TECHNICAL SPECIFICATIONS

No.	Particulars
1	Applicable Standards - Civil Works
2	List of Approved Make - Civil Works
3	Cement Consumption
4	Material Specification - Civil Works
5	Item Specifications - Civil Works

APPLICABLE STANDARDS – CIVIL WORKS

1	Conversion factors	IS:786
2	Method of measurement of building works	IS:1200
3	Code of practice for measurement of civil engineering works	IS:3385
4	Materials and workmanship for earthwork and excavation	IS:1200 (PART I)
5	Safety code for blasting and related drilling operations	IS:4081
6	Safety code for excavation work	IS:3764
7	Moisture content in sand for filling	IS:2720
8	Determination of moisture content	IS:2720 (PART II)
9	Determination of moisture content & dry density relation using light compaction	IS: 2720 (PART VIII)
10	Determination of dry density of soils in-place by the sand replacement method	IS:2720(PART XXVIII)
11	Determination of dry density of soils in-place by the core cutter method	IS:2720 (PART XXIX)
12	Anti termite treatment	IS:6313(PARTI TO III)
13	Construction water	IS:456
14	Methods of sampling and test (physical and chemical water used in industry)	IS:3025
15	Ordinary (33 grade)/low heat Portland cement	IS:269
16	Ordinary Portland cement (43 grade)	IS:8112
17	Ordinary Portland cement (53 grade)	IS:12269
18	White Portland cement	IS:8042-E
20	Rapid hardening Portland cement	IS:8041, IS:269
26	Standard for testing of cement	IS:650
27	Methods of physical tests for hydraulic cement	IS:4031
28	Specification for standard sand for testing of cement	IS:650
29	Coarse and fine aggregates for concrete	IS:383, IS:515
30	Gradation of coarse aggregates	IS:383(TABLEII)
31	Gradation of fine aggregates	IS:383 (TABLE III)
32	All-in-aggregates	IS:383 (TABLE IV)
33	Method of tests for aggregates for concrete	IS:2386 (PART I TO VIII)

34	Methods of determination the maximum qty. of deleterious materials in aggregate	IS:2386 (PART II)
35	Limiting values of the maximum quantities of deleterious materials in aggregate	IS:383 (TABLE I)
36	Flakiness index of aggregates	IS:2396 (PART I), IS:5640
37	Moisture content test for aggregates	IS:2386 (PART III)
43	Mild steel binding wire	IS:280
44	Code of practice for welding of mild steel bars used for RCC	IS:2751
45	Code of practice for plain and reinforced concrete	IS:456
47	Testing of reinforced cement concrete	IS:516
48	Method of tests for strength of concrete	IS:516
49	Methods of sampling & analysis of concrete	IS:1199
51	Code of practice for composite construction	IS:3935
54	Specification for batch type concrete mixers	IS:1791
62	Code of practice for use of immersion vibrators for consolidated concrete	IS:3558
63	Air entraining agent	ASTM:6260
68	Specification for plywood for concrete	
69	Shuttering work	IS:4990
70	Code of practice for steel tubular scaffolding	IS:4014 (PART I & II)
71	Specification for steel scaffolding	IS:2750
72	Safety code for scaffolds and ladders	IS:3696
73	Common burnt clay building bricks	IS:1077
74	Classification of burnt clay bricks	IS:3102
75	Burnt clay building bricks, heavy duty	IS:2180
76	Burnt clay facing bricks	IS:2691,IS:1077
77	Method of sampling and testing clay building bricks	IS:3495 (PART I - IV)
78	Mortar for brick work	IS:2250
79	Code of practice for brick work	IS:2221
80	Masonry works	IS:3466
81	Structural safety etc. Of building masonry walls	IS:1905

82	Load bearing hollow concrete blocks	IS:2185
85	Code of practice for construction of stone masonry	IS:1597 (PART I)
86	Stone tests	IS:1124
87	Code of practice for design and installation of joints in buildings	IS:3414
88	Joint sealing compound	IS:834
89	Pre-molded bituminous joint filler	IS:1838
90	Timber door, window and ventilator frames	IS:4021
91	Material & workmanship for wood work	IS:883, IS:4021
92	Wooden flush door shutters (solid core type)	IS:2202 (PART I)
93	Timber paneled and glazed shutters	IS:1003 (PART I & II)
94	Method of tests for wooden flush doors, type tests	IS:4020
95	Plywood & tests	IS:303
96	General tests for wood work	IS:1659
97	Red lead for wood knot	IS:103
98	Oil type wood preservative	IS:218
99	Particle board	IS:3087
100	Transparent sheet glass for glazing & framing purposes	IS:1761
101	Resin bonded fiber glass	IS:3144
102	Putty for glazing	IS:420
103	Steel door frames	IS:4351
104	Steel window	IS:1361
105	Steel doors	IS:1038
106	Steel ventilators	IS:1081
108	Primer for steel doors, windows & ventilators	IS:102
109	Aluminum alloy for door/window frames	IS DSGN. HEA-WP OF IS:733
110	Sections	IS:1948
111	Anodizing	BS:1616
119	Rough cast plaster	IS:1661(CLAUSE-165)
120	Specification for integral cement water proofing compounds	IS:2645

121	Water proofing asphalt/maxphalt	IS:702
122	Bitumen saturated layer	IS:1322
123	Bitumen felt	IS:1322
124	Bitumen	IS:702
126	Material & workmanship for flooring	IS:1197, IS:1344
127	Code of practice for laying in situ terrazzo floor finish	IS:2114
129	Mosaic tiles	IS:1237
130	Glazed earthenware tiles	IS:777
131	Marble chips & marble mosaic terrazzo	IS:2114
132	Plain cement tiles & tests	IS:1237
133	Marble mosaic tiles	IS:1237
134	Marble slab	IS:1130
135	PVC flooring tiles & sheets	IS:3461,IS:3462
136	Broken marble mosaic tiles	IS:1257
140	Pigment for terrazzo flooring	IS:459
141	Rivets	IS:1148
142	Electrodes for welding	IS:814
143	Code of practice for use of electric arc welding for general construction in steel	IS:813
144	Tests for welding works	IS:1181
145	Welding works	IS:816
146	Bolts and nuts	IS:1367
147	Tests for bolts and nuts	IS:1608
148	Structural steel sections & tests	IS:226
149	Structural steel plates	IS:2062
150	Defects in structural steel	IS:229
151	Dimension & properties of steel section	IS:808
152	Structural steel work	IS:226, IS:4948
154	Expanded metal steel sheet	IS:412
155	Mild steel wire gauze jali	IS:280

156	Welding procedure & edge preparation	IS:823
157	Washers	IS:2016
158	Storage of welding wire & electrodes	IS:816
159	Primer to structural surface for bolts	IS:2074
160	Checkered plates	IS:3502
161	Code of practice for painting of ferrous metal in building and allied finishes	IS:1477 (PART I & II)
162	Distemper and dry colour	IS:427
163	Code of practice for painting concrete, masonry and plaster surfaces	IS:2395
164	Distemper and oil emulsion	IS:428
165	Enamel paints	IS:2933
170	Coat of zinc chromate	IS:104
171	French spirit polish	IS:348
172	GI sheets	IS:227
173	Ac sheets	IS:459
174	Ac sheet fixing	IS:730
175	Mangalore pattern tiles	IS:654
176	Fiber glass reinforced polyester	IS:4154
177	Galvanized steel for barbed wire	IS:278
178	Insulation of hot water pipes, tanks & heat exchanger	BS:476
179	GI pipes & MS tubes	IS:1239 (PART I)
180	Screw down bib cocks & stop cocks	IS:781
181	Vitreous sanitary fixtures(general)	IS:2556 (PART I)
182	Gun metal wheel, globe, check, gate & non return valves	IS:778
183	Wash basin	IS:2556 (PART IV), IS:771
184	European W.C.	IS:2556, IS:771
185	Solid plastic seat & cover	IS:2548
186	Orissa pan W.C.	IS:2556 (PART III)
187	Squatting pans & traps	IS:2556 (PART III)
188	Indian W.C. (wash down W.C.)	IS:2556 (PART II),

		IS:771
189	Urinals	IS:2556 (PART VI)
190	Half round channels	IS:2556 (PART VII)
191	Specific requirements of siphonic wash down W.C.	IS:2556 (PART VIII)
192	Ss sink/C.I./flushing tank brackets	IS:775
193	C.I. siphonic flushing cistern	IS:774
194	Lead pipes	IS:404 (PART I)
195	Sand cast pipes & fittings	IS:1729
196	C.I. spun soil pipes & fittings	IS:3939
197	Gully trap	IS:651
198	Glazed stone ware pipes & fittings	IS:651
199	Ac pipe	IS:1626,IS:1626 (PART I)
211	Low level ceramic cistern	IS:774
212	Bowl pattern flat back urinals	IS:2556 (PART IV)
213	Showers	IS:2064
215	Concrete mix design	IS:10262
216	Code of practice for construction of floor and roof with joists and filler blocks	IS:6061 (PART I)
217	Code of practice for construction of light weight concrete block masonry	IS:6042
218	Specification for load bearing light weight concrete blocks	IS:3590
219	Code of practice for construction of hollow concrete block masonry	IS:2572
220	Specification for concrete masonry units (hollow and solid concrete blocks)	IS:2185 (PART I)
221	Chemical composition of ordinary Portland cement	IS:4032
223	Specifications for circular hollow sections	IS:1161
224	Properties of rectangular & square hollow sections	IS:4923
225	Cold formed welded & seamless carbon steel structural tubing	ASTMA 500
226	Cold but not formed welded & seamless carbon steel structural tubing	ASTMA 501
227	Hot formed welded & seamless high strength low alloy tubing	ASTMA 618
228	Hot rolled structural steel hollow section	BS:4848/

LIST OF APPROVED MAKE / MANUFACTURER - CIVIL WORK MATERIALS

1)	Ordinary Portland cement	Ultratech/Ambuja/Sanghi/JK/Laxmi/ Binani/Jaypee/ Hathi / Siddhi / Kamal
2)	White cements	Birla/J.K. Brand
3)	Cold twisted Ribbed bars	Tata/Sail/Vizag/Electro Therm (ET) / Diamond / Friends / Akshat / German / National / Gallent / ASR / Someshwar / KB
4)	Structural Rolled Steel sections-beams, channels, tee, flats, angles, bars (round, square, hexagonal)	Tata/Vizag/Jindal/Sail/Asian brand
5)	Structural Hollow steel sections (Square & Rectangular)	Tata Tata/Jindal/ Vizag/Asian
6)	Structural tubular sections	Tata/Jindal/ Vizag/Asian
9.1)	Shuttering plywood	Green /Kitply/Anchor brand
9.2)	Marine plywood	Green/Kitply/Century brand
9.3)	Commercial plywood	Green /Duro/Century brand
9.4)	Decorative ply (Veneer)	Green/Durian/Century brand
9.5)	MDF	Duratuff/Nuwood/Asian tessa brand
9.6)	Prelam particle board	Novapan/Bhutan/ Asian tessa brand
9.7)	Laminate sheet	Green /Bloom/Formica/Levin/ rotolam
9.8)	Bison Panel (cement bonded particle board)	Euro/Bison/NCL Industries brand
10)	Flush door	Green doors/Kitply/Anchor/ Century
11.1)	Door and Window frames	kommerling/superwin upvc/Domal aluminium
11.2)	Z - section steel window & Ventilators	AGEW Steel Mfg Pvt. Ltd / Equivalent
11.3)	MS & GI seamless flush door shutters Including door Frames	NA
12)	Locks	Apex/Godrej /Vale/Armour brand/Hafelee
13)	Float Glass	Modi guard / Saint Gobain/ASAI
14)	Mirror	Modi guard / Saint Gobain/ASAI
15)	Polished Kotah stone slab grey	Approved quarry of Ramganjmandi.
16)	Bathroom tiles	Asian/Cera/Dakshinamurty/Johnson/ Somani/Kajaria /Simpolo Brand

17) Flooring tiles	Asian/ Simpolo /Johnson/Kajaria/ Dakshinamurtybrand
18) Construction chemicals Bauchemie/Roffee/Fosroc/Pidilite	Dr.Fixit/M.C. Brand
19) Joint Filler	GE silicone, Cibatul, STP
20) Pre-coated steel roofing/ walling sheets	Tata/Jindal
21) Paints	Berger/Asian/ICI/Nerolac brand
22) Polish	MRF, Asian, ICI
23) Water stop	Fixopan/Equivalent
24) Hardware	/Ebco/Micromess/Pluspoint/Ferrari/Hafeles
25) Adhesives	Fevicol, Kitcol, Araldite, BAL
26) Sanitary ware	Somany/Cera/ Kajaria/Hindware brand
27) Sanitary fittings	Aquel/Cera/Jaguar brand
28) Pipes	Supreme/Astral/Dutron /prince
29) Cover blocks	Astra brand
30) RMC	Ultra tech/Johnson brand/Equivalent
31) Bricks	Red brick

Note:
All the Materials/Makes listed above cost and availability has been checked and other than as specified above shall not be used unless prescribed and approved in writing by the Engineer / Consultant.

CEMENT CONSUMPTION

	Item	Ration/ Grade	Consumption	
A.	**CEMENT CONCRETE**			
	BBCC	01:06:12	2.3	Bags/m3.
		01:05:10	2.6	Bags/m3.
		01:04:08	3.4	Bags/m3.
	PCC	01:06:12	2.3	Bags/m3.
		01:05:10	2.6	Bags/m3.
		01:04:08	3.4	Bags/m3.
	RCC			
		01:03:06	4.2	Bags/m3.
		01:02:04	6.4	Bags/m3.
		01:1.5:03	7.2	Bags/m3.
		01:01:02	12.2	Bags/m3.
		01:02:05	5.4	Bags/m3.
		01:2.5:05	5.1	Bags/m3.
B.	**MORTARS**			
	Cement and Sand mortar			
		01:01	20.4	Bags/m3.
		01:02	13.6	Bags/m3.
		01:03	10.2	Bags/m3.
		01:04	7.6	Bags/m3.
		01:05	6.2	Bags/m3.
		01:06	5	Bags/m3.
		01:08	4	Bags/m3.
	Gauged mortar			
	(Cement Lime and Sand mortar)			
		01:01:06	4.9	Bags/m3.
		01:01:08	3.8	Bags/m3.
		01:02:09	3.3	Bags/m3.
		01:05:10	2.95	Bags/m3.
		01:06:12	2.4	Bags/m3.
C.	**MASONRY WORK**			
	Brickwork in Cement sand mortar	**Modular (19 x 9 x 9)**		
		01:03	2.55	Bags/m3.
		01:04	1.9	Bags/m3.
		01:05	1.56	Bags/m3.
		01:06	1.27	Bags/m3.
		01:08	0.95	Bags/m3.

	Brickwork in Gauge Mortar		
		01:01:06	1.21 Bags/m3.
		01:01:08	0.96 Bags/m3.
		01:02:09	0.81 Bags/m3.
	Stone masonry, Uncoursed		
	Random Rubble walling	**Conventional (23 x 11 x 7)**	
		01:03	2.95 Bags/m3.
		01:04	2.29 Bags/m3.
		01:06	1.51 Bags/m3.
		01:08	1.18 Bags/m3.
	Stone masonry in Gauged Mortar		
		01:01:06	1.48 Bags/m3.
	Item	**Ratio/Grade**	**Consumption**
		01:01:08	1.14 Bags/m3.
		01:02:09	0.99 Bags/m3.
D.	**PLASTERING**		
	12 mm. thick plaster in Cement mortar, on Brick masonry		
		01:02	0.24 Bags/m².
		01:03	0.17 Bags/m².
		01:04	0.14 Bags/m².
		01:05	0.1 Bags/m².
		01:06	0.09 Bags/m².
	12 mm. thick plaster in Gauged mortar, on Brick masonry		
		01:01:08	0.07 Bags/m².
		01:02:09	0.06 Bags/m².
	12 mm. thick plaster in Cement mortar, on Stone masonry		
		01:02	0.31 Bags/m².
		01:03	0.22 Bags/m².
		01:04	0.17 Bags/m².
		01:06	0.11 Bags/m².
	12 mm. thick plaster in Gauged mortar, on Stone masonry		
		01:01:08	0.08 Bags/m².
		01:02:09	0.07 Bags/m².
	20 mm. thick plaster in Cement mortar, on Brick masonry		
		01:02	0.34 Bags/m².
		01:03	0.24 Bags/m².
		01:04	0.19 Bags/m².
		01:05	0.13 Bags/m².

		01:06	0.12 Bags/m².
	20 mm. thick plaster in Gauged mortar, on Brick masonry		
		01:01:08	0.1 Bags/m².
		01:02:09	0.08 Bags/m².
	20 mm. thick plaster in Cement mortar, on Stone masonry		
		01:02	0.41 Bags/m².
		01:03	0.29 Bags/m².
		01:04	0.22 Bags/m².
		01:06	0.14 Bags/m².
	20 mm. thick plaster in Gauged mortar, on Stone masonry		
		01:01:08	0.11 Bags/m².
		01:02:09	0.09 Bags/m².
	20 mm. thick Sand Face plaster		0.2 Bags/m².
	12 mm. thick Water Proof plaster in 1:4 Cement mortar		0.15 Bags/m².
	Neat Cement finishing		0.044 Bags/m².
E.	**POINTING**		
	Flush, Grooved or Struck in Cement Brick masonry		
		01:01	0.06 Bags/m².
		01:02	0.05 Bags/m².
		01:03	0.03 Bags/m².
		01:04	0.028 Bags/m².
	Flush, Grooved or Struck in Cement Random Stone masonry		
		01:02	0.01 Bags/m².
		01:03	0.08 Bags/m².
		01:04	0.06 Bags/m².
F.	**FLOORING**		
	Precast Mosaic Tiles in cement mortar		0.2 Bags/m².
	Precast Mosaic Tiles dado in cement mortar		0.23 Bags/m².
	Green and Brown Kotah Stone in flooring, skirting & dado		0.3 Bags/m².
	Item	**Ratio/ Grade**	**Consumption**
	Green Kotah Stone in Risers and Treads		0.3 Bags/m².
	Double Polished Kotah Stone		0.3 Bags/m².
	Rough Kotah Stone		0.3 Bags/m².
	Glazed Tiles		0.2 Bags/m².
	Spartek Tiles		0.2 Bags/m².
	China mosaic		0.22 Bags/m².
	Marble Slab		0.25 Bags/m².
	Granite Slab		0.25 Bags/m².
	Jesalmer		0.25 Bags/m².
	Red Mandana		0.35 Bags/m².

	I.P.S,	40 mm. thick	0.35	Bags/m².
		50 mm. thick	0.4	Bags/m².
	Pinkish White Dholpur		0.15	Bags/m².
	Red Dholpur		0.15	Bags/m².
	Brick-on-edge		0.31	Bags/m².
	Terrazzo		0.17	Bags/m².
G.	**STEEL WORK**			
	Fixing Windows in C.C Blocks 15 x 10 x 10 cm. in C.C	01:03:06	0.03	Bags/m².
	Fixing Holdfasts in C.C Blocks			
	15 x 15 x 30 cm. in C.C	01:03:06	3.3	Bags/100 nos.
	23 x 25 x 30 cm. in C.C	01:03:06	7.76	Bags/100 nos.
	30 x 30 x 45 cm. in C.C	01:03:06	19.8	Bags/100 nos.
H.	**MISCELLANEOUS**			
	Filling Zaris with			
	C.M.	01:03	5	Bags/100 nos.
	C.C	01:02:04	3.2	Bags/100 nos.
	BBCC 1:5:10 Blocks, 30 x 30 x 50 cm. for Wire fencing		5.1	Bags/100 nos.
	C.C Blocks for Flooring, 30 x 30 x 30 cm.	01:04:08	5	Bags/100 m².
I.	**ROADWORK**			
	Precast Curbs of P.C.C	01:02:04	21.5	Bags/100 m.
J.	**SANITARY WORK**			
	R.C.C Hume pipes jointed with Cement mortar 1:1			
		600 mm. dia.	6.4	Bags/100 m.
		450 mm. dia.	4.8	Bags/100 m.
		300 mm. dia.	2.2	Bags/100 m.
		230 mm. dia.	1.8	Bags/100 m.
		150 mm. dia.	1.2	Bags/100 m.
		100 mm. dia.	1	Bags/100 m.
	SW pipes jointed with Cement mortar 1:1			
		300 mm. dia.	12.94	Bags/100 m.
		230 mm. dia.	9.74	Bags/100 m.
		150 mm. dia.	6.56	Bags/100 m.
		100 mm. dia.	4.34	Bags/100 m.
	C.I Waste water line, concealed including filling the zari with	75 mm. dia.	8.6	Bags/100 m.
	Cement mortar 1:4 and joints in Cement mortar 1:1	100 mm. dia.	10.88	Bags/100 m.

	C.I Soil pipe/Rain water pipe, concealed, including filling the	100 mm. dia.	10.88 Bags/100 m.
	Item	**Ratio/ Grade**	**Consumption**
	zari with C.M. 1:4 and joints in Cement mortar 1:1	150 mm. dia.	14.66 Bags/100 m.
	Fixing European type WC		0.1 Bag/no.
	Fixing Orissa pan		
	Fixing Urinal/s.		0.2 Bag/no.
	Fixing Wash Hand Basin		0.03 Bag/no.
	Fixing S.S Sink		0.05 Bag/no.
	Brick Masonry Chambern 300 x 300 x 610 mm.		1.7 Bag/no.
	Half Round Channel 100 mm.		15.86 Bags/100 m.
	Fixing 100 mm. dia. SW Gully Trap		0.5 Bag/no.
K.	**STORM WATER DRAINAGE & CULVERTS**		
	R.C.C. pipe NP - 2		
		230 mm. dia.	1.8 Bags/100 m.
		300 mm. dia.	2.4 Bags/100 m.
		450 mm. dia.	5.4 Bags/100 m.
		900 mm. dia.	9.8 Bags/100 m.
	Storm water Gully Chamber		6 Bag/no.

MATERIALS SPECIFICATIONS – CIVIL WORKS

N.B.: Only the related specifications pertaining to the tender are to be considered.

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 RCC container for transport, storage and handling of water shall be clean. Water shall conform to the standards specified in IS : 456.

1.2 If required by the Engineer-in-charge and Architects 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 IS : 269. Any indication of unsounding change in time of setting by 30 minutes or more or decrease of more than 10 per cent 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 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 generally be found unsuitable for curing mortar or concrete.

1.5 Potable water shall be generally found suitable for curing mortar and concrete.

Testing Standards :

A. Chemical Analysis :-

Sampling : Test shall be carried out only once for one particular source.

Results :

a) TDS - 3000 mg/lit. e) Carbonic contents - 200 mg/lit.

b) Sulphates - 5000 mg/lit.f) Non-carbonic contents - 3000 mg/lit.

c) pH values - 6 to 8

d) Chlorides

P.P.C - 2000 mg/lit.

R.C.C - 1000 mg/lit.

M-1 Cement :

1.1 Cement shall be ordinary Portland slag cement, grade 33, as per IS : 269, grade 43, as per IS : 8112 and grade 53, as per IS : 12269 or Portland slag cement as per IS : 455.

Testing Standards :

A. Setting time :

Sampling :

(i) From a lot of 50 tones of cement, 2% of bags shall be picked out at random, from which one sample of 15 kg. shall be taken.

(ii) For a lot of 50 to 100 tones - 2 samples

(iii) For a lot of 100 to 200 tones - 3 samples

(iv) For a lot of 100 to 200 tones - 3 samples

(v) For a lot of 200 to 300 tones - 4 samples

(vi) For a lot of 300 to 500 tones - 5 samples

(vii) For a lot of 500 to 800 tones - 6 samples

(viii)For a lot of 800 to 1300 tones - 7 samples

Results :

(a) Initial setting time - not less than 30 minutes

(b) Final setting time - not more than 100 minutes

B. Fineness test by Sieving :

Sampling :

Using any 5 samples, made as above, one test is carried out, using IS sieve no. 90 microns.

Results :

90% or more should pass through the above mentioned IS sieve.

C. Fineness test by determination of specific surface :

Sampling :

Using any 5 samples, made as above, one test is carried out.

Results :

For O.P.C, the surface area shall be 225 cm^2/gm. or more.

For P.P.C, the surface area shall be 3000 cm^2/gm.

D. Consistency test :

Sampling :

Sampling shall be as in A.

Results :

Consistency in all samples shall be about 30%.

E. Compressive strength :

Sampling :

Sampling shall be as in A.

Results :

On 2nd day, compressive strength must be 160 Kg/cm^2., for O.P.C

On 7th day, compressive strength must be 220 Kg/cm^2., for O.P.C

On 28th day, compressive strength must be 310 Kg/cm^2., for O.P.C

F. Chemical composition (IS : 4032):

Sampling :

Using any 5 samples, made as above, one test is carried out.

Results :

a. Magnesium oxide - less than 6%.

b. Sulphur as Sulphuric anhydride - less than 2.75%.

c. Loss on ignition - upto 5%.

The above is for ordinary Portland cement.

M-1A Rapid Hardening Cement (RHC) :

1A.1 Rapid hardening cement shall be from source like Gujarat High Tech, Ambuja, Birla or equivalent as approved by the Architect and Engineer-in-charge. It shall conform to IS : 8041. Test certificates showing that the cement complies to the specifications must be submitted to the Architect.

1A.2 It shall have strength in one day equal to that of OPC in 3 days. It shall be used for products like hume pipes, tiles, sleepers, poles, prestressed and precast concrete members. It shall also be used for foundations, bridges, culverts, causeways etc. where quick construction activity is required however, prior permission of the Architect and Engineer-in-charge shall be taken before use.

1A.3 It shall capable of giving required workability, final strength and better surface finish.

M-2 White Cement :

2.1 The white cement shall conform to IS : 8042-E

M-3 Coloured Cement:

3.1 Coloured cement shall be with white or grey Portland cement mixed with pigments as specified in the item of the work.

3.2 The pigments used for coloured cement shall be of approved quality and its quantity shall not exceed 10% of the cement used in the mix. The mixture of pigment and cement shall be properly ground to have a uniform colour and shade. The pigments shall have such properties as to provide for durability for colour under exposure to sunlight and weather.

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

M-4 Sand :

4.1 Sand shall be medium/coarse 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 Engineer-in-charge and Architects. The sand shall not contain more than 8% of silt as determined by field test and 3% by laboratory test , if necessary the sand shall be washed to make it clean. **All sand to be used for plaster, brickwork , concrete shall be strictly sieved by 4.75 mm seive.**

Testing Standards :

A. Silt Content :

Sampling :

Test shall be carried out for every 150 m^3 of sand. The sample taken for testing shall weigh 10 Kg.

Results :

Permissible content shall be 3% in laboratory test & 8 % in field Test.

B. Fineness Modulus :

Sampling :

Sampling shall be as in A.

Results :

Fine sand : 2.2 to 2.6 shall be used as earth filling in plinth, zari, etc.

Medium sand : 2.6 to 2.9 shall be sued for Brickwork and plaster.

Coarse sand : 2.9 to 3.2 shall be used for concrete.

In general, the fineness modulus of sand shall not be less than 2.5 and shall not exceed 3.0. A sand having a fineness modulus more than 3.2 will be unsuitable for making satisfactory concrete.

C. The sieve analysis of sand shall be as under

IS Sieve Designation	% By weight Passive sieve	IS Sieve Designation	% By Weight passive sieve
4.75 mm	100	600 Micron	30-100
2.36 mm	90-100	300 Micron	5-70
1.18 mm	70-100	150 Micron	0-50

M-5 Stone Dust :

5.1 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 fields test is given under:

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

5.3 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 content within the allowable limit.

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

M-6 Stone Grit :

6.1 Grit shall consist of crushed or broken **black trap stone** and be hard, strong, dense, durable clean of proper gradation and free from skin or coating likely to prevent proper 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 IS : 383 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 and Architects. The grit shall have no deleterious reaction with cement.

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

IS Sieve Designation	% passing Through sieve	IS Sieve Designation	% Passing Through sieve
12.50 mm.	100%	4.75 mm.	0-20%
10.00 mm.	85-100%	2.36 mm.	0- 5%

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

7.4 The necessary tests for grit shall be carried out as per the requirements of IS : 2386 (parts I to VIII) , as per instructions of the Engineer-in-charge and Architect. The necessity of test will be decided by the Engineer-in-charge and Architect.

M-8 Cinder :

8.1 Cinder is well burnt furnace residue which has been fused or centered into lumps of varying sizes.

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

8.3 The average grading for cinder aggregates shall be as mentioned below:

IS Sieve Designation	% Passing	IS Designation	% Passing
20 mm.	100	4.75 mm.	70
10 mm.	86	2.36 mm.	52

M-9 Lime mortar:

9.1 Lime shall conform to M-2. Water shall conform to M-1. Sand shall conform to specification M-6.

9.2 Proportion of mix:

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

9.3 Proportion of mortar:

9.3.1 Lime mortar shall be prepared by wet process as per IS : 1625. 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 180 revolutions 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.

9.4 Storage:

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

9.5 Use :

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

M-10 Cement Mortar :

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

10.2 Proportion of Mix:

10.2.1 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 50Kg/Bag of cement being equal to 0.0342 m^3. The mortar may be hand mixed or machine mixed as directed.

10.3 Proportion of Mortar :

10.3.1 In hand mixed mortar. cement and sand in the specified proportions shall be thoroughly mixed dry on a clean impervious platform by turning over atleast 3 times or more till a homogeneous 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.

10.3.2 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-11 Stone Coarse Aggregate For Nominal Mix Concrete :

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

11.2 The aggregate shall generally be cubical/round in shape. Unless special stones of particular quarries are mentioned aggregates shall be machine crushed from the **black trap** or equivalent black 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 the cover, whichever is smaller.

TABLE

IS Sieve Designation	% passing for single size aggregates of Nominal Size			IS Sieve Designation	% passing for single size aggregates of Nominal size		
	40 mm	20 mm	16 mm		40 mm	20 mm	16mm
80 mm.	-	-	-	12.5 mm.	-	-	-
63 mm.	100	-	-	10 mm.	0.5	0 - 20	0.30
40 mm.	100	100	-	4.75 mm.	-	0 - 5	0.5
20 mm.	0-20	85-100	100	2.35 mm.	-	-	-
16 mm.	-	-	85-100				

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

11.3 The grading test shall be taken in the beginning and at the change of source of materials. The necessary tests indicated in IS : 383 and IS : 456 shall have to be carried out to ensure the acceptability. The aggregate 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.

Testing Standards :

A. Flakiness Index :

Sampling :

For every 200 m^3. of aggregates, one test shall be carried out.

Results :

The Flakiness index is taken as the total weight of the aggregates passing through the various thickness gauges, expressed as a percentage of the total weight of the sample taken.

Permissible is not more than 35% for aggregates used in concrete for wearing surfaces.

B. Impact value :

Sampling :

For every 100 m^3. of aggregates, one test shall be carried out.

Results :

The impact value shall not be more than 45% by weight for aggregates used for concrete other than wearing surfaces.

For aggregates used for concrete to be used as wearing surface, the impact value shall not be more than 30%, by weight.

C. Abrasion Value :

Sampling :

Sampling shall be as in B.

Results :

The percentage of wear shall not be more than 35%.

M-12 Black Trap or Equivalent Hard Stone Coarse Aggregates for Design Mix Concrete :

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

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

12.3 The necessary tests indicated in IS : 383 and IS : 456 shall have to be carried out to ensure the acceptability of the material.

12.4 If the aggregates are covered with dust, they shall be washed with water to make them clean.

M-13 Brick Bats Aggregates :

13.1 Brick bat aggregate shall be broken from well burnt or slightly over burnt and dense bricks. It shall be homogeneous in texture, roughly cubical in shape, clean and free from dirt or any other foreign material. The brick bats shall be less than 40 mm. size, unless

otherwise specified in the item. The under-burnt or over-burnt brick bats and brick dust shall not be allowed.

13.2 The brick bats shall be hand measured by suitable boxes or as directed.

M-14 Bricks :

14.1 The bricks shall be of **first quality** 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 of 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 1 m.

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

14.3 The size of the conventional bricks shall be (9"x4.5" x 3") 230 mm. x 110 mm. x 76.5 mm.

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

Length : + 1/8"(3.0 mm.). Width : + 1/6" (1.50 mm.). Height : + 1/6"(1.50 mm.).

14.5 The crushing strength of the bricks shall not be less than **50 Kg./cm^{2},**. No unburned/over burnt bricks shall be used for any structure. The bricks should have dimensional stability as per IS standards. The average water absorption shall not be more than 20% by weight. Necessary tests for crushing strength and water absorption etc. shall be carried out as per IS : 3495 (Part I to IV) .

Testing Standards :

A. Efflorescence :

Sampling :

Test of 20 bricks is carried out from a stock of 20,000 bricks.

Results :

Moderate.

B. Water Absorption :

Sampling :

Test of 32 bricks is carried out from a stock of 35,000 bricks.

Results :

Absorption shall not be more than 20%.

C. Compressive Strength :

Sampling :

Test of 50 bricks is carried out from a stock of 1,00,000 (1 Lac) bricks.

Results :

On average the compressive strength shall not be less than **50 Kg/cm^2**. And every result shall not be less than 20% of the IS standards.

M-14A First Class Bricks for Exposed brickwork:

14A.1 First class bricks are those which strictly conform to the standard size of modular bricks, i.e. 19 cm. x 19 cm. x 9 cm. actual size, such that ten layers of brick laid in mortar shall form masonry of 1 m. height. Conventional bricks should have quality standard as per modular brick except size.

14A.2 These bricks are manufactured from good quality plastic earth, which is free from saline deposits. They are of good uniform colour. They are well burnt, giving a hard ringing sound when two bricks are struck together.

14A.3 They should have straight edges and even surfaces. They are free from cracks, chips, flaws and modules of lime.

14A.4 When immersed in water for an hour, they do not absorb water more than 1/6th of their weight. On drying, these bricks do not show any sign of efflorescence.

M-14A First Class Bricks for Exposed brickwork :

14A.1 First class bricks are those which strictly conform to the standard size of modular bricks, i.e. 19 cm. x 19 cm. x 9 cm. actual size, such that ten layers of brick laid in mortar shall form masonry of 1 m. height. Conventional bricks should have quality standard as per modular brick except size.

14A.2 These bricks are manufactured from good quality plastic earth, which is free from saline deposits. They are of good uniform colour. They are well burnt, giving a hard ringing sound when two bricks are struck together.

14A.3 They should have straight edges and even surfaces. They are free from cracks, chips, flaws and modules of lime.

14A.4 When immersed in water for an hour, they do not absorb water more than 1/6th of their weight. On drying, these bricks do not show any sign of efflorescence.

M-15 Stone :

15.1 The stone shall be of specified variety such as Granite/Trap Stone/Quartz 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 IS : 1124. The minimum crushing strength of the stone shall be 200 Kg/cm^2. unless otherwise specified.

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

15.3 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-16 Bella/ white sand Stone :

16.1 Laterite stone shall be obtained from the approved quarry. It shall be uniform in texture, sound, durable and free from soft patches. It shall have a minimum crushing strength of 100 Kg./cm^2. 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.

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

16.3 Those type of stones in which white clay occurs should not be used.

16.4 Special corner stone shall be provided where so directed.

M-17 Mild Steel Bars :

17.1 Mild steel bars reinforcement for RCC work shall conform to IS : 432 (Part-II) and shall be of tested quality. It shall also comply with relevant part of IS : 456.

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

17.3 For the purpose of payment, the bar shall be measured correct upto 10 mm. length and weight payable worked out at the rate specified below :

1.	6 mm.	0.22 Kg/m.	8.	20 mm.	2.47 Kg/m.
2.	8 mm.	0.39 Kg/m.	9.	22 mm.	2.98 Kg/m.
3.	10 mm.	0.62 Kg/m.	10.	25 mm.	3.85 Kg/m.
4.	12 mm.	0.89 Kg/m.	11.	28 mm.	4.83 Kg/m.
5.	14 mm.	1.21 Kg/m.	12.	32 mm	6.31 Kg/m.
6.	16 mm.	1.58 Kg/m.	13.	36 mm.	7.99 Kg/m.
7.	18 mm.	2.00 Kg/m.	14.	40 mm	9.86 Kg/m.

17.4 Procurement of Steel should be from authorised/approved rolling mills and test certificates should be submitted with each lot.

Testing standards :

Sampling :

For every 40 tonnes of steel, atleast one test shall be done.

Results :

Thickness	Ultimate Tensile strength	Chilled state	% Elongation

0 - 20 mm.	42 Kg/cm^2.	26 Kg/cm^2.	23
20 - 40 mm.	42 Kg/cm^2.	24 Kg/cm^2.	23
40 mm. & more	42 Kg/cm^2.	24 Kg/cm^2.	23

M-18 A High Yield Strength Steel Deforms Bars :

18.A.1 High yield strength steel deformed bars be either cold twisted or hot rolled shall conform to IS : 1739 and IS : 1139 respectively.

18.A.2 Other provision and requirements shall conform to M-18 for Mild steel bars.

M-18 B Thermo-mechanically Treated Bars (TMT)

18.B.1 TMT bars shall conform to IS: 1786

18.B.1 Procurement of Steel should be from authorized dealer and test certificates should be submitted with each lot.

M-18 C Corrosion Resisting Steel (CRS)

18.C.1 CRS bars shall conform to IS: 1786

18.C.1 Procurement of Steel should be from authorized dealer and test certificates should be submitted with each lot.

M-19 High Tensile Steel Wire :

19.1 The high tensile wires for the use in prestressed concrete work shall conform to IS : 2090.

19.2 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 IS : 1785. Testing shall be done as per IS requirements.

19.3 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.

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

Testing standards :

Sampling :

For every 40 tonnes of steel, atleast one test shall be done.

Results :

Thickness	Ultimate Tensile strength	Chilled state	% Elongation
For all sizes	49.5 Kg/cm^2.	42.5 Kg/cm^2.	14.5

M-20 Mild Steel Binding Wire :

20.1 The mild steel wire shall be of 1.63 mm. or 1.22 mm. (16 or 18 gauge) diameter and shall conform to IS : 280.

20.2 The use of black wire will be permitted for binding reinforcements 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-21 Structural Steel :

21.1 All structural steel shall conform to IS : 226. The steel shall be well and cleanly rolled to the dimensions and weight specified by the IS, subject to the permissible tolerances as per IS : 1852. The finished materials shall be reasonably free from cracks, surface flaws, laminations, rough and imperfect edges and all other harmful defects mentioned in IS : 229 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. River bars shall conform to IS : 1148. The decision of the Engineer-in-charge regarding rejecting any steel section on account of any of the above defects shall be final and binding to the Contractor.

21.2 Structural steel shall conform to the following requirements. The mechanical and chemical properties shall be as below :

MECHANICAL COMPOSITION OF STEEL

Steel designation	Class of steel product	Nominal thickness in mm.	Tensile strength in Kgf/mm^2	Yield stress min. Kgf/mm^2	% elongation
ST-42 W & ST-42 S	Plates, flats, bars.	Below 6 mm.	Bend test only shall be required.		
		upto 20 & Vc	42 to 54	26.0	23
		Over 20 upto Vc 40	42 to 54	24.0	23
		Below 10	Bend test only shall be		

			required			
		10 upto 20 & Vc	42 to 54	28.0	23	
		Over 20	42 to 54	24.0	23	
ST-42 O	Plates, sections, flats,Over 6	Below 6	Bend test only shall be required.			
		10 & above	42 to 54	28.0	23	

CHEMICAL COMPOSITION OF STEEL

Steel designation	Maximum percentage		
	Carbon	Sulphur	Phosphorous
ST-42 W	0.23	0.06	0.06
ST-42 S	0.25/0.28	0.06	0.06
ST-42 O		0.07	0.07

22.3 The following variety of steel shall be used for structural purposes:

ST-42 S : It shall be used for all types of structure (riveted or bolted), including those subjected to dynamic loading and where fatigue, wide fluctuations of stresses, reversal of stresses and great restraint are involved. It shall be suitable for welded structures, provided that the thickness of the material does not exceed 20 mm.

22.4 When the steel is supplied by the Contractor, test certificate of the manufacture shall be obtained according to IS : 226 and other relevant Indian Standards.

M-22A Timber/Wooden planking:

22A.1 The shuttering shall be either of wooden planking of 30 mm. minimum thickness with or without steel lining or 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 place of ballie props, brick pillar of adequate section built in mud mortar may be used.

22A.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, 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.

22A.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 and Architect, before the reinforcement bars are placed in position.

22A.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 plate 40 mm. thick and minimum bearing area of 0.10 m^2. laid on sufficiently hard base.

22A.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.

22A.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 planned 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.

22A.7 As far as possible, clamps shall be used to hold the forms together and use of nails and spikes shall be avoided.

22A.8 The surface of timber shuttering that would come on 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 manufacture 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.

22A.9 The shuttering for beams and slabs shall have camber of 4 mm. per meter (1 in 250) or as directed by Engineer-in-charge and Architect, so as to offset the subsequent deflection. For cantilevers, the camber at free end shall be 1/50 of the project length or as directed by the Engineer-in-charge and Architect.

M-22B Concrete Shuttering Plywood :

22B.1 It shall be made from strong and selected hard-woods. It shall be bonded with high quality Phenol Formaldehyde synthetic resin adhesive, hot pressed and then shall be further treated with a permanent type of preservative by vacuum-cum-pressure impregnation.

22B.2 Due to the bonding with Phenol Formaldehyde, it shall be moisture and weather proof. The use of selected hard-woods render hard and wear-resistant faces and thereby it shall be reusable several times. It shall be highly resistant to rot, termites and other wood inhabiting insects. Due to complete penetration of the preservative, it shall be exceedingly durable.

22B.3 It shall have high impact strength and therefore shall be used successfully in place of timber planks and steel sheets. It shall protect the concrete from rapid temperature changes and shall provide optimum conditions for setting of the concrete. As it shall possess remarkable design flexibility, it shall be ideal for curved formwork.

22B.4 Besides it shall be used as centering, shuttering and formwork of concrete columns, beams, slabs, walls, tanks, bridges, fly-overs, silos etc. It shall also be used for structural applications like external walling, roofing, flooring, curtain walls, work-site offices, in cabins of trucks, rail coaches etc.

M-22C Steel Sheeting and Steel Plates :

22C.1 Steel sheeting and steel plates should be free from clinks, twists, offsets, warps, etc. Their surface should be neat, clean and smooth. Before placing concrete, steel forms shall be thoroughly cleaned off of all rust, dust and loose materials. Colourless oil or grease of approved quality shall be applied before placing steel.

22C.2 The size of angles used for framing and bracing of steel plates should be sufficient to withstand the weight of concrete without forming clinks, twists, offsets, warps, etc. in the steel plates. Also, the gauge of steel sheeting used should not be higher than 14 G.

22C.3 Minimum two bracing angles should be provided along with angle framing while making the steel plates. It should be riveted or welded to suit the requirement of finish concrete surface. Minimum two rivets should be provided at all Four Corners and at junction of angle framing and bracing.

22C.4 If the plates are to be welded, steel sheet and angle framing/bracing should be welded from sides and at back. Welding on sides should be buffed to make the sides smooth. Also, intermittent welding should be done to keep steel sheet and angle framing/bracing in one plane.

M-23 Expansion Joints-Premoulded Filler :

23.1 The item provides for expansion joints in RCC frame structure, for internal joints as well as exposed joints, with the use of premoulded bituminous joint filler.

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

23.3 Thickness of the pre-moulded joint filler shall be 25 mm., unless otherwise specified.

23.4 Premoulded bituminous joint filler shall conform to BE : 1838.

M-24 Expansion Joints-Copper Strips & Hold fasts :

24.1 The item provided for expansion joints in RCC frame structure, for internal joint as well as for exposed joints, with the use of necessary copper strip and holdfasts.

24.2 Copper sheet shall be 1.25 mm. thick and 1.25 mm. wide and shall be of `U' shape, in the middle. Copper strip shall have holdfast of 3 mm. diameter copper rod, fixed to the plate, soldered on the 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 concrete work shall be 25 mm. Depth of `U' to be provided in the expansion joint, in copper plate shall of 25 mm.

M-25 Wooden Flush Door Shutters (Solid Core) :

25.1 The solid core type (water proof/ Commercial) flush door shutters shall be of decorative face or non-decorative face type, as specified in the drawing. The size and thickness of the shutter shall be as specified in drawings or as directed. The timber species for core shall be used as per IS: 2202-(Part-I). 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 IS : 303. And waterproof plywood shall confirm to IS 710.

25.2 The solid core shall be of wood laminate, prepared from battens of well seasoned and treated good quality wood, having straight grains. The battens shall be of uniform size of about 2.5 cm. width. These shall be properly glued and machine pressed together, with grains of each piece reversed from that of the adjoining one. The longitudinal joints of the battens shall be staggered and no piece shall be less than 50 cm. in length. Edges of the core shall be lipped internally with 1st class teak wood battens of 4 cm.(1-1/2") minimum width, glued and machine pressed along with the core.

25.3 The core surface shall then have two or three veneers firmly glued on each face. The first veneer (called cross hand) shall be laid with its grains at right angles to those of the core and the second and the third veneers with their grains parallel to those of the core.

25.4 The face panel of the shutters shall be formed by gluing, by the hot press process on both faces of the core with either plywood or cross-bands and face veneers. The lipping, reveting, opening of glazing, venation etc. shall be provided if specified in the drawing.

25.5 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 make smooth even texture.

25.6 The shutters shall be tested for -

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

(2) Knife test : The face panel when tested in accordance with IS : 1659 shall pass the test.

(3) Glue Adhesion test : The flush door shall be tested for glue adhesive test in accordance with IS :2202 (Part-I) . 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 & more than 3 mm. in depth has occurred in the assembly glue lines between the plywood face and the style and rail. Delamination at the corner shall be measured continuously around the corner. Delamination at the knots, knot holes and other permissible wood defects shall not be considered in assessing the sample.

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

In Normal thickness +1.2 mm. In Normal height +3 mm.

25.8 The thickness 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-26 Aluminium Doors, Windows, Ventilators :

26.1 Aluminium alloy used in the manufacture of extruded window sections shall conform to IS designation HEA-WP of IS : 733 and also to IS designation WVG-WP of IS : 1285. The section shall be as specified in the drawing and design. The fabrication shall be done as directed.

26.2 The hinges shall be cast or extruded Aluminium hinge of same type as in window but of larger size.

26.3 The hinges shall normally be of 50 mm., openable/projecting type. Non-projecting type of hinges may also be used, if directed. The handles of the door shall be of specified design. A suitable locks for the door, operable either from outside or inside shall be provided. In

double shutter door, the first closing shutter shall have concealed aluminium alloy tower bolt at top and bottom.

M-27 Plywood:

27.1 The plywood for general purpose shall conform IS : 303.

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 at right angles to the grain in the adjacent layer.

27.2 The chief advantages of plywood over a single board of the same thickness is that, plywood offers more uniform strength, along its length and width and also offers greater resistance to cracking and splitting with change in moisture content.

27.3 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 90^0C to 140^0C and a pressure of 11 to 14 Kg/$cm^{2.}$, on the wood. The time of heating may be anything from 2 to 60 minutes depending upon the thickness.

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

27.5 According to IS: 303, the plywood for general purpose shall be of the grades namely BWR, WWR and CWR, depending upon the adhesives used for bonding the veneers, and it will be further classified into six types namely AA, AB, AC, BB, BC and CC based on the quality of the two faces, each face being of three kinds namely, A,B and C. After pressing, the finished plywood should be reconditioned to a moisture content not less than 8% and not more than 16%.

27.6 Thickness of plywood boards:

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

Types of plywood:

M-27A Water Proof (Weather Proof) Plywood:

27A.1 The plywood shall be from Kitply, Wonder Wood, Anchor Board or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to IS : 710 and to the relevant Defence and Navy specifications.

27A.2 Plywood shall be made from veneers of hard wood timbers and bonded with high quality BWP type Phenol Formaldehyde Synthetic Resin Adhesive and hot pressed at high temperature and pressure, and further treated with a fixed type of preservative by vacuum-cum-pressure impregnation, to produce thin boards or sheets of wood panels. There are always an odd number of layers. The plies shall be placed, so that, grain of each layer is at right angles to the grain in the adjacent layer.

27A.3 Plywood shall be waterproof, weather proof, boilproof, and highly durable even against strenuous vulnerable uses. It shall resist the attack of termites, cockroaches, wood burrowers, fungus, mould, rot, decay and other wood destroying insects and marine organisms.

27A.4 The tensile strength of the plywood shall be minimum 600 kg/cm$^{2.}$ and bending strength above 400 kg/cm^2. The swelling of plywood in water should be almost negligible. Specific gravity of plywood should be 0.7 to 0.75, having screw and nail holding strength normal to face, atleast 250 kg. and 60 kg., respectively.

27A.5 The moisture content shall be less than 10% and the plywood shall have high fire resistance and shall be free from any cracks, wraps, split etc., and shall have uniform strength all over the panel surface. It shall be used for marine structures, leather tanning tables, wall panelling, and underlayment for kitchen and other furniture, subjected to heat and moisture.

M-28 Glass:

28.1 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 as mentioned in the item or specification or in the special provisions or as shown in detailed drawings. Thickness of the glass panels shall be uniform. The specifications for different kinds of glass shall be as under:

M-29 Fixtures and Fastenings :

29.1 **General :**

29.1.1 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 specification.

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

29.1.3 The fixtures shall be heavy types. The fixtures and fastenings shall be smooth finished and shall be such as will ensure ease of operations.

29.1.4 The samples of fixtures and fastenings shall be got approved by Engineer-in-charge and Architect, as regards its quality and shape before fixing them in position.

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

29.2 **Holdfasts :**

29.2.1 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 frame with screws. At the other end, the holdfast shall be forked and bent at right angles in opposite directions.

29.3 **Butt hinges :**

29.3.1 Railway standard heavy type butt hinges shall be used when so specified.

29.3.2 Tee and strap hinges shall be manufactured from MS Sheet.

29.4 **Siding door bolts (Aldrops) :**

29.4.1 The aldrops as specified in the item shall be used and shall be got approved.

29.5 **Tower bolts (Barrel type) :**

29.5.1 Tower bolts as specified in the item shall be used and shall be got approved.

29.6 **Door Latch :**

29.6.1 The size of door latch shall be taken as the length of latch.

29.7 **Bathroom Latch :**

29.7.1 Bathroom latch shall be similar to tower bolt.

29.8 **Handle :**

29.8.1 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.

29.9 **Door Stoppers :**

29.9.1 Door stoppers shall be either floor door stopper type or door catch types. Floor stopper shall be of overall size as specified and shall have a rubber cushion.

29.10 **Door Catch :**

29.10.1 Door catch shall be fixed at a height of about 900 mm. from the floor level such 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 fixing. The catch shall be fixed 20 mm. inside the face for the door for easy operation of catch.

29.11 **Wooden Door Stop with Hinges :**

29.11.1 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 oil paint.

29.12 **Casement Window Fastener :**

29.12.1 Casement window fastener for single leaf window shutter shall be left or right handed as directed.

29.13 **Casement Stays (Straight Peg Stay) :**

29.13.1 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 required. Size of the stay shall be 250 mm. to 300 mm., as directed.

29.14 **Ventilator Catch :**

29.14.1 The pattern and shape of the catch shall be as approved.

29.15 **Pivot :**

29.15.1 The base and socket plate shall be made from minimum 3 mm. thick plate, and projected pivot shall not be less than 12 mm. in diameter and 12 mm. in 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-30 Paints:

M-30A Oil Paints:

30A.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 of specified shade or tint is not available white ready mixed paint with approved stainer shall be allowed. In such a case, the Contractor shall ensure that the shade of the paint so allowed shall be uniform.

30A.2 All the paints shall meet with the 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, levering, caking or colour separation and shall be free from lumps and skins.

(ii) The paint as received shall brush easily, possess good levelling 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.

30A.3 Ready mixed paint shall be used exactly as received from the manufacturers and generally according to their instructions and without any admixtures, whatsoever.

M-30B Enamel Paints :

30B.1 The enamel paint shall satisfy all general requirements in specification of oil paints. Enamel paint shall conform to IS : 2933. It shall be from Nerolac, Berger, Asian Paints or equivalent. It shall offer variety of finishes like Glossy, Semi-glossy, Pearl lustre and Matt.

30B.2 It shall be applied either by brush, roll or spray. It shall have a covering capacity of 13 to 18 m^2. per coat, depending on the surface to be painted. It shall be used both on metal and wood surfaces.

30B.3 It shall have a viscosity of application of 60 to 65 seconds, if brush or rollers are used and 30 to 40 seconds, if spraying is done. It shall have flash point at above 30 ^{0} C. The drying time shall however vary with the ambient temperature and humidity.

M-30B Acrylic Emulsion :

30B.1 It shall be from Nerolac, Asian Paints, ICI, Berger or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to the relevant IS Codes.

30B.2 It shall be used on both interiors and exteriors, on all different types of plaster, wooden surfaces, stone, brickwork, asbestos cement sheets, hard and soft boards, etc. It shall

render rich smooth finish and shall provide a tough film that forms a suitable protection against all elements.

30B.3 It shall be water thinnable. It shall require no primer. On a well prepared surface, it shall be applied, after one coat of cement primer, in case it is an interior surface and waterproof cement coating, in case it is an exterior surface. On a new but highly absorbent surface, a thin coat of the same shall be applied by adding two parts of water by volume to two parts of Acrylic Emulsion by volume. On previously painted surfaces, one coat of the same shall be applied by thinning four parts of the emulsion with one or two parts of water. It shall be applied by brush, roller or spray. It shall have a covering capacity of 25-30 m^2/lit., depending on the surface and shade used. It can be washed to remove the day-to-day dirt, after the surface has been painted, minimum for a month.

M-30C Water Bound Distemper :

30C.1 It shall be from Berger, Nerolac, ICI, Asian Paints or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to the relevant IS Codes.

30C.2 It shall be available in dry powder form and shall be prepared by adding preferably warm water, in the manner and proportion, as described by the manufacturer. It shall be applied by the conventional distemper brush to all plastered walls, ceilings and woodwork. It shall generally not require any primer, but if found necessary, a size coat made by an experienced painter from glue, soap, warm water and distemper powder shall be applied. It shall offer a covering capacity of 13-16 m^2 per Kg. depending on the surface and shade used.

M-30D Cement Paints :

30D.1 It shall be from Berger, ICI, Asian Paints or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to the relevant IS Codes.

30D.2 It shall be manufactured from selected range of raw materials and a special cement, so the it shall be suitable for both indoors and outdoors. It shall be suitably used on concrete renderings, cement/sand renderings, cement/lime/sand renderings, asbestos sheets, fibre boards, brickwork, etc. It shall offer matt finish. It shall require no primer and shall be water thinnable. It shall offer a covering capacity of 6-8 m^2 per Kg., depending on the surface and shade used. It shall preferably not be applied under direct sunlight to avoid patchy effect.

M-31 Flooring Tiles :

M-31A Marble Mosaic Tiles :

31A .1 These tiles have the same specifications as plain cement tiles except for the requirements stated below:

31A.2 The marble mosaic tiles shall conform to IS : 1237. 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 backing of the tiles. All angles shall be right angles and all edges shall be sharp and true.

31A.3 Chips used in the tiles shall be of the smallest size upto 20 mm. size. The minimum thickness of the wearing layer of tiles shall be 6 mm. For pattern of chips required on the wearing face, a few samples with or without their full size photographs, as directed shall be presented to the Engineer-in-charge and Architect, for approval.

31A.4 Any particular sample, if found suitable shall be approved by the Engineer-in-charge and Architect, or he may ask for a few more samples to be presented. The samples shall 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 the backing layer and wearing surface, materials, ingredients, colour shade, chips distribution, etc. required.

31A.5 The tiles shall be prepared from cement conforming to IS or coloured Portland cement, generally depending upon the colour of tiles to be used or as directed.

M-31B Chequered Tiles :

31B.1 Chequered tiles shall be plain cement tiles or marble mosaic tiles. The former shall have the same specification as per 47A above, and the latter as per marble mosaic tiles as per 47C, except as mentioned below:

31B.2 The tiles shall be of nominal size of 250 mm. x 250 mm. or as specified. The center to center 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.

31B.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 tiles 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.

31B.4 Tiles shall conform to IS : 1237.

M-32 Rough Kotah Stone :

32.1 The kotah stones shall be hard, even, sound and regular in shape and generally be uniform in colour. The colour of the stone shall generally be green. Brown coloured stones shall not be allowed for use. The stones shall be without any soft veins, cracks or flaws.

32.2 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.

32.3 Tolerance of -30 mm., on accounts of chisel dressing of edges shall be permitted for length as well as breadth. Tolerance in thickness shall be +3 mm.

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

32.5 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-33 Polished Kotah Stone :

33.1 Polished kotah stone shall have the same specification as Rough kotah stone, except as mentioned below:

33.2 The stones shall have machine polished surface. When brought on site, the stone shall be single polished or double polished, depending upon its use. Single polished kotah stone shall have single face of the stone polished whereas, double polished kotah stone shall have both the faces polished. The stones for paving shall generally be single polished. The stones to be used for dado, skirting, sink, veneering, sills, steps, etc., where machine

polishing after the stones are fixed in situ, is not possible, shall be polished more than once for the desired finish, before fixing.

33.3 When brought at site, the colour of the stone shall be fairly uniform. It shall be ensured that the stones to be used in a particular work, shall not differ much in shade or tint, from the approved sample.

M-33A Cobbler Stones (Interlock Pavers) :

33A.1 Cobbler stones shall be of best quality, as approved by the Architect and Engineer-in-charge and shall be obtained from reliable source. The make will be approved by the Architect and the source of supply shall not be changed without prior approval of the Architect. The stone shall be without any veins, cracks and flaws. The cobbler stones shall be even, sound, durable and regular in shape and of uniform colour.

33A.2 The size of the cobbler stone shall be as specified in the items or detailed drawing or as approved by the Architect and Engineer-in-charge. The thickness of the stone shall be as specified in the item of work, with permissible tolerance of $\pm$ 2 mm.

33A.3 The stone shall have machine polished surface. When brought on site the stone shall be single polished or double polished, depending upon its use and as specified in the item or detailed drawing. The cobbler stones to be used for walkways, roadways, parking, floors, docks, roofs, public squares etc., where machine polishing after the fixing of stones, is not possible, the stones to be fixed shall be double polished or polished more than once, as required. All angles and edges of the cobbler stone shall be true and plane.

M34 Marble Slab :

34.1 Marble slab shall be white or of any other available colour and of best quality, as approved by the Engineer-in-charge and Architect.

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

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

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

34.5 Except as above, the marble slabs shall conform to IS : 1130.

M-34A Blended Marble tile/slab :

34A.1 It shall of the best quality like Carara, Marbella or equivalent, as approved by the Architect and Engineer-in-charge.

34A.2 It shall be predominantly a marble tile/slab, composed of 80% to 95% of finest grains of quality selected marble aggregates, bonded together with 4% to 8% special resins, alongwith palette of colourants. It shall therefore offer a wide range of colour compared to natural marble. It shall be manufactured so, that its design goes right through the tile, insuring lasting designs.

34A.3 It shall be available in pre-cut, pre-polished, chamfered and grooved upto sizes of 600 mm. x 600 mm. Sizes upto 2400 mm. x 1200 mm. shall also be supplied. It shall have indispensable mechanical strength,

Test	Dry	Wet
Compressive strength in Kg/cm^2.	1340	1317
Flexural strength in Kg/cm^2.	308	453
Modulus of Rupture in Kg/cm^2.	462	453

It shall offer flexibility, high wear resistance, impact resistance and on testing shall be 1.5 kgcm/cm., hardness on the Moh's scale shall be 3 to 4, abrasive wear index shall be 22 and total water absorption shall be around 0.13%. It shall not be easily affected by the freeze and thawing cycling.

34A.4 It shall be non-porous and shall be used in all types of weather. It shall be used for internal and external surfaces. It shall be easily cut with a normal hand cutting machine, if required and shall be laid in the same manner as natural marble stone or with latexbased glues.

M-35 White Glazed Tiles :

35.1 The tiles shall be of best quality, as approved by the Engineer-in-charge and Architects. 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.

35.2 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 $\pm$ 1.5 mm. The thickness of tile shall be 6 mm. Except for the above, the tiles shall conform to IS : 777.

M-35A Coloured Glaze Tiles :

35A.1 They shall be similar to white glazed tiles mentioned above, in all respects, except that they shall be available in variety of colours and shades, from Johnson & Johnson or equivalent, as approved by the Architect and Engineer-in-charge.

M-36 Ceramic Tiles :

36.1 Ceramic tiles shall be of 1st quality such as Asian, Somani, Ramesth, tiles or equivalent, as approved by the Architect and Engineer-in-charge. They shall adequately meet the relevant IS

36.2 They shall be light weight, with thickness varying between 6 to 8 mm., depending on the manufacturer. Therefore, they require thinner floor bedding compared to mosaic/stone flooring. On laying, they require no further polishing making the floor ready to live in and use. They shall be suitably used for residences, offices, hotels, hospitals, auditoriums, restaurants, canteens, commercial complex and such other public places. They shall be extremely strong, breaking strength of the tile being 350 Kg/cm^2. and flexural strength of 350 Kg/cm^2. They shall offer good resistance to abrasion, i.e. can withstand upto 5000 grindings. They shall be scratch resistance, their hardness on the Moh's scale shall be 6.8 to 7. They shall be resistant to all acids and alkalies except hydrofluoric acid. In addition,

they shall be bacteria free and fire proof, as they are fired at @ 1160^{0}C. They shall have very high acoustic damping factor and their specific gravity shall be 0.12, making them good insulators. Their resistance to thermal shocks shall be upto 10 cycles and their co-efficient of linear thermal expansion shall be 9 from ambient temperature to 100^{0}C.

36.3 They shall be available in various sizes, 8"x4", 8"x8", 8"x12", 12"x12" and 12"x16". They shall have a size tolerance of ± 0.4% to 0.75%, in length and width and ± 5% in thickness. Allowable warpage shall be ± 0.5%. Allowable squareness wedging shall be ± 0.4 to 0.5%. The allowable straightness of edges shall be ± 0.5% and allowable flatness shall be ± 0.4 to 0.5%. Their water absorption rate shall be less than 5%.

36.4 Ceramic tile for Industrial purposes, shall have a hardness of 8.6 on the Moh's scale and shall be non-skid, hard wearing, long lasting and acid and alkali resistant. They shall adequately meet the IS : 4457.

M-37 Vitrified Floor Tiles :

37.1 Vitrified floor tiles shall be of best quality like Granamite or equivalent, as approved by the Architect and Engineer-in-charge. They shall conform to the relevant IS Codes.

37.2 They shall be monolithic and available in smooth, mirror-polished and anti-skid finishes, in sizes 24"x24", 48"x48" and 60"x30". They shall have a size tolerance of ± 0.5%, in length and width and ± 5% in thickness. Allowable warpage shall be ± 0.2%. Allowable squareness wedging shall be ± 0.5%. Their water absorption rate shall be less than 0.5%. They shall offer hard-working and hard-wearing floors for homes, public buildings, apartments and airports. The tiles shall be of ASTM or DIN standards.

37.3 They shall be extremely strong, breaking strength of the tile being 1600 Kg/cm^2., flexural strength, 200 Kg/cm^2. and bonding strength of 2500 Kg/cm^2. They shall offer good resistance to abrasion, i.e. greater than 100. They shall be scratch resistance, their hardness on the Moh's scale shall be min. 7. They shall be able to resist thermal shock upto 10 cycles. They shall have a bond strength of 2500 Kg/cm^2. and shall have a density of greater than 2.2 gm/cc. They shall have 0.60 co-efficient of friction for polished/unpolished surfaces.

M-38 Admixtures for Tile/Stone Cladding:

M-38A Waterproof Adhesive:

38A.1 Waterproof adhesive, shall be of best quality and from manufacturer like Feb Roffe or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code. It shall be in powdered state, complying with BS : 5980 Type 2, class AA and BS : 5385 Part 1. It shall comprise of selected Portland cements, graded sand and synthetic additives.

38A.2 It is useful for permanent adhesion of ceramic tiles, stone and marble cladding to surfaces that may be subjected to extreme weather conditions. It shall provide good tensile adhesion and shear adhesive strength, after application, in thick/thin layer beneath the tile/stone cladding. Its application and coverage shall be as specified by the manufacturer.

M-39 Selected Earth :

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

39.2 The selected earth shall be good yellow soil and shall be got approved from the Architect and 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 staking of the material shall be done as directed by Architect and Engineer-in-charge, in such a way as not to interfere with any constructional activities and in proper stacks.

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

M-40 Admixtures for Mass Concrete and Mortar:

M-40A Joint Sealant:

40A.1 The sealant shall be of best quality and from manufacturer like CICO, MC-BAUCHEMIE, PIDILITE, HMP or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.

40A.2 It shall be a two component polysulphide rubber joint sealant, based on a low molecular weight polymer. It should not contain chlorides or other corrosive substances.

40A.3 It shall be used for sealing joints in water retaining structures, roofs, external walls, cladding, floors, partitions, ceilings etc. It shall have excellent property to adhere most of building materials like Aluminium, Stainless Steel, Glass, Concrete, Marble, Stone, Brick, Masonry block, Plaster, Ceramic and quarry tiles, Timber etc. The modulus of elasticity of the sealant shall be less than 0.16 MPa, $\pm$10% at 100% elongation. The shore "A" hardness of the sealant shall be 22$\pm$3 @ 25^{O}C. The operating temperature range for the sealant shall be -25^{O}C to 800C. The permanent dynamic movement capability of the sealant shall be $\pm$25%. The tensile strength of the sealant shall not be less than 0.4 MPa. The optimum width/depth ratio shall be 2:1. The Sp.gr. of the sealant shall be 1.6 kg/lit. The sealant should be capable to resist attack of water, sunlight, oxidation, corrosive fumes, oils, petrol, diluted acids and alkalies, salt spray, aliphatic and aromatic solvents and shall not contain tar or bituminous ingredients.

40A.4 It shall posses the properties like 550% elongation at break, non-toxicity when fully cured, no staining and shrinkage less than 1%. The trafficable strength shall be achieved within 24 hours and full at 7 days (at 25^{O}C & 250% RH). It shall possess excellent coverage capacity and more strength at low dry temperatures.

M-40B Water Repellent Coating:

40B.1 The Water repellent coating shall be of best quality and from manufacturer like CICO or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.

40B.2 Water repellent coatings for exterior exposed surfaces shall be acrylic resin based, having a Flash point of approx. 40^{0}C and specific gravity of 0.95.

40B.3 It shall be suitably used for concrete, brick, stone and plastered surfaces preventing moisture penetration and thus any damage to the interiors. It shall be quick acting, long lasting, invisible i.e. colourless so as to maintain the original colour of the surface treated. It shall impart sealing characteristics so that the treated surface becomes stain and dust free. The coating itself shall not darken or turn yellow with age.

M-40C Water & Weather Proof Compound :

40C.1 The water & weather proof integral cement admixture shall be of best quality and from manufacturer like Feb Roffe's Roff Hyseal, Roff hyproof, Algiproof or equivalent, as approved by the Architect and Engineer-in-charge. The prior approval for the source shall be taken from the Architect. It shall conform to the relevant IS Code.

40C.2 It shall be used as an excellent cement admixture in all types of concrete/plaster mortars, pointing mortars, masonry works, guniting works and pressure grouting works. It shall improve resistance of concrete surfaces to weathering and chemical attack. It shall be non-toxic so as to use for waterproofing water tanks, reservoirs, bio-gas tank, leaking ceiling, basements, tunnels, lift wells etc.

40C.3 It shall be mixed to concrete or plaster mortar, while mixing. First, water is added and then the admixture, at the rate instructed by the manufacturer. For use of the admixture, precaution shall be taken to use clean materials for preparation of mortar.

M-40D Plaster Admixture:

40D.1 An admixture which gives the plaster workability, durability and quality at an economical rate shall be of best quality from manufacturer like Feb Roffe (product name - Roff plaster master) or equivalent, as approved by the Architect or Engineer-in-charge. It shall comply to the relevant IS Codes.

40D.2 It shall keep the plastering mortar plastic for a longer time, giving higher strength on prolonged curing. It shall provide cohesiveness, workability and eliminate efflorescence. It shall reduce shrinkage, cracking and crazing to the minimum.

.

M-40 Fiberglas Reinforced Plastics (FRP):

40.1 Fiberglas Reinforced Plastic shall be from CEAT or equivalent, as approved by the Architect and Engineer-in-charge. It shall conform to relevant IS Code.

40.2 It shall be either unidirectional reinforced or sheet moulded or filament wound epoxy to match the purpose of work and item of tender. It shall have versatile chemical inertness, electrical resistance and mechanical strength, ease of processibility, repeatability and predictability. It shall have desirable characteristics like light weight, high strength, stiffness, toughness, thermal insulation properties, superior weather resistance, complete elasticity, fatigue, creep, resistance to corrosion, rot, swelling, insects, fungus etc.

40.4 There shall be no yield point beyond which buckling or denting of the FRP occurs, to reduce the possibility of irritating damages for minor stresses or impacts. The density, flexural strength and flexural modules shall not be less than 1.5 mg/m^3., 1000 MPa and $40x10^3$ MPa, respectively. It shall have minimum tensile strength, tensile modulus and compressive strength of 1000 MPa, $40x10^3$ MPa and 250 MPa, respectively. The FRP shall have thermal conductivity about 0.2 w/m^OC. Thermal coefficient of expansion shall be less than $10x10^{-6}$ per ^OK.

40.5 The minimum glass content shall be 60%. The weight index for stiffness and tensile strength at yield shall not be less than 0.6 and 0.9 respectively. No damage should be there while testing at impact energy of 8 joules. The level of translucency should be greater than 80% of diffused transmission that of direct light. It shall provide superior aesthetic value with incorporated colour. It shall be good fire retardant, durable and impermeable to water.

ITEM SPECIFICATION – CIVIL

EARTH WORK

1.1.0 **Excavation for foundation at depth as per item no. (1.1.1 to 1.1.3), including sorting out and stacking of useful materials, disposing of the excavated stuff up to 100 m. lead in any type of soil (including hard rocks), including refilling as per item no. 1.2.1 the trenches etc. complete, as directed. The rate shall be inclusive of dewatering if required.**

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. falls under this category. For materials and workmanship for earthwork and excavation, relevant specifications of IS 1200 (Part I) and IS: 3764 shall be followed.

2.0 Clearing the Site :

2.1 The site on which the structure is to be built shall be cleared and all obstructions, loose stones, materials and rubbish of all kind, bush, wood and all type trees shall be removed, as directed. The materials so obtained shall be the property of the Client and shall be conveyed and stacked as directed, within 100-m. lead. The roots of the trees coming in the sides of the trenches shall be cut and coated with hot asphalt.

2.2 All types of trees, woods etc. which requires prior permission of Govt./Forest Authority, before cutting shall be cut after obtaining such permission from them. It shall be the Contractor's responsibility to obtain such permission from the respective authorities.

2.3 The rate of site clearance is deemed to be included in the rate of earthwork, for which no extra will be paid.

3.0 Setting out :

3.1 After cleaning the site, the centerlines will be given by the Consultant and 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 labours, 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 :

4.1 The excavation in the 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 strutting or shall provide necessary slopes to a safe angle or steps, as required or directed, at his own cost. No extra payment shall be made for such precautionary measures, taken. The bottom of the excavated area shall be leveled both longitudinally and transversely, as directed, by removing excess soil 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 drawings or as directed. The extra depth or width shall be made up with concrete of the same proportion, as specified for the foundation concrete, at the cost of the Contractor. The excavation depth as per item no 1.1.1 to 1.1.6 shall be measured under this item.

4.2 The Contractor shall at his own expense and without extra charge make provision of supporting all utility services, lighting the trenches, separating and stacking serviceable

materials neatly, shoring, timbering, strutting, bailing out water either sub-soil or rainwater, including pumping at any stage of the work. Trenches shall be kept free of water while masonry or concrete works are in progress and till the Consultant and Engineer-in-charge considers it necessary, i.e. till the concrete is sufficiently set.

4.3 The rates for excavation items shall include for clearing of site, surface dressing, making layout of building, fixing permanent grid points with MS angle iron posts and embedding them in C.C. 1:2:4, placed sufficiently away from the building lines, establishing bench marks etc. complete.

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 leveling the ground in layers, including ramming and watering etc. complete.

5.2 The Contractor shall remove the balance of the excavated quantity from the site of work, to a place, as directed, within a lead up to 100 m. and for 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 Consultant and Engineer-in-charge**. No payment shall be made for surplus excavation made in excess of above requirements or due to stepping and sloping back as found necessary, on account of conditions of soil and requirements of safety.

6.2 The rate shall include for clearing the site, surface dressing, making layout of the building, fixing permanent grid points with MS iron posts, embedded in C.C. 1:2:4, placed sufficiently away from the building and establishing bench marks etc.

6.3 The rates shall include for necessary shoring, timbering and strutting for protection of sides of the excavated trenches and pits, pumping out rain or surface water at any stage of construction so as to keep the trenches/pits dry, to the satisfaction of the Consultant /Engineer-in-charge.

6.4 The rate shall include leveling and ramming the bottoms of excavations to receive concrete, etc. including trimming to slope wherever necessary etc. complete.

6.5 In filling and refilling, clods bigger than 50 mm. shall not be allowed. Only consolidated measurements of filling shall be paid. Consolidation to be done by mechanical compactor as per item no. 1.2.0.

6.6 The rate shall be for a unit of one m^3.

1.1.1 **Excavation for foundation up to 1.5 m. depth, including sorting out and stacking of useful materials, disposing of the excavated stuff up to 100 m. lead in any type of soil (including hard rocks), including refilling as per item no. 1.2.1 the trenches etc. complete, as directed.**

The relevant specifications of item no. 1.1.0 shall be followed except that the depth of excavation will be up to 2.5 m. The excavation work up to 2.50 m shall be measured and paid under this item.

1.1.2 **Excavation for foundation for a depth of 1.5 to 3.0 m., including sorting out and**

stacking of useful materials, disposing of the excavated stuff up to 100 m. lead, in any type of soil (including hard rocks) including refilling the trenches as per item no. 1.2.1 etc. complete, as directed.

The relevant specifications of item no. 1.1.0 shall be followed except that the depth of excavation will be from 2.5 to 5.0 m. The excavation work from 2.5 m. to 5.0 m. shall be measured and paid under this item.

1.1.3 Excavation for foundation for a depth of 3.0 to 4.5 m., including sorting out and stacking of useful materials, disposing of the excavated stuff up to 100 m. lead, in any type of soil (including hard rocks) including refilling the trenches as per item no. 1.2.1 etc. complete, as directed.

The relevant specifications of item no. 1.1.0 shall be followed except that the depth of excavation will be from 5.0 to 7.5 m. The excavation work from 5.0 m. to 7.50 m. shall be measured and paid under this item.

1.2.1 Filling with available excavated earth (excluding rock), in plinth & general development in layers not exceeding 15 cm. in depth, including consolidating each deposited layer by mechanical compactor and watering etc. complete as directed.

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 to a size not bigger than 50 mm.

1.2 As soon as the work in foundation has been completed and measured, the sides of foundation shall be cleared of all debris, brick bats, mortar dropping etc. and filled with earth in layers not exceeding 15 cm. Each layer shall be adequately watered, rammed well and consolidated before the succeeding layer is laid. The earth shall be rammed with mechanical rammer of different capacity as per site condition.

1.3 The plinth shall be similarly filled with earth in layers not exceeding 15 cm. adequately watered and consolidated by ramming with iron 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 and gradient, intended to receive any floor finish.

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

1.6 The excavated stuff of the selected type only shall be allowed to be used for filling the trenches and plinths. Under no circumstances, black cotton soil shall be used for filling the plinths.

2.0 Mode of Measurements and Payment :

2.1 The payment shall be made for filling in plinth and sides of foundations. No deductions shall be made for shrinkage or voids, if considered as instructed above. Only consolidated measurements shall be paid.

2.2 The rate includes the cost of mechanical compaction by compactors.

2.3 The rate shall be for a unit of one m^3.

1.3.1 **Filling, in foundations and plinths & general development with murrum or selected soil obtained from outside (Contractor's earth) in layers of 15 cm. thickness, including watering, ramming well and consolidating etc. complete, as directed.**

1.0 Materials :

1.1 Murrum or selected earth brought from outside shall be clean, of good binding quality and of approved quality obtained from approved pots/quarries of disintegrated rocks which contain silicones materials and natural mixture of clay of calcareous origin. The size of murrum shall not be more than 20 mm. and shall be approved by the Engineer-in-charge, before use. It shall conform to **M-52**.

2.0 Workmanship :

2.1 The relevant specifications of item no. 1.2.1 shall be followed except that the murrum or selected soil shall be filled in foundations and plinths in 15 cm. layers, including consolidating, ramming well, watering, dressing etc., complete.

3.0 Mode of Measurements and Payment :

3.1 The relevant specifications of item no. 1.2.1 shall be followed.

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

3.3 The rate shall be for n unit of one m^3.

1.4.1 **Filling, in foundation and plinth (under floors), with good quality sand, obtained from outside, including watering, ramming well, consolidating and dressing etc. complete, as directed.**

1 Materials: Sand shall conform to **M-6**

2 Workmanship :

2.1 The relevant specification of item no.1.2.1 shall be followed except that sand shall be filled in foundations and in plinth, under floors, including watering, ramming well, consolidating and dressing etc., complete.

3 Mode of Measurements and Payment :

3.1. The relevant specification of item no. 1.2.1 shall be followed.

3.2. The rate includes cost of collecting, carting good quality sand, with all lead, lift and labour for filling the same in foundations and in plinth, mechanical compaction.

3.3. The rate shall be for a unit of one m^3.

1.8.0 Providing and laying rubble soling in a compact manner, in plinth and for plinth protection, using suitable cut size stones 150 to 230 mm, as per the thk. of soling, covering and leveling the surface with a layer of murrum after filling the voids with smaller size of stone/metals or stone chips, including watering, ramming well and consolidating each layer.

1.0 Materials :

1.1 Stone and stone chips shall conform to **M-16** and Murrum brought from outside shall be clean, of good binding quality, and of approved quality obtained from approved pots/quarries of disintegrated rocks which contain silicones materials and natural mixture of clay of calcareous origin. The size of murrum shall not be more than 20 mm. and shall be approved by the Engineer-in-charge. It shall conform to **M-52**.

2.0 Workmanship :

2.1 The relevant specification of item no. 1.2.1 shall be followed except that first layer of stone, of average size 150 to 230 mm. shall be laid in plinth and for plinth protection. Thereafter, the voids between the stones laid in the first layer shall be filled by hand packing the stones of smaller size or stone chips of the same stones, as directed. The voids shall be filled with smaller sized of stones. The layers then shall be rammed well and consolidated.

2.2 The surface of the stone layer then shall be covered and leveled with a layer of murrum. This shall then be watered and well consolidated using power driven rammers or rollers, as directed. The consolidated thickness of the above layers, totally, should be average 15/23/30 cm. thick.

3.0 Mode of Measurements and Payment :

3.1 The relevant specification of item no. 1.2.1 shall be followed.

3.2 The rate includes the cost of collecting, carting stones and murrum, with all leads, lifts and labour for laying, hand packing and consolidating the same in plinth.

3.3 The rate shall be for a unit of one m^3

1.5.2 Do- as above for 230 thk rubble soling

The relevant specifications of item no. 1.6.0 shall be followed except that the thickness of rubble soling will be from 230 thk.

1.6.1 Disposing of the surplus excavated earth and/or debris etc. including loading at site, transporting & disposal, unloading, spreading and dressing etc. complete, as directed beyond the initial lead of 100 m. to 500 m.

1.0 Workmanship :

1.1 The surplus excavated earth shall be disposed off as and when directed by the Engineer-in-charge and the Consultant within 500 m. lead. The site to which the excavated earth should be disposed off shall be specified by the Engineer-in-charge. The disposal of the stuff includes loading the earth in vehicle, conveyance to the specified site, unloading and spreading the same. The Contractor should contact the Engineer-in-charge before disposing the material, i.e. when the trucks are being loaded for disposal. Every time the truck is loaded, the Engineer-in-charge shall check whether it is loaded properly to the pre-decided level and then note its number in the register used to keep the record of the trips made by the same truck.

2.0 Mode of Measurements and Payment :

2.1 The work shall be measured as 75% of the quantity, in m^3, loaded in a single truck. The total no. of trucks shall be taken from the register and the quantity shall thus be calculated. The total measurement shall be in m^3.

2.2 The rate includes for spreading, dressing etc. complete, at the specified site and shall be for a unit of one m^3.

1.7.1 Carrying out pre anti termite treatment with anti termite chemicals like aldrin, heptachlor, chlorophyriphos 20 EC in three parts i.e. at foundation level, at plinth level and at periphery of the building as per IS : 6313 (Part I - III)-1981, 1st revision, as directed.

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.

Chemical Concentration:	1.	Aldrin or Termex or equivalent	0.50% (by weight)
	2.	Heptachlor	0.50% (" ")
	3.	Chlordane	1.00% (" ")

2.0 Workmanship :

2.1 The chemical barrier shall be complete and continuous under whole of the structure to be protected.

2.2 The bottom and the sides of foundation up to a height of 30 cm. from the bottom of excavation made for masonry foundation and for basement, and also for plinth level before floor concrete shall be treated with the chemical emulsion at the rate of 5.0 liters/$m^{2\ 20\ EC}$ of the surface area. Periphery treatment before plinth protection at the rate of 7.5 lit chemical emulsion 20 EC per meter length as per IS code or PCI standards.

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 water or sub soil water.

2.4 Once formed, treated soil barriers shall be not disturbed. If 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 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 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 the Contractor's risk and cost, and the decision of Consultant or 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 Twenty Rupee stamp paper shall be given by the Contractor to the Client, in the manner form described below :

2.7 Reconciliation of chemicals brought on site and treated area shall be submitted on completion of job.

FORM OF GUARANTEE BOND

"I/We .....(Contractor) hereby guarantee that work will remain unaffected 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 the Contractor hereby indemnifies and agrees to save the Client from any loss and or damage that might be caused on account of termite and or other similar type of germs and hereby guarantees to make good any loss or damages suffered by the Client and further guarantees to redo the affected work without claiming any extra cost."

2.8 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 Contractor for period of 10 years.

2.9 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 virtual completion of the work.

3.0 Mode of Measurements and Payment :

3.1 The plan area shall be measured and paid. No deduction shall be made nor extra paid for any opening for pipes, etc., up to 0.1 m^2. The rate shall include the cost of all labour and materials required for the operation involved for satisfactory completion of this item.

3.2 The rate shall be for a unit of one m^2.

1.8.1 Providing and laying 150 mm thk metal soling in two layers of 75 mm each- metal size 50 mm size with ramming, leveling and compacting as required by the engineer in charge with 8-10 t roller / mechanical compactor.

1.0 Materials :

1.2 Stone and stone chips shall conform to **M-16** and of approved quality obtained from approved pots/quarries of disintegrated rocks which contain silicones materials and natural mixture of clay of calcareous origin.

2.0 Workmanship :

2.2 The first layer of stone, of average size 50 mm shall be laid in plinth and for plinth protection. Thereafter, the voids between the stones laid in the first layer shall be filled by hand packing the stones of smaller size or stone chips of the same stones, as directed. The voids shall be filled with smaller sized of stones. The layers then shall be rammed well and consolidated.

2.3 Then the second layer shall be done with same manner.

3.0 Mode of Measurements and Payment :

3.2 The relevant specification of item no. 1.5.1 shall be followed.

3.3 The rate includes the cost of collecting, carting stones with all leads, lifts and labour for laying, hand packing and consolidating the same in plinth.

3.4 The rate shall be for a unit of one m^3

PCC AND RCC WORK

2.1.0 Providing and laying CC (cement Concrete) and curing etc. complete, excluding the

cost of formwork in foundations and plinth.

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

1.0 Workmanship :

1.0 **General**: Before commencing concreting, the bed of foundation / trenches / Plinth shall be cleared off of all loose materials, leveled, watered and rammed, as directed.

2.0 **Proportion of mix**: The proportion of cement, sand and coarse aggregate shall be as per proportion and shall be so measured by volume.

3.0 **Mixing:** The concrete shall be mixed in a mechanical mixer at the site of work. Hand mixing, may however be allowed for smaller quantity of work, if approved by the consultant and Engineer-in-charge. When hand mixing is permitted by the Architect and Engineer in-charge, in case of break down of machinery 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 the 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 mixing in mechanical mixer shall be done for a period 1.5 to 2 minutes. The quantity of water shall be just sufficient to produce a dense concrete of required workability for the purpose.

4.0 **Transporting & placing the concrete**

1.4 The concrete shall be handled from the place of mixing to the final position within 15 minutes by the method, as 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.

1.5 The concrete shall be laid in layers of not exceeding 20 cm in thickness.

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

6.0 **Curing**: 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.

1.0 Mode of Measurements and Payment :

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

5.0 The rate shall be for a unit of one m^3.

1.2-a Providing and laying CC 1:5:10 (1 cement: 5 coarse sand: 10 graded stone aggregate 40 mm. nominal size) and curing etc. complete, in foundations and plinth.

1.0 Materials: As per item no. 2.1.0.

2.0 Workmanship: Relevant specifications of item no. 2.1.0 shall be followed except that CC shall be mixed in the proportion of 1:5:10 by volume.

3.0 Mode of Measurements and Payment : Relevant specifications of item no. 2.1.0 shall be followed.

1.2-b Providing and laying CC 1:4:8 (1 cement: 4 coarse sand: 8 graded stone aggregate 40 mm. nominal size) and curing etc. complete, in foundations and plinth.

4.0 Materials: As per item no. 2.1.0.

5.0 Workmanship: Relevant specifications of item no. 2.1.0 shall be followed except that CC shall be mixed in the proportion of 1:4:8 instead of 1:5:10 by volume.

6.0 Mode of Measurements and Payment : Relevant specifications of item no. 2.1.0 shall be followed.

1.2-b Providing and laying CC 1:3:6 (1 cement: 3 coarse sand: 6 graded stone aggregate 40 mm. nominal size) and curing etc. complete, in foundations and plinth.

7.0 Materials: As per item no. 2.1.0.

8.0 Workmanship: Relevant specifications of item no. 2.1.0 shall be followed except that CC shall be mixed in the proportion of 1:3:6 instead of 1:4:8 by volume.

9.0 Mode of Measurements and Payment : Relevant specifications of item no. 2.1.0 shall be followed.

2.2.0 Providing and laying machine mixed and machine vibrated controlled CC grade for RCC work as per the drawing, at all floors, heights, locations and shapes & sizes for all structures, footing, slabs, beams, columns, lintels, coping, arches, sloping-curved roof, staircase, landing, Machine Foundation ,Cable Trench etc, and curing, etc. complete. The item shall exclude the cost of formwork & reinforcement.

1.0 Materials: Water shall conform to **M-1**. Cement to **M-3**. Sand to M-6. Grit to **M-8**. Coarse aggregate **M-13**.

2.0 General:

2.1 The relevant specifications of item no. 2.1.0 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-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/cm^2.

2.2 The proportion of cement, sand and coarse aggregates shall be determined by weight. The weight batch machine shall be used for maintaining proper control over the proportion of aggregates as per mix design. The strength requirements of different grades of concrete shall be as under:

Grade of	Compressive strength of 15 cm. cubes in $Kg/cm^{2.}$
Concrete	28 days conducted in accordance with IS : 516-1959.

	Preliminary test	Work test min.
M-20	260	200
M-25	320	250
M-30	380	300
M-35	440	350
M-40	500	400

In all cases, the 28 days compressive strength specified in above table be the criteria for acceptance or rejection of the concrete.

2.3 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.

2.4 To secure good exposed and normal concrete surface necessary care in formwork and concrete shall be taken. For any sub-standard results of exposed and normal surface concrete form-work and steel shall be treated as one item even though they are two separate items in bills of quantities.

2.5 The Contractor shall take necessary care to avoid sand streaks, air holes, honey combining etc., on finished concrete surface.

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 Architect and 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 aggregate, in different sizes and blending them 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 find aggregate shall be checked as frequently as possible, the frequency for a given job being determined by the Architect and 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 proportioning 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 weighed separately, to check the net weight, where cement is weighed from bulk stocks at site and not by bags. It shall be weighed separately from the aggregates. Water shall either be measured by volume in calibrated tanks or weighed. All measuring equipment shall be maintained in clean and serviceable condition. Their accuracy shall be periodically checked and calibrated in standard laboratory.

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

Architect and 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 the determination of moisture content in the aggregates, IS : 2386 (Part III) shall be referred to. Suitable adjustments shall also be made in the weights of aggregates due to variation in their moisture content.

3.4 The minimum cement content for the various mixes shall be as under. Cement shall be Ordinary Portland Cement only.

MIX	MINIMUM CEMENT/Cum.	MIX	MINIMUM EMENT/Cum.
M-7.5	170 Kg.	M-25	350 Kg.
M-10	210 Kg.	M-30	375 Kg.
M-20	325 Kg.	M-35	400 Kg.

3.5 All RCC works shall be carried out as per the detailed drawings and direction of Architects and Engineer-in-charge

4.0 Mode of Measurements and Payment :

4.1 The relevant specifications item no. 2.1.0 shall be followed except that the controlled concrete RCC work for work as specified in item shall be measured under this item. The rate excludes cost of formwork and reinforcement and is for any cross sectional area of the members specified in the item. Minimum cement content 325 kg/m3

4.2 The rate shall be for a unit of one m^3.

2.2.1 Do-as-above for CC M-20

1.0 Materials & Workmanship: The relevant specifications of item no. 2.2.0 shall be followed except that the grading of concrete shall be controlled concrete M-20 grade, for the work as specified in item. Minimum content :- 1) cement -260 kg/m3. 2) Fly ash 65 kg/m3.

2.0 Mode of Measurements and Payment:

2.1 The relevant specifications of item no.2.2.0 shall be followed and rate excludes the cost of formwork and is for any cross sectional area of the members, at any floor, height, level and in any position.

2.2 The rate shall be for a unit of one m^3.

2.2.2 Do-as-above for CC M-25

1.0 Materials and Workmanship: The relevant specifications of item no. 2.2.0 shall be followed except that the grading of concrete shall be controlled concrete M-25 grades for the works as specified in the item. Minimum content :- 1) cement -290 kg/m3. 2) Fly ash 70 kg/m3.

2.0 Mode of Measurements and Payment:

2.1 The relevant specifications of item no. 2.2.0 shall be followed. The rate shall be for a unit of one m^3.

2.2.3 Do-as-above for CC M-30

1.0 Materials and Workmanship: The relevant specifications of item no. 2.2.0 shall be followed except that the grading of concrete shall be controlled concrete M-25 grades for the works as specified in the item. Minimum content :- 1) cement -340 kg/m3. 2) Fly ash 80 kg/m3.

2.0 Mode of Measurements and Payment:

2.1 The relevant specifications of item no. 2.2.0 shall be followed. The rate shall be for a unit of one m^3.

2.2.4 CC M-20 :- Do as above but with ready mix concrete (RMC)

2.2.5 CC M-25 :- Do as above but with ready mix concrete (RMC)

2.2.6 CC M-30 :- Do as above but with ready mix concrete (RMC)

2.3.0 Extra for providing and mixing chemical additives & admixtures, as approved by the Consultant & Engineer-in-charge, as per the specifications stipulated by the manufacturer. (The make and its technical specifications must be specified herein.)

1.0 Materials: The additives and admixture materials shall be as per the manufacturer's standards. They shall conform to **M-54.**

2.0 Workmanship: The additives and admixtures used for different purpose shall be as specified by manufacturer.

1.0 Mode of Measurements and Payment: The rate shall be for a unit of one Kg.

2.3.1 Concrete adhesives for old & new concrete joint.

2.3.2 Concrete Water proofing additives

2.3.3 Concrete Plasticizer

2.3.4 Concrete Rapid hardening additives.

2.3.5 Concrete Curing compound.

2.3.6 Non shrink grouting

2.3.7 None shrink grouting material for pocket of foundation bolts & under base plate.

1.0 Materials: The additives and admixture materials shall be as per the manufacturer's standards. They shall conform to **M-54.**

2.0 Workmanship: The additives and admixtures used for different purpose shall be as specified by manufacturer.

1.0 Mode of Measurements and Payment: The rate shall be for a unit of one m^3.

2.4.0 Charges for making holes in RCC beam/slab with diamond core cutter.

1.0 Workmanship: The work shall be carried out in true line and level and shall have the dia, as shown in the drawings or as directed. The Contractor shall at his own expense and without extra charge make provision of supporting all utility services. If there is any damage to the adjoining property, injury to workers etc. due to the negligence of the Contractor, he will be responsible and liable to all the consequences, including compensation.

2.0 Mode of Measurements and Payment:

2.1 The rate shall be for a unit of rmt

2.4.1 100 mm dia
2.4.2 101.0 mm dia to 200mm dia
2.4.3 201 mm to 300 mm dia

3.5-a Drilling And fixing reinforcement dowel of following diameter by using chemical grout of HILTI-HY150/200/RE500V3 or equivalent. Fixing shall be carried out though authorized applicator of the company, and as per supplier specification.

1.0 Workmanship & Mode of Measurements and Payment: The relevant specifications of item no. 2.5.0 shall be followed except that the Chemical used for grout purpose shall be as specified by manufacturer. The rate shall be for a unit of per no.

3.5-a 8mm dia
3.5-a 10mm dia
3.5-a 12mm dia
3.5-a 16mm dia
3.5-a 20mm dia
3.5-a 25mm dia

2.6.0 Providing and fixing in expansion joints, Capcell HD 100, of specified thick Supreme or equivalent (Polyethylene foam filler) of the best quality, including cutting to required size and shape, at all levels as per suppliers specifications, etc. complete, as directed.

1.0 Materials & workmanship: The work shall be carried out in good workmanship. The rate shall be for a unit of sqm.

2.6.1 Do-as-above for 25 mm thk Supreme or equivalent (Polyethylene foam filler)

1.0 The relevant specification of item no 2.6.0 shall be followed except that the 25 mm thk supreme or equivalent (Polyethylene foam filler) shall be used. The rate shall be for a unit of sqm.

2.6.2 Do-as-above for 50 mm thk Supreme or equivalent (Polyethylene foam filler)

1.0 The relevant specification of item no 2.6.0 shall be followed except that the 50 mm thk supreme or equivalent (Polyethylene foam filler) shall be used. The rate shall be for a unit of sqm.

2.7.0 Providing ,Laying & filling the expansion joints of specified size with polysulphide

sealant as per supplier's specifications including cleaning, scraping the joints, filling with necessary back up PU rod of supreme or equivalent, repairing the broken edges with polymer mortar(PLASTER) /epoxy mortar(RCC)& abro tap to line level complete as directed.

1.0 The relevant specification are as per item no 2.6.0 the shall be for a unit of rmt

2.7.1 Do-as-above for 10 x 25 mm with polysulphide sealant.

1.0 The relevant specification are as per item no 2.6.0 the shall be for a unit of rmt

2.7.2 Do-as-above for 15 x 50 mm with polysulphide sealant.

1.0 The relevant specification are as per item no 2.6.0 the shall be for a unit of rmt.

CENTERING & FORMWORK

3.1.0 Providing, laying, placing and fixing in position in true line & level the good quality centering, shuttering , formwork, at all levels, height, shape and depths of steel plates or wooden ply for all kinds of plain cement concrete or reinforced cement concrete elements, as stated in Concrete works specification at all levels and all heights, including, providing and fixing adequate, strong and stable props supportive structure adequate scantlings, packing, bracings, bolting, tieing with binding wires, wherever directed sufficiently wire nailing, removing / striking off the same on stipulated time, as directed by Engineer in charge, etc. complete.

1.0 Materials:

1.1 The shuttering to be provided shall be of ordinary timber planks shall conform to M-26A. Shuttering plywood shall conform to M-25B.

1.2 The dimensions of scantling 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 shape, lines and dimensions as shown on the drawings and shall be so constructed so as to remain sufficiently rigid and water-tight, during the placement and compaction of the concrete. Adequate arrangement 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 formwork of shuttering, centering, scaffolding, bracing, etc. shall be as per the design. False staging should be erected with Acro-props or H frames only.

2.2 **Cleaning & Treatment of Forms :** All rubbish, particularly chipping, 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 wetted or treated. The surface shall be coated with soap solution, applied before concreting is done. Soap solution for the oil or from oil of approved manufacture may be applied, incase steel shuttering is used. Care shall be taken that the coating is not applied on the construction joints surface and steel reinforcement bars.

2.3 **Stripping Time:** In normal circumstances and where ordinary Portland cement is used, form work may be struck after expiry of the following periods:

(a) Sides of walls columns and vertical faces of beams 24 to 48 hours.

(b) Beam soffits (Props left under) 7 days.

(c) Removal of props for slabs - (i) Slabs spanning upto 4.5 m. 7 days.

(ii) Slabs spanning over 4.5 m. 14 days.

(d) Removal of props to beams and Arches - (i) Spanning upto 6 m. 14 days.

(ii) Spanning over 6 m. 21 Days.

2.4 **Procedure while removing the form work:** All form work shall be removed without such shocks 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 till it achieved full strength. Watch should be kept to see that behavior 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, the 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 facilitating of concreting shall be provided and removed on completion work by Contractor, at his own expense. The scaffolding, hoisting arrangement, 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 Architect and Engineer-in-charge. However, Contractor shall be solely responsible for the safety of the scaffolding, hoisting arrangement, ladders, work and workmen, etc.

2.6.2 The scaffolding, hoisting arrangements and ladders shall allow easy approach to the work spot and afford easy inspection.

2.7 **Reuse:** Before re-use, all forms shall be inspected by the Engineer-in-charge and their suitability shall be ascertained. If, any of the forms are found to be unsuitable, they shall be immediately removed from the site. The forms ascertained for re-use, shall be scarred, cleaned, and joints gone over and repaired, wherever required. The inside surface shall be retreated to prevent adhesion to concrete.

3.0 Mode of Measurements and Payment:

3.1 Form work shall be measured as an area in $m^{2.}$ of shuttering in contact with concrete except in the case of inclined members and portion of curved pro-files, in which case, only area of underside shall be measured for payment.

3.2 Form work to secondary beams shall be measured upto the sides of main beams but no deduction shall be made from the form work of the main beam at the inner section point. No deduction shall be made from the form work of a column at inner section of beams.

3.3 The rate is applicable to all conditions of working and height upto 6.0 m.. The rate shall include the cost of materials, its transportation at site 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 opening in the forms for pouring concrete.

(d) Scarring, removal of rubbish, dressing with oil to prevent adhesion of concrete with shuttering,

(e) Raking or circular cutting.

(f) Making necessary grooves, gissis, Architectural cut-outs, pockets and drip moulds.

The rate is for the completed item.

3.4 The rate shall be for an unit of one m^2.

3.3 Do-as- above but for false centering with H frame in case of floor-to-floor clear height is more than 8.0 meter. as directed by Engineer in charge, etc. complete.

The relevant specifications of item no. 3.1.0 shall be followed.

3.3 Providing, laying, placing and fixing in position in true line & level the good quality centering for exposed concrete surfaces (vertical surface) with laminated ply wood and horizontal surface with laminated ply wood in desired pattern and size at all levels and at all heights as per drawing and specifications, including rendering with white cement and grey cement, for all types RCC elements like slabs, walls, columns, beams, pardi, fins, arch, curves etc. and removal of the same, including neat cleaning the exposed concrete surface, all complete as per drawing, specificationis, instruction & directions of the Engineer-in-charge. The contractor shall submit shuttering pattern on based on architectural conceptual drawings. Payment shall be done as per drawing/laid at site.

1.0 **Material and Workmanship:** The relevant specification of item no. 3.1.0 shall be followed except that the height of propping and centering between supporting floor to ceiling exceeds 6.0 m. upto 12.0 m.

2.0 **Mode of Measurements and Payment:**

2.1 The payment shall be made for the false staging work. This will be paid only if there is no slab/platform in between and extra staging is necessary. Extra over and above the payment made for form work of slab in relevant items. The work of false staging shall be measured is m^2. The relevant specification of item no. 3.1.0 shall be followed. The rate includes the cost of providing stone or masonry temporary pillars for supporting, as required without any extra cost.

2.2 The rate shall be for an unit of one m^2.

3.4 **Providing and fixing 12mm thick Ply sheet over a Brick masonary with cement mortar 1:2 including cutting to required size, shape, labour, machinery etc, complete at all levels as directed by engineer in charge.**

The relevant specification of item no. 3.1.0 shall be followed except that the height of propping and centering between supporting floor to ceiling exceeds 12.0 m. up to 18.0 m.

3.5 **Providing, laying, placing and fixing in position in true line & level the good quality centering, shuttering , formwork for pockets of following size as directed by Engineer in charge, etc. complete.**

3.5-a Pocket size : 75 x75 x 200 mm deep
3.5-a Pocket size : 100 x 100 x 300 mm deep
3.5-c Pocket size : 150x 150 x 450 mm deep
3.5-e Pocket size : 200 x 200 x 450 mm deep

REINFORCEMENT

4.1.1 **Supplying and fixing in position TMT FE - 500 grade steel reinforcement for RCC structures as per design including transporting steel to the work site, handling, cutting, bending and binding with wires, welding if necessary, etc. for all floors/levels complete as directed by Engineer. Measurement will be made on the length basis and converted into weight by using standard IS co-efficient (rolling margin's and wastage will not be paid). The rate shall be inclusive of PVC cover or Chairs, spacers, separators and binding wire-1 mm thick.**

1.0 **Materials:** TMT Bar shall conform to **M-19B**. Mild steel binding wires to **M-21**.

2.0 **Workmanship :**

2.1 The work shall consist of furnishing and placing reinforcement to the shape and dimensions, as shown 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 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 transportation or handling shall be straightened before being used on the work. They shall not be heated to facilitate bending. 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 4 times the diameter of the round bar. In case of bars which are not round and incase of deformed bars, the diameter shall be taken as the diameter of circle having an equivalent effective area.

2.4 All the reinforcement bars shall be accurately placed in exact position shown 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 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 drawing. Placing bars on layers of freshly laid concrete as the work progresses for adjusting bar spacing shall not allowed. Pieces of broken stone or brick and wooden blocks shall not be used. Layers of bars shall be separated by spacer bars, Pre cast 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 projecting 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 than 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. Where directed, where 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 movement is maximum.

2.7 Whenever indicated on the drawings or desired by the Architect and 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 sectional the base of threads is not less than normal cross section of the bar. Threads shall be standard threads. Steel coupling shall conform to IS : 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 % of the maximum permissible stresses and welds so staggered that any one section not more than 20 % of the rods are welded. Only electric are 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 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 of test shall be as directed.

3.0 Mode of Measurements and Payment :

3.1 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 tones on the same basis of as per **M-18**. Length shall include hooks at the ends. The wastage and annealed steel wire for binding shall not be measured and the cost of these items shall be needed to be included in the rate for reinforcement.

3.2 The rate for reinforcement includes cost of mild steel binding wires and its carting. Cutting, bending, placing, binding and fixing in position as shown on the drawings and as directed. It shall also include all devices like chairs, pins etc. for keeping reinforcement in approved position, cost of joining as per approved method and all wastage, covers and spacer bars.

3.3 The rate shall be for a unit of one Kg.

MASONARY WORK

5.1 Brick work using common burnt clay conventional building bricks, having crushing strength not less than 40 Kg/cm^2., in foundations and plinth, in CM 1:4 (1 cement : 4 sand), including curing, scaffolding, etc. complete, as directed.

1.0 Materials: Water shall conform to **M-1**. Cement to **M-3**. Sand to **M-6**. Brick to **M-15**. Cement mortar to **M-11**.

2.0 Workmanship:

2.1 **Proportion:** The proportion of the CM shall be 1:4 (1 cement: 4 sand), by volume.

2.2 **Soaking of bricks:** The bricks required for masonry shall be thoroughly wetted with clean water for about 4 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 the bond; closer and in such case it 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 the handle of the trowel or wooden mallet. Its inside face shall be flushed with mortar before the next brick is laid and pressed against it. On completion of the 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 joints shall be truly vertical. Vertical joints in alternate courses shall generally be in one vertical plane. The thickness of brick course shall be kept uniform.

2.3.4 The bricks shall be laid with the frog facing upwards. A set of tools comprising of wooden straight edges, manson's spirit level, square half meter rub, 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, having thickness greater than 23 cm. shall be kept in proper plumb. All the connected brick work shall be kept not more than 1 m. 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^{O}.

2.3.6 All the fixtures, pipe outlets of water, holdfasts of doors and windows, etc. which are required to be built in the wall shall be embedded in CM, as per the drawings or as directed.

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, subsequently.

2.4.2 The face of bricks shall be cleaned everyday on which the brick work is laid and all mortar dropping shall be removed.

2.4.3 At the end of day's work or on holidays the top of unfinished masonry shall be kept wet. If the mortar becomes dry, white or powdery, for want of curing, work shall be pulled down and re-built at Contractor's expense.

2.5 **Curing :** Fresh work shall be protected from rain suitably. Masonry work shall be kept moist on all the faces for minimum period of 7 days. The top of masonry work shall be kept well wetted at the end of the day's work.

2.6 **Preparation of foundation bed :** If the foundation is to be laid directly on the excavated bed, the bed shall be levelled, cleared off of all loose materials, cleaned and wetted before starting masonry work. If masonry is to be laid on concrete footing, the top of concrete shall be roughened, cleaned and moistened. The Contractor shall obtain approval of the Engineer-in-charge for the foundation bed, before foundation masonry is started. When pucca flooring is to be provided flush with the top of the plinth, the inside of the plinth wall shall be lowered down having an offset of the same thickness of the flooring with respect to the outside plinth wall top or as directed.

3.0 Mode of Measurements and Payment :

3.1 The measurement of this item shall taken for the brick masonry fully completed in foundation upto plinth. The limiting dimensions not exceeding those shown on the drawings 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 shall be made for embedding in masonry or making holes in respect of following items :

(1) End of joists beams, posts, girders, rafters, purlins, trusses, corbel, steps etc. where cross sectional area does not exceed 500 cm^2.

(2) Architectural openings in walls, parapet and compound walls, not exceeding 1.0 m^2. area.

(3) Wall plates and bed plates, bearing of slabs, chhajjas and the like whose thickness does not exceed 10 cm. and the bearing does not extend to the full thickness of wall.

(4) Drainage holes, recesses for cement concrete blocks to embed hold fasts for doors, windows etc., forming too things, grooves etc. and providing cramps for holding stone lining.

(5) Iron fixtures, pipes upto 300 mm. dia.; holdfasts and doors and windows built into masonry and sanitary and water supply pipes, etc., for concealed electrical wiring and any other fixtures or inserts.

(6) Forming chases of section not exceeding 350 cm^2. 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. The rate shall include for work of any shape e.g. pillars of any size and shape, curved or tapered walls, drip courses, projections, parapets, load bearing walls, sills, ottas, steps, tank walls, platforms and counter walls, ducts, channels and architectural moldings like corbelling, pattas, etc.

3.4 The rate shall be for an unit of one m^3.

5.2 Brick work using common burnt clay conventional building bricks, having crushing strength not less than 40 Kg/cm², in super structure above plinth, for all floor levels, at any height and level, in any position, in C.M. 1:6, including curing, scaffolding, etc. complete, as directed.

1.0 Materials: Brick shall conform to **M-15**. Cement mortar to **M-11**.

2.0 Workmanship:

2.1 The relevant specifications of item no. 5.1.1 shall be followed except that the masonry work shall be carried out above plinth level upto floor levels i.e. for height as specified in the special conditions & brick masonry work shall be carried out with conventional bricks using CM in proportion 1:6.

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, windows 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 shall be embedded later on in order to avoid damage to the frames.

2.3 Necessary scaffolding shall be provided by the Contractor. The supports of the scaffolding shall be sound and strong, tied together with horizontal pieces over which the scaffolding planks shall be fixed. Normally simple scaffolding only shall be allowed. In this case horizontal pieces of the scaffolding shall rest in the holes, made in the header coarse only. Minimum number of holes shall be left in brick work for supporting horizontal member of the scaffolding.

2.4 The Contractor is responsible for providing and maintaining sufficiently strong scaffolding so as to withstand all loads likely to come upon it.

2.5 For the face of brick work, where plastering is to be done, joints shall be racked out to a depth not less than the thickness of the joints. The face of brick work shall be cleaned off of mortar dropping and other foreign matters at the end of day's work.

3.0 Mode of Measurements and Payment:

3.1 The masonry work above plinth level to floor levels shall be measured and paid under this item.

3.2 Brick work in parapet shall be measured in the corresponding masonry item.

3.3 No deduction shall be made from quantity of brick work, nor extra payment shall be made for embedding in masonry or making holes in respect of following items:

(1) Ends of joists, beams, posts, rafters, purlins trusses corbel, step etc. where cross sectional area does not exceed 500 cm^2.

(2) Architectural openings in walls, parapet and compound walls, not exceeding 1000 cm^2. area.

(3) Wall plate, sand bed plates, bearing of slab, chhajjas and like whose thickness does not exceed 10 cm. and the bearing does not extend the full thickness of wall.

(4) Drainage holes, recesses for cement concrete blocks to embed hold fasts for doors, windows, etc., forming too things, grooves etc. and providing cramps for holding stone lining.

(5) Iron fixture, pipes upto 300 mm. dia hold fasts of doors, and windows built into masonry and sanitary and water supply pipes etc., for concealed electrical wiring and any other fixtures or inserts.

(6) Forming chases of section not exceeding 350 cm^2. In masonry.

(7) Apertures for fire places shall not be deducted nor shall extra labour required to make spraying of Jambs, throating and making trenches over the aperture be paid for separately. The rate shall include for work of any shape e.g. pillars, curved or tapered walls, drip courses, projections, parapets, load walls, sills, ottas, steps, tank walls, platform and counter walls, ducts, channels and architectural mouldings like corbelling, pattas, etc.

3.4 The rate shall be for a unit of one m^3.

5.4 Half brick, 4½" thick masonry in common burnt clay conventional building bricks, having crushing strength not less than 40 Kg/cm², for all floors, at any height and level, in any position, in C.M. 1:4 (1 cement : 4 sand), including curing, scaffolding, etc. complete, as directed.

1.0 **Materials:** Bricks shall conform to **M-15**. Water to **M-1**. Cement to **M-3**. Sand to **M-6**. Cement mortar to **M11**.

2.0 Workmanship:

2.1 Relevant specifications of bricks, wetting and laying of brick, joints, curing, etc. shall conform to item no. 5.1.1 except that the brick work of half bricks, 115 mm. thick shall be carried out, in foundation and plinth.

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 stretcher wise, breaking joints with those in the upper 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 mason's tools shall be maintained on work site as required for frequent checking.

2.4 The joints in course where reinforcement is placed shall allow sufficient mortar cover to the reinforcement.

3.0 Mode of Measurements 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 not be measured and paid for.

3.2 The rate shall be for a unit of m^2.

5.5 Charges for making holes in brick work with drilling machine.

1.0 Workmanship & Mode of Measurements and Payment: The relevant specifications of item no. 2.5.0 shall be followed. The rate shall be for a unit of per no.

5.5 100 mm dia

5.5 101 to 200 mm dia

201 to 300 mm dia

DOORS & WINDOWS

6.1.0 Providing and fixing Steel Doors, Windows and Ventilators of approved manufacturer and of required size, as per approved drawing, design and direction.

1.0 Materials: Hot rolled steel sections for the fabrication of steel doors, windows and ventilators shall conform to IS: 7452, which are suitable for, single glazing. Pressed steel door frames for steel flush doors shall be out of 1.25mm thick mild steel sheets of profiles as per IS : 4351.Transparent sheet glass shall conform to the requirements of IS : 2835. Wired and figured glass shall be as per IS : 5437.Builder's hardware of fittings and fixtures shall be of the best quality from the approved manufacturers.

2.0 Workmanship: All steel doors, windows and ventilators shall be of the type as specified in the respective items of work and of sizes as indicated in the Drawings prepared by the Contractor. Steel doors, windows and ventilators shall conform to the requirements as stipulated in IS : 1038. Steel windows shall conform to IS : 1361, if so specified.

2.1.1 Doors, windows and ventilators shall be of an approved manufacture. Fabrication of the unit shall be with rolled section, cut to correct lengths and metered. Corners shall be welded to form a solid fused welded joint conforming to the requirements of IS : 1038. Tolerance in overall dimensions shall be within ±1.5mm. The frames and shutters shall be free from wrap or buckle and shall be square and truly plain. All welds shall be dressed flush on exposed and contact surfaces. Punching of holes, slots and other provisions to install fittings and fixtures later shall be made at the correct locations as per the requirements. Samples of the units shall be got approved by engineer before further manufacture/purchase by the Contractor.

2.1.2 Type and details of shutters, hinges, glazing bar requirement, couplings, locking arrangement, fittings and fixtures shall be as described in the respective items of work and / or as shown in the Drawings for single or composite units.

2.1.3 For windows with fly proof mesh as per the item of work prepared by the Contractor, rotor operator arrangement, for the operation of the glazed shutters from the inside shall be provided

2.1.4 Pressed steel door frames shall be provided with fixing lugs at each jamb, hinges, lock-strike plate, mortar guards, angle threshold, shock-absorbers of rubber or similar material as per the requirements of IS : 4351. Pressed steel doorframes shall be fixed as `built-in' as the masonry work proceeds. After placing it plumb at the specified location, masonry walls shall be built up solid on either side and each course grouted with mortar to ensure solid contact with the doorframe, without leaving any voids. Temporary struts across the width shall be fixed, during erection to prevent bow/sag of the frame.

2.1.5 Door shutters of flush welded construction shall be 45mm thick, fabricated with two outer skills of 1.25mm thick steel sheets, 1mm thick steel sheet stiffeners and steel channels on all four edges. Double shutters shall have meeting stile edge beveled or rebated. Provision of glazed viewing panel, louvers shall be made as per the items of works and/or Drawings prepared by the Contractor. Shutters shall be suitably reinforced for lock and other surface hardware and to prevent sagging/twisting. Single sheet steel door shutters shall be fabricated out of 1.25mm thick steel sheets, mild steel angles and stiffeners as per the Drawings.

2.1.6 Doors, windows and ventilators shall be fixed into the prepared openings. They shall not be 'built-in' as the masonry work proceeds, to avoid distortion and damage of the units. The dimensions of the masonry opening shall have 10mm clearance around the overall dimensions of the frame for this purpose. Any support of scaffolding members on the frames/glazing bars is prohibited.

2.1.7 Glazing of the units shall be either with flat transparent glass or wired / figured glass of the thickness as specified in the items of works prepared by the Contractor. All glass panels shall have properly squared corner and straight edges. Glazing shall be provided on the outside of the frames.

2.1.8 Fixing of the glazing shall be either with spring glazing clips and putty conforming to IS:419 or with metal beads. Pre-formed PVC or rubber gaskets shall be provided for fixing the beads with the concealed screws. The type of fixing the glazing shall be as indicated in the items of work and/or in Drawings prepared by the Contractor.

2.1.9 Steel doors, windows and ventilators shall be provided with finish of either painting as specified or shall be hot dip galvanized with thickness of the zinc coating as stipulated all as described in the respective items of works.

2.1.10 The material of the Builders hardware of fittings and fixtures of chromium plated steel, cast brass, brass copper oxidized or anodized aluminum shall be as specified in the items. The number, size and type of fittings and fixtures shall be as in the Drawings /items of works.

2.1.11 Installation of the units with fixing lugs, screws, mastic caulking compound at the specified locations shall generally conform to the requirements of IS:1081. Necessary holes etc required for fixing shall be made by the Contractor and made good after installation. Workmanship expected is of a high order for efficient and smooth operation of the units.

3.0 **Mode of Measurements and Payment:** The item shall be measured and paid in m2. No hidden measurements shall be measured and paid. Only actual visible measurement shall be measured and wastage shall not be permitted.

6.1.1 Providing and fixing 38 mm. solid core flush type door with heavy Z section frame complete of approved manufacturer and of required size, as per approved drawing, design and direction. The rate shall also include 4 nos. of heavy M.S. oxidized parliamentary or butt hinges, necessary fixtures and fittings of heavy quality., as directed and as approved by the Architect and Engineer-in-charge, including 3 coats of painting.

1.0 **Materials & workmanship:** The relevant specific of item no. 6.1.0 shall be followed.

2.0 **Mode of Measurements and Payment:** The item shall be measured and paid in m2.

Supplying and fixing in position 20 micron anodized aluminium work for doors, windows, ventilators and partitions with extruded built up standard tubular and other sections of minimum 100mm wide & minimum1.5mm thk of Jindal make or other equivalant or as per engineer in charge and confirming to IS : 733 (latest revision) and IS : 1285 (latest revision), fixed with rawl plugs and screws or with fixing clips or with expansion hold fasteners including necessary filling up of gaps at junctions at top bottom and sides with required EPDM gaskets etc. All sections shall be smooth, rust free, straight, mitred & jointed mechanically wherever'required including cleat angle, aluminium snap beading for glazing/ panelling C.P. brass/stainless steel screws, nylon rollers with ball bearings, silicon sealent in gaps, concealed lock handle, etc all complete. (All Alu Section Anodised M 2 Grade).Rate to include for supplying and fixing necessary hold fasts, all fixtures and fastenings of anodized aluminium as per requirement with 5 mm/ 6 mm thick MODI/Saint Gobain or equivelant float glass,silicon sealent for water tightness at all sides etc complete at any level & height or as per direction of engineer in charge.cost of aluminum snap beading shall be included in the item rate.(Measurement on the basis of out to out dimensions of the frame)

1.0 **Preamble:** Providing and applying approved 25 micron color anodized sections /50 micron pure polyester powder coating of uniform shade and finish as mentioned in drawings /approved. the rate shall also include for required pre-treatment to sections such as cleaning, buffing, chromating etc. complete as per approval of architect /consultant .The Tenderer has to submit their powder coating / anodizing /process by which they wish to perform the work. Arrangement for the equipments to measure the thickness of anodized / power coating sections to be made by the contractor.

The contractor shall have to give a guarantee bond, for powder coating / amnodizing, on appropriate stamp paper for a period of 10 years .In this period he shall attend to and rectify all complaints without casing any inconvenience to the owner /client .The form of guarantee bond shall be as prescribed below:

''I/We…… (contractor) hereby guarantee that work shall remain unaffected and shall not be in any way damaged by atmospheric conditions, For a period of 10 years after the completion of work of powder coating /anodizing the aluminum doors as per the terms and conditions of the contract and guarantees to redo the affected work without claming any extra cost.'

1.1 In case of alteration items of M.S windows standard "Z" sections, M.S. rolled or fabricated sections to any shape including bending as per requirement are to be used matching to the respective aluminium sections. The windows shall be painted with minimum two coats of spray enamel paint (of approved make and shade) over zinc chromate yellow oxide and with steel putty etc. Complete as per design, direction and approved sample.

1.2 The windows and doors are to be fixed with the external finished surface (either stone cladding /external plaster) and hence all the necessary EPDM rubber or wood packings

/rough ground, fastners of fisher / hilti, polyurethane backer road of the minimum 10mm size. Neutral grade silicon weather sealant minimum 10 x 6 mm (between the frame and wall or other surface all around) shall be provided within the rate quoted so as to make the junctions fully water tight /air tight as per the drawings.

1.3 Approved make selected clear glass (clear /frosted) / wired glass of specified thickness (5 to 12mm) as mentioned in the drawings shall be used in doors. Wired glass /frosted glass louvers shall be provided wherever shown in the drawings after grinding the edges.

1.4 Necessary hardware like locking arrangement with pin cylinder locks, mortised locks, SS baby latch (occupied /vacant) SS push /pull or mortised handle, heavy quality hinges /pivot, concealed tower bolts ,etc of approved make & design (by architect) as per the drawings and as per SOQ . floor springs and door closer shall be measured and paid as per mentioned in BOQ/SOQ.

1.5 All gaskets used shall be 100% EPDM/ siliconised rubbers gaskets of approved colour for long life guarantee.

1.6 Necessary operating devise (as per design) for operation of louvers of windows, ventilators, sky lights ,including necessary, rods shall be provided without any, extra cost.

1.7 The rates quoted shall be inclusive of manufacture supply and installation at site, and inclusive of all the necessary accessories EPDM rubber strips/siliconised rubber strip, loacks, road, excise, taxes, VAT, transport, lobour charges, insurance, storage and safe custody ,etc complete.

1.8 The rates shall also be inclusive of providing and applying neutral grade sealant of approved make weather or structural with ordinary gun or compressed air operated gun as per the requirement and making the joints around aluminium doors, windows curtain wall glazing etc. watertight. On the external periphery of the building at the junction of two different materials as directed by the architect and site engineer.
The contractor shall have to give a guarantee bond, for water tightness, on appropriate stamp paper for a period of 10 years in this period he shall attend to and rectify all complaints without causing any inconvenience to the owners/client. The form of guarantee bond shall be as prescribed below:

‘’I”/ We …… (contractor) hereby guarantee that work shall remain unaffected and shall not be in any way damaged by atmospheric conditions for conditions, for a period of 10 years after the completion of the work of applying sealant and making the joints around aluminium doors watertight on the external periphery of the building at the junction of two different materials as per the terms and conditions of the contrite and guarantees to redo the affected work without claiming any extra cost.”

1.9 Necessary provision for rain water disposal shall be done in the bottom guides /frames as directed and approved by architect.

1.10 Offer must be in accordance with detailed drawings with dimensions of aluminium sections in frames and shutters and shutters as shown in drawing. It shall be accompanied by the detailed drawings if any deviation is proposed.

1.11 The quantities are provisional and may vary to any extent .no claim will be entertained on this account for any reason.

All the door shutters shall have double action hydraulic floor springs of approved make with minimum one year guarantee. The floor springs shall be of least possible thickness. The contractor shall have to give a guarantee bond, for the hydraulic floor springs, on appropriate stamp paper for a period of 1 year. In this period he shall attend to and rectify all complaints without causing any inconvenience to the owners/client .The form of guarantee bond shall be us prescribed below:

"I/We……..(contractor) hereby ,guarantee that the floor springs shall remain unaffected and shall not be in any way damaged by normal usage, pulls and pushes, for a period of 1 year after the completion of the work of supplying & fixing the hydraulic floor springs to aluminum doors as per terms and conditions of the contract and guarantees to redo the affected work without claiming any claiming any extra cost"

1.12 Details /arrangements for after sales /maintenance services shall be furnished.

1.13 Work shall be carried out in co –operation and in coordination with all other agencies working at site.

1.14 The civil work as required for fixing of floor springs, hold fast or other works required for the erection and completion of doors/windows etc. shall be done by the contractor without any extra cost.

1.15 Any damage if caused to the existing work done by other agencies shall be reinstated by the contractor to its original condition without any extra cost.

1.16 During the course of work the contractor shall pay due care to avoid any stains on the powder coating work and if required, the contractors shall provide shall provide necessary protective arrangement as directed by the architects for which no extra payments shall be made. After the installation is completed, if required by the architects, the aluminium work shall be washed with mild solution of non alkali soap and water.

1.17 The contractor shall be responsible for the windows/doors/curtain wall glazing/grills etc. being set straight, in plumb level and for their satisfactory operations after the fixing is completed.

1.18 Wherever required and as directed strengthening of members shall be down by providing steel/M.S concealed members without extra cost.

1.19 The door shutters may have hydraulic door closer of approved make with minimum one year guarantee as and where shown in drawings and as directed.

The contractor shall have to give a guarantee bond, for the hydraulic door closer, on appropriate stamp paper for a period of 1 year. In this period he shall attend to and rectify all complaints without causing any inconvenience to the owners /client. The form of guarantee bond shall be as prescribed below:

"I"/We……. (contractor) hereby guarantee that the hydraulic door closers shall remain unaffected and shall not be in any way damaged by normal usage, pulls and pushes, for a period of 1 year after the completion of the work of supplying & fixing the hydraulic door closers to aluminum doors as per terms and conditions of the contract and guarantees to redo the affected work without claiming any extra cost'"

2.0 Mode of Measurements and Payment: Kg based aluminum items specified in the BOQ will be paid only measuring the weight of the aluminum sections. However the rates shall be inclusive of all the items specified in the item description.

6.2.0 Fully glazed door - with 6 mm thick clear toughened glass.

1.0 Materials & workmanship: The relevant specific of item no. 6.2.0 shall be followed. Glass shall be of best quality. The item shall be measured and paid in one m2

6.2.1 Partly glazed and Partly paneled door with 12 mm thick both side laminated particle board - Marino or eqv., with 6 mm thick clear toughened glass.

1.0 Materials & workmanship: The relevant specific of item no. 6.2.0 shall be followed. Glass shall be of best quality. The item shall be measured and paid in one m2

6.2.2 Fully glazed sliding window including mosquito net , separate Alu. fixed shutter for mosquito net with 5 mm thick clear toughened glass.

1.0 Materials & workmanship: The relevant specific of item no. 6.2.0 shall be followed. Glass shall be of best quality. The item shall be measured and paid in one m2

6.2.3 Fully glazed sliding window including mosquito net , separate Alu. fixed shutter for mosquito net with 6 mm thick clear toughened glass.

1.0 Materials & workmanship: Glass shall be of best quality. Glass shall be of best quality. The item shall be measured and paid in one m2

6.2.4 Fixed type Fully glazed window with 8 mm thick clear toughened glass.

1.0 Materials & workmanship: The relevant specific of item no. 6.2.0 shall be followed. Glass shall be of best quality. The item shall be measured and paid in one m2

6.2.5 Fixed type Fully glazed window with 12 mm thick clear toughened glass.

1.0 Materials & workmanship: Glass shall be of best quality. Glass shall be of best quality. The item shall be measured and paid in one m2

6.2.6 Supply, installation, testing & commissioning of fixed type aluminium D.G.U.window of following glass thk,gap between glass shall be filled with argon gas.Rate shall be includding all labour ,machinery,sealent etc,complete or as directed by engineer incharge.

1.0 Materials & workmanship: The relevant specific of item no. 6.2.0 shall be followed. Glass shall be of best quality. The item shall be measured and paid in one m2.

6.2.6.1 Do as above but for 6mm thk clear toughened glass + 18 mm gap (Argon gas) + 6mm thk clear toughened glass.

6.2.6.2 Do as above but for 8mm thk clear toughened glass + 18 mm gap (Argon gas) + 8mm thk clear toughened glass

6.2.7 Partly glazed and Partly Paneled partition wall with 12mm thick both side laminated particle board - Marino or equivalent with 6 mm thick clear toughened glass.

Materials & workmanship: The relevant specific of item no. 6.2.0 shall be followed. Glass shall be of best quality. The item shall be measured and paid in one m2

6.2.8 Partly glazed and Partly Paneled partition wall with 12mm thick both side laminated particle board - Marino or equivalent with 8 mm thick clear toughened glass.

Materials & workmanship: The relevant specific of item no. 6.2.0 shall be followed. Glass shall be of best quality. The item shall be measured and paid in one m2.

6.2.9 Aluminum adjustable louvered glazed ventilators with mosquito net with 5 mm thick clear toughened glass.

Materials & workmanship: The relevant specific of item no. 6.2.0 shall be followed. Glass shall be of best quality. The item shall be measured and paid in one m2.

6.2.10 Aluminum fixed glazed ventilators with mosquito net with 5 mm thick clear toughened glass.

Materials & workmanship: The relevant specific of item no. 6.2.0 shall be followed. Glass shall be of best quality. The item shall be measured and paid in one m2.

6.2.11 Providing and fixing aluminium automatic proxi sensor slidding glass door - 12 mm thk toughened glass with required fittings and fixture as directed by Engineer in charge, etc. complete.

Materials & workmanship: The relevant specific of item no. 6.2.0 shall be followed. Glass shall be of best quality. The item shall be measured and paid in one m2.

6.2.12 Providing and fixing 12mm thk toughened glass door with SS handle(ss 304), locking arrgement & double action hydraulic floor spring with top adjustable pivot, sag wood one-piece packing SS cover plate of approved make for doors including cost of cutting doors as required, embedding in floors, making good as required and SS cover plates with brass pivot and etc. complete as the direction of engineer-in-charge. Rate shall be inclusive of all labour,material etc complete.

Materials & workmanship: The relevant specific of item no. 6.2.0 shall be followed. Glass shall be of best quality. The item shall be measured and paid in one m2.

6.2.13 Providing and fixing 12.5 mm gypsum board false ceiling system, as per standard specification of Saint-Gobain India or equivalent. All the material and specifications to be used as per manufacturer instructions. Electrical and HVAC provision in the ceiling also to be done as per drawings, as directed by Engineer in charge, etc. complete.

Materials & workmanship: The material shall be as per item no M-84 .The item shall be measured and paid in one m2.

6.2.14 Providing and fixing at all height in all floor with all lead seamless type M/F suspended GRID -Mineral Fiber False ceiling of Armstrong or equivalent using GI perimeter channel of size 0.55 mm thick(having one flange of 20 mm and another flange of 30mm and web of 27 mm) along with perimeter of ceiling, screws fixed to brick wall / partition with the help of nylon sleeves and screws at 610mm centers. Then suspending GI intermediate channels of size 45mm (0.9mm thick with two flanges of 15mm each) from the soffit at 1220mm centers with ceiling angle of width 25mmX10mmX0.5mm thick fied to soffit with GI cleat and steel expansion fasteners. Ceiling section of 0.55mm thickness having knurled web of 51.5mm and two flanges of 26mm each withlips of 10.5mm are than fixed to the intermediate channel with the help of connecting clip and in direction of perpendicular to the intermediate channel at 5/457 mm centers. 12.5mm tapered edge gypboard (confirming to IS 2095 (latest revision)) is then screw fixed to ceiling section with 25mm dry wall screws at 230mm centers. Screws fixing is done mechanically either with screw driver or drilling machine with suitable attachment. Finally the boards of 12.5mm thick mineral fiber board are to be jointed and finished so as to have a flush look which

includes filling and finishing the tapered and sq.

Materials & workmanship: The material shall be as per item no M-84 .The item shall be measured and paid in one m2.

6.3.0 Providing and fixing interlocking rolling shutters with push pull arrangement of approved make made of 80mm. wide M.S. Laths 18 gauge interlocked together through their entire length and jointed together at the end locks mounted on specially designed pipe shaft with bracket plates guide channels 10 gauge and out side locking with push-pull operation including the cost of Hood cover of 16 gauge and spring etc. complete. Guide rail shall be fixed to the wall with the help of continuous angle of 25x25x4 mm and anchor fasteners including 2 coat of zinc chromate yellow oxide primer and 2 coats of synthetic enamel paint of approved make etc. as directed..(Measurements considered for payments shall be clear **size of opening plus guide** channels on both the sides for width and 450mm on top for drum height).

1.0 **Materials & workmanship:** Rolling shutter shall conform to M-32; Enamel paint shall conform to M-37Rolling shutters shall be of an approved manufacture, conforming to the requirements specified in IS: 6248.

1.1 The type of rolling shutter shall be self coiling type (manual) for clear areas up to 12 sq.m, gear operated type (mechanical) for clear areas up to 35 sq.m and electrically operated type for areas up to 50 sq.m. Mechanical type of rolling shutters shall be suitable for operation from both inside and outside with the crank handle or chain gear operating mechanism duly considering the size of wall/column. Electrical type of rolling shutter shall also be provided with a facility for emergency mechanical operation.

1.2 Rolling shutters shall be supplied duly considering the type, specified clear width/height of the opening and the location of fixing as indicated in the Drawings prepared by the Contractor.

1.3 Shutters shall be built up of interlocking laths 75 mm width between rolling centers formed from cold rolled steel strips. The thickness of the steel strip shall not be less than 0.90 mm for shutters up to 3.50m width and not less than 1.20 mm for shutters above 3.50 m width. Each lath section shall be continuous single piece without any welded joint.

1.4 The guide channels out of mild steel sheets of thickness not less than 3.15 mm shall be of either rolled, pressed or built up construction. The channel shall be of size as stipulated in IS:6248 for various clear widths of the shutters.

1.5 Hood covers shall be of mild steel sheets not less than 0.90 mm thick and of approved shape.

1.6 Rolling shutters shall be provided with a central hasp and staple safety device in addition to one pair of lever locks and sliding locks at the ends.

1.7 All component parts of the steel rolling shutter (excepting springs and insides of guide channels) shall be provided with one coat of zinc chrome primer conformity to IS: 2074 at the shop before supply. These surfaces shall be given an additional coat of primer after erection at the site along with the number of coats and type of finish paint as specified in the respective items of works prepared by the Contractor.

1.8 In case of galvanized rolling shutter, the lath sections, guides, lock plate, bracket plates, suspension shaft and the hood cover shall be hot dip galvanized with a zinc coating containing not less than 97.5 percent pure zinc. The weight of the zinc coating shall be at least 610gms/sq.m.

1.9 Guide channels shall be installed truly plumb at the specified location. Bracket plate shall be rigidly fixed with necessary bolts and holdfasts. Workmanship of erection shall ensure strength and rigidity of rolling shutter for trouble free and smooth operation.

2.0 Mode of measurement and payment:

2.1 Measurement considered for payment shall be clear size of opening, between the jambs plus guide channels on both the sides for width and 450mm on top for drum height shall be added to the height of the opening, the clear distance between the sill and the soffit of the opening.

2.2 The rate shall include for all materials, its transportation at site, labour etc. involved in the operation described as above. It shall include for a primer coat and 2 coats of enamel paint.

2.3 The rate shall be for a unit of one sq. m.

6.3.1 Shutter shall be and pull and push type.

1.0 Materials & workmanship: The relevant specific of item no. 6.3.0 shall be followed.

6.3.2 With mechanical device with a pair of handles.

1.0 The relevant specifications of item no. 6.3.0 shall be followed except that the shutter shall be operated with a mechanical device with a pair of handles.

6.3.3 Shutter shall be partly grilled and partly paneled, and pull and push type.

1.0 The relevant specifications of item no. 6.3.0 shall be followed except that the shutter shall be partly grilled and partly panelled, operated with pull and push type arrangement.

6.3.4 Shutter shall be partly grilled and partly paneled, mechanically operated with a pair of handles.

1.0 The relevant specifications of item no. 6.3.0 shall be followed except that the shutter shall be partly grilled and partly panelled, operated with a mechanical device with a pair of handles.

PLASTERING & POINTING WORK

7.1.1 20 mm. thick Sand face cement plaster on any surface like RCC, Masonry etc. up to any height above ground level consisting of 12 mm. thick backing coat of C.M. 1:4 (1 cement : 4 sand) and 8 mm. thick finishing coat using Gutka, in C.M. 1:2 (1 cement : 2 sand), etc. complete.

1.0 Materials: Water shall conform to **M-1**. Cement mortar shall conform to **M-11**.

2.0 Workmanship:

2.1 Scaffolding: Wooden ballies, bamboo, planks, trestles and other Steel 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 dense hacking if it is concrete. In case of concrete surface, if a chemical retarder or shuttering oil has been applied to the form work, the surface shall be roughened by wire brushing and all the resulting dust and loose particles shall be cleaned off and care shall be taken that none of the retarder is left on the surface. Trimming of projections on brick/concrete surface wherever necessary shall be carried out to get an even surface.

2.2.2 Raking of joints in case of masonry wherever necessary shall be allowed to dry out for sufficient period before carrying out the plaster work.

2.2.3 Scaffolding for carrying out plastering work shall be double scaffolding having two sets of vertical supports so that the scaffolding is independent of the walls.

2.3 **Preparation of Surface :**

2.3.1 All putlog holes in brickwork and junction between concrete and brickwork shall be properly filled in advance. Joints in brick work shall be raked about 12 mm. and concrete surface shall be hacked to provide grip to the plaster. Projecting burrs of mortars formed due to gaps at joints in shuttering shall be removed. The surface shall be scrubbed clean with wire brush/coir brush to remove dirt, dust etc., and the surface thoroughly washed with clean water to remove efflorescence, grease and oil etc., and shall be kept wet for a minimum of two hours before application of plaster. The work shall be carried out in two coats. The **backing coat (base coat) shall be in CM 1:4** and The thickness of the back coat shall be 12 mm. average. Before the first coat hardens its surface shall be beaten up by edges of wooden tapers 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.

2.3.2 The second coat shall be completed to **average 8 mm. thickness in CM 1:2** as described above. The surface shall then be tapered to uniform grained texture by using **Gutka** only, as specified. The sample of sand face shall be got approved before the work is started. The whole work shall be carried out uniformly as per the sample approved.

2.3.3 **Curing:** The curing shall be started overnight after finishing of the plaster work. The plaster shall be kept wet for a period of 7 days. During this period, it shall be protected from all damages.

2.3.4 For external plaster, the plastering operation shall be started from the top floor and carried downwards. For internal plaster, the plastering operations may be started wherever the building frame and cladding work are 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.

2.4 **Applications of Plaster :**

2.4.1 The plaster about 15 cm. x 15 cm., shall be first applied horizontally and vertically at not more than 2 m. intervals over the entire surface to serve as gauge. The surfaces of these gauges shall be truly in plane 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 upwards and sideways movements at a time. Finally, the surface shall be finished off true with a trowel or wooden float according to the texture, smooth or sandy granular, as may be

required. Excessive Trowelling or over working the float shall be avoided. All corners, arises, angles and junctions etc. shall be carried out with proper templates to the size required.

2.4.2 Cement mortar shall be used within half an hour after addition of water. Any mortar or plaster which is partially set shall be rejected and removed from the site.

2.4.3 In suspending the work at the end of the day, the plaster shall be left out, clean to line both horizontally and vertically. While recommencing the plaster, the edges of the old work shall be scrapped 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 shall not be nearer than 15 cm. to any corners or arises. 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 patched up later on.

2.4.4 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 mats or gunny bags on the outside of the plaster and by keeping them wet.

3.0 Mode of Measurements & Payment:

3.1 The rates shall include for work at any height, position, and floor and for all necessary scaffolding, etc. as may be required. The rates shall also include for hacking and/or bush hammering to form key for plaster and for spatter dash treatment, as specified, as and where necessary.

The rates shall also include for all work in narrow width, arises, rounded angles, chamfered external angles, drip moulds, grooves and for making good after all trades.

The rate shall also include for groove with cement finish upto 12 mm. x 6 mm. to be formed in plaster at junction of slab and beam and slab and brick without any extra charge. The rate shall also include for similar grooves in plaster at the junction of masonry and wood or steel door/window/ventilator frame or at bottom of beam/lintels as drip moulds without extra charge.

3.2 All plastering shall be measured in m^2., unless otherwise specified. Length, breadth or height shall be measured correct to a centimeter.

3.3 Thickness of the plaster shall be exclusive of the thickness of the key i.e. grooved or open joints in brick work, stone work, etc. or space between laths.

3.4 The measurement of wall plastering shall be taken between the walls or partitions (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/folding soffits shall be measured separately.

3.7 For jambs, soffits, sills, etc., openings exceeding 0.5 sqm and not exceeding 3.0 sqm, area deductions and additions shall be made in the following manner: -

(a) No deductions shall be made for end joints, beams, posts, etc. for openings not exceeding 0.5 sqm. each and no addition shall be made for reels, jambs, soffits, sills, etc. of these opening for finish to plaster around ends of joints, beams, posts, etc.

(b) Deduction for openings exceeds 0.5 sqm. but not exceeding 3.0 sqm. 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 any wall are plastered with same plaster, deduction shall be made for one face only.

(ii) When two faces of any 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, windows, 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 may be.

3.8 For openings having door frames equal to projection 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 having area above 3.0 m2. each, deduction shall be made for the opening but jambs, soffits, and sills shall be measured additionally.

3.10 The rate shall be for a unit of one m^2.

7.2.1 Providing & laying 20 mm. thick cement plaster in two coats. First base coat in C.M. 1:4 with rough finishing and second coat in C.M. 1:2 in cement mala finish (finished with steel trowel) including scaffolding, curing, making grooves, forming pattas and drip mould, etc. complete, as directed. Rate shall be inclusive of the chicken mesh to be provided at the junction of brick and RCC works.

1.0 Materials & Workmanship: The relevant specifications of item No. 7.1.1 shall be followed except that the thickness of the plaster shall be average 20 mm. and shall be carried out as specified in the item. The base coat shall be carried in **CM 1:4 having average 12 mm. thickness**. Before the plastered surface hardens roughing shall be done to receive the second coat. Second coat shall be applied only after minimum curing of **72 hours**. The second coat shall be carried out in **CM 1:2 having average 8 mm thickness**. The surface shall be finished smooth with steel trowel (Mala finish).

2.0 Mode of Measurements and Payment:

2.1 The relevant specifications of item No. 7.1.1 shall be followed.

2.2 The rate shall be for a unit of one m^2.

7.3.1 Providing & laying 12 to 15 mm. thick cement plaster in single coat, in C.M. 1:3 with cement mala finish (finished with steel trowel) including scaffolding, curing, making grooves, forming pattas and drip mould, etc. complete as directed. Rate shall be inclusive of the chicken mesh to be provided at the junction of brick and RCC works.

Materials & Workmanship: The relevant specifications of item no. 7.1.1 shall be followed same except that the proportion of mortar shall be CM 1:3 instead of CM 1:4 and thickness shall be 12 to 15 mm. instead of 20 mm.

2.2 Mode of Measurements & Payment:

2.1 The relevant specifications of item No. 7.1.1 shall be followed.

2.2 The rate shall be for a unit of one m^2

7.4.1 Providing and applying minimum 15 mm thick rough plaster in CM 1:3 at all levels

laid in single coat to concrete or masonry surfaces and around openings in jambs and sills, hacking of concrete surfaces, racking of joints, scaffolding, sharp and clear grooves, pattas, drip moulds, providing and fixing chicken mesh jali (22 gauge) at the junction of two different surfaces material component and as detailed in drawings at all levels and all heights, as directed by Engineer in charge, etc. complete..

Materials & Workmanship: The relevant specifications of item no. 7.1.1 shall be followed same except that the proportion of mortar shall be CM 1:3 instead of CM 1:4 and thickness shall be 15 mm. instead of 20 mm.

2.2 Mode of Measurements & Payment:

2.1 The relevant specifications of item No. 7.1.1 shall be followed.

2.2 The rate shall be for a unit of one m^2

7.5.0 Providing cement vata of specified size, quarter round in PCC (1:1.5:3) with 6 mm down size grit with neat cement finishing, watering, etc. complete. Item of making coving shall be considered in this item only. Coving shall be at floor between floor to wall junction, at ceiling between ceiling and walls and at wall corners between wall to wall. Rate shall be inclusive of the for all heights and final finish of the coving shall be equivalent to the adjacent plaster finish surface.

1.0 Materials: Water shall conform to M-1. Cement mortar shall conform to M-11.

2.0 Workmanship: The work of cement vata of specified 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 workman-like manner. The internal portion of rain water pipe shall be rounded off properly during constructing the vata. The work shall be cured for 7 days.

3.0 Mode of Measurement and Payment :

3.1 The work shall be measured for finished item in rmt.

3.2 The rate shall be for a unit of one rmt.

7.5.1 Cement vata of 10 cm. x 10 cm. size.

1.0 Materials & Workmanship: The relevant specifications of item No. 7.5.0 shall be followed except that the Size of cement vata shall be 10 cm X 10 cm.

2.0 Mode of Measurements and Payment:

2.1 The relevant specifications of item No. 7.5.0 shall be followed.

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

7.5.2 Cement vata of 15 cm. x 15 cm. size.

1.0 Materials & Workmanship: The relevant specifications of item No. 7.5.0 shall be followed except that the Size of cement vata shall be 15 cm X 15 cm.

2.0 Mode of Measurements and Payment:

2.1 The relevant specifications of item No. 7.5.0 shall be followed.

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

WATER PROFFING WORK

8.1.1 **Providing and laying cement water proofing of average 125mm thick for terrace slabs using cement slurry & waterproofing chemical after cleaning, arranging brick bats in cement mortar 1:5,according to the slope, adding suitable chemical for water-tightness and again after 3 days ponding with water and testing same, providing on top cement mortar 1:3 including addition of waterproofing compound and finishing the top with neat cement @ 2.75 kg/m2 and as per direction and instructions, complete at all levels and floors, including furnishing a guarantee bond for 10 years. The work should be carried out through an approved specialized agency like India Water Proofing Co. or equivalent. (Wall to wall measurement will be considered only including vata up to 300mm height)**

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**. Brickbats shall conform to **M-14**. Approved waterproofing compound shall be added in cement mortar as per manufacturer's specification and shall conform to **M-67**. Cement mortar shall conform to **M-11**.

2.0 Workmanship:

2.1 Unless otherwise specified proprietary waterproofing treatment shall be executed through M/s. India Waterproofing Co. or approved equivalent, who should give a guarantee of 10 years on stamp paper to the employer directly and the tender rate shall be inclusive of the same.

A guarantee bond on appropriately stamp paper shall be given by the contractor to the client in the manner form prescribed below:

FORM OF GUARANTEE BOND

"I/We .....(Contractor) hereby guarantee that work will remain unaffected and will not be in any way damaged by water or any other form of humid condition, for a period of 10 years after completion of the work of water-proofing as per the terms and conditions of the contract and the Contractor hereby indemnifies and agrees to save the Client from any loss and or damage that might be caused on account of water and or other similar form of humid conditions and hereby guarantees to make good any loss or damage suffered by the Client and further guarantees to redo the affected work without claiming any extra cost."

2.2 This guarantee shall remain in force for a period of 10 years from the completion of the work under the contract and it shall remain binding to the Contractor for period of 10 years.

2.3 While tendering the contractors should clearly stipulate the type of treatment proposed to be provided by them and the name and particulars of firm through whom they propose to carry out the treatment.

2.4 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. The brickbats of varying size as per requirement shall be arranged in proper gradient using cement mortar 1:5 according to the desired slope. Suitable waterproofing chemical shall be added to make the CM water tight and then cement mortar 1:3 shall again be provided on top of the brickbats, including the waterproofing compound which shall be added in the CM

and finishing on top with neat cement @ 2.75 kg/m2. The top surface shall be finished rough surface as per the direction so as to receive the next finishing item.

2.5 The testing shall be done by ponding for atleast 72 hours.

2.6 Well defined cracks other than hair cracks in the treated structure shall be cut to `V' section, cleaned and then filled up flush with cement sand slurry or with bitumen conforming to IS : 702-1961.

2.7 The surface under treatment, part of parapet (incase of balcony or terrace) 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 brushing and dusting.

2.8 Drain outlet shall be suitably placed with respect to the surface gradient to ensure rapid drainage and prevention of local accumulation of water on the treated surface. Masonry drain mouth, shall be widened sufficiently and rounded with cement mortar.

2.9 For cast iron drain outlets, a groove shall be cut all around to touch the treatment.

2.10 When a pipe passes 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 shall be taken over the fillet.

2.11 In case of parapet wall over 450 mm. in height, for tucking in the water proofing treatment, a horizontal groove 75 mm. wide and 65 mm. deep at minimum height of 300 mm. above terrace 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.

2.12 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.

2.13 In case of existing R.C.C. and stone wall cutting the chase for tacking in the water proofing treatment is not recommended.

2.14 At the junction between the roof and vertical face of the parapet wall, a fillet 75 mm. in radius shall be constructed.

2.15 At the drain mouths the fillet shall be suitably cut back and rounded off for each application of water proofing treatment and easy flow of water.

2.16 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.

3.0 Mode of Measurements and Payment:

3.1 The rate shall include providing water proof cement concrete terracing of adequate thickness to give desired slope for drainage of rain water from terraces.

3.2 The measurements for this item shall be taken as under:

(a) Water proofing of roof shall be measured in $m^{2.}$ Plan area of treated surface shall be measured correct to a centimeter.

(b) Measurement shall be taken for the plan area of roofing/terrace. Flashing treatment including flashing over the parapet wall up to 300 m from terrace. Low dividing walls and expansion joints and at the pipe projections etc. Overlapping and tucking into flashing grooves shall not be measured extra.

(e) In measurements, no deduction shall be made for either openings or recess for chimney stacks, roof lights etc. having areas upto 0.4 m2. Deduction shall be made in measurements for full opening but nothing extra shall be paid for extra labour and materials in forming such openings.

3.3 The rate includes cost of all materials and labour required to carry the works as per the above specifications. The rate also includes cleaning of surface and treating the cracks shall not be paid separately. Cutting of horizontal grooves in parapet walls for tucking in water proofing treatment shall not be measured or paid separately.

3.4 Measurements shall be based on the drawings or as executed on site, the lesser of the two shall be given. No extra payment shall be made for rounding and vata at the junction of slab & parapet. A 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% of the same shall be retained for the balance of the guarantee period and shall be refunded only after the completion of the guarantee period.

3.5 This item shall be measured and paid in m^2.

8.4.1 Providing & laying broken white china mosaic flooring for plain and curved surfaces, comprising of 20 to 25 mm. size broken pieces of glazed tiles (one or more colours, as directed), laid over cement mortar 1:6 bedding including applying cement slurry at the rate of 2.75 kg per sq.m. , on plain or sloped surfaces. and filling joints with white cement. The flooring shall be tampered to bring the mortar cream up to the surface, including rounding of the junctions and extending them upto 15 cm. along the parapet wall. The rate shall include bands, if different colour is used, any pattern or design as per drawing and direction, curing, cleaning with water and oxalic acid, etc. complete. (Wall to wall measurement will be considered only including vata upto 150mm height)

1.0 Mode of Measurements and Payment:

1.1 The rate shall be for a unit of one m^2.

8.6.0 Providing and laying specified dia rain water down take PVC pipe with bends & joints etc. complete.

1.0 Materials:

The specified dia PVC pipe shall be of the best quality of approved make or equivalent as approved by the consultants & also bends reducer. Tees, Elbow as per requirements.

2.0 Workmanship:

All pipes shall be laid as per proper slope, level and gradient specified on the drawing.

PVC pipes shall be of the specified diameter and in full length including socket ends of the pipes unless shorter lengths are required at junctions with fitting.

2.1 **Fixing:** The pipes and fittings shall be fixed in vertical alignment, unless otherwise specified and shall be secured to the walls at joints with brackets/clamps. They shall be of MS or Aluminum, bent to the required shape and size to fit tightly on the pipe when tightened with MS bar, nut, bolt and washer. The brackets/clamps shall be fixed to the walls and kept about 25mm clear off the finished face of the wall so as to facilitate cleaning and painting of the pipes. Joints shall be with good workmanship & in proper manner.

2.3 **Painting:**

PVC pipes shall be painted with two coats of bitumen paint covered with polyethylene tape and a final coat of bitumen paint.

3.0 Mode of Measurement and Payment:

The length of pipe shall be measured including all fittings along its length in running meters, correct to a centimetre. No allowance shall be made for the portion of pipe length entered in the sockets of the adjacent pipe or fittings. The rate shall be inclusive of all materials, labour, tools and plant etc., required for satisfactory completion, testing and commissioning of this item. The rate shall be for a unit of one running meter.

8.6.1 100 mm dia & Pressure of 4 kg/m2

1.0 Material, Workmanship & Mode of measurement & payment: The relevant specification of item no. 8.5.0 shall be followed except that the dia pipe shall be 100 mm & pressure of 4 kg/m2.

8.6.2 160 mm dia & Pressure of 6 kg/m2

1.0 Material, Workmanship & Mode of measurement & payment: The relevant specification of item no. 8.5.0 shall be followed except that the dia pipe shall be 160 mm & pressure of 6 kg/m2.

FLOORING WORK

9.1.1 Providing and laying green Polished kotah stone 40 mm thick of approved quality having size as per drawings and pattern, selected and sorted for uniform colour in floors, over 20mm thick mortar bedding of 1:6 cement mortar, mirror polishing, curing, as directed by the Engineer In Charge.

1.0 Materials: Water shall conform **M-1**. Lime mortar shall conform to M-10. Cement mortar shall conform to **M-11.** Polished kotah shall conform to **M-42** and shall be of reasonably uniform colour. The size of the kotah shall be upto 60 cm. only. Waxing shall not be permitted.

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 work shall be carried out in normal pattern (square or rectangular), with or without bands of selected brown kotah stone etc. as per drawing and as directed by the Architect. The sides thus dressed shall have full contact if laid along a straight edge. The sides shall be table rubbed with coarse sand, before paving. All angles and edges of the slabs shall be truly square and free form chipping and shall give a plane surface. The thickness of the slab 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 slab flooring shall be of cement mortar 1:6 (1 cement: 6 coarse sand) 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 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 a bit. Over this surface, cement slurry of honey-like consistency shall be applied. The slab shall then be gently placed in position and tapped with wooden

mallet till it is properly padded 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 and floor shall be finished neatly. The finished surface shall be true to levels and slopes, as directed.

2.3 While laying, any chiselling which may be required for making the skirting or dado flush with the plaster and/or other finishes shall be done. Necessary grooves of required size in cm., between plaster and/or other finishes, dado or skirting (if required) shall be provided. Forming machine-cut/rounded edges, gutters, sills, platforms, channels, curbing, etc. if any, if required, shall be provided as per the drawing and design.

2.4 In places where full tiles cannot be fixed, the tiles shall be cut to the size and smoothened at edge to give straight and true joints.

2.5 All necessary slopes, gradients and levels shall be truly maintained as required and directed by the Architect and Engineer-in-charge.

2.6 The floor shall be kept wet for a minimum period of 7 days, so that bedding and joints set properly.

2.7 **Polishing** shall be normally commenced after 14 days of laying the slab. First polishing shall be done with carborundum of 60 - 120 grade grit fitted in the heavy machine and then second polishing shall be done with carborundum of 220 to 350 grade grit fitted in the heavy machine. Water shall be properly used during polishing. The flooring shall then be washed clean with water and oxalic acid. As directed by the Architect and as specified in the item, no waxing will be permitted.

2.8 If any tile is disturbed or damaged it shall be refitted or replaced, properly jointed and polished.

2.8 The holes required for Nahni traps, pipes any other fittings shall be made without any extra cost.

3.0 Mode of Measurements and Payment :

3.1 Kotah slab flooring shall be measured in m^2. 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 m^2. 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. Kotah slabs laid in floor boarders and bands etc. shall be measured in the same item and nothing extra shall be payable on account of these or similar bands 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 The rate shall include the cost of all materials (inclusive of all taxes, levies, and delivery at site), labour & sundry involved in all the operations, at all floors, at any height and level, as described above. It shall also include for breakage and wastage. Floating materials and margin of profit shall also be included. All material samples shall be got approved by the Architect/Engineer-in-charge before placing orders.

3.5 No extra shall be paid for any small quantities like narrow widths, mitred & returned ends, rounds & cutting, fixing and making good upto & around pipes, fittings and fixtures etc.

3.6 The rate shall include for fixing the flooring in composite pattern as per the drawings, using different materials and sizes. The measurements of the different materials shall be taken category-wise separately and paid accordingly.

3.7 The basic rate, if at all provided or agreed upon includes cost of material, all taxes, levies & cost of delivery at site.

3.8 The risers of steps, skirting or dado shall be measured in m^2. 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.

3.9 The rate shall be for a unit of one m^2.

9.3.1 Providing & laying in position, vitrified/ceramic tiles of approved make & colour, of first quality of any size as per design, set in cement slurry over a minimum 12 mm. thick cement mortar 1:4 bedding and laid to proper slope and level. Joints shall be filled with self matching colour (white cement plus pigment). Curing & cleaning with mild oxalic acid etc. complete to be done for flooring, dado or channel work, as directed by the Architect and Engineer-in-charge.

1.0 Materials: Water shall conform to **M-1**. Cement mortar shall conform to **M-11**. Ceramic tiles shall conform to **M-56** and shall be of the make as specified in the item. The ceramic tiles shall be of first quality and make as specified in the item. The ceramic tiles shall be of Regency or Bell make. The pigment used for mixing with white cement for pointing shall be of Rainbow Tile Mate from `Roffe' or equivalent, conforming to **M-63**

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, as described above, 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/coloured tiles shall then be laid on the cement mortar bedding of 12 mm. thickness, in CM 1:4. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of the bedding. The base shall be cleaned and well wetted, before laying. The mortar shall then be spread in thickness not less than 10 mm. at any place and average 12 mm. thick. The proportion of the cement mortar shall be as specified in the item.

2.2 Fixing tiles:

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/$m^{2.}$ of honey-like consistency shall be spread over the mortar bedding as directed. The edges of the tiles shall be smeared with neat cement slurry. The tiles shall then 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 center line both ways. The Nahni trap coming in the flooring shall be so positioned that its grating shall replace only one tile as far as possible. Where full size tiles cannot be fixed, they shall be cut (Sawn) to the required size and the edges rubbed smooth to ensure straight and true joints. After the tiles are 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 up pin holes that may exist on the surface. White cement with or without matching pigment 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 cure undisturbed for 7 days.

2.2.3 While laying, any chiselling which may be required for making the skirting or dado flush with the plaster and/or other finishes shall be done. Necessary grooves of required size in cm., between plaster and/or other finishes, dado or skirting (if required) shall be provided. Forming machine-cut/rounded edges, gutters, sills, platforms, channels, curbing, etc. if any, if required shall be provided as per the drawing and design.

2.2.4 In places where full tiles cannot be fixed, the tiles shall be cut to the size and smoothened at the edges to give straight and true joints.

2.2.5 All necessary slopes, gradients and levels shall be truly maintained as required and directed by the Architect and Engineer-in-charge.

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 and cleaned by dilute acid and dried. Proper precautions and measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.

2.3.2 If any tile is disturbed or damaged it shall be refitted or replaced, properly jointed and polished.

3.0 Mode of Measurements and Payment :

3.1 The work done shall be measured in m^2. for the visible area of work done in floor and dado. The length and width of the flooring shall be measured between the faces of skirting or dado or plastered face of walls 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 m^2. Nothing extra shall be paid for laying the floors at different levels in the same room. The dado will be measured from the finish floor level to the top of tile fixed.

3.2 The rate shall include the cost of all materials (inclusive of all taxes, levies, and delivery at site), labour & sundry involved in all the operations, at all floors, at any height and level, as described above. It shall also include for breakage and wastage. Floating materials and margin of profit shall also be included. All material samples shall be got approved by the Architect/Engineer-in-charge before placing orders.

3.3 No extra shall be paid for any small quantities like narrow widths, mitred & returned ends, rounds & cutting, fixing and making good upto & around pipes, fittings and fixtures etc.

3.4 The rate shall include for fixing the flooring in composite pattern as per the drawings, using different materials and sizes. The measurements of the different materials shall be taken category-wise separately and paid accordingly.

3.5 The basic rate if at all provided or agreed upon includes cost of material, all taxes, levies & cost of delivery at site.

3.6 The rate shall be for a unit of one m^2.

9.2.1 Providing & laying 25 mm. thick green polished kotah of approved quality, selected and sorted for uniform colour, in floor, otta, sill, skirting, dado etc., in required

sizes up to 60 cm. and as per design with normal pattern (square, rectangular) as per drawings, including cement mortar 1:6 bedding of required thickness, joints & pointing as specified, three or more coats of polishing (with oxalic acid) up to mirror finish surfaces with different grades of Emery, curing, daily moping with water & kerosene as directed for at least 15 days or up to the satisfaction of the Architect & Engineer-in-charge, with selected brown kotah to form bands etc. complete. (NO WAXING WILL BE PERMITTED).

1.0 **Materials:** Water shall conform **M-1**. Lime mortar shall conform to M-10. Cement mortar shall conform to **M-11.** Polished kotah shall conform to **M-42** and shall be of reasonably uniform colour. The size of the kotah shall be upto 60 cm. only. Waxing shall not be permitted.

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 work shall be carried out in normal pattern (square or rectangular), with or without bands of selected brown kotah stone etc. as per drawing and as directed by the Architect. The sides thus dressed shall have full contact if laid along a straight edge. The sides shall be table rubbed with coarse sand, before paving. All angles and edges of the slabs shall be truly square and free form chipping and shall give a plane surface. The thickness of the slab 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 slab flooring shall be of cement mortar 1:6 (1 cement: 6 coarse sand) 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 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 a bit. Over this surface, cement slurry of honey-like consistency shall be applied. The slab shall then be gently placed in position and tapped with wooden mallet till it is properly padded 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 and floor shall be finished neatly. The finished surface shall be true to levels and slopes, as directed.

2.3 While laying, any chiselling which may be required for making the skirting or dado flush with the plaster and/or other finishes shall be done. Necessary grooves of required size in cm., between plaster and/or other finishes, dado or skirting (if required) shall be provided. Forming machine-cut/rounded edges, gutters, sills, platforms, channels, curbing, etc. if any, if required, shall be provided as per the drawing and design.

2.4 In places where full tiles cannot be fixed, the tiles shall be cut to the size and smoothened at edge to give straight and true joints.

2.5 All necessary slopes, gradients and levels shall be truly maintained as required and directed by the Architect and Engineer-in-charge.

2.6 The floor shall be kept wet for a minimum period of 7 days, so that bedding and joints set properly.

2.7 **Polishing** shall be normally commenced after 14 days of laying the slab. First polishing shall be done with carborundum of 60 - 120 grade grit fitted in the heavy machine and

then second polishing shall be done with carborundum of 220 to 350 grade grit fitted in the heavy machine. Water shall be properly used during polishing. The flooring shall then be washed clean with water and oxalic acid. As directed by the Architect and as specified in the item, no waxing will be permitted.

2.8 If any tile is disturbed or damaged it shall be refitted or replaced, properly jointed and polished.

2.8 The holes required for Nahni traps, pipes any other fittings shall be made without any extra cost.

3.0 Mode of Measurements and Payment :

3.1 Kotah slab flooring shall be measured in $m^{2.}$ 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 m^2. 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. Kotah slabs laid in floor boarders and bands etc. shall be measured in the same item and nothing extra shall be payable on account of these or similar bands 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 The rate shall include the cost of all materials (inclusive of all taxes, levies, and delivery at site), labour & sundry involved in all the operations, at all floors, at any height and level, as described above. It shall also include for breakage and wastage. Floating materials and margin of profit shall also be included. All material samples shall be got approved by the Architect/Engineer-in-charge before placing orders.

3.5 No extra shall be paid for any small quantities like narrow widths, mitred & returned ends, rounds & cutting, fixing and making good upto & around pipes, fittings and fixtures etc.

3.6 The rate shall include for fixing the flooring in composite pattern as per the drawings, using different materials and sizes. The measurements of the different materials shall be taken category-wise separately and paid accordingly.

3.7 The basic rate, if at all provided or agreed upon includes cost of material, all taxes, levies & cost of delivery at site.

3.8 The risers of steps, skirting or dado shall be measured in m^2. 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.

3.9 The rate shall be for a unit of one m^2.

9.2.1 Providing & fixing green double polished kotah of 25 mm. thick of uniform size and colour for platforms, staircases, sinks, shelves, morry etc. in floor, dado or facia etc. up to 1.0 m. long, including necessary machine-cut edges (uniform thickness) rounded edges, necessary cement mortar bedding in C.M. 1:2 of required thickness. Cement joints and pointing as specified with polishing (with oxalic acid), curing, daily mopping with water and kerosene as directed for at least 15 days or up to the satisfaction of the Architect & Engineer-in-charge etc. complete.

1.0 Materials & Workmanship: The relevant specifications of item no. 9.4.1 shall be followed except that the thickness of kotah shall be 25 mm. and the kotah shall be double polished. The size of the kotah shall be upto 1.0 m. only. Waxing shall not be permitted.

The polishing shall be done manually instead of machine polishing and bedding shall be in CM 1:2.

2.0 **Mode of Measurements and Payment:** The relevant specifications of item no. 9.4.1 shall be followed. The rate shall be for a unit of one m^2.

9.2.1 **Providing and laying 63 mm. thick I.P.S (Indian Patent) 1:2:4 (1 cement : 2 coarse sand : 4 graded aggregate 20 mm. nominal size), laid in one layer finished with trowel finish with using 1:1 cement mortar for filling the minor holes etc. complete.**

1.0 **Materials:** Water shall conform to **M-1**. Cement shall conform to **M-3**. Sand shall conform to **M-6**. Aggregate 20 mm. nominal size shall conform to **M-12**. Cement concrete 1:2:4 proportion measured by volume shall conform to relevant specification of ordinary grade 1:2:4 concrete.

2.0 **Workmanship:**

2.1 **Preparation of Surface:** Before the operation for laying the topping is started, the surface of the base concrete shall be thoroughly cleaned of all dirt, loose particles, caked mortar droppings and laitance, if any, by scrubbing with coir or steel wire brush. Where the concrete has hardened so much that roughening of surface by wire brush is not possible, the surface shall be roughened by chipping or hacking at close intervals. The surface shall then be cleaned with water and kept wet for 12 hours and surplus water shall be removed by mopping before the topping is laid.

2.2 **Laying:**

2.2.1 The screed strips shall be fixed over the base concrete dividing it into suitable panels. Before placing the concrete for topping, neat cement slurry shall be thoroughly brushed into the prepared surface of the base concrete just ahead of the finish. Concrete of specified proportion and thickness shall be laid in alternate panels to required level and slope and thoroughly tamped and cement concrete 1:2:4 shall conform to relevant specifications of section 2.00.

2.2.2. The cement concrete flooring of 63 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 Architect. It shall carried be 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 a period of 1.5 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 of 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 is to be 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.

2.2.3 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.

2.2.4 The form work shall be provided if necessary as directed by Architect. Concreting shall be done as per alternate bay method with necessary centering either by mastic or cement mortar as directed.

2.3 Finishing the Surface: After the concrete has been fully compacted it shall be finished by trowelling or floating with neat cement rendering. Finishing operations shall start shortly after the compaction of concrete and the surface shall be trowelled three times at intervals so as to produce an uniform and hard surface. The satisfactory resistance of floor to wear and tear, depends largely upon the care with which trowelling is carried out. The time interval allowed between successive trowelling is very important. Immediately after placing cement rendering, only just sufficient trowelling shall be done to give a level surface. Excessive trowelling in the earlier stages shall be avoided as this tends to bring a layer in cement to the surface. Sometime, after the first trowelling, the duration depending upon the temperature and atmospheric conditions and the rate of setting of the cement used, the surface shall be retrowelled to close any pores in the surface and to bring to surface and to scrape off any excess water in concrete or any laitance. No dry cement shall be used directly on the surface to absorb moisture or to stiffen the mix. The final trowelling shall be done well before the concrete has become too hard but at such a time that considerable pressure is required to make any impression on the surface.

If directed by the Architect & Engineer-in-charge, approved mineral pigment shall be added to the rendering to give desired colour and shade to the flooring at no extra cost.

When 1:2:4 mix is specified the topping shall be rendered with 1:1:2, (1 part cement mortar with a suitable mineral pigment (if directed), 1 part sand and 2 parts grit - 6 mm. and down size), instead of cement only. If specified in the schedule of quantities, the flooring shall be machine polished as per Architect & Engineer- in-charge's instructions.

Wherever the patent flooring is used as a finishing on roof, the joints shall be filled with an approved bitumastic filler in a workman-like manner.

Ironite Topping: Instead of finishing the top with rendering coat of 1:1 cement mortar, the top shall be finished with ironite topping. Unless, otherwise specified, one part of ironite and four parts of ordinary cement by weight shall be mixed dry thoroughly. This dry mixture shall be mixed with grit 6 mm. (1/4") and down size or as otherwise directed in the ratio of 1:2 by volume and well turned over. Just enough water shall be added to this dry mix and mixed thoroughly well and laid to uniform thickness of 12 mm. and compacted. After the initial set has started the surface shall be finished as directed.

3.0 Mode of Measurements and 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 $m^{2.}$ in area, in the floor, nothing extra shall be paid for laying the floor at different levels in the same room or the courtyard.

3.2 The rate shall be for an unit of one m^2.

9.8.1 Providing and laying interlocking paver blocks of high density 60 mm thick M-40 grade for footpath, parking areas, service lanes and other areas as mentioned in the drawing. The metalling and sand bedding shall be done as per the drawing and it shall be paid in relevant item. The work of the paving blocks shall be executed in line and level. It should be laid in such a way that the no cutting of the paver block to be necessary. Paver blocks shall be compacted and shall be re-laid

if necessary.

1.0 Material: The compressive strength of the interlocking paver block shall be minimum 400 kg/sq.cm. and water absorption should be less than 6% by weight. Abrasion resistance should be less than 2 (maximum permissible value 3 mm) Same shall be manufactured by automatic press and compaction must include vibration and pressing force not less than 200 tones. The blocks should be steam cured.

2.0 Base on which the paver blocks to be laid shall be levelled and well compacted with mechanical compactor. Special care of consolidation shall be taken to assure a permanent laying. The depth of the base shall be as per the design and drawing. Base shall be leveled properly. It shall be done with long and strong skreed board. Pipes or skreeding bar may also be used. A frame of steel section shall be made to maintain the base. The skreed shall not be warped or twisted.

2.1 The pavers shall be placed in the pattern as per drawing and detail close together. The space between the pavers should be minimum and consistent. The overall pattern shall be uniform. If require, then the stone shall be cut with a splitter chiesel or masonry saw as require.

2.2 The pavers should then be tamped down and leveled with a vibrating plate compactor. This will bring the pavers to their true grade as well a level the stones. Sand will be forced into spaces to make stones firm and free of movement. Dry fine sand shall be sweeped above the paver block.

3.0 Mode of payment: Rate shall be inclusive of all types of material including handling charges, all types if lead and lift, all types of labour charges, all types of taxes, duties, octroi etc. and transportation charges. It shall be inclsuve of wastage and over heads and profits.The unit of measurement shall be sq.meter.

9.9.1 Providing & fixing white polished marble of 12 mm. thick of uniform size and colour for window sill, sides and top, as per design ,with recess, to recive aluminum window , including necessary machine-cut edges (uniform thickness) rounded edges, necessary cement mortar bedding in C.M. 1:2 of required thickness. Cement joints and pointing as specified with polishing (with oxalic acid), curing, up to the satisfaction of the Architect & Engineer-in-charge etc. complete.

1.0 The relevant specification of item no. 9.4.1 shall be followed except that the 12mm thk white polished marble to be used instead of green polished kotah.

9.10.1 Providing & laying in position, vitrified tiles of approved make & colour, of first quality of any size as per design, set in cement slurry over a minimum 12 mm. thick cement mortar 1:4 bedding and laid to proper slope and level. Joints shall be filled with self matching colour (white cement plus pigment). Curing & cleaning with mild oxalic acid etc. complete to be done for flooring, dado or channel work, as directed by the Architect and Engineer-in-charge.

1.0 **Materials:** Water shall conform to **M-1**. Cement mortar shall conform to **M-11**. The vitrified tiles shall be of first quality and make as specified in the item. The Vitrified tiles

shall be of, Regency or Bell make. The pigment used for mixing with white cement for pointing shall be of Rainbow Tile Mate from `Roffe' or equivalent, conforming to **M-52**

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, as described above, 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/coloured tiles shall then be laid on the cement mortar bedding of 12 mm. thickness, in CM 1:4. The mortar shall have sufficient plasticity for laying and there shall be no hard lumps that would interfere with the evenness of the bedding. The base shall be cleaned and well wetted, before laying. The mortar shall then be spread in thickness not less than 10 mm. at any place and average 12 mm. thick. The proportion of the cement mortar shall be as specified in the item.

2.2 Fixing tiles:

2.2.1 The tiles before laying shall be soaked in water for at least two hours. Neat grey cement grout at 3.3 Kg./Cement/$m^{2.}$ of honey-like consistency shall be spread over the mortar bedding as directed. The edges of the tiles shall be smeared with neat cement slurry. The tiles shall then 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 center line both ways. The Nahni trap coming in the flooring shall be so positioned that its grating shall replace only one tile as far as possible. Where full size tiles cannot be fixed, they shall be cut (Sawn) to the required size and the edges rubbed smooth to ensure straight and true joints. After the tiles are 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 up pin holes that may exist on the surface. White cement with or without matching pigment 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 cure undisturbed for 7 days.

2.2.3 While laying, any chiselling which may be required for making the skirting or dado flush with the plaster and/or other finishes shall be done. Necessary grooves of required size in cm., between plaster and/or other finishes, dado or skirting (if required) shall be provided. Forming machine-cut/rounded edges, gutters, sills, platforms, channels, curbing, etc. if any, if required shall be provided as per the drawing and design.

2.2.4 In places where full tiles cannot be fixed, the tiles shall be cut to the size and smoothened at the edges to give straight and true joints.

2.2.5 All necessary slopes, gradients and levels shall be truly maintained as required and directed by the Architect and Engineer-in-charge.

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 and cleaned by dilute acid and

dried. Proper precautions and measures shall be taken to ensure that the tiles are not damaged in any way till the completion of the construction.

2.3.2 If any tile is disturbed or damaged it shall be refitted or replaced, properly jointed and polished.

3.0 Mode of Measurements and Payment :

3.1 The work done shall be measured in m^2. for the visible area of work done in floor and dado. The length and width of the flooring shall be measured between the faces of skirting or dado or plastered face of walls 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 $m^{2.}$ Nothing extra shall be paid for laying the floors at different levels in the same room. The dado will be measured from the finish floor level to the top of tile fixed.

3.2 The rate shall include the cost of all materials (inclusive of all taxes, levies, and delivery at site), labour & sundry involved in all the operations, at all floors, at any height and level, as described above. It shall also include for breakage and wastage. Floating materials and margin of profit shall also be included. All material samples shall be got approved by the Architect/Engineer-in-charge before placing orders.

3.3 No extra shall be paid for any small quantities like narrow widths, mitred & returned ends, rounds & cutting, fixing and making good upto & around pipes, fittings and fixtures etc.

3.4 The rate shall include for fixing the flooring in composite pattern as per the drawings, using different materials and sizes. The measurements of the different materials shall be taken category-wise separately and paid accordingly.

3.5 The basic rate if at all provided or agreed upon includes cost of material, all taxes, levies & cost of delivery at site.

3.6 The rate shall be for a unit of one m^2.

IRON & STEEL WORK

aProviding, erecting and fixing in position structural steel sections confirming to IS:806:1968 and IS:1161:1979 for the work of sheds, canopy, space frame, industrial buildings including necessary RHS & SHS of TATA, rolled joists, channels, angles and angle cleats, gusset plates, chequred plate, position hips and jack lifters, purlins,etc. including cutting and welding the members as per detailed drawing and design. The rate shall include sand blasting of the steel sections, plates,2 coat of zinc chromate yellow oxide primer and 2 coats of synthetic enamel paint of approved make over all the surfaces of the steel sections.(Only standard measurements will be paid for). Shop drawings for the connection details shall be prepared for the approval of the architect. Gusset plates, Corner plates, joining plates etc. will be profiled and the rate of the profile cutting shall be including in the rate quoted.

1.0 Materials: The structural steel work shall conform to **M-22**. Zinc cromate yellow oxide/red oxide primer to IS:102-1962. Enamel paint to **M-37.**

2.0 Workmanship:

2.1 The steel sections, as specified or required, shall be straightened and cut square, to the correct lengths, as per drawings and design, measured with a steel tape. The sections shall be cold straightened and the finished goods shall be free from bending, twisting and other such defects. The cut ends, exposed to view shall be finished smooth. No two pieces shall be welded or otherwise jointed, to make up the required length or member, except as indicated in the drawing or as directed. All straightening and shaping, to form

the specified shape and size 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 sections, frame work:

2.2.1 The steel structure as shown in the drawings or as per direction of the Architect and Engineer-in-charge shall be laid out on a level platform to full scale or in parts. A steel tape shall be used for measurements to ensure maximum accuracy.

2.2.2 The rate shall include all means of hoisting to places with scaffolding and equipments, etc., cutting chases, etc. in walls and floors of R.C.C., neat finishing, concreting, etc.

2.2.3 Wooden templates 12 mm. to 19 mm. thick or metal sheet template shall be made to correspond to each connecting gusset plate/member 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 drilling. The base of steel columns and the position of the anchor bolts shall be carefully set out.

2.2.4 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. The drawings shall indicate the shop and field rivets and bolts. The steel members shall be distinctly marked or stenciled with paint with the identification mark, as given in the shop drawings.

2.2.5 Great accuracy shall be observed in fabrication of various members, 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, links, buckles or open joints. Before making holes in individual members for fabrication, the steel work intended to be riveted or bolted together, shall be assembled or clamped properly and tightly, so as to ensure close abutting or lapping of surfaces of the different members, with proper jigs and fixtures. All contact surfaces shall be cleaned and given a coat of primer. 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, in the required manner, as per the details and fitted close together, properly and tightly.

2.2.6 Web splice plates and fillers under stiffeners, shall be cut within 3 mm. to fit properly, or flange angles, web plates of girders shall have their ends flush with the top of angles forming the flanges, unless otherwise required. The web plates when spliced shall have clearance of, not more than 6 mm.

2.2.7 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.

2.2.8 Pins and rollers shall be accurately turned to gauge. These shall be straight and smooth and free from flaws. The roller bearing shall be provided with adequate arrangement for holding the girders or trusses resting on it. In columns caps and bases, the ends of shafts together with the attached gusset angles, channels etc., after riveting together shall accurately be mechanised so that the parts butt connected against each other over the entire surface of contact, connecting angles or channels shall be fabricated and placed in position with greater accuracy so that they are not unduly reduced in thickness by machining.

2.2.9 The ends of bearing stiffeners shall be mechanised 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 reamered thereafter to the required size. The holes for rivets and bolts shall be larger than the nominal diameter of rivets or black bolts, as allowable by IS : 800.

2.2.10 Holes shall have their axis perpendicular to the surface bored through. The drilling or reaming shall be free from burrs and the holes shall be clean and accurate, to the diameter specified in the drawings. No enlargement of the holes by filling, man drilling or oxyacetylene flame shall be allowed. Maximum deviation for spacing of two holes shall be $\pm$ 1 mm. Holes for counter sunk bolts shall be made in such a manner, that their heads fit flush with the surface after fixing. Hole reaming shall be allowed only if the number of faulty holes do not exceed 15% of the total number of holes for one joint.

2.2.11 The fabrication work shall be completed in workshop as far it is practicable to do so. Site joints shall be done with rivets and fitted bolts or black bolts, 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 required is of such a nature, 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.

2.2.12 **Assembly :** The parts assembled for riveting shall be in close contact with each other and the bearing 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. Members to be riveted shall be properly pinned or bolted and rigidly held together while riveting. Hole for rivets and black bolts shall be of nominal diameter plus 1.5 mm., for rivets of nominal diameter less than 25 mm. and 2.0 mm., for rivets of nominal diameter exceeding 25 mm., unless specified otherwise. Drifting 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.

2.2.13 **Riveting :**

2.2.13.1 Rivets shall be used where the connection is such that slip under load has to be avoided.

2.2.13.2 Members to be riveted shall have all their parts firmly drawn and held together before and during riveting and special care shall be taken in this respect for all single riveted connections. For multiple riveted connections, a service bolt shall be provided in every third or fourth hole.

2.2.13.3 The shanks of rivets shall project beyond the plate surface sufficiently so as to fill the hole thoroughly and form the required head after riveting.

2.2.13.4 The riveting shall be done by hydraulic or pneumatic process. However, where such facilities are not available, hand riveting may be done, if permitted by Architect and Engineer-in-charge. 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 heat finish with heads full and of equal size. All loose, burnt or badly formed rivets with concentric or different 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 rivets and the assembled members. Caulking or reoccupying shall not be permitted.

2.2.13.5 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.

2.2.13.6 All rivet heads shall be painted with red lead paint, within a week of their fixing.

2.2.14 While bolting, all bolt heads and nuts shall be hexagonal and of equal size, unless specified otherwise. The screwed threads shall conform to IS : 1363-1960 and the threaded surface shall not be tapered.

2.2.15 The nominal length of the bolt shall be the distance from the underside of the head to the farthest end of the shank. The nominal diameter shall be the diameter at the shank above the screwed threads. Bolts, nuts, washers shall be thoroughly cleaned and dipped in double boiled linseed oil, before use. The bolts shall be of such length so as to project atleast 2 clear threads beyond the nuts when fixed in positions and these shall fit in the holes without any shakes. The nut shall be fit in the threaded ends of bolts properly, i.e by tightening them so as to transfer the required tension. 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, it shall project through the nut atleast by 2 thread. 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 lock nuts and spring washers of cross-cutting, as directed.

2.2.16 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 oxide and 3 coats of synthetic enamel paint as per relevant specifications of painting. However, the application shall be such that the first coat of paint shall be much lighter than the final coat, the second coat shall be slightly lighter than the final coat and the final coat shall be exactly of the shade specified. This differentiation is done to demarcate the no. of application of painting coats.

3.0 Steel Work Welded:-

3.1 **Workmanship:-**

3.1.1 The relevant specifications of item No. 2.2 shall be followed except that the steel work shall be done by welding. Straightening, shaping to form, cutting and assembling shall be as per item no. 2.2 as far as applicable except that the words `riveted or bolted' shall be read as `welded' and holes shall be made for the bolts used for temporary fastening as shown in drawings. The definition of various terminologies in welding process shall be as follows:

3.1.1.1 **Run:** The metal deposited during one passage of the electrode or blow pipe, in making of a joint

3.1.1.2 **Bead :** A single run of weld metal deposited on a surface.

3.1.1.3 **Weld :** An union between two pieces of metal at faces rendered plastic or liquid by heat or by pressure or both. Filler metal may be used to effect the union.

3.1.1.4 **Weld metal :** All metal melted and/or made plastic in making a weld.

3.1.1.5 **Butt weld :** A weld in which the weld metal lies substantially within the extension of the planes of the surfaces of the parts joined or within the extension of the planes of the smaller of the 2 parts, of different size. The edges of the metal pieces shall be bevelled or chiselled to the required shape at the throat, for which no extra payment shall be made.

3.1.1.6 **Crater :** A depression left in the weld metal where the arc was broken or the flame was removed.

3.1.1.7 **End crater :** A crater at the end of a weld or at the end of a joint.

3.1.1.8 **Fillet weld :** A weld of approximately triangular cross-section joining two surfaces, approximately at right angles to each other in a lap joint, tee joint or corner joint. It shall be of two types 1) Continuous 2) Intermittent.

3.1.1.9 **Fusion welding :** Any welding process in which the weld is made between metals in a state of fusion without hammering or pressure.

3.1.1.10 **Fusion Penetration :**

3.1.1.10.1 **In fusion welding,** the depth to which the parent metal has been fused.

3.1.1.10.2 **In spot, seam or projecting welding,** the distance from the interface to the edge of the weld nugget, measured in each case on a cross-section through the center of the weld and normal to the surface.

3.1.1.10.3 **Non-fusion welding:** A term applied to the deposition by Oxy-Acetylene process, of filler metal on parent metal, without fusion of the latter.

3.1.1.10.4 **Oxy-Acetylene pressure welding:** Pressure welding in which an Oxy-Acetylene flame is used to make plastic the surface, to be united. No filler metal is used.

3.1.1.10.5 **Throat:** In a resistance welding machine, the distance from the center line of the electrodes or platens to the nearest point of interference for flat work or sheets. In case of seam-welding machine with an universal head, the throat depth is measured with the machine arranged for transverse welding.

3.1.1.10.6 **Throat thickness :** The minimum thickness of weld metal in a fusion weld measured as under :

a) For a fillet weld or A, V, U, J or a bevel butt weld: Along a line passing through the roof.

b) For a close square-butt-weld: In the plane of the abutting faces.

c) For an open square-butt-weld: At the center of the original gap in a plane parallel to the fusion faces.

3.2 Welding shall generally be done by electric process. The electric arc welding is usually adopted and is economical. In absence of electricity, generators shall be used. Gas welding shall be restored to using oxyacetylene flame with specific prior approval. Gas welding shall not be permitted for structural steel work as it requires heating of the members along with the welding rod and temperature stresses are likely to be developed in the welded members. Precautions shall be taken to avoid distortion of the members due to temperature stresses.

3.3 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 welded as well as type of

electrodes to be used. Symbol for welding on plans and shop drawing shall be according to IS : 813-1961. As far as possible, every effort shall be made to limit the welding that must be done after erection so that, improper welding that is likely to be done due to heights and difficult position on scaffolding etc., after erection, is avoided. The maximum diameters of electrodes for welding any work shall be as under, unless otherwise specified.

Average thickness of plate or section.	Maximum dia. of electrode to be used.
Less than 5 mm.	3 mm.
5 mm. upto but not including 8 mm.	4 mm.
8 mm. upto but not including 10 mm.	5 mm.
10 mm. upto but not including 16 mm.	6 mm.
16 mm. upto but not including 25 mm.	9 mm.
25 mm. and over	9 mm.

The welding work shall conform to IS : 816-1969.

3.4 **Preparation of surface:** 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.

3.5 **Assembly for welding:** Before welding is commenced, the plates shall be first 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.

3.6 **Precautions:** The operations connected with welding and cutting equipment shall conform to safety requirement given in IS : 818-1968.

3.7 **Welding process :** 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 sequence of welding shall be such that where possible, the members which offer the greatest resistance to compression are welded first.

(d) Freedom of movement of one member of the joint shall be allowed wherever possible. Wherever joints shall be welded allowance shall be made for the movement of one component to the order of 1.5 mm.

(e) The electrode manipulation during welding shall be such as to ensure that (1) The base metal is in fused stage when the filler metal makes contact with it. (2) The filler metal does not overflow upon any unfused base metal. (3) The base metal is not under-cut along the weld edges. (4) and that the metal floats, the slag, the oxides and the gas that bubbles to the surface behind the advancing pool.

3.8 Each time the arc is started, the electrode shall be moved in such a way that the fusion of the base metal at the starting point is assured. At the completion of a run the movement of electrode shall be adjusted or the electrode size changed.

3.9 After every interruption of the arc except at the completion of a run, the arc shall be restarted ahead of previous deposit and then moved back to fill the crater or such alternative technique shall be used as will ensure complete filling of the crater or complete fusion between the new and old deposits and the base metal at the point of junction and result in continuous weld. Before the welding operation is completed, all traces of slag shall be removed from the deposit, by chipping if necessary and the deposit and the adjoining base metal shall be wire brushed and cleaned at all points. The requirements shall apply not to successive layers, but also to successive beads and to the overlapping area wherever a junction is made on starting a new electrode.

3.10 The weld shall be free from cracks, discontinuity and other defects like under size, over size, under-cutting etc. All the defective welds which shall be considered harmful to the strength shall cut out and re-welded.

3.11 Finished welds and adjacent part shall be protected with clean boiled linseed oil and after all slag has been removed from the welds and adjacent parts, painting shall be done after the same is approved.

2.12 All the members shall be thoroughly cleaned of rust, cakes, dust etc. and given a priming coat of red lead paint before fixing them in position.

2.13 Grinding to the finished level is to be done, if directed by the Architect and Engineer-in-charge. All expose weld shall be ground smooth. Welds which have not been ground shall be scrubbed with a 10% solution of Hydrochloric acid which shall be washed of with water before painting unless alkali resistant paint is used.

2.14 For erection the relevant specifications of item no. 2.2 shall be adopted except that while erecting a welding structure, adequate means shall be employed for temporary fastening the members together and bracing the framework until the joints are welded. Such means shall consist of bolts, tack welding or other positive devices imparting sufficient strength and stiffness to resist all temporary loads and lateral forces including wind.

4.0 Mode of Measurements and Payment:

4.1 (a) All work shall be measured on the basis of finished dimensions, as fixed on site and measured net unless specified otherwise.

(b) The weight of steel sections, steel strips in finished works shall be calculated from standard weight on the same basis on which steel is supplied to the Contractor by the Client or those given in relevant IS Codes, if steel is arranged by the contractor.

(c) The weight of steel plates and strips shall be taken from relevant IS Codes, based on 7.85 kg/m² for every mm. 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 the Client.

(d) Unless otherwise specified weight of cleats, brackets, packing pieces, bolts, nuts, washers, distance pieces, separators, diaphragm gusset (taking over all square dimension) fish plates etc. shall be added to the weight of respective items.

(e) In riveted work, allowance shall be made for weight of rivet heads. No deductions shall be made for rivet or bolt holes excluding holes for anchor or holding down bolts.

(f) For forged steel and steel castings, weight shall be calculated on the basis of 7850 kg/m^3.

(g) Unless otherwise specified an addition of 2.5% of the weight of structure shall be made for shop and site rivet heads in riveted steel structure.

(h) Dimensions other than cross sections and thickness of plates shall be measured to nearest 0.001 m.

(i) Mill tolerance shall be ignored when weight is determined by calculation.

4.2 The rate includes cost of all material, labour, erection, hoisting, scaffolding, safety measures and sundry required for proper completion of the item of work, at all heights. This shall also include conveyance and delivery, handling, loading, unloading and storing etc. required for completion the item described above including necessary wastage involved.

4.3 The weight of welding material shall not be added in the weight of members for payment and nothing extra shall be paid for making and filling the temporary fastening of members during erection before welding.

4.4 The rate shall be for a unit of one kg.

4.5 Only standard sectional weight will be considered and welding will not be considered in weight.

PAINTING & POLISHING WORK

11.2.1 Providing & applying Distempering (3 coats) with oil bound washable distemper of approved manufacturer like Asian, Berger, Nerolac or equivalent and of required shade, on any surface to give an even shade, including a priming coat with alkali resistant primer and applying two coats of putty after thoroughly brushing the surface free from mortar dropping and other foreign matter and also including preparing the surface even and sand papered smooth etc., after applying of putty, complete, as directed..

1.0 Materials:

1.1 Oil bound washable distemper and cement primer if on plastered surfaces and woodorite, if on wood surfaces, shall be of approved brand and manufacture. The distemper shall be of required colour and shade and the same shall conform to IS : 428-1969. Paint shall conform to **M-37**.

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 (Zoola) 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 and the floor area shall be covered with plastic so that the flooring is not spoilt.

2.2 **Preparation of surface:**

2.2.1 The surface shall be thoroughly cleaned of all dust, dirt, mortar dropping and other foreign matter before white wash is to be applied.

2.2.2 The surface spoiled by smoke soot shall be scrapped 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 and dirt and shall be washed with clean water.

2.2.3 Oil or grease spots shall be removed by suitable chemical. Smooth surfaces 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 portions shall be wetted and allowed to dry. Any crevices, at any level shall be cleaned and filled with the plaster mortar and cured as above. 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 material similar in composition to the surface to be prepared.

2.2.1 The undecorated surface to be distempered shall be thoroughly brushed from dust, dirt, grease, mortar dropping and other foreign matter and sand papered smooth. New plaster surface shall be allowed to dry for at least 2 months before applications of distemper or one coat of white wash with white cement shall be done prior to painting with distemper.

2.2.2 All unnecessary nails, hooks etc. shall be removed. Pitting in plaster shall be made good with plaster again and papered 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 applied. The surface affected by moulds, moss, fungi, algae lichens, efflorescence etc. shall be treated in accordance with IS : 2395 (Part-1)-1966. Before applying distemper, any unevenness shall be made good by applying putty made out of plaster of paris mixed with water, on entire surface, including filling up the undulation and then sand papering the same after it has dried.

2.3 **Priming coat :**

2.3.1 A priming coat of cement primer of approved manufacture shall be applied over the papered surface in case of new work or undecorated surface. If the distemper priming is done after the plastered wall surface dries completely, the distemper primer shall be avoided.

2.3.2 Application of primer and putty 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. A coat of putty (lapi) shall be applied to the entire

surface. Putty shall be used of readymade or brought of the company like Asian as directed by the Engineer-in-charge and Architect. The second coat of primer and putty shall then be applied and it shall thereafter be allowed to dry for at least 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 mineral turpentine oil or any other prescribed thinner in a manner recommended by the manufacturer only. Sufficient quantity of distemper required for a day's work shall be prepared.

2.5 **Application of Distemper coat :**

2.5.1 On any surfaces, after the primer coat has dried for at least 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 at least 24 hours between 2 consecutive coats to allow proper drying of the preceding 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 a day's work, brushes shall be thoroughly washed in hot water with 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 measure:**

2.6.1 The surface of doors, windows, ventilators, floors, articles of furniture etc. and such other part of the buildings which 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 and Payment:

3.1 Priming coat of distemper primer, scraping of surface spoiled by smoke soot, removal of oil and grease spots, treatment for infection of efflorescence, 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 this item 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 m^2.

All work shall be measured in m^2. No deductions shall be made for ends of joints, beams, posts etc. and openings, not exceeding 0.5 m^2. 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 $m^{2.}$ but not exceeding 3.0 $m^{2.}$ 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 for one face only.

(b) When each face of 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 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 reveal is equal or more than that on untreated side neither deductions nor additions to be made for reveals, jambs, soffits, sills etc.

3.4 In case of opening of area exceeding 3.0 $m^{2.}$ 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 Corrugated surfaces shall be measured flat as fixed and not girth. The quantities 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 picked out in a different finish/colour shall be girthed and included in the general area.

3.8 Item includes removing nails, making good holes, cracks, patches with materials similar in composition of distemper.

3.9 The rate includes cost of all materials, labours, scaffolding, protective measures etc. involved in all the operations described above, carried out at all floor heights, in any position, at all levels. This shall also include conveyance, delivery, handling, unloading, storing work etc.

3.10 The rate shall be for a unit of one m^2.

11.3.1 Providing & applying three coats of Glossy or Matt/luster enamel paint of desired shade, of approved make, shade, brand and manufacture, on any surfaces, at all heights, to give an even shade, including thoroughly brushing the surface free from mortar droppings and other foreign matter and sand papering smooth. The paint shall be applied after applying a coat of primer and metal putty.

2.0 **Materials:** Glossy, Flat, Pearl Luster and Matt enamel paint shall conform to IS: 1932-1964 and **M-37B**.

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, cage etc. with seal unbroken.

2.1.2 All materials not in actual use shall be kept properly protected, lid 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 paint shall be stirred thoroughly in its container before pouring into small containers.

2.1.3 If for any reasons, 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 unfavorable weather and all the surfaces shall be thoroughly dry before painting work is started.

2.1.5 For Glossy, Flat, Pearl luster and Matt finish, painting of same specification shall be followed except that the type of paint shall be changed as per the direction of Architect and Engineer- in-charge, to give the desired finish.

2.2 **Application:**

2.2.1 Brushing operation are to be adjusted to the spreading capacity advised by the manufacturer 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 Architect & Engineer-in-charge before next coat is started.

2.2.3 Each coat shall be lightly rubbed down with sand paper of fine pumice stone and cleaned off 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 moldings 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 Approved best quality brushes shall be used.

3.0 Mode of Measurements and 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 herein after:

(a) Dimensions shall be measured to the nearest 0.01 m.

(b) Areas shall be worked out to the nearest 0.01 m^2.

3.3 No deductions shall be made for openings not exceeding 0.5 m^2 each and no addition shall be made for painting to beading, moldings, edges, jambs, soffit etc. of such opening.

3.4 In case of fabricated structural steel and iron work, primer coat of oil paint shall be included with fabrication**.** In case of trusses, if measured in m^2, compound girders, stanchions, lattices, girder and similar work, actual area shall be measured in m^2 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 relevant I.S. code for payment.

3.6 The rate shall include the cost of all materials, labour, scaffolding, protective measures etc but is excluding priming coat. required for the above specified operation, at all floors, at any height, in any position. Scrapping of surface, washing etc. of surfaces spoiled by smoke, soot, removal of oil and grease spots, treatment for infection with efflorescence, moulds, moss, fungi, algae and lichen shall not be paid extra. This shall also include conveyance, delivery, handling, unloading, storing work etc.

3.6 The rate shall be for an unit of one m^2..

11.4.1 Providing and applying, 100% Acrylic paint of approved shade, on any surface (3 coats) to give an approved brand or manufacture (Apex or equivalent) and of required even shade after thoroughly brushing the surface to remove all dirt and remaining all loose powdered materials.

1.0 Materials :

1.1 The water shall conform to M-1. Cement water proofing paint shall conform to IS : 5410-1969, M-37

.8.(H) and shall be of approved shade.

2.0 Workmanship :

2.1 **Scaffolding :** The relevant specifications of item No. 11.1.1 shall be followed.

2.2 **Preparation of surface :**

The relevant specifications of item no. 11.1.1 shall be followed except that the work 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 paint shall be prepared by adding paint powder to water and stirring to obtain a thick paste, which shall then be diluted to a brush able 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 shut 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 7^0C within 48 hours after application.

2.4.2 When weather conditions are such as to cause damage, the work shall be carried out in 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 undecorated surfaces, the surface shall be treated with minimum two coats of water proof cement paint. Not less than 24 hours shall be allowed between two consecutive coats. Next coat shall not be started until the proceeding 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 fiber bristles. The paint shall be brushed in uniform thickness and shall be free from excessively heavy brush marks. The lumps 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. 11.2.1, Para 2.6.

3.0 Mode of Measurements and Payment:

3.1 The relevant specifications of item No. 11.1.1 shall be followed.

3.2 The rate shall be for a unit of one m^2.