

CIVIL
ENGINEERING
STANDARD
DATAS

Design Mix:

M10 (1 : 3.92 : 5.62)

Cement	:	210 Kg/ M ³
20 mm Jelly	:	708 Kg/ M ³
12.5 mm Jelly	:	472 Kg/ M ³
River sand	:	823 Kg/ M ³
Total water	:	185 Kg/ M ³
Fresh concrete density:		2398 Kg/M ³

M20 (1 : 2.48 : 3.55)

Cement	:	320 Kg/ M ³
20 mm Jelly	:	683 Kg/ M ³
12.5 mm Jelly	:	455 Kg/ M ³
River sand	:	794 Kg/ M ³
Total water	:	176 Kg/ M ³
Admixture	:	0.7%
Fresh concrete density:		2430 Kg/ M ³

M25 (1 : 2.28 : 3.27)

Cement	:	340 Kg/ M ³
20 mm Jelly	:	667 Kg/ M ³
12.5 mm Jelly	:	445 Kg/ M ³
River sand	:	775 Kg/ M ³
Total water	:	185 Kg/ M ³
Admixture	:	0.6%
Fresh concrete density:		2414 Kg/ M ³

Note: sand 775 + 2% moisture, Water 185 -20.5 = 164 Liters,
Admixture = 0.5% is 100ml

M30 (1 : 2 : 2.87)

Cement	:	380 Kg/ M ³
20 mm Jelly	:	654 Kg/ M ³
12.5 mm Jelly	:	436 Kg/ M ³
River sand	:	760 Kg/ M ³
Total water	:	187 Kg/ M ³
Admixture	:	0.7%
Fresh concrete density:		2420 Kg/ M ³

Note: Sand = 760 Kg with 2% moisture (170.80+15.20)

M35 (1 : 1.79 : 2.57)

Cement	:	410 Kg/ M ³
20 mm Jelly	:	632 Kg/ M ³
12.5 mm Jelly	:	421 Kg/ M ³
River sand	:	735 Kg/ M ³
Total water	:	200 Kg/ M ³
Admixture	:	0.7%
Fresh concrete density:		2400 Kg/ M ³

Note: sand = 735 + 2%, Water = 200- 14.7 = 185.30,
Admixture = 0.7%

M40 (1 : 1.67 : 2.39)

Cement	:	430 Kg/ M ³
20 mm Jelly	:	618 Kg/ M ³
12.5 mm Jelly	:	412 Kg/ M ³
River sand	:	718 Kg/ M ³
Water Cement ratio	:	0.43
Admixture	:	0.7%

Note: Sand = 718 + Bulkage 1%

M45 (1 : 1.58 : 2.26)

Cement	:	450 Kg/ M ³
20 mm Jelly	:	626 Kg/ M ³
12.5 mm Jelly	:	417 Kg/ M ³
River sand	:	727 Kg/ M ³ + Bulkage 1%
Water Cement ratio	:	0.43
Admixture	:	0.7%

M50 (1 : 1.44 : 2.23)

Cement	:	450 Kg/ M ³
20 mm Jelly	:	590 Kg/ M ³
12.5 mm Jelly	:	483 Kg/ M ³
River sand	:	689 Kg/ M ³ + Bulkage 12%
Water Cement ratio	:	0.36 (188 Kg)
Admixture	:	1.20% ³
Micro silica	:	30 Kg
Super flow	:	6.7% of cement

WEIGHT OF MATERIALS

50 mm J bolt	:	751 No's / 52 Kg
40 mm J bolt	:	883 No's / 54 Kg
2" nails	:	385 No's / Kg
3" nails	:	118 No's / Kg
4" nails	:	72 No's / Kg
Binding wire	:	170 rings /Kg

SIMPLEX FORMULA:-

$$U = (N / L) \times \{(W \times H) / (1 + S)\} \times \text{Sq.rt} \{(L/50)\}$$

U	=	Ultimate load in tones
N	=	Number of blows
L	=	Pile length in feets
W	=	Weight of hammer in tones
H	=	Height of fall in feet.
S	=	Set for 1 blows in Inch

Safe load = (ultimate load/ 2.5)

Factor of safety = 2.5

10 blows = below 10 MM

Thread couplers:- (For Column lapping)

Couplers for reinforcing bars 20 mm to 28 mm crimped sleeve

Slump IS 456

Lightly reinforced 25 – 75 mm

Heavily reinforced 75 – 100 mm

Trench fill (insitu & Tremie) 100 – 150 mm

(For Termie vibrator not required)

Durability:-

- The Environment
- Cover to Steel
- Type and quality of the constituent material
- Cement content and Water Cement ratio.
- Workmanship to obtain full compaction.
- Compaction and efficient curing.

Accuracy of measuring equipment in batching plant.

Cement	:	$\pm 2\%$
Aggregate	:	$\pm 3\%$
Admixture	:	$\pm 3\%$
Water	:	$\pm 3\%$
Mixing time	:	2 minutes for one mixing.(site Mixing)

TOLERANCE:-

Form work:-

In C/S for columns & Beams deviation is	= + 12mm more (or) - 6mm less in size
In footing plan	= + 50 mm more (or) – 12 mm less size
In depth	= $\pm 0.05 D$ (specified thickness).

Reinforcement:-

For effective depth $D \leq 200\text{mm}$	= $\pm 10\text{mm}$
For effective depth $D > 200\text{mm}$	= $\pm 15\text{mm}$
For Cover to reinforcement	= + 10mm
Maximum freefall of concrete	= 1.50 m height.

TOLERANCE ON DIA IN LENGTH:-

0-25mm	= ± 0.5 %
25-35mm	= ± 0.6 %
35-50mm	= ± 0.8 %

TOLERANCE ON WEIGHT PER METRE:-

0-10mm	= ± 7 %
10-16mm	= ± 5 %
16 and above	= ± 3 %

TOLERANCE FOR CUTTING LENGTH :-

- | | | |
|----|--|-----------------------|
| A) | When the specified length is not given | = + 75mm (or) – 25 mm |
| B) | When the min. length is specified | = + 50 mm (or) – 0 mm |

GENERAL:-

- Lapping is not allowed for the bars having diameters more than 36 mm.
- Chair spacing maximum spacing is 1.00 m (or) 1 No per 1 Sq.m
- For dowels rod minimum of 12 mm dia should be used.
- Chairs minimum of 12 mm dia bars to be used.
- Longitudinal reinforcement not less than 0.8% and more than 6% of gross C/S.
- Minimum bars for square column is 4 No's and 6 No's for circular column.
- Main bars in the slabs shall not be less than 8 mm (HYSD) or 10 mm (Plain bars) and the distributors not less than 8 mm and not more than 1/8 of slab thickness.
- Minimum thickness of slab is 125 mm
- Dimension tolerance for cubes ± 2 mm.
- Free fall of concrete is allowed maximum to 1.50m.
- Lap slices not be used for bar larger than 36 mm.
- Water absorption not more than 15 %.
- PH value of the water should not be less than 6.
- Compressive strength of Bricks is 3.5 N / mm²
- In steel reinforcement binding wire required is 8 kg per MT
- In soil filling as per IS code 100 sqm should take 3 sample for core cutting test

DENSITY OF MATERIALS:-

Weight of Bricks	= 1600-1920 Kg/M ³
Weight of Block work	= 1920 Kg/M ³
Weight of R.C.C	= 2310 – 2700 Kg/M ³

CURING:-

Super Sulphate cement	: 7 days
Ordinary Portland cement OPC	: 10 days
Minerals & Admixture added cement:	14 days

STRIPPING TIME (De-Shuttering):-

For columns, walls, vertical form works	: 16-24 hrs
Soffit formwork to slabs	: 3 days (props to be refixed after removal)
Soffit to beams props	: 7 days props to refix after removal.
Spanning up to 4.50m	: 7 days
Spanning over 4.50m	: 14 days
Arches spanning up to 6m	: 14 days
Arches spanning over 6m	: 21 days

CUBE SAMPLES:-

1 – 5 M ³	:	1 No.
6 – 15 M ³	:	2 No's
16 – 30 M ³	:	3 No's
31 – 50 M ³	:	4 No's
Above 50 M ³	:	4 + 1 No of addition sample for each 50 M ³

TEST RESULTS OF SAMPLES:-

The test results of the samples shall be the average of the strength of three specimens.
The individual variation should not be more than ± 15 % of the average.

If more the results of the sample are invalid.

COMPRESSIVE STRENGTH:-

3 days	:	45 %
7 days	:	67 – 70 %
14 days	:	85 %
28 days	:	100% +

APPROXIMATE COST PER SQ.FT (MANTRI PROJECT)

HIGH RISE BUILDING:-

Structure (Concreting, Block work, Plastering, Flooring, Dado, painting)	= 979 / Sft
Electrical works (Modular switches)	= 172 / Sft
Plumbing (P.H.E)	= 93 / Sft
Fire Fighting	= 13 / Sft
Lift	= 34 / Sft
Common Area	= 94 / Sft
External development (Landscape, road works, drains etc.,)	= 87 / Sft

TEST FOR SILT & CLAY:-

- Take 200 ml measuring cylinder fill sand up to 100ml mark
- Add 150ml of water and shake well
- Allow it to settle for 3 hrs.
- Measure the total height and height of clay.
- Calculate the clay and silt in total sand
- Clay and Silt should not exceed 3% by weight (or) 8-10% by volume
- For crushed sand Clay and Silt should not exceed 15% by weight

ORGANIC IMPURITIES:-

- Don't dried the specimen before testing
- Take 250 ml measuring cylinder.
- Add 75 ml of water with 3% of Sodium Hydroxide. Fill sand layer to 125 ml
- Make the volume up to 200ml by adding more of sodium hydroxide solution
- Shake well allow it to stand for 24 hrs
- If the solution becomes darker than straw yellow colour then the sand has to be tested for further by casing mortar cubes for 7 & 28 days is not less than 95%.

- If the solution is lighter or just straw yellow colour the sand can be used for concreting without any further test.

QUANTITIES REQUIRED:-

Plastering (CM 1:3)	= 1.50 bags / 10 m ²
Plastering (CM 1:5)	= 1.05 bags / 10 m ²
Ceiling Plastering (CM 1:3)	= 48 kg / 10 m ²
Brick work (CM 1:5)	= 86 Kg / 10 m ³
Brick work (CM 1:6) 9" thick	= 80.64 Kg / 10 m ³
Brick work (CM 1:3) 4½" thick	= 15.46 Kg / 10 m ³
Lime for white washing	= 10 Kg/100 m ²
Painting	= 10 ltr/ 100 m ²
Distemper 1 st coat	= 6.5 Kg / 100 m ²
Distemper 2 nd coat	= 5.0 kg / 100 m ²
Snowcem 1 st coat	= 30 Kg / 100 m ²
Snowcem 2 nd coat	= 20 Kg / 100 m ²
Paint ready mixed one coat	= 10 ltr / 100 m ²
Weathering Course	= 7.68 Kg / m ²
Flooring	= 8.10 kg / m ²
Pressed tiles for weathering course (CM 1:3)	= 7.68 Kg / 10 m ²
Granolithic floor finish	= 8.10 Kg / 10 m ²

WATER CEMENT RATIO:-

M20	=	0.55
M25	=	0.50
M30	=	0.45
M35	=	0.45
M40	=	0.40

SPACING OF BARS:-

- Provide the dia of the bar, if the dia of the bar are equal.
- Provide the dia of the larger bar, if the dia are unequal.
- 5mm more than the nominal maximum size of the coarse aggregate.

CONVERSION:-

1 Acre = 4046.72 m²

1 cent = 40.4672 m²

COVER TO MAIN REINFORCEMENT:-

Column	:	40 mm (D>12mm)
Column	:	25 mm (D= 12mm)
Beam	:	25 mm
Slab	:	15 mm (or) not less than dia of the bar.
Footing	:	50 mm
Sunshade (Chajja)	:	25 mm

CO-EFFICIENT FOR PAINTING:-

Partly paneled and glazed doors	: 0.80 times the door or window area.
Collapsible gates	: 1.50
Corrugated sheeted steel doors	: 1.25
Rolling shutters	: 1.10
Expanded metal hard drawn steel	: 1.00
Open palsied fencing and gates, brace, rails	: 1.00
Corrugated iron sheeting	: 1.14
A.C corrugated sheeting	: 1.20
A.C Semi corrugated sheeting	: 1.10
Wire gauged shutters	: 1.00
Paneled framed and braced doors, windows	: 1.30
Ledged and battened doors and windows	: 1.30
Flush doors	: 1.20
Partly paneled doors	: 1.00
Fully glazed doors	: 0.80
Fully louvered	: 1.80
Trellis work	: 2.00
Curved or enriched	: 2.00
Weather boarding	: 1.20
Wooded single roofing	: 1.10
Boarding with cover tilets and match boarding	: 1.05
Tile and slate battering	: 0.80

Plain sheeted steel	: 1.10
Fully glazed steel	: 0.50

Calculation of Materials:-

a) For 1 m³ of concrete Mix 1:2:4 (M15)

Add 50% for wet concrete = 1.50 m³

$$= 1.50 / (1+2+4) = 0.214 \text{ m}^3$$

For 1 m³ = 30 bags of cement required (1440/50) say 30 bags

$$\text{Cement} = 0.214 \times 30 = \mathbf{6.42 \text{ bags}}$$

$$\text{Sand} = 0.214 \times 2 = \mathbf{0.428 \text{ m}^3}$$

$$\text{Aggregate} = 0.214 \times 4 = \mathbf{0.856 \text{ m}^3}$$

b) Wall plastering in CM 1:4 of 12 mm thick for 100 m²:-

$$\text{Volume} = 100 \times (12/1000) = 1.20 \text{ m}^3$$

$$\text{Add 30 to 35\% as bulking of sand} = 0.36 \text{ m}^3$$

$$\text{Add 20 as wastage of sand} = \underline{0.312 \text{ m}^3}$$

$$\text{Total} = \underline{\mathbf{1.872 \text{ m}^3}}$$

$$= (1.872/1+4) = 0.374 \text{ m}^3$$

$$\text{Cement} = 0.374 \times 30 = \mathbf{10.77 \text{ bags}}$$

$$\text{Sand} = 0.374 \times 4 = \mathbf{1.496 \text{ m}^3}$$

c) For 100 m³ of solid Block masonry in CM 1:6 mix 8" thick:-

$$\begin{aligned} \text{Volume} &= 100 \times 0.2 \text{ (Thickness of wall)} \\ &= 20 \text{ m}^3 \end{aligned}$$

$$\begin{aligned} \text{No. of blocks required} &= 20 / (0.4 \times 0.2 \times 0.2) \\ &= 12502 \text{ No's} \end{aligned}$$

$$\begin{aligned} \text{Volume of mortar} &= 20 - \{0.39 \times 0.19 \times 0.19 \times 1250\} \\ &= 20 - 17.598 \\ &= 2.40 \text{ m}^3 \end{aligned}$$

Note: 200mm – 10 mm for mortar thickness = 190 mm

$$\begin{aligned} \text{Blocks} &= 17.598 / (0.4 \times 0.2 \times 0.2) \\ &= 1100 \text{ No's} \end{aligned}$$

$$\text{Add 2\% wastage} = 22$$

$$\text{Total} = 1122 \text{ No's}$$

$$\text{Increase by 25\% for dry mortar} = 3 \text{ M}^3$$

Cement	$= 3 / (1+6)$
Sand	$= 0.429 \text{ M}^3$
Blocks	$= 0.429 \times 30 = 12.50 \text{ bags}$
	$= 0.429 \times 6 = 2.57 \text{ M}^3$
	$= 1122 \text{ No's}$

STEEL:-

- Weight of rod per meter length $= d^2 / 162$ where d in mm
- “L” for column main rod in footing is minimum of **300mm**
- Hook for stirrups is **9D** for one side
- For Cantilever anchorage length for main steel is **69D**
- No. of stirrups = (clear span/Spanning) + 1
- Design strength is M 40, target strength is $1.25 \times 40 = 50 \text{ Mpa}$

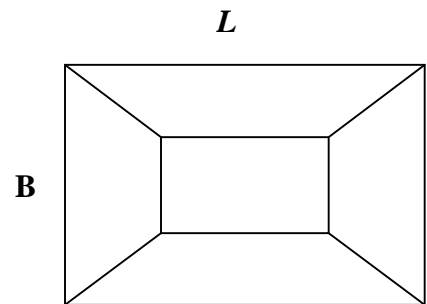
TRAPEZOIDAL FOOTING FORMULA:-

Volume, $V = (L \times B \times D) = H/3\{A1 + A2 + \text{sq.rt} (A1+A2)\}$

Where $A1 = L \times B$

$A2 = l \times b$

$H = D-d$ (Overall depth of footing – depth of Rectangular footing)



THEROTICAL WEIGHT:-

Cement	=	1440 Kg/m ³
Steel	=	7850 Kg/m ³
Bricks	=	1600 – 1920 Kg/m ³
1 HP	=	745.7 watts

WEIGHT OF ROD PER METER LENGTH:-

DIA	WEIGHT PER METER
6mm	= 0.222
8mm	= 0.395
10mm	= 0.616
12mm	= 0.888
16mm	= 1.578
20mm	= 2.466
25mm	= 3.853
32mm	= 6.313
40mm	= 9.865

CMET REQUIREMENTS:-

M10	:	210 Kg
M20	:	320 Kg

M25	:	340 Kg
M30	:	380 Kg
M35	:	410 Kg
M40	:	430 Kg
M45	:	450 Kg
M50	:	450 + M.S 7.5%

General Notes for civil Engineering

- Electrical conduits shall not run in column
 - Earth work excavation for basement above 3 m Should be stepped form
 - Any Back filling shall be compacted 95% of dry density at the optimum moisture content and in layers not more than 200mm for filling above structure and 300 mm for no structure
 - F SOLING IS SPECIFIED THE SOLING STONES SHALL BE LAID AT45° TO 60° INCLINATION (AND NOT VERTICAL) WITH INTERSTICES FILLED WITH SAND OR MOORUM.
 - Y REPRESENTS TOR STEEL GRADE - Fe-415 OF IS:1786. WITH CHARECTERISTIC YIELD STRENGTH OF 415 N/MM MINIMUM.
 - Ø REPRESENTS MILD STEEL GRADE - 1 OF IS:432 (PART-1)
 - ALL REINFORCEMENT SHALL BE FREE FROM MILL SCALES, LOOSE RUST & COATS OF PAINTS, OIL OR ANY OTHER SUBSTANCES.
 - BY PROVIDING PROPER COVER BLOCKS, SPACERS, CHAIRS ETC.. ALL REINFORCEMENT SHALL BE PLACED AND MAINTAINED IN POSITION AS SHOWN IN STRUCTURAL DRAWING
 - CEMENT SHALL BE 43 GRADE ORDINARY PORTLAND CEMENT CONFORMING TO IS:8112 OR53 GRADE ORDINARY PORTLAND CEMENT CONFORMING TO IS:12269-1987.
 - CEMENT SHALL BE STORED IN DRY PLACES ON A RAISED PLATFORM ABOUT 200mm ABOVE FLOOR LEVEL AND 300mm AWAY FROM WALLS. BAGS TO BE STACKED NOT MORE THAN 10 BAGS HIGH IN SUCH A MANNER THAT IT IS ADEQUATELY PROTECTED FROM MOISTURE AND CONTAMINATION.
 - WATER USED FOR BOTH MIXING AND CURING SHALL BE CLEAN AND FREE FROM INJURIOUS AMOUNTS OF OILS, ACIDS, ALKALIS, SALTS, SUGAR AND ORGANIC MATERIALS OR OTHER SUBSTANCES THAT MAY BE DELETERIOUS TO CONCRETE OR STEEL. THE pH SHALL BE GENERALLYBETWEEN 6 AND 8.
 - CEMENT SHALL BE TESTED FOR ITS SETTING.
1. THE INITIAL SETTING TIME SHALL NOT BE LESS THAN 30 MINUTES.

2. THE FINAL SETTING TIME SHALL NOT BE MORE THAN 10 HOURS.
- SAMPLES FROM FRESH CONCRETE SHALL BE TAKEN AND AT LEAST A SET OF 6 CUBES OF 150mm SHALL BE PREPARED AND CURED. 3 CUBES EACH AT 7 DAYS AND 28 DAYS SHALL BE TESTED FOR COMPRESSIVE STRENGTH. THE TEST RESULTS SHOULD BE SUBMITTED TO ENGINEER FOR APPROVAL. IF RESULTS ARE UNSATISFACTORY NECESSARY ACTION/RECTIFICATION/REMEDIAL MEASURES HAS TO BE EXERCISED.
- A SET OF CUBE TESTS SHALL BE CARRIED OUT FOR EACH 30 Cum OF CONCRETE / EACH LEVELS OF CASTING / EACH BATCH OF CEMENT.
- WATER CEMENT RATIO FOR DIFFERENT GRADES OF CONCRETE SHALL NOT EXCEED 0.45 FOR M20 AND ABOVE AND 0.50 FOR M10 / M15 CONTRACTOR / MIX DESIGNER TO CARRY OUT THE NECESSARY INITIAL (PRELIMINARY) TESTS. FOR CONCRETE GRADES M20 AND ABOVE APPROVED ADMIXTURE SHALL BE USED AS PER MIX DESIGN REQUIREMENTS.

CONCRETE COVER

- CLEAR COVER TO MAIN REINFORCEMENT IN

1. FOOTINGS	: 50 mm
2. RAFT FOUNDATION.TOP	: 50 mm
3. RAFT FOUNDATION.BOTTOM/SIDES	: 75 mm
4. STRAP BEAM	: 50 mm
5. GRADE SLAB	: 20 mm
6. COLUMN	: 40 mm
7. SHEAR WALL	: 25 mm
8. BEAMS	: 25 mm
9. SLABS	: 15 mm
10. FLAT SLAB	: 20 mm
11. STAIRCASE	: 15 mm
12. RET. WALL on earth	: 20/ 25 mm
13. WATER RETAINING STRUCTURES	: 20 / 30 mm
- CONTRACTOR SHALL ALLOW FOR INDEPENDENT TESTING OF REINFORCEMENT STEEL FOR EACH DIA OF BAR FOR EVERY 50T AND AT CHANGE OF SOURCE.
- ALL BEAM REINF. TO BE ANCHORED FOR A MINIMUM LENGTH OF 46 x DIA OF BAR INTO COL / SUPPORTING BEAM U.N.
- BINDING WIRES SHALL BE 16 GAUGE 1.6mm SOFT ANNEALED STEEL WIRES FREE FROM RUST AND OTHER CONTAMINANTS.
- CONCRETE DESIGN MIX REPORT.
 1. CONCRETE DESIGN MIX REPORT ALONG WITH THE TEST RESULTS FOR CONCRETE CUBES SHALL BE

SUBMITTED IN ADVANCE FOR APPROVAL BEFORE
RELEVANT CONCRETING. AND THE MINIMUM
CEMENT CONTENT SHALL BE NOT LESS THAN 300
Kg/m

2. SLUMP SHALL BE 100 + 25mm.

- **POURING OF CONCRETE.**

NO CONCRETING OPERATION SHALL BE CARRIED OUT DURING
INCLEMENT WEATHER CONDITIONS LIKE HEAVY RAIN, STORM AND
HIGH WINDS.

REPAIRS

- CONCRETE REPAIRS IN ANY STRUCTURAL ELEMENTS SHALL BE CARRIED OUT ONLY AFTER INSPECTION AND AS PER THE APPROVED METHOD. CONTRACTOR TO SUBMIT DETAIL METHOD STATEMENT FOR ENGINEER'S REVIEW AND RESPONSE
- CONCRETE FLOOR SCREED SHALL BE IN PANELS OF 3M x 3M WITH JOINTS SEALED WITH SEALANT TO MATCH WITH JOINTS IN SLAB. LOCATIONS TO BE APPROVED BY ENGINEER PRIOR TO CONCRETING.
- ALL CONCRETING MUST STOP AT A SHUTTERED SURFACE ONLY.
- AT ALL CONSTRUCTION JOINTS THE REINFORCEMENT SHALL BE CONTINUOUS.
- CONSTRUCTION JOINT IN RETAINING WALLS & WATER TANK SHALL BE PROVIDED WITH AN APPROVED SEALANT
- ALL DEEPER EXCAVATION BELOW THE GROUND LEVEL SLAB SHALL BE RETAINED BY A LOCALIZED SOIL AND WATER RETENTION SYSTEM, AS MAY BE RETAINED BY A LOCALIZED SOIL AND WATER RETENTION SYSTEM, AS MAY BE
- DEWATERING BY SUITABLE MEANS TO BE ADOPTED (ENSURING NO FINES ARE DRAWN OUT) TO KEEP THE FOUNDING STRATA COMPLETELY DRY AND SHALL BE CONTINUED UNTIL THE GROUND FLOOR SLAB / BEAMS ARE CAST AND CURED TO ACHIEVE SPECIFIED DESIGN STRENGTH.
- CEMENT PROPORTION: CONCRETE MIX IN ABOVE SUCH FOUNDATIONS SHALL CONTAIN 10 PERCENT EXTRA CEMENT THAN SPECIFIED.
- AT LOCATIONS OF ISOLATION / EXPANSION JOINT PROVIDE POLYSULPHIDE SEALANT WITH BACKER ROD POLYSTYRENE BOARDS.
- NO THROUGH BOLTS SHALL BE USED IN FORMWORK OF RETAINING WALL. AND WATER TANK WALLS.

FOUNDATIONS

- ALL LOOSE POCKETS AND SOFT SPOTS ARE TO BE FILLED IN MASS CONCRETE OF GRADE M-10.
- BACK FILLING BEHIND THE RETAINING WALL SHALL BE CARRIED OUT ONLY AFTER THE GROUND FLOOR SLAB IS CAST AND HAS ATTAINED DESIGN STRENGTH.

- THE SPACE BETWEEN HARD STRATA (TO ACHIEVE A MINIMUM OF 25 MT/M2) AND BOTTOM OF RAFT/ FOUNDATION SHALL BE FILLED WITH PLUM CONCRETE.
- SIZE STONE MASONRY SHALL BE IN CM 1:6 UNLESS SPECIFIED OTHERWISE.
- CONTINUOUS WALL FOUNDATION SHALL BE STEPPED IN A RATIO OF 1 VERTICAL TO 2 HORIZONTAL WHEREVER LEVEL CHANGES ARE NECESSARY.
- SLOPED PORTION TO BE FINISHED SMOOTH WITH TROVEL WITHOUT USING MORTAR. COLUMN PORTION TO BE FINISHED SMOOTH WITH CONCRETE.
- GRADE OF CONCRETE SHALL BE AS PER FOOTING SCHEDULE/ RAFT DETAILS.

SUPER STRUCTURE

- ALL EXPOSED CORNERS OF COLUMNS AND BEAMS SHALL HAVE STRAIGHT EDGES AND SHALL BE CHAMPHERED IF SPECIFIED IN ARCHITECTURAL DRAWINGS.
- CONCRETING OF COLUMNS , BEAMS, FACIAS, AND THIN SECTIONS OF CONCRETE MEMBERS SHALL BE CARRIED OUT USING APPROVED PLASTICISER AS PER MANUFACTURERS SPECIFICATIONS.
- CONCRETE POURING , TESTING, REMOVAL OF FORMWORK AND ACCEPTANCE CRITERIA SHALL BE AS PER RELEVANT INDIAN STANDERD CODE OF PRACTICE.
- CENTERING OF CANTILEVER BEAMS AND SLAB PROJECTIONS SHALL NOT BE REMOVED UNLESS ROOF SLAB ABOVE IS CAST AND CURED AND SUFFICIENT BALANCING LOAD IS ATTAINED. PROVIDE PRE CAMBER TO CANT. BEAMS/SLABS
- BEFORE POURING FLOOR LEVEL CONCRETE, THE FLOOR SYSTEMS BELOW SHALL BE SUFFICIENTLY SUPPORTED BY MEANS OF PROPPING AND THIS SYSTEM SHALL BE APPROVED BY THE ENGINEER-IN-CHARGE.
- CONCRETE IN TOILET, KITCHEN, WATER BODY AREAS SHALL BE MIXED WITH APPROVED WATERPROOF COMPOUND AND WATERPROOFING OVER SLABS AND SIDES OF WALLS SHALL BE DONE AS PER ARCHITECTURAL DETAILS.
- CONTRACTOR SHALL CHECK ALL THE OPENINGS AS PER ARCHITECTURAL/SERVICE DRAWINGS AND SHALL PROVIDE NECESSARY TRIMMING BARS.NO ADDITIONAL OPENING SHALL BE DRILLED IN THE STRUCTURE UNLESS APPROVED.
- CONCRETE SHOULD BE PLACED IN THIN LAYERS WHICH CAN BE EFFECTIVELY COMPACTED AS THE PLACING PROCEEDS SAY IN 300mm.
- WHEN CASTING COLUMNS, WALLS OR BEAMS OF DEPTH 700mm OR MORE, A LAYER OF RICH CEMENT MORTAR SHOULD BE PLACED FIRST. THIS IS TO AVOID ACCUMULATION OF GRAVEL IN THE BOTTOM LAYER AND TO HAVE A BETTER BOND.
- COMPACTION OF CONCRETE SHALL BE DONE BY MECHANICAL VIBRATORS. PROPER CARE SHALL BE TAKEN TO AVOID SEGREGATION AND HONEYCOMBING.

- CONTRACTOR SHALL SUBMIT SHOP DRAWINGS INCLUDING BAR BENDING SCHEDULE FOR APPROVAL PRIOR TO TAKING UP OF CONSTRUCTION.
- THE SECONDARY BEAM BARS SHALL BE PLACED OVER MAIN BEAM BARS WHEN THE DEPTH OF BEAMS ARE SAME AT JUNCTIONS.
- SHORT SPAN STEEL SHALL BE AT BOTTOM LAYER IN TWO WAY SLAB SYSTEM AND SPACERS BAR, CHAIRS TO TOP STEEL SHALL BE PROVIDED WITH ADEQUATE COVER.
- NO SPLICING OF BARS SHALL BE MADE AT THE POINT OF MAXIMUM TENSILE STRESSES.
- FOR SPLICES OF REINFORCEMENT, MINIMUM LAP LENGTH FOR BAR SHALL BE 50 X DIA OF BAR.
- NOT MORE THAN 1/3 OF MAIN REINFORCEMENT SHALL BE LAPPED AT ANY SECTION.
- SPLICES IF UN AVOIDABLE, MUST BE LOCATED FROM FACE OF THE COLUMN AT NOT CLOSER THAN TWICE THE BEAM DEPTH.
- SPLICES IN BEAMS SHALL BE CONTAINED BY ADDITIONAL STIRRUPS AT A SPACING NOT EXCEEDING 150MM OVER THE ENTIRE LENGTH OF SPLICES.
- STIRRUPS SHALL BE CLOSED TYPE WITH ENDS HOOKED AT 135 WITH 10 X BAR DIA EXTENSION (BUT NOT LESS THAN 75MM).
- SPACING OF STIRRUPS SHALL NOT EXCEED 200MM.

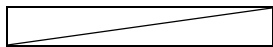
COLUMNS

- CONCRETE MIX SHALL BE AS PER SCHEDULE OF COLUMNS.
- P.V.C COVER BLOCKS TO BE USED WITH PRIOR APPROVAL OF ENGINEER.
- RINGS TO BE PROVIDED FOR FULL LENGTH OF MAIN RODS TO PREVENT DISLOCATION OF MAIN BARS WHILE CONCRETING, AT A SPACING AS SPECIFIED IN THE SCHEDULE.
- Ld SHALL BE

1. M25 AND ABOVE

46 x DIA

- COLUMN STARTER TO BE SET BY TEMPLATE AND SHALL BE PROVIDED WITH NEXT HIGHER GRADE OF CONCRETE MIX OF COLUMNS.
- BEAM BOTTOM LEVELS ARE TO BE MARKED ON COLUMN RODS AND COLUMN TO BE STOPPED AT THIS LEVEL TO AVOID EXTRA SHUTTERING OF COLUMNS BELOW BEAM BOTTOMS.



- INDICATES COLUMNS CONTINUING FURTHER



- INDICATES COLUMNS STOPPING AT THIS LEVEL.

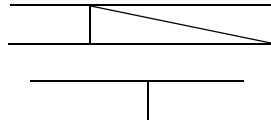
DESHUTTERING TIME

- IN NORMAL CIRCUMSTANCES WHERE AMBIENT TEMP. DOES NOT FALL BELOW 15 °C & WHERE ORDINARY PORTLAND CEMENT IS USED & ADEQUATE CURING IS DONE. FOLLOWING STRIPPING TIME MAY BE DEEMED TO SATISFY.
 - i. VERTICAL FORMWORK TO COLUMNS, WALLS, BEAMS - 16 TO 24 HRS
 - ii. SOFFIT FORMWORK TO SLABS (PROPS TO BE REFIXED IMMEDIATELY AFTER REMOVAL OF FORMWORK) - 3 DAYS
 - iii. SOFFIT FORMWORK TO BEAMS (PROPS TO BE REFIXED IMMEDIATELY AFTER REMOVAL OF FORMWORK) - 7 DAYS
- PROPS TO SLABS:
 - a) SLABS SPANNING UP TO 4500 mm - 7 DAYS
 - b) SLABS SPANNING OVER 4500 mm - 14 DAYS
- PROPS TO BEAMS AND ARCHES:
 - a) BEAMS SPANNING UP TO 6000 mm - 14 DAYS
 - b) BEAMS SPANNING ABOVE 6000 mm - 21 DAYS

ROOF LEVEL CONCRETE.

FLOOR SHUTTERING LEVELS TO BE AS PER ARCHITECTURAL DRAWINGS. THE SHUTTERING SHOULD BE LEVELLED AND CONTAIN NO VOIDS TO PREVENT SLURRY LEAKAGE. THE EXTERNAL SHUTTERING TO BE MORE IN HEIGHT BY 75 mm THAN REQUIRED. DIAGONALS OF EACH RECTANGLES / SQUARES SHALL BE CHECKED.

- REINFORCEMENT FOR SLABS SHOWN THUS



AT TOP

AT BOTTOM

- DISTRIBUTION REINFORCEMENT FOR SLAB TOP RODS SHALL BE Y8@225CC UNLESS SPECIFIED OTHERWISE IN RELEVANT DRAWING

PIN RODS/CHAIRS

- SECOND LAYER AND THIRD LAYER REINFORCEMENT IN BEAMS TO BE TIED WITH PIN RODS OF Y20 / Y25 ONLY.
- CHAIRS TO BE PROVIDED TO SUPPORT TOP REINFORCEMENT IN SLABS USING SUITABLE DIA BARS WITH APPROVAL OF ENGINEER-IN-CHARGE

CONSTRUCTION JOINTS

- CONSTRUCTION JOINTS IN SLABS AND BEAMS ARE OFTEN PLACED EITHER AT POINT OF CONTRAFLEXURE IN WHICH CASE THE CONCRETE MAY BE LEFT SLOPED OFF OR STEPPED OFF BY MEANS

OF STOP FORMS.CONSTRUCTION JOINTS LOCATED NEAR MINIMUM SHEAR SHALL HAVE STOP FORMS PERPENDICULAR TO THE ACTING FORCES. WHERE THE CONCRETE IS TO BE PLACED IN THE SECOND POUR, THE OLD CONCRETE SHALL BE THOROUGHLY ROUGHENED TO EXPOSE AGGREGATES.MOISTENED AND A LAYER OF RICH FRESH MORTAR SHOULD BE LAID IMMEDIATELY BEFORE FRESH CONCRETE IS PLACED. IT SHOULD BE PLACED TO A THICKNESS OF 20 TO 30mm AND SHALL BE WORKED WELL INTO THE IRREGULARITIES OF HARDENED CONCRETE.

- ALL THE CONSTRUCTION JOINTS SHALL BE PRE-DETERMINED AS PER THE SEQUENCE OF OPERATION AND SHALL BE GOT APPROVED.
- CONSTRUCTION JOINTS SHALL BE IN ACCORDANCE WITH TYPICAL CONSTRUCTION JOINT DETAILS.
- EXPANSION JOINT DETAIL SHALL BE AS PER TYPICAL EXPANSION JOINT DETAILS.

CURING METHOD

- CURING OF SLABS AND BEAMS SHALL BE ACHIEVED BY PONDING ONLY, FOR A MINIMUM PERIOD OF 7 DAYS.
- CURING OF FOOTING TOPS,RCC WALLS,COLUMNS AND EXTERNAL BEAM FACES SHALL BE DONE BY COVERING THEM WITH GUNNY BAGS OR HESSIAN AND KEEPING WET CONSTANTLY FOR COMPLETE CURING PERIOD OF 7 DAYS.
- GROOVE CUTTING MACHINE SHALL BE USED FOR CHASING OF WALLS FOR ALL ELECTRICAL CONDUITS.
- 4" WIDE TO 7" WIDE EXPANDED METAL MESH SHALL BE USED BEFORE PLASTERING OF ALL CONDUIT CHASINGS IN WALLS.
- FOR COLUMN-WALL JUNCTIONS & BEAM-WALL JUNCTIONS 4" WIDE EXPANDED METAL MESH SHALL BE USED, BEFORE PLASTERING OF CONCRETE AND WALL JUNCTIONS.

WATER RETAINING STRUCTURE

- CONCRETE MIX M-25 SHALL BE USED FOR ALL WATER RETAINING STRUCTURE WITH 330Kg/CU.M OF CEMENT MINIMUM.UNLESS OTHERWISE SPECIFIED.
- DITCHMENT D.M OR CONPLAST LIQUID ADMIXTURE SHALL BE USED WITH M-25 CONCRETE AT 150 ml PER BAG OF CEMENT.
- PLASTERING SHALL BE DONE WITH C.M 1:4 USING PUTZ DITCHMENT D.M OR CONPLAST LIQUID ADMIXTURE AT 150ml PER BAG OF CEMENT.

Thumb rule requirement of standard materials and standard calculation in high raised building

Steel	=3 to 5 kg / sft
Cement	=.5bags/ sft
RMC	=.05 m3/sft
Block	=12.5 nos /sqm
Electrical cast	= Rs 133/sft
Plumbing cost	= Rs 126/sft
Fire fighting cost	= Rs 40/sft
External development	= Rs 94.5/sft
Civil works-Structure	= RS 751.25/sft

200 mm in cm 1:6	.124Bags /sqm	
200 mm in cm 1:4	0.206	bags/sqm
150 mm in cm 1:6	0.093	bags/sqm
150mm in cm 1:4	0.144	bags/sqm
100 mm in cm 1:4	0.103	bags/sqm
Ceiling plastering	0.11	bags/sqm
Wall plastering	0.09	bags/sqm
Rough plastering	0.09	bags/sqm
Duct plastering	0.09	bags/sqm
External plastering	0.175	bags/sqm
lathen plastering	0.55	bags/sqm
stucco plaster	0.175	bags/sqm
100 mm plaster band	0.012	bags/rmt
pcc 1: 4: 8	3.4	bags/cum
pcc 1:5:10	2.52	bags/cum
pcc 1:3:6	4.2	bags/cum
pcc 1:2:4	6.02	bags/cum
230 mm brick	0.876	bags/cum
115 mm brick work	0.218	bags/cum
vdf 100 mm thick	0.82	bags/sqm
granolithic flooring 40 mm	0.35	bags/sqm
granolithic flooring 20 mm	0.28	bags/sqm
anti-skid	0.28	bags/sqm
ceramic	0.28	bags/sqm
vertified tile flooring	0.28	bags/sqm
vertified tile dado	0.27	bags/sqm
cerami dado	0.27	bags/sqm
marble flooring	0.3	bags/sqm
100 mm heigh marble skirting	0.027	bags/rmt
marble glading	0.27	bags/sqm
terracota tle flooring	0.3	bags/sqm
mangalore tile	0.3	bags/sqm
Door frame fixing	0.17	bags/sqm
water proofing for sunken slab	0.23	bags/sqm
water proofing for walls	0.23	bags/sqm
water proofing for balcony/toilets	0.65	bags/sqm

- Ant terminate treatment chemical Name is chloropyrifoc 20% . Diluting 5 Lit of Chemical with 95 Lit of water and usage is 7.5 Sqm Per liter {Diluted} .To Provide 1” Dia hole And Deep1Foot.

Labour Productivity:

Brick work	1 mason 1 Men mazdoor 1 Women Mazdoor	1.25 cm
Wall Plastering	1 mason 1 Men mazdoor 1 Women Mazdoor	10 sqm
Ceiling Plastering	1 mason 1 Men mazdoor 1 Women Mazdoor	8 sqm
External Plastering	1 mason 1 Men mazdoor 1 Women Mazdoor	8 sqm
Blockk work	8” 1 mason 1 Men mazdoor 1 Women Mazdoor	10 sqm
Blockk work	6” 1 mason 1 Men mazdoor 1 Women Mazdoor	8 sqm
Blockk work	4” 1 mason 1 Men mazdoor 1 Women Mazdoor	8 sqm
Carpenter	1 Skilled 1 Un skilled	4 Sqm
Bar bender	1 Skilled 1 UN skilled	200Kg
Tile work	1 Mason 1M Mazdoor	10 Sqm
Painter skilled	OBD Emulsion	600 Sft 800 Sft

Putty	600 Sft
Primer	800 Sft

One Sqm=10.763Sft
 One Cum=35.314 Cft
 One Acres=4046.873 Sqm=43560.17 Sft=4840.019Yards
 One Cubic meter = 1000 litere
 One Meter=3.280Feet
 One Mile =1609.344 meter
 One Acre = 100 cent
 One ground =2400 Sft=5.51 cent
 ½ ground =2.75 cent
 One Mile =8 Furlong
 One cement bag=1.25 Cft

One Forma box =1*1*1.25 feet

External Painting

Ace-Low quality
 Apex-Medium Quality
 Apex ultima –High Quality

Interior walls

Darker shades may require an additional coat for proper hiding. The actual shade, especially for darker shades, can be observed only after the film is dry and not in the can or in the wet state.

Felt rolling is to be done only for Royale and Lustre finish. The darker shades are never to be felt rolled since this will cause foaming due to presence of more surfactants in them.

Solvent based paints (those using thinner other than water) should be given twice as long a drying time than given here in case of high humidity climate like monsoons.

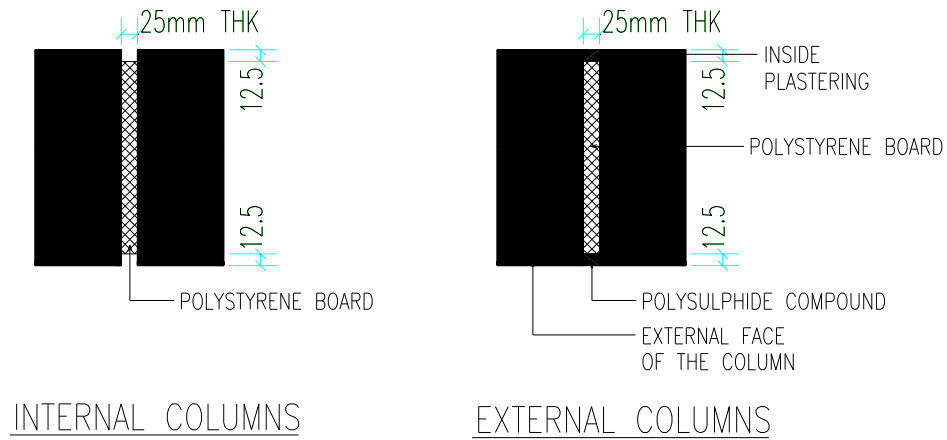
Putty can be applied to make the substrate smoother; however it has to be sandwiched between 2 coats of primer.

Recommended dilution and application procedure for interior walls

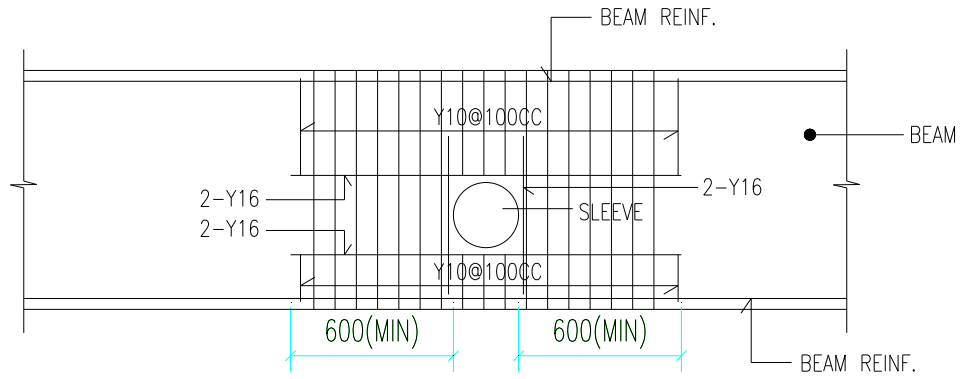
Sr. No.	Name of Paint	Thinner for 1 ltr/kg of paint In mls	Thinner	No of coats recommended and application	Undercoat applied	Recoating Time (hrs)
1	AP Apcolite	80 - 100	T - 101 or Mineral	2 - brushing	AP Decoprime Wall Primer(ST) or AP	8 - 10

	Premium Gloss Enamel		Turpentine Oil (MTO)		Metal primer (for metal surface) or AP Wood Primer (for wooden surface)	
2	AP Apcolite Premium Satin Enamel	150 - 200 T - 101 or 350 - 400 MTO		2 - brushing 2 - spraying	AP Decoprime Wall Primer(ST) or AP Metal primer (for metal surface) or AP Wood Primer (for wooden surface)	6 - 8
3	AP Interior Wall Finish - Matt	70 - 90	T - 101 or MTO	2 - brushing Top coat rolling	AP Decoprime Wall Primer (ST)	8 - 10
4	AP Interior Wall Finish - Lustre	70 - 90	T - 101 or MTO	2 - brushing followed by rolling on every coat	AP Decoprime Wall Primer (ST)	8 - 10
5	AP Gattu Enamel	80 - 100	MTO	2 - brushing	AP Decoprime Wall Primer (ST) or AP Metal primer (for metal surface) or AP Wood Primer (for wooden surface)	6 - 8
6	AP Luxury Ultra Gloss Enamel	60 - 100	MTO Or T - 101	2 - Brushing	AP Decoprime Wall Primer (ST) or AP Metal primer (for metal surface) or AP Wood Primer (for wooden surface)	8
7	AP Premium Semi - Gloss Enamel Water Based	150 - 250	Water	2 - Brushing 2 - Spraying	AP Decoprime Wall Primer (ST) or AP Metal primer (for metal surface) or AP Wood Primer (for wooden surface)	4 - 6
8	AP Royale Luxury Emulsion	400 - 450	Water	3 - for light shades and 4 - for dark shades. Brushing followed by rolling on every coat for scrap down / new job. Refinish jobs will have 1 coat lesser.	AP Decoprime Wall Primer (ST)	4
9	AP Premium Emulsion White Shades	600 - 700 500 - 600	Water	2 - for light shades. 3 - for dark shades Brushing followed by rolling of top coat.	AP Decoprime Wall Primer (ST) or AP Decoprime. Wall Primer (WT)	3 - 4

- | | | | | |
|----|--|---|--|-------|
| 10 | AP Tractor 500 - 750 Water Emulsion | 2 - for light shades. 3 - for dark shades | AP Decoprime Wall Primer (ST) or AP Decoprime Wall Primer (WT) | 4 |
| 11 | AP Tractor 550 - 600 Water Acrylic wt Distemper | 2 - for light shades. 3 - for dark shades | AP Decoprime Wall Primer (ST) or AP Decoprime Wall Primer (WT) | 3 - 4 |
| 12 | AP Tractor 500 - 600 Water Synthetic by wt Distemper | 2 - for light shades. 3 - for dark shades | AP Decoprime Wall Primer (ST) or AP Decoprime Wall Primer (WT) | 6 |

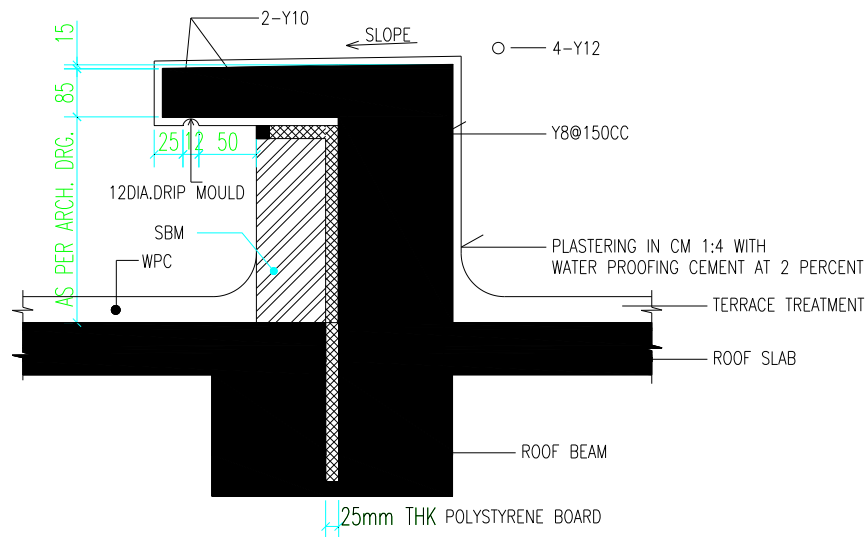


TYPICAL EXP. JOINT (EJ) IN COLUMN
TYPICAL DETAIL-1

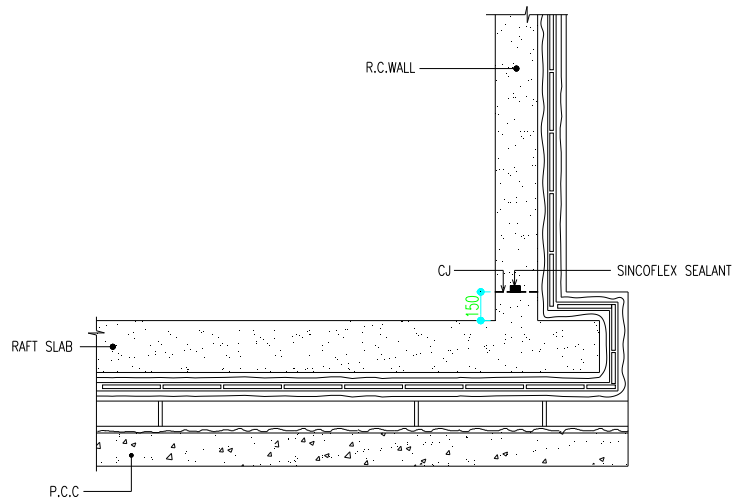


SLEEVE DETAILS IN BEAMS.
(FOR BEAMS ABOVE 450 DEPTH ONLY)
ONLY WITH PRIOR APPROVAL.

TYPICAL DETAIL-2

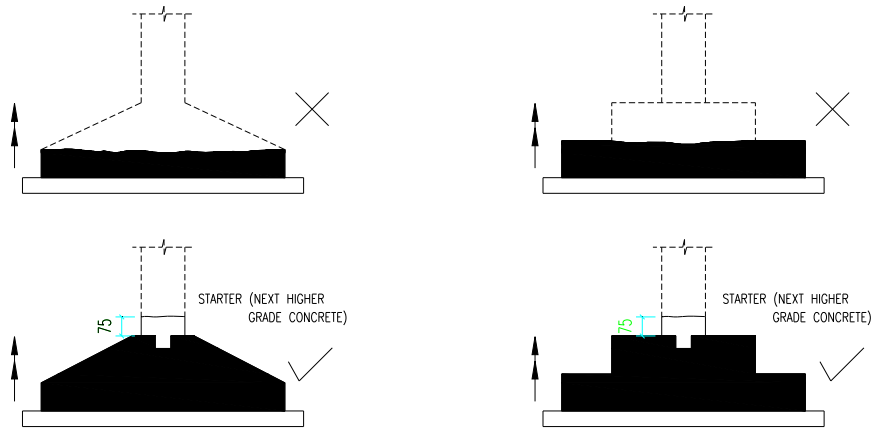


EJ DETAIL TYPICAL DETAIL-3



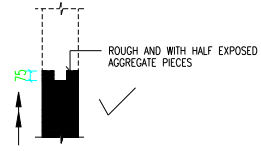
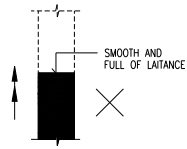
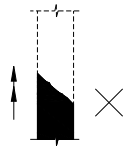
WATER-PROOFING DETAILS
(AS PER APPROVED DETAILS)

TYPICAL DETAIL-4



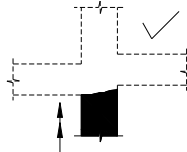
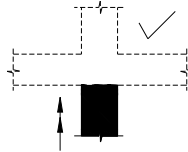
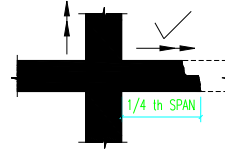
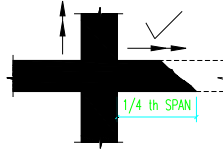
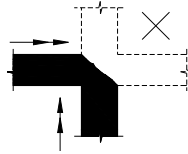
CONSTRUCTION JOINTS
CONSTRUCTION JOINTS IN FOOTINGS

TYPICAL DETAIL-5



CONSTRUCTION JOINTS IN COLUMNS

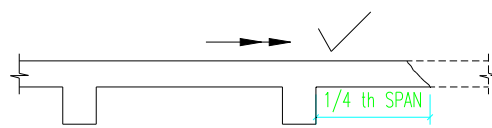
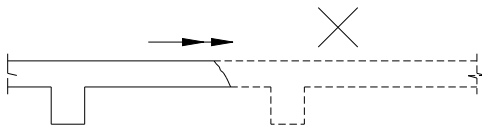
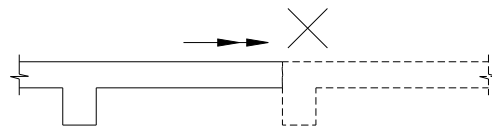
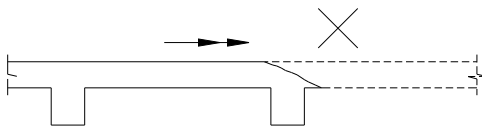
TYPICAL DETAIL-6



- INDICATES DIRECTION OF CONCRETING
- ✓ INDICATES DOS
- ✗ INDICATES DON'TS

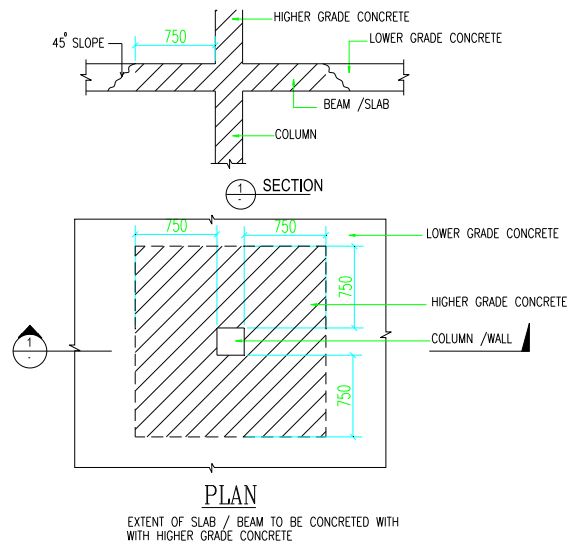
CONSTRUCTION JOINTS IN BEAMS / BEAM COLUMN JUNCTIONS

TYPICAL DETAIL-7

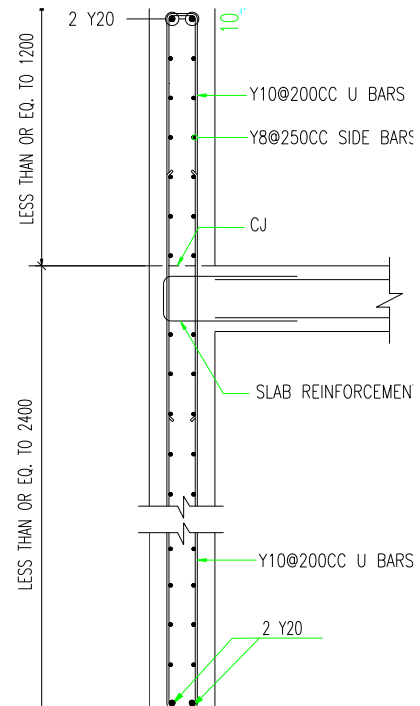
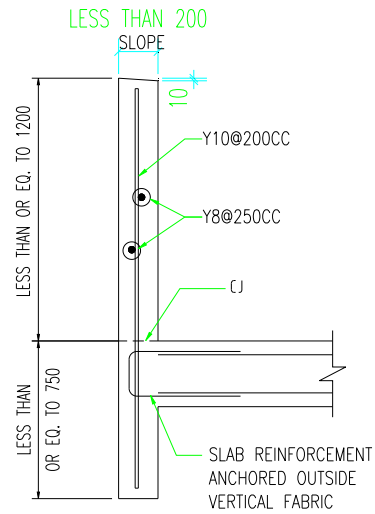


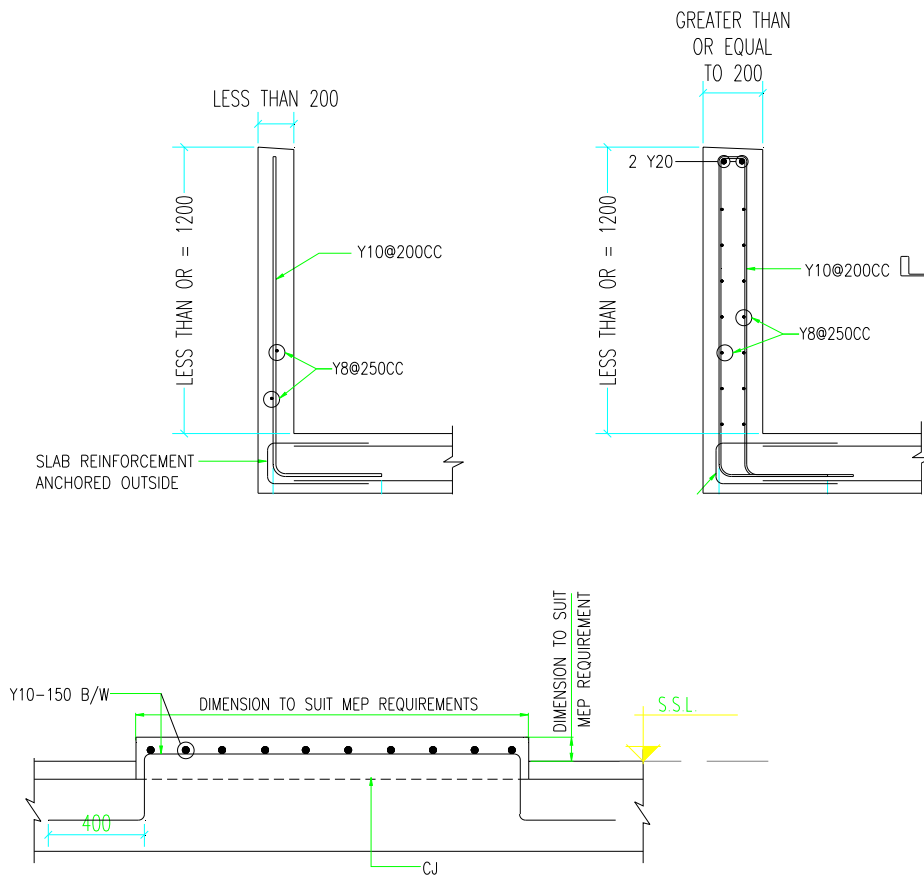
CONSTRUCTION JOINTS IN SALBS

TYPICAL DETAIL-8

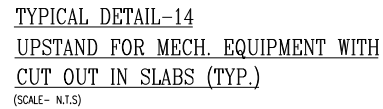
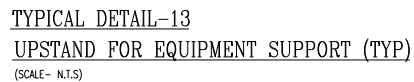


TYPICAL DETAIL-9
(BEAM / COLUMN JUNCTION DETAIL)





TYPICAL DETAIL-12
PLINTH DETAIL FOR EQUIPMENT BASE
 (SCALE- N.T.S)



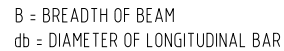
UPSTAND FOR EQUIPMENT SUPPORT (TYP)

(SCALE- N.T.S)

UPSTAND FOR MECH. EQUIPMENT WITH
CUT OUT IN SLABS (TYP.)

(SCALE- N.T.S)

- * DIMENSION TO BE AS PER APPROVED EQUIP. SUPPLIER'S REQUIREMENT.
- * ALL EQUIP. TO BE PROVIDED WITH SUITABLE BASE ISOLATIONS TO AVOID TRANSMITTANCE OF DYNAMIC FORCES TO SUPPORTING STRUCTURE.



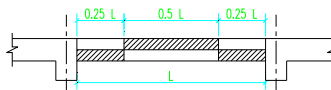
WIDTH OF BEAM	SIDE FACE REINF
200	Y12-250
300	Y12-200
400	Y12-150
500 OR GREATER THAN 500	Y16-200

WHERE REINF IS TO BE DETAILED CONTINUOUSLY
LAPS IN REINF MAY OCCUR ONLY IN SHADED AREAS SHOWN

2 LAP LOCATIONS

TYPICAL SUSPENDED BEAM DETAILS



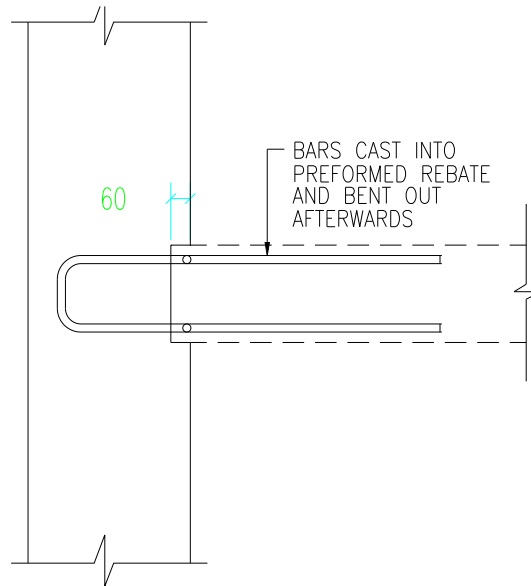
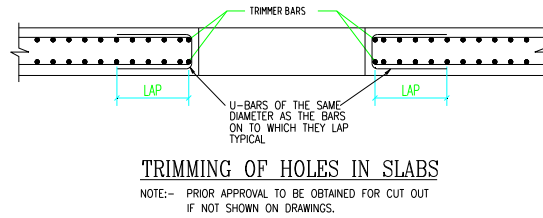
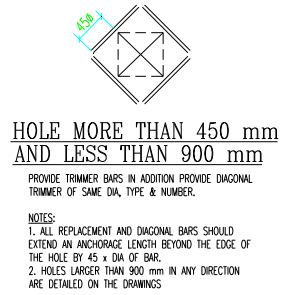
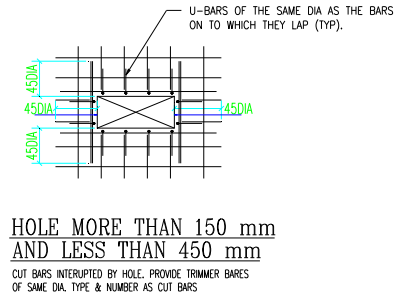
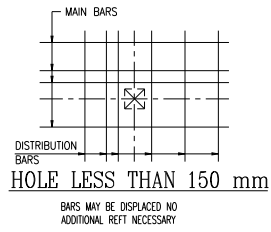


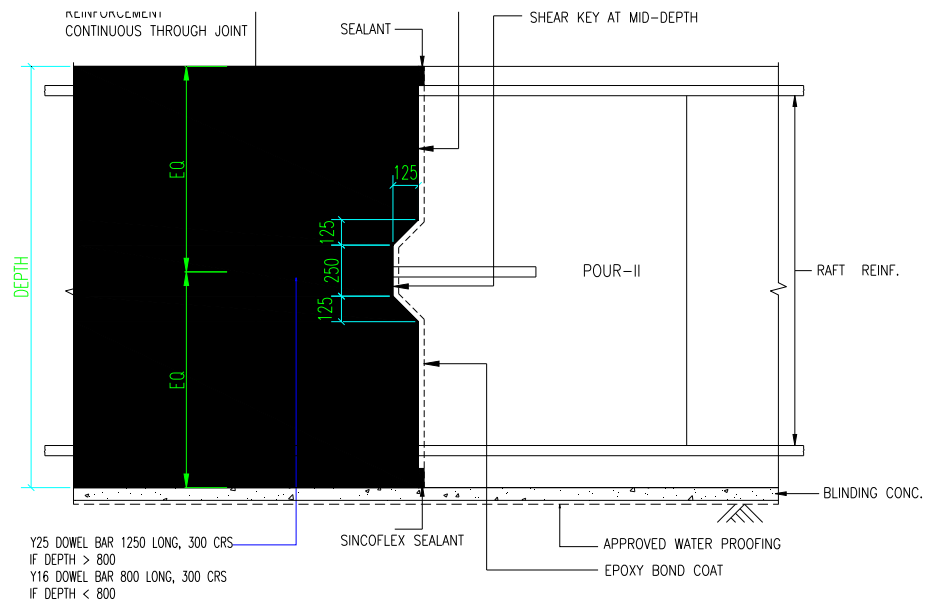
ALTERNATIVE END DETAIL

LAP LOCATIONS

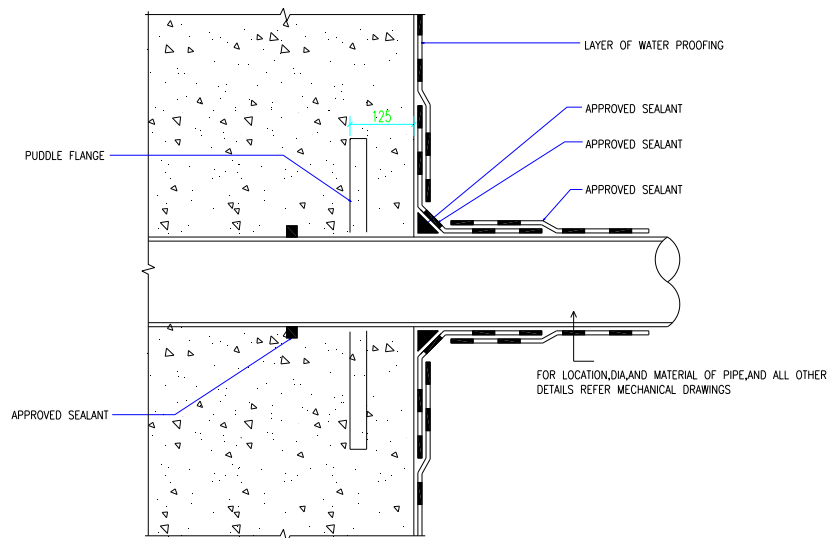
TYPICAL SOLID SLAB REINFORCEMENT DETAILS

NOTE:- PRECAMBER TO CANTILEVER SLAB MINIMUM 6mm UNO

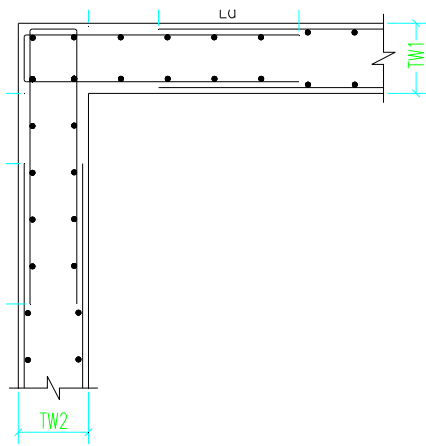




DETAIL AT CONSTRUCTION JOINT IN RAFT

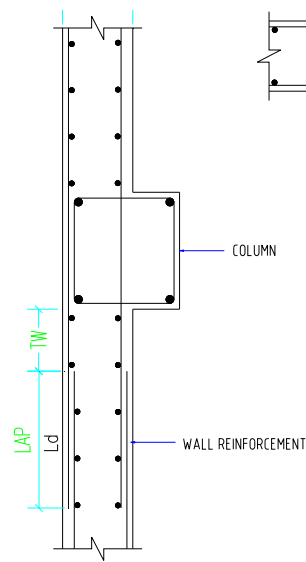


DETAIL OF SERVICE ENTRY INTO RET. WALL

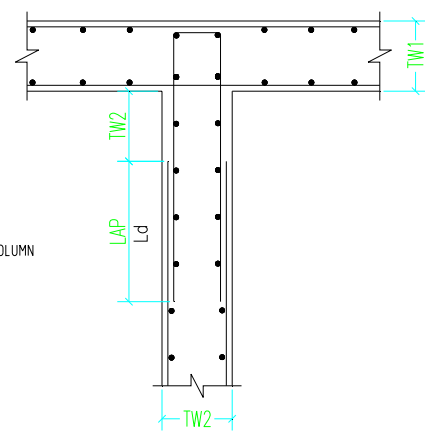


CORNER

NOTE:
1. TW, TW1 & TW2 ARE WALL
THICKNESS AS PER SCHEDULE



WALL / COLUMN JUNCTION
WHERE WALL HORIZ. REFT. IS LAPPED AT COLUMN



INTERSECTION

WALL JUNCTION DETAILS

Simple material calculations

Eg:

1.1000 Sqm Built up area

=1000/(0.9*0.6)

=1851 sheets

Span=1851 sheet/5=370 spans

Props=370 span*2.5=925 props

TOWER	FLAT NOS. AS PER SALE PLAN	UNIT TYPE	CARPET AREA INCLUDING BALCONY/SITOUT	BUILT UP AREA INCL. BALCONY/SITOUT	TERRACES BUILT UP AREA	TOTAL BUILT UP AREA INCL. BALCONY (A)	COMMON AREA (B) (% OF A)	SHARED COMMON AREA (C) (% OF A)	TOTAL SBAD = (A+B+C)	CARPET AREA PER UNIT (E)	EFFICIENCY = (E/D)X100
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Carpet Area is the area enclosed within the walls, actual area to lay the carpet. This area does not include the thickness of the inner walls. It is the actual used area of an apartment/office unit/showroom etc.

•Built up Area is the carpet area plus the thickness of outer walls and the balcony.

•Super Built Up Area is the built up area plus proportionate area of common areas such as the lobby, lifts shaft, stairs, etc. The plinth area along with a share of all common areas proportionately divided amongst all unit owners makes up the Super Built-up area. Sometimes it may also include the common areas such, swimming pool, garden, clubhouse, etc. This term is therefore only applicable in the case of multi-dwelling units.

carpet area is the actual usable area which the user gets to use. Built-up area consists of area outside your house, staircase, elevator, etc which can constitute upto 25% of the area.

Example if you buy a 1000 sq.ft built-up area, you will actually get to use only 750 sq.ft. Super built-up is area for the parapet, podium, garden,etc, all of which is charged at market price and can constitute upto 40% of the area.

It is ILLEGAL to sell property at anything other than carpet area because while developing the land, the developer is not charged FSI for the built-up area, garden, parking space,etc. So if anyone is charging you for anything other than carpet area you have a right to complain to a redressal forum like consumer protection.

1. Carpet area - The actual area you use. The area on which ‘you can put a carpet’.

2. Built up area - Carpet area + area of walls and ducts. Around 10% more than the carpet area. A terrace is considered as half the actual area for calculating built up area. Some projects charge dry terrace same as internal rooms.

3. Super built up / Saleable area - Built up area + markup for common spaces like lifts and stairs. Usually 25% more than the built up area.

.

1. Take grid levels at 5-metre interval before the start of mass excavation.

2. Approved material shall be used for backfilling. Soil with liquid limit exceeding 65% and for plasticity index exceeding 35% cannot be used. High clay soil is not preferred for backfilling.
3. Imported fill shall be selected - graded hard granular fill with 100% free stones larger than 100mm, up to 50% passing 5mm mesh and not more than 20% passing a 75 micron sieve.
4. Insitu field densities of compacted material should be 95% of maximum dry density or as specified by the consultant. Test should be conducted 10m centre-to-centre and before the anti-termite treatment is done.
5. For volumetric calculations cater for 30% quantity more of loose backfill to compacted volume.

ANTI-TERMITE TREATMENT

6. Treatment shall be carried out according to the stipulations laid down by IS 6313 part II.
7. The chemical to be used is Chloropyriphous 20%, EC with ISI certification.
8. Dilute one part of Chloropyriphous 20% EC with 20 parts of water to get 1% emulsion.
9. For horizontal and vertical surface, the dosage rate is 7.5 litre/m².
10. For along the perimeter of building insert rod at intervals of 150mm and depth 300mm and pour the chemical directly into the hole.

SIZE STONE MASONRY/ RUBBLE MASONRY

1. Use silt free (less than 5%) medium gritty clean sand for mortar.
2. Approved grade cement less than 1 month old should be used.
3. The mortar proportions shall be either 1:4 or 1:6. The mortar when mixed shall have a slump of 75mm
4. The thickness of mortar joints shall be 10 mm both horizontally and vertically
5. The height of wall to be done in a day's work shall be restricted to 1 metre.

Test results

Water absorption solid blocks

IS :2185-1979 part I (reaffirmed 1992)

Water absorption, being the average of three units when determined in the manner in appendix d .shall be not more than 10% by mass .

Steel

Mechanical properties

Properties	Tor-40 Fe 415	Tor-50 Fe 500	Tor-55 Fe 550
.2 % proof stress/yield stress min (N/Sqm)	415	500	550
Elongation % on a gauge length of 5 times the nominal dia bar (min)	14.5	12	8
Tensile strength Min(N/sqmm)	485or 10% more than actual .2 % proof stress but not less than 485	545or 8% more than actual .2 % proof stress but not less than 545	585or 6% more than actual .2 % proof stress but not less than 585

Bend test: no transverse crack should be formed after bending the bar through 180 Degree around a mandrel of dia specified below

Bars up to and including 20 mm dia	4d	4d	4d
Bars over 20 mm dia	6d	6d	5d

Rebend test : no transverse crack should be formed after bending the bar through 45 Degree And reverse bending the same through 22.5 degree around a mandrel of dia specified below

Bars up to and including 10 mm dia	4d	4d	4d
Bars over 10 mm dia	6d	6d	7d

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Chemical composition

Constituents	Fe 415	Fe 500	Fe 550
Carbon % max	.3	.3	.3
Sulphur % max	.06	.055	.055
phosphorus % max	.06	.055	.05

Solid block test result

1. The maximum variation in the length of the units shall not be more than ± 5 mm
2. In maximum variation in height and width oh unit not more than ± 3 mm (Refer 2185-1)
3. Minimum compressive strength 4.00 n/mm²
4. % of water abortion acceptance shall be not more than 10% by mass

Cement (53 grade)

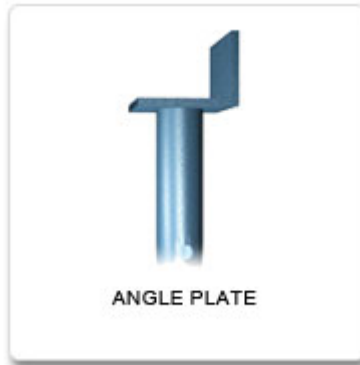
Chemical requirement

1. Lime saturation factor –not less than .80 and not greater than 1.02
2. Ratio of %ge of alumina oxide to that of iron oxide –not less than .66
3. Insoluble residue (% by mass) –not more than 3 %
4. Magnesia(% by mass) - not more than 6 %
5. Sulphuric anhydride(% by mass) - not more than 3 %
6. Total loss on ignition(% by mass) - not more than 4 %
7. Chloride content(% by mass) - not more than 0 .05 %

Physical requirement

1. Fineness (m²/kg) - Not less than 225 m²/kg
2. Soundness
 - a.lechatlier expansion(mm) - not more than 10 %
 - b.Auto clave expansion(%) - not more than 0.08 %
3. Setting time (in minutes)
 - a.Intial -Not less than 30 minutes
 - b.Final -Not greater than 600 minutes
4. Compressive strength (MPA)
 - a.72+/-1 hours - Not less than 27 mpa
 - b.168+/-2hours - Not less than 37 mpa
 - c.672+/-4hours - Not less than 53 mpa

TOP DETAILS



Inner-48.30 mm O.D. Outer-60.30mmO.D.					
Type	Outer Pipe mts.	Inner Pipe mts	Min Height mts	Max Height mts. ft	
P 1.	1.5	2.0	2.0	3.2	10,-3"
P 2	2.0	2.0	2.0	3.7	12'-3"
P 3	2.0	2.5	2.5	4.2	13'-9"
P 4	2.0	3.0	3.0	4.7	15'-6"

ADJUSTABLE JACKS



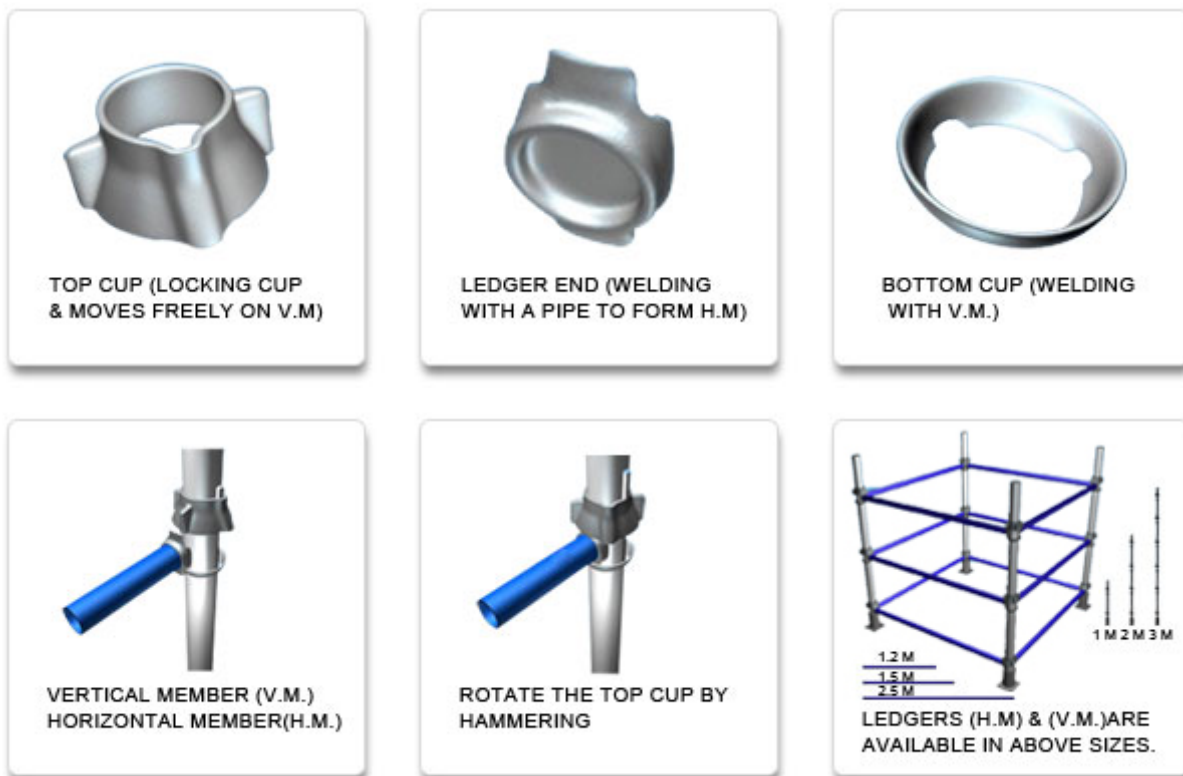
Available in solid & hollow design with various adjustment from 75 mm to 660 mm with malleable / cast iron nuts

STANDARD SIZES

- 32mm dia, 225mm adjustment
- 36mm dia, 350mm adjustment
- 36mm dia, 450mm adjustment



CUP-LOCK SYSTEM



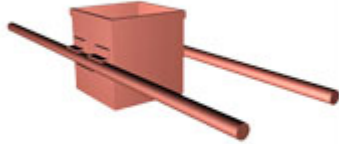
- | | |
|------------------------------------|--|
| 1. Push the H.m. towards the V.m | 1. Rotate the top cup by hammering. |
| 2. Engage the H.m. into lower cup. | 2. Pull the V.m. outwards to ensure perfect locking. |
| 3. Lower the top cup for locking. | |



SPAN & TROLLEYS



Type	Outer Body	Inner Body	Min. Span	Max. Span
S-1	1.83M 6'-0"	1,83M 6'-0"	1.9M 6'-3"	3.2M 10'-6"
S-2	2.5M 8'-0"	1,83M 6'-0"	2.5M 8'-3"	3.9M 12'-6"
S-3	2.5M 8'-0"	2.5M 8'-0"	2.6M 8'-3"	4.5M 14'-6"



FARMA (VOLUMETRIC SIZES)



SLAB TROLLEY



WHEEL BARROW

20, 25, 30, 35, 40, & 45 litres



SCAFFOLDING FITTINGS



BOARD RATAINING BRACKET



PUTLOG COUPLERS



TOW BOARD BRACKET



SELVEE COUPLERS



BEAM COUPLERS



PROP NUT (HEAVY DUTY)



TUBE CLIP



SWIVEL COUPLER



FIXED COUPLER

For connecting Waling

For connecting two

For connecting two tubes

tubes to wall panels



WING NUT & TIE ROD

tubes at various degrees.



4 WAY-HEAD

at right angles.



GO GO CLAMP WITH JACK



PIPE BARREL



H-FRAMES



ASSEMBLY OF H-FRAME

Type	H	W	L
1.	2 m	1 m	2 m
2.	2 m	1.25 m	2 m
3.	2.5 M	1.25 m	2 m

- H-Frames are manufactured from 40NB & 25NB medium class pipe as per IS : 1239 Part - I & Cross Bracings
- Bracings are made from 20 NB - Pipe or 35 mm Angle for 2/2.5m spacing between two H-Frames.



Sequence of earth works

Materials and Tools Used:

The following are the materials used for the earthwork for [foundation](#).

1. Spade,
2. Kassi,
3. Pick Axe,
4. Crow Bar,
5. Rammer,
6. Wedge,
7. Boning Rod,
8. Sledge Hammer,
9. Basket,
10. Iron Pan,
11. Line and Pins

Drawings Required

1. Centerline Drawing
2. Layout Plan

Size of [Foundation](#)

- a. For Main [Walls](#) 4'0" Depth
- b. For Partition [Walls](#) 2'0" Depth

Scope of the work:

- Setting out of corner benchmarks.
- Survey for ground levels.
- Survey for top levels
- Excavation to approved depth.
- Dressing of loose [soil](#).
- Making up to cut off level
- Constructing dewatering wells and interconnecting trenches.
- Marking boundaries of the building.
- Constructing protection bunds and drains

Working Procedure

- The extent of [soil](#) and rock strata is found by making trial pits in the construction site. The excavation and depth is decided according to the following guidelines in the site
- i. For Isolated [footing](#) the depth to be one and half times the width of the [foundation](#)

ii. For adjacent footings with clear spacing less than twice the width (i.e.) one and half times the length

iii. 1.5m in general and 3.5 m in black cotton soils

In this site open foundation pits for columns and trenches for CR Masonry was carried out. The maximum depth was upto 3m.

Setting out or ground tracing is the process of laying down the excavation lines and center lines etc. on the ground before the excavation is started. The center line of the longest outer [wall](#) of the building is marked on the ground by stretching a string between wooden or mild steel pegs. Each peg may be projected about 25 to 50 mm from the ground level and 2m from the edge of the excavation. The boundary is marked with the lime powder. The center lines of other [walls](#) are marked perpendicular to the longer walls. A right angle can be formed by forming 3, 4 and 5 triangles. Similarly, outer lines of the foundation trench of each cross walls and are set out

Removal of Excess [Soil](#)

· Estimate the excavated stuff to be re-utilized in filling, gardening, preparing roads, etc. As far as possible try to carry excavation and filling simultaneously to avoid double handling. Select and stack the required material in such a place that it should not obstruct other construction activities. The excess or unwanted material should immediately be carried away and disposed off by employing any of the following methods.

- Departmental labour.
- Tractor.
- Trucks.

[QUALITY](#) CHECKS FOR EXCAVATION

- Recording initial ground level and check size of bottom.
- Disposal of unsuitable material for filling.
- Stacking suitable material for backfilling to avoid double handling.
- Strata classification approval by competent authority.
- Dressing bottom and sides of pits as per drawing with respect to centerline.
- Necessary [safety](#) measures observed.

[QUALITY](#) CHECKS FOR FILLING

- Recording initial ground level
- Sample is approved for back filling.
- Necessary marking/ reference points are established for final level of backfilling.
- Back filling is being carried out in layers (15cm to 20cm).
- Required watering, compaction is done.
- Required density is achieved.

[Brick work](#)

Working Procedure

All the [bricks](#) to use in construction are soaked well in water so that they don't absorb water from the mortar. Mortar is spread on the top of the [foundation](#) course over an area to be covered by the edges of the [wall](#). The corner of the [wall](#) is constructed first. The excess mortar from the sides will squeeze out, which is cleaned off with trowel. The level and the alignment are checked. If the brick is not in level, they are pressed gently further. After having laid the first course at the corner, mortar is laid and spread over the first course and the end stretcher is laid first and hammered it on the laid mortar. Perpend must be kept vertical. This should be checked, as the work proceeds with the help of straight edge and square. After having constructed the [wall](#), jointing and pointing is done.

PCC

Materials and Tools used

- Auto level instrument – 1 Nos
- Wooden /Steel rammer – 1 Nos
- Mixer machine – 1 Nos

Scope of work

- Verifying levels and dimension
- Ramming the earth surface
- Placing the concrete.
- Ramming and finishing the concrete surface

Working Procedure

- Excavation levels and dimensions to be checked as per drawings. Remove all the loose earth from the pits. Do water sprinkling and ramming the cleaned surface of pit by mechanical rammer. Do the shuttering by planks and runners wherever if necessary. Mix the concrete with required proportion and water [cement](#) ratio by mechanical mixer machine and place the same in to pits. Poured surface to be rammed and finished smoothly