Dow Construction Products

Thermal Insulation of Floors

This seminar covers the principles, design and installation of ground bearing and suspended insulated floors. You will discover

- Why a floor should be insulated
- How a floor can be insulated
- The general design considerations including the relevant codes of practice, building and materials standards
- The "whys and wherefores" of insulation selection
- How to rate the thermal performance of a floor
- How to avoid thermal bridging
- How to control moisture transfer through the floor
- The "dos and don'ts" of insulated floor installation
- How to renovate an old suspended timber ground floor

DOW CONSTRUCTION PRODUCTS

(a division of the Dow Chemical Company Ltd)

THERMAL INSULATION OF FLOORS

Welcome to this RIBA approved CPD seminar.

Some information about the Dow Chemical Company:

US origin, 100 years old
2nd largest chemical company in the world
Products : chemicals, plastics, agrochemicals.
Annual sales: £18 billion.
Employs 39,000 world-wide (Europe 7,200)

Dow in the UK
STYROFOAM*, the blue extruded polystyrene foam insulation from Dow, has been produced at Kings Lynn since 1969.
The Styrofoam range comprises:

Floors	- *Floormate* 200,350,500 and 700*
Cavity walls	- *Wallmate* CW*
Walls internally	- *Styrofoam IB*
Structures below ground	- *Perimate* DI*
Pitched roofs	- *Roofmate* PR, RL*
Inverted flat roofs	- *Roofmate SL, LG*
Conventional flat roofs	- *Deckmate* CM, FF*

Introduction

The aim of this seminar is to cover the principles, design considerations and installation of insulated floors so that failure and subsequent business disruption (*and possible litigation*) can be avoided.

- ***50 % of domestic floor failures are the fault of the builder rather than the designer*** *(execution: 52%; design/specification:30%; materials: 5%; other 13%) - BRE.*
- ***Floor (industrial, commercial, public) litigation accounts for 80% of all litigation concerning buildings*** - *structural engineering consultancy*.
- Concrete floor failures are due to cracking, surface/finish failure and detachment. Entrapped water (due to inadequate drying out of the concrete base) is also a major contributor to failure - BRE.
- Floors are difficult to repair and result in maximum disturbance to the building occupants (domestic and business disruption).
- Floors are extremely "sensitive" to construction methods and practice.
- With the trend towards improved thermal performance of buildings (see proposed changes to Building Regulations Approved Document L June 2000) there will be a corresponding increase in insulated floors and in the thickness of the insulation required.

Content

- Floor categories / types
- General design issues
- Insulation issues
- Thermal performance
- Design & installation specifics
- Renovation
- Summary

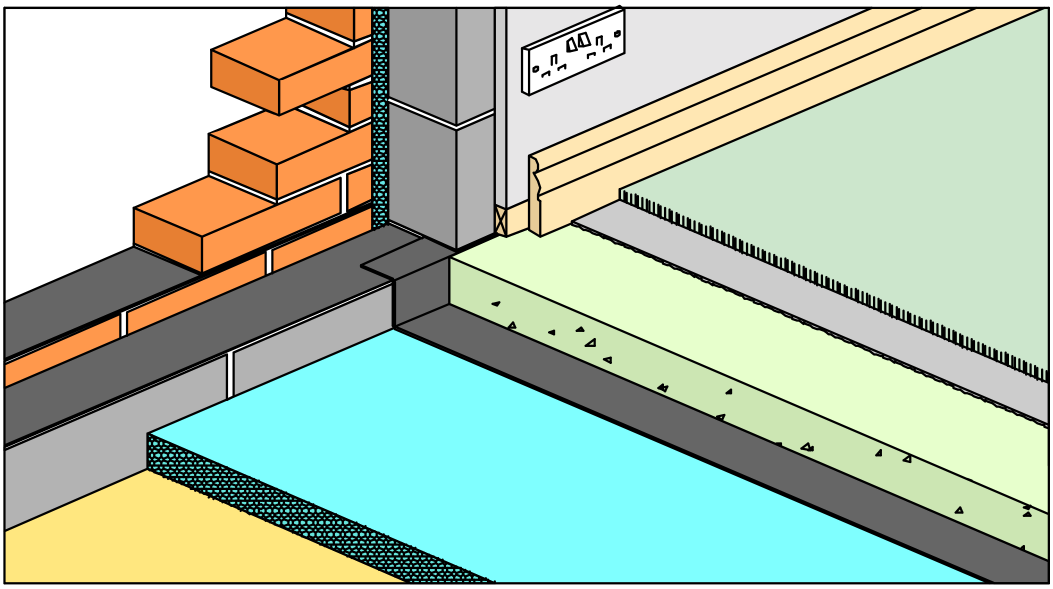
Thermal insulation of floors

What is a Floor?

• a construction providing the lowest horizontal surface in any space in a building.
• a ground bearing floor will be the lowest in a building.

Why Insulate ?

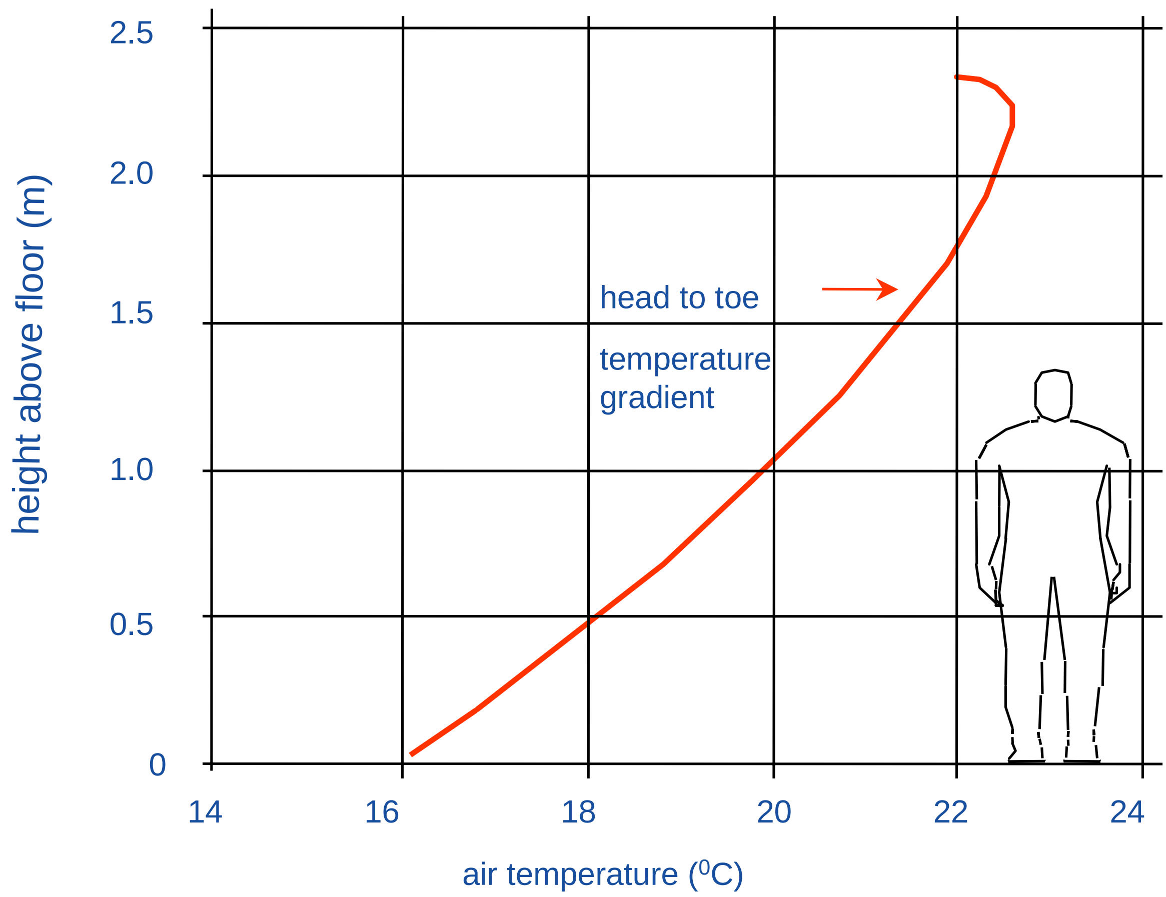
•15 - 20% of total building heat loss is through the floor
• to improve internal conditions
• to eliminate thermal bridging at floor/wall junctions and so reduce heat loss
• it reduces risk of condensation, the presence of which could damage adjacent materials e.g. mold formation on internal wall finishes



Temperature profile: floor to ceiling
- uninsulated floor

- The graph below shows for a person standing about 1 metre from a wall the temperature can fluctuate as follows:-

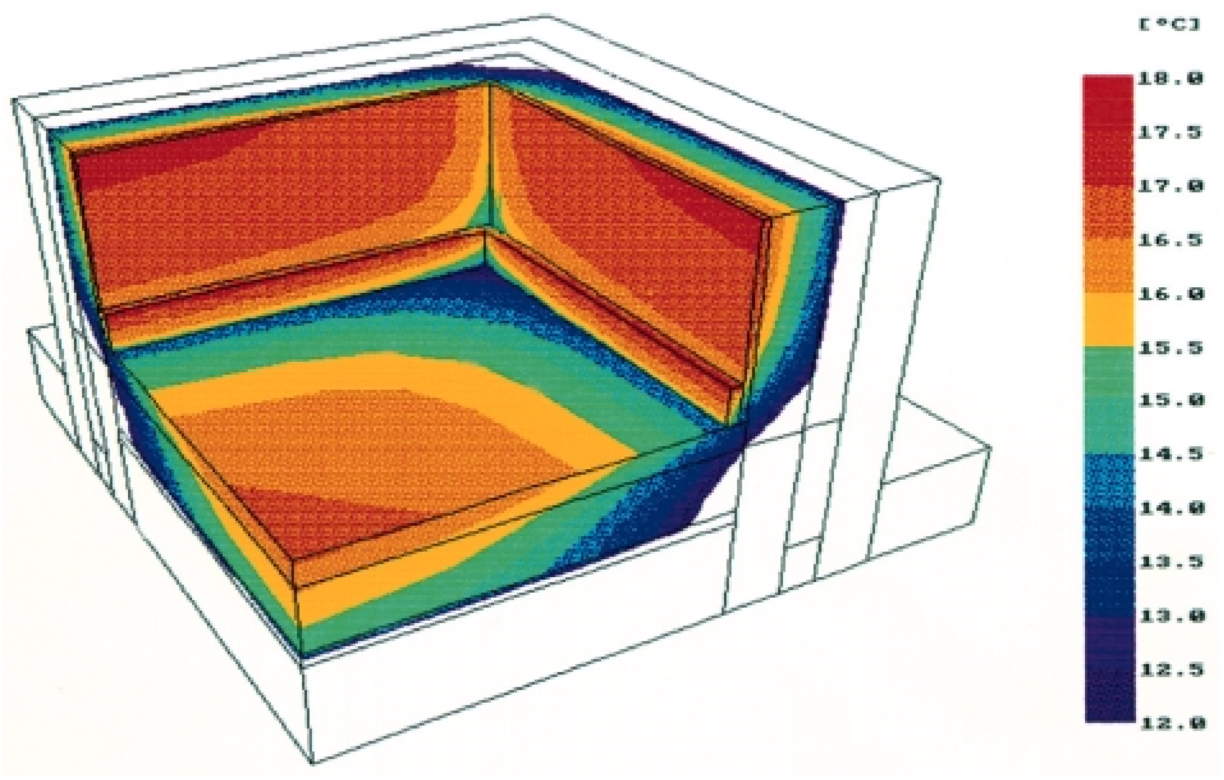
from floor to ceiling: 7 deg C
from feet to head: 5 deg C



Thermograph: room corner - uninsulated floor

•The temperature gradients measured at the floor/wall junction indicate thermal bridging. This causes excessive heat loss via the building fabric.

• Even if the U-value calculation for the floor indicates that there is no need for insulation it is recommended that a 1 metre wide horizontal layer of insulation be positioned around the entire exposed perimeter. This will reduce/eliminate the thermal bridge at the edge of the floor shown below.



Floor categories & U-values

Location of floor

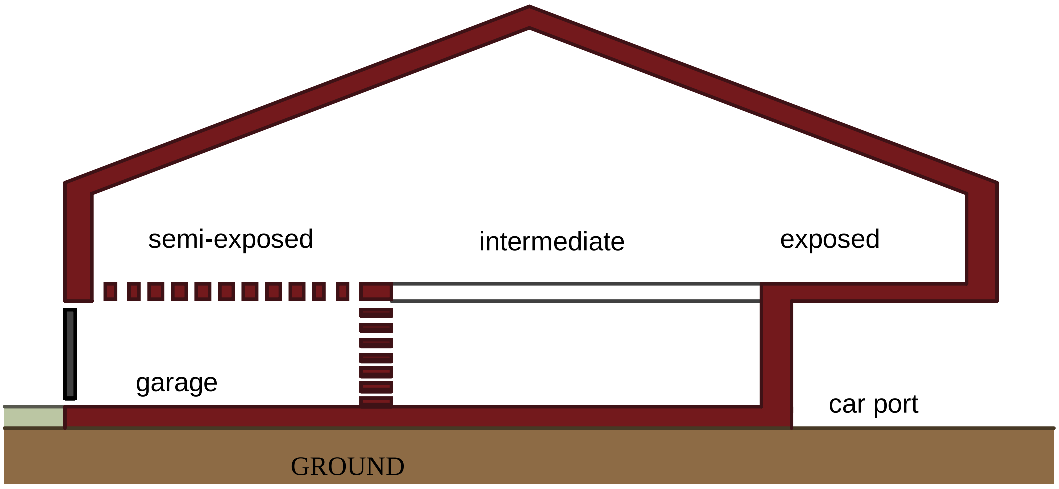
Ground
Intermediate
Exposed
Semi-exposed

Type

Ground bearing
Suspended
(*Note:1. Ground floors can be ground bearing or suspended*
2. Intermediate are always suspended)

Materials of construction

Concrete
Timber



Uvalues W/m2K		Dwellings SAP ≤ 60	Dwellings SAP > 60	Other buildings
Elemental methods	ground floors and exposed floors	0.35	0.45	0.45
	semi-exposed floors	0.60	0.60	0.60
Other methods	limiting values	0.70	0.70	0.70

Groundbearing floor : typical build-up

A groundbearing floor is used where the condition of the ground is suitable for supporting the floor slab.

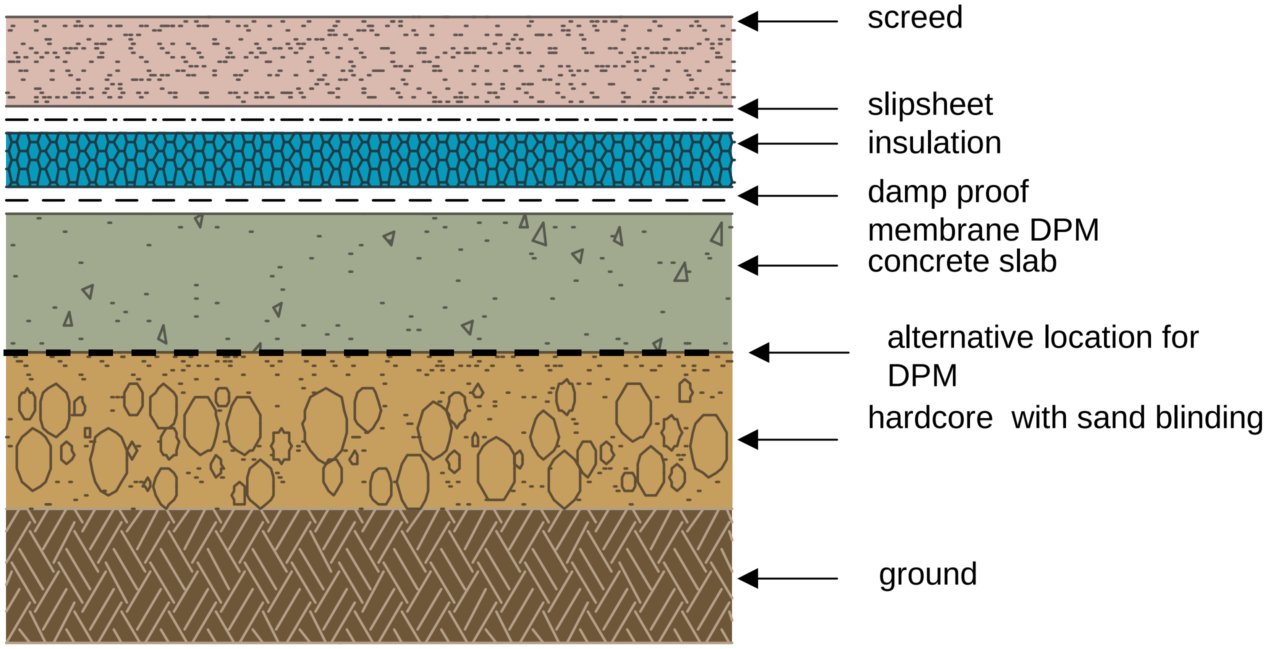
• The slab is concrete (reinforced or non-reinforced) poured within, but separate from the external walls (which have independent foundations)

(a *reinforced concrete raft is an alternative type of ground bearing floor - see later)*

• DPM (damp proof membrane) can be located above or below the concrete slab

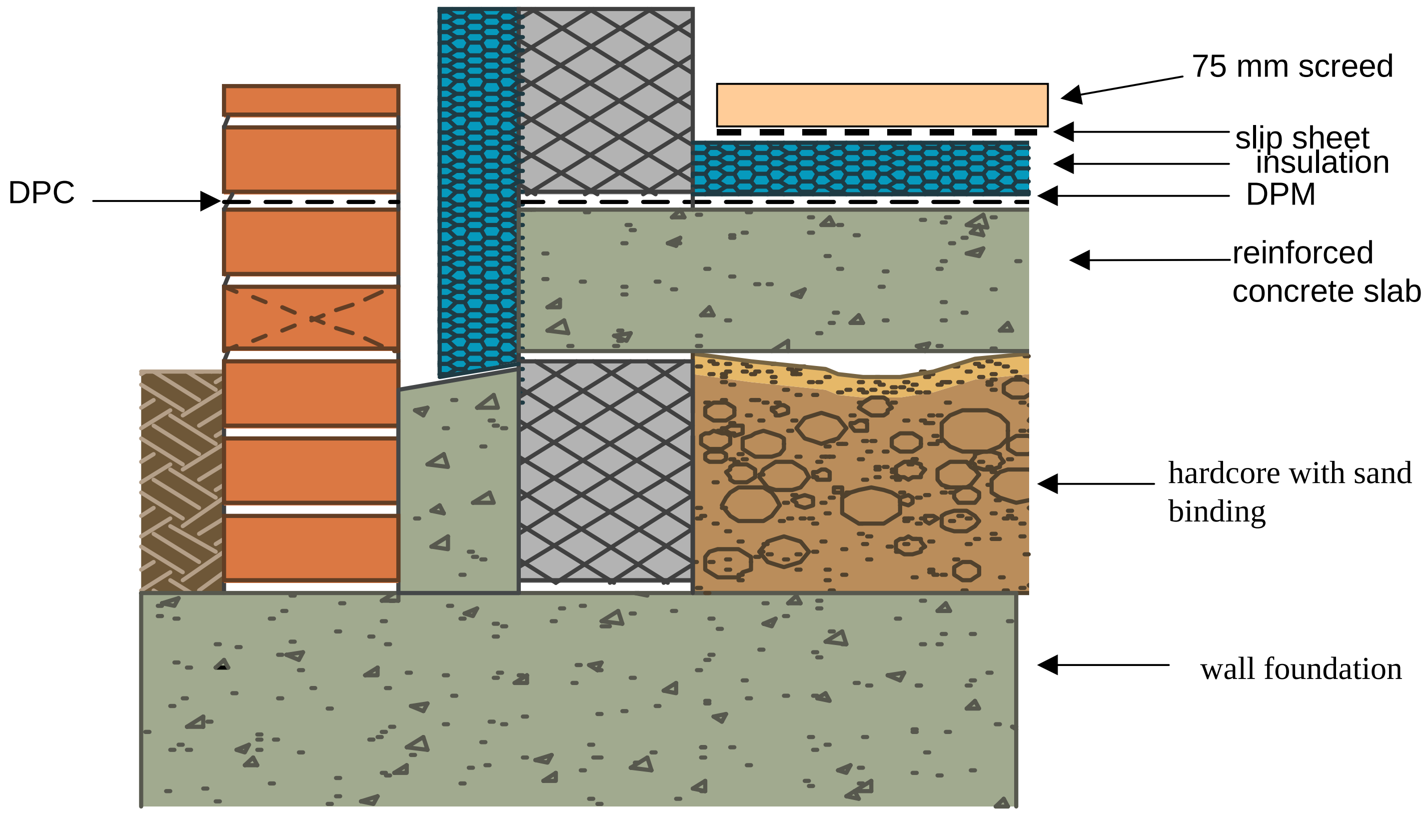
• insulation (rigid boards eg Floormate)can also be located below the slab - if so then the DPM should be positioned between insulation and slab

• screed (75 mm min thickness) is sometimes referred to as a 'floating' screed. ***Note use of a slip sheet between insulation and screed, this also doubles as a vapour control layer (VCL)*** - min 1200 gauge (0.3 mm thick) polyethylene sheet recommended lapped 150 mm and taped at joins and turned up at floor edges



Suspended in-situ cast concrete ground floor

Ground floor slabs may be formed in-situ on to fill which is expected to settle and is, therefore, regarded simply as temporary shuttering. In such cases the slab must be designed and **reinforced** as a suspended slab even though it is, initially, ground-bearing.
DPM is best placed directly on top of the slab followed by the other layers.
Insulation should not be positioned below the slab as it will drop away from the underside when settlement occurs.



Suspended ground floors

• suspended floors are supported on the walls and comprise:

- concrete beams with block in fills
- pre-cast concrete units
- cast in-situ concrete

or

- timber joists & boarding

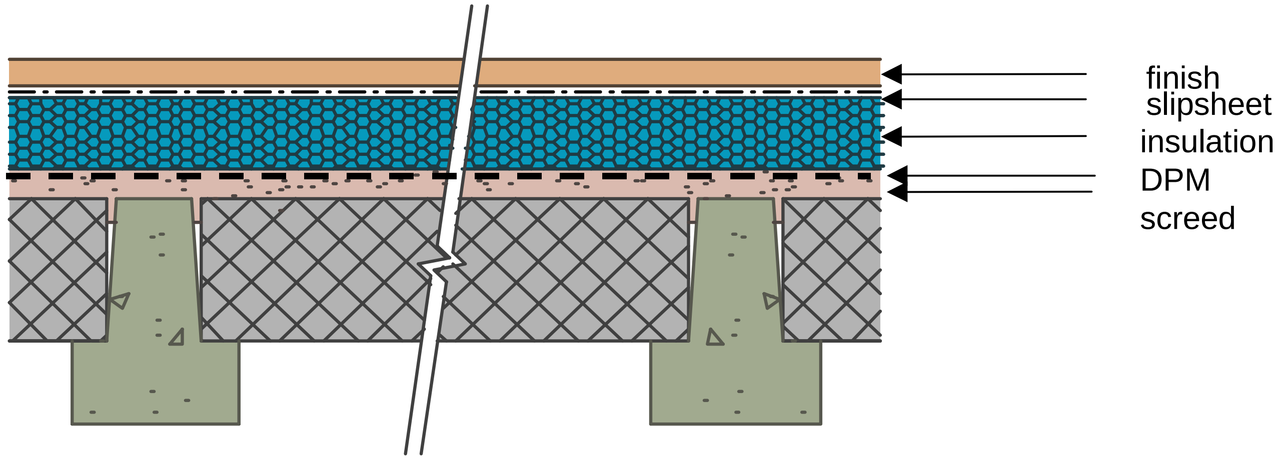
• some proprietary block and beam floor systems incorporate insulation on the underside of the blocks

• 75 mm thick screed laid on top of block and beams and pre-cast concrete

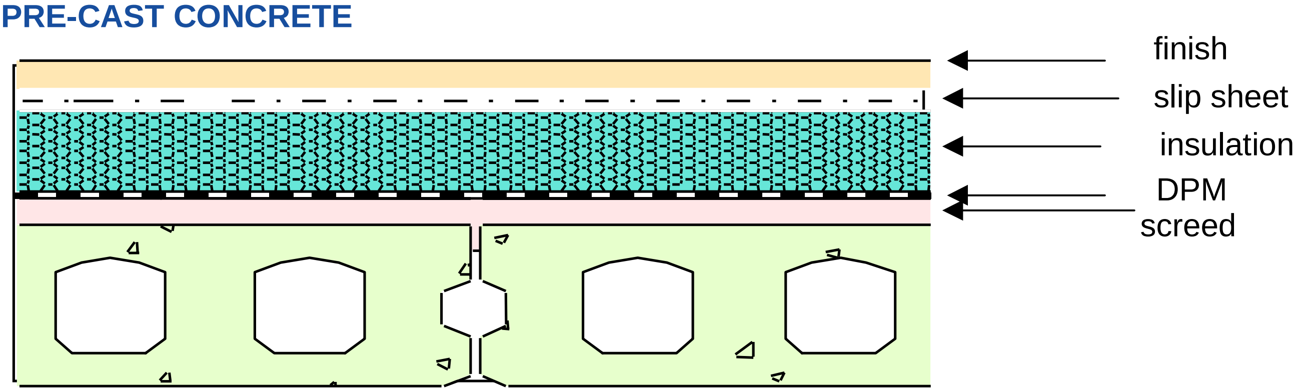
• DPM between screed and insulation must be continuous with the DPC

• slip sheet will act as a VCL (vapour control layer)

BLOCK AND BEAM



PRE-CAST CONCRETE



Suspended timber ground floors

Timber joist floors are simple to install, avoid the need for large amounts of compacted backfill and do not involve wet trades
The insulation boards (eg Floormate, Wallmate) can be positioned:

- between joists
- attached to bottom of joists

(but note that these may not be suitable solutions for a ground floor - it is essential to maintain the space beneath for ventilation purposes)

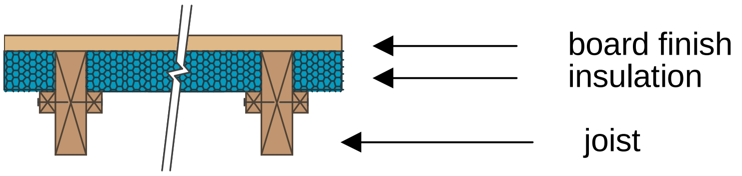
- on decking (eg tongue & groove boarding) laid over joists.

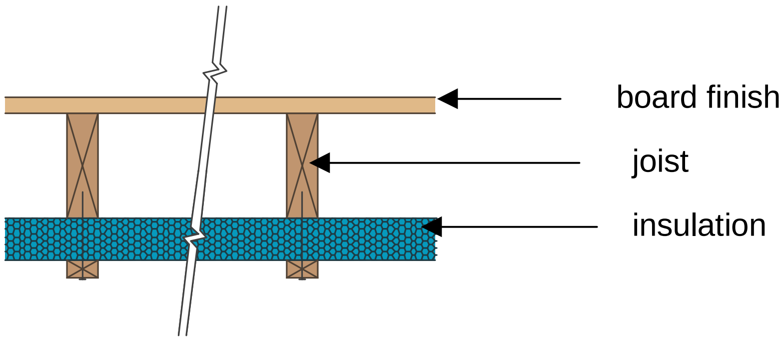
(note that the insulation will not provide a suitable surface for the direct application of the floor finish. A slip sheet (500 gauge polyethylene sheet) must be laid on top of the insulation. The insulation should be overlaid with large rigid panels of plywood or particle board (preferably with interlocking edges) which will ensure that high localised loads are uniformly distributed before installing the final floor finish.Check compatibility of timber treatment used with the insulation.)

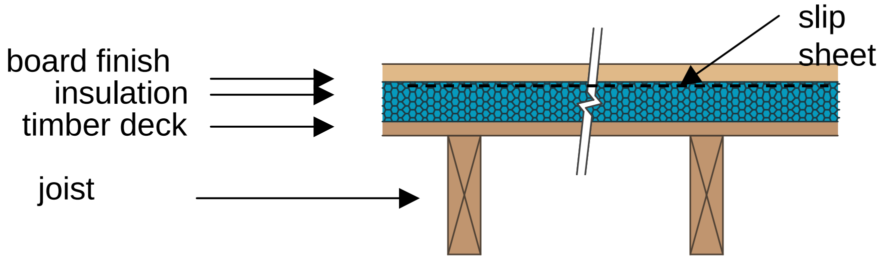
Note particularly the need for:

- underfloor void ventilation
- timber treatment
- concrete blinding over surface of floor void to avoid organic matter growth.

and that <u>insulation boards should not be laid directly onto the joists</u>







General design issues

Building Regulations - Approved Documents

A Structure
B Fire safety
C Site preparation & resistance to moisture
E Sound resistance
L Thermal performance
and Basements for dwellings

Structural

- floors
  - design BS 8103
  - loads BS 6399 : Part1
- materials
  - steel BS 5950
  - concrete BS 8110
  - screeds BS 8204
  - timber BS 5268
  - insulation BS 3837, prENs **
  - DPM BS CP102, Approved Document C

Codes of practice

BS 8103 Parts 1-4 Structural design of low rise buildings
BS 6399 Part 1 Loading for buildings *
BS 5950 Parts 1-9 Structural use of steelwork in buildings
BS 8110 Parts 1-3 Structural use of concrete
BS 8204 Parts 1-3 Screeds, bases and in-situ floorings
BS 5268 Parts (various) Structural use of timber
BS 3837 Expanded polystyrene boards - specification for extruded boards
BS CP 102 Code of practice for protection of buildings against water from the ground
Approved Document C 1992 Site preparation and resistance to moisture

* Gives details of uniformly distributed and concentrated static loads (Table1) eg domestic floors 1.5 and 1.4 kN/m^2 respectively, offices 2.5 and 2.7kN/m^2 (for dynamic loads refer to British Cement Association Technical Report 550)

** prENs are draft European norms and will include all insulants - due 2002 (?) eg prEN 13164 for XPS

General design issues

• Insulation

- key properties

Thermal conductivity - use long term value i.e. that expected to be achieved over the expected building life span (25 years) as design value - refer back to insulation suppliers.

Compressive strength - that load which will give 10% compression (no time factor)

Design load - that load which will give a *max 2% compression after 50 years* (refer to compressive creep data)

Water absorption - should be as low as possible ie. less than 0.5% volume. Above this level thermal conductivity will be adversely affected.

Water vapour resistance - required for condensation risk analysis (refer back to insulation suppliers)

User friendliness - easy to cut and install, clean and with no health risk to installers.

Insulation

- typical physical properties

		XPS	EPS	PUR/PIR	MF	Foam glass
Thermal conductivity	W/mk	0.028	0.038	0.024	0.039	0.048
Compressive strength (max)	kN/m2	700	190	175	120	1600
Water absorption	% vol	0.3	6	3	?	0
Water vapour resistance	μ	160	50	30 -100	1	∞
Max service temperature	ºC	75	80	120	230	485
Density	kg/m³	30	15 - 30	30	24-180	120-165
Form		board	board	board	batts	blocks
User-friendliness		++	+	+	-	-

Insulation materials

XPS - Extruded foamed polystyrene eg.Styrofoam - rigid boards
EPS - Expanded foamed polystyrene eg. bead board - rigid boards
PUR - Polyurethane - rigid boards
PIR - Polyisocyanurate - rigid boards
Foam Glass - foamed glass - rigid boards
MF - Mineral fibre, flexible board, quilt

Compressive strength

recommend min 200 kN/m2 (for foot traffic) eg. FLOORMATE 200

Thermal conductivity

XPS, EPS, MF measured long term ie after 90 days
PUR/PIR measured fresh ie immediately after production

Note: New CEN Standards will require 25 year values to be stated by insulation manufacturers

Water absorption

Floormate - water absorption negilible, hence able to position above or below the DPM
MF very difficult to quantify!

Water vapour resistance

relative to air (equal to 1); the higher the figure the more resistance to the passage of water vapour.

Fire

XPS, EPS, PUR and PIR are combustible; MF and Foam glass are non-combustible

Insulation issues
FLOORMATE * insulation

		FLOORMATE 200	FLOORMATE 350	FLOORMATE 500	FLOORMATE 700
Compressive strength	kN/m^2	200	350	500	700
Design load	kN/m^2	60	120	180	250
Density	kg/m3	25	34	38	45
Thermal conductivity	W/mK	0.028	0.027	0.026	0.024
Application		Standard load bearing – domestic	Medium load bearing – offices	High load bearing – industrial	Extra-high load bearing warehouses cold stores

Note: a) Agrement certificates 92/2782 and 99/3597/C for Floormate 200, 350 & 500 and 200-A & 500-A

b) Floormate 200-A,500-A are available with carbon dioxide blowing agent

Insulation Issues:

Design load (that load which gives a max 2% compression after 50 years)

Below is a typical compressive creep curve for Styrofoam XPS

Design load of FLOORMATE 500 is 180 kN/m2 ie 35% of its compressive strength 500 kN/m2

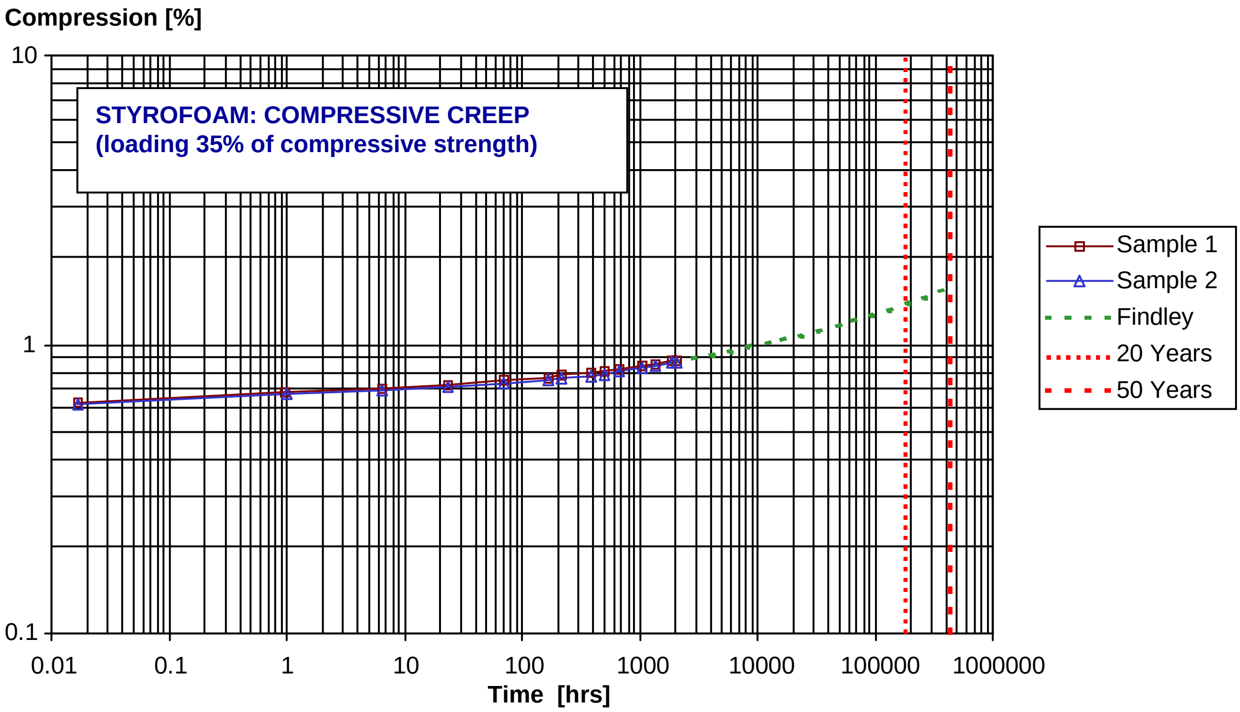
BS 6399 Part 1 - ***Static loads***

	Uniformly Distributed load (kN/m2)	Concentrated load (kN)
Domestic/Residential	1.5 - 3.0	1.4 - 4.5
Offices	2.5	2.7
Shops	4.0	3.6
Public assembly areas	5.0	3.6
Light industrial	5.0	4.5
Cold storage	15.0	9.0
Heavy industrial	20.0	calculated

See also: BRE 2 /77 - loading in domestic buildings; British Cement Association Technical Report 550 - ***Dynamic loads***

Load safety factors:

No load repetitions	Safety factor
> 400,000	2.0
< 8000	1.5



Insulation issues :

- **Health & Safety**

  composition
  toxicity
  handling / storage

- **Environmental**

  manufacture continuous extrusion process

  composition - polystyrene

  disposal
  sustainability

- **Construction Design Maintenance**

  long term performance

  - thermal conductivity
  - compressive creep
  - compatibility
  - degradation

- **Fire**

  combustibility

  products of combustion

→ **consult manufacturers literature / safety data sheets / advisory notes / Agrement certificates**

Refer to Dow for literature: 'Styrofoam - insulating floors', 'A Question of Balance' and Safety Data Sheets / Advisory Notes .

• Foamed plastics insulation materials - HCFC blowing agent phase out end 2001 (Ozone Depletion (Montreal Convention) and Global Warming (Kyoto Protocol & EU/UK Climate Change Programme).

• *Dow has already developed and commercialised an environmentally friendly blowing agent system based on recycled carbon dioxide. These products have been available for over 4 years - FLOORMATE 200-A, 500-A. Products using a HFC blowing agent system will be available in the UK in Q4 2001*

Insulation issues:

• Fire

- XPS boards do not prejudice the fire resistance properties of the floor

- when properly installed on/in concrete floors or timber flooring XPS boards will not add significantly to any existing fire hazard.

- refer to *BS 6203:1991 Guide to fire characteristics and fire performance of expanded polystyrene materials used in building applications.*

- refer to *Approved Document B*

- *BS 476: Part 1 Surface spread of flame test*
  - lists Classes 1 (highest) to 4; XPS is unclassifiable.
  - Approved Document B refers to a Class 0 which is not identified in BS 476; however, it can be achieved by materials of limited combustibility eg plasterboard or a Class 1 material which has a fire propogation index (I) < 12 and a sub-index (I,) < 6.

Thermal performance

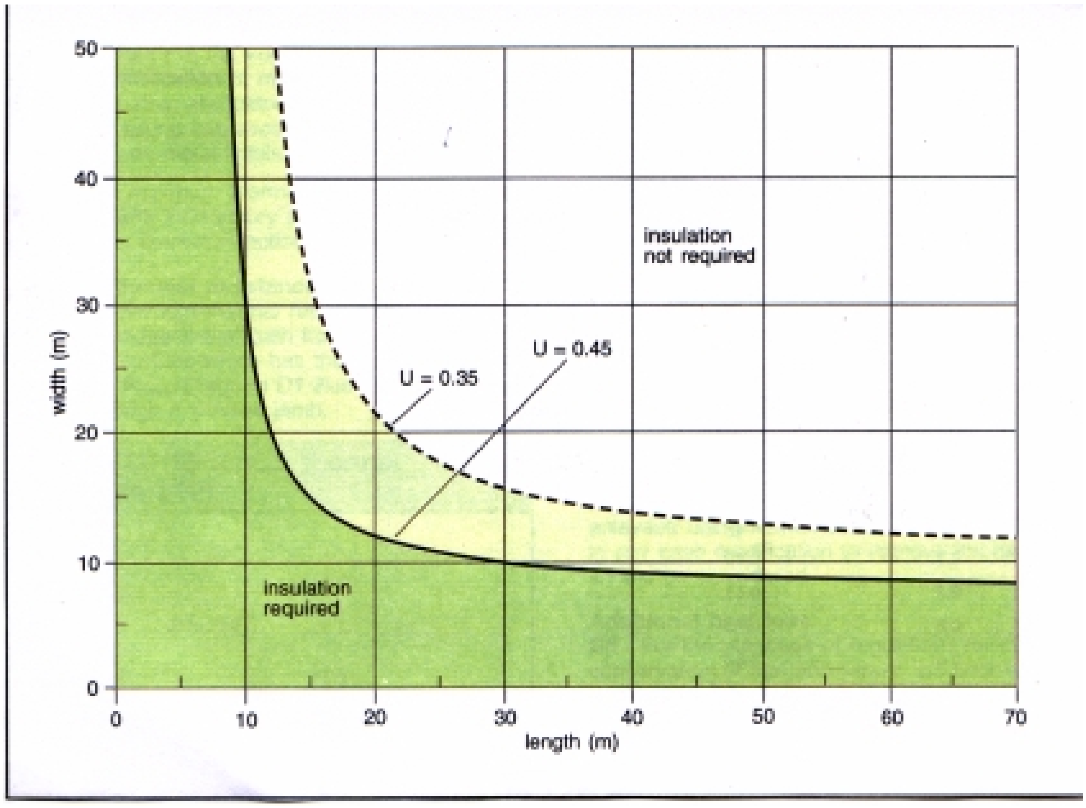
Approved Document L - floor U values

U values W/m2C		Dwellings		Other buildings
		SAP ≤ 60	SAP > 60	
Elemental methods	ground floors and exposed floors	0.35	0.45	0.45
	semi-exposed floors	0.60	0.60	0.60
Other methods	limiting values	0.70	0.70	0.70

Proposed changes to Approved Document L (June 2000) will impose a maximum U of 0.25 W/m^{2}K for floors - likely introduction early 2002.

Thermal performance

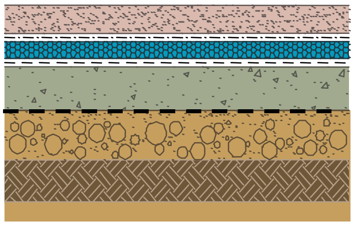
Ground floor dimensions for which insulation is required



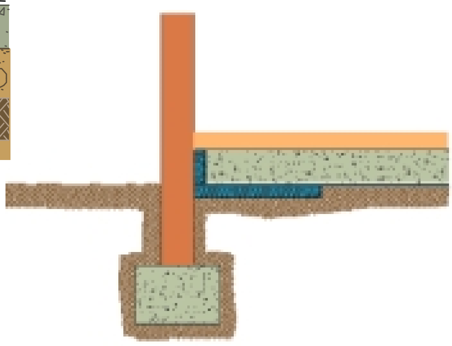
It is not necessary to insulate a floor to achieve a Uvalue of 0.45 W/m2K if its area is more than 225m2. Similarly for U values of 0.35, 0.30 and 0.25W/m^{2}K the area limits are 460, 625 and 840m2 respectively.

Thermal performance: groundbearing floors

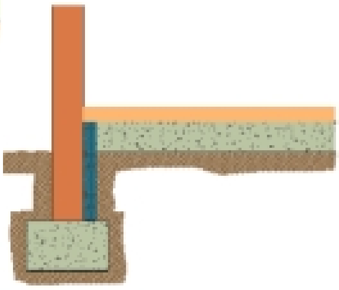
Where to position the insulation ?



Under the floor



At floor edge
- horizontal



At floor edge
- vertical

***Under the floor** ie over whole floor area*
Use Perimeter /area U-value calculation method

***At floor edge** - horizontal / vertical*
It may be possible to achieve the required Uvalue by simply restricting the insulation to the perimeter of the floor.
Refer to BRE IP (Information Paper) 7/93 for Uvalue calculation method.

Basements
Refer to BRE IP 14/94 + Approved Document: Basements (1997)

Thermal performance

U value calculation - ground floors

Perimeter/Area method - BRE IP 3/90

(1) $$U_{un} = 0.05 + 1.65 \frac{P}{A} - 0.6 \left[\frac{P}{A}\right]^2$$

U_{un} = *uninsulated floor U value*
P = *exposed perimeter*
A = *floor area*

(2) $$t_{ins} = L \left[\frac{1}{U_{req}} - \frac{1}{U_{un}}\right]$$

t_{ins} = *required insulation thickness*
U_{req} = *required U value*
L = *thermal conductivity of insulation*

- assumes thermal conductivity of soil 1.4 W/mK and thickness of surrounding walls 0.3 m
- can be used for any shape of floor
- takes into account unexposed edges eg party walls
- U_{un} should include thermal resistance of insulation plus that of floor deck itself if different from 0.2 m²K/W
- calculation method is valid for P/A less than 0.8 *(ie floor area greater than 25m²)*

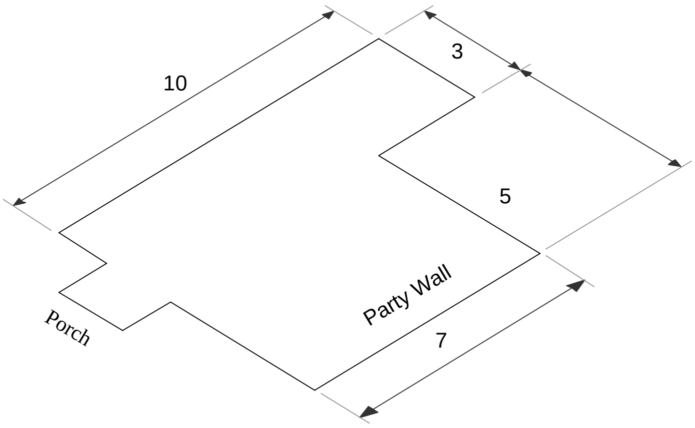
Don't worry an insulation supplier's help desk can do this calculation for you !

Thermal performance: ground floor U-value

U-value calculation

Perimeter/Area method

Example : Semi-detached house - solid concrete floor



Calculation

Exposed perimeter P = 29m

Floor area A = $65m^2$

$\frac{P}{A} = 0.45$

U_{un} = 0.67 W/m2C

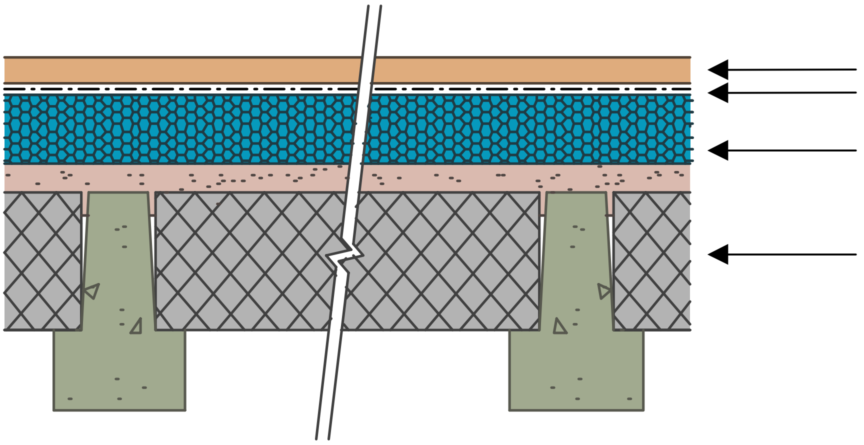
U_{req} = 0.45 W/m2C

lambda of insulation = 0.028 W/mC

∴ required insulation thickness = 20mm

Thermal performance: intermediate, exposed & semi-exposed floors
U-value calculation

•U-value calculation takes into account thermal bridging of the block & beam construction. (Thermal conductivities of block and beam 0.51 and 1.13 W/mK respectively.)
• In this case a slip sheet is not required to act as a vapour control layer



	Thickness mm	λ W/mK	Thermal resistance m^2K/W
Surface resistance	-	-	0.14
Screed	**65**	**1.400**	**0.046**
Slip sheet (500 gauge pe sheet)	**0.3**	**0.500**	**0.001**
Insulation	**50**	**0.028**	**1.786**
Screed	**25**	**1.400**	**0.018**
Block & beam	**100/150**	**0.810**	**0.196***
Surface resistance	-	-	0.14
		U = 0.43 W/m^2K	

* taking into account thermal bridging

•Floor can be: (non) reinforced concrete slab - separate from walls
or as a concrete raft combining both foundation & floor

• Insulation:

above slab below screed fast thermal response

or

below slab slow thermal response

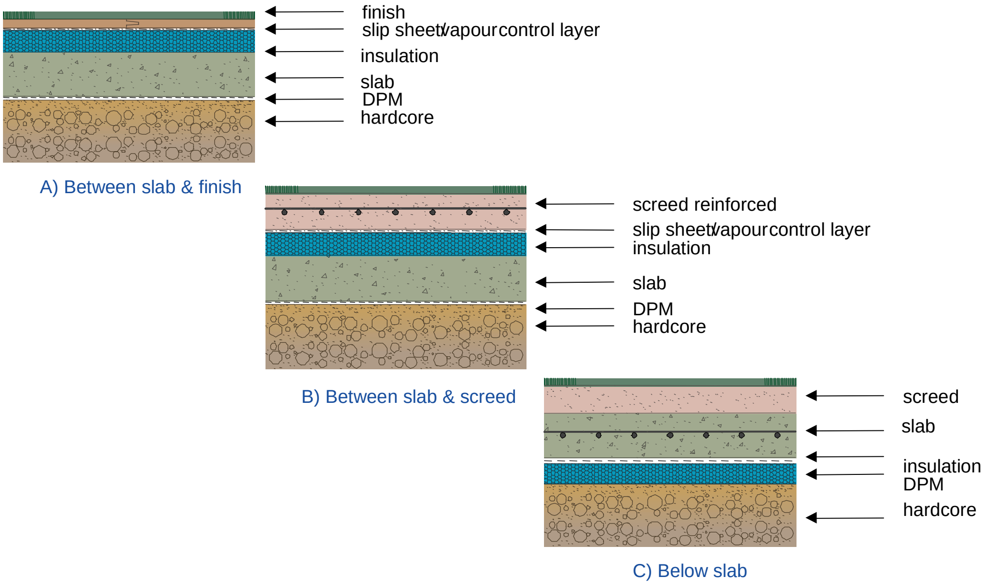
• Screed : sand/cement (BS 8204)

• For A) and B) DPM can be above the slab

• For A) and B) the slip sheet doubles as a vapour control layer, recommend this to be 1200 gauge (0.3 mm) polyethylene sheet, 150mm overlaps taped at the joints and turned up 100 mm at the walls.

Insulated groundbearing floors: design

Location of insulation



A) Between slab & finish

B) Between slab & screed

C) Below slab

Insulated groundbearing floors: design

- **Site preparation**

  - excavate

  - fill

  - blinding

Blinding - It is necessary to protect the next layer of construction from hardcore, usually sand for DPM or insulation. Should be flat and level so as to prevent 'rocking' of insulation boards

Insulated groundbearing floors: design

- **Concrete slabs**
  - **min. thickness 150mm**
  - **slip sheet (concrete /insulation)**
  - **even surface for insulation**
- **Screeds**
  - **min. thickness 75mm**
  - **slipsheet (screed/insulation)**
- **Insulation**

• ***Concrete slab***

- see BS 8110 : Part 1 for need increased thickness and reinforcement.100mm min thickness quoted, 150mm used in practice.
- movement joints in slab should be aligned with those in other elements of the structure
- slip sheet (can also be the DPM) must be incorporated between the insulation and poured concrete (min1200 gauge polyethylene)
- surface of concrete must be even, aim for smoothest possible surface
- insulation should only be laid over the slab once the building is weathertight and overlaid as soon as practical to avoid damage from follow-on trades

• ***Screeds***

- for insulated floors where the screed is directly on top of the insulation it is referred to as a 'floating ' screed
- minimum recommended thickness for a sand/cement screed is 75mm (can be 65 mm for lightly loaded domestic floors) suitably reinforced with a light wire mesh. Thickness can be reduced by using reinforcement (or proprietary screeds) - refer to BS 8204: Part 1, BRE Digest 104:1973 - Floor screeds and /or Concrete Advisory Service (Tel 01794 324455)

• ***Slip sheet***

under floating screed, also acts as a vapour control layer - min 1200 gauge (0.3 mm) polyethylene sheet recommended. Remember to lap and seal at joins, turn up at edges.

• ***Insulation***

when the insulation is laid on the slab it will not provide a suitable surface for the direct application of the final floor finish eg carpet. It should be overlaid with a screed or with timber boarding such as chipboard. A slip sheet/vapour control layer will be required between the timber boarding and insulation (as for the insulation/screed).

Insulated groundbearing floors: design

- **Moisture**

  Damp proof membrane (DPM)

  - above or below concrete slab

  - above insulation laid direct on hardcore

  - link to damp proof course (DPC)

  Slip sheet

  - also vapour control layer (VCL) in ground floors

- moisture can enter a building as ground water via porous construction elements or as construction water from concrete slabs/screeds.
- check compatibility of DPM material with insulation
- must allow sufficient time for concrete and screed to dry out

  eg 150mm concrete slab - up to 1 year !

  75 mm screed - 6 - 8 weeks

Insulated groundbearing floors: design - avoiding thermal bridging

Observe how in each of the 3 details below how the continuity of the insulation envelope is maintained so as to avoid / minimise thermal bridging

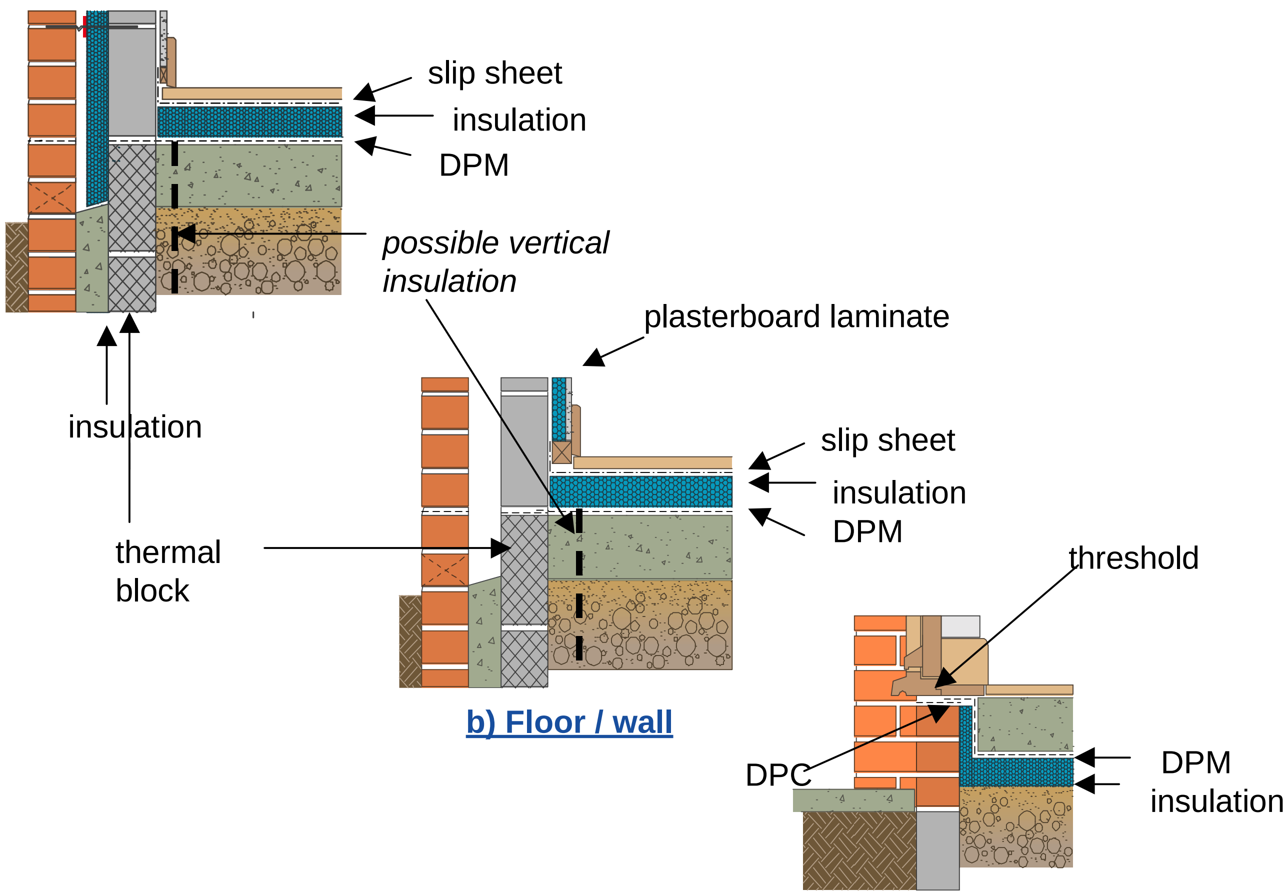
Floor/wall (a/b)

Note how cavity wall insulation and insulated plasterboard laminate are used
Thermal blocks are used for the inner leaf of the wall below floor level eg aircrete type (Thermolite Hi Strength, Celcon Hi 7 7kN, 0.19W/mK).
An alternative solution would be to include a vertical layer of insulation between inner blockwork skin and slab / hardcore.
Slip sheet also acts as a vapour control layer.

At threshold (c)

External doors require openings at floor level which need special attention to avoid thermal bridging

a) Floor / wall



b) Floor / wall

c) At threshold

Insulated suspended exposed, semi-exposed floors: design -avoiding thermal bridging

It is important to maintain continuity of the insulation !

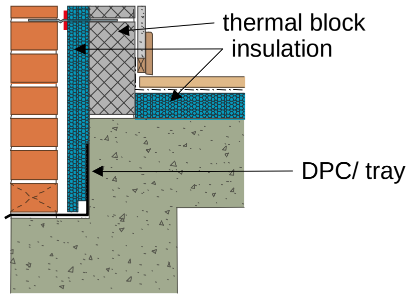
a) Exposed wall/floor junction

Note use of <u>insulating</u> blockwork of inner leaf and overlapping layers of insulation

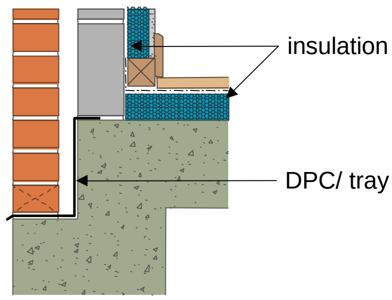
b) Exposed wall/floor junction - internal insulation

Note use of insulated plasterboard laminate

(If these details were for a ground floor then a DPM must be included and this should be continuous with the DPC)



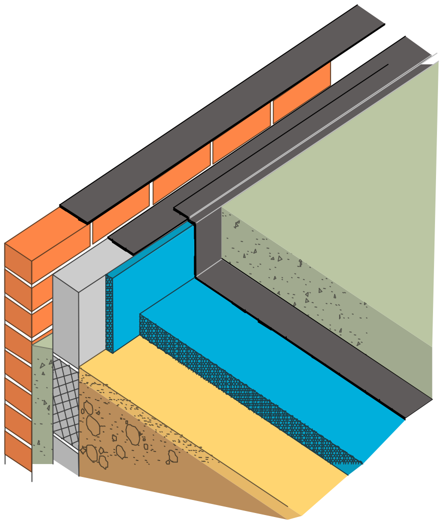
a) Exposed wall / floor junction



b) Exposed wall / floor junction - internal insulation

Insulated groundbearing floors: installation

Insulation under slab

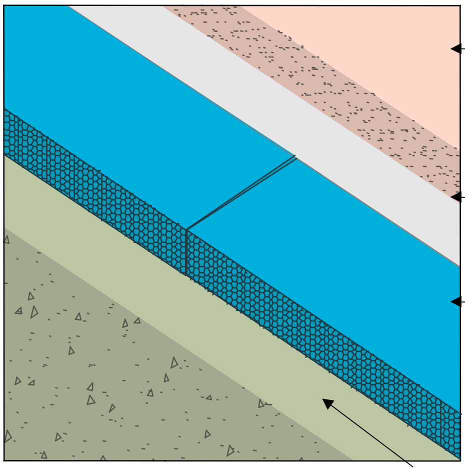


Suggested Installation sequence:

1. Compact fill and blind with sand
2. Fit 25mm thick insulation boards vertically at the edges
3. Lay insulation boards with edges tightly butted. *If more than one layer of insulation required stagger each layer*
4. Overlay with the DPM, lapping and sealing joints. turn up at edges ready to link into the DPC.
5. Lay the floor slab

Insulated groundbearing floors: installation

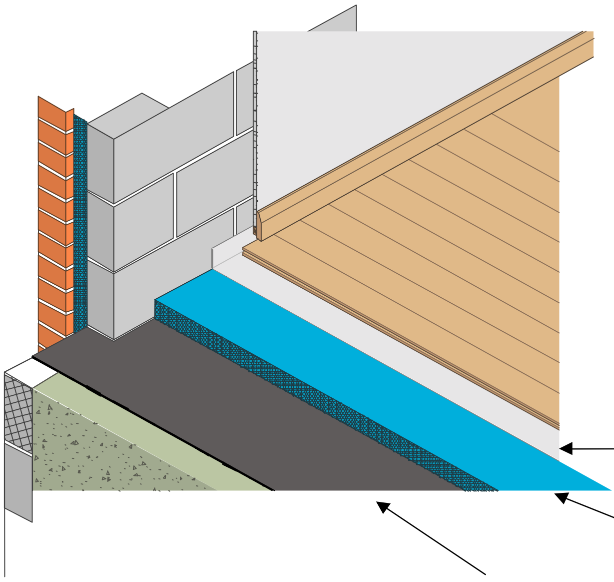
Insulation under screed



Suggested Installation sequence:

1. When the concrete slab is sufficiently cured check the surface for trueness and if necessary blind with sand.
2. Lay insulation boards with edges tightly butted. *If more than one layer stagger each layer.*
3. Overlay with a slip sheet/vapour control layer with joins lapped and sealed, turn up at wall edges.
4. Lay screed and leave to cure for at least seven days.

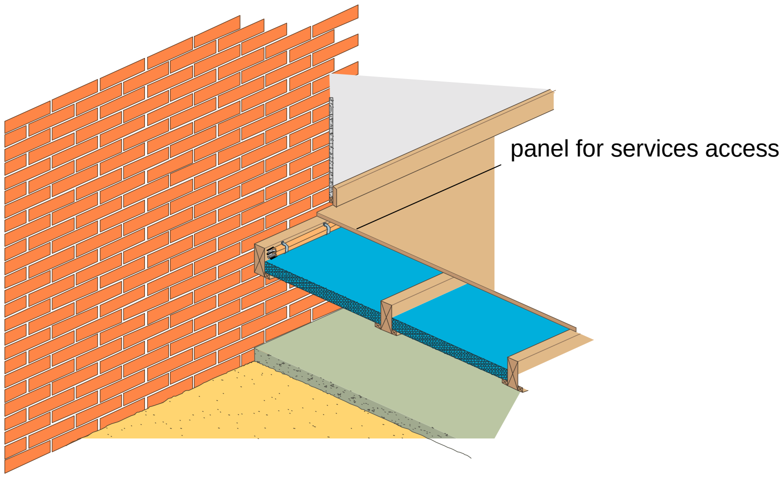
Insulated groundbearing floors: installation
Insulation below timber



Suggested installation sequence

1. Lay DPM over the concrete slab
2. Lay insulation boards with edges tightly butted. *Stagger each layer of insulation if more than one layer is required*
3. Overlay insulation with slipsheet / vapour control layer with joints lapped and sealed with edges turned up
4. Fit flooring boards leaving a 10mm gap at perimeters

Insulated timber floors : Installation



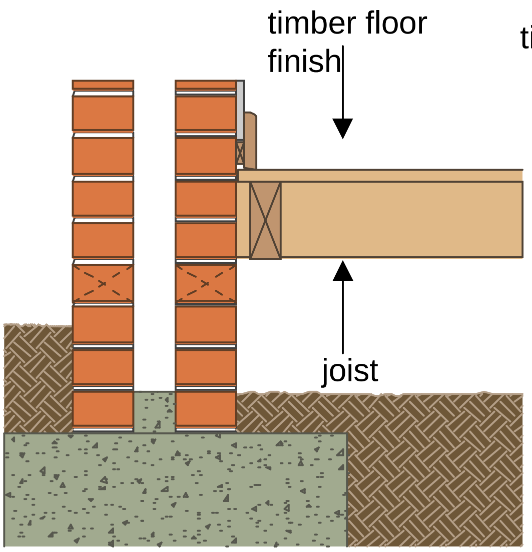
Central heating
Insulate pipes and run in space between insulation and wooden floor

Gas
Run pipework below insulation - if necessary (ie freezing conditions anticipated) thermally insulate

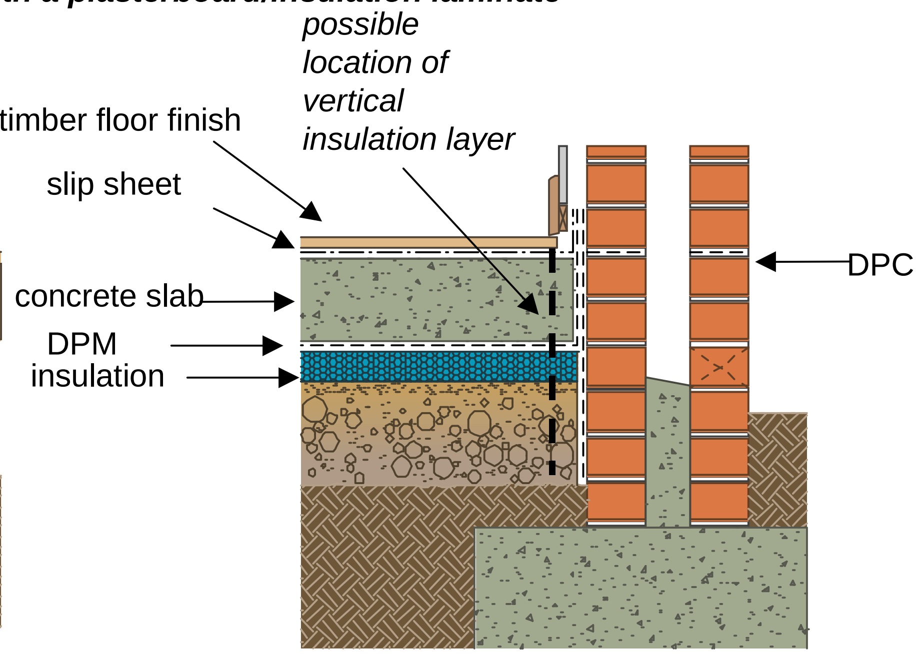
Electrical cabling
Check cabling rating if run in insulated void (overheating?)
Check compatibility with insulation

Ventilation
Ensure adequate ventilation below floor

- Improving thermal performance of existing floors during renovation can be desirable and economic
- Existing timber ground floors may be overlaid (or underpinned) with insulation and a new flooring surface provided as necessary
- Timber ground floors in pre-war properties often suffer from rot and insect infestation while the under-floor void can be a habitat for rodents. Such floors may be replaced by a ground bearing concrete floor incorporating thermal insulation
- ***Overlaying existing timber floors***
- When upgrading an existing timber floor the skirting should be removed and the insulation laid. The flooring and finish is then laid on top of a slipsheet (500 gauge pe say). The skirting can then be reinstalled or replaced and doors shortened to open over the new level
- ***Renovating with a concrete ground bearing floor***
- When replacing an existing timber floor with a concrete ground bearing floor take into account the following:
- fill deep sub-floor voids with hard core or a suitable non-settling fill to a maximum depth of 600mm
- if the DPM cannot be tied into the DPC, it should be dressed up behind the skirting
- block off ventilation openings but check out adjacent floors for adequate ventilation
- ***Note that there is a possible thermal bridge at the edge of the slab as shown above. This could be overcome by providing vertical (upstand) insulation between the wall inner leaf and slab. The insulation could be extended further up the internal wall say with a plasterboard/insulation laminate***



original construction



replacement floor

Insulated ground bearing floors: installation

Recommendations

Key Points

- Avoid point loading (eg wheelbarrows,) of insulation during installation
- Protect insulation boards and DPM while concreting/screeding
- Ensure integrity of insulation layer over floor
- Protect edge insulation (if present) at perimeter walls
- Ensure DPM is correctly positioned and continuous with DPC. Tape DPM at joins.
- Ensure all DPMs and slip sheets are installed and turned up correctly
- Ensure correct reinforcement and installation of screeds as specified
- Allow screeds to cure before applying floor finishes
- Where service and soil pipes penetrate the floor slab, take care to avoid ground moisture bypassing the DPM. Cut insulation boards to fit the penetration closely. Seal small gaps with a foam filler
- Where services are run within a concrete slab, test before the slab is laid
- Keep service runs beneath the flooring to a minimum, ensure they are accessible for maintenance
- Allow a gap of at least 10mm between timber flooring panels and walls

Refer to relevant NBS clauses in specification:

- E20/200 Formwork for insitu concrete
- M10/290 Cement : sand/concrete screeds / toppings
- K11/225/115/125/135/145/215/235/245 Rigid sheet flooring
- K20/150/160
- K21/120/130
- P10/225 Sundry insulation

Recommended reading:

- Floors & Flooring : P Pye, H W Harrison - BRE 1997 BR 332
- Good Building Guide - 28: Domestic Floors - BRE
- Thermal Insulation : avoiding risks - BRE BR 262
- British Cement Association: Technical Report 550
- Dow literature

Thermal insulation of floors

Summary

You have dealt with:

- Classification & types of floor
- General design issues
- Thermal performance
- Design specifics
- Installation

Remember:

Dow Technical Help Line - 0208 917 5049

Dow Literature Line - 0208 917 5791

If the following questionnaire is successfully completed and sent to **Dow Construction Products**, **2 Heathrow Boulevard, 284 Bath Road, West Drayton, Middx UB7 0DQ Fax Number 0208 917 5413** a CPD certificate will be forwarded to you.

1. Litigation concerning floor failures accounts for what percentage of all building failure litigation ?

   A ☐ 40

   B ☐ 60

   C ☐ 80

2. What percentage of the total heat loss in an uninsulated domestic building is through the floor ?

   A ☐ 20

   B ☐ 40

   C ☐ 60

3. What is the maximum allowable U-Value for the ground floor of a domestic property with a SAP rating of more than 60 ?

   A ☐ 0.35

   B ☐ 0.45

   C ☐ 0.60

   D ☐ 0.70

4. Where would you find guidance on static and dynamic loadings on floors ?

   A ☐ Approved Document A

   B ☐ BS 8103

   C ☐ BS 6399

   D ☐ BS 8110

   E ☐ BS 5268

   F ☐ BRE IP 2/77

   G ☐ British Cement Association Technical Report 550

   H ☐ BS 5250

   I ☐ Insulation manufacturers’ literature

5. When selecting insulation for floors the following properties should be considered:

A ☐ Thermal conductivity (over life span of floor)

B ☐ Compressive strength (10% compression)

C ☐ Design load

D ☐ Tear strength

E ☐ Dimensional stability

F ☐ Water absorption

G ☐ Water vapour resistance

H ☐ Fire performance

6. Where would you find details of how to calculate the floor U-value when the floor is insulated:

	Approved Documents	CIBSE	BRE IP	
		Guide A	7/93	14/94
A Over its whole area	☐	☐	☐	☐
B Only at the edges	☐	☐	☐	☐
C In basement	☐	☐	☐	☐

7. For a typical insulated groundbearing concrete slab floor can a rigid insulant such as Floormate be laid:

A ☐ below the slab

B ☐ below the screed

If so where should be DPM be positioned be positioned ?

	A	B	
C	☐	☐	between hardcore and insulation
D	☐	☐	between slab and insulation
E	☐	☐	between slab and screed
F	☐	☐	between insulation and screed

if a slip sheet/VCL is required where should it be located ?

	A	B	
G	☐	☐	between hardcore and insulation
H	☐	☐	between slab and insulation
I	☐	☐	between slab and screed
J	☐	☐	between insulation and screed
K	☐	☐	between insulation and floor finish

Name ____

Company Name ____

Address ____

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Telephone Number ____