



Site calculator and converter

The site maths on paper: the units that change between the drawing, the dealer and the site, and the quantities every house build asks for. Every figure that is not yours has its source beside it. The Excel twin does the arithmetic for you.

How to use it

1. Converter tables: read across. 1 foot = 0.3048 m; 1 sq ft = 0.0929 sq m; 1 gaj = 9 sq ft; 1 cft = 0.0283 cum; 1 brass = 100 cft.
2. Formula cards: one formula, one worked example, one source. Put your own numbers in the same places.
3. Everything in metres unless the card says otherwise. 125 mm is 0.125 m.
4. Your engineer's mix design and your city's rates win over any figure here. These are CPWD's nominal quantities for checking an order, not a design.

What is inside

1. Length, area, volume, weight and strength conversion tables
2. Concrete, brickwork, plaster, steel, water, rain and layout cards with sources
3. The source list

Free, and more. This PDF and its Excel twin are free. Sign up at nirmandost.in with your phone number and a one-time code for the rest of the set, the BOQ calculator and the Site Planner.

Made by NirmanDost, Ahmedabad. A working tool, not professional advice: your engineer, your accountant and your contract decide.



Conversion tables

Length

Unit	mm	m	inch	ft
1 mm	1	0.001	0.0394	0.0033
1 m	1,000	1	39.37	3.2808
1 inch	25.4	0.0254	1	0.0833
1 ft	304.8	0.3048	12	1

Area

Unit	sq ft	sq m	gaj
1 sq ft	1	0.0929	0.1111
1 sq m	10.764	1	1.196
1 gaj (sq yard)	9	0.8361	1
1 guntha	1,089	101.17	121
1 cent	435.6	40.47	48.4
1 acre	43,560	4,046.9	4,840
1 hectare	107,639	10,000	11,960

Volume

Unit	cft	cum	litre
1 cft	1	0.0283	28.32
1 cum	35.315	1	1,000
1 brass	100	2.832	2,832
1 litre	0.0353	0.001	1

Weight

Unit	kg	bags (50 kg)
1 kg	1	0.02
1 quintal	100	2
1 tonne	1,000	20
1 cement bag	50	1

Strength

Unit	N/mm2	kg/cm2	psi
1 N/mm2 (= 1 MPa)	1	10.197	145.04
1 kg/cm2	0.0981	1	14.22
M20 concrete	20	204	2,901

Not fixed anywhere

Bigha (vigha in Gujarat) changes from state to state, even district to district. Go by the area written in your land record, in sq m or sq ft, and convert from that.

Units above are by definition: 1 ft = 0.3048 m exactly; 1 acre = 43,560 sq ft; 1 guntha = 1/40 acre; 1 cent = 1/100 acre; 1 cft = 0.028316846592 cum.



Quantity cards

Concrete volume

Volume (cum) = L x B x T, all in metres

Slab 4 m x 5 m x 0.125 m = 2.5 cum

Geometry. 125 mm = 0.125 m.

Nominal 1:1.5:3 concrete, per cum

8 bags cement, 0.425 cum coarse sand, 0.85 cum stone (20 and 10 mm)

2.5 cum = 20 bags, 1.06 cum sand, 2.13 cum stone

CPWD Analysis of Rates (DAR) 2021, Vol. I, item 5.1.2.
nirmandost.in/dsr/rcc-m20.html

PCC 1:4:8, per cum

3.4 bags cement, 0.47 cum coarse sand, 0.89 cum stone (40 and 20 mm)

10 cum under footings = 34 bags, 4.7 cum sand, 8.9 cum stone

CPWD Analysis of Rates (DAR) 2021, Vol. I, item 4.1.8

230 mm brick wall

Bricks = L x H x 0.23 x 494; per cum also 1.9 bags cement, 0.2675 cum sand

3 m x 3 m wall = 2.07 cum = 1,023 bricks, 3.9 bags, 0.55 cum sand

CPWD DAR 2021, item 6.4.1 (1:4 mortar). Take out doors and windows first.

115 mm half-brick wall, per sq m

56.5 bricks, 0.29 bags cement, 0.03 cum sand

10 sq m partition = 565 bricks, 2.9 bags, 0.3 cum sand

CPWD DAR 2021, item 6.13.1 (1:3 mortar)

Plaster, per sq m

Inside 12 mm: 0.11 bags, 0.0154 cum fine sand. Outside 20 mm: 0.17 bags, 0.024 cum coarse sand

50 sq m inside = 5.5 bags, 0.77 cum sand

CPWD DAR 2021, items 13.1.1 and 13.6.1 (1:4)

Steel weight

kg per metre = D x D / 162 (D in mm)

12 mm: 144 / 162 = 0.888 kg/m; one 12 m bar = 10.66 kg; 8 mm 0.395, 10 mm 0.617, 16 mm 1.58, 20 mm 2.47, 25 mm 3.86 kg/m

Steel density 7,850 kg per cum. Count the bars, weigh one metre.

How big a tank

Litres = people x 135 x days of storage

Family of 5, two days = 1,350 litres; buy the next size up

IS 1172; NBC 2016 Part 9 Section 1: 135 litres per person per day with full flushing

What a tank holds

Rectangular: L x B x H x 1,000. Round: 3.1416 x r x r x H x 1,000 (metres)

1.5 x 1.2 x 1.0 m = 1,800 litres

1 cum = 1,000 litres. Measure the inside faces.

Rain your roof catches

Litres a year = roof area (sq m) x rainfall (mm) x 0.85

100 sq m x 764 mm x 0.85 = 64,940 litres (Ahmedabad average rain)

CGWB design note: runoff 0.85 for a concrete roof. Use your city's rainfall.

A true corner (3-4-5)

Diagonal = square root of $(a \times a + b \times b)$

3 ft and 4 ft: the diagonal must read 5 ft; 6 and 8 give 10

Pythagoras. Check every corner before the first course.

A square room

Each diagonal = square root of $(L \times L + B \times B)$; with opposite walls equal, both diagonals equal means true corners

10 ft x 12 ft: 15.62 ft each

Pythagoras. Measure both; fix it before the wall goes up.

Trench to dig

Volume = $L \times B \times D$; labour = 0.2 labourer-days per cum (soft soil, up to 1.5 m deep)

20 m x 0.9 m x 1.2 m = 21.6 cum, about 4.3 labourer-days

CPWD DAR 2021, item 2.8.1. Rock and water change everything.



Sources

Figure	Value	Source
Cement, sand, stone per cum of nominal 1:1.5:3 concrete	8 bags, 0.425 cum, 0.85 cum	CPWD Analysis of Rates (DAR) 2021, Vol. I, item 5.1.2; nirmandost.in/dsr/rcc-m20.html
Cement, sand, stone per cum of PCC 1:4:8	3.4 bags, 0.47 cum, 0.89 cum	CPWD DAR 2021, item 4.1.8
Bricks, cement, sand per cum of 230 mm wall	494, 1.9 bags, 0.2675 cum	CPWD DAR 2021, item 6.4.1 (1:4); nirmandost.in/dsr/230mm-brick-wall.html
Bricks, cement, sand per sq m of 115 mm wall	56.5, 0.29 bags, 0.03 cum	CPWD DAR 2021, item 6.13.1 (1:3)
Cement, sand per sq m of plaster	12 mm: 0.11 bags, 0.0154 cum; 20 mm: 0.17 bags, 0.024 cum	CPWD DAR 2021, items 13.1.1 and 13.6.1 (1:4)
Steel weight per metre	$D \times D / 162$ kg	IS 1786:2008 cl. 6.2 and Table 1; $D \times D / 162$ is a rounded formula
Water per person per day	135 litres	IS 1172; NBC 2016 Part 9 Section 1
Runoff share, concrete roof	0.85	CGWB (Central Ground Water Board) design note
Ahmedabad yearly rainfall	about 764 mm	long-term average; use your own city's figure
Labour per cum of trench	0.2 labourer-days	CPWD DAR 2021, item 2.8.1
Unit factors	by definition	1 ft = 0.3048 m; 1 acre = 43,560 sq ft; 1 guntha = 1/40 acre; 1 cent = 1/100 acre; 1 cft = 0.028316846592 cum; 1 N/mm ² = 10.197 kg/cm ² = 145.04 psi

CPWD rates are Delhi base rates and the quantities are CPWD's nominal ones. Your engineer's mix design and your city's rates take precedence.