOR TYPE			TEFC
MOTOR RATING			BY PUMP VENDOR

NOTES:

1	THE PUMP MOTOR SHALL BE DISCHARGE FOR OPEN DISCHARGE CONDITION.
2	DISCHARGE MATCHING FLANGES ALONG WITH NUTS, BOLTS, GASKETS, CHAIN (10M MINIMUM) SHALL BE PROVIDED ALONG WITH PUMPS.
3	REFER SHEET 2 OF 2 FOR SCOPE OF SUPPLY BY VENDOR.
4	ALL PUMPS SHALL BE MOTOR DRIVEN
5	PUMPS SHALL BE SUITABLE FOR PARALLEL OPERATION.
6	REFER P&ID NO B895-999-81-45-35222
7	THE PUMP SHALL HAVE PROVISION FOR MANUAL START / STOP IN ADDITION TO AUTOMATIC START/STOP THROUGH LEVEL TRANSMETER
8	ALL PUMPS IN PORTABLE INSTALLATION WITH STRAINER BASE ARRANGEMENT & MAIN MOUNTING ACCESSORIES SHALL BE PROVIDED ALONG WITH PUMP.
9	SUCTION STRAINER TO BE CONSIDERED FOR ALL PUMPS.

999-P-9905 A/B

REV	DATE	REVISIONS	BY	CHK	APP
A	06.11.2025	ISSUED FOR COMMENTS	BSM	LP	AK

Project	PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery		**Client**	BPCL - KOCHI REFINERY	
Unit	Common	**Location**	**Job No.**	B895	**Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	46
2.	Minimum Ambient Temperature	°C	1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	95
5.	Altitude Above MSL	mm	<1000
6.	Environment		Humid & Highly Corrosive
B.	**Operating Conditions**		
1.	Voltage	kV	6.6 +/- 10 %
2.	Frequency	Hz	50 +/- 3 %
3.	No of phases		Three
4.	System fault level	kA	40kA for 1 Sec
5.	System earthing		Resistance Earthing
6.	Auxiliary supply		
	AC	V	240 +/- 10 %
	DC	V	110 +/- 10 DC
C.	**Electrical Data**		
1.	Busbar current rating (inside panel at design temp.)		
2.	1 sec. Short Circuit withstand capacity	kA	40kA for 1 Sec
3.	System Breaking capacity	kA	40kA for 1 Sec
	% D.C. Component		As per IEC
4.	System making capacity	kA(peak)	100kA
5.	Type of Circuit Breaker		VCB
	Shunt Trip Coil-1 :	V	110 DC
	Shunt Trip Coil-2 :	V	
6.	Duty Cycle of C.B.		O-3min-CO-3min-CO
7.	Suitability for Cap. Switching		No
8.	Surge supressor for Motor Feeder.		Yes
9.	Provision of earthing		
	Earthing truck		Required
	Earthing switch		Not Required
D.	**Miscellaneous**		
1.	Interface with ECS		Required
2.	Incoming Power Entry		Cable
3.	Cable Entry		Bottom
4.	Separate bolted removable gland palte for cable entry		Reqd.(Gland Plate Drilled at side)
5.	Cable glands and lugs for cable termination		Included
6.	Paint shade		RAL-7032
7.	Windows at the rear side of panels for thermography		Required

MANUFACTURER'S DATA

A.	**Switchboards**	
1.	Make	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	26-MAY-2025	ISSUED WITH MR	RAMAN SOOD	RAMAN SOOD	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

2.	Type designation		
3.	Degree of protection		
4.	Max. overall weight of C.B. panel	Kg	
5.	Overall dimensions of C.B. panel		
	Width	mm	
	Depth	mm	
	Height	mm	
6.	Overall dimensions of dummy /gland palte for cable entry		
	Width	mm	
	Depth	mm	
	Height	mm	
7.	Overall weight and dimensions of largest shipping section		
	Weight	Kg	
	Width	mm	
	Depth	mm	
	Height	mm	
8.	Overall dimensions of each swbd. including all dummy/adaptor/rear extension panels		
	Width	mm	
	Depth	mm	
	Height	mm	
9.	Recommended clearances		
	Front	mm	
	Rear	mm	
	Above	mm	
10.	Shock loading on foundation		
11.	Max. size/no. of cables that can be terminated inside the panel		
	without rear extension panel		
	with rear extension panel		
	size of rear extension panel		
12.	Clearance in air		
	Phase to Phase (min.)	mm	
	Phase to Earth (min.)	mm	
13.	Busbar current rating at design ambient temperature	A	
14.	Busbar (separately for each swbd)		
	(a).Horizontal main busbar size (No. of flats x size of each flat)		
	(b).Horizontal main busbar size as tested at CPRI for full short ckt		
	withstand as per specification requirement (No. of flats x size of each flat)		
	(c).Vertical dropper size (No. of flats x size of each flat)		
15.	Horizontal main busbar/Vertical busbar material		
16.	Insulating material (Busbar supports)		
17.	Earth busbar size		
18.	Earth busbar material		
19.	1 min. power frequency withstand voltage (rms	kV	
	Over voltage factor for PTs		
20.	Impuse withsatnd voltage (peak)	kV	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	26-MAY-2025	ISSUED WITH MR	RAMAN SOOD	RAMAN SOOD	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

	Wave shape of impulse voiltage		
21.	1 sec. short ckt. Withstand capacity	kA	
22.	Peak dynamic withsatnd capacity	kA	
23.	Safety Features		
	(a).Heat shrinkable sleeves, rated to		
	withstand the system line to line		
	voltage for one min., provided on busbar		
	(b).Removable FRP shrouds for all busbar		
	joints and tap-off connections provided		
	(c).Arc propagation barrier in busbar		
	compartment provided		
	(d).Breaker service, test and drawn-		
	out position provided		
	(e).Distinct overall lockable door for		
	breaker compartment provided		
	(f).Automatic safety shutter provided		
	(g).Independent pressure release		
	flaps provided for all HV compartments		
	(h).Wire mesh for all louvered		
	openings provided		
	(i).Suitable intrlocks to prevent		
	faulty operation as per Cl. 4.4.10		
	of spec. 6-51-0001 provided		
B.	**Circuit Breaker**		
1.	Type		
	2nd shunt trip coil for VFD feeders		
2.	Make		
3.	Type Designation		
4.	Circuit Breaker mounting in panel		
5.	No. of poles/phase		
6.	Current rating (in free air)	A	
7.	Current rating inside the panel at specified design tempeature	A	
8.	Short time rating (1sec.)	kA	
9.	Symmetrical breaking capapcity	kA	
9.1	% D.C. Component		
10.	Peak making current	kA	
11.	1 min. dry withsatnd voltage (power frequency)	kV	
12.	Duty Cycle		
13.	Total openeing time	m sec.	
14.	Total closing time	m sec.	
15.	Power required for opening	W/VA	
16.	Power required for closing	W/VA	
17.	Power required for spring charging motor	W/VA	
18.	Breaker is trip free		
19.	Closing mechanism		
20.	Provision of manual spring charging provided		
21.	Mechanical Trip PB provided		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	26-MAY-2025	ISSUED WITH MR	RAMAN SOOD	RAMAN SOOD	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

22.	Mech. On/Off indicator provided	
23.	Operation counter provided	
24.	Time taken for spring charging sec.	
25.	No. of aux. contacts and their current ratings	
26.	Interrupter	
	(a).Make	
	(b).Pressure switch for monitoring of SF6 gas pressure provided	
	(c).Re-filling arrangement of SF6	
27.	LOTO (Lock-Out Tag-Out) Provision for mechanical locking arrangement	
28.	Supressor	
	Type designation	
	Make	
27.	Derating reqd. for Cap. Switching	
29.	Earthing System	
30.	Copies of following test cerificates enclosed	
	For each type of offered circuit breaker panel with breake	
	(a).Short Circuit tests (Peak and 1 sec.withstand)	
	(b).Heat run test	
	(c).Internal arc test	
	(d).Impulse and power freq. withstand	
	For each type of offered circuit breaker (in panel)	
	(a).Short Circuit test duties	

Eil Notes

1.HV switchboard shall be suitable for Internal Arc as indicated below:
   a. Short Circuit Current (kA)- 40
   b. Duration (Second)- 0.1

2. Rear door interlock (i.e., Door should not be opened if breaker is closed. Breaker should not close if door is open) shall be provided for cable chamber of 6.6kV switchgear

3. ON/OFF indication shall be provided on all the rear doors of switchgear.

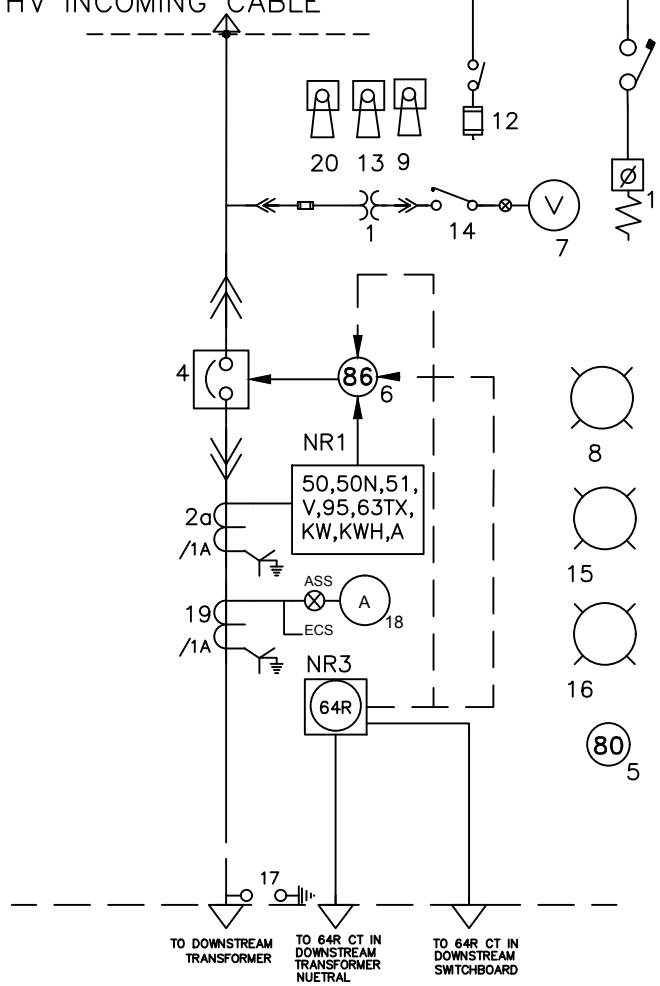
Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	26-MAY-2025	ISSUED WITH MR	RAMAN SOOD	RAMAN SOOD	RAMAN SOOD

PROJECT: PPU & REVAMP OF PFCCU CLIENT: M/s BPCL-KOCHI	REV	DATE	PURPOSE	BY	CHKD	APPRV
	A	07.11.2025	ISSUED WITH MR/TENDER	NNB	AS	RS

CONTROL BUS (240 V AC UPS)

240V AC AUX. CKT BUS

HV INCOMING CABLE



NR1 PART OF NUMERICAL RELAY-1

NR3 PART OF NUMERICAL RELAY-3

NOTES:
1. ANTIPUMPING RELAY USED, IF ANY, SHALL BE CONSIDERED AS PART OF BREAKER MECHANISM.
2. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE . ALL THE ITEMS SPECIFIED UNDER JOB SPEC.,INSTRUCTIONS TO VENDOR AND IN SPECIFICATION 6-51-0001 SHALL BE IN VENDOR'S SCOPE.
3. CT VA BURDEN WHERE NOT INDICATED SHALL BE DECIDED BY VENDOR.
4. ALL PROTECTION RELAYS SHALL BE NUMERICAL TYPE WITH IEC61850 COMMUNICATION PROTOCOL.

EQUIPMENT DATA

ITEM NO.	NEMA NO.	QTY	DESCRIPTION
1	–	3	Y/Y CONNECTED, Cl.-1, P.T. WITH 110V/√3 SECONDARY WITH PRIMARY FUSE
2a	–	3	PROTECTION C.T CLASS-5P10
	–		DELETE
3	–	3	DIFFERENTIAL C.T. FOR 87F CLASS PS
4	52	1	VACUUM CIRCUIT BREAKER (DRAW OUT TYPE)
5	80	1	CONTROL SUPPLY SUPERVISION RELAY
6	86	1	TRIPPING RELAY (CONVENTIONAL TYPE)
7	–	1	VOLTMETER WITH SELECTOR SW. 4-WAY
8	–	AS REQD	CLUSTER LED TYPE IND. LAMP
9	52 C/S	1	BREAKER CONTROL SWITCH (TNC) CLOSE-NEUTRAL-TRIP (LOCKABLE WITH SPRING RETURN TO NEUTRAL)
10	–	1	PANEL SPACE HEATER WITH SWITCH, FUSE AND THERMOSTAT
11	–	1	CUBICLE LAMP WITH SWITCH FUSE, DOOR SWITCH
12	–	1	D.P. SWITCH 10 A WITH FUSE FOR D.C. CONTROL SUPPLY
13	–	1	UPSTREAM BREAKER TRIP SWITCH
14	–	1	4-POLE MCB 10A
15	–	1	TRIP CIRCUIT HEALTHY INDICATING LAMP (LED)
NR1	–	1	KW METER
	50	1	INSTANTANEOUS O/C RELAY (50-200%)
	50N	1	INSTANTANEOUS E/F RELAY (10-40%)
	51	1	IDMTL O/C RELAY (50-200%)
	–	1	VOLTMETER
	95	1	TRIP CIRCUIT SUPERSUPERVISION RELAY
	63TX	1	TRANSFORMER AUXILLIARY PROTECTION RELAY
	–	1	AMMETER
	–	1	KWH METER
NR3	64R	1	RESTRICTED EARTH FAULT RELAY WITH STABILISING RESISTOR
16		1 Set	UPSTREAM BREAKER ON/OFF/TRIP INDICATING LAMPS
17		1 SET	METAL OXIDE TYPE SURGE SUPPRESSOR
18		1	AMMETER WITH SELECTOR SWITCH 4-WAY
19		3	METERING CT CLASS 1.0
20		1	LOCAL/REMOTE SELECTOR SWITCH (STAYPUT IN BOTH POSITION

ENGINEERS INDIA LIMITED NEW DELHI	HV SWITCHBOARD HARDWARE DATASHEET FOR ISOLATING BREAKER PANEL -UPSTREAM PLANT FEEDER AND DOWNSTREAM TRANSFORMER	DATA SHEET	REV
		B895-000-16-50-DS-0125	A

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	46
2.	Minimum Ambient Temperature	°C	1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	95
5.	Altitude Above MSL	mm	<1000
6.	Environment		Humid & Highly Corrosive
B.	**Technical particulars**		
1.	System Voltage		
	Nominal		6.6KV(UE)
	Highest		7.2KV
	Voltage grade		6.6/6.6KV
2.	Frequency	Hz	50 +/- 3 %
3.	Conductor material		
	HV Power cable		NA
	MV Power cable		Aluminium
	MV control cable		NA
4.	Installation under DGMS jurisdiction (See Note)		No
5.	Applicable spec.		6-51-0051
6.	Insulation		XLPE
7.	PVC compound type		ST-2
8.	Type of conductor		Stranded
9.	Conductor class		As per Spec
10.	Types of cable		FRLS - Outersheathed
11.	Armour		
	Type		Refer EIL Spec 6-51-0051
	Size of armour		As per 7098 (part-2)
12.	Type of drum		Steel

MANUFACTURER'S DATA

A.	**Technical particulars**		
1.	Name of manufacturer		
2.	MR/PR item no.		
3.	Cable type/ code		
4.	Conductor material		
5	Conductor semiconducting screen (HV cables)		
	Material		
	Thickness	mm	
6.	Insulation		
	Type of compound		
	Thickness	mm	
7.	Insulation semiconducting screen (HV cables)		
	Material		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	24-OCT-2025	ISSUED WITH MR	RAMAN SOOD	RAMAN SOOD	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

	Thickness	mm	
8.	Copper tape		
	Thickness	mm	
9.	Inner sheath		
	Type of compound		
	Thickness	mm	
10.	Nominal dia under armour	mm	
11.	Calculated dia under armour	mm	
12.	Armour		
	Material		
	Type		
	Size		
13.	Nominal dia under outersheath	mm	
14.	Calculated dia under outersheath	mm	
15.	Outersheath		
	Type of compound		
	Thickness	mm	
16.	Nominal outer dia of cable	mm	
17.	Tolerance on outer dia	%	
18.	Weight of cable per km	kg	
19.	Maximum drum length	mtr.	
20.	Maximum DC resistance of conductor at 20 °C		
21.	AC resistance at 90 °C		
22.	Reactance of cable at 50 Hz		
23.	Capacitance of cable		
24.	Zero sequence impedance of cable		
25.	Capacitive charging current per km		

Notes

1 UE-Un Earthed system

2 Single Line to Ground fault for sizing of Insulation screen for 6.6 kV cables shall be considered as 600 Amps (1 Second)

3 Outer sheath of cable shall be as per following:
6.6kV - Yellow (Shade 309 as per IS 5)

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
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Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	46
2.	Minimum Ambient Temperature	°C	1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	95
5.	Altitude Above MSL	m	<1000
6.	Environment		Humid & Highly Corrosive
B.	**Operating Conditions**		
1.	Voltage	V	415 +/- 10 TPN
2.	Frequency	Hz	50 +/- 3 %
3.	No of phases		Three
4.	System fault level	kA	50kA for 1 sec
5.	System earthing		Solidly Earthed
6.	Auxiliary supply		
	AC	V	240 +/- 10 % SPN
	DC	V	110 +/- 10 % DC
7.	Power supply for spring charging motor	V	Not Applicable AC
C.	**Electrical Data**		
1.	Short circuit withstand capacity for 1 sec.	KA	50
2.	Busbar current rating inside panel at specified ambient		As per job spec
3.	Busbars		Heat shrunk PVC sleeved
4.	System breaking capacity	kA	50
5.	System making capacity	kA(peak)	
6.	Circuit breaker		
	Type		Not Applicable
	Duty cycle		0-3 min-co-3 min-co
	Rating		Not Applicable
7.	Incoming power entry		Cable
8.	Cable entry (I/C & O/G)		Top/ Bottom
9.	Bus duct entry		NA
10.	Cable gland/lugs		Included
11.	Painting/paint shade		RAL-7032
12.	Feeder arrangement & Execution		Single Front, Fixed type
13.	Minimum motor starter module size		240 mm
14.	Minimum switchfuse module size		Not Applicable
15.	Floor fixing		Integral base frame & tack welding to floor channel
16.	Seperate bolted removablegland plate		Reqd.(Gland Plate Drilled at side)
17.	Minimum MCCB module		Vendor standard

MANUFACTURER'S DATA

A.	**Switchboards**	
1.	Tag no.:	
2.	Make	
3.	Type designation	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	05-MAR-2025	ISSUED WITH MR	NAGARAJU NAIK	ACHUTUNI SAI	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

4.	Degree of protection	
5.	CB panel	
	Overall weight	
	Incomer	
	Outgoing	
	Overall dimensions	
	Length*Depth*Height	
6.	Overall dimensions of MCC/ contactor controlled feeder panel	
	Length*Depth*Height	
7.	Overall dimensions of each PCC	
	Length*Depth*Height	
8.	Overall dimensions of each PMCC/ EPMCC	
	Length*Depth*Height	
9.	Overall dimensions of each MCC	
	Length*Depth*Height	
10.	Overall dimensions of each ASB	
	Length*Depth*Height	
11.	Overall dimensions of each LDB	
	Length*Depth*Height	
12.	Largest shipping section:	
	Max. overall weight	
	Length*Depth*Height	
13.	Recommended clearances for SWBD	
	Front*Rear*Above	
14.	Shock loading on foundation	
15.	Max. size/no. of cables that can be terminated	
	with rear extension	
	without rear extension	
16.	Size of rear extension panel	
17.	Clearance in air	
	Phase to Phase	
	Phase to Earth	
18.	Main horizontal bus bar	
	Bus bar current rating at	
	design ambient temp.	
	Main bus bar size	
	Main bus bar material	
	Main bus bar location	
19	Vertical bus bars	
	Bus bar current rating at	
	design ambient temp.	
	Bus bar size	
	Bus bar material	
	Bus bar location	
20.	Insulating material	

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Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

21.	Earth bus bar size	
	Material	
22.	1min power freq voltage	
23.	Short circuit	
	1 second	
	Peak dynamic	
24.	Whether adaptor panel required	
	between PCC/MCC panel	
	If Yes, furnish dimensions	
B.	**Circuit breaker**	
1.	Type designation	
2.	Make	
3.	Mounting	
4.	No. of poles/phases	
5.	Current rating (in air)	
6.	Current rating (inside panel	
	at design temperature)	
7.	Short time rating (1 sec)	
8.	Sym breaking capacity	
	% DC component	
9.	Peak making capacity	
10.	Power frequency withstand	
11.	Impulse withstand voltage	
12.	Duty cycle	
13.	Total opening time	
14.	Total closing time	
15.	Power requirement	
	Opening	
	Closing	
	Spring charge motor	
16.	Time for spring charging	
17.	Breaker is trip free	
18.	Closing mechanism	
19.	Provision of manual spring charging	
20.	Tripping mechanism	
21.	Mechanical trip PB provided	
22.	Mechanical ON/OFF indicator provided	
23.	Operation counter provided	
24.	Time taken for spring charging	
25.	No. of auxiliary contacts	
26.	Derating required for capacitor switching	
C.	**Contractor**	
1.	Type designation	
2.	Make	
3.	Rated Voltage	
4.	Rated current	

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Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

	AC-3 Duty	
	AC-4 Duty	
5.	Thermal rating	
6.	Making capacity	
7.	Breaking capacity	
8.	Switching frequency	
9.	Life	
	Electrical	
	Mechanical	
10.	Coil consumption	
	Pick up	
	Hold on	
11.	Closing time	
12.	Opening time	
13.	No of aux. contacts	
14	Maximum permitted back up fuse rating	
D.	**Switch**	
1.	Rated voltage	
2.	Rated current	
3.	AC 23 rating	
4.	Rated making capacity	
5.	Rated breaking capacity	
6.	Rated short circuit withstand current with	
	max. permissible rated fuses	
7.	Mechanical life	
8.	Maximum permitted back up fuse rating	
E.	**Thermal Overload Relay**	
1.	Make	
2.	Type	
3.	Setting range	
4.	Single phasing preventor	
5.	Type of operation	
6.	Maximum permitted back up fuse rating	
F.	**Fuses**	
1.	Make	
2.	Type	
3.	Current rating	
G.	**Electronic Motor protection relay**	
1.	Make	
2.	Type	
3.	Setting range	
4.	Single phasing preventor	
5.	Type of operation	
6.	Maximum permitted back up fuse rating	
7.	Earth fault protection available	
H.	**MCCB/MCB**	
1.	Make	

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Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

2.	Type	
3.	Rated voltage	
4.	Rated current	
5.	Rated frequency	
6.	No. of poles	
7.	Derating factor for operation under site conditions	
8.	Rated 10 sec short time rating	
9.	Rated breaking capacity at service voltag	
10.	No. of operations at full fault	
11.	No. of operations at partial fault	
12.	No. of guaranteed mech. operations	
13.	1 min dry p.f with stand voltage	
14.	Shunt trip feature (for MCCB only)	
15.	Operating voltage range for MCCB shunt trip	

Eil Notes

1

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	05-MAR-2025	ISSUED WITH MR	NAGARAJU NAIK	ACHUTUNI SAI	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	46
2.	Minimum Ambient Temperature	°C	1
3.	Design Ambient Temperature	°C	45
4.	Design temperature for battery sizing	°C	10
5.	Relative Humidity	%	95
6.	Altitude Above MSL	mm	<1000
7.	Environment		
B.	**Input power supply**		
1.	Voltage	V	415 ± 10 %
2.	Frequency	Hz	50 ± 3 %
3.	IInput Cable Size		
	(To be informed by purchaser during drawing review stage)		By Contractor
4.	Phase :		TPN
5.	System fault level :	kA	As per SLD
C.	**System requirements**		
1.	Equipment tag no.:		
2.	Type of inverter :		IGBT
3.	Rating :	kVA (0.8 P.F.)	By Contractor
4.	Phase :		SPN
5.	Output voltage :	V	110 ± 1 %
6.	Output frequency :	Hz	50 ± 1 %
7.	Mode of operation :		DUAL REDUNDANT WITH INDIVIDUAL BYPASS
8.	Load power factor,		
	Rated	(lag)	0.8
	Variation	(lag)	0.6-1.0
9.	Fault diagnostic unit :		Not Required
10.	Cell booster		Required
11.	Type of battery :		Ni-Cd
12.	Battery backup time :		120

	Description	KVA	Backup time (mins.
	Instrumentation		
	Telecom		
	PA system		
	Lighting		

13.	Battery rack information :	Double row double tier
14.	Ingress protection of enclsoure :	As per specification/ tender
15.	Cable entry :	Bottom
16.	Colour shade :	RAL-7032
17.	Applicable EIL specification	6-51-0017

D. AC distribution board (Outgoing feeder details)

Sl No.	Item no. as per MR	Incomer rating (Amp.)	No. of outgoing feeders	KVA rating of feeders	Switch rating (Amp.
1					

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A			PUNEET SHRIVASTAVA		

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

2.	Mounting of ACDB :	Floor mounted
3.	Type of ACDB	Compartmentalised (fixed)

MANUFACTURER'S DATA

A.	**UPS System**		
1.	Make		
2.	Type designation :		
3.	Rating :		
4.	Mode of Operation :		
5.	Output voltage distortion under the following conditions :		
	- For 50% step load :	V	
	- For 100% step load	V	
	- For 100% step unload :	V	
	- Power supply interruption and restoration :	V	
	- Load transferred to bypass line :	V	
	- When one inverter gets faulty and load transferred to healthy inverter	V	
6.	Phase angle distortion under the following conditions,		
	- For 50% step load :	°	
	- For 100% step load	°	
	- For 100% step unload :	°	
	- Power supply interruption and restoration :	°	
	- Load transferred to bypass line :	°	
	- When one inverter gets faulty and load transferred to healthy inverte	°	
7.	Maximum recovery time to reach steady state after above		
	disturbances (clause nos. 5 & 6) :	milli sec.	
8.	Maximum recovery time to reach steady state after above		
9.	Noise level :		
10.	Guaranteed overall dimensions of UPS system except ACDB and battery ,		
	- Length	mm	
	- Depth	mm	
	- Height	mm	
11.	Efficiency of each rectifier and inverter module including		
	input and output transformer		
	- At 100% load :- Length	%	
	- At 75% load :	%	
	- At 50% load :	%	
	- At no load ::	%	
12.	Efficiency of bypass stabiliser including input transformer		
	- At 100% load :- Length	%	
	- At 75% load :	%	
	- At 50% load :	%	
	- At no load ::	%	
13.	Heat loss for the total system :	kW	
14.	Overall efficiency of UPS system (ratio of output load to input power		
	drawn from mains when all charger and inverters are on and		
	synchronised with bypass, operating at no laod),		
	- At 100% load :- Length	%	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A			PUNEET SHRIVASTAVA		

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

	- At 75% load :	%	
	- At 50% load :	%	
	- At no load ::	%	
B.	**Inverter**		
1.	Rating :	kVA	
2.	No. of phase (s) :		
3.	Steady state output voltage,		
	- Nominal	V	
	- Variation:	V	
4.	Output voltage adjustment range at rated load :		
5.	Input DC voltage		
	- Nominal		
	- Range		
6.	Frequency variation limit for inverter when phase locked with mains :		
7.	Allowable unbalance between phases : (for 3 phase only)		
8.	Harmonic distortion at inverter output at rated load,		
	- For linear load :		
	- For non linear load		
9.	Overload capacity & duration :		
	- For 110% load	min.	
	- For 125% load :	min.	
	- For 150% load :	sec.	
10.	Short circuit capacity & duration		
11.	Output voltage/phase angles (for 3 phase only)		
	- For 30% unbalanced load :		
	- For 40% unbalance load :		
	- For 50% unbalnce load :		
	- For 100% unbalnce load :		
12.	Type of control circuit :		
13.	Max. allowable rating of outgoing feeders for fault clearance of		
	feeder fault by UPS with mains bypass supply back up,		
	- WIth fast acting semiconducting fuses :	amps.	
	- With normal HRC fuses :	amps.	
14.	Max. allowable rating of outgoing feeders for fault clearance of		
	feeder fault by UPS without mains bypass supply back up,		
	- WIth fast acting semiconducting fuses :		
	- With normal HRC fuses :		
15.	Load Crest factor		
C.	**Static switches**		
1.	No. of static switches in the UPS system :		
2.	Current rating at specified ambient ,		
	- Continuous :		
	- Short time :		
3.	Type of static switch :		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A			PUNEET SHRIVASTAVA		

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

4.	Transfer time,		
	- Synchronised mode :	milli sec.	
	- Unsynchronised mode :	milli sec.	
D.	**Battery charger:**		
1.	Current rating :		
2.	Type of charger:		
3.	Output voltage range under,		
	- Float charging condition :	V	
	- Boost charging condition :	V	
4.	Output voltage accuracy under specified input		
5.	Maximum ripple content on DC side with battery,		
	- Connected :		
	- Disconnected :		
6.	Maximum harmonic content in input current		
7.	Input transformer rating :	kVA	
E.	**Manual transfer devices**		
1.	Make :		
2.	Type designation :		
3.	Rating		
	- Continuous :		
	- Short time :		
F.	**Battery**:		
1.	Make :		
2.	Type designation :		
3.	Type :		
4.	AH rating :		
5.	End Cell Voltage :		
6.	Nominal Voltage :		
7.	Boost charging time :	hrs.	
8.	No. of cells in each bank :		
9.	No. of battery banks :		
10.	No. of racks :		
11.	Overall rack dimension		
	- Length :	mm	
	- Depth :	mm	
	- Height :	mm	
12.	Battery charging requirements,		
	- Nominal voltage / cell :	V	
	- Float voltage / cell :	V	
	- Boost charging voltage / cell :	V	
13.	Container type :		
14.	No. of recommended air changes / hour for battery room :	m3	
G.	**Stepdown bypass transformer with solid voltage stabilizer**		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A			PUNEET SHRIVASTAVA		

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

1.	Make :		
2.	Type designation :		
3.	Rating :	kVA	
4.	Voltage ratio :	V	
5.	Accuracy of stabiliser :	%	
6.	Type of control :		
7.	Type of Cooling :		
8.	Type of stabiliser :		
H.	**AC distribution board**		
1.	Make :		
2.	Type of designation :		
3.	Rating :	A	
4.	Degree of protection :		
5.	No. of outgoing Feeder / rating of each		
6.	Overall dimensions ,:		
	Length	mm	
	Depth	mm	
	Height	mm	
	(Including max. & min. operating Height)		
I.	**Cell Booster**		
1.	Make :		
2.	Type designation :		
3.	Voltage range :		
4.	Current range :		
5.	Overall dimensions,		
	- Length	mm	
	- Depth	mm	
	- Height	mm	
J.	**Reliability**		
1.	Safety factor used for selecting the components		
	- Electronic devices :		
	- Electrical devices :		
2.	MTBF / MTTR :		
3.	Availability factor :		

Notes

1 UPS shall have Static Voltage Regulator for bypass supply.

2 Two incomers of UPS ACDB shall be fed from two redundant UPS. The bus coupler of ACDB shall have static switch changeover facility.

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A			PUNEET SHRIVASTAVA		

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	46
2.	Minimum Ambient Temperature	°C	1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	95
5.	Altitude Above MSL	m	<1000
6.	Environment		
B.	**Operating Conditions**		
1.	Voltage	V	415 +/- 10 TPN
2.	Frequency	Hz	50 +/- 3 %
3.	No of phases		Three
4.	System fault level	kA	65kA for 1 sec
5.	System earthing		Solidly Earthed
6.	Auxiliary supply		
	AC	V	240 +/- 10 % SPN
	DC	V	110 +/- 10 % DC
7.	Power supply for spring charging motor	V	110 DC
C.	**Electrical Data**		
1.	Short circuit withstand capacity for 1 sec.	KA	65
2.	Busbar current rating inside panel at specified ambient		As per SWBD data sheet
3.	Busbars		As per Spec
4.	System breaking capacity	kA	
5.	System making capacity	kA(peak)	
6.	Circuit breaker		
	Type		ACB
	Duty cycle		0-3 min-co-3 min-co
	Rating		
7.	Incoming power entry		Busduct/Cable
8.	Cable entry (I/C & O/G)		Bottom
9.	Bus duct entry		Top
10.	Cable gland/lugs		Included
11.	Painting/paint shade		RAL-7032
12.	Feeder arrangement & Execution		Drawout Double Front (Note-1)
13.	Minimum motor starter module size		Vendor standard
14.	Minimum switchfuse module size		Vendor standard
15.	Floor fixing		Integral base frame & tack welding at the floor channel
16.	Seperate bolted removablegland plate		Reqd.(Gland Plate Drilled at side)
17.	Minimum MCCB module		Vendor standard

MANUFACTURER'S DATA

A.	**Switchboards**	
1.	Tag no.:	
2.	Make	
3.	Type designation	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	20-SEP-2024	ISSUED WITH MR	PUNEET SHRIVASTAVA	ACHUTUNI SAI	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

4.	Degree of protection	
5.	CB panel	
	Overall weight	
	Incomer	
	Outgoing	
	Overall dimensions	
	Length*Depth*Height	
6.	Overall dimensions of MCC/ contactor controlled feeder panel	
	Length*Depth*Height	
7.	Overall dimensions of each PCC	
	Length*Depth*Height	
8.	Overall dimensions of each PMCC/ EPMCC	
	Length*Depth*Height	
9.	Overall dimensions of each MCC	
	Length*Depth*Height	
10.	Overall dimensions of each ASB	
	Length*Depth*Height	
11.	Overall dimensions of each LDB	
	Length*Depth*Height	
12.	Largest shipping section:	
	Max. overall weight	
	Length*Depth*Height	
13.	Recommended clearances for SWBD	
	Front*Rear*Above	
14.	Shock loading on foundation	
15.	Max. size/no. of cables that can be terminated	
	with rear extension	
	without rear extension	
16.	Size of rear extension panel	
17.	Clearance in air	
	Phase to Phase	
	Phase to Earth	
18.	Main horizontal bus bar	
	Bus bar current rating at	
	design ambient temp.	
	Main bus bar size	
	Main bus bar material	
	Main bus bar location	
19	Vertical bus bars	
	Bus bar current rating at	
	design ambient temp.	
	Bus bar size	
	Bus bar material	
	Bus bar location	
20.	Insulating material	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	20-SEP-2024	ISSUED WITH MR	PUNEET SHRIVASTAVA	ACHUTUNI SAI	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

21.	Earth bus bar size	
	Material	
22.	1min power freq voltage	
23.	Short circuit	
	1 second	
	Peak dynamic	
24.	Whether adaptor panel required	
	between PCC/MCC panel	
	If Yes, furnish dimensions	
B.	**Circuit breaker**	
1.	Type designation	
2.	Make	
3.	Mounting	
4.	No. of poles/phases	
5.	Current rating (in air)	
6.	Current rating (inside panel	
	at design temperature)	
7.	Short time rating (1 sec)	
8.	Sym breaking capacity	
	% DC component	
9.	Peak making capacity	
10.	Power frequency withstand	
11.	Impulse withstand voltage	
12.	Duty cycle	
13.	Total opening time	
14.	Total closing time	
15.	Power requirement	
	Opening	
	Closing	
	Spring charge motor	
16.	Time for spring charging	
17.	Breaker is trip free	
18.	Closing mechanism	
19.	Provision of manual spring charging	
20.	Tripping mechanism	
21.	Mechanical trip PB provided	
22.	Mechanical ON/OFF indicator provided	
23.	Operation counter provided	
24.	Time taken for spring charging	
25.	No. of auxiliary contacts	
26.	Derating required for capacitor switching	
C.	**Contractor**	
1.	Type designation	
2.	Make	
3.	Rated Voltage	
4.	Rated current	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	20-SEP-2024	ISSUED WITH MR	PUNEET SHRIVASTAVA	ACHUTUNI SAI	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

	AC-3 Duty	
	AC-4 Duty	
5.	Thermal rating	
6.	Making capacity	
7.	Breaking capacity	
8.	Switching frequency	
9.	Life	
	Electrical	
	Mechanical	
10.	Coil consumption	
	Pick up	
	Hold on	
11.	Closing time	
12.	Opening time	
13.	No of aux. contacts	
14	Maximum permitted back up fuse rating	
D.	**Switch**	
1.	Rated voltage	
2.	Rated current	
3.	AC 23 rating	
4.	Rated making capacity	
5.	Rated breaking capacity	
6.	Rated short circuit withstand current with	
	max. permissible rated fuses	
7.	Mechanical life	
8.	Maximum permitted back up fuse rating	
E.	**Thermal Overload Relay**	
1.	Make	
2.	Type	
3.	Setting range	
4.	Single phasing preventor	
5.	Type of operation	
6.	Maximum permitted back up fuse rating	
F.	**Fuses**	
1.	Make	
2.	Type	
3.	Current rating	
G.	**Electronic Motor protection relay**	
1.	Make	
2.	Type	
3.	Setting range	
4.	Single phasing preventor	
5.	Type of operation	
6.	Maximum permitted back up fuse rating	
7.	Earth fault protection available	
H.	**MCCB/MCB**	
1.	Make	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	20-SEP-2024	ISSUED WITH MR	PUNEET SHRIVASTAVA	ACHUTUNI SAI	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

2.	Type	
3.	Rated voltage	
4.	Rated current	
5.	Rated frequency	
6.	No. of poles	
7.	Derating factor for operation under site conditions	
8.	Rated 10 sec short time rating	
9.	Rated breaking capacity at service voltag	
10.	No. of operations at full fault	
11.	No. of operations at partial fault	
12.	No. of guaranteed mech. operations	
13.	1 min dry p.f with stand voltage	
14.	Shunt trip feature (for MCCB only)	
15.	Operating voltage range for MCCB shunt trip	

Eil Notes

1 Breaker panels shall be Drawout Single Front type.
2 MCC and ASB rating shall be limited to 1250A
3 Up to 4000A rating, forced cooling shall not be provided
4 LOTO provision shall be done as a standard feature in all the Switchgear /MCC/PCC/DBs/SDBs etc., in all the incoming and outgoing feeders (includin all field DBs).
5 ON/OFF indication shall be provided on all the rear doors of switchgear
6 All the MV switchboards (PCC/PMCC/EPC/EPMCC/MCC) shall be provided with online temperature monitoring system.

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	20-SEP-2024	ISSUED WITH MR	PUNEET SHRIVASTAVA	ACHUTUNI SAI	RAMAN SOOD

DATA SHEET FOR MEDIUM VOLTAGE SWITCHBOARD COMPONENTS

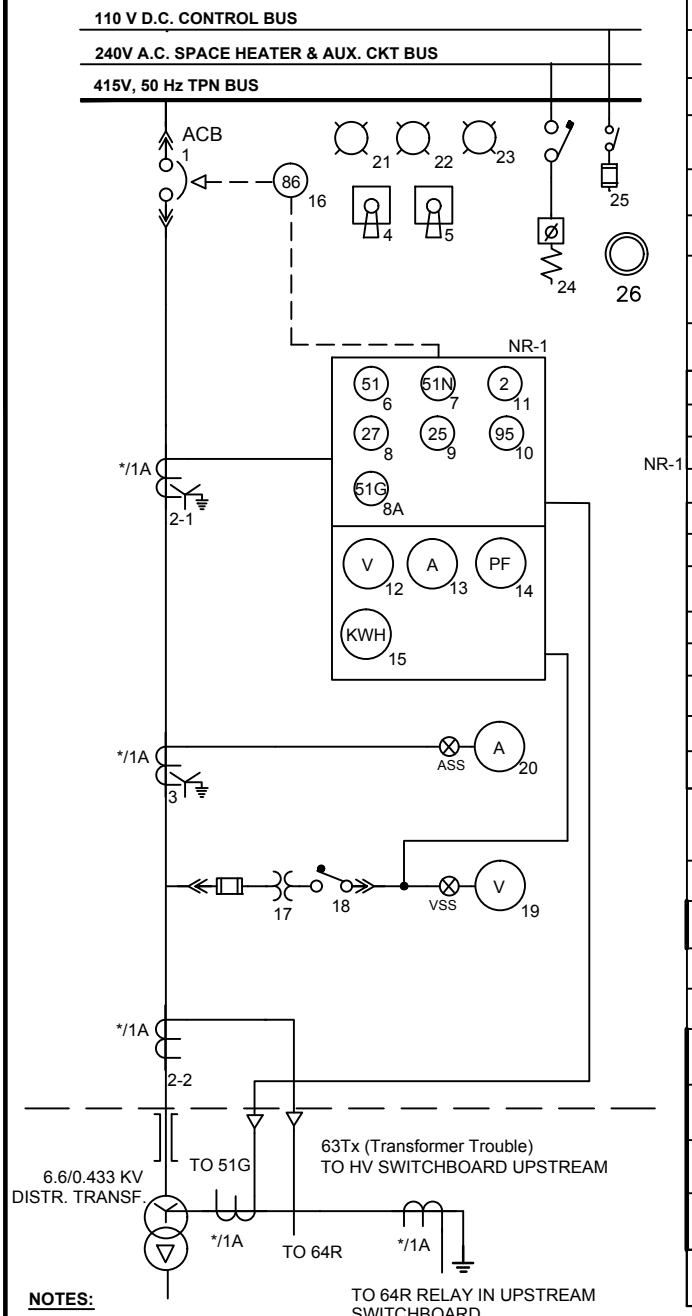
FEEDER TYPE	MOTOR RATING KW	MAX. CABLE SIZE	COMPONENT RATING (A)			
			DMPR	CT RATIO	MCCB	CONTACTOR
FVNR-15 FVR-15 FVNR-15HD	≤5.5	3*16	CEMPR (46,49,27,50N,50LR & ELR)	15/1 (See note-1)	32	15
FVNR-30 FVR-30 FVNR-30HD	5.5 < KW≤11	3*50	CEMPR (46,49,27,50N,50LR & ELR)	30/1 (See note-1)	63	30
FVNR-60 FVR-60 FVNR-60HD	11< KW ≤22	3*95	CEMPR (46,49,27,50N,50LR & ELR)	60/1 (See note-1)	125	60
FVNR-100 FVR-100 FVNR-100HD	22< KW≤45	2R*3*95	CEMPR (46,49,27,50N,50LR & ELR)	100/1 (See note-1)	250	100
FVNR-150 FVR-150 FVNR-150HD	45< KW≤55	2R*3*120	CEMPR (46,49,27,50N,50LR & ELR)	150/1 (See note-1)	250	150
ACB Feeder	55< KW≤160	4R*3*240	MOTOR PROTECTION RELAY (46,50,49,27,50N,50LR), ELR)		ACB	
MCCB, Contactor, CBCT & ELR -32A	MCCB	3.5*50	32A MCCB WITH SHUNT TRIP, OVERLOAD & S/C RELEASES	30/1	16/32	32
MCCB, Contactor, CBCT & ELR -63A	MCCB	3.5*95	63A MCCB WITH SHUNT TRIP, OVERLOAD & S/C RELEASES	60/1	63	63
MCCB, Contactor, CBCT & ELR -125A	MCCB	2*3.5*120	125A MCCB WITH SHUNT TRIP, OVERLOAD & S/C RELEASES	100/1	125	125
MCCB, Contactor, CBCT & ELR -160A	MCCB	2*3.5*185	160A MCCB WITH SHUNT TRIP, OVERLOAD & S/C RELEASES	150/1	160	160
MCCB, Contactor, CBCT & ELR -250A	MCCB	2*3.5*300	250A MCCB WITH SHUNT TRIP, OVERLOAD & S/C RELEASES	250/1	250	250
MCCB, Contactor, CBCT & ELR -400A	MCCB	3*3.5*300	400A MCCB WITH SHUNT TRIP, OVERLOAD & S/C RELEASES	400/1	400	400

NOTES:

1. ALL MOTORS SHALL BE PROVIDED WITH CBCT BASED EARTH FAULT PROTECTION.
   i. FEEDERS FOR MOTORS RATED UPTO 55 KW SHALL BE CONTROLLED THROUGH MCCB, CONTACTOR, COMMUNICABLE ELECTRONIC MOTOR PROTECTION RELAY (CEMPR), CBCT & ELR. ELR SHALL BE PART OF EMPR.
   ii. FEEDERS FOR MOTORS RATED ABOVE 55 KW SHALL BE CONTROLLED THROUGH AIR CIRCUIT BREAKER (ACB) WITH NUMERICAL MOTOR PROTECTION RELAY. ELR SHALL BE PROVIDED SEPARATELY.
2. CBCT & ELR SHALL BE PROVIDED FOR MCCB WITH CONTACTOR OUTGOING FEEDER RATING UPTO 400A.
3. CT FOR METERING SHALL BE PROVIDED FOR MOTOR RATING MORE THAN 5.5 KW.
4. TYPICAL MCCB & CONTACTOR RATING ARE SPECIFIED ABOVE FOR MOTOR FEEDERS RATED UPTO 55KW. FINAL MCCB RATINGS, CONTACTOR RATING AND BIMETAL RANGE (EMPR) SHALL BE SELECTED BY THE MANUFACTURER MEETING THE TYPE -2 CO-ORDINATION AS PER IS-13947 & IS/IEC: 60947 CONSIDERING THE ENERGY EFFICIENT MOTORS OF IE3 FOR HAZARDOUS & IE4 FOR SAFE AREA.
5. MAJOR COMPONENTS ARE SHOWN ABOVE, ALL OTHER ITEMS AS SPECIFIED IN EQUIPMENT DATA SHEET AND SPECIFICATION: 6-51-0018/ 6-51-0012 SHALL ALSO BE IN VENDOR'S SCOPE.
6. RCCB WITH 30mA SHALL BE PROVIDED IN OUTGOING FEEDERS OF LDB/ ASB FOR LP/ PP.
7. NUMERICAL RELAY AND EMPR DATA SHALL BE TRANSMITTED TO ECS THROUGH SAS. FURTHER, STATUS SIGNALS SHALL BE TRANSFERRED FROM ECS TO DCS ON MODBUS TCP/IP PROTOCOL.

Rev. No	Date	Purpose	Prepared by	Checked by	Approved by
A	24.09.2024	ISSUED WITH MR/TENDER	NNB	AS	RS

EMPLOYER : M/s BPCL	REV.	DATE	PURPOSE	BY	CHECKED	APPD.	APPD.
PROJECT : PPU & REVAMP OF FCCU	A	23.09.2024	ISSUED WITH MR/TENDER	NNB	AS	RS	
	B	07.03.2025	ISSUED WITH MR/TENDER	NNB	AS	RS	



EQUIPMENT DATA

ITEM NO.	NEMA NO.	QTY	DESCRIPTION
1	52	1	AIR CIRCUIT BREAKER (ACB) 4-POLE
2-1	--	3	PROTECTION CURRENT TRANSFORMER (C.T.), CLASS-5P10
2-2	-	3	PROTECTION CURRENT TRANSFORMER (C.T.), CLASS-PS
3	--	3	METERING CURRENT TRANSFORMER (C.T.), CLASS-1.0
4	52C/S	1	BREAKER CONTROL SWITCH TRIP-NEUTRAL-CLOSE (LOCKABLE WITH SPRING RETURN TO NEUTRAL)
5	--	1	UPSTREAM BREAKER TRIP SWITCH (2 POSITION, STAYPUT TYPE AND LOCKABLE)
6	51		IDMTL OVER-CURRENT FUNCTION (50-200%)
7	51N		IDMTL EARTH-FAULT FUNCTION (10-40%)
8	27		UNDER-VOLTAGE FUNCTION (40-80%)
8A	51G		STANDBY EARTH FAULT FUNCTION (20-80%)
9	25		CHECK SYNCHRONISATION RELAY
10	95		TRIP CIRCUIT SUPERVISION FUNCTION
11	2		TIME DELAY ON PICK UP/DROP OFF TIMER 0.5-5.0 SEC.
12	--		VOLTAGE METERING FUNCTION (3 PHASE)
13	--		CURRENT METERING FUNCTION (3 PHASE)
14	--		POWER FACTOR METERING FUNCTION 0.5LAG-1.0-0.5 LEAD
15	--		KWH METERING FUNCTION
16	86		LOCK-OUT RELAY (ELECTROMECHANICAL TYPE RELAY)
17	--	1 SET	Y/Y CONNECTED, CLASS-1.0, POTENTIAL TRANSFORMER (P.T.) WITH 110/√3 V SECONDARY WITH PRIMARY FUSE
18	--	1	4 POLE MCB 10A (For P.T. Secondary)
19	--	1	VOLTMETER WITH SELECTOR SWITCH 4-WAY & OFF
20	--	1	AMMETER WITH SELECTOR SWITCH 4-WAY
21	--	1	TRIP CIRCUIT HEALTHY INDICATING LAMP
22	--	AS REQD.	CLUSTER LED TYPE INDICATING LAMP
23	--	3	CLUSTER LED TYPE INDICATING LAMP (Upstream ON/OFF/Trafo Trouble)
24	--	1	PANEL SPACE HEATER WITH DOUBLE POLE MCB AND THERMOSTAT
25	--	1	DOUBLE POLE SWITCH 10A WITH FUSE FOR D.C. CONTROL SUPPLY
26	--	1	TRIP CIRCUIT HEALTHY CHECK PUSHBUTTON

NOTES:

1. ANTIPUMPING RELAY USED, IF ANY, SHALL BE CONSIDERED AS PART OF BREAKER MECHANISM.
2. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER `EQUIPMENT DATA' SHALL BE IN VENDOR'S SCOPE.
3. FOR THE OTHER REQUIREMENTS OF RELAYS AND METERS, REFER ELSEWHERE IN PR\ TENDER.
4. ALL PROTECTION RELAY SHALL BE NUMERICAL TYPE EXCEPT LOCK-OUT RELAY (86).
5. ONE OF THE OUTPUT OF LOCK-OUT RELAY (86) SHALL BE WIRED TO NUMERICAL RELAY FOR LED INDICATION.
6. FOR THE REQUIREMENTS OF ECS INTERFACE, REFER I/O LIST ENCLOSED SEPARATELY.
7. 64R RELAY & CT SHALL BE PROVIDED FOR TRANSFORMERS>=2.5MVA
8. VA BURDEN OF CT & PT SHALL BE DECIDED BY VENDOR WHERE NOT INDICATED.

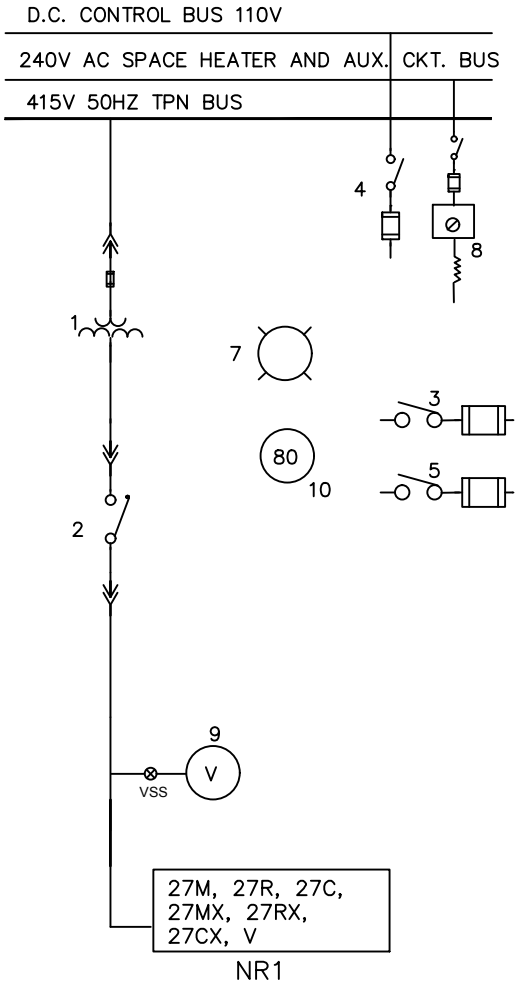
NR1 ▭ PART OF NUMERICAL RELAY-1
NR2 ▭ PART OF NUMERICAL RELAY-2

ENGINEERS INDIA LIMITED NEW DELHI	415 V SWITCHBOARD DATASHEET PCC/PMCC INCOMER FROM TRANSFORMER	DOCUMENT NO.	REV.
		B895-000-16-50-DS-1803	B

PROJECT: PPU & REVAMP OF FCCU

CLIENT: M/S BPCL

REV	DATE	PURPOSE	BY	CHKD	APPD
A	23.09.2024	ISSUED WITH MR/TENDER	NNB	AS	RS



NR1 PART OF NUMERICAL RELAY-1

EQUIPMENT DATA

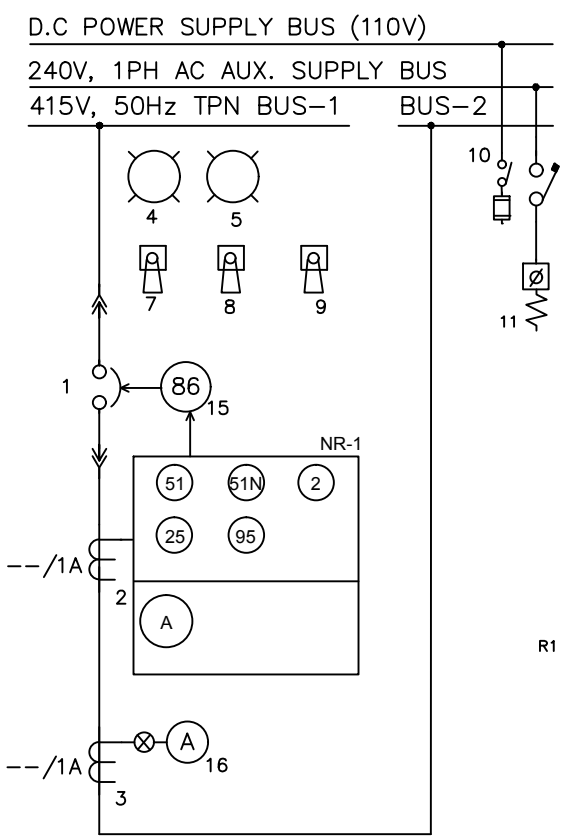
ITEM NO	NEMA NO.	QTY.	DESCRIPTION
1	–	3	DRAWOUT TRUCK WITH DISCONNECT CONTACT & $Y_{\frac{1}{3}}$ / $Y_{\frac{1}{3}}$/$Y_{\frac{1}{3}}$ CONNECTED 200VA P.T. WITH 2 NOS. $\frac{110V}{\sqrt{3}}$ SECONDARY WITH PRIMARY FUSE
NR1	27M	3	U/V RELAY FOR TRIPPING MOTORS SETTING RANGE 40-80% (27M)
	27R	1	RESIDUAL VOLTAGE CHECK RELAY WITH 40% SETTING (27R)
	27C	1	HEALTHY VOLTAGE CHECK RELAY
	–	AS REQD.	AUX. RELAY FOR 27M,27R & 27C
	–	1	VOLTMETER (3 PHASE)
2	–	1	4 POLE MCB 20A
3	–	1	63A (MINIMUM) DP DC SWITCH FUSE FOR MAIN DC INCOMING CONTROL SUPPLY
4	–	1	DP SWITCH 10A WITH FUSE FOR DC CONTROL SUPPLY. (NOTE-4)
5	–	1	32A(MINIMUM) SPN AC SWITCH FUSE FOR MAIN AC INCOMING AUXILIARY CONTROL SUPPLY
6	–	1	CUBICLE LAMP WITH SWITCH & FUSE
7	–	AS REQD	CLUSTER LED TYPE INDICATING LAMP
8	–	1	PANEL SPACE HEATER WITH SWITCH FUSE AND THERMOSTAT
9	–	1	VOLTMETER WITH SELECTOR SWITCH 3-WAY & OFF
10	80	2	CONTROL SUPPLY SUPERVISION RELAY

NOTES:

1. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN SPECIFICATION 6-51-0001 SHALL BE IN VENDOR'S SCOPE.
2. ALL PROTECTION RELAYS SHALL BE NUMERICAL TYPE WITH IEC 61850 COMMUNICATION PROTOCOL.
3. ALL PROTECTION RELAYS SHALL BE NUMERICAL TYPE EXCEPT CONTROL SUPPLY SUPERVISION RELAY (80).
4. VA BURDEN OF PT SHALL BE DECIDED BY THE VENDOR WHERE NOT SPECIFIED.

ENGINEERS INDIA LIMITED NEW DELHI	HARDWARE DATASHEET FOR BUS PT PANEL	DATA SHEET	REV
		B895-000-16-50-DS-1805	A

PROJECT: PPU & REVAMP OF FCCU CLIENT: M/S BPCL-KOCHI	REV	DATE	PURPOSE	BY	CHKD	APPRV
	A	23.09.2024	ISSUED WITH MR/TENDER	NNB	AS	RS
	B	05.03.2025	ISSUED WITH MR/TENDER	NNB	AS	RS



R1 ▭ —PART OF NUMERICAL RELAY-1

EQUIPMENT DATA

ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	52	1	AIR CIRCUIT BREAKER (WITH 4-POLES)
2	–	3	PROTECTION CT CL-5P10
3	–	3	METERING CT CL-1.0
4	–	AS REQ	INDICATING LAMP AND CUBICLE LAMPS, (LED TYPE)
5	–	1	TRIP CKT. HEALTHY CHECK INDICATION LAMP LAMP(LED TYPE)
6	–		DELETED
7	52C/S	1	BREAKER CONTROL SWITCH CLOSE-NEUTRAL -TRIP(LOCKABLE WITH SPRING RETURN TO NEUTRAL)
8	–	1	AUTO-IND-MAN SELECTOR SWITCH (LOCKABLE)
9	–	1	3 POSITION SEL. SWITCH FOR TRIP BKR-A/ TRIP TIE/TRIP BKR-B (STAYPUT & LOCKABLE)
10	–	1	DP SWITCH FUSE 10A FOR DC SUPPLY
11	–	1	PANEL SPACE HEATER WITH MCB & THERMOSTAT
12	95	1	TRIP CIRCUIT SUPERVISION RELAY
13	25	1	CHECK SYNCRONISING
14	51 & 51N	1	IDMTL O/C RELAY 2 NOS O/C (50-200%) & 1NO E/F (10-40%)
15	86	1	TRIPPING RELAY
16	–	1	ANALOGUE AMMETER WITH 4-WAY SELECTOR SWITCH
17	2		TIME DELAY ON PICKUP/DROPOFF TIMER 0.5-5.0 SEC

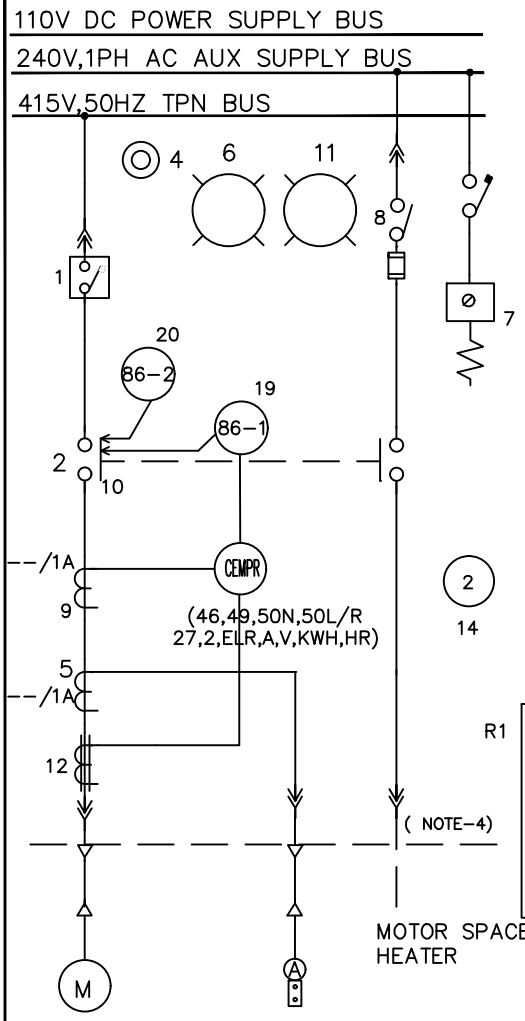
NOTES:

1. ANTIPUMPING RELAY USED, IF ANY, SHALL BE CONSIDERED AS PART OF BREAKER MECHANISM.
2. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN SPECIFICATION 6-51-18 SHALL BE IN VENDOR'S SCOPE.
3. FOR THE OTHER REQUIREMENTS OF RELAYS AND METERS, REFER JOB SPECIFICATION
4. FOR THE REQUIREMENTS OF ECS INTERFACE, REFER I/O LIST ENCLOSED SEPARATELY IN M.R.
5. ALL PROTECTIVE RELAYS SHALL BE NUMERICAL TYPE (EXCEPT TRIPPING RELAY [86]) OF APPROVED MAKES. METERING SHALL BE A PART OF NUMERICAL RELAY.
6. VA BURDEN OF CTs SHALL BE DECIDED BY THE SWITCHBOARD VENDOR.
7. AUTO CHANGEOVER LOGIC BETWEEN INCOMERS AND BUS COUPLER SHALL BE BUILT IN THE NUMERICAL RELAY.

ENGINEERS INDIA LIMITED NEW DELHI	M.V. SW. BD. DATA SHEET PCC/PMCC/MCC/ASB BUS-COUPLER	DATA SHEET	REV
		B895-000-16-50-DS-1806	B

PROJECT: PPU & REVAMP OF PFCCU
CLIENT: M/S BPCL-KOCHI

REV	DATE	PURPOSE	BY	CHKD	APPRV
A	13.09.2024	ISSUED WITH MR/TENDER	NNB	AS	RS
B	05.03.2025	ISSUED WITH MR/TENDER	NNB	AS	RS



EQUIPMENT DATA

ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	–	1	MCCB NON-MICROPROCESSOR BASED WITH SHUNT TRIP & SHORT CIRCUIT PROTECTION
2	–	1	AIR BREAK CONTACTOR, DUTY-AC3 WITH 2NO+2NC AUXILIARY CONTACTS.
3	–	–	–
4	–	1	STOP PUSH BUTTON
5	–	3	METERING CT, CL-1.0, 15VA BURDEN
6	–	AS REQD	INDICATING LAMPS – LED TYPE
7	–	1	PANEL SPACE HEATER WITH MCB AND THERMOSTAT
8	–	1	DP SWITCH & FUSE FOR MOTOR SPACE HEATER
9	–	3	PROTECTION CT CL-5P20
10	–	AS REQD	AUX.CONTACTORS WITH MIN.2NO+2NC CONTACTS
11	–	1	MOTOR SPACE HEATER ON INDICATION – LED TYPE
12	–	1	CORE BALANCE CURRENT TRANSFORMER
13	CEMPR	1	COMMUNICABLE ELECTRONIC MOTOR PROTECTION RELAY
14	2	2	ON DELAY AND OFF DELAY TIMER
15	–	1	AMMETER (3-PHASE)
16	–	1	VOLTMETER (3-PHASE)
17	–	1	KWH METER
18	–	1	HOUR RUN METER
19	86-1	1	LOCKOUT RELAY FOR ELECTRICAL TRIP (ELECTROMECHANICAL RELAY-LATCH TYPE)
20	86-2	1	LOCKOUT RELAY FOR PROCESS TRIP (ELECTROMECHANICAL RELAY-SELF RESET TYPE)

NOTES:

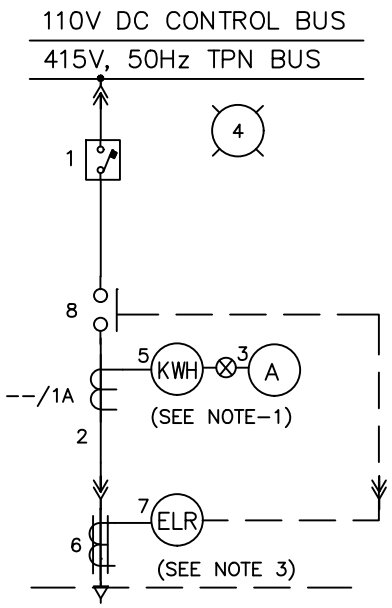
1. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN RESPECTIVE JOB SPECIFICATION/STANDARD SPECIFICATION SHALL BE IN VENDOR'S SCOPE.
2. COMPONENT RATING SHALL BE AS PER MV SWITCHBOARD COMPONENT DATA SHEET
3. NO. OF CONTROL TERMINALS PROVIDED SHALL INCLUDE 20% SPARE TERMINALS SUBJECT TO A MINIMUM 24 TERMINALS.
4. MOTOR SPACE HEATER CKT. TO BE PROVIDED FOR MOTORS RATED 30kW AND ABOVE.
5. VA BURDEN OF CTs (EXCEPT METERING CT) SHALL BE DECIDED BY THE SWITCHBOARD VENDOR.
6. MOTOR PROTECTION RELAY SHALL BE SUITABLE FOR 110V DC CONTROL SUPPLY.
7. CEMPR SHALL BE TYPE-2 COORDINATED WITH THE OTHER MV COMPONENTS IN THE FEEDER.
8. CEMPR SHALL BE SUITABLE FOR IE-4 MOTORS.
9. CONTROL SUPPLY FOR CONTACTOR SHALL BE 110V DC.
10. CT FOR AMMETER SHALL BE PROVIDED FOR ALL MOTORS RATED ABOVE 5.5 KW.
11. TIMER FOR DELAYED TRIPPING ON BUS UNDER VOLTAGE SHALL BE PROVIDED FOR CONTACTOR CONTROLLED MOTOR FEEDER.

ENGINEERS INDIA LIMITED
NEW DELHI

MV SWITCHBOARD
DATASHEET
CONTACTOR CONTROLLED MOTOR FEEDER
(FOR MOTORS <=55kW)

DATA SHEET	REV
B895-000-16-50-DS-1811	B

PROJECT: PPU & REVAMP OF PFCCU CLIENT: M/S BPCL-KOCHI	REV	DATE	PURPOSE	BY	CHKD	APPRV
	A	23.09.2024	ISSUED WITH MR/TENDER	NNB	AS	RS



EQUIPMENT DATA

ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	–	1	MCCB WITH SHUNT TRIP, S/C & O/C RELEASE
2	–	3	METERING CT, CL-1
3	–	1	AMMETER WITH 4WAY SELECTOR SWITCH.
4	–	3	INDICATING LAMPS – LED TYPE
5	–	1	KWH METER WITH ACCURACY CL.1.0
6	–	1	CORE BALANCE CURRENT TRANSFORMER
7	–	1	EARTH LEAKAGE RELAY SETTING RANGE (1-16%) WITH BUILT-IN TIMER
8	–	1	CONTACTOR WITH 2NO+2NC AUX. CONTACTS

NOTES:

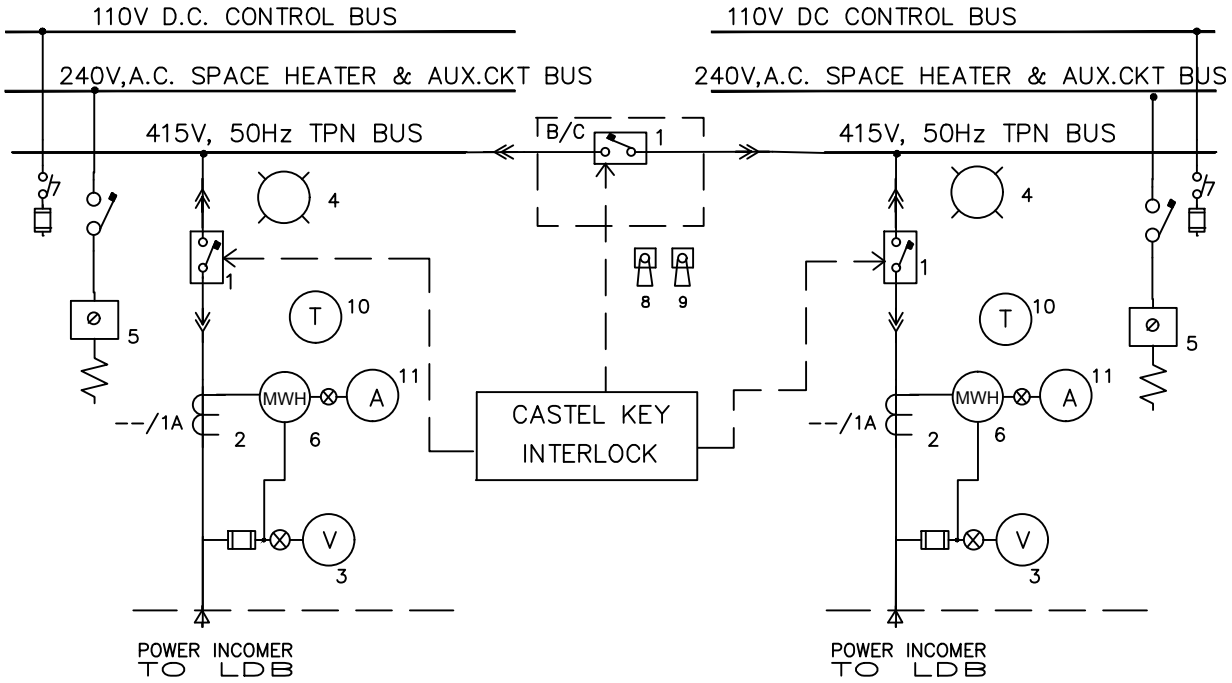
1. CT, AMMETER AND KWH METER SHALL BE PROVIDED FOR FEEDERS RATED 250A & ABOVE.
2. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE. ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN SPECIFICATION 6-51-0018 SHALL BE IN VENDOR'S SCOPE.
3. CBCT RATIO SHALL BE SELECTED TO SUIT E/F RELAY SETTING RANGE
4. ELR SHALL BE SUITABLE FOR 110V DC CONTROL SUPPLY.
5. VA BURDEN OF CTs SHALL BE DECIDED BY SWITCHBOARD VENDOR.
6. MCCB SHALL BE SUITABLE FOR SYSTEM FAULT LEVEL.

ENGINEERS INDIA LIMITED NEW DELHI	M.V. SW. BD. DATA SHEET MCCB CONTACTOR FEEDER	DATA SHEET	REV
		B895-000-16-50-DS-1813 Sheet 1 of 1	A

EMPLOYER: M/s BPCL	REV	DATE	PURPOSE	BY	CHKD	APPD.
	A	09.09.2021	ISSUED WITH MR/ TENDER	PS	AS	RS
PROJECT: CBR PROJECT	B	07.03.2025	ISSUED WITH MR/ TENDER	PS	AS	RS

EQUIPMENT DATA (FOR EACH INCOMER)

ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	–	1	MOULDED CASE CIRCUIT BREAKER(MCCB) WITH O/L, S/C, E/F AND SHUNT RELEASES (4 POLE)
2	–	3	METERING CT, CL-1, 10VA
3	–	1	ANALOG VOLTMETER WITH 4WAY SELECTOR SWITCH & FUSE
4	–	AS REQ.	R Y B INDICATING LAMPS – LED TYPE
5	–	1	PANEL SPACE HEATER WITH MCB AND THERMOSTAT
6	–	1	MWH METER
7	–	1	DP SWITCH FUSE 10A FOR DC SUPPLY
8	–	1	AUTO-MANUAL SELECTOR SWITCH
9	–	1	ECS-LOCAL SELECTOR SWITCH
10	–	2	SYNCHRONOUS TIMER (ASTRONOMICAL TYPE SMART TIMER) TO TAKE CARE OF WEATHER CONDITION AND PROGRAMMING FOR FULL YEAR.
11	–	1	ANALOG AMMETER WITH 4 WAY SEL SWITCH & FUSE

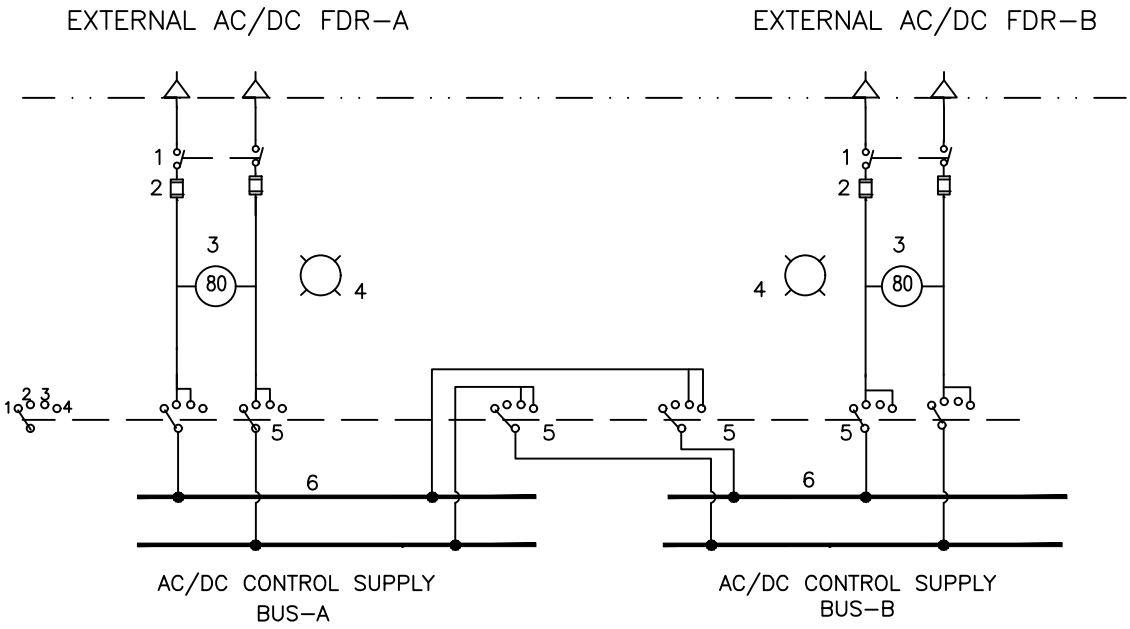


NOTES

1. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE . ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN SPECIFICATION 6-51-0018 SHALL BE IN VENDOR'S SCOPE.
2. DIGITAL MULTIFUNCTION CUM ENERGY METER SHALL BE PROVIDED FOR EACH INCOMER OF LDB/ELDB IRRESPECTIVE OF RATING.
3. FOR THE REQUIREMENTS OF ECS INTERFACE, REFER I/O LIST ENCLOSED SEPARATELY.
4. LOCAL/REMOTE SELECTOR SWITCH SHALL BE PROVIDED ON EACH LDB/ELDB INCOMER FOR CENTRALISED CONTROL OF LIGHTING.
5. SCHEME INDICATED IS FOR CENTRALISED CONTROL OF THE LIGHTING FEEDERS ie., SWITCHING 'ON' & 'OFF' THROUGH MAIN CONTACTOR WHICH SHALL BE ACTUATED BY A SYNCHRONOUS TIMER(ASTRONOMICAL TYPE)
6. FOR EACH OF THE LDB/ELDB PROVIDED IN A SUBSTATION PROVISION FOR EMERGENCY BLACK-OUT FROM CENTRALISED LOCATION I.E., THROUGH A MAIN CONTACTOR SHALL BE PROVIDED. FOR THIS ONE NO. POTENTIAL FREE CONTACTS EACH FOR "ON" & "OFF" OF ALL CONTACTOR FEEDERS WILL BE PROVIDED FOR EACH SUBSTAION FROM ECS. THIS CONTACT SHALL BE SUITABLY MULTIPLIED AND USED FOR ALL LDBs/ELDBs IN THE SUBSTATION

ENGINEERS INDIA LIMITED NEW DELHI	M.V. SW. BD. DATA SHEET LDB/ELDB I/C & B/C	DATA SHEET	REV
		B895-000-16-50-DS-1814	B

PROJECT: PPU & REVAMP OF PFCCU CLIENT: M/S BPCL-KOCHI	REV	DATE	PURPOSE	BY	CHKD	APPRV
	A	24.09.2024	ISSUED WITH MR/TENDER	NNB	AS	RS



SELECTOR SWITCH POSITION

POSITION	DESCRIPTION
POSITION-1	OFF
POSITION-2	CONTROL SUPPLY FROM INDIVIDUAL FEEDER
POSITION-3	CONTROL SUPPLY FROM AC/DC FEEDER -A
POSITION-4	CONTROL SUPPLY FROM AC/DC FEEDER -B

EQUIPMENT DATA

ITEM NO.	NEMA NO.	QTY.	DESCRIPTION
1	-	2	DP SWITCH 25A (MIN)
2	-	4	HRC FUSE
3	80	2	AC/DC SUPPLY FAILURE RELAY SETTING RANGE 30-60%
4	-	2	INDICATING LAMP - LED TYPE
5	-	1	4 POSITION CHANGEOVER SWITCH
6	-	4	AC/DC CONTROL SUPPLY BUS

NOTES:

1. THE ONE LINE DIAGRAM SHOWN ABOVE IS ONLY INDICATIVE ALL THE ITEMS SPECIFIED UNDER "EQUIPMENT DATA" AND IN SPECIFICATION 6-51-18 SHALL BE IN VENDOR'S SCOPE.
2. THE COMPONENT RATING ARE INDICATIVE AND SAME SHALL BE SIZED BASED ON DC POWER REQUIRMENT OF THE SWITCHBOARD BY THE VENDOR.
3. IN NORMAL CONDITION, EACH AC FEEDER SHALL BE FEEDING RESPECTIVE AC BUS. IN CASE OF TRIPPING OF ONE INCOMER, AUTO-CHANGEOVER SHALL TAKE PLACE SO THAT COMPLETE BUS SECTION CAN BE FED FROM HEALTHY SOURCE. ONCE POWER IS AGAIN AVAILABLE AT BOTH INCOMERS, RESTORATION SHALL BE DONE SO THAT THERE IS NO LOSS OF CONTROL POWER.
4. MANUAL CHANGEOVER SHALL BE PROVIDED FOR AC AUXILIARY SUPPLY. AUTO CHANGEOVER SHALL BE PROVIDED FOR DC CONTROL SUPPLY.
5. AC/DC SUPPLY FAILURE RELAY SHALL BE ELECTRO-MECHANICAL TYPE.

ENGINEERS INDIA LIMITED NEW DELHI	M.V. SW. BD. DATA SHEET SCHEME FOR AC/DC CONTROL SUPPLY FOR TWO INCOMER SWITCHBOARD	DATA SHEET	REV
		B895-000-16-50-DS-1825 Sheet 1 of 1	A

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	46
2.	Minimum Ambient Temperature	°C	1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	95
5.	Altitude Above MSL	mm	<1000
6.	Environment		Humid & Highly Corrosive
B.	**Technical particulars**		
1.	Tag no.:		
2.	Duty:		Continuous
3.	No. of windings:		Two
4.	Type of cooling:		ONAN
5.	Rated MVA		
6.	Oil type		Mineral (as per IS 335)
7.	Rated voltage		
	HV winding	kV	6.6
	LV winding	kV	0.433
8.	HV Phase sequence		UVW
9.	LV Phase sequence		TO SUIT SWITCH GEAR
10.	System earthing:		
	HV side		Resistance Earthed
	LV side		Solidly Earthed
11	Rated frequency:		50 Hz +/- 3 %
12.	No. of phases:		Three
13.	Fault level on HV side:	kA	40
14.	Connection		
	HV side		Delta
	LV side		Star
15.	Vector group:		Dyn11
16.	Impedance at max. MVA:	%	As per short circuit study/Min as per IS
17.	Insulation class:		A
18.	Insulation level:		
	P. f withstand		
	HV winding	kV	As per CBIP/ IS
	LV winding	kV	As per CBIP/ IS
	Impulse withstand		
	HV winding	kVp	As per CBIP/ IS
	LV winding	kVp	As per CBIP/ IS
19.	Winding insulation type:		Uniform
20.	Noise Level		As per CBIP
21.	Clearance:		
	Ph to Ph		As per CBIP/ IS
	Ph to N		As per CBIP/ IS
22.	Tap changer		
	Location		HV winding
	Type		Offcircuit

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	05-DEC-2024	ISSUED WITH MR/TENDER	RAMAN SOOD	RAMAN SOOD	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

	Range	%	± 5
	No. of steps		5
23.	Normal load:	%	30-40
24.	Temp. rise at extreme tap having max. losses :		
	oil	°C	As per IS-1180/Amendment
	winding	°C	As per IS-1180/Amendment
25.	Limiting Dimention (Max) :		7-51-0337
26..	Minimum guaranteed efficiency at 0.8 p.f at 40% of ONAN rating		99.5
27.	Power flow:		Unidirectional
28.	Explosion protection		PRV
29.	Terminal location:		
	HV side		Smaller side
	LV w.r.t HV	°	90
30.	Terminal connection		
	HV side		Cable box
	LV side		Busduct
31.	Cable size		
	HV side		
	LV side		Not applicable
32.	Neutral CT specification:		
	51G (After Bifurcation)		VA CL 5P10
	64R (Before Bifurcation)		VA CL PS
	Vk	A	
	Im at Vk/2	mA	
	RCT	ohm,	
33.	Installation		Outdoor
34.	Painting & colour		Epoxy & shade RAL 7031
35.	AC Auxiliary voltage		240 V +/- 10 % SPN
36.	Bidirectional roller type		Flat
37.	¢ distance of flat rollers	mm	1000
38.	Applicable specifications		6-51-0041, IS 1180 & IS 2026
39.	Loss Capitalization		Not applicable
	a. Rate for copper loss Rs./kW		
	b. Rate for iron loss Rs./kW		
40.	Accessories requirement		
	Sampling valve		Yes
	Conservator drain valve		Yes
	Top oil filter valve		Yes
	Explosion vent/PRV		Yes
	Air bag for conservator		No
	Dial type thermometer & contacts for OTI, WTI		Yes
	Drain valve		Yes
	Marshalling box		Yes
	Double float Buchholz		Yes
	Channels, towing lugs :		Yes
	Rollers		Yes
	Neutral bushing outside terminal box with connector assembly		Yes

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	05-DEC-2024	ISSUED WITH MR/TENDER	RAMAN SOOD	RAMAN SOOD	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

	Inspection cover		Yes
	Disconnecting chamber		Yes
	WTI & OTI		Yes
	Busduct flange on LV		Yes
	Lugs and cable glands		Yes
41.	Tests requirements		
	Impulse test:		Test certificate to be furnished
	Heat run test		Test certificate to be furnished
	Short circuit test (On Transformer):		Test certificate to be furnished
	Short circuit test (On Terminal Box):		Test certificate to be furnished
	Vaccum test (On Tank):		Required
	Pressure test (On Tank):		Required
	Oil Leakage Test :		Required

MANUFACTURER'S DATA

A.	**Make**		
B.	**Performance**		
1	No load loss at		
	100% Voltage :	kW	
	110% Voltage :	kW	
2	Full load copper loss at 75 C	kW	
3	No load current at		
	100% Voltage :	A	
	110% Voltage :	A	
4	Efficiency at full load at 75 C		
	at 0.8 p.f.	%	
	at 1.0 p.f.	%	
5	Eff.at 50% load at 75 C		
	at 0.8 p.f.	%	
	at 1.0 p.f.	%	
6	Maximum efficiency:		
	at 0.8 p.f.	%	
	at 1.0 p.f.		
7	Load at which max eff. Occurs:		
	at 0.8 p.f.		
	at 1.0 p.f.		
8	Regulation at 75 C		
	at 0.8 p.f.	%	
	at 1.0 p.f.	%	
9	X1/R1 Ratio		
	X0/R0 Ratio		
10	Zero sequence in impedence, Z0		
11	Inrush Current :	A	
12	Duration of Inrush Current :	Sec	
13	Hot spot temp of winding :	°C	
14	Value of Permissible Overloading :	%	
15	Zero sequence in impedence, Z0		
	For 0.5 hrs		
	For 1 hrs		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	05-DEC-2024	ISSUED WITH MR/TENDER	RAMAN SOOD	RAMAN SOOD	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

	For 2 hrs		
	For 4 hrs		
	For 6 hrs		
	For 8 hrs		
	For 12 hrs		
	For 24 hrs		
C.	**Constructional Features**		
1	Location of terminals		
	Primary		
	Secondary		
2	Location of Neutral CT		
3	Explosion protection		
D.	**Mechanical Data**		
1	Core & winding weight	kgs.	
2	Tank & fitting weight	kgs.	
3	Radiator without oil weight	kgs.	
4	Total weight	kgs.	
5	Total quantity of oil :	ltrs	
6	Quantity of oil in radiators :	ltrs	
7	Overall dimensions		
	Length	mm	
	Breadth	mm	
	Height	mm	

Eil Notes

1

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	05-DEC-2024	ISSUED WITH MR/TENDER	RAMAN SOOD	RAMAN SOOD	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	46
2.	Minimum Ambient Temperature	°C	1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	95
5.	Altitude Above MSL	m	<1000
6.	Environment		Humid & Highly Corrosive
B.	**Technical particulars**		
1.	Tag no.		
2.	Duty		Continuous
3.	Service		Lighting
4.	No. of windings		Two
5.	Type of cooling		AN
6.	Rated MVA		
7.	Rated voltage		
	HV winding	kV	0.415
	LV winding	kV	0.415
8.	System earthing		
	HV side		Solidly Earthed
	LV side		Solidly Earthed
9.	Rated frequency	Hz	50 +/- 3 %
10.	No. of phases		Three
11.	Fault level on HV side	kA	
12.	Connection		
	HV side		Delta
	LV side		Star
13.	Vector group		Dyn11
14	Impedance at max. MVA	%	Min. as per IS
15.	Insulation class		H
16.	Insulation level		
	P.f withstand		
	HV winding	kV	As per IS
	LV winding	kV	As per IS
	Impulse withstand		
	HV winding	kVp	As per IS
	LV winding	kVp	As per IS
17.	Winding insulation type		Uniform
18.	Creepage distance		
	Prim. winding		
	total		As per IS
	protected		As per IS
	LV winding		
	total		As per IS
	protected		As per IS
19.	Tab changer		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	04-DEC-2024	ISSUED WITH MR	PUNEET SHRIVASTAVA	ACHUTUNI SAI	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

	Location		Primary Winding
	Type		Offcircuit
	Range	%	± 10
	No. of steps		9
20.	Normal load	%	30-40
21.	Max efficiency at 0.8 p.f		By vendor
22.	Load at which max eff. occurs	% MVA	40
23.	Power flow		Unidirectional
24.	Terminal location		
	HV side		
	LV w.r.t HV	°	
25.	Terminal connection		
	HV side		Cable box
	LV side		
26.	Cable Size/Type		
	HV side		
	LV side		
27.	Neutral CT specification		
	51G		Not Required
	64R		Not Required
	Vk	A	
	Im at Vk/2	mA	
	RCT	ohm	
28.	Installation		Indoor
29.	Painting & colour		RAL-7032
30.	AC Auxiliary voltage	V	240 +/- 10 % SPN
31.	DC Auxiliary voltage	V	
32.	Bidirectional roller type		
33.	¢ distance of flat rollers	mm	1000 mm
34.	Applicable specifications		EIL std. 6-51-42
35.	Loss Capitalization		Not Applicable
a.	Rate for copper loss Rs./kW		
b.	Rate for iron loss Rs./kW		
36.	Accessories requirement		Yes
	Two temp. sensing		Yes
	devices in each limb		
	Marshalling box(IP-55)		Yes
	Temp. sensing relay		Yes
	Channels, towing lugs :		Yes
	Rollers		Yes
	Neutral bushing		Yes
	outside terminal box		
	with connector assembly		
	Indicating platinum		Yes
	resistance type		
	thermometer with contacts		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	04-DEC-2024	ISSUED WITH MR	PUNEET SHRIVASTAVA	ACHUTUNI SAI	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

	Busduct flange on LV		Not Required
	Lugs and cable glands		Required
37.	Tests requirements		
	Impulse test		Test Certificate Reqd.
	Heat run test		Test Certificate Reqd.
38.	Partial discharge test		
	(cast resin)		Test Certificate Reqd.
	Short circuit test		Test Certificate Reqd.
	Acoustic sound		Test Certificate Reqd.

MANUFACTURER'S DATA

1.	Make		
2.	Rated power at ambient temperature of		
	25 °C		
	30 °C		
	35 °C		
	40 °C		
	45 °C		
	50 °C		
3.	Insulation type		
B.	**Performance**		
1.	No load loss at		
	100% voltage	kW	
	110% voltage	kW	
2.	Full load copper loss at 75 °C	kW	
3.	No load current at		
	100% voltage	A	
	100% voltage	A	
4.	Efficiency at full load at 75 °C		
	at 0.8 p.f	%	
	at 1.0 p.f	%	
5.	Eff. at half load at 75 °C		
	at 0.8 p.f	%	
	at 1.0 p.f	%	
6.	Load at which max eff. occurs	MVA	
7.	Regulation at 75 0 C		
	at 0.8 p.f	%	
	at 1.0 p.f	%	
8.	Maximum efficiency	%	
C.	**Mechanical data**		
1.	Core & winding weight	kgs.	
2.	Total weight	kgs.	
3.	Wheel gauge		
4.	Overall dimensions		
	Length	mm	
	Breadth	mm	
	Height	mm	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	04-DEC-2024	ISSUED WITH MR	PUNEET SHRIVASTAVA	ACHUTUNI SAI	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

Eil Notes

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	04-DEC-2024	ISSUED WITH MR	PUNEET SHRIVASTAVA	ACHUTUNI SAI	RAMAN SOOD

इंजीनियर्स इंडिया लिमिटेड ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)

HV / MV Cable DATA SHEET

Document No. B895-000-16-50-DS-5102
Rev. No. A

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	46
2.	Minimum Ambient Temperature	°C	1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	95
5.	Altitude Above MSL	mm	<1000
6.	Environment		
B.	**Technical particulars**		
1.	System Voltage		
	Nominal		415 V
	Highest		500 V
	Voltage grade		650/1100 V
2.	Frequency	Hz	50 +/- 3 %
3.	Conductor material		
	HV Power cable		NA
	MV Power cable		Copper & Aluminium (Refer Note 1)
	MV control cable		NA
4.	Installation under DGMS jurisdiction (See Note)		No
5.	Applicable spec.		6-51-0051 Rev 9
6.	Insulation		XLPE
7.	PVC compound type		ST-2
8.	Type of conductor		As per 6-51-0051
9.	Conductor class		AS PER IS
10.	Types of cable		Flame retardant low smoke / Fire survival
11.	Armour		
	Type		AS PER IS 1554
	Size of armour		As per Table -3 of IS 1554
12.	Type of drum		Steel

MANUFACTURER'S DATA

A.	**Technical particulars**		
1.	Name of manufacturer		
2.	MR/PR item no.		
3.	Cable type/ code		
4.	Conductor material		
5	Conductor semiconducting screen (HV cables)		
	Material		
	Thickness	mm	
6.	Insulation		
	Type of compound		
	Thickness	mm	
7.	Insulation semiconducting screen (HV cables)		
	Material		

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Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

	Thickness	mm	
8.	Copper tape		
	Thickness	mm	
9.	Inner sheath		
	Type of compound		
	Thickness	mm	
10.	Nominal dia under armour	mm	
11.	Calculated dia under armour	mm	
12.	Armour		
	Material		
	Type		
	Size		
13.	Nominal dia under outersheath	mm	
14.	Calculated dia under outersheath	mm	
15.	Outersheath		
	Type of compound		
	Thickness	mm	
16.	Nominal outer dia of cable	mm	
17.	Tolerance on outer dia	%	
18.	Weight of cable per km	kg	
19.	Maximum drum length	mtr.	
20.	Maximum DC resistance of conductor at 20 °C		
21.	AC resistance at 90 °C		
22.	Reactance of cable at 50 Hz		
23.	Capacitance of cable		
24.	Zero sequence impedance of cable		
25.	Capacitive charging current per km		

Notes

1 All power cables 2.5 sqmm to 16 sqmm shall be with copper conductor and above 16 sqmm shall be aluminium conductor.

2 Medium voltage power cable for motors shall be minimum 4 sqmm (Copper).

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PAIRED CONTROL CABLES

DATA SHEET

Document No. B895-000-16-50-DS-5201
Rev. No. A

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	46
2.	Minimum Ambient Temperature	°C	1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	95
5.	Altitude Above MSL	m	<1000
6.	Environment		
B.	**Technical particulars**		
1.	Cable Type/Code		Control Cable
2.	Embossing Details		As per specification
3.	Details of Color Coding		As per Specification
4.	Details of Pairing		As per Specification
5.	Standard Drum Length		As per Specification

MANUFACTURER'S DATA

A.	**Twisted Pair Unshielded Cables**		
1.	Name of Manufacturer		
2.	Material Specifications		
	Conductor dia.	mm	
	Insulation Thickness	mm	
	Inner Sheath Thickness	mm	
	Outer Sheath Thickness	mm	
3.	Performance Data		
	Rated Voltage	V	
	Max. Resistance at 20°C	ohms	
	Max. Core-Core Capacitance	nF	
	Max. Inductance	mH	
	Nominal Impedance	ohms	
4.	Technical Particulars		
	Approx. overall diameter	mm	
	Approx. dia. over armour	mm	
	Approx. dia. under armour	mm	
	Armour Galvanised Steel wire thickness		
	Minimum outer sheath thickness	mm	
B.	**Twisted Pair Shielded Cables**		
1.	Name of Manufacturer		
2.	Material Specifications		
	Conductor dia.	mm	
	Insulation Thickness	mm	
	Inner Sheath Thickness	mm	
	Outer Sheath Thickness	mm	
3.	Performance Data		
	Rated Voltage	V	
	Max. Resistance at 20°C	ohms	
	Max. Core-Core Capacitance	nF	

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Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

	Max. Core-Screen Capacitance	nF	
	Maximum Inductance	mH	
	Nominal Impedance	ohms	
4.	Shielding Data		
	Material of Shielding		
	Minimum Thickness	mm	
	Coverage and Overlap		
5.	Drain Wire for Overall Sheath		
	Drain Wire Material		
	Area of Cross Section	mm sq	
	No. of Strands		
	Diameter	mm	
6.	Technical Particulars		
	Conductor Size	mm sq	
	Approx. overall diameter	mm	
	Approx. dia. over armour	mm	
	Approx. dia. under armour	mm	
	Armour Galvanised Steel wire thickness		
	Minimum outer sheath thickness	mm	

Eil Notes

1 Control cable shall be twisted pair, individual as well as overall screened/ shielded type. The conductor shall be stranded.
2 Applicable spec: 6-51-0052.

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COMMUNICATION & FIRE ALARM CABLES DATA SHEET

Document No. B895-000-16-50-DS-5202
Rev. No. A

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	46
2.	Minimum Ambient Temperature	°C	1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	95
5.	Altitude Above MSL	m	<1000
6.	Environment		
B.	**Technical particulars**		
1.	Cable Type/Code		Fire Alarm & Communication
2.	Embossing Details		Sequential markings every mtr
3.	Details of Color Coding		As per ITD specification
4.	Details of Pairing		As per Specification
5.	Standard Drum Length		As per Specification

MANUFACTURER'S DATA

A.	**Twisted Pair Unshielded Cables**		
1.	Name of Manufacturer		
2.	Material Specifications		
	Conductor dia.	mm	
	Insulation Thickness	mm	
	Inner Sheath Thickness	mm	
	Outer Sheath Thickness	mm	
3.	Performance Data		
	Rated Voltage	V	
	Max. Resistance at 20°C	ohms	
	Max. Core-Core Capacitance	nF	
	Max. Inductance	mH	
	Nominal Impedance	ohms	
4.	Technical Particulars		
	Approx. overall diameter	mm	
	Approx. dia. over armour	mm	
	Approx. dia. under armour	mm	
	Armour Galvanised Steel wire thickness		
	Minimum outer sheath thickness	mm	
B.	**Twisted Pair Shielded Cables**		
1.	Name of Manufacturer		
2.	Material Specifications		
	Conductor dia.	mm	
	Insulation Thickness	mm	
	Inner Sheath Thickness	mm	
	Outer Sheath Thickness	mm	
3.	Performance Data		
	Rated Voltage	V	
	Max. Resistance at 20°C	ohms	
	Max. Core-Core Capacitance	nF	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
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Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

	Max. Core-Screen Capacitance	nF	
	Maximum Inductance	mH	
	Nominal Impedance	ohms	
4.	Shielding Data		
	Material of Shielding		
	Minimum Thickness	mm	
	Coverage and Overlap		
5.	Drain Wire for Overall Sheath		
	Drain Wire Material		
	Area of Cross Section	mm sq	
	No. of Strands		
	Diameter	mm	
6.	Technical Particulars		
	Conductor Size	mm sq	
	Approx. overall diameter	mm	
	Approx. dia. over armour	mm	
	Approx. dia. under armour	mm	
	Armour Galvanised Steel wire thickness		
	Minimum outer sheath thickness	mm	

Eil Notes

1 Applicable spec: 6-51-0052

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BUSDUCT DATA SHEET

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	46
2.	Minimum Ambient Temperature	°C	1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	95
5.	Altitude Above MSL	m	<1000
6.	Environment		Humid & Highly Corrosive
B.	**Operating Condition**		
1.	Voltage		0.415 kV ± 10 % TPN
2.	Frequency		50 Hz ± 3 %
3.	No. of Phases		Three
4.	System Fault level	kA	65
5.	System earthing		Solidly earthed
6.	Auxillary supply AC		240 V ± 10 %
C.	**Busduct Details**		
1.	Rated Voltage		0.415 kV ± 10 %
2.	Current Rating	A	
3.	Short circuit rating	kA	65
4.	Type		TPN Non Phase segregated
5.	Location		Outdoor/Indoor
6.	Wall frame assembly with seal off bushings and bus conductors		Required
7.	Paint shade of enclosure		Indoor- RAL 7032, Outdoor - RAL 7031
8.	Space heater and breather with silica gel in bus duct		Required
9.	Supporting arrangement of busduct		Required

MANUFACTURER'S DATA

1.	Make		
2.	Current rating		
3.	Short circuit rating		
4.	Type		
5	Degree of protection		
6.	canopy of outdoor busduct		
7.	Busbar details		
a.	Busbar Material		
b.	Busbar size (No. of flats x size of each flat)	mm^2	
c.	Busbar size as tested at CPRI for full short ckt withstand(No. of flats x size of each flat)	mm^2	
d.	Busbar insulator		
i.	Type		
ii.	Tracking index		
e.	Clearance		
i.	Phase to phase	mm	
ii.	Phase to earth	mm	
f.	Flexibles	Size/Qty	
g.	Earth bus material/size		

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
A	04-DEC-2024	ISSUED WITH MR	NAGARAJU NAIK BHUKYA	ACHUTUNI SAI	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

h.	Heat shrinkable sleeves rated to withstand the system line to line voltage for 1 min provided	
i.	Removable FRP shrouds for all busbars joints provided	
8.	Space heater provided	
9.	Overall dimensions(LxBxH)	
10.	Weight of each section of busduct	
11.	Type test certificates	
	Short ckt(Peak & 1 sec withstand)	
	Temperature rise	
	Voltage withstandability	

Eil Notes

1 Bus duct Ingress protection shall be as per 6-51-0054.

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Project	PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery			**Client**	BPCL - KOCHI REFINERY
Unit	Common	**Location**	Kochi	**Job No.** B895	**Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	46
2.	Minimum Ambient Temperature	°C	1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	95
5.	Altitude Above MSL	m	<1000
6.	Environment		
B.	**RELAY SELECTION**		
1.	**RELAY FUNCTION**		
a	Only Protection		☐
b	Protection and metering		☐
c	Protection and metering and control		☑
d	Ethernet communication		☑
e	Password protection		
	a. For write		☐
	b. For both read and write		☑
2	**CONTRUCTION FEATURE**		
a	Enclosure type		IP5X
b	Terminal size-sqmm for external wires		2.5 for control, 4 for CT/PT
c	Mounting		flush
d	Drawout feature		as per 6-51-0055
e	Display type		as per 6-51-0055
3	**SPECIAL REQUIREMENT IF ANY**		
a	Applicable standards		IEC
b	Distance for cable capacitance for application where field		
	contacts are directly wired to relay e.g. Motor start/ stop, intertrip	m	4000
4	**INPUT POWER SUPPLY**		
a	Site selectable feature		☑
b	Input supply	V	110 DC
5	**CT/ PT INPUT TO RELAY**		
a	Current operated relays		☐
	a1 Main CT input		
	a2 CT for sensitive EF or back up EF		
b	Voltage operated relays		☐
	b1 PT input		
c	Comprehensive relay		☑
	c1 Main CT input		3 CTs, 4 wire
	c2 PT input		3 Phase, 4 Wire
	c3 CT for sensitive EF or back up EF		1 CT, 2 wire input (Refer Note-3)
d	CT Secondary current		1
C	**RELAY PROTECTION/ METERING FUNCTIONS**		
1	**CURRENT OPERATED RELAYS**		
a	3 phase O/C element (50, 51)		* I> ☑ * I>> ☑ * I>>> ☑
	Characteristics as per IEC		
	* Inverse (normal, very, extremely, long) and definite time for I > and I >>		

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Unit	Common	**Location**	Kochi	**Job No.** B895	**Unit No.** 000

	* Definite time for I >>>	
b	E/F relay (50N, 51N, 51G)	* I> ☑ * I>> ☑ * I>>> ☑
	Characteristics as per IEC	
	* Inverse (normal, very, extremely, long) and definite time for IO >, IO >>	
	* Definite time for IO>>>	
c	Metering/ event recording	
	3 phase/ line currents	☑
	Disturbance record	☑
	Breaker trip/ close status	☑
	Relay faults	☑
	Trip Values	☑
2	**VOLTAGE OPERATED RELAYS**	
a	3 phase O/V element with time delay (59+2)	* OV> ☑ * OV>> ☑
b	3 phase U/V element with time delay (27+2)	* UV> ☑ * UV>> ☑
	Characteristics as per IEC	
	* Inverse (normal, very, extremely, long) and definite time for UV> ,UV>>	
c	Under/ Over Frequency element with time delay (81U/ 81O)	
	Settable under voltage restraint	☐
	df/dt element	☐
	Number of stages with u/f	
	Number of stages with df/dt	
d	Synchrocheck function	☑
e	Metering/ event recording	
	3 phase/ line Voltages	☑
	Disturbance record	☑
	Breaker trip/ close status	☑
	Relay faults	☑
	Trip Values	☑
3	**MOTOR PROTECTION RELAY**	
a	Protection elements	
	Thermal overload (49)	☑
	OC protection with doubling feature (50)	☑
	EF protection (50N)	☑
	Locked Rotor protection	☑
	Maximum start time	☑
	Maximum number of starts	☑
	Negative phase sequence	☑
	Under voltage delayed trip	☑
	EF Through CBCT	☑
	Single phasing	☑
b	Metering/ events	
	3 phase/ line current	☑
	Hour run	☑
	KW, KWH, pf	☑
	Disturbance record	☑
	Plot start characteristic	☑

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Unit	Common	**Location**	Kochi	**Job No.** B895	**Unit No.** 000

	Trip values	☑
	Start time	☑
	Start current	☑
c	Control	
	Breaker close in test mode	☑
	Reacceleartion logic	☑
	Breaker trip	☑
	RTD/BTD input	☐
4	**COMPREHENSIVE NUMERICAL RELAY**	
a	Current op elements (51, 50, 51N, 50N, 51G)	As per Hardware datasheet.
b	Voltage op elements (59, 27, 2, 81U, 81O)	As per Hardware datasheet.
c	Control function	
	Breaker close/ trip from relay	Required
	Breaker close/ trip on serial	Required
	PLC logic function for control scheme	Required
	Digital I/P & Digital O/P:	As per approved logic and 20 % spare
	Motor Feeder control function	Required
5	**SPECIAL PROTECTION RELAYS (Refer Job Spec)**	
	Part of main relay	☐
	Separate relay	☑
a	Differential relays	☑
	BUS	As per hardware Datasheet/specification.
	Feeder	As per hardware Datasheet/specification.
	Trafo	As per hardware Datasheet/specification
	Machine	As per hardware Datasheet/specification
b	Directional relays (67, 67N)	☐
c	Restricted EF (64R)	☑
d	Generator protection	☐
e	Distance protection	☐
f	Reverse power relay	☐
6	**OTHER RELAY FEATURES**	
a	Analog inputs 4-20mA	
	RTD/ BTD-GPR	Not Required
	WTI/ OTI-Trafo relay	Required
	WTI= Winding temperature indicator	
	OTI= Oil temperature indicator	
b	Out put relays	
	Number of relays	As required
	Contact rating	2A, 110V DC
	Reset	Hand Reset
	FUNCTIONS part of numerical relay	
c	Lock out function (86)	☐
d	Trip circuit supervision(95)	☑
e	Watch dog	☑
f.	Time stamp	☑
g	Modular construction for easy and quick replacement of faulty PCB/circuit	☑
D	**ETHERNET COMMUNICATION AND RELAY INTEGRATION**	

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Project	PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery			**Client**	BPCL - KOCHI REFINERY
Unit	Common	**Location**	Kochi	**Job No.** B895	**Unit No.** 000

1	**RELAY INTEGRATION**	
a	Communication ports at Relay	
	Relay front	RS 232/ RJ45/USB as per 6-51-0055
	Relay back	RJ45/FO(Suitable for IEC 61850 interface)
b	Protocol of relay LAN	IEC 61850 - RSTP
c	Requirment of Integration	
	Integraton with DC	☑
	Directly to MMI	☐
d	Topology	As per specification
e	Data concentrators	Connected ethernet switch
2	**REDUNDANCY**	
a	Relay LAN / serial	☑
	Redundant (serial)	☑
	Non redundant (star)	☑
b.	From DC to MMI	☑
	Redundant	☑
	Non redundant	☐
c	From DC to ECS-RTU	☑
	Redundant	☑
	Non redundant	☐
3	**REDUNDANCY REQUIREMENT FOR DC/ETHERNET SWITCH/MMI**	
a	Ports at STAR coupler	
	For each relay	Non Redundant
	For DC/Ethernet Switch	Redundant
b	Data concentrator / Ethernet Switch	
	Power supply card	Redundant
	Communication port for each relay LAN	Redundant
	Communication Processor	Dual redundant
4	**SERIAL COMMUNICATION FROM DC/ETHERNWT SWITCH ONWARDS**	
a	DC/Ethernet Switch to MMI	
	Topology	as per 6-51-0055
	Protocol	IEC 61850
b	DC to DCS	
c	DC/Ethernet Switch to ECS-RTU	IEC 61850
d	Scan time	AS PER 6-51-0055
5	**OTHER REQUIREMENT**	
a	Time synchronization	☑
b	Remote relay parameterization	☑
c	Annunciation at MMI	☑

MANUFACTURER'S DATA

1. NUMERICAL RELAY TYPES

	Relay Make/Model	Serial Ports	Analouge Inputs	No of DI/DO	Protocal	Any Other Data	Remarks
A	Incomer						
B	Buscoupler						

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Unit	Common	**Location**	Kochi	**Job No.**	B895
Unit No.	000				

C	Generator						
D	Transformer						

2	**DATA CONCENTRATOR / ETHERNET SWITCH AND RELAY INTEGRATION**	
a	Model no.	
	Make	
b	Input power supply	
	Voltage	
	Power reqt	
c	Redundancy	
	Power supply	
	Communication processor	
	Communication port	
	Relay LAN/ Serial communication	
	ECS-RTU interface	
	MMI interface	
d	Serial interface/ Relay LAN	
	Topology	
	Protocol	
	Nos of relay in each	
	Topology	
	Type of port	
	Cable type	
e	Serial interface- MMI	
	Topology	
	Protocol	
	Type of Port	
	Cable type	
f	Serial Interface -ECS-RTU	
	Topology	
	Protocol	
	Type of Port	
	Cable type	
g	Number of Digital Input/ Aanalog Input (4-20mA)	
	DI for substation eqpt	
	Spare DI	
	AI as per project data sht	
	Spare AI	
h	Maximum Scan Time	
	Status	

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Unit	Common	**Location**	Kochi	**Job No.**	B895

Unit No. 000

	events	
	Data acqusition (analog)	
	Disturbance record download time	
i	Other features	
	Spare capacity for additional devices for relay LAN	
	Time synchronization options	
	Power walk in time	
	Restoration time of communication of DC with NR & MMI	
3	**STANDARD FEATURES OF RELAY / SYSTEM ARCHITECTURE**	

Notes

1 Motor Feeder Numerical relay shall be provided with Sensitive earth fault function and same shall be suitable for accepting additional CBCT input for the same.
2 Data Concentrator (DC) mentioned in the datasheet shall be read as ethernet switch of relay LAN.
3 CT for sensitive EF or back up EF shall be provided for I/C, TR feeder and motor feeder.

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A	20-SEP-2024	ISSUED WITH MR	PUNEET SHRIVASTAVA	ACHUTUNI SAI	RAMAN SOOD

Project	PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery		**Client**	BPCL - KOCHI REFINERY	
Unit	Common	**Location**	**Job No.**	B895	**Unit No.** 000

PURCHASER'S DATA

A.	**Site Conditions**		
1.	Maximum Ambient Temperature	°C	46
2.	Minimum Ambient Temperature	°C	1
3.	Design Ambient Temperature	°C	45
4.	Relative Humidity	%	95
5.	Altitude	mm	<1000
6.	Environment:		Humid & Highly Corrosive
B.	**Technical particulars**		
1.	Motor Tag no.:		
2.	Driven Equipment name:		
3.	Voltage:	V	415 +/- 10 %
4.	Phase:		Three
5.	Frequency:	Hz	50 +/- 3 %
6.	Fault level:	kA	65
7.	Method of starting:		D.O.L
8.	Winding Connection:		Delta
9.	No of Terminals:		6
10.	Cable size:	mm²	
11.	Cable type:		Cu/Al
12.	Temperature rise:	°C	
13.	Cooling:		TEFC
14.	Insulation class:		F
15.	Temperature rise Limited to insulation class		B
16.	Hazardous area classification:		As per area classification
17.	Dust classification		NA
18.	Gas group:		As per area classification
19.	Dust Group		NA
20.	Type of explosion protection:		As per MR/ Tender
21.	Prestart purging for Ex(n) motor		Not Required
22.	Type of ingress protection:		IP 55
23.	Color shade:		RAL-7031
24.	Thermisters:		Not Required
25.	RTD:		Not Required
26.	BTD:		Not Required
27.	RTD/BTD monitoring device:		Not Required
28.	Applicable specification:		6-51-0064
29.	Efficiency:		IE3 for Hazardous Area and IE4 for Safe Area

DRIVEN EQUIPMENT MANUFACTURER's DATA

1.	Suggested motor rating:	kW	
2.	Manufacturer:		
3.	BkW at Full load:	kW	
4.	kW:at end of Curve	kW	

Rev. No.	Date	Purpose	Prepared By	Reviewed By	Approved By
0	21-OCT-2025	ISSUED WITH PR	NAGARAJU NAIK	ACHUTUNI SAI	RAMAN SOOD

Project PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery **Client** BPCL - KOCHI REFINERY

Unit Common **Location** **Job No.** B895 **Unit No.** 000

5.	Speed:	RPM	
6.	Rotation of eqpt. from coupling end:		
7.	Driven equipment:		
8.	Coupling type:		
9.	Torque required starting	mkg	
	Torque required Maximum	mkg	
10.	GD2 of eqpt including flywheel	kgm²	
	excluding flywheel:	kgm²	
11.	thrust Up:	kg	
	thrust Down:	kg	
12.	Starting condition:		

MOTOR MANUFACTURER's DATA

1.	Rating:	kW	
2.	Manufacturer:		
3.	No. of poles:		
4.	Frame designation:		
5.	Full load speed:	RPM	
6.	Mounting:		
7.	Full load torque (FLT):	mkg	
8.	Starting torque:	% of FLT	
9.	Break down or pull out torque:	% of FLT	
10.	Full load current (FLC):	A	
11.	Starting current at 100% voltage:	% of FLC	
12.	Rotation viewed from coupling end:		
13.	Starting time at 75% voltage:	sec.	
	100% voltage:	sec.	
14.	Locked rotor withstand time (cold/hot) at,		
	75% voltage	sec.	
	100% voltage:	sec.	
15.	Time (Te) for Increased Safety Motor at 100% Voltag	sec.	
16.	Heating/Cooling Time Const. (min.)	min	
17.	Space heater - voltage & power:		
18.	Efficiency at 75% Load:	%	
	100% Load: voltage:	%	
19.	Power factor at 75%/ Load:		
	100% Load:		
	starting		
20.	Moment of inertia, GD2:	kgm²	
21.	NDE bearing type & no		
22.	DE bearing type & no.:		
23.	Type of lubrication:		
24.	Weight of motor:	kg	

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Project	PMC & EPCM Services for PPU & Revamp of PFCCU at Kochi Refinery		**Client**	BPCL - KOCHI REFINERY	
Unit	Common	**Location**	**Job No.**	B895	**Unit No.** 000

25.	Thermisters, quantity	no.	
	make: type:		
26.	RTD, quantity:	no.	
	make: type:		
27.	BTD, quantity	no.	
	make: type:		
28.	Shaft voltage:	V	
29.	Critical speed, 1st/2nd stage:	RPM	
30.	Canopy:		

Notes

1 FRP canopy shall be provided for all outdoor motors.
2 Starting time calculations shall be based on operating conditions specified on Material Requisition e.g. open valve condition/closed valve condition, at no load/full load, as applicable.
3 Space heater shall be provided for motors rated 30 kW and above.

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0	21-OCT-2025	ISSUED WITH PR	NAGARAJU NAIK	ACHUTUNI SAI	RAMAN SOOD

DATASHEET FOR LED LIGHTING FIXTURE SCHEDULE

PROJECT : PPU & REVAMP OF PFCCU

UNIT NO. : 000

CLIENT : M/s BPCL, KOCHI REFINERY

EPCM : M/s ENGINEERS INDIA LTD.

JOB NO. : B895

Rev	Date	Purpose	Prepared By	Checked By	Approved By
B	20.02.2025	ISSUED WITH BID PACKAGE	NNB	AS	RS
A	04.10.2024	ISSUED WITH BID PACKAGE	NNB	AS	RS

S. No.	Light Fixture - Description	Makes & Catalogue Nos.
1.	**LED IND-1**: Surface mounted / Pendant Type LED Tube Lights for Office or Commercial Buildings – completely integral with in-built linear SMD LEDs/ electronic drivers / length of 1200 mm (4 Feet) for a minimum rating of 20 Watts.	• Bajaj : BLRB 18W LED XE • Crompton : LSDL –20- CDL ; • Philips : TMC501 With TLED 1X18W/4FT Master LED Tube • Pyrotech: PC-14-D-L-WXOA/18W Or Equivalent Models.
2.	**LED IND-2**: Surface mounted / Pendant Type Integral LED Tube Lights for Industrial Warehouses /Workshops / Sub-Stations – completely integral with in-built linear SMD LEDs / electronic drivers / length of 1200 mm (4 Feet) for a minimum rating of 36 Watts. An alternative solution for conventional 2x28 W/2x36 W fluorescent Battens.	• Philips : TMC 501 With TLED 2X18W/4FT Master LED Tube • Crompton : LDL -36 – CDL; • Bajaj : BLRB 218W LED XE • Pyrotech: PC-14-D-L-WXOA/36W Or Equivalent Models
3.	**LED IND-3**: Surface mounted / Pendant Type Integral LED Tube Lights for industrial outdoor /weatherproof applications & IP-65 Ingress Protection – completely integral with in-built linear SMD LEDs / electronic drivers / length of 1200 mm (4 Feet) for a minimum rating of 36 Watts.	• Bajaj : Linea Excel {BIPC 40W LED XE}; • Crompton : Shield {IPFC1LT8/16 & 2X LGT8-20-865-2; • Philips : Endura LED Waterproof – 42 Watts; WT550 C LED 40S CW PSU S1 PC; Or Equivalent Models.
4.	**LED IND-4**: Surface mounted / Pendant Type Integral LED Tube Lights for Industrial Warehouses /Workshops / Sub-Stations – completely integral with in-built linear SMD LEDs / electronic drivers / length of 1200 mm (4 Feet) for a minimum rating of 36 Watts. An alternative solution for conventional 2x28 W/2x36 W fluorescent Battens.(Suitable for Mounting on Metsec Channel with white enameled reflector)	• Crompton: Master LED tube 1200mm-18W 869 T8 • Bajaj: BLRB 218W LED XE Or Equivalent Models.
5.	**LED-1:** Recess mounted, compact / slim panel / tile light in square shape – suitable for mounting in 2 Feet X 2 Feet Grid type False Ceiling with minimum 35 Watts rating & White Color – with built-in driver & all mounting accessories.	• Bajaj : ""Armstorme" {BZRSQL 36W WH GZi}; • Crompton : LCTLRNI-36-FO-CDL • Philips : RC 420B LED 35S PSU W60L60 • Pyrotech: PB-12-D-L-WXOA/36W Or Equivalent Models.
6.	**LED-2:** Recess mounted, compact / slim panel / tile light in square shape – suitable for mounting in 2 Feet X 2 Feet Grid type False Ceiling White Color – with minimum 50 Watts rating and with built-in driver & all mounting accessories.	• Crompton: LCTLRN-50-FO-CDL • Bajaj: BZRSQL 43W LED GZi WH Or Equivalent Models.

7.	**LED -3:** Recess mounted, compact / flat, round or square shaped LED down-lighter in white finish – suitable for mounting in gypsum / Armstrong type false ceiling – with minimum 18 Watts rating & White Color – with built-in driver and all mounting accessories.	• Bajaj : SLEEK Round / Square {BGSLO Sleek 18W WH RD / SQ}; • Crompton : QUARTZ Round / Square {LCDE or LSDE-18W-CDL/NW }; • Philips : Green LEDi {DN 195B LED 20S – 6500PSU WHS1}; • Pyrotech: PB-12-D-L-WXOA/18W Or Equivalent Models.
8.	**LED -4:** Recess Mounted Adjustable / Swivel LED spot-light / COB Light with tilting (Gimbal) feature and a minimum rating of 20 Watts & golden yellow / white color light – with white round / square frame, built-in driver, suitable for mounting on gypsum false-ceiling & all mounting accessories.	• Philips : ECO Accent Recessed Adjustable {RS271B LED 20/850 PSU-E WB WH}; • Bajaj : KLASS Series COB {BRDCSL 16 W WW}; • Crompton : AQUA COB LED {LR-RAD-20-CDL/NDL-24/50D}; Or Equivalent Models.
9.	**LED -5:** Surface Mounted – Ceiling Tile LED Fixture of dimensions 2 Feet X 2 Feet – suitable for direct ceiling mounting - with minimum 35 Watts rating & White Color – with built-in driver & all mounting accessories.	• Crompton : ORION-I – LCTLSN-36-CDL • Bajaj : BZSSQL 36W LED • Philips : CIRRUS – SM365C LED33-6500 PSU-OD WH • Pyrotech: PB-12-D-L-WXOA/36W Or Equivalent Models.
10.	**LED -6 :** Surface mounted round or square shaped LED down-lighter in white finish – suitable for direct ceiling mounting – with minimum 18 Watts rating & White Color – with built-in driver and all mounting accessories.	• Crompton : Pearl II – Round / Square {LCDSPLN- R-18-CDL / LCDSPLN-S-18-CDL}; • Bajaj : Sleek – Round / Square– BGSLO Sleek Surface 18 W WH RD / BGSLO Sleek Surface 18W WH SQ}; • Philips : Cirrus Mini {SM5 18C LED 16S 6500PSU OD WH} • Pyrotech: PB-13-D-L-WXOA/18W Or Equivalent Models.
11.	**LED -7:** Surface mounted round or square shaped LED Dome -lights – suitable for direct wall mounting – with minimum 18 Watts rating & White Color – with built-in driver and all mounting accessories.	• Philips : CoreLine Wall-Mounted {WL120V LED12S / 840 PSR WH}; • Bajaj : Sleek – Round / Square– BGSLO Sleek Surface 18 W WH RD / BGSLO Sleek Surface 18W WH SQ}; • Crompton : Orbit {LCDSPLN-R-18-CDL}; Or Equivalent Models.
12.	**LED -8:** Rechargeable Batten type LED Fixtures of minimum 4 Watts rating - with inbuilt sealed rechargeable Battery / Cell suitable for operation at 240 Volts AC and with a minimum battery back-up time of 2 hours.	• Philips – Ujjwal Plus LED Lantern; • Bajaj LED Glow 648 LR Rechargeable Lantern; • Crompton - CG-LL30 LED Rechargeable Lantern; Or Equivalent Models.

13.	**LED RSD-10:** LED Fixture suitable for 110V DC complete with 18W LED Lamp, driver, including other materials as applicable for installation (Recess mounted)	• Pyrotech (PB-13-P-L-WXOA/18W) Or Equivalent Models.
14.	**LED SFD-12:** LED Fixture suitable for 110V DC complete with 18W LED Lamp, driver, including other materials as applicable for installation (Surface mounted)	• Pyrotech (PB-13-P-L-WXOB/18W) Or Equivalent Models.
15.	**LED LB–1:** Indoor Industrial Low Bay LED Luminaries - with high pressure die-cast aluminum housing, mirror / lens optics (heat- resistant) for symmetric light distribution and high system efficacy for a rating of 80 Watts up to 100 Watts – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories.	• Bajaj : Duranto Highbay Luminaire 100 Watts{BGHB 100W LED GV}; • Crompton : SURROUND -II LHB11-70-CDL/60 - 70Watts; • Philips : GreenPerform Highbay G2 – 80 Watts{BY689P LED 90/NW PSU S-NB}; • Pyrotech: PD-17-D-L-WXOA/90W Or Equivalent Models.
16.	**LED HB-1:** Indoor Industrial Medium Bay LED Luminaries - with high pressure die-cast aluminum housing, mirror / lens optics (heat- resistant) for symmetric light distribution and high system efficacy for a rating of 120 Watts up to 150 Watts – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories.	• Bajaj : Duranto Highbay Luminaire 150 Watts{BGHB 150W LED}; • Crompton : : SURROND-II {LHB11-110-CDL/60 -110 Watts}; • Philips : GreenPerform Highbay G2 – 130 Watts{BY688P LED 140/NW PSR S-NB}; • Pyrotech: PD-17-D-L-WXOA/150W Or Equivalent Models.
17.	**LED –HB2:** Indoor Industrial High Bay LED Luminaries - with high pressure die-cast aluminum housing, mirror / lens optics (heat- resistant) for symmetric light distribution and high system efficacy for a rating above 180 Watts – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories.	• Bajaj : Duranto Highbay Luminaire 200 Watts{BGHB 200W LED}; • Crompton : Crompton : LHB11-180-CDL/60- 180Watts; • Philips : Green Perform Highbay G2 – 200 Watts{BY687P LED200/NW PSR S-WB L3000}; • Pyrotech: PD-17-D-L-WXOA/180W Or Equivalent Models.
18.	**LED STP-12** Flexible LED Strip with IP65 protection with IP65 LED driver for continuous operation.	• PHILIPS : BGC201 RGB L5000 • BAJAJ : - STRIP LIGHT BENT • CROMPTON: LED STRIP LST SERIES IP65 WH / WW / NW+IP 65 Driver

OUTDOOR LED LIGHT FIXTURES		
19.	**LED BK -1:** Outdoor Surface Mounted Bulkhead LED Lights – with die-cast aluminum housing / toughened glass lens and minimum IP -65 ingress protection of minimum 10 watts rating – complete with integral type electronic drivers & all mounting accessories.	• Bajaj : Wee Plus {BIBWP 10 W LED} Crompton : Sunrise LED Bulkhead {LBH-10- CDL}; • Philips : Vista Glow WT140W LED7S CW PSU S1 PC; • Pyrotech: PP-11-D-L-WXOA/10W Or Equivalent Models.
20.	**LED BK -2:** Outdoor Surface Mounted Bulkhead LED Lights – with die-cast aluminum housing / toughened glass lens and minimum IP -65 ingress protection of minimum 30 watts rating – complete with integral type electronic drivers & all mounting accessories.	• Pyrotech: PP-11-D-L-WXOA/30W Or Equivalent Models.
19A.	**LED BK-3:** Outdoor type well glass light fixture with LED lamp, LED driver, reflectors, mounting hardwares, clamps and brackets etc. and minimum IP-65 ingress protection. This lighting shall be suitable for operation on 240V AC supplies and platform type light poles. Light Output i.e. LUMENS of fixture 6000 to 6500 LM and min. 100 LM/Watt.	Equivalent models
21.	**LED ST-4 :** LED Street Light Fixtures with Leaf / Sleek Type design & SMD or COB Type LEDs for high system efficacy & rating of 80 Watts to 100 Watts – having powder coated Pressure Die-Cast Aluminum Body & toughened glass visor fitted in a frame & completely integral – with all mounting accessories. The fixture enclosure shall have minimum IP 65 ingress protection.	• Bajaj : EDGE Streetlight – 90 Watts {BRLEP 90W LED}; • Crompton : NEXUS STAR - 90 Watts {LSTP-90-CDL}; • Philips : Green Line V2 BRP410 LED 092 CW HE NR FG S2 PSU GR; • Pyrotech: PP-11-D-L-WXOA/10W Or Equivalent Models.
22.	**LED ST-10 :** LED Street Light Fixtures with Leaf / Sleek Type design & SMD or COB Type LEDs for high system efficacy & rating of 120 Watts having powder coated Pressure Die-Cast Aluminum Body & toughened glass visor fitted in a frame & completely integral – with all mounting accessories. The fixture enclosure shall have minimum IP 65 ingress protection.	• Crompton: LSTP120 CDL • Bajaj:- BRTFG 120W LED Or Equivalent Models.
23.	**LED ST-11 :** LED Street Light Fixtures with Leaf / Sleek Type design & SMD or COB Type LEDs for high system efficacy & rating of 120 Watts to 150 Watts – having powder coated Pressure Die-Cast Aluminum Body & toughened glass visor fitted in a frame & completely integral – with all mounting accessories. The fixture enclosure shall have minimum IP 65 ingress protection.	• Bajaj : Edge Streetlight – 150 Watts {BRTFG 135W LED}; • Crompton : 135 Watts {LSTP-135- CDL};; • Philips : Greenline Extra BRP322 LED 122 CW HE MR PC S3 XT; • Pyrotech: PE-11-D-L-WXOA/150W Or Equivalent Models.
24.	**LED FD-1:**	• Philips : Uniflood 2 Series Flood Light -

	LED Flood-Light Fixtures with COB or SMD Type LEDs and high system efficacy for a rating of 80 Watts up to 110 Watts – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories – suitable for outdoor installation & having a minimum IP 65 ingress protection. The Flood-Light fixtures shall have powder-coated pressure die-cast & Aluminum Body & toughened glass front cover.	110Watts {BVP122 LED110 CW FLNB FG XTFC}; • Crompton : OMEGA LED Flood Light – 110 Watts{LFLN11-110-CDL/60}; • Bajaj : Force Flood Light – 100 Watts {BJFL 100W LED I}; • Pyrotech: PD-17-D-L-WXOA/110W Or Equivalent Models.
25.	**LED FD-2:** LED Flood-Light Fixtures with COB or SMD Type LEDs and high system efficacy for a rating of 150 Watts up to 200 Watts – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories – suitable for outdoor installation & having a minimum IP 65 ingress protection. The Flood-Light fixtures shall have powder-coated pressure die-cast & Aluminum Body & toughened glass front cover.	• Philips : Tempo Series LED Flood Lights – 172Watts { BVP410 LED 172 CW HE NB FG S3 XT}; • Crompton : 200 Watts LED Flood Lights {LFLN11-200-CDL/60};; • Bajaj : Turbo Flood Light – 200 Watts {BJFL 200W LED I}; • Pyrotech: PD-17-D-L-WXOA/200W Or Equivalent Models.
26.	**LED FD-3:** LED Flood-Light Fixtures with COB or SMD Type LEDs and high system efficacy for a rating of 250 Watts & above – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories – suitable for outdoor installation & having a minimum IP 65 ingress protection. The Flood-Light fixtures shall have powder-coated pressure die-cast & Aluminum Body & toughened glass front cover.	• Philips : Tempo Series LED Flood Lights – 252Watts {BVP410 LED 252 CW HE AK55 FG S3XTFC}; • Crompton : MAGPIE – 250 Watts LED Flood Lights{LFLPI-250-CDL/60}; • Bajaj : Turbo Flood Light – 350 Watts {BJFL 350W LED I}; • Pyrotech: PD-17-D-L-WXOA/250W Or Equivalent Models.
27.	**LED FD-9:** LED Flood-Light Fixtures with COB or SMD Type LEDs and high system efficacy for a rating of 400 Watt & above – complete with integral electronic LED drivers, heat sinks for efficient heat dissipation & all mounting accessories – suitable for outdoor installation & having a minimum IP 65 ingress protection. The Flood-Light fixtures shall have powder-coated pressure die-cast & Aluminum Body & toughened glass front cover.	• Crompton: MAGPIE+ LFLPI-400-CDL/60 • Bajaj: BJFL 400W LED IP66 • Philips: Tango G3 BVP383 LED450/CW 400W 220-240V SWB IN; • Pyrotech: PD-17-D-L-WXOA/500W Or Equivalent Models
28.	**LED BL-1:** Integral decorative LED Bollard Luminaries with opal acrylic diffusers of minimum 8 Watts rating & suitable for landscape lighting with IP-65 Ingress Protection and anti-corrosive powder-coated die-cast aluminum housing – complete with all mounting accessories (anchor bolts / base-plates)	• Bajaj : Tetris LED Bollard {BGBOS 600 9W LED}; • Crompton : Maya-III COB LED Bollard {LBLA3-10- CDL}; • Philips : City Cube Series LED Bollard - 8.5 Watts{BCP400 LED04 U CW PSU GR S1}; • Pyrotech: PD-15-D-L-WXOA Or Equivalent Models.
29.	**LED PT-1** LED Post Top Lantern type fixture. Lumen Output shall be equivalent to that of 80W HPMV	• Bajaj BLTSP 25W NW LED (Globe) Or Equivalent Models.

OUTDOOR TYPE FIXTURES			
FLAMEPROOF LIGHTING FIXTURE (ZONE-1 AND 2)			
S.NO.	**FIXTURE NO.**	**DESCRIPTION**	**WATTAGE**
1.	FLP-LED-1	Flameproof well glass/linear LED lighting fixture suitable for use in zone-1/2 & gas group IIA/IIB classified areas complete with LED lamp, LED driver, reflectors, mounting hardwares, clamps & brackets etc. This Lighting fixtures shall be suitable for operation on 240V AC supplies. **(Light Output i.e. LUMENS of fixture 4000 to 4500 LM and min. 100 LM/Watt.)**	Up to 45 W
2.	FLP-LED-1 IIC	Flameproof well glass/linear LED lighting fixture suitable for use in zone-1/2 & gas group IIC classified areas complete with LED lamp, LED driver, reflectors, mounting hardwares, clamps & brackets etc. This Lighting fixtures shall be suitable for operation on 240V AC supplies. **(Light Output i.e. LUMENS of fixture 4000 to 4500 LM and min. 100 LM/Watt.)**	Up to 45 W
3.	LED FLP-2 IIA/IIB	Flameproof and weatherproof LED cluster based aviation obstruction light suitable for use in zone-1/2 & gas group IIA/IIB classified areas complete with LEDs (Twin type) with LED Lamp, driver, including other materials as applicable for installation.	Up to 60W (Medium Intensity)
4.	LED FLP-2 IIC	Flameproof and weatherproof LED cluster based aviation obstruction light suitable for use in zone-1/2 & gas group IIC classified areas complete with LEDs (Twin type) with LED Lamp, driver, including other materials as applicable for Installation.	Up to 60W (Medium Intensity)
5.	LED FLP IIC-3	Flameproof & WP Well glass lighting fixture with LED Lamp, driver, including other materials as applicable for installation for use in IIC classified areas. **(Light Output i.e. LUMENS of fixture 4000 to 4500 LM and min. 100 LM/Watt.)**	Up to 45 W
6.	LED ExnR-4	Weatherproof well glass non sparking restricted breathing type lighting fixture for use in zone-1/2 & gas group IIA/IIB classified areas but with LED lamp, LED driver, reflectors, mounting hardwares, clamps & brackets etc. **(Light Output i.e. LUMENS of fixture 6000 to 6500 LM and min. 100 LM/Watt.)**	Upto 65 W

7.	LED FLP-4 IIA/IIB	Flameproof & WP Well glass lighting fixture with LED Lamp, driver, including other materials as applicable for installation for use in zone-1/2 & gas group IIA/IIB Classified areas. **(Light Output i.e. LUMENS of fixture 6000 to 6500 LM and min. 100 LM/Watt.)**	Upto 65 W
8.	LED FLP-4 IIC	Flameproof & WP Well glass lighting fixture with LED Lamp, driver, including other materials as applicable for installation for use in zone-1/2 & gas group IIC Classified areas. **(Light Output i.e. LUMENS of fixture 6000 to 6500 LM and min. 100 LM/Watt.)**	Upto 65 W
9.	LED ExnR-5	Weatherproof well glass non sparking restricted breathing type lighting fixture for use in zone-1/2 with LED lamp with LED driver, reflectors, mounting hardwares, clamps & brackets etc.. **(Light Output i.e. LUMENS of fixture 13500 to 14000 LM and min. 100 LM/Watt.)**	Upto 140 W
10.	LED FLP-5 IIA/IIB	Flameproof & WP Well glass lighting fixture with LED Lamp, driver, including other materials as applicable for installation for use in zone-1/2 & gas group IIA/IIB Classified areas. **(Light Output i.e. LUMENS of fixture 13500 to 14000 LM and min. 100 LM/Watt.)**	Up to 140 W
11.	LED FLP-5 IIC	Flameproof & WP Well glass lighting fixture with LED Lamp, driver, including other materials as applicable for installation for use in zone-1/2 & gas group IIC, Classified areas. **(Light Output i.e. LUMENS of fixture 13500 to 14000 LM and min. 100 LM/Watt.)**	Up to 140 W
12.	LED ExnR-6	Weatherproof well glass non sparking restricted breathing type lighting fixture for use in zone-1/2 with LED lamp with LED driver, reflectors, mounting hardwares, clamps & brackets etc.. **(Light Output i.e. LUMENS of fixture 22500 to 23000 LM and min. 100 LM/Watt.)**	Up to 230 W
13.	LED FLP-6 IIA/IIB	Flameproof and weatherproof flood Lighting fixture with LED Lamp, driver, including other materials as applicable for installation for use in zone-1/2 & gas group IIA/IIB, Classified areas. **(Light Output i.e. LUMENS of fixture 22500 to 23000 LM and min. 100 LM/Watt.)**	Up to 230 W
14.	LED FLP-6 IIC	Flameproof and weatherproof flood Lighting fixture with LED Lamp, driver, including other materials as applicable for installation for use in zone-1/2 & gas group IIC, Classified areas. **(Light Output i.e. LUMENS of fixture 22500 to 23000 LM and min. 100 LM/Watt.)**	Up to 230 W

15.	LED ExnR-7	Weatherproof flood light non sparking restricted breathing type lighting fixture for use in zone-1/2 & with LED lamp with LED driver, reflectors, mounting hardwares, clamps & brackets etc.. **(Light Output i.e. LUMENS of fixture 13500 to 14000 LM and min. 100 LM/Watt.)**	Up to 140 W
16.	LED FLP-7 IIA/IIB	Flameproof and weatherproof flood Lighting fixture with LED Lamp, driver, including other materials as applicable for installation for use in zone-1/2 & gas group IIA/IIB, Classified areas. **(Light Output i.e. LUMENS of fixture 13500 to 14000 LM and min. 100 LM/Watt.)**	Up to 140 W
17.	LED FLP-7 IIC	Flameproof and weatherproof flood Lighting fixture with LED Lamp, driver, including other materials as applicable for installation for use in zone-1/2 & gas group IIC, Classified areas. **(Light Output i.e. LUMENS of fixture 13500 to**	Up to 140 W
18.	FLP LED1 IIA/IIB	Flameproof well glass/linear LED lighting fixture suitable for use in zone-1/2 & gas group IIA/IIB classified areas complete with LED lamp, LED driver, reflectors, mounting hardwares, clamps & brackets etc. This Lighting fixtures shall be suitable for operation on 240V AC supplies. **(Light Output i.e. LUMENS of fixture 6000 to 6500 LM and min. 100 LM/Watt.)**	Up to 65 W
19.	FLP LED2 IIA/IIB	Flameproof well glass/linear LED lighting fixture suitable for use in zone-1/2 & gas group IIA/IIB classified areas complete with LED lamp, LED driver, reflectors, mounting hardwares, clamps & brackets etc. This Lighting fixtures shall be suitable for operation on 240V AC supplies. **(Light Output i.e. LUMENS of fixture 10000 to 10500 LM and min. 100 LM/Watt.)**	Up to 100 W
20.	FLP LED FD3	Flameproof and weatherproof flood Lighting fixture with LED Lamp, driver, including other materials as applicable for installation for use in zone-1/2 & gas group IIA/IIB, Classified areas. **(Light Output i.e. LUMENS of fixture 15000 to 15500 LM and min. 100 LM/Watt.)**	Up to 150 W
21.	FLP IIC-10	Flameproof and weatherproof type twin tube lighting fixture with LED lamp, driver including other materials as applicable for installation for use in zone-1/2 & gas group IIC, Classified areas. **(Light Output i.e. LUMENS of fixture 3600LM for each tube and min. 100 LM/Watt.)**	Up to 2 X 36 W

Notes:

1. All fixtures shall be latest energy efficient type.Power factor shall be >= 0.95.
2. For Hazardous Area Lighting Fittings Lumen Efficacy shall be 100 Lumen/Watt (min.).
3. LED lamps and Drivers shall be provided with min. 5 years warranty period. Driver shall have valid BIS certification and copy of same shall be furnished during drawing review stage.
4. The LED light fixtures should be tested for luminous lux level as per IES-LM-79. Type test certificates shall be furnished in compliance to same. Type test certificates for LM-79 for all fixtures shall be from a NABL (National Accreditation Board for Testing and Calibration Laboratories) accredited Lab or UL Laboratory.
5. The LED's used in the lighting fixtures should be tested for the service life as per IES-LM-80. Type test certificates shall be furnished in compliance to same.
6. The LED Driver shall comply with the requirement of IEC 61347-2-13.
7. All fixtures shall be suitable for installation in Zone-1/Zone-2 areas. Flameproof LED lighting fixtures shall comply with the requirement of IEC 60079-1 & 0. Fixtures shall be suitable for dust classification wherever applicable.
8. Fixture life time (L70) shall be > 50000 hrs.
9. LED fixtures shall be complete with internal reflectors. No external reflector is envisaged for LED.
10. 2 nos cable entries shall be provided for loop in & loop out with internal wiring for driver & lamp for all LED FLP/Exn'R' fixtures.
11. All mirror optics luminaries should be epoxy powder coated.
12. Make of fixtures shall be embossed on the body of the lighting fixtures.
13. Colour rendering Index (CRI) for LED lamps shall be greater than 80.
14. Colour temperature for LED lamps shall be 6500K.
15. LED lamps shall have wide beam angle suitable for uniform light distribution.
16. LED lamps shall be provided with highly translucent diffusers with advance optical system with high internal reflectivity material of excellent and smooth output for glare free light and no visibility of LED to eyes.
17. All lighting fixtures shall be supplied complete with associated LED lamp and driver.
18. All LED fixtures including driver shall be provided with 5 years warranty.
19. All lighting fixtures shall be supplied with fixture mounting nuts and bolts of stainless steel SS-304.
20. For corrosive areas, die-cast Aluminium enclosed light fixtures shall be installed with die cast aluminium JBs / DBs (in hazardous areas).
21. All above Luminaries with controllers & drivers must be suitable for a working voltage range of 150 to 270 Volts – 50 / 60 Hz - AC.
22. The rates for all above luminaries are inclusive of LED lamps / Electronic Drivers / Transformers / RGB Controllers / internal luminaries wiring.
23. In case any of the above referred models / makes are discontinued, prior approval from the engineer-in- charge has to be taken for supplying any alternate makes / models.
24. Retrofit type of flameproof LED fixtures will not be acceptable (implies LED bulbs fixed inside flameproof enclosures). All flameproof fixtures shall have integral panelled LED clusters (COB - Chip on Board or SMD - Surface mount Device).
25. Loop in and Loop out facility to be provided for all safe area lighting fixtures and in case same is not possible from vendor side, then provision of JB for loop in loop out facility to be provided by subject to meeting following requirements:
    a) The material of JB shall be SS.
    b) Vendor to clearly indicate the location of JB i.e where it is being mounted on fixture and to be indicated in revised drawing.
    c) Vendor to confirm that there shall be no cost and time implication owing to meeting the above requirement.

ELECTRICAL LOAD DATA

NOTES: -

1. Vendor shall fill the details of all electrical power consumer loads, which are included in the scope of this MR/Tender and submit with the offer.
2. Motors/load requiring emergency power supply shall be separately identified in this Electrical load data format.

MOTOR

S.NO	TAG NO.	SERVICE	Make	Type of enclosure	Applicable standard for hazardous area application	Motor Kw	Duty (continuous /intermittent)	No. of poles	Type designation for cooling

OTHER ELECTRICAL LOADS

S.NO	TAG NO.	SERVICE	Make	Type of enclosure	Applicable standard for hazardous area application	Rated KW	Duty (continuous /intermittent)	Voltage

S.No	Tag No.	Service	Make	Type of Cooling (Air/ Water)	Water Qunatity (m^3/hr)	For Motors			
						Type of Enclosure	Air Quantity (Start up) Nm^3/hr	Duration of Purging (Start up) in minutes	Air Quantity (Continuous) Nm^3/hr

Vendor shall fill the details of all motors & VFDs, which are included in the scope of this MR and submit with the offer

B	16.08.2024	ISSUED WITH MR/ TENDER	PS	AS	RS
Rev. No.	**Date**	**Purpose**	**Prepared**	**Checked**	**Approved**

VENDOR DATA REQUIREMENTS
FOR
PROTECTIVE COATINGS-B895-999-85-41-EP-T-9802

Rev. No.	Date	Purpose	Prepared by	Checked by	Approved by
0	03-NOV-2025	Issued for Bids	JATIN	SAHIL	SS

VENDOR DATA REQUIREMENTS

The following drawings/documents marked "✔" shall be furnished by the bidder.

COATING SYSTEMS

S. NO.	DESCRIPTION	WITH BID	POST ORDER			REMARKS
			FOR REVIEW	FOR RECORD	WITH DATA BOOK (FINAL)	
1.	Schedule of Vendor Documents		✔		✔	
2.	Painting Scheme / Schedule/specifications (Including particulars of surface conditions, surface preparation and coating system etc. and inspection).		✔		✔	
3.	Paint manufacturer?s Credentials/PTR (Past Track record)			✔	✔	
4.	Paint Pre-qualification Certificates as per the specifications.		✔		✔	
5.	Paint datasheets and Material safety Datasheets (MSDS)		✔		✔	

Notes :

1. "TICK" denotes applicability.
2. Post order, drawing / document review shall commence only after approval of Document Control Index (DCI).
3. All post order documents shall be submitted / approved through EIL eDMS portal.
4. Final documentation shall be submitted in hard copy (Six prints) and soft (two CDs/DVDs) in addition to submission through EIL eDMS.
5. Refer - 6-78-0001: Specification for quality management system from Bidders.
6. Refer - 6-78-0002: Specification for documentation requirements from Contractors.
7. Refer - 6-78-0003: Specification for documentation requirement from Suppliers.
8. All drawings & documents shall be submitted in A4 or A3 paper sizes. Documents in higher paper size shall be submitted in exceptional circumstances or as indicated in the MR/Tender.
9. Post order- The schedule of drawing / data submission shall be mutually agreed between EIL & the bidder / contractor / supplier during finalization of Document Control Index (DCI).
10. "@" indicates submission of documents to Inspection Agency.
11. Bill of Material shall form part of the respective drawing.
12. Also refer other department's VDR :-
13. Electrical
14. Instrumentation
15. Packaged Equipment
16. Static Equipment
17. Rotating Equipment
18. General Civil
19. Piping

20. Structures
21. Offshore Engineering
22. Architecture
23. Pipeline
24. Heat & Mass Transfer

इंजीनियर्स इंडिया लिमिटेड (भारत सरकार का उपक्रम) ENGINEERS INDIA LIMITED (A Govt. of India Undertaking)	DATA SHEET FOR FREIGHT CUM PASSENGER ELEVATOR	Data Sheet No. B985-999-80-42-DS-9802-01 Rev : 0

1	**Project**	PMC AND EPCM SERVICES FOR POLYPROPYLENE PROJECT					**Quantity**	One (1)												
2	**Client**	BPCL					**Location**	BPCL KOCHI REFINERY												
3	**Job No.**	B895	**Tag no.**	999-LZ-L01			**Manufacturer**	*												
4	**Building/Unit**	LAB BUILDING					**Type/Service**	Passenger Lift												
5	■ Denotes applicability		Applicable standards:EIL Std. Spec. No.6-61-0202 and codes & standards reffered therein.																	
6	Applicable to	■ Proposal	☐ Purchase	☐ As built																
7	**Purchaser's Requirement**																			
8	Capacity(kg)	11-passenger (748 kg)			Control drive	VVVF	Control	Full collective simplex												
9	Speed of travel (m/sec.)	1			Power supply	Refer Electrical specification														
10	Area classification	As per approved Area Classification Drawing			Mode of Lift operation	■	Automatic	☐	Manual											
11	Duty/Operation	Heavy Duty/Intermittent Operation			No. of start per hour	*														
12	Painting specification	■	Vendor standard	☐	EIL specification															
13	Environment	☐	Corrosive	■	Highly corrosive	Anti spark design	■	Yes	☐	No										
14	**Landing / Door Opening Details**																			
15	Floors	(G+2) Number Of Landing shall be as per EIL Drawing of Lab Building																		
16	Landings																			
17	Door opening on both side	Note Required																		
18	Landing floor elevations,m	As per EIL Drawing of Lab Building																		
19	Overhead (mm)	*																		
20	**Car Details**																			
21	Car Inside size (WxD) (mmxmm)	1700 x 1100																		
22	Car construction details	As per EIL Standard Specification of Lift (6-61-0202)																		
23	Type of car entrance door	☐ Single slide, horizontal (either left or right)																		
		■ Central opening horizontal slide door																		
		☐ Single slide, vertical																		
		☐ Vertical slide, biparting door																		
		☐ Horizontal slide from one side, collapsible type door																		
		☐ Vertical slide, collapsible grill type door																		
24	Door Operation (Car entrance)	■	Automatic	☐	Manual															
25	No. of car door	☐	One (If opening on same side on all floors)					■	Two (If opening on two sides on any floor)											
26	Car Entrance Door size (WXH) (mmXmm) **(Clear)**	900 x 2000																		
27	Car height (H) (mm)	2200																		
28	**Machine Room Details**																			
29	Position of machine room	Overhead																		
30	Pressurization inside the machine room	☐	Provided	■	Not provided															
31	Machine room beam for Chain Pulley Block	■	By Lab Contractor			☐	By purchaser													
32	Trap Door	■	Required			☐	Not required													
33	**Hoistway (Well) Details**																			
34	Type of Hoist way	☐	Fully enclosed			☐	Partially enclosed													
		☐	Steel Structure			☐	Brick wall structure													
35	Type of hoist way entrance door	☐ Single slide, horizontal (either left or right)																		
		■ Central opening horizontal slide door																		
		☐ Single slide, vertical																		
		☐ Vertical slide, biparting door																		
		☐ Horizontal slide from one side, collapsible type door																		
		☐ Vertical slide, collapsible door																		
36	Door Operation (Hoistway entrance)	■	Automatic			☐	Manual													
37	No. of hoist way doors for each lift	■	One (If opening on same side on all floors)			☐	Two (opening on both sides at GF only) & one on other floors.													
38	Hoistway size (WxD) (mmXmm)	*																		
39	Hoist way entrance size (WXH) (mmXmm) **(Clear)**	Same as Car Entrance Size																		
40	**Pit Details**																			
41	Pit Depth (mm)	*																		
42	Buffer Type	☐	Spring Buffer (Speed≤1.5m/s)			☐	Oil Buffer (Speed>1.5m/s)													
43	**Vendor's Data**																			
44	**Car**		**Hoistway**																	

45	Car outside dimension (WxDxH) (mm X mm X mm)	*		Hoistway entrance size (WXH) (mm X mm)	*	
46	Car entrance size (WXH) (mm X mm)	*		Hoistway entrance door size (WXH) (mm X mm)	*	
47	No. of door section (as applicable)	*		No. of light required inside hoist way	*	
48	Total weight of car un-laden (kg)	*		No. of door section (as applicable)	*	
49	**Traction Motor**			**Machine room**		
50	Make / Model	*	*	Machine room inside dimens.(LxWxH)(mmxmmxmm)	*	
51	Rating (kW)	*		Machine room entrance door size (WXH) (mmXmm)	*	
52	R.P.M.	*		Machine room trap door size (LXW) (mmXmm)	*	
53	Weight (kg)	*		Weight of heaviest component inside machine room (kg)	*	
54	**Gear Box**	*		Machine room CP Block capacity (kg)	*	
55	Gear box (Make/model)	*	*	Total lift required for CP Block (mm)	*	
56	Type of Gear	*		Machine room beam size	*	
57	Reduction ratio	*		**Brake**		
58	Service factor	*		Make/Model	*	*
59	**Governor**			Type	*	
60	Governer type	*		Braking capacity at full load torque	*	
61	Governer (Make / Model)	*	*	Designed distance for complete stopping from full speed, mm	*	
62	F.O.S of governor rope	*		MOC of brake shoe	*	
63	**Safety Gear**			**Sheave**		
64	Type(Instantenous/Progressive)	*		MOC of drive sheave		
65	Stoping distance of car	*		MOC of deflector sheaves	*	
66	**Traction Rope**			No. of deflector sheaves ,if any.	*	
67	Specification	*		**Counter weight**		
68	Construction	*		Total counter weight (kg)	*	
69	Tensile designation	*		Wt. of each counter weight		
70	F.O.S of each rope	*		Counter weight rope dia. (mm)	*	
71	**Guide Rail**			Counter weight rope length (mm)	*	
72	Specification	*		M.O.C of counter weight	*	
73	Rail Size	*				
74	MOC	*				
75						
76	1. * Contractor to fill up missing data and submit after bid.					
77	2. Up to the award of contract "Contractor" implies "Bidder".					
78						
79	11/4/2025	0	NJ	DV	SPC	
80	Date	Rev.	Prepared by	Checked by	Approved by	

DATA SHEET FOR EXHAUST FAN/ BLOWER (SEPARATE DATA SHEET TO BE PROVIDED FOR EACH EXHAUST SYSTEM)

A	**OPERATING CONDITIONS**		
i	Fluid handled		
ii	Suspended Solids		
iii	Nature of fluid		
iv	Suction temperature Maximum / Minimum		^{o}c
v	Fluid flow rate		CFM
vi	Duty		Continuous
vii	Height above m.s.l.		M
viii	Area Classification		Safe/Hazardous
ix	Quantity		
a	Working		1 Nos.
b	Stand by		1 Nos.
x	Location		Indoor / Outdoor
B	**MANUFACTURER SPECIFICATION**		
i	Make		
ii	Model		
iii	Spark proof construction		Reqd. / Not reqd.
iv	Class of construction		I/II/III/IV
v	Type		Centrifugal SISW/DIDW
vi	Blade		Backward/Forward/Radial
vii	Static pressure		mm WC
viii	Outlet velocity		m/sec
ix	Operating Range		Nm^3/hr to Nm^3/hr
x	Outlet area		m^2
xi	Impeller speed at design condition		RPM
xii	Mounting arrangement		
xiii	Impeller diameter		Mm
xiv	Impeller speed (Safe Limit)		RPM
xv	Type of drive		Direct/Gear/V-belt
xvi	Motor kw/rpm		
xvii	Noise level		
xviii	Corrosion proof construction		Only painting required
xix	Details of painting		Painting as per specs.
xx	Total weight (Fan + motor + Base frame)		Kg.
xxi	Maximum maintenance weight		Kg.
C	**ACCESSORIES**		
		Purchaser's Requirement	**Vendor's Confirmation**
i	Casing (Axial/Radial, Split/Non split)	Required	
ii	Back draft damper at outlet	Required	
iii	ON-OFF Damper at each fan's outlet	Required	
iv	Damper control (Manual/Automatic)	Required	
v	Inlet guide vanes	Not Required	
vi	IGV Control (Manual/Automatic)	Not Required	
vii	Impeller Washing system	Not Required	
viii	Common base frame for fan & motor	Required	
ix	Casing drain (Plugged/Isolation valve)	Required	
x	Rain hood	Not Required	
xi	Flexible (Rubberised canvass) connection at suction/discharge	Required	

xii	Painting (as per attached specs.)	Required	
xiii	V-belt drive package	Required	
xiv	Slide rail for motor	Required	
xv	Vibration Eliminators at base, Cushy Foot Type	Required	
xvi	Access door on casing	If Required	
xvii	Foundation nuts & bolts	Required	
xviii	Guards for moving parts, spark proof	Required	
xix	Lifting lugs	Not Required	
xx	Cooling disc/radiation shield	Not Required	
xxi	Foundation (Concrete/Structural/Floating)	Required	
xxii	Inlet/Outlet connection (Flanged/Non flanged)	Required	
xxiii	Inlet screen	Not Required	
xxiv	Antistatic belts in case of belt drive	Required	
D	**MATERIAL OF CONSTRUCTION**		
i	Casing		
ii	Impeller		
iii	Shaft		
iv	Shaft sleeve		
v	Damper/IGV		18 Gauge G.I.
E	**INSPECTION AND TESTING**		
i	As per EIL's standard specification no. 6-81-0154		

1.	**OPERATING CONDITIONS**	
2.	Duty	Continuous
3.	Installation	Indoor
4.	Area Classification	Safe/Hazardous
5.	Type (Double skin)	Draw through/forced through
6.	Quantity	
7.	Working	
8.	Stand by	
9.	Arrangement	Horizontal floor mounted
10.	**MANUFACTURER SPECIFICATION**	
11.	Make / Model	
12.	**FILTER AT AHU INLET**	
13.	Make / Model	
14.	Total air flow rate	m^3/hr
15.	Quantity of filter elements	nos.
16.	Filtration efficiency	Microns
17.	Size of filter elements	mm x mm x mm
18.	Face velocity	m/sec
19.	Pressure drop in clean condition	mm WC
20.	Maximum allowable pressure drop	mm WC
21.	Fixing	Flange/channel
22.	Type of filter	Dry fabric cleanable
23.	**COOLING COIL SECTION**	
24.	Make /Model	
25.	Air entering condition	^oC DB/ ^oC WB
26.	Air leaving condition	^oC DB/ ^oC WB
27.	ADP	^oC
28.	LMTD	^oC
29.	Capacity	TR
30.	Total air flow rate	m^3/hr
31.	Face area	m^2
32.	Coil size	mm x mm
33.	Velocity of air across coil (face velocity)	m/sec
34.	No. of rows	
35.	Tube per row	
36.	Type	DX/Chilled Water
37.	By pass factor	
38.	Pressure drop (Air side)	mm WC
39.	Pressure drop (Refrigerant/Water side)	mm WC
40.	Tube OD	mm
41.	Tube thickness	mm
42.	Bend thickness	mm
43.	Fin spacing	FPI
44.	Bonding of fins (Hydraulically/with mandrel)	
45.	**BLOWER SECTION**	
46.	Type	Centrifugal
47.	Blade profile	~~Forward~~/Backward/~~Radial~~
48.	No. of impellers	nos.
49.	Impeller diameter	mm
50.	Air flow rate	m^3/hr
51.	Static pressure	Minimum 65 mm WC
52.	Impeller speed	RPM.
53.	Power consumption at shaft	kW
54.	Guaranteed power consumption at motor	kW
55.	Air out velocity	Not more than 9.2 m/sec

56.	Drive arrangement	V-belt drive	
57.	Motor	kW/ RPM	
58.	No. of belts		
59.	Bearings	Self aligning heavy duty ball	
60.	Noise level		
61.	**DIMENSIONS / WEIGHTS**		
62.	Overall size & Overall weight	Kg.	
63.	**ACCESSORIES**		
64.		**Purchaser's**	**Vendor's confirmation**
65.	**Requirement**		
66.	Guard for moving parts	Required	
67.	Slide rail below motor	Required	
68.	Fire resistant flexible connection at AHU outlet	Required	
69.	Insulated drain pan with drain connection	Required	
70.	Grease nipple for bearings	Required	
71.	Painting on MS parts	Required	
72.	Vibration isolator (ribbed neoprene rubber	Required	
73.	Bronze/gun metal bushes at spindle ends of	Required	
74.	Drain piping	Required	
75.	V-belt drive with V-belts, pulleys	Required	
76.	Common base frame	Required	
77.	Volume control damper at AHU outlet	Required	
78.	Insulation of fan section & coil section	Required	
79.	**ACCESSORIES/INSTRUMENTS/CONTROLS (REFRIGERANT CIRCUIT ONLY)**		
80.	Liquid strainer	Required	
81.	Drier	Required	
82.	Sight glass	Required	
83.	Pressure gauge for Refrigerant in/out	Required	
84.	Solenoid valve	Required	
85.	Expansion valve	Required	
86.	**MATERIAL**		
87.	Coil tubes	Seamless copper tubes	
88.	Filter Media	HDPE mesh	
89.	Fins	Aluminium	
90.	AHU casing		
91.	Drain pan	18 Gauge SS Sheet	
92.	Impeller	M.S. sheets	
93.	Blower shaft	C-40/EN-8	
94.	V-pulley	C.I. Grooved	
95.	Face & bypass damper blade	16 Gauge G.I. Sheet	
96.	Filter casing	Aluminium	
97.	Face & bypass damper frame	16 Gauge CRCA	
98.	Bearings at face & bypass damper	Nylon / Sintered Brass / Gun Metal	
99.	Filter mounting frame	Zinc sprayed M.S. Sections	
100.	Coil header	MS	
101.	Coil casing	GSS	
102.	**INSPECTION AND TESTING**		
103.	As per EIL Standard Specification No. 6-61-0017 & 6-81-0154		

1.0	**OPERATING CONDITIONS**	
1.1	Location	
1.2	Total quantity of air handled	CFM (m^3/hr.)
1.3	Type of filter media	
1.4	Expected impurities in air	As generally present in ambient air
2.0	**MANUFACTURER SPECIFICATION**	
2.1	Make/ Model	
2.2	Capacity per filter element	CFM (m^3/hr.)
2.3	Quantity of filter element	Nos.
2.4	Size of filter element	610 mm x 610 mm x 305 mm
2.5	Face velocity	~500 FPM
2.6	Filtration efficiency	95% down to 5 micron
2.7	Pressure drop in clean condition	6.5 mm WC
2.8	Maximum allowable pressure drop (When due for cleaning)	mm WC
2.9	Fixing	Flange / ~~Channel~~
2.10	Weight of each filter element	Kg.
2.11	Method to clean filter	Wash in water / ~~Compressed air jet~~
2.12	Mounting of filter	~~Horizontal~~ / Vertical
2.13	Direction of air flow	Horizontal / ~~Vertical~~
3.0	**ACCESSORIES**	
3.1	Nuts, bolts, rubber bushes, springs as necessary for mounting	To be provided by Vendor
3.2	The filter modules in ladder type	
4.0	**MATERIAL**	
4.1	Filter casing	~~Carbon steel~~ / Aluminium / ~~SS~~
4.2	Filtering media	HDPE/~~Nylon mesh/Non woven felt/G.I. wire mesh~~
4.3	Separators	Aluminium
4.4	Wire mesh to support filter media	G.I. / ~~S.S.~~
4.5	Gasket	~~Felt~~ / Neoprene sponge rubber
4.6	Nuts/bolts/bush/springs	Galvanised
4.7	Filter mounting frame	Ladder type made of MS rolled sections, Spray galvanised
5.0	**INSTRUMENT**	
5.1	Pressure drop measurement device	~~DPG~~ / Water tube manometer
6.0	**INSTRUMENT**	
6.1	As per EIL's Standard Specification No. 6-61-0017. Dust test not required. Type test will suffice.	

1	**GENERAL**									
2	Project:	**BPCL KR PP Project**				Job No.:	B895			
3	Owner:					Site:				
4	Purchaser:					Building :		Unit No:		
5	Item No.:					Service:	**Chilled Water**			
6	No. Reqd.:	Working : 1 (One)		Standby : 1 (One)		Parallel Operation Required:		☐ Yes		☐ No
7	Applicable to	☐ Proposal	☐ Purchase				☐ As Built			
8	☐ Scope option & Information specified by purchaser ☐ Information Reqd. from & option left to vendor. Vendor to cross ☐ the selected option									
9	Driver: Working		Standby		Driver Supplied & Mounted		☐ Pump Mfr.		☐ Other	
10	**OPERATING CONDITIONS**									
11	Liquid Handled					Capacity (m^3/hr): Min/Nor/Rated:				
12	Pumping Temp.	Normal		Max.		Discharge Pressure (kg/cm²,A):				
13	Specific Gravity at P.T./15☐C:					Suction Pressure: Nor./ Max.				
14	Vapour Pressure at P.T.					Diff. Pressure (kg/cm²) @ Rated				
15	Viscosity at P.T.		Corr./Eros. By:			Diff. Head (m) @ Rated Capacity:				
16	Solids in	☐ Yes	☐ No	Size:	%	NPSH Available (m):				
17	**MANUFACTURERS SPECIFICATIONS**									
18	Pump Manufacturer:					Model No.:				
19	**CONSTRUCTION**					**PERFORMANCE**				
20	Casing Mounting:	☐ Centerline	☐ Foot	☐ Inline		Proposal Curve No.				
21	Casing Split:	☐ Axial	☐ Radial			Visc. Corr.	$C_{\square}$	C_Q	C_H	
22	Type:	☐ Single Volute	☐ Double Volute		☐ Diffuser	NPSH Reqd. (Water)		F/L Speed		
23	Casing Connection:	☐ Vent	☐ Drain	☐ Gauge		No. of stages:		Efficiency (%):		
24	Nozzles	Size	ANSI Rating	Facing	Position	Rated BKW(0% Tol.):	kW	Max.BKW rtd. Imp.:		
25	Suction					BKW @	kW	Rec. Driver Rating:		
26	Discharge					Max.head rtd imp.(m):		Cap@		
27	Imp. ☐ (mm)	Max:	Rated:	Min:	Type:	MCF		Thermal		
28	Brg.: Type/No. Radial:	Thrust:		Lub:		M.A.W.P @ 15☐C/P.T./Design Temp.(kg/cm²,G):				
29	Cplg.:Make/Typ		**Fleximetl w**	Nonspark	☐ ☐ No	Hydrostatic Test pressure (kg/cm²,G):				
30	Driver Half cplg. mounted by:		☐ Pump Mfr.	☐ Others		Rotation facing coupling end:		☐ CW	☐ CCW	
31	Packing Type:		Size:	No. of rings:		Seal flush/ Quench plan:		Material :		
32	Mech. Seal:		Model	API Code :		Ext. seal flush fluid:		LPM:	@ kg/cm²G/	ºC
33	Base Plate Drain Rim	☐	☐ No	Fdn. Bolts:	☐ ☐ No	Seal Barrier fluid:		LPM:	@ kg/cm²G/	ºC
34	Throat Bush: ☐	☐ No	Matl.:	Bal. Device:	☐ ☐ No	Ext. quench fluid:		LPM:	@ kg/cm²G/	ºC
35	Materials (API-610 Matl. Class):			MOC	ASTM Grades	C.W. Plan :		LPM:	@ kg/cm²G/	ºC
36	I - Cast Iron	Casing				Weight(kg):			Driver:	
37	B - Bronze	Impeller				**AUXILIARY PIPING INTERFACE CONNECTIONS**				
39	S - Carbon Steel	Inner Case parts				(All interface conn.shall be termntd.with a flng. block				
40	C - 11-13% Chr.	Sleeve Packed					**Size**	**Rating(ANSI)**	**Facin**	
41	h - Hardened	Sleeve Seal				Lantern Ring Inlet/Outlet				
42	f - Faced	Casing ring	☐H-BHN			Ext. Seal flush fluid				
43	K -SS 304	Impeller ring	50(min)			Seal Quench fluid Inlet				
44	L -SS 316	Shaft				Seal pot vent/ drain				
45	X	Throttle Bush				Casing vent/ drain				
46	Y	Throat Bush				C.W Inlet/ Outlet				
47	Z	Balance Drum				Base plate drain (only				
48	☐ Driver suitable for Pump starting with open Disc. Valve condition.					Casing steam jacket				
49	**INSPECTION & TESTS (EACH PUMP)**									
50		Witness	Observe					Witness	Observe	
51	☐ Shop Test / Inspection	☐	☐	☐ NPSH As Reqd.☐ Per Spec. ☐ Mandatory				☐	☐	
52	☐ Material Certificates	☐	☐	☐ Dismantle Insp. & Re-assembly after Test				☐	☐	
53	☐ Hydrostatic	☐	☐	☐ Unitization/Dimensional Check				☐	☐	
54	☐ Performance/Sound Level	☐	☐	☐ Check for direction of rotation of pump &				☐	☐	
55	**Applicable Specification: EIL Std. Specification No. 6-41-0003**									
56	**REMARKS:-** 1) Max. allowable casing working pressure shall not be less than ___ kg/cm²G @__ ☐C.									
57	2) Down Stream Design Pressure is ____ kg/cm²g.									
58	3) Accessories and Instrumentation shall be as per EIL approved vendors only.									
59	4) Unitization of Pump and Driver shall be done in pump manufacturer's shop.									

1.	**OPERATING CONDITIONS**	
2.	Duty	Continuous/~~Intermittent~~
3.	Installation	~~Indoor~~/Outdoor
4.	Quantity	
5.	Working	__ Nos.
6.	Stand by	__ Nos.
7.	Area classification	Safe/Hazardous
8.	Type	Air Cooled
9.	Driver	Electric motor
10.	Refrigerant	
11.	Capacity of each Condensing Unit – Nominal	___ TR
12.	Capacity of each Condensing Unit – Actual	___ TR
13.	**MANUFACTURER SPECIFICATION**	
14.	**Compressor**	
15.	Make	
16.	Model	
17.	Type	(Refer Job Specification No. B559-839-80-42-SP-8201)
18.	No of stages/ No. of compressor/ Unit	
19.	Capacity	
20.	Saturated suction pressure	
21.	Saturated suction temperature	
22.	Saturated discharge pressure	
23.	Saturated discharge temperature	
24.	Drive	V-belt / flexible coupling
25.	**Reciprocating Compressor**	
26.	Cooling of cylinder side, top covers (Recip. Compressor)	By air
27.	No of cylinders (Recip. Compressor)	
28.	Bore/stroke (Recip. Compressor)	
29.	Actual discharge temperature	
30.	Maximum allowable cylinder temperature (Recip. Compressor)	
31.	Maximum allowable cylinder pressure (Recip. Compressor)	
32.	Mean piston speed (Recip. Compressor)	m/sec.
33.	**Screw Compressor**	
34.	Rotor Diameter	
35.	No of lobes – Male/Female	
36.	Rotor length to diameter ratio(L/D)	
37.	Rotor Clearance	
38.	Shaft Diameter	
39.	Shaft seal type	
40.	**General Parameters**	
41.	Compressor speed	RPM
42.	Guaranteed shaft power	
43.	Motor power & speed	
44.	Motor suitable for loaded starting	Yes/No
45.	Description of unloaded starting arrangement	
46.	Min compressor speed for proper lubrication/capacity control	RPM

47.	**LUBRICATION**				
48.	Type				Splash/Pressure
49.	Oil pump driven by				Compressor shaft/ Electric motor
50.	Grade of lubrication oil				
51.	Lubrication oil charge				
52.	**CAPACITY CONTROL**				
53.	Type				Sliding valve/ Valve unloaders/ Hot gas bypass/Others
54.	Actuators				Automatic cum manual
55.	Actuators operated by				Microprocessor controlled
56.	Compressor to unload on power failure/stoppage				Automatic cum manual
57.	Capacity regulation steps	%	%	%	%
58.	Capacity (TR)	100	75	50	25
59.	Shaft power (kW)				
60.	**DIMENSIONS/WEIGHTS**				
61.	Compressor weight				
62.	Maximum erection weight				
63.	Maximum maintenance weight with component name				
64.	Overall size				
65.	**MATERIAL**				
66.	**Reciprocating Compressor**				
67.	Cylinder & head				
68.	Piston				
69.	Piston rings				
70.	Cylinder liners				
71.	Valve plates				
72.	Valve seat				
73.	Valve springs				
74.	Connecting rod				
75.	Crankshaft				
76.	Crankcase				
77.	Bearings				
78.	Suction strainer				
79.	Flywheel				
80.	**Scroll Compressor**				
81.	Casing				
82.	Rotors/Scroll				
83.	Shaft				
84.	Shaft Sleeve				
85.	Shaft Seals				
86.	**Screw Compressor**				
87.	Casing				
88.	Rotors				
89.	Shaft				
90.	Shaft Sleeve				
91.	Shaft Seals				
92.	**ACCESSORIES**				

93.		Purchaser's Requirement	Vendor's Confirmation
94.	Local panel & gauge panel	Required	
95.	Pressure gauge for compressor gas inlet	Required	
96.	Pressure gauge for compressor gas outlet	Required	
97.	Pressure gauge for lubrication oil	Required	
98.	Temperature gauge for compressor gas inlet	Required	
99.	Temperature gauge for compressor gas outlet	Required	
100.	HP/LP switch	Required	
101.	Lub. Oil pressure low switch	Required	
102.	Sight Glass	Required	
103.	Capacity control device	Required	
104.	Automatic unloading device for start up	Required	
105.	V-belt/flexible coupling drive package	Required	
106.	Oil separator	If required	
107.	Common base frame for compressor & motor	Required	
108.	Slide rail for motor / belt tensioner	Required	
109.	Foundation nuts & bolts	Required	
110.	Guards for moving parts	Required	
111.	~~Cooling water piping~~	~~If required~~	
112.	~~Suction strainer~~	~~Required~~	
113.	Thermostat operated crank case heater	Required	
114.	Suction & discharge manifolds	Required	
115.	Suction & discharge service valves	Required	
116.	Safety valve for each cylinder	Required	
117.	Replaceable cylinder liners	Required	
118.	Magnetic oil plug	Required	
119.	Discharge muffler	Required	
120.	Oil pump	Required/Not required	
121. 122.	Mechanical seal	Required/Not required	
123.	Oil filter	Required	
124.	Oil temp. gauge	Required	
125.	Sight glass	Required	
126.	**Air Cooled Condenser**		
127.	Model		
128.	Quantity of condensers per unit		
129.	Type		
130.	Total heat rejection		TR
131.	Face area of each coil		
132.	Face velocity across coil		
133.	Tube O.D.		
134.	Tube thickness		
135.	Bend thickness		
136.	Fin spacing		FPI
137.	Fin thickness		
138.	Quantity of fans per condenser		
139.	Air flow rate per fan		
140.	Type of fan for air circulation		
141.	Motor rating / speed of each fan	kW /	RPM

142.	Diameter of fan impeller	mm
143.	**Material**	
144.	Tubes	
145.	Fins	
146.	Impeller	
147.	Shaft	
148.	Frame / casing	
149.	Coating	
150.	**Dimensions / Weights**	
151.	Size	mm x mm x mm
152.	Maximum weight	Kg.
153.	**Chiller (Evaporator)**	
154.	Type	Shell & Tube
155.	Make	
156.	Model	
157.	Capacity	TR (actual)
158.	Chilled water temperature at inlet	^oC
159.	Chilled water temperature at outlet	^oC
160.	Chilled water pressure at inlet	Kg/cm^2 (g)
161.	Chilled water pressure at outlet	Kg/cm^2 (g)
162.	Fouling resistance, water side	0.0002 m^2 hr ^oC/Kcal
163.	LMTD	^oC
164.	Overall heat transfer coefficient	Kcal/hr m^2 ^oC
165.	Chilled water flow rate	m^3/hr
166.	No. of passes, tube side	Nos.
167.	Pressure drop, water side	Kg/cm^2
168.	Design pressure, shell side	Kg/cm^2 a
169.	Design pressure, tube side	Kg/cm^2 a
170.	Hydraulic test pressure, shell side	Kg/cm^2 a
171.	Hydraulic test pressure, tube side	Kg/cm^2 a
172.	Pneumatic test pressure, shell side	Kg/cm^2 a
173.	Pneumatic test pressure, tube side	Kg/cm^2 a
174.	Design temperature, shell side	^oC
175.	Design temperature, tube side	^oC
176.	Total no. of tubes	Nos.
177.	Tube OD at plain end	mm
178.	Tube thickness at plain end	mm
179.	Tube length between tube sheets	mm
180.	Tube type	copper tubes
181.	Fin spacing	FPI
182.	Total tube surface areas, m^2	
183.	Water side	
184.	Refrigerant side	
185.	Shell OD	mm
186.	Shell thickness	mm
187.	Tube to tube sheet joint, expanded/welded	
188.	Water inlet flange	Size mm
189.	Water outlet flange	Size mm
190.	**Material**	
191.	Shell	
192.	Channel/channel covers	
193.	Tube sheet	

194.	Baffles/Tube supports	
195.	Tubes	
196.	Flanges	
197.	Gasket	
198.	Bolts & Nuts	
199.	**INSPECTION AND TESTING**	
200.	As per EIL Standard Specification No. 6-61-0017	