



THUMP RULE

A READY RECKONER FOR QUANTITY SURVEYORS

Material and Labour ratio for various trades of building construction

Sl no	Description of the trade	Material	Labour
1	Excavation and earth work in solis	-	100%
2	Concrete	80%	20%
3	Brick work	75%	25%
4	Wood work (including form work) and joinery	72%	28%
5	Bilders hard ware	85%	15%
6	Steel and iron work	82%	18%
7	Roof covering	85%	15%
8	Pavings and floor finishes	75%	25%
9	Plastering	65%	35%
10	Glazing	88%	12%
11	Paintitng, white colour wash and distempering on walls and ceiling	65%	35%
12	Water supply	85%	15%
13	Electrifications	85%	15%
14	Sanitary fittings and plumbing	84%	16%
15	Fire fighting installation including connections plumbing items	85%	15%
16	Central air conditioning installation including ducting etc	87%	13%
17	Lifts	86%	14%

DESIGN MIX



Design Mix: (Approx-By Weight)

M10 (1: 3.92: 5.62)

Cement	:	210 Kg/M3
20 mm Jelly	:	708 Kg/M3
12.5mm Jelly	:	472 Kg/ M3
River sand	:	823 Kg/M3
Total water	:	185 Kg/ M3
Fresh concrete density	:	2398Kg/M3

M20 (1: 2.48: 3.55)

Cement	:	320 Kg/M3
20 mm Jelly	:	683 Kg/M3
12.5mm Jelly	:	455 Kg/ M3
River sand	:	794 Kg/M3
Total water	:	176 Kg/M3
Admixture	:	0.7%
Fresh concrete density	:	2430 Kg/M3

M25 (1 : 2.28 : 3.27)

Cement	:	340 Kg/M3
20 mm Jelly	:	667 Kg/M3
12.5mm Jelly	:	445 Kg/ M3
River sand	:	775 Kg/M3
Total water	:	185 Kg/M3
Admixture	:	0.6%
Fresh concrete density	:	2414 Kg/M3

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

M30 (1: 2: 2.87)

Cement	:	380 Kg/M3
20 mm Jelly	:	654 Kg/M3
12.5mmJelly	:	436 Kg/ M3
River sand	:	760 Kg/M3
Total water	:	187 Kg/M3
Admixture	:	0.7%
Fresh concrete density	:	2420 Kg/M3

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



M35 (1: 1.79: 2.57)

Cement	:	410 Kg/M3
20 mm Jelly	:	632 Kg/M3
12.5mmJelly	:	421 Kg/ M3
River sand	:	735 Kg/M3
Total water	:	200 Kg/M3
Admixture	:	0.7%

Fresh concrete density : 2400 Kg/M3

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

M40 (1: 1.67: 2.39)

Cement	:	430 Kg/M3
20 mm Jelly	:	618 Kg/M3
12.5mmJelly	:	412 Kg/ M3
River sand	:	718 Kg/ M3
Water Cement ratio	:	0.43

Admixture : 0.7% Note: Sand = 718 + Bulkage1%

M45 (1: 1.58: 2.26)

Cement	:	450 Kg/M3
20 mm Jelly	:	626 Kg/M3
12.5mmJelly	:	417 Kg/M3
River sand	:	727 Kg/ M3+ Bulkage1%
Water Cement ratio	:	0.43
Admixture	:	0.7%

M50 (1 : 1.44 : 2.23)

Cement	:	450 Kg/M3
20 mm Jelly	:	590 Kg/M3
12.5mmJelly	:	483 Kg/M3
River sand	:	689 Kg/ M3 + Bulkage 12%
Water Cement ratio	:	0.36 (188Kg)
Admixture	:	1.20%3
Micro silica	:	30 Kg Super flow6.7% of cement

STEEL DETAILS



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 feet

W = Weight of hammer in tones

H = Height of fall in feet.

S = Set for 1 blow 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: + 2%

Aggregate: + 3%

Admixture: + 3%

Water: + 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 = + 0.05 D (specified thickness).

REINFORCEMENT :

For effective depth $D < 200\text{mm}$ = + 10mm

For effective depth $D > 200\text{mm}$ = + 15mm

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 are 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

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.

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 $1.25 \times 40 = 50$ Mpa

Weight of Different Steel Bars

MS Steel round & square Bar

Sr.No.	Dia. of steel bar	Weight per meter	
		Round Bar	Square Bar
1	6 mm	0.22 Kg.	0.28 Kg
2	8 mm	0.39 Kg	0.50 Kg
3	10 mm	0.62 Kg	0.78 Kg
4	12 mm	0.89 Kg	1.13 Kg
5	16 mm	1.58 Kg	2.01 Kg
6	20 mm	2.46 Kg	3.14 Kg
7	25 mm	3.85 Kg	4.91 Kg
8	28 mm	4.83 Kg	6.15 Kg
9	32 mm	6.31 Kg	8.04 Kg
10	36 mm	7.99 Kg	10.17 Kg
11	40 mm	9.86 Kg	12.56 Kg
12	45 mm	12.49 Kg	15.90 Kg
13	50 mm	15.41 Kg	19.62 Kg

CEMENT MIX PROPORTIONS



THEORITICAL CEMENT CONSUMPTION

Sno	Description of item	Mix by Volume	Unit	Cement In Kg	Constant In bags
	Cement concrete				
1	Mixed cement concrete delivered on bunker	1:1.5:3	Cum	402.83	8.05
		1:2:4		308.53	6.17
		1:2:5		268.55	5.37
		1:2.5:4		253.18	5.06
		1:3:6		213.20	4.26
		1:4:8		161.95	3.24
		1:5:10		129.15	2.58
		1:7:12		104.55	2.09
2	Mixed cement concrete using all in aggregate delivered on bunker	1:5	Cum	312.63	6.25
		1:6		264.45	5.29
		1:8		206.03	4.12
		1:12		138.38	2.77
	MORTARS				
3	Cement and sand mortars	1:1	Cum	1058.82	21.18
		1:2		699.05	13.98
		1:3		493.03	9.86
		1:4		382.33	7.65
		1:6		254.20	5.08
		1:8		192.70	3.85
4	Gauged mortar(cement lime and sand mortar)	1:1:6	Cum	244.98	4.90
		1:1:8		189.63	3.79
		1:2:9		164.00	3.28
		1:5:10		147.60	2.95
		1:7:12		120.95	2.42
5.	BRICKWORK				
				Old size	Modular
	Brickwork in well burnt bricks straight on plan or to curve exe 6M mean inner radius, built in cement, built in gauged mortar	1:3	Cum	123.00	113.38
		1:4		95.84	87.96
		1:6		64.05	58.47
		1:8		47.98	44.32



6	Stone masonry Walling of random or polygonal rubble uncoarsed or brought upto coarsed well bonded bedded and solidly hearted in cement mortar	1:3	Cum	147.60	2.95
		1:4		114.80	2.29
		1:6		65.00	1.51
		1:8		58.94	1.18
7	Walling of random or polygonal rubble uncoarsed or brought upto coarsed well bonded bedded and solidly hearted in gauged mortar	1:1:6	Cum	73.80	1.48
		1:1:8		114.80	2.29
		1:1:9		49.71	0.99
8	Plastering 10mm (1/2") th. Rendering or screeding on bricks or concrete surface in cement and sand mortar	1:2	Sqm	11.79	0.24
		1:3		8.41	0.17
		1:4		6.77	0.14
		1:6		4.66	0.09
9	10mm (1/2") th. Rendering or screeding on bricks or concrete surface in cement and gauged mortar	1:1:8	Sqm	3.38	0.07
		1:2:9		2.82	0.06
10	10 mm (1/2") th. Rendering or screeding on stone masonry surfaces or lathing in cement and sand mortar	1:2	Sqm	15.68	0.31
		1:3		11.17	0.22
		1:4		8.41	0.17
		1:6		5.64	0.11
11	10 mm (1/2") th. Rendering or screeding on stone masonry surfaces or lathing in cement and gauged mortar	1:1:8	Sqm	4.20	0.08
		1:2:9		3.64	0.07
		1:4		2.51	0.05
12	Add to or deduct from serial item no. 8 &10 for each 5mm(1/4") th. In CM over or under 10 mm (1/2") on concrete, brick, lathing or stone masonry surfaces	1:2	Sqm	4.77	0.10
		1:3		3.38	0.07
		1:4		2.51	0.05
		1:6		1.69	0.03
13	-ditto- item no.9&11 in gauged mortar	1:1:8	Sqm	1.38	0.03
		1:2:9		1.13	0.02



14	POINTING Raking cut joints to a depth of 10 mm and flush keyed or stuck pointing on brick work	1:2	Sqm	2.51	0.05
		1:3		1.69	0.03
		1:4		1.39	0.03
		15	Raking cut joints to a depth of 10 mm and flush keyed or stuck pointing on random rubble masonry, uncoarsed or brought to coarsed, with 20mm thick joints in CM	1:2	Sqm
1:3	1.69			0.03	
1:4	2.83			0.06	
16	Struck, keyed or flush pointing to squared rubble coursed or uncoursed walling in cement mortar			1:2	Sqm
		1:3	1.13	0.02	
		1:4	0.85	0.01	
		17	Bastard tuck or manson's V-joint pointing to squared rubble coursed or uncoursed masonry in cement mortar	1:2	Sqm
1:3	3.64			0.07	
1:4	2.82			0.06	
18	Bastard tuck or manson's V-joint pointing to random rubble masonry uncoursed or brought to coarsed in cement mortar			1:2	Sqm
		1:3	3.64	0.07	
		1:4	2.82	0.06	
19	Brick Flooring Hard burnt brick floors, laid flat jointed and pointed flush in cement and sand mortar	1:3	Sqm	11.17	0.22
		1:6		5.64	0.11
		20	- ditto- but bricks laid on edge ditto	1:3	Sqm
1:6	8.41			0.17	
21	Surface finishing to concrete floors				
	Flooring with wool or steel hand float as ordered cement concrete floor surface to fair and even surface using extra cement		Sqm	1.38	0.03



22	Granolithic Flooring				
	30 mm thick granolithic concrete floor tapping	1:1:2	Sqm	16.09	0.32
	spread over ordinary concrete floors etc, including floating or troweling to an even and fair surface				
23	10 mm (3/8") thick layer of terrazzo (consisting of one part of mixture of cement and marble powder to 1.5 parts of approved crushed stone chipping, 4 to 7 mm size laid level or to false including cut and polished finish	1:1:5	Sqm	8.71	0.17
24	Terrazzo flooring				
	10 mm thick layer of terrazzo (consisting of 3 parts of cement mixed with one part of marble powder by weight; and one part of such mixture by volume mixed with 1.5 parts by volume of crushed marble or other approved stone chippings laid to levels or false	1;1:2	Sqm	8.71	0.174

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

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

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

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

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

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

Add 30 to 35% as bulking of sand = 0.36 m³

Add 20 as wastage of sand = 0.312 m³

Total = 1.872 m³

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

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

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

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

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

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

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

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

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

Add 2% wastage = 22

Total = 1122 No's

Increase by 25% for dry mortar = 3 M³

= $3 / (1+6)$

= 0.429 M³

Cement = $0.429 \times 30 = 12.50 \text{ bags}$

Sand = $0.429 \times 6 = 2.57 \text{ M}^3$

Blocks = 1122 No's



VARIOUS CHECK LIST FOR CONSTRUCTION

A. Electrical check list

Sample Home Electrical Inspection Checklist

Scout's Name: _____

Outlets

- ☐ Check for outlets that have loose-fitting plugs, which can overheat and lead to fire.
- ☐ Replace any missing or broken wall plates.
- ☐ Make sure there are safety covers on all unused outlets that are accessible to children.

Line Cords

- ☐ Make sure cords are in good condition-not frayed or cracked.
- ☐ Make sure they are placed out of traffic areas.
- ☐ Make sure that cords are not nailed or stapled to the wall, baseboard or to another object.
- ☐ Make sure that cords are not under carpets or rugs or any furniture rests on them.

Extension Cords

- ☐ Check to see that extension cords are not overloaded & only be used on a temporary basis, not as permanent wiring.
- ☐ Make sure extension cords have safety closures to help protect children from shock hazards and mouth burns.

Plugs

- ☐ Make sure your plugs fit securely into your outlets.
- ☐ Make sure no plugs have had the ground pin (the third prong) removed in order to make a three-prong fit a two-conductor outlet; this could lead to an electrical shock.
- ☐ Never force a plug into an outlet if it doesn't fit.
- ☐ Avoid overloading outlets with too many appliances.

Ground Fault Circuit Interrupters (GFCIs)

GFCIs can help prevent electrocution. When a GFCI senses current leakage in an electrical circuit, it assumes a ground fault has occurred. It then interrupts power fast enough to help prevent serious injury from electrical shock. GFCIs can be installed at the outlet, or as a replacement for the circuit breaker for an entire circuit at the fuse box.

- ☐ Kitchen ☐ Bathrooms ☐ Garage ☐ Laundry room ☐ Outdoors
- ☐ Test GFCIs according to the manufacturer's instructions monthly and after major electrical storms to make sure they are working properly.

Light Bulbs

- ☐ Check the wattage of all bulbs in light fixtures to make sure they are the correct wattage for the size of the fixture.
- ☐ Replace bulbs that have higher wattage than recommended; if you don't know the correct wattage, check with the manufacturer of the fixture.
- ☐ Make sure bulbs are screwed in securely; loose bulbs may overheat.

Circuit Breakers/Fuses

- ☐ Make sure circuit breakers and fuses are the correct size current rating for their circuit. If you do not know the correct size, have an electrician identify and label the size to be used. Always replace a fuse with the correctly specified size fuse.
- ☐ Make sure everyone in your home knows where the main breaker is located and how to shut off power to the entire house.

Plug In Appliances

- ☐ Make sure there are no plugged-in appliances where they might fall in contact with water. If a plugged-in appliance falls into water, NEVER reach in to pull it out—even if it's turned off. First turn off the power source at the panel board and then unplug the appliance. If you have an appliance that has gotten wet, don't use it until it has been checked by a qualified repair person.



Sample Home Electrical Inspection Checklist

Scout's Name: _____

Sample Home Electrical Inspection Checklist (page 2)

Appliances

- ☐ If an appliance repeatedly blows a fuse, trips a circuit breaker or if it has given you a shock, unplug it and have it repaired or replaced.

Entertainment/Computer Equipment

- ☐ Check to see that the equipment is in good condition and working properly. Look for cracks or damage in wiring, plugs and connectors.
- ☐ Use a surge protector bearing the seal of a nationally recognized certification agency.

Outdoor Safety

- ☐ Electric-powered mowers and other electric tools should not be used in the rain, on wet grass or in wet conditions.
- ☐ Inspect power tools & electric lawn mowers before each use for frayed power cords, broken plugs & cracked or broken housings. If any part is damaged, stop using it immediately. Repair it or replace it.
- ☐ Always use an extension cord marked for outdoor use and rated for the power needs of your tools.
- ☐ Remember to unplug all portable power tools when not in use.
- ☐ When using ladders, watch out for overhead wires and power lines. Stay at least 10 feet from all overhead lines.

Lightning

- ☐ During an electrical storm, do not use appliances (i.e., hairdryers, toasters and radios) or telephones (except in an emergency); do not take a bath or shower;
- ☐ Keep batteries on hand for flashlights and radios in case of a power outage.
- ☐ Use surge protectors on electronic devices, appliances, phones, fax machines and modems.

Space Heaters

- ☐ Space heaters are meant to supply supplemental heat. Keep space heaters at least 3 ft. away from any combustible materials such as bedding, clothing, draperies, furniture and rugs.
- ☐ Don't use space heaters in rooms where children are unsupervised and remember to turn off and unplug when not in use.
- ☐ Do not use space heaters with extension cords; plug directly into an outlet on a relatively unburdened circuit.

Halogen Floor Lamps

- ☐ Halogen floor lamps operate at much higher temperatures than a standard incandescent light bulb. Never place a halogen floor lamp where it could come in contact with draperies, clothing or other combustible materials.
- ☐ Be sure to turn the lamp off whenever you leave the room for an extended period of time.
- ☐ Never use torchiere lamps in children's bedrooms or playrooms. Consider using cooler fluorescent floor lamps.

Plans and Permits

Job address is posted in a visible location. (IRC 321.1)

Permit and approved plans are on site and accessible to the inspector. (UPC 103.3.2)

Permit information is correct. (address, permit number, scope of work, etc.) (UPC 103.3.2)

Confirm that all fixtures are included. (UPC 103.2 & 103.5)

Underground Plumbing

No pipes directly embedded in concrete. All pipes passing through concrete walls or floors are protected from breakage. Voids around piping passing through concrete floors on the ground are appropriately sealed. (UPC 313.1 & 313.2)

Sleeves are used for piping passing through concrete or masonry that are not bored or drilled. (UPC 313.10)

No flat venting. Vent pipe inverts taken off above the centerline of the drain. (UPC 905.1 & 905.2)

Vents downstream of trap. (UPC 905.2)

Pipe trenches parallel to footings offset a minimum 45° from footing bearing line. (UPC 313.3)

Type L copper for water lines installed underground. (See exceptions UPC 604.2)

Ferrous metals must be wrapped. (UPC 609.3.1)

Drains, waste and vents (DWV) water tested with a 10' head for 15 minutes or air tested a 5psi for 15 minutes. Plastic pipe not allowed to be tested with air. (UPC 712.1, 2 & 3)

Water lines tested to working pressure or 50 psi for 15 minutes. Plastic water piping not allowed to be tested with air. (UPC 609.4)

Sewage Ejectors

Only and all fixtures installed on a floor level lower than the next upstream manhole cover feed through accessible backwater valve. (UPC 710.1)

Only fixtures on floor levels below crown level of the sewer may discharge through ejector. (UPC 710.2)

Backwater and gate valves on pump discharge. (UPC 710.4)

Sized for 2 fixture units per gallon per minute of flow. (UPC 710.5)

Minimum 2" discharge when a water closet discharges to the sump. (UPC 710.3 as amended by WA State)

Lift to horizontal sewer then drain by gravity. (UPC 710.4)

Pump(s) have audio and visual alarms and are readily accessible. (UPC 710.9)

Drains

Drains, waste and vents (DWV) water tested with a 10' head for 15 minutes or air tested at 5psi for 15 minutes. (UPC 712.1, 2 & 3)

Drains properly sized. (UPC Table 7-3 & 7-5)

Back to back fixtures require double fixture fitting. (UPC 704.2)

Change in direction from vertical-to-horizontal or horizontal-to-horizontal through wye branches or 45° wye branches or fittings or equal sweep. (UPC 706.3 & 706.4)

Tub waste openings into crawl space must be closed off with metal collars or metal screens fastened to structure with openings no greater than ½ inch. (UPC 313.12.4)

Double sanitary tees may be used when barrel of stack is 2 times larger than inlets, for connecting with a vertical stack. (UPC 706.2)

No threaded ABS fittings or joints located in a non-accessible location. (UPC IS 5-316.1.59)

Install 18 gauge nail plates when plastic or copper plumbing in within 1" of face of framing. (UPC 313.9)

Hangers and straps don't compress, distort, cut or abrade the piping and allow free movement of pipe. Pipes exposed to damage by sharp surfaces are protected. (UPC IS 5-314.1)

Support plastic lines at every 4'. Support at each horizontal branch connection. (UPC Table. 3-2)

Support vertical plastic lines at base and each floor. Provide mid-story guides. (UPC Table. 3-2)

Support horizontal cast iron hubless at every other joint, unless over 4' then support each joint. Support adjacent to joint, not exceed 18". Support at each horizontal branch connection. Hangers not placed on the coupling. (UPC Table 3-2)

Support vertical cast iron hubless at base and each floor not to exceed 15'. (UPC Table 3-2)

Waste pipes installed outside or in exterior walls are protected from freezing where necessary. P-traps for example. (UPC 313.6 amended by WA State)



Traps

Each trap protected by a vent. (UPC 1002.2)

The developed length of the trap arm not to exceed the following limits. (UPC Table. 10-1):

Pipe Size	Length of trap arm
1 ¼"	2'6"
1 ½"	3'6"
2"	5'
3"	6'
4" & larger	10'

Trap arms less than 3" cannot change direction more than 90° without the use of a cleanout. (UPC 1002.3)

Trap arms 3" and larger cannot change direction more than 135° without the use of a cleanout when installed at the lowest level of the gravity drain. (UPC 707, 1002.3, exception & IAPMO interpretation)

Vertical distance between fixture outlet and the trap as short as practicable and not over 24" in length except for clothes washer which can have maximum 30" standpipe. (UPC 1001.4)

Cleanouts

Each horizontal drainage pipe provided with a cleanout at its upper terminal and each run of piping which is more than 100' in total developed length, provided with a cleanout for each 100', or fraction thereof, in length of such piping. See exceptions. (UPC 707.4)

Cleanouts not required at horizontal runs <5 except sinks. (UPC 707.4, ex. 1)

Cleanouts may be omitted on any horizontal drainage pipe installed on a slope of 72° or less from the vertical angle. (UPC 707.4 ex. 2)

Cleanouts not required above the lowest level of the gravity drain. (UPC 707.4, ex 3 & IAPMO interpretation)

An approve (2) way cleanout fitting, installed inside the building wall near the connection between the building drain and building sewer or installed outside of a building at the lower end of a building drain and extended to grade, may be substituted for an upper terminal cleanout. (UPC 707.4, ex. 4)

Required at each aggregate horizontal change of direction exceeding 135°. (UPC 707.5)

Each cleanout installed so that it opens to allow cleaning in the direction of flow of the soil or waste or at right angles thereto and, except in the case of wye branch and end-of-line cleanouts, installed vertically above the flow line of the pipe. (UPC 707.6)

Underfloor cleanout not more than 20' from access door with an unobstructed 30" wide x 18" high pathway (UPC 707.10)

Cleanouts are accessible, 12" clearance required at lines less than or equal to 2", 18" clearance at lines greater than 2" (UPC 707.10)

Extend above floor or outdoors if access limited. (UPC 707.10)

Island-Sink Venting

Drain loop method requires fittings be of drainage type only. (UPC 909)

Drain serving the island serves no other fixtures upstream from return vent. (UPC 909)

Island sink cleanout in vertical section of foot vent. (UPC 909)

Vents

Unless prevented by structure the vent must rise vertically 6" above the floor level rim before continuing to horizontal. (UPC 905.3)

Horizontal vent above fixture rim except island sink, where structurally impossible or when allowed by the local jurisdiction. (UPC 905.3)

Vent pipe located below flood level of rim must be drainage pattern. (UPC 905.3)

Takeoffs for vents must be above the weir. (UPC 905.5)

No flat venting. Vent pipe inverts are taken off above the centerline of horizontal drainage pipe. (UPC 905.2)



Aggregate vent areas must be $\geq$ to the building drain. (UPC 904.1)
Vents terminate a minimum 6" above roof line (10" in high snow load areas) (UPC 906.7)
Vent clearance to building openings are 3' above or 10' horizontal. (UPC 906.2)

Air-Admittance Valves

Minimum 4" above drain. (Per local jurisdiction)
Minimum 6" above insulation in attic. (Per local jurisdiction)
Must be accessible and open to air flow. (Per local jurisdiction)

Wet Vents

Not greater than 6' developed length. (UPC 908.1)
Maximum unregulated pressure 80 psi. (UPC 608.2)
Limited to traps of one and two fixture units. (UPC 908.1)
Not to serve as vent to more than four fixtures. (UPC 908.1)

Water Service

Minimum service $\frac{3}{4}$ ". (UPC 610.8)
Maximum unregulated pressure 80 psi. (UPC 608.2)
Main valve on discharge side of the meter is full way type. (UPC 605.2)
Dielectric fittings or other approved fitting used between galvanize and copper piping. (UPC 508.1 & 604.1)
Replacement of metal pipe water service with plastic pipe water service has not affected the building grounding system. (UPC 604.8 & NEC 250.104)
Backflow prevention for protection from fire-sprinkler, irrigation systems, or other cross connection/contaminations (UPC 603.4)
Water service buried deep enough to protect from freezing. Minimum is typically 18" or 12" below frost level, but varies from jurisdiction to jurisdiction. (UPC 609.1 & 313.6 as amended by WA State)
Materials: copper, Polyethylene, PVC, CPVC, PEX galvanize are all approved by the State of Washington. All installed per manufacture's installation requirements. (UPC 604 as amended by WA State)
50 lbs. Minimum water test required or working pressure for 15 minutes. Plastic water piping not allowed to be tested with air. (UPC 609.4)
Inside the building, barbed insert fitting with hose clamps on plastic water pipe are prohibited. A ford fitting or equal must be installed. (UPC 604.15 as amended by WA State)
If you can verify water pressure and if it exceeds 80 lbs, a pressure-reducing valve is required CPVC water supplies under a slab require 150 psi 2 hr test. Plastic water piping cannot be air tested. (UPC 608.2.1S 20-609.4).
Water pipes not in same trench as building sewer or drainage piping constructed of clay or materials which are not approved for use within a building unless both of the following conditions are met. The bottom of the water pipe, at all points, is at least twelve inches above the top of the sewer or drain line and the water pipe is placed on solid shelf excavated at one side of the common trench with a minimum clear horizontal distance of at least 12" from the sewer or drain line. (UPC 609.2.1 & 609.2.2)
Water pipes crossing sewer of drainage constructed of clay or materials, which are not approved for use within a building are laid a minimum 12" above the sewer or drain pipe. (UPC 609.2.2)
Water piping installed within a building and in or under a concrete floor or slab resting on the ground installed per section. (UPC 609.3)
Ferrous piping has a protective coating of an approved type, machine applied and conforming to recognized standards. Field wrapping to provide equivalent protection and is restricted to those short sections and fittings necessarily stripped for threading. Galvanized coating is not deemed adequate protection for piping or fittings. Approved non-ferrous piping not required to be wrapped. (UPC 609.3.1)
Underground copper tubing installed without joints where possible. Where joints are permitted, they are brazed and fittings are of wrought copper. (Within the fixed limits of the building foundation). (UPC 609.3.2)



Valves, including pressure-reducing valves, if installed in the ground require access boxes. (UPC 605.6)
For the replacement of metallic water services metallic water pipe must be replaced with metallic pipe or an approved grounding system installed when installing plastic water pipe. Per the electrical code, a minimum of 10' of copper piping is installed in the ground on the house side to maintain the existing electrical grounding system. (UPC 604.8, NEC 250-81) If 10' of metallic piping cannot be installed consult the building official for a viable option.

Unsuitable bedding and backfill such as rocks larger than ¾", asphalt and debris cannot be installed below or above the water service. If backfill material looks bad you should require select fill minimum 6" below and 12" above the water service. Inspection of the fill prior to covering. Water service may be sleeved with SCH 40 sleeve 2 pipe sizes larger than pipe in lieu of select fill. (UPC 315.4)

Building shutoff valve required to be full way type. (UPC 605.2)

Water Lines

It is required to have adequate backflow prevention when the building has a fire sprinkler system. A RPB (reduced pressure backflow preventer) is required when there is a water supply to hydronic heat boiler. If a backflow device such as an RPB or DCVA is within the building, verify that it has been tested and signed off. (UPC 603.1 as amended by WA State)

Water hammer arrestors or air chambers installed. Devices are installed per manufacturer's specifications for location and installation. (UPC 609.10.2)

Hot and cold water lines installed outside the building or conditioned space insulated with minimum R-3. (UPC 313.6 as amended by WA State)

Water lines tested to working pressure or 50 psi for 15 minutes. Plastic water piping not allowed to be tested with air. (UPC 609.4)

Laundry

Standpipe receptor $\geq$ 18 in. & $\leq$ 30 in. above trap. (UPC 804.1)

No trap for clothes washer stand pipe installed below the floor. (UPC 804.1)

Trap minimum 6", maximum 18" above the floor. (UPC 804.1)

Water hammer arrestors or air chambers installed. Devices are installed per manufacturer's specifications for location and installation. (UPC 609.10.2)

Kitchen

Dishwasher drain requires air gap. (UPC 807.4)

Water hammer arrestors or air chambers installed. Devices are installed per manufacturer's specifications for location and installation. (UPC 609.10.2)

Bathroom

Rigidly support faucet and shower head fittings. (UPC 609.1, 412.12)

Minimum shower area 1024 sq. in. with a 30" clear diameter to 70" from the floor of the shower. (UPC 411.7)

Minimum shower rough pan 32"x32". (UPC 412.7)

Listed anti-scald/pressure balance valve required. (120° F. maximum) (UPC 420)

Water closet set a minimum of 15" to center from sidewall with a total clear width of 30" and 24" at the front. (UPC 408.6)

Flange secured with corrosion resistant fasteners. (UPC 408.3)

Closet ring to vent is maximum distance of 6'. (UPC Table 10-1)

Slip joints used at tub drain are accessible. Access door a minimum of 12" x 12". (UPC 405.02)

Over rim tub faucets set with a minimum 1" air gap to tub rim. (UPC Table 6-3, 602.3 & 603.3.5)

Water hammer arrestors or air chambers installed. Devices are installed per manufacturer's specifications for location and installation. (UPC 609.10.2)

Shower Subpans

See section above for minimum dimensions.

Dam $\geq$ 2" and $\leq$ 9". (UPC 412.6)

Pan liner plastic, 3 layers hot mop type 15 lb. Felt or other approved membrane. (UPC 412.8)

Liner minimum 3" above the dam. (UPC 412.8)

Slope underpayment ¼" per foot. (UPC 412.6)

No fasteners less than 1" above dam. (UPC 412.8)

Weep holes at drain are clear. (UPC 412.8)

Doorway minimum finished opening of 22" wide. (UPC 412.6)

Exterior

Vacuum breakers on all hose faucets. (UPC 603.4.7)

Backflow protection on all irrigation systems. (UPC Table 6-2 & 603.4.6 as amended by WA State)

No valves downstream of vacuum breakers. (UPC Table 6-2)

Explanatory Notes for Fire Safety Checklist



Purpose of the Checklist

1. The purpose of this Checklist is to facilitate building owners/occupiers to carry out routine inspections on fire safety provisions of their own buildings, and to rectify minor irregularities identified. This would enhance their awareness on fire safety, and is the most effective and immediate means to protect their lives and properties.

The Checklist

2. The Checklist is devised for the general use of building owners/occupiers. The items for inspection are common but essential on fire safety.
3. The building owners/occupiers may co-ordinate themselves to inspect the buildings on a regular basis. District Of fices would assist owners in the formation of Owner's Corporations or Mutual Aid Committees if necessary.
4. If any of the items in the Checklist is 'Yes', it implies that fire safety of the building is adversely affected. The locatio ns of the irregularities should be duly recorded by the inspection personnel.
5. Most of the items could be dealt with easily e.g. removal of obstructions in the staircases, closing the smoke stop doors properly, etc. The building owners/occupiers should rectify such irregularities immediately on the spot.
6. If there is doubt in rectifying the irregularities, building owners/occupiers may consult relevant professionals or seek advice/information from the relevant government departments as indicated at para.9 below.
7. The Checklist serves as a general guidance only, it is always a good practice to appoint a professional to check the building conditions regularly.
8. The Checklist should be kept by the building owners for necessary follow-up actions and future reference.

Enquiries

9. For any enquiries, please contact the following departments:-

Fire Services Department	2272 9112 (for building fire safety measures)
	2170 9630 (for Fire Safety Checklist)

Home Affairs Department	2123 8399 (for formation of Owner's Corporations or Mutual Aid Committees)
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Buildings Department	2135 2416 (for general construction requirements)
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Electrical and Mechanical Services Department	1823 (forelectricalinstallations)
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Fire Safety Checklist

Types of Deficiencies

_____ Yes _____ No N/A

(If Yes, please put a "✓" in the appropriate box)

	Common Staircase	Corridor	Building Entrance/Exit
--	---------------------	----------	---------------------------

(A) Management of Smoke Stop Doors

1. Missing or defective smoke stop doors, defective door hinges or broken glazing.

☐☐☐☐

Floor : _____

2. Smoke stop doors wedged open or not in a properly closed position.

☐☐☐☐

Floor : _____

(B) Management of Means of Escape

3. Unit gates swing out onto escape routes and causing obstruction.

☐☐☐☐

Floor : _____

4. Doors/gates in escape routes, common areas installed with locking device which cannot be openable from inside without the use of a key.

☐☐☐☐☐

Floor : _____

5. Lock-up of the door to main roof with a locking device which cannot be openable from inside without the use of a key.

☐☐☐☐

Floor : _____

6. Staircase wall openings for installation of exhaust fans, air-conditioners, doors, windows, etc.

☐☐☐

Floor : _____



Types of Deficiencies

_____ Yes _____ No N/A

(If Yes, please put a "✓" in the appropriate box)

	Staircase	Common Corridor	Building Entrance/Exit		
Unauthorized structures such as cabinet, shelves or stores in escape routes.	☐	☐	☐	☐	☐
Floor : _____	_____	_____			
Refuse, waste furniture or similar obstructions in escape routes.	☐	☐	☐	☐	☐
Floor : _____	_____	_____			
Emergency lighting in escape routes or exits are damaged or not illuminated.	☐	☐	☐	☐	☐
Floor : _____	_____	_____			
10. Exit signs are damaged or not illuminated.	☐	☐	☐	☐	☐
Floor : _____	_____	_____			

(C) Maintenance of Fire Service Installations

11. Extinguishers provided in the building are defective, damaged, missing or lack of maintenance.	☐	☐	☐	☐	☐
Floor : _____	_____	_____			
12. Manual fire alarm call points are defective, damaged or obstructed by other objects.	☐	☐	☐	☐	☐
Floor : _____	_____	_____			

**Types of Deficiencies**

_____ Yes _____ No N/A

(If Yes, please put a "✓" in the appropriate box)

	Staircase	Common Corridor	Building Entrance/Exit		
13. Fire hydrants / hose reels system are defective, damaged or obstructed.	☐	☐	☐	☐	☐
Floor : _____	_____	_____			
14. Signs of Fire Service Inlets / Sprinkler Inlets / Hose Reels or Hose Reel cabinets are illegible or missing.	☐	☐	☐	☐	☐
Floor : _____	_____	_____			
15. Obstruction to Fire Service Inlets of the building, such as a metal gate in the course of swinging, fixtures, etc.			☐	☐	☐
16. Obstruction to Sprinkler heads by storage racks, goods, fixed structures such as cockloft, cabinet, etc, such that the clearance below each individual sprinkler head is less than 500mm.	☐	☐	☐	☐	☐
Floor : _____	_____	_____			
17. Unauthorized tampering with the Fire Service installations such as the shut-down of the control valves of sprinkler system rendering the system not in efficient working order.	☐	☐	☐	☐	☐
Floor : _____	_____	_____			
18. Fireman lift sign is illegible or missing.			☐	☐	☐
19. The Fire Service Installations is lack of maintenance or not inspected by a Registered Fire Service Installation Contractor annually.			☐	☐	☐



Types of Deficiencies

Yes _____ No _____ N/A _____

(If Yes, please put a "✓" in the appropriate box)

Staircase Common Building
Corridor Entrance/Exit

20. The building Ventilating System is lack of maintenance or not inspected by the Registered Specialist Contractors (Ventilation Works) annually.

☐☐☐

Main Lobby

21. The Certificate of Annual Fire Service Installations Inspection is not displayed at the prominent position of the building.

☐☐☐

(D) Maintenance of Electricity System

22. Damaged or untidy electric wires.

☐☐☐☐☐

Floor : _____

Name of Building : _____ Responsible Person : _____

Address of Building : _____ Date : _____

POUR CARD



POUR CARD FOR RAFT SLAB

Project

Grid:		Block:		client		Date:
Sl No	Description	Contractor	Yes No		Remarks	

MARKING

1	Base level checking				
2	Center line checking				
3	Raft orientation				
4	inner size				
5	Diagonal				

REINFORCEMENT

1	Raft reinforcement				
2	Plump for vertical reinforcement				
3	Spacing				
4	Raft top rods				
5	Raft bottom rods				
6	Overlaps				
7	Raft alignment				
8	Chair rod				

FORM WORK

1	Cover				
2	Side alignment				
3	Side Plump				
4	Footing side support				
5	Footing side depth				
6	Beam side plumb				
7	Beam cover				
8	Beam support				
9	Beam side alignment				
10	Beam side depth				
11	Oil coating for form work.				

RCC

1	Rcc mix				
2	Base level checking				
3	Footing top level checking				
4	Rcc compaction by vibrator				
5	Slump test				
6	Finishing				
7	Cube casting				



POUR CARD FOR FOOTING

Project

Grid:		Block:		Date:	
SI No	Description	Contractor	client		Remarks
			Yes	No	
MARKING					
1	Base level checking				
2	Center line checking				
3	Column orientation				
4	Column size				
5	Footing orientation				
6	Footing size				
7	Diagonal				
REINFORCEMENT					
1	Footing mate reinforcement				
2	Column reinforcement				
3	Column reinforcement orientation				
4	Plump for Column reinforcement				
5	Column stirrups spacing				
6	Beam top rods				
7	Beam bottom rods				
8	Beam top extra rods				
9	Beam bottom extra rods				
10	Overlaps for beam & base slab				
11	Beam alignment				
12	Spacer rod				
13	Chair rod				



FORM WORK					
1	Footing cover				
2	Footing side alignment				
3	Footing side Plump				
4	Footing side support				
5	Footing side depth				
6	Beam side plump				
7	Beam cover				
8	Beam support				
9	Beam side alignment				
10	Beam side depth				
11	Oil coating for form work.				
RCC					
1	Rcc mix				
2	Base level checking				
3	Footing top level checking				
4	Rcc compaction by vibrator				
5	Slump test				
6	Finishing				
7	Cube casting				



POUR CARD FOR COLOUMN

Project

Grid:		Block:			Date:
SL No	Description	Contr actor	client		Remarks
			Yes	No	

MARKING

1	Center line checking				
2	Both side alignment				
3	Column orientation				
4	Column size				
5	Diagonal				

REINFORCEMENT

1	Column reinforcement				
2	Column reinforcement orientation				
3	Column stirrups spacing				
4	Overlaps				
5	Hook rod				
6	Column reinforcement cover				

FORM WORK

1	Column box plump				
2	Column box side support				
3	Column top level.				
4	Oil coating for box				
5	Diagonal				

RCC

1	Rcc mix				
2	Top level				
3	Rcc compaction by vibrator				
4	Slump test				
5	Finishing				
6	Cube casting				



POUR CARD FOR PLINTH BEAM

Project

Grid:		Block:			Date:
SL No	Description	Contractor	client Yes No		Remarks
FORM WORK					
1	Building outer to outer				
2	Bottom center line				
3	Column top level				
4	Beam bottom ply measurement from basement level				
5	Beam bottom ply alignment to column				
6	Beam side ply height				
7	Beam inner width				
8	Right angle checking				
9	Outer sides alignment				
10	Outer side plump				
11	Outer side support				
12	Bottom supports and brazing				
13	Holes or gaps at column joints				
REINFORCEMENT					
1	Column main rods overlaps				
2	Column reinforcement orientation (by paint marking)				
3	Beam width				
4	Beam alignment to column				
5	Beam main rods (bottom & top)				
6	Beam extra rods				
7	Overlaps for beam rods				
8	Beam rings spacing				
9	Spacer rod				
10	Beam binding				
11	Beam cover block				
RCC					
1	Rcc mix				
2	Top level				
3	Vibrating				
4	Cube casting				
5	Bottom & beam sides checking (any bulge or support problems)				
6	Finishing				



POUR CARD FOR LINTEL

Project

Grid:		Block:		Date:	
SL No	Description	Contractor	client Yes No		Remarks

FORM WORK

1	Lintel bottom ply measurement from FFL				
2	Lintel bottom ply alignment to Block work				
3	Lintel side ply height				
4	Lintel sunshade Measurements				
5	Sides around plump				
6	Sides around alignment				
7	Lintel sunshade bottom level				
8	Oil coating at Lintel and sunshade				
9	Outer side around supports, especially joints.				
10	No Holes or gaps				

REINFORCEMENT

1	Lintel width				
2	Lintel alignment				
3	Lintel main rods (bottom & top)				
4	Lintel rings spacing				
5	Sunshade main rods & distributor				
6	Lintel & Sunshade binding				
7	Laying the cover blocks				

RCC

1	Rcc mix				
2	Top level				
3	Bottom & sides checking(any bulge or support problems)				
4	Finishing				



POUR CARD FOR ROOF SLAB

Project

Grid:		Block:		Date:	
SI No	Description	Contractor	client		Remarks
			Yes	No	

FORM WORK

1	Building outer to outer				
2	Bottom center line				
3	Column top level				
4	Beam bottom ply measurement from floor level				
5	Beam bottom ply alignment to column				
6	Beam side ply height (beam depth-slab thickness)				
7	Beam inner width				
8	Beam inner side plump				
9	Beam inner side alignment				
10	Beam inner side support				
11	Slab bottom level				
12	Slab right angle checking				
13	Cellular tap laying & oil coating at slab				
14	Outer sides alignment				
15	Outer side plump				
16	Outer side supports, especially joints.				
17	Slab supports and brazing				
18	Holes or gaps at column joints slab joints				
19	Duct measurement				
20	Duct alignment				
21	Duct plump and support				



REINFORCEMENT

1	Beam width				
2	Beam alignment to column				
3	Beam main rods (bottom & top)				
4	Beam extra rods				
5	Overlaps for beam rods				
6	Overlaps for slab rods				
7	Beam rings spacing				
8	Spacer rod				
9	Slab main rods & distributor				
10	Slab extra rods				
11	Chair rod				
12	Slab & beam binding				
13	Column main rods overlaps				
14	Column reinforcement orientation (by paint marking)				
15	Laying the cover blocks at beam bottom, beam side, slab, columns and staircase waist slab.				

Electrical works

1	Quality of pipe and specials				
2	Conduit line as per drawing				
3	Gap between pipes				
4	Protection for junction & pipe line				

Plumbing works

1	Sleeves as per drawing				
---	------------------------	--	--	--	--

RCC

1	Rcc mix				
2	Top level				
3	Vibrating				
4	OTS and Duct location				



5	Cube casting				
6	Slab bottom & beam sides checking (any bulge or support problems)				
7	Finishing				

POUR CARD FOR CEILING PLASTERING

Project

Grid:		Block:		Date:	
SL No	Description	Contractor	client		Remarks
			Yes	No	

PLASTERING WORK

1	Hacking				
2	Ceiling bottom level				
3	Button fixing every 6ft in around				
4	No bulge in ceiling				
5	Beam to slab right angle checking				
6	Beam bottom level				
7	Beam bottom measurement				
8	Beam bottom alignment				
9	Beam bottom alignment match to the column				
10	Beam side depth				
11	Beam side plump				
12	Beam side alignment				
13	Beam side alignment match to the column				

Finishing work

1	Plastering mix				
2	Finishing at corner at four sides				
3	Button removal after plastering				
4	No holes or ugly finishing				

**POUR CARD FOR WALL PLASTERING****Project**

Grid:		Block:		Date:	
SL No	Description	Contractor	client		Remarks
			Yes	No	
Location:					
1	HACKING				
2	CHICKEN MESH WORKS				
3	THK AS PER SPECIFICATION				
4	BUTTON FIXING EVERY 6FT IN AROUND				
5	BEAM TO SLAB RIGHT ANGLE CHECKING				
6	PLUMB FOR WALLS				
7	BUTTON MARK @ WALL ALL AROUND				
8	CORNERS TOWARDS RIGHT ANGLE				
9	OPENINGS (WINDOWS, DOORS, VENTILATORS) AS PER DRAWING				
10	WINDOW OPEN TOWARDS RIGHT ANGLE				
11	WINDOW OPEN AS PER DRAWING/TEMPLATE				
12	MORTAR MIX AS PER SPECIFICATION				
13	LEVELS WITH ALIGNMENT BY THREAD				
14	BEAM OFFSET, LOFT - TOP & BOTTOM LEVEL				
15	LOFT THICKNESS				
16	FINISHING THE WALLS				
17	MODULAR BOX FINISHING				

BATH ROOM CHECK LIST



Residential Spaces

BATHROOMS

Planning Data

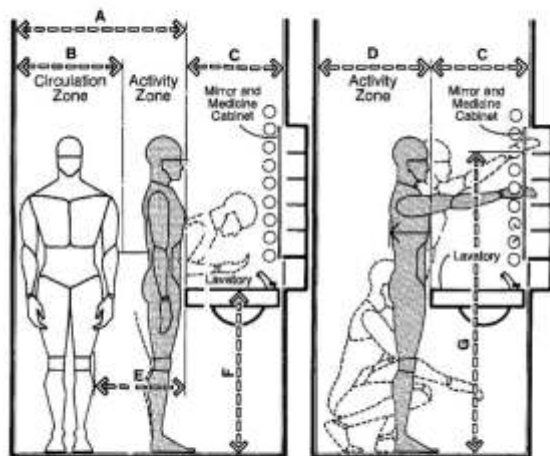


Fig. 1 Lavatory: male anthropometric considerations.

Figure 1 deals primarily with some of the more critical male anthropometric considerations. A lavatory height above the floor of 37 to 43 in., or 94 to 109.2 cm, is suggested to accommodate the majority of users. It should be noted, however, that common practice is to locate the lavatory in the neighborhood of 31 in. above the floor. In order to establish the location of mirrors above the lavatory, eye height should be taken into consideration.

Figure 2 explores, in much the same manner, the anthropometric considerations related to women and children. Given the great variability in body sizes to be accommodated within a single family, a strong case can be presented for the development of a height adjustment capability for the lavatory. Until that is developed, there is no reason, on custom installations, why the architect or interior designer cannot take anthropometric measurements of the client to ensure proper interface between the user and the lavatory.

	in	cm
A	48	121.9
B	30	76.2
C	19-24	48.3-61.0
D	27 min.	68.6 min.
E	18	45.7
F	37-43	94.0-109.2
G	72 max.	182.9 max.
H	32-36	81.3-91.4
I	69 max.	175.3 max.
J	16-18	40.6-45.7
K	26-32	66.0-81.3
L	32	81.3
M	20-24	50.8-61.0

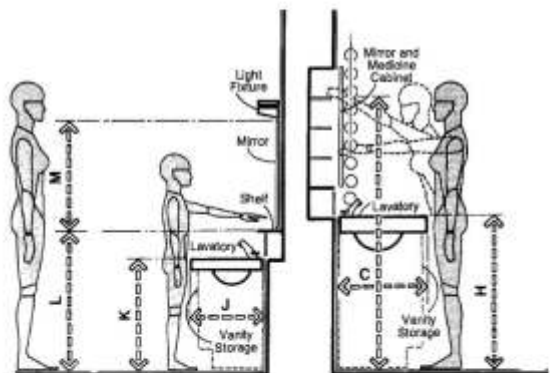


Fig. 2 Lavatory: female and child anthropometric considerations.

Residential Spaces

BATHROOMS

Typical Plans and Fixture Arrangements

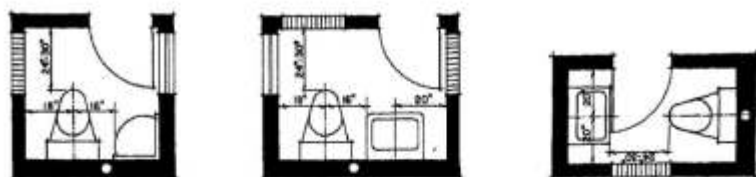


Fig. 3 Two-fixture plans: water closet and washbasin.

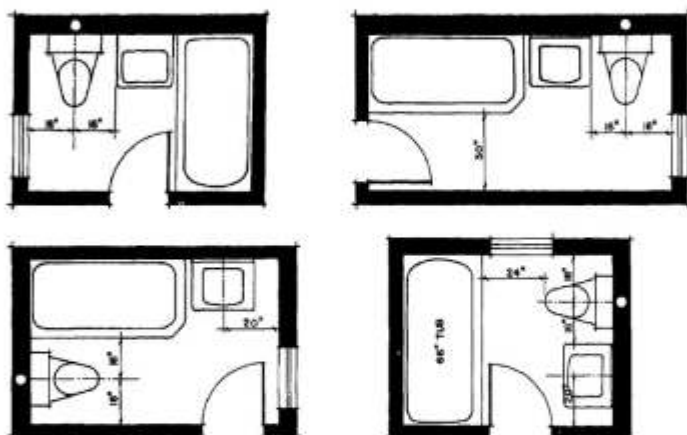


Fig. 4 Three-fixture plans: water closet, washbasin and tub.

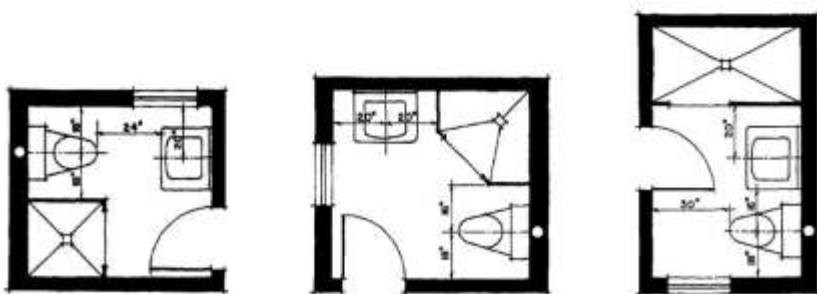
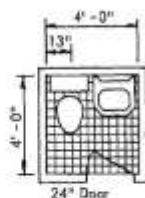


Fig. 5 Two- and three-fixture noncompartmented plans: water closet, washbasin, and shower.

Residential Spaces

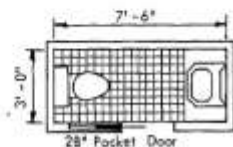
BATHROOMS

Typical Plans and Fixture Arrangements



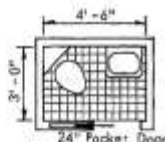
Minimum half-bath.

16 SF is about minimum for standard fixtures; 4'-6" x 4'-6" gives a more spacious feeling.



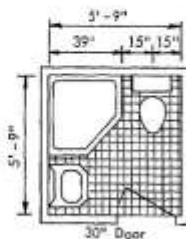
Generous half-bath.

22.5 SF is a generous half-bath. A well-hung lavatory instead of a vanity squeezes into 2'-6" width and 15.3 SF.



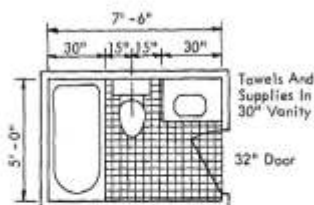
Corner toilet in a half-bath.

A corner toilet and a small lavatory fit 13.5 SF. Consider this idea for installing a half-bath in a closet or under a stairway.



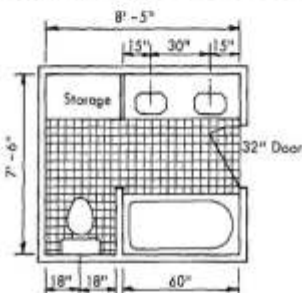
Corner shower.

A corner shower, toilet, and lavatory fit in 33 SF. Very little storage space available.



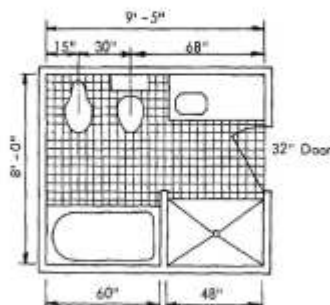
Small, 3-fixture bathroom.

A small 3-fixture bathroom with limited storage in a built-in vanity meets basic bathroom requirements in a space 37.5 SF. The door is 32" wide for a person with a cane or crutches. This bathroom is too small for a wheelchair.



Two-lavatory bathroom.

A 2-lavatory bathroom with adequate room at the toilet and each lavatory. Note storage space under the lavatories and in a floor-to-ceiling unit. Area: 63 SF.



Separate tub and shower.

This plan also includes a bidet. Storage is in the 48" long vanity. Area: 75.3 SF.

Fig. 7 A wide array of two-, three-, four-, and five-fixture toilet plans.



RESPONSIBILITIES OF A SITE ENGINEER

1. Materials to be checked before commencement of work on an everyday basis.
2. The statement of materials in site & requirement should be maintained.
3. Proper alignment, Plumb, Levels, drawing dimensions before & after doing work to be checked every day.
4. M. book checking, writing to be maintained.
5. Control as per quoted company labour rate, material wastage, as per specification of mix to be checked.
6. Quality of work to be maintained every day.
7. Preparing the weekly statement such as materials, laborers, tools on a weekly basis, before beginning next week's work.
8. Processing the work only after a detailed study of the drawings.
9. Concrete levels, Steel reinforcement dimensions to be checked and approved by Client's engineer before execution of work.
10. Daily report of labour details to be informed in office before 11.00am and be checked every 2 hours.
11. Absence of any laborer for more than 30 minutes should be informed to the site engineer. An absence of more than 1 hour should be considered as half day leave.
12. For any work to be extended as per time limit (over time), the site engineer should get approval from owner.
13. For any additional work, as per specialization & drawing, the site engineer needs to seek permission from the owner before execution of work.
14. Daily check on the curing progress.
15. Site engineer needs to take charge of site supervisor and be responsible for project, supervisor control & client satisfactions.
16. Any doubts with respect to drawing & specification, the site engineer should discuss with the client, before approaching the owner.
17. Any other future improvement for company & Site should be discussed with the owner before giving labour payments.
18. The preliminary checking for plumb & level should be done by Site Supervisor only.
19. P.M or MD must discuss daily work progress with the site supervisor between 8.30 am and 8.45am
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DOCUMENTS TO BE MAINTAINED BY BILLING ENGINEER

Complete Architectural and Structural Drawings (all the revisions)

BOQ / Letter of Intent / P. O / Amended P.O

Contract Document and Technical Specifications

Certified RA Bill Copies with measurements, Invoice, Client Certification letter, Cheque Copies.

Confirmation of Verbal Instruction (CVI) signed by the Client/Architect.

Non-Tendered items Requisition Letter with Client/Architect's approval

Client supplies Material Reconciliation Statement.

Soft Copies of all the Documents mentioned above in one Folder in Order.

Details & copies of the External agency bills

Copy of IS: 1200 (Method of Measurements)

Billing Vs. Costing - Reconciliation Statement

CURING TIME



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

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 generally between 6 and 8.

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 deem to satisfy

- Vertical formwork to columns, walls, Beams- 16 to 24hrs
- Soffit formwork to slabs (props to be refixed immediately after removal of formwork) - 3 days
- Soffit formwork to beams (props to be refixed immediately after removal of formwork) - 7 days

Props to slabs :

1. Slabs spanning up to 4500 mm - 7days
2. Slabs spanning over 4500 mm - 14days

Props to beams and arches:

- a) Beams spanning up to 6000 mm - 14days
- b) Beams spanning above 6000 mm - 21days

CURING METHOD

Curing of slabs and beams shall be achieved by ponding only, for a minimum period of 7days.

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 7days.

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 on walls.

For column-wall junctions & beam-wall junctions 4" wide expanded metal mesh shall be used, before plastering of concrete and wall junctions.