

3. LOADS

Rev A. 22 Feb 1999, units for load at the end of 3.4 corrected.

3.1 DENSITY OF MATERIALS^{1,2}

Material	Density (kN/m ³)	Material	Density (kN/m ³)
Aluminium	27.2	Marble	25.5 - 27.8
Asphalt, paving	22.6	Mastic	11.0
Blockwork Lightweight	12.6	Mortar, cement	18.9 - 20.4
Standard	21.2	Mud	16.5 - 18.8
Brickwork Concrete	22.8	Oils In bulk	8.8
Facing	19.7	In barrels	5.7
Cement	14.1	In drums	7.1
Chalk, in lumps	11.0 - 12.6	Plaster	13.3
Clay (in lumps)	11.0	Plasterboard	8.6
Clay (dry)	18.8 - 22.0	Sand Dry	15.7 - 18.8
Clay (moist)	20.4 - 25.1	Moist	18.1 - 19.6
Clay (wet)	20.4 - 25.1	Wet	18.1 - 20.4
Concrete Normal	24.0	Sandstones	12.6 - 18.8
Lightweight	18 - 20	Shale	14.1 - 18.8
Crushed brick	12.6 - 15.7	Slate, Welsh	28.2
Crushed stone	17.3 - 20.4	Snow Wet compact	3.1
Foamed blocks	13.0	Fresh	0.9
Glass	27.4	Steel	78.5
Gravel, clean	14.1 - 17.3	Timber C18	- 3.8
Iron Cast	70.7	(Softwoods) C24	- 4.2
Wrought	75.4	C30	- 4.6
Lead, cast or rolled	111.1	Water	9.8
Limestone	25.1		

3.2 DEAD LOADING

3.2.1 General^{1,3}

C In the absence of specific details, use the following:

Floor finish (screed) 75mm	1.2 kN/m ² on plan
Ceiling boards	0.4 kN/m ² on plan
False ceiling	0.25kN/m ²
Services: nominal	0.25kN/m ²
HVAC	0.4kN/m ²
Demountable lightweight partitions	1.0 kN/m ² on plan
Blockwork partitions	2.5 kN/m ² on plan
External walling:	
curtain walling and glazing	0.5 kN/m ² on elevation
cavity walls (lightweight block/brick)	3.5 kN/m ² on elevation

3.2.2 Specific dead loading

C Composite construction⁴

Layer	Typical Thickness (mm)	Typical Dead Load on plan kN/m ²
Screed Normal	50	1.2
Lightweight		0.9
Slab Normal	130	2.8 - 3.3 *
Lightweight		2.3 - 2.6 *

The lower value is for a trapezoidal deck (Ribdeck AL), the higher value is for a re-entrant profile (Holorib).

C Cladding¹

Cladding Arrangement	Load on Elevation (kN/m ²)
Cladding sheeting and fixings	0.5
Steel wall framing only	0.25 - 0.4
Framing + brick panels and windows	2.4
Framing + steel sheeting	0.75
Windows, industrial type	0.25
Patent glazing: single	0.3
double	0.55
Doors - industrial wood	0.4
Lath + plaster + studding	0.5
Plate glass / 25mm thick	0.65
Lead plywood	

C Walls

Wall type	Composition	Dead load on elevation (kN/m ²)
Concrete walls	225 wall	5.4
	12mm plaster each face	0.2
Masonry wall (280 cavity)	102.5 brick	2.25
	100 lightweight block and plaster	1.15
Party wall	Cavity wall two 102.5 brick leaves plastered both sides	5.0
Internal wall	100mm lightweight block plastered both sides	1.4
	102.5mm brick plastered both sides	2.75
	225mm thick plastered both sides	4.4
Curtain wall	Glazing + spandrel	1.0
Acoustic wall	265 brick and block	2.5
Partition	Demountable	1 on plan
	Stud with lath & plaster	0.76

Roofs^{1.5}

Description	Dead load on plan (kN/m ²) (Assuming flat)
Bituman roofing felts (3 layers including chipping)	0.29
Ceiling tray/panels	0.25
Asphalt (19mm, 25mm)	0.41, 0.58
Tiles (clay laid to 100mm gauge)	0.62 - 0.70
Concrete tiles interlocking	0.48 - 0.55

3.3 TYPICAL IMPOSED LOADING²

- C Be generous at scheme design stage
- C Allow for change of use and flexibility of building.
- C Make no allowance for imposed load reductions during the scheme design except when assessing the load on foundations.

Use of structure	Intensity of distributed loading (kN/m ²)	Concentrated load
Assembly areas	5.0	3.6
Banking hall	3.0	2.7
Bedrooms (hotels, hospitals)	2.0	1.8
Book stores	2.4 for each metre of storage height (min 6.5)	7.0
Churches	3.0	2.7
Classrooms	3.0	2.7
Communal kitchens	3.0	4.5
Corridors	4.0	4.5
Domestic, floor	1.5	1.4
Factories (general industrial)	5.0	4.5
File rooms in offices	5.0	4.5
- compactus †	7.5	
Garages (cars and light vans)	2.5	9.0
Grandstands (fixed seats)	5.0	3.6
Gymnasias	5.0	3.6
Libraries		
- reading rooms	4.0	4.5
- mobile racking	4.8 for each metre of storage height (min 9.6)	7.0
Plant / motor rooms etc.	7.5	4.5
Museum floors	4.0	4.5
Rooms with mainframe computers	3.5	4.5
Offices, general	2.5 *	2.7
Shops (not stock rooms)	4.0	3.6

* This may increase up to 5.0 kN/m² depending on the clients requirements, add 1.0 kN/m² for lightweight demountable partitions.

† Compact filing system (usually over a small proportion of the floor area e.g. adjacent to cores).

3.4 IMPOSED LOADS ON BARRIERS

- 3.4.1 The horizontal force F (in kN), normal to and uniformly distributed over any length of 1.5m of a barrier for a car park, required to withstand the impact of a vehicle is given by:

$$F = \frac{0.5mv^2}{\delta_c \delta_b}$$

where m is the gross mass of the vehicle (in kg);
 v is the velocity of the vehicle (in m/s) normal to the barrier;
 δ_c is the ceformation of the vehicle (in mm);
 δ_b is the deflection of the barrier (in mm).

Variables	Mass of vehicles <2500 kg	Mass of vehicles >2500 kg
m	1500	mass of vehicles
v	4.5	4.5
δ_c	10	100

Note : where $\delta_b = 0$ use $F = 150$ kN for mass of vehicle = 2500 kg.

3.5 REFERENCES

1. SCI, Steelwork Design Guide to BS 5950 (Vol. 4) (1991)
2. OVE ARUP & PARTNERS, Metric Handbook (1970)
3. IStructE & ICE, Manual for the design of reinforced concrete building structures ("Green Book") (1985)
4. RICHARD LEES Ltd, Steel Deck Flooring Systems
5. BS 6399 - Parts 1 & 2