

<b>Civil Material Approved Vendors Details (As On. 10.06.2026)</b>			
<b>Sr. No.</b>	<b>Item</b>	<b>No. Of Approved Vendors</b>	<b>No. Of Debarred Vendors</b>
1	HDPE Pipe	40	0
2	DWC Pipe	8	0
3	UPVC Pipe	59	0
4	Screen & Casing Pipe	13	0
5	MS Pipe	13	0
6	DI Pipe	14	0
7	CI Sluice Valve	29	0
8	Non Return Valve	27	0
9	Butter-fly Valve	27	0
10	Air Valve	24	0
11	Check Valve	22	0
<b>Total</b>		<b>276</b>	<b>0</b>

GUJARAT WATER SUPPLY & SEWERAGE BOARD, GANDHINAGAR							
List of Approved Vendors of GWSSB for supply of HDPE (PE-80 & 100) Pipes (IS-4984) with ISI mark as per Vendor Selection Report submitted by Different TPI (As on dt. 10.06.2026)							
Sr. No.	Name of Agency	Address/E-mail Address	Approved Sizes & Class			Approval Valid up to Date	Remarks
			Material Grade	Size (mm)	Class		
1	2	3	4	5	6	7	8
1	M/s. Chamunda Plastic Pvt. Ltd., Daskroi (Ahmedabad)	Plot No. 1051, Nr. Kothiya Patiya, Kuha Gam Road, Kathwada-Indore Highway, Ta:- Daskroi, Ahmedabad-382433 <b>cppl.dhruv@gmail.com</b>	PE-80	40 to 500 mm	PN - 6.0(SDR 17)	28-01-2028	
				32 to 500 mm	PN - 8.0(SDR 13.6)		
				32 to 500 mm	PN - 10(SDR 11)		
			PE-100	50 to 500 mm	PN - 6.0(SDR 21)		
				40 to 500 mm	PN - 8.0(SDR 17)		
				32 to 500 mm	PN - 10(SDR 13.6)		
2	M/s. Duke Pipe Pvt. Ltd., Palanpur	Survey No:- 365/1, At & post: Chadotar, Gadhi Road, Ta- Palanpur, Dist- Banaskantha, Gujarat (India)-385001 <b>Miken Patel</b> <b>9998984281</b> <b>miken@dukepipes.com</b> <b>projects@dukepipes.com</b>	PE-80	40 to 500 mm	PN - 6.0 (SDR 17)	31-01-2029	
				40 to 500 mm	PN - 8.0 (SDR 13.6)		
				40 to 500 mm	PN - 10 (SDR 11)		
				40 to 110 mm	PN 12.5 (SDR 9)		
				40 to 110 mm	PN 16 (SDR 7.4)		
			PE-100	50 to 500 mm	PN - 6.0 (SDR 21)		
				40 to 110 mm	PN - 8.0 (SDR 17)		
				200 to 500 mm	PN - 10 (SDR 13.6)		
				40 to 110 mm	PN 12.5 (SDR 11)		
				200 to 500 mm	PN 16 (SDR 9)		
				40 to 110 mm	PN 12.5 (SDR 11)		
				40 to 110 mm	PN 16 (SDR 9)		
3	M/s. Dolphin Polyplast Pvt. Ltd., Rajkot	Plot No.G/1/C, Nr. Almighty Gate, Kalawad Road, Ta. Lodhika, Dist. Rajkot – 360021, Gujarat <b>Shailesh Limbasiya</b> <b>9727873737</b> <b>info@dolphinpipe.com</b> <b>www.dolphinpipe.com</b>	PE-80	40 to 200 mm	PN - 6.0 (SDR 17)	31-01-2029	
				40 to 200 mm	PN - 8.0 (SDR 13.6)		
				40 to 200 mm	PN - 10 (SDR 11)		
				40 to 200 mm	PN 12.5 (SDR 9)		
				40 to 200 mm	PN 16 (SDR 7.4)		
			PE-100	40 to 450 mm	PN - 6.0 (SDR 21)		
				40 to 450 mm	PN - 8.0 (SDR 17)		
				40 to 450 mm	PN - 10 (SDR 13.6)		
				40 to 200 mm	PN 12.5 (SDR 11)		
				40 to 200 mm	PN 16 (SDR 9)		
4	M/s. Sagar Polytechnik Ltd., Rajkot	Plot no. 109/110/111, Old highway, Bamnbore GIDC, Bamnbore, Chotila, <b>surendranagar</b> <b>denish@sagarpolymers.com</b> <b>balbhadra.jadeja@sagarpolymers.com</b>	PE-80	75 to 500 mm	PN - 2.5 (SDR 41)	12-07-2026	
				50 to 500 mm	PN - 4.0 (SDR 26)		
				32 to 500 mm	PN - 6.0 (SDR 17)		
				25 to 500 mm	PN - 8.0 (SDR 13.6)		
				20 to 500 mm	PN - 10 (SDR 11)		
				20 to 500 mm	PN 12.5 (SDR 9)		
				20 to 400 mm	PN 16 (SDR 7.4)		
			PE 100	40 to 500 mm	PN - 6.0 (SDR 21)		
				32 to 500 mm	PN - 8.0 (SDR 17)		
				25 to 500 mm	PN - 10 (SDR 13.6)		
				20 to 500 mm	PN 12.5 (SDR 11)		
				20 to 500 mm	PN 16 (SDR 9)		

Sr. No.	Name of Agency	Address/E-mail Address	Approved Sizes & Class			Approval Valid up to Date	Remarks
			Material Grade	Size (mm)	Class		
1	2	3	4	5	6	7	8
5	M/s. Jain Irrigation Systems Ltd., Jalgaon	Jain Plastics Park, N.H. no. 6, P.O. Box 72, Bambhori, Jalgaon-425001, Maharashtra <b>pipes@jains.com</b> <b>pemktgws@jains.com</b>	PE-80	90 to 1000 mm	PN - 2.5 (SDR 41)	12-07-2026	
				50 to 1000 mm	PN - 4.0 (SDR 26)		
				32 to 1000 mm	PN - 6.0 (SDR 17)		
				32 to 710 mm	PN - 8.0 (SDR 13.6)		
				20 to 630 mm	PN - 10 (SDR 11)		
				20 to 500 mm	PN 12.5 (SDR 9)		
				16 to 400 mm	PN 16 (SDR 7.4)		
			PE-100	75 to 1200 mm	PN - 3.0 (SDR 41)		
				75 to 1200 mm	PN - 4.0 (SDR 33)		
				50 to 500 mm & 1200 mm	PN - 5.0 (SDR 26)		
				40 to 1200 mm	PN - 6.0 (SDR 21)		
				40 to 1000 mm	PN - 8.0 (SDR 17)		
				25 to 1000 mm	PN - 10 (SDR 13.6)		
				25 to 630 mm	PN 12.5 (SDR 11)		
				16 to 500 mm	PN 16 (SDR 9)		
				16 to 180 mm	PN 20 (SDR 7.4)		
6	M/s. Texmo Pipes & Products Ltd., Burhanpur (MP)	98, Bahadarpur Road, Burhanpur, Madhya Pradesh-450331 <b>vijay.prasad@texmopipe.com</b>	PE-80	75 to 315 mm	PN - 2.5 (SDR 41)	12-07-2026	
				75 to 315 mm	PN - 3.2 (SDR 33)		
				50 to 315 mm	PN - 4.0 (SDR 26)		
				40 to 315 mm	PN - 5 (SDR 21)		
				32 to 315 mm	PN - 6.0 (SDR 17)		
				25 to 315 mm	PN - 8.0 (SDR 13.6)		
				20 to 315 mm	PN - 10 (SDR 11)		
				20 to 200 mm	PN 12.5 (SDR 9)		
			PE 100	20 to 200 mm	PN 16 (SDR 7.4)		
				75 to 315 mm	PN - 3.0 (SDR 41)		
				75 to 315 mm	PN - 4.0 (SDR 33)		
				50 to 315 mm	PN - 5.0 (SDR 26)		
				40 to 315 mm	PN - 6.0 (SDR 21)		
				32 to 315 mm	PN - 8.0 (SDR 17)		
				25 to 315 mm	PN - 10 (SDR 13.6)		
				25 to 315 mm	PN 12.5 (SDR 11)		
				20 to 315 mm	PN 16 (SDR 9)		
7	M/s. Idol Polytech Pvt. Ltd. , Rajkot	Fac.Add:- Survey No. 11/P1, Plot No. 1, 2, R. K, Industrial Zone-8, Wankaner Kuvadva Highway, Kuvadva Chowkdi, Ranpur (Navagam) Dist. Rajkot-360023 <b>Jitendra Patel</b> <b>9925255255</b> <b>hdpe@idolpipe.com</b> <b>project@idolpipe.com</b>	PE- 80	40 to 500 mm	PN - 6.0 (SDR 17)	31-01-2029	
				40 to 500 mm	PN - 8.0 (SDR 13.6)		
				40 to 500 mm	PN - 10 (SDR 11)		
				40 to 200 mm	PN 12.5 (SDR 9)		
				40 to 200 mm	PN 16 (SDR 7.4)		
			PE 100	40 to 500 mm	PN - 6.0 (SDR 21)		
				40 to 500 mm	PN - 8.0 (SDR 17)		
				40 to 500 mm	PN - 10 (SDR 13.6)		
				40 to 200 mm	PN 12.5 (SDR 11)		
				40 to 200 mm	PN 16 (SDR 9)		

Sr. No.	Name of Agency	Address/E-mail Address	Approved Sizes & Class			Approval Valid up to Date	Remarks
			Material Grade	Size (mm)	Class		
1	2	3	4	5	6	7	8
8	M/s. Krishna Plastics, Rajkot	Plot No. G-925, Kishan Gate, GIDC (Iodhika), Kalawad Road, Dist. Rajkot-360021 <b>info@sumolexpipe.com</b>	PE- 80	75 to 315 mm	PN - 2.5 (SDR 41)	12-07-2026	
				50 to 315 mm	PN - 4.0 (SDR 26)		
				50 to 315 mm	PN - 6.0 (SDR 17)		
				32 to 315 mm	PN - 8.0 (SDR 13.6)		
				25 to 315 mm	PN - 10 (SDR 11)		
				20 to 315 mm	PN 12.5 (SDR 9)		
				20 to 315 mm	PN 16 (SDR 7.4)		
			PE 100	20 to 315 mm	PN - 6.0 (SDR 21)		
				40 to 315 mm	PN - 8.0 (SDR 17)		
				32 to 315 mm	PN - 10 (SDR 13.6)		
				25 to 315 mm	PN 12.5 (SDR 11)		
				20 to 315 mm	PN 16 (SDR 9)		
				20 to 315 mm	PN 20 (SDR 7.4)		
9	M/s. Elegant Polymers, Surendranagar	Elegant Polymers, At-Navagam (Bamanbore), Survey No:- 96, Nr.- High School Taluka:- Chotila, Surendranagar. <b>sales@elegantdpepipe.com</b>	PE- 80	75 to 315 mm	PN - 2.5 (SDR 41)	12-07-2026	
				50 to 315 mm	PN - 4.0 (SDR 26)		
				32 to 315 mm	PN - 6.0 (SDR 17)		
				25 to 315 mm.	PN - 8.0 (SDR 13.6)		
				20 to 315 mm	PN - 10 (SDR 11)		
				20 to 315 mm	PN 12.5 (SDR 9)		
				20 to 315 mm	PN 16 (SDR 7.4)		
			PE 100	355 to 500 mm	PN - 5.0 (SDR 26)		
				40 to 500 mm	PN - 6.0 (SDR 21)		
				32 to 315 mm	PN - 8.0 (SDR 17)		
				25 to 315 mm	PN - 10 (SDR 13.6)		
				20 to 315 mm	PN 12.5 (SDR 11)		
				20 to 315 mm	PN 16 (SDR 9)		
10	M/s. Parixit Irrigation Limited, Ahmedabad	Survey NO. 214/1, 214/2, Virpura Bus Stop, P.O.Iyava, Ta. Sanand, Ahmedabad - 382 170 <b>prnagar@parixit.com, kamlesh.shah@parixit.com, priti.mistry@parixit.com</b>	PE-80	90 to 1000 mm	PN - 2.5 (SDR 41)	12-07-2026	
				50 to 1000 mm	PN - 4.0 (SDR 26)		
				32 to 450 mm & 800 to 1000 mm	PN - 6.0 (SDR 17)		
				32 to 180 mm	PN - 8.0 (SDR 13.6)		
				20 to 450 mm	PN - 10 (SDR 11)		
				20 to 180 mm	PN 12.5 (SDR 9)		
				20 to 450 mm	PN 16 (SDR 7.4)		
			PE-100	50 to 1000 mm	PN - 6.0 (SDR 21)		
				40 to 315 mm	PN - 8.0 (SDR 17)		
				32 to 500 mm & 800 mm	PN - 10 (SDR 13.6)		
				20 to 450 mm	PN 16 (SDR 9)		
11	M/s. Signet Industries Ltd., Dhar (MP)	Plot no. 462-465 , Sector-3, Industrial Area, Pithampur, Dhar, Madhya Pradesh <b>saurabh@groupsignet.com ashish.butani@groupsignet.com</b>	PE-80	200 to 500 mm	PN - 2.5 (SDR 41)	12-07-2026	
				200 to 500 mm	PN - 4.0 (SDR 26)		
				200 to 500 mm	PN - 6.0 (SDR 17)		
				200 to 500 mm	PN - 8.0 (SDR 13.6)		
				200 to 500 mm	PN - 10 (SDR 11)		
				20 to 450 mm	PN 12.5 (SDR 9)		
				20 to 400 mm	PN 16 (SDR 7.4)		
			PE-100	560 to 630 mm	PN - 3.0 (SDR 41)		
				560 to 630 mm	PN - 4.0 (SDR 33)		
				560 to 630 mm	PN - 5.0 (SDR 26)		
				20 to 630 mm	PN - 6.0 (SDR 21)		
				20 to 630 mm	PN - 8.0 (SDR 17)		
				20 to 630 mm	PN - 10 (SDR 13.6)		
				560 to 630 mm	PN 12.5 (SDR 11)		
				560 to 630 mm	PN 16 (SDR 9)		
				560 to 630 mm	PN 20 (SDR 7.4)		



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			Material Grade	Size (mm)	Class		
1	2	3	4	5	6	7	8
12	M/s. Shree TNB Polymers Limited, Silvassa	Sr. no. 132/1/1/4, Village:- Athal, Silvassa-396230, U.T. Of Dadra & Nagar Haveli & Daman & Diu <b>noblepolymers@gmail.com</b>	PE-80	90 to 630 mm	PN - 2.5 (SDR 41)	27-09-2026	
				50 to 630 mm	PN - 4.0 (SDR 26)		
				40 to 630 mm	PN - 6.0 (SDR 17)		
				32 to 500 mm	PN - 8.0 (SDR 13.6)		
				25 to 500 mm	PN - 10 (SDR 11)		
				20 to 400 mm	PN 12.5 (SDR 9)		
				20 to 315 mm	PN 16 (SDR 7.4)		
			PE 100	50 to 630 mm	PN - 6.0 (SDR 21)		
				40 to 500 mm	PN - 8.0 (SDR 17)		
				32 to 500 mm	PN - 10 (SDR 13.6)		
				25 to 400 mm	PN 12.5 (SDR 11)		
				20 to 315 mm	PN 16 (SDR 9)		
13	M/s. Kevin PVC Pipe Industries, Amreli	Survey No-299, Paaiki 1, Rajkot-Bhavnagar Highway Road, At Untvad-Ta-Babra-Dist-Amreli-365421 <b>info@kevinpvcpipe.com</b>	PE-80	32 to 110 mm	PN - 6.0 (SDR 17)	27-09-2026	
				32 to 110 mm	PN - 8.0 (SDR 13.6)		
				32 to 110 mm	PN - 10 (SDR 11)		
				20 to 110 mm	PN 12.5 (SDR 9)		
				20 to 110 mm	PN 16 (SDR 7.4)		
				20 to 110 mm	PN 20 (SDR 6)		
			PE 100	40 to 110 mm	PN - 6.0 (SDR 21)		
				32 to 110 mm	PN - 8.0 (SDR 17)		
				32 to 110 mm	PN - 10 (SDR 13.6)		
14	M/s. Kisan Moulding Ltd., Silvassa	Survey No. 108/1/6 Opp. Power Station, Surangi ROAD, Khadoli-Silvassa (UT of D&N) <b>rakesh.biyani@kisangro up.com</b> <b>maharashtra@kisangro up.com</b>	PE-80	90 to 250 mm	PN - 2.5 (SDR 41)	27-09-2026	
				50 to 250 mm	PN - 4.0 (SDR 26)		
				Up to 250 mm	PN - 6.0 (SDR 17)		
				32 to 250 mm	PN - 8.0 (SDR 13.6)		
				25 to 250 mm	PN - 10 (SDR 11)		
				125 to 180 mm	PN 12.5 (SDR 9)		
			PE 100	110 to 180 mm	PN 16 (SDR 7.4)		
				50 to 250 mm	PN - 6.0 (SDR 21)		
				40 to 250 mm	PN - 8.0 (SDR 17)		
				25 to 250 mm	PN - 10 (SDR 13.6)		
				125 to 250 mm	PN 12.5 (SDR 11)		
				110 to 180 mm	PN 16 (SDR 9)		
15	M/s. Delta Irrigation LLP, Kolhapur	Plot No. A-234, Kagal Five Star MIDC, Kolhapur-416236 <b>info@deltairrigat.in</b>	PE-80	75 to 710 mm	PN - 2.5 (SDR 41)	27-09-2026	
				75 to 710 mm	PN - 3.2 (SDR 33)		
				50 to 710 mm	PN - 4.0 (SDR 26)		
				40 to 710 mm	PN - 5 (SDR 21)		
				32 to 710 mm	PN - 6.0 (SDR 17)		
				25 to 710 mm	PN - 8.0 (SDR 13.6)		
				20 to 710 mm	PN - 10 (SDR 11)		
				20 to 500 mm	PN 12.5 (SDR 9)		
				20 to 500 mm	PN 16 (SDR 7.4)		
				20 to 500 mm	PN 20 (SDR 6)		
			PE 100	75 to 710 mm	PN - 3.0 (SDR 41)		
				75 to 710 mm	PN - 4.0 (SDR 33)		
				50 to 710 mm	PN - 5.0 (SDR 26)		
				40 to 710 mm	PN - 6.0 (SDR 21)		
				32 to 710 mm	PN - 8.0 (SDR 17)		
				25 to 710 mm	PN - 10 (SDR 13.6)		
				20 to 500 mm	PN 12.5 (SDR 11)		
				20 to 500 mm	PN 16 (SDR 9)		
				20 to 500 mm	PN 20 (SDR 7.4)		

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			Material Grade	Size (mm)	Class		
1	2	3	4	5	6	7	8
16	M/s. Sarovar Polymers Pvt. Ltd., Rajkot	M/s.Sarovar Polymers Pvt. Ltd., Rajkot 27/28, Atul Ind. Estate, Opp. Jyoti CNC, Kalawad Road, METODA GID, Rajkot. <a href="mailto:info@sarovarpolymers.com">info@sarovarpolymers.com</a>	PE 80	32 to 315 mm	PN - 6.0 (SDR 17)	27-09-2026	
				25 to 180 mm	PN - 8.0 (SDR 13.6)		
				20 to 180 mm	PN - 10 (SDR 11)		
				20 to 110 mm	PN 12.5 (SDR 9)		
				20 to 110 mm	PN 16 (SDR 7.4)		
			PE 100	40 to 315 mm	PN - 6.0 (SDR 21)		
				32 to 315 mm	PN - 8.0 (SDR 17)		
				25 to 315 mm	PN - 10 (SDR 13.6)		
				20 to 110 mm	PN 12.5 (SDR 11)		
				20 to 110 mm	PN 16 (SDR 9)		
17	M/s. Kothari Agritech Pvt. Ltd., Solapur	M/s. Kothari Agritech Pvt. Ltd., Solapur Plot No. 123 to 125, Chandramouli Ind. Co-op. Estate, Mohol, Dist. Solapur 413213 <a href="mailto:project.pipe@kotharigroupindia.com">project.pipe@kotharigroupindia.com</a> <a href="mailto:shailesh.thakkar@kotharigroupindia.com">shailesh.thakkar@kotharigroupindia.com</a>	PE 80	75 to 315 mm	PN - 2.5 (SDR 41)	27-09-2026	
				75 to 315 mm	PN - 3.2 (SDR 33)		
				50 to 315 mm	PN - 4.0 (SDR 26)		
				40 to 315 mm	PN - 5 (SDR 21)		
				40 to 315 mm	PN - 6.0 (SDR 17)		
				32 to 315 mm	PN - 8.0 (SDR 13.6)		
				25 to 315 mm	PN - 10 (SDR 11)		
				20 to 315 mm	PN 12.5 (SDR 9)		
			PE 100	20 to 315 mm	PN 16 (SDR 7.4)		
				50 to 315 mm	PN - 5.0 (SDR 26)		
				50 to 315 mm	PN - 6.0 (SDR 21)		
				40 to 315 mm	PN - 8.0 (SDR 17)		
				32 to 315 mm	PN - 10 (SDR 13.6)		
				25 to 315 mm	PN 12.5 (SDR 11)		
				20 to 315 mm	PN 16 (SDR 9)		
18	M/s. Vasani Polymers Pvt. Ltd., Talod	Survey No. 488/P & 519/P GIDC Talod Ta-Talod, Dist.- Sabarkantha-383215 <a href="mailto:project@vasanipolymer.com">project@vasanipolymer.com</a> <a href="mailto:vasanipvc@yahoo.com">vasanipvc@yahoo.com</a>	PE 80	75 to 450 mm	PN - 2.5 (SDR 41)	27-09-2026	
				75 to 450 mm	PN - 3.2 (SDR 33)		
				50 to 450 mm	PN - 4.0 (SDR 26)		
				40 to 450 mm	PN - 5 (SDR 21)		
				32 to 450 mm	PN - 6.0 (SDR 17)		
				25 to 450 mm	PN - 8.0 (SDR 13.6)		
				25 to 450 mm	PN - 10 (SDR 11)		
				16 to 450 mm	PN 12.5 (SDR 9)		
				16 to 450 mm	PN 16 (SDR 7.4)		
			PE 100	16 to 180 mm	PN 20 (SDR 6)		
				75 to 450 mm	PN - 3.0 (SDR 41)		
				75 to 450 mm	PN - 4.0 (SDR 33)		
				50 to 450 mm	PN - 5.0 (SDR 26)		
				40 to 450 mm	PN - 6.0 (SDR 21)		
				32 to 450 mm	PN - 8.0 (SDR 17)		
				25 to 450 mm	PN - 10 (SDR 13.6)		
				20 to 180 mm	PN 12.5 (SDR 11)		
				16 to 180 mm	PN 16 (SDR 9)		
				16 to 180 mm	PN 20 (SDR 7.4)		

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			Material Grade	Size (mm)	Class		
1	2	3	4	5	6	7	8
19	M/s. Nataraj Polyplast, Rajkot	Survey No- 156/157, Ribda-Lodhika Road, Nr. Makhavad Chokdi Makhavad (Rajkot)- 360035 <a href="mailto:natarajpolyplast@gmail.com">natarajpolyplast@gmail.com</a> <a href="mailto:dhaval@natarajpolyplast.com">dhaval@natarajpolyplast.com</a>	PE 80	90 to 450 mm	PN - 2.5 (SDR 41)	17-10-2026	
				50 to 450 mm	PN - 4.0 (SDR 26)		
				40 to 450 mm	PN - 6.0 (SDR 17)		
				32 to 450 mm	PN - 8.0 (SDR 13.6)		
				32 to 450 mm	PN - 10 (SDR 11)		
				32 to 90 mm	PN 12.5 (SDR 9)		
				50 to 90 mm	PN 16 (SDR 7.4)		
			PE 100	75 to 500 mm	PN - 3.0 (SDR 41)		
				75 to 500 mm	PN - 4.0 (SDR 33)		
				40 to 500 mm	PN - 6.0 (SDR 21)		
				32 to 500 mm	PN - 8.0 (SDR 17)		
				25 to 500 mm	PN - 10 (SDR 13.6)		
				20 to 500 mm	PN 12.5 (SDR 11)		
				16 to 500 mm	PN 16 (SDR 9)		
				16 to 500 mm	PN 20 (SDR 7.4)		
20	M/s. Miraj Pipes & Fittings Pvt. Ltd., Udaipur	Fac. Add:- Opp. Gangotri, Badi Thur Road, Feniyan Ka Guda, Udaipur (Rajasthan) <a href="mailto:sales.mpfpl@mirajgroup.in">sales.mpfpl@mirajgroup.in</a> <a href="mailto:haresh.chavda@mirajgroup.in">haresh.chavda@mirajgroup.in</a>	PE 80	90 to 180 mm	PN-2.5 (SDR 41)	10-01-2027	
				50 to 180 mm	PN-4.0 (SDR 26)		
				200 to 400 mm	PN-5.0 (SDR 21)		
				32 to 400 mm	PN-6.0 (SDR 17)		
				32 to 400 mm	PN-8.0 (SDR 13.6)		
				32 to 400 mm	PN-10.0 (SDR 11)		
				20 to 400 mm	PN-12.5 (SDR 9)		
				20 to 400 mm	PN-16.0 (SDR 7.4)		
			PE 100	75 to 200 mm	PN-3.0 (SDR 41)		
				75 to 200 mm	PN-4.0 (SDR 33)		
				50 to 400 mm	PN-5.0 (SDR 26)		
				40 to 400 mm	PN-6.0 (SDR 21)		
				32 to 400 mm	PN-8.0 (SDR 17)		
				25 to 400 mm	PN-10.0 (SDR 13.6)		
				20 to 50 mm	PN-12.5 (SDR 11)		
				20 to 50 mm	PN-16.0 (SDR 9)		
			PE 80	75 to 110 mm	PN-2.5 (SDR 41)		
				75 to 110 mm	PN-3.2 (SDR 33)		
				50 to 110 mm	PN-4.0 (SDR 26)		
				40 to 110 mm	PN-5.0 (SDR 21)		
				32 to 110 mm	PN-6.0 (SDR 17)		
				32 to 110 mm	PN-8.0 (SDR 13.6)		
				32 to 110 mm	PN-10.0 (SDR 11)		
				16 to 110 mm	PN-12.5 (SDR 9)		
				16 to 110 mm	PN-16.0 (SDR 7.4)		
				16 to 110 mm	PN-20.0 (SDR 6)		
21	M/s. GSK Industries Pvt. Ltd., Gandhinagar	Fac.Add:- Plot No 8A,8B & 9 No. Saibaba Ind. Esatate, Zak- Jalundra Road, Village Zak, Dehgam Gandhinagar- 382330, Gujarat <a href="mailto:mkt@gskirrigation.com">mkt@gskirrigation.com</a>	PE 80	75 to 315 mm	PN-3.0 (SDR 41)	10-01-2027	As per Letter no CE(M)/Mat./Vender Name Change/N-4/2023/677 Dated. 19/7/2023. Company name of Company has changed from M/s GSK Irrigation Private Limited to M/s GSK Industries Private Limited, Gandhinagar.
				75 to 315 mm	PN-4.0 (SDR 33)		
				50 to 315 mm	PN-5.0 (SDR 26)		
				40 to 315 mm	PN-6.0 (SDR 21)		
				32 to 315 mm	PN-8.0 (SDR 17)		
				32 to 315 mm	PN-10.0 (SDR 13.6)		
				20 to 110 mm	PN-12.5 (SDR 11)		
				16 to 110 mm	PN-16.0 (SDR 9)		
				16 to 110 mm	PN-20.0 (SDR 7.4)		
			PE 100	75 to 110 mm	PN-2.5 (SDR 41)		
				75 to 110 mm	PN-3.2 (SDR 33)		
				50 to 110 mm	PN-4.0 (SDR 26)		
				40 to 110 mm	PN-5.0 (SDR 21)		

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Sizes & Class			Approval Valid up to Date	Remarks
			Material Grade	Size (mm)	Class		
1	2	3	4	5	6	7	8
22	M/s Vishakha Renewables Pvt Ltd., Gandhinagar	Fac.Add:- Block No. 792, Sabaspur Road, Moti Bhoyan, Ta. Kalol, Dist. : Gandhinagar – 382721 E-mail:- <a href="mailto:rajivrraval@vishakha.com">rajivrraval@vishakha.com</a> <a href="mailto:krunal.chauhan@vishakha.com">krunal.chauhan@vishakha.com</a> <a href="mailto:dimple.pancholi@vishakh a.com">dimple.pancholi@vishakh a.com</a>	PE 80	90 to 110 mm	PN-2.5 (SDR 41)	26-05-2027	As per Letter no CE(M)/Mat./Vend er Name Change/N-5/2024/645 Dated. 28/8/2024. Company name has changed from M/s Vishakha Plastic Pipe Pvt. Ltd.to M/s Vishakha Renewables Pvt Ltd., Gandhinagar.
				63 to 110 mm	PN-4.0 (SDR 26)		
				63 to 125 mm	PN-6.0 (SDR 17)		
				125 mm	PN-8.0 (SDR 13.6)		
				125 mm	PN-10.0 (SDR 11)		
				20 to 125 mm	PN-12.5 (SDR 9)		
			PE 100	20 to 125 mm	PN-16.0 (SDR 7.4)		
				50 to 315 mm	PN-5.0 (SDR 26)		
				40 to 315 mm	PN-6.0 (SDR 21)		
				32 to 315 mm	PN-8.0 (SDR 17)		
				25 to 315 mm	PN-10.0 (SDR 13.6)		
				25 to 125 mm	PN-12.5 (SDR 11)		
				20 to 125 mm	PN-16.0 (SDR 9)		
23	M/s.Western Irrigation System Pvt.Ltd., Rajkot	Fac : Plot No. 16-19, Shivam Industrial Zone- 3, Chhapra, Kalawad Road, Rajkot Gujarat-360021 <b>Deep R Tarpara - 9909978440</b> <a href="mailto:westernhdpepipe@redif fmail.com">westernhdpepipe@redif fmail.com</a> <a href="mailto:info@westernispl.com">info@westernispl.com</a>	PE 80	40 to 500 mm	PN - 6.0 (SDR 17)	31-01-2029	
				40 to 500 mm	PN - 8.0 (SDR 13.6)		
				40 to 500 mm	PN - 10 (SDR 11)		
				40 to 180 mm	PN 12.5 (SDR 9)		
				225 to 500 mm			
				40 to 180 mm	PN 16 (SDR 7.4)		
				225 to 500 mm			
			PE 100	40 to 500 mm	PN - 6.0 (SDR 21)		
				40 to 500 mm	PN - 8.0 (SDR 17)		
				40 to 500 mm	PN - 10 (SDR 13.6)		
				40 to 180 mm	PN 12.5 (SDR 11)		
				225 to 500 mm			
				40 to 180 mm	PN 16 (SDR 9)		
225 to 500 mm							
24	M/s. Aerochem Piping Pvt. Ltd., Ahmedabad	Fac : Plot No. 258, Road No. 1/B, Phase – 1, Kathwada GIDC, Ahemdabad – 382430, Gujarat, INDIA <a href="mailto:info@aeropipes.in">info@aeropipes.in</a> , <a href="mailto:sales@parthvalves.com">sales@parthvalves.com</a> , <a href="mailto:md@parthvalves.com">md@parthvalves.com</a>	PE 80	90 to 315 mm	PN- 2.5 (SDR-41)	31-01-2028	
				50 to 315 mm	PN-4 (SDR-26)		
				40 to 315 mm	PN-6 (SDR-17)		
				32 to 315 mm	PN- 8 (SDR-13.6)		
				25 to 315 mm	PN- 10 (SDR-11)		
			PE 100	280 to 315 mm	PN- 4 (SDR- 33)		
				50 to 315 mm	PN- 6 (SDR-21)		
				40 to 315 mm	PN- 8 (SDR-17)		
				32 to 315 mm	PN- 10 (SDR-13.6)		
				25	M/s.Gayatri Polymers, Vyara		
25 to 110 mm	PN- 8 (SDR-13.6)						
20 to 110 mm	PN- 10 (SDR-11)						
PE 100	40 to 315 mm	PN- 6 (SDR-21)					
	32 to 315 mm	PN- 8 (SDR-17)					
	32 to 315 mm	PN- 10 (SDR-13.6)					

Sr. No.	Name of Agency	Address/E-mail Address	Approved Sizes & Class			Approval Valid up to Date	Remarks
			Material Grade	Size (mm)	Class		
1	2	3	4	5	6	7	8
26	M/s. Delta Irrigation India LLP, Kolhapur	Plot No. A-234, Kagal Five Star MIDC, Kolhapur-416236 <b>info@deltairrigation.in</b>	PE-80	63mm	PN - 4.0 (SDR 26)	31-02-2027	
			PE 100	180 to 1200mm	PN - 3.2 (SDR 41)		
				180 to 1200mm	PN - 4.0 (SDR 33)		
				63 to 1200mm	PN - 5.0 (SDR 26)		
				63 to 1200mm	PN - 6.0 (SDR 21)		
				63 to 1200mm	PN - 8.0 (SDR 17)		
				63 to 1200mm	PN - 10 (SDR 13.6)		
27	M/s. Darshan Pipe, Rajkot	Survey no 156p plot no 3, Nr. Shiv Shakti Hotel, Rajkot-Jamnagar Highway Ta-Paddhari, Dist. Rajkot - 360110 <b>Email :- darshanpipe@gmail.com</b>	PE 100	125 mm to 315 mm	PN- 5 (SDR- 26)	31-07-2027	
				40 mm to 315 mm	PN- 6 (SDR- 21)		
				32 mm to 315 mm	PN- 8 (SDR- 17)		
				32 mm to 315 mm	PN - 10 (SDR 13.6)		
				25 mm to 315 mm	PN- 12.5 (SDR- 11)		
				20 mm to 315 mm	PN- 16 (SDR- 9)		
				125 mm to 315 mm	PN-20 (SDR-7.4)		
			PE 80	125 mm to 315 mm	PN- 2.5 (SDR-41)		
				125 mm to 315 mm	PN-3.2 (SDR 33)		
				125 mm to 315 mm	PN - 4.0 (SDR 26)		
				125 mm to 315 mm	PN- 5 (SDR- 21)		
				32 mm to 315 mm	PN-6 (SDR-17)		
				32 mm to 315 mm	PN- 8 (SDR-13.6)		
				25 mm to 315 mm	PN- 10 (SDR-11)		
				20 mm to 315 mm	PN- 12.5 (SDR- 9)		
				20 mm to 315 mm	PN- 16 (SDR- 7.4)		
				125 mm to 315 mm	PN- 20 (SDR- 6)		
28	M/s. Balaji Polyplast, Paddhari, Rajkot.	Fac.Add:- Survey No. 693, Plot No.-1, Near Jivil Ploytech, Rajkot-Jamnagar Highway Road, AT: Metoda, Ta Paddhari, Dist: Rajkot- 360110. balaji_polyplast@yahoo.in sales@balajipolyplast.com	PE 80	32 To 315 MM	PN-6 (SDR-17)	28-01-2028	
				32 To 315 MM	PN- 8 (SDR-13.6)		
				32 To 315 MM	PN- 10 (SDR-11)		
				32 To 110 MM	PN- 12.5 (SDR- 9)		
			PE 100	40 To 315 MM	PN - 6.0 (SDR 21)		
				32 To 315 MM	PN - 8.0 (SDR 17)		
				32 To 315 MM	PN -10 (SDR 13.6)		
				32 To 315 MM	PN-12.5 (SDR- 11)		
				32 To 315 MM	PN- 16 (SDR- 9)		
				32 To 315 MM	PN-20 (SDR-7.4)		

Sr. No.	Name of Agency	Address/E-mail Address	Approved Sizes & Class			Approval Valid up to Date	Remarks
			Material Grade	Size (mm)	Class		
1	2	3	4	5	6	7	8
29	M/s. SAS Polymers Pvt. Ltd., Chhindwara-M.P.	<b>Office Add.</b> 2160, Swamipuram, C Wing office no. 110, 1st floor B/H S.P. College Ground, sadashiv peth pune - 411030 <b>Fact.Add.</b> MPIDG Industrial area, IGC, Sector J, Plot no J8 to J12 Behind Raymond factory, Khairitai Bargaon, Sausar, Chhindwara, MP-480108. <b>Email : -</b> <b>info@saspolymers.in</b>	PE 100	75 mm to 500 mm	PN- 3 (SDR- 41)	31-07-2027	
				75 mm to 500 mm	PN - 4.0 (SDR 33)		
				50 mm to 500 mm	PN - 5.0 (SDR 26)		
				40 mm to 500 mm	PN - 6.0 (SDR 21)		
				32 mm to 500 mm	PN - 8.0 (SDR 17)		
				25 mm to 500 mm	PN -10 (SDR 13.6)		
				20 mm to 500 mm	PN-12.5 (SDR- 11)		
				16 mm to 500 mm	PN- 16 (SDR- 9)		
				16 mm to 500 mm	PN-20 (SDR-7.4)		
			PE 80	75 mm to 500 mm	PN- 2.5 (SDR-41)		
				75 mm to 500 mm	PN-3.2 (SDR 33)		
				50 mm to 500 mm	PN - 4.0 (SDR 26)		
				40 mm to 500 mm	PN- 5 (SDR- 21)		
				32 mm to 500 mm	PN-6 (SDR-17)		
				25 mm to 500 mm	PN- 8 (SDR-13.6)		
				20 mm to 500 mm	PN- 10 (SDR-11)		
				16 mm to 500 mm	PN- 12.5 (SDR- 9)		
				16 mm to 500mm	PN- 16 (SDR- 7.4)		
				16 mm to 500mm	PN- 20 (SDR- 6)		
30	M/s. Kisan Irrigations & Infrastructure Limited	Unit -2 , Plot No. 91-110, Sector -3, Pithampur, Dist-Dhar (MP)-454 775 <b>rajesh.sharma@kisanirrigation.com</b> <b>rajsharma_kisan@yahoo.com</b> <b>customercare@kisanirrigation.com</b>	PE 80	20 to 400 mm	PN - 2.5 (SDR 41)	17-10-2026	
				20 to 400 mm	PN - 4.0 (SDR 26)		
				20 to 400 mm	PN - 6.0 (SDR 17)		
				20 to 400 mm	PN - 8.0 (SDR 13.6)		
				20 to 400 mm	PN - 10 (SDR 11)		
				20 to 200 mm	PN 12.5 (SDR 9)		
				20 to 200 mm	PN 16 (SDR 7.4)		
			PE 100	25 to 630 mm	PN - 3.0 (SDR 41)		
				25 to 630 mm	PN - 4.0 (SDR 33)		
				25 to 630 mm	PN - 5.0 (SDR 26)		
				25 to 630 mm	PN - 6.0 (SDR 21)		
				25 to 630 mm	PN - 8.0 (SDR 17)		
				25 to 630 mm	PN - 10 (SDR 13.6)		
				20 to 400 mm	PN 12.5 (SDR 11)		
				20 to 400 mm	PN 16 (SDR 9)		
31	M/s. Polyraj Pipes LLP., Indore	Rau-Pithampur Bypass, PO Rau, Indore - 453331 (M.P.) Praveen Agrawal - 7313530000, Umesh Dwivedi – 7470305000 marketing2@polyraj.com	PE 80	40 to 710 mm	PN - 6.0 (SDR 17)	31-01-2029	
				40 to 710 mm	PN - 8.0 (SDR 13.6)		
				40 to 710 mm	PN - 10 (SDR 11)		
				40 to 500 mm	PN 12.5 (SDR 9)		
				40 to 500 mm	PN 16 (SDR 7.4)		
			PE 100	40 to 710 mm	PN - 6.0 (SDR 21)		
				40 to 710 mm	PN - 8.0 (SDR 17)		
				40 to 710 mm	PN - 10 (SDR 13.6)		
				40 to 500 mm	PN 12.5 (SDR 11)		
				40 to 500 mm	PN 16 (SDR 9)		

Sr. No.	Name of Agency	Address/E-mail Address	Approved Sizes & Class			Approval Valid up to Date	Remarks
			Material Grade	Size (mm)	Class		
1	2	3	4	5	6	7	8
32	M/s. Mahashakti Plast, Ahmedabad	Plot no. 1, Mahashakti estate, Nr. Rajlakshmi plot, Bhavda, Ahmedabad - 382433, Gujarat, India. Dr. MahendraSinh Vaghela <b>Email : - mahashaktiplast.0607@gmail.com</b>	PE 80	32 To 110MM	PN- 10 (SDR-11)	31-07-2027	
				32 To 110MM	PN- 8 (SDR-13.6)		
				32 To 110MM	PN-6 (SDR-17)		
				40 To 110MM	PN- 5 (SDR- 21)		
				50 To 110MM	PN - 4.0 (SDR 26)		
				75 To 110 MM	PN-3.2 (SDR 33)		
				75 To 110 MM	PN- 2.5 (SDR-41)		
				125 To 400MM	PN- 2.5 (SDR-41)		
				125 To 400MM	PN-3.2 (SDR 33)		
				125 To 400MM	PN - 4.0 (SDR 26)		
				125 To 400MM	PN- 5 (SDR- 21)		
				125 To 400MM	PN-6 (SDR-17)		
				125 To 400MM	PN- 8 (SDR-13.6)		
				125 To 400MM	PN- 10 (SDR-11)		
				180 To 400MM	PN- 12.5 (SDR- 9)		
				180 To 400MM	PN- 16 (SDR- 7.4)		
				180 To 400MM	PN- 20 (SDR- 6)		
			PE 100	32 To 110MM	PN -10 (SDR 13.6)		
				32 To 110MM	PN - 8.0 (SDR 17)		
				40 To 100MM	PN - 6.0 (SDR 21)		
				50 To 110MM	PN - 5.0 (SDR 26)		
				75 To 110 MM	PN - 4.0 (SDR 33)		
				75 To 110 MM	PN- 3 (SDR- 41)		
				125 To 400MM	PN - 4.0 (SDR 33)		
				125 To 400MM	PN - 5.0 (SDR 26)		
				125 To 400MM	PN - 6.0 (SDR 21)		
				125 To 400MM	PN - 8.0 (SDR 17)		
				125 To 400MM	PN -10 (SDR 13.6)		
				180 To 400MM	PN-12.5 (SDR- 11)		
				180 To 400MM	PN- 16 (SDR- 9)		
				180 To 400MM	PN-20 (SDR-7.4)		
				90MM	PN-6.0 (SDR 21)		

Sr. No.	Name of Agency	Address/E-mail Address	Approved Sizes & Class			Approval Valid up to Date	Remarks
			Material Grade	Size (mm)	Class		
1	2	3	4	5	6	7	8
33	M/s.Time Technoplast Ltd., Silvassa	Fac : Survey No.: 326/ 1/ 1 (Part) & 328, Unit-2, Dhodharpada, Vilaage – Velugam, Silvassa – U.T of D & N.H.- 396230 <b>haresh@timetechnoplast.com, infra@timetechnoplast.com</b>	PE 80	90 to 1000 mm	PN- 2.5 (SDR-41)	31.01.2028	
				50 to 1000 mm	PN-4 (SDR-26)		
				40 to 1000 mm	PN-6 (SDR-17)		
				32 to 630 mm	PN- 8 (SDR-13.6)		
				25 to 630 mm	PN- 10 (SDR-11)		
				20 to 500 mm	PN- 12.5 (SDR- 9)		
				20 to 500 mm	PN- 16 (SDR- 7.4)		
			PE 100	75 to 500 mm	PN- 3 (SDR- 41)		
				75 to 500 mm	PN- 4 (SDR- 33)		
				50 to 1000 mm	PN- 6 (SDR-21)		
				40 to 800 mm	PN- 8 (SDR-17)		
				32 to 800 mm	PN- 10 (SDR-13.6)		
				25 to 500 mm	PN- 12.5 (SDR- 11)		
				20 to 500 mm	PN- 16 (SDR- 9)		
34	M/S. Kelvin Plastic private Limited, Rajkot	Survey No. 108/P, Nr. Toll Plaza, Rajkot-Gondal National Highway-27, At. Bhunava, Gondal, Rajkot- 360311 <b>mail@kelvinpipe.com kelvinpipe@gmail.com</b>	PE-80	75 to 630 mm	PN - 2.5(SDR 41)	25-10-2026	
				50 to 630 mm	PN - 4.0(SDR 26)		
				32 to 630 mm	PN - 6.0(SDR 17)		
				25 to 630 mm	PN - 8.0(SDR 13.6)		
				20 to 630 mm	PN - 10(SDR 11)		
				16 to 500 mm	PN 12.5(SDR 9)		
				16 to 500 mm	PN 16(SDR 7.4)		
			PE-100	75 to 200 mm	PN - 3.0(SDR 41)		
				75 to 200 mm	PN - 4.0(SDR 33)		
				40 to 630 mm	PN - 6.0 (SDR 21)		
				32 to 630 mm	PN - 8.0 (SDR 17)		
				25 to 630 mm	PN - 10 (SDR 13.6)		
				20 to 500 mm	PN 12.5 (SDR 11)		
				16 to 500 mm	PN 16 (SDR 9)		



Sr. No.	Name of Agency	Address/E-mail Address	Approved Sizes & Class			Approval Valid up to Date	Remarks
			Material Grade	Size (mm)	Class		
1	2	3	4	5	6	7	8
35	M/s. Vinayak Polypipes Pvt. Ltd., Talod	Survey no.-589, 590/2, Harsol-Ahmedabad Road, At & PO- Harsol, Talod, Sabarkantha <a href="mailto:vinayakpolypipes@gmail.com">vinayakpolypipes@gmail.com</a>	PE-80	75 to 500 mm	PN - 2.5 (SDR 41)	25-10-2026	
				75 to 500 mm	PN - 3.2 (SDR 33)		
				50 to 500 mm	PN - 4.0 (SDR 26)		
				40 to 500 mm	PN - 5.0 (SDR 21)		
				32 to 500 mm	PN - 6.0 (SDR 17)		
				25 to 500 mm	PN - 8.0 (SDR 13.6)		
				20 to 500 mm	PN - 10 (SDR 11)		
				16 to 500 mm	PN 12.5 (SDR 9)		
				16 to 500 mm	PN 16 (SDR 7.4)		
				16 to 500 mm	PN 20 (SDR 6)		
			PE-100	75 to 500 mm	PN - 3.0 (SDR 41)		
				75 to 500 mm	PN - 4.0 (SDR 33)		
				50 to 500 mm	PN - 5.0 (SDR 26)		
				40 to 500 mm	PN - 6.0 (SDR 21)		
				32 to 500 mm	PN - 8.0 (SDR 17)		
				25 to 500 mm	PN - 10 (SDR 13.6)		
				20 to 500 mm	PN 12.5 (SDR 11)		
				16 to 500 mm	PN 16 (SDR 9)		
				16 to 500 mm	PN 20 (SDR 7.4)		
36	M/s. Kataria Plastics Pvt. Ltd., Ratlam	39,44A, Industrial Area, Ratlam(457001) <a href="mailto:jeeten.kipl@gmail.com">jeeten.kipl@gmail.com</a>	PE-80	125 to 450 mm	PN - 2.5 (SDR 41)	25-10-2026	
				50 to 450 mm	PN - 4.0 (SDR 26)		
				40 to 630 mm	PN - 6.0 (SDR 17)		
				32 to 630 mm	PN - 8.0 (SDR 13.6)		
				25 to 630 mm	PN - 10 (SDR 11)		
				20 to 450 mm	PN 12.5 (SDR 9)		
				20 to 400 mm	PN 16 (SDR 7.4)		
			PE-100	50 to 630 mm	PN - 6.0 (SDR 21)		
				40 to 630 mm	PN - 8.0 (SDR 17)		
				32 to 630 mm	PN - 10 (SDR 13.6)		
				25 to 450 mm	PN 12.5 (SDR 11)		
				20 to 450 mm	PN 16 (SDR 9)		
37	M/S. Mayfair Polymers Pvt.Ltd., Himmatnagar	Mayfair Compound, N.H. No-8, Shamlaji Road, Nr. Sahkari jin, Himatnagar-383001, Gujarat <a href="mailto:smayfair50@gmail.com">smayfair50@gmail.com</a>	PE-80	40 to 140 mm	PN - 6.0 (SDR 17)	25-10-2026	
			PE-100	50 to 180 mm	PN - 6.0 (SDR 21)		
				32 to 160 mm	PN - 10 (SDR 13.6)		

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Sizes & Class			Approval Valid up to Date	Remarks
			Material Grade	Size (mm)	Class		
1	2	3	4	5	6	7	8
38	M/s. Dutron Polymers Limited, Kheda	Block No. 642, NH 8, At Hariyala, Kheda <a href="mailto:ales@dutronindia.com">ales@dutronindia.com</a>	PE-80	90 to 630 mm	PN - 2.5 (SDR 41)	25-10-2026	
				50 to 630 mm	PN - 4.0 (SDR 26)		
				40 to 500 mm	PN - 6.0 (SDR 17)		
				40 to 315 mm	PN - 8.0 (SDR 13.6)		
				25 to 315 mm	PN - 10 (SDR 11)		
				25 to 200 mm	PN 12.5 (SDR 9)		
			PE-100	50 to 630 mm	PN - 6.0 (SDR 21)		
				40 to 315 mm	PN - 8.0 (SDR 17)		
				32 to 630 mm	PN - 10 (SDR 13.6)		
				25 to 200 mm	PN 12.5 (SDR 11)		
39	M/S. ARON PIPES PVT.LTD., Surat	Block no.- 187, Plot No 1 to 21, Karanj, Kim- Mandvi highway, Mandvi, Surat- 394110 <a href="mailto:purchase.aron@gmail.com">purchase.aron@gmail.com</a> <a href="mailto:sales.aronpipes@gmail.com">sales.aronpipes@gmail.com</a>	PE-80	40 to 450 mm	PN - 5 (SDR 21)	25-10-2026	
				32 to 450 mm	PN - 6.0 (SDR 17)		
				25 to 450 mm	PN - 8.0 (SDR 13.6)		
				20 to 450 mm	PN - 10 (SDR 11)		
			PE-100	50 to 450 mm	PN - 5.0 (SDR 26)		
				40 to 450 mm	PN - 6.0 (SDR 21)		
				40 to 450 mm	PN - 8.0 (SDR 17)		
				40 to 450 mm	PN - 10 (SDR 13.6)		
40	M/S. Balson Polyplast PVT.LTD., Rajkot	R.S. No. 13/2 p1, Plot No. 4, NH 27, Opp. Sadak Pipaliya Gate, Village: Sadak Pipaliya, Ta: Gondal, Dist. Rajkot- 360 311 <a href="mailto:balsonpolyplast@yahoo.co.in">balsonpolyplast@yahoo.co.in</a>	PE-80	75 to 180 mm	PN - 2.5 (SDR 41)	25-10-2026	
				50 to 180 mm	PN - 4.0 (SDR 26)		
				32 to 110 mm	PN - 6.0 (SDR 17)		
				25 to 180 mm	PN - 8.0 (SDR 13.6)		
				20 to 110 mm	PN - 10 (SDR 11)		
				16 to 110 mm	PN 12.5 (SDR 9)		
			PE-100	40 to 180 mm	PN - 6.0 (SDR 21)		
				32 to 180 mm	PN - 8.0 (SDR 17)		
				25 to 110 mm	PN - 10 (SDR 13.6)		
				20 to 110 mm	PN 12.5 (SDR 11)		
				16 to 110 mm	PN 16 (SDR 9)		

**Note:- It is advisable to use this information as a reference only & kindly confirm it with concern authority before use.**

**GUJARAT WATER SUPPLY & SEWERAGE BOARD, GANDHINAGAR**

**List of Approved Vendors of GWSSB for supply of DWC (HDPE) Pipes (IS-16098 Part -2) with ISI mark as per Vendor Selection Report submitted by Different TPI (As on dt. 10.06.2026)**

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Sizes & Class		Approval Valid up to Date	Remarks
			Size (mm)	Class		
1	2	3	5	6	7	8
1	M/s. Jain Irrigation Systems Ltd., Jalgaon	Jain plastic Park, NH No. 6, Bambhori, Jalgaon,- 425001 (Maharashtra) <b>jisl@jains.com</b>	75 to 500 mm	SN: 4 & 8	12-07-2026	
2	M/s. Prince Pipes & Fittings Limited.,Silavasa	Survey No.53, Jayant Desai Marg, Vaghdara Road, Dadra & Nagar Haveli- 396191 <b>hrp@princepipes.com</b> <b>info@princepipes.com</b>	600 to 1200 mm	SN: 2	27-9-2026	
			75 to 1200 mm	SN : 4 & 8		
3	M/s. Signet Industries Limited, Dhar (MP)	Plot No- 462-465, Industrial Area, Sector-3, Pithampur Dist.- Dhar, M.P <b>saurabh@groupsignet.com</b> <b>ashish.butani@groupsignet.com</b>	75 to 500 mm	SN : 4 & 8	17-10-2026	
4	M/s. Astral Limited., Maharashtra	C.S. No. 190,191,192,193/1,193/2, 195/2,&196/3 Tasgaon-Miraj Road, Kanadwadi - 416306,Dist-Sangli, Maharastra <b>drex@astralpipes.com</b>	75 to 500 mm	SN : 4 ,8 & 16	18-03-2027	
			600 to 800 mm	SN: 2,4, 8 & 16		
5	M/s. Delta Irrigation India LLP, Kolhapur	Plot No. A-234, Kagal Five Star MIDC, Kolhapur-416236 <b>info@deltairrigation.in</b>	100 to 500 mm	SN 4	31-02-2027	
			100 to 500 mm	SN 8		
6	M/s. Alom Poly Extrusions Ltd. Kolkata	Alom Poly Extrusions Ltd. Baganagar, PS-FALTA, South 24 Paragnas Dist. WB-743513 <b>mkt@alom.in</b>	75 to 500 mm	SN : 4 & 8	17-10-2026	
			600 to 1000 mm	SN: 2,4 & 8		
7	M/s. Kiran Infra Tech., Jaipur	F 445 (F), F 441 (E), Road No. 12, Vishwakarma Industrial Area, Jaipur – 302013 Mr. Kapil Gemini – 9414061798, Mr. Vivek Verma – 9351136969 <b>sales@geminipipes.com</b> , <b>info@kiraninfraitech@gmail.com</b>	600 mm to 1000 mm	SN 2	31-01-2029	
			100 mm to 1000 mm (Excluding 125 & 225 mm)	SN 4		
			75 mm to 1000 mm (Excluding 125 & 225 mm)	SN 8		
			200 mm to 500 mm (Excluding 225 mm)	SN 16		



GUJARAT WATER SUPPLY & SEWERAGE BOARD, GANDHINAGAR						
List of Approved Vendors of GWSSB for supply of Ringfit UPVC Pipes (IS-4985) with ISI mark as per Vendor Selection Report submitted by Different TPI (As on dt. 10.06.2026)						
Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		Approval Valid up to Date	Remarks
			Size (mm)	Class		
1	2	3	4	5	6	7
1	M/s. Polysil Pipes, Silvassa	Survey no. 103/1/2 & Survey No. 101, Plot No. 18, Rakholi Industrial Estate, Village:- Rakholi, Silvassa-396230 <a href="mailto:sagarwal@tufropes.com">sagarwal@tufropes.com</a> <a href="mailto:rohit@tufropes.com">rohit@tufropes.com</a> <a href="mailto:qcqp@tufropes.com">qcqp@tufropes.com</a> <a href="mailto:polysilgujarat@polysilpipes.com">polysilgujarat@polysilpipes.com</a> <a href="mailto:ramkumar_silvpipe@yahoo.com">ramkumar_silvpipe@yahoo.com</a>	63 to 400 mm	Class II- 4.0 kg/cm2	09.08.2026	
			63 to 315 mm	Class III- 6.0 kg/cm2		
			63 to 315 mm	Class IV- 8.0 kg/cm2		
			63 to 315 mm	Class V- 10.0 kg/cm2		
2	M/s. Jain Irrigation Systems Ltd., Jalgaon	Jain Plastics Park, N.H. no. 6, P.O. Box 72, Bambhori, Jalgaon-425001, Maharastra <a href="mailto:jjsl@jains.com">jjsl@jains.com</a>	63 to 630 mm	Class II , III and IV ( 4, 6 and 8 kg/cm2)	12-7-2026	
3	M/s. Signet Industries Ltd., Dhar (MP)	Plot no. 462-465 , Sector-3, Industrial Area, Pithampur, Dhar, Madhya Pradesh <a href="mailto:saurabh@groupsignet.com">saurabh@groupsignet.com</a> <a href="mailto:ashish.butani@groupsignet.com">ashish.butani@groupsignet.com</a>	63 to 315 mm	Class II- 4.0 kg/cm2	12-7-2026	
			40 to 315 mm	Class III- 6.0 kg/cm2		
			25 to 315 mm	Class IV- 8.0 kg/cm2		
			63 to 160 mm	Class V- 10.0 kg/cm2		
4	M/s. Apollo Pipes Ltd., Uttar Pradesh	Plot (Khasra ) No. 2928 (JHA) & 2938, Dhoom Manikpur, Dadri, Dist. Gautam Budh Nagar, Uttar Pradesh <a href="mailto:jjyotikaul@apollopipes.com">jjyotikaul@apollopipes.com</a>	125 to 315 mm	Class II- 4.0 kg/cm2	12-7-2026	
			63 to 315 mm	Class III- 6.0 kg/cm2		
5	M/s. Sagar Polytechnik Ltd., Rajkot	Plot no. 109/110/111, Old highway, Bamnbore GIDC, Bamnbore, Chotila, Surendranagar <a href="mailto:projects@sagarpolymers.com">projects@sagarpolymers.com</a> <a href="mailto:denish@sagarpolymers.com">denish@sagarpolymers.com</a>	63 to 400 mm	Class II- 4.0 kg/cm2	12-7-2026	
			63 to 315 mm	Class III- 6.0 kg/cm2		
			63 to 315 mm	Class IV- 8.0 kg/cm2		
			63 to 315 mm	Class V- 10.0 kg/cm2		
6	M/s. Elegant Polymers, Surendranagar	At:- Navagam (Bamanbore) Survey No:- 96, Nr. High School Tal:- Chotila Surendranagar-363520 <a href="mailto:sales@eleganthdpepipe.com">sales@eleganthdpepipe.com</a>	63 to 315 mm	Class II- 4.0 kg/cm2	12-7-2026	
			40 to 315 mm	Class III- 6.0 kg/cm2		
7	M/s. Captain Pipes Ltd., Rajkot	Survey no.257, Plot No.23 to 28, NH-27, Shapar (Veraval), Rajkot <a href="mailto:info@captainpipes.com">info@captainpipes.com</a>	63 to 315 mm	Class II- 4.0 kg/cm2	12-7-2026	
			40 to 315 mm	Class III- 6.0 kg/cm2		
8	M/s. Milan Pipe Industries, Ahmedabad	Survey No. 114, Bavla-Sanand Road, Village:- Lodariyal, Bavla, Ahmedabad-382110 <a href="mailto:milanpipeind@gmail.com">milanpipeind@gmail.com</a>	63 to 400 mm	Class II- 4.0 kg/cm2	12-07-2026	
			63 to 400 mm	Class III- 6.0 kg/cm2		
9	M/s. Texmo Pipes & Products Ltd., Burhanpur (MP)	Khasara No.98, Bahadarpur Road, Burhanpur, Madhya Pradesh-450331 <a href="mailto:vijay.prasad@texmopipe.com">vijay.prasad@texmopipe.com</a>	63 to 315 mm	Class II- 4.0 kg/cm2	12-07-2026	
			63 to 315 mm	Class III- 6.0 kg/cm2		
			63 to 315 mm	Class IV- 8.0 kg/cm2		
			63 to 315 mm	Class V- 10.0 kg/cm2		
10	M/s. Sumo Polyplast Pvt. Ltd., Rajkot	Plot No. G-925, Kishan Gate, GIDC (Iodhika), Kalawad Road, At, Methoda Dist. Rajkot-360021 <a href="mailto:info@sumolexpipe.com">info@sumolexpipe.com</a> <a href="mailto:sumopoly@rediffmail.com">sumopoly@rediffmail.com</a>	63 to 200 mm	Class II- 4.0 kg/cm2	12-07-2026	
			63 to 200 mm	Class III- 6.0 kg/cm2		

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		Approval Valid up to Date	Remarks
			Size (mm)	Class		
1	2	3	4	5	6	7
11	M/s. Parixit Irrigation Limited, Sanand	Survey NO. 214/1, 214/2, Virpura Bus Stop, P.O.Iyava, Ta. Sanand, Ahmedabad - 382 170 <a href="mailto:anand.gandhi@parixit.com">anand.gandhi@parixit.com</a> , <a href="mailto:rgsuthar@parixit.com">rgsuthar@parixit.com</a> <a href="mailto:info@parixit.com">info@parixit.com</a>	63 to 315 mm	Class II- 4.0 kg/cm2	12-7-2026	
			63 to 315 mm	Class III- 6.0 kg/cm2		
12	M/s. Idol Plasto Pvt. Ltd., Rajkot	Rajkot Ahmedabad N.H. No. 8-B, Wankaner Chowkdi, Survey no.552, Opp. Kuvadava High School, Kuvadava, Rajkot-360 023 <a href="mailto:info@idolpipe.com">info@idolpipe.com</a> <a href="mailto:project@idolpipe.com">project@idolpipe.com</a>	63 to 315 mm	Class II- 4.0 kg/cm2	28-01-2028	
			63 to 315 mm	Class III- 6.0 kg/cm2		
13	M/s. Kisan Moulding Ltd., Silvassa	Survey No. 108/1/6 Opp. Power Station, Surangi ROAD, Khadoli-Silvassa (UT of D&N) <a href="mailto:rakesh.biyani@kisangroup.com">rakesh.biyani@kisangroup.com</a> <a href="mailto:maharashtra@kisangroup.com">maharashtra@kisangroup.com</a>	63 to 400 mm	Class II- 4.0 kg/cm2	27-09-2026	
			40 to 400 mm	Class III- 6.0 kg/cm2		
			63 to 400 mm	Class IV- 8.0 kg/cm2		
			25 to 400 mm	Class V- 10.0 kg/cm2		
			140 to 200 mm	Class VI- 12.5 kg/cm2		
14	M/s. Prince Pipes & Fittings Limited, Silvassa	Survey No.53, Jayant Desai Marg, Vaghdara Road, Dadra & Nagar Haveli- 396191 <a href="mailto:hrp@princepipes.com">hrp@princepipes.com</a> <a href="mailto:info@princepipes.com">info@princepipes.com</a>	63 to 315 mm	Class II- 4.0 kg/cm2	27-09-2026	
			63 to 315 mm	Class III- 6.0 kg/cm2		
			63 to 280 mm	Class V- 10.0 kg/cm2		
15	M/s. Flowkem Polyplast Pvt. Ltd., Gandhinagar	Survey/Block No. 417,418,419 Near Amba Hotel, New Mirzapur cut, Nr. Mirzapur, Ahmedabad, Indore Highway, Vill: Chamla, Tal : Dehgam, Gandhinagar, Gujarat- 387610 <a href="mailto:info@flowkempipes.com">info@flowkempipes.com</a> <a href="mailto:alpeshpatel@flowkempipes.com">alpeshpatel@flowkempipes.com</a>	63 to 110 mm	Class II- 4.0 kg/cm2	27-09-2026	
			63 to 315 mm	Class III- 6.0 kg/cm2		
16	M/s., Active Pipe Industries, Dhoraji	Near Railway Crossing, Junagadh road, DHORAJI-360410 <a href="mailto:activepipe@gmail.com">activepipe@gmail.com</a>	63 to 315 mm (Except 125 mm)	Class II- 4.0 kg/cm2	27-09-2026	
			63 to 315 mm (Except 125 mm)	Class III- 6.0 kg/cm2		
17	M/d. Bhumi PVC Pipe, Botad	Samdhiyala No-1, Botad-Bhavnagar Road, Ta-Botad, Botad-364710 <a href="mailto:bhumipvcpipe33@gmail.com">bhumipvcpipe33@gmail.com</a>	90 to 315mm	Class I- 2.5 kg/cm2	31-02-2027	
			63 to 315mm	Class II- 4.0 kg/cm2		
			40 to 315mm	Class III- 6.0 kg/cm2		
			25 to 315mm	Class IV- 8.0 kg/cm2		
			20 to 315mm	Class V- 10.0 kg/cm2		
18	M/ds. Godavari Pipes Pvt. Ltd., Rajkot	Survey No. 137/1, Veraval Padavla Main Road, Padavla, Rajkot-360024 <a href="mailto:godavari@waterflo.in">godavari@waterflo.in</a>	63 to 315 mm	Class II- 4.0 kg/cm2	27-09-2026	
			63 to 315 mm	Class III- 6.0 kg/cm2		
			63 to 315 mm	Class V- 10.0 kg/cm2		

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		Approval Valid up to Date	Remarks
			Size (mm)	Class		
1	2	3	4	5	6	7
19	M/s. Vasani Polymer Pvt. Ltd., Talod	Survey No. 488/P & 519/P GIDC Talod Ta-Talod, Dist.- Sabarkantha-3832 <a href="mailto:project@vasanipolymers.com">project@vasanipolymers.com</a> <a href="mailto:vasanipvc@yahoo.com">vasanipvc@yahoo.com</a>	125 to 400 mm	Class I- 2.5 kg/cm2	27-9-2026	
			63 to 400 mm	Class II- 4.0 kg/cm2		
			40 to 400 mm	Class III- 6.0 kg/cm2		
			25 to 400 mm	Class IV- 8.0 kg/cm2		
			20 to 400 mm	Class V- 10.0 kg/cm2		
			20 to 400 mm	Class VI- 12.5 kg/cm2		
20	M/s. Kothari Agritech Pvt. Ltd., Solapur	Plot No. 185-193 Chandramouli Ind. Coop estate Mohol Dist. Solapur 413213 <a href="mailto:project.pipe@kotharugroupindia.com">project.pipe@kotharugroupindia.com</a> , <a href="mailto:shailesh.thakkar@kotharigroupindia.com">shailesh.thakkar@kotharigroupindia.com</a>	63 to 315 mm	Class II- 4.0 kg/cm2	27-09-2026	
			40 to 315 mm	Class III- 6.0 kg/cm2		
			25 to 315 mm	Class IV- 8.0 kg/cm2		
			20 to 315 mm	Class V- 10.0 kg/cm2		
21	M/s. Kisan Irrigations & Infrastructure Limited	Unit -2 , Plot No. 91-110, Sector -3, Pithampur, Dist- Dhar (MP)-454 775 <a href="mailto:rajesh.sharma@kisanirrigation.com">rajesh.sharma@kisanirrigation.com</a> <a href="mailto:rajsharma_kisan@yahoo.com">rajsharma_kisan@yahoo.com</a> <a href="mailto:customercare@kisanirrigation.com">customercare@kisanirrigation.com</a>	63 to 400 mm	Class II- 4.0 kg/cm2	17-10-2026	
			40 to 315 mm	Class III- 6.0 kg/cm2		
			25 to 315 mm	Class IV- 8.0 kg/cm2		
			20 to 315 mm	Class V- 10.0 kg/cm2		
22	M/s. Miraj Pipes & Fittings Pvt. Ltd., Udaipur	Fac. Add:- Opp. Gangotri, Badi Thur Road, Feniyan Ka Guda, Udaipur (Rajasthan) <a href="mailto:sales.mpfp@mirajgroup.in">sales.mpfp@mirajgroup.in</a> <a href="mailto:hareesh.chavda@mirajgroup.in">hareesh.chavda@mirajgroup.in</a>	90 to 315 mm	Class I- 2.5 kg/cm2	10-01-2027	
			63 to 400 mm	Class II- 4.0 kg/cm2		
			40 to 400 mm	Class III- 6.0 kg/cm2		
			25 to 315 mm	Class IV- 8.0 kg/cm2		
			20 to 315 mm	Class V- 10.0 kg/cm2		
23	M/s. Borana Industries, Jodhpur	Fac. Add:- E- 39(B), Marudhar Industrial Area Basni iind Phase, Jodhpur, Rajsthan, India 342005 <a href="mailto:sales@boranaindustries.com">sales@boranaindustries.com</a>	63 to 315 mm	Class II- 4.0 kg/cm2	10-01-2027	
			63 to 315 mm	Class III- 6.0 kg/cm2		
			125 to 180 mm	Class IV- 8.0 kg/cm2		
24	M/S. Kothari Agritech Pvt. Ltd., Mehsana	Survey No. 269, Tintodan Road, A/p- Kukarwada, Tal- Vijapur, Dist- Mehsana, Gujarat- 382830 <a href="mailto:project.pipe@kotharigroupindia.com">project.pipe@kotharigroupindia.com</a>	63 to 315 mm	Class II- 4.0 kg/cm2	18-03-2027	
			40 to 315 mm	Class III- 6.0 kg/cm2		
			25 to 315 mm	Class IV- 8.0 kg/cm2		
			20 to 315 mm	Class V-10.0 kg/cm2		
25	M/s. Somnath Polyplast Pvt. Ltd., Mehsana	Plot No 88, Nirmal Industrial Park, Nr. Gozaria GIDC, Gozaria, Ta. & Dist. Mehsana <a href="mailto:somnathpipe164@gmail.com">somnathpipe164@gmail.com</a>	63 to 250 mm (Except 125 mm)	Class II- 4.0 kg/cm2	18-03-2027	
			40 to 250 mm (Except 125 mm)	Class III- 6.0 kg/cm2		
26	M/s Vishakha Renewables Pvt Ltd., Gandhinagar	Fac.Add:- Block No. 792, Sabaspur Road, Moti Bhoyan, Ta. Kalol, Dist. : Gandhinagar – 382721 E-mail:- <a href="mailto:rajivraval@vishakha.com">rajivraval@vishakha.com</a> <a href="mailto:krunal.chauhan@vishakha.com">krunal.chauhan@vishakha.com</a> <a href="mailto:dimple.pancholi@vishakha.com">dimple.pancholi@vishakha.com</a>	63 to 315 mm	Class II- 4.0 kg/cm2	26-05-2027	As per Letter no CE(M)/Mat./Vender Name Change/N-5/2024/645 Dated. 28/8/2024. Company name has changed from M/s Vishakha Plastic Pipe Pvt. Ltd.to M/s Vishakha
			63 to 315 mm	Class III- 6.0 kg/cm2		
			63 to 315 mm	Class IV- 8.0 kg/cm2		
			63 to 315 mm	Class V-10.0 kg/cm2		
27	M/s. Narmada PVC Pipe., Botad	Fac : 34, G.I.D.C, OPP – Trikon Khodiyar, Paliyad Road Botad-364710, Gujarat <a href="mailto:gambhavak@gmail.com">gambhavak@gmail.com</a>	63 to 250 mm (Except 125 mm)	Class II- 4.0 kg/cm2	31-01-2028	
			40 to 250 mm (Except 125 mm)	Class III- 6.0 kg/cm2		

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		Approval Valid up to Date	Remarks
			Size (mm)	Class		
1	2	3	4	5	6	7
28	M/s. Yogi Polyplast., Kheda	Fac : Survey no – 347, Sardar Nagar Industrial Estate, Saraswati Nagar, At. – Chhapra, Mahemdabad-387130, Kheda, Gujarat <a href="mailto:yogipolyplast@gmail.com">yogipolyplast@gmail.com</a>	63 to 315 mm (Except 125 mm)	Class II- 4.0 kg/cm <sup>2</sup>	31-01-2028	
			63 to 315 mm (Except 125 mm)	Class III- 6.0 kg/cm <sup>2</sup>		
29	M/s.Sahebpolyplast Private Limited, Palanpur	Fac : Survey No. 507, Chandisar - Kumbhalmer Road, Nr. Railway Crossing, Chandisar, Ta. – Palanpur. 385510 <a href="mailto:sahebpipes@gmail.com">sahebpipes@gmail.com</a> ,	63 to 315 mm	Class II- 4.0 kg/cm <sup>2</sup>	31-01-2028	
			40 to 315 mm	Class III- 6.0 kg/cm <sup>2</sup>		
30	M/s.Amardeep Pipes,Gandhinagar	843/3, Rakanpur village road, Rakanpur-382721, Ta. Kalol, Dist. Gandhinagar <a href="mailto:info@amardeeppipes.com">info@amardeeppipes.com</a>	63 to 200 mm (Except 125 mm)	Class III- 6.0 kg/cm <sup>2</sup>	31-01-2028	
31	M/s. Donga Watertech Pvt. Ltd., Ahmedabad	Plot No 3, Kailash industrial Estate, Opp. Essar Petrol Pump, Sanand – Viramgam highway, Eyava, Ta. Sanand, Dist. Ahmedabad.382170 <a href="mailto:rakesh@dongawatertech.com">rakesh@dongawatertech.com</a> <a href="http://www.dongawatertech.com">www.dongawatertech.com</a>	40 mm to 315 mm dia	Class III- (6.0 kg/cm <sup>2</sup> )	31-06-2026	
32	M/s. Sarathi Pipes India Pvt. Ltd., Gandhinagar	Survey no. 623, At.: Bhumli, Ta.: Dholka, Dist.: Ahmedabad, Bagodara-Tarapur Highway, Gujarat – 382230 <a href="mailto:tulsidholariya@gmail.com">tulsidholariya@gmail.com</a> <a href="mailto:info@sarathipipes.com">info@sarathipipes.com</a>	63 mm to 315 mm (Except 125 mm)	Class II (4.0 kg/cm <sup>2</sup> )	31-06-2026	
			40 mm to 315 mm (Except 125 mm)	Class III (6.0 kg/cm <sup>2</sup> )		
33	M/s. Kamdhenu Pipes, Rajkot	NH-27, Nr. Murkhadas Patiya, At.: Murkhada, Ta.: Upleta, Dist. Rajkot, Gujarat <a href="mailto:kamdhenupipe2011@gmail.com">kamdhenupipe2011@gmail.com</a> <a href="mailto:info@kamdhenupipe.com">info@kamdhenupipe.com</a> <a href="http://www.kamdhenupipe.com">www.kamdhenupipe.com</a>	125 to 315 mm	Class II (4.0 kg/cm <sup>2</sup> )	31-06-2026	
			63 mm to 315 mm	Class III (6.0 kg/cm <sup>2</sup> )		
			63 mm to 315 mm	Class IV (8.0 kg/cm <sup>2</sup> )		
			63 mm to 315 mm	Class V (10.0 kg/cm <sup>2</sup> )		
34	M/s. Shree Ram Industries	Survey No. 13, Block No. 23, Plot no. 25-36, kim-Mandvi Road, Karanj, Ta.- Mandvi, Surat- 394110 <a href="mailto:shrirami@yahoo.com">shrirami@yahoo.com</a>	63 mm to 315 mm	Class II (4.0 kg/cm <sup>2</sup> )	31-06-2026	
			40 mm to 315 mm	Class III (6.0 kg/cm <sup>2</sup> )		
35	M/s. Standard Pipes Techniques, Gandhinagar	Plot No. – 112/P & 113/P, B/H Binal, Air Systems, Opp. Shri Harihar Mahadev Mandir Road, At-Santej Ta.- Kalol, Dist.- Gandhinagar - 382721 <a href="mailto:Standardpipes.tech@gmail.com">Standardpipes.tech@gmail.com</a> <a href="http://www.standardpipes.com">www.standardpipes.com</a>	63 mm to 315 mm	Class II (4.0 kg/cm <sup>2</sup> )	30.06.2028	
			40 mm to 315 mm	Class III (6.0 kg/cm <sup>2</sup> )		
36	M/s. OM Irritech Ltd, Rajkot	Reg. off. & Factory Add: "OM Drip" Survey no 36, Behind Emberald Club, Nr Shivam- 2, Kalawad Road to Devda Road Village Devda, Ta- Lodhika, Dist.- Rajkot-360021 <a href="mailto:omirri2003@hotmail.com">omirri2003@hotmail.com</a>	63 to 315 mm	Class II- 4.0 kg/cm <sup>2</sup>	31-02-2027	
			63 to 315 mm	Class III- 6.0 kg/cm <sup>2</sup>		



Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		Approval Valid up to Date	Remarks
			Size (mm)	Class		
1	2	3	4	5	6	7
37	M/s. Golden PVC Industries, Botad	Reg. off. & Factory Add: Plot no. 3-4, Botad Bhavnagar Highway, Nr. India Petrol Pump, At: Lathidad, Ta.Dist. Botad' 354710 <a href="mailto:info@goldenpvcindustries.com">info@goldenpvcindustries.com</a> <a href="http://www.goldenpvcindustries.com">www.goldenpvcindustries.com</a>	63 to 250 mm	Class II- 4.0 kg/cm <sup>2</sup>	13-03-2027	
			40 to 250 mm	Class III- 6.0 kg/cm <sup>2</sup>		
38	M/s. Kevin PVC Pipe Industries, Amreli	Suruey no 299, Paiki 1, Ralkot- Bhavnagar Highway Road, At Untvad, Tal. Babra, Dist. Amrell - 365421 <a href="mailto:info@kevinpvcpipe.com">Email : info@kevinpvcpipe.com</a>	63 mm to 315 mm (Except 125 mm)	Class II (4.0 kg/cm <sup>2</sup> )	31-07-2027	
			63 mm to 315 mm	Class III (6.0 kg/cm <sup>2</sup> )		
			25 mm to 315 mm	Class IV (8.0 kg/cm <sup>2</sup> )		
			20 mm to 315 mm	Class V (10.0 kg/cm <sup>2</sup> )		
			20 mm to 315 mm	Class VI (12.5 kg/cm <sup>2</sup> )		
39	M/s. Atlas Pipes, Surat	Plot no 111-112, Sukhram Industrial Estate, Velanja Hazira Road, Umra, Surat - 394130. <a href="mailto:atlaspipes123@gmail.com">atlaspipes123@gmail.com</a>	63 mm to 200 mm	Class III (6.0 kg/cm <sup>2</sup> )	31-07-2027	
40	M/s. Rewa Polymers, Jabalpur	Plot no 77, Industrial Area , Richhai, Jabalpur - 482010, M.P. <a href="mailto:rewa_polymers@yahoo.com">rewa_polymers@yahoo.com</a> , <a href="mailto:rewapolymers20@gmail.com">rewapolymers20@gmail.com</a>	90 mm to 200 mm	Class I (2.0 kg/cm <sup>2</sup> )	31-07-2027	
			63 mm to 200 mm	Class II (4.0 kg/cm <sup>2</sup> )		
			40 mm to 200 mm	Class III (6.0 kg/cm <sup>2</sup> )		
			40 mm to 110 mm	Class V (10.0 kg/cm <sup>2</sup> )		
41	M/s. Kachnar Polymers Pvt Ltd., Jabalpur	18/1-2, Village- Kheri, Katangi Main Road, Beside state bank of india, Belkhadu Branch, Tehsil Panagar, Dist. Jabalpur, M.P. <a href="mailto:kachnarpolymers@gmail.com">kachnarpolymers@gmail.com</a>	110 mm to 315 mm	Class II (4.0 kg/cm <sup>2</sup> )	31-07-2027	
			110 mm to 315 mm	Class III (6.0 kg/cm <sup>2</sup> )		
			110 mm to 315 mm	Class V (10.0 kg/cm <sup>2</sup> )		
42	M/s. Roshan Pipe Industries, Gojaria	Plot no. 44-45, Nirmal Industrial park, Gozaria Ta. & Dist. - Mehsana Gujarat. <a href="mailto:roshanpipeindustries@gmail.com">roshanpipeindustries@gmail.com</a>	63 mm to 315 mm (Except 125 mm)	Class II (4.0 kg/cm <sup>2</sup> ) & Class III (6.0 kg/cm <sup>2</sup> )	31-07-2027	
43	M/s. I.M.F. Polymer LLP, Ahmedabad	Office Add. 603-605,B-Block, 6th floor, ATMA house, Nr. Times of India, opp. Old RBI, Ashram Road, Navrangpura, Ahmedabad, Gujarat -380009. Fact. Add. Survey no. 182P to 185P, Sanand- Bawla road, Ta. Sanand, Dist. Ahmedabad - 382220 Email : <a href="mailto:sabarent@gmail.com">sabarent@gmail.com</a>	63 mm to 315 mm	Class II (4.0 kg/cm <sup>2</sup> )	31-07-2027	
			40 mm to 315 mm	Class III (6.0 kg/cm <sup>2</sup> )		
			25 mm to 315 mm	Class IV (8.0 kg/cm <sup>2</sup> )		
			20 mm to 315 mm	Class V (10.0 kg/cm <sup>2</sup> )		
			20 mm to 315 mm	Class VI (12.5 kg/cm <sup>2</sup> )		
44	M/s. Vivon polymers Pvt.Ltd.,Surat.	Fac.Add:- R.S.no./Block No-593, Shivalay Ind., N/H-Khodiya petrol Pump, N.H.No.08, Kosamba, Mangrol,Surat, Gujarat- 394210.	63 to 315mm	Class II (4.0 kg/cm <sup>2</sup> )	28-01-2028	
			63 to 315mm	Class III (6.0 kg/cm <sup>2</sup> )		

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		Approval Valid up to Date	Remarks
			Size (mm)	Class		
1	2	3	4	5	6	7
45	M/s. Infinity Enterprise, Kalol	Plot No. 225, Dantali Industrial Estate, Near Icemake Factory, Dantali GIDC, Ta: Kalol, Dist: Gandhinagar. <a href="mailto:infinityenterprise0106@gmail.com">infinityenterprise0106@gmail.com</a>	63 to 250 mm	Class II- 4.0 kg/cm2	18-03-2027	
			40 to 250 mm	Class III- 6.0 kg/cm2		
46	M/s. Rajeshri Pipe Industries LLP., BK	Plot no 7 to 10, Survey no 563 P1, Old S. 75P1, Opp. Rajaram cold storage, Deesa-Dhanera Highway, Deesa, Banaskantha - 385535, Gujarat Shantibhai Mali 9780102444, 8141943696 <a href="mailto:info@rajeshripipeindustries.com">info@rajeshripipeindustries.com</a> , <a href="mailto:technical@rajeshripipeindustries.com">technical@rajeshripipeindustries.com</a>	63 mm to 200 mm	Class II- 4.0 kg/cm2	31-01-2029	
			40 mm to 200 mm	Class III- 6.0 kg/cm2		
47	M/s. Aroma Plasto Technique., BK	NH-27, Deesa-Palanpur Highway, Opp. Green wood Hotel, Badarpura (Khodla), Palanpur-385510, Banaskantha - Gujarat Rameshbhai Salvi - 8000820364, <a href="mailto:aromapipes@gmail.com">aromapipes@gmail.com</a>	63 mm to 315 mm	Class II- 4.0 kg/cm2	31-01-2029	
			63 mm to 315 mm	Class III- 6.0 kg/cm2		
48	M/S. Kelvin Plastic private Limited, Rajkot	Survey No. 108-p, Near Toll Plaza, Rajkot- Gondal NH-27 At. Bhunava, Taluka: Gondal Dist. Rajkot. <a href="mailto:mail@kelvinpipe.com">mail@kelvinpipe.com</a> <a href="mailto:kelvinpipe@gmail.com">kelvinpipe@gmail.com</a>	90 to 400 mm	Class I- 2.5 kg/cm2	25-10-2026	
			63 to 400 mm	Class II- 4.0 kg/cm2		
			40 to 400 mm	Class III- 6.0 kg/cm2		
			25 to 315 mm	Class IV- 8.0 kg/cm2		
			20 to 315 mm	Class V- 10.0 kg/cm2		
			20 to 250 mm	Class VI- 12.5 kg/cm2		
49	M/s. Dolphin Polyplast Pvt. Ltd., Rajkot	Unit 2- Survey No. 51, Plot No. 1 & 2, Khirasara to Sarapdad Road, Opp. Nilkanth paper Mill, Ta- Paddhari, Dist. Rajkot, Nani Amreli-360110 <a href="mailto:info@dolphinpipe.com">info@dolphinpipe.com</a>	63 to 315 mm	Class II- 4.0 kg/cm2	25-10-2026	
			40 to 315 mm	Class III- 6.0 kg/cm2		
50	M/s. Vinayak Polypipes Pvt. Ltd., Talod	Survey no.-589, 590/2, Harsol-Ahmedabad Road, At & PO- Harsol, Talod, Sabarkantha <a href="mailto:vinayakpolypipes@gmail.com">vinayakpolypipes@gmail.com</a>	90 to 400 mm	Class I- 2.5 kg/cm2	25-10-2026	
			63 to 400 mm	Class II- 4.0 kg/cm2		
			40 to 400 mm	Class III- 6.0 kg/cm2		
			25 to 400 mm	Class IV- 8.0 kg/cm2		
			20 to 400 mm	Class V- 10.0 kg/cm2		
51	M/s. Duke Pipes Pvt. Ltd., Palanpur	Survey No:- 365/1, At & post: Chadotar, Gadh Road, Ta- Palanpur, Dist-Banaskantha, Gujarat (India)-385001 <a href="mailto:bvpatel@dukepipes.com">bvpatel@dukepipes.com</a> <a href="mailto:projects@dukepipes.com">projects@dukepipes.com</a>	63 to 400 mm	Class II- 4.0 kg/cm2	25-10-2026	
			63 to 400 mm	Class III- 6.0 kg/cm2		
			125 to 400 mm	Class IV- 8.0 kg/cm2		
			63 to 400 mm	Class V- 10.0 kg/cm2		
			20 to 400 mm	Class VI- 12.5 kg/cm2		
52	M/s. Kataria Plastics Pvt. Ltd., Ratlam	39,44A, Industrial Area, Ratlam-457001 <a href="mailto:jeeten.kipl@gmail.com">jeeten.kipl@gmail.com</a>	63 to 315 mm	Class II- 4.0 kg/cm2	25-10-2026	
			40 to 315 mm	Class III- 6.0 kg/cm2		
			20 to 315 mm	Class V- 10.0 kg/cm2		
53	M/S. Swastik Krushi Polypipes Pvt.Ltd., Gandhinagar	Plot No. 314, Zak Industrial Area, Vahelal Road, Vill-Zak, Post Pardhol, Tal-Dahegam, Dist-Gandhiangar 382330 <a href="mailto:swastikpipe@yahoo.com">swastikpipe@yahoo.com</a>	63 to 250 mm	Class II- 4.0 kg/cm2	25-10-2026	
			63 to 250 mm	Class III- 6.0 kg/cm2		
			63 to 200 mm	Class V- 10.0 kg/cm2		

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		Approval Valid up to Date	Remarks
			Size (mm)	Class		
1	2	3	4	5	6	7
54	M/S. Vimco Pipe, Mehsana	219, Phase1, GIDC, Nr. Nagalpur Collage, Mehsana <b>vimcopipes@gmail.com</b>	63 to 355 mm	Class II- 4.0 kg/cm2	25-10-2026	
			40 to 315 mm	Class III- 6.0 kg/cm2		
			20 to 315 mm	Class V- 10.0 kg/cm2		
55	M/S. Kankai Pipes & Fittings Pvt.Ltd., Rajkot	Survey No. 97, Palki 4, Padadhari Morbi road, Village- ukarda, Ta-Rajkot 360110 <b>projects@kankaipipes.com</b>	63 to 315 mm	Class II- 4.0 kg/cm2	25-10-2026	
			63 to 315 mm	Class III- 6.0 kg/cm2		
56	M/S. Mayfair Polymers Pvt.Ltd., Himmatnagar	Mayfair Compund, N.H. No-8, Shamlaji Road, Nr. Sakhari jin, Himatnagar-383001, Gujarat <b>smayfair50@gmail.com</b>	90 to 315 mm (Except 125 mm)	Class II- 4.0 kg/cm2	25-10-2026	
			63 to 315 mm	Class III- 6.0 kg/cm2		
			90 to 250 mm (Except 125 mm)	Class V- 10.0 kg/cm2		
57	M/s. Dutron Polymers Limited., Kheda	Block No. 642, NH 8, At Hariyala, Kheda <b>sales@dutronindia.com</b>	63 to 400 mm	Class II- 4.0 kg/cm2	25-10-2026	
			63 to 315 mm	Class III- 6.0 kg/cm2		
58	M/S. ARON PIPES PVT.LTD., Surat	Block no.- 187, Plot No 1 to 21, Karanj, Kim- Mandvi highway, Mandvi, Surat-394110 <b>purchase.aron@gmail.com</b> <b>sales.aronpipes@gmail.com</b>	90 to 315 mm	Class I- 2.5 kg/cm2	25-10-2026	
			63 to 400 mm	Class II- 4.0 kg/cm2		
			40 to 315 mm	Class III- 6.0 kg/cm2		
			20 to 315 mm	Class V- 10.0 kg/cm2		
59	M/S. Balson Polyplast PVT.LTD., Rajkot	R.S. No. 13/2 p1, Plot No. 4, NH 27, Opp.Sadak Pipaliya Gate, Village: Sadak Pipaliya, Ta: Gondal,Dist. Rajkot- 360 311 <b>balsonnolynplast@yahoo.co.in</b>	90 to 315 mm	Class I- 2.5 kg/cm2	25-10-2026	
			63 to 315 mm	Class II- 4.0 kg/cm2		
			40 to 315 mm	Class III- 6.0 kg/cm2		

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GUJARAT WATER SUPPLY & SEWERAGE BOARD, GANDHINAGAR						
List of Approved Vendors of GWSSB for supply of uPVC Screen & Casing Pipes (IS-12818) with ISI mark as per Vendor Selection Report submitted by Different TPI (As on dt. 10.06.2026)						
Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		Approval Valid up to Date	Remarks
			Size (mm) (NM)	Class		
1	2	3	4	5	6	7
1	M/s. Jain Irrigation Systems Ltd., Jalgaon	Jain Plastics Park, N.H. no. 6, P.O. Box 72, Bambhori, Jalgaon-425001, Maharastra <a href="mailto:jisl@jains.com">jisl@jains.com</a>	35 to 400 mm	CM	12-7-2026	
			150 to 400 mm	CS		
			35 to 400 mm	RMS		
			100 to 400 mm	RDS		
2	M/s. Apollo Pipes Ltd., Uttar Pradesh	Plot (Khasra ) No. 2928 (JHA) & 2938, Dhoom Manikpur, Dadri, Dist. Guatam Budh Nagar, Uttar Pradesh <a href="mailto:jyotikaul@apollopipes.com">jyotikaul@apollopipes.com</a>	40 to 300 mm (Except 115 mm)	CM	12-7-2026	
			150 to 300 mm	CS		
			200 to 300 mm	CD		
			50 to 250 mm (Except 115 mm)	RSP		
3	M/s. Milan Pipe Industries, Ahmedabad	Survey No. 114, Bavla-Sanand Road, Village:- Lodariyal, Bavla, Ahmedabad-382110 <a href="mailto:milanpipeind@gmail.com">milanpipeind@gmail.com</a>	100 to 300 mm	CM	12-7-2026	
			150 to 300 mm	CS		
			100 to 300 mm	CD		
4	M/s. Prince Pipes & Fittings Limited, Silavasa	Survey No.53, Jayant Desai Marg, Vaghdara Road, Dadra & Nagar Haveli-396191 <a href="mailto:hrp@princepipes.com">hrp@princepipes.com</a> <a href="mailto:info@princepipes.com">info@princepipes.com</a>	40 to 250 mm	CM	27-09-2026	
			150 to 250 mm	CS		
			40 to 250 mm	RS		
5	M/s. Vasani Polymer Pvt. Ltd., Talod	Survey No. 488/P & 519/P GIDC Talod Ta-Talod, Dist.- Sabarkantha-3832 <a href="mailto:project@vasanipolymers.com">project@vasanipolymers.com</a> <a href="mailto:vasanipvc@yahoo.com">vasanipvc@yahoo.com</a>	35 to 250 mm (Except 40, 50, & 115 mm)	CM	27-09-2026	
			150 to 250 mm	CS		
			35 to 400 mm	RMS		
6	M/s. Signet Industries Limited	Plot No- 462-465, Industrial Area, Sector-3, Pithampur Dist.Dhar,MP <a href="mailto:saurabh@groupsignet.com">saurabh@groupsignet.com</a> <a href="mailto:ashish.butani@groupsignet.com">ashish.butani@groupsignet.com</a>	100 to 200 mm (Except 115 mm)	CM	17-10-2026	
			150 to 200 mm	CS		

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		Approval Valid up to Date	Remarks
			Size (mm) (NM)	Class		
1	2	3	4	5	6	7
7	M/s.Sahebpolyplast Private Limited, Palanpur	Fac : Survey No. 507, Chandisar - Kumbhalmer Road, Nr. Railway Crossing, Chandisar, Ta. – Palanpur. 385510 <a href="mailto:sahebpipes@gmail.com">sahebpipes@gmail.com</a>	150 to 300 mm	CS	31-01-2028	
			100 to 300 mm	CM		
			100 to 300 mm	CD		
8	M/s. Standard Pipes Techniques, Gandhinagar	Plot No. – 112/P & 113/P, B/H Binal Air Systems, Opp. Shri Harihar Mahadev Mandir Road, At-Santej Ta.- Kalol, Dist.- Gandhinagar - 382721 <a href="mailto:Standardpipes.tech@gmail.com">Standardpipes.tech@gmail.com</a> <a href="http://www.standardpipes.com">www.standardpipes.com</a>	150 mm to 400 mm	CS	30.06.2028	
			100 mm to 400 mm	CM		
			100 mm to 400 mm	CD		
9	M/s. Idol Plasto Pvt. Ltd., Rajkot	Rajkot Ahmedabad N.H. No. 8-B, Wankaner Chowkdi, Survey no.552, Opp. Kuvadava High School, Kuvadava, Rajkot- 360 023 <a href="mailto:info@idolpipe.com">info@idolpipe.com</a> <a href="mailto:project@idolpipe.com">project@idolpipe.com</a>	150 to 280mm	CS	28-01-2028	
			63 to 280mm	CM		
			100 to 280mm	CD		
10	M/s. Vivon polymers Pvt.Ltd.,Surat.	Fac.Add.:- R.S.no./Block No-593, Shivalay Ind., N/H-Khodiyar petrol Pump, N.H.No.08, Kosamba, Mangrol,Surat, Gujarat-394210.	150 to 315 mm	CS	18-01-2028	
			100 to 315 mm	CM		
11	M/s. Kevin PVC Pipe Industries, Babra, Amreli.	Fac. Add.:- Survey No. 299, Paiki 1, Rajkot-Bhavnagar Highway Road, At: Untvad Ta: Babra, Dist Amreli. <a href="mailto:Info@kevinpvcpipe.com">Info@kevinpvcpipe.com</a> , <a href="http://www.kevinpvcpipe.com">www.kevinpvcpipe.com</a>	150 to 175mm	CS	28-01-2028	
			125 to 200 mm	CM		
12	M/s. Aroma Plasto Technique., BK	NH-27, Deesa-Palanpur Highway, Opp. Green wood Hotel, Badarpura (Khodla), Palanpur-385510, Banaskantha - Gujarat Rameshbhai Salvi – 8000820364, <a href="mailto:aromapipes@gmail.com">aromapipes@gmail.com</a>	150 to 300 mm	CS	31-01-2029	
			100 to 300 mm	CM		

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		Approval Valid up to Date	Remarks
			Size (mm) (NM)	Class		
1	2	3	4	5	6	7
13	M/s. Duke Pipes Pvt. Ltd., Palanpur	Survey No:- 365/1, At & post: Chadotar, Gadh Road, Ta- Palanpur, Dist- Banaskantha, Gujarat (India)-385001 <b>bvpatel@dukepipes.com</b> <b>projects@dukepipes.com</b>	150 to 400 mm	CS	25-10-2026	
			35 to 400 mm	CM		
			100 to 400 mm	CD		
			200 to 400 mm	PMS		
			200 to 400 mm	PDS		
			35 to 400 mm	RMS		
			100 to 400 mm	RDS		

**Note:- It is advisable to use this information as a reference only & kindly confirm it with concern authority before use.**

GUJARAT WATER SUPPLY & SEWERAGE BOARD, GANDHINAGAR					
List of Approved Vendors of GWSSB for supply of MILD STEEL (M.S.) Pipes (IS 3589) with ISI mark as per Vendor Selection Report submitted by Different TPI (As on dt. 10.06.2026)					
Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Thickness	Approval Valid up to Date	Remarks
1	2	3	4	5	6
1	M/s. Jindal Saw Ltd., Kutch	Integrated Pipe Unit (PIU), Vill: Samaghoda, Paragpar- Mandvi Road, Tal: Mundra, Dist: Kutch-370415 <a href="mailto:mspipes@jindalsaw.com">mspipes@jindalsaw.com</a>	M.S. Pipe With ISI mark:- IS 3589: Pipe size 457 mm to 2540 mm IS 5504: Pipe size 457 mm to 3250 mm	25.10.2026	
2	M/s. Welspun Corp Limited, Kutch	Welspun Corp Limited Welspun City, Village-Versamedi, Taluka-Anjar, Dist. Kutch, Gujarat-370110, India <a href="mailto:harshit_shah@welspun.com">harshit_shah@welspun.com</a>	M.S. Pipe With ISI mark:- IS 3589: Pipe size 168.3 mm to 2540 mm IS 5504: 610 mm to 3250 mm	27-9-2026	
3	M/s. Surya Roshni Ltd., Kutch	Survey No. 188 Anjar Mundra Road Village-Bhuvad Ta.Anjar Dist. Kutch-370130 Gujarat <a href="mailto:ashitmittal@surya.in">ashitmittal@surya.in</a> , <a href="mailto:neerajgarg@surya.in">neerajgarg@surya.in</a> , <a href="mailto:rajeshmittal@surya.in">rajeshmittal@surya.in</a> , <a href="mailto:suniluniyal@surya.in">suniluniyal@surya.in</a>	M.S. Pipe With ISI mark:- IS 3589: Pipe size 457 mm to 2332 mm ERW Pipe Size 15 to 400 mm	17-10-2026	
4	M/s. Arcelor Mittal Nippon Steel India Limited, Surat	Fac.Add.: -AMNS Pipe Mill, 27th KM, Surat-Hazira Road, Hazira, Surat, Gujarat-394270 <a href="mailto:gaurav.sharma1@amns.in">gaurav.sharma1@amns.in</a> <a href="mailto:yatin.thakur@amns.in">yatin.thakur@amns.in</a>	M.S. Pipe With ISI mark:- (i) IS 3589: 508 to 2540 mm (ii) IS 5504: 457 to 3035 mm	10-01-2027	
5	M/s Riddhi Steel & Tubes Ltd., Ahmedabad	83/84, Village-Kamod, Piplaj-Pirana Road, Ahmedabad-382427 E-mail:- <a href="mailto:marketing@riddhitubes.com">marketing@riddhitubes.com</a>	M.S. Pipe With ISI mark:- IS 1239:- Pipe size 15 MM to 150 MM	26-05-2027	As per Letter no CE(M)/Mat./Vendor Name Change/1054/2021 Dated. 21/10/2021. Company name has changed from M/s Riddhi Steel & Tubes Pvt. Ltd., Ahmedabad to M/s Riddhi Steel & Tubes Ltd., Ahmedabad.

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Thickness	Approval Valid up to Date	Remarks
1	2	3	4	5	6
6	M/s. Asian Mills Private Limited., Kadi	Plot-1, Phase-1, GIDC Chhatral, Tal: Kalol, Dist- Kadi, Gujrat <a href="mailto:marketing@asiansteels.com">marketing@asiansteels.com</a>	M.S. Pipe With ISI mark:- 1. IS 1239:2004:15 mm to 150 mm NB black plain,screwed & socketed end pipes 2. IS 3589:2001:168.3 mm OD to 508 mm OD except 244.5 mm OD, Black & Plain End & Beveled End Pipes Gr Fe330 & Fe410 3. IS 4270:2001:100 mm to 400 mm NB except 225 mm NB, Black Beveled End Pipes Gr Fe410	31/08/2027	
7	M/s. Ashwamedh Engineers & Fabricators, Navi Mumbai	37, Mahadev Industrial Estate, Shiv Panvel Road, Uttarshiv, Navi Mumbai – 400612 <a href="mailto:parulekarashish@yahoo.com">parulekarashish@yahoo.com</a> <a href="http://www.ahswamedhengineers.com">www.ahswamedhengineers.com</a>	M.S. Pipe With ISI mark:- MS Pipe 457 mm to 711 mm As per IS 3589:2001	31-06-2026	
8	M/s. Shri Bajrang Power & Ispat Ltd., Raipur	Khasra No. 521/44, Village - Tandwa and Kundru, Dharsiwa tilda Road, Tilda Dist. - Raipur, Chhattisgarh-493116 Email : <a href="mailto:rajat.rathod@goelgroup.co.in">rajat.rathod@goelgroup.co.in</a>	M.S. Pipe With ISI mark:- -15 mm to 150 mm OD (Light, Medium, Heavy GI ) IS 1239:2004 -168.3 mm to 323.9 mm OD (Grade 330,410,450) IS 3589 : 2001	31-07-2027	
9	M/s. Hitech Pipes Limited, Sikandrabad (U.P.)	Office Add. 10th GH, Pearls omaxe Tower, Netaji subhash Place, Pitampura, New Delhi - 110034. Fact. Add. Plot no 10, Industrial Area, Bulandshahar, Sikandrabad, U.P. - 203205 <a href="mailto:kishan.jain@hitechpipes.in">kishan.jain@hitechpipes.in</a>	M.S. Pipe With ISI mark:- -15 mm to 300 mm OD GI IS-1239 (Part-1) 2004 -100 mm to 300 mm Pipe IS 4270:2001 -150 mm to 300 mm Pipe IS 3589:2001	31-07-2027	



Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Thickness	Approval Valid up to Date	Remarks
1	2	3	4	5	6
10	M/s. Mega Pipes private Limited, Maharashtra	Village- Hedavali, Khopoli-Pali Road, Taluka- Sudhagad, Dist- Raigad, Maharastra, 410205, India marketing@megapipes.in umesh.dubey@megapipes.in	M.S. Pipe With ISI mark:- (i) IS 3589: 457 to 2032 mm	18-03-2027	
11	M/s. Tata Steel Ltd., Maharashtra	Office Add. Bombay House, 3rd Floor, 24 Homi Mody Street, Fort, Mumbai City, Mumbai, Maharashtra - 400001. Fact. Add. Ishamba Phata, Khopoli, Tal- Khalapur, Dist- Raigarh, MH - 410203 Ashish Rajguru - 9234638281, Sidheshwar Kumar- 8092086264 s.ananthan@tatasteel.com pulkitbhatnagar@tatasteel.com	M.S. Pipe With ISI mark:- - 80 NB to 150 NB Class - light, medium, heavy (IS-1239:2004 (Part-1) ) - Outer Dia: 168.3 mm to 610 mm, Thickness: 4 mm to 16 mm (IS 3589:2001)	31-01-2029	
12	M/s. Deep Seals (India) Limited, Kutch	S.NO.583, Lakadiya, NH -27, Opp. Meena Agency Ltd., Samakhiali, Kutch-370150 <b><a href="mailto:purchase.deepcoating@gmail.com">purchase.deepcoating@gmail.com</a></b>	<b>MS pipe with ISI mark:-</b> (i) IS 3589;- Pipe size 168.3 mm OD to 2540 mm (ii) IS 5504: Pipe Size 457 mm to 3035 mm	09.08.2026	
13	M/s. Ratnamani Metals & Tubes Ltd.,	Survey No. 474, Anjar-Bhachau Road, Village:- Bhimasar, Anjar, Kutch <b><a href="mailto:info@ratnamani.com">info@ratnamani.com</a></b> <b><a href="mailto:dhirendra.sharma@ratnamani.com">dhirendra.sharma@ratnamani.com</a></b>	<b>M.S. Pipe With ISI mark:-</b> IS 3589: Pipe size 168.3 mm to 2540 mm IS 5504: Pipe size 457 mm to 3035 mm	25-10-2026	

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**GUJARAT WATER SUPPLY & SEWERAGE BOARD, GANDHINAGAR**

**List of Approved Vendors of GWSSB for supply of DI Pipes (IS 8329) with ISI mark as per Vendor Selection Report submitted by Different TPI (As on dt. 10.06.2026)**

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		Approval Valid up to Date	Remarks
			Size (mm)	Class		
1	2	3	4	5	6	7
1	M/s. Electrosteel Castings Ltd., Andhra Pradesh	Rachagunneri-517641, Srikalahasthi Mandal, Chittoor District, Andhra Pradesh <a href="mailto:eclamd@electrosteel.com">eclamd@electrosteel.com</a> <a href="mailto:swmarketing@electrosteel.com">swmarketing@electrosteel.com</a> <a href="mailto:nikul.patel@electrosteel.com">nikul.patel@electrosteel.com</a>	100 to 1100 mm	K-7, K-8 & K-9	25.10.2026	As per Letter no: Mat. Cell/C/Vendorselection/4119/44 dtd: 18/02/2022 Company name has changed from M/s. Srikalahasthi Pipes Ltd., to M/s. Electrosteel Castings Ltd.
2	M/s. Jindal Saw Ltd., Kutch	Integrated Pipe Unit (PIU), Vill: Samaghoda, Paragpar-Mandvi Road, Tal: Mundra, Dist: Kutch-370415 <a href="mailto:manoj.singla@jindalsaw.com">manoj.singla@jindalsaw.com</a>	Up to 1200 mm	K-7 & K-9	25.10.2026	
3	M/s, Jai Balaji Industries Ltd., Kolkata	Village -Banskopa, P.O.- Rajbandh, P.S.- Kanksa, Dist. Burdwan-713212, West Bengal <a href="mailto:mkt.dip@jaibalajigroup.com">mkt.dip@jaibalajigroup.com</a>	100 to 1200 mm	K-7 & K-9	12-7-2026	
4	M/s. Electrosteel Castings Limited, WB	30, BT Road, Khardah, PO Sukchar, Dist.: North 24 Parganas, W. B.-700115 <a href="mailto:ukghosh@electrosteel.com">ukghosh@electrosteel.com</a> <a href="mailto:nikul.patel@electrosteel.com">nikul.patel@electrosteel.com</a> <a href="mailto:eclamd@electrosteel.com">eclamd@electrosteel.com</a>	80 to 1000 mm	K-7 & K-9	17-10-2026	
5	M/s. Tata Steels Limited, Kolkata	P.O.- Samraipur, Kharagpur, Dist.: Medinapur(West) - 721301, West Bengal <a href="mailto:jitendra.mishra@tmdipl.com">jitendra.mishra@tmdipl.com</a>	80 to 1200 mm	K-7, K-9 & K12	13-03-2027	As per Letter no CE(M)/Mat./Vender Name Change/N-6/2024/72 Dated. 03/03/2025. Company name has changed from M/s. Tata Metaliks Ltd., Kolkata to M/s. Tata Steels Ltd., Kolkata
6	M/s. Welspun D.I. Pipes Limited Anjar, Kutch	Welspun City, Survey No. 650, Village: Versamedi, Taluka: Anjar, Dist.: Kutch, Gujrat - 370110, India <a href="mailto:mukesh_agarwal@welspun.com">mukesh_agarwal@welspun.com</a>	80 to 400 mm	K-7 & K-9	31-08-2027	
7	M/s. Welspun D.I. Pipes Limited Anjar, Kutch	Welspun City, Survey No. 650, Village: Versamedi, Taluka: Anjar, Dist.: Kutch, Gujrat - 370110, India <a href="mailto:sourav_das@welspun.com">sourav_das@welspun.com</a> <a href="mailto:sales_di@welspun.com">sales_di@welspun.com</a>	450 to 600 mm	K-7, K-8 & K-9	31-01-2028	
			700 to 1000 mm			
8	M/s. Welspun D.I. Pipes Limited Anjar, Kutch	Welspun City, Survey No. 650, Village: Versamedi, Taluka: Anjar, Dist.: Kutch, Gujrat -370110, India <a href="mailto:sourav_das@welspun.com">sourav_das@welspun.com</a>	up to 1200 mm	K-7 & K-9	31-02-2027	

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		Approval Valid up to Date	Remarks
			Size (mm)	Class		
1	2	3	4	5	6	7
9	M/s. Jindal Saw Ltd., Mathura(U.P.)	Reg. Off. Add.- A-1 UP SIDC Industrial Area Nandgaon Road, Kosi Kalan Dist. Mathura (UP) - 281403 Fac. Add - Survey No. 42-49, Village: Haresamundram PO: Bommanahal Manadal - 515871 Dist: Anantapur, Andhra pradesh. <a href="mailto:Jayesh.thakkar@jindalsaw.com">Jayesh.thakkar@jindalsaw.com</a> <a href="mailto:manoj.singla@jindalsaw.com">manoj.singla@jindalsaw.com</a>	80 to 1000mm (excluding 125 & 750 mm)	K-7 & K-9	28-01-2028	
10	M/s. Rungta Mines Ltd., Jharkhand	Reg. Office:- 11, Express Tower, 42 A, Shakespere sarani, Kolkata - 700017 Fac. Add.: Chaliyama Steel Plant, Village-Chaliyama, Bankasai, Kuju, Arahasa, Mendki, PO: Keshagari, PS/Block- Rajnagar, District: Saraikela - Kharsawan, Jharkhand Keyur Desai - 9510678937 <a href="mailto:dipmkt.west2@rungtamines.com">dipmkt.west2@rungtamines.com</a> <a href="mailto:dipmkt.enquiry@rungtamines.com">dipmkt.enquiry@rungtamines.com</a>	80 mm to 1200 mm	K-7 & K-9	31-01-2029	
11	M/s. Kejriwal Castings Limited., Kolkata	Bamunara industrial Estate, Bamunara, Durgapure, West Bengal-713212 <a href="mailto:info@kejriwalcastings.com">info@kejriwalcastings.com</a>	80 to 400 mm	K-7 & K-9	31-01-2028	
12	M/s. Electrotherm (India) Limited, Kutch	Survey No. 325, Near Toll Tax Booth, National Highway No. 8A, 310 KM Stone, Village: Samkhiyali, Ta:- Bhachau, Kutch- 370140 <a href="mailto:pipe@electrotherm.com">pipe@electrotherm.com</a>	80 to 1200 mm	K-7 & K-9	25-10-2026	
13	M/S. RASHMI METALIKS LIMITED, Kolkata	Vill: Gokulpur, P.O. Shyamraipur, P.S. Kharagpur, Paschim Medinipur Pin-721 304, W.B. India <a href="mailto:diptender@rashmigroup.com">diptender@rashmigroup.com</a> <a href="mailto:sales.gujarat.dip@rashmigroup.com">sales.gujarat.dip@rashmigroup.com</a> <a href="mailto:gmsalesnorth@rashmigroup.com">gmsalesnorth@rashmigroup.com</a>	80 to 1000 mm	K-7 & K-9	25-10-2026	
14	M/s, Jai Balaji Industries Ltd., Kolkata	Village -Banskopa, P.O.- Rajbandh, P.S.- Kanksa, Dist. Burdwan- 713212, West Bengal <a href="mailto:mkt.dip@jaibalajigroup.com">mkt.dip@jaibalajigroup.com</a>	100 to 1200 mm	K-7 & K-9	12-01-2027	

**Note:- It is advisable to use this information as a reference only & kindly confirm it with concern authority before use.**

**GUJARAT WATER SUPPLY & SEWERAGE BOARD, GANDHINAGAR**

**List of Approved Vendors of GWSSB for supply of C.I. Sluice Valves (IS-14846) as per Vendor Selection Report submitted by Different TPI (As on dt. 10.06.2026)**

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7	8	9
1	M/s. VAG Valves (India) Pvt. Ltd., Telangana	Plot No. 57 & 56, Phase-III, TSIC, Pashamylaram, Patancheru (M), Sangareddy (D), Telangana, Hyderabad-502307 <a href="mailto:info.india@vag-group.com">info.india@vag-group.com</a>	All Type of Valve			28-01-2028	A	Reputed Company
2	M/s. Jupiter Engineering Co., Howrah	Kashipur, Dasnagar, Howrah-711105 <a href="mailto:jupiterbrc@gmail.com">jupiterbrc@gmail.com</a>	50 to 1200 mm	PN 1.0	With ISI mark	25.10.2026	B	
			50 to 600 mm	PN 1.6				
			1400 to 1800 mm	PN 1.0 & PN 1.6	Without ISI mark			
3	M/S. R & D MULTIPES PVT. LTD. (PLANT-2)	Reg Off. Add.- 106/108, United Industrial Estate, Mogul Lane, Mahim(W), Mumbai-400016 Reg. Fac. Add.- Plant-2, Survey No. 304, Balda, Pardi-396125, Dist. Valsad, Gujarat <a href="mailto:mumbai@rdmultiples.com">mumbai@rdmultiples.com</a> <a href="mailto:bhupesh@rdmultiples.com">bhupesh@rdmultiples.com</a>	Up to 1200 mm	PN 1.0	With ISI mark	28-01-2028	A	
			Up to 600 mm	PN 1.6				
			Up to 1800 mm	Up to PN 3.0	Without ISI mark			
4	M/s. Aarko Manufacturing co., Jalandhar	74-75 Industriell Estate, Behind Sharp Chucks, Jalandhar- 144012 <a href="mailto:info@aarko.in">info@aarko.in</a> <a href="mailto:aarkomfg@gmail.com">aarkomfg@gmail.com</a>	50 to 600 mm	PN 1.0 & 1.6	With ISI mark	27-9-2026	B	
			Up to 1000 mm	PN 1.0 & 1.6	Without ISI mark			
5	M/s. G. M. Dalui & Sons Pvt. Ltd., Howrah	"Vivekanand Industrial Estate" Balitikuri, Bakultala, Howrah-711 113, West Bengal, India <a href="mailto:daluisuman@gmail.com">daluisuman@gmail.com</a> <a href="mailto:nkdalui@gmail.com">nkdalui@gmail.com</a>	50 to 1200 mm	PN 1.0	With ISI mark	17-10-2026	B	
			50 to 600 mm	PN 1.6				
			Up to 1600 mm	Up to PN 2.0	Without ISI mark			
6	M/s. Cair Euromatic Automation Pvt. Ltd., Ahmedabad	Survey No: 200, Plot 207, Beral Market,. Unique Ind. Park, Nr Kashiram Textile Mill,Ranipur Road, Narol Road, Ahmedabad -382 405 Gujarat,India. <a href="mailto:info@cairindia.com">info@cairindia.com</a>	50 to 600 mm	PN 1.0 & 1.6	With ISI mark	17-10-2026	B	

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7	8	9
7	M/s. SSPR Valve Manufacturing Private Limited, Howrah	Reg.off.Add. & Fac. Add.: ONGC Road South Jhapordah, Domjur, Howrah- 711405, West Bengal, India <a href="mailto:info@ssprvalve.com">info@ssprvalve.com</a>	50 to 600 mm,	PN 1.0 & 1.6	With ISI mark	18-03-2027	B	
			700 to 900 mm	PN 1.0				
			Up to 1100 mm	PN 1.0	without ISI Mark			
8	M/s. Ketan Engineering Works, Gujarat	Reg.off.Add. & Fac. Add.: Plot No. 34, Opp. Pramukh Packaging, Nr. Pooja Dhanadal, s'nagar- Rajkot Highway, Shekhpar, Surendranagar	50 to 600 mm	PN 1.6	With ISI mark	18-03-2027	B	
			50 to 1200 mm	PN 1.0				
			50 to 2000 mm	Upto PN 4.0	without ISI Mark			
9	M/s. Perfect Valves Pvt. Ltd. Jalandhar	Wariana Industrial Complex Sangal Sohal Road, Adjoining Leather Complex, Jalandhar- 144013 <a href="mailto:lpvalves@lpvalves.com">lpvalves@lpvalves.com</a>	50 to 600 mm,	PN 1.0 & 1.6	With ISI mark	18-03-2027	B	
10	M/s. Kamala Valves & Engineering Pvt. Ltd. Howrah	41/2," Q" Road,Belgachia, Howrah- 711108, West Bengal <a href="mailto:kamalavalve@gmail.com">kamalavalve@gmail.com</a>	50 to 1200 mm	Upto PN- 1.0	With ISI mark	31-01-2028	B	
			50 to 600 mm	Upto PN- 1.6				
			50 to 1600 mm	PN- 1.0	Without ISI mark			
11	M/s. Sigma Flow Control India Ltd. Howrah	Chatterjee Industrial Estate, Jhipara, Bankra, Domjur, Howrah- 711403 <a href="mailto:enquiry@sigmaflow.in">enquiry@sigmaflow.in</a> <a href="mailto:pkn@sigmaflow.in">pkn@sigmaflow.in</a> <a href="http://www.sigmaflow.in">www.sigmaflow.in</a>	50 to 300 mm	PN 1.0 & 1.6	With ISI mark	31-06-2026	B	
12	M/s. Venus Engineering Works, Ahmedabad	Reg. Off. & Fac. Add - 23, Shiv Aradhna Industrial Park Opp, IOC Petrol Pump, Kuha, Ahmedabad - Indoor Highway - 382433 <a href="mailto:sales@venusengineering.co.in">sales@venusengineering.co.in</a>	15 to 1200 mm	PN 1.0 & PN 1.6 & PN 4	Without ISI mark	31-02-2027	B	
13	M/s. Orbit Engineers LLP, Ahmedabad	Reg. off. & Factory Add: 267/2, Nr. Balkrishna Textiles Unit-2, B/h. Eagle Motors, NH No.-8, Narol-Sarkhej Road, Ahmedabad-382405 <a href="mailto:orbiteng@hotmail.com">orbiteng@hotmail.com</a> , <a href="mailto:zafar@orbitengineers.in">zafar@orbitengineers.in</a>	50 to 600mm	PN 1.0 & PN 1.6	With ISI mark	31-02-2027	B	
			up to 1800 mm	up to PN 3.0	Without ISI mark	31-02-2027		

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7	8	9
14	M/s. R.S. Valve & Products, Hyderabad	Reg. off. 304, 3'd Floor, Minerva Complex, S. D. Road, secunderabad - 500003, Telanga na, India, <a href="mailto:rsvalve@yahoo.com">rsvalve@yahoo.com</a> , <a href="mailto:rsvalve@gmail.com">rsvalve@gmail.com</a>	50 mm to 1200 mm	PN 1.0 & PN 1.6	With ISI mark	13-03-2027	B	
		Factory Add: Plot no 201/7, Phase 02, IDA Cherlapally, Hyderabad - 500051, Telangana, India	1250 mm to 3000 mm	PN 2.0	Without ISI mark	13-03-2027		
15	M/s. Kejriwal Castings ltd.,Kolkata	Reg. off.Millennium City IT Park, DN 62, Salt Lake, Sec-V, 14'h Floor, Tower-2, Kolkata - 700091 <a href="mailto:info@kejriwalcastings.com">info@kejriwalcastings.com</a> <a href="mailto:pawan.jalan@kejriwalcastings.com">pawan.jalan@kejriwalcastings.com</a> Factory Add: NH-5 Chamrail, Near Kona Powersub Station, kona Howrah - 711114	50 mm to 1200 mm	PN 1.0 & PN 1.6	With ISI mark	13-03-2027	B	
16	M/S. L&T Valves Limited., Chennai.	Reg. off.L&T Campus, TC III Building, Mount Poonamallee Road, Manapakkam, Chennai, Tamil Nadu, 600089. <a href="mailto:Trupal.NK@lntvalves.com">Trupal.NK@lntvalves.com</a> Factory Add: L&T Valves Limited., Enathur, Kanchipuram, Tamil Nadu, 631561.	All Type of Valve			28-01-2028	A	Reputed Company
17	M/s. GM Engineering Pvt. Ltd., Rajkot	Reg. Off. & Fac. Add - 23, Survey No. 168, Village: Dhokaliya Via Metoda, 360021 Rajkot. <a href="mailto:valve@gmengg.com">valve@gmengg.com</a>	50 to 1200 mm	PN 1.0 & PN 1.6	Without ISI mark	28-01-2028	B	
18	M/s. Wellcast Industries.	Reg. Off. & Fac. Add - Plot No. 06, Hari om estate, G.D. School Road, Memco, Ahmedabad - 382350. Gujarat.	50 to 600 mm	PN 1.0 & PN 1.6	With ISI mark	28-01-2028	B	

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7	8	9
	Ahmedabad	Vipul@wellcastindustries.com vipulpatel1987@gmail.com	700 to 1000 mm	PN 1.0 & PN 1.6	Without ISI mark			
19	M/s. Bikaner Engineering Works , Jaipur	F-445, Road No.12 VKI Industrial Area Jaipur-302013 bewfoundry@hotmail.com	50 to 600 mm	PN 1.0 & 1.6	With ISI mark	27-9-2026	B	
20	M/s. Paras Valves Pvt. Ltd., Jalandhar	101 Kranti Industrial Area, Gadaipur, Jalandhar (Punjab)-144004 paras.valves@gmail.com	50 to 600 mm,	PN 1.0 & 1.6	With ISI mark	18-03-2027	B	
21	M/s. Bir Industries, Jalandhar	G.T. Road, Bye pass, Maqsudan, Jalandhar-144008 industries.bir@gmail.com	50 to 300 mm	PN 1.0 & 1.6	With ISI mark	27-09-2026	B	
22	M/s. Durga Valves PVT.LTD., Howrah	Village & Post: Mahiserkha, Tusiberia Road (Near Ideal School), PS: Uluberia, Dist: Howrah-711 303 gujarat@durgavalves.com kolkatta@durgavalves.com info@durgavalves.com	50 to 1200 mm	PN 1.0	With ISI mark	25-04-2026	B	
			50 to 600 mm	PN 1.6				
			up to 1500 mm	PN 1.0	Without ISI mark			
23	M/s. Paras Valves Pvt. Ltd., Jalandhar	101 Kranti Industrial Area, Gadaipur, Jalandhar (Punjab)-144004 paras.valves@gmail.com	50 to 600 mm,	PN 1.0 & 1.6	With ISI mark	18-03-2027	B	
24	M/s. Bir Industries, Jalandhar	G.T. Road, Bye pass, Maqsudan, Jalandhar-144008 industries.bir@gmail.com	50 to 300 mm	PN 1.0 & 1.6	With ISI mark	27-09-2026	B	
25	M/s. DSP Pipe Fitting Works., Punjab	35, Industrial Estate Extention, Jalandhar, Punjab – 144004 Parminder Singh - 9876700112, 8288000112 dsppipefittingworks@yahoo.com	50 mm to 300 mm	PN-1.6	With ISI mark	31-01-2029	B	

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7	8	9
26	M/s. Sigma Flow Control India Ltd., Kolkata, WB	CHATTERJEE INDUSTRIAL ESTATE, Jhipara, Baknra, Domjur, Howrah - 711403 Pramod KR Neotia - 9831072481, Vivek KR Neotia - 9831105987 enquiry@sigmaflow.in pkn@sigmaflow.in	Upto 1800 mm	Upto PN-2.0	Without ISI mark	31-01-2029	A	
			Upto 1200 mm	Upto PN-1.0	With ISI mark			
			Upto 600 mm	Upto PN-1.6				
27	M/s. Shiva Industries, Jaipur	Unit:-1- KH No. 518, Near Vaidh ji Ka Chouraha, Niwaroo Road, Jhotwara, Jaipur- 302012 navinebus@yahoo.co.in	50 to 1200 mm	PN 1.0	With ISI mark	25-10-2026		
			50 to 600 mm	PN 1.6				
28	M/S. Shree Balaji Industries, Howrah	72/A, Manikpirtala, 2nd Bye Lane, Howrah- 711113 balajivalveskol@gmail.com	50 to 1200 mm	PN 1.0	With ISI mark	25-10-2026		
			50 to 600 mm	PN 1.6				
29	M/s. Sachdeva Metal Works, Jalandhar	C -33, Focal Point Extension, Jalandhar-144004, Punjab smw@rgindustriessachdeva.com	50 to 1200 mm	PN 1.0	With ISI mark	25-10-2026		
			50 to 600 mm	PN 1.6				

**Note:- It is advisable to use this information as a reference only & kindly confirm it with concern authority before use.**



**GUJARAT WATER SUPPLY & SEWERAGE BOARD, GANDHINAGAR**

**List of Approved Vendors of GWSSB for supply of C.I. Non Return (Reflux) Valves (IS:5312) as per Vendor Selection Report submitted by Different TPI (As on dt. 10.06.2026)**

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7		8
1	M/s. VAG Valves (India) Pvt. Ltd., Telangana	Plot No. 57 & 56, Phase-III, TSIIC, Pashamylaram, Patancheru (M), Sangareddy (D), Telangana, <a href="mailto:info.india@vag-group.com">info.india@vag-group.com</a>	All Type of Valve			28-01-2028	A	Reputed Company
2	M/s. Jupiter Engineering Co., Howrah	Kashipur, Dasnagar, Howrah-711105 <a href="mailto:jupiterbrc@gmail.com">jupiterbrc@gmail.com</a>	50 mm to 600 mm	PN 1.0 & PN 1.6	With ISI mark	25.10.2026	B	
			700 to 1400 mm	PN 1.0 & PN 1.6	Without ISI mark			
3	M/S. R & D MULTIPES PVT. LTD. (PLANT-2)	Reg Off. Add.- 106/108, United Industrial Estate, Mogul Lane, Mahim(W), Mumbai-400016 Reg. Fac. Add.- Plant-2, Survey No. 304, Balda, Pardi-396125, Dist. Valsad, Gujarat <a href="mailto:mumbai@rdmultiples.com">mumbai@rdmultiples.com</a> <a href="mailto:bhupesh@rdmultiples.com">bhupesh@rdmultiples.com</a>	Up to 2200 mm	Up to PN 3.0	Without ISI mark	28-01-2028	A	
4	M/s. Aarko Manufacturing co., Jalandhar	74-75 Industriel Estate, Behind Sharp Chucks, Jalandhar- 144012 <a href="mailto:info@aarko.in">info@aarko.in</a> <a href="mailto:aarkomfg@gmail.com">aarkomfg@gmail.com</a>	50 to 300 mm	PN 1.0 & 1.6	With ISI mark	27-9-2026	B	
			Up to 600 mm	PN 1.0 & 1.6	Without ISI mark			
5	M/s. G. M. Dalui & Sons Pvt. Ltd., Howrah	" Vivekanand Industrial Estate" Balitikuri, Bakultala, Howrah-711 113, West Bengal, India <a href="mailto:daluisuman@gmail.com">daluisuman@gmail.com</a> <a href="mailto:nkdalui@gmail.com">nkdalui@gmail.com</a>	50 to 1400 mm	Up to PN 1.6	Without ISI mark	17-10-2026	B	
6	M/s. Cair Euromatic Automation Pvt. Ltd., Ahmedabad	Survey No: 200, Plot 207, Beral Market., Unique Ind. Park, Nr Kashiram Textile Mill,Ranipur Road, Narol Road, Ahmedabad -382 405 Gujarat,India. <a href="mailto:info@cairindia.com">info@cairindia.com</a>	50 to 350 mm	PN 1.0 & 1.6	Without ISI mark	17-10-2026	B	

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7		8
7	M/s. SSPR Valve Manufacturing Private Limited, Howrah	Reg.off.Add. & Fac. Add.: ONGC Road South Jhapordah, Domjur, Howrah- 711405, West Bengal, India <a href="mailto:info@ssprvalve.com">info@ssprvalve.com</a>	50 to 600 mm	PN 1.0 & 1.6	With ISI mark	18-03-2027	B	
8	M/s. Ketan Engineering Works, Gujarat	Reg.off.Add. & Fac. Add.: Plot No. 34, Opp. Pramukh Packaging, Nr. Pooja Dhanadal, s'nagar-Rajkot Highway, Shekhpar, Surendranagar. <a href="mailto:ketanengiw@yahoo.in">ketanengiw@yahoo.in</a>	50 to 600 mm	PN 1.0 & 1.6	With ISI mark	18-03-2027	B	
			50 to 1200 mm	Upto PN 4.0	without ISI Mark			
9	M/s. Perfect Valves Pvt. Ltd. Jalandhar	Wariana Industrial Complex Sangal Sohal Road, Adjoining Leather Complex, Jalandhar- 144013 <a href="mailto:lpvalves@lpvalves.com">lpvalves@lpvalves.com</a>	50 to 300 mm	PN 1.0 & 1.6	With ISI mark	18-03-2027	B	
10	M/s. Kamala Valves & Engineering Pvt. Ltd. Howrah	41/2," Q" Road,Belgachia, Howrah-711108, West Bengal <a href="mailto:kamalavalve@gmail.com">kamalavalve@gmail.com</a>	50 to 700 mm	up to PN- 1.6	Without ISI mark	31-01-2028	B	
11	M/s. Sigma Flow Control India Ltd. Howrah	Chatterjee Industrial Estate, Jhipara, Bankra, Domjur, Howrah- 711403 <a href="mailto:enquiry@sigmaflow.in">enquiry@sigmaflow.in</a> <a href="mailto:pkn@sigmaflow.in">pkn@sigmaflow.in</a> <a href="http://www.sigmaflow.in">www.sigmaflow.in</a>	50 to 700 mm	PN 1.0	Without ISI mark	31-06-2026	B	
			700 to 1200 mm	PN 1.6				
12	M/s. Venus Engineering Works, Ahmedabad	Reg. Off. & Fac. Add - 23, Shiv Aradhna Industrial Park Opp, IOC Petrol Pump, Kuha, Ahmedabad - Indoor Highway - 382433 <a href="mailto:sales@venusengineering.co.in">sales@venusengineering.co.in</a>	15 to 1200 mm	PN 1.0 & PN 2.5	Without ISI mark	31-02-2027	B	
13	M/s. Orbit Engineers LLP, Ahmedabad	Reg. off. & Factory Add: 267/2, Nr. Balkrishna Textiles Unit-2, B/h. Eagle Motors, NH No.-8, Narol-Sarkhej Road, Ahmedabad- 382405 <a href="mailto:orbiteng@hotmail.com">orbiteng@hotmail.com</a> , <a href="mailto:zafar@orbitengineers.in">zafar@orbitengineers.in</a>	50 to 600 mm	PN 1.0 & PN 1.6	With ISI mark	31-02-2027	B	
			up to 1200 mm	up to PN 3.0	Without ISI mark	31-02-2027		

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7		8
14	M/s. R.S. Valve & Products, Hyderabad	Reg. off. 304, 3'd Floor, Minerva Complex, S. D. Road, secunderabad - 500003, Telangana, India, Factory Add: Plot no 201/7, Phase 02, IDA Cherlapally, Hyderabad - 500051, Telangana, India <a href="mailto:rsvalve@yahoo.com">rsvalve@yahoo.com</a> , <a href="mailto:rsvalve@gmail.com">rsvalve@gmail.com</a>	50 mm to 2500 mm	PN 1.6	Without ISI mark	13-03-2027	B	
15	M/s. Kejriwal Castings ltd., Kolkata	Reg. off. Millennium City IT Park, DN 62, Salt Lake, Sec-V, 14'h Floor, Tower-2, Kolkata - 700091 Factory Add: NH-5 Chamrail, Near Kona Powersub Station, kona Howrah - 711114 <a href="mailto:info@kejriwalcastings.com">info@kejriwalcastings.com</a> <a href="mailto:pawan.jalan@kejriwalcastings.com">pawan.jalan@kejriwalcastings.com</a>	50 mm to 600 mm	PN 1.0 & PN 1.6	With ISI mark	13-03-2027	B	
16	M/S. L&T Valves Limited., Chennai.	Reg. off. L&T Campus, TC III Building, Mount Poonamallee Road, Manapakkam, Chennai, Tamil Nadu, 600089. Factory Add: L&T Valves Limited., Enathur, Kanchipuram, Tamil Nadu, 631561. <a href="mailto:Trupal.NK@lntvalves.com">Trupal.NK@lntvalves.com</a>	All Type of Valve			28-01-2028	A	Reputed Company
17	M/s. GM Engineering Pvt. Ltd., Rajkot	Reg. Off. & Fac. Add - 23, Survey No. 168, Village: Dhokaliya Via Metoda, 360021 Rajkot. <a href="mailto:valve@gmengg.com">valve@gmengg.com</a>	125 mm to 300 mm	PN 1.0 & PN 1.6	With ISI mark	28-01-2028	B	
			50 mm to 600 mm	PN 1.0 & PN 1.6	Without ISI mark			
18	M/s. Wellcast Industries	Reg. Off. & Fac. Add - Plot No. 06, Hari om estate, G.D. School Road, Memco, Ahmedabad - 382250	50 mm to 300 mm	PN 1.0 & PN 1.6	With ISI mark	28-01-2028	B	

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7		8
18	Industries, Ahmedabad	Ahmedabad - 382350, Gujarat. Vipul@wellcastindustries.com vipulpatel1987@gmail.com	350 mm to 700 mm	PN 1.0 & PN 1.6	Without ISI mark	28-01-2028	B	
19	M/s. Bikaner Engineering Works , Jaipur	F-445, Road No.12 VKI Industrial Area Jaipur-302013 bewfoundry@hotmail.com	50 to 300 mm	PN 1.0 & 1.6	Without ISI mark	27-9-2026	B	
20	M/s. Durga Valves PVT.LTD., Howrah	Village & Post: Mahiserkha, Tusiberia Road (Near Ideal School), PS: Uluberia, Dist: Howrah- 711 303 gujarat@durgavalves.com kolkatta@durgavalves.com info@durgavalves.com	50 to 600 mm	PN 1.0 & PN 1.6	With ISI mark	25-04-2026	B	
			up to 1600 mm	PN 1.0	Without ISI mark			
21	M/s. Paras Valves Pvt. Ltd., Jalandhar	101 Kranti Industrial Area, Gadaipur, Jalandhar (Punjab)- 144004 paras.valves@gmail.com	50 to 300 mm	PN 1.6	With ISI mark	18-03-2027	B	
22	M/s. Bir Industries, Jalandhar	G.T. Road, Bye pass, Maqsudan, Jalandhar-144008 industries.bir@gmail.com	50 to 300 mm	PN 1.0 & 1.6	With ISI mark	27-09-2026	B	
23	M/s. DSP Pipe Fitting Works., Punjab	35, Industrial Estate Extention, Jalandhar, Punjab - 144004 Parmindar Singh - 9876700112, 8288000112 dsppipefittingworks@yahoo. com	50 mm to 300 mm	PN 1.0 & PN 1.6	With ISI mark	31-01-2029	B	
24	M/s. Sigma Flow Control India Ltd., Kolkata, WB	CHATTERJEE INDUSTRIAL ESTATE, Jhipara, Baknra, Domjur, Howrah - 711403 Pramod KR Neotia - 9831072481, Vivek KR Neotia - 9831105987 enquiry@sigmaflow.in pkn@sigmaflow.in	Upto 1800 mm	Upto PN- 2.0	Without ISI mark	31-01-2029	A	
			Upto 600 mm	Upto PN- 1.6	With ISI mark			
25	M/s. Shiva Industries, Jaipur	Unit:-1- KH No. 518, Near Vaidh ji Ka Chouraha, Niwaroo Road, Jhotwara, Jaipur- 302012 navinebus@yahoo.co.in	50 to 600 mm	PN 1.0 & PN 1.6	Without ISI mark	25-10-2026		

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7		8
26	M/S. Shree Balaji Industries, Howrah	72/A, Manikpirtala, 2nd Bye Lane, Howrah- 711113 <b>balajivalveskol@gmail.com</b>	50 to 600 mm	PN 1.0 & PN 1.6	With ISI mark	25-10-2026		
			up to 700 mm	PN 1.0	Without ISI mark			
27	M/s. R.G. Industries, Jalandhar	Vill:-Fazalpur, Behind Focal Point, Jalandhar-144004, Punjab <b>enquiry@rgindustriessachdeva.com</b>	Up to 600 mm	PN 1.0 & PN 1.6	With ISI mark	25-10-2026		

**Note:- It is advisable to use this information as a reference only & kindly confirm it with concern authority before use.**

**GUJARAT WATER SUPPLY & SEWERAGE BOARD, GANDHINAGAR**

**List of Approved Vendors of GWSSB for supply of Butterfly Valves (IS 13095) as per Vendor Selection Report submitted by Different TPI (As on dt. 10.06.2026)**

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7		8
1	M/s. VAG Valves (India) Pvt. Ltd., Telangana	Plot No. 57 & 56, Phase-III, TSIIC, Pashamylaram, Patancheru (M), Sangareddy (D), Telangana, <a href="mailto:info.india@vag-group.com">info.india@vag-group.com</a>	All Type of Valve			28-01-2028	A	Reputed Company
2	M/s. Jupiter Engineering Co., Howrah	Kashipur, Dasnagar, Howrah-711105 <a href="mailto:jupiterbrc@gmail.com">jupiterbrc@gmail.com</a>	40 to 1200 mm	PN 1.0	With ISI mark	25.10.2026	B	
			40 to 2000 mm	PN 1.6				
			1800 to 2000 mm	PN 1.0 & PN 1.6	Without ISI Mark			
3	M/S. R & D MULTIPES PVT. LTD. (PLANT-2)	Reg Off. Add.- 106/108, United Industrial Estate, Mogul Lane, Mahim(W), Mumbai-400016 Reg. Fac. Add.- Plant-2, Survey No. 304, Balda, Pardi-396125, Dist. Valsad, Gujarat <a href="mailto:mumbai@rdmultiples.com">mumbai@rdmultiples.com</a> <a href="mailto:bhupesh@rdmultiples.com">bhupesh@rdmultiples.com</a>	Up to 2000 mm	PN 1.6	With ISI mark	28-01-2028	A	
			Up to 3600 mm	Up to PN 3.0	Without ISI Mark			
4	M/s. Aarko Manufacturing co., Jalandhar	74-75 Industriel Estate, Behind Sharp Chucks, Jalandhar- 144012 <a href="mailto:info@aarko.in">info@aarko.in</a> <a href="mailto:aarkomfg@gmail.com">aarkomfg@gmail.com</a>	40 to 300 mm	PN 1.0 & 1.6	With ISI mark	27-9-2026	B	
			Up to 1000 mm	PN 1.0 & 1.6	Without ISI mark			
5	M/s. G. M. Dalui & Sons Pvt. Ltd., Howrah	" Vivekanand Industrial Estate" Balitikuri, Bakultala, Howrah-711113, West Bengal, India <a href="mailto:daluisuman@gmail.com">daluisuman@gmail.com</a> <a href="mailto:nkdalui@gmail.com">nkdalui@gmail.com</a>	50 to 1200 mm	PN 1.0 & 1.6	With ISI mark	17-10-2026	B	
			1400 to 2000 mm	PN 1.0 & 1.6				
			Up to 2400 mm	PN 2.0	Without ISI mark			
6	M/s. Cair Euromatic Automation Pvt. Ltd., Ahmedabad	Survey No: 200, Plot 207, Beral Market,. Unique Ind. Park, Nr Kashiram Textile Mill,Ranipur Road, Narol Road, Ahmedabad -382405 Gujarat,India. <a href="mailto:info@cairindia.com">info@cairindia.com</a>	40 to 1200 mm	PN 1.0 & 1.6	With ISI mark	17-10-2026	B	

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7		8
7	M/s. SSPR Valve Manufacturing Private Limited, Howrah	Reg.off.Add. & Fac. Add.: ONGC Road South Jhapordah, Domjur, Howrah- 711405, West Bengal, India <a href="mailto:info@ssprvalve.com">info@ssprvalve.com</a>	50 to 300 mm	PN 1.0 & 1.6	With ISI mark	18-03-2027	B	
			350 to 600 mm	PN 1.0				
			Up to 1100 mm	PN 1.0	without ISI Mark			
8	M/s. Paras Valves Pvt. Ltd., Jalandhar	# 101 Kranti Industrial Area, Gadaipur, Jalandhar - 144004 <a href="mailto:paras.valves@gmail.com">paras.valves@gmail.com</a>	40 to 600 mm,	PN 1.6	With ISI mark	18-03-2027	B	
9	M/s. Perfect Valves Pvt. Ltd. Jalandhar	Wariana Industrial Complex Sangal Sohal Road, Adjoining Leather Complex, Jalandhar- 144013 <a href="mailto:lpvalves@lpvalves.com">lpvalves@lpvalves.com</a>	40 to 600 mm,	PN 1.0 & 1.6	With ISI mark	18-03-2027	B	
10	M/s. Ketan Engineering Works, Gujarat	Reg.off.Add. & Fac. Add.: Plot No. 34, Opp. Pramukh Packaging, Nr. Pooja Dhanadal, s'nagar-Rajkot Highway, Shekhpur, S'nagar. <a href="mailto:ketanengiw@yahoo.in">ketanengiw@yahoo.in</a>	40 to 2000 mm	PN 1.0 & 1.6	With ISI mark	18-03-2027	B	
			40 to 3200 mm	Upto PN 4.0	without ISI Mark			
11	M/s. Kamala Valves & Engineering Pvt. Ltd. Howrah	41/2," Q" Road,Belgachia, Howrah-711108, West Bengal <a href="mailto:kamalavalve@gmail.com">kamalavalve@gmail.com</a>	40 to 1200 mm	up to PN-1.6	With ISI mark	31-01-2028	B	
			40 to 1900 mm	up to PN-1.6	Without ISI mark			
12	M/s. Brightech Valves and Controls Pvt.Ltd., Ahemdabad	Survey No. 98, B/H S.R. Belting Pvt. Ltd, Near kubadthal Water Tank, Kubadthal, Ahmedabad-382430 <a href="mailto:info@brightechvalves.com">info@brightechvalves.com</a> <a href="mailto:sales1@brightechvalves.com">sales1@brightechvalves.com</a> <a href="http://www.brightechvalves.com">www.brightechvalves.com</a>	50 to 600 mm	PN 1.0 & 1.6	Without ISI mark	31-06-2026	B	
13	M/s. Sigma Flow Control India Ltd. Howrah	Chatterjee Industrial Estate, Jhipara, Bankra, Domjur, Howrah- 711403 <a href="mailto:enquiry@sigmaflow.in">enquiry@sigmaflow.in</a> <a href="mailto:pkn@sigmaflow.in">pkn@sigmaflow.in</a> <a href="http://www.sigmaflow.in">www.sigmaflow.in</a>	50 to 600 mm	PN 1.0 & 1.6	Without ISI mark	31-06-2026	B	
			700 to 1700 mm					

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7		8
14	M/s. Venus Engineering Works, Ahmedabad	Reg. Off. & Fac. Add - 23, Shiv Aradhna Industrial Park Opp, IOC Petrol Pump, Kuha, Ahmedabad - Indoor Highway - 382433 <a href="mailto:sales@venusengineering.co.in">sales@venusengineering.co.in</a>	50 to 2100 mm	PN 1.0 & PN 4	Without ISI mark	31-02-2027	B	
15	M/s. Orbit Engineers LLP, Ahmedabad	Reg. off. & Factory Add: 267/2, Nr. Balkrishna Textiles Unit-2, B/h. Eagle Motors, NH No.-8, Narol-Sarkhej Road, Ahmedabad-382405 <a href="mailto:orbiteng@hotmail.com">orbiteng@hotmail.com</a> , <a href="mailto:zafar@orbitengineers.in">zafar@orbitengineers.in</a>	40 to 300mm	PN 1.0 & PN 1.6	With ISI mark	31-02-2027	B	Wafer Valve
			40 to 600mm	PN 1.0 & PN 1.6	With ISI mark			Double Flange
			700 to 2000mm	PN 1.0 & PN 1.6	With ISI mark			Double Flange
			up to 3000mm	PN 1.0 & PN 1.6	Without ISI mark			
			up to 1200 mm	up to PN 2.0, 2.5 & 3.0	Without ISI mark			
16	M/s. R.S. Valve & Products, Hydrabad	Reg. off. 304, 3'd Floor, Minerva Complex, S. D. Road, secunderabad - 500003, Factory Add: Plot no 201/7, Phase 02, IDA Cherlapally, Hyderabad - 500051, <a href="mailto:rsvalve@yahoo.com">rsvalve@yahoo.com</a> , <a href="mailto:rsvalve@gmail.com">rsvalve@gmail.com</a>	32 mm to 3000 mm	PN 1.6 & PN 2.0	Without ISI mark	13-03-2027	B	
17	M/s. Kejriwal Castings Ltd., Kolkata	Reg. off. Millennium City IT Park, DN 62, Salt Lake, Sec-V, 14'h Floor, Tower-2, Kolkata - 700091 Factory Add: NH-5 Chamrail, Near Kona Powersub Station, kona Howrah - 711114 <a href="mailto:info@kejriwalcastings.com">info@kejriwalcastings.com</a> <a href="mailto:pawan.jalan@kejriwalcastings.com">pawan.jalan@kejriwalcastings.com</a>	80 mm to 1200 mm	PN 1.0 & PN 1.6	With ISI mark	13-03-2027	B	



Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7		8
18	M/s. Delval flow Control Pvt. Ltd., Satara- Maharashtra	Office Add. B Cube Building, S NO 6/10/1, Opposite Bavdhan Police station, Bavdhan Khurd, Pune. 411021 Fact. Add. 25,37,43/1A At : Kavathe, Post-Javale, Tal.- Khandala, Khandala MIDC Dist.- Satara, Pin- 412801 , Maharashtra, India Email : <a href="mailto:drajput@delvalflow.com">drajput@delvalflow.com</a> , <a href="mailto:khargapur@delvalflow.com">khargapur@delvalflow.com</a>	Up to 2200 mm	Up to PN 1.6	Without ISI mark	31-07-2027	B	
19	M/S. L&T Valves Limited., Chennai.	Reg. off.L&T Campus, TC III Building, Mount Poonamallee Road, Manapakkam, Chennai, Tamil Nadu, 600089. Factory Add: L&T Valves Limited., Enathur, Kanchipuram, Tamil Nadu, 631561. <a href="mailto:Trupal.NK@Intvalves.com">Trupal.NK@Intvalves.com</a>	All Type of Valve			28-01-2028	A	Reputed Company
20	M/s. GM Engineering Pvt. Ltd., Rajkot	Reg. Off. & Fac. Add - 23, Survey No. 168, Village: Dhokaliya Via Metoda, 360021 Rajkot. <a href="mailto:valve@gmengg.com">valve@gmengg.com</a>	40 to 2000 mm	PN 1.0 & PN 1.6	Without ISI mark	28-01-2028	B	
			40 to 1800 mm	PN 1.0 & PN 1.6	With ISI mark			
21	M/s. Wellcast Industries, Ahmedabad	Reg. Off. & Fac. Add - Plot No. 06, Hari om estate, G.D. School Road, Memco, Ahmedabad - 382350, Gujarat. <a href="mailto:Vipul@wellcastindustries.com">Vipul@wellcastindustries.com</a> <a href="mailto:vipulpatel1987@gmail.com">vipulpatel1987@gmail.com</a>	40 to 600 mm	PN 1.0 & PN 1.6	With ISI mark	28-01-2028	B	
			700 to 1500 mm	PN 1.0 & PN 1.6	Without ISI mark			
22	M/s. Paras Valves Pvt. Ltd., Jalandhar	101 Kranti Industrial Area, Gadaipur, Jalandhar (Punjab)- 144004 <a href="mailto:paras.valves@gmail.com">paras.valves@gmail.com</a>	40 to 600 mm,	PN 1.6	With ISI mark	18-03-2027	B	

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7		8
23	M/s. Omval Controls Pvt. Ltd., Rajkot	Road-D Almighty Gate-2, GIDC Lodhika, Village-Metoda, Rajkot – 360021 Ravirajsinh Jadeja - 9998860676 omvalcontrols@gmail.com	350 mm to 1100 mm	PN 1.0 & PN 1.6	Without ISI mark	31-01-2029	B	
			40 mm to 300 mm	PN 1.0	With ISI mark			
24	M/s. Sigma Flow Control India Ltd., Kolkata, WB	CHATTERJEE INDUSTRIAL ESTATE, Jhipara, Baknra, Domjur, Howrah - 711403 Pramod KR Neotia - 9831072481, Vivek KR Neotia - 9831105987 enquiry@sigmaflow.in pkn@sigmaflow.in	Upto 2200 mm	Upto PN-2.0	Without ISI mark	31-01-2029	A	
25	M/s. Shiva Industries, Jaipur	Unit:-1- KH No. 518, Near Vaidh ji Ka Chouraha, Niwaroo Road, Jhotwara, Jaipur- 302012 <a href="mailto:navinebus@yahoo.co.in">navinebus@yahoo.co.in</a>	50 to 700 mm	PN 1.0 & PN 1.6	Without ISI Mark	25-10-2026		
26	M/S. Shree Balaji Industries, Howrah	72/A, Manikpirtala, 2nd Bye Lane, Howrah- 711113 <a href="mailto:balajivalveskol@gmail.com">balajivalveskol@gmail.com</a>	40 to 300 mm	PN 1.0 & PN 1.6	With ISI mark	25-10-2026		
			Up to 1500 mm	PN 1.0	Without ISI Mark			
27	M/s. R.G. Industries, Jalandhar	Vill:-Fazalpur, Behind Focal Point, Jalandhar-144004, Punjab <a href="mailto:enquiry@rgindustriessachdeva.com">enquiry@rgindustriessachdeva.com</a>	Up to 600 mm	PN 1.0 & PN 1.6	With ISI mark	25-10-2026		

**Note:- It is advisable to use this information as a reference only & kindly confirm it with concern authority before use.**

**GUJARAT WATER SUPPLY & SEWERAGE BOARD, GANDHINAGAR**

**List of Approved Vendors of GWSSB for supply of C.I. Air Valves (IS 14845) as per Vendor Selection Report submitted by Different TPI (As on dt. 10.06.2026)**

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		Type	ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class					
1	2	3	4	5	6	7	8		9
1	M/s. VAG Valves (India) Pvt. Ltd., Telangana	Plot No. 57 & 56, Phase-III, TSIIC, Pashamylaram, Patancheru (M), Sangareddy (D), Telangana, Hyderabad-502307 <a href="mailto:info.india@vag-group.com">info.india@vag-group.com</a>	All Type of Valve				28-01-2028	A	Reputed Company
2	M/s. Jupiter Engineering Co., Howrah	Kashipur, Dasnagar, Howrah-711105 <a href="mailto:jupiterbrc@gmail.com">jupiterbrc@gmail.com</a>	15 to 40 mm	PN 1.0 & PN 1.6	S1	With ISI mark	25.10.2026	B	
			25 to 50 mm	PN 1.0 & PN 1.6	S2				
			40 to 200 mm	PN 1.0 & PN 1.6	DS1, DS2 & DK				
			up to 300 mm	PN 1.0, PN 1.6 & PN 2.0	Temper Proof	Without ISI Mark			As per AWWA C - 512
3	M/S. R & D MULTIPLES PVT. LTD. (PLANT-2)	Reg Off. Add.- 106/108, United Industrial Estate, Mogul Lane, Mahim(W), Mumbai-400016 Reg. Fac. Add.- Plant-2, Survey No. 304, Balda, Pardi-396125, Dist. Valsad, Gujarat <a href="mailto:mumbai@rdmultiples.com">mumbai@rdmultiples.com</a> <a href="mailto:bhupesh@rdmultiples.com">bhupesh@rdmultiples.com</a>	Up to 300 mm	Up to PN 3.0	-	Without ISI Mark	28-01-2028	A	
			Up to 400 mm	Up to PN 3.0	Temper Proof	Without ISI Mark			
4	M/s. Aarko Manufacturing co., Jalandhar	74-75 Industriell Estate, Behind Sharp Chucks, Jalandhar- 144012 <a href="mailto:info@aarko.in">info@aarko.in</a> <a href="mailto:aarkomfg@gmail.com">aarkomfg@gmail.com</a>	Up to 50 mm	PN 1.0 & PN 1.6	Single Acting	Without ISI Mark	27-9-2026	B	
			Up to 200 mm	PN 1.0 & PN 1.6	Double Acting	Without ISI Mark			
			Up to 200 mm	PN 1.0 & PN 1.6	Temper Proof	Without ISI Mark			
5	M/s. G. M. Dalui & Sons Pvt. Ltd., Howrah	" Vivekanand Industrial Estate" Balitikuri, Bakultala, Howrah-711 113, West Bengal, India <a href="mailto:daluisuman@gmail.com">daluisuman@gmail.com</a> <a href="mailto:nkdalui@gmail.com">nkdalui@gmail.com</a>	50 to 200 mm	PN 1.0 & PN 1.6	DS1, DS2, DK	With ISI Mark	17-10-2026	B	
			15 to 50 mm	PN 1.0	S1 & S2	Without ISI Mark			
			40 to 300 mm	PN 1.0 & PN 1.6	Temper Proof	Without ISI Mark			
6	M/s. Cair Euromatic Automation Pvt. Ltd., Ahmedabad	Survey No: 200, Plot 207, Beral Market,, Unique Ind. Park, Nr Kashiram Textile Mill,Ranipur Road, Narol Road, Ahmedabad -382 405 Gujarat,India. <a href="mailto:info@cairindia.com">info@cairindia.com</a>	40 to 200 mm	PN 1.0 & PN 1.6	DS1, DS2, DK	Without ISI Mark	17-10-2026	B	
			20 to 50 mm	PN 1.0 & PN 1.6	Single Acting				
			40 to 150 mm	PN 1.0 & PN 1.6	Temper Proof	Without ISI Mark			

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		Type	ISI Mark	Approval Valid up to Date	Grade	Remarks	
			Size (mm)	Class						
1	2	3	4	5	6	7	8		9	
7	M/s. SSPR Valve Manufacturing Private Limited, Howrah	Reg.off.Add. & Fac. Add.: ONGC Road South Jhapordah, Domjur, Howrah- 711405, West Bengal, India info@ssprvalve.com	50 to 200 mm	PN 1.0 & PN 1.6	DS1 & DS2	With ISI mark	18/03/2027	B		
			up to 200 mm	PN 1.0 & PN 1.6	Temper Proof	Without ISI Mark			As per AWWA C - 512	
8	M/s. Ketan Engineering Works, Gujarat	Reg.off.Add. & Fac. Add.: Plot No. 34, Opp. Pramukh Packaging, Nr. Pooja Dhanadal, s'nagar-Rajkot Highway, Shekhpar, S'nagar. ketanengiw@yahoo.in	40 to 200 mm	PN 1.0 & PN 1.6	Double Acting	With ISI mark	18/03/2027	B		
			40 to 200 mm	upto PN 4.0	Double Acting	Without ISI Mark				
			40 to 200 mm	upto PN 4.0	Temper Proof	Without ISI Mark			As per AWWA C - 512	
9	M/s. Perfect Valves Pvt. Ltd. Jalandhar	Wariana Industrial Complex Sangal Sohal Road, Adjoining Leather Complex, Jalandhar- 144013 lpvalves@lpvalves.com	Up to 200 mm	PN 1.6		With ISI mark	18/03/2027	B		
10	M/s. Kamala Valves & Engineering Pvt. Ltd. Howrah	41/2," Q" Road,Belgachia, Howrah-711108, West Bengal kamalavalve@gmail.com	40 to 200 mm	up to PN-1.6	-	With ISI mark	31-01-2028	B		
			15 to 200 mm	up to PN-1.6	-	Without ISI mark				
			40 to 200 mm	up to PN-1.6	Temper Proof	Without ISI mark				
11	M/s. Sigma Flow Control India Ltd. Howrah	Chatterjee Industrial Estate, Jhipara, Bankra, Domjur, Howrah- 711403 enquiry@sigmaflow.in pkn@sigmaflow.in www.sigmaflow.in	40 to 200 mm	PN 1.0 & 1.6	-	Without ISI mark	31-06-2026	B	-	
			250 to 300 mm		-				-	
			40 to 200 mm		Temper Proof					As per AWWA C - 512
			250 to 300 mm							
12	M/s. Venus Engineering Works, Ahmedabad	Reg. Off. & Fac. Add - 23, Shiv Aradhna Industrial Park Opp, IOC Petrol Pump, Kuha, Ahmedabad - Indoor Highway - 382433 sales@venusengineering.co.in	50 to 300 mm	PN 1.0 & PN 4	-	Without ISI mark	31-02-2027	B		
13	M/s. Orbit Engineers LLP, Ahmedabad	Reg. off. & Factory Add: 267/2, Nr. Balkrishna Textiles Unit-2, B/h. Eagle Motors, NH No.-8, Narol-Sarkhej Road, Ahmedabad- 382405 orbiteng@hotmail.com, zafar@orbitengineers.in	Up to 200 mm	PN 2.5	-	Without ISI mark	31-02-2027	B		

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		Type	ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class					
1	2	3	4	5	6	7	8		9
14	M/s. R.S. Valve & Products, Hyderabad	Reg. off. 304, 3'd Floor, Minerva Complex, S. D. Road, secunderabad - 500003, Factory Add: Plot no 201/7, Phase 02, IDA Cherlapally, Hyderabad - 500051, Telangana, India <a href="mailto:rsvalve@yahoo.com">rsvalve@yahoo.com</a> , <a href="mailto:rsvalve@gmail.com">rsvalve@gmail.com</a>	15 mm to 300 mm	PN 1.0 & PN 1.6		Without ISI mark	13-03-2027	B	
			25 mm to 300 mm		Temper Proof				
15	M/s. Kejriwal Castings Ltd., Kolkata	Reg. off. Millennium City IT Park, DN 62, Salt Lake, Sec-V, 14'h Floor, Tower-2, Kolkata - 700091 Factory Add: NH-5 Chamrail, Near Kona Powersub Station, kona Howrah - 711114 <a href="mailto:info@kejriwalcastings.com">info@kejriwalcastings.com</a> <a href="mailto:pawan.jalan@kejriwalcastings.com">pawan.jalan@kejriwalcastings.com</a>	15 mm to 200 mm	PN 1.0 & PN 1.6	-	With ISI mark	13-03-2027	B	
16	M/S. L&T Valves Limited., Chennai.	Reg. off. L&T Campus, TC III Building, Mount Poonamallee Road, Manapakkam, Chennai, Tamil Nadu, 600089. Factory Add: L&T Valves Limited., Enathur, Kanchipuram, Tamil Nadu, 631561. <a href="mailto:Trupal.NK@lntvalves.com">Trupal.NK@lntvalves.com</a>	All Type of Valve				28-01-2028	A	Reputed Company
17	M/s. GM Engineering Pvt. Ltd., Rajkot	Reg. Off. & Fac. Add - 23, Survey No. 168, Village: Dhokaliya Via Metoda, 360021 Rajkot. <a href="mailto:valve@gmengg.com">valve@gmengg.com</a>	50 mm to 250 mm	PN 1.0 & PN 1.6	-	Without ISI mark	28-01-2028	B	
18	M/s. Wellcast Industries, Ahmedabad	Reg. Off. & Fac. Add - Plot No. 06, Hari om estate, G.D. School Road, Memco, Ahmedabad - 382350, Gujarat. <a href="mailto:Vipul@wellcastindustries.com">Vipul@wellcastindustries.com</a> <a href="mailto:vipulpatel1987@gmail.com">vipulpatel1987@gmail.com</a>	Up to 200 mm	PN 1.0 & PN 1.6	-	Without ISI mark	28-01-2028	B	
19	M/s. Bikaner Engineering Works, Jaipur	F-445, Road No.12 VKI Industrial Area Jaipur-302013 <a href="mailto:bewfoundry@hotmail.com">bewfoundry@hotmail.com</a>	20 to 50 mm	PN 1.0 & PN 1.6	Single Acting	Without ISI Mark	27-9-2026	B	
			40 to 200 mm	PN 1.0 & PN 1.6	DS1, DS2, DK	Without ISI Mark			
			40 to 200 mm	PN 1.0 & PN 1.6	Temper Proof	Without ISI Mark			

Sr. No.	Name of Agency	Adress/E-mail Address	Approved Size & Class		Type	ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class					
1	2	3	4	5	6	7	8		9
20	M/s. Sigma Flow Control India Ltd., Kolkata, WB	CHATTERJEE INDUSTRIAL ESTATE, Jhipara, Baknra, Domjur, Howrah - 711403 Pramod KR Neotia - 9831072481, Vivek KR Neotia - 9831105987 enquiry@sigmaflow.in pkn@sigmaflow.in	Upto 300 mm	Upto PN-2.0	-	Without ISI mark	31-01-2029	A	
			Upto 200 mm	Upto PN-1.6	-	With ISI mark			
			Upto 300 mm	Upto PN-2.0	Temper Proof	Without ISI Mark			
21	M/s. Bir Industries, Jalandhar	G.T. Road, Bye pass, Maqsudan, Jalandhar-144008 <a href="mailto:industries.bir@gmail.com">industries.bir@gmail.com</a>	50 to 200 mm	PN 1.0 & 1.6	-	With ISI mark	27-09-2026	B	
22	M/s. Shiva Industries, Jaipur	Unit:-1- KH No. 518, Near Vaidh ji Ka Chouraha, Niwaroo Road, Jhotwara, Jaipur- 302012 <a href="mailto:navinebus@yahoo.co.in">navinebus@yahoo.co.in</a>	15 to 80 mm	PN 1.0 & PN 1.6	Single Acting	Without ISI Mark	25-10-2026	As per AWWA C -512	
			40 to 200 mm	PN 1.0 & PN 1.6	Double Acting	Without ISI Mark			
			40 to 200 mm	PN 1.0 & PN 1.6	Temper Proof	Without ISI Mark			
23	M/S. Shree Balaji Industries, Howrah	72/A, Manikpirtala, 2nd Bye Lane, Howrah- 711113 <a href="mailto:balajivalveskol@gmail.com">balajivalveskol@gmail.com</a>	40 to 200 mm	UP to PN 2.5	DS1-DS2, DK	With ISI Mark	25-10-2026	As per AWWA C -512	
			40 to 300 mm	PN 1.0 & PN 1.6	Temper Proof	Without ISI Mark			
24	M/s. R.G. Industries, Jalandhar	Vill:-Fazalpur, Behind Focal Point, Jalandhar-144004, Punjab <a href="mailto:enquiry@rgindustriessachdeva.com">enquiry@rgindustriessachdeva.com</a>	Up to 200 mm	PN 1.0 & PN 1.6	-	With ISI mark	25-10-2026		
Note:- It is advisable to use this information as a reference only & kindly confirm it with concern authority before use.									

**GUJARAT WATER SUPPLY & SEWERAGE BOARD, GANDHINAGAR**

**List of Approved Vendors of GWSSB for supply of Dual Plate Check Valves (as per API 594) as per Vendor Selection Report submitted by Different TPI (As on dt. 10.06.2026)**

Sr. No.	Name of Agency	Address/E-mail Address	Approved Size & Class		ISI Mark	Approval Valid up to Date	Grade	Remarks
			Size (mm)	Class				
1	2	3	4	5	6	7	8	9
1	M/s. Jupiter Engineering Co., Howrah	Kashipur, Dasnagar, Howrah-711105 <a href="mailto:jupiterbrc@gmail.com">jupiterbrc@gmail.com</a>	Up to 1200 mm	PN-1.0 & PN-1.6	Without ISI mark	25.10.2026	B	
2	M/S. R & D MULTIPES PVT. LTD. (PLANT-2)	Reg Off. Add.- 106/108, United Industrial Estate, Mogul Lane, Mahim(W), Mumbai-400016 Reg. Fac. Add.- Plant-2, Survey No. 304, Balda, Pardi-396125, Dist. Valsad, Gujarat <a href="mailto:mumbai@rdmultiples.com">mumbai@rdmultiples.com</a> <a href="mailto:bhupesh@rdmultiples.com">bhupesh@rdmultiples.com</a>	Up to 2400 mm	Up to PN 3.0	Without ISI mark	28-01-2028	A	
3	M/s. Aarko Manufacturing co., Jalandhar	74-75 Industriel Estate, Behind Sharp Chucks, Jalandhar- 144012 <a href="mailto:info@aarko.in">info@aarko.in</a> <a href="mailto:aarkomfg@gmail.com">aarkomfg@gmail.com</a>	Up to 300 mm	PN 1.0 & 1.6	Without ISI mark	27-09-2026	B	
4	M/s. G. M. Dalui & Sons Pvt. Ltd., Howrah	" Vivekanand Industrial Estate" Balitikuri, Bakultala, Howrah-711 113, West Bengal, India <a href="mailto:daluisuman@gmail.com">daluisuman@gmail.com</a> <a href="mailto:nkdalui@gmail.com">nkdalui@gmail.com</a>	Up to 3000 mm	Up to PN 1.6	Without ISI mark	17-10-2026	B	
5	M/s. Cair Euromatic Automation Pvt. Ltd., Ahmedabad	Survey No: 200, Plot 207, Beral Market,. Unique Ind. Park, Nr Kashiram Textile Mill,Ranipur Road, Narol Road, Ahmedabad -382 405 Gujarat,India. <a href="mailto:info@cairindia.com">info@cairindia.com</a>	50 to 600 mm	PN 1.6	Without ISI mark	17-10-2026	B	
6	M/s. SSPR Valve Manufacturing Private Limited, Howrah	Reg.off.Add. & Fac. Add.:- ONGC Road South Jhapordah, Domjur, Howrah- 711405, West Bengal, India <a href="mailto:info@ssprvalve.com">info@ssprvalve.com</a>	upto 800 mm	Up to PN 2.5	Without ISI mark	18-03-2027	B	
7	M/s. Ketan Engineering Works, Gujarat	Reg.off.Add. & Fac. Add.:- Plot No. 34, Opp. Pramukh Packaging, Nr. Pooja Dhanadal, s'nagar-Rajkot Highway, Shekhpur, S'nagar. <a href="mailto:ketanengiw@yahoo.in">ketanengiw@yahoo.in</a>	50 to 2400 mm	Upto PN 4.0	without ISI Mark	18-03-2027	B	
8	M/s. Kamala Valves & Engineering Pvt. Ltd. Howrah	41/2," Q" Road,Belgachia, Howrah-711108, WB. <a href="mailto:kamalavalve@gmail.com">kamalavalve@gmail.com</a>	50 to 1500 mm	Upto PN 1.6	Without ISI mark	31-01-2028	B	

**Mechanical Material Approved Vendors Details (As On. 10.06.2026)**

<b>Sr. No.</b>	<b>Item</b>	<b>No. Of Approved Vendors</b>	<b>No. Of Debarred Vendors</b>
1	Pump Sets	45	<b>1</b> 1. M/s. Silver Consumer Electricals Pvt. Ltd., Rajkot. (Upto 29.09.2026)
2	Electric Motor (LT/HT)	17	0
3	Electrical Control Panel (LT)	24	0
4	Soft Starter	11	0
5	PLC	11	0
6	Automation & System Intregator	9	0
<b>Total</b>		<b>117</b>	<b>1</b>



GUJARAT WATER SUPPLY AND SEWERAGE BOARD, GANDHINAGAR.						
Statement - AP -1						
Item - Pump sets (All types of Water & Sewerage Pump sets) (As On. 10.06.2026)						
Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
1	Duke Plasto Technic Pvt. Ltd., Palanpur	N.H. 27, Deesa highway, Badarpura, Palanpur-385511, North Gujarat Parth G Patel 9408701753 / 37 info@dukeplasto.com www.dukeplasto.com	<b>Submersible Pump sets</b> <b>1) Single phase submersible pump sets</b> A) V-3 Rating up to 1 HP Head up to 60 meter and discharge up to 60 LPM B) V-4 Rating up to 5 HP Head up to 200 meter and discharge up to 300 LPM <b>2) Three phase submersible pump sets</b> A) V-4 Rating up to 7.5 HP Head up to 250 meter and discharge up to 400 LPM B)V-5 Rating up to 15 HP Head up to 280 meter and discharge up to 500 LPM C) V 6 Rating up to 30 HP Head up to 360 meter and discharge up to 1200 LPM D) V7 Rating up to 25 HP Head up to 110 meter and discharge up to 1500 LPM E) V-8 Rating up to 85 HP Head up to 310 meter and discharge up to 2200 LPM F)V-9 Rating up to 60 HP Head up to 220 meter and discharge up to 2200 LPM <b>3) Open well Submersible Pumps as sets</b> A) single up to 5.00 HP Head up to 45 meter and discharge up to 1100 LPM B)Three phase Rating up to 10 HP Head up to 45 meter and discharge up to 1500 LPM	30-06-2026	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors
2	MBH PUMPS (Guj.) Pvt. Ltd., Ahmedabad	14 GIDC Naroda Indl. Estate, NARODA Ahmedabad - 382330 079-22823066, 22821018 9427630967 Yogesh Vachhani 9427533830 marketing@mbhpumps.com www.mbhpumps.com	(1) <b>Single Phase Borewell submersible Pumpset</b> - V4 Rating upto 5 HP, Head upto 210 mtr, Discharge upto 400LPM (2) Three Phase Borewell submersible Pumpset - V4 Rating upto 7.5 HP, Head upto 280 mtr, Discharge upto 400LPM (3) Three Phase Borewell submersible Pumpset - V6 Rating upto 30 HP, Head upto 280 mtr, Discharge upto 1060LPM (4) Three Phase Borewell submersible Pumpset - V8 Rating upto 70 HP, Head upto 275 mtr, Discharge upto 2200LPM (5) Three Phase Borewell submersible Pumpset - V10 Rating upto 120 HP, Head upto 150 mtr, Discharge upto 6500LPM (6) End Suction Back Pull Out Pump - Head upto 102 mtr, Discharge upto 8340 LPM (7) Non-clog sweage submersible Pump Rating upto 225 HP, Head upto 42 mtr, Discharge upto 21600 LPM (8) Submersed Centrifugal Pumpset - Rating upto 200 HP, Head upto 80 mtr, Discharge upto 15000LPM (9) Mono Submersible Pumpset - Rating upto 35 HP, Head upto 55 mtr, Discharge upto 1920 LPM (10) HSCF Pumpset - Head upto 90 mtr, Discharge upto 15200 LPM (11) Polder Pump set-Rating upto 200 HP, Head upto 90 mtr and Discharge upto 20,000 LPM	30-06-2026	B	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
3	Sabar Pumps Pvt. Ltd, Ahmedabad	3704/1,GIDC Estate, Phase-4, B/H New Nirma Chemicals, Vatva, Ahmedabad-382445 Abdulbhai 9427020423 sabarpumps@dataone.in www.sabarpumps.com	(1) Single Phase Borewell submersible Pumpset - V4 Rating, Bore size 100 mm, 0.5 to 2.0 HP, Head 9 mtr to 132 mtr, Discharge 19.8 to 285 LPM (2) Three Phase Borewell submersible Pumpset - V4 Rating Bore size 100 mm 1 to 5 HP, Head 15 mtr to 132 mtr, Discharge 19.8 to 109.8 LPM (3) Three Phase Borewell submersible Pumpset - V6 Rating Bore size 150 mm 3 to 30 HP,Head 13.5 mtr to 290 mtr, Discharge 120 to 1105 LPM (4) Three Phase Borewell submersible Pumpset - V8 Rating Bore size 200 mm 6 to 60 HP,Head 12 mtr to 142 mtr, Discharge 834 to 3336 LPM (5) Three Phase Borewell submersible Pumpset - V10 Rating Bore size 250 mm 10 to 60 HP,Head 13.5 mtr to 99 mtr, Discharge 1700 to 3334 LPM (6) Three Phase Borewell submersible Pumpset - V12 Rating Bore size 300 mm 35 to 95 HP,Head 45 mtr to 220 mtr, Discharge 833 to 2500 LPM	30-06-2026	B	
4	Techno Industries Pvt Ltd., Ahmedabad	Plot no: 5002, Nr. IGTR, Phase-IV, Vatva, Ahmedabad-382445, 079-25840651/0652/0653/ 0654 91-98980 61589 Prakash Shah 9687608117 chirag@technoindustries.co.in, info@technoindustries.co.in submersible@technoindustries.co.in, www.technoindustries.co.in	<b>1) Single phase submersible Borewell pump sets</b> a) V-4 up to 5 HP Head up to 280 meter and discharge up to 450 LPM b) V-6 up to 7.5 HP Head up to 220 meter and discharge up to 750 LPM <b>2) Three phase submersible Borewell pump sets</b> a) V-6 up to 45 HP Head up to 390 meter and discharge up to 1900 LPM b) V-8 up to 85 HP Head up to 330 meter and discharge up to 3300 LPM c) V-10 up to 150 HP Head up to 310 meter and discharge up to 3950 LPM d) V-12 up to 150 HP Head up to 170 meter and discharge up to 5400 LPM <b>3) Open well submersible pumpset</b> e) Single phase upto 5 HP, Head upto 40 meter, Discharge upto 1100 LPM f) Three phase upto 30HP, Head upto 90 meter,Discharge upto 2900 LPM <b>4) AC Solar submersible pumpset up to 10 HP</b> , Head upto 100 meter, Discharge upto 356 LPM <b>5) DC Solar submersible pumpset up to 10 HP</b> , Head upto 100 meter, Discharge upto 394 LPM	30-06-2026	B	
5	Topland Pumps pvt. Ltd., Rajkot	2, Umakant pandit udhyog Nagar- Mavadi Plot, Rajkot, Gujarat 360004 kirit Patel 9409104355 amm@topland-india.com, salesrajkot@topland-india.com www.topland-india.com	<b>1) Submersible pumpsets</b> A. Single phase upto 2.2 Kw/3 HP Bore size 100 MM head upto 135 MTR. Discharge upto 515 LPM B. Three phase upto 1.5 Kw/2 HP Bore size 100 MM head upto 135 MTR. Discharge upto 162 LPM C. Three phase upto 15 Kw/20 HP Bore size 150 MM head upto 243 MTR. Discharge upto 1200 LPM D. Three phase upto 18.4 Kw/25 HP Bore size 200 MM head upto 52 MTR. Discharge upto 2100 LPM <b>Openwell submersible pumpsets</b> A. Three phase upto 7.5 Kw/10 HP Head upto 54 Mtr Discharge upto 1620 LPM <b>2)Electric monoblock pumpsets</b> A. Single phase upto 1.5 Kw/2HP head upto 32MTR. Discharge upto 840 LPM	30-06-2026	B	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
6	Unnati pumps Pvt. Ltd., Ahmedabad	81, Amarnath Ind.Estate, Opp. Shayona Estate, Naroda Road, Ahmedabad-380025 MR. Vishal Modasariya 8866701666 liaison@unnatipumps.com, sales@unnatipumps.com www.unnatipumps.com	<b>SUBMERSIBLE PUMPSETS</b> -Three Phase, Up to 56kW/75 Hp, Bore Size :150mm (V6), 200 mm (v8) Head upto 300mtr, Discharge up to 1650 LPM (99 cubic.m/hr) <b>OPENWELL SUBMERSIBLE PUMPSETS</b> - Single Phase, 0.37kW/0.5 Hp to 2.2 kW/3 HP, Delivery Pipe Size : 25 x 25mm to 50 x 50mm, Head : Up to 42m, Discharge : Up to 1260 LPM(75.6 cubic.m/hr), -Three Phase, 0.37kW/0.5 Hp to 11kW/15Hp, Delivery Pipe Size : 50 x 50mm to 100 x 100mm, Head : Up to 42m, Discharge : Up to 1260 LPM(75.6 cubic.m/hr)	30-06-2026	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors
7	Unnati pumps Enterprise, Ahmedabad	22-27 Amarnath Ind.Estate,22-27,Nimesh Estate,B/H Shayona estate,Naroda Road,Ahmedabad-380025. 079-22203695 22203434 99099 72584 Vishal Modasariya 9909972582 sales@unnatipumps.com www.unnatipumps.com	1) Single Phase V4 Borewell submersible Pumpset - Rating upto 3 HP, Head upto 180 mtr, Discharge upto 180 LPM (2)Three Phase V4 Borewell submersible Pumpset- Rating upto 5 HP, Head upto 200 mtr, Discharge upto 180 LPM	30-06-2026	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors
8	Wilo Mather & Platt Pumps Limited Pune, Maharashtra.	Geeaves Coumpound, Pune-Mumbai Road, opp. Kalbhor Nagar, chinchwad, Pune-411019, Maharashtra, India Abdeali Bharmal - 8140922277 sales.in@wilo.com (Pune office) abdeali.bharmal@wilo.com www.willo.com	(1 ) Vertical Turbine pumps- Discharge: up to 46500 Cubic.meter/hr, Head : up to 300 meter (2) Horizontal & Verticle Split Casing (HSCF)Pumps- Discharge: up to 15500 Cubic.meter/hr, Head : up to 250 meter (3) Vertical & Horizontal End Suction Pumps- Discharge: up to 1600 Cubic.meter/hr, Head : up to 135 meter (4) Vertical & Horizontal Multistage Pumps- Discharge: up to 1000 Cubic.meter/hr, Head : up to 1500 meter (5) Vertical & Horizontal End Suction/Non Clog Sewage Pumps- Discharge: up to 7000 Cubic.meter/hr, Head : up to 70 meter (6) Sewage Submersible Centrifugal Pumps- Discharge: up to 21600 Cubic.meter/hr, Head : up to 60 meter (7) Submerged Centrifugal Pumps- Discharge: up to 4000 Cubic.meter/hr, Head : up to 100 meter	31-05-2027	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
9	Yash Manufactures Rajkot	Jay shiyaram Industrial Estate, Nr,Mira Udyog, NH-8B, Rajkot 0281-6536212,2385053 9998833153 Vasant Thumar 9428284035/8530939700, info@yashpump.in www.yaspump.in	<b>Submersible Pump sets</b> 1) Single phase submersible pump sets a) v-4 Rating up to 5 HP Head up to 210 meter and discharge up to 305 LPM 2) Three phase submersible pump sets a) v-4 Rating up to 7.50 HP Head up to 250 meter and discharge up to 305 LPM b) v-6 Rating up to 25 HP Head up to 280 meter and discharge up to 1500 LPM <b>Open well Submersible Pump sets</b> a) Three phase Rating up to 25 HP Head up to 70 meter and discharge up to 1860 LPM	13-03-2027	B	
10	Xylem Water Solutions India Pvt. Ltd. Vadodara Gujarat,	Plot No. 731, GIDC, Savli, Manjusar Savli Road, Vadodara-391770, Dharmendra Choksi 7490001981 266-7265800 77380-83550 dharmendra.chokshi@xylem.com, indiasales@xylem.com, www.jeepumps.com	<b>(1)Vertical Turbine pump set</b> (Discharge upto 72000 M3/hr and head -224 Mtr) <b>(2)Horizontal Split Case centrifugal Pump set</b> (Discharge up to 3700 m3/hr, head up to 50 mtr) <b>(3) End suction Cetrifugal /Back Pull out Pump</b> (Discharge: up to 536 m3/hr and head 70 mtr) [Approved as per Board meeting minute no. 286 resolution no.16 Dated.03/07/2021]	30-12-2026	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors
11	M/s. Kirloskar Brothers Ltd., Maharashtra	Kirloskarvadi-416308, Sangli(Dist), Maharashtra Email- rajesh.nair@kbl.co.in, hitesh.vaghela@kbl.co.in Rajesh Nair- 9687641312	(1 ) Vertical Turbine pumps-45500 CuM/hr, Max Head 200 Mtrs, Delivery Size -up to 2100 mm (2) Horizontal Axially Split Casing Pumps-24000 CuM/hr, Max Head 218 Mtrs,Delivery Size -up to 1200 mm (3) Metallic Volute Pumps (MVP) -18000 CuM/hr, Max Head 130 Mtrs, Delivery Size -up to 1500 mm (4) Concrete Volute Pumps (CVP)- 72000 CuM/hr, Max Head 40 Mtrs, Delivery Size -up to 1500 mm (5) Multistage Pumps -864 CuM/hr, Max Head 750 Mtrs, Delivery Size -up to 300 mm (6) Submerged Centrifugal pump -3000 CuM/hr, Max Head 29.5 Mtrs, Delivery Size -up to 600 mm (7) Sewage submersible pump -3000 CuM/hr, Max Head 29.5 Mtrs,Delivery Size -up to 600 mm (8) Non- clog Solid Handling pumps -1876 CuM/hr, Max Head 85 Mtrs, Delivery Size -up to 400 mm (9) End- suction pumps --500 CuM/hr, Max Head 36 Mtrs, Delivery Size -up to 200 mm	31-10-2026	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
12	M/s. Latteys Industries Limited Ahmedabad	Plot no. 16 Phase 1/2, GIDC Estate, Naroda, Ahmedabad 382330 Amit Darji -9898992635 9374991130 latteys@gmail.com amit.solar@latteysindustries.com	1. Single Phase Submersible Pumpset: V4 Borewell submersible Pumpset (Discharge range (Q) : upto 4 LPS ,Head Range (H) upto 180 Mtr, Motor Rating: Upto 3.7 KW/5.0 HP) 2. Three Phase Submersible Pumpset: V6 Borewell submersible Pumpset (Discharge range (Q): upto 17.5 LPS ,Head Range (H) upto 256 Mtr, Motor Rating: Upto 15 KW/20 HP) 3. Three Phase Openwell Mono Submersible Pumpset: (Discharge range(Q) : upto 435 LPM ,Head Range (H) upto 45 Mtr, Motor Rating: Upto 5.5 KW/7.5 HP)	31-10-2026	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors
13	M/s. WPIL, Ghaziabad	A-5, Sector - xxii, Meerut road, Ghaziabad,201003(U.P.) Mr. Vimal Patel- 9909411601 & 9324699512bpbk@wpil.co.in	1. HSCF Pump :- Discharge:- 11650 M3/HR, Head-150 Mtrs 2. End Suction Pump :- Discharge :- 1900 M3/HR ,Head -58 Mtrs 3. NC Sewerage Pump :- Discharge :- 1890 M3/HR, Head -48 Mtrs 4. Verticle Turbine Pump :- Discharge :- 7200 M3/HR, Head -70 Mtrs	31-10-2026	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors
14	M/s. Lubi Industries LLP, Naroda, Ahmedabad	Near Kalyan Mills, Naroda Road, Ahmedabad- 380025 Alkesh Dalwadi 9898640212 Ruturaj Rajaji 8238087808 adalwadi@lubipumps.com	1. Single phase Openwell Mono submersible pump up to 2 HP, Head up to 30 meter, Discharge up to 990 LPM 2. Three phase Openwell Mono submersible pump up to 30 HP, Head up to 58 meter, Discharge up to 1860 LPM 3. Single phase borewell submersible pump a) V4 up to 4 HP Head up to 180 meter , Discharge up to 60 LPM 4. Three phase borewell submersible pump a) V6 up to 25 HP Head up to 320 meter ,Discharge up to 400 LPM b) V8 & V10 up to 250 HP, Head up to 252 meter,discharge up to 5000 LPM	31-10-2026	B	
15	M/s. JEE Pumps(Guj) Pvt Ltd, Ahmedabad	Block no - 407-B & 408-B, Kubadthal- Pasunj Road, Village : Kubadthal , Taluka : Dascroi, District, 382430, Ahmedabad, Gujarat india Alpesh Bhai 8000770926 tender@jeepumps.com	1. Horizontal Split Casing Pump discharge up to 1240 Cu.m/h, Head up to 61 meter 2. Single stage,End suction back pull out type centrifugal pump discharge up to 545 Cu.m/h,Head up to 150 meter 3. Vertical long shaft sump pumps discharge up to 100 Cu.m/h,Head up to 26 meter 4. Non clog self priming mud/ sewage pumps discharge up to 200 Cu.m/h,Head up to 32 meter 5. self priming multi stage centrifugal pumps discharge up to 75 Cu.m/h,Head up to 270 meter 6. Sewage & Effluent submersible pumps discharge up to 150 Cu.m/h,Head up to 180 meter	31-10-2026	B	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
16	M/s. Aqua Machineries Pvt Ltd, Ahmedabad	Survey no.442/2,504/1 & 504/2, Near Haridarshan Estate, Near Express Highway, Ramol, Ahmedabad,382445, Gujarat, India Abhinav Patel - 9377053317 Dipesh Khatri - 9377053314 marketing@aquapumps.com ho@aquapumps.com srt@aquapumps.com dhk@aquapumps.com	1. Submerged Centrifugal Pump(SCF) ☑ Flow Upto – 12240 m3/hr ☑ Head Upto – 300 Mtr ☑ Power Upto – 2077 HP 2. Non clog type sewage submersible Pumps ☑ Flow Upto – 5500 m3/hr ☑ Head Upto – 76 Mtr ☑ Power Upto – 845 HP	31-01-2029	B	
17	M/s. Mak Pump Industries, Ahmedabad	Plot no- 65, Phase-1 G.ID.C.,Naroda,Ahmedabad-382330 ,Gujarat Bindesh Bhatt - 9601273572 Arvind Patel -9909030523 md@makpump.co.in sales@makpump.co.in	1. Single phase submersible pumpsets V4 rating up to 5 HP, Head up to 200 meter, Discharge up to 300 LPM 2. Three phase submersible pumpsets:- a) V4 rating up to 7.5 HP, Head up to 250 meter, Discharge up to 400 LPM b) V5 rating up to 15 HP, Head up to 280 meter, Discharge up to 500 LPM c) V6 rating up to 30 HP, Head up to 360 meter, Discharge up to 1200 LPM d) V8 rating up to 85 HP, Head up to 310 meter, Discharge up to 2200 LPM 3. Single phase openwell submersible pumpsets rating up to 5 HP Head up to 45 meter , Discharge up to 1100 LPM 4. Three phase openwell submersible pumpsets rating up to 20 HP Head up to 45 meter ,Discharge up to 1500 LPM	31-10-2026	B	
18	M/s. Delite Pumps, Ahmedabad	40&42 A+B, Tirupati Estate, Near Ambar Cinema, Bapunagar, Ahmedabad Jitendrakumar Patel 9426353968 mail@delitepumps.com	<b>1. Single Phase submersible Pumpset:</b> V4 Borewell submersible Pumpset (Discharge range (Q) : upto 2.25 LPS ,Head Range (H) upto 87 Mtr, Motor Rating Upto 2.2KW/3.0 HP) <b>2. Three Phase submersible Pumpset:</b> V6 Borewell submersible Pumpset (Discharge range (Q): upto 9.5 LPS ,Head Range (H) upto 280 Mtr, Motor Rating: Upto 22 KW/30 HP) <b>3. Three Phase Openwell Mono Submersible Pumpset:</b> (Discharge range (Q) : upto 20 LPS ,Head Range (H) upto 26 Mtr, Motor Rating: Upto 7.5 KW/10 HP)	31-10-2026	B	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
19	M/s. Jasco Pump Pvt. Ltd, Ahmedabad	47, Phase-1, GIDC Naroda, Ahmedabad- 382330, Gujarat Hiresh Pandya- 9374063726 Rakesh Patel - 9374063721 info@jascopump.com	1. V4 Borewell submersible Pump- Three phase (Discharge range (Q) : upto 250 LPM , Head Range (H) upto 88 Mtr, Motor Rating : Upto 3.0 HP) 2. V6 Borewell submersible Pump (Discharge range (Q) : upto 900 LPM , Head Range (H) upto 240 Mtr, Motor Rating : Upto 20 HP/15KW) 3. V8 Borewell submersible Pump (Discharge range (Q) : upto 1700 LPM , Head Range (H) upto 108 Mtr, Motor Rating : Upto 60 HP) 4. V10 Borewell submersible Pump (Discharge range (Q) : upto 1800 LPM , Head Range (H) upto 170 Mtr, Motor Rating : Upto 100 HP) 5. Openwell Mono Submersible Pumps sets- Three Phase (Discharge range (Q) : upto 6000 LPM , Head Range (H) upto 105 Mtr, Motor Rating : Upto 60 HP) 6. Non-clog sewage submersible Pumpset (Discharge range (Q) : upto 41000 LPM , Head Range (H) upto 71 Mtr, Motor Rating : Upto 250HP) 7. Submersed Centrifugal Pumpset (Discharge range (Q) : upto 35000 LPM , Head Range (H) upto 110 Mtr, Motor Rating : Upto 225 HP) 8. Polder Submersible Pumpset (Discharge range (Q) : upto 21660 LPM , Head Range (H) upto 110 Mtr, Power Rating : Upto 250 HP) 9. Horizontal split Case Centrifugal pumpset (HSCF) (Discharge range (Q) : upto 6540 LPM , Head Range (H) upto 88 Mtr)	31-10-2026	B	
20	M/s. Flotech Engineering Pvt Ltd., Veraval	Rani Industrial Area, Shapar Main Road, Shapar( Veraval) 360024, Vinodkumar.K.-9979888435, Kashyapbhai.M.- 9825218415, flotechpumpmkt@gmail.com	1. Openwell mono submersible pump : Rating up to 15 kW/20 HP , Head up to 72 m, Discharge upto 21.00 lps 2. Single Phase Borewell submersible pump : Bore size 100 mm, Rating up to 2.2 kW/3.0 HP , Head up to 168 m, Discharge upto 2.5 lps 3. Three phase Borewell submersible pump: a) Bore size 100 mm, Rating up to 5.5 kW/7.5HP , Head up to 229 m, Discharge upto 2.75 lps b) Bore size 150 mm, Rating up to 22 kW/30HP , Head up to 423 m, Discharge upto 18.3 lps c) Bore size 200 mm, Rating up to 45 kW/60HP , Head up to 410 m, Discharge upto 34.15 lps	30-11-2026	B	
21	M/s. Unnati industrial Corporation, Ahmedabad	D-61, Diamond Park, GIDC Naroda, Ahmedabad-382330. Gordhanpatel.B.Patel- 9825044355, pump.uneel@gmail.com	1. Polder submersible pump up to 75 kW , Head up to 50 m, Discharge upto 148.3 lps 2. Openwell mono submersible pump up to 22 kW , Head up to 54 m, Discharge upto 58 lps 3. Three phase borewell submersible pump (a) For 150 mm Bore dia Motor Rating up to 22 kW , Head up to 340 meter, Discharge upto 13.8 lps (b) For 200 mm Bore dia Motor Rating up to 75 kW , Head up to 252 meter, Discharge upto 26.50 lps (c) For 250mm Bore dia Motor Rating up to 63 kW , Head up to 170 meter, Discharge upto 21.6 lps	30-11-2026	B	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
22	M/s. Falcon Pumps Pvt. Ltd, Rajkot	Survey No. 39/4, Vavdi Village, Near NH-27, Gondal Road, NH-27, Rajkot-360004, Gujarat. India. Dhirajlal.S-9825084787, Kamalnayan sojitra-9978999791 b2g@falconpumps.in	1. Openwell mono submersible pump : Rating up to 45 kW , Head up to 138 m, Discharge upto 44.0 lps 2. Single Phase Borewell submersible pump : Bore size 100 mm, Rating up to 3.7 kW , Head up to 210 m, Discharge upto 3.75 lps 3. Three phase Borewell submersible pump: a) Bore size 100 mm, Rating up to 4.5 kW , Head up to 180 m, Discharge upto 3.45 lps b) Bore size 150 mm, Rating up to 26 kW , Head up to 646 m, Discharge upto 15 lps c) Bore size 200 mm, Rating up to 75 kW , Head up to 432 m, Discharge upto 33.5 lps d) Bore size 300 mm, Rating up to 93.25 kW , Head up to 351 m, Discharge upto 50 lps	30-11-2026	B	
23	M/s. Lubi Industries LLP, Vadsar, Gandhinagar	Vadsar, Khatraj road, Ta. Kalol, Dist. Gandhinagar, Rajan.N.Borecha-7961700199, Ruturaj Rajaji-8238087808, adalwadi@lubipumps.com	HSCF Pump : Discharge :- 2040 m3/h , Head-135 meter End Suction Pump : 210m3/h, Head-110 meter Non clog type sewage submersible pump : 1260m3/h , Head- 55 meter	30-11-2026	B	
24	M/s Coach International Technique Private Limited, Ahmedabad.	<b>Office Add.-</b> 1st Floor, 113, Sayona Center, Memco Char Rasta, Naroda Road, Ahmedabad, Gujarat <b>Work location-</b> Ahmedabad Highway Road, Nr. Gathamani Patiya, opp Umiya way bridge Palanpur, Banaskantha, -385001 Gujarat. Dipak Prajapati 9909032133 info@coachinternational.in www.coachinternational.com	1) Three phase submersible pumpsets as per IS 8034:2018- 2.2 kW/3.0 HP to 63 kW/84.48 HP, Head 23.6 meter to 210 meter, Discharge 2.98 lps(10.728 cu.m/h) to 29 lps(104.4 cu.m/h) , Bore size:150mm(V6), 200mm(V8), Delivery size:50,65 & 75 & 100mm	31-05-2027	B	As per Letter no CE(M)/Mat./Vender Name Change/N-3/2023/696 Dated. 19/7/2023. Name of Company is changed from M/s Captain Pumps Private Limited to M/s Coach International Technique Private Limited, Ahmedabad.
25	M/s. Amrit Engineering Pvt.Ltd.,visnagar	115/1-2, GIDC Estate, Unja-Kansa Road, Visnagar-384315 amrumpump@gmail.com amrumpump@yahoo.com	(1 ) <b>V4</b> Borewell Submersible Pump- <b>Single Phase</b> Discharge Range ( <b>Q</b> ) : Upto 5 LPS, Head Range ( <b>H</b> ): Upto 190 Mtr, Motor Rating : Upto 2.2 KW (2) <b>V4</b> Borewell Submersible Pump- <b>Three Phase</b> Discharge Range ( <b>Q</b> ) : Upto 5 LPS, Head Range ( <b>H</b> ): Upto 171 Mtr, Motor Rating : Upto 3.7 KW (3) <b>V6</b> Borewell Submersible Pump- <b>Three Phase</b> Discharge Range( <b>Q</b> ) : Upto 21.25 LPS. Head Range ( <b>H</b> ): Upto 439 Mtr, Motor Rating : Upto 18.5 KW (4) <b>V8</b> Borewell Submersible Pump- <b>Three Phase</b> Discharge Range( <b>Q</b> ) : Upto 55 LPS, Head Range ( <b>H</b> ): Upto 306 Mtr , Motor Rating : Upto 45 KW (5) <b>V10</b> Borewell Submersible Pump- <b>Three Phase</b> Discharge Range( <b>Q</b> ) : Upto 150 LPS. Head Range ( <b>H</b> ): Upto 250 Mtr , Motor Rating : Upto 112.5 KW (6) Openwell Mono Submersible Pump- <b>Three Phase</b> Discharge Range( <b>Q</b> ) : Upto 10 LPS. Head Range ( <b>H</b> ): Upto 44 Mtr , Motor Rating : Upto 7.5 KW	31-08-2027	B	



Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
26	M/s. KISHOR Pumps Pvt Ltd.,Pune	A-13/H, M.I.D.C., Pimpri, Pune 4111018 INDIA vishwas.deshmukh@kishorpumps.com, info@kishorpumps.com	a) Submerged centrifugal pump: Discharge up to 16660 LPM,Head up to 27 meter, motor rating up to 215HP b) Non clog type sewage submersible pump: Discharge up to 62775 LPM, Head up to 57 Meter,Motor rating up to 450 HP	31-08-2027	B	
27	M/s. Aqua Machineries Pvt.Ltd., Ahmedabad	442/2, 504/1 & 504/2, Near Haridarshan Estate, Nr. Express Highway, Romal, Ahmedabad - 382445 Abhinaya Patel - 9327027240, 9377053317 pullen@aquapumps.com dhk@aquapumps.com www.aquapumps.com	<b>1) Polder Pump</b> (Q= up to 1821 m <sup>3</sup> /hr @ up to 110 mtr Head; up to 200 HP) <b>2) Borehole Submersible Pump sets:</b> (V12 to V24; Q= 273 m <sup>3</sup> /hr @ up to 250 mtr Head: up to 350 HP) <b>3) Horizontal Mono submersible Pump sets</b> (Q=up to 138 m <sup>3</sup> /hr@ up to 105 mtr Head: up to 130 HP)	31-06-2026	B	
28	Grundfos Pumps India Pvt. Ltd., Chennai	118, Rajiv Gandhi Salai, Thoraipakkam, Chennai-600097, (044) 45966800, Email:- salesindia@grunfos.com	All type of Pump sets	Reputed Company	A	
29	M/s. Jyoti Ltd. Vadodara	Nanubhai Amin Marg, Industrial Area, P.O. Chamilal Industries, Vadodara-390003 Email- jmukhopadhyay@jyoti.com Mr. A.S. Gopalkarishnan M.-0265-3054444, 9824174649	<b>1.HSCF Pump</b> : Discharge upto 15300 m <sup>3</sup> /h, Head up to 126 meter <b>2.End suction Pump</b> : Discharge upto 300 m <sup>3</sup> /h, Head up to 30 meter <b>3.Non-clog type sewage submersible pump</b> : Discharge upto 3780 m <sup>3</sup> /h,Head up to 30.5 meter <b>4.Vertical Turbine pump</b> : Discharge upto 59544 m <sup>3</sup> /h, Head up to 187 meter	31-01-2027	B	
30	M/s. Divine Pump industries, Ahmedabad	Plot No. 437, Road No. 11, Kathwada GIDC, S.P. Ring Road, Ahmedabad - 382430, Gujarat. Email - tender.divinepump@gmail.com, divinwpump@yahoo.com	<b>1. Three phase submersible pumpsets:</b> - 2.2 kw/3.0 HP to 18.5 kw/ 25 HP, Head: 21 meter to 320 mtr, Discharge: 1.5 lps (5.4 cubic.meter/hour) to 17 lps (61.2 cubic.meter/hour), Bore size: 150mm (V6) <b>2. Three phase Openwell submersible pumpsets:</b> - 2.2 kw/ 3.0 HP to 7.5 kw/ 10 HP, Head: 22 meter to 42 meter, Discharge: 5.0 lps (18 cubic.meter/hour) to 9.5 lps (34.2 cubic.meter/hour), Delivery size: 50mm <b>3. Submersible Sewage pump:</b> - Up to 56 kw/ 75 HP, Head: Up to 41 meter, Discharge: Up to 4160 lpm (249.6 cubic.meter/hour) <b>4. Submersible Dewatering pump:</b> - Up to 112 kw/ 150 HP, Head: Up to 150 meter, Discharge: Up to 2274 lpm (136.44 cubic.meter/hour)	31-07-2027	B	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
31	M/s. Splendor Pump LLP, Rajkot	390, Plot no.3/31, 20 Samarat Ind. Area, Near ST work Shop, Gondal road, Rajkot - 360004, Gujarat. Email: director@splendorpump.com	<b>1. Single Phase Submersible Borewell Pump Set:</b> - V-4 Rating up to 3 HP, Head- up to 180 Meter & Discharge up to 350 LPM (ISI Marked) <b>2. Three Phase Submersible Borewell Pump set:</b> - V-4 Rating up to 5 HP, Head – up to 230 Meter and Discharge up to 380 LPM (ISI Marked) - V-6 Rating up to 15 HP, Head – up to 317 Meter and Discharge up to 700 LPM (ISI Marked) - V-8 Rating up to 85 HP, Head – up to 330 Meter and Discharge up to 3300 LPM (Confirming to IS but Non ISI) <b>3. Openwell Submersible Pump Set:</b> - Three phase up to 20 HP, Head - up to 70 Meter and Discharge up to 2900 LPM (ISI Marked) <b>4. AC Solar Submersible Pump Set:</b> - AC Solar Sub. Pump set up to 15 HP, Head up to 150 Meters and Discharge up to 500 LPM <b>5. DC Solar Submersible Pump Set:</b> - DC Solar Sub. Pump set up to 5 HP, Head up to 150 Meters and Discharge up to 394 LPM	31-07-2027	B	
32	Wilo Mather & Platt Pumps Limited Pune, Maharashtra.	E-25, MIDC, Gokul Shrigaon, Kolhapur, Maharashtra. sales.in@wilo.com, himanshu.malaviya@wilo.com. Www.wilo.in.	1. Horizontal & Vertical Split Casing Pumps ( Up to Flow & Head Pertaining to KW range): - Flow Upto 600 m3/hr, Head Upto 200, 300 HP 2. Vertical & Horizontal end Suction Pumps: - Flow Upto 1000 m3/hr, Head Upto 170, 400 HP 3. Vertical & Horizontal Multistage Pumps: - Flow Upto 27 m3/hr, Head Upto 221, 10 HP 4. Borewell Submersible Pumps: - Flow Upto 138 m3/hr, Head Upto 227, 100 HP 5. Vertical & Horizontal end Suction Sewage Pumps: - Flow Upto 8000 m3/hr, Head Upto 61, 250 HP 6. Sewage Submersible Centrifugal Pumps: - Flow Upto 1500 m3/hr, Head Upto 71, 100 HP 7. Open well Mono Submersible Pumps: - Flow Upto 204 m3/hr, Head Upto 148, 30 HP 8. Horizontal Monoblock Pumps: - Flow Upto 135 m3/hr, Head Upto 70, 40 HP	28-01-2028	A	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
33	M/s. KSB Limited, Maharashtra	<b>OfficeAdd.</b> Office No. 601, Runwal R-Square, L.B.S. Marg, Mulund (West), Mumbai - 400080, Maharashtra, Mumbai. Mr. Pushkar Gohad, Mo. 9860565645. Email - Pushkar.Gahad2@ksb.com atul.pol@ksb.com <b>Fact.Add.</b> Mumbai-Pune Road, Pimpri, Pune - 411018, Maharashtra www.ksbindia.co.in	<b>1. Horizontal Split Casing (HSCF) Pumps:</b> - Discharge upto 2400 Cubic.metre/hour, Head up to 40 Mtr <b>2. Non Clog Submersible Sewage Pumpset:</b> - Up to 245kw/328 HP, Discharge up to 1600 Cubic.metre/hour, Head up to 40 Mtr <b>3. Non Clog End Suction Pumps:</b> - Discharge up to 1200 Cubic.metre/hour, Head up to 30 Mtr	31-07-2027	A	
34	M/s. KSB Limited., Maharashtra	Plot no: E-3 & E-4, MIDC Sinnar, Nasik – 422113, Maharashtra, India Atul Pol – 8407906384 atul.pol@ksb.com, Vicky Singh- 9316366718 vicky.singh@ksb.com, www.ksbindia.co.in	<b>1) Single Phase Submersible Pump sets</b> as per IS 8034: 2018 - 0.37 kW/ 0.5 HP to 3 kW/ 4 HP, Head: 9 meter to 176 meter, Discharge: 0.36 lps(1.296 cubic.meter/hour) to 4.72 lps (16.992 cubic.meter/ hour), Bore Size: 100mm (V4) <b>2) Three Phase Submersible Pump sets</b> as per IS 8034: 2018- 0.75 kW/ 1.0 HP to 30 kW/ 40.23 HP, Head: 14.5 meter to 320 meter, Discharge: 0.36 lps (1.296 cubic meter/hour) to 26.94 lps (96.984 cubic.meter/hour), Bore Size: 100mm (V4), 150mm (V6), 200mm (V8) <b>3) Three Phase Sewage Submersible Pump sets</b> - 1.03 kW/ 1.0 HP to 120 kW/ 160 HP, Head: 10 meter to 100 meter, Discharge: 1.5 lps ( 5.4 cubic.meter/hour) to 600 lps (2160 cubic.meter/hour) <b>4) Solar Deep well (submersible) Pumping Systems</b> with A.C. Induction Motor Pump Set - Capacity: Up to 10 HP as per Models specified in Annexure III of MNRE Specification of Solar Photovoltaic Water Pumping Systems having ref. no.: Annexure-I of Circular No. F. No.41/ 3 / 2018-SPV Division dated 17.7.2019. <b>5) Solar Shallow well (Surface) Pumping Systems</b> with A.C. Induction Motor Pump Set Capacity: Up to 5 HP as per Models specified in Annexure III of MNRE Specification of Solar Photovoltaic Water Pumping Systems having ref. no.: Annexure -I of Circular No. F. No.41/3/ 2018-SPV Division dated 17.7.2019.	31-06-2026	A	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
			<p><b>6) Solar Deep well (submersible) Pumping Systems with D.C. Motor Pump Set with PMSM DC Motor-</b> Capacity: Up to 10 HP as per Models specified in Annexure II of MNRE Specification of Solar Photovoltaic Water Pumping Systems having ref. no.: Annexure-I of Circular No. F. No. 41/3/2018 - SPV Division dated 17.7.2019.</p> <p><b>7) Solar Shallow Well (Surface) Pumping Systems with D.C. Motor Pump Set with PMSM DC Motor</b> Capacity: Up to 5 HP as per Models specified in Annexure II of MNRE Specification of Solar Photovoltaic Water Pumping Systems having ref. no.: Annexure-I of Circular No. F. No. 41/3/2018- SPV Division dated 17.7.2019</p> <p><b>Remarks:</b> 1. Vendor is manufacturing submersible pump sets as per IS 8034 and other components of "SOLAR PHOTOVOLTAIC WATER PUMPING SYSTEMS" such as PV Module/ Solar Photo Voltaic Array, SPV Controller, Module mounting structures, Tracking systems (if any), Earthing arrangements, Cables and connection arrangements shall be as per MNRE specification - Annexure-I of Circular No. F. No. 41/3/2018-SPV Division dated 17.7.2019 and other relevant guidelines/requirements</p>			
35	M/s. Mascot Pump Ltd., Ahmedabad	185/B Phase-1, NR, Havmore Icecream, Naroda GIDC, Ahmedabad 382330 Email - info@mascotpumps.com, gmmktg@mascotpumps.com	<p><b>Single Phase Submersible Pumps Sets</b> 1. V 4 Rating up to 4 HP, Head up to 99 mtr, Discharge up to 102 LPM (IS 8034) 2. V 4 Rating up to 5 HP, Head up to 263 mtr, Discharge up to 600 LPM (Non ISI)</p> <p><b>Three Phase Submersible Pumps Sets</b> 1. V 6 Rating up to 20 HP, Head up to 256 mtr, Discharge up to 810 LPM (IS 8034) 2. V 8 Rating up to 50 HP, Head up to 55 mtr, Discharge up to 1500 LPM (IS 8034)</p> <p><b>Dewatering Pumpset</b> Rating up to 50 HP, Head up to 50 mtr, Discharge up to 7000 LPM (Non ISI)</p> <p><b>Sewage Submersible Pumpset</b> Rating up to 50 HP, Head up to 50 mtr, Discharge up to 13800 LPM (Non ISI)</p> <p><b>Three Phase Openwell Submersible Pumps Sets</b> Rating up to 30 HP, Head up to 60 mtr, Discharge up to 1890 LPM (IS 14220)</p>	31-07-2027	B	
36	M/s. Jalganaga pumps LLP. Rajkot	Plot No.122 to 124, Survey No.128, Behind Shantidham Society, SIDC Road Veraval (Shapar)- 360024, Dist. Rajkot, Gujarat. Email- sales@jalgangapumps.com Mr. Mahendra Devaliya (AC & Finance) M.-9714801686	<p>1.Openwell mono submersible pump up to 5.50 kW, Head upto 24 Meter, Discharge upto 12 LPS</p> <p>2.Single pahse borewell Mono submersible Pump (a) for 100 mm Bore dia-Motor rating upto 1.5kW,Head upto 108 Meter, Discharge upto 2.67 LPS</p> <p>3.Three pahse borewell submersible Pump (a) for 100 mm Bore dia- Motor rating upto 3.7KW, Head upto 160 Meter, Discharge upto 2.67 LPS (b) for 150 mm Bore dia- Motor rating upto 15KW, Head upto 252 Meter,Discharge upto 15 LPS</p>	31-01-2027	B	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
37	M/s. WPIL Ltd. Kolkata	Trinity Plaza, 84/1 A, Topsia Road (South), Kolkata-700046 West Bengal Email- mandowara@wpil.co.in, j.ganguly@wpil.co.in Mr. Vimal Patel M. (033)40556800, 09324699512	Verticle Turbine Pump Discharge up to 43400m3/hr, Head up to 228 m head	31-01-2027	B	
38	M/s. Flowmore Ltd, Ghaziabad	28, A-A1. Site - IV, Unit - II, Ind. Area, Sahibabad, Ghaziabad (U.P.) Email- corporate@flowmoregroup.com fplworks@flowmoregroup.com Mr. Chandan Bharti M.0124-2563200, 9313241727	1. HSCF Pumps ☑ Discharge - 15300 m3/hr ☑ Head - 111 Mtr 2. End Suction Pumps ☑ Discharge - 1000 m3/hr ☑ Head - 300 Mtr 3. Vertical Turbine Pump ☑ Discharge - 43000 m3/hr, ☑ Head - 248 Mtr	31-01-2029	B	
39	M/s. Chandra Pumps Pvt. Ltd., UP	34, Delhi Road, Opp-BSNL Brahmapuri Tel. Exchange, Meerut, UP- 250002 K.K. Maheshwari - 9837893411 shagunkashiv0333@gmail.com rajesh@chandrapumps.in contact@chandrapumps.in	1. Vertical Turbine Pump ☑ Pump Flow Range - 12 m3/hr to 2400 m3/hr, ☑ Pump Head Range - upto 250 m, ☑ Power Upto 250 KW/335 HP	31-01-2029	B	
40	M/s. Sintech Precision Products Ltd., Gaziabad, UP	C-189 & 190, B. S. Road Industrial Area, Ghaziabad UP-201001 Chirag Patel 9824493830 sales3@sintechpumps.com	1. Horizontal Split Casing Pumps ☑ Pump range Flow- upto 3315 m3/hr, ☑ Pump range Head 160 m, ☑ Pump range 500 KW/670 HP. 2. End Suction Pumps ☑ Pump range Flow- upto 1100 m3/hr, ☑ Pump range Head 150 m, ☑ Pump range 355 KW/475 HP. 3. Vertical Turbine Pump ☑ Pump range Flow- upto 6120 m3/hr, ☑ Pump range Head 197 m, ☑ Pump range 418 KW/560 HP.	31-01-2029	B	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
41	M/s. Activa Pumps., Rajkot	Plot No. 13/14, Survey no. 224, Somnath Industrial Area, Gondal Road, Kothariya, Opp. Krishna Park Hotel, Rajkot- 360004 Vipulbhai Bavaliya- 9825723323 activapumps@gmail.com	1. Three Phase Open well Mono submersible Pump ☑ Upto 10 HP ☑ Discharge – Upto 780 LPM ☑ Head – Upto 34 Mtr 2. Single Phase borewell submersible Pump ☑ Upto 3 HP ☑ Discharge – Upto 180 LPM ☑ Head – Upto 140 Mtr 3. Three Phase borewell submersible Pump ☑ Upto 15 HP ☑ Discharge – Upto 720 LPM ☑ Head – Upto 360 Mtr	31-01-2029	B	
42	M/s Angel Pumps Pvt. Ltd., Rajkot	G-1604 to 1607-B, Gate No. 2, GIDC Metoda, Rajkot-360021 Kirit Adroja - 9824284404, oem.marketing@pumpsangel.com info@pumpsangel.com	1. Three Phase Open well Mono submersible Pump ☑ Upto 7.5 KW ☑ Discharge – Upto 1020 LPM ☑ Head – Upto 42 Mtr 2. Single Phase borewell submersible Pump ☑ Upto 2.2 KW ☑ Discharge – Upto 30 LPM ☑ Head – Upto 198 Mtr 3. Three Phase borewell submersible Pump ☑ Upto 15 KW ☑ Discharge – Upto 200 LPM ☑ Head – Upto 371 Mtr	31-01-2029	B	
43	M/s. Waterman Industries Private Limited,Ahmedabad	Plot No.: 407, Opp. New INTAS Pharma, Sarkhej – Bavla Highway, Moraiya,Changodar,Ahmedabad – 382213,Gujarat, India sales@watermanpump.com	<b>Submersible Pump Sets</b> <b>1] Single Phase Submersible Pumpsets V-4 rating:</b> 0.5HP to 3.0HP, Head: 19.5 meter to 135 meter ,Discharge: 33 LPM to 222 LPM, Delivery Size:32mm, 50 mm <b>2] Three Phase Submersible Pumpsets V-4, V-6 &amp; V-8 rating:</b> 2.0 HP to 60 HP, Head; 15 metre to 324 meter, Discharge : 42 LPM to 1620 LPM, ,Delivery siz:32,38,50,65,75,100 & 125 mm <b>3] Three Phase Openwell Submersible Pumpsets:</b> 3.0 HP to 5.0 HP, Head; 21 metre to 34 meter, Discharge : 300 LPM to 600LPM ,Delivery size :50 & 65 mm	31.01.2028	B	
44	Unnati pumps Pvt.Ltd. Ahmedabad	81, Amarnath Ind.Estate, Opp. Shayona Estate, Naroda Road, Ahmedabad-380025 MR. Vishal Modasariya 8866701666 liaison@unnatipumps.com, sales@unnatipumps.com www.unnatipumps.com	<b>SUBMERSIBLE PUMPSETS</b> -Three Phase, Up to 56kW/75 Hp, Bore Size :150mm (V6), 200 mm (v8) Head upto 300mtr, Discharge up to 1650 LPM (99 cubic.m/hr) <b>OPENWELL SUBMERSIBLE PUMPSETS</b> - Single Phase, 0.37kW/0.5 Hp to 2.2 kW/3 HP, Delivery Pipe Size : 25 x 25mm to 50 x 50mm, Head : Up to 42m, Discharge : Up to 1260 LPM(75.6 cubic.m/hr), -Three Phase, 0.37kW/0.5 Hp to 11kW/15Hp, Delivery Pipe Size : 50 x 50mm to 100 x 100mm, Head : Up to 42m, Discharge : Up to 1260 LPM(75.6 cubic.m/hr),	30-12-2026	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
45	Unnati pumps Enterprise Ahmedabad	22-27 Amarnath Ind.Estate,22-27,Nimesh Estate,B/H Shayona estate,Naroda Road,Ahmedabad-380025. 079-22203695 22203434 99099 72584 Vishal Modasariya 9909972582 sales@unnatipumps.com www.unnatipumps.com	1) Single Phase V4 Borewell submersible Pumpset - Rating upto 3 HP, Head upto 180 mtr, Discharge upto 180 LPM (2)Three Phase V4 Borewell submersible Pumpset- Rating upto 5 HP, Head upto 200 mtr, Discharge upto 180 LPM	30-12-2026	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors

**Note:- It is advisable to use this information as a reference only & kindly confirm it with concern authority before use.**

GUJARAT WATER SUPPLY AND SEWERAGE BOARD, GANDHINAGAR.					
Statement - AP - 2					
Item - Pump sets (All types of Water & Sewerage Pump sets) (As On. 10.06.2026)					
Debarred / Black list vendor details					
Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Grade	Remark
1	2	3	4	5	6
1	Silver Consumer Electricals Pvt. Ltd., Rajkot	Rajkot-Gondal Highway, Nr.Krishan Petrol Pump, Behind Magotteaux pvt Ltd, Kangasiyali, Ta: Lodhika, Rajkot- 360002 0281-2222156, 2222017, (M) 9099913245,98252 15610 ketanpatel@silverpumps.com, tenders@silverpumps.com www.silverpumps.com	<b>SUBMERSIBLE PUMPSETS</b> - Single Phase, 0.37kW/0.5 Hp to 3.7 kW/5 HP, Bore Size :75mm (V3) to 100 mm(V4), Head : Up to 400m, Discharge : Up to 575 LPM(34.5 cubic.m/hr) -Three Phase, Up to 75kW/100 Hp, Bore Size :100mm (V4), 150mm(V6),200mm(V8), Head : Up to 465m, Discharge : Up to 2150LPM (129 cubic.m/hr) <b>OPENWELL SUBMERSIBLE PUMPSETS</b> - Single Phase, 0.37kW/0.5 Hp to 2.2 kW/3 HP, Delivery Pipe Size : 25 x 25mm to 100 x 100mm, Head : Up to 58m, Discharge : Up to 1000 LPM(60 cubic.m/hr), -Three Phase, 0.37kW/0.5 Hp to 22.37kW/30Hp, Head : Up to 58m, Discharge : Up to 1000 LPM (60 cubic.m/hr)	<b>A</b>	DEBARRED (29-09-2023 TO 29-09-2026)
<b>Note:- It is advisable to use this information as a reference only &amp; kindly confirm it with concern authority before use.</b>					



**GUJARAT WATER SUPPLY AND SEWERAGE BOARD, GANDHINAGAR.**

**Statement - AM -1**

**Item -Electric Motor (HT/LT) (As On. 10.06.2026)**

<b>Sr. No.</b>	<b>Name of Agency</b>	<b>Address, E-mail address and contact Nos.</b>	<b>Approved Item, type, Size, category, grade and class</b>	<b>Validity date</b>	<b>Grade</b>	<b>Remarks</b>
<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
1	M/s. Havells India Limited, Alwar, Rajasthan.	1001,10th Floor, Venus Amadeus, Jodhpur Cross Road, Satellite, Ahmedabad-380015 Sudhir Joshi 9909909287/ 9662504914 jigar.parikh@havells.com, rakesh.tripathi@havells.com, www.havells.com	LT Motor of 415 V( with efficiency classes-IE2 & IE3) from 0.18kW upto & including 300kW rating	30-06-2026	B	
2	M/s. Laxmi Hydraulics Pvt Ltd, Solapur, Maharastra	B-11 MIDC Chincholi Solapur Maharashtra Niraj Khaneja 9099694302, 9922111835 ahmedabad.gm@lhpmotor.com satish.unje@lhpmotor.com www.lhp.co.in	<b>LT Electric Motor</b> Electric Motor (LT) of Output Rating 0.18 KW to upto and including 600 KW, upto 10 pole and efficiency class: IE2 and IE3.	28-01-2028	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021, it has been decided to double head, discharge and kilowatt of concerned Pumps for "A" Grade Vendors
3	M/s. Karad Projects and Motors ltd., Maharastra	Plot No. B67 & 68,Karad Industrial Area,MIDC Tasawade-415109 Amit Deshpande 9850983352 amit.deshpande@kpml.co.in	<b>LT Electric Motor</b> Line operated three phase ac motors , up to and including 1000V LT, 50Hz, S1 duty, 2/4/6/ poles, Efficiency class IE2/IE3/IE4, Degree of protection up to and including IP 55, Foot mounted/ Flange mounted insulation class F, Rated outputs 0.55 Kw upto and including 315kW	31-10-2026	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021, it has been decided to double head, discharge and kilowatt of concerned Pumps for "A" Grade Vendors
4	M/s. Techno Industries Pvt. Ltd, Ahmedabad	Plot No 5002, Phase-IV, G.I.D.C, Vatva, Ahmedabad-382445 1.) Jimmy Shah- 9924869699 2.) Prakash Shah- 9687608117 info@technoindustries.co.in chirag@technoindustries.co.in	(1) Single Phase Squirrel cage Induction Motor - 0.5HP to 5.0 HP (2) Threee Phase Squirrel cage Induction Motor- 0.5 HP to 500 HP	31-10-2026	B	

Sr. No.	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
5	M/s. JSL Industries Ltd Mogar	National Highway No.8, Village Mogar 388340. K.J.Gupta - 78782442555 vp@jslmogar.com	LT Motor up to 500 HP	31-10-2026	B	
6	M/s. Lubi Industries LLP, Ahmedabad	Near Kalyan Mills, Naroda Road, Ahmedabad. Rajan.N.Borecha- 7961700199, Raturaj Rajaji- 8238087808, adalwadi@lubipumps.com, rrajaji@lubipumps.com	Electrical Motor (LT) 315 KW (430 hp)	30-11-2026	B	
7	M/s. Rotomotive Powerdrives india ltd., Anand	223 Napa Talpad, Gana Borsad Road, Tal.-Borsad, Anand-388560, Gujarat, Praveen Kumar 9343704949 praveen.kumar@rotomotive.com www.rotomotive.com	<b>LV Electric Motor</b> Rated output from 0.37KW to 90KW 415V, 3-Phase, S1 duty 2/4/6 pole up to and including efficiency class IE3, Foot/Flange mounted with Degree of protection IP55 Energy efficient squirrel cage induction motors.	31-05-2027	B	
8	M/s. Marathon Electric Motors (India) Limited, Kolkata	58, Taratala Road Kolakata-700024 (West Bengal) Email- memi.mktg@marathonelectric.com, Sh. Nalin Prasad M.-(91)3344030501, 9903900884	Three Phase HT & LT Electric Motors 1.HT Motor-132 kW to 2600 kW, 280 to 1000 Frame size, 690V-11000V 2 to 12 Pole 2.LT Motor- 0.37 kW to 1000 kW, 80 to 450 Frame size, 240V-690V, 2 to 12 Pole, IE2/IE3/IE4 Type	31-01-2027	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors
9	M/s. HEM Industries, Daman(UT)	Survey No: 738/1, Somnath, Dabhel, Daman-396210, U.T. Sanjay Jadia – 9967178830 Siddharth Desai – 9820083250 vdpatel@hindmotors.com, udesai@hindmotors.com okeswani@hindmotors.com	Electric Motor (LT) up to 400 KW (536 HP)	31-06-2026	B	

Sr. No.	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
1	2	3	4	5	6	7
10	M/s. TD Power Systems Limited, Bengaluru	Office Add. 27,28,29, KIADB Industrial area, Dabaspet, Nelamnagala Taluk, Bengaluru Rural District, Bengaluru- 562111, India Email: tdps@tdps.co.in, kaushik.swapnil@tdps.co.in	HT/MV Electric Motors from 350 KW to 3500 KW	31-07-2027	A	
11	M/s. Innomotics India Private Limited.	Plot No. C-39, Pawane MIDC, Mahape Road, TTC Industrial Area, Turbhe, Navi Mumbai, Thane, Maharashtra-400705 Phone: 9874159689 Email: supravat.dey@innomotics.com c.selvam@innomotics.com	Electric Motors ( HT -Motor / LT Motor)	Reputed Company	A	As per Letter no CE(M)/Mat/Vendor Name Change/2025/229 Dated. 22/05/2025. Company Name has changed from M/s. Siemens Ltd., to M/s. Innomotics India Private Limited.
12	BHEL (Govt of India)	BHEL House, Siri Fort, New Delhi - 110049, India. Email:- exports@bhel.in	Electric Motors ( HT -Motor / LT Motor)	Reputed Company	A	
13	ABB India Ltd	Plot no 4A, 5 & 6 Peenya Industrial Area, 2nd Phase, Bengaluru- 560058 080-22949150 ajay.sharma@in.abb.com www.abb.com/in	Electric Motors ( HT -Motor / LT Motor)	Reputed Company	A	
14	CG Power & Industrial Solution Ltd.	D2 & D1/2, MIDC Waluj, Aurangabad- 431136 Ph. 022-24237777 Fax. 022-24237733 pankaj.hiray@cgglobal.com dilip.wakoda@cgglobal.com www.cgglobal.com	Electric Motors ( HT -Motor / LT Motor)	Reputed Company	A	



**GUJARAT WATER SUPPLY AND SEWERAGE BOARD, GANDHINAGAR.**

**Statement - ACP -1**

**Item-Electrical Control Panels (LT) (As On. 10.06.2026)**

<b>Sr. No</b>	<b>Name of Agency</b>	<b>Address, E-mail address and contact Nos.</b>	<b>Approved Item, type, Size, category, grade and class</b>	<b>Validity date</b>	<b>Grade</b>	<b>Remarks</b>
1	2	3	4	5	6	
1	SIA Engineering Projects India, Ahmedabad	Survey no. 1207, Chosar-Jetalpur, AHmedabad Ta: Dascroi - 382435 Jay Dossani 9558801466/ 9377672053, jay.dossani@siasales.in www.siasales.in	PLC Panel (Soft starter & PLC Must be procured from GWSSB approved Vendor)	28-01-2028	B	
2	SIA Engineering Projects India, Ahmedabad	Survey no. 1207, Chosar-Jetalpur, AHmedabad Ta: Dascroi - 382435 Jay Dossani 9558801466/ 9377672053, jay.dossani@siasales.in www.siasales.in	LT panel 1. PMCC Panel upto 6300 A 2. MCC Panel upto 6300 A 3. APFC Panel upto 1000 KVAR 4. Power Distribution Board Panel upto 600 A 5. Lighting Distribution Board Panel upto 400 A 6. DOL Panel upto 75 Kw 7. Star Delta Panel upto 200 KW 8. ATS Panel Upto 275 KW (Soft starter & PLC Must be procured from GWSSB approved Vendor)	30-06-2026	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors
3	M/s. Industrial Controls, Ahmedabad	3A-3B , Block B, Samanvay Business park, kalidas Mill compound, Gomtipur, Ahmedabad- 380021, Gujarat Mehulbhai -9624032075 9624492075 info@indconpanels.com mehul@indconpanels.com, pratik@indconpanels.com	(1) 415V LV DOL Starter panel up to 7.5 KW (2) 415V LV Star Delta Starter panel up to 350 KW (3) 415V LV ATS panel up to 150 HP (4) 415V LV Soft Starter panel up to 375 KW (5) 415V LV PMCC/PCC/LVDB panel up to 6300 A (6) 415V LV MCC Panel up to 3200 A (7) 415V LV Automatic Power Factor Correction Panel (APFC) up to 650 kVAR (8) 415V LV Power Distribution Board (PDB) (9) 415V LV Lightnig Distribution Board (LDB) (10) PLC Control Panel (Soft starter & PLC Must be procured from GWSSB approved Vendor)	31-10-2026	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
4	M/s. Elembica Services Ahmedabad	Plot No-340-341, GIDC, Nr Deverson's, Odhav,Ahmedabad-382410 Mahesh Patel -9825067797 elembicaservices@gmail.com	1. PMCC Panel upto 6300 A 2. MCC Panel upto 6300 A 3. APFC Panel upto 1200 KVAR 4. Power Distribution Board Panel upto 6300 A 5. Lighting Distribution Board Panel upto 400 A 6. DOL Panel up to 600 KW 7. Star Delta Panel upto 600 KW 8. ATS Panel Upto 450 KW 9. Soft starter Panel up to 600 KW 10. PLC Panel 11. Single phase Panel (Soft starter & PLC Must be procured from GWSSB approved Vendor)	31-10-2026	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors
5	M/s. Shiv Shakti Engineers, Ahmedabad	Survey No. 1187-88-89, Nr Narmada Canal, Village Bhavda, Ta. Daskroi, Ahmedabad - 382433 R. B. Rana – 9825009011 Chittal Shah - 9825804151 shivshakti450@gmail.com	1. PLC Panel 2. PCC Panel up to 6300 A 3. MCC Panel up to 4000 A 4. PMCC Panel up to 4000 A 5. APFC Panel up to 1250 KVAR 6. Soft Starter Panel up to 450 KW 7. DOL Control Panel up to 160 KW 8. Star Delta Control Panel up to 200 KW 9. ATS Control Panel up to 275 KW (Soft Starter & PLC must be procured from GWSSB Vendor List)	31-01-2029	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors
6	M/s. Swati Switchgears (India) pvt. Ltd, Ahmedabad	36, Subhlaxmi industrial Estate Sarkhej- Bavala Highway, Viil- Moraiya, Ta- sanand , Ahmedabad 382210. 9925172177 elecpln@swatiswitchgears.com mkt@swatiswitchgears.com	1) PMCC Panel up to 4000 A 2) MCC Panel up to 2500 A 3) APFC Panel up to 1000 KVAR 4) PCC Panel up to 6300 A 5) PLC Panel 6) Soft Starter Panel up to 250 Kw 7) ATS Starter Panel up to 149kW/200 HP 8) Light Distribution Panel/ Board (1 Phase & 3 Phase) up to 630 A 9) DOL Panel/ Star Delta up to 200kW (Soft starter & PLC Must be procured from GWSSB approved Vendor)	31-07-2027	B	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
7	M/s. Bhagyshree Power Control, Ahmedabad	Plot no 6B & 7 , Somnath Estate , indore N.H. 8 Kunjad cross road , Dhamatavan , Bakrol, Nr. Shanti chemicals, Ahmedabad- 382435 Gujara Arvind Patel - 9624695903 blessingpower_51@yahoo.co.in	(1) 415V LV DOL Starter panel up to 30 HP (2) 415V LV Star Delta Starter panel up to 325 HP (3) 415V LV Auto transformer starter panel up to 225 HP (4) 415V LV PCC/PMCC/MCC/LVDB panel up to 4000 A (5) 415V LV APFC panel up to 400 kVAR (6) 415V LV Soft starter panel up to 420 HP (7) 415V LV Power Distribution Board upto 1250 A (8) 415V LV Lightnig Distribution Board upto 250 A (Soft starter Must be procured from GWSSB approved Vendor)	31-10-2026	B	
8	M/s. Samudra Power Products, Ahmedabad	Plot No.150, Shyam Industrial Hub, Nr. Shahitya Industrial Hub, Bakrol-Gatrad Road, Bakrol (Bhujrang)- 382433, Ta. Daskroi, Dist. Ahmedabad-382433 Dilip Patel - 9574008900 9426079746 dilippatel.samudra@gmail.com	LT Panel for PLC LT Power Control Center (PCC) up to 6300 A LT Motor Control Center (MCC) up to 6300 A LT Auto Power Factor Control (APFC) Panel up to 1500 kVAR LT Power & Motor Control Center (PMCC) up to 3200 A LT Panel for soft Starter (up to 315 KW / 420 HP) LT DOL Starter PAnel up to 50 HP LT Star Delta Starter Panel up to 160 KW LT Auto Transformer Starter (ATS) Panel up to 160 KW / 215 HP LT Lighting Distribution Board up to 63 A LT Power Distribution Board up to 315 A ( Soft Starter & PLC must be procured from GWSSB Vendor List)	28-01-2028	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors
9	M/s. Sun Automat Controls pvt. Ltd Ahmedabad	Plot No. B/39-41, Saundarya Industrial Park, Nr. Nakshatra-2, , Bakrol- Gatrad Road, Bakrol (Bhujrang)- 382433, Ta. Daskroi, Dist. Ahmedabad Vikash Pandya - 9825244753 info@sunautomat.com	1) PMCC Panel up to 6300 A 2) MCC Panel up to 4000 A 3) APFC Panel up to 1500 KVAR 4) Bus Duct up to 6300 A 5) Power Distribution Board Panel Up to 4000 A 6) Lighting Distribution Board Panel Up to 400 A 7) DOL Panel up to 175kw 8) Star Delta Panel up to 200kw 9) ATS Panel up to 275kW 10) Soft Starter Panel up to 450kw 11) VFD Panel 12) PLC Panel ( Soft Starter & PLC must be procured from GWSSB Vendor List)	28-01-2028	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
10	M/s. Lubi Electronics, Gandhinagar	Saradar Patel Ring Road, Near Karai gam patia, Nana Chiloda, Dist-Gandhinagar-382330 Pratik Shah - 7817009799 pbshah@lubielelectronics.com, info@lubielelectronics.com	1. PMCC Panel upto 5000 A 2. MCC Panel upto 4000 A 3. APFC Panel upto 1200 KVAR 4. Power Distribution Board Panel upto 5000 A 5. Lighting Distribution Board Panel upto 400 A 6. DOL Panel up to 150 KW 7. Star Delta Panel upto 150 KW 8. ATS Panel Upto 110 KW 9. Soft starter Panel up to 450 KW 10. PLC Panel 11. Single phase Panel (Soft starter & PLC Must be procured from GWSSB approved Vendor)	31-10-2026	B	
11	M/s.Hema Automation, Surat	Plot No. 1190,1191,1192, Diamond industrial Park, Road no. 3, Nr. Sachin SEZ, Sachin-394230. Divyesh-9727283838, sales@hemaautomation.com	1. PCC Panel up to 6300 A 2. MCC Panel up to 6300 A 3. APFC Panel up tp 1500 kVAR 4. Power distribution board up to 4000 A 5. Lighting Distribution Panel up to 400 A 6. DOL Panel up to 175 kw 7. SD Starter Panel up to 200 kw 8. ATS Panel up to 275 kw 9. Soft starter panel 10. PLC Panel ( Soft starter & PLC Panel must be procure from GWSSB vendor list)	30-11-2026	B	
12	M/s. Nutral Powertech, Bakrol	Plot no.7 & 8, Somnath Industrial Estate Part-1, Bakrol, Dhamatwan Road, Dhamatwan, Ahmedabad-382435. Email- nutralpowertech@gmail.com Mr. Vijay Arvindbhai Vora M.9998261763, 9724227659	1) PMCC Panel up to 6300 A 2) PCC Panel up to 6300 A 3) APFC Panel up to 1500 KVAR 4) DOL Panel up to 125 HP 5) Star Delta Panel up to 250 HP 6) ATS Panel up to 400 HP 7) Soft Starter Panel up to 350kw ( Soft Starter & PLC must be procured from GWSSB Vendor List)	28-01-2028	A	As per Board Minutes 286 resolution no 16 dated 03/07/2021 ,it has been decided to double head,discharge and kilowatt of concerned Pumps for "A" Grade Vendors



Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
13	M/s. Plasma Control System., Ahmedabad	Plot. No 31, Shivbhumii Industrial Park, Nr. Kubadthal Patiya, Kubadthal, Ahmedabad-382430 Alpesh Patel 9824688531, 9909250566, 9723820531 plasmacontrolsystem@gmail.com www.plasmacontrol.net	1.PMCC Panel up to 3200 A 2.MCC Panel up to 3200 A 3.APFC Panel up to 1500 KVAR 4.Power Distribution Board Panel up to 2500 A 5.Lighting Distribution Board Panel up to 630 A 6. DOL Panel up to 5.5 KW 7. Star Delta Panel up to 90 KW 8. ATS Panel up to 110 KW 9. Soft Starter Panel up to 400 KW 10. PCC Panel up to 6300 A (Soft starter & PLC Must be procured from GWSSB approved Vendor)	31-05-2027	B	
14	M/s. Powertech Switchgears (I) Pvt.Ltd., Haryana	171,172,191,192, EHTP, Sector-56, Phase-V, Kundli Industrial estate, Sonapat (Hariya) -131028 sales@powertechswitchgears.com, powertech@maxgroup.co.in, rahulmanocha@maxgroup.co.in	1) MCC/PCC/PMCC Panel up to 5000A 2) Auto Power Factor Correction (APFC) Panel up to 1700 KVAR 3) PLC & SCADA Panel 4) Soft Starter Panel up to 160 KW 5) light Distribution Panel / Board (1 Phase & 3Phase) up to 400A 6) DOL Panel up to 7.5 HP 7) Star-Delta Panel up to 52 HP (Soft starter & PLC Must be procured from GWSSB approved Vendor list)	31-08-2027	B	
15	M/s. Vasu Automation and Electricals, surat	A/4/25, Beside Mexican Plaza Road No.4, Udhyognagar, Udhana, Surat-394210 info@vasuautomation.com shakil@vasuautomation.com	(1) PLC Panel (2) PCC Panel upto 4000 A (3) MCC/PMCC Panel upto 2500 A (4) APFC Panel upto 250 KVAR (5) Soft Starter Panel upto 250 kW (6) Control Panel (DOL) upto 55 kW (7) Control Panel (Star Delta) Upto 200 kW (Soft Starter & PLC Must be procured from GWSSB approved vendor)	31-01-2028	B	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
16	M/s. Siddhi Vinayak Industries, Ahmedabad	Plot no : 28/29/38, Ved Bhoomi Industrial Estate Opp. Saundayra Ind. Estate, Gatrad-Bakrol Road, Bakrol – Bujrang, Bakrol, Daskoi Ahmedabad - 382430 Rameshchandra Prajapati - 9601131448 Ghanshyam Prajapati – 9825108477 Siddhivi2009@gmail.com, info@svicontrolpanel.com, ghanshyam_me2@yahoo.com, www.svicontrolpanel.com	1. PMCC PANEL UP TO 4000 A 2. MCC PANEL UP TO 3200 A 3. APFC PANEL UP TO 1350 KVAR 4. POWER DISTRIBUTION BOARD PANEL UP TO 5000 A 5. LIGHTING DISTRIBUTION BOARD PANEL UP TO 630 A 6. DOL PANEL UP TO 5.5 KW 7. STAR DELTA PANEL UP TO 250 KW 8. ATS PANEL UP TO 150 KW 9. SOFT STARTER PANEL UO TO 315 KW 10. PLC PANEL (Soft starter & PLC Must be procured from GWSSB Vendor List)	31-06-2026	B	
17	M/s Dhaval Electricals Pvt.Ltd., Vadodara	Plot no. 113/13, G.I.D.C., Industrial Estate, Near Vadsar Bridge, Makarpura, Vadodara, Gujarat- 390010 Dhaval Desai- 8199522895, Ravi Bhavsar- 9687684605 marketings@dhavalgroup.net dhaval.desai@dhavalgroup.net	1) PLC Pannel 2) PCC Panel up to 6300 A 3) MCC/PMCC Panel up to 2000 A 4) APFC Panel up to 900 KVAR 5) Control Panel (DOL) up to 7.5 KW 6) Control Panel (Star-Delta) up to 200 KW (Soft starter & PLC Must be procured from GWSSB Vendor List)	31-02-2027	B	
18	M/s. Electronic Instrumentation & Control Pvt. Ltd., Ahmedabad	56, Panchratna Ind. Estate, Sarkhej-Bavla Highway, Changodar, Ahmedabad - 382213, Gujarat. Email: eic@eicpanel.com	1. PLC Panel 2. Soft Starter Panel up to 200kw (Soft starter & PLC Must be procured from GWSSB Vendor List)	31-07-2027	B	
19	M/s. Shree Ganesh Automation, Mehsana	Plot Shed no. 41, 42, 47a, b, c 1'st Floor, Shree Sai industrial estate, Opp. Nayra Petrol Pump, Nugar by-pass, Mehsana-384002 Email: shreeganesh.ndp@gmail.com, shreeganesh.rnp@gmail.com	1-PMCC PANEL UP TO 5000 A 2-MCC PANEL UPTO 2500 A 3-APFC PANEL UPTO 1200 KVAR 4-POWER DISTRIBUTION BOARD PANEL UPTO 3200A 5- LIGHTING DISTRIBUTION BOARD PANEL 600A 6-DOL PANEL UPTO 5.5 KW 7-STAR DELTA PANEL UP TO 220KW 8-ATS PANEL UPTO 150KW 9- Soft Starter Panel Up 220 KW 10-PLC Panel (Soft starter & PLC Must be procured from GWSSB Vendor List)	31-07-2027	B	
20	Hitachi India Pvt. Ltd.	508, Ascot Center, Next to Hiltpn Hotel, Sahar road, Andheri (East), Mumbai 400099, India	Electric Control Panel Board (Soft starter & PLC Must be procured from GWSSB Vendor List)	Reputed Company	A	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
21	Siemens Ltd	Plot 2, Sector 2, New Mumbai - 410210, Maharastra- India, Phone - 022-27568000, Fax:- 022-27568018/8030, Email:- contact.india@siemens.com	Electric Control Panel Board (Soft starter & PLC Must be procured from GWSSB Vendor List)	Reputed Company	A	
22	ABB India Ltd	Plot no 4A, 5 & 6 Peenya Industrial Area, 2nd Phase, Bengaluru- 560058 080-22949150 ajay.sharma@in.abb.com www.abb.com/in	Electric Control Panel Board  (Soft starter & PLC Must be procured from GWSSB Vendor List)	Reputed Company	A	
23	M/s. Patel Electric., Ahmedabad	A-108, Swarnim Industrial Park, Bakrol dhamtwan road, Bakrol Bujrang, Vill. Bakrol, Ahmedabad - 382433 Sachin Patel -9428354109 patel.electric1@gmail.com	1. PLC Panel 2. PCC Panel up to 4000 A 3. MCC Panel up to 2500 A 4. PMCC Panel up to 2500 A 5. APFC Panel up to 2000 KVAR 6. Soft Starter Panel up to 275 HP 7. DOL / Star Delta Panel up to 200 HP 8. Light Distribution Board/Panel up to 630 A 9. ATS Starter Panel up to 250 HP (Soft Starter & PLC must be procured from GWSSB Vendor List)	31-01-2029	B	
24	M/s. Prayan Electrical & Automation Pvt Ltd., Ahmedabad	Plot no.23 Krishna Industrial Park-3, Kubadthal,Ta. Daskroi, Ahmedabad-382433, Gujarat, India info@prayanelectricals.com	1) PMCC Panel up to 4000 A 2) PCC Panel up to 2000 A 3) MCC Panel up to 400 A 4) Auto Power Factor Correction (APFC) Panel up to 400 KVAR 5) PLC & SCADA Panel 6) Soft Starter Panel up to 132 kW 7) Light Distribution Panel / Board (1 Phase & 3Phase) up to 400A 8) DOL Panel up to 15 HP 9) Star-Delta Panel up to 50 HP 10) ATS Panel up to 80 HP (Soft starter & PLC Must be procured from GWSSB approved Vendor list)	31-08-2027	B	

**Note:- It is advisable to use this information as a reference only & kindly confirm it with concern authority before use.**

**GUJARAT WATER SUPPLY AND SEWERAGE BOARD, GANDHINAGAR.**

**Statement - ACP -1**

**Item-Micro Processor based Soft Starter/FCMA/HFSR (As On. 10.06.2026)**

<b>Sr. No</b>	<b>Name of Agency</b>	<b>Address, E-mail address and contact Nos.</b>	<b>Approved Item, type, Size, category, grade and class</b>	<b>Validity date</b>	<b>Grade</b>	
1	2	3	4	5	6	
1	Amtech Electronics (India) Ltd, Gandhinagar,	E-6, GIDC Electronics Zone, Sector- 26, Gandhinagar, 079-23289101/102/103 info@amtechelectronics.com MR. Shailesh Patel 9909975941 Mr.Piyush Patel – 9825005336 sales@amtechelectronics.com	Electronics Soft Starter • Current Range- 15 A to 1065 A, • Voltage Range- 200 V to 690 V AC, • Power Range- 3.7 KW to 1000 KW	31-01-2029	B	
2	M/s. Innovative Technomics Pvt. Ltd., Pune	Gat No. 25, Mumbai- Pune road, wadgaon Maval , Kanhe Phata Pune- 412106 Mr. Sanjay bhade - 9049900100 sales.itpl@itechnomics.com.	FCMA LT Soft Starter of Rating (1) 415 V - Up to 1500 KW FCMA HT Soft Starter of Rating (1) 3.3 KV - Up to 1500 KW (2) 6.6 KV - Up to 2500 KW (3) 11 KV - Up to 14.8 MW	31-01-2028	B	
3	M/s. Lecon Energetics Pvt. Ltd., Bangalore	Reg.Off. & Fac. Ad:- No. 484 B&C, IV Phase, Opp. BMTC Depot No.- 9, Peenya Industrial Area, Bangalore- 560058, Karnataka, India	(1) FCMA HT Soft Starter Up to 12.0 MW, 11KV (2) FCMA LT Soft Starter 706 KW, 415 V	31-02-2027	B	
4	ABB India Ltd.	ABB India Ltd., Plot No.5 & 6, 2nd main road, 2nd stage, peenya industrial area, phase IV, Bengaluru-560058, Karnataka, India.	Soft starter	Reputed Company	A	
5	Siemens Ltd.	Siemens Ltd., Birla aurora, level 21, Plot No.1080, Dr.Annie Besant road, worli, mumbai-400030, Maharashtra, India.	Soft starter	Reputed Company	A	
6	Schneider Electric India Private Ltd.	Schneider Electric India Private Ltd., 9th floor DLF, Building No.10, Tower-C, DLF cyber city, phase-2, Gurgaon- 122001, Haryana, India.	Soft starter	Reputed Company	A	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	
7	Rockwell Automation India Private Ltd.	Rockwell Automation India Private Ltd., 5th floor DLF, Building No.10-B, DLF cyber city, phase-2, Gurgaon-122001, Haryana, India.	Soft starter	Reputed Company	A	
8	Danfoss Industries Private Limited	Danfoss Industries Private Limited, Plot No.A-19/2, SIPCOT Industrial growth centre, Oragadam, Kanchipuram District, Chennai-631604, Tamilnadu, India	Soft starter	Reputed Company	A	
9	M/s Lauritz knudsen Electrical & Automation, Mumbai.	L&T House, N. M. Marg, Ballard Estate, Mumbai-400001, India. bhavesh.nayak@lntebg.com	Miscroprocessor based softstarter/FCMA/HFSR	Reputed Company	A	As per Letter no CE(M)/Mat./Vender Name Change/N-8/2024/18 Dated. 16/01/2025 Company name has changed from M/s. L & T, E & A, Mumbai to M/s Lauritz knudsen Electrical & Automation, Mumbai.
10	M/s. Jayashree Electron Pvt. Ltd., Maharastra	EL-12/13, J Block, MIDC-Bhosari, Near Oerlinkon Balxers Coating, Bhosari, Pune, Maharashtra - 411026. Email - sales@soft-starters.co.in, UPA@jayashree.in. Mr.Ujjwal Akkar. 9975596758	1. FCMA Soft Starter upto 11 kV, upto 7 MW 2. HFSR Soft Starter upto 13.8 kV, upto 9.2 MW	31-07-2027	B	
11	M/s. Eltech Engineering, Maharashtra	PAP-S-88, Phase-II, Chakan MIDC, Bhamboli, Ta. Khed, Dist. Pune, Maharashtra-410501. Shubhas Patil- 7588025047 Shilpa Patil - 7588025140 info@eltech-engineering.com	FCMA Type Soft Starter Panel Up to 16 MW & Voltage Level up to 11 KV	31-01-2029	B	
<b>Note:- It is advisable to use this information as a reference only &amp; kindly confirm it with concern authority before use.</b>						

**GUJARAT WATER SUPPLY AND SEWERAGE BOARD, GANDHINAGAR.**

**Statement - ACP -1**

**Item-Programmable Logic Control (PLC) (As On. 10.06.2026)**

<b>Sr. No</b>	<b>Name of Agency</b>	<b>Address, E-mail address and contact Nos.</b>	<b>Approved Item, type, Size, category, grade and class</b>	<b>Validity date</b>	<b>Grade</b>	<b>Remarks</b>
1	2	3	4	5	6	7
1	M/s. CIMCON Software India Pvt. Ltd., Ahmedabad	Office Add. 1106, 11th Floor, Times Square Arcade, Opp-Rambug, Thaltej - Shilaj Road, Ahmedabad - 380059 Fact.Add. 802, I Square Corporate Parlq Sukan Gross B/S Hir Party Plot, Science City, Ahmedabad Email- prashant.pandey@cimconautomation.com	1. PLC (RTU) 2. SCADA	31/07/2027	B	
2	ABB India Ltd.	ABB India Ltd., Plot No.5 & 6, 2nd main road, 2nd stage, peenya industrial area, phase IV, Bengaluru-560058, Karnataka, India.	PLC	Reputed Company	A	
3	Siemens Ltd.	Siemens Ltd., Birla aurora, level 21, Plot No.1080, Dr.Annie Besant road, worli, mumbai-400030, Maharashtra, India.	PLC	Reputed Company	A	
4	Schneider Electric India Private Ltd.	Schneider Electric India Private Ltd., 9th floor DLF, Building No.10, Tower-C, DLF cyber city, phase-2, Gurgaon-122001, Haryana, India.	PLC	Reputed Company	A	
5	Rockwell Automation India Private Ltd.	Rockwell Automation India Private Ltd., 5th floor DLF, Building No.10-B, DLF cyber city, phase-2, Gurgaon-122001, Haryana, India.	PLC	Reputed Company	A	
6	Mitsubishi Electric India Private Ltd.	Mitsubishi Electric India Private Ltd., B-1/G-3, 4th floor, Mohan Co-oprative industrial estate, Mathura roa, South Delhi, New Delhi-110044, India	PLC	Reputed Company	A	
7	Fuji Electric India Private Ltd.	Fuji Electric India Private Ltd., 2nd floor, 4/329-A, old mahabalipuram road, Chennai-600041, Tamilnadu, India.	PLC	Reputed Company	A	

Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarks
8	M/s Lauritz knudsen Electrical & Automation, Mumbai.	L&T Business Park TC-2 Tower B, 3dr floor, Gate No.5 Powai Champus, Saki Vihar Road, Mumbai-400071. bhavesh.nayak@lntebg.com	PLC	Reputed Company	A	As per Letter no CE(M)/Mat./Vender Name Change/N-8/2024/18 Dated. 16/01/2025 Company name has changed from M/s. L & T, E & A, Mumbai to M/s Lauritz knudsen Electrical & Automation, Mumbai.
9	M/s. Omron Automation Pvt.Ltd., Gurgaon.	6th floor, Seva Tower, Plot No. 19, Sector-18, Udyog Vihar, Maruti Industrial Complex, Gurgaon(Haryana)-122008.	PLC	Reputed Company	A	
10	M/s. General Industrial Controls Pvt. Ltd., Maharashtra	T-Block, Plot No. 106 & 107, Near MIDC Post Office, Bhosari, Pune, Maharashtra - 411026 Hardik Suthar - 6353823431 hardik.suthar@gicindia.com info@gicindia.com	PLC	31-01-2029	A	
11	M/s. Renu Electronics, Maharashtra	Gat No. 1163, Ghotawade Village, Ta. Mulshi, Pune, Maharashtra - 412115 Vishal Patil - 9167755673 Sanjay Madkar 9970330278 sales@renuelectronics.com vishalp@renuelectronics.com info@renuelectronics.com	PLC	31-01-2029	B	

**Note:- It is advisable to use this information as a reference only & kindly confirm it with concern authority before use.**

**GUJARAT WATER SUPPLY AND SEWERAGE BOARD, GANDHINAGAR.**

**Statement - ACP -1**

**Item-Automation & Instrumentation System Integrator(As On. 10.06.2026)**

<b>Sr. No</b>	<b>Name of Agency</b>	<b>Address, E-mail address and contact Nos.</b>	<b>Approved Item, type, Size, category, grade and class</b>	<b>Validity date</b>	<b>Grade</b>	<b>Remarkd</b>
1	2	3	4	5	6	7
1	Axis sollutions pvt. Ltd, Ahmedabad	Plot No.324, Road No.5, GIDC, Kathwada, Ahmedabad-382430 . Gujarat, India, 9825073842, Email- axis@axisindia.in	SCADA (Control automation and instrumentation system integrator) (PLC Must be procured from GWSSB Vendor List)	30-06-2026	B	
2	Sai Applied Techmnologies pvt. Ltd., Vadodara	Fac.Add:- 133, Por Industrial Park, Por, Vadodara-391243. krunal.ghadiyali@saiapplied.com meet.makwana@saiapplied.com www.saitech.co.in	1. SCADA 2. Control Automation and Instrumentation system integrator (PLC Must be procured from GWSSB Vendor List)	28-01-2028	A	
3	M/s. Phoenix Contact India Pvt Ltd., Hariyana	Dhatir Road, Dudhola, Village: Dudhola, Prithla, Palwal – 121102, Hariyana, India jshah@phoenixcontact.co.in	SCADA & Control System includes Programmable Logic Controller and Remote Terminal Unit (PLC Must be procured from GWSSB Vendor List)	31-08-2027	B	
4	M/s. Vasu Automation and Electricals, surat	A/4/25, Beside Mexican Plaza Road No.4, Udhyognagar, Udhana, Surat-394210 info@vasuautomation.com shakil@vasuautomation.com	(1) Instrumentation Panel (2) SCADA (3) Control Automation and instrumentation system integrator (PLC Must be procured from GWSSB Vendor List)	31-01-2028	B	
5	Mitsubishi Electric India Pvt.Ltd.	B-1/G-3, 4th floor, Mohan Co-oprative industrial estate, Mathura road, South Delhi, New Delhi-110044, India gurvinder.gandhi@asia.meap.com	Automation & Instrumentation System Integrator (PLC Must be procured from GWSSB Vendor List)	Reputed Company	A	
6	M/s. Aarohi Embedded Systems Pvt. Ltd.,Rajkot.	Plot No. G1004 to 1008/A, Metoda, Kishan Gate-3 Main road, Lodhika, Rajkot, Gujarat 360021 info@aarohies.com	1) Instrumentation Panel 2) SCADA 3) Control Automation and Instrumentation System Integrator (PLC Must be procured from GWSSB Vendor List)	13-03-2027	B	



Sr. No	Name of Agency	Address, E-mail address and contact Nos.	Approved Item, type, Size, category, grade and class	Validity date	Grade	Remarkd
7	M/s Lauritz knudsen Electrical & Automation, Mumbai.	L&T Business Park TC-2 Tower B, 3dr floor, Gate No.5 Powai Champus, Saki Vihar Road, Mumbai-400071. bhavesh.nayak@Intebg.com	Automation & Instrumentation System Integrator (PLC Must be procured from GWSSB Vendor List)	Reputed Company	A	As per Letter no CE(M)/Mat./Vender Name Change/N-8/2024/18 Dated. 16/01/2025 Company name has changed from M/s. L & T, E & A, Mumbai to M/s Lauritz knudsen Electrical & Automation, Mumbai.
8	M/s. Omron Automation Pvt.Ltd., Gurgaon.	6th floor, Seva Tower, Plot No. 19, Sector-18, Udyog Vihar, Maruti Industrial Complex, Gurgaon(Haryana)-122008.	1) SCADA 2) Control Automation and Instrumentation System Integrator (PLC Must be procured from GWSSB Vendor List)	Reputed Company	A	
9	M/s. Forbes Marshall Pvt. Ltd., Pune	B-85, Chakan MIDC, Phase - II, Chakan Industrial Area, Sawardari Haveli, Pune, MH - 401501 Rakesh - 9850567712 Manish - 9820697668 rjoshi@forbesmarshall.com	Automation & Instrumentation System Integrator/RTU/SCADA (PLC Must be procured from GWSSB Vendor List)	31-01-2029	A	

**Note:- It is advisable to use this information as a reference only & kindly confirm it with concern authority before use.**

**GUJARAT WATER SUPPLY AND SEWERAGE BOARD, GANDHINAGAR.**

**Statement - B**

**Electro-mechanical items as mentioned in this Statement are deleted from the approved vendor list of GWSSB as per New Vendor Policy.**

**List of items to be procure from GETCO approved vendor list. Provision of condition in respect of pre-delivery joint inspection at respective works shall have to be made in respective tenders.**

<b>Sr.No</b>	<b>Name of item</b>	<b>Details of procurement of material</b>
1	Power Transformers.	These items can be procured from approved vendors of GETCO.
2	LT / HT Power, Control, Instrumentation Cable	Approval given by GETCO to the vendors for higher capacities shall be considered approved for lower capacities for procurement of materials as per the requirements of GWSSB/GWIL.
3	VCB (vacuum circuit breaker) Panel (HT)	GETCO's approved vendors of 11 KV VCB panels shall be considered approved for the procurement of 3.3 KV/6.6 KV/11 KV MCC/ PCC panels as per the requirements of GWSSB/GWIL.
4	Protection Relay (HT)	
5	Isolators	
6	Lightening Arrestors.	
7	PIN / Disc Insulators.	
8	HT Cable	
9	HT Cable Jointing Kit.	
10	Instrumentation & Control Cable.	`
11	Batteries	
12	Battery Chargers.	
13	VCB (vacuum circuit breaker) Panel / Relay Panel.	
14	Current & Voltage Transformers.	
15	HT – PCC (Power control center) / MCC(Motor control center) / MVDB (MV Distribution Board) / LDB(Lightening Distribution Board) / APFC(Automatic Power Factor Correction) / BUS Duct	

**GUJARAT WATER SUPPLY AND SEWERAGE BOARD, GANDHINAGAR.**

**Statement - C**

**Electro-mechanical items as mentioned in this Statement are deleted from the approved vendor list of GWSSB as per New Vendor Policy**

**List of items to be procure as per tested by any power DISCOM (MGVCL, UGVCL, PGVCL, DGVCL) of Gujarat can be made eligible for the use of GWSSB/GWIL**

<b>Sr.No</b>	<b>Name of item</b>	<b>Details of procurement of material</b>
1	Capacitors (APP)	As tested by any power DISCOM (MGVCL, UGVCL, PGVCL, DGVCL) of Gujarat can be made eligible for the use of GWSSB/GWIL.

**GUJARAT WATER SUPPLY AND SEWERAGE BOARD, GANDHINAGAR.**

**Statement - D**

**Electro-mechanical items as mentioned in this statement are deleted from the approved vendor list of GWSSB as per New Vendor Policy.**

**List of items to be procure as per relevant IS. GOI has made the BIS certificate mandatory hence these items can be procured strictly as per respective IS.**

<b>Sr.No</b>	<b>Name of item</b>	<b>Details of procurement of material</b>
1	Welding Electrodes	GOI has made the BIS certificate mandatory hence these items can be procured strictly as per respective IS.
2	Submersible Flat Cable / Round Cable (PVC / Rubber)	

**GUJARAT WATER SUPPLY AND SEWERAGE BOARD, GANDHINAGAR.**

**Statement - E**

**Electro-mechanical items as mentioned in this Statement are deleted from the approved vendor list of GWSSB as per Vendor Policy.**

**List of items to be procure as per Any make type tested by CPRI/ERDA or any NABL accredited laboratory can be procured for the use of GWSSB/GWIL.**

<b>Sr.No</b>	<b>Name of item</b>	<b>Details of procurement of material</b>
1	Air Circuit Breaker / Mounded Case Circuit Breaker / Switch Disconnectors Fuse Unit / Contactors & Overload Relay.	Any make type tested by CPRI/ERDA or any NABL accredited laboratory can be procured for the use of GWSSB/GWIL.
2	Contactors and Overload Relays.	
3	Protective Relays.	
4	Multi-Function Meter (Load Manager) / Indicating Meter (AVPF)	
5	Push Buttons / Indicating Lamps.	
6	HRC Fuses & Base	
7	Timers	
8	SPP (Single phasing preventer)/ ELR(Earth leakage relay) / ELCB (earth leakage breaker)	
9	Auto Transformers.	
10	Selector Switches	

**GUJARAT WATER SUPPLY AND SEWERAGE BOARD, GANDHINAGAR.****Statement - F**

**Electro-mechanical items as mentioned in this Statement are deleted from the approved vendor list of GWSSB as per New Vendor Policy.**

**List of non-critical type items hence not required to be incorporated in the GWSSB vendor list. These items can be procured as per detailed specifications and as per relevant IS codes wherever applicable.**

Sr.No	Name of item	Details of procurement of material
1	Terminals	These items are non-critical type hence not required to be incorporated in the vendor list. However, these items can be procured as per detailed specifications and as per relevant IS codes wherever applicable.
2	Cable Glands	
3	Enunciators.	
4	Cooling Fan	
5	Wires	
6	Cable Trays.	
7	Change Over Switch	
8	Lighting Fixtures	
9	Modular Switches, Sockets & Accessories.	
10	PVC Conducts & Accessories	
11	EOT(Electric overhead travelling) Cranes, HOT (Hoist one track)Cranes	
12	Expansion Bellow	
13	Panel Enclosure & PC Consoler.	
14	Float & Board Type level Measuring System.	
15	Ultrasonic Type level Measuring System.	
16	Capacitance Type Level Measuring System.	
17	Conductivity Type level Switch.	
18	Pressure measurement System.	
19	Pressure Switch	
20	Temperature Scanner	
21	Pressure Gauge	
22	Gang Operated offload Disconnectors (GOD)	

**GUJARAT WATER SUPPLY AND SEWERAGE BOARD, GANDHINAGAR.**

**Statement - G**

**Electro-mechanical items as mentioned in this Statement are deleted from the approved vendor list of GWSSB as per New Vendor Policy.**

**List of items to be procure as per standards and specifications/MOC, decided by GWIL/ GWSSB**

<b>Sr.No</b>	<b>Name of item</b>	<b>Details of procurement of material</b>
1	Flow Measuring Device – Ultrasonic Full Bore Type/ Electromagnetic Full Bore Type / Mechanical Type	As per standards and specifications/MOC, decided by GWIL/ GWSSB to ensure quality of the product, these items can be procured. Receiver / Indicator is a part of flow measuring device.
2	Receiver / Indicator (Micro Processor Based)	

**List of Debarred of agencies/contractors/suppliers by GWSSB**

**Date: 10.04.2026**

Sr No.	Zone	Name of Office	Name & Address of debarred Contractors/Suppliers agencies	Agreement No. & Date	Designation of officer who issued order for debarred	Order No. & Date of debarred	Order Date/start date	Valid upto Date	Duration(Month)	Remarks (If any) Period
1	2	3	4	5	6	7	8	9	10	11
1	Zone-5	P.H.W.DN. 1 AMRELI	Avadha Construction, Amreli	-	Executive Engineer, P.H.Works Division.1, Amreli	1/2013/772 Dt.16/3/2013	16-03-13	-	-	Till the settlement of the Civil & Criminal claim from the date of order
2	Zone-5	P.H.W.DN. 1 AMRELI	R.K. Construction, Morbi	-	Executive Engineer, P.H.Works Division.1, Amreli	2/2013/773 Dt.16/3/2013	16-03-13	-	-	Till the settlement of the Civil & Criminal claim from the date of order
3	Zone-5	P.H.W.DN. 1 AMRELI	Ankur Construction, Amreli	-	Executive Engineer, P.H.Works Division.1, Amreli	3/2013/774 Dt.16/3/2013	16-03-13	-	-	Till the settlement of the Civil & Criminal claim from the date of order
4	Zone-5	P.H.W.DN. 1 AMRELI	K.K. Sorthiya, Madhapar	-	Executive Engineer, P.H.Works Division.1, Amreli	4/2013/775 Dt.16/3/2013	16-03-13	-	-	Till the settlement of the Civil & Criminal claim from the date of order
5	Zone-5	P.H.W.DN. 1 AMRELI	Jaymeen Construction, Amreli	-	Executive Engineer, P.H.Works Division.1, Amreli	5/2013/776 Dt.16/3/2013	16-03-13	-	-	Till the settlement of the Civil & Criminal claim from the date of order
6	Zone-5	P.H.W.DN. 1 AMRELI	Jagdish Enterprise, Amreli	-	Executive Engineer, P.H.Works Division.1, Amreli	6/2013/777 Dt.16/3/2013	16-03-13	-	-	Till the settlement of the Civil & Criminal claim from date of order
7	Zone-5	P.H.W.DN. 1 AMRELI	Vimal Construction, Amreli	-	Executive Engineer, P.H.Works Division.1, Amreli	7/2013/778 Dt.16/3/2013	16-03-13	-	-	Till the settlement of the Civil & Criminal claim from date of order
8	Zone-4	P.H.W.DN.2 Anjar	C.K.Tank	-				-	-	Parmenately kept in black list
9	Zone-5	P.H.W.DN. Porbandar	Tapi Prestressed Products Ltd., Pune	Tender Agreement no. Turnky/2013-14/1 Dtd.15/7/2013	Executive Engineer, P.H.W.Dn.Porbandar	AB/PBR Aug. WSS/2909 Dt.27-10-2014	27-10-14	-	-	Agency is terminated from Tender Agreement No.Turnky/2013-14/1 Date-15/07/2013
10	Zone-3	PHW Division Surendranagar	M/s P.K Prajapati	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/457,30.05.2023	30-05-23	29-05-26	36	Banned from participation of tender for 3 Years from date of order
11	Zone-6	PHW Division Surat	M/s Dharati Engineers	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/178,01.06.2023	01-06-23	31-05-26	36	Banned from participation of tender for 3 Years from date of order
12	WASMO	Unit Manager, WASMO, Chhotaudepur	M/s Shree Pragati Construction, Banaskantha	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/214,20.06.2023	20-06-23	19-06-26	36	Banned from participation of tender for 3 Year from date of order
13	WASMO	Unit Manager, WASMO, Panchmahal	M/s Shree Gokul Construction, Banaskantha	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/214,20.06.2023	20-06-23	19-06-26	36	Banned from participation of tender for 3 Year from date of order
14	WASMO	Unit Manager, WASMO, Chhotaudepur	M/s Shree Daxesh C. Prajapati Chhotaudepur	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/214,20.06.2023	20-06-23	19-06-26	36	Banned from participation of tender for 3 Year from date of order
15	Zone-2	PHW Division Mehsana	M/s Gayatri Construction Company, Mehsana	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/215,27.06.2023	27-06-23	26-06-26	36	Banned from participation of tender for 3 Year from date of order
16	Zone-2	PHW Division Palanpur	M/s Mahalaxmi Construction, Palanpur, Banaskantha	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/216,27.06.2023	27-06-23	26-06-26	36	Banned from participation of tender for 3 Year from date of order



**List of Debarred of agencies/contractors/suppliers by GWSSB**

**Date: 10.04.2026**

Sr No.	Zone	Name of Office	Name & Address of debarred Contractors/Suppliers agencies	Agreement No. & Date	Designation of officer who issued order for debarred	Order No. & Date of debarred	Order Date/start date	Valid upto Date	Duration(Month)	Remarks (If any) Period
1	2	3	4	5	6	7	8	9	10	11
17	Zone-2	PHW Division Palanpur	M/s Shree Habibbhai Manknojiya, Vadgam, Banaskantha	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/216,27.06.2023	27-06-23	26-06-26	36	Banned from participation of tender for 3 Year from date of order
18	Zone-2	PHW Division Modasa	M/s Swastik Agency, Bodakdev, Ahmedabad	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/216,27.06.2023	27-06-23	26-06-26	36	Banned from participation of tender for 3 Year from date of order
19	Zone-1	PHW Division Dahod	Shri M.P Babariya, Surat	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/229,04.07.2023	04-07-23	03-07-26	36	Banned from participation of tender for 3 Year from date of order
20	Zone-1	PHW Division Godhara	Vibrant Developers, Tharad	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/269,24.07.2023	24-07-23	23-07-26	36	Banned from participation of tender for 3 Year from date of order
21	Zone-1	PHW Division Dahod	M/s Gayatri Construction Company, Mehsana	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/269,24.07.2023	24-07-23	23-07-26	36	Banned from participation of tender for 3 Year from date of order
22	Zone-1	PHW Division Godhara	M/s Ghanshyam Prajapati, Surendranagar	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/276,27.07.2023	27-07-23	26-07-26	36	Banned from participation of tender for 3 Year from date of order
23	Zone-1	PHW Division Godhara	M/s Swastik Agency, Rajkot	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/293,07.08.2023	07-08-23	06-08-26	36	Banned from participation of tender for 3 Year from date of order
24	Zone-2	PHW Division Modasa	Gujarat Construction, Mehsana	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR/2023/323,16.09.2023	16-09-23	15-09-26	36	Banned from participation of tender for 3 Year from date of order
25	Zone-6	PHW Division Valsad	Axar Construction, Ahmedabad	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/340,04.10.2023	04-10-23	03-10-26	36	Banned from participation of tender for 3 Year from date of order
26	Zone-2	PHW Division Modasa	J.M Vaghasiya, Ahmedabad	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/348,05.10.2023	05-10-23	04-10-26	36	Banned from participation of tender for 3 Year from date of order
27	Mech	CE Mechanical, GWSSB	Silver Consumer Electricals Pvt. Ltd., Rajkot	-	Chief Engineer (Mechanical Cell), GWSSB, Gandhinagar	CE(mech)/Mat/2023/C-342/Single phase Pump/802,29.09.2023	29-09-23	28-09-26	36	Banned from participation of tender for 3 Year from date of order
28	WASMO	Unit Manager, WASMO, Panchmahal	M/s S.S Infrastructure, Tharad	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/357,10.10.2023	10-10-23	09-10-26	36	Banned from participation of tender for 3 Year from date of order
29	Zone-2	PHM Division Himmatnagar	Jay Construction Company, Valsad	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/382,06.11.2023	06-11-23	05-11-26	36	Banned from participation of tender for 3 Year from date of order
30	Zone-2	PHW Division Mehsana	Able Infraproject, Mehsana	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/385,06.11.2023	06-11-23	05-11-26	36	Banned from participation of tender for 3 Year from date of order
31	Zone-2	PHW Division Mehsana	M/s Gayatri Construction Company, Mehsana	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/386,06.11.2023	06-11-23	05-11-26	36	Banned from participation of tender for 3 Year from date of order
32	WASMO	Unit Manager, WASMO, Jamnagar	M/s Sumat Savdasbhai Chavda, Devbhoomi Dwarka	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/402,21.11.2023	21-11-23	20-11-26	36	Banned from participation of tender for 3 Year from date of order

## List of Debarred of agencies/contractors/suppliers by GWSSB

Date: 10.04.2026

Sr No.	Zone	Name of Office	Name & Address of debarred Contractors/Suppliers agencies	Agreement No. & Date	Designation of officer who issued order for debarred	Order No. & Date of debarred	Order Date/start date	Valid upto Date	Duration(Month)	Remarks (If any) Period
1	2	3	4	5	6	7	8	9	10	11
33	Zone-6	PHW Division Bharuch	N.P Patel & Company, Ahmedabad	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/89,08.02.2024	08-02-24	07-02-27	36	Banned from participation of tender for 3 Year from date of order
34	Zone-3	PHW Division Jetpur	Hitesh C.Kachhadiya,Vadodara	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/106,19.02.2024	19-02-24	18-02-27	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
35	Zone-6	PHW Division Navsari	Goyam Enterprise, Bilimora	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/goyam enterprise/308,21.08.2024	21-08-24	20-08-27	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
36	Zone-6	PHW Division Navsari	Jyoti Switchboard Works, Navsari	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/Jyoti Switchboard Works/309,21.08.2024	21-08-24	20-08-27	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
37	Zone-6	PHW Division Navsari	Sara Enterprise, Gandevi	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/Sara Enterprise/310,21.08.2024	21-08-24	20-08-27	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
38	Zone-6	PHW Division Navsari	Super Construction, Vapi	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/Super Construction/311,21.08.2024	21-08-24	20-08-27	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
39	Zone-6	PHW Division Navsari	Thummar Construction, Surat	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/Thummar Construction/312,21.08.2024	21-08-24	20-08-27	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
40	Zone-6	PHW Division Navsari	Akshay Traders, Bilimora	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/Akshay Traders/313,21.08.2024	21-08-24	20-08-27	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
41	Zone-6	PHW Division Navsari	Abhinandan Enterprise,Bilimora	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/Abhinandan Enterprise/314,21.08.2024	21-08-24	20-08-27	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
42	Zone-6	PHW Division Navsari	Dharmesh V. Patel, Valsad	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/Dharmesh V. Patel/315,21.08.2024	21-08-24	20-08-27	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
43	Zone-3	PHW Division Rajkot	Shiv Builders,Post-Vadviyala, Gir Somnath	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/330,31.08.2024	31-08-24	30-07-27	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
44	WASMO	Unit Manager, WASMO Chhotaudepur	Purvi P. Parikh, Vadodara	-	Chief Engineer, WASMO, Gandhinagar	WASMO/chhotaudepur/Purvi P Parikh/1347/2025, 09.01.2025	09-01-25	08-01-28	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
45	WASMO	Unit manager, WASMO Bhavnagar	C.M Vaghela, Moti Paniyari, Palitana, Bhavnagar	-	Chief Engineer, WASMO, Gandhinagar	WASMO/CM VAGHELA/1282/2024; 04.12.2024	04-12-24	03-12-27	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
46	WASMO	Unit manager, WASMO Bhavnagar	Ranmalbhai Jehabhai ayer,Kalyanpur, Santalpur, Patan	-	Chief Engineer, WASMO, Gandhinagar	WASMO/1386/2025; 28.01.2025	28-01-25	27-01-28	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order

## List of Debarred of agencies/contractors/suppliers by GWSSB

Date: 10.04.2026

Sr No.	Zone	Name of Office	Name & Address of debarred Contractors/Suppliers agencies	Agreement No. & Date	Designation of officer who issued order for debarred	Order No. & Date of debarred	Order Date/start date	Valid upto Date	Duration(Month)	Remarks (If any) Period
1	2	3	4	5	6	7	8	9	10	11
47	WASMO	Unit manager, WASMO Panchmahal	Shatish builder,kapadvanj, kheda	-	Chief Engineer, WASMO, Gandhinagar	WASMO/1403/2025; 07.02.2025	07-02-25	06-02-28	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
48	WASMO	Unit Manager, WASMO Chhotaudepur	Jay Construction ,kwant, chhotaudepur	-	Chief Engineer, WASMO, Gandhinagar	WASMO/1507/2025; 17.03.2025	17-03-25	16-03-28	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
49	WASMO	Unit Manager, WASMO Kachchh	Krishna enterprice, dhaneti,bhuj, kachchh	-	Chief Engineer, WASMO, Gandhinagar	WASMO/1551/2025; 27.03.2025	27-03-25	26-03-28	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
50	Zone-5	PHW Division Veraval	Shyam Construction co., Sarthana, Surat	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR ORDER/126,29.03.2025	29-03-25	28-03-28	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
51	WASMO	Unit Manager, WASMO Mahesans	Ankur P. Italiya	-	Chief Engineer, WASMO, Gandhinagar	WASMO/57/2025; 22.04.2025	22-04-25	21-04-28	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
52	WASMO	Unit Manager, PATAN	Harsidhdhi construction, pro. Bharatbhai kaner, Palanpur, Banaskantha	-	Chief Engineer, WASMO, Gandhinagar	WASMO/411/2025; 13.08.2025	13-08-25	12-08-28	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
53	Zone-5		Maruti Infra, Ahmedabad	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR/ 311,26.08.2025	26-08-25	25-08-26	12	Debarred from participation of tender for GWSSB, GWIL, WASMO for 01 Year from date of order
54	Zone-6	PHW Division Surat	K.S Godhani, Surat	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR/ 312,26.08.2025	26-08-25	25-08-26	12	Debarred from participation of tender for GWSSB, GWIL, WASMO for 01 Year from date of order
55	Zone-3	PHW Division Limbadi	P.C snehal Construction Pvt. Ltd., Ahmedabad	-	Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR/ 332,08.09.2025	08-09-25	07-09-28	36	નામદાર હાઇકોર્ટેના આદેશ અન્વયે, અત્રેની કચેરી દ્વારા તા.૦૮.૦૯.૨૦૨૫ ના રોજ કરેલ ડિબાર આદેશ હાલ પુરતો સ્થગિત કરવામાં આવે છે.
56	Zone-4		Gujarat Construction co., Mehsana		Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR/ 363,15.10.2025	16-09-26	15-09-29	36	Debarred from participation of tender for GWSSB for 03 Year as described besides
57	Zone-4		Krishna enviro Engineers., Ahmedabad		Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/DEBAR/ 419,11.12.2025	11-12-25	10-12-28	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 03 Year from date of order
58	WASMO	Unit Manager, Panchmahal	Jaydevsinh H Solanki,Mota Sonela,Mahisagar		Chief Engineer, WASMO, Gandhinagar	WASMO/781/2026; 21.01.2026	21-01-26	20-01-29	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
59	Zone-6	PHW Division, Surat	Jayanti Super Construction Pvt. Ltd.,Mehsana		Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/ORDER/ 181,07.04.2026	07-04-26	06-04-29	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order

**List of Debarred of agencies/contractors/suppliers by GWSSB**

**Date: 10.04.2026**

Sr No.	Zone	Name of Office	Name & Address of debarred Contractors/Suppliers agencies	Agreement No. & Date	Designation of officer who issued order for debarred	Order No. & Date of debarred	Order Date/start date	Valid upto Date	Duration(Month)	Remarks (If any) Period
1	2	3	4	5	6	7	8	9	10	11
60	Zone-6	PHW Division, Surat	Babubhai Ambalal Patel., Mehsana		Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/ORDER/181,07.04.2026	07-04-26	06-04-29	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
61	Zone-6	PHW Division, Navsari	R&B Infra Project Ltd., Mumbai		Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/ORDER/186,09.04.2026	09-04-26	08-04-29	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
62	Zone-6	PHW Division, Navsari	Dev Engineers., Mumbai		Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/ORDER/186,09.04.2026	09-04-26	08-04-29	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
63	Zone-6	PHW Division, Navsari	Madhavram Tukaram Phad, Parbhani, Maharashtra-431401		Chief Engineer (Technical Cell), GWSSB, Gandhinagar	GWSSB/TECHCELL/ORDER/186,09.04.2026	09-04-26	08-04-29	36	Debarred from participation of tender for GWSSB, GWIL, WASMO for 3 Year from date of order
<b>Debarred by Other organization</b>										
1	Other	Narmada,Water Resources, Water Supply and Kalpsar Department	Krishna Buildspace Pvt.Ltd., Thaltej, Ahemedabad	-	Officer on special duty(I.P) NWRWSK Department	No.NWRWSKD/MISC/e-file/13/2024/3799/Section MI Cell(Planning) ; dated-12.08.2024	12-08-24	11-07-27	36	Banned and kept in abeyance for a period of 3 years from assigning the business with Government of Gujarat from the date of issue of this order

**APPROVED LIST OF MATERIALS**  
**LIST OF APPROVED MAKE / MANUFACTURER/ BRAND OF MATERIALS FOR CIVIL ITEMS**

The following are approved brand makes/manufacture's makes listed below. In case it is established that material as listed below is not available in the market, approved equivalent material and finished of any other specialized brand names/ manufacturer's makes may be used as per approval of Architect.

Material certificate: Material tests as required by the Engineer, if any, shall be carried out by the Contractor from the approved laboratories and the tests reports shall be submitted in the required formats before use of such material. The Engineer shall have the right to reject any material or work, if he finds that the quality of material used/intended to be used and work are not satisfactory. The Contractor shall make good such defective material or the works at his own cost (within the contract price) and without causing any delay to the completion time as specified in the TENDER.

No	Item	Approved make
1	Cement	Ambuja, Ultratech, JK Laxmi, Jaypee, Sanghi, Siddhee, ACC or approve by Architect/EIC
2	White Cement	Birla, J.K
3	Sand	Locally available & as approved sample
4	Aggregates	Vadagam or approved by Client
5	Bricks	As per approved sample by Client
6	Reinforcement bar/TMT Bars	Sail ,Tata, Rinl, Jindal , Vizag , GUJ NRE, Kamdhenu, National Electotherm, ASR Thermax, Gallant, Sanghi, Friends, Vinayak, Varsana, Utkarsh, Aditya, Grace, God
7	Structural steel	Sail ,Tata, Rinl, Jindal, Essar, Vizag, Asian, Appolo
8	Paver blocks	Vyara, Super, Sona tiles, Asian or equivalent
9	Shuttering plywood	Kitply, Anchor, Green, Pragati or equivalent
10	Anti-termite treatment	Pest control India, Bayer-Premise, Rallis India-Termex, Item Secure
11	Waterproofing compound	Pidilite, Sikka, Balendura, Fosroc, Kerakoll, BASF, Sunanda Chemical
12	Weather sealant	Kerakoll, Down corning, Fosroc, Sikka, Dr. Fixit(Pidilite), Bostik, Wacker
13	Joint Filler / silicon paint	Wacker, Dowcorning, Sika, Chokshi, Saudal.
14	Tile adhesive	Saint gobain - Weber, Balendura , Kerakoll, Pidilite ,Roff , Myk Laticrete
15	Epoxy grouting	Myk Laticrete, Dubond, Kerakoll, Bal Endura, Fosroc ,Saint Gobain –Weber, Pidilite
16	Paint, primer	Jotun, Asian, Berger, Nerolac, Indigo, ICI
17	Putty	Birla , Berger, Asian
18	Polish	MRF, Asian, ICI, Taralac
19	Water stops	Arti Cables, Fixopan
20	Granite	As per approved sample

21	Vitrified tiles/ Glazed tiles/ Ceramic tiles	Varmora, Sunheart, Nitco, Kajaria, Somany, Asian, Sempolo, Motto, Silon, Johnson
22	Glass Mosaic	Pavit, Italia, Bissaza, Piccolo
23	Auto sensor Door	Dorma, Geze, Ozone
24	Glass door hardware & fittings	Dorma, Geze, Haffle, Enox, Kitch
25	Door Window & Furniture Hardware	Kitch, EPPW, Dorma, Palladium, Ozon, Magnum, Yale.
26	Adhesives	Fevicol, Kitcol, Araldite, BAL.
27	Anchor fastener / bolts	Hilti. Fischer, Mungo
28	Linseed oil	Saffola
29	Floor spring	Ozone, Everite, Hemco, Godrej, Hyper, Starling, Dorma, Enox
30	Door closer	Godrej, Dorma, Enox, Efficient Gadget, Yale
31	Locks	Godrej, Dorset, Yale, EPPW, Dorma, Kitch.
32	Glass	Modiguard, Saint-Gobain, Asahi, HNG
33	Wood	Teak, Sal sycamore, Merandi
34	Flush door- decorative / non decorative	Greenly-door, century-door, Archidply - door, Eurodoor, Nippon, Duro
35	MS Rolling shutter	Sarvottam, Suryoday, Gandhi, Sagar
36	Ply (BWP - IS 710 & BWR 303)	Green ply, Euro ply, Nippon, Duro, Century, Silicon(evoke)
37	Laminate	Greenlam, Century, Merino, Euro, Royal touch, Formica, Nippon
38	Veneer	Greenlam, Century ply, Euro ply, Timex, Natural Decowood
39	MDF	Nuwood, Maftalal, Duratuff
40	Prelam particle board	Novapan, Bhutan. (exterior grade only)
41	Cement bonded particle board	NCL (Bison board), Everest (Eternite), Shera
42	Compact sheet	Vir, Bloom, Formica.
43	Aluminium heavy duty section	Jindal, Domal series, Hindalco, Banco, Gujarat Extrusion
44	Sanitary vessels	Kohler, Jaquar, Hindware, Cera, Parryware, Johnson
45	Sanitary accessories	Kohler, Jaquar, Hindware, Cera, Parryware, Johnson
46	Hand drayer	Euronics, Cera, Jaquar
47	Toilet Cubical	Marino, Greenlam, Matalium, T-Line
48	CPVC & UPVC, PVC pipe	Prince, Supreme, Astral, Finolex, Ashirvad flow guard,
49	Polycarbonate sheet	Makrolon, Lexan, Bayer, Dupalon, Sabic, Coxwell
50	Anchor fastener and bolts	Hilti, Fischer
51	Gypsum board false ceiling	Saint gobain, USG Boral, Ecotone, Hilux
52	Grid ceiling	Aerolite, Saint gobain, Armstrong, Anutone
53	Acoustic Ceiling	Armstrong, Anutone, Aerolite, Saint gobain
54	Metal ceiling	Metalium, Supersill, USG Boral, Aerolite
55	ACP	Aludecor, Alucobond, Alston, Alstrong, Eurobond, VIVA
56	Acoustic paneling	Artois, Ecotone, Aerolite

57	Glass film	3M, Avery , Garvey,
58	Modular Glass Partition	Sonic, Kubik, Otic , Ozone
59	Carpet flooring	Welspun, Unitex, Ecosoft,Tarkett Flotex, SolarbriteRosetta, Dubond Sorona
60	Wooden flooring	Vista, Pergo , Armstrong, Mikasa, Ecosoft, Quick step
61	Roller blinds	Vista, Hunterdouglas, Ferrari
62	Hardware & fittings	Hettich, Haffle, Enox, Ebco, kitch
63	Aluminium profile handles & frames	Olive, Hettich, Haffle, Enox, Ebco, kitch
64	Door hardware & accessories	Geze ,Haffle, Enox, Dorma, Kitch, Ozone, kitch
65	PVC edge beading	Rehau , Dolken
66	Furniture	Monarch, Amardeep , HOFF, Godrej , Wipro
67	Glass wool/ synthwool	Rockwool, Twiga , Aco sonic
68	Compactor	Kompress , Wipro , Godrej , HOFF
69	Artificial stone	Emcer , Kalinga, CMC, AGL , Johnson
70	Vinyl	Welspun , Solarbrite , Tarkett, Unitex, Responsive, LG
71	Window locks cum handle	Alualpha, Giessee or equivalent.
72	Filler rubber of glass panel	EPDM quality only
73	Wool felt/weather strip	Anand, red-diplex ltd or equivalent
74	Rust Remover	Feovert (Krishna Conchem), Roff Rust Clear (PidiliteIndustries)
75	Polymer bonding agent	Monobond (Krishna Conchem), Roff Bond Repair(Pidilite Industries)
76	Non-shrink grout	Polygrout -HS (Krishna Conchem), Roff Grout GP(Pidilite Industries)
77	Super plasticizer for jacketing	Supercon-100 (Krishna Conchem), RoffPlast 330 /Concrete Master
78	Rebar and Anchor Fasteners	Hilti or Fischer OR Mungo.
79	Acrylic SBR base bonding agent	Mono-bond SBR (Krishna Conchem), CICO, BASF, Pidilite
80	Epoxy Bonding	EPI bond 21 LP (Krishna Conchem), Roff ConcreteBond (Pidilite)
81	Modular Kitchen	Timbor Home, Tiara furniture system, Godrej interio
82	PVC Sleeve	Supreme / Astral / Prince
83	Expansion Board	Capcell HD Board
84	Expansion Joint	Pidilite / Roof/Laticreteor mentioned in BOQ
85	Expansion Joint System	3R as per Item description
86	Water Proofing	BASf/ Fosroc / Sika or mentioned in BOQ
87	Overdeck Insulation	BASf/ Fosroc / Sika or mentioned in BOQ
88	PVC spacer	BAL Endura / Kerakoll / BASF
89	PVC Flooring	Armstrong, Gerflor, Tarkett
90	Self Levelling Chemicals	Ardex / BASF / Cico / Sika
91	Anti-bacterial Paint	Sikka / Liquid Plastic/SSK/Viessmann/artilin / BASF /Huntsman
92	Galvalume roofing sheet	Jindal,Mansha,Eashar
93	Pre coated Sheet	J.S.Eng., Fielders, Rama, Shree Precoated, S.Kumar

94	Floor stamping	Ultratech, Vyara, Flexstone or Equivalent
95	WPC door	Alstone , Flexibond or equivalent
96	Roofing shingles	Saint Gobain , Malarkey , Technicol , Docke or equivalent
97	Fiber Cement sheet board	Ecopro, Everest , Shera , CK Birla Group
98	Roof Gutter	Saint Gobain , Malarkey , Technicol or equivalent



## PLUMBING MAKE LIST

Sr.No.	Item	Approved Make
1.	SWR PVC PIPE & FITTINGS 6 KG CM <sup>2</sup> ; FITTINGS : 6 KG CM <sup>2</sup>	ASTRAL / SUPREME/PRINCE/FINOLEX
2.	ECO. DRAIN PIPE & FITTINGS	SUPREME/ ASTRAL
3.	GULLY TRAP	GIRCO / TIRUMALA / SONIA/ SUPREME/ ASTRAL
4.	STONE WARE PIPES FOR INTERNAL UNDER GROUND DRAIN PIPE	GIRCO / TIRUMALA / SONIA
5.	RCC HUME PIPES EXTERNAL MAIN UNDER GROUND PIPE	INDIAN HUME PIPE / PRANALI
6.	M.S/G.I. PIPES FOR WATER SUPPLY	TATA / JINDAL/ SWASTIK
7.	ASTM/CPVC PIPE & FITTINGS FOR WATER SUPPLY	ASTRAL / SUPREME/ASHIRWAD / FINOLEX
8.	COMPOSITE PLUMBING PIPE & COMPOSITE FITTINGS	KITEC OR EQ
9.	G.I. PIPES FITTINGS WATER SUPPLY	DRP-M / R-BRAND / ZOLOTO
10.	GI TO GI JOINTS	CHAMPION / EQUIVALENT
11.	SOLVENT CEMENT	SUPREME / KISSAN / FINOLEX
12.	BALL VALVES	LEADER / ZOLOTO / AUDCO
13.	WHEEL VALVES	LEADER / ZOLOTO/AUDCO
14.	DCV / NRV	ZOLOTO/SPIREX/AUDCO
15.	TAR	SHALIBIND / TIKIBOND-BS
16.	SELF PRIMING SEWAGE PUMPS	HBD / GRUNDFOS
17.	VALVES	AUDCO/ZOLOTO / R.B. / KBL / KSB
18.	PUMPS	KIRLOSKAR / GRUNDFOS/XYLEM
19.	STARTER	SIEMENS / L&T
20.	PRESSURE GAUGE	BELLS / H GURU
21.	BOTTLE TRAP & WASTE COUPLING	JAQUAR / HINDWARE/KOHLER
22.	DEWATERING PUMPS	GRUNDFOS/KIRLOSKAR/ KSB
23.	HYDROPNEUMATIC SYSTEM	GRUNDFOS OR EQUIVALENT
24.	EOT CRANE WITH HOIST	INDEF / ELECTROMECH / SAFEX / WH-BRADY / EQUIVALENT
25.	METALLIC BELLOWS	BELLOW FLEX / PRICISION / DHRUV / B.D. ENGR.
26.	ELECTRIC GEYSER	A-O SMITH/ RACOLD/SPHERHOT
27.	HOT WATER GENERATOR	THERMAX/A.O.SMITH / KEPL OR EQUIVALNET

No	Item	Approved Make
<b>LT PANELS,LT CABLES SWITCHGEAR &amp; ACCESSORIES</b>		
1	ENCLOSURE MANUFACTURER	ACTIVE ENGINEERS, ELMEX, AD ENTERPRISE, ACCESS CONTROLPANELS.
2	MCB/ELCB/RCCB/ELMCB	LEGRAND, ABB,HAGER,SCHNEIDER,C&S, L&T,SEIMENS
3	MCCB/ACB	LEGRAND, ABB, SCHNEIDER,SIEMENS,L&T
4	DISTRIBUTION BOX	LEGRAND, ABB,HAGER,SCHNEIDER,C&S, L&T,SEIMENS
5	CHANGEOVER SWITCH	HH ELECON,L&T, ABB, HPL,C&S
6	CAPACITOR	L&T, EPCOS,CONZERV,DATAR,POWERMATRIX,ABB
7	PUSH BUTTON	SIEMENS,ABB,L&T,SCHNEIDER
8	INDICATING LIGHT	SIEMENS,ABB,L&T
9	TIMERS	L&T,SIEMENS,ABB,CONZERV
10	SELECTOR SWITCH	L&T,SEIMENS,KAYCEE
11	AUTOMATIC TRANSFER SWITCH	L&T,HPL,CUMMINS,HAVELLS
12	CTs	KAPPA,L&T,AREVA,MAXWELL
13	PTs	KAPPA,L&T,AREVA,MAXWELL
14	CONNECTORS	L&T, SCHINDER,SEIMENS,ABB
15	PROTECTION RELAY	AREVA,L&T,ABB,SEIMENS
16	ANALOG/DIGITAL METER/LOAD MANAGER/MFM	CONSERV,L&T,SCHNEIDER/ABB/HPL
17	IRON CLAD SWITCH WITH REWIREABLEFUSE/SFU	KEW, TRISHUL,SUPER,C&S
18	METALCLAD SWITCH WITH REWIREABLEFUSE/SFU	HAVELLS, KEW,C&S, INDOASIAN
19	MAIN LT CABLE	AVOCAB,FINOLEX,PRIMECAB,POLYCAB,DIAMON DPOWER,RRCABLE,HAVELLS
20	CABLE GLANDS	COMET, HMI, DOWELLS, SIEMENS,CROMPTON,HEX
21	CABLE LUGS	DOWELLS,JOHNSON,HEX
22	BUSDUCT	L&T,SCHNEIDER,C&S,SEIMENS,LEGRAND
<b>INTERNAL WIRING, FIXTURES &amp; ACCESSORIES</b>		
1	RIGID FR PVC CONDUIT	NIHIR,PRECISION,POLYCAB,BEC, Power Flow

2	ACCESSORIES OF CONDUIT	NIHIR,PRECISION,POLYCAB,BEC
3	COPPER FLEXIBLE WIRES	AVOCAB,FINOLEX,POLYCAB,RRCABLE,HAVELLS ,Caliplast
4	TISSINO TYPE SWITCHES & SOCKETS	POINTER-TRUMP, SSK-TOPLINE PC, ANCHOR-PENTA CHEERY
5	MODULAR TYPE SWITCHES & SOCKETS	LEGRAND-MYRIUS, MK-WRAP ROUND, ANCHOR-WOODS, HAVELLS-CRABTREE-ATHENA
6	PVC TAPE	STEEL GRIP,ANCHOR
7	M.S. CONDUIT	BEC,AKG,STEEL CRAFT
8	LIGHT FIXTURES & LAMPS	OSRAM, XAL WIPRO, PHILIPHS, NIRVANA, GE, CG, , JAQUAR , ENDO , TISVA ,LT
9	CEILING FAN & EXHAUST FAN	USHA,CG,ORIENT,HAVELLS
10	CALL BELL	ANCHOR/ORPAT/MAX
11	WATER COOLER	VOLTAS,USHA,BLUESTAR
12	GEYSER	RECOLD,HAVELLS,BAJAJ,SPHEREHOT
13	MOTOR PUMP SET	CROMPTON,AMRUT,KSB,UNEEL,KIRLOSKAR
<b>CABLE TRAY, RACEWAY &amp; ACCESSORIES</b>		
1	CABLE TRAY	INDIANA,RUSHABH,PROFAB
2	ALUMINIUM FLOOR RACEWAY	MK OR APPROVED BY CONSULTANTS
3	GI FLOOR RACEWAY	MK OR APPROVED BY CONSULTANTS
4	PVC WALL RACEWAY	MK, PROFAB,LEGRAND
<b>UPS &amp; INVERTER</b>		
1	UPS	NUMERIC,EATON,APC, BPE
2	INVERTER	SUVIK,SUKAM,MEGATECH
3	SMF BATTERY	PANASONIC,EXIDE,GLOBAL (YUASA)
4	RACK	FABRICATED
<b>STREETLIGHT POLES, FIXTURES &amp; ACCESSORIES</b>		
1	GI POLES	FABRICATED
2	MS POLES	FABRICATED
3	SMC PRESS MOULDED JUNCTION BOX	SYNTEX OR AS APPROVED BY CONSULTANTS
<b>LIGHTNING PROTECTION &amp; EARTHING SYSTEM</b>		
1	AIR TERMINAL	MAP, LPI, INDESCO
2	SUPPORTING GAYED MAST	MAP, LPI, INDESCO

3	LIGHTNING STROKE RECORDER	MAP, LPI, INDESCO
4	COPPER BONDED ROD & CHEMICAL COMPOUND	MAP, LPI, INDESCO
5	ELECTROLYTIC/CHEMICAL EARTHING KIT	GRESLO, GALAXY EARTHING
<b>ELV SYSTEM &amp; ACCESSORIES</b>		
1	FIRE ALARM PANEL & DISPLAY PANEL	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
2	REPEATER PANEL	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
3	ADDRESSABLE & CONVENTIONAL SMOKE DETECTORS	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
4	INTELLIGENT SMOKE & HEAT DETECTORS	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
5	ADDRESSABLE & CONVENTIONAL HEAT DETECTORS	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
6	ADDRESSABLE & CONVENTIONAL BEAM DETECTORS	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
7	FAULT ISOLATOR	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
8	RESPONSE INDICATOR	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
9	MANUAL CALL POINT	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
10	ADDRESSABLE HOOTER	ESSER, EDWARD, NOTIFIER, SIEMENS, GST
11	FIRE CABLE	RRCABLE, FINOLEX, DELTON, POLYCAB, AVOCAB, Caliplast
12	RJ-45 SOCKET OUTLET (COMPUTER & TELEPHONE)	LEGRAND-MYRIUS, MK-WRAP ROUND, ANCHOR-WOODS, HAVELLS-CRABTREE-ATHENA, PLEXONICS, AECONNECT
13	RJ-11 TELEPHONE SOCKET	LEGRAND-MYRIUS, MK-WRAP ROUND, ANCHOR-WOODS, HAVELLS-CRABTREE-ATHENA, PLEXONICS
14	CAT-6 CABLE	TYCO ELE(AMP), SCHINDER ELE.(DIGILINK), R&M, SYSTIMAX, MOLEX, PLEXONICS, AECONNECT

15	CAT-6E CABLE	TYCO ELE(AMP), SCHINDER ELE.(DIGILINK), R&M,SYSTIMAX,MOLEX, PLEXONICS, AECONNECT
16	TELEPHONE TAG BOX	KRONE
17	TELEPHONE PAIR WIRE	RRCABLE, FINOLEX,DELTON,POLYCAB
18	NETWORK SWITCH	CISCO,HP, PLEXONICS, , D LINK, AECONNECT, NETGEAR
19	ETHERNET SWITCH	CISCO,HP, PLEXONICS , D LINK, , AECONNECT, NETGEAR
20	PATCH CORDS	CISCO,HP, PLEXONICS , D LINK , , AECONNECT, NETGEAR
21	U RACKS	VERO PRESIDENT,VALRACK,SPIDER OR APPROVED BYCONSULTANTS, AECONNECT
22	PUSH BUTTON PHONE	PANASONIC,BEETEL,SONY OR APPROVED BY CONSULTANTS,PRAMODA
23	PROGRAM PHONE	PANASONIC,BEETEL,SONY OR APPROVED BY CONSULTANTS,MATRIX
24	AMPLIFIER (POWER & BOOSTER)	JBL, AUDIOQUEST,BOSCH,AVTRON
25	AUDIO MIXER	JBL, AUDIOQUEST,BOSCH, AVTRON
26	CD/DVD/FM PLAYER	JBL, AUDIOQUEST,BOSCH, SONY, AVTRON
27	MICROPHONE	JBL, AUDIOQUEST,BOSCH, AVTRON
28	MULTIPLEXER	JBL, AUDIOQUEST,BOSCH, AVTRON
29	CEILING AND WALL SPEAKER	JBL, AUDIOQUEST,BOSCH, AVTRON
30	GOOSENECK MIC	JBL, AUDIOQUEST,BOSCH, AVTRON
31	WIRELESS MIC	JBL, AUDIOQUEST,BOSCH, BEYERDYNAMIC
32	STAND MIC	JBL, AUDIOQUEST,BOSCH
33	SPEAKER CABLE	RRCABLE, FINOLEX,DELTON,POLYCAB,CALIPLAST
34	2 MP HD IR VERIFOCAI CAMERA	AVTRON,HONEYWELL,SONY, SCHNEIDER (PELCO), HIKVISION, CPPLUS

35	2 MP FIX DOME CAMERA	AVTRON,HONEYWELL,SONY, SCHNEIDER (PELCO), HIKVISION, CPPLUS
36	DOME CAMERA	AVTRON,HONEYWELL,SONY, SCHNEIDER (PELCO), HIKVISION, CPPLUS
37	DIGITAL VIDEO RECORDER	AVTRON,HONEYWELL,SONY, SCHNEIDER (PELCO), HIKVISION, CPPLUS
38	NETWORK VIDEO RECORDER	AVTRON,HONEYWELL,SONY, SCHNEIDER (PELCO), HIKVISION, CPPLUS
39	LED/LCD DISPLAY UNIT	SONY, SAMSUNG,PANASONIC,LG

Sr. No.	Description	Make
1	VRF	DAIKIN, O GENERAL, HITACHI, MITSUBISHI, BLUESTAR / TOSHIBA
2	Treated Fresh Air Unit	Zeco / Citizen / Ethos
3	Dx Type Condensing Unit	DAIKIN, O GENERAL, HITACHI, MITSUBISHI, BLUESTAR / TOSHIBA
4	Ventilation Fan	Kruger/Nicotra/System Air
5	Grills/ Jet Nozzel	Caryaire /System Air /Ruskin Titus
6	Nitrile Insulation	K Flex/ Armacell /Areoflex
7	Copper pipes	Maxflow / Mandev
8	Drain Pipe	Prince/Finolex/ Astral
9	GI Sheet	Jindal/Tata
10	Electrical Cables	Polycab/Finolex Eq Approve

Only above said material is to be used as per Schedule “B”

Notes:

The consultant / Nagarpalika reserves the right to select the manufacturers or approved make from the above list and also to make changes (add or delete names of other makes) in this list during the execution of the contract,

Tenderers should quote rates of various items considering supply/ use of first preference make of material selected by him. Second preference make material would be accepted by the consultant if they are satisfied that first preference make material cannot be supplied/ used by Tenderers due to any specific reasons. However, the final decision for accepting second preference makes or accepting only first preference would be that of the consultant.

Note:

All the material/ makes listed above and other than as specified above shall be used after obtaining prior approval from the architect/ Eng. in charge equivalent material listed in complete tender document should only be used in case the specified material or not available the equivalent material should be used after obtaining prior approval from the architect/Eng-in-charge. Any extra item has to be approved in advance and then execute the same else university will not be liable for payment of such item. If any items are not included in the tender and need to do on site then contractor has to give RA (rate analysis) for the same.

TENDERER'S SEAL AND SIGNATURE.

A decorative border with a repeating floral and leaf pattern in black and white, framing the entire page.

# **GENERAL TECHNICAL SPECIFICATIONS FOR BUILDING WORKS**

Circle : \_\_\_\_\_

Division : \_\_\_\_\_



## SPECIFICATIONS OF MATERIALS

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## GENERAL

## STANDARD TECHNICAL SPECIFICATIONS

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1		26		51		76		101		126	
2		27		52		77		102		127	
3		28		53		78		103		128	
4		29		54		79		104		129	
5		30		55		80		105		130	
6		31		56		81		106		131	
7		32		57		82		107		132	
8		33		58		83		108		133	
9		34		59		84		109		134	
10		35		60		85		110		135	
11		36		61		86		111		136	
12		37		62		87		112		137	
13		38		63		88		113		138	
14		39		64		89		114		139	
15		40		65		90		115		140	
16		41		66		91		116		141	
17		42		67		92		117		142	
18		43		68		93		118		143	
19		44		69		94		119		144	
20		45		70		95		120		145	
21		46		71		96		121		146	
22		47		72		97		122		147	
23		48		73		98		123		148	
24		49		74		99		124		149	
25		50		75		100		125		150	

## GENERAL TECHNICAL SPECIFICATIONS FOR BUILDING WORKS

### GENERAL:

1. In the specifications, “as directed” / “Approved” shall be taken to mean “as directed” / “approved” by the Engineer-in-charge.
2. Wherever a reference to any Indian Standard appears in the specifications, it shall be taken to mean as a reference to the latest edition of the same in force on the date of agreement.
3. In “Mode of Measurement” in the specifications wherever a dispute arises in the absence of specific mention of a particular point or aspect, the provisions on these particular points, or aspects in the relevant Indian Standards shall be referred to.
4. All measurements and computations, unless otherwise specified, shall be carried out nearest to the following limits :
  - (i) Length, width and depth (height) ..... 0.01 Metre.
  - (ii) Areas ..... 0.01 Sq. Mt.
  - (iii) Cubic Contents ..... 0.01Cu.Mt.

In recording dimensions of work, the sequence of length, width and height (depth) or thickness shall be followed.

5. The distance which constitutes lead shall be determined along the shortest practical route and not necessarily the route actually taken. The decision of the Engineer-in-charge in this regard shall be taken as final.
6. Where no lead is specified, it shall mean “all leads”.
7. Lift shall be measured from plinth level.
8. Upto “floor two level” means actual height of floor (Maxi. 4 M.) upto 3 Mt. above plinth level.
9. Definite particulars covered in the items of work, though not mentioned or elucidated in it, specifications shall be deemed to be included therein.
10. Reference to specifications of materials as made in the detailed specification of the items of work is in the form of a designation containing the number of the specification of the material and prefix ‘M’ e.g. ‘M-5’.
11. Approval to the samples of various materials given by the Engineer-in-charge shall not absolve the contractor from the responsibility of replacing defective material brought on site or materials used in the work found defective at a later date. The contractor shall have no claim to any payment or compensation whatsoever on account of any such materials being rejected by the Engineer-in-charge.
12. The contract rate of the item of work shall be for the work completed in all respects.
13. No collection of materials shall be made before it is got approved from the Engineer-in-charge.
14. Collection of approved materials shall be done at site of work in a systematic manner. Materials shall be stored in such a manner as to prevent damage, deterioration or intrusion of foreign matter and to ensure the preservation of their quality and fitness for the work.
15. Materials, if and when rejected by the Engineer-in-charge, shall be immediately removed from the site of work.
16. No materials shall be stored prior to, during and after execution of a structure in such a way as to cause or lead to damage or overloading of the various components of the structure.
17. All works shall be carried out in a workmanlike manner as per the best techniques for the particular item.
18. All tools, templates, machinery and equipment for correct execution of the work as well as for checking lines, levels, alignment of the works during execution shall be kept in sufficient numbers and in good working condition on the site of the work.
19. The mode, procedure and manner of execution shall be such that it does not Cause damage or over loading of the various components of the structure during execution or after completion of the structure.
20. Special modes of construction not adopted in general Engineering practice, if proposed to be adopted by the Contractor, shall be considered only if the contractor provides satisfactory evidence that such special mode of construction is safe, sound and helps in speedy construction and completion of work to the required strength and quality. Acceptance of the same by the Engineer-in-charge shall not, however, absolve the contractor of the responsibility of any adverse effects and consequences of adopting the same in the course of execution of completion of the work.
21. All installations pertaining to water supply and fixtures thereof as well as drainage lines and sanitary fittings shall be deemed to be completed only after giving satisfactory tests by the Contractor.

22. The contractor shall be responsible for observing the rules and regulations imposed under “Minor Minerals Act”, and such other law’s and rules prescribed by Government from time to time.
23. All necessary safety measures and precaution (including those laid down in the various relevant Indian Standards) shall be taken to ensure the safety of men, materials and machinery on the works as also of the work itself.
24. The testing charges of all materials shall be borne by the Contractor unless recovery at one percent towards testing charges is separately made.
25. Approval to any of the executed items for the work does not in any way relieve the contractor of his responsibility for the correctness, soundness and strength of the structure as per the drawings and specification.

## **SPECIFICATIONS OF MATERIALS**

### **M-1 Water**

1.1 Water shall not be salty or brackish and shall be clean, reasonably clear and free from objectionable quantities of silt and traces of oil and injurious alkalies, salts, organic matter and other deleterious material which will either weaken the mortar or concrete or cause efflorescence or attack the steel in R.C.C: Container for transport, storage and handling of water shall be clean. Water shall conform to the standards specified in I.S. 456-1978.

1.2 If required by Engineer-in-charge it shall be tested by comparison with distilled water. Comparison shall be made by means of standard cement tests for soundness, time of setting and mortar strength as specified in I.S. 269-1976. Any indication of unsoundness, change in time of setting by 30 minutes or more or decrease of more than 10 percent in strength of mortar prepared with water sample when compared with the results obtained with mortar prepared with distilled water shall be sufficient cause for rejection of water under test.

1.3 Water for curing mortar, concrete or masonry should not be too acidic or too alkaline. It shall be free of elements which significantly affect the hydration reaction or otherwise interfere with the hardening of concrete during curing or those which produce, objectionable stains or other unsightly deposits on concrete or mortar surfaces.

1.4 Hard and bitter water shall not be used for curing.

1.5 Potable water will be generally found suitable for curing mortar or concrete.

### **M-2. Lime**

2.1 Lime shall be hydraulic lime as per I.S. 712-1973. Necessary test shall be carried out as per I.S. 6,932 (Parts I to X) 1973.

2.2 The following field tests for limes are to be carried out:

(1) A very rough idea can be formed about the type of lime by its visual examination i.e. fat lime bears pure white colour, lime in form of porous lumps of dirty white colour indicates quick lime, and solid lumps are the unburnt lime stone.

(2) Acid tests for determining the carbonate content in lime. Excessive amount of impurities and rough determination of class of lime.

2.3 Storage shall comply with I.S. 712-1973. The slaked lime, if stored, shall be kept in a weather proof and damp-proof shed with impervious-floor and sides to protect it against rain, moisture, weather and extraneous materials mixing with it. All lime that has been damaged in any way shall be rejected and all rejected materials shall be removed from site of work.

2.4 Field testing shall be done according to I.S. 1624- 1974 to show the acceptability of materials.

### **M-3. Cement**

3.1 Cement shall be ordinary portland slag cement as per I.S. 269-1976 or Portland slag cement as per I.S. 455-1976.

### **M-4. .White Cement**

4.1 The white cement shall conform to I.S.,80412”-E 1978.

### **M-5. Coloured Cement**

5.1 Coloured cement shall be with white or gray portland cement as specified in the item of the work.

5.2 The pigments used for coloured cement shall be of approved quality-and shall not exceed 10% of cement used in the Mix, The mixture of pigment shall be properly grounded to have a uniform colour and shade. The pigments shall have such properties to provide-for durability under exposure to sunlight and weather.

5.3 The pigment shall have the property such that it is neither affected by the cement nor detrimental to it.

**MS. Sand**

6.1 . Sand shall be natural sand, clean, well graded, hard strong durable and gritty particle free from injurious-amounts of dust clay, kankar nodules, soft or flaky particles Shale, alkali, salts-organic matter, loam, mica or other deleterious substance and shall be got approved, from the Engineer-in-charge. The sand shall not contain more than 8 percent of silt as determined by field test. If necessary the sand shall be washed to make it clean.

**6.2 Coarse Sand :**

The fineness, modulus of coarse sand shall not be less than 2.5 and shall not exceed 3.00. The sieve analysis of coarse shall be as under:

<b>I.S. Sieve Designation</b>	<b>Percentage by Weight Passing sieve</b>	<b>I.S. Sieve Designation</b>	<b>Percentage by Weight Passing sieve</b>
4.75 mm	100	600 Micron	30-100
2.36 mm.	90 to 100	300 Micron	5-70
1.18 mm.	70-100	150 Micron	0-50

**6.3. Fine Sand**

The fineness modulus shall not exceed 1.0. The sieve analysis of fine sand shall be as under :

<b>I.S Sieve Designation</b>	<b>Percentage by weight Passing through</b>	<b>I.S. Sieve Designation</b>	<b>Percentage by Weight Passing through</b>
4.75 mm.	100	600 Micron	40-85
2.36 mm	100	300 Micron	5-50
1.18 mm	70 – 100	150 Micron	0-10

**M-7. Stone Dust**

7.1. This shall be obtained from crushing hard black trap or equivalent.. It shall not contain- more than 8% of silt as, determined by field test with measuring cylinder. The method of determining silt contents by field test is given as under:

7.2. A sample of stone dust to be tested shall be placed without drying in 200mm. measuring cylinder. The quantity of . the sample shall be such that it fills the cylinder upto 100 mm. mark. The clean water shall be added upto 150 mm. mark. The mixture shall be stirred vigorously and the content allowed to settle for 3 hours.

7.3 The height of silt visible as settled layer above the stone dust shall be expressed as percentage of the height of the stone dust below. The stone dust containing more than 8% silt shall be washed so as to bring the silt content within the allowable limit.

7.4 The fineness modulus of stone dust shall not be less than 1.80.

**M-8 Stone Grit**

8.1 Grit shall consist of crushed or broken stone and be hard strong, dense, durable, clean, of proper gradation and free from skin or coating likely to prevent adhesion of mortar Grit shall generally be cubical in shape and as far as possible flaky elongated pieces shall be avoided. It shall generally comply with the provisions of I.S. 383-1970. Unless special stone of particular quarries is mentioned, grit shall be obtained from the best black trap or equivalent hard stone as approved by the Engineer-in-charge. The grit shall have no deleterious reaction with cement.

8.2 The grit shall conform to the following gradation as per sieve analysis :

<b>I.S Sieve Designation</b>	<b>Percentage by weight Passing through</b>	<b>I.S. Sieve Designation</b>	<b>Percentage by Weight Passing through</b>
12.50 mm.	100%	4.75 mm	0-20%
10.00 mm	85-100%	2.36 mm.	0-25%

8.3. The crushing strength of grit will be such as to allow the concrete in which it is used to built up the specified strength of concrete.

8.4. The necessary tests for grit-shall carried out as per the requirements of I.S. 2386 (Parts I to VII) 1963, as per instructions of the Engineer-in-charge. The necessity of test will be decided by the Engineer-in-charge.

**M-9 Cinder:**

9.1 Cinder is well burnt furnace residue which has- been fused or sintered into lumps of varying sizes. .

9.2. Cinder aggregates shall be well burnt furnace residue obtained from furnace using coal fuel only. It shall be sound clean free from clay, dirt, ash or other deleterious matter.

9.3. the average grading for cinder aggregates shall be as mentioned below :

I.S Sieve Designation	Percentage Passing	I.S. Sieve Designation	Percentage Passing
20 mm.	100	4.75 mm	70
10 mm	86	2.36 mm.	52

#### **M.10. Lime Mortar**

10.1 Lime shall conform to Specification M-2. Water shall conform to specification M-1.

Sand shall conform to specification M-6.

#### **10.2. Proportion of Mix :**

10.2.1 Mortar shall consist of such proportions of slaked lime and sand as may be specified in the item. The slaked lime and sand be measured by volume.

#### **10.3 Preparation of mortar :**

10.3.1 Lime mortar shall be prepared by wet process as per I.S. 1625-1971. Power driven mill shall be used for preparation of lime mortar. The slaked lime shall be placed in the mill in an-even layer .and ground for .the 180 revolution's with a sufficient water. Water shall be added as required during grinding (care being taken not to add more water) that will bring the mixed material to-a consistency-of stiff paste. Thoroughly wetted sand shall then be added evenly and the mixture ground for another 180 revolutions.

#### **10.4 Storage:**

10.4.1. Mortar shall always be kept damp, protected from sun and rain till used up, covering it by tarpaulin or open sheds.

#### **10.5. Use :**

10.5.1. All mortar shall be used as soon as possible after grinding. It should be used of the day in which it is prepared. But in no case mortar made earlier than 36 hours shall be permitted for use.

#### **M-11 Cement Mortar :**

11.1. Water shall conform to specification M-1. Cement shall conform to specification M-3. Sand shall conform to M-6.

#### **11.2. Proportion of Mix :**

1-1.2.1. Cement and sand shall be mixed to specified proportion, sand being measured by measuring boxes. The proportion of cement will be by volume on the basis of 50 Kg./Bag of cement being equal to 0.0342 Cu.m. The mortar may be hand mixed or machine mixed as directed.

#### **11.3. Preparation of mortar:**

11.3.1 In hand mixed mortar cement and sand in the specified proportions shall be thoroughly mixed dry on a clean Impervious platform by turning over at least 6 times or more till a homogenous mixture of uniform colour is obtained. Mixing platform shall be so arranged that no deleterious extraneous material shall get mixed with mortar-or mortar shall flow out. While mixing, the water shall be gradually added and thoroughly-mixed to form a stiff plastic mass of uniform colour so that each particle of sand shall be completely covered with a film of wet cement. The water cement ratio shall be adopted as directed.

11.3.2 The mortar so prepared shall be used within 30 minutes of adding water. .Only such quantity of mortar shall be prepared as can be used within 30 minutes.

#### **M-12. Stone Coares Aggregate for Nominal Mix Concrete**

12.1 Coarse aggregate shall be machine crushed stone of black trap or equivalent and be hard, strong, dense, durable, clean and free from skin and coating likely to prevent proper adhesion of mortar.

12.2 The aggregate shall generally be cubical in shape. Unless special stones of particular quarries are mentioned aggregates shall be machine crushed from the best black trap or equivalent hard stone as approved. Aggregate shall have no deleterious reaction with cement. The size of the coarse aggregate for plain-cement concrete and ordinary reinforced cement concrete shall generally be as per the table given below. "However in case of reinforced cement concrete the maximum limit may be restricted to 6 mm. less than the minimum lateral clear distance between bars or 6 mm. less than the cover, whichever is smaller.

TABLE

I.S. Sieve Designation	Percentage passing for single sized aggregates of Nominal size.			I.S. Sieve Designation	Percentage passing for single sized aggregates of Nominal size.		
	40 mm	20mm	16 mm		40mm	20mm	16mm
80 mm.	—	—	—	12.5 mm.	—	—	—
63 mm.	100	—	—	10 mm.	0.5	0.02	0.30
40 mm.	85-100	100	—	4.75 mm.	—	0.5	0.5
20 mm.	0-20	85-100	100	2.35mm	—	—	—
16 mm.	—	—	85-100				

**Note :** This percentage may be varied .some what by Engineer- in-charge when considered necessary for obtaining better density and strength of concrete.

12.3 The grading test shall be taken in the beginning and at the change of source of materials. The necessary test indicated in I.S. 383-1970 and I.S. 456-1978 shall have to be carried out to ensure the acceptability. The aggregates shall be stored separately and handled in such a manner as to prevent the intermixing of different aggregates, If the aggregates are covered with dust they shall be washed with water to make them clean.

#### **M-13. Blak Trap or Equivalent Hard Stone Coares.**

13.1. Aggregate For Design Mix Concrete : Coarse aggregate shall be of machine crushed stone of black trap or equivalent hard stone and be hard strong dense, durable clean and free from skin and coating likely to prevent proper adhesion of mortar.

13.2. The aggregates shall generally be cubical in shape. Unless special stones of particular quarries are mentioned, aggregate shall be machine crushed from the best, black trap or equivalent hard stones as approved. Aggregate shall have no deleterious reaction with cement.

13.3. The necessary tests indicated in I.S. 383-1970 and I.S. 456-1978 shall have to be carried out to ensure the acceptability of the material.

13.4. If aggregate is covered with dust it shall be washed with water to make it clean..

#### **M-14. Brick Bats Aggregate**

14.1. Brick bat aggregate shall be broken from well burnt or slightly over burnt and dense brick. It shall be homogeneous in texture roughly cubical in shape, clean and free from dirt of any other foreign material. The brick bats shall be of 40 mm. to 50 mm. size unless otherwise specified in the item. The under burnt or over burnt brick bats shall not be allowed.

14.2. The brick' bats shall be measured by volume by suitable boxes or as directed.

#### **M-15. Brick**

15.1. The bricks shall be hand or machine moulded and made from suitable soils and kiln-burnt. They shall be free from crack and nodules of free lime. They shall have smooth rectangular faces with sharp corners and shall be of uniform colour.

The bricks shall be moulded with a frog of 100mm. x 40 mm. and 10mm. to 20 mm. deep on one of its flat sides. The bricks shall not break when thrown off the ground from a height of 600 mm.

15.2. The size of modular bricks shall be 190 mm. x 90 mm. x 90 mm.

15.3. The size of the conventional bricks shall be as under :

(9" x 4 3/8 " X 2 3/4 ") 225 x 110 x 75 mm.

15.4. Only bricks of one standard size shall be used on one work. The following variances shall be permitted in the conventional size adopted in a particular work.

Length  $\pm 1/8$  " (3.0 mm.) Width :  $\pm 1/16$  " (1.50 mm.,) Height  $\pm 1/6$  " (1.50 mm.)

15.5. The crushing strength of the bricks shall not be less than 35 Kg./Sq.Cm. The average water absorption shall not be more than 20 percent by weight. Necessary tests for crushing strength and water absorption etc. shall be carried out as per I.S. 3495 (Part-I to IV) 1976.

#### **M-16 Stone**

16.1. The stone shall be of the specified variety such as Granite/Trap Stone/Quartzite or any other type of good hard stones.

The stones shall be obtained only from the approved quarry and shall be hard, sound, durable and free from defects like cavities, cracks, sand holes, flaws, injurious veins, patches of loose or soft materials etc. and weathered portions and other structural defects or imperfections tending to affect their soundness and strength. The stone with round surface shall not be used. The percentage of water absorption shall not be more than 5% of dry weight, when tested in accordance with I.S. 1134- 1974. The minimum crushing strength of the stone shall be 200 Kg./Sq.Cm. unless otherwise specified.

**16.2.** The samples of the stone to be used shall be got approved before the work is started.

**16.3.** The Khanki facing stone shall be dressed by chisel as specified in the item for khanki facing in required shape and size. The face of stone shall be so dressed that the bushing on the exposed face shall not project by more than 40 mm. from the general wall surface and on face to be plastered it shall not project by more than 19 mm. nor shall it have depressions more than 10 mm. from the average wall surface.

#### **M-17. Laterite stone**

17.1 Laterite stone shall be obtained from the approved quarry. It shall be compacted in texture, sound, durable and free from soft patches. It shall have a minimum crushing strength of 100 Kg./Sq.Cm. in its dry condition. It shall not absorb water more than 20% of its own weight, when immersed for 24 hours in water. After quarrying the stone shall be allowed to weather for some time before using in work.

17.2. The stone shall be dressed into regular rectangular blocks so that all faces are free from waviness and unevenness, edges true and square.

17.3 Those types of stone in which white clay occurs, should not be used.

17.4 Special corner stones shall be provided where so directed.

#### **M-18. Mild Steel Bars**

18.1 Mild steel bars reinforcement for R.C.C. work shall conform to I.S. 432 (Part-II) 1966 and shall be of tested quality. It shall also comply with relevant part of I.S. 456- 1978.

18.2 All the reinforcement shall be clean and free from dirt, paint, grease, mill scale or loose or thick rust at the time of placing.

18.3 For the purpose of payment, the bar shall be measured correct upto 100 mm. length and weight payable worked out at the rate specified below :

1.	.6 mm.	0.22 Kg./Rmt.	8	20 mm.	2.47 Kg./Rmt.
2.	8 mm.	0.39 Kg./Rmt.	9.	22. mm.	2.98 Kg./Rmt.
3.	10mm.	0.62 Kg./Rmt.	10.	25 mm.	3.85 Kg./Rmt.
4.	12 mm.	0.89 Kg./Rmt.	11.	28 mm.	4.83 Kg./Rmt.
5.	14 mm.	1.21 Kg./Rmt.	12.	32 mm.	6.3.1 Kg./Rmt.
6.	16mm.	1.58 Kg./Rmt,	13.	36 mm.	7.99 Kg./Rmt.
7.	18 mm.	2.00 Kg./Rmt.	14.	40 mm.	9.86 Kg/Rmt.

#### **M-19. High Yield Strength Steel Deformed Bars**

19.1. High yield strength steel deformed bars be either cold twisted or hot/rolled, shall conform to I.S. 1739-1966 and I.S.1139-1966 respectively.

19.2. Other provision and requirements shall conform to specification No. M-18. for Mild steel bars.

#### **M-20 High Tensile Steel Wires**

20.1. The high tensile wires for the use in prestressed concrete work shall conform to I.S. 2090-1962.

20.2. The tensile strength of the high tensile steel bars shall be as specified in the item. In absence of the given strength, the minimum strength shall be taken as per para 6.1 of I.S. 1785-1962, Testing shall be done as per I.S. requirements.

**20.3.** The high tensile steel shall be free from loose mill scale, rust oil, grease, or any other harmful matter. Cleaning of steel bars may be carried out by immersion in solvent solution, wire brushing or passing through a pressure box containing carborundum.

**20.4.** The high tensile wire shall be obtained from manufactures in coil having diameter not less than 350 times the diameter of wire itself so that wire springs back straight on being uncoiled.

#### **M-21 Mild Steel Binding Wire**

21.1. The mild steel wire-shall be of 1.63 mm. or 1.22 mm. (16 or 18 gauge) diameter and shall conform to I.S. 280- S 972.



21.2. The use of black wire will be permitted for binding reinforcement bars, it shall be free from rust, oil paint, grease, loose mill scale or any other undesirable coating which may prevent adhesion of cement mortar.

#### **M-22. Structural Steel**

22.1. All structural steel shall conform to I.S. 226-1965. The steel shall be free from the defects mentioned in I.S. 226-1975 and shall have a smooth finish. The material shall be free from loose mill scale, rust pits or other defects affecting the strength and durability. Rivet bars shall conform to I.S. 1148-1973.

22.2. When the steel is supplied by the Contractor test certificates of the manufacturers shall be obtained according to I.S. 226-1975 and other relevant Indian Standards.

#### **M-23. Galvanised Iron Sheets**

23.1 The galvanised iron sheets shall be plain or corrugated sheets of specified in item. The G.I. Sheets all conform to I.S. 277-1977. The sheets shall be undamaged in carriage and handling either by rubbing off of zinc coating or otherwise they shall have clean and bright surface and shall be free from dents, holes, rust or white powdery deposit.

23.2. The length and width Of G.I. sheet shall be as directed as per site condition.

#### **M-23-A; G.I. Valleys gutter ridges**

**23.A.1.** The G.I. ridges and hips shall be of plain galvanised sheets class-3 of the thickness as specified item. These shall be 600 mm. in width and properly bent up to shape without damage to the sheets in process of bending.

**23.A.2.** Valleys gutters and flashings shall also be galvanised sheet of thickness as specific in item, Valley's shall be 900 mm. wide overall and fishing shall be 380 mm. wide overall. They shall be bent (to the required shape without damage to the sheet in the process of bending).

#### **M-24. Asbestos Cement Sheets**

24.1. Asbestos cement sheets plain, corrugated or semi corrugated shall conform to I.S. 459-1970. The thickness of these sheets shall be as specified in the item. The sheets shall be free from all defects such as cracks, holes deformities, chipped edges or otherwise damaged.

#### **24.2. Ridged-& Hips**

**24.2.1.** Ridges and hips shall be of same thickness as that of A.C. sheets. The types of ridges suitable for the type of sheets and location's.

24.2.2. Other accessories to be used in roof such as flashing pieces, cavity filler pieces, valley gutters, north light and ventilator curves, barge boards etc. shall be standard manufacture and shall be suitable for the type of sheets and location.

#### **M-25. Mangalore Pattern Roof Tiles**

25.1. The Mangalore pattern tiles shall conform to I.S. 654-1972 for Class AA or Class 'A' type as specified in item. Samples of the tiles to be provided shall be got approved from the engineer in charge. Necessary tests shall be carried out as directed.

#### **M-26. Shuttering**

26.1. The shuttering shall be either of Wooden planking of 30 mm. minimum thickness with or without steel lining or of steel plates stiffened by steel angles. The shuttering shall be supported on battens and beams and props of vertical ballies properly cross braced together so as to make the centering rigid. In places of bulbie props, brick pillar of adequate section built in mud mortar may be used.

26.2. The form work shall be sufficiently strong and shall have camber, so that it assumes correct shape after deposition of the concrete and shall be able to resist forces caused by vibration of live load of men working over it and other incidental loads associated with it. The shuttering shall have smooth and even surface and its joints shall not permit leakage of cement grout.

26.3. If at any stage of work during or after placing concrete in the structure, the form work sags or bulges out beyond the required shape of the structure, the concrete shall be removed and work redone with fresh concrete and adequately rigid form work. The complete form work shall be got inspected by and got approved from the Engineer-in-charge, before the reinforcement bars are placed in position.

26.4. The props shall consist of ballies having 100 mm. minimum diameter measured, at mid length and 80 mm, at thin end and shall be placed as per design requirement. These shall rest squarely on wooden sole plates 40 mm; thick and minimum bearing area of 0.10 sq. m. laid on sufficiently hard base.

26.5. Double wedges shall further be provided between the sole plate and the wooden props so as to facilitate tightening and easing of shuttering without jerking the concrete.

26.6 The timber used in shuttering shall not be so dry as to absorb water from concrete and swell or bulge nor so green or wet as to shrink after erection. The timber shall be properly sawn and planed on the sides and surface coming in contact with concrete. Wooden form work with metal sheet lining or steel plates stiffened by steel angles shall be permitted.

26.7 As far as practicable, clamps shall be used to hold the forms together and use of nails and spikes avoided.

26.8 The surface of timber shuttering that would come in contact with concrete shall be well wetted and coated with soap solution before the concreting is done. Alternatively coat of raw linseed oil or oil of approved manufacturer may be applied in place of soap solution. In case of steel shuttering either soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Under no circumstances black or burnt oil shall be permitted.

26.9 The shuttering for beams and slab's shall have camber of 4 mm. per metre (1 in 250) or as directed by the Engineer-in-charge so as to offset the subsequent deflection. For cantilevers, the camber at free end shall be 1/50 of the projected length or as directed by the Engineer-in-Charge.

**M-27. Expansion joints- Premoulded filter:**

27.1 The item provides for expansion joints in R.C.C. frame structures for internal joints, as well as exposed pints, with the use of premoulded bituminous joint filler.

27.2. Premoulded bituminous joint filler, i.e. performed strip of expansion joint filler shall not get deformed or broken by twisting, bending or other handling when exposed to atmospheric condition. Pieces of joint filler that have been damaged shall be rejected.

27.3 Thickness of the pro-moulded joint filler shall be 25 mm. unless otherwise specified.

27.4 Premoulded bituminous joint filler shall conform to I.S. 1838-1961

**M-28. Expansion joints-Copper strips & hold fasts:**

28.1 The item provide for expansion joints in R.C.C. frame structure for internal joint as well as for exposed joints with the use of necessary copper strip and holdfasts.

28.2 Copper sheet shall be of 1.25 mm. thick and of 1.25 mm. width with the 'U' shape in the middle. Copper strip shall have holdfast of 3 mm. diameter copper rod fixed to the plate soldered on strip at intervals of about 30 cm. or as shown in the drawing or as directed. The width" of each flange (horizontal side) of the copper plate to be embedded in the concrete work shall be 25 mm. Depth of 'U' to be provided in the expansion joint, in the copper plate shall be of 25 mm.

**M-29. Teak wood:**

29.1 The teak wood shall be of good quality as required for the item to be executed. When the kind of wood is not specifically mentioned, good Indian teak wood as approved shall be used.

29.2 Teak wood shall generally be free from large, loose, dead or cluster knots, flaws, shakes, warps, twists bends, or any other-defects. It shall generally be uniform in substance and of straight fibres as far as possible. It shall be free from rot, decay, harmful fungi and other defects of harmful nature which will affect the strength durability of its usefulness for the purpose for which it is required. The colour shall be uniform as far as possible. Any effort like painting, using any adhesive or resins materials made to hide the defects shall render the pieces liable to rejection by the Engineer in-charge.

29.3. All scantlings; planks etc. shall be sawn in straight lines and planes in the direction of grains and of uniform thickness.

29.4. The tolerances in the dimensions shall be allowed at the rate of 1.5 mm. per face to be planed.

**29.5. First class teak wood :** 29.5.1. First class teak wood shall have no individual hard and sound knots, more than 6 sq. cm. size and the aggregate area of such knots shall not be more than 1% of area of piece. The timber shall be closed grained.

**29.6 Second Class Teak wood:** 29.6.1. No individual hard and sound knots shall be more than 15 sq. cms. in size and aggregate area of such knots shall not exceed 2% of the area of piece.

**M-29. A. Non-teak wood:**

The non teak wood shall be chemically treated, seasoned as per IS Specifications and of good quality. The type of wood shall be got approved Before collecting the same on site. Fabrication of wooden members shall be started only after approval.

For this purpose wood of Bio, Kalali, Siras, Bhada, Jamun, Sisoo will be used for door frames where as only Kalali, Siras, Halda, Kalam etc, will be permitted for shutters after proper seasoning and chemical treatment.

The non-teak wood shall be-free from large, loose, dead or cluster knots, flows shakes, warps, bends or any other defect. It shall be uniform in substance and of straight fibers as far as possible. It shall be free from rots, decay harmful fungi and other

defects of nature which effect the strength, durability or it usefulness for the purpose for which it is required. The colour of wood shall be uniform as far as possible. The scantlings planks etc. shall be sawn in straight lines and planes in the direction of grain and uniform thickness.

The department will use the Agency to produce certificate from Forest Department in event of Dispute and the decision of the Department shall be final and binding to me contractor.

The tolerance in the dimension shall be allowed as 1.5 mm. per face to be planed.

#### **M-30. Wooden flush door shutters (solid core):**

30.1. The solid core type flush door shutters shall be decorative or non-decorative type as specified in the drawing. The-size and thickness of the shutter shall be as specified in drawings or as directed. The limber, species for core shall be used as per I.S. 2202 - (Part-I) 1980. The timber shall be free from decay and insect attack. Knots and knot holes less than half the width of cross-section of the members in which they occur may be permitted. Pitch pockets, pitch streaks and harmless pin holes shall be permissible except in the exposed edges of the core members. The commercial plywood, cross-bands shall conform to I.S. 303-1275.

30.2. The face panel of the shutters shall be formed by gluing by the hot press process on both face of the core with either ply wood or cross-bands and face veneers. The hopping rebating opening of glazing Venetian etc. shall be provided if specified in the drawing.

30.3. All edges of the door shutters shall be square. The shutters shall be free from twist or warp in its plane. Both faces of the shutters shall be sand papered to smooth even texture.

30.4. The shutters shall be tested for

(1) End immersion test.: The test shall be carried out as per I.S. 2202 (part-I) 1980. There shall be no delamination at the end of the test.

(2) Knife Test: The face panel when tested in accordance with I.S. 1659-1979 shall pass the test.

(3) Glue adhesion test :The flush door shall be tested for glue adhesive test in .accordance with KS..2202 (Pan 4) 1930, The shutters shall be considered to have passed the test if no delamination occurs in the-glue lines in the plywood and if no single delamination more than 80 mm. in length and more than 3 mm. in depth has occnrred in the assembly glue lines between the . plywood face and the style and rail. Delamination at the comer shall be measured continuously around the comer. Delamination at the knots, knot holes and other permissible wood defects shall not be considered in assessing the sample.

30.5. The tolerance in size of solid core type flush door shall be as under.

In Normal thickness  $\pm 1.2$  mm. In Normal height  $\pm 3$  mm.

30.6. The thick of the shutters .shall be uniform throughout with a permissible variation of not more than 0.8 mm. when measured at any two points.

#### **M-31. Aluminium doors, windows, ventilators**

31.1 Aluminium alloy used in the manufacture of extruded window sections shall conform to I.S. designation HEA-WP of I.S.: 733-3975 and also to I.S. Designation WVG-WP of I.S. 1285-1975. The Section shall be as specified in the drawing and design. The fabrication shall be done as directed.

31.2. The hinges shall be cast or extruded aluminium hinge of same type as in window but of large size.

313. The hinges shall normally be of 50 mm. projecting type. Non-projecting type of hinges may also be used if directed.

The handles of door shall be of specified design. A suitable lock for the door operatable either from outside or inside shall be provided. In double shutter door, the first closing shutter shall have concealed aluminium alloy bolt at top and bottom.

#### **M-32. Rolling Shutters:**

32.1. The rolling shutters shall conform to 1 .S. 6248-1979. Rolling shutters shall be supplied of specified type with accessories. The size of the rolling shutters shall be specified in the drawings. The shutters shall be constructed with interlocking lath sections formed from cold rolled steel strips not less than 0.9 mm. thick and 80 mm: wide for shutters upto 3.5mm., width not less than L25 mm. thick and 80 mm; wide for shutters 3.5 mm in width and at above unless otherwise specified.

32.2. Guide channels shall be of mild steel deep channel section and of rolled pressed or built up (fabricated) joint construction. The thickness of sheet used shall not be less than 3.15mm.

32.3. Hood covers shall be made of M.S. Sheets not less than 0 92 mm. thickness. For shutters having width 3.5 Meter and

above, the thickness of M.S. Sheet for the hood cover shall be not less than 1.25 mm.

32.4. The spring shall be of best quality and shall be manufactured from tested high tensile spring steel wire or strip of adequate strength to balance the shutters in all position. The spring pipe shaft etc. shall be supported on strong M.S. or malleable C.I. brackets. The brackets shall be fixed on or under the lintel as specified with raw plugs and screws bolts etc.

32.5. The roiling shutters shall be of self rolling type up to 8 Sq. in. clear area without ball bearing and up to 12 sq. m. clear area with ball bearing. If the rolling shutters are larger, then gear operated type shutters shall be used.

32.6. The locking arrangement shall be provided at the bottom of shutter at both ends. The shutters shall be opened from outside.

32.7. The shutters shall be completed with door suspension shafts, locking arrangements, pulling hooks, handles and other accessories.

### **M-33. Collapsible. Steel-Gate:**

33.1. The collapsible steel gate shall be in one or two leaves and size as per approved drawings or as specified. The gate shall be fabricated from best quality mild steel channels, flats etc. Either steel pulleys or ball bearings shall be provided in every double channel. Unless otherwise specified the particulars of collapsible gate shall be as under :

(a) Pickets: These shall be of 20 mm. M.S., channels of heavy sections unless otherwise shown on drawings. The distance centre to centre of pickets shall be 12 cms. with an opening of 10 cms.

(b). Pivoted M.S. flats shall be 20 mm x 6 mm.

(c) Top and bottom guides shall be from tee or flat iron of approved size.

(d) The fittings like stoppers, fixing hold fasts, locking cleats, brass handles and cast iron rollers shall be of approved design and size.

### **M-34. Welded Steel Wire Fabric :**

**34.1.** Welded steel wire fabric for general purpose shall be manufactured from cold drawn steel wire “as drawn” or galvanised steel conforming to I.S. 226-1975 with longitudinal and transverse wire securely connected at every intersection by a process of electrical resistance welding and conforming to I.S. 4948-1974. It shall be fabricated and finished in workmanlike manner and shall be free from injurious defects and shall be rustproof. The type of mesh shall be oblong or square as directed. The mesh sizes and size of wire for square as well as oblong welded steel wire fabric shall be as directed. The steel wire fabric in panels shall be in one whole piece in each panel as far as stock size permit.

### **M-35. Expanded Metal Sheets :**

35.1. The expanded metal sheets shall be free from flaws, joints, broken strands, laminations and other harmful surface. Expanded metal steel sheet shall conform to I.S. 412-1975, except that blank sheets need not be with guaranteed mechanical properties. The size of the diamond mesh of expanded metal and dimensions of strands (width and thickness) shall be as specified. The tolerance in nominal weight of expanded metal sheets shall be of + 10 percent.

35.2 Expanded metal in pannels shall be in one whole piece panel each as far as stock size permit. The expanded metal sheets shall be coated with suitable protective coating to prevent corrosion.

### **M-36. Mild Steel Wire (Wire Gauze Jali) :**

36.1 Mild steel wire, may be galvanised, as indicated. All finished steel wire shall be well cleanly drawn to the dimensions and-size of wire as specified in item. The wire shall be sound, free from splits, surface flaws, rough jagged and imperfect edges and other harmful surface defects and shall conform to I.S. 280-1978.

### **M-37. Plywood :**

37.1. The plywood for general purpose shall conform I.S. 303- 1975.

Plywood is made by cementing together thin boards or sheets of wood into panels. There are always an odd number of layers 3, 5, 7, 9 ply etc. The plies are placed so that grain of each layer is right angle to the grain in the adjacent layer.

37.2. The chief advantages of plywood over a solid board of the same thickness is the more uniform strength of the plywood, along the length and width of the plywood and greater resistance to cracking and splitting with change in moisture content,

37.3. Usually synthetic resins are used for gluing, phenolic resins are usually cured in a hot press which compresses and simultaneously heats the plies between hot plates which maintain a temperature of 90 degree. C. to 140 degree C. and a pressure of 11 to 14 Kg/Sq. Cm. on the wood. The times of heating may be anything from 2 to 60 minutes depending upon thickness.

37.4. When water glue are used, the wood absorbs so much water that the finished plywood must be dried carefully. When synthetic resins are use as adhesive finished plywood must be exposed to an atmosphere of controlled humidity until the proper amount of moisture, has been absorbed.

37.5. According to I.S. 303-1975 the plywood for general purpose shall be of three grades namely BWR, WWR and CWR, depending upon the adhesives used for bonding and veneers, and it will be farther classified into six types namely AA. AB. AC, BB, BC and C,C based on the quality of the two faces, each face being of three finds namely, A, B. and C. After pressing, the finished ply wood should be reconditioned to a moisture content not less than 8 percent and not more than 16 percent.

37.6. Thickness of ply wood Boards :

**TABLE**

Board	Thickness	Board,	Thickness	Board	Thickness	Board	Thickness
3 ply	3mm	5 ply	5mm	7 ply.	9mm	9 ply.	16mm.
	4 mm.		6mm.		13mm.		19 mm.
	5 mm:		8mm.		16mm.	11 Ply.	19 mm.
	6 mm.		9mm.	9 Ply.	13mm.		22mm.
							25 mm.

### **M.38. Glass:**

38.1 All glass shall be of the best quality, free from specks, bubbles, smokes, veins, air holes blisters and other defects. The kind of glass to be used shall be mentioned in the item or specification or in the special provisions or as shown in detailed drawings. Thickness of glass panes shall be uniform. The specifications of different kinds of glass shall be as under:

#### **38.2.Sheet Glass:**

38.2.1. In absence of any specified thickness or weight in the item or detailed specifications of the item of work, sheet glass shall be weighing 73 Kg/Sq.m. for panes upto 600 mm x 600 mm.

38.2.2. For panes larger than 600 mm. x 600 mm. and upto 800 mm. x 800 mm. the glass weighing not less than 8.75 Kg/Sq. m. shall be used. For bigger panes upto 900 mm. x 900 mm. glass weighing not less than 11.25 Kg/Sq. m. shall be used.

38.2.3. Sheet glass shall be paten, flattened glass of best quality and for glazing and framing purposes shall conform to I.S.: 1761 -1960. Sheet glass of the specified colours shall be used, if so shown on detailed drawings or so specified. For important buildings and for panes with any dimension over 900 mm. plate glass of specified thickness shall be used.

38.3. Plate Glass. 38.3.1. When plat, glass is specified, it shall be 'Polished patent plate glass' of best quality. It shall have both the surface ground flat and parallel and polished to obtain clear undistrubed vision and reflection. The plate glass shall be of the thickness mentioned in the item or as shown in the detailed drawing or as specified. In absence of any specified thickness the thickness of plate glass to be supplied shall be 6mm and a tolerance of 0.20 mm. shall be admissible.

38.4. Obscured Glass : 38.4.1. This type of glass transmits light so that vision is partially or almost completely obscured. Glass shall be plain rolled, figured, ribbed or fluted or frosted glass as may be specified as required. The thickness and type of glass shall be as per details on drawings or at specified or as directed.

38.5. Wired Glass: 38.5.1. Glass shall be with wire netting embedded in a sheet of plate glass electrically welded 13 mm. Georgian square mesh may be used. Thickness of glass shah riot be less than 6 mm. Wired glass shall be of type and thickness as specified.

### **M-39. Acrylic Sheets:**

39.1. Acrylic sheet shall be of thickness as specified in the item and of an specified shape and size as the case may be. Panels may be flat or curved. It should be light in weight. It shall be colourless or coloured or opaque as specified in the item. Colourless sheet shall be as transparent as the finest optical glass, its light transmission rate shall be about 95%. Transparency shall not bef affected for the sheets of larger thickness. It shall be extremely .resistant to sunlight, weather and low temperatures. It shall not show any significant yellowing or change in physical properties or loss of light transmission over a longer period of use. The sheet Shall be impact resistant also. Sheets should be available in complete range of standard transparent, translucent and opaque colours. Sheets shall be of such quality that they can be cut bent and jointed as desired. Solution for the joints shall be used as per the requirement of manufacturer.

**M-40. Particle board : 40.1.** The particle boards used for face panels shall be of best quality free from any defects. The particle boards shall be made with phenolaldehyde adhesive. The particle boards shall conform to I.S. : 3087-1965. "Specification for wood particle board for general purpose". The size and the thickness shall be as indicated.

**M-41. Expanded polystyrene of framed styroper slabs :41.1.** The expanded polystyrene ceiling boards and files shall be of approved make and shall be of size, thickness, finish and colour as indicated. It shall be of high density and suitable for use as insulating material. The insulating material shall be like slab of Thermocole etc.

**M-42. Resin bonded fibre glass : 42.1** The resin bonded fibre glass tiles, or rolls shall be of approved make and shall be of sizes, thickness and finish as indicated.

42.2. For test of Minerral wool thermal insulation Blanket I.S.: 3144/1965 shall be followed.

42.3. Insulation wool blanket shall be with following coverings on one or both sides as indicated.

(1) Bituminised hessian Kraft paper suitable for use in position where moisture has to be excluded.

(2) Hessian cloth or Kraft paper for keeping out dust.

(3) G.I. wire netting, suitable for surfaces to be plastered over.

#### **M-43. Fixtures and fastenings :**

##### **43.1. General:**

43.1.1. The fixtures and fastenings, that is, butt, hinges, tee and strap hinges, sliding door bolts, tower bolts, door latch, bath room latch, handles, door stoppers, casement window fasteners, casement stays and ventilators catch shall be made of the metal as specified in the item or its specifications.

43.1.2. They shall be of iron, brags, aluminium, chromium plated iron, chromium plated brass, copper oxidised iron, copper oxidised brass or anodised aluminium as specified.

43.1.3. The fixtures shall be heavy, medium or light type. The fixtures and fastenings shall be smooth finished and shall be such as will ensure ease of operation.

43.1.4. The samples of fixtures and fastenings shall be got approved as regards quality and shape before providing them in position.

43.1.5. Brass and anodised aluminium fixtures and fastenings shall be bright finished.

**43.2. Holdfasts: 43.2.1.** Holdfasts shall be made from mild steel flat 30 cm. length and one of the holdfasts shall be bent at right angle and two nos. of 6 mm. diameter holes shall be made in it for fixing it to the Farme with screws. At the other end, the holdfast shall be forked and bent at right angles in opposite directions.

##### **43.2. Butt hinges:**

43.3.1. Railway standard heavy type butt hinges shall be used when so specified. 43.3.2. Tee and strap hinges shall be manufactured from M.S. Sheet.

43.4. Siding door bolts (Aldrops): 43.4.1. The aldrops as specified in the item shall be used and shall be got approved.

43.5. Tower bolts (Barrel Type): 43.5.1. Tower bolts as specified in the item shall be used and shall be got approved.

43.6. Door latch : 43.6.1. The size of door latch shall be taken as the length of latch.

43.7. Bathroom Latch : 43.7.1. Bathroom latch shall be similar to tower bolt.

43.8. Handle: The size of the handles shall be determined by the inside grip length of the handles. Handles shall have a base plate of length 50 mm. more than the size of the handle.

43.9. Door Stoppers: 43.9.1. Door stoppers shall be either floor door stopper type or door catch type. Floor stopper shall be of overall size as specified and shall have a rubber cushion.

43.10. Door Catch : 43.10.1. Door catch shall be fixed at a height of about 900 mm. from the floor level so that one part of the catch is fitted on the inside of the shutter and the other part is fixed in the wall with necessary wooden plug arrangements for appropriate fixity. The catch shall be fixed 20 mm. inside the face of the door for easy operation of catch.

43.11. Wooden Door Stop with hinges : 43.11.1. Wooden door stop of size 100 mm x 60 mm x 40 mm shall be fixed on the door frame with a hinge of 75 mm size and at a height of 900 mm. from the floor level. The wooden door stop shall be provided with 3 coats of approved oil paint.

43.12. Casement window Fastener: Casement window fastener for single leaf window shutter shall be left or right handled

as directed.

43.13. Casement stays (Straight Peg Stay) :43.13.1. The stays shall be made from a channel section having three holes at appropriate position so that the window can be opened either fully or partially as directed. Size of the stay shall be 250 mm. to 300 mm. as directed.

43.14. Ventilator Catch: 43.14.1. The pattern and shape of the catch shall be as approved.

43.15. Pivot: 43.15.1. The base and socket plate shall be made from minimum 3 mm. thick plate and projected pivot shall not be less than 12 mm. diameter and 12 mm. length and shall be firmly riveted to the base plate in case of iron pivot and in single piece base plate in the case of brass pivot.

#### **M-44.**

##### **Paints: 44.1 (A) Oil paints :**

44.1.1. Oil paints shall be of the specified colour and shade, and as approved. The ready mixed paints shall only be used. However, if ready mixed paint or specific shade or tint is not available, white ready mixed paint with approved stainer will be allowed. In such a case, the contractor shall ensure that the shade of the paint so allowed shall be uniform.

44.1.2. All the paints shall meet with following general requirements :

- (i) Paint shall not show excessive setting in a freshly opened full can and shall easily be redispersed with a paddle to a smooth homogeneous state. The paint shall show no curdling, livering, caking or colour separation and shall be free from lumps and skins.
- (ii) The paint as received shall brush easily, possess good leveling properties and show no running or sagging tendencies.
- (iii) The paint shall not skin within 48 hours in a three quarters filled closed container.
- (iv) The paint shall dry to a smooth uniform finish free from roughness, grit, unevenness and other imperfections.

44.1.3. Ready mixed paint shall be used exactly as received from the manufacturers and generally according to their instructions and without any admixtures whatsoever.

##### **44.2. (B) Enamel Paints:**

44.2.1. The enamel paint shall satisfy in general requirements as mentioned in specification of oil paints. Enamel paint shall conform to I.S. 2933-1975.

#### **M-45 French polish :**

45.1. The french polish of required tint and shape shall be prepared with the below mentioned ingredients and other necessary materials:

- (i) Denatured spirit of approved quality (ii) Chandras (iii) Shellac (iv) Pigment.

45.2. The french polish so prepared shall conform to I.S.: 348-1968.

#### **M-46 Marble chips for marble mosaic terrazzo:**

46.1. The marble chips shall be of approved quality and shades. It shall be hard, sound, dense and homogeneous in texture with crystalline and coarse grains. It shall be uniform in colour and free from stains, cracks decay and weathering.

46.2. The size of various colours of marble chips ranging from the smallest upto 20 mm. shall be used where the thickness of top wearing layer is 6 mm. size. The marble chips of approved quality and colours only as per grading as decided by the Engineer-in- charge shall be used for marble mosaic tiles or works.

46.3 The marble chips shall be machine crushed. They shall be free from foreign matter, dust etc. Except as above, the chips shall conform to I. S.: 2114-1962.

#### **M-47. Flooring Tiles: 47.1. (A) Plain Cement tiles :**

47.1.1. The plain cement tiles shall be general purpose type. These are the tiles in the manufacturer of which no pigments are used. Cement used in the manufacture of tiles shall be as per Indian Standards.

47.1.2. The tiles shall be manufactured from a mixture of cement and natural aggregates by pressure process. During

manufacture, the tiles shall be subjected to a pressure of not less than 140 Kg/Sq. Cm. The proportion of cement to aggregate in the backing of the tiles shall be not less than 1:3 by weight. The wearing face through the tiles are of plain cement, shall be provided with stone chips of 1 to 2 mm. size. The proportions of cement to the marble chips aggregate in the wearing layer of the tiles shall be three parts of cement to one part chips by weight. The minimum thickness of wearing layer shall be 3 mm. The colour and texture of wearing layer shall be uniform throughout its face and thickness. On removal from mould, the tiles shall be kept in moist conditions continuously at least for seven days and subsequently, if necessary, for such long period as would ensure their conformity to requirements of I.S.: 1237-1980 regarding strength resistance to wear and water absorption.

47.1.3. The wearing face of the tiles shall be plain, free from projections, depressions and cracks and shall be reasonably parallel to the back face of the tile. All angles shall be right and all edges shall be sharp and true.

47.1.4. The size of tiles shall generally be square shape 24.85 Cm. x 24.85 Cm. or 25 Cm. x 25 Cm. The thickness of tiles shall be 20 mm.

47.1.5. Tolerance of length and breadth shall be plus or minus one millimeter. Tolerance on thickness shall be plus 5 mm.

47.1.6. The tiles shall satisfy the tests as regards transverse strength resistance to wear and water absorption as per I.S. : 1237-1980.

#### **47.2. (B) Plain Coloured Tiles :**

47.2.1. These tiles shall have the same specification as per plain cement tiles as per (A) above except that they shall have a plain wearing surface wherein pigments are used. They shall conform to I.S. 1237-1980.

47.2.2. The pigment used for colouring cement shall not exceed 10 percent by weight of cement used in the mix. The pigments synthetic or otherwise, used for colouring tiles shall have permanent colour and shall not contain materials detrimental to concrete.

47.2.3. The colour of the tiles shall be specified in the item or as directed.

#### **47.3. (C) Marble mosaic tiles :**

47.3.1. These tiles have, the same specifications as per plain cement tiles except the requirements as stated below:

47.3.2. The marble mosaic tiles shall conform to I. S. 1237-1980. The wearing face of the tiles shall be mechanically ground and filled. The wearing face of tiles shall be free from projections, depressions and cracks and shall be reasonably parallel to the back face of the tiles. All angles shall be right angles and all edges shall be sharp and true.

47.3.3. Chips used in the tiles be from smallest upto 20 mm. size. The minimum thickness of wearing layer of tiles shall be 6 mm. For pattern of chips to be used on the wearing face, a few samples with or without their full size photographs as directed shall be presented to the Engineer-in-charge for approval.

47.3.4. Any particular samples, if found suitable shall be approved by the Engineer-in-charge, or he may ask for a few more samples to be prepared indicating roughly the particular sized chips to be more-or less in the samples presented. The samples have to be made by the contractor till a suitable sample is finally approved for use in the work.

The Contractor shall ensure that the tiles supplied for the work shall be in conformity with the approved sample only, in terms of its dimensions, thickness of backing layer and wearing surface, materials, ingredients, colour shade, Chips, distribution etc. required.

47.3.5. The tiles shall be prepared from cement conforming to Indian Standards or coloured portland cement generally depending upon the colour of tiles to be used or as directed.

#### **47.4. (D) Chequered Tiles :**

47.4.1. Chequered tiles shall be plain cement tiles or marble mosaic tiles. The former shall have the same specification as per (A) above and the latter as per marble mosaic tiles as per (C) except as mentioned below :

47.4.2. The tiles shall be of nominal size of 250 mm. x 250 mm. or as specified. The centre to centre distance of chequer shall not be less than 25 mm. and not more than 50 mm. The overall thickness of the tile shall be 22 mm.

47.4.3. The grooves in the chequers shall be uniform and straight. The depth of the grooves shall not be less than 3 mm. The chequered shall be plain, coloured or mosaic as specified. The thickness of the upper layer measured from the top of the chequers shall not be less than 6 mm. The tiles shall be given the first grinding with machine before delivery to site.

47.4.4. Tiles shall conform to relevant I.S. 1237-1930.



**47.5 (E) Chequered Tiles for Stair cases :**

47.5.1. The requirements of these tiles shall be the same as chequered as per (D) above except in following respects;

- (1) The length of a tile including nose shall be 330 mm.
- (2) The minimum thickness shall be 28 mm.
- (3) The nosing shall have also the same wearing layer as at the top.
- (4) The nosing edge shall be rounded.
- (5) The front portion of the tile for a minimum length of 75 mm. from and including the nosing shall have grooves running parallel to nosing and at centre not exceeding 25 mm. Beyond that the tiles shall have normal chequer pattern.

**M-48. Rough Kotah Stone :**

48.1. The kotah stones shall be hard, even, sound, and regular in shape and generally uniform in colour. The colour of the stone shall generally be green. Brown colour stones shall not be allowed for use. They shall be without any softveins, cracks or flows.

48.2 The size of the stones to be used for flooring shall be of size 600 mm x 600 mm and/or size 600 mm x 450 mm, as directed. However smaller sizes will be allowed to be used to the extent of maintaining required pattern. Thickness shall be as specified.

48.3. Tolerance of minus 30 mm. on account of chisel dressing of edges shall be permitted for length as well as breadth. Tolerance in thickness shall be  $\pm 3$  mm.

48.4. The edges of stones shall be truly chiselled and table rubbed with coarse sand before paving. All angles and edges of the stone shall be true, square and free from chipping and me surface shall be true and plain.

48.5 When machine cut edges are specified, the exposed edges and the edges at joints shall be machine cut. The thickness of the exposed machine cut edges shall be uniform.

**M-49. Polished Kotah Stones.**

49.1. Polished kotah stone shall have the same specifications as per rough kotah stone except as mentioned below :

49.2. The stones shall have machine polished smooth surface. When brought on site, the stones shall be single polished or double polished depending upon its use. The stones for paving shall generally be single polished. The stones to be used for dedo, .skirting, platforms, sink, veneering, sills, steps, etc. where machine polishing after the stones are fixed in situ is not possible, shall be double polished.

**M-50. Dholpur Stone Slab :**

50.1 Dholpur stone slab shall be of best quality as approved by the Engineer-in-charge The stone slab shall be even, sound and durable, regular in shape and of uniform colour.

50.2. The size of the stone shall be specified in the item or detailed drawings or as approved by the Engineer-in-charge. The thickness of the stone shall be as specified in the item of work with the permissible tolerance of plus or minus 2 mm. The provisions in respect of polishing as for polished Kotah stone shall apply to polished Dholpur stone also. All angles and edges of the face of the stone slab shall be fine chiselled or polished as specified in the item of work and all the four edges shall be machine cut.

All angle and elges of the stone slab shall be true and plane.

50.3 The sample of stone shall be got approved from the Engineer-in-charge for shade and tint for a particular work. It shall be ensured that the stones to bemused in a particular work shall not differ much in shade or tint from the approved sample.

**M-51. Marble Slab:**

51.1. Marble slab shall be white or of other colour and of best quality as approved by the Engineer-in-charge.

51.2. Slabs shall be hard, uniform and homogeneous in texture. They shall have even crystalline grain and free from defects and cracks. The surface shall be machine polished to an even and perfectly plant surface and edges machine cut true and square. The rear face shall be rough to provide key for the mortar.

51.3. Marble slabs with natural veins, if selected shall have to be laid as per the pattern given by the Engineer-in-charge. Size of the slab shall be minimum 450 mm x 450 mm. and preferable- 600 mm x 600 mm. However, smaller sizes will be allowed to be used to the extent of maintaining required palter.

51.4. The slab shall not be thinner than the specified thickness at its thinnest part. A few specimen of finished slab to be used shall be deposited by the Contractor in the office for reference.

51.5. Except as above, the marble slabs shall conform to I.S. 1130-1969.

#### **M-52. Granite Stone Slab :**

52.1. Granite shall be of approved colour and quality. The stone shall be hard, even, sound regular in shape and generally uniform in colour. It shall be without any soft veins, cracks or flows.

52.2. The thickness of the stone shall be as specified in the items.

52.3. All exposed face shall be double polished to tender truly smooth and the even reflecting surface. The exposed edges and corners shall be rounded off as directed. The exposed edges shall be machine cut and shall have uniform thickness.

#### **M-53 P.V.C Flooring:**

53.1. P. V.C sheets for P.V.C. floor covering shall be of homogeneous flexible type, conforming to I.S. 3452-1966. The P.V.C. covering shall neither develop any toxic effect while put to use nor shall give off any disagreeable odour.

53.2 Thickness of flexible type covering tiles shall be as specified in the description of the item.

53.3. The flexible type shall be backed with hessain or other woven fabric. The following tolerances shall be applicable on the nominal dimension of the sheet rolls or tiles :

(a) Thickness 0.15 mm

(b) Length or Width :

1. 300 mm. square tiles	± 0.20 mm.	39.00 mm. square tiles	± 0.30 mm.
2. 600mm. “ “	± 0.40mm.	4. Sheets and rolls	± 0.10 percent

#### **53.4. Adhesive:**

53.4.1. The adhesive for PVC flooring shall be of the type and make recommended by the manufacturers of PVC sheets/tiles.

#### **M-54. Facing tiles :**

54.1. The facing tiles (burnt clay facing bricks) shall be free from cracks, flaws and nodules of free lime. They shall be thoroughly burnt and shall have plane rectangular faces with parallel sides and sharp straight right edged faces. The texture of the finished surface that will be exposed when in place, shall conform to an approved sample consisting not less than four stretcher bricks each representing the texture desired. The facing tiles shall have a pleasing appearance, sufficient resistance to penetration by rain and greater durability than common bricks. The tiles shall conform to I.S. 2691-1972.

54.2. The standard size effacing brick tiles shall be 19 x 9 x 4 cms. The facing brick tiles shall be provided with frog which shall conform to I.S. 1077-1976.

54.0. The permissible tolerance in dimensions specified above shall be as follows :

#### **Size Tolerance for**

	<b>1st class Brick</b>	<b>2nd class Brick</b>
19 Cm.	± 6mm.	± 10 mm.
9cm.	± 3mm.	± 7mm.
4cm.	± 1.5 mm	± 3 mm.

54.4. The tolerance for distortion or warpage of face or edges of individual brick from a plane surface and from a straight line respectively shall be as follows:

Facing dimensions Permissible tolerance

Max. below 19 cms. Max. 2.5mm.

-do- above 19 cm. Max. 3.0 mm.

54.5. The average compressive strength obtained as a sample of five dies when tested in accordance with the procedure laid as per I.S. 1077-1976 shall be not less than 175 Kg/Sq. Cm. The average compressive strength of any individual bricks shall be not less than 160 Kg/Sq.Cm.

54.5. The average water absorption for five bricks files shall not exceed 12 percent of average weight of brick before testing.

The absorption for each individual bricks shall not exceed 25 percent.

54.7. The brick tiles when tested in accordance with I.S. 1077-1976, the rate of efflorescence shall not be more than 'Slightly effloresced.'

**M-55. White glazed tiles :**

55.1. The tiles shall be of best quality as approved by the Engineer-in-charge. They shall be flat and true to shape. They shall be free from cracks, crazing, spots, chipped edges and corners. The glazing shall be of uniform shade.

55.2. The tiles shall be nominal size of 150 mm. x 150 mm. unless otherwise specified. The maximum variation from the stated sizes, other than the thickness of tile, shall be plus or minus 1.5 mm. The thickness of tile shall be 6 mm. Except as above the tiles shall conform to I.S. 777 1970.

**M-56. Galvanised iron pipes and fittings :** 56.1. Galvanised iron pipe shall be of the medium type and of required diameter and shall comply with I.S.I 239-1979. The specified diameter of the pipes shall refer to the inside diameter of the bore. Clamps, screw and all galvanised iron fittings shall be of the standard 'R' or equivalent make.

**M-57. Bib cock and stop cock :**

57.1. A bib cock is a draw off tap with a horizontal inlet and free outlet. A stop cock is a valve with a suitable means of connection for insertion in a pipe line for controlling or stopping the flow.

57.2. They shall be of screw down type and of brass chromium plated and of diameter as specified in the description of the item. They shall conform to I.S. 781-1977 and they shall be of best Indian make. They shall be polished bright.

57.3. The minimum finished weight of bib cock and stop cock shall be as given below :

Diameter	Bib cock	Stop cock	Diameter	Bib cock	Stop cock
8 mm	0.25 Kg.	0.25 Kg.	15 mm.	0.40 Kg.	0.40 Kg.
10 mm.	0.30 Kg.	0.35 Kg.	20 mm.	0.75 Kg.	0.75 Kg.

**M-58. Gun metal wheel valve :** 58.1. The gun metal wheel valve be of approved quality. These shall be gun metal fitted with wheel and shall be of gate valve opening full way and of the size as specified. These shall conform to I.S. 778-1971. **M-59.**

**White glazed porcelain wash basin :**

59.1. Wash basin shall be of white porcelain first quality best Indian make and it shall conform to I.S. 2556 (Part-IV) 1972 and I.S. 771-1979.

The size of the wash basin shall be as specified in the item, Wash basin shall be of one piece construction with continued over-flow arrangements. All internal angles shall be designed so as to facilitate cleaning. Wash basin shall have single tap hole or two holes as specified. Each basin shall have a circular waste hole which is either rabbled or bevelled internally with 65 mm. diameter at top and 10 mm. depth to suit the waste fitting. The necessary stud slot to receive the bracket on the under side of the basin shall be provided. Basin shall have an internal soap holder recess which shall fully drain into the bowl.

59.2 White glazed pedestal of the quality and colour as that of the basin shall be provided where specified in the item. It shall be completely recessed at the back for reception of supply and wash pipe. It shall be capable of supporting the basin rigidly and adequately and shall be so designed as to make the height from floor to top of the rim of basin 750 mm. to 800 mm. as directed.

**M-60. European type water closet/with low level flushing :**

60.1. The European type water closet shall be white glazed porcelain first quality and shall be of wash down type conforming to I.S. 2556-1973 and I.S. 771-1979.

60.2. 'S' trap shall be provided as required with water seal not less than 50 mm. The solid plastic seat and cover shall be of the best Indian make conforming to I.S. 2548-1980. They shall be made of moulded syntactic materials which shall be tough and hard with high resistance to solvents and shall be free from blisters and other surface defects and shall have chromium plated brass hinges and rubber buffer of suitable size.

**M-61. Orissa type water closet:** 61.1. The specification of Orissa type white glazed water closet of first quality shall conform to I.S. 2556 (Part-III) 1981 and relevant specification of Indian type water closet except that pan will be with the integral squatting pan of size 580 mm. x 440 mm. with raised footrest.

**M-62. Indian type water closet:**

62.1. The Indian type white glazed water closet of first quality shall be of size as specified in the item and conforming to I.S.

771-1979 and I.S. 2556 (Part-II) 1981. Each pan shall have integral flushing ring of suitable type with adequate number of holes around as directed to have satisfactory flushing. It shall also have an inlet at back or front for connecting flush pipe as directed. The inside of the bottom of the pan shall have sufficient slope from the front towards the outlet and surface shall be uniform and smooth.

Pan shall be provided with 100 mm. diameter 'P' or 'S' trap with approximately 50 mm. water seal and 50 mm. diameter vent horn.

M-62.A Foot Rests : 62-A-1. A pair of white glazed-earthen ware rectangular foot rests of minimum size 250 mm. x 130 mm. 20 mm. shall be provided with water closet.

#### **M-63. Glazed Earthen Ware Sink :**

63.1. The glazed earthen-ware sink shall be specified size, colour and quality. The sink shall conform to I.S. 771 Part-II-1979. The brackets for sinks shall conform to I.S. 775-1970.

63.2. The pipes shall conform to I.S. 1239-Part-11973 and I.S. 404-1962 for steel and lead pipes respectively 32 mm. brass waste coupling of standard pattern with brass chain and rubber plug shall be provided with sink.

**M-64. Glazed earthen ware Lipped type flat back urinal/corner type urinal:** 64.1 The lipped type urinal shall be flat back or corner type as specified in the item and shall conform to I.S. 771-1979. It shall be of best Indian make and size as specified and approved by the Engineer-in-charge. The flat back or corner type urinal must be of 1st quality free from any defects, cracks, etc.

**M-65. Low level enamel flushing tank :** 65.1. The low level enamel flushing tank shall be of 15 litres capacity. It shall conform to I.S. 774-1971. The flushing cistern shall be of best quality and free from any defects. The flushing tank shall have outlet 32 mm. diameter. The outlet shall be connected with W.C. Pan by lead pipe or P.V.C. pipe as specified. The flushing tank shall be provided with inlet and outlet for fixing G.I. inlet pipes and over-flow pipes. The flushing cistern shall be provided with chromium plated handle for flushing. The flushing tank shall be provided with bracket of cast iron so that it can be fixed on wall at specified height. The brackets shall conform to I.S. 775-1970.

**M-66. Cast iron flushing cistern:** 66.1. The cast iron flushing cistern shall be of 15 litres capacity. It shall conform to I.S. 774-1971. The flushing cistern shall be of best quality free from any defects. The flushing cistern shall have outlet of 32 mm. diameter. The outlet shall be connected to lead pipe of 32 mm. diameter. The lead pipe shall conform to I.S. 404 (Part-I) 1962. For fixing G.I. inlet pipes and overflow pipe 20 mm. dia. inlet and outlet shall be provided. The flushing cistern shall be provided with galvanised iron chain and pull of sufficient length and shall be got approved from the Engineer-in-charge. The cast iron flushing cistern shall be painted with one coat of anticorrosive paint and two coats of paints. The flushing cistern shall be fixed on two C.I. brackets. The C.I. brackets shall conform to I.S. 775-1970.

**M-67. Flush cock:** 67.1. Half turn flush cock (Heavy weight) shall be of gun metal chromium plated of diameter as specified in the description of the item. The flush cock shall conform to relevant Indian Standard.

#### **M-68. Cast iron pipes and fittings :**

68.1 All soil, waste, vent and antisiphonage pipes and fittings shall conform to I.S. 1729-1964. The pipe shall have spigot and socket ends with head on spigot end. The pipes and fittings shall be true to shape, smooth, cylindrical, their inner and outlet surfaces being as nearly as practicable concentric. They shall be sound and nicely cast and shall be free from cracks, laps, pinholes or other imperfection and shall be neatly dressed and carefully fettled. 68.2. The end of pipes and fittings shall be reasonable square to their axis.

68.3. The sand cast iron pipes shall be of the diameter as specified in the description and shall be in lengths of 1.5 M. 1.8 M. and 2 M. including socket ends of the pipe unless shorter lengths are either specified or required at junctions etc. The pipes and fittings shall be supplied without ears unless specified or directed otherwise.

Tolerances:

68.4.1. The Standard weights and thickness of pipes shall be as shown in the following table : A tolerance upto minus 10 per cent may however be allowed against these standard weights.

Sr. No.	Nominal dia. of bore	Thickness	Overall Weight of Pipe excluding ears 2 m. long		
			1.5 m. long	1.8m. long.	2m. long
1.	75 mm.	5.0 mm.	12.83 Kg.	16.52 Kg.	18.37 Kg.

2. 100 mm 5.0mm 18.14 Kg. 21.67 Kg. 24.15 Kg.

68.4.2. A tolerance upto minus 15 percent in thickness and 20 mm. in length will be allowed. For fittings tolerance in lengths shall be plus 15 mm. and minus 10 mm.

68.4.3. The thickness of fittings and their socket and spigot dimensions shall conform to the thickness and dimensions specified for the corresponding sizes of straight pipes. The tolerances in weights and thickness shall be the same as for straight pipes.

#### **M-69. Nahni Trap:**

69.1. Nahni trap shall be of cast iron and shall be sound and free from porosity or other defects which affect serviceability. The thickness of the base metal shall not be less than 6.5 mm. The surface shall be smooth and free from craze, ships and other flaws or any other kind of defects which affect serviceability. The size of nahni trap shall be as specified and shall be of self cleansing design.

69.2. The nahni trap shall be of quality approved by the Engineer-in-charge and shall generally conform to the relevant Indian Standards.

69.3. The Nahni trap provided shall be with deep seal, minimum 50 mm, except at places where trap with deep seal can not be accommodated. The cover shall be cast iron. Perforated cover shall be provided *on* the trap of appropriate size.

#### **M-70. Gully Trap:**

70.1 Gully trap shall conform to I.S. 651-1980. It shall be sound, free from defects such as fire cracks. The glaze of the traps shall be free from crazing. They shall give a sharp clear note when struck with light hammer. There shall be no broken blisters.

70.2. The size of the gully trap shall be as specified in the item.

70.3. Each gully trap shall have one C.I. grating of square size corresponding to the dimensions of inlet of gully trap. It will also have a water tight C.I. cover with frame inside dimensions 300 mm; x 300 mm., the cover with frame inside dimension, 300 mm. x 300 mm., the cover weighing not less than 4.53 Kg. and the frame not less than 2.72 Kg. The grating cover and frame shall be of sound and good casting and shall have truly square machined seating faces.

#### **M-71. Glaze Stone Ware Pipe And Fitting :**

71.1. The pipes and fittings shall be of best quality as approved by the Engineer-in-charge. The pipe shall be of best quality manufactured from stone-ware of fire clay, salt glazed thoroughly burnt through the whole thickness, of a close even texture, free from air blows, fire blisters, crack and other imperfections, which effect the serviceability. The inner and outer surfaces shall be smooth and perfectly glazed. The pipe shall be capable to-withstand pressure of 1.5 m. head without showing sign of leakage. The thickness of the wall shall not be less than 1/12th of the internal dia. The depth of socket shall not be less than 38 mm. The socket shall be sufficiently large to allow a joint of 1 mm. around the pipe.

71.2. The pipes shall generally conform to relevant I.S. 651 -1980.

#### **M-72. Wall Peg Rail:**

72.1. The aluminium wall peg rail shall have three aluminium pegs of approved quality and size. It shall be fixed on teakwood plank of size 450 mm. x 75 mm. x 20 mm. The teakwood shall be french polished or oil painted as specified.

#### **M-73. G.I. Water Spot:**

73.1. The G.I. pipes of 40 mm. dia shall be of medium quality and specials shall be of 'R' brand or equivalent brand of best approved quality.

73.2. The pipe shall have length as required for the thickness of wall in which it is fixed, and at the outside end tee and bend cut at half the length shall be provided and at other end coupling shall be provided to have better fixing. The water spout shall be provided as per detailed drawing or as directed.

#### **M-74. Asbestos Cement Pipe (A.C. Pipe ):**

74.1. The asbestos cement pipe of diameter as specified in the description of the item shall conform to I.S. 1626-1980. Specials like bends, shoes cowl, etc. shall conform to relevant Indian Standards. The interior of pipe shall have a smooth finish, regular surface and regular, internal diameter. The tolerance in all dimensions shall be as per I.S. 1626-Part-1-1980.

**M-75. Crydon Ball Valve : 75.1.** Ball valve of screwed type including polythylene float and necessary lever etc. shall be of the size as mentioned in the description of item and shall conform to I.S. 1703-1977.

**M-76. Bitumen Felt For Water Proofing And Damp Proofing : 76.1** Bitumen felt shall be on the fibre bases and shall be type 2, self finished grade-2 and shall conform to I.S. 1322-1970.

**M-7.7 Select Earth :**

77.1. The selected earth shall be that obtained from excavated material or shall have to be brought from outside as indicated in the item. If item does not indicate anything, the selected earth shall have to be brought from outside.

77.2 The selected earth shall be good yellow soil and shall be got approved from the Engineer-in-charge. In no case black cotton soil or similar expansive and shrinkable soil shall be used. It shall be clean and free from all rubbish and perishable materials, stones or brick bats. The clods shall be broken to a size of 50 mm or less, Contractor shall make his own arrangement at his own cost for land for borrowing selected earth. The stacking of material shall be done as directed by the Engineer-in-charge in such a way as not to interfere with any constructional activities and in proper stacks.

77.3 When excavated material is to be used, only selected stuff got approved from the Engineer-in-charge shall be used. It shall be stacked separately and shall comply with all the requirements of selected earth mentioned above :

**M-78. Barbed Wire :**

78.1 The barbed wire shall be of galvanised steel and it shall generally conform to I.S. 278-1978. The barbed wire shall be of type-I whose nominal diameter for line wire shall be 2.5 mm. and point wire 2.24 mm. The nominal distance between two bars shall be 75 mm. unless otherwise specified in the item. The barbed wire shall be formed by twisting together two line wires, one containing the barbs. The size of the line and point wires and barb spacings shall be as specified above. The permissible deviation from the nominal diameter of the line wire and point wire shall not exceed  $\pm 0.08$  mm.

78.2 The barbs shall carry four points shall be formed by twisting two point wires, each two turns, lightly round one line wire, making altogether four complete turns. The barbs shall be so finished that the four points are set and locked at right angles to each other. The barbs shall have a length of not less than 13 mm. and not more than 18 mm. The point, shall be sharp and cut at an angle not greater than 35 degree of the axis of the wire forming the barbs.

78.3 The line and point wire shall be circular section free from scale and other defects and shall be uniformly galvanised. The line wire shall be in continuous length and shall not contain any weld other than those in the rod before it is drawn. The distance between two successive splices shall not be less than 15 meters.

78.4 The lengths per 100 Kg. of barbed wire I.S. type I shall be as under

Nominal 1000 metre Minimum 834 Metre Maximum 1066 Metre.

**SECTION-4****DETAILED SPECIFICATIONS-EXCAVATION**

**4.0.0 (a)** Excavation for foundation upto 1.5 M depth including sorting out and stacking useful materials disposing of the excavated stuff upto 50 metre lead in loose or soft soil.

**1.0. General: 1.1.** Any soil which generally yields to the application of pickaxes and shovels, phawaras, rakes or any such ordinary excavating implement or organic soil, gravel, silt, sand, turf, loam, clay, peat etc., fall under this category.

**2.0 Clearing the site : 2.1** The site on which the structure is to be built shall be cleared and all obstructions, loose stone, materials and rubbish of all kind, bush, wood and trees shall be removed as directed: The materials so obtained shall be property of the Government and be conveyed and stacked as directed within 50 M. lead. The roots of the trees coming in the sides shall be cut and coated with a hot asphalt.

2.2 The rate of site clearance is deemed to be included in the rate of earth work for which no extra will be paid.

**3.0 Setting out:** After clearing the site, the center lines will be given by the Engineer-in-charge. The contractor shall assume full responsibility for alignment, elevation and dimension of each and all parts of the work. Contractor shall supply labourers, materials, etc. required for setting out the reference marks and bench marks and shall maintain them as long as required and directed.

**4.0 Excavation :** The excavation in foundation shall be carried out in true line and level and shall have the width and depth as shown in the drawings or as directed. The contractor shall do the necessary shoring and shutting or providing necessary slopes to a safe angle, at his own cost. The payment for such precautionary measures shall be paid separately if not specified. The bottom of the excavated area shall be levelled both longitudinally and transversely as directed by removing and watering as required. No earth filling will be allowed for bringing it to level, if by mistake or any other reason excavation is made

deeper or wider than shown on the plan or directed. The extra depth or width shall be made up with concrete of same proportion as specified for the foundation concrete at the cost of the contractor. The excavation upto 1.5 m. depth shall be measured under this item.

**5.0. Disposal of the excavated stuff :** 5.1. The excavated stuff of the selected type shall be used in filling the trenches and plinth or levelling the ground in layers including ramming and watering etc.

5.2. The balance of the excavated quantity shall be removed by the contractor from the site of work to a place as directed with lead upto 50 M. and all lift.

**6.0. Mode of measurement and payment:**

6.1. The measurement of excavation in trenches for foundation shall be made according to the sections of trenches shown on the drawing or as per sections given by the Engineer-in-charge. No payment shall be made for surplus excavation made in excess of above requirements or due to slopping and sloping back as found necessary on account of conditions of soil and requirements of safety.

6.2. The rate shall be for a unit of one cubic metre.

**4.0.0. (B)** Excavation for foundation upto 1.5 M. depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 metre lead in dense or hard soil.

**1.0. Dense or Hard Soil:** Any soil which generally require close application of picks or jumpers or scarifiers to loosen it stiff clay, gravel and rubble stone etc. fall under this category.

**2.0. Workmanship :** The relevant specification of item No. 4.0.0. (A) shall be followed except that the excavation work shall be carried out in dense or hard soil.

**3.0. Mode of measurement and payment:**

3.1. The relevant specification of item No. 4.0.0. (A) shall be followed.

3.2. The rate shall be for a unit of one cubic metre.

**4.0.0. (C):** Excavation for foundation upto 1.5 M. depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 meter in lead-hard murrum.

**1.0. Hard murrum:** The hard murrum shall be clean of good binding quality and of approved quality obtained from approved quarries, of disintegrated rocks which contain siliceous material and natural mixture of clay of calcareous origin. The size of hard murrum shall not be more than 20 mm.

**2.0. Workmanship :** The relevant specification of item No. 4.0.0. (A) shall be followed except that the excavation work shall be carried out in hard murrum.

**3.0. Mode of measurement and payment:**

3.1. The relevant specification of item No. 4.0.0. (A) shall be followed.

3.2. The rate shall be for a unit of one cubic metre.

**4.0.0.(D)** Excavation for foundation upto 1.50 M. depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 meter lead-soft rock not requiring blasting.

**1.0. Workmanship:**

1.1. The relevant specification of item No. 4.0.0. (A) shall be followed except that the excavation shall be carried out for foundation upon 1.5 m. lift in soft-rock not requiring blasting.

1.2. The excavation in soft or disintegrated rock shall be carried out by crow bars, pickaxes or pneumatic drills or any other suitable means.

1.3. If contractor desires to resort to blasting, he can do so with permission of the Engineer-in-charge but nothing extra shall be paid to him.

1.3. If contractor desires to resort to blasting, he can do so with permission of the Engineer-in-charge but nothing extra shall be paid to him.

1.4. The materials available from soft rock excavation shall be properly Stacked within 50m. lead and 1.5 m. lift and shall be the property of department.

1.5. The classification of strata of the foundation soil shall be done by the Engineer-in-charge and shall be acceptable to the

contractor.

1.6. However this shall include the type of rock and boulder which may quarried or split with crow bars. Laterite and conglomerate also come under this category.

**2.0. Mode of measurement and payment:**

2.1. The relevant specification of item No.4.0.0. (A) shall be followed.

2.2. The rate shall be for a unit of one cubic metre.

**4.0.0. (E):** Excavation for foundation upto 1.5 M. depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 meter lead in hard rocks.

**1.0. Workmanship:**

1.1. The relevant specification of item No. 4.0.0. (A) shall be followed except that the excavation for foundation work shall be carried out in hard rock.

1.2. Excavation shall be done by blasting to the dimensions shown in the drawings or as directed. The blasting shall be carried out only with written permission of the Engineer-in-charge. All the laws, regulations etc., pertaining to the precautions, acquisition, transport, storage, landing and use of explosives shall be rigidly followed. The Magazine for the storage for the explosive shall be built to the design and specifications of explosive authority and located at the approved site. No unauthorized persons shall be admitted into the magazine and when not in use it shall be kept securely locked. No matches or inflammable materials shall be allowed in the Magazine. The Magazine shall have an effective lightning conductor. The rules of explosive 1940 revised from time to time shall be followed strictly for obtaining, handling, undertaking blasting work.

1.3. The contractor shall be responsible for damage to property, workmen, public due to any accident due to use of explosives and blasting operations.

**1.4. Precautions:**

1.4.1. The blasting operation shall remain in charge of competent and experienced supervisor and workmen who are thoroughly acquainted with the details of handling explosives and blasting operations. The blasting shall be carried out during fixed hours of the day, preferably during the mid-day-lunch hours or at the close of the work as ordered in writing by the Engineer-in-charge. The hours of blasting shall be notified in advance to the people in the vicinity. All the charges shall be prepared by the man in charge only.

1.4.2. Red danger flags shall be displayed prominently in all directions during the blasting operations.

1.4.3. People except those who actually light the fuse shall be prohibited from entering into this area. The flag shall be stationed as 200 m. from the firing site in all directions and all persons including workmen shall be excluded from the flagged area at least 10 minutes before the firing warning whistle being sounded for this purpose.

1.4.4. During excavation in rock by blasting, the lowest 15 cm. of the strata shall be blasted with light charges so as not to shatter or weaken the underlying rock on which the foundation will be actually laid. If excavation in rock is done to larger width and lengths than those shown on the drawings or as directed, no payment shall be made for such over break. If excavation is done to depth greater than shown on the drawings or directed, excess depth shall be made up with foundation grade concrete as directed at the contractor's cost.

1.4.5. The charged hole shall be drilled to the required depth and in suitable places when blasting is done with powder, the fuse cut to the required length shall be inserted in the holes and the powder dropped in the powder shall be gently tamped with copper rod with rounded ends. The explosive powder shall then be covered with trapping materials which shall be tamped lightly but firmly. When blasting is done with dynamite and other high explosive, dynamite cartridges shall be prepared by inserting the square cut ends of fuse into the detonator, and finished with dippers at the open ends. The detonator should be gently pushed into the primer leaving one third of the copper exposed outside. The primer shall be housed into the explosive. Bore holes shall be of such size that the cartridges can be easily passed down. The holes shall be cleared of all debris and explosive inserted. The space for about 20 cms. above the charge shall then be gently filled with dry clay pressed home and rest of the tamping is firmed with any convenient materials gently packed with a wooden cover.

1.4.6. At a time, not more than 20 such charges shall be prepared and fired. The man in charge shall blow a whistle in a recognised manner for cautioning the people. All the people shall then be required to move to safe distances. The charges shall be lighted by the man in charge only. The man in-charge shall count the number of explosions, He shall satisfy himself



that all the charges have been exploded before allowing the workmen to go to the work site.

1.4.7. The contractor shall be fully responsible to strictly follow the prevailing rules and procedures regarding blasting Procedures.

### **1.5. Misfire:**

1.5.1. In case of a misfire the following procedure shall be observed : 1.5.2. Sufficient time shall be allowed to account for the delayed blast. The man in charge shall inspect all the charges and determine the missed charge.

1.5.3. If it is the blasting powder charge, it shall be completely flooded with water. A new hole shall be drilled at about 45 C.m. from the old and fired. This should blast the old charge. Should it not blast the old charge, the procedure shall be repeated till the old charge is blasted.

1.5.4. In case of charge of gelatine, dynamite etc., the man in charge shall gently remove the lamping and the primer with detonator. A fresh detonator and primer shall then be used to blast the charge. Alternatively the hole may be cleared of one foot of lamping and the direction then ascertained by placing a stick in the hole. Another hole may then be drilled 15 cm. away and parallel to it. This hole shall then be charged fired when the misfired hole should explode at the same time. The man in charge shall report to the office at once all cases of misfire, the cause of the same and what steps were taken in connection therewith.

1.5.5. If a misfire has been found to be due to defective detonator or dynamite, the whole quantity in the box from which defective article was taken must be sent to the authority as directed for inspection to ascertain whether all the remaining materials in the box are also defective or not.

**1.6. Accidents : 1.6.1.** The contractor shall be solely responsible for any accident during the entire procedure of handling explosive and blasting and shall pay necessary compensation to persons affected or damage to lands or property etc., due to the blasting without extra claims on the department.

**1.7. Account: 1.7.1.** A Careful and day-to-day account of explosives shall be maintained by the contractor in an approved manner and shall be open to inspection of the Engineer-in-charge at all times. Surprise visit may also be paid by the Engineer-in-charge to the storage and in case of any unaccountable shortage or unsatisfactory accounting, the contractor shall be liable to be penalised by forfeiture of part or whole of his Security Deposit or by cancellation of tender in which case he shall not be entitled for any compensation.

### **1.8. Disposal of Excavated materials :**

1.8.1. No materials excavated from foundation trenches of whatever kind they may be, are to be placed even temporarily nearer than 1.5m. of distance prescribed by the Engineer from the outer edge of excavation. All materials excavated shall remain the property of Government. Rate for excavation includes sorting out of useful materials and stacking them separately as directed within the specified lead. Materials suitable and useful for backfilling or other use shall be stacked in convenient places but not in such a way as to obstruct free movement of men, animals and vehicles or encroach upon the area required or constructional purpose. The site shall be left clean of all debris on completion.

1.8.2. Disposal of excavated materials is subject to the following :

Unsuitable materials obtained from clearing site and excavation shall be disposed off within a lead of 50 metres as directed. Useful materials obtained from clearing site and excavation shall be stacked within a lead of 50 M. beyond the building area as directed. Materials suitable for back filling shall be stacked at convenient places within a lead of 50 M. from the structure for reuse. Useful stones from rock excavation shall be stacked neatly within a lead of 50 M. and will be allowed to be used by the contractor on payment at rates laid down in the contract or if not so laid down, at schedule of rates of the Division or at a mutually agreed rates if there are no such rates in the Schedule of rates.

1.8.3. If surplus materials are required to be conveyed beyond 50 M. conveyance will be paid for under a separate item.

### **2.0. Mode of measurement and payment:**

2.1. The work shall be measured for the work limited to the dimensions shown on drawings or directed. Excavation to dimensions in excess of the above will not be measured or paid for and if so ordered by the Engineer the contractor shall have to fill up the excess depth with cement concrete specified for foundation without extra payment.

2.2. Driving of sounding bards, drill holes to explore the nature of substratum upto a total length of meter distributed in 2 or 3 places in each foundation if necessary, will be considered incidental work and will not be paid for separately.

2.3. Removal of slips and blows in the foundation trenches will not be measured or paid for.

2.4. If it is necessary in the opinion of the Engineer-in-charge to carry foundation below the levels shown on the plants, the excavation for the first 1.5 M. of additional depth will be included in the quantity for the particular classification and will be paid for as extra work at rate to be decided under the general conditions of contract unless the contractor is willing to accept payment as tendered rates.

2.5. The rate shall be for a unit of one cubic metre.

**4.001 (A):** Excavation for foundation for depth from 1.50 M. to 3.0 M. including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 M. in lead-loose or soft soil.

**1.0. Workmanship: 1.1.** The relevant specifications of item No. 4.0.0. (A) shall be followed except that the excavation work shall be carried out in loose or soft soil with lift 1.5 M. to 3.0 M.

**2.0 Mode of measurement and payment:**

2.1. The relevant specification of item No. 4.0.0. (A) shall be followed.

2.2. The excavation work of lift 1.5 M. to 3.0 M. shall be measured under this item.

2.3. The rate shall be for a unit of one cubic metre.

**4.001. (B)** Excavation for foundation for depth from 1.5. M. to 3.0 M. including sorting out and stacking of useful materials and disposing of excavated stuff upto 50 M. lead in Dense or Hard soil.

**1.0. Workmanship:** The relevant specification of item No. 4 0.0. (B) shall be followed except that the excavation work shall be carried out with 1.5 M. to 3.0 M. lift in dense or hard soil.

**2.0. Mode of measurement and payment:**

2.1. The relevant specification of item No. 4.0.0. (A) shall be followed.

2.2. The excavation work from 1.5 to 3.0 M. shall be measured under this item.

2.3. The rate shall be for a unit of one cubic metre.

**4.001.(C):** Excavation for foundation for depth from 1.5 M. to 3.0 M. including sorting out and stacking of useful materials and disposing of excavated stuff upto 50 M. lead in Hard murrum.

**1.0. Workmanship: 1.1.** The relevant specification of item No. 4.0.0. (C) shall be followed except that the excavation work shall be carried out from 1.5 M. to 3.0 M. lift in hard murrum.

**2.0. Mode of measurement and payment:**

2.1. The relevant specification of item No. 4.0.0. (A) shall be followed.

2.2. The excavation work from 1.5 M. to 3.0 M. Shall be measured under this item.

2.3. The rate shall be for a unit of one cubic metre.

**4.001. (D):** Excavation for foundation for depth 1.5 M. to 3.0 M. including sorting out and stacking of useful material and disposing of excavated stuff upto 50 M. lead in soft rock not requiring blasting.

**1.0. Workmanship :** The relevant specification of item No. 4.0.0. (D) shall be followed except that the excavation work shall be carried out from 1.5 m to 3.0 M. lift in soft rock not requiring blasting.

**2.0. Mode of measurement and payment:**

2.1. The relevant specification of item No. 4.0.0. (A) shall be followed.

2.2. The excavation work from 1.5 M. to 3.0 M. lift shall be measured under this item.

2.3. The rate shall be for a unit of one cubic metre.

**4.001.(E):** Excavation foundation for depth 1.5 M to 3.0 M. including sorting out and stacking of useful material and disposing of excavated stuff upto 50 M. lead in hard rock.

**1.0. Workmanship: 1.1.** The relevant specification of item No. 4.0.0. (E) shall be followed except that the excavation work shall be carried out from 1.5 M. to 3.0 M. lift in hard rock.

**2.0. Mode of measurement and payment:**

2.1 The relevant specification of item No. 4.0.0. (A) shall be followed.

2.2. The excavation work from 1.5 M. to 3.0 M. lift shall be measured under this item.

2.3. The rate shall be for a unit of one cubit metre.

**4.002. (A):** Excavation for foundation for depth 3.0 M. to 5.0 M. including sorting out and slacking of useful materials and disposing of the excavated stuff upto 50 M. lead in loose of soft soil.

**1.0. Workmanship : 1.1.** The relevant specifications of item No. 4.0.0. (A) shall be follwed except that the excavation work

shall be carried out from 3.0 M. to 5.0 M. lift in loose of soft soil.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 4.0.0. (A) shall be followed.

2.2. The excavation work from 3.0 M. to 5.0 M, lift shall be measured under this item.

2.3. The rate shall be for a unit of one cubic metre.

**4.002. (B):** Excavation for foundation for depth from 3.0 M. to 5.0 M-including sorting out and slacking of useful materials and disposing of the excavated stuff upto 50 M. lead in Dense or Hard soil.

**1.0. Workmanship: 1.1.** The relevant specifications of item No. 4.0.0. (B) shall be followed except that the excavation work shall be carried out from 3.0 M. to 5.0 M. lift in Dense or Hard soil.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 4.0.0. (A) shall be followed.

2.2. The excavation work from 3.0 M. to 5.0 M. lift shall be measured under this item.

2.3. The rate shall be for a unit of one cubic metre.

**4.002. (C):** Excavation for foundation for depth from 3.0 M. to 5.0 M including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 M. lead in Hard murrum.

**1.0. Workmanship: 1.1.** The relevant specifications of item No. 4.0.0. (C) shall be followed except that the excavation work shall be carried out from 3.0 m. to 5.0 M. in hard murrum.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 4.0.0. (A) shall be followed.

2.2. The excavation work from 3.0 M. to 5.0 M. lift shall be measured under this item.

2.3. The rate shall be for a unit of one cubic metre.

**4.002 (D):** Excavation for foundation for depth from 3.0 M. to 5.0 M including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 M. lead in soft rock not requiring blasting.

**1.0. Workmanship: 1.1.** The relevant specifications of item No. 4.0.0. (D) shall be followed except that the excavation work shall be carried out from 3.0 M. to 5.0 M. in soft rock not requiring blasting.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 4.0.0. (A) shall be followed.

2.2. The excavation work from 3.0 M. to 5.0 M. lift shall be measured under this item.

2.3. The rate shall be for a unit of one cubic metre.

**4.002.(E) :**Excavation for foundation for depth from 3.0 M. to 5.0 M including sorting out and stacking of useful materials and disposing of excavated stuff upto 50 M. lead in Hard rock.

**1.0. Workmanship: 1.1.** The relevant specifications of item No. 4.0.0. (E) shall be followed except that the excavation work shall be carried but from 3.0 M. to 5.0 M. in hard rock.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 4.0.0. (A) shall be followed.

2.2. The excavation work from 3.0 M. to 5.0 M. lift shall be measured under this item.

2.3. The rate shall be for a unit of one cubic metre.

**4.003.(A):** Extra for additional depth more than 5.0 M. for excavation for foundation including sorting out and stacking of useful materials disposing of the excavated stuff upto 50 M. lead in loose or soft soil.

**1.0. Workmanship: 1.1.** The relevant specifications of item No. 4.0.0. (A) shall be followed except that the excavation work shall be carried out from more than 5.0 M. lift in loose or soft soil.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 4.0.0. (A) shall be followed.

2.2. The rate shall be paid extra over and above the rate of No. 4.002. (E) for carrying out excavation work for additional depth from 5.0 M. and above.

2.3. The rate shall be for a unit of one cubic metre per metre.

**4.003. (B):** Extra for additional depth more than 5.0 M. for excavation for foundation including sorting out and stacking of useful materials disposing of excavated stuff upto 5.0 M. lead in Dense or hard soil.

**1.0. Workmanship: 1.1.** The relevant specifications of item No. 4.00. (B) shall be followed except that the excavation work shall be carried out from more than 5.0 M. lift in dense or hard soil.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 4.0.0. (A) shall be followed.

2.2. The rate shall be paid extra over and above the rate of item No. 4.002. (B) for carrying out excavation work for additional depth from 5.0 M. and above.

2.3. The rate shall be for a unit of one cubic metre per metre.

**4.003. (C):** Extra for additional depth more than 5.0 M. for excavation for foundation including spitting out and stacking of useful materials disposing of excavated stuff upto 5.0 M. lead in Hard murrum.

**1.0. Workmanship: 1.1.** The relevant specifications of item No. 4.0.0. (C) shall be followed except that the excavation work shall be carried out from more than 5.0 M. lift in hard murrum.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 4.0.0. (A) shall be followed.

2.2. The rate shall be paid extra over and above the rate of item No. 4.002. (C) for carrying out excavation work for additional depth from 5.0 M. and above.

2.3. The rate shall be for a unit of one cubic metre per metre.

**4.003.(D):** Extra for additional depth more than 5.0 M. for excavation for foundation including sorting out and stacking of useful materials disposing of excavated stuff 5.0 M. lead in soft rock not requiring blasting.

**1.0. Workmanship : 1.1.** The relevant specifications of item No. 4.0.0. (D) shall be followed except that the excavation work shall be carried out from more than 5.0 M. lift in soft rock not requiring blasting.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 4.0.0. (A) shall be followed.

2.2. The rate shall be paid extra over and above the rate of item No. 4.002 (D) for carrying out excavation work for additional depth from 5.0 M. and above.

2.3. The rate shall be for a unit of one cubic metre per metre.

**4.003.(E):** Extra for additional depth more than 5.0 M. for excavation for foundation including sorting out and stacking a useful materials disposing of excavated stuff upto 50 M. lead in hard rock.

**1.0. Workmanship: 1.1.** The relevant specifications of item No. 4.0.0. (E) shall be followed except that the excavation work shall be carried out from more than 50 M. lift in hard rock.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 4.0.0. (A) shall be followed.

2.2. The rate shall be paid extra over and above the rate of item No. 4.002 (E) for carrying out excavation work for additional depth from 5.0 M. and above.

2.3. The rate shall be for a unit of one cubic metre per metre.

**4.12.** Filling available from excavated earth (excluding rock) in trenches, plinth sides of foundations, etc. in layers not exceeding 20 CM in depth, consolidating each deposited layer by ramming and watering.

**1.0. Workmanship:**

1.1. The earth to be used for filling shall be free from salts, organic or other foreign matter. All clods of earth shall be broken.

1.2. As soon as the work in foundation has been completed and measured, the site of foundation shall be cleared of all debris, brick bats, mortar dropping etc; and filled with earth in layers not exceeding 20 Cms. Each layer shall be adequately watered, rammed and consolidated before the succeeding layer is laid. The earth shall be rammed with iron rammers where feasible and with the butt ends of crow-bars, where rammer cannot be used.

1.3. The plinth shall be similarly filled with earth in layers not exceeding 20 Cms. adequately watered and consolidated ramming with iron or wooden rammers. When filling reaches finished level, the surface shall be flooded with water for atleast 24 hours and allowed to dry and then rammed and consolidated.

1.4. The finished level of filling shall be kept to shape intended to be given to floor.

1.5. In case of large heavy duty flooring like factory flooring, the consolidation may be done by power rollers, where so specified. The extent of consolidation required shall also be as specified.

1.6. The excavated stuff of the selected type shall be allowed to be used in filling the trenches and plinth. Under no

circumstances black cotton soil be used for filling the plinth.

**2.0. Mode of measurement and payment:**

2.1. The payment shall be made for filling in plinth and trenches. No deduction shall be made for shrinkage or voids, if consolidated as instructed above.

2.2. The rate shall be for a unit of one cubic metre.

**4.24.** Filling in plinth with sand under floors including watering, ramming consolidating and dressing etc. complete.

1.0. Materials: 1.1. Sand shall conform to M. 6.

**2.0. Workmanship : 2.1.** The relevant specifications of item No. 4.12 shall be followed except that sand shall be filled in plinth, floors, including watering, ramming, consolidating and dressing etc. complete.

**3.0. Mode of measurement and payment:**

3.1. The relevant specifications of item No. 4.12 shall be followed.

3.2. The rate includes cost of collecting carting sand with all lead and labour for filling the same in plinth under floors.

3.3. The rate shall be for a unit of one cubic metre.

**4.004. :** Filling in foundation and plinth with murrum or selected soil in layers of 20 cm. thickness including watering, ramming and consolidating etc. complete.

**1.0. Materials : 1.1.** Murrum shall be clean of good binding quality, and of approved quality obtained from approved pits/quarries of disintegrated rocks which contain siliceous materials and natural mixture of clay of calcareous origin. The size of murrum shall not be more than 20 mm.

**2.0. Workmanship : 2.1.** The relevant specifications of item No. 4.12 shall be followed except that the murrum or selected soil shall be filled in foundation and plinth in 20 cms. layers including consolidating, ramming, watering, dressing etc. complete.

**3.0. Mode of measurement and payment:**

3.1. The relevant specifications of item No. 4.12 shall be followed.

3.2. The rate includes cost of collecting and carting murrum/or selected earth of approved quality with all lead and labour required for filling in trenches and plinth.

3.3. The rate shall be for a unit of one cubic metre.

**4.005.** Filling in foundation and plinth with brick-bats/chhara in layers of 20 cms. thickness including watering ramming and consolidating etc. complete.

**1.0. Materials :** Bricks bats shall conform to M. 14.

**2.0. Workmanship :** The relevant specifications of item No. 4.12 shall be followed except that brick-bats of burnt bricks shall be filled in foundation and plinth in 20 cms. layers including watering, ramming, consolidating etc. complete.

**3.0. Mode of measurement and payment:**

3.1. The relevant specifications of item No. 4.12 shall be followed.

3.2. The rate includes cost of collecting and carting brick/chhara with all lead and labour required for filling in trenches and plinth.

3.3. The rate shall be for a unit of one cubic metre.

**4.27.** Boring holes 3.5 M. deep in ordinary soil (for cast in situ piles) and getting out the soil and disposal of the surplus excavated soil as directed within a lead of 50 M. for following diameter for piles (i) 200 mm. (ii) 250 mm. (iii) 300 mm.

**1.0. Workmanship:**

1.1. The ground shall be roughly levelled and after making the position of piles, the holes shall be bored with spirally to the 3.5 M. depth and specified diameter using boring guide.

1.2. The bore holes shall be truly vertical and uniform bore throughout of specified diameter. After boring to the required depth, the bore shall be cleared off the loose soil and disposal of surplus excavated stuff as directed within a lead of 50 M.

**2.0. Mode of measurement and payments:**

2.1. The rate for boring holes shall include :-

(a) Roughly levelling the ground in positions where piles are to be provided.

(b) Making the positions of piles by pegs and boring guide and also for shifting of boring guide.

(c) Bailing out water, if any met with during boring.

(d) Disposal of surplus excavated soil within a lead of 50 M. and

(e) All tools, plants, equipments and tools required for satisfactory completion of work.

2.2. The rate shall be for a unit of one number.

**4.28.** Extra for under reaming inside the bore holes for under reamed piles of following nominal diameter, (i) 200 mm. (ii) 250mm. (iii) 300 mm.

**1.0. Workmanship :** The relevant specifications of item No. 4.27 shall be followed except that after boring to the required depth, the bore shall be enlarged at the bottom by an under reamer 2 to 2 1/2 times the diameter of the bore as directed. It shall be ensured that the bore for the pile shall be enlarged to the correct diameter.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 4.27 shall be followed.

2.2. The rate shall be paid extra over and above the rate of item No. 4.27 under reaming the piles.

2.3. The rate shall be for a unit of one Number.

## **SECTION-5**

### ***DETAILED SPECIFICATIONS - PLAIN & RCC WORKS***

**5.1.6.** Providing and laying in foundation and plinth/under floors lime concrete with hard broken aggregate 40 mm. nominal size and 40% mortar comprising of 1 Lime putty : 2 fine sand and curing complete excluding cost of form work.

**1.0. Materials:** **1.1.** Water shall conform to M-1. Sand shall conform to M-6. Lime shall conform to M-2. Graded aggregated 40 mm, nominal size shall conform to M-12.

**2.0. Workmanship:**

2.1. General 2.1.1. Before starting the concrete the bed of the foundations trenches shall be cleared of all loose materials and watered and rammed as directed.

**2.2. Proportion of Mix :**

2.2.1. The proportion of lime, sand and aggregate shall be specified in the item of the work and shall be measured by volume.

2.2.2. The lime mortar shall consist of proportion of 1 Lime putty : 2 sand volume. The lime mortar shall be prepared by wet process Power driven mill shall be used for preparation of lime mortar. The slaked lime shall be placed in the Mill in even layers and ground for 180 revolutions with sufficient water. The water shall be added as required during grinding (and care shall be taken not to add more water) so that it will bring the mixed materials to a consistency of stiff paste, thoroughly wetted sand shall then be added evenly and the mixture ground for another 180 revolutions.

2.2.3. Lime mortar shall be kept damp, protected from sun and rain till used-up, covering it by tarpauline or open sheds.

2.2.4. All the lime mortar shall be used as soon as possible after grinding. It should be used on the day of which it is prepared but in no case mortar made earlier than 36 hours shall be permitted for use.

**2.3. Mixing :** **2.3.1.** The concrete shall be mixed in mechanical mixer. Mixing shall be continued until there is uniform distribution of the material and the mass is uniform in colour and consistency but in no case mixing shall be done for less than 2 to 3 minutes.

**2.4. Laying & Compacting:** **2.4.1.** The concrete shall always be used while quite fresh. It shall be laid (not thrown) in layers not exceeding 150 mm: in thickness and shall be well and quickly\_ rammed with wooden or iron rammers, till the required compaction is achieved. The concrete laid shall not be of too fluid consistency. After it has been mixed no more water shall be added, but the surface during and after compaction shall be kept damp. In laying consecutive layers, the layer east shall be well watered and made rough before the upper layer is laid. The concrete shall be kept continuously wet for period of 7 days from the date of placing or until it is built over whichever is more.

**2.5. Mode of measurement and payment:**

2.5.1. The concrete work shall be measured in length, breadth and depth as specified on drawing or as directed, correct upto nearest centimetre and cubical content shall be worked out nearest upto two places or decimals.

2.5.2. The rate shall be for a unit of one cubic metre.

**5.1.8.** Providing and laying in foundation and plinth/under floors lime concrete with graded bricks aggregate 40 mm. nominal size and 40% mortar comprising of 1 Lime Putty : 9 fine sand and curing complete excluding cost of form work.

**1.0. Materials :** **1.1.** Water shall conform to M-1. Lime mortar shall conform to M-10. Brick bats aggregates 40 mm. nominal size shall conform to M-14.

**2.0. Workmanship :** **2.1.** The relevant specifications of item No. 5.1.6. Shall be followed except that brick aggregate shall be

ued instead of graded stone aggregate.

### **3.0. Mode of measurement and payment:**

3.1. The concrete work shall be measured in length, breadth and depth as specified in drawing or as directed, correct upto larest centimetre and cubical content shall be worked out upto two places of decimals. 3 2. The rate shall be for a unit of one cubic metre.

**5 3.2. (A)** Providing and laying cement concrete 1:3:6(1 cement: 3 coarse sand: 6 graded stone aggregate 40 mm. nominal size) and curing complete excluding the cost of form work in foundations and plinth.

**1.0. Materials: 1.1.** Water, shall conform to M-1. Sand shall conform to M-6. Cement shall conform to M-3. Stone aggregate 40 mm. nominal size shall conform to M-12.

### **2.0. Workmanship:**

**2.1. General: 2.1.1.** Before starting concrete bed of foundation treaches shall be cleared of all loose materials, levelled, watered and rammed as directed.

**2.2. Proportion of Mix : 2.2.1.** The Proportion of cement, sand and coarse aggregate shall be one part of cement, 3 parts of sand, 6 parts of stone aggregates and shall so measured by volume.

**2.3. Mixing : 2.3.1.** The concrete shall be mixed in a mechanical mixer at the site of work. Hand mixing may however be lowed for smaller quantity of work if approved by the Engineer-in-charge. When hand mixing is permitted by the Engineer-in-charge in case of break-down of machineries and in the interest of the work, it shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. However such cases 10% more cement than otherwise required shall have to be used without any extra cost. The mixing in mechanical mixer shall be done for a period 1 to 2 minutes. The quantity of water shall be sufficient to produce a dense concrete of required workability for the purpose.

### **2.4. Transporting & Placing the concrete :**

2.4.1. The concrete shall be handled from the place of mixing to the final position in not more than 15 minutes by the method s directed and shall be placed into its final position, compacted and finished within 30 minutes of mixing with water i.e. before the setting commences.

1.4.2. The concrete shall be laid in layers of 15 cms. to 20 cms.

**2.5. Compacting: 2.5.1.** The concrete shall be rammed with heavy iron rammers and rapidly to get the required compaction and allow all the interestices to be filled with mortar.

**2.6. Curing : 2.6.1.** After the final set, the concrete shall be kept continuously wet, if required by ponding for a period of not less than 7 days from the dale of placement.

### **2.7. Mode of measurement and Payment:**

2.7.1. The concrete shall be measured for its length breadth and depth, limiting dimensions to those specified on plan or as directed.

2.7.2. The rate shall be for a unit of one cubic metre.

**5.3.3.(A)** Providing and laying cement concrete 1:4 : 8 (1 cement: 4 coarse sand: 8 graded stone aggregate 40 mm. nominal size) and curing complete excluding cost of form work in foundations and plinth.

**1.0. Materials: 1.1.** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Stone aggregate 40 mm. nominal size shall conform to M-12.

**2.0. Workmanship : 2.1.** Relevant specifications of item No. 15.3.2. shall be followed except that cement concrete shall be mixed in the proportion of 1 : 4 : 8 instead of 1 : 3 : 6 by volume.

### **2.0. Mode of measurement and payment:**

3.0. The concrete shall be measured for its length, breadth and depth, limiting dimensions to those specified on plans or directed.

3.1. The rate shall be for a unit of one cubic metre.

**5.3.14 (A)** Providing and laying cement concrete 1:3:6(1 cement: 3 coarse sand: 6 crushed stone aggregate 20 mm. nominal size) and curing complete including cost of form work in wall caps/coping.

**1.0. Materials & Workmanship : 1.1.** Ther relevant specification of item No. 5.3.2 (A) shall be followed except that the work shall be carried out for coping and wall caps, except the stone aggregate 20 mm. nominal size shall be used for the concrete work of wall caps/coping.

**2.0. Mode of measurement and payment: 2.1.** The relevant specifications of item No. 5.3.2. (A) shall be followed except

that the rate includes cost of necessary form work.

2.1. The rate shall be for a unit of one cubic metre per metre.

**5.3.3. (B):** Providing and laying brick bats cement 1:4 : 8 (1 cement: 4 coarse sand: 8 graded brick bats) and curing complete excluding the cost of form work in foundation and plinth.

**1.0. Materials:** 1.1. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Brick bat shall conform to M-14.

**2.0. Workmanship:** 2.1. The specification of this item shall be followed as per item No. 5.3.3. except that the proportion of brick bat cement concrete shall be 1 : 4 : 8 i.e. 1 part of cement, 4 parts of coarse sand and 8 parts of graded brick bat by volume, using graded brick bat as coarse aggregate instead of stone aggregate.

**3.0 Mode of measurement and payments:**

3.1. The concrete work shall be measured in length, breadth and depth as specified on drawing limiting dimensions to those specified on drawings or as directed.

3.2. The rate shall be for a unit of one cubic metre.

**5.3.4. (a) :** Providing and laying cement concrete 1 : 5 : 10 (1 cement: 5 coarse sand : 10 graded stone aggregate 40 mm. nominal size) and curing complete, excluding the cost of form work, for foundation and plinth.

**1.0 Materials:** 1.1. Water shall conform to M-1, Cement shall conform to M-3. Sand shall conform to M-6. Stone aggregate 40 mm. nominal size shall conform to M-12.

**2.0. Workmanship:** 2.1. The relevant specification of item No. 5.3.2. (A) shall be followed for the work except that the work is to be carried out in cement concrete 1 : 5 : 10.

**3.0. Mode of measurement and payment:**

3.1. The concrete shall be measured for its length, breadth and depth, limiting dimensions to those specified on plans or as directed.

3.2. The rate shall be for a unit of one cubic metre.

**5.3.8. (A) :** Providing and laying cement concrete 1: 5 : 10 (1 cement: 5 coarse sand, 10 graded brickbats 10 mm. nominal size) and curing complete excluding, cost of form work in foundation and plinth.

**1.0. Materials:** 1.1. Water shall conform -to M-1, sand shall conform to M-6. Cement shall conform to M-3. Brick bats shall conform to M-14.

**2.0. Workmanship :** 2.1. The relevant specification of item No. 5.3.4 shall be followed except that brick bats aggregate shall be used instead of stone aggregate.

**3.0. Mode of measurement and payment:**

3.1. The relevant specification of item No. 5.3.4. shall be followed.

3.2. The rate shall be for a unit of one cubic metre.

**5.3.2. (B):** Providing and laying brick bat cement concrete : 1 : 3 : 6 (1 cement: 3 coarse sand : 6 graded brick bats) and curing complete excluding cost of form work in foundation and plinth.

**1.0.** The specification of item No. 5.3.2. A shall be followed for mode of measurements and payment except that it excludes the cost of form work.

2.2. The rate shall be for a unit of one cubic metre.

**5.4.18.** Providing throating or plaster drip and moulding to R.C.C. Chhajjas.

**1.0. Materials:** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Cement mortar shall conform to M-1 1.

**2.0. Workmanship :** 2.1. The work shall be carried out as directed. The proportion of mix for finishing touching shall be in CM. 1:2 by volume. Curing shall be done for not less than 7 days. The work shall be carried out in best workman like manner.

The throating or plaster drip, and moulding shall be one centimetre in thickness.

**5.7.5.** Extra for providing and mixing water proofing or plaster drip and moulding shall be one centimetre in thickness.

**2.0. Workmanship :** 2.1. The proportions of materials for the cement concrete shall be mentioned with the specifications of that item. The quantity of water proofing materials to be added and the method of addition shall be as specified by manufacturers.

**2.2. Mixing** 2.2.1. The mixing of the water proofing materials in cement, water or concrete shall be done according to the specifications of the manufacturer.

**3.0. Mode of measurement and payment:**



3.1. The payment is extra over and above the rate of concrete for mixing water proofing proper.

3.2. The rate shall be for a unit of one Hire of Kg. per quintal of cement in which water proofing material is added.

**5.7. 1.** Providing and laying damp proof course 25 mm. thick cement concrete 1:2:4(1 cement, 2 coarse sand, 4 stone aggregate 10 mm. nominal size) and curing complete.

**1.0.** The specifications of item No. 5.3.1.(A) of ordinary concrete with, or without reinforcement shall be followed except that the size of the stone aggregate shall be 10 mm. nominal size and the concrete work shall be carried out in 25 mm. thick damp proof course.

**2.0. Mode of measurement and payment:**

2.1. The rate includes cost of all material and labour required to complete the item.

2.2. The rate shall be for a unit of one sq. metre.

**5.3.13.** Providing and laying cement concrete 1:2:4(1 cement: 2 coarse sand, 4 graded stone aggregate 20 mm. nominal size) and curing complete excluding cost of form work in (A) foundation and plat, (B) Independent piers, columns and pillars upto floor two level.

**1.0. Materials :** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Grit shall conform to M-8. Graded stone aggregate 20 mm. nominal size shall conform to M-12.

**2.0. General:**

2.1. The concrete mix is not required to be designed by preliminary tests. The proportion of the concrete mix shall be 1 : 2 : 4 (1 cement: 2 coarse sand ; 4 graded stone aggregate 10 mm. nominal size) by volume. Concrete work shall have exposed concrete surface or as specified in the item.

2.2. The designation ordinary M-100, M-150, M-200, M-250 specified as per. I.S. Corresponding approximately to 1 : 3 : 6, 1 : 2 : 4, 1 : 1 1/2 : 3 and 1:1:2 nominal mix of ordinary concrete by volume respectively.

2.3. The ingredients required for ordinary concrete containing one bag of cement of 50 Kg. by weight (0.0342 Cu. M.) for different proportions of mix shall be as under:

Grade of concrete	Total quantity of dry aggregate by volume per 50 Kgs. of cement to be taken as the sum of individual volume of fine and coarse aggregates, maximum	Proportion of fine aggregate to coarse aggregate	Quantity of water per 50 Kgs. of cement maximum.
1	2	3	4
M-100 (1 : 3: 6)	300 Liters	Generally 1 : 2 for fine aggregate	34 Liters
M-150 (1 : 2 : 4)	2.20 “	to coarse aggregate by volume	32 “
M-200 (1 : 1 1/2 : 3)	160 “	but subject to and upper limit	30 “
M-250 ( 1:1:2)	100 “	of 1 : 1 1/2 and lower limit 1 : 3	27 “

2.4. The water cement ratios shall not more than those specified in the above table. The cement content of the mix specified in the Table shall be increased if the quantity of water in a mix has to be increased to overcome the difficulties of placement and compaction so that the water-cement-ratio specified in the Table is not exceeded.

2.5. Workability of the concrete shall be controlled by maintaining a water-cement-ratio that is bound to give a concrete mix which is just sufficiently wet to be placed and compacted without difficulty with the means available.

2.6. The maximum size of coarse aggregate shall be as large as possible within the limits specified but in no case greater than one fourth of the minimum thickness of the member, provided that the concrete can be placed without difficulty so as to surround all reinforcement thoroughly and to fill the corners of the form.

2.7. For reinforced concrete work, coarse aggregates having a nominal size of 20 mm. are generally considered satisfactory.

2.8. For heavily reinforced concrete members as in the case of ribs of main beams, the nominal maximum size of coarse aggregate should usually be restricted to 5 mm. less than the minimum, clear distance between the main bars, or 5 mm. less than the minimum cover to the reinforcement whichever is smaller.

2.9. Where the reinforcement is widely spaced as in solid slabs, limitations of size of the aggregate may not be important and the nominal maximum size may sometimes be as great as OF greater than the minimum cover.

2.10. Admixture may be used in concrete only with approval of Engineer-in-charge based upon the evidence that with the passage of time, neither the compressive strength of concrete is reduced nor are other requisite qualities of concrete and steel impaired by the use of such admixtures.

### **3.0. Workmanship:**

3.1. Proportioning : Proportioning shall be done by volume, except cement which shall be measured in terms of bags of 50 Kg. weight. The volume of one such bag being taken as 0.0342 Cu. metre. Boxes of suitable sizes shall be used for measuring sand aggregate. The size of the boxes (internal) shall be 35 cms. x 25 cms. and 40 Cms. deep. While measuring the aggregate and sand, the box shall be filled without shaking ramming or hammering. The proportioning of sand shall be on the basis of its dry volume and in case of damp sand, allowances for bulkage shall be made.

### **3.2 Mixing:**

3.2.1. For all work, concrete shall "be mixed in a mechanical mixer which alongwith other accessories shall be kept in first class working condition and so maintained throughout the construction. Measured quantity of aggregate, sand, cement required for each batch shall be poured into the drum of the mechanical mixer while it is continuously running. After about half a minute of dry mixing, measured quantity of water required for each batch of concrete mix shall be added gradually and mixing continued for another one and a half minute. Mixing shall be. continued till materials are uniformly distributed and uniform colour of the entire mass is obtained and each individual particle of the coarse aggregate shows complete coating of mortar containing its proportionate amount of cement. In no case shall the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

3.2.2. When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on the smooth watertight platform large enough to allow efficient turning over the ingredients of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material gets mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate, which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse and fine aggregate and cement shall then be mixed thoroughly by turning over to get a mixture to uniform colour. Specified quantity of water shall then be added gradually through a rose-can and the mass turned over till a mix of required consistency is obtained. In hand mixing, quantity of cement shall be increased by 10 percent above that specified.

3.2.3. Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer-in-charge the first batch of concrete from the mixture shall contain only two thirds of normal quantity of coarse aggregate. Mixing plant shall be thoroughly cleaned before changing from one type of cement to another.

3.3. Consistency: 3.3.1. The degree of consistency which shall depend upon the nature of the work and methods of vibration of concrete, shall be determined by regular slump tests in accordance with I.S. 1199-1959. The slump of 10 mm. to 25 mm. shall be adopted when vibrators are used and 80 mm. when vibrators are not used.

### **4.4. Inspection:**

3.4.1. Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength, alignment, and general fitness but such inspection shall not relieve the contractor of his responsibility for the safety of men, machinery, materials and for results obtained. Immediately before concreting, all forms shall be thoroughly cleaned.

3.4.2. Centering design and its erection shall be got approved from the Engineer-in-charge. One carpenter with helper shall invariably be kept present throughout the period of concreting. Movement of labour and other persons shall be totally prohibited for reinforcement laid in position. For access to different parts, suitable mobile platforms shall be provided so that steel reinforcement in position is not disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber, kapachi or metal pieces shall not be used for this purpose.

### **3.5. Transporting and laying:**

3.5.1. The method of transporting and placing concrete shall be as approved. Concrete shall be so transported and placed that no contamination segregation or loss of its constituent material takes place.

All form work shall be cleaned and made free from standing water, dust, snow or ice immediately before placing of concrete.

No concrete shall be placed in any part of the structure until the approval of the Engineer-in-charge has been obtained.

3.5.2. Concreting shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer. Except where otherwise agreed to by the Engineer-in-charge concrete shall be deposited in horizontal layers to a compacted depth of not more than 0.45 metre when internal vibrators are used and not exceeding 0.30 metre in all other cases.

3.5.3. Unless otherwise agreed to by the Engineer-in-charge, concrete shall not be dropped into place from a height exceeding 2 metres. When trucking or chutes are used they shall be kept close and used in such a way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted and covered with a 13 mm. thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm. layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all laitance shall be removed by scrubbing the wet surface with wire or bristle brushes, care being taken to avoid dislodgement of any particles of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150 mm. in thickness and shall be well rammed against old work, particular attention being given to corners and close spots.

3.5.4. All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators unless, otherwise permitted by the Engineer-in-charge for exceptional cases, such as concreting under water, where vibrators cannot be used. Sufficient vibrators in serviceable condition shall be kept at site so that spare equipment is always available in the event of breakdowns.

Concrete shall be judged to be compacted when the mortar fills the spaces between the coarse aggregate and begins to cream up to form an even surface. Compaction shall be completed before the initial setting starts i.e. within 30 minutes of addition of water to dry mixture. During compaction, it shall be observed that needle vibrators are not applied on reinforcement which is likely to destroy the bond between concrete and reinforcement.

**3.6. Curing:** Immediately after compaction, concrete shall be protected from weather, including rain, running water, shocks, vibration, traffic, rapid temperature changes, frost and drying out process. It shall be covered with wet sacking, hassain or other similar absorbant material approved, soon after the initial set and shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over foundation concrete may be started after 48 hours of its laying but curing of concrete shall be continued for a minimum period of 14 days.

### **3.7. Sampling and Testing of concrete :**

3.7.1. Samples from fresh concrete shall be taken as per I.S. 1199-1959 and cubes shall be made, cured and tested at 7 days or 28 days as per requirements in accordance with I.S. 516-1959. A random sampling procedure shall be adopted to ensure that each concrete batch shall have a reasonable chance of being tested i.e. the sampling should be spread over the entire period of concreting and cover all mixing units. The minimum frequency of sampling of concrete of each grade shall be in accordance with following :

Quantity of concrete in the work	No. of samples	Quantity of concrete in the works	No. of samples
1-5Cmt.	1	16-30Cmt.	3
6-15Cmt.	2	31-50	4

51 and above 4 + one additional for each additional 50 M. or part thereof.

NOTE : At least one sample shall be taken from each shift. Ten test specimens shall be made from each sample, five for testing at 7 days and the remaining five at 28 days. The samples of concrete shall be taken on each day of the concreting as per above frequency. The number of specimens may be suitably increased as deemed necessary by the Engineer-in-charge when procedure of tests given above reveals a poor quality of concrete and in other special cases.

3.7.2. Tire average strength of the group of cubes cast for each day shall not be less than the specified cube strength of 150 Kg/Cm at 28 days. 20% of the cubes cast for each day may have value less than the specified strength provided the lowest value is not less than 85% of the specified strength. If the concrete made in accordance with the proportions given for a particular grade does not yield the specified strength, such concrete shall be classified as belonging to the appropriate lower, grade concrete made in accordance with the proportions given for a particular grade shall not, however, be placed in a higher grade on the ground that the test strength are higher than the minimum specified.

### **3.8. Stripping:**

3.8.1. The Engineer-in charge shall be informed in advance by the contractor of his intention to strike the form work. While fixing the time for removal of form work, due consideration shall be given to local conditions, character of the structure, the weather and other condition that influence the setting of concrete and of the materials used in the mix. In normal circumstances (generally where temperatures are above 20 ° C) and where ordinary concrete is used, forms may be struck after expiry of periods specified in item No. 9.1 (A) for respective item of form work.

3.8.2. All form work shall be removed without causing any shock or vibration as would damage the concrete. Before the soffit and struts are removed, the concrete surface shall be exposed, where necessary in order to ascertain that the concrete has sufficiently hardened. Centring shall be gradually and uniformly lowered in such manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal ties are permitted, they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortar. No permanently embedded metal part shall have less than 25 mm. cover to the finished concrete surface. Where it is intended to re-use the form work, it shall be cleaned and made good to the satisfaction of the Engineer-in-charge. After removal of form work and shuttering, the Executive Engineer shall inspect the work and satisfy by random checks that concrete produced is of good quality.

3.8.3. Immediately after the removal of forms, all exposed bolts etc., passing through the cement concrete member and used for shuttering or any other purpose shall be cut inside the cement concrete member to a depth of at least 25 mm. below the surface of the concrete and the resulting holes be filled by cement mortar. All fine caused by form joints, all cavities produced by the removal of form ties and all other holes and depressions honeycomb spots, broken edges or corners and other defects shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished and of as dry consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surfaces which are pointed shall be kept moist for a period of 24 hours.

If rock pockets/honeycombs in the opinion of the Engineer in-charge are of such an extent or character to effect the strength of the structure materially or to endanger the life of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of the structure affected.

#### **4.0. Mode of measurement and payment:**

4.1. The consolidated cubical contents of concrete work as specified in item shall be measured. The concrete laid in excess of section shown on drawings or as directed shall not be measured. No deduction shall be made for

- (a) Ends of dissimilar materials such as joists, beams, posts, girders, rafters, purline trusses, corbels and steps etc upto 500 Sq. Cm. in section.
- (b) Opening upto 0.1 Sq. M.

4.2. The rate includes cost of all materials, labour, tools and plant required for mixing, placing, positioning, vibrating and compacting, finishing, as directed, curing and all other incidental expenses for producing concrete of required strength. The rate excludes the cost of form work.

4.3. The rate shall be for a unit of one cubic metre.

5.4.1. Providing and laying cement concrete 1:2:4 (1 cement: 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) and curing complete excluding cost of form work and reinforcement for reinforced concrete, work in :

- (A) Foundations footing, base of columns and mass (C) Slabs, landings, shelves, balconies, internal beams girders and cantilever upto floor two level (D) Columns, pillars, posts, and struts upto floor two level, (F) Staircase upto floor two level, (K) Vertical and horizontal fins upto floor two level.

#### **1.0. Materials & Workmanship :**

1.1. The relevant specification of item No 5.3.13. shall be followed except that the work shall be carried out for reinforced concrete work as specified in item 1.2. In addition, the following stipulations shall be followed for:

- (a) The bars shall be kept in position by the following methods:
    - (i) In case of beam and slab construction, sufficient number of precast cover blocks in cement mortar 1:2 (1 cement: 2 coarse sand) about 4 cms. x 4 cms. section and of thickness equal to the specified cover shall be placed between the bars and shuttering as to secure and maintain the requisite cover of concrete over the reinforcement.
- In case of cantilevered or doubly reinforced beams of slabs, the main reinforcing bars shall be held in position by introducing chain spacers or supports bars at 1.0 to 1.2 metres centres.

(ii) In case of columns and walls, the vertical bars shall be kept in position by means of timber templates with slots accurately cut in them. The templates shall be removed after concreting has been done below it. The bars may also be suitably tied by means of annealed steel wires to the shuttering to maintain their position during concreting.

1.2. All bars projecting from pillars, columns, beams, slabs, etc., to which other bars and concrete are to be attached or bounded to later on, shall be protected with a coat of thin neat cement grout, if the bars are not likely to be incorporated with succeeding mass of concrete within the following 10 days. This coat of thin neat cement shall be removed before concreting.

**2.0. Mode of measurement and payment:**

2.1. Relevant specifications of item No. 5.3.13 shall be followed.

2.2. The volume occupied by reinforcement shall not be deducted from R.C.C. work.

2.3. The rate shall be for a unit of one cubic metre.

**5.4.4.** Providing and laying cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm. nominal size) for reinforced concrete chhajjas not exceeding 10 cms. thickness up to floor level including finishing the exposed surface with cement mortar 1 : 3 (1 cement: 3 fine sand) to give a smooth and even surface centering and form work and curing complete excluding cost of reinforcement.

**1.0. Materials & Workmanship :**

1.1. The cement mortar shall conform to M-1.

1.2. The relevant specifications of item No. 5.3.13 and 5.4.1 shall be followed except that the work shall be carried out for reinforced concrete chhajjas not exceeding 10 cms. in thickness.

1.3. The specifications for form work and centering shall be as per item No. 9.1

1.4. The finishing work in cement mortar 1:3 (1 cement: 3 fine sand) shall be carried out as per specifications of item No. 17.59(1). Before the plastering is done, the surface of the concrete shall be raked for proper bond.

**2.0. Mode of measurement and payment:**

2.1 The relevant specifications of item No. 5.3.13 and 5.4.1 shall be followed except that the work of chhajjas up to 10 cms. shall be carried out including centering form work and finishing the surface with cement mortar 1 :3 (1 cement: 3 fine sand).

2.2. The rate shall be for a unit of one cubic metre.

**5.4.10.** Providing Mild Steel reinforcement of R.C.C. work including bending binding and placing in position etc. complete up to floor two level.

**1.0. Materials :** 1.1. Mild steel bars shall conform to M-18. Mild steel binding wires shall conform to M-21.

**2.0. Workmanship :**

2.1. The work shall consist of furnishing and placing reinforcement to the shape and dimensions shown as on the drawings or as directed.

2.2. Steel shall be clean and free from rust and loose mill scale at the time of fixing in position and subsequent concreting.

2.3. Reinforcing steel shall conform accurately to the dimensions given in the bar bending schedules shown on relevant drawings. Bars shall be bent cold to specified shape and dimensions or as directed using a proper bar bender, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in a manner that will injure the material. Bars bent during transport or handling shall be straightened before being used on the work. They shall not be heated to facilitate bending. Unless otherwise specified, a 'U' type hook at the end of each bar shall invariably be provided to main reinforcement. The radius of the bend shall not be less than twice the diameter of the round bar and the length of straight part of the bar beyond the end of the curve shall be at least four times the diameter of the round bar. In case of bars which are not round and in case of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area. The hooks shall be suitably encased to prevent any splitting of the concrete.

2.4. All the reinforcement bars shall be accurately placed in exact position shown on the drawing and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm. in size, and by using stay blocks or metal chair spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars shall not be allowed to sag between supports nor displaced during concreting or any other operations of the work. All devices used for positioning shall be of non-corrodible material. Wooden and metal supports shall not extend to the surface of concrete, except where shown on drawings. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not be allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bars, precast mortar blocks or other approved devices. Reinforcement after being placed in position shall be maintained

in a clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To prevent reinforcement from corrosion, concrete cover shall be provided as indicated on drawing. All the bars protruding from concrete and to which other bars are to be spliced and which are likely to be exposed for a period exceeding 10 days shall be protected by a thick coat of neat cement grout. .

2.5. Bars crossing each other where required shall be secured by binding wires (annealed) of size not less than 1 mm. in such manner that they do not slip over each other at the time of fixing and concreting.

2.6. As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed. When practicable, overlapping bars shall not touch each other, but be kept apart by 25 mm. or 1.25 times the maximum size of the coarse aggregate whichever is greater by concrete between them. Where not feasible, overlapping bars shall be bound with annealed wires not less than 1 mm. thick twisted tight. The overlaps shall be staggered for different bars and located at points along the span where neither shear nor bending moment is maximum.

2.7. Whenever indicated on the drawings or desired by the Engineer-in-charge, bars shall be joined by couplings which shall have a cross-section sufficient to transmit the full stresses of bars. The ends of the bars that are joined by coupling shall be upset for sufficient length so that the effective cross section at the base of threads is not less than normal cross-section of the bar. Threads shall be standard threads. Steel for coupling shall conform to I.S. 226.

2.8. When permitted or specified on the drawings, joints of reinforcement bars shall be butt-welded so as to transmit their full stresses. Welded joints shall preferably be located at points when steel will not be subject to more than 75 per cent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 percent of the rods are welded. Only electric arc welding using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work shall be accepted. Suitable means shall be provided for holding bars securely in position during welding. It shall be ensured that no voids are left in welding and when welding is done in two or three stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale, rust, grease, paint and other foreign matter before welding. Only competent welders shall be employed on the work. The M.S. electrodes used for welding shall conform to I.S. 814. Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number and frequency of test shall be as directed.

### **3.0. Mode of measurement and payment:**

3.1. For the purpose of calculating consumption, wastage shall not be permitted beyond 5 percent. Excess consumption over 5% will be charged at penal rate.

3.2. Reinforcement shall be measured in length including overlaps, separately for different diameters as actually used in the work. Where welding or coupling is resorted to, in place of lap joints, such joints shall be measured for payment as equivalent length of overlap as per design requirement. From the length so measured, the weight of reinforcement shall be calculated in tonnes on the same basis of as per M-18 even though steel is supplied to the contractor by the department on actual weight. Length shall include hooks at the ends. Wastage and annealed steel wire for binding shall not be measured and the cost of these items shall be deemed to be included in the rate for reinforcement.

3.3. The rate for reinforcement includes cost of steel binding wires its carting from Department store to work site., cutting, bending, placing; binding and fixing in position as shown on the drawings and as directed. It shall also include all devices for keeping reinforcement in approved position, cost of joining as per approved method and all wastage and spacer bars.

3.4. The rate shall be for a unit of one Kg.

**5.4.11.** High yield deform bars steel reinforcement for R.C.C. work including bending, binding and placing in position complete upto floor two level.

**1.0. Materials :** 1.1. Cold twisted steel bars (high yield strength steel deformed bars) shall conform to M 19. Mild steel binding wires shall conform to M-21.

**2.0. Workmanship:** 2.1. The specifications of item No. 5.4.10. shall be followed except that the cold twisted steel bars shall be used with or without hooks at the ends. Deformed bars, without hooks shall, however, comply with relevant anchorage requirements.

### **3.0. Mode of measurement and payment:**

3.1. The relevant specifications of item No. 5.4.10 shall be followed.

3.2. The rate shall be for a unit of one Kg.

**5.4.13.** Extra for additional lift of concrete for all R.C.C. work above floor two level excluding cost of reinforcement.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 5.4.1. shall be followed for the work except that the R.C.C. work shall be done for ground floor i.e. above plinth level to first floor level.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 5.4.1. shall be followed except that the rate shall be for extra lift above plinth to floor two level, over and above the rate of concrete at floor two level.

2.2. The rate shall be for a unit of one cubic metre.

**5.4.13. (A)** Extra for additional lift of reinforcement steel for all R.C.C. work above floor two level.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 5.4. 10. or 5.4.11. as may be applicable, shall be followed except that the work shall be carried out above floor two level for each floor.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 5.4.10. or 5.4.11, as may be applicable, shall be followed except that the work shall be carried out above floor two level.

2.2. The rate shall be for unit of one Kg. per floor.

**5.6.2.** Providing upto floor two level precast cement concrete jali or grill 1:2:4(1 cement: 2 coarse sand : 4 graded stone aggregate 6 mm. nominal size.) reinforced with 1: 6 mm. dia. mild steel wire including roughening, cleaning, fixing and finishing in cement mortar 1: 3 and curing complete.

(A) 50 mm. thick (B) 40 mm. thick (C) 25 mm. thick (D) 75 mm thick. (E) 100 mm. thick.

**1.0. Materials: 1.1** Water shall conform to M-1. (2) Cement shall conform to M-3. (3) Sand shall conform to M-6. (4) Mortar shall conform to M-11 (5) Aggregates shall conform to M-12 (6) Mild steel wire shall conform to M-21 (7) Shuttering shall conform to M-26.

**2.0. Workmanship:**

It shall be of cement concrete 1 : 2 : 4 (1 cement: 2 coarse sand; 4 graded stone aggregate 6 mm. nominal size), reinforced with 1.6 mm. dia mild steel wire unless otherwise specified. The thickness of jali shall be as specified in the item.

The jali shall be set in position true to line and level before the jambs sills and soffits of the opening are plastered. It shall then be properly cemented with cement mortar 1 : 3 : (1 cement: 3 sand) and rechecked for levels. Finally the jambs, sills and soffits shall be plastered gripping the Jali uniformly on all sides.

**3.0. Mode of measurement and payment:**

3.1. The item shall be measured in square metre.

3.2. The rate shall be for 1 unit of one square metre.

**5.8.1.** Providing and laying controlled concrete M-150 and curing complete excluding the cost of form work and reinforcement concrete work in:

(A) Foundations, footings, base of columns, and mass concrete. (B) Walls from top of foundations/level upto floor two level. (C) Slabs, landing shelves, Balconies, lintels, beams, girders, and cantilever, upto floor two level, (D) Columns, pillars, posts, and struts upto floor two level (E) Staircase upto floor two level. (F) Vertical and horizontal fins upto floor two level.

**1.0. Materials : 1.1.** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Grit shall conform to M-8 Coarse aggregate shall conform M-12 B.

**2.0. General :**

2.1 The relevant specifications of item No. 5.4.1. of ordinary concrete shall be followed except that the concrete mix shall be designed from preliminary tests, the proportioning of cement and aggregates shall be done by weight and necessary precautions shall be taken in the production to ensure that the required work cube strength is attained and maintained. The controlled concrete shall be in grades of M-100, M-150, M-200, M-250, M-300, M-350, & M-400, with prefix controlled added to it. The letter 'M' refers to mix and numbers specify 28 days works cube compressive strength of 150 mm. cubes of the mix expressed in Kg./Cmt.

2.2 The porportion of cement, sand and coarse aggregates shall be determined by weight, the weight batch machine shall be used for maintaining proper control over the porportion of aggregates as per mix design.

The strength requirements of different grades of concrete shall be as under:

Grade of Concrete	Compressive strength of 15 cms. 28 days, conducted in accordance Preliminary test    Work test		Cement Req. for 1 Cum. as per Circular Dt. 08-12-86
	Min.	cubes in Kg./Cmt. at with I.S. 516-1959. Min.	
M-150	200	150	320
M-200	260	200	400
M-250	320	250	450
M-300	380	300	475
M-350	440	350	500
M-400	500	400	525

In all cases, the 28 days compressive strength specified in above table above be the criteria for acceptance or rejection of the concrete.

Where the strength of a concrete mix as indicated by tests, lies in between the strength of any two grades specified in the above table, such concrete shall be classified in for all purposes-as concrete belonging to the lower of the two grades between which its strength lies.

### 3.0. Workmanship :

3.1. The proportions for ingredients chosen shall be such that concrete has adequate workability for conditions prevailing on the work in question and can be properly compacted with means available except where it can be shown to the satisfaction of the Engineer-in-charge, that the supply of properly graded aggregate of uniform quality can be maintained till the completion of work. Grading of aggregate shall be controlled by obtaining the coarse aggregates, in different sizes and beingint hem in the right proportions as required. Aggregate of different sizes shall be stocked in separate stock piles. The required quantity of material shall be stock piled several hours, preferably a day before use. The grading of coarse and fine aggregate shall be checked as frequently as possible, the frequency for a given job being determined by the Engineer-in-charge to ensure that the suppliers are maintaining the uniform grading as approved for samples used in the preliminary tests.

3.2. In porportioning concrete, the quantity of both cement and aggregate shall be determined by weight. Where the weight of cement is determined by accepting the maker's weight per bag a reasonable number of bags shall be weighted separately to check the net weight. Where cement is weighted frombulk stocks at site and not by bags, it shall be weighted separately from the aggregates. Water shall either be measured by volume in calibarated tanks or weighed. All measuring equipments shall be maintained in clean, and serviceable condition. Their accuracy shall be periodically checked.

3.3. It is most important to keep the specified water cement ratio constant and at its correct value. To this end, moisture content in both fine and coarse aggregates shall be determined by the Engineer-in-charge, according to the weather conditions. The amount of mixing water shall then be adjusted to compensate for variations in the moisture content. For determination of moisture, content in the aggregates, I.S. 2389 (Part-III) shall be referred to. Suitable adjustments also be made in the weights of aggregates due to variation in their moisture content. Minimum quantity of cement used in concrete shall not be less than 220 Kg/M<sup>3</sup> in plain concrete and not less than 250 Kg/M<sup>3</sup> in reinforced concrete.

### 4.0. Mode of measurement and payment:

4.1. The relevant specifications item No, 5.4.1. shall be followed except that the controller concrete R.C.C. work for work as specified in item shall be measured under this item. The rate excludes cost of form work.

4.1. The rate shall be for a unit of one cubic metre.

5.8.2. Providing and laying controlled cement concrete M-200 and curing complete, excluding the cost of form work and reinforcement for reinforced concrete work in :

(A) foundations, footings, base of columns and mass concrete. (B) walls from top of foundation upto floor two. level, (C) Slabs, landing, shelves, balconies lintels, beams, girders and cantilever upto floor two level.. (D) Columns, pillars posts and struts upto two level. (E) Stair cases upto floor two level. (F) Vertical and horizontal fins upto floor two level.

### 1.0. Mode of measurement and payment:



The relevant specifications of item No. 5.8.1. shall be followed except that the grading of concrete shall be controlled concrete M 200 grades for the work as specified in item.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 5.8.1. shall be followed.

**2.2. The rate shall be for one cubic metre.**

**5.8.3.** Providing and laying controlled cement concrete M-250 and curing complete excluding the cost of reinforcement for reinforced concrete work in :

(A) Foundations, footings, bases of columns and the like and mass concrete (B) Walls from top of foundation level upto floor two level (C) Slabs, landings shelves, balconies, beams, girders and cantilever upto floor two level. (D) Columns, pillars, struts upto two level.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 5.8.1. shall be followed except that the grading of concrete shall be controlled concrete M-250 grades for the works as specified in the item.

**2.0. Mode of measurement and payment:**

2.1 The relevant specifications of item No. 5.8.1. shall be followed.

2.2. The rate shall be for a unit of one cubic metre.

**5.00.1.** Providing and laying ordinary cement concrete 1:2:4 (1 cement: 2 coarse sand : 4 graded stone aggregates 20 mm. nominal size) and finishing smooth with curing etc., complete including the cost of form work but excluding the cost of reinforcement of R.C.C. work in :

(I) Slabs upto 8 cms. thickness (II) Slab having more than 8 cms. and upto 10 cms. thickness (III) Slab having more than 10 cms. and upto 13 cms. thickness. (IV) Slab having more than 13 cms. and upto 15 cms. thickness.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 5.4.1. shall be followed for concrete work and relevant specifications of item No. 9.1 shall be followed for form work and centering work. The concrete surface shall be smooth finished in cement mortar 1 : 3 (1 cement: 3 fine sand) as per item No. 17.59 (1). The thickness of the slab shall be as specified in the item.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item 5.4.1. shall be followed except that the item includes cost for providing form-work and centering work as directed.

2.2. The rate shall be for a unit of one cubic metre.

**5.002.** Providing and laying controlled cement concrete M-150 and finishing smooth with curing etc. complete including the cost of form work but excluding the cost of reinforcement for R.C.C. work in:

(I) Slabs upto 8 cms. thickness (II) Slabs more than 8 cms. and upto 10 cms. (III) Slabs more than 10 cms. and upto 13 cms. (IV) Slabs more than 13 cms. and upto 15 cms.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 5.8.1. shall be followed for concrete work and item no. 9.1 shall be followed for form work and centering. The concrete surface shall be smooth finished with cement mortar 1 : 3 (1 cement, 3 fine sand) as per item No. 17.59 (1). The thickness shall be as specified in the item.

**2.1. Mode of measurement and payments :**

2.1. The relevant specifications for item No. 5.8.1. shall be followed except that the item shall include the cost and form work and centering.

2.2. The rate shall be for a unit of one cubic metre.

**5.003.** Providing and laying ordinary cement concrete 1:2:4 (1 cement, 2 coarse sand, 4.graded stone aggregates 20 mm. nominal size) exposed work with curing etc. complete, including the cost of form work but excluding the cost of reinforcement for R.C.C. work in (I) Slab upto 8 cms. thickness (II) Slabs having more than 8 cms. and upto 10 cms. thickness. (III) Slabs having more than 10 cms. and upto 13 cms. thickness (IV) Slabs having more than 13 cms. and upto 15 cms. thickness.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 5.4.1. shall be followed for concrete work and that of form work, and centering work shall be followed as per item No. 9.1. and 9.7. The thickness of the slab shall be as specified in the item.

**2.0 Mode of measurements and payment:**

2.1. The relevant specifications of item No. 5.4.1. shall be followed except that form work and centering work shall be included in the item.

2.2. The rate shall be for a unit of one cubic metre.

**5.004.** Providing and laying controlled cement M-150 exposed work with curing etc. complete including the cost of form work but excluding the cost of reinforcement for R.C.C. work in:

(I) Slabs upto 8 cms. thickness (II) slabs having more than 8 cms. and upto 10 cms. thickness. (III) Slabs having more than 10 cms. and upto 13 cms. thickness (IV) Slabs having more than 13 cms. thickness.

**1.0 Materials & Workmanship: 1.1.** The relevant specifications of item No. 5.4.1. shall be followed for controlled concrete and the relevant specifications of item No. 9.1. and 9.7. shall be followed for exposed concrete form work and centering work. The thickness of the slab shall be as specified in the item.

**2.0 Mode of measurements and payment:**

2.1. The relevant specifications of item No. 5.8.1. shall be followed except that the form work and centering work shall be included in the item.

2.2. The rate shall be for a unit of one cubic metre.

**5.005.** Providing and laying ordinary cement concrete 1:2:4(1 cement: 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) for R.C.C. lintel including finishing smooth with curring etc. complete including the cost of form work but excluding the cost of reinforcement.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 5.4,1. shall be followed for concrete work, relevant specifications of item No. 17.59 (I) for finishing work and relevant specifications of item No. 9.1 shall be followed for form work and centering work. The concrete work shall be followed for the form work and centering work for exposed concrete work.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 5.8.1. shall be followed except that the item includes the cost of form work and centering work for exposed concrete work.

2.2 The rate shall be for a unit of one cubic metre.

**5.006.** Providing and laying ordinary cement concrete 1:2:4(1 cement: 1 coarse sand : 4 graded stone aggregate 20 mm. nominal size) and finishing smooth with curing tie. complete including the cost of form work but excluding reinforcement for R.C.C. work in:

**(A) Beams :** (I) Having cross sectional area 0.05 to 0.08 Sq. metre (II) Having cross sectional area more than 0.08 Sq. mt. upto 0.12 Sq. mt. (III) Having cross sectional area more than 0.12 Sq. mt. upto 0.18 Sq. mt.

**(B) Columns :** (I) Having cross sectional area 0.05 to 0.08 Sq. Mt. (II) Having cross sectional area more than 0.08 Sq. mt. and upto 0.12 Sq. mt. (III) Having cross sectional area more than 0.12 Sq.mt. and upto 0.18 Sq. int.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 5.4.1. shall be followed for concrete work and item No. 9.1 shall be followed for form work and centering work. The finishing shall be done in cement mortar 1: 3 (cement : 3 fine sand) as per item No. 17.59 (I). The cross sectional area of beam shall be specified in item.

**2.0. Mode of measurements and payment:**

2.1 The relevant specifications of item No. 5.4.1. shall be followed but the form work and centering work shall be included in the item.

2.2. The rate shall be for a unit of one cubic metre.

**5.007.** Providing and laying controlled cement concrete M-150 exposed work with curing etc. complete including the cost of form work but excluding the cost of reinforcement for R.C.C. work in :

**(A) Beams:** (I) Having cross sectional area 0.05 to 0.08 Sq. nit. (II) Having cross sectional area more than 0.08 Sq. mt. upto 0.12 Sq. mt. (III) Having cross-sectional area more than 0.12 Sq.mt. upto 0.18 Sq.mt.

**(B) Columns:** (I) Having cross sectional area of 0.05 to 0.08 Sq. mt. (II) Having cross sectional area more than 0.08 Sq. mt. and upto 0.12 Sq.mt. (III) Having cross sectional area more than 0.12 Sq.mt. and upto 0.18 Sq.mt.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 5.8.1. shall be followed for controlled concrete

work for work as specified in item for M-200 and relevant specifications of item 9.1 and 9.7 shall be followed for the form work and centering work for exposed cement work.

**2.0. Mode of measurements and payment:**

2.1 The relevant specifications of item No. 5.8.1. shall be followed excepted (that the form work and centering work shall be included in the item.

2.2. The rate shall be for a unit of one cubic metre.

**5.008.** Providing and laying controlled cement concrete M-200 exposed work with curing etc. complete including the cost of form work but excluding the cost of reinforcement for R.C.C. work in

(A) Beams: (I) Having cross sectional area 0.05 to 0.08 Sq. mt. (II) Having cross sectional area 0.08 Sq. mt upto 0.12 Sq. mt. (III) Having cross sectional area 0.12 Sq. mt. upto 0.18 Sq. mt.

(B) Columns : (I) Having cross sectional area 0.05 to 0.08 Sq. mt. (II) Having cross sectional area more than 0.08 Sq. mt. and upto 0.12 Sq. mt. (III) Having cross sectional area more than 0.12 Sq. mt. and upto 0.18 Sq. mt.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 5.8.1. shall be followed for controlled concrete work as specified in item for M-200 and relevant specifications of item 9.7 and 9.1 shall be followed for the form work and centering work for exposed cement work.

**2.0. Mode of measurements and payment:**

2.1 The relevant specifications of item No. 5.8.1. shall be followed except that item includes the cost of form work and centering work for exposed work.

2.2. The rate shall be for a unit of one cubic metre.

**5.009.** Providing and laying controlled cement concrete M- 250 exposed work with curing etc. complete including the cost of form work but excluding the cost of reinforcement for R.C.C. work in

(A) Beams : (I) Having cross sectional area 0.05 to 0.08 Sq. mt, (II) Having cross sectional area more than 0.08 Sq. mt. and upto 0.12 Sq. mt. (III) Having cross sectional area more than 0.12 Sq. mt. and upto 0.18 Sq. mt.

(B) Columns : (I) Having cross sectional area 0.05 to 0.08 Sq. mt. (II; Having cross sectional area more than 0.08 Sq. mt. and upto 0.12 Sq. mt. (III) Having cross sectional area more than 0.12 Sq. mt. and upto 0.18 Sq. mt.

**1.0 Materials & Workmanship : 1.1** The relevant specifications of item No. 5.8.1. shall be followed for controlled concrete work for the work as specified in the item for M-250 and the relevant R.C.C. lintels shall be carried out.

**2.0. Mode of measurement and payment:**

2.1. The relevant specifications of item No. 5.4.1. shall be followed except that the cost of form work finishing and centering shall be included in the item.

2.2. The rate shall be for a unit of one cubic metre.

## SECTION-6

### DETAILED SPECIFICATIONS - MASONRY WORK

6.12. (A) Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg./Sq. Cm. in foundations and plinth in cement mortar 1 : 5 (1 cement: 5 fine sand) modular bricks.

**1.0 Materials :** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Brick shall conform to M-15. Cement mortar shall conform to M-11.

**2.0. Workmanship:**

**2.1. Proportion:**

2.1.1. The proportion of the cement mortar shall be 1 : 5 (1 cement: 5 fine sand) by volume.

2.2. Wetting of bricks : 2.2.1. The bricks required for masonry shall be thoroughly wetted with clean water for about two hours before use or as directed. The cessation of bubbles, when the bricks are wetted with water is an indication of thorough wetting of bricks.

**2.3. Laying:**

2.3.1. Bricks shall be laid in English bond unless directed otherwise. Half or cut bricks shall not be used except when necessary to complete to bond; closers in such case shall be cut to required size and used near the ends of walls.

2.3.2. A layer of mortar shall be spread on full width for suitable length of the lower course. Each brick shall first be properly bedded and set home by gently tapping with handle of trowel or wooden mallet. Its side face shall be flushed with mortar before the next brick is laid and pressed against it. On completion of course, the vertical joints shall be fully filled from the top with mortar.

2.3.3. The walls shall be taken up truly in plumb. All courses shall be laid truly horizontal and all vertical joint shall be truly vertical. Vertical joints in alternate course shall generally be directly one over the other. The thickness of brick course shall be kept uniform.

2.3.4. The brick shall be laid with frog upwards. A set of tools comprising of wooden straight edges, mason's spirit level, square half metre rule, and pins, string and plumb shall be kept on the site of work for frequent checking during the progress of work.

2.3.5. Both the faces of walls of thickness greater than 23 cms. shall be kept in proper place. All the connected brick work shall be kept not more than one metre over the rest of the work. Where this is not possible, the work shall be raked back according to bond (and not left toothed) at an angle not steeper than 45 degrees.

2.3.6. All fixtures, pipes, outlets of water, hold fasts of doors and windows etc. which are required to be built in wall shall be embedded in cement mortar.

#### **2.4. Joints:**

2.4.1. Bricks shall be so laid that all joints are quite flush with mortar. Thickness of joints shall not exceed 12 mm. The face joints shall be raked out as directed by taking tools daily during the progress of work, when the mortar is still green so as to provide key for plaster or pointing to be done.

2.4.2. The face of brick shall be cleaned the very day on which the brick work is laid and all mortar dropping removed,

**2.5. Curing.** 2.5.1. Green work shall be protected from rain suitably. Masonry work shall be kept moist on all the faces for a period of seven days. The top of masonry work shall be kept well wetted at the close of the day.

2.5. Preparation of foundation bed : 2.6.1. If the foundation is to be laid directly on the excavated bed, the bed shall be levelled, cleared of all loose materials, cleaned and wetted before starting masonry. If masonry is to be laid on concrete footing, the top of concrete shall be cleaned and moistened. The contractor shall obtain the engineer's approval for the foundation bed, before foundation masonry is started. When pucca flooring is to be provided flush with the top to plinth, the inside plinth offset shall be kept lower than the outside plinth top by the thickness of the flooring.

#### **3.0. Mode of measurements and payment:**

3.1. The measurements of this item shall be taken for the brick masonry fully completed in foundation upto plinth. The limiting dimensions not exceeding those shown on the plans or as directed shall be final. Battered, tapered and curved portions shall be measured net.

3.2. No deduction shall be made from the quantity of brick work, nor any extra payment made for embedding in masonry or making holes in respect of following items :

(1) Ends of joints, beams, posts, girders, rafters, purlins, trusses, corbel steps etc. where cross sectional area does not exceed 500 Sq.Cm.

(2) Openings not exceeding 1000 Sq. Cm.

(3) Wall plates and bed plates, bearing of slabs, chhajjas and the like whose thickness does not exceed 10 Cms. and the bearing does not extend to the full thickness of wall.

(4) Drainage holes, and recesses for cement concrete blocks to embed hold fasts for doors, windows etc.

(5) Iron fixtures, pipes upto 300 mm. dia; hold fasts and doors and windows built into masonry and pipes etc. for concealed wiring.

(6) Forming chases of section not exceeding 350 Sq. Cm. in masonry.

3.3. Apertures for fire places shall not be deducted nor shall extra labour required to make splaying of jambs, throating and making Arches over the aperture be paid for separately.

3.4 The rate shall be for a unit of one cubic metre.

**6.12. (B)** Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. In foundations and plinth in cement mortar 1 : 5 (1 cement : 5 fine sand) conventional bricks.

**1. Materials :** Cement mortar of proportion 1 : 5 shall conform to M-11. Conventional bricks shall conform to M-15.

**2. Workmanship :** The relevant specifications of item No. 6.12 (A) shall be followed except that the masonry work shall be carried out by using conventional bricks.

**3.0. Mode of measurements and payment:**

3.1. The relevant specifications of item No. 6.12 shall be followed.

3.2. The rate shall be for a unit of one cubic metre.

**6.13. (A)** Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. cm. In foundation and plinth in cement mortar 1:6 (1 cement, 6 fine sand), with modular bricks.

**1.0. Materials:** Cement mortar of proportion of 1:6 shall conform to M-11. Bricks shall conform to M-15.

**2.0. Workmanship: 2.1.** The relevant specifications of item No. 6.12. (A) shall be followed except that the bricks to be used shall be modular bricks and the proportion of cement mortar is 1:6.

**3.0. Mode of measurements and payment:**

3.1. The relevant specifications of item No. 6.12 (A) shall be followed.

3.2. The rate shall be for a unit of one cubic metre.

**6.13. (B)** Bricks work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. In foundation and plinth in cement mortar 1:6 (1 cement: 6 fine sand) with conventional bricks.

**1.0. Materials:** Water shall conform to M-1, Cement mortar shall conform to M-11. Bricks shall conform to M-15.

**2.0. Workmanship: 2.1.** The relevant specifications of item No. 6.12. (A) shall be followed except that the bricks to be used shall be conventional bricks and proportion of cement mortar shall be in C.M. 1 : 6.

**3.0. Mode of measurements and payment:**

3.1. The relevant specifications of item No. 6.12. (A) shall be followed.

3.2. The rate shall be for a unit of one cubic metre.

**6.0.01 (A)** Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. In foundation and plinth in cement mortar 1:8 (1 cement: 8 fine sand) with Modular bricks.

**1.0. Materials:** Water shall conform to M-1, Cement mortar shall conform to M-11. Bricks shall conform to M-15.

**2.0. Workmanship : 2.2.** The relevant specifications of item No. 6.12 (A) shall be followed except that the proportion of mortar shall be C.M. 1: 8.

**3.0. Mode of measurements and payment:**

3.1. The relevant specifications of item No. 6.12. (A) shall be followed.

3.2. The rate shall be for a unit of one cubic metre.

**6.0.01 (B)** Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. in foundation and plinth in cement mortar 1:8 (1 cement: 8 fine sand), with conventional bricks.

**1.0. Materials :** Water shall conform to M-1. Bricks shall conform to M-15. Cement mortar shall conform to M-11.

**2.0. Workmanship : 2.1.** The relevant specifications of item No. 6.12. (A) shall be followed except that the proportion of cement mortar shall be 1:8 and bricks used shall be conventional bricks.

**3.0. Mode of measurements and payment:**

3.1. The relevant specifications of item No. 6.12. (A) shall be followed.

3.2. The rate shall be for a unit of one cubic metre.

**6.0.02. (A)** Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. in foundation and plinth in lime mortar 1: 1.5 (1 Lime putty, 1.5 fine sand) modular bricks.

**1.0. Materials:** Lime mortar of proportion (1:1.5) shall conform to M-10. Bricks shall conform to M-15.

**2.0. Workmanship :** The relevant specifications of item No. 6.12. (A) shall be followed except the masonry work shall be carried out in lime mortar 1:1.5 (1 Lime putty 1.5 fine sand) in foundation and plinth.

**3.0. Mode of measurements and payment:**

3.1. The relevant specifications of item No. 6.12. (A) shall be followed.

3.2. The rate shall be for a unit of one cubic metre.

**6.0.02 (B)** Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/sq. Cm. in foundation and plinth in lime mortar 1:1.5 (1 Lime putty: 1.5 fine sand) conventional bricks.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 6.12. (A) and 6.0.02 (A) shall be followed except that the masonry work shall be carried out in lime mortar 1: 1.5 (1 Lime putty: 1.5. fine sand) in foundation and plinth.

**2.0. Mode of measurements and payment:**

2.1. The relevant specifications of item -No. 6.12. (A) shall be followed.

**6.0.03. (A)** Brick using common burnt clay building brick having crushing strength not less than 35 Kg/Sq. Cm. in foundation and plinth in lime mortar 1.2 (1 Lime putty : 2 fine sand) modular bricks.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 6.12. (A) and 6.00. (A) shall be followed except that the masonry work shall be carried out in lime mortar 1 : 2 (1 Lime putty: 2 fine sand) in foundation and plinth.

**2.0. Mode of measurements and payment:**

2.1. The relevant specifications of item No. 6.12. (A) shall be followed.

2.2. The rate shall be for a unit of one cubic metre.

**6.0.0.3 (B)** Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/Sq. Cm. in foundation and plinth in Lime mortar 1 : 2 (1 Lime putty : 2 fine sand) conventional bricks.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 6.12. (A) and 6.0.0.3 (A) shall be followed except that the masonry work shall be carried out in lime mortar 1 :2 (1 Lime : 2 fine sand) using conventional brick in foundation and plinth.

**2.0. Mode of measurements and payment:**

2.1. The relevant specifications of item No. 6.12. (A) shall be followed.

2.2. The rate shall be for a unit of one cubic metre.

**6.19 (A)** Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/ per sq. Cm. for super structure above plinth level upto floor two level in cement mortar 1:5 (1 cement; 5 fine sandy modular bricks.

**Materials:** Brick shall conform to M-15. Cement mortar shall conform M-11.

**2.0. Workmanship:**

2.1. The relevant specifications of item No. 6.12. (A) shall be followed except that the masonry work shall be carried out above plinth level to floor two level i.e. for ground floor.

2.2. The frames of doors, windows, cupboards etc. shall be housed into the brick work at the correct location and level as directed. The heavy steel doors, window frames etc. shall be built in with brick work, but for ordinary steel doors and windows required opening for frames, hold-fasts etc. shall be left in the wall and frames embedded later on in order to avoid damage to the frames.

2.3. Necessary scaffolding shall be provided. The supports of the scaffolding shall be sound and strong tied together with horizontal pieces over which the scaffolding planks shall be fixed. Simple scaffolding shall be allowed normally. In this case scaffolding hole shall rest in hold header horizontal course only. Minimum number of holes shall be left in brick work for supporting horizontal scaffolding holes.

The contractor is responsible for providing and maintaining sufficiently strong scaffolding so as to withstand all loads likely to come upon it.

2.4. For the face of brick work, where plastering is to be done, joints shall be raked out to a depth not less than thickness of joints. The face of brick work shall be cleaned and mortar dropping removed on very same day that brick work is laid.

**3.0. Mode of measurement:**

3.1. The masonry work of G.F. i.e. above plinth level to floor two level shall be measured and paid under this item.

3.2. Brick work in parapet shall be included in the corresponding masonry item of storey immediately below the floor above which the parapet is built.

3.3. No deduction shall be made from quantity of brick work. No extra payment shall be made for embedding in masonry

or making holes in respect of following items :

- (1) Ends of joints, beams, posts, girders, rafters, purlins truses corbel, steps etc. where cross sectional area does not exceed 500 Sq.Cm.
- (2) Opening not exceeding 1000 Sq. Cm.
- (3) Wall plate, sand bed plates, bearing of slab, chhajjas and like whose thickness does not exceed 10 Cms. and the hearing does not extend the full thickness of wall.
- (4) Drainage holes and recesses for cement concrete blocks to embed hold fasts for doors, windows etc.
- (5) Iron fixtures pipes upto 300 mm. dia. hold fasts of doors, and windows built into masonry and pipes etc. for concealed wiring.
- (6) Forming charges of section not exceeding 350 Sq. Cm. in masonry.
- (7) Apertures for fire places, shall not be deducted nor shall extra labour required to make spaying of Jambs, throating and making trenches over the aperture be paid for separately.

3.4. The rate shall be for a unit of one cubic metre.

**6.19.(B)** Brick work using common burnt clay building bricks having crushing strength not less than 35 Kg/sq. cm. for super structure above plinth upto floor two level in cement mortar 1:5. (1 cement; 5 fine sand) conventional bricks.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 6.19. (A) shall be followed except that brick masonry work shall be carried out with conventional bricks.

**2.0. Mode of measurements and payment:**

2.1. The relevant specifications of item No. 6.19 (A) shall be followed.

2.2. The rate shall be for a unit of one cubic metre.

**6.20.** Extra for brick in super structure above floor two level.

**1.0. Materials & Workmanship:** The relevant specifications of item masonry work to be carried out shall be followed except that this work is for additional lift of one floor above floor two level.

**2.0. Mode of measurements and payment:**

2.1. The relevant specifications of item No. 6.19 (A) masonry work shall be followed.

2.2 The extra payment shall be made for additional life above floor two level to each additional floor over and above the rate of masonry work.

2.3. The rate shall be for a unit of one cubic metre.

**630.1. (A)** Half brick masonry in common burnt clay building bricks having crushing strength not less than 35 kg/sq. cm. in cement mortar 1:4(1 cement: 4 coarse sand) in super structure above plinth level upto floor two level with modular bricks.

**1.0 Materials:** Bricks shall conform to M -15. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Cement mortar shall conform to M-11.

**2.0. Workmanship:**

2.1. Relevant specifications of bricks, wetting and laying of bricks, joints, curing etc. shall conform to item No. 6.19 (A) except the brick work of half bricks shall be carried out.

2.2. Cement mortar used in masonry work shall be in proportion of 1 part of cement and 4 parts of sand by volume.

2.3. All bricks shall be laid strecher wise, breaking joints with those in the under and lower courses. The wall shall be taken truly plumb. All courses shall be laid truly horizontal and all vertical joints shall be truly vertical. The bricks shall be laid with frogs upwards. A set of masons tools shall be maintained on work as required for Sequent checking.

**3.0 Mode of measurement and payment.**

3.1. The half brick masonry work in foundation and plinth shall be measured under this item, the limiting dimensions shall not exceed those shown in the plan or as directed. Any work done extra over the specified dimensions shall be ignored.

3.2. The relevant specifications of item No. 6.12 shall be followed. The length shall be measured nearest to one Cm.

3.3. The rate shall be for a unit of sq. metre.

**630.1. (B)** Half brick masonry in common burnt clay building bricks having crushing strength not less than 35 kg/sq. cm. in

cement mortar 1 : 4 (1 cement: .4 coarse sand) for superstructure above plinth level upto floor two level with conventional bricks.

**1.0. Materials & Workmanship : 1.1** The relevant specifications of item No. 6.30 (A) shall be followed for bricks, wetting of bricks, joints, curing, except that the bricks to be used shall be conventional bricks instead of Modular bricks.

**2.0. Mode of measurements and payment:** 2.1. The limiting dimensions shall no. exceed those shown in the plan or as directed. Any work done extra over specified dimensions shall be ignored.

**6.30II. (A)** Half brick masonry in common burnt clay building bricks having crushing strength not less than 35 Kg/sq. cm. in cement mortar 1:5(1 cement: 5 coarse sand) in foundation and plinth modular bricks.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 6.30.1 (A) shall be followed except the half brick masonry work shall be carried out in cement mortar 1:5(1 cement: 5 coarse sand) with modular bricks in foundation and plinth.

**2.0. Mode of Measurement and payment:**

2.1. The relevant specifications of item No. 6.30 (I)-A shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**6.30. II. (B)** Half brick masonry in common clay building bricks having crushing strength not less than 35 Kg/sq. cm. in cement mortar 1:5(1 cement: 5 coarse sand) in foundation and plinth using conventional bricks.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 6.30.(I)-A shall be followed except that the half bricks work shall be carried out in cement mortar 1: 5 (1 cement: 5 coarse sand) in foundation and plinth using conventional bricks.

**2.0. Mode of measurements and payment:**

2.1. The relevant specifications of item No. 6.30. (I)-A shall be followed.

2.2. The rate shall be for a unit of one Sq. metre.

**6.30. III. (A).** Half brick masonry in common burnt clay building bricks having crushing strength not less than 35 kg/sq.cm. in lime mortar 1 :1.5 (1 Lime putty 1: 1.5 coarse sand) in foundation and plinth with modular bricks.

**1.0. Materials:** Modular bricks shall conform to M-15. Water shall conform to M-1 Lime mortar of proportion L.M. 1: 1.5 (1 Lime putty : 1.5 coarse sand) shall be conform to M-10.

**2.0. Workmanship:** The relevant specifications of item No. 6.30 (I)-A shall be followed except that half brick masonry work shall be carried out in Lime Mortar 1:1.5 (1 Lime putty: 1.5 coarse sand) in foundation and plinth using conventional bricks.

**3.0. Mode of measurements and payment:**

3.1. The relevant specifications of item No. 6.30 (I)-A shall be followed.

3.2. The rate shall be for a unit of one sq. metre.

**6.30. III (B)** Half brick masonry in common burnt clay building bricks having crushing strength not less than 35 kg/sq. cm. in lime mortar 1 : 1.5 (1 lime putty : 1.5 coarse sand) in foundation and plinth using conventional bricks.

**1.0. Materials :** Conventional bricks shall conform to M-15. Water shall conform to M-1. Lime mortar of proportion L.M. 1 : 1.5 (1 Lime putty : 1 coarse sand) shall be conform to M-10.

**2.0. Workmanship:** The relevant specifications of item No. 6.30 (I)-A shall be followed except that half brick masonry work shall be carried out in Lime Mortar 1:1.5 (Lime putty : 1.5 coarse sand) in foundation and plinth using conventional bricks.

**3.0. Mode of measurements and payment:**

3.1. The relevant specifications of item Na. 6.30 (I)-A shall be followed.

3.2. The rate shall be for a unit of one Sq. metre.

**6.30. IV. (A)** Half brick masonry in common burnt clay building bricks having crushing strength not less than 35 kg/sq. cm. in cement mortar 1 : 5 : (1 cement: 5 coarse sand) with hoop iron 25 mm x 1.6 mm. or equivalent reinforcement fit every third coarse embedded in cement mortar in foundation and plinth with modular bricks.

**1.0. Materials:** Bricks shall conform to M-15. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Cement mortar shall conform to M-11. M.S. reinforcement shall conform to M-18.

**2.0. Workmanship:**



2.1. Relevant specification of bricks; wetting and laying of bricks, joints, curing, scaffolding etc. shall conform to item No. 6.30 (I)- A except the following:-

2.2. Cement mortar used in masonry work shall be proportion to 1 part of cement and 5 parts of sand by volume and shall conform to M-11, and this work is for half brick thickness for partitions walls.

2.3. The hoop iron 25 mm x 1.6 mm. or equivalent reinforcement shall be provided at every third course. The ends of reinforcement shall be fully embedded in main walls on both sides as directed. Reinforcement shall be placed on the top of the bottom-most course. Laps shall be of 15 cms. of mild steel bars of hoop iron.

2.4. The joints in the course, where reinforcement is placed shall admit of mortar cover to the reinforcement.

**3.0. Mode of measurement and payment;**

3.1. The rate shall be for half brick masonry work including providing specified reinforcement, the limiting dimensions not exceeding those in the plan or as directed. The length shall be measured nearest to one Cm.

3.2. Any work done extra over specified dimensions shall be ignored.

3.3. The rate shall be for a unit of one Sq. metre.

**6.30. IV (B)** Half brick masonry in common burnt clay building bricks having crushing strength not less than 35 kg/sq. cm. in cement mortar 1 : 5 (1 cement: 5 coarse sand) with hoop iron 25 mm. x 1.6 mm or equivalent reinforcement at every third course embedded in cement mortar in foundation and plinth, with conventional bricks.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 6.31.1(A) shall be followed except that the work is to be carried out with conventional bricks instead of Modular bricks.

**2.0. Mode of measurements and payment:**

2.1. The rate shall be for brick work, including providing specified reinforcement, the limiting dimensions not exceeding those shown in the plan or as directed. The length shall be measured nearest to one Cm.

2.2. The work done extra over specified dimensions shall be ignored.

2.3. The rate shall be for a unit of one Sq. metre.

**6.33: (A)** Extra for half brick masonry in superstructure above floor two level in Modular bricks.

**1.0 Materials & Workmanship : 1.1.** The relevant specifications of item Mo. 6.30 (A) & 6.30 (B) shall be followed except that this work is for additional lift of each floor above floor two level using Modular bricks.

**2.0. Mode of measurements and payment:**

2.1. The payment shall be made for the half brick masonry work carried out above floor two level for each additional lift over and above the payment of work upto floor two level. 2.2. The rate shall be for a unit of one sq. metre per floor.

**6.33. (B)** Extra for half brick masonry work in superstructure above floor two level. Conventional bricks.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 6.30 (A) & 6.30 (B) shall be followed except that this work is for additional lift of each floor above floor two level using conventional bricks.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 6.33 (A) shall be followed.

2.2. The rate shall be for a unit of one Sq. metre per floor.

**6.55. (1)** Half bricks thick Honey comb brick work with burnt clay building bricks having crushing strength not less than 35 kg/sq. cm. in C.M. 1 : 4 (1 cement. 4 coarse sand)

**1.0. Materials :** Bricks shall conform to M-15 Cement of proportion shall conform to M-11.

**2.0. Workmanship :** The relevant specifications of item No. 6.32. (A) shall be followed except that the masonry work shall be carried out Honey-comb in thickness of half bricks in cement mortar 1:4 (1 cement: 4 coarse sand) and where directed with all lifts.

**3.0. Mode of measurements and payment:**

3.1. The honey-comb work shall be measured in Sq. metres. The full area of honey-comb work shall be measured without deduction for openings.

3.2. The rate shall be for a unit of one square metre of wall surface.

## SECTIONS DETAILED SPECIFICATIONS - RUBBLE MASONRY WORKS

7.6. (I) Uncoursed rubble masonry with hard stone approved quality in foundations and plinth in cement mortar 1:6 (1 cement : 6 coarse sand) including levelling etc. complete.

**1.0. Materials :** The cement mortar shall conform to M-11. Stones shall conform to M-16.

### **2.0. Workmanship:**

2.1. Dressing of stones : Stone used for uncoursed rubble masonry work shall be hammer dressed on the sides, and beds in such a way as to close up with the adjacent stone in the masonry work as strongly as possible. The face, stones shall be dressed in such a manner as to give a specified Pattern such as Blygonal tucing etc. The face of the stones shall be so dressed that busing on the exposed face shall not project by more than 40 mm. from the general wall surface and on the face to be plastered. It shall not project by more than 19 mm. nor shall have depressions more than 10 mm. from the average wall surface.

2.2. Laying : All the stone shall be sufficiently wetted before laying to prevent absorption of water from mortar. The wall shall be built true to plumb (or true to required batter when so specified). All connected walls in a structures shall normally be raised up uniformly and regularly. However if for any specific reason, one part of masonry is required to be left behind, the wall shall be racked back at an angle not steeper than 45°. Vertical Toothed joints in masonry shall not be allowed. The work shall be carried out regularly and masonry of any day will not be raised by more than 1 metre in height.

2.3. The stone shall be laid in an uncoursed fashion or random facing etc. However the masonry is required to be brought to level at various stages viz. plinth level, window sill level, roof level and any other level specifically shown in the drawings. This may be done by first by adjusting the laying of stones to one level and then by providing levelling course of cement concrete 1: 6 : 12 (1 cement: 6 sand : 12 graded stone aggregate 20 mm. nominal size) or as otherwise specified.

2.4. Proper bonding shall be achieved by closely filling in adjacent stones as well as by using bond stones or through stones as described herein below. Face stones shall extend back sufficiently and bond well with the masonry. The stone shall be carefully set so as to break joints and avoid formation of vertical joints. The depth of stone from the face of wall inwards shall not be less than weight or breadth at the face. The hearting or interior filling of the wall shall consist of rubble stones which may be of any shape. Neither the face stone nor the hearting stone shall be so small to pass through circular ring of 150 mm. internal diameter in any direction nor shall any of them shall have minimum thickness 100 mm.

2.5. All stone shall be carefully laid, hammered down by a wooden mallet into position and solidly embedded in mortar, chips and spawls of stone may be used wherever necessary to avoid thick mortar beds or joints at the same time ensuring that no hollow space is left anywhere in the masonry. The chips used shall not be more than 20% by volume of masonry. The hearting shall be laid nearly level with face stones except that at about one metre intervals vertical bond stone or plums projecting about 150 to 200 mm. shall be firmly embedded to form vertical bonding in masonry.

2.6. Bond stones : Bond stones or through stones running right across the thickness of the wall shall be provided in walls upto 600 mm. thick. In thicker walls two stones overlapping each other by atleast 150 mm. shall be provided across the thickness of the wall to form bond stones. There shall be atleast one bond stone for every 0.5 Sq. M. of wall surface. The bond stone shall be marked by a distinguishing letter during construction for subsequent verification and shall be laid staggered in subsequent layers.

2.7. Quoins: The quoins or corners stone shall be selected stone nearly dressed with hammer and/or chisel to form the required corner angle and laid header and stretcher alternatively. The bed and top surface of quoins shall be chiselled dressed to give horizontal joints. The quoins shall have a uniform chisel draft of at least 25 mm. width at four edges of each exposed face, all the edges of the same face being in one plane. No quoins stone shall be smaller than 0.025 Cum. in volume.

2.8. Jamb Stones: The jamb stone shall be made with stone specified for quoins, except that the stone provided on the jambs shall have their length equal to thickness of wall upto 600 mm. and a line of headers shall be provided for walls thicker than 600 mm. as specified for bond.

2.9. Joints: All the joints shall be completely filled with mortar and their width shall not exceed 25 mm. When plastering or pointing is not required to be done, the joints shall be struck flush and finished simultaneously while laying the stone. Otherwise the joints shall be racked to a minimum depth of 20 mm. by a racking tools, during progress of laying while the mortar is still green.

2.10. Scaffolding : Single or double scaffolding -ha!' be used. The scaffolding shall be strong and sound. The holes left in

masonry for supporting scaffolding shall be filled And made good before plastering.

2.11. Curing: Gree work shall be projected from rains by suitably covering the same. Masonry shall be kept constantly moist on all the faces for a period of atleast 7 days. The top of masonry shall be flooded at the close of the day.

**3.0. Mode of measurements & payment:** 3.1. All work shall be measured on the basis of finished dimensions and measured net except where otherwise specified. Only specified dimensions shall be allowed. Anything extra shall be ignored. The masonry work in foundation and plinth shall be measured under this item. No deduction shall be made nor extra payment made for the following :

- (a) Ends of joints, beams, posts, girders, rafters, purlins, trusses, corbels, etc. each upto 500 Sq. cm. in section.
- (b) Opening each upto 0.1 sq. m.
- (c) Wall plates and bed plates bearings of chhaja and like upto 10 cm. depth (bearing of floor and roof slabs shall be deducted from masonry).
- (d) Drain holes and recesses for cement concrete blocks to embed hole fasts for doors windows.
- (e) Building in the masonry iron fixtures pipes upto 300-mm. dia. hold fasts of doors and windows.
- (f) Forming cheses in masonry upto section of 350 Sq. Cm.

3.2. The rate shall be for a unit of one cubic metre.

**7.6 (II)** Uncoursed rubble masonry with hard stone of approved quality in foundations and plinth” in cement mortar 1 : 5 (1 cement, 5 coarse sand) including levelling up etc. complete.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 7.6. (I) shall be followed except that the proportion of cement mortar shall be in C.M. 1:5(1 cement: 5 coarse sand).

**2.0. Mode of measurements & payment:** 2.1. The relevant specifications of item No. 7.67 (I) shall be followed.

2.2. The rate shall be for a unit of one cubic metre.

**7.6. (III)** Uncoarsed rubble masonry with hard stone of approved quality in foundation and plinth in lime mortar 1 : 1.5 (1 lime putty: 1.5 coarse sand) including levelling etc. complete.

**1.0. Materials :** Lime mortar shall conform to M-10. The rubble shall conform to M-16.

**2.0. Workmanship :** The relevant specifications of item No. 7.6 (I) shall be followed.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 7.6 (I) shall be followed.

3.2. The rate shall be for a unit of one cubic metre.

**7.17. (A)** Coarsed rubble masonry with hard stone of approved quality in foundation and plinth in cement mortar 1 : 6 (1 cement: 6 coarse sand) etc. complete.

**1.0 Materials :** 1 Cement mortar shall conform to M-1 1. The stone shall conform to M-16.

**2.0 Workmanship :**

2.1. Dressing Stone: The face stone shall be hammer dressed so as to give approximately rectangular blocks. They shall be squared on bed and side joints. The bed joints shall be rough chisel dressed for a depth of atleast 50 mm. back from the faces and the side joints shall be so dressed to a depth of atleast 40 mm. back from the face, such that no portion of the dressed surface is more than 10 mm. from a straight edge held against the surface. The remaining portions of surface shall not project above the chisel dressed bed and side joints. The bushing on the face shall not project by more than 40 mm. on an exposed face and 10 mm. on a face to be plastered. The hammer dressed stone shall also have a rough tooling for a minimum width of 25 mm. along the four edges of the face of the stone.

2.2. Laying: 2.2.1. All stones shall be wetted before laying. The wall shall be built up truly plumb (or to required batter where so specified).

All connected masonry in a structure shall normally be raised up uniformly and regularly. However if for any specific reasons one part of wall is required to be left behind, such wall shall be raked back at an angle not steeper than 45°. Vertical Toothed joints in masonry shall not be allowed. The work shall be carried up regularly and masonry on any day shall not be raised by more than 1 metre in height.

2.2.2. All the courses shall be laid truly horizontal. The height of course shall not be less than 150 mm. nor more than 300mm. Face stone shall be laid in alternate header and strecher Fashion.

They shy 11 be so arranged as to break joints by atleast 75 mm. Stones shall be laid with grains horizontal so that the load is

transmitted along the direction of their maximum crushing strength The depth of :one shall not be less than the height or breadth. The breadth of a face stone shall also be not less than 150mm. Each face stone shall be of the same height in any given course. The courses shall be built in perpendicular to the pressure which the masonry will bear. In case of battered walls (such as retaining walls) the beds of the stone and the plane of courses shall be laid with their bed perpendicular to the battered face.

2.2.3. The hearting or the interior filling of the wall shall consist of flat bedded stone carefully laid on their proper beds in mortar, chips and spawls of stone being used where necessary to avoid excessive use of mortar, care being taken to see that no hollow space is left anywhere in the masonry. Chips shall not be used below the hearting stone to bring these up to the level of stones. The use of chips shall be restricted to be, filling of interstices between the hearting stone but the volume of chips shall be limited to 15% of the total volume of the masonry for masonry.

2.3. Bond Stones: The relevant specifications of item No. 7.6. (I) para 2.6. shall be followed except that the hard stone shall be provided for at least 1.8 m. length of every course.

2.4. Quoins: The quoins, which shall be of the same height as the course to which it belongs shall be formed from elected stone of at least 400 mm. length. They shall be laid square or beds as stretchers and headers alternatively. The beds shall be rough, chisel dressed to a depth of at least 100 mm. These stones shall have a minimum uniform chisel drafts of 25 mm. width at four edges. All the edges being in the same plane, quoins stone shall not be smaller than 0.025 cum. in volume and it shall also be not less than 300 mm. in length, 25% of them being not less 500 mm. in length.

2.5. Joints : All the bed joints shall be horizontal and all sides joints shall be vertical. Face joints shall not be more than 10 mm. thick. All joints shall be properly and completely filled with mortar. On cases where no plastering or pointing is required to be done the joint shall be struck flush and finished simultaneously while laying stones. In other cases the joint shall be raked to a minimum depth of 20 mm. by raking tools during the progress of work while the mortar is still green.

2.6. Curing: The relevant specifications of item No. 7.6. (I) para 2.9. shall be followed.

### **3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 7.6(I) shall be followed.

3.2. The rate shall be for a unit of one cubic metre.

**7.17. (B)** Coarsed rubble masonry with stone of approved quality in foundations and plinth in cement mortar 1:5(1 cement : 5 coarse sand) etc. complete.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 7.17 (A) shall be followed except that the proportion of cement mortar shall be C. M. 1: 5 (1 cement 1:5 coarse sand).

### **2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 7.17 (A) shall be followed.

2.2. The rate shall be for a unit of one cubic metre.

**7.17. (C)** Coarsed rubble masonry with stone of approved quality in foundation and plinth in CM. 1:4(1 cement: 4 coarse sand) etc. complete.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 7.17 (A) shall be followed except that proportion of mortar shall be C. M. 1:4 (1 cement: 4 coarse sand).

### **2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 7.17 (A) shall be followed.

2.2. The rate shall be for a unit of one cubic metre.

**7.17. (D)** Courses rubble masonry with stone of approved quality in foundations and plinth in C. M. 1: 3 (1 cement: 3 coarse sand) etc. complete.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No.7.17 (A) shall be followed, except that the proportion of mortar shall be C.M. 1 : 3 (1 cement: 3 coarse sand).

### **2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 7.17 (A) shall be followed.

2.2. The rate shall be for a unit of one cubic metre.

**7.19. (A)** Coarsed rubble masonry with stone of approved quality for superstructure above plinth level upto floor two level in C.M. 1 :6 (1 cement 6 coarse sand) etc. complete.

### 1.0. Materials & Workmanship :

The relevant specifications of item No. 7.17 (A) shall be followed except that the coarsed rubble masonry work shall be carried out for superstructure above plinth level upto floor two level.

1.2. Single or double scaffolding may be used. The scaffolding shall be strong and sound. In case single scaffolding is used, the holes shall be carefully made good as directed.

### 2.0. Mode of measurements & payment:

2.1. The relevant specifications of item No. 7.17 (A) shall be followed.

2.2. The rate shall be for a unit of one cubic metre.

**7.75.** Precast concrete block masonry (including quoin block, jamb block, closer etc. with solid concrete blocks of approved size made of cement concrete 1:3:6 Mix. (1 cement: 3 coarse sand: 6 graded stone aggregate of 20 mm. and down gauge) in foundation and plinth in cement mortar 1:6.

**1.0 Materials :** (a) Aggregate shall conform to M-12 (b) Sand shall conform to M-6. Cement shall conform to M-3.

1.1. The solid cement concrete block shall be precast with concrete of 1: 3 :6 mix (1 cement; 3 coarse sand; 6 graded stone aggregate).

1.2. A block shall be deemed to be solid if the solid material is not less than 75% of the total volume of the block calculated from over all dimensions.

1.3. The concrete mix used for blocks shall not be richer than 1 part by volume of cement to 6-parts by volume of combined aggregate.

The actual size of the blocks shall be one of the following.

Size-A 39 x 30 x 19 cms. Size-B 39 x 20 x 19 cms. Size-C 39 x 10 x 19 cms.

The size other than those specified above may be used with the approval of Engineer-in-charge.

1.5. The blocks may be either machine made or hand made. The concrete mix, the mixing of concrete, the manufacture of blocks, curing and drying shall be in accordance with para-6 to 10 under I.S. 2185-1967.

1.6. Faces of blocks shall be flat and rectangular. Surface finish shall be rendered smooth or plastered with cement mortar 1: 3 (1 cement: 3 coarse sand).

1.7. The average compressive strength of eight blocks when determined in the manner described in I.S.: 2185 1967 shall not be less than 50 Kg/Sq. Cm. of gross area. The strength of lowest individual block shall not be less than 75 percent of average compressive strength of eight blocks.

1.8. Concrete blocks shall be stored and stacked properly in such a way as to avoid any contact with moisture at site. They shall be stock piled on planks or other supports free from contact with ground and covered to protect against wetting. Cement under mortar of-proportion 1 : 6 shall conform to M-11.

### 2.0. Workmanship:

2.1. The blocks need not be wetted before or during laying in the walls. In case climatic conditions so required, the top and the sides of block may only be slightly moistured so as to prevent absorption of water from the mortar and ensure the development of required bond with mortar.

2.2. Operations of laying precast cement concrete block masonry shall be carried out in accordance with instructions detailed in I.S. 6042-1962. The mortar shall not be spread so much ahead of the actual laying of the units that it tends to stiffen and lose its plasticity, thereby resulting in poor bond. For most of the work; the joints, both horizontal and vertical shall be 10 mm. thick except in the case of extended Joint construction. The mortar joints shall be struck off flush with wall surface and when the mortar has started stiffening, it shall be compressed with rounded or U-shaped tool. The mortar shall be pressed against the units with a jointing tool after the mortar has stiffened in effect intimate contact between the mortar and the masonry it and obtained a weather tight joint.

2.3 Quoins & closers: Special quoins blocks (with a return face equal to half the length of normal face) shall be cast for all building blocks and slabs for external work. Proper half length closers shall be cast and cut from full size blocks. The returned ends of blocks for door and windows reveals and quoins shall be finished with a fair face in the mould.

2.4. Only double scaffolding shall be used, The scaffolding shall be strong and sound. No holes in the masonry for supporting shall be allowed.

2.5. Curing: The curing of concrete block masonry shall be carried out for 7 days.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 7.6 (I) shall be followed.

3.2. The work of concrete block masonry in foundation and plinth shall be measured under this item.

3.3. The rate shall be for a unit of one cubic metre.

**7.82.(A)** Percast concrete block masonry in partition walls 10 cms. thick with solid block of approved size (including quoins, blocks, jamb blocks, clossers etc.) made of C.C. 1:3:6(1 cement; 3 coarse sand; 6 graded stone aggregates 20 mm. and down guage) in C.M. 1:4.

**1.0 Materials:** The relevant specifications of item No. 7.75 shall be followed except that the precast concrete blocks shall be size suitable for 10 cms: size partition wall i.e. size 'C' and the proportions of cement mortar shall be in cement mortar 1 : 4 (1 cement: 4 coarse sand).

**2.0 Workmanship:** The relevant specifications of item No. 7.75 shall be followed except that the work shall be for precast concrete block partition walls of 10 cms. thickness.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 7.75 shall be followed.

3.2. The rate shall be for a unit of one Sq. metre.

**7.0.0.** White stone bela masonry block in coarse in superstructure with stone of approved quality in lime mortar 1 : 1.5 (1 Lime Putty: 1.5 fine sand) including raking out joints etc, complete.

**1.0 Materials :** The stone or beta shall be white hard sand stone bela or block. The stone shall be sound hard rough and durable. It shall be free from skin. Thickness of bela or block shall not be less than 15 cms. or as directed. The mortar used shall consist one part of lime putty and 1.5 parts of find sand Lime mortar shall conform to M-10.

**2.0. Workmanship:**

2.1. Dressing of stone: Stone shall be chiselled dressed on all the sides so that all six side shall be in a rectangular shape and all the stones shall be so dressed that the bushing of the exposed face shall not project nor depressed from the general wall surfaces. The size of bela or block shall be as per thickness of the wall to be constructed or as directed.

2.2. Laying: All the stone shall be sufficiently wetted before laying to prevent absorption of water from mortar. All connected walls in a structure shall normally be raised up uniformly and regularly. The vertical joint shall not be allowed and also it shall not be more than 12 mm. in thickness.

2.3. Proper bonding shall be made by laying bela or block side by side each other with lime mortar on bed as well as in between two bela or block vertically.

2.4. Bond stones: Bond stones or through stones running right across the thickness of the wall shall be provided in walls upto 450 mm. thick. In thicker walls<sup>1</sup> two bellas or blocks over laying each other by atleast 150 mm. each other shall be provided across the thickness of the wall to form bond stone, such bond stone shall be atleast one for every 10 Sq. nit, area of the wall surface.

2.5. Joints : All the joints shall be completely filled up with mortar and their thickness shall not exceed by 12 mm. When plastering or pointing is not required to be done, the joints shall be struck flush and finished, simultaneously while laying the stone. Otherwise the joints shall be raked to a minimum depth of 20 mm. during process of laying while mortar is still green.

2.6. Scaffolding : Single or double scaffolding shall be used. It shall be strong and sound. The holes left in masonry for supporting shall be made good before plastering.

2.7. Curing: Green work shall be cured for a period of 7 days continuously.

**3.0. Mode of measurements & payment:**

3.1. The work shall be measured on the basis of finish dimensions. No deduction shall be made nor extra payment shall be made for the following:

(a) Ends of joints, beams, posts, girders, rafters, purlins, truses, corbels, etc. each upto 500 Sq. cms. in section (b) Opening each upto 0.10 Sq. M. (c) Small plates and bed plates, bearing of chhajas and like upto 10 cms. depth (bearing or floor and roof slabs shall be deducted from masonry), (d) Drain holes and recesses for cement blocks to embedded holdfasts for doors and windows etc.

3.2. The rate shall be for a unit of one cubic metre.

**7.0.0.2.** White stone bela masonry work in partition wall upto 15 cms. thickness in C.M. 1:4(1 cement: 4 coarse sand).

**1.0 Materials & Workmanship :** The relevant specifications of item No. 7.0.0.1 as above shall be followed except that the proportion of mortar shall be C.M. 1:4(1 cement: 4 coarse sand)

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 7.6. (I) shall be followed.

2.2. The rate shall be for a unit of one Sq. metre.

**7.0.0.3.** While stone bela masonry block in coarse in superstructure with stone of approved quality in C.M. 1:5(1 cement : 5 coarse sand) including raking to joints etc. complete.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 7.0.0.1. as above, shall be followed except that the proportion of cement mortar shall be. in C. M. 1: 5 (1 Cement: 5 coarse sand).

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 7.6. (I) shall be followed.

2.2. The rate shall be for a unit of one cubic metre.

**7.0.0.4.** White stone bela masonry block in coarse in superstructure with stone of approved duality in C.M. 1:6(1 cement; 6 coarse sand) including raking the joints etc. complete.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 7.0.0.1. shall be followed except that the proportion of cement mortar shall be 1:6(1 cement: 6 coarse sand).

**2.0. Mode of measurements & payment:**

2.1 The relevant specifications of item No. 7.6. (I) shall be followed.

2.2. The rate shall be for a unit of one cubic metre.

## SECTION - 9

### DETAILED SPECIFICATIONS - CENTERING & FORM WORK

**9.1. (A)** Providing form work of ordinary timber planking so as to give a rough finish including centering shuttering, strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for in site reinforced concrete and plain concrete work in foundations, footing, bases of columns, and mass concrete.

**1.0. Materials:**

1.1. The shuttering to be provided shall be of ordinary timber planks and shall conform to M-26.

1.2. The dimensions of scantlings and battens shall conform to the design. The strength of the wood shall not be less than that assumed in the design.

**2.0. Workmanship :** 2.1. The form work shall conform to the shapee lines and dimension as shown on the plans and be so constructed as to remain sufficiently rigid during the placing and compacting of the concrete. Adequate arrangements shall be made by the contractor to safe-guard against any settlement of the form work during the course of concreting and after concreting. The form work of shuttering, centering, scaffolding bracing etc. shall be as per design.

2.2. Cleaning & Treatment of forms: 2.2.1. All rubbish, particularly chippings shaving and saw dust shall be removed from the interior of the form before the concrete is placed and the form work in contact with concrete shall be cleaned and thoroughly weltd or treated. The surface shall be then coaled with soap solution applied before concreting is done. Soap solution for the purpose shall be prepared by dissolving yellow soap in water to get consistency of paint. Alternatively a coat of raw linseed oil or form oil of approved manufacture may be applied in case steel shuttering is used. Soap solution or raw linseed oil shall be applied after thoroughly cleaning the surface. Care shall be taken that the coaling does not gel on construction joint surface and reinforcement bars.

2.3. Stripping time : 2.3.1. In normal circumstances and where ordinary cement is used forms may be struck after expiry of following periods.:

(a) Sikes of walls columns and vertical faces of beam - 24 to 48 hours.

(b) Beam soffits. (Props left under) - 7 days.

(c) Removal of props slabs

(i) Slabs spanning upto 4.5 m. - 7 days (ii) Spanning over 4.5 mm. -14 days.

(d) Removal of props to beams and Arches

(i) Spanning upto 6m.-14 days. (ii) Spanning over 6 m. - 2 days.

2.4. Procedure when removing the form work : 2.4.1. All form work shall be removed without such shock or vibrations as would damage the reinforced concrete surface. Before the soffit form work and struts are removed, the soffits and the concrete surface shall be exposed where necessary in order to ascertain that the concrete has sufficiently hardened.

2.5. Centering : 2.5.1. The centering to be provided shall be got approved. It shall be sufficiently strong to ensure absolute safety of the form work and concrete work before, during and after pouring concrete. Watch should be kept to see that behaviour of centering and form work is satisfactory during concreting. Erection should also be such that it would allow removal of forms in proper sequence without damaging either the concrete or the forms to be removed.

2.5.2. The props of centering shall be provided on firm foundation or base of sufficient strength to carry the loads without any settlement.

2.5.3. The centering and form work shall be inspected and approved by the Engineer-in-charge before concreting. But this will not relieve the contractor of his responsibility for strength, adequacy and safety of form work and centering. If there is a failure of form work or centering, contractor shall be responsible for the damages to the work, injury to life and damage to property.

## **2.6. Scaffolding:**

2.6.1. All scaffolding, hoisting arrangements and ladders etc. required for the facilitating of concreting shall be provided and removed on completion work by contractor at his own expense. The scaffolding, hoisting arrangements and ladders etc. shall be strong enough to withstand all live, dead and impact loads expected to act and shall be subject to the approval of the Engineer-in-charge. However, contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work and workman etc.

2.6.2. The scaffolding, hoisting arrangements and ladders shall allow easy approach to the work spot and afford easy inspection.

2.6.3. The rate is applicable to all conditions of working and height up to 4 mts. The rate shall include the cost of materials and labour for various operations involved such as :

(a) Splayed edges, notching, allowance for overlaps and passing at angles, battens centering, shuttering, strutting, propping bolting, nailing, wedging, easing, striking and removal.

(b) Filleting to form stop chamfered edges or splayed external angles not exceeding 20 mm. width to beams, columns and the like.

(c) Temporary openings in the forms for pouring concrete, if required, removing rubbish etc.

(d) Dressing with oil to prevent adhesion of concrete with shuttering and

(e) Raking or circular culling.

**2.7. Re-Use : 2.7.1.** Before-re-use, all forms shall be inspected by Engineer-in-charge and their suitability ascertained. The forms shall be scarred, cleaned, and joints gone over, repaired where required. Inside surface shall be retreated to prevent adhesion of concrete.

## **3.0. Mode of measurements & payment:**

3.1. Form work shall be measured as the area in square meters of shuttering in contact with concrete except in the case of inclined member and portion of curved profile and upper side in which case only area of underside shall be measured for payment.

3.4. Form work to secondary beams shall be measured up to the sides of main beams but no deduction shall be made from the form work of the main beam at the intersection point. No deduction shall be made from the form work of a column at intersection of beams.

3.5. The rate is for the completed item.

3.6. The rate shall be for a unit of one Sq. metre.

**9.1. (A) (I)** Extra for providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering, strutting and propping etc. height of propping and centering below supporting floor to ceiling in between 4m. to 5 m. and removal of the same off in situ reinforced or plain concrete work in foundation, footings, bases of columns etc. and mass concrete.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 9.1. (A) shall be followed except that the height of propping and centering below supporting floor- to ceiling exceeding 4 m. but not exceeding 5 m.



**2.9. Mode of measurements & payment:** **2.1.** The payment shall be made extra over and above the payment made upto 4 mt. height. The relevant specifications of item No. 9.1 (A) shall be followed. The rate shall be for a unit of one Sq. metre.

**9.1. (B) (I)** Providing form work of ordinary timber planking so as to give a rough finish including centering shuttering, of strutting, and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for in-site reinforced and plain concrete work in flat surface such as soffits of slabs, landing and the like floors etc. upto 200 mm. in thickness.

**1.0 Materials & Workmanship: 1.1.** The relevant specifications of item No. 9.1. (A) shall be followed except that the work is to be carried out for flat surface such as soffits of slabs, landings and the like for floors etc. upto 200 mm, in thickness.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 9.1. (A) shall be followed.

2.2. The rate shall be for a unit of one Sq. metre.

**9.1. (B)(II)** Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering, 8 ruting and propping etc. height or propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for in-situ reinforced and plain concrete work in flat surfaces such as soffits of slabs, landings and the like floors etc. above 200 mm. in thickness.

**1.0. Materials & Workmanship : 1.1.** Relevant specifications of item No. 9.1. (A) shall be followed except that the work is for floors etc. above 200 mm. in thickness.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 9.1. (A) shall be followed.

2.2. The rate shall be for a unit of one Sq. metre

**9.1. (C)** Providing form work of ordinary timber plankings so to give a rough finish including centering, shuttering strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for in-situ reinforced concrete and plain concrete work in vertical surfaces such as walls (any thickness) partitions.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 9.1. (A) shall be followed except that the form work shall be carried out for vertical surfaces such as walls of any thickness, partitions etc.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 9.1 (A) shall be followed.

2.2. The rate shall be for a unit of one Sq. metre.

**9.1. (G) (i)** Providing form work of ordinary timber planking-so as to give a rough finish including centering, shuttering, uniting and propping etc. height or propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for in-situ reinforced and plain concrete work in columns, pillars posts, and struts, square rectangular, polygonal in plan.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 9.1. (A) shall be followed except that the works for columns, pillars, posts and struts square, rectangular, polygonal in plan.

**2.0. Mode of measurements & payment.:**

2.1. The relevant specifications of item No, 9.1. (A) shall be followed.

2.2. The rate shall be for a unit of one Square metre.

**9.1.(H) (1)** Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering, strutting and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for in-situ reinforced and plain concrete work in side and soffits of beams, beam haunchings, cantilevers, girders bressumers and lintels not exceeding 1 M. in depth.

**1.0 Mode of measurements & payment:**

1.1. The relevant specifications of item No. 9.1. (A) shall be followed.

1.2. The rate shall be for a unit of one Sq. metre.

**9.1.(H) (2)** Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering, strutting and propping etc. Height of propping and centering below supporting floor to ceiling not exceeding 4 m. and removal of the same for in-situ reinforced and plain concrete work insides and soffits of beam, haunchings cantilevers, girders, bressumers and lintels exceeding 1 M. in depth.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 9.1. (A) shall be followed except that the work is for side and soffits of beams, beams haunchings, cantilevers, girders, bressumers, and lintels exceeding 1 M. in depth.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 9.1. (A) shall be followed, except that the work is for side and soffits of team, beam haunchings, cantilevers, girders, bressumers, and lintels, exceeding 1 M. in depth.

2.2. The rate shall be for a unit of one Sq. metre.

**9.1. (I)** (i) Providing form work of ordinary limber planking so as to give a rough finish including centering, shuttering, strutting, and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in-situ reinforced and plain concrete work in edges of slabs and breaks in floor and walls.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 9.1. (A) shall be followed except that the work is for edges of slabs and breaks in floors and walls.

**2.0. Mode of measurements & payment:**

2.1. The length and breadth shall be measured nearest to one Cm.

2.2. The rate shall be for a unit of one Sq. metre.

**9.1.(J).** Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering, strutting, and propping etc., height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in-situ reinforced and plain concrete work in edges of slabs and breaks in floor and walls.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 9.1. (A) shall be followed except that the work is for edges of slabs and breaks in floors and walls.

**2.0. Mode of measurements & payment:**

2.1. The length and breadth shall be measured nearest to one Cm.

2.2. The rate shall be for a unit of one Sq. metre.

**9.1. (K)** Providing from work of ordinary timber planking so as to give a rough finish including centering, shuttering, strutting, and propping etc., height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in-situ reinforced and plain concrete in small surfaces such as cantilevers ends, brackets, and ends of the steps, caps, and bases to pilasters and columns and the like.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 9.1. (A) shall be followed except that the work is for small surface such as cantilever ends, brackets and ends of steps, caps, and bases to pilasters and columns and the like.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 9.1. (A) shall be followed.

2.2. The rate shall be unit of one Sq. metre.

**9.1.(L)** Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering, strutting, and propping etc., height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in-situ reinforced and plain concrete in chullah hoods, weather sheds, chhajas carbels etc. including edges.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 9.1. (A) shall be followed except that the work is for chullah hoops, weather-sheds, chhajas, carbels etc. including edges of the same.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 9.1. (A) shall be followed.

2.2. The rate shall be for a unit of one Sq. metre.

**9.1.(M)** Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering, strutting, propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in-situ reinforced and plain concrete work in staircase with slopping or stepped soffits including risers and stringers excluding landing.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 9.1. (A) shall be followed except that the work is for staircases, with slopping or stepped soffits including risers and stringers excluding landing.

**2.0. Mode of measurement & payments:**

2.1. The relevant specifications of item No. 9.1. (A) shall be followed.

2.2. The rate shall be for a unit of one Sq. metre.

**9.1.(Q)** Providing form work of ordinary timber planking so as to give a rough finish including centering, shuttering, strutting, and propping etc. height of propping and centering below supporting floor to ceiling not exceeding 4 M. and removal of the same for in-situ reinforced and plain-concrete work in vertical fins and vertical sun breakers.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 9.1. (A) shall be followed except the work is for vertical fins and vertical sun breakers.

**2.0 Mode of measurements & payment:**

2.1. The relevant specifications of item No. 9.1. (A) shall be followed.

2.2. The rate shall be for a unit of one Sq. metre.

**9.2.** Extra for providing form of work with sheathing of steel sheets so as to give a fair finish in

(A) Foundation, footings, base of columns etc. and mass concrete.

(B) Flat surfaces such as soffits of slab, landing and the like.

(i) Floors etc. upto 200 mm. in thickness.

(ii) Floor etc. above 200 mm. in thickness.

(C) Vertical surfaces such as walls (Any thickness), partitions.

(D) Columns, pillars, posts and struts,

1. Square, rectangular, breassumers, and lintels not exceeding 1 mm. depth.

2. Sides and offits of beams, beam haunchings, cantilevers, girders, breassumers and lintels exceeding 1 mm. in depth.

(I) Edges of slabs, and breaks in floors and walls.

(K) Small surface such as cantilever ends, brackets, and ends of steps, caps and bases to pillars and columns including edges.

(L) Chollar woods wheather sheds, chhajjas, coroeds etc. and the like.

(M) Stair cases with sloping or steeped soffits, including risers, skingers, excluding landing.

(Q) Vertical fins and vertical sun breakers.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 9.1. (A) to(Q) shall be followed except that the extra rate shall be paid for using sheathing of steel sheets, and plates of steel or plywood instead of ordinary timber plank, to obtain a desired smooth exposed finish of surface. The surface shall be presentable without further treatment.

**2.0. Mode of measurements & payment:**

2.1. The measurement of form work shall be taken for the form work done with steel sheathing, extra over and above the rate of form work of the respective item of form work done. The relevant specification of respective item No. 1. A to Q shall be followed.

2.2. The rate shall be for a unit of one Sq. metre.

## SECTION-10

### ***DETAILED SPECIFICATIONS – MASONARY WORK***

**10.1. (A)** Providing wood work in frames of doors, windows clerestory windows and other similar work, wrought, framed and fixed in position, Indian Teak wood.

**1.0 Materials :** Wood in frames shall conform to M-29.

**2.0. Workmanship : 2.1.** The item covers the requirement of frames for doors, windows, clerestory windows their supply and fixing.

2.2. Frames: 2.2.1. All members of the frames shall be exactly at right angles. The right angle shall be checked from inside surface of the respective members.

2.2.2. All members of frames shall straight without any warp or bow and shall have smooth surface well planed on the three sides exposed at right angles to each other. The surface touching the wall may not be planed unless it is required in order to straighten up the member or to obtain the overall size, within the tolerances specified.

2.2.3. Frame shall have dovetail joints. When clerestory windows are included, it shall be provided by having full length one piece post for door or windows and clerestory window extending the frame on top at the head to the required extent. Homs shall not be provided in the head of the frame. When no sills arc provided, the vertical posts of the frame in the ground floor shall be embedded in the sill masonry for 10 cm. on upper floors, the vertical posts shall be fixed in the floor or masonry by

forming notches 10 mm. deep. Slight adjustment or spacing as necessary shall be done to have the hold fasts in the joints of masonry course. The frame shall be erected in position and held plumb with strong support from both sides and built in masonry as it is being built. The transom shall be through tenoned into the mortices of the jamb post to the full width of the jamb post and the thickness of the tenon shall be not less than 15 mm.

**2.3. Tolerance :** Unless specially mentioned otherwise tolerance of  $\pm 1.5$  mm. shall be allowed for each wrought face.

2.4. The tenons shall be closely fitting into the mortices and suitably pinned with wood dowels not less than 10 mm. dia. metre. The depth of rebates for housing the shutter shall be as shown in the detailed drawing or as directed.

2.5. The contact surface of tenon and mortice shall be treated before putting together with an adhesive of approved make.

2.6. Minimum number of three hold-fasts shall be fixed on each side of door and windows frames, one at the centre point and the other two at 30 cm. from the top and the bottom of the frames. In case of windows and ventilators frames whose height is less I M. two hold-fasts, on each side shall be fixed at quarter points of the frames. The size of each hold-fast shall be 300 x 25 x 6 mm. and of mild-steel with split end. The hold-fast shall be fixed with screws to frames.

2.7. Mild steel hold fasts shall be protected with a coating of coal asphalt tar. The surface of frame abutting the masonry or concrete faces shall be properly treated by applying a coat of approved coating.

**3.0. Mode of measurements & payment:**

3.1. The linear dimensions shall be measured correct up to 1 cm. The quantity shall be worked out correct to 2 places of decimals of a cu. m.

3.2. The rate shall be for a unit of 10 cu. diameter.

**10.4. (A)** Providing wood work in trusses, purlins, rafters, posts, post plates, wall plates, and like wrought, framed, hoisted and fixed in position, Indian teak wood.

**1.0. Materials:** The teak wood shall conform to M-29.

**2.0. Workmanship:**

2.1. The relevant specifications of item No. 10.1. (A) shall be followed except that the wood work shall be carried out in trusses, purlins, rafters, posts, post plates, wall plates and like wrought framed.

2.2. The work shall be carried out as per detailed drawings supplied by the Departmental and as directed.

2.3. The length of each members shall be in one piece or as directed.

**3.0. Mode of measurements & payment:** The length, breadth and depth shall be measured nearest to 1 cm. of unfinished member.

The rate shall be for a unit of 10 cubic decimetre.

**10.5. (A)** Providing wood work in frames of false ceiling, partition etc. swan and put up in position - Indian teak wood.

**1.0. Materials:** The teak wood shall conform to M-29.

**2.0. Workmanship:** The relevant specifications of item No. 10.1. (A) shall be followed except that the wood work shall be for false ceiling, partitions, etc. swan and put up in position.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 10.1. (A) shall be followed.

3.2. The rate shall be for a unit of ten cubic decimetre.

**10.12. (A)(I)** Providing and fixing 35 mm. thick fully panelled shutters for doors, windows, and clerestory windows including anodised aluminium butt hinges with necessary screws, Indian Teak Wood.

**1. Materials:**

1.1. Wood for shutter shall conform to M-29. (2) Glass shall conform to M-28. (3) Anodised aluminium butt hinges shall conform to M-43.

**2.0 Workmanship:** The item covers the requirement of preparation of shutters for doors, windows, clerestory windows, their supply and fixing.

**2.2. Shutters:**

2.2.1. Panelled shutters shall be constructed in the form of timber frame work of styles and rails with panel inserted of type as specified in the detailed drawings. Panel shall be fixed by providing grooves in the style and rails. The styles and rails shall be joined to each other by mortise and tenon joints at right angles.

2.2.2. All members of the shutters shall be straight without any warp or bow and shall have smooth, well planed faces at right

angles to each other.

2.2.3. The size of styles and rails shall be as per drawing or as directed. Styles and rails of shutters shall be made of one piece only.

### **2.3. Timber panelling:**

2.3.1 Thickness of the panel shall be as specified in the item as shown in the drawing or as directed. If the panel is made from more than one piece, the pieces shall be finished as shown in the detailed drawings and shall be joined with continuous groove with specified size. The end pieces of the panel and the top and bottom of the panel shall be provided with continuous tongue to frame into groove of the frame shutter. An air space of 1.5 mm. shall be left in the groove of frame shutter while fixing the panel in it.

2.3.2 The faces of the panel as well as various pieces of the panel shall be closely filled to the sizes of the grooves.

2.3.3. Finishings of the corners of raised panel edges shall be done as shown in drawings or as directed.

**2.5. Fixtures & Fastenings: 2.5.1.** The rate shall include anodised aluminium butt hinges including fixing with iron screws. The size and number of hinges shall be as per table given in annexure-1.

### **3.0. Mode of measurements & payment:**

3.1. The rate for shutter includes cost of providing block and clear for keeping the shutter in open position as directed.

3.2. The dimensions of the shutter shall be measured clear size of the shutter in close position between the grooves of the frame.

3.3. The rate shall be for a unit of one sq. metre.

**10.12. (A)(II)** Providing and fixing 35 mm. thick fully glazed shutters for doors, windows and clerestory windows including anodised aluminium butt hinges with necessary stretchers, Indian teak wood.

**1.0. Materials :** Teak wood shall conform to M-29. Glass shall conform to M-38. Anodised aluminium butt hinges shall conform to M-43.

**2.0. Workmanship : 2.1.** The relevant specifications of item No. 10.12(A) I shall be followed except that the 35 mm. thick shutters fully glazed for doors, windows and clerestory windows including aluminium butt hinges with necessary screws.

### **2.2. Glazing:**

2.2.1. The glass panels shall be embodied in putty and secured to the rebate by wooden beads or mouldings shape and size as approved with counter sunk screws of suitable size.

2.2.2. The glass pane shall be properly cut to fit the rebates of the frames and sashes fully with a light minus margin of about 1.5 mm. on all sides. Before glazing, the frame shall be primed and prepared for painting so that wood may not draw oil out of putty.

The rebate shall be putted to an extent to provide bedding all round the glass.

2.2.3. The glass shall then be bedded in putty and fitted to frames with wooden beads or mouldings as directed and secured with counter sunk screw. The screw shall be spaced not more than 100 mm. from each corner and not more than 200 mm. apart.

2.2.4. The size of the rebate in the frame and size and shape of beads or moulding shall be as per detailed drawings or as directed. The beds or mouldings shall have mitred corners.

### **3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 10.12.(A)(I) shall be followed.

3.2. The rate shall be for a unit of one sq. metre.

**10.12 (A)(III)** Providing and fixing 35 mm. thick partly panelled and partly glazed shutters, or doors, windows including anodized aluminium butt hinges with necessary screws, Indian teak wood.

**1.0. Materials :** Teak wood shall conform to M-29 Glass shall conform to M-38. Anodised aluminium butt hinges shall conform to M-43.

**2.0. Workmanship:** The relevant specifications of item No. 10.12. (A)(I) and 10.12 (A)(II) shall be followed except that the 35 mm. thick shutters shall be partly panelled and partly glazed for door windows clerestory windows etc. as per drawings.

### **3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 10.12. (A)(I) shall be followed.

3.2. The rate shall be for a unit of one sq. metre.

**10.13.(A)(I):** Providing and fixing 35mm. thick fully panelled, shutters for doors, windows and clerestory windows including black enamelled M.S. Butt hinges with necessary screws. Indian Teak Wood.

**1.0. Materials & Workmanship: 1.1.** Relevant specifications of item No. 10.12 (A) shall be followed except that the hinges shall be of black enamelled M.S. Butt type hinges. The hinges, bolts, and other items of iron-mongery with moving parts shall be properly oiled by the contractor before handing over the building.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 10.12 (A) I shall be followed.

2.2. The rate shall be for a unit .of one sq. metre.

**10.13. (A)(II)** Providing and fixing 35 mm. thick fully glazed shutters for doors window and clerestory windows including black enamelled M.S. Butt hinges with necessary screws. Indian Teak wood.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 10.12 (A) I shall be followed except that the hinges shall be of black enamelled M.S. Butt hinges, bolts and other items of ironmongery with moving parts shall be properly oiled by the contractor before handling over the building.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 10.12 (A) (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**10.13. (A)(III)** Providing and fixing 35 mm. thick partly panelled and partly glazed shutters for doors windows and clerestory windows including black enamelled M.S. Butt hinges with necessary screws, Indian Teak Wood.

**1.0 Materials of Workmanship:** The relevant specifications of item No. 10.12 (A) II shall be followed except that the hinges shall be black enamelled M.S. butt type hinges. The hinges, bolts and other items of Ironmongery with moving parts shall be properly oild by the contractor before handing over the building.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 10.12 (A) (I) shall be followed.

2.2. The rate shall be for a unit of one Sq. metre.

**10.15. (A)(I)** Providing and fixing 25 mm. thick fully panelled, shutters for cup-boards etc. including anodised aluminium butt hinges with necessary screws Indian Teak Wood.

**1.0. Materials :** First class Indian teak wood for shutters shall conform to M-29. Glass shall conform to M-38. Anodised aluminium butt hinges shall conform to M-43.

**2.0. Workmanship : 2.1.** The relevant specifications of item No. 10.12 (A) (I) shall apply except that the thickness of shutter shall be 25 mm. for cup-boards.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 10.12 (A) (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**10.15. (A)(II)** Providing and fixing 25 mm. thick fully panelled shutters for cup-boards etc. including anodiswed aluminium butt hings with necessary screws. Indian teak wood.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 10.12 (A) (II) shall apply except that the thickness of shutters shall be 25 mm. thick and fully glazed for cupboards.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 10.12 (A) (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**10.15. (A)(III)** Providing and fixing 25 mm. thick partly panelled and partly glazed shutters for cup-boards etc. including anodised aluminium butt hinges with necessary screws, Indian Teak Wood.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 10.12 (A) (I) and 10.12 (A) (II) shall be followed except that the thickness of shutters shall be 25 mm. thick and partly panelled and partly glazed shutters as per drawing for cub-boards.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 10.12 (A) (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**10.16. (A)(I)** Providing and fixing 25 mm. thick fully panelled shutters for cup-boards etc. including black enamelled M.S. Butt hinges with necessary screws, Indian Teak Wood.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 10.12 (A) (I) shall apply except that the wood for shutters shall be Indian teak wood and black enamelled M.S. Butt hinges are to be used instead of anodised aluminium butt hinges and thickness of shutter shall be 25 mm.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 10.12 (A) (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre

**10.16. (A)(II)** Providing and fixing 25 mm. thick fully glazed shutters for a cup-boards etc. including black enamelled M.S. butt hinges with necessary screws. Indian Teak wood.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 10.15 (A) (II) shall be followed except that the fully glazed shutters of 25 mm. thickness shall be of Indian teak wood and fixed in position with black enamelled butt hinges for cup-boards.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 10.12 (A) (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**10.16. (A)(III)** Providing and fixing 25 mm. thick partly panelled and partly glazed shutters for cup-boards including black enamelled M.S. butt hinges with necessary screws. Indian Teak Wood.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 10.15 (A) (I) & 10.15 (A)(II) shall be followed except that the shutters shall be partly panelled and partly glazed of 25 mm. thickness of Indian Teak wood fixed with black enamelled butt hinges for cup-boards.

**2.0. Mode of measurements & payment:**

2.1 The relevant specifications of item No. 10.12 (A) (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**10.23.** Providing and fixing 35 mm. thick panelled glazed or panelled and glazed shutters for doors, windows and clerestory windows, including anodised aluminium butt hinges with necessary screws. Indian Teak wood shutters with (A) Plywood, (B) Particle Board (C) Hard Board, (D) Asbestos sheet panels.

**1.0. Materials:** Indian teak wood for shutters shall conform to M-29. Glass shall conform to M-38.

(A) Plywood shall conform to M-37.

(B) Particle board shall conform to M-40. Anodised aluminium butt hinges shall conform to M-43.

(C) Hard board shall be of best quality and shall be as approved by Engineer-in-charge.

(D) A.C. sheet shall conform to M-24.

**2.0. Workmanship:**

2.1. The relevant specifications of item No. 10.12 (A) (I) shall apply to this item except that the work is shuttered with (A) plywood (B) particle board (C) hard board panels (D) A.C. sheets panels as specified in item.

2.2. The shutters shall be prepared by fitting styles and rails (top, bottom, lock and frieze) as for panelled leaves with simple chamfer on edges only. The styles and rails shall be grooved with just sufficient width for received panels and plain panels of specified type panels shall be filled into the grooves.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 10.12 (A) (I) shall be followed.

3.2. The rate shall be for a unit of one sq. metre.

**10.24.** Providing and fixing 35 mm. thick panelled glazed or panelled and glazed shutters for doors, windows and clerestory windows including 2 black enamelled M.T. butt hinges with necessary screws. Indian Teak Wood shutters with (A) Plywood (B) Particle board (C) Hard board (D) Asbestos sheet panels.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 10.23 shall be followed except that the hinges shall be of black enamelled M.S. Butt hinges instead of anodised aluminium butt hinges and shutter with (A) Plywood (B) Particle board (C) Hard board (D) Asbestos sheet panels as specified in item.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 10.12 (A) (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**10.30.** Providing and fixing flush door shutters, solid core construction with frame of 1st class hard wood with cross band and face veneer or plywood face panels including anodised aluminium butt hinges with necessary screws (A) Non-decorative type and block board core. (2) 35 mm. thick.

**1.0. Materials :** Rush door shall conform to M-30. Plywood shall conform to M-37. Anodised aluminium butt hinges shall conform to M-43.

**2.0. Workmanship:**

2.1. The relevant specifications of item No. 10.23 shall be followed except that the shutters be non-decorative type and block board core with face veneer or plywood, with 35 mm. thickness.

2.2. Ready made shutters shall be correct size and shall fit into the door or other openings without excessive scraping of edges. Adding of battens etc. to make up to the size shall not be allowed.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 10.12 (A) (I) shall be followed.

3.2. The rate shall be for unit of one sq. metre.

**10.37.** Extra for using bright finished M.S. Piano hinges of anodised aluminium butt hinges in flush doors shutters (A) Nickel Plated Piano hinges.

**1.0 Materials & Workmanship :** 1.1. The relevant specifications of item No. 10.30 shall be followed except that the nickel plated piano hinges shall be provided fixed. It shall conform to the latest Indian Standards and shall be got approved by the Engineer-in-charge.

**2.0. Mode of measurements & payment:**

2.1. The extra payment shall be made on Sq. M. basis of door over and above the item No. 10.30 for providing bright finish M.S. Piano hinges instead of anodised aluminium butt hinges.

2.2. The rate shall be for unit of one sq. metre.

**10.39.** Extra for providing vision panel not exceeding 0.1 sq. m. in all types of flush doors. (A) Rectangular or square.

**1.0. Materials & Workmanship :**

1.1. The relevant specifications of item No. 10.30 shall be followed except that the vision panel not exceeding 0.1 sq. m. shall be provided.

1.2. The glass panels shall conform to M-38 and this item is for extra work of providing vision panel rectangular or square not exceeding 0.1 sq. m. in all types of flush doors.

**2.0. Mode of measurements & payment:**

2.1. The payment shall be made over and above of item No. 10.30 for this extra work on shutters in which vision panels are provided.

2.2. The rate shall be for a unit of one sq. metre of door area.

**10.51.** Providing and fixing 30 mm. thick wire gauze shutters using galvanised M.S. Wire of I.S. gauze designation 85-G with wire of 0.56 mm. dia for doors, windows, and clerestory windows including anodised aluminium butt hinges with necessary screws : Indian Teak Wood.

**1.0. Materials :** Wire gauze jali shall conform to M-36. The teak wood shall conform to M-29. Anodised aluminium butt hinges shall conform to M-43.

**2.0. Workmanship :** 2.1. Specifications for item No. 10.12 (A)(I) shall be adopted for shutter, and fixtures and fastenings except that 30 mm. thick wire gauze shutter shall be provided.

**2.2. Wire gauze shuttering:**

2.2.1. The finished sizes of the wooden components like styles, rails, mountings shall be as per the panelled doors. Each leaf shall have 2 panels of wire gauze as per drawings or as directed.

2.2.2. The styles, rails etc. shall be rebated 12 mm. along the side where they received the gauze. The galvanised iron webbing of 0.56 mm. dia mesh shall be used unless otherwise specified. The webbing shall be at 90° to 12 mm. along both sides of the rebate and fixed securely to the styles and rails and mounting by 12 mm. galvanised iron staples at about 7.5 cms. Intervals staggered spacing. Teak wood fillets of the size 10 mm. x 10 mm. shall be securely and neatly fixed with small screws, spaced



about 7.5 cm. centres around the rebate for each panel of webbing. After the fillets are pressed well into the angle to hold the gauze in two laces, the exposed edge of fillets shall be neatly rounded. The gauze shall be tightly stretched during fixing. The space between fillet and the rebate where the webbing is bent shall be neatly finished with putty so that cut end of webbing may not be visible. Each shutter shall be fitted with a pair of anodised aluminium butt hinges with necessary iron screws.

**3.0 Mode of measurements & payment:**

3.1 The relevant specifications of item No. 10.12 shall be followed.

3.2 The rate shall be for a unit of one sq. metre.

**10.53.** Providing and fixing 30 mm. thick wire gauze shutters using galvanised M.S. wire of wire gauze designation 85 G with wire of 0.56 mm. dia. for doors, windows, and clerestory windows including bright finished or/and black enamelled M.S. butt hinges with necessary screws. Mango wood or equivalent quality.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 10.51 shall be followed except that the hinges to be used shall be bright finished or/and black enamelled M.S. butt hinges with screws and the wood shall be Mango wood or equivalent quality of non-teak wood.

**2.0. Mode of measurements & payment:**

2.1. The, relevant specifications of item No. 10.12 shall be followed.

2.2. The rate shall be for unit of one sq. metre.

**10.54.** Extra for providing and fixing galvanised M.S. Wire gauze of I.S. gauge designation 140 G. to doors, windows and clerestory windows with wire of dia. 0.71 mm. instead of I.S. gauge designation 85-G. with wire of dia. 0.56 mm.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications for item No. 10.51. & 10.53 shall be followed for this item except that the diameter of wire shall be 0.71 mm. of I.S. Gauge designation 140-G instead of 0.56 mm. diameter I.S. gauge designation 85 G.

**2.0. Mode of measurements & payment:**

2.2. The payment shall be extra over and above the payment for galvanised M.S. wire gauze.

2.1. The rate I.S. gauge designation 85 G. shall of one sq. ml. of doors and windows shutters.

**10.74.** Providing and fixing 12 mm. thick and 100 mm. wide pelmet of flat pressed 3 layer veneered particle board solid core with 25 mm. diameter aluminium curtain rod and brackets including fixing with 25 mm. x 3 mm M.S. flat 10 cms. long and plugs etc. complete.

**1.0. Material:** (1) 3 layers veneered particle board solid core shall conform to M-40. (2) 25 mm. diameter aluminium curtain rod and 25 mm. x 3 mm. x 10 cms. long M.S. flat and plugs shall of best approved quality as directed.

**2.0. Workmanship:**

The work shall be done as per drawing and description given in the item of work, the wooden planks shall be planed smooth and even on the exposed surface.

The pelmet shall be fixed to level by means of 10 cms. long x 25 mm. x 3 mm. M.S. flat brackets lent in the form of angle and wooden plug fixed in the wall using wooden screws. For pelmet upto 1.5 metre long two such brackets shall be used and additional bracket provided for longer pelmet at the rate of one per metre length extra. The curtain rods shall be fixed by suitable brackets at the ends to the pelmet as directed.

**3.0. Mode of measurements & payment:**

3.1. Pelmets shall be measured in running metres along the sides and face.

3.2. The rate shall be for a unit of one running metre.

**10.84.** Providing and fixing 40 mm. panelled, glazed or panelled and glazed partitions fixed to frames with iron screws etc. complete with Indian teak wood (Frames to be paid separately)

**Materials:** Indian Teak wood shall conform to M-29. Glass shall conform to M-38. Iron screws shall of best approved quality. Plywood, asbestos shall conform to relevant specifications of material.

**Workmanship :** The work shall be done as per detailed drawing or as directed The wooden frames shall be of sizes as indicated in the drawing and description of item. They shall be planed and finished smooth and even. The vertical styles and rails shall be framed by tenon and mortise joints. The panels which may be planks, asbestos, plywoods, glass or any other materials specified shall be fixed in the grooves made in the styles and rails or by means of rebate and beading, fixed by suitable screws. When glazing is used as panels, the glass shall be fixed by using putty in addition to beading. The putty shall

be used before applying beading material.

**3.0 Mode of measurements & Payment:**

Partitions shall be measured in square metres of the net area of the filler materials provided.

**10.85** Providing and fixing decorative ply wood 4 mm. thick in partitions including fixing to frame with screws etc. complete with 50 mm. x 12 mm. teak wood beading. (Frames to be paid separately.)

**1.0 Materials :** 4 mm. thick decorative plywood shall be of best approved quality. Teak wood beading and screws shall be best approved quality as directed.

**2.0 Workmanship :** The relevant specifications shall be the same as per that of item No. 10.84 except that partitions shall be with 4 mm. thick decorative plywood and with teak wood beading.

**3.0. Mode of measurements & payment:**

The specifications shall be same as that of item No. 10.84.

The rate shall be for unit of one square metre.

**10.86.** Providing and fixing plain Asbestos cement sheet 6 mm. thick in partition including fixing to frames with screws etc. complete with 50 mm. x 12 mm. deodar wood beading (Frames to be paid separately).

**1.0. Materials :** Plain A.C. Sheets shall conform to M-24. Deodar wood beading shall conform to M-29 A.

**2.0. Workmanship :** The relevant specifications of item No. 10.84 shall be followed same except that plain asbestos cement sheet 6 mm. thick shall be used in partition and Deodar wood beading of size 50 mm. x 12 mm. size shall be used.

**3.0. Mode of measurements & payment:**

**3.1.** The relevant specifications of item No. 10.84 shall be followed except that the rate excludes cost of frame work.

**3.2.** The rate shall be for unit of one Sq. metre.

**10.88.** Providing and fixing in partition 4 mm. thick medium hard board of approved quality including fixing to frames with screws etc. complete with 50 x 12 mm. Teak wood beading (Frame to be paid separately).

**1.0. Materials :** The hard board shall be 4 mm. thick and of best quality and make as approved. Teak wood beading shall conform to M-29.

**2.0. Workmanship :** The relevant specifications of item No. 10.84. shall be followed except that the hard board of 4 mm. thickness shall be used in partition and teak wood beading 50 x 12 mm. size shall be used.

**3.0. Mode of measurements & payment:**

**3.1.** The relevant specifications of item No. 10.84 shall be followed, except that the rate excludes cost of frame work.

**3.2.** The rate shall be for a unit of one square metre.

**10.96.** 25 mm. thick wooden shelves supported on 40 x 40 x 6 mm. T or L Iron brackets fixed at suitable distance not exceeding 75 cms. apart with Mango wood or equivalent quality.

**1.0. Materials :** The mango wood shall conform to M-29 A. Structural steel shall conform to M-22.

**2.0 Workmanship :** The mango wood or equivalent quality nontak wood shelves shall be prepared from 25 mm. thick planks. The planks shall be planed smooth. The planks shall be used in single piece upto 30 cms. width. The shelves shall be fitted in position by fixing 40 x 40 x 6 mm. T or L Iron brackets. The spacing of brackets shall not be more than 75 cms. The 40 x 40 x 6 mm. T or L Iron brackets shall be fixed firmly in position by embedding the same in concrete. The shelves shall be fixed as directed. The season teak wood battens of 35 x 12 mm. shall be fixed on open side as directed.

**3.0. Mode of measurements & payment:**

**3.1.** The shelves shall be measured in Sq. metre. The length and breadth of shelves shall be measured net.

**3.2.** The rate is inclusive of batton provided.

**3.3.** The rate shall be for unit of one sq. metre.

**10.97.** 40mm tick wood shelves supported on 40 x 40 x 6 mm. T or L Iron brackets fixed at suitable distance but not exceeding 75 Cms. apart with Mango wood or equivalent quality.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 10.96 shall be followed except that the thickness of shelves shall be 40 mm. Thick teak wood battens shall be provided of 50 x 12 mm. on all open sides.

**2.0. Mode of measurements & payment:**

**2.1.** The relevant specification of item No. 10.96 shall be followed.

**2.2.** The rate shall be for unit of one sq. metre

**10.99** Providing and fixing M.S. round or square *burs* with M.S. flats at required spacing in wooden frames of windows and clerestory windows.

**1.0 Materials :** M.S. bars flats shall conform to M-18 and M- 22 respectively.

**2.0. Workmanship:**

2.1 The M.S. bars shall be fabricated as shown in the drawing or as directed. It shall conform to I.S. 226-1975 and I.S. 961 and I.S. 1977-1975. the M.S. bars shall be fixed at the required spacing in mild steel flats, after drilling holes in the latter. The diameter and spacing of these bars shall be as mentioned in the drawing or as directed. The bars shall be passed through drill holes drilled into the mild steel flats, fixed in the recess in the frames. The flats shall be fixed with iron screws.

**3.0. Mode of measurements & payment:**

3.1. The rate shall be for the M.S. round or square bars with M.S. provided and fixed in position as per the specifications for the completed item.

3.2. The rate shall be for a unit of one Kg.

**10.100. (A)** Providing and fixing M.S. Grills of required Pattern to wooden frames of windows frames of windows etc. with M.S. flat at required spacing and frame around, square, or round bars with round headed bolts and nuts or by screws : Plain Grill.

**1.0. Materials :** The structural steel shall conform to M-22.

**2.0. Workmanship:**

**2.1.** The M.S. Grill shall be prepared as per the drawings or as directed for fixing to wooden frames of windows etc.

**2.2.** The grill shall be fabricated to the designs and patterns shown in the drawings and the weight shall be as directed, and the joints shall be rivetted or welded as shown in the plan or as directed. The grill so formed shall be fixed into the frames of the windows etc., before they are erected in position. The outside strip frame of the grill shall be housed to its full thickness into the recess cut into the frame of the windows etc. The grill shall be fixed to the frame with number of bolts and nuts of screws viz. bolt nut/screw per 30 cm. of the length of outer strip subject to a minimum of 2 Nos. on each side of the frame or as indicated in the drawings or as directed.

**2.3.** The bolts and nuts or screws shall be counter sunk and shall be fixed with the top of their heads flush with the face of frame strips.

**3.0. Mode of measurements & payment:**

3.1 No payment shall be made for weight of screws, bolts, nuts etc. Only weight of grill shall be paid.

3.2. The rate shall be for unit of one Kg.

**10.100 (B)** Providing and fixing M.S. grill of required pattern to wooden frames of windows etc. with M.S. plates, at required spacings and frame around, square or round bars with round headed bolts and nuts or by screws and with ornamental grill.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 10.100 (A) shall be followed except that the work is for ornamental grill.

**2.0. Mode of measurements & payment:**

**2.1.** The relevant Specifications of item No. 10-100(A) shall be followed.

**2.2.** The rate shall be for unit of one Kg.

**10.102.** Providing and fixing hard drawn steel wire fabric 75 x 25 mm. mesh of weight not less than 7.75 Kg. per Sq. M. to window frames etc. including 60 x 20 mm. beading of teak wood.

**1.0. Materials:** Hard drawn steel wire fabric of 75 x 25 mm. mesh shall conform to M-34. Teak wood beading shall conform to M-29.

**2.0. Workmanship :** The steel wire fabric 75 x 25 mm. mesh of weight not less than 7.75 Kg. per Sq. M. to windows frames etc. shall be fabricated as per detail drawing. The wire fabric shall be fixed to windows frame by teak wood beading of 60 x 20 mm. size by means of screws.

**3.0. Mode of measurements & payment:**

3.1. The wire mesh (Hard drawn) shall be measured net clear opening of frame of windows in which mesh is fitted. Nothing shall be paid extra for fixing mesh in groove below teak wood beadings.

3.2. The rate shall be for unit of one sq. metre.

**10.103.** Providing and fixing fly proof galvanised M S. Wire gauge of I.S. Gauge designation 85 G. with wire of dia 0.56 mm.

to windows and clerestory windows including 60 x 20 mm. beading of Indian Teak Wood.

**1.0. Materials :** The fly proof galvanised M. S. wire gauge shall conform to M-36. Teak wood beading shall conform to M-29.

**2.0. Workmanship :** The relevant specifications of item No. 10.102 shall be followed except that the fly proof galvanized M.S. wire gauge of I.S. gauge designation 85-G with wire of 0.56 mm. shall be provided.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 10.102 shall be followed.

3.2. The rate shall be for unit of one square metre.

**10.120.** Providing and fixing, first class Indian teak wood, 75 x 60 mm. moulded hand rails in straight lengths completed.

**1.0 Materials:** First class Indian teak wood shall conform to M-29.

**2.0 Workmanship :** The teak wood hand rail shall of size 75 x 60mm. The hand rail shall be prepared from first class Indian teak wood. The hand rail shall be moulded as per detail drawings.

The hand rail shall be fixed in straight length as per detail drawings with screws. The relevant specifications of item No. 10.4 shall be followed except that the teak wood work shall be for a railing of specified size.

**3.0. Mode of measurements & payment:**

3.1. The hand rail shall be measured in running metre.

3.2. The rate shall be for unit of one running metre.

**10.00 (I)** Providing and fixing glazed louvered Glass windows and ventilators with teak wood frame 10 x 75 mm. size including 3 coats of oil painting to wood work etc. complete.

**1.0. Materials:** Indian teak wood shall conform to M-29. Glass shall conform to M-38.

**2.0. Workmanship :** The relevant specifications of item No. 10.1 (A) shall be followed for frame work except that the frame work of 10 x 7 cms. size of required size ventilators shall be provided with glazed glass louvers. The glass louvers shall be provided as directed. In the groove of 1.25 cms. depth made in frames, the thickness of glass shall be 5 mm. and glass shall be glass of best quality. The ventilation blades shall slope down towards the outside at an angle of 45°.

**3.0. Mode of measurements & payment:**

3.1. The area of opening within the frame in which louvers are fixed shall be measured in sq. metres.

3.2. The rate includes painting 3 coats to wood work with ready mix paint.

3.3. The rate shall be for a unit of one square metre.

**10.00 (II)** Providing and fixing with wooden louvers 12 mm. thick windows and ventilators with teak wood frame 10 x 7 cms. size including 3 coats of oil painting to wood work etc. complete.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 10.00 (I) shall be followed except that the teak wood planks 12 mm. thick louvers shall be provided.

**2.0. Mode of measurements & payment:**

**2.1. The relevant specifications of item No. 10.00 (I) shall be followed.**

2.2. The rate shall be for unit of one square metre.

## SECTION-II

### DETAILED SPECIFICATIONS-STEEL SHUTTERS, WINDOWS, VENTILATORS

**11.2 (A)** Steel work riveted, in built up sections, framed work including cutting, hoisting fixing in position and applying a priming coat of red lead paint. In beam and joints, channels, angles tees, flats with connecting plates or Angle cleats as in main & cross beams, Hop and jack rafters, purlins connected to common rafters and the like.

**1.0. Materials:** The structured steel work shall conform to M-22. Red lead paint primer shall conform to I.S.: 102-1962.

**2.0. Workmanship:**

2.1. The steel sections as specified or required shall be cut, square and to correct lengths, as per drawings and design. The cut

ends exposed to view shall be finished smooth; No. two pieces shall be welded or other wise jointed to make up the required length of member, except as indicated in the drawing or as directed. All straightening and shaping to form shall be done by application of pressure and not by hammering. Any bending or cutting shall be carried out in such a manner as not to impair the strength of the metal. All operations shall be done in cold state unless otherwise directed/permitted.

## 2.2. Steel riveted or bolted in built up section,fram work.

2.2.1. The steel structure as shown in the drawings or as per direction of the the Engineer-kin-charge shall be laid out on level platform to full scale and to full size or in parts. A steel tape shall be used for measurements to ensure maximum accuracy.

2.2.2. Wooden templates 12 mm. to 19 mm. thick or metal sheet template shall be made to correspond to each connecting gusset plate and rivet holes shall be accurately marked on them and drilled. The templates shall be laid on the steel members, and holes of the steel members shall also be marked for cutting. The base of steel columns and the position of Anchor bolts shall be carefully set out.

2.2.3. All stiffeners shall be formed by pressure and where practicable, the metal shall not be cut and welded in making these. In major works or where so specified, shop drawings giving complete details and information for the fabrication of the component parts of the structure, including location type size, length and details of rivets, bolts, or weld shall be prepared in advance of the actual fabrication and as approved. The drawings shall indicate the shop and field rivets and bolts. The steel members shall be distinctly marked or stencilled with paint with the identification mark as given in the shop drawings. The bars shall be thickened at the ends, so as to provide for screwed threads and gradually tapered off to meet their normal section.

Great accuracy shall be observed in fabrication of various member, so that these can be assembled without being unduly packed, strained or forced into position and when built up, shall be true and free from twists, bniks, buckles, or open joints. Before making holes individual members for fabrication, the steel work intended to be rivetted or bolted together shall be assembled or clamped properly and tightly so as to ensure close abutting or lapping of the different members. All stiffeners shall bear tightly both at top and bottom without being drawn or caulked. The abutting joints shall be cut or dressed true and straight and fitted close together.

Web splice plates and fillers under stiffeners shall be cut to fit within 3 mm. or flange Angles, web plates of Girders shall have not cover plates, shall have their ends flush with the top of angles forming the flanges unless otherwise required. The web plates when spiced shall have clearance of more than 6 mm.

The erection, clearance for cleared ends of members connecting steel to steel shall preferably be not greater than 1.5 mm. The erection clearance at the ends of beams without web cleats shall not be more than 3 mm. at each end but where for a practical reason greater clearance is necessary, suitably designed seating shall be provided.

Pins and rollars shall be accurately turned to gauge. These shall be straight and smooth and free from flows. The roller bearing shall be provided with adequate arrangement for holding the girders or truss resting on it. In columns caps and bases, the ends of shafts together with the attached gussets Angles, channels etc., after rivetting together shall be accurately machanised so that the parts connected butt against each other over the entire surfaces of contract connecting angles or channels shall be fabricated and placed in position, with greater accuracy so that they are not undully reduced in thickness by machining.

The ends of bearing stiffners shall be machanised or ground to fit tightly both at the top and bottom. All holes shall generally be drilled to the required size and at required position. Sub punching shall be permitted, provided it is done 3 mm. or less in diameter and reamed thereafter to the required size. The holes for rivets and bolts shall be larger by 0.4 to 6 mm. than the nominal diameter of rivets or black bolts depending upon the diameter of rivets.

Holes shall have their axis perpendicular to th6 surface-bored through. The drilling or reamering shall be free from butts, and the holes should be clean and accurate. Holes for counter shunk bolts shall be made in such a manner that their heads fit flush with the surface after fixing.

The fabrication work shall be completed in workshop as far as it is practicable to do so. Site joints shall be done with rivets and fitted bolts or black bots, as shown in the drawings or as directed. Generally the following principles shall govern the use of rivets turned and fitted bolts, and black bolts.

- (i) Rivets and turned and fitted bolts shall be used where the connection is such that slip under load has to be avoided.
- (ii) Black bolts may be used very sparingly where a force is carried through a connection without impact, vibration or reversal of stresses.

**2.2.4. Rivetting :** The parts assembled for rivetting shall be in close contact with each other and the bearing stiffeners shall

bear lightly both at top and bottom without being drawn or caulked. Members to be rivetted shall be properly pinned or bolted and rigidly held together while rivetting. Drilling of holes shall not be permitted except to draw the parts together and the drifting tools so used shall have maximum diameter not exceeding the nominal diameter of rivets or bolts. Drifting done during assembling shall not distort the metal or enlarge the holes.

The shanks of rivets shall project beyond the plate-surface sufficiently so as to fill the hole thoroughly and from the required head after rivetting.

The rivetting shall be done by hydraulic or pneumatic process. However, where such facilities are not available, hand riveting may be permitted. The rivet shall be heated red hot, care being taken to control the temperature of heating so as not to burn the steel. Rivets of diameter less than 10 mm. may be fitted cold. Rivets shall be of heat finish with heads full and of equal size. All loose, burnt or badly formed rivets with concentric or diffident heads shall be cut out and replaced. The heads of rivets shall be central to shanks and shall grip the assembled members firmly. In cutting out rivets, care shall be taken so as not to injure the assembled members, caulking or recuppying shall not be permitted.

For testing rivets, hammer weighing approximately 0.25 kg. shall be used. Both heads of the rivets shall be tapped, slack rivets will give a hollow sound and a jar.

All rivet heads shall be painted with red lead paint within a week of their fixing.

2.2.5. Bolting all bolt heads and nuts shall be hexagonal and of equal size unless specified otherwise. The screwed heads shall conform to I.S.: 1363-1960 and the threaded surface shall not be tapered.

The bolts shall be of such length so as to project two clear threads beyond the nuts when fixed in position and these shall fit in the holes without any shakes. The nut shall be fit in the threaded ends of bolts properly. Where turned and fitted bolts are required to be used in place of rivets they shall be provided with washers not less than 6 mm. thick so that the nut when tightened shall not bear on the unthreaded body of the bolt. Tapered washers shall be provided for all heads and nuts bearing on levelled surfaces. The threaded portion of the bolts shall not be within the thickness of the parts bolted together. The faces of the bolt heads and nuts abutting against steel members shall be machine finished. Where there is a risk of the nut being removed or becoming loose due to vibrations or reversal of stresses, these shall be secured from slackening by the use of locknuts, spring washers cross-cutting or hammering down of threads as directed.

Bolts, nuts and washers shall be thoroughly cleaned and dipped in double boiled linseed oil before use. The whole steel work shall be painted with a coat of priming coat of red lead, as per relevant specifications of painting.

### **3.0. Mode of measurements & payment:**

**3.1.** The steel work shall be measured in general as under.

(a) All work shall be measured on the basis of finished dimensions as fixed at site and measured net unless specified otherwise.

(b) The weight of steel sections, steel strips in finished work shall be calculated from standard weight on the same basis on which steel is supplied to the Contractor by department or those given in relevant I.S. if steel is arranged by the contractor.

(c) The weight of steel plates and strips shall be taken from relevant I.S. based on 7.85 Kg/sq. metre for every millimetre sheet thickness if steel is supplied by the contractor, otherwise, the weight shall be calculated on the basis on which steel is supplied to the contractor by department.

(d) Unless otherwise specified weight of clearets, brackets, packing pieces, bolts, nuts, washers, distance pieces, separators, diaphragm gusset (taking over all square dimensions) fish plates etc. shall be added to the weight of respective items.

(e) In rivetted work allowance to be made of weight of rivet heads. No deductions shall be made for rivet or bolt holes excluding holes for anchors or holding down bolts.

(f) For forged steel and steel castings, weight shall be calculated on the basis of 7850 kg/cum.

(g) Unless otherwise specified an addition of 2.5 percent of the weight of structure shall be made for shop and site rivet heads in rivetted steel structure.

(h) Unless otherwise specified, no allowance shall be made for the weld metal in case of welded steel structure.

(i) Dimensions other than cross sections and thickness of plates shall be measured to nearest 0.001 m.

(j) Mill tolerance shall be ignored when weight is determined by calculation.

**3.2.** The rate includes cost of all material, labour, erection, hoisting, scaffolding protective measure, required for proper completion of the item of work. This shall also include conveyance and delivery handling, loading, unloading and storing etc. required for completing the item described above including necessary wastage involved.

**3.3.** The rate shall be for a unit of one quintal.

**11.2 (D)** Steel work rivetted in built up section, framed work including cutting, hoisting, fixing in position and applying a priming cost of red lead paint in trusses, and trussed purlins, upto 25 mm. span and 15 M overall height.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 112 (A) shall be followed except that the work shall be for trusses and trussed purlins upto 25 mm. span and 15 M overall height.

**2.0. Mode of measurements & payment:**

**2.1.** The relevant specifications of item No. 11.2 (A) shall be followed.

**2.2.** The rate shall be for unit of one quintal.

**11.4. (A)** Steel work welded in built up sections frame work including cutting, hoisting, fixing in position and applying a priming coat of red lead paint. In beams and joints, channels, angles, tees, flats, with connecting plates or angle cleats as in main and cross beams. Hip and jack rafters, purlins, connected to common rafters and the like.

**1.0. Materials & Workmanship :**

1.1. The relevant specifications of item No. 11.2 (A) shall be followed except that the steel work shall be done by welding.

1.2. Welding shall generally be done by electric process. Gas welding shall be resorted to using oxyacetylene flame with specific approval. Gas welding shall not be permitted for structural steel work.

1.3. The work shall be done as shown in the shop drawings which should clearly indicate various details of the joints to be welded, shop and site welds as well as type of electrodes to be used. Symbol for welding on plans and shop drawing shall be according to I.S. 813-1961. As far as possible every effort shall be made to limit the welding that must be done after improper welding that is likely to be done due to heights and difficult position on scaffoldings etc. The welding work shall conform to I.S. 816-1969.

1.4. Preparation of surfaces : Surfaces which are to be welded together shall be free from loose mill scale, rust, paint, grease or other foreign matter. A coating of boiled linseed oil shall be permitted.

1.5. Assembly for welding : Before welding is commenced, the plates shall first be brought together and firmly clamped or spot welded at specified distance. The temporary connection has to be strong enough to hold the plates accurately in place without displacement.

**1.6 Precautions :**

All operations connected with welding and cutting equipment shall conform to safety requirement given in I.S. 818-1968.

The following points shall be borne in mind during the process of welding :

(a) Welds shall be made in flat position wherever practicable.

(b) Arc length, voltage and amperage shall be suited to the thickness of material, type of groove and other circumstances of the work.

(c) The segments of welding shall be such that where possible, the members which offer the greatest resistance to compression are welded first.

1.7. The defective welds which shall be considered harmful to the strength shall cut out and rewelded.

1.8. Finished welds and adjacent parts shall be protected with clean boiled linseed oil and after all slag has been removed welds and adjacent parts shall be painted after the same are approved.

1.9. All the members shall be thoroughly cleaned of rust, scales, dust etc. and given a priming coat of red lead paint before fixing them in position, ting of welding to be added in the specification I.N. 12.2.2.12. (i) to (viii).

**2.0 Mode of measurements & payment:**

**2.1** The relevant specifications of item No. 11.2 (1) shall be followed.

**2.2** The rate shall be for unit of one quintal.

**11.4 (D)** Steel work welded in built up sections framed work including cutting, hoisting, fixing in position and applying a priming coat of Red paint in trusses and trussed purlins upto 25 m. span and 15 mm. overall height.

**1.0 Materials & Workmanship :**

The relevant specifications of item No. 11.4 (A) shall be followed except that the work shall be for trusses and trussed purlins upto 25 m. span and 15 m. overall height.

**2.0. Mode of measurements & payment:**

**2.1.** The relevant specifications of item No. 11.4. (A) shall be followed. **2.2.** The rate shall be for unit of one quintal.

**11.6.** Providing and fixing in position collapsible shutters with vertical channels 20 x 10 x 2 mm. braced with flat iron diagonal 20 x 5 mm. size with top and bottom rails T Iron 40 x 40 x 6 mm. with 38 mm. dia steel pulleys complete with bolts, units, locking arrangements, stoppers, handles, including a priming coat of red lead paint.

**1.0. Materials:** The collapsible steel gate shall conform to M-33.

**2.0. Workmanship:** T-Rails shall be fixed to the floor and to the lintel at top by means of Anchor bolts, embedded in cement concrete on floor and lintel. The anchor bolts shall be placed approximately at 45 mm. centres alternatively in the two flanges of the T Iron. In the bottom runner (T-Iron) shall be embedded in the floor and proper groove shall be formed along the runner for the purpose. The collapsible gate shall be fixed at the sites by fixing the end double channels in the T-iron rail and also by hold fasts bolted to the end double channel and fixed in the masonry of the side walls or the otherwise, In case where the collapsible gate is not required to the lintel beams or slop above, a tee iron suitably designed may be fixed at the top embedded in masonry and provided with necessary clamps and roller arrangement at the top.

All the adjoining work damaged while fixing of gate shall be made good to match the existing work without any extra payment.

All the members of the collapsible gate including T-Iron shall be thoroughly cleaned of rust, scales, dust etc. and given a priming coat of red lead before fixing them in position.

**3. Mode of measurements & payment:**

3.1. The collapsible gate shall be measured in sq. metre. The height of the gate shall be measured as the length of double channels and breadth from outside to outside of the end fixed double channels in open position of the gate. The rate includes providing handles, locking arrangements, stoppers etc.

3.2. The rate shall be for unit of one sq. metre.

**11.7.** Providing and fixing 1 mm. thick M.S. sheet sliding shutters both frame and diagonal braces of 40 x 40 x 6 mm. Angle iron 3.15 mm. M.S. gusset plates at junctions and corners. 25 mm. dia pulley 40 x 40 x 6 mm. Angle and T-iron guide rail at top and bottom respectively with handles, stoppers and locking arrangements etc. including applying priming coat of red lead paint.

**1.0. Materials:** M.S. sliding shutters shall be lubricated of M.S. component as given in the description of item. M.S. sheets 1 mm. thick shall be fixed to the frame with rivets or welds as approved. The shutters shall be provided with top and bottom guide rails of Angls or T-iron as specified and 25 mm. dia. steel pulleys at the top. The frame shall be riveted and/or welded and wherever retreating shall be done 3.15 mm. gusset plates shall be provided at the junctions.

**2.0. Workmanship :**

2.1. The shutters shall be single or double leaf Gutters as specified. The guide rails shall be sufficiently long and continued along the wall on both ends so that the sliding shutters can rest against walls, leaving full opening when so required.

2.2. The guide rails shall be fixed to the floor by means of anchor bolts embedded in the cement concrete floor. The steel section at the top shall be suitably supported from the walls. Two channel sections shall be suitably fixed vertically below the extreme clamps in the wall and floor to avoid the shutters from going out of the supports at the top and bottom. A suitable clamping arrangement will be provided at either end of the opening to avoid the shutters from rolling back into opening.

2.3. All the adjoining work damaged while fixing shall be made good to match the existing work.

2.4. All members of the sliding shutter including T-iron shall be thoroughly cleaned of rust, scales, dust etc. and given a priming coat of red lead before fixing them in position.

**3.0. Mode of measurements & payment:**

3.1. The sliding doors shall be measured in sq. metre. The height of the shutters shall be measured from outside to cut of the guide rail and width outside to outside of shutters including vertical channels in side. The rate includes providing handles, stoppers and locking arrangements etc. complete.

3.2. The rate shall be for unit of one sq. metre.



## SECTION-12

### DETAILED SPECIFICATIONS - LABOUR FOR    FIXING FIXTURES & FASTENING

**12.4.** Fixing metallic lower bolts of size with necessary screws etc. complete (tower bolts and screws to be paid under separate items) :

**1.0 Workmanship:**

- 1.1. This item provide for labour fixing metallic tower bolts of any size with screws, nuts etc.
- 1.2. The cower bolls shall be fixed in proper position as shown in the drawings or as directed. There shall be fixed truly vertical or horizontal as the case may be.
- 1.3. The screws shall be driven home with screw driver. In not case the screws shall be hammered in.
- 1.4. All recesses and seats shall be cut to the exact size for counter sinking etc. where so required.
- 1.5. Care shall be taken to see that no gaps arc left between the fitting and the surface meant to receive the fittings.
- 1.6. The fittings shall be properly cleaned and left inoriginal finish after fixing.

**2.0. Mode of measurements & payment:**

- (1) Cutting of holes, recesses and seats involved in process of fixing.
- (2) Cost of filling and cushioning materials where so required forper seating of new fittings.
- (3) Cost of nails etc. for temporary positioning of fitting.
- (4) Cost of cleaning materials like old washed dhoti, stain remove, etc.
- (5) Cost of making good the over cut recesses or holes, if any.
- (6) Cost of making hole of required size on the wooden frame for housingg the bolt for locking.
- 2.2. The rale including cost of labour involved in all operations required for proper completion of the items, including carraige, handling, fixing etc. complete.

**2.3.** The rate shall be for unit of one number.

**12.5.** Fixing metallic flush bolts of sizes with necessary screws etc. complete (flush bolts and screws shall be paid under separate item).

**1.0. Workmanship:**

- 1.1. The relevant specifications shall be followed as per item No. 12.4 except for fixing metallic flush bolts instead of tower bolts.

**2.0. Mode of measurements & payment:**

- 2.1. The relevant specifications of item No. 12.4 shall be followed.
- 2.2. The rate shall be for unit of one number.

**12.8.** Fixing metallic or plastic door handles of sizes with necessary screws etc. complete (door handles and screws to be paid under separate items):

**1.0. Workmanship:**

- 1.1. The relevant specifications of item No. 12.4 shall be followed except fixing.

**2.0. Mode of measurements & payment:**

- 2.1. The relevant specifications of item No. 12.4 shall be followed.
- 2.2. The rate shall be for unit of one number.

**12.10.** Fixing metallic gate and shutters hooks and eyes of sizes (hooks and eyes to be paid under separate item)

**1.0. Workmanship:**

- 1.1. The relevant specifications shall be followed as per item No. 12.4 except that the fixing of eye and hooks instead of tower bolts.

**2.0. Mode of measurements & payment:**

- 2.1. The relevant specifications of item No. 12.4 shall be followed.
- 2.2. The rate shall be for unit of one number (Hook & Eye).

**12.11.** Fixing metallic door latches of sizes with necessary screws (door latches and screws to be paid under separate items):

**1.0 Workmanship :** 1.1. The relevant specifications of item No. 12.4 shall be followed except that fixing metallic door latches instead of lower bolts.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 12.4 shall be followed.

2.2. The rate shall be for unit of one number.

**12.12.** Fixing metaqllic mortise night latches with necessary screws including making necessary screws holes in wooden door shutters etc. complete (mortise night latches and screws to be paid under separate items)

**1.0. Workmanship :** 1.1. The relevant specifications of item No. 12.4 above shall be followed except that die fixing mortise night latches instead of tower bolts.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 12. shall be followed.

2.2. The rate shall be for a unit of one number.

**12.18.** Fixing metallic ball catchers 100 mm. dia. (Ball catchers to be paid under separate item):

**1.0. Workmanship :** 1.1. The relevant specifications of item No. 12.4 shall be followed same except fixing of ball catchers 100 mm. dia.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 12.4 shall be followed.

2.2. The rate shall be for a unit of one number.

**12.20.** Fixing metallic casement window fasteners, with necessary screws etc. complete (Casement window fasteners and screws to be paid under separate item):

**1.0. Workmanship :** 1.1. The relevant specifications of item No. 12.4 shall be followed except fixing metallic casement windows fasteners.

**2.0. Materials & Workmanship :**

2.1. The relevant specifications of item No. 12.4 shall be followed.

2.2. The rate shall be for a unit of one number.

**12.21.** Fixing metallic casement stays of sizes with necessary screws etc. complete (Casement stays and screws to be paid under separate items)

**1.0. Workmanship :** 1.1. The relevant specifications of item No. 12.4 shall be followed except fixing of metallic casement stays.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 12.4 shall be followed.

2.2. The rate shall be for a unit of one number.

**12.24.** Fixing metallic cup-board or ward robe locks of sizes with necessary screws etc. complete (Locks and screws to be paid separately).

**1.0. Workmanship :** The relevant specifications of item No. 12.4 shall be followed except that fixing metallic cup-board or ward robe locks of size with necessary screws etc. complete.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 12.4 shall be followed.

2.2. The rate shall be for a unit of one number.

**12.25.** Fixing metallic or plastic cup-board or ward robe knobs of size with necessary screws/bolts etc. complete (knobs and screws/bolts to be paid separately.)

**1.0. Workmanship:** The relevant specifications of item No. 12.4 shall be followed except that fixing of metallic or plaswlic cup-board or ward robe knobs of sizes with necessary screws/bolts etc. complete.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 12.4 shall be followed.

2.2. The rate shall be for a unit of one number.

**12.26.** Fixing metallic floor door stoppers of sizes with rubber cushion, screws etc. to suit shutter thickness complete. (Floor door stopper with rubber cushion and screws to be paid under separate items.)

**1.0 Workmanship: 1.1.** The relevant specifications of item No. 12.4 shall be followed except that fixing of metallic floor doorstoppers.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 12.4 shall be followed.

2.2. The rate shall be for a unit of one number.

**12.28** Fixing metallic door handles or knobs for mortice locks with necessary screws etc. complete (doors, handles/knobs and screws to be paid separately).

**1.0. Workmanship:** The relevant specifications of item No. 12.4 shall be followed except that fixing of metallic doorhandles or knobs for mortice with necessary screws etc. complete.

**24. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 12.4 shall be followed.

2.2. The rate shall be for a unit of one number.

## SECTION-13

### DETAILED SPECIFICATIONS FOR GLAZING

13.1. Providing and fixing sheet glass, selected quality (type-C) bedded in putty and fixed with wooden beading including cost of wooden beading of rist class teak wood and necessary cutting of glass 5 mm. thick.

**1.0. Materials:** The glass shall conform to M-38. The wood beading shall conform to M-29. Putty shall conform to I.S. : 419-1967.

**2.0. Workmanship:**

The glass shall be sheet glass of selected quality of 5 mm. thick.

2.1. Size of glass for glazing shall allow a clearance of 2.5 mm. between the edges of glass and the wood or metal surrounds. The clearance may be increased, provided the depth of the rebate of groove is sufficient to provide not less than 1.5. cm. cover to the glass. The detailed process or glazing shall be as specified in I.S. 3548-1966.

2.2. All stains from the surface of glass shall be removed and cleaned with thinner or spirit without any extra payment.

**2.3. Wooden beading:**

2.3.1. The size of the wood beads for glass panes shall be 1.5 cms. x 3 cms. unless otherwise specified. Beads shall be secured to wooden frames with either panels pains or screws and to metal frames in the way provided for in the frame.

2.3.2. Sufficient putty compound shall be applied to the rebate so that when the glass has been pressed into the rebate, a bed of compound not less than 1.5 mm. thick will remainbetween the glass and the rebate. There should also be surplus of compound squeezed out above the rebate which should be stripped aqt an angle not undercut to prevent water accumulating. Beads should be bedded with compound against the glass and wood beads should also be bedded against the rebate.

Care should be taken to see that no voids arc left between the glass and the bead.

**3.0. Mode of measurements & payment:**

3.1. All measurements of cutting shall, unless otherwise stated, be held to include the consequent waste.

3.2. Each pane of glass shall be measured to the nearest 0.5 cms.”both in width and height/length.

3.3. Irregular shaped or circular panes shall be measured as the smallest rectangular area from which the irregular or circular pane can be cut.

3.4. The rate includes cost of materials labour, required for complete of the item including hoisting, carriage, temporary erections like scaffolding etc.

3.5. The rate also includes:

(i) The wastages and breakage involved in the process, (ii) Oiraight cutting on glass and glazing putty, teak wood beading glass, pins, etc. complete.

3.6. The rate shall be for a unit of sq. metre.

**13.1.(II)** Providing and fixing sheet glass selected quality (Type-C) bedded in putty and fixed with wooden beading including cost of wooden headings of first class teak wood and necessary cutting of glass 6mm. thick.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 11.3 shall be followed except that the sheet glass of selected quality of 6 mm. thick.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 13.1 (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**13.3. (C)** Providing and fixing rough cast wired glass 6 mm. thick bedded in putty and fixed with wooden beadings including the cost of wooden beadings of Indian teak wood and necessary cutting of glass wired figured glass.

**1.0. Materials:** Wired figured glass shall conform to M-38. Wooden beading shall conform to M-29. Putty shall conform to I.S.419-1967.

**2.0. Workmanship :** The relevant specifications of item No. 13.1 (I) shall be followed except that the wired figures glass of 6 mm. thick shall be used.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 13.1 (I) shall be followed.

3.2. The rate shall be for a unit of one sq. mt.

**13.5. (3)** Providing and fixing sheet glass ordinary quality bedded in the putty and fixed with wooden beading including the cost of wooden beading of first class teak wood and necessary cutting of glass 3 mm. thick.

**1.0. Materials:** Glass shall conform to M-38. Wooden beading shall conform to M-29. Putty shall conform to I.S. 419-967.

**2.0. Workmanship : 2.1.1.** The specifications of this item shall be followed as per item No. 13.1 (I) except that the sheet glass of ordinary quality shall be used and thickness of sheet glass shall be 3 mm. thick.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 13.1 0) shall be followed.

3.2. The rate shall be for a unit of one sq. metre.

**13.5. (4)** Providing and fixing sheet glass ordinary quality, bedded in putty and fixed with wooden beadings including the cost of wooden beadings of first class teak wood and necessary cutting of glass 4 mm. thick.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 13.5 (3) shall be followed, except that the thickness of ordinary sheet glass shall be 4 mm.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 13.1 (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**13.7.** Extra for using ground glass (Frosted or obscured on one side) instead of plain glass.

**1.0. Materials:** Glass shall conform to M-38. Wooden beading shall conform to M-29. Putty shall conform to I.S. 419-967.

**2.0. Workmanship :** The specification of this item shall be followed as per item No. 13.1 except that ground glass (Frosted or obscured on one side) shall be used.

**2.0. Mode of measurements & payment:**

2.1. The payment shall be made on Sq. ml. basis extra over and above the payment for plain glass for using ground glass (Frosted or obscured).

2.2. The relevant specifications of item No. 13.5 (III) shall be followed.

2.3. The rate shall be for a unit of one sq. metre.

**13.11. (A)** Difference in cost of material and labour involved in method of glazings if changed in item No. 13.1. to front and

back puttied and sprigged or fixed with glazing pins:

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 13., shall be followed except that the glazing is to be done by front and back putting and sprigged or fixed with glazing pins.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 13.1 (I) and 13.1 (II) shall be followed.

2.2. The extra rate for extra cost involved shall be paid over and above item No. 13.1 (1) & 13.1. (II).

2.3. The rate shall be for a unit of one sq. metre.

**13.12.** Gridding, polishing and round of edges glass or glazing sheets :

**1.0. Materials:** The glass shall conform to M-38.

**2.0. Workmanship:** The edges of glass or glazing sheets shall be grind polished and rounded of such that it renders uniform took throughout the length and shall be neatly finished. The work shall be carried out in best workman's like manner.

**3.0. Mode of measurements & payment:**

3.1. The edges of glass round, polished and rounded off shall be measured in metre.

3.2. The rate shall be for a unit of one running metre.

## SECTION-14

### DETAILED SPECIFICATIONS OF ITEMS - PAVING & FLOOR FINISHING AS PER "SCHEDULE OF RATES"

**14.2. (A)** 40 mm. thick marble chips flooring rubbed and plished (i.e. Terrazzo) to granolithic finishing with under layerly 30 mm. thick cement concrete (1: 2:4) (1 cement: 2 coarse sand: 4 graded stone aggregate 10 mm. and down gauge) and top layer 10 mm. thick with white, black and black marble chips of required sizes from 1 mm. to 4 mm. nominal size laid in cement marble power mix 3 : 1 (3 cement: 1 marble powder by weight in proportion 4 : 7 (4 cement marble powder mix, 7 marble chips by volume): Dark shade pigment with ordinary cement (in top layer only).

**1.0. Materials :** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Stone grit shall conform to M-8.

The pigment incorporated in terrazzo shall be of permanent colour and shall conform to requirement mentioned in Appendix\_A in I.S.: 2114-1962. Marble chips shall conform to M-46. The marble powder shall pass through I.S. Sieve Terrazzo-30.

**2.0. Workmanship: 2.1.** Terrazzo finish shall be laid over a layer of base concrete in case of ground floor. When the terrazzo floor is laid over R.C.C. slabs a cushioning layer consisting of 75 mm. thick lime concrete shall be provided below the terrazzo floor. The terrazzo flooring shall consist of an under layer of cement concrete and layer of terrazzo which shall be laid monolithically.

**2.2. Under Layer: 2.2.1.** The under layer shall be of cement concrete mix 1:2:4. The maximum size of aggregate used shall not exceed 10 mm. Specification for cement concrete shall be followed as per Item No. 5.4.1.

**2.3. Terrazzo topping : 2.3.1.** The topping shall have mix of ordinary cement and marble powder in proportion (3 : 1) (3 cement: 1 marble powder: 7 marble powder by weight) and marble aggregate shall be mixed in proportion 4 : 7 (4 cement marble chips by volume). The thickness of concrete and cushioning layer shall not be less than 10 Cms. and 7.5 Cms. respectively. The minimum thickness of under layer and topping shall be 40 mm.

**2.4. Panels : 2.4.1.** The floor, both while laying the under layer and topping shall be divided into panels not exceeding 2 sq.m. in area so as to reduce the risk of cracking due to differential shrinkage or expansion of terrazzo and sub-floor. The joints be so located that the layer dimensions of any panel do not exceed 2 M. The panels shall preferably be separated by means of dividing strips. However where the butt joints are provided, the bays shall be laid alternatively allowing for an interval of at least 24 hours between the laying of adjacent bays.

**2.5. Mixing Materials: 2.5.1.** With a view to avoid variation in colour, mixing shall be done in trough or tub, and the complete

quantities of cement and pigment required for one unit shall be mixed at the beginning of the work. Colour cement and pigment mix shall be dry mixed with marble powder. The mix thus obtained shall be mixed with aggregate. Care shall be taken not to get the materials into a head as this would result in coarser aggregates moving on the sides and cement to the centre. To the dry mix thus prepared, water shall be added in small quantities while materials are being worked to get a mix of proper consistency. The mixture shall be plastic but not so wet to flow. The mix shall be used within half an hour of mix of addition of water during preparation laying.

## **2.6. Laying:**

2.6.1. The base shall be divided into panels with the help of dividing strips including the strips required for decorative design upto the finished surface level of the floor. Screed strips shall be used where the dividing strips are not used. The base shall be cleaned of all dust, dirt, laitance and any loose materials. It shall be then wetted with water mopped and smeared with cement slurry at 2.75 Kg/sq. mt. Under layer shall be then spread and levelled with a screeding board. The top surface shall be left rough to provide a good bond to the terrazzo.

2.6.2. The terrazzo topping shall be laid while the under layer is still plastic but has hardened enough to prevent cement from rising to the surface. This is normally achieved between 18 to 24 hours after laying of under layer. A cement slurry preferably of the same colour as the topping shall be brushed on the surface immediately before laying the topping. The terrazzo mix shall be laid to a uniform thickness on the screed bed and be complete thoroughly by taping or rolling and trowelled smooth. Excessive trowelling or rolling in early stages shall be avoided as it results in working up cement to the surface which will produce a surface liable to cracking and will require more grinding to expose marble chip. The terrazzo surface shall be lamped trowelled, and brought one to required level by a straight edge and steel floats in such a manner that the maximum amount of marble chips come up and are spread uniform over the surface and no part of the surface is left without chips.

**2.7. Curing:** 2.7.1. The surface shall be left dry for air curing for a period of 12 to 18 hours. Thereafter, water shall be allowed to stand overnight in pools for a period of a minimum of four days. The floor shall be prevented from being subjected to extreme temperature.

## **2.8. Grinding and finishing:**

2.8.1. Grinding and finishing shall be done either by hand or by machine. In case of manual grinding, the process of grinding shall begin after two days, while in case of machine grinding, the process shall be started after seven days after completion of laying.

2.8.2. First grinding shall be done by carborundum stones of 60 grit size. The surface shall then be washed clean and grouted with a grout of cement or/and colouring matter in the same mix and proportion as the topping in order to fill any pin holes that appear. It shall be allowed to dry for 24 hours and wet cured for four days in the same manner as mentioned in para 2.7 above.

2.8.3. The second grinding shall be done with carborundum stone of 80 grit size. The surface shall then be prepared as after first grinding. The third grinding shall be done with carborundum stone of 120 to 150 grit size. The surface shall then be washed again and allowed to dry for 12 hours, and wet cured four days as before. The fourth grinding shall be done with carborundum stone of 320 to 400 grit size. The surface shall again be washed clean rubbed hard with fine and slightly moistened Oxalic acid powder @ 5 gms. per sq. metre of floor surface. After the finishing work is over, the surface shall be washed with dilute oxalic acid solution and dried for floor polishing, machine fitted with felt or hessian bobs shall then be run over it until floor shines. In case wax polished surface is required, wax-polished shall be applied on the surface with the help of soft linen over a clean and dry surface. The polishing machine fitted with bobs shall be run over it, clean saw dust shall be spread over the floor surface and polishing machine again operated which will remove excess wax and leave glossy surface. Floor shall not be left slippery.

## **3.0. Mode of measurements & payment:**

3.1. Terrazzo flooring shall be measured as laid in sq. metres. Length and breadth shall be measured for visible area of work done. No deduction shall be made for, nor extra for any opening in floor or area up to 0.10 sq. metres. The rate shall cover laying the floor at different levels in the same room or court-yard and nothing extra shall be paid on that account.

3.2. The rate includes the cost of all materials and labour involved in all operations described above. The rate shall also not

include dividing strip.

3.3. The rate shall be for a unit of one sq. metre.

**14.2. (B)** 40 mm. thick marble chips, flooring rubbed and polished (i.e. Terrazzo) to granolithic finish with under layer 30 mm. thick cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 10 mm. and down gauge) and top layer 10 mm. thick with white, black or white and black marble chips, of required sizes from 1 mm. to 4 mm. nominal size laid in cement marble powder mix 3 : 1 (3 cement: 1 marble powder mix by weight in proportion 4 : 7 (4 cement: 7 marble powder: 7 marble chips by volume): light shade pigment with white cement (in top layer only).

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 14.2 (A) shall be followed, except Light shade pigment with white cement shall be used in top layer.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 14.2 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**14.2 (C)** 40 mm. thick marble chips, flooring rubbed and polished (i.e. Terrazzo) to granolithic finish with under layer 30 mm. thick cement concrete 1:2:4 (1 cement: 2 coarse sand : 4 graded stone aggregate 10 mm. and down gauge) and top layer 10 mm. thick with white, black or white and black marble chips of required sizes from 1 mm. to 4 mm. nominal size laid in cement marble powder mix 3 : 1 (3 cement: 1 marble powder mix by weight) in proportion 4 : 7 (4 cement: marble powder: 7 marble chips by volume). Medium shade pigment with approx. 50% white cement and 50% ordinary cement (in top layer only).

**1.0. Materials & Workmanship :**

1.1. The relevant specifications of item No. 14.2 (2) shall be followed, except that medium shade pigment with approximately 50% white cement 50% ordinary cement in top layer only shall be used.

**2.0, Mode of measurements & payment:**

2.1. The relevant specifications of item No. 14.2 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**14.2. (D)** 40 mm. thick marble chips, flooring rubbed and polished (i.e. Terrazzo) to granolithic finish with under-layer 30 mm. thick cement concrete 1 : 2 : (1 cement: 2 coarse sand : 4 graded stone aggregate 10 mm. and down gauge) and top layer 10 mm. thick with white, black or white and black marble chips of required sizes from 1 mm. to 4 mm. nominal size laid in cement marble powder mix 3: 1 (3 cement: 1 marble powder mix by weight) in proportion 4 : 7 (4 cement: marble powder: 7 marble chips by volume). White cement without any pigment (in top layer only).

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 14.2 (2) shall be followed, except that white cement without any pigment in top layer shall be used.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 14.2 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**14.2 (E)** 40 mm. thick marble chips, flooring rubbed and polished (i.e. Terrazzo) to granolithic finish with under layer 30 mm. thick cement concrete 1 : 2:4 (1 cement: 2 coarse sand : 4 graded stone aggregate 10 mm. and down gauge) and top layer 10 mm. thick with white, black or white and black marble chips of required sizes from 1 mm. to 4 mm. nominal size laid in cement marble powder mix 3 : 1 (3 cement: 1 marble powder mix by weight) in proportion 4 : 7 (4 cement: marble powder: 7 marble chips by volume): light shade pigment with ordinary cement (in top layer only). 14).

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 14.2 (A) shall be followed, except that the light shade pigment with ordinary cement (in top layer only) shall be used.

**2.0. Mode of measurements. & payment:**

2.1. The relevant specifications of item No. 14.2 (A) shall be followed.

2.2. The rate shall be for a unit of one Square metro.

**14.4 (A)** Marble chips skirting (terrazzo) of reddish brown and polished to granolithic finish top layer 6 mm. thick with white

and black or white and black marble chips of sizes from smallest to 4 mm. nominal size laid in cement marble powder mix 3 : 1 (3 cement: 1 marble powder by weight) in proportion of 4 : 7 (4 cement: 7 marble chips by volume) 20 mm. thick with under layer 14 mm. thick in cement plaster 1:3(1 cement: 3 coarse sand); Dark shade pigment with ordinary cement (in top layer only).

**1.0 Materials : 1.1** The relevant specifications of item No. 14.2 (A) shall be followed.

**2.0. Workmanship:**

2.1. Under layer: The under layer for terrazzo on vertical surfaces like skirting and dedoes shall be of stiff cement mortar 1: 3 (1 cement: 3 coarse sand) finished rough so as to give a good'bond to the topping.

2.2. Terrazzo topping shall not be less than 6 mm. thick and the combined thickness of under layer and topping shall be not less than 20 mm. The other details shall be followed same as per specifications of item No. C 24 except that the light shade pigment with white cement in top layers shall be used.

**3.0. Mode of measurements & payment:**

3.1. The skirting and dedo shall be measured in square metres correct to two places of decimals. The height shall be measured from the finished level of floor.

3.2. The rate shall be for a unit of one sq. metre.

**14.4. (B)** Marble chips skirting (terrazzo) of dedo rubbed and polished to granolithic finish top layer 6 mm. thick with white, black or white and black marble chips of sizes from smallest to 4 mm. nominal size laid in cement marble powder mix 3 : 1 (3 cement: 1 marble powder by weight) in proportion of 4 : 7 (4 cement marble powder mix : 7 marble chips by volume) 20 mm. thick with under layer 14 mm. thick in cement plaster 1 : 3 (1 cement: 3 coarse sand); medium shade pigment with approximate 50% white cement and 50% ordinary cement (In top layer only).

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 14.4 (A) shall be followed except that the light shade pigment with white cement in top layers only shall be used.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 14.4 (A) shall be followed.

2.2. The rate shall be for a unit of one square metre.

**14.4. (C)** Marble chips skirting (terrazzo) of dedo rubbed and polished to granolithic finish top layer 6 mm. thick with white, black or white and black marble chips of sizes from smallest to 4 mm. nominal size laid in cement marble powder mix 3 : 1 (3 cement: 1 marble powder-by weight) in proportion of 4 : 7 (4 cement marble powder mix: 7 marble chips by volume) 20 mm. thick with under layer 14 mm. thick in cement plaster 1 : 3 (1 cement: 3 coarse sand); medium shade pigment with approximate 50% in cement plaster 1:3(1 cement: 3 coarse sand); medium shade pigment with approximate 50% white cement and 50% ordinary cement (in top layer only).

**1.0 Materials & Workmanship:** The relevant specifications of item No. 1-4.4 (A) shall be followed except that the medium shade pigment with approximate 50% white cement and 50% ordinary cement in top layers only shall be used.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 14.4 (A) shall be followed.

2.2. The rate shall be for a unit of one Sq. metre.

**14.4. (D)** Marble chips skirting (terrazzo) of dedo rubbed and polished to granolithic finish top layer 6 mm. thick with white, black or white and black marble chips of sizes from smallest to 4 mm. nominal size laid in cement marble powder mix 3 : 1 (3 cement: 1 marble powder by weight) in proportion of 4 : 7 (4 cement marble powder mix : 7 marble chips by volume) 20 mm. thick with under layer 14 mm. thick in cement plaster 1:3(1 cement: 3 coarse sand); medium shade pigment with approximate 50% in cement plaster 1:3(1 cement: 3 coarse sand) : white cement without any pigment (In top layer only).

**1.0 Materials & Workmanship :** The relevant specifications of item No. 14.4 (A) shall be followed except that the white cement without any pigment in top layers shall be used.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 14.4 (A) shall be followed.



2.2. The rate shall be for a unit of one Sq. metre.

**14.4. (E)** Marble chips skirting (terrazzo) of dedo rubbed and polished to granolithic finish top layer 6 mm. thick with white black or while and black .narble chips of sizes from smallest to 4 mm. nominal size in cement marble powder-mix 3 : 1 (3 cement: 1 marble powder by weight) in proportion 4: 7 (4 cement marble powder mix 7 marble chips by volume) 20 mm. thick with underlayer 14 mm. thick in cement plaster 1:3(1 cement 3 coarse sand) light shake pigment with ordinary cement (In top layer only):

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 14.4 (A) shall be followed and except that the light shade pigment with ordinary cement in top layers only shall be used.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 14.4 (A) shall be followed and except that the light shade pigment with ordinary cement in top layers only shall be used.

2.1. The rate shall be for a unit of one sq. metre.

**14.16.** Providing and laying cushioning layer on R.C.C. slab consisting of 75 mm. thick lime concrete using brick aggregate of 20 mm. nominal size 50% mortar comprising of 1 lime: 2 fine sand.

**1.0. Materials : 1.1.** Water shall conform to M-1. Lime mortar of proportion 1 : 2 shall conform to M-10. Brick aggregate 20 mm. nominal size shall conform to M-14.

**2.0. Workmanship : 2.1** The relevant specifications of item No. 4.18 shall be followed except that the proportion of mix shall be 50% mortar comprising of 1 lime: 2 coarse sand and the size of brick aggreghate shall be 20 mm. nominal size. The lime concrete work shall be carried out ir. 7.5 cms. average thickness as a cushioning layer on R.C.C. slab.

**3.0. Mode of measurements & payment:**

3.1. The line concrete work shall be measured for visible area of work done.

3.2. The rate shall be for a unit of one sq. metre.

**14.19.** Precast terrazzo (Mosaic) tiles 20 mm. thick with white, black or white and black marble chips of sizes upto 6 mm. laid in floors, treads of steps and landings on a bed of 25 mm. average thickness of lime mortar 1 : 1.5. (1 lime putty : 1.5. Fine sand) or C.M. 1: 6 jointed with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing and polishing complete with precast tiles of: Light shades, using white cement.

**1.0. Materials: 1.** Water shall conform to M-1. Cement shall conform to M-3. Lime Mortar shall conform to M-10. Cement mertar shall conform to M-1 1. The precast terrazzo tiles of 20 mm. thick shall be of light shade using white cement and conform to M-47.

**2.0. Workmanship: 2.1.** The wo»k shall be carried out as per I.S. 1443-1972.

**2.2. Bedding:**

2.2.1. Before spreading the mortar, the sub-base of the floor shall be cleaned of all dirt, scum and loose materials and then well wetted without forming any pools of water on the surface.

2.2.2. In case of R.C.C. floors, the top shall be left a little rough, all points of level for the finished surface shall be marked out The lime mortar of proportion 1: 1.5 (lime putty: 1.5 fine sand) or cement mortar of proportion C.M. 1:6 as directed shall be then evenly and smoothly spread over the base. Bedding layer of mortar shall be not less tftan 10 mm. and average thickness of bedding shall be 25 mm.

**23. Laying:**

23.1. Before laying the terrazzo (Marble/Mosaic) tiles, the tiles shall be thoroughly wetted with water. Neat cement group of required consistency at 4.4. Kg. cement/sq.mt. shall be spread on the mortar bed. The tiles shell be laid on the neat cement float and shall be evenly and firmly bedded to the required level and slope. There shall be no hollows left. The joints shall be of uniform thickness and in straight line as per the pattern.

23.2. The surface of flooring shall be checked frequently with a straight edge at-least two metres long so as to obtain a true surface with required slope.

2.3.3. The tiles which are fixed in the floor adjoining the wall shall go about 10 mm. under plaster. Skirting or dado shall be left unfinished for about 50 mm, above finished floor level and unfinished strip them left earlier shall be finished.

2.3.4. In places where full tiles cannot be fixed, the tiles shall be cut to the size and smoothened at edges to give straight and true joints.

2.3.5. After the tiles have been laid, the surplus cement slurry and the joints shall be cleaned and washed fairly deep before cement hardens.

2.3.6 The day after tiles, have been laid, the joints shall be cleaned of grey cement grout with a wire brush to a depth of about 5 mm. and then grouted with white cement with or without pigment to match the shade of the topping of tiles. The same cement slurry shall then be spread over the whole surface in a thin coat to protect the surface from abrasive damage and to fill pin holes that may exist on the surface.

**2.4. Curing:** 2.4.1. The flooring shall be kept wet with damp sand or water for seven days. It shall be kept undisturbed atleast for 14 days. The grinding shall normally be commenced after 14 days.

### **2.5. Polishing:**

2.5.1. After the tiles are properly cured, first grinding shall be done with carborundum stone of 48 to 60 grade grit fitted in machine. Water shall be properly used during grinding. When the chips-show up and the floor has been uniformly rubbed, it shall be cleaned with water, baring all pin holes. It shall be covered with a thin coat of white cement mixed with or without pigments to match the colour of the topping of the tiles. Pin holes if any shall thus be filled. This grout shall be kept moist for a week. Thereafter second grinding shall be started with carborundum of 120 grit. Grouting and curing shall follow again. Final grinding shall be done when other works are finished. The machine shall be fitted with carborundum of grit 220 to 350 using water in abundance. The floor shall then be washed clean with water. Oxalic acid powder shall then be dusted at 33 grams per square metre on the surface and the surface rubbed with machine fitted with hessian bobs or rubbed hard with pad of woolen rags. The floor shall then be washed clean and dried with a soft cloth or linen. The finished floor shall not sound hollow when tapped with a mallet.

2.5.2. If any tile is disturbed or damaged it shall be refitted or replaced properly jointed and polished.

2.5.3. Testing of the tiles shall be carried out by the contractor at his own cost as per I.S. requirement for required tests.

### **3.0. Mode of measurements & payment:**

3.1. Terrazzo tiles flooring shall be measured in sq. metres for visible area of work done.

3.2. No deductions shall be made nor extra paid for any opening in the floor area upto 0.1 sq. mt.

Nothing extra shall be paid for use of cut tiles or for laying the floors at different levels in the same room or court yard. Mosaic tiles laid indoor borders and bands etc. shall be measured in the same item and nothing extra shall be payable on account of these or similar bonds formed of half or multiples of half size standard tiles/or other uncut tiles.

3.3. The treads of stairs and steps paved with tiles without nosing shall also be measured under this item.

3.4. Extra rate shall however be paid for such area where width of treads does not exceed 30 cms.

3.5. The rate shall include the cost of all materials, labour involved in all the operations as described above.

3.6. The rate shall be for a unit of one sq. metre.

**14.19. (B)** Precast Terrazzo (Marble/Mosaic) tiles 20 mm. thick with white black or white and black marble chips of size upto 6 mm. laid in floors, treads of steps and landing on a bed of 25 mm. average thickness of lime mortar 1 : 1.5 (1 lime putty : 1.5 fine sand) or C.M. 1 : 6 jointed with neat cement slurry mixed with pigment to match the shade of the tiles, including rubbing and polishing complete with precast tiles of medium shades using approximately 50% white cement and 50% ordinary cement.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 14.19 (A) shall be followed except that the precast terrazzo (marble mosaic) tiles shall be medium shades using approximately 50% white cement and 50% ordinary cement.

**2.0. Mode of measurements & payment: 2.1.** The rate shall be for a unit of one sq. metre.

**19.19. (C)** Precast terrazzo marble mosaic tiles 20 mm. thick with white black or white and black marble stone chips of size upto 6 mm. laid in floors, treads of step and landing on a bed of 25 mm. average thickness of lime mortar 1 : 1.5 (1 Lime putty : 1.5 fine sand) or Cm. 1.6 jointed with neat cement slurry mixed with pigment to match the shade of tiles including

rubbing and polishing complete with precast tiles of dark shade using ordinary cement.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 14.19 (A) shall be followed except that the precast tiles shall be of Dark shade using ordinary Portland cement.

**2.0. Mode of measurements & payment:**

2.1. The mode of measurements and payment shall be same as item No. 14.19 (A).

2.2. The rate shall be for a unit of one sq. metre.

**14.21. (A)** Precast terrazzo (Marble/Mosaic) tiles 20 mm. thick with marble chips of. size upto 6 mm. in skirting and risers of steps not exceeding 30 cms. in height on 10 mm. thick cement plaster 1:8(1 cement; 8 coarse sand) jointed with neat cement slurry including rubbing and polishing complete with tiles of light shades using white cement.

**1.0. Materials :** Water shall conform to MI. Cement Mortar shall conform to M-11. The precast terrazzo (Marble/Mosaic) tiles of light shades using white cement tiles 20 mm. thick shall conform to M-47.

**2.0. Workmanship :** The work shall be carried out for skirting as dedo. Before fixing precast terrazzo (Mosaic marble) tiles of shade and size as specified, the surface shall be prepared by heavy scarping, making joints etc. to the required line, level and plumb. The surface shall be thoroughly wetted before commencing the laying work. Thereafter about 10 mm. thick backing of cement mortar in specified proportion shall be applied on the surface in true line and level generally as per specifications of plaster item.

2.2. Fixing : The back of each tile to be fixed shall be smeared with cement paste of matching colour and the mosaic tiles shall then be gently tapped against the surface, with a wooden mallet. The skirting shall be done only after the flooring is completed. Any pipes coming out of the wall through the dedo or skirting shall only be at the intersections of the horizontal and vertical joints. The tiles shall not have staggered joints. The joints shall be true to entire line both ways and vertical joints shall be in line with joints of flooring. Tiles shall be fixed as close as possible to the adjoining tiles and any difference in the thickness of the mosaic tiles shall be evened out in the cement paste so that all the tiles faces are set in conformity with one another. The skirting shall project uniformly and not more than 6 mm. thickness beyond the finished surface above. Top of skirting of dedo shall be truly horizontal. The risers of steps, - skirting or dedo shall rest on top of treads of flooring wherever required. The tiles shall be cut (sawn) and thin edges smoothed before use.

2.3. Curing : Curing shall be done for 7 days continuously.

2.4. Finishing : Skirting and dedo shall be hand polished to have an even smooth and shining surface. In case of skirting only 10 mm. x 10 mm. groove shall be provided at the junction of cement plaster and cement tiles.

**3.0. Mode of measurements & payment:**

3.1. The terrazzo tiles with light shade using white cement base shall be paid under this item. The length shall be measured along finished surface of the riser, skirting or dedo, correct to a centimetre height measured from finished or treads or floor to the top (under side of treads in case of steps).

3.2. The rate shall include all materials and labour required for all the operations involved and described above.

3.3. The rate shall be for a unit of one sq. metre.

**14.21.(B)** Precast terrazzo tiles 20 mm. thick with marble chips of size upto 6 mm. in skirting and risers of steps not exceeding 30 cms. in height on 10 mm. thick cement plaster 1:3(1 cement 3 coarse sand) jointing with neat cement slurry including nibbing and polishing complete with tiles of medium shades using approximately 50% white cement and 50% ordinary cement.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 14.21 (A) shall be followed except that the work is for using tiles of medium shades using approximately 50% white cement and 50% ordinary cement.

**2.0. Mode of measurements & payment:**

2.1. The mode of measurements and payment shall be followed same as item No. 14.21 (A).

2.2. The rate shall be for a unit of one sq. metre.

**14.21. (C)** Precast terrazzo tiles 20 mm. thick with marble chips of sizes upto 6 mm. in skirting and risers of steps not exceeding 30 cms. in height on 10 mm. thick cement plaster in C.M. 1:3(1 cement; 3 sand) jointing with neat cement slurry including rubbing and polishing complete, with tiles of Dark shade using ordinary cement.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 14.21 (A) shall be followed except that the

tiles of dark shade using Portland cement shall be used.

**2.0. Mode of measurements & payment:**

2.1. The mode of measurements and payment shall be followed as per item No. 14.21 (A).

2.2. The rate shall be for a unit of one sq. metre.

**14.25. (A)** Chequered terrazzo tiles 2 mm. thick with marble chips of size upto 6 mm. in floor on 25 mm. thick bed of like mortar 1:1.5 (LLimePutty: 1.5 coarse sand) or C.M. 1:5 jointed with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing and polishing etc. complete, light shade using white cement.

**1.0. Materials :** Water shall conform to M-1. White cement shall conform to M-4. Lime mortar of proportion 1 : 1.5 shall conform to M-10. Cement mortar shall conform to M-1 1. Chequered tiles shall conform to M-47 D.

**2.0. Workmanship : 2.2.** The relevant specifications of item No. 14.21 (A) shall be followed except that chequered tiles of light shade using white cement shall be used.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 14.21 (A) shall be followed.

3.2. The rate shall be for a unit of one sq. metre.

**14.25 (B)** Chequered terrazzo tiles 25 mm. thick with marble chips of sizes upto 6 mm. in floors on 25 mm. thick bed of like mortar 1: 1.5 (1 Lime Putty : 1.5 coarse sand) or C.M. 1:6 jointed with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing and polishing etc. complete medium shade using approximate 50% white cement and 50% ordinary cement.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 14.25 (A) shall be followed except that the chequered tiles of medium shade using approximate 50% white cement and 50% ordinary cement shall be used.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 14:25 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**14.25(C)** Chequered terrazzo tiles 25 mm. thick with marble chips of sizes upto 6 mm. floors on 25 mm, thick bed of like mortar 1 : 1.5 (1 Lime putty : 1.5 coarse sand) or C.M. 1.6 jointed with neat cement slurry mixed with pigment to match the shade of the tiles including rubbing and polishing complete” Dark shade using ordinary cement.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 14:25 (A) shall be followed except that chequered tiles or dark shade using ordinary cement shall be used.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 14.25 (A) shall be followed.

2.2. The rate shall be for a unit of one Sq. metre.

**14.26 (A)** Chequered terrazzo tiles 28 mm. thick with Marble chips of size upto 6 mm. in treads of stairs and staircases in 12 mm. thick bed of like mortar 1 : 1.5 (1 Lime putty : 1.5 coarse sand) or C.M. 1.6 jointed with neat cement slurry mixed with pigment to match the shade of tiles including rubbing and polishing complete, Light shade using white cement.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 14.25 (A) shall be followed except that the chequered tiles 28 mm. thick of light shade using white cement shall be used in treads, stair cases etc.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 14.25 (A) shall be followed.

2.2. The rate shall be for a unit of one Sq. metre.

**14.27. (B)** Chequered terrazzo tiles 28 mm. thick with marble chips of sizes upto 6 mm. in treads of stairs and staircases in 12 mm. thick bed of like mortar 1 : 1.5. (1 Lime p’utty: 1.5 coarse sand) or C.M. 1 : 6 jointed with neat cement slurry mixed with pigment to match the shade of tiles including rubbing and polishing complete; Medium shade using approximately 50% white cement and 50% ordinary cement.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 14.25 (A) shall be followed except that the chequeretktiles 28 tnn}. thick of medium shade using approximately 50% while and 50% ordinary cement shall be used in treads of ttair, staircases etc.

2.1. The relevant specifications of item No. 14.25 (A) shall be followed.

2.2. The rate shall be for a unit of one Sq. metre.

**14.27 (C)** Chequered tenazzo tiles 28 mm. thick with marble chips of sizes of upto 6 mm. in treads of stairs and staircases in 12mm. thick bed of like mortar 1: 1.5(1 Lime putty: 1.5 coarse sand) or CM. 1 :6 jointed with neat cement slurry mixed with pigment to match the shade of tiles including rubbing and polishing complete: Dark shade using ordinary cement.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 14.25 (A) shall be followed except that the chequered tiles 28 mm. thick of dark shade using ordinary cement shall be used in treads of stair, staircases etc.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 14.25 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. rrietre.

**14.29.** White glazed tiles 6 mm. thick in flooring treads of steps and landings laid on a bed of 12 mm. thick cement mortar 1: 3 (1 cement: 3 coarse sand) finished with flush pointing inwhite cement.

**1.0. Materials :** Water shall conform to M-I. Cement mortar shall conform to M-11. White glazed tiles shall conform to M-55.

**2.0. Workmanship:**

**2.1. Bedding:**

2.1.1. The sub-grade shall be cleaned, wetted and mopped- The bedding shall then be laid evenly over the surface tamped and corrected to desired level and allowed to harden enough to offer a rigid cushion to tiles and to enable the mason to place wooden planks across and squat on it.

2.1.2. The white glazed tiles shall be laid on cement mortar bedding of 12 mm. thick in C.M. 1 : 3 The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of bedding. The base shall be cleared and well wetted. The mortar shall then be spread in thickness not less than 10 mm. at any place and average 12 mm. thickness. The proportion of the cement mortar shall be as specified in the item.

**2.2. Fixing tries:**

2.2.1. The tiles before laying shall be soaked in water for atleast two hours. Neat grey cement grout at 3.3. Kg/Cement/Sq. mt. of honey like consistency shall be spread bver the mortar bedding as directed. The edges of the tiles be smeared with neat cement slurry. The tiles shall be well pressed and gently tapped with a wooden mallet till they are properly bedded and in level with the adjoining tiles. There shall be no hollows in bed or joints. The joints between the tiles shall be as thin as possible in straight line or as per pattern.

2.2.2. The tiles shall not have staggered joints. The joints shall be true to centre line both ways. The Nehni trap coming in the flooring shall be so positioned that its grating shell replace only one tile as far as possible. Where full size tiles cannot be fixed, they shall be cut (Swan) to the required size and the edges rubbed smooth to ensure straight and true joints. The joints shall be filled with grey cement grout with wire brush of trowel to a depth of 5 mm. and loose material removed. White cement shall be used for pointing the joints. After fixing the tile finally in an even plane the flooring shall be kept wet and allowed to nature undisturbed for 7 days.

**2.3. Cleaning: 2.3.1.** The surplus cement grout that may have come out of the joints shall be cleared off before it sets. Once the floor has set, it shall be carefully washed, cleared by dilute acid and dried. Proper precaution and measures shall be taken to ensure that the tiles are not damaged inany way till the completion of the construction.

**3.0. Mode of measurements & payment:**

3.1. The work done shall be measured in sq. mt. for visible area of work done. The length and width of the flooring shall be measured not between the faces of skirting or dedos or plastered face of wall as the case may be. The paving under dado or skirting shall not be measured. No deduction shall be made nor extra paid for any opening in the floor of area upto 0.1 sq. mt. Nothing extra shall be paid for laying the floors at different levels in the same rooms.

3.2. The rate shall be for a unit of one sq. metre.

**14.32.** White glazed tiles 5 mm, thick in skirting, risers of steps and dado on 10 mm. thick cement plaster 1:3 (1 cement: 3 coarse sand) and jointed with white cement slurry.

**1.0. Materials:**

Water shall conform to M-1. Cement mortar shall conform to M-11. White glazed tiles shall conform to M-55.

## **2.0. Workmanship:**

2.1. Preparation of Surface : In case of brick masonry wall, the joints shall be raked-out to a depth of atleast 15 mm, while the masonry is being laid. In case of concrete wall, the surface shall be chiselled and roughened with wire brushes. The surface shall be cleaned and wetted thoroughly before commencing the laying work.

## **2.2. Laying:**

2.2.1. The wall surface shall be covered 10 mm. thick plaster of cement mortar 1: 3 mix and allowed to harden. The plaster shall be roughened with wire brushes both way. The back of tiles shall be floated with grey cement slurry and edges with white cement slurry set in bedding mortar. The tiles shall be gently tapped in position one after die other keeping the joints as thin as possible. Top of skirting or dado shall be truly horizontal and the joints vertical or as per required pattern.

2.2.2. Risers of steps, skirting and dado shall rest on top of treads or flooring. Where full size tiles cannot be fixed, they shall be cut to the required size and the edges be smoothened.

2.2.3. The joints shall be cleaned and flush pointed with white cement. The surface shall be kept wet for seven days. After curing the surface shall be washed clean.

## **3.0. Mode of measurements & payment:**

3.1. The rate shall include the cost of all materials and labour required for various operations described above. Risers of steps, skirting and dado shall be measured in square metres. Length and height shall be measured along the finished face of the skirting or dado including curves, where special such as covers, internal and external angles, etc. used. The length and height shall be measured correct to the centimetre except in case of risers and skirting where height shall be measured correct to 3mm.

3.2. The rate shall be for a Unit of one sq. metre.

**14.34.** Providing and fixing 50 mm. infernal or external angles of white glazed tiles.

## **1.0. Materials:**

Water shall conform to M-1. Cement shall conform to M-11. Glazed tiles shall conform to M-55.

2.0. Workmanship: 2.1. The relevant specifications of item No. 14.32 shall be followed except that the internal or external angles of glazed tiles shall be of thickness not less than the tiles with which they are used. The fixing shall be done as per directions.

## **3.0. Mode of measurements & payment:**

3.1. Rate shall be including the cost of materials and labour involved in all the operations described above. Internal o external angles of glazed tiles shall be measured in running metres correct uplp a centimetre, length being measured on the exposed face of the special at its centre line. No extra payment shall be made for corner places at angles junctions of cover beads and cornices for using cut length of special.

3.2. The rate shall be for a unit of one running metre.

**14.36 (A)** Providing and laying marble stone slabe flooring over 20 mm. (Average) base of cement mortar 1:6 (1 cement: 6 coarse sand) or L.M. 1 : 1.5 laid and jointed with grey cement slurry including rubbing and polishing complete: Marble slab 25 mm thick.

## **1.0. Materials:**

Water shall conform to M-1. Lime mortar shall conform to M-10: Cement mortar shall conform to M-II. Marble stone slab 25mm. thick shall conform to M-51.

## **2.0. Materials:**

2.1. Dressing of slabs: Every stone shall be cut to required size and fine chisel dressed to give a smooth and even surface on all sides to the full depth. A straight edge laid along the sides of the stone shall be fully in contact with it. Chisel dressing shall also be done on top surface to remove any waviness. The sides and top surface of marble slabs shall be machine rubbed or table rubbed with hoarse sand before using. All angles and edges of slabs shall be true, square and free from chippings.

2.2. The thickness of stone shall be 25 mm. The allowable tolerance shall be 2 mm. allowable. The tolerance shall be 15 mm. in length and breadth.

2.3 Bedding: Bedding of marble slabs sha'l either be lime mortar 1: 1.5 (1 Lime putty : 1.5 coarse sand or cement mortar

1 : 6 (1 cement: 6 coarse sand of average thickness 20 mm. thick as given in description of item. Minimum thickness at any place shall not be less than 10 mm.

**2.4. Laying :** The surface of sub grade shall be cleared wetted and mopped. Mortar of specified mix and thickness shall then be spread on an area sufficient to receive one marble slab. The slab shall be washed clean before laying. It shall be laid on top pressed and tapped gently to bring it in level with other slabs. It shall then be lifted and laid a side. The top surface of the mortar shall then be corrected by adding fresh mortar at hollows, or depressions. The mortar shall then be allowed to harden it over this surface cement slurry of honey like consistency at 4.4 Kg. of cement per sq. metre. The edges of slabs already paved shall be buttered with grey cement. The slab shall then be gently placed in position and tapped with wooden mallet till it is properly bedded in level with and close to the adjoining slab. The joints shall be as fine as possible: Surplus cement on the surface of the slabs shall be removed. The slab fixed in the floor adjoining the walls shall enter not less than 10 mm. under the plaster skirting or dado. The junction between the walls and floors shall be finished neatly. The finished surface shall be true to level and slopes as directed.

**2.5. Curing :** The floor shall be cured for a minimum period of seven days.

**2.6. Polishing and finishing:** Uncveness at the meeting edges of slab shall be removed by fine chiselling. Finishing etc. shall be done as per relevant specifications of item No. 14.21 (A) of terrazo tiles flooring except that cement slurry with/or without pigments shall not be applied on the surface before each polishing.

### **3.0. Mode of measurements & payment:**

**3.1.** Marble swtone flooring with various kinds of marble shall be measured in sq. metre. The length and breadth shall be measured between the finished face of skirting or dado or wall plaster. No deduction shall be made nor extra shall be paid for any openings in the floor of area upto 0.05 sq. mt. Nothing extra shall be paid for laying stone at different levels in the same room. Treads and steps of stairs paved with marble stone slabs shall also be measured under flooring.

**3.2.** The rate shall be for a unit of one sq. metre.

**14.43. (A)** Kotah stone slab (Polished, Green colour) flooring over 20 mm. (average) thick base of cement mortar 1:6(1 cement: 6 coarse sand) or lime mortar 1: 1.5 laid over and jointed with grey cement slurry including rubbing and polishing complete 25 mm. thick.

**1.0. Materials : 1.1.** Water shall conform M-1. Lime mortar shall conform to M-10. Cement mortar shall conform to M-11 polished kotah stone shall conform to M-49.

### **2.0. Workmanship :**

**2.1** Each slab shall be cut to the required size and shape and fine chisel dressed at all the edges.

The sides thus dressed shall have a full contact if a straight edge is laid along. The sides shall be table rubbed with coarse and before paving. All angles and edges of the slabs shall be true square and free from clippings and giving a plane surface. The thickness shall be 25 mm. (Average) as specified in the item but not less than 20 mm. at any place of the slab.

**2.2** Bedding for the kotah stone slabs shall be cement mortar 1 : 6 (1 cement; 6 coarse sand) or L.M. 1 : 1.5. of average thickness 20 mm. as given in the description of the item. Sub grade shall be cleaned, wetted and mopped. Mortar of the specified mix and thickness shall be then be spread on an area sufficient to receive one kotah stone slab. The slab shall be washed clean before laying. It shall be laid on top pressed, tapped gently to bring it in level with the other slabs. It shall then be lifted and laid aside. Top surface of the mortar shall then be corrected by adding fresh mortar at hollows or depressions. The mortar shall then be allowed to harden bit. Over this surface, cement slurry of honey like consistency shall be applied. The slab shall then be gently placed in position and lapped with wooden mallet till it is properly pedded in level with and close to the adjoining slab. The joint shall be as fine as possible. The slabs fixed in the floor adjoining the wall shall enter not less than 10 mm. under the plaster, skirting or dado. The junction between the wall floor shall be finished neatly. The finished surface shall be ture to levels and slopes as directed.

**2.3** The floor shall be kept wet for a minimum period of 7 days, so that bedding and joints set properly.

**2.4** Polishing shall be normally commenced after 14 days of laying the stone slab. First polishing shall be done with carborundum stones of 120 grade grit fitted in the heavy machine and then second polishing shall be done with carborundum stone of 220 to 350 grade grit fitted in heavy machine. Water shall be properly used during polishing. The stone shall then be washed clean with water. When directed by the Engineer-in-charge wax polish of approved quality shall be applied on the surface with the help of soft cloth over a clean and dry surface. Then the polish machine fitted with bobs shall be run over it.

**2.5.** The holes required for Nahni traps, pipes any other fittings shall be made without any extra cost.

**3.0. Mode of measurements & payment:**

**3.1** The rate shall include the cost of all materials and labour involved in all the operations described above. The kotah stone flooring shall be measured in square metres correct to, two places of decimal, length and breadth shall be measured correct to a centimeter and between the finished face of skirting dado or wall plaster and no deduction shall be made nor extra paid for any opening in floor of areas upto 0.1sq. mt.

**3.2** The rate shall be for a unit of one sq. metre.

**14.43 (B)** Kotah stone slab flooring over 20 mm. (average) thick base of cement mortar 1:6 (1 cement: 6 coarse sand) L.M. or 1: 1.5 laid over and jointed with grey cement slurry including and polishing complete 30 mm. thick.

**1.0. Materials & Workmanship “ 1.1.** The relevant specifications of item No. 14.43 (A) shall be followed except that the thickness of stone shall be 30 mm.

**2.0. Mode of measurements & payment:**

**2.1.** The relevant specifications of item No. 14.43 (A) shall be followed.

**2.2.** The rate shall be for a unit of one sq. metre.

**14.44.** Kotah stone slab 25 mm. thick in riser of steps, dado and pillars laid on 10 mm. thick cement mortar 1:3(1 cement: 3 coarse sand) jointed with grey cement slurry including rubbing and polishing etc. complete.

**1.0. Materials :** Water shall conform to M-I. Cement mortar shall conform to M-11. Kotah stone slab 25 mm. thick shall conform to M-49.

**2.0. Workmanship: 2.1.** The relevant specifications of item No. 14.43 (A) shall be followed except that the kotah stone shall be fixed for risers of steps, dado or skirting in C.M. 1:3 and the polishing shall be done manually instead of machine polishing.

**3.0. Mode of measurements & payment:**

**3.1.** The risers of steps, skirting or dado shall be measured in sq. metre. Length shall be measured along the finished faces of risers, skirting or dado, Height shall be measured from finished level of treads or floor to top. Lining of pillars shall be measured under this item.

**3.2. The rate shall be for a unit of one sq. metre.**

**14.46. (A)** Rough chiselled dressed (Kotah stone green) stone flooring over 20 mm. thick base of cement mortar 1 : 5 (I cement: 5 coarse sand) or L.M. 1: 1.5 including pointing with cement mortar 1: 2 (1 cement: 2 stone dust) etc. complete. 25 mm. thick

**1.0. Materials :** Water shall conform to M-I. Line mortar shall conform to M-10. Cement mortar shall conform to M-11. Rough chisel dressed stone shall conform to M-48.

**2.0. Workmanship:**

**2.1.** The relevant specifications of item No. 14.43(A) shall be followed except that the rough chisel dressed stone of 25 mm. thickness of approved quality are to be fixed on cement mortar bedding in C.M. 1 : 5 or L.M. 1 : 1.5 of 25 mm. average thickness.

**2.2. Dressing of stone slab :** Every stone slab shall be cut to the required size and shape and rough chisel-dressed on top, if required, so that the dressed surface shall not be more than 6 mm. from straight edge placed on it. The sides shall also be chisel-dressed to a minimum depth of 20 mm. so that the dressed edge shall at no place be more than 30 mm. from straight edge butted against it. Beyond this depth, the sides may be dressed slightly splayed so as to form an inverted ‘V’ shaped joint with adjoining slab. The surface shall be reasonable true and plane and all the angles and edges shall be square and free from drippings. Where the stone slabs are to be used for nosing, exposed edges shall be rough chisel-dressed to full depth and cut to the uniform thickness.

**2.3.** The thickness of the stone slab shall be 25 mm. with permissible tolerance of  $\pm 2$  mm.

**2.4. Laying :** The surface of the sub-grade concrete shall be cleaned, wetted and mopped. “The bedding of specified mortar mix shall be spread under each slab to the specified thickness. The slab shall be washed clean before laying. It shall be then laid-on top pressed so that all hollows underneath filled up and surplus mortar works up through the joints. The top shall be tapped and brought level to the adjoining slab. The thickness of the joints shall not exceed 5 mm. Subsequent slabs shall be laid in the same manner.



**2.5. Curing & Finishing :** Any surplus mortar on the surface of the slab shall be cleaned off and joints finished lush. The joints shall be raked out uniformly to a minimum depth of 12 mm. when the mortar is still green, the slabs which are fixed in the floor adjoining the wall shall enter not less than 12 mm. under the plaster, skirting or dado. The junctions between wall plasters and floor shall be finished neatly and without waviness. The pointing shall be done with CM. 1: 2. The pointing shall be cured for minimum period of seven days. The finished floor shall not sound hollow when tapped with wooden mallet and the finished surface shall be true to level and slopes as directed.

**3.0. Mode of measurements & payment:**

**3.1.** The relevant specifications of item No. 14.43 (A) shall be followed.

**3.2.** The rate shall be for a unit of one sq. metre.

**14.46 (B)** Rough chisel dressed (Kotah stone green) stone flooring over 20mm. thick base of cement mortar 1:5 (1 cement, 5 coarse sand) or Lime Mortar 1: 1.5 including pointing with cement 1 : 2 (1 cement: 2 stone dust) etc. complete 40 mm. thick..

**1.0.1.1. The relevant specifications of item No. 14.46 (A) shall be followed except that the thickness of stone slab shall be 40 mm. thick.**

**2.0. Mode of measurements & payment:**

**2.1.** The relevant specifications of item No. 14.46(A) shall be followed.

**2.2.** The rate shall be for a unit of one sq. metre.

**14.71. (A)** Cement concrete flooring for I.P.S. 1:2:4 (for Indian Patents tones) (1 cement: 2 coarse: sand: 4 graded stone aggregate 20 mm. nominal size) laid in one layer finished with a floating, coat of net cement 40 mm. thick.

**1.0. Materials:** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Stone aggregate 20 mm. nominal size shall conform to M-12.

Cement concrete 1:2:4 proportion measured by volume shall conform to relevant specification or ordinary grade 1:2:4 concrete.

**2.0. Workmanship:**

**2.1.** The cement concrete flooring of 40 mm thick (Average) is to be laid as per the site condition. The concrete shall be mixed in a mechanical mixer at the work. Hand mixed may however be allowed for smaller quantities of work and in case of failure of machines or as permitted by the Engineer-in-charge. It shall be carried out on a water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. However, in such cases 10% more cement than otherwise required shall have to be used without any extra cost. The mechanical mixing shall be done for period of 1/2 to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the purpose. Flooring of specified thickness shall be laid in accordance with approved pattern or as directed. Finishing operation shall start shortly after the cessation of beating and shall be spread over a period one to six hours depending upon the temperature and atmospheric conditions. The surface shall be left for some time till moisture disappears from it. Fresh quantity of cement shall be mixed with water to form a thick slurry and spread over the surface while the concrete is still green. Use of dry cement or cement and sand mixture sprinkled on this surface to stiffen the concrete or absorb excessive moisture shall not be permitted. The cement slurry shall then be properly pressed twice by means of iron floats, once, when the slurry is applied and the second time when cement starts setting and finished smooth. The surface shall be marked with string or B.R.C. fabric jali to make the surface non-slippery as and when directed. The junction of floors with wall plaster, dado or skirting shall be rounded off where so required upto 25 mm. radius. Flooring in lavatories and bath rooms shall be laid after fixing of water closet and squatting pans and floor traps which shall be plugged while laying the floors and opened after the floors are completed. Any damage, done to water supply or sanitary fittings during execution of work shall be made good.

**2.2.** After the final set, the concrete shall be kept continuously wet, if required by ponding for a period of not less than 7 days from the date of placement,

**2.3.** The form work shall be provided if necessary as directed by the Engineer-in-charge. Concreting shall be done as per alternate bay method with necessary centering either by mastic or cement mortar as directed.

**3.0. Mode of measurements & payment:**

**3.1.** The rate shall include the cost of all materials and labour involved in all the operations described above. No deduction

shall be made or extra paid for any opening upto 0.1 sq. mt. In area in the floor, nothing extra shall be paid for laying the floor at different levels in the same room or the courtyard.

**2.2** The rate shall be for unit of one sq. metre.

**14.71 (B)** Cement concrete flooring (Indian patent stone) 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm. nominal size) laid in one layer finished with floating coat of neat cement: 50 mm. thick.

**1.0. Mode of measurements & payment:**

**1.1.** The relevant specifications of item No. 14.71 (A) shall be followed except that the thickness of concrete flooring shall be 50 mm.

**2.0. Mode of measurements & payment:**

**2.1.** The relevant specifications of item No. 14.71 (A) shall be followed.

**2.2.** The rate shall be for a unit of one sq. metre.

**14.74** Cement concrete pavement (25 mm. to 50 mm. thick) with 1:2:4 (1 cement: 2 coarse sand: 4 stone aggregate 20 mm. nominal size) including finishing with a floating coat of neat cement complete.

**1.0. Materials & Workmanship : 1.1. The relevant specifications of item No. 14.71 (A) shall be followed except that the thickness of concrete flooring vary from 25 mm. to 50 mm.**

**2.0. Mode of measurements & payment:**

**2.1.** The relevant specifications of item No. 14.71 (A) shall be followed except that thickness shall be measured correct upto 1 mm. flooring laid in borders, margins and treads of steps, shall be measured under item or flooring in respective of width.

**2.2** The rate shall be for a unit of one cubic metre.

**14.81. (C)** 20 mm. thick precast concrete tile with aggregate of sizes upto 6 mm. laid in floors, treads of steps and landings on 20 mm. thick bed of cement mortar 1 : 6 (1 cement: 6 coarse sand) or L.M. 1: 1.5 jointed with neat cement slurry with pigment to match the shade of the tiles complete with precast .tiles of Dark shades using ordinary cement.

**1.0 Materials:** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Lime mortar 1: 1.5 shall conform to M-10. Cement mortar shall conform to M-11. Tiles shall conform to M-47 (A). Cement concrete tiles shall conform to I.S. 1237-1959 and pigments to be admixed with mortar or for grouting shall conform to I.S. 2114-1962.

**2.0. Workmanship:**

**2.1** The tiles shall be laid on the sub-grade of concrete of the R.C.C. slab. Bedding shall be in lime mortar 1: 1.5 or cement mortar (1:6). The amount of water added shall be minimum required for sufficient plasticity and workability in C.M. or lime mortar where the ingredients shall be thoroughly mixed dry, hard lumps removed and water added to give a good workability.

**2.2.** The base shall be cleaned of ail dust, dirt and scum and properly wetted without allowing water pools. For a bedding of cement mortar the mortar shall be then spread evenly over the base of two rows of tiles and three to five metres in length. The top shall be kept rough so that cement slurry can be absorbed. The thickness of the bedding shall be not less than 10 mm. at any place. The laying of tiles shall be commenced with neat cement slurry of honey-like consistency and shall be spread over the mortar bed over an area sufficient to receive about 20 tiles. The tiles shall then be fixed in this grout one after the other, each tile being gently tapped and properly bedded in line and level with the adjoining tiles. The joints shall be as narrow as possible and normally shall not exceed 1.5 mm. After the day's work tghe excess cement slurry on top shall be cleaned as also the joints with a broom stick and washed before the slurry sets hard. Next day the joints shall be filled with the cement grout of the same shade as the matrix of the dies. Tiles which are fixed in the floor adjoining the wall shall go a minimum of 10 mm. under the wall plaster, skirting or dado. For the purpose, plaster etc. may be left unfinished by about 50 mm. above the proposed finished level of the floor. The unfinished strip shall be plastered after laying the floor tiles. Where full die cannot be used, tile shall be cut to the size to be used.

**2.3.** The flooring shall be cured for 7 days.

**3.0. Mode of measurements & payment:**

**3.1.** The rate shall include the cost of all materials and labout involved in all the operations described above.

**3.2.** The rate shall be for a unit of one sq. metre.

**14.86.** Chequered precast concrete dies 22 mm. thick with aggregate of sizes upto 6 mm. in floors, treads of steps and landings

on 20 mm. thick bed of C.M. 1 : 6 (1 cement: 6 sand) or like mortar 1 : 1.5 (1 lime putty 1.5 coarse sand) jointed with neat cement slurry with pigment to match the shade of tiles.

**1.0. Materials :** 1.1. The relevant specifications of item No. 14.25 (A) shall be followed.

**2.0. Workmanship:** 2.1. The relevant specifications of item No. 14.21 (A) shall be followed except that chequered precast cement concrete tiles 22 mm. thick shall be used in floors, treads of steps and landings on average 20 mm. thick bed of C.M. 1 : or L.M. 1 : 1.5.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 14.21 (A) shall be followed.

3.2 The rate shall be for a unit of one sq. metre.

**14.87.** Extra for rubbing and polishing the precast cement concrete tiles in flooring, skirting or dado.

**1.0. Workmanship:**

1.1. Grinding and rubbing shall normally be commenced after 14 days of laying the tiles, except for skirting or small areas, machine shall be used for the purpose.

1.2. First grinding shall be done with carborundum stones of 48 to 60 grade grit fitted in machine. Water shall be properly used during grinding. When the chips show up and the floor has been uniformly rubbed, it shall be cleaned with water baring all pin holes. It shall then be covered with a thin coat of grey or white cement mixed with or without pigments to match the colour of the topping of the tiles. Pin holes if any shall thus be filled. This grout shall be kept moist for sufficient period as directed. Thereafter, second grinding shall be started with carborundum of 120 grit. Grouting and curing shall be followed again. Final grinding shall be done when other works are finished. The machine shall be fitted with carborundum of grit 220 to 350 using water in abundance. The floor shall then be washed clean with water. Oxalic acid powder shall then be dusted as needed on the surface and the surface rubbed with machine fitted with hessian bobs or rubbed hard with pad of woollen rags. The floor shall then be washed cleaned and dried with a soft cloth of linen. The finished floor shall not sound hollow when tapped with a mallet.

1.3. If any tile is disturbed or damaged it shall be refitted or replaced properly jointed and polished.

1.4. For skirting dado or small areas where it is not possible to do machine polishing all the above operations are to be done manually.

**2.0 Mode of measurements & payment:**

2.1 The rate shall include the cost of all materials and labour involved in all the operations as described above.

2.2. The rate shall be for a unit of one sq. metre.

**14.90.** Providing and laying brick on edge flooring laid dry, grouted with C.M. 1 : 6 (1 cement: 6 coarse sand) including finishing the joints flush, curing etc. complete.

**1.0. Material:** Water shall conform to M-1. Cement mortar shall conform to M-11. Brunt bricks shall conform to M-15.

**2.0. Workmanship:**

2.1. The flooring shall be laid on concrete sub-grade where so provided. The slope in the floor shall be provided in the sub-grade. Where sub-grade is not provided, the earth below shall properly stopped, watered, rammed and consolidated. Before laying the flooring it shall be moistured. Plinth masonry offsets shall be depressed so as to allow the sub-grade concrete to rest on it.

2.2. Laying : The brick shall be laid in plain, diagonal herring bond, or other pattern as directed. The brick shall be dry laid properly and set home by gentle tapping. On completion of the portion of flooring, the vertical joints shall be grouted with C.M. 1 : 6 and all joints shall be finished flush. The joints shall be as fine as possible and not exceeding 5 mm. These points shall be filled with cement mortar 1:6.

2.3. **Curing :** The brick paving shall be cured for 7 days.

**3.0. Mode of measurements & payment:**

3.1. The length and breadth shall be measured correct to a centimeter between skirting dado or wall plaster. No deductions shall be made nor extra paid for any opening upto 0.1 sq. m. in area in the floor. Nothings extra shall be paid for laying the floors at different levels in the same room or courtyard.

3.2. The rate shall be for a unit of one sq. metre.

## SECTION-15

### DETAILED SPECIFICATIONS OF ITEMS AS PER 'SCHEDULE OF RATES

**15.1.** Providing corrugated G. I. sheets roofing fixed with galvanised iron 'J' or 'L' hook bolts, and nuts 8 mm. dia with bitumen and G.I. limpet washers filled with white lead complete excluding the cost of purline, rafters and trusses. (1) 1.8 mm. thick sheet.

**1.0 Materials :** Corrugated G.I. sheets shall conform to M-24.

**2.0. Workman.ship :**

**2.1.** Spacing of purlins : One purlin shall be provided at the ridge and one at the eaves. The spacing of other purlins for 0.8 mm. thick G.I. sheet shall not exceed 1.80 metres. The purlin shall coincide with the centre line of the end lap. The ridge purlins shall be placed in such a way that the ridges can be fixed properly. The portion overhanging the wall support shall not be more than one fourth of the spacing of purlins.

**2.2.** The top surface of the purlins shall be painted before the sheets are fixed over them. Embedded portions of purlins shall be finished with two coats of coal-tar.

**2.3. Laying of Sheets :**

**2.3.1.** The sheets shall be laid in purlins to a true plane with the line of corrugations truly parallel or normal to the sides of area to be covered. The sheets shall not generally be built into gables and parapets. They shall be bent up along their side edges close to the wall, and the junction shall be protected by suitable flashing or by projecting drip course.

**2.3.2.** The laps at end shall be provided 150 mm. minimum for roof slopes 1 in 2 (1 vertical: 2 horizontal) and steeper but 200 mm. shall be provided for flatter slopes than those above. The side lap shall be provided two ridges of corrugations at each side.

**2.3.3.** The sheets shall be cut to the dimensions of the shape of the roof either along their lengths or their width or in slant across the line of corrugations at hips and valleys. The sheets shall be cut carefully with a straight edge and chisel to give a straight finish. The sheets shall be laid such that the laps are turned away from the usual direction of local heavy rain.

**2.3.4 Fixing of Sheets:**

**2.3.4.1.** Sheets shall be fixed to the purlins or other roof members such as hips of valley rafter etc. with 'J' or 'L' galvanised hook bolts, and galvanised nuts 8 mm. dia, with bitumen impel washers and G.I. washers. Limpet washers with white lead shall be used. Length of hook bolt shall be varied to suit the requirement. Bolts shall be sufficiently long so that after fixing the project above the top of their nuts by not less than 12 mm. the grip of 'J' or 'L' hook bolts on the side of purlins shall not be less than 25 mm. There shall be minimum of three hooks bolts placed at the ridge of corrugations in each sheet in every purlin, and their spacing shall not exceed 300 mm. coach screw shall not be used for fixing the sheets to purlins, where the slopes of roof are not less than 2 1/2 horizontal). (1 vertical: 2 1/2 horizontal). Sheets shall be jointed together at the side laps by galvanised iron bolts and nuts 25 mm. x 6 mm. size each bolt with a bitumen and G. I. limpet washer filled with white lead. Where the overlaps at the sides extend to two corrugations these bolts shall be placed zig-zag over the two overlapping corrugations, so that the ends of the overlapping sheets are drawn lightly towards each other. The spacing of same bolts shall not exceed 600 mm. along each of the staggered rows.

**2.3.5.** Holes for all bolts shall be drilled and not punched in the ridges of the corrugations from the under side, while the sheets are on the ground. The holes in the sheets shall be at least 50 mm. from the edge. Sheets drilled wrongly shall be rejected. The holes in the washers shall be of the exact diameter of hook, bolts or the screw bolts. The nuts shall be tightened from above to give a leak-proof roof.

**2.3.6.** The roof when complete shall be true to lines and slopes and shall be leak-proof.

**3.0. Mode of measurements & payment:**

**3.1** The measurements of the C.G.I. sheet roof shall be taken for finished work in superficial area in general plane (not girthed on the roof). The laps between the C.G.I. sheets both at their ends and along the side edges shall not be measured. The overlaps of C.G.I. sheets over the valley piece and their underlap under the ridge, hip and flashing piece shall be included in the measurements.

**3.2.** No deductions in measurements shall be made for openings for chimney stacks, sky light etc., of area upto 0.40 sq. mt. nor extra be paid for extra labour in cutting and for wastage etc., in forming such openings.

**3.3** The rate of roof shall include the cost of all materials and labour involved in all operations described above. The rate all includes the cost of provision, erection and removal of the scaffolding, benching, ladders, templates and tools required for the proper erection and completion of the work. The rate includes the cost of purlins, rafters and trusses.

**3.4** The rate shall be for a unit of one sq. metre.

**15.7.** Providing ridges or hips 600 mm. overall in plain G.I. sheets fixed with G.I. 'J' or 'L' hooks bolts and nuts 8 mm. dia G.I. limpet and bitumen washer etc. complete 0.80 mm. thick sheet.

**1.0. Materials:** The G.I. valley gutters and ridges shall conform M-23. A.

## **2.0. Workmanship:**

**2.1.** The relevant specifications of item No. 15.1 shall be followed except that the work shall be carried out for ridges or hips. The overlaps for ridges and hips on either side over the C.G.I., sheets and end legs shall be minimum 225 mm. width of the ridges and hips shall be as described in the item.

**2.2.** Ridges shall be fixed to the purlins with same 8 mm. dia. G.I. hook bolts and nuts and bitumen and G.I. limpet washers, which fix the sheets for the purline. Hips shall be fixed to the roof members with the same 8 mm. dia. G.I. hook bolts and nuts and bitumen and G.I. limpet washers which fixed the sheets. Atleast one of the fixing bolts shall pass through the end laps of the ridges and hips on other sides. If this is not possible, extra hook bolt shall be provided. End laps of ridges and hips shall be jointed together by galvanised iron seam bolts and G.I. washers. There shall be atleast two such bolts in each end lap.

**2.3.** Ridges and hips shall fit ia squarely on the sheets.

## **3.0. Mode of measurements & payment:**

**3.1.** The measurements of ridges or hips shall be taken for finished work in length along their centre lines.

**3.2.** No laps shall be measured.

**3.3.** The payment for ridges and hips be made in a similar way as in case of C.G.I. sheet roofing.

**3.4.** The rate shall be for a unit of one running metre.

**15.8.** Providing valleys 900 mm. overall in plain 1.6 mm. thick G.I. sheet Class -3 fixed with 'J' or 'L' hook bolts and nuts and 8 mm. diameter G.I. Limpet and bitumen washers complete.

**1.0. Materials: 1.1.** The G.I. valleys 900 mm. overall in galvanised plain sheet of 1.6 mm. thickness shall be of class-3. The valleys shall be 900 mm. wide overall and flashing shall be 380 mm. wide overall. These shall be bent to the required shape without damage to the sheets in the process of bending.

## **2.0. Workmanship:**

**2.1.** The relevant specifications of item No. 15.1 shall be followed except that the work shall be carried out for G.I. Valleys 900 mm. overall with G.I. sheets 1.6 mm. thickness.

**2.2.** Wherever the edge of a roof sheeting or valey gutter is turned up against a wall, the edge shall be weather proofed with a flashing. Flashing shall be bent to shape and fixed. Lap over the sheet shall be not less than 150 mm. over the roofing sheets. The end laps between the flashing sheets shall not be less than 225 mm.

**2.3.** The flashing shall be inserted into brick work or masonry joints to a depth of 50 mm. These joints shall be filled with, cement mortar (1:3). The flashing shall be well secured to the masonry whenever flashing has to be laid at a slope, it shall be stepped at each course of masonry, the step being out back at angle of not less than 30 degrees to the vertical.

**2.4.** Valleys shall be bent to shape and shall have end lap and projection on either side under C.G.I, sheet not less than 225 mm. Valleys shall be fixed to the roof members below, with same 8 mm. dia. G.I. hook bolts and nuts and bitumen and G.I. limpet washer which fixes the sheets to these members. Atleast one of the fixing bolts shall pass through the end laps of the valley piece. If necessary, extra bolts shall be provided for this purpose.

## **3.0. Mode of measurements & payment:**

**3.1.** The measurement for valleys shall be taken, for finished work in length along their centre lines.

**3.2.** No laps shall be measured.

**3.3.** The rate excludes the cost of boarding underneath which shall be paid separately.

**3.4.** The rate of dashing includes the cost of mortar for fixing in wall and other labour and materials required for it.

**3.5.** The rate shall be for a unit of one running metre.

**15.10.** Providing and fixing 150 mm. wide 450 mm. overall semicircular plain. G.I. sheet class-3 Gutter with iron brackets 40 mm. x 3 mm. size bolts nuts, washers etc. including making necessary connections with rain water pipes: 0.80 mm. thick.

**1.0. Materials: 1.1** These shall be of plain galvanised sheets Class -3 of 0.80 mm. thickness. The gutter shall be designed to carry the maximum discharge from the roof without flowing over and shall be constructed wherever possible with shank channel or gutter.

**2.0. Workmanship :**

**2.1.** The longitudinal edges, shall be turned back to the extent of 12 mm. and beaten to form a rounded edge. The ends of the sheets at junction of pieces shall be hooked into each other and beaten flush to avoid leakages.

**2.2.** The size of gutters shall be as specified in the item.

**2.3.** The gutter shall be laid with a minimum fall 1 in 120 Gutter shall be true to line and slope and shall be supported on fixed M.S. Flat iron brackets bent to shape or any other suitable bracket.

**3.0. Mode of measurements & payment:**

**3.1.** The measurements of gutters shall be taken for finished work in length along their centre lines. No laps shall be measured.

**3.2.** The rate of gutter shall include the cost of all labour and materials specified above, including all specials such as angles, junctions, dropends or funnelshaped connecting pieces, step ends etc. flat iron brackets and bolts and nuts required for fixing the latter to the roof members.

**3.3.** The rate shall be for a unit of one running metre.

**15.20. (A) (I)** Providing asbestos cement sheets roofing fixed with G.I. plain and bitumen washers complete excluding cost of purlins, rafters and trusses : 7 mm. thick corrugated sheet.

**1.0. Materials : 1.1.** Asbestos cement sheets shall conform to M-24.

**2.0. Workmanship :**

**2.1.** The maximum spacing of purlins shall be 1.6 metres in case of 7 mm. thick A.C. sheets and 1.4. metres for 6 mm. thick A.C. sheets.

**2.2.** Laying and fixing of Sheets: The sheets shall be laid on the purlins and other roof members as per code of practice. Top bearing surfaces of all purlins and other roof members shall be in one plane so that the sheets when being fixed shall not be required to be forced down to rest on the purlins. The finished roof shall present uniform slope and the line of corrugation shall be straight and true. The sheets shall be laid with smooth side upwards. Corrugated sheets shall be laid starting at the eaves either from left to right or right to left depending upon the direction of wind before actual laying of the sheets is started. The purlins spacing and the size of sheets shall be checked to ensure that the arrangements shall provide the laps required and the specified overhang at the eaves. In case the sheets are laid from right to left, the first-sheet shall be laid uncut but the remaining sheets in the bottom row shall have the top left hand corners cut or mitred. The sheets in the second and other immediate rows shall have bottom right hand corner of the first sheet cut. AU other sheet except the last sheets shall have both bottom right hand corners and top left hand corners cut. The last sheet shall have only top left hand corner cut. The last of the top row sheets shall have the bottom right hand corner cut with exception of the last sheet which shall be left uncut. If the sheets are laid from left to right, the first sheet shall be laid and cut and the remaining procedure shall be reversed.

**2.3.** The free overhang of the sheets at the eaves shall not exceed 400 mm. in case of 7 mm. thick sheets and 300 mm. in case of 6 mm. thick sheets.

**2.4.** The mitre described above is necessary to provide snug fit. Where 4 sheets meet at a lap the length of mitre shall be 150 mm. and the width of mitre shall be equal the width of the side lap. The cutting may be done with ordinary wood saw at site.

**2.5. Laps :** The sheet shall be laid with an end lap of 150 mm. minimum. In case of roof with a pitch flatter than 1 vertical to 2½ horizontal (Approx. 22°) or in the case of very exposed situations appropriate larger laps may be provided. The sheets shall be laid with side lap of half a corrugation.

**2.6. Fixing Accessories:** The sheets shall be secured to the purlins and other roof members by means of 8 mm. dia galvanized iron bolts (J) type hook bolts in case of angle iron purlins and “L” type bolts in case of R.S. joints, precast concrete or timber purline, and nuts bearing on galvanised iron washers and bitumen washers. The grip of ‘J’ or ‘L’ bolts on the side of purlins shall not be less than 25 mm. Each galvanised iron ‘J’ or ‘L’ hook bolts shall have a bitumen washer and galvanised iron washer placed Over the sheets before the nuts is screwed down from above. On each purlin there shall be one hook bolt on the crown adjacent to the side lap on either side. Bitumen washer shall be of approved quality. The G.I. flat washer shall be 25 mm. in diameter and 1.60 mm. thick and bitumen washer shall be 35 mm. in dia. and 1.5 mm. thick with hole to suit the required size of fixing accessory. Each nut shall be screwed lightly at first. After a dozen or more sheets are laid, the nuts shall be tightened to ensure a leak-proof joint and also nuts tightened only to extent so as to prevent damage to the sheets. The length of the ‘J’ bolts or crank bolts shall be 75 mm. more than the depth of purlins for single sheets fixing and 90 mm. more where two sheets overlap or where ridges or other accessories are to be fixed. The minimum length of coach screw for timber purlins shall be 110 mm.

**2.7. Holes:** The holes for fixing the sheet shall be drilled in the centre of end lap of sheets to suit the purlins i.e. on the centre line of the purlins, if these are of timber and square head coach screws are used, or as close as possible to the back of purlins if ‘J’ or ‘L’ bolts are used as with steel angles or precast concrete or timber purlins. Holes for hook bolts etc. shall be 2 mm. more than the diameter of the fixing bolts. No holes shall be nearer than 40 mm. to any edge of sheet or accessory.

### **3.0. Mode of measurements & payment:**

**3.1.** The relevant specifications of item 15.1. shall be followed except that the over lap of the corrugated sheets over valley gutters, roof lights, caves, filler pieces and underlay of the corrugated sheets below ridges, hips, north light curves, flashing pieces, roof light sheets and barge board shall be included in the measurement. No deduction shall be made for holes cut for extractors or cowl type ventilators. Deductions shall be made for roof light sheets.

**3.2.** The rate shall be for a unit of one sq. metre.

**15.20. (A) (III)** Providing asbestos cement sheets roofing fixed with G.I. plain and bitumen washers complete excluding the cost of purlins, rafters and trusses : 6 mm. thick corrugated sheets.

**1.0. Materials & Workmanship :** The relevant specifications of Item No. 15.20 (A) (I) shall be followed except that the thickness of A.C. sheets shall be 6 mm.

### **2.0. Mode of measurements & payment:**

**2.1.** The relevant specifications of item No. 14.20 (A) (I) shall be followed.

**2.2.** The rate shall be for a unit of one sq. metre.

**15.25. (D)** Providing and fixing ridges and hips in asbestos cement sheets roofing with G.I. ‘J’ or ‘L’ hook, bolts and nuts 8 mm. dia. G.I. plain and bitumen washers complete : North light adjustable ridges.

**1.0. Materials : 1.1.** The ridges and hips of Asbestos cement sheets roofing shall conform to M-24.

### **2.0. Workmanship :**

**2.1.** The relevant specifications of item No. 14.21 (A) (I) shall be followed except that the work is to be carried out for ridges and hips in A. C. Sheet roofing.

**2.2.** The ridges shall be laid as per manufacture’s instructions with rolls of the two wings in case of adjustable ridges, fitting closely and with a separation of serrated ridges registering correctly with the sheet underneath. The staggered lapping of two wings of adjustable ridge section and the lap between the adjacent pieces on the same wing of ridges shall be as per manufacturer’s instructions. The end portion of the wing of the adjustable ridges which project beyond verges of the roof shall be cut and trimmed off neatly.

**2.3. Hips :** In laying hip pieces, serrations to suit the corrugation in the sheets below should be cut in them so that they shall be snug fit over the sheets. The wings of ridges shall be fixed to the sheet below with seam bolts and nuts 8 mm. dia. G.I. ‘J’ or ‘L’ hook bolts and bitumen and G.I. washers which fix the sheets to the purlins. In addition, in north light adjustable ridges, the roll of the two wings shall be jointed together at their crown, with 8 mm. dia. G.I. seam bolts and nuts at the rate of two numbers per pair wings. Each seam bolt shall be provided with one bitumen and a pair of G.I. washers. Where the plain wing angular or plain wing adjustable ridges are used, the gaps formed by roofing corrugation and the wings shall be filled with C.C. (1:2:4) upto a full length of the overlaps. The exposed face shall be finished perpendicular to the sheeting. Wings of hips shall be fixed to the roof members below with the same. 8 mm. dia. G.I. ‘J’ or ‘L’ bolts and end nut which fix

the sheets to the member. In addition, they shall be secured to the sheet below with 8 mm. dia. G.I. seam bolts, nuts and washers so that taken together with hook bolts, there shall be bolt on each wing at least at every fifth corrugation of the sheets below in case of corrugated and at least every second corrugation of the sheet below in case of semi-corrugated sheets. Each seam bolt shall be provided with one bitumen and pair of G.I. washers.

**3.0. Mode of measurements & payment:**

3.1. Measurements of ridges, hips and other accessories shall be for nished work and die length shall be taken along the centre line. The lap shall not be measured. The under lap of ridges under expansion joint pieces shall be measured.

3.2. The rate shall be for a unit of one running metre.

**15.26.** Filling cement concrete 1 : 2 : 4 (1 cement: 2 coarse sand: 4 graded stone aggregate 12.5 mm. nominal size) in gaps of A.C. sheet corrugation and wings of ridges.

**1.0. Materials :** Water shall conform to M-1. Cement shall conform to M-3. Coarse sand shall conform to M-6. Stone grit shall conform to M-8.

**2.0. Workmanship :** 2.1. The relevant specifications of item No. 5.4.1. of C.C. shall be followed except that the work shall be for filling gaps of A. C. Sheet corrugation and wings of ridges.

**3.0. Mode of measurements & payment;**

3.1. The measurements of filling gaps in ridges, hips of A.C. sheet corrugation and wings or ridges shall be for finished work. The length shall be measured along the centre line.

3.2. The rate shall be for a unit of one running metre.

**15.27 (III)** Providing and fixing asbestos cement roofing accessories with galvanised iron 'J' or 'L' hook bolts and nuts G.I. plain and bitumen washer etc. complete : North light and ventilator curves.

**1.0. Materials & Workmanship :**

1.1. The relevant specifications of item No. 15.10 (I) shall be followed except that the work is tarried out for accessories for asbestos cement roofing north light and ventilator curfves.

1.2. The accessories such as north light and ventilator curves shall be laid and secured with same G.I. hook bolts to secure the sheets to the roof, or with separate G.I. hook bolts to the roof members below and/or with 8 mm. dia. G.I. seam bolts, nuts and washers to the sheeting, generally as per manufacturer's written instructions.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 15.25 (D) shall be followed.

2.2. The rate shall be for a unit of one running metre.

**15.29 (I)** Providing and fixing asbestos cement socketed half round eaves gutter with bolts, nuts, bitumen washer etc. and flat iron brackets 40 mm. x 3 mm. size including asbestos rope and plastic roofing compound in joints complete: 150 mm. nominal size.

**1.0. Materials & Workmanship**

1.1. The relevant specifications of item No. 15.10 (I) shall be followed except that the asbestos cement socked half round eaves gutter shall be provided. The size of gutter shall be 150 mm. nominal.

1.2. Gutters shall be laid with a minimum fall of 1 in 120 which should increase where possible. Gutters shall be tur eto line and slope and shall be laid with requisite accessories such as drop ends, nozzles, angles and union slips, as directed. The size of outlet of dropends and nozzles shall be the same as the size of rain water pipe into which they discharge water. Gutters and their accessories shall be supported by M.S. flat/iron bracket. Where these are required to be fixed to the side of rafter they shall be fixed with 40 him. by 3 mm. section bent to shape and fixed rigidly to the sides of the rafter with 3 Nos. of 10 mm. dia. bolts, nuts and washers. The brackets shall overlap the rafter not less than 300 mm. and connecting bolts shall be 115 mm. centres.

1.3. Where the brackets are to be fixed with purlins, these shall consist of 40 x 3 M.S. flat iron bent to shape with one and turned at a right angle and fixed to the purlins face with a 10 mm. bolt, but and washer. The perpendicular over handg portion of 40 mm. x 3 mm. bracket shall be stiffended by another 40 x 3 mm. flat bent to right angle shape with its longer leg connected to the bracket with two numbers of 6 mm. dia. M.S. bolts, nuts and washers and its shorter legs fixed to the face of purlins with one number 10 mm. dia. bolts, nuts and washers. The overhang of the vertical portion of the flat iron bracket from the face of the purlin shall not exceed 225 mm.



1.4. Requisite slope in the gutter shall be given in the line of bracket. The brackets shall be placed at not more than 900 mm. centres.

1.5. The gutters shall be fixed to the brackets with 2 Nos. 8 mm. dia. G. I. seam bolts and nuts, each bolt and nut being equipped with a pair of bitumen and G. I. washers. These connecting bolts shall normally be above the water line of gutter.

1.6. Spigot and socket end of gutters of socketed half round gutter and their accessories shall be connected together at their laps with one row of 8 mm. dia. G. I. bolts and nuts. Each of the bolts and nuts shall be provided with a pair of bitumen and a pair of G. I. washers. The gap between socket and spigot shall be packed with approved plastic roofing compound and flanked on the both sides with 6.35 mm. dia. asbestos rope. The connecting G.I. Bolt shall be then tightened so that the lapped joint becomes leak-proof. The outer face of packed asbestos rope shall not be further than 6mm. from the edges of the spigot and socketed ends. Where both ends of gutters and/or their accessories to be connected together are spigot ends, they shall be laid as butt jointed with 1.5 mm. gap in between over union clips. The union clips connected to the two butt ends of the gutter or other sections with two rows. The gap between union clips and ends of gutter sections or accessories shall be packed with plastic roofing compound flanked with edges of 6.35 mm. dia. asbestos ropes as before. The whole joint shall be made leak-proof by tightening the bolt.

## **2.0. Mode of measurements & payment:**

2.1. The asbestos socketed half round eaves gutter shall be measured for finished work and the length shall be measured along the centre line.

2.2. The rate of gutters shall include the cost of providing and fixing accessories such as dropends, stop ends, nozzles and fixing union clips together with bolts, nuts and washers.

2.3. The rate shall be for a unit of one running metre.

**15.29. (II)** Providing and fixing Asbestos cement stocketed half round eaves gutters with bolus, nuts, bitumen washers etc. and flat won brackets 40 mm. x 3 mm. size including Asbestos rope and plastic roofing compound in joints etc. complete. 300 mm. nominal size.

## **1.0. Materials & Workmanship :**

1.1. The relevant specifications of item No. 15.29 (I) shall be followed except that the size of the Asbestos socketed eaves half round gutter shall be 300 mm. nominal size.

## **2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 15.29 (I) shall be followed.

2.2. The rate shall be for a unit of one running metre.

**15.51.** Tiled roofing with Mangalore pattern roof tiles including teak reepers of size 50 mm. x 25 mm.

**1.0. Materials :** (1) Mangalore pattern roof tiles shall conform to M-25 (2) Teak wood battren shall conform to M-29.

## **2.0. Workmanship:**

2.1. Laying: The maximum distance between centre to centre of rafters shall be not more than 600 mm. Teak wood reepers 50 mm. x 25 mm. shall be nailed to each rafter at central distances suited to the size of the tiles by means of nails 50 mm. long. The reepers shall be well seasoned teak wood and shall be straight places of uniform size and colour and not shorter than the length necessary to cover at least four rafter. The under face and sides of the reepers shall be planed before fitting up. Joints shall come over the rafters. The joints of two adjacent rows of reepers shall not come over the same rafter. At the eaves, there shall be two reepers of such thickness and shape that the uniformity of the top slope of the roof shall be preserved.

2.2. The work of valleys shall be executed as under:

Galvanised iron sheet 1200 mm. wide and 1.25 mm. thick shall be used for valleys. The sheet shall extended by about 450 mm. under tiles on either side in a depth of 100 mm. at centre. The sheet shall be carried 75 mm. into the wall and set with cement mortar unless flashing is specified. The laps, if any, on the slope shall be 300 mm. The sheets shall be laid over the reepers and nailed. Two repers 50 mm. x 25 mm. each shall be fixed over the galvanised iron sheet 150 mm. away from the centre line of the valley on either side to keep the tiles and mortar from falling into the gutter of the valley.

**2.3. Laying:** The tiles shall be laid from the eaves towards the ridges after fitting of the reepers, the rebate of the tiles resting fully against the reepers. The joints of the hips and ridges tiles and also those between them and the plain tiles shall be set in and well grouted with lime mortar and, the mortar surface painted and finished off with a mixture of red panint and portland cement to preserve of colour. The finished sloop of roof shall be uniform ridges to eaves. The eaves line shall beperfectly staight, horiaonml and parallel to each other. The end ever gable shall be protected by lime borders and neatly finished.

2.4. At the side of valleys and for 230 mm. on either side of the roof at valleys, cement plastering 12mm. thick shall be done to prevent the rain water from the gutter leaking by the side of valleys.

2.5. At the eaves, wind tie shall be pieced over the ends of the last tiles and secured by means of galvanised iron washers and screws 25 mm. into the raft to prevent tiles from being blown up. Care shall be taken (p put the screws in the ridges and not in the gutter of the tiles, where, full tiles are not necessary, half tiles manufactured for the purpose shall be used.

### **3.0. Mode of measurements & payment:**

3.1. The measurements of the roof shall be taken for finished work for superficial area flat in the plane of the roof and not girthed. Laps shall not be measured.

3.2. No deduction in measurements of roof shall be made for openings of area upto 0.40 sq. mt. nor shall any extra be paid for labour and wastage in forming such openings.

3-3. The rate includes the cost of all materials and labour including ridges, hips, eaves and battens.

3.4. The rate shall be for a unit of one sq. metre.

**15.75.** Providing and fixing five course water proofing treatment felt consisting of second and fourth course of blown bitumen or/and residual bitumen applied hot 1.20 kg./sq. mt. of area for each course and first course with fibre base self finished felt type 2 Grade-I, fifth and final course of stone grit 6 mm. and down size or pea sized gravel spreaded at 0.008 cum/sq. mt. including preparation of surface, excluding grading complete.

**1.0. Materials :** The tarfelt shall conform to M-76. The bitumen primer shall conform to I.S. 3388-1965. The bitumen shall conform to I.S. 702-1961. The grit or gravel shall conform to M- 8.

### **2.0. Workmanship:**

#### **2.1. Preparation of surface :**

2.1.1. Well defined cracks other than hair cracks in the roof structure shall be cut to 'V' section cleaned and filled up flush with cement sand slurry or with bitumen conforming to I.S. 702-1961. The surface to be treated shall have a minimum slope of 1 in 120. The grading shall be carried out prior to the application of water proofing treatment by cement mortar or line surkhi mortar or as specified in description of item.

2.1.2. The surface of room, part of parapet and gutters, drain mouths etc. over which the water proofing treatment is to be applied, shall be cleaned of all foreign matter such as fungus, moss and dust by wire burshing and dusting.

2.1.3. Drain outlet shall be suitably placed with respect to the roof gradient to ensure rapid drainage and prevent local accumulation of water on the roof, surface, masonry drain mouth, shall be widen sufficiently and rounded with cement mortar.

2.1.4. Form cast iron drain outlets, a groove shall be cut all round to touch the treatment.

2.1.5. When a pipe passess through a roof on which water proofing treatment is to be laid, a cement, concrete angle fillet shall be built round it and the water proofing treatment taken over the fillet.

2.1.6. In case of parapet wall over 450 mm. in height for tucking in the waterproofing treatment, a horizontal groove 75 mm. wide and 65 mm. deep at minimum height of 150 mm. above roof level shall be left in the vertical face at the time of construction, the horizontal face of the groove shall be shaped with cement mortar 1:4.

2.1.7. In case of low parapet where the height does not exceed 450 mm. no groove shall be provided and the water proofing treatment shall be carried right over the top.

2.1.8. In case of existing R.C.C. and stone walls cutting the chase for tacking in the water proofing treatment is not recommended.

2.1.9. At the junction between the roof and verifical face of the parapet wall, a fillet 75 mm. in radius shall be constructed.

2.1.10. At the drain mouths the fillet shall be suitably cut back and rounded off for easy application of water proofing treatment and easy flow or water.

2.1.11. Outlet at every low dividing wall about less than 300 mm. in height shall be rounded smooth and corners rounded off for easy application of water proofing treatment.

#### **2.2. Priming coat:**

2.2.1. Bitumen primer shall conform to I.S. 3385-1965. A priming coat consisting of bitumenous solution of low viscosity shall be applied with brush on the roof and wall surface at specified per unit area to assist adhesion of bonding materials as specified in the description of the item.

2.2.2. Where a floating treatment of water proofing with self finished bitumen felt is required i.e. where water proofing treatment is required to be isolated from the roof structure, layer of bitumen saturated felt (underlay) shall be spread over the surface and tucked into the flashing grooves, to keep the underlay free from the structure no bonding materials shall be used below underlay. Overlapping to the adjoining strip of underlay shall be minimum of 75 mm. at sides and 10 mm. at ends and shall be sealed with the same bonding materials, as used for the self finished felt treatment. The underlay shall be of type-1 saturated felt conforming to I. S. 1322-1970.

### **2.3. Laying of Felt:**

2.3.1. The self-finished tarfelt shall be cut to the required lengths, brushed clean of dusting materials, laid out flat on the roof to eliminate curls and subsequent stretching. The felt shall be laid in length running at right angles to the direction of runoff gradient commencing at the lowest level and working up to crest, so that the lower laps of the adjacent felt layer offer minimum obstruction to the flow of water. The felt shall not be laid in a single piece of very long lengths as it is likely to shrink 6 to 8 metres are suitable length. The roof shall be cleaned and dried before the felt treatment is begun. Each length shall be laid in position and rolled up for a distance of half its lengths. The hot bonding materials heated to correct working temperature as specified by manufacture shall be poured on to the roof across the full width of the felt as the latter is steadily unrolled and pressed down. The excess of bonding materials which squeezes out at the ends shall be removed as the laying proceeds. The pouring shall be so regulated that correct weight of the bonding materials as per unit area is spread uniformly over the surface when the first half of the tarfelt has been bonded to the roof, the other half shall be rolled up and then unrolled on the hot bonding materials in the same way. Subsequent strips shall also be laid in the same manner. Each strip shall overlap the preceding one by at least 75 mm. at the longitudinal edges and 100 mm. at the ends. All overlaps shall be firmly bonded with hot bitumen. Streaks and trailings of bitumen near edges of laps shall be levelled by heating the overlaps with blow lamp and levelling down unevenness.

2.3.2. Third layer of bonding materials in four course treatment shall be carried out in similar manner after the flashing has been complete.

2.3.3. Water proofing treatment shall be carried out in the drain pipe or outlets by at least 100 mm. The water proofing treatment laid on the surface shall overlap the upper edge of water proofing treatment in the drain outlets by at least 100 mm. Flashing felt shall be laid as flashing. Wherever junction of vertical horizontal surface occurs longitudinal laps shall be 100 mm. The lower layer of flashing felt shall overlap the roofing felt by 100 mm. on vertical and sloping faces. Last course of flashing shall not be of stone, grit or pea sized gravel but it shall be replaced by providing two coats of bitumen solution of approved quantity.

2.3.4. The lower edge of flashing shall overlap the flat portion of the roof and the upper edge of the flashing shall be tucked to the horizontal groove 75 mm. thick wide, 65 mm. deep provided at minimum height of 150 mm. from top of the roof surface. The flashing treatment shall be firmly held in place in the grooves with wooden wedges at intervals and the grooves shall be followed with cement mortar 1 : 4 (1 cement: 4 coarse sand) or cement concrete (1 : 2 : 4) (1 cement: 2 coarse sand : 1 graded stone aggregate 6 mm. nominal size) and surface finished smooth with the rest of wall. The cement work shall be cured for 7 days. When dry, the exposed plaster joints of grooves shall be pointed with bitumen and two coats of bituminous solution shall be applied on the vertical and sloping surface of flashing.

2.3.5. After the top flashing felt layer has been laid, the penultimate layer of bonding materials shall be applied over the roofing felt and horizontal overlap, and vertical and sloping surface of flashing shall be spread uniformly over the hot bonding materials on the horizontal roof surface and pressed into it with wooden roller.

2.3.6. The material for surface finish shall be spread as described in the item over top layer.

2.3.7. If ballooning occurs the defects may be rectified as under:

2.3.8. Remove the gravel on the ballooned surface. Then cut open and squeeze out the trapped vapour by firm pressure applied by hand, seal the bitumen felt so lifted back on the surface by applying additional bitumen, finally seal the cut with piece of bitumen felt with bitumen application.

### **3.0. Mode of measurements & payment:**

3.1. The measurements for this item shall be taken as under:

- (a) Waterproofing of roof with bitumen shall be measured in sq. mt. length and breadth shall be measured correct to centimetre.
- (b) Measurement shall be taken for the superficial area of roofing and flashing treatment including flashing over the parapet

wall, low dividing walls and expansion joints and at the pipe projections etc. Overlapping and tucking into flashing groover shall not be pleased.

(c) Sloping and vertical surface of water proofing treatment shall be measured under the four or five course treatment as the case may be irrespective of the fact that the final course of grit or gravel is replaced by bitumen primer.

(d) In measurements, no deduction shall be made for either openings or recesses for chimney stacks roof lights etc. for areas upto 0.40 sq. mt. nor anything extra shall be paid or extra labour and materials in forming such openings. For similar area exceeding 0.40 sq. mt. deduction shall be made in measurements for full opening but nothing extra shall be paid for extra labour and materials in forming such openings.

(e) The grading (coba bedding) shall be paid separately but cleaning of surface and treating the cracks shall not be paid separately.

(f) Cutting of horizontal grooves in parapet walls for tucking in wawa proofing treatment shall not be measured or paid separately.

3.2. The rate includes cost of all materials and labour.

3.3. The rate shall be for a unit of one sq. metre.

**15.87 (A)** Providing and fixing on wall face C.I. rain water pipe including filling the joints with spun yam soaked in neat cement slurry and cement mortar 1 : 2 (1 cement: 2 fine sand) 75 mm. dia.

**1.0. Materials :** Water shall conform to M-1. The C.I. rain water pipes and fittings shall conform to M-68. Cement mortar shall conform to M-11.

## **2.0. Workmanship:**

2.1. C.I. rain water pipes shall be of the specified diameter and shall be in full lengths of 1.8 metres including socket ends of the pipes unless shorter lengths are required at junctions with fittings.

2.2. Fixing : The pipe and fillings shall be fixed in vertical alignment unless otherwise specified and shall be secured to the walls at joints with M.S. clamps. The clamps shall be M.S. sheet 30 mm. bent to required shape and size so as to fit tightly on the socket of-pipe when tightened with screw bolts. It shall be formed out of two semi-circular pieces, hinged with 6 mm. dia. M.S. pin on one side and provided flanged ends on the other side with holes to fit in the screw boll and nut 40 mm. long. The clamps shall be provided with hook made out of 275 mm. long, 10 mm. dia. M. S. bar rivetted to the ring at the centre of one semicircular piece. The clamps shall be fixed to the walls. The damps shall be kept above 25 mm. clear of finished face of wall so as to facilitate cleaning and painting the pipes.

2.3. The pipe shall be fixed vertically. The spigot of the upper pipe shall be properly fitted in the socket of the lower pipe such that there is uniform annular space for filling with the jointing materials. The annular space between the spigot and socket shall be filled with a few turns of spun yarn soaked in cement slurry or blown bitumen 85/25 grade. These shall be pressed home by caulking tools. The joints shall then be filled with stiff cement mortar 1:2(1 cement: 2 fine sand) well pressed with caulking tools and finished smooth at top at an angle of 45° sloping up. The joints shall be kept wet atleast for 7 days by typing four fonds of gunny bag to the pipe and keeping it moist constantly.

## **3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 15.93 (B) of A.C. rain water pipes shall be followed except that the C. I. rain water pipe shall be fixed.

3.2. The rate shall be (or a unit of one running metre.

**15.88. (A)** Providing and fixing M.S. Holder bat clamps of approved design to C. I. or S.C.I, pipes embedded and including cement concrete blocks (100 mm. x 100 mm. x 100 mm. size in 1 : 2 :4 (1 cement 2 coarse sand: 4 graded, stone aggregate 20 mm. nominal size) and cost of cutting holes and making good the walls etc. complete: 75 mm. dia.

## **1.0. Materials Workmanship:**

1.1. The relevant specifications of item No. 15.94 (B) shall be followed except that the M. S. holder bat clamps of approved design shall be for C. I. rain water pipe-75 mm. dia.

1.2. The bat clamps shall be fixed as directed with C. C. blocks of 100 mm. x 100 mm. x 100 mm. The relevant specification of item No. 5.4.1. shall be followed for concrete work.

## **2.0. Mode of measurements & payment:**

- 2.1. The bat clamp of M. S. holder suitable for 75 mm. dia. shall be measured for finished item.
- 2.2. The rate includes cost of all materials and labour etc. required for satisfactory completion of this item.
- 2.3. The rate shall be for a unit of one Number.

**15.93 (A)** Providing and fixing and embedding sand C I. rain water pipe in the mason surrounded with 12 mm. thick cement mortar of the same mix as that of masonry : 75 mm. dia pipe.

**1.0. Materials:** Water shall conform to M-1. Cement mortar shall conform to M-11. The C. I. pipe and fittings shall conform to M-68.

**2.0. Workmanship:**

- 2.1. The relevant specifications of item No. 15.87 (A) shall be followed except the C. I. pipe 75 mm. dia. shall be embedded in masonry surrounded with 12 mm. thick cement mortar.
- 2.2. The pipes shall be fixed in the masonry work as it proceeds. The pipe shall be kept vertical or to the line as directed. The pipe shall have minimum surroundings of 12 mm. thick cement mortar at every portion of external surface. The length shall be caulked with spun yarn and cement mortar as soon as the next length of pipe is placed in position. The socket end the pipe shall be kept closed till the next length of pipe is fitted and jointed to prevent any brick-bats or concrete or pieces of wood falling in and chocking the pipes.

**3.0. Mode of measurements & payment:**

- 3.1. The relevant specifications of item No. 15.87 (A) shall be followed.
- 3.2. The rate shall be for a unit of one running meter.

**15.93 (B)** Providing and fixing on wall face asbestos cement rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1 : 2 (1 cement 2 coarse sand) complete 80 mm. dia.

**1.0. Materials : 1.1.** Asbestos cement pipes of 80 mm. dia. shall conform to I. S. : 1626-1960 for pipes fixed on wall face. A.C. pipe shall conform to M-74.

**2.0. Workmanship:**

- 2.1. Asbestos cement rain water pipes and fittings shall be of the diameter, size and type specified in the item. The pipe shall be fixed in full lengths of 2 metre as far possible. All the pipes shall be fixed on wall face at locations indicated on drawings or as ordered by the Engineer-in-charge. Pipe shall be secured to face of wall below all joints by M.S. clamps with wooden gutties.
- 2.2. The spigot of the upper pipe shall be property fitted into the socket of the lower pipe such that there is uniform annular space for fitting with the jointing materials. One third depth of annular space between the socket and the spigot shall be filled with spun-yarn socked inbitumatic jointing compound and shall be pressed home by means of a caulking tool. The remaining 2/3 depth of the joints shall be filled in with stiff cement mortar 1 : 2 and shall be pressed with caulking tool and finished smooth at top at an angle 45° sloping up.

**3.0. Mode of measurements & payment:**

- 3.1. The pipe shall be measured including all fittings along its length in running metre. No allowance shall be made for the portion of pipe length entering the sockets of the adjacent pipe or fittings.
- 3.2. The rate includes the cost of all materials and labour involved in all the operations including jointing.
- 3.3. The rate shall be for a unit of one running metre.

**15.93 (C)** Providing and fixing on wall face Asbestos cement rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1 : 2 (1 cement: 2 coarse sand) complete : 100 mm dia.

**1.0. Materials & Workmanship :**

- 1.1. The relevant specifications of item No. 15.93 (B) shall be followed except that the diameter of pipes shall be 100 mm.

**2.0. Mode of measurements & payment:**

- 2.1. The pipe shall be measured including all fittings along its length in running metre. No allowance shall be made for the portion of pipe length entered into the sockets of the adjacent pipe of fittings.
- 2.2. The rate includes the cost of all materials and labour involved in all the operations including jointing.

2.3. The rate shall be for a unit of one running metre.

**15.94** Providing and fixing for A. C. pipe on wall plugs and standard holder bat clamps comprising of two semi circular halves of flat iron and cast iron base screwed on wooden plugs : 80 mm. dia.

**1.0. Materials & Workmanship :**

1.1. The bat clamps shall consist of a cast iron base with a projecting 'I' shaped lay, teeth web of which the semicircular halves of the flat iron clamps are bolted. The base on the holder bat clamp shall be screwed on a pair of wooden plugs fixed in the wall with screw slotted driven through the holes in the base. The screws shall be not less than 75 mm. long for 80 mm. diameter pipes and 100mm. for 100 mm. diameter pipes. The plugs shall be fixed in the wall to a depth of 150 mm. in cement mortar 1: 2 centrally to the holes in the base of the bat clamps and with their front face projecting to such a length from the brick face that when the bat clamp is fixed, the outer base of its base shall be flush with the plaster face of the wall. The plugs shall be 110 mm. x 50 mm. wide at face increasing to 160 mm. x 70 mm. width at rear and shall be 70 mm. deep through out.

**2.0. Mode of measurements & payment:**

2.1. The work shall be measured on number basis of clamps prescribed with accession including cost of all materials and labour Involved in all the operation including jointing etc. complete fixing in position etc. complete.

2.2. The rate shall be for a unit of one number.

**15.94(C)** Providing and fixing for A.C. pipe on wall plugs and standard holder bat clamps comprising of two semi circular halves of flat iron and cast iron base screwed on wooden plugs: 100 mm. dia.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 15.94 (B) shall be followed except that the standard holder bat clamps shall be for A.C. pipe of 100 mm. dia.

**2.0. Mode of measurements & payment:**

2.1. The work shall be measured on number basis of clamps including cost of all materials and labour involved in all the operation including jointing, fixing in position etc. complete.

2.2. The rate shall be for a unit of one number.

**15.95(A)** Providing and fixing on wall face asbestos cement fittings for rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 cement: 2 coarse sand) Bend of required degree-80 mm. dia. without door. 100 mm. without door.

**1.0. Materials : 1.1.** The bend of required degree and size as specified in item shall be of best quality and make as approved by the Engineer-in-charge. The fittings shall conform to I.S. 1626-1960.

**2.0. Workmanship: 2.1.** The fitting (bends of required degree) shall be fixed as per relevant specifications of item No. 1593 (B) except that the A.C. bends of required degree shall be provided instead of pipe.

**3.0. Mode of measurements & payment: 3.1. The rate shall be for a unit of one member.**

**15.95 (B)** Providing and fixing on wall face Asbestos cement fittings for rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 cement: 2 coarse sand) offset 5C :nm. (2) 80 mm. dia. (3) 100 mm. dia..

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 15.95 (A) shall be followed except that the offset 50 mm. of specified size of A.C. pipe shall be used instead of bends.

**2.0. Mode of measurements & payment: 2.1.** The rate shall be for a unit of one number.

**15.95 (C)** Providing and fixing on wall face Asbestos cement fittings for rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1 : 2 (1 cement: 2 sand) off set 75 mm. (2) 80 mm. dia. (3) 100 mm. dia.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 15.95 (A) shall be followed except that offset 75 mm. specified size of A.C. Pipe shall be provided instead of bends.

**2.0. Mode of measurements & payment: 2.1.** The rate shall be for a unit of one number.

**15.95 (J)** Providing and fixing on wall face Asbestos cement fittings for rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1:2(1 cement: 2 coarse sand) junction equal angle. (3) 80 mm. dia. without door. (5) 100mm. dia. without door.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 15.95 (A) shall be followed except that junction of angle of specified size of A. C. Pipe shall be provided instead of Bends.

**2.0. Mode of measurements & payment: 2.1.** The rate shall be for a unit of one number.

**15.95 (K)** Providing and fixing on wall face Asbestos cement fittings for rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1:2 (1 cement: 2 coarse sand) 1 junction of equal double angle. (3) 80 mm. dia. without door. (5) 100mm. dia with out door.

**1.0. Materials & Workmanship 1.1.** The relevant specifications of item No. 15.95 (A) shall be followed except that junction of equal double angles of A. C. rain water pipe of specified size shall be provided instead of A.C: bend.

**2.0. Mode of measurements & payment:** 2.1. The rate shall be for a unit of one number.

**15.95 (L)** Providing and fixing wall face Asbestos cement fittings for A.C. rain water pipe including jointing with spun yarn soaked in bitumen and cement mortar 1: 2 (1 cement: 2 coarse find): Standard shoe (2) 80 mm. dia. (3) 100 mm. dia.

**1.0. Materials & Workmanship : 1.1.** The relevant specifitcafccon of item No. 15.95 (A) shall be followed except that the standard shone of A.C. Pipe of specified size shall be provided instead of bend.

**2.0. Mode of measurements & payment:** 2.1. The rate shall before unit of one number.

## SECTION-16

### DETAILED SPECIFICATIONS FOR CEILING LINING

#### AS PER “SCHEDULE OF RATES”

**16.3 (A) Providing and fixing wooden planks ceiling with tongued and grooved jointing and wood screws (frame work and cover Fillets in be measured and paid separately) : Indian Teak Wood (i) 12 mm. thick (ii) 20 mm. thick (iii) 25 mm thick.**

**1.0. Materials : 1.1** The India Teak wood shall conform to M-29.

**2.0. Workmanship:**

**2.1. General :** The planks shall be clean sawn in the direction of the grain, cut, square and straight. Each plank shall have tongued and grooved jointing. On exposed faces, it shall planed for full face.

**2.2** The frame for supporting the ceiling may be wooden or metal and the size and the other details of frame work shall be as directed. Suspenders of M.S. angles or other sections may be used for suspending the frame. Use of wooden suspenders shall be permitted, the bottom surface of the frame shall be checked and corrected to true surface and slope.

**2.3. Fixing:** Planks of specified timber and thickness shall be used. The width of the planks shall not be more than 100 mm. upto 20 mm. thick planks and 150 mm. for planks above 20 mm. thick and length shall not exceed 3 metres. The planks shall be of uniform width except in the first and last lines of planks adjacent to the walls where remaining additional odd width shall be adjusted equally on both sides. The minimum length of planks in finished work shall be such that it will span at least two spacings of the supporting frame work except where shorter lengths are unavoidable. The planks shall be planed true on the exposed sides.

**2.4.** The longitudinal edges of the planks shall be jointed with tongued and grooved type joints as described in the item.

**2.5.** The outer lines of planks shall be accurately fixed parallel and close to the wall. Each subsequent plank shall be carefully jointed up. The plank shall be fixed to the frame above with two screws at each and joint of frame and one at every intermediate joint. (The screws shall not be thinner than designation 8 and of a length not less than twice the thickness of the boards) The screws shall be counter sunk and the screw holes filled with putty or sloping out way. The unexposed face of planks shall be treated with wood preservative before the board is fixed.

**3.0. Mode of measurements & payment:**

**3.1.** The supporting frame, cover fillets and suspenders shall not be included in rate of ceiling.

**3.2.** No deductions in measurements shall be made for opening not exceeding 0.40 Sq. m. and no extra payment shall be made for forming such openings.

**3.3.** Each type of work in ceiling shall be measured separately.

**3.4.** The rate shall be for a unit of one sq. metre.

**16.4.** Providing and fixing fibre insulation board lining with butt jointing and nails (frame work and cover fillets to be measured and paid separately, (i) 12 mm. thick (ii) 18 mm. thick (iii) 25 mm. thick.

**1.0. Materials: 1.1.** The fibre insulation board of specified thickness shall conform to I.S. 3348-1965.

**2.0. Workmanship:**

2.1. Fixing: The work shall be carried out as per detailed drawings for panel arrangements.

2.2. All boards are subject to slight movements due to moisture and temperature changes, and this shall be allowed for in fixing. Preferably the board shall be stored up for at least 24 hours before use in the same environment as the one in which they are to be fixed.

2.3. Frame Work : The studs and grounds for fixing the boards shall be spaced at 300 mm. to 450 mm. centres both ways, the actual spacing selected depending on the width of the cut board in the panel arrangements. All edges of the boards shall be supported. Intermediate supports shall be provided at dado heights for pircurerails and cornices etc. 2.4. Planked battens 40 mm x 20 mm. shall be used for grounds on solid walls. The batten shall be plugged to wall as described under. The batten shall be fixed on apering plugs with 50 mm. Jong wood screws. The tapering plug shall be trapeszoidal in shape having base 50 x 50 mm. at bottom 38 x 38 mm. at top with depth of 50 mm. Plugs shall be embedded in C. m. 1 : 3 and shall be placed at 450 x 500 mm. centres. The plugs shall be treated with coal tar and battens shall be treated with wood preservative before use. On uneven walls faces the battens shall be plugged and fitted with packing pieces at the back where necessary. The frame shall be treated with wood preservative before boards are nailed on.

Nailing shall be done by nails have a shank diameter of 2.5 mm. and head diameter of about 8 mm. Nails shall have length as per requirement. The nails shall be placed at supports at 100 mm. to 150 mm. centre in centre and edges 75 mm. centres. Minimum clearance for nails from edges shall be 10 mm. The nails shall be rustless where the nail heads are exposed. Where the joints are to be covered with beading, felt headed (clout) nails shall be used instead of lost head nails.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 16.3 (A) shall be followed.

3.2. The rate shall be for a unit of one sq. metre.

**16.13 (I)** Providing and fixing plywood lining with butt jointing and nails (frame work and cover fillets to be measured and paid for separately) 6 mm. thick ply.

**1.0. Materials :** 6 mm. thick plywood shall conform to M-37.

**2.0. Workmanship:** The relevant specification of item 16.4 shall be followed except that 6 mm. thick plywood shall be fixed in lining.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 16.4 shall be followed..

3.2. The rate shall be for a unit of one sq. metre.

**16.13 (II)** Providing and fixing plywood lining with but jointing and nails (frame work and cover fillets to be measured and paid for separately) 9 mm. thick ply.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 16.13 (I) shall be followed except that the thickness of plywood to be fixed shall be 9 mm.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 16.4 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**16.21. (I)** Providing and fixing plain asbestos sheet lining with but jointing and woods (frame work and cover fillets to be paid for separately). Class-A 6.5 mm. thick.

**1.0. Materials: 1.1.** Plain A.C. Sheets 6.5 mm. thick shall be conform to M-24.

**2.2. Workmanship:**

2.1 The relevant specifications of item No. 16.4 shall be followed except that the plain A. C. Sheet class-A of 6.5 mm. thickness shall be fixed in lining.

2.2 In fixing asbestos cement sheets, care shall be taken to avoid fixing as this may cause cracking if the supporting structure expands or shrinks. The sheet shall be fixed with wood screws to wooden ground and the screw holes shall be drilled slightly longer than the screws. Asbestos sheet may also be advantageously fixed on to walls with cement plaster backing. The screws



shall be fixed at 150 mm. to 200 at supports. The boards shall be fitted either with wooden cover fillets or asbestos strips as described in item.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 16.4 shall be followed.

3.2. The rate shall be for a unit of one sq. metre.

**16.21. (II)** Providing and fixing plain asbestos sheet lining with but jointing to wood screws (frame work and cover fillets to be paid for separately). Class-B 5 mm. thick.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 16.21 (I) shall be followed except that the plain A. C. sheet of class-B. 5 mm. thick shall be fixing in lining.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 16.21 (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**SECTION -17**

**DETAILED SPECIFICATIONS FOR PLASTERING AND PAINTS  
AS PER "SCHEDULE OF RATES"**

**17.58.(I)** 10 mm. thick cement plaster in single coat on fair side pf brick concrete walls for interior plastering upto floor two level and finished even and smooth in (i) C.M. 1:3.

**1.0. Materials: 1.1.** Water M-1. The cement mortar of proportion 1 : 3 shall conform to M-13.

**2.0. Workmanship:**

2.1. Scaffolding : Wooden ballies, bamboos, planks, treaties and other scaffolding shall be sound. These shall be properly examined before erection and use. Stage scaffolding shall be provided for ceiling plaster which shall be independent of the walls.

2.2. Preparation of back-ground:

2.2.1. The surface shall be cleaned of all dust, loose mortar droppings, traces of algae, efflorescence and other foreign matter by water or by brushing. Smooth surface shall be roughened by wire brushing if it is not hard and by racking if it is hard. In case of concrete surface, if a chemical retarder has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles cleaned off and care shall be taken that none of the retarders is left on the surface. Trimming of projections on brick/concrete surface where necessary shall be carried out to get an even surface.

2.2.2. Raking of joints in case of masonry where necessary shall -be allowed to dry out for sufficient period before carrying out the plaster work.

2.2.3. The work shall not be soaked but only damped evenly before applying the plaster. If the surface becomes dry such area shall be moistened again.

2.2.4. For external plaster, the plastering operation shall be started from top floor and carried downwards. For internal plaster, the plastering operations may be started wherever the building frame and cladding work arc ready and the temporary supporting ceiling resting on the wall of the floor have been removed. Ceiling plaster shall be completed before starting plaster to walls.

**2.3. Applications of plaster :**

2.3.1. The plaster about 15 x 15 cms. shall be first applied horizontally and vertically al not more than 2 metres intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly inplane of the finished plastered surface. The mortar shall then be applied in uniform surface slightly more than the specified thickness, then brought to a true surface by working a wooden straight edge reaching across the gauges with small upward and sideways movement at a time. Finally, the surface shall be finished off true with a trowel or wooden float according as a smooth or a sandy granular texture is required. Excessive trowelling or overworking the float shall be avoided. All comers, arrises, angles and junctions be truly vertical or horizontal as the case may be and shall be carefully finished. Rounding or chamfering corners, arrises junctions etc. shall be carried out with proper templates to the size required.

23.2. Cement plaster shall be used within half an hour after addition of water. Any mortar or plaster which is partially set shall be rejected and removed forthwith from the site.

2.3.3. In suspending the work at the end of the day, the plaster shall be left out clean to the line both horizontally and vertically. When recommencing the plaster, the edges of the old work shall be scraped clean and wetted with cement putty before plaster is applied to the adjacent areas to enable the two to properly join together. Plastering work shall be closed at the end of the day on the body of the wall and nearer than 15 cm. to any corners or arrises. Horizontal joints in plaster work shall not also occur on parapet tops and copings as these invariably lead to leakage. No portion of the surface shall be left out initially to be packed up later on.

2.3.4. Each coat shall be kept damp continuously till the next coat is applied or for a minimum period of 7 days. Moistening shall commence as soon as plaster is hardened sufficiently. Soaking of walls shall be avoided and only as much water as can be readily absorbed shall be used, excessive evaporation on the sunny or windward side of building in hot air or dry weather shall be prevented by hanging matings or gunny bags on the outside of the plaster and keeping them wet.

### **3.0. Mode of measurements & payment:**

3.1. The rate shall include the cost of all materials, labour and scaffolding etc. involved in the operations described under workmanship.

3.2. All plastering shall be measured in square metres unless, otherwise specified. Length, breadth or height shall be measured correct to a centimetre.

3.3. Thickness of the plaster shall be exclusive of (the thickness of the key i.e. grooves or open joints in brick work, stone work etc. or space between laths. Thickness of plaster shall be average thickness with minimum 10mm. at any point on this surface.

3.4. This item includes plastering upto floor two level.

3.5. The measurement of wall plastering shall be taken between the walls or partition (dimensions before plastering being taken) for length and from the top of floor or skirting to ceiling for height. Depth of cover of cornices if any shall be deducted.

3.6. Soffits of stairs shall be measured as plastering on ceilings. Flowing soffits shall be measured separately.

3.7. For jambs, soffits, sills etc. for openings not exceeding 0.5 sq. mt. each in area for ends of joists, beams, posts, girders, steps, etc. not exceeding 0.5 sq. mt. each in area and for openings exceeding 0.5 sq. mt. and not exceeding 3.00 sq. mt. in each area deductions and additions shall be made in the following manner:

(a) No deductions shall be made for ends of joints, beams, posts etc. and openings not exceeding 0.5 sq. mt. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these opening for finish to plaster around ends of joints, beams posts etc.

(b) Deduction for openings exceeding 0.5 sq. mt. but not exceeding 3 sq. mt. each shall be made as follows and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings.

(i) When both faces of all wall are plastered with same plaster, deduction shall be made for one face only.

(ii) When two faces of wall are plastered with different types of plasters or if one, faces is plastered and the other pointed, deductions shall be made from the plaster or pointing on the side of frame for door, window etc. on which width of reveals is less than that on the other side but no deductions shall be made on the other side. Where width of reveals on both faces of all are equal, deductions of 50% of area of opening on each face shall be made from area of plaster and/or pointing as the case maybe.

3.8. For openings having door frames equal to projecting beyond the thickness of wall, full deduction for opening shall be made from each plastered face of the wall.

3.9. In case of openings of area above 3 sq. mt. each, deduction shall be made for opening but jambs, soffits and sills shall be measured.

3.10. The rate shall be for a unit of one sq. metre.

**17.58. (II)** 10 mm. cement plaster in single coat on fair side of brick/concrete walls for interior plastering upto floor two level and finished even and smooth in C.M. 1:4.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 17.84 (I) shall be followed except that the proportion of mortar is C.M. 1 :4 instead of C. M. 1:3.

### **2.2. Mode of measurements & payment:**

2.1. The mode of measurements and payment shall be the same as for item No. 17.58 (I).

2.2. The rate shall be for a unit of one sq. metre.

**17.58. (III)** 10 mm. cement plaster in single coat on fair side of brick/concrete walls for interior plastering upto floor two level and finished even and smooth in C.M. 1:6.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 17.58 (I) shall be followed except that the proportion of mortar is Cement Mortar 1:6.

**2.0. Mode of measurements & payment:**

2.1. The mode of measurement and payment shall be followed same as item No. 17.38 (I).

2.7 The rate shall be for a unit of one sq. metre.

**17.61. (I)** 20 mm. thick cement plaster in single coat on rough side of single or half brick wall for interior plastering upto floor two level, finished even and smooth in cement mortar 1:3 (1 cement: 3 sand).

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 17.59 (I) shall be followed except that the thickness of item plaster shall be 20 mm. The plastering work shall be in single coat on rough side of half brick wall for interior plastering upto floor two level, finished even and smooth in C.M. 1:3.

**2.0. Mode of measurements & payment:**

**2.1. The relevant specifications of item No. 17.59 (I) shall be followed.**

2.2. The rate shall be for a unit of one sq. metre.

**17.61. (II)** 20 mm. thick plaster in single coat on rough side of single or half brick wall for interior plastering upto floor two level, finished even and smooth in cement mortar 1:4 (1 cement: 4 sand).

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 17.59 (II) shall be followed except that the thickness of plastering shall be 20 mm. in C. M. 1 : 4.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 17.59 (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**17.61 (III)** 20 mm. thick cement plaster in single coat on rough side of single or half brick wall for interior plastering upto floor two level, finished even and smooth in C. M, 1 : 6 (1 cement: 6 sand).

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 17.59 (III) shall be followed except that thickness of plaster shall be 20 mm. in C. M. 1 : 6.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 17.59 (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

17.69. Extra over item 58 to 64 for finishing with a floating coat of neat cement slurry.

**1.0. Materials & Workmanship :**

1.1. The relevant specifications of item No. 17.58 and 17.61 shall be followed for materials and workmanship except that this work is only of providing smooth cement finish with floating coat of neat cement slurry.

1.2. The coat of cement and fine sand mortar of proportion 1:1 (1.5 mm. thick about) shall be applied to the plastered surface with a trowel to provide uniform texture while the base coat is still plastic.

1.3. In any continuous face of wall the finishing treatment should be carried out continuously and day to day break made to coincide with architectural breaks in order to avoid unsightly junctions.

1.4. Curing : All the plaster work shall be kept damp continuously for a period of 7 days.

**2.0. Mode of measurements & payment:**

2.1. The payment shall be made for a unit of 1.0 sq. mt. of work done over and above the finishing of work of base coat.

2.2. The relevant specifications of item of base coat shall be followed for measurements and payment.

2.3. The rate shall be for a unit of one sq. metre.

**17.70.** Extra over items 17.58 to 17.61 for providing and mixing water proofing materials in cement mortar in proportion recommended by the manufacturers.

**1.0 Materials & Workmanship :1.1.** The relevant specification of item No. 17.58 to 17.61 shall be followed except that

the water proofing materials of approved make shall be added to the cement at the rate specified or as directed by the Engineer-in-charge. The proportion of water proofing materials to be mixed with 50 kg. bags shall be as recommended by the manufactures of the water proofing material.

**2.0. Mode of measurements & payment:**

2.1. The payment shall be made extra for this work over and above the plaster work.

2.2. The rate shall be for a unit of 1- Kg. of water proofing materials used in 1 bag weighing 50 Kg. cement used extra over the rate of plastering work.

**17.91.** Extra over item No. 17.59 to 17.61 for plastering on ceiling and soffits of stair upto floor two level instead of plastering on walls.

**1.0 Materials & Workmanship :**

1.1. The relevant specifications of item No. 17.59 (I) shall be followed except that this work is for ceiling soffits of stairs, upto two floor level instead of plaster on walls.

1.2. The smooth concrete surface shall be suitably roughened to provide necessary bond before plastering.'

**2.0. Mode of measurements & payment:**

2.1. The payment shall be made for a unit of one sq. metre of work done, extra over and above the payment plaster work on wall surfaces.

2.2. The rate shall be for a unit of one sq. metre.

**17.94 (I)** Extra over item No. 1 to 69, 71 to 87 and 90 for interior plastering above floor two level for every additional story height (i). Single coat plaster.

**1.0. Materials & Workmanship :**

1.1. The relevant specifications of item No. 17.59 (I) shall be followed except that the whole work is to be carried out above floor two level.

**2.0. Mode of measurements & payment:**

2.1. The mode of measurements and payment shall be same as item No. 17.59 (1).

2.2. The extra payment shall be made over and above the floor two level rate for every additional floor height.

2.3. The rate shall be for a unit of one sq. metre.

**17.94 (II)** Extra over item 1 to 69, 71 to 87 and 90 for interior plastering above floor two level for every additional story height. Two coat plaster.

**1.0. Materials & Workmanship :**

1.1. The relevant specifications of item No. 17.94 (I) shall be followed except that extra payment for work shall be for a two coat plaster.

**2.0. Mode of measurements & payment :**

2.1. The relevant specifications of item No. 17.94 (I) shall be followed.

2.2. The rate shall-be for a unit of one sq. metre.

**17.94 (III)** Extra over item 1 to 69,71 to 87 and 90 for interior plastering above floor two level for every additional story height Floating coat of neat cement.

**1.0. Materials & Workmanship :**

1.1. The relevant specifications of item No. 17.94 (I) shall be followed except that the extra payment shall be made for work of floating coat of neat cement slurry.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 17.59 (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**17.95.** 20 mm. thick sand face cement plaster on walls upto height of 10 mm. and above ground level consisting of 12 mm. thick backing coating of C. M. 1: 3 (1 cement: 3 sand) and 8 mm. thick finishing coat in C. M. 1: 1 (1 cement: 1 sand) etc. complete.

**1.0. Materials :**

1.1. Water shall conform to M-12. Cement mortar shall conform to M-11.

**2.0. Workmanship:**

2.1. The work shall be carried out in the coats: The backing coat (base coat) shall be 12 mm. thick in C. M. 1:3. The relevant specifications of item No. 17.58 (I) shall be followed except that the thickness of back coat shall be 12 mm. average. Before the first coat hardens its surface shall be beaten up by edges of wooden tappers and close dents shall be made on the surface.

The subsequent coat shall be applied after this coat has been allowed to set for 3 to 5 days depending upon the weather conditions. The surface shall not be allowed to dry during this period.

2.2. The second coat shall be completed to 8 mm. thickness in C. M. 1:1 as described above, including raising sand facing by bushing. The sample of sand face shall be got approved before the work is started. The whole work shall be carried out uniformly as per sample approved.

2.3. Curing : The curing shall be started overnight after finishing of plaster. The plaster shall be kept wet for a period of 7 days. During this period, it shall be protected from all damages.

### **3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 17.58 (I) shall be followed except that the sand face plaster on outside upto m. above ground level shall be measured under this item.

3.2. The rate shall be for a unit of one sq. metre.

**17.116 (A) Pointing on brick work with cement mortar 1 : 3 (1 cement: 3 coarse sand) flush pointing.**

**1.0. Materials :** 1. Water shall conform to M-12. Cement mortar shall conform to M-11.

**2.0. Workmanship:** 2.1. The flush pointing work shall be carried out with cement mortar of proportion 1:3 (1 part of cement and 3 parts of coarse sand) by volume.

2.2. Preparation of surface : 2.2.1. The joints shall be raked to such a depth that the average of new mortar measured from either the sunk surface of finished pointing or from the edge of the brick shall be average 10 mm.

2.3. Application of Mortar & Finishing : 2.3.1. The mortar shall be pressed into the raked out joints with a pointing trowel according to the type of pointing specified in item. The mortar shall not spread over the corner edges or surface of the masonry. The pointing shall then be finished with the pointed tools.

2.4. Curing : 2.4.1. The pointing shall be kept wet for 7 days. During this period, it shall be suitably protected from all damages.

### **3.0. Mode of measurements & payment:**

3.1. No deductions shall be made for end of joints, beams and posts etc. and openings not exceeding 0.5 sq. mt. each and no addition shall be made for reveals, jambs, soffits, sill etc. of these openings.

3.2. Deductions for openings exceeding 0.5 sq. mt. but not exceeding 3 sq. mt. each shall be paid as follows and no addition shall be made for reveals jambs, soffits-sills etc. of these openings.

(i) When both faces of walls are pointed with same type of pointing, deduction shall be made for one face only.

(ii) When two faces of walls are pointed with different type of pointing or if one face is plastered and the other is pointed, deduction shall be made in the plaster or pointing on the side of frame for door, windows etc. on which the width of reveals is less than that on the other side but no deduction shall be made from plaster or pointing on the other side.

(iii) When only one face is treated and the other face is not treated, full deduction shall be made, if the width of the reveals on the treated side is less than on the untreated side, but if the width of the reveal is more, then no deduction shall be made nor any addition shall be made for reveals jambs soffits, sills etc.

3.3. In case of openings of area above 3 sq. mt. each deduction shall be made for opening but jambs, sills and soffits, shall be measured.

3.4. The rate shall be for a unit of one sq. metre.

**17.116 (B) Pointing on brick work with cement mortar 1 : 3 (1 cement: 3 coarse sand) Ruled pointing.**

### **1.0. Materials & Workmanship :**

1.1. The relevant specifications of item No. 17.116 (A) shall be followed except that the pointing to be done ruled pointing asunder:

1.2. The joints shall be initially formed for flush pointing and then while the mortar is still green a groove of specified shape shall be formed by running forming tool straight along the centre line of joints till a smooth and hard surface is obtained. The vertical joints shall also be finished in a similar way. The pointing lines shall be uniform in width and truly horizontal and parallel in case of floor and ceiling.

### **2.0. Mode of measurements & payment:**

2.1. The mode of measurements and payment shall be the same as per item No.17.116(A).

2.2. The rate shall be for a unit of one sq. metre.

**17.117 (A)** Painting on brick work with cement mortar 1 : 4 (1 cement: 4 sand) Flush pointing.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 17.116 (A) shall be followed except that the pointing work shall be carried out C. M. 1 : 4.

2.0. The relevant specifications of item No. 17.116 (A) shall be followed.

2.1. The rate shall be for a unit of one sq. metre.

**17.117 (B)** Pointing on brick work with cement mortar 1:4(1 cement: 4 sand): Ruled pointing.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 17.116 (B) shall be followed except that the proportion of C. M. 1 : 4 shall used for ruled pointing.

**2.0. Mode of measurements & payment:**

2.1 The relevant specifications of item No. 17.117 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**17.140 (A)** Pointing on coursed stone masonry with cement mortar 1 : 3 (1 cement: 3 sand) flush pointing.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 17.116 (A) shall be followed except that the pointing shall be done on coursed stone masonry with C. M. 1:3 and the mortar shall be simply struck off with a trowel and the work left showing the natural irregularities in line and the surface of the stones themselves.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 17.116 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**17.140 (B)** Pointing on course masonry with cement mortar 1:3(1 cement :3 sand) Ruled pointing.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 17.140(A)and 17.116 (B) shall be followed.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 17.116 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**17.144. (A)** Pointing on uncoursed stone masonry with cement mortar 1:3(1 cement: 3 sand) Flush pointing.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 17.116 (A) shall be followed except that the flush pointing shall be done on uncoursed rubble masonry work in C. M. 1: 3 and the mortar shall be simply struck off with a trowel and the work left showing the natural irregularities in line and the surface of the stone themselves.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 17.116 (A) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**17.144 (B)** Pointing on uncoursed stone masonry with cement mortar 1:3(1 cement: 3 sand) : Ruled pointing.

**1.0. Materials & Workmanship :** 1.1.The relevant specifications of item No. 17.116,(A)and 17.144 (A) shall be followed except that the ruled pointing work shall be carried out on uncoursed rubble masonry work in C. M. 1 : 3.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 17.116 (A) shall be followed.

2.2 The rate shall be for a unit of one sq. metre.

**17.0.0.1.** Providing cement vata (10 cms. x 10 cms.) size quarter round in cement mortar 1: 1 including near cement finishing, watering etc. complete.

**1.0. Materials :** 1.1. Water shall conform to M-1.2 Cement mortar shall conform to M-11.

**2.0. Workmanship :** 2.1. The work of cement vata of 10 cms. x 10 cms. size shall be carried out at junctions of parapets and terraces as directed. The vata shall be finished in quarter round shape. The work shall be carried out in the best workmanlike manner. The inter portion of rain water pipe shall be rounded off properly during constructing the vata. The work shall be cured for 7 days.

**2.0. Mode of measurements & payment:**

2.1. The work shall be measured for finished item in running metre.

2.2. The rate shall be for a unit of one running metre.

## SECTION-18

### DETAILED SPECIFICATIONS FOR WHITE WASHING & DISTEMPERING AS PER "SCHEDULE OF RATES"

18.11. White washing with lime on undecorated wall surfaces (two coats) to give an even shade including thoroughly brooming surface to remove all dirt, dust, mortar drops and other foreign matter.

#### 1.0. Materials:

1.1. The clearcolle shall be made from glue and boiling water by Mixing 1 kg. mixture shall be suitably tinted where required use under coloured distemper if directed. Glue shall conform to I.S. 852-1969 (Specifications for animal glue). 1.2 Lime used shall be freshly burnt class 'C' Lime (fat lime) and white in colour conforming to I.S. 712-1973/ Water shall conform to M-1 Best quality of gum shall be used in the preparation of white wash. Ultramarine blue or Indigo: This shall conform to I.S. 55-1970 for points, and shall be used for preparation of white wash. Pigments : Mineral colours, not affected by lime shall be used in preparing colour wash.

#### 2.0. Workmanship : 2.1. Preparation of white wash solution :

Surface already white or colour. The fat lime shall be slaked at site and shall be mixed and stirred with about five litres of water for 1 kg. of unslaked lime to make a thin cream. This shall be allowed to stand for a period of 24 hours and then shall be screened through a clean coarse cloth, 4 Kg. of gum dissolved in hot water shall be added to each cubic metre of lime cream. Small quantity of ultramarine blue (Upto 3 gms. per kg. of lime) shall also be added to the last two coats of white wash solution and the whole solution shall be stirred thoroughly before use.

#### 2.1. Preparation of surface:

2.2.1. The surface shall be thoroughly cleaned of all dust, dirt, mortar croppings and other foreign matter before white wash is to be applied.

2.2.2. The surface spoiled by smoke soot shall be scraped with steel wire brushes or steel scrapers or shall be rubbed with over-burnt surkhi or brick bats. The surface shall be then broomed to remove all dust, dirt and shall be washed with clean water.

2.1.3. Oil or grease spots shall be removed by suitable chemical and smooth surface shall be rubbed with wire brushes.

2.2.4. All unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the masonry joints properly. Such portion shall be wetted and allowed to dry. They shall then be given one coat of white wash.

2.2.5. All unnecessary nails shall be removed, the holes cracks patches etc. shall be made good with materials similar in composition to the surface to be prepared.

**2.3. Scaffolding :** Wherever scaffolding is necessary it shall be erected in such a way that as far as possible on part of scaffolding shall rest against the surface to be white or colour washed. A properly secured strong and well tied suspended platform (Zoola) may be used for white washing. Where ladders are used, pieces of old gunny bag shall be tied at top and bottom to prevent scratches to the floors and walls. For white washing of ceilings proper stage scaffolding shall be erected where necessary.

#### 2.4. Application of white wash:

2.4.1 On the surface prepared the white wash shall be applied with 'Moon' brush. The first stroke of the brush shall be from top downwards another, from bottom upwards over the first stroke and similarly one stroke from the right another from the left, over the first stroke brush before it dries. This will form one coat. Each coat shall be allowed to dry before next coat applied. Number of coats as specified in item shall be applied. It shall present smooth and uniform finish free from brush marks and it should not come off easily when rubbed with finger.

2.4.2. Splashing and dropping if any on the doors and windows, ventilators etc. shall be removed and the surface cleaned.

2.4.3. Priming and Alkali resistant treatments, scraping of surface washing etc. surface spoiled by smoke soot removed of oil and grease spots treatment for infection with efflorescence moulds moss, fungi, algae and lichen and patch repairs to plaster

wherever done shall not be paid extra.

### **3.0. Mode of measurements & payment :**

3.1. All the work shall be measured in the decimal system as under :

(a) Dimensions shall be measured to the nearest 0.01 M.

(b) Area in individual items shall be worked out to the nearest 0.01 Sq. M.

All the work shall be measured in sq. mt. Deductions for jambs, soffits, sills etc. for opening not exceeding 0.5 sq. mt. each in area for ends of joints, posts, beams, girders, steps etc. not exceeding 0.5 sq. mt. each in area and for opening exceeding 0.3 sq. mt. and not exceeding 3.0 sq. mt. each in area deductions and additions shall be made as under :

3.2. No deductions shall be made for ends of joints beams, posts etc. and openings not exceeding 0.5 sq. mt. each. No addition shall be made for reveals, jambs, soffits, sills etc. of these openings nor for finish arounds ends of joints, beams, posts etc.

3.3. Deductions for openings exceeding 0.5 sq. mt. but not exceeding 3 sq. mt. each shall be made as follows and no addition shall be made for reveals, jambs, soffits etc. of these openings:

(a) When both the faces or walls are provided with finish, deduction shall be made for one face only.

(b) When each face of wall is provided with different finish deduction shall be made for that side of frame for door, windows etc. on which width of reveals is less than that of the other side, where width of reveals on both faces of wall are equal, deduction of 50% of area of opening on each face shall be made from total area of finish.

(c) When only one face of wall is treated and the other face is not treated, full deduction shall be made if the width of reveal on the treated side is less than that on the untreated side, but if the width of the reveal is equal or more than on the untreated side neither deductions nor additions be made for reveals, jambs, soffits, sills etc.

3.4. In case of area of opening exceeding 3 sq. mt. each, deduction shall be made for openings but jambs, soffits, shall be measured.

3.5. No deduction shall be made for attachment such as casing, conducts, pipe, electric wiring and the like.

3.6. Corrugated surfaces shall be measured flat as fixed and not girth. The quantities so measured shall be increased by the following percentage and the resultant shall be included with the general areas.

(a) Corrugated steel sheets 14%

(b) Corrugated A. C. Sheets 20%

(c) semi corrugated A. C. Sheets 10%

(d) Nainital pattern roof (Plain sheeting with rolls) 10%

(e) Nainital pattern roof (with corrugated sheets) 25%

3.7. Cornices and other wall features, when they are not picked out in a different finish/colour shall be girthed and included in the general area

3.8. The rate shall include the cost of all materials, labour, scaffolding, protective measures etc. involved in all the operations described above.

3.9. The rate shall be for a unit of one sq. metre.

**18.12.** White washing with lime on decorated wall surface-(One coat) to give an even shade including thoroughly brooming the surface to remove dirt, dust mortar drops and loose scales of lime wash and other foreign matter.

**1.0. Materials & Workmanship :** 1.1. -The relevant specifications of item No. 18.11 shall be followed except that the white washing work shall be carried out on decorated wall surface in single coat.

### **2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.11 shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**18.13.** Extra over item 18.11 and 18.12 for every subsequent coat of white washing with lime on wall surfaces.

**1.0. Materials & Workmanship:** 1.1. The relevant specifications of item No. 18.11 shall be followed except that this work is for extra coat over and above two coats on wall surface.

### **2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.11 shall be followed except that the payment of subsequent coat shall be made extra over and above the item No. 18.11 for every subsequent coat applied.



2.2. The rate shall be for a unit of one sq. mt.

**18.14.** Extra over item 18.11 for white washing with the lime on ceiling and/or sloping roof.

**1.0. Materials & Workmanship:** 1.1. The relevant specifications of item No. 18.11 above shall be followed except that this work is for ceiling and/or sloping roof.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.11 shall be followed except that extra payment for white washing on ceiling and/or sloping roof shall be made over and above the payment of item No. 18.11.

2.2. The rate shall be for a unit of one sq. metre.

**18.15.** Extra over 18.12 for white washing with lime on ceilings and sloping roofs.

**1.0. Material & Workmanship :** 1.1 The relevant specifications of item No. 18.12 shall be followed except that the white washing work shall be carried out on decorated ceilings and/or sloping roofs.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.12 shall be followed except that the extra payment for white washing on ceiling and/or sloping roof shall be made over and above the payment of item No. 18.12.

2.2. The rate shall be for a unit of one sq. metre.

**18.16.** Extra over the item No. 18.13 for every subsequent coat of white washing with lime on ceiling and/or sloping roofs.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 18.11 and 18.13 shall be followed except that this work is for extra coat over and above two coats of ceiling and/or sloping roofs.

**2.0 Mode of measurement & Payment:**

2.1. Relevant specifications of item No. 18.11 and 18.13 shall be followed except that the extra payment for white washing shall be made for sloping roof or/and ceiling for every subsequent coat applied over and above item 18.13.

2.2. The rate shall be for a unit of one sq. metre.

**18.17.** Colour washing with lime on undecorated wall surfaces (Two coats) over and including priming coat of white washing to give even shade including thoroughly brooming the surface to remove all dirt, dust, mortar drops and other foreign matter. The relevant specifications for the materials and workmanship of item No. 18.11 shall be followed except that it shall be for colour wash.

**1.0. Materials:**

1.1. Clear-Colle : This shall be made from glue and boiling water by mixing 1 Kg. of glue to every 15 litres of water. The mixing shall be suitable tinted to match with colour of washing as directed. Glue shall conform to I.S. 852-1969.

1.2. Lime : Lime used shall be freshly burnt class 'C' lime (Fat lime) and white in colour conforming to I.S. 712-1973.

1.3. Water : Water shall conform to M-1.

1.4. Gum : Best quality of gum shall be used in the preparation of white or colour wash. The colour pigment of required tint and shade shall be mixed in lime cream. The mineral colour not affected by lime shall be used in preparing the colour wash.

**2.0. Workmanship :** 2.1. Sufficient quantity of colour wash enough for the complete job shall be prepared in one operation to avoid any difference in shade. The basic white wash solution shall be prepared in accordance with item 18.11. Mineral colours not affected by lime shall be added to the white wash solution. No colour wash shall be done until a sample of the colour has been approved. It shall be noted that small samples of colour appears lighter in shade than when the same shades are applied precisely to large surface. The colour shall be of even tint, over the whole surface. If it is patchy or otherwise badly applied, it shall be rejected. Preparation of the colour wash with pigment shall be as under :

(a) With Yellow and Red Ochre: Solid Lumps if any in the powder shall be crushed to powder and solution in water prepared and then added to white wash sieving it through a coarse cloth, mixed evenly and thoroughly to white wash in small quantities till the required shade is obtained.

(b) With Blue Vitriol: Fresh crystals of hydrous copper sulphate (i.e. blue vitriol) shall be ground to fine powder and dissolved in small quantity of water. Sufficient quantity of solution enough to produce the colour wash of required shade shall be strained through a clean cloth, the filtrate being mixed evenly and thoroughly to the white wash.

(c) Colour wash from other colouring pigment shall be prepared in accordance with the instructions of the manufacturer.

2.2. Preparation of Surface : The surface shall be prepared by removing mortar toppings and foreign matter and thoroughly clean with wire or fibre brush or any suitable means as directed by the Engineer-in-charge. All loose pieces and scales shall be scrapped off and holes filled with mortar.

2.2.1. For scaffolding and application of colour wash, relevant specification of item No. 18.11 above shall be followed. The colour wash shall be applied as under:

The colour wash shall be applied in accordance with the procedure given in item No. 18.11. Application of white wash for colour washing on undecorated surface after the surface has been prepared. The first primary coat shall be of white wash and subsequent (minimum two) shall be colour wash and the entire surface shall represent a smooth and uniform finish. To start with, patch of 0.1 sq.mt. on prepared surface shall be colour washed with first coat of white wash and subsequent coat of colour wash solution in full numbers of coats as described in the item and the shade so obtained shall be examined before the entire work of colour washing is taken up in hand. It shall be noted that small areas of colour wash will appear lighter in shade than when the same shade is applied to the large surface.

2.2.2. For colour washing on decorated surfaces, after the surface has been prepared, a coat of white wash shall be applied for the patches and repairs. Then one coat or more of colour wash shall be applied over the entire surface, such that the colour of washed surface shall present a uniform colour shade. No primary coat is needed for a decorated surface bearing colour of same shade on surface requiring change of colour after the surface has been prepared as described above. Two coats of white wash shall be applied before application of specified number (minimum two) of coats of colour wash of the new shade.

**2.3. Protective measure:** The surface of doors, windows, floors, articles of furniture etc, and such other parts of the building not to be white washed shall be protected from being splashed upon. Such surfaces shall be cleaned of white wash splashed if any.

### **3.0. Mode of measurements & payment:**

3.1. The relevant specification of item No.18.11 shall be followed.

3.2. The rate shall be for it unit of one sq. metre.

**18.18.** Colour washing, with lime on decorated wall surfaces (one coat) to give an even shade including thoroughly brooming the surface remove all dirt dust, mortar drops and loose scales of, lime wash and other foreign matter.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 18.17 shall be followed except that the colour washing shall be carried out on decorated wall surfaces in one coat.

### **2.0. Mode of measurements payment:**

2.1. The relevant specification of item No.18.17 shall be followed.

2.1. The rate shall be for it unit of one sq. metre.

**18.19.** Extra over item No. 18.17 and 18.18 for every subsequent coat of colour wash with lime on wall surface.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 18.17 shall be followed except that this work is for extra cost of colour wash overhand above two coats on wall surface.

### **2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No; 18.17 shall be followed except that the extra payment for every subsequent coat of white wash shall be made over and above the rate of item 18.17 and 18.18.

2.2. The rate shall be for a unit of one sq. metre.

**18.20.** Extra over item 18.17 for colour washing on ceilings and/or sloping roofs.

**1.0. Materials & Workmanship :** The relevant specifications of item No.18.17 shall be followed except that this work is for colour washing on ceiling and/or sloping roofs.

2.2. The rate shall be for a unit of one sq. metre.

**18.29.** Cement washing with Portland cement slurry on undecorated wall surfaces, (one coat) to give a smooth finish including thoroughly brooming the surface to remove all dirt dust, mortar drops and other foreign matter.

**1.0. Materials:** 1. Water shall conform to M-1. Portland cement shall conform to M-3.

**2.0. Materials & Workmanship :** 2.1. The relevant specifications of item No. 18.11 for preparation of surface, scaffolding, application of wash etc. shall be followed except that the cement wash shall be applied instead of white wash. Cement shall be mixed to

water to form slurry to the consistency of good ready mix oil paint. The slurry shall be applied with brushes to form a smooth bodies opaque surface.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 18.11 shall be followed.

3.2. The rate shall be for a unit of one sq. metre.

**18.30.** Extra over item No. 18.29 for every subsequent coat of cement washing with portland cement slurry.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 18.29 shall be followed except that the work of cement slurry wash shall be provided for every, subsequent coats above item No. 18.29 to be applied.

**2.0. Mode of measurements payment:**

The relevant specifications of item No. 18.29. shall be followed except that the extra rate shall be paid for every subsequent coat applied over and above the rate of item No.18.29.

2.1. The rate shall be for a unit of one sq. metre.

**18.33.** Removing dry or oil bound distemper by washing and scraping and sand papering the wall surface smooth including necessary repairs to scratches complete.

**1.0. Materials & Workmanship :** 1.1. All loose pieces and scales shall be removed by sand papering and surface shall be cleared of all greasy, dust, dirt, etc. on decorated wall surface. Where heavy scaling has taken place, the entire surface shall, be scrapped by means of steel scrappers so as to remove all accumulated distemper, leaving clean surfaces. Necessary repairs to the scratches shall be made as directed.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.11 shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**18.34.** Extra over item No. 18.33 for removing dry oil bound distemper on ceiling and sloping roofs!

**1.0. Workmanship:** 1.1. The relevant specifications of item No. 18.33 shall be followed except that removing dry oil bound distemper from sipping roof, ceiling is to be carried out.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.33 shall be followed except that the payment shall be made for removing dry/oil bound distemper from ceiling/sloping roof over and above the rate-of item No. 18.33.

2.2. The rate shall be for a unit of one sq. metre.

**18.38.** Distempering with dry (water bound) Distemper of approved brand and manufacture (two coats) and of required shade on undecorated wall surfaces to give an even shade, over and including a priming coat of white washing, after thoroughly brooming the surface free from mortar droppings and other foreign matter.

**1.0. Materials:** 1.1. The dry distemper and primer shall be of approved brand and manufacture. The dry distemper shall be of required colour and shade and the same shall conform to I.S. 427-1965. Whiting shall conform to I. S. 63-1964.

**2.0. Workmanship:**

2.1. Scaffolding: Where scaffolding is required it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be distempered. A properly secured strong and well tied suspended platform (Jools) may be used for distempering. Where ladders are used, pieces of old gunny bags shall be laid at top and bottom to prevent scratches to the walls and floors. For distempering to ceiling, proper stage scaffolding shall be erected where necessary.

2.2. Preparation of Surface : 2.2.1 The undecorated surface to be distempered shall be thoroughly brushed free from dust, dirt, grease, mortar, droppings and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry at least 2 months, before application of distemper.

2.2.2. All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster of paris mixed with distemper of the colour to be used. The surface shall then be rubbed down again with a/me grades and paper and made smooth. The surface affected by moulds, moss, fungi, algae, lichens, efflorescence etc. shall be treated in accordance with I.S.: 2395 (Part-I)-1966 before applying distemper. Any unevenness shall be made good by applying putty made of plaster of paris mixed with water on entire surface including filling up the undulations & then papering the same after it is dry.

**2.3. Priming coat:**

23.1. A priming coat of whiting shall be applied as per item No. 18.11. over the prepared surface in case of new work on undecorated surface; No coat of white washing with lime shall be used as a priming coat for distemper.

2.3.2. Application of plaster shall be done as under:

The primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for atleast 48 hours before oil bound distemper or paint is applied.

2.3.3. Distemper is not recommended to be applied within six months of the completion of wall plaster.

**2.4. Proportion of Distemper :** The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by the manufactures only. Sufficient quantity of distemper required-for one day's work shall be prepared.

**2.5. Application of Distemper coat:**

2.5.1. For undecorated surfaces, after the primer coat is dried for at least 48 hours, the surfaces shall be lightly sand papered to make them smooth for receiving the distemper, taking care not to rub cut the priming cort, All loose particles shall be dusted off after rubbing. Minimum two coats of distemper shall be applied with brushes in horizontal strokes followed immediately by vertical strokes which together shall constitute one coat. The subsequent coats shall be applied after time interval of at least 24 hours between consecutive coats to permit proper drying, of the preceding coat. The finished surfaces shall be even and uniform without patches, brush marks; distemper drops etc.

2.5.2. Sufficient quantity or distemper shall be mixed to finish one room at a time. The application of a coat in each room shall be finished in one operation and no work shall be started in any room which cannot be completed on the same day.

2.5.3. 15 cm. double bristled distemper brush shall be used. After the days work, brushes shall be thoroughly washed in hot water with a soap solution and hang down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.

**2.6. Protective Measure:** 2.6.1. The surfaces of door, windows, floors, articles of furniture etc. and such other parts of the building as are not to be distempered shall be protected from being aplashed upon. Such surfaces shall be cleaned of distemper aplashes if any.

**3.0. Mode of measurements & payment:**

3.1. Priming coat of distemper, Primer scraping of surface spoiled by smoke soot, removal of oil and greast spots, treatment for infection of effloresces, mouldmoss, fungi, algee and litoben and patch repairs to plaster shall be included in this item for which nothing extra shall be paid.

3.2. All the work shall be measured net in the decimal system as in places subject to the following limits unless otherwise stated hereinafter.

(a) Dimension shall be measured to the nearest 0.01 m.

(b) Area in individual items shall be worked out the nearest 0.01 sq. m. all work shall be measured in sq. metre. No deductions shall be made for ends of joints beams, posts etc. and openings not exceeding 0.5 sq. m. each and no addition shall be made for reveals jambs, soffits, sills etc. of these openings nor finish alround the ends of joints, beams, posts etc.

3.3. Deductions of openings exceeding 0-5 sq. m. but not exceeding 3 sq. m. each shall be made as follows and no addition shall be made for reveals, jambs, soffits sills etc. of these openings:

(a) When both the faces of wall is provided with the same finish deductions shall be made for one face only.

(b) When each face of wall is provided with different finish, deduction shall be made for that of frame for doors, windows etc. on which width of reveal is less than that of the other side but no deductions shall be made on the other side. Where the width of reveals on the both the faces of wall are equal, deduction of 50% of area of opening on each face shall be made from area of finish.

(c) When only one face of wall is treated and the other face is not treated, full deductions shall be made if the width of the reveal on treated side is less than that on untreated side but if the width of the reveals is equal or more than that of untreated side neither deductions nor additions to be made for reveals; jambs, soffits, sills etc.

3.4. In case of area exceeding 3 sq. m. each, openings of deduction shall be made for openings, bat jambs, sills and soffits

shall be measured.

3.5. No deductions shall be made for attachments such as casing, conduits, pipes, electric wiring and the like.

3.6. Item includes removing nails, making good holes, cracks, patches with materials similar in composition to the distemper.

3.7. The rate includes cost of all materials, labour, scaffolding, protective measures etc. involved in all the operations described above. This shall also include conveyance, delivery, handling, unloading storing etc.

3.8. The rate shall be for a unit of one sq. metre.

**18.39.** Distempering with dry (water bound) distemper of approved brand and manufacture (one coat) and of required shade on decorative wall surface to give an even shade after thoroughly brushing the surface clean of all grease dirt, loose pieces of scales including preparing the surfaces and even sand papered smooth.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 18.38 shall be followed except that the dry distemper shall be applied on decorative wall surface in one coat.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.38 shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**18.40.** Extra over item 38 & 39 for every subsequent coat of distemper with dry distemper of approved brand and manufacture.

**1.0. Material & Workmanship :** The relevant specifications of item No. 18.38 shall be followed same except that the extra work for applying subsequent coat of dry distemper is to be carried out over and above the work of item No. 18.38 and 18.39.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.38 shall be followed except that extra rate shall be paid for every subsequent coat applied over and above the rate item No. 18.38 and 18.39.

2.2. The rate shall be for a unit of one sq. metre.

**18.41.** Extra over item 38 for distempering with dry distemper on ceiling and sloping roofs.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 18.38 shall be followed except that the dry distempering shall be carried out on ceiling and sloping roofs on undecorated surface.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.38 shall be followed except that extra rate shall be paid for carrying out work on ceiling/sloping roof on undecorated surface over and above of item 18.38.

2.2. The rate shall be for a unit of one sq. metre.

**18.42.** Extra over item 18.40 for distempering with dry distemper on ceiling/sloping roofs.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 18.39 shall be followed except that the work shall be carried out on ceiling/sloping roofs on decorated surfaces.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.39 shall be followed except that the extra rate shall be paid for the distempering work carried out by dry distemper on ceiling/sloping roofs with decorated surface over and above the rate of item No. 18.39.

2.2. The rate shall be for a unit of one sq. metre.

**18.44.** Distempering (two coats) with oil bound distemper of approved brand and manufacture and of required shade on undecorated wall surfaces to give an even shade, over and including a priming coat with distemper primer of approved brand and manufacture after thoroughly brushing the surface free from mortar dropping and other foreign matter also including preparing the surface even and sand papered smooth.

**1.0. Materials :** 1.1. Oil bound washable distemper and primer shall be of approved brand and manufacture.

The distemper shall be required colour and shade and the same shall conform to I.S. 428-1969.

**2.0. Workmanship:** 2.1. Scaffolding: Where scaffolding is required, it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be distempered. A properly secured strong and well tied suspended platform (Joola) may be used for distempering. Where ladders are used, pieces of old gunny bags shall be tied at top and bottom to prevent scratches to the walls and floors. For distempering to ceiling, proper stage scaffolding shall be erected where necessary.

**2.2. Preparation of surface :**

2.2.1. The undecorated surface to be distempered shall be thoroughly brushed off from dust, dirt, grease, mortar dropping and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry for atleast 2 months before applications of distemper.

2.2.2. All unnecessary nails shall be removed. Pitting in plaster shall be made good with plaster of paris mixed with dry distemper of colour to be used. The surface shall then be rubbed down again with a fine grade sand paper and made smooth. A coat of distemper shall be applied over the patches. The surface shall be allowed to dry thoroughly before the regular coat of distemper is allowed. The surface affected by moulds, moss, fungi algae lichens, efflorescence etc. shall be treated in accordance with I.S. 2395 (Part-I) 1966. Before applying distempering, any unevenness shall be made good by applying putty made of plaster of paris mixed with water on entire surface including filling up the undulation and then sand papering the same after it is dry.

### **2.3. Priming coat:**

2.3.1. A priming coat or distemper prime of approved manufacture and shade shall be applied over the papered surface in case of new work on undecorated surface. If the distemper priming is done after the wall surface dries completely, the distemper primer shall be applied.

2.3.2. Application of Primer shall be done as under:

The primer shall be applied with a brush on the clean dry and smooth surface. Horizontal strokes shall be given first and vertical strokes shall be applied immediately afterwards. This entire operation will constitute one coat. The surface shall be finished as uniformly as possible leaving no brush marks. It shall be allowed to dry for atleast 48 hours before oil bound distemper or Paint is applied.

2.3.3. Oil bound distemper is not recommended to be applied within six months of the completion of wall plaster.

**2.4. Preparation of oil bound distemper :** 2.4.1. The distemper shall be diluted with water or any other prescribed thinner in a manner recommended by the manufacture only. Sufficient quantity of distemper required for a day's work shall be prepared.

### **2.5. Application of Distemper coat:**

2.5.1. For undecorated surfaces, after the primer coat is dried for atleast 48 hours, the surface shall be lightly sand papered to make it smooth for receiving the distemper, taking care not to rub out the priming coat. All loose particles shall be dusted off after rubbing. Minimum two coats of distemper shall be applied with brushes in horizontal strokes followed immediately by vertical strokes which together shall constitute one coat. The subsequent coats shall be applied after a time interval of atleast 24 hours between consecutive coats to permit proper drying of the proceeding coat. The finished surface shall be even and uniform without patches, brush marks, distemper drops etc.

2.5.2. Sufficient quantity of distemper shall be mixed to finish one room at a time. The application of a coat in each room shall be finished in one operation and no work shall be started in any room which cannot be completed on the same day.

2.5.3. 15 cm. double bristled distemper brush shall be used. After day's work brushes shall be thoroughly washed in hot water soap solution and hung down to dry. Old brushes which are dirty and caked with distemper shall not be used on the work.

**2.6. Protective measurements :** The surfaces of doors, windows, floors, articles of furniture etc. and such other parts of the buildings as are not to be distempered shall be protected from being splashed upon. Such surfaces shall be cleaned of distemper splashes if any.

### **3.0. Mode of measurements & payment:**

3.1. Priming coat of distemper primer, scraping of surface spoiled by stunk soots removal of oil and grease spots, treatment for infection of effloresces mould moss, fungi, algae and lichen and patch repairs to plaster shall be included in this item for which nothing extra shall be paid.

3.2. All the work shall be measured net in the decimal system as in place subject to the following limits unless otherwise stated hereinafter:

(a) Dimensions shall be measured to the nearest 0.01 m.

(b) Area in individual items shall be worked out to the nearest 0.01 sq. m. All work shall be measured in sq. metre. No deductions shall be made for ends of joints, beams, posts etc., and openings, not exceeding 0.5 sq. m. each and no addition shall be made for reveals, jambs, soffits, sills etc. of these openings nor for finish around ends of joints, beams, posts etc.

3.3 . Deductions of opening exceeding 0.5 sq. m. but not exceeding 3 m. in each shall be made as follows and net addition shall be made for reveals, jambs, soffits etc. of these openings:

- (a) When both the faces of walls are provided with same finish deductions shall be made on one face only.
- (b) When each face of wall is provided with different finish, deduction shall be made for that side of frame for doors, windows etc. on which width of reveal is less than that of the other side but no deduction shall be made on the other side. Where the width of reveals on both the faces of wall are equal, deduction of 50% of area of opening of each face shall be made from area of finish.
- (c) When only one face of wall is treated and the other face is not treated, full deduction shall be made if the width of the reveal on treated side is less than that on untreated sides but if the width of the reveal is equal or more than that on untreated side neither deductions nor addition to be made for reveals, jambs, soffits, sills etc.

3.4. In case opening of area exceeding 3 sq. m. each, deduction shall be made for openings but jambs, sills and soffits shall be measured.

3.5. No deductions shall be made for attachments such as casings, conduits, pipes, electric wiring and the like.

3.6. Item includes removing nails, making good holes, cracks, patches with material similar in composition of distemper.

3.7. The rate includes cost of all materials, labours, scaffolding, protective measures etc. involved in all the operations described above. This shall also include conveyance, delivery, handling, unloading, storing work etc.

3.8. The rate shall be for a unit of one sq. metre.

**18.45.** Distempering (two coats) with oil bound washable distemper of approved brand and manufacture and of shade required on undecorated wall surfaces to give an even shade, over and including a priming coat with alkali resistance primer of approved brand and manufacture after thoroughly brushing the surface free from mortar droppings, and other foreign matter and also including preparing the surface even and sand-papered smooth.

**1.0. Materials & Workmanship:** 1.1. The relevant specifications of item No. 18.44 shall be followed except that the primer of alkali resistance primer of approved brand and manufacture shall be used instead of distemper primer.

**2.0. Mode of measurements & payment:**

2.1. The mode of measurements and payment shall be the same as for item No. 18.44 above.

2.2. The rate shall be for a unit of one sq. metre.

**18.46** Distempering (one coat) with oil bound washable distemper of approved brand of required shade on decorated wall surfaces to give an even shade after thoroughly brushing the surfaces clean of all grease, dirt, loose pieces of scales and also including distempering with oil bound washable distemper of preparing the surface even and smooth.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 18.44 shall be followed except that distempering with oil bound washable distemper shall be carried out on decorated wall surfaces in one coat.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.44 shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**18.47.** Extra over items 18.44 to 18.46 for every subsequent coat of distempering with oil bound washable distemper of approved brand and manufacture.

**1.0. Materials & Workmanship:** 1.1. The relevant specifications of item No. 18.44 shall be followed except that this work is for providing extra coat of oil bound distempering over and above two coats of distempering.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.44 shall be followed except that the extra rate shall be paid over and above the rate for every subsequent coats over two coats of item 18.44 and 18.46.

2.2. The rate shall be for a unit of one sq. metre.

**18.48.** Extra over item 18.44, 18.45 for distempering with oil bound washable distemper on ceiling and sloping roofs.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 18.44 shall be followed except that the distempering shall be carried out on ceiling/sloping roofs.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.44 shall be followed except that the extra rate shall be paid for earning out

distempering work on ceiling/sloping roofs over and above the rate of item No. 18.44 and 18.45.

2.2. The rate shall be for a unit of one sq. metre.

**18.49.** Extra over item 18.46, 18.47, for every subsequent cost of distempering on ceiling and sloping roofs.

**1.0. Materials & Workmanship :** 1.1, The relevant specifications of item No. 18.44 shall be followed except that the distempering work shall be carried out for subsequent coats over item No. 18.46 and 18.47.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.46 shall be followed except that the extra rate shall be paid for every subsequent coat of distemper applied over and above the rate of item No. 18.46 and 18.47.

2.2. The rate shall be for a unit of one sq. metre.

**18.51.** Finishing wall with water proofing cement paint on an undecorated wall surfaces (two coats) to give an approved brand and manufacture and of required shape even shade after thoroughly brushing the surface to remove all dirt and remains of loose powered materials.

**1.0. Materials :** 1.1. The water shall conform to M-I. Cement water proofing shall conform to I.S. 5410-1969.

**2.0. Workmanship :**

2.1. Scaffolding: The relevant specifications of item No. 18.11 shall be followed.

2.2. Preparation of surface: The relevant specifications of item No. 18.11 shall be followed except that the word white wash colour wash shall be substituted with water proofing cement paint. The surface shall be thoroughly wetted with clean water before cement water proofing paint is applied.

2.3. Preparation of paint: Portland cement shall be prepared by adding paint powder to water and stirring to obtain a thick paste, which shall then be diluted to a brushable consistency. Generally, equal volumes of paint powder and water make a satisfactory paint. In all cases, the manufacture's instructions shall be followed. The paint shall be mixed in such quantities as can be used up within an hour of mixing as otherwise the mixture will set and thicken, affecting flowing and finish. The lids of cement paint drums shall be kept tightly when not in use.

**2.4. Application of Paint:**

2.4.1. No painting shall be done when the paint is likely to be exposed to a temperature of below 7°C within 48 hours after application.

2.4.2. When weather conditions are such as to cause damage the work shall be carried out in the shadow as far as possible.

This helps the proper hardening of the paint film by keeping the surface moist for a longer period.

2.4.3. To maintain the uniform mixture and to prevent segregation, the paint shall be stirred frequently in the bucket.

2.4.4. For undercoated surfaces, the surfaces shall be treated with minimum two coats of water proof cement paint. Not less than 24 hours shall be allowed between two coats. Next coat shall not be started until the preceding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the preceding coat shall be allowed between two coats. Next coat shall not be started until the preceding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather, the preceding coat shall be slightly moistened before applying the subsequent coat.

2.4.5. The finished surface shall be even and uniform in shade, without patches, brush marks, paint drops etc.

2.4.6 The cement paint shall be applied with a brush with relatively short stiff hog or fibre bristles. The paint shall be brushed in uniform thickness and shall be free from excessive heavy brush marks. The laps shall be well brushed out.

2.4.7. Water proof cement paint shall not be applied on surfaces already treated with white wash colour wash, distemper dry or oil bound varnishes, paint etc. It shall not be applied on gypsum, wood and metal surfaces.

**2.5. Curing :** Painted surfaces shall be sprinkled with water two or three times a day. This shall be done between coats and for at least two days following the final coat. The curing shall be started as soon as the paint has hardened so as not to be damaged by the sprinkling of water say about 12 hours after the application.

2.6. Protection measures shall be taken as per item No. 18.11 para 2.6.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 18.11 shall be followed.

3.2. The rate shall be for a unit of one sq. metre.

18.53. Extra over item 18.51 for every subsequent coat of water proofing cement paint of approved brand and manufacture.



**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 18.51 shall be followed except that the work is for applying subsequent coat of cement water proofing paint.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.51 shall be followed except that the extra rate shall be paid for applying every subsequent coat of cement water proofing paint over and above the rate of item No. 18.51.

2.2. The rate shall be for a unit of one sq. metre.

**18.54.** Extra over item 18.51 for finishing with cement paid on ceiling/sloping roofs.

**1.0. Materials & Workmanship:** 1.1. The relevant specifications of item No. 18.51 shall be followed except that the cement water proofing paint shall applied on ceiling and sloping roofs.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 18.51 shall be followed except that the extra shall be paid for applying cement water proofing paint on ceiling and sloping roofs, over and above the rate of item No. 18.51.

2.2. The rate shall be for a unit of one sq. metre.

**18.56.** Extra over item 18.53 for every subsequent coat of finishing with cement paint on ceiling and sloping roofs.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 18.51 shall be followed except that the work shall be carried out for subsequent coat on ceiling and sloping roofs.

**2.0. Mode of measurements & payment:** 2.1. The relevant specifications of item No. 18.53 shall be followed except that extra rate shall be paid for every subsequent coat applied with cement water proofing paint over and above the rate of item No. 18.53.

**18.57.** Wall painting (two coats) with plastic emulsion paint of approved brand and manufacture on undecorated wall surfaces to give an even shade including thoroughly brushing the surface free from mortar dropping and other foreign matter and sand paper smooth.

**1.0. Materials :** Water shall be conform to M-1. The plastic emulsion shall conform to I.S. 5411-1969 (part-I).

**2.0. Workmanship:**

2.1. Scaffolding : The relevant specifications of item No. 18.11 para 2.1. shall be followed.

2.2. Preparation of surface : The relevant specifications of item No. 18.44 para 2.2. shall be followed.

2.3. Preparation of Mix : This shall be done as per manufacturers instructions. The thinning of emulsion is to be done with water and not with turpentine. The quantity of thinner to be added shall be as per manufacturer instructions.

**2.4. Applications:**

2.4.1. Before pouring into small containers for use, the paint shall be stirred thoroughly in its container. When applying also, the paint shall be continuously stirred in the smaller container, so that its consistency is kept uniform.

2.4.2. The paint shall be laid on evenly and smoothly by meant of crossing and laying off the crossing and laying off consist of covering the area over with paint, brushing the surface hard for the first lime over and then brushing alternately in opposite direction two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. No hair marks from the brush or clogging of paint puddles in the corners of panels, angles of mouldings, etc. shall be left on the work. The full process of crossing and laying off will constitute one coat.

2.4.3. The paint shall be applied with brush or rollers. For undecorated surfaces, the surface shall be treated with minimum two coats of cement water proofing paint. The second or subsequent coat shall not be started until the preceeding coat has become sufficiently hard to resist marking by brush being used.

2.4.4. The surface on finishing shall present a flat velvety smooth finish. It shall be even and uniform in shade without patches, brush marks, paint drops etc.

**2.5. Precautions:**

(a) Old brushes if they are to be used with emulsion paints, shall be completely dried of turpentine oil paint by washing in warm soap wafer.

Brushes shall be quickly washed in water immediately after use and kept immersed in water during break periods to prevent the paint from hardening on the brush.

- (b) In the preparation of wall for plastic emulsion painting, no oil base putties shall be used in filling cracks, holes etc.
- (c) Splashes on floors etc. shall be cleaned out without delay as they will be difficult to remove after hardening.
- (d) Washing of surfaces treated with emulsion paint shall not be done within 3 to 4 weeks of application.

**2.6. Protective measures: 2.6.1.** The relevant specifications of item No. 18.17. para 2.3. shall be followed:

**3.0. Mode of measurements & payment:**

**3.1.** The relevant specifications of item No. 18.11 shall be followed.

**3.2.** The rate shall be for a unit of one sq. metre.

**18.59** Extra over item No. 18.57 for every subsequent coat of wall painting with plastic emulsion paint of approved brand.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 18.57 shall be followed except that the painting work shall be for subsequent coat of plastic emulsion paint.

**2.0. Mode of measurements & payment: 2.1.** The relevant specifications of item No. 18.57 shall be followed except that the extra shall be paid for every subsequent coat of plastic emulsion paint applied over and above the rate of item No. 18.57. **2.2.** The rate shall be for a unit of one sq. metre.

**18.60** Extra over item 18.57 for painting with plastic emulsion paint of approved brand on ceiling and sloping roofs.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 18.57 shall be followed except that the painting shall be done on ceiling and sloping roofs.

**2.0. Mode of measurements & payment:**

**2.1.** The relevant specifications of item No. 18.57 shall be followed except that the extra payment shall be made for applying plastic emulsion paint on ceiling and sloping roofs over and above the rate of item No. 18.57.

**2.2.** The rate shall be for a unit of one sq. metre.

**18.62.** Extra over item 18.59 for paint on ceiling and sloping roofs.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 18.57 shall be followed except that the work for subsequent coat of plastic emulsion paint will be carried out on ceiling and sloping.

**2.0. Mode of measurements & payment:**

**2.1.** The relevant specifications of item No. 18.57 shall be followed except that the extra rate shall be paid for carrying out painting on sloping roofs and ceiling with plastic emulsion paint over and above the rate of item No. 18.59.

**2.2.** The rate shall be for a unit of one sq. metre.

## SECTION-19

### *DETAILED SPECIFICATIONS OF ITEMS - PAINTINGS & POLISHING*

#### *AS PER "SCHEDULE OF RATES"*

**19.11.** Painting one coat (excluding priming coat) on previously painted steel and other metal surface with enamel paint, brushing to given and even shade including cleaning the surface of all dirt, dust and other foreign matter.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 19.7 shall be followed except that painting shall be carried out in one coat with enamel paint on previously painted steel and metal surface.

**2.0. Mode of measurements & payment:**

**2.1.** The relevant specifications of item No. 19.7 shall be followed.

**2.2.** The rate shall be for a unit of one sq. metre.

**19.12.** Applying priming coat over new steel and other metal surfaces after and including preparing the surface by thoroughly cleaning oil, grease, dirt and other foreign matter and secured with brushes, fine steel, wood scrapes and sand paper, with ready mixed priming paint, brushing red lead.

**1.0 Materials:**

**1.1.** The ready mixed primer, brushing red lead shall conform to I. G. 102-1962.

**1.2.** The thinner (linsed oil) shall conform to I.S. 75-1973. If for any reason, thinning is necessary in case of ready mix paint, the brand of thinner recommended by manufacturer shall be used.

**2.0. Workmanship:**

2.1. Preparation of surfaces : The surfaces to be painted shall be cleaned of all rust, scale, dirt and other foreign matter sticking to it with wire brushes, steel wool, scrapers, sand paper etc. This surface shall then be wiped finally with mineral turpentine which shall also remove grease and perspiration of hand marks. The surface shall then be allowed to dry.

2.2. Application of primer : 2.2.1. After the preparation of the surface, the priming coat shall be applied immediately. The brushing operations are to be adjusted to the spreading capacity advised by the manufacturer of the particular primer. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing alternately in opposite directions, two or three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat.

2.2.2. During painting, every time after the priming coat has been worked out of the brush bristles or after the brush has been unloaded of the bristles of the brush shall be opened up by striking the brush against portion of the unpainted surface with the end of the bristles, held at right angles to the surface, so that bristles thereafter will collect the correct amount of paint when dipped again into a paint container. The priming coat shall be allowed to dry completely before painting is started.

2.2.3. No hair marks from the brush or clogging at paint puddles in the corner or panels angles of mouldings etc. shall be left on the work.

2.2.4. Special care shall be taken while painting over bolts, nuts, rivets overlaps etc.

2.2.5. The container when not in use shall be kept close and free from air so that paint does not thicken and also shall be kept guarded from dust.

**3.0. Mode of measurements & payment:**

3.1. The new steel and other metal surface shall be measured under this item.

3.2. All the work shall be measured net in the decimal system as executed subject to the following limits unless otherwise stated hereinafter:

(a) Dimensions shall be measured to the nearest 0.01 metre.

(b) Areas shall be worked out to the nearest 0.01 Sq. metre.

3.3. No deductions shall be made for openings not exceeding 0.5 sq. mt. each and no addition shall be made for painting to headings, mouldings, edges, jambs, soffits, etc. of such opening.

3.4. In case of fabricated structural steel and iron work, priming coat of paint shall be included with fabrication. In case of trusses if measured in sq. m. compound girders, stanchions, lattices, girder and similar work, actual area shall be measured in sq. M. and no extra shall be paid for painting on bolts, heads, nuts, washers etc. No addition shall be made to the weight calculated for the purpose of measurements of steel and iron works for paint applied on shop or at site.

3.5. The different surfaces shall be grouped into one general item, areas of uneven surface being converted into equivalent plain areas in accordance with the table given as per Annexure II for payment.

3.6. The rate shall be for a unit of one sq. metre.

**19.7.** Painting two coats (excluding priming coat) on new steel and other metal surfaces with enamel paint, brushing, interior to give an even shade including cleaning the surface of all dirt, dust and other foreign matter.

**1.0. Materials :** The enamel paint shall conform to M-44 B.

**2.0 Workmanship : 2.1. General:**

2.1.1. The materials required for work of painting work shall be obtained directly from approved manufacturers or approved dealer and brought to the site in maker's drums, kegs etc. with seal unbroken.

2.1.2. All materials not in actual use, shall be kept properly protected, lids of containers shall be kept closed and surface of paint in open or partially open containers covered with a thin layer of turpentine to prevent formation of skin. The materials which have become stale or flat due to improper and long storage shall not be used. The paint shall be stirred thoroughly in its container before pouring into small containers. While applying also the paint shall be continuously stirred in smaller container. No left over paint shall be put back into stock tins. When not in use, the containers shall be kept properly closed.

2.1.3. If for any seasons, thinning is necessary, the brand of thinner recommended by the manufacturer shall be used.

2.1.4. The surface to be painted shall be thoroughly cleaned and dusted. All rust, dirt and grease shall be thoroughly removed

before painting is started. No painting on exterior or other exposed parts of the work shall be carried out in wet, damp or otherwise unfavourable weather and all the surfaces shall be thoroughly dry before painting work is started.

## **2.2. Application:**

2.2.1. Brushing operations are to be adjusted to the spreading capacity advised by the manufacture of particular paint. The paint shall be applied evenly and smoothly by means of crossing and laying off. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternately in opposite directions two or three times and then finally brushing lightly in direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute one coat.

2.2.2. Each coat shall be allowed to dry completely and lightly rubbed with very fine grade of sand paper and loose particles brushed off before next coat is applied. Each coat shall vary slightly in shade and shall be got approved from Engineer-in-charge before next coat is started.

2.2.3. Each coat except the last coat shall be lightly rubbed down with sand paper of fine pumice stone and cleaned of dust before the next coat is applied. No hair marks from the brush or clogging of paint puddles in the corners of panels angles of mouldings etc. shall be left on the work.

2.2.4. Special care shall be taken while painting over bolts, nuts, rivets, overlaps etc.

Approved best quality brushes shall be used.

## **3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 19.12 shall be followed for mode of measurements and payment. The rate is excluding priming coat.

3.2. The rate shall be for a unit of one sq. metre.

**19.15.** Extra over item No. 19.7 and 19.11 for every subsequent coat of paint.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 19.7 shall be followed except that the work of painting shall be carried out for subsequent coat.

## **2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 19.7 shall be followed except that the extra rate shall be paid for every subsequent coat of paints applied over and above the rate of item No. 19.7 and 19.11.

2.2. The rate shall be for a unit of one sq. metre.

19.19. Painting two coats (excluding priming coat) on new steel and other metal surface with synthetic enamel paint, brushing to give an even shade including cleaning the surface of all dirt, dust and other foreign matter.

**1.0. Materials :** Synthetic enamel paint shall conform to I. S. 1932-1964.

**2.0. Workmanship :** 2.1. The relevant specifications of item No. 19.7 shall be followed except that the painting shall be carried out with synthetic enamel paint.

## **3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 19.7. shall be followed.

3.2. The rate shall be for a unit of one sq. metre.

**19.21.** Painting one coat (excluding priming coat) on previously painted steel and other metal surfaces with synthetic enamel paint brushing to give an even shade including cleaning the surface of all dirt, dust and other foreign matter.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 19.19. shall be followed except that the painting shall be carried out on previously painted steel and other metal surfaces using synthetic enamel paint in one coat.

## **2.0. Mode of measurements & payment:**

2.1 The relevant specifications of item No. 19.19 shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

19.23. Extra over item No. 19.19 and 19.21 for every subsequent coat of paint.

**1.0. Materials & Workmanship:** 1.1. The relevant specifications of item No. 19.19. shall be followed except that the work shall be carried out for subsequent coat of paint.

**2.0. Mode of measurements & payment:** 2.1. The relevant specifications of item No. 19.19 shall be followed except that the extra rate shall be paid for applying subsequent coat of oil paint over and-above the item No. 19.19.and 19.21.

**19.50 (B)** Painting two coats (excluding priming coat) on external surfaces of new rain water, soil, waste and vent pipes and fittings with ready mixed bituminous paint brushing, black anticorrosive to give an even shade including cleaning of all dirt, dust and other foreign matter (75 mm. dia).

**1.0. Materials :** 1.1. Ready mixed bituminous paint shall conform to I.S. 158 : 1968.

**2.0. Workmanship :**

2.1. The relevant specifications of item No. 19.7 shall be followed except that the painting work of external surfaces of 75 mm. dia. rain water pipe, soil, waste and vent pipe and fitting with ready mixed bituminous paint shall be carried out.

**3.0. Mode of measurements & payment:**

3.1. The rate is excluding the cost of priming coat but including painting of all fittings coming in line.

3.2. The rate shall be for a unit of one running metre.

**19.50 (C)** Painting two coats (excluding priming coat) on external surfaces of rain water, soil waste and vent pipe and fittings with ready mixed bituminous paint brushing, black anticorrosive to give an even shade including cleaning off all dirt dust and other foreign matter: 100 mm. dia.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 19.50 (B) shall be followed except that the pipes to be painted on is 100 mm. dia. metre.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 19.50 (B) shall be followed. The rate is excluding the cost of priming coat but including cost of painting all fitting coming in line.

2.2. The rate shall be for a running metre.

**19.59 (B)** Applying priming coat over new wood and based surfaces after and including preparing the surface by thoroughly cleaning of dirt grease, dust and oilier foreign matter, sand papering and knotting: Ready mixed paint, brushing wood primer pink.

**1.0. Materials :** 1.1. The ready mixed paint, brushing, wood primer pink shall conform to I. S. 3536-1966.

**2.0. Workmanship :** 2.1. Preparation of Surfaces :

2.2.1. All wood work shall be dry and free from any foreign matter incidental to building operations. Nails shall be punched well below the surface to provide a firm key for stopping. Mouldings shall be carefully smoothened with abrasive paper and projecting fibres shall be removed. Flat portion shall be smoothened off with abrasive paper used across the grain prior to staining and with the grain prior to staining or if the wood is to be left in its natural colour, wood work which is to be stained may be smoothened to scraping instead of by glass papering if so required.

2.2.2.. Any knots, resinous or stricaks or blueish sap wood that are not large enough to justify cutting out shall be treated with two coats of pure shellac knotting applied thinly and extended about 25 mm. beyond the actual area requiring treatment.

2.2. Application of primer : 2.2.1. The relevant specifications of item No. 19.12 (A) shall be followed for application of primer.

**3.0. Mode of measurements & payment:** 3.1. The relevant specifications of item No. 19.32 shall be followed except that work done on wood and wood based surfaces shall be paid under this item. : J.2. The rate shall be for a unit of one sq. metre.

**19.59. (C)** Applying priming coal over new wood and wood based surface after and including preparing the surface by thoroughly cleaning oil, grease, dirt and other foreign matter sand papering and knotting; Ready mixed paint brushing priming, or enamel.

**1.0. Materials :** 1.1. The Ready mixed paint for brushing priming for enamels wood shall conform to I. S. 106-1962.

**2.0. Workmanship :** 2.1. The relevant specifications of item No. 19.59 (B) shall be followed except that ready mixed paint rushing priming for enamel shall be used instead of ready mixed paint brushing wood primer pink.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 19.12 shall be followed.

3.2. The rate shall be for a unit of one sq. metre.

**19.62. (B)** Extra over item 19.59(B) for every subsequent coal o' priming coat. Ready mix paint brushing wood primer pink.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 19.59 (B) shall be followed except that the

painting work shall be carried out with ready mix paint, brushing wood primer pink for subsequent coat.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 19.59 (B) shall be followed except that the extra rate shall be paid for every subsequent coat applied with Ready mix paint; brushing wood primer pink over and above the rate of item No. 19.59 (B).

**19.62 (C)** Extra over item No. 19.59(C) for every subsequent coat of priming coat ready mix paint brushing priming for enamel.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 19.59 (C) shall be followed except that the painting work shall be carried out with ready mix paint brushing priming for enamel.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 19.59 (C) shall be followed except that the extra shall be paid for every subsequent coats of priming coat with ready mixed paint, brushing priming for enamel.

2.2. The rate shall be for a unit of one sq. metre.

**19.71.** Painting two coats (excluding priming coat) on new wood and wood based surfaces with enamel paint interior to give an even shade including cleaning the surface off all dirt, dust and other foreign matter sand papering and slopping.

**1.0. Materials : 1.1.** The enamel paint shall conform to I. S. 133-1975.

**2.0. Workmanship:**

2.1. The relevant specifications of item No. 19.7 shall be followed for general and applications of paint, except that the enamel paint shall be used for painting on new wood/wood based surfaces.

2.2. In painting doors and windows the putty, round the glass panes also be painted but care shall be taken to see that no paint, stain etc. are left on the glass. Top of shutters and surfaces in similar hidden locations shall not be left out in painting.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 19.12 shall be followed, for mode of measurements and payments. The rate excludes cost of priming coat.

3.2. The rate shall be for a unit of one sq. metre.

**19.73.** Painting one coat (excluding priming coat) on previously painted wood and wood based surfaces with enamel paint to give even shade including cleaning of all dirt, dust and other foreign matter.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 19.71 shall be followed except that the painting work shall be carried out on previously painted wood and wood based surfaces with enamel paint to give even shade in one coat with paint.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 19.71 shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**19.75.** Extra over item 19.71 and 19.73 for every subsequent coat of paint.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 19.71 shall be followed except that painting work shall be for subsequent coat with paint.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 19.71 shall be followed except that the extra rate shall be paid for every subsequent coat applied over and above the item No. 19.71 and 19.73.

2.2. The rate shall be for a unit of one sq. metre.

**19.77.** Painting two coats (excluding priming coat) on new wood and wood based surfaces with of ready mixed paint brushing, oil gloss, semi-gloss, to give an even shade including cleaning all dust, dirt and other foreign matter sand papering and stopping.

**1.0. Materials :** The ready mixed paint shall conform to M- 44. The ready mixed paint brushing gloss, semi-gloss shall conform to I. S. 129-1962 and I. S. 117-1964.

**2.0. Workmanship: 2.1.** The relevant specifications of item No. 19.71 shall be followed for general and application of paint except that ready mixed paint brushing, oil gloss and semi-gloss shall be used of approved colour and shade instead of enamel paint.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 19.12 shall be followed for measurements and payment. The rate excludes cost of priming coat.

3.2. The rate shall be for a unit of one sq. metre.

**19.84.** Varnishing two coats (excluding priming coat) on new wood and wood based surfaces undercoating with flattening varnish and finishing coat varnish to give an even surface of aldisri, dust and sand papering so as to produce a smooth dry surface.

**1.0. Materials :** The varnish shall conform to I. S. 338-1962.

**2.0. Mode of measurements & payment:**

2.1.1. The surface to be varnished shall be prepared to produce a smooth, dry neat surface. The previous coat of paint or stain, if any shall be allowed to dry and rubbed down slightly wiped off and allowed to dry.

2.1.2. The operation of varnishing calls for careful attention to cleanliness. All dust and dirt shall be removed from the surface to be varnished and also from the neighborhood. If surfaces are dampened to avoid raising of dust, they shall be allowed to dry thoroughly before varnishing is commenced. Damp atmosphere and draughts shall be avoided. For exterior work a normal dry day should be chosen. Exposure to extreme of heat or cold, or to a damp atmosphere will spoil the work.

2.1.3. In handling and applying varnish care should be taken to avoid forming air bubbles. Brushes and containers shall be kept scrupulously clean.

**2.2. Application :**

2.2.1. The varnish shall be applied liberally with a brush and spread evenly over a portion of the surface with a short light strokes to avoid frothing. It shall be allowed to flow out while the next section is being laid-in. Excess varnish then be scrapped out of the brush and the first section be crossed recrossed and then laid off lightly. Too much or too little varnish left on the surface will mar the appearance of the finish. The varnish once it has begun to set, shall not be retouched. If a mistake is made, the varnish shall be removed and the work started afresh.

2.2.2. In case of two coats of varnish work, the first shall be hard drying, under coating or flattening varnish, this shall be allowed to dry hard and then be flattened down before applying the finishing coat. If two coats are applied, sufficient time shall be allowed between two coats.

2.2.3. When flat varnish is used for finishing a preparatory coat of hard drying under coating or flattening varnish shall be first applied and shall be allowed to harden thoroughly. It shall then be lightly rubbed down before the flat varnish is applied, section of the work such as panels, shall be cut in clearly, so as to avoid any overlapping during applications, as this is likely impart some measure, of gloss to partially dried area, worked up in lapping. On larger area the flat varnish shall be applied rapidly and the edges of each patch applied shall not be allowed to set but shall be followed up whilst in free working conditions.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 19.71 shall be followed.

3.2. The rate shall be for a unit of one sq. metre.

**19.86.** Extra over Item No. 19.84 for every subsequent coat of varnish.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 19.84 shall be followed except that the work shall be for a subsequent coat of varnishing.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 19.84 shall be followed except that the extra rate shall be paid for every subsequent coat of varnishing done over and above the rate of item No. 19.84. 2.2. The rate shall be for a unit of one sq. metre.

**19.87.** Polishing with french polish on new wood and wood based surface to give an even surface including cleaning the surface of all dirt, dust and sand papered smooth and including a coat of wood filler.

**1.0. Material:**

1.1. The French polish of required tint and shade shall be prepared with the below mentioned ingredients and other necessary materials : (i) Denatured spirit of approved quality (ii) Chadras, (iii) Sheilac (iv) Pigment. The french polish so prepared shall conform to I.S. 348-1968.

**2.0. Workmanship : 2.1. Preparation of Surface :**

2.1.1. All unevenness shall be rubbed down to smoothness with the paper and the surface shall be well dusted. The pores in the wood shall be filled up with a filler made of paste of whiting in water or methylated spirit (with a suitable pigment like burnt sienna or umber if required); Otherwise the French polish will get absorbed and a good gloss will be difficult to obtain.

**2.2. Application : 2.2.1.** A pad of woolen cloth covered by a fine cloth shall be used to apply the polish. The pad shall be moistened with polish and rubbed hard on the surface in a series of over laping circles applying the polish sparingly but uniformly over the entire area to give an even surface. A trace of linseed oil on the face of the pad may be added which shall facilitate this operation. The surface shall be allowed to dry and the remaining coats applied in the same way. To finish off the pad shall be covered with a fresh piece of clean fine cloth, slightly dampened with methylated spirit and rubbed lightly and quickly with circular motions. The finished surface shall present a uniform texture and high gloss.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 19.12 shall be followed for mode of measurements and payment.

3.2. The rate includes cost of wood filler etc. complete.

3.3. The rate shall be for a unit of one sq. metre

**19.88.** Polishing with french polish on previously polished wood and wood based surface to give an even surface including cleaning the surface of all dirt, dust and sand papered smooth including a coat of wood filler.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 19.87 shall be followed except that the french polish will be applied on previously polished wood and wood based surface.

**2.0. Mode of measurements & payments:**

2.1. The relevant specifications of item No. 19.87 shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**19.91.** Applying wax polish on new wood work and wood based surfaces with bee's wax polish in proportion 2:1.5:1 .05:05 (2 Bess Wax, 1.5 linseed oil: 1 Turpentine oil: 0.5 Varnish by weight) to give an even surface including cleaning the surface of all dirt, dust and sand papered smooth.

**1.0. Materials :** Bee's Wax shall conform to LS.: 1504-1968 Linseed oil shall conform to I. S. 75-1967. Turpentine shall conform to I.S.83-1950. Varnish shall conform to I.S. 337-1952.

**2.0. Workmanship : 2.1. Preparation of bees wax :**

2.1.1. In case of bees wax it shall be prepared locally with following specifications :

2.1.2. Pure bees wax free paraffin or stearine adulterants shall be used. The polish shall be prepared from mixture of bees wax, linseed oil, turpentine and varnish in proportion 2 : 1.5 : 1 : 0.5 by weight. The bees wax and boiled linseed oil shall be heated over a slow fire. When the wax is completely dissolved the mixture shall be cooled till it is just warm and turpentine and varnish added to it in the required-proportions and entire mixture shall be well stirred.

**2.0. Preparation of surfaces:**

2.2.1. The surface to be waxed shall be prepared to produce a smooth dry, neat surface. Previous coat of paint or stain of any shall be allowed to dry and be rubbed down lightly wiped off and all allowed to dry. All dust and dirt shall be removed from the surface to be waxed, and also from the neighborhood. Damp atmosphere and draughts shall be avoided. For waxing, normal dry day shall be chosen.

**2.3. Application:**

2.3.1. The polish shall be applied evenly with clean soft pad of cotton cloth in such a way that the surface is completely and fully covered. The surface shall then be rubbed continuously for half an hour. After well rubbing in one coat of wax polish the work shall be covered with dust proof sheet. (Cloth for preventing dust falling on the work.) Subsequent coat shall be applied after the surface is quite dry and shall be rubbed off with soft fiannel until the surface has assumed a uniform gloss and in dry showing no sign of stickness.

2.3.2. The final polish depends largely on the amount of rubbing which shall be continuous and with uniform pressure with Sequent changes in the direction.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 19.12 shall be followed.



3.2. The rate shall be for a unit at one sq. metre.

**19.92.** Applying wax polish on previous wax polished wood and wood based surfaces with boss, wax polish in proportion of 1 : 1.5 : 1 : 0.5 (2 Bees wax 1.5 linseed oil: 1 Turpentine: 0.5 Varnish by weight) to give an even surface including cleaning the surface of all dirt, dust and sand papered smooth.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 19.91 shall be followed except that the wax polishing shall be carried out on previously was polished wood and wood based surfaces with bess wax polish.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item Ne.19.91 shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**19.98** coal tarring two coats on new wood and wood based surfaces using 0.15 and 0.12 litres of coal tar per sq.m. in the first and second coat respectively to give an even shade including cleaning of all dirt, dust and other foreign matter:

**1.0. Materials :** The coal tar shall conform to I. S. 290-1961.

**2.0. Workmanship : 2.1.** 200 Cms, of unslaked lime shall be added to every litre of coal tar and heated till it begins to boil. It shall be taken off the fire and kerosene oil added to it slowly at the rate of 1 part kerosene oil and 6 parts or more parts of coal tar by volume and stirred thoroughly. The addition of lime is for preventing the tar from runnings.

2.2. Preparation of surface : 2.2.1. The surface to be painted shall be allowed to dry sufficiently. Any existing fungus of mould growth shall be completely removed. All major cracks or defects in the plaster shall be cut out and made good. Before primer is applied holes and undulations shall be filled up with plaster of paris and rubbed smooth.

2.3. Application of paint: 2.3.1. The coal tar shall be applied as per relevant specifications of applying mixed paint item No.19.7 except coal tarring is used instead of enamel paint.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No.19.12 shall be followed.

3.2 The rate shall be for a unit of one sq. metre.

**19.119. (I)** Writing letter of figures on any surface with black Japan paint (stops, comas, hyphens and the like not be measured and paid for separately): block (Letters/figures).

**1.0. Materials : 1.1.** Ready mixed the black Japan paint shall conform to I. S. 341-1952.

**2.0. Workmanship : 2.1.** The loiters and figures shall be to the heights and widths as per approved drawings or as directed. These shall be stenciled or drawn in pencil and got approved before painting. They shall be of uniform size and finished neatly. The edges shall be straight or in pleasant smooth curves.

**3.0. Mode of measurements &. payment:**

3.1. Letters, figures and similar items etc. stops, commas, hyphens and the like shall be deemed to be included in the item.

3.2. The rate per cm. height of letter shall hold good irrespective of width of the letters of figures or the thickness of the lettering.

3.3. The rate shall be for a unit of per letter per cm. height.

**19.119 (II)** Writing letter of figures on any surface with black japan paint stops, commas, hyphens and the like not be measured and paid for separations: Indian Letters/figures.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 19.119 (I) shall be followed except the writing of letters shall be Indian letters/figures.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 19.119(1) shall be followed.

2.2. The rate shall be for a unit of per letter per cm. height.

**19.126 (I)** Painting lines, dashes, arrows, letters etc. on roads, air fields, and like in two coats with road marking paint, brushing including the surface of all dirt, dust and other foreign matter: Over 10 cms in width.

**1.0. Materials : 1.1.** The road marking paint shall conform to I. S. 164-1951.

**2.0. Workmanship : 2.1.** The relevant specifications of item No. 19.119 (I) shall be followed except that the painting lines, dashes arrows and letters on roads, air fields and like thall be carried out with road marking paint in two coats : over 10 cms. in width.

**2.0. Mode of measurements & payment :**

2.1. The relevant specifications of item No. 19.119(I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**19.126. (II)** Painting lines, clashes, arrows, letters etc. on roads, fields and like in two coats with road making paint brushing including cleaning the surface of all dirt, dust and other foreign matter: upto 10 cms. in width.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 12.126 (I) shall be followed, except that painting work shall be upto 10 cms. width.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 19.119 (I) shall be followed.

2.2. The rate shall be for a unit of one running metre.

**19.127 (A)** Painting lines, dashes, arrows, letters etc. on roads, airfields and like in one coat with road marking paint, brushing including cleaning the surface of all dirt, dust and other foreign matter : over 10 cms. in width.

**1.0. Materials & Workmanship:** The relevant specifications of item No. 19.126 (1) shall be followed except that the painting shall be done in one coat over 10 cms. in width.

**2.0 Mode of measurements & payment:**

2.1. The relevant specifications of item No. 19.126 (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**19.127 (B)** Painting lines, dashes, arrows, letters etc. on roads air fields and like in one coat with road making paint, brushing including cleaning the surface of all dirt, dust and other foreign matter: upto 10 cms. in width.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 19.126 (I) shall be followed except that the painting shall be done in one coat upon 10 cms. in width.

**2.0 Mode of measurements & payment:**

2.1. The relevant specifications of item No. 19.126 (I) shall be followed.

2.2. The rate shall be for a unit of one running metre.

**SECTION-20**

***DETAILED SPECIFICATIONS FOR DEMOLITION & DISMANTLING  
AS PER "SCHEDULE OF RATES"***

**20.1. (I) Demolition and disposal of unserviceable materials with all leads and lifts : Lime Concrete.****1.0. Workmanship:**

1.1. The demolition shall consist of demolition of one or more parts of the building as specified or shown in the drawings. Demolition implies taking up or down or breaking up. This shall consist of demolishing whole or part of work including all relevant item as specified or shown in the drawings.

1.2. The demolition shall always be planned before hand and shall be done in reverse order of the one in which the structure was constructed. This scheme shall be got approved from the Engineer- in-charge before starting the work. This however will not absolve the Contractor from the responsibility of proper and safe demolition.

1.3. Necessary dropping, shoring and under pinning shall be provided for the safety of the adjoining work or property, which is to be left intact, before dismantling and demolishing is taken up and the work shall be carried out in such a way that no damages is caused to the adjoining property.

1.4. Wherever required, temporary enclosures or partitions shall also be provider. Necessary precautions shall be taken to keep the dust nuisance down as and where necessary.

1.5. Dismantling shall be commenced in a systematic manner. All materials which are likely to be damaged by dropping from a height or demolishing roof, masonry etc. shall be carefully dismantled first. The dismantled articles shall be properly stacked as directed.

1.6. AH materials obtained from demolition shall be the property o. Government unless otherwise specified and shall be kept in safe custody untill handed over to the Engineer-in-charge.

1.7. Any serviceable materials, obtained during dismantling or demolition shall be separated out and stacked properly as directed, with all lead and lift. All unserviceable materials, rubbish etc. shall be slacked as directed by the Engineer-in-charge.

1.8. On completion of work, the site shall be cleared of all debris rubbish and cleaned as directed.

**2.0. Mode of measurements & payment:**

2.1. Measurements of all work except hidden work shall be taken before demolition or dismantling and no allowance for increase in bulk shall be allowed. The demolition of lime concrete shall be measured under this item. Specification for deduction for voids, openings etc. shall be on same basis as that employed for construction of work.

2.2. All work shall be measured in decimal system as fixed in its place subject to the following limits, unless otherwise slated hereinafter: (a) Dimensions shall be measured to the nearest 0.01 mt. (b) Area shall be worked out to the nearest 0.01 sq. ml. (c) Cubical connection shall be worked out to the nearest 0.01 Cu. m.

2.3. The rate shall include cost of all labour involved and tools used in demolishing and dismantling including scaffolding. The rate shall also include the charges for separating out and stacking the serviceable materials properly and disposing the unserviceable materials with all lead and lift. The rate also includes for temporary storing for the safety of the portion not required to be pulled down or of adjoining property and providing temporary enclosures or partitions where considered necessary.

2.4. The rate shall be for a unit of one cubic metre..

**20.1. (ii)** Demolition and disposal of unserviceable materials with all leads and lifts. Unreinforced cement concrete.

**1.0. Workmanship:** The relevant specifications of item 10.1 (i) shall be followed except that the unreinforced cement concrete work is to be demolished instead of lime concrete.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No.20.1 (I) shall be followed.

2.2. The rate shall be for a unit of one cubic metre.

**20.3.** Demolition including slacking of serviceable materials and disposal of unserviceable materials with all leads and lifts R.C.C. work.

**1.0. Workmanship: 1.1.** The relevant specifications of item No. 20.1 (I) shall be followed except that demolition of R.C.C. work is to be done.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 20.1. (I) shall be followed except that the demolition of reinforced concrete structure. The unserviceable materials shall be disposed of at all leads and lifts. The rate excludes scraping straightening of reinforcement but includes cutting of reinforcement.

2.2. The rate shall be for a unit of one cubic metre.

**20.11. (I)** Demolition of brick work and stone masonry including stacking of serviceable materials and disposal of unserviceable materials with all leads and lifts: in lime mortar.

**1.0. Workmanship : 1.1.** The relevant specifications of item No. 20.1 (I) shall be followed except that demolition of brick or stone masonry in lime mortar is to be done.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 20.1 (I) shall be followed except that the wall and independent piers of columns of brick or stone masonry shall be measured in cubic metres. All copings, corbels, cornices and other projections shall be included with the wall measurements.

2.2. In measuring thickness plastered walls, the thickness of plaster shall be included. The unserviceable materials shall be disposed off with all lead and lift Ashlar face stones dressed stone etc. if required to be taken down intact shall be dismantled and measured separately in cubic metres.

2.3. The rate is exclusive of cleaning of bricks or stones. Honey comb works or hollow block walling shall be measured as solid.

2.4. The rate shall be for a unit of one cubic metre.

**20.11 (II)** Demolition of brick work and stone masonry including stacking of serviceable materials and disposal of unserviceable materials with all leads and lifts: in cement mortar.

**1.0. Workmanship :** The relevant specifications of item No. 20.1 (I) shall be followed except demolition of brick or stone masonry in cement mortar is to be done:

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 20.11 (II) shall be followed. The unserviceable materials shall be stacked as directed by Engineer-in-charge with all leads and lifts.

**20.22.** Demolition in terrace including stacking of serviceable materials and disposal of unserviceable materials with all lead and lift: Brick tiles covering.

**1.0. Materials: 1.1.** The relevant specifications of item No. 20.1 (I) shall be followed except that the demolition of terrace brick tiles is to be done.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 20.1 (I) shall be followed pt that the brick tiles covering of terrace shall be measured in sq. mt. The unserviceable materials shall be stocked as directed at all leads and lifts.

2.2. The rate shall be for a unit of one sq. metre.

**20.23.** Dismantling tiled or stone floors laid in mortar including stacking of serviceable materials and disposal of unserviceable materials with all lead and lifts.

**1.0. Workmanship: 1.1.** The relevant specifications of item No. 20.1 (I) shall be followed except the dismantling of tiled or stone floors laid on mortar shall be done. Dismantling implies carefully taking up or down or these are fixed by nail, screws, bolts etc. these shall be taken out with proper tools.

**2.0. Mode of measurements & payment:**

2.1. The supporting materials such as joints, beams if any etc. shall be measured separately, the relevant specification of item No.20.1 (I) shall be followed. The rate shall include stacking the unserviceable materials as directed will lead and lift.

2.2. The rate shall be for a unit of one sq. metre.

**20.25.** Dismantling of wooden floors, inc hid ing stacking of serviceable materials and disposal of unserviceable materials with all lead and lifts.

**1.0. Materials : 1.1.** The relevant specifications of item No. 20.1 (I) shall be followed except that wooden floors shall be dismantled.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 20.1 (I) shall be followed. The supporting members such as joints, beams etc. shall be measured separately. The rate includes disposal of unserviceable materials as directed with all lead and lift.

2.2. The rate shall be for a unit of one sq. metre.

**20.27 (I)** Dismantling of sheet roofing including ridges, hips, valleys, gutters etc. stacking of serviceable materials and disposal of unserviceable materials with all leads and lifts G.I. sheet roofing.

**1.0. Materials: 1.1.** The relevant specifications of item No. 20.1 (i) shall be followed except that G. I. sheet roofing shall be dismantled instead of concrete work.

**2.0. Mode of measurements & payment:**

2.1. The area of G. I. sheet roofing shall be measured in sq. metre. Ridge, hips and valley shall be girthed and included with roof area. Corrugated and semi-corrugated surfaces shall be measured flat and not girthed.

2.2. Supporting member such as rafters, purlins, beams, joints, trusses etc. shall be measured separately.

2.3. The rate shall be include disposal of unserviceable materials with all leads and lifts and stacking the serviceable materials as directed.

2.4. The rate shall be for a unit of one sq. metre.

**20.27 (II)** Dismantling of sheet roofing including ridges, hips, valleys, gutters etc. stacking or serviceable materials and disposal of unserviceable materials with all leads and lifts: A. C. Sheet roofing.

**1.0. Workmanship: 1.** The relevant specifications of item No. 20.1 (I) shall be followed except the dismantling work of A.C. sheet roofing is to be done.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 20.27 (i) shall be followed except that the A.C. sheets roofing shall be

measured in this item.

2.2. The rate shall be for a unit of one sq. metre.

**20.28.** Dismantling Mangalore or country tile roofing with battens, boarding etc. including stacking of serviceable materials and disposal of unserviceable materials with all lead & lifts.

**1.0. Workmanship:** The relevant specifications of item No. 20.1 (I) shall be followed that the country tile roof of Mangalore roof shall be dismantled.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 20.1 (I) shall be followed.

2.2. The supporting members shall be measured under separate item.

2.3. The rate includes labour required for disposal of unserviceable item with all leads and lifts.

2.4. The rate shall be for a unit of one sq. metre.

**20.30.** Dismantling cement asbestos/hard board in ceiling or partition walls, wooden trellis work including frames, stacking of the serviceable materials and disposal of unserviceable materials with all leads and lifts.

**1.0. Workmanship: 1.1.** The relevant specifications of item 20.1 (I) shall be followed except that the cement asbestos hard board in ceiling or partition walls, wooden trellis, work etc.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 20.1 (I) shall be followed. The serviceable materials shall be stacked as and where directed and the unserviceable materials shall be disposed off with all leads and lifts.

2.2. The rate shall be for a unit of one sq. metre.

**20.35.** Dismantling wood work, wrought frame and fixed in frames, trusses including stacking the materials with all lead and lift.

**1.0. Workmanship: 1.1.** The relevant specifications of item No. 20.1 (I) shall be followed except that the wood work, wrought framed, and fixed in frames, trusses, etc. shall be dismantled.

**2.0. Mode of measurements & payment:**

2.1. The relevant specification of item No. 20.1 (I) shall be followed.

2.2. The materials shall be stacked as and where directed with all lead and lifts,

2.3. The rate shall be for a unit of one cubic metre.

**20.39.** Dismantling expanded metal or I. R. C. fabric with necessary battens and headings including frame work and stacking the serviceable materials with all lead and lift.

**1.0. Workmanship :** The relevant specifications of item 20.1 (I) shall be followed except that the dismantling of expanded metal or I. R. C. fabric shall be done.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 10.1 (I) shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**20.43.** Dismantling steel work including dismembering and stacking the materials with all lead and lifts.

**1.0. Materials : 1.1.** The relevant specifications of item.No..20.1 (i) shall be followed except that the dismantling of steel work shall be carried out.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 20.1 (I) shall be followed.

2.2. The weight of the member shall be computed from standard tables unless the actual weight can be readily determined.

2.3. Riveted works where rivets are required to be cut, the same shall be carried out under this item and nothing extra shall be paid.

2.4. In farmed steel gate, the weight of any covering materials or filling such as iron sheets and expanded metal shall be added to the weight of the main articles if such covering is not ordered to be taken out separately.

2.5. The rate includes stacking the materials as and where directed with all leads and lifts.

2.6. The rate shall be for a unit of one kg.

**20.49. (I)** Dismantling doors, windows, ventilators etc. (wood or steel) shutters including chowkhats Architraves, hold fasts and other attachments etc. complete and stacking them within all lead & lifts, Not exceeding 3 sq. m. in area.

**1.0. Workmanship: 1.1.** The relevant specifications of item No. 20.1 (I) shall be followed except that the doors, windows, ventilators etc. (wood or steel) shutters including chowkhats, architraves, holdfasts and other attachments etc. are to be dismantled.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 20.1 (I) shall be followed.

2.2. The doors, windows, ventilators etc. not exceeding 3 sq. ml. in area (each) including shutters and chowkhats, Architrave, holdfasts and other attachment to frames etc. will be dismantled and measured under this item.

2.3. The rate includes stacking serviceable materials as and where directed with all leads and lifts.

2.4. The rate shall be for a unit of one number.

**20.49. (ii)** Dismantling doors, windows, ventilators etc. (wood or steel) shutters including chowkhats, Architraves, hold fasts and other attachments etc. complete and stacking them within all leads and lifts exceeding 3 sq. metres in area.

**1.0. Workmanship : 1.1.** The relevant specifications of item No. 20.49 (I) shall be followed except that the area of doors, windows, ventilators, exceeding 3 sq. metres are to be dismantled under this item.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 20.49 (I) above shall be followed.

2.2. The rate shall be for a unit of one number.

**20.51.** Dismantling barbed wire fencing including making rolls and also including dismantling fencing posts including all earth work, concrete in the base and making good the disturbed ground, stacking useful materials as directed and disposing all the unserviceable materials with all leads and lifts.

**1.0. Workmanship : 1.1.** The relevant specifications of item No. 20.1 (I) shall be followed except that the dismantling of barbed wire fencing shall be carried out.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 20.1 (i) shall be followed.

2.2. The rate includes making rolls of dismantled wires and including dismantling fencing posts, concrete work, in case and making good the disturbed ground etc. complete.

2.3. The serviceable materials shall be stacked as and where directed and the unserviceable materials shall be disposed with all leads and lifts.

2.4. The rate shall be for a unit of one running metre.

**20.56.** Dismantling C.P. Pipes, G. S. W. Pipes and A. C. rain water pipes with fitting and clamps including stacking the materials with all lead and lift (for any dia. of pipe.)

**1.0. Workmanship: 1.1.** The relevant specifications of item No. 20.23 shall be followed except that the dismantling work of pipe lines of C.I., G.S.W. & A.C. Pipes with fitting shall be carried out.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 20.1 (I) shall be followed.

2.2. Water pipe lines, including rain water pipes; with clamps and specials, sewer pipe lines, (Salt glazed ware or concrete) etc. shall be measured in running metre inclusive of joints (The measurements shall be taken along the centre line of pipe and fittings.)

2.3. The rate shall be for a unit of one running metre.

**20.001.** Dismantling sanitary fittings like wash basin. W. C. Pan Indian & European Type Hushing tank, etc. including stacking the materials with all lead lifts.

**1.0. Workmanship : 1.1.** The relevant specifications of item No. 20.23 shall be followed except that the dismantling work of sanitary fittings such as wash basin, W. C: Pan (all type of pans), flushing tanks etc. shall be carried out.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 20.1 (I) shall be followed.

2.2. The rate shall be for a unit of one number.

20.002. Scraping oil paint from steel and other metal surface and making the surface even (with hand scraping), .1.0 workmanship the oil haint from steel and other metal surface shall be scraped thoroughly withhand scraper followed by wire brushing (first with coarse and then with fine brushes) and finally sand papering with coarse and paper (No. 3) steel wood (No. 2) or emery paper (No. 3) or with emery clothes. This shall then be wipped finally with mineral terpentine to remove grease and prospiration of hand marks etc. and allowed to dry. The surface shall be made even and smooth.

**2.0. Mode of measurements & payment:**

2.1. The work shall be measured in actual area of work done.

2.2. The rate shall be for a unit of one sq. metre.

## SECTION-21

### ***DETAILED SPECIFICATIONS FOR REPAIRS TO BUILDINGS***

#### ***AS PER “SCHEDULE OF RATES”***

**21.8** Providing and fixing M. S. Fan clamps of shape and size as specified in existing R. C. C. slab including culling chase and making good.

**1.0. Materials:** 1.1. M.S. Bar shall conform to M-18.

**2.0. Workmanship:**

2.1. The shape and size of fan clamp shall be as directed.

2.2. For fixing M. S. fan clamp in existing R. C. C. slab a chase of size 150mmx75mm shall be cut from the ceiling so as to expose reinforcement and upto 25 mm. clear round the reinforcement bar. This shall be done without any damage to adjoining portion of ceiling. The two arms of the ends of the clamp shall be passed through the space over reinforcement bar from the bottom of the slab. Then the two arms shall be bent down about 15 mm. by means of crow bar. The clamp shall be held in position and the chase in the ceiling filled with cement concrete 1 : 2 : 4 (1 cement, 2 coarses and: 4 graded stone aggregate 20 mm. nominal size), The ceiling shall be then finished to match the existing surface and properly cured.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all materials and labour required for satisfactory completion of this item as described above.

3.2. The rate shall be for a unit one number.

**21.23.** Cutting out cracks of roof terrace to V. Section. Cleaning out, welting, grouting with cement and sand slurry 1: 3 (1 cement 3 sand).

**1.0. Materials:** (i) Water shall conform to M-I, (2) Cement shall conform to M-3. (3) Sand M-6.

**2.0. Workmanship :** 2.1. The cracks shall be cleaned out and trimmed to V. shaped cuts atleast 6 mm. wide on top. The cracks shall be cleaned off end then cracks shall be thoroughly flocoded with water, allowed to a soak in cracks, and then grouted with cement and sand slurry in proportion 1:3. The required cracks shall be cured atleast 7 days.

**3.0. Mode of measurements & payment:**

3.1. The rate shall include cost of all materials and labour required for satisfactory completion of item as described above.

3.2. The rate shall be for a unit of “one running metre.

**21.24.** Cutting out cracks of roof terrace to V-Section cleaning out, and filling solidly with a hot mixtures of bitumen and clean dry sand (1: 1 by weight).

**1.0. Materials:** (i) Bitumen shall be 85/25 penetration. (2) Sand shall conform to M-6.

**2.0. Workmanship:**

2.1. The relevant specifications of item No. 21.23 shall be followed for opening cracks and cleaning.

2.2. The cracks shall be absolutely dried and cleaned and Tilled solidly with a hot mixtures of 85/25 penetrating and sand in ratio of 1:1 by weight The filter shall be well filled in cracks with the edges of trowel and left flush with surface of roof. Repaired cracks shall cause no ridges across the direction of the slope of roof.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 21.23 shall be followed.

3.2. The rate shall be for a unit of one running metre.

## SECTION -22

### *DETAILED SPECIFICATIONS FOR MIS. BUILDING ITEMS*

#### *AS PER “SCHEDULE OF RATES”*

**22.20.** Providing and fixing 1.20 metre high fencing with 2 metre long M.S. angle posts 40 mm. x 40 mm. x 6 mm. and oil painting 3 coats fixed at 2.5 M. C/C with five horizontal lines, and two diagonals of galvanised steel barbed wire weighing 9.38 kg. per 100 metre (Min.) strained and fixed to posts with G. I. staples including fixing the post in ground with 0.5 M. x 0.5 M. x 0.5 M. M block in C. C. 1:5: 10(1 cement, 5 sand, 10 graded brick aggregate 40 mm. nominal size) etc. complete. 1.0. Materials: (1) Water shall conform to M-1. (2) Cement shall conform to M-3 (3) Sand shall conform to M -6. (4) Bricks bats aggregate shall conform to M-14. (5) Oil paint shall conform to M-44 (6) Barbed wire shall conform to M-78.

**2.0. Workmanship:**

2.1. The pits of the size 0.5 M. x 0.5 M. x 0.5 M. shall first be excavated, true to line and level to receive the post at 2.5 M. C/C. The relevant specifications of item 4.00.1 shall be followed for excavation work.

2.2. The pits shall be filled with a layer of 0.15 M. thick with lean concrete 1: 5 : 10 (1 cement: 5 sand: 10 graded brick bat aggregates 40 mm. nominal size). The M. S. angle 40 mm. x 40 mm. x 6 mm. shall be then placed over the concrete in true to line and plumb. The remaining portion of block shall be filled in with lean concrete 1: 5 :10 and rammed properly so as to form total 0.5 M. x 0.5 M. x 0.5 M. concrete block. The concrete shall be cured for 7 days to allow it to set.

2.3. The barbed wire shall be stretched and fixed in 5 horizontal rows and two diagonals. The bottom row shall be 140 mm. above ground and the rest at 125 mm. centre to centre. The diagonal shall be stretched between adjacent posts from top wire of one post to the bottom wire of 2nd post. The wires shall be fixed to posts by means of staples. 2.4. The M. S. Angle posts shall be painted with 3 coats of oil paint of approved tint and shade.

**3.0. Mode of measurements & payment:**

3.1. The work shall be measured for the finished work from centre to centre of the posts.

3.2. The rate shall include the cost of all labour and materials involved in the operations described above.

3.3. The rate shall be for a unit of one running metre.

**22.00.1** Constn. of B. B. Masonry Paniara 23 cm x 75 cm. wall including fixing precast R.R.C. marble Mosaic (Terrazo) slab of 75 mm. thickness on top and smooth finishing to walls in cement plaster in C.M. 1 : 3 curing etc. complete including drainage out waste water arrangements.

**1.0. Materials :** (1) Water shall conform to M -1. (2) Cement shall conform to M-3- Sand shall conform to M-6 (4) Burnt bricks shall conform to M-15 (5) Precast marble mosaic terrazo paniara of 75 mm. thickness shall be of best quality. The width of paniara shall be as directed.

**2.0. Workmanship:**

2.1. The brick masonry shall be constructed for paniara for the size as directed in C. M. 1 : 6. The thickness of wall shall be 23 cms. thick and height shall be 74 cms. The relevant specifications of B. B. masonry at item 6.13 (b) shall be followed for B. B. masonry work.

2.2. The B. B. masonry work shall be covered with precast marble terrazo paniara a top, of width and length as specified or as directed. The terrazo masaic paniara shall be 75 mm. thickness.

2.3. The whole masonry work shall be finished smooth with C.m. 1: 3. on both sides. The relevant specification of item No. 17.59 (I) shall be followed.

2.4. The drainage outlet and water arrangement shall be made as directed.

**3.0. Mode of measurements & payment:**

3.1. The work shall be measured for the finished work.

3.2. The rate shall include the cost of all labour and materials involved in the operations described above.

3.3. The rate shall be for a unit of One Running Metre.

**22.00.2.** Constructing a Chowkadi with C. C. over 12 cm. thick B. B. masonry in front and dwarf wall 1 M. high and 23 cms. thick cement plaster to masonry in C. M. (1:3) and cement concrete flooring in 1 :2:4, with 5 cm. dia. A. C. Drain pipe etc. complete.



**1.0. Materials :** 1.1. Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Burnt bricks shall conform to M-15. Stone aggregate 20 mm. nominal size shall conform to M-12.a. and A. C. Drain pipe of 5 cms. dia. shall conform to M-74.

**2.0. Workmanship:**

2.1. The chowkadi shall be constructed of Specified size and as directed. The slab shall be cast on B. B. masonry wall 12 cms. thick and dwarf wall 1 M. high, and 23 cms. thick shall be constructed in proportion of C. M. 1:3. The relevant specification of item 6.3 (I) shall be followed for masonry partition work and 5.4.1. (c) shall be followed for reinforced concrete work.

2.2. The whole masonry work shall be finished with cement mortar 1 : 6 and finished smooth. The relevant specifications of item No. 17.59 (I) shall be followed for plastering work.

2.3. The A.C. pipe of 5 cms. dia. shall be fixed as drainage pipe. The bottom shall be finished with C.C. 1:2:4 finished with cement slurry.

**3.0. Mode of measurements & payment:**

3.1. The work shall be measured for finished work.

3.2. The rate includes cost of all materials labour etc. required for carrying out satisfactory completion of work.

3.3. The rate shall be for a unit of one sq. metre.

**22.00.3 (I)** Constructing cooking platform 60 cm. width and 70 cm. height resting on B. B. Masonry wall 23 cms. thick in C. M. 1:6 with fixing of precast 1:2:4 R.C.C. 0.08 M thick slab with marble mosaic chips set in C. M. (Terrazo) with plastering on exposed faces to wall in cm. 1:4 etc. complete.

**1.0. Materials :** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Burnt brick shall conform to M-15. Marble Mosaic chips shall conform to M-46. Stone aggregate 20 mm. nominal size shall conform to M-12 and M. S. Bars shall conform to M-18.

**2.0. Workmanship:**

2.1. The cooking platform of size as directed shall be constructed in 60 cms. width and 70 Cms. height. The brick masonry wall in C. M. 1:6 shall be constructed in 23 cms. thickness upto full depth. The relevant specifications of item 6.13 (B) shall be followed for masonry work.

2.2. The R. C. C. slab of 8 cms. thickness and of adequate design and size shall be precast and the same shall be put up on the B. B. masonry work.

2.3. The top and exposed sides of the C.C. slab shall be finished with marble mosaic terrazzo 8 mm. thick with required colour pigment. The work of terrazzo shall be carried out as per relevant specification of item 14.4 (E).

2.4. The whole masonry work shall be finished with cement mortar in C. M. 1 : 4. The relevant specifications of item 17.59 (II) shall be followed.

**3.0. Mode of measurements & payment:**

3.1. The work of cooking platform shall be measured for finished work.

3.2. The rate includes cost of all labour and materials, etc. required for satisfactory completion of this item as described above.

3.3. The rate shall be for a unit of one Running metre.

**22.00.3 (II)** Constructing cooking platform of 60 cm. width and 70 cms. height resting on B. B. masonry walls 23 cm. Thick in C. M. 1 : 1 with fixing black kada pastone surface laid on precast R.C.C. slab 1 : 2 : 4 with plastering on exposed faces to wall in C. M. 1 : 4 etc. complete.

**1.0. Materials & Workmanship :** 1.1. The relevant specifications of item No. 22.00.3. (I) shall be followed except that the cooking platform shall be constructed by providing black kada pastone of 25 mm. to 20 mm. thickness on precast R.C.C. 1: 2: 4 slab 8 cms. thick. The black stone shall be provided in single piece upto 1.8 M. in length and specified width. All the exposed edges of stone shall be machine cut.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item 22.00.3 (I) shall be followed.

2.2. The rate includes providing machine, cut edges on exposed face of kada pastone.

2.3. The rate shall be for a unit of one running metre.

**12.00.4.** Providing and fixing Rajula stone 75 mm. thick 50 cm x 45 cms, size including fixing in cement mortar as directed.

**1.0. Materials :** Water shall conform to M-1. Cement mortar shall conform to M-11. Rajula stone of specified size shall be of best quality and free from any defects. The stone shall not be less than 75 mm. in thickness.

**2.0. Workmanship .2.1.** The Rajula stone of size 60 x 45 cms. size shall be fixed as and where directed in cement mortar in 1:3. All the edges of the stone shall be fixed with cement mortar in C.M. 1:3 and sloped at 45E and finished smooth. The work shall be cured for 7 days after fixing.

**3.0. Mode of measurements & payment:**

3.1. The work shall be measured for finished work.

3.2. The rate includes cost of all labour and materials required for satisfactory completion of this item.

3.3. The rate shall be for a unit of one sq. metre.

**22.00.5.** Providing and laying Bilimora type brick facing in C. M. 1 : 1 laid over bedding of cement mortar 1 : 3 (13 mm. thickness) including cleaning, watering scaffolding etc. complete.

**1.0. Materials: 1.1.** Water shall conform to M-1. Cement mortar of specified proportion shall conform to to M-11. Bilimora type bricks shall be best quality and make as approved. The bricks shall be approved before collecting the same on site.

**2.0. Workmanship:**

2.1. The surface on which the Bilimora type bricks is to be provided shall be cleaned of all dust, dirt, etc. and finished with CM 1 : 3 in 13 mm. thickness. The relevant specifications of item 17.59 (I) shall be followed except that the thickness of finishing shall be 13 mm. The top surface shall be roughened by wire brushes to give proper grip to the tiles to be fixed.

2.2. The Bilimora type bricks shall be fixed with CM 1 : 1. The tiles shall be properly wetted before fixing. The horizontal and vertical joints shall be maintained in true line and level by providing 12 mm. or 20 mm. sq. bars as directed. The tiles shall be tamped by trowel so that there shall not be any hollows left behind the tiles.

2.3. The tiles shall be cut to the required size on ends or at top bottom of beams in best workman like manner.

2.4. The whole work shall be cured for. 7 days.

**3.0. Mode of measurements & payment:**

3.1. The work shall be measured as per relevant specification of item No. 17.58 (I).

3.2. The rate includes cost of all materials, wastage etc., occurring due to cutting of tiles and ends, top and bottom of beams etc. including base cost.

3.3 The rate shall be for a unit of one sq. metre.

**22.00.6.** Providing and fixing teak wood rail of 60 mm. x 20 mm. size and 60 cms. length incl. 3 coats of oil paint to wood work with set of 3 pegs.

**1.0. Materials :** Teak wood battens of specified size conform to M-29. Oil paint shall conform to M-44. Wall pegs of aluminium 3 Nos. of approved quality and make shall be provided.

**2.0. Workmanship : 2.1.** The teak wood battens of size 60 mm. x 20 mm. and 50 cms. long shall be planed on all sides. The anodised aluminium wall pegs of approved make shall be fixed on wooden batten prepared with screws as directed. The wall pegs unit shall be fixed on wall with wooden gutties and screws as directed. The wooden battens shall be painted with 3 coats of ready mix paint of approved colour and shade.

**3.0. Mode of measurements & payment:**

3.1. The work shall be measured of finished work.

3.2. The rate shall be for a unit of one number.

**22.00.7.** Treating the bottom and sides (upto a height of 300 mm.) of the excavations for the masonry foundation and basement with chemical emulsion at the rate of 5 litres per sq. metre of the surface area.

**1.0. Materials:** The chemicals used for the soil treatment shall be only one of the following with concentration shown against each in aqueous emulsion.

Chemicals	Concentration
1 Aldrin	0.50% (by weight)
2 Heptachlor	0.50% (“ “)
3 Chlordane	1.00% (“ “)

**2.0. Workmanship:**

- 2.1. The chemicals barrier shall be complete and continuous under whole of the structure to be protected.
- 2.2. The bottom and the sides of foundations upto a height of 30 cms. from the bottom of excavation made for masonry foundation and for basement column pits shall be treated with the chemical emulsion at the rate 5 litres/sq. metre of the surface area.
- 2.3. The chemical treatment shall be carried out when the surface is quite dry. Chemical treatment shall not be carried out when it is raining or when the soil is wet with rain or sub soil water.
- 2.4. Once formed, treated soil barriers shall be not disturbed. If by chance, treated soil barriers are disturbed, immediate steps shall be taken to restore the continuity and compactness of the barrier system.
- 2.5. The treatment against termite infection shall remain full effective for a period not less than 10 years from date of issue of the final certificate of completion of work. If at any time during this period, any defects in treatment are revealed or any evidence of infection in any part of the building or structure is noticed, the contractor shall be rectify the concerned defects within 15 days on receipt of notice from Engineer-in-charge. On contractor's failure to do so, the Engineer-in-charge may get the same rectified through any other agency at contractor's risk and cost, and decision of Engineer-in-charge as to the cost payable by the contractor for the same shall be final and binding to the contractor.
- 2.6. A guarantee bond on appropriately stamped paper shall be given by the contractor to the department in the manner and form prescribed below:

**FORM OF GUARANTEE BOND**

"I/We..... (Contractor) hereby guarantee that work will remain uneffected and will not be in any way damaged by termite or any other germs of similar types, for a period of 10 years after completion of the work of anti-termite as per the terms and conditions of the contract and contractor hereby indemnifies and agrees to save harmless the Government of Gujarat from any loss and or damage that might be caused on account of termite and or oilier similar type of germs and hereby Guarantees to make good any loss or damages suffered by the Government of Gujarat and further guarantee to redo the effective work without claiming any extra cost."

- 2.7. This guarantee shall remain force for the period of 10 years from the completion of the work under the contract and it shall remain binding to the contactor for period of 10 years.
- 2.8. The deposit at the rate of 50% of the cost of this item from the running and final bills shall be recovered and retained for the first one year after completion of, the work and 10% shall be retained for the balance of guarantee period and shall be refunded only after the completion of the guarantee period.

**3.0. Mode of measurements & payment:**

- 3.1. The length and breadth shall be measured correct to a Cm. as per the dimensions of sanctioned plans. No deduction shall be made norextra paid for any opening for pipes etc. upto 0.1 Sq. ml. The rate shall include the cost of all labour and materials required for the operation involved for satisfactory completion of this item. The sides of the trenches 30 cms. each side and bottom shall be measured under this item.
- 3.2. The rate shall be for a unit of one sq. metre.

**22.00.8.** Treating the backfill immediately in contact with foundation structure with chemical emulsion at the rate 7.5 litres per sq.mt. of vertical surface of the sub-structure for each side (In case of R.C.C. columns, beams and R.C.C. basement walls, treating the sides of 50 cms. from ground level with chemical emulsion at the rate of 7.5 Litres/sq.metre).

**1.0. Materials :** 1.1. The specifications of the item 22.00.7 shall be followed.

**2.0. Workmanship:**

- 2.1. After masonry foundations and retaining wall of basement come up, the backfill immediately in contact with foundation shall be treated with the chemical emulsion at the rate of 7.5 litres per sq. m. of the vertical surface of the sub-structure for each side. The filling of earth is usually carried out in layers and the treatment shall be directed towards the concrete or masonry surfaces of the columns and walls so that the earth in contact with these surfaces is well treated with chemical.
- 2.2. In case of R.C.C. framed structure with columns and plinth beams, and R.C.C. basements the treatment shall start at the depth of 50 cms. below ground level from this depth back-fill around the columns, beams and R.C.C. basement walls shall be treated at 7.5 lit/sq. m. of vertical surface. The relevant specifications shall be followed same as item 22.00.7.

**3.0. Mode of measurements & payment:**

- 3.1. The area of sub-structure in contact with backfill to be measured. The length and breadth shall be measured correct to a

Cm. as per dimension of sanction plans for the surfaces in contact with backfill.

3.2. No deduction shall be made nor extra paid for any opening for pipes etc. upto 0.1 sq. m.

3.3. The rate includes cost of all labour, materials required for satisfactory completion of this item.

3.4. The rate shall be for a unit of one sq. metre.

**20.00.9.** Treating the top surface of the plinth filling with chemical emulsion at the rate of 5 litres per sq. metre before the sand bed or subgrade is laid.

**1.0. Materials : 1.1.** The relevant specifications of item 22.00.7 shall be followed.

**2.0. Workmanship : 2.1.** The relevant specifications of item 22.00.7 shall be followed except that the top surface of the consolidated earth within the walls shall be treated with the chemical emulsion at the rate of 5 litres/sq. metre of the surface before the and bed or sub-grade is laid. If the filled earth has been well rammed and the surface does not allow the emulsion to seep through, holes upto 50 to 75 mm. deep at 150 mm. centres both ways may be made with 12 mm. dia. M. S. rod on the surface to facilitate absorption of the emulsion.

### **3.0. Mode of measurements & payment:**

3.1. The length and breadth shall be measured clean for the actually treated.

3.2. No deduction shall be made nor extra paid for ;ny opening for pipes etc. uplo 0.1 sq. m.

3.3. The rate shall be for a unit of one sq. metre.

**22.00.10.** Treating the junctions of walls and floor area with chemical emulsion at the rale of 7.5 liters/sq. mt. by making holes at junction of walls, and columns, with the floor before laying sub-grade to a depth of 15 cms. by making holes.

**1.0. Materials : 1.1.** The relevant specifications of item 22.00.7 shall be followed.

**2.0. Workmanship : 2.1.** The relevant specifications of item 22.00.7 shall be followed except that the junction of wall, and columns with the floor shall be treated with the chemical emulsion at the rate 7.5 litres/sq. metre. Special care shall be taken to establish countinuity of the vertical chemical barrier on inner wall surfaces from the ground level upto the level of filled earth surface. To achieve this, a small channel 3 x 3 cm. shall be made at the junctions of the wall and columns with floor (before laying the sub-grade) and rod holes made in the channels upto the ground level 15 cms. apart and the rod moved backward and forward to breakup the earth and chemical emulsion poured along the channel at the rate of 7.5 litres per sq. m. of the vertical walls or columns surfaces of sub-structurers so as to soak the soil right lo the bottom. The soil should be tamped back into place after this operation.

### **3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item 22.00.7 shall be followed.

3.2. The vertical area of sub-structure in contact with filled up earth above ground level lo top of filled up earth shall be measured for payment.

3.3. The rate shall be for a unit of one sq. metre.

**20.00.11.** Treating the earth along the external perimeter of the building by making holes 15 cms. apart upto a depth of 30 cms. with chemical emulsion at the rate of 7.5 litres per sq.metre along the wall.

**1.0. Materials : 1.1.** The relevant specifications of item 22.00.7 shall be followed.

**2.0. Workmanship : 2.1.** The relevant specifications of item 22.00.7 shall be followed except that the external perimeter of the building shall be treated with chemical emulsions. After building is complete, the earth along the external permierter of the building should be treated at intervals of 15 cms. and to a depth of 30 ems. The rods shall be moved backward and forward parelled to the wall to breakup the earth and chemical emulsion poured along the wall at the rate of 7.5 litres per sq. metre of vertical surfaces. After the treatment the earth shall be lamped back into place, the earth out side of the building should be graded on completion of building. This treatment shall be carried out on the completion of such grading. In event of filling being more than 30 cms. the external permierter and treatment shall be extended to the full depth of filling upto ground level so as to ensure continuity of the chemical barrier.

### **3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 22.00.7 shall be followed.

3.2. The vertical surface area of sub-structure 30 cms. in depth from finished ground level in external perifary only shall be measured and paid under this item. The depth of wall treated under back filled shall not be included in this item.

3.3. The rate shall be for a unit of one sq. metre.

**22.00.12.** Providing treatment along outside of foundation using chemical emulsion at 7.5 litres per sq. m. of vertical surface (for each side) of sub-structure.

**1.0. Materials : 1.1.** The chemical used for the soil treatment shall be any one of the following with concentration shown against each in aqueous emulsion.

Chemicals	Concentration
1. Aldrin	0.50% (by weight)
2. Heptachlor	0.50% (“ “)
3. Chlordane	1.00% (“ “)

**2.0. Workmanship : 2.1.** The surface of consolidated earth around the existing shall be treated with chemical emulsion at the rate 7.5. litres/sq. m. of vertical surface of sub structure. The minimum height 10 sub-structure shall be considered 60 cms. for treatment. If the earth along the perimeter does not allow emulsion to seep through, holes upto 300 mm. depth at 150 mm. centres both way be made by 12 mm. dia. mild steel rod on the surface on facilitate saturation of the soil with chemical emulsion.

2.2. The chemical barrier shall be complete and continuous under hole of the structure to be protected.

2.3. The chemical treatment shall be carried out when the surface is quite dry. Chemical treatment shall not be carried out when it is raining or when the soil is wet with rain or sub soil water.

**3.0. Mode of measurements & payment:**

3.1 The length shall be measured along the periphery of the sub- structure. The depth shall be taken 0.60 M.

3.2. No deduction shall be made nor extra paid for any opening for pipes etc. upto 0.1 sq. m.

3.3. The rate includes cost of all labour and material required for the operations involved for satisfactory completion of this item.

3.4. The rate shall be for a unit of one sq. metre.

**22.00.13.** Providing treatment along external wall perimeter below concrete or masonry apron using chemical at 5 Lt./per linear including drilling and plugging etc.

**1.0. Materials: 1.1.** The relevant specifications of item No. 22.0.12 shall be followed.

**2.0. Workmanship : 2.1.** The relevant specifications of item No. 22.0.12 shall be followed except that the treatment shall be Carried out along external wall perimeter below concrete or masonry apron, using chemical at rate 5 lit./running metre.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 22.0.12 shall be followed.

3.2. The rate includes drilling and plugging holes in apron etc. complete.

3.3. The rate shall be for a unit of one running metre.

**22.00.14.** Treatment of soil below existing floor using chemical at 1 litre per hole at 300 mm. including drilling plugging holes etc.

**1.0. Materials: 1.1.** The relevant specifications of item No. 22.0.12 shall be followed.

**2.0. Workmanship:**

2.1. The relevant specifications of item No. 22.00.9 shall be followed except that the termite control treatment shall be carried out in soil below existing floors.

2.2. The holes of 12 mm. dia. rod shall be drilled in floor upto 150 mm. depth at 300 mm. apart both ways. The chemicals shall be then injected with pressure at the rate 1 litres/hole of surface area.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item 22.00.9 shall be followed.

3.2. The rate shall be includes cost of drilling holes and plugging.

3.3. The rate shall be for a unit of one sq. metre.

**22.00.15.** Treatment of voids in masonry using chemical at 1 Lit./hole at 300 mm. apart including drilling holes plugging. 1.0. Materials: The relevant specifications of item 22.0.12 shall be followed.

**2.0. Workmanship : 2.1.** The walls effected by termite shall be cleaned off all live for my bidding inside and holes or voids in masonry wall surface shall be treated by chemical emulsion at rate 1 Lit. hole. The holes in cracks in surface of wall shall

wall shall be drilled at 300 mm. apart.

**3.0. Mode of measurements & payment:**

3.1. The rate shall be for a unit of one Number of voids treated.

**22.00.16.** Treatment to wood work by chemical emulsion in oil or kerosene based including 6 mm. dia. down ward slanted holes 150 mm. C/C and plugging the same with cement mortar.

**1.0. Materials:** 1.1. The relevant specifications of item No. 22.00.7 shall be followed.

**2.0. Workmanship:**

2.1. The wood work effected by Anus shall be cleaned of all live formly hiding inside. The whole wood surface shall be then treated with oil or kerosene based chemical emulsion. The holes of 6 mm dia. shall be drilled slanted downwards at 150 mm. centres to centres and chemical emulsion shall be poured into holes by means of funnels specifically prepared for the same and allowed to seep. After funds become empty, another dose of chemical shall be poured in them. This process shall be done repeatedly till the whole wood work fully be comesaturated with chemical.

2.2. The holes drilled in wood work shall be filled in with party and other similar materials as directed and the whole wooden surface shall be made good as before.

**3.0. Mode of measurements & payment:**

3.1. The work shall be measured for the finished work in sq. metre including frame.

3.2. The out to out of frame shall be measured as width and from top flooring to top of frame shall be as height. This area includes for treating frame and shutters both.

3.3. The rate includes cost of all labours and materials, required for satisfactory completion of this item.

3.4. The rate includes drilling holes plugging the same after treatment completed and making good as before.

3.5. The rate shall be for a unit of one sq. metre.

## **SECTION -23**

### **DETAILED SPECIFICATIONS FOR WATER SUPPLY,**

#### **PLUMBING AND SANITARY FITTINGS AS PER “SCHEDULE OF RATES”**

**23.2.** Providing and fixing to wall, ceiling and floor galvanised mild steel tube (Medium grade) of the following nominal bore, tube fittings and clamps including making good the wall ceiling and floor (A) 15 mm. dia. (8) 20 mm dia. (C) 25 mm. dia. (D) 342 mm. (E) 40 mm. (F) 50 mm.

**1.0. Materials:** Galvanised mild steel lubes of specified dia. nominal bore shall conform to I. S. 1239-1968. The galvanised fittings, clamps, etc. required for specified dia. bore pipes shall be of best quality and make as approved by the Engineer-in-charge.

**2.0. Workmanship : 2.1. Cutting, Laying and Jointing:**

2.1.1. When the tubes arc to be cut or retheraded the end shall be carefully filed out so that no obstruction to bore in offered. The ends of the tubes shall then be threaded conforming to the requirements of I. S. 554-1955 with pipe dies and taps carefully in such a manner as will not result in slackness of joints when the two pieces are screwed together.

2.1.2. The taps and dies shall be used only for straightening screw threads which have become bent or damaged and dies shall not be used for turning of the threads so as to make them slacks as the latter procedure may not result in a watertight joints. The screw threads for tube and fittings shall be protected from edge unit they are fitted.

2.1.3. In jointing the tubes, the inside of the socket and the screwed end of the tubes shall be oiled and smeared with white or red lead and wapping around with a few turns of fine spun yarn round the screwed end of the tube. The end shall then be tightly screwed in the socket, tees, etc. with a pipe wrench. Care shall be taken that all pipes and fittings are properly jointed so as to make the joints completely water tight and pipes are kept at all times free from dust, and din during fixing. Burr joints shall be removed after screwing. After laying, the open ends of the pipes shall be temporarily plugged to prevent aces of water, soil, or any other foreign matter.

2.1.4. Any threads exposed after jointing shall be painted or in the case of underground piping thickly coated with approved anti corrosive paint to prevent corrision.

**2.2. Fixing of the tabe fitting to wall ceiling and Poors :**

2.2.1. In case of fixing of tubes and fillings to the walls or ceiling, these shall run on the surface of the wall or ceiling (not in chase) unless otherwise specified. The fixing shall be done by means of standard pattern, holder clamps keeping the pipes about 15 mm. clear of the wall. When it is found necessary to conceal the pipes and when specified so, chasing may be adopted or pipe fixed in duets or resesses etc. provided that there is sufficient space to work on the pipe with usual tools. The pipe shall not ordinarily be buried in walls or solid floors, where unavoidable, pipes may be buried for short distances provided that adequate protection is given against damage and where so required joints are not buried. Where required M.S. tube sleeve shall be fixed at a place a pipe is passing through a wall or floor for expansion and contraction and other movements. In case the pipe is embedded in walls or floors, it should be painted with anti-corrosive bitumastic paint of approved quality. The pipe should not come in contact with lime mortar or lime concrete as the pipe is affected by lime. Under the floors, the pipe shall be laid in layer of sand filling.

2.2.2. All pipes and fittings shall be fixed truly vertical and horizontal unless unavoidable. The pipes shall be fixed to walls with standard pattern clamps of required size and shape, one end of which shall be properly plugged or cemented into walls with cement mortar 1 : 3 (1 cement: 3 coarse sand) and the other tightened round the pipes to hold it securely. These clamps shall be spaced at regular intervals in straight length at 2 M C/C interval in horizontal run and 2.5 M. interval in vertical run. For pipe of 15 mm dia. upto 25 mm. dia. the holes in the walls and floors shall be made by drilling with chisel or jumper and not by dismantling the brick work or concrete. However for bigger diameter pipes, the holes shall be carefully made of the smallest required size. After fixing the pipe the holes shall be made good with cement mortar 1:3(1 cement: 3 coarse sand) and properly finished to match the adjacent surface.

### **2.3. Testing of joints :**

2.3.1. After laying and jointing, the pipes and fittings shall be inspected under working conditions of pressure and flow. Any joint found leaking shall be redone, and all leaking pipes removed and replaced without extra cost.

2.3.2. The pipes and fillings as they are laid shall be tested to hydraulic pressure of 6 Kg./sq. cm. The pipe shall be slowly and carefully charged with water allowing all air to escape and avoiding all shock and water hammer. The draw off takes and stopcock shall then be closed and specified hydraulic pressure shall be applied gradually. The pressure gauge must be accurate. The pipes and fillings shall be tested in sections as the work of laying proceeds keeping the joints exposed for inspection during the testing.

### **3.0. Mode of measurements & payment:**

3.1. The description of each item shall unless otherwise stated, be held to include where necessary, conveyance, and delivery, handling, unloading, storing fabrication, hoisting, all labour for finishing to required shape and size; testing, fitting in position, straight, culling and waste, return of packing etc.

3.2. The length shall be measured on running metre basis of finished work. The length shall be taken along the centre line of the pipe and fittings. The pipes fixed to walls, ceiling, floors etc. shall be measured and paid under this item.

3.3. All the work shall be measured in decimal system as fixed in its place, subject to tolerance given below unless otherwise stated:

- (i) Dimension shall be measured to the nearest 0.01 metre,
- (ii) Area shall be worked out to the nearest 0.01 sq. metre.

3.4. All measurements of culling shall unless otherwise stated be held to include the consequent waste.

3.5. In case of filling of unequal bore, the largest bore shall be measured for the test.

3.6. Testing of pipe lines filling sand joints include for providing all plant and appliances necessary for obtaining access to the work to be tested and carrying out the tests.

3.7. The rate includes galvanised steel tubing with screwed socket joints, together with all fittings (such as bends, sockets, springs, elbows, tees, crosses, short pieces, clamps and plugs unions etc.) and fixing complete with clamping wall-hooks, wooden plugs etc. and also cutting, screwing and waste and for making forged (or hand mad) bends on piping as required. Connector shall be inserted, where required or directed. The rate also includes cutting through walls, floors etc. and their making good and painting exposed threads with anti-corrosive paint as above and testing. Where lugs are to be fixed to wall, ceiling and flooring, the rate shall not include painting of pipes, providing sleeves and sand Oiling under floor for which separate payment shall be made.

3.8. The rate shall be for a unit of one Running metre.

**23.4.** Providing and laying in trenches galvanised mild steel tubes (Medium grade) of the following nominal bore and tube

fittings (earth work in trenches to be measured and paid for separately : (A) 15 mm. dia. (B) 20 mm. (C) 25 mm. (D) 40 mm. (E) 60 mm. (F) 80 mm.

**1.0. Materials :** 1.1. Galvanised mild steel tube of specified dia. nominal bore and fitting shall conform to I.S. 1239-1968.

**2.0. Workmanship:**

2.1. The relevant specifications of item 23.2 (A) shall be followed for cutting, laying and jointing testing of joints except that the fixing of tube shall be done in trenches.

2.2. The width and depth of the trenches for different diametres of the tubes shall be as unclsr : For 15 to 80 mm. dia. tube width of trenches-shall be 30 cms. and depth of trenches 60 cms.

2.3. At joints, the trench width shall be widened where necessary. The work of excavation and refilling shall be done true to line and gradient in accordance with general specifications of earth work in trenches.

2.4. The pipes shall be painted with two coat of anti-corrosive bitumasic paint of approved quality. The pipe shall be laid on a layer of 75 mm. sand filled upto 150 mm. above the pipe so specified. The remaining portion of trench shall be then filled with excavated earth. The surplus earth shall be disposed of as directed.

2.5. When the excavation is done in rock, the bottom shall be cut deep enough to permit the pipe to be laid and cushion of sand 75 mm. In case of bigger diameter of tube where the pressure is very high, thrust block of cement concrete 1:2:4 (1 cement: 2 coarse sand : 4 graded stone aggregate of 20 mm. nominal size) shall be constructed on all bends to transmit the hydraulic thrust without imparing the ground and spreading it over a sufficient area if so specified.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 23.2. (A) shall be followed. The authorised quantities shall be measured.

3.2. For purpose of calculating cubic content cross section shall normally be taken at suitable intervals i.e. at manhole or wall chamber intervals except in abnormal cases like sudden change in strata or undulating ground etc. when they may be taken at closer intervals as approved by the Engineer-in-charge whose decision shall be final conclusive and binding.

**3.3. Authorised width:**

(a) Upto one metre depth, the width of the trenches for the purpose of measurement of excavation shall be arrived at by adding 40 cms. to the external diameter of the tube (not the socket) where a pipe is laid on concrete bed/cushioning layer. The authorised width shall be the external diameter of tube plus 40 cms. or the width of. the concrete bed cushioning layer whichever is more.

(b) For depths exceeding one metre an allowance of 5 cms. per metre of depth for each side of the trench shall be added to the authorised width (i.e. external diameter of pipe of plus 40 cms.) This allowance shall apply to the entire depth of the trench. The authorised width in such cases shall therefore be, equal to the depth of trench, plus external diameter or tube plus 40 cms.

(c) When more than one tube is laid, the diameter shall be reckoned as the horizontal distance for outside to outside of the outermost pipes.

(d) Where sheeting etc., has been provided the authorised width of the trenches at bottom shall be increased to accommodate for sheeting etc. so that the clear width available between faces of sheeting is as per provisions of (a), (b) & (c) above.

(e) If the side of the trench are not vertical, the toes of the side slopes shall end at the top of pipe and vertical sided trench of authorised width as per (a), (b), (c) and (d) above shall be excavated from these down to the bed of trenches.

3.4. Where the tubes are laid in trenches, the work of excavation and refilling shall be paid for separately. The rate also does not include painting of pipes and sand filling all round tubes for which separate payment shall be made. The length shall be measured on running metre basis.

3.5. The rate shall be for a unit of one running metre.

**23.6.** Making connection of galvanised M. S. distribution branch with galvanised mild steel main 50 mm. to 80 mm. Nominal bore by providing and fixing tee including cutting and threading the pipes etc. complete.

**1.0. Materials:** The fittings required of specified dia. of pipe shall conform to I.S. 1237-1968

**2.0. Workmanship: 2.1** A pit of suitable dimensions shall be dug at the point where the connection is to be-made with the main and earth removed upto 150 mm. below the main. The flow of water in water main shall be also be disconnected by closing the sluice or wheel



valves on the mains. The main shall first be cut, Water if any, collected in the pit shall be bailed out, ends of the pipe threaded.

2.2. The connections of distribution pipe shall be made by fixing malleable galvanised mild steel tee of the required size and fittings such as jam nut, socket, connecting piece etc.

2.3. The testing of the joints shall be done as per relevant specifications of item No. 23.2. (A).

### **3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all labour, materials, tolls and plant required for satisfactory completion of this item.

3.2. The rate shall be for a unit of one number.

**23.8.** Providing and fixing to wall ceiling and floor 6 Kgs/Sq. Cm. working pressure- polythene pipes of the following outside diameter low density complete with special flange compression type fittings wall clips etc. including making good the wall/ceiling and floor, (A) 20 mm. dia (B) 25 mm dia. (C) 32 mm. dia. (D) 40 mm. dia. (E) 50 mm. dia.

**1.0. Materials: 1.1.** The low density polythene pipe of specified diameter with 6 Kg./Sq.Cm. working pressure shall conform to I.S. 3076-1968. The specials and fitting required shall be of best quality.

### **2.0. Workmanship:**

2.1. The P. V. C. Pipes of specified diameter shall be fixed as directed. Due to thermal expansion of rigid P. V. C. Pipes, due allowance shall be made particularly in over ground pipe lines for any change in length of pipe line which may occur during installation or when pipe line is in service.

2.2. Above ground installation of rigid P.V.C. pipe should be undertaken after preparations are observed for their protection against direct sun rays and mechanical damage.

2.3. The rigid P.V.C. pipe lines should not be kept exposed above ground when it passes through public places, railway lines, road side and footpaths.

2.4. P.V.C. pipes shall be supported at the following intervals:

20 mm dia. 500 mm. 32 mm. dia. 900 mm.

25 mm. dia. 750 mm.

2.5. Closer support spacings shall be provided if recommended by the manufacture.

2.6. The guide lines indicated by the manufacturer regarding, handling, transportation, storing laying and jointing of pipes shall be kept in view during execution.

2.7. P.V.C. pipes shall be fixed on wall with wooden plugs and suitable plastic clamps.

2.8. Jointing the pipes :

2.8.1 The pipes and sockets shall be accurately cut. The ends of the pipes and fittings should be absolutely free from dirt and dust. The outside surface of the pipes and the inside of the fittings shall then be roughened with emery paper, and then solvent cement joint. Since solvent cement is aggressive to P.V.C., care must be taken to avoid applying excessive cement to the inside of pipe sockets as any surplus cement cannot be wiped off after jointing. Empty solvent cement tins, brushes rags, or paper impregnated with cement should not be buried in the trenches. They should be gathered, not left scattered about, as they can prove to be a hazard to animals, which may chew them.

2.8.2. If manufacture recommends its own methods of jointing, the same shall be adopted after necessary approval from the Engineer- in-charge.

### **2.9. Laying pipes in Trenches :**

2.9.1. The pipe shall be laid over uniform relatively soft fine grained soil found to be free of presence of hard objects such as large flints, rocky projections, large tree roots etc. The width of the trenches shall be minimum width required for working.

2.9.2. The pipes laid underground shall not be less than one metre from the ground level. The pipe shall be positioned in the trenches so as to avoid any induced stresses due to deflection. Any deviation required shall be obtained by using proper type of rubber ring joints.

### **3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item 23.2. (A) shall be followed except that the P. V. C. pipes of specified dia. shall be paid under this item.

3.2. The unit rate shall be for a unit of one running metre.

23.111. (A)(I) Providing and fixing water closet seating pan (Indian type W.C. Pan) size 580 mm. (Earth work, bed concrete, foot-rests and trap to be measured and p; id for separately). Vitreous china. Long pattern white colour.

**1.0. Materials:** **1.1.** Water closet squatting pan (Indian type W.C. Pan) shall conform to M-62. Cement mortar shall conform to M-11.

**2.0. Workmanship :** **2.1.** The pan shall be sunk into the floor and embedded in a cushion of average 15 cm. cement 1:5: 10 (1 cement: 5 fine sand : 10 graded stone aggregate or brick aggregate 40 mm. nominal size) or as specified. This concrete shall be left 115 mm. below the top level of the pan so as to allow for flooring and its bed concrete. The floor should be suitably sloped so that the waste water is drained into the pan. The pan shall be provided with 100 mm. 'P' or 'S' trap as specified in the item No. 23.113 with approximately 50 mm. seal. The joints between the pan and the trap shall be made leak-proof with cement mortar 1 : 1 (1 cement: 1 fine sand).

**3.0. Mode of measurements & payment:**

3.1. The rate shall include the cost of all materials and labours involved in the operations described under workmanship.

3.2. The rate shall be for a unit of one number.

3.3. The 'P' or 'S' trap shall be paid separately.

**23.79.** Providing and fixing cast iron spigot and sockets soil waste water and ventilating pipes of the following normal size (B) 75 mm. dia. (C) 100 mm. dia.

**1.0. Materials 1.1.** The specified dia. C.I. Spigot and socket soil or waste pipe shall conform M-68.

**2.0. Workmanship:**

2.1. The fixing of C. I. spigot and sockets soil waste and ventilating pipe shall be carried out as per relevant specifications of item 15.93 (B) except the C. I. spigot and socket shall be fixed. The joints shall be fixed with cement mortar 1:2 (1 cement : 2 sand) and spun yarn. The pipes without cars shall be fixed to all with M.S. clamps. The pipes with cars shall be secured with 40 mm. before steel or iron barrel distance pieces or bobbins and stout galvanised iron nails 10 cms. long driven into hand wool plugs fixed in walls. Access doors to fittings shall be provided with 3 mm. rubber insertion packings and secured without screws to make air and water tight.

2.2. All soil pipes shall be carried up above the roof and shall have a wire ballon guard or a cowl.

2.3. The ventilating pipe or shaft shall be carried out to a height of atleast one metre above the outer covering of the roof of the building or in the case of windows in a gable wall or a dormer windows, it shall be carried upto the ridge of the roof or atleast two metres above the top of the windows. In case of flat roof to which access for use is provided, it shall be carried out upto a height of atleast one metre above the parapet or two metres measured vertically from the top of any windows in opening which may exist upto a horizontal distance of five metres from the vent pipe into such building and in no case shall be carried out to a height less than three metres.

2.4. Where ventilating pipe are carried in pipe shafts, the shafts shall be of a minimum size of one metre. If the shafts roof also used to give light and air to rooms, the ventilating pipes must be carried out to a horizontal distance at roof level not less than five metre from the site of the shaft.

2.5. The sand cast iron pipes above parapet shall be fixed with M. S. clamps and stays. The clamp shall be made from 1.5 mm. thick M. S. flat or 3 mm. width band to the required shape and size to fit tightly on the sockets when tightened with screw bolts. It shall be formed of two semi circular pieces with flanged ends on both sides; with holes to fit in the screw bolts and nut 40 mm. dia. M. S. Bars. One end of the stay shall be bent to form a hook to be fixed with clamps by means of bolts and the other end shall be bent for embedding in wall in cement concrete block of size 200 mm. x 100 mm. x 100 mm. in 1 : 2: 4 mix. The concrete shall be finished to match the surrounding surfaces.

2.6. The connection between the main pipe and branch pipes shall be made by using branches and bends with access doors for cleaning.

2.7. The waste from lavatories, kitchens basins, sinks, baths and other floor traps shall be separately connected to respective stacks of upper floors. The waste stack of lavatories shall be connected directly to main hole while the waste stack of other shall be separately discharged over gully trap.

**3.0. Mode of measurement:, & payment:**

3.1. The length of pipe shall be measured including all fittings along its length in running metres correct to a centimetre. No allowance shall be made for the portion of pipe length entered the sockets of the adjacent pipe or fittings.

3.2. The rate includes all labour, and materials, tools and plant etc. required for satisfactory completion of this item.

33. The rate shall be for a unit of one running metre.

**23.87.** Providing and fixing cast iron (spun) Nahni trap of the following nominal diameter of self cleaning design with C. I. Screwed down or hinged grating including cost of culling and making good the walls and floors: 100 mm. inlet and 50 mm. outlet.

**1.0. Materials: 1.1.** The cast iron (spun) Nahni trap shall be conform to M-69. The C. I. hinged or screwed down cover shall be of best quality.

**2.0. Workmanship:**

2.1. The Nahni trap with 100 mm. dia. inlet and 50 mm. dia. outlet shall be fixed as per drawing or as directed.

2.2. The Nahni trap shall be jointed with C. I. Pipe, 75 mm. dia. with lead joints. The lead joints shall be done in conformation with I.S. 782-1976.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all labour, materials, tools and plants etc. required for satisfactory completion of this item including lead jointing and testing.

3.2. The rate shall be for a unit of one number.

**23.112. (A)(I)** Providing and fixing wash down water closet (European type W.C. Pan) with integral 'P' or 'S' trap including joining the trap with soil pipe in C.M. 1: 1 (1 cement: 1 fine sand) (seat and cover to be measured and paid for separately) : Vitreous china pattern : In white colour.

**1.0. Materials :** Wash down water closet (European type W.C. Pan) shall conform to M-60. Cement mortar shall conform to M-11.

**2.0. Workmanship:** Closet shall be fixed to the floor by means of 75 mm. long 6.5 mm. diameter counter sunk bolts and nuts embedded in the floor concrete using rubber or fibre washers so as not to allow any lateral displacement. The joint between the trap of W. C. and soil pipe shall be made with C.M. 1:1 (1 cement: 1 fine sand).

**3.0. Mode of measurements & payment:**

3.1. The rate shall include the cost of all labour for fixing pans and seat and cover, inlet, connections etc. complete including testing the same.

3.2. The payment of seat and cover shall be made separately. 3.3.

The rate shall be for a unit of one number.

**23.113. (A)** Providing and fixing 100mm. size 'P' or 'S' trap for water closet squatting pan including jointing the trap with the pan and soil pipe in cement mortar 1:1 (1 cement: 1 fine sand) Vitreous china.

**1.0. Materials :** The 100 mm. size 'P' or 'S' trap for water closet shall conform to M.62 Cement mortar shall conform to M.11

**2.0 Materials :** Workmanship 'P' or 'S' trap shall be fixed with pan and cast iron pipe with C. M. 1 : 1. The pan shall be provided with a 100 mm. 'P' or 'S' trap as specified in the item with an approximately 50 mm. seal. The joint between the pan and the trap shall be made leak-proof with cement 1: 1 (1 cement: 1 fine sand).

**3.0. Mode of measurements & payment:**

3.1. The rate shall include the cost of all materials and labour involved in the operations described under workmanship including testing.

3.2. The rate shall be for a unit of one number.

**23.114.** Providing and fixing in C.M. 1 : 3 (1 cement: 3 coarse sand) a pair of white vitreous china 250 mm. x 130mm. x 30 mm. foot rest for long pattern squatting pan water closet.

**1.0. Materials: 1.1.** The pair of white vitreous china foot-rests shall conform to M-62. Cement mortar shall conform to M-11.

**2.0. Workmanship: 2.1.** After laying the floor, the floor, shall be suitably sloped so that the waste water is drained into the pan. A pair of foot-rests of size 250 mm x 130 mm. x 30 mm. of white vitreous china shall be set in cement mortar 1: 3 (1 cement: 3 coarse sand). The foot-rests shall be fixed at a distance of 175 mm. from the inner edge of the back side of the pan and shall be fixed at convenient angle.

**3.0. Mode of measurements & payment:**

3.1. The rate shall include the cost of all materials and labours involved in all the operations described under workmanship.

3.2. The rate shall be for a unit of one pair.

**23.115. (A)(I)** Providing and fixing 1215 litres low level flushing cistern with a pair of C. I. or mild steel brackets complete with fittings such as lead valveless syphon, 15 mm. nominal size brass ball valve with polythene float, C. P. brass ball handle, unions and coupling for connections with inlet, outlet and overflow pipes, 40 mm. dia. porcelain enamelled flush including cutting holes in walls and making good the same and connecting the flush bend with cistern and closet, (overflow pipe to be measured and paid for separately): Vitreous China. In white colour.

**1.0. Materials : 1.1.** The low level vitreous china (Enamel) flushing tank shall conform to M-65, except that the flushing cistern shall be 12.5 litres low level type as mentioned in the item.

**2.0. Workmanship:**

2.1. The low level cistern shall be fixed firmly on two C.I. or mild steel brackets which shall be firmly embedded in the wall in C. M. 1 : (1 cement: 4 fine sand).

2.2. The height of the bottom of the cistern from the top of the pan shall be 30 cms. The low level flushing cistern shall be connected to the closet by means of 40 mm. dia. white porcelain enamelled flush bend using Indian rubber adaptus joint. The flush pipe shall be securely connected to the cistern outlet by means of coupling nut made of any non-corrosive materials non-ferrous metal or galvanised steel. The flush pipe from the cistern shall be connected to the closet by means of cement or red-lead.

**3.0. Mode of measurements & payment:**

3.1. The rate shall include the cost of all materials, fitting and labour involved in all the operations described under workmanship including testing.

3.2. The rate shall be for a unit of one number.

**23.116.** Providing and fixing 12.5 litres high level C. I. flushing cistern with a pair C. I. or mild steel brackets, complete with fittings such as syphonic arrangement, 15 mm. nominal size brass ball valve with polythene flat, lever G. I. China (60 cms.) and pull unions and couplings for connections with inlet outlet and overflow pipes etc. including cutting holes in walls and making good the same. (overflow pipe to be measured and paid for separately).

**1.0. Materials : 1.1** The high level C. I. flushing cistern shall conform to M-66, except that the flushing cistern shall be of 32.5 litres high level C. I. flushing cistern as mentioned in the item.

**2.0. Workmanship 2.1.** The cistern shall be fixed on two C. I. or mild steel brackets which shall be firmly embedded in the wall in cement mortar 1 : 4 (1 cement, 4 fine sand).

2.2. The height of the bottom of the cistern from the top of the pan shall be two metres.

2.3. The W.C. Pan shall be connected to the cistern by galvanised steel flushed pipes of 32 mm. nominal internal diameter. The flush pipe shall be fixed to wall by using clamps. The flush pipe from the cistern shall be connected to the closet by means of cement or red-lead. The flush pipe shall be securely connected to the cistern outlet by means of coupling nut made of any corrosive material non-ferrous metal or galvanised steel.

2.4. The china and the pull union shall be fixed to the protruding lever arm of the flushing cistern.

2.5. The whole installation shall be tested for leak-proof joints and satisfactory functioning.

**3.0. Mode of measurements & payment:**

3.1. The rate shall include the cost of all materials, fillings and labour involved in all operations, described under workmanship including testing.

3.2. The rate shall be for a unit of one number.

**23.117.** Providing and fixing in position with clamps etc. 32 mm. nominal internal dia. galvanised steel tube flush pipe for high level flushing cistern including connecting the flush pipe with cistern and closet and making good the walls and floors.

**1.0. Materials : 1.1.** The 32 mm. nominal internal dia. galvanised steel tube flush pipe shall conform to M-56.

**2.0. Workmanship :**

2.1 The W.C. pan shall be connected to the cistern by galvanised steel flush pipe of 32 mm. nominal internal diameter. The pipe shall be fixed to wall by using clamps.

2.2. the flush pipe from the cistern shall be connected to the closet by means of cement or red-lead.

2.3. The flush pipe shall be securely connected to the cistern outlet by means of coupling nut made of any non-corrosive materials, non-ferrous metal or galvanised steel.

**3.0. Mode of measurements & payment:**

3.1. The rate shall include the cost of all materials, fittings and labour involved in all the operations described under workmanship including testing.

3.2. The rate shall be for a unit of one running metre.

**23.120.** Providing and fixing G. I. inlet connection for flush pipe with W. C. Pan.

**1.0. Materials: 1.1.** The G. I. inlet connection for flush pipe shall conform to M-56.

**2.0. Workmanship : 2.1.** The flush pipe from the cistern shall be connected to the closet by means of cement or read-lead.

**3.0. Mode of measurements & payment:**

3.1. The rate shall include the cost of all materials, fittings and labour involved in all the operations described under workmanship including testing.

3.2. The rate shall be for a unit of one number,

**23.127.** Providing and fixing wash basin with single hole for pillar top white C.I. or M.S. brackets painted white intruding cutting holes, and making good the same but excluding fittings, vitreous china flat back wash basin 550 mm. x 400 mm. in white colour.

**1.0. Materials: 1.1.** The white glazed earthenware wash basin shall be 550 cm. x 400 mm. of 1st quality and make as approved by the Engineer-in-charge. The wash basin shall conform to M-59.

**2.0. Workmanship :**

2.1. The wash basin shall be fixed on the wall as and where directed. The wash basin shall be supported on a pair of M.S. or C.I. brackets fixed in C.M. 1 : 3 (1 cement: 3 sand). The bracket shall conform to I. S.: 775-1962. The wall plaster on the rear shall be cut to rest the top edge of the wash basin. After fixing the basin, plaster shall be made good and surface finished to match with the existing one.

2.2. The bracket shall be painted white with ready-mixed paint.

2.3. The C.I. brass trap and union shall be connected to 32 mm. dia. waste pipe which shall be suitably bent towards the wall and which shall discharge into an open drain leading to a gully trap or direct into the gully-trap on the ground floor and shall be connected to a waste pipe through a floor trap on the upper floors. C.P. brass trap and union may not be provided where the surface drain or a floor trap is placed directly under the basin and the waste is discharged into vertically.

2.4. The height of the front edge of the wash basin from the floor level shall be 80 cms.

2.5. The necessary inlet, outlet connections and fittings such as pillar cocks. C.P. dress waste trap waste pipe, stop cock, chain with rubber plug etc. shall be fixed.

2.6. The payment of fittings shall be made separately under separate item.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all labour, materials; tools and plant etc. required for satisfactory completion of this item as specified in workmanship.

3.2. The rate shall be for a unit of one number.

**23.130 (C)** Providing and fixing kitchen sink with C.I. or M.S. Brackets painted white including cutting holes in walls and making good the same but excluding fittings, Vitreous china Sink 600 mm. x 450 mm. x 150 mm. size.

**1.0. Materials : 1.1.** While glazed vitreous china sink 600 mm. x 450 mm. x 150 mm. size shall conform to M-63.

**2.0. Workmanship :**

2.1. The kitchen sink shall be supported on a pair of M. S. or C. I. brackets fixed in cement mortar 1:3 (1 cement: 3 coarse sand). The M.S. or C.I. brackets shall conform to I.S. 775-1972. The wall plaster on the rear shall be cut to rest over the top edge of the sink. After fixing the sink plaster shall be made good and the surface finished to match with the existing one.

2.2. The C.P. brass trap and union shall be connected to 40 mm. dia. nominal bore galvanised mild steel waste pipe which shall be suitably bent towards the wall and which shall discharge into an open drain leading to a gully-trap or direct into the

gully- trap on the ground floor and shall be connected to a waste pipe through a floor trap on the upper floors. C.P. brass trap and union may not be provided where surface drain or a floor trap is placed directly under the sink and the waste is discharged to it vertically.

2.3. The height to front edge of the wash basin from the floor level shall be 80 cms.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all labour, materials tools and plant and other equipment required for satisfactory completion of this item as described in workmanship.

3.2. The rate shall be for a unit of one number.

**23.135 (A)** Providing and fixing 32 mm dia. C.P. brass waste for wash basin or sink.

**1.0. Materials: 1.1.** The C.P. brass waste trap and unions shall be of 12 mm. dia. and of best quality and make as approved by the Engineer-in-charge.

**2.0. Workmanship:**

2.1. C. P. brass waste trap and union shall be connected to 32 mm. dia. waste pipe which shall be suitably bent towards the wall and which shall discharge into drain through a floor trap. The C. P. brass waste trap shall be provided for wash basin or sink as the case may be.

**3.0. Mode of measurements & payment:**

3.1. The rate includes all labours and providing C. P. brass waste trap and union including waste coupling of 32 mm. dia. The rate excludes the cost of waste pipe of 32 mm. dia.

3.2. The rate shall be for a unit of one number.

**23.135 (B)** Providing and fixing 40 mm. dia. C. P. Brass waste for wash basin of sink.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item 23.135 (A) shall be followed except that the diameter of C. P. brass waste is 40 mm. dia.

**2.0. Mode of measurements & payment: 2.1.** The rate shall be for a unit of one number.

**23.136. (A)** Providing and fixing 32 mm. dia. M. I. Fisher union shall be of best quality and make as approved by the Engineer-in-charge.

**1.0. Materials : 1.1.** The 32 mm. dia. M. I. Fisher union shall be of best quality and make as approved by the Engineer-in-charge.

**2.0. Workmanship: 2.1.** The 32 mm. dia. M. I. Fisher union shall be fixed to wash basin or sink in best workman like manner.

**3.0. Mode of measurements & payment: 3.1.** The rate includes all labours and materials, tools & Plants etc. required for satisfactory completion of the item.

**23.136 (B)** Providing and fixing 40 mm. dia. M. I. fisher union for wash basin or sink.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 23.136 (A) shall be followed except the diameter of M. I. Fisher union shall be 40 mm. dia.

**2.0. Mode of measurements & payment:** The rate shall be for a unit of one number.

**23.139.** Providing and fixing 100 mm. dia. sand cast iron grating for gulley floor or Nahni trap.

**1.0. Materials: 1.1.** The 100 mm. dia. sand cast iron gratings for gulley floor or Nahni trap shall be of best quality and make as approved.

**2.0. Workmanship: 2.1.** The cast- iron grating shall be provided to gully trap floor or Nahni trap as the case may be in best workman like manner.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all labour, materials tools, and plants, etc. required for satisfactory completion of this item.

3.2. The rate shall be for unit of one number.

**23.141. (A)** Providing and fixing 100 mm. dia. C. P. brass shower rose with 15 mm. or 20 mm. inlet. **1.0. Materials: 1.1.** 100 mm. dia. C. P. brass shower rose shall conform to LS.: 2556-1972 part XI and of best quality and make as approved by the Engineer-in-charge. The inlet of shower rose shall be 15 mm. dia. or 20 mm. dia. as directed. **2.0. Workmanship :2.1.** The C.P. brass shower rose shall be fixed as directed 15 mm. dia. or 20 mm. dia. G.I. inlet pipe as

the case may be.

**3.0. Mode of measurements & payment:**

3.1. The rate includes all labour and materials, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of one number.

**23.143.** Providing and fixing 600 mm. x 450 mm. bevelled edge mirror of superior glass mounted on 6 mm. thick A. C. Sheet or plywood sheet and fixed to wooden plugs with C. P. brass screws and washers.

**1.0. Materials:**

1.1. The 600 x 450 mm. size mirror shall be of superior glass with edge rounded off or bevelled as specified. It shall be free from flaws specks, or bubbles and its thickness shall not be less than 6 mm. The glass for the mirror shall be uniformly silver plated at the back and shall be free from silvering defects. Silvering shall have a protective uniform covering of red-lead paint. The 6 mm. thick plywood shall conform to M-37.

1.2. The 6 mm. thick A. C. Sheets shall conform to M-24.

**2.0. Workmanship : 2.1.** The mirror of 500 mm.x450mm. size mounted on A.C. sheet or plywood 6mm. thick with. C.P. brass clips shall be fixed as directed, by fixing wooden plugs in wall and C. P. brass screws and washers. The work shall be carried out in best workman like manner.

**3.0. Mode of measurements & payment: 3.1.** The rate includes cost of all labour and materials, tools and plant etc. required for satisfactory completion of this item. The rate shall be for a unit of one number.

**23.144 (B)** Providing and fixing 600 x 20 mm. C. P. brass towel rail complete with C. P. brass brackets fixed to wooden plugs with and C. P. brass screws.

**1.0. Materials : 1.1.** The C. P. brass towel rail shall be 600 x 20 mm. of best quality as approved by the Engineer-in- charge. The brackets shall be of C. P. brass. The rail shall conform to I.S. 1068-1958.

**2.0. Workmanship : 2.1.** The brackets of the towel rail shall be fixed by means of C.P. brass to screws wooden plugs finny embedded in the wall with C.M. 1 : 3 (1 cement: 3 coarse sand). The towel rail shall be fixed as and where directed.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all labour and materials, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of one number.

**23.145.** Providing and fixing 600 mm. x 120 mm. glass shelf with C.P. brackets and guard rail complete, fixed to wooden plugs with C.P. brass screws.

**1.0. Materials : 1.1.** The glass shelf of 600 mm. x 120 mm. size shall be of 5 mm. thick plate glass. The edge of the glass shall be grounded. The C.P. over brass guard rail shall be of best quality and make.

**2.0. Workmanship : 2.1.** The C. P. brass brackets of the glass shelf shall be fixed with C.P. brass screws to wooden plug firmly embedded in the wall C. M. 1 : 3 (1 cement: 3 coarse sand). The C. P. guard rail shall be fixed to glass shelf as directed.

**3.0. Mode of measurements & payment:**

3.1. The rate includes all labour and materials, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of one number.

**23.146 (A)** Providing and fixing C. P. brass toilet paper holder.

**1.0. Materials : 1.1.** The C.P. brass toilet paper holder shall be of best quality and make. The chromium plating shall be of grade 'B' type conforming to I.S. 1068-2958.

**2.0. Workmanship : 2.1.** The toilet paper holder shall be fixed in position by means of screws and wooden plug embedded in wall with cement mortar 1 : 3 (1 cement: 3 coarse sand).

**3.0. Mode of measurements & payment:**

3.1. The rate includes best of all labour and materials, tools and plant etc. required for satisfactory completion, of the item.

3.2. The rate shall be for a unit of one number.

**23.92. (A)(I)** Providing and fixing brass screw down bib taps of following size: Polished bright 14 mm. dia.

**1.0. Materials: 1.1.** 15 mm. dia. brass screw down with bright polished finish shall conform to I.S. 781-1977. The bib coak shall be best Indian make and quality.

**2.0. Workmanship : 2.1.** The screw down bib cock 15 mm. dia. as specified above shall be fixed as directed. The threaded portion shall be smeared with white or red lead and around with a few turns of fine spun yarn round the screwed end of the pipe. The bib cock shall be than screwed and fixed to water tight position.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of one number.

**23.92(A)(II)** Providing and fixing brass screw down bib taps of following size: Polished bright: 20 mm. dia.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item 23.92 (A)(I) shall be. followed except that the bib taps of 20 mm. dia. shall be fixed.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item 23.92 (A)(I) shall be followed.

2.2. The rate shall be for a unit of one number.

**23.92 (B)(I) 1.0. Materials & Workmanship :** Providing and fixing Chromium plated brass screw down bib taps of the following size: 15 mm. dia.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 23.92 (A)(I) shall be followed except that brass chromium plated screw down bid tap of 15 mm. dia. shall be fixed.

**2.0. Mode of measurements & payment 2.1.** The rate shall be for a unit of number.

**23.92 (B)(II):** Providing and fixing chromium plated brass screw down bib taps of the following size: 15 mm. dia.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 23.92 (A)(i) shall be followed except that the brass chromium placed screw down bib lap shall be fixed.

**2.0. Mode of measurements & payment: 2.1.** The rate shall be for a unit of one number.

**23.92 (C)(I)** Providing and fixing gun metal screw down bib taps of the following size : 15 mm. dia.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item No. 23.92 (A)(i) shall be followed except that the 20 mm. dia. gun screw down bib tap shall be fixed.

**2.0. Mode of measurements & payment: 2.1.** The rate shall be for a unit of one number.

**23.92 (C)(II)** Providing and fixing gun metal screw down bib taps following size : 20 mm. dia.

**1.0. Materials & Workmanship: 1.1.** The relevant specifications of item No. 23.92 (A)(I) shall be followed except that the 20 mm. dia. gun screw down bib tap shall be fixed.

**2.0. Mode of measurements & payment: 2.1.** The rate shall be for a unit of one number.

**23.95 (A)** Providing and fixing biller tap capsion head screw down high pressure with screw shank and back nuts : (A) 15 mm. dia. (B) 20 mm. dia.

**1.0. Materials: 1.1.** The capsten head pillar tap of specified dia. of C.P. over brass shall be of best quality and shall conform to I.S.: 1795-1961. The pillar taps shall be of tested quality.

**2.0. Workmanship:** The capstan head pillar tap of specified dia. shall be fixed as directed with required washwer of selected leather or rubber asbestos composition or of plastic as directed. The cock shall fixed with pipe line with white zink end spun yarn to make joint water light. The work shall be carried out in best workman like manner.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all labour, materials lolls and plant etc. required for satisfaction completion of this item.

3.2. The rate shall be for a unit of one number.

**23.96(A)** Providing and fixing brass screw down stop cock (A) 15 mm. diy. (B) 20 mm. dia. (C) 25 mm. dia.

**1.0. Materials : 1.1.** The brass screw down slorJ cock of specified dia. shall conform to I.S.: 781-1977. The stop cock shall be tested quality.

**2.0. Workmanship : 2.1.** The stop cock shall be fixed in position by means of Jam nut and stocket. The stop cock shall be fixed near the inlet of the water metre or as directed. The joints shall be done with white zinc and spun yarn. The joint shall be tested for leak proofing.

**3.0. Mode of measurements & payment:**



3.1. The rate includes cost of all labours, materials, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of one number.

**23.99.** Providing and fixing gun metal check or non-return valve (A) 15 mm. dia. (B) 20 mm. dia. (C) 25 mm. dia. (D) 32 mm. dia. (E) 40 mm. dia.

**1.0. Materials: 1.1.** The gun metal check or non return full way wheel valve of specified dia. shall conform to I.S. 778-1964. The non return valve shall be of tested quality.

**2.0. Workmanship : 2.1.** The gun metal check or non return valve" shall be fully cleared of all foreign matter before fixing. The fixing of valve shall be done by means of bolts nuts and 3 mm. rubber insertions with flanges of spigot and socketed tail pieces, drilled to the same specification as in case of socket and spigot and with flanges in case of flanged pipes. The jointing shall be done leak proof.

**3.0. Mode of measurements & payment:**

3.1. The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of one number.

**23.00.1.** Providing and fixing chromium plated brass half turn flush cock of approved quality incl. fixing in pipe line etc. complete (I) 20 mm. dia. (II) 25 mm. dia. (III) 32 mm. dia.

**1.0. Materials: 1.1.** Chromium plated brass half turn flush cock shall conform to M-67.

**2.0. Workmanship :** The half turn flush cock of specified diameter shall be fixed as directed. The flush cock shall be fixed in G.I. pipe line with necessary fillings. The joints shall be made leak proof by using spun yarn and white zink. The fixing work shall be carried out as per relevant specifications of item No. 23.2 (4).

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all materials and labour required for satisfactory completion of this item including fittings.

3.2. The rate shall be for a unit of one number.

**23.004.** Providing and fixing chromium plated bottle trap with necessary coupling of approved quality for wash basin.

**1.0. Materials :** The chromium plated bottle trap shall be of approved make and of best quality. The bottle trap shall be provided with coupling.

**2.0. Workmanship:** The bottle trap shall be fixed on hand wash basin with wooden gullies and screws as directed. The work shall be carried out in best workman like manner.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all materials and labour involved for satisfactory completion of this item.

3.2. The rate shall be for a unit of one number.

**23.122. (A)** Providing and fixing urinal of approved quality including connecting the urinal with waste pipe, trap etc. complete : white earthen ware flat back or corner type size 430 mm. x 260 mm. x 350 mm.

**1.0. Materials: 1.1.** The white earthenware flat pack or comer type urinal of size 430 mm. 260 mm. x 350 mm. shall conform to M-64.

**2.0. Workmanship: 2.1.** The urinals shall be fixed in position by using wooden plugs and screws and shall be at a height 65 cms. from the floor level to the top of the lip or urinal, unless otherwise directed. The wooden plugs shall be 50 mm. x 50 mm. at base lapping to 38 mm. x 38 mm. at top and 50 mm. in length shall be fixed in wall in cement mortar 1: 3 (1 cement : 3 coarse sand). The urinal shall be connected to 32 mm, dia. galvanised mild steel waste pipe which shall discharge in the channel or-floor trap. The connection between the urinal and flush or waste pipe shall be made by means of putty or whit elead mixed with chopped hemp.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all labours, materials, tools and plants etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of one number.

**22.124. (A)** Providing and fixing urinal of approved quality deluding connection with trap and with integral longitudinal flush pipe squatting plate pattern white earthenware 550mm x 300 mm.

**1.0 Materials : 1.1.** The squatting plate plattern, white glazed earthenware urinal of 550 mm. x 300 mm. shall conform to I.S. 771-1063. It shall be of best Indian Make.

**2.0. Workmanship:**

2.1. The squatting plate urinal shall be fixed as directed.

2.2. The lop edge of the squatting plate shall be flush with the finished floor level adjacent to it. It shall be embedded on a layer of 25 mm. thick cement mortar 1:8(1 cement: 8 fine sand) laid over a bed of burnt brick bl cement a: 5 : 10 (1 cement : 5 fine sand. 10 graded brick aggregate 20 mm. nominal size). There shall be 100 mm. dia. glazed earthenware of vitreous china channels as specified with stop and outlet pieces suitably fixed in floor in Cement mortar 1:3(1 cement: 3 coarse sand) and joint finished with white cement. The earthenware vitreous china shall discharge into 65 mm. C.P. brass outlet grating. The trap and fitting shall be fixed as directed.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all materials, tools and plants and labour required for satisfactory completion of this item.

3.2. The rate shall be for a unit of one number.

**23.134.** Providing and fixing rubber plug for sink or wash basin.

**1.0 Materials: 1.1.** The rubber plut for sink or wash hand basin shall be best quality and make as approved by the Engineer-in-charge.

**2.0. Workmanship :2.1.** The rubber plug with chain shall be fixed in wash basin or sink as directed.

**3.0. Mode of measurements & payment: 3.1.** The rate shall for a unit of one number.

**23.00.5 (A)** Providing and fixing ball cock of approved quality as directed (Copper metal) : (I) 25 mm. dia. (II) 50 mm. dia.

**1.0 Materials:** The ball cock of specified diameter shall conform to M-75.

**2.0. Workmanship:** The ball cock of specified diameter shall be fixed as directed. The fixing of ball cock shall be carried out as per relevant specifications of item No. 23(A) for joints etc.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all materials and labour involved for carrying out satisfactory work.

3.2. The rate shall be for a unit of one number.

**23.00.5(B)** Providing and fixing ball cock of approved quality as directed: (Abonite (I) 25 mm. dia. (II) 50 mm. dia.)

**1.0 Materials & Workmanship :** The relevant specifications of item No. 23.00.5(I) shall be followed except that the bail cock of specified dia. of Abonite shall be fixed.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 23.00.5.(A) shall be followed.

2.2. The rate shall be for a unit of one number.

**22.00.6.** Providing and fixing C.I. Manhole cover 0.60 CM x 0.45 CM size having weight not less than 35 Kg.

**1.0 Materials:** C.I. Manhole cover of 0.60 x 0.45 Cms. size shall be of best quality. The weight of C.I. cover and frame shall not be less than 35 Kg. The C.I. manhole cover shall be of light duty and conform relevant I.S.

**2.0. Workmanship : 2.1.** C.I. Manhole cover shall be fixed as per relevant specifications of item No. 24.44 except that the C.I. cover shall be fixed as and where directed.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all labour and materials required for satisfactory completion of this item.

3.2. The rate shall be for a unit of one number.

**23.00.7.** Providing and fixing G.I. rain water spout of 50 mm. dia. and 20 cms. length.

**1.0 Materials:** G.I. M.S. pipe of 50 mm. dia. shall conform to M-56.

**2.0. Workmanship: 2.1.** The G.I. pipe of 30 cms. fixed as rain water pipe as directed. The pipe shall be fixed about 1/4 dia. below the floor level so as to make approach of water easy. The inlet of pipe shall be rounded off for easy entry of fain water pipe. The pipe shall be fixed in C.M. 1 : 3.

**3.0. Mode of measurements & payment:**

3.1. The rate includes of all labour and materials required for satisfactory completion of this item.

3.2. The rate shall be for a unit of one number.

**23.8.** Providing and fixing to wall ceiling and floor polythene pipe of specified diameter will 6 Kg. F/Sq. cm. working pressure outside diameter, low density completion with special flange compression type fittings wall clips, etc., incl. making good the wall ceiling and floor. (A) 20 mm. dia. (B) 25 mm. dia. (C) 32 mm. dia. (D) 40 mm. dia. (F) 50 mm. dia.

**1.0. Materials : 1.1.** The low density polythene pipe of specified diameter with 6 Kg./F. Sq. Cm. working pressure shall conform to I.S. 3076-1968. The specials and fillings required shall be of best quality.

## **2.0. Workmanship:**

2.1. The P.V.C. Pipes of specified diameter shall be fixed as directed. Due to thermal expansion of rigid P.V.C. Pipes, due allowance shall be made particularly in over ground pipe lines for any change in length of pipe line which may occur during installation or when pipe line is in service.

2.2. Above ground installation of rigid P.V.C. pipe should be undertaken after precautions are observed for their protection against dirt sun rays and mechanical damage.

2.3. The rigid P.V.C. pipe lines should not be kept exposed above ground when it passes through public place, railway lines, roads, road side and footpaths.

2.4. P.V.C. pipes shall be supported at the followings intervals :

20 mm. dia.	500 mm.
25 mm. dia.	750 mm.
32mm. dia.	900mm.

2.5. Closet support spacings shall be provided, if recommended by the manufacturer.

2.6. The guide line indicated by the manufacturer regarding handling, transportation, storing, laying and jointing of pipes shall be kept in view during execution.

2.7. P.V.CV. pipes shall be fixed on wall with wooden plugs and suitable clamps.

## **2.8. Jointing the pipes :**

2.8.1. The pipes and sockets shall be accurately cut. The ends of the pipes and filling should be absolutely free from dirt and dust The outside surface of the pipes and the inside of the fillings shall then be roughened with emery paper, and then solvent cement shall be applied to the matching surface and pushed home and joint. Since solvent cement is aggreswive to P.V.C. care must be taken to avoid applying excessive cement to the inside of pipe sockets as any surplus cement cannot be wiped off after jointing. Empty solvent cement tins, brushes, rags, of paper unpregneted with cement should not be buried in the trenches. They should be gathered, not left scaterred about, as they can prove to be a hazard to animals which may chew them.

2.8.2. If any manufacturer recommends its own methods of jointing the same shall be adopted after necessary approval from the Engineer-in-charge.

## **2.9. Laying pipes in trenches :**

2.9.1. The pipes shall be laid over uniform relatively soft fine grained soil found to be free of presence of hard objects such as large flints, rocky projections, large tree roots etc. The width of the trenches shall be minimum width required for working.

2.9.2. The pipes laid underground shall not be less than one metre from the ground level. The pipe shall be positioned in the trenches so as to avoid any induced stresses due lo reflection. Any deviation required shall be obtained by using proper type of rubber ring joints.

## **3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 23.2 (A) shall be followed except that the P.V.C. pipes of specified dia. shall be paid under this item.

3.2. The rate shall be for a unit of one running metre.

## SECTION – 24

### DETAILED SPECIFICATIONS FOR DRAINAGE & SEWERAGE

24.1.(A) Providing and laying (Two level or slopes) and jointing with stiff mixture of cement mortar in proportion 1 : 1 salt glazed stone-ware pipes, following nominal internal diametres including testing of pipes and joints complete: 100 mm. dia.

**1.0 Materials :** (1) Water shall conform to M-1, (2) Cement mortar of proportion 1: 1 shall conform to M-11. (3) 100mm. dia. glazed stoneware pipe shall conform to M-71.

**2.0. Workmanship: 2.1.** The trenches for stoneware pipe drains shall be carried out as per relevant specifications of item No. 23.4(A) except that the work is for stoneware pipes of 100 mm. dia.

**2.2. Laying: 2.2.1.** The pipes shall be laid accurately and perfectly true to line, levels and gradients. Great care shall be taken to prevent sand etc., from entering the pipes. The pipes between two manholes shall be laid truly in a straight line without vertical or horizontal undulation. All junctions and changes in direction and diameter shall be made inside manholes by means of curved tapered channels formed in cement concrete finished smooth and benched on both sides. The body of the pipe shall rest for its entire length, on an even level bed grips being made or left on the bed to receive the sockets of the pipes.

**2.3. Jointing:**

2.3.1. Tarred gaskin or yam socked in neat cement slurry first be placed around the spigot of each pipe and the spigot shall then be placed well home into the socket of the pipe previously laid. The pipe shall then be adjusted and fixed in the correct position and gaskin cculked home so as to fill not more than 1/4th of the total dept or (13 mm. in depth) of the socket.

2.3.2. The remainder of the socket shall be filled with stiff mixture of cement mortar in porportion of one part of cement and one part of sharp sand. When the socket is filled, a fillet, shall be formed round the joints trowel, forming an angle of 45° with the barrel of the pipe.

2.3.3. The mortar shall be mixed as necessary for immediate use.

2.3.4. After the joint is made, any extraneous materials shall be removed from the inside of the joints with a suitable scraper of 'badger'. The newly made joint shall be protected, until set, from the sun, dry winds, rain or *host*, sacking or other suitable materials which shall be used for the purpose.

23.5. The mortar shall be cured to 10 days.

2.4. Testing of Joints: The pipe line shall be tested as directed.

2.4.1. If any leakage is visible, the defective part of the work shall be made good at no extra cost.

2.4.2. A slight amount of sweating which is uniform may be overlooked, but excessive sweating from a particular pipe or joints shall be watched for and taken as indicating a defect to be made good.

**3.0. Mode of measurements & payment:**

3.1. Pounding or bottaning of the trenches bed to fit the lower part of the pipe and 'Grips' left to take socket, collars etc. are included in the rate of laying the pipes.

3.2. The measurements shall be net without any allowance for cutting and waste. The length of bends, junctions and other connections shall be included in the total length of the drain pipes. Nothing extra shall be paid for the same. The rate includes necessary excavation refilling trenches etc. complete.

3.3. The rate shall be for a unit of one running metre.

**24.1.(B)** Providing and laying and jointing salt glazed stoneware pipes with the lime concrete 1 : 2 : 4 (1 lime: 2 fine sand: 4 graded brick aggregate 40 mm. nominal size) bedding with necessary form work and curing etc. complete: 150 mm. dia.

**1.0 Materials & Workmanship:** The relevant specifications of item 24.1 .(A) shall be followed except that the diametre of pipe shall be 150 mm. dia.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item 24.1.(A) shall be followed.

2.2. The rate shall be for a unit of one running metre.

**24.2.(A)** Providing and laying cement concrete 1:5: 10 (1 cement: 5 fine sand.: 10 graded stone: aggregate 40 mm. nominal size) bedding for stoneware pipe of following internal diameter with necessary formwork and curring complete : 100 mm. dia. 300 mm, width (12 mm. average bed thickness).

**1.0 Materials :** (1) Water shall conform to M-1. (2) Cement shall conform to M-3. (3) Sand shall conform to M-6. (4) Stone aggregate 4C mm. nominal size shall conform to M-12.

**2.0. Workmanship :** 2.1. The relevant specifications of item 5.3.4. shall be followed except that the concrete work shall be carried out in trenches as bedding for stoneware pipes. The width of concrete work shall be 300 mm. and average thickness of bedding shall be 112 mm. The concrete shall be brought up atleast to the invert level of the pipe to form a cradle and to avoid line contact between the pipe and the bed.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all labour and materials required for satisfactory completion of this item.

3.2. The rate includes cost of necessary formwork required if any.

3.3. The rate shall be for a unit of one running metre.

**24.2. (B)** Providing and laying cement concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm. nominal size) bedding for stoneware pipe of following internal diametres with necessary form work and curing complete : 150 mm. dia. 450 mm. width (166 mm. average bed thickness)

**1.0 Materials & Workmanship :** 1.1. The relevant specifications of item 24.2.(A) shall be followed except that the cement concrete work shall be carried out for bedding for stoneware pipe of 150 mm. dia. The average thickness of bedding shall be 166 mm. and width shall be 450 mm.

**2.0 Mode of measurements & payment:**

2.1. The relevant specifications of item 24.2.(A) shall be followed.

2.2. The rate shall be for a unit of one running metre.

**24.19.(I)** Providing and fixing S. W. gully trap with G. I. grating, brick masonry chamber and watertight C.I. cover with frame of 300 mm. x 300 mm. size (Inside) with standard weight : (A) square mount traps 100 mm. x 100 mm. size P. type.

**1.0 Materials :** (1) Water shall conform to M-1. (2) Cement mortar of proportion 1: 5 shall conform to M-1. (3) Burnt brick shall conform to M-15. (4) The S.W. Gully trap of 100 mm. x 10-0 mm. size shall conform to M-70.

**2.0. Workmanship :** 2.1. Excavation for gully trap shall be done true to dimensions and levels as indicated on plans or as directed. The excavation work shall generally be done as per relevant specification of item 4.0.0. of earth work.

**2.2. Fixing :** 2.2.1. The gully trap shall be fixed over cement concrete 1: 5 : 10 (1 cement: 5 sand : 10 graded brick bats aggregate 40 mm. nominal size) foundation 650 mm. square and 100 mm. thick. The depth of top of concrete below the ground level shall be 675 mm. The jointing of gully outlet to the branch drain shall be done similar to jointing of S. W. pipe as described in item No. 24.1.(A).

**2.3. Brick masonry chamber:** After fixing and testing gully and branch drain, a brick masonry 300 x 300 mm. inside with bricks in C.M. 1 : 5 (1 cement: 5 sand) shall be built With a 100 mm. brick work round the gully trap from the top of bed concrete upto ground level. The space between the chamber walls and the trap shall be filled with cement concrete 1:5:10. The upper portion of the chamber i.e. above the top level of the trap shall be plastered inside with cement mortar 1 : 3 (1 cement: 3 sand) finished with floating coat of neat cement. The corners and bottom of the chamber shall be rounded off so as to slope towards the grating.

2.4. C.I. cover with frame 300 mm. x 300 mm. (inside) size shall than be fixed on the top of the brick masonry with C.C. 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm. nominal size) 40 mm. thick and rendered smooth. The finished top of the cover shall be left about 40 mm. above the adjoining ground level so as to exclude the surface water from entering the gully trap.

**3.0. Mode of measurements & payment:**

3.1. The rate includes cost of all labour, materials, tools and plant etc. required for satisfactory completion of this item as described above.

3.2. The rate shall be for a unit of one number basis.

**24.22.** Providing and laying (to level or slopes and jointing reinforced concrete light duty non-pressure pipes I.S. class N.P. 2 of the following internal diametres with collars and butt-ends prepared for collar joints incl. testing of joints etc. complete (B) 150 mm. (C) 250 mm. (D) 300 mm. (AE) 450 mm. (F) 600 mm. (G) 900 mm. (K) 1000 mm. (M) 1200 mm. **1.0**

**Materials :** 1.1. The reinforced concrete light duty non -pressure pipes of specified diameter shall conform to I.S.

458-1971.

**2.0. Workmanship :** 2.1. The relevant specifications of item No. 24.1.(A) shall be followed for work of trenches except that the excavation in trenches shall be for reinforced concrete pipes of specified diameter.

**2.2. Laying:**

2.2.1. The pipes shall be lowered into the trenches carefully. Mechanical appliances may be used. Where necessary pipe shall be laid in straight lines or with easy curves and true to line and gradient as specified. The laying of pipe shall proceed upgrade of a slope. In the pipe with loose collars, the collars shall be slipped on before the next pipe is laid.

2.2.2. In case where the foundation conditions are unusual such as the proximity of trees or holes, under existing or proposed around in 150 mm. thick cement concrete 1 : 5 : 10 (1 cement: 5 fine sand : 10 graded stone aggregate 40 mm. nominal size) or compacted sand or gravel.

2.2.3. In case where the natural foundation is inadequate the pipe shall be laid either in concrete cradle, supported on proper foundation or on any other suitably designed structure. If concrete bedding is used, the depth of concrete below bottom of the pipe shall be at least  $\frac{1}{4}$  th of the internal diameter of the pipe subject to a minimum of 100 mm. and maximum 300 mm. The concrete shall be extended upto the sides of the pipe at least a distance of  $\frac{1}{4}$  th of the outside diameter for pipes 300 mm. and over in diameter.

2.2.4. The pipes shall be laid in the concrete bedding before the concrete has set. Pipe laid in trench in earth shall be bedded evenly and firmly and as far as upto the haunches of the pipe as to safely transmit the load expected from the back fill through the pipe to the bed. This shall be done either by excavating the bottom of the trenches to fit the curve of the pipe or by compacting the earth under round curve of the pipe to form an even bed. Necessary provision shall be made for joints wherever required.

**2.3. Jointing:** 2.3.1. The joints shall be done by slipping the collar over and clear of the end of the pipe. The recess of the end of the pipe shall be filled with jute threading dipped in hot bitumen. The new pipe shall then be brought forward until the bitumen ring in recess of first pipe is set into the recess of the second pipe. This process shall be repeated for two or three pipes which shall then be jacked up so as to thoroughly compress the bitumen. The quantity of jute and bitumen shall be just enough to fill the recess when pressed hard by jacking, care being taken that no offset of the jute braiding shall be visible either outside or inside of pipe. The collar shall then be set up over the joints covering equally both the pipe and leaving an even caulking space all round. Cement and sand mortar 1 : 1½ shall then be well punched or pressed home with a caulking tool within this caulking space. Care shall be taken that the underside of the joints is properly filled with mortar.

**2.4. Curing:**

2.4.1. Every joint shall be kept wet for about 10 days for maturing, the section of the pipe line laid and jointed shall be covered immediately to protect from weather effects. Minimum bore of 100 mm. is considered adequate. 2 A2. The joints shall be left exposed for observation.

2.5. Testing of joints : 2.5.1. The testing of joints shall be done as per relevant specifications of item No. 24.1.(A) except that the testing of reinforced concrete pipes shall be done.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item No. 24.1.(A) shall be followed except that the rate includes for laying (to level or slope in trenches etc. measured separately) making the joints as indicated and testing to stand the water test.

3.2. The measurements shall be net without any allowance for cutting and waste. The length of bends, junctions and other connections (measured along the centre line) shall be included in the total length of the pipes, the connections being numbered afterwards and paid for extra over pipes.

3.3. The size of bends, junctions etc. shall suit the size of pipe. The bore (internal diameter of pipe) shall be the criterion for payment.

3.4. Nothing extra shall be paid separately for the use of mechanical appliances, Where necessary, as described above.

3.5. The rate shall be for a unit of one running metre.

**24.27. Constg. Manhole with R.C.C. top slab in 1 : 2 : 4 mix (1 cement: 2 coarse sand : 4 graded stone aggregate 20 mm. nominal size) foundation concrete in 1 : 3 : 6 (1 cement: 3 coarse sand: 6 brick bats 40 to 50 mm. size) inside plastering 15 mm. thick with CM. 1 : 5 (1 cement: 5 coarse sand) finished with floating coat of neat cement and making channels in C. C. 1 : 2 : 4 (1 cement: 2 coarse sand : 4 stone aggregate 20 mm. nominal size) finished smooth complete incl. curing and**

testing (I) inside size 900 mm. x 120 mm. and 1.5 mm. deep including C. I. cover with frame size 560 mm. diameter, total weight of cover and frame to be not less than 18 Kgs. (Wt. of cover 64 Kg. and Wt. of frame 64 Kg.) (A) with 230 mm. thick walls of masonry using brick shaving crushing strength not less than 35 Kg./sq.cm. in C.M. 1:5 (1 cement: 5 coarse sand).

- i. A type depth 0.90 metre for 150 mm. sewer, ii. B type depth 150 metre for 150 sewer
- iii. C type depth 2.25 metre for 150 mm. sewer iv. D type depth 315 metre for 150 sewer

**1.0 Materials :** Water shall conform to M-1. Cement shall conform to M-6. Burnt bricks shall conform to M-15. Prick bats of 40 to 50 mm. size shall conform to M-14. Stone coarse aggregate of 20 mm. nominal size shall conform to M-12. Grit shall conform to M-8. Cement mortar of specified proportion shall conform to M-11. The cast iron manhole cover of 560 mm. dia. with frame shall conform to I.S. 1726-1966.

**2.0. Workmanship : 2.1.** The manholes of different types and sizes as specified shall be constructed in sewer line at such places and to such levels and dimension as shown in drawings or as directed.

## **2.2. Bed Concrete:**

2.2.1. The manhole shall be built on a bed of cement concrete 1:3:6 (1 cement: 3 coarse sand: 6 brick bats) (40 to 20 mm. nominal size) to the thickness of the bed concrete shall be 15 cms. for manhole upto 1 M. depth and 20 cms. for manholes over metre and upto 2 metres, depth and 30 cms. for manholes of greater depth.

2.2.2. Projection of bed concrete beyond the masonry wall shall be 15 cms.

**2.3. Walls : 2.3.1.** The walls or manhole shall be carried out with burnt bricks using bricks, having crushing strength not less than 35 Kg./Cm<sup>2</sup> in C.M. 1:5 (1 cement: 5 coarse sand. The thickness of brick masonry wall shall be 230 mm. The jointing face of such brick shall be well buttered with cement mortar before laying so as to ensure full joints.

**2.4 Plaster: 2.4.1.** The inside of walls shall be plastered 15 mm. thick with C:M. 1:5 (1 cement: 5 coarse sand) and finished with floating coat of neat cement. All angles shall be rounded to 7.50 cms. radius and all rendered internal surfaces shall have hard impervious finish obtained by using a steel trowel. The external joints of masonry shall be finished smooth.

## **2.4 Channels & Benching:**

2.5.1. Channels shall be semicircular in the bottom half and of diameter equal to the sewer. Above the horizontal diameter, the sides shall be extended vertically to the same level as the crown of the outgoing pipe and the top edge shall be suitably bonded off. The branch channels shall also be similarly constructed with respect to the benching but at their junction with the main channel and appropriate fall suitably rounded off in the direction of flow in the main channel shall be given.

2.5.2. The channel and benching shall be done C.C. 1 : 2 : 4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm. nominal size) rising at a slope in line from edges of channel. The channels of the bottom of the chamber shall be plastered with C.M. 1:2 (1 cement: 2 coarse sand) and steel trowelled smooth.

**2.6. Cover slab: 2.6.1.** The cover slab of R.C.C. 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm. nominal size) 15 cms. thick reinforced with 10 mm. bars at 15 cms. C/C bothways, surface and edges finished fair. Full bearing equal to the width of wall shall be given to the slab on all sides. The frame of manhole cover shall be embedded firmly in R.C.C.

Slab so that the top of the frame remains flush with the top of R.C.C. slab.

## **2.7. Testing:**

2.7.1. Manhole shall be tested by filling with water to a depth not exceeding 1.2 M. as directed.

2.7.2. After completion of work, manhole covers shall be sealed by means of thick grease.

## **3.0. Mode of measurements & payment:**

3.1. The depth of manhole shall be distance between the top of the manhole cover and the invert level of the main drain. The rate includes all labours, materials, tools and plant etc. required for satisfactory completion of this item as directed above.

3.2. The rate shall be for a unit of one number.

**24.28.(I)** Extra rate for costing B. B. masonry for every additional depth of 0.1 M. or part thereof over item 24.27(I) for depth from 0.90 M to 1.5 M.

**1.0 Materials & Workmanship :** The relevant specifications of item No. 24.27(I) shall be followed for excavation except that the depth of manhole shall be done 0.1 M. or part thereof more than 0.90 metre upto 1.5 M. the extra payment shall be made for additional depth of 0.1 M. or part thereof manhole done over and above the depth 0.90 metre.

## **2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item 24.27 0) shall be followed except that the extra rate shall be paid for every addition depth of 0.1 M. and part thereof shall be paid over and above the rate of item No. 24.27(1).

2.2. The rate shall be for a unit of one number.

**24.28.(II)** Extra rate for constg. B. B. masonry for every additional depth of 0.1 M. and part thereof-over item 24.27(1) for depth from 1.5 M. to 2.25 M.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item 24.27(1) shall be followed except that the depth of manhole shall be done 0.1 M. or part thereof more than 1.5 M. upto 2.25 M. The extra payment shall be made for additional depth of 0.1 M. or part thereof manhole done over and above the depth 1.50 M. upto 2.25 M.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item 24.27(II) shall be followed except that the extra rate shall be paid for 0.1 M. or part thereof additional depth of manhole provided over and above item 24.27(I).

2.2. The rate shall be for a unit of one number.

**24.28.(III)** Extra rate for constg. B. B. masonry for every additional depth of 0.1 M. or part thereof over item 24.27(I) for depth from 2.25 to 3.15 M.

**1.0. Materials & Workmanship : 1.1.** The relevant specifications of item 24.27(1) shall be followed except that the depth of manhole shall be done 0.1 M. or part thereof more than 2.25 M. upto 3.15 M. Extra payment shall be made for additional depth of 0.1 or part thereof manhole done over and above depth 2.25 M. upto 3.15 M.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item 24.27(I) shall be followed except that the extra rate shall be paid for every addition 0.1 M. or part thereof depth provided over and above item 24.27(I).

2.2. The rate shall be for a unit of one number.

**24.28(IV)** Extra rate of constg. B. B. masonry for every additional depth of 0.1 M. or part thereof over item 24.27(I) for depth above 3.15 M.

**1.0. Materials & Workmanship:**

1.1. The relevant specifications of item 24.27(I) shall be followed except that the depth of manhole shall be done 0.1 M. or part thereof more than 3.15 M. above.

1.2. Extra payment shall be made for additional depth of manhole 0.1 M. or part thereof done above 3.15 M. and above depth.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item 24.27(I) shall be followed except that extra rate shall be paid for every additional 0.1 M. or part thereof depth provided for above item 24.27(I).

2.2. The rate shall be for a unit of one number.

**24.13.** Providing and fixing C. I. steps of size 500 x 150 mm. x 22.5 mm. and painting with two coats of anti-corrosive paint etc. complete.

**1.0 Materials: 1.1.** The C. I. steps of size 500 x 150 x 22.5 mm. size shall conform I.S. 5455-1969. Paint shall conform to M-44.

**2.0. Workmanship :** The C. I. steps of size 500 x 150 x 22.5 mm. size shall be fixed in manhole as and where directed. The steps shall be staggered in vertical runs 380 mm. apart horizontally. The top step shall be 450 mm. below the manhole cover and lowest not more than 300 mm. above the benching. The steps shall be embedded in well of manhole with C.C. 1: 3: upto 200 mm. depth and the surface finished with cement plaster 15 mm. thick in C.M. 1:5. The steps shall be painted with two coats of anti-corrosive paint.

**3.0. Mode of measurements & payment:**

3.1. The rate includes all labours, materials, tools and plants etc. required for satisfactory completion of this item.

3.2. The rate shall be for a unit of one number.

**24.30.** Providing and erecting at the site of work steel ventilating column of 150 mm. internal dia. and 12.20 M. high from G. L. to bottom of top grill incl. C.I. grill and base plate, bolts and nuts etc. and excavation in foundation of size 120 x 120 x



165 cms. and filling the pit with 1st layer of cement concrete 1 : 3 : 6 mix (1 cement: 3 coarse sand : 6 graded stone aggregate 20 mm, nominal size) of size 120 x 120 x 90 cm. and remaining pit with B.B.C.C. 1:3:6 mix ( 1 cement: 3 coarse sand 6 brick bats, 40 to 50 mm. size) and providing Filled in cement concrete 1:2:4 mix (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm. nominal size) at G.L. and 3 coats of silver paint etc. Complete.

### **1.0 Materials:**

1.1. The steel ventilating column internal dia. 150mm. 12.20m, high shall be of standard make and best quality as approved. Stone aggregate of 20 mm. nominal size shall conform to M-12. Brick-bats 40 to 50 mm. nominal size shall conform to M-14. Cement shall conform to M-3. Water shall conform to M-1. Silver (Aluminium) paint shall conform to I.S. 2339-1963.

### **2.0 Workmanship:**

2.1. The vent shaft shall be provided at the strung point of main sewer and at such points where the flow of sewerage is disturbed i.e. at falls, syphons etc. As far as possible, the location shall be at such a place where it receives sun rays for the maximum period of the day.

2.2. A pit of 120 x 120 x 165 cms. size shall be dug. The cement concrete of 1 : 3 : 6 (1 cement: 3 coarse sand : 6 graded stone aggregate 20 mm. nominal size) shall be first laid in the pit to form 90 cms. thick concrete foundation which shall be allowed to set for 24 hours. The vent shaft shall then be erected at the centre of the pit truly in plumb by means of such as shear legs, pullies, tackles and rope etc.

2.3. The connection with sewer manhole shall be made using 150 mm. diameter cement concrete pipe. After the connection is completed the pit shall be filled with cement concrete 1:3:6 (1 cement: 3 coarse sand: 6 brick bats 40 to 50 mm. nominal size) round the vent shaft upto ground level except top 150mm. which shall be filled with C.C.I : 2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm. nominal size) and rendered smooth. The junction of vent shaft with cement concrete shall be grouted with cement mortar 1 : 1 (1 cement: 1 sand). The concrete work shall be cured for 7 days.

2.4. The steel shaft shall be painted with silver paint (aluminium paint) 3 coats. The relevant specifications of item of painting shall be followed for painting.

### **3.0 Mode of measurements & payment:**

3.1. The rate shall include the cost of all labours and materials tools and plant etc. required for satisfactory completion of this item as directed above.

3.2. The rate shall be for a unit of one number.

**24.00.1.(A)** Providing and laying lime concrete 1:2:4 (1 : 2 fine sand : 4 graded brick aggregates 40 mm. nominal size) bedding for stoneware pipes of following internal diameters with necessary form work and curing complete 100 mm. dia. (112 mm. average bed thickness)

**1.0. Materials:** Water shall conform to M-1. Lime mortar shall conform to M-10. Brick aggregate 40 mm. nominal size shall conform to M-14.

**3.0. Workmanship :** The relevant specifications of item No. 5.1. 8. shall be followed except that the proportion of mix shall be 1 : 2 : 4 (1 Lime putty : 2 fine sand : 4 graded brick bats aggregate 40 mm. nominal size) and the concrete work shall be done in trenches for beddings of stoneware pipes of 100 mm. dia. The width of concrete shall be 300 mm. and the thickness of bedding shall be 112 mm. average.

### **3.0. Mode of measurements & payment:**

Mode of measurements & payment:

3.1. The relevant specifications of item 24.2.(A) shall be followed.

3.2. The rate shall be for a unit of one running metre.

**24.00.1.(B)** Providing and laying lime concrete 1:2:4 (1 Lime putty: 2 fine sand: 4 graded brick aggregates 40 mm. nominal size) bedding for stoneware pipes of following internal diameter with necessary form work and curing complete 150 mm. dia. (166mm. average bed thickness).

**10. Materials & Workmanship:** The relevant specifications of item No. 24.00.1 (A) shall be followed except that the concrete bedding shall be carried out for 150 mm. dia. stoneware pipe. The width of concrete bedding shall be 450 mm. and the average thickness shall be 166 mm.

### **2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item T.Mo. 24.2.(A) shall be followed.

2.2. The rate shall be for a unit of one running metre.

**24.17.(I)** Extra over item 24.1. for providing salt glazed stoneware fittings : Bends of required degree (Any Radius) of following internal diameters: A-100 mm. dia.B-150mm.dia..

**1.0. Materials & Workmanship :** The relevant specifications of item No. 24.1.(A) shall be followed except that the salt glazed stoneware bends of any degree of specified diameter shall be provided.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No.24.1 .(A)shall be followed except that the extra payment shall be made for providing salt glazed stoneware bend of specified diameter of required degree of any radius over and above the rate of item No. 24.1.

2.2. The rate shall be for a unit of one number.

**24.17.(II)** Extra over item 24.1. for providing salt glazed stoneware fittings : Taper bend of required degree of following internal diameters : 100 mm. x 150 mm.

**1.0. Materials & Workmanship :** The relevant specifications of item No. 24.1.(A) shall be followed except that the salt glazed stoneware taper bend of required degree of 100 mm. x 150 mm. shall be fixed.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item No. 24.1.(A) shall be followed except that the extra payment shall be made for providing salt glazed stoneware taper bend of required degree of 100 mm. x 150 mm. size over and above the rate of item No. 24.1.

2.2. The rate shall be for a unit of one number.

**24.17.(III)** Extra over item 24.1 for providing salt glazed stoneware fittings : Single junction of required angle of following internal diameter (A) 100 mm. dia. (B) 150 mm. dia.

**1.0. Materials & Workmanship :** The relevant specifications of item No.24.1.(A) shall be followed except that the salt glazed stoneware single junction of required angle of specified diameter shall be fixed.

**2.0. Mode of measurements & payment: .**

2.1. The relevant specifications of item 24.1 .(A) shall be followed except that the extra shall be paid for providing salt glazed stoneware single junction of required angle for specified diameters over and above the rate of item 24.1.

2.2. The rate shall be for a unit of one number.

**24.18.** Providing and laying jointing and pointing with stiff mixture of C.M. 1: 1 (1 cement: 1 fine sand) 150mm. internal diameter salt glazed stoneware half round channels.

**1.0. Materials & Workmanship :**

1.1. The relevant specifications of item 24.1. shall be followed except that the half round channel of 150 mm. internal diameters shall be fixed in cement mortar 1:1.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item 24.1 .(A) shall be followed.

2.2. The rate shall be for a unit of one running metre.

**24.35.** Supplying and fixing C.I. cover 300 x 300 mm. without frame for gully trap (Standard pattern). The weight of cover not less than 4.53 kg.

**1.0. Materials :** The G.I. cover of 300 x 300 mm. size shall be standard pattern and approved make the weight of C.I. cover shall not be less than 4.53 Kg. without frame.

**2.0. Workmanship:** The C.I. cover 300 x 300 mm. size without frame shall be fixed on top of the brick masonry with cement concrete 1 : 2:4 (1 cement: 2 sand : 4 graded stone aggregate 20 mm. nominal size) 40 mm. thick and rendered smooth. The finished top of the cover shall be left about 40 mm. above the adjoining ground level so as to exclude the surface water from ring the gully trap.

**3.0. Mode of measurements & payment:**

3.1. The relevant specifications of item 24.19 shall be followed.

3.2. The rate shall be for a unit of one number.

24.410. Consig. brick masonry road gully chamber 500 mm. x 450 mm. 600 mm. incl. 500 mm. x 450 mm. G.I. horizontal gratings with frame complete.

**1.0 Materials :** Water shall conform to M-1. Cement shall conform to M-3. Sand shall conform to M-6. Brick shall conform M-15. C.I. Grating of 509 x 450 mm. size of standard make shall be approved quality. Stone aggregate 40 mm. nominal size shall conform to M-12. Coal tar shall conform to relevant M-5.

**2.0. Workmanship:**

2.1. The chamber shall be of size 500 mm. x 450 mm. internal clear dimensions between the masonry wall faces. The height of 500 mm. shall be measured from the top of the bed concrete to the top of the C. I. frame. The size of the grating indicates the clear internal dimensions of the C.I. frame of the gratings.

2.2. The excavation shall be done to true dimensions and levels.

2.3. The foundation concrete shall consist of 150 Cms. x 130 Cms. 15 Cms. thick C.C. 1: 5:10(1 cement: 5 sand: 10 graded stone aggregate 40 mm. nominal size).

2.4. The wall of the chamber shall be constructed in brick work with C.M. 1 5 and 23 Cms. thick as per relevant specifications of item 6.12(B).

2.5. The walls and the bed concrete of chamber shall be plastered inside with 12 mm. thick cement plaster 1: 3 (1 cement: 3 coarse sand) finished smooth.

2.6. The gully grating cover shall be hinged to frame to facilitate its opening for leaning and repairs. The frame of the gully gratings shall be fixed on the top of masonry walls of the chamber in 15 cms. thick C.C. 1: 2: 4 (1 cement: 2 coarse sand : 4 graded stone aggregate 20 mm. nominal si/e) laid over the full thickness of walls.

2.7. The chamber shall have connection pipe, the length of which in metre between the road gully chamber and the manhole of the drain shall not be less than 1/40 times the nominal diameter of the pipe in MM i.e. for 150 mm. connection pipe, the length shall not be less than 3.75 metre. The invert of the pipe at the junction with the wall shall be flush with the top of the cement plaster on the bed concrete.

2.8. Painting: After the completion of the work the exposed surface of the grating and the frame shall be painted with a thick coat of coal tar.

**3.0. Mode of measurements & payment:**

3.1. The cost of connection pipes is not included in the item and shall be paid separately. However fixing connection pipes in the walls of gully chambers is included in the rate for gully chambers and nothing extra shall be paid for this separately.

3.2. The rate includes all labours, and materials required for satisfactory completion of this item as described above.

3.3. The rate shall be for a unit of one sq. metre.

**24.41.** Constg. brick masonry road gully chamber 450 mm. x 450 mm. x 775 mm. with vertical grating complete.

**1.0. Materials & Workmanship :** The relevant specifications of item 24.40 shall be followed except the size of road gully chamber is 450 mm. x 450 mm. x 775 mm. with vertical grating complete.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item 24.40 shall be followed.

2.2. The rate shall be for a unit of one number.

**24.42.** Constg. brick masonry road gully chamber 1100 mm. x 500 mm. x 775 mm. incl. 500 mm. x 450 mm. C. I. horizontal grating with frame and vertical grating complete.

**1.0. Materials & Workmanship :** The relevant specifications of item 24.40 shall be followed except that the size of road gully chamber shall be 1100 mm. x 500 mm. x 775 mm. incl. 500 mm. x 450 mm. C. I. horizontal grating with frame and vertical grating complete.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item 24.40 shall be followed.

2.2. The rate shall be for a unit of one sq. metre.

**24.44.(I)** Constg. brick masonry chamber for underground C.I. inspection chamber and bends with brick having crushing strength not less than 35 Kg./CM<sup>2</sup> in C.I. 1 : 5 C.M. cover with frame (light duty) 455 x 610 mm. internal dimensions, total weight of cover with frame to be not less than 38 Kg. (Wt. of cover 23 Kg. and Wt. of frame 15 Kg.) R.C.C. top slab with C.C. 1:2:4 mix (1 cement : 2 coarse sand : 4 graded aggregate 20mm. size) foundation concrete 1 : 5 : 10 inside plaster 15 mm. thick with C.M. 1 : 3 finished smooth with a finishing coat of neat cement on walls and bed concrete etc. complete.

Inside dimensions 450 mm. x 610 mm. and 450 mm. deep for single pipe line.

**1.0 Materials:** Water shall conform to M-1. Cement shall conform to M-3. Coarse sand shall conform to M-5. Brick shall conform to M-15. stone aggregate shall conform to M-12. Brick bat shaft shall conform to M-14. M.S. bar shall conform to M-18.

**2.0. Workmanship:**

2.1.C.I. inspection chamber with provision of C.I. bends of specified size with bolts, nuts and left washers for underground drain shall be enclosed in masonry chamber which shall be constructed as under:

2.2. The excavation shall be done true to dimensions and levels shown on the plans or as directed.

2.3. Bed concrete shall be of 15 cms. thick C.C. 1:5: 10 (1 cement: 5 coarse sand : 10 graded brick bat aggregates). The projection of bed concrete beyond the masonry walls shall be 7.5 cms.

2.4. Masonary walls and plaster work shall be carried out as per relevant specifications of item 24-40.

**2.5.** The cover slab shall be constructed as per relevant specifications of 24.27(1).

**3.0. Mode of measurements & payment:**

3.1. The earth work in excavation providing and laying C.I. inspection chamber and bends shall be measured and paid for separately.

3.2. The rate shall be for a unit of one number.

**24.44.(II)** Constg. brick masonry chamber for underground C.I. inspection chamber and bends with brick having crushing strength not less than 35 Kg./CM<sup>2</sup> in C.M. 1:1:5 C.I. cover with frame (light duty) 455 x 610 mm. internal dimensions, total weight of cover with frame to be not less than 38 Kg. (Wt. of cover 23 Kg. and Wt. of frame 15 Kg.) R.C.C. top slab with C.C. 1 : 2 : 4 mix (1 cement: 2 coarse sand : 4 graded stone aggregate 20 mm. size) foundation concrete 1 : 5 : 10 inside plaster 15 mm. thick with C.M. 1 : 3 finished smooth with a floating coat of neat cement on walls and bed concrete etc. complete. Inside dimensions 500 mm. 700 mm. and 450 mm. deep for pipe line with one or two inlets.

**1.0. Materials & Workmanship :** The relevant specifications of item 24.44.(I) shall be followed except that the inside dimension of brick masonry chamber shall be 500 mm. x 700 mm. and 450 mm. deep for pipe line with one or two inlets.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item 24.44(I) shall be followed.

2.2. The rate shall be for a unit of one number.

**24.44.(III)** Constg. brick masonry chamber for underground C.I. inspection chamber and bends with brick having crushing strength not less than 35 Kg./CM<sup>2</sup> in C.I. 1 : 5 C.M. cover with frame (light duty) 455 x 610 mm. internal dimensions, total weight of cover with frame to be not less than 38 Kg. (Wt. of cover 23 Kg. and Wt. of frame 15 Kg.) R.C.C. top slab with 1 : 2:4 mix (1 cement: 2 Coarse sand : 4 graded stone aggregate 20 mm. size) foundation concrete 1 : 5 : 10 inside plaster 15 mm. thick with C.M. 1 : 3 finished smooth with a finishing coat of neat cement on walls and bed concrete etc. complete. Inside dimensions 600 mm. 850 mm. and 450 mm. deep for pipe line with three or more inlets.

**1.0. Materials & Workmanship :** The relevant specifications of item 24.44 (I) shall be followed except that the inside dimension of brick masonry chamber shall be 600 mm. x 850 mm and 450 mm. deep for pipe lines with three or more inlets.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item 24.44 (I) shall be followed.

2.2. The rate shall be for a unit of one number.

**24.46.** Extra over item 24.44 for every additional depth 0.1 M or part thereof beyond 450 mm. depth for brick masonry chamber, (i) For 455 mm. x 610 mm. size (ii) For 500 mm. x 700 mm. size. (iii) For 600 mm. x 850 mm. size.

**10. Materials & Workmanship :** The relevant specifications of item 24.44 (I),(ii),(III) shall be followed except that extra depth of 0.1 M. or part thereof shall be constructed over and above the depth of chambers of respective kerns.

2.1. The relevant specifications of item 24.4(1) shall be followed except that extra shall be paid for providing additional depth of 0.1 M. or part thereof over and above the item No. 24.44(I), 24.44(II), 24.44(III) as the case may be.

2.3. The rate shall be for a unit of one number.

**2.0. Mode of measurements & payment:**

**24.00.2.(A)** Providing soak pit of 2 cum. volume incl. excavating and filling brick bats with dry masonry work at top for 45 cms. height incl. covering the top with stone incl. providing Vatas in C.M. 1: 3 with finishing, curing etc. complete as directed.

**1.0 Materials :** Water conform to M-1. Cement mortar shall conform to M-1 1. Burnt Bricks shall conform to M-15. Rough stone slab 40 x 50 mm. thick shall conform to M-48. Brick bat shall conform to M-14.

**2.0. Workmanship:**

2.1. The excavation for soak pit shall be carried out as per relevant specifications of item 4.00.1.(A) except that the size of soak pit shall be such that the clear volume shall remain 2 cum. The diameter and depth shall be as directed.

2.2. The periphery of the soak pit shall be provided with dry masonry with burnt bricks in 23 cm. thick. The masonry wall be done with best workman like manner in true line and plumb.

2.3. The soak pit shall be filled in with brick bats of burnt brick, 40 mm. nominal size in 45 cms. height. The work of filling brick-bats shall be done in such a way that no dry masonry shall be damaged during filling of brick bats.

2.4. The top of the soak pit shall be covered with rough kotah stone slab 40 to 50 mm. thickness The length of the stone shall be in single piece in length.

2.5. The cement mortar 1: 3 shall be used to fill up the joints and preparing vata as directed.

2.6. The cement work shall be cured for 4 days.

**3.0. Mode of measurements & payment:**

3.1. The rate includes coat of all labour and materials required for satisfactory completion of this item as described above.

3.2. The rate shall be for a unit of one number.

**24.00.2.(B)** Providing soak-pit of 5 cum. volume incl. excavating and filling brick-bats with dry masonry work at top for 45 cms. height incl. covering the top with stone incl. Providing Vatas in CM. 1 : 3 with finishing curing etc. complete as directed.

**1.0. Materials & Workmanship :** The relevant specifications of item 24.00.2(A) shall be followed except that the volume of soak pit shall be 5 cum. clear.

**2.0. Mode of measurements & payment:**

2.1. The relevant specifications of item 24.00.2(A) shall be followed.

2.2. The rate shall be for a unit of one number.

## EQUIVALENT PLAIN AREAS OF UNEVEN SURFACES

*(Vide specifications for items relating to : Painting & Polishing)*

Sr. No.	Description of work	How measured	Multiplying Factor
1.	Panelled or framed and braced or ledged and battened or ledged and braced joinery.	Measured flat (not girthed) including chowkat or frame, Edges, chocks, cleats, etc. shall be deemed to be included in the item.	1.30 (For each side)
2.	Flush joinery.	Measured flat (not girthed) including chowkat or frame. Edges, chocks, cleats, etc. shall be deemed to be included in the item.	1.20 (For each side)

1	2	3	4
3.	Fully glazed or gauzed joinery.	Measured flat (not girthed) including chowkat or frame. Edges, chocks, cleats, etc. shall be deemed to be included in the item.	0.80 (For each side)
4.	Partly panelled and partly glazed or gauzed joinery.	Measured flat (not girthed) including chowkat or frame. Edges, chocks, cleats, etc. shall be deemed to be included in the item.	1.00 (For each side)
5.	Fully venetioned or louvered joinery.	Measured flat (not girthed) including chowkat or frame. Edges; chocks, cleats, etc. shall be deemed to be included in the item.	1.80 (For each side)
6.	Weather boarding.	Measured flat (not girthed) supporting frame work shall not be measured separately.	1.20 (For each side)
7.	Wood single roofing.	Measured flat (not girthed).	1.10 (For each side)
8.	Boarding with cover fillets and match boarding.	Measured flat, (not girthed)	1.05 (For each side)
9.	Tile and State battening.	Measured flat, over all : No deduction shall be made for open space.	0.80 (For painting all over)
10.	Trellies (or Jafri) work one way or two way.	Measured flat, over all : No deduction shall be made for open spaces, supporting members shall not be measured separately.	1.00 (For painting all over)
11.	Guard bars, balustrades gates, gratings, grills, expanded metal and railings.	Measured flat, over all : No deduction shall be made for open spaces, supporting members shall not be measured separately.	1.00 (For painting all over)
12.	Gates and open palisade fencing including standards.	Measured flat, over all : No deduction shall be made for open spaces, supporting members shall not be measured separately. (See Note).	1.00 (For painting all over)
13.	Curved or enriched work	Measured flat.	2.0 (For each side)
14.	Steel roller shutters.	Measured flat (size of opening) over all, jamb, guides bottom rails and locking' arrangement etc. shall be included in the item (top cover shall be measured separately)-	1.10 (For each side)
15.	Plain sheet steel door and windows	Measured flat (not girthed) including frame.	1.10 (For each side)
16.	Measured flat (not girthed) including frame edges etc.		0.50 (For each side)
17.	Partly paneled and partly glazed or gauzed steel doors.	Measured flat (not girthed) including frame edges etc.	0.80 (For each side)
18.	Collapsible gate.	Measured flat (size of opening) : no separate measurement shall be taken for the top and bottom guide, rails, rollers, fittings etc.	1.50 (For painting all over)

Note: The height shall be taken from the bottom of the lowest rail if the palisades do not go below it (or from the lower end of palisades, if they protect below the lowest rail) upto the top of palisades, but not upto the top of standards if they are higher than the palisades.

**CODE OF PRACTICE-13(B)  
SCHEDULE OF FIXTURES AND  
FASTENINGS FOR DOOR,  
WINDOWS, VELTILATORS,  
WARDROBES AND  
CUPBOARDS.**

NOTATIONS												
Da	- Teak wood doors fully panelled or fully glazed or partly panelled and glazed.							50	40	30	25	20
Db	- Bathroom and W.C. door with single shutter.	1.	-	-	-	-	-	2	-	-	-	-
		2.	-	-	-	-	-	2	-	-	-	-
Dd	-Doors battenned ledged and braced	3.	8	8	6	8	4		-	-	-	-
		4.	-	-	-	-	-	8	-	-	-	-
De	-Doors battenned framed and braced	5.	-	-	-	-	-	-	8		-	-
		6.	-	-	-	-	-	-	6		-	-
Wa	- Teak wood windows fully panelled or fully glazed or partly panelled and glazed.	7.	-	4	4	8	-	-	-	6	-	-
		8.	-	-	-	-	-		-	4	-	-
		9.	-	-	-	-	-		-	-	-	-
		10.	-	-	-	-	-	8	-	-	-	-
Va:lud	-Teak wood ventilators (independent)	11.	-	-	-	-	-	7	-	-	-	-
		12.	-	-	-	-	-	2	-	16	-	-
S.W.	-Steel windows	13.	-	-	-	-	-		-	8	-	-
SV-Ind	-Still ventilators (independent)	14.	-	-	-	-	-		-	6	-	-
		15.	-	-	-	-	-		-	6	-	-
CB	-Cupboard	16.	-	-	-	-	-		-	6	-	-
S.1	-Single shutter	17.	2	2	2	4			-	-		6
S.2	-Duble shutter	18.	-	-	-	-	-	-	-	-	2/18	-
S.4	-Four shutter	18A	-	-	-	-	-	-	-	-		-
B	-Breadth of door Shutter	19.	-	-	-	-	-	-	-	-	6/4	-
H	-Height of window shutter	20.	-	-	-	-	-	-	-	-		-
900	-900mm and below	21.	-	-	-	-	-	-	-	-		-
900	-above 900mm	22.	-	-	-	-	-	-	-	-		-
1200	-1200mm & below	23.	-	2					-	-	4	-
1200	-above 1200mm	24.	-		2	2	4	2	-	-	4	-
		25.	-	-	-	-	-	-	-	-	8	-
		26.		-	-	-	-	-	-	-	6	2
		27.	2	-	-	-	-	-		-	-	-
									Per 75 mm Length			
		28.	-	1	1	2	-	-	-	-	-	-
		29.	1	-	-	-	-	-	-	-	-	-
		30.	-	-	-	-	-	-	-	-	-	-
		31.	2	-	-	-	-	-	-	-	-	-

Sr. No	Particulars of fixtures & Fastenings	Size in mm
1. Hold Fast	300x40x3	6    6    6    6    6    6    6    6    6
2. Hold Fasts	200x40x3	-    -    -    -    -    -    -    -    -
3. Coach Screws (Hexagonal Head)	-	-    -    -    -    -    -    -    -    -
4. Butt Hinges	125	-    -    -    3    -    -    -    -    6
5. Butt Hinges	100	3    3    3    -    6    6    6    6    -
6. Butt Hinges	75	-    -    -    -    -    -    -    -    -
7. Butt Hinges	75-A	-    -    -    -    -    -    -    -    -
8. Butt Hinges	50	-    -    -    -    -    -    -    -    -
9. Non projecting type-Hinget (Box type)	22	-    -    -    -    -    -    -    -    -
10. Tee & Strap Hinges	300	-    -    -    -    -    -    -    -    -
11. Tee & Strap Hinges	200	-    -    -    -    -    -    -    -    -
12. Sliding Door Bolts	250x16	1    1    1    1    1    1    1    1    1
13. Tower Bolts (Barrel Type)	200x10	1    1    1    1    1    1    1    1    1
14. Tower Bolts (Barrel Type)	150x10	-    -    -    -    -    -    -    -    -
15. Tower Bolts (Barrel Type)	100x10	-    -    -    -    -    -    -    -    -
17. Tower Bolts (Barrel Type)	50x6	-    -    -    -    -    -    -    -    -
18. Door Latch	200x16x5	1    1    1    1    1    1    1    1    1
18A. Hooks and Eye	20mm.	-    -    -    -    -    -    -    -    -
19. Bathroom Latches	60x12	-    -    -    -    -    -    -    -    -
20. Casement window fastner		-    -    -    -    -    -    -    -    -
21. Casement Stays (Straight Peg Stay)		-    -    -    -    -    -    -    -    -
22. Ventilator Catch/Lug.		-    -    -    -    -    -    -    -    -
23. Handles	100	2    2    2    2    2    2    2    2    2
24. Handles	75	-    -    -    -    -    -    -    -    -
25. Door Stoppers	75	1    1    1    \    1    1    1    1    1
26. Wooden Door Stop with Hinges		-    -    -    -    -    -    -    -    -
27. Continuous Piano Hinges	30 width	-    -    -    -    -    -    -    -    -
28. Hasps and Staples (Safety types)	115x40	-    -    -    -    -    -    -    -    -
29. Hasps and Staples (Safety type)	90x40	-    -    -    -    -    -    -    -    -
30. Cupboard Lock (6 Levers)	-	-    -    -    -    -    -    -    -    -
31. Cupboard knob	--	-    -    -    -    -    -    -    -    -



[illegible]

**NOTE: PLEASE READ CAREFULLY**

- (1) Where detailed specification of an item provides for specific size of any fixture fastening that's shall prevail over the provisions in this schedule.
- (2) Fixtures and fastenings (except hold fasts which shall be of M.S. Plate only) shall be of brass, copper oxidised brass, chromium plated brass, Iron, copper oxidised iron, or chromium plated iron as specified in the item of work of detailed specifications.
- (3) External door and door falling in staircase excepting the door in balcony shall have sliding door bolt of size 360 mm. x 18 mm. in place of 250mm. x 16 mm. as shown in this schedule.
- (4) The length of tower bolt shown is for a door having shutter height upto 2100 mm. only. For door having shutter height more than 2100 mm., the length of tower bolt is to be increased to the extent of increase door shutter height beyond 2100mm.
- (5) 150 mm. x 150 mm. size glass vision panel shall be provided in the doors of Officer's chamber in addition to the scheduled provisions if so directed by the Engineer-in-charge.
- (6) Diamond shape chromium plated brass peeping plate of approved quality shall be provided in one entrance door in residential building in addition to the scheduled provisions.
- (7) Drawer in a wardrobe shall be provided with one furniture handle and 4ne drawer lock (4 levers) in addition to its scheduled provision.
- (8) For door and window with steel frame, 75 mm. size screws, shaft be provided both in top and bottom frame for fixity as shown below:
  - (a) For width upto 1200mm..... 2 Nos.
  - (b) For width above 1200 mm. and upto 1800 mm..... 3 Nos.
  - (c) For every additional width of 500 mm. over and above 1800mm..... 1Nos.
- (9) When the mortice local (6 levers) and latch is specified to be provided to a door enter in the item of work itself or by a separate item, the requirement of providing sliding door bolt door latch and handles as per this schedule shall be dispensed with.
- (10) For door/window with ventilator at top, fixtures and fastenings of door/window plus those of ventilator (excluding hold fasts) shall be used.
- (11) Where the item of work or its specification provides for anodised aluminium fixtures, all the fixtures except hinges and screws will be of anodised aluminium and chromium plated iron hinges and screws will be of anodised aluminium and chromium plated iron hinges and screws shall be used.
- (12) For door, window, or cupboard frame abutting concrete section, instead of hold fasts as shown in the schedule, coach screws of size as mentioned below shall be used :
  - (a) Teak wood frame..... 00.125 mm
  - (b) Steel frame..... 00.75 mm.
- (13) The locking etc. in the door latch shall be so positioned that the door can be properly locked even if part of the latch, when fully, slided, remains in the frame or masonry.
- (14) Showcase cupboards having single shutter shall be provided with ball catcher instead of tower bolt (barrel type) as per schedule.
- (15) The size of the handle shown in the schedule indicates grip length.
- (16) Door stopper shall be either floor door stopper or door catchas directed by the Engineer-in-charge.
- (17) Piano hinges shall be for the fall height of the shutter.
- (18) Shutters with piano arrangements shall be provided with two pivots 'of approved size instead of hinges as per the schedule.
- (19) For butt hinges, only lengths are indicated in the schedule. The width of each flap being 5 mm. less than the thickness of the shutter to which they are to be fixed and the thickness of the flap shall be as specified inthe relevant I.S.S. for heavy medium or light as specified in the detailed specification of we item of work.

### SCHEDULE FOR TESTING OF MATERIALS (BUILDING)

For ensuring quality control and workmanship, various tests prescribed below corresponding to the material concerned shall be taken at periodic intervals as stipulated below.

The Material shall be got tested at GERI or Govt. recognised Laboratory or filed Laboratory of GERI for which 1% of the estimated amount to tender shall be recovered from the contractor from the R. A. Bill and Final bill as the testing charges shall be paid by the Govt. to the Laboratory. However if the charges increase over 1% no excess recovery shall be made from the contractor as per resolution of B & C department dated 10th May 1985, vide TNC/1085(4) S.

Item No. as per Sch. "B"	Brief Description of material to be tested.	Prescription of test which shall be carried out	Frequency @ which test shall be carried out (As per GERI Q.C. Vol. I, 2002)	Qty. of materials	Total No. of test to be carried out
1	2	3	4	5	6
	Coarse Aggregate (Metal, gravel etc.)	Gradation test impact value, flakiness index, water absorption, stripping value.	1/150 M <sup>3</sup> for concrete or as per specification.		
	Fine aggregate (Sand)	Gradation fineness modulus, specific gravity, water absorption, silt content.	1/150 or concrete or as per requirement of relevant specification		
	Bricks	Dimension and tolerance, water absorption, compressive strength; efflorescence	1 test per 50,000 Bricks 5 bricks from (Sample) 5 Woks from (Sample) 5 bricks from (Sample)		
	C.C. Tiles	Water absorption. Transverse strength abrasion size tolerances.	1/2000 tiles (18 tiles for Sample)		
	Cement concrete	Compressive strength (I.S. 516-1959).	<b><u>Qty. Of C.C. M3</u></b> <b><u>No. of Test</u></b> 1 – 5                      1 test 6 – 15                    2 test 16 – 30                  3 test 31 – 51                  4 test 51 & above              4 + 1 For each Addnl. 50M <sup>3</sup> or part thereof		
	Cement	Consistency, setting time, compressive strength, fineness, Chemical analysis Soundness	Upto 50 T                1 test 50 – 100 T              2 test 100 – 200 T            3 test 200 – 300 T            4 test 300 – 500 T            5 test 500 – 800 T            6 test 800 – 1300 T           7 test and 8 test for larger consignment		
	Steel	Tensile strength, yield stress, Elongation	1/40 tonnes / per category		
	Teak Wood	Anatomy test, density tests moisture content test.	1 test		

**SIGN OF CONTRACTOR**

**EXECUTIVE ENGINEER**

# **SPECIFICATIONS FOR READYMADE BITUMINOUS POTHOLE PATCHING MIX USING CUT-BACK BITUMEN**



**INDIAN ROADS CONGRESS  
2014**



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# **SPECIFICATIONS FOR READYMADE BITUMINOUS POTHOLE PATCHING MIX USING CUT-BACK BITUMEN**

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## PERSONNEL OF THE HIGHWAYS SPECIFICATIONS AND STANDARDS COMMITTEE

(As on 7<sup>th</sup> January, 2014)

1.	Kandasamy, C. (Convenor)	Director General (RD) & Spl. Secy. to Govt. of India, Ministry of Road Transport & Highways, New Delhi
2.	Patankar, V.L. (Co-Convenor)	Addl. Director General, Ministry of Road Transport & Highways, New Delhi
3.	Kumar, Manoj (Member-Secretary)	The Chief Engineer (R) S,R&T, Ministry of Road Transport & Highways, New Delhi
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4.	Basu, S.B.	Chief Engineer (Retd.) MORTH, New Delhi
5.	Bongirwar, P.L.	Advisor, L & T, Mumbai
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7.	Duhsaka, Vanlal	Chief Engineer, PWD (Highways), Aizwal (Mizoram)
8.	Gangopadhyay, Dr. S.	Director, Central Road Research Institute, New Delhi
9.	Gupta, D.P.	DG(RD) & AS (Retd.), MORTH, New Delhi
10.	Jain, R.K.	Chief Engineer (Retd.), Haryana PWD, Sonipat
11.	Jain, N.S.	Chief Engineer (Retd.), MORTH, New Delhi
12.	Jain, Dr. S.S.	Professor & Coordinator, Centre of Transportation Engg., Deptt. of Civil Engg., IIT Roorkee, Roorkee
13.	Kadiyali, Dr. L.R.	Chief Executive, L.R. Kadiyali & Associates, New Delhi
14.	Kumar, Ashok	Chief Engineer, (Retd), MORTH, New Delhi
15.	Kurian, Jose	Chief Engineer, DTTDC Ltd., New Delhi
16.	Kumar, Mahesh	Engineer-in-Chief, Haryana PWD, Chandigarh
17.	Kumar, Satander	Ex-Scientist, CRRI, New Delhi
18.	Lal, Chaman	Engineer-in-Chief, Haryana State Agricultural Marketing Board, Panchkula (Haryana)
19.	Manchanda, R.K.	Consultant, Intercontinental Consultants and Technocrats Pvt. Ltd., New Delhi.
20.	Marwah, S.K.	Addl. Director General, (Retd.), MORTH, New Delhi
21.	Pandey, R.K.	Chief Engineer (Planning), MORTH, New Delhi
22.	Pateriya, Dr. I.K.	Director (Tech.), National Rural Road Development Agency, (Min. of Rural Development), New Delhi
23.	Pradhan, B.C.	Chief Engineer, National Highways, Bhubaneshwar
24.	Prasad, D.N.	Chief Engineer, (NH), RCD, Patna

25.	Rao, P.J.	Consulting Engineer, H.No. 399, Sector-19, Faridabad
26.	Raju, Dr. G.V.S	Engineer-in-Chief (R&B) Rural Road, Director Research and Consultancy, Hyderabad, Andhra Pradesh
27.	Representative of BRO	(Shri B.B. Lal), ADGBR, HQ DGBR, New Delhi
28.	Sarkar, Dr. P.K.	Professor, Deptt. of Transport Planning, School of Planning & Architecture, New Delhi
29.	Sharma, Arun Kumar	CEO (Highways), GMR Highways Limited, Bangalore
30.	Sharma, M.P.	Member (Technical), National Highways Authority of India, New Delhi
31.	Sharma, S.C.	DG(RD) & AS (Retd.), MORTH, New Delhi
32.	Sinha, A.V.	DG(RD) & SS (Retd.), MORTH, New Delhi
33.	Singh, B.N.	Member (Projects), National Highways Authority of India, New Delhi
34.	Singh, Nirmal Jit	DG (RD) & SS (Retd.), MORTH, New Delhi
35.	Vasava, S.B.	Chief Engineer & Addl. Secretary (Panchayat) Roads & Building Dept., Gandhinagar
36.	Yadav, Dr. V.K.	Addl. Director General (Retd.), DGBR, New Delhi

#### ***Corresponding Members***

1.	Bhattacharya, C.C.	DG(RD) & AS (Retd.) MORTH, New Delhi
2.	Das, Dr. Animesh	Associate Professor, IIT, Kanpur
3.	Justo, Dr. C.E.G.	Emeritus Fellow, 334, 14 <sup>th</sup> Main, 25 <sup>th</sup> Cross, Banashankari 2nd Stage, Bangalore
4.	Momin, S.S.	Former Secretary, PWD Maharashtra, Mumbai
5.	Pandey, Prof. B.B.	Advisor, IIT Kharagpur, Kharagpur

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2.	Secretary General	(Prasad, Vishnu Shankar), Indian Roads Congress, New Delhi

# SPECIFICATIONS FOR READYMADE BITUMINOUS POTHOLE PATCHING MIX USING CUT-BACK BITUMEN

## 1 INTRODUCTION

The draft “Specifications for Readymade Bituminous Pothole Patching Mix Using Cut-Back Bitumen” was prepared by Prof. P.S. Kandhal. The H-6 Committee deliberated on the draft and also noted the successful experience of the Rajasthan PWD and Jaipur Development Authority with the patching mix made to these specifications for repairing potholes. The Committee in its meeting held on 30<sup>th</sup> November, 2013 approved the draft document with certain modifications in the light of the comments and suggestions given by the members and authorized the Convener to refer the duly modified draft to the Highways Specifications & Standards (HSS) Committee. The modified draft was approved by HSS Committee in its meeting held on 7<sup>th</sup> January, 2014 and by the Executive Committee in its meeting held on 9<sup>th</sup> January, 2014 for placing before the Council. The Council in its 201<sup>st</sup> meeting held at Guwahati, Assam on 19<sup>th</sup> January, 2014 approved the document “Specifications for Readymade Bituminous Pothole Patching Mix Using Cut-Back Bitumen” for publication.

The Composition of H-6 Committee is as given below:

S.C. Sharma	-----	Convener
Dr. S.S. Jain	-----	Co-convenor
K. Sitaramanjaneyulu	-----	Member Secretary

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Jain, Dr. M.C.	Singh, R.K.
Jain, Dr. P.K.	Singh, R.P.
Kadiyali, Dr. L.R.	Yadav, Dr. V.K.
Kumar, Dr. Ashok	The Chief Engineer (NH) (Gupta, R.K.)
Kumar, Dinesh	The Chief Engineer (NH) (Mandpe, P.S.)
Kumar, Manoj	The Chief Engineer (NH) HP PWD
Nahar, S.S.	(Sharma, Er. Anil)
Pandey, R.K.	The Chief General Manager
Pateriya, Dr. I.K.	(Dhanda, J.S.)
Prasad, Vishnu Shankar	The Director, Quality Assurance and
Pyngrope, S.	Research, Chennai

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Reddy, Dr. K. Sudhakar

Singh, Dr. Dharamveer  
Veeraraghvan, Dr.

### ***Co-opt Member***

Nagabhushana, M. N.

### ***Ex-Officio Members***

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(Road Development) & Special  
Secretary  
Secretary General

(Kandasamy, C.), Ministry of Road  
Transport & Highways  
  
(Prasad, Vishnu Shankar),  
Indian Roads Congress

## **2 SCOPE**

The material shall consist of plant mixed readymade pothole patching bituminous mixture composed of mineral aggregate coated with bituminous material. The material shall be capable of being stocked for at least six months without stripping and shall be workable at all times. Unless specified otherwise, this mix shall be supplied in 50 kg plastic lined, sturdy bags. This material is intended for patching potholes up to 75 mm deep. For deeper potholes, patching mix shall be placed and compacted in 75 mm thick layers. Details on preparation of potholes, placing and compacting the mix in potholes are also given to ensure its effective use. The readymade cold patching mix is suitable for patching potholes only and shall not be used for patching long stretches of damaged road surfaces.

## **3 MATERIALS**

### **3.1 Bitumen**

Medium Curing Cutback Bitumen MC-800 conforming to Indian Standards Specification IS:217 Specification for Cutback Bitumen shall be used in preparing the patching mix and shall be supplied by a certified manufacturer of this product. For proper mixing, the bitumen shall be heated as specified in **Section 4**.

MC Cutback Bitumen shall be treated with a proper type and amount of an anti-stripping agent by the approved bitumen supplier so that when combined with the proposed job aggregate the resulting mix shall pass the Wet Coating Test, Static Immersion Test and



Water Resistance Test as given in **Appendix-I**. The anti-stripping agent shall Conform to IS:14982. The Contractor shall furnish the sample of the job aggregate each year to the bitumen supplier for these coating and stripping tests and obtain a certificate that the bitumen material has been treated to suit the job aggregate. This yearly certificate must be on file and shall be available at the asphalt mix plant when required by the Engineer. The Contractor shall also forward a copy to the Engineer. Under no circumstances, the Contractor or the department shall be permitted to manufacture the MC Cutback by blending paving bitumen and kerosene.

### 3.2 Coarse Aggregate

**3.2.1** The coarse aggregate shall consist of crushed rock, crushed gravel or other hard material retained on 2.36 mm sieve. It shall be clean, hard, durable and cubical shape, free from dust and soft organic and other deleterious substances. The aggregate shall satisfy the physical requirements specified in **Table 1**.

**Table 1 Physical Properties of Coarse Aggregate**

Property	Test	Requirement	Test Method
Cleanliness	Grain size analysis	Max. 2% passing 0.075 micron	IS:2386 Part I
Particle shape	Flakiness & Elongation Index (combined)	Max. 35%	IS:2386 Part I
Strength*	Los Angeles Abrasion Value	Max. 40%	IS:2386 Part IV
	Aggregate Impact Value	Max. 30%	IS:2386 Part IV
Durability	Soundness (Sodium or Magnesium), 5 cycles		
	Sodium Sulphate	Max. 12%	IS:2386 Part V
	Magnesium Sulphate	Max. 18%	IS:2386 Part V
Water Absorption	Water Absorption	Max. 2%	IS:2386 Part III

\* The coarse aggregate may satisfy either of the two strength tests.

**3.2.2** Where crushed gravel is proposed for use as aggregate, not less than 90 percent by weight of the crushed material retained on 4.75 mm sieve shall have at least two fractured faces resulting from crushing operation.

### 3.3 Fine Aggregate

Fine aggregate shall consist of crushed mineral material passing 2.36 mm sieve and retained on 75 micron sieve. It shall be clean, hard, durable, and free from dust and soft organic and other deleterious substances. No natural sand shall be permitted.

### 3.4 Composition of Mixtures

When tested in accordance with IS:2386 Part 1 (wet sieving method), the combined aggregate grading shall fall within the limits shown in **Table 2**. As far as possible an aggregate with

water absorption of 1.0 or less shall be used. The amount of residual bitumen binder (total cutback bitumen minus diluent such as kerosene) in the mix shall be as shown in **Table 3**. The readymade patching mix shall be rejected if it does not meet the grading (especially the 0.075 mm sieve) and the minimum residual bitumen content. The produced mix shall be tested by an independent approved testing laboratory before its acceptance by the Engineer.

**Table 2 Gradation of Stockpile Patching Mix**

<b>Sieve Size, mm</b>	<b>Percent Passing</b>
9.5	100
4.75	40 – 100
2.36	10 – 40
1.18	0 – 10
0.075	0 – 2

**Table 3 Minimum Residual Bitumen Content by Weight of Mix**

<b>Aggregate water absorption, %</b>	<b>Minimum residual bitumen content, %</b>
Less than 1.0	4.5
1.1 to 1.5	5.0
1.6 to 2.0	5.5

Based on the characteristics of the aggregate and the performance of the mix, the Engineer can specify amount of residual bitumen higher than that shown in **Table 3**.

The Contractor shall ascertain from the supplier of MC-800 as to how much residual bitumen it contains. For example, if the MC-800 contains 80 percent bitumen and 20 percent kerosene and a total of 6.0 percent MC-800 is used by weight of the mix, the residual bitumen content in the mix will be 4.8 percent.

#### **4 PREPARATION AND STORAGE OF MIXTURE**

The readymade patching mix shall preferably be produced in a conventional batch type hot mix plant. However, if a portable or stationary asphalt drum plant is used, under no circumstances drying/heating of aggregates with a burner flame and mixing with MC-800 shall be carried out simultaneously because MC-800 containing volatile kerosene will catch fire and pose a safety hazard. The Contractor and the Engineer shall ensure there is no open flame inside or outside the drum when MC-800 is added for mixing.

The mix should be such that it can be stocked, handled, placed, and finished without stripping of the bitumen from the aggregate. To help prevent stripping and avoid heat buildup in a stockpile (which may burn the entire stockpile due to chimney effect), the mixed material should not be stockpiled not higher than 1.5 m for the first 48 hours. The stockpile then can

be raised in height and made conical in shape. Unless specified otherwise, the readymade cold mix shall be placed and sealed in plastic lined, sturdy 50 kg bags on cooling.

The mineral aggregate should be clean and surface dry before mixing. The temperature of aggregate and bituminous material should comply with those shown in **Table 4**.

**Table 4 Temperature Ranges for Producing Stockpile Patching Mix**

<b>Bituminous Material</b>	<b>Aggregate Temperature, °C</b>	<b>Bitumen Temperature, °C</b>
MC-800	25 – 65	75 - 95

Since the range of aggregate temperature is rather low and the maximum aggregate temperature is restricted to 65°C, it may not be possible to dry the aggregate within this temperature range. Therefore, the aggregate can be processed in a dryer at high temperatures and allowed to cool before the bituminous binder is added. Pre-drying the aggregate at high temperatures will also help in reducing the fines (material passing 0.075 mm sieve), which will go into the bag house. The resulting mix then would have fines less than 2 percent as required in the stringent gradation specifications.

High aggregate temperatures while mixing with the cutback bitumen will not only cause excessive loss of kerosene from the cutback but will also pose a safety hazard in the plant pug mill. Proper and adequate venting of the pug mill is necessary. Under no circumstances there shall be any open flame in the vicinity of MC-800 cutback because it contains volatile kerosene.

Since the mix contains volatile kerosene it is not safe to store the loose mix or sealed bags in a closed building/warehouse. Store under an open shed or in a well ventilated warehouse. No open flame or smoking shall be allowed in the vicinity of the stored mix.

## **5 PREPARATION OF POTHOLES, PLACING AND COMPACTING OF READYMADE POTHOLE PATCHING MIX**

### **5.1 Preparation of Potholes**

Pothole shall be cleaned with a stiff wire brush and all loose material including dust shall be removed with a soft brush. Pothole need not be dry. However, excess water shall be swept off the pothole.

### **5.2 Placing Mix in Potholes**

The mix is intended for patching potholes up to 75 mm (3 inches) deep. For deeper potholes, patching mix shall be placed and compacted in 75 mm thick layers.

If the pothole is deep and extends to WMM or granular base, it is recommended to apply a suitable tack coat or prime coat as feasible before placing the patching mix. If angular aggregate (nominal size 25 mm) is used to partially fill deep potholes, the aggregate should



be compacted thoroughly and primed with MC-30 before placing the patching mix. At least 50 mm thick pothole patching mix shall be placed at the top.

### 5.3 Compacting the Mix

First the outside edge or periphery of the patch shall be compacted with a hand rammer/small compactor and then compaction shall proceed inwards. To prevent initial pick up of the loose mix by the hand rammer either continue to wet the hand rammer with water or place empty plastic lined bags on the loose mix.

For deep potholes, place the patching mix and compact in 75 mm thick layers. After compaction, the compacted patch shall be slightly proud of the existing road surface to allow for further compaction by traffic.

If there are numerous closely spaced patches, it is preferred to use a small roller rather than a hand rammer. If a roller is used, the mix shall be placed and spread slightly proud of the surface so that after rolling the compacted surface shall be flush with the adjoining surface.

### 5.4 Applying Sand to Prevent Pick up by Traffic

Before opening the compacted patch to traffic, sufficient amount of clean sand shall be sprinkled on the patch to prevent pick up by traffic.

## 6 QUALITY CONTROL AND ACCEPTANCE OF MIXTURE

The composition of the produced mix (gradation and bitumen content) shall be tested by an independent, approved testing laboratory before acceptance by the Engineer. Before conducting the bitumen extraction test to determine residual bitumen content in the patching mix, the sample shall be cured completely to remove all kerosene. Curing shall be done as follows. Place the loose mix in an open metal container and heat slowly on a hot plate with frequent stirring until a constant weight is achieved.

The following two tests shall be performed by the Contractor (in presence of a department representative) on the mixture, freshly prepared or taken from a stockpile or sealed bag at any time during its storage life (usually 6 months).

- i) Water Resistance Test (See **Appendix I**, Test C)
- ii) Workability Test (See **Appendix I**, Test D)

The water resistance test would indicate whether the patching mix has a potential for stripping in the pothole in presence of water. If the mix fails this test, it means a proper type and/or amount of an anti-stripping agent has not been used in the bituminous binder.

If the mix fails in workability it could be due to improper bitumen type, low bitumen content, excessive fines or improper gradation. Even one-half percent lower bitumen content can make the patching mix unworkable and useless.

Stocked patching material may be rejected, at any time during the six months period if, in the opinion of the Engineer, the patching material has stripped (more than 10 percent uncoated particles) or otherwise become unfit or unworkable for use.

**Appendix-I**  
(Refer Clause 3.1)

**A Wet Coating Test (Clause 3.1)**

Heat the unwashed job aggregate, cutback bitumen and distilled water to 40°C in a suitable oven. Weigh 100 g of dry aggregate into a suitable mixing container (such as seamless tin can, 16 oz capacity). Add 3 ml of distilled water. Mix thoroughly with a spatula until the aggregate particles are uniformly wetted. Add cutback bitumen equivalent to 5.0 +/- 0.2 g of bitumen residue. Mix rigorously with the spatula until all aggregate is coated, but not more than 5 minutes. Transfer the contents into a 400 ml beaker containing 150 ml of distilled water (22 - 32°C). Let stand for 15 minutes and visually determine the percent of retained coating, which should be at least 98 percent.

**B Static-Immersion Test (Clause 3.1)**

The coated aggregate as prepared in the preceding Wet Coating Test shall remain immersed in the beaker of distilled water (22 – 32°C) for 24 hours. At the end of this period, visually determine the percent of retained coating while the sample remains immersed in water, which should be at least 95 percent.

**C Water Resistance Test (Clause 3.1 and 6)**

Fifty grams of patching mix, whether freshly prepared or taken from the stockpile or a sealed bag, shall be heated at 120°C in a laboratory oven for 1 hour, cooled to 95°C in laboratory air, and then placed in 400 ml of boiling water in a 600 ml glass beaker and stirred with a glass rod at the rate of 1 revolution per second for 3 minutes. The water shall be decanted and the mix shall be spread on an absorbent paper for visual observation of the coating. The aggregate shall be at least 90 percent coated with a bituminous film.

**D Workability Test (Clause 6)**

Approximately 2.5 kg of the patching mix shall be cooled to -7°C in a freezer. After cooling, the mixture shall be capable of being broken up readily with a spatula that has a blade length of approximately 200 mm. This test shall be performed when the mix is produced and thereafter anytime during storage. If the mix is not workable at -7°C, it shall be rejected and the composition of the mix shall be properly modified (for example, by increasing the bitumen content and/or gradation changes). This test is also applicable in areas with hot climate because it amplifies the workability characteristics of the mix by using a lower test temperature.

## REFERENCES

- 1) Kandhal, P.S. and Mellott, D.B. Rational Approach to Design of Bituminous Stockpile Patching Mixtures. Transportation Research Board, Transportation Research Record 821, 1981.
  - 2) Kandhal, P.S. A Simple and Effective Method of Repairing Potholes in India. Journal of the Indian Roads Congress, Volume 69-3, October-December 2008.
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**(The Official amendments to this document would be published by the IRC in its periodical, 'Indian Highways' which shall be considered as effective and as part of the code/guidelines/manual, etc. from the date specified therein)**



# इंटरनेट

# मानक

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IS 217 (1988): Cutback Bitumen [PCD 6: Bitumen Tar and their Products]



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“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”





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*Indian Standard*  
**SPECIFICATION FOR CUTBACK BITUMEN**  
*( Second Revision )*

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**BUREAU OF INDIAN STANDARDS**  
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG  
NEW DELHI 110002

# Indian Standard

## SPECIFICATION FOR CUTBACK BITUMEN

### ( Second Revision )

#### 0. FOREWORD

**0.1** This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards on 8 August 1988, after the draft finalized by the Bitumen, Tar and Their Products Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

**0.2** This standard was published in 1951, and was revised in 1961 in view of the publication of IS : 1201 to 1220-1958\*.

**0.3** The Committee responsible for the preparation of this standard decided to revise the standard in order to update the same in accordance with the revised version of IS : 1201 to 1220-1978\*. In the present version, six grades of rapid curing type (RC), medium curing type (MC) and slow curing type (SC) have been unified into four grades, five grades and four grades respectively, which are currently

produced and marketed in the country.

**0.4** This standard is one of the series of Indian Standards on bitumen. Other specifications so far published in the series are:

IS : 73-1961	Paving bitumen
IS : 454-1961	Digboi type cutback bitumen (revised)
IS : 702-1988	Industrial bitumen (second revision).

**0.5** For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960\*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

\*Methods for testing tar and bituminous materials.

\*Rules for rounding off numerical values (revised).

#### 1. SCOPE

**1.1** This standard covers the physical and chemical requirements of cutback bitumen produced by fluxing bitumen with distillates of petroleum or coal tar for use in road construction.

#### 2. TERMINOLOGY

**2.1** For the purpose of this standard, the definitions given in IS : 334-1982\* shall apply.

#### 3. TYPES AND GRADES

**3.1** Cutback bitumen shall be of the following three types:

- a) Rapid curing (RC),
- b) Medium curing (MC), and
- c) Slow curing (SC).

**3.2** The three types of cutback bitumen shall be classified into grades on the basis of initial kinematic viscosity and designated as under.

**3.2.1 Rapid Curing (RC)**—These shall be used with aggregates containing practically no fine aggregates passing through 2.36 mm sieve and shall be classified into four grades with following designations:

- a) RC 70,
- b) RC 250,
- c) RC 800, and
- d) RC 3 000.

**3.2.2 Medium Curing (MC)**—These shall be used with aggregates containing less than 20 percent of fine aggregates passing through 2.36 mm sieve and shall be classified into five grades with designations:

- a) MC 30,
- b) MC 70,
- c) MC 250,
- d) MC 800, and
- e) MC 3 000.

**3.2.2.1** MC 30 grade shall be used as primer.

\*Glossary of terms relating to bitumen and tar.

**3.2.3 Slow Curing (SC)** — These shall be used with aggregates containing more than 20 per cent of fine aggregates passing through 2.36 mm sieve and shall be classified into four grades with designations:

- a) SC 70,
- b) SC 250,
- c) SC 800, and
- d) SC 3 000.

#### 4. MANUFACTURE AND SOURCE

**4.1** The material shall be prepared by fluxing bitumen with distillate from petroleum or coal tar.

**4.2** The source and type shall be stated by the manufacturer.

#### 5. REQUIREMENTS

**5.1** Rapid curing cutback bitumen shall comply with the requirements specified in Table 1.

**5.2** Medium curing cutback bitumen shall comply with the requirements specified in Table 2.

**5.3** Slow curing cutback bitumen shall comply with the requirements specified in Table 3.

#### 6. TESTS

**6.1** Tests shall be carried out as described in the appropriate Indian Standards specified in col 7, 8 and 7 of Tables 1, 2 and 3 for rapid curing, medium curing and slow curing cutback bitumens, respectively.

#### 7. PACKING AND MARKING

**7.1 Packing** — The material shall be supplied in drums of Type A or Type B according to IS : 3575-1977\* or as agreed to between the purchaser and the supplier.

**7.2 Marking** — Each container of bitumen shall be legibly and indelibly marked with the following:

- a) Manufacturer's name or trade-mark, if any;
- b) Month and year of manufacture;
- c) Type and grade of material; and
- d) Batch number.

**7.2.1** Each container may also be marked with the Standard Mark.

**NOTE** — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well-defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or processors may be obtained from the Bureau of India Standards.

#### 8. SAMPLING

**8.1** Representative samples of the material shall be drawn and their conformity of the requirements to this standard be judged as prescribed in Appendix A.

\*Specification for bitumen drums (first revision).

**TABLE 1 REQUIREMENTS OF RAPID CURING (RC) CUTBACK BITUMEN**

(Clause 5.1)

SL No.	CHARACTERISTICS	RC 70		RC 250		RC 80		RC 3 000		METHOD OF TEST, REF TO
		Min	Max	Min	Max	Min	Max	Min	Max	
(1)	(2)	(3)		(4)		(5)		(6)		(7)
i)	Kinematic viscosity at 60°C, cSt	70	140	250	500	800	1 600	3 000	6 000	IS : 1206 (Part 3)-1978*
ii)	Flash point, Pensky Martens closed type, °C	26	—	26	—	26	—	26	—	IS : 1209-1978†
iii)	Distillate volume percent of total distillate up to 360°C.									IS : 1213-1978‡
	a) Up to 190°C	10	—	—	—	—	—	—	—	
	b) Up to 225°C	50	—	35	—	15	—	—	—	
	c) Up to 260°C	70	—	60	—	45	—	25	—	
	d) Up to 315°C	85	—	80	—	75	—	70	—	

\*Methods for testing tar and bituminous materials: Determination of viscosity: Part 3 Kinematic viscosity (first revision).

†Methods for testing tar and bituminous materials: Determination of flash point and fire point (first revision).

‡Methods for testing tar and bituminous materials: Distillation test (first revision).

(Continued)

TABLE 1 REQUIREMENTS OF RAPID CURING (RC) CUTBACK BITUMEN — *Contd*

SL No.	CHARACTERISTICS	RC 70		RC 250		RC 800		RC 3 000		METHOD OF TEST, REF TO
		Min	Max	Min	Max	Min	Max	Min	Max	
(1)	(2)	(3)		(4)		(5)		(6)		(7)
iv)	Residue from distillation up to 360°C, percent by volume (by difference)	55	—	65	—	75	—	80	—	
v)	Tests on residue from distillation up to 360°C									
a)	Viscosity at 60°C, Poises	600	2 400	600	2 400	600	2 400	600	2 400	IS : 1206 ( Part 3 )-1978*
b)	Ductility at 27°C, cm	100	—	100	—	100	—	100	—	IS : 1208-1978†
c)	Matter soluble in trichloroethylene, percent by mass	99	—	99	—	99	—	99	—	IS : 1216-1978‡
vi)	Water content, percent by mass	—	0.2	—	0.2	—	0.2	—	0.2	IS : 1211-1978§

\*Methods for testing tar and bituminous materials: Determination of viscosity: Part 3 Kinematic viscosity (*first revision*).

†Methods for testing tar and bituminous materials: Determination of ductility (*first revision*).

‡Methods for testing tar and bituminous materials: Determination of solubility in carbon disulphide or trichloroethylene (*first revision*).

§Methods for testing tar and bituminous materials: Determination of water content ( Dean and Stark method ) (*first revision*).

TABLE 2 REQUIREMENTS OF MEDIUM CURING (MC) CUTBACK BITUMEN  
( Clause 5.2 )

SL No.	CHARACTERISTIC	MC 30		MC 70		MC 250		MC 800		MC 3 000		METOD OF TEST, REF TO
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	
(1)	(2)	(3)		(4)		(5)		(6)		(7)		(8)
i)	Kinematic viscosity at 60°C, cSt	30	60	70	140	250	500	800	1 600	3 000	6 000	IS : 1206 ( Part 3 )-1978*
ii)	Flash point Pensky Martens closed cup, °C	38	—	38	—	65	—	65	—	65	—	IS : 1209-1978†
iii)	Distillate volume, percent of total distillate upto 360°C.											IS : 1213-1978‡
a)	Up to 225°C	—	25	—	20	—	10	—	—	—	—	
b)	Up to 260°C	40	70	20	60	15	55	—	35	—	15	
c)	Up to 315°C	75	93	65	90	60	87	45	80	15	75	
iv)	Residue from distillation up to 360°C, percent volume by difference	50	—	55	—	67	—	75	—	80	—	
v)	Test on residue from distillation up to 360°C.											
a)	Viscosity at 60°C, Poises	300	1200	300	1 200	300	1 200	300	1 200	300	1 200	IS : 1206 ( Part 3 )-1978*
b)	Ductility at 27°C, cm	100	—	100	—	100	—	100	—	100	—	IS : 1208-1978§
c)	Solubility in trichloroethylene, percent	99	—	99	—	99	—	99	—	99	—	IS : 1216-1978
vi)	Water content, percent by mass	—	0.2	—	0.2	—	0.2	—	0.2	—	0.2	IS : 1211-1978¶

\*Methods for testing tar and bituminous materials: Determination of viscosity: Part 3 Kinematic viscosity (*first revision*).

†Methods for testing tar and bituminous materials: Determination of residue of specified penetration (*first revision*).

‡Methods for testing tar and bituminous materials: Distillation test.

§Methods for testing tar and bituminous materials: Determination of ductility (*first revision*).

||Methods for testing tar and bituminous materials: Determination of solubility in trichloroethylene (*first revision*).

¶Methods for testing tar and bituminous materials: Determination of water content ( Dean and Stark method ) (*first revision*).

TABLE 3 REQUIREMENTS FOR SLOW CURING (SC) CUTBACK BITUMEN  
( Clause 5.3 )

Sl No.	CHARACTERISTICS	SC 70		SC 250		SC 800		SC 3 000		METHOD OF TEST, REF TO
		Min	Max	Min	Max	Min	Max	Min	Max	
(1)	(2)	(3)		(4)		(5)		(6)		(7)
i)	Kinematic viscosity at 60°C, cSt	70	140	250	500	800	1 600	3 000	6 000	IS : 1206 ( Part 3 )-1978*
ii)	Flash point, Pensky Martens closed type, °C,	65	—	79	—	93	—	107	—	IS : 1209-1978†
iii)	Total distillate up to 360°C volume, percent	10	30	4	20	2	12	—	5	IS : 1203-1978‡
iv)	Kinematic viscosity on distillation residue up to 60°C, Stokes	4	70	8	100	20	160	40	350	
v)	Tests on residue from distillation up to 360°C:									
a)	Residue of 100 penetra- tion percent	50	—	60	—	70	—	80	—	IS : 1204-1978§
b)	Ductility of 100 penetra- tion residue at 27°C, cm	100	—	100	—	100	—	100	—	IS : 1208-1978
c)	Solubility in trichloro- ethylene, percent	99	—	99	—	99	—	99	—	IS : 1216-1978¶
vi)	Water content, percent by mass	—	0.5	—	0.5	—	0.5	—	0.5	IS : 1211-1978**

\*Methods for testing tar and bituminous materials: Determination of viscosity: Part 3 Kinematic viscosity ( *first revision* ).

†Methods for testing tar and bituminous materials: Determination of flash point and fire point ( *first revision* ).

‡Methods for testing tar and bituminous materials: Determination of penetration ( *first revision* ).

§Methods for testing tar and bituminous materials: Determination of residue of specified penetration.

||Methods for testing tar and bituminous materials: Determination of ductility ( *first revision* ).

¶Methods for testing tar and bituminous materials: Determination of solubility in trichloroethylene ( *first revision* ).

\*\*Methods for testing tar and bituminous materials: Determination of water content ( Dean and Stark Method ) ( *first revision* ).

## APPENDIX A

( Clause 8.1 )

### SAMPLING AND CRITERIA FOR CONFORMITY FOR CUTBACK BITUMEN

#### A-1. SCALE OF SAMPLING

**A-1.1 Lot**— In any consignment all the containers of the same type, same grade and belonging to the same batch of manufacture shall be grouped together to constitute a lot.

**A-1.2** The number of containers to be selected from the lot shall depend upon the size of the lot and shall be in accordance with Table 4.

TABLE 4 SCALE OF SAMPLING

LOT SIZE	NUMBER OF CONTAINERS TO BE SELECTED
(1)	(2)
Up to 50	3
51 to 150	5
151 to 500	7
501 and above	10

**A-1.3** These containers shall be selected at random from the lot. In order to ensure the randomness of selection, procedures given in IS : 4905-1968\* may be followed.

#### A-2. PREPARATION OF TEST SAMPLES

**A-2.1** From each of the containers selected according to A-1.2 and A-1.3, a sample representative of the material in the container shall be drawn in accordance with the methods prescribed in IS : 1201-1978†, taking all the precautions mentioned therein. All these samples from individual containers shall be stored separately.

#### A-3. NUMBER OF TESTS

**A-3.1** All the individual samples shall be tested for kinematic viscosity, flash point and ductility.

\*Method of random sampling.

†Methods for testing tar and bitumen: Sampling.

**A-3.2** For the remaining characteristic given in Table 1, Table 2 and Table 3 of the specification, a composite sample prepared by mixing together approximately equal quantities of bitumen from all individual samples shall be tested.

#### **A-4. CRITERIA FOR CONFORMITY**

**A-4.1** The lot shall be declared as conforming to the requirements of this specification if **A-4.1.1** and **A-4.1.2** are satisfied.

**A-4.1.1** From the test results of each of the characteristics given in **A-3.1** the mean ( $\bar{X}$ ) and the range ( $R$ ) shall be calculated as below:

$$\text{mean } (\bar{X}) = \frac{\text{sum of the test results}}{\text{number of test results}}$$

range ( $R$ ) = difference in the largest and the smallest of the test results.

If the expression ( $\bar{X} - 0.6 R$ ) is greater than or equal to the *minimum* specification limit, the expression ( $\bar{X} + 0.6 R$ ) is less than or equal to the *maximum* specification limit and both the conditions are satisfied in case of two sided specification limits, the lot shall be considered to have met these requirements.

**A-4.1.2** The composite sample, when tested for the characteristics mentioned in **A-3.2**, shall satisfy the corresponding specification requirements.



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NEW DELHI 110002

### Telephone

{ 311 01 31  
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Eastern : 1/14 C. I. T. Scheme VII M, V. I. P. Road, Mapiktola  
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37 86 62

Northern : SCO 445-446, Sector 35-C, CHANDIGARH 160036

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Roads & Buildings Department  
Government of Gujarat

Division \_\_\_\_\_

**TENDER  
FOR  
ELECTRIAL WORK**

Name of work \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Estimated Cost Rs. \_\_\_\_\_

Date of Issue of Tender \_\_\_\_\_

Last Date of Receiving Tender \_\_\_\_\_

# GENERAL CONDITION OF CONTRACT FOR ELECTRICAL WORKS IN THE BUILDING AND COMMUNICATION DEPARTMENT

## GENERAL CONDITIONS OF CONTRACT

### 1. Definition of terms :

In construing these general conditions and the annexed specification the following words shall have the meaning here assigned to them unless there is something in the subject or context inconsistent with such constructions :

The "GOVERNOR OF GUJARAT" shall include his successors and assigns.

The "Engineer" shall mean the Ex. Engineer, Electrical Division, for the time being attached to the Public Works Department of the Gujarat State or such other officer as may be appointed by the Ex. Engineer, Electrical Division to supervise the work on behalf of the Governor of Gujarat.

The "CONTRACTOR" shall mean the Tenderer whose tender, shall be accepted by the Governor of Gujarat, and shall include the tenderer's legal personal representatives or successors and assigns.

"PLANT" shall mean and include any machine, fixed or movable, used for the generation or transmission of power or actuated by power.

"WORK" or "WORKS" shall mean the whole of the plant and material to be provided and work to be done, executed or carried out by the contractor under the contract.

The "CONTRACT" shall mean all the documents by which the agreement by the contractor to be provided to execute or carry out the plant work or works shall be constituted or in or by which the terms of such agreement or any of them are contained or set forth specially as per these General conditions, any special conditions attached to or issued, with these conditions, the specification, the Drawing, the invitation for Tenders (if any) or any other letter, notice or document upon or with reference to which the Tender is made and the schedule of prices (if any) furnished by the contractor with his Tender.

The "SPECIFICATION" shall mean the specification annexed to these General conditions and the Schedule thereto (if any).

The "SITE" shall mean the whole of the premises, buildings and grounds in or upon which the Plant work or works is or are to be provided, executed, erected, done or carried out.

The "DRAWINGS" shall mean the drawings issued with the specification which will ordinarily be identified by being signed by the Engineer and any further drawings submitted by the contractor with his tender and duly signed by him and accepted or approved by the Engineer and all other drawings supplied or furnished by the contractor or by the Engineer in accordance with these General conditions.

The 'SPECIAL CONDITIONS' shall mean the special conditions of contractor (if any) attached to general condition.

The "SCHEDULE" shall mean the schedule or schedules attached to the specification.

### 2. Contractor to inform himself fully :

The contractor shall be deemed to have carefully examined the invitation for Tender (if any) the general and any special conditions, the specification and Drawings and the Schedule of price (if any). In case of discordance or want of agreement between or amongst the several things herein described as the grounds or data of the contract, then these conditions shall have precedence of and be held to be more correct and binding and in like manner detailed drawings shall be held to be more correct, and binding than general drawings and in like manner drawing made to a large scale, or for special instruction, shall be held to be more correct and binding than drawing made to a smaller scale, or for general instruction and figured dimensions shall be held to be more correct than dimensions by scale but subject nevertheless in case of doubt or dispute as to any of the matters aforesaid to the determination and decision of Engineer as hereafter is more particularly mentioned and provided always that nothing herein contained shall limit the powers of the Engineer hereinafter mentioned.

### 3. Security Deposit :

The person/persons whose tender is accepted (hereinafter called the "Contractor" which expression shall, unless excluded by, or repugnant to the context include his Legal heirs, executors, administrators and assigns) shall (a) Deposit with the Executive Engineer a sum sufficient to make up the full security deposit specified in the tender in cash or Government securities (as mentioned in para 208 of Gujarat Public Works Department Manual Vol. 1) duly transferred in the name of the Executive Engineer or fixed deposit receipts or Term Deposits of Narmada Project in the name of the Executive Engineer within a period of 10 days from the date of receipt of the Notification of acceptance of his tender, or (b) (i) deposit fifty percentage of the total security deposits as specified in the tender form with the Executive Engineer in form of small saving schemes or securities of Sardar Sarovar Narmada Nigam or F.D. Rs. of scheduled bank. However, the Contractor can deposit twenty five percentage of total security deposit in the form of Govt. security (as mentioned in para 208 of Gujarat Public Works Department Manual Vol. 1) or Term Deposits of Narmada Project duly transferred in the name of the

Executive Engineer, or fixed deposit receipts in the name of the Executive Engineer within a period of ten days from the date of receipt of notification of acceptance of his tender. If the security deposit is not paid within the above specified time, no work order will be issued till the issue about delay is finally decided by the competent authority. (b) (ii) The Government shall be deemed to have been authorised to deduct the balance of fifty percentage of the security deposit as specified in the tender form from the amounts that become payable to the contractor for the work done under the contract from time to time, such deduction shall not exceed ten percentage of the amount so payable and the whole amount paid in cash or by way of deduction shall be held by Government by way of security deposit. For the works whose estimated amount is more than rupees fifteen lacs, the Contractor shall have to give the performance bond supported by F. D. R. or Unconditional. So that same can be encashed without giving any reason by the Executive Engineer Non Transferable and Irrecoverable Bank Guarantee of any schedule bank equivalent to five percentage of the estimated amount put to tender alongwith the initial security deposits. All compensation, Liquidated damages or other sums or money payable by the contractor to Government under the terms of this contract shall be deducted from or recouped by the realisation of a sufficient part of his security deposit, or from the interest arising therefrom or performance bond or from any sums which may due or may become due by Government to the Contractor on any account whatsoever and whether in respect of this contract, any other contract, or otherwise. In the event of his security deposit being reduced by reason of any such deduction or recoupment as aforesaid, the contractor shall within ten days thereafter, make good in cash or in Government securities transferred as aforesaid any sum or sums required to make good the shortfall in the amount of the security deposit. The security deposit, when paid as above shall at the cost of the depositor, be converted into interest bearing Government securities in the name of Executive Engineer provided that the depositor has expressly desired this in writing. This is subject to the condition that twenty five percentage of the total security deposit must be held in the form of small saving Schemes or Term Deposits of Narmada Project. If the full amount of the security deposit to be paid as above within the period specified above, is not paid the tender/contract already accepted shall be considered as cancelled and legal steps shall be taken against the contractor for recovery of the amounts.

Fifty percentage of the Security Deposit alongwith performance bond shall become refundable within fifteen days after the final completion certificate is issued as per Clause-25. All dues under this contract or other contract, or otherwise, including the royalty charge if "No Due-Certificate" is not produced by the contractor shall be recovered from the aforesaid amount of fifty percentage of the said security deposit and the balance shall be refunded within fifteen days after the final certificate is issued as per clause-25. The remaining fifty percentage of the security deposit shall be refunded after the expiry of the Defect Liability period as per clause-33 after deducting therefrom the amount of expenses, if any, due to Government under this contract.

#### Annexure

### PERFORMANCE BOND

( The date of this bond must not be prior to the date of the instrument in connection with which it is given).

.....  
Principal (Contractor)

.....  
Surety (Bank)

.....  
Sum of bond (express in words and figures)

.....  
Contract No. and date of contract

**KNOW ALL MEN BY THESE PRESENTS, THAT WE, THE PRINCIPALS AND SURETY** above named are held and firmly bound unto the ..... hereinafter called the Employer in the amount stated for payment of which sum, well and truly to be made, we bind ourselves, our heirs, executors, administrators and successors jointly and severally, firmly by these presents subject to the provisions of which the aforesaid Contractor on demand and without demand on a claim being made by the Employer.

**THE CONDITION OF THIS OBLIGATION IS SUCH,** that whereas the principals have entered in to a contract with the Employer numbered and dates as shown above and hereto attached for the execution of work .....

**NOW THEREFORE,** if the Principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original terms of the said Contract and any extensions thereof that may be granted by the Employer with or without notice to the surety and during the life or any guarantee required under the contract and shall also well and truly perform and fulfill all the Undertakings, covenants, terms, conditions and agreements of any all duty and unduly authorized modifications of said Contract that may hereafter be made, notice of which modifications to the surety being hereby waived or shall pay over, make good and reimburse to the Employer all loss and damages which the employer may sustain by reason of failure or default on the part of said Principal so to do.

We ..... further agree that the guarantee herein Contained shall remain in full force and effect during the period that would be taken for the validity of the said Contract, and that it shall continue to be enforceable till all the dues of the employer under or by virtue of the Contract have been fully paid and its claims satisfied or discharged or till the Employer certifies that the terms and conditions of the Contract have been fully and properly carried out by the said Contractor and accordingly discharges the guarantee. Unless a demand or claim under this guarantee is made on us in writing on or before the ..... we shall be discharged from all liability under this guarantee thereafter.

**IN WITNESS WHERE OF**, the above bounded parties have executed this instrument under their several seals on the date indicated above the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representatives, pursuant to authority of its governing body.

In the presence of witness

individual

Principal

1. .... as to ..... (seal)
2. .... as to ..... (seal)
3. .... as to ..... (seal)
4. .... as to ..... (seal)

Attested by ..... affix Corporate Seal  
Corporate surety  
Business address  
Affix by ..... corporate Seal

Title

For and on behalf of the Employer

#### 4. Mistake in contractor's Drawings :

The contractor shall submit such drawings as may be required and shall be responsible for any discrepancies, errors or omissions in any drawings or other particulars supplied by him notwithstanding that such drawings or particulars may have been approved by Engineer.

#### 5. Patent Rights etc.

The contractor shall fully indemnify the Governor of Gujarat against all actions suits claims demands, costs, charges and expenses arising from or incurred by reason of any infringement or alleged infringement, of any, letters patent, design, trademark or name copyright or other protected rights in respect of any machine, plant, work materials thing or system or method of using, fixing, working or arrangement used or fixed or supplied by the contractor but this indemnity shall not extend or apply to any action, suit, claim, demand, cost charges or expenses arising from or incurred by reason of the use of the work or any part thereof otherwise than in the manner of for a purpose contemplated by the contract. All royalties and other similar payments which may have to be paid for the use of any machine, plant, work, material, thing, system or method as aforesaid (whether payable in one sum or by installments or otherwise) shall be covered by the contract price and payable by the contractor.

In the event of any claim or demand being made or action or suit brought against the Governor of Gujarat in respect of any such matter or matters as all negotiations for the settlement of such claim or demand and such action aforesaid the contractor shall be duly notified, thereof, and he shall conduct or suit also be conducted by him subject if and so far as the Governor of Gujarat shall think proper under the Supervision & Control of Governor of Gujarat through the officer duly authorised on his behalf.

#### 6. Excess over Tender quantities, Extra items & Variations in Specifications, Drawings etc. :

6.1 The Engineer-in-charge shall have power to make any alterations additions in or to the original specifications, drawings, designs and instructions that may appear to him to be necessary or advisable during the progress of the work and the contractor shall be bound to carry out the work in accordance with any instructions in this connection which may be given to him in writing signed by the Engineer-in-charge and such alternation shall not invalidate the contract and additional work which the contractor may be directed to do in the manner above specified as part of the work shall be carried out by the contractor on the manner above specified as part of the work shall be carried out by the contractor in the same conditions in all respects on which he agreed to do the work and at the same rate as are specified in the tender for the main work.

6.2 Except that when the quantity of any item exceeds the quantity as in the tender by more than 30% the contractor will be paid for the quantity in excess of 30% at the rate entered in the S.O.R. of the year during which the excess in quantity is first executed and for the materials consumed in excess quantity the rate for the materials to be charged would be the basic rate taken into account for fixing the rate for the S.O.R. above instead of the rate stipulated in schedule-A.

6.3 If the additional or altered work includes any class of work for which no rate is specified in this contract, then

such class of work shall be carried out.

(i) At the rate derived from the item within the contract which is comparable to the one involving additional or altered class of work; where there are more than one comparable items, the item of the contract which is nearest in comparison with regard to class or classes of the work involved shall be selected and the decision of the Superintending Engineer as to the nearest comparable item shall be final and binding on the contractor.

(ii) If the rate cannot be derived in accordance with (i) above, such class of works shall be carried out at the rate entered in the Schedule of Rates of the Division for the year in which, the tender was received, increased or decreased by the percentage by which the tender received, increased or decreased by the percentage by which the tender amount is more or less as compared or decreased by the percentage by which the tender amount is more or less as compared to the amount arrived at the rates in the "Schedule of Rates" of the Division in the year in which the tender was received. If the Schedule of rates calculated considering such items which were included in the "Schedule of Rates" of the Division for the year and for materials consumed on such item the rate to be charged would be the basic rate taken into account for fixing the rate in S.O.R. referred to above, instead of the rate.

(iii) If it is not possible to arrive at the rate from (1) and (ii) above, such class of work shall be carried out at the rate decided by the competent authorities on the basis of detailed rate analysis after hearing the contractor before a committee of two superintending Engineers stationed at the same place or the nearest place.

**6.4** If the additional or altered work, for which no rate is entered in the "Schedule of Rates" of the Division is ordered to be carried out before the rate is agreed upon, then the contractor shall within seven days of the date of receipt by him of the order to carry out the work, inform the Engineer-in-charge of the rate, which it is his intention to charge for such class of work and if the Engineer-in-charge does not agree to this rates, he shall by notice in writing be at liberty to cancel his order to carry out such class of work and arrange to carry it out in such manner as he may consider it advisable, provided always that if the contractor shall commence work or incur any expenditure in regard thereof before the rates shall have been determined as lastly herein before mentioned, then in such cases he shall only be entitled to be paid in respect of the work carried out or expenditure incurred by him prior to the date of the determination of the rate as aforesaid according to such rate or rates as shall be fixed by the Engineer-in-charge. In the event of the dispute, the decision of the Superintending Engineer of the Circle shall be final.

Where, however, the work is to be executed according to the designs, drawings and specifications recommended by the contractor and accepted by the competent authority, the alternation above referred to shall be within the scope of such designs, drawings and specifications appended to the tenders.

The time limit for the completion of the work shall be extended in the proportion that the increase in the cost occasioned by alternations bears to the cost of the original contract work and the certificate of the Engineer-in-charge as to such proportion shall final and conclusive.

#### **7. Workmanship and Materials :**

The work shall be carried out in all respects with workmanship and materials of the best and most substantial and approved qualities to the entire satisfaction of the Engineer who may reject any plant, apparatus of material or workmanship which shall in his opinion be of defective quality any such rejection to be final and conclusive. The contractor shall at his own expenses provide all material labour, haulage, power, tools, tackles and apparatus necessary to execute and complete the works and plant in the manner aforesaid.

#### **8. Use of work pending completion :**

The Governor of Gujarat shall be at liberty at any time to put into beneficial use the whole or any part of the work he may desire to use pending the formal completion and taking over of the same.

#### **9. Subletting of contract :**

The contractor shall not without the consent in writing of the Governor of Gujarat under the hand of the Engineer assign or sublet the contract nor make any sub contract with any person or persons for the execution of any portion of the work other than for raw materials, or for any part of the work of which the manufacturers are named on his contract.

#### **10. Protection and liability for accidents, Theft and Damage .**

The Contractor shall at all times until the commencement of the period maintenance as provided in clause 16 property and sufficiently cover up and protect all materials delivered on site from damage or injury by exposure to the weather and shall take every proper precaution against accident, damage or injury on the same from any cause. The contractor shall be and remain answerable and liable for all accident and damage thereto which until the commencement of the period of maintenance as provided for under clause 16 may arise or be occasioned by the acts or omissions of the contractor or his workmen, agents, servants or sub-contractors and all losses and damages arising from such accidents, damage or injuries as aforesaid shall be made good in the most complete and substantial manner by and at sole cost of the contractor and to the satisfaction of the Engineer.

Provided that should the Engineer certify, that the work has been completed but that owing to circumstances over which the contractor has no control the work cannot be taken over the contractor shall not be held liable for any loss of or damage to the work occasioned by such delay in taking over and occurring more than one month after date of completion of the work as certified by the Engineer.

Until the work shall be or deemed to be taken over as hereafter provided the Contractor shall also indemnify to Governor of Gujarat from and against all claims and demands, suits, proceedings, cost and expenses in respect in respect of or in connection with any injury to person or damage to property by whomsoever sustained or by defective design work or materials made, done, furnished or supplied by the contractor. The Contractor shall also be responsible for thefts of any property of the Governor of Gujarat or of others committed by any employees of his own or his subcontractors and shall be liable for the costs of replacing any property stolen.

#### **11. Insurance :**

Subject as hereinafter provided the contractor shall at his own expense insure and at all times prior to the commencement of the period of maintenance keep insured against destruction or damage by fire or earthquake storm and tempest such plant and materials ordered for the work as may for the time being be upon the site for the full value of such plant and materials.

#### **12. Materials brought on the site :**

All materials, tools and tackle brought to and delivered upon the site for the purpose of the work shall from the time of their being so brought vest in and be the property of the Governor of Gujarat but may be used for the purpose of the work but for that purpose only and not on any account be removed or taken away by the contractor or any other person without the express permission in writing of the Engineer, but the Contractor shall nevertheless (Subject as hereinafter provided) be solely liable and responsible for any loss or destruction thereof or damage unless resulting from causes beyond the Contractor's control not being causes insurance against destruction or damage from which is provided for in clause 11. The Governor of Gujarat shall have a lien on such materials, tools and tackle for any sum which may to any time prior to the completion of the works be due or owing to him by the Contractor under in respect of or by reason of the Contract and shall be at liberty to sell and dispose of any of such materials, tools and tackle remaining after the completion of the works in such manner as he shall think fit, and to apply the proceeds in or towards the satisfaction of such sum or sums so due or owing as aforesaid but subject to such lien and power of sale and disposal such surplus materials, tools and tackle shall belong to the contractor and may be removed and disposed of by him as he shall think fit after the lien is withdrawn by the Engineer in charge.

#### **13. Default :**

If the Contractor shall at any time fail in the opinion of the Engineer to proceed with the work with due diligence and expedition, or shall refuse, neglect or omit to comply with any orders given to him in writing by the Engineer in accordance with the provisions of these conditions or shall commit any other breach of the provision of the contract, the Engineer shall be at liberty to give notice in writing to the Contractor to make good the failure neglect, omission or breach complained of and should the Contractor shall fail to comply with any such notice within such period as may be prescribed in such notice then and in such case the Governor of Gujarat shall be at liberty to employ workmen other than those of the contractor to perform and execute the work in respect of which the failure neglect or omission referred to in such notice shall have been committed or occurred. If the Governor of Gujarat shall think fit, it shall be lawful for him to enter into a new contract with any other persons, or person, for the execution of such part of the work as may not have been executed and in that event the Governor of Gujarat shall without incurring any liability to the Contractor be entitled to use all or any of the materials, tools, tackle or other things which may then be on site for the purpose of completing the work or any part thereof and to provide any additional materials, tools, or tackle required for the purpose and the cost of executing any such work and providing any such materials shall be paid by the contractor to the Governor of Gujarat on demand.

Subject to and after satisfaction of the lien of the Governor of Gujarat for any sum due to him by the Contractor for any expenses, cost or charges incurred in the completion of the work, all materials, tools, tackle or other thing remaining on the site and unsold after such completion shall forthwith hereafter be removed by the contractor.

#### **14. Replacement of Defective work or material :**

If during the progress of the work the Engineer shall notify in writing to the contractor that in his opinion the Contractor has executed any unsound or imperfect work, or has supplied any materials inferior in quality to those stipulated for by the Contractor, the contractor shall at his own expense, within ten days of his receiving the notice, proceed with due expedition to remove or alter and reconstruct or replace the work, or as the case may be supplied fresh materials up to the standard of the specification. In place of the work or materials complained of by the notice (as the case may be) and in case the contractor shall fail to do so the Governor of Gujarat may after expiration of ten days from giving of such notice give a further notice in writing stating that the Governor of Gujarat intention so to do forthwith at the cost of the Contractor remove the work or materials complained of and perform all such work or (as the case may be) supply all such materials in place of those complained of as may be necessary or proper in order to comply with the Contractor and the cost as certified by the Engineer of any such removed and performance of work or supply of materials shall be paid by the contractor to the Governor of Gujarat on demand, provided always that nothing

in this clause shall be deemed to deprive the Governor of Gujarat or effect any other rights or remedies under the Contract or otherwise which he may have in respect of such defects or deficiencies. No payment which have been made on account of materials delivered or work executed shall be looked on as acceptance of such or any work or materials.

#### **15. Cutting away & making good :**

The tender is to include all necessary cutting and making good for the purpose of the contract of the wood work, walls, floors etc. of the site. The contractor will be held responsible for, and will have to make good at his own expense, to the satisfaction of the Engineer, any damages to or disfigurement of the site which may have been caused by the acts or omissions of himself or his servants or agents in connection with the carrying out of the contract.

#### **16. Maintenance :**

The Contractor shall make good at his own expense all defects due to faulty design material, or workmanship on the part of the contractor which may during a period of 6 calendar months from the date on which the work is certified by the Engineer to have been brought into beneficial use or if no such certificate is given from the date of the final payment for the work under clause 20 (which period is hereinafter called the "the period of maintenance" ) develop under proper use in the work or any part thereof by replacing plant materials or work or otherwise as may be necessary. Any such making good by the contractor shall in no case relieve him from his liability to make good any further defect in the work made good of replace which may develop during the remainder of such period of twelve months. If any such defects are clearly caused by the fault of the Contractor and are liable to recurrence the contractor shall make such alterations as are required to prevent any recurrence of such defects. If any defects or alterations which Contractor shall become liable to make good or make under this clause be not made good or made (as the case may be) within such time as the Engineer may prescribe for the purpose, the Engineer may proceed to make good or make the same (as the case may be) at the risk and expense of the Contractor, but without prejudice to any other right or remedies which the Governor of Gujarat may have against the Contractor in respect of his default in making good or making the same as aforesaid and the cost of any such making good or making shall be paid by the Contractor to the Government of Gujarat on demand.

#### **17. Contractor's Representative & workmen :**

The contractor Shall employ at least one competent representative, whose name or names shall have previously been communicated in writing to the Engineer by the Contractor to Superintend the carrying out the works. The said representative, of if more then one shall be employed then, one of such representative, shall always be present on the site during working hours and any written orders or instruction which the Engineer or his duly authorized representative, whose name shall have been previously communicated in writing to the contractor, may give to the said representative of contractor, shall be deemed to have been given to the contractor.

The Engineer shall be at liberty to object to any representative or person employed by the Contractor in the execution of or otherwise about the work who in the Engineers opinion shall misconduct himself or be incompetent or negligent and the contractor shall remove every person so objected to forthwith upon receipt from the Engineer of notice in writing requiring him to do so.

#### **17.A Minimum age of persons employed and employment of donkeys or other animals :**

- (i) The Contractor shall not employ any person who is under the age 12 years.
- (ii) The contractor shall not employ donkeys or other animals with breaching of string or thin rope. The breaching must be attest three inches side and should be tape (Nawar).
- (iii) No animal suffering from sores, lameness or emaciation or which is immature shall be employed on the work.
- (iv) If contractor does not accept the proceeding conditions No. (i), (ii), & (iii) his tender shall not be accepted and his name shall be removed from the list of contractors.
- (v) The Engineer shall remove from the work any person or animal found working which does not satisfy these conditions and to responsibility shall be accepted by the Governor of Gujarat for any delay caused in the completion of the work by such removal.

#### **18. Submission of Samples :**

The contractor shall not without written sanction of the Engineer use for the execution of the work any materials plant or stores of any type of description other than those specified in his tender. He shall, if required to do so, or at his options, deposit samples, at the office of the Engineer for approval and the Engineer shall within 14 days of the receipt of the samples, express in writing to the contractor his approval or otherwise of the samples deposited, and all materials, plant and stores used in the execution of the works must be in every way equal to the deposited samples. All the deposited samples will be returned to the contractor within one month of the work being taken over :



## 19. Deduction from contract Price :

The amount or all costs of works, expenses or other sums which under the contract shall be payable by the contractor to the Governor of Gujarat from any moneys due or becoming due by him to the Contractor under contract, without prejudice to the Governor of Gujarat, right to recover the same by the ordinary process of law.

## 20. Terms of Payment :

Subject to any deduction which the Governor of Gujarat may be authorised to make under the contract, the Contractor shall be entitled upon the certificate of the Engineer to the effect hereinafter stated **payments of R.A.Bills shall be made to the contractor as per items, in measurable units executed according to the specifications.**

If at any time the contractor shall be prevented for any period of not less than 30 days from causes within the control of the Governor of Gujarat either first, from delivering on the site any plant or material ready in India for delivery or secondly from proceeding with the erection at any plant or materials which he had already delivered on the site, the Governor of Gujarat shall bear the cost of storage and protection, including insurance in accordance with clause II, of the plant and material during such period in the first of such of contractor shall be entitled to payment of 80% percent of the value certified as aforesaid of the plant or materials delivery of which shall have been so prevented within one month from the date on which as certified by the Engineer such plant or material are so ready as aforesaid provided that all portions thereof have been suitably and sufficiently marked as being property of the Governor of Gujarat and are delivered into the custody of some person approved by the Engineer who has granted a receipt thereof.

Installments shall be due and payable by the Governor of Gujarat within one month from the date of each certificate of the Engineer.

## 21. Certificates of Engineer :

Every applications to the Engineer for a certificate must be accompanied by a detailed claim in duplicate) setting forth (in the order of the Schedule for price if any) particulars of the Plant or materials delivered and work executed to the date of the claim, and the certificate as to such of the plant and work mentioned in the claim as is in the opinion the Engineer in accordance with the contract shall be issued within 14 days of the application. No application for a certificate shall be made within 14 days previous applications.

## 22. Certificate not to affect rights of the Governor of Gujarat of contractor :

The Engineer may by any certificate make any correction or modification in any certificate previously issued, by him, any payment shall be regulated and adjusted accordingly. No certificate of the Engineer shall nor shall any payments on account by the Governor of Gujarat to the Contractor, nor extension of time for the execution of the works by the contractor which may be granted by or behalf of the Governor of Gujarat affect or prejudice any of the rights of the Governor of Gujarat against the contractor under or relieve him any of his obligations for or in respect of the due performance of the contract, or be interpreted as approval of work done or of material supplied.

## 23. Suspension of Work :

The Governor of Gujarat shall any to the contractor all proper expenses arising from suspensions of the works by order in writing of the Engineer or any other officer on behalf of the Governor of Gujarat unless such suspension is due of some default on the part of the Contractor or any sub-contractor under him.

## 24. Damages for delay in completion :

(i) If the Contractor fails to complete the work under contract by the stipulated date, he shall pay liquidated damages of Rs. 0.1 percentage of the contract value per day from the date of delaying the said work upto the date of completion and handing over to the Government.

(ii) However also if the contractor fails to complete any part of the work Proportionate to by the time in relation to the value of such part, he shall pay Liquidated damages per day from the date of delaying the said part of the work up to the date of completion of the said designated part at the rates shown in the said schedule of the contract Value of such part for such failure till the said designated part is completed.

(iii) The aggregate maximum of liquidated damages payable under this clause shall not exceed Rs. 0.1 percentage of contract value per day and shall be subject to the maximum amount of ten percent of the estimated amount put to tender.

(iv) Delays requiring payment of ten percent liquidated damages of the amount put to tender for performance shall be sufficient cause for termination of contract and for forfeiture of security deposit. (including amount of performance bond in respect of works estimated to cost more than Rs. 15 lacs, for performance) and registration of the contractor shall also be kept in abeyance for three years from the date as fixed in all such cases.

**24-A** If the Contractor shall desire an extension of the time for completion of work on the ground of his having been unavoidably hindered in it execution or on any other ground he shall apply in writing to the Ex. Engr. before the

expiration of the period stipulated in the tender or before expiration of 30 days from the date on which he was hindered as aforesaid on with the cause for making for extension occurred whichever is earlier and the Ex. Engr. may if in his opinion. There are reasonable and bonafide grounds for granting, and extension grant such extension as he thinks necessary or proper. The decision of the Ex. Engr. in this matter shall be final.

No applications for extension of time for completion of work shall be considered unless it is received by registered post in the office of the Executive Engr. or left at his office and obtained receipt there of duly signed by the Ex. Engr. or his nominee authorised in this respect.

The date of receipt of application by the Ex. Engr. shall be considered as the date of application for the purpose of counting the period as mentioned above.

**24-B.** "If the contractor or his workmen, or servants shall break, deface, injure or destroy and part of the building, or the work in question in/or which they may be working or any building, road fence, enclosure or glass-land or cultivated ground contingence to the premises on which the work or any part thereof is being executed or if any damage shall be done to the work from any cause whatever before completion of the work or before the completion of the maintenance period whichever is later or any damages occurred/caused due to normal flood or rain or if any imperfection become apparent in it within three-months from the grant of a certificate of completion, final or otherwise by the Engineer-in-charge, the contractor shall make good the same at his own expenses or in default, the Engineer-in-charge may cause the same to be good by other contractor, and deduct expenses (of which the certificate of the Engineer-in-charge shall be final) from any sums that may then be due or may thereafter become due to the contractor or from his security deposit or the proceeds of sale thereof a sufficient portion thereof".

**24-C Force Major Clause :**

Neither party shall be liable to the other for any loss or damage occasioned by or arising out of acts of God, such as Unprecedented flood, Volcanic eruption, earthquake or other convulsion of nature and other acts such as but not restricted to general strike, invasion, the acts of foreign countries, hostilities, or war like operations before or after declaration of war, rebellion, military or Usurped power which prevent performance of the contract and which could not have been foreseen or avoided by a prudent person.

**Note :** "Unprecedented flood" means the flood crossing the High Flood Level of the past \_\_\_\_\_ year(s) which is on the available record.

(Modified Vide R & B D. G. R. No. TNC - 1096 - IB - 143 - (16) - C dated 11-1-99)

**25. Time of taking over :**

The work shall for the purpose of all the provisions of these conditions be deemed to have been completed and taken over by the Governor of Gujarat when the Engineer, shall have certified in writing that it has been completed in accordance with the Contract conditions and such Certificate shall not be unreasonable withheld nor shall the Engineer delay its issue on account of commissions or defects which in his opinion do not effect the efficient use of the work, but such issue shall be without prejudice to the Contractor's liability to make good any such omissions and defects with the greatest possible expedition.

**26. Death & Bankruptcy :**

If the Contractor shall die, or become insolvent or bankrupt or have a receiving order made against him or compound with or make no proposal carrying on his business under inspection or for the benefit of his creditors, or commit an act of insolvency or bankruptcy, or being a corporation be ordered to be wound up or have a received of its business appointed the Governor of Gujarat shall be entitled forthwith by notice in writing to the Contractor his legal representatives to determine the contract and the Governor of Gujarat may in that event complete the contract in such time and manner and by such person as he shall think fit.

**27. Disputes to be referred to Gujarat Public Works Disputes Arbitration Tribunal :**

The disputes relating to this Contract in so far as they fall within the jurisdiction of Gujarat Public Works Disputes arbitration tribunal shall be referred to the said Tribunal of Gujarat State.

However the reference to Arbitration Tribunal under this clause will not stay fulfillment of obligations of the contractor or rights of the Engineer-in-charge under this contract, unless otherwise ordered to the contrary by the said Tribunal as Interim Relief measure.

**(The following clause is to be deemed included in this conditions only when Plant or Machinery is included in the Contract).**

**28. Contract Drawings :**

The contractor shall submit to the Engineer for his approval on or before the dates stipulated for this purpose in the specification copies of all the drawings of the general arrangements of the plant as set out therein and of such detail

drawings as may be reasonably necessary.

Within Fourteen days from the receipt, by him of such copies the Engineer shall signify his approval or otherwise of the same and if he does not do so he shall be deemed to have approved thereof.

Within Fourteen days from the notification by the Engineer to the Contractor of his approval such copies, or in the absence of such notification within thirty days from the receipt of such copies, the copies in ink on tracing cloth or ferrographic prints mounted on cloth, of all drawings as approved shall be supplied to the engineer by the contractor respectively and shall thereupon be signed by the contractor and become the property of the Governor of Gujarat.

Such signed copies of the drawing shall not be departed from in any way whatsoever except with the written permission of the Engineer. During the execution of the works of the signed copies shall be always kept available for reference on the site.

In the event of the Contractor desiring to keep in his own possession a signed copy of the drawings as approved he shall supply three copies instead of two and in this case the Engineer shall sign the third copy and return the same to the Contractor.

### **29. Manner of Execution, Quality of materials etc. :**

The plant shall be manufactured, constructed, provided, put in position and maintained in the best and most substantial and workmen like manner and materials of the best and approved qualities having regard to their respective uses.

### **30. Tests on site :**

In all cases where the special conditions are provided for tests on the site whether of plant, materials or workmanship the Governor of Gujarat except where otherwise specifically stipulated shall provide free of charge such labour, materials fuel stores, apparatus and instruments as may be requisitioned from time to time efficiently to carry out such tests in accordance with the condition.

Where electrical energy is required for tests on site and a supply is available on the site from an existing installation such electrical energy shall be supplied to the contractor by the Govt. free of charge at the pressure and frequency of the ordinary supply is available the electrical energy necessary for such tests shall be provided by the contractor.

### **31. Delivery of plants & materials :**

No Plant materials shall be tendered for delivery until an intimation in writing shall have been given to the contractor by the Engineer that Governor of Gujarat is ready to take delivery.

### **32. Tests on completion :**

On the completion of the works on the site in accordance with the contract the contractor shall give the Engineer notice in writing of such completion. The Engineer shall after receipt of such notice by notice in writing under his hand for date and an hour on that date for the making of the test on site if any such are provided for the contract.

The contractor shall carry out such tests upon the date and at the hour so fixed and if the Engineer or his authorised representative shall attend on that date at that hours such test shall be carried out in the presence of the Engineer or such representative.

If any portion of the plant fails under the tests to satisfy the contract conditions similar tests according to the contract of the portion so failing shall if required by the Engineer or by the Contractor be repeated within a time to be fixed by the Engineer and the provisions of this clause shall apply to such repeat test as if they were the original tests and the contractor shall pay to the Governor of Gujarat all reasonable expenses to which he may be put by such tests.

If the tests or any repeated tests so required as aforesaid be not made by the Contractor on the date fixed as aforesaid for the same by the Engineer may proceed to make such test himself at the contractor's risk and expense.

If in any test under this clause the plant tested shall fail to satisfy the contract conditions the Governor of Gujarat shall as from the date stipulated by the contract for completion nevertheless have the right of using such plant until the same shall satisfy such conditions and such use shall be at the contractor's risk. In the event of the question whether the works have been completed in accordance with the contract or any question regarding such completion being submitted to Arbitration as any portion of the plant the Engineer may certify to be capable of being used on condition of paying to the contractor a sum calculated (according to the period or the use) at the rate of 5 percent per annum upon the amount withheld or deducted in respect of such plant.

### **33. Rejection of Defective work :**

If the works, or any portion thereof shall not in the opinion of the Engineer on the stipulated tests (if any) being made in accordance with the contract satisfy the contract condition within three months after the date stipulated for completion the engineer may give notice in writing to the contractor setting for the particular of the defects of particulars in respect of which the works in his opinion fail to comply with the contract conditions and requiring the contractor to make good, after or replace the same within such time to be specified in the notice as the engineer may consider reasonable and the contractor shall make good, after or replace the same as required by such notice and so as to make it comply with the requirements

of the contract condition within the time so specified. Should he fail to do so within that time the Governor of Gujarat may make good after or replace the same as so required and the cost of such making alteration good or replacement (less in the case of any replacement any sum which would have become due to the contractor under the contract in respect of the works replaced and which shall not have been paid to him) shall be paid by the contractor to the Governor of Gujarat on demand or should the Governor of Gujarat not make good, after or replace any defective works in respect of which such notice as aforesaid shall be given within six weeks from the date of the giving of such notice the contractor shall repay to the Governor of Gujarat all sums (if any) paid by him to the Contractor in respect of such works. Nothing contained in this clause shall prejudice or affect the rights of the Governor of Gujarat under the contract whether in the way of enforcement of penalties or otherwise in respect of any delay in the completion of this work.

**34. Use of plant of works pending making good :**

If at expiration of the time specified for making good, altering or replacing the plant of works in any notice given by the engineer to the contractor under the last preceding clause the contractor shall not have duly made good, altered or replaced the same in accordance with the contract the Governor of Gujarat shall be at liberty if he thinks fit to make use of the same for such time as shall be reasonably sufficient according to the circumstances to enable him, to make good after or replace the same (whichever he may see fit to do) provided that in respect of the period of such user, the Govt. of Gujarat shall not be entitled to any damages under clause 24 of these conditions and in the case of complete replacement the contractor shall be entitled to be paid in reasonable sum for the same.

**35. Workman's compensation in case of injury :**

The contractor shall be responsible for any compensation and shall pay to his workmen Compensation payable for injuries under, the workmen's Compensation Act, 1923 (VIII of 1923) hereinafter called the said Act. If such compensation is paid by Govt. as principal under sub-section (1) of section 12 of the said Act, on behalf of the Contractor, it shall be recoverable by Government from the contractor under sub section (2) of the said section such compensation shall be recovered in the manner laid down in clause 3 and 19 of the condition of contract.

**36. The Apprentices :**

The contractors shall afford or procure as the case may be every facility to Indian apprentices for practical training in the factory.

Owned managed controlled or patronized by them, so as to enable the Indian Apprentices to acquire full knowledge of the technique and work of their trade industry, calling or profession.

**37. Set-off Clause :**

Any sums of money due to the Contractor (including the security deposit returnable to the contractor under this contract shall be appropriated by the Government and shall be set off against any claim of the Government for the payment of sum of a money arising out of or under any other contract made by the contractor with the Government. When no such amount for purpose of the recovery from the contractor against any claim of the Government is available such a recovery shall be made from the contractor as arrears of land revenue.

**38. Appointment of Local Labourers :**

The Contractor should as far as possible obtain the requirement of labourers skilled and unskilled from the nearest employment exchange, so as to utilize the local employment potential. If there are no local employment exchange or such exchanges are not able to provide the required labourers locally, suitable local labours should be utilized to the maximum extent possible.

**39. Fairwages :**

If a contractor fails to pay within '7' (seven) days to the labourer (s) worker(s) the minimum wages prescribed by the Government under the Minimum Wages Act, 1949 as in force from time to time the Executive Engineer or the officer of a equal rank shall be at liberty to deduct the amount payable to the labourer (s) workers from his (contractor's) bill or deposit(s) payable by the contractor after making due inquiries and shall not be entitled to any payment or compensation on account of any loss that he (contractor) may have to incur of the action as aforesaid. Before the action as aforesaid is enforced notice in writing to the contractor shall be issued by the Executive Engineer or the officer of the equal rank to pay the wages as per minimum Wages Act in force at the relevant time. If the contractor does not act as aforesaid within seven days then the action contemplated as above shall be taken against him.

Signature of contractor/s

Executive Engineer.  
Division

**Specifications for Electrical Works in Government Building Subject to the General  
condition of Contract in force**

(1986)

General

1.     Wirings Rule: The installation generally shall be carried out in conformity with relevant Indian standard. Specification of and code of practices prevalent, Indian Electricity Rules, 1956 and Indian Electricity Act. 1910 as amended from time to time.
2.     Definition : The definition of terms shall be in accordance with Indian standard code of Practice for Electrical wiring installation IS-732-1982 except for the definition of point in case of internal Electrical Installation. For definition of point wiring and measurement of Electrical works IS-5908-1970 shall be referred to.
3.     Voltage and Frequency of supply:  
All current consuming devices shall be suitable for frequency of 50C/s and systems of voltage manual for unless otherwise specified.
4.     Layout of wiring and its description:  
(i) The wiring shall be carried out as per schedule "Power" wiring must be in screwed conduit and shall be kept separate and distinct from lighting wiring. All wiring must be done on the distribution system with main and branch distribution boards at convenient centers and without isolated fuses. All conductors shall be run as far as possible along the walls and ceiling as to be easily accessible and capable of being thoroughly inspected. The balancing of circus will be arranged before hand by the Ex. Engineer Electrical Division.  
(ii) Within one month of the taking over the installation, the contractor shall supply to the Ex. Engineer Elect. Division a complete set of wiring diagrams of the same on drawings to be supplied when available by the Executive Engineer Electrical Division and to the satisfaction of the Ex. Engineer, Elect. Dept. and these wiring pains shall be "Drawings" within the meaning of the term as used in the General conditions of contract.
5.     Conductors:  
All conductors unless otherwise specified shall not be less than 1.5 sq. mm. for point wiring and 2.5 sq. mm for mains conductors for power and lighting circuits shall be adequate size to carry the designed circuit load without exceeding the permissible thermal limits for the installation, and such sizes will be stipulated in specifications and or drawings.
6.     Cables:
  - 6.1    All cables shall conform to relevant Indian Standards.
  - 6.2    Conductors of all cables except the flexible cable shall be of aluminum. The smallest aluminum conductor for the final circuit shall have nominal cross sectional area of not less than 1.5 sq. mm. The minimum size of the aluminum conductors for power wiring shall be 4 sq. mm.

6.3.1 Conductors of flexible cables shall be of copper the minimum cross sectional area of such a cables shall be 14.0193 mm. the Flexible cable shall have uniform and adequate insulation.

6.3.2 Unless the flexible cables and conductors are protected by armour or though rubber or PVC Sheath, theses shall not be used in workshops and other places where they are liable to mechanical damage.

6.3.3 Core flexible cables shall be used for connecting single phase Appliances or phase, natural & earth connections.

7. Fall of Potential: The Cross sectional area of all conductors inside buildings shall be so proportioned to their lengths that the drop in voltage between main fuses and the farthest point or any lamp shall not exceed three percent of the voltage of the consumer's with all the consuming devices in use.

7.1 If the Cable Size is increased to avoid the voltage drop in circuit current rating of the cable shall be more than that for which circuit is designed. In each circuit or sub circuit or sub circuit every cable shall have current higher than the full load current.

8. Ratings of lamps and fans socket outlets: Points and exhaust fans

8.1 Incandescent lamps installed in residential and non-residential building shall be rated at 60 watts & 100 watts respectively.

8.2 Table fans and ceiling fans shall be rated at 60 watts, exhaust fan shall be rated at 100 watts and 1000 watts respectively for the purpose of load assessment unless actual values of the load are, know or specified.

8.3 5 Amp. Socket outlet points and 1 5 Amp. Sockets outlet points shall be rated at 1 00 watts and 1 000 watts respectively for the purpose of load assessment unless actual values of the load are know or specified.

9. Tests:

9.1 Before the installation is commissioned following tests shall be carried out.

- (1) Insulation Resistance Test.
- (2) Polarity Tests of Switches
- (3) Earth continuity tests
- (4) Earth electrodes Resistance test.

9.2.1.1 The insulation Resistance shall be measured between earth and the whole system of conductors or any section thereof with all fuses in place and all switches close, and except in earthed concentric wiring all lamps in position or both poles of installation otherwise electrically connected together. A direct current pressure of not less than the twice working pressure provided that it need not exceed. 500 volts for medium voltage circuits where the supply is derived from three wire D.D or a ploy phase A.C. system, the neutral pole of which is connected to earth either direct or through added resistance, the working pressure shall be deemed to be that which is maintained between the phase conductor and the neutral.

9.2.1.2 The insulation sentence shall also be measured between all conductors to one pole or phase conductor of the supply and all the conductors connected to the neutral or to the order pole or phase conductors of the supply with all lamps in position and switches in "OFF" position and its value shall be less than specified in sub-clause 9.2. 1.3

9.2.1.3 The insulation resistance in Mega-ohms measured as above shall not be less than 50 mega ohms divided by the number of outlets or when PVC insulated cables are used for wiring 12.5 mega ohms divided by number of outlets.

9.2.1.4 Where a whole installation is being tested a lower value than that given by the formula subject to a minimum of 1 mega ohm is acceptable.

9.2.1.5 A preliminary and similar test may be made before lamps, etc., are installed and in this event the insulation resistance to earth should be not less than 100 mega ohms divided by the number of outlets or when PVC insulated cables are used for wiring 25 mega ohms divided by number of outlets.

9.2.1.6 The term "Outlet" includes every switch except that a switch combined with a socket outlet appliance or lighting, fitting is regarded as one outlet.

9.2.1.7 Control rheostat heating and electric sign may, if required, be disconnected from the circuit during the test, but in that event the insulation resistance between the case or frame work, and all live parts of each rheostat, appliance and sign, shall be not less than that specified in the relevant Indian Standard Specification or where there is no such specification shall be not less than half a mega ohm.

## 9.2 Polarity Test:

9.2.2.1 In a two wire installation a test shall be made to verify that all switches in every circuits have been fitted in the same conductor throughout & such conductor shall be labeled or marked for connection to the phase conductor or to the non-earthed conductor of the supply is fitted in a conductor which is labeled or marked for connection to one of the phase conductor of the supply.

9.2.2.2 In a three wire or a four wire installation a test shall be made to verify that every non-linked single pole switch is fitted in a conductor which is labeled or marked for connection to one of the phase conductor of the supply.

9.2.2.3 The installation shall be connected to the supply for testing. The terminals of all switches shall be tested by a test lamp one lead of which is connected to the earth. Glowing of test lamp to full brilliance when the switch is in on position irrespective of appliance in position or not shall indicate that the switch is connected to the right polarity.

## 9.2.3 Earth Continuity Test :

The earth continuity conductor including metal conduits and metallic envelopes of cables in all cases shall be tested for electric continuity and the electrical resistance of the same along with the earthing lead but excluding any added resistance or earth leakage circuit breaker measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

### 9.2.3.1 Earth Electrode Resistance Test:

Earth electrode Resistance test may be carried out by megger Earth Testers containing a direct reading ohmmeter, a hand driven generator and auxiliary electrodes.

9.3 On completion of an electric installation (addition and alteration) a certificate shall be furnished by the contractor countersigned by the certified Supervisor under whose

direction supervision the installation was carried out. This certificate shall be in the prescribed form as given in Appendix-B in addition to the test certificate required by Local Electrical Supply Authorities.

10. Joint and looping back :

Unless with the sanction of Ex. Engineer, Electrical Divisions all joints in conductor shall be means of approved mechanical connectors in suitable and approved junction boxes but looping back system shall be preferable. in wiring unless otherwise specified phase and live conduct shall be looped at the switch box where a neutral conductor can be looped from light, fan or socket in non-residential buildings neutral and earth continuity wire shall be brought to each of the switch boards should be of adequate size to accommodate at least one number of 5 Amps, socket outlet and control switch in future.

11. Switches:

Main Switchgears, Switch Board and their location:

11.1 All main switches (other than loss of iron clad pattern) carrying current of 10 Amp. and above shall be provided for back connections and shall be suitably protected.

11.2 All switches and circuit breakers shall be constructed in accordance with the I.S. 4237-1967. General requirement for switchgear and control gear for voltage not exceeding 1000 volts and other relevant I.S. provided also that spring shall be either of phosphor bronze or if steel shall be copper or Nickel plated and that handle shall be so fastened that they do not tend to unscrew or become loose.

11.3 All main switches shall be either of metal clad enclosed pattern or any insulated enclosed pattern which shall be fixed at close proximity to the point of entry of supply.

11.4 Switch boards shall not be erected above gas, stoves, or within 2.5 mm of any washing unit in the washing rooms of laundries or in the bath rooms, lavatories, toilets or kitchens.

11.5 Switch boards, if unavoidably fixed in places likely to be exposed to weather, to drip or to abnormal moisture temperature the outlet casing shall be weather proof and shall be provided with glands or bushing of adopted to receive screwed" conduit according to the manner in which cables are run P/C and double flanged bushes shall be fitted in the holes of the switches for entry and exit of wires.

11.6 A Switch board shall be installed so that its bottom is within 1.25 mm above the floor unless the front of the switch board completely enclosed by a door or the switch board is located in a position to which only authorized persons have access.

11.7 Switch boards shall be recessed in the wall if so specified in the schedule of work or in the special specification. The front shall be fitted with hinged panel of other suitable material such as Bakelite in wood frame with locking arrangement, the butts surface of door being flush with the walls. Ample room shall be provided at the back for connections and at the front between the switchgear mountings and the door.

11.8 Equipments which are on the front of a switch board shall be so arranged that inadvertently personal contact with live parts is unlikely during the manipulation of switchgears. Changing of fuses or like operations.

11.9 No holes other than the holes by means of which the panel is fixed shall be drilled closer than 1.3 from any edge of the panel.



- 11.10 The various live parts, unless they are effectively screened by substantial barriers of non hygroscopic, nonflammable insulating material, shall be so spaced that space shall not be maintained between such parts and earth.
- 11.11 The arrangement of gear shall be such that they shall be readily accessible and their connections to all instruments and apparatus shall also be traceable.
- 11.12 In every case in which switches and fuses are fitted on the same panel, these fuses shall be so arranged that the fuses are not alive when their respective switches are in the off position.
- 11.13 No fuses other than fuses in instrument circuit shall be fixed on the back of or behind a switch board panel or frame.
- 11.14 All the metal switchgears and switch boards shall be painted, prior to erection with one coat of antirust primer, After erection they shall be painted with two coats of approved enamel or aluminium paint as required on all sides wherever accessible.
- 11.15 All switch boards connected to medium voltage and above shall be provided with "Danger Notice Plate" conforming to relevant Indian Standards.

## 12. Control at Point of Commencement of Supply :

- 12.1 There shall be a linked main switchgear with fuse on each live conductor of the supply mains at the point of entry. The wiring throughout the installation shall be such that there is no break in the natural shall also be distinctly marked. In this connection Rule 32(2) of the Indian Electricity Rules, 1966 (See Appendix-A\_ shall also be referred.
- 12.2 The main switchgear shall be situated as near as practicable to the termination of services line and shall be easily accessible without the use of any external aid.
- 12.3 On the main switchgear, where the conductor of a two wire system or any earthed neutral conductor of a multi wire system or a conductor which is to be connected thereto, an indication of a permanent nature shall be provided to identify earthed neutral conductor. In this connection Rule 32(1) of Indian Electricity Rules, 1956 (see appendix 'A') shall be referred.

## 13. Switch Board & Distribution Boards :

I Metal clad switch gear shall preferably be mounted on any of the following types of Board.

### 13.1 Hinged type Metal Board :

There shall consist of a box made of sheet metal not less than 2 mm thick and shall be provided with a hinged cover to enable the board to swing open for examination of the wiring at the back. The joints shall be welded. A teak wood board, thoroughly protected both inside and outside with good insulating varnish conforming to

IS : 347-1952 specification for varnish sheath for General purpose and of not less than 6.5 mm thickness shall be provided at the back for attachment of incoming and outgoing cables. There shall be a clear distance of not less than 2.9 cm between the teak wood board and the cover, the distance being increased for larger boards in order that on closing of the cover, the insulation of the cables is not subjected to damage and no short length of cables is subjected to excessive twisting or bending in any case.

The board shall be securely fixed to the wall by means of lag bolts, plugs or wooden Gut ties and shall be provided with a locking arrangement and an earthing stud. All wires passing through the metal board shall be bunched. Alternatively, hinged type metal boards shall be made of sheet covering mounted on channel or angle iron frame.

Note: Such type of boards is particularly suitable for small switch-boards for mounting metal-clad switchgear connected to supply at low voltages.

13.2 Fixed type Metal Boards:

These shall consist of an angle or Channel of iron frame fixed on the wall or on floor and supported on the wall at the top if necessary. There shall be a clear distance of one meter in front of the switch board. If there are attachments of base connections at the back of the switch board Rules 51(1)c) of Indian Electricity Rules, 1956 shall apply

NOTE: Such type of boards is particularly suitable for large switchboard for mounting large Number of switchgears or higher capacity metal clad switchgears of both.

13.3 Teak wood Boards:

For small installation connected to a single phase 230 volts supply teak wood boards may be caused as main boards or sub-boards. These shall be of seasoned teak or other durable wood with solid back impregnated with varnish of approved quality with all joints dovetailed.

13.4 In large size medium voltage installations, before proceeding with the actual construction of the boards proper drawing showing the detailed dimensions and design including the disposition of the mounting a which shall be symmetrically and neatly arranged for arriving at the overran dimensions shall be prepare and approved by the engineer-in-charge.

13.5 Recessing of Boards:

Where so specified the switch boards shall be recessed in the wall. The front shall be fitted with a hinged panel of teak wood or other suitable materials, such as Bakelite, or with unbreakable glass doors in teak wood frame with locking arrangement, the other surface off the doors being flush with the walls, ample room shall be provided at the back for connection and at the front between the switchgear mountings.

13.6 Arrangement of Apparatus:

- a) Equipment which is on the front of a switch board shall be so arranged that inadvertently personal contact with live parts is unlikely during the manipulation of switches, changing of fuses or like operation.
- b) No apparatus shall project beyond any edge of panel. No fuse body shall be mounted within 2.5 cm of any edge of the panel and no hole other than holes by means of which the panel is fixed shall be drilled closer than 1.3 cms from any edge of the panel.
- c) The various live parts unless they are effectively screened by substantial barriers of non-hydroscopic, non inflammable insulating material, shall be so spaced that an area cannot maintain between such parts and earth.
- d) The arrangement of the gear shall be such that they shall be readily accessible and their connections to all instruments and apparatus shall also be easily traceable.
- e) In every case in which switches and fuses are fitted on the same pole, these fuses shall be so arranged that the fuses are not alive when their respective switches are in the 'OFF' position.

- f) No fuses other than fuses instrument circuit shall be fixed on the back of or behind a switchboard panel or flame.

### 13.7 Marking of Apparatus:

- a) Where a boards is connected to voltage higher than 250 volts, all the apparatus mounted on it shall be marked in the following colours to which the apparatus or its different terminal may have been connected.

Alternating Current	Direct Current
Three-phase-red	Three wire system-2 otherwise
Yellow & blue	Positive red & negative blue
Natural-black	Natural-black

Where fuse-wire three phase wiring is done, the neutral shall be in one colour and the other three wires in another colour

- b) Where a board has more than one switch shall be marked to indicate which section of the installation it controls)
- c) All markings required under the rule shall be clear permanent.

### 13.8 Main & Branch Distribution Board :

13.8.1 Main and branch distribution boards shall be any type mentioned in 13.1, 13.8.1.  
Main and branch distribution boards shall be of any type mentioned in 13.1

13.8.2 Main distribution boards shall be provided with a switch or air circuit breaker on each pole of each circuit, a fuse on the phase or live conductor and a link on the neutral or earthed conductor of each circuit. The switches shall always be linked.

#### 13.8.3 Branch Distribution Board:

13.8.3.1 Branch distribution boards shall be provided with a fuse of a miniature circuit breaker of both the (adequate rating-setting chosen on the live conductor of each circuit and the earthed neutral conductor shall be connected to a common line and be capable of being disconnected individually for testing purposes. At least one spare circuit of the same capacity shall be provided on each branch distribution board.

13.8.3.2 In residential installations, lights and fans may be wired on a common circuit such sub circuit shall not have [more than total after points of lights, fans and socket outlets/The load of such circuits shall be restricted to 800 watts. III a separate of a circuit is provided the number of fans in the circuit shall not exceed ten. Power sub-circuits shall be designed according to the load but in no case shall there be more than two outlets on each sub-circuit

13.8.3.3 In industrial another similar installations requiring the use of group control of switching operation, circuits, for (socket outlets may be kept separate from fans f<v>n lights. Normally fans and lights may be wired on a common circuit, however, if need is let separate circuits may be provided for the two. The road on any law voltage sub circuit shall not (exceed 3000 Watts.) In case of new installation, all circuits and sub-circuits shall be designed by making provision of 20 (percent increase in load due to any future modification.

Power sub-circuits shall be designed according to the load but in no case shall there be more than four outlets in each sub-circuit

#### 13.9 Installation of Distribution Boards:

13.9.1 The distribution fuse-boards shall be located as near as possible to the centre of the load they are intended to control.

13.9.2 These shall be fixed on suitable stanchion or wall and shall be accessible for replacement of fuses.

13.9.3 These shall be of either metal-clad type or damp situations, they shall be of the weather proof type and if instated where exposed to explosive dust, vapour or gas, they shall be of flame proof type

13.9.4 Where two or more distribution fuse boards feed low voltage these distribution boards shall be

- (1) Fixed not less than 2 mm apart or
- (2) Arranged so that it is not possible to open two at a time, namely they are interlocked and the metal case is marked Danger 415 volts or
- (3) Installed in a room of enclosure accessible to only authorized person.

13.9.5 All distribution boards shall be marked lighting, power as the case may be and also marked with the voltage and number of phases of the supply each shall be provided with a circuits list giving details of each circuit which it controls and the current rating of the circuit and size of fuse element.

13.9.6 Triple pole distribution boards shall not be generally used for final circuit distribution unless specification approval of Engineer-in-charge is obtained in special cases where use of Triple pole distribution boards are inevitable they shall be of H.R.C. fuse type only.

#### 13.10 Wiring and Distribution Board:

13.10.1 In wiring a branch board, total load of the consuming devices shall be divided as far as possible, evenly between the numbers of ways of the boards leaving the spare circuit for future extension.

13.10.2 All connections between pieces of apparatus or between apparatus and terminal son a board shall be neatly arranged in a definite sequence following the arrangement of the apparatus mounted thereon, avoiding unnecessary crossing.

13.10.3 Cables shall be connected to a terminal only by soldered or welded or crimped lugs using suitable sleeve, lugs or ferrules unless the terminal is such a form that it is possible to securely clamp them without the cutting away of cable strands.

13.10.4 All bare conductor shall be rigidly fixed in such a manner that a clearance of at least 2.5 cms. is maintained between conductor of opposite polarity or phase and between the conductors any material other than insulating material.

13.10.5 If required a pilot lamp shall be fixed and connected through on independent single-pole switch and fuse to the bus-bars of the board.

13.10.6 In a hinged type board, the incoming and outgoing cables shall be fixed at one or more points according to the number of cables on the back of the board leaving suitable space in between cables and shall also, if possible be fixed at the corresponding points on the switch board panel. The cables between these points shall be arranged to form a "U" or "S" shaped loop which shall be of such length as to allow the switchboard panel to swing through an angle of not less than 90

14. Capacity of Circuits:

14.1 Lights and fans may be issued on a common circuits and such a circuit shall not have more than a total of ten points of lights, fan and socket outlets or a load of 800 watts whichever is less. The power circuits shall be designed with a maximum of two outlets per circuits generally when load is not known or specified. In non-residential buildings at important District centers however one outlet per circuit may be preferred. The circuit shall be designed based on the loading of the

circuit where not specified the load shall be taken as 1 kw per outlet, where the load is more than 1 kw it should be controlled by a isolator switch or miniature circuit breaker.

15. Passing Through walls and floors:

15.1 Where conductors pass through walls one of the following methods shall be employed. Care shall be taken to see that wires pass very freely through protective pipe of box and that the wires pass through in a straight line without any twist of cross in wires, on other ends of such holes.

(a) A teak wood box extending through the whole thickness of the wall shall be buried in the wall and casings or conductors shall be carried so as to allow 1.3 cms air space on three sides, of the casing conductor.

(b) The conductor shall be caned either in a rigid steel conduit conforming to \*IS : 1653-1964 specification for Rigid Steel conduits of Electrical wiring (Revised) or a rigid non - metallic conduit conforming to \*IS : 2609-1963 specification of Rigid Non-Metallic conduits for Electrical Installations, or in a porcelain tube of such size which permits easy drawing in. The end of conduit shall be neatly bushed with porcelain, wood or other approved material.

(c) Insulated conductors while passing through floors shall be protected form mechanical injury by means of rigid steel conduit (see \*IS 1653-1964) to a height not less than 1.5 mm above the floors and flush with the ceiling below. This steel conduit shall be earthed and securely bushed.

15.2 Where a was tube passed outside a building so as to be exposed to weather the outer end shall be belt mounted and turned downwards and portly bushed on the open end.

16. Fixing to Walls and Ceilings:

Plugs for ordinary walls or ceilings shall be of while seasoned teak or other approved hardwood not less than 5 cm long 2.5 c.m. square on his inner end and 2 c.m. square on the outer end. They shall be cemented into walls to within 7.5 mm of the surface, the remaining being finished according to the nature of the surface with plaster of lime punning.

16.1 Where owing to irregular crossing or other reasons the plugging of the walls or ceiling with wood plugs presents difficulties, the weed casing weed pattern, metal conduit or clear (as the case may be) shall be attached to the wall or ceiling in an approved manner in the case of new building wherever possible teak wood plugs shall be fixed in the walls before they are plastered.

16.2 To achieve neatness, plugging of walls or ceiling may be done by an approved type of asbestos metallic or a fiber fixing plug.

17. Branch Switches:

Where the supply is derived from a three-wire or four-wire source, and distribution is done on the two wire system all branch switches shall be placed in the outer or live conductor of the circuit and no single-phase switch of use shall be inserted in the middle wire, earth or earthed natural conductor of the circuit. Single pole switches (Other than for multiple control) Carrying not more than 15 amperes any be of tumbler type which shall be 'ON' when the handle known is down.

18. Fittings:

Where conductors are required to be threaded through tubes or channels formed in the metal work of fittings Liofor must be free from sharp angles or projecting edges and such size that will enable them to be wired with the conductors used for the final sib-circuits without removing the boarding taping or outer covering as far as possible all tubes and channels should be of sufficient size of permit 'Looping bank' of wires cables and flexible cords other than those designed for high temperature shall not be used for wiring fittings except for portable fit limits. All fittings must have not less than a half inch male nipple Fittings and lamp holders for gas filled lamps shall be adequately ventilated.

18.1 Where light fitting is supported by one or more flexible cords the maximum weight to which the two flexible cords may be subjected shall be as follows.

Nominal cross Sectional Area cord mm <sup>2</sup>	No. & Dia in mm of wires.	Max. Permissible weight
0.5	16/0.2	1.7
0.75	24/0.2	2.6
1.0	32/0.2	3.5
2.5	48/0.2	5.3
3.5	80/0.2	8.8
4	128/0.2	14.0

18.2 No inflammable shade shall form a part of light fitting unless such shade is well protected against all risks or fire. Celluloid shade or light fitting shall not be used under any circumstances.

18.3 Fitting of wire : The use of fitting wire shall be restricted to the internal wiring and the lighting fittings. Where fitting wire is used for wiring, for the sub-circuit loads shall be terminated in a ceiling zone or connector from which they shall be carried into the fittings.

19. Lamp Holders : Lamp holders for use on brackets and the like shall be in accordance with \*IS : 1258-1967 specification for Bayonet lamp holders and all those for use flexible pendants shall be provided with cord grips. All lamp holders shall be provided with shade carriers. Where centre contact Edison screw lamp holders are used, the outer or screw contacts shall be connected to the middle wire, the natural and the earthed conductor of the circuit.

20. Outdoor Lamps:

External and road lamps shall have weather proof fittings of approved design so as to effectively prevent the admission of moisture. An insulating distance piece of moisture proof materials shall be inserted in the fittings. Flexible cord and cord grip lamp holders shall not be used where exposed to whether in veranda's and similar exposed situations where pendants are used, they shall be of fixed rod type

21. Lamps:

All incandescent lamps, unless otherwise required and suitable protected, shall be hung at a height of not less than 2.5 m above the floor level. They shall be in accordance with IS : 418 : 1957 specification for Tungsten Filament General Service electric lamps

22. Fans, Regulators and Clamps

22.1 Ceiling fans:

Ceiling fans including their suspension shall conform to \*IS 374-1960 specification for electric ceiling fans and regulators (Revised) & to the following requirements

- (a) All ceiling fans shall be wired to ceiling roses or to special connector boxes to which fans rod wires shall be connected and suspended from hooks or shackles with insulators between rod wires shall be connected and suspended from hooks or shackles with insulators between hooks and suspension rods. There shall be no joint in the suspension rod. but if joints be avoidable then such joints shall be screwed to special couplers of 5 cm minimum length and both ends of pipes shall touch together within couplers and shall in addition be secured by means of split pins alternatively the two pipes may be welded.
- (b) Fans clamps shall be of suitable design according to the nature of construction of ceiling on which these clamps are fitted in all cases fan clamps shall be fabricated from tested new metal of suitable sizes and they shall be as close fitting as possible Fan clamps for wood beams shall be of suitable flat iron fixed on two sides of the beam and according to the size and section of the beam one or two mild steel bolts passing through the beam shall hold both flat irons together Fan clamps for steel join shall be fabricated from tested flat iron to fit in rigidly at the bottom flange of the beam. Care shall be taken during form tested flat iron to fit in rigidly at the bottom flange of the beam. Care shall be taken during form tested flat iron to fit in rigidly to the bottom flange of the beam Care shall be taken during fabrication that the metal

does not crack while hammering to shape. Other fan clamps shall be made to suit the position, but in all cases care shall be taken to see that they are rigid and safe.

Note : All fan clamps shall be so fabricated that fans revolve steadily.

- (c) Canopies on top and bottom of suspension rod shall effectively hide suspensions and connections to fan motors, respectively.
- (d) The lead-in wire shall be of nominal cross-sectional area not less than 1.0 mm<sup>2</sup> with copper and 1.5 mm<sup>2</sup> aluminum and shall be protected from abrasion.
- (e) Unless otherwise specified the clear distance between the ceiling fan and the floor shall be less than 2.75 m

#### 22.2.0 Exhaust Fans:

For fixing of an exhaust fan a circular hole shall be provided in wall to suit the size of the fan which shall be fixed by the means of rag-bolts embedded in the wall the hole shall be neatly plastered with cement and brought to the original finish of the wall. The exhaust fan shall be connected to exhaust fan point which be wired as neat to the hole as possible by means of a flexible cord, care being taken that the blades in the proper direction.

#### 23. Attachment of fittings and accessories:

- 23.1 In other than conduit wiring all ceiling crosses, brackets, pendants and accessories attached to walls or ceiling shall be mounted on substantial teak wood block twice Varnished after all fixing holes are made in them. Blocks shall be not less than 4 cms deep. Brass screws only shall be used for attaching fittings and accessories to their base blocks.

#### 24. Interchangeability:

Similar part of all switches, lamp holder, distribution, fuse board, ceiling roses, brackets, pendants, fans and all other fittings of same type shall be interchangeable in each installation.

#### 25. Conduit Wiring System:

- 25.1.1 Type and size of conduit - All conduit pipes shall be conforming to \*IS : 1653-1964, furnished with galvanized or stove enameled surface. All conduit accessories shall be of threaded type and under no circumstances pin grip type or clamp type accessories be used. No steel conduit less than 16 mm in diameter shall be used. The numbers of insulated conductors that can be drawn into rigid steel conduit are given in Table II.
- 25.1.2 Bunching of cables - Unless otherwise specified, insulated conductors of AC supply and DG supply shall be bunched in separate conduits.
- 25.1.3 Conduit-Joints-Conduit pipes shall be joined by means of screwed couplers and screwed accessories only (\*IS : 2667-1964) Specification for Fittings for Rigid Steel Conduits for Electrical Wiring. In long distance straight runs of conduit inspection type couplers at reasonable intervals shall be provided or running threads with couplers and jam-puts (in the latter case the bare threaded portion shall be treated with anti - corrosive preservative) shall be provided. Thread on conduit pipes in all cases shall be between 11 mm to 27 mm long sufficient to accommodate pipes



to full thread portion of couplers or accessories. Cut ends of conduit pipes shall have neither sharp edges nor any or buries left to avoid damage to the insulation of conductors while pulling them through such pipes.

Table-II Maximum Permissible Number of 250-V Grade  
Single core cables that can be drawn into rigid steel  
Conduit  
(clause 6.51 1)

Size of cable Nominal Crossectional area	Number and Diameter in mm of wires	16 (No. of Cables Max)		20		25		32		40		50		63	
		B	S	B	S	B	S	B	S	B	S	B	S	B	S
1.0	1/1.12			5	4	7	5	12	10	20	14	-			
1.5	1/1.40	4	3	7	5	12	10	20	14	-	-	-			
2.5	1/1.80	3	2	6	5	10	8	16	12	-	-	-			
4	1/2.24	3	2	6	5	10	8	18	12	-	-	-			
6	(3/1.06*) (7/0.85) 1/2.80	2		3	2	6	5	10	8						
	(7/1.06*)														
10	1/3.55+	-	-	-	2	-	5	4	8	7	-	-			
16	7/1.40*	-	-	-	2	-	4	3	6	5	8	6			
	-														
	7/1.70	-	-	-	-	2	-	4	3	7	6	-25			
35	7/2.24	-	-	-	-	-	-	2	-	4	3	-			
	-	-	-	-	-	-	-	-	-	-	-	-			
50	7/2.50	-	-	-	-	-	-	2	-	5	4	6			
	5														
	7/3.00+	-	-	-	-	-	-	-	-	-	2	-			
	5	4	6	5											
	19/1.80	-	-	-	-	-	-	-	-	-	2	-			
	5	4	6	5											

\* For Cu. Conductors only

+ For Al Conductors only

Note-1 The cable shows the maximum capacity of capacity for the simultaneous drawing-in of cables. The table applies to 250 volts grade able the columns heads 'S' apply to runs of conduit which have distance not exceeding 4.25M between draw in boxes and which do not deflect from the straight by angle of more than 15°. The columns headed 'B' apply to runs of conduit which deflect from the straight by an angle of more than 15°.

**NOTE2:** 2 In case of inspection type draw-in box has been provided and if the cables is first drawn through one straight conduit, then through the drawn box, and then through the second straight conduit, such systems may be considered as that of a straight conduit even if the conduit deflects through the straight by more than 15°.

- 25.1.4 Protection against dampness - in order to minimize condensation or seat in inside the tube, all outlets of conduit system, shall be properly drained and ventilated, but in such a manner as to prevent the entry of insects as far as possible
- 25.1.5 Protection of conduit against rust - The outer surface of the conduit pipes including all bends, unions, tees junction boxes, etc., forming part of the conduit system shall be adequately protected against rust particularly when such system is exposed to weather in all cases no bare threaded portion of conduit pipe shall be allowed unless such bare threaded portion is treated with anti-corrosive preservative or covered with approved plastic compound.
- 25.1.6 Fixing of Conduit - Conduit pipes shall be fixed by heavy gauge saddles, secured to suitable wood plugs or any other approved plug with screws in an approved manner at an interval of not more than one meter but on either side of coppers or bends or similar fittings, saddles shall be fixed at a distance of 30 cm. from the centre of such fittings.
- 25.1.7 Bends in conduit - All necessary bends in the system including diversion shall be done bending pipes, or by insuring suitable solid or inspection type normal bends, elbows or similar fittings or by fixing cast iron inspection boxes whichever is more suitable. Conduit fitting shall be avoided as far as possible. On conduit system exposed to weather, where necessary, said type fitting shall be used. Radius of such bends in conduit pipes shall be not less than 7.5 cm. No length of conduit shall have more than the equivalent of four quarter bends from outlet, the bends at the outlets not being counted.
- 25.1.8 Outlets - All outlets for fitting switches etc., shall be boxes, of suitable metal or any other approved outlet boxes for other surface mounting or flush mounting system.
- 25.1.9 Conductors - All conductors used in conduits wirings shall preferably be stranded. No single core cable nominal Cross - sectional area greater than 130 mm shall be enclosed in a conduit and used for alternating current.
- 25.1.10 Erection and earthing of conduit - The conduit of each circuit or section shall be completed before conductors are drawn in. The entire system of conduit and permanently connected to earth conforming the requirements specified under pipe in a workman like manner for a perfect continuity between each wire and conduit. Gas or water pipes shall not be used as earth medium. If conduit pipes are liable to mechanical damage, they shall be adequately protected.
- 25.2 Recessed Conduit wiring system with Rigid Steel conduits - Recessed conduit wiring system comply with all the requirements for surface conduit wiring system specified in 6.5.2.1 to 6.5.2.4.
- 25.2.1 Making of chase - The chase in the wall shall be neatly made and be of ample dimensions to permit the conduit to be fixed in the manner desired In the case of buildings under construction chases shall be provided in the wall, ceiling etc., at the

time of their construction and shall be filled up nearly after erection of conduit and brought to the original finish of the wall.

25.2.2 Fixing of conduit in chase - The conduit pipe shall be fixed by means of staples or by means of soft saddles not more than 60 cm apart. Fixing of standard bends or elbows shall be avoided as far as practicable and all curves maintained by bending the conduit pipe itself with a large radius which will permit easy drawing in of conductors. All threaded joints of rigid steel conduit shall be treated with some approved preservative compound to secure protection against rust.

25.2.3 Inspection boxes - Suitable inspection boxes shall be provided to permit periodical inspection and to facilitate removal of wires, if necessary. These shall be mounted flush with the wall. Suitable ventilating holes shall be provided in the inspection box covers.

25.2.4 Type of accessories to be used - AM outlets such as switches and wall sockets, small is either of flush mounting type or surface mounting type.

(a) Flush mounting type - All flush mounting outlets shall be of cast iron mild steel boxes with a cover of approved insulating material or shall be a box made of a suitable insulating material.

The switches and other outlets shall be mounted on such boxes as would be approved. The metal box shall be efficiently earthed with conduit by an approved means of earth attachment.

(b) Surface mounting type - If surface mounting type outlet box is specified, it shall be of any type through flexible conduits of the same size as the rigid conduit.

25.2.5 When crossing through expansion joints in buildings, the conduit sections across the joint may be through flexible conduits of the same size as the rigid conduit.

25.3 Conduit Wiring System with Rigid Non-Metallic Conduits:

Rigid Non-Metallic conduits are used for surface recessed and concealed conduit wiring.

25.3.1 Type and size - All non-metallic conduits used shall conform to IS : 2509-1963 and shall be used with the corresponding accessories (See IS : 3419-1965) specification for Fittings for Rigid Non - Metallic Conduits).

25.3.2 Bunching of cables - Conductors of AC supply and DC supply shall be bunched in separate conduits. The numbers of insulated cables that may be drawn into the conduits are given in Table III. In this table space, Factor does not exceed 40 percent.

Table-III MAXIMUM PERMISSIBLE NUMBER OF 240 VOLTS GRADE SINGLE, GORE CABLE THAT MAY BE DRAWING INTO RIGID non-metallic conduits

Size of cable		Size of Conduits (mm)					
Nominal Cross	Number	16	20	25	32	40	50
Sectional area	and	(Number of Cables Max)					
mm <sup>2</sup>							
1.0	1/1.12*			5	7	13	20
1.5	1/1.40	4	6	10	14	-	-
2.5	1/1.80	3	5	10	14	-	-
	3/1.06*						
4	1/2.24	2	3	6	10	14	-
	7/0.85*						
6	1/2.80	-	2	5	8	11	-
10	1/3.55*		-	-	4	7	9
	7/1.40*						
16	7/1.70	-	-	2	4	5	15
25	7/2.24	-	-	-	4	2	5
35	7/2.50	-	-	-	-	2	5
50	7/3.00*)	-	-	-	-	2	3
	19/1.80						

\*For copper conductors only

\*For aluminum conductors only.

25.3.3 Conduit joints - shall be joined by means of screwed or plain couplers depending on whether the conduits are screwed or plain. Where there are long runs of straight conduit. Inspection type couplers shall be provided at intervals. For conduit fittings and accessories reference may be made to IS : 3419-1965.

25.3.4 Fixing of conduits - The provision of 25.1.6 shall apply except that the septum between saddles or supports is recommended to be 60 cms for rigid non-metallic conduits.

25.3.5 Bends in conduit - wherever necessary, bends or diversions may be achieved by bending the conduits (See 6.5.3.9) or by employing normal bends, inspection bends, impaction boxes elbows or similar fittings.

25.3.6 Conduit fittings shall be avoided, as far as possible on outdoor system.

25.3.7 Outlets - All the outlets or fittings, switches, etc. shall be boxes of substantial construction. In Order to minimum is condensation or sweating inside in side the conduit, all outlets of conduit system shall be properly drained and ventilated, but in such a manner as to prevent the entry of insects, etc. as far as possible.

25.3.8 For use with recessed conduit wiring system the provisions of 6.5.2.1 to 6.5.2.4 shall apply

25.3.9 Heat may be used to soften conduit for bending and forming joints in case of plain conduits. As the material softens when heated fitting of conduit in close proximity to hot surfaces should be avoided. Caution should be exercised in the use of the

conduit in locations where the ambient temperature is 500 C or above Use of such conduits in place where ambient temperature is 600 C or above is prohibited.

#### PVC INSULATED AND P.V.C. sheathed or T.R.S wiring SYSTEM

##### 26.0 GENERAL

This system of wiring is suitable for low pressure installation and shall not be used in places exposed to sun and rain or in damp places. Provided they are sheathed in the special approved protective covering and well protected to withstand dampness.

##### 26.1 Attachment to walls and ceiling:

26.1.1. All caies on brick walls, stone or plastered walls and ceiling shall be run on well seasoned perfectly straight and well seasoned, perfectly straight and well varnished on four sides, teak wood or any approved hard weed battens not less than 10 mm fin shed thick, width of which shall be such as to suit total width of cables laid on the batten, prior to election, these shall be paired with one coat of varnish or approved paint of colour to match with surrounding. These battens shall be secured to wall and ceilings by flat head wood screws to fawns plug or Phil plug at an internal not exceeding 75em. Wood plug can be used only with special approval of the Engineer in charge. The flat head wood screws shall be counter within wood batten and smoothed down

1.2 Where wiring is to be carried out along the face of the rolled steel joints a wooden batten adequate width shall first be laid on the same and dipped to it as in corispicousiy as possible. The wiring should then be fixed to this barking shall be suitable bushed to prevent the abrasion of the cables.

26.1.3 Attachment to false ceiling: In no case, the open wiring shall be run above the false ceiling without the approval of Engineer-in-charge

26.20 Link dips: Only aluminum alloy clips/joint clips shall be used. The thickness shall be 0.32 mm (30 SWG) for lengths of 50 mm to 80 mm. The width shall not be less than 8 mm in all these cases. Link clips/joint clips shall be so arranged that one single clip shall not hold more than two cores or three single core Tiffs of PVC insulated and PVC sheathed up to 2.5 sq. mm above while-a single clip shall hold a single twin core or two single core cables. The clips shall be fixed on varnished wood batten switch iron pins and space at interval of 15 cm bet in the case of horizontal and vertical runs.

26.3.0 Bends in wiring: The wiring shall not in circumscribes be bent so as to form and abrupt right angle but must be rounded off at the corners to a radius not less than six times the overall diameter of the cable.

26.4.0 Protection of wiring from Mechanical Damage:

26.4.1 In cases where there are chances of any damage to wiring such wiring shall be drawn complying with all the requirements of conduit wiring system.

26.4.2 Such protective covering shall in all cases be fitted on all down drops within 1.5m from the floor. or from floor level up to the switch board whichever is less.

26.5.0 Passing through floors: All cables taken through floor shall be enclosed in heavy gauge steel conduit extending 1.5m above the floor or up to the switch board whenever is less and flush conduits or pipes shall be neatly bushed with porcelain wood or other approved material. The conduit pipes shall be security earthed.

26.6.0 Passing through walls: When conductors pass through walls, anyone of the following methods shall be employed. Care should be taken to see that Wires pass very freely through protective pipe or box and those wires pass through in a straight line without any twist or cross in wires on their ends of such holders.

(a) A box of teak wood or approved hard wood extended through the whole thickness of the wall shall be buried in the wall and casings or conductors and casing or conductors shall be carried so as to allow 1.3 cm air space on the three sides of the casing of the conductor.

(b) The conductors shall be carried in. an approved heavy huge solid drawn or lap weld conduit or in aporce-tain of such a size that it permits easy drawing in, the enciad of conduit shall be neatly bushed with porcelain, wood or other approved material.

26.6.1 Where a wall tube passed outside a building so as to be exposed to weather, the outer end shall be mounted anutured downwards and property bushed or the open end, The conduit shall be neatly arranged so that the cables enter them without bending.

26.7.0 Buried cables: Tile HIS PVC sheathed cable shall not normally be burring directly in plaster. Where so specified in the special in the specification they may be taken in task wood channeling of .ample capacity or conduit pipe boned In The wall.

26.8.0 Stripping of outer covering: While citing and stripping of the outer covering of the, care shall be taken that the sharp edge of the cutting instrument does not tough the inner insulation of the conductors. The protective outer covering of the cables shall be stripped off near connecting terminals as far as practicable. Care shall be taken to avoid hammering on link clips with any metal instrument after the cables are laid. Where junction boxes are provided they shall be made moisture proof with a plastic compound.

## 27.0 PAINTING WORK IN GENERAL:

27.1 Paints: paints, oils varnishes etc. of approved make in original to the satisfaction of the Engineer -in charge shall only be used.

27.2 Preparation of surface: The surface shell be thoroughly cleaned and dusted before painting is started. The proposed surface shall be inspected by Engineer-in-charge or his authorized agent and shall have received the approval before painting is commenced.

- 27.3 Application: Paint shall be applied with brush. The paint shall be spread as smooth & even as possible particular care shall be paid to rivets, nuts bolts and cover lapping. Before drawing cut, it shall be continuously stirred, in the sardier containers with a smooth stick while it is being applied.
- Each coat shall be allowed to dry out sufficiently before a subsequent coat is applied
- 27.4 Scope: painting on old surface in in/door Situations will not include prior coat except where specially motioned in the schedule of work or special specification. However, where rust has formed on iron and steel surfaces the spots will be painted with one anti-rust primer coat.
- 27.5 Precautions: All furniture fixtures, glazing floors, etc. shall be protected by covering. All stains smears, oil-shirig, dropping of every kind shall be removed. While painting of wiring etc. it shall be ensured that painting of wall ceiling etc. is not spoiled in any way.
- 27.6 Painting of conduit and accessories: After installation surface of conduit pipes, fittings switch and regulator boxes, etc. shall be painted with two coats of approved enamel paint or aluminum paint as required to match the finish of surrounding wall, trussed, etc.
28. link clip: The clip for batten wiring shall be of Aluminum conforming to I.S. specification No. 2415-1975.

#### APPENDIX - 'A'

Important Clauses of Indian Electricity Rules, 1956. Following clauses of Indian Electricity Rule, 1956 shall in particular be taken care of in the execution of electrical works.

Clause No.

Subject

3. Authorization:
29. Construction, installation, protection, operation and maintenance of electric supply lines and apparatuses.
31. Cut-out on consumer's premises.
32. Identification of earthed and earthed neutral conductors and position of switches and cutouts therein.
33. Earthed terminal on consumer's premises.
34. Handling of electric supply lines and apparatus.

- 41. Distinction of circuits of different voltages.
- 42. Accidental charge.
- 44. Provisions applicable to protective, equipment.
- 45. Instruction for restoration of persons suffering form electric shock.
- 45. Precautions to be adopted by consumers, owners electrical contractors. Electrical workmen and suppliers.
- 46. Periodical inspection and testing of consumer's installation.
- 48. Precautions against leakage before connection
- 50. Supply to consumers.
- 51. Provisions applicable to medium high voltage installations.
- 58. Point of commencement of supply.
- 59. Precautions against failure of supply; Notice of failures.
- 61. Connection with earth, (low and Medium Voltage system.)
- 64. Use of energy at high and extra-high voltage system.
- 67. Connection with earth. (High & Extra-high voltage systage)
- 68. General conditions as to transformation and control of energy.  
All clauses under Chapter VIII on Overhead Lines.
- 137. Mode of entry.
- 138. Penalty for breaking seal.
- 139. Penalty for breach of rule 45.
- 140. Penalty for breach of rule 82.
- 141. Penalty for breach of rules.



APPENDIX - 'B'  
Form of Completion Certificate

I/We certify that the installation detailed below has been installed by me/us and tested

and that to the best of my/our knowledge and belief, it complies with Indian Electricity Rules, 1956, as well as the C.P.W.D. General Specification for Electrical Works, 1972.

Electrical Installation at Voltage and system of supply

(1) Particulars of works:

(a)	Internal Electrical installation	No. Total Load	Type of system or wiring
-----	----------------------------------	----------------	--------------------------

(i) Light point

(ii) Fan point

(iii) Plug point

(a) 3 pin 5 Amp.

(b) 3 pin 15 Amp.

(b) Others:

Description	HP/KW	Type of starting
-------------	-------	------------------

(a) Molars: (i)

(ii)

(iii)

(c) Other plants:

(d) If the work involves installation of over head line/or underground cable:

(a) (i) Type & Description of overhead line.

(ii) Total length & No. of spans,

(iii) No. of street light & its description

(b) (i) Total length of underground cable & its size

(ii) No. of joint.

End joint:

Toe Join

St. through joint:

2) Earthing:

(i) Description of earthing electrode

(ii) No. of earth electrodes:

(iii) Size of main earth lead:

3) Test Results:

(a) Insulation Resistance:

(i) Insulation resistance of the whole system Megohms.  
of conductors to earth.

(ii) Insulation resistance between the Mega ohms.

Phase conductors and neutral.

Between phase R and neutral.                      Mega ohms

Between phase Y and neutral Mega ohms

Between phase B and neutral                      Mega ohms

(iii)      Insulation resistance between the phase conductors in case of polyphase supply.

Between phase R & phase Y                      Mega ohms

Between phase Y & phase B                      Mega ohms

Between phase B & phase R                      Mega ohms

(b)      Polarity Test:

Polarity of non linked single pole branch switches.

(c)      Earth continuity Test:

Maximum resistance between any point in the earth continuity conductor including metal conduits & main earthing lead.

(d)      Earth Electrode Resistance.

Resistance of each electrode.

(i)      Ohms

(ii)      ohms

(iii)      ohms

(iv)      ohms

(e)      Lightning protective System:

Resistance of the whole of lightning protective system to earth before any bonding is effected with electrode and metal in/on the structure.

ohms

Signature of Supervisor

Name & Address

Signature of Contractor

Name & Address

## **SPECIFICATIONS**

All Specification standard publication etc. specified mean the latest standards, publication etc. pertaining to electrical and should conform to the following wherever applicable.

- 1) Indian Electricity Act. 2003 with its amendments.
- 2) Indian Electricity Rules 1956 and its amendments.
- 3) Indian Electricity supply Act 1948.
- 4) Regulation for Electricity Equipment in building by I.E.F. Landon.
- 5) The Factory Act, 1948 and its amendments.
- 6) I.S. 732\* 1982 Part -1, II & 1.11 code of practice for Electrical wiring and filings in buildings for low and medium voltages
- 7) I.S. 4064-1976 H.D. Air break switches and fuses for-Voltages not exceeding 1100 volts.
- 8) I.S. 3043 - Earthing code of practice for
- 9) I.S. - 1554 Part-11970 PVC insulated (Heavy duty) Electrical Cables for working voltages upto and unfading 110 volts
- 10) I.S. 694-1964 Part-11 - PVC insulated cable with Aluminum conduits (revised) for voltages upto 110 volts.
- 11) I.S.: 5908 -1970 - Electrical installations in buildings method of measurements of.
- 12) I.S.: 4237 -1967 - General requirement for switchgear and control gear for voltage not exceeding 1000 volts.
- 13) I.S.: 1653 -1964 - rigid steel conduits for electrical wiring (revised)
- 14) I.S.: 2509 -1973 - Rigid steel conduits for electrical installation (First revision)
- 15) I.S.: 1248 -1967 - Bayonet landholders (First revision)
- 16) I.S.: 418 1957 - Tungsten - Filament General service-electric lamps (Third revision)
- 17) I.S.: 374 -1966 - Fans and Regulators, ceiling type, electric (second revision)
- 18) I.S.: 2667 -1964 - Filings for rigid steel conduits for electrical wiring.
- 19) I.S.: 3419-1976 - Fining for rigid non-metallic conduits (First revision)
- 20) National Electric Code, 1986.

## **ANNEXURE-I**

Abstract of the Wiring Rules of the Institution of  
Electrical Engineer  
(Referred to in the specification)  
Division (See clause 2 of the specification)

### Systems:

All electrical system in which all the conductor and apparatus are connected to a common source of supply.

- 1) Earthed: Effectually connected, to the general mass of the earth. Solidly earthed without the Intervention of a fuse. Switch, circuit - breaker, resistor reactor or solenoid.
- 2) Un-insulated Conductor: A conductor without provision, by the Interposition of a dielectric or otherwise. for its insulation from earth.
- 3) Bare: Not covered with insulating material.
- 4) Dielectric: any material which offers high resistance to the passage of an electric current.
- 5) Bunch Conductor: When more than one conductor is contained within a single duct or groove or when they are run enclosed and spaced and not spaced apart from each other;
- 6) Points: In wiring as per IS: 5908 -1970 - Method of measurements of electrical installation in buildings.
- 7) Switch board: Assemblage pf switchgear with or without instruments, but the term does not apply to a group of local switches in a final sub- circuit where each switch has' its own insulating base.

Note: In the electricity (Factories Act) special regulations, 1908. and 1944 the term "Switchboard" includes "Distribution board."

- 8) Single pole switch: A switch suitable for closing and or opening a circuit on one phase or pole only.
- 9) Linked switches: A switch the blades of which are so linked mechanically as to make break all poles simultaneously or in a definite sequence.

- 10) Fuse Switch: A switch the moving part of which carries one or more fuses.
- 11) Three Wire System:
- a) Outer Conductor: Those between which there is the greatest difference of potential. This use of the word outer must not be confused with the use of the word when applied to the external conductor of a concentric main.
  - b) Neutral Conductors: The term includes the neutral conductor of a 3 phase 4 wire system, the conductor of a single phase or d. c. installation which is earthed by the supply undertaking (or otherwise at the source of the supply) and the middle wire or common return conductor of a 3 wire d.c. or single phase a.c. system.
- 12) Semi enclosed machine: One in which the ventilating openings in the frame are covered with -
- a) Girds expanded metal or wire gauze, with openings of less than 1/4 Inch but not less than so as to obstruct free ventilation.
  - b) Wire gauge. in which the openings are less than 1/4 inch but not less than 3/32 inch (diameter or width):
  - c) Screens with smaller openings than the above.
- 13) Totally - enclosed Machine:
- One in which the enclosing case and bearings are dust proof and which does not allow circulation of air between the inside and outside of the case.
- 14) Pipe Ventilated Machine: An enclosed machine in which, the frame is so arranged that the ventilating air may be conveyed to it through a pipe attached to the frame the ventilation opening maintained by the fanning action produced by the machine itself.
- 15) Forced draught machine: An enclosed machine in which the ventilating air supply is maintained by an independent fan external to the machine itself.
- 16) Protected Machine: One having ended shall bearings and in which is free access to the interior without opening doors or removing covers.

## SWICHES AND BREAKERS CIRCUIT

(See clause II of Specifications)

### 17) Switches and Circuits Breakers:

Switches and circuit breakers (rules 2b. 36 and 37) whether fixed separately or combined with lamps, holders of fittings, must comply with the following requirements:

- (a) Over threading must not take place at the point of contact or elsewhere, when the full current flows continuously.
- (b) They must be so constructed or arranged that the contacts cannot accidentally close when left open.
- (c) The base must be of incombustible, nonconductor and moisture proof material.
- (d) Circuit breaker as must be so arranged and placed that no combustible material is endangered by their action.
- (e) Unless placed in an engine room or in a compartment arranged for the purpose, they must have their live parts covered. The covers must be incombustible material and, must be either non-conducting or of rigid metal and clear of all internal machinery. For more than 6 amperes, air pressures exceeding 125 volts metal covers must be lined with insulating material.
- (f) In positions where they are liable to injure or come into contact with goods, they must be further protected by an open fronted box or other suitable guard.
- (g) Handles must be insulated so arranged that the hand cannot touch live metal, or be injured through an adjacent face blowing.
- (h) Switches having a handle projecting through an opening in the cover, must not be used.

Signature of Contractors

Executive Engineer

SECTION F-1A  
GENERAL REQUIREMENTS

1.1 Scope of works:

The work covered by electrical specification consists supplying and installing, electrical wiring system complete in strict accordance with this specification and the applicable drawing and subject to the terms and conditions of the contract./It includes.

- (a) Conduit and wiring system for fans, lighting points bells, clocks sockets, etc. including fixing of lighting fixtures and fans etc. and miscellaneous points.
- (b) Conduit and wiring system for exhaust fans, power sockets etc.
- (c) Panel boards, distribution boards, switch fuse units.
- (d) Complete power and lighting cable systems.
- (e) Grounding system.
- (f) Conduits system.
- (g) Street lighting system.
- (h) Other miscellaneous electrical work.

1.2 Completeness of Contract;

Any work fittings accessories or apparatus which may not have been specifically mentioned in the specification but which are necessary in the equipment for efficient working of the plant should be deemed to be included in the contract and should be executed and provided by the contractors. All plant and apparatus should be complete in all the details, where such details, are mentioned in the specifications or not.

Three prints and one permanent negative of each of the finally approved drawings incorporating all the modifications proposed by the Department should be submitted. No modifications should be made in a drawing already approved by the Engineer-in-charge without his prior consent.

Approval of the contractor's drawing will not relieve the contractor of any part of his obligation to meet all the requirements of the contract.

1.3 Guarantee:

The performance of all the equipments and the installation should be guaranteed at least a minimum period of one year from the date of taking over the installation by the Department. All equipments must comply with the relevancy IS-BS specifications.

1.4 Interchangeability:

All corresponding parts of similar plant and equipment should be interchangeable in every way.

1.5 Tools;

All special tools required for dismantling and assembly of the equipment covered by the contract shall be supplied as obligation under the contract.

A list of to be supplied by the Contractor should be submitted along with the tender

**SECTION F-2A**

- Specifications for Electrical Installation in Buildings

- GENERAL:

- These specifications relate to the electrical installations in the buildings of P.W.D. Electrical. The specifications cover general requirements to be fulfilled. These general specifications are supplemented by the specifications for the particular buildings separately attached.

- These specifications are governed by the General conditions of the contract attached hereto.

- APPLICABLE RULES AND REGULATIONS:

- Installation shall be carried out conformity with regulations for electrical equipments of buildings, published by the Institute of Electrical Engineers London (14th Edition 1966 and as amended upto date) herein after referred to as the I E. E. wiring regulations Where these specifications, or the special specifications for the particular building attached hereto are at variance with the I.E.E> regulation shall also comply with the requirements of the Indian Electricity Act, 1910 as amended upto date rules issued there under and also the regulations for the Electrical Association of India Where not specified otherwise, the installation should generally follow the Indian standard codes of practice and in their absence the relevant British Standard of practices. All the materials shall comply with the relevant Indian Standard of British Standard specifications

- DEFINITIONS:

- 1.4.1. The definitions of terms in the I.E.E. Regulations shall apply in general.

- DRAWINGS:

- 1.5.1. The preliminary drawings only indicate the general scheme of requirement. The exact position of all points, control switch boxes, runs of wiring and/or conduits joint boxes, inspection boxes, llains, and sub-distribution boards, mains etc shall be got approved Engineer-in-charge. All circuits shall be clearly numbered in wiring diagrams and building plans. The detailed design of a switch-board, special fixture or any other part of the electric installation as may be called for by the engineer-in-charge shall also be supplied by the Contractor and should be got approved by the Engineer-in-charge. Three sets of completion drawings and wiring diagrams showing the instillations as executed shall be supplied by the contractor along with the completion certificate.



- MATERIALS: All materials shall be new and of the best quality conforming to the relevant I.S.B.S. specifications. They must be the products of reliable manufacturers of many years or standings, All like parts of materials shall be interchangeable. In case of equipments such as circuit breakers; switch fuses etc. a descriptive and illustrated literature shall accompany the tender. The names of manufacturers' of various materials shall be furnished in perform in Appendix-1. Samples of materials wherever required should be deposited with the Engineer-in-charge. All materials shall be rust-proof or rendered rust proof by application of suitable paints. The supply of all equipments, switchgears etc. shall be complete with accessories. filings and mountings as may be required for their proper performance, and as specified in the relevant IS-BS Code of Practice and standards.
- WORKMANSHIP:
  - 1.7.1. Good workmanship and neat finished appearance are the prerequisites for complying with the clauses. of these specifications. With a view to ensure fine workmanship the Tenderer shall employ licensed wiremen with an experience of not less than 5 years in the type of work they are engaged. The work should be done under supervisions of licensed Electrical Supervisors with good educational qualifications and considerable experience.
  - 1.7.2 Tenderer shall furnish the names of Supervisor and their wiremen. who will be engaged in this work, with details of their experience.
- CO-OPERATIVE WITH CIVIL AND OTHER WORKS CONTRACTORS:

▪ The Tenderer after the award of the contract, shall co-operate with the civil and other contractors and shall coordinate his work of the other contractors with the least amount of dislocation and interference to the other works. Tenderer shall go through the drawings carefully and shall furnish the Engineer-in-charge with all the details of openings in the walls etc they may be required for concealing any of the electrical equipments or accessories. Where the contractor fails to furnish such information as may be required for the purpose of concealing the equipments etc. they shall be made at his (Contractor) cost and expense. Any alteration to parts of the building shall be made good at the contractor's expense and brought to the original shape finish and colour.

- TESTING: The electrical contractor shall be completely responsible of the testing and commissioning of those installations covered by these specifications in compliance with the standard procedure, in obtaining permission of the Government Electrical Inspector. Any modification which is demanded by Government Electrical Inspector shall have to be carried out within the scope of the contract. The contractor shall submit four copies of drawings of installations as per regulations for shall be provided by the contractor for carrying out the
- Installation work. All tests shall be carried out in the presence of the Engineer-in-charge or his authorized representative and his approval obtained for the test results.
- 1.10. COMPLETION CERTIFICATE AND MAINTENANCE GUARANTEE:
  - 1.10.1. After the completion of the installation and contractor should furnish a certificate in the Performa in Appendix-III, at the time of taking over the installation by the Department. The installation shall be guaranteed for period of 12 months from the date of taking over by the Department. During the period of guarantee all defects in material or workmanship shall be rectified or rectified or replaced free of cost to the Department.

- TENDERER'S ABILITY

- 1.11.1. In order to enable the Department to assess the ability of the Tenderer to execute the work, the Tenderer shall furnish evidence of his experience and capacity to carry out magnitude and nature.
  - RATES:
- 1.12.1. The rates of items shall include all traces, transport, loading and unloading charge and all such charges that may the market are not entertained Break up figure as required in the schedule of work shall also be furnished. As far as possible indigenous materials only shall be included for supply. Where It is unavoidable, imported items may be included and Tenderer should clearly indicate materials, quantity, rate and amount of these items.
  - STORAGE SPACE:
    - No covered storage space will be provided-by the Department. The contractor has to make his own arrangement. However, the Department may give an open space near the place of execution where the contractor can build his own stores for executing the work.
  - DEPARTURE FROM SPECIFICATIONS:
    - The Tenderer should clearly indicate departure, if any from the specifications with reasons for the same.
  - EXTRA ITEMS:
    - Rates for extra items shall generally be derived from the rates already available in the schedule. Where it is not possible, the rates shall be mutually agreed upon and contractor shall furnish a detailed analysis of the rates claimed by him.
- TECHNICAL SPECIFICATION:
- 2.1 Supply System:
  - The wiring installation shall be suitable for 3 phase 4 wire, 400-440 V 50 cycles system of supply Colour code of different phase shall be followed as per standard.
  - Wiring for Light and Fans:
- 2.2.2 Looping system to wiring shall be adopted. No joints shall be made at intermediate runs of cables and where they are unavoidable. such joints shall be through approved mechanical connections.
- 2.2.2 Point wiring:
  - Point wiring shall consist to the branch wiring from the board together with the controlling switch or push as far as and including the ceiling rose or any other approved connector or socket, outlets. In case of more than one light being controlled by one switch, the wiring upto the ceiling rose of the first light including the switch shall be considered as a Primary point. Loop wiring from light shall be considered as a 'Secondary' point and rates shall be quoted separately, including final connections to fixtures and plugs.
- 2.2.3 Conductors:
  - No conductor for final sub circuit wiring for light and socket outlets shall across-section less than that of 2.5 sq.m (aluminium)
- 2.2.4 Loading:
  - No final sub-circuit radiating from the fuse board of sub-distribution board and wires with 25 sq. m. (Al) cable shall carry more than 10 lights, fans or socket outlets or a connected load of 800 watts whichever is greater. The following wattages may be assumed for estimating the load on each sub-circuit unless otherwise known or specified.
 

○ Incandescent lamps	100 watts
○ Ceiling fans	60 watts
○ 5-A Socket Outlets (lighting)	100 watts
○ 4. ft. fluorescent tube	50 watts

- 5. ft. fluorescent. tubes 100 watts
  - In each sub-distribution board at least-one way preferably two ways shall be left spare for future requirement. A wiring diagram giving the exact Utilization of the ways shall be prepared and fixed in the sub-distribution board itself or any other easily accessible place. The ways of sub distribution boards shall be accordingly numbered.
- 2.2.5 Local Control Switches (General) :
  - Local control switches for circuit carrying net less than 5-5 shall be piano type and shall conform to relevant I.S. Standards. The switch shall be "ON" when the knob is in the down position. All local control switches shall be connected in the phase or live conductor only and in the natural conductor, switches shall be fixed in iron clad box and shall is so placed that the centre of the switch box is 1.3 Mtr. from the finished floor level unless otherwise
  - Stated. All switch boxes shall be provided with 1 /8" thick Perspex cover fixed to the switch box with chromium plated counter sunk screws (brass).
- 2.2.5A Switches (Two Way) :
- Two way swatches shall be piano type single pole, double throw, 250V, suitable for flush mounting and of 5A capacity as per the drawings. All switches shall be recessed in an embedded metal box.
- Each box shall have suitable outlet for fixing conducts directly.
- Each box shall have Perspex cover painted inside with the wall colour, if required.
- Each switch shall have suitable for the position in a stairway wiring. 2.2.5.B Switch Boxes (General) Electrical circuits shall be written suitable on the cover of all switched boxes, as approved by the Engineer-in charge (elect) whenever different phase are terminated in a switch box Bakelite partition shall be provided. Each cash shall be provided with a G.I. Earth stud nut and washers for earth connectors.
- **2.2.5B Switch Boxes (General):**
  - Electrical circuits shall be written suitably on the cover of all switches boxes, as approved by the Engineer-in-charge (Elect) whenever Different phase are terminated in a switch box Bakelite partition shall be provided. Each case shall be provided with a G.I. Earth stud nut and washers for earth connectors.
- 2.2.6 Ceiling Rose:
  - Ceiling rose shall be used on circuits having a normally exceeding 200V. Only one flexible cord shall be attached to a ceiling rose. Only 3-pin 5A socket outlet shall be provided in lighting circuits. All socket outlets be provided with a control switch and they shall be mounted in switch boxes in an approved manner.
- 2.2.7 Fittings:
  - These shall be of approved type as specified in the tender schedule. The subscripts leads should terminate in a ceiling rose or conductor in the fitting and internal connection made there from. Wherever these fitting are suspended they shall be done so through the conduits and ball and socket joint. All fittings shall be grounded by a G.I. conductor not less than 16 S.W.G.
- 2.2.8 Flexible wiring:
  - Flexible cords of not less than .23/0076 size be shall be used, The weight of suspension road shall be governed by I.E.F. Regulations.

- 2.2.9. Ceiling Fans:
  - All ceiling fans shall be wired to ceiling rose and suspended from a hook shackle or clamp and insulated from the same. All joints in the suspension, rod shall be screwed and means of split pins. The fan clamps supplied by the Contractor shall be suitable for the ceiling or roof member as the case may be. For concrete roofs, fan hooks shall be buried in concrete during concrete during construction in an approved manner and secure bound to the reinforcement.
- 2.2.10 Conduits and Earthing:
  - All conduits feeding lighting and circuits shall be provided with earth continuity G.I. conductor as specified for power wiring. All conduits shall be as specified for power wiring.
- 2.3.1 Point wiring:
  - Point wiring power shall be as defined under section 2.2.2 and shall include the switches and sockets.
- 2.3.2. Loading:
  - All distribution board for power wiring shall be not less than 15 A per way. Loading per way shall not exceed normally 100 watts. The following loads may be assumed if exact figure are not known.
  - 3-Pin 15A      Outlets 1.000 Watts
  - 3-Pin 5A       Outlets 100      Watts
- Wiring for Motors :
- 2.3.3.1 Final sub-circuits loop in motors shall be connected to separate ways of the Distribution board even if the current in the sub-circuit is less than 15A. No looping is permissible.
- 2.3.3.2 All wiring shall be carried in H.G. conduit as specified in I.S. specification for gauge for
  - Different sizes of conduit. When the motor is resiliently mounted fixable with approved adopters shall be used for the last few feet. Where cables are used sufficient loop shall be left.
    - All switch fuse units controlling circuits feeding motor shall be provided with H.R.C. fuses or as specified:
    - The frame of every motor and its association contra gear shall be earthed by two separate and distinct connections to earth connector shall be capable of carrying 3 times the rating of fuse or 1.1/2 time the setting of the circuit breakers but in no case than NO.8 S.W.G. or 7064" or equivalent cross section of copper. Where practicable, the earth connections shall be visible for periodical inspection. Gas or water pipes shall not be used for earth connections.
- 2.3.3.5 Socket Outlets and Control Switches of 5 A and 15 A :
  - All socket outlets shall be of 3 pin type, the third pin being connected to the earth stud of nearest distribution board by separate earthing wire: The socket shall conform to I.S.: 1293/1938, single pole, piano type. Each socket outlet shall be provided with a control switch of appropriate rating and as specified. The switch and socket shall be mounted inside the iron clad box provided with 1/8" Perspex cover as directed by the Engineer-in-charge or as specified in schedule of quantities. Inside switch box ample space shall be available around switches for connection wires to switches. All socket outlets for power

shall be mounted at the skirting level otherwise specified or as directed by the Engineer-in-charge.

- The three phase plug receptacles shall have their earth terminals connected by independent earth wires to ring main strip on the building. In buildings where explosion proof fixtures are installed single phase plug receptacles as well as light points shall be connected to ring main ground bus installed in the building by separate earth wires of approved size.
- Socket outlet shall have some provision not to receive the matching plug unless the grounding pin is in correct position. The grounding pin of the plug shall make the contact first and break the contact last at the time of inserting or removing the plug respectively.
- The grounding terminal shall be connected to the enclosed metal body providing G.I.Stud, nut washers welded to the box.
- Each unit shall be suitable for flush mounting as required and indicated in the applicable drawings.
- Combination unit socket outlet and switch shall be complete with necessary internal wiring. The switch/socket shall be mounted on M.S. bracket enclosed in a box.
- Conduit Wiring:
  - 2.4.1 Where conduit wiring is adopted type and size of the conduit shall be as indicated in the drawing. The minimum of the conduit shall be 19 mm.
  - 2.4.2 The contractor shall thoroughly study the structural of the buildings and wherever, necessary shall in consultation with Department's representatives at site, make suitable adjustments in the cable routings, earthing arrangements, and location boxes, fitting etc. with a view to avoid interference with any part of the building, structure, equipment or any other work in the building or to effect any improvement in the arrangement.
  - 2.4.3 Protection of conduit against rust:
    - Conduit shall be given two coats of oxide paint before they are placed in position. All exposed conduit shall be planed after installation with the colour as approved by the Engineer-in-charge. This does not apply to galvanized conduit.
  - 2.4.3.A. Protection against insects and damp:
    - In order to minimize condensation or sweating inside the conduit, system shall be properly drained and ventilated in such a manner as to prevent the entry of insects.
  - 2.4.4. Conduit shall first be installed as a complete system without cables and shall be continuous from outlet to outlet from fitting to fitting and mechanically and electrically connected to all boxes and fittings-

## 2.5. SPECIFICATION FOR POWER CONTROL AND TELEPHONE CABLES:

### I. SCOPE:

- i. The specifications cover the supply and medium voltage Power and control cables either in ground or trench depending on the conditions at site including accessories for the same. The work in general, consists of supplying, laying, jointing, terminating and connecting at 1.1. KV APLSTS PVC power and control cables.
- ii. The contractor shall supply all accessories including jointing and terminating materials, compound, tapes, supporting materials, cleats, cable lugs, concrete stable, bricks, sand, cable-markers etc. as required to make the installation work including digging and filling of the trenches as required.

II. SPECIFICATION:

- i. All power cables to be supplied mentioned as 'APLSTS' in the Schedule should be mass impregnated, non draining, paper insulated lead sheathed, double steel tape armored and must comply with the latest IS1BS specifications.
- ii. All cabling materials such as cable compound, cable lugs, taped shall be of approved quality acceptable to the type recommended by the manufacture of the cable for which it is used and approved by the Department.
- iii. Installation of all equipment shall also conform to the applicable. Codes and practice as per the IS and shall be executed to comply with the latest Indian Electrical rules as regards the safety, payable of equipments and other essential provisions specified therein.
- iv. Only approved make of cable shall be used. ICC and CCI will be preferred,
- v. The cables shall generally be laid as per is Code of practice.

III. GENERAL RULES CABLE LYING:

- i. Installation shall be carried out in neat workmen like manner by skilled experienced and competent workmen in accordance with the standard practices.
- ii. Cables shall be laid preferably in one length to avoid joins. If straight joints are found-necessary, these can be introduced with prior approval of the Engineer-in-charge. The cost of the straight joint however, shall not be borne by the Department. But in no case joint shall be within the conduit G.I. pipe and duct.
- iii. Proper care should be exercised in handling the cable to avoid formation of kind etc. and should it become necessary a cable be bent to a radius not less than 20 times the overall diameter of the cable.
- iv. Method of installation, routing of cable etc. shall in every case be subject to the Department's approval and the contractors shall modify and or certificate no extra cost to the Department's any portions of the installation which do not meet with the Department's approval. All damages to the civil and other works on this account shall be made good by the contractor at no extra cost to the Department. The electrical contractor while notifying the building contractor for such work shall furnish the proper draws, dully explaining the work involved of indicate at suit actual work to be carried out as may be required by the building contractor. The electrical of any such work as the electrical work with this to the same has been completed.
- v. Where cables pass through hume pipes, contractor shall fix hard wood bushed round the cables at the ends of hume pipes. Where the cables pass through the floors or chambers and in such situation's the Engineer shall require, the contractor shall seal cable holes in a manner approved by Engineer-in-charge. Where cable. pass through roads mullahs. etc. cables must be protected by class 'A' Hume pipe of diameters not less than 6. (15cms).

- vi. The cable routes shall be the shortest and these shall be minimum interference with built up areas, lawns etc.
- vii. Care shall be exercised for providing suitable props other service lines on earth at the time of excavation. Where cutting of a lawn inevitable it should be with the approval of the Engineers-in-charge.
- viii. Excavation of the trenches shall be executed with vertical sides and the trenches shall be kept as straight as possible. The exact location of each trench shall be settled by the Engineer-in-charge. On the site when the contract is in a position to commence each portion of the work.  
The trench shall be not less than 1/2 meter wide and 90 cms deep. If more, cables are to be laid, the width should be suitably increased.
- ix. After the cables are laid, the trench shall be filled in layers, the each layer being well rammed by spraying water and consolidated and sufficient allowance made for settlement. The extra earth over the trench should be removed from the place of trench to a place as decided by the Engineer-in-charge at site.
- x. Ends of cables shall be properly sealed to prevent entry of moisture prior to installation.
- xi. Where it is as specified as 1/2 core cables the 1/2 core shall be a natural conductor having reduced section.
- xii. For all multi core cables each core and tails shall be brought out, marked and or colored in an approved manner.
- xiii. Cables termination shall be done with suitable compression brass glands in the case of PVC cables and cast iron trifurcating boxes in the case of APLSTS cables. The Armour should be connected to the right main earth building with duplicate earth wires as per the relevant IS/BS specification.  
The core insulation over each conductor shall however be retained throughout the run of the conductor upto the end where lugs shall be fitted thereon for connections. The lugs shall be fitted by means of approved solder and the such as a lead and Solder NO.7 liberally used. The joint shall be mechanically strong and pressure tested.

## 2.6 DISTRIBUTION BOARDS AND PANELS.

### General Requirements:

- 2.6.2 All distribution panels shall comply with IEE. Rules 60-61. A clear distance of 0.91 meter in front of the switch board shall be kept. Where bare connections of attachment are provided at the back of the switch board the space behind the panel

shall be greater less than 0.299 meter or more than 0.762 main width there shall be a passage way from the further outstanding part of any attachment or conductor. If the space behind the switch board exceeds 0.70 main width there shall be a passage way from either end of the switch board clear to a height of 1.928m width 0.299 m. All wiring connection shall be made neatly and securely.

- 2.6.3 For circuits carrying more than 10 Amps, tinned cable sockets shall be used, all connections shall be so made as to form own diagram Circuit shall be clearly numbered to correspond to wiring diagram. Names of the distribution boards shall be painted as directed by the Engineer-in-charge. All the which fuse units and isolators D.Bs. shall be complete with earthing studs lugs neutral bar etc. H.R.C. fuses and of approved make.
- 2.6.4 Skeiten type panels shall have a rigid frame work adequately braced and supporting frames adequately braced over which sheet metal shall be neatly secured. All switches distribution boards etc. shall be neatly arranged on the panels and all connections made from the back of switches. The panels shall be rendered dust and vermin-proof. The interior of the panels shall not be accessible to unauthorized persons.
- 2.6.5 The recess type boards shall be embedded in wall in a cupboard with a metal hinged door with locking arrangement. In all recessed conduit work all distribution boards shall be recessed. Where recessing is not possible, free standing panel may be provided as approved by the Engineer-in-charge.
- 2.6.6 All individual components the switch fuse units D.Bs. etc. shall be connected by earth connected by earth continuity wire of appropriate size with the main earth bus of the D.B. etc. The panel switches of D.Bs. shall be earthed by the less than 2 distinctive paths to earth. Earthing of metallic parts of exposed metal shall not be effected through any structural metal work which houses the installation. Where metallic parts are not required to be earthed and are liable to become alive should the installation of the contractor become defective such metallic parts shall be separated by durable non conducting material from any structural work.
- (a) Power panels shall be 3 phase, 4 wire, 400/230 volts for the distribution of 3 phase or single phase power loads. Lighting panels shall be 3 phase 4 wire 400/230 volts for single phase lighting load distribution on all 3 phase.
- (b) All panels shall be done of protected front type with no mechanical or electrical defects.
- (c) Bus bars shall be of electrolytic copper or aluminum as specified and the properly tinned sizes as indicated on applicable drawings as required.



- (d) All knock outs for branch circuits entries shall be drilled and filled as required, for lighting panels the top and bottom cover plates shall be removable type. ,
- (e) Main disconnect device for all panel boards shall be of switches of disconnect type and of the size as indicated shall be mounted directly below the panel or through a short thread conduit of required size.
- (f) The main disconnect for all panel boards shall have an entry suitable for PVC Armored cable from bottom.
- (g) All panel boards shall be provided with an earthing terminal and lug for connection to the grounding system.
- (h) Temperature rise of all electrical parts shall not be more than 300c With full load amperes at room temperature.
- (i) All barnes and supports of current carrying parts shall be of moisture resistant insulating material and shall not be adversely affected by arcing.
- (k) The locations of panels shown in the drawings are only tentative; panels may be located at a place approved by the Engineer-in-charge.
- (l) All civil works connected, with fixing such as grouting chasing and making good shall be the Tenderer responsibility.
- (m) Wires adequate capacity with proper size of lugs shall be used for inter connections.
- (n) Panel should be self supported on angle channel iron frame work. It should be preferably of bolted construction in case bolted or grated rigidly after leveling and alignment.
- (o) The cupboard and D. B. should be of such size so to be accommodated in the existing room as per I.S. codes of practice for installations of Medium voltage switchgear.
- (p) Fabrication drawing showing the detailed dimensions and panels and its components indicating the frame work, earthing positioning of switches. 6 Bs. cable boxes, adopter chambers etc shall be furnished to the Engineer-in-charge for his approval. All material to be got approved by the Engineer-in-charge. Panel should be guaranteed for satisfactory operations for a period of one year after handing over.
- (q) The panel should be painted with anticorrosive paint suitable for humid ,and salty atmosphere on two coast to primer.

Switch Gears, powers panels D. B. And S.F. Us.

Phase bus bar, the Sizes of the bus bars shall be so selected that the current density in bar does not exceed 150 amps, per sq. m. for copper. The length of bus-bar chamber should be as suitable length to fix all the switches etc. as per the prevailing standards, clear spacing of two adjacent buses shall be 1 a/2" minimum bar should be tased all along with colour coated 11 KV grade PVC tape The maximum internal of support for each unsupported length shall exceed 600 mm.

## SWITCH GEARS, POWERS PANELS D.B. AND S.F. U.S.

2.6.8 The bus bar shall be of copper/aluminum and fabricated to the relevant standards specification. In case aluminum bus bar is used special with high conductivity aluminum bus bar alloy E 91 C frame conforming to E.S.S. 2898 shall be used. The current density shall not exceed 800A per sq. inch. Hylam barriers will be provided over the joints to prevent any short circuit.

The bus enclosing shall be made out not less than 16 gauges M. S. sheet construct on with angle iron support. All interconnections between bus bars S. F Us and O. Bs shall be of adequate size and details of such inter connection shall be furnished to the Engineer-in - charge for his approval.

The busbar shall be air insulated extensible type rectangular one. The bus bars chamber shall be dust tight by providing gaskets secured property so as to tender it veritin proof.

The combination fuse switch unit should comply with IS 4064 BSS61 and BBS 2510 wherever applicable. It should be suitable to accommodate High Rupturing capacity cartridge Fuse links complying with IS 2208 or BS 88 and having a certified rupturing capacity of not less than' 35 MVA at 4440 volts (ACS duly Q The switch gear (panrs D, Bs. etc. shall be installed generally as per is-Part -1 3072 and as specified and shown in drawings.

All fuse switch units shall be provided with, non-deteriorating HRC fuse links complying with IS 2208-1962 and having rupturing capacity of 35 MVA at 415 volts or as specified.

All switches above 60 amps, rating shall be provided with suitable size adapted boxes. All switches mounted-on the top of the busbars shall be provided ,with detachable type reverse entry adapter boxes. Suitably engraved tables shall be provided for each circuit as well as for the board.

A meters sector switches and LMH meter shall be provided where. Specifically mentioned. Small wiring for the inter-connecting shall be colour coded and provided with numbered teuses for easy identification of circuits.

- (a) The distribution boards should be totally enclosed metal clad complying with B. S. 214. The M. S. sheet steel enclosures for recessed D. Bs. shall be of not less than 14 gauges.
- (b) The D. B. shall be with hindod dooi and the locking arrangements as approved by the Engineer-in-charge.
- (c) All the components shall be enclosed in the enclosure. The mounting of D. B. shall be got approved by the Engineer-in-charge before carrying out the installation.

- (d) The D. Bs shall have proper side-cut outs for conduits entry or cable entry as required and these shall be made on site.
- (e) Adequate spacing shall be provided inside the D Bs. for easy removal of the fuses and carry out the interconnection.
- (f) A set of insulating beamers have to be provided between incoming breakers switches and fuses.

Switch fuses Units:

- (a) All the D.P.T.P. and T. PN. Switch fuse units shall be totally enclosed iron a clad quick Make, quick break type to best Indian make conforming to the I.S. or S. 3185 specifications. All the switch fuse units shall have mechanical Interlock with a door so that the door cannot be opened when the swatches are in ON position. The switch should be of double be i> \ solution type to ensure safely.
- (b) Each T.P & T.PN switch fuse unit shall be earthed with two distinct each connection.
- (c) Suitable insulator shall be provided between phases.
- (d) There shall be suitable natural link in the fuse box.
- (e) All T.P and T.PN: switch fuse units snail be rated for 500 volts and D.P, (required for single phase supply) and S.PN. Switches for 250 volts.
- (f) The H.R.C. catndge fuse shall conform to U.S. 88 (1952).

The O.C.Bs. ACS shall be suitable for 400/440 volts 3 phase escapable of interrupting a fault MVA of not less than 31. The circuit breaker shall conform to the BSS-936 1940. BSS 3659 with such tripping arrangement as many as required under special specification is for the building. Efficient and fool - proof mechanical interlocking shall be provided for the safe operation and maintenance. The rate is inclusive of the first filling of oil.

## 2.7 Instrumentation:

Tile instruments and meters wherever necessary shall be housed in special sheet steel box located between switch fuses units and bus bar chambers. The instruments etc. shall be mounted on the hinged cover with heir dial flushed. All instruments shall have protective H. R.C. fuse links. All interconnections and small wiring shall be neatly dressed arranged and duly coloured 10r easy identification of circuits.

Meters shall be provided as required in the Schedule, Meters shall be dead head and be suitable for 400/ 440 volt 3 phase 4 wire 50 c/cie (in balanced load) supply.

Each section switch shall be 3 point and of minimum 250 volts grade with silver tipped contact suitable for metering circuits, current transformers shall be of 5VA

burden and commercial metering accuracy. Indication lamps shall be panel mounting type preferably of 250V grade. Every unit shall be prewired and interconnected to the system for its required indicating performance. Indicating lamps shall have independent circuit fuse.

## 2.8 FIXING OF LIGHTING FIXTURES:

1. Location of fixtures their manner of fixing mounting height etc. are indicated in relevant drawing. Actual location and levels shall however be arrived at site in co-ordination with other service etc. and prior approval of the Engineer-in-charge regarding the actual location Manner of fixing shall be obtained before the work is taken up in hand.
2. In all cases the contractor shall provide necessary interconnection wiring earthing painting etc. all necessary for complete installation. The contractor shall also test and commission the fixtures during completion of the work.
3. General arrangement of fixtures layout is indicated in drawings. Care shall be taken to see that all light fixtures are in a row in a room or particular area, are in absolute line and plumb and are symmetrically disposed with respect to finished surfaces of walls, columns beams etc.
4. The inter-connections wiring from the light outlet point upto the fixture shall be carried out by means of flexible copper wire of section not less than 1.5 mm<sup>2</sup>.
5. All fixtures suspended by means of conduits shall be done with all and socket joints or as per approved design.

## 2.9 Telephone system:

1. Empty conduits shall be done recessed or exposed to surface along with pull boxes, junction boxes and telephone outlet boxes, in areas. and location as indicated in the relevant drawing as per materials and methods as described in regard to conduits under section "Wiring in conduits" except the G.I. pull wires of gauge not less than 20 SWG shall be kept pulled through conduits in all sections so that in future telephone wires can be pulled. easy.
2. Location shown on the drawing are approximate and final location shall be decided in the field by the Engineer-in - charge.

## SECTION-G

### SPECIFICATION FOR EARTHING &

#### 1. Installation of Earthing Plates:.

All installation of earthing shall conform to Indian Electricity Rules, IS - 3043 latest edition and I.E.E. the copper earth plates should be tinned before installation. the earth plates of copper 60 cm x 60 cm x 3.515 mm thick size as mentioned in the schedule be in separate pits at least 150 cms to 300 cms. Away from the building at a depth necessary to reach moist earth surface but with a minimum depth of 2.5 Mtr from the finished ground Level upto the top vertical dodge of earth electrode. The earth plate shall be thoroughly cleaned to remove all dirt from the surface and be tinned properly for electrical contact with the main ground. Each earth pit should be provided with 38 mm. dia . G.I. pipe 2.5 Mts.long or more depending upto the depth of pit, put over the vertical edge of earth plate (with top end of pipe provided with a closed to coupler.) Alternative layers of salt and coke shall be provided surrounding the plate. The pits shall be filled when the plates are in position and with the approval of Engineer-in-charge.

To facilitate watering the pit, a concrete compartment should be made-with funnel with mesh and cover plate as per rules provide in ISI regulation. The masonry endorser's shall be 25 cm x 25cm x 25 cm (deep) with C.I, lid of 23 cm x 30 cm x30 cms. Size. After installation, the earthing resistance of each earth plate should be measured by resistance meggar in the presence of Engineer-in-charge, three days after the completion of earthing work, and the value should conform to regulations.

Signature of contractors  
Mech. Division.

Executive Engineer (Mech),

AS PER LATEST APPROVAL OF SUPERITENDING ENGINEER  
(ELCTRICAL), R&B CIRCLE, GANDHINAGAR  
**LIST OF THE APPROVED PRODUCTS, R &B SOR 2013-2014**  
**CHAPTER – I**

**WIRING**

**1.1 SHOCKPROOF ACCESSORIES**

(A) Concealed / Surface Type

Any I.S.I.' marked Which is Approved by Department

**CATEGORY - I**

**1. ALLWYN - APPROVED**

M/s Allwyn Electricais Industire, 78, Kakad Industrial Estate, Lady Jamshedji Road, Mahim - Mumbai - 400016

**2. SAFECON'S**

M/s KALA ELECTRICAL INDUSTRIES, 12/A, Eagal Market, 90 Feet Road, Saki Naka, Mumbai - 400072

**3. MILLION & MILLTEC**

M/s Mutha Electricals

1940/4, Ehadia Cross Road, Gandhi Road, Ahmedabd ~ 01

**4. LEGENDSWIT**

M/S, MINAYAK ELECTRICAL INDUSTRIAL, Dal Mill, Opp.

Charch,

Behind Sonis Wadim SURENDRANAGAR - 363001

**5. VIMAL**

Mis Solanki Industries, 22/180, Motilalnagar, Opp Old best colony, Goregaon [W], MumbaJ

**CATEGORY - II**

**(1) VINAY**

M/s Vinay Electricals, 16-A, Singh Industrial, Estate, Bldg NO.1, Rammandir Road, Gorengaon (W), Mumbai - 40014.

**CATEGORY - III**

**(1) TOYAMA**

M/S Toyama Electric Ltd

36(A), Kiadb Industiral Estate, Hoskote, Bangiore \* 562114

**(2) ORPAT**

M/s. Ajanta Industrial Estate, Rajkot

Highway Post Box NO. 115, Morbi

(B) Mini Modular Type [Approved]

**1. ANCHOR [NOVA / XL]**

Anchor Elect. PUd., Marathon Innova C Wing, Opp. Penivisula Corporate Park, Opp, G.K,Marg, Lower Parel [W] Mumbai

**2. POINTER**

H.O B-15, Atlanta Evershine, Evershine

Nagar, Malad [WI, Mumbai - 400064

**3. PRISM- POINTER**

M/s Prism Industires (Refer to Ch.1.1.(B), Cat.-III (2))

**4. ORPAT (Refer to Ch 1.1.(A), Cat.-III (2))**

**5. VIMAL(Refer to CM.1 (A), Cat.-III (5))**

**6. GELCO-Cat II**

GELCO ELECTRONICS PVT LTD

5,7,6 & 16Amarnath Estate, Nr. Kdshna Gopal Estate,

Naroda Road, Ahmedabad - 360025

**(C) Modular Type APPROVED**

**1. L&T ORIS**

M/s LARSON & TURBRO UMITED

501, SAKAR-I, OPP GANDHIGRAM RAILWAY

STATION, AHMEDABAD - 380009

**2. LEGEND & WIT (Refer to Ch.I.I.(A), Cat.-I (4))**

**3. INDOSIMON**

M/s. EON Electric Limited

B/68, Sector 63, NOIDA- 201305, U.P., INDIA

**4. RANI**

M/s. Param Swdchgear (P,) Ltd,

11, CSG Anand Niketan New Delhi-II0021.

**CATEGORY - I**

**1. PRECISION**

M/s Precision Eetricals Shiv Sagar estate,

A-Block (Basement) Dr. A.B.Road Worli, Mumbai - 400018

**2. POINTER~ITALIA Refer to Ch.1.1. B), Cat.-10 (2))**

**3. ALEX**

M/s Alex Industires, 3, Neminath Industrial

Estate no.3 Navghar Road,, Vasai [E] Dist. Thane - 401210

**4. PRISM - POINTER (Refer to Oh 1.1.(B), 3)**

**5. VIMAL (Refer to Ch.1.1 iA), Cat.-I (5))**

**6. S.G.**

**CATEGORY – II**

**1. ANCHOR-RIDER (Refer to Ch,1.1.(S)-3)**

**2. GELCO (Refer to Ch 1.1 (B)-Cat III (6))**

**3. POINTER - SPECTRA (Refer to Ch 1.1(B) Cat.III- (3)**

**4. ELLYS**

M/s ELLE Electrical PL. ,Cama Industrial Area, Walbhat Road. Next to Rajaram Tarphe, Goregaon (E), Mumbai - 400063

**5. HI-FI**

M/s Aerotite Industries ,5, Sati Industrial Estate,

I.S. Road, Goregaon (E), Mumbai - 400063

**6. WONDER [EVER / PLAYBOY/COOLCY/FORTUNE/DASH/GOLD]**

M/s Wonder Industries, G-14, O.I.D.C. Udh yog

Nagar Industrial Estate, GIDC, Ringanwada DAMAN (U.T)

**7. ALLWYN (Refer to Ch.1.1(A) Cat 1 (1))**

**8. INDOASIAN**

M/s Indo Asian Fusegear Limited~ 203-204, Shreedhar Avenue,

11, Sardar Patel Colony, Nc. Sardar Patel Statue, Naranpura, Ahmedabad

**9. VINAY (Refer to Ch.1.1 (A) Cat.-II (I))**

**10. LEADER**

M/s Leader Electrical P.L., Leader House, 9 B, Mahal Industrial

Estate, P.B.No 9483, Mahakali Caves Read, Andheri (E),

Mumbai - 400 093

**11. LK**

L.K. Switchges, 165, Gl,DC Makarpura, Baroda - 390001

**12 NORTHWEST**

North West Switchgear Ltd.,

14/3, Mathura Road, Faridabad Haryana - 121003

**13 MK**

**CATEGORY - III**

**1. HAVELL'S - CRABTREE**

M/S Havell's India Ltd, 202-206, SHIVALIK II, Nr. Shivranjani

Crass Road, Satelite 132 Ft. Ring Road, Ahmedabad - 380015

**2. TOYAMA (Refer to Ch.1.1 (A) Cat-III (I))**

**3. ANCHOR [ROMA / WOOD IAVE] (Refer to Ch 1. I (B)-I)**

**4. PHILIPS**

M/S. Philips Electronics india Ltd., 7, Justice Chandra

Madhab Road, Kolkata-700020.

**6. ABB**

M/S ABB Limited 2nd Floor, Est Wing, Khanija Bhavan, 49,

Race Course Road, Bangalore - 560 001

**6. ORPAT (Refer to Ch 1.1(A) Cat-III-(2))**

**7. SALZER**

M/s SALZER ELECTRONICS LTD,

Samichettipalayam, Coimbatore-641047

**8. C&S GEWISS**

M/s. Control & Switchgears Contactors Ltd

9th Floor, HERITAGE, Nr. Gujarat Vidyapith,

Ashram Road, Ahmedabad - 380 009

**1,2 RIGID PVC PIPES / OVAL PIPES & FITTINGS. FIA Approved**

& ISI marked Which is Approved by Department.

**1. VRAJ**

M/s VRAJ PLASTIC INDUSTRIES,

41,42&43 Amarnath Estate, Nr. Gokulesh Petroleum, Narol

Cross Road, Ahmedabad - 382 405

**2. PRECISION (Refer to Ch.1 1.(C) Cat-(I)-I)**

**3. NIHIR**

M/s NIHIR POLYMERS INDUSTRIES, 52, Umed Part Society,

Sola Road, Ghatlodia, Ahmedabad - 380 061,

**4. HIMA / AMIT**

M/s Hima Sales Corporation, Opp, Relish Pharma, Nr. Nilkanth

Hotel, Ta, Kalol, Dist Gandhinagar. RAKANPUR

**5. VINAY (Refer to Dh.1 1.(A) Dat.-II (I))**

**6. POLYCAB**

M/s Polycab Wires Pvt. Ltd., HICO House, 1 st Floor, 771,

Pandit Satwalekar Marg, Mahim(W), Mumbai - 400016

**7. BLP**

M/S, Bhaglaxmi Plastic Industires, 32, Asharva Ind. Estate,

Opp. Khodiyar Estate, Narol, Ahmedabad

**8. POWER FLOW INDIA I CROWN PLAST**

M/S, CROWN INDUSTRIES

Plot No 6, Opp, Torrent Power Sub Station B/11,

Shahwadi Bus Stop, Narol Ahmedabad-382405

**9. 9 - NINE / ADITYA**

## AS PER LATEST APPROVAL OF SUPERITENDING ENGINEER (ELCTRICAL), R&B CIRCLE, GANDHINAGAR

M/s. Aaditya Polymake, 550, Rajput Road, Opp. Volga airtech,  
Sarkhaj Bavla Highway, changodar, Ahmedabad.

### 10. MARUTI

18, Kamal Estate, Bombay Conductors, VATVA, AHMEDABAD 11.

### PRESTO PLAST

M/s, HARSH POLYMERS PVT LTD

1/11 C, Proctor Road, Grant Road; [East], MUMBAI - 400007 12.

### SHRINATH

### 13. AMIT

Amit Electro Plast, 431,4th Floor, Sarvoday Comm. Center  
Salapas Road, Nr. G.P.O, Ahmedabad.

### 14. MAXCEL PLAST

M/S. Maxcel Plast 133, SHREE Ram Ind. Estate, B/h. C.M.C,  
Anup Eng. Compound, Nr. Soni's Chawl Cross Road, ODHAV,  
Ahmedabad - 352415.

### 1.3 OVAL I CASING & CAPING & PVC TRUNKING

1. **VRAJ** (Refer to Ch.1.2.(1))

2. **PRECISION** (Refer to Ch. 1.1 (C) Cat.-1.(I))

3. **NIHIR** (Refer to Ch.1.2.(3))

4. **HIMA / AMIT** (Refer to Ch.1.2.(4))

5. **VINAY** (Refer to Ch.1.1. (A) Cat.-II (1))

6. **POLYCAB** (Refer to Ch.1.2.(6))

### 7. MODI'S

M/S. Modi's Group of Companies, 34, Palace manor, 31 & 32,  
BAIfour Road, Kellys, Channai - 600010

8 **9 NINE / AADITYA** (Refer to Ch 1.2 (9))

9. **MARUTI** (Refer to Ch.1.2.(10))

10. **PRESTO PLAST** (Refer to Ch.1.2.(11))

11. **POWER FLOW INDIA / CROWN PLAST** ~Refer to Ch.1 2.(8))

12. **SHRINATH**

13. **M.K.** 14. **AMIT** (Refer to Ch.1.2 Cat III i13)) 15. **MAXCEL**  
**PLAST** (Refer to Ch.1.2 (14))

### LAMPS & FITTINGS

### 2.1 FILAMENT LAMPS I FLOURESCENT TUBES

### (A) CAT.I

### ANY ISI MARKED WHICH IS APPROVED BY DEPARTMENT; (B) CATEGORY - II

### 1. ARYA

M/s,Arya Filaments P.L., 344, Vishnupuri  
Annex. AB.Road, Indore - 452 001

### 2. GE

M/s GE India Industrial Pvt. LTd., 405, "Kirtiman", Kinariwala House,  
S/H Citibank, Off. C,GRoad. Ahmedabad - 380 009

### 3. BAJAJ

M/S Eajaj Electricals Limited, 109, Ist Fl, Sakar 411, Nr. Ashram Broad,  
Navrangpura, Ahmedabad 380 014

### 4. OSRAM

M/s Osram India P.L. Delhi Road, Sonipat - Haryana - **131001**

5. **ANCHOR** (Refer to Ch 1.1 (B) Cat.-III (I))

6. **JILCO**

M/S JAIN INDUSTRIAL LIGHTING COP~

B-70122, DS[DC Complex, Lawrence Road, New Delhi - 35

7. **INDOASIAN** (Refer to Ch.1.1.(C) Cat.-II-8)

### CATEGORY - III

### 1. SURYA

M/s. Surya Roshni Ltd, (Lighting Division)

308, Shefali Centre, Nr. Paldi Char Rasta, Ahmedabad - 380006

2. **PHILIPS** (Refer to Ch.1.1(C) Cat. III (4))

3. **CROMPTON**

M/s. Crompton Greaves, C.Q. Hube, 6th Floor, Dr. Annie Besant Road,  
Worli, Mumbai - 400030

4. **HALONIX**

M/s. Halonix Limited, 59A, 59D, Noida Special Economic Zone, Phase -  
II, Noida, Dist. Gautam Budhnagar - 201305 [UP]

### 5. WIPRO

M/s Wipro Ltd, A/210, Fair deal House, Opp. St. Xavier"s Ladies  
Hostel, Navrangpura, Ahmedabad

### 6. HPL

M/s B/707, Premium House, Nr. Gandhi Gram Rly Station, B/H Natraj  
Cinema, Ashram Road, Ahmedabad - 380009

### 2.3 SODIUM WAPOUR LAMPS CATEGORY-I

### ANY ISI MARKED WHICH IS APPROVED BY DEPARTMENT CATEGORY - II

1. **ARYA** (Refer to Ch.2.1. Cat.-II(I))

2. **ANCHOR** (Refer to Ch.1.1(B) Cat.-III (1))

3. **BAJAJ** (Refer to Ch.2.1.Cat.-II (3))

4. **OSRAM** (Refer to Ch.2.1. Cat.-II (6))

5. **JILCO** (Refer to Ch.2.1 Cat.-II (6))

6. **PUSHKAR / AKSHAR**

M/s. Puskhar Industries 87/1, Vilage ShihoIdi,  
Vaso Alindra Road, Ta. Matar, Dist. Kheda - 387380

### 7. VAPOLITE

### CATEGORY - III

1. **HAVELLS'** (Refer to Ch;1.1. (C) Cat.-III (I))

2. **SURYA** (Refer to Ch.2.3 Cat.-III (1))

3. **G.E.** (Refer to Ch.2:1. Cat.-II (2))

4. **PHILIPS** (Refer to Ch. 1.1. Cat.-III (2))

5. **CROMPTON** (Refer to Ch.2.1. Cat III (3))

6. **HALONIX** Refer to Ch 2.1 Cat.III (4))

7. **WIPRO** (Refer to Ch 2,1, Cat.-III (5))

8. **C&S GEWISS** (Refer to Ch.1.1.(C) Cat-III (8))

### 9. SHAKTI

M/s Shakti Fixtu re Industceis 212IB, Bombay Talkies Compound Matad  
(W), Mumbai -400 064

### 2.4 COMPACT FLOURESCENT LAMPS

### CATEGORY - I

1. **ANCHOR** (Refer to Ch.1.1 .(B)-Cat.-III 1))

### CATEGORY - II

1. **SPANCO**

M/S Spance Semiconductors, 10/11, Bhagat Industrial Estate,  
Nr.18 No. ESI Hospital, Jay Bharat Rangshala Compound,  
Saraspuh Ahmedabad - 380018

### 2. GRE

M/s. GRE Electronics Pvt. Ltd.,  
Plot No 423, G.I.D.C.-II, Dediyanan, Mehsana - 384002

3. **OSRAM** (Refer to Ch.2.1 Cat -II (4))

4. **JILCO** (Refer to Ch 2.1. Cat.-II (6))

### 5. STANDARD

M/s. Standard Electrical Ltd

202-205, Shivalik - II, Nr. Shivrangni Cross Road,  
Satelite, 132 feet Ring Road,Ahmedabad - 15

### 6. SILVER

### 7. INDOASIA

### 8. OREVA

M/s. Ajacta Manufacturing Ltd,  
SA, National Highway, Morbi-363642,

### CATEGORY - III

1. **HAVELLS'** (Refer to Ch.1.1, (C) Cat III (1))

2. **SURYA** (Refer to Ch.2.1. Cat.-III (1))

3. **PHILIPS** (Refer to Ch,1.1 (C) Cat -III (3))

4. **CROMPTON** (Refer to Ch 2,1. Cat.-III (3))

5. **HALONIX** i(Refer to Ch.2.1. Cat III (4))

6. **WIPRO** (Refer to Ch.2,1. Cat. III (5))

### 7. ASIAN

M/s ASIAN ELECTRONICS LTD, 11-14,  
Tej Complex, Nr. Lions Hall, Opp. Ashoka Chambers,  
Mithakhali, Ellisbridge, Ahmedabad - 380 006 - India

8. **HPL** (Refer to Ch.2.1. Cat.-III (6))

### 2.5 METAL HALIDE LAMPS CATEGORY - I ANY ISI MARKED WHICH IS APPROVED BY DEPARTMENT CATEGORY - II

1. **ARYA** (Refer to Ch.2.1. Cat.-II (1)) 2. **ANCHOR** (Refer to Ch.1 1  
(B) Cat-III (1)) 3. **BAJAJ** (Refer to Ch.2,1, Cat-II (3))

4. **OSRAM** (Refer to Ch.2.1 Cat -II (4)) 8. **PUSHKAR / AKSHAR**  
(Refer to Ch.2.3 Cat.-III (8))

### CATEGORY - III

1. **SURYA** (Refer to Ch.2.1. Cat.-III (1)) 2. **GE** (Refer to Ch.2 1. Cat.-II  
(2)) 3. **PHILIPS** (Refer to Ch,1.1. (C) Cat-III (2))

4. **CROMPTON** (Refer to Ch.2.1. Cat.-III (3))

## AS PER LATEST APPROVAL OF SUPERITENDING ENGINEER (ELCTRICAL), R&B CIRCLE, GANDHINAGAR

5. **HALONIX** (Refer to Ch 2.1 Cat-III(4))

6. **WIPRO** (Refer to Ch.2.1. Cat -61 (5))

7. **HAVELL'S** (Refer to Ch.1.1. (A) Cat.-III (1))

8. **C&S GEWISS** (Refer to Ch.1.1.(C) Cat.-SI (8))

9. **SHAKTI** (Refer to Ch.2.3. Cat.-6 (9))

### 2.6 ENERGY SAVING FLOURESCENT TUBE & CFL FITTINGS (Box Type/Industrial Type/Mirror Optic/Mirror Light/Street Light) APPROVED

1. FUTURE LIGHTING

M/S. FUTURE LIGHTING INDIA LTD+ 8TH FLOOR, TOWER "C"~  
247 PARK, LB.S, MARG, VIKHROLI [VV] MUMBAI - 400063 2.

**CAMAY**

M/S. CAMAY ELECTRONICS, CAMAY HOUSE, OHANDN[ CHOWK,  
FULWAOI OHORE, JETPUR ~ 390370

3. **EUROLITE**

M/S RUBYCON ELECTRICALS & ELECTRONICS INDUSTRIES

SURVEY NO 249/4, OPP. G I.D.C. PHASE-I SIHOR - 364240

BHAVNAGAR - GUJARAT

4. **ENERGYVISION**

M/S ENERGY VISION, 39)598, SHASTRINAGAR, KHATODARA  
COLONY, SUP, AT - 696002 EUROLITE (Refer to Ch,2 6, Approved (3))  
**CATEGORY - I**

1. PULSE

M/s Pulse Electronics & Control B/1, Maruti tenament,  
Opp. Shdji Bapa Complex, Nr. Rabari Colony, Vastral to Odhav  
Canal Road, Ahmedabad

2. **HAVELL'S** (Refer to Ch.1 1, (A) Cat.-III (1))

3. **AKHIL**

M/S SATYA ENGINEERING WORKS PL. A-111, MANGOL PURI IND  
AREA PHASE - II, NEW DELHI - 110034

4. **Optic Lighting**

M/S Optic Lighting PL Rajiv House4, Smritikunj,  
Nr, Navrangpura Post Office. Navrangpura, Ahmedabad -09

5. **Pulse / Rand** (Refer to Ch26 Cat.-I (1))

6. Aash Cube

M/s Aashcube Lighting ILL. C/41,165, Krishna Estate  
B/h Anuptech, Opp B,I.D C. Gorwa, Vadodara - 390015

### **CATEGORY - II**

1. **JABLA**

M/S JARLA ELECTRICAL INDUSTRIES, 29 B/C JAY KHODIYAR  
INDUSTRIAL ESTATE, NR. SUBHASH ESTATE, RAMOL ROAD C  
T-M. AMRAIWADI, AHMEDABAD - 360029

2. **GELCO** (Refer to Ch 1,1, (B) Cat.-III (6))

3. **INAVA**

M/s. t-ava Instruments International 94, Ratxta[yot Ind. Estate,  
Irla Lane, Vile Parle (W), Mumbai - 400056

4. **PIERLITE**

M/s. Pierlite India PL. Rakhial Road,Ahmedabad.

### **CATEGORY - III**

1. **SPANCO** (Refer to Ch 2.4. Cat.-II (1))

2. **HPL**

Mis. HPL Eleetrie& Power Ltd., Plot No. 76-B, Phase-IV, Sec.-57, JSIIDC,  
Indl Area, Kundli Dist. Sonipat, (Haryana)-131028.

3. **FIXOLITE**

Mis FIXOLITE INDUSTRIES, dhon Robert Compound

Sewri Fort Road, Sewri (E), Mumbai - 400015

4. **PRESTOLITE**

Mis Prestolita Corporation, 57/5, Khalii Sth Compound,  
Off M.G. Road, Gorgaon [WI,

5. **SHAKTI** (Refer to Ch.2.3. Cat.-tg (9))

6. **C&S GEWISS** (Refer to Ch.1 t. (C) Cat.-III (18))

### [ENERGY SAVING T-5 TUBE FITTING I CFL INDOOR TYPE] **CATEGORY - II**

1. **SPANCO** (Refer to Ch.2.4: Cat-II (1))

2. **GELCO** (Refer to Ch.1.1. (B) Cat-III (6))

3. **TEKNOLITE**

M/s TeknovisionAllied Product P.L 16, Waman PaGI Indistdal Estate, Nr.  
Dukes Factory, Nr. Chembur, Mumbai-71

4. **ARYA** (Refer to Ch,2,1, Cat-II (1))

5. **SHAKTI** (Refer to Ch.2,5. Cat-H1 (9))

6. **JILCO** (Refer to Ch.2,1. Cat.-II (6))

7. **ANCHOR** (Refer to Ch.1.t. (B) Cat-III (t))

8. **GLOMORE**

M/S Devraj Enterprises (P) Ltd , 401, SobhnaAppartment. 4th Floor, Above  
Mandavi Bank, Chartdravarkar Road, BerivaU [WI, Mumbai - 400092

9. **C&S GEWISS** (Refer to Ch 1 I (C) Cat qll (8))

10. **CILVER** (Refer to Ch26. Cat -II (10))

11. **ACON**

M/s Surer Electronics "Sorab Villa", Nr. Popular House,  
Ashram Road, Ahmeal~ad - 9

12 **INAVA** (Refer to Ch.2.6, Cat.-9 (3))

13 **PRESTOLITE** (Refer to Ch 26 Cat-18 (4))

14 **INDOASIAN** (Refer to Ch.1 1. (C) Cat.-II (6))

15 **SHAH**

M/s Shah Electronics, A-3, Manoharvila, New Naroad, N/col Road,  
Nr Naroda Canal, Nicol, Ahmgdabad ~ 382330

16 **Pulse / Mane** (Refer to Ch 26, Cat.-I (1))

17 **AKHIL**(Refer tech26 Cat.-1 (3))

### **CATEGORY - II**

[ENERGY SAVING T-5 TUBE FITTING I CFL OUTDOOR TYPE] 1.  
**GELCO** (Refer to Ch,1 .1 (B) cat-III (6)) 2. **SHAKTI** (Refer to Ch 2 3. Cai  
411 (9))

3. **JILCO** (Refer 10 Ch2.1. Cat -II (9))

4. **CILVER**(RefertoCh26 Cat.-11(10))

5. **AKHIL** (Refer to Ch,25 Cat-1 (3))

6 **ACON** (Refer to Ch25 Cat-il (11))

### **CATEGORY - III**

(ENERGY SAVING T-5 TUBE FITTING / CFL INDOOR TYPE]

1. **HAVELL'S** (Refer to Ch.1.1. (C) Cat-III (1))

2. **HALONIX** (Refer to Ch,2 1 Cat -Iii (5))

3. **GRE** (Refer to Ch.2.4. Cat.-II (2))

4. **WIPRO** (Refer to Oh 2.1. Cat.-III (5))

5. **THORN**

M/s. Thorn Lighting India PL C/o,f 0 parshwanath Apt., Somnath Park  
Lane, Opp Tele, Exchange, Sahibaug, Ahmedabad - 380004

6. **SURYA**(Refer to Ch21 Cat.-19 (1))

7. **ASIAN** (Refer to Ch 2.6. Cat-H (4))

8. **G.E.**(RefertoCh.21 Cat-II(2))

9. **PHILIPS** (Refer to Ch I 1. (C) Cat.-III (4))

10. **CROMPTON** (Refer to Ch.2.t. Cat. III (3)) 11. **BAJAJ** (Refer to Ch.21

.C~t Al (3)) 12. **PASOLITE** M/s Pasolite Electricals P.L. 7, k/lad road,  
14th cross, Banglota- 590053 13. **PRESTOLITE** (Refer to Oh 2 6 Cat -10  
(4)) 14. **HPL** (Refer to Ch 2 6 Cat.-III (2)) 15. **SHAKTI** (Refer to Ch,2.3.  
Cat.-61 (9))

**ENERGY SAVING T-5 TUBE FITTING / CFL [OUTDOOR TYPE]**

### **CATEGORY - III**

1. **HAVELL'S**(Refer toCh.1.1. (C) Cat-[0(1))

2. **GRE** (Refer to Ch,2 4, Cab-H (2)) 3. **SURYA** (Refer to Ch.2 1. Cat.-gl  
(1)) 4. **PIERLITE** (Refer to Ch26 Cat,Al (4)) 5. **PHILIPS** (Refer to Ch,1.1  
(C) Cat.-16 (4)) 6. **CROMPTON**(RefertoCh2,1 Cat 111(3)) 7. **WIPRO**

(Refer to Ch.2.1. Cat.-gl (5)) B. **THORN** [Refer ta Ch.2.5. Cat -lit (5)) 9.  
**BAJAJ** (Refer to Ch.2.1.Cat-II (3))

10. **SHAH** (Refer to Ch 2.6, Cat -II (15))

11. **PRESTOLITE** (Refer to Ch 2.6 Cat.-II (3))

12. **HPL** (Refer to Ch,2.6.Cat.-gl (2))

13. **FIXOLITE** (Refer to Ch.2.S.Cat,46 (3)~

14. **SHAKTI** (Refer to Oh23. Cat. All (9))

15. **TEKNOLITE** (Refer to Ch26. Cat.-IH (3))

### 2.7 FLOURESCENT TUBE FITTINGS [ ELECTRONICS BALLAST] (Box TypeNndustrial Type/Mirror Optic/Mirror Light/Street Light) APPROVED

1. ACTION

M/S. ADHUNIK SWITCHGEARS R L

UNIT-1, 902/290, SHALIMAR IND AREA DELHI - 110088

### **CATEGORY - I**

**ANY ISI MARKED WHICH IS APPROVED BY DEPARTMENT**

1. PULSE (Refer to Ch.2 6. Cat q (2))



## AS PER LATEST APPROVAL OF SUPERITENDING ENGINEER (ELCTRICAL), R&B CIRCLE, GANDHINAGAR

### CATEGORY - II

1. **GELCO** (Refer to Ch.1.1. (B) Cat.-III(6))
2. **PRESTOLITE** (Refer to Ch.2.6. Cat -III (4))
3. **GLOMORE** (Refer to Ch.2.6. Cat.-II (8))
4. **TEKNOLITE** (Refer to Ch.2.6. Cat.-II (3))
5. **ARYA** (Refer to Ch.2.1, Cat-II (1))
6. **INDOASIAN** (Refer to Ch.1.1. (C) Cat.-II (8))
7. **JILCO** (Refer to Ch.2.1 Cat.-II (6))
8. **CILVER** (Refer to Ch.2.6 Cat.-II (10))
9. **ANCHOR** (Refer to Ch 1.1. (B) Cat.-II (1))
10. **G.E.** (Refer to Ch.2.1. Cat.-II (2))
11. **PASOLITE** (Refer to Ch.2.6. Cat.-II (12))
12. **ACON** (Refer to Ch.2.6 Cat.-II (11))
13. **ACQURATE**

M/S ACQURATE Engitech Uimited, Plot NO 1471145, GIDC  
Ankleshwar, Dist. Bharuch Gujarat - 393002

14. **BAJAJ** (Refer to Ch 2.1. Cat.-II (3))
15. **AKHIL** (Refer to Ch.2.6, Cat.-I (3))

### 16. SUNBEAM

M/s Sunbeen Electricais, 292/71B Shastri Laghu Udhog Nagar,  
Maeshwari Mill Road, Tavdipura, Shahibaug, Ahmedabad-30004.

### CATEGORY - III

1. **PHILIPS** (Refer to Ch.1.1 (C) Cat.-III (3))
2. **CROMPTON** (Refer to Ch.2.1, Cat.-III (4))
3. **SURYA** (Refer to Ch 2.1.. Cat -III (1))
4. **HAVELL'S** (Refer to Ch.1.1, (C) Cat.-III (1))
5. **WIPRO** (Refer to Ch.2.1 Cat -III (5))
6. **HALONIX** (Refer to Ch.2.1. Cat.-III (4))
7. **GRE** (Refer to Ch 2.4. Cat -II (2))
8. **SHAH** (Refer to Ch.2.6 Cat.-II (15))
9. **FIXOLITE** (Refer to Ch.2.6. Cat.-III (2))
10. **HPL** (Refer to Ch 2.6, Cat.-III (2))
11. **PIERLITE** (Refer to Ch.2.6. Cat.-II (4))
12. **C&S GEWISS** (Refer to Ch.1.1, (C) Cat -III (5))
13. **SHAKTI** (Refer to Ch 2.5. Cat.-III (9))

### 2.9 SODIUM VAPOUR LAMP FITTINGS

#### (POST TOP LANTERN / STREET LIGHTS)

##### CATEGORY - I

1. **GLOMORE** (Refer to Ch.2.6 Cat.-II (8))
2. **EUROLITE** - APPROVED (Refer to Ch.2.5. Cat. Approved (3))
3. **SUNBEAM** (Refer to Ch.2.7, Cat.-II (16))
4. **OPTIC LIGHTING** (Refer to Ch.2.6. Cat.-I (4))

##### CATEGORY - II

1. **SPANCO** (Refer to Ch.2.4 Cat.-II (1))
2. **ARYA** (Refer to Ch.2.1, Cat II (1))
3. **JILCO** (Refer to Ch.2.1. Cat.-III (6))
4. **CILVER** (Refer to Ch.2.6 Cat.-II (10))
5. **ANCHOR** (Refer to Ch.1.1. (B)-Cat.-III (1))
6. **G.E.** [COMMON FITTING] (Refer to Ch 2.1 Cat.-II (2))
7. **ACQURATE** (Refer to Ch 2.7, (18))
8. **PULSE/NANO** (Refer to Ch.2.6. Cat.-I (1))

##### CATEGORY - III

1. **HAVELL'S** (Refer to Ch.1.1, (C) Cat.-III (1))
2. **PIERLITE** (Refer to Ch.2.6. Cat.-II (4))
3. **SURYA** (Refer to Ch.2.1. Cat.4 (1))
4. **G.E.** (SRISPPT/OLYMPIA/RANGER / GEN-X / SKYGEN / MET-40/SPECTRA / QUNA / NOVA T-5 STREET / OPTYLANE) (Refer to Ch.2.1. Cat.-II (2))
5. **PHILIPS** (Refer to Ch 1.1. (C) Cat.-III (4))
6. **CROMPTON** (Refer to Ch.2.1. Cat.-III (3))
7. **GRE** (Refer to Ch.2.4 Cat.-II (2))
8. **HALONIX** (Refer to Ch.2.1. Cat.-III (4))
9. **WIPRO** (Refer to Ch.2.1. Cat.-III (5))
10. **THORN** (Refer to Ch.2.6. Cat.-III (5))
11. **BAJAJ** (Refer to Ch.2.1. Cat.-II (3))
12. **FIXOLITE** (Refer to Ch.2.6 Cat.-II (3))
13. **PASOLITE** (Refer to Ch.2.6, Cat.-III (13))
14. **TRANSRAIL**

A-201/209, Boomerang Complex, Chandivali Farm Road,  
Artadheri [E], Mumbai - 400072

15. **PRESTOLITE** (Refer to Ch.2.6 Cat.-III(3))
16. **HPL** (Refer to Ch 2.6 Cat.-III (2))
17. **C&S GEWISS** (Refer to Ch.1.1, (C) Cat.-III (8))
18. **SHAKTI** (Refer to Ch~2.3 Cat.-III (9))

### 2.10 FLOOD LIGHTS WITH BCIES/IMV I SV I MH / LAMPS (POST TOP LANTERN I STREET LIGHTS)

#### CATEGORY - I

##### ANY ISI MARKED WHICH IS APPROVED BY DEPARTMENT

1. **EUROLITE** (Refer to Ch.2.6 Cat Approved (3))
2. **SUNBEAM** (Refer to Ch 2.9. Cat.-I (3))

#### CATEGORY - II

1. **SPANCO** (Refer to Ch.2.4. Cat.-II(1))
2. **GLOMORE** (Refer to Ch.2.6 Cat ~II (18))
3. **ARYA** (Refer to Ch.2.1. Cat.-II (1))
4. **ANCHOR** (Refer to Ch.1.1. (B) Cat.-III (1))
5. **G.E.** (COMMON FITTING) (Refer to Ch 2.1. Cat.-II (2))

#### CATEGORY - III

1. **SURYA** (Refer to Ch.2.1. Cat.-III (1))
2. **HAVELL'S** (Refer to Ch.1.1, (C) Cat.-III(1))
3. **GRE** (Refer to Ch 2.4. Cat.-II (211))
4. **PIERLITE** (Refer to Ch.2.6. Cat.-III (8))
5. **G.E.** (SF/GEMF/BLAZE/ZION/GLANZ/EI-2000+/CONJA-J R / HELLO FLOOD / ARINA)  
(Refer to Ch.2.1, Cat II (2))

6. **PHILIPS** (Refer to Ch.1.1, (C) Cat.-III (4))
7. **CROMPTON** (Refer to Ch.2.1, Cat.-III (3))
8. **WIPRO** (Refer to Ch.2.1. Cat -III (511))
9. **TRANSRAIL** (Refer to Ch.2.9. Cat.-III (14))
10. **HALONIX** (Refer to Ch.2.1. Cat.-III (4))
11. **BAJAJ** (Refer to Ch 2.1. Cat.-II (3))
12. **PRESTOLITE** (Refer to Ch.2.6. Cat.-III (4))
13. **FIXOLITE** (Refer to Ch 2.6. Cat.-III (3))
14. **HPL** (Refer to Ch.2.6 Cat -III (2))
15. **C&S GEWISS** (Refer to Ch.1.1, (C) Cat.-III (8))
16. **SHAKTI** (Refer to Ch.2.3 Cat.-III (9))

#### 2.11 Halogen Tube Fittings

##### ANY (SI MARKED WHICH IS APPROVED BY DEPARTMENT I.

**EUROLITE** (Refer to Ch.2.6. Cat. Approved (3))

##### Category - II

1. **ARYA** (Refer to Ch.2.1. Cat.-II (1))
2. **PIERLITE** (Refer to Ch.2.6. Cat -II (4))

##### Category - Iii

1. **HAVELL'S** (Refer to Ch.1.1. (C) Cat.-III (1))
2. **WIPRO** (Refer to Ch.2.1, Cat.-II (4))
3. **HALONIX** (Refer to Ch.2.1. Cat.-III (4))
4. **TRANSRAIL** (Refer to Ch 2.4 Cat.-III (7))
5. **SHAKTI** (Refer to Ch.2.3 Cat.-III (9))

#### 2.1 (A) METAL HEMDE LAMP FITTINGS

##### CATEGORY - I

1. **GLOMORE** (Refer to Ch 2.6 Cat -II (8))
2. **EUROLITE** (Refer to Ch.2.6 Cat Approved (3))
3. **OPTIC LIGHTING** (Refer to Ch.2.6 Cat -I (4))

##### CATEGORY- II

1. **BAJAJ** (Refer to Ch.2.1, Cat.-II (3))
2. **ARYA** (Refer to Ch 2.1, Cat.-II (1))
3. **JILCO** (Refer to Ch 2.1. Cat -II (6))
4. **PASTOLITE** (Refer to Ch 2.6 Cat.-II (13))
5. **PIERLITE** (Refer to Ch.2.6 Cat.-II (4))

##### CATEGORY - III

1. **HAVELL'S** (Refer to Ch.1.1, (C) Cat 4) (1))
2. **THORN** (Refer to Ch.2.6. Cat.-III(5))
3. **GRE** (Refer to Ch.2.4. Cat.-II (2))
4. **TRANSRAIL** (Refer to Ch.2.9. Cat.-III (14))
5. **SURYA** (Refer to Ch 2.1. Cat.-III (1))
6. **WIPRO** (Refer to Ch.2.1. Cat -III (7))
7. **HALONIX** (Refer to Ch.2.1 Cat.-III (5))

#### 2.12 ELECTRONIC BALLAST

##### CATEGORY - I

1. **AMIT** (Refer to Ch.1.2. (13))
2. **INAVA** (Refer to Ch.2.6. Cat.-II (13))
3. **ANCHOR** - APPROVED (Refer to Ch 1.1, (B) Cat.-III (2))
4. **CILVER** (Refer to Ch.2.6. Cat II (10))
5. **PULSE** (Refer to Ch.2.6. Cat.-I (1))
6. **JILCO** (Refer to Ch.2.1, Cat.-II (6))
7. **EUROLITE** - APPROVED (Refer to Ch.2.6. (3))
8. **CAMAY** (Refer to Ch.2.6~ Approved (2))

##### CATEGORY - II

1. **SPANCO** (Refer to Ch.2.4 Cat.-II(1))

## AS PER LATEST APPROVAL OF SUPERINTENDING ENGINEER (ELECTRICAL), R&B CIRCLE, GANDHINAGAR

2. GLOMORE (Refer to Ch.2.6. Cat.-II (8))
3. TEKNOLITE (Refer to Ch.2.0. Cat.-2 (3))
4. GELCO (Refer to Ch.1.1. (B) Cat.-2 (6))
5. INDOASIAN (Refer to Ch.1.1. (C) Cat.-II (8))
6. ARYA (Refer to Ch.2.1. Cat.-II (1))
7. ASIAN (Refer to Ch.2.4. Cat.-III (7))
8. OSRAM (Refer to Ch.2.1. Cat.-II (4))
9. ACON (Refer to Ch.2.6. Cat.-II (11))
10. INTELUX

M/S Intelux Etactro2cs P.L. Unit No 2, Electronics Ce. Op. Estate  
Pune - Satara Road, Pune - 411009

### 11. OCLEG

M/s. OCLEG CONTROLS, 93-94, Amar Estate, B/h Lubi Elect.,  
memco, Naroda Road, Ahmedabad

12. Pulse/Nano (Refer to Ch.2.6. Cat.-1 (1))

### CATEGORY - 12

1. HAVELL'S (Refer to Ch.1.1. (C) Cat.-III (1))
2. GRE (Refer to Ch.2.4. Cat.-II (2))
3. PIERLITE (Refer to Ch.2.5. Cat.-II (4))
4. PHILIPS (Refer to Ch.1.1 (C) Cat. III (3))
5. CROMPTON (Refer to Ch.2.1. Cat.-III (4))
6. WIPRO (Refer to Ch.2.1. Cat.-III (7))
7. HALONIX (Refer to Ch.2.1. Cat.-III (5))
6. SHAH (Refer to Ch.2.6. Cat.-II (15))
9. HPL (Refer to Ch.2.1 Cat.-II (6))
10. FIXOLITE (Refer to Ch.2.6. Cat.-III (8))
11. C&S GEWISS (Refer to Ch.1.1 (C) Cat.-III (8))
12. SHAKTI (Refer to Ch.2.3, Cat.-III (9))

### CHAPTER III

#### SWITCHGEARS & DISTRIBUTION BOARDS

##### 3.1 CAST IRON CLAD SWITCHES WITH REWIREABLE FUSE

##### CATEGORY - I

##### ANY ISI-MARKED WHICH IS APPROVED BY DEPARTMENT CATEGORY - II

###### 1. TRISHUL

M/s Aum Electrical Industries, 1014, GIDC,  
Waghodia - 321760 Gujarat

###### 2. MODI

M/S MODI INDUSTRIES ~ 61, Mahaveer Estate, Nr. Anupam  
Cinema, Khokhara, Ahmedabad-380008

###### 3. NEW/NILANG

M/s Nilang Engineering Works, Plot No. 156/2, A-31 Kailashnagar  
Estate, Opp. New Tale. Exchange, F Road, G.I.D.C, Vatva,  
Ahmedabad - 382445

###### 4. PEW

M/s Patel Engineering Works, 23, Vrundavandham, Society, Opp.  
PC (Partiya College, Nr. Smruti Mandir, Ghodasra~Ahmedabad 5.

###### SUPER

M/S SUPER SWITCHGEARS, SHED - C, 5/6, GIDC VITTHAL

UDHYOG NAGAR, ~ZVNAGAR, - 388121

###### 6. AEW

M/s. Ambica Engineering Works, L-51, G.I.O C. Estate,

Nr. Water Tank, Odhav, Ahmedabad - 882415

### CATEGORY - III

###### 1. KEW

M/s KEW FUSEGEAR PVT, LTD C 1 B1336/38, G.I.D.C. Estate,  
Makarpura, Vedodara - 390010 2. STENLY · 3.2 METAL CLAD

##### SWITCHES WITH REWIREABLE FUSE (63A - 100 A) APPROVED

1. ACTION I ADHUNIK (Refer to 2.7 Approved (1))

### CATEGORY - I 1. REMO

M/S R.L. Electrical Industries, 8, Sri Ram Marg, Opp, Central bank,  
Moujpur Road, Shahdara, Delhi-110053 (INDIA)

### CATEGORY - II

1. KEW (Refer to Ch.3.1, Cat.-III (1))
2. TRISHUL (Refer to Ch.2.12. (8.1) Cat.-II (1))
3. MODI (Refer to Ch.2.12. (3.1) Cat.-II (2))
4. PEW (Refer to Ch.2.12. (3.1) Cat.-II (4))
5. SUPER (Refer to Ch.2.12. (3.1) Cat.-II (5))
6. NEW/NILANG (Refer to Ch.2.12. Cat.-II (3))
7. BENTEC

M/s Bentec Electrical & Electronics PL. No 7, Maharaja Estate,  
B/4, Bhagyoday Hotel, Sarkhej - Sannd Highway,  
Sarkhej - Ahmedabad - 362210

6. ACTION (Refer to 2.7 Approved (1))

### CATEGORY - III

1. HAVELLS (Refer to Ch.1.1 (A) Cat.-III (1))
2. INDOASIAN (Refer to Ch.1.1 (C) Cat.-II (8))
3. STANDARD (Refer to Ch.2.4. Cat.-II (5))
4. L&T

M/S L & T House, Baliord Estate RD. Box No 278 Mumbai-01.

5. CROMPTON (Refer to Ch.2.1. Cat.-III (4))

6. C&S (Refer to Ch.1.1 (C) Cat.-III (8))

### 7. GUTS

M/s GUTS CIRCUIT BREAKERS PVT LTD, Manas Anand Bldg  
No. 1 Flat No 804, Dongri Pada, Godbunder Road, Thane West  
400601

8. HPL (Refer to Ch.2.1, Cat. -12 (6))

### 3.3 METAL CLAD SWITCHES WITH HRC FUSE

### CATEGORY - II

1. KEW (Refer to Ch.3.1, Cat.-III (1))
2. PIERLITE [ELECON] (Refer to Ch.2.6. Cat.-II (4))
3. PEW (Refer to Ch.2.12. (3.1) Cat.-II (4))
4. SUPER (Refer to Ch.2.12 (3.1) Cat.-II (5))
5. CROMPTON (Refer to Ch.2.1. Cat.-III (3))
7. NEW / NILANG (Refer to Ch.2.12 (3.1) Cat. II (3))
6. ELECTRO POWER

M/s. Electro Power, B-22, Jay Estate, Opp. Keval weigh bridge  
Rakhial, Ahmedabad ~ 380023

### CATEGORY - III

1. HAVELLS (Refer to Ch.1.1. (A) Cat.-III (1))
2. INDOASIAN (Refer to Ch.1.1 (C) Cat.-II (8))
3. STANDARD (Refer to Ch.2.4. Cat.-II (5))
4. C&S GEWISS (Refer to Ch.1.1. (C) Cat.-III (8))
5. L & T refer to Ch.3.2 cat.-III (4))
6. Siemens

M/s. Siemens Ltd L/Z Control & Distribution

Products Thane Belapur Road, Thane - 661

7. GE. (Refer to Ch.2.1. Cat. II (2))

8. GUTS (Refer to Ch.3.2. Cat.-III (7))

9. HPL (Refer to Ch.2.1. Cat.-III (6))

### 3.4 MOULDED CASE CIRCUIT BREAKERS

### CATEGORY - I

##### ANY ISI-MARKED WHICH IS APPROVED BY DEPARTMENT

1. L.S. APPROVED

2. ACTION I ADHUNIK (Refer to Ch.2.7 Approved (1))

### CATEGORY - II

1. BENTEC (Refer to Ch.3.1. Cat.-II (7))
2. CROMPTON (Refer to Ch.2.1. Cat.-III (3))

### CATEGORY - III

1. HAVELLS (Refer to Ch.1.1. (C) Cat.-III (1))
2. STANDARD (Refer to Ch.2.4~ Cat.-II (5))
3. BCH

M/s. BCH Electric Limited 93, City centre Nr. Swank Char

Rasta, C.G Road, Ahmedabad -380 009

4. C&E GEWISS (Refer to Ch.1.1. (C) Cat.-III (9))

5. INDOASIAN (Refer to Ch.1.1. (C) Cat.-II (6))

6. L&T (Refer to Ch.3.2, Cat.-III (4))

7. SIEMENS (Refer to Ch.3.3 Cat.-III (6))

8. GE. (Refer to Ch.2.1 Cat.-II (2))

9. GUTS (Refer to Ch.3.2 Cat.-III (7))

10. HPL (Refer to Ch.2.6, Cat.-III (3))

### 3.5 AIR CIRCUIT BREAKERS

### APPROVED

##### ANY ISI-MARKED WHICH IS APPROVED BY DEPARTMENT

### 1. BIECCO

M/s. Biecco Lawrie Limited, 95, maker tower "F", 9th Floor, Cuffee

Parade~ Mumbai 400005

2. HPL (Refer to Ch.2.1. Cat.-III (6))

### 3. L S

### CATEGORY - III

1. C&S (Refer to Ch.1.1. (C) Cat.-III (8))
2. INDOASIAN (Refer to Ch.1.1. (C) Cat.-III (8))
3. G.E. (Refer to Ch.2.1 Cat.-II (2))

## AS PER LATEST APPROVAL OF SUPERITENDING ENGINEER (ELCTRICAL), R&B CIRCLE, GANDHINAGAR

4. CROMPTON (Refer to Ch 2.1, Cat -III (3))

8. L&T(Refer to Ch.3.2 Cat-III(4))

8. Siemens (Refer to Ch.3 3. Cat-II (6))

7. HAVELLS ~Refer to Ch 1.1. (C) Cat.-III(1))

8. HPL (Refer to Ch 2 8. Cat.-III(12))

### 3.6 CHANGE OVER SWITCHES

APPROVED

1. ACTION / ADHUNIK (Refer to 2.7 Approved (1))

#### CATEGORY - I

1. MODI (Refer to Ch2.12 Cat.-II(2))

2. REINO (Refer to Ch.3.2. Cat-I(1))

#### CATEGORY - II

1. PEW (Refer to Ch 2.12 (3.1) Cat -II (4))

2. KEW(Refer to Ch3.1 Cat.-III(1))

3. BENTEC (Refer to Ch 3.1 Cat -II 17))

4. NEW / NILANG (Refer to Ch 2.12 (3 1) Cat -II (3))

5. SUPER (Refer to Ch 2.12.(3.1) Cat.-II(5))

6. ANCHOR (Refer to Ch 1.1. (B) Cat.-III(1))

7. ELECTRO POWER (Refer to Ch 3.3 Cat II(8))

#### 8. SIGMA

M/S. MCB Electronic CenJroies, C-176, Mayapuri industrial Area, Phase411, New Delhi-II0064

9. AEW (Refer to Ch 3 1. Cat -II (6))

#### CATEGORY - III

1. HAVELLS (Refer to Ch1.1. (C) Cat.-III(1))

2. STANDARD ( Refer to Ch.2.4 Cat -II(5))

3. C&S GEWISS(Refer to Ch. 1.1 (C) Cat-(12))

4. INDOASIAN (Refer to Ch 1.1. (C) Cat-II(8))

5. L & T (Refer to Ch.3.2 Cat.-III(4))

6. Siemens (Refer to Ch.3.3. Cat-II (6))

7. Crompton (Refer to Ch.2 1, Cat-III(3))

8. G.E.(Refer to Ch2.1 Cat.-II(2))

8. GUTS (Refer to Ch.3 2. Cat.-III(7))

10. HPL (Refer fo Ch.2 1, cat-III (2))

11. PIERLITE - ELCON (Refer to Ch2.6 Cat.-II (4))

### 3.7 MCB & MCB DISTRIBUTION BOX APPROVED

1. TOYAMA (Refer to Ch.1.1 (A) Cat-III (1))

2. MILLION & MILLTEC (Refer to Ch11. (A) Cat-I (3))

3. BALKAM

M/s Balkam India Ltd, B-83, Old Vishnu Garden, New Delhi - 110 018

4. ESCO

M/S ELECTRO SPARES & Co. 1894/A/1 Inside Pade Pole Gandhi Road, Ahmedabad - 380 001

8. SMPL

M/s SARD METALS PL Plot NO45, Sector Ne.25, Sohna Road, Faridabad- 121005

6. ELLICO

M/S General Electronics & Controls, C/71, G. LD.C. Odhav, Ambicanagar Road, Ahmedabad - 352415.

7. ACTION (Refer to 2.7 Approved (1))

8. MAXCELPLAST (Refer to 1.2 (14))

#### CATEGORY - I

1. VIMAL (Ref. to Ch 1.1(A) Cat.-I (5))

2. S.G

3. VINAYAK

#### CATEGORY - II

1. GELCO (Refer to Ch.1.1, (B) Cat.-III(6))

2. GRE (Refer to Ch 2.4, Cat.-(2))

3. RANI (Refer to Ch1. (C), (4))

4. KEW (Refer to Ch.3.1. cat-II (1))

5. AECO-MEFA

M/S Punjab Switchgears P.L. E-30, Phase - V Focal Point, Dhandari } (alan, Ludhiana - 141010

6. NEW / NILANG (Refer to Ch.2.12.(3.1) Cat.-II(3))

7. VINAY (Refer to Ch1 1. (A) Cat.-II(1))

8. LEADER (Refer to Ch.1.1 (C) Cat.-II(11))

9. SUPER(Refer to Ch.2.12.(3.1)Cat.-II(5))

10. ANCHOR (Refer to Ch.1.1, (B)Cat -III (I))

11. ELECON-CLIPSAL

M/s GERARD ELECTRIC INDIA PVT.LTD.

RakhJal Road, Ahmedabad -366 023

12. OCLEG (Refer to Ch 2.12. **Cat.-II(11)**)

13. BENTEC (Refer to Ch.3.4 Cat.-II (7))

14. SIGMA (Refer to Ch 3.6 Cat. II (8))

#### CATEGORY - III

1. HAVELLS (Refer to Ch.1 1. (C) Cat.-III(1))

2. STANDARD (Refer to Ch 2.4, Cat -II (5))

3. C&S (Refer to Ch.1.1 (C) Cat-II (12))

4. INDOASIAN (Refer to Ch 1.1. (C) Cat.-II(8))

5. ABB(Refer to Ch.1.1(C) Cat-III(5))

6. L&T (Refer to Ch.3.2 Cat.-III(14))

7. GUTS (Refer to ch3.2 Cat-III(7))

8. G.E (Refer to Ch 2.1. Cat.-II(2))

9. HPL(RefertQCh2.1 Cat-III(6))

10. NANO;

M/s Ajay Electrical Industries, B-257, naraina ind. area, phase - I, New Delhi

11. MDS

12. PIERLITE SAFETY (Refer to Ch2.6 Cat-II (4))

### 3.8 ELCB & RCCB

APPROVED

1. ACTION / AOHUNIK (Refer Lo 2.7 Approved 1))

#### CATEGORY - I

1. PULSE CONTROL(Refer to Ch2.6 Cat.-I(1))

2. MILLION & MILLTEC(RefertoCh 1.1 (A) Cat-1(3))

3. ELLICO (Refer to Ch3.7 Approved (6))

4. S.G,

#### CATEGORY - II

1. GELCO(Refer to Ch.1.1 (B) Cat.-III (6))

2. GRE (Refer to Ch 2 4. Cat -(2))

3. RANI (Refer to Ch.1 (C) (4))

4. BENTEC(Refer to Ch3.1 Cat-II (7))

5. AECO-MEFA (Refer to Ch.3.7 Cat.-II (5))

6. ANCHOR (Refer to Ch.1.1 (B)Cat -III (I))

7. SUPER (Refer to Ch.2 12 13.1) Cat.-II (8))

8. ELECOR-CLIPSAL (Refer to Ch 3.7. Cat.-II(11)))

9. OCLEG(Refer to Ch.2.12. Cat.-II(11))

10. Pulse / Nano (Refer to Ch 26 Cat -I(1))

11. SIGMA (Refer to Ch 36. Cat.-II(8))

#### CATEGORY - III

1. GUTS (Refer to Ch.3.2 Cat -Id 17))

2. STANDARD (Refer to Ch 2.4. Cat.-II (5))

3. C & S (Refer to Ch.1 1. (C) Cat -III(8))

4. INDOASIAN (Refer to Ch.1.1. (C) Cat -II (8))

5. ABB(Refer to Ch1.1 (C) Cat-III(5))

6. HAVELL'S (Refer to Ch.1.1 (C) Cat -III (1))

7. L&T (Refer to Ch.3.2 Cat.-II(4))

8. HPL (Refer to Ch,2 1 Cat-III (6))

9. NANO (Refer to Ch.3.7. Cat.-II(10))

10. PIERLITE (Refer to Ch.2.6 Cat -II (4))

11. MDS

### 3.9 TIME SWITCHES

1. GELCO (Refer to Ch 1.1 (B) Cat -III (6))

2. L&T (Refer to Ch 3 2. Cat -III 4))

3. OCLEG (Refer to Ch.2.12. Cat.-II(11))

4. INDOASIAN (Refer to Ch1.1 (C) Cat-II (8))

8. MDS

6. ELLICO

### 3.10 ENERGY METER

9 NANO Approved (Refer to Oh 3.7. Cat.-III (10))

#### CATEGORY - I

##### 1. NIPPEN

M/s NIPPEN ELECTRICAL INSTRUMENTS CO 12~A, Joy Engg Compound, Maroi Maroshi Read, Andheri (E), Mumbai - 59

2. HPL (Refer to Ch.2.1. Cat.-III(6))

3. L&T (Refer to Ch3.2 Cat-III (4))

4. G.E (Refer to Ch.2.1. Cat.-II(2))

6. TRINITY

119, Trinity CO. Op. Hsg. Soc. 1st Floor, CH Street Bhobitalao, Mumbai- 400002

6. NANO. (Refer to Ch 3.7 Cat III (10))

7. GELCO (Refer to Ch 1.1. (B) Cat.-(6))

#### CATEGORY - II

1. BENTEC (Refer to Ch 3 1 Cat -II 17))

2. ANCHOR (Refer to Ch.1 1. (B) -Cat-III(1))

## AS PER LATEST APPROVAL OF SUPERITENDING ENGINEER (ELCTRICAL), R&B CIRCLE, GANDHINAGAR

3. HPL (Refer to Ch 2.6 Cat.-III (2)) 3,11 BUSBAR CHAMBER  
CATEGORY - I 1. PEW - APPROVED (Refer to Ch.3.1 Cat.-II(4)) 2.  
REIKO - (Refer to Ch 3.2. Cat.-I (1)) CATEGORY - II 1, NEW / NILANG  
(Refer to Ch.2.12 (3 1) Cat.-II (3)) 2, AEW  
**CABLES & WIRES 4.1 ALLUMINIUM & COPPER XLPE CABLES  
(ALL Type) 1. UPTO 35SQ MM ANYISI MARKED WHICH IS  
APPROVED BY DEPARTMENT**

1. L&T 2. ALLCAB

M/s. ALLWIN INDUSTRIES, Serve No. 251, Plot NO 7,

B/h. Devsaon Ceramic, Shapar - Veraval Dist Rajkot

3. GELCO (Refer to Ch.1.1 (B) Cat-III (6))

4. AVOCAID

M/S Chandresh Cables Ltd 1108, Village Chhatral, Ta. Kalol Dist

Gandhinagar, North Gujarat

5, KUNTH CAB

M/s ORBIT POWER & CONTROL CABLES (I) 56 A, Dilshad Garden

Industries Area, Shahdara, Delhi- 110095 6. JEELEX

46/02, NewAhmedabad Industrial Estate, Nova Petro~ Chem, Moraiya,

Sanand, Ahmedabad

7. WINFLEX & WNCAB

K.P. Industires, 53,54, Krishna Estate, Parma Estate Road,

B/h Bec Gases, Nr, Soni's Chal Rakhial Ahmedabad - 380023

8. VARSHA

M/s VARSHA CABLES PVT LTD. Plot No,65, A-2, Hootagalli

Indusfiral Area, DIC Layout, Mysore - 570018

9. KATAR[A

M/s RATA RIA INDUSTRIES PVT LTD Off-34-44, Industrial Area,

RaUam - 457001, MP. [ INDIA]

10. ZENIUM CABLES

M/s ZENIUM CABLES LTD 118, GAurav Garden, Opp Bharat

Petrol Pump, Mira IDhayander Road, Mira Road, Mumba-

401107

11. BENTON

M/s Benton Cables (INDIA) PL. A-114-115,

RICO Industrial Area, Phase - I, IDhiwadi, Rajasthan

12, HAVELLS (Refer to Ch.1 1, (C) Cal.-III (I))

13, NIKI

M/s NIKi Cables Industries, E/9 B PanchratnaApph Opp Sunview Tower,

Memnagar, Ahmedabad 52

14. LEADER (Refer to Ch.1 (C) Cat.-III (10))

15 FINOLEX

M/s Fino}ex Cables India 108, Mahakant Building, Opp. WS Hospital,

Ashram Road, Ahmedabad - 380 006

16. SHREEJI

Caii Ptast Processor, 47, Narayan Estate, Near Raipur Mills, Saraspur,

Ahmedabad - 380 0~8.

17. SONA GOLD

Call Plast Processor, 47, Narayan Estate, Near Raipur Mills, Saraspuq

Ahmedabad - 350 018

18. HITEX PLUS

MIS Jay Cable Industries, Plct No 80, Tdbhuvan Industrial Estate, Opp,

Road No 11, Kathwada GIDC, Kathwada, Ahmedabad - 382430

19. KAMALEX

MIs Bhumi Cables & Wires Pvt. Ltd. Plct No. D-101/102,

Road-C, Lodhika G.I.D.C., (Metoda) Kalaward Road, Rajkot 20.

CAIDCOM

M/s. CabCem India, 304, 3rd Floor, Aggarwal Cid Mall (Opp M2K Pitam

Pura Multiplex), Road NO. 44, Pitampura, Delhi- 110034

21. DICAB

M/S DIMOND POWER INFRA. LTD.

PHASE II, VILLAGE VADALA, TA SAVLI, VADODARA

22. JAINFLEX

M/s Jainflex Cables RL , A-2/1, Sabarrlla5 IndustbaJ Society, Sabarmati,  
Ahmedabad - 380005

23. KEI

M/s REI INDUSTRIES LIMITED 803, Siddhadh Complex, Nr Hotel

Express, RC DuD Road, Baroda- 390007

24. MECAB

M/s MECAB Cables RL E35/A, Phase IV,

GIDC, VATVA, Ahmedabad - 382445

29. LOOKMAN

M/S ODIAN INDUSTRIES, Opp Ravi Vidhyalaya, N~ Gandhi Society,

Jamnagar Road~ Madhapa~ Rajkot - 300 006

26. PRIMECAB

M/s. Ravin Cables Limtied, 302, Akrut~ Trade Centre, 3rd Floor,

Road No 7, M~DC, MarelAndheri (E), Mumbai-400 0.93 ,

27. RALLISION

M/S RALLIS ON ELECTRICAL R L 205, Shreyas Complex, Opp. Jain

Derasar Navrangpura, Ahmedabad - 380009

28. BINTEX

M/s Jay Industires , IDintex House, Bhavnagar

Road, Nr. Rajmo0 Ind. Rajkot

29. EKTA

M/s Scot Innovation Wires & Cables RL,

195/1,197/1, Jharmajri BaddJ, Dist Soian (MP)

30. TEREXEL

M/s Teracom Limded, "To racom House, B-

84, Sector No 60, Noida - 201301 UR (India)

31. MITUSHI

M/s Sight Sound Electronic (I) PL.

A-128, Wazirpur industrial Area, Delhi-110052

32. TERACAS INDIA

M/S TERA CABLES & IND.RL, VILLAGE KALANA,

PO CHBARODI FARM, SANAND,AHMEDABAD

33. HI-FLEX

M/S Helly Plast Industries 17/18, Nirman Industries Estate, Fupadia

Opp Samshan Gruh, A.K. Road, Surat-8

34. BHARAT CAB

M/S Vardhman Cables & Controls, Belgaum

35. CORE CABLE

M/S Core Cables Pvt Ltd 202, arpan Complex,

Opp Swaminarayan Mandir, Kalawad Road, Rajkot-360001

36. RRKABEL

M/S R R Kabel Limited, 305/A, Windsor Plaza, RC. Dutta Road,

Alkapuri, Vadodara-390007

37. ADCAID

M/S Atlas Cables & Accessories R L Plct NO. D/2, Sector NO 12,

Heavy Ind Area, Gandhidham Gujarat

38. POPULAR

M/S Popular industries, 12, Sudama Estate, B/h Calico Nagar, Narol-

sarkhej Road, Narol, Ahmedabad

**ALLUMIBIUM & COPPER XLPE CABLES (ALL Type)**

**ABOVE 35 SQ. MM & UP TO 185 SQ.MM**

1. ALLCAB-RefertoCh 4.1 (2))

2. VARSHA (Refer to 4.1, (8))

3. KUNTHCAB (Refer to Ch 4 1. (5))

4. MITUSHI (Refer to Ch.4 1. (31))

5. RALLISION (Refer to C541. (27))

6. LOOKMAN (Refer to C54.1 (25))

7. NIKI(RefertoCh~41 (13))

8. KEI (Refer to Ch.4 1 (23))

9 FINOLEX(RefertoCh4.1 (15))

10 CABCOM (Refer to Ch 4.1 (20))

11. KAMALEX (Refer to Ch.4 1. (19))

12 MECAB (Refer to Ch.4 1. (24))

13 DICAB (Refer to Ch.4.1. (21))

14, HAVELLS ,(Refer to Ch1.1 (C) Cat-III (1))

15. BENTON (Refer to Ch 4.1 (11))

16. SONALGOLD (Refer to 4.1: (17))

17 SHREEJI(RefertoCh41 (15))

18. WINFLEX (Refer 10 Ch4 (7))

19. HI-FLEX (Refer tech41 (33))

20, CORE CAIDLE (Refer to Ch 4,1 (35))

21. HITEX PLUS (Refer to Ch 4.1, (18))

22. JAINFLEX (Refer to Ch 4.1 (22))

## AS PER LATEST APPROVAL OF SUPERITENDING ENGINEER (ELCTRICAL), R&B CIRCLE, GANDHINAGAR

23. PRIMCAB (Refer to Ch.4.1. (26))

24. TEBACAS INDIA (Refer to Ch.4.1. (32))

25. L&T

26. AVOCAB (Refer to Ch.4.1 (4))

27. TEREXEL (Refer to Ch.4.1 (30))

28. BHARATCAB (Refer to Ch.4.1. (34))

29. ZENIUM CABLES (Refer to Ch.4.1 (16))

30. RRRKABLE (Refer to Ch.4.1. (36))

31. WINPLEX & WINCAB (Refer to Ch.4.1. (7))

32. ADCAB (Refer to Ch.4.1 (38))

33. POPULAR (Refer to Ch.4.1, (38))

ALLUMINIUM & COPPER XLPE CABLES (ALL Type) ABOVE

185 SQMM

1. HAVELL'S (Refer to Ch.1.1 (C) Cat.-III (1))

2. ALLCAB (Refer to Ch.4.1, (2))

3. KUNTHCAB (Refer to Ch.4.1 (5))

4. TEREXEL (Refer to Ch.4.1 (30))

5. TERACAB INDIA (Refer to Ch.4.1 (32))

7. AVOCAB (Refer to Ch.4.1(4))

8. GEMSCAB

M/S GEMSAD IND LTD. PREM SADAN - 11, RAJENDRA

PLACE NEW DELHI - 110008

9. PRIMECAB'

M/s Ravin Cables Limited, 302, Akruti Trade Centre, EtD Floor,

Read No.7, MIDC, Marol Andheri (E), Mumbai - 400 093

10. PELEC

43. Sudarna Estate, S/h, Swas0k Bansidha! Mills, Narol Cross

Road, Ahmedabad ~ 362405

11. HITEX PLUS (Refer to Ch.4.1 (18))

12. POPULAR (Refer to Ch.4.1 (38))

13. LOOKMAN (Refer to Ch.4.1, (25))

14. KEI (Refer to Ch.4.1. (28))

15. RALLISON (Refer to Ch.4.1 (27))

16. CORE CABLE (Refer to Ch.4.1. (38))

17. POWER CAB

M/s. SMRUTI CABLES PVT LTD. Plot No 2, Block No 243,

Nr. Ramdev Exports. Santej Vadsar Road, la. Kale, Dist

Gandhleagar - 382721

18. ZENIUM CABLES (Refer to Ch.4.1(10))

19. RRRKABLE (Refer to Ch.4.1 (36))

20. ADCAB (Refer to Ch.4.1, (37))

**FLEXIBLE WIRES & CABLE /INDUETIRES WIRES / FRLS  
WIRES/ PVC WIRES / CO-AXIAL CABLE, SUBMERSIBLE CABLE  
/ ZH FR**

**CABLE ETC**

**ANY ISI ( MARKED WHICH IS APPROVED SY DEPARTMENT**

1. ALLCAB (Refer to Ch.4.1 (2))

2. AVOCAB (Refer to Ch.4.1 (4))

3. HAVELLS (Refer to Ch.1.1. (C) Cat -III (1))

4. KONARK

M/s. Servo Cable industries 90/5, Mandir Marg, ndL Complex,

Haiderpur, New Delhi-110052

5. KUNTHCAB (Refer to Ch.4.1. (6))

6. BBARAT CAB (Refer to Ch.4.1 (5))

7. VINAY (Refer to Ch.1.1. (C) Cat.-II (1))

8. EKTA

M/s Scot Innovat)on Wires & Cables P.L.,

195/197/1, Jharmalri Baddi, Dist. Solon (M.R)

9. TERA-CAB-INDIA (Refer to Ch.4.1 (4))

10. EcoTEK ZHFR

M/s SHAKUN POLYMERS LIMITED, 601/502, IVORY

TERRACE, RC.DUT] ROAD, ALKAPURI, VADODARA - 390607

11. NIKI (Refer to Ch.4.1 (13))

12. JAINFLEX (Refer to Ch.4.1 (22))

13. SINTEX (Refer to Ch.4.1 (28))

14. DARSBAN PLUS

M/S DARSHAN CABLE INDUSTRIES C/1 135/A, PHASE -I,

VATVA GIDC ESTATE NR PUSHPAK ESTATE, AHMEDABAD

16. INDOASIAN (Refer to Ch.1.1. (C) Cat.-II (8))

16 LEADER (Refer to Ch.1.1.(C) Cat.-II (10))

17. GEMSCAB (Refer to Ch.-4.2 (3))

18. ACT{ON / ADHUNIK (Refer to 2.7 Approved (1))

19. ANCHOR (Refer to Ch.1.1, (B)Cat.-III (1)

20. BENTON (Refer to Ch.-4, (11))

21. POPULAR (Refer to Ch.-4 {38))

**22. NEOCAB**

M/s R.S. Industries, Anand Industrial Estate, Borsad Chokdi,

Anand - 388001

23. CAPTON & **Arormac**

M/s MILAN INDUSTRIES, Plot NO 12, Sarthi Complex, Opp. GV M.M.,

ODHAV, Ahmedabad

24. RUBICON

M/s. RUBICON CABLES INDUSTRIES, C-1/80)6, Nr. Pushpak Estate

Cross Road, GIDC. Phase - 1, VATVA. Ahmedabad - 382445

**25 EON**

M/s. Eon Electric Limited

B-88, Sector 83, Nolda -201305, U.R, INDIA

**26. VIMAL,** [Refer to Ch.-1.1(A) Cat - I (5))

27. HPL (Refer to Ch.2.1 Cat.-III (6))

28. NANO, (Refer to Ch.3.7 Cat (14))

29. ZENIUM CABLES (Refer to Ch.-4 (f0))

30. CORE CABLE Refer to Ch.4.1 (35))

81. KAMALSX (Refer to Ch.4.1 (19))

32. CABCOM (Refer to Ch.4.1 (20))

83. MECAB (Refer to Ch.4.1 (24))

**34. RALLISON {Refer to Ch.4./ (27))**

35. SHREEJI (Refer to Ch.4.1 (16)

36. SONA GOLD (Refer to Ch.4.1 (17))

47. HITEX PLUS (Refer to Ch.4.1 (18))

68. VARSHA (Refer to Ch.-4.1 (8))

88. L&T

46. FINOLEX (Refer to Ch.4.1 (15))

41. RRRKABLE (Refer to Ch.4.1 (36))

**42. ADCAB [Refer to Ch.4.1 (37))**

43. WINFLEX & WINCAB (Refer to Ch.4.1 (7))

44. JATNSON

M/s. Jalesorl Cables india PL Surve NO. 16, Plot NO. 16A & S Ahmedabad

Mehsana Highway Vi]lsge OhandanCa Post Ghuma. san, To. KadL Diet

Mehdanad-362718

**46. GELCO - SUBMERSIBLE CABLE** (Refer to Ch.4.1 (3))

**FANS**

**5.t CEILING FANS & TABLE FANS**

**1. ORPAT .APPROVED** (Refer to Ch.1.1A) Cat III (2))

2. USHA

M/S, USHA INTERNATIONAL LTD 1st Floor, Super Market, Nr, Natraj

Cinema, Ashmram Road, Ahmedabad - 380 009

3. ANCHOR[ (Refer to Ch.1.1 (B)Cat -III (1))

4. CROMPTON (Refer to Ch.2.1, Cat -III (4))

5. BAJAJ (Refer to Ch.2.1. Cat -II (3))

**6. Philips** (Refer to Ch.1.1 (C) Cat.-III (4))

7. KHAITAN

M/s Khailtan Electric, ale, 181/102, Mahakant Complex;

Opp, MS Hospital, Ashram Road, Ahmedabad - 380 086,

**8 DECON**

M/s Bacon Lighting, Y-43, Okhak Phase - II New Delhi-110023

9. HAVELL'S (Refer to Ch.1.1, i) Cat.-III (1))

**10. ALMONDARD**

11. CINNI

12. REMI

13. KEDIA

14. NOVA

**15. GEC**

16. ORIENT

17. INDO PLUS

M/s. The Universal Appliances (India) Nalagarh Dist Sona(H.P)

**ENERGY SAVING 50 WATT CEILING FAN**

1. HAVELL'S (Refer to Ch.1.1 (C) Cat.-III(1)

2. CROMPTON (Refer to Ch.2.1. Cat.-III (4))

3. BAJAJ (Refer to Ch.2.1, Cat (3))

4. USHA (Refer to Ch.-5. (2)

5. ORIENT

6. SATYA

7. KELTRON

## AS PER LATEST APPROVAL OF SUPERITENDING ENGINEER (ELCTRICAL), R&B CIRCLE, GANDHINAGAR

8. RIDER
9. OCLEG
10. ELLICO
11. PULSE

### EXHAUST FANS, BRACKET FANS & PEDESTAL FANS

#### (A).CATEGORY - I

1. ANCHOR (Refer to Ch 1.1 (B)Cat III (1))
2. ORPAT (Refer to Ch.1.1. (A) Cat.III(2))
3. ANSU

4. NOVA
5. EPC
6. REMI
7. KHAITAN

8. INDOPLUS(Refer to Ch-5.1 (17))

· CATEGORY-II 1. USHA (Refer to Ch.5 (2)) 2. HAVELL'S (Refer to Ch 1.1. (C) Cat.-SI (!)) 3. CROMPTON (Refer to Ch.2.1. Cat. III (4)) 4. BAJAJ (Refer to Ch.2 1. Cat.-g (3)) 5. ALMONARD 6. ORIENT 7. SATYA 8. G.E.C.

#### CHAPTER -VI

SMC PRESS MOULDED BOX FOR STREET LIGHTS 1. SINTEX - APPROVED

M/S SINTEX INDUSTRIES LTD KALOL (NORTH GUJARAT) PIN - 382 721

2. EVEREST-APPROVED

M/S EVEREST ELECTRICALS 133, PRINCESS STREET,  
GOPAL NIWAS,1 ST FLOOR, ROOM NO 9/1 Of 1, MUMBAI - 400002

3. ESCO - APPROVED (Refer to Ch 3.7. Approved (4))

4. NATIONAL

M/s. R M Enterprise 203/B, Gurukul Tower, Jaywant Sawant  
Road, Dahisar [W] Mumbai - 400068

5. EPP

M/s EP Composites PL Plot No 2646, Kran8 Gate Main Road,  
GIDC Lodhika Ind Estate, Kalawad Road, Metoda, Rajkot-860021

### AIRCONDITION ERS, WATER COOLERS APPROVED

1. DIAKIN

M/s Daikin Ar[condgioning India PL. 12th Floor, Building No. 9,  
Tower A, DLF Phase gl, Gurgaon-122022. Haryana.

2. MISHIBISHU ELECTRIC

M/s. Mitsubishi Electric India PL Primate 303/A, 3rd ROORr Judges  
Bungalow Cross Road, Bodakdev, Ahmedabad.

3. ONIDA,

MIRC Electronics, ONiDA House, G-1, MIDC

Mahakali Caves Road, Andheri [E] Mumbai - 400093

4 OGENRAL

5. BLUE SATAR

6. PANASONIC

7. VOLTAS

8. CARRIERS

9. AMTREX

### SERVO CONTROLLED VOLTAGE STABILIZER& ELECTRONICS

#### POWER CONDITIONERS

1. GRE (Refer to Ch 2 4, Cat.-II (g))
2. GELCO (Refer to Ch.f.l. (B) Cat.-III (6))
3. SUVIK

M/S SUVIK ELECTRONICS RL. SECTOR NO 28, INDUSTRIAL  
ESTATE, GANDHINAGAR.

4. KEPREJ

M/S KEPREJ ELECTRONICS, SECTOR NO. 28, INDUSTRIAL  
ESTATE, GANDHINAGAR.

5 SERVOTECH

M/S. SERVOTECH POWER SYSTEM PVT LTD. D-212,  
Sector-2, DSIDC, Bawana Indi Area, Delhi.

6. CONSUL

CONSUL CONSOLIDATED PVT LTD 4/329A, Old  
Mahabalipuram Road,Chennai - 600041

7. Pulse I Nano (Refer to Ch 2.6 Cat I (1)) **CAPACITOR**

1. HAVELL'S(Refer to Ch 1.1 (C) Cat-III(1)) 2. MATRIX M/S Matrix  
Control & Engineering P.L, E 725, DSIDC Indusidal Complex, Narela,  
Delhi-110040 3. PMX M/s. Power Matrix Solution P.E. 4018 & 4019,  
Shandup Ind Estater *Pannalal* Compound, Off LBS Road, Bhandup [W],  
Mumbai 4, JILCO (Refer to Ch 2.1. Cat-Ii (6)) 5. UNIVERSAL M/s Care  
Enterprise FF-9 ShalimarComplex, Mahajalaxmi Five Road, Paldi,  
Ahmedabad-380007

#### ON LINE UPS

1. GRE (Refer to Ch.2 4. Cat II(2)) 2. SUVIK (Refer to Ch.~ (3)) 3.  
KEPREJ (Refer to Ch.\*6 (4)) 4. OCLEG (Refer to Ch.2.12 Cat -II (11)) 5.  
CONSUL (Refer to Ch 6 (6)) 6. SERVOTECH (Refer to Ch -6 (5)) 7.  
NUMERICUPS M/S, Numeric Power System Limited umeric House NO.  
5 Sir P. SI Sivasamy Salai, Mylapore, Chennai 600004 India 8.

**KELTRON WATER HEATERS CATEGORY - I** 1. BAJAJ (Refer to  
Ch.2.1. Cat -II (3)) 2. USHA (Refer to Ch.-5 (2)) 3. INDO PLUS (Refer  
to Ch 5 1. (17))

#### CATEGORY - II

1. JILCO 2. SPHEREHOT 3. RECOLD 4. VENUS

#### MOTOR PUMPS

#### MOTOR PUMP STARTERS & STARTER ACCESSORIES

#### APPROVED

1. GELCO (Refer to Ch.t.1 (B) Cat-III (6)) 2. **OCLEG** 3. PULSE 4.  
ELLICO 5. L.S.

#### CATEGORY - II

1. CROMPTON (Refer to C823. Cat.-Ig (4)) 2. JYOTI 3. AEW 4.PECO  
M/s. Poco Industries Estate, Nr. Gota Flyover Gota Road, Ahmedabad-  
382481

#### CATEGORY III

1. HAVELL'S (Refer to Ch.1.1. (C) Cat -III (1))

2. **BCH** (Refer to Ch 3.4. Cat.-III (3))

3. C&S GEWISS (Refer to Ch.1.1, IC) Cat -II (8)) 4. L & T (Refer to Ch  
3.2. Cat-III (4)) 5. **Siemens** (Refer to Ch 3.3. Cat.-II (6)) 6. ALSTHOM 7.  
SUECO

#### POWERAND CONTROL PANEL I PANELACCESSORIES

1. C&S GEWISS (Refer to Ch.1.1 (C) Cat.-III (8))

2. GELCO (Refer to Ch1.1.(B) Cat-II (9))

3.TRINITY (Refer to Ch,3 I0 Cat-I (5))

4. NIPPEN (Refer to Ch 3.10 Cat-I (1))

5.STANDARD (Refer to Ch.2.4. Cat.-II (5))

6. L&T (Refer to Ch.32 Cat.-III (4))

7. OCLEG (Refer to Ch 2.12. Cat -II (11)

8.ELICO -APPROVED

9, L.S, - APPROVED

**10, PRATHAM - APPROVED**

11. SAHIL - APPROVED

**12. MEGAWIN-APPROVED**

**13. ACTION /ADHUNIK** (Refer to Ch ~2.7 Approved (1))

**14. SKY**

M/s. Sky Control System 160, Vikas Estate, Opp Anil Starch Mill  
Road Nr Vrma Yojna Hospital Bapunagar Ahmedabad 380025.

**AS PER LATEST APPROVAL OF SUPERINTENDING ENGINEER (ELCTRICAL), R&B CIRCLE,  
GANDHINAGAR**

**SINGLE PHASE MONO BLOCK PUMPS CATEGORY-II**

1. AMIT /Refer to Ch.1.2(13)
- 2 LUBI  
B/h Lubi Elect Memco. Naroda Road Ahmedabad
8. UNEEL  
M/S UNNATI INOUSTIRAL CORPORATION D-61. Diamond  
Park G I D C. Nr Nana Chiloda N H NO 8. Naroda -  
Ahmedabad - 382330
4. PRIMA  
M/s. Prima Pumps P L34 GV.M Au VasanaT Odhav  
Ahmedabad - 382410
5. SABAR  
M/s SABAR PUMP PVT LTD 3704/A. G I D C Estate Phave - B/h New  
Nirma Chemicals vatva Ahmedabad - 382445

**CATEGORY III**

1. CROMPTGN Refer to Ch 2 1 Cat.III(4)
- 2 SIEMENS RefertoOh23.  
Cat-I 61
- 3 KIRLOSKAR

**OPEN WELL TYPE HORIZONTAL MONO BLOCK PUMPS  
CATEGORY - I**

1. PRIME

**2. SABAR**

**CATEGORY -II**

1. UNEEL Refer to Ch.9(3)
2. AMRUT  
M/sAmit Engineering PL PO No 4141 2ndFloor, Motilal Centre Nr  
Dinesh Hall Ashram Road Ahmedabad - 3800009
- 3 AMIT(Refer to Ch1.2(13))
4. LUB (Refer to Ch.9 (2))
5. CROMPTON (Refer to Ch.2.3 Cat-III(4))

**6, DUKE**

**7 PRIMA**

**8. KIRLOSKAR**

**STARTER PANELS [APPROVED]**

1. GELCO Refer to Ch1.1(B) Cat-III (6)
2. SAHIL

M/s SAHIL ELECTRO SYSTEM 163 Vi kas Industrial Estate  
**Opp** Anii Starch **Mills** Nr Vlma yojna hospital Nutan Mills Road  
Ahmedabad - 380025

3. HAVELL'S Refer to Ch1.1 (C)Cat-III(1)

4. OCLEG Refer to Ch 2.12 Cat-(11))

5. L&T Refer to Ch 3.2. Cat III( 4)

**6. SAMUDRA**

M/S Samudra Power Products, Plot No. 32, Road Ne, 5/A,  
G ID.C. Kathawada, Ahmedabad - 380415

**7. SUECO**

M/s SHREE UMIYA ELECTRICAL CO. 304 SHAILLY HOUSE,  
HARIHAR PARK SOCIETY Nr OLD HIGH COURT, RAILWAY  
UNDERBRIDGE, NAVRANGPURA, AHMEDABAO - 380009

**8. ELLICO**

**CATEGORY - III**

1. C&S GEWISS (Refer to Ch.1.1, (C) Cat-III(8))
2. BCH (Refer to  
Ch3.4 Cat-III(3))

**SUBMERSIBLE PUMPS CATEGORY - I**

1. AROMA  
M/S ARTHANT PUMPS PVT. LTO., Near Ladbi Nala, Oeesa H ghway  
PaJanpur- 385 001

**2. PLUGA-APPROVED**

M/S Shroffs Engineering Limited, 850/2,  
G I.DC Estate Makarpura, Vadodara - 390 010

**3. JEE-APPROVED**

M/S Jee Frumps (Gui.) RL Plot No 1 & 2, GIDC Nr. Water Tank,  
Odhav - Ahmedabad - 382415

**4. FALCON -APPROVED**

M/s Falcon SubmerSible PL. Survey No 39/4, Vavdi Industiral  
area gondal road Ralkot - 360004

**CATEGORY - II**

1. CROMPTON (Refer to Ch.2 1. Cat-III (4))  
**2 DUKE** M/s Duke PlastoTechnique PL N.H 14 Deesa Highway Opp'.  
Hotel Green Wood, Badarpura. Palanpur - 385511  
3. SABAR (Refer to  
Ch 9. (5))  
4. JASCO  
WS JASCO PUMPS PVT LTO 47, Phase -It, GI D.C., Mangal Estate,  
Naroda, Ahmedabad - 382330

**CATEGORY - III**

1. UNEEL (Refer to Ch.9 (3))
2. AMRUT '~Refer te Ch 9 (2)
3. LUBI (Refer to Ch9(2))
4. DUKE  
(RefertoCh.9 Cat II (2))
- 5. KEB**
6. KIRLOSKAR

**CHAPTER X**

**SUB STATION EQUIPMENTS APPROVED**

1 BIECCO (Refer to Ch3 5. (Approved)-1)

2. HAVELL'S (Refer to Ch  
1.1 (C) Cat-III (1))

3. VOLTAMP

4. MATRIX

5 MEGHAWIN

6 PMX

**CATEGORY - II**

1. UNIVERSAL

M/s Unirversal Power Xmer Ltd. 26/A 2nd Phase, Peenya Industrial  
Area, Bangalore - 560058

2. SKP **CATEGORY - III**

1. CROMPTON  
(Refer lo Ch.2 3. Cat.-III(4))

2. L&T(Refer to Ch 32 Cat -III(4))

3. KIRLOSKAR

4 ALSTOM

5 C&SEFACCCE

**TRANSFORMER**

TRANSFORMER SHOULD COMPLY E.C.B.C, CODE CRITERIA

**1. TRANSFORMER-APPROVED**

MIS Danke Electncars Ltd 778/780 G. IDC Estate,  
Weghod~a - 391760, Baroda - Gujarat

**CATEGORY - I**

1. POWERLITE
2. INSTA POWER
3. SHILCHAR
4. VARDHMAN ELECTRO-MECH

**CATEGORY - II**

1. UNIVERSAL

**2. DICAB**

3. KOKILA

M/S. Koklla Electricals TB Hoapmtal Road, Viiapur-382770 Dist  
Mehsana

4. ARYA-ELECTRONICS (AE)

Plot No 1 g8/1, GIDC-IV Sihor Ghanghali Road, Bib. Sitaram  
weight Bridge, sihor Gist Bhavnagar

5. RAYCHEM RPG

Raychem. RPG House, 463, Dr. Annie Basant Road, Worli,  
Mumba~.00039.

**CATEGORY - III**

1. VOLTAMP

2. POWERLITE

M/s Powelite Electncals Plot No 627, Nr Gayatri Temple, Phase- 4,

G.I.D.C. Estate, Naroda, Ahmedabad -382330

**3. CROMPTON**

**4. L&T**

**5. SIEMENS**

**6. GE.**

7. KILOASKAR

8. ALSTHOM

- 9, SKP

**Note:- Other products are supposed to be included as per latest approval of  
Superintending Engineer, Electrical (R & B ) Circle Gandhinagar as on or before last date of  
submission of tender.**

**AS PER LATEST APPROVAL OF SUPERITENDING ENGINEER (ELCTRICAL), R&B CIRCLE,  
GANDHINAGAR**

**CHAPTER -11 NEW ITEMS APPROVED**

No	Name of Company	Brand Name	Description of Make	Remarks
1	M/S VijayshreeElectromech (p) Ltd 103, vedant complex, 7 Kelpana Society, B/h N.V RRO off CG Road, Navrangpura,Ahmedabad - 009	WELLTECH	1. Swaged Steel Tubular poi /Stel Octagonal pole / Steel conical pole/GRP / FRP Pole 2. SMC/DMC Junction bax/G I Race way -Trunking/GRP Cable Tray/G.I. Cable Tray	Cat-II  Approved
2	M/S Bajaj Electrica[s LimgedAhmedabad	BAJAJ	1. High Mast / Octagonal pole / GRP poles / DecoralivePolesi Conical GI Pole	Cat -III
3	M/sJayCopper&A]loysRL. Pict No 2219, Nr Shah Alleys Ltd., Science City To Khatraj Road, Village - Santeh - 382721	ELECTRO- EARTH	1 GalvanizingEarthing[ChemicalBarthing - 1/2/3 Mtr 2 Copper Earthing [ Chemical Earthing 1/2/5 Mtr	Approved  Approved
4	M/S Prestolite Corporation (Refer Ch 2.6 Cat qll (3)	PRESOLrfe	1 High Mast pole upto 30 Mtr	Approved
5	Mis Surya Roshni Ltd Ahmedabad	S URYç,	1 High Mast / Octagonal Pole	Cat. III
6	MIs Kemrook India	KEMROK	1 FRP Lighting pole	Approved
7	Mis Accurate Eng. LTd.	ACCURATE	I High Mast / Tower	Approved
8	M/s. SumipCompostesPvt. Ltd	SUMIP	1 FRP Light Pole / FRP Cable Tray / Trefoil Clamp / Luminaries / FRP Leader	Approved
9	Mis.Aster	ASTER	HIGH Mast Pole	Cat II
10	M/S Ammini Eng. System RL	AMMINI	Out Door Street Light	Approved
11	M/S GELCO ELECTRONICS RE (Refer. Oh1.1 Cat -III (B) (8))	GELCO	Motor control cubical panel, Electbcal Starter for A.C. etc	Approved
12	TransrailLighbng Ltd A-201/209, Boomerang Comrex, Chandivali Farm Road, Andheri [E], Mumbai - 400072	TRANSRAIL	1 H[gh mast Pole 2 Street Light Pole (Conical / Hexagonal / Octagonal / swageç pole)	Cat III Cat III
13	M/s Halonix (Refer Ch2.1 Cat -III (4))	HALONIX	t Land Scape & Garden Light / High Mast / All type ~uminers	III
14	M/S, Megawin	MEGAWIN	# United Sub-Station upto 12kw # Control relay panels custom built # SF 6 Ring main units upto 36 ky # Auto reclosers& capacitor switch upto 36 ky # Air insulated icad break switchgear upto 36 ky # Metal porcelain clad VCB switchgear upto 36 kv	Approved
15	Mis. THRON LIGHTING C/o 10, ParshwanathApttSomnath Park Lane, Opp. Tole Exchange Sahibaug, Ahmedabad-380004	31-IRON	Street Light / Landscape & Garden Light	III
16	M/s. Control & Switchgears Contractors Ltd 9th Floor, HERITAGE, Nr. Gui. University, AshramRoad, Ahmedabad-380009,	C&S	# Indoor Air insulated Metal Clad Switchgear with VCB # Compact SF6 insulated Ring main units for Indoor & Outdoor installation	III
17	Mis. Keselec Schrader Pvt.LTd 69 Friends Colony, West, New Delhi - 110065	SCHREDER	# Indoor & Outdoor Decorative Pole & Bracket # Premium Light Fixture # Furyol 140 w compolis with dimmable electronic.~ ballast # Contemporary / classic / Traditional City Lighting # Urban Lighting # Indirect / direct lighting I free standing Mi lighters # Compact recessed & surface mounted luminaries # Modular recessed & surface mounted luminaries#Wallceilin & pendent mounted luminaries # Row lighting system # Spot Lighting & track system #Luminares with increased IP rating & special luminaries # Emergency Luminaries / Outdoor luminaries # Access cries & light sources	III
18	M/s. Regent BeleuchtungsKorper AG Dornacherstrasse 390 P O Box 246	REGENT	Description of Make	III



	OH 4018 Basel Switzerland C/o Bharat Bech Corporation, 3, Abhigam, Opp Dr. House, Nr. Padmal Rly. Crossing, Ahmedabad.			
19	M/S Sylvania India Ltd ORG Towers 2D Sector 126, Expressway Noida [UP] - 201304	SYLVANIA	# Down lighter # Fluorescent Recessed # Fluorescent surface mounted/suspended # Spot Lights # Track # Ambient/Decorative # Pendant # Batts / Trunking system # High protection # High Bay / Low Bay # Amenity / Bollard # In Ground / wall light~ # Flood light # Pole top	III
20	M/s Ligman Lighting India Pvt Ltd Plot No. 4th Floor, Gulmohar Plaza, Gulmohar park, ITI Road, Aundh Pune-411007.	LIGMA	# Architectural Outdoor Lighting	III
21	<b>M/S Philips India Ltd</b> M/S Philips Electronics India Ltd	PHILIPS	# Indoor Lighting # Public Lighting System # Spot Lighting # Urban Decorative Lighting # Landscape Lighting # Special Application Lighting # Lighting Control for Indoor & Outdoor Lighting system	III
22	M/S ABB (Refer Ch 1.1 (C) Cat III (4))	ABB	# Composed Substation # Ring Main unit	III
23	M/s. WIPRO (Refer Ch-2.1 (C) Cat-III(5))	WIPRO	# High Mast Motorized & Not Motorized # ( Pole - Octagonal, Decorative Swaged and All type of tubular pole	III
24	M/S Aspire Composites, Survey No 172, Plot NO 27, Opp Rencopet at Pump. Madhapur- Anjar Highway Village Madhapur, Bhuj Kutch	ASPIRE	FRP Industrial Lighting Products	Approved
25	M/s REX POLYEXTRUSION LTD, Kumar Plaza, 1st Floor, 1077, North Shivajinagar, Opp K.W.C. College, Sangli - 416416.	REX	# DOUBLE WALL CORRUGATED PIPE # NON THREADED COMMUNICATION & ELEC], INSULATED CONDUIT PIPES	Approved
26	M/s DURA-UNE INDIA PVT LTD, Plot No. 24- 25 Verna Electronics City Phase I A, Verna GOA-403722 (North Goa)	DURA – GUARD	# Conduit Systems for Electrical installation : & Communication installation Non Threadable of size upto 200mm OD	Approved
27	M/s Trupati Plastomatic Pvt Ltd F-543 Road, No 6 D VKI Area, Jaipur - 302013	GEMINI	# HDPE Corrugated Sheathing Ducts & HDPE Double Wall Corrugated Pipe (DWC)	Approved
28	M/s Aashcube Lighting PL (Refer, Ch. 2.6 Cat.-I (7))	Aash Cube	# Gate / Bollard Light	Cat-I
29	M/S Havell's India Ltd, (Refer to Ch 1.1 (C) Cat-III(1))	HAVELL's	# Humefree Electronics Regulator	Approved
30	M/S GRE Electronics Pvt Ltd Plot NO 423, G.I.D.C II, Dediya San Mehsana- 384002	GRE	# Humefree Electronics Regulator	Approved
31	M/s. GELCO ELIZTRONICS PVT LTD (Refer to Ch. 1.1 (B) Cat.-gl (6))	GELCO	# Humefree Electronics Regulator	Approved
32	M/s VALMONT STRUCTURES PL, 909/910, FILIX LBS Marg, Bhandup (w) Mumbai:- 400078	VALMONT	# High Mast, Octagonal Pole, Conical Pole, decorative Pole, Stadium Mast	Cat-III
33	M/s MAXCEL PLAST 133, Shree Ram Ind Estate, B/h C M C. Anumeng Compound, Nr. Son's Chawl Cross Road, ODHAV, Ahmedabad-382415	MAXCEL PLAST	# YUVA Gang Box, Modular Box, Mudlar Plastic Concealed Box, G.I Metal Modular Box, Plastic Fan Box, Point Box, Polycarbonate Lamp Holder, Nice Holder Plate / Fan Plate Pipe Fittings Accessories	Approved
34	M/s, THE UNIVERSAL APPLIANCE (India) Nalagarh Dist Sona (HP)	INDO PLUS	# Geyser ISI [Geyser Metal 1,6,10,15,25, Ltr] # [Geyser ABS 5 Star Rating-15, 25 Ltr] [Geyser ABS [1,6,10, Ltr, 50 Ltr Powder Coated] # Immersion Heater ISI [1.5, 2.0 KW] # Heat Converter ISI [Super ISI, Super Dlx ISI U Type (HOT AIR ISI)]	Approved  Approved  Approved Approved
35	M/s PECO industries,, (Refer to Ch 9 Cat-d (4))	PECO	# HRC Fuse & Fuse Link	

**NAME OF WORK : DEVELOPMENT OF NARESHWAR DHAM  
(CIVIL , LANDSCAPE & ELECTRICAL WORK)**

**Item No 139: LED Step Light: Supply, Installation, testing & commissioning of LED step light as per approved sample by EIC. Work complete including Integrated driver and equipped mounting box, all type of fittings, accessories, fixtures etc complete as per instruction of EIC. Equivalent to Philips Model No-34152 -3W- ANTHRACITE LED- IP 44 .Make: ABBA / PHILIPS / WIPRO / GE.**

**1. Materials:**

- LED step light shall be used for work as per approved sample by EIC/Architect.

**2. Workmanship:**

- Work complete as per as described above specification.
- The whole works is to be completed as per design, sample material, and any other requirement shall be as per instruction of EIC/Architect.

**3. Measurements:**

- The rate shall be consolidated for all above items.
- The rate shall include the cost of all materials, finishing, labour, scaffolding, etc. to complete the whole work satisfactorily as per instruction of EIC/Architect.
- No extra payment will be given for any of the reasons.
- The rate shall be for a unit of each.

# **TECHNICAL SPECIFICATIONS**

## **TECHNICAL SPECIFICATION ELECTRICAL WORK**

### **CONTENTS**

<b>SR NO.</b>	<b>DESCRIPTION OF ITEM</b>
1	Applicable codes and standards General technical specifications
A	LT Panels
B	L.T. Cable and cable laying
C	Distribution Boards
D	L.T. Cables and Cable termination
E	Internal Wiring
F	LED Light Fixtures
G	Earthing
H	Lightening Arrestor
I	Telephone and Networking System
J	Video Surveillance System
3	Factory Acceptance Test for All bought out items
4	Mode of Payment
5	Safety Code
6	Testing of Installation
7	Form of Completion Certificate
8	Special conditions of Contract

## **1. VARIOUS CODES FOR ELECTRICAL WORKS**

### **1.0 APPLICABLE IS STANDARDS**

1.	METERS (MEASURING) FOR ANALOG METERS	IS:1248-1986
2.	INSTALLATION AND MAINTENANCE OF SWITCH GEARS	IS:3072-1975
3.	CODE OF PRACTICE FOR EARTHING	IS:3043
4.	H.D. AIR BREAKER, SWITCH GEARS AND FUSES FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:4047-1977
5.	SELECTION, INSTALLATION AND MAINTENANCE OF FUSES UP TO 650 VOLTS	IS:8106-1966
6.	GENERAL REQUIREMENTS FOR SWITCH GEAR AND GEAR FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:4237-1967
7.	DEGREE OF PROTECTION PROVIDED BY ENCLOSURES FOR LV S/GEARS	IS:2147-1962
8.	INSULATED CONDUCTOR RATING ENCLOSED DISTRIBUTION FUSE BOARDS AND CUT-OUTS FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:8084-1972 IS:2675-1983
10.	MINIATURE CIRCUIT BREAKER	IS:8828-1978
11.	FUSE WIRE USED IN RE-WEARABLE TYPE ELECTRIC FUSES UP TO 650 VOLTS	IS:9926-1981
12.	PVC INSULATED ELECTRIC CABLES HEAVY DUTY	IS:1554 (PART I)
13.	RECOMMENDED CURRENT RATING FOR CABLES	IS:3961(PART II)
14.	COPPER CONDUCTOR IN INSULATED CABLES AND CORES	IS:2982
15.	CONDUCTOR FOR INSULATED ELECTRIC CABLES AND FLEXIBLE CORDS	IS:8130
16.	MILD STEEL WIRES, STRIPS AND TAPES FOR ARMOURING CABLES	IS:3975

17.	PVC INSULATION AND SHEATH OF ELECTRIC CABLES	IS:5831
18.	ALUMINIUM CONDUCTOR FOR INSULATED CABLES	IS:1753
1.	PVC INSULATED AND PVC SHEATHED SOLID ALUMINIUM CONDUCTOR CABLES OF VOLTAGE RATING NOT EXCEEDING 1100 VOLTS	IS:4288
20.	RECOMMENDED CURRENT RATING FOR CABLE	IS: 961
21.	CODE OF PRACTICE FOR ELECTRICAL WIRING INSTALLATION SYSTEM VOLTAGE NOT EXCEEDING 650 VOLTS	IS: 732
22.	CODE OF PRACTICE FOR FIRE SAFETY OF BUILDINGS GENERAL ELECTRICAL INSTALLATION	IS: 1646
23.	RIGID STEEL CONDUITS FOR ELECTRICAL WIRING	IS:1653
24.	FITTINGS FOR RIGID STEEL CONDUITS FOR ELECTRICAL WIRING	IS:2667
25.	FLEXIBLE STEEL CONDUIT FOR ELECTRICAL WIRING	IS:3480
26.	ACCESSORIES FOR RIGID STEEL CONDUITS FOR ELECTRICAL WIRING	IS:3837
27.	PVC INSULATED CABLES (WIRES)	IS:694
28.	RIGID NON-METALLIC CONDUITS FOR ELECTRICAL WIRING	IS:2509
29.	FLEXIBLE (FLEXIBLE) NON-METALLIC CONDUITS FOR ELECTRICAL INSTALLATION	IS:6946
30.	THREE PIN PLUGS AND SOCKETS	IS:1293
	CONDUCTORS FOR INSULATED ELECTRICAL CABLES AND FLEXIBLE CABLES	IS:8180
32.	SPECIFICATION FOR CONDUIT FOR ELECTRICAL INSTALLATION	IS:9537-1980
33.	ACCESSORIES FOR NON-METALLIC CONDUITS FOR ELECTRICAL WIRING	IS:3419
34.	SWITCHES	IS:3854
35.	PLUGS	IS:6538
36.	SHUNT CAPACITORS FOR POWER SYSTEMS	IS:2834-1954

37.	HRC CARTRIDGE FUSES AND LINKS UP TO 660 VOLTS	IS:2208
38.	GENERAL AND SAFETY REQUIREMENT FOR LIGHTING FITTINGS	IS:1913-1969
39.	CODE OF PRACTICE FOR LIGHTING PUBLIC THOROUGH FARES	IS:2944-1981
40.	WATERPROOF ELECTRIC LIGHTING FITTINGS	IS:3528
41.	WATER TIGHT ELECTRIC LIGHTING FITTING	IS:3553-1966
42.	MILD STEEL TUBULAR AND OTHER WROUGHT STEEL PIPE FITTING	IS:1239-1958
43.	LUMINARIES FOR STREET LIGHT	IS:2149-1970
44.	HRC FUSES HAVING RUPTURING CAPACITY OF 90 KA	IS:9224
45.	EXHAUST FAN	IS:2312-1967
46.	CLASS I CEILING FAN	IS:374-1979
47.	DANGER NOTICE BOARDS	IS: 2551
48.	Cabinets and Boxes	UL 50
49.	Smoke Detectors for Fire Protective Signaling Systems	UL 268
50.	Control Units for Fire Protective Signaling Systems	UL 864
51.	Smoke Detectors for Duct Applications	UL 268A
52.	Thermal Detectors for Fire Protective Signaling Systems	UL 521
53.	Door Closers-Holders for Fire Protective Signaling Systems	UL 228
54.	Audible Signaling Appliances	UL 464
55.	Manually Activated Signaling Boxes	UL 38
56.	Water flow Indicators for Fire Protective Signaling Systems	UL 346
57.	Power Supplies for Fire Protective Signaling Systems	UL 1481
58.	Proprietary Burglar Alarm Units and Systems	UL 1076
59.	Visual Notification Appliances	UL 1971

**NOTE:**

All codes and standards means the latest where not specified otherwise the installation shall generally follow the Indian Standard codes of practice or relevant British Standard Codes of Practice in the absence of corresponding Indian Standards.

**PLEASE FOLLOW:**

- a. Indian Electricity Act of 1910 and rules issued there under revised up to date.
- b. Special Attention should be given to Rule No. 50.
- c. Regulations for electrical equipment in building issued by The Bombay Regional Council of insurance Association of India.

**1.2.0 General:**

**1.2.1 Dimension:**

The dimensions wherever stated do not allow for waste, laps, joints, etc. but the Contractor shall provide sufficient labour and material to cover such waste, laps joints etc.

**1.2.2 The Contractors shall provide:**

All equipments necessary to carry out the electrification of the building. All the material required for the said job shall be provided by the contractor. The labour with supervision shall be provided by the contractor.

**1.2.3 Material quality:**

All the materials used in the work are to be of the very best quality of their respective kinds as specified or described, and all materials to be used in and about every part of the work may from time to time be subjected to tests by means of machines, instruments and appliances as the CLIENT AND/OR ITS ARCHITECT may direct and wholly at the expenses of the Contractor. Samples subjected to any tests, will not be returned or paid for.

**1.2.4 Rates:**

A rate for any one description of work in the schedule of quantities and rates is to be held to include each items of other classes of work as are obviously necessary for its due completion and, for these, no separate or specific charge will be admitted.

**1.2.5 Material Measurement:**

Record of all the challans and day to day usage of any sort of material shall be kept at site in duplicate.

**1.2.6 Supervising:**

The supervisors shall always carry with them the required tool box together with measuring tap and pad to note any and all the instructions given during the visit of client and or its architect.

**1.2.7 Measurements:**



The Contractors or their representative shall accompany the CLIENT AND/OR ITS ARCHITECT or his representative or the clerk-of-works when required to do so, and assist in taking the measurements and shall agree to the measurements recorded on the spot. All measuring tapes shall be of steel and scaffolding and the Contractor shall supply ladders that may be required for taking measurements. If the Contractors fail to accompany the clerk-of-works or any other person that has been duly authorized by the CLIENT AND/OR ITS ARCHITECT to take measurements, they shall be bound by the measurements recorded by the CLIENT AND/OR ITS ARCHITECT or his representatives.

**1.2.8 Protection:**

- a) The Contractors must cover up and protect from injury from any cause all new works.

**1.3.0 Materials and Workmanship:**

**1.3.1 General:**

All materials brought on the site of works and meant to be used in the same, shall be the best of their respective kinds and to the approval of the CLIENT AND/OR ITS ARCHITECT. The CLIENT AND/OR ITS ARCHITECT or his representative will accept that the materials are really the best of their kinds, when it is approved beyond doubt that no better materials of the particular kind in question are available in the markets.

**1.3.2 Samples:**

Samples and make of all materials shall be got approved by the CLIENT AND/OR ITS ARCHITECT and shall be deposited with him before the order for the materials is placed with the supplier. The materials brought on the work shall conform in every respect to the respective approved samples.

**1.3.3 Check:**

The Contractors shall check each fresh consignment of materials, as it is brought on to the site of the works, to see that they conform in all respects to the specification and/or the samples approved by the CLIENT AND/OR ITS ARCHITECT.

**1.3.4 Testing:**

The CLIENT AND/OR ITS ARCHITECT will have the option to have any of the materials tested to find whether they are in accordance with the specification, and the Contractors will bear all expenses in that connection. All bills, vouchers and test certificates which, in the opinion of the CLIENT AND/OR ITS ARCHITECT or his representatives are necessary to convince him as to the quality of the materials or their suitability shall be produced for his inspection on requisition.

**1.3.5 Rejection:**

Any materials that have not been found to conform to the specifications will be rejected forthwith and shall be removed from the site by the Contractors at their own cost.

**1.3.6 Storing:**

The materials shall be stored or stocked on the site as directed by the CLIENT AND/OR ITS ARCHITECT and if any additional space is to be hired for this purpose, the Contractors will do so at their own expenses.

**1.3.7 Purchase:**

The CLIENT AND/OR ITS ARCHITECT shall have the power to cause the Contractor to purchase and use such materials from any particular source as may in his opinion be necessary for the proper execution of the work.

**1.3.8 Special Materials:**

Any special materials that may be required on the works which are supplied by any other person or firm selected by the CLIENT or by the CLIENT AND/OR ITS ARCHITECT on their behalf shall be taken over in writing by the Contractors for safe custody until they are required on the works when called upon to do so by the CLIENT AND/OR ITS ARCHITECT. The Contractors will be responsible for all special materials or articles, which may be supplied by specialists.

**1.3.9 Drawings, Specifications & Deviations:**

- A. The drawings and specifications lay down minimum standards of equipment and workmanship. Should the tenderer wish to depart from the provisions of the specifications and drawings either on account of manufacturing practice or for any other reasons, he should clearly draw attention in his tender to the proposed points of departures and submit such complete information, drawings and specifications as will enable the relative merits of the deviations to be fully appreciated. In the absence of any deviations, it will be deemed that the tenderer is fully satisfied with the intents of the specifications and drawings and their compliance with the statutory provisions and local codes.
- B. In case of discrepancy between the drawings and specifications, the tenderer shall assume the more stringent of the two and furnish his rates accordingly.
- C. The Contractor shall prepare fabrication and working drawings and all work shall be as per the approved working drawings. Approval of drawings does not relieve the Contractor of his responsibility to meet with the intents of the specifications. All such drawings for approval shall be in duplicate.
- D. Equipment data shall be submitted along with the filled tender. The contractor shall be responsible for any unfilled data of the data sheets and the same shall be executed according to the requirements of the Engineer in charge / Consultant without any extra cost.
- E. y fittings, assemblies, accessories, hardware items, foundation bolts, termination lugs for electrical ns as required, and all other sundry items which are useful and necessary for proper assembly and working of the various components of the work shall be deemed to have been included in the hether such items are specifically mentioned in the tender documents or not.

## **2. GENERAL TECHNICAL SPECIFICATIONS FOR ELECTRIC WORKS**

### **L. T. PANELS / P.C.C. / M.C.C.**

#### **1.0 TYPE OF PANEL:**

All the PCC's / PDB's / MCC's shall be metal clad, totally enclosed, rigid, floor mounted, air - insulated, cubical type suitable for operation on three phase / single phase, 415 / 230 volts, 50 Hz.

The PCC's / MCC's shall be designed to withstand the and heaviest condition at site, with minimum expected ambient temperature of 45 degree Celsius, 80 percent humidity and dusty weather.

Should conform to Indian Electricity Act and rules (till last amendment) & approved as per FIA norms.

#### **1.1 APPLICABLE IS STANDARDS**

METERS (MEASURING) FOR ANALOG METERS	IS:1248-1958
INSTALLATION AND MAINTENANCE OF SWITCH GEARS	IS:3072-1975
H.D. AIR BREAKER, SWITCH GEARS AND FUSES FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:4047-1977
SELECTION, INSTALLATION AND MAINTENANCE OF FUSES UP TO 650 VOLTS	IS:8106-1966
GENERAL REQUIREMENTS FOR SWITCH GEAR AND GEAR FOR VOLTAGE NOT EXCEEDING 1000 VOLTS DEGREE OF PROTECTION PROVIDED BY ENCLOSURES FOR LV S/GEARS	IS:4237-1967
INSULATED CONDUCTOR RATING	IS:2147-1962
ENCLOSED DISTRIBUTION FUSE BOARDS AND CUT-OUTS FOR VOLTAGE NOT EXCEEDING 1000 VOLTS	IS:8084-1972
FUSE WIRE USED IN RE-WEARABLE TYPE ELECTRIC FUSES UP TO 650 VOLTS	IS:2675-1983
CONDUCTOR FOR INSULATED ELECTRIC CABLES AND FLEXIBLE CORDS	IS:9926-1981
SHUNT CAPACITORS FOR POWER SYSTEMS	IS:8130
	IS:2834-1954

HRC CARTRIDGE FUSES AND LINKS UP TO 660 VOLTS	IS:2208
HRC FUSES HAVING RUPTURING CAPACITY OF 50 KA	IS:9224
AC ELECTRICITY METERS: PART – 1 GENERAL REQUIREMENTS AND TESTS	IS:772 PART 1
DIRECT ACTING ELECTRICAL INDICATING INSTRUMENTS	IS:1248
CURRENT TRANSFORMERS	IS:2705
ELECTRICAL RELAYS FOR POWER SYSTEMS PROTECTION	IS:3231
PHOSPHATE TREATMENT OF IRON AND STEEL FOR PROTECTION AGAINST CORROSION	IS:3618
GUIDE FOR MARKING OF INSULATED CONDUCTOR	IS:5578
CODE OF PRACTICE OF PHOSPHATING OF IRON AND STEEL	IS:6005
FACTORY BUILT ASSEMBLIES OF SWITCHGEAR AND CONTROL- GEAR FOR VOLTAGES UP TO AND INCLUDING 1000V AC AND 1200V DC.	IS:8623
GUIDE FOR UNIFORM SYSTEM MARKING AND IDENTIFICATION OF CONDUCTORS AND APPARATUS TERMINALS	IS:11353
LOW VOLTAGE FUSES	IS:13703
LV SWITCHGEAR AND CONTROL GEAR (PART 1 TO PART 5)	IS:13947
STRUCTURE CONSTRUCTION (IP-54)	IS:2147
MINIATURE CIRCUIT BREAKER (MCB)	BS:3871PART-1 1965
	IS:8825 (1996)
FUSE	IS:2000-1962
AIR CIRCUIT BREAKER	IS:2516 PART 1,2,3
CONTACTORS	IS:2959 & BS:775
DIGITAL METER	IS:13779
ELECTRICAL POWER & CONTROL WIRING CONNECTION WIRING INSIDE THE MODULE FOR POWER, CONTROL	

PROTECTION	IS:694 & IS:8130
DANGER NOTICE PLATE	IS:2551-1982 & IS:5-1978
MCCB	IEC 60439-2 / IS:8623-2
SFU	IS:13947 (PART-3) & IEC 60947-3
ELCB	BS 3871 & 4293, IS.,CEE 27

## 1.2 STRUCTURE :

The PCCs, MCCs & PDBs shall be metal clad enclosed and be fabricated out of high quality CRCA sheet, suitable for indoor installation, front operated and floor mounting type.

CRCA sheet steel used in the construction of PCCs / MCCs / PDBs shall be 2 mm thick for structure, 1.6 mm thick for doors, covers shrouds and 3 mm thick for gland plate and shall be folded and braced as necessary to provide a rigid support for all components. Joints of any kind in sheet shall be seam welded, all welding slag grounded off and welding pits wiped smooth with plumber metal.

The PCCs / MCCs / PDBs shall be totally enclosed, completely dust and vermin proof and degree of protection being no less than IP-54 confirming to IS 2147. Gaskets between all adjacent units and beneath all covers shall be provided to render the joints dust proof. All doors and covers shall be fully gasketed with neoprene gaskets and shall be lockable.

All panels and covers shall be properly fitted and secured with the frame, and holes in the panel correctly positioned. Fixing screw shall enter into holes tapped into an adequate thickness of metal or provided with bolts and nuts. Self-threading screws shall not be used in the construction of PCCs / MCCs / PDBs.

A base channel of 75 mm x 75 mm x 5 mm or as per the weight of the panel shall be provided at the bottom.

PCCs / MCCs / PDBs shall be arranged in multi-tier formation. The PCCs / MCCs / PDBs shall be of adequate size to facilitate enough space for maintenance and cooling. The size of the PCCs / MCCs / PDBs shall be designed in such a way that the internal space is sufficient for hot air movement, and the electrical component does not attain temperature more than 40 degree Celsius. Openings shall provide for natural ventilation, but the said openings shall be screened with fine weld mesh.

Knockout holes of appropriate size and number shall be provided in the PCCs / MCCs / PDBs in conformity with number, and size of incoming and outgoing conduits / cables.

Alternatively the PCCs / MCCs / PDBs shall provided with removable sheet plates at top and bottom to drill holes for cable / conduit entry at site.

The PCCs / MCCs / PDBs shall be designed to facilitate easy inspection, maintenance and repair.

The PCCs / MCCs / PDBs shall be sufficiently rugged in design and shall support the equipment without distortion under normal and short circuit condition they shall be suitable braced for short circuit duty

**1.3 PROTECTION CLASS:**

All the indoor PCCs / MCCs / PDBs shall have protection class of IP - 54.

**1.4 POWDER COATING:**

All sheet steel material shall undergo seven-tank process after all the necessary shearing and other mechanical works are completed. After the seven-tank process powder coating treatment shall be adopted using powder of reputed make. After the powder coating is complete welding in the panel or any sort of shearing, bending or cutting activity shall not be done. The colour shall be Siemens Grey 631

**1.5 CIRCUIT COMPARTMENT:**

Each circuit breaker and switch fuse units shall be housed in separate compartments and shall be enclosed on all sides. Sheet steel hinged lockable door shall be duly interlocked with the breaker / switch fuse units in ON and OFF position. Safety interlocks shall be provided for non-opening of the door when the breaker is in ON position.

The door shall not form integral part of the draw out position of the circuit breaker. All instruments and indicating lamp shall be mounted on the compartment door. Sheet steel barriers shall be provided between the tines in a vertical section.

**1.6 INSTRUMENT COMPARTMENT :**

Separate and adequate compartment shall be provided for accommodating instruments, indicating lamp, control contactors, relays and control fuses etc. These components shall be accessible for testing and maintenance without any danger of accidental contact with live parts of the circuit breaker, switch fuse units, busbars and connections.

**1.7 BUSBARS :**

The busbar shall be air insulated and made of high quality, high conductivity, high strength copper and as per relevant IS code. The busbar shall be for three phases and neutral system with separate neutral and earth bar. The busbar and interconnection between busbar and various components shall be of high conductivity, hard drawn, electrolytic copper. The busbar shall be of rectangular cross section designed to withstand full load current for phase busbar and full rated current for neutral busbar and shall be extensible type on either side. The busbar shall be rated for the frame size of the main incoming breaker. The busbar shall have uniform cross section throughout the length. Ratio of 1 sqmm = 1.2 A shall be adopted for tinned copper busbars.

The busbar and interconnection shall be insulated with heat shrinkable PVC sleeves and be colour coded in red, Yellow, Blue and Black to identify the three phases and neutral of the system. The busbar shall be supported on unbreakable, non hygroscopic DMC insulated supports at sufficiently close interval to prevent busbar sag and shall effectively withstand electromagnetic stresses in the event of short circuit capacity of 50 KA RMS symmetrical for one second and a peak short circuit withstand of 105 KA minimum.

The busbar shall be housed in a separate compartment. The busbar shall be isolated with 3 mm thick FRC sheet to avoid any accidental contact. The busbar shall be arranged such that minimum clearances between the busbar are maintained as per below.

Between phases	:	27 mm min.
Between phases and neutral	:	25 mm min.
Between phases and earth	:	25 mm min.
Between neutral and earth	:	23 mm min.

All busbar connection shall be done by drilling holes in busbars and connecting by chromium plated bolt and nuts. Additional cross section of busbar shall be provided in all PCCs / MCCs / PDBs to cover-up the holes drilled in the busbars. Spring and flat washers shall be used for tightening the bolts.

All connection between busbar and circuit breaker / switches and between circuit breaker/ switches and cable terminals shall be through solid copper strips of proper size to carry full rated current. These strips shall be insulated with insulating strips.

## **1.8 ELECTRICAL POWER & CONTROL WIRING CONNECTION :**

Terminal for both incoming and outgoing cable shall be suitable for 1100 volts grade, aluminum/copper conductor PVC insulated and sheathed, armoured cable and shall be suitable for connections of solder less sockets for the cable size as indicated on the appended drawing for the PCCs, MCCs, PDBs.

Both control and power wiring shall be brought out in cable alley for ease of external connections, operation and maintenance.

Both control and power terminals shall be properly shrouded.

10% spare terminal shall be provided on each terminal block. Sufficient terminals shall be provided on each terminal block so that not more than one outgoing wire connected per terminal.

Terminal strip for power and control shall preferably be separated from each other by suitable barriers of enclosures.

Wiring inside the module for power, control protection and instrument etc. shall be done with use of 1100 V conforming to IS 694 and IS 8130. Power wiring inside the starter module shall be rated for full current rating of contactor, but not less than 4 sq mm cross section area. For current transformer circuits, 2.5 sq mm-copper conductor wire shall be used. Other control wiring shall be done with 1.5 sq mm copper conductor wires. Wires for connections to the door shall be flexible. All conductors shall be crimped with solder less sockets at the ends before connections are made to the terminals.

Control power for the motor starter module shall be taken from the respective module switchgear outgoing from R phase and Neutral. Control wiring shall have control fuse (HRC type).

Particular care shall be taken to ensure neat and orderly laying of the wiring. Identification ferrules shall be tagged to all the wire termination for ease of identification and to facilitate and testing.

"CUPAL" washers shall be used for all copper and aluminum connections.

Final wiring diagram of the PCC, MCC, PDB power and control circuit with ferrules number shall be submitted along with the PCC/MCC/PDB as one of the documents.

**1.9 TERMINALS :**

The outgoing terminals and neutral link shall be brought out to a cable alley suitably located and accessible from the panel front. The current transformer for instrument metering shall be mounted on the disconnecting type terminal blocks. No direct connection of incoming and outgoing cables to internal components connection of the distribution board is permitted. Only one conductor may be connected in one terminal.

**1.10 WIREWAYS:**

A horizontal PVC wire way with screwed covers shall be provided at the top to take interconnecting control wiring between different vertical sections.

**1.11 CABLE COMPARTMENT:**

Cable compartment of adequate size shall be provided in the PCCs, MCCs, and PDBs for easy termination of all incoming and outgoing cables entering from top. Adequate support shall be provided in the cable compartment.

**1.12 EARTHING:**

Copper earth busbar of minimum 25 mm x 6 mm size shall be provided in the PCCs, MCCs, PDBs for the entire length of panel. As per the rating of the main busbars the size of earthing busbar shall be decided. The framework of the PCCs, MCCs, PDBs shall be connected to this earth busbar. Provisions shall be made for connection from earth busbar to the main earthing bar coming from the earth pit on both sides of the PCCs, MCCs, PDBs.

The earth continuity conductor of each incoming and outgoing feeder shall be connected to this earth bar. The armour shall be properly connected with earthing clamp and the clamp shall be ultimately bounded with the earth bar.

**1.13 LABELS:**

Engraved Aluminium sheet labels shall be provided on all incoming and outgoing feeders. Single line circuit diagram showing the arrangements of circuit inside the distribution board shall be pasted on inside of the panel door and covered with transparent laminated plastic sheet.

**1.14 NAME PLATE:**

A name plate with panel designation in bold letter shall be fixed at top of the central in panel. A separate name plate giving feeder details shall be provided for each feeder module door.

Inside the feeder compartment, the electrical component, equipments, accessories like switchgear, contactor, lamp, relays etc. shall suitably be identified by providing stickers.

Engraved nameplates shall be of Aluminium strip of black colour and silver letters format.

Nameplate shall be fastened by counter sunk screws / riveted and not by adhesives.



#### **1.15 DANGER NOTICE PLATE:**

The danger plate shall be affixed in a permanent manner on operating side of the panel.

The danger notice plate shall indicate danger notice both in Hindi and English and with a sign of skull and bones.

The danger notice plate in general shall meet to requirements of local inspecting authorities.

Overall dimension of the danger notice plate shall be 200 mm wide and 150 mm high. The danger notice plate shall be made from minimum 1.6 mm thick mild steel sheet and after due pretreatment to the plate, the same shall be painted white with vitreous enamel paint on both front and rear surface of the plate.

The letter, the figure, the conventional skull and bones shall etc. shall be positioned on the plate as per recommendations of IS : 2551-1982.

The said letter, the figure and the sign of skull and bones be painted in single red colour as per IS: 5-1978.

The danger plate shall have rounded corners. Locations of fixing holes for the plate shall be decided to suit design of the panel.

The danger notice plate, if possible, be of ISI certification mark.

#### **1.16 INTERNAL COMPONENTS:**

The PCC / MCC / PDB shall be equipped complete with all type of required number of air circuit breakers, switch fuse unit, contactor, relays, fuses, meters, instruments, indicating lamps, push buttons, equipment, fittings, busbar, cable boxes, cable glands etc. and all the necessary internal connections /wiring as required and as indicated on relevant drawings. Components necessary for proper complete functioning of the PCC / MCC / PDB but not indicated on the drawings shall be supplied and installed on the PCC / MCC / PDB.

All part of the PCC / MCC/ PDB carrying current including the components, connections, joints and instruments shall be capable of carrying their specified rated current continuously, without temperature rise exceeding the acceptable values of the relevant specifications at any part of the PCC / MCC / PDB.

All units of the same rating and specifications shall be fully interchangeable.

#### **1.17 INSPECTIONS / TESTING:**

Each equipment should inspect and witness by client & consultant.

The PCC / MCC / PDB shall be inspected and checked as per inspection manual of the PCC / MCC / PDB manufacturer.

Various electrical components and accessories of the PCC / MCC / PDB shall be checked as per drawing for the respective PCC / MCC / PDB.

The PCC / MCC / PDB shall be checked for rigid mounting, earthing connections, proper rating and size of components, internal wiring, etc.

All mechanical fasteners and electrical connections shall be checked and tightened before installation.

### **1.18 Type test:**

Type test certificates for all switchgears shall be provided.

Routine Test:

Prior to dispatch of the PCC / MCC / PDB following tests shall be carried out.

Mechanical endurance test shall be carried out by closing and opening of all the ACB's, MCB's switches etc.

Over voltage and Insulation resistance test shall be carried out between phases and between phase to earth bus, keeping the isolating switch in ON position. Similar test shall be carried out keeping the isolating switch in closed position.

All the interlocks, controls and tripping mechanism of the switchgears shall be tested for their proper functioning.

High voltage test, Continuity test, Control circuit test shall be carried out.

- **L. T. SWITCHGEARS:**

- **GENERAL:**

The type, size, and rating of the components shall be as indicated on the relevant single line diagrams.

- **MINIATURE CIRCUIT BREAKER (MCB):**

Miniature circuit breakers shall be quick make and break and break type conform with British standard BS: 3871 (Part-I) 1965 and IS: 8825 (1996). The housing of MCBs shall be heat resistant and having high impact strength. The fault current of MCBs shall not be less than 10000 amps, at 230 volts. The MCBs shall be flush mounted and shall be provided with trip free manual operating mechanism with mechanical "ON" and "OFF" indications.

The circuit breaker dollies shall be of trip free pattern to prevent closing the breaker on a faulty current.

The MCB contact shall be silver nickel and silver graphite alloy and tip coated with silver. Proper arc chutes shall be provided to quench the arc immediately. MCB's shall be provided with magnetic fluid plunger relay for over current and short circuit protection. The over load or short circuit devices shall have a common trip bar in the case of DP and TPN miniature circuit breakers. All the MCB's shall be tested and certified as per Indian Standard, prior to Installation.

- MCB'S should be confirming IS/IEC/EN 60898-1, ISI, CE, KEMA
- MCB having Trip Free mechanism with Energy Limiting class :3.
- Minimum breaking capacity should be 10KA
- The input and output can be interchanged ( Line and load Reversibility)

**FUSE:**

Fuses shall be of high rupturing capacity (HRC) fuse links and shall be in accordance with IS : 2000-1962 and having rupturing capacity of not less than 35 MVA at 415 Volts.

**AIR CIRCUIT BREAKER:**

The ACB shall meet with IS : 2516 part I, II and III. Each pole of the ACB's shall be equipped with under current, earth fault and short circuit release. The ACB's shall be equipped with under voltage trip only on those used as main incomer of all sources, bus coupler and inter connector. The trip devices shall be direct acting.

Disconnecting devices of approved type shall be provided to facilitate the removal of the circuit breakers from the housing for test and maintenance purpose.

The ACB's shall have an arc-quenching device on each pole. The ACB's shall have auxiliary contacts for signaling, interlocking etc. The ACB's shall have slow close facilities for checking contact operation and contact gap adjustment.

All contacts subject to arcing shall be tipped with arc resisting material. Main contacts shall be silver plated, multi-finger and spring-loaded type. Facilities shall be provided to isolate the circuit breaker for inspection purpose.

Interlocks shall be provided to:

Prevent the breaker from being isolated unless it is in the "OFF" position.

Prevent the breaker from being racked in to the service position unless it is in the "OFF" position.

Prevent the breaker from being accidentally pulled completely "OFF" the guide rail. Safety shutters of insulating material shall be provided to prevent access to all live contacts, when the breaker is in the inspection position or completely withdrawn.

Facilities shall be provided for earthing the circuit breaker.

Air circuit breaker shall be capable of clearing the maximum fault current, which can occur.

The breaker plates shall have an ON-OFF indicators, spring charge indicators, provision to padlock manual handle and provision to lock draw-out mechanism. Electrically operated breaker shall have provision for emergency manual closing by inserting a tool through the fuse plate. A control isolating switch shall be provided on the fuse plate to isolated the supply to the charging motor.

- All ACB should be microprocessor based with inbuilt overload, short circuit instantaneous and Ground Fault (LSIG) protection.
- $I_{cs}=100\% I_{cu}$  at operational voltage 690V AC.  $I_{cw}=50Ka$  for 3 seconds.

- ACB'S Microprocessor based release should be modular type and communication compatible.
- ACB shall be fully rated upto 50 degree C.

**LT panel Main feeder shall have remote control provision for Emergency operation. Contractor shall consider emergency Push button as well as control cable for the same. Contractor shall consider all cost of cable & material in this Item. Construction shall also include the cost of fix capacitor in the Incoming supply of Transformer to panel.**

**MOULDED CASE CIRCUIT BREAKER:**

The MCCB shall be air break type and having quick make quick break with trip free operating mechanism.

Housing of the MCCB shall be of heat resistant and flame retardant insulating material.

Operating handle of the MCCB shall be in front and clearly indicate ON / OFF / TRIP positions.

The electrical contact of the circuit breaker shall be of high conducting non-deteriorating silver alloy contacts.

The MCCB shall be provided with microprocessor based trip units. All the releases shall operate on common trip busbar so that in case of operation of any one of the releases in any of the three phases, it will cut off all the three phases and thereby single phasing of the system is avoided.

The MCCB whenever called for in the drawings shall provide an earth fault relay.

The MCCB shall provide two sets of extra auxiliary contacts with connections for additional controls at future date.

- All MCCB should be  $I_{cs}=100\%I_{cu}$  at 440V.
- Minimum Insulation voltage should be 600V.
- MCCB should be operate its rated current at ambient temperature 40 degree C without derating .
- The MCCB should provide the flexibility of terminating line and load from any direction. (Line and load reversibility)
- All MCCB'S should be current limiting type.
- All MCC'S having class II front facia. MCCB'S accessories should be clip on type.
- All thermal magnetic and microprocessor based MCCB should be adjustable type having minimum 36KA,  $I_{cs}=100\% I_{cu}$ .
- 400Amp and above rating of MCCB'S are 50KA Microprocessor based.

**CONTACTORS:**

The contactor shall meet with the requirements of IS: 2959 and BS: 775.

The contactors shall have minimum making and breaking capacity in accordance with utilization category AC 3 and shall be suitable for minimum class II intermittent duty.

If the contactor forms part of a distribution board then a separate enclosure is not required, but the installation of the contactor shall be such that it is not possible to make an accidental contact with live parts.

**TRIVECTOR:**

Flush mount 96 x 96 x 80 mm load manager type Enercon EM 6400 or equivalent meter of accuracy class 1 as per IS 13779 shall be provided. The meter shall be accurate on distorted waveforms; simultaneous sampling of voltage and amperes shall be done. It shall have low burden on PT and CT shall have bright display, shall view 3 parameters together shall have auto scaling from kilo to mega to giga units, shall have programmable CT, PT ratios with built in phase analyser. Auto scrolling shall be programmable as per user choice and communication with PC; PLC DCS shall be possible through RS 485 serial port. It shall be dust proof, tamper proof with data import export option and 10 years back up of integrated data.

Parameters to be monitored shall be Frequency, Line to line and average and line to neutral and average voltage, phase wise and average current, phase wise and total KVA, KW and P.F. reading and KWH monitoring.

User programmable facility for delta 2e and star 3e measurement, C.T. and P.T. ratios, sliding window auto sync. And auto scrolling of parameters shall be available.

Sensing shall be 3 phase, 4 wire measuring True RMS with voltage input range of 110 to 415 V nominal and current input of 5 amps or 1 amps as per field configuration. Current range shall be from 50 mA to 7.5 A and burden on PT or CT shall be app 0.2 VA.

Accuracy for kW / kWh shall be as per IS 1377 / CBIP88 and for all other parameters shall be +/- 0.5% of full scale + 0.5% of reading + 1 digit. Digital readout shall be of 3 rows of 4 digits each (12.5 mm size) with 7 segments bright red LED. Input frequency shall be 50Hz / 60Hz +/- 5%. Power factor range shall be 0.5 lag – unit – 0.8 lead.

Resolution for power parameters shall be for 4 digits and energy parameters shall be 8 digits. Display update shall be at every 15 seconds for demand parameters and 1 sec for other parameters. Display sequence shall be parameter followed by value. Temperature range shall be 0-50oC and humidity <95% non-condensing.

Display pages shall be as follows:

Instantaneous –	VLL, A avg., F
	VLn, A avg., F
	KVA, kW, PF

Individual pages of above parameters.

Integrated -	kVAh
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KWh

Run hours

On hours

Interruption

**CURRENT TRANSFORMER:**

Where called for, CT's shall provided for current measuring. Each phase shall be provided with separate CT of class I accuracy and VA burden as shown in SLD for operation of associated metering and controls. Current transformer shall be in accordance with IS: 2705 - 1964 as amended up to date.

**PUSH BUTTON:**

The push button unit shall comprise of the contact element, a fixing holder, and push button actuator. The push button shall be momentary contact type. The contacts shall be of silver alloy and rated at 10 Amps. Continuous current rating. The actuator shall be of stranded type and colour as per its usage for ON, OFF and Trip.

**INDICATING LAMP:**

The push button unit shall comprise of the contact element, a fixing holder, and push button actuator. The push button shall be momentary contact type. The contacts shall be of silver alloy and rated at 10 Amps. Continuous current rating. The actuator shall be of stranded type and colour as per its usage for ON, OFF and Trip. Push button shall be of self-glowing type with LED lamp.

Indicating Lamp shall be LED type and shall supplied complete with translucent covers to diffuse the lamp light. Indicating lamps shall be part of push buttons.

Colour shade for the indicating lamps shall be as below:

ON indicating lamp	:	Green
OFF indicating lamp	:	Red
TRIP indicating lamp	:	Amber
PHASE indicating lamp	:	Red, Yellow, and Blue.

**VENDORS DATA : TO BE SUBMITTED WITH OFFER :**

**Approved Makes:**

Vendor shall provide information on the offered make and Cat nos. of items offered for respective Panels:

Sr. No.	Item Description	Specified Make	Vendor Confirmation
1.0	All incoming breakers in		

	main L.T. panel (SEC / DG) Air Circuit Breakers Ics=Icu=Ics(1sec) –		
1.0A	All other Breaker		
2.0	MCCB Microprocessor based release – Ics = Icu		
3.0	MCB		
4.0	SFU		
5.0	Capacitors – APP type / heavy duty type		
6.0	Contactors		
7.0	Starters		
8.0	CRCA sheet		
9.0	Gaskets		
10.0	Meters		
11.0	Indicating lamps – LED		
12.0	Push Buttons		
13.0	Connectors		
14.0	C.T.s		
15.0	APFC Relay		
16.0	Selector Switches		

**Note:**

**All material and workmanship has to be as per latest IS / international standards.**

## **CABLE LAYING AND TRENCHES WITH TRAYS**

### **1.0 SPECIFICATIONS**

#### **CABLE TRENCH**

Cable trench shall be dug to the minimum depth of 1 mtr and the width shall dependent on the no of cables to be kept with the layer of brick in between two cables.

#### **BRICKS**

The bricks shall be hand or machine moulded and made from suitable soils and kiln burnt. They shall be free from cracks, flaws and modules of free lime. They shall have smooth rectangular faces with sharp corners and shall be uniform in colour. The bricks shall be moulded with a frog of size 100 mm. x 40 mm., and 10 mm. to 20 mm. deep on one of its flat sides. The bricks shall not break when thrown on the ground from a height of 6 m. B – grade brick shall be used.

#### **SAND**

Sand shall be natural sand, clean, well graded, hard, strong, durable and gritty. Sand particles should be free from injurious amounts of dust, clay, kankar nodules, soft or flaky particles of shale, alkali, salts, organic matter loam, mica or other deleterious substances and shall be got approved from the CLIENT AND/OR ITS ARCHITECT. The sand shall not contain more than 8% of silt as determined by field test, if necessary the sand shall be washed to make it clean. The sand used by civil agency shall be used.

#### **CABLE TRAYS**

Cable trays shall be fabricated from Hot Dip GI and channels of 14 gauge and shall be powder coated with 7 tank process if specified. The design shall be ladder type with optional cover. Shall be fixed or suspended from the ceiling with the help of suspenders which shall have adequate diameter to sustain the weight of the cables and channels. Also if necessary anchor fasteners shall be used for grouting purpose.

### **1.1 WORKMANSHIP**

The cable shall be laid side by side in trench with brick covering on all the three sides. The trench shall be such that sharp bends shall be avoided while laying the cable. The bedding of fine sand under the cable shall be not less than 6 mm. The trench shall be terminated in Manholes with specified size of R.C.C. hume pipes as shown in drawing. Cable markers shall be provided through out the route of cable at 10 mtrs distance. The trenches shall be refilled after the cable are laid and the Ground level shall be done as per original after pressing the same. The cables shall be checked for insulation resistance and continuity tests shall be carried out.

### **1.2 MODE OF MEASUREMENT**

The cable laying shall be measured in rmt. The trenches dug and refilled shall be measured in cu. Mtr. The bricks and sand bedding shall be measured in rmt. The cable trays shall be measured in rmt.

#### **Note:**

**All material and workmanship has to be as per latest IS / international standards.**



## **DISTRIBUTION BOARDS:**

### **1.0 SPECIFICATIONS**

Distribution boards shall be fabricated from 18 gauge M.S. sheet or shall be readymade as specified in the make of material list. It shall be of double door type with hinged (lockable if required) door suitable for recessed mounting in wall. Distribution boards shall be powder coated with 7-tank process application.

The distribution boards shall be provided with phase barriers, wiring channels to accommodate wires and individual per phase neutral links. There shall be separate or individual earth link as per requirement. Proper arrangement shall be made for mounting of MCB's and other accessories.

Distribution boards shall meet with the requirements of IS 2675 and marking arrangement of bus bars shall be in accordance with I.S. standards.

Bus bars shall be suitable for the incoming switch rating and sized for a temperature rise of 35° C over the ambient. Each board shall have two separate earthing terminals. Circuit diagram indicating the load distribution shall be pasted on the inside of the DB as instructed. One earthing terminal for single phase and two terminals for 3 phase DB's shall be provided with an earth strip connecting the studs and the outgoing ECU earth bar.

The top and the bottom faces of the D.B. shall be provided for conduit entry of minimum 1" dia. The faces if asked shall be kept detachable.

All outgoing feeders shall terminate on a terminal strip which in turn is interconnected to the MCB/Fuse base by means of insulated single conductor copper wires as follows

Up to 15 A	2.5 sq.mm.	40 A	10 sq.mm.
25 A	4.0 sq.mm.	63 A	16 sq.mm.
32 A	6.0 sq.mm.		

Each DB shall have indicating lamps preferably neon type denoting power availability in the board after the switch indicating lamps shall be complete with fuses.

### **MINIATURE CIRCUIT BREAKERS (MCB) :**

MCB's shall have quick make and break non-welding self-wiping silver alloy contacts for 10 KA short circuit both on the manual and automatic operation. Each pole of the breaker shall be provided with inverse time thermal over load and instantaneous over current tripping elements, with trip-free mechanism. In case of multi-pole breakers, the tripping must be on all the poles and operating handle shall be common. Breakers must conform to BS 3871 with facility for locking in OFF position. Pressure clamp terminals for stranded/solid conductor insertion are acceptable up to 4 sq.mm. aluminium or 2.5 sq.mm. copper and for higher ratings, the terminals shall be suitably shrouded. Wherever MCB isolators are specified they are without the tripping elements.

### **RCCB / ELCB**

The RCCB should suffice all the requirements of IS as per code IS - 12640 - 1988. The RCA should be current operated and not on line voltage.

The RCCB should ensure mainly the following functions:

- i) Measurement of the fault current value.
- ii) Comparison of the fault current with a reference value.
- iii) The RCCB should have a toroidal transformer which has the main conductors of primary (P - N) which check the sum of the current close to zero.
- iv) All metal parts should be inherently resistant to corrosion and treated to make them corrosion resistant.
- v) It should be truly current operated.
- vi) It should operate on core balance toroidal transformer.
- vii) Its accuracy should be  $\pm 5\%$ .
- viii) It should operate even in case of neutral failure.
- ix) It should trip at a present leakage current within 100 mA
- x) Its enclosure should be as per IP 30.
- xi) Its mechanical operation life should be more than 20,000 operations.
- xii) It should provide full protection as envisaged by IE rules - 61-A, 71 - ee, 73 - ee, 1985 and also rule 50 of IE rule 1956.
- xiii) It should conform to all national and international standards like IS: 8828-1993, IS: 12640-1988, BS 4293 - 1983, CEE 27 (International commission Rules for the approval of electrical equipment).

## **1.1 WORKMANSHIP**

The D.B. shall be properly grouted in the wall in concealed manner taking care that the powder coating is not scratched and dents are not formed on the D.B. The MCBs and ELCBs. In the distribution boards shall be fixed as per the circuit details provided. All the wires terminating in the MCBs and the ELCBs shall be lugged for proper contact and ferrules depicting the circuit nos shall be provided. D.B.s mounted in concealed manner shall have a groove around it so as to save the finish of the plaster and colour during future opening of the door. The distribution boards shall have circuit chart tagged on the door for future maintenance. Danger notice plates shall be fitted to the distribution boards with screws and not stuck so as to assure its presence for a longer duration.

## **1.2 MODE OF MEASUREMENT**

The distribution boards shall be measured in nos and the MCBs and ELCBs shall be measured in numbers separately.

### **Note:**

**All material and workmanship has to be as per latest IS / international standards.**

## **1.1 KV GRADE L.T. CABLES AND CABLE TERMINATION:**

### **1.0 SPECIFICATIONS L. T. XLPE CABLE:**

#### **GENERAL:**

The medium voltage cables shall be supplied, laid, connected, tested and commissioned in accordance with the drawings, specifications, relevant Indian Standards specifications, manufacturer's instructions. The cables shall be delivered at site in the original drums with manufacturer's name, size and type clearly written on the drums.

All cables shall be adequately protected against any risk of mechanical damage to which they may be liable in normal conditions of handling during transportation, loading, unloading etc.

The cable shall be supplied in single length i.e. without any intermediate joint or cut unless specifically approved by the client.

The cable ends shall be suitably sealed against entry of moisture, dust, water etc. with cable compound as per standard practise.

#### **CONDUCTOR :**

Uncoated, annealed copper / aluminium, of high conductivity, upto 4 mm<sup>2</sup> size the conductor shall be solid and above 4 mm<sup>2</sup> the conductors shall be concentrically stranded as per IEC : 228.

#### **INSULATION :**

Cross link polyethylene (XLPE) extruded insulation rated at 70°C.

#### **CORE IDENTIFICATION :**

Two core	:	Red and Black
Three core	:	Red, Yellow and Blue
Four core	:	Red, Yellow, Blue and Black
Single core	:	Green, Yellow for earthing.

Black shall always be used for neutral.

#### **ASSEMBLY :**

Two, three or four insulated conductors shall be laid up, filled with non-hygroscopic material and covered with an additional layer of thermoplastic material.

#### **ARMOUR :**

Galvanised steel flat strip / round strips applied helically in single layers complete with covering the assembly of cores.

For cable size upto 10 sq mm : Armour of 1.4 mm dia G.I. round wire

For cable size above 10 sq mm : Armour of 4 mm wide 0.8 mm thick GI strip

#### **SHEATH :**

ST -2 PVC along with polypropylene fillers to be provided.

Inner sheath shall be extruded type and shall be compatible with the insulation provided for the cables.

Outer sheath shall be of an extruded type layer of suitable PVC material compatible with the specified ambient temp. of 50°C and operating temperature of cables. The sheath shall be resistant to water, ultra violet radiation, fungus, termite and rodent attacks. The colour of outer sheath shall be black.

Sequential length marking along with size and other standard parameters shall be required at every 1.0 mtr on the outer sheath.

#### **TESTING:**

Finished cable tests at manufacturers works : The finished cables shall be tested at manufacturer's works for all the routine tests for all the length and size of cables to be delivered at site and the certificate for the same shall be furnished to client. If required the cables shall be tested in presence of the client's representative.

Voltage test: Each core of cable shall be tested at room temperature at 3 KV A.C. R.M.S. for duration of 5 minutes.

Conductor resistance test: The D.C. resistance of each conductor shall be measured at room temperature and the results shall be corrected to 20°C to check the compliance with the values specified in the IS 8130 – 1976.

Cable tests before and after laying cables at site:

Insulation resistance test between phases, phase to neutral and phase to earth.

Continuity test of all the phases, neutral and earth continuity conductor.

Earth resistance test of all the phases and neutral.

All the tests shall be carried out in accordance with the relevant IS code of practice and Indian Electricity Rules. The vendor shall provide necessary instruments, equipments and labour for conducting the above tests and shall bear all the expenses in connection with such tests. All tests shall be carried out in the presence of client and the results shall be prescribed in forms and submitted.

#### **CABLE MARKING :**

The outer sheath shall be legibly embossed at every meter with following legend :

ELECTRIC CABLE : 1100 V, SIZE : \_\_\_\_ C X \_\_\_\_ MM<sup>2</sup> with Manufacturers name, year of manufacturing and ISI symbol.

#### **SEALING DRUMMING AND PACKING :**

After tests at manufacturer's works, both ends of the cables shall be sealed to prevent the ingress of moisture during transportation and storage.

Cable shall be supplied in length of 500 mtrs or as required in non-returnable drums of sufficiently sturdy construction.

Cables of more than 250 meters shall also be supplied in non-returnable drums.

The spindle hole shall be minimum 110 mm in diameter.

Each drum shall bear on the outside flange, legibly and indelibly in the English literature, a distinguishing number, the manufacturer's name and particulars of the cable i.e. voltage grade, length, conductor size, cable type, insulation type, and gross weight shall also be clearly visible. The direction for rolling shall be indicated by an arrow. The drum flange shall also be marked with manufacturer's name and year of manufacturing etc.

#### **CABLE TERMINATION:**

Cable terminations shall be made with aluminium crimped type solder less lugs for all aluminium cables and stud type terminals. For copper cables copper crimped solder less lugs shall be used.

Crimping shall be done with the help of hydraulically operated crimping tool.

For joints where cable is with aluminium conductor and busbars are aluminium, bimetallic lugs shall be used with compound. CUPAL type of washers shall be used.

Crimping tool shall be used for crimping any size of cable.

#### **CABLE GLANDS:**

Cable glands shall be of brass single compression type. Generally single compression type cable glands shall be used for indoor protected locations and double compression type shall be used for outdoor locations.

#### **FERRULES:**

Ferrules shall be of self-sticking type and shall be employed to designate the various cores of the control cable by the terminal numbers to which the cores are connected, for ease in identification and maintenance.

#### **CABLE JOINTS:**

Kit type joint shall be done and filled with insulating compound. The joint should be for 1.1 KV grade insulation.

## **1.1 WORKMANSHIP**

Cables shall be laid in the routes marked in the drawings. Where the route is not marked, the Contractor shall mark it out on the drawings and also on the site and obtain the approval of the CLIENT AND/OR ITS ARCHITECT before laying the cable. Procurement of cables shall be on the basis of actual site measurements and the quantities shown in the schedule of work shall be regarded as a guide only.

Cables shall be laid on walls, cable trays, inside shafts or trenches. Saddling or support for the cable shall not be more than 500 mm apart. Plastic identification tags shall be provided at every 30 m.

Cables shall be bent to a radius not less than 12 (twelve) times the overall diameter of the cable or in accordance with the manufacturer's recommendations whichever is higher.

In the case of cables buried directly in ground, the cable route shall be parallel or perpendicular to roadways, walls etc unless marked on drawing by architect / consultant. Cables shall be laid on an excavated, graded trench, over a sand or soft earth cushion to provide protection against abrasion. Cables shall be protected with brick or cement tiles on all the three sides as shown on drawings. Width of excavated trenches shall be as per drawings. Back fill over buried cables shall be with a minimum earth cover of 750 mm to 1000 mm. The cables shall be provided with cables markers at every 10 meters and at all loop points.

All cables shall be full runs from panel to panel without any joints or splices. Cables shall be identified at end termination indicating the feeder number and the Panel/Distribution board from where it is being laid. Cable termination for conductors up to 4 sq.mm. may be insertion type and all higher sizes shall have compression type lugs. Cable termination shall have necessary brass glands. The end termination shall be insulated with a minimum of six half-lapped layers of PVC tape. Cable armouring shall be earthed at both ends.

In case of cables entering the buildings. It would be done duly only through pipes. The pipes shall be laid in slant position, so that no rainwater may enter the building. After the cables are tested the pipes shall be sealed with M. seal & then tarpaulin, shall be wrapped around the cable for making the entry watertight.

Testing : MV cables shall be tested upon installation with a 500 V Meggar and the following readings established:

Continuity on all phases.

Insulation Resistance.

between conductors.

all conductors and ground.

All test readings shall be recorded and shall form part of the completion documentation.

Cable joints shall be done as per regular practice and check shall be carried out for loose connections and leakages. Insulation cutting shall be done properly taking care that no area of the conductor remains exposed. Crimping shall be done with the help of hydraulic tool. Proper insulation tape shall be applied at the cable and lug joint.

Format for cable testing certificate :

- a. Drum no. from which cable is taken :
- b. Cable from \_\_\_\_\_ to \_\_\_\_\_
- c. Length of run of this cable \_\_\_\_\_ mtr
- d. Insulation resistance test
- between core 1 to earth \_\_\_\_\_mega-ohm
- between core 2 to earth \_\_\_\_\_mega-ohm
- between core 3 to earth \_\_\_\_\_mega-ohm
- between core 1 to core 2 \_\_\_\_\_mega-ohm
- between core 2 to core 3 \_\_\_\_\_mega-ohm
- between core 1 to core 3 \_\_\_\_\_mega-ohm
- duration used :
- e. High voltage test :                      Voltage                      Duration
- between core and earth
- between individual cores

## 1.2 MODE OF MEASUREMENT

The cables shall be measured in rmt and terminations on unit basis.

**Note:**

**All material and workmanship has to be as per latest IS / international standards.**

## **INTERNAL WIRING**

### **1.0 SPECIFICATIONS**

#### **RIGID PVC AND FLEXIBLE PVC FRLS LHSFT CONDUITS:**

All conduits shall be rigid PVC alloy low in halogens pipe having minimum wall thickness of medium gauge 1.6 to 2.0 approved by F.I.A. & I.S.I. and shall confirm to IS 9537 part 3 and complying with fire safety standards classification V-0. The temperature stability shall be from  $-20^{\circ}\text{C}$  -  $+80^{\circ}\text{C}$  and also shall be UV stabilised.

Up to 38 mm diameter in slab - minimum 1.8 mm. wall thickness.

Up to 38 mm diameter in floor - minimum 2.0 mm. wall thickness.

Above 40 mm. diameter - minimum 2.2 mm. wall thickness.

Flexible conduits shall be formed from a continuous length of spirally wound interlocked steel strip with a fused zinc coating on both sides. The conduit shall be terminated in brass adapters.

#### **ACCESSORIES:**

PVC conduit fittings such as bends, elbows, reducers, chase nipples, split couplings, plugs etc. shall be specifically designed and manufactured for their particular application. All conduit fittings shall conform to IS: 2667-1964 and IS: 3857-1966. All fitting associated with galvanized conduit shall also be galvanized.

#### **WIRES:**

All wires shall be single core multi-strand/ flexible copper or single strand Copper ( if specified in BOQ), PVC insulated **FRLS** grade as per IS: 694 and shall be 660 V\1100 V.

All wires shall be colour coded as follows:

<b><u>Phase</u></b>	<b><u>Colour of wire</u></b>
R	Red
Y	Yellow
B	Blue
N	Black
Earth	Green (insulated)
Control (If any)	Grey
All off wires	Same as Phase wire

#### **SWITCHES & SOCKETS:**



Switches shall be modular type with silver-coated contacts. Sockets shall be 5 pins with switch and plate type cover. Combination of multiple switch units and sockets should be used to minimize the switch boxes.

For heavy duty, metal clad sockets with M.C.B / Isolator mounted in a galvanized steel box shall be provided.

#### SWITCH PLATE AND BOX:

Plates of the same make, as that of switches shall be used with the modular range. Also M.S. boxes shall be taken as switch boxes.

### 1.1 WORKMANSHIP

The size of conduit shall be selected in accordance with the number of wires permitted under table given below. The minimum size of the conduit shall be 25 mm diameter unless otherwise indicated or approved. Size of wires shall not be less than 1.0 sq.mm. Copper or 2.5 sq.mm. Aluminium.

Nominal Dia of wires (mm)	Nominal Cross sec. Area (mm <sup>2</sup> )	20 mm		25 mm		32 mm		38 mm	
		S	B	S	B	S	B	S	B
1/2.40	1.50	4	3	8	6	15	9	--	--
1/1.80	2.50	4	2	6	4	10	8	--	--
1/2.24	4.00	2	2	4	3	8	6	--	--
1/2.80	6.00	1	--	4	3	6	6	--	--
1/3.55	10.00	1	--	3	2	5	4	6	5

S - runs of conduits which have distance not exceeding 4.25 m. between draw boxes & which do not deflect from the straight by an angle more than 15 degree.

B - runs of conduits, which deflect, from the straight by more than 15°.

Conduits shall be kept at a minimum distance of 100 mm. from the pipes of other non-electrical services. And maintain minimum 300 mm distance between telephones, TV & Computer piping.

Separate conduits/raceways shall be used for :

Normal lights and 5 A 3 pin sockets on lighting circuit.

Separate conduit shall be laid from D.B. to switch board.

Power outlets - 15 A 3 pin 20 A/30 A, 2 pin scraping earth metal clad sockets.

Emergency lighting.

Telephones.

Fire alarm system.

Public address system & Music system.

For all other voltages higher or lower than 230 V.

T.V. Antenna.

Water level guard.

#### Computer Wiring

Wiring for short extensions to outlets in hung ceiling or to vibrating equipments, motors etc., shall be installed in flexible conduits. Otherwise rigid conduits shall be used. No flexible extension shall exceed 1.25 m.

Conduits run on surfaces shall be supported on metal 12 mm. thick G.I. pressure saddles which in turn are properly screwed to the wall or ceiling. Saddles shall be at intervals of not more than 500 mm. Fixing screws shall be with round or cheese head and of rust-proof materials. Exposed conduits shall be neatly run parallel or at right angles to the walls of the building. Unseemly conduit bends and offsets shall be avoided by using fabricated mild steel junction/pull through boxes for better appearances. No cross-over of conduits shall be allowed unless it is necessary and entire conduit installation shall be clean and neat in appearance.

Conduits embedded into the walls shall be fixed by means of staples at not more than 500 mm. intervals. Chases in the walls shall be neatly made and refilled after laying the conduit and brought to the finish of the wall but the building Contractor will do final finish.

Conduits buried in concrete structure shall be put in position and securely fastened to the reinforcement and got approved by the CLIENT AND/OR ITS ARCHITECT, before the concrete is poured. Proper care shall be taken to ensure that the conduits are neither dislocated nor choked at the time of pouring the concrete suitable fish wires shall be drawn in all conduits before they are embedded.

Where conduit passes through expansion joints in the building, adequate expansion fittings shall be used to take care of any relative movement.

Inspection boxes shall be provided for periodical inspection to facilitate withdrawal and removal of wires. Such inspection boxes shall be flush with the wall or ceiling in the case of concealed conduits. Inspection boxes shall be spaced at not more than 12 meters apart or two 90° solid bends or equal. All junction and switch boxes shall be covered by 6 mm clear plate. These junction boxes shall form part of point wiring or conduit wiring as the case may be including the cost of removing the cover for painting and re-fixing. No separate charges shall be allowed except where specially mentioned.

Conduits shall be free from sharp edges and burrs and the threading free from grease or oil. The entire system of conduits must be completely installed and rendered electrically continuous before the conductors are pulled in. Conduits should terminate in junction boxes of not less than 32 mm. deep.

An insulated earth wire of copper rated capacity shall be run in each conduit.

#### Lighting & Power Wiring :

All final branch circuits for lighting and appliances shall be single conductor/ stranded/ flexible wires run inside conduits. The conduit shall be properly connected or jointed into sockets, bends, and junction boxes.

Branch circuit conductor sizes shall be as shown in the schedule of quantities and or drawings.

All circuits shall preferably be kept in a separate conduit up to the Distribution Board. No other wiring shall be bunched in the same conduit except those belonging to the same phase. Each lighting branch circuit shall not have more than ten outlets or 800 watts whichever is lower. Each conduit shall not hold more than three branch circuits.

Flexible cords for connection to appliances, fans and pendants shall be 650/1100 V grade (three or four cores i.e. with insulated neutral wire of same size) with tinned stranded copper wires, insulated, twisted and sheathed with strengthening cord. Colour of sheath shall be subject to the CLIENT AND/OR ITS ARCHITECT'S approval.

Looping system of wiring shall be used. Wires shall not be jointed. Where joints are unavoidable, they shall be made through approved mechanical connectors. No such joints shall be made unless the length of the sub-circuit, sub-main or main is more than the length of the standard coil.

Control switches shall be connected in the phase conductors only and shall be 'ON' when knob is down. Switches shall be fixed in 3 mm. thick painted or galvanized steel boxes with cover plates as specified. Cadmium plated brass screws shall be used.

Power wiring shall be distinctly separate from lighting wiring. Conduits not less than 25 mm. and wires not less than 2.5 sq.mm. copper shall be used.

Every conductor shall be provided with identification ferrules at both ends matching the drawings.

Testing: the entire installation shall be tested for :

Insulation resistance.

Earth continuity.

Polarity of single pole switches.

General: All the wiring switch board, outlet points shall be done in a concealed manner in wall & slab in PVC conduit of minimum 25 mm dia. (medium gauge) & with 650v / 1100v grade PVC insulated flexible copper conductor wire. The switches should be modular with moulded cover plates, blank plates for outlet boxes. The accessories, connectors, sockets, should be fixed with brass chrome / cadmium plated machine screw. For fan points the rates should be with hum -free type 300 W regulators as required to complete the point wiring. The wiring shall be as per IS: 732 and IS: 4648. The wiring shall be done in a looping manner so as to avoid junction boxes at any place. All the looping shall be done only in the switchboard and outlet

points. The size of the wire shall be as per the specification. Colour code shall be strictly followed.

The size of wires shall as follow :

25-32 Amp. metal clad points:

Phase / Neutral 4.0 mm<sup>2</sup>

Earth 2.5.0 m m<sup>2</sup>

20 Amp. out let points :

Phase / Neutral 4.0 m m<sup>2</sup>

Earth 2.5 m m<sup>2</sup>

Two nos. of 15 Amps. socket out let connected in parallel

from DB to first outlet

Phase / Neutral 4.0 m m<sup>2</sup>

Earth 2.5 m m<sup>2</sup>

from first outlet to second outlet.

Phase / Neutral 2.5 m m<sup>2</sup>

Earth 2.5 m m<sup>2</sup>

Light, fans, exhaust fan, 5 Amp. On board plug point, two way light points, bell point etc from switch to outlet.

Phase / Neutral 1.5 m m<sup>2</sup>

Earth 1.0 m m<sup>2</sup>

From D.B. to switch board – lighting / 5 A socket etc – i.e. circuit mains part of point wiring

Phase / Neutral 2.5 m m<sup>2</sup>

Earth 1.5 m m<sup>2</sup>

15/20 Amps. Socket outlet for AC (Single Phase/Three Phase) / Geyser

Phase / Neutral 2.5 m m<sup>2</sup>

Earth 1.5 m m<sup>2</sup>

15/20 Amps. Socket outlet for appliances or looped from sockets with 4 sq mm ckt.

Phase / Neutral 2.5 m m<sup>2</sup>

Earth 2.5 m m<sup>2</sup>

Separate pipes shall be laid for off wires and circuit mains.

Circuit mains of same phase shall be drawn in one pipe with prior permission/discussion with the consultant.

Separate phase, neutral and earthing wire of sizes recommended by consultant shall be drawn for each and every circuit mains.

Mains for lighting and on board plug points shall be of one-size higher wires than those used in off.

**The point definition shall be conduiting and wiring from D.B. to S.B. and there from to final outlet point including switches and accessories, junction boxes, fan boxes, zarri work with cement –sand etc of approved make.**

## **1.2 MODE OF MEASUREMENT**

The items shall be measured on unit basis or on mtr basis as per BOQ.

### **Note:**

**All material and workmanship has to be as per latest IS / international standards.**

## **LED LIGHT FIXTURES & FANS**

### **1.0 SPECIFICATIONS**

General Purpose Led Luminaries suitable for Office /Industry / Street Light applications. The Fixtures should be Operational for 220-240 V Single Phase 50 HZ AC , and operational from 170-280 V without significant drop in output .T he LED modules should be from Cree/Nichia/Philips Lumi Leds Only with efficiency of a min 130 lm/watt and efficacy of fixtures should be greater than 80 lm/w for both indoor and outdoor fixtures, built with Integral driver . The Min degree of Protection for Indoor Fixtures should be IP20 and IP65 for Outdoor/ Semi Indoor Fixtures. The THD of Fixtures should be strictly <10 % and drivers should be compulsarily provided with miswiring/ overload and short circuit protections .For Indoor applications the housing should be made of die cast/ Metal Housing and diffusers should be polycarbonate only, out door fixtures should be with die aluminum / extruded aluminum housing only .The Fixtures should be prewired upto the terminal block and easy to mount and Install and maintain if necessary. The fixture should comply LM79-08 certification criteria and also module should be backed with LM80-08 Certificate from the OEM. The fixtures should be warranted for a period of 3yrs from the date of Installation . The fixtures should have some kind of embossing/ engraving to identify the brand name . The manufactures should provide all kind of test report , technical details as and when called for . The fixture may be tested from govt approved Lab for Claimed parameters by the manufacturer.

### **1.1 WORKMANSHIP**

The fixture shall be installed on wall / ceiling as directed and as per manufacturer's instruction, with necessary accessories for surface, concealed, suspended from ceiling, bracket mounting etc. The job also includes connection of fixture with respective outlet point with heat resistant wires through heat resistance sleeve and PVC connector. The exhaust fan shall be installed complete with M.S. angle iron mounting frame/ ring, G.I. louvers, wire mesh and plug at the end of the cord including wiring & earthing etc. Proper earthing shall be provided to the fixtures.

### **1.2 MODE OF MEASUREMENT**

The unit rate shall be considered for fitting one fixture. The rate shall include following

All fixing accessories, mounting bracket, ballast condensers and control gear wherever applicable.

Supplying and fixing Ball and socket joints wherever required.

Earthing of fittings.

Electrical connections to fittings/fans from the junction box/ceiling rose.

Installation and interconnection of Electronic regulators for ceiling fans.

Supplying and fixing 300 mm. GI down rod for ceiling fans.

#### **Note:**

**All material and workmanship has to be as per latest IS / international standards.**

## **EARTHING**

### **1.0 SPECIFICATION**

#### **EARTH ELECTRODES**

The earth electrode is the main component of the earthing system, which is in direct contact with the ground and, thus provides a means of releasing or collecting any earth leakage currents. In earthed systems, it will normally be required to carry quite a large current for a short period and so will need to have adequate mechanical and electrical properties to continue to meet the demands on them over a relatively long period, during which actual testing or inspection is difficult. The material should have good electrical conductivity and should not corrode in a wide range of soil conditions.

**Galvanized steel, Copper, and Stainless steel** are generally the preferred material.

Aluminum is sometimes used for above ground bonding, but most of the standards forbid its use as an earthing electrode, due to the risk of accelerated corrosion. The corrosive product which is the oxide layer on the electrode is non-conductive in nature, so could reduce the effectiveness of the earthing.

The heavy flat strip is placed inside the bigger dia. pipe and the annular space between the two is filled with a special type of conductive, non-corrosive Backfill Compound. The completed Earth Electrode is heavily electroplated externally as per UL standards to enhance the life of the Electrode susceptible to corrosion (depends on the soil conditions). The water is used once during installation and fitting, and then the moisture is retained by the compound, throughout its life eliminating the use of water in regular intervals.

**PROPER INSTALLATION METHOD :** The Earthing Electrode can be installed by any one of the following methods depending on the soil condition.

#### **Normal Soil:**

Make a bore of 8" to 10" in diameter manually up to the electrode length (2 Mtr or 3 Mtr). Put a little quantity of Back Fill Compound (a layer of min. 3 to 4 inch) inside the pit and drop the electrode exactly in the center of the pit. Now mix the soil that has been dug out with the B.F.C. (conductive and non corrosive mixture) eliminating the stones, rocks and other bigger shapes. Now pour the above mixture in small quantity in to the pit followed by water and remove the trapped air inside the pit by poking a rod in to the mixture repeatedly. Repeat the above exercise till the pit is completely filled up. Pour sufficient water so that mixture is in paste /mud form. Allow the pit to stand for 24 hrs. and absorb the water and becomes compact. Test the earth pit and connect to the electrical circuit. Avoid excess watering. **Do not hammer the earth electrode.**

#### **Sandy Soil:**

Make a big pit of 06' x 06' and 11' deep; fill the entire pit with black cotton soil or normal soil, pour enough water so that pit is full with water, leave it for three days so that soil soaks up the water. You will notice that soil level has gone down and again top up the pit with soil & fill the water. Now after two or three days this pit is ready for earthing purpose and our earthing can be installed there by above described normal method, that will definitely give you a very good earth resistivity value. However, if the pit is filled with BFC mix soil then that will show better earth resistance value. These types of installations may needs regular watering after certain intervals that depends on the characteristics of the soil described in the "Factors determining the soil resistivity". It is to be noted that more than one earth electrode

may be required to be installed and connected in parallel to bring down the earth resistance value with in safe limits.

### **Semi-Rocky Soil:**

If enough soil is there then earthing can be done by normal method otherwise that can be done by making a big pit as in case of sandy soil. Ours is a corrosion resistant, long life and almost maintenance free earthing system in normal soil conditions & if installed properly it will give better earth resistivity value than conventional earthing system throughout there life. It is a Fit & Forget earthing system. However, these types of installations may needs regular watering after certain intervals that depends on the characteristics of the soil described in the “Factors determining the soil resistivity”. It is to be noted that more than one earth electrode may be required to be installed and connected in parallel to bring down the earth resistance value with in safe limits when done on ROCKY SOIL.

### **BACK FILL COMPOUND ( BFC )**

In all cases, the backfill medium should be conductive but non-corrosive in nature, be of a relatively small particle size and should, help to retain moisture for a considerable period of time. More often than not the previous excavated soil is suitable as a backfill, but should be sieved to remove any large stones and rubbles and placed around the electrode, taking care to ensure that it is well compacted. The soil should maintain a pH value between 6.0 (acidic) to 10.0 (alkaline). Normal stiff clay is not a suitable backfill material as, if heavily compacted; it may become almost impervious to water and could remain relatively dry. It may also form large lumps, which do not consolidate around the electrode avoiding to make good contact with soil to the electrode itself.

BFC, (back fill compound) is a specially developed compound, which is capable of absorbing and retaining the moisture for a long time, it reduces the soil resistivity, it helps in faster dissipation of fault current, least fluctuation of Ohmic value and it eliminates the use of Salt, Charcoal etc. around the Earthing Electrode. It has low solubility, hence is not easily washed away, and has a low resistivity (approximately 5-10 Ohm-meters in a saturated solution). It is virtually neutral, having a pH value of between 6.2 and 6.9. should not generally cause environmental difficulties in use.

## **1.1 WORKMANSHIP**

Following points shall be followed strictly.

The masonry chamber shall be provided with a Cast Iron hinged cover resting over the Cast Iron frame, which shall be embedded in the block masonry.

Construction of the earthing station shall in general be as shown in the drawing and shall conform to the requirement on earth electrodes mentioned in the latest edition of Indian Standard IS: 3043, Code of Practice for Earthing Installation.

The earth conductors (Hot dip G.I. strips) inside the building shall properly be clamped / supported on the wall with Galvanized Iron clamps and Mild Steel Zinc Passivated screws / bolts. The conductors outside the building shall be laid at least 600 mm. below the finished ground level.

The earth conductors shall either terminate on earthing socket provided on the equipment or shall be fastened to the foundation bolt and / or on frames of the equipment. The earthing connection



to equipment body shall be done after removing paint and other oily substances from the body and then properly be finished.

Over lapping of earth conductors during straight through in joints, where required, shall be of minimum 75mm. long.

The earth conductors shall be in one length between the earthing grid and the equipment to be earthed.

Additional equipment earthing shall be done with Cu strip / Bare Cu Wire as per size indicated in drawing.

Lightening arrestors shall be installed at topmost point of the building. The quantity for the same shall be designed & specification in BOQ to cover total building area. Finial type arrestor shall be used with Cu pipe & Cu base plate. The arrestor / base plate shall be connected to separate earth pit with Cu Strip.

Following tests shall be carried out:

The entire earthing installation shall be tested as per requirements of Indian Standard Specification IS: 3043.

The following earth resistance values shall be measured with an approved earth megger and recorded.

Each earthing station

Earthing system as a whole

Earth continuity conductor

Earth conductor resistance for each earthed equipment shall be measured which shall not exceed 5 Ohm in each case.

Measurements of earth resistance shall be carried out before earth connections are made between the earth and the object to be earthed.

## **1.2 MODE OF MEASUREMENT**

Earthing stations shall be measured in units whereas earthing strips and wires shall be measured in rmt.

### **Note:**

**All material and workmanship has to be as per latest IS / international standards.**

## **Lightening Arrestor**

### **SCOPE**

This specification covers the requirement of Design, supply, installation, testing and commissioning of lightning protection system. Vendor has to submit first design of Lightening arrestor system & submit to client / consultant for approval.

#### **1**

### **General**

- a) The Advanced Lightning Protection system shall include components as follow: air-termination(s), mechanical support(s), down-conductor(s), performance recording equipment(s) (optional) and a low impedance grounding system.
- b) Installation procedures of the entire lightning protection system shall be governed by the IS: 2309, the IEC 61024, NFC17-102, UNE-21186 and UNE-EN-50164-1 standard. The manufacturer of the air-termination shall provide designs and instructions for the installation as per the former standards.
- c) Prior to the installation of the system, a risk assessment survey shall be conducted to determine: the level of protection required for the structure (according to standards) and the adapted solution and design to be chosen.
- d) The Advanced lightning protection system shall be mounted adequately rated for wind shear loading. Guying kits shall be provided as appropriate to local environmental conditions, or based on mast arrangement selected.
- e) Each air terminal must be connected to the earth termination system by at least one-down-conductor. Two down-conductors are required when a) The horizontal projection of the conductor is larger than its vertical projection, b) When the structure is higher than 28m.

#### **e2**

### **Air termination**

- a) Manufacturing process of the air-terminal shall be ISO: 9001 certified
- b) The air terminal shall have been tested in a High-Voltage laboratory with a standardized waveform: 8/20 $\mu$ s or 10/350 $\mu$ s.
- c) The protection area of the air-terminal shall be determined using an acceptable method given in the following standards IS: 2309, IEC62-305 (Rolling Sphere Method), and NFC17-102 (Early Strimer Emission).
- d) The air terminal shall be made of non-corrosive materials. It shall be equipped with a central rod made of copper, copper alloy or stainless steel.
- e) The rod and the air-terminal tip shall have a conductive cross-sectional area larger than 120mm<sup>2</sup>.
- f) Lightning Air Terminal - Configured as a Spheroid which is comprised of separate electrically isolated 4panels surrounding an Earthened Central Finial. The upper section of the central finial shall be rated to withstand 200KA. The Insulation material used to electrically isolate the panels shall be comprised of base polymer which provides high Ozone & UV resistance with a di-electric strength of 24-38KV/mm & ESE terminal shall withstand a minimum Switching Impulse Voltage of 500KV tested as per NFC 17-102 & IEC Test Standard - IEC60-1:1989. The air-terminal shall guarantee a full electrical continuity between the tip and the down-conductor

- g) The air-terminal shall be able to support a 200kA current or more
- h) No external power supply shall be required
- i) The air-terminal shall be active only during a storm
- j) The air-terminal shall ensure the emission of a streamer (ionisation of the air around the tip) when a lightning strike is occurring in the protection area claimed
- k) The intensity and potential of the streamer shall be controlled by the air-terminal to ensure sufficient values (above 10A and 2000V) so it can develop properly and intercept the lightning
- l) The air terminal shall emit a streamer only when a lightning strike is occurring (provoking lightning strikes can induce surges!!!)
- m) Performances of the air-terminal shall not be affected by extreme climatic conditions

### **3 Air termination support**

The air terminal support shall consist of a minimal 5 meters Galvanized steel (GI), Powder Coated or steel elevation pole with a minimal diameter of 50 mm. The mast having arrangement for fixing of air terminal on the top.

The air termination support shall be fixed securely on the structure to enable the air termination and mast system to withstand maximum locally recorded wind velocities. Guy wires might be necessary to secure the system properly.

### **4 Down-conductor**

- a) Down-conductors consist of strips, braided cables or round sections.
- b) Materials to be used: insulated multi-strand copper (recommended) suitable for 1.1KV insulation.
- c) Minimal cross-sectional area must be 70mm<sup>2</sup>
- d) Down conductors shall be routed to the earth termination as direct as possible. Sharp bends and upward sections (40cm max with a 45° slope max are acceptable) are to be avoided.
- e) Down conductors shall be attached on the basis of three fixing per metre
- f) Down conductors shall eventually be protected against the risk of impact by installing sleeves up to height of 2m above ground level
- g) The down conductors shall be directly connected to the base of the air terminal and to the earth termination system by the mean of a test clamp.

### **5 Earth Termination**

- a) One earth termination system is to be provided for each down-conductor
- b) Resistance value should be 10 ohms or less (5 ohms or less when the structure contents sensitive materials). Minimum Resistance should be achieved by using earth enhancing compound and these compound should hold and absorb the moisture for long life and does not required regular recharging of earthing system.
- c) Material to be used: Bare or tin-plated copper (recommended), or stainless steel.
- d) Bonding of the earth termination to the electrical earth of the building, to metallic parts of the building, to the structural reinforcing steel of the building and to arriving services is strongly recommended.

## **6 Performance recording equipment**

- a) Each protection system shall be supplied with a lightning strike recorder.
- b) The lightning flash counter shall register a strike for every discharge where the peak current exceeds 1500A
- c) The lightning flash counter shall have been tested and certified in a high-voltage laboratory with a 8/20 $\mu$ s or 10/350  $\mu$ s waveform.
- d) The lightning flash counter shall be installed directly on the down-conductor and as per the manufacturer instructions

## **7 Earthing of Air Terminal**

- a) Air terminal shall be connected to Maintenance free earthing Suitable i.e. ( 5/8" dia and 3 meter long copper bonded earth rod).
- b) Maintenance free Earthing shall be based on copper bonded earth rod minimum copper bonding of 150 micron.
- c) Suitable quantity shall be used of Back fill compound (Moisture Holder) as recommended by manufacturer and these earth enhancing compound should hold and absorb the moisture for long life and does not required regular recharging of earthing system.
- d) Each earth pit shall be covered with using CI Cover of 12" X 12' of GI with 6/7 mm thick.

## **8 Test Joint**

- a) Each Down conductor shall be incorporated a Test Joint, which allows disconnecting the earth electrode and thus allows to measuring its resistivity. The test joint shall be mounted 2 meter above the ground.

## **9 Maintenance**

- a) As per the standards (IS: 2309, IEC 62-305 and NFC 17-102), the lightning protection system shall be inspected at least every 2 years.
- b) A visual inspection shall be performed to make sure that: a) No extension or modification of the protected structure calls for the installation of additional lightning protective measures, b) the electrical continuity of visible conductors is correct, c) all components fasteners and mechanical protectors are in good condition, d) no parts have been weakened by corrosion
- c) Measure of the earth termination resistance shall be realized to ensure it is still below 10 ohms (or 5 ohms) Air termination system shall be checked to ensure a) It is still properly connected to the down conductor(s), b) The tip has not melt, c) The system is still in operating conditions d) It is still properly installed on the support and it can withstand high wind velocities (relatively to the local conditions).

### **Note:**

**All material and workmanship has to be as per latest IS / international standards.**

## **TELEPHONE AND NETWORKING SYSTEM**

### **1.0 SPECIFICATIONS**

#### **TELEPHONE CABLES AND WIRES:**

The type of cables and the services shall be as follows:

Indoor – Multipair PVC sheath armoured / un-armoured as specified 0.6 mm tin Cu. Cable.

Outside -- Multipair PVC sheath armoured / jelly filled as specified 0.6 mm tin Cu. Cable.

All multi core cables and wires shall be of tinned copper conductor of not less than 0.6 mm dia and shall be colour coded twisted pairs with rip cord.

The conductor resistance shall be less than 150 ohms per KM and the insulation resistance between the conductors not less than 50 mega ohms and the nominal capacitance of about 0.1 microfarad per kilometre.

Cables laid under ground or locations subject to dampness and flooding shall be filled with polyethylene compound and shall have sufficient protection against moisture and water ingress.

All armouring shall be of galvanized steel wires and protected against corrosion by an outer sheath of PVC in the case of indoor cables and polyethylene in the case of outdoor cables. Outer sheathing must be fire retarding and anti-termite.

All un-armoured single core cables and inner sheath of armoured cables shall be provided with ripcord.

#### **TELEPHONE TAG BLOCKS:**

The telephone tag blocks shall be suitable for the multi core telephone cables and shall have two terminal blocks, cross connect type. All incoming and outgoing cables shall be terminated on separate terminal blocks and termination shall be silver soldered. The cross connecting jumpers shall be insulated wires of same diameter and screw connected.

The tag blocks shall be mounted inside fabricated sheet steel boxes with removable hinged covers and shall be fully accessible. The enclosure shall be painted with 2 coats of red oxide and stove enamelled.

#### **TELEPHONE OUTLET SOCKET:**

Telephone outlet socket shall be of the same make as that of the switches and accessories. The outlet sockets shall consist of 2 A 2 Pair polyethene connector in M.S.I / PVC boxes with switch plate of the same make as that of switches and telephone socket. The telephone outlet socket unless and otherwise specified shall be jack type and not pin type.

# SOFTWARE AND HARDWARE COMPONENTS

## 5.1 Software Components

- **VMS, NVR & Camera should be from same OEM**
- **VMS-Client Application** shall provide live video view, various video playback support, historical video search and playback, PTZ Controls, alarm management, E-Map integration and front end control features to an operator. Client Application shall also able to manage & control all devices depending on the user access privileges. System should support virtually unlimited VMS Clients.
- **VMS Database Server** contain a web based data management center includes user management, facility management system logs etc. and event & control service which receives and controls events and commands of various formats via different communication modes, integrating video, access & intrusion (alarm) devices. The Primary Database Server shall able to support either upto 500 cameras/server or a combination of 300 cameras with 200 access readers and 200 intrusion alarm zones per server or any such combination of various front end devices. However the system should be capable to expand virtually upto unlimited number of cameras, access & intrusion points by incorporating multiple servers to make a complete enterprise security systems.
- **VMS Redundancy Kit** shall provide necessary hardware and software to provide hot standby for the VMS database servers.
- **Network Video Recorder (NVR)** shall able to receive and store videos from various front end devices and forward to various decoders, clients applications connected to the enterprise security system; ensuring a smooth transmission when transmitting mass videos in various bandwidth levels. Each NVR server shall able to support upto 340mbps data throughput which can take upto 128 cameras recording @ D1 resolution with 40 channels playback at real time simultaneously. Each NVR shall be provided with a storage chassis which should able to expand upto 32TB and can be further expanded upto 96TB by incorporating the additional storage chassis.
- **NVR Storage Expansion Chassis** Storage Expansion Chassis, a direct-access storage disk array which shall connect to a NVR to provide extra data storage capability. Each NVR storage expansion chassis shall able to support upto 32TB of storage expansion.
- **VMS Decoder**, 4 Channels High Definition Network Video Decoder; Support 4 VGA/DVI-D ports which shall able to decode high definition (1080P / 720P), megapixel and standard resolution. Each monitor shall support upto 16 images per screen or simultaneously decode upto 4 streams at D1 resolution with real time on each port.

### 5.1.1 SYSTEM COMPONENT DESCRIPTION & INTEGRATION

**System shall support integration of various system components as detailed below as a minimum to create an enterprise level Security Management System.**

- A.** Recorders: Video Management System (VMS) shall support integration with digital and network video recorders (DVRs/NVRs). VMS shall have the ability to access and manage necessary functions of the recording devices through the VMS client interface, such as live video, recorded video, playback, camera configuration, PTZ control and other associated functions. The system shall support 128 Channel NVR & 16 Channel NVR at 25 fps @ D1 resolutions as a minimum.
- B.** Encoders: VMS shall support integration with video encoders. VMS shall have the ability to access necessary functions of the analog cameras connect to video encoder, such as live video, recorded video, PTZ control and other associated functions. The system shall support 2-Channel; 4- Channel encoders @ D1 resolution as a minimum. Encoders should support HDD upto 6TB for local recording.
- C.** Decoders: VMS shall support the decoder to view the live video on analog Monitor or Video wall. The system shall support Single Channel & 4-Channel decoder devices as a minimum.
- D.** IP Cameras: VMS system shall support IP cameras. VMS shall have the ability to access necessary functions of IP cameras, such as live video, PTZ control and other associated functions. The system shall support IP Dome (Indoor/Outdoor) with fixed/Varifocal lens; IP Dome with inbuilt IR illuminator; IP Box with fixed/varifocal lens and IP PTZ Cameras. VMS shall support various Camera resolutions at VGA; 4CIF; D1; 720P; 1.3MP 1080P/2.1MP.
- E.** VMS shall support Edge based Video Analytics.
- F.** VMS shall have a capability of Analog Video Switcher integration.
- G.** VMS shall support IP keyboard with joystick for PTZ control, Camera and Monitor Selection as a minimum.

### **5.1.2 OPERATIONAL REQUIREMENTS**

- H.** VMS shall provide a single graphical user interface (GUI) to monitor, control and administer digital video surveillance equipment from multiple systems and platforms; Access Control & Intrusion Detection System.
- I.** All the Alarms from all the interfaces i.e CCTV; Access Control & Intrusion Detection shall be reported into a single GUI.
- J.** VMS shall include a fully scalable enterprise-class media management system to enable simultaneous live monitoring from multiple stations and be configurable for storage both on and off site.
- K.** VMS shall be configured to store and view images captured by one camera or numerous cameras and monitor connections across an unrestricted number of servers.
- L.** All the Software & hardware equipment's for CCTV, Access Control & Intrusion Detection Systems shall be of same make/manufacture.

### **5.1.3 VMS SOFTWARE FEATURES:**

The VMS application software shall have following major features:

- A. **Scalability:** System shall be scalable to enterprise level system so that increase in the number of cameras; number of servers & number of Clients shall not affect the currently running system operations & functionality.

B. **Architecture:**

1. **Single Location:**

System shall adopt centralized architecture. All configuration data of IP Video Solution shall be stored in Database Management Center. All other services of VMS, NVR and VMS-Client get configuration data from Data Management Center instead of storing decentralized data.

System shall have capability to access live and recorded data from NVR only. Video (Live and Recorded) need not to be routed through VMS Database Server, so that VMS-Client application shall continue to access Live and Recorded video in case of VMS Database Server failure.

- C. **Open Standard Support:** VMS Software shall be ONVIF compliant so that it can integrate with multiple digital IP cameras, multiple digital and network video recording devices, multiple video matrix switchers and matrix keyboards.

- D. **System Integration:** System shall have Integration capabilities with electronic access control system, Intrusion detection system, video analytics and data management utility. Integration capabilities of the system shall be measured on below mentioned aspects as a minimum:

VMS shall support integration with Access Control & Intrusion Detection System. It shall support real time linkage of digital video clips to their associated alarms from the access control & intrusion alarm system. System Administrators shall configure video segments by specifying pre- and post-alarm time marks, then link those defined video segments to specific alarms. The software shall provide at least 10 minutes of tagged pre and post activity recording per event.

In an event of an alarm generated by Access Controller or Intrusion Detection System the software shall ensure that the operator is automatically provided with the CCTV video from the designated camera to view the alarm location as soon as the alarm is received, allowing the operator to visually assess the event and also providing continuous recording. The software shall also automatically focus the nearest PTZ cameras to view to the point of alarm.

In an event of a card being shown to a card reader (where there is camera located near the door), the system shall capture a video clip containing at least 2 minutes before the card swipe, during card swipe event & 2 minutes after card swipe and bundle them together & tag them along with the card event database. When the card event is retrieved then it should be possible to play the associated video clip of that particular Event/Alarm.

VMS shall support defining multiple rule logics which can be assigned to any alarm to run automatically when those alarms received in the system. There shall not be any limitation in defining such rule logic. Example of such rule is “in case there is an alarm received from a zone of Intrusion Detection System, then specific Camera assigned to that Zones shall automatically Pop up on the VMS-Client GUI and start recording based on the Pre & Post record time defined during the configuration and defined set of Access Controlled doors shall go into Locked/Unlocked state as defined.

VMS shall support operation from Central console but not limited as defined below:-



Intrusion Alarm integration operation:

- Arm, disarm, bypass status shall be displayed on VMS-Client machine.
- Zones can be sorted by status.
- Arm, disarm, bypass operation can be implemented to all the zones.

Access Control Integration Operation:

- User name, card No., card type, privilege and reader No. can be gained upon swiping card.
- Door control can be fulfilled manually or automatically assigned in rule defined in the system.
- Above information shall be able to be logged in system database.

- E. **Redundant Recording Device:** VMS shall support failover or redundant capabilities of the Recording device(s) as a minimum. N+1 redundancy for recording device(s) shall ensure system availability in the event of main recording device failure or network failure of the main recording device.
- F. **Redundancy and Backup service:** VMS shall have a feature of Redundancy & Backup Service. The system shall perform real-time dynamic monitoring and backup of the content of VMS Primary Server in monitoring center. Once trouble event occurs, it switches to the Standby VMS Server automatically, such that the Standby Server can replace the Primary Server; so there shall not be any down town with respect to VMS Database Server functionality.
- G. **Service Stability:** VMS shall integrate with sandbox framework to ensure crash of server will not result in service crash. It will also try to restart a crashed server to increase system accessibility and stability.
- H. **Compression Techniques:** System shall use various compression techniques simultaneously to utilize storage and network bandwidth effectively. Video compression techniques shall including H.264, MPEG-4 and M-JPEG as minimum.
- I. **Multi Operations:** Managing pentaplex user operations of attached recording devices simultaneously, including live viewing, recording, playback, and handling the exchange of data between the server and a remote workstation.
- J. **Live View:** Live viewing of up to 64 cameras on a single VMS-Client up to D1 resolution. VMS-Client application shall have capability to connect to 4 monitors & 16 cameras can be viewed on one Monitor.
- K. **Alarm Management:** System shall receive alarms & events from multiple video, access and alarm devices. It shall provide capability of Alarm & event viewing, management and interlocking. Alarm interlock logic shall reside in VMS Server which will trigger device to execute preset operations on receiving of an alarm.
- L. **Reports:** Log Report shall be used to search the device alarm events, device operations, user login, and web operation. It shall also be used to set queries to get results quickly. Log reports shall be exported in XML, CSV, TIFF, PDF, Web Archive and Excel file formats.
- M. **Search:** System shall manage investigation, post-recording motion detection, motion detection-based recording, Alarm (from any of integrated solution CCTV, Access Control and Intrusion

Detection) Based recording and search tools with advanced search capabilities of the recording devices.

- N. **User Rights:** System shall provide multi-level user access rights for viewing and managing access to the recorder functions. The user level shall range from 0 to 255; the bigger the number, the higher the control priority is.
- O. **Recording Modes:** System shall support recording modes of continuous, scheduled, manual, event and alarm-based recording.
- P. **Network:** System shall support for both multicast and unicast network topologies and communication protocols.
- Q. **Rule engine:** This capability shall allow for custom scripts and to provide both customization and third party integration. Rules Engine Service shall provide functions such as rules analysis, state monitoring and rules management. By way of logical programming for various devices and event alarms in graphical editing interface, Rules Engine Service shall perform automatic execution of rules when emergency occurs. The visual dynamic user interface shall make it easy to acknowledge alarm circumstances and allows prompt response in case on emergency.
- R. **Client Application:** VMS shall provide at least 20 Client licenses as inbuilt. System shall provide unified VMS-Client login to users. User shall be able to login from any PC loaded with VMS-Client application. User shall have the option of two modes of user logins:
  - i. Online login: User shall be able to login when at least one VMS service online.
  - ii. Offline login: User shall be able to login when there is no VMS service online after user at least success one time online login.
- S. **Hardware:** System shall utilize off-the-shelf computer workstations, servers, networking and storage equipment. No proprietary hardware shall be acceptable.

#### **5.1.4 VMS OPERATOR FEATURES:**

VMS shall provide the following operator functions:

- A. **Configuration:** The operator (with Administrator privileges) shall have the option to configure the system. It shall support live updates of all configurations. The configurations shall provide the option to add/edit/delete recorders, cameras, switchers, keyboards, users and roles, sites, recording rule, rule engine service etc. Configuration of video recording trigger service and device recovery service parameter shall be basic feature of VMS.
- B. **Event & Control Service Configuration:** EC service integrates with sandbox framework to ensure crash of specified device adapter will not result in service crash. EC service will also try to restart a crashed adapter to increase system accessibility and stability Option to configure Event & Control Service. The following configurations shall be possible:
  - i. Supported devices.
  - ii. Alarm filters mechanism.
  - iii. Judgment mechanism for control priority
  - iv. Mechanism for cascading connections of Event & Control services.

- C. **Data Dynamic Synchronization:** The configuration data in VMS shall be able to synchronous to all connected VMS-Clients and NVR services.
- D. **Log Report:** The operator shall be able to view following log reports:
  - a. Device alarm log report.
  - b. Device operation log report.
  - c. User login log report.
  - d. Web operation log report.
- E. **Disaster Recovery and Backup Service:** Disaster Recovery and Backup Service shall provide the following operator functions:
- F. This backup system shall supervise and backup the center contents dynamically. Once there is an accident, the system can switch to the backup system automatically, which replaces the original center and continues the work. Disaster Recovery and Backup Service can backup for Event Control Service, Video Trigger Service and Rule Engine Service.

#### **5.1.5 VMS-CLIENT FEATURES:**

- G. VMS-Client Application shall have below mentioned features:
  - A. **Live View:** Main video viewing screen capable of showing 1, 4, 9, 16 and other customized split layout of live or recorded video. Standard presets may be customized to the user preferences.
  - B. **Scenarios:** Current view can be saved as scenario and allowing the user to restore this view at any later point in time. These scenarios shall be modified, overwrite or deleted as and when required.
  - C. **Drag and Drop:** VMS-Client application shall provide drag and drop functionality. Particular video device can be dragged onto main video viewing screen to view live video.
  - D. **Favorites:** VMS-Client application shall have feature to save favorites, where user can create a device/scenario folder and drag devices/scenarios into it so that these can be quickly accessed.
  - E. **Patrol:** VMS-Client application shall provide user the capability of configuring and running video patrol sequences to automatically play videos of multiple channels in specified windows by turns. A patrol shall include several scenarios and a scenario includes several video channels.
  - F. **PTZ Control:** Support both analog and digital PTZ through GUI and the keyboard. PTZ control shall be used for adjusting PTZ movement and setting the focus, aperture and preset bit of the camera.
  - G. **Snapshot:** Capable of capturing snapshot of live video and allowing user to export snapshot. Snapshot tool shall be available in video window itself. Only the authorized users shall have snapshot functionality.
  - H. **Video Export:** VMS-Client shall have capability of download and export recorded video from recorders. Exported video clip shall be in OEM's native format to ensure data integrity. Download link to the player shall be provided with video exported.
  - I. **Playback:** VMS-Client shall be able to playback recorded video from recorders. Different playback modes shall be there as 8x, 16x, 32x, 64x, frame by frame and backward playback.

- J. **Instant Playback:** Allow the user to view and save 30sec ago instant playback for any playing live video. It shall be used for monitoring emergent situation. This function shall be enabled by default, if required, user may disable this function.
- K. **Recording:** Allows the user to initiate recording through GUI. Recording can be initiated remotely on NVR and locally on VMS-Client PC.
- L. **Alarm Management:** Capability of complete alarm management for the alarms coming from recorders, switchers, intrusion detection systems and access control systems. Alarm Management shall be based on below mentioned aspects:
  - i. User shall get the pop-up message for response plan upon receiving the alarm so that same response plan can be followed by each operator.
  - ii. E-mail notification can be sent out which shall include alarm information and User editable information along with individual alarm. One or multi receiver addresses and SMTP can be assigned for E-Mail notification.
- M. **E-Maps:** VMS-Client shall have capability to upload GIS Map which shall support .shp, AutoCAD, bmp, jpg, png format file. These maps can be interlinked with 8 levels. Devices including cameras, access control readers and intrusion detectors shall be planted on maps. E-map application shall have below mentioned functionalities:
- N. Video verification can be displayed within 1 second after alarm is triggered.
- O. Multi video verification (at least four) can be triggered by same alarm input.
- P. Alarm can come from any kind of event notification which system can recognize.
- Q. **Surrounding Camera View:** VMS-Client application shall have facility of surrounding camera view. It shall support setting presets in surrounding cameras.
- R. In a surround view, video from a specific device shall be playing in the centre and the other surround videos will be from surrounding video devices. Once the object moves to some other camera's FOV, operator can pull that camera in the center and surrounding videos from the associated surrounding camera plays in the surround views. Every video device can be configured one surround view with related 12 surrounding cameras. There shall not be any limit in defining such surround views.
- S. Surround video can be called through keyboard and VMS-Client operation.
- T. Surround video can be configured through web or VMS-Client.
- U. **Alternate Camera View:** For continuous monitoring, system shall have alternative view functionality. Every camera can be assigned an alternative view camera. If one camera is unavailable, operator can achieve alternative camera to get same/similar scene.
- V. Alternative view camera can be called through keyboard and VMS-Client operation.
- W. Alternative view camera can be assigned through web configuration or through NVR-Client.
- X. **Operations:** Option to perform various operations through context menu on a particular video (live/recorded/patrol). These operations shall include: Full screen, point and drag, enable square select, digital zoom, start recording, stop recording, take snapshot, show surrounding cameras, trigger alternative view.
- Y. **Timeline Control:** Ability to manage timeline control of the recording device, which provides camera recording statistics. Timeline control shall have following features: time slider, time search,

time jump, play controls. Timeline control shall also include dedicated buttons for step reverse and step forward and keyboard shortcuts for playback operations.

- Z. **Keyboard Functionality:** VMS-Client shall be controllable by a keyboard controller connected to the VMS server and shall have following major features: Selecting layout, ending monitor commands, switching operations, PTZ control operations. PTZ control latency shall be less than 500ms
- AA. **Search:** The search facility shall include search based on date and time, device type, trigger type, alarm, operator, location and site. The search facility shall be able to search records in specified recorder.
- BB.**Device and Service Status:** VMS-Client shall be capable to show the running status of Event & Control services, Rule Engine service and VMS site in bottom status bar. It shall also monitor connected devices status.
- CC.**Server Usage:** VMS-Client shall provide facility to view CPU, Memory and Network usage information.
- DD. STORAGE CAPABILITIES:
- EE. NVR shall have below mentioned capabilities:
- FF. Video Streaming: NVR shall relay the real-time streaming to the VMS-Client.
- GG. Recording: NVR shall store the real-time streaming for a certain period of time when it receives the storage command from Trigger Service.
- HH. Each individual camera can be set a different preset recording frame rate .Camera recording frame rate will be changed to full frame rate upon motion detection or other alarm information (according to configuration).Frame rate change interval (from alarm received to recording frame rate change) shall be less than 1 second.
- II. Video playback and download: NVR shall allow the user to playback and download video records from NVR-Client. It shall also allow the user to configure the storage locations.
- JJ. Pre-alarm Recording: NVR shall be capable to cache the real-time streaming for a certain time (no longer than 10 minutes). When there is an event or alarm triggering recording, prerecording can help trace the situation before the event or alarm occurs.
- KK. Re-Linking: NVR shall re-link to disconnected front-end devices. The following two conditions can result in re-linking:
- LL. If the NVR fails to link with the front-end device for the first time, it will try to re-link with the front-end devices repeatedly; the maximum interval is 30 seconds for each try.
- MM. When the NVR succeeds in linking with the front-end devices and is recording or relaying the streaming, if the bit rate from the device remains as “0”, it will start the re-linking operation.
- NN. Overwriting: NVR shall be capable to cycle overwrite video records. NVR supports the cycle overwrite in the following two situations:
- OO. Delete the videos older than N days regularly. If the disk can store the videos for N days, at which point the NVR deletes video files older than N days according to the required video storage space after a certain capacity is filled.
- PP. Delete the oldest videos when the disk capacity is full.

- QQ. Device Status Monitoring: NVR allows the user to monitor the running status of NVR via GUI. The following health statuses need to be monitored: system overload (CPU, Network), storage getting full, and hard disk error, data accumulation to an unstable level, temperature too high, power supply failure and fan failure.
- RR. Health status abnormal shall be able to be reported out to VMS-Client as alarm information.
- SS. User shall be able to configure which alarm to be received
- TT. The following status shall be provided:
- UU. Total connected device number
- VV. Working device number
- WW. Receive BPS (KB/S)
- XX. Relay device number
- YY. Relay BPS (KB/S)
- ZZ. Storage device
- AAA. Storage BPS (KB/S)
- BBB. Historical Relay number
- CCC. Historical Relay BPS (KB/S)
- DDD. Storage locations
- EEE. All space (MB)
- FFF. Remain space (MB)
- A. Remote Upgrade: NVR shall be able to be upgraded without sending device back to factory. It shall be remotely upgraded from VMS-Client.

## **5.2 Hardware Components**

### **1) NETWORK SWITCHES:**

All switches shall be managed switches so as to manage the bandwidth of the systems and avoid any flooding of data in either unicast for multicast mode of operations. Network Switches shall be of following specification as minimum:

1. Layer 3 Network Managed Switches:
  - (a) The network Switch shall be 3 layer Switch with 10/100/1000 ports. Each switch shall be supplied with minimum 2 SFP ports where fiber can be terminated directly.
  - (b) It should have capability to support L3 switching and routing functionalities.
  - (c) The device should have capability to work on environmental temperature of 50° C
2. Layer 2 Network Managed Switch
  - (a) The Network switch shall have 10/100Base-TX ports with min. 2 SFP ports loaded with 100Base-FX SFP module.

- (b) The Network Switch shall have Non-blocking functionality at half & full duplex speed.
- (c) Network Switch shall support Web-based configuration and management.
- (d) System configuration with SNMP v1 V2 and V3 shall be supported by Network Switch.

5) Central Management & Recording Server

- A. Support up to 700Mbps data throughput
- B. Support multi front end solution, including H.264, MPEG-4, MPEG2 and MJPEG formats
- C. Complete fail-over solution provided by N+1 redundancy system design in future
- D. One standard storage unit supports up to 64TB, expansion total storage up to 256 TB
- E. Hot swappable hard disk for easy maintenance and high availability
- F. Recommend certified enterprise class hard disk for high reliability
- G. Continuous, scheduled, motion and alarm triggered recording support
- H. Quick video record search by date, time, alarm event, channel number

System Throughput Capacity	Support 700 Mbps bandwidth throughput capacity.
Processor	Intel quad-core processor 3.1 GHz, 8MB Cache
Memory	8 GB
Hard Disk	Enterprise class hard disk 1TB, 3.5" 7200 RPM, SATA, 32 MB Cache
Network	2 x 1Gbps Ethernet RJ-45 Ports
RAID controller	Enterprise LSI MegaRAID SAS 9260 (6Gb/s per port)
Operating System	Windows Server 2008 64bit
IOPS	140,000 (Input/Outputs Per Second)
Condition Monitoring	Fault/error/overload and alarm (including disk / RAID / power / fan / temperature / IO performance)
Hardware Redundancy	Power supply and fan module redundancy (2 x PFC)
Video Storage	
Video Input	IP mode access
Video Compression	H.264, MPEG4, MPEG2, MJPEG
Video Resolution	1080P / 720P / Megapixel / D1 / 4CIF / VGA / CIF
Frame Rate	At most 25 fps (PAL) / 30 fps (NTSC). Support set variable code flow storage
Recording Mode	Time and events, alarm, manual trigger, continuous video
Recording Inquires	Date, equipment name and channel numbers, alarm and event type, video trigger mode
Audio	G.711
Hard Disk	4 TB Per Bay
Slot number	Support 16 x 3.5" enterprise hard disk (SAS/SATA)
Storage Extension	One system can install maximum 64 x 3.5" enterprise hard disks (SAS/SATA), and support 3 units of video storage expansion array
Hard Disk Hot Plug	Support
Expansion Interface	Mini SAS (6Gb/s)
RAID Level	RAID 0, 1, 5, 6, 10, 50, 60
RAID Management	Based on the Web browser mode, GUI configuration and management
RAID Performance	RAID banding change Settings and RAID flash SAS/SATA hard disk mixed management mode Roll online flash and disk hot backup mechanism Disk medium detection and hard disk bad area isolation Data Snapshot copy function: Snapshot

	Different alarm information means: SNMP/Email
Power Consumption	2 x 550W
Operating Temperature	10°C to 35°C
Storage Temperature	-40°C to 65°C
Relative Humidity	8% to 90% , non-condensing
Certification	CE, FCC, CCC

Central Management Server	
System Capacity	
Server	Dell PowerEdge Server
Processor	Quad-Core Intel E5-2403 Series Processors
Cache	10MB
Memory	8 GB ,1333 MHz
Network	2 Gigabit Ethernet RJ-45 Ports
Hard Disk	3.5" SATA (7200 RPM): 500GB
Drive Bays	Up to 4 x 3.5" hot-swappable SAS or SATA drives
Operating System	Windows Server 2008 Standard 64 bit
Database	SQL Server 2008 Standard
Power Input	100 - 240VAC, 50/60Hz
Power Consumption	350W
Operating Temperature	10°C to 35°C
Storage Temperature	-40°C to 65°C
Relative Humidity	10% to 85% , non-condensing
Certification	CCC, CE, FCC,UL

## 8.1 WORKMANSHIP

All cables shall be on cable racks and neatly stitched together.

The connection at the tag blocks shall be silver soldered so as to achieve minimum contact resistance.

The final branch connections with single pair cables in conduits and the maximum number of cables in each conduit shall be as follows:

Conduit	diameter	Max. No. of cables
<u>Inch</u>	<u>mm.</u>	
3/4"	20	2 Nos. single pair
1"	25	6 Nos. single pair
1¼"	32	12 Nos. single pair
1½"	40	18 Nos. single pair



The tag blocks shall be mounted inside fabricated sheet steel boxes with removable hinged covers and shall be fully accessible. The enclosure shall be painted with 2 coats of red oxide and stove enamelled.

## **8.2 MODE OF MEASUREMENT**

The wires, conduits and raceways shall be measured in rmt whereas the outlet sockets, junction boxes and tag blocks shall be measured in units.

## **J. CCTV CAMERA**

### **9.1 General**

The work under this system shall consist of design, supply, installation, testing, training & handing over of all materials, equipment's and appliances and labor necessary to commission the said system, complete with Hi-Speed Dome Cameras, Vandal resistant varifocal dome camera, Digital Video Recorder and Monitor. It shall also include laying of cabling, necessary for installation of the system as indicated in the specification and Bill of Quantities. Any openings/chasing in the wall/ceiling required for the installation shall be made good in appropriate manner.

### **9.2 Equipment**

The CCTV System shall comprise of Fixed indoor camera, Bullet camera, Indoor/outdoor ptz camera, Digital Video Recorder, power supply.

#### **Indoor Dome Camera**

- A. Full HD 1080p 25/30 fps image with a 1/2.7" 2 MP sensor
- B. True WDR (120 dB) ensures glare-free images
- C. True Day/Night provides color images by day and black-and-white images at night with ICR
- D. 2.7-12 mm, F1.4, motorized focus & zoom lens
- E. H.264 and MJPEG codec, triple stream support
- F. IR LEDs provide up to 65' (20 m) of illumination in dimly lit or nighttime scenes (depending on scene reflectance)
- G. Smart IR technology provides even distribution of IR
- H. -22°F to 122°F (-30°C to 50°C) working temperature
- I. ONVIF Profile S and G compliant
- J. Security features include individual signed certificates and data encryption
- K. Built-in PoE (Power over Ethernet) eliminates separate power supply and associated wiring; 24 V AC/12 V DC inputs where PoE power is unavailable
- L. Remote configuration, motorized zoom adjustments and auto focus through web client or from the VMS
- M. Supports 128 GB microSDHC (Class 10) card for local video storage when network is interrupted.
- N. Video Analytics : Motion detection, Tamper detection, Face detection

<b>Model</b>	<b>Indoor Dome Camera</b>
Image Sensor	1/2.7" 2 MP progressive CMOS
Effective Pixels	1280 (H) × 960 (V)
Electronic Shutter Speed	Auto, Manual, 1/3(4)-1/10 000 s
Min. Illumination	0.01 lux color/0 lux with IR LEDs on @ F1.4
S/N Ratio	More than 50 dB
IR Distance	Up to 65' (20 m), depending on scene
Day/Night	reflectance Auto(ICR)/Color/BW
Backlight Compensation	BLC/HLC

REDUCTION PRIVACY	3DNR
Privacy Masking	Up to 4 areas
Focal Length	2.7-12 mm, MFZ, F1.4
Horizontal Angle of View	99°-34°
Lens Type	Motorized focus and zoom
Compression	H.264/H.264H/H.264B/MJPEG
Resolution	1080p (1920x1080)/ SXGA (1280x1024)/1.3M(1280x960)/720p (1280x720)/D1 (704x576/ 704x480)/ CIF (352x288/352x240)
Primary Stream	1-25 fps (1080p, SXGA-1280x1024, 1280x960, 720p, D1-704x576)
Secondary Stream	1-25 fps (D1-704x576, CIF-352x288)
Triple Stream	720p 1-14 fps, D1 (704x576) 1-25 fps, CIF (352x288) 1-25 fps
Audio Stream	Dual Channel, Built in Mic
Corridor Mode	Support
Ethernet	RJ-45 (10/100Base-T)
Protocol	IPv4/IPv6, HTTP, HTTPS, TCP/IP, UDP, UPnP, ICMP, IGMP, RTSP, RTP, SMTP, NTP, DHCP, DNS, PPPoE, DDNS, FTP, QoS, SNMP v2c/v3, LDAP (Client), NFS, RTCP, Bonjour
Compatibility	ONVIF Profile S & G
Max. User Access	20 users
Memory Slot	128 GB microSDHC card Class 10
Power Supply	12VDC +/-10%, 24VAC +/-10%, PoE IEEE 802.3af
Power Consumption	8.5 W max. (IR LEDs on)
Working Environment	Temperature -30°C to 50°C & 0% to 95%, non-condensing Humidity
EMISSIONS	FCC Part 15, CE (EN 55022); Complies with RCM (AS/NZS
IMMUNITY	CE (EN 50130-4)
SAFETY	UL listed , CE (EN 60950-1)

## 2) *Bullet Camera with 2.7 to 12 mm Lens*

- O. Full HD 1080p 25/30 fps image with a 1/2.7" 2 MP sensor
- P. True WDR (120 dB) ensures glare-free images
- Q. True Day/Night provides color images by day and black-and-white images at night with ICR
- R. 2.7-12 mm, F1.4, motorized focus & zoom lens
- S. H.264 and MJPEG codec, triple stream support
- T. IR LEDs provide up to 195' (60 m) of illumination in dimly lit or nighttime scenes (depending on scene reflectance)
- U. Smart IR technology provides even distribution of IR
- V. Waterproof (IP67) and IK10 vandal resistant camera housing
- W. -40°C to 60°C working temperature
- X. ONVIF Profile S and G compliant
- Y. Security features include individual signed certificates and data encryption
- Z. Built-in PoE (Power over Ethernet) eliminates separate power supply and associated wiring; 24 V AC/12 V DC inputs where PoE power is unavailable
- AA. Remote configuration, motorized zoom adjustments and auto focus through web client or from the VMS

BB.Supports 128 GB microSDHC (Class 10) card for local video storage when network is interrupted.

<b>Model</b>	<b>Vandal Bullet Camera</b>
Image Sensor	1/2.7" 2 MP progressive CMOS
Effective Pixels	1280 (H) × 960 (V)
Electronic Shutter Speed	Auto, Manual, 1/3(4)-1/10 000 s
Min. Illumination	0.01 lux color/0 lux with IR LEDs on @ F1.4
S/N Ratio	More than 50 dB
IR Distance	Up to 60 m
Day/Night	reflectance Auto(ICR)/Color/BW
Backlight Compensation	BLC/HLC
REDUCTION PRIVACY	3DNR
Privacy Masking	Up to 4 areas
Focal Length	2.7-12 mm, MFZ, F1.4
Horizontal Angle of View	99°-34°
Lens Type	Motorized focus and zoom
Compression	H.264/H.264H/H.264B/MJPEG
Resolution	1080p (1920x1080)/ SXGA (1280x1024)/1.3M(1280x960)/720p (1280x720)/D1 (704x576/ 704x480)/ CIF (352x288/352x240)
Primary Stream	1-25 fps (1080p, SXGA-1280x1024, 1280x960, 720p, D1-704x576)
Secondary Stream	1-25 fps (D1-704x576, CIF-352x288)
Triple Stream	720p 1-14 fps, D1 (704x576) 1-25 fps, CIF (352x288) 1-25 fps
Audio Stream	Dual Channel
Corridor Mode	Support
Ethernet	RJ-45 (10/100Base-T)
Protocol	IPv4/IPv6, HTTP, HTTPS, TCP/IP, UDP, UPnP, ICMP, IGMP,RTSP, RTP, SMTP, NTP, DHCP, DNS, PPPoE, DDNS, FTP,QoS, SNMP v2c/v3, LDAP (Client), NFS, RTCP, Bonjour
Compatibility	ONVIF Profile S & G
Max. User Access	20 users
Memory Slot	128 GB microSDHC card Class 10
Power Supply	12VDC +/-10%, 24VAC +/-10%, PoE IEEE 802.3af
Ingress Protection	IP67
Vandal Resistance	IK10
Working Environment	Temperature -40°C to 60°C & 10% to 100%, condensing Humidity
EMISSIONS	FCC Part 15, CE (EN 55022); Complies with RCM (AS/NZS
IMMUNITY	CE (EN 50130-4)
SAFETY	UL listed , CE (EN 60950-1)

### 3) Indoor/ Outdoor PTZ Camera

CC.Full HD 1080p 25/30 fps image with a 1/1.9 inch 2 MP sensor

- DD. True WDR (120 dB) ensures glare-free images
- EE. True Day/Night provides color images by day and black-and-white images at night with ICR
- FF. 6.0-180 mm, F1.6-F4.8, 30x optical zoom lens with 360° continuous rotation for the flexibility to clearly view the target area with desired width and depth
- A. H.264 and MJPEG codec, triple stream support
- B. IR LEDs provide up to 656' (200 m) of illumination in dimly lit or nighttime scenes (depending on scene reflectance)
- C. Smart IR technology provides even distribution of IR
- D. Waterproof (IP67) and IK10 vandal resistant camera housing
- E. -40°C to 70°C working temperature
- F. ONVIF Profile S complaint
- G. Security features include individual signed certificates and data encryption
- H. Built-in High PoE (Power over Ethernet) eliminates separate power supply and associated wiring; 24 V AC input where PoE power is unavailable
- A. Remote configuration, motorized zoom adjustments and auto focus through web client or from the VMS
- B. Supports 128 GB microSDHC (Class 10) card for local video storage when network is interrupted.
- C. Inbuilt Auto Tracking

<b>Model</b>	<b>PTZ camera</b>
Image Sensor	1/1.9 in. Sony Progressive CMOS
Effective Pixels	1280 (H) × 960 (V)
Optical Zoom	30 X
Min. Illumination	0.005 lux (color)/0.0005 lux (B/W) @ F1.6; 0 lux IR On
S/N Ratio	More than 50 dB
IR Distance	Up to 60 m
Day/Night	reflectance Auto(ICR)/Color/BW
Backlight Compensation	BLC/HLC/WDR
ELECTRONIC IMAGE STABILIZATION	On/oFF
DEFOG	On/oFF
Focal Length	6-180 mm, ( Aperture F1.6 – F4.8)
Horizontal Angle of View	H: 61.2° – 2.32°
TILT TRAVEL	-10° to 90°, auto flip 180°
MANUAL PAN SPEED	Up to 200°/s
MANUAL TILT SPEED	Up to 120°/s
PRESETS & PRESET SPEED	250 & Pan: Up to 200°/s; Tilt: Up to 200°/s
PRESET ACCURACY	0.225°
ALARM INPUT / OUTPUT	7 / 2
PRIVACY MASKS	24
TOURS	8
AUTO RESUME AFTER POWER FAILURE	Yes

Video Streaming	Primary Stream: 1080p @ 30 fps/720p @ 60 fps Second Stream: D1/CIF @ 30 fps Third Stream: 720p/D1/CIF @ 30 fps
Event	Motion Detect; Video Tamper; Audio Detect; No SD card; SD card error; SD card capacity warning; Network disconnection; IP address conflict; Illegal access
Audio Stream	Full-duplex, Simplex
Corridor Mode	Support
Ethernet	RJ-45 (10/100Base-T)
Protocol	IPv4/v6, TCP/IP, UDP, RTP, RTSP, RTCP, HTTP, HTTPS, SSL, ICMP,FTP, SMTP, DHCP, PPPoE, UPnP, IGMP, SNMP v2c/v3, Bonjour, DNS, DDNS, QoS, NTP, NFS
Compatibility	ONVIF Profile S
Max. User Access	20 users
Memory Slot	128 GB microSDHC card Class 10
Power Supply	24 V AC $\pm$ 25%, 3A and High PoE (Class 5)
Ingress Protection	IP67
Vandal Resistance	IK10
Working Environment	Temperature -40°C to 70°C & Less than 90%, non-condensing Humidity
EMISSIONS	EN55022, FCC Part 15 subpart B AS/NZS CISPR 22:2009+ A1 (2010)
IMMUNITY	EN50130-4
SAFETY	UL listed , CE (EN 60950-1)
ROHS	EN50581

## Digital Video Recorder

### Main Features

- Up to 4/8/16 cameras with 1080p realtime preview
- >H.264 dual-stream video compression
- >HCVR5404/5408/5416L: All channel 720P
- >HDMI / VGA/BNC simultaneous video output
- >4/8 channel synchronous realtime playback, GRID interface & smart search
- >3D intelligent positioning with Dahua PTZ dome camera
- >Support 4 SATA HDD up to 16TB, 1 eSATA up to 16TB,3 USB2.0
- >Multiple network monitoring: Web viewer, CMS(DSS/PSS) & DMS

### Functions & Performances

<b>Main Processor</b>	Embedded processor
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<b>Operating System</b>	Embedded LINUX
<b>Video</b>	
Input	16 channel, BNC
Standard	NTSC(525Line, 60f/s), PAL(625Line, 50f/s)
<b>Audio</b>	
Input	4 channel, BNC
Output	1 channel, BNC
Two-way Talk	Reuse audio input/output channel 1
<b>Display</b>	
Interface	1 HDMI, 1 VGA, 1BNC
Resolution	1920×1080, 1280×1024, 1280×720, 1024×768, 800×600
Display Split	1/4/8/9/16
Privacy Masking	4 rectangular zones (each camera)
OSD	Camera title, Time, Video loss, Camera lock, Motion detection, Recording
<b>Recording</b>	
Video/Audio Compression	H.264 / G.711
Resolution	720P(1280×720/1280×600)/960H(960×576/960×480)/D1/4CIF(704×576/704×480) / CIF(352×288/352×240) / QCIF(176×144/176×120)
Record Rate Main Stream:	720P/960H/D1/HD1/2CIF/CIF(1~25/30fps)
Extra Stream	CIF/QCIF(1~25/30fps)
Bit Rate	48~6144Kb/s
Record Mode	Manual, Schedule(Regular(Continuous), MD), Stop
Record Interval	1~120 min (default: 60 min), Pre-record: 1~30 sec, Post-record: 10~300 sec

Video Detection&Alarm	
Trigger Events	Recording, PTZ, Tour, Video Push, Email, FTP, Spot, Buzzer & Screen tips
Video Detection	Motion Detection, MD Zones: 396(22×18), Video Loss & Camera Blank
Alarm Input	16 channel
Alarm Output	6 channel
<b>Playback &amp; Backup</b>	
Sync Playback	1/4/8/16
Search Mode	Time/Date, MD & Exact search (accurate to second)
Playback Functions	Play, Pause, Stop, Rewind, Fast play, Slow play, Next file, Previous file, Next camera, Previous camera, Full screen, Repeat, Shuffle, Backup selection, Digital zoom
Backup Mode	USB Device / Network
<b>Network</b>	
Ethernet	RJ-45 port (10/100M/1000M)
Network Functions	HTTP, IPv4/IPv6, TCP/IP, UPNP, RTSP, UDP, SMTP, NTP, DHCP, DNS, PPPOE, DDNS, FTP, IP Filter
Max. User Access	128 users
Smart Phone	iPhone, iPad, Android, Windows Phone
<b>Storage</b>	
Internal HDD	4 SATA port, up to 16TB
External HDD	1 eSATA port (Max 4 SATA HDDs), up to 16TB
<b>Auxiliary Interface</b>	
USB Interface	3 ports (2 Rear), USB2.0



RS232	1 port, For PC communication & Keyboard
RS485	1 port, For PTZ control
General	
Power Supply	AC 100~240 V, 50/60 Hz
Power Consumption	40W
Working Environment	-10 ~+55°C / 10~90%RH / 86~106kpa

### **LED Screen**

Screen size 42" LED Backlighting

- Full HD 1080p Resolution
- ENERGY STAR® Qualified
- Picture Wizard II (Easy Picture Calibration)

### **Warranty**

All component, system software, parts and assemblies supplied by the contractor shall be guaranteed against defects in materials and workmanship for one year from the acceptance date. Labour to troubleshoot, repair, reprogram, or replace system components shall be furnished by the contractor at no charge to the owner during the warranty period. All corrective software modifications made during warranty service periods shall be updated on all user documentation and on user and manufacturer archived software disks.

## **FACTORY ACCEPTANCE TEST FOR ALL BOUGHT OUT ITEMS**

Client, his consultant and their authorized representative shall have the right to inspect and test or get inspected and tested the goods at the works of the Seller or its sub suppliers any time during manufacture and prior to dispatch and to inspect within a reasonable time after arrival of goods at the ultimate destination and during and after erection, testing and commissioning. The goods shall not be deemed accepted until after the said inspection, testing and commissioning and signing of the Acceptance Certificate. Failure to make any inspection of or payment for or acceptance of goods shall in no way impair client right to reject non-conforming goods or to avail itself of any other remedies to which client may be entitled, notwithstanding client knowledge of the nonconformity, its substantiality in the case of its discovery. In the event of failure of Seller to remove the rejected goods within the time allowed, client shall have the right to dispose of the same at the seller's risk and cost. During the time the rejected goods lie with client awaiting removal by the seller, they will so lie at the seller's risk. All goods rejected by client after receipt at the destination shall be removed by the seller within a reasonable time allowed by client, not exceeding 30 (thirty) days at seller's expense and risk.

The Seller will permit client Inspectors, Consultant and their authorized representatives free access during normal working hours to his works, godown, storage or loading spot etc. and will give them all necessary assistance to perform their task including free use of all accessories, testing and control instruments. The seller shall ensure that the same facilities are granted by his sub-suppliers.

Unless specifically stated to the contrary in the order, all expenses relevant to the preparation and performance of testing, inspection and preparation of any test reports or certificates shall be borne by the Seller EXCEPT for the salaries, fees, traveling, lodging and boarding expense of the Consultant's / client's representatives. However, if the visit duration of UCJ / client's representatives is extended for the reasons not attributable to UCJ / client, the cost of the extended period of visit shall be borne by the seller.

The sellers shall carry out tests related to performance tests as described in the specifications and specified in the order. All such performance tests shall be at supplier costs. Supplier shall also provide all the tests certificates and documents as demanded by the Inspector for his satisfaction that the order has been executed as per PO specifications. All such certificates, documents in original shall be submitted to the Client before dispatch of material. The goods shall be dispatched from suppliers shop only after written confirmation from clients / or its authorized representative.

**The contractor shall consider all cost towards inspection of goods by consultant / EIC at factory / manufacturers works prior to shipping for 2 persons. (travelling (Air / 1<sup>st</sup> AC) / stay etc complete)**

## **1. MODE OF PAYMENT**

The following payment will be made after deducting retention money.

Payment for various item shall be made as follows:

- |    |  |   |
|----|--|---|
| 1. | A.) Light, Fan Plug, Bell, Etc.(Part payment of plug on Board will not be considered | 20 % when conduits are laid in slab & Boxes are fixed                       |
|    |  | 20 % when conduits are laid in wall & boxes are fixed.                      |
|    | B.) Telephone, TV ,Computer  | 40 % when wires are drawn in above conduits.                                |
|    |  | 10 % when switches are fitted and testing is done.                          |
|    |  | 10 % after completion of the job.   |
| 2. | Boards , Panels, Circuit D.B. s  | 70 % for materials at site .  |
|    |  | 20 % for erection.  |
|    |  | 10 % after testing and commissioning  |
| 3. | Bus ducts, cable trays etc.  | 70 % for materials at site .  |
|    |  | 10 % of labour cost after laying.   |
|    |  | 20 % after testing and commissioning.                                       |
| 4. | Cables   | 80 % of labour cost after laying.   |
|    |  | 20 % after testing and commissioning.                                       |
|    |  | .   |
| 5. | Earthing   | 70 % for materials at site .  |
|    |  | 10 % of labour cost after earthing is complete.                             |
|    |  | 20 % after testing and commissioning.                                       |
| 6. | Fixing the fittings, Fans & street light poles                                       | 80 % of labour cost after fixing the fittings, fans and erecting the poles. |

20 % after testing and commissioning.

## **2. SAFETY CODE**

- 6.0 Suitable scaffolds shall be provided for workmen for all work that cannot safely be done from the ground, or from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used an extra labour shall be engaged for holding the ladder and if the ladder is used for carrying materials as well suitable footholds and handhold shall be provided on the Ladder and the ladder shall be given an inclination not steeper than 1/4 to 1 (1/4 horizontal and 1 vertical).
- 6.1 Safe means of access shall be provided to all working platform and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 meters in length. Width between side rails in a rung ladder shall in no case be less than 30 cm. for ladders upto and including 3 meters in length. For longer ladders this width shall be increased atleast 6 mm. for each additional 30 cm. of length. Uniform step spacing shall not exceed 30 cm.
- Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites shall so stacked or placed as to cause danger or inconvenience to any person or the public. The contractor shall provide all necessary fencing and lightest to protect public from accidents and shall be bound to bear expenses of defense of every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and costs which may be awarded in any such suit, action or proceedings to any such person or which may with the consent of the contractor be paid to compromise any claim by any such person.
- 6.2 Demolition : Before any demolition work is commenced and also during the process of the work:-
- a) All roads and open areas adjacent to the work site shall either be closed or suitably protected.
  - b) No electric cable or apparatus, which is liable to be a source of danger over a cable or apparatus used by operator, shall remain electrically charged.
  - c) All practical steps shall be taken to prevent danger to persons employed, from risk or fire or explosion or flooding. No floor, roof, or other part of a building shall be so overloaded with debris or any materials as to render it unsafe.
- 6.3 All necessary personal safety equipment as considered adequate by the Engineer-in-charge shall be available for use of persons employed on the site and maintained in a condition suitable for immediate use; and the contractor shall take adequate steps to ensure proper use of equipment by those concerned.
- a) Those engaged in handling any material, which is injurious to eyes, shall be provided with protective goggles.
  - b) Those engaged in welding works shall be provided with welder's protective-shields.

- c) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
  - d) The contractor shall not employ male or female labour below the age of 18 years.
- 6.4 When work is done near any place where there is risk of drowning, all necessary equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.
- 6.5 Use of hoisting machines and tackle including their attachments, anchorage and supports shall confirm to the following:
  - a)
    - i. These shall be of good mechanical construction, sound material and adequate strength and free from patent defects and shall be kept in good repair and in good working order.
    - ii. Every rope used in hoisting or lowering materials or as a means suspension shall be of durable quality and adequate strength, and free from patent defects.
  - b) Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years shall be in charge of any hoisting machine including any scaffold winch or give signals to operator.
  - c) In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or lowering or as means of suspension, safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with safe working load. In case of a hoisting machine having a variable safe working load, each safe working load and the conditions under which it is applicable shall be clearly indicated. No part of any machine or of any gear referred to above in this paragraph shall be loaded beyond safe working load except for the purpose of testing.
  - d) In case of a departmental machine, safe working load shall be notified by the Engineer-in-charge. As regards contractor's machines the contractor shall notify safe working load of each machine to the Engineer-in-charge whenever he brings it to site work and get it verified by the Engineer-in-charge.
- 6.6 Motors gearing, transmission, electric wiring and other dangerous parts of hoisting appliances shall be provided with efficient safeguards; hoisting appliances shall be provided with such means as will reduce to the minimum risk of accidental descent of load adequate precautions shall be taken to reduce to the minimum risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations, which are already energized, insulating mats working apparel such as gloves, sleeves and boots as may be necessary, shall be provided. Workers shall not wear any rings, watches and carry keys or other materials, which are good conductors of electricity.
- 6.7 All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in a safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities shall be provided at or near places of work.

- 6.8 These safety provisions shall be brought to the notice of all concerned by display on a notice board at a prominent place at the work spot. Persons responsible for ensuring compliance with the safety code shall be named therein by the contractor.
- 6.9 To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the contractor shall be open to inspection by the Engineer-in-charge or his representatives and the Inspecting Officers.
- 6.10 Notwithstanding the above conditions 1 to 14 the contractor is not exempted from the operation of any other Act or Rule in force.
- 6.11 If the height at which the contractor is working is more than 12 feet then the staff should wear safety helmet and tie himself with safety belt, client/ architect have all right to ask the contractor to stop work if the safety condition are not fulfilled.

### **3. TESTING OF INSTALLATION**

#### **7.0 SCOPE**

This chapter describes the details of tests to be conducted in the completed internal electrical installations, before commissioning.

#### **7.1 GENERAL**

##### **7.1.1 Tests**

On completion of installation, the following tests shall be carried out:-

1. Insulation resistance test.
2. Polarity test of switch.
3. Earth continuity test.
4. Earth electrode resistance test.

##### **7.1.2 Witnessing of tests**

Testing shall be carried out for the completed installations, in the presence of and to the satisfaction of the Engineer-in-charge by the contractor. All test results shall be recorded and submitted to the Department.

##### **7.1.3 Test instruments**

All necessary test instruments for the tests shall be arranged by the contractor if so required by the Engineer-in-charge.

#### **7.2 INSULATION RESISTANCE**

- 7.2.1 The insulation resistance shall be measured by applying between earth and the whole system of conductors, or any section thereof with all fuses in place, and all switches closed, and except in earthed concentric wiring, all lamps in position, or both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure, provided it need not exceed 500 volts for medium voltage circuits. Where the supply is derived from a three wire D.C. or a polyphase A.C. system, the neutral pole of which is connected to earth either directly or through added resistance, the working pressure shall be deemed to be that which is maintained between the phase conductor and the neutral.
- 7.2.2 The insulation resistance shall also be measured between all the conductors connected to one pole, or phase conductor of the supply, and all the conductors connected to the neutral, or to the other pole, or phase conductors of the supply with all the lamps in position and switches

in "off" position, and its value shall be not less than that specified in sub-clause 16.2.3.

- 7.2.3 The insulation resistance in mega ohms measured as above shall not be less than 12.5 mega ohms for the wiring with PYC insulated cables, subject to a minimum of 1 mega ohm.
- 7.2.4 Where a whole installation is being tested, a lower value than that given by the formula, subject to a minimum of 1 mega ohm, is acceptable.
- 7.2.5 A preliminary and similar test may be made before the lamps etc. are installed, and in this event the insulation resistance to earth should not be less than 25 mega ohms for the wiring with PYC insulated cables, subject to a minimum of 2 mega ohms.
- 7.2.6 The term "outlet" includes every point along with every switch, except that a switch combined with a socket outlet, appliance or lighting fitting is regarded as one outlet.
- 7.2.7 Control rheostats, heating and power appliances and electric signs may, if required, be disconnected from the circuit during the test, but in that event the insulation resistance between the case or frame work, and all live parts of each rheostat, appliance and sign, shall be not less than that specified in the relevant Indian Standard Specifications, or where there is no such Specification, shall be not less than one mega ohm.

### **7.3 POLARITY TEST OF SWITCH**

- 7.3.1 In a two wire installation, a test shall be made to verify that all the switches in every circuit have been fitted in the same conductor throughout, and such conductor shall be labeled or marked for connection to the phase conductor, or to the non-earthed conductors of the supply.
- 7.3.2 In a three wire or a four wire installation, a test shall be made to verify that every non-linked single pole switch is fitted in a conductor which is labeled, or marked for connection to one of the phase conductors of the supply.
- 7.3.3 The installation shall be connected to the supply for testing. The terminals of all switches shall be tested by a test lamp, one lead of which is connected to the earth. Glowing of test lamp to its full brilliance, when the switch is in "on" position irrespective of appliance in position or not, shall indicate that the switch is connected to the right polarity.

### **7.4 TESTING OF EARTH CONTINUITY PATH**

The earth continuity conductor, including metal conduits and metallic envelopes of cables in all cases, shall be tested for electric continuity. The electrical resistance of the same along with the earthing lead, but excluding any added resistance, or earth leakage circuit breaker, measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

### **7.5 MEASUREMENT OF EARTH ELECTRODE RESISTANCE**

- 7.5.1 Two auxiliary earth electrode, besides the test electrode, are placed at suitable distance from the test electrode (see figure 14). A measure current is passed between the electrode 'A' to be tested and an auxiliary current electrode 'C', and the potential difference between the electrode 'A' and auxiliary potential 'B' is measured. The resistance of the test electrode 'A' is then given by:

$$R = V/I$$

Where,

- |   |   |   |
|---|---|---|
| R | - | Resistance of the test electrode in ohms, |
| V | - | Reading of the voltmeter in volts.        |
| I | - | Reading of the ammeter in amps.           |

- 7.5.2 (i) Stray currents flowing in the soil may produce serious errors in the measurement of earth resistance. To eliminate this, hand driven generator is used.  
(ii) If the frequency of the supply of hand driven generator coincides with the frequency of stray current, there will be wandering of instrument pointer. An increase or decrease of generator speed will cause this to disappear.
- 7.5.3. At the time of test, the test electrode shall be separated from the earthing system.
- 7.5.4 The auxiliary electrodes shall be of 13 mm diameter mild steel rod driven upto 1 m into the ground.
- 7.5.5 All the three electrodes shall be so placed that they are independent of the resistance area of each other. If the test electrode is in the form of a rod, pipe or plate, the auxiliary current electrode 'c' shall be placed at least 30 m away from it, and the auxiliary potential electrode 'B' shall be placed mid-way between them.
- 7.5.6 Unless three consecutive readings of test electrode resistance agree, the test shall be repeated by increasing the distance between electrodes A and C upto 50 m, and each time placing the electrode B midway between them.
- 7.5.7 On these principles, "Megger Earth Tester", containing a direct reading ohm-meter, a hand driven generator and auxiliary electrodes are manufactured for direct reading of earth resistance of electrodes.

## 7.6 TEST CERTIFICATE

On completion of an electrical installation (or an extension to an installation), a certificate shall be furnished by the contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as given in Appendix 'E' in addition to the test certificate required by the local Electric Supply Authorities.

## 4. FORM OF COMPLETION CERTIFICATE

I/We certify that the installation detailed below has been installed by me/us and tested and that to the best of my/our knowledge and belief it complies with Indian Electricity Rules, 1956, as well as the C.P.W.D. General Specifications of Electrical Works 2004.

Electrical installation at \_\_\_\_\_

Voltage and system of supply \_\_\_\_\_

1. Particulars of work:

a) Internal Electrical Installation

	No.	Total Load:	Type or system of wiring
i)	Light point		
ii)	Fan point		
iii)	Plug point		
a)	3 pin 5 Amp.		



	b)	3 pin 15 Amp.		
	b)	others		
		Description	Hp/KW	Type of Starting
a)	Motors:	i)		
		ii)		
		iii)		
b)	Other plants:			
c)	If the work involves installation of overhead line and/or underground cable.			
d)	i)	Type & description of overhead line.		
	ii)	Total length and no. of spans.		
	iii)	No. of street lights and its description.		
b)	i)	Total length of underground cable & its size.		
	ii)	No. of joints:	End joint:	
			Tee joint:	
			St. through joint:	
II)	Earthing			
	i)	Description if earthing electrode.		
	ii)	No. of each electrodes.		
	iii)	Size of main earth lead.		
III)	Test results:			
	a)	Insulation resistance		
	i)	Insulation resistance of the whole system of		
		Conductors to earth		Mega ohms
	ii)	Insulation between the phase conductor and neutral		
		Between Phase R and neutral	-	Mega ohms
		Between Phase Y and neutral	-	Mega ohms
		Between Phase B and neutral	-	Mega ohms

iii) Insulation resistance between the phase conductors

in case of polyphase supply.

Between Phase R and Phase Y - - Mega ohms

Between Phase Y and Phase B - - Mega ohms

Between Phase B and Phase R - - Mega ohms

b) Polarity test

Polarity of won linked single pole branch switches.

c) Earth continuity test

Maximum resistance between any point in the earth continuity conductor including metal conduits and main earthing .....Ohms

d) Earth electrode resistance

Resistance of each earth electrode

i) - - - - Ohms

ii) - - - - Ohms

iii) - - - - Ohms

iv) - - - - Ohms

e) Lighting protective system

Resistance of the whole of lighting protective system to earth before any bonding os effected with earth electrode and metal in/on the structure.....

Signature and name of

Junior Engineer (E) / AE (E)

Signature and name of the

Contractor

## **5. SPECIAL CONDITIONS OF CONTRACT**

### **GENERAL**

The complete Electrical Installation shall be carried out in strict accordance with the regulations of the electricity supply authority, Institution of Electrical Engineers, ISI Standards, fire Insurance Company insuring the building and national code of practice.

The standard conditions of contract are meant to amplify the specifications, schedule of quantities and drawings and the more stringent of the above shall apply should there be any ambiguity or inconsistency. The contractor should report the same to the Architect/Consultant and obtain clarification before submitting his tender.

All Equipments, cables etc. shall be adequately rated to suit the climatic conditions experienced in this country.

Clause in this specification shall apply equally throughout.

## **ORDERING**

As soon as possible after the contractor receives written notification of the acceptance of his tender he shall order all the materials and equipment required to complete the contract. He shall submit to the consultant the detailed summary of all the orders placed, providing the details about the name of Supplier/Vendor, make of equipment, date of order and forecast of delivery date at site.

## **STANDARD OF MATERIALS**

When the material and equipment is specifically described named in the specifications, it is so named or described for the purpose of establishing a standard of materials and workmanship to which the contractor must adhere. The Contractor must quote with the material as listed in the make of materials list attached later in the document. The Contractor may submit with his tender a list indicating any alternative make of material that he proposes to install. Before installing such a make the contractor shall take permission from the consultant. All materials condemned by the consultant as not approved for use are to be removed from the premises and suitable material shall be delivered and installed in their place at the expense of the Contractor. If alternatives are not offered during the tender stage then the contractor will be deemed to have submitted his tender based on all materials and equipment specified or shown on the drawings and therefore no alternative manufacturer or supplier of such material and equipment specified or shown will be considered after the contract is awarded if however the material or equipment specified or shown on the drawing is not available due to any genuine reason. The contractor shall prior to order get the written approval of the consultant for the particular material/equipment.

The Contractor shall be responsible for the safe custody of all material and shall insure them against theft damage by fire earthquake etc. A list of materials and equipment together with a sample of each shall be submitted to the consultant as directed by him within 30 days of the award of the contract.

All materials required for the works shall be new and the best of their respective kinds and shall be of uniform pattern. All materials shall be suitable for use in temperatures of 50°C with comparative humidity.

The protective finishes detailed as follows must be provided on all materials and apparatus used on this contract to ensure that no deterioration is caused by the local climatic conditions.

All materials shall be inspected by the Contractor to ensure that finishes are in accordance with this specifications.

- A. The interior fittings in all distribution boards and control units shall be properly painted.
- B. All holes in distribution boards and similar equipment shall be blanked off to protect from dust and vermin where ventilation is necessary holes are to be neatly covered.

- C. All cable entry holes on switchgears and similar equipment shall be fitted with PVC/Rubber Bushings.

The material supplied by the client or other agencies shall be properly inspected by the contractor before accepting so that any damage thereafter is the liability of the contractor.

### **WORKMANSHIP**

The workmanship and method of installation shall conform to the best standard practice. All work shall be performed by skilled tradesman to the satisfaction of the Consultant/Architects. Helpers shall have qualified supervision.

Any work that in the opinion of the consultant does not confirm to the best standard practice shall be removed and reinstated at the Contractor's expense permits certificates and licenses must be held by all tradesman for the type of work in which they are involved where such permits certificates and licenses exist under government legislation.

### **PROCEDURE**

Throughout all stages of work the contractor shall maintain a close liaison with the consultant and with all other contractors involved in the work.

Site work shall commence immediately with the start of building work and shall proceed expeditiously in harmony with the building work so as not to delay the latter in any way. All plant to be supplied and work to be done under this specification shall be manufactured and executed in the manner set out in this specification or where not so set out the reasonable satisfaction of the consultant and all the contractors works on site shall be carried out in accordance with the such reasonable directions as the consultant may give.

The contractor in the interest of the work shall furnish a bar chart based on the chart furnished by the civil contractor stating all the starting and completion dates clearly in the format that consultant approves or in the format of the civil bar chart.

The contractor shall also furnish the time chart showing the material procurement marking the ordering date and the delivery date of the material on site. In case of delay in delivery of material at site the contractor may be asked to furnish proper reason for the delay.

The contractor if at all feels necessary shall attach the drawing schedule requirements with the tender documents.

### **PERMITS**

The Contractor shall obtain all necessary permits prior to work commencement for the excavation of cable trenches etc. in the areas where it is suspected that existing services are present the contractor shall carry out excavation work by hand. He shall also obtain the necessary permits from the respective authorities prior to working on major items of the switchgear. All application permits shall be made in writing with a copy to the consultant.

### **TEMPORARY AND TRIAL USAGE**

It shall be understood and agreed that temporary and trial usage by the employer of any device, machinery, apparatus, equipment or any other work or materials supplied under this

contract before final completion and written acceptance of the item by the employer it is further understood and agreed that the employer shall have privilege of such temporary and trial usage as soon as the contractor shall claim that the said work is completed and in accordance with the drawings and specifications and to the manufacturer's instructions and for such reasonable length of time as the consultant shall deem suitable for making a complete and thorough test of the apparatus or system under test.

No claim for the damage will be made by the contractor for the injury to or breaking of any parts of the works which have been placed under test whether this damage has been caused by weakness, flaw or inaccuracy of structural parts or by defective material or workmanship of any kind whatsoever.

## **CLEANING**

Before operating any of the systems the contractor shall clean out all rubbish and dirt upon completion of the contract the contractor shall ensure that all items of plant are left in a clean and tidy condition.

## **SETTING OUT OF WORKS**

The specification and schedule of rates shall be considered as part of this contract and any work materials shown on the schedule and not called for in the specifications or vice-versa shall be executed as if specifically called for in both.

The Contractor at his own expense shall set out all his hardworks and take all his measurements and dimensions required for the erection of his materials on site making and modifications in detail to the consultant before proceeding and must allow in his tender for all such modifications and for the provision of any sketches or drawings related there to.

The position of all DB's Panels, Cable routes, fixtures, Wiring Systems, Service Outlets and control Switches shown on the drawings are to be assumed as being correct for the purpose of tendering final positions of these must be agreed with the consultant before installation.

The data given here in and on the drawings is as exact as could be secured but its complete accuracy is not guaranteed. The drawings are for the guidance of the contractor, exact locations, distances and levels will be governed by the site conditions.

## **AS BUILT DRAWINGS / SHOP DRAWINGS**

Contractor shall make all necessary shop drawings indicating conduit / cable tray routes / qtys / sizes; cable schedule, circuiting details etc complete before starting the works and get approval of consultant / EIC.

At the completion of the works and before issue of the certificate of virtual completion, the contractor shall submit to the consultant 4 sets (HARD AND SOFT FORMAT) of layout drawings drawn at approved scale indicating the complete wiring system as installed. These drawings must provide the following minimum information :

- A. Run and size of conduits, inspections, junction and pull boxes.

- B. Size of conductors in the conduits.
- C. Location and rating of sockets and switches controlling the light and power outlets.
- D. Location and details of distribution boards, mains, switches, switchgear, main panel and other particulars.
- E. A complete wiring diagram, as installed and schematic drawings showing all connections in the complete electrical system.
- F. Location of outlets, junction boxes, sizes of various conduits for telephones.
- G. Location of all earthing stations, routes, sizes of all earthing conductors, manholes, layout of earth link strips, etc.
- H. Layout and particulars of all cables.
- I. Necessary drawings with prints for approvals from local / govt. authorities.

Above indicates the general requirement. However, contractor must include all information desired by the client and Architects/Consultants in the final as built documents. Guidance for the preparation of as built document shall be had from the consultant.

#### **MANUFACTURER'S INSTRUCTIONS**

Where manufacturer's have furnished specific instructions, relating to the materials used in this job for covering, paints etc which are not specifically mentioned in this documents, manufacturer's instructions shall be followed.

#### **GUARANTEE**

At the close of the work and before issue of the final certificate of virtual completion. The contractor shall furnish written guarantee indemnifying the Architect/Consultant against defective materials and workmanship for a period as mentioned in the schedule of fiscal aspects. The contractor shall hold himself fully responsible for reinstallation or replacement, free of cost to client the following :

- A. Any defective work or material supplied by the Contractor.
- B. Any material or equipment damage or destroyed as a result of defective workmanship by the Contractor.

#### **SAFETY OF MATERIAL**

The Contractor shall provide proper and adequate storage facilities to protect all materials and equipment, including those issued by the owner against damage from any cause whatsoever.

#### **COMPLETION CERTIFICATE**

On completion of the Electrical Installation a certificate shall be furnished by the Contractor counter signed by the licensed supervisor, under whose direct supervision the installation was carried out. The certificate shall be in the prescribed form as required by the local authority.

The contractor shall be responsible for getting the Electrical installation inspected and approved by the local authorities connected.

#### **ENGINEER AND FOREMAN**

The Contractor shall employ a competent fully licensed, qualified full time electrical Engineer and foreman to direct the work of Electrical Installation in accordance with drawings and specification. The foreman shall be available full time on site to receive instruction from Architect/Consultant or his nominee in the day to day activities throughout the duration of the contract the foreman shall correlate the progress of work in connection with all relevant requirements of the supply authorities.

#### **LIASIONING WITH LOCAL SUPPLY COMPANY**

The contractor shall be responsible for all the liasioning work with the supply company. However, all the technical assistance required for the same may be furnished by the consultant. The contractor has to fill the necessary forms and submit test reports so as to ensure that the supply is available intime. The contractor shall prepare necessary drawings for the approval of the concern government departments and has to get the necessary permissions for supply and D.G. sets etc.

#### **SPECIFICATIONS AND SCHEDULE**

The specification and schedule of rates shall be considered as part of this contract and any work or materials shown on schedule and not called for in this specifications or vice versa shall be executed as if specially called for in both. The drawings indicate the extent and general arrangement of the fixtures, controlling switches, wiring system etc. and are essentially diagrammatic. The drawing indicates the points of termination of conduit runs and are suggestive of the routes to be followed.

#### **9.17 SUPERVISION**

Supervision shall be by a competent person experienced in the nature of the work to be undertaken. This person shall be available on site for the full period of works. The Engineer may demand at any time during the contract the replacement of the contractors personnel who fails to satisfy this requirement of competent.

#### **9.18 TOOLS AND EQUIPMENTS**

The Contractor shall provide all necessary Jointing Equipment, tools, Portable power tools, test equipment etc which will be required to carry out the Electrical work. All the zarri work, except in unavoidable circumstances, shall be done with a zarri cutter.

This includes all heavy duty equipments such as Cranes, lorries, etc. for site delivery and fixing.

The contractor must have minimum following instruments :

- 1) 1000 / 500 V Meggar.

- 2) Clip on meter.
- 3) Earth tester.
- 4) Lux meter.
- 5) Zarri Cutter.
- 6) Multi Meter.
- 7) Drill machine upto 25 mm dia.
- 8) Ladders suitable for 30 ft. and above.
- 9) All safety equipments like helmet, safety rope etc.
- 10) Complete set of spanners, screw drivers etc.

### **SITE STORAGE**

The contractor shall be responsible for the safe storage of materials on site. This includes ensuring that all equipment is handed to the client in sound undamaged order.

The Contractor shall be responsible for safe storage of materials on site, and liable for their replacement. The Contractor would be required to maintain a watch man on site and this shall remain Contractors Choice.

### **SPARES**

The Contractor shall prepare a schedule of manufactures recommended for spares for one year maintenance.

### **OPERATING AND MAINTENANCE MANUALS**

The Contractor shall furnish two sets of operating manuals which shall include services maintenance instructions and circuit diagram for each item of equipment.

### **SITE CONDITIONS**

The Contractor shall take all necessary action to acquaint himself fully with site conditions. Any conditions at tendering stage will not be accepted.

After the contract is awarded the Contractor shall acquaint himself fully with existing services and obtain all necessary information to avoid any damage to the services during excavation etc.

### **LABELS AND NOTICES**

On all switchgear identification name plates shall be fitted these will identify the substation and/ or out going ways. The labels shall be made on indestructible non deteriorating material with lettering engraved in black or white background except where otherwise specified. Fixing shall be by means of rivets or screws in addition to any adhesive. all labels shall be English/Hindi /mother language as directed by the Consultant. All pillars and mini feeder pillars in addition to identification labels shall have each way identified by a label to the same



specification fitted in the feeder pillar. An indestructible “Danger 415 volts” plates should be fitted externally with a double flush danger signal. The letters to be 12 MM height minimum in signal red.

In addition each distribution board shall have a typed chart detailing particulars of the circuits controlled which shall be fixed to the inside of the door. The details shall include the circuit load, description, the type and rating of the protection device, and the cable size. A sheet of transparent rigid plastic shall be used to completely cover the chart to prevent damage.

### **PACKING AND RECEIPT OF MATERIAL**

The contractor shall take every possible measure including appropriately strong packing, proper supervision of loading and off loading and proper transportation by the most suitable route to ensure the safe delivery to site of plant and equipment. The Contractor shall keep at site up-to-date record of all materials received and fully annotated with details of the carrier and condition of equipment on arrival.

### **RECORDING OF WORK**

The contractor shall keep a diary and a set of drawing recording the progress of the works and details of all instruction received. These shall be available for the consultant upon request. The contractor’s site representative will submit a written report every two weeks outlining the progress of the work including work completed to date. The review of the work completed and the barchart submitted shall be done weekly and the difference in the two shall be submitted to be Consultant specifying the reasons for the difference.

On completion of work the contractor has to submit detailed reconciliation statement of all electrical materials. The loss of material shall be recovered at prevailing market rate for the material supplied by the client or other agency.

The contractor shall take permission from the employer before he takes all the unused material from the site on completion of work.

### **MARKING OUT**

Routes and positions of systems, and positions of all electrical equipment shall be marked out by the contractor and approved by the Engineer before such items are installed.

These items shall be installed in the positions shown on the drawings, but reasonable variations may be made on site with the consent of Engineer.

### **FIXING**

Screws fixing brick concrete or similar materials which necessitates plugging shall be made using steel woodscrews into plugs in rotary drilled holes.

Items of switch fuse gear, cable racks and trays etc. shall be fixed using corrosion resistant steel bolts fitted with expanding collars, e.g. ‘Anchor Fastner’ set into rotary drilled holes of the correct size all such bolts shall be provided with one number wide flange washer and one heavy spring washer.

### **CONTRACTORS RATES**

The Contractors rates must be included the cost of transportation of materials to the site. All taxes such as sales tax, Excise and Octroi etc. and the fixing or placing in position for which the items of work is intended to be operated.

The contractor shall quote in English, in words and figures, the amount tendered by him in the Form of Schedule of rates forming part of the tender document in such a way that interpolation is not possible. The amount for each item shall be worked out and entered and requisite totals given for all items. The tendered amount for the work shall be entered in the Tender and duly signed by the tenderer.

The contractor shall include in rates quoted all expenses (travelling / lodging / boarding) for inspection of goods at manufacturers workshop for two persons from client / consultants office.

If some discrepancies are found between the rates in words and figures or the amounts shown in the tender following procedure shall be followed :

- a) When there is difference between the rates in figures and words, the rate in words shall be taken as correct.
- b) When the rate quoted by the tenderer in figures and words, tallies, but the amount is incorrect, the rate quoted by the tenderer shall be taken as correct.
- c) When it is not possible to ascertain the correct rate, in the manner prescribed above, the rate as quoted in the words shall be adopted.

The contractor shall be liable to furnish the rate analysis for the rates quoted by them, if the architect/consultants find the rates to be non workable and ask for the analysis.

Labour rates not quoted for the items / or rates for extra items shall be decided 15 days prior to the start of the work as per the procedure listed in schedule of fiscal aspects. However, looking to the urgency of the work, if it is required to execute the item without the settlement of rate, then the rate for the same item will be finalised before making the payment.

## **ARCHITECTS / CONSULTANTS DECISIONS**

Matters not covered by the specification given in the contract as a whole shall be covered in the relevant ISI codes. If such codes for a particular subject have not been framed, the decision of the Architect/Consultant shall be final.

The work shall be carried out under the direction and supervision of the architect / consultant or their representative at site who shall guide the representative of contractor from time to time. On acceptance of the tender, the contractor shall intimate the name of the representative who would be supervising the construction and would be responsible for taking instructions for carrying out the work.

The Architects / consultants or their representative at site shall have access to the workshops of the successful tenderer so as to ensure themselves of the quality of material and workmanship.

The Architects / Consultants decision with regard to the quality of material and workmanship will be final and binding any material rejected by the Architect / Consultant shall be immediately removed by the contractor.

#### **DEFECTS LIABILITY PERIOD**

This period of 12 months, shall be in force from the date of “Virtual completion” and minor defects if any shall be corrected / rectified within 24 hours and major defects within 3 day which shall develop during this period. However, if the same are not rectified by the Contractor within the period mentioned above the clients with the concurrence of the Architects shall get the work done at the risk and the cost of the Contractor.

#### **OCCUPYING PART AREAS**

If the owner wants to occupy areas in part, the Contractor shall have to complete the work of these areas in consultation with the owner and handover the same to the employer without affecting any of the clause of the contract agreement.

#### **TEMPORARY WIRING**

Whenever any temporary wiring is done, it has to be done so that all precaution for safety are taken and temporary wiring shall be done so that, it is not hazardous to any body. Any accident due to temporary or permanent wiring or installation shall be the responsibility of the contractor and compensation shall be paid by the contractor to all the concerned.

#### **DEPOSITS AND PAYMENTS**

Earnest Money Deposit along with Security Deposit, as specified in schedule of fiscal aspects, has to be deposited with the employer in the form of draft in the name of the client, for the fulfillment of contract. Besides EMD and security deposit, retention money at the rate of 5% of the value of each bill but upto maximum of 2.5% of the contract value shall be deducted (cash) from each running bill.

On the Architects certificate of virtual completion of the works, the contractor would be paid 50% of the above mentioned amount and the remaining 50% will be released after the rectification of the defects, if any, pointed out during the defects liability period.

The contractor can have mobilization advance of 5% of the contract value against Bank Guarantee of the same amount till the defects liability period expires. The mobilization advance will be deducted at the rate of 20% (of the mobilization advance) from each running bill till total deductions are done. 75% of the value of the contract shall be raised by contractor in parts as running bills the value of which shall not be less than 15% of the contract value. 10% of the contract value shall be paid on commissioning of the installation. 10% of the contract value shall be paid on submission of as built drawings, test certificates and Final Bill.

For the material to be procured by the contractor please refer to the mode of payment sheet attached in the document.

# **MAKE OF MATERIALS**

<b>SR NO.</b>	<b>ITEM</b>	<b>APPROVED MAKE</b>
1	Capacitor (APP / Heavy duty type)	Havells, Epcos, Subodhn, Schneider, Matrix
2	Main Cables Upto 185 Sq.mm	XLPE armoured cable for 1.1 KV Polycab, Havells, RR Kabel
3	Main Cables Above 185 Sq.mm	XLPE armoured cable for 1.1 KV Polycab, Havells, RR Kabel
4	Glands	Double Compression type, Siemens type with rubber ring and double washers. – Comet, Standard Metal Industries
5	Distribution Boards	Legrand, L&T, Mitsubishi
6	MCBs	Legrand-DX3, L&T, Mitsubishi
7	MCCB	Legrand DPX/DPX <sup>3</sup> , L&T, Mitsubishi
8	ACB (Should have inbuilt power metering)	Legrand DMX <sup>3</sup> (MP4 release), L&T U POWER (With 2.0 release), Mitsubishi
9	Switches & Its accessories	MK Blenze, Legrand Myris, L&T Englaze,
10	Flexible Wires (FRLS)	Polycab, Havells, RR Kabel, Lapp Infra
11	Light Fixtures	Lighting Technology , Ensava, Crompton, Bajaj – Approved model only.
12	Chemical type earthing	Erico, Rapid, Doksun
13	Cat-6	Legrand, Finolex, D-link, Havells
14	Meter (Digital)	Elmeasure, Legrand, SEMS, Konzerv, HPL
15	PVC PIPE & Accessories	1.6-1.8 mm wall thickness ISI & FIA approved & manufactured

		from virgin material. Precision plastic industries, Polycab, Nihir, Vraj
16	Raceway	MK, Legrand
17	Lightening Arrestor	Rapid, Doksun
18	PA System / Music System	Stone Water, JBL, Australian Monitor, TOA, Tennoy
19	CCTV	Pelco, Honeywell, Bosch
20	Fire Alarm System	Honeywell-notifier, Siemens
21	Panel Vendor	CPRI approved min 1000Amp

Consultant/Client is ask to choose any make from above. Any other item which has not mention in make list, consultant/Engineer-in-charge is final authority to suggest.

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# GENERAL TECHNICAL SPECIFICATIONS

## 1.0 General : .

All measurements shall be made in the metric system. Different items of work shall be measured in accordance with the procedures set forth in the relevant sections read in conjunction with General Conditions of Contract. The same shall not however apply in the case of lump-sum items. All measurements and computations; unless otherwise indicated, shall be carried nearest to the following limits :

- (i) length and breadth... 10mm
- (ii) height, depth or thickness of earthwork,  
sub-base, bases, surfacing, and structural members...5mm
- (iii) areas,..... 0.01 Sq. Metre
- (iv) cubic contents ..... 0.01 cubic metre

in recording dimensions of work the sequence of length, width and height or depth or thickness shall be followed.

## 2.0 Measurement of lead for Materials :

Where lead is specified in the contract for construction materials, the same shall be measured as described hereunder.

Lead shall be measured over the shortest practicable route and not the one actually taken and the decision of the Engineer-in-charge in this regard shall be taken as final. Distance upto and including 100 meters shall be measured in units of 50 metres, exceeding 100 metres but not exceeding 1 KM. in units of 100 metres, and exceeding 1 km. in units of 500 metres. The half and greater than half of the units shall be reckoned as one and less than half of the units ignored. In this regard, the source of the material shall be divided into suitable blocks and for each block the distance from the centre of the block to the centre of placing pertaining to that block shall be taken as the lead distance.

## 3. Surface Regularity of Sub grade & Pavement Courses :

The surface regularity of completed sub-base courses and wearing surfaces in the longitudinal and transverse directions shall be within the tolerances indicated in Table below. The longitudinal profile shall be checked with a 3 metre long straight edge, at the middle of each traffic lane along a line parallel to the centre line of the road. The transverse profile shall be checked with a set of three camber boards at intervals of 10 metres.

**PERMITTED TOLERANCES OF SURFACE REGULARITY FOR PAVEMENT COURSES**

Sr.	Type of Construction	Longitudinal Profile with 3 metre straight edge					Cross Profile
		Maximum Permissible undulation in mm	Maximum number of undulation permitted in any 300m. length exceeding in mm.				Maximum permissible variation from specified profile camber template – mm
			18	12	10	6	
1	2	3	4	5	6	7	8
1	Earth Sub grade	36	30	-	-	-	15
2	Granular / lime / Cement Stabilised Sub – base.	23	-	30	-	-	12
3	Water Bound Macadam with nominal size metal (20-50) mm	18	-	-	30	-	8
4	Semi – Dense Carpet @	15	-	-	-	20	6

## Notes:-

1 . @ @ These are for machine laid surfaces. If laid manually, due to unavoidable reason, tolerance upto 50 percent above these values in this column may be permitted. However, this relaxation does not apply to the values of maximum undulation for longitudinal and cross profiles mentioned in columns 3 and 8 in the table.

2. Surface evenness requirements in respect of both the longitudinal and cross profiles should be simultaneously satisfied.

3. **Rectification** : Where the surface irregularity of subgrade and the various pavement courses fall outside the specified tolerances, the contractor shall be liable to rectify these in the manner described below and to the satisfaction of the Engineer-in-charge at his own cost.

(i) **Subgrade** : Where the surface is high, it shall be trimmed and suitably compacted. Where the same is low, the deficiency shall be corrected by adding fresh material. The degree of compaction and the type of material to be used shall conform to the specified requirements.

(ii) **Granular/Sub-base** : Same as at (i) above except that the degree of compaction and the type of material to be used shall conform to the specified requirements.

(iii) **Lime/Cement stabilized soil sub-base** : For Lime/Cement treated materials where the surface is high, the same shall be suitably trimmed while taking care that the material below is not disturbed due to this operation. However, where the surface is low, the same shall be corrected as described herein below.

For cement treated material, when the time elapsed between detection of irregularity and the time of mixing of the material, is less than 2 hours, the surface shall be scarified to a depth of 50 mm, supplemented with freshly mixed material as necessary and recomposed to the relevant specification. When this time is more than 2 hours, the full depth of the layer shall be removed from the pavement and replaced with fresh material, to specification. In either case, the area treated shall not be less than 5 metres long by 2 metres wide. This shall also apply to lime treated material except that the time criterion shall be 3 hours instead of 2 hours.

(iv) **Water Bound Macadam Base** : Where the surface is high or low, the top 75mm shall be scarified, reshaped with added material as necessary and recompacted. The area treated at a place shall not be less than 5 metres long and 2 metres wide.

(v) **Bituminous Constructions** : For bituminous constructions, other than wearing course, where the surface is low, the deficiency shall be corrected by adding fresh material and recompaction to specifications. Where this surface is high, the full depth of the layer shall be removed and replaced with fresh material and compacted to specifications. For wearing course, where the surface is high or low; the full depth of the layer shall be removed and replaced with fresh material and compacted to specifications in all cases where the removal and replacement of a bituminous layer is involved, the area treated shall not be less than 5 metre long and not less than 1 lane wide.

## 4. Quality Control Tests During Construction :

The materials supplied and the works carried out by the Contractor shall conform to the enclosed relevant specifications. For ensuring the requisite quality of construction, the materials and works shall be subjected to quality control test as described hereinafter, by the Engineer-in-charge. The testing frequencies set forth are the desirable minimum and the Engineer-in-charge shall have the full authority to carry out test as frequently as he may deem necessary to satisfy that the materials at work comply with the appropriate specifications. Test procedures for the various quality control tests are indicated in the respective sections of the specifications or for certain tests within this section. Where no specific testing procedure is mentioned, the test shall be carried out as per prevalent accepted engineering practice to the directions of the Engineer-in-charge.

## 5. Tests on Earthwork for Embankment Construction :

### 5.1 Borrow Material :

- (a) Sand Content (IS : 2720 Part IV)  
Two test per 8000 Cubic Metres of soil.
- (b) Plasticity Test (IS : 2720 Part-V)  
Each type to be tested. Two tests per 8000 Cubic Metres of soil.

- (c) Density test (IS : 2720 Part VII)  
Each soil type to be tested. Two tests per 8000 Cubic Metres of soil.
- (d) Moisture Content Test (IS : 2720 Part-II)  
One test for every 250 Cubic Metres of soil.

## 5.2 Compaction Control :

Control shall be exercised by taking at least one measurement of density for each 1000 square metres of compacted area, or closer as required to yield the minimum number of test results for evaluating day's work on statistical basis. The determination of density shall be in accordance with IS. : 2720 (Part XXVMI). Test locations shall be chosen only through random sampling techniques. Control shall not be based on the result of any one test but on the mean value of a set of 5-10 density determinations. The number of tests in one set of measurements shall be 5 as long as it is felt that sufficient control over borrow material and the method of compactions is being exercised-. If considerable variations are observed between individual density results, the minimum number of tests in one set of measurement shall be increase to 10.. The acceptance of work shall be subject to the condition that the mean dry density equals or exceeds the specified density and the standard deviation for any set of results is below 0.08 gm/cc. However for earthwork in shoulders and in top 500 mm portion of the embankment below the sub grade, at least one density measurement shall be taken for every 500 square meters of the compacted area provided further that the number of the tests in each set-of measurement shall be at least 10. In other respects, the control shall be similar to that described earlier.

## 6. Following materials shall conform to the Indian Standards shown against them :

- |  |           |
|--|-----------|
| (1)....Cement.....                       | IS : 269  |
| (2)....Sand for masonry.                 | IS :2116  |
| (3).....Sand for concrete.               | IS : 383  |
| (4) ... Coarse aggregate.                | IS : 383  |
| (5).....Mild Steel...                    | IS : 432  |
| (6)....High yield strength deformed bars |           |
| .....(a) Hot Rolled .....                | IS : 1139 |
| .....(b) Cold Twisted..... '.....        | IS : 1786 |

## 7. Barrel thickness of pipes of different class shall be as under :

Sr.No.	Internal Diametre of pipe in mm	Barrel thickness ( in mm).		
		NP1	NP2	NP2
1	80	25	25	-
2	100	25	25	-
3	150	25	25	-
4	250	25	25	-
5	300	30	30	-
6	350	32	32	75
7	400	32	32	75
8	450	35	35	75
9	500	-	35	75
10	600	-	40	80
11	700	-	40	80
12	800	-	45	90
13	900	-	50	100
14	1000	-	55	100
15	1100	-	60	115
16	1200	-	65	115

## STANDARD TECHNICAL SPECIFICATIONS FOR ROADWORKS

### ITEM 1-A Earthwork for embankment including clods, dressing with all lead and lift (including watering and consolidation) (a) From 'borrow pits within Sand width.

1. The land width on which the earth work is to be done shall be cleared of all trees having a girth of 30 cm and less, loose stones, vegetation, bushes, stumps and all other objectionable materials. All the materials cleared will be the property of Government. Useful material shall be arranged in convenient stacks along the roads boundary or as directed at places within 50 metres lead, and handed over to the department in convenient sections. Unsuitable material shall be burnt or otherwise disposed off by the contractor at his own cost without causing any nuisance, inconvenience or damage to the works, property or people in the neighborhood. In all cases, the materials shall be disposed off in a neat manner.
2. After clearing the site, the alignment of the road shall be properly set out true to line, curves, slopes, grades and sections as shown on then plan or directed by the Engineer-in-charge. 'The contractor shall provide all labours and materials such as lime, string, pegs, nails, bamboos, stones, mortar, concrete etc. required for setting out, establishing Bench Marks and giving profiles. The contractor shall be responsible for maintaining the B.M.S. profiles alignments and other marks as long as they are required for the work in the opinion of the Engineer-in-charge. If the contractor defaults in this respect they may be restored by the department at the cost of the contractor.
3. When an existing embankment is to be widened, continuous, horizontal benches, each at least 0.3 metre wide, shall be cut into existing slope for ensuring adequate bond with the fresh embankment material to be added. The material obtained from the cutting of benches can be utilised in the widening of the embankment. Where the width of the widened portions is insufficient to permit the use of usual rollers, compactors shall be carried out with the help of tandem/sheepfoot rollers, mechanical tampers or other approved plant. The dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other type of hauling equipment.
4. The soil to be used for embankment shall be free from trees, stumps, roots, rubbish or any other objectionable materials. Only materials considered suitable by the Engineer-in-charge shall be used for the construction and that considered unsuitable shall be disposed off as directed by him. The selection of materials to be used in the construction of embankment shall be made after soil survey and investigations are carried out by the Department. The embankment shall consist of earth available from road-side borrow pits on either side' with all lead and lifts.
5. The materials satisfying the density requirements given the table shall be employed for embankment construction.

Type of work	Laboratory Dry Density when tested as per IS : 2720 (Pt.VII)
- Embankment up to 3 metre height	Not less than 1.44 gm/cc
- Embankment exceeding 3 metre height or embankment of any height subject to long period of inundation.	Not less than 1.52 gm/cc
- Top 0.5 metre of embankment below the sub grade level and shoulder [Where earth shoulder are specified]	Not less than 1.65 gm/cc

Field density shall be a percentage of laboratory density as recommended by the Gujarat Engineering research institute. Location, shape and size of borrow pits shall be as indicated by the Engineer-in-charge. Pits shall not be dug continuously. Ridges of not less than 8 metres width should be left at intervals not exceeding 300 metre. Small drain shall be cut through the ridges of facilities drainage. The outer edge of borrow pits shall be so regulated that the bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of final section of the bank, the maximum depth in any case being limited to 1.5 metres. Also no pits shall be dug within 5 metres of the tow of the final section of the road embankment.

5.1 No borrow pits shall be allowed at the following sites along the road.

- (i) upto 30 metres on either side of C.D. Works;
- (ii) upto 15 metres on either side of cart rack crossing for which approaches are to be constructed
- (iii) in the length in which earth obtained from cutting is specified to be used in the embankment.

5.2 If there is top layer of black cotton or other objectionable soils, the same shall be removed and disposed off elsewhere and usable material found at lower level will only be used in earthen embankment.

6. The embankment shall be constructed in uniform layers not exceeding 250 mm in loose thickness. The soil shall be spread uniformly over the entire width of the embankment. Unless otherwise directed by The Engineer-in-charge. The consolidation including watering and rolling of earthwork shall be carried out by the Department, The operation of laying the successive layer of earth shall have to be suitably synchronized with the consolidation work. If the soil as delivered to the road is too wet, it shall be dried by exposure to the sun till the moisture content is acceptable for compaction. All clods of hard lumps of earth shall be broken to have maximum size of 15 cm. when being placed in the embankment and a maximum size of 5 cm. when being placed in the top 45 cm. of the embankment. The work of next layers shall be allowed only after the first layer below it has been thoroughly compacted to the density specified.

7. Where an embankment is to be placed on sloping ground, the surface of the ground shall be benched in the step of trenches or broken up in such a manner that the new material shall have perfect bond with the existing surface. Where the embankment is to be placed over an existing surface, the new material. However when the embankment is to be placed over an old concrete, pavement shall be broken up in pieces not to exceed 0.1 m and may be left under the new-embankment. If the existing road surface is of granular or bituminous type and lies within 1 mt. of the new subgrade level, the same shall be scarified to a depth of minimum 50 mm. so as to provide ample bond between the old and the new material.

8. To avoid interference with construction of abutments, wing walls or return walls of culverts/bridge structures, the contractor shall, at point to be determined by the Engineer-in-charge, suspend work on embankments forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of interference of damage to the bridge work. Unless directed otherwise the filling around culverts, bridge and other structures up to a distance of twice the height of the embankment from the back of the embankment shall be carried out independent of the work on the main embankment. The fill materials shall not be placed against any abutment or wing wall unless permission has been given by the Engineer-in-charge but in any case not until the concrete or masonry has been in position for 14 days. The embankment shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer-in-charge. Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material the material used for the filler shall conform to the requirement rollers or other heavy equipment, the compaction shall be carried out by mechanical tampers or other methods approved by the Engineer-in-charge. Care shall be taken to see that the compaction plant does not hit or come too close to any structural members so as to cause any damage to them.

9. The embankment shall be finished in conformity with the alignment, level, cross sections and dimensions shown on the plans or as directed by the Engineer-in-charge. Where the alignment of the road is in a curve, the top of the embankment shall be formed with the super elevation and the increased width shown on the drawings or as the Engineer-in-charge may direct. Finishing operations shall include the work of shaping and dressing the shoulder, road bed and the slopes to conform to the cross section.

10. The consolidation of earth work including rolling and watering at O.M.C. as per laboratory requirement shall be carried out by the Department, the field and laboratory investigations and testing of samples shall be carried out by the department. However, the contractor shall give full co-operation and shall bear the charges for layout and collection of samples for testing at authorized Government laboratory. The work of laying of earthwork in layers shall be synchronized with the work of compaction and consolidation of the earth work and the operations shall also be synchronized with the field and laboratory testing. When density measurements reveal any soft areas in the embankment, the Engineer-in-charge shall direct that these areas shall be compacted further. In spite of that, specified compactions is not achieved, the materials in the soft area shall be removed as directed and replaced by the approved materials. Deduction of 15% shall be made for the shrinkage from the sectional measurements to be paid to the contractor, if measured before first monsoon and 10% measured after one or more monsoon have passed over the earth embankment.

11. The earth work measurements shall be paid on cross sectional measurements and computing the volumes of earth-work in cubic metres by average area method. The contractor shall sign day to day leveling work and also original cross sections in token of his acceptance etc. The working sections both longitudinal and cross of the ground shall be taken by the Engineer-in-charge before the actual earth work is started. The contractor or his authorised representative shall attend day to day leveling work and sign with date the field book daily, in token of this acceptance. If there is any disagreement the contractor shall inform of it in writing to the officer concerned of any complaint shall be taken. Merely not signing of the level book shall not be deemed as disagreement. The Executive Engineer shall also verify leveling work to the extent of 5% before commencement of earth work and on finalisation. The contractor shall maintain the embankment by filling in ruts, rain cuts depression due to shrinkage

etc. to proper formation and grade till this item is finally measured and accepted by the Department. The measurement shall be taken on compacted earth work, no deduction for shrinkage shall be made from gross measured quantity of compacted earth work. However the contractor shall have to bear loss of quantity due to all settlement as well as other types of deformations etc. if any that might have taken place at the time of taking the final measurement of this item. If the Compaction as stipulated in para-10 is not done by the department in that case shrinkage from such earthwork quantity shall be deducted as per norms, i.e. 10% after monsoon and 15% before monsoon. 12. The rate of earthwork includes clearing jungles, dogbelling, fixing profiles, erecting necessary pillars or stones for bench mark for leveling purpose, excavating earth from borrow pits, breaking clods, conveying and spreading earth in layers with all lead and lift, finishing the entire embankment to the proper profile camber, grade and slopes. The rate also includes all labour, materials, tools, equipment and incidentals necessary to complete the work according to the specifications. Cutting stuff of cutting in ordinary soil, soft murrum, soft rock, hard murrum and hard rock shall be utilised in embankment construction under this item within the lead specified in that particular item. No payment shall be made under this item for the cutting stuff used in the embankment but labour for cutting will be paid as per specifications in the particular item and only balance quantity brought from borrow pits will be paid in this item.

**ITEM 1-B Earthwork for embankment including breaking clods, dressing with all lead and lift (excluding watering and consolidation) (a) From borrow pits within land width.**

1. The land width on which the earth work is to be done shall be cleared of all tree having a girth of 30 cm and less, loose, stones, vegetation, bushes, stumps and all other objectionable materials. All the materials cleared will be the property of Government. Useful material shall be arranged in convenient stacks along the road boundary or as directed at places within 50 metres lead, and handed over to the department in convenient section. Unsuitable material shall be burnt or otherwise disposed off by the contractor at his own cost without causing any nuisance, inconvenience or damage to the works property or people in the neighborhood. In all cases, the materials shall be disposed, off in a neat manner.
2. After clearing the site, the alignment of the road shall be properly set out true to line, curves, slopes, grades and sections as shown on the plan or directed by the Engineer in-charge. The contractor shall provide all labours and materials such as lime, strings, pegs, nails, bamboos, stone, mortar, concrete, etc. required for setting out, establishing. Bench Marks and giving profiles. The contractor shall be responsible for maintaining the B. Ms. profiles alignments and other marks as long as they are required for the work in the opinion of the Engineer-in-charge. If the contractor defaults in this respect they may be restored by the department at the cost of the contractor.
3. When an existing embankment is to be widened, continuous, horizontal benches, each at least 0.3 metre wide shall be cut into the existing slope for ensuring adequate bond with the fresh embankment of the embankment. The dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other type of hauling equipment.
4. The soil to be used for embankment shall be free from trees, stumps, roots, rubbish or any other objectionable materials. Only material considered suitable by the Engineer-in-charge shall be used for the "construction and that considered unsuitable other disposed off as directed by him. The selection of the materials to be used in the construction of embankment shall be made after soil surveys and investigations carried out by the Department. The embankment shall consist of earth available from road side borrow pits on either side with all lead and all lifts.
5. Location, shape and size of borrow pits shall be as indicated by the Engineer-in-charge. Pits shall not be dug continuously. Ridges of not less than 8 metres width should be left at interval not exceeding 300 metres. Small drain shall be cut through the ridges of facilitate drainage. The outer edge of borrow pits shall be so regulated that the bottom does not cut an imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of final section of the bank, the maximum depth in any case being limited to 1.5 metres. Also no pits shall be dug within 5 metres of the toe of the final section of the road embankment.
  - 5.1 No borrow pits shall be allowed at the following sites along the road,
    - (i) up to 30 metres on either side of C.D. Works.
    - (ii) up to 15 metres on either side of cart track crossing for which approaches are to be constructed.
  - 5.2 If there is top layer of black cotton or other objectional soils, the same shall be removed and disposed off elsewhere and usable material found at lower level will only be used in the embankment.
6. The embankment shall be constructed in uniform layers not exceeding 250 mm in loose thickness. The soil shall be spread uniformly over the entire width of the embankment, unless otherwise directed by the Engineer-in-charge. The consolidation including watering and rolling of earth work shall be carried out by the

Department. The operation of Laying the successive layer of earth shall have to be suitably. All clods of hard lumps if earth shall be broken to have maximum size of 15 cm. when being placed in the embankment and a maximum of size 5 cm when being placed in the top 45 cm of the embankment. The work of next layer shall be allowed only after the first layer below it has been thoroughly compacted.

7. Where an embankment is to be placed on sloping ground, the surface of the ground shall be benched in the steps of trenches or broken up in such a manner that the new material shall have perfect bond with the existing surface. Where the embankment is to be placed over an existing road surface, the surface shall be scarified to minimum depth of a 5 cm so as to provide ample bond between the old and new material. However when the embankment is to be placed over an old concrete pavement and lies within 1 metre of new subgrade level the pavement shall be broken up in pieces not to exceed 0.1 m. and may be left under the new embankment. If the existing road surface is of granulate or bituminous type and lies within 1 mt. of the new subgrade level, the same shall be scarified to a depth of minimum 50 mm. so as to provide ample bond between the old and the new material.

8. To avoid interference with the construction of abutment, wing walls or return walls of culverts/bridge structures, the contractor shall, at point to be determined by the Engineer-in-charge, suspend work on embankments forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of interference or damage to the bridge work. Unless directed otherwise, the filling ground culverts, bridges and other structures up to a distance of twice the height of the embankment. The fill material shall not be placed against any abutment or wing wall unless permission has been given for 14 days, the embankment shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement it and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer-in-charge. Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material. The material used for the filter shall conform to the requirements for filler medium and will be paid extra in the relevant item.

9. The embankment shall be finished in conformity with the alignment, levels, cross sections and dimension shown on the plans or as directed by Engineer-in-charge. Where the alignment of the road is in a curve, the top of the embankment shall be formed with the super elevation and the increased width shown on the drawings or as the Engineer-in-charge may direct. Finishing operations shall include the work of shaping and dressing the shoulders, road bed and the side slopes to conform the cross section.

10. The earthwork measurements shall be paid on cross sectional measurements and computing the volumes of earth work in cubic metres by average area method. The contractor shall sign day to day leveling work and also original cross section, longitudinal section etc. in token of his acceptance. The working sections both longitudinal and cross of the ground shall be taken by the Engineer-in-charge before the actual work is started. The contractor or his authorised representative shall attend day to day leveling work and sign with date the field book daily, in token of his acceptance. If there is any disagreement the contractor shall inform of it in writing to the officer concerned with specific reference to the sections before starting further work. Once the work is started, no cognizance of any complaint will be taken. Merely not signing of level book shall not be deemed as disagreement. The Executive Engineer shall also verify leveling work to the extent of 5% before commencement of earth work and on finalisation. The contractor shall maintain the embankment by filling in ruts, rain cuts, depression due to shrinkage etc. to proper formation and grade till this item is finally measured and accepted by the Department. The measurements shall be taken on compacted earth work. If the compaction as stipulated in para above is not done by the department in that case shrinkage from such earth work quantity shall be deducted as per norms i.e. 10 percent after monsoon and 15% before monsoon. However the contractor shall have to bear loss of quantity due to all settlements as well as other types of deformations etc. if any, that might have taken place at the time of taking the final measurements of this item.

11. The rate of earthwork includes, clearing jungles, bogoelling, fixing profiles, erecting necessary pillars for stones for bench marks for leveling purpose, excavating earth from borrow areas, breaking clods, conveying and spreading earth in layers with all lead and lift, finishing the entire embankment and incidentals necessary to complete the work to the specifications. The cutting stuff of cutting in ordinary soil, soft murrum, soft rock, hard murrum and hard rock shall be utilised in embankment construction under this item within the lead specified in the particular item. No payment shall be made under this item for the cutting stuff used in the embankment but labour for cutting will be paid as per specifications in the particular item, and only balance quantity of earthwork brought from borrow areas will be paid in this item.

**ITEM 1-C Earthwork for embankment for side shoulders including breaking clods, dressing with all lead and lift (excluding watering and consolidation) (b) From borrow pits within \_ kms. lead.**

1. The land width on which the earth work is to be done shall be cleared of all trees having a girth of 30 cm and less, loose stones, vegetation, bushes, stumps and all other objectionable materials. All the materials cleared will



be the property of Government. Useful material shall be arranged in convenient stacks along the road boundary or as directed at places within 50 meters lead, and handed over to the department in convenient section. Unsuitable materials shall be burnt or otherwise disposed off by the contractor at his own cost without causing any nuisance, inconvenience or damage to the works property or people in the neighborhood. In all cases, the materials shall be disposed off in a neat manner.

2. After clearing the site, the alignment of the road shall be properly set out true to line, curves, slopes, grades and sections as shown on the plan or directed by the Engineer-in-charge. The contractor shall provide all labours and materials such as lime, strings, pegs, nails, bamboos, stone, mortar, concrete, etc.. required for setting out. establishing. Bench Marks and giving profiles. The contractor shall be responsible for maintaining the B. Ms. profiles alignments and other marks as long as they are required for the work in the opinion of the Engineer-in-charge. If the contractor defaults in this respect they may be restored by the department at the cost of the contractor.

3. When an existing embankment is to be widened, continuous, horizontal benches, each at least 0.3 metre wide shall be cut into the existing slope for ensuring adequate bond with the fresh embankment materials to be added. The material obtained from the cutting of benches can be utilised in the widening of the embankment. The dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other type of hauling equipment.

4. The soil to be used for embankment shall be free from trees, stumps, roots, rubbish or any other objectionable materials. Only material considered suitable by the Engineer-in-charge shall be used for the construction and that considered unsuitable other disposed off as directed by him. The selection of the materials to be used in the construction of embankment shall be made after soil surveys and investigations carried out by the Department. The embankment shall consist of earth available from road-side borrow pits on either side with all lead and all lifts and within land width in the manner specified in para 11 below. The road, if any required for the purpose of haulage of earth by men, animals or vehicles will be constructed.(if not existing)and maintained by the contractor at his own cost.

5. Department will extend all necessary co-operation in helping contractor to get borrow area from nearby Government or Panchayat land, if available. However, department is not responsible if not such area is made available to the contractor and in the case, contractor will have to make his own arrangement to get borrow area for borrowing earth of the quantity even by making temporary arrangement with the private land owners.

6. The embankment shall be constructed in uniform layers not exceeding 250 mm in loose thickness. The soil shall be spread uniformly over the entire width of the embankment, unless otherwise directed by the Engineer-in-charge. All clods of hard lumps of earth shall be broken to have maximum size of 15 cm .when being placed in the embankment and a maximum of size 5 cm when being placed in the top 45 cm of the embankment. The work of next layer shall be allowed only after the first layer below it has been thoroughly compacted.

7. Where an embankment is to be placed on sloping ground the surface of the ground shall be benched in the steps of trenches or broken up in such a manner that the new material shall have perfect bond with the existing surface. Where the embankment is to be placed over an existing road surface the surface shall be scarified to minimum depth of a 5 cm so as to provide ample bond between the old and new material. However when the embankment is to be placed over an old concrete pavement and lies within 1 metre of new sub grade level, the pavement shall be broken up in pieces not to exceed 0.1 m and may be left under the new embankment. If the existing road surface is of granular or bituminous type and lies within 1 mt. of the new sub grade level, the same shall be scarified to a depth of minimum 50mm.so as to provide ample bond between the old and the new material.

8-. To avoid interference with the construction of abutment, wing walls of culverts/bridge structures, the contractor shall, at point to be determined by. the Engineer-in-charge, suspend work on embankments forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of interference or damage to the bridge work. Unless directed otherwise, the filling ground culverts bridge and other structures up to a distance of twice the height of the embankment from the back of the embankment shall be carried out independent of the work on the main embankment. The fill material shall not be placed against any abutment or wing wall unless permission has been given by the Engineer-in-charge but in any case not until the concrete or masonry has been in position for 14 days the embankment shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer-in-charge. Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers with the laying of fill material. The material used for the filter shall conform to the requirements for filler medium and will be paid extra in the relevant item.

9. The embankment shall be finished in conformity with the alignment, levels cross sections and dimension shown on the plans or as directed by Engineer-in-charge. Where the alignment of the road is in a curve, the top of the embankment shall be formed with the super elevation and the increased width shown on the drawings or as the Engineer-in-charge may direct. Finishing operations shall include the work of shaping and dressing the shoulders road bed and the side slopes to conform the cross section.

10. The earthwork measurements shall be paid on cross sectional measurements and computing the volumes of earth work in cubic metres by average area method. The contractor shall sign day to day leveling work and also original cross sections longitudinal section etc, in token of his acceptance. The working sections both longitudinal and cross of the ground shall be taken by the Engineer-in-charge before the actual work has started. The contractor or his authorised representative shall attend day to day leveling work and sign with date the field book daily, in token of his acceptance. If there is any disagreement the contractor shall inform of it in writing to the officer concerned with specific reference to the sections. Before starting further work. Once the work is started, no cognizance of any complaint will be taken. Merely not signing of level book shall not be deemed as disagreement. The Executive Engineer shall also verify leveling work to the extent of 5% before commencement of earth work and on finalisation. The contractor shall maintain the embankment by filling in ruts rain cuts depression due to shrinkage etc. to proper formation and grade till this item is finally measured and accepted by the Department. The measurements shall be taken on compacted earth work. Deduction of 15% for shrinkage shall be made from gross measured quantity if measured before first monsoon and 10% if measured after one or more monsoon have been passed over the earth embankment. However the contractor shall have to bear loss of deformations etc. if any due to all settlements as well as other type of deformations etc. if any, that might have taken place at the time of taking final measurement of the item.

11. If usable approved material is available within the land width of road, the same shall be permitted for use in the road embankment subject to the following conditions :-

- (i) The borrow pits will be so excavated as to form a road side longitudinal gutter to drain the water, interrupted by such gutter,
- (ii) The width of the drain shall be restricted to 1.5mts, only. The depth will be restricted to such grade so as to drain the water efficiently. All balance quantity of earth shall be brought from distant borrow areas only,
- (iii) If there is top layer of black cotton or other objectionable soils, the same shall be removed and disposed off elsewhere and usable material found at the lower level will only be used in the earthen embankment, if the contractor choose to utilize this material,
- (iv) The drain should be aligned along the boundary of the land width of the road. Not pit, other than this drain, shall be dug within 5 meters of the toe to the final section of the road embankment,
- (v) No borrow pits shall be allowed in the length in which earth obtained for cutting from cutting is specified to be used in embankment.

12. The rate of earthwork includes, clearing jungles, dogbelling, fixing profiles, erecting necessary pillars for stones for bench marks for leveling purpose, excavating earth from borrow areas, breaking clods, conveying and spreading earth in layers with all lead and lift, finishing the entire embankment and incidentals necessary to complete the work to the specifications. The cutting stuff of cutting in ordinary soil, soft murrum, soft rock, hard murrum and hard rock shall be utilised in embankment construction under this item within the lead specified in the particular item. No payment shall be made under this item for the cutting stuff used in embankment but labour for cutting will be paid as per specifications in the particular item, and only balance quantity of earthwork brought from borrow areas will be paid in this item.

**ITEM 1-D Earthwork for embankment including breaking clods, dressing with all lead and lift {including watering and consolidation} (b) From borrowpits within \_\_\_\_\_ kms. lead.**

1. The land width on which the earth work is to be done shall be cleared of all trees having a girth of 30 cm and less, loose, stones, vegetation, bushes, stumps and all other objectionable materials. All the materials cleared will be the property of Government. Useful material shall be arranged in convenient stacks along the road boundary or as directed at places within 50 metres lead, and handed over to the department in convenient section. Unsuitable material shall be burnt or otherwise disposed off by the contractor at his own cost without causing any nuisance, inconvenience or damage to the works property or people in the neighborhood. In all cases, the materials shall be disposed off in a neat manner.

2. After clearing the site, the alignment of the road shall be properly set out true to line, curves, slopes grades and sections as shown on the plan or directed by the Engineer-in-charge. The contractor shall provide all labours and materials such as lime, strings, pegs, nails, bamboos, stone, mortar, concrete etc. required for setting out, establishing. Bench Marks and giving profiles. The contractor shall be responsible for maintaining the B.Ms, profiles alignments and other marks as long as they are required for the work in the opinion of the Engineer-in-charge. If the contractor defaults in this respect they may be restored by the department at the cost of the contractor.

3. When an existing embankment is to be widened, continuous. Horizontal benches, each at least 0.3 metre wide shall be cut into the existing slope for ensuring adequate bond with the fresh embankment materials to be added. The material obtained from the cutting of benches can be utilised in the widening of the embankment. Where the width of the widened portions is insufficient to permit the use of usual rollers, compaction shall be carried out with the help of tandem/sheeps foot rollers, hand rollers, mechanical tampers or other approved plant. The dumping of material from trucks for widening operations shall be avoided except in difficult circumstances when the extra width is too narrow to permit the movement of any other type of hauling equipment.

4. The soil to be used for embankment shall be free from trees, stumps, roots, rubbish or any other objectionable materials. Only material considered suitable by the Engineer-in-charge shall be used for the construction and that considered unsuitable shall be disposed off as directed by him. The selection of the materials to be used in the construction of embankment shall be made after soil surveys and investigations are carried out by the Department. The embankment shall consist of earth available from road-side borrow pits on either side with lead and all lifts, and within land-width in the manner specified in para 12 below. The road, if any, required for the purpose of haulage of earth by men, animals or vehicles will be constructed (if not existing) and maintained by the contractor at his own cost, the material satisfying the density requirements given in the table below shall be employed for embankment construction.

<b>Type of Work</b>	<b>Laboratory Dry Density when tested as per IS : 2720 (Pt. VII)</b>
- Embankment up to 3 metre height	Not less than 1.44 gm/cc
- Embankment exceeding 3 metre height or embankment of any height subject to long period of inundation.	Not less than 1.52 gm/cc
- Top 0.5 metre of embankment below the subgrade level and shoulder [Where earth shoulder are specified]	Not less than 1.65 gm/cc

Field density shall be percentage of laboratory density as recommended by Gujarat Engineering Research Institute

5. Department will extend all necessary co-operation in helping contractor to get borrow area from nearby Government or Panchayat land, if available. However, department is not responsible if no such area is made available to the contractor and in that case, contractor will have to make his own arrangement to get borrow area for borrowing earth of the approved quantity even by making temporary arrangement with the private land owners.

6. The embankment shall be constructed in uniform layers not exceeding 250mm in loose thickness. The soil shall be spread uniformly over the entire width of the embankment, unless otherwise directed by the Engineer-in-charge. The consolidation including watering and rolling of earthwork shall be carried out by the Department. The operation of laying the successive layer of earth shall have to be suitably synchronized with the consolidation work. If the soil as delivered to the road bed is too wet, it shall be dried by exposure to the sun till the moisture content is acceptable for compaction. All clods of hard lumps of earth shall be broken to have maximum size of 15cm when being placed in the embankment and a maximum of size 5 cm when being placed in the top 45 cm of the embankment. The work of next layer shall be allowed only after the first layer below it has been thoroughly compacted to the density specified.

7. Where an embankment is to be placed on sloping ground, the surface of the ground shall be benched in the steps of trenches or broken up in such a manner that the new material shall have perfect bond with the existing surface. Where the embankment is to be placed over an existing road surface, the surface shall be scarified to minimum depth of a 5 cm so as to provide ample bond between the old and new material. However when the embankment is to be placed over an old concrete pavement and lies within 1 metre of new subgrade level the pavement shall be broken up in pieces not to exceed 0.1 m and may be left under the new embankment. If the existing road surface is of granular or bituminous type and lies within 1 ml. of the new subgrade level, the same shall be scarified to a depth of minimum 50 mm. so as to provide ample bond between the old and the new material.

8. To avoid interference with the construction of abutment, wing walls or return walls of culverts/bridge structures, the contractor shall, at point to be determined by the Engineer-in-charge, suspend work on embankments forming approaches to such structures, until such time as the construction of the latter is sufficiently advanced to permit the completion of approaches without the risk of interference or damage to the bridge work. Unless directed otherwise, the filling ground culverts, bridges and other structures up to a distance of twice the height of the embankment from the back of the embankment shall be carried out independent of the

work on the main embankment. The fill material shall not be placed against any abutment or wing wall unless permission has been given by the Engineer-in-charge but in any case not until the concrete or masonry has been in position for 14 days, the embankment shall be brought up simultaneously in equal layers on each side of the structure to avoid displacement and unequal pressure. The sequence of work in this regard shall be got approved from the Engineer-in-charge. Where the provision of any filter medium is specified behind the abutment, the same shall be laid in layers simultaneously with the laying of fill material. The material used for the filter shall conform to the requirements for filler medium and will be paid extra in the relevant item. Where it may be impracticable to use power rollers or other heavy equipment, the compaction shall be carried out by mechanical tampers or other methods approved by the Engineer-in-charge. Care shall be taken to see that the compaction plant does not hit or come too close to any structural member so as to cause any damage to them

9. The embankment shall be finished in conformity with the alignment, levels, cross sections and dimension shown on the plans or as directed by Engineer-in-charge. Where the alignment of the road is in a curve, the top of the embankment shall be formed with the super elevation and the increased width shown on the drawings or as the Engineer-in-charge may direct. Finishing operations shall include the work of shaping and dressing the shoulders, road bed and the side slopes to conform the cross section.

10. The consolidation of earth work including rolling and watering at O.M.C as per laboratory requirements shall be carried out by the department. The field and laboratory investigations and testing of sample shall be carried out by the Department. However, the contractor shall give full co-operation and shall be the charges for labours and collection of samples for testing at authorised Government laboratory. The work of laying of earthwork in layers shall be synchronized with the field and laboratory testing. When density measurements reveal any soft area as in the embankment the Engineer-in-charge shall direct that these areas shall be compacted further. If in spite of that, specified compaction is not achieved the materials in the soft areas shall be removed as directed and replaced by the approved materials.

11. The earthwork measurements shall be paid on cross sectional measurements and computing the volumes of earth work in cubic metres by average area method. The contractor shall sign day to day leveling work and also original cross section, longitudinal section etc. in token of his acceptance. The working sections both longitudinal and cross of the ground shall be taken by the Engineer-in-charge before the actual work is started. The contractor or his authorised representative shall attend day to day leveling work and sign with date the field book daily, in token of his acceptance. If there is any disagreement the contractor shall inform of it in writing to the officer concerned with specific reference to the sectioned before starting further work. Once the work is started, no cognizance of any complaint will be taken. Merely not signing of level book shall not be deemed as disagreement. The Executive Engineer shall also verify leveling work to the extent of 5% before commencement of earth work and on finalisation. The contractor shall maintain the embankment by tilling in ruts, rain cuts, depression due to shrinkage etc. to proper formation and grade till this item is finally measured and accepted by the Department. The measurements shall be taken on compacted earth work. No deduction for shrinkage shall be made from gross measured quantity of compacted earth work. However the contractor shall have to bear loss of quantity due to all settlements as well as other types of deformations etc. if any, that might have taken place at the time of taking the final measurements of this item.

12. If usable approved materials is available within the land width of road, the same shall be permitted for use in the road embankment subject to the following conditions :-

- (i) The borrow pits will be so excavated as to form a road side longitudinal gutter to drain the water. interrupted by such gutter,
- (ii) The width of the drain shall be restricted to 1.5 mts, only. The depth will be restricted to such grade so as to drain the water efficiently. All balance quantity of earth shall be brought from distant borrow areas only.
- (iii) If there is top layer of black cotton or other objectionable soils, the same be removed and disposed off elsewhere and usable material found at the lower level will only be used in the earthen embankment, if the contractor chooses to utilize this material.
- (iv) The drain should be aligned along the boundary of the land width of the road. No pit, other than this drain, shall be dug within 5 metres of the toe to the final section of the road embankment,
- (v) No borrow pits shall be allowed in the length in which earth obtained from cutting is specified to be used in embankments.

13. The rate of earthwork includes clearing jungles, dogbelling, fixing profiles, erecting necessary pillars for stones for bench marks for leveling purpose, excavating earth from borrow areas, breaking clods, conveying and spreading earth in layers with all lead and Lift, finishing the entire embankment and incidentals necessary to complete the work to the specifications. The cutting stuff of cutting in ordinary soil, soft murrum, soft rock, hard murrum and hard rock shall be utilised in embankment construction under this item within the lead specified in that particular item. No payment shall be made under this item for the cutting stuff used in the embankment but labour

for cutting will be paid as per specifications in that particular item, and only balance quantity of earthwork brought from borrow areas will be paid in this item.

**ITEM 1 (E) Rolling and Watering of earth work in layer with power roller including filling in depression which occurs during the process.**

1. For spreading materials in layers and bringing the appropriate moisture content, the embankment materials shall be spread uniformly over the entire width of the embankment in layers not exceeding 250mm in loose thickness. Successive layers of embankment shall not be placed until the layer under construction has been thoroughly compacted to the requirements set down hereunder :-

Moisture content of the materials shall be checked at the source of supply and if found less than that specified for compaction, the same, shall be made good either at the source or after spreading the soil in loose thickness for compaction. In the latter case, water shall be sprinkled directly from a hose line or from a truck mounted water tank, and flooding shall not be permitted under any circumstances.

If the materials delivered to the road bed is too wet it shall be dried, by evaporation and exposure to the sun. till the moisture content is brought down to acceptable standard for compaction. Should circumstances arise, where owing to wet weather, the moisture content cannot be reduced to the required level by the above procedure, work of compaction shall be suspended.

Moisture content of each layer of soil shall be checked in accordance with IS 2720 (Part-II) and unless otherwise mentioned shall be so adjusted, making due allowance for evaporation losses, that at the time of the compaction it is in the range of 1 percent to 2 percent below the optimum moisture content determined in accordance with IS (Part-VII). Highly expansive clays shall however be compacted at 2 to 4 percent above the optimum moisture content

After adding the required amount of water, the soil shall be processed by means of harrows, rotary mixers or as otherwise approved until the layer is uniformly wet.

Clods or hard lumps of earth shall be broken to have maximum size of 150mm when being placed in the lower layers of the embankment and a maximum size of 60mm when being placed in the top 0.5 meter portion of the embankment below the subgrade.

Hauling equipment shall be dispersed uniformly over entire surface of the previously constructed layer to minimise cutting of uneven compaction

Where the embankment is to be constructed on low area ground that will not support the weight of trucks of other hauling equipment, the lower part of the fill should be constructed by dumping successive loads in a uniformly distributed layers of a thickness not greater than that necessary to support the hauling equipment while placing subsequent layers.

**2. COMPACTION** : Only compacting equipment approved by the Engineer-in-charge shall be employed to compact the materials. The contractor shall demonstrate the efficiency of the plants he intends to use for carrying out compaction trials.

Each layer of the materials shall be thoroughly compacted to the densities specified in Table 1.2 Table 1.2 Compaction requirements for embankment.

Sr. No.	Type of Work/materials	Field dry density as per centage of maximum laboratory dry density as per IS:2720 (Part-VII)
1.	Top 0.5 meter portion of embankment below subgrade level and shoulders.	Not less than 100.
2.	Other portion of embankment.	Not less than 95
3.	Highly expansive class	85 to 90

Subsequent layers shall be placed only after finished layer has been tested according to M.O.S.T. specification clause 902 and accepted by the Engineer-in-charge.

When density measurements reveal any soft areas in the embankment further compaction shall be carried out as directed by the Engineer-in-charge. If in spite of that the specified compaction is not achieved, the materials in the soft areas shall be removed and replaced by approved materials and compacted to the density requirement to the satisfaction of the Engineer-in-charge.

3. Measurements for Payment : Consolidation of earth embankment construction shall be measured by taking cross section at intervals in the original position before the work starts and after its completion and computing of the volume of earthwork in cubic meters by the method of average and areas. The measurement of fill material from borrow areas shall be the difference between the net quantities of suitable materials brought from roadway and drainage excavation. For this purpose it shall be assumed that one cubic meter of suitable materials brought to site

from roadway and drainage excavation froms one cubic meter of compacted fill and all bulking or shrinkage shall be ignored

Stripping including storing and reapplication of top soil shall be measured as volume in cubic meter.

4. The contract unit rate includes cost of mechanical roller required for consolidation including ail labour, equipments fuel, hire charges, tolls, and incidentals necessary.

**ITEM-2 Earth Work In cutting In all sorts of Soil and Soft Murrum including conveying and putting the stuff spoil bank maintaining minimum distance of five meter between top edge of cutting and top of bank, (a) within 200 metres from the ends of the cutting with alt required Lead and Lift.**

1. The land width required for the roadway, gutter side slopes and catch water gutters shall be cleared of all trees having a girth of 30 cms and less, loose, stones, vegetation, bushes, stumps and all other objectionable materials. The roots of trees and stumps shall be removed to a depth of 30 cms below the grade formation and slopes and excavation filled up with excavated materials and compacted. All the materials cleared will be the property of Government. Useful materials shall be arranged in convenient stacks along the road boundary or as directed at places within 50 mts. lead, and handed over to the department in convenient sections. Unsuitable material shall be burnt or otherwise disposed off by the contractor at his own cost without causing any nuisance, inconvenience or damage to the work, property or people in the neighborhood. If the materials are to be disposed off outside the road land, necessary permission from the private land owners shall be taken by the contractor and royalty etc. If any paid by him without claiming compensations In all cases, the materials shall be disposed off in a neat manner.

2. After clearing the site, the alignment of the road shall be properly set out true to lines, curves slopes, grades and sections as shown on the plans or directed by the Engineer-in-charge. The contractor shall provide all labour and materials such as lime, strings, pegs, nails, bamboos, stones mortar, concrete etc required for setting out alignment establishing bench marks and giving profiles. The contractor shall be responsible for maintaining the B. Ms. profiles alignments and other stakes and marks as long as they are required for the work in the opinion of the Engineer. If the contractor defaults in this respect even after the direction by the Engineer within the specified time. they may be restored by the Engineer at the levels etc. If there is any disagreement the contractor shall inform of it in writing to the officer concerned with the specific reference to the sections before starting further work. Once the work has started, no cognizance of any complaint shall be taken. Merely not signing of the book shall not be deemed as disagreement.

3. Profiles of the section including the road side gutters to be excavated shall be laid at suitable intervals of 10m to 50 m. or other intervals as directed by Engineer to conform to the curved or straight alignment, sections, grades and side slopes. The line out shall be clearly marked and profiles of embankments where excavated materials are to be used shall be set up with the toe line marked on each side. The road way section shall first be excavated with vertical side for each lift and the sides slopes for that lift shall be excavated in steps. These steps shall be smoothened to the required slope when the excavation reaches the road formation. The contractor shall on no account excavate beyond the slopes or below the specified grade unless so directed by the Engineer in writing. If excavation is done below the specified level or outside the section, it shall not be paid for and the contractor shall be required to fill up at his own cost such extra excavation in the road portion, with approved materials of the embankment grade in layers, watered and fully compacted to attain maximum density laid down for the embankment

in its relevant item. The Engineer may require measurement ridges and dead man to be left at specified intervals or places and kept intact till ordered to be removed for the purpose of check measurements. The excavation shall be finished neatly, smoothly, and evenly to the correct lines, curves, grades, if loose shall be scarified, watered and compacted to the same density as the embankment. The section, side slopes and catch water gutter shall be maintained by the contractor at his own cost in such a way that the formation and gutters will be drained by providing for necessary diversions etc, and not damaged due to obstruction of any drainage. Necessary passages shall be provided for leading away seepage, springs, surface flow or rainwater safely without damaging the work If any damage occurs due to default of the contractor in this respect, he shall make good the damage at his own cost. If it is necessary in the execution of the work to interrupt existing surface drainage, irrigation channels, sewers or under drainage, temporary arrangements shall be provided till such time as is necessary. The contractor at his own cost shall make the existing works or work in hand caused as a result of his operations or negligence shall be made good by the contractor at his own cost. Road side gutters shall be excavated to the specified sections and shall be measured along with the main cutting in cubic meters

4. If slides occur in the cutting they shall be removed as ordered by the Engineer. If finished slopes slide into the roadways before the final acceptance of the work, such slides shall be removed by the contractor and shall be paid for at the contract rate for the class of excavation involved provided the slides are not due to any negligence of the contractor. The classification of the material in slides shall conform to its conditions at the time of removal

and payment made accordingly regardless of its prior condition. Care shall be taken to see that excavation is arranged in a safe way so that there will be no risk to the workmen by slides, falling materials, boulders and collapsing sides etc.

5. If there is traffic nearby or if there are towns and villages in the neighborhood, barricades and or traffic signals shall be provided day and night for the duration of the work in such a way as to prevent accidents. Warning signals shall be displayed at 7mt from the danger point on both sides giving sufficient warning. If necessary, signalers shall be stationed at each end to regulate traffic where it is heavy. Measures shall be taken to see that the excavation does not affect or damage adjoining structures or property. If there is damage to property, injury to workers, the members of the public, animals etc.. due to the negligence of the contractor, he will be responsible and liable to all the consequences including compensation.

6. All the excavated materials shall be property of Government. When the useful excavated material is to be used in embankment within a lead of 200 metre and all lift, it shall be directly deposited at the required location in specified layers. No handing or conveyance charges shall be paid if the material is temporarily deposited elsewhere and subsequently conveyed to site of deposition. The sequence of operations at convenient places, without interfering with the drainage in any way. If no Government land is available but the excavated useful stuff is to be stacked temporarily before use under the same agreement, the contractor shall make his own arrangements for the stacking of this material not required for use on embankment or unsuitable materials may be used on his own to uniformly widen embankment to flatten slopes and to fill low places in the road land, if so permitted by the Engineer. Material not required for any use whatsoever may be disposed off by the contractor at his own cost in a manner approved by the Engineer. The excavated material shall not be deposited within 3 m from the top edge of slope or toe of the bank. The lead shall be measured from the junction point of cutting and embankment up to 200 mt. on either side.

7. If the contractor does not wish to utilise the quantity of cutting within the specified lead for any reason, then he may do the embankment work with the earth from other sources (except borrow pits in the length of the road where cutting stuff is to be utilised) but in that case the full or part quantity of acceptable quality stuff for which payment is made or to be made will be deducted from the net quantity of the earth work in the embankment arrived at within the chainage measured as above.

8. The Contract rate shall be a unit of one cubic metre for the start mentioned in the wording of the item of excavation acceptably completed, limited to the dimensions shown on the plans or as directed by the Engineer. Excavation shall be measured in its original positions by taking cross sections before the work starts and after it is entirely completed. The quality shall be worked by the average end area method. When the classification of the strata changes, the contractor shall bring this to notice of the Engineer, who will then verify and if necessary take levels for the changed strata for purpose of measurement.

(b) In Spoil Bank :Specification shall be as per Item 2(a) except that the excavated stuff shall be deposited in spoil Bank instead of using same in road embankment.

**ITEM 3 Supplying and Stacking murrum binding materials including materials on road side including filling boxes with all lead & lift etc. complete.**

1. Material for the purpose shall be of approved quality. Any material which is found inferior shall be rejected and the contractor shall remove such rejected material from the site at his own cost. The material shall be collected from quarries approved by the Executive Engineer. The material shall be granular and gritty\*.

2. The material shall be got approved by the Executive Engineer prior to collection on site. It shall be free from all rubbish, dust and any organic materials as well as clods of black cotton soils. Materials shall not be allowed to be collected from within the road boundary. Material to be used as crust and for side shoulders shall be as per C.B.R. report and that to be used as bindaga in W.B.M. road construction shall have P.I. value of less than 6 as determined in accordance with IS 2720 (Part-V). The material to be used should be got tested prior to its use in road construction. Testing charges shall be borne by the contractor.

3. River or nala or sea sand required for the work shall be clear, sound, properly, graded, free from organic materials silt clay etc. and shall be got approved by the Engineer-in-charge. The sand shall be obtained and brought from the source approved by the Engineer-in-charge. The sand shall be well graded.

The payment shall be made on Cubic Metre basis

4. Stacking shall be done by filling in the standard steel boxes of 2 m x 1.5 m x 0.5 m size which shall be supplied by the Department if available on rent. Otherwise contractor shall make his own arrangement. No deduction for voids shall be made from the grade measurements. Where any doubt exists as to whether the quantity of slacks of murrum in an hectometre is not confirming with the cubic content of the standard pharas (2 x 1.5 x 0.5 M) the same shall be got corrected by the contractor if so ordered by the Engineer-in-charge for which no extra payment shall be claimed by the contractor. If the quantity of murrum in any stack in a particular hectometre is found to be less than the standard measurements viz.. 1.5 cmt the entire collection in the

hectometre shall be paid on the basis of the quantity so found. Regular stacks shall be done by the Contractor on a fairly level ground. Stacking of the murrum shall be done in a manner as directed by the Engineer-in-charge. 5. For road work completed stacking of murrum as per requirement shall be earned out in 2 K.M. length before spreading. The collection shall always, be commenced at one end of the K.M. and be carried continuously toward the other end unless the Engineer-in-charge shall direct otherwise.

6. The payment shall be made on cubic metre basis without deduction for voids. The contractor shall maintain all stacks in regular and proper size till the whole materials are collected, measured and finally accepted by the Department. The spreading of materials shall not be allowed till the materials are fully stacked and completed kilometer wise,

7. The rate includes cost of collection, conveyance to the site with all lead and lift and filling the boxes including all labour, tools, equipment and other incidental expenses.

8. The rate quoted are inclusive of all shall such tools, duties, fees, royalties, taxes etc.

**Item-3(A) Supplying and Stacking hard murrum / sand/yellow earth/ binding materials on road site including filling boxes with all leads and lifts etc. complete on site of work as per specification.**

1. The materials for the purpose shall be of approved quality. Any materials which is found inferior shall be rejected and the contractor shall remove such rejected materials from the site at his own cost. The material shall be approved by the Executive Engineer or his authorised agent Para 3 to 8 of Item No. 3 shall apply. The sand used as crust shall be as per C.B.R. Report

9. The measurements shall be taken on cubic metre basis.

**ITEM NO 4 : Supplying standard size stone aggregate.**

**ITEM NO.4(A) Supplying and stacking of hand broken stone coarse aggregates shippings etc of hard stone of size 25mm.to 90 mm size nominal size free of disintegrated pieces, deleterious and organic matter including Filling boxes with all lead and lift etc complete for W.B.M. road.**

1. The stone metal shall be obtained from quarries approved by the Executive Engineer prior to collections. The metal shall be of approved quality with all leads and lift. The metal shall be obtained from hard tough, sound durable .stone of close texture as is locally available and reasonably free from decay and weathering. Pieces of the stone shall be angular and roughly cubical in shape and round .elongated or flaky materials shall be allowed. The size of metal shall be 25 mm to 90 mm and shall be hand broken. All unsound weathered or disintegrated stone obtained form the upper surface layer of the quarry or other layers of boulders shall be rejected.

2. The samples of metal collected from approved quarries shall be got tested at Government recognized laboratory as may be directed to the contractor at his own cost. The test results shall conform to the standard requirements laid down for metal to be used for W.B.M. work.

3. The physical requirement for standard size metal shall conform to the test results indicated in the Table below :-

Type of Const,	Test	Test Method	Requirement
Base	(a) Los Angeles Abrasion Value	IS 2386 Part IV	50% (Maximum)
	Aggregate Impact value (b) Flakiness Index	IS 2386 Part- IV IS 5640 IS 2386 Part - 1	or 40% (Maximum) 15% (Maximum)

Frequency of test shall be as per Ministry of Surface Transport Specifications. The

4. grading requirements of the metal to be used for W.B.M. shall be as under ;

Sr. NO	Size Range	Sieve designation	Percentage by weight Passing through the sieve
1.	25 mm to 90 mm	100 mm	100
		90 mm	90-100
		50 mm	40-60
		25 mm	0-10
		20 mm	0-5

The size of metal for W.B.M shall be 25 mm to 90 mm. wherein tolerance limit for oversize shall be up to 10% and that for lower size should be up to 10%.



5. Wherever any doubt exists as to whether the above requirements are satisfied, in whole or any part of the collection, metal shall be got screened by the contractor at his own cost, if so ordered by Engineer-in-charge.

6. Stacking shall be done by filling in the standard steel boxes of 2 m x 1.5 m x 0.5 m size which shall be supplied by the Department if available on rent. Otherwise contractor shall make his own arrangements. No deduction for voids shall be made from the gross measurements. Where any doubt exists as to whether the quantity of stacks of metal in any hectometre is not confirming with the cubical content of the standard pharas ( 2 m x 1-5 m x 0.5 m) shall be got corrected by the contractor if so ordered by the Engineer-in-charge for which no extra payment shall be claimed by the contractor. If the quantity of metal in any stack in a particular Hectometre shall be paid on the basis of the quantity so found. Regular stacks shall be done by the contractor on a fairly level ground. Stacking of the metal shall be done in a manner as directed by the Engineer-in-charge. Collection of metal shall be completed in two hectometre wise as per the final requirement and measurement shall be recorded two hectometre-wise. Until the quantity of metal as per the final requirement is not collected in any two consecutive HM. and std. boxes are not filled in completely in two hectometres, measurements shall not be recorded and payments shall not be done.

7. For road work complete staking of metal as per requirement shall be carried out in 2 Km. length before spreading. The metal stacks shall be measured and recorded and got cross checked by other Deputy Executive Engineer as per rules before spreading. The collection shall always, commence at one end of the Km. and be carried continuously towards the other end unless the Engineer-in-charge shall direct otherwise.

8. The payment shall be on cubic metre basis without deduction for voids. The contractor shall maintain all stacks in regular and proper size till the whole materials shall not measured and finally accepted by the Department.

The spreading of materials shall not be allowed till the materials are fully stacked and completed kilometer wise.

9. The rate includes cost of collection, conveyance to the site with all lead and lift and filling the boxes including all labour, tools, equipment and other incidental expenses. The rates quoted are inclusive of all such tools, duties, fees, royalties, taxes, etc.

**ITEM 4 (B) Supplying & stacking of hand broken crushed stone aggregate Chippings etc of hard stone of 40mm to 63mm size nominal size free of disintegrated pieces, deleterious and organic matter including filling boxes with all lead and lift etc. complete for road work.**

Para to 1 to 9 of item of hand broken metal size 25 mm to 90 mm size will apply except the size of metal mentioned in para 1 and the table of grading requirements. These will be as under

(i) Para 1 to size will be 40 mm. to 63 mm. instead of 25 mm. to 90 mm. in para 1.

**(4)** The grading requirements of the metal to be used for W.B.M shall be as under:-

Sr. No.	Size range	Sieve Designation	Percentage by weight Passing through the sieve
1	2	3	4
1.	40 mm to 63 mm	75 mm 63 mm 50 mm 40 mm 25 mm	100-100 90-100 60-80 0-15 0-5

The size of metal for W.B.M shall be 40 mm. to 63 mm. wherein tolerance limit for oversize shall be 10 percent and that for lower size should be upto 15 percent and below 25 mm it shall be upto 5 percent. 10. Standard for acceptance at reduced rates and rejection shall be as under :-

(a) Retained on 63 mm. square mesh sieve :  
Not more than 30%

(b) Retained on 75 mm. square mesh sieve :  
Nothing will be retained & 100% metal shall be pass through the sieve. For the over size metal, payment at reduced Rate should be made as under;

(A) 90% of accepted tender rates for the metal retained between 10% and 20% square mesh sieve of 63 mm. gauge.

(B) 75% of accepted tender rates for the metal retained more than 20% and upto 30% on square mesh sieve of 63 gauge.

If more than 30% of metal is retained on specified sieve, (i.e. 63 mm. square sieve) the stack shall be

rejected. Also if any stone aggregate retained on 75 mm. sieve the stack shall be rejected.

The quality for which reduced rate will be applicable is the quantity retained on the above mentioned square mesh sieve and not the whole quantity.

For example in a stack of 1.5 cum. metal if 18% is retained on square mesh sieve of the prescribed size (i.e. 63 mm) the reduced rate of 90% will be applicable to 0.27 cu.m. only and the balance quantity size shall be paid for the accepted rates for standard size metal.

Before any secured advance for metal is paid to the contractor, the metal shall have to be tested for its quality in the laboratory. Contractors' request for such secured advance will be considered only after test results of metals are received and results are satisfactory.

[As per Government circular No. SSR 1070-1B-191-22-S of 5-3-92]

**ITEM 4 (C) Supplying and Stacking of machine Crushed Stone aggregate Chipping etc of hard Stone of 20 to 50 mm nominal size free of disintegrated pieces, deleterious and organic matter (for bitumen surface dressing etc.) as per I.R.C. Code including filling the boxes with all toad and lift etc. complete.**

1. The field of M.C. metal shall be of approved quarry as shown on the quarry chart as well as approved by the Executive Engineer prior to collection.
2. The M.C. metal shall be hard, tough, sound, durable, black trap field metal of close texture, free from decay and weathering. Each piece of the stone shall be angular and roughly cubical in shape and round elongated or flaky material shall be rejected. No round or oblong pebbles or angular chips larger or smaller than specified size shall be allowed.
3. All unsound, weathered or disintegrated stone obtained from the upper surface layer of the quarry or other layer of boulders shall be rejected. The physical requirement for standard size metal shall conform to the test results indicated in para 3 of item 4.
4. The M.C. metal shall be as nearly uniform in size as possible and shall conform to following minimum requirements of passing through the rings :

Sieve Size.	Percentage Passing through
63mm	100
50mm	95-100
40mm	35-70
20mm	0-10

5. Wherever and doubt exists as to whether the above requirement are satisfied in whole or part, the collection of M.C. metal shall be got screened by the contractor if so ordered by the Executive Engineer and for which no extra payments shall be claimed by the contractor.

6: Any collection which does not fully satisfy the above requirements is liable to be rejected altogether.

7. Stacking shall be done by filling in the standard steel pharas of 2.00 x 1.50 x 0.50 metre and no deduction of voids shall be made from the gross measurements.-

8. Regular stacks shall be done by the contractors on a fairly level ground. All the stacks shall be marked by white wash immediately on being measured and recorded by the Engineer-in-charge.

9. The rate includes blasting the rock, if any, breaking the metal, stacking, measuring in pharas etc. complete.

**ITEM - 4 (d) Supplying & stacking machine crushed stone aggregate chipping etc. of hard stone of 25 mm to 40 mm nominal size free of disintegrated pieces, deleterious and organic matter including filling the boxes with all lead and lift etc. complete on site of the work for bituminous surface dressing etc. as per I.R.C. Code.**

as per item No. 4 (c) except that gradation of Aggregate shall be as under.

Sieve Size	% by weight passing through
50mm	95-100
40mm	65-90
20mm	0-10
10mm	0-5

**ITEM-4(e) Supplying and stacking of quarry spauls materials at site including filling boxes with all lead and lift.**

1. The quarry spauls shall be approved quarry as approved by the Ex. Engineer prior to collection. Filling of boxes, shall not be allowed till the metal is broken to the specified site.
2. The quarry spaul shall be as uniform in size as possible. The quarry spaul shall be hard, tough, solid, durable of black trap quarry of close texture, free from decay and weathering. The stone shall be angular and roughly cubical in shape and round elongated or flaky materials shall be rejected. No sound or long rubble or angular chips smaller than specified size shall be allowed.
3. All unsound, weathered or disintegrated stone obtained from the under surface layer of the quarry or other layers of boulders shall be rejected.
4. Wherever any doubt as to whether above requirement are satisfied in whole or part of the collection it shall be got screened by the Contractor if so ordered by the Executive Engineer, and for which no extra payment shall be claimed by the contractor
5. Any collection which does not fully satisfy the above requirements is liable to be rejected all together.
6. Stacking shall be made by the Contractor by steel pharas of 2 M x 1.5 M x 0.5 M and no deduction of voids shall be made from the gross measurements.
7. Regular stacks shall be made by the contractor on a fairly level ground. All the stack shall be marked by white wash immediately on being measured and recorded by the Engineer-in-charge.
8. The rate includes blasting the rock, if any, breaking the quarry spauls. stacking measuring in pharas etc. complete.
9. Stacks shall as per actual requirements and any materials in excess shall have to be transported by the contractor at the places directed by the Executive Engineer at the risk and cost of the contractor.
10. While stacking materials the depositing should commence at one end of the K.M. and carried continuously towards the other end unless the Executive Engineer shall direct otherwise and as a rule measurements shall be taken after metal for half kilometer or Km. has been fully collected. Any fraction of these distance shall not be measured up.
11. The measurements shall be recorded in on Cum, basis & shall be paid accordingly,

**ITEM-4(f) Supplying and stacking rubble of hard stone on road side with all leads and lift as directed.**

1. The rubble stones shall be black in colour, shall be hard, tough, sound durable and of close texture, free from cracks and it shall be obtained from the approved quarries.
2. The rubble obtained from the top surface of the quarry is soft one and hence such soft variety shall not be accepted. All unsound weathered or disintegrated stones obtained from the upper portion of the quarry shall be rejected.
3. The quarry shall be well protected shall be dug by removing all the katcha and weathered stuff till approved quality of materials is available.
4. The length and breadth shall not exceed 1/t (f .2) times the thickness of the stones.
5. The rubble stacks shall be made on a fairly level ground and stacks shall be so made that rubble stones are stacked as close as possible so as to leave no excessive voids and no hollows are left out.
6. The tendency to prepare the stacks by keeping excessive voids or keeping hollow places shall not be tolerated.
7. The stacks shall be uniform in length and breadth and top portion shall be in level so that height at any point is uniform.
8. All the stacks shall be of standard dimensions which shall be prescribed by the Executive Engineer deduction for voids shall not be made.
9. The rubble shall be got approved by the Executive engineer, prior to collector on site or otherwise it is liable to rejection for which no claim shall be entertained.
10. The contractor shall maintain all stacks in regular and proper sizes till the whole material is collected Measured and finally accepted by the department. 15 percent spauls will be allowed for filling in interstices.
11. The rubble shall be stacked in quantities as per hectometre wise requirement as directed by the Executive Engineer or his agent.
12. Measurement shall be given only when the full quantity of a half kilometer is stacked measurements shall be recorded and paid only once in a hectometre and no piecemeal measurements shall be recorded and paid.

13. Stacks shall be made as per actual requirements and any material in excess shall have to be transported by the contractor at the places directed by the Executive Engineer at the risk and cost of the contractor.

**ITEM-4A { As approved by R & B. D Circular No. SSR / 080 / IB / 547 (28) C dl. 15.3.88)**

**1.0 Specifications for W.B.M. : (Sub base/Base Course)**

**1.0 Item** : Providing and laying water bound macadam of crushed/broken stone aggregates of .... mm compacted thickness mechanically interlocked by rolling and bonded together with screenings/approved quality of murrum or gritty material and water in accordance with the requirements of specifications, etc. complete.

**2.0 Materials :**

**2.1 Coarse aggregates : General requirements** : The coarse aggregates shall be stone metal obtained from quarries approved by the Executive Engineer prior to collection. The metals shall be of approved quality with all leads and lifts The metal shall be obtained from hard, tough, sound, durable, stone of close texture as is locally available and reasonably free from decay and weathering. Pieces of the stone shall be angular and roughly cubical in shape and round, elongated or flaky materials shall be rejected. No round or oblong pebbles or angular chips larger or smaller than specified size shall be allowed. The size of metal shall be 40 mm to 63 mm and shall be crushed/hand broken. All unsound weathered or disintegrated tone obtained from the upper surface layer of the quarry or other layers & boulders shall be rejected.

**2.1.1 Physical requirements** : The aggregates shall conform to the physical requirements as indicated in the Table No. 1 hereafter.

**Table No. 1 :**  
**Physical requirements of Coarse Aggregates for Water Bound**

S.N.	Type of Construction	Test	Test Method	Requirement
1 .	Sub Base	(a) Los Angeles Abrasion value Or Aggregate Impact Value	IS : 2386 (Part IV)  IS : 2386 (Part IV) or IS : 5640**	50% (Max.)  40% (Max.)
2.	Base	(a) Los Angeles Abrasion value * Or Aggregate Impact Value  (b) Flakiness Index	IS : 2386 (Part IV)  IS : 2386 (Part IV) or IS : 5640**  IS : 2386 (Part 1)	50% (Max )  40% (Max.)  15% (Max.)

\* Aggregates may satisfy requirements of either Two tests.

\*\* Aggregates like vricks, metal kankar laterite etc. which get softened in presence of water, shall be tested for impact value under wet condition in accordance with IS : 5640

**2.1.2 Grading requirement** : The coarse aggregates shall conform to the grading requirement as indicated in Table No. 2 below :

**Table No. 2 :**  
**Grading Requirements of Coarse Aggregates**

Grading No.	Size range	Sieve Designation	Percent by weight
2	63 mm to 40 mm	80	100
		63	85-100
		40	0-15

**2.2 Screenings/approved quality of murrum/gritty materials** : Screenings/murmm/gritty materials to fill voids in the coarse aggregate and to act as binding materials shall generally consist of predominantly non-plastic material such as murrum or gravel (other than rounded river borne material) provided the liquid limit and plasticity index of the material is below 20 & 6 respectively & fraction passing 75 micron sieve does not exceed 10 percent.

**2.2.1** As far as possible, screening/murrum/gritty materials shall conform to the gradings set forth in Table No. 3 below :

**Table No. 3 :**  
**Grading for Screenings/approved quality or murrum/gritty materials.**

Grading Classification	Size of Screenings	Sieve Designation	Percent by weight passing the Sieve
A	12-5 mm	12.5 mm	100
		10.0 mm	90-100
		4.75 mm	10-30
		1 50 micron	0-8
B	10 mm	10 mm	100
		4.75 mm	85-100
		150 mm	10-30

### **3.0 Construction Operations :**

**3.1 Preparation of base :** The subgrade/sub-base/base to receive the water bound macadam course shall be prepared to the specified grade and camber and made free of dust and other extraneous material. Any ruts or soft yielding places shall be corrected in an approved manner and rolled until firm. Where water bound macadam is to be laid over an existing black topped surface.50 mm x 50 mm furrows shall be cut at an angle of 45 degrees to the road at 1 metre intervals in the latter before laying the coarse aggregate.

**3.2 Spreading course aggregate :** The coarse aggregates shall be spread uniformly upon the prepared base in such quantities that the thickness of the compacted layer is 100 mm for grading 1 and 75-100 mm for gradings 2 and 3 as specified.

The spreading shall be done from stock piles along the side of the roadway or directly from vehicles. In no case shall the aggregate be dumped in heaps directly on the surface prepared to receive the aggregate nor shall hauling over uncompacted or partially compacted base be permitted.

The surface of the aggregates spread shall be carefully checked with templates and all high or low spots remedied by removing or adding aggregate as may be required. No segregation of large or fine particles shall be allowed and the coarse aggregate as may be required. No segregation of large or fine particles shall be allowed and the coarse aggregate as spread shall be of uniform gradation with no pockets of fine material.

The coarse aggregate shall not normally be spread more than 3 days-in advance of the subsequent construction operations.

**3.3 Rolling :** Immediately following the spreading of the coarse aggregate, rolling shall be started with three wheeled power rollers of 6 to 10 tonne capacity or tandem or vibratory rollers of approved type. The weight of the roller shall depend upon the type of the aggregate and as may be indicated by the Engineer-in-charge.

Except on super elevated portions where the rolling shall proceed from inner edge to the outer rolling shall begin from the edges gradually progressing towards the centre. First the edge/edges shall be compacted with roller running forward and backward. The roller shall then move inwards parallel to the centre line of the road, in successive passes uniformly lapping preceeding tracks by at least one half width.

Rolling shall continue until the aggregate are thoroughly keyed and the creeping of aggregates ahead of roller is longer visible. During rolling slight sprinkling of water may be done, if necessary. Rolling shall not be done when the sub grade is soft or yielding or when it causes a wave-like motion in the subgrade or sub-base course.

The rolled surface shall be checked transversely and longitudinally with templates and any irregularities corrected by loosening the surface, adding and removing necessary amounts of aggregates and re-rolling until the entire surface conforms to desired number and grade. In no case shall the use of screenings be permitted to make up depressions

**3.4 Application of screenings/ murrum/ gritty material :** After the coarse aggregate has been rolled to Clause 3.3 screenings/murrum/gritty material to completely fill the interstices shall be applied gradually over the surface. These shall not be damp or wet at the time of application. Dry rolling shall be done while the screenings/murrum/gritty material are being spread so that vibrations of the roller cause them to settle into the voids of the coarse aggregate. The screenings/murrum/gritty material shall not be dumped in piles but spread uniformly in successive thin layers either by the spreading motion of hand shovels or by mechanical spreaders or directly from trucks. Trucks operation for spreading the screenings/murrum/gritty material shall be driven as not to disturb the coarse aggregate.

The screenings/approved quality murrum/gritty material shall be applied at a slow and uniform rate (in three or more applications) so as to ensure filling of all voids. This shall be accompanied by dry rolling and brooming with mechanical brooms, hand-brooms or both. In no case shall the screenings; be applied so fast

and thick as to form cakes or ridges on the surface in such a-manner as would prevent filling of voids or prevent the direct bearing of the roller on the coarse aggregate. These operations shall continue until no more screenings can be forced into the voids of the coarse aggregate.

The spreading, rolling and brooming of screening/murum/gritty material shall be carried out in only such lengths of the road which could be completed within one day's operation.

**3.5 Sprinkling and grouting :** After the screenings/murum/gritty material have been applied. the surface shall be copiously sprinkled with water, swept and rolled Hand brooms shall be used to sweep the wet screenings/murum/gritty material into void and to distribute them evenly. The sprinkling, sweeping and rolling operations shall be continued with additional screenings applied as necessary until the coarse aggregate has been thoroughly well-bonded and firmly set in full depth and a grout has been formed of screenings/murum/gritty material Care shall be taken to see that the base or sub grade does not get damaged due to the addition of excessive quantities of water during construction.

**3.6 Setting and drying :** After the final compaction of water bound macadam course, the road shall be allowed to dry overnight Next morning hungry spots shall be filled with screenings/murum/gritty material as directed, slightly sprinkled with water if necessary and rolled. No traffic shall be allowed on the road until the macadam has set. The Engineer-in-charge shall have the discretion to stop having traffic from using the completed water bound macadam course if in his opinion it would cause excessive from to the surface.

#### **4.0 Surface Finish :**

The surface finish of construction shall conform to the following requirements :

**4.1 General :** All works performed shall conform to the lines, grades, cross sections and dimensions shown on the drawings or as directed by the Engineer-in-charge subject to the permitted tolerances described hereinafter.

**4.2 Horizontal Alignments :**Horizontal alignments shall be reckoned with respect to the centre line of the carriage way as shown on the drawings The edges of the carriage way as constructed shall be correct within a tolerance of  $\pm 25$  mm therefrom. The corresponding tolerance for edges the roadway and lower layers of payments shall  $\pm 40$  mm.

**4.3 Longitudinal profile :** The levels of the subgrade and different pavement course as constructed shall not vary from those calculated with reference to the longitudinal and cross-profile of the road shown on the drawings or as directed by the Engineer-in-charge, beyond the tolerances mentioned below:

Subgrade	$\pm 25$ mm
Sub-base	$\pm 20$ mm
Base course	$\pm 15$ mm
Wearing course	$\pm 10$ mm

provided, however, that the negative tolerance for wearing coarse shall not be permitted in conjunction with the positive tolerance for base course if the thickness of the former is thereby reduced by more than 6 mm.

**4.4 Surface Regularity :** The surface regularity of completed sub-base, base course and wearing surface in the longitudinal and transverse directions shall be within the tolerance indicated in Table No.4 below:

**Table No. 4:**  
**Permitted tolerance of surface Regularity for payment course**

Sr.No.	Type of Construction		Longitudinal Profile	Cross Profile
	Template	Maximum Permissible undulation mm	With 3metre Straight edge Maximum number of undulations permitted in any 300 mm length exceeding mm	Maximum Permissible variation from specified Profile under camber
1	2	3	4	5

1 . Water Bound Macadam with normal size metal (20-50 mm and 40-63 mm size)

12

30

8

The longitudinal profile shall be checked with a 3 metre long straight edge at the middle of each traffic lane along a line parallel to the centre line of the road. The transverse profile shall be checked with a set of three camber at intervals of 10 metres.

**4.5 Rectification :** Where the surface irregularly of subgrade and the various pavement course fall outside the specified tolerances the shall be liable to rectify these in the manner described below and to the

satisfaction of the Engineer-in-charge

When the surface is high or low, the top 75 mm shall be scarified, reshaped with added material as necessary and recompact as per the specification of W.B.M. The area treated at a place shall not be less than 5 metres long and 2 metres wide.

## **5.0 Quality Control tests during Construction :**

**5.1 General :** The materials supplied and the works carried out by the contractor shall conform to the specification prescribed in the preceding Clauses

For ensuring the requisite quality of Construction, the materials and works shall be subjected to quality control test as describe hereinafter, by the Engineer-in-charge. The testing frequencies set forth are desirable minimum and the Engineer-in-charge shall have the full authority to carry out tests as frequently as he may deem necessary to satisfy himself that the materials and works comply with the appropriate specifications.

Test procedures for the various quality control tests are indicated in the sections of the specifications or for certain test within this section. Where no specific testing procedure is mentioned the tests shall be carried out as per the prevalent engineering practice to the directions of the Engineer-in-charge

### **5.2 Test on Sub-bases & Bases :**

**5.2.1** The tests and their frequencies for W.B.M. types of Bases & sub-base shall be as given in Table No.5 below :

**Table No. 5**  
**Control tests & their frequency for sub-base & bases of water bound macadam**

<b>Sr. No.</b>	<b>Type of Construction</b>	<b>Test</b>	<b>Frequency</b>
1 .	Water Bound Macadam	(i) Agregate impact value	One test per 1200 cu.m.
		(ii) Grading	One test per 100 cu.m.
		(iii) Flakiness index	One test per 200 cu.m.
		(iv) Atterberg limit	One test per 25 cu.m. of materials for screenings.

**5.2.2 Compaction Control :** Control shall be exercised by tacking at least one measurement of density for each 1000 square metres of compacted area, or closer as required to yield the minimum number of test results for evaluating a day's work on statistical basis. The determination of density shall be in accordance with IS 2720 (Part XX VIII). Test locations shall not be based on the results of any one test but on the mean value of a set of 5-10 density determinations. The number of tests in one set of measurements shall be 5 as long as it is felt that sufficient control over materials and the method of compaction is being exercised. If considerable variations are observed between individual density results, the minimum number of tests in one set of measurement shall be increased to 10. The acceptance of work shall be subject to the condition that the mean dry density equals or exceeds the specified density and the standard deviation for any set of results is below 0.08 gm/cc. **6.0 Arrangement of Traffic during Construction :**

**6.1 General :** The contractor shall at all times carry out work on the highway in a manner creating least interference to the flow of traffic while consistent with the satisfactory execution of the same .For all work involving improvements to the existing highway the contractor shall, in accordance with the directives of the Engineer-in-charge, provided and maintain, during the execution of the work, a passage for traffic along a part of the existing way under improvement, or along a temporary diversion constructed close to the highway.

**6.2 Passage of Traffic along a part of the Existing Carriage way Improvement :** This method shall be adopted where, in the opinion of the Engineer-in-charge, the improvement works, namely widening of the existing pavement or reconstruction/repairs to cross-drainage works, could be carried out on part widths at a time and the traffic could simultaneously be passed without undue delay and difficulty on the other part. The road shoulder shall be dressed and brought in line with the pavement and maintained throughout the duration of the work to the satisfaction of the Engineer-in-charge. Where works is in progress in continuous long stretches, passing places, at least 20 metre long 6 metre wide, inclusive of the width of the existing carriage way shall be provided at half to one kilometer intervals as directed by the Engineer-in-charge. Extra treatment to shoulders where necessary, shall be given as ordered by the Engineer-in-charge.

**6.3 Passage of traffic along a Temporary Diversion :** If in the opinion of the Engineer-in-charge it is not possible to pass the traffic on part width of the carriage way for any reason, a temporary diversion close to the highway shall be constructed as directed. It shall be paved with locally available materials such as hard murrum. gravel, brick or stone metal to the specified thickness and provided with bituminous surfacing, where directed. In all case, the alignment. gradients and surface type of the diversion, including its junctions, shall be

approved by the Engineer-in-charge before the highway is detoured and closed to traffic. At cross drainage points, the contractor shall provide temporary crossings for the diversion according to the designs approved by the Engineer-in-charge.

**6.4 Traffic Safety and control :** The contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as may be required by the Engineer-in-charge for the information and protection of traffic approaching or passing through the section of the highway under improvement. Before taking up any construction, an agreed phased programme for the diversion of traffic on the highway shall be drawn up in consultation with the Engineer-in-charge.

The barricades erected on either side of the carriage/portion of the carriage way closed to traffic, shall be of strong design to resist violation, and painted with alternate black and white stripes. Red lanterns or warning lights of similar type shall be mounted on the barricades at night and kept throughout from sunset to sunrise.

At the point where traffic is to deviate from its normal path whether on temporary diversion or part width of the carriage way the channel for traffic shall be clearly marked with the aid of pavement markings painted drums or a similar device to the directions of the Engineer-in-charge. At night the passage shall be delineated with lanterns or other suitable light source.

One way traffic operation shall be established wherever the traffic is to be passed over part of the carriage way inadequate for two-lane traffic. This shall be done with the help of flagmen kept positioned on opposite sides during all hours for regulation of traffic. The flagmen shall be equipped with red and green flags and lanterns/lights.

On both sides suitable regulatory/warning signs shall be installed for the guidance of road users, On each approach at least two signs shall be put up one close to the point where transition of carriage way begins and the other 120 metres away. The signs shall be of approved design and of refractory type if so directed.

**6.5 Maintenance of Diversion and traffic control Devices :** Signs, lights, barrier and other traffic control devices, as well as the riding surface of diversions shall be maintained, in satisfactory conditions till such time they are required as directed by the Engineer-in-charge. The temporary travel way shall be kept free of dust by frequent application of water if necessary.

**6.6 Measurements for payment traffic Arrangement:** All arrangements for traffic during construction including maintenance thereof but excluding initial dressing and/or extra treatment of the shoulders and construction of temporary diversions shall be considered as incidental to the works and Contractor responsibility.

Construction of temporary diversions, initial dressing of the shoulders and extra paving at passing places shall, however be paid for as provision sum, if written order is issued to do so by the Engineer-in-charge.

## **7.0 Measurements for payments for W.B.M.**

**7.1** Water bound macadam shall be measured as finished work in position in cubic metres. The finished thickness of sub-base and base courses to be paid on volume basis shall be computed in the following manner:

Levels shall be taken before and after construction, at a grid of points 10 metres centre to centre longitudinally in straight reaches but 5 metres at curves. Normally, on two-lane roads the levels shall be taken at four positions transversely, at 0.75 and 2.75 metres from either edge of the carriage way and on single lane roads these shall be taken at two positions transversely being at 1.25 metre from either edge of the carriage way.

Suitable reference for the transverse grid line should be left in the form of embedded bricks on either ends or by the oilier means so that it is possible to locate the grid points for level measurements after each successive course is laid.

For pavements courses laid only over widening portion, at least one line of levels shall be taken on each strip of widening or more depending on the width of widening as decided by the Engineer-in-charge; notwithstanding the above, if the need may arise particularly in the case of estimation of the volume of the material for leveling course. The average thickness of the pavement source in any area shall be the arithmetical mean of the difference of levels before and after construction at all the grid points falling in that area; provided that thickness of finished work shall be limited to those shown on the drawings or approved by the Engineer-in charge.

As supplement to level measurement, the Engineer-in-charge shall have the portion to cut cores/holes to check on the depth of construction.

The contractor shall sign day to day leveling work and also original cross section, longitudinal section in token of his acceptance etc. The working sections both longitudinal and cross of the sub-grade shall be taken by the Engineer-in-charge before the actual W.B.M. work is started, The contractor, or his authorised representative shall attend day to day leveling work and sign with date the field book daily in token of his



acceptance. If there is any disagreement the contractor shall inform of it in writing to the officer concerned with specific reference to the sections before starting further work. Once the work is started no cognizance of any complaint taken. Merely not signing of the level book shall not be deemed as disagreement. The Executive Engineer shall also verify leveling work to the extent of 5 percent before commencement of WBM. WBM shall be maintained by the contractor to proper formation and grade till this item is finally measured and accepted by the Department. The measurement shall be taken on compacted WBM.

Any crack formation or screenings observed in between any layer of WBM work shall be deducted from the measurements so taken and net quantity of WBM work shall be considered for payment.

## **8.0 Rate**

**8.1** The contract unit rate for water bound macadam sub-base/base course shall be payment in full for carrying out the required operations including full compensation for all components listed below :

- (j) Making arrangements for traffic to Clause-6 except for initial treatment to shoulders and construction of diversions.
- (ii) Furnishing all materials to be incorporated in the work including all royalties, fees, rents where necessary and all leads and lifts.
- (iii) All labour, tool, equipment and incidentals to complete the work to the specifications and
- (iv) Carrying out the work in part widths of roadway where directed.

### **ITEM - 5 Spreading Soft murrum/murrum/sand/yellow/earth/bindage or road crust filling the gaps in metal and leveling to camber and gradient as directed.**

Spreading of material shall be started after the full supply in a particular K.M. is collected, measured and recorded in the measurement books. Permission of the Engineer-in-charge shall be obtained before spreading. It shall be seen that the formation is dressed to the required camber and grade. If the murrum is to be spread over the metaled surface then the spreading shall be uniform and as it has to act as binding surface it shall be used for filling the interstices of metal and forming a smooth running surface as far as possible. Murrum blindage shall be specified as blindage shall be spread evenly with a twisting motion of the baskets. No more Murrum shall be used than specified as blindage. The rate is for gross measurements and no deduction of voids shall be made. I. the murrum is to be spread over earthen embankment as a sub-base or for side shoulders or as blindage it shall be spread in a manner as directed by the Engineer-in-charge and as per required width and thickness. The contractor shall make good all unevenness, depression, projections etc. during consolidation work. Rate of this item includes all these operations except consolidation. The payment shall be made on cmt. basis.

### **ITEM - 6 Spreading the stone aggregates for soiling and W.B.M. including filling the interstices to required camber and gradient (excluding spreading of blindage) (i) 40 mm to 63 mm size H.B. Stone aggregates (H.B.) (ii) 25 mm to 90 mm size H.B. stone aggregate, (iii) Chipping varying from 6 mm to 25 mm size (iv) 20 mm to 50mm size crushed.**

1. Metal shall not be spread without permission of the Engineer-in-charge. Metal should be spread under careful supervision by trained coolies. Contractor shall see that uniform spreading as per collection of metal is done. The contractor shall spread the metal fully from the stacks without keeping any balance unless directed by the Engineer-in-charge to keep some stock in balance for making good unevenness or depressions during rolling works. To ensure that the material is spread to the required thickness, the road surface shall be marked out in to length over which the contents of heaps are to be spread. The bounds of earth or murrum (one on either side) shall be laid with a distance between them equal to the width of road to be metaled and shall be enough to prevent the loose metal from spreading during consolidation as well as to retain water used for consolidation. Payment for bunds will be made in the respective item,

2. The metal (including old metal) shall be screened and rubbish, dust, grass shall be removed and spread evenly on the prepared surface in grade and camber by using camber board etc. so as to ensure that the surface is true to camber and grade. At least two camber by using camber boards shall be in use at site. The surface shall be checked at every 50 ft. by means of template while the correctness of the camber in between shall be tested by string and corrected as required. Between the straight lengths and the curves in camber of road to superelevation shall be made very gradually as may be directed by the Engineer-in-charge.

3. The spreading of metal shall proceed only 200 mt. (max.) advance of the rolling operations. The collection and spreading of the metal shall not be carried out in one and the same kilometer.

4. At the time of rolling all surface irregularities, hollows, depressions, humps etc. shall be straight. The spreading of metal in required layer shall be done by the contractor. The rate for this item shall be paid on cmt. basis and includes all the above operations with all lead and lift except consolidation.

**Item-6(A) Spreading the stone aggregates for soiling and W.B.M. including tilling the interstices forming the surface to required camber and gradient by paver finisher (Labour charges only but including hire and operating charges of paver)**

Specification same as item No.6 except that metal or stone aggregate shall be spread by paver finisher and not manually. Besides all the labour charges, the rate also includes the hire and operating charges of paver. The contractor shall have to make his own arrangement for procuring appropriate paver.

**Item-6(B) Spreading quarry spalls in grade & camber complete.**

1. The quarry spalls shall only be allowed to be spread after the written permission of the Executive Engineer is obtained.
2. The permission for spreading the metal shall be given by the Executive Engineer if
  - (i) The full quantity of a particular mile(kilometer) is completely collected.
  - (ii) The collection of metal is also completed in the adjoining two miles (Kilometers)
  - (iii) The measurements are recorded in the Measurement book.
3. Q. S. shall, if required, be screened, if containing rubbish dust, grass etc. it shall then be filled in basket & conveyed where required and spread evenly on the prepared surface be given twisting motion to the basket at the time of spreading. The surface shall then (15 m) by means of templates and strings as well as with camber boards and spirit level.
4. Between the straight length and curves and at the meeting points of the convex and concave portions of the reverse curves, the change in camber of the road, due to super elevations shall be made as well as with camber boards and spirit level.
5. At the time of spreading Q. S. a small quantity (about 4 to 5 percent) of metal as directed, shall be retained at the first instance. It shall be spread later 0:1 after partial consolidated as required to rectify the camber and to fill up the hollows if any. No extra amount shall be paid for this.
6. Measurements shall be paid as per the measurements of collection less the quantity remained to be spread and on cubic metre basis.
7. The rate includes the cost of screening the Q. S. if any spreading, sectioning, with template and adding reserved quota of metal, while oiling is in progress for making good hollows and camber.
8. The surface shall be brought to the required camber which shall be checked at every 50 ft. (15 M) by means of templates while the necessary of the in between shall be tested by strings and corrected as required.
9. The centre line shall first be marked in the subgrade which is properly consolidated and has uniform camber and grade as required
10. The Q. S. shall be laid for a small length on 25 ft. (8 M.) and then the edge stones shall be laid.
11. Pegs shall be driven on either side of the road and joined with strings true and parallel with a distance between them equal to the width be laid with over the metal Similarly.
12. The Q. S. shall be laid as close as possible so as to leave minimum possible interstices and voids.
13. Before rolling is allowed on soiling the side berms shall be filled up to the top of the soiling and at least 3'-0" (1 m.) on either side so as to prevent metal layer getting disturbed at times during rolling. The rate is inclusive of all the operations as stated above.

**ITEM-7 Rolling & Consolidating water bound macadam (except laterite & kankar) incl. watering not exceeding 150 mm thickness (main layer including binding materials) including filling in depression which occur during the process with power roller exceeding 8.0 M.T. but not exceeding 12.0 M.T.**

1. Immediately following the spreading of the coarse aggregates rolling shall be with three wheeled power rollers of 8 to 10 tonne capacity or tandem roller or equivalent vibratory roller. The weight of the roller shall depend upon the type of the aggregate and be indicated by Engineer in-charge.
2. Except on super elevated portions where the rolling shall proceed from inner edge to outer, rolling shall begin from the edges gradually progressing towards the centre. First the edge/edges shall be compacted with roller running forward and backward. The roller shall then move inwards parallel to center line of the road in successive passes uniformly lapping preceding tracks by at least one half the width.
3. Rolling shall continue until the aggregate is thoroughly keyed and the creeping of the aggregate ahead of the roller is no longer visible. During Rolling slight sprinkling of water may be done, if necessary. Rolling shall not be done when the sub-grade is soft or yielding or when it causes a wave like motion in the sub-grade or sub-base course.
4. The rolled surface shall be checked transversely and longitudinal with templates and any irregularities corrected by loosening the surface, adding or removing necessary amounts of aggregate and rerolling until, the entire surface conforms to desired camber and grade. In no case shall the use of screening be permitted to make up depression.

5. The blindage material where it is required to be used shall be applied successively in two or more thin layers at a slow and uniform rate. After each application, the surface shall be copiously sprinkled with water, the resulting slurry swept in with hand brooms or mechanical brooms to fill the voids properly and rolled during which water shall be applied to the wheels of the rollers if necessary to wash down the binding material sticking to them. These operations shall continue until the resulting slurry after filling of voids forms a wave ahead of the moving roller.

6. After the final compaction of water bound macadam course the road shall be allowed to dry overnight. Next morning hungry spots shall be filled with screenings of binding materials as directed lightly sprinkled with water if necessary and rolled. No traffic shall be allowed on the road until the macadam has set. The Engineer-in-charge shall have the discretion to stop hauling traffic from using the completed water bound macadam course if in his opinion it would cause excessive damage to the surface.

7. Payment will be made on Smt. basis of the finished work and shall include cost of watering, rent of machinery, cost of fuel, wages of drivers and cleaners and murrum bund etc.

**ITEM-8 Providing and fixing indicator stone of approved stone as per I.R.C. type design in C.C. 1:4:8 including whitewashing etc. complete.**

**(1) Fixing in earth.**

1. Indicator stones shall be of approved quality and of the size 20 cm x 20 cm its length shall not be less than 80 cms. The top 38 cm shall be chisel dressed on all sides. The size shape and dimension of the indicator stone shall be exact and stones shall be neatly dressed and finished before fixing. The indicator stones shall be fixed firmly in position in embankment or cutting as the case may be. The exposed part of the indicator stone shall be done by the contractor at his own cost. The measurement for payment shall be per number of indicator stone fixed in position.

2. Unit rate indicator stone includes the cost of all materials, labour, tools, fixing, and white washing as directed by the Engineer-in-charge.

**(2) Fixing in C.C. 1:5:10**

Specification same as 8(1) above except that the indicator stone shall be fixed in C.C. 1:5:10 which will consist of one part of cement, five parts of good sand and ten parts of good brick bats. Rate includes all labour and curing etc. necessary for concrete.

**ITEM-9 Providing and fixing ordinary kilometre stone of precast C.C. 1:2:4 including necessary reinforcement as per I.R.C. type design in C.C. 1:4:8 including and paints and letter etc. complete, (for N.H., S.H. and M.D.R.)**

1. Kilometre stone shall be of approved quality and shall be either black Rajula stone or of precast 1:2:4 R.C.C. as specified in the item.

2. The size manner of fixing, painting and lettering of K.M. stone shall conform specification as per I.R.C.-8 (Type design for Highway kilometre stones). The fixing of K.M. stone shall be carried out in ordinary concrete of grade specified in the item using hand broken metal, field metal or gravel. The measurement for payment shall be made per No. of K.M. stone fixed in position.

3. Unit rate for kilometre stone includes the cost of all materials, labour, tools, fixing, finishing, curing, lettering and painting as directed by the Engineer-in-charge.

**ITEM-10 Providing and fixing fifth kilometre stone of precast C.C. 1:2:4 including necessary reinforcement as per I.R.C. type design in C.C. 1:4:8 including painting and lettering etc. complete, (for N.H., S.H. and M.D.R.)**

1. The work shall be carried out as per the item of ordinary kilometre stone except that the size of the fifth kilometre stone shall be bigger than that of ordinary kilometre stone as per I.R.C.-8 (Type design for highway kilometre stones). The fixing of K.M. stone shall be in ordinary concrete of grade specified in the item. The measurement for payment as well as the operation included in the unit rate shall be as per ordinary kilometre stone.

**ITEM-11 Providing and fixing hectometre stone as per I.R.C. type design including painting lettering etc. complete.**

**(1) Fixing in Earth :**

The work shall be carried out as per the item of ordinary kilometre stone except that the size of Hectometre stone shall be smaller than that of ordinary kilometre stone as per I.R.C. 26 (Type design for 200 metre stones) and fixing shall be in earth. The measurement for payment as well as the operations included in the unit rate shall be as per ordinary kilometre stone.

**(2) Fixing in C. C. 1:5:10**

Specification same as 11 (1) above except that the indicator stone shall be fixed in C.C. 1:5:10 which will consist of one part of cement, five part of good sand and ten parts of good brick bats. Rate includes all labour and curing etc. necessary for concrete.

**ITEM-12 Providing and fixing guard stone as per I.R.C. type design including white washing etc. Complete.**

**(1) Fixing in Earth/Wearing Coat:**

1 . The guard stone shall be of approved quality and of 20 cm x 15 cm. size and its length shall not be less than 75 cms. The top portion shall be rounded. The top 38 cm. shall be chisel dressed on all sides. The size, shape and dimensions of the guard stones shall be exact and shall be neatly dressed and finished.

2. The guard stone shall be fixed in position as directed by the Engineer-in-charge in earth/wearing coat. If the guard stone shall be fixed in wearing coat, the equivalent volume covered by the guard stones shall be deducted from the gross measured quantity of wearing coat. The exposed part of the guard stones shall be given three coats of white wash. Any excavation necessary for fixing of the guard stones shall be done by the contractor at his own cost; The measurement for payment shall be per number of guard stone fixed in position.

3. Unit rate of guard stone includes the cost of all materials, labours, tools, fixing & white washing as directed by the Engineer-in-charge.

4. In case of Deep/Causeway the guard stone shall be fixed in masonry of head wall as directed by Engineer-in-charge.

**(2) Fixing in C.C. 1:5:10**

Specification same as 12 (1) above except that the indicator stone shall be fixed in C.C. 1:5:10 which will consist of one part of cement, five part of good sand and ten parts of good brick bats. Rate includes all labour and curing etc. necessary for concrete.

**ITEM-13 Supplying and fixing road sign board of M.S. Plates and angle iron including painting, lettering etc. complete including fixing in C.C. 1:4:8 with necessary excavation etc. complete as per I.R.C. design.**

**(1) Non reflective type :**

1 . The board shall consist of a 90 cm x 90 cm triangular plate of 6 mm thickness at the top and a 90 cm x 61 cm rectangular plate of 6 mm thickness below if fixed at suitable distance. This shall be fixed to the angles iron post of 75 mm x 75 mm x 6 mm size by means of welding or riveting as directed by the Engineer-in-charge. The angle iron post shall be split at the bottom end to 10 cm (minimum) in length and shall be fixed at right angle to the central line of the road in ordinary concrete of grade as specified in the item/using hand broken metal, field metal or gravel. Two steel bars of 12 mm dia, shall also be embedded in concrete for fixing as directed by the Engineer-in-charge. The top of the post shall be at a height of 25 cm. as above the ground level. Concrete platform shall be of the size 45 cm x 45 cm and shall project 2.5 cm above ground level and shall be at least 60 cm below ground level. Total height of post shall be 3 mt. (minimum). The exposed platform shall be neatly finished and its shape shall be as directed by the Engineer-in-charge.

2. The post will be painted with two coats alternatively in black and white strips 23 cm in height after applying one coat of anticorrosive paint. The paint shall be of approved quality. The board shall be painted with approved colour and lettering shall be in accordance with I.R.C. 30 (Standard Letters and Numerals of Different Heights for use on Highway designs) and as per notified signs of Motor Vehicle Act. respectively.

3. The measurement for payment shall be per number of sign board fixed in position.

4. The unit rate includes the cost of materials, labour tools, drilling of holes, riveting or welding, fixing, curing, lettering, painting as directed by the Engineer-in-charge.

**(2) Reflective Type**

Specifications will be same as 13 (1) above except that signs shall be reflective type.

**ITEM-14 Providing and fixing village name boards as per standard I.R.C. type design of steel plate including painting, lettering etc. complete with fixing in C.C. 1:4:8 block with necessary excavation.**

1 . The work shall be carried out as per the item of sign boards except that there shall not be top plate of 90 cm x 90 cm triangular shape and lower plate of 90 cm x 61 cm rectangular plate of 6 mm thickness shall be fixed at top facing towards the direction of the village.

2. The board plate shall be painted in black colour Letters & figures shall be painted in white colour with an arrow directing towards the village painting & lettering shall be done both sides. The size of the letters & figures as well as thickness of arrow will be as directed by the Engineer-in-charge.

3. The measurement for payment as well as operations included in the unit rate shall be .as per item of sign boards.

**ITEM-15 Supplying of machine crushed stone aggregate chipping etc. of hard stone following nominal size free of disintegrated pieces deleterious and organic matter including filling the boxes with all lead and lift etc. complete on site of road.**

**(a) Kapchi and (b) Grit**

1. Stone chips shall consist of regular fragments of clean, hard, tough and durable rock of uniform quality throughout. They shall be obtained by crushing rock, and shall be free of elongated and flaky pieces, soft and disintegrated materials, and vegetable or deleterious matter They shall satisfy the quality requirements set forth as shown hereafter.

Sr.No.	Test	Test Method.	Requirement.
1	Los Angeles Abrasion Value	IS : 2386 (part IV)*	35% Maximum
2.	Aggregate Impact Value	-do-*	30% Maximum
3	Flakiness Index	IS : 2385 (Part I)	30% Maximum
4.	Stripping Value	IS : 6241	25% Maximum
5.	Water Absorption	IS : 2386 (Part III)	2% Maximum

\* Aggregate may satisfy requirement of either of the two tests.

Size of stone chips shall be as under :-

(a) Kapchi : 12 mm size : Passing 20 mm sieve and retained on 10 mm sieve.

(b) Grit : 5 mm size : Passing 10 mm sieve and retained on 2.36 mm sieve.

3. The samples of stones chips collected from approved quarries shall be got tested at Government recognised laboratory as may be directed to the contractor at his own cost. The result shall conform to the standard requirements laid down in para (i) above. Collection of stone chips as per approved samples shall be allowed by the Engineer-in-charge. Testing charges shall be borne by the contractor Payment at full rates for the stones chips shall not be made till the test results from the laboratory are received and found acceptable

4. Stacking shall be done by filling in standard steel boxes of 2.0 m x 1.5 m x 0.5 m size which shall be supplied by the Department if available on rent, otherwise contractor shall make his own arrangements. No deduction for voids shall be made from the gross measurements. Where any doubt exist as to whether the quantity of stacks in any hectometre is not confirming with the cubic content of the standard pharas (2.5 m x 1.5 m x 0.5 m) it shall be got corrected by the Contractor if so ordered by the Engineer-in-charge for which no extra payment shall be claimed by the Contractor If the quantity in any stack in a particular hectometre is found to be less than the standard measurements viz.. 1.5 cmt. the entire collection in the hectometre shall be paid on the quantity of the smallest stack so found Regular stacks shall be done by the Contractor on a fairly level ground. Stacking shall be done in a manner as directed by the Engineer-in-charge.

5. The collection shall always commence at one end of the Kilometre and be carried out continuously towards the other end, unless the Engineer-in -charge directs otherwise.

6. Control on quality of material shall be exercised by the Engineer-in-charge by carrying out the following tests at the frequencies shown against each.

Sr. No.	Type of Construction Material	Test	Frequency
1.	Grit/Kapchi for open graded Carpet and seal coat.	(i) Aggregate impact value (ii) Flakiness Index of aggregate (iii) Stripping value & water absorption of aggregates  (iv) Grading of aggregates	One test per 100 cu.m. One test per 100 cu.m. initially one set of 3 representative specimens for each source of supply subsequently when warranted by changes in the quality of aggregates One test per 100 cu.m. of aggregate

8. The payment shall be made on cubic metre basis without deduction for voids. The contractor shall be responsible for preserving the materials throughout the period the contract remains in force The use of materials shall not be allowed till the materials conveyance to the site with all lead and lift and filling boxes including all labour, tools, equipment and other incidental expenses.

**ITEM - 16(A)Supplying and Stacking 80/10C asphalt as per requirement including carting, stacking, and protecting on road side etc. complete. (If asphalt is supplied by Department)**

1. Bitumen shall be issued by the Department at the rate and place mentioned in Schedule 'A' of the tender. It shall have to be carted by the contractor to the site of work at his own cost Empty asphalt drums shall have to be returned free of cost to P.W.D. store from where they are issued or as directed, if so provided in

Schedule 'A' Any damage caused to the asphalt drum or loss of asphalt after issue from the store shall be the responsibility of the contractor. Drums of asphalt shall be so stored as to allow easy inspection and in such place a will not damage the drums and cause leakage or allow water and other foreign matter to enter, (dilute may be included in labour)

2. Bitumen shall be issued by department in bulk at the rate and places as shown in Schedule-A. For bulk asphalt contractor shall have to make adequate arrangement taking bulk asphalt at plant site according to requirement.

Bulk asphalt shall be used as per instructions of the Engineer in charge of work. The tanker of bulk asphalt should be unloaded in asphalt tank or in empty drums on site of work as directed. Proper rate for carting shall be deducted as per carting rate, if the bulk asphalt is given on site of work instead of place shown in Schedule-A. The carting of bulk asphalt shall be made by the contractor from Koyali Refinery as per Schedule-A.

**Keeping Records : -**

The department shall keep a day to day account of the supply and use of the asphalt in separate bound registers having number pages and in the proforma prescribed by the department. The contractor's responsible representatives shall also sign day to day in the register

3. The payment shall be made on tonnage basis.

4. The contract unit rate of supplying bitumen shall include

(1) Obtaining the bitumen from the Department.

(2) Transporting to- site.

(3) Storing, stacking and protecting

(4) Keeping record of supply and use and

(5) Returning of handing over the empty drums in good condition to the Department if so provided in Schedule -'A'.

**ITEM - 16(B) Supplying and Stacking 80/100 asphalt as per requirement including carting, stacking, testing and protecting on road side etc. complete. (If asphalt is supplied by Contractor)**

1. Bitumen shall be procured directly from refinery by the Contractor. The contractor shall make adequate arrangements for storing bulk asphalt at plant site. The Contractor will produce in original the bill of Refinery all the gate passes issued by the refinery and the number of transport tanker. The Contractor will also produce the Test Certificate regarding the grade of asphalt issued by Refinery. The Department does not undertake to furnish "P" form (regarding Sales Tax Concessions) for purchase of asphalt.

2. On receipt and storage of bitumen, The bitumen shall be got tested in GERI Laboratory or other Laboratories approved by R. & B Department. The frequency of test is specified in Para 5.

3. The Contractor will establish OR site of work site laboratory in area not less than 25 sq.m. with pucca construction and equipped with instruments to enable to carry out the following tests.

1. Penetration test as per I.S. 1203
2. Softening point test as per I.S. 1204
3. Ductility test as per I.S. 1208
4. Viscosity test as per I.S. 1206
5. Specification Gravity test as per I.S. 1202

The above instruments should be certified as per I.S. standard, the same should be regularly calibrated and should be maintained in efficient condition.

4. The Registers for use, temperature and other quality requirements of bitumen will be maintained at Plant site. The registers will be printed, as per formats approved by R.&B. Department and authorised for use by the Engineer-in-charge. The entries in the registers will be made by the departmental representative and signed by the contractor or his authorised representative.

**5. Frequency of Tests :**

As regards quality of binder, three tests of one sample per two tankers will be done on plant site. The tests will be carried out as per Table 900.4 of Section 900 of M.O.S.T. standard specifications. The frequency of use of specifications will be as under:

No. of Tanker	No. of Tests	No. of Tanker	No. of Tests
Upto 10	One	50. to 100	Four
11 to 20	Two	For further every 50 tanker	One
20 to 50	Three		

**ITEM-17 2 cm thick open graded pre-mix carpet surfacing with 0.27 cum. of stone chipping (12 mm size 0.18 cum and 10 mm size 0.09 cum) mixed with 14.4 kg. of bitumen per 10 sq.m. of road**

**Surface excluding rolling and consolidation etc. complete. ( Stone chipping and bitumen shall be paid seperately).**

**1. With tack coat at rate of 5.00 Kg/10 sq.m.**

**2. With tack coat at rate of 10.0 kg/10 sq.m.**

1. This work shall consist of laying an open graded carpet of 2 cm thickness in a single course and seal coat ( excluding cost of asphalt, stone chips and rolling) composed of suitable small size aggregates premixed with a bituminous binder on a previously prepared base.

2. The materials shall be proportioned as per quantities given in the following table.

Quantities of materials required for 10 smt. of road surface for 2 cm. thick open – graded premix carpet with seal coat.

**Aggregate for Carpet**

(A)	Stone Chipping	12mm size	0.18 cubic metre
(B)	Stone Chipping	6mm size	0.09 cubic metre
<b>Total</b>			<b>0.27 cubic metre</b>

**Aggregate for seal coat :**

Stone chipping	6mm size	0.12 cubic metre
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**Binder for premixing ( Quantities in terms of straight run bitumen)**

**(i) For Carpet**

(A)	For 0.18 cmt of 12mm size stone chipping at 52Kg/cmt	9.36	Kg.
(B)	For 0.18 cmt of 6mm size stone chpping at 64kg/cmt	5.04	Kg.
<b>Total</b>		<b>14.40</b>	<b>Kg.</b>

**(ii) For Seal coat**

(A)	For 0.12 cmt 10mm size stone chipping at 64kg/cmt.	7.68	Kg.
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3. Carpet shall not be laid during rainy weather or when the base course is damp or wet or when the atmospheric temperature in shade is 16 degree centigrade or below.

4. The underlying base on which the bituminous carpet is to be laid shall be prepared, shaped and conditioned to the specified lines, grade and cross – section as directed by the Engineer in charge. The surface shall be well cleaned with wire brushed, sweeping with brooms and finally dusting with sacks as necessary.

5. **Tack coat** : This work shall consist of application of a single coat of bituminous material to an existing road surface preparatory to another bituminous construction. The temperature of bitumen at the time of application shall be in the range of 160.0 deg. Centigrade to 175.0 deg. Centigrade.

6. Binder shall be heated to temperature appropriate to the grade of bitumen used and approved by the Engineer in charge at the rate specified hereafter. The rate of spread in terms of straight run bitumen shall be 5 kg per 10 square metre area for untreated water bound macadam surface. The binder shall be applied uniformly. The tack coat shall be applied just ahead of the on coming bituminous construction. For the purpose of calculating consumption, wastage of bitumen will not be permitted beyond 2.5% Excess consumption over 2.5% will be charged at panel rate.

7. Mixers of approved type shall be employed for mixing the aggregates with the bituminous binder. The binder shall be heated to the temperature approved by the Engineer in charge, avoiding local overheating and ensuring a continuous supply. The aggregates shall be dry before they are placed in the mixer. After about 15 seconds of dry mixing, the heated binder shall be distributed over the aggregates at the rate specified. Kerosene to an extent of 4% to 6% of asphalt shall be provided by the contractor according to the requirement at the contractors cost. The mixing of binder with chipping shall be continued until the chipping are thoroughly coated with the binder. The mix shall be immediately transported from the mixer to the point of use in suitable vehicles or wheel barrows. The vehicles employed for transport shall be clean & be covered over in transit, if so directed.

8. The premixed material shall be spread on the road surface with rakes to the required thickness and camber, or distributed evenly with the help of a drag spreader, without any undue loss of time. The chamber shall be checked by means of camber boards and inequalities evened out. As soon as sufficient length of bituminous material has been laid rolling shall commence ( Rolling shall be done departmentally) When the roller has passed over the whole area once, any high spots or depressions which become apparent shall be corrected by removing or adding premixed materials. The contractor shall provide necessary labour for keeping the roller wheels damp during rolling so as to prevent the premix from adhering to the wheels and being picked

up. The edges along and transverse of the carpet laid and compacted earlier shall be cut to their full depth so as to expose fresh surface which shall be painted with a thin surface coat of appropriate binder before the new mix is placed against.

9. Seal coat for preparation of premix and spreading, etc Para 7 & 8 above shall apply. The coat shall be applied immediately after the laying of bituminous course of carpet. Before application of seal coat, materials surface shall be cleaned free of any dust or other extraneous matter.

10. Coarse sand or stone dust flushing at the rate of 0.03 cmt/10 smt shall be done on asphalt surface at the contractors own cost.

11. Traffic may be allowed soon after final rolling when the premixed materials has cooled down to surrounding temperature.

12. Control on quality works shall be exercised by the Engineer-in-charge by carrying out the following tests at the frequencies shown against each :

Sr.No.	Type of Const. Material.	Test.	Frequency.
1	Tack Coat	(i) Binder temperature for application	At regular close intervals.
		(ii) Rate of Spread of binder of aggregate.	Two test per day.
2	Open graded premix carpet with seal coat.	(i) Temperature of binder at application.	At regular close intervals.
		(ii) Binder content (vide As/TM : D2172).	Two tests per day for work of every 3km length in one lane.
		(iii) Rate of spread of mixed material.	Regular control throughout checks on material & layer thickness.

13. Para 13 to 17 : As regards arrangements for traffic para 29 of 33 of semidense carpet shall apply.

18. Open graded carpet and seal coat shall be measured in cubic metres on the basis of stone chips actually used.

19. The contract unit rate for open grade carpet and seal coat (excluding cost of asphalt. stone chips and rolling) shall be payment in full for carrying out the required operations including full compensation for

- (1) Preparation of base.
- (2) Providing all materials like fuel, lubricants, kerosene and coarse sand or stone dust for flushing with all-leads and lifts.
- (3) All labours, tools, equipment and incidentals.
- (4) Making arrangements for control and safety of traffic.

**ITEM-18 Providing and laying 20/25mm thick bituminous open graded carpet with B.T. aggregates 0.66 cm/M.T. using bitumenious for tack coat at the rate of @ rate of 10 Kg./10 Smt. on W.B.M. surface and 5 Kg.710 Smt. for B.T. surface and for mixing at the rate of 32.8 kg/M.T. of total mix i.e.3.28 per M.T. of total mix and heating asphalt & aggregate by continuous batching hot mix plant and spreading the same by paver finisher including consolidation with power road roller including providing equipment T & P oil, fire wood ,kerosene labour charges etc. compt. using contractor's own machineries hot mix plant and paver finisher including . flushing of sand 0.30 cmt/100 sq.mt.**

The work shall consist of construction in a single course of 20/25 mm. thick premixed carpet as course, on a previously prepared base Single course shall also include additional thickness if any to remove unevenness of the existing surface.

1. The coarse aggregates shall consist of crushed stone only. These, shall be clean, strong durable of fairly cubical shape. free of disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements set forth as under.

#### Physical Requirements of Aggregates for Bituminous Macadam.

Sr. No.	Test	Test Method	Requirement.
1	Los Angles Abrasion Value	IS : 2386 (Part IV)*	35% Maximum
2	Aggregate Impact Value	-do-	30% Maximum
3	Flakiness Index	IS : 2386 (Part I)	30% Maximum
4	Stripping Value	IS : 6241	25% Maximum
5	Water Absorption	IS : 2386 (Part III)	2% Maximum



\* Aggregate may satisfy requirements of either of the two tests.

3. The fine aggregates shall consist of crushed run screening, natural sand or mixture of both. There shall be clean hard durable, uncoated, dry and free from injurious, soft or flaky pieces and organic or deleterious substance.
4. The filler, where required, shall be an inert material, the whole of which passes 600 micron sieve at least 90 percent passing 150 micron sieve and not less than 70 percent passing 75 micron sieve. The filler shall be cement, stone dust, hydrated lime or fly ash approved by the Engineer in charge.
5. The mineral aggregates, including mineral filler, shall be so graded or combined as to conform to the grading as under.

**Table Aggregate gradation for Asphalt carpet.**

Sieve Size	% by weight passing the Sieve for 20/35 mm
20 mm	100
12.5 mm	70-100
10.0 mm	20-40
4.75 mm	0-5
2.36 mm	

6. The samples of aggregate of requires gradings for the work shall be got approved from the Engineer-in-charge prior to transportation and collection on plant site. Unapproved materials shall have to be removed from the plant site by the contractor at his own cost. If contractor fails to remove the inferior type of materials from the plant site, the same will be removed by the Department at the cost of the Contractor Collection of aggregate shall be in different stacks according to various sizes of aggregates.

7. For the purpose of collection of materials, plant site shall be established at suitable place, where hot mix plant shall be installed. Department will extend all necessary co-operation in helping Contractor to get nearby Government land of establishing plant site. However, department is not responsible if no such land is made available to the Contractor and in that case, the Contractor will have to make his own arrangement for the same. Incoming material shall be recorded in a register for the purpose of record.

8. The binder shall be straight run bitumen of a suitable grade satisfying the requirements of IS:73. Bitumen shall be 60/80/100 grade and shall be supplied by the department at the rate and place as mentioned in Schedule "A" of the tender and it shall have to be carted, by the Contractor to the site of work at his own cost. Empty asphalt drums shall have to be returned free of cost to P.W.D. Store from where they are issued or as directed, if so provided in Schedule 'A' Any damage caused to the asphalt drums or loss of asphalt after issue from store shall be the responsibility of the Contractor. Drums of asphalt shall be so stored so as to allow easy inspection and in such place as will not damage the drums and cause the leakage of allow water and other foreign matter to enter For the purpose of calculating consumption, wastage will not be allowed beyond 2.5 percent Excess consumption over 2.5 percent will be charged at a panel rate.

9. In case bitumen is to be issued by department in bulk, the same shall be issued to the Contractor at plant site by tankers at the same rate as shown in Schedule 'A'. Contractor shall have to make adequate arrangement for slacking bulk asphalt at plant site according to the requirement No deduction in rate will be made for supplying heated bulk asphalt.

10. The asphalt should not be used as a fuel. If however, Contractor is found to be using asphalt as fuel, The quantity of asphalt utilised shall be assessed, by the Executive Engineer whose decision will be final and binding to the Contractor who will be charged at double the rate provided in Schedule 'A' of the agreement even though the total consumption of asphalt may be within the theoretical consumption.

11. Department shall keep a day to day account of the supply and consumption of bitumen in a separate bound register having numbered pages and the proforma prescribed by the Department. Day to day signature of the Contractor's representative shall be obtained in this register Issue rate of bitumen includes (i) Obtaining asphalt from Department's store, (ii) Transporting to site, (iii) Storing and stacking, (iv) Keeping records of supply and consumption and (v) returning the empty drums in good condition to the Department.

12. Semi dense carpet shall not be laid during rainy weather or when the base course is damp or wet.

13. The base on which semidense carpet is to be laid shall be thoroughly swept and scraped clean and free of dust and foreign matter.

14. The work shall consist of application of a single coat of bituminous to an existing road surface preparatory to another bituminous construction. The temperature of bitumen at the time of application shall be in the range of 160 Degree centigrade to 175 degree centigrade.

15. Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge and sprayed on the base at the rate specified hereafter. The rate, of spread of straight run" bitumen for tack coat shall be 5 kg per 10 square meter area for an existing bitumen treated surface. The binder shall be applied uniformly. The tack coat shall be applied just ahead of the on coming bituminous construction. In case carpe Us to be laid on W.B.M. surface. rate of spread of Bitumen for tack cost will be 40 kg./10smt.

16; The binder content for premixing shall be 3.28 percent by weight of the total mix unless otherwise specified. The quantities of aggregates shall be sufficient to yield the specified thickness after compaction.

17. The contractor shall get the job-mix formula for the mix approved, by the Engineer-in-charge before starting the work. In order to obtain the required type of mix, the department may change the proportion of bitumen and gradings of aggregate and contractor shall have to collect the materials accordingly. In case of increase in proportion of bitumen the increased or decreased quantity will be adjusted at the rate provided in Schedule 'A' The contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job-mix formula and producing a uniform mix,

18. Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant may be either a batch type or a continuous one, having coordinated set of essential unit such as dryer for heating the aggregates, a binder heating and control unit for metering out the correct quantity of heated binder together with a paddle mixer for intimate mixing of the binder and aggregate. .

19. The temperature of binder at the time of mixing shall be the range of 150 -177 degree centigrade and of "aggregates in the range of 155 - 163 degree centigrade. .Provided also that, at no time shall the difference in temperature between the aggregates and the binder exceed 14 degree centigrade.

20. Mixing shall be thorough to ensure that a homogeneous mixture is obtained in which all the particles to the mineral aggregates are coated uniformly.

21. The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shaft be clean and be covered over during transit if so directed by the Engineer-in-charge.

22. The mix transported from the hot mix plant to the site, shall be spread by means of a self propelled mechanical paver with suitable screeds capable of spreading, tamping and finishing the mix, to specified grade, lines and cross sections. The temperature of mix at the time of laying shall be in range 121-163 degree centigrade.

23. Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road. Longitudinal joints shall be offset by at least 150 mm. from those in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

24. Immediately after the spreading of mix, it shall be thoroughly compacted by 8-10 tonnes 3 Wheel . roller moving at a speed not exceeding 5 km per hour.

25. The roller wheels shall be kept damp to prevent the mix from adhering to them but in no case shall fuel lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge arid progress towards the centre except on super elevated portions. When it shall progress from the lower to upper edge parallel to the centre line of the pavement. The roller should/proceed on the fresh material with rear or mixed wheel leading or as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated.

26. Sand or stone dust flushing at the rate of 0.03 cmt / 10 smt. shall be done on asphalt surface for which no separate payment will be made.

27. Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

28. Surface finish and quality control of work : Control on the quality of materials and works shall be exercised by the Engineer-in-charge by carrying out the following test at the frequencies shown against each :-

Sr. No.	Type of Construction	Test	Frequency.
1.	Tack Coat	(i) Binder temperature for application	At regular close intervals.
2.	Semi-Dense Carpet	(ii) Rate of spread of binder	Two test per day
		(i) Aggregate Impact Value	One test per 100 Cu. m. of aggre.
		(ii) Flakiness Index of Aggre.	-Do-
		(iii) Stripping Value	-Do-
		(iv) Mix Grading	One set of test on individual constituents and mixed aggregates from the dryer for each 100 tonnes of mix subject to a minimum of two test per day
		(v) Temperature of binder in the boiler, aggregate in the dryer and mix at the time of laying and rolling	At regular close intervals.
		(vi) Control of binder content and gradation in the mix (Binder Content test vide ASTM D-2172)	One test for each 100 tonnes of mix subject to max. of two test per day per plant
		(vii) rate of spread mix material	Regular control through checks on layer thickness

29. The contractor shall at all times carry out work on the highway in a manner creating least interference to the flow of traffic while consistent with the satisfactory execution of the same. For all work involving improvements to the existing highway, the contractor shall in accordance with the directives if the Engineer-in-charge provide and maintain, during the execution of the work, a passage for traffic either along a part of the existing carriage way under improvement or on diversion.

30. In case of the improvement works, namely widening strengthening of the existing pavement or reconstruction repairs-to cross-drainage works. Where such works could be carried out on part widths at a time and the traffic could simultaneously be passed without undue delay and difficulty on the other part; the road shoulder shall be dressed and brought in-line with the pavement and maintained throughout out the duration of the work to the satisfaction of the Engineer-in-charge Where work is continued on long stretches, passing places, at least 20 metre long and 6 metre wide inclusive of the width of the existing carriage way shall be provided at

half or one kilometer intervals as directed by the Engineer-in-charge. Extra treatment to shoulders where necessary, shall be given as ordered by the Engineer-in-charge

31. The contractor shall take the all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades including signs, marking lights and flagmen as may be required, by the Engineer-in-charge for the information and protection of traffic approaching or passing through the section, of the highway under improvement. Before taking up any construction an agreed phased programme for the control of traffic on the highway shall be drawn up in consultation with the Engineer-in-charge.

32. The barricades erected on either side of the carriage way/portion of the carriage way closed to traffic shall be strong to resist violation, and painted with alternate black and white stripes. Red lanterns or warning lights of similar type shall be mounted on the barricades at night and kept lit throughout from sunset to sunrise. At the points where traffic is to deviate from its normal path the channel for traffic shall be clearly marked with the aid of pavement marking painted drums or a similar device to the direction of the Engineer-in-charge. At night the passages shall be delineated with lanterns or other suitable light source.

33. One way traffic operation shall be established whenever the traffic is to be passed over part of the carriage way inadequate for two lane traffic. This shall be done with the help of flagmen kept positioned on opposite side during all hours. For regulation of traffic, the flagmen shall be equipped with red and green flags and lanterns lights. On both sides, suitable regulatory/warning signs shall be installed for the guidance of carriage way begins and the other 120 metres away. The signs shall be of approved design and the refractory type if so directed.

34. The payment shall be made on the tonnage basis of the weight of mix of aggregate and bitumen. For this purpose the contractor shall have to install a weigh bridge of suitable capacity for the purpose of weighing of dumpers at suitable place at his cost as directed. Weight of empty dumper and weight of loaded dumper will be recorded in bound and numbered register on plant site.

Department will be free to get some loaded dumpers test checked at other weigh bridges. Weigh bridge will be

periodically got calibrated and verified from weight and measure authorities.

35. Weight of mix materials will be done in presence of responsible person, not less than the rank of supervisor of Department and the measurements shall be recorded by the Deputy Engineer. Junior Engineer of Supervisor, if so authorised. Record of each dumper will be maintained separately in bound and numbered register which will be maintained by the department representatives and signed by the contractor. Proper gate pass system shall be established, for the vehicles coming to the plants, site and out going from the plant site. The location of hectometre in which individual dumpers are unloaded shall be recorded carefully.

36. The contract unit rate for semidense carpet shall be in full for carrying out the required operation including lull compensation for :-

- 1 . Making arrangements of control and safety of traffic.
2. Preparation of base.
3. Providing all materials to be incorporated in the works with all lead and lifts.
4. All labour, tools, equipment and incidentals to complete the work to the specification.

#### **ITEM 19 Semi Dense Carpet**

(As standardized by R & B Circular No. SSR-1087-205 (21) (C) dated : 29-10-1987.

##### **1 . Description**

The work shall consist of construction in a single course of 20/25 mm. thick semi-dense carpet as wearing course, on a previously prepared base, to the requirements of these specifications.

##### **2. Materials**

**2.1 Binder** : The binder shall be straight run bitumen of 60/70 or 80/100 grade satisfying the requirement of IS . 73. The actual grade of the binder to be used shall be decided by the Engineer-in-charge.

**2.2 Coarse aggregates** : The coarse aggregate shall consist of crushed stone or crushed gravel. These shall be clean, durable, of cubical shape, free from disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements set forth in Table given in Item No. 18 Para 2.

**2.3 Fine aggregates** : The fine aggregates shall consist of crusher run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from injurious, soft or flaky pieces and organic or deleterious substances.

**2.4 Filler** : The filler, where required, shall be an inert material the whole of which passes 600 micron sieve at least 90 percent passing 150 micron sieve and not less than 70 percent passing 75 micron sieve. The filler shall be cement, stone dust, hydrated lime, fly ash and other non-plastic mineral matter approved by the Engineer-in-charge.

**2.5 Aggregate gradation** : The mineral aggregates, including mineral filler, shall be so graded or combined as to conform to gradings set forth in tables below :

**Table : Aggregate gradation For Semi-Dense Carpet**

Sieve Designation	% by weight passing the Sieve		Sieve Designation	% by weight passing the Sieve	
	For 25 mm thickness	For 20 mm thickness		For 25 mm thickness	For 20 mm thickness
20 mm	100		600 micron	10-22	10-22
12.5 mm	75-100	100	300 micron	6-16	6-16
10 mm	60-85	75-100	1 50 micron	4-12	4-12
4.75 mm	35-55	35-55	75 micron	2-8	2-8
2.36 mm	20-35	20-35			

**2.6 Proportioning of materials** : The binder content for premixing shall be 4.28 percent by weight of the total mix.

The quantities of aggregates shall be sufficient to yield the specified thickness after compaction. The contractor shall get the job-mix formula for the mix approved by the Engineer-in-charge before starting the work.

**2.7 Variation in Proportioning of material** : The Contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job mix formula and producing a uniform mix. variation in binder content of  $\pm 0.3$  percent by weight of total mix shall, however, be permissible in individual specimen taken for quality control tests vide MOST Specification Section 900.

### **3. CONSTRUCTION OPERATIONS**

**3.1 Weather and seasonal limitation :** Semi dense carpet shall not be laid during rainy weather or when the base course is damp or wet.

**3.2 Preparation of base :** The base on which semi-dense carpet is to be laid shall be prepared shaped and conditioned to the specified, lines grade and cross section in accordance with MOST Specification Clause 601 as directed by the Engineer-in-charge. The surface shall be thoroughly swept and scraped clean and free of dust and foreign matter.

**3.3 Tack coat : Application of binder :** Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge and sprayed on the base at the rate specified hereafter. The rate of spread in terms of straight run bitumen shall be 5 kg per 10 square metre area for an existing bitumen treated surface and 10 kg per 10 per square metre area for an untreated water bound macadam surface. The binder shall be applied uniformly with the aid of sprayers. The tack coat shall be applied just ahead of the oncoming bituminous construction.

**3.4 Preparation of the mix :** Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant should be continuous type having a co-ordinated set of essential units such as dryer for heating the aggregates, device for feeding by weight or volume the required quantities of aggregates, a binder heating and control unit for metering out the correct quantity of heated binder together with a paddle heating and control unit for metering out the correct quantity of heated binder together with a paddle mixer for intimately mixing of the binder and aggregates. For details regarding Hot mix plant the Annexure 'A' may be referred.

The temperature of binder at the time of mixing shall be in the range of 150° C - 177° C and aggregates in the range of 150° C – 163° C provided also that at no time shall the difference in temperature of the aggregates and the binder exceed 14° C.

Mixing shall be through to ensure that a homogeneous mixture is obtained in which all the particles of the mineral aggregates are coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in the transit if so directed by the Engineer-in-charge.

**3.5 Spreading :** The mix, transported from the hot mix plant to the site, shall be spread by means of self propelled mechanical paver with suitable screens capable of spreading, tamping and finishing the mix, true to specified grade, line and cross sections. The temperature of mix at the time of laying shall be in the range of 121° C- 163° C.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road. Longitudinal joints shall be offset by at least 150 mm from those in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

**3.6 Rolling :** Immediately after the spreading of mix, it shall be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5 km per hour. The initial or break-down rolling shall be with 8-12 tonne three wheeled rollers and the surface finished by final rolling with 8-10 tonne tandem rollers, or suitable pneumatic rollers.

The roller wheels shall be kept damp to prevent the mix adhering to them but in no case shall fuel lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the centre except that at super elevated portions, it shall progress from the lower to upper edges parallel to the centre line of the pavement. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated.

#### **4. OPENING TO TRAFFIC**

Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

#### **5. SURFACE FINISH AND QUALITY CONTROL OF WORK**

The surface finish of construction shall conform to the requirements of most specification Clause 901. Control on the quality of material and works shall be exercised by the Engineer-in-charge in accordance with MOST Specification Clause 902.

#### **6. ARRANGEMENT FOR TRAFFIC**

The provision of MOST Specification Clause 112 shall apply as regards the flow to traffic during construction.

## 7. MEASUREMENT FOR PAYMENT

The payment shall be made on the tonnage basis of the weight of mix of aggregates and bitumen. For this purpose the contractor shall have to install a weigh bridge of suitable capacity, for the purpose of weighing of dumpers at suitable place, at his cost as directed. Weight of "empty dumper and weight of loaded dumper will be recorded in bound and numbered register on plant side.

Department will be free to get some loaded dumpers test checked at other, weigh bridge. Weigh bridge will be periodically got calibrated and verified from weight and measure authorities.

For the purpose of application at tack coat if the theoretical area as per sanctioned estimate for basis of tonne differs with the actual area of work done in the field, then the reduction in or addition to payment shall have to be effected to the contractor on proportionate basis depending upon the area, reduced or exceeded respectively.

Weight of mix materials will be done in presence of Responsible person, not less than the rank of-supervisor of Department Deputy Executive Engineer or Assistant Engineer or Addl. Assistant Engineer if so authorised. Record of each dumper will be maintained separately in bound and numbered register which will be maintained by the departmental representatives and signed by the contractor, proper gate pass system shall be established for the vehicles coming to the plant site and but going from the plan site. The location of the kilometer, hectometer in which individual dumper are unloaded will -be recorded\* carefully.

## 8. RATE

The Contract unit rate for semi-dense carpet shall be payment in full for carrying out the required operations including full compensation for all components listed in MOST Specification Clause 503.8.

### ANNEXURE-A

#### TECHNICAL REQUIREMENTS OF HOT MIX PLANT

**Composition of plant :** The Hot Mix Plant shall conform generally to IS Specifications No. I S 3066/ 1965 as amended from time to time and shall be equipped with the following arrangements :-

1 . **Cold Aggregate Feeder :** The cold aggregate feeder shall have minimum three independent bins or compartment, each provided with accurate mechanical pre-determined rate to the cold elevator-or to some intermediate conveyor or directly into the dryer. The feeder shall provide for the adjustment of total and proportional feed and shall be capable of being locked in any setting.

2. **Dryer :** The dryer shall be capable of 'continuously agitating the aggregates while heating to the desired temperature. At the discharge end of the dryer or any other -suitable location, means, shall be provided for ascertaining the temperature of the heated aggregate.

3. **Screening Unit and Gradation Control :** The dried aggregate shall be screened into not less than three size. The plant shall include means for accurately proportioning each bin size of aggregate-either by weight or volumetric measurement, When the gradation control is by volume, ,the unit shall include a feeder mounted under the compartment bins. Each bin shall have an accurately controlled, individual gate to form an orifice for proportioning the material drawn from each respective bin compartment. The orifice shall have positive mechanical adjustment and provided with a lock Indicators shall be provided on each gate to show the opening in centimeters.

4. **Mixer Unit :** The plant shall include a mixer of an approved twin shaft pugmill type capable of producing a uniform mix. If not enclosed, the mixer box shall be equipped with-a dust hood to prevent loss of fines.

5. **Mineral Filler Supply Unit :** There shall be an Independent arrangement to feed mineral filler directly into the pugmill. The hopper to bin for mineral filler shall provide for the adjustment to proportion the feed with the aggregate and bitumen feeds and shall be capable of being locked in any setting.

6. **Bitumen Heating :** A heating system for bitumen always with effective and positive control of temperature shall be provided, to maintain proper temperature and for allowing continuous circulation between storage tank and proportioning units during the entire operating period. Suitable arrangements shall be provided for recording the temperature at the tanks and in the circulating system.

7. **Synchronization :** For Synchronization of Aggregate, Bitumen and filler feeds satisfactory means shall be provided to afford positive inter-locking control between the flow of aggregate from the bins or compartment, flow of bitumen from the tank and flow of mineral filler.

#### ITEM - 20 40 mm Thick Asphaltic Concrete

##### 1. DESCRIPTION

The work shall consist of construction in a single course, of 40 mm thick asphaltic concrete as wearing surface, on a previously prepared base to the requirements of these specifications

## 2. MATERIALS

**2.1. Binder :** The binder shall be straight run bitumen of 60/70 or 80/100 grade satisfying the requirement of IS: 73. The actual grade of the binder to be used shall be decided by the Engineer in charge.

**2.2 Coarse aggregate :** The coarse aggregate shall consist of crushed stone or crushed gravel. These shall be clean, durable, of cubical shape, free of disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements set forth in Table given in Item No.18 Para 12.

**2.3 Fine aggregate :** The fine aggregates shall consist of crushed run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from injurious, soft or flaky pieces and organic or deleterious substances.

**2.4 Filler :** The filler, where required, shall be an inert material the whole of which passes 600 micron sieve at least 90 percent passing 150 micron sieve and not less than 70 percent passing 75 micron sieve. The filler shall be cement, stone dust, hydrated lime, fly ash and other non – plastic mineral matter approved by the Engineer in charge.

**2.5 Aggregate gradation :** The mineral aggregates, including mineral filler, shall be so graded or combined as to conform to gradings set forth in table below :

**Table : Aggregate gradation For Asphaltic Concrete**

Sieve Designation.	% by the weight passing the sieve	Sieve Designation.	% by weight passing the Sieve.
20mm	100	600 micron	18 – 29
12.5mm	80 – 100	300 micron	13 – 23
10mm	70 – 90	150 micron	8 – 16
4.75 mm	50 – 70	75 micron	4 - 10

**2.6 Proportioning of materials :** The binder content for premixing shall be 5.5 percent by weight of the total mix.

The quantities of aggregates shall be sufficient to yield the specified thickness after compaction. The contractor shall get the job – mix formula for the mix approved by the Engineer – in – charge before starting the work.

**2.7 Variation in Proportioning of material :** The Contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job mix formula and producing a uniform mix. A variation in binder content of  $\pm 0.3$  percent by weight of total mix shall, however, be permissible in individual specimen taken for quality control tests vide MOST Specification Section 900.

## 3. CONSTRUCTION OPERATIONS

**3.1 Weather and seasonal limitation :** Asphaltic Concrete shall not be laid during rainy weather or when the base course is damp or wet.

**3.2 Preparation of base :** The base on which asphaltic concrete is to be laid shall be prepared shaped and conditioned to the specified, lines grade and cross section in accordance with MOST Specification Clause 601 as directed by the Engineer in charge. The surface shall be thoroughly swept and scraped clean and free of dust and foreign matter.

**3.3 Tack coat : Application of binder :** Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer in charge and sprayed on the base at the rate specified hereafter. The rate of spread in terms of straight run bitumen shall be 5 kg per 10 square metre area for an existing bitumen treated surface and 10 kg per 10 square metre area for an untreated water bound macadam surface. The binder shall be applied uniformly with the aid of sprayers. The tack coat shall be applied just ahead of the oncoming bituminous construction.

**3.4 Preparation of the mix :** Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant should be continuous type having a co-ordinated set of essential units such as dryer for heating the aggregates, device for feeding by weight or volume the required quantities of aggregates, a binder heating and control unit for metering out the correct quantity of heated binder together with a paddle mixer for intimately mixing of the binder and aggregates. For details regarding Hot mix plant the Annexure 'A' may be referred.

The temperature of binder at the time of mixing shall be in the range of 150° C - 177° C and aggregates in the range of 150° C - 163° C provided also that at no time shall the difference in temperature of the aggregates and the binder exceed 14° C.

Mixing shall be through to ensure that a homogeneous mixture is obtained in which all the particles of the mineral aggregates are coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in the transit if so directed by the Engineer-in-charge.

**3.5 Spreading :** The mix, transported from the hot mix plant to the site, shall be spread by means of self propelled mechanical paver with suitable screens capable of spreading, tamping and finishing the mix, true to specified grade, line and cross sections. The temperature of mix at the time of laying shall be in the range of 121° C- 163° C.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road. Longitudinal joints shall be offset by at least 150 mm from those in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

**3.6 Rolling :** Immediately after the spreading of mix, it shall be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5 km per hour. The initial or break-down rolling shall be with 8-12 tonne three wheeled rollers and the surface finished by final rolling with 8-10 tonne tandem rollers, or suitable pneumatic rollers.

The roller wheels shall be kept damp to prevent the mix adhering to them but in no case shall fuel lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the centre except that at super elevated portions, it shall progress from the lower to upper edges parallel to the centre line of the pavement. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated.

#### **4. OPENING TO TRAFFIC**

Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

#### **5. SURFACE FINISH AND QUALITY CONTROL OF WORK**

The surface finish of construction shall conform to the requirements of most specification Clause 901. Control on the quality of material and works shall be exercised by the Engineer-in-charge in accordance with MOST Specification Clause 902.

#### **6. ARRANGEMENT FOR TRAFFIC**

The provision of MOST Specification Clause 112 shall apply as regards the flow to traffic during construction.

#### **7. MEASUREMENT FOR PAYMENT**

The payment shall be made on the tonnage basis of the weight of mix of aggregates and bitumen. For this purpose the contractor shall have to install a weigh bridge of suitable capacity, for the purpose of weighing of dumpers at suitable place, at his cost as directed. Weight of "empty dumper and weight of loaded dumper will be recorded in bound and numbered register on plant side.

Department will be free to get some loaded dumpers test checked at other, weigh bridge. Weigh bridge will be periodically got calibrated and verified from weight and measure authorities.

For the purpose of application at tack coat if the theoretical area as per sanctioned estimate for basis of tonne differs with the actual area of work done in the field, then the reduction in or addition to payment shall have to be effected to the contractor on proportionate basis depending upon the area, reduced or exceeded respectively.

Weight of mix materials will be done in presence of Responsible person, not less than the rank of supervisor of Department Deputy Executive Engineer or Assistant Engineer or Addl. Assistant Engineer if so authorised. Record of each dumper will be maintained separately in bound and numbered register which will be maintained by the departmental representatives and signed by the contractor, proper gate pass system shall be established for the vehicles coming to the plant site and but going from the plant site. The location of the kilometer, hectometer in which individual dumper are unloaded will be recorded\* carefully.

#### **8. RATE**

The Contract unit rate for semi-dense carpet shall be payment in full for carrying out the required operations including full compensation for all components listed in MOST Specification Clause 503.8.



**ITEM-21 Providing and laying bituminous 37.5 mm thick lean bound macadam in one or two layers considering 0.66 cum. per M.T. mix materials with machine crushed stone aggregate and asphalt for tack coat @ the rate of 10 Kg /10 sq. mt. (on metaled surface) / 5 kg per 10 sq. mt. (on existing B. T. surface) using 30 kg. of bitumen per asphalt including mixing the aggregate, heating the asphalt including mixing by continuous batching of hot mix plant and spreading the same by paver finisher and consolidation with power roller including providing atl equipments by the contractor and flushing sand at the rate of 0,30 cu.m /100 sq. mt.**

### 1. DESCRIPTION

The work shall consist of construction in one layers each 37.5 mm thick LBM 'on previously prepared base, to the requirements of these specifications.

### 2. MATERIALS

2.1 **Binder** : The binder shall be straight run bitumen of 60/70 or 80/100 grade satisfying the requirement of IS.73. The actual grade of the binder to be used shall be decided by the Engineer-in-charge and it shall have to be brought by the contractor to the site of work at his own cost.

2.2 **Coarse aggregates** : The coarse aggregate shall consist of crushed stone or crushed gravel. These shall be clean, durable, of cubical shape, free disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements set forth in Table given in Item No. 18 Para 2.

2.3 **Fine aggregates** : The fine aggregates shall consist or crusher run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from injurious, soft of flaky pieces and organic or deleterious substances.

2.4 **Filler** : The filler, where required, shall be an inert material the whole of which passes 600 micron sieve at least 90 percent passing 150 micron sieve and not less than 70 percent passing 75 micron sieve. The filler shall be cement, stone dust, hydrated lime, fly ash and other non-plastic mineral matter approved by the Engineer-in-charge.

2.5 **Aggregate gradation** : The mineral aggregates, including mineral filler, shall be so graded or combined as to conform to gradings set forth in tables below :

**Table : Aggregate gradation For LBM**

Sieve Size	%by weight passing the Sieve		Sieve Size	%by weight passing the Sieve	
	37.5	75 m.m.		37.5	75 m.m
40mm	-	100			
25mm	100	75-100	4.75 mm	15-35	15-35
20.0 mm	70-100	60-95	2.36mm	5-20	5-20
10.0mm	35 -60	30-55	0.75 mm	0-5	0-5

The above gradation is tentative. To achive Correct quantity the contractor shall get the job mix farmula for the mix approved by Engineer-in-charge before starting the work.

2.6 **Proportioning of materials** : The binder content for premixing shall be 3.0 percent by weight of the total mix. The quantities of aggregates shall be sufficient to yield the specified thickness after compaction The contractor shall get the job-mix formula for lthe mix approved by the Engineer-in-charge before starting the work Variation in Proportioning of material : The Contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job mix formula and producing a uniform mix. A variation in binder content of  $\pm 0.3$  percent by weight of total mix shall, however, be permissible in Individual specimen taken for quality control tests vide MOST Specification Section 900.

### 3. CONSTRUCTION OPERATIONS

3.1 **Weather and seasonal limitation** : Lean bound Macadam shah not be laid during rainy weather or when the base course is damp or wet.

3.2 **Preparation of base** : The base on which LBM is to be laid shall be prepared shaped and conditioned to the specified, lines, grade and cross section in accordance with MOST Specification Clause 601 as directed by the Engineer-in-charge. The surface shall be thoroughly swept and scraped clean and tree of dust and foreign matter

3.3 **Tack coat** : Application of binder : Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge and sprayed on the base at the rate specified hereafter. The rate of spread in terms of straight run bitumen shall be 5 kg per 10 square metre area for an existing bitumen treated surface and 10 kg per 10 square metre area for an untreated water bound macadam surface. The binder shall be applied uniformly with the aid of sprayers. At specified temperature, so as to provide uniformly rate and unbroken spread bitumen. The tack coat shall be applied just ahead of the oncoming bituminous construction.

3.4 **Preparation of the mix** : Hot mix plant of adequate capacity and capable of producing a proper and

uniform quality shall be used for preparing the mix. The plant should be continuous type having a co-ordinated set of essential units such as dryer for heating the aggregates, device-for feeding by weight or volume the required quantities of aggregates, a binder heating and control unit for metering out the correct quantity of heated binder together with a paddle mixer for intimately mixing of the binder and aggregates. For details regarding Hot mix plant the Annexure 'A' may be referred.

The temperature of binder at the time of mixing shall be in the range of 150 C - 177° C and aggregates in the range of 150 C - 163° C provided also that at no time shall the difference in temperature of the aggregates and the binder exceed 14 C.

Mixing shall be throughout to ensure that a homogeneous mixture is obtained in which all the particles of the mineral aggregates are coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in the transit if so directed by the Engineer-in-charge

**3.5 Spreading :** The mix, transported from the hot mix plant to the site, shall be spread by means of self propelled mechanical paver with suitable screens capable of spreading, tamping and finishing the mix, true to specified grade, line and cross sections. The temperature of mix at the time of laying, shall be in the range of 121 C-163° C.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road, Longitudinal joints shall be offset by at least 150 mm from those, in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

**3.6 Rolling :** Immediately after the spreading of mix, it shall be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5 km per hour. The initial or break down rolling shall be with 8-12 tonne three wheeled rollers and the surface finished by final rolling with 8-10 tonne tandem rollers, or suitable pneumatic rollers.

The roller wheels shall be kept damp to prevent the mix adhering to them but in no case shall fuel lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the centre except that at super elevated portions, it shall progress from the lower to upper edges parallel to the centre line of the payment. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated

#### **4. OPENING TO TRAFFIC**

Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

#### **5. SURFACE FINISH AND QUALITY CONTROL OF WORK**

The surface finish of construction shall conform to the requirements of most specification Clause 901 Control on the quality of material and works shall be exercised by the Engineer-in-charge in accordance with MOST Specification Clause 902.

#### **6. ARRANGEMENT FOR TRAFFIC**

The provision of MOST Specification Clause 105 shall apply as regards the flow to traffic during construction.

#### **7. MEASUREMENT FOR PAYMENT**

The payment shall be made on the tonnage basis of the weight of mix of aggregates and bitumen For this purpose the contractor shall have to install a weigh bridge of suitable capacity for the purpose of weighing of dumpers at suitable place at his cost as directed; Weight of empty dumper and weight of loaded dumper will be recorded in bound and numbered register on plant side.

Department will be free to get some loaded dumper test checked at other weigh bridge. Weigh bridge will be periodically got calibrated and verified from weight and measure authorities.

For the purpose of application of tack coat if the theoretical area as per sanctioned estimate for basis of tonne differs with the actual area of work done in the field, then the reduction in or addition to payment shall have to be effected to the contractor on proportionate basis depending upon the area reduced or exceeded respectively.

Weight of mix materials will be done in presence of responsible person, not less than the rank of supervisor of Department Deputy Executive Engineer or Assistant Engineer or Addl. Assistant Engineer if so authorised. Record of each dumper will be maintained separately in bound and numbered register which will be maintained by the departmental representatives and, signed by the contractor. Proper gate pass system shall be established for the vehicles coming to the plant Site and out going from the plant site. The location of the kilometer, hectometer in which individual dumper are unloaded will be recorded carefully.

7.2 In case of LBM, DBM and asphaltic concrete of thickness 50 mm and above, initial levels before commencement of the work and final levels after completion of the work will be taken as indicated below for working out the average thickness of pavement laid, also the actual area of work done will be measured and the quantity of the work actually done shall be computed in Cu. M. basis. The article tonnage of the mix shall then be worked out based on the designed density, for broad cross check on the actual tonnage of total mix used in the works.

Surface levels before and after laying the pavement course shall be taken as below:

Cross profiles will be taken at least at every ten meters longitudinally as shown below :

(a) For single Lane : Levels at 15 Cms & 75 from both the edges and centre point.

(Levels at 5 points)

(b) For double Lane: Levels at 15 Cms & 75 cms : 175 Cms. 275 Cms. from both the edges and the centre point. (Levels at 9 Points)

(c) Widening single to double lane : Levels at 15 Cms. from both the edges and the centre Carriage way (Up to 2 meters widening) point (levels at 3 Points)

However, in special cases if necessary, the cross profiles may be taken at closer length upto 3 meters.

## 8. RATE

The contract unit rate for LBM shall be for payment in full for carrying out the required operations including full compensation for all components listed in MOST Specification Clause 503.8.

## ITEM 22 DBM 50MM THICK.

### 1. DESCRIPTION

The work shall consist of construction in a single course of 50 mm thick DBM on previously prepared base, to the requirements of these specifications.

### 2. MATERIALS

**2.1 Binder** : The binder shall be straight run bitumen of 60/70 or 80/100 grade satisfying the requirement of IS.73. The actual grade of the binder to be used shall be decided by the Engineer-in-charge.

**2.2 Coarse aggregates** : The coarse aggregate shall consist of crushed stone or crushed gravel. These shall be clean, durable, of cubical shape, free disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements set forth in Table given in Item No. 18 Para 2.

**2.3 Fine aggregates** : The fine aggregates shall consist of crusher run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from injurious, soft or flaky pieces and organic or deleterious substances.

**2.4 Filler** : The filler, where required, shall be an inert material the whole of which passes 600 micron sieve at least 90 percent passing 150 micron sieve and not less than 70 percent passing 75 micron sieve. The filler shall be cement, stone dust, hydrated lime, fly ash and other non-plastic mineral matter approved by the Engineer-in-charge.

**2.5 Aggregate gradation** : The mineral aggregates, including mineral filler, shall be so graded or combined as to conform to gradings set forth in tables below :

**Table : Aggregate gradation For LBM**

Sieve Size	%by weight passing the Sieve	Sieve Size	%by weight passing the Sieve
25mm	100	10mm	35-60
20mm	70 – 100	4.75mm	15-35
12.5mm	55 – 80	2.60mm	5-20
		0.75mm	0-5

**2.6. Proportioning of materials** : The binder content for premixing shall be 3.0 percent by weight of the total mix.

The quantities of aggregates shall be sufficient to yield the specified thickness after compaction.

The contractor shall get the job-mix formula for the mix approved by the Engineer-in-charge before starting the work.

**2.7. Variation in Proportioning of material** : The Contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job mix formula and producing a uniform mix. A variation in binder content of  $\pm 0.3$  percent by weight of total mix shall, however, be permissible in Individual specimen taken for quality control tests vide MOST Specification Section 900.

### **3. CONSTRUCTION OPERATIONS**

**3.1 Weather and seasonal limitation :** DBM shall not be laid during rainy weather or when the base course is damp or wet.

**3.2 Preparation of base :** The base on which DBM is to be laid shall be prepared shaped and conditioned to the specified, lines, grade and cross section in accordance with MOST Specification Clause 601 as directed by the Engineer-in-charge. The surface shall be thoroughly swept and scraped clean and free of dust and foreign matter.

**3.3 Tack coat :** Application of binder : Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge and sprayed on the base at the rate specified hereafter. The rate of spread in terms of straight run bitumen shall be 5 kg per 10 square metre area for an existing bitumen treated surface and 10 kg per 10 square metre area for an untreated water bound macadam surface. The binder shall be applied uniformly with the aid of sprayers. At specified temperature, so as to provide uniformly rate and unbroken spread bitumen. The tack coat shall be applied just ahead of the oncoming bituminous construction.

**3.4 Preparation of the mix :** Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant should be continuous type having a co-ordinated set of essential units such as dryer for heating the aggregates, device for feeding by weight or volume the required quantities of aggregates, a binder heating and control unit for metering out the correct quantity of heated binder together with a paddle mixer for intimately mixing of the binder and aggregates. For details regarding Hot mix plant the Annexure 'A' may be referred.

The temperature of binder at the time of mixing shall be in the range of 150° C - 177° C and aggregates in the range of 150° C - 163° C provided also that at no time shall the difference in temperature of the aggregates and the binder exceed 14° C.

Mixing shall be throughout to ensure that a homogeneous mixture is obtained in which all the particles of the mineral aggregates are coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in the transit if so directed by the Engineer-in-charge

**3.5 Spreading :** The mix, transported from the hot mix plant to the site, shall be spread by means of self propelled mechanical paver with suitable screens capable of spreading, tamping and finishing the mix, true to specified grade, line and cross sections. The temperature of mix at the time of laying, shall be in the range of 121° C-163° C.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road, Longitudinal joints shall be offset by at least 150 mm from those, in the binder course. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

**3.6 Rolling :** Immediately after the spreading of mix, it shall be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5 km per hour. The initial or break down rolling shall be with 8-12 tonne three wheeled rollers and the surface finished by final rolling with 8-10 tonne tandem rollers, or suitable pneumatic rollers.

The roller wheels shall be kept damp to prevent the mix adhering to them but in no case shall fuel lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the centre except that at super elevated portions, it shall progress from the lower to upper edges parallel to the centre line of the pavement. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated

### **4. OPENING TO TRAFFIC**

Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

### **5. SURFACE FINISH AND QUALITY CONTROL OF WORK**

The surface finish of construction shall conform to the requirements of most specification Clause 901 Control on the quality of material and works shall be exercised by the Engineer-in-charge in accordance with MOST Specification Clause 902.

### **6. ARRANGEMENT FOR TRAFFIC**

The provision of MOST Specification Clause 105 shall apply as regards the flow to traffic during construction.

### **7. MEASUREMENT FOR PAYMENT**

The payment shall be made on the tonnage basis of the weight of mix of aggregates and bitumen For

this purpose the contractor shall have to install a weigh bridge of suitable capacity for the purpose of weightment of dumpers at suitable place at his cost as directed; Weight of empty dumper and weight of loaded dumper will be recorded in bound and numbered register on plant side.

Department will be free to get some loaded dumper test checked at other weigh bridge. Weigh bridge will be periodically got calibrated and verified from weight and measure authorities.

For the purpose of application of tack coat if the theoretical area as per sanctioned estimate for basis of tonne differs with the actual area of work done in the field, then the reduction in or addition to payment shall have to be effected to the contractor on proportionate basis depending upon the area reduced or exceeded respectively.

Weight of mix materials will be done in presence of responsible person, not less than the rank of supervisor of Department Deputy Executive Engineer or Assistant Engineer or Addl. Assistant Engineer if so authorised. Record of each dumper will be maintained separately in bound and numbered register which will be maintained by the departmental representatives and, signed by the contractor. Proper gate pass system shall be established for the vehicles coming to the plant Site and out going from the plant site. The location of the kilometer, hectometer in which individual dumper are unloaded will be recorded carefully.

7.2 In case of LBM, DBM and asphaltic concrete of thickness 50 mm and above, initial levels before commencement of the work and final levels after completion of the work will be taken as indicated below for working out the average thickness of pavement laid, also the actual area of work done will be measured and the quantity of the work actually done shall be computed in Cu. M. basis. The article tonnage of the mix shall then be worked out based on the designed density, for broad cross check on the actual tonnage of total mix used in the works.

Surface levels before and after laying the pavement course shall be taken as below:

Cross profiles will be taken at least at every ten meters longitudinally as shown below :

- (a) For single Lane : Levels at 15 Cms & 75 from both the edges and centre point.  
(Levels at 5 points)
- (b) For double Lane: Levels at 15 Cms & 75 cms : 175 Cms. 275 Cms. from both the edges and the centre point. (Levels at 9 Points)
- (c) Widening single to double lane : Levels at 15 Cms. from both the edges and the centre Carriage way  
(Up to 2 meters widening) point (levels at 3 Points)

However, in special cases if necessary, the cross profiles may be taken at closer length upto 3 meters.

## 8. RATE

The contract unit rate for DBM shall be for payment in full for carrying out the required operations including full compensation for all components listed in MOST Specification Clause 503.8.

**ITEM-23 Providing and laying seal coat with 0.18 cum stone chips i.e. 0.2727 M. T. per 10 sq. nit. using 42.50 kgs of bitumen per M.T. (4.25% by weight) for mixing the aggregates, heating the asphalt including mixing by continuous batching of hot mix plant and spreading the same by paver finisher and consolidation with power roller including providing all equipments by the contractor and flushing sand at the rate of 0.30 cu. m /100 sq. mt.**

### 1 DESCRIPTION

The work shall consist of construction of premix seal coat as wearing course, on a previously prepared base, to the requirement of these specification.

### 2. MATERIALS

2.1 **Binder:** The binder shall be straight run bitumen of 60/70 or 80/100 grade satisfying the requirement of IS:73. The actual grade of the binder to be used shall be decided by the Engineer-in-charge and it shall have to be brought by contractor to the site at his own cost unless otherwise specified in schedule 'A'.

2.2 **Coarse aggregates:** The coarse aggregate shall consist of crushed stone or crushed gravel. These shall be clean, durable, of cubical shape, free disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity and shall satisfy the physical requirements set forth in Table given in Item No. 18 Para 2. Except that the upper limit for water absorption value shall be one percent.

2.3 **Fine aggregates;** The fine aggregates shall consist of crusher run screenings, natural sand or a mixture of both. These shall be clean, hard, durable, uncoated, dry and free from injurious, soft or flaky pieces and organic or deleterious substances.

2-4 **Filter:** The filler, where required, shall be an inert material the whole of which passes 600 micron sieve at least 90 percent passing 150 micron sieve and not less than 70 percent passing 75 micron sieve. The filler shall be cement, stone dust, hydrated lime, fly ash and other non-plastic mineral matter approved by the Engineer-in-charge.

2.5 **Aggregate gradation :** The mineral aggregates, including mineral filler, shall be so graded or combined as to conform to gradings set forth in tables below:

**Table : Aggregate gradation Pre-Mix Seal Coat**

Sieve Designation	Percentage by wt passing through Sieve	
	For type 'A'	For Type 'g.'
12.5 mm		100 70-
10 mm	100	100 20-
4.75 mm	40-85	40
2.35	5-20	5-20
75micron	0-4	0-4

**2.6 Proportioning of materials :** The binder content for premixing shall be 42.50 kg per M.T. (4.25% by weight) for mixing aggregate.

The quantities of aggregates shall be sufficient to yield the specified thickness after compaction. The contractor, shall get the job-'mix formula for the mix approved by the Engineer-in-charge before starting the work.

**2.7 Variation in Proportioning of material :** The Contractor shall have the responsibility of ensuring proper proportioning of materials in accordance with the approved job mix formula and producing a uniform mix. A variation in binder content of  $\pm 0.3$  percent by weight of total mix shall, however, be permissible in individual specimen taken for quality control tests vide MOST Specification Section 900.

### 3. CONSTRUCTION OPERATIONS

**3.1 Weather and seasonal limitation :** Premix seal coat shall not be laid during rainy weather or when the base course is damp or wet.

**3.2 Preparation of base :** The base on which premix seal coat is to be laid shall be prepared shaped and conditioned to the specified, lines, grade and cross section in accordance with MOST Specification Clause 601 as directed by the Engineer-in-charge. The surface shall be thoroughly swept" and scraped clean and free of dust and foreign matter.

**3.3 Tack coat :** Application of binder : Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge and sprayed on the base at the rate specified hereafter. The rate of spread in terms of straight run bitumen shall be 5 kg per 10 square metre area for an existing bitumen treated surface and 10 kg per 10 square metre area for an untreated water bound macadam surface. The binder shall be applied uniformly with the aid of sprayers. The tack coat shall be applied just ahead of the oncoming bituminous construction.

**3.4 Preparation of the mix :** Hot mix plant of adequate capacity and capable of producing a proper and uniform quality shall be used for preparing the mix. The plant should be continuous type having a co-ordinated set of essential units such as dryer for heating the aggregates, device for feeding by weight or volume the required quantities of aggregates, a binder heating and control unit for metering out the correct quantity of heated binder together with a paddle mixer for intimately mixing of the binder and aggregates. For details regarding Hot mix plant the Annexure 'A' may be referred.

The temperature of-binder at the time of mixing shall be in the range of 150° C - 177° C and aggregates in the range of 150° C -163° C provided also that at no time shall the difference in temperature of the aggregates and the binder exceed 14° C.

Mixing shall be throughout to ensure that a homogeneous mixture is obtained in which all the particles of the mineral aggregates are coated uniformly.

The mix shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed for transport shall be clean and be covered over in the transit if so directed by the Engineer-in-charge.

**3.5 Spreading :** The mix, transported from the hot mix. plant to the site, shall be spread by means of self propelled mechanical paver with suitable screens capable of spreading, tamping and finishing the mix, true to specified grade, line and cross sections. The temperature of mix at the time of laying shall be in the range of 121° C -163°C.

Longitudinal joints and edges shall be constructed true to the delineating lines parallel to the centre line of the road, Longitudinal joints shall be offset by at least 150 mm from those in the binder course. All joints shall be cut vertical to the full thickness'of the previously laid mix and the surface painted with hot bitumen before placing fresh material.

**3.6 Rolling :** Immediately after the spreading of mix, it shall be thoroughly compacted by rolling with a set of rollers moving at a speed not exceeding 5 km per hour. The initial or break-down rolling shall be with 8-12 tonne three wheeled rollers and the surface finished by final rolling with 8-10 tonne tandem rollers, or suitable pneumatic rollers. Rolling temperature shall not be-less than 100 °C in any case the rolling shall be completed the temperature of mix falls about 80 ° C.

The roller wheels shall be kept damp to prevent the mix adhering to them but in no case shall fuel lubricating oil be used for this purpose. Rolling shall commence longitudinally from the edge and progress towards the centre except that at super elevated portions, it shall progress from the lower to upper edges parallel to the centre line of the pavement. The roller should proceed on the fresh material with rear or fixed wheel leading so as to minimise the pushing of the mix and each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass. Rolling shall continue until the entire surface has been rolled to compaction and all the roller marks eliminated.

#### **4. OPENING TO TRAFFIC**

Traffic may be allowed immediately after completion of the final rolling when the mix has cooled down to the surrounding temperature.

#### **5. SURFACE FINISH AND QUALITY CONTROL OF WORK**

The surface finish of construction shall conform to the requirements of most specification Clause 901. Control on the quality of material and works shall be exercised by the Engineer-in-charge in accordance with MOST Specification Clause 902.

#### **6. ARRANGEMENT FOR TRAFFIC**

The provision of MOST Specification Clause 105 shall apply as regards the flow to traffic during construction.

#### **7. MEASUREMENT FOR PAYMENT**

The payment shall be made on the tonnage basis of the weight of mix of aggregates and bitumen. For this purpose the contractor shall have to install a weigh bridge of suitable capacity for the purpose of weighing of dumpers at suitable place at his cost as directed. Weight of empty dumper and weight of loaded dumper will be recorded in bound and numbered register on plant side.

Department will be free to get some loaded dumper test checked at other weigh bridge. Weigh bridge will be periodically got calibrated and verified from weight and measure authorities.

For the purpose of application of tack coat if the theoretical area as per sanctioned estimate for basis of tonne differs with the actual area of work done in the field, then the reduction in or addition to payment shall have to be effected to the contractor on proportionate basis depending upon the area reduced or exceeded respectively.

Weigh of mix materials will be done in presence of responsible person, not less than the rank of supervisor of Department, Deputy Executive Engineer or Assistant Engineer or Addl. Assistant Engineer if so authorised. Record of each dumper will be maintained separately in bound and numbered register which will be maintained by the departmental representatives and signed by the contractor. Proper gate pass system shall be established for the vehicles coming to the plant site and out going from the plant site. The location of the kilometer, hectometer in which individual dumper are unloaded will be recorded carefully.

#### **8. RATE**

The Contract unit rate for seal coat shall be for payment for carrying out the required operations including full compensation for all components listed in MOST Specification Clause 503.7

#### **ITEM - 24 Special Conditions for Bituminous surface work with use of Hot Mix Plant paver Finisher.**

1. The Hot Mix Plant and accessories to be used for the work shall be in conformity with the specifications prescribed vide Govt. of India, Ministry of Transport Circular No. RQ/RMP/1613784 dt.1-1-87. The plant shall be equipped with all units and accessories as per latest I.S. 3066/1965, as amended from time to time. The Contractor will have to modify their plants suitably within a period of six months from the date of issue of latest I.S. Specification or Codes.

2. The work of laying aggregate mixed with bitumen shall start on site of work only after 8.00 hours in the morning and continue upto 17.00 hours in winter season and upto 18.30 hours in summer. No work shall be done except during the period mentioned above and also on Sundays and National holidays viz. 26th January, 15th August & 2nd October.

3. Quantity of bituminous aggregate mix to be laid shall be restricted to 250 tonnes per day for 30/4'0 capacity plant and may be more\* or less depending upon the rated capacity of the plant.

4. The work of laying asphalt mix shall start latest within 60 days from the date of issue of work order except when work is closed for few days due to breakdown of machinery and during such period the contractor has not shifted paver plant to any other paver work not carried out by the same plant and will be completed as per time limit. Reasons for delay in starting of work after 60 days shall result into sufficient cause for levying compensation for disproportionate progress. However, the period from 15th June to 15th October monsoon shall not be counted for the purpose of disproportionate progress and consequent cause for levy of compensation. The contractors shall commence the work of laying pavement on or before the last date of the period mentioned above failing which he shall pay for every day that he shall delay the commencement of the work as above in accordance with clause-2 of the contract.

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5. The Contractor shall invariably get the job mix formula for the mix approved by the Engineer-in-charge before starting the work.

6. These special conditions shall be applicable to the specifications of all the items included in this contractor where work is to be carried out with Hot Mix Plant and paver finisher.

7. No asphalt work shall be executed in monsoon as per condition 4 of same Item 24. However in critical circumstances asphalt work may be executed during monsoon with permission of Superintending Engineer who may give permission after ascertaining the proportion of moisture in existing surface & atmosphere (R & B D. G R. dated 24-10-94 & No. S.S.R.-102004 (23)-C dated 23-6-2004).

#### **SCHEDULE OF WORK TO BE EXECUTED SHALL BE AS UNDER**

Time Limit:-

<b>Sr.No.</b>	<b>Period</b>	<b>Description of items to be executed</b>
1	Month.....Month	1. Collection of Materials on site
2	From Month 2 to 4 Month	2. Erection of Plant Machinery as required
3	From Month....to...Month	3. Laying of asphalt work carpet & Seal coat & Flushing of sand over surface, side with filling with earth as required-and directed

#### **ITEM-25 Dismantling [Road and bridge items]**

1. The work shall consist of removing, as herein after set forth, existing, culverts, bridges, pavement, kerbs and other structures like guards-rails, fences, utility poles, manholes, catch basins, inlets, etc Which are in place but interfere with the new construction or are not suitable to remain in place and of salvaging and disposing of the resulting materials and back filling the resulting trenches and pits.

2. Existing culverts, bridge, pavements and other structures which are within the highway and which are designated to be removed, shall be removed upto the limits and extent specified in the drawings or as indicated by the Engineer-in-charge.

3. Dismantling and removal operations shall be carried out with such equipment and in such a manner as to leave undisturbed, adjacent pavement, structures and other work to be left in tact.

4. All operations necessary for the removal of any existing structure which might endanger new construction shall be completed prior to the start of new work.

5. The structures shall be dismantled carefully and the resulting materials so removed as not to cause and damage to the serviceable materials to be salvaged, the part of the structure to be retained and any other properties or structures nearby.

6. Unless otherwise specified, the superstructure portion of culverts/bridges shall be entirely removed and other parts removed to below the ground level or as necessary depending upon the interference they cause to the new construction. Removal of overlying of adjacent material if required in connection with the dismantling of the structures shall be incidental to this item.

7. Where existing culverts/bridges are to be extended or otherwise incorporated in the new Work only such part of parts of the existing structure shall be removed as are necessary to provide a proper connection to the new work. The connecting edges shall be cut, chipped and trimmed to the required lines and grades without weakening or damaging any part of the structure to be retained. Reinforcing bars which are to be left in place so as to project into new work as dowels or ties shall not be injured during removal of concrete.

8. Pipe culverts shall be carefully removed in such a manner as to avoid damage to the pipes.

9. Steel structures shall unless otherwise provided be carefully dismantled in such a manner as to avoid damage to members thereof/If specified-in the drawing or directed-by the Engineer-in-charge that structure is to be removed in a condition suitable for re-erection all-members shall be match marked by the contractor with white lead paint before dismantling. End pins, nuts, loose, plates, etc. shall be painted with a mixture of white lead and tallow and loose parts shall be securely wired to adjacent members or packed in boxes.

10. Timber structures shall be removed in such a manner as to avoid damages to such timber or lumber as is designated by the Engineer-in-charge to be salvaged.

11. In removing pavements, kerbs, gutters, and other structure, like guards rails, fences, manholes, catch, basins, inlets etc. where portions of the existing construction are to be left in the finished work, the same, shall be



removed to an existing joint or cut and chipped to a true line with a face perpendicular to the surface of the existing structure. Sufficient removal shall be made to provide for proper grades and connections with the new work as directed by the Engineer-in-charge.

12. All concrete pavements base course in carriage way and shoulders etc. designated for removal shall be broken to pieces whose volumes shall not be exceed 0.02 cubic metre and stockpiled at designated locations if the material is to be used later or otherwise arranged for disposal as directed,

13. Where directed by the Engineer-in-charge holes and depressions caused by, dismantling operations shall be back filled with excavated or other approved materials and thoroughly compacted in line with surrounding area.

14. All materials obtained by dismantling shall be the property of Government. Unless otherwise specified, materials having any salvage value shall be placed in neat stack of like material within the right-of-way as directed by, the Engineer-in-charge, for which contractor will remain responsible for its safe custody and preservation for 60 days after recording measurements of the salvaged material.

15. Pipe culverts that are removed shall be cleared and neatly piled on the right-of-way at points designated by the Engineer-in-charge.

16. Structural steel removed from old structure shall, unless otherwise specified or directed be stored in a neat and presentable manner on blocking in locations suitable for loading. Structures or portions thereof which are specified in the contract for re-erections shall be stored in separate piles.

17. Timber or lumber from old structures which is designated by the Engineer-in-charge as materials to be salvaged shall have all nuts and bolts removed from and shall be stored in neat piles in locations suitable for loading.

18. All the products of dismantling operations which in the opinion of the Engineer-in-charge cannot be used or auctioned shall be disposed as directed, within 100 metres.

19. The work of dismantling structure shall be paid for in units indicated below by taking measurement before and after, as applicable ;

(i) Dismantling brick stone/concrete (Plain and Reinforced) masonry	Cubic Metre
(ii) Dismantling flexible and cement concrete pavement	Cubic Metre
(iii) Dismantling steel structure	Tonne
(iv) Dismantling timber structure.	Cubic Metre
(v) Dismantling pipes, guard rails, kerbs gutters and fencing	Linear metre
(vi) Utility poles	Nos.

20. The contract unit rates for the various items of dismantling shall be for payment in full for carrying out the required operations including full compensation for all labour, materials, tools equipment, safeguard and incidentals necessary to complete the work. These will also include excavation and back filling where necessary and for handling, salvaging, piling and disposing of the dismantled material within all lifts and upto a lead of 100 metres.

**ITEM-26 Excavation for foundation up to 1.5 m depth including sorting out and stacking of useful material and disposing stuff 50 metre lead. (A) in loose or soft soil (B) in dense or hard soil.**

1. Excavation for structures shall consist of the removal of material for the construction of foundations for culverts, retaining walls, cut of walls pipe culverts and other similar structures, in accordance with the requirements of these specifications and the lines and dimensions shown on the drawing or as indicated by the Engineer-in-charge The work shall include all necessary sheeting, shoring, bracing draining and pumping and the removal of all logs, stumps, grubs and other deleterious matter and obstructions necessary for placing the foundations, trimming bottoms of excavations, back filling and clearing up the site and the disposal of all surplus material.

2. After the site has been cleared the limits of excavation shall be set out true to lines, curves and slopes.

3. Excavation shall be taken to the width of the lowest step of the footing. The contractor at his own expense shall put up necessary shoring, strutting and planking or cut slopes to a safer angle or both with due regard to the safety of persons and works and to the satisfaction of the Engineer-in-charge.

4. The depth to which the excavation is to be carried out shall be as shown, on the drawings, unless the type of material encountered is such as to require changes, in which case the depth shall be as ordered by the Engineer-in-charge.

5. Where waters is met with in excavation due to stream-flow, seepage springs, rain or other reasons, the contractor shall take adequate measures such as bailing, pumping, constructing diversion channels drainage channels, and other necessary work to keep the foundation trenches dry when so required and to protect green

concrete/masonry against damage by erosion or sudden rising of water level. The method to be accepted in this regard and other details thereof shall be left to the choice of (the contractor but subject to approval of the Engineer-in-charge, Approval of the Engineer-in-charge shall, however, not relieve the contractor of the responsibility for the adequacy of dewatering and protection arrangements and for the quality and safety of the work.

6. Pumping from the interior of any foundation enclosures shall be done in such manner as to preclude the possibility of the movement of water through any fresh concrete. No pumping shall be permitted during the placing of concrete or for any period of at least 24 hours thereafter unless it is done from a suitable sump separated from the concrete work by a water tight wall or other similar means.

7. The bottom of the foundation shall be leveled both longitudinally and transversely or stepped as directed by the Engineer-in-charge. Before tooling is laid, the surface shall be slightly watered and rammed. In the event of excavation having been made deeper than that shown on the drawings or as otherwise ordered by the Engineer-in-charge, the extra depth shall be made up with concrete or masonry of the foundation grade at (the cost of the contractor Ordinary filling shall not be used for the purpose of bringing the foundation to level. If there are any slips or blows in the excavation these shall be removed by the contractor at his own cost.

8- Near towns, villages and all frequented places, trenches and foundation pits shall be securely fenced, provided with proper caution signs and marked with red lights at night to avoid accidents. The contractor shall be required to take adequate protective measures to see that the excavation operations do not affect or damage adjoining structures.

9. Back filling shall be done with approved material after concrete or masonry is fully set and carried out in such a way as not to cause under thrust on any part of the structure. All space between foundation masonry or concrete and the sides of excavation shall be refilled to the original surface, making due allowance for settlement in 250 mm loose layers. Which shall be watered and compacted.

10. All the excavated materials shall be the property of the Government. Where the excavated material is directed to be used in the construction of embankment, it shall be directly deposited at the required locations.

11. All useful materials, not intended for use in the bank, shall be stacked neatly on Government land as directed by the Engineer-in-charge within 50 metres lead. Unsuitable and surplus materials not intended for use in any part of the road shall be disposed off as directed by the Engineer-in-charge.

12. Excavation for structures shall be measured in cubic metres for each class of material encountered, limited to the dimensions shown on the drawings or as directed by the Engineer-in-charge. Excavation over increased width, cutting of slopes, shoring, shattering and planking shall be deemed as convenience for the Contractor in executing the work and shall not be measured and paid for separately.

13. The contract unit rate for the items of excavation for structures shall be paid in full for carrying out the required operations including.

1. Setting out
2. Construction of necessary shoring and bracing and their subsequent removal;
3. Removal of all logs stumps, grubs and other deleterious matter and obstructions for placing the foundations including trimming of bottoms of excavations;
4. Foundation sealing, dewatering including pumping;
5. Backfilling, clearing up the site and disposal of all surplus material within all lifts and leads upto 100 metres;
6. All labour, materials, tools, equipment, safeguards and incidentals necessary to complete the work to the specification.

14. Excavation shall be for ordinary soil such as vegetable or organic soil, turf slit, and loam, clay, mud, plat, black cotton soil, soft shale or soft murrum a mixture of these and similar material which yields to the ordinary application of pick and shovel, rake or other ordinary digging equipment. Removal of gravel or any other nodular material having diameter in any one direction not exceeding 75 mm occurring in such strata shall be deemed to be covered under this category. The classification of excavation shall be decided by the Engineer-in-charge and his decision shall be final and binding on the Contractor.

#### **ITEM - 27 -DO- in hard murrum**

1.0 Para 1 to 13 of the item of excavation for foundation in all sorts of soil shall apply.

14. Excavation shall be in hard soil such as stiff heavy clay, hard shale or compact murrum requiring grouting tool or pick or both and shovel. Closely applied and gravel and rubble stone having maximum diameter in any one direction between 75 and 300 mm and soft conglomerate. The classification of excavation shall be decided by the Engineer in-charge and his decision shall be final and binding on the Contractor

#### **ITEM - 28 - DO - in hard rock**

1. Para 1 to 13 of the item of excavation for foundation in all sorts of soil shall apply.

14. Excavation shall be in soft rock such as limestone, sand stone, laterite, hard conglomerate or other softer disintegrated rock which may be quarried or split with crow bars, boulders which do not requiring and any rock which in dry state may be hard, requiring blasting but which when wet becomes soft and manageable by means other than blasting. The classification of excavation shall be decided by the Engineer-in-charge and his decision shall be final and binding on the Contractor.

**ITEM-29 - DO - in hard rock**

1. Para 1 to 13 of the item of excavation for foundation in all sorts of soil shall apply.

14. Excavation shall be in any rock or boulders for which the use of mechanical plant for blasting is required. The classification of excavation shall be decided by the Engineer-in-charge and his decision shall be final and binding on the Contractor. Merely the use of explosives in excavation will not be considered as a reason for higher classification unless blasting is clearly necessary in the opinion of the Engineer-in-charge.

15. In the opinion of the Engineer-in-charge where blasting is prohibited for any reason, excavation shall be carried out by chiselling, wedging or any other agreed method.

16. Blasting shall be carried out with the written permission of the Engineer-in-charge. All the statutory law, regulation rules, etc. pertaining to the acquisition, transport, storage, handling and use of explosives shall be strictly followed.

17. The Contractor may adopt any method or methods of blasting consistent with the safety and job requirements, after approval from the Engineer-in-charge.

18. The magazine for the storage of explosives shall be built to the designs and specifications of the Explosives Department concerned and located at the approval site. No unauthorised person shall be admitted into the magazine which when not in use shall be kept securely locked. No matches or inflammable material shall be allowed in the magazine. The magazine shall have an effective lightning conductor. The following shall be hang in the lobby of magazine.

(a) A copy of the relevant rules regarding safe storage both in English and in the language with which the workers concerned are familiar.

(b) A statement of upto date stock in the magazine.

(c) A certificate showing the last date of testing of the lightning conductor.

(d) A notice that smoking is strictly prohibited.

19. In addition to these, the Contractor shall also observe the following instructions and any further additional instructions which may be given by the Engineer-in-charge and shall be responsible for damage to property and any accident which may occur to workmen or the public on account of any operations connected with the storage/handling or use of explosive and blasting. The Engineer-in-charge shall frequently check the Contractor's compliance with these precautions.

20. All the materials, tools and equipments used for blasting operations shall be approved type. The Engineer-in-charge may specify the type of explosives to be allowed in special cases. The fuse to be used in wet locations shall be sufficiently water resistant as to be unaffected when immersed in water for 30 minutes. The rate of burning of the fuse shall be uniform and definitely known to permit such a safe length being cut as will permit sufficient time to the fires or reach safely before explosion takes place. Detonators shall be capable of giving effective blasting of the explosives. The blasting powder explosives, detonators etc. shall be fresh and not damaged due to damp., moisture or any other cause. They shall be inspected totally and removed immediately.

21. The blasting operation shall remain in the charge of competent and experienced supervisor and workmen who are thoroughly acquainted with the handling explosives and blasting operations.

22. The blasting shall be carried out during fixed hours of the day preferably during the midday lunch hour or at the close of the works as ordered in writing by the Engineer-in-charge. The hours shall be made known to the people in the vicinity. All the charges shall be prepared by the man in charge only.

23. Red danger flags shall be displayed prominently in all directions during the blasting operations. People except those who actually light the fuse, shall be prohibited from entering this areas. The flags shall be planted 200 meters from the blasting site in all directions and all persons including workmen shall be excluded from the flagged area at least 10 minutes before the firing, a warning whistle being sounded for the purpose.

24. The enlarge holes shall be drilled to required depths and in suitable places. Blasting should be as light as possible consistent with through breakage of the material necessary for economic loading and hauling. Any method of blasting which leads to overshooting shall be discontinued.

25. When blasting is done with powder, the fuse cut to the required length shall be inserted into the hole and powder dropped in. The powder shall be gently tamped with copper rods with rounded ends. The explosive powder shall then, be covered with tamping materials which shall be tamped light but firmly.

26. When blasting is done with dynamite and other high explosives, dynamite cartridges shall be prepared by inserting the square cut end of a fuse into the detonator and finishing it with nippers at the open end, the detonator gently pushed into the primer leaving 1/3rd copper tube exposed outside. The paper of the cartridge shall then be closed up and securely bound with wire, or twine,. The primer shall be housed into the explosive. Bore holes shall be of such size that the cartirdge can easily go down. The holes shall be cleared of all debris and explosive inserted. The space of about 20 cm. above the charge shall then be gently filled with dry clay, passed home and the rest of the tamping formed of any convenient material gently packed with a wooden hammer.

27. At a time, not more than 10 such charges will be prepared and fired: The man in charge shall blow a whistle in a recognised manner for cautioning the people. All the people shall then be required to move to safe distances. The charge shall be lighted by the man in charge only. The mean in charge shall count "the numbers explosions, He shall satisfy himself that all the charges have been exploded before allowing the workmen to go back top the work site.

28. In case of a misfire, the following procedure shall be observed.

(1) Sufficient time shall be allowed to account for the delayed blast. The man incharge shall inspect all the charges and determine the missed charges.

(2) If it is the blasting powder charge it shall be completely flooded with water. A new hole shall be drilled at about 45 cm from the old hole and fired. This should blast the old charge should it not blast the old charge the procedure shall be repeated till the old charge is blasted.

(3) In case of charges of gelatin, dynamite, etc. the man in charge shall gently remove the tramping and the primer with the detonator. A fresh detonator and primer shall then be used to blast the charge alternatively the hole may be cleared of 30 cm. of tamping and the direction then ascertained by placing a stick in the hole. Another hole may then be drilled 15 cm away and parallel of H,. This hole shall then be charged and fired. The misfired hole should explode at the same time. The man in charge shall at once report to the contractor's offic and Engineer-in-charge all cases of misfire, the cause of the same and what steps were taken in connection therewith.

29. If a misfire has been\* found to be due to defective detonator or dynamite, the whole quantity in the box from which defective article was taken must be sent to the authority by the Engineer-in-charge for inspection to ascertain whether all the remaining materials in the box are also defective.

30. A careful and day to day account of the explosive shall be maintained by the contractor in the approved register and manner which shall be open to inspection by the Engineer-in-charge at all times.

31. Excavation shall be measured after removal of over burden by taking cross Sections at suitable intervals in the original position before the work starts and after it completion, and computing the volumes in cubic meters by the methods of average end areas. Where it is not feasible to compute volumes by this method because of erratic location of isolated deposits, the volumes shall be computed by other accepted methods. At the option of the Engineer-in-charge, the Contractor shall leave depth indicators during excavation of such shape and size, and in such positions as directed so as to indicate the original ground level as accurately as possible. The contractor shall see that these remain intact till the final measurements are taken. Where cross sectional measurements could not be taken due to irregular configuration, or where the rock is admixed with other classes of materials, the volumes shall be computed on the basis of stacks of excavated rubble after making 40 percent deduction therefrom.

**ITEM 30 Providing and laying uncoursed rubble masonry with hard stone of approved quality in foundations and plinth in cement mortar 1:6 (1 cement: 6 course sand) including levelling up etc. complete.**

1 . Stone shall be hard, sound, free from cracks, decay and weathering and shall be freshly quarried from an approved quarry. Stone with round surface shall not be used. The stones when immersed in water for 24 hours shall not absorb water by more than 5 percent of their dry weight when tested in accordance with IS : 1124. The length of stone shall not exceed three times its height and the breadth on base shall not be greater than three fourths of the thickness of wail nor less than 15 cm.

2. Cement and sand shall be mixed in proportion as specified in the item. Cement and sand shall be proportioned by volume after making due allowance for bulking. The required quantity of water shall then be added and the mortar mixed to produce workable consistency.

3. The mixing shall be done intimately. The operation shall be carried out on a clean water tight platform, and cement and sand shall be first mixed dry in the required proportion to obtain as uniform colour and then the mortar shall be mixed for at least two minutes after addition of "water. In case of cement mortar, that has stiffened because of evaporation of water the same shall be retempered by adding water as frequently as needed to restore the requiste consistency, but this retempering shall be permitted only, within thirty minutes from the time of addition of water at the time of initial mixing.

4. The dressing of stone shall conform to the general requirements of dressing of stone covered in IS : 1129. Stones shall be sufficiently wetted before laying to prevent absorption of water from mortar. The bed which is to receive the stone shall be cleaned, wetted and covered with a layer of fresh mortar. All stones shall be laid lull in mortar both in bed and in vertical joints and settled carefully in place with a wooden mallet immediately on placement so that it is solidly bedded in mortar before the same has set. Clean chips and spalls shall be edges into the mortar joints and beds wherever necessary to avoid truck beds or joints of mortar. Whenever foundation masonry is laid directly on rock, the face space of the first course shall be dressed to fit into the rock snugly when pressed down in the mortar bedding over the rock. No dry or hollow space shall be left anywhere in the masonry and each stone shall have all the embedded faces completely covered with mortar. Vertical joints, shall be staggered as far as possible. Sufficient transverse bond shall be provided by the use of bond stones extending from the front to the back of the masonry. In case of thick walls bond stones shall overlap each other in their arrangement. Bed shaped bond stones or headers shall not be used.

5. At all angular junctions, stones at each alternate course shall be well bonded into the respective course of the adjacent wall. All connected masonry in structure shall be carried up at one uniform level throughout as far as possible, but when breaks are unavoidable, the masonry shall be raked in sufficient long steps to facilitate joining of new work with old. The stepping of taking shall not be more than 45 degree with horizontal wing walls. Abutments and piers etc. shall be carved up truly plumb or with the specified batter. Face work and hearting shall be brought up evenly. The top of each course, however, shall not be levelled up by use of flat chips.

6. Stone shall be hammer dressed on the face, the sides and beds to enable it to come in proximity with the neighboring stone. The bushing on the face shall not be more than 4 cm on exposed face chips and spalls of stone may be used where necessary to avoid thick mortar beds or joints and it shall also be ensured that no hollow spaces are left anywhere in the masonry. The chips shall not be used below hearting stone to bring these up to the level of face stone. Use of chips shall be restricted to filling of interstices between the adjacent stones in hearting and they shall not exceed 20 percent of the quantity of stone masonry.

7. The hearting or interior filling of wall face shall consist of rubble stones not less than 15 cm. in any direction, carefully laid, hammered down with a wooden mallet into position and solidly bedded in the mortar. The hearting should be laid nearly level with facing and backing. Through bond stone shall be provided in masonry up to 60 cm. thickness and in case of masonry above 60 cm. thickness a set of two or more than bond stones overlapping each other at least by 15 cm shall be provided in a line from face to back. In case of highly absorbent types of stone (Porous lime stone and sand stones etc.) the bond stone shall extend only about two third into the wall, as through stone in such cases may give rise to penetration of dampness and therefore for all thickness of such masonry a set of two or more bond stones, overlapped each other by at least 15 cm shall be approved. One bond stone or a set of bond stones shall be provided for every 0.50 square metres of the masonry surface, bond stones shall be stacked separately and marked to distinguish from other stones. Masonry work shall be started after sufficient number of bond stones are collected on site as directed by the Engineer-in-charge.

8. The quoins shall be laid header and stretcher alternately. Every stone shall be tilted to the adjacent stone so as to form neat and close joint. Face stone shall extend and bond well in the back. These shall be arranged to break joints, as much as possible and to avoid long vertical lines of joints.

9. The face joints shall not be more than 20 mm thick, but shall be sufficiently thick to prevent stone to stone contact and shall be completely filled with mortar.

10. Green work shall be protected from rain by suitable covering. Masonry work in cement or composite mortar shall be kept constantly wet on all faces for a minimum period of seven days. The top of the masonry work shall be left flooded with water at the close of the day. During hot weather all finished or partly completed work shall be covered for wetted in such manner as will prevent rapid drying. The racking of joints where necessary shall be done at the end of day's work when mortar is green.

11. The scaffolding shall be sound and strong to withstand all loads likely to come upon it. The holes which provide resting space for horizontal members shall not be left in masonry under one metre in width or immediately near the skew backs of arches. The holes left in the masonry work for supporting the scaffolding shall be filled and made good.

12. When fresh masonry is to be placed against existing surface of structures, these shall be cleaned of all loose material, roughened and wetted as directed by the Engineer-in-charge so as to effect a good bond with the new work.

13. Stone masonry shall be measured cubic meters

14. The contract unit for stone masonry work shall include the cost of all labour, materials, tools and plant. Scaffolding and other expenses incidental to the satisfactory completion of the work as described herein above.

**ITEM-31 Providing and laying coursed rubble masonry hard stone of approved quality for super structure -and plinth in cement mortar 1:5 (1 cement :5 course sand) etc. complete.**

1. Para 1 to 14 of item of U.C.R. masonry shall apply.

15. Masonry shall be laid with course, where there is variation in the height of course. Large courses shall be placed at lower levels with height of courses decreasing gradually towards the top.

16. In case of abutment and wing walls, weep holes shall be provided in the masonry to drain moisture from the backfilling. Weep holes shall be 8 cm wide, 15 cm high or circular of 15 cm. diameter and shall extend through the full width of the masonry with slopes of about 12 vertical to 20 horizontal towards the draining face. The spacing of weep holes shall be generally 1 metre in either direction with the lowest one at about 1.5 cm. above the low water level or ground level whichever is higher or as directed by the Engineer-in-charge.

**ITEM-32 Providing and laying Brick work using common burnt clay building bricks having crushing strength not less than 35 kg/sq.m. in foundation and plinth in cement mortar 1:5 (1 cement: 5 fine sand)**

1. Burnt clay bricks shall conform to the requirements of IS: 1017, except that the minimum compressive strength when tested flat shall not be less than 35 Kg/square cm. and that the size may be according to local practice with a tolerance of 5 percent.

2. Cement and sand shall be mixed in proportions as specified in the item. Cement and sand shall be proportioned by volume after making due allowance for bulking. The required quantity of water shall then be added and the mortar mixed to produce workable consistency.

3. The mixing shall be done intimately. The operation shall be carried out on a clean, wet, tight platform, and cement and sand shall be first mixed dry in the required proportion to obtain uniform colour and then the mortar shall be mixed for at least two minutes after addition of water. In case of cement mortar, that has suffered because of evaporation of water, the same shall be re-tempered by adding water as frequently as needed to restore the requisite consistency but this retempering shall be permitted only within thirty minutes from the time of addition of water at the time of initial mixing.

4. Bricks shall be soaked in water for a minimum period of one hour before use. When bricks are soaked they shall be removed from the tanks sufficiently in advance so that at the time of laying they are skin-dry. Such soaked bricks shall be stacked on a clean place where they are not spoiled by dirt, earth etc.

5. All brick work shall be laid in English bond, even and true to line, plumb level and all joints accurately kept. The bricks used on the face shall be selected whole ones of uniform size and with true rectangular face.

5.1 Bricks shall be laid frogs up, if any, on a full bed of mortar. When laying bricks shall be slightly pressed so that the mortar gets into all the surface pores of bricks to ensure proper adhesion. All joints shall be properly flushed and packed with mortar so that no hollow spaces are left.

5.2 Before laying bricks in foundations, a layer of not less than 12 mm. of mortar shall be spread to make the surface on which the work will be laid even.

5.3 The brick work shall be built in uniform layer, corners and other advanced work shall be racked back. Brick work shall be done true to, plumb or in specified manner. No part of it, during construction, shall rise more than one metre above the general construction level to avoid unequal settlement and improper jointing.

5.4 Toothing may be done where future extension is contemplated but shall be used as an alternative to raking back.

5.5 The thickness of joints shall not exceed 12 mm.

6. When fresh masonry is to be placed against existing surface of structures, these shall be cleaned of all loose material, roughened and wetted as-directed by the Engineer-in-charge so as to effect a good bond with the new work.

7. Green work shall be protected from rain by suitable covering. Masonry work in cement or composite mortar shall be kept constantly moist on all faces for a minimum period of seven days. The top of the masonry work shall be left flooded with water at the close of the day.

7.1 During hot weather, all finished or partly completed work shall be covered or wetted in such manner as will, prevent rapid drying of the brick work.

8. The scaffolding shall be sound and strong to withstand all loads to come upon it. The holes which provide resting space for horizontal members shall not be left in masonry under one metre in width or immediately near the skew backs or arches. The holes left in the masonry work for supporting the scaffolding shall be filled and made good.

9. In case of abutment and wing wall, weep holes as shown on the drawing or directed by the Engineer-in-charge shall be provided in the masonry to drain moisture from the backfilling. Weep holes shall

be 8 cm wide 15 cm. high or circular 15 cm. diameter and shall extend through the full width of the masonry with slope of about 1 vertical to 20 horizontal high or circular of 15 cm towards the draining face. The spacing of weep holes shall be generally 1 m. in either direction with the lowest one at about 15 cm. above the low water level or ground level whichever is higher or as directed by the Engineer-in-charge.

10. All brick work shall be measured in cubic metres.

11. The contract unit for brick work shall include the cost of all labour, materials tools and plant, scaffolding and other expenses incidental to the satisfactory completion of the work as described herein above and provision of weep holes.

**ITEM-33 Supplying and fixing reinforced concrete heavy duty non-pressure pipes with collars for culverts carrying heavy traffic as per Indian Railway Standard specifications including setting the pipes in C.M. 1:2 watering and laying (to level or slope) of class NP3 of following internal diameters, (i) 300 mm dia. (ii) 450 mm dia. (iii) 600 mm dia. (iv) 750 mm dia (v) 900 mm dia. (vi) 1050 mm dia. (vii) 1200 mm dia.**

1. The work shall consist of furnishing and installing reinforced cement concrete pipe of the type dia metre and length required at the location shown on the drawings or as ordered by the Engineer-in-charge.

2. Reinforced concrete pipe shall be NP3 type conforming to the requirements of IS : 458 and shall be of dia as specified in the item. Each consignment of cement concrete pipes shall be inspected, if necessary and approved by the Engineer-in-charge, either at the place of manufacture or at the site before their incorporation in the works.

NP3, NP2, NP1 pipes are used for R. C. C. Pipes, where testing of pipes will not be feasible the contractors will have to produce a certificate from the manufacturers on company's letter head the given hereinafter form.

Production of such certificate will not however relieve the contractor from his responsibility of supplying pipes of required standard and will have to bear the loss or damage caused to the work on account of defects found subsequently during the execution. It will also be necessary to purchase these pipes from manufacturer having standard equipments for carrying out various test as per IS : 458 at his factory.

#### **FORM OF CERTIFICATE FOR NP3, NP2, NP1 PIPES**

We \_\_\_\_\_ manufacturer of R.C.C. pipes produce B.C.C. pipes as per the requirement of IS: 458 and also carry out the required test at our place. We have acquired equipments for carrying out test and are prepared to carryout test at our factory sites.

We have experience of manufacturing of pipes of \_\_\_\_\_ years  
The pipes supplied by us to M/s. \_\_\_\_\_ satisfy the requirement of IS : 458

Date: \_\_\_\_\_

Place : \_\_\_\_\_ Manufacturer's Sign \_\_\_\_\_

3. No pipe shall be placed in position until the foundations have been approved by the Engineer-in-charge. Where two or more pipes are to be laid adjacent to each other, they shall be separated by a distance equal to at least half the diameter of the pipe subject to minimum of 450 mm. The laying of pipes on the prepared foundation shall start from the outlet and proceed towards the inlet and be completed to the specified lines and grades. The pipes shall be fitted and matched so that when laid in works they form a culvert with a smooth uniform invert. Any pipe found defective or damaged during laying shall be removed at the cost of Contractor.

4. The pipes shall be jointed either by collar joint or by flush joint. In the former case, the collars shall be of R.C.C., 150 to 200 mm wide and having the same strength as the pipes to be jointed. Caulking, space shall be between 13 and 20 mm according to the diameter of the pipes., Caulking material shall be slightly wet mix of cement and sand in the ratio of 1:2 rammed with Caulking irons. Before caulking the collar shall be so placed that its centre coincides with that of pipe and an even annular space is left between the collar and the pipes. Flush joint may be shaped to form a self centering joint with a joining space 13 cm wide. The joining space shall be filled with cement mortar. 1 cement to 2 sand, mixed sufficiently dry to remain in position when forced with a trowel or rammer. Care shall be taken to fill all voids and excess mortar shall be removed. All joints shall be made with care so that their interior surface is smooth and consistent with the interior surface of the pipes. After finishing, the joint shall be kept covered and damp for at least four days.

5. R. C. C. pipe shall be measured along their centre between their inlet and outlet ends in linear metres.

6. The rate for the pipes shall include the cost of pipe including loading, unloading, handling storing laying in position and joining complete.

**ITEM-34 Supplying and fixing reinforced concrete heavy duty non-pressure pipes with collars for culverts including setting and jointing the pipes in C. M. 1:2 watering and laying (to level or slope) of I.S. class of NP2 of following internal diameter, (i) 300 mm dia. (ii) 450 mm dia. (iii) 600 mm dia. (iv) 750 mm dia (v) 900 mm dia. (vi) 1050 mm dia (vii) 1200 mm dia.**

1. The work shall be carried out as per item of NP3 pipes except that the pipes will be of NP2 class instead of NP3 class conforming to requirements of IS : 458 and of the dia as specified in this item.

**ITEM-35 Supplying and fixing NP1 class R.C.C. pipes**

1. The work shall be carried out as per item of NP3 pipes except that the pipes will be ordinary irrigation pipes of NP 1 class instead of NP 3 class conforming to requirements of IS'458 and of the dia. as specified in this item. Please see Item No 53 for detailed information.

**ITEM-36 Filling around the pipes with murrum including dressing, tampering etc. complete.**

1. Area around pipes shall be filled with murrum, chhara or other gritty material immediately after the pipes have been laid and the joining material has hardened. The material shall be clean, free from boulders large roots, excessive amount of sods or other vegetable matter, and lumps and shall be approved by the Engineer-in-charge. Filling upto 0.3 metre above the top of the pipe shall be carefully done and the soil thoroughly rammed, tampered or vibrated in layers of not exceeding 150 mm: particular care being taken to thoroughly consolidate the materials under the haunches of the pipe. Filling shall be carried out simultaneously on both sides of the pipes in such a manner that unequal pressures do not occur. In case of high embankments, after filling upto the top pin the above said manner a loose fill of a depth equal to external diameter of the pipe shall be placed over the pipe before further layers are added and compacted. Materials shall be filled in pharas 3m. x 1,5m x 0.5m size and shall be measured in cubic metres. Unit rate includes cost of materials and spreading including labour and tools needed for the above operations.

**ITEM-37 Providing and laying ordinary (unreinforced) concrete 1:2:4 (1 cement :2 coarse sand :4 crushed stone aggregate 20 mm nominal size) & curing complete including cost of form work (without reinforcement)**

1. In case of ordinary concrete, mix is not required to be designed by preliminary tests and proportions of cement, fine aggregates and coarse aggregates are specified by volume as given in table below for different four grads designated as ordinary M.100: M.150: M.200 and M.250.
2. In the designation of a concrete mix .letter 'M' refers to the mix and the number to the specified 28 days works cube compressive strength of that mix on 150 mm cubes, expressed in kg./cm.
3. The ordinary concrete mix shall generally be specified by volume. For cement which normally comes in bags and is used by weight, volume shall be worked out taking 50 kg. of cement as 0.035 cubic metre in volume. While measuring aggregate by volume, shaking, ramming or hammering shall not be done, proportioning of sand be as per its dry volume. In case it is damp allowance lor bulking shall be made as per IS:2386 (Part III).
4. In gradients required for ordinary concrete cotaining one 50 kg bag of cement for different proportions ofmix shall be as given in Table below.

TABLE

Grade of Concrete	Mix by Volume	Total quantity of dry aggregate by volume per 50 kg cement to be taken as sum of individual volume of fine % coarse aggregate maximum (1 cubic metre = 1000 Litres)	Proportion of fine aggregate to Coarse aggregate	Quantity of water per 50 kg of cement maximum
1.	2.	3.	4.	5.
Ordinary M200	1:3:6	300	Generally 1:2 for	34
Ordinary M1 50	1:2:4	220	fine aggregate to	32
Ordinary M200	1:1.5:3	160	coarse aggregate by	30
Ordinary M250	1:1:2	100	volume but to a upper limit of 1:1.5 and Limit of 1 :3	27

**Note :** The proportions of the aggregates shall be adjusted from upper limit to lower limit progressively as the grading of the final aggregate becomes finer and the maximum size of coarse aggregate becomes larger.

**Example :** For an average grading of fine aggregate (that is Zone II of IS:383-1963) the proportions shall be 1:1 1/



2. 1:2 and 1:3 for maximum size of aggregates 10 mm, 20 mm and 40 mm respectively.

Note : *K* mix leaner than *M* 100 (1:3:6) may be used for non structural part, if provided in the contract. In such cases grading of aggregates shall be by volume. Other requirements for mixing, placing and curing shall be the same.

5. Following shall be the maximum nominal size of coarse aggregate for the different items of work.

- |  |       |
|--|-------|
| (i) Plain C.C.   | 63 mm |
| (ii) Soild type piers, abutments and wing walls, and their per caps. (Coarse aggregate of size upto 40 mm shall be machine crushed.) | 40 mm |
| (iii) C.C. Wearing Coat M-150  | 20mm  |
| (Coarse aggregate of size upto 40 mm shall be machine crushed.)  |       |

6. Fine aggregate shall be clean, hard coarse sand. It shall be free from dust and such other substanes. The sand shall be got approved by the Engineer in-charge.

7. All materials shall be stored as to prevent their deterioration or intrusion of their quality and fitness for the work. Any material which has deteriorated or has been damaged or is otherwise considered defective by the Engineer-in-charge shall not be used in the work.

8. Cement shall be stored above the ground level in perfectly dry and watertight sheds and 'shall be stocked not more than eight, bags high. Wherever bulk storage containers are used, their capacity should be sufficient to cater to the requirements at site and should be cleaned atleast once every 3 to 4 months. Cement more than 3 to 4 months old shall invariably be tested to ascertain that it satifies the acceptability requirements. The aggregates shall be stored in such a way as to prevent admixture of foreign materials. Different sizes of fine or coarse aggregate shall be stored in separate stock piles sufficiently removed from each other to prevent intermixing the materials at edges of the pipes.

9. The water for mixing shall be potable water to the satisfaction of the Engineer-in-charge. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the job,

10. For all work, concrete shall be mixed in a mechanical mixer along with other accessories shall be kept in first class working condition and so maintained throughout the construction. Mixing shall be. continued till materials are uniformly distributed and an uniform colour of the entire mass is obtained and each individual particles of the coarse aggregate shows complete coating of mortar containing its proportionate amout of cement. In no case shall the mixing be done for less than 2 minutes after all ingredients have been put into the mixer.

11. When hand mixing is permitted by the Engineer-in-charge for small jobs or for certain other reasons, it shall be done on a smooth watertight platform large enough to allow efficient turning over of the ingrediets of concrete before and after adding water. Mixing platform shall be so arranged that no foreign material shall get mixed with concrete nor does the mixing water flow out. Cement in required number of bags shall be placed in a uniform layer on top of the measured quantity of fine and coarse aggregate. Which shall also be spread in a layer of uniform thickness on the mixing platform. Dry coarse" and fine aggregate and cement. Then shall be mixed thoroughly by turning over to mass turned over till a mix of required consistency is obtained. In hand mixing quantity of cement shall be increased by 10 percent above that specified.

12. Mixers which have been out of use for more than 30 minutes shall be thoroughly cleaned before putting in a new batch. Unless otherwise agreed to by the Engineer-in-charge the first batch of concrete from the mixer shall contain only two third of normal quantity of course aggregate. Mixing plants shall be thoroughly cleaned before chnging from one type of cement to another.

13. The method of transporting and placing concrete shall be approved by the Engineer-in-charge Concrete shall be so transported and placed that no contamination, segregation or loss of its constituent material takes place. All form work and reinforcement contained in it shall be cleaned and made free from standing water, dust snow or ice immediately before placing of conrete. No concrete shall be placed in any part of the structure until the approval of the Engineer-in-charge has been obtained.

If concreting is not started with 24 hours of the approval being given, it shall have to be obtained again from the Engineer-in-charge. Concreting then shall proceed continuously over the area between construction joints. Fresh concrete shall not be placed against concrete which has been in position for more than 30 minutes unless a proper construction joint is formed. Concrete shall be compacted in its final position within 30 minutes of its discharge from the mixer unless carried in properly designed agitators, operating continuously, when this time shall be within 2 hours of the addition of cement to the mix and within 30 minutes of its discharge from the agitator. Except where otherwise agreed to by the Engineer-in-charge, concrete shall be disposed in horizontal layer to a compacted depth of not more than 0.45 metre when internal vibrators are used and not exceeding 0.30 metre in all other cases.

15. Unless otherwise agreed to by the Engineer-in-charge. concrete shall not be dropped into place from a height exceeding 2 metres. When trucking or chutes are used they shall be kept clean and used in such way as to avoid segregation. When concreting has to be resumed on a surface which has hardened, it shall be roughened, swept clean, thoroughly wetted, and cleaned with a 13mm.thick layer of mortar composed of cement and sand in the same ratio as in the concrete mix itself. This 13 mm layer of mortar shall be freshly mixed and placed immediately before placing of new concrete. Where concrete has not fully hardened, all laitance shall be removed by scrubbing the new surface with wire or bristle brushed. Care being taken to avoid dislodgement of particulars of coarse aggregate. The surface shall then be thoroughly wetted, all free water removed and then coated with neat cement grout. The first layer of concrete to be placed on this surface shall not exceed 150 mm. in thickness, and shall be well rammed against old work particular attention being given to corner and close spots.

16. All concrete shall be compacted to produce a dense homogeneous mass with the assistance of vibrators, unless otherwise permitted by the Engineer-in-charge for exceptional cases, such as concreting under water, where vibrator cannot be used sufficient vibrators in serviceable condition shall be kept at site so that spare equipments is always available in the event of break downs.

17. Immediately after compaction, concrete shall be protected against harmful effects of weather, including rain, running water, shocks, vibrations due to traffic, rapid temperature changes, fast drying put process. It shall be covered with wet sacking hessian or other similar absorbent material approved by the Engineer-in-charge soon after the initial set. It shall be kept continuously wet for a period of not less than 14 days from the date of placement. Masonry work over the foundation concrete may be started after 48 hours of its laying but the curing of concrete shall be continued for a minimum period of 14 days.

18. Form work shall include all temporary or permanent forms required for forming the concrete, together with all temporary construction required for their support. Forms for concrete shall be constructed of metal or timber suitably lined and be of substantial and rigid construction true to shape and dimensions shown on the drawings. Where metal forms are used, all bolts and rivets shall be counter sunk and well ground to provided a smooth, plain surface. Where timber is used it shall be well seasoned, free from loose knots, projecting nails, splits or other defects that may mark the cement surface of concrete. For exposed concrete faces, timber for shuttering shall be wrought on all faces in contact with concrete.

19. Forms shall be mortar tight and shall be made sufficiently rigid by the use of ties and bracings to prevent any displacement or sagging between supports. They shall be strong enough to withstand all pressure, ramming and vibration, without deflection from the prescribed lines occurring during and after placing the concrete. Screw jacks or hardwood wedges where required shall be provided to make up any settlement in the form work either before or during the placing of concrete. Suitable camber shall be provided in horizontal members of surface specially in long spans to counteract the effects of any deflection. The frame work shall be so fixed as to provide for such camber. Forms shall be so constructed as to be removable in sections in the desired sequence, without damaging the surface of concrete or disturbing other sections. Unless otherwise specified or directed. Chamfers or fillets of size 25 mm x 25 mm shall be provided at all angles of form work to avoid sharp corners.

20. The inside surface of forms shall, except in the case of permanent form work or where otherwise agreed to by the Engineer-in-charge. be coated with an approved material to prevent adhesion of concrete to the form work. Release agents shall be applied strictly in accordance with the manufacturer's instructions and shall not be allowed to come into contact with any reinforcement of prestressing tendons and anchorage. Different release agents shall not be used in form work of concrete which will be visible in the finished works.

21. Special measures shall be taken to ensure that the formwork does not hinder the shrinkage of concrete because without these cracking could occur before the form work is removed Where applicable arrangements must be made to ensure that the form does not restrain the shortening and hogging of the beams of slabs during tensioning of the tendons. The formwork should take due account of the calculated amount at positive or negative camber so as to ensure the correct final shape of the structures having regard to the deformation of false work, scaffolding or propping and the instantaneous deformation due to various causes affecting prestressed structures. Where there are re-entrant angles in the concrete sections, the formwork should be removed at these sections as soon as possible after the concrete has set in order to avoid cracking due to shrinking of concrete. Formwork shall be tight enough to prevent any appreciable loss of cement during vibrations. Suitable tolerances should be provided in the formwork, immediately before concreting all forms shall be thoroughly cleaned Contractor shall give the Engineer-in-charge due notice before placing any concrete in the forms to permit him to inspect and accept the false work and forms as to their strength alignment and general fitness, but such inspection shall not relieve the contractor of his responsibility for safety of machinery, materials and for results obtained.

22. The Engineer-in-charge shall be informed in advance by the contractor of his intention to strike any formwork. While fixing the time for removal of formworks, due consideration shall be given to local conditions, character of the structure, the weather and other conditions that influence the setting of concrete the removal of the load supporting or soffit forms may commence when concrete has attained strength and of the materials used in the ix. Where field operations are controlled by the strength test of concrete, the removal of the load supporting or soffit forms may commence when concrete has attained strength equal to at least twice the stress to which the concrete will be subject at the time of striking props including the effect of any further addition of loads. When field operations are not controlled by strength tests of concrete the vertical forms of beams, columns and walls may be removed after 2 days. The props of slabs and beams may be removed after 14 and 21 days respectively. All form work shall be removed without causing any damage to the concrete. Centering shall be gradually and uniformly lowered in such a manner as to avoid any shock or vibrations. Supports shall be removed in such a manner as to permit the concrete to take stresses due to its own weight uniformly and gradually. Where internal metal ties are permitted they or their removable parts shall be extracted without causing any damage to the concrete and remaining holes filled with mortars. No permanently embedded metal part shall have less than 25mm. cover to the finished concrete surface. Where it is intended to reuse the formwork it shall be cleaned and made good to the satisfaction of the Engineer-in-charge.

23. Immediately after the removal of forms, all exposed bars or bolts passing through the Cement Concrete member and used for shuttering or any other purpose shall be cut inside the Cement Concrete member to a depth of at least 25 mm. below the surface of the concrete and the resulting holes filled by cement mortar. All fins cause by form joints, all cavities produced by the removal of form ties and all other holes and depressions, honeycomb spots, broken edges or corners and other defects, shall be thoroughly cleaned, saturated with water and carefully pointed and rendered true with mortar of cement and fine aggregate mixed in the proportions used in the grade of concrete that is being finished and of as dry a consistency as is possible to use. Considerable pressure shall be applied in filling and pointing to ensure thorough filling in all voids. Surface which have been pointed shall be kept moist for a period of 24 hours. If rock, pockets/honeycombs, in the opinion of the Engineer-in-charge are of such an extent and character as to affect structure materially or to endanger the life of the strength of the steel reinforcement, he may declare the concrete defective and require the removal and replacement of the portions of the structure affected. Joint shall be filled up with bitumen as directed by Engineer-in-charge in case of C.C. wearing surface.

24. The unit rate for concrete shall include the cost of all materials, labour, tools and plants required for mixing, placing in positions, vibrating and compacting, finishing as per directions of the Engineer-in-charge, curing and all other incidental expenses for producing concrete of specified strength to complete the structure or its components as shown in the drawings and according to these specifications, The rate shall also include the cost or making, fixing and removing of all centering and forms required for the work centering.

25. The payment will be made on cmt. basis of the finished work.

**Item No. 37 A : Providing & laying C.C.1:4:8 (1=Cement, 4=coarse sand, 8=grade agg 40 m.m. nominal size) and curing comp of form work.**

**Item No. 37 B : Providing & laying C.C.1:5:10 (1=Cement, 4=coarse sand, 8=grade agg 40 m.m. nominal size) and curing comp. incl. cost of form work.**

Materials : Specification for all the ingredients to be used shall be as per the details given in the central specifications for materials attached.

**PROPORTION** : The concrete shall consist of the part of cement, sand and metal as per (40 to 63 m.m. size) the above description of items.

**MIXING** : Mixing of the materials shall be done as for specified volumetric proportion as a possible after water is added, so that every place of agg, is uniformly coated by cement plaster. The concrete must be used immediately after it is prepared and in any case shall be used after the cement has attained final set. Generally concrete prepared before more than half an hour shall not be permitted to be used.

**LAYING** : Consolidation shall be rapidly carried out sufficient labour being employed to permit of ramming or spreading etc. being comp. within as short time as possible causing the mortar to cream up in no case shall ramming be prolonged after the cement has been to take its initial sets.

**CURING** : As soon as the concrete has set sufficiently i.e. after about an hour of laying the surface must be protected from rapid curing out by being covered with at sand wet sunny or where possible curing shall be done by forming the shall be allowed pools of water by means of sand pollics. The curing shall be continued or atleast 10 (ten) days broadly two or three weeks and where possible for longer period. The rate includes all necessary equipments, labour etc. Payment shall be made on cubic measurement of cement concrete. The entire work shall be carried out as per the specification for the PWD Hand book Vol. I Page No. 166 to the satisfaction of the Engineer-in-charge.

**ITEM-38 Providing and laying ordinary (reinforced) concrete 1:2:4 (1 cement :2 coarse sand :4 crushed stone aggregate 20 mm nominal size) & curing complete (excluding cost of reinforcement)**

1. Para 1 to 25 of ordinary concrete [without reinforcement ] shall apply.

26. In the case of reinforced concrete work, workability shall be such that the concrete surrounds and properly grips all reinforcement. The degree of consistency which must depend upon the nature of work and methods of vibration of concrete, shall be determined by regular slumps test. Following test slump shall be adopted for different types of works:

Type of work	Stumps where vibrators are used	Stumps Where vibrators are not used
(i) Mass concrete in R.C.C. foundation, footings and retaining walls,	10mm to 25 mm	80mm
(ii) Beams, slabs and column simply reinforced	25 mm to 40 mm	100mm to 120 mm
(iii) Thin R.C.C. section or sections with congested steel	40 mm to 50 mm	125mm to 150mm

Maximum nominal size of the concrete aggregate shall be 20 mm. and shall machine crushed.

Works strength test shall be made in accordance with IS : 516. Each test shall be conducted on ten specimens five of which shall be taken on each day of concreting and cubes shall be made at the rate of one for every 5 cubic metre to concrete or a part thereof. However, if concreting done in a day is less than 15 cubic metre, the minimum number of cubes can be reduced to 6 with the 15 cubic metre of concrete or a part thereof. However, if concreting done in a day is less than 15 cubic metre, the minimum number of cubes can be reduced to 6 with the specific permission of the Engineer-in-charge. Similar works test shall be carried out whenever the quality and grading of materials is changed irrespective of the quantity of concrete poured. The number of specimens may be suitably increased as deemed necessary by the Engineer-in charge, when procedure of test given above reveals a poor quality to concrete and in other special cases.

26. All necessary labour, materials, equipment, etc. for sampling, preparing test cubes, curing etc. shall be provided by the contractor. Testing of the materials and concrete may be arranged by the Engineer-in-charge in an approved laboratory at the cost of the contractor.

29. The average strength of the group of cubes for each day shall be less than the specified works cube strength 20 percent of the cubes cast for each day may have values less than the specified strength, provided the lowest value is not less than 85 per cent of the specified strength.

30. R.C.C. work shall have exposed concrete surface. Centering design and its erection shall be approved by the Deputy Engineer-in-charge. One carpenter with helper will invariably be kept present through out the period of concreting. Movement of labour and other persons shall be totally prohibited over reinforcement laid in position. For access to different part as suitable platforms shall be provided so that steel reinforcement in positions is not disturbed. For ensuring proper cover, mortar blocks of suitable size shall be cast and tied to the reinforcement. Timber, kapachi or metal pieces shall not be used for this purpose. Concreting of important structural members shall always be done in the presence and under the supervision of department person not below the rank of Junior Engineer/ Supervisor/Overseer. After removal of form work and shuttering, the Executive Engineer shall inspect the work and satisfy by random checks that concrete of good quality. Plastering shall not be allowed to the exposed face of concrete.

32. In reinforced concrete, the volume occupied by reinforcement shall not be deducted. The slab shall be measured as running continuously through and the beam as the portion below the slab.

**ITEM-39 Providing steel reinforcement.**

- (a) Providing & placing in position mild steel bar reinforcement including cutting, bending, Hooking & tying complete as per details.
- (b) High yield strength deformed bars reinforcement.

1. The work shall consist of furnishing and placing, reinforcement of the shape and dimensions shown on the drawings or as-directed by the Engineer-in-charge.

2. Steel shall be clean and free from loose rust and loose mill scale at the time of fixing in position and of subsequent concreting.

3. Reinforcing steel shall conform accurately to the dimensions given in bar bending schedules shown on relevant drawing's. Bars shall be bent cold to the specified shape and dimensions or as directed by the Engineer-in-charge using a proper bar bender, operated by hand or power to attain proper radius of bends. Bars shall not be bent or straightened in manner that will injure the material. Bars bent during transporting or handling

shall be straightened before use on work; they shall not be invariably be provided. The radius of the bend shall not less than twice the diameter of the round bar and length of the straight part of the bar-beyond the end of the curve shall be at least four times the diameter of the round bar. In the case of bars which are not round and in the case of deformed bars, the diameter shall be taken as the diameter of a circle having an equivalent effective area. The work shall be suitably encased to prevent any splitting of the concrete.

4. All reinforcement bars shall be accurately placed in exact position on the drawings, and shall be securely held in position during placing of concrete by annealed binding wire not less than 1 mm, in size and conforming to IS : 280 and by using stay blocks or metal chairs spacers, metal hangers, supporting wires or other approved devices at sufficiently close intervals. Bars will not be allowed to sag between supports or displaced during concreting or any of their operations over the work. All devices used for positioning shall be non corrodible material. Wooden and metal supports will not extend to the surface of concrete except where shown on the drawings. Placing bars on layers of freshly laid concrete as the work progress or adjusting bar spacing will not be allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bars, precast mortar block, or other approved device. Reinforcement after being placed in position shall be maintained in clean condition until completely embedded in concrete. Special care shall be exercised to prevent any displacement of reinforcement in concrete already placed. To protect reinforcement from corrosion, concrete cover shall be provided as indicated on the drawings. All bars protruding from concrete and to which other bars are to be spliced and which are likely to be exposed for an indefinite period shall be protected by a thick coat of neat cement grout.

5. Bars crossing each other, where required, shall Lie secured by binding wire (annealed) of size not less than 1 mm, and conforming to IS : 280 in such a manner that they do not slip over each other at the time of fixing and concreting.

6. As far as possible, bars of full length shall be used. In case this is not possible, overlapping of bars shall be done as directed by the engineer-in-charge. When practicable, overlapping bars shall not touch each other, but be kept apart by 25 mm or 1.25 times the maximum size of the coarse aggregate which ever is greater, by concrete between them. Where not feasible, overlapping bars shall be bound with annealed steel wire, not less than 1 mm. thickness twisted right. The overlaps shall be staggered for different bars and located at points, along the span where neither shear nor bending movement is maximum.

7. Whenever indicated on the drawings or desired by the Engineer-in-charge, bar shall be joined by couplings which shall have a cross-section sufficient to transmit the full strength of bars. The end of the bars that are joined by coupling shall be upset for a sufficient length so that the effective cross-section at the base of threads shall be standard white worth threads. Steel for coupling shall conform to IS :226.

8. When permitted or specified on the drawings joints of reinforcement bars shall be butt welded so as to transmit their full strength. Welded joints shall preferably be located at points where steel will not be subject to more than 75 per cent of the maximum permissible stresses and welds so staggered that at any one section not more than 20 per cent of the rods are welded. Only electric are welded using a process which excludes air from the molten metal and conforms to any or all other special provisions for the work .will be accepted. Suitable means shall be provided for holding the bars securely in position during welding. It must be ensured that no voids are left in welding and when welding is done in 2 or 3 stages, previous surface shall be cleaned properly. Ends of the bars shall be cleaned of all loose scale rust grease ,paint and other foreign matter before welding. Only competent welders shall be employed on the work. The M.S. Electrodes used for welding shall conform, to IS :814, Welded pieces of reinforcement shall be tested. Specimen shall be taken from the actual site and their number and frequency to test shall be as directed by the Engineer-in-charge.

9. Wastage shall be permitted upto 5 per cent maximum. Useful pieces of steel, as may be decided by the Engineer-in-charge shall be taken back by the Government at issue rate and at P.W.D. Store from where the steel was supplied. All the expenses of loading, carting, unloading and returning the waste will be borne by the contractor.

10. Reinforcement shall be measured in length separately for different diameters as actually used in the work. From the length so measured the weight of reinforcement shall be calculated in tones on the same basis of IS: 1732 even though steel is supplied to the contractor by the Department on actual weighment Lengths shall include hooks at ends. Wastage and annealed steel wire for binding shall not be measured and cost of these items shall be deemed to be included in the rates for reinforcement.

11. Rate for reinforcement shall include cost of all steel, its carting from P.W.D. Store to work site, its bending, placing binding and fixing in position as shown on the drawings and as directed by the Engineer in charge It shall also include cost of all devices for keeping reinforcement in approved position, cost of joining as per approved methods, and all wastage, & spacer bars, & also returning the useful wastage of the Department.

**ITEM – 40      Providing Cement pointing on uncoursed / coursed stone / brick wall masonry with cement mortar 1:3 ( 1 cement : 3 sand) (A) Flush pointing (B) Ruled Pointing.**

1. For surface which is to be subsequently jointed, the joints shall be squarely raked out to a depth of 15 mm while the mortar is still green. The raked joints shall be well brushed to removed dust and loose particles and the surface shall be thoroughly washed with water, cleaned and wetted.
2. Cement and sand shall be mixed in proportions as specified in the item. Cement and sand shall be proportioned by volume after making due allowance for bulking. The required quantity of water shall then be added and the mortar mixed to produce workable consistency.
3. The mixing shall be done intimately by hand – mixing. The operation shall be carried out on a clean watertight platform and cement and sand shall be first mixed dry in the required proportion to obtain a uniform colour and then the mortar shall be mixed for at least two minutes after addition of water. In case of cement mortar, that has stiffened because of evaporation of water, the same shall be re-tempered by adding water as frequently as needed to restore the requisite consistency but this re-tempering shall be permitted only with thirty minutes from the time of addition of water at the time of initial mixing.
4. For pointing, the mortar shall be filled and pressed into the raked out joints before giving the required finish. The pointing shall then be finished to proper type given on the drawings. If type of pointing after the mortar has been filled and pressed into the joints and finished off level with the edge of the bricks, it shall while still green be ruled along the centre with a half round tool of such width as may be specified by the Engineer – in – charge. The superfluous mortar shall then be cut off from the edges of the lines and the surface of masonry shall also be cleaned of all mortar.
5. Curing shall be started as soon as the mortar used for finished has hardened sufficiently not to be damaged when watered. It shall be kept wet for a period of at least 7 days. During this period it shall be suitably protected from all damage.
6. Stage scaffolding shall be approved for the work. This shall be independent of the structure.
7. The work of pointing shall be measured in square metres of the surface treated.
8. The rate for pointing shall include erecting the removal of scaffolding all labour, materials and equipment incidental to complete the pointing, raking out joints, wetting filling with mortar, trowelling, point and watering.

**ITEM – 41      Providing and laying 22.50 cms thick rubble stone pitching including preparing surface, lying 15 cms thick murrum layer over prepared surface and arranging rubbles on it by hand packing and in level & lined surface in slope camber including filling the interstices between adjacent stone by spalls of proper size & wedged for right packing as directed etc. complete without cement pointing.**

1. The work shall consist of covering the slopes of guide banks, training works and road embankment with stone or boulders, over a layer of murrum bedding.
2. Stone subject to marked deterioration by water or weather will not be accepted. The stone shall be sound, hard, durable and fairly regular in shape and its thickness in any one direction shall not be less than the thickness of pitching as specified in the item and thickness of the stone at any place shall not be less by 15% of the thickness specified. The largest stones procurable shall be supplied on site. The sizes of spalls shall be minimum 25mm and shall be suitable to fill the voids in the pitching. Thickness of the pitching shall be as specified in the pitching item. ( G.C.No.SSR/2080 IB 547/28/C, dated 6<sup>th</sup> March, 1982)
3. Before laying the pitching, the sides of banks shall be trimmed to the required slope and profiles put up by means of line and pegs at intervals of 3 metres to ensure regular straight work and uniform slope throughout. Depressions shall be filled and thoroughly compacted.
4. Murrum for bedding shall be laid over the prepared base and suitably compacted to a thickness 150mm. Quality of murrum will be as per its relevant specifications.
5. The stone pitching shall commence in a trench below the toe of the slope. Stone shall be placed by derrick or by hand to the required length, thickness and depth conforming to the drawing. Stones shall be set normal to the slope and placed so that the largest dimensions is perpendicular to the face of the slope, unless such dimensions are greater than the specified thickness of pitching. The largest stones shall be placed in the bottom courses and for use as headers for subsequent course. When full depth of pitching can be formed with a single stone, the stones shall be laid breaking joints and all interstices between adjacent stones shall be filled in with spalls of the proper size and wedged in with hammers to ensure tight packing. Pitching shall be done in panles of 3.0 M x 3.0 M with a 30 CM wide and 8 Cm. deeper band all around.

6. Payment shall be made on Square Meter basis of the-finished work. If directed by the Engineer-in-charge, for measurement the materials may have to be stacked at site before laying and nothing extra will be paid to the Contractor for this stacking. Preparation of base for laying bedding shall be deemed indicated to the work.

7. The rate shall include the cost of preparing the base, putting to the profiles, providing, laying and compacting the murrum bedding and stone pitching of dry rubble as per embankment slopes to specified thickness, lines, curves, slopes levels and all labour and materials as well as tools and plant required of the work.

**ITEM-42 Providing 12 mm thick premoulded asphalt filler joints as per drawings.**

1. Open joints shall be constructed at the location as directed by the Engineer-in-charge using a wood strip metal plate or other suitable material which is subsequently removed. When removing the material, care shall be exercised to avoid chipping or breaking the corners of the concrete. The edge of the concrete, at the joints, shall be well finished. Reinforcement shall not extend across an open joint.

2. When preformed filler is to be provided, the filler shall be placed in correct position before concrete is placed against the filler. The filler material shall form part of the joint and while concreting the slab. Care shall be taken to prevent the former form being displaced, After the work is completed, the exposed face of the joint shall be cleaned of all loose materials sticking to it.

3. The material used for filling expansion joint shall be bitumen impregnated felt. Impregnated felt shall conform to the requirement of IS:1838, and shall be got approved from the Engineer-in-charge. The joint shall consist of large pieces and assembly of small places to make up the required size shall be avoided.

4. The expansion joint shall be measured in running metres. Thickness of the expansion joint will be 20 to 25 mm. Width of expansion joint shall be equal to full depth of the slab.

5. The rate shall include the cost of all materials, labour, equipments 'incidental charges for fixing the joints complete in all respects as per these specifications and as shown on the drawings.

**ITEM-43 Providing parapet of controlled cement concrete M 150 as per detailed drawing with necessary reinforcement including shuttering laying, vibrating & finishing to line level complete precast consistency.**

1. Railings shall not be placed until the centering or false work for the span has been released, and is self supporting. The type of railing to be constructed shall be as shown on the drawing. The railing shall be carefully erected true to the line and grade. Posts shall be vertical with a tolerance not to exceed 6 mm in 3 metres.

2. The portion of the railing or parapet which is to be casting in place shall be constructed in accordance with the relevant specification for reinforced cement concrete. Forms shall either be of single width boards or shall be lined with suitable materials duly approved by the Engineer-in-charge. Form joints in plane surfaces will not be permitted. All mouldings, panels in the finished work shall be constructed according to the details shown on the drawings. All corners in the finished work shall be true, sharp and clean cut and shall be free from cracks, spall or other defects.

3. Railing shall be measured in running metres.

4. The rate of railing shall include the cost of all labour, material, tools and plant required, for doing the work complete in all respects in accordance with these specifications, and as shown on the drawing.

**ITEM-44 Providing 15 mm thick cement plaster in single coat on brick/Concrete wall for interior plastering up to floor two level finished even and smooth in (i) Cement mortar 1:3 (1 cement :3 sand) (ii) Cement mortar 1:4 (1 cement :4 sand) (iii) Cement mortar 1:6 (1 cement :6 sand)**

1. For a surface which is to be subsequently plastered the joints shall be squarely raked out to a depth of 15 mm, while the mortar is still green. The raked joints shall be well brushed to remove dust and loose particles and the surface shall be thoroughly washed with water, cleaned and wetted.

2. Cement and sand shall be mixed in proportion as specified in the item, Cement and sand shall be proportioned by volume after making due allowance for bulking. The required quantity of water shall then be added and the mortar mixed to produce workable consistency.

3. The mixing shall be done intimately by hand mixing. The operation shall be carried out on a clean watertight platform, and cement and sand shall be first mixed dry in the required proportion to obtain a uniform colour and then the mortar shall be mixed thoroughly after addition of water. In case of cement mortar that has stiffened because of evaporation of water, the same shall be retamped by adding water as frequently as needed to restore the requisite consistency but this retamping shall be permitted only within thirty minutes from the time of addition of initial mixing.

4. Plastering shall be started from top & worked down All pitlog holes shall be properly filled in advance

of the plastering as the scaffolding is being taken down. Wooden screeds 75 mm wide and of the thickness of the plaster shall be fixed vertically 2.5 metres to 4 metres apart to act as gauges and guides in applying the plaster. The mortar shall be laid on the wall between the screeds using the plaster float and pressing the mortar to the racked joints are properly filled.

The plaster shall then be finished off with a wooden straight edge reaching across the screeds. The straight edge shall be worked on the screeds with a small upward and side way motion 50 mm or 75 mm at a time. Finally, the surface shall be finished off with a plaster's wooden float. Metal floats shall not be used.

5. When recommencing plastering beyond the work suspended earlier the edge of the old plaster shall be scrapped, cleaned and wetted before plaster is applied to the adjacent areas. No portion of the surface shall be left out initially or be patched by later on. The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness as required by the Engineer-in-charge. The average thickness of plaster shall not be less than the thickness specified in the item with a tolerance of 3 mm thickness which appear in the surface and all portions, which sound hollow when tapped, or are found to be otherwise defective, shall be cut out in rectangular shape and re-done as directed by the Engineer-in-charge.

6. Curing shall be started as soon as the mortar used for finished has hardened sufficiently not to be damaged when watered. It shall be kept wet for a period of atleast 7 days. During this period, it shall be suitably protected from all damages.

7. Stage scaffolding shall be provided for the work. This shall be independent of the structure.

8. The work of plastering shall be measured in sq. metre of the surface treated.

9. The rate of plastering shall include the cost of all labour, materials tools and plant scaffolding and all incidental expenses as described herein above.

**ITEM-45 Box cutting of the road surface to proper, slope and camber for making a base for road work including removing the excavated stuff and depositing the road side as directed upto 50 M. lead etc. comp.**

1. Specification No. 162 and 553 of P.W.D. Hand book volume II and the following additional specifications shall be applicable here.

2. Cutting shall be done in proper grade & camber as per measurements given. Care must be taken the tall slopes are evenly and truly dressed. Cutting shall be done to the exact depth required and shall be as per formation level in proper grade and the camber. If extra depth of cutting is done due to negligence of contractor the same shall be refilled with approved quality of materials duly consolidated to the satisfaction of the Engineer-in-charge (without extra cost). Box cutting for soling and metalling in required width the depth shall be done.

3. The stuff received from the cutting shall be utilised for filling cuts and correcting side slopes of bank with all lead and lift as directed. Useful stuff shall be carefully stacked separately as directed.

4. The measurement shall be taken as per cross section measurement of the cutting based on length, breadth, depth measured with tape at every 25 metres interval.

5. The payment shall be made on Cmt. basis.

**ITEM - 46 Providing open graded carpet with Premix H.M.P. & P.P.:**

1. The work shall consist of construction in a single course of 20. 25 mm thick open graded carpet on a previously prepared base. Single course shall also include additional material @ 20% to remove unevenness of the existing surface.

Para 1 to 4 of item of semidense carpet (Item - 18) shall apply.

5. Proportioning of materials. The material shall be proportioned as quantities given below.

- |   |     |
|---|-----|
| (a) Stone chipping 12 mm size and retained on 10 mm sieve.                      | 67% |
| (b) Stone chipping 10mm size passing 12.5 mm sieve and retained on 6.3 mm sieve | 33% |

Para 6 to 11 of item of semidense carpet (Item - 18) shall apply.

12. Open graded carpet shall not be laid during rainy weather or when the base course is damp or wet.

13. The base on which open graded carpet is to be laid shall be thoroughly swept and scrapped clean and free of dust and foreign matter.

14. The work shall consist of application of single coat of bituminous material to an existing road surface preparatory to bituminous construction. The temperature of bitumen at the time of application shall be in the range of 160 degree centigrade to 175 degree centigrade

15. Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge and sprayed at the rate specified below. The rate of spread of straight run bitumen for tack coat shall be 5/10 Kg / 10 Sq. metre are for an existing B.T./W.B.M. surface. The binder shall be applied uniformly. The tack coat shall be applied, just ahead of the coming bituminous constructions.



16. The binder content for premixing shall be 3.50/3.28 percent by weight of the total mix unless otherwise specified.

The quantities of aggregate shall be sufficient to yield the specified thickness after compaction. Para 17 to 35 of item of semi dense carpet (Item No. 18) shall apply.

36. The contract unit rate of open-graded carpet shall be paid in full for carrying out the required operations including full compensation for :

- 1 . Making arrangement of control and safety of traffic.
2. Preparation of base
3. Providing all materials to be incorporated in the works with all lead and lift.
4. All labours, tools, equipments and incidental to complete the works to the specification.

**TTEM-47 Providing & laying bituminous mix seal coat surfacing considering 0.66 cmt / 1 M.T. with m/c stone chipping as per gradation and asphalt of 4.25% by wt. of mixing by heating asphalt & mixing by continuous batching of hot mix plant and spreading by paver finisher consolidation by power roller & providing & operating plant machineries with cost of fuel, oil, lubricants etc, with sand / dust flushing at 0.30 cmt /100 smt.**

1. The work shall consist of constructing in a single course of mix seal surfacing as course on a previously prepared base of carpet single course shall also include additional thickness. If any. to remove unevenness of the existing surface.

Para 3 to 4 of item No. 18 shall apply.

5. The aggregates shall be so graded or combined as to confirm to the grading as under.

Sieve Designation	Percent by weight passing Sieve for type 'A' Mix seal surfacing.
20mm	100
7.75mm	40 –85
7.36mm	5 – 10
75 micron	0 - 4

Para 6 to 11 of item of Semi-Dense carper (Item No. 18) shall apply.

12. Mix seal surfacing shall not be laid during rainy weather or when the base course is damp or wet.

13. The base on which mix seal surfacing is to be laid shall be thoroughly cleaned and free of dust and foreign matter.

14. The work shall consist of application of mix seal surfacing of single coat of bitumninous mateial to an existing carpet surface preparatory to. bituminous construction. The temperature of bitumen at the time of application shall be in the range of 160 degree centigrade to 175 degree centigrade.

16. Tack coast for mix seal surfacing shall be applied as the work of laying mix seal surfacing is being preceded by a bituminous open graded carpet.

17. The binder content for pre mixing shall be 4% by weight of the total unless otherwise specified in item of schedule B of the work. Quantity of aggregate shall be sufficient to yield the specified thickness after compaction.

Para 18 to 35 of the item of Semi-dense carpet) (item 18) shall apply.

36. The contract unit rate for mix seal surfacing shall be paid in full for carrying out the required operation including full compaction for:

- 1 . Making arrangement of control and safety of traffic.
2. Preparation of base.
3. Providing all materials to be incorporated in the works with all lead and lift.
4. All labours, tools, equipments and incidental to complete the works to the specification.

**1TEM-48(A) Providing and laying 20 mm. thick (completed asphalt carpet using asphalt for tack coat at the rate of 5-10 kg./10 sq. mt. using crushed stone aggregates as per the gradation and bitumen at the rate of 3.26% by wt. of total mix for binder using hot mix plant and laid by paver finisher including consolidation by Power road roller providing and operating plant, machineries and equipment, cost of fuel oil, lubricant and charges, including flushing sand @ 0.30 cmt/100 sq. mt. at directed etc. complete.**

The specification of this item, shall be the same as per item No. 18 except for aggregate gradation and weather and seasonal limitation which shall be as below and the binder shall be as specified.

## **2. Table Aggregate gradation for Asphalt carpet.**

Sieve Size	% by weight passing the Sieve
20mm	100
12.5mm	70-100
10.0mm	20-40
4.75 mm	0-5
2-36 mm	

**3.1 Weather and seasonal limitation :** Carpet shall not be laid during rainy weather or when base course is damp or wet.

**ITEM-48(B) Providing and laying 25 mm. thick (completed asphalt carpet using asphalt for tack coat at the rate of 5-10 kg./10 sq. mt. using crushed stone aggregates as per the gradation and bitumen at the rate of 3.28% by wt. of total mix for binder using hot mix plant and laid by paver finisher including consolidation by Power road roller providing and operating plant, machineries and equipment, cost of fuel oil. lubricant and charges, including flushing sand & 0.30 cmt/100 sq. mt. at directed etc. complete.**

The specification of this item, shall be the same as per item No. 18 except for aggregate gradation and weather and seasonal limitation which shall be as below and the binder shall be as specified.

## **2. Table Aggregate gradation for Asphalt carpet.**

Sieve Size	% by weight passing the Sieve.
20mm	100
12.5mm	70-100
10.0mm	20-40
4 75 mm	0-5
2.36mm	

**3.1 Weather and seasonal limitation :** Carpet shall not be laid during rainy weather or when base course is damp or wet.

**ITEM-49 (1) Surface dressing one coat with paving bitumen using 18 kg. bitumen per 10.0 Sq.m. with 0.15 cum of Stone chipping 12 mm. nominal size per 10.0 sq.m of road surface excluding rolling and consolidation (stone chipping and bitumen shall be paid separately). (2) Surface dressing in two coats with bitumen using 18 Kg. per 10sqm. with 0.15 sqm of stone chipping 12mm nominal size per 10sqm. for first size 11kg. of bitumen with 0.10 cum of stone chipping 10mm nominal size per 10 sqm. of road surface for second coat excluding consolidation etc. complete, (stone chipping and bitumen shall be paid separately)**

### **1 . DESCRIPTION**

This work shall consist of the application of one coat of surface dressing, consisting of a layer of bituminous binder sprayed on a base prepared previously followed by a cover of stone chipping properly rolled to form a wearing course to the requirements of these specifications.

### **2. MATERIALS**

**2.1 Stone chipping :** The machine crushed B.T. stone chipping shall consist of fairly cubical fragments of clean, hard, tough and durable rock of uniform quality throughout. These shall be obtained by crushing B T. stone. The chipping shall be free of elongated or flaky pieces, soft or disintegrated stone, salt, alkali, vegetable matter, dust and adherent coatings.

**2.2 Binder :** The binder shall be straight run bitumen of 80/100 or 60/70 penetration and satisfying the requirement of I.S. 73 or other type of bitumen as may be approved by the Department

Necessary storage arrangements i.e. provision of tanks etc for bulk asphalt shall be done by the contractor without any extra charges.

In the case of bitumen is to be supplied by Department in bulk at the rate and place shown in Schedule "A" for bulk asphalt, contractor shall have to make adequate arrangement for stacking bulk asphalt at plant site, according to requirement. If the asphalt is supplied as bulk on plant site, the rate of conveyance for lead difference from store to plant site shall be recovered at S.O.R. for Qty of asphalt supplied

**2.3 Keeping Records :** The Department shall keep a day account of the supply and use of the asphalt in separate bound register having numbered pages in the proforma prescribed by the Department. Day to day signature of the responsible contractor or his representative as may be directed by Engineer-in-charge shall be obtained in this register. The register shall be maintained by the Department and shall be produced with each bill.

**TABLE . Physical requirements of aggregates**

Sr. No.	Test	Test Method	Requirement
1	Los Angeles Abrasion Value*	IS : 2386 (Part IV)	40% Maximum
2	Aggregate Impact Value*	-do-	30% Maximum
3	Flakiness Index	IS : 2386 (Part I)	30% Maximum
4	Stripping Value	IS : 6241	25% Maximum
5	Soundness		
	(i) Loss with Sodium Sulphate 5 cycles		12%
	(ii) Loss with Magnesium		18%
6	Water Absorption	IS ; 2386 (Part III)	1% Maximum

" Aggregate may satisfy requirements of either of the two tests.

Note : If crushed slag is used. Clause 404.2 3 shall apply.

Requirements of stone chipping and binder content for surface dressing for 10 sq.mt.

Sr. No.	Type of Construction	Nominal Size of stone chipping	Specifications percent passing through Sieve and retained on Sieve	Quantity of materials	Binder content
1	Single coat surface dressing of first coating of two coat surface coating	12mm	Passing 20 mm Sieve & Retained on 10 mm Sieve	0.15 CM	18 Kg.
2	Second Coat of two coat surface dressing	10mm	Passing 12 mm Sieve & retained on 4.5mm sieve	0.10 CM	11 Kg.

### 3. CONSTRUCTION OPERATION

**3.1 Weather & seasonal limitations** ; The surface dressing work shall be carried on only when the atmospheric temperature in shade is above 15° C. No bituminous materials shall normally be applied when the surface of cover material is damp. when the weather is foggy or rainy or during dust storms.

**3.2 Preparation of base** : The base on which surface dressing is to be laid shall be prepared, shaped and conditional to the specified lines, grade and cross section as directed by the Engineer-in-charge.

The surface shall be thoroughly swept and scraped cleans of dust and any other extraneous matter before the spraying of binder. As necessary the cleaning shall be Hone first with hard brushed, then with softer brushes and finally by blowing with sacks or gunny bags

**3.3 Application of binder** : Binders shall be heated to 163° C to 177° C. and sprayed on the dry surface in uniform manner with the help of self-propelled mechanical sprayers having, self-heating arrangement and bitumen pressure pump and spray nozzle bar capable of spraying bitumen uniformly at specified rate as given in above table. Excessive deposits of binder caused by stopping or starting of the sprayer or Through leakage or any other reasons shall be suitably corrected before the stone chipping are spread.

**3.4 Application of stone chippings** : The cover material i e. machine crushed B T chips of 11.2 mm nominal size shall be stacked on road side by filling standard boxes of 2.0 m x 1.50 m x 0.50 m the measurement shall be recorded in the measurement book after collection in two kilometer length is complete. The material shall be cross checked by another D .E. E. as per rules. There after, the spreading shall be allowed. The permission of Engineer-in-charge shall be obtained before spreading.

Immediately after the application of binder, stone chippings in a dry and clean, state shall be spread uniformly on the surface, preferably by means of mechanical gritter. otherwise, manually so as to cover the surface completely. If necessary, the surface shall be broomed to ensure uniform spread of chippings.

**3.5 Rolling** : Immediately alter the application of the cover material, the entire surface shall be rolled with a 8-10 tones three wheeled roller. Rolling shall commence at the edges and progress towards the center except in supper elevated portions, where it shall proceed from the inner edge to the other. Each pass of the roller shall uniformly be not less than one third, of the track made in the preceding pass. While rolling is in progress additional chippings shall be spread by hand in whatever quantities required to make up irregularities. Rolling shall continue until aggregate particles are firmly bedded in the binder and present a uniform closed surface.

**3.6 Application of second coat of surface dressing** : Where surface dressing in two coats is specified the second coat shall be applied immediately after laying the first coat. The operation shall be the same as describe in para 8.3.3 to 8.3.5.

#### 4. OPENING TO TRAFFIC

Traffic shall not be permitted to run on any newly surface dressed area until the following day. In circumstances, however, the Engineer-in-charge may open the road to traffic immediately after rolling, but in such cases its speed shall be limited to 16 k.m. per hour till the following day.

#### 5. SURFACE FINISH AND QUALITY CONTROL OF WORK

The surface finish of construction shall conform to requirements of M.O.S.T. No. 902 Specification. Control on the quality of materials and works shall be exercised by the Engineer-in-charge in accordance with section 900.

#### 6. ARRANGEMENTS FOR TRAFFIC

During the period of construction flow of traffic shall be maintained as per clause-112.

#### 7. MEASUREMENTS FOR PAYMENT

Surface dressing shall be measured as finished work in square metres.

#### 8. RATE

The contract unit rate for surface dressing shall be payment in full for carrying out the required operations including full compensation for all components listed in item No. 1 para 2.8

**ITEM 50 Providing & laying with built up spray grout (B.S.G.) base course in one layer with asphalt for tack coat at rate of 5kg/10sq.mt and then bitumen at the rate of 15kg/10sq.mt. with 0.50 CMT aggregate per 10 SMT of road surface for first layer and then spraying over it key aggregate at the rate of 0.13 cmt per. 10 smt. including rolling and consolidation.**

##### 1. Description:

This work shall consist at a one layer/two layer composite construction of compacted crushed coarse aggregates with application of bituminous binder after each layer and key aggregates on the top of the second layer, in accordance with requirement of these specifications and in conformity with the lines, grades and cross-sections shown on the drawing or directed by the Engineer-in-charge.

##### 2. Materials:

2.1 **Binder** : The binder shall be straight run bitumen of a suitable grade, 60/70 or 80/100 as directed by the Engineer-in-charge, satisfying the requirements of IS-73 or approved cutback.

2.2 **Aggregates** : The aggregates shall, durable, of fairly cubical shape and free of disintegrated pieces, organic or other deleterious matter and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity.

The aggregates shall satisfy the physical requirements set forth in Annexure-B except that the upper limit for Los Angeles Abrasion Value and Aggregate impact Value shall be 50 and 40 respectively. The coarse and key aggregates for built-up spray grout shall conform to the gradings given below.

Gradings requirements of coarse and key aggregates for built-up spray grout

Sieve Designation	Percent by weight passing the Sieve	
	Coarse Aggregate	Key Aggregate
50.0 mm	100	-
25.0 mm	35-70	—
20.0 mm	—	100.0
12.5mm	0-15	35-70
4.75 mm	—	0-15
2.36 mm	0-5	0-5

##### 3. Construction Operations

3.1 **Weather and seasonal limitations** : Built-up spray grout shall not be constructed during rainy weather, when the base is damp or wet or when the atmospheric temperature in shade is 16° C or below.

3.2 **Preparation of base** : The base on which built-up spray grout is to be constructed shall be prepared, shaped and conditioned to the specified lines, grades and cross-sections as directed by the Engineer-in-charge. The surface be thoroughly swept and scrapped clean of dust and other foreign matter.

3.3 **Tack coat**: A tack coat as per item No. 21 para 3.3 shall be applied over the base preparatory to construction of the spray grout course.

3.4 **Spreading and rolling coarse aggregates** : Immediately after the application of tack coat the coarse aggregates in a dry and clean form shall be spread uniformly, and evenly at the rate of 0.5 cum per 10 Sq. m. area. The surface of the layer shall be carefully checked with templates and all high and low spots remedied by removing or adding as may be required.

Immediately after spreading of the coarse aggregates, dry rolling shall be done with a 8-10 tonne smooth wheeled roller Rolling shall commence at the edge and progress towards the centre except in super-elevated portions where it shall proceed from the inner edge to the outer. Each pass of the roller shall uniformly overlap not less than one third of the track made in the preceding pass.

After initial rolling the surface shall be checked transversely and longitudinally with templates and any irregularities corrected by loosening the surface, adding or removing necessary amounts of aggregate followed by rolling.

Rolling shall be stopped before voids in the aggregate layer are closed to such an extent as to prevent free and uniform penetration of the binder.

**3.5 Application of binder - First spray :** The binder shall be heated to the temperature appropriate to grade of bitumen approved by the Engineer-in-charge and sprayed on aggregate layer at the rate of 15 kg/ 10 m<sup>2</sup> (In terms of straight-run bitumen) in a uniform manner with the help of mechanical sprayers. Excessive deposits of caused by stopping or starting of the sprayers or through leakage or any other reason shall be corrected promptly.

**3.6 Spreading and rolling for coarse aggregate for the second layer :** Immediately after the first application of binder the second layer of coarse aggregates shall be spread and rolled to 3.4 above.

**3.7 Application of binder - second spray :** The second aggregate layer shall then be given a binder spray at the rate of 15 kg/10 m<sup>2</sup> (in terms, of straight-run bitumen) to 3.5 above.

**3.8 Application of key aggregate :** immediately after second application of the binder key aggregate in a clean and dry state shall be spread uniformly at the rate of 0.13 m<sup>3</sup> / 10m<sup>2</sup> so as to cover the surface completely. If necessary, the surface shall be broomed to ensure uniform application of the key aggregates. The entire surface shall then be rolled with a 8-10 tonne smooth wheeled roller. While rolling is in progress, additional key aggregates where required shall be spread by hand. Rolling shall continue until the entire course is thoroughly compacted and the key aggregates are firmly in position.

**4. Surface Finish and Quality Control :** The surface finish of construction shall conform to the requirements of 902 of M.O.S.T.

5. The built-up spray -grout shall be provided with final surfacing without any delay.

6. **Arrangements for Traffic :** During period of construction, arrangements of traffic shall be done as per para 112 of M.O.S.T. Specification.

7. **Measurements for Payment :** Built-up spray grout shall be measured as finished work in square meters.

8. **Rate :** The contract unit rate for built-up spray grout shall be payment in full for carrying out the required operations including full compensation for all components as follows :

(1) Providing all materials to be used in the work including royalty charges, fees, rent where necessary with all lead & lift.

(2) All labour, tools, plants, equipments and incidental to complete the work to the specification.

(3) Providing and maintaining diversion and controlling traffic.

Asphalt if used less than as specified on account of deviation in tack coat or modification in rate of asphalt consumption in the item, it will be recovered at the rate as mentioned in Schedule "A" for quantity used less.

#### **ITEM-51 Providing & Laying L.C.C. from working foundation & plinth.**

**(A) Providing and laying C.C. 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregates, of 40 mm. nominal size) & curing etc. complete excluding cost of form work in foundation & plinth.**

**Material :** The specifications for graded stone shall be as per details given in the General Specification for materials attached,

**Proportions :** The concrete shall consist of one part of Cement, Five parts of Sand and Ten parts of Metal (40 to 63 mm size)

**Mixing :** Mixing of the materials shall be as thorough as possible after water is added so that every pieces of aggregate is uniformly coated by cement. The concrete must be used immediately after it is prepared and in no case shall it be used after the cement has achieved final set. Generally concrete which has been standing for more than half an hour shall not be permitted to be used.

**Laying :** The concrete must be laid gently (not dumped from height) as not to permit the segregation of the concrete.

**Consolidation :** Consolidation shall be strictly earned out. Sufficient labour shall be employed to permit ramming, rodding, spreading etc. being complete within as short time as possible causing the mortar come up. In no cases shall ramming be permitted after the cement has begun to take initial set.

**Curing** : As soon as the concrete has set sufficiently i.e. about an hour of laying the surface must be protected from rapid drying out by being covered with sand quarry dust or where possible the curing shall be done by forming pond. The watering shall be continued for at later 10 (Ten) days usually two to three weeks and where possible for longer period.

The rate includes all necessary equipment etc. complete.. Payment shall be made on cubic measurement of concrete.

The entire work shall be carried out as per the specification for PWD Hand Book Vol. 1 to the satisfaction of the Engineer-in-charge.

**(B) Providing & laying L.C.C. 1:5:10 (1 cement : 5 coarse sand : 10 graded brick bats of 40 to 50 mm. nominal size) & curing complete excluding cost of form work in foundation and plinth.**

The specification shall be same as per item No 51 (A) except that coarse aggregate shall be brick bats of 40 mm to 50 mm nominal size instead of graded metal.

**(C) Providing & laying L.C.C. 1:5:10 (1 cement : 5 coarse sand : 10 graded stone aggregate of 40 to 63 mm. nominal size) including curing etc. complete excluding cost of form an work in the foundation and plinth.**

The specification shall be same as per Hem No. 51 (A).

#### **ITEM-52 Whitewashing :**

**White washing with lime on wall surface two coat to give an even shade including thoroughly brooming the surface to remove all dirt, and mortar drops and other foreign matter.**

1. **General**: Lime shall be hydraulic lime of approved quality

The slaked lime, if stored, shall be kept in a weather proof and damp roof shed with impervious floor and sides to protect it against rain, moisture, weather and extraneous materials mixing with it. All lime that has been damaged to any ways shall be rejected and all rejected materials shall be removed from site of work

2. **Workmanship** : The fat lime shall be slaked at site and shall be mixed and stirred with about five liters of water and 1 Kg of unslaked lime to make a thin cream. This shall be allowed to stand for a period of 24 hours and then shall be added to each cubic meter of lime cream. Small quantity of ultra marine blue shall also be added to the last two coat of while wash solution and the whole solution shall be stirred thoroughly before use.

3. **Preparation of surface** : The surface shall be thoroughly cleaned of all dust mortar dropping and other foreign matter before white wash is to be applied. Oil or grease spots shall be removed by suitable chemicals and smooth, surface shall be rubbed with wire brush

All unsound portion of the surface plaster shall be removed to full depth of plaster in rectangular patches and plastered again after raking the masonry joints properly.

4. **Application of white wash** : On the surface so prepared the white wash shall be applied with brush. The first stroke of the brush shall be from top to downwards and another from bottom to upwards over the first stoke and similarly one stroke from the right and another from the left over the first stroke before it dries.

Each coat shall be allowed to dry before next coat is applied number of coats as specified in item shall be applied.

5. **Mode of Measurement & Payment** : All work shall be measured in the decimal system i.e. in sq meters. Deduction for pipe openings shall be made fully both sides of openings. The rates shall includes the cost of all materials, labour, scaffolding protective etc. involved in all the operations described. The rate shall be for a unit of one sq. meter.

#### **ITEM-53 Providing and fixing 4" (100 mm) dia. G.I. water spouts 2'6" long in CM necessary iron grating as per design etc. complete (10 CM dia pipe)**

The galvanized water spouts of the size 10 cm dia and the Galvanize iron gritting shall be of the approved quality and type, and shad be first got approved from the Engineer-in-charge before actual use.. The G.I. pipe shall be of sufficient length projecting. Out beyond the concrete surface for sufficient discharge. Iron grating shall be fixed rigidly into the concrete. The galvanized pipe iron as well as gratings shall be painted with two coats of anticorrosive paint.

The measurement shall be recorded and paid on the basis of each Mo. of pipe fixed in position

#### **ITEM-54 Providing and fixing 30 cm x 22 cm x 2.5 cm thick year plate of marble stone set in cm 1:4 including finishing and engraving letters etc complete.**

Providing and fixing 30 cms x 22 cms x 2.5 cms No and year plate of marble and of standard lettering with leads or paint including finishing etc. complete.

Marble plate shall be white and of approved quality and shall be 25 mm thick and of standard size as

directed by the Engineer – in – charge of the work.

Lettering shall be done by U-shape engraving and shall be filled with black paint of approved quality. Lettering shall be done as directed by the Engineer – in – charge. The marble plate shall be fixed in neat cement at a place as directed by the Engineer – in – charge. Cement shall conform to relevant I.S. Specification.

Measurement shall be per number of marble plate fixed.

Unit rate includes cost of all material, labour etc. for complete work.

**ITEM – 55      Numbering the C.D. works with approved paint including all materials for painting etc. complete.**

Numbering the C.D. works shall be carried out as per relevant I.R.C. specification. Oil paint of approved quality and make shall be used for the purpose. Numbering shall be very neat and clean Arrow shall be marked on the Head wall in the correct direction of flow of water. Payment shall be made on the number basis. Unit rate include the cost of all materials, labours for painting & lettering as directed by Engineer – in – charge.

**ITEM – 56      Providing and fixing junction Board of R.C.C. precast as per standard design of I.R.S. including fixing in C.C. block of 1:4:8 with necessary excavation enamel painting, lettering figures etc. complete.**

1.      These boards should be fixed at a distance of 120 metre from the centre line of the crossing and they should be located on the left hand side of the road in the direction of the traffic and facing the traffic.

2.      The board will be located in such a way that the edge of the board towards the centre of the road will be at a distance of 4.57 metres from the centre of a National Highway and 3.66 meters from the centre of State Highway or Major District Road.

3.      The bottom of the board should be 1 metre above the road surface and the board shall be at right angle to the centre line of the road facing the direction of traffic.

4.      The board shall be of the size of 107 cm in length and 91 cm in height for “T” and “Y” junctions shall be 145 C.M. in length and 91 C.M. in height for cross roads.

5.      The board shall be painted by two coarse, the Board and posts shall be R.C.C. as shown in the type design.

6.      The post shall be fixed in concrete and the projection of this above the road level shall be 45 cm x 45 cm and height of 24 cms above the road level and the top to be finished in plaster from the height of 15cm.

7.      The size of letter and figures shall be 8 cm for English and 10 C.M. for devnagri and Gujarati scripts.

8.      The post shall be painted in black and white reflective strips 23 cm in height.

9.      The board shall be painted in white with border 2 C.M. wide.

10.      On this board tablets shall be painted in yellow with black and the tablets shall have 5 cm clear distance from the board.

11.      Each such tablet shall be 61 cm in length and 33 cm in height, arrow lines indicating the direction of the road at the junctions shall be painted in black and shall have a thickness of ..... C.M. for National Highway and 4 C.M. on a State Highway and a ..... C.M. for a Major district road.

12.      All letters and figures shall be painted in black.

13.      The work shall be carried out as per design as per the instructions of the Engineer – in – charges. The measurements shall be recorded and paid on number basis for board fixed in position.

**ITEM – 56 A      Providing & fixing Board of M.S. Plate with two angles iron post and fixing in C.C. Concrete 1:4:8.**

The size of the board shall be 110 cm in length & 60 cm in height. It shall be prepared from M.S. plate of 6 mm thickness. The angle iron post shall be of size 75 mm x 75 mm and 6mm thick. The length of iron post shall be 2.1 metres. The post shall be fixed to the board by welding. The welding shall be true and strong and neat in appearance.

The board shall be fixed in C.C. 1:4:8 concrete. The concrete block for each post shall be 30 cm x 30 cm in size. The depth of the concrete block shall be 85 cm of which 60 cm will be below ground and 25cm above ground level. The exposed concrete block i.e. its portion above ground level shall be neatly finished and its shape should be truly square.

The post shall be painted with two coats of paint, alternatively in black & white strips 23 cms in height after applying one coat of anticorrosive paint. The paint shall be of approved quality. The board shall be painted with colour, as directed by Engineer – in – charge. The information as per instruction of engineer-in-charge shall be written on board with letters & signs in accordance with IRC The information may be one or more of the three script. viz. Hindi, English & Gujarati.

The board shall be fixed truly vertical & workmanship of the board shall be neat, clean & good in appearance.

The measurement for payment shall be for number of board fixed in position & complete in all respect.

The unit rate includes cost of material, labour, tools, welding, concreting, painting, lettering etc.

**ITEM – 57 Providing & fixing Boundary stone as per I.R.C. type design including painting, carving, lettering etc. complete.**

**(i) Fixing earth / Fixing in C.C. 1:5:10.**

1. Boundary stone shall be of the size 20 x 15 x 75 cms true to all the faces.
2. Boundary stones shall be neatly finished shall be chisel dressed on all the sides and at top.
3. Boundary stones shall be fixed at the border line of acquired length so that the land width is properly demarcated. The width between boundary stones shall be fixed at a distance of 330 feet ( 100 mt) a part in the direction of length of the road.
4. The letter B.B. of ( Border) as directed by the Engineer in charge shall be carved on the face of the boundary stone & letter shall be painted with black Japan.
5. The measurement shall be recorded per No. of boundary stone fixed in position and paid accordingly.

**ITEM – 58 Clearing the site before commencement and after completion of the work :**

1. Before starting the work, the site shown on plans shall be cleared of all obstructions, loose stones and materials, rubbish of all kinds as well as all trees and brush wooden except those marked for preservation, the roots being entirely grubbed up. No trees are to be cut down before obtaining the instruction from Engineer – in – charge.
2. The stuff obtained from clearance shall be stacked in such a place and in such a manner as ordered by the Engineer – in – charge and the ground shall be left in a perfectly clean condition.
3. In jungle clearing, all trees, not specifically marked for preservation, bamboos, jungle wood & brush wood shall be cut down, their roots rubbed up. All wood and material available as directed by the Engineer – in – charge.
4. All holes or hollows, whether originally or produced by digging up roots shall be carefully filled up with earth, well rammed and leveled up neatly as directed.
5. After completion of the work, but before its acceptance, the site shall be cleared of all scaffolding, surplus materials and rubbish etc. as per contract. No extra payment shall be made for site.
6. The rate for this item of work shall be for the complete job and shall be paid at the lump sum rate tendered for the work on completion of the entire work.

**ITEM – 59 Supplying and fixing rough kota stone 60 to 80 mm size including fixing in line & level etc. complete.**

The stone to be used shall be approved quality kota stone. It shall be sound, hard, durable and fairly regular in shape and its thickness of the stone at any place shall not be less b 15% of the thickness specified.

The stone shall be laid in line and level with camber as directed & set properly in sand. The whole work shall be generally carried out to the entire satisfaction of Engineer in charge of the work.

The rate shall include the cost of all materials and labour involved in all the operations described above. The kota stone flooring shall be measured in square metre correct to two places of decimal. Length and breadth shall be measured correct to be centimeter & between the finished faces of skirting or Dado and no deduction shall be made extra paid for any opening in floor of a unit of one sq.m.

**ITEM – 60 Providing & laying kota stone for kerbing on both sides of stone paving including fixing kota stone kerbing in 0.30 Mtrs. depth ( Kerbing stone of 60 to 80 mm thick size) etc. complete.**

The stone shall be of approved quality kota stone. Specifications for the materials & laying as per item No.59 above. The rate shall per unit of one Rmt.

**ITEM – 61 Supplying and stacking hard murrum on site of work etc. as directed.**

1. Hard murrum should be of approved quality. Any material which is found interior shall be rejected and contractor shall remove such rejected material from the site at his own cost. The material of Hard murrum shall be collected from quarries approved by the Executive Engineer.

2. The materials shall be got approved by the Executive Engineer prior to collection on site and shall be free from all, rubbish, dust and any organic materials as well as clods of black cotton soil. Material shall not be allowed to be collected from within the road boundary. The materials to be used shall be got tested prior to its use in road construction.

For road work complete stacking of materials as per requirement shall be carried out in 2 Km. length before spreading. The materials stacks shall be got cross checked by other Deputy Executive Engineer as per rules before spreading. The collection shall always commence at one end of K.M and be carried continuously towards the other end.

The materials shall be stacked by filling standard boxes of size 2m x 1.5m x 0.5m on a fairly level ground. It shall be stacked on road land beyond the top of the bank and on a level ground. The rate includes supplying the hard murrum with all lead and lift on road site and stacking the same in regular pharas of the required dimensions. Materials shall be collected in required quantity only at required site of work.

The payment shall be made on cubic metre basis.

**ITEM-62 White stone Bela masonry in C.M. 1:5 including curing etc. complete.**

The stone shall be fine dressed chisel draft one incl. the drafts on all beds and joints.

The stone shall be laid in regular course. The height of the course shall be as approved by the Executive Engineer. All the course shall be of same height unless otherwise ordered but no course will be thicker than any course below it. No stone shall be less in breadth than in height and less in length than twice the width.



The stone shall break the joints in each course and to be carried out in cement mortar 1:6 and thickness of the joints shall not be more than 10 mm. The side joints and beds of all stone shall be vertical and horizontal respectively and all stones shall be rough, true and square.

The work shall be measured and paid for cubic measurements of the work carried out as per approved drawing or as directed by the Engineer-in-charge.

**ITEM-63 40 mm. thick asphalt carpet:**

1. This work shall consist of laying an open graded carpet of 40 mm thickness in a single course and seal coat (excluding cost of asphalt) composed of suitable small sized aggregates premixed with a bituminous binder on a previously prepared basis.

2. The materials shall be proportioned as per quantities given within the following table.

Quantities of materials required for 10 Smt. of road surface for 4 cm. thick open graded premix carpet with seal coat.

**Aggregate for carpet:**

(A)	Stone chipping-20 mm size	0.27 Cum.
(B)	Stone Chipping-12 mm size	0.24 Cum.
(C)	Stone Chipping-10 mm size	0.06 Cum.

**Aggregate for Seal Coat :**

Stone Chipping-6mm size	0.09 Cum.
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**Binder for premixing (Quantities in item of strengthened bitumen)**

1. For Carpet

(A)	For 0.27 Cum. of 20mm size stone chipping at 48 kg./Cum.	12.96 kgs
(B)	For 0.24 Cum. of 12 mm size stone chipping at 52 kg./Cum	12.48 kgs
(C)	For 0.06 cum of 10mm size stone chipping at 56 kg/Cum	3.36 kgs

**Seal Coat :**

For 0.09 Cum. of 6 mm size grit at 80 kg./Cum	7.20 kgs
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**36.00 kgs**

3. Carpet shall not be laid during rainy weather or when the base course is damp or wet or when the atmospheric temperature in shade is 16° degree centigrade or below.

4. The underlying base on which the bituminous carpet is to be laid shall be prepared, shaped and conditioned to the specified line, grade and cross-section as directed by the Engineer-in-charge. The surface shall be well wire cleaned with brushes. Sweeping with brooms and finally dusting with sacks as necessary.

5. **Tack coat :** This work shall consist of application of a single coat of bituminous material to an existing road surface preparatory to another bituminous construction. The temperature of bitumen at the time of application shall be in the range of 160.0 deg, centigrade.

6. Binder shall be heated to the temperature appropriate to the grade of bitumen used and approved by the Engineer-in-charge at the rate specified below. The rate of spread in terms of straight run bitumen shall be 9.75 Kgs per 10 square meter area for a surface untreated water bound macadam surface. The binder shall be applied uniformly. The tack coat shall be applied just ahead of the oncoming bituminous construction. For the purpose of calculating consumption wastage of bitumen will not be permitted beyond 2.5% Excess consumption over 2.5% will be charge at penal rate.

7. Mixers of approved type shall be employed for mixing the aggregates with the bituminous binder. The binder shall be heated to the temperature approved by the Engineer-in-charge, avoiding local overheating and ensuring a continuous supply. The aggregates shall be dried before they are placed in the mixer. After about 15 seconds of dry mixing the heated binder shall be distributed over the aggregates at the rate specified. Kerosene to an extent of 4% to 6% of asphalt shall be provided the contractor according to the requirement at the contractor cost. The mixing of binder with chipping shall be continued until the chippings are thoroughly coated with the binder. The mixing of binder with chipping shall be continued until the chippings are thoroughly coated with the binder. The mix shall be immediately transported from the mixer to the point of using suitable vehicles or wheel barrows. The vehicle employed for transport shall be clean and be covered over in transit if so directed.

8. The premixed materials shall be spread on the road surface with rakes to the required thickness and camber or distributed evenly with the help of a drag spreader, without any undue loss of time. The camber shall be checked by means of camber boards and inequalities evented out. As soon as sufficient length of bituminous material has been laid, rolling shall commence (rolling shall be done departmentally) when the roller has passed over the whole area once any. Stops or depressions which become apparent shall be corrected by removing or adding premixed materials. The contractor shall provide necessary labour for keeping the roller wheels damp during rolling so as to prevent the premix from adhering to the wheels and being packed up. The edges both longitudinal and transverse of the carpet laid and compacted earlier shall be cut to their full depth so as to expose fresh surface which shall be painted with thin surface coat of appropriate binder before the new mix is placed against.

9. Seal coat: for preparation of premix and spreading etc. para 7 & 8 above shall apply. The coat shall be applied immediately after the laying of bituminous course of carpet. Before application of seal coat materials surface shall be cleaned free of any dust or other Extraneous matter.

10. Coarse sand or stone dust flush in as the rate of 0.03 Cmt/10 Smt. Shall be done on asphalt surface at the contractor's own cost.

11. Traffic may be allowed stood after final rolling when the premixed material had cooled down to surrounding temperature.

12. Control on quality of works shall be exercised by the Engineer-in-charge by carrying out the following tests as shown against each.

Sr.No.	Type of Const. Material.	Test	Frequency
1	Tack Coat	(i) Binder temperature for application	At regular close intervals
		(ii) Rate of spread of binder of aggregate	Two test per day
	Open graded premix carpet with seal coat	(i) Temperature of binder at application	At regular close intervals
		(ii) Binder Content (vide As/TM:D2172)	Two test per day for work of every 3 Km length in one lane
		(iii) Rate of spread of mixed material	Regular control through checks on material and layer thickness.

13. Para 13 to 17 as regards arrangements for traffic para 29 to 33 of semidense carpet shall apply.

18. Open graded carpet and seal coat shall be measured in cubic metres on the basis of stone chips actually used.

19. The contract unit rate for open grade carpet and seal coat (excluding cost of asphalt, stone chips and rolling) shall be payment in full for carrying out the required operation including full compensation for

- (1) Preparation of base.
- (2) Providing all materials like fuel, lubricants, kerosene and coarse sand or stone dust for flushing with all lead and lifts.
- (3) All labours, tools equipment and incidentals.
- (4) Making arrangements for control and safety of traffic.

**ITEM-64 Providing 75 mm thick premix asphalt macadam using 611.00 Kg. Asphalt 10.80 CU.MT. chips for IOOSq.M.**

1. This work shall consist of laying an open graded carpet of 7.5 cm. thickness in a single course and seal coat (excluding cost of asphalt stone chips) composed of suitable small aggregated premixed with a bituminous binder on a previously prepared base.

2. The materials shall be proportioned as per quantities given in the table.

Quantities of materials required for 100 smt. of road surface for 7.5 cm thick open graded premixed cement.

<b>Aggregate for carpet</b>		
(A) Stone Chipping	40 to 50mm size	4.80 Cum.
(B) Stone Chipping	25 to 40mm size	3.60 Cum.
(C) Stone Chipping	12 to 20mm size	2.40 Cum.
<b>Total...</b>		<b>10.80 Cum.</b>

Asphalt 611.00 Kg per 100 SM.

3. Carpet shall be laid during rainy weather or when the base course damp or whether or when the atmospheric temperature in shade is 160 Centigrade or below.

<b>Asphalt Requirement</b>			
Size of Chips	Quantity of Chips	Rate of Asphalt	Total Qty. of Asphalt.
1. Tack coat	-	73.40 Kg/Cum.	73.40
2. 50 to 40mm	4.80	48.00 Kg/Cum.	230.40
3. 40 to 20mm	3.60	58.80 Kg/Cum.	172.80
4. 20 to 10mm	2.40	56.00 Kg/Cum.	134.40
			<b>611.00 Kg.</b>

i.e. 0.611 tonnes per 100 sq. metres.

4. The under laying base on which the bituminous carpet is to laid shall be prepared , shaped and conditioned to the specified line , grade and cross section as directed by the Engineer-in –charge . The surface shall be well cleaned with brushes. Swiping with brooms and final dusting with sacks as necessary .

5 **Tack coat :** This work shall consist of application of a single coat of bituminous material to an existing road surface preparatory to another bituminous construction . The temperature of bitumen at the time of application shall be in range of 160.0 deg. Centigrade to 175.0 deg. Centigrade.

6 Binder shall be heated to the appropriate temperature grade of bitumen used and approved by the Engineer-in-charge at the rate of specified below. The rate of spread in terms of straight run bitumen shall be 611 kgs. per 100 sq. Mt . area. The binder shall be applied uniformly . Wastage of bitumen will not be permitted beyond 2.5 %

7 Mixers of approved type shall be employed for mixing the aggregate with the bitumens binder. The binders shall be heated to the temperature approved by the Engineer-in-charge avoiding local overheating and ensuring a continuous supply .The aggregates shall be dried before they are placed in the mixture. After is seconds of dry mixing the aggregates at the rate specified. Kerosene to an extent of 4 % to 6% of asphalt shall be provided by the contractor or all to the requirement at the contractors cost.

8 The premixed materials shall be spread on the road surface with rates to the required thickness and camber and distributed evenly with the help of a drag spread , without any induce loss of time. The camber shall be checked by means of camber boards and inequalities evented out . As soon as sufficient length of bituminous material has been laid rolling has pass over the wheels clean during so as to prevent the premix from adhering to the wheels and being packed up. The edge along and of carpet laid and compacted earlier shall be cut to their depth so as to expose fresh surface which will be cut to their full depth so as to expose fresh surface which shall be pointed with a thin surface coat of appropriate binder before the new mix is placed against.

Control on quality of the work shall be exercised by the Engineer – in – charge by carrying out the following tests at the frequencies shown against each.

Sr No.	Type of Const. Material.	Test.	Frequency.
1.	Tack coat for application	(i) Binder temperature (ii) Rate of spread of binder.	At regular close intervals Two test per day.
2	Open graded premix carpet with seal coat.	(i) Temperature of binder at application. (ii) Binder Content (vide As/TM:D2172) (iii) Rate of spread of mixed material.	At regular close intervals. Two test per day for work of every 3 Km length in one line. Regular control through checks On materials and layer thickness.

13. Para 13 to 17 as regards arrangements for traffic para 29 to 33 of semidense carpet shall apply.

18. Open graded carpet and seal coat shall be measured in cubic metres on the basis of stone chips actually used.

19. The contract unit rate for open grade carpet and seal coat (excluding cost of asphalt, stone chips and rolling) shall be payment in full for carrying out the required operation including full compensation for

(1) Preparation of base.

(2) Providing all materials like fuel, lubricants, kerosene and coarse sand or stone dust for flushing with all lead and lifts.

(3) All labours, tools, equipment and incidentals.

(4) Making arrangements for control and safety of traffic.

**TEM-65 Earthwork in cutting including preparing the slope and camber and stacking or utilising the cutting stuff in bank as directed up to 200 mt. from the end of cutting with all lead and lift (I) Hard Murrum**

(1) Para 1 to 8 of Item "Earth work in cutting in all sort of soil" shall apply except that the work shall be carried out in hard murrum.

(9) Earth work in cutting shall be made in hard soil such as stiff heavy clay, hard shale or compact murrum, requiring grafting tool or pick or both and shovel, closely applied and gravel and rubble stone having maximum diameter direction between 75 and 300 mm and soft conglomerate. The classification of cutting shall be decided by the Engineer-in-charge and his decision shall be binding on the contractor. Mode of measurement shall be measured after removal of over burden by tucking cross section at suitable intervals in the original position before the work starts and after its completion areas. Payment shall be made in CMT basis. The rate shall include the cost of labour tools to complete the Job.

**ITEM-66 U.C.R. Masonry for super structure in C.M.:**

Para\* 1 to 14 item No. 30 of the roads specification booklet shall apply for the work of this item.

**ITEM-67 Earthwork in cutting including preparing the slope and camber and stacking or utilising the cutting stuff in bank as directed up to 200 mt. from the end of cutting with all lead and lift (I) Soft Roack (not requiring blasting)**

(1) Para 1 to 8 of Item "Earth work in cutting in all sort of soil" shall apply except that the work shall be carried out in soft rock.

(9) Earth work in cutting shall be in soft rock such as lime stone, sand stone, laterite, hard conglomerate or other soft rock which may be quarried or split with crow bars, boulders which do not require blasting and any rock which dry state may be hard, requiring blasting but which when wet becomes soft and manageable by means other than blasting. The classification shall be decided by the Engineer-in-charge and his decision shall be final and binding on the contractor.

(10) Mode of measurement shall be measured after removal of over burden by taking cross sections at suitable intervals in the original position, the work starts and after its completion and computing the volumes in cubic meter by method of average and areas, payment shall be made on CMT basis. The rate shall include the cost of labour, tools to complete the job, Name of the works :

**ITEM-68 Supplying and Stacking Rubble on site of work etc. as directed.**

The stone shall be hard, sound free from cracks decay and weathering and shall be freshly quarried from and approved quarry stone. with round surface shall be used. The stone when immersed in water for 24 hours shall not absorb water by more than 5 percent of their dry weight when tested in accordance with I.S. 124. The length of stone shall not exceed three times its height and the breadth on base shall not be greater than three fourth of the thickness of wall. The rubble shall be stacked on fairly levelled ground.

Stacking shall be done as per the instruction; given by Engineer-in-charge. 15% deductions for voids shall be made from the gross measurement. The payment shall be made on cubic meter basis.

**ITEM-69 Carting and stacking of scarcity hand broken metal on site with all lead including filling the boxes.**

The stone metal shall be obtained from stacking of security metal which is broken in previously scarcity period carting shall be done as per instruction of Engineer-in-charge.

Stacking shall be done by filling the standard steel boxes of 2m x 1.5 m x 0.5 m size which shall be supplied by the Department, if available, on rent otherwise contractor shall make his own arrangement and no

deduction for voids shall be made from the gross measurements. Where any doubt exists as to whether the quantity of stacks of metal in any hectometer is not confirming with the cubical content of the standard para (2m x 1.5m x 0.5 m) shall be got corrected by the contractor, if so order by the Engineer-in-charge, for which extra payment shall be claimed by the contractor. If the quantity of metal in any stack in particular Hectometer is found to be less than the standard measurement viz 1.5 cm, the entire collection the Hectometre shall be paid on the basis of the quantity so found. Regular stacks shall be done by the contractor on a fairly level ground. Stacking of the metal shall be done in a manner as directed by the Engineer-in-charge. The standard size box measurement for aggregate will be recorded as final and no subsequent change will be permitted.

The payment shall be made on cubic meter basis without deduction for voids. The contractor shall maintain all stacks in regular and proper size till the whole materials are collected, measured and finally accepted by the Department. The rate includes conveyance to the site with all lead and lift and filling the boxes including all labour, tools, equipment and other incidental expenses.

**ITEM-70 Providing and laying 50 mm thick compacted bituminous macadam with tack coat at 5 kg/10 sq. mt. using stone aggregate as per M.O.S.T. gradation specification and asphalt mixing at the rate of 4% (40 kg/H.T.) using hot mix plant and spreading the same with paver finished including consolidation with power rollers including fuel, labour charges, equipments etc. complete.**

## 1. DESCRIPTION

The work shall consist of construction, in a single course, of 50 mm/75 mm thickness of compacted crushed aggregates premixed with bituminous binder, laid immediately after mixing, on a base prepared previously in accordance with the requirement of these specification and in conformity with lines, grades and cross sections shown on the drawings or as directed by the Engineer-in-charge.

## 2. MATERIALS

**2.1 Binder :** The binder shall be straight run bitumen of a suitable grade as directed by the Engineer-in-charge complying with IS : 73

**2.2 Aggregates :** The aggregates shall consist of crushed stone, crushed gravel (shingle) or other stones. They shall be clean, strong, durable of fairly cubical shape and free of disintegrated pieces, organic and other deleterious matters and adherent coatings. The aggregates shall preferably be hydrophobic and of low porosity.

The aggregates shall satisfy the physical requirements set forth in Table hereafter.

**Table-1 PHYSICAL REQUIREMENTS OF AGGREGATES FOR BITUMINOUS MACADAM**

SR.NO.	Test	Test Method	Requirement
1	Los Angeles Abrasion Value'	IS : 2386 (part IV)	35% Maximum
2	Aggregate Impact Value*	-do-	30% Maximum
3	Flakiness Index	IS : 2386 (Part 1)	30% Maximum
4	Stripping Value	TS:6241	25% Maximum
5	Water Absorption	IS: 2386 (Part III)	2% Maximum

\* Aggregates may satisfy requirements of either of the two tests.

The aggregate for bituminous macadam for different thicknesses shall conform to the Grading A or B given in Tables 2 and 3. The actual grading to be used shall be specified in the contract).

**TABLE 2 AGGREGATES GRADING FOR 75 mm COMPACTED THICKNESS OF BITUMINOUS MACADAM**

Sieve Designation	Percentage by wt. passing through Sieve	
	For type 'A'	For Type 'B'
63mm	100	-
50mm	90-100	-
40 mm	35-65	100
25mm	20-40	70-100
20mm	—	50-80
12.5mm	5-20	-
4.75 mm	—	10-30
236mm	—	5-20
75 micron	0-5	0-4

**TABLE 3 AGGREGATES GRADING FOR 50 MM  
COMPACTED THICKNESS OF BITUMINOUS MACADAM**

Sieve Designation	Percentage by wt pasting through Sieve	
	For type 'A'	For Type 'B'
50 mm	100	—
40mm	90-100	—
25 mm	50-80	100
20mm	-	70-100
12.5mm	10-30	—
10mm	-	35-60
4.75 mm	—	15-35
2.36mm	—	5-20
75 micron	0-5	0-4

**2.3 Proportioning of materials :** The binder content for pre mixing shall be 35 and 4.0 percent by weight of the total mix for aggregate grading A and B respectively, except when otherwise directed by the Engineer-in-charge.

The quantities of aggregates to be used shall be sufficient to yield the specified thickness after compaction.

**2.4 Variation in proportioning of material :** The Contractor shall have the responsibility for ensuring proper proportioning of materials and producing a uniform mix. A variation in "binder content of  $\pm 0.3$  percent by weight of total mix shall, however, be permissible for individual specimens taken for quality control tests vide Section 900 V

### **3. CONSTRUCTION OPERATION**

**3.1 Weather and seasonal limitation :** Bituminous macadam shall not be laid during rainy weather or when the base course is damp or wet.

**3.2 Preparation of the base :** The base on which bituminous macadam is to be laid shall be prepared. shaped and conditioned to the specified lines, grades and cross sections in accordance with Clause 501', as directed by the Engineer-in-charge. The surface shall be thoroughly swept and scraped clean and free from dust and foreign matter.

**3.3 Tack coat :** A tack coat as per Clause 503' shall be applied over the base except when the laying of bituminous macadam is being preceded by a bituminous leveling course.

**3.4 Preparation and transport of mix :** Hot mix plant of adequate capacity shall be used for preparing the mix.

The temperature of binder at the time of mixing shall be in the range of  $150^{\circ}\text{C}$  to  $165^{\circ}\text{C}$ , Provided that the difference in temperature between the binder and aggregate at no time exceeds  $25^{\circ}\text{C}$ .

Mixing shall be thorough to ensure that a homogeneous mixture is obtained in which all particles of the aggregates are coated uniformly.

The mixture shall be transported from the mixing plant to the point of use in suitable vehicles. The vehicles employed (or transport shall be dean and be covered over tn transit if so directed by the Engineer-in-charge.

**3.5 Spreading :** The mix shall be spread immediately after mixing by means of self propelled mechanical paver with suitable screeds capable of spreading, tamping and finishing the mix true to the specified lines, grade and cross sections. However, in restricted and in narrow widths, where the available plants cannot operate in the opinion of the Engineer-in-charge, he may permit manual laying of the mix.

The temperature of the mix at the time of laying shall be in the range of  $110^{\circ}$  to  $135^{\circ}\text{C}$ . In multi layer construction the longitudinal joint in one layer shall offset that in the layer below by about 150 mm. However, the joint in the most layer shall be at the center line of the pavement.

Longitudinal joint and edges shall be constructed true to the delineating line parallel to the centre line of the road. All joints shall be cut vertical to the full thickness of the previously laid mix and the surface painted with hot bitumen-placing fresh material.

**3.6 Rolling :** After the spreading of mix. rolling shall be done by 8 to 10 tonne power rollers or other approved plant. Rolling should start as soon as possible after the material has been spread. Rolling should be done with care to keep from unduly roughening the pavement surface.

Rolling of the longitudinal joints shall be done immediately behing the paving operation. After this the rolling shall commence at the edge and progress towards the centre longitudinally except that on super elevated portions it shall progress from the lower to the upper edge parallel to the centre line of the pavement.

The initial or break down rolling shall be done, as soon as it is possible to roll the mixture without cracking the surface or having the mix pick up on the roller wheels. The second or intermediate rolling shall follow the break down rolling as lossely as possible and be done while the paving mix is still at a temperature that will result in maximum density. The final rolling shall be done while material is still workable enough for removal of roller marks.

When the roller has passed over the whole area once, any high spots or depressions which, become apparent shall be corrected by removing or adding fresh material. The rolling shall then be continued till the entire surface has been rolled to compaction, there is no crushing of aggregates and all roller marks have been eliminated. Each pass of the roller marks have been eliminated. Each pass of the roller shall uniformly overlap not less than one-third of the track made in the preceding pass. The roller wheel shall be kept damp if necessary to avoid bituminous material from sticking to the wheels and being picked up. in no case shall fuel lubricating oil be used for the purpose.

Rolling operation shall be completed in every respect the temperature of the mix falls below 80° C. Rollers shall not stand on newly laid material while there is a risk that it will be deformed thereby. The edges along and transverse of the bituminous macadam laid and compacted earlier shall be cut to their full depth so as to expose fresh surface which shall be painted with a thin surface coat of appropriate binder before the new mix is placed against it.

#### **4. SURFACE FINISH AND QUALITY CONTROL OF WORK**

The surface finish of construction shall conform to the requirements of Clause 90,1.

Control on the quality of materials of materials and works shall be exercised by the Engineer-in-charge in accordance with Clause 902\*.

5. The bituminous macadam shall be provided with final surfacing without any delay. If there is to be any delay, the course shall be covered by a seal coat to the requirement of Clause 511 before allowing any traffic over it.

#### **6. ARRANGEMENTS OF TRAFFIC**

The provision of Clause 105 shall apply as regards the flow of traffic during construction.

#### **7. MEASUREMENTS FOR PAYMENT**

Bituminous macadam shall be measured as finished work in cubic metres.

#### **8. RATE**

The contract unit rate for bituminous macadam shall be payment in full for carrying out the required operations including full compensation for:

(i) making arrangements for traffic to clause 105 except for initial treatment to shoulders and construction of diversions.

(ii) preparation of base except for laying of levelling course but including filling of potholes;

(iii) providing all materials to be incorporated in the work, including all royalties, fees, rents where necessary and all leads and lifts.

(iv) all labour, tools, equipments and incidentals to complete the work to the specifications, and

(v) carrying out the work in par widths where directed.

#### **ITEM-71 Providing and laying C.C. 1:5:10 (1 Cement: 5 Coarse sand : 10 graded stone aggregate of 40 mm nominal size) and curing etc. complete excluding cost of form work in foundation & plinth**

##### **1.0 Material**

##### **1. Water**

1.1 Water shall not be salty or brackish and shall be clean, reasonably clear and free from objectionable quantities of silt and traces of oil and injurious alkalis, salts organic matter and other deleterious material which will either weaken the mortar or concrete or otherwise cause efflorescence or attack the steel in RCC contrainer for transport, storage and handling of water shall be clean water shall conform to the standards specifications in I.S. 456-1978

1.2 If required by the Engineer-in-charge it shall be tested by comparison with distilled water.

Compression shall be and means of standard cement tests for soundness, time of setting and mortar strength as specified in I.S. 269-1976. Any indication on unsoundness, change in time of setting by 30 minutes or more of decrease or more than 10 percentage of mortar prepared with water .sample when compared with the results obtained with mortar prepared with distilled wate shall be sufficient cause for rejection of water under test.

1.3 Water for curing mortar, concrete or masonry should not be too acidic or too alkaline. It shall be free of elements which significantly effect the hydration reaction or otherwise interface with the hardening of mortar or concrete during curing or those which produce objectionable stains or other unsightly deposits on concrete or

mortar surfaces.

1.4 Hard and bitter water shall not be used for curing

1.5 Portable water will generally be found suitable for curing mortar or concrete.

## 2.0 SAND

2.1 Sand shall be natural sand, clean well graded, hard strong durable and gritty particles free from immures amounts of dust, clay kanker modules, soft or flaky particles shall alkali salts, organic matter, learn mica or other deleterious substance and shall be got approved from the Engineer-in-charge. The sand shall not contain more than 8 percent of slit as determined by field test. If necessary the sand.

### 2.2 Course Sand

The fineness modules of coarse sand shall not be less than 2.5 and shall not exceed 3.0. The sieve analysis of coarse sand shall be as under:-

4.75 mm	100
2.36 mm	90 to 100
1.18mm	70 to 100
600 MC	30to 100
300 MC	85 to 70
150 MC	00 to 50

### Fine Sand

2.3 The fineness module shall not exceed 1.0 the sieve analysis of fine sand be as unde

% by wt. passing	
1. S. Sieve Designation	% by wt. passing
4 75 mm	100
2.36 mm	100
1.18mm	75 to 100
600 MC	40 to 85
300 MC	05 to 50 '
150 MC	00 to 10

## 3.0 Cement

3.1 Cement shall be ordinary portland slab cement as per I.S. 1975 pr portlar alag cement as per I.S 455 1976

## 4.0 Stone coarse Aggregate for Nominal Mix Concrete :

Coarse aggregate shall be or machine crushed stone of black trap of equivalent and hand, strong, dense, durable, clean and free from skin and coating likely to proven! proper adhesion of mortar.

4.1 The aggregate shall be generally be cubical in shape unless special stones of particular quarries are mentioned aggregates shall be machine crushed from the best blacktrap or equivalent hard stone as approved. Aggregate shall have no deleterious reaction with cement. The size of the coarse aggregate for plain cement concrete and ordinary reinforced cement The concrete shall generally be as per the table given below. However in case of reinforced cement concrete the Minimum limit may be restricted to 6 mm less than the minimum lateral clear distance between bars or 6 mm. less than the cover whichever is smaller.

IS Sieve Designation	Percentage passing for single sized aggregate of nominal size		
	40mm	20. mm	16 mm
80 mm	-	-	-
63 mm	100	-	-
40 mm	85-100	100	-
20mm	0-20	85-100	100
16 mm	-	-	85-100

IS Sieve . Designation	Percentage passing for single sized aggregate of nominal size		
	40 mm	20 mm	16mm
12.5 mm	-	-	-
10mm	0.5	0.20	0.30
4.75 mm	—	0.5	0.5
2.35 mm	-	-	—

Note : This percentage may be varied some what by the Engineer-in-charge when consiidered necessary containing better density and strength of concrte.

4.3 The grading test shall be taken in the beginning and at the change of source of material. Theis necessary that indicates in I.S. 383-1970 and I.S. 456-1978 shall have to be carried pit to ensure the acceptability. Aggregate shall be stored separately and handled in such a member as to prevent the intermixing diff. aggregate if

- M.O.S.T. Specifications



the aggregate are covered with dust. they shall be washed with water to make them clean.

## **2.00 Workmanship :-**

### **2.1 General :-**

2.1.1 Before starting concreting the bed of foundation trenches shall be cleared of all loose materials level watered and rammed as directed.

### **2.2 Proportion of Mix :**

2.2.1 The proportion of cement sand and coarse aggregate shall be one part of cement 5 parts of sand and 10 parts of bricks bats aggregate and shall be measured by volume

### **2.3 Mixing -**

2.3.1 The concrete shall be mixed in a mechanical mixer at the site of hand mixing may however be allowed for collar quantity work if approved by the Engineer-in-charge when hand mixing is permitted by Engineer-in-charge in case of break down of machineries and in the interest of work it shall be carried out on water tight platform and care shall be taken to ensure that mixing is continued until the mass is uniform in colour and consistency. However in such cases 10% more cement extra case. One mixing in mechanical mixer shall be done period of 1.5 to 2 minutes and the quantity of water shall be just sufficient to provide a dense concrete of required workability for the purpose.

### **2.4 Transporting and Placing the Concrete :-**

2.4.1 The concrete shall be handled from the place of mixing to the final position in not more than 15 minutes by the method as directed and shall be placed into its final position completed and finished within 30 minutes of mixing with water i.e. before the setting commences.

2.4.2 The concrete shall be laid in layer of 15 cms to 20 cms.

### **2.5 Compacting**

2.5.1 The concrete shall be rammed with heavy iron rammer and rapidly to get the required compaction and to allow all the interstices to be filled with mortar.

### **2.6 Curing :-**

2.6.1 After final set the concrete shall be kept continuously wet if required by ponding for a period of not less than 7 days the date of placement

### **2.7 Mode of Measurements and Payments :**

2.7.1 The concrete shall be measured for its length, Breadth and depth limiting dimensions to those specified on plan or as directed.

2.7.2 The rate shall be for a unit of one cubic meter.

## **ITEM-72 Supplying and stacking unscreened gravel on site of work etc. as directed.**

The unscreened gravel shall be obtained from quarries approved by Executive Engineer prior to collection. The material shall be of approved quality with all lead and lift. The material shall be clear and free from organic material, silt, clay etc. and shall be got approved from Engineer-in-charge

Wherever any doubt exists as to whether the above requirements are satisfied in work or any part of the collection, it shall be rectified by the contractor at his own cost, if so ordered by Engineer-in-charge.

Stacking shall be done by filling in the standard steel boxes of 2 mt. X 1.5 mt. x 0.5 mt. size which shall be supplied by the department if available on rent otherwise contractor shall make his own arrangements. No deduction for voids shall be made from the gross measurement... its. Where any doubt exists as to whether the quantity of stacks of material in any hectometer is not confirming with the cubical content of the standard pharas (2 mt. x 1.5 mt. x 0.5 mt.) shall be got corrected by the contractor if so ordered by the Engineer-in-charge for which no extra payment shall be claimed by the contractor. If the quantity of material in any stack in a particular Hectometer is found to be less than the standard measurements viz. 1.5 cmt. the entire collection in the Hectometer shall be paid on the basis of the quantity so found. Regular stacks shall be done by the contractor on fairly level ground Stacking of material shall done in a manner as directed by the Engineer-in-charge.

For road work complete stacking of material as per requirements shall be carried out in 2 k.m. length before spreading. The material stacks shall be measured and recorded and got cross checked by the other Deputy Executive Engineer as per rules before spreading. The collection shall always commence at one end of the k m. and be carried out continuously towards the other end unless the Engineer-in-charge direct otherwise.

The payment shall be made on cubic metre basis without deduction for voids/ The contractor shall maintain all stacks in regular and proper size till the whole materials shall not measured and finally accepted by the Department. The spreading of materials shall not be allowed till the materials are fully stacked and completed kilometer wise.

The rate includes cost of collection, conveyance to the site with all lead and lift and filling be boxes including all labour, tools, equipments and other incidental expenses. The rates quoted are inclusive of all such tools, duties, fees, royalties, taxes etc.

**ITEM-73 Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers not exceeding 20 cm. in depth consolidating each deposited layer by ramming and watering.**

1.0 The earth to be used for filling shall be free from salts, organic or other foreign matter. All clods at earth shall be broken.

2.0 As soon as the work in foundation has been completed and measured, the site of foundation shall be cleared of all debris, stone, mortar droppings etc and filled with earth in layers not exceeding 20 cms. each layer shall be adequately watered, rammed and consolidated before the succeeding layers is laid. The earth shall be rammed with iron rammers where feasible and with the butt ends of crow-bars where rammer can not be used. With iron rammers finished level, the surface shall be flooded with water for atleast 24 hours and allowed to dry and then rammed and consolidated.

3.0 The excavated stuff of the selected type shall be allowed to be used in tilling the trenches and plinth under no circumstances black cotton soil be used for filling.

4.0 The payment shall be made for filling in trenches and plinth. No deduction shall be made for shrinkage or voids if consolidated as instructed above.

5.0 The rate shall be for a unit of one cubic metre.

**ITEM-74 Providing and fixing junction board of M.S. Plate and angle as per standard I.R.C. design including fixing in C.C. 1:4:8 with necessary excavation, painting, lettering, figuring and lettering on board etc. complete.**

1.0 The boards shall be fixed at a distance of 120 mtr. from the centre line of the crossing and they should be located on the left hand side of the road in the direction of the traffic and facing the traffic.

2.0 The board will be located in such a way that the edges of the board towards the centre line of the road will be at a distance of 4.57 mt. from the centre of a N.H. and 3.56 mtr. from the centre of a S.H. or M.D R or as directed by the Engineer-in-charge

3.0 The bottom of the board shall be 1 m above the road surface and the board shall be at right angles of the centre line of the road facing the direction of the traffic.

4.0 The size for the junction board M.S plate and angles shall be as per standard confirming to I.R.C type design.

5.0 The board shall be fixed in concrete and the projection of this above the road level shall be 4 cms x 45 cms. and a height of 24 cms. above the road level and the top is to be finished tapering from to the height of 15 cms.

6.0 The board shall be supported by the angle iron parts of M.S. angle as shown in the standard type design.

7.0 The size of letters and figures shall be 8 cm. for English and 10 cms for Devnagri and Gujarati scripts.

8.0 The post shall be painted in black and white alternative strips of 23 cms. in height. 9.0 The board shall be painted in white with blackboard 2 cm. wide.

10.0 On this board tablets shall be painted in yellow with a black border and the tablets shall have 5 cms. clear distance from the board.

11.0 Each such tablets shall be 61 cms in length and 33 cms. in height arrow lines indicating the direction of the road at a junction shall be painted in black and shall have a thickness of 5 cms for N.H. and 4 cms of S.H and 2.5cms.for M.D.R.

12.0 All letters and figures shall be painted in black.

13.0 The work shall be carried out as per design and as per the instructions of the Engineer-in-charge.

**ITEM-75 Scarifying gravelled macadam of bitumen macadam surface 6 cm to 10 cm. depth including stacking useful materials on road side and depositing or remaining stuff.**

1.0 The layer of the existing layer metalling shall be excavated and shall be screened on site of work. Stacking of 75% of metal obtained from screening shall be done by filling in the standard steel boxes of 2 m x 1.5 m x 0.5 mt. size which shall be supplied by department if available on rent, otherwise contractor shall make his own arrangements. No deductions for voids shall be made from the gross measurements. Where any doubt exist as to whether the quantity of stacks of metal in any hectometer is not confirming with cubical content of the standard pharas { 2m x 1.5 m x 0.5 m) shall be got corrected by the contractor if so ordered by the Engineer-in-charge for which no extra payment shall be claimed by the contractor. If the quantity of metal in any stack in a particular hectometer is found to be less than the standard measurements viz. 1.5 cmt. the entire collection in the hectometre shall be paid on the basis of the quantity so found. Regular stacks shall be done by the contractor on a fairly level ground. Stacking of the metal shall be done in a manner as directed by the Engineer-in-charge.

2.0 The remaining material except 75% of metal obtained from screening process shall be used in embankment with all lead and lift. It shall be directly deposited at the required location in specified layers. No handling or conveyance charges shall be paid if the materials is temporarily deposited else where and subsequently convey to site of deposition. The sequence of operations should be arranged properly. Material not required for any use whatsoever may be disposed off by the contractor at his own cost in manner approved by the Engineer-in-charge. The material utilised in the embankment will be deducted from the net quantity of earthwork in embankment arrived at within the chainage measured.

3.0 The payment shall be made on sq. mt. basis, the contractor shall maintain all stacks in regular and proper size till the whole materials shall not be measured and finally accepted by the department. The spreading of materials shall not be allowed till the materials are fully stacked and completed kilometer wise.

4.0 The rate includes the cost of scarifying macadam, screening, depositing, conveyance with all lead and lift, filling the boxes including all labour, tools, equipments and all other incidental expenses.

**ITEM-76 Extra for dewatering in foundation etc. as directed.**

1.0 Where water is met within excavation due to stream flow, seepage, springs, rain or other reasons, the contractor shall take adequate measures such as bailing, pumping, to keep the foundation trenches dry when so required and protect green concrete/masonry against damage by erosion or sudden rising of water level. The methods to be adopted in this regard and other details thereof shall be left to the choice of the contractor but subject to approval of Engineer-in-charge shall, however, not relieve the contractor of the responsibility for the adequacy of dewatering and protection arrangements and for the quality and safety of the work.

2.0 Pumping from the interior of any foundation enclosure shall be done in such a manner as to preclude the possibility of movement of water through any fresh concrete. No pumping shall be permitted during the placing of concrete or for any period of at least 24 hours thereafter, unless it is done from a suitable pump separated from the concrete work by a water height wall or other similar means.

3.0 The measurements shall be paid on Cubic Meter basis for each class of materials encountered.

4.0 The rate includes the cost of dewatering including pumping.

**ITEM-77 Supplying and stacking of rubble including rubble dumping as and where required as directed.**

1.0 Stone shall be hard, sound, free from cracks, decay and weathering and shall be freshly quarried from an approved quarry. Stone with round surface shall not be used. The length of stone shall not exceed three times its height and the breadth on base shall not be greater than three fourth of the thickness of wall nor less than 15 cm. The rubble shall be stacked in chhattas manner on fairly levelled ground as and where directed as per the instruction of the Engineer-in-charge. 16% for voids shall be deducted from gross measured quantity. The rate includes all labours, materials, tools and equipments, dumping the rubble and all other incidental expenses incurred. The payment shall be made on cmt. basis

**ITEM-78 Jungle cutting for road side clearance on road site as directed.**

The land width shall be cleared i.e. cutting of trees of any diameter, grass, vegetation etc. as per the instruction of the Engineer-in-charge, The wood obtained if any by clearing off the jungle shall be the property of department and the same shall be casted and stacked to the place and hand over the same to the Deputy Executive Engineer as per the instructions laid by him.

**CONTRACTOR'S SIGNATURE**

**EXECUTIVE ENGINEER**

### SCHEDULE FOR TESTING OF MATERIALS

For ensuring quality control and workmanship. Various tests prescribed below for materials shall be taken at periodical intervals as stipulated below.

The materials shall be a got tested at Government recognised Laboratory, (R & B) or field Laboratory of GERI (R & B) for which 1% of the estimated amount put to Tender shall be recovered from the contractor from the R. A. bills and final bills at the testing charges shall be paid to the GERI by the Government. However if the charges increase over 1% no exceeds recovery shall be made from the contractor as per resolution of B & C Department dated 10th May. 1985 Vide TNC/1085 (4) s.

Item No as per schedule 'B'	Brief Description of Materials to be tested	Qty. of Material	Prescription of test which shall be carried out	Frequency @ which test shall be carried out	Total No. of Test to be taken
1	25 to 90 H. B Metal 40 to 63 H. B. Metal 40 to 50 M. C.Metal 20 to 50 M.C. Metal Kapachi		- Gradation Test - Impact value - Flakiness Index	(1 to 100 Cmt - 1 Test 100 to 500Cmt-3 Test 500 to 1500Cmt-5 Test 1500 to 5000 Cmt - 7 Test)	
2	Grit		- Stripping Value	— As Above —	
3	Murum		- P.I- Value	One test per / 50 cmt	
4	Sand Quarry Spaul CBR-1test per work		- Silt Content – Gradation	One test per work One test per 200 cmt.	
5	Asphalt		1 Penetration Test as per I.S.1203  2 Ductility Test 3 Specification Gravily Test 4 Softening point Test 5 Viscosity Test	No. of Tanker Test 1 to 10 1 11 to 20 2 21 to 50 3 51 to 100 4 Remaining every 50 tank. 1 As per I.S. 1208 As per I.S. 1202 As per I.S. 1204 As per I.S. 1206	
6.	Tack coat		- Binder temperature for application. - Rate of spread of binder	Irregular close in intervals Two tests per day.	
7.	Carpet & seal coat mix		- grading - temperature of binder in boiler, aggregates in the dryer and mix at the time of laying and rolling (Binder content vide 45 IMD 2172)  - Rate of Spreaded mix materials	One Test on individual contituents and mixed aggregates from the dryer for each 100 tonnes of mix subject to minimum of Two tests per plant per day. One Test for each 100 tons of mix subjects to mini, of Two per day plant Regular control through checks on layer thickness.	
8	Bricks		- Water absorption Efflorence -Size -Compressive Strength	1 test per 50,000 Bricks	

Item No. As per Schedule 'B'	Brief Description of Materials to be tested	Qty of Materials	Prescription of test which shall be carried out.	Frequency @ which test shall be carried out	Total No. of Test to be taken														
9.	Cement		- Consistency - Setting time - Compressive Strength - Fineness - Chemical analysis - Soundness	Upto 50 T    1 test    (As per 100 T        2 tests    GERt 200 T        3 tests    Manual 300 T        4 tests    2002) 500 T        5 tests 800 T        6 tests 1300T        7 tests and 8 test for larger consingment															
10.	Steel		- Tensile Strength - Yield Stress - Elongation -Size	1 test / 40 tonnes / per category															
11.	C.C. cube 1:2:4		- Compressive Strength {I.S. 516 - 1959)	<table><tr><th>Qty. C.C.M<sup>3</sup></th><th>No. of test</th></tr><tr><td>1 to 5</td><td>- 1 no.</td></tr><tr><td>6 to 15</td><td>- 2 no.</td></tr><tr><td>16 to 30</td><td>- 3 no.</td></tr><tr><td>31 to 50</td><td>- 4 no.</td></tr><tr><td>51 &amp; above</td><td>-4+1</td></tr><tr><td colspan="2">(For each additional 50 M<sup>3</sup> or part thereof).</td></tr></table>	Qty. C.C.M <sup>3</sup>	No. of test	1 to 5	- 1 no.	6 to 15	- 2 no.	16 to 30	- 3 no.	31 to 50	- 4 no.	51 & above	-4+1	(For each additional 50 M <sup>3</sup> or part thereof).		
Qty. C.C.M <sup>3</sup>	No. of test																		
1 to 5	- 1 no.																		
6 to 15	- 2 no.																		
16 to 30	- 3 no.																		
31 to 50	- 4 no.																		
51 & above	-4+1																		
(For each additional 50 M <sup>3</sup> or part thereof).																			

The number of tests will be as per Manual of Quality Control or latest Govt. G.R. / Circulars will be final.

The contractor shall have to pay 1% of the estimate cost put to tender towards all testing of materials & the same shall be deducted from their bills for the works. The testing of various materials shall be carried out in GER1 and result received shall be binding to all i.e. the contractor and Govt.

Testing charges of GERI shall be borne by Govt. No refund be made nor extra charges over 1% shall be recoverable from the contractor

SIGNATURE OF CONTRACTOR

EXECUTIVE ENGINEER



