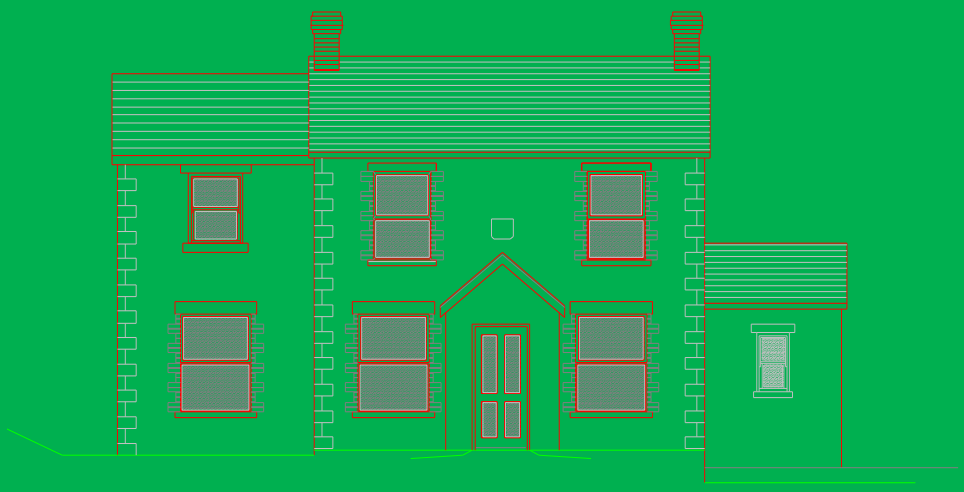
Forest of Dean District Council

Building control guidance document

for

Domestic Extensions



Building Regulations 2010 (including 2015 Amendments)
For use in England

This edition is currently being revised (August 2018)

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Nov 2015: Part C: BRE publication 'Radon-Guidance on protective measures for new buildings 2015' BS 8485:2015 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings'
Feb 2016: Part H; Revised drainage details
Sept 2016: Part Wall Act
Oct 2016: PCC beam & block floor span table added
September 2017: Cavity wall tie details amended, Insulation tables amended in line with new insulation products

Introduction

This document has been produced for home owners/occupiers, students, builders, designers and other property professionals who have a basic knowledge of building construction and require easy to understand guidance on the building regulations for domestic building projects in England A separate system of building control applies in Scotland, Northern Ireland and Wales.

This document intends to provide education and guidance on how some of the more common technical design and construction requirements of the building regulations can be achieved and met for single occupancy domestic extensions up to three storeys in height, and single storey garages. The author has produced additional guidance for new dwellings, loft conversions, conversions of existing garages, basements and barns, the upgrading of old buildings including the use of natural breathable lime mortars, plasters, renders and paints and is available to purchase as a book- please see back page of this guidance for details.

Typical details, tables, and illustrations have been provided in the guidance documents for the more common construction methods used in dwellings and have been adapted from the technical details contained within the Approved Documents of the Building Regulations. The diagrams and details produced in these guidance documents are for guidance only and are only interpretation of how the requirements of the building regulations can be met, the actual diagrams and details must be agreed and approved by building control at an early stage and before works commence. You must comply with the requirements of the Building Regulations and you are advised to fully refer to the Approved Documents and contact a suitably qualified and experienced property professional for details and specifications for the most suitable form and method of construction for your project.

Disclaimer

Forest of Dean District Council (the Council) has made every effort to ensure that the information contained in this Building Control Guidance Document issued October 2015 is accurate at the time of publication. However, the Guidance is advisory and has been developed by Council officers to assist home owners/occupiers, students, builders, designers England. This Guidance is not a substitute for the advice of a suitably qualified professional.

The Council does not guarantee and accepts no legal liability of whatever nature arising from or connected to, the accuracy, reliability, currency or completeness of the content of this Guidance. Users of the Guidance must be aware that alterations after the date of publication may not be incorporated into the content of the Guidance.

References to organisations or websites in this Guidance does not constitute an endorsement thereof on the part of the Council.

The Building Act 1984 and the Building Regulations 2010

The power to make building regulations are contained within Section 1 of the Building Act 1984 and deals with the powers of the Secretary of State to make building regulations for the following purposes:

- Securing the health, safety, welfare, and convenience of people in or about buildings
- Conservation of fuel and power
- Preventing waste, undue consumption, misuse or contamination of water

(The Building Act 1984 can be viewed at: www.legislation.gov.uk)

The current building regulations are the Building Regulations 2010 and The Building (Approved Inspectors etc.) Regulations 2010 which came into force on October 1st 2010, and applies to England. A separate system of building control applies in Scotland, Northern Ireland and Wales. The 2010 Regulations in both cases consolidate the Building Regulations 2000 and the Building (Approved Inspectors etc.) Regulations 2000. Incorporating amendments since 2000. The Building Regulations are very short, contain no technical details and are expressed as functional requirements and are difficult to interpret or understand. For this reason, the department for Communities and Local Government publishes guidance on meeting the requirements in a series of documents known as ‘Approved Documents’.

Approved Documents

The Approved Documents are intended to provide guidance on how to achieve the requirements of the building regulations and make reference to other guidance and standards. In themselves the Approved Documents are not mandatory and there is no obligation to adopt any particular solution contained within them if it can be achieved in some other way. In all cases it is the responsibility of the designer, applicant/owner and contractor to ensure the works are carried out in compliance with the building regulations. The current Approved Documents, are listed below and are available to view on the Department for Communities and Local Government web site: www.communities.gov.uk, or to purchase from The Stationary Office (TSO) on line at www.tsoshop.co.uk or telephone: 0870 600 5522. TRADA Technology span tables are available from: www.trada.co.uk/bookshop

Approved Documents and sections they cover
(Details in red apply to domestic extensions):

A: Structure (2004 edition with 2010 and 2013 amendments)
B: Volume 1: Fire safety in dwelling houses (2006 edition with 2010 & 2013 amendments);
B: Volume 2: Buildings other than dwelling houses (2006 edition with 2010 & 2013 amendments)
C: Site preparation and resistance to contaminants and moisture (2004 edition with 2010 & 2013 amendments);
D: Toxic substances (1992 with 2002, 2010 and 2013 amendments);
E: Resistance to the passage of sound (2003 with 2004, 2010, 2013 & 2015 amendments);
F: Ventilation (2010 edition with 2010 & 2013 amendments);
G: Sanitation, hot water safety and water efficiency (2015 edition);
H: Drainage and waste disposal (2015 edition);
J: Combustion appliances and fuel storage systems (2010 edition with 2013 amendments);
K: Protection from falling, collision and impact (including safety glazing which replaces Approved Document N) (2013 edition);
L1A: Conservation of fuel and power in new dwellings (2013 edition);
L1B: Conservation of fuel and power in existing dwellings (2010 edition incorporating 2010, 2011 & 2013 amendments);
L2A: Conservation of fuel and power in new buildings other than dwellings (2013 edition);
L2B: Conservation of fuel and power in existing buildings other than dwellings (2010 edition with further 2010, 2011 & 2013 amendments);
Domestic building service compliance guide (2013 edition)
Non- domestic building service compliance guide (2013 edition)
M: Access to and use of buildings: Volume 1: Dwellings (2015 Edition)- normally applies to new dwelling- but may apply in certain circumstances- see PART M section and how it applies;
M: Access to and use of buildings: Volume 2: Buildings other than dwellings (2015 Edition);
P: Electrical safety (2013 edition);
Q: Security- Dwellings (2015 edition)
R: Physical infrastructure for high-speed electronic communication networks (2016 Edition- comes into force 1/1/2017)
Regulation 7: Materials and workmanship (2013 edition).

Reproduced/modified details: The details in this guidance has been reproduced/modified from the details contained in the Approved Documents into an interpretation provided in this guidance and additional information has been provided that is not contained within the Approved Documents. None of the values contained within the Approved Documents have been changed. For each table and diagram used or modified in this guidance, only the more common values and information has been reproduced in this guidance and the reader should fully refer to the Approved Documents.

Abbreviations: References made in this guidance to Approved Documents are abbreviated as AD, for example, reference to Approved Document A: Structure (2004 edition with 2010 amendments) will be abbreviated to ADA.

Directgov at: www.direct.gov.uk/en/SiteInformation/DG_020460

Other ways of satisfying the building regulation requirements

The building regulation requirements may be satisfied in other ways or non-standard ways by calculations or test details from a manufacturer or an approved third party method of certification such as a British Board of Agreement (BBA or other third party accredited) Certification.

Technical and condensation risks

The technical details in this guidance document should be read in conjunction with the BRE publication 'Thermal Insulation Avoiding Risks', which explains the technical risks and condensation risks which may be associated with meeting the building regulation requirements for thermal insulation for the major elements of the building. A copy of the publication can be obtained from: www.brebookshop.com

A condensation risk analysis (including interstitial condensation risk) should be carried out for the details and diagrams produced in this guidance for particular situations and construction projects, following the procedures set out in BS 5250:2002 (Code of practice for the control of condensation in buildings). The insulation manufacturer's technical services department will normally carry out this service.

Timber sizing tables independently calculated by GEOMEX for solid timber members

The timber sizing tables in this guidance have been independently calculated by Geomex Ltd (Consulting Structural Engineers) and have been carried out totally independent of TRADA Technology span tables. Timber sizes stated in the tables in this guidance are commonly available for solid timber members used in the construction of floors, ceilings, cut roofs (excluding manufactured trusses) and flat roofs for single occupancy dwellings up to 3 storeys in height (measured above ground level). Normally, two grades of timber are commercially available, strength grades C16 and C24 (grade C24 being stronger than C16).

Grade C24 timber has been used for the calculation of all values for particular imposed and dead loadings as contained in timber sizing tables in this guidance and each case should be separately analysed and assessed since site parameters may change including wind and snow loading for particular geographical areas.

Where possible the calculations have been performed using current timber Eurocodes based on the latest release of TEDDS design software. The TEDDS design software is the design package employed to undertake the calculations. However where the software does not include the Eurocode standards, British Standards have been used. This is still recognised as a design standard and we understand that this will remain acceptable for most local authorities until March 2013. Please note that the TRADA Technology Span Tables have not been reproduced in this guidance.

Engaging a property professional

The design and construction of extensions, garages, new dwellings and conversions of existing buildings are normally complex projects and unless you are experienced in design and construction you are advised to get some professional advice and help from the following:

1. Appoint a suitably qualified and experienced property professional who will prepare drawings and designs for your proposal, obtain the necessary approvals and if required they will also help you to find a suitable builder and manage the project for you.
2. Appoint a specialist company who can offer a complete design and build package for your proposal, they can usually prepare drawings and designs for your proposal, obtain the necessary approvals and carry out all the necessary construction works and project management to complete the project.
3. Use an experienced builder.

Obtaining Building Regulations approval

There are two alternative routes available to the building owner to obtain building regulations approval as detailed below, option 1 is the local authority route and option 2 is an Approved Inspector route and is a private system of certification.

Option1: Local Authority route

The building owner or agent must make a building regulations application and pay a fee for the construction of new works. All work must comply with the 2010 Building Regulations.

The person carrying out the building works is to liaise with and meet the requirements of the Local Authority Building Control and give the required notice for certain key stages of works as detailed in the guidance below

There are two methods of making a Building Regulations application as follows:

(i) Full Plans application

This is often thought of as the traditional way of applying for Building Regulations Approval. The building designer will draw up detailed plans, specification and supporting information for the proposed scheme and will send them to the local authority together with a completed application form and the necessary fee. Building Control will then check the details and following any necessary consultations and liaisons with the building designer, a building regulations approval or conditional approval will be issued. The approvals can also be dealt with in stages when design information becomes available, this can be on a rolling program agreed between the parties as the information becomes available. Applications can be rejected in certain instances.

Work can start any time after the application together with the correct fee has been accepted as a valid application, although it is wise to wait until the scheme has had its initial check under the Building Regulations, this usually takes between two and three weeks (works carried out before formal approval is given is carried out at the building owners risk). The building control surveyor will normally liaise with the builder/owner and inspect the work as it progresses on site. When the project is satisfactorily completed a Building Regulations Completion Certificate will normally be Issued.

Information required:

- One copy of this form should be complete and returned to Building Control together with the appropriate fee (see appropriate fee table for type of work carried out) and one copy of the detailed plans and full constructional specification (guidance documents are available) and site plan (1:1250 or 1: 2500)
- Additional set of plan layouts is required for non dwellings for consultation with the Fire Authority- indicating the escape routes in red.

(ii) Building Notice application

This system is best suited to minor domestic work carried out by a competent builder. Under this scheme no formal approval of plans is issued and work is approved on site as it progresses.

Building notices cannot be used in the following circumstances:

- The building is a 'designated use' under the Fire Safety Regulatory Order (i.e. offices, shops, industrial buildings and residential buildings) and or is a workplace subject to the Fire Precautions (Workplace) Regulations 1997 which will require consultation with the relevant Fire Authority
- The building work is over or near a public sewer (see notes in application form)
- Proposed new dwellings front onto a private street

To use the Building Notice process, the owner or agent will need to submit a completed Building Notice application form together with a site location plan and the required fee. Work can

commence 48 hours after the notice has been received. When work commences, the Councils surveyor will normally meet with the owner/builder to discuss the proposals and to agree how the work should be carried out, agree when the work will need to be inspected and to establish whether any further information will be required e.g. drawings, specifications or other information. When the project is satisfactorily completed a Building Regulations Completion Certificate will normally be Issued.

Information required:
One copy of this form should be complete and returned to Building Control together with the appropriate fee (see appropriate fee table for type of work carried out) and site plan (1:1250 or 1: 2500) indicating drainage layouts and site boundaries. Additional information may also be requested depending on the complexity of the works. i.e. structural calculations and details. Guidance are available on the FoDDC web site.

Unauthorized works - Regularisation Certificates
For unauthorized works carried out on or after **11th November 1985** an separate form of application can be made to the local authority in certain instances to regularise the works which is a retrospective form of application- fees for the works are charged as listed in the relevant fee table excluding VAT with an additional 50% premium added to it. This type of application is exempt VAT.
One copy of the following details are required to be submitted at the application stage:

- Completed application forms ((Please refer to separate application forms and fee table which can be down loaded at: www.fdean.gov.uk
- Correct fee. (see appropriate fee table for type of work excluding VAT with an additional 50%)
- Site plan 1:1250 or 1:2500
- Detailed plans/specification/supporting information for the actual works carried out (Building control guidance documents are available to down load at: www.fdean.gov.uk
- An Additional set of plan layouts is required for non dwellings for consultation with the Fire Authority- indicating the escape routes in red.

Site inspections and areas of work to be exposed for inspection- To be agreed with the Councils surveyor

Works to provide access and facilities for disabled persons
Fees are not payable when the proposed works is to provide access and facilities in an existing dwelling or extension to store equipment or provide medical treatment for a disabled person. In order to claim an exemption, the appropriate evidence as to the relevance of the adaptation for the persons disability must accompany the application.

Relaxation of building regulation requirements
In certain circumstances, local authorities have powers to dispense with or relax regulation requirements. However a majority of the regulation requirements cannot be relaxed because they require something to be adequate or reasonable and to grant a relaxation could mean acceptance of something that was inadequate or unreasonable. For more advise please contact your local authority building control department.

Contraventions
Where works are carried out in contravention of the building regulations, the local authority may require it's alteration or removal within a period of time by serving notice on the building owner. Failure to comply with the notice may result in the work being carried out by the local authority who can recover their expenses from the defaulter. The person who contravened the building regulations also renders themselves liable to prosecution for the offence in the magistrates court. To find your local authority building control in England and Wales contact Local Authority Building Control (LABC) at: www.labc.uk.com

Notices of stages of works

Site inspections are normally carried out by Building Control at key stages to ensure the works are being carried out in compliance with the Building Regulations. Please note it is your responsibility to ensure that Building Control is called at commencement of work, as well as the stages of work they have asked to inspect which are typically shown below. Inspections are made at the discretion of the Building Control Surveyor for your area and can be contacted as shown below. Additional inspections may be requested, or carried out at the same time as others or omitted depending upon the type, scope and scale of the works.

Typical site inspections for stage of work and notice required		
	Stage of Work	**Notice required**
1.	Commencement	2 working days before
2.	Foundation excavation before pouring concrete	1 working day before
3.	Ground floor oversite before covering or pouring concrete	1 working day before
4.	Before covering drainage over	1 working day before
5.	Before covering over structural elements, upper floors and roof	1 working day before
6.	Other inspections required or requested by the Building Control Surveyor	1 working day before
7.	Occupation or completion of the works	5 working days before
Note: More than one inspection may be carried out for each key stage and where possible additional items for inspection are normally carried out at the same time as the key stages. i.e. damp proof courses etc.		

Option 2: Approved Inspector route

If the owner employs an approved inspector the inspector must give to the local authority an initial notice in a prescribed form before the work commences on site. The owner should ensure that all the relevant information is provided in the prescribed form, because if the local authority are not satisfied that the notice contains sufficient information or if the works start before they receive it, they can reject it within 5 working days and it is of no effect.

Once the notice has been accepted, or is deemed to have been accepted by the passing of 5 days, the approved inspector is responsible for inspecting the works and issuing of the appropriate certificates to the local authority as required under the Building (Approved Inspectors, etc) Regulations 2010. The building designer will draw up detailed plans, specification and supporting information for the proposed scheme and will send them to the approved inspector, this can be on a rolling program agreed between the parties as the information becomes available. When the project is satisfactorily completed a Building Regulations Completion Certificate will normally be issued.

Contraventions

Unlike the local authority, the Approved Inspector has no direct power to enforce the building regulations if the works are in contravention of the regulations. If the Approved Inspector is not satisfied with the works and cannot resolve the matter, the inspector will not issue the 'final certificate' and cancel the initial notice, thereby terminating the inspectors involvement in the project. Cancelling the initial notice results in the building control function being taken on by the local authority who have enforcement powers to ensure the works comply. A list of approved inspectors is available from The Construction Industry Council's Web Site at: www.cic.org.uk

Exempt buildings and work

The following list is a brief extract of the more common buildings and works that are exempt the building regulations, for full details see Schedule 2 of the Building Regulations 2010.

Green Houses and agricultural buildings: Buildings used for agriculture including horticulture (i.e. growing of fruit, vegetables, plants, seeds and fish farming) or principally for the keeping of

animals; providing in each case that no part of the building is used as a dwelling; the building is at least one and a half times its height from a building which contains sleeping accommodation; the maximum distance to a fire exit or point of escape from the building is 30m; and the building is not used for retailing, packing or exhibiting.
Temporary buildings: A buildings which is not intended to remain were it is erected for more than 28 days
Ancillary buildings: Buildings used only in connection with the sale of buildings or plots on that site; or on a site of construction or civil engineering works which is intended to be used only during the course of those works and contains no sleeping accommodation; or a building, other than a building containing a dwelling or used as an office or showroom, erected for use on the site of and in connection with a mine or quarry..
Small detached buildings (garages, workshops or sheds): A detached single storey building with less than $30m^2$ internal floor area, with no sleeping accommodation. If constructed substantially of combustible materials it must be positioned at least one metre from the boundary of its curtilage; or a detached building with less than $15m^2$ internal floor area, with no sleeping accommodation- does not have any boundary restrictions.
Conservatory, porch, covered yard/way and carports: The extension of a building by the addition of a single storey building at ground level of:
(a) a conservatory, porch, covered yard or covered way; or
(b) a car port open at least two sides;
where the floor area of that extension is less than $30m^2$ internal floor area, providing the glazed areas satisfies the requirements of Approved Document K for safety glazing. (Please note that as there is no definition of conservatory in the Building Regulations 2010 and due to the variance in interpretation of the building regulations, building control may require a percentage of the walls and roof in a conservatory to be formed from translucent materials to be exempt, typically 75% of the roof and 50% of the walls. You are advised to contact building control for their specific requirements). Additional requirements: existing walls/ doors/ windows of the building separating the conservatory or porch are to be retained or, if removed are to be replaced with elements that meet the energy efficiency requirements of Approved Document L1B, and the heating system of the dwelling must not be extended into the conservatory or porch.

Competent Person Scheme

Certain works can be carried out by an installer who is registered with a Competent Persons Scheme and will not require building regulations approval.

Competent Person Schemes (CPS) were introduced by the UK Government to allow individuals and enterprises to self-certify that their work complies with the Building Regulations as an alternative to submitting a building notice or using an approved inspector. A Competent Person must be registered with a scheme that has been approved by The Department for Communities and Local Government (DCLG). Schemes authorised by the DCLG are listed on its website at http://www.communities.gov.uk

An installer registered with a Competent Person Scheme will notify the local authority on your behalf and will issue a certificate on completion which can be used as proof of compliance. It will also show up on a solicitor's local authority search. To understand why you should use a Competent Person, a consumer book let can be down loaded on the DCLG website above, which has been developed by a collaboration of all of the approved scheme providers to provide the consumer with the ability to search for a Competent Person registered with one of the schemes.

Schemes authorized include: Installation of cavity wall insulation, Installation of gas appliances; Installation or replacement of hot water and heating systems connected to gas appliances; Installation or replacement of oil-fired boilers, tanks and associated hot water and heating systems; Installation or replacement of solid fuel burners and associated hot water and heating systems; Installation of fixed air conditioning or mechanical ventilation systems; Electrical work in dwellings; Electrical work only in association with other work (e.g. kitchen installations, boiler installations); Replacement windows, doors, roof windows, or roof lights in dwellings; Installation of plumbing and water supply systems and bathrooms and sanitary ware; Replacement of roof

coverings on pitched and flat roofs (not including solar panels); Installation of micro generation or renewable technologies. This list can be altered at any time and for a current list of all registered scheme members go to the DCLG website above.

Preliminary works

Site assessment

A desk study and initial walk over of the site and surrounding area should be carried out by a suitable person to identify any potential hazards and problems at an early stage. Items to be taken into account should include;

- Geology of the area including any protection measures required for Radon ground gas.
- Landfill and tipping including any protection measures required for methane and carbon monoxide ground gases and foundation design requirements.
- Surface and ground water including flooding.
- Soils and previous industrial, commercial or agricultural uses including any protection measures required for ground contaminates.
- Mining and quarrying including any special foundation design requirements.

Further guidance on site preparation and the resistance to contaminants and moisture is provided in ADC and Part C of this guidance. Typical construction details in Part A of this guidance contains details on how to achieve basic and full radon protection in sub structures.

Sources of information include: Local Authority (building control, planning departments, environmental health departments), Environment Agency, Coal Authority, Utility Companies, Health Protection Agency, British Geological Survey, Ordinance Survey Maps, etc.

Where hazards are suspected, a detailed site investigation should be carried out by a specialist.

Demolitions

Where the demolition of a structure or part of a structure exceeds $50m^3$, a notice of the proposed demolition must be sent to the local authorities building control (and planning) department before works commence. For further information please contact your local authority planning and building control departments. The Construction (Design and Management) Regulations 2007 will apply to demolition works (see guidance below for details).

Statutory Service Authorities

Prior to and during works, the person carrying out the works is to liaise with and meet the requirements of the relevant Statutory Service Authorities/Utility Companies, including the provision and protection of new services, sewers and location and protection of all existing services/sewers as necessary.

Public sewers

Following the implementation of the Private Sewers Transfer Regulations 2011, persons proposing to make a new direct or indirect drainage connection to a public sewer or build over or carry out any works within 3 meters of a public sewer are reminded that it is now their responsibility to consult with the relevant sewerage provider and obtain any permission that may be required and ensure the sewer pipe and systems are protected in accordance with the sewerage provider's requirements. A sewer which is subject to these regulations will typically carry waste water from more than one property and communicate it to a public sewer.

Further information on the implementation of the Private Sewers Transfer Regulations is available from: www.defra.gov.uk/environment/quality/water/sewage/sewers and www.water.org.uk/home/policy/private-sewer-

Sewerage providers contact details:
Severn Trent: Telephone: 01902 793755, Email: net.dev.west@severntrent.co.uk
Welsh Water: Telephone: 0800 9172652, Email: developer.services@dwrcmru.com

Existing services

Plumbing, drainage, heating appliances, electrical services etc that need to be altered, modified, adjusted, or re-sited to facilitate the new building works, should be carried out by a suitably qualified and experience specialists or registered competent persons, tested and appropriate certification issued where necessary. Existing services should be located, altered/ modified/ relocated as necessary, including sealing up, capping off, disconnecting, removing redundant services where required.

Structural timber

All structural timber should be stress graded as either C16 or C24 to BS 4978 and sawn to BS 4471. C16 graded timber has a lesser strength than C24 graded timber and C24 timber has been used for the calculation of all values contained in Geomex timber sizing tables in this guidance. All timber is to be protected on site to minimize moisture content which must not exceed 22%. Preservative treatment of timber should be in accordance with the requirements of BS 8417, and treatment against House long horn beetles should be carried out in geographical areas in accordance with Table 1 of ADA .

Opening up of the existing structure

The builder should open up the existing structure where required for inspection purposes in areas or locations as requested by building control or a structural engineer and allow for making good all disturbed structures and finishes to match existing on completion. For example the exposure and inspection of the existing foundations of a building may be required to determine if they are adequate enough to support the increased loadings of a new storey.

Protected species (bats etc)

Many buildings have features which are of value to wildlife and which may be used by legally protected species including European Protected Species (e.g. Bats, Dormice & Great Crested Newts). Where these species are present, legal protection extends to their places of shelter and a license from Natural England may be required before works start. It is therefore advisable to take appropriate measures to avoid harm to protected species and a potential offence under the relevant legislation. Natural England are the relevant advisory organisation and can be contacted at: www.naturalengland.org.uk, or contact the Councils Sustainability Team on 01594 810000 for further information.

Protection of the works

Adequate precautions should be taken on site to protect the work, particularly the laying of concrete and other wet trades or processes in accordance with product manufacturer's details or specialists requirements in the following circumstances:.

- When the air temperature is below or likely to fall below 2^{o}C (additional consideration should be made for wind chill and freezing conditions)
- No concrete should be placed into or onto frozen surfaces or excavations
- Ready mixed concrete should be delivered to site at a minimum temperature of 5^{o}C in accordance with BS 5328
- No frozen materials should be used in the works
- Works should not continue until it is free of frost and frozen materials
- Where there is a possibility that new work will be affected by frost or freezing before it has set. Curing periods may need to be extended in accordance with product manufacturer's details

Short and long term protection and storage of material on site should be in accordance with product manufacturer's details. The use of admixtures must be carried out in accordance with product manufacturer’s details. Adequate precautions should be taken to protect the works in accordance with product manufacturer’s details or specialists requirements. Typically polythene sheeting/hessian should be used to protect works in progress from becoming saturated, and prevent drying out from direct winds and sun. Wetting may also be required to ensure that mortars/ rendering/ plastering/ screeds/ slabs etc do not dry out too quickly and cause failures.

Matters related to the building regulations

The following are related to, but are not enforced under the requirements of the building regulations.

Planning Permission, listed building and conservation area consents

Planning permission, listed building/conservation area consents may be required for your proposed development and no works should be commenced until approval has been given by the relevant local authority planning department.

If the requirements of the building regulations will unacceptably alter the character or appearance of a historic/listed building/ancient monument or building within a conservation area, then the requirements may be exempt or relaxed to what is reasonably practical or acceptable, ensuring that any exemption or relaxation would not increase the risk of deterioration of the building fabric or fittings in consultation with the local planning authorities conservation officer (any exemption or relaxation must be approved before works commence). For further information, please contact your local authority planning department.

Health and safety at work

Provide all necessary health and safety requirements including; all necessary personal protective equipment, site security, scaffolding, access ladders, material hoists, temporary protection and working platforms etc which are to be erected, maintained, certificated, dismantled and removed by suitably qualified and insured specialists.

The Health and Safety at Work etc Act 1974

The Health and Safety at Work etc Act 1974 (HSWA) is enforced by the Health and Safety Executive. The HSWA requires persons in control of premises to make broad provisions for the health, safety and welfare of people including visitors and other users of the premises. The HSWA also requires all persons at work (i.e. contractors) to ensure, so far as is reasonably practical, the health and safety of themselves and any other people who may be affected by their work.

The Construction (Design and Management) Regulations 2015 (CDM).

The CDM 2007 Regulations will end on 6th April 2015 with a 6 month transitional period up to 6th October 2015.

The Construction (Design and Management) Regulations 2015 comes into force on 6th April 2015 and applies to every commercial and domestic construction project . If you are about to undertake construction work, which could include alterations, extensions, routine maintenance, new build or demolitions, then you need to know to what extent these Regulations will apply to you and whether you are a duty holder under these Regulations and what your responsibilities are.

Projects are required to be noitified to the Health and Safety Executive (HSE) if they exceed 30 construction days with 20 or more workers working simultaneously, or if the project exceeds 500 person days.

The Duty Holders responsibilities under The Construction (Design and Management) Regulations 2015 and further guidance is indicated **in Appendix 1** of this guidance document

Asbestos, contaminated materials, lead paint etc

Any suspected asbestos/contaminated material/soil/lead paint is to be inspected by a specialist. Asbestos is to be removed and disposed off site by a specialist licensed contractor as required under the Control of Asbestos Regulations 2012.

Further information regarding the above can be obtained from the Health and Safety Executive at: www.hse.gov.uk

The Party Wall Act 1996

Introduction: The Party Wall etc Act 1996 (the Act) is a law that must be followed in certain circumstances. The Act does not apply to all building work, but its requirements are quite separate to those of Planning and Building Regulations. Professional advice about the Act should be considered by both building owners and neighbours (neighbours' affected are called ”adjoining owners” and an adjoining owner is a free hold or lease hold owner or anyone with a tenancy for more than 1 year).

Where the Act applies: The following are examples of where a building owner is required by law to serve a formal notice on adjoining owners. A Party Wall Act Notice (notice) must show the details of the relevant proposals and other necessary information, and is only valid for one year:

- When building work is planned on a boundary with a neighbouring property.
- When work is planned directly to an existing wall or other structure which is shared with another property.
- When an excavation is planned within three metres of a neighbour’s building or other structure, where it will be to a lower level than the underside of the neighbour’s foundation.
- When an excavation is planned within six metres of a neighbour’s building or other structure, where that excavation would cut a line drawn downwards at 45° from the underside of the neighbour’s foundation.

Serving of a Party Wall Act Notice: Must be at least 2 months before the planned start date for the work to the party wall (or at least 1 month for (i) a new wall astride the boundary, (ii) foundations within 3/6 m of the neighboring buildings and (iii) 'special foundations' extending onto neighboring land- see note below*). The adjoining owner may agree to allow works to start earlier but is not obliged to even when agreement on the works is reached. The notice is only valid for 1 year.

Example notices and letters can be found in the reference sources below.

What happens after serving a Party Wall Act Notice: A person who receives a notice about intended work may:

- Give his consent in writing
- Object (dissent) to the proposed works in writing
- Do nothing

If after a period of 14 days from serving of the notice, the person receiving the notice has done nothing, a dispute is regarded as having risen

A person who receives notice about intended work, may within 1 month, give a counter notice setting out what additional or modified work he would like to be carried out for his own benefit. A person who receives a notice and intends to give a counter notice, should let the building owner know within 14 days.

If you receive a counter notice, you must respond within 14 days otherwise a dispute is regarded as having risen.

Example notices and letters can be found in the reference sources below

Disputes under the Act: Agreeing in writing to a notice allows the work to proceed in due course. However, if a neighbour does not agree (including not replying in writing within fourteen days) a dispute arises. For a dispute Section 10 of the Act (Resolution of disputes) applies necessitating the appointment of surveyors. The building owner and adjoining owner must either:

a) agree to appoint one surveyor (an “agreed surveyor”), or

b) each appoint their own surveyor. (Those two surveyors then select a third surveyor, but only in case of a dispute between themselves.)

The dispute procedure may well be longer than the period required for the notice, and in complex cases can be several months.

An Award: By appointing surveyors, the dispute is resolved by them on behalf of the owners, and the result is the service of an “Award” for each dispute. An Award is a legal document describing when, where and how the work subject to the Act is to be carried out. An Award cannot deal with matters outside the Act, and cannot deal with other work on site.

Once served, both the building owner and the adjoining owner each have a right to appeal the Award in the county court, but only for a period of fourteen days. After that the Award is *totally* binding *and shall not be questioned in any court.* This is a very powerful provision and must be very carefully considered by all involved.

Who pays: The surveyor (or surveyors) will decide who pays the fees for drawing up the award and for checking that the work has been carried out in accordance with the award. However- Usually the building owner will pay **all** costs associated with drawing up the award if the works are solely for his benefit.

Other Items: The Act cannot be used to resolve a boundary dispute, and neighbour's cannot use it to prevent approved work from being carried out. The Act deals with many matters not covered above and only the Act should be relied on for the scope and meaning of any item. There are many guides available relating to then Act, but even they should not be relied on in preference to the Act.

*Important note: The Act does not give right to construct 'special foundations' on a neighbours land - as this would be trespass without agreement from the adjoining owner and a party wall surveyor should be consulted.

The Act does not recognize a retrospective process, however, recent case law has changed this but it does not mean that the Act can be ignored as the building owner will still be responsible for damage caused before the retrospective Award is published- and a party wall surveyor should be consulted.

Reference sources: Explanatory booklet with example notices and letters (published by the Department for Communities and Local Government) is available from:
http://www.communities.gov.uk/partywall-1996

Part A: Structure

Please refer fully to Approved Document A: Structure (2004 edition with 2010 & 2013 amendments)

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Foundations

Concrete mixes for foundations
Foundation work to comply with BS 8000:1, 2 and 5 and BS 8004. General purpose concrete mixes for non hazardous conditions to comply with BS 8500 and BS EN 206-1.

(i) Site mixed concrete (Standardised Prescribed mix ST)
Site mixed concrete for domestic construction activities to be in accordance with the guidance table below, designed using materials and mix proportions given in BS 5328: 1 Section 4. Standard mixes should not be used in soils, ground waters or adjoining materials containing sulphates or other aggressive chemicals

(ii) Ready mixed concrete (Designated mix GEN, RC and FND)
Ready mixed concrete designed and specified in accordance with BS 5328:1 Section 5, produced and mixed under quality controlled conditions in accordance with BS EN ISO 9001. Note: GEN to be used for general purposes, RC is used for reinforced concrete and FND to be used in soils containing sulphates, in accordance with the guidance table below.

(iii) Hand mixed concrete
Hand mixed concrete proportions must be agreed with building control before works commence on site.

Guidance Table 1: Concrete mixes for foundations

Application	**Site mixed (Standardised prescribed mix)**	**Ready mixed (Designated mix)**	**Compaction method**
Blinding, Strip foundations, trench fill foundations and mass concrete fill	ST2	GEN1	Mechanical vibration/ poker or tamping by hand
Reinforced concrete foundations (i.e. raft foundation)	Designed by a suitably qualified specialist	RC35- designed by a suitably qualified specialist	Designed and specified by a suitably qualified specialist
Foundations in sulphate Conditions*	n/a	FND- designed by a suitably qualified specialist	Designed and specified by a suitably qualified specialist
Notes: *Foundations in sulphate conditions to be in accordance with BS 5328:1 Table 7a			

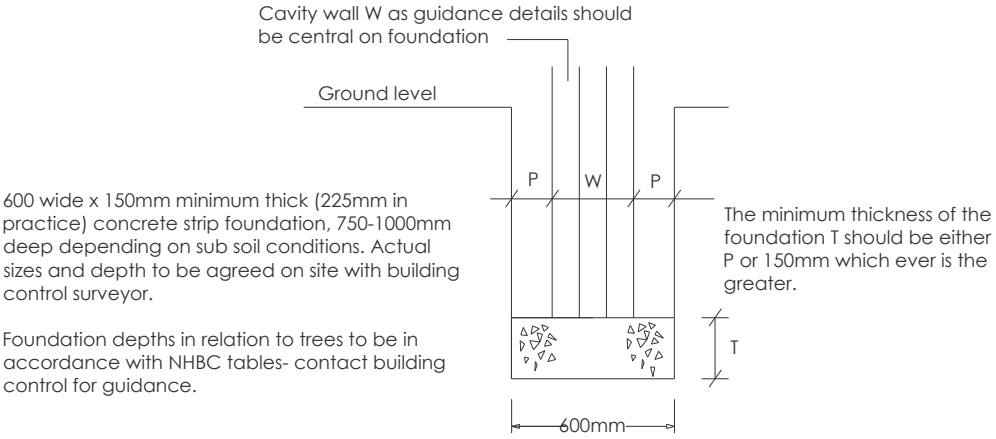
Foundation types

Strip foundations

Strip foundations to have a minimum width in accordance with the table below (typically 600mm wide for 300mm thick cavity walls and 450mm wide for 100mm thick walls), a minimum thickness of 150mm (typically 225mm in practice) and minimum depth below ground level in accordance with the guidance table below and as required by building control. Maximum depth is to be restricted to 1.0m deep for health and safety for persons working in trenches. Foundation for three storey buildings should be designed by a suitably qualified person i.e. structural engineer. Any services should pass through the sub structure walls protected by precast concrete lintels and not through the foundation - for more details see pipes penetrating though walls in Part H of this guidance. Foundations should be located centrally under all external and internal walls and taken to a depth below the influence of drains and or surrounding trees and taken to natural undisturbed ground of adequate ground bearing capacity.

Guidance Diagram 1: Strip foundation section detail (not to scale)

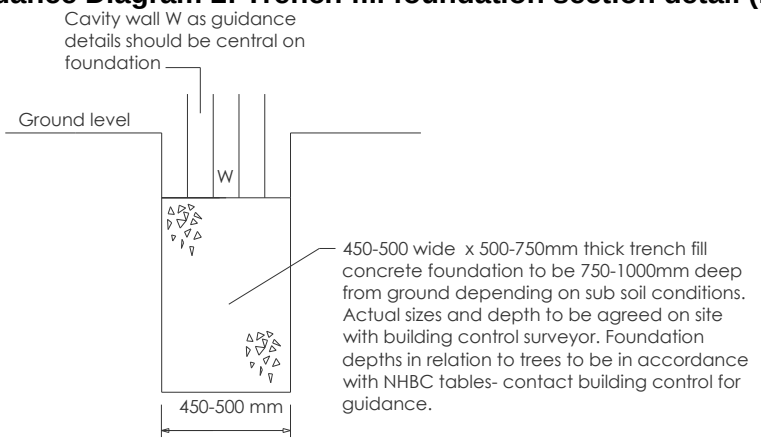
See Diagram 23 of ADA for full details



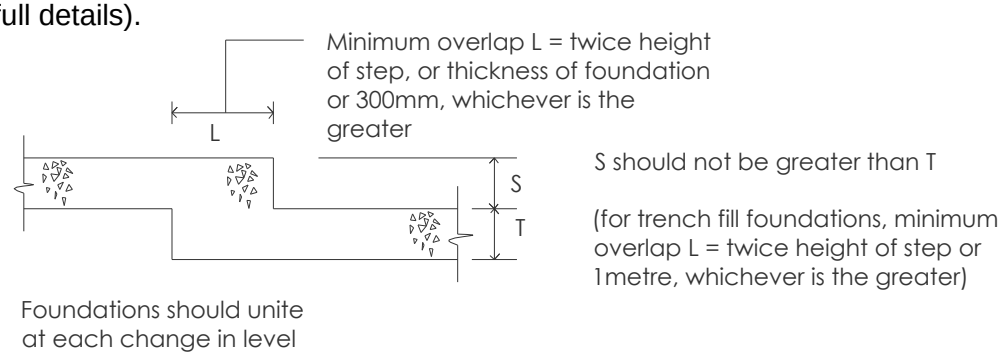
Trench fill foundations

Trench fill foundations to have a minimum width of 450/500mm, a minimum thickness and a minimum depth below external ground level in accordance with the guidance diagram and tables below and as required by building control . Foundation for three storey buildings or depths in excess of 2.5m should be designed by a suitably qualified person i.e. structural engineer. Any services passing through trench fill concrete should be ducted or sleeved or wrapped in flexible material (e.g. fiberglass and polythene sheet fixed around drainage pipes or services to allow space for movement and to prevent differential movement damaging the services). Pipes through foundations should have flexible joints either side of the foundation- see pipes penetrating though walls in Part H of this guidance for more details. Foundations should be located centrally under all external and internal walls and taken to a depth below the influence of drains and or surrounding trees and taken to natural undisturbed ground of adequate ground bearing capacity.

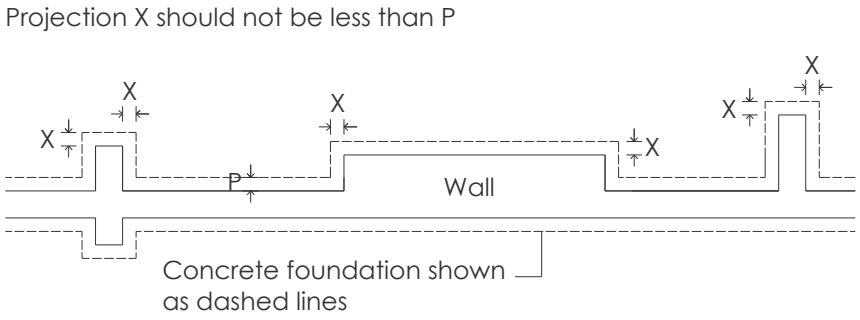
Guidance Diagram 2: Trench fill foundation section detail (not to scale)



Guidance Diagram 3: Stepped foundation section detail (not to scale)
Steps in strip foundations should not exceed its thickness and should overlap by twice its thickness or 300mm if greater as detailed in the simplified diagram below (see Diagram 21 of ADA for full details).



Guidance Diagram 4: Foundation projections to piers, buttresses and chimneys (Plan detail not to scale) see Diagram 22 of ADA for full details.



Guidance Table 2: Minimum width of strip/trench fill foundations

(See Table 10 of ADA for full details)

Type of ground (including engineered fill)	Condition of ground	Field test applicable	Total load of load-bearing walling not more than (kN/linear metre)					
			20	30	40	50	60	70
			Minimum width of strip/trench fill foundation (mm)					
I Rock	Not inferior to sandstone, limestone Or firm chalk	Requires at least a pneumatic or other mechanically operated pick for excavation	In each case equal to the width of the wall					
II Gravel or sand	Medium dense	Requires pick for excavation. Wooden peg 50mm square cross section hard to drive beyond 150mm	250	300	400	500	600	650
III Clay Sandy clay	 Stiff Stiff	Can be indented slightly by thumb	250	300	400	500	600	650
IV Clay Sandy clay	 Firm Firm	Thumb make impression easily	300	350	450	600	750	850
V Sand Silty sand Clayey sand	 Loose Loose Loose	Can be excavated with a spade. Wooden peg 50mm square cross section can be easily driven	400	600	Note: Foundations on soil type V do not fall within the provisions of this section if the total load exceeds 30kN/m			
VI Silt Clay Sandy clay Clay or silt	 Soft Soft Soft Soft	Finger pushed in up to 10mm	450	650	Note: Foundations on soil type V I do not fall within the provisions of this section if the total load exceeds 30kN/m			
VII Silt Clay Sandy clay Clay or silt	 Very soft Very soft Very soft Very soft	Finger pushed in up to 25mm	Refer to specialists advice					
The table is applicable only within the strict terms of the criteria described within it.								

Guidance Table 3: Minimum depth of strip/trench fill foundations

(to be in compliance with paragraph 2E4 of ADA)

Ground condition	Minimum foundation depth[1 and 5]
Rock or low shrinkage firm natural gravel, sand or chalk sub soils (not clays or silts)	450mm minimum in frost susceptible soils[4]
Low shrinkage clay sub soils[2]	750mm[4]
Medium to High shrinkage clay sub soils[3]	900 - 1000mm[4]

Note 1: Minimum foundation depth is taken from external ground level to formation level (trench bottom). If finished ground level is above existing ground level and freezing is likely to occur, the foundation depth should be taken from the existing ground level and not the finished levels.
Note 2: Clay with a Modified Plasticity Index less than 20% has a **low** volume change potential in accordance with BRE Digest 240
Note 3: Clay with a Modified Plasticity Index 20 to 40% has a **medium** volume change potential and 40 to 60% has a **high** volume change potential in accordance with BRE Digest 240
Note 4: Foundations should be taken to a depth below the influence of drains and or surrounding trees and taken to natural undisturbed ground of adequate ground bearing capacity to support the total loads of the building to the approval of the building control surveyor.

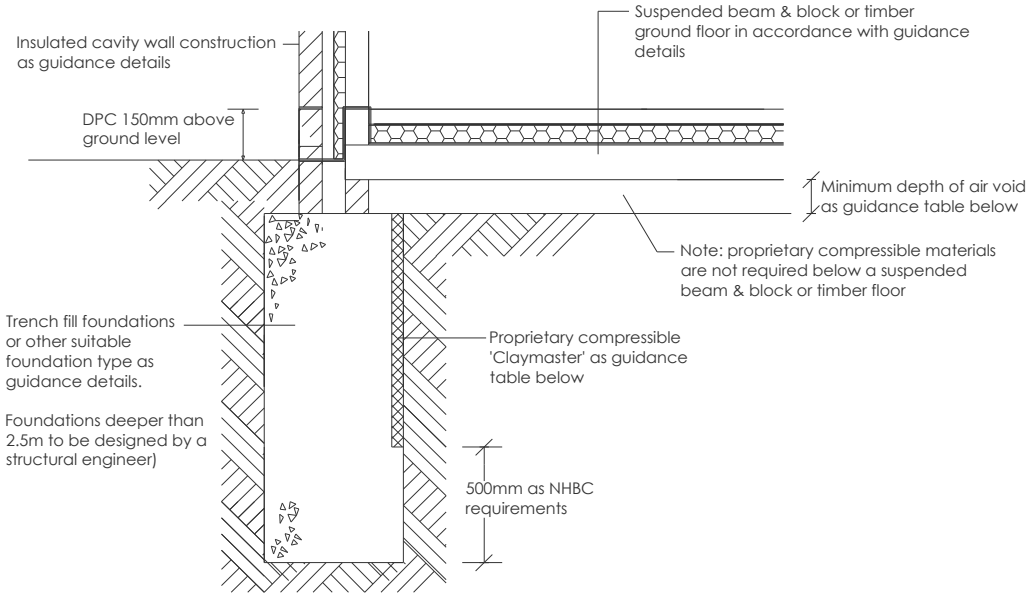
Building near trees, hedges, shrubs or in clay sub soils

Foundations in shrinkable cohesive clay soils to be taken to a depth below the influence of any existing or proposed trees, hedges or shrubs near the building which can take moisture from the ground, causing significant volume changes, resulting in possible ground settlement and damage to the foundations and building.

Foundation depths should be in accordance with the NHBC foundation depth calculator (or other foundation depth calculator acceptable by building control) which calculates the foundation depth from the type of sub soil and tree type including the mature height and water demand. Calculators obtained at a charge from: www.nhbc.co.uk

Foundations, substructure and services should incorporate adequate precautions to prevent excessive movement due to ground heave in shrinkable clay sub soils in accordance with design details from a suitably qualified specialist. Typical heave precautions for trench fill foundations with suspended floors in shrinkable sub soils should be carried out in accordance with requirements of building control and the guidance diagrams and tables below.

Guidance Diagram 5: Heave precautions for trench fill foundations with suspended beam and block floors in shrinkable clay sub soils (section detail not to scale)

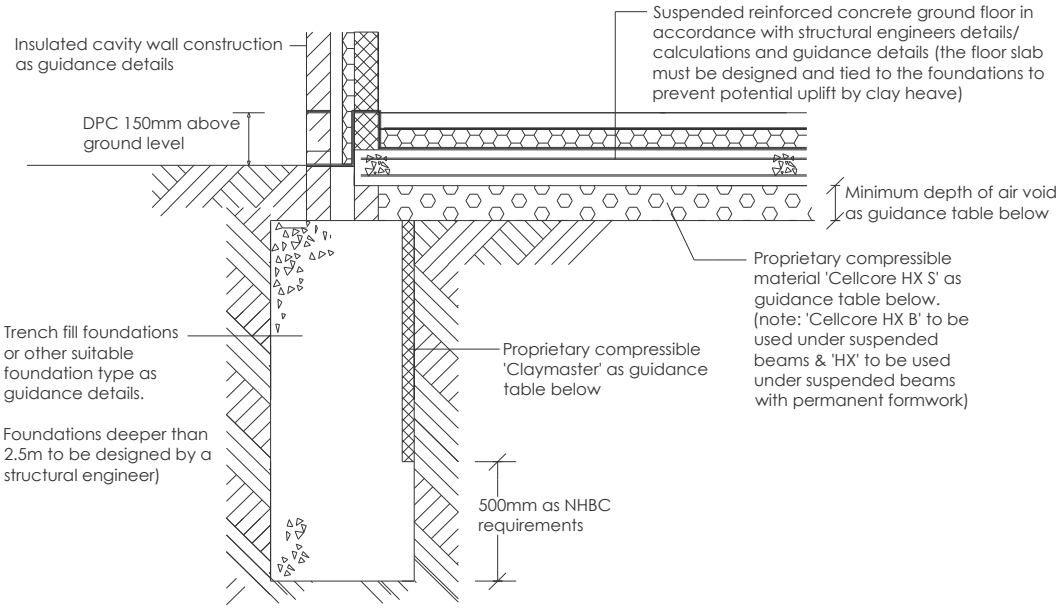


Guidance Table 4: Minimum void dimensions and clay heave protection for foundations and suspended beam and block floors

Volume change potential in soil	Minimum NHBC void dimension against side of foundation (mm)[1]	Thickness of 'Claymaster' against side of foundation (mm)[2]	Minimum NHBC void dimension under suspended beam and block floors (mm)[1]
Low shrinkage clay sub soils (10- 20%)	0	Not required	200
Medium shrinkage clay sub soils (20-40%)	25	50	250
High shrinkage clay sub soils (40-60%)	35	75	300

Notes: [1]The void dimension is measured from the underside of the beam/joist to the top of the ground level under the floor (includes 150mm ventilated void). Where the void beneath suspended floors are liable to flooding, drainage is to be provided.
[2]Compressible 'Claymaster' products to be installed in accordance with the manufacturer's details. Information and products can be obtained from: www.cordek.com or other approved compressible products with BBA or other approved technical accreditation.
Source: includes information from The NHBC (www.nhbc.co.uk) and information from CORDEK Ltd (Reproduced by kind permission from Cordek)

Guidance Diagram 5.1: Heave precautions for trench fill foundations with suspended cast in-situ reinforced concrete floor in shrinkable clay sub soils (section detail not to scale)



Guidance Table 4.1: Minimum void dimensions and clay heave protection for foundations and suspended in-situ reinforced concrete floors and beams

Volume change potential in soil	Minimum NHBC void dimension against side of foundation (mm)[1]	Thickness of 'Claymaster' against side of foundation (mm)[2]	Minimum NHBC void dimension under suspended in-situ reinforced concrete floors and beams (mm)[1]	Thickness of 'Cellcore' under suspended in-situ reinforced concrete floors and beams (mm)[2]
Low shrinkage clay sub soils (10- 20%)	0	Not required	50	90
Medium shrinkage clay sub soils (20-40%)	25	50	100	160
High shrinkage clay sub soils (40-60%)	35	75	150	225

Notes: [1]The void dimension should be able to accommodate the clay heave and compressible product. The void dimension shown is the minimum void dimension after collapse of the compressible product. Compressible products to be installed in accordance with the manufacturer's details. Where the void beneath suspended floors are liable to flooding, drainage is to be provided.

[2]Compressible 'Claymaster' and 'Cellcore' products to be installed in accordance with the manufacturer's details. Information and products can be obtained from: www.cordek.com or other approved compressible products with BBA or other approved technical accreditation.

Source: includes information from The NHBC (www.nhbc.co.uk) and information from CORDEK Ltd (Reproduced by kind permission from Cordek)

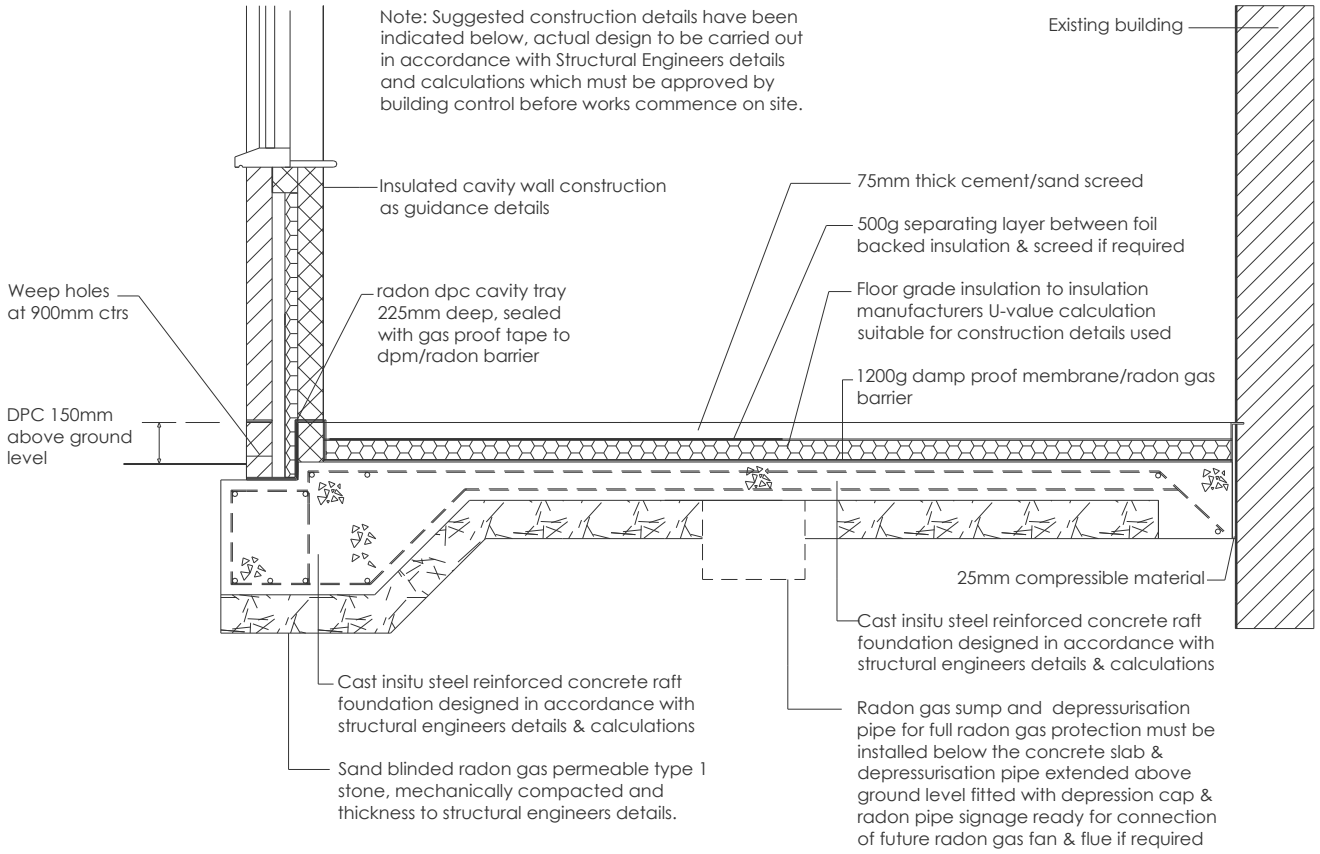
Alternative foundation designs

Alternative foundation designs, i.e. raft foundations (as detailed below) and pile foundations are required instead of strip foundations on soft/ loose soils or filled areas which have low bearing capacity and should be designed for the particular project by a suitably qualified person and design should be approved by building control before works commence on site. Note: insulation details in this guidance is to be read in conjunction with Part L of this guidance.

Raft foundations

Raft foundations should be designed for the particular project by a suitably qualified specialist (i.e. structural engineer) constructed normally as a cast in-situ reinforced concrete slab with thickened edges normally 450mm below ground level typically as detailed in the guidance diagram below.

Guidance Diagram 6: Raft foundation section detail (not to scale)
Suitable for basic and full radon protection (U-value 0.22 W/m².k)



Piled foundations

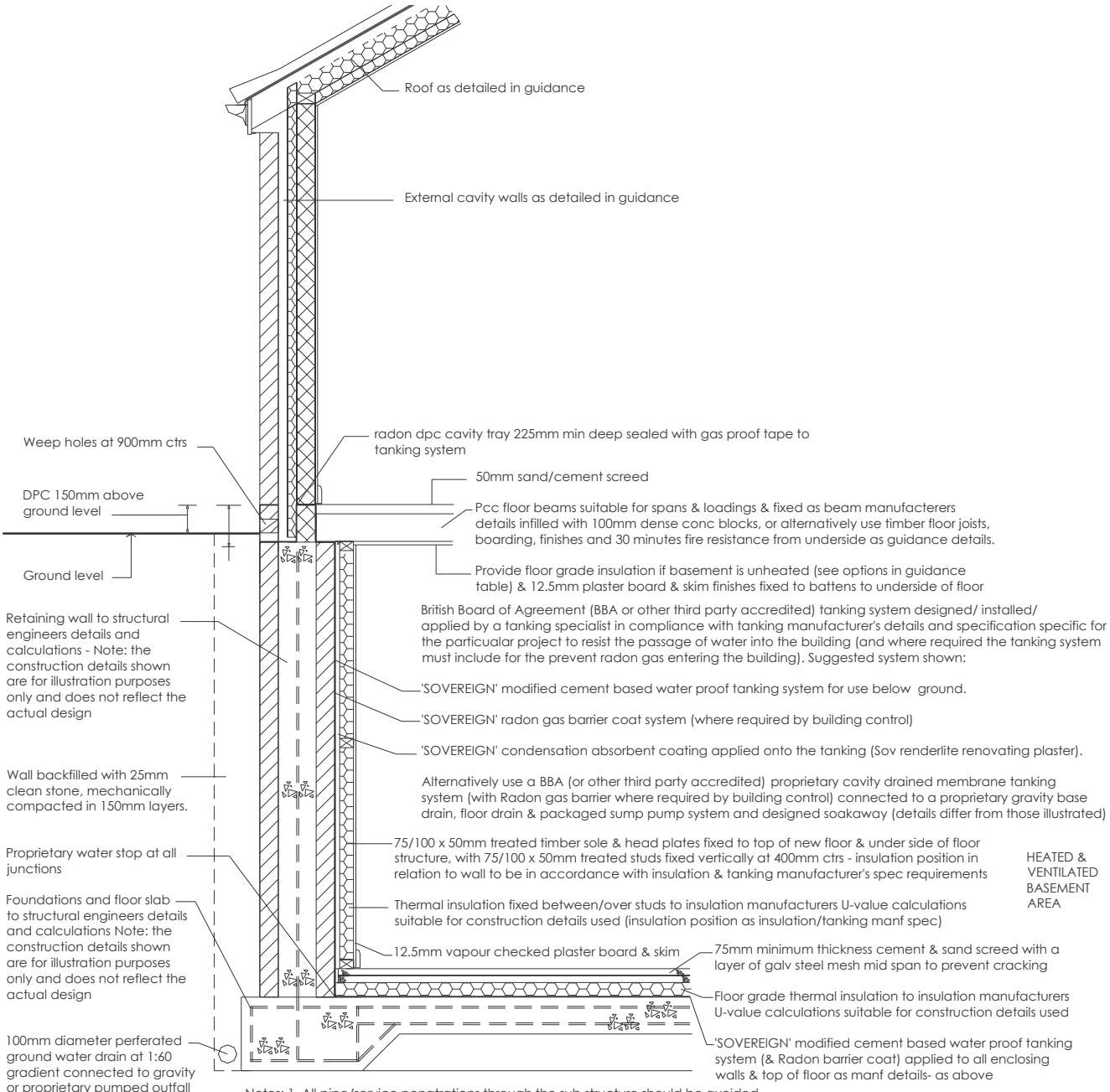
Piled foundations should be designed by a suitably qualified specialist (i.e. structural engineer) for a particular project and is outside the scope of this guidance

Retaining walls and basements

Retaining walls and basements (typically as detailed below) to be designed for the particular project by a suitably qualified person (i.e. structural engineer) and the design should be approved by building control before works commence on site.

Guidance Diagram 7: Basement section detail (not to scale) *Suitable for basic and full radon protection* (U-value 0.22 W/m².k)

The diagram below contains suggested construction details only and the actual details must be in accordance with a structural engineers details and calculations. The tanking and insulation details in the diagram below are suggested details only and the actual details must be in accordance with a tanking specialist and insulation specialists details and specification which has been produced for the particular project as detailed in the guidance commentary below the diagram.



Notes: 1. All pipe/service penatrations through the sub structure should be avoided
2. Radon gas sump and depressurisation pipe for full radon gas protection to be installed below the concrete slab & upstand extended above ground level with cap & radon pipe signage ready for connection of future radon gas fan & flue if required by building control for full radon gas protection
3. Suggested construction details have been indicated above- actual design to be carried out in accordance with Structural Engineers details and calculations which must be approved by building control before works commence on site.
4. Condensation risk analysis to be carried out by specialist for a particular situation/project and proposed tanking/insulation system.

Basements and tanking systems

Site investigation and risk assessment to be carried out before works commence to establish: ground conditions and water table levels, presence of any contaminates and radon gas, including location of drains and services etc.

Basement sub structures to be constructed in compliance with structural engineers details and calculations suitable for the ground conditions, loadings and proposed tanking system.

Provide all necessary temporary protection, support, shoring and working platforms etc in compliance with current health and safety requirements and structural engineer's details which are to be erected, maintained, certificated, dismantled and removed by suitably qualified and insured specialist.

Tanking systems providing either barrier, structural or drained protection to the building must be assessed, designed and installed for the particular project in compliance with BS 8102: 2009 Code of Practice for Protection of Below Ground Structures Against Water from The Ground. Tanking systems can be installed internally or externally in accordance with a tanking specialists details.

The illustrated tanking section details above are suggested details only and actual details must be approved by building control before works commence on site. Forms of tanking include: bonded sheet materials; liquid applied membranes; mastic asphalt, drained cavity membranes and cementitious crystallization and cementitious multi coat renders.

Suitable tanking systems to have British Board of Agreement (BBA or other approved third party) accreditation and individually assessed by a tanking specialist as suitable for the proposed situation.

Tanking systems must be designed/installed/applied by a tanking specialist for the particular project in compliance with tanking manufacturer's details to resist the passage of water into the building and prevent condensation and mould growth within the building and where required prevent radon gas entering the building.

Tanking systems to be properly connected to and made continuous with wall damp proof courses/radon dpc trays. Perforation of the tanking system by service entry pipes etc should be avoided or carried out strictly in accordance with the tanking manufacturer's details.

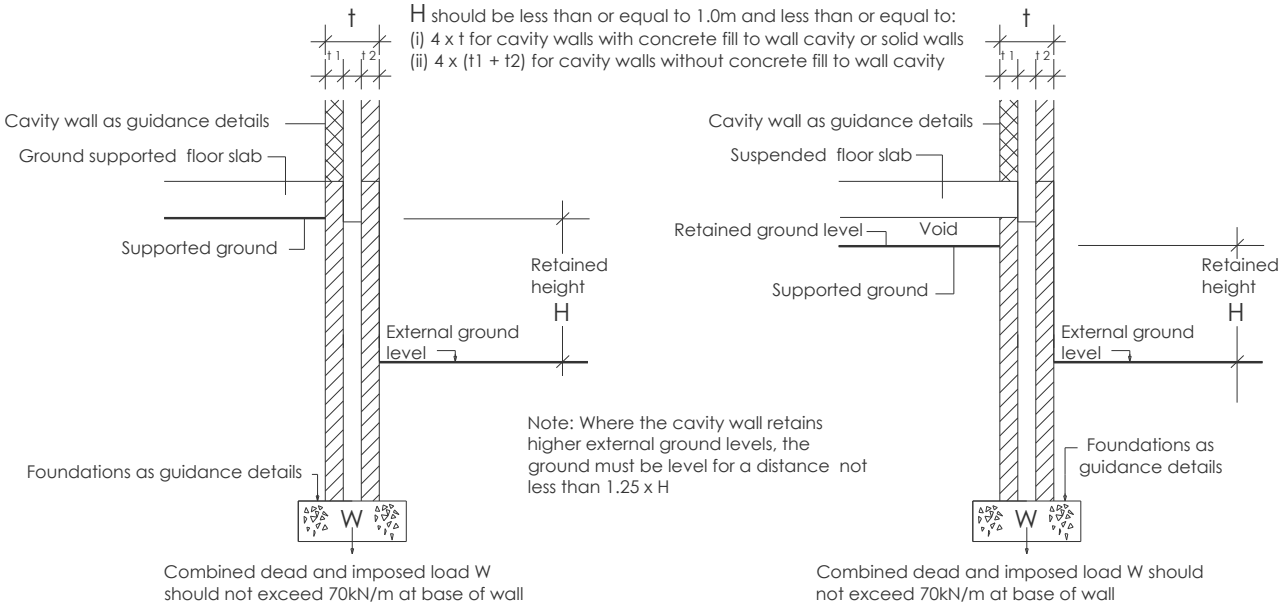
Important note: The risk of condensation with any tanking system should be assessed by a specialist, a condensation risk analysis should be carried out for the particular project and the tanking and thermal insulation system should be designed and installed to prevent any potential condensation/ interstitial condensation problems.

Ground floors and sub structure walls

Sub structure walls

Walls below DPC level up to 1m deep are to be constructed with two skins of 7N/mm² 100mm or 140mm if over 1m deep concrete blocks 1:3 - 4 cement mortar with plasticiser and in-filled with concrete to a maximum of 225mm below DPC level. Block and cavity width and wall tie spacing, etc, to be same as the wall above, but with a row of wall ties to support the cavity wall insulation below DPC level. All materials to be frost resistant. If sulphates are present in the ground- use sulphate resisting cement.

Guidance Diagram 8: Walls supporting differences in ground levels (not to scale)
See Diagram 11 of ADA for full details



Ground floors

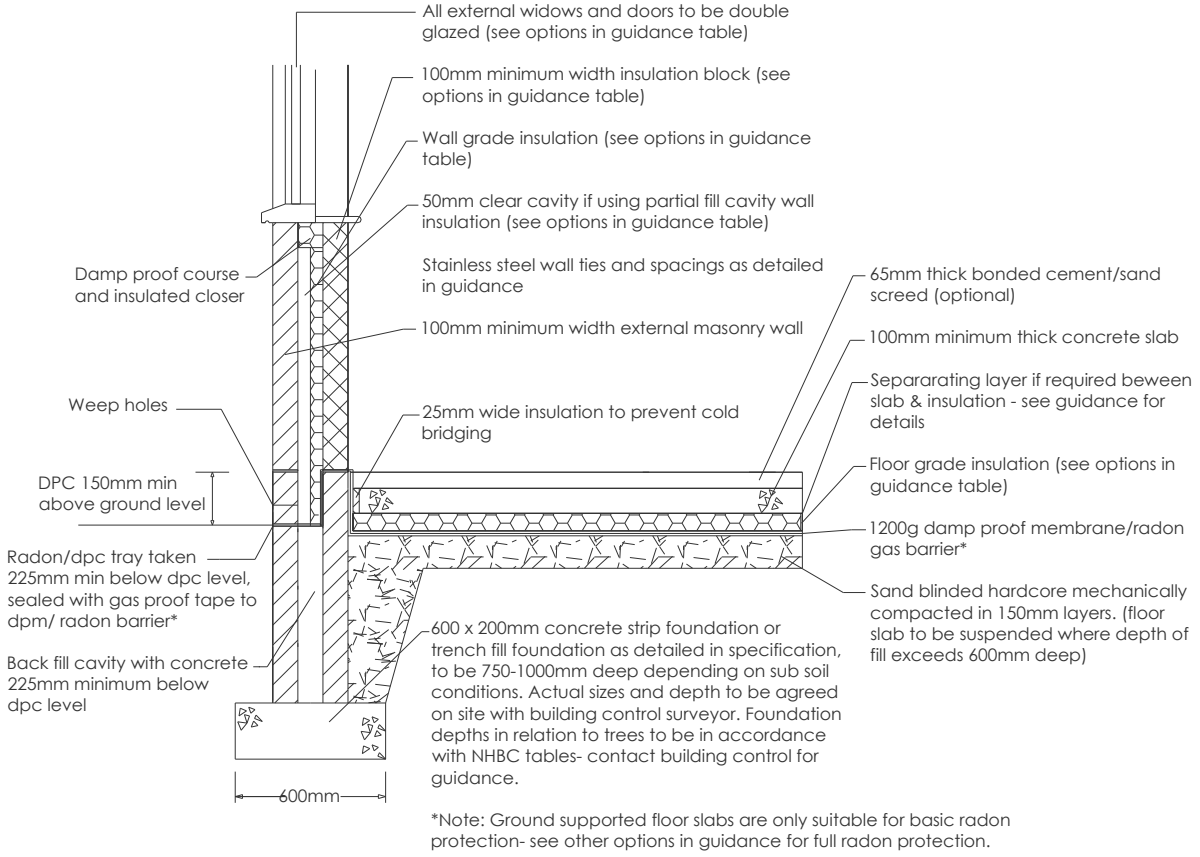
Ground bearing solid concrete floors (U-value 0.22 W/m².k)
Is suitable for areas where basic radon protection is required but is not suitable where full radon protection is required or for use over clay sub soils which can shrink or heave and damage the floor.

Topsoil and vegetable matter to be cleared from site and floor area to be in filled between walls with minimum 150mm/maximum 600mm clean, sand blinded, mechanically compacted, hardcore. 1200g (300 micrometer) continuous polythene damp proof membrane (DPM) and radon gas proof barrier is to be laid over sand blinded hardcore, lapped and sealed at all joints and linked to DPC's in walls. To provide basic protection from radon gas, the damp-proof course within the cavity wall should be in the form of a cavity tray and sealed to DPM to prevent radon from entering the building through the cavity. Sealing of joints in the barrier and sealing around service penetrations are also required with radon gas proof tape in compliance with part C of this guidance.

Lay floor grade insulation over DPM, minimum thickness and type in accordance with the guidance table below including 25mm thick insulated up-stands between slab and external walls.

Lay 100mm minimum thick ST2, or Gen1 concrete floor slab with a trowel smooth surface ready for finishes over insulation, (note: 500g polythene separating layer is to be installed between the concrete slab and insulation if using a foil faced polyurethane/ PIR type insulation board.) Insulation to be omitted and concrete thickness increased in areas where non-load bearing partitions are to be built off the floor slab (load bearing partitions should be built off a foundation). Where area of fill exceeds 600mm the floor is to be suspended as detailed in this guidance.

Guidance Diagram 9: Typical section through a ground bearing solid concrete floor and foundation. (not to scale)



Guidance Table 5: Examples of insulation for ground bearing floor slabs

U-value no worse than 0.22 W/m²k

NOTE: Where P/A ratio has not been calculated use insulation thickness stated in 1.0*

Required thickness of insulation (mm)											
Insulation product	**K value**	**Calculated Perimeter/Area ratio (P/A)**									
		1.0*	**0.9**	**0.8**	**0.7**	**0.6**	**0.5**	**0.4**	**0.3**	**0.2**	**0.1**
Kingspan Kooltherm K3 Floorboard	0.020-0.023	75	70	70	65	65	60	55	45	30	20
Celotex GA4000	0.022	80	75	75	70	70	65	60	50	30	12
Jablite Jabfloor Premium	0.030	105	105	100	95	95	95	80	65	50	20
Styrofoam Floormate 300A **and Knauf Polyfoam** Floorboard	0.035	110	100	100	100	90	90	80	70	50	50
Rockwool Rockfloor	0.038 (50-100mm) 0.040 (25-40mm)	130	130	125	120	120	110	100	80	50	50

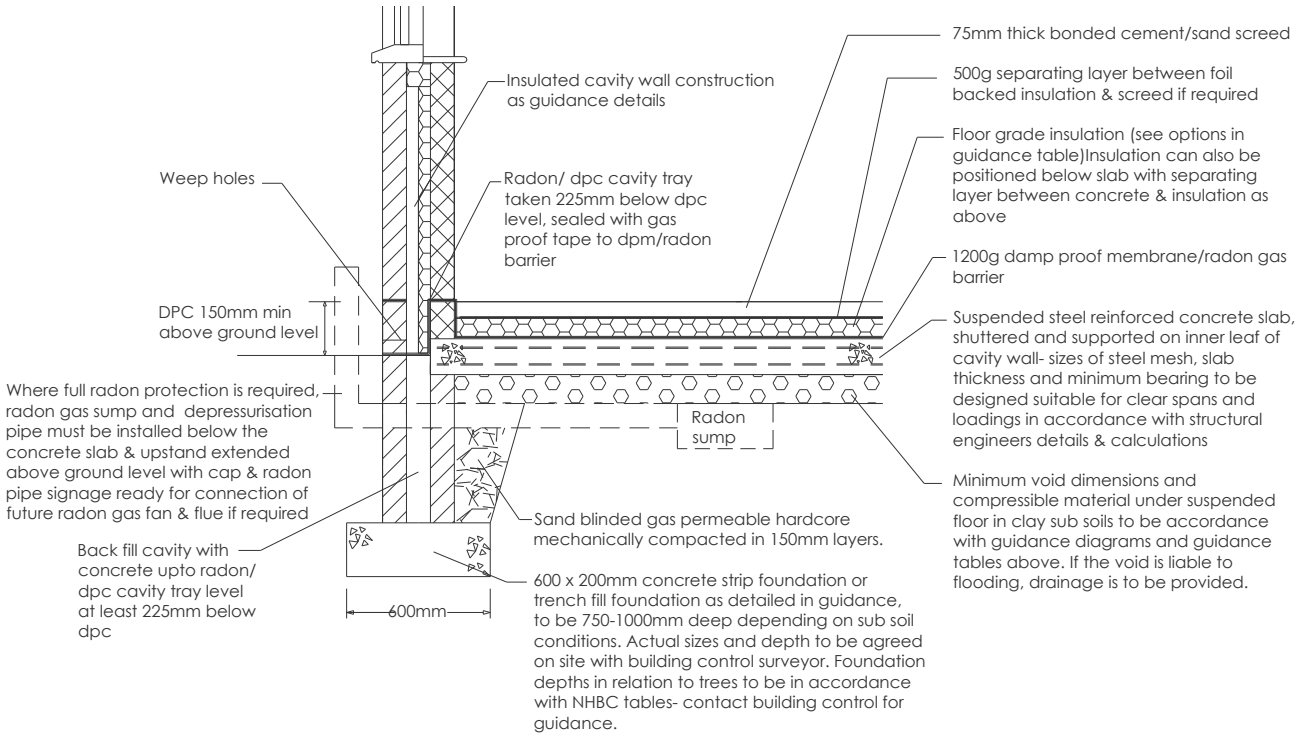
Note 1. Figures indicated above should be rounded up to the insulation manufacturer's nearest thickness
Note 2*. Where P/A ratio has not been calculated use insulation thickness stated in 1.0* above
Note 3. Insulation to be installed in accordance with manufacturer's details
Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control

Suspended reinforced in-situ concrete ground floor slab supported on internal walls. (U-value 0.22 W/m².k) *Is suitable for areas where basic or full radon protection is required. Is suitable for use over clay sub soils which can shrink or heave.*

Topsoil and vegetable matter to be cleared from site and floor area to be in filled between walls with minimum 150mm/maximum 600mm clean sand blinded compacted hardcore. Minimum void dimensions and compressible materials below slab in clay sub soils to be in accordance with guidance diagram and table above (in clay sub soils, the floor slab should be designed and restrained to prevent uplift from the compressible materials). Where full radon protection is required, a sub floor sump, depressurization pipe with up stand is to be positioned below the concrete floor slab and compressible materials in radon gas permeable hardcore-in accordance with sump manufacturer's details and part C of this guidance. Shutter and cast reinforced concrete floor slab supported on inner leaf of the cavity wall in accordance with structural engineers details and calculations to prevent settlement of the slab and rupture of the radon-proof barrier. 1200g (300 micrometer) continuous polythene damp proof membrane (DPM)/radon gas proof barrier is to be laid over concrete slab surface, lapped and sealed at all joints and linked to DPC's in walls. To provide basic protection from radon gas, the damp-proof course within the cavity wall should be in the form of a cavity tray and sealed to DPM to prevent radon from entering the building through the cavity. Sealing of joints in the barrier and sealing around service penetrations are also required with radon gas proof tape.

Floor grade insulation to be laid over DPM, minimum thickness and type in accordance with guidance table including 25mm thick insulated up-stands between slab and external walls. 75mm sand/cement thick structural screed (mix between 1:3 - 1:4 1/2), laid over insulation with trowel smooth finish ready for finishes, screed area should be limited to room sizes, floor areas exceeding 40m^2 should have expansion/contraction joints as detailed in the note below. Screed be laid over insulation with a trowel smooth surface ready for finishes. (500g polythene separating layer is to be installed between the screed and insulation if using a foil faced polyurethane/ PIR type insulation board.) Insulation to be omitted in areas where non-load bearing partitions are built off the floor slab. See guidance below for installation of proprietary under floor heating system

Guidance Diagram 10: Typical section through a suspended reinforced in-situ concrete ground floor slab supported on internal walls. (not to scale)



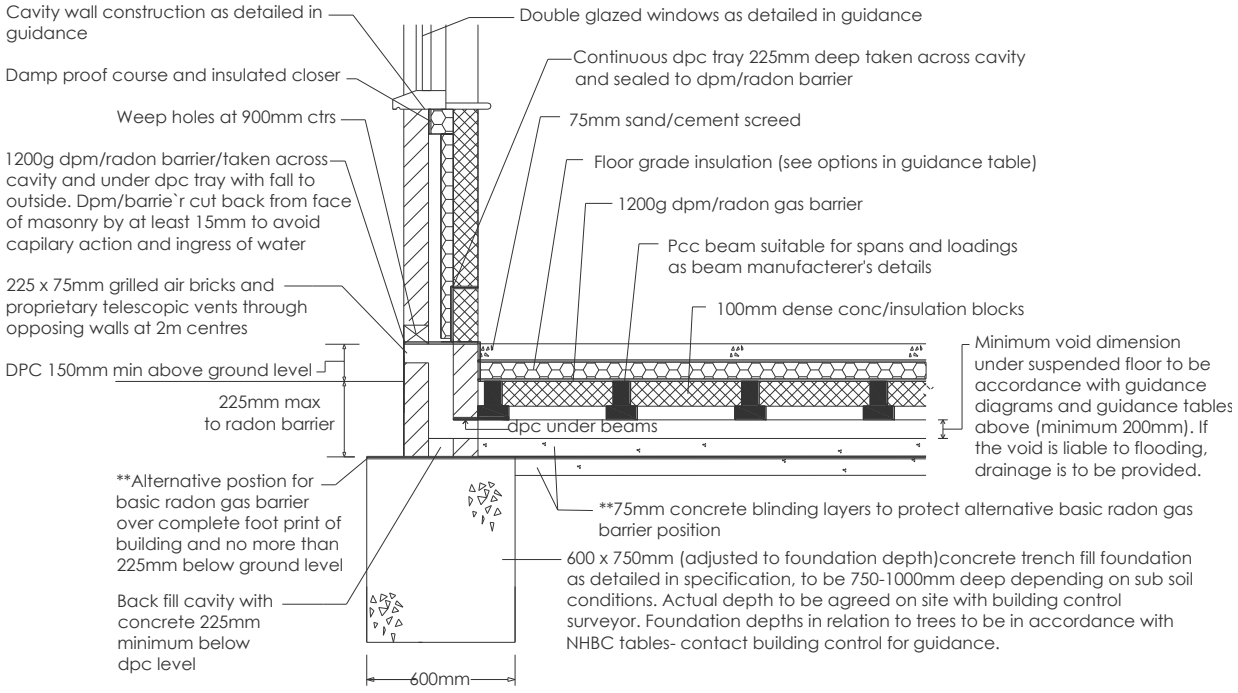
Suspended beam and block ground floors (U-value 0.22 W/m².k)

Is suitable for areas where basic and full radon protection is required. Is suitable for use over clay sub soils which can shrink or heave.

Remove top soil and vegetation and lay to 1:80 falls to outside of building, minimum void dimension below underside of suspended floor to be in accordance with the guidance above. PCC beams to be supplied and fixed in accordance with beam manufacturer's plan layouts and details. (copies to be sent to Building Control and approved before works commence on site).

Typically for domestic loading, pre-stressed beams to have 100mm minimum bearing onto DPC course and load bearing walls. All garage floors to be designed suitable for loadings. Wet and grout all joints with 1:4 cement/ sand mix. Below non-load bearing parallel partitions provide double beams. Sub structure void to be vented on opposing sides to provide cross ventilation using 225 X 150mm proprietary ventilators at 2m centers and 450mm from wall corners, sub floor level to be above external ground levels and if the floor void is liable to flood, drainage is to be provided. 1200g (300 micrometer) continuous polythene damp proof membrane (DPM) and radon gas proof barrier is to be laid over beam and block floor, taken across cavity, cut back from face of masonry wall by at least 15mm to avoid capillary action and ingress of water, lapped and sealed at all joints and linked to DPC's in walls. To provide basic radon gas protection, the damp-proof course within the cavity wall should be in the form of a cavity tray and sealed to the DPM to prevent radon gas from entering the building through the cavity. Sealing of joints in the barrier and sealing around service penetrations are also required with radon gas proof tape. Where full radon protection is required, provision is to be made for connection of future depressurization pipe to vented floor and up stand in accordance with manufacturer's details. Floor grade insulation to be laid over DPM, minimum thickness and type of insulation to be in accordance with guidance table below including 25mm thick insulated up-stands between screed and external walls. 75mm sand/cement thick structural screed (mix between 1:3 - 1:4½), laid over insulation with trowel smooth finish ready for finishes, screed area should be limited to room sizes, floor areas exceeding 40m^2 should have expansion/contraction joints as detailed in the note below (500g polythene separating layer is to be installed between the concrete slab and insulation if using a foil faced polyurethane/PIR type insulation board.) Insulation to be omitted where non-load bearing partitions are built off the beams to beam manufacturer's design details. See guidance below for installation of proprietary under floor heating system.

Guidance Diagram 11: Typical section through a suspended beam and block ground floor (not to scale)



Notes: *For full radon protection a radon gas fan and flue should be connected to the floor vents if required
** Not suitable full radon protection or clay sub soils which may shrink/heave- where radon gas proof membrane should be fitted above suspended floor to prevent it rupturing)

Guidance Table to Diagram 11: Examples of pcc beam spans (source: www.rackhamhousefloor.co.uk)

PCC Beam sizes	Maximum span[1] (Imposed load 1.5kN/m² max - no partitions)
175mm deep x 100mm wide (Standard beam)	6000mm
175mm deep x 160mm wide (Wide beam)	6500mm
225mm deep x 150mm wide (Deep beam)	7300mm
Note 1: Maximum spans depending on spacing of beams as manufacturer's details using 1300kg/m^2 infill blocks	

Guidance Table 6: Examples of insulation for suspended beam and block ground floors.
U-value no worse than 0.22 W/m²k. Block K value = 0.18.
NOTE: Where P/A ratio has not been calculated use insulation thickness stated in 1.0*

Required thickness of insulation (mm)											
Insulation product	**K value**	**Calculated Perimeter/Area ratio (P/A)**									
		1.0*	**0.9**	**0.8**	**0.7**	**0.6**	**0.5**	**0.4**	**0.3**	**0.2**	**0.1**
Kingspan Kooltherm K3 Floorboard	0.020-0.023	65	65	65	60	60	55	55	50	40	20
Celotex GA4000	0.022	75	75	70	70	65	65	65	55	40	12
Jablite Jabfloor Premium	0.030	95	95	95	90	90	85	80	70	55	25
Styrofoam Floormate 300A and Knauf Polyfoam Floorboard	0.035	100	100	100	100	90	90	90	80	60	50
Rockwool Rockfloor	0.038 (50-100mm) 0.040 (25-40mm)	130	125	125	125	120	110	100	90	70	25
Note 1. Figures indicated above should be rounded up to the insulation manufacturer's nearest thickness Note 2*. Where P/A ratio has not been calculated use insulation thickness stated in 1.0* above Note 3. Insulation to be installed in accordance with manufacturer's details Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control											

Proprietary under floor heating systems- Proprietary under floor heating system to be fixed above insulation and under screed layer in compliance with heating pipe manufacturer's/heating specialist details. Screeds over under floor heating should be sub divided into bays not exceeding 40m^2 in area. Expansion/contraction joints in screeds should be consistent with joints in slabs, and pipes protected in accordance with heating pipe manufacturer's/heating specialist details.

Floating floors- Alternatively instead of cement/sand floor screed, a floating timber board floor to be laid over 500g vapour check and insulation using 22mm minimum thick moisture resistant tongue and grooved timber floor board sheets with all joints glued and pinned and secured at perimeters by skirting boards, with allowance for expansion joints in compliance with floor board manufacturer's details (typically 10-15mm) and current BS EN standards. Insulation details as indicated in table below.

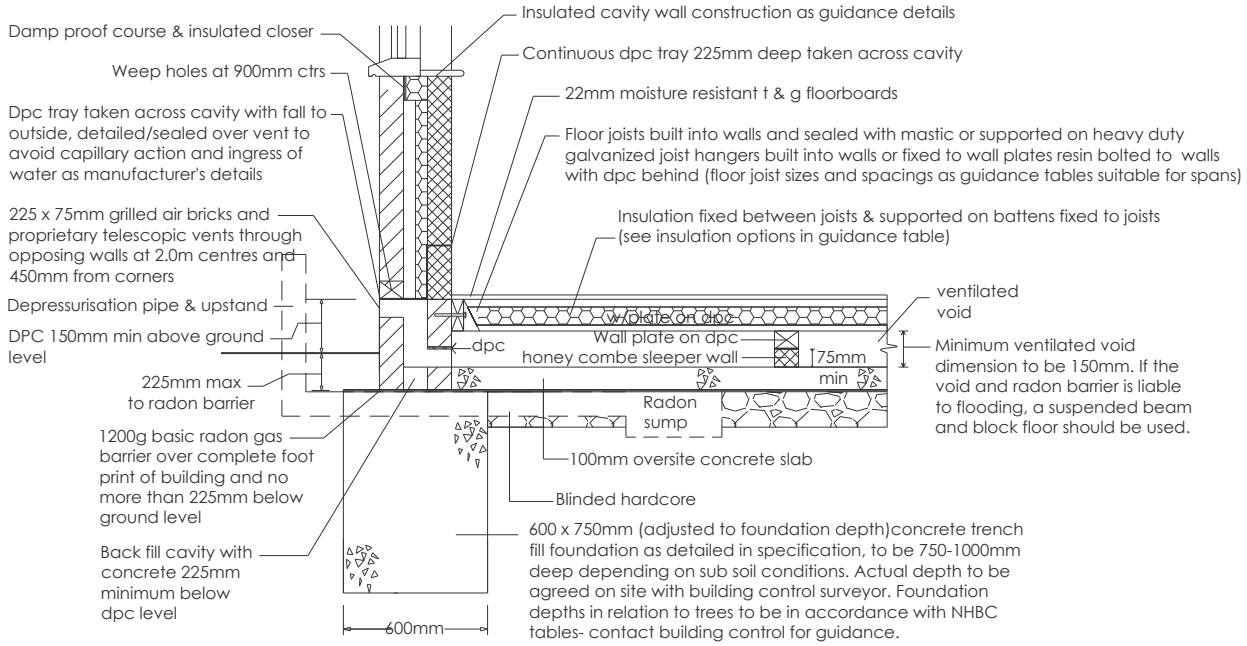
Guidance Table 7: Examples of insulation for floating floors U-value no worse than 0.22 W/m²k
NOTE: Where P/A ratio has not been calculated use insulation thickness stated in 1.0*

Required thickness of insulation (mm)										
Insulation product	**K-value**	**Calculated Perimeter/Area ratio (P/A)**								
		1.0*	**0.9**	**0.8**	**0.7**	**0.6**	**0.5**	**0.4**	**0.3**	**0.2**
Kingspan Kooltherm K3 Floorboard	0.020-0.023	95	95	90	85	85	75	70	60	35
Kingspan Thermafloor TF70 and Celotex GA4000	0.022	75	75	70	70	65	60	55	45	30
Note 1. Figures indicated above should be rounded up to the insulation manufacturer's nearest Thickness. Note 2* Where P/A ratio has not been calculated use insulation thickness stated in 1.0* above Note 3. Insulation to be installed in accordance with manufacturer's details Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control										

Suspended timber ground floor (U-value 0.22 W/m².k)
Is suitable for areas where basic radon protection is required and is <u>not</u> suitable in clay sub soils which can heave and rupture the sub floor radon membrane and damage the floor.
Remove top soil and vegetation and 150mm min thick sand blinded hardcore, lay 100mm min thick concrete over site at 1:80 gradient to outside of building (concrete mix should be in accordance with BS 8110, BS 5328, mix type ST2 or GEN1 or RC grade if reinforcement is required), on 1200g (300 micrometer) damp proof membrane (DPM)/radon gas proof membrane which should extend across foot print of building and cavity wall for basic radon gas protection. Radon barrier should be no more than 225mm below external ground level and positioned to prevent water collection. A sub floor sump, depressurization pipe with up stand is to be positioned below the over site concrete floor slab in radon gas permeable hardcore-in accordance with sump manufacturer's details and Part C of this guidance below.

Allow a ventilated air space at least 75mm from the top of the over site concrete to the underside of any wall plates and at least 150mm to the underside of the suspended timber floor or insulation. Provide sub floor ventilation using 225 x 75mm grilled air bricks and proprietary telescopic vents through two opposing external walls at 2m centers and 450mm from wall corners to vent all parts of the floor void. If the floor void is liable to flood a beam and block floor should be used instead of timber. Joists to be built into walls off dpc and sealed with silicon or supported off proprietary heavy duty galvanized joist hangers built into new masonry walls or fixed to treated timber wall plate (same size as joists), resin bolted to existing walls at 600mm centers using 16mm diameter high tensile bolts. Where necessary, floor joists can be supported in the span on treated wall plates and damp proof course (DPC) onto masonry honeycombed sleeper walls built off over site concrete. Floor joists sizes should be in accordance with upper floor guidance table below (depth to be increased where necessary to match floor levels). Proprietary galvanized steel strutting to be fixed at mid span for 2.5 - 4.5m span and 2 rows at 1/3rd points for spans over 4.5m. Floor to be insulated in accordance with the guidance table below and friction fixed between joists. Fix 22mm thick moisture resistant tongue and grooved timber floor boards laid with joints staggered, long edge fixed across the joists and all joints positioned over joists/noggins. All boards to be glued and screwed to floor joists with all joints glued (using water proof glue) and pinned, in accordance with floor board manufacturer's details and current BS EN standards. Allow expansion gap around wall perimeters as manufacturer's details (typically 10-15mm).

Guidance Diagram 12: Typical section through a suspended timber ground floor (not to scale)



*Note: Timber suspended floors are not as robust as concrete floors and even for basic radon protection, a radon gas sump and depressurisation pipe should be installed below the oversite concrete slab and upstand extended above ground level with cap and radon pipe signage ready for connection of future radon gas fan and flue if required

Guidance Table 8: Examples of insulation for suspended timber ground floors

U-value no worse than 0.22 W/m²k.

NOTE: Where P/A ratio has not been calculated use insulation thickness stated in 1.0*

Required thickness of insulation (mm)									
Insulation product	**K value**	**Calculated Perimeter/Area ratio (P/A)**							
		1.0*	**0.9**	**0.8**	**0.7**	**0.6**	**0.5**	**0.4**	**0.3**	**0.2**
Kingspan Thermafloor TF70	0.022	75	75	75	70	70	65	60	50	35
Celotex FR4000	0.022	75	75	75	70	70	65	60	50	35
Jablite Jabfloor Premium 70	0.030	140	140	130	130	125	120	115	105	80
Jablite Jabfloor 70	0.038	160	160	160	155	150	145	135	120	100
Rockwool Flexi	0.038	160	160	160	140	140	140	140	120	90
Knauf Earthwool loft roll 40	0.040	170	170	170	170	170	150	150	150	100
and loft roll 44	0.044	200	200	200	170	170	170	150	150	100

Note 1. Figures indicated above should be rounded up to the insulation manufacturer's nearest thickness
Note 2*. Where P/A ratio has not been calculated use insulation thickness stated in 1.0* above
Note 3. Insulation to be installed in accordance with manufacturer's details
Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control

Garage ground bearing concrete floor

Power floated 150 mm thick concrete slab (concrete mix should be in accordance with BS 8500 and BS EN 206-1, mix type ST4 or GEN3 for non hazardous conditions with 1 layer anti-crack steel mesh positioned mid depth of the slab where required- typically A193 or A252) on 1200g polythene damp proof course/radon barrier on sand blinding on 150mm minimum well consolidated sulphate free clean hardcore. (No reclaimed or demolished material is permitted).

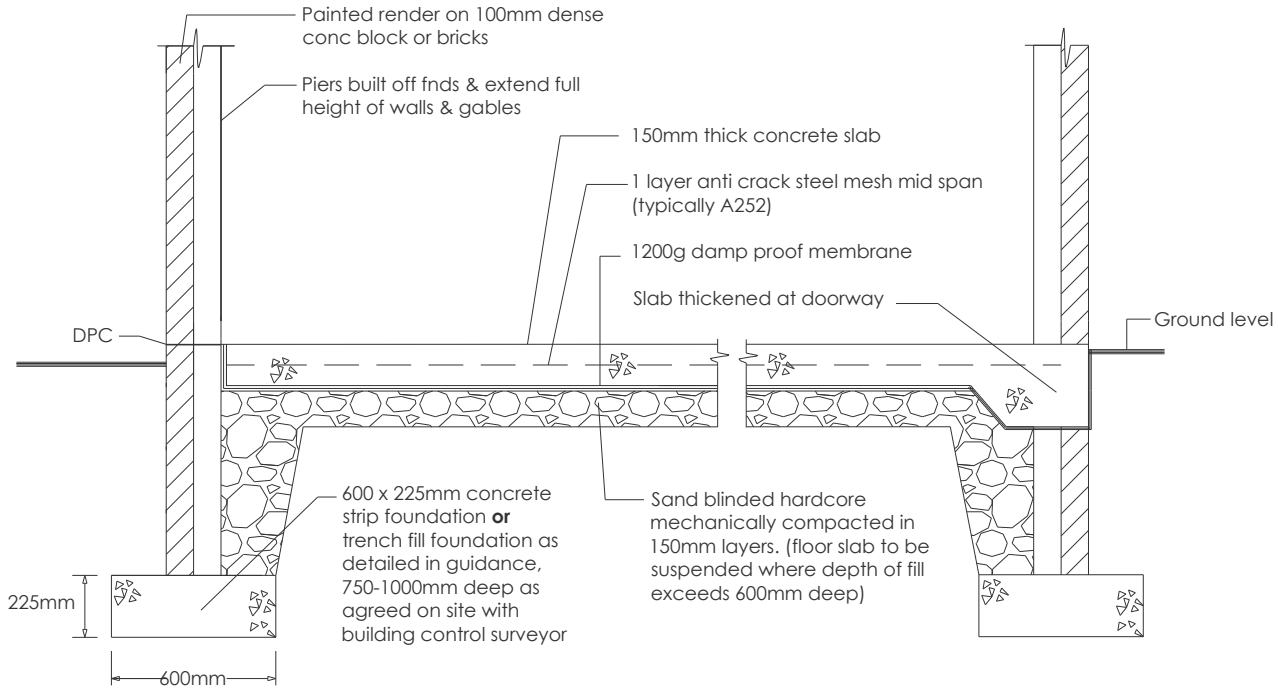
1:80 fall is required on floor from back of garage to front garage door opening, floor to be thickened to 300mm at garage entrance.

Provide 25mm polystyrene compressible clay board to perimeter of walls. Where area of fill exceeds 600mm the floor is to be suspended in compliance with structural engineers details and calculations which must be approved by building control.

100mm high non combustible step or ramp down into garage (including FD30 fire door as guidance details) to be provided at doorways from attached domestic accommodation.

Radon gas protection is to be provided in garages integral with the dwelling in accordance with the above ground floor details depending on level of radon protection required.

Guidance Diagram 13: Typical section through a ground bearing garage floor and foundation (not to scale)



A2: Superstructure

Minimum headroom heights

There are no minimum head room height requirements in the building regulations for habitable rooms in single occupancy dwellings except for stairs and ramps (see Part K of this guidance), however a minimum ceiling height of 2.3m is recommended.

Maximum height of residential buildings up to 3 storeys

See paragraph 2C4 and Diagram 1 of ADA.

(i) The maximum height of the building constructed of coursed brick or block work measured from the lowest finished ground level adjoining the building to the highest point of any wall or roof should not be greater than 15m, subject to paragraph 2C16 and Tables a, b and c of Diagram 7 of ADA, correlating to various site exposure conditions and wind speeds. A map showing wind speeds and topographic zones is given in Diagram 6 of ADA.
(ii) The height of the building H should not exceed twice the least width of the building W1
(iii) The height of wing H2 should not exceed twice the least width of the wing W2 where the projection P exceeds twice the width W2.
(iv) Floor area limit should not exceed the following: 70m^2 where floor is bounded by walls on all 4 sides and 36m^2 where floor is bounded by walls on 3 sides

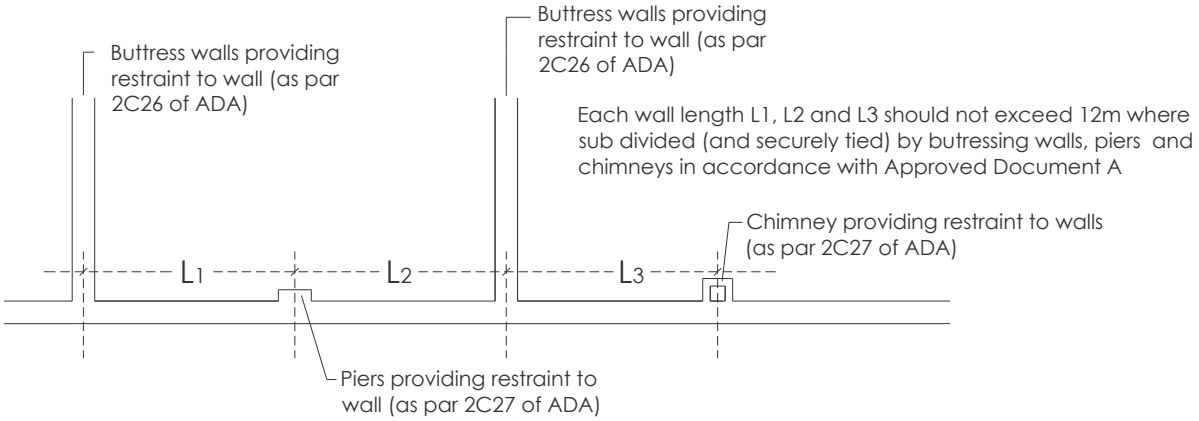
Maximum storey heights

Storey heights should not exceed 2.7m in accordance with Diagram 8 of ADA for buildings constructed of coursed brick or block work.

Maximum wall lengths

External walls, compartment walls and separating walls, wall lengths should not exceed 12m for buildings constructed of coursed brick or block work in accordance with Paragraph 2C17 of ADA and Table 3 of ADA and as illustrated in the guidance diagram below.

Guidance Diagram 14: Measuring wall lengths (plan detail not to scale)



Vertical lateral restraint to walls

The ends of every wall should be bonded or otherwise securely tied throughout their full height to a buttressing wall, pier or chimney. Long walls may be provided with intermediate buttressing walls, piers or chimneys dividing the wall into distinct lengths within each storey; each distinct length is a supported wall for the purposes of this section. The intermediate buttressing walls, piers or chimneys should provide lateral restraint to the full height of the supported wall, but they may be staggered at each storey.

Minimum thickness of external walls, compartment walls and separating walls constructed of coursed brick or block work.

To be carried out in accordance with the guidance table below and paragraphs 2C5 - 2C18 and Table 3 of ADA .

Guidance Table 9: Minimum thickness of certain external walls, compartment walls and separating walls constructed of coursed brick or block work.

Height of wall	Length of wall	Minimum thickness of wall
Up to 3.5m	Up to 12m	190mm for whole of its height
3.5m - 9m	Up to 9m	190mm for whole of its height
	Exceeding 9m	290mm from the base for the height of one storey and 190mm for the rest of its height
9m - 12m	Up to 9m	290mm from the base for the height of one storey and 190mm for the rest of its height
	9 - 12m	290mm from the base for the height of two storeys and 190mm for the rest of its height

Minimum thickness of internal load-bearing walls

All internal load-bearing walls (except compartment walls and separating walls) should have a thickness (in accordance with paragraph 2C10 of ADA) not less than:

$$\frac{\text{Minimum thickness of wall from guidance table 9 above (as Table 3 of ADA)}}{2} - 5\text{mm}$$

Buttressing wall design

If the buttressing wall is not itself a supported wall, its thickness should not be less than:
a. half the thickness required by this section for an external or separating wall of similar height and length less 5mm; or
b. 75mm if the wall forms part of a dwelling house and does not exceed 6m in total height and 10m in length; and
c. 90mm in other cases.
The length of the buttressing wall should be at least 1/6 of the overall height of the supported wall and be bonded or securely tied to the supporting wall and at the other end to a buttressing wall, pier or chimney. The size of any opening in the buttressing wall should be restricted as shown in Diagram 12 of ADA.

Pier and chimney design providing restraint:

a. piers should measure at least 3 times the thickness of the supported wall and chimneys twice the thickness, measured at right angles to the wall. Piers should have a minimum width of 190mm (see Diagram 13 of ADA.);
b. the sectional area on plan of chimneys (excluding openings for fireplaces and flues)should be not less than the area required for a pier in the same wall, and the overall thickness should not be less than twice the required thickness of the supported wall (see Diagram 13 of ADA.).

Buttressing, sizes of openings and recesses in cavity walls

Openings, buttressing and sizes of openings and recesses should be in accordance with diagrams 12, 13 and 14 of ADA. Openings exceeding 2.1m in height or openings less than 665mm measured horizontally to an external corner wall should be in accordance with details and calculations from a suitably qualified person (i.e. structural engineer).

Guidance Table 10: Compressive strength of masonry units

The declared compressive strength of masonry units to be in compliance with the guidance table below and Paragraph 2C21, Diagram 9 and Tables 6 and 7 of ADA.

Single storey building	**Masonry unit**			
Wall position	**Clay bricks**	**Dense concrete bricks**	**Dense concrete blocks**	**Insulation blocks**
Inner & outer leaf of cavity wall Fnd to roof level	9 N/mm^2	6 N/mm^2	2.9 N/mm^2	2.9 N/mm^2
Internal walls Fnd to roof level	-	-	2.9 N/mm^2	2.9 N/mm^2

Two storey building	**Masonry unit**			
Wall position	**Clay bricks**	**Dense concrete bricks**	**Dense concrete blocks**	**Insulation blocks**
Inner & outer leaf of cavity wall				
Fnd to gnd floor level				
• Up to 1.0m	9 N/mm^2	6 N/mm^2	2.9 N/mm^2	2.9 N/mm^2
• More than 1.0m	13 N/mm^2	9 N/mm^2	7.3 N/mm^2	7.3 N/mm^2
Gnd floor to roof level	9 N/mm^2	6 N/mm^2	2.9 N/mm^2	2.9 N/mm^2
Internal walls				
Fnd to gnd floor level				
• Up to 1.0m	9 N/mm^2	6 N/mm^2	2.9 N/mm^2	2.9 N/mm^2
• More than 1.0m (see #1)	13 N/mm^2	9 N/mm^2	7.3 N/mm^2	7.3 N/mm^2
Gnd floor to roof level	9 N/mm^2	6 N/mm^2	2.9 N/mm^2	2.9 N/mm^2
Notes: #1. Where Internal walls exceed 1.0m below ground floor level, wall thickness to be increased to 140mm min thickness if block work or 215mm min thickness if brickwork				

Three storey building	**Masonry unit**			
Wall position	**Clay bricks**	**Dense concrete bricks**	**Dense concrete blocks**	**Insulation blocks**
Outer leaf of cavity wall Fnd to roof level	13 N/mm^2	9 N/mm^2	7.3 N/mm^2	7.3 N/mm^2
Inner leaf of cavity wall				
Fnd to 1st floor level	25 N/mm^2	18 N/mm^2	7.3 N/mm^2	7.3 N/mm^2
1st floor to roof level	9 N/mm^2	6 N/mm^2	2.9 N/mm^2	2.9 N/mm^2
Internal walls				
Fnd to 1st floor level (see #1)	13 N/mm^2	9 N/mm^2	7.3 N/mm^2	7.3 N/mm^2
1st floor to roof level	9 N/mm^2	6 N/mm^2	2.9 N/mm^2	2.9 N/mm^2
Notes: #1. Wall thickness to be increased to 140mm min thickness if block work or 215mm min thickness if brickwork				

External cavity wall construction

Cavity wall construction (U-value not worse than 0.28 W/m².k)
External walls constructed in either 100mm minimum thickness reconstituted stone facings; facing brickwork or 2 coat render on 100mm thick dense concrete block skin with a 100mm minimum thickness insulation/dense block inner leaf with either a 15mm lightweight plaster finish or 12.5mm plasterboard on dabs skimmed dry lining as guidance table below.

Proprietary purpose made lintels to be constructed over all external openings in accordance with lintel manufacturer's details which should be approved by building control before works commence on site. Walls should be built in 1:5-1:6 cement /sand mortar mix with plasticiser and tied with approved stainless steel wall ties suitable for cavity width to BS 5268-6.1: 1996 as guidance tables below. Wall ties should be installed strictly in accordance with the manufacturers details and have a slight fall towards the external skin of the cavity wall to prevent the ingress of moisture

Full fill or partial fill insulating material to be placed in the cavity between the outer leaf and an inner leaf of masonry walls subject to the suitability of the cavity wall construction and UK zones for exposure to wind-driven rain in accordance with Diagram 12 and Table 4 of ADC.

Subject to the suitability of the cavity wall construction, insulation to be positioned in the wall in compliance with the insulation guidance tables below and installed to prevent cold bridging and also any possible capillary attraction of water between the insulation and cavity surfaces past the damp-proof courses into the building in accordance with the insulation manufacturer's details.

Proprietary British Board of Agreement (BBA or other third party accredited) acoustic/thermally insulated/fire resistant cavity closers/ cavity barriers are to be provided to all cavity openings/ closings, tops of walls and junctions with other properties in accordance with manufacturer's details.

Tops of cavity walls can be closed using a proprietary British Board of Agreement (BBA or other third party accredited) 30 minutes fire resistant rigid board to prevent the passage of fire, fixed in accordance with manufacturer's details.

Typical cavity wall construction details are indicated in sub structure guidance diagrams above

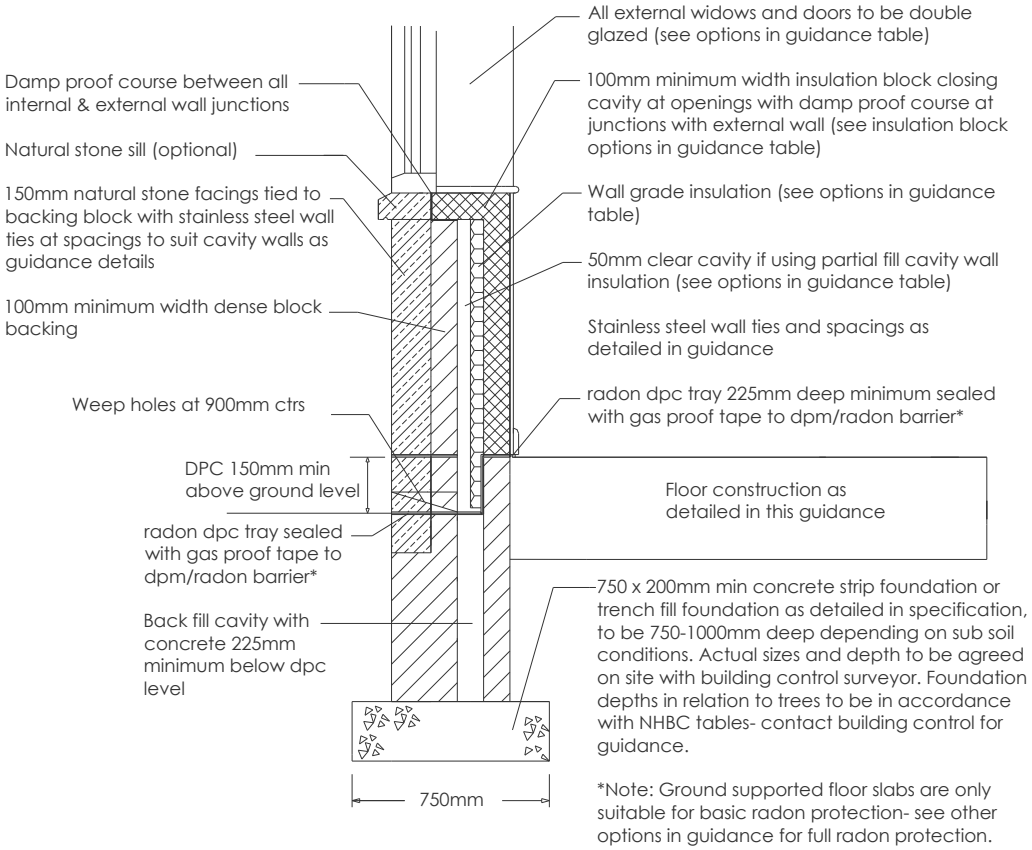
Natural stone faced cavity walls (U-value not worse than 0.28 W/m².k)
100-150mm thick natural stone facings fixed against one of the following backing options to form a uniform cavity within the cavity wall:
(i) 100mm thick dense concrete block backing course connected together with stainless steel wall ties as detailed below and foundation widths increased to 750mm as detailed in guidance diagrams 19 and 20 below or;
(ii) British Board of Agreement (BBA or other third party accredited) proprietary cavity spacer system installed strictly in accordance with manufacturer's details as detailed in guidance diagrams 21 and 22 below or;
(iii) 100mm wide clear continuous cavity, shuttered and formed with temporary shuttering in 450mm vertical stages between wall ties, moved as work proceeds the following day (subject to proposed height of wall and building control approval).

Proprietary purpose made lintels to be constructed over all external openings with extended flange to suit thickness of stone- normally 150mm thick. Lintels must be designed and installed in accordance with lintel manufacturer's details and calculations which should be approved by building control before works commence on site.

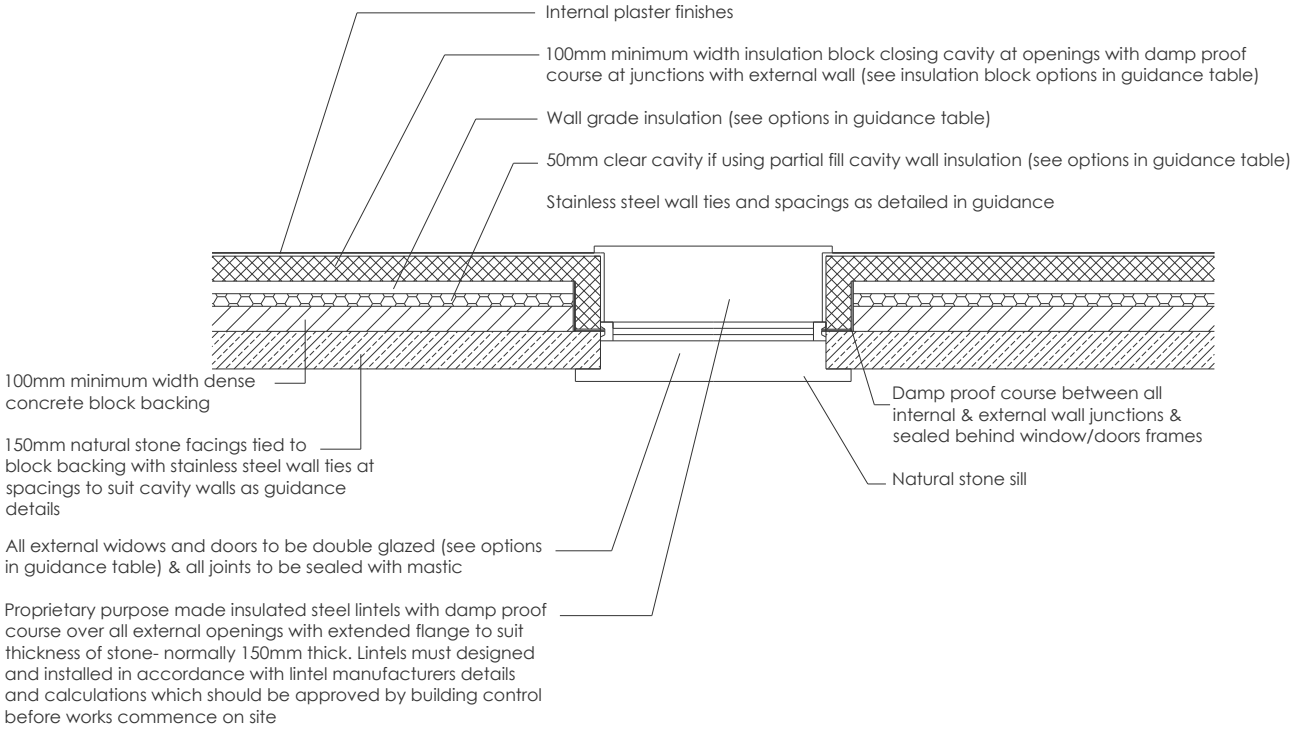
Walls should be built in 1:5-1:6 cement /sand mortar mix with plasticiser and tied with approved stainless steel wall ties suitable for cavity width to BS 5268-6.1: 1996 as guidance tables below. Wall ties should be installed strictly in accordance with the manufacturers details and have a slight fall towards the external skin of the cavity wall to prevent the ingress of moisture

Cavity wall insulation and insulation inner block skin to be positioned in the wall in compliance with the insulation guidance tables below (together with proprietary insulated closers to prevent cold bridging which have been omitted for clarity). The wall insulation should be continuous with roof insulation level and taken below floor insulation levels in compliance with manufacturer's details.

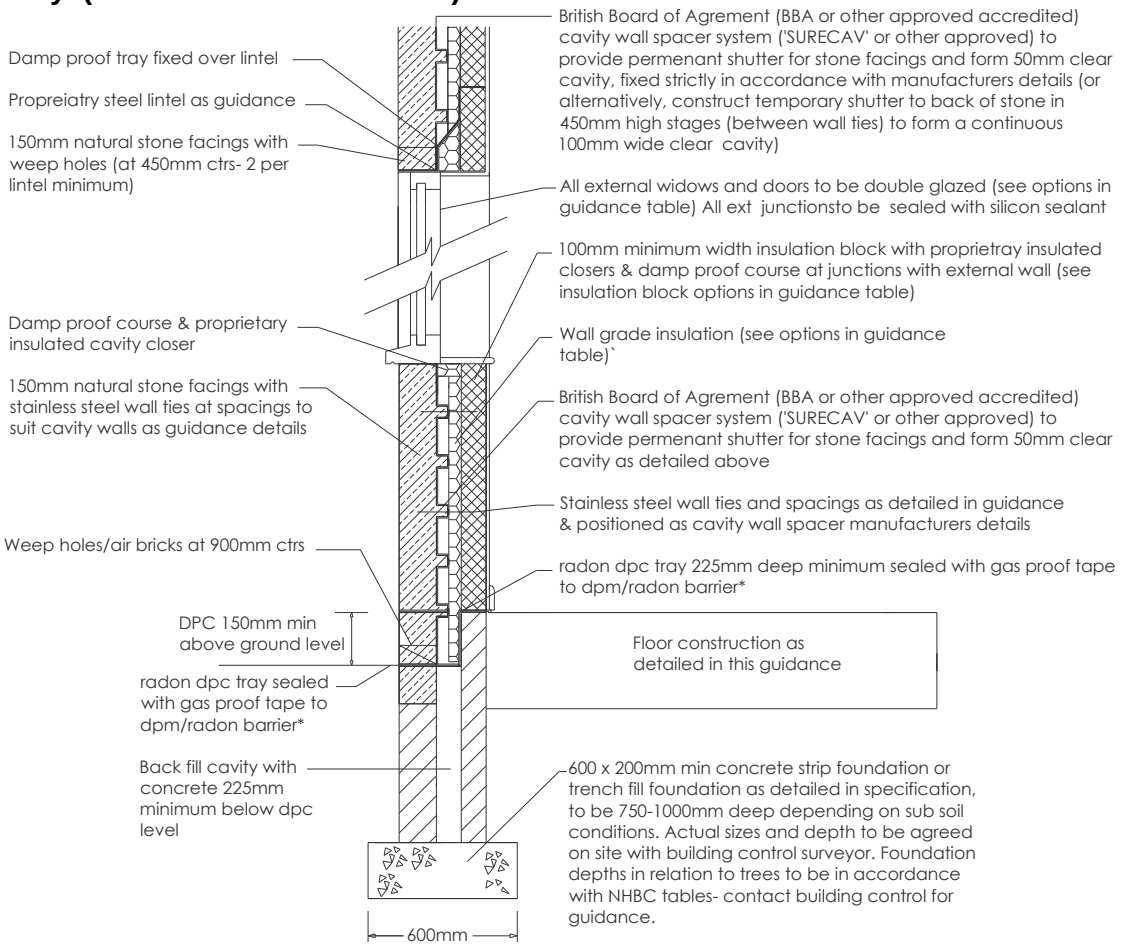
Guidance Diagram 15: Stone faced cavity wall with concrete block backing forming clear cavity - (section detail not to scale)



Guidance Diagram 16: Stone faced cavity wall with concrete block backing forming clear cavity (plan detail not to scale)

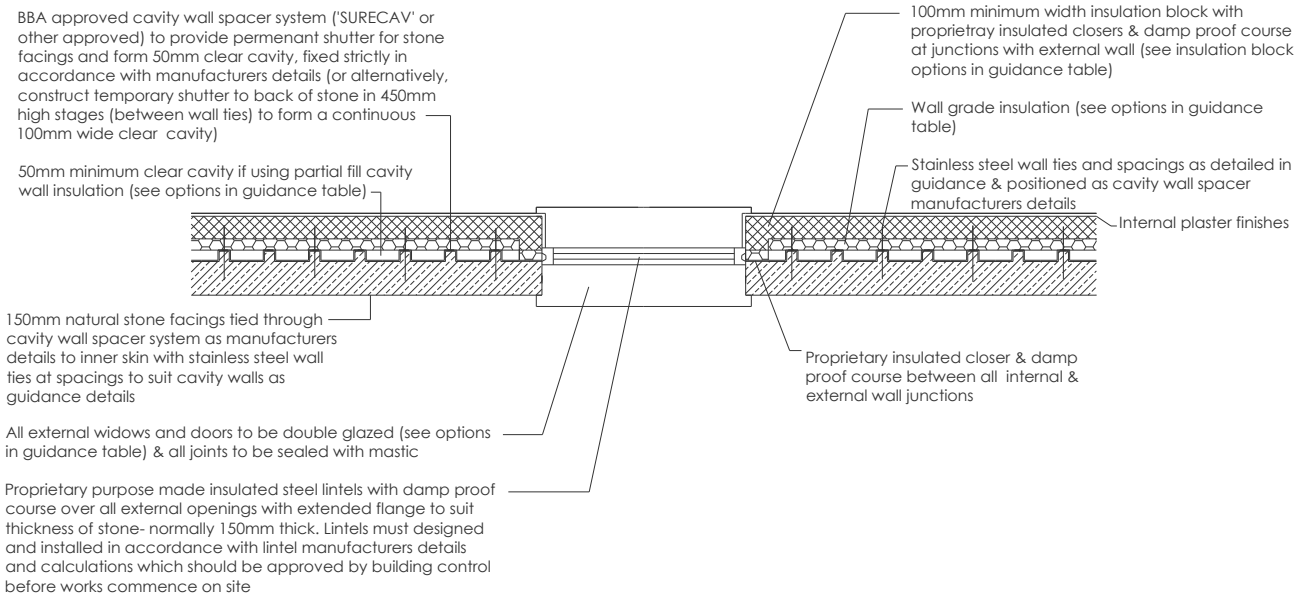


Guidance Diagram 17: Stone faced cavity wall with cavity wall spacer system or shuttered cavity (section detail not to scale)

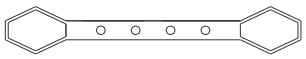
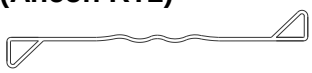
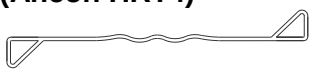


*Notes: 1. Ground supported floor slabs are only suitable for basic radon protection- see other options in guidance for full radon protection.
2. Surecav can also be fixed against a timber frame in accordance with Manufacturer's details (details differ from those illustrated above)
3. Surecav details and product are available from: www.surecav.com

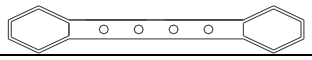
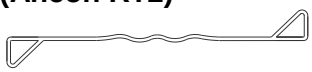
Guidance Diagram 18: Stone faced cavity wall with cavity wall spacer system or shuttered cavity (plan detail not to scale)



Guidance Table 11: More common Masonry to Masonry stainless steel cavity wall ties - Locations not more than 150m above sea level (Please refer to PD6697:2010 and 'Ancon' wall tie manufacturer's technical literature for full details at: www.ancon.co.uk)

Wall tie type	Cavity width mm	Tie length mm	Maximum spacing of ties (mm) Horizontal x Vertical (see notes)
Type 1 - Heavy duty (Ancon ST1) 	50 76-100 101-125 126-150	200 225 250 275	900 (750 max recommended) x 450 (2.5 ties/m^2 or 3-4 ties/m^2 at Un-bonded edges). Suitable for most sites except very exposed areas (coastal areas)
Type 2 - General purpose (Ancon RT2) 	50 76-100 101-125 126-150	200 225 250 275	As Type 1 (should not be used in areas more than 150m above sea level). For sites outside these parameters, wall tie provision should be calculated or see table 11.1 below
Type 4 - Light duty (Ancon HRT4) 	50 76-100 101-125 126-150	200 225 250 275	As Type 1 (should not be used in areas more than 150m above sea level)
Note1: Embedment of ties to be 62.5 to 75mm into mortar joints. Note 2: Wall ties should be positioned in a staggered pattern. Note 3: Additional wall ties should be positioned at vertical openings and at un-returned or un-bonded edges at a rate of one per 300mm height (but usually 225mm high to suit block courses) and located not more than 225mm from the edge. Note 4: For wall ties positions at vertical and horizontal movement joints- please refer to the wall tie manufacturer's details.Note 5: Insulation retaining clips to be fixed in accordance with the wall tie manufacturer's details. (Source: www.ancon.co.uk)			

Guidance Table 11.1: More common Masonry to Masonry stainless steel cavity wall ties - <u>Locations more than 150m above sea level</u> (Please refer to PD6697:2010 and 'Ancon' wall tie manufacturer's technical literature for full details at: www.ancon.co.uk)

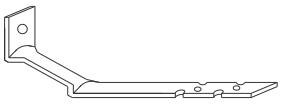
Wall tie type	Cavity width mm	Tie length mm	Maximum spacing of ties (mm) Load Class (see Table 11.2 below)		
			Low	Medium	High
Type 1 - Heavy duty (Ancon ST1) 	50 76-100 101-125 126-150	200 225 250 275	900x450	900x450	750x450
Type 2 - General Purpose (Ancon RT2) 	50 76-100 101-125 126-150	200 225 250 275	450x450	700x225	500x225
Notes: As Table 11 (Source: www.ancon.co.uk)					

Guidance Table 11.2: Load Class for use with Table 11.1 above - For projects which lie outside of the descriptors for tie types in accordance with PD 6697, and in the absence of loading information provided by a structural engineer - for a given project, the only option in order to specify tie spacing would be to take a conservative assumption on the load. BS 8298-2:2010 (Code of practice for the design and installation of natural stone cladding and lining), Table 1, provides indicative design loads for general use in the design of fixings in the absence of site specific information. These loads are quite conservative and would require some judgement on the part of the user to select the relevant exposure category which could be safely applied to the job. These categories are as follows:

Class	Load (N/m^2) ULS	Brief description
Low	1500	A sheltered environment such as the lower floors of a building in a central urban area.
Medium	2250	An exposed environment such as the higher floors of a tall building or a more exposed location.
High	3000	An exposed environment such as a coastal location.

Note: In many cases the loads above and the associated tie spacing will be conservative, particularly for buildings in built up areas in towns, assuming the relevant category has been selected. However in other cases it may not be obvious which class to use. For example, a modest house in the countryside relatively close to the coast (say 25-30km, not necessarily a “coastal” location) could easily fall within the “medium” class. Therefore some caution should be exercised when using these figures and some knowledge of the project location and local conditions would still be necessary.
(Source: www.ancon.co.uk)

Guidance Table 11.3: More common Timber frame to Masonry stainless steel cavity wall ties (Please refer to BS 5268-6.1: 1996 and 'Ancon' wall tie manufacturer's technical literature for full details at: www.ancon.co.uk)

Wall tie type	Cavity width mm	Tie length mm	Maximum spacing of ties (mm) Horizontal x Vertical (see notes)
Type 6 - Timber frame tie (Ancon STF 6) 	50 75 100	As supplied Length for a particular cavity width	600 x 375 (fixed to vertical studs or reduced to actual stud spacing's of 400 or 450mm ctrs) (4.4 ties/m^2 or 3-4 ties/m at unbounded edges). Suitable for most sites except very exposed areas and should not be used in areas more than 150m above sea level) For sites outside these parameters contact the wall tie manufacturer for specification
Type 6- Helical timber tie (Ancon Thor Helical TIM 6) 	50-75 76-100 101-125 126-150	175 200 225 250	As for type 6 - Timber frame tie

Note 1: Embedment of ties: To be in accordance with the wall tie manufacturer's details, typically Ancon STF 6 to be 77mm into mortar joints. Ancon Thor Helical TIM 6 to be 35mm min embedment in timber and 65mm in to mortar joints. Note 2: Wall ties should be positioned to suit vertical timber stud spacing's (max 600mm ctrs). Note 3: Additional wall ties should be positioned at vertical openings and at un-returned or un-bonded edges at a rate of one per 300mm height (but usually 225mm high to suit block courses) and located not more than 225mm from the edge. Note 4: For wall ties positions at vertical and horizontal movement joints- please refer to the wall tie manufacturer's details.Note 5: Where required, insulation retaining clips to be fixed in accordance with the wall tie manufacturer's details. (Source: www.ancon.co.uk)

Guidance Table 12: Examples of partial cavity fill insulation for external cavity walls
100mm dense brick outer leaf, cavity, partial fill insulation, block inner leaf and internal finishes
U-value no worse than 0.28 W/m²k

Clear cavity width required	Insulation type and Minimum thickness	Overall cavity width required	Internal Block Type and Thickness
50mm[1]	40 mm Kingspan Kooltherm K8 Cavity Board. K value 0.021	90mm[1]	100 mm insulation block- K value 0.14 or lower with 13mm lightweight plaster
50mm[1]	40mm Celotex CW4000 K value 0.022	90mm[1]	100 mm insulation block- K value 0.12 or lower with 13mm lightweight plaster
50mm[1]	50 mm Kingspan Kooltherm K8 Cavity Board. K value 0.020 **or** 50mm Celotex CW4000 K value 0.022	100mm[1]	100 mm dense concrete block (K value 1.13) with 13mm lightweight plaster

Notes: [1]Clear cavities can be reduced to 25mm in compliance with certain insulation manufacturer's details - subject to building control approval and any building warranty providers approval where applicable. Note 2. Insulation to be installed in accordance with manufacturer's details subject to the suitability of the cavity wall construction and UK zones for exposure to wind-driven rain in accordance with Diagram 12 and Table 4 of ADC.
Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control

Guidance Table 13: Examples of partial cavity fill insulation for external cavity walls
100mm dense block with render finished external leaf, cavity, partial fill insulation, block inner leaf and internal finishes
U-value no worse than 0.28 W/m²k

Clear cavity width required	Insulation type and Minimum thickness	Overall cavity width required	Internal Block Type and Thickness
50mm[1]	40 mm Kingspan Kooltherm K8 Cavity Board. K value 0.021 **or** 40mm Celotex CW4000 K value 0.022	90mm[1]	100 mm insulation block- K value 0.11 or lower with 13mm dense or lightweight plaster
50mm[1]	50 mm Kingspan Kooltherm K8 Cavity Board. K value 0.020 **or** 50mm Celotex CW4000 K value 0.022	100mm[1]	100 mm dense concrete block (K value 1.13) with 12.5mm plaster board on dabs and skim
Notes: [1]Clear cavities can be reduced to 25mm in compliance with certain insulation manufacturer's details - subject to building control approval and any building warranty providers approval where applicable. Note 2. Insulation to be installed in accordance with manufacturer's details. Note 2. Insulation to be installed in accordance with manufacturer's details subject to the suitability of the cavity wall construction and UK zones for exposure to wind-driven rain in accordance with Diagram 12 and Table 4 of ADC. Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control			

Guidance Table 14: Examples of full cavity fill insulation for external cavity walls
100mm dense brick outer leaf, full fill insulation, block inner leaf and internal finishes
U-value no worse than 0.28 W/m²k

Clear cavity width required	Insulation type and Minimum thickness	Overall cavity width required	Internal Block Type and Thickness
n/a	85mm Earthwool DriTherm 32 K value 0.032	85mm	100 mm insulation block- K value 0.15 or lower with 12.5mm plaster board on dabs and skim
n/a	100mm Earthwool DriTherm 37 K value 0.037	100mm	100 mm insulation block- K value 0.11 or lower with 12.5mm plaster board on dabs and skim
n/a	100mm Earthwool Dritherm 32 K value 0.032	100mm	100 mm dense concrete block (K value 1.13) with 12.5mm plaster board on dabs and skim
Notes. 1. Insulation to be installed in accordance with manufacturer's details subject to the suitability of the cavity wall construction and UK zones for exposure to wind-driven rain in accordance with Diagram 12 and Table 4 of ADC. Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control			

Guidance Table 15: Examples of full cavity fill insulation for external cavity walls
100mm dense block with render finished external leaf, full fill insulation, block inner leaf and internal finishes
U-value no worse than 0.28 W/m²k

Clear cavity width required	Insulation type and Minimum thickness	Overall cavity width required	Internal Block Type and Thickness
n/a	100mm Earthwool DriTherm 32 K value 0.032	75mm	100 mm insulation block- K value 0.15 or lower with 13mm dense or lightweight plaster
n/a	100mm Rockwool cavity batts K value 0.037	80mm	100 mm insulation block- K value 0.11 or lower with 13mm lightweight plaster
Notes. 1. Insulation to be installed in accordance with manufacturer's details subject to the suitability of the cavity wall construction and UK zones for exposure to wind-driven rain in accordance with Diagram 12 and Table 4 of ADC.. Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control			

Walls between heated and un heated areas (U-value 0.28 W/m².k)
Walls between heated and unheated areas such as garages etc, to be constructed and insulated as external walls or constructed with 2.8/mm² 100/215mm solid dense concrete blocks with light weight plaster/plaster board on dabs finish to one side, 25 x 50mm timber battens to the opposite side, with insulation fixed across face of battens (as detailed in table below), with integral 12.5mm vapour checked plaster board (or 500g polythene vapour check) and 5mm skim coat plaster finish.

Guidance Table 16: Examples of insulation for solid walls between heated and un-heated areas
U-value no worse than 0.28 W/m²k

Insulation product	Minimum thickness (mm)
Kingspan Kooltherm K18 Insulated Plasterboard K value 0.020	62.5 fixed over battens
Celotex PL 4000 Insulated Plasterboard K value 0.022	72.5 fixed over battens
Notes. 1. Insulation to be installed in accordance with manufacturer's details.	

External timber framed walls with separate brick or block finish

General: Design, manufacture, supply, erection and certification of the complete timber frame including roof, walls, lintels and floors etc to be carried out by a specialist timber frame manufacturer in compliance with structural engineers details and calculations. Shell of building to be air sealed and fitted with protective coverings and measures to prevent condensation within the building. All details to be approved by building control before works commence on site. Moisture content of timber should not exceed 20% and to be kiln dried and grade C24, workmanship to comply to BS 8000:5. All timber to be treated using an approved system and all fixings to be stainless steel or other approved.
Sole plates: 38 x 140mm CCA preservative treated C16 CLS kiln dried timber, set level, securely fixed to sub structure which must puncture the dpc/dpm/radon gas barrier and must not overhang or set back from the wall edge by more than 12mm and must be protected from damp.
External timber framed stud walls
Prefabricated panels - factory fabricated, timber framing with 38 x140mm C16/24 CLS kiln dried, preservative treated timber studs, secured at 600mm maximum centres, including sole and head plates and bracing to structural engineers details. Panels to be accurately aligned, plumb and level and fixed together with suitable rust resistant fixings. Holes and notches to be in

accordance frame manufacturer's/structural engineer's details. Structural beams, lintels and columns etc- factory fixed for the timber superstructure only as dictated by Structural Engineer's recommendations. Window/ Door Closers - 38x89mm timber closers/cavity barriers with dpc fixed around all external openings.

Notches / holes/cuts in structural timbers

Notches / holes/cuts in structural timbers should be carried out in accordance with BS 5268-2002 and should not be deeper than 0.125 times the depth of the joists and should be not closer to the support than 0.07 times the span and not further away than 0.25 times the span. Holes should have a diameter not greater than 0.25 times the depth of joist and should be drilled at the joist centre line. They should be not less than 3 diameters (centre to centre) apart and should be located between 0.25 and 0.4 times the span from the support. Notches or holes exceeding the above requirements or cut into other structural members should be checked by a structural engineer.

External boarding: 12mm preservative treated OSB (Orientated Strand Board) or other pproved structural sheathing boards to BS EN 622; 634:2; 314; 636 and BS 1982:1, nail fixed using galvanized/stainless steel fixings to the timber studwork or in accordance with board manufacturer's details.

Breather Membrane: Proprietary British Board of Agreement (BBA or other third party accredited) breather membrane, factory fixed as manufacturer's details to external sheathing by stainless steel staples fixed through white proprietary tape to distinguish wall tie positions.

Thermal insulation and fire resistance: thermal insulation to be fitted between studs in accordance with guidance tables and manufacturer's details, and stud walls finished internally with 500g sheet polythene vapour check and 12.5mm thick plaster board fixed to studs and 3mm skim coat of finishing plaster (to achieve 30 minutes fire resistance- increased to 2 x 12.5mm thick layers of plaster board with joints staggered for 60 minutes fire resistance within 1.0m of a boundary in accordance with part B of this guidance) . All junctions to have water and air tight construction, seal all perimeter joints with tape internally and with silicon sealant externally.

External walls: to be 100mm minimum thickness brick/reconstituted stone/ painted sand and cement render (render to BS 5262), on 100mm medium dense external concrete as required. Masonry walls/mortar/render details are contained elsewhere in this guidance.

External masonry skin to be tied to timber frame studs (not the sheathing) using British Board of Agreement (BBA or other third party accredited) proprietary flexible stainless steel wall ties in compliance with manufacturer's details, BS 5628 and BS EN 845-1, typically at spacings not exceeding 600mm horizontally and 375 mm vertically and 225mm max at reveals. Wall ties should be embedded in mortar to a minimum depth of 75mm with a slight fall towards the external brickwork. Provide proprietary flexible water and fire resistant cavity barriers at eaves level, gable end walls and vertically at junctions with separating walls and horizontally at separating walls with continuous dpc tray over, installed in compliance with manufacturer's details. Cavity to be vented as timber frame manufacturer's details.

Proprietary steel lintels: to BS EN 845 to be provided with 150mm bearing over all external openings to support external masonry skin, fitted with continuous dpc tray and retaining clips. Lintel type and sizes to be in accordance with manufacturer's details suitable for proposed clear spans and loadings. Weep holes using proprietary insect proof vents to be provided at 900mm spacing at base of wall above dpc tray and above all lintels (2 weep holes minimum per lintel)

Separation of combustible materials from solid fuel fire places and flues: Minimum separating distance from combustible materials from a chimney/fire place should be in compliance with Part J of guidance details and Diagram 21 of ADJ as follows:

(i) at least 200mm thick solid non combustible masonry wall should separate combustible materials from a flue liner

(ii) at least a 40mm air gap is required between combustible materials and a solid non combustible masonry wall which is up to 200mm thick (but must not be less than 100mm minimum thickness)

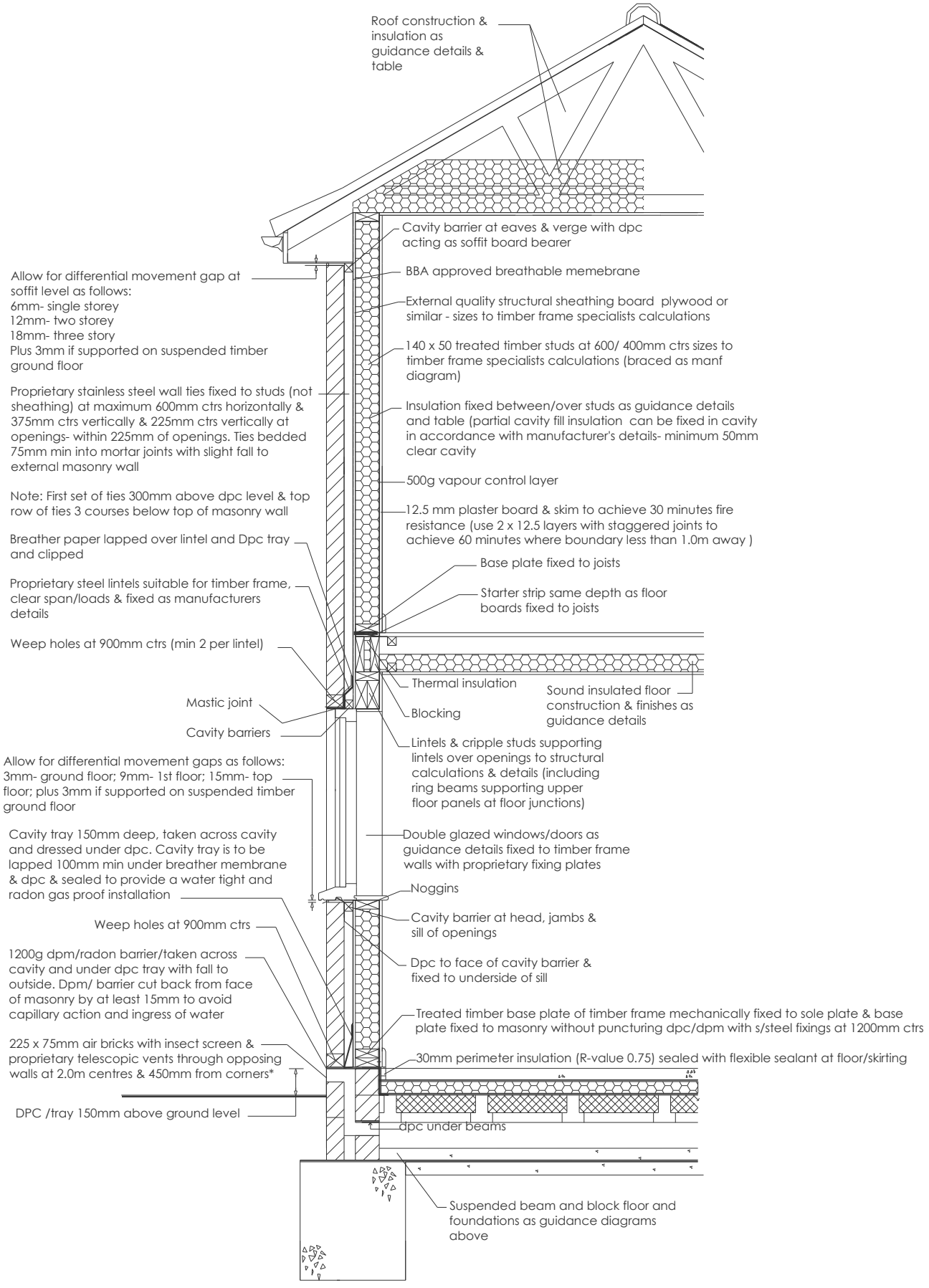
Ensure **all gaps** and **all voids** are **sealed** to prevent any air leakage.

Guidance Table 17: : Examples of insulation for cavity walls with internal timber frame:
103mm dense brick/100mm dense block with render finished external leaf, 50mm clear cavity with breather membrane, structural board, timber studs at 600 and 400mm centers and 12.5mm vapour checked plasterboard and 3mm skim internal finish.
U-value no worse than 0.28 W/m²k

External wall	**Clear cavity width required**	**Timber stud (mm)**	**Insulation type and Minimum thickness**
Brick or rendered dense block	50mm	100	80mm Kingspan Kooltherm K12 Framing Board between studs K value 0.020
Brick or rendered dense block	50mm	150	70mm Kingspan Kooltherm K12 Framing Board between studs K value 0.020
Rendered dense block	50mm	100	90 mm Celotex FR4000 between studs K value 0.022
Rendered dense block	50mm	150	75 mm Celotex FR4000 between studs K value 0.022
Brick	50mm	150	140 mm Knauf Earthwool Frame Therm 38 slab between studs K value 0.038
Brick	50mm	150	140 mm Rockwool Flexi slab between studs K value 0.035 using 140mm insulation thickness

Notes. 1. Insulation to be installed in accordance with manufacturer's details subject to the suitability of the cavity wall construction and UK zones for exposure to wind-driven rain in accordance with Diagram 12 and Table 4 of ADC.
Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control

Guidance Diagram 19: Typical section through external timber framed walls with separate external brick or block wall and cavity (not to scale)



External timber framed walls with render finish (U-value 0.28 W/m².k)
Render finish (to comply to BS 5262) - applied in 3 coats at least 16mm – 20mm thick overall to render lath as detailed below. Typical render mixes for first and second coats 1:3 (cement : sand with plasticiser). final coat 1:6 (cement : sand with plasticiser)- proportions by volume . Render should be finished onto an approved durable render stop, angle beads or jointing sections- stainless steel or other approved using drilled or shot fired fixings.

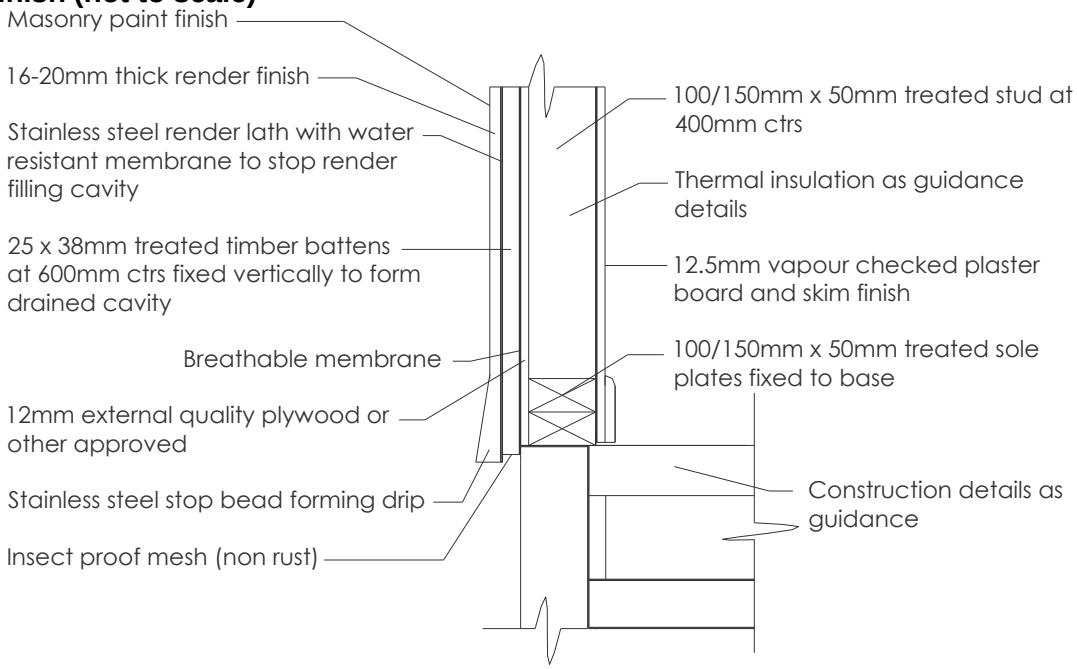
Stainless steel render lath fixed (using stainless steel staples) to vertical studs at 600mm max centers with all laps wired together at 150mm centers (Mesh to be backed by a water resistant membrane) and fixed to: Treated battens - 25 x 50mm preservative treated battens fixed vertically to studs at max 600mm centers using 75mm long hot dipped galvanized or stainless steel annular ring nails, fixed to:

British Board of Agreement (BBA or other third party accredited) proprietary breathable membrane (suitable for timber framed walls): fixed as manufacturer's details to:

12mm external quality plywood or other approved structural water proof sheathing, (joints covered by dpc and battens) fixed to 100/150 X 50mm timber studs at 400mm ctrs with 100/150 X 50mm timber head and sole plates and 2 rows noggins and diagonal bracing as structural engineers details. Studs exceeding 2.5m high should be designed by structural engineer.

Thermal insulation to be fixed between/over studs in accordance with the insulation guidance table below, with vapour check and plaster board fixed to internal face of studs (increase thickness of plaster board in certain circumstances for increased fire resistance in accordance with Part B of this guidance), finished with 3mm skim coat of plaster. All junctions to have water tight construction, seal all perimeter joints with tape internally and with silicon sealant externally.

Guidance Diagram 20: Typical section through external timber framed walls with painted render finish (not to scale)



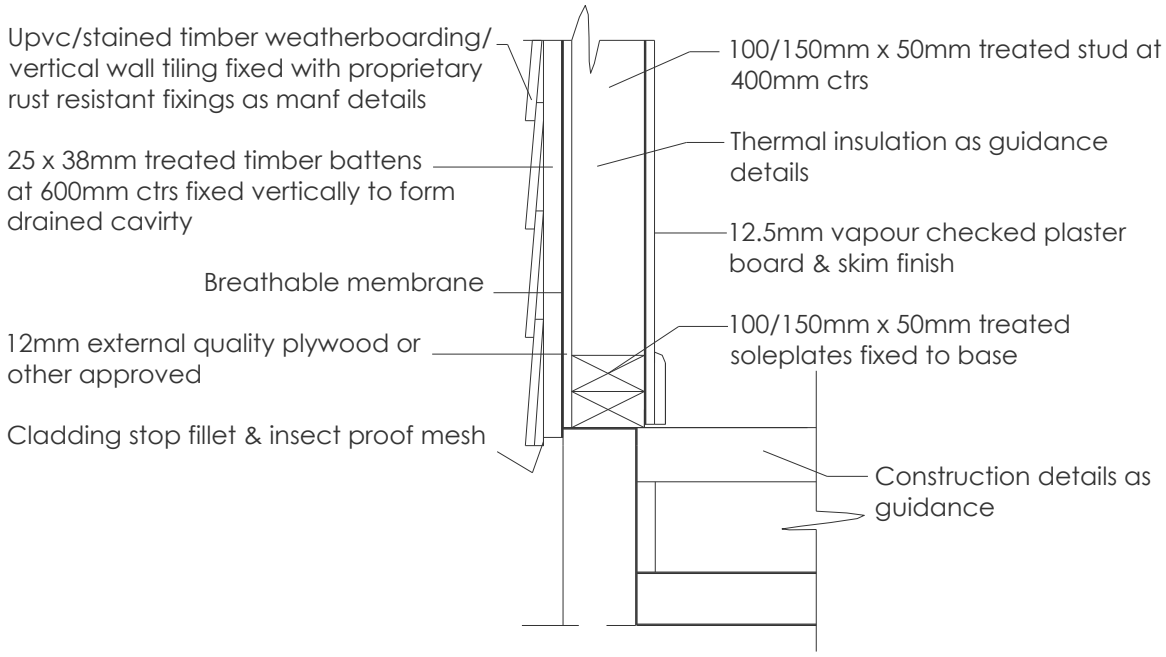
External timber framed walls with cladding finish (U-value 0.28W/m².k)
Approved timber/upvc weatherboarding/vertical wall tiling fixed with proprietary rust resistant fixings to: 50 X 25mm treated battens/counter battens at 400mm ctrs fixed to:

British Board of Agreement (BBA or other third party accredited) proprietary breathable membrane (suitable for timber framed walls): fixed as manufacturer's details to:

12mm external quality plywood or other approved structural water proof sheathing, (joints covered by dpc and battens) fixed to 100/150 X 50mm timber studs at 400mm ctrs with 100/150 X 50mm timber head and sole plates and 2 rows noggins and diagonal bracing as structural engineers details. Studs exceeding 2.5m high should be designed by structural engineer.

Thermal insulation to be fixed between/over studs in accordance with the insulation guidance table below, with vapour check and plaster board fixed to internal face of studs (increase thickness of plaster board in certain circumstances for increased fire resistance in accordance with Part B of this guidance), finished with 3mm skim coat of plaster. All junctions to have water tight construction, seal all perimeter joints with tape internally and with silicon sealant externally.

Guidance Diagram 21: Typical section through external timber framed walls with Upvc/timber weather board finish (not to scale)



Guidance Table 18: Examples of insulation for timber frame walls with external tile/render/cladding finishes:

Tiles/render/cladding on battens as guidance, timber studs at 600 / 400mm centers with insulation fixed between/over studs with vapour checked integral /separate plasterboard as stated below with 3mm plaster finishes.

U-value no worse than 0.28 W/m²k

Timber stud (mm	Insulation type and minimum thickness	Internal insulation/finish
100 x 50mm	50mm Kingspan Kooltherm K12 Framing Board. K Value 0.20 **or** Kingspan Thermawall TW55 K value 0.022 fixed between studs	32.5mm Kingspan Kooltherm K18 Insulated Plasterboard. K value 0.023 fixed over studs
100 x 50mm	60mm Celotex FR4000 K value 0.22 fixed between studs	37.5mm Celotex PL4000 K value 0.22 fixed with integral plaster board with lightweight skim fixed over studs
125/150 x 50mm	85mm Kingspan Kooltherm K12 Framing Board. K value 0.020 fixed between studs	12.5mm plaster board and 3mm skim finish fixed over studs
125/150 x 50mm	90mm Celotex FR4000 K value 0.22 fixed between studs	12.5mm plaster board and 3mm skim finish fixed over studs

Notes. 1. Insulation to be installed in accordance with manufacturer's details subject to the suitability of the wall construction and UK zones for exposure to wind-driven rain in accordance with Diagram 12 and Table 4 of ADC.

Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control

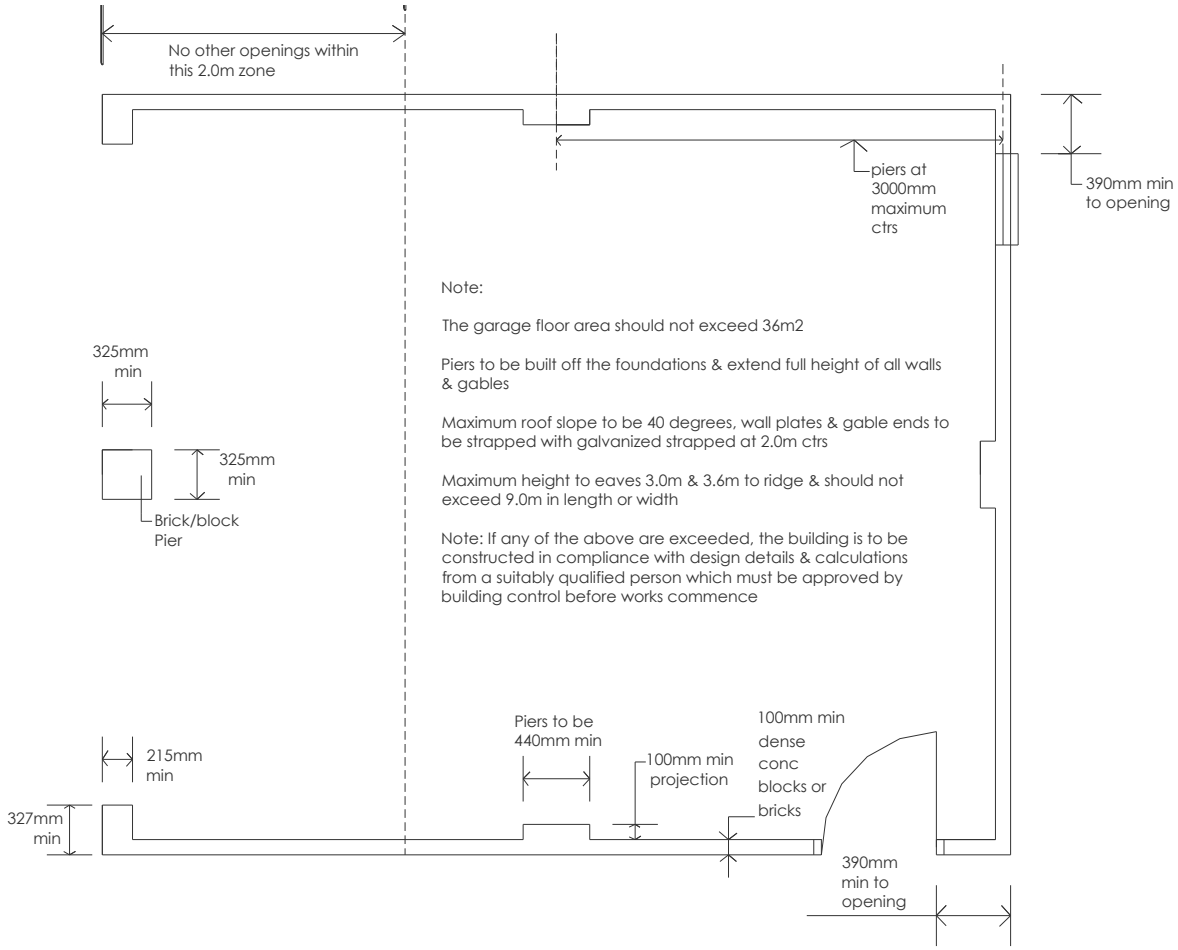
Detached garage (or similar single storey building) with SINGLE SKIN external walls
External walls to be constructed using: 100mm minimum thickness brick/reconstituted stone, or sand and cement render (render to BS 5262), on 100mm minimum thickness dense concrete blocks with 100 x 400mm minimum sized piers at maximum 3.0m centers, tied or built into walls, with fair face finish internally. Bricks to have a minimum compressive strength of 5N/mm^2 and dense concrete blocks 2.8N/mm^2 minimum.

Floor area exceeding 36m^2 will require structural engineers details and calculations to confirm stability of the structure. Eaves level should not exceed 3.0m in height and ridge height should not exceed 3.6m without structural engineers details and calculations to confirm stability of the structure.

Size and proportion of the garage to comply with paragraph 2C38, and the size and location of openings in building to comply with Diagrams 17, 18 and 19 of ADA, and briefly as follows:

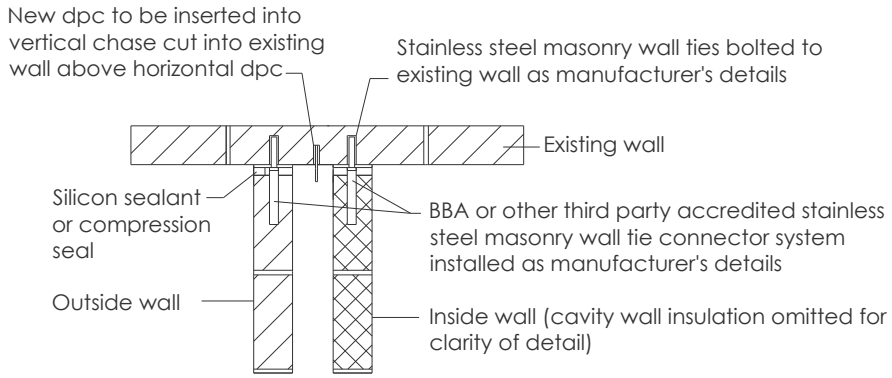
- Major openings to be restricted to one wall only (normally at the front entrance)
- Their aggregate width should not exceed 5.0m and their height should not exceed 2.1m.
- There should be no other openings within 2.0m of a wall containing a major opening.
- The aggregate size of openings in a wall **not** containing a major opening should not exceed 2.4m^2
- There should not be more than one opening between piers.
- Unless there is a corner pier, the distance from a window or a door to a corner should not be less than 390mm.
- Isolated central columns between doorways (where applicable) to be 325 x 325mm min.
- Openings other than those stated above will require structural engineers details and calculations to confirm structural stability.
- Mortar mix to be 1:1:5-6 or as required by the stone/brick/block manufacturer.

Guidance Diagram 22: Design criteria for small detached single storey garages or similar (plan not to scale) See Par 2C38 and diagrams 17/18/19 of ADA for full details



Wall abutments

Vertical junctions of new and old walls to be secured with proprietary profiled stainless steel metal crocodile type system bolted to the existing wall with a dpc inserted into a vertical chase cut into the existing wall above the horizontal dpc and pointed with flexible mastic as manufacturer's details. Depth of chase and position of dpc to be agreed with building control.



Lintels and weep holes

Proprietary manufactured lintels to current British Standards/Euro codes (including specialist lintels supporting stone facings) are to be provided over all structural openings. The positions, types, sizes, end bearings etc of lintels must be in compliance with the lintel manufacturer's standard tables suitable for the proposed loadings and clear spans. Stop end and dpc trays etc to be provided above all externally located lintels in compliance with lintel manufacturer's details. Weep holes are required in porous external walls (i.e. brickwork) at 900mm centers or two per opening.

Structural columns/beams etc

Non proprietary beams/columns (including pad stones) to be fabricated and installed in compliance with details and structural calculations carried out by a suitably qualified and experienced person (i.e. structural engineer), which must be approved by building control before works commence on site. Dpc trays to be provided above all externally located beams. Weep holes are required in porous external walls (i.e. brickwork) at 900mm centers with at least two per opening.

Movement joints

The external leaf of a cavity wall should be provided with adequately spaced and sized vertical movement joints in accordance with the guidance table below to minimize the risk of cracking due to the expansion and contraction of the wall and maintain stability, in accordance with masonry manufacturer's and structural engineer's details. Proprietary wall ties to be provided on each side of the joint using stainless steel wall ties, positioned at each block height (225mm max) and joint sealed externally with a proprietary flexible mastic sealant.

Guidance Table 19: Movement joint widths and spacing in walls

Construction	Movement joint widths	Spacing of movement joints in walls[1]
Clay bricks	16mm	12m
Calcium silicate bricks	10mm	7.5m
Concrete bricks and blocks	10mm	6m
Key [1] The first movement joint should be positioned not more than half the above distance from a wall return and should extend the full storey height of the wall		

Cavity closers

Proprietary British Board of Agreement (BBA or other third party accredited) acoustic/thermally insulated/fire resistant cavity closers, or similar are to be provided to all cavity openings/closings, tops of walls and junctions with other properties in accordance with manufacturer's details.

Tops of cavity walls to be closed to prevent the passage of fire using a proprietary British Board of Agreement (BBA or other third party accredited) 30 minutes fire resistant rigid board, fixed in accordance with manufacturer's details.

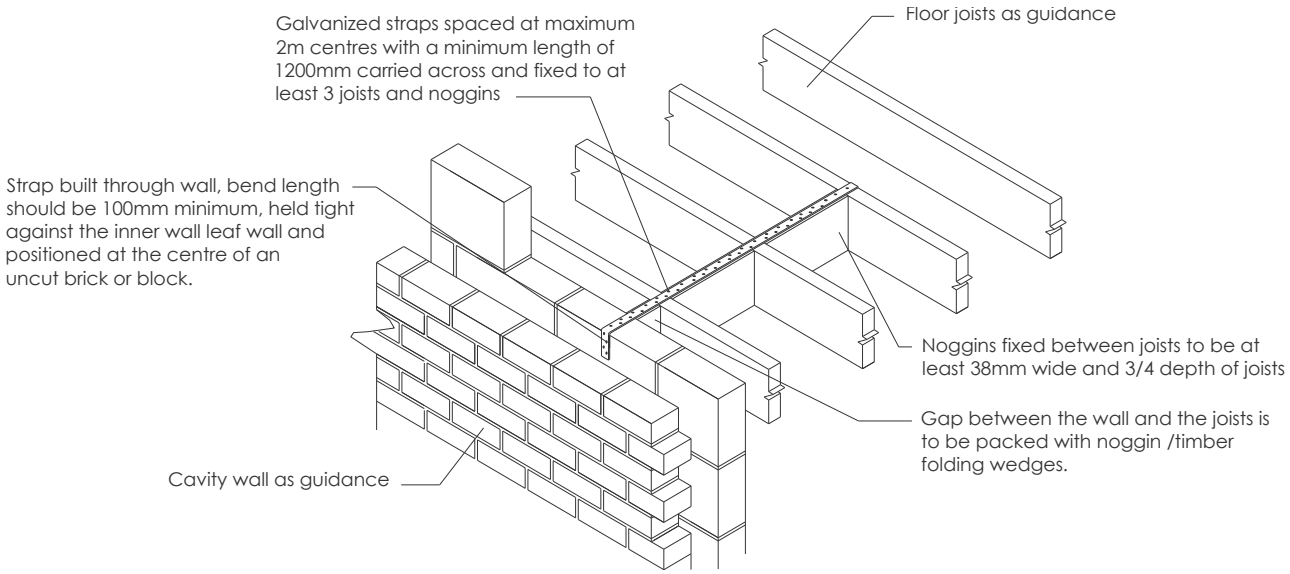
Lateral restraint strapping of upper floors to walls

Upper floors should be connected to walls with lateral restraint straps (in accordance with Par 2C32- 2C37 and Diagram 16 of ADA), fixed horizontally to stiffen and stabilize the walls by restraining its movement in a direction at right angles to the wall length by the provision of pre galvanized and edge coated heavy duty horizontal lateral restraint straps, with a minimum cross sectional size of 30 x 5mm with a tensile strength of 8kN in compliance with BS 5268 Part 3 and BS EN 845-1 in the following locations:

(i) Strapping of floor joists parallel to walls

Straps should be spaced at maximum 2m centres with a minimum length of 1200mm carried across and fixed to at least 3 joists in accordance with the manufacturer's details and typically by the use of 4 x 4mm x 75mm round nails or screws into noggins (noggins to be at least 38mm wide and 3/4 depth of joist or rafter). Any gap between the wall and the timber member is to be packed with timber folding wedges. The bend length should be 100mm minimum and should be held tight against the masonry wall and positioned at the centre of an uncut brick or block.

Guidance Diagram 23: Strapping of floor joists parallel to walls (not to scale)

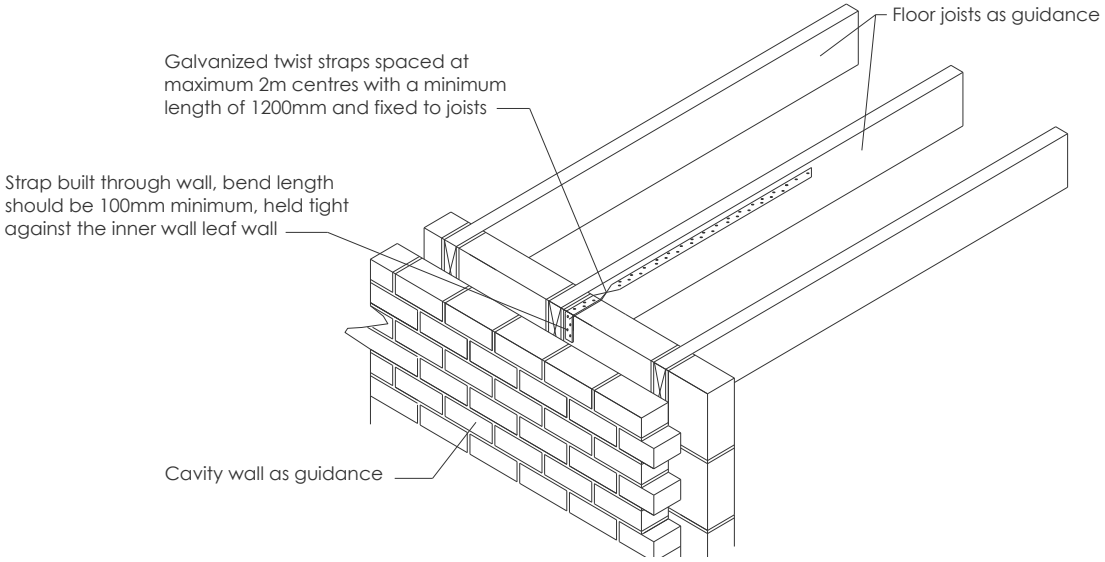


(ii) Strapping of floor joists at right angles to walls

Straps should be spaced at maximum 2m centres with a minimum length of 1200mm fixed in accordance with the manufacturer's details and typically to joists by the use of 4 x 4mm x 75mm round nails or screws. The bend length should be 100mm minimum and should be held tight against the masonry wall and positioned at the centre of an uncut brick or block. Straps can be omitted in houses with no more than 2 storeys as follows:

- If the joists are not more than 1200mm centres and have at least 90mm bearing on the supported wall or 75mm bearing on a timber wall plate at each end.
- If the joists are supported by joist hangers built into walls at not more than 2m centers.
- Where a concrete floor has at least 90mm bearing on the supported wall
- Where floors are at or about the same level on each side of the wall.

Guidance Diagram 24: Strapping of floor joists at right angles to walls (not to scale)



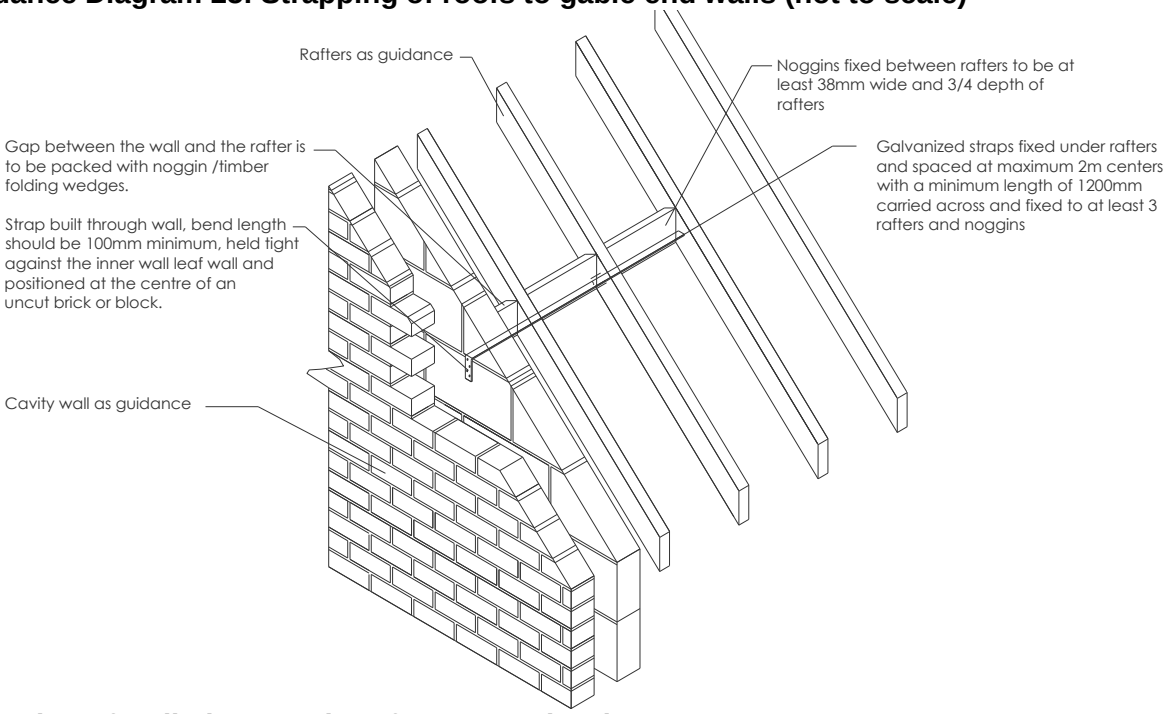
Lateral restraint strapping of roofs to walls

Strapping of roofs to gable end walls

Roofs should be connected to walls with lateral restraint straps (in accordance with Par 2C32-2C37 and Diagrams 16 of ADA), fixed horizontally to stiffen and stabilize the walls by restraining its movement in a direction at right angles to the wall length by the provision of pre galvanized and edge coated heavy duty horizontal lateral restraint straps. Straps to have a minimum cross sectional size of 30 x 5mm with a tensile strength of 8kN in compliance with BS 5268 Part 3 and BS EN 845-1. Straps should be spaced at maximum 2m centers (strap at highest point must provide a secure connection), with a minimum length of 1200mm carried across and fixed to at least 3 rafters by the use of 4 x 4mm x 75mm round nails or screws into noggins (noggins to be at least 38mm wide and 3/4 depth of joist or rafter). Any gap between the wall and the timber member is to be packed with timber folding wedges. The bend length should be 100mm minimum and should be positioned at the centre of the uncut brick or block.

Where the straps cannot be fixed into a cavity wall (e.g. single skin garage walls), the bend should be fixed to masonry walls using fixings in accordance with manufacturer's details (e.g. proprietary stainless steel expansion bolts fixed to block/ brick work as agreed with building control, typically 3 no x M6 expansion fixings per strap bend fixed 75mm into masonry walls).

Guidance Diagram 25: Strapping of roofs to gable end walls (not to scale)

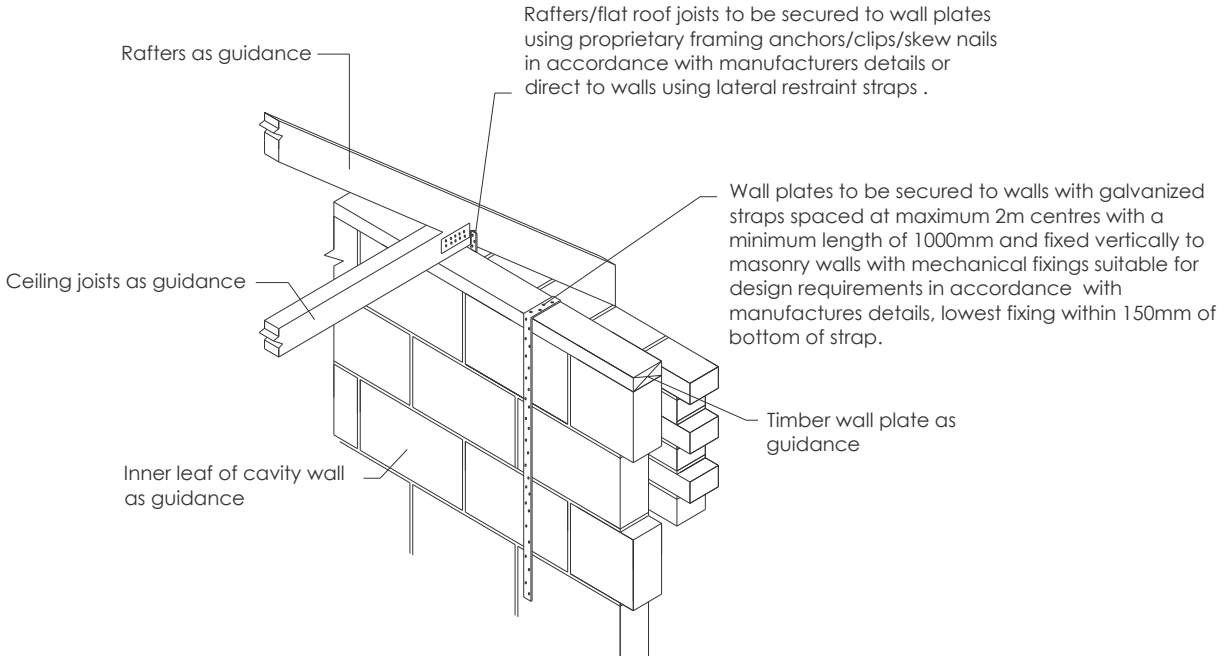


Strapping of wall plates and roofs at eaves level

Wall plates to be secured to walls by the provision of pre galvanized and edge coated horizontal lateral restraint straps(in accordance with Par 2C32- 2C37 and Diagram 16 of ADA), with a minimum cross sectional size of 30 x 5mm or light strap in compliance with BS 5268 Part 3 and BS EN 845-1. Straps should be spaced at maximum 2m centers with a minimum length of 1000mm and fixed vertically to masonry walls with mechanical fixings suitable for design requirements in accordance with manufacturer's details, lowest fixing within 150mm of bottom of strap. Rafters/flat roof joists to be secured to wall plates using proprietary framing anchors/clips/skew nails in accordance with manufacturer's details or direct to walls using lateral restraint straps as detailed above.

Vertical strapping can be omitted if the roof has a pitch of 15^{o} or more, and is tiled or slated, and is of a type known by local experience to be resistant to damage by wind gusts and has main timber members spanning onto the supported wall at not more than 1.2m centers.

Guidance Diagram 26: Strapping of wall plates and roofs at eaves level (not to scale)



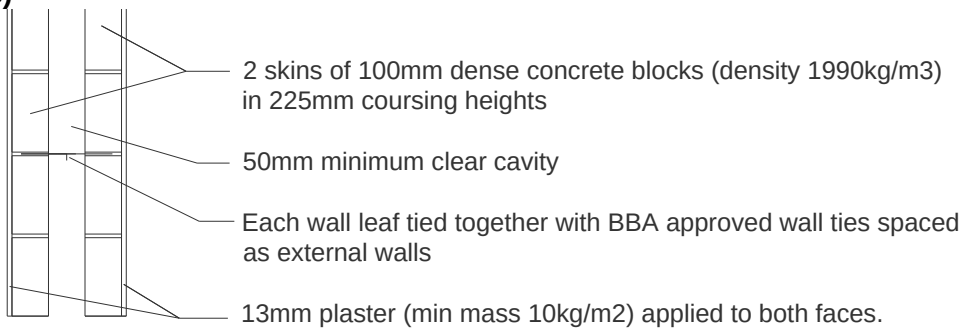
Lateral restraint strapping of walls at ceiling level

Where the height of the gable end wall exceeds 16 x thicknesses of the external wall leaves +10mm (excluding cavity width) measured from the top of the floor to centre of the gable end wall above ceiling level, lateral straps to be provided at ceiling joist level (in accordance with Par 2C32- 2C37 and Diagram 16 of ADA) as detailed in this guidance for intermediate floors.

A3: Separating walls and floors

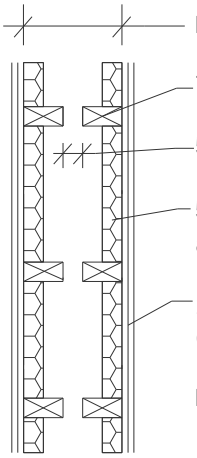
Masonry party walls separating dwellings (U-value 0.2 W/m^2.K)
Party walls separating dwellings to achieve a minimum 60 minutes fire resistance from both sides and sound insulation value of 45dB value for airborne sound insulation (reduced to 43dB for conversions). Typically constructed using of 2 skins of 100mm minimum thickness dense concrete blocks (density 1990kg/m^3) in 225mm coursings with a clear 50mm minimum cavity and tied together with wall ties spaced as external walls with 13mm plaster (min mass 10kg/m^2) applied to both faces. Walls to be built up to the underside of the roof coverings and fire stopped with mineral wool or an approved proprietary intumescent product. The party wall to be built off a foundation, bonded/tied to the inner leaf and the junction of cavities are to be fire stopped throughout its length with a proprietary acoustic/ insulated fire stop cavity closer and all other vertical and horizontal cavities are to be closed in a similar manner to provide effective edge sealing and a U-value of 0.2 W/m^2.K. Additional party wall solutions are available in ADE.

Guidance Diagram 27: Section detail of masonry separating wall as Wall type 2.1 of ADE (not to scale)



Double leaf timber frame party walls separating dwellings (U-value 0.2 W/m^2.K)
Timber framed stud party walls to achieve a minimum 60 minutes fire resistance from both sides and sound insulation value of a minimum 45 dB value (43dB for conversions) for airborne sound insulation and constructed with 2x independent leafs of timber framed walls with 50mm minimum clear cavity, minimum distance between inside lining faces to be 200mm. Timber studs constructed using 100 x 50mm sawn timber studs at 400mm centers with head and sole plates, with 50mm thick layer of Rockwool ProRox SL920 acoustic mineral wool insulation slabs (density 45kg/m^3) friction (or similar with a minimum density of 10kg/m^3) fixed between each studs, and 2x 15mm thick layers of 'LAFARGE dB check wall board (or similar with a minimum mass of 10kg/m^2) fixed to both sides of stud wall (joints staggered) with skim coat of plaster finish- as wall board manufacturer's details. No electrical fittings to be fixed into/onto party walls and all gaps to be fire sealed and smoke stopped to the full height and width of the party wall and up to the underside of the roof coverings using mineral wool (not glass wool) or an approved proprietary intumescent product to provide effective edge sealing and a U- value of 0.2 W/m^2.K. Additional party wall solutions are available in ADE.

Guidance Diagram 28: Plan detail of timber stud separating wall as Wall type 4.1 (new buildings) of ADE (not to scale)



Minimum distance between inside lining faces to be 200mm.

Timber studs 100 x 50mm sawn timber studs at 400mm centers with head & sole plates,

50mm minimum clear space between face studs

50mm thick layer of ROCKWOOL PRO ROC SL920 mineral wool (density 45kg/m^3 or similar with a minimum density of 10kg/m^3) friction fixed between each studs

2x 15mm thick layers of 'LAFARGE dB check wall board (or similar with a minimum mass of 10kg/m2) fixed to both sides of stud wall (joints staggered) with skim coat of plaster finish.

No electrical fittings to be fixed into/onto party walls

Upgrading sound insulation of existing party walls separating dwellings

Existing wall should achieve 60 minutes fire resistance, be at least 100mm thick, of masonry construction and plastered on both faces. With other types of existing wall the independent panels should be built on both sides.

Construct new independent frame fixed at least 10mm from one side of the existing wall using either; 100 x 50mm timber studs at 400mm ctrs fixed onto head and sole plates or to a proprietary galvanised metal frame, fixed as manufacturer's details.

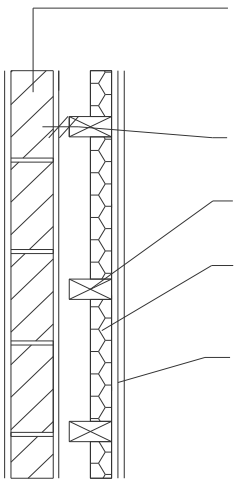
Fix 50mm thick Rockwool ProRox SL920 acoustic mineral wool insulation slabs (density 45kg/m3) or other approved (min density 10kg/m^3) friction fixed between studs

Fix two layers of 15mm thick dB checked wall board with staggered joint and plaster skim finish to the independent frame using mechanical fixings. Note- allow a minimum distance of 35mm between face of existing wall and inner wall board face.

No electrical fittings to be fixed into/onto party walls and all gaps to be fire sealed and smoke stopped to the full height and width of the party wall and up to the underside of the roof coverings using mineral wool (not glass wool) or an approved proprietary intumescent product to provide effective edge sealing and a U-value of 0.2 W/m^2.K.

Additional upgrading party wall solutions are available in ADE.

Guidance Diagram 29: Plan of upgrading masonry separating wall as Wall type 4.2 (material change of use) of ADE (not to scale)



Existing wall should be at least 100mm thick, of masonry construction and plastered on both faces. With other types of existing wall the independent panels should be built on both sides.

Construct new independent frame fixed at least 10mm from one side of the existing wall

100 x 50mm timber stud at 400mm centers fixed onto head & sole plates

50mm thick layer of ROCKWOOL PRO ROC SL920 mineral wool (density 45kg/m^3 or similar with a minimum density of 10kg/m^3) friction fixed between studs

Fix two layers of 15mm thick dB checked wall board with staggered joint and plaster skim finish to the independent frame using mechanical fixings. Note- allow a minimum distance of 35mm between face of existing wall & inner wall board face.

Party floors separating buildings
Outside the scope of this guidance- see relevant sections in ADE

Sound testing requirements
Pre completion sound testing is required for all new party walls/floors which should be carried out by a sound specialist in accordance with ADE, copy of test results sent to building control.

A4: Internal partitions

Internal load bearing masonry partitions
Internal load bearing walls to be 100mm minimum thick dense concrete blocks (actual wall thickness must not be less than the wall it supports above), built off suitable concrete foundations (as guidance details above, typically 450mm wide x 225mm deep), with pre-cast concrete/proprietary steel lintels over openings (in compliance with lintel manufacturer's span tables) and walls bonded/tied to external or party walls with proprietary ties each course and restrained by floor or ceiling joists/trusses.

Internal load bearing timber stud partitions
Load bearing timber stud partitions and non-proprietary lintels to be in compliance with structural engineers details and calculations which must be built off suitable concrete foundations (as guidance details above, typically 450mm wide x 225mm deep) and approved by building control before works commence on site. Fix a minimum of 25 mm of 10Kg/m^3 proprietary sound insulation quilt suspended between the studs and finished with 12.5 mm plasterboard and skim both sides. Sole/head plates to be glued and screwed to floor joists and where necessary fix additional timber members to allow adequate fixing of fittings etc.

Internal masonry non-load bearing partitions
Internal non-load bearing partitions to be constructed of 100mm minimum thick dense concrete blocks built off a thickened floor slab (as agreed with building control) and tied/block bonded to all internal and external walls at maximum 225mm centers with either a plaster or dry lined finish as the external walls.

Internal timber studwork non-load bearing partitions
Non-load bearing stud partitions are to be constructed of 100 x 50mm soft wood framing with head and sole plates and intermediate noggins fixed at 400/600mm centres, built off a thickened floor slab (as agreed with building control) with a minimum thickness of 25 mm of 10Kg/m^3 proprietary sound insulation quilt suspended between the studs and finished with 12.5 mm plasterboard and skim both sides. Sole/head plates to be glued and screwed to floor joists and where necessary fix additional timber members to allow adequate fixing of fittings etc.

A5: Intermediate upper floor(s)

Note: Although there are no minimum head room height requirements in the building regulations for habitable rooms (except for stairs and ramps- see Part K of this guidance), a minimum ceiling height of 2.3m is recommended.

Floor Joists
Floor to be constructed of kiln dried, structural grade, timber joists with sizes and spacing suitable for the proposed clear span in compliance with the guidance table below. The maximum span for any floor supported by a wall is 6m, measured to the centre of each bearing in accordance with Paragraphs 2C23-2C24 of ADA.

Joists to have a nominal minimum bearing of 40mm (increased to 80mm where indicated in the guidance table below), supported by heavy-duty, proprietary, galvanized metal restraint joist hangers built into walls or fixed to treated timber wall plates (same sizes as joists) resin bolted 100mm minimum into sound walls at 600-800mm centers using approved 12-16mm diameter

stainless steel fixings- as agreed with building control. Alternatively, joists can be built into walls using approved proprietary sealed joist caps or sealed with silicon sealant to provide an air tight seal for new dwellings which require air testing, as agreed with building control. Two joists are to be bolted together under baths and non load bearing partitions running parallel with joists, increased to three joists under non load bearing partitions, where indicated in guidance table. Where non load bearing partitions run at right angles to the joists, the spans in the guidance table below should be reduced by 10%.

Floor void between joists to be insulated with a minimum thickness of 100 mm of 10Kg/m^3 proprietary sound insulation quilt, ceiling to be a minimum 15mm plasterboard and skim to give the required sound insulation and 30 minutes fire resistance. Floor joists to be provided with 1 row of 38 x ¾ depth solid strutting at ends between joist hangers or proprietary galvanized struts to BS EN 10327 fixed as manufacturer's details, at mid span for 2.5 – 4.5m spans and 2 rows at 1/3 centers for spans over 4.5m.

Fix 22mm thick moisture resistant tongue and grooved timber floor boards laid with joints staggered, long edge fixed across the joists and all joints positioned over joists/noggins. All boards to be glued and screwed to floor joists with all joints glued (using water proof glue) and pinned, in accordance with floor board manufacturer's details and current BS EN standards. Allow expansion gap around wall perimeters as manufacturer's details (typically 10-15mm).

Guidance Table 20: Timber sizes and spans for domestic floor joists (Strength Class C24)
Supporting domestic floor loads and non load bearing timber stud partitions (imposed load not exceeding 1.5kN/m^2 ; dead load (excluding self weight of joist) not more than 0.5kNm^2)

Size of joist		Spacing of joist (mm)		
		400	450	600
Breadth (mm)	X Depth (mm)	Maximum clear span (m)		
47	97	2.10*	1.99*	1.74
47	120	2.67*	2.56*	2.31
47	145	3.21*	3.09*	2.80
47	170	3.76*	3.61*	3.28
47	195	4.30*	4.13*	3.75[1]
47	220	4.83*	4.65*[1]	4.23[1]
75	220	5.61*	5.41*	4.93*
Notes: Where non load bearing partitions run at right angles to the joists, the spans in the guidance table should be reduced by 10%. Two joists are to be bolted together under baths and non load bearing partitions running parallel with joists.				
Key *Increased to three joists bolted together under baths and non load bearing partitions running parallel with joists; [1] 80mm minimum bearing required				
The above values have been independently compiled for guidance table by Geomex Ltd Structural Engineers: www.geomex.co.uk				
Span tables for C16 and C24 strength class solid timber members in floors, ceilings and roofs for dwellings are available from TRADA Technology at: www.trada.co.uk/bookshop				

Trimming and trimmer joists
Trimming joists and trimmer joist sizes supporting trimmed joists around openings should be in accordance with the guidance tables below or calculations and details are required from a suitably qualified person (i.e. structural engineer) which should be approved by building control before works commence on site. Minimum bearing 80mm and double joists should be mechanically fixed together using at least two bolted connections at 1/3rd spacing, using 12mm diameter high tensile bolts and 3 x 50mm steel washers at each bolt end. Joists to be supported on heavy duty galvanized joist hangers to current British Standards and fixed in accordance with joist hanger manufacturer’s details. Notches / holes/cuts in structural timbers should be carried out in accordance with these guidance details and BS 5268-2002.

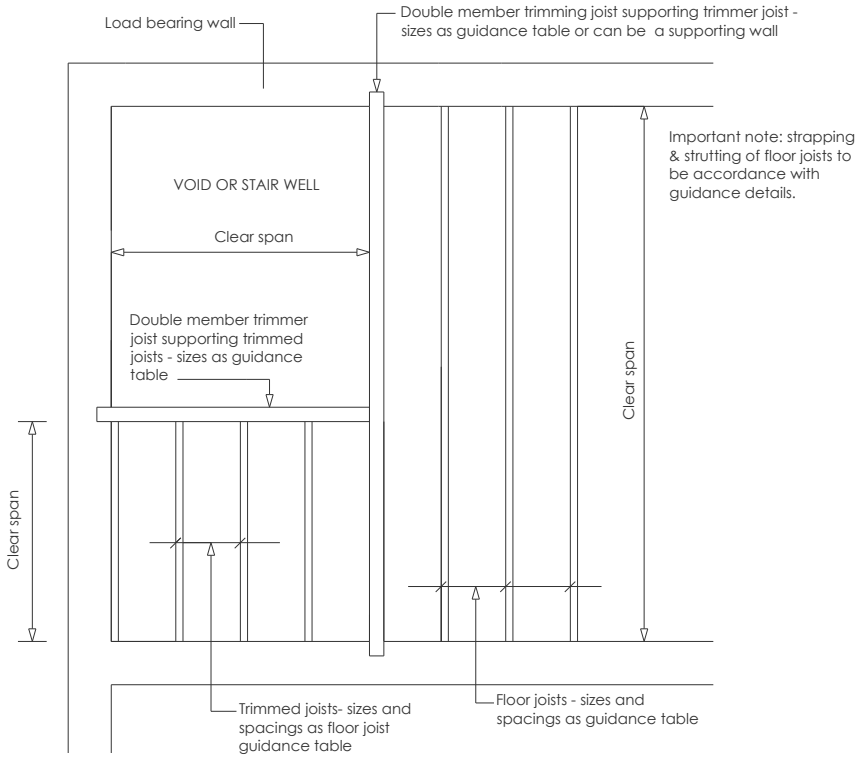
Guidance Table 21: Timber sizes and spans for trimmer joist supporting trimmed joists (Strength Class C24) Supporting domestic floor loads and non load bearing timber stud partitions (imposed load not exceeding 1.5kN/m^2; dead load (excluding self weight of joist) not more than 0.5kNm^2)

Size of trimmer joist (mm)	Length of trimmed joists (m)			
	1.0	2.0	3.0	4.0
2no. x breadth x depth	Clear span of trimmer joist (m) supporting trimmed joists			
2 x 47 x 145	2.68	2.27	1.97	1.68
2 x 47 x 170	3.21	2.68	2.33	1.99
2 x 47 x 195	3.69	3.09	2.69	2.31
2 x 47 x 220	4.17*	3.50	3.06	2.62
2 x 75 x 220	4.81*	4.13	3.62	3.21
See plan layout below for configuration of trimming, trimmer and trimmed joists.				
Key: * Increased to three trimmer joists bolted together under non load bearing partitions running parallel with joists.				
The above values have been independently compiled for guidance table by Geomex Ltd Structural Engineers: www.geomex.co.uk				
Span tables for C16 and C24 strength class solid timber members in floors, ceilings and roofs for dwellings are available from TRADA Technology at: www.trada.co.uk/bookshop				

Guidance Table 22: Timber sizes and spans for trimming joist supporting trimmer joist (Strength Class C24) Supporting domestic floor loads and non load bearing timber stud partitions (imposed load not exceeding 1.5kN/m^2; dead load (excluding self weight of joist) not more than 0.5kNm^2)

Size of trimming joist (mm)	Length of trimmer joist (m)		
	1.0	2.0	3.0 max
2no. x breadth x depth	Clear span of trimming joist (m) supporting trimmer joist		
2 x 47 x 145	2.62	2.42	2.25
2 x 47 x 170	3.08	2.84	2.65
2 x 47 x 195	3.54	3.27	3.05
2 x 47 x 220	3.99	3.70	3.46
2 x 75 x 220	4.66	4.32	4.05
See plan layout below for configuration of trimming, trimmer and trimmed joists			
The above values have been independently compiled for guidance table by Geomex Ltd Structural Engineers: www.geomex.co.uk			
Span tables for C16 and C24 strength class solid timber members in floors, ceilings and roofs for dwellings are available from TRADA Technology at: www.trada.co.uk/bookshop			

Guidance Diagram 30: Typical plan layout of opening formed in suspended timber floor(s) using trimming, trimmer and trimmed joists. (not to scale) *See guidance tables for joist sizes*



Notching and drilling of structural timbers

Notching and drilling in structural timbers should be in accordance with BS 5268-2:2002. Notches should not be deeper than 0.125 times the depth of the joists and should be not closer to the support than 0.07 times the span and not further away than 0.25 times the span. Holes drilled should have a diameter not greater than 0.25 times the depth of joist and should be drilled at the joist centre line. They should be not less than 3 diameters (centre to centre) apart and should be located between 0.25 and 0.4 times the span from the support. Notches or holes exceeding the above requirements should be checked by a structural engineer.

Sound insulation to floors within the dwelling

Intermediate floors to be provided with sound insulation as described in the relevant floor section in this guidance.

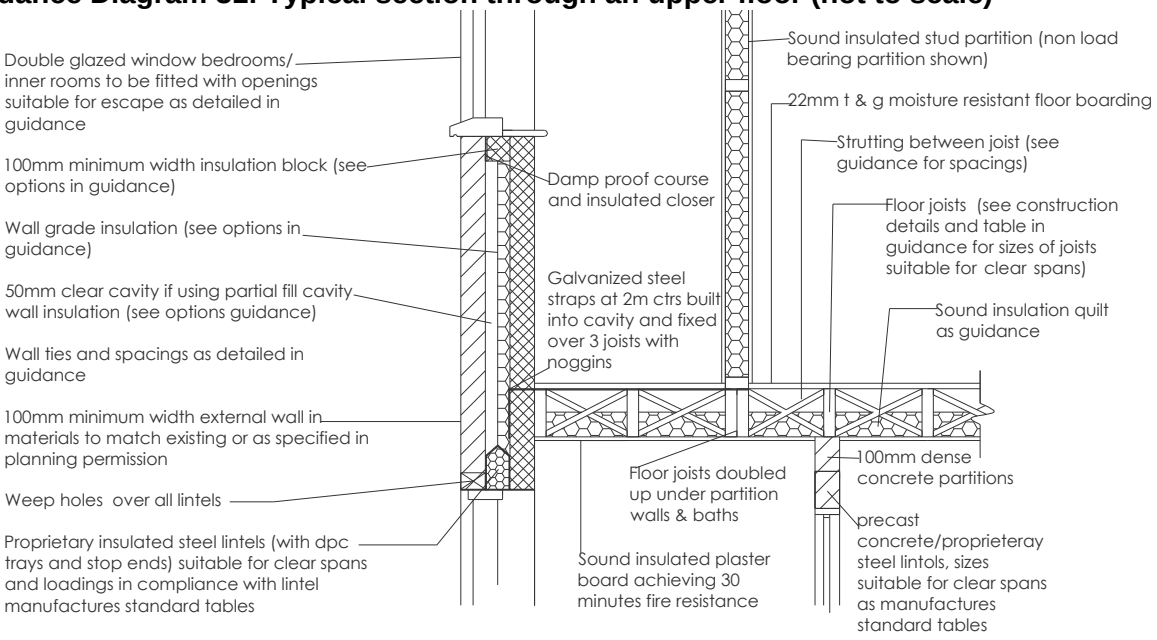
Soil and vent pipe (SVP) boxing internally

SVP pipe boxing to consist of soft wood framing, 2 layers of 15mm plasterboard and skim and void filled with mineral wall quilt for sound insulation and fire/smoke stopping. Boxing to be continuously carried up to roof space for soil and vent pipe and provided with air grills where an air admittance valve is used. Ensure **all gaps** and **all voids** are **sealed** to prevent any air leakage.

Exposed intermediate upper floors

Semi exposed intermediate timber floors over unheated areas such as garages, porches, walkways, and canopy's to be insulated with the following minimum thickness and types of insulations to achieve a U-value 0.22w/m².k in accordance with the insulation guidance table below. Where the construction is open to the environment a vapour barrier and proprietary external mineral fiber or similar 30 minute fire and moisture resistant boarding is to be applied to the underside of the floor.

Guidance Diagram 31: Typical section through an upper floor (not to scale)



Guidance Table 23: Examples of insulation for exposed upper floors

U-value no worse than 0.22 W/m².k

Insulation product	K value	Required thickness of insulation (mm)
Kingspan Thermafloor TF70	0.022	110
Celotex FR5000	0.021	110
Rockwool Flexi	0.038	200
Knauf Earthwool loft roll 40	0.040	200
Notes. 1. Insulation to be installed in accordance with manufacturer's details		

A6: Pitched roofs

Note: Although there are no minimum head room height requirements in the building regulations for habitable rooms (except for stairs and ramps- see Part K of this guidance), a minimum ceiling height of 2.3m is recommended.

Pitched roof coverings

Roof covering to consist of slates/tiles and associated ridge, verge, eaves, hip, valley, abutment and ventilation systems etc fitted in accordance with the tile manufacturer's details, suitable for the minimum recommended roof pitches and exposure.

Roof tiles/cladding to be fixed in accordance with manufacturer's details to 25 x 50mm treated timber battens (battens to be at least 1.2m long, nailed to each rafter and fixed over at least three rafters and spaced in accordance with tile manufacturer's details), rafters to be overlaid with un-tearable underlay's using either a non breathable/high water vapour resistance underlay to BS EN 13707: 2004 (requires ventilation on opposing sides as detailed in guidance) or a British Board of Agreement (BBA or other third party accredited) vapour permeable breathable/low water resistance type underlay, both types to be fixed, ventilated and lapped in accordance with manufacturer's details.

Where roof coverings cannot be fixed to the tile/slate manufacturer's required pitch, roof coverings can be fixed below manufacturer's minimum recommended roof pitch by using a proprietary British Board of Agreement (BBA or other third party accredited) corrugated roof sheet system below roof coverings to create an independent secondary weatherproof roof, which must be installed to minimum roof pitches and ventilated in accordance with manufacturer's details. e.g. 'Ondutile' under tile and slate under-sheeting system manufactured by Onduline Building Products Ltd: www.onduline.net. (Typical minimum roof pitches: 12.5^{o} for concrete interlocking tiles; 17.5^{o} for clay pan tiles/ natural and fibre cement slates; 22.5^{o} for plain double lap tiles- contact manufacturer for minimum roof pitches achievable)

Pitched roof structure

Roof to be constructed using either manufactured roof trusses or a cut roof as follows:

(i) Roof trusses (including attic and girder trusses)

Roof to be constructed using specialist designed and manufactured trusses (or Attic trusses where forming room(s) in the roof or used for storage) at 400mm (or 600mm maximum) spacing's to BS 5268:3 or PD 6693-2. Trusses to be fixed and braced strictly in accordance with BS 5268:3 or PD 6693-2 and truss manufacturer's details, mechanically fixed to 100 x 50mm treated soft wood wall plates using proprietary galvanized steel truss clips. Reinforced concrete pad stones are required to support girder trusses to details and calculations by a suitably qualified person.

The person carrying out the building work is to check and confirm the actual roof pitch to the truss manufacturer prior to placing an order. Details of trusses and bracing diagram is to be prepared by the specialist designer/truss manufacturer, which must be submitted and approved by building control prior to commencing roof construction.

(ii) Cut roof construction

Roof to be constructed using kiln dried –stress graded timber. Rafters, ceiling joists, purlins, hanger and binder sizes as stated in the independent guidance tables below or see TRADA Technology Span Tables available from: www.trada.co.uk, suitable for the proposed clear spans and all properly fixed together using approved mechanical fixings. Where the ceiling joists are raised above wall plate level they must be fixed within the bottom third of the rafter using 12mm diameter high tensile bolts and proprietary steel toothed connectors to connect each rafter and ceiling joist to prevent possible roof spread. Joists raised above this level are to be designed by a suitably qualified person and approved by building control before works commence.

Typical minimum sizes of roof timbers: struts and braces to be 100 X 50mm, hip sizes to be the splayed rafter depth + 25mm X 50mm thick(under 30 degree pitch the hips are to be designed by

a suitably qualified person), lay-boards to be the splayed rafter depth + 25mm X 32mm thick, ridges to be splayed rafter depth + 25mm X 38mm thick, all valley beams are to be designed by a suitably qualified person, wall plates to be 100 x 50mm fixed to inner skin of cavity wall using galvanized strapping as detailed below. Angle ties should be used on hipped roof corners to prevent spreading. Hip rafters over 150mm deep to be supported on 100 X 75mm angle ties mechanically connected across wall plates and hip rafter notched to fit over angle tie at corners of roof. Proprietary hip irons to be screwed to base of hip rafters to support ridge tiles.

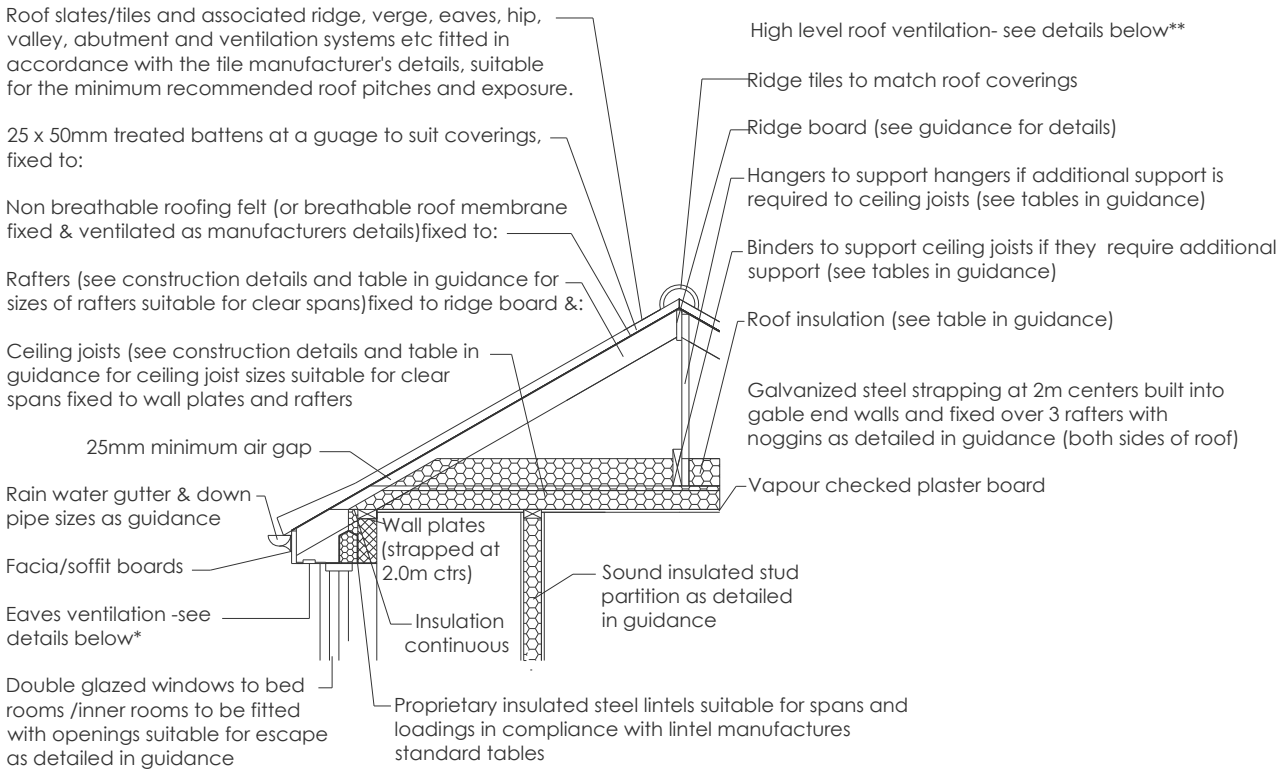
Soffits, fascias and barge boards etc should be constructed in painted/stained soft/hardwood or Upvc to BS 4576. Allow for all necessary alteration/modification of any existing adjoining roof as required to enable the proper completion of the works and in agreement with building control.

Allow for building in as work proceeds or insertion of proprietary stepped/cavity tray dpc to follow line of new roof 150mm above all roof/wall abutments as necessary using proprietary dpc trays and code 5 lead flashings. Tie the new roof into the existing, alter/modify/renew existing roof coverings and form a weather tight structure. Fix 12.5mm foil backed plasterboard (joints staggered) and 3mm skim coat of finishing plaster to the underside of all ceilings using galvanized plasterboard nails.

Roof pitch to (single storey) single skin buildings with walls 100mm thick should not exceed 40° without structural engineers details and calculations to confirm stability of the structure. Cut roofs over 40° are to be diagonally/laterally braced in accordance with BS 5268.

Notching and drilling of structural timbers
Notching and drilling in structural timbers should be in accordance with guidance details above.

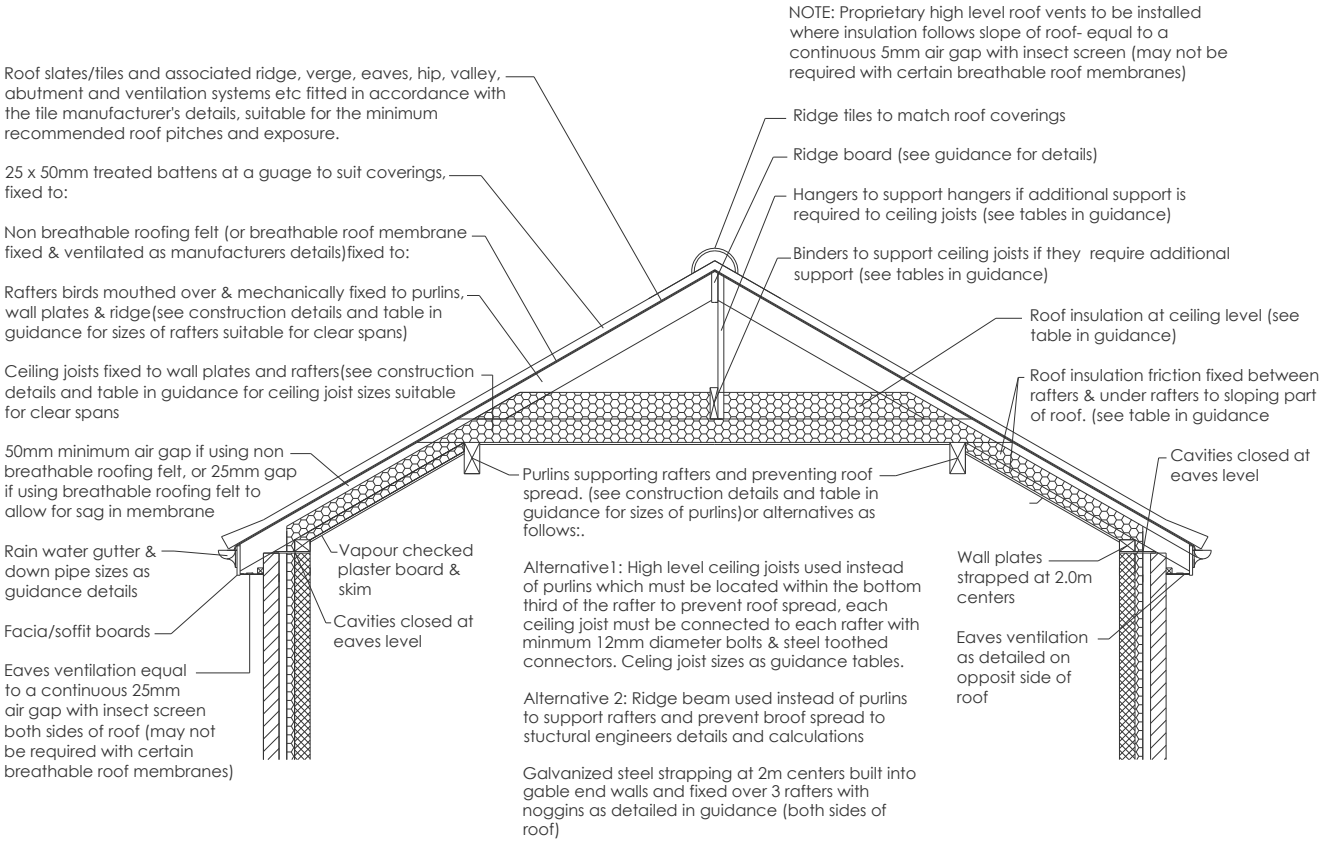
Guidance Diagram 32: Typical section through pitched roof with ceiling joists at wall plate level (not to scale) U-value no worse than 0.16 W/m².k



*when using non breathable roofing felt, cross ventilation is to be provided by either proprietary facia ventilation strips or soffit vents to opposing sides of roof at eaves level and fitted with an insect grill with a ventilation area equivalent to a 25mm continuous gap for roof pitches below 15° or a 10mm gap for roof pitches above 15°.

**When using non breathable roofing felt and the roof span is more than 10 metres or when the pitch is more than 35°, provide additional high level ventilated openings equivalent to a continuous 5mm air gap at ridge level to cross ventilate roofs using proprietary dry ridge systems or vent tiles spaced and fixed in accordance with tile manufacturer's details.

Guidance Diagram 33: Typical section through a pitched roof with purlins and high collars (not to scale) U-value no worse than 0.18 W/m².k



Guidance Table 24: Timber sizes and permissible clear spans for single span common jack rafters at 400mm spacing (Strength Class C24)

Size of Rafter	Slope of Roof (degrees)		
	15 - 22.5°	22.5 - 30°	30 - 45°
Breadth x Depth (mm)	Maximum clear span (m)		
47 x 100	2.08	2.12	2.18
47 x 125	2.74	2.79	2.87
47 x 150	3.40	3.47	3.56
47 x 195	4.59	4.68	4.81
Minimum rafter bearing 35mm			
Imposed load: 1.02 kN/m^2 (high snow load - altitudes not exceeding 100m)			
Dead load: not more than 0.75kN/m^2 (concentrated load 0.9kN) excluding self weight of rafter			
The above values have been independently compiled for guidance table by Geomex Ltd Structural Engineers: www.geomex.co.uk			
Span tables for C16 and C24 strength class solid timber members in floors, ceilings and roofs for dwellings are available from TRADA Technology at: www.trada.co.uk/bookshop			

Guidance Table 25: Timber sizes and permissible clear spans for purlins (Strength Class C24)

	Slope of Roof (degrees)											
	15 - 22.5°				22.5 - 30°				30 - 45°			
Size of purlin (mm)	Spacing of Purlins (mm)											
	1500	1800	2100	2400	1500	1800	2100	2400	1500	1800	2100	2400
B x D	Maximum clear spans (m)											
75 x 125	2.01	1.88	1.77	1.65	2.06	1.92	1.82	1.73	2.12	1.99	1.88	1.79
75 x 150	2.41	2.25	2.13	1.98	2.46	2.31	2.18	2.07	2.54	2.38	2.25	2.15
75 x 175	2.81	2.63	2.48	2.31	2.87	2.69	2.54	2.42	2.97	2.78	2.63	2.50
75 x 200	3.20	3.00	2.83	2.63	3.28	3.07	2.90	2.76	3.39	3.17	3.00	2.86
75 x 225	3.60	3.37	3.19	2.96	3.68	3.45	3.26	3.10	3.81	3.57	3.35	-
Minimum purlin bearing 80mm												
Imposed load: 1.02 kN/m^2 (high snow load - altitudes not exceeding 100m)												
Dead load: not more than 0.75kN/m^2 (concentrated load 0.9kN) excluding self weight of purlin												
The above values have been independently compiled for guidance table by Geomex Ltd Structural Engineers: www.geomex.co.uk												
Span tables for C16 and C24 strength class solid timber members in floors, ceilings and roofs for dwellings are available from TRADA Technology at: www.trada.co.uk/bookshop												

Guidance Table 26: Timber size and permissible clear spans for ceiling joists at 400mm spacing (Strength Class C24)

Size of Ceiling Joist Breadth x Depth (mm)	Maximum clear span (m)
47 x 97	2.00
47 x 120	2.61
47 x 145	3.29
47 x 170	3.69
47 x 195	4.64
47 x 220	5.32
Minimum ceiling joist bearing 35mm	
Imposed load: 0.25kN/m^2 (concentrated load 0.9kN)	
Dead load: 0.50kN/m^2 excluding self weight of joist	
The above values have been compiled for guidance table by Geomex Ltd Structural Engineers: www.geomex.co.uk	
Span tables for C16 and C24 strength class solid timber members in floors, ceilings and roofs for dwellings are available from TRADA Technology at: www.trada.co.uk/bookshop	

Guidance Table 27: Timber sizes and permissible clear spans for ceiling binders (Strength Class C24)

Size of Binder (mm)	Spacing of Binders (mm)					
	1200	1500	1800	2100	2400	2700
Breadth x Depth	Maximum clear span or hanger spacing (m)					
47 x 175	2.88	2.69	2.54	2.42[1]	2.32[1]	2.23[1]
47 x 200	3.33	3.11	2.93[1]	2.29[1]	2.67[1]	2.56[1]
75 x 175	3.43	3.21	3.04	2.90	2.78	2.67
75 x 200	3.95	3.70	3.50	3.33	3.19	3.07
75 x 225	4.47	4.18	3.95	3.76	3.60[1]	3.47[1]
Minimum ceiling binder bearing 60mm						
Key: [1] 120mm minimum bearing required						
Imposed load: 0.25kN/m^2 (concentrated load 0.9kN)						
Dead load: 0.50kN/m^2 excluding self weight of binder						
The above values have been independently compiled for guidance table by Geomex Ltd Structural Engineers: www.geomex.co.uk						
Span tables for C16 and C24 strength class solid timber members in floors, ceilings and roofs for dwellings are available from TRADA Technology at: www.trada.co.uk/bookshop						

Roof restraint

Roof and walls to be provided with lateral restraint straps as guidance details above

Roof insulation and ventilation gaps

Insulation to be fixed in accordance with manufacturer's details and must be continuous with the wall insulation but stopped back at eaves or at junctions with rafters to allow for a continuous 50mm minimum ventilated air gap above the insulation to underside of the roofing felt where a non breathable roofing felt is used or 15- 25mm air space to allow for sag in felt if using a breathable roofing membrane in accordance with the manufacturer's details. All guidance diagrams and details assume rafters at 400mm centers and 12.5mm vapour checked plaster board ceilings with skim finish.

Guidance Table 28: Examples of roof insulation fixed between/under rafters.

(Vented cold roof achieving a U-value of 0.18 W/m².k)

Product	**K value**	**Position in roof**
Kingspan Kooltherm K7 Pitched Roof Board and Kingspan Kooltherm K18 Insulated Plasterboard	0.020 0.021	100mm friction fixed between rafters and 42.5mm fixed under rafters, with integral vapour checked plaster board and skim finish
Kingspan Kooltherm K7 Pitched Roof Board and Kingspan Kooltherm K18 Insulated Plasterboard	0.020 0.021	100mm friction fixed between rafters and 37.5mm fixed under rafters, with integral vapour checked plaster board and skim finish*
Celotex GA4000	0.022	100mm friction fixed between rafters and 35mm fixed under rafters, with vapour checked plaster board and skim finish*
Celotex GA4000	0.022	165mm friction fixed between rafters with vapour checked plaster board and skim finish fixed to underside of rafters*
Multi foils		
Web Dynamics TLX Silver FB multi foil and Insulation with a k value of 0.022 or better	R-value 1.69 0.022	One layer of multi foil fixed under rafters With vapour checked plaster board fixed to 25mm deep battens to create air space and 75mm Kingspan or Celotex (or other approved foil faced rigid insulation) fixed between rafters allowing a 25mm cavity between the multi foil and rigid insulation*
YBS SuperQuilt multi foil and Insulation with a k value of 0.023 or better	R-value 2.71 (including both air spaces) 0.023	One layer of multi foil fixed under rafters With vapour checked plaster board fixed to 25mm deep battens to create air space and 65mm Kingspan or Celotex (or other approved foil faced rigid insulation) fixed between rafters allowing a 25mm cavity between the multi foil and rigid insulation
Key: *All unvented roofs using vapour permeable underlay.		
Notes. 1. Insulation to be installed in accordance with manufacturer's details Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control		

Guidance Table 29: Examples of roof insulation laid horizontally between and over ceiling joists

(Vented cold roof achieving a U-value of 0.16 W/m².k)

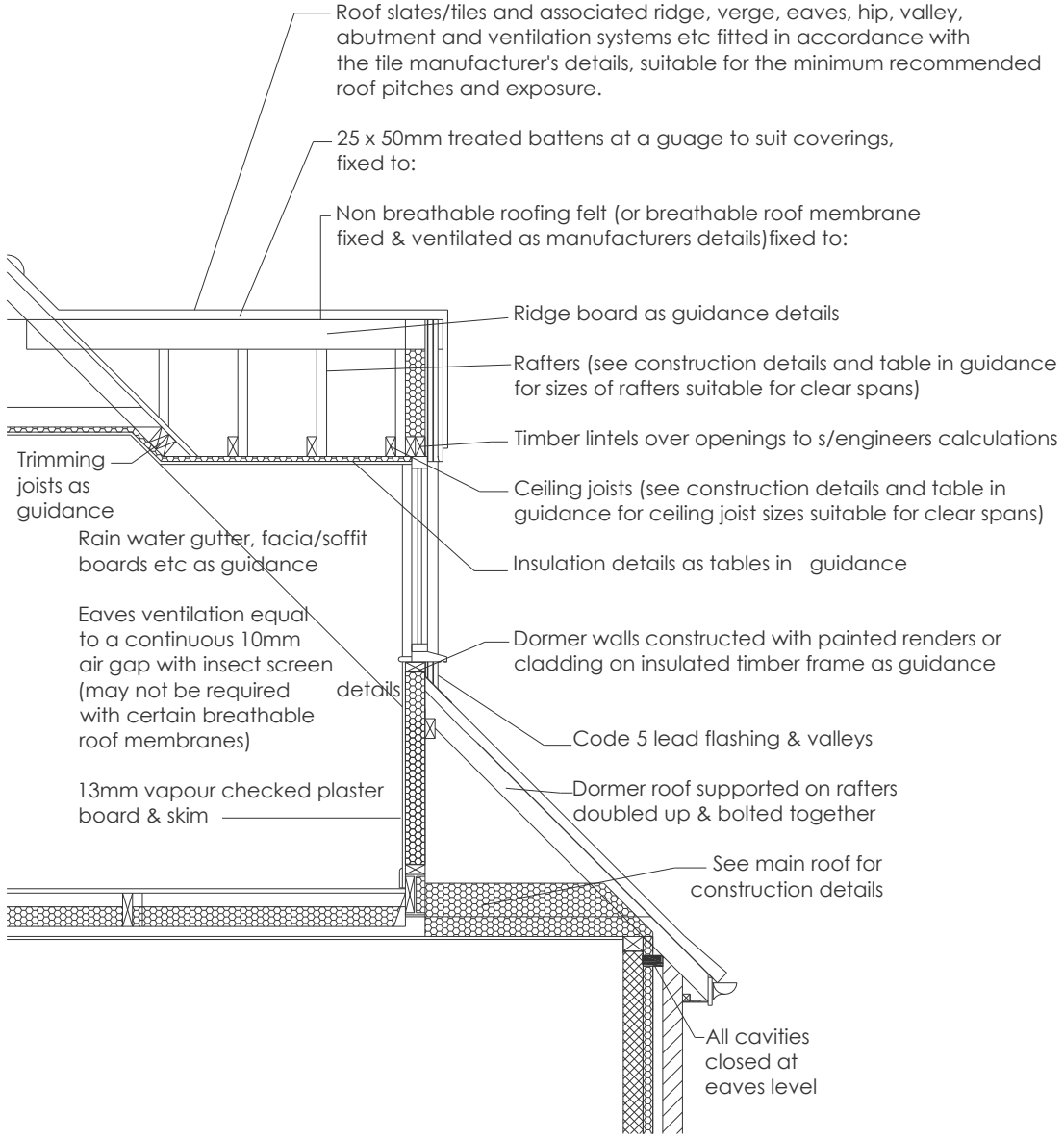
Product	K value	Position in roof
Earthwool Loft Roll 44	0.044	100mm between joists and 170mm laid over joists
Rockwool Roll	0.044	100mm between joists and 170mm laid over joists
Earthwool Loft Roll 44 and Polyfoam Space Boards	0.044 0.029	100mm between joists and 2 layers 52.5mm Space Boards fixed over joists and over laid with 18mm floor boards
Notes. 1. Insulation to be installed in accordance with manufacturer's details Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control		

Guidance Table 30: Examples of roof insulation fixed over/between rafters

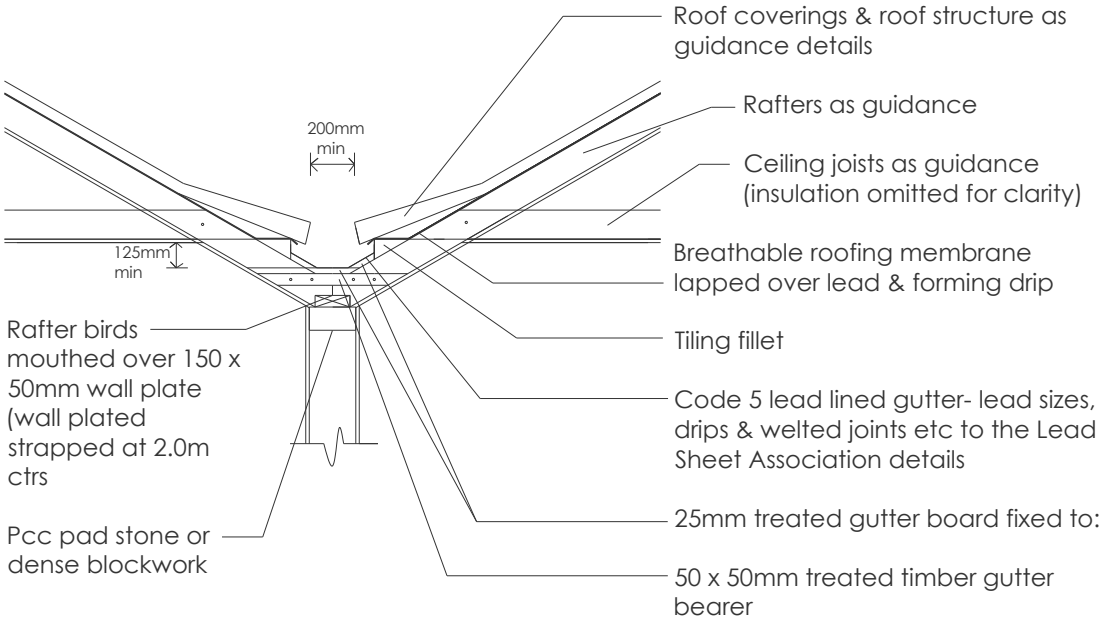
(Warm roof achieving a U-value of 0.18 W/m².k)

Product	K -Value	Position in roof
Kingspan Kooltherm K7 Pitched Roof Board	0.020	100mm fixed over rafters with breathable membrane, for example Kingspan Nilvent fixed beneath counter battens* **or** 90mm fixed over rafters with breathable membrane fixed over counter battens*
Kingspan Kooltherm K7 Pitched Roof Board	0.020	55mm fixed over rafters and 50mm fixed between rafters with breathable membrane, for example Kingspan Nilvent fixed beneath counter battens* **or** 50mm fixed over rafters and 50mm fixed between rafters with breathable membrane fixed over counter battens*
Celotex GA4000	0.022	100mm fixed over rafters with breathable membrane*
Celotex GA4000	0.022	60mm fixed over rafters and 60mm fixed between rafters with breathable membrane*
Key: *All unvented roofs using vapour permeable underlay.		
Notes: 1. insulation fixed over the roof should be carried out in accordance with insulation manufacturer's details which may require specialist fixings for the build-up of insulation, battens/ counter battens and breathable membrane positions required. Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control		

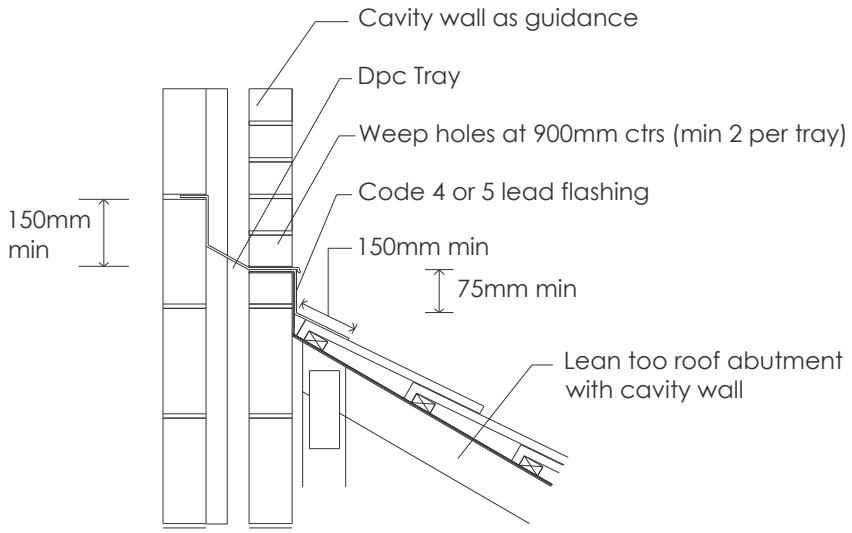
Guidance Diagram 34: Typical section through a dormer roof (not to scale)



Guidance Diagram 35: Typical roof valley detail (not to scale)



Guidance Diagram 36: Typical lean too roof abutment with cavity wall detail (section detail not to scale)



Pitched roof ventilation requirements when using a non breathable roof membrane

(i) Duo pitched roof with horizontal ceilings and insulation at ceiling level
Roof insulation to be continuous with the wall insulation but stopped back at eaves or at junctions with rafters to allow a 50mm minimum air gap. Cross ventilation is to be provided by either proprietary facia ventilation strips or soffit vents to opposing sides of roof at eaves level and fitted with an insect grill with a ventilation area equivalent to a 25mm continuous gap for roof pitches below 15^{o} or a 10mm gap for roof pitches above 15^{o}.

When the roof span is more than 10 metres or when the pitch is more than 35^{o}, provide additional high level ventilated openings equivalent to a continuous 5mm air gap at ridge level to cross ventilate roofs using proprietary dry ridge systems or vent tiles spaced and fixed in accordance with tile manufacturer's details.

(ii) Mono pitched roofs with horizontal ceilings and insulation at ceiling level
Roof insulation to be continuous with the wall insulation but stopped back at eaves or at junctions with rafters to allow a 50mm minimum air gap. Cross ventilation is to be provided by either proprietary facia ventilation strips or soffit vents at eaves level and fitted with an insect grill with a ventilation area equivalent to a 25mm continuous gap for roof pitches below 15^{o} or a 10mm gap for roof pitches above 15^{o}.

Provide high level ventilated openings fitted with an insect grill equivalent to a continuous 5mm air gap to cross ventilate roofs using proprietary ventilation systems or vent tiles spaced and fixed in accordance with tile manufacturer's details.

(iii) Duo pitched roof with insulation following slope of rafters (rooms in the roof)
Roof insulation to be continuous with the wall insulation but stopped back at eaves or at junctions with rafters to allow a continuous 50mm air gap between the top of the insulation and underside of the roof membrane. Cross ventilation to be provided by a proprietary eaves ventilation strips equivalent to a 25mm continuous air gap to opposing sides of roof at eaves level, fitted with insect grill and at ridge/high level to provide ventilation equivalent to a 5mm air gap in the form of proprietary dry ridge system or vent tiles spaced and fixed in accordance with tile manufacturer's details.

Proprietary vapour permeable roof membrane

Ventilation to the roof space may be omitted, only if a proprietary British Board of Agreement (BBA or other third party accredited) vapour permeable breathable roof membrane is used. Vapour permeable breathable roof membranes must always be installed in strict accordance with manufacturer's details (note. some breathable membranes may also require additional roof ventilation in accordance with manufacturer's details)

Valleys and lead work

Lead work, flashing, soakers, valleys and gutters, etc, to be formed from Code 5 lead sheet and fully supported on treated valley boards, etc, and to have a minimum 150mm lap joints, dressed 200mm under tiles, etc, and not to be fixed in lengths exceeding 1.5m and to be fixed in accordance with the roof cladding manufacturer's and the Lead Sheet Association recommendations.

Lofts hatches, doors and Light wells to roof spaces

All hatches, doors and light wells in the roof space to be insulated to the same standard as the roof, draft stripped and positively fixed.

A7: Flat roof construction

4 options as follows:

Option 1. Flat roof with 'cold deck'
The insulation layer is placed at ceiling level with an air space between the top of the insulation and underside of the deck, ventilated to external air on opposing sides and should only be considered for timber structural decks as detailed in the guidance diagram below. (note: due to the technical difficulties in achieving the required levels of insulation between roof timbers and the associated risks of condensation within the 'cold roof' and at thermal bridges, a flat roof with a 'warm deck' is the preferred option).

Waterproof covering to be either:

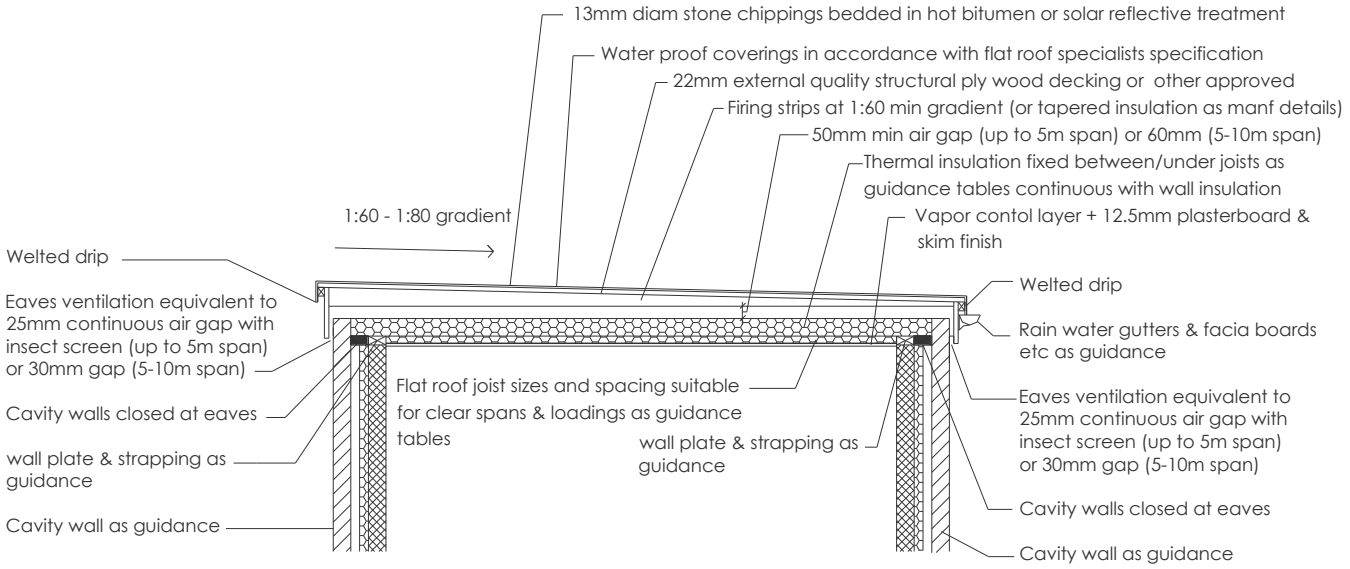
- 3 layers of high performance felt (hot bonded together with bitumen) to a current BBA Certificate in compliance with BS 8217
- Single layer system with a current BBA or WIMLAS Certificate
- Glass reinforced plastic (GRP) system with a current BBA or other approved accreditation
- Rolled lead sheet fixed in compliance with the Lead Sheet Associations publication 'Rolled Lead Sheet- The Complete Manual' obtainable from: www.leadsheet.co.uk
- Mastic asphalt fixed in accordance with the Mastic Asphalt Councils technical guides and specifications obtainable from: www.masticasphaltcouncil.co.uk

Waterproof covering to be fixed by a flat roofing specialist in accordance with manufacturer's details typically onto a timber deck as follows:

- 18 - 22mm thick external quality plywood decking or similar approved laid to 1:60 minimum gradient using firing strips at spacing to match joists, fixed onto:
- Timber flat roof joists constructed of kiln dried structural grade timber with sizes and spacing suitable for the proposed clear span in compliance with independent span table below or see TRADA Span Tables.
- Flat roof covering (excluding lead and areas used for habitable use) to have a surface finish of bitumen bedded stone chippings covering the whole surface to a depth of 12.5mm to achieve a class AA (or B (t4) European class) fire rated designation for surface spread of flame
- Restrain flat roof to external walls by the provision of 30 x 5 x 1000mm lateral restraint straps at maximum 2000mm centers fixed to 100 x 50mm wall plates and internal wall faces.
- Insulation to be fixed between/under joists in compliance with the guidance table below and is to be continuous with the wall insulation. Fix 12.5mm vapour checked plaster board (unless plaster board is integral with the insulation) and 3mm skim to underside of joists
- Eaves ventilation- provide cross ventilation to each and every void of the flat roof by installing eaves ventilation on opposing sides (fitted with insect grills) equivalent to a continuous 25mm gap up to 5m span or 30mm gap for 5-10m span.
- Ventilated air space over roof- provide an unrestricted ventilated air space between the top of the insulation and underside of the complete roof deck at not less than 50mm for up to 5m spans and not less than 60mm for 5-10m spans.

Flat roofs with unlimited access/habitable use
Flat roof with unlimited access to have proprietary non slip finishes/tiles in accordance with manufacturer's details and suitable protection from falling in accordance with guidance details and Approved Document K.

Guidance Diagram 37: Typical section through a flat roof with 'cold deck' (not to scale)



Guidance Table 31: Examples of 'cold roof' insulation fixed between/under flat roof joists
(Vented 'cold roof' achieving a U-value of 0.18 W/m².k)

Product	K -Value	Position in roof
Kingspan Thermapitch TP10	0.022	185mm (105 + 80mm) friction fixed between joists
Kingspan Thermapitch TP10 and Kingspan Kooltherm K18 Insulated Plasterboard	0.022 0.021	120mm friction fixed between joists and 37.5mm fixed under rafters, with integral vapour checked plaster board and skim finish
Celotex XR4000	0.022	185mm friction fixed between joists **or** 125mm friction fixed between joists and 25mm fixed under joists, with 12.5mm vapour checked plaster board and 3mm skim finish
Jablite Premium Board	0.030	220mm friction fixed between joists **or** 150mm between joists and 50mm fixed under joists with 12.5mm vapour checked plaster board and 3mm skim finish

Notes: 1. The joist depth must be sufficient to maintain a 50mm air gap above the insulation and cross ventilation to be provided on opposing sides by a proprietary ventilation strip equivalent to a 25mm continuous gap at eaves level with insect grill for ventilation of the roof space.
2. All specifications assume 50mm wide joists at 400mm centers with 12.5mm vapour checked plaster board and 3mm skim finish. 3. Insulation to be installed in accordance with manufacturer's details
Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control

Option 2. Flat roof with 'warm deck'

The insulation layer is placed above the roof deck, but below the weatherproof membrane and normally there should be no insulation below the deck unless it is British Board of Agreement (BBA or other third party) accredited. Ventilation of the roof is not required as the insulation is fixed/bedded on an approved vapour control layer. Warm roofs can be used above timber structural decks as detailed in the guidance diagram below, and is also suitable for concrete and metal structural decks, in accordance with a flat roof specialists design for the particular project.

Waterproof covering to be either:

- 3 layers of high performance felt (hot bonded together with bitumen) to a current BBA Certificate in compliance with BS 8217
- Single layer system with a current BBA or WIMLAS Certificate
- Glass reinforced plastic (GRP) system with a current BBA or other approved accreditation
- Rolled lead sheet fixed in compliance with the Lead Sheet Associations publication 'Rolled Lead Sheet- The Complete Manual' obtainable from: www.leadsheet.co.uk
- Mastic asphalt fixed in accordance with the Mastic Asphalt Councils technical guides and specifications obtainable from: www.masticasphaltcouncil.co.uk

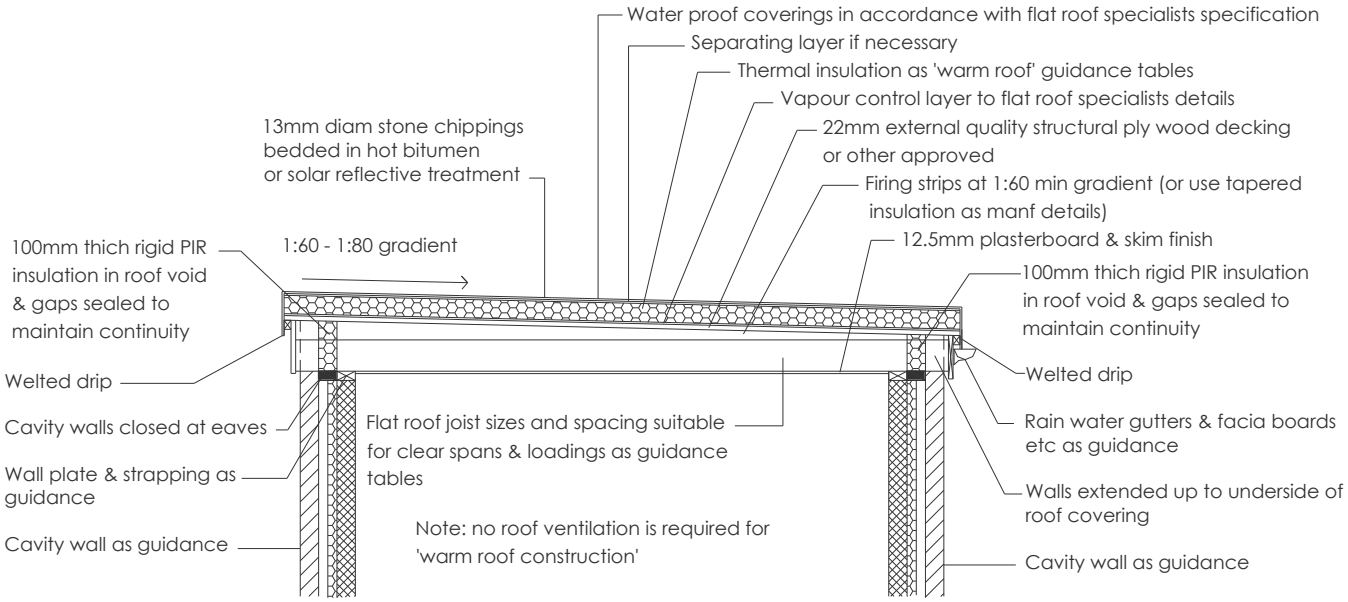
Waterproof covering to be fixed by a flat roofing specialist in accordance with manufacturer's details typically onto a timber deck as follows:

- Waterproof coverings to be fixed on to a separating layer where necessary and on to:
- Roof insulation layer in compliance with the guidance table below, fixed/bonded to an approved vapour control layer (fully supported by the roof deck in accordance with the manufacturer's details) on to:
- 18 - 22mm thick external quality plywood decking or similar approved laid to 1:60 minimum gradient using firing strips at spacing to match joists, fixed onto:
- Timber flat roof joists constructed of kiln dried structural grade timber with sizes and spacing suitable for the proposed clear span as annotated on the drawing or in compliance with the independent span table below or see TRADA Span Tables.
- Flat roof covering (excluding lead and areas accessible for habitable use) to have a surface finish of bitumen bedded stone chippings covering the whole surface to a depth of 12.5mm to achieve a class AA (or B (t4) European class) fire rated designation for surface spread of flame
- Restrain flat roof to external walls by the provision of 30 x 5 x 1000mm lateral restraint straps at maximum 2000mm centers fixed to 100 x 50mm wall plates and internal wall faces.
- Fix 12.5mm vapour checked plaster board and 3mm skim to underside of joists

Flat roofs with unlimited access/habitable use

Flat roof with unlimited access to have proprietary non slip finishes/tiles in accordance with manufacturer's details and suitable protection from falling in accordance with guidance details and Approved Document K.

Guidance Diagram 38: Typical section through a flat roof with 'warm deck' (not to scale)



Guidance Table 32: Examples of 'warm roof' insulation fixed above flat roof joists
(Non vented 'warm roof' achieving a U-value of 0.18 W/m².k)

Product	**K -Value**	**Insulation fixed above deck**
Kingspan Thermaroof TR26 LPC/FM (use with mechanically fixed single ply membranes)	0.022	110mm fixed using telescopic tube fixings
Kingspan Thermaroof TR27 LPC/FM (use with bonded or mechanically fixed to substrate – finish with 3 layer partially bonded built up felt, mastic asphalt or single ply membrane and approved liquid applied systems)	0.024	120mm
Celotex TD4000 (use with mechanically fixed single ply membrane or 3 layers built up felt. Note: 12mm additional ply layer required for single ply membranes)	0.022	126mm
Knauf Polyfoam Roofboard Standard (use with single ply membrane only) with timber deck	0.035	180mm
Knauf Rocksilk Krimpact Flat Roof Slab (use with bonded fixing over a plywood deck- finished with 3 layer built up felt, mastic asphalt or single ply membrane)	0.038	185mm
Jablite Jabdec(use with bonded fixing over a plywood deck- finished with 3 layer built up felt, mastic asphalt or single ply membrane	0.035	183mm (with mechanical fixings) 163mm (without mechanical fixings)

Notes: 1. Where composite deck insulation is to be used with a single ply membrane - ensure the conditions of use of the membrane are met. It may be necessary to use an additional layer of 12mm external quality structural plywood above the insulation to meet the conditions of use. 2. All specifications assume 50mm wide joists at 400mm centers with 12.5mm vapour checked plaster board and 3mm skim finish fixed to underside of joists 3. Insulation to be installed in accordance with manufacturer's details

Source: A representative selection of values taken from *Technical Note 10, U-values of Elements (Approved Document L1B2010)* produced by Hertfordshire Technical Forum for Building Control. Reproduced by kind permission of Hertfordshire Technical Forum for Building Control

Option 3. Flat roof with inverted 'warm deck' (insulation on top of waterproof coverings)
Typically constructed as a ballast layer, over a filter layer, over insulation layer, over water proof coverings/ vapour control layer and structural deck, designed and constructed by a flat roofing specialist. Not covered by this guidance.

Option 4. Flat roof with green roof on 'warm deck' (Either intensive or extensive)

Intensive green roof
Typically constructed with vegetation in 1.0m deep soil layer,over filter layer, over drainage/ reservoir layer, over protective layer, over root barrier, over water proof coverings/ vapour control layer and structural deck, designed and constructed by a flat roofing specialist. Not covered by this guidance.

Extensive green roof
Typically constructed with Sedum blanket, over filter layer, over root barrier, over water proof coverings/ vapour control layer and structural deck, designed and constructed by a flat roofing specialist. Not covered by this guidance.

The design, workmanship and selection of materials for flat roofs

The design, workmanship and selection of materials should comply with Model Specification Sheet P.L.1 Built-Up Roofing: Plywood Deck, published by The British Flat Roofing Council. Metallic roof trims to be of non-corrodible material and resistant to sunlight and not fixed through the water proof covering. All timber to be treated using CCA vacuum/pressure or O/S double vacuum to BS 5268:5, including all cut ends of timber etc 300mm of any joint.

All flat roofing works to be carried out by a specialist flat roofing contractor and all materials etc to be fitted in compliance with manufacturer’s details. Work should not be carried out during wet weather or when the deck has not fully dried out. A vapour control barrier is required on the underside of the roof below the insulation level, (typically 500g polythene or foil backed plaster board). Fix 12.5mm plasterboard (joints staggered) and 5mm skim coat of finishing plaster to the underside of all ceilings using galvanized plasterboard nails.

Flat roof to be carried out as detailed on the drawings. Moisture content of timber should not exceed 20% and to be kiln dried and grade C24. Workmanship to comply to BS 8000:4. All fixings to be proprietary stainless steel or galvanized steel.

Cavity closers
Proprietary British Board of Agreement (BBA or other third party accredited) acoustic/thermally insulated/fire resistant cavity closers, or similar are to be provided to all cavity openings/closings, tops of walls and junctions with other properties in accordance with manufacturer's details.

Tops of cavity walls can be closed to prevent the passage of fire using a proprietary British Board of Agreement (BBA or other third party accredited) 30 minutes fire resistant rigid board, fixed in accordance with manufacturer's details.

Guidance Table 33: Timber sizes and permissible clear spans for joists for flat roofs - with access and use for maintenance and repairs only (Strength Class C24)

Size of joist (mm)			Spacing of joist (mm)		
			400	450	600
Breadth	x	Depth	Maximum clear span (m)		
47	x	97	1.97	1.93	1.83
47	x	120	2.57	2.51	2.37
47	x	145	3.22	3.15	2.95
47	x	170	3.88	3.78	3.45
47	x	195	4.51	4.34	3.95
Minimum flat roof joist bearing 40mm					
Key: [1] 80mm minimum bearing required					
Imposed load: 1.02 kN/m^2 (high snow load - altitudes not exceeding 100m)					
Dead load: not more than 0.75kN/m^2 (concentrated load 0.9kN) excluding self weight of joists					
The above values have been independently compiled for guidance table by Geomex Ltd Structural Engineers: www.geomex.co.uk					
Span tables for C16 and C24 strength class solid timber members in floors, ceilings and roofs for dwellings are available from TRADA Technology at: www.trada.co.uk/bookshop					

Guidance Table 34: Timber sizes and permissible clear spans for joists for flat roofs - with unlimited access (Strength Class C24)

Size of joist (mm)			Spacing of joist (mm)		
			400	450	600
Breadth	x	Depth	Maximum clear span (m)		
75	x	120	2.50	2.46	2.37
75	x	145	3.20	3.15	3.02
75	x	170	3.91	3.85	3.65
75	x	195	4.63	4.55	4.17
Minimum flat roof joist bearing 40mm					
Imposed load: 1.5 kN/m^2 (high snow load - altitudes not exceeding 100m)					
Dead load: not more than 0.75kN/m^2 (concentrated load 2 kN) excluding self weight of joists					
The above values have been independently compiled for guidance table by Geomex Ltd Structural Engineers: www.geomex.co.uk					
Span tables for C16 and C24 strength class solid timber members in floors, ceilings and roofs for dwellings are available from TRADA Technology at: www.trada.co.uk/bookshop					

A8: Mortars, renders and gypsum plasters

Cement mortars and renders

Guidance Table 35: Cement mortar - general mix ratio

	Cement: sand with plasticiser (mix ratio by volume)	
Wall construction	**Sheltered**	**Exposed**
Hard durable materials[1and2]	1 : 5 - 6	1 : 3 - 4
Moderately hard materials[1and2]	1 : 7 - 8	1 : 5 - 6
Soft weak materials	See notes 1, 2 and 3	See notes 1, 2 and 3

Notes: 1. If sulphates are present in the ground- use sulphate resisting cement. 2. Retaining walls and 3 storey mortar mix to be designed by suitably qualified person i.e. structural engineer. 3. Mortar mix is to be specified by a suitably qualified and experienced specialist- suitable for the type of wall material and degree of exposure.

Guidance Table 36: Cement render - general mix ratio

Wall construction	**Exposure**	**Cement: sand with plasticiser (mix ratio by volume)**	
		Under coat	**Top coat with smooth float finish**
Hard durable materials	Severe	1 : 3 - 4	1 : 5 - 6
	Sheltered/moderate	1 : 3 - 4	1 : 5 - 6
Moderately hard materials	Severe	1 : 5 - 6	1 : 5 - 6
	Sheltered/moderate	1 : 5 - 6	1 : 7 - 8
Soft weak materials	Severe	See note 1	See note 1
	Sheltered/moderate	See note 1	See note 1

Notes: 1. Mortar mix is to be specified by a suitably qualified and experienced specialist, suitable for the type of backing wall material and degree of exposure, in accordance with the manufacturer's details.

Guidance Table 37: Thickness of render coats

Application	**type of coat**	**Thickness**	**Notes**
External render	Dubbing out	16mm max	
	Under coat	10mm	Comb scratched for key
	Top coat	10mm	Smooth float finish

Notes: 1. Thickness of render coats to be specified by a suitably qualified and experienced specialist, in accordance with the manufacturer's details.

Gypsum plasters

Guidance Table 38: Gypsum plaster for internal finishes - general mix ratio

Background[1]	**Gypsum plaster**[1]	
	Under coat[1]	**Final coat (smooth finish)**[1]
New masonry walls	Bonding coat - 11mm thick	Finish coat - 3mm thick
Existing masonry walls	Renovation plaster bonding coat- 11mm thick	Renovating plaster finish coat - 3mm thick
New plaster board	New plaster board	3mm thick board finish plaster

1. Preparation of walls, product suitability, application, and protection of gypsum plaster to be specified by a suitably qualified and experienced specialist, in accordance with the manufacturer's details suitable for the type of backing wall material.

Part B: Fire safety and means of escape

Please refer fully to Approved Document B: Volume 1: Fire safety in dwelling houses (2006 edition with 2010 & 2013 amendments);

Contents

Fire detection and fire alarm systems
- (i) New houses and extensions
- (ii) Large houses

Means of escape
- Ground storey in dwellings
- Two storey dwelling with a floor not more than 4.5m above ground level
- Three storey dwellings with one upper floor more than 4.5m above ground level
- Option 1: Protected stairway
- Option 2: Fire separated 3rd storey with alternative external/internal fire exit

General provisions for means of escape
- Fire doors to protected stairway enclosures
- Protected stairway enclosures
- Limitations on the use of un-insulated glazed elements
- Fire resistance to upper floors and elements of structure
- Means of escape windows and external doors
- Galleries
- Basements
- Passenger lifts
- Replacement windows (excludes repairs)
- Fire separation between an integral garage and dwelling
- Protection of openings, fire stopping and cavity barriers
- Fire resistance of areas adjacent to external fire exit stairs
- Circulation systems in houses with a floor more than 4.5m above ground level.
- Residential sprinkler systems for means of escape
- Guidance Table 39: Internal surface spread of flame: Classification of wall and ceiling linings

Fire resistance to elements of structure
- Guidance Table 40: Fire resistance to common elements of structure etc

External wall construction in relation to a boundary

Compartment walls and floors separating buildings

Permitted building openings in relation to a boundary:
- Openings within 1.0m of a boundary
- Openings more than 1.0m from a boundary
- Guidance Table 41: Permitted unprotected areas in relation to a relevant boundary

Designation of roof covering and minimum distance to boundary
- Guidance Table 42: Limitations on designation of roof coverings and minimum distance to boundary

Typical fire and rescue service vehicle access route specification for dwellings

Part B: Fire safety and means of escape

Fire detection and fire alarm systems

Self contained mains operated smoke alarms with battery backup to BS EN 14604 or BS 5446, and fire alarm systems to be installed in accordance with BS 5839 to the following standards:

(i) New houses and extensions: Grade D Category to a LD3 standard
Self contained mains operated smoke alarms with battery backup to BS EN 14604 or BS 5446, to be installed in accordance with the relevant recommendations of BS 5839 Part 6: 2004 as follows:

- in all circulation areas at each storey level that form part of the escape route from the dwelling
- within 7.5m of all doors to habitable rooms.
- sited at least 300mm from walls and light fittings
- interconnected together
- Heat alarms to be installed in kitchens if the kitchen is open to the stairway or circulation area (in two storey dwellings).

(ii) Large houses - which has more than 1 storey and any of those storeys exceed 200m^2 as follows:

a. Large 2 storey house (excluding basement) - Grade B Category to a LD3 standard

- Fire detection and alarm system comprising fire detectors (other than smoke/heat alarms), fire alarm sounders and control and indicating equipment to either BS EN 54-2 (and power supply to BS EN 54-4), or to Annex C of BS 5839: Pt.6
- Detection system to be installed in all circulation areas at each storey level that form part of the escape route from the dwelling

b. Large 3 storey house (excluding basements) - Grade A Category to a LD2 standard (smoke/heat alarms sited in accordance with BS 5839-1 for a Category L2 system)

- Fire detection and alarm system incorporating control and indicating equipment to BS EN 54-2, and power supply to BS EN 54-4, installed to BS 5839: Pt.1 with some minor exceptions
- Detection system to be installed in all circulation spaces that form part of the escape routes from the dwelling, and in all rooms or areas that present a high risk of fire.

Means of escape

Ground storey in dwellings
Except for kitchens, all habitable rooms in the ground storey should either:
(i) open directly onto a hall leading to the entrance or other suitable exit; or
(ii) be provided with a means of escape window (or door) in compliance with the guidance details below.

Two storey dwelling with a floor not more than 4.5m above ground level
Habitable rooms in the first floor storey served by only one stairs should either:
(i) be provided with a means of escape windows (or doors) in compliance with the guidance details below; or
(ii) provided with direct access to a protected stairs as described in three storey buildings guidance below.

Three storey dwellings with one upper floor more than 4.5m above ground level
The dwelling house may either have a protected stairs as described in option 1 below or the top floor can be separated and given its own alternative escape route as described in option 2 below. Alternatively, where the fire safety requirements of the building regulations cannot be met, a sprinkler system may be allowed against the requirements of Approved Document B as described in the guidance below. **Important note:** The options below need not be followed if the dwelling house has more than one internal stairway, which affords an effective alternative means of escape in two directions and are physically separated from each other (to be approved by building control).

Option 1: Protected stairway
The stairs, landings and hallway from the top storey down to the ground floor must be protected and enclosed in 30-minute fire resisting construction and the doors fitted with FD 20 fire doors (as detailed below), the protected stairs must discharge directly to an external door at ground level or the protected stairs can give access to at least two escape routes and final exits separated by 30 minutes fire resisting construction at ground level. Note: Toilets and bathrooms onto the protected stairs do not require fire doors providing the partitions between the toilet/bathroom and the rooms onto the stairs has 30 minutes fire resistance from both sides and there is no heat producing appliances fitted in the toilet/bathroom. All cupboards onto the stairs will require FD 20 fire doors.

Option 2: Fire separated 3rd storey with alternative external/internal fire exit
The top 3rd storey should be separated from the lower storeys by 30 minute fire resisting construction and provided with an alternative escape route leading to its own final exit. Fire resistance of areas adjacent to external stairs are detailed in the guidance below.

General provisions for means of escape

Fire doors to protected stairway enclosures
Fire doors to protected stairway enclosures to be FD 20 fire resisting door-sets having 20 minutes fire resistance (fire resistance must be from both sides) to BS 476-22:1987, fitted with intumescent strips rebated around sides and top of door or frame, excludes toilets/bathrooms/en-suite-providing the partitions protecting the stairs has 30 minutes fire resistance from both sides. (Note: a self-closing FD30 fire door is required between the dwelling/garage in accordance with the guidance details below)

Existing/new solid hardwood/timber doors may achieve 20 minutes fire or doors may be suitable for upgrading to achieve 20 minutes fire resistance (as agreed with building control) with a proprietary intumescent paint/paper system in accordance with manufacturer's details. More details are available from: www.fireproof.co.uk, who can supply (and apply where required) an intumescent paint/paper system which must be applied in accordance with the manufacturer's details. A copy of the manufacturer's certificate of purchase/ application must be provided for building control on completion. Upgraded doors/frames to be fitted with intumescent strips as detailed in the guidance above.

Protected stairway enclosures
To have 30 minutes fire resisting construction from both sides, constructed in accordance with partition wall details in Part A of this guidance

Limitations on the use of un-insulated glazed elements
Limitations on the use of un-insulated glazed elements on escape routes to be in compliance with Table A4 of Approved Document B: Volume 1- Dwelling Houses. (un-insulated refers to the fire insulation value of the glazing (normally 30 minutes) and not the thermal insulation value)

Fire resistance to upper floors and elements of structure
Upper floors to have 30 minutes fire resisting construction from the underside, constructed in accordance with upper floor details in Part A of this guidance, other elements of structure to have fire resistance in compliance with the guidance table below.

Means of escape windows and external doors
Means of escape windows to be fitted with proprietary hinges to open the window to the minimum required clear width of 450mm. Escape windows must have minimum clear opening casement dimensions of 0.33m² (typically 450mm wide x 750mm high), with the opening located between 800-1100mm above floor level to all bedrooms and habitable rooms at first floor level and inner habitable rooms on the ground floor level. (roof window openings may be acceptable 600mm above floor level subject to approval by building control)

The means of escape window or door should lead to a place of safety away from the fire. A courtyard or back garden from which there is no exit other than through other buildings would have to be at least as deep as the dwelling house is high to be acceptable as detailed in Par 2.8 (b) and Diagram 4 of ADB V1.

Windows above the ground floor storey and within 800mm of floor level are to be provided with containment/ guarding/ proprietary catches which should be removable (child proof) in the event of a fire. Where an escape window cannot be achieved, direct access to a protected stairs (or protected route to inner rooms) is acceptable in compliance with guidance details above for 3 storey buildings and ADB V1par 2.6 (a) or (b).

Windows should be designed to remain in the open position whilst making an escape

Locks (with or without removable keys) and stays may be fitted to escape windows, subject to the stay being fitted with a release catch which is child resistant.

Galleries
A gallery floor providing a raised area or platform around the sides or at the back of a room (to provide extra space) should be provided with:

- an alternative exit or,
- where the gallery floor is not more than 4.5m above ground level, a means of escape window in accordance with guidance details above.

Where a gallery is not provided with an alternative exit or means of escape window, it should comply with the following requirements (see Diagram 5 of ADB V1 for full details):

- the gallery should overlook at least 50% of the room below;
- the distance between the foot of the access stairs to the gallery and the door to the room containing the gallery should not exceed 3m;
- the distance from the head of the access stairs to any point on the gallery should not exceed 7.5m and;
- any cooking facilities within a room containing a gallery should either:
  (i) be enclosed in fire resisting construction; or
  (ii) be remote from the stair to the gallery and positioned such that they do not prejudice the escape from the gallery

Basements
If the basement storey is served by a single stairway and contains a habitable room, the basement should be either fitted with a means of escape window or door in compliance with this guidance or a protected stairs leading from the basement to the final exit in compliance with guidance details for 3 storey buildings. Fire resistant glazing in protected routes is to be in compliance with Table 4 of ADB V1

Passenger lifts
Lifts installed in dwellings with a floor more than 4.5m above ground level should either be located within the enclosures to the protected stairway or contained in a 30 minute fire resisting lift shaft in accordance with lift manufacturer's details.

Replacement windows (excludes repairs)
The replacement window opening should be sized to provide at least the same potential for means of escape as the window it replaces, or
where the original window is larger than necessary for purposes of means of escape, the window opening could be reduced down to the minimum specified in this guidance for means of escape windows. Cavity barriers should be provided around windows where necessary and the window should also comply with the requirements of Parts L and N in this guidance.

Fire separation between an integral garage and dwelling
The wall and any floor between an integral garage and the dwelling house is to be constructed as a compartment wall/floor to give 30 minutes fire resistance from both sides of the wall and taken up to the ceiling/roof level and fire stopped with mineral wool. Any door between the house and garage is to be fitted with; a FD30 fire door in compliance with BS476-22:1987; proprietary mechanical self-closers; intumescent strips and smoke seals. The garage floor should be laid to falls to allow fuel spills to flow away from the fire door to the outside, alternatively, the door opening should be positioned at least 100mm above the garage floor level as detailed in the guidance diagram below. Fire resistant glazing is to be in compliance with Table 4 of ADB V1

Protection of openings, fire stopping and cavity barriers
Upvc pipes passing through compartment walls/floors should not exceed an internal diameter of 110mm and should either be fitted a proprietary intumescent collar at the wall/floor junction or enclosed throughout the pipe length with 30 minutes fire resisting construction (typically soft wood framing fixed around pipe work, packed with acoustic quilt with 12.5mm plaster board and skim finish or 2x layers plaster board with staggered joists). Other pipe materials and pipe sizes to be in compliance with Table 3 of ADB V1.

30 minute fire resisting ceiling should be provided between a protected stairway and roof void in a dwelling house with a floor more than 4.5m above ground level. Alternatively if the stairway extends through the roof void up to the roof level, a 30 minute fire resisting cavity barrier or wall should separate the stairway from the roof space.

Fire resistance of areas adjacent to external fire exit stairs
The external stairs must not be within 1.8m of any unprotected opening at the side of the stairs, and no openings are permitted below the stairs- unless the opening is fitted with 30 minute fire resisting glass and proprietary bead system and is permanently sealed shut (subject to adequate ventilation requirements for the room) as detailed in the guidance diagram below.

Circulation systems in houses with a floor more than 4.5m above ground level.
Where ventilation ducts pass through compartment walls into another building, follow the guidance in ADB2.

Air circulation systems which circulate air within an individual dwelling house should be designed to prevent smoke and fire spread into a protected stairs as follows:

- No air transfer grills to be fitted in any walls, floors or ceilings to the protected stairs
- Ducts passing through protected stairs or entrance hall to be constructed of rigid steel and all joints between the duct work and the enclosure fire stopped
- Ventilation ducts serving protected stairs should not serve other areas
- Ventilation systems serving protected stairs and other areas should be designed to shut
- down on detection of smoke within the system
- A room thermostat for a ducted warm air system should be mounted in a living room 1370-1830mm above floor and set at 27degrees maximum.

Residential sprinkler systems for means of escape

Where fire safety requirements of the building regulations cannot be met, the proposals for fire engineered solutions which may incorporate a sprinkler suppression system as part of the solution can be allowed against the requirements of ADB where a risk assessment has been carried out by a suitably qualified and experienced fire engineer and approved by building control before works commence on site. The residential sprinkler system is to be designed and installed to BS 9251: 2014, which should carry third party accreditation from the installing contractor and which must be approved by Building Control before works commence on site.

In three storey dwellings where the stairs discharges into a habitable open plan area, a partial sprinkler installation to the whole of all connected open plan areas may be used. Fire separation of the route will be required from the upper floor from this open plan area with a 30 minute fire resisting partition and FD20 fire door fitted with intumescent strips. Instead of the separation it may be possible to fully sprinkler the whole dwelling and retain the open plan arrangement with the agreement of building control.

(An alternative solution to the open plan arrangement effecting the means of escape as detailed above is to link delayed operating automatic opening vent (AOV) designed to be opened by an electronic sprinkler control panel available from Fire Sprinkler supply Ltd 0115 9408221).

With the agreement of the building control, it should be possible to reduce fire protection throughout the dwelling by 30 minutes with the introduction of a full sprinkler installation. Where dwellings are unable to meet the requirements for access and facilities for the fire service under Section 5 of ADB V1, it should be possible to install a full sprinkler installation as a compensatory measure with the agreement of the building control.

In Wales, all new dwellings will require a full sprinkler system designed and installed in accordance with BS:9251:2014, and offering third party accreditation from the installing company to all habitable parts of any dwelling, excluding unused roof voids, cupboards under 2m2 and bathrooms under 5m2 from April 2016. This does not remove the requirement to separate a second floor (or more floors) from an open plan to the stairwell ground floor arrangement, where the AOV system noted above may be considered as a design solution.

For further information on sprinkler systems contact Keith Rhodes of Nationwide Fire Sprinklers at http://www.nationwidefiresprinklers.co.uk/index.html ; The British Automatic Sprinkler Association (BAFSA)- *Sprinklers for Safety: Use and Benefits of Incorporating Sprinklers in Buildings and Structures (2006) ISBN: 0 95526 280 1. See also: www.bafsa.org.uk ; see also ISBN 0-9552628-3-6 technical guidance note no.1; see also www.firesprinklers.org.uk*
(Revised by Keith Rhodes April 2015)

Surface spread of flame: internal wall and ceiling linings including roof lights

Surface spread of flame over internal wall or ceiling finishes to be in compliance with product manufacturer's details in compliance with BS 476 -7:1997 (as amended). Please refer to Section 3: Wall and ceiling linings of ADB V1 for full details.

Guidance Table 39: Internal surface spread of flame: Classification of wall and ceiling linings See Table 1 of ADB V1 for full details.

Location	National class	European class
Small rooms upto $4m^2$ and Domestic garages upto $40m^2$	3	D-s3,d2
Other rooms over $4m^2$ inc Garages over $40m^2$ and Circulation spaces within	1	C-s3,d2

Dwellings (e.g. hall, stairs and landings)		

Note: Plaster on masonry walls and plaster board and skim linings in this guidance will achieve class 1. Exposed timber linings should be treated with a proprietary treatment to achieve the above classifications.

Fire resistance to elements of structure

Load bearing elements of structure to have the minimum standard of fire resistance for buildings up to three storeys as stated in the guidance table below to prevent premature failure of the structure and minimize the risk to occupants, also reduce the risk to fire fighters and reduce the danger to people in the vicinity of the building should failure of the building occur. See Table A1: Appendix A of ADB V1 for full details.

Guidance Table 40: Fire resistance to common elements of structure etc[1]

Building element	**Fire resistance in minutes**			**Method of protection**
	Load bearing capacity	Integrity	Insulation	
Structural beam, column or frame	30	Na	Na	All exposed faces
Load bearing wall (which is not also a wall described in any of the following items)	30	Na	Na	Each side separately
Upper floors (not above a garage or basement)	30	15	15	From underside
Roof (only if forming part of an escape route)	30	30	30	From underside
External walls:[2 and 3] (i) Less than 1.0m to relevant boundary (ii) More than 1.0m to relevant boundary (max 3 storey building)	 60 30	 60 30	 60 30	 Each side separately From inside building
Walls and upper floors separating an integral garage from the dwelling	30	30	30	From garage side
Compartment walls separating dwellings Compartment floors separating dwellings	60 30	60 30	60 30	Each side separately Each side separately
Protected stairs and lift shaft (not forming part of a compartment wall)	30	30	30	Each side separately
Cavity barriers etc (i.e. junctions between roof and compartment/separating walls or in cavities between separating walls and floors)	Na	30	15	Each side separately
Ceiling above protected stairs (3 storey)	Na	30	30	From underside
Ducts in cavity barriers	Na	30	No provision	From outside
Casing around soil pipes etc	Na	30	No provision	From outside

Notes: 1. 12.5mm plasterboard with a plaster skim finish applied to 100 x 50mm timber stud partitions/ ceiling/ floor joists as detailed in this guidance will achieve 30 minutes fire resistance, two layers of 12.5mm plaster board (joints staggered) with a plaster skim finish will achieve 60 minutes fire resistance. Masonry walls detailed in this specification will achieve 60 minutes minimum fire resistance.
2. External walls within 1.0m of a boundary should achieve class 0 surface spread of flame.
3. Combustible materials used on external surfaces should comply with Diagram 10 of ADB V1

External wall construction in relation to a boundary

External walls less than 1.0m to a relevant should have 30 minutes fire resistance from each side separately, and external walls more than 1.0m to a relevant boundary should have 30 minutes fire resistance from inside the building. Typical construction details are detailed in part A of this guidance. External walls within 1.0m of a boundary should achieve class 0 external surface spread of flame. Please refer to Section 8 of ADB V1 for full details. Combustible materials used on external surfaces should comply with Diagram 19 of ADB V1.

Compartment walls and floors separating buildings

Compartment walls (party walls) and compartment floors (party floors) separating buildings should have 60 minutes fire resistance, (including; load bearing capacity, integrity and insulation) from each side separately. Typical construction details for party walls are detailed in part A of this guidance. Party floors are out of the scope of this guidance and reference should be made to ADE.

Permitted building openings in relation to a boundary:

Openings within 1.0m of a boundary

An unprotected opening of $1m^2$ (e.g. window) is permitted every 4.0m on the same building face. This unprotected opening can consist of two or more smaller openings within an area of $1m^2$ (openings less than $0.1m^2$ is permitted every 1500mm on the same building face). There are no restrictions on dimensions between openings separated by compartment walls and floors. Please refer to Diagram 20 of ADB V1 for full details.

Openings more than 1.0m from a boundary

Permitted unprotected openings to be in compliance with table below for buildings not exceeding 3 storeys high (excludes basements) or more than 24m long.

Guidance Table 41: Permitted unprotected areas in relation to a relevant boundary [1and2]
See Diagram 22 (and Table 4) of ADB V1 for full details

Minimum distance between side of building and relevant boundary	Maximum total area of unprotected openings
1.0m	$5.6m^2$
2.0m	$12m^2$
3.0m	$18m^2$
4.0m	$24m^2$
5.0m	$30m^2$
6.0m	no limit

Notes:1. Refer to Section 9 of ADB V1 for full details relating to space separation and other methods of calculating unprotected areas.
2. If sprinklers are fitted throughout the building to BS 9251, the above distances can be reduced by 50% (min 1.0m) or the unprotected opening area doubled.

Designation of roof covering and minimum distance to boundary

Roof coverings (not roof structure) near a boundary should give adequate protection against the spread of fire when exposed to fire from outside in accordance with the guidance table below. Please refer to Section 10 of ADB V1 for full details.

Guidance Table 42: Limitations on designation of roof coverings* and minimum distance to boundary (see table 5 of ADB V1 for full details).

Designation# of coverings of a roof or part of a roof		Minimum distance from any point on relevant boundary			
National Class	**European Class**	**Less than 6m**	**At least 6m**	**At least 12m**	**At least 20m**
AA.AB or AC	B_{roof}(t4)	Acceptable	Acceptable	Acceptable	Acceptable
BA.BB or BC	C_{roof}(t4)	Not acceptable	Acceptable	Acceptable	Acceptable
CA.CB or CC	D_{roof}(t4)	Not acceptable	Acceptable [(1)(2)]	Acceptable[(1)]	Acceptable
AD.BD or CD	E_{roof}(t4)	Not acceptable	Acceptable[(1)(2)]	Acceptable[(1)]	Acceptable[(1)]
DA.DB, DC or DD	F_{roof}(t4)	Not acceptable	Not acceptable	Not acceptable	Acceptable[(1)(2)]

**Notes: ***See table 5 of ADB V1 for limitations on glass, thatch, wood shingles and plastic roof lights
#For explanation of the designation of external roof surfaces and separation distances see table 5 of ADB V1. Separation distances do not apply to the boundary between roofs of a pair of semi detached houses or enclosed/covered walkways, but it does over the top of a compartment walls- see Diagram 11 of ADB V1
(1) Not acceptable in any of the following buildings:
a. Houses in terraces of three or more houses
b. Any other building with a cubic capacity of more than $1500m^3$
(2) Acceptable on buildings not listed in Note(1), providing that part of the roof is no more than $3m^2$ in area and is at least 1500mm from any similar part, with the roof between the parts covered with a material of limited combustibility.

Typical fire and rescue service vehicle access route specification for dwellings see Section 11 of ADB V1 for full details or new dwellings guidance.

Part C: Site preparation and resistance to contaminates and moisture

Please refer fully to Approved Document C: Site preparation and resistance to contaminants and moisture (2004 edition with 2010 & 2013 amendments);

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C1: Resistance to contaminants

The site should be prepared and building constructed in accordance Approved Document C of the Building Regulations and the details in this guidance to prevent and resist contaminates (and moisture) from causing damage to the building and effecting the health of its occupants.

Radon gas

Protective measures

Where required, protective measures against radon gas to be in incorporated in the building in compliance with BRE publication 'Radon-Guidance on protective measures for new buildings 2015' (available at a cost from: www.brebookshop.com) and in accordance with the following guidance details and approved by building control before works commence. Note: The level of radon protection required can be determined at a cost from: the BRE website: www.bre.co.uk/radon or British Geological Society: www.bgs.ac.uk or contact building control for more information.

Basic radon protection

Ground supported concrete floors are only acceptable for basic radon protection.

Ground supported floors with a 1200g (300 micrometer) polythene damp proof membrane (DPM) is acceptable as a radon barrier subject to building control approval (recycled products may not be suitable and proprietary radon membranes are available which must also be suitable for use as a damp proof membrane, positioned and fixed in accordance with manufacturer's details) laid within the floor as illustrated in the guidance diagrams in Part A of the guidance above.

To prevent damage of the radon barrier, it should be installed at a later stage of construction - and sealed with gas proof tape to strips of membrane already built into the walls, or use a proprietary reinforced radon barrier/damp proof membrane. Any damaged areas to be repaired with radon membrane and sealed with two strips of gas proof tape with 150mm minimum laps.

Full radon protection

Full radon protection is to be achieved by the provision of a continuous radon proof barrier (which must also be suitable as a damp proof membrane as detailed in the guidance diagrams in Part A of the guidance above) over the foot print of the building, continuing through the external/cavity walls, together with suspended beam and block floors or cast in-situ reinforced concrete slabs with sumps and sub floor depressurisation pipes as illustrated in the ground floor diagrams below. In areas requiring full radon protection the floor needs to be suspended and supported on the cavity wall to prevent settlement of the ground floor and rupture of the radon proof barrier at the external wall junction. Also see guidance details above for prevention of damage and repair of radon membranes.

Number and position of sumps

Clean permeable fill to be used in the sub floor make up, with a single radon sump suitable for a single dwelling over an area of approximately 250m^2 or for a distance of 15m from the sump. Sumps to be connected together in multi compartmented sub floor areas using a pipe work manifold and connected to an external or internal fan, or vent openings/ducts formed through sub walls.

Sump construction

(i) Site constructed sumps

Site constructed sumps are typically 600mm x 600mm square x 400mm deep, constructed using bricks laid in a honeycomb bond so as to form a box around the end of the pipe, the top of the box is covered with a paving slab.To avoid subsequent collapse when compacting fill around the sump, mortar should be used for horizontal joints. However, it is essential that all vertical joints are left open. Further details are available on the BRE website at: www.bre.co.uk/radon

(ii) Proprietary prefabricated sumps

Prefabricated sumps used as an alternative to brick construction should be installed in accordance with manufacturer's details.

(iii) Depressurisation pipes

The pipe from the sump needs to be 110mm diameter Upvc with joints using standard couplings which are sealed and airtight. The pipe needs to leave the building so that it could be coupled to a fan mounted on the external wall. The pipe should terminate about 100mm from the external wall, and located at the rear of the house or at a re-entrant corner where subsequent installation of a boxed-in fan and vertical stack will be least obtrusive. until such time as a fan is installed, the pipe should be capped off 300mm above ground level to prevent vermin and rain penetration and capped off with an access plug and sign identifying radon pipe work fixed to wall above capping.

(iv) Geo-textile drainage matting (as an alternative to sumps)

Geo-textile drainage matting to be laid beneath the slab and connected to an extract pipe to provide a sump in accordance with manufacturer's details.

(v) Edge-located sumps (mainly used for retrospective fitting or conversion work)

Edge-located mini-sumps can be used instead of centrally located sump in accordance with details available on the BRE web site at: www.bre.co.uk/radon which must be agreed with building control before works commence on site. Edge- located sumps are typically constructed by excavating a hole 400 x 400 x 400mm in the hardcore or fill beneath the dwelling alongside the perimeter wall to form an open area around the end of the extract pipe. fix 600 x 600mm paving slab or similar over sump to provide permanent formwork to support the floor slab (or make good existing cast in-situ floor slabs where sumps are fitted retrospectively). Seal

the pipe where it passes through the wall. Prefabricated sumps or site constructed sumps detailed above can also be used as edge-located sumps. (Concrete floor slabs to be reinforced over sumps if required by building control)

Radon fan locations
When required, the fan should be positioned with the outlet well away from windows, doors and ventilation grilles and discharging just above eaves level. Low-level discharge is permitted if there are no openings or vents close by. To avoid penetrating the radon-proof floor membrane, the pipe should be taken through the wall, not up through the floor. The pipe work can be installed in ducts inside the house and connected as close as possible to the roof space fan and outlet terminating out through the roof using proprietary roof vent and flashing system- 900mm above any roof opening or vent that is within 3.0m of the terminal.

Stepped foundations and retaining walls
Where possible, stepped foundations should be avoided, as they complicate the achievement of radon protection using only sealing techniques. It may prove less expensive to excavate around the house to provide a ventilated space, than to try to build into the hillside and seal all the faces of the building which are below ground level.

Further details
Guidance on protective measures against Radon gas are available on the BRE web site at: www.bre.co.uk/radon

Methane and other gas protection in sub structure

Protection is to be provided in the sub structure in compliance with a specialists design and in the following circumstances:

- If within 250m of a landfill site. (The Environment Agency's policy on building development on or near landfill sites should be followed).
- On a site containing biodegradable substances (including made up ground or fill); or subject to use that could have petrol oil or solvent spillages; or naturally occurring methane, carbon dioxide and other hazardous gases (e.g. hydrogen sulfide).
- Further information on protective measures for methane and other ground gases is available in BS 8485:2015 'Code of practice for the design of protective measures for methane and carbon dioxide ground gases for new buildings' available at a cost from: bsigroup.com/shop

Risk assessments, ground investigations and any necessary remedial works should be carried out by a specialist in accordance with ADC which should be approved by Building Control/ Environmental Health Department before works commence on site

Landfill gas and radon
Building works located on or adjacent to a landfill site or old coalfield may require additional precautions to a specialists design to deal with methane which exceed those required for radon, so where both methane and radon are present, methane-protective measures should be applied, and only intrinsically safe (non-sparking) fans and switchgear should be used.

C2: Resistance to moisture

The walls, floor, and roof of the building should be constructed in accordance with ADC and the details/diagrams in this guidance to prevent and resist the passage of moisture into the building.

Horizontal damp proof courses (dpc's)
Horizontal damp proof course (dpc) and dpc trays with weep holes at 900mm ctrs to be provided 150mm above external ground level continuous with and sealed to the floor damp proof membrane (dpm) and radon/ dpc tray to prevent the ingress of moisture into the building.

Vertical damp proof courses and damp proof course trays etc (dpc's)
Stepped and horizontal dpc/cavity trays are to be provided over all openings, roof abutments/ projections and over existing walls with different construction or materials. Install vertical dpc or proprietary insulated cavity closers at all closings, returns, abutments to cavity work and openings etc to prevent the ingress of moisture into the building.

External cavity walls
50mm minimum wide clear continuous cavity should extend the full height and width between the internal and external wall leafs bridged only by wall ties, cavity trays, cavity barriers, fire stops and cavity closures. (where a cavity is to be partially filled, the residual cavity should not be less than 50mm wide- unless the product has a British Board of Agreement (BBA or other approved third party accreditation) for use and approved by building control). The cavity should be carried down at least 225mm below damp course level at ground floor level to protect the inner wall leaf and damp proof (cavity) trays should be at least 150mm deep as diagrams/details in this guidance.

Tanking systems providing either barrier, structural or drained protection to the building must be assessed, designed and installed for the particular project in compliance with BS 8102: 2009 Code of Practice for Protection of Below Ground Structures Against Water from The Ground. Tanking systems can be installed internally or externally in accordance with a tanking specialist's details. The illustrated tanking section details in this guidance are suggested details only and actual details must be approved by building control before works commence on site. Forms of tanking include: bonded sheet materials; liquid applied membranes; mastic asphalt, drained cavity membranes and cementitious crystallization and cementitious multi coat renders.

Suitable tanking systems to have British Board of Agreement (BBA or other approved third party) accreditation and individually assessed by a tanking specialist as suitable for the proposed situation. Tanking systems above ground should be vapour permeable to prevent condensation problems within the building and prevent mould growth. Tanking systems must be designed/installed/applied by a tanking specialist for the particular project in compliance with tanking manufacturer's details and where necessary additional measures taken to prevent radon gas and other such ground gases and contaminates from entering the building.

Tanking systems to be properly connected to and made continuous with wall damp proof courses/radon dpc trays. Perforation of the tanking system by service entry pipes etc should be avoided or carried out strictly in accordance with the tanking manufacturer's details.

Flood risk
Flood risk should be assessed and precautions carried out in compliance with paragraph 0.8 of ADC

Condensation risks
The technical details and diagrams in this guidance document should be read in conjunction with the BRE publication 'Thermal Insulation Avoiding Risks', which explains the technical risks and condensation risks which may be associated with meeting the building regulation requirements for thermal insulation for the major elements of the building. A copy of the publication can be obtained from: www.brebookshop.com

Part D: Toxic substances

Please refer fully to Approved Document D: Toxic substances (1992 with 2002 and 2010 amendments)

If insulating material is inserted into a cavity in a cavity wall -precautions must be taken to prevent the subsequent permeation of any toxic fumes from that material into any part of the building occupied by people.

The suitability of the cavity wall for filling must be assessed before the works is carried out by an insulation specialist in accordance with BS 8208: Part 1: 1985 and the insulation system must be British Board of Agreement (BBA or other third party) accredited.

The insulation specialist carrying out the work must hold or operate under a current BSI Certificate of Registration of Assessed Capability for the work being carried out.

The insulation material must be in accordance with BS 5617: 1985 and the installation must be in accordance with BS 5618: 1985

The Installation of urea-formaldehyde (UF) in cavity walls is to be carried out in compliance with paragraphs 1.1 — 1.2 of ADD1

Part E: Resistance to passage of sound

Please refer fully to Approved Document E: Resistance to the passage of sound (2003 with 2004, 2010, 2013 & 2015 amendments)

New party walls and floors in new extension

Sound insulation details for new party walls to be carried out in accordance with the relevant details in ADE Section 2 and floors to be carried out in accordance with the relevant details contained within Section 2 of this guidance and ADE Section 3. Please note that the Party Wall Act may be applicable to works to party walls (see guidance in general information above)

New Internal walls and floors in new extension

Sound insulation details between internal walls and floors separating bedrooms or a room containing a WC and other rooms to be carried out in accordance with the relevant details contained within Section 2 of this guidance and ADE Section 5.

Pre completion sound testing

Where new party walls or party floors are constructed, pre-completion sound testing is to be carried out to demonstrate compliance with ADE Section 1 and as follows:

Pre completion sound testing is to be carried out by a suitably qualified person or specialist with appropriate third party accreditation (UKAS or ANC registration) to demonstrate compliance with ADE1, and copy of test results sent to building control.

Remedial works and re-testing

Remedial works and re-testing will be required where the test has failed, in compliance with Section 1 of ADE

Exemptions and relaxations

If the requirements of the building regulations will unacceptably alter the character or appearance of a historic/listed building/ancient monument or building within a conservation area, then the requirements may be exempt or relaxed to what is reasonably practical or acceptable, ensuring that any exemption or relaxation would not increase the risk of deterioration of the building fabric or fittings in consultation with the local planning authorities conservation officer (before works commence) For further information see ADE and contact your local authority planning department

Part F: Ventilation

Please refer fully to Approved Document F: Ventilation (2010 edition with further 2010 amendments)

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Purge (natural) ventilation
Mechanical extract ventilation and fresh air inlets for rooms without purge ventilation
Background ventilation
Mechanical extract ventilation rates
Ventilation systems for basements
Ventilation of a habitable room through another room or conservatory
Mechanical extract ventilation fan ducts
General requirements for mechanical extract ventilation

Part F: Ventilation

Purge (natural) ventilation

Purge (natural) ventilation to be provided to all habitable rooms equal to 1/20th (5%) floor area. The 1/20th applies where the external windows/doors open more than 30 degrees and is increased to 1/10th (10%) of the floor area where the windows opens between 15 - 30 degrees. Window openings which open less than 15 degrees is not suitable for purge ventilation and alternative ventilation details are required as detailed below (in compliance section 5 and Appendix B of ADF1). Purge ventilation openings to habitable rooms to be typically located 1.75m above floor level. The area of external windows, roof windows and doors should not exceed 25% of the usable internal floor area otherwise SAP calculations may be required from a suitably qualified person to confirm design flexibility.

Unprotected openings (glazed window and door openings) should not exceed the permitted areas in relation to a boundary in compliance with Part B of this guidance.

Means of escape windows to be fitted with proprietary hinges to open to the minimum required clear width of 450mm. Escape windows must have minimum clear opening casement dimensions of 0.33m² and 450mm (typically 450mm wide x 750mm high), located within 800-1100mm above floor level to all bedrooms and habitable rooms at 1st floor level and inner habitable rooms on the ground floor. Windows above the ground floor storey and within 800mm of floor level are to be provided with containment/ guarding/ proprietary catches which should be removable (child proof) in the event of a fire. Where escape windows cannot be achieved, direct access to a protected stairs (or protected route to inner rooms) is acceptable in compliance with ADB V1- par 2.6 (a) or (b).

Mechanical extract ventilation and fresh air inlets for rooms without purge ventilation

Mechanical extract ventilation and fresh air inlet are required for habitable rooms without purge (natural) ventilation which must designed by a ventilation specialist having a minimum of 4 air changes per hour and manually controlled in compliance section 5 of ADF1. This system can incorporate heat recovery if required. Note: means of escape windows are required to all bedrooms and habitable rooms at 1st floor level and inner habitable rooms on the ground floor in accordance with the guidance details above.

Background ventilation

Background ventilation to be provided equivalent to 8000mm² to habitable rooms and 2500mm^2 to wet rooms via operable hit and miss vents into frames (or two stage security catches fitted to operable windows if agreed with building control). Fans and background vents fitted in the same room should be a minimum of 0.5m apart.

Mechanical extract ventilation rates

Mechanical ventilation is to be provided to the rooms listed below directly ducted to the outside air equivalent to the following rates.

Kitchen	30 litres per second over hob or 60 litres elsewhere
Utility room	30 litres per second
Bathroom	15 litres per second (including shower rooms and en-suites)
Toilet	6 litres per second W/C (with or without a window)

Ventilation systems for basements

To be carried out in compliance with Paragraphs 5.11- 5.13 of ADF1

Ventilation of a habitable room through another room or conservatory

To be carried out in compliance with Paragraphs 5.14- 5.16 of ADF1

Mechanical extract ventilation fan ducts

Mechanical ventilation to be ducted using proprietary ducts/insulated ducts installed through walls to proprietary external vent or through roof spaces to proprietary external roof tiles or external soffit vents, installed in accordance with the manufacturer's details and 'The Domestic Ventilation Compliance Guide' 2010 Edition as follows:

- Proprietary rigid rectangular or circular ducts should be used where possible and installed in accordance with manufacturer's details.
- Proprietary flexible ducts should be installed in accordance with manufacturer's details and duct length should not exceed:
    - 1.5m for axial fans;
    - 6m for centrifugal fans with extract rates 6 to 30l/s and
    - 3m for centrifugal fans with extract rates 31 to 60l/s.
- The number of bends for all duct types should not exceed two for up to 30l/s and one for higher extract rates
- Rigid ducting to be used through unheated spaces and insulated with at least 25mm of insulation (having a thermal conductivity no worse than 0.04W/(m.K)) to prevent condensation
- Horizontal ducting (including in walls) to slope slightly to outside away from the fan to prevent backflow of moisture into the fan and building.
- Vertical ducting to be fitted with a condensate trap in accordance with the manufacturer's details to prevent backflow of moisture into the fan and building
- Ducts passing through a fire stopping wall/compartment wall should be protected in accordance with Approved Document B

The Domestic Ventilation Compliance Guide 2013 Edition is available from RIBA Bookshop telephone orders: 020 7256 7222

General requirements for mechanical extract ventilation

Mechanical ventilation to rooms without operable windows to be linked to light operation, independent switch or PIR and have 15 minutes overrun and a 10mm gap under the door for air supply. Fans must not be installed in rooms containing open flue appliances unless the interaction of mechanical ventilation and open flue heating appliances is checked and certified by an approved method and suitably qualified person as contained in ADJ.

Part G: Sanitation, hot water safety and water efficiency Please refer fully to Approved Document G: Sanitation, hot water safety and water efficiency (2015 edition)

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Electrical water heating
Supply (Water Fittings) Regulations 1999
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Part G: Sanitation, hot water safety and water efficiency

Wholesome hot and cold water supply
Sinks with wholesome hot and cold running water are to be provided in all food preparation areas, bathrooms to be fitted with either a bath or shower. Hot and cold water supplies to wash basins, baths, showers and sinks including external taps to have water from a wholesome water supply.

Hot taps should be located on left hand side (traditionally as most people are left handed it prevents people from unwittingly running the hot tap and burning themselves) .

Softened wholesome cold water should not be provided where drinking water is drawn off or to any sink where food is prepared.

Wholesome water supply to comply with The Water Supply (Water Quality) Regulations 2000 (SI2000/3148) and in Wales; The Water Supply (Water Quality) Regulations 2001 (SI2001/3911) and Annex1 of AD. Private water supplies to comply with The Private Water Supplies Regulations 2009 (SI 2090/3101) and in Wales; The Private Water Supplies (Wales) Regulations (SI 2010/66)

Scale of provisions
Any dwelling house or flat must have at least one bathroom, with a fixed bath or shower, wash basin and wc in compliance with BS 6465. Hot taps should be located on left hand side. In new dwellings, wc should be located in the principle entrance storey.

Wash basins and separation of w/c from any food preparation areas
Wash hand basins to be provided in all rooms containing a w/c (or in an adjacent room providing the room is not used to prepare food) and a door must separate the w/c and wash basin from any food preparation area in a dwelling.

Water tanks/cisterns base
Water tanks/cisterns must have an adequate designed flat platform base to support the proposed loads.

Pumped small bore foul water drainage
Pumped small bore foul water drainage from a toilet is only permitted if there is also access to a gravity draining toilet in the same dwelling. Proprietary pumped foul water macerator systems must have BBA or other approved accreditation and fitted in compliance with manufacturer's details to a suitable foul water drainage system.

Vented and unvented hot water storage systems
Vented and unvented hot water storage systems to be designed, installed, commissioned and tested by a suitably qualified heating engineer/specialists (unvented systems to be indelibly marked with information contained in paragraph 3.23 of ADG), in compliance with paragraphs 3.10- 3.27 of ADG. Copy of commissioning certificates to be issued to Building Control on completion of the works.

Safety valves, prevention of scalding and energy cut outs (see new dwellings)

Discharge pipes from safety devices
Discharge pipes from safety devices should be 600mm max length, constructed of metal (or other material suitable for proposed temperatures to BS 7291- 1:2006) and connect to a Tundish fitted with a suitable air gap in compliance with the current 'Water Supply (Water Fittings) Regulations. Any discharge into the Tundish must be visible (and where the dwelling is occupied by visibly or physically impaired- the devise must be electronically operated able to warn of discharge).

Discharge pipes from Tundish should be at least 300mm in length and fixed vertically below Tundish-before connection to any bend or elbow and at a continuous fall of 1:200 thereafter until point of termination. Pipes from Tundish should be at least one pipe size larger than the outlet of the safety devise upto 9m in length (2x larger 9-18m and 3x larger 18-27m) and constructed of metal (or other material suitable for proposed temperatures to BS 7291- 1:2006).

Point of termination from discharge pipes can be either:
(i) To a trapped gully - below grating - but above the water seal
(ii) Downward discharges at low level- upto 100mm above external surfaces (car parks, hard standings, grassed areas etc) and fitted with proprietary wire guard to prevent contact.
(iii)Discharges at high level into metal hopper and metal down pipes at least 3m from plastic guttering collecting the discharge.
Note: visibility of discharge must be maintained at all times and discharges of hot water and steam should not come into contact with materials that could be damaged by such discharges.

Solar water heating
Solar water heating roof/wall panel systems to be factory made to BS EN 12976-1:2006, fitted with safety devices and an additional heating source to maintain an adequate water temperature and fitted in compliance with manufacturer's details. Solar water heating systems should comply with current European/ British/ Standards.

Electrical water heating
Fixed electrical immersion heaters to BS EN 60335-2-73:2003, electrical instantaneous water heaters to BS EN 60335-2-35:2002, electrical storage water heaters to BS EN 60335-2-21:2003 and safety devices to be manufactured and installed in accordance with ADG, manufacturer's details and current European/ British/ Standards.

Supply (Water Fittings) Regulations 1999
All new water installations must be in compliance with the 'Supply (Water Fittings) Regulations 1999' for England and Wales, for the protection against frost and freezing, prevention of waste, misuse, undue consumption, contamination and erroneous measurement of a water supplier's mains water supply. A free copy of regulations can be downloaded from the HMSO website, or alternatively a hard copy of the new Regulations can be purchased directly from your local HMSO stationary office. The Regulations are Statutory Instrument No 1148 and the amendments are Statutory Instrument No 1506 both dated 1999.

Insulation of pipe work to prevent freezing

All hot and cold water service pipe work, tanks and cisterns should be located within the warm envelope of the building to prevent freezing.

Where hot and cold water service pipe work, tanks and cisterns are located in unheated spaces they should be insulated to prevent freezing in compliance with BS 6700 and BS 8558, and typically as follows:

(i) All tanks and cisterns should be thermally insulated to prevent freezing with proprietary insulated systems in compliance with manufacturer's systems (insulation normally omitted from below tank where it benefits from heat in the heated area below).

(ii) Pipe work should be insulated with proprietary insulated sleeves of phenolic/ polyosocyanurate/ polyurethane foam having a minimum wall thickness of 30mm for 15mm diameter pipes and 12mm for pipes 22mm diameter pipes, (or other approved) and fixed in accordance with manufacturer's details.

Incoming cold water supply service pipes should be at least 750mm below the ground level and other precautions should be carried out to prevent freezing and protect the pipe in accordance with the relevant Water Authorities requirements, which will require consent from the Water Authority before works commence.

Commissioning certificates

Commissioning certificates for fixed building services are required on completion with copy sent to building control

Part H: Drainage and waste disposal

Please refer fully to Approved Document H: Drainage and waste disposal (2015 edition)

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H1: Foul water drainage

Foul water drainage systems
An adequate system of foul water drainage shall be provided to carry foul water from appliances within the building to one of the following, listed in order of priority:

(i) **public sewer**, or where that is not reasonably practicable,
(ii) **private sewer**, or where that is not reasonably practicable,
(iii) **sewage treatment system**, or where that is not reasonably practicable,
(iv) **septic tank**, or where that is not reasonably practicable,
(v) **cesspoo**l - all as detailed in this guidance.

Small developments should connect to a public sewer if its within 30m of a public sewer wherever its reasonably practical in accordance with paragraphs 2.3-2.7 of Approved Document H (ADH1)

Important note: New surface/rainwater system must be separate from the foul water or combined sewer system unless written consent is obtained from the relevant Water Authority.

Surcharging of drains
Prevention of the surcharging of drains to be carried out in accordance with paragraphs 2.8- 2.12 of ADH1

Layouts
Drainage layouts to be carried out in accordance with paragraphs 2.13- 2.21 of ADH1.
All connections should be made using proprietary prefabricated components and connected obliquely or in the direction of flow. Drainage system (including those fitted with intercepting traps on sealed systems- or systems subject to surcharging), is to be vented near to or at the head of the main drain using a 100mm diameter pipe (or discharge stacks) fitted with a propriety vented guard and terminated at least 900mm above any openings into the building (not an air admittance valve).

Pipes to be laid at even gradients and any change of gradient or direction to be fitted with an access point (for example an inspection chamber). Pipes to be laid in straight lines or slight curves, bends (as large as possible) to be located in or close to inspection chambers, man holes and base of discharge stacks.

Commercial kitchens to be fitted with grease traps (or other approved method to allow grease removal) to BS EN 1828 -1:2004 and BS EN 1828 -2:2002

Rodent control
Where necessary, rodent control to be carried out in accordance with paragraph 2.22 of ADH1

Protection from settlement
Drainage/services to incorporate adequate precautions to prevent excessive movement due to possible ground movement in shrinkable clay sub soils in accordance with paragraphs 2.23- 2.26 and Diagrams 7 and 8 of ADH1, or design details from a suitably qualified specialist.

Depth of pipe cover
Upvc pipes should be surrounded in a single size aggregate (size 5-10mm) at a minimum/ maximum depth of 0.6/7.0m in fields, 0.9/7.0m in drives and roads in compliance with the guidance diagram below. If minimum depths cannot be achieved, pipes can be protected with a 100mm reinforced concrete slab with compressible material under and 300mm minimum bearing on original ground in compliance with the guidance diagram below.

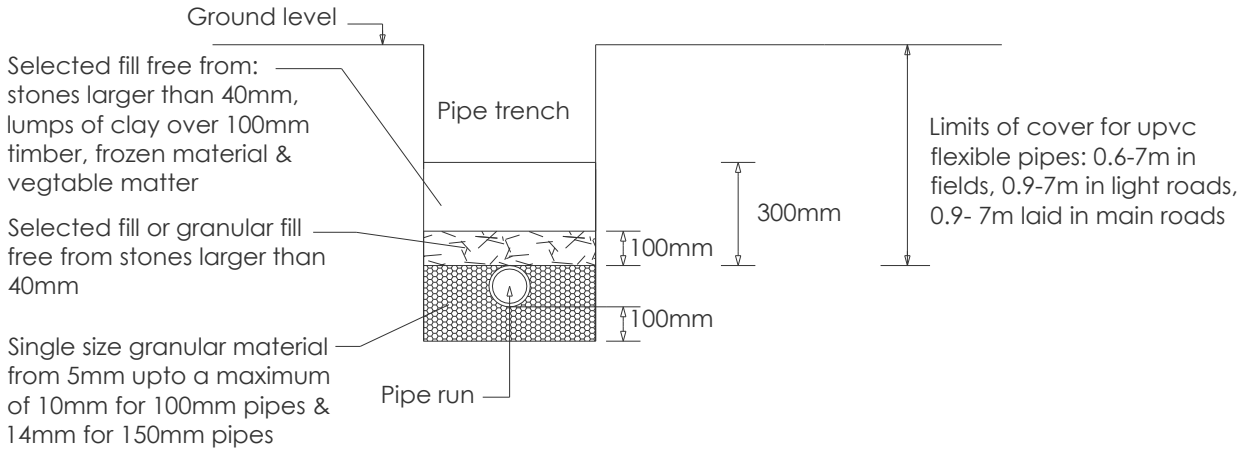
Pumping stations
Pumping stations and installation of pumping stations to be carried out in accordance with paragraphs 2.36- 2.39 of ADH1, or design details from a suitably qualified specialist.

Materials for pipes and jointing
Foul water drainage systems to comply with British standards, BBA certification (or other approved accreditation), installed in accordance with manufacturer's details.

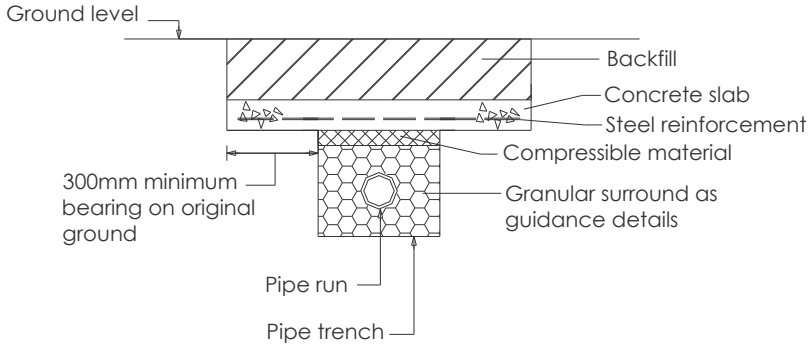
Pipe gradients and sizes
100mm minimum diameter pipes to be laid at a minimum gradient of 1:40 (or 1:80 where serves one or more wc). 150mm diameter pipes to be laid at a minimum gradient of 1:150.

Bedding and backfilling requirements for rigid and flexible pipes
Ridged Upvc pipes should be bedded and surrounded in a single size aggregate (size 5-10mm). Vitrified clay, concrete and iron pipes to be laid in accordance with manufacturers details
See Diagram 10 of ADH1 for full details

Guidance Diagram 39: Typical bedding detail for flexible pipes (not to scale)



Guidance Diagram 40: Typical protection detail for pipes laid at shallow depths (not to scale) See Diagram 11 of ADH1 for full details



Pipes penetrating though walls
Pipes penetrating though walls should have joints formed within 150mm of either wall face, with 600mm maximum length adjacent rocker pipes fitted both sides with flexible joints, or alternatively lintels provided above openings though walls to give 50mm clear space around pipes and openings in-filled with inert sheet material and sealed to prevent ingress of fill, vermin and radon gas.

Drain trenches near buildings
Trench excavations for pipe runs located within 1.0m of buildings which extend below the level of the existing foundations should have trenches backfilled with concrete up to the underside of the existing foundations. Trench excavations for pipe runs located more than 1.0m from buildings which extend below the level of the existing foundations should have trenches backfilled with concrete up to the underside of the existing foundations less 150mm.

Inspection chambers and gullies

Proprietary Upvc 450mm diameter inspection chambers to be provided at all changes of level and or direction and at 45m maximum spacing in straight runs up to 1.2m in depth. Other access fittings and rodding eyes to be in accordance with the guidance table below. All gullies to be trapped and have rodding access where serving branches. Inspection chamber covers to be single sealed to prevent odours, mechanically fixed and suitable for loadings in accordance with BS EN 124: (Ductile iron: Class A15 for light duty- suitable for pedestrians and pedal cyclists; Class B125 for medium duty - suitable for driveways and pedestrian areas; Class C250 for heavy duty - suitable for car parks; Class D400 for heavy duty - suitable for use in main roads and carriageways) . Covers and frames in buildings to be double sealed with air tight bolt down covers and frames in accordance with manufacturer's details.

Guidance Table 43: Minimum dimensions for access fittings and inspection chambers

(See Table 11 of ADH1 for full details)

Type of fitting	Depth to invert from cover level (m)	Internal sizes		Cover sizes	
		Length x Width (mm)	Circular (mm)	Length x Width (mm)	Circular (mm)
Rodding access	n/a	As drain but min 100	n/a	n/a	Same size as Pipework[1]
Access fitting					
Small : 150 diam 150 x 100	0.6 or less except where situated in a chamber	150 x 100	150	150 x 100[1]	Same size as access fitting
Large: 225 x 100	0.6 or less except where situated in a chamber	225 x 100	225	225 x 100[1]	Same size as access fitting
Inspection chamber					
Shallow	0.6 or less 1.2 or less	225 x 100 450 x 450	190[2] 450	Min 430 x 430	190[1] 450
Deep	Greater than 1.2	450 x 450	450	Max 300 x 300[3]	Access restricted to max 350[3]

Notes: [1] The clear opening may be reduced by 20mm in order to provide proper support for the cover and Frame [2] Drains up to 150mm diameter [3] A larger clear opening cover may be used in conjunction with a restricted access. The size is restricted for health and safety reasons to deter entry

Guidance Table 44: Minimum dimensions for manholes

(See Table 12 of ADH1 for full details)

Type	Size of largest pipe (DN) (mm)	Min internal dimentions[1]		Min clear opening size[1]	
		Rectangular length and width (mm)	Circular diameter (mm)	Rectangular length and width (mm)	Circular diameter (mm)
Manhole					
Less than 1.5m deep to soffit	Equal to or less than 150 225 300 Greater than 300	750 x 675[7] 1200 x 675 1200 x 750 1800 x (DN+450)	1000[7] 1200 1200 The larger of 1800 or (DN+450)	750 x 675[2] 1200 x 675[2]	n/a[3]
Greater than 1.5m deep to soffit	Equal to or less than 225 300 375-400 Greater than 450	1200 x 1000 1200 x 1075 1350 x 1225 1800 x (DN+775)	1200 1200 1200 The larger of 1800 or (DN+775)	600 x 600	600
Manhole shaft[4]					
Greater than 3.0m deep to soffit pipe	Steps[5]	1050 x 800	1050	600 x 600	600
	Ladder[5]	1200 x 800	1200	-	-
	Winch[6]	900 x 800	900	600 x 600	600

Notes

1. Larger sizes may be required for manholes on bends or where there are junctions
2. May be reduced to 600 x 600 where required by highway loading considerations, subject to a safe system of work being specified.
3. Not applicable due to working space needed

4. Minimum height of chamber in shafted manhole 2m from benching to underside of reducing slab
5. Min clear space between ladder or steps and the opposite face of the shaft should be approximately 900mm
6. Winch only- no steps or ladders, permanent or removable
7. The minimum size of any manhole serving a sewer (i.e. any drain serving more than one property) should be 1200mm x 675mm rectangular or 1200mm diameter

Guidance Table 45: Maximum spacing of access points in metres
(See Table 13 of ADH1 for full details)

From	To access fitting				
	Small	**Large**	**Junction**	**Inspection chamber**	**Manhole**
Start of external drain[1]	12	12	-	22	45
Rodding eye	22	22	22	45	45
Access fitting: Small 150 diam and 150 x100 Large 225 x100	 - -	 - -	 12 45	 22 22	 22 45
Inspection chamber shallow	22	45	22	45	45
Manhole and inspection chamber deep	-	-	-	45	90[2]
Notes: 1. Stack or ground floor appliance 2. May be up to 200 for man-entry size drains and sewers					

Foul water disposal
Foul water should be discharged in to new or existing foul water drainage facilities using existing or new inspection chamber connection as shown on plans/specification, or as agreed with building control on site.

Foul drainage systems to low lying buildings or basements which carry storm water or other vulnerable drainage systems should be provided with anti flood protection such as one way valves, etc, to prevent flooding and sewage entering the building.

Waste pipes
All W/Cs to have trapped outlet connected to 100mm diameter pipes. Sanitary appliances such as wash hand basins, baths, showers, sinks etc, to be provided with waste pipes laid to falls and fitted with traps sizes as stated in the guidance table below. Where waste pipe runs exceed 4m British Board of Agreement (BBA or other third party accredited) air admittance valves are to be fitted above appliance spill over level. Waste pipes to either discharge below trapped gully grating or into soil and vent pipes via proprietary waste manifolds or bossed junctions. Internally all waste and drainage pipes to have rodding access/eyes at changes of direction and be adequately clipped/supported and provided with 30 minutes fire protection where passing through floors.

Guidance Table 46: Waste pipe and trap design limits
See Tables 1 and 2 of ADH1 for full details

Appliance	Minimum diameter of pipe and trap (mm)	Depth of trap Seal (mm)	Slope of pipe (mm/m)	Maximum length of Pipe to stack (m)
Sink	40	75	18 to 90	3 (increased to 4 for 50mm diam pipe[1])
Bath	40	50	18 to 90	3 (increased to 4 for 50mm diam pipe)
WC	100	50	18	6-8 for single wc
Washbasin	32	75[2]	120/0.5 80/0.75 50/1.0 35/1.25 25/1.5 20/1.75	1.7 (increased to 3 for 40mm diam pipe[1])

Notes:
1. Trap sizes should not be increased -only the pipe sizes- commencing 50mm beyond tail of trap
2. Depth of seal may be reduced to 50mm only with flush grated wastes without plugs on spray tap basins

Soil and vent pipes (discharge stack)
To consist of Upvc proprietary above ground drainage system, sized in accordance with the table below. Discharge stack is normally installed internally through the building in sound insulated boxing as guidance details and fitted with proprietary flashing system through the roof or vent tile, or alternatively soil and vent pipe fixed externally in accordance with manufacturer's details. A ventilated stack should terminate 900mm minimum above any opening into the building that is within 3.0m of the stack and fitted with a proprietary grilled vent cap. An open soil and vent pipe should always be fitted wherever possible at the head of the drainage system, particularly where a septic tank or sewage treatment system is installed.

Guidance Table 47: Minimum diameters for discharge stacks
See Table 3 of ADH1 for full details

Stack size (mm)	Maximum capacity (liters/sec)
50*	1.2
65*	2.1
76**	3.4
90	5.3
100	7.2
Key: *No wc's **Not more than 1 wc with outlet size < 80mm	

Waste pipe connections to soil and vent pipes (discharge stack) - to prevent cross flow

(i) Waste pipes up-to 65mm diameter- opposed pipe connections (without swept entries) should be offset at least 110mm on a 100mm diameter stack and 250mm on a 150mm diameter stack, at a radius of 25mm or angle of 45 degrees- or alternatively a proprietary manifold fitted in accordance with manufacturer's details.
(ii) Waste pipes over 65mm diameter- opposed pipe connections (with swept entries) should be offset at least 200mm irrespective of stack diameter (no connections are allowed within this 200mm zone), at a radius of 50mm or angle of 45 degrees. Unopposed connections may be at any position.
(iii) Lowest waste pipe connection to soil and vent pipe- 450mm minimum distance is required between centre line of waste pipe connection to soil and vent pipe and invert level of below ground drain, ensuring a 200mm minimum radius bend connects the soil and vent pipe to the drain.

Stub stacks
To consist of 100mm diameter Upvc proprietary above ground drainage system, with wash basins/sinks connected to the sub stack within 2.0m of the invert level of the drain and the wc floor level is to be within 1.3m of the invert level of the drain.

Air admittance valves
Proprietary air admittance valves fitted to sub stacks or soil and vent pipes should comply with BS EN 12380 and be installed in accordance with manufacturer's details, and valve is to be located above the spillover level of the highest appliance i.e. wash basin or sink. Valves installed internally should be located in sound insulated boxing, accessible for maintenance and clearance of blockages etc. and fitted with 225 x 75mm louvered vent. Valves should not be installed in dusty environments. An open vent should always be fitted wherever possible at the head of the drainage system, particularly where a septic tank or sewage treatment system is installed.

Pumping installations
Where gravity drainage is impractical, or protection is required against flooding due to surcharging in downstream sewers, pumped drainage solutions may be required - subject to building control approval.

Proprietary packaged pumping systems to consist of a watertight GRP/polyethylene chamber, lockable pedestrian/vehicle covers, pumps, high level alarm, preset automatic level control, float switch, non-return valve, discharge pipe and connections etc. Domestic sewage pump sets located within buildings should conform to BS EN 12050, designed in accordance with BS EN 12056-4 and installed in accordance with manufacturer's details. Domestic sewage pump sets located outside buildings should be designed in accordance with BS EN 752-6 and installed in accordance with manufacturer's details. Pumped installations must contain 24 hours inflow storage. The minimum daily discharge of foul drainage should be taken as 150 litres per person per day for domestic use. Auto-changeover duty/standby duplex (twin pumps) pump stations may be accepted as an alternative to 24 hours storage subject to approval by building control.

Air tightness and testing
Pipes, fittings and joints should be capable of withstanding an air test of positive pressure of at least 38mm water gauge for at least 3 minutes. Every trap should maintain a water seal of at least 25mm. Smoke testing should be used to identify defects where water test has failed. Note: smoke testing is not recommended for Upvc pipes.

H2: Septic tanks, sewage treatment systems and cesspools

Existing septic tank and effluent drainage
Where additional drainage effluent is to be connected to the existing septic tank/treatment system, it should be checked by specialist and sizes/condition of tank/system to be confirmed as suitable for treatment of additional effluent.

Non mains foul drainage waste water treatment systems
Non mains drainage systems are to be used only where connection to the mains drainage system is not possible. Either a septic tank or sewage treatment system is to be installed as to suit specific ground conditions as agreed with Building Control. No septic tank/ sewage treatment system and associated tertiary (secondary) treatment is permitted by the Environment Agency in prescribed Zone 1 ground water source protection zones. Where no other option is feasible, the installation of a cesspool is to be agreed with Building Control and the Environment Agency.

Septic tanks
Septic tanks to consist of a watertight chamber (watertight from both sides to prevent the ingress of water and contain the effluent). The sewage is liquefied by anaerobic bacteria action in the absence of oxygen assisted by the natural formation of a surface scum or crust. Sludge settlement at the base of the tank must be removed annually (or more frequently if required). Discharge from tanks is to be taken to drainage fields, drainage mounds or wetlands/reed beds for secondary treatment as detailed in the guidance below.

Proprietary factory made septic tanks to be designed and constructed to BS EN 12566 and installed in accordance with manufacturer's details, or

Non proprietary septic tanks constructed in situ to be designed and constructed to a drainage specialist's design and approved by Building Control before the works commence on site. Typically, the tank consists of two chambers (the first being twice as large as the second) constructed using 150mm minimum thick reinforced concrete base C25P mix to BS 5328, 220mm thick engineering quality brickwork walls (or concrete), mortar mix 1:3 cement/sand ratio with water proof rending or suitable proprietary tanking system applied to both sides and designed heavy concrete roof structure. 100mm diameter Inlet and outlet 'dip pipes' is required

and designed to prevent disturbance of the surface scum, inlet pipe laid at a flatter gradient for at least 12 meters before it enters the tank.

Septic tanks to be fitted with durable lockable lids or covers for emptying and cleaning, and inspection chamber fitted on the discharge side of tank for sampling of the effluent.

Septic tanks to be sited at least 7m from any habitable part of any building, preferably down slopes, within 30m of a suitable vehicle access for emptying and cleaning sludge which must not be taken through a dwelling or place of work and must not be a hazard to the building occupants. If the tank invert is more than 3.0m the 30m distance should be reduced.

Septic tank should have a minimum capacity of 2,700 litres for upto 4 users and increased by 180 litres for each additional user. (Recommended minimum size of septic tank to be 3,800 litres to accommodate discharges from washing machines/dishwashers etc). A notice plate must be fixed within the building and include the following information: Address of the property; location of the treatment system; description of the septic tank and effluent drainage installed; necessary maintenance to be carried out (including monthly checks of the apparatus and emptying of the tank every 12 months by a licensed contractor) and a statement that the owner is legally responsible to ensure that the system does not cause pollution, health hazard or nuisance.

Consultations are to be carried out with Building Control and The Environment Agency before any works commence on site. It is the Occupier's responsibility to register the effluent discharge as an exempt facility with the Environment Agency for discharges of $2m^3$ or less per day to the ground from a septic tank, or obtain an Environmental Permit from the Environment Agency. Septic tanks must not discharge to a water course. For more information contact the Environment Agency at: www.environment-agency.gov.uk

Sewage treatment systems

Proprietary sewage treatment systems treat sewage by an accelerated (aerobic) process to higher standards than that of septic tanks, and are to be factory made, designed and constructed to BS EN 12566 (if less than 50 persons otherwise to BS 6297:2007 Code of Practice for design and installations of small sewage treatment works and cesspools and BBA certification (or other approved accreditation), be installed and maintained in accordance with the manufacturer's details and fitted with a uninterruptible power supply (or 6 hours power back up). Note: only treatment systems suitable for intermittent use should be used for holiday lets or similar uses where the system is unused for periods of time.

Sewage treatment system to be sited at least 7m from any habitable part of any building, preferably down slopes, within 30m of a suitable vehicle access for emptying and cleaning sludge which must not be taken through a dwelling or place of work and must not be a hazard to the building occupants. If the tank invert is more than 3.0m the 30m distance should be reduced.

Sewage treatment system should be designed to British Water design criteria based on the maximum occupancy of the property, and the final effluent quality requirements of the Environment Agency.

Discharges from sewage treatment systems can be taken to a water course or alternatively a designed drainage field, drainage mound, wetlands or reed beds as detailed below.

A notice plate must be fixed within the building and include the following information: Address of the property; location of the treatment system; description of the sewage treatment system and effluent drainage installed; necessary maintenance to be carried out in accordance with the manufacturer's details and a statement that the owner is legally responsible to ensure that the system does not cause pollution, health hazard or nuisance.

Consultations should be carried out with Building Control and The Environment Agency before any works commence on site. It is the Occupier's responsibility to register the effluent discharge

as an exempt facility with the Environment Agency for discharges of $5m^3$ or less per day to a surface water course or $2m^3$ or less per day to the ground from a sewage treatment system, or to obtain an Environmental Permit from the Environment Agency. For more information contact the Environment Agency at: www.environment-agency.gov.uk

Disposal of sewage from septic tanks and sewage treatment systems

Drainage fields
Drainage fields consist of irrigation pipes laid below ground allowing partially treated effluent to percolate into the ground and further biological treatment to take place in the aerated soil layers. Construction of drainage fields to be carried out as tank/system manufacturer's details and BS6297:2007 + A1:2008. See typical guidance section detail and drainage field layout below. The drainage field area is calculated from the percolation test results which should have a suggested minimum area of 30m x 0.6m wide subject to percolation test results and number of users and approved by Building Control before works commence on site. See below for percolation test procedure.

Drainage fields to be located 10m from any water course, 50m from any point of water abstraction, 15m from any building, 2m from any boundary (recommendation in BS6297) and sufficiently far from any other drainage areas so the overall soakage capacity of the ground is not exceeded. Water supply pipes, access roads, drives or paved areas etc must not be located within the drainage areas.
See diagram 1 of ADH2 for typical drainage field construction details.

Drainage mounds
Drainage mounds consist of drainage fields constructed above the ground allowing further biological treatment of the partially treated effluent in the aerated soil layers. Drainage mounds to be used where there is a high water table level, impervious or semi water logged ground. Drainage mounds and drainage mound areas should be designed by a drainage specialist for particular ground problems and approved by Building Control before works commence on site. See diagram 2 of ADH2 for typical drainage mound construction details.

Drainage fields to be located 10m from any water course, 50m from any point of water abstraction, 15m from any building, 2m from any boundary and sufficiently far from any other drainage areas so the overall soakage capacity of the ground is not exceeded. Water supply pipes, access roads, drives or paved areas etc must not be located within the drainage areas. See diagram 1 of ADH2 for typical drainage field construction details.

Wetlands/reed beds
In situations where additional treatment is required, wetland treatment systems consisting of manmade reed beds can be constructed as either vertical or horizontal flow reed bed systems (see Diagrams 3 and 4 of ADH2 for full details) for the purification of the partially treated effluent by filtration, biological oxidization, sedimentation and chemical precipitation as the partially treated effluent passes through gravel beds and root systems of wetland plants. Wetlands should not be constructed in shaded, windblown or severe winter areas. Vertical or horizontal flow wetland treatment systems should be designed by a drainage specialist for particular ground problems and approved by Building Control before works commence on site.

A notice plate must be fixed within the building and include the following information: Address of the property; location of the treatment system; description of the sewage treatment system and effluent drainage installed; necessary maintenance to be carried out in accordance with the drainage specialist's details and a statement that the owner is legally responsible to ensure that the system does not cause pollution, health hazard or nuisance.

Percolation tests for septic tanks

A percolation test is required to calculate the area of a drainage field for a septic tanks or sewage treatment system. A preliminary assessment of the site should be carried out including consultation with the Environment Agency and building control to determine the suitability of the site.

Ground conditions

Ground conditions should be assessed to determine the suitability of sub soils. Examples of suitable sub soils with good percolation include sand, gravel, chalk, sandy loam and clay loam. Examples of poor sub soils are sandy clay, silty clay and clay. It is important that percolation characteristics are suitable in both summer and winter conditions and that the sub soil is well drained and not saturated with water. A trial hole should be excavated 1.5m below the invert of the proposed effluent drainage pipe work to determine the position of the standing ground water table. The ground water level in summer and winter should be at least 1.0m below the invert of the effluent drainage pipe work.

Percolation test method

Percolation tests should not be carried out in abnormal weather conditions such as heavy rain, sever frost or drought.

Step 1: Excavate a test hole 300mm square x 300mm deep below proposed invert level of the drainage field trench bottom

Step 2: Fill the test hole with water and allow to drain away over night

Step 3: Refill to a depth of 300mm and note time taken in seconds to drain away from 75% full to 25% full (i.e. 150mm drop in level from 225mm to 75mm)

Step 4: Carry out the procedure a second and third time (can be in the same day if the hole empties completely and quickly enough)

Step 5: Repeat the procedure in two more test holes and calculate the average of the three results as follows: $\frac{\text{test 1 + test 2 + test 3}}{3}$ **= average time taken for each test hole**

Step 6: Find the average of these results as follows: $\frac{\text{Hole 1 + Hole 2 + Hole 3}}{3}$ **= average time taken for all test holes**

Step 7: Calculate the Vp (average time in seconds for the water to drop 1mm) as follows:

For example: If average time above took 2100 seconds

(i) Divide 2100 seconds by 150mm depth of water

(ii) $\frac{2100}{150}$ = 14 Vp* (see note below*)

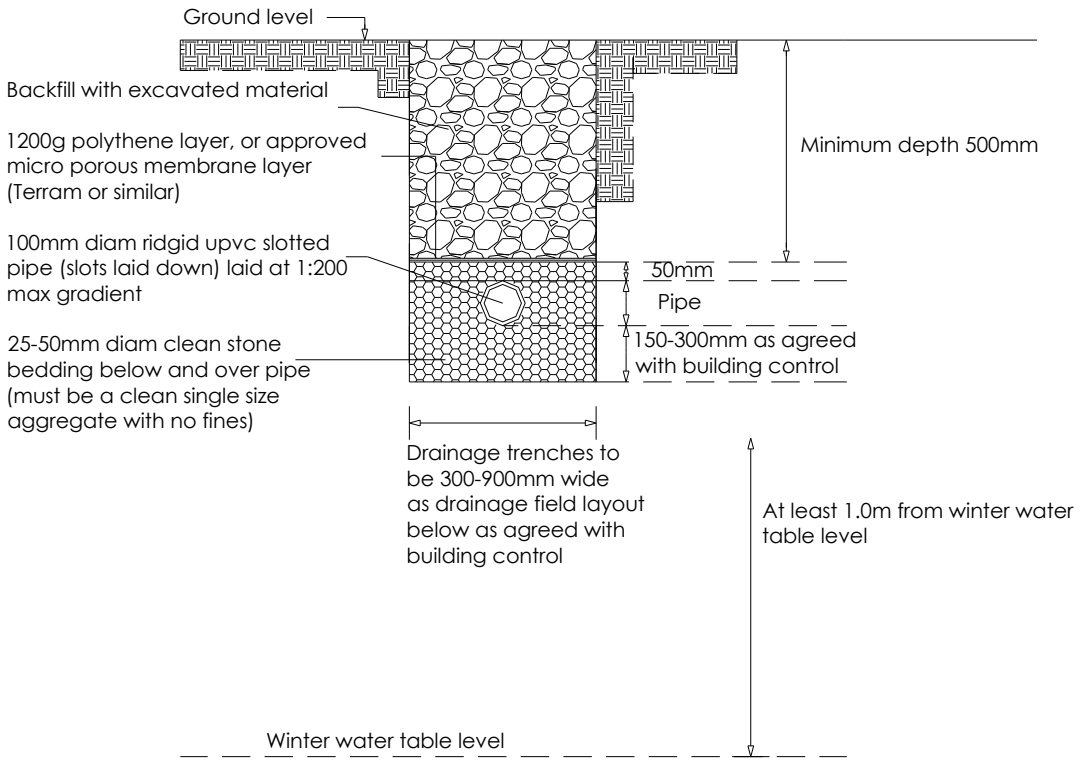
(iii) Area of trench = number of persons to use property X Vp X 0.25 (0.25 figure is used for septic tanks and can be reduced to 0.20 for treatment systems)

Therefore: 5 persons X 14 X 0.25 = 17.5m^2 of effluent drainage field is required.

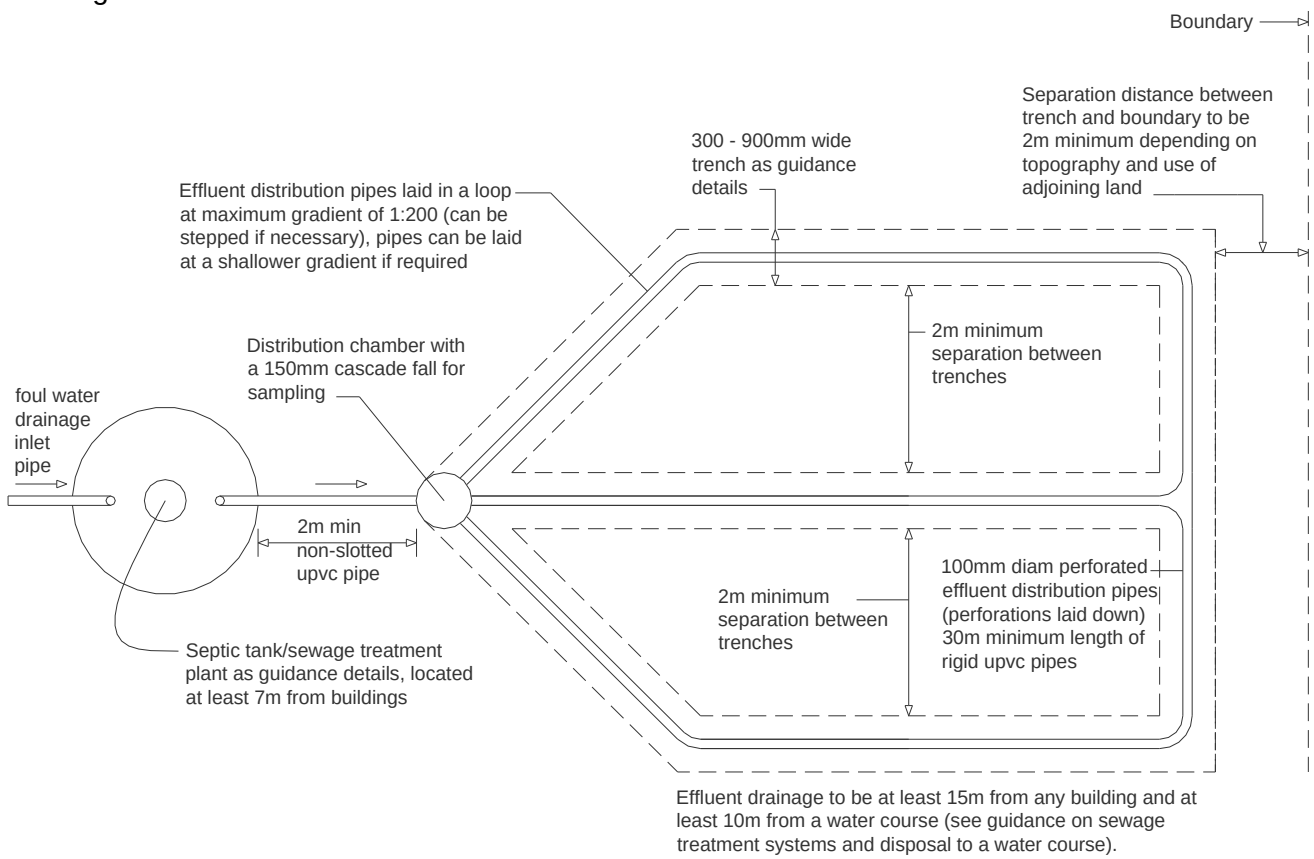
(iv) To calculate actual length of drainage trench required divide 17.5m^2 by width of the trench Required, therefore: $\frac{17.5\text{m}^2}{0.6\text{m wide}}$ = **29.16 (Suggested minimum area 30m long x 0.6m wide**)

***** Vp should range between 12 and 100 to be successful; otherwise the system should be designed by a drainage specialist.

Guidance Diagram 41: Typical section through a septic tank/sewage treatment system drainage field (not to scale) See Diagram 1 of ADH2 for full details



Guidance Diagram 42: Typical drainage field plan layout (not to scale)
See Diagram 1 of ADH2 for full details



Cesspools

Cesspools are sealed watertight tanks used for the containment of domestic sewage and must be emptied regularly by a licensed contractor. Cesspools are used in locations without main drainage in locations acceptable to the Environment Agency, where the discharge of treated effluent is not permissible due to unsuitable ground conditions, or where infrequent use or seasonal use would prevent the functioning of a septic tank or sewage treatment system.

Proprietary factory made cesspools to be designed and constructed to BS EN 12566-1 and installed in compliance with manufacturer's details, or

Non proprietary cesspool can be constructed in situ to a drainage specialist's design and approved by Building Control before the works commence on site. Cesspools to be watertight to prevent leakage of the contents and ingress of sub soil water, Typically the tank consists of one chamber constructed using 150mm minimum thick reinforced concrete base designed by a suitably qualified specialist suitable for storing aggressive effluents, 215mm thick engineering quality brickwork walls (or dense concrete bricks), bond to be agreed with building control, mortar mix 1:3 cement/sand ratio with water proof render or suitable proprietary tanking system applied to both sides and designed heavy concrete roof structure.

Cesspools to be ventilated and fitted with durable lockable lids or covers for emptying and cleaning, and the inlet side of tank should be fitted with a lockable access for inspection. No other openings are permitted. A high level alarm should be fitted for monitoring the cesspool for optimum usage.

Cesspools to be sited:

- At least 7m from any habitable part of any building, preferably down slopes and lower than any existing building and
- Within 30m of a vehicle access suitable for emptying and cleaning the effluent, and the contents should not be taken through a dwelling or place of work and must not be a hazard to the building occupants.

Cesspools should have a minimum capacity of 18,000 litres (18.0m^3) for up to 2 users and increased by 6800 litres (6.8m^3) for each additional user.

A notice plate must be fixed within the building describing the necessary maintenance and the following is an example of such wording:

- 'The foul drainage system from this property is served by a cesspool'
- 'The system should be emptied approximately every (insert frequency) by a licensed contractor and inspected fortnightly for overflow'
- 'The owner is legally responsible to ensure that the system does not cause pollution, a health hazard or a nuisance'

Consultations are to be carried out with Building Control and The Environment Agency before any works commence on site. Cesspools normally do not need registration with the Environment Agency as they are sealed systems with no discharge to the environment. For more information contact the Environment Agency at: www.environment-agency.gov.uk

H3: Rainwater drainage and rainwater harvesting

Rain and storm water drainage systems (single dwellings)
An adequate system of rainwater drainage shall be provided to carry rainwater from roofs of the building and paved areas around the building to one of the following, listed in order of priority:

(i) **adequate soak away** as detailed in this guidance (or similar approved filtration system) or where that is not practicable,
(ii) **water course** or where that is not practicable,
(iii) **a sewer** (note: discharge to a water course or sewer is subject to the relevant Water Authority's written approval).

Important note: New surface/rainwater system must be separate from the foul water or combined sewer system unless written consent is obtained from the relevant Water Authority.

Construction
Rain and storm drainage to consist of proprietary underground drainage system with BBA certification (or other approved accreditation), with 100mm minimum diameter pipes laid at a minimum gradient of 1:100. Upvc pipes should be surrounded in a single size aggregate (size 5-10mm) at a minimum/ maximum depth of 0.6/7.0m in fields, 0.9/7.0m in drives and roads in compliance with the guidance diagram below. If minimum depths cannot be achieved, pipes can be protected with a 100mm reinforced concrete slab with compressible material under and 300mm minimum bearing on original ground in compliance with the guidance diagram below. Drainage/services to incorporate adequate precautions to prevent excessive movement due to possible ground movement in shrinkable clay sub soils in accordance with design details from a suitably qualified specialist.

Bedding and backfilling requirements for rigid and flexible pipes
See Diagram 10 of ADH1 for full details

Rainwater gutters and down pipes
Rainwater gutters and down pipe sizes and number to be suitable for roof area to be drained in compliance with the guidance table below, and fixed in compliance with manufacturer's details. See H3 of ADH for further information

Guidance Table 48: Gutter sizes and pipe outlet sizes for drainage of roof areas
See Table 2 of ADH3 for full details

Maximum effective roof area m^2	Gutter sizes (mm diam)	Outlet sizes (mm diam)
18.0	75	50
37.0	100	63
53.0	115	63
65.0	125	75
103.0	150	89
Notes: 1. The sizes above refer to half round gutters and round rain water pipes. 2. Gutter and outlet sizes for roof areas exceeding the above should be designed by a drainage specialist or be in compliance with manufacturer's details- copy to be sent to building control		

Rainwater harvesting system
Used for collecting and storing rainwater at source rather than allowing runoff. This can include runoff from within the boundaries of a property, roofs and surrounding surfaces.

Rain water harvesting tanks
Rain water harvesting tanks and systems to be designed, installed, and commissioned by a specialist to supply rainwater to sanitary appliances. Below drainage pipe work is to be carried out in accordance with the foul water pipe guidance details above. Overflow from the rain water storage tank is to discharge to a designed soakaway system constructed at least 5m from any building.

Rainwater butts
Rainwater butts used to store rain water is to be connect to the downpipe from the roof gutter. Modular designs of decorative water butts range in size from 100-200 liters and can be connected together to make a series and increase the water storage. Rainwater is diverted from the down pipe via a proprietary pre-filter and rainwater diverter kit which prevent the water butt from overflowing once the butt is full.

Grey water harvesting
(consisting of recycled bath, shower and basin waste water) systems designed for use within the building to be designed, manufactured, installed and commissioned by a suitably qualified and experienced specialist. Grey water to be treated prior to use in toilets etc by an approved method and overflow to discharge to the foul water drainage system.

Grey water and rainwater tanks and systems should:

- Prevent leakage of the contents, ingress of subsoil water and should be ventilated
- Have an anti backflow device on any overflow connected to a drain or sewer
- Have a corrosion proof locked access cover for emptying and cleaning
- Supply pipes from the grey water or rain water collector tanks to the dwelling must be clearly marked as either ‘GREY WATER’ or ‘RAIN WATER’.
- Guidance should be followed in par 1.69-1.72 of App Doc H2, App Doc G of the Building Regulations and the Water Regulations Advisory Scheme Leaflet No: 09-02-04, and BS 8515:2009.

Surface water drainage around the building

Paths and paved areas: around the building to have a non slip finish and provided with a surface cross fall of 1:40 – 1:60 to dispose of rain/surface water and a reverse gradient of at least 500mm away from walls of building (unless the paved/path area is a proprietary system designed to be porous and installed in accordance with manufacturer's details). Surface water to be disposed of by an adequately sized and roddable drainage system via soakaways, or other approved means. Alternatively paths and paved areas to be constructed of self-draining permeable materials (gravel etc) or a proprietary self-draining system with a BBA or other approved third party accreditation and installed in accordance with manufacturer’s details.

Driveways and hard standings: to be constructed of self-draining permeable materials (gravel etc) or a proprietary self-draining system with a BBA or other approved third party accreditation and installed in accordance with manufacturer’s details.

Rain/surface water disposal
Rain/surface water to be piped away from buildings as detailed in guidance above and discharged in to new or existing surface water soakaway, storm water or combined storm/foul water drainage facilities using existing or new inspection chamber connection as shown on plans/ specification, or as agreed with building control on site. New connections to existing storm or combined storm/foul water systems may require consent from the relevant Water Authority before works commence on site. The new surface/rainwater system must (unless agreed by the planning department) be separate from the existing foul water or combined sewer system. Written consent will also be required from the relevant Water Authority.

Rain/surface water disposed of in a separate surface water sewer or combined sewer should be connected via trapped gullies, with inspection chamber positions as detailed in guidance for foul water drainage. Drainage systems to low lying buildings or basements which carry storm water or other vulnerable drainage systems should be provided with anti flood protection such as one way valves, etc, to prevent flooding and sewerage entering the building.

Existing soakaways
Where additional rain/surface water systems are to be connected to the existing soakaway system, it should be checked by a specialist and sizes of the soakaway should be confirmed and agreed with building control as adequate for percolation into the ground.

New soakaways

1. For roof /paved areas less than 100m^2 and individual soakaways serving a single rainwater pipe and roof area less than 25m^2 the following is applicable:
New surface water soakaway(s) to be designed, sited and constructed to provide adequate short term storage for rain/surface water and adequate percolation into the ground.
Important note: for soakaways serving a roof area exceeding 25m^2 up to a maximum area of 100m^2 and soakaways in clay sub soils or serving roof/paved areas exceeding 100m^2 see items 2 and 3 below

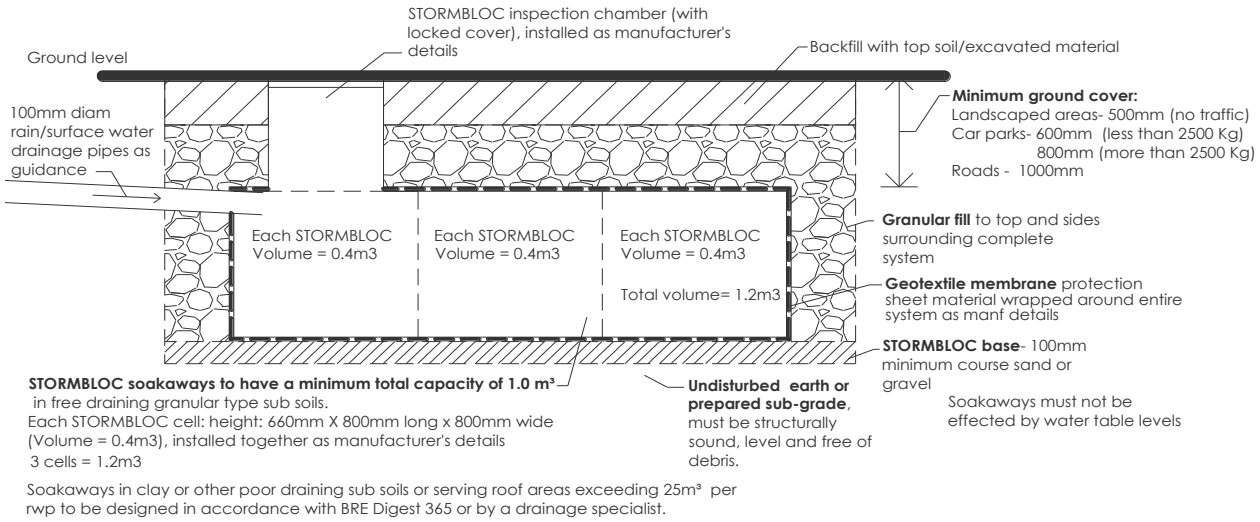
Siting of Soakaways:
Soakaways should be sited:

- at least 5m from any buildings and 2m from boundaries and sloping away from the foundations of any building.
- on land lower than existing/new buildings.
- with an exceedance pathway to prevent flooding of existing/new buildings/land including any adjoining buildings/land. Note: Exceedance pathways should be provided from soakaways, or by linking soakaways together with an overflow to an acceptable exceedance area, for example, a driveway/road or other approved by the planning department.

Types of soakaway
Three common options:

Option 1: Geocellular (open cell plastic boxes) soakaway
Individual geocellular soakaway to have a minimum void capacity of 1.0m³ (constructed in free draining granular type sub soils), per rain water pipe serving a roof area up to 25m^2 - constructed using a proprietary underground modular block type geocellular structured system for infiltration, soakaway and storage of rain/storm/surface water, with a BBA/European certification (or other approved third party accreditation), installed in accordance with the manufacturer's details, typically as detailed in the diagram below.

Guidance Diagram 43.1: Typical 'Stormbloc' geocellular soakaway system (section detail not to scale)

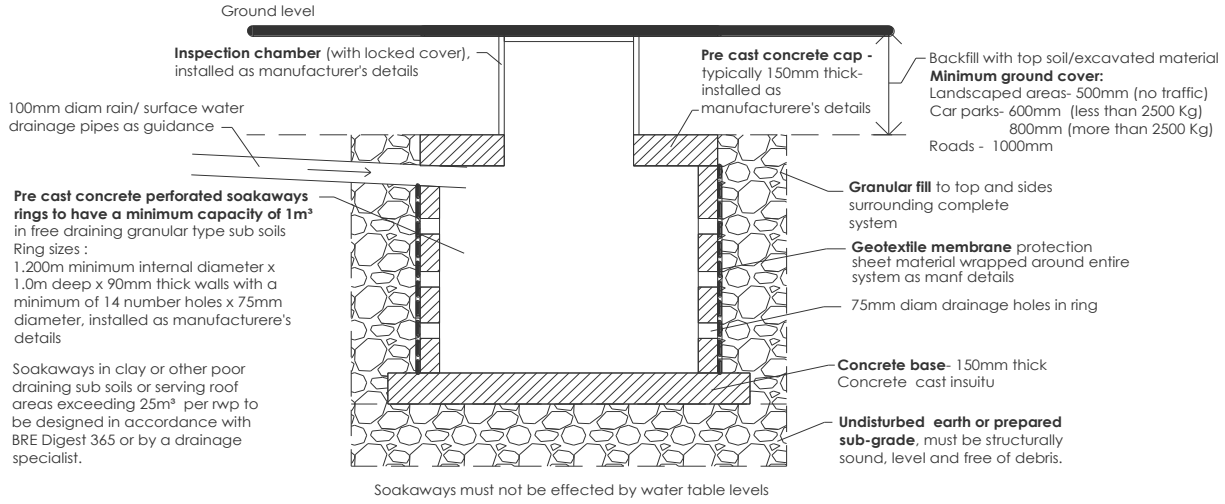


Stormbloc obtained from: Hydro International: www.hydro-int.com Tel: 01275 878371 enquiries@hydro-int.com

Option 2: Perforated precast concrete ring soakaway

Individual soakaway to have a minimum void capacity of 1.0m³ (constructed in free draining granular type sub soils), per rain water pipe serving a roof area up to 25m^2 - constructed using a proprietary perforated precast concrete underground ring system for infiltration, soakaway and storage of rain/storm/surface water, with a BBA/European certification (or other approved third party accreditation), installed in accordance with the manufacturer's details, typically as detailed in the diagram below.

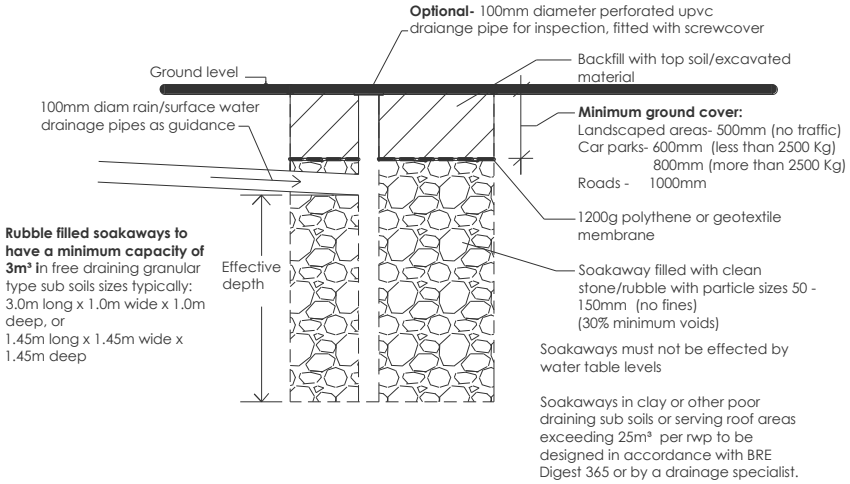
Guidance Diagram 43.2: Typical 'Perforated precast concrete ring' soakaway system (section detail not to scale)



Option 3: Rubble filled soakaway

Individual soakaway to have a minimum void capacity of 3.0m³ (constructed in free draining granular type sub soils), per rain water pipe serving a roof area up to 25m^2 - constructed of clean stone/rubble with particle sizes ranging in size from 50 to 150mm (30% minimum voids) and covered with polythene/geotechnical membrane with a BBA/European certification (or other approved third party accreditation), installed in accordance with the manufacturer's details, and top soil /excavated material- typically as detailed in the diagram below.

Guidance Diagram 43.3: Typical 'Rubble filled' soakaway system (section detail not to scale)



2. Soakaways serving a roof area 25m^2 up to a maximum area of 100m^2
To be designed in accordance with the soakaway design details below (following example 1 for actual roof area to be served- soakaway sizes must not be less than those stated above) or by a drainage specialist.

3. Soakaways in clay sub soils or serving roof/paved areas exceeding 100m^2
To be designed in accordance with BRE Digest 365 or by a drainage specialist.

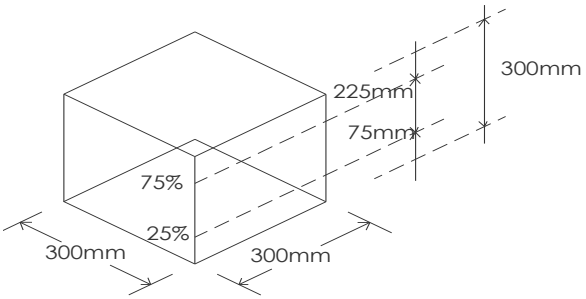
Rainwater/paved area soakaway design

Example 1: Roof area of 25m^2 extension to be drained to a 1.0m^3 soakaway* filled with rubble with at least 30% voids. (*Please note minimum soakaway size is to be 3.0m^3)

Ground conditions
Ground conditions should be assessed to determine the suitability of sub soils. Examples of suitable sub soils with good percolation include sand, gravel, chalk, sandy loam and clay loam. Examples of poor sub soils are sandy clay, silty clay and clay. It is important that percolation characteristics are suitable in both summer and winter conditions and that the sub soil is well drained and not saturated with water. A trial hole should be excavated 1.5m below the invert of the proposed effluent drainage pipe work to determine the position of the standing ground water table. The ground water level in summer and winter should be at least 1.0m below the invert of the effluent drainage pipe work.

Percolation test
Percolation tests should not be carried out in abnormal weather conditions such as heavy rain, sever frost or drought.

Step 1: Excavate a test hole: 300mm square x 300mm deep below proposed invert level of the drainage field trench bottom



Step 2: Calculate percolation of soil using formula: $f = \frac{Vp}{a \times t}$

Where:

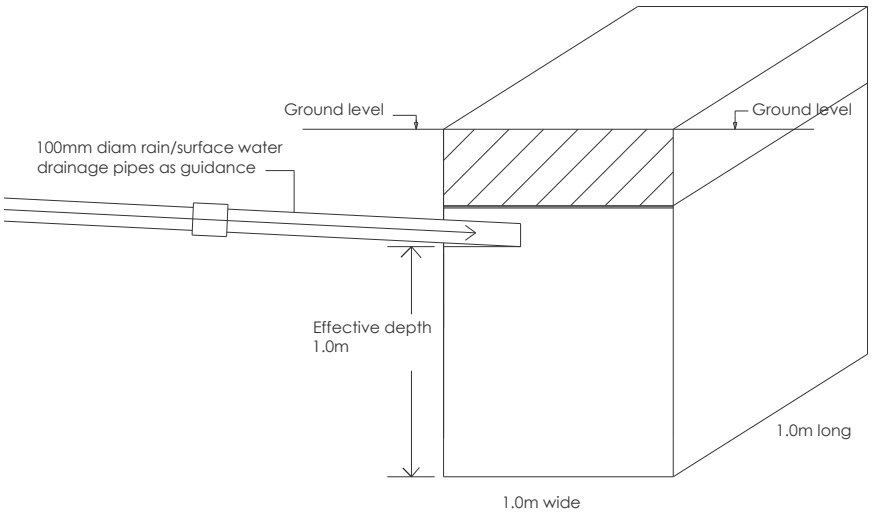
f =	**soil infiltration rate (meters/second)**
Vp =	**volume of water measured between 75% to 25% of test hole (m^3)** Calculated as follows: 0.3 x 0.3 x (0.225-0.075 =0.15) = **0.0135 m^3**
a =	**internal surface area of test hole (m2) (50% effective depth of sides + base)** Calculated as follows: 4 sides x 0.3 x (50% of 0.3 = 0.15) + (0.3 x 0.3) = **0.27m^2**
t =	**time taken for water to fall from 75% full to 25% full (in seconds)*** Calculated as follows: (i) Fill the test hole with water and allow to drain away over night (ii) Refill to a depth of 300mm and note time taken in seconds to drain away from 75% full to 25% full (i.e. 150mm drop in level from 225mm to 75mm) (iii) Carry out the procedure a second and third time (can be in the same day if the hole empties completely and quickly enough) (iv) Repeat the procedure in two more test holes and calculate the average of the three results as follows: test 1 + test 2 + test 3 **= average time taken for each test hole** 3 (v) Find the average of these results as follows: Hole 1 + Hole 2 + Hole 3 **= average time taken for all test holes** 3 (vi) For example: average time for (v) took 35 minutes x 60 = **2100 seconds** *** Note:** Time taken should Between XXX and XXX to be successful; otherwise the system should be designed by a drainage specialist.
Calculate the soil percolation using formula: $f = \frac{Vp}{a \times t}$ $f = \frac{0.0135}{0.27 \times 2100}$ **f = 0.0000238 m/s**	

Step 3: Calculate the Inflow using formula: I = A x R

Where:

I =	**Inflow (m3)**
A =	**Actual area of impermeable roof/paved area to be drained (m^2)** For example: actual roof area of new extension = **25m^2**
R =	**Total rainfall in design storm (m)** In accordance with Approved Document H3: 2015 edition - for soakaway up to 25m2 a design rainfall of 10mm in 5 minutes is to be assumed Calculated as follows: 10mm = **0.01m** 1000
Calculate the inflow using formula: I = A x R I = 25 x 0.01 **I = 0.25m^3**	

Step 4: Assume a soak away size: 1.5m below ground level with an effective depth of 1.0m (below inlet) x 1.0m wide x 1.0m long



Step 5: Calculate the Out flow using formula: O = a x f x d

Where:

O =	**Out flow (m^3)**
a =	**internal surface area of proposed soakaway(m2) (50% effective depth of sides + base)** Calculated as follows: 4 sides x 1.0m x (50% of 1.0m = 0.5m) + (1.0x1.0m) = **3.0m^2**
f =	**Percolation (soil infiltration rate) (m/s)** See step 2: **f = 0.0000238 m/s**
d =	**Storm duration (seconds):** Calculated as follows: 5 minutes x 60 = **300 seconds**
Calculate the Out flow using formula: O = a x f x d O = 3 x 0.0000238 x 300 **O = 0.02142 m^3**	

Step 6: Calculate the required stored volume using formula: S= I - O

Where:

S =	**Soakaway storage volume required (m^3)**
I =	**Inflow (m3)** See step 3: **I = 0.25m^3**
O =	**Out flow (m3)** See Step 5: **O = 0.02142 m^3**
Calculate the required stored volume using formula: S= I - O S= 0.25 - 0.02142 **S= 0.2285 m^3**	

Step 7: Check proposed soakaway with 30% voids will have sufficient capacity

Required soakaway storage volume required in Step 6 = **0.2285 m^3**
Proposed soakaway sizes with 30% voids: 1.0m x 1.0m x 1.0m x 0.3 (30% voids) = **0.3m^3**

Therefore proposed soakaway is suitable - Note: minimum size of a rubble filled soakaway is 3.0m^3

Oil/fuel separators

Under the requirements of the Water Industries Act, it is an offence to discharge fuels into water courses, coastal water or underground water. Oil separators are required where fuel is stored or in other high risk areas or car parks and the Environment Agency has issued guidance on the provision of oil separators. For paved areas around buildings or car parks a bypass separator is required with a nominal size of 0.0018 times the contributing area and silt storage area (in litres) equal to 100 times the nominal size.

In fuel storage areas and other high risk areas full retention separators are required with a nominal size equal to 0.018 times the contributing area and silt storage area (in litres) equal to 100 times the nominal size. Separators discharging to infiltration devices or surface water sewers should be class 1 (and capable of accommodating the whole content volume of one compartment of a delivery tanker)

Proprietary oil separators should be factory made, water proof, designed and constructed to the requirements of the Environment Agency, licensing authorities requirements (where the Petroleum Act applies), prEN858 and BBA certification or other approved accreditation). Separators must be installed and maintained in compliance with the manufacturer's details and inlet arrangements should not be direct to the water surface, adequate ventilation must be provided. The separator must be cleaned out and emptied regularly by a licensed contractor. See Appendix H3 -A of ADH3 for further information

Air tightness and testing

To be carried out as for foul water drainage above

H4: Building over or close to and connections to public sewers

Building over or close to a Public Sewer

The Water Authority (WA) being the sewerage undertaker is responsible for maintaining public sewers and the owner/developer of a building being constructed, extended or underpinned within 3m of a public sewer as indicated on the relevant WA sewer maps are required to consult with the WA to ensure:

(i) No damage occurs to the sewer. The extra weight of building being constructed, extended or underpinned a new building above a sewer could cause the sewer to collapse, resulting in structural damage to the new building, interrupted drainage from other properties and wastewater flooding. In these instances the sewer will need to be repaired quickly and this may involve taking down the building.

(ii) Suitable access is available to carry out any maintenance, repair or replacement works to the public sewer.

(iii) Consent is obtained and an agreement is entered into to build close to or over the public sewer before works commence on site

Locating a public sewer

Copies of the sewer record maps are held by the WA and Local Authority for the location of public sewers, and checks should be carried out at an early stage to ensure that the proposed works do not effect a public sewer.

Options

If you find that your plans could affect a public sewer, you should consult the relevant WA and discuss with them the following options;

- Avoiding the sewer through modifications of plans so that the building is at least 3 metres away from the sewer. This is often the easiest and cheapest option.
- Diverting the sewer. If the plans cannot be modified, the WA will usually require the sewer to be diverted. In most cases the diversion works is carried out at the property owners expense, normally by contractors approved by the WA.

The WA will not normally allowed construction directly over a manhole or pressurized pumping main.

The Build Over Process

If the only option is to apply to build over a public sewer, the building owner should make an application to the WA who may allow to build over a sewer, subject to the sewer being in satisfactory condition and their written Agreement before works commence.

Typical procedure:

- A Closed Circuit Television (CCTV) survey is carried out by WA before works commence to ascertain whether any repair work is required
- Another survey is required when the building is completed, to check that the sewer has not been damaged.
- In certain circumstances, if the building owner does not obtain the WA agreement, the WA have the right to discontinue the works, and the take down the building erected over the public sewer.
- Consultations should be carried out early on in the design process to avoid any abortive costs, delays or other problems.
- The WA make a charge for applications.

Private Sewer Transfer Regulations

Since the implementation of the Private Sewer Transfer Regulations on 1st October 2011, all lateral drains and sewers, i.e. those serving two or more properties that connect to the public sewer network, will be adopted by the relevant Water Authority/sewerage provider and the above requirements for building over/ close to and/or making new connections to public sewers will apply. As these lateral drains and sewers may not yet show up on the sewer maps it is important that consultations with the WA are carried out at an early stage.

Protection

Protection of the sewer pipes and systems are to be carried out in compliance with the WA requirements.

Further information

Is available from the relevant Water Authority or
www.defra.gov.uk/environment/quality/water/sewage/sewers or
www.water.org.uk/home/policy/private-sewer-transfer

Connections to public sewers

Owners/developers of a building with new drainage connections or indirect drainage connections being made to a public sewer as indicated on the relevant Water Authorities sewer maps are required to consult with the WA and where necessary obtain consent before works commence on site.

H5: Separate systems of drainage

The building owner/agent must carry out all necessary consultations with the relevant Water Authority before works commence on site. Rain/surface water systems cannot be connected to foul water drains without the written permission of the relevant Water Authority. See H5 of ADH for further information.
ail: building.control@fdean.gov.uk

H6: Solid waste storage

Only applies to new dwellings and conversion to create a new dwelling. See H6 of ADH and new dwellings in this guidance for further information

Part J: Combustion appliances and fuel storage systems

Please refer fully to Approved Document J: Combustion appliances and fuel storage systems (2010 edition with further 2010 amendments);

Contents

Space and hot water heat producing appliances in general
- Guidance Table 49: Typical minimum design guide temperatures for rooms

Solid fuel appliances up to 50kW rated output
- Construction of open fire recessed and hearth
- Guidance Diagram 44: Non combustible hearth details for recessed open fire
- Construction of solid fuel masonry chimneys
- Guidance Diagram 45: Solid fuel masonry chimney construction
- Guidance Diagram 46: Lead flashing detail to solid fuel masonry chimney
- Guidance Diagram 47: Solid fuel chimney construction with bends
- Guidance Diagram 48: Minimum separation distances from combustible material in or near to a solid fuel chimney
- Free standing solid fuel stove and hearth
- Guidance Diagram 49: Non combustible hearth detail under free standing solid fuel stove
- Flue pipe connections to free standing stove and chimneys
- Construction of factory made insulated twin walled metal chimneys
- Guidance Diagram 50: Free standing stove and metal chimney detail through a building
- Guidance Diagram 51: Separation of twin walled insulated flue from combustible materials
- Guidance Table 50: Sizes of flues in chimneys
- Carbon monoxide alarms
- Air supply (ventilation) to solid fuel appliances
- Guidance Table 51: Air supply (permanent ventilation) to solid fuel appliances
- Construction of factory made flue block chimneys
- Configuration of flues serving open flue appliances
- Inspection and cleaning openings in chimneys and flues
- Interaction of mechanical extract vents and opened flue combustion appliances
- Chimney /flue heights
- Repair/relining of existing flues
- Notice plates for hearths and flues

Appliances other than solid fuel

Gas heating appliances up to 70kw
- Interaction of mechanical extract vents and opened flue gas combustion appliances

Oil heating appliances up to 45kW
- Interaction of mechanical extract vents and opened flue oil combustion appliances

Fuel storage tanks
- LPG tanks and cylinders up to 1.1 tonnes
- Oil tanks up to 3500 litres

Renewable energy/micro regeneration Installations
- Provision of information- commissioning certificates (testing)

Part J: Combustion appliances and fuel storage systems

Space and hot water heat producing appliances in general

All space and hot water systems must be in accordance with BS 5449, BS 5410 and BS 8303, installed, commissioned, calibrated and certified by a suitably qualified person or installer registered with an appropriate competent persons scheme and details supplied to Building Control and the owner along with the operating manuals, etc before the building is completed/ occupied.

Guidance Table 49: Typical minimum design guide temperatures for rooms

Room	Design room temperature °C
Living room (including study or similar room)	21
Dining/breakfast room	21
Bed-sitting room/open plan flat	21
Bedroom	18
Hall and landing	18
Kitchen	18
Bathroom/shower room/en-suite	22
Toilet/cloakroom	18

Note: design room temperatures above are based on external temperature of -3^{o}C

Boilers to have a SEDBUK efficiency above 90% to comply with Building Regulations as amended in October 2010 for gas/ LPG/oil and must be provided with separate controls for heating and hot water with a boiler interlock and timer. Separate temperature control of zones within the dwelling should be provided as follows; room thermostat or programmable room thermostats in all zones, and individual radiator control such as thermostatic radiator valves (TRV's) on all radiators other than in reference rooms (with a thermostat) and bathrooms. Un-vented hot water systems require safety devices including non self setting energy cut out and temperature release valve and thermostat. Safety valves from vented hot water systems must discharge safely.

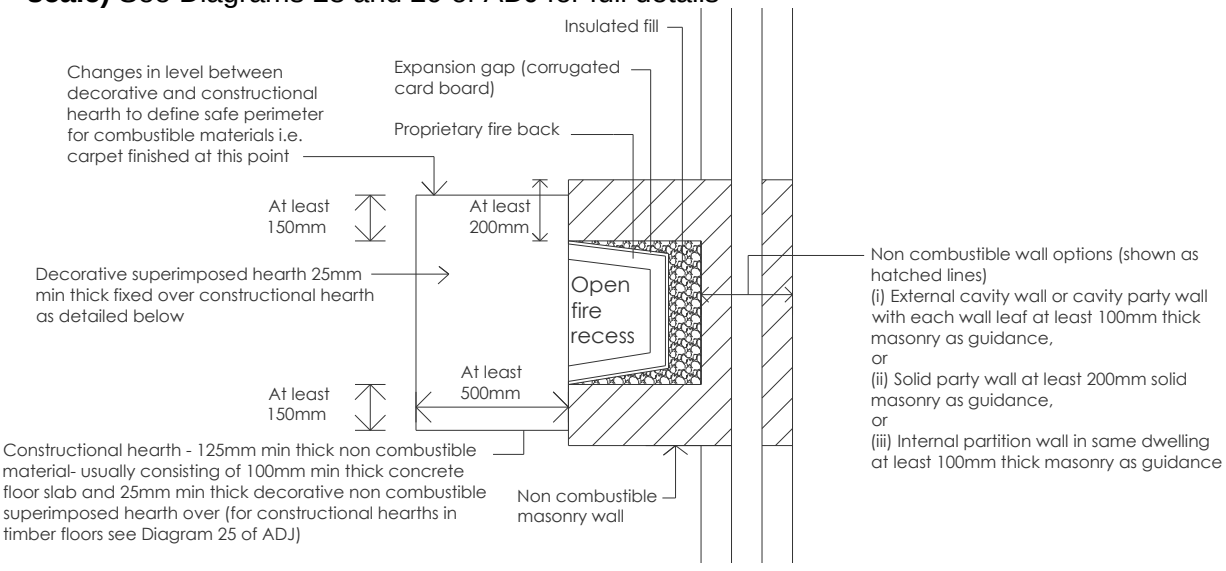
Hot water vessels to be insulated with 35mm minimum thickness of PU foam and both heating and water pipes to be insulated with proprietary foam covers equal to their outside diameter within 1m of the vessel and in unheated areas.

Solid fuel appliances up to 50kW rated output

Construction of open fire recessed and hearth

Fire place walls to consist of non combustible material of at least 200mm in thickness to the side and at least 100mm thick in the back wall recess, lined with suitable fire bricks or proprietary fire back. The constructional hearth to be at least 125mm thickness (or 25mm minimum thickness decorative non combustible superimposed hearth with changes in levels to mark safe perimeter, fixed over 100mm minimum concrete floor slab). Hearth to project at least 150mm from the sides jambs and 500mm in front of the jambs as detailed in the guidance diagram below

Guidance Diagram 44: Non combustible hearth details for recessed open fire (plan not to scale) See Diagrams 28 and 29 of ADJ for full details



Construction of solid fuel masonry chimneys

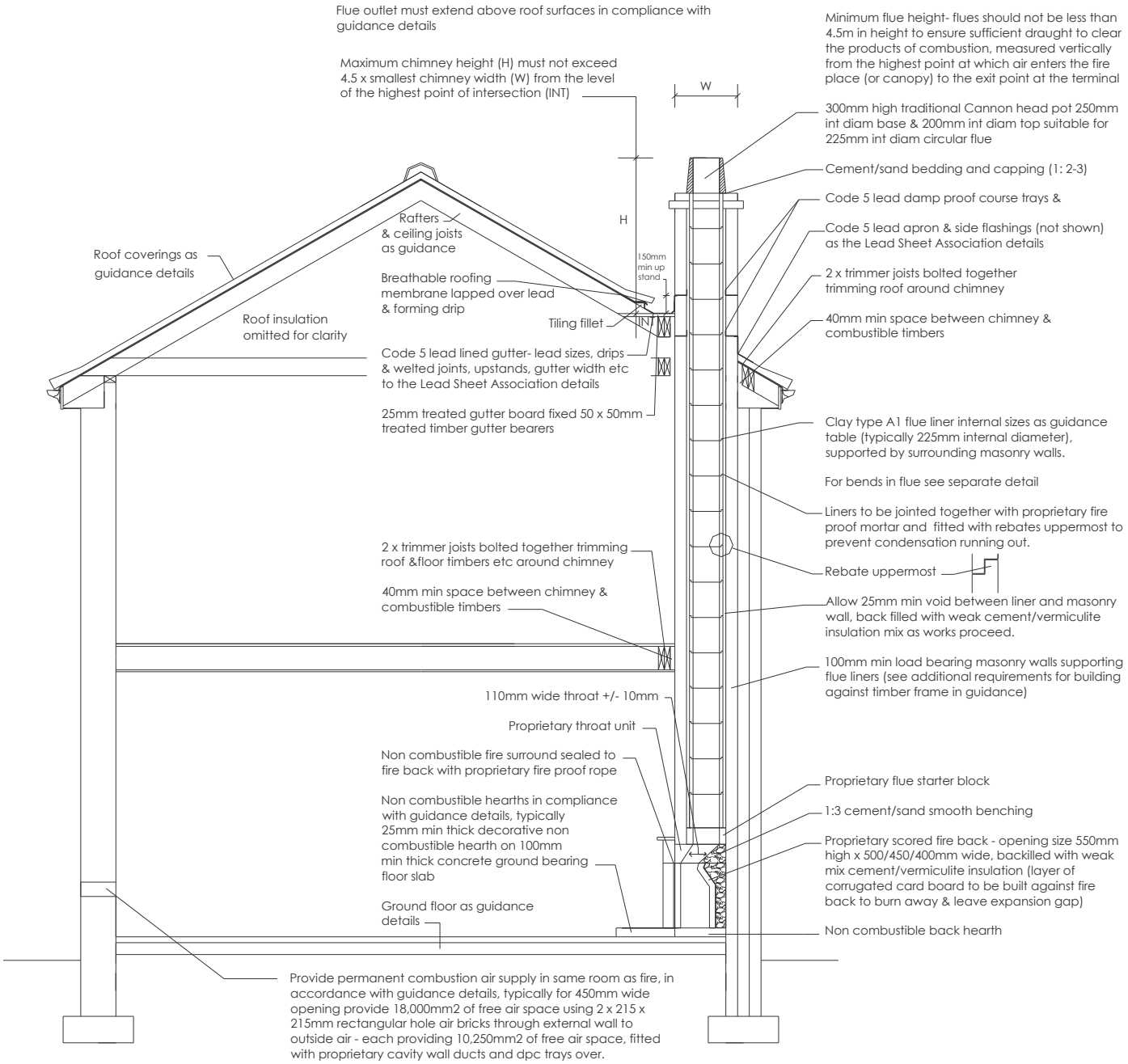
Chimneys to be constructed as detailed in guidance diagram below, in external quality frost resistant materials 100mm minimum thickness (increased to 200mm where separates another fire compartment or another dwelling), using brick, dense blocks or reconstituted/natural stone to match the existing, with suitable mortar joints for the masonry as the masonry manufacturer's details with any combustible material kept at least 200mm away from the flue and 40mm away from the walls containing flues in compliance with diagram 21 of ADJ. Line chimney with manufactured flue liners installed in compliance with manufacturer's details as follows:

(i) Clay flue liners to BS EN 1457:2009: Class A1 N1 or Class A1 N2, to be laid vertically and continuously with socket up (jointed with fire proof mortar) from appliance with a minimum diameter in compliance with the guidance table below.

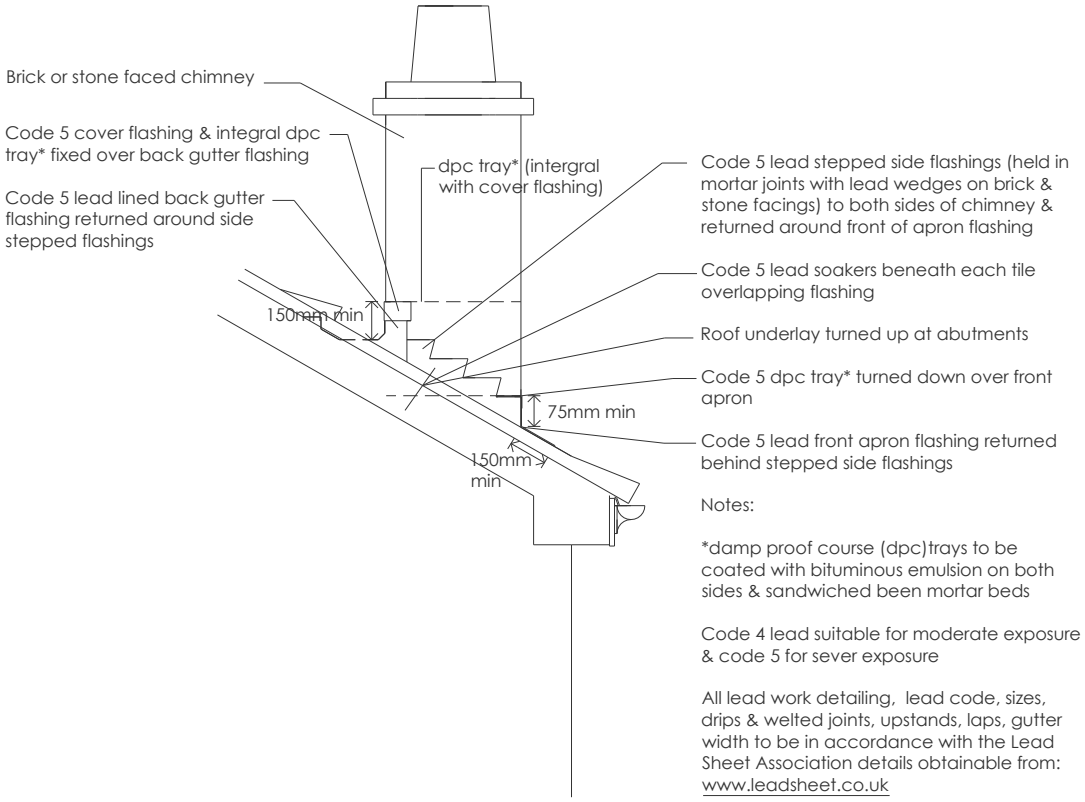
(ii) Concrete flue liners to BS EN 1857:2003: Type A1, A2, B1 or B2 to be laid vertically and continuously socket up (jointed with fire proof mortar) from appliance with a minimum diameter in compliance with guidance table below.

(iii) Liners whose performance complies to BS EN 1443:2003: designation: T400 N2 D 3 G with a minimum diameter in compliance with guidance table below.

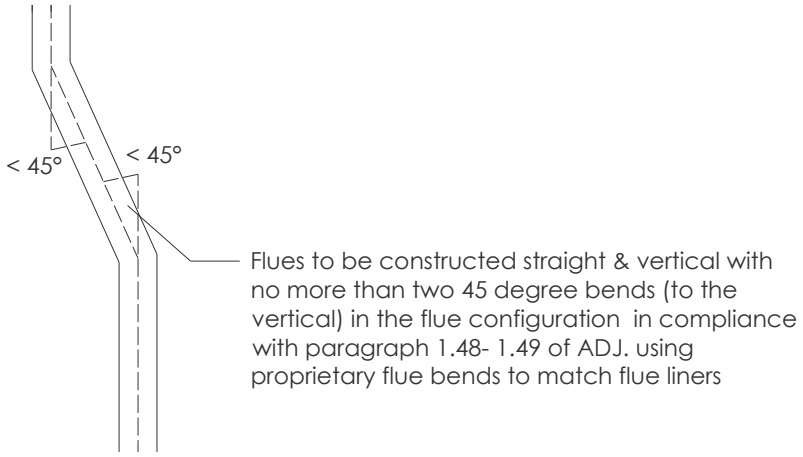
Guidance Diagram 45: Solid fuel masonry chimney construction (not to scale)



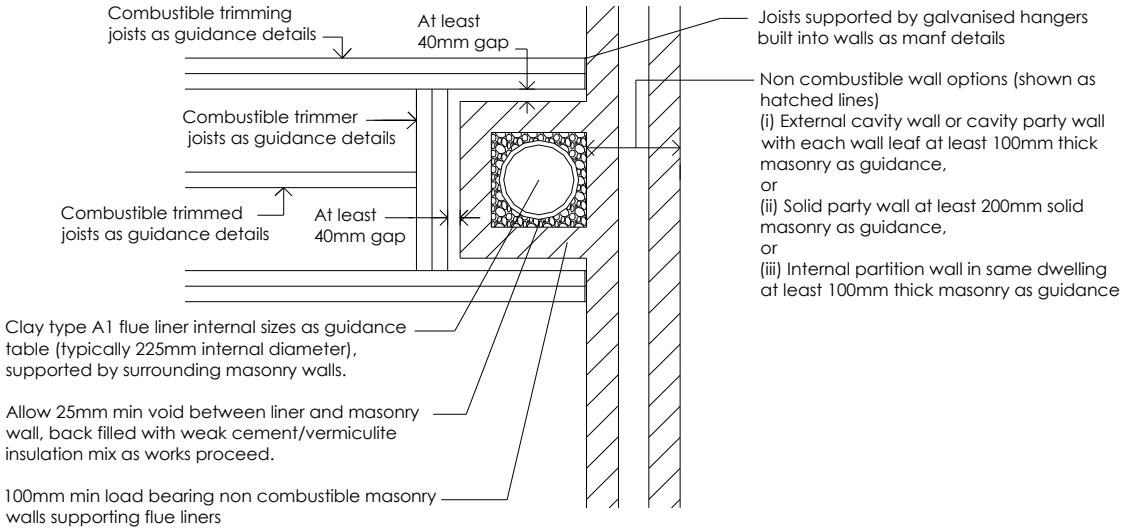
Guidance Diagram 46: Lead flashing detail to solid fuel masonry chimney (elevation detail not to scale)



Guidance Diagram 47: Solid fuel chimney construction with bends (section detail not to scale) See Diagram 15 of ADJ for full details



Guidance Diagram 48: Minimum separation distances from combustible material in or near to a solid fuel chimney (plan detail not to scale) See Diagram 21 of ADJ for full details

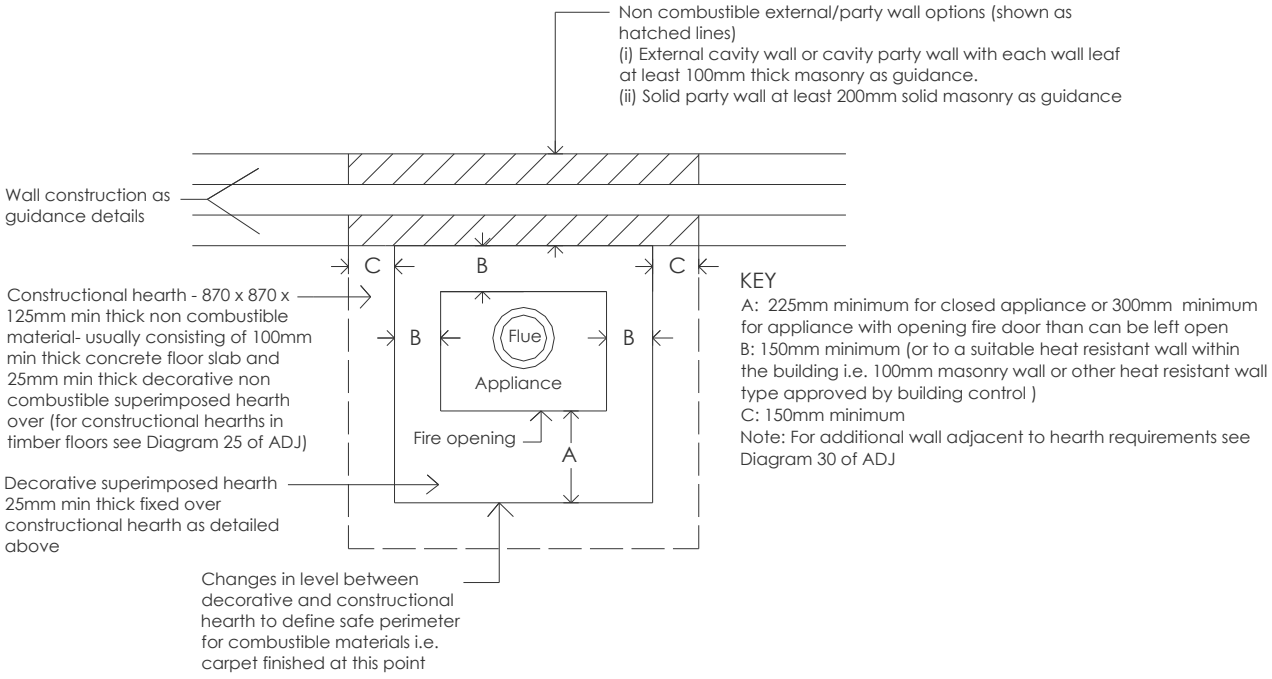


Additional space separation requirements:
(i) Combustible material i.e. floor joists, etc built into or fixed to chimney wall must be at least 200mm from the flue liner
(ii) Timber frame construction built against a chimney wall must be at least 200mm from the flue liner
(ii) Combustible material supported by metal fastening or support bracket built into chimneys must be at least 50mm from the flue liner
Note: Decorative trims i.e. skirting board, picture rail, architrave etc can be fixed directly to 100mm min thick chimney wall with no additional space separation requirements

Free standing solid fuel stove and hearth

Free standing solid fuel stoves to be installed in accordance with manufacturer's details, fixed to a non combustible hearth, sizes at least 840 x 840mm, positioned 150mm minimum away from enclosing non combustible walls (walls at least 100mm thick). The constructional hearth to be at least 125mm thickness (or can be a decorative non combustible superimposed hearth 25mm minimum thickness fixed over 100mm minimum concrete floor slab with changes in levels to mark a safe perimeter). Hearth should project at least 150mm to the sides and rear of the appliance and 300mm in front of the operable appliance door as detailed in the guidance diagram below.

Guidance Diagram 49: Non combustible hearth detail under free standing solid fuel stove (plan detail not to scale) See Diagrams 26, 27 and 30 of ADJ for full details



Flue pipe connections to free standing stove and chimneys

Single flue pipes connecting the appliance to a chimney should not extend beyond the room in which the appliance is located, and should not pass through any roof space, partition, internal wall or floor (unless it connects to the chimney at that point). The maximum recommended length is 1-1.5m to prevent heat transfer and improve flue efficiency. Minimum flue length 0.6m.

Single flue pipes should be guarded if they could be at risk of damage, or if the burn hazard is not immediately apparent to people. Single flue pipes must be located to avoid igniting combustible materials and must be at least 3 times its internal diameter from any combustible materials (3 x 150mm = 450mm); **or**

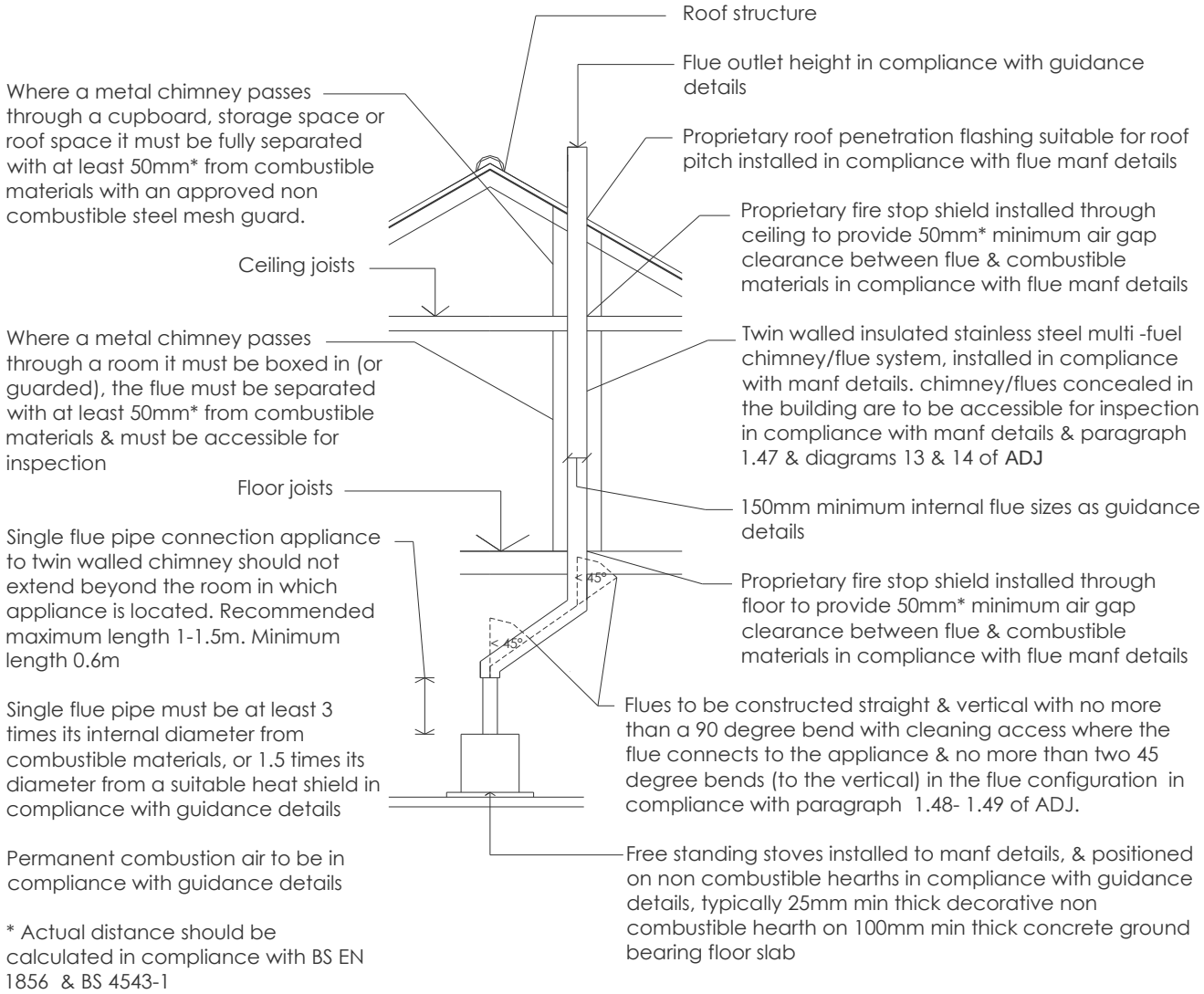
The combustible material can be heat shielded, the flue must be at least or 1.5 times its diameter from the heat shield. The heat shield (typically 12mm thick proprietary fire resistant board) must extend at least 1.5 times the flues internal diameter to each side of the flue and there must be an air gap of at least 12mm (formed with strips of fire board) between the shield material and the combustible material; **or**

The connecting flue pipe is factory made in compliance with T 400 N2 D3 G according to BS EN 1856-2:2004, and installed to BS EN 15827-1

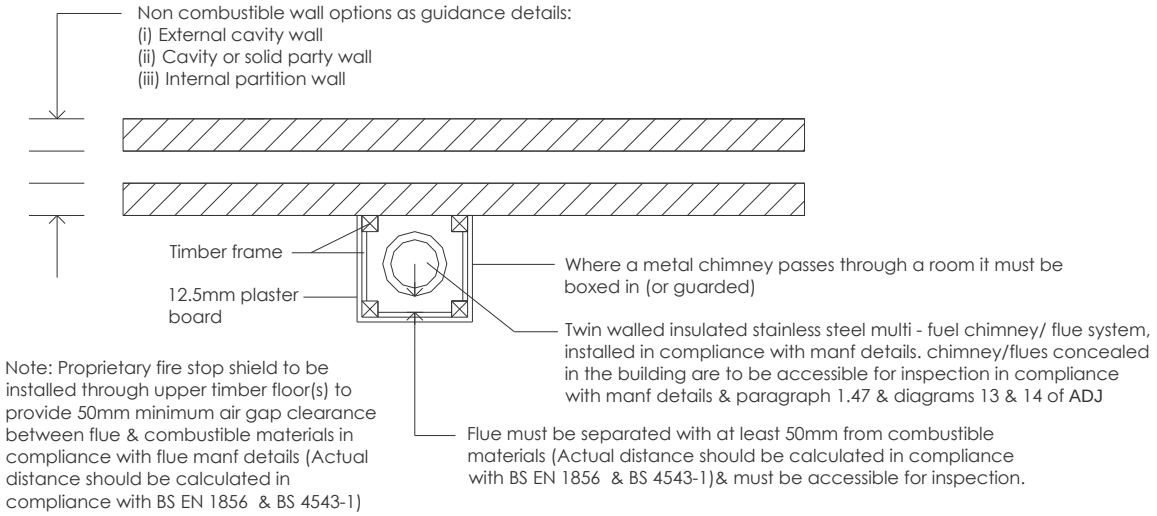
Construction of factory made insulated twin walled metal chimneys

Construction of factory made metal chimneys are to be carried out in compliance with paragraphs 1.42 – 1.46 of ADJ, and appliance manufacturer's details. The separation of combustible materials from a factory- made twin walled metal chimney is to be carried out in compliance with Diagram 13 of ADJ. Where a metal chimney passes through a cupboard, storage space or roof space it must be fully separated with at least 50mm from combustible materials with a non combustible steel mesh guard. Factory made metal chimneys concealed in the building are to be accessible for inspection in compliance with paragraph 1.47 and diagrams 13 and 14 of ADJ. Chimneys passing through combustible floors and roofs should be fitted with proprietary fire stop shields. Chimneys passing through fire compartment walls or floors-contact building control for further advice.

Guidance Diagram 50: Free standing stove and metal chimney detail through a building (section detail not to scale) See Diagrams 14,15,16, 17, 18 and 19 of ADJ for full details



Guidance Diagram 51: Separation of twin walled insulated flue from combustible materials (plan detail not to scale) See Diagram 13 of ADJ for full details



Guidance Table 50: Sizes of flues in chimneys
(see Table 2 of ADJ for full details)

Installation	Minimum internal flue sizes
Fire place with opening up to 500 x 500mm	200mm (diameter, rectangular or square)
Fire place with opening more than 500 x 500mm or exposed on both sides	Area equal to 15% of the total face area of the fireplace opening. (note: total face areas more than 15% or 0.12m^2 to be designed by heating specialist)
Closed appliances (stove, cooker, room heater and boiler) up to: 30kW rated output 30- 50kW rated output	(diameter, rectangular or square) 150mm 175mm
Closed appliances up to 20kW rated output which-burns smokeless/low-volatile fuel, or complies to the Clean Air Act	See table 2 of Approved Document J
Pellet burner which compiles to the Clean Air Act	See table 2 of Approved Document J

Carbon monoxide alarms
A mains operated carbon monoxide alarm is required at ceiling level in the same room as the solid fuel appliance, which must be either battery operated in compliance with BS EN 5029: 2001: or mains operated with sensor failure warning device in compliance with BS EN 5029: Type A. Carbon monoxide alarm to be positioned on the ceiling at least 300mm from walls, or if located on the wall as high up as possible (above any doors or windows) but not within 150mm of the ceiling, and between 1m and 3m horizontally from the appliance

Air supply (ventilation) to solid fuel appliances
Permanently open combustion air vents ducted to outside are to be provided in the same room as the solid fuel appliance with a total free area in compliance with the guidance table below (see Table 1 of ADJ for further information)

Guidance Table 51: Air supply (permanent ventilation) to solid fuel appliances
See Table 1 of ADJ for full details

Type of appliance	Minimum amount of ventilation
Open fire place with no throat (i.e. under a Canopy)	50% of the cross section area of the flue
Open fire place with throat	50% of the cross section area of the Throat opening area
or for fire openings sizes: 500mm wide 450mm wide 400mm wide 350mm wide	 20,500mm^2 18,500mm^2 16,500mm^2 14,500mm^2
Enclosed stove with flue draught stabilizer*:	
(i) In new building/extension (good air tightness)	850mm^2/kW of appliance rated out put
(ii) In existing older building (if air tightness improved- use figure for new extension)	300mm^2/kW for first 5kW and 850mm^2/ kW of balance of appliance rated out put
Enclosed stove with **no** flue draught stabilizer:	
(i) In new building/extension (good air tightness)	550mm^2/kW of appliance rated out put
(ii) In existing building (if air tightness improved- use figure for new extension)	550mm^2/kW for appliance rated out put above 5kW
Note: *Draught stabilizer is a factory made counter-balance flap devise admitting air to the flue, from the same space as the combustion air, to prevent excessive variations in the draught. it is usual for these to be in the flue pipe or chimney, but they may be located in the appliance. (see diagram 3 of ADJ)	

Construction of factory made flue block chimneys
Construction of factory made flue block chimneys are to be carried out in compliance with paragraphs 1.29 – 1.30 of ADJ, and appliance manufacturer's details.

Configuration of flues serving open flue appliances
Flues to be constructed straight and vertical with no more than a 90 degree bend with cleaning access where the flue connects to the appliance and no more than two 45 degree bends (to the vertical) in the flue configuration in compliance with paragraph 1.48- 1.49 of ADJ.

Inspection and cleaning openings in chimneys and flues
Where a chimney/flue cannot be cleaned through the appliance, an air tight accessible inspection and cleaning opening should be fitted using proprietary factory made components compatible with the flue system, fitted and located to allow sweeping of the flue in compliance with appliance manufacturer's details.

Interaction of mechanical extract vents and opened flue combustion appliances
Where a kitchen etc contains an opened flue solid fuel appliance and a mechanical extract vent, the appliance should be tested and certificated by a suitable qualified and registered HETAS engineer that the combustion appliance operates safely whether or not the fans are running. Alternatively, the ventilation from the passive stack effect of an open flue appliance may negate the need for a mechanical extract fan to be fitted in the same room subject to approval by building control.

Chimney /flue heights
Chimney height not to exceed 4.5 times its narrowest thickness above highest point of intersection (density of masonry to be greater than 1500kg/m^3). Chimney/terminal to discharge at a minimum height in compliance with Diagram 17 of ADJ as follows:

- 1.0m above flat roofs
- 1.0m above opening windows or roof lights in the roof surface
- 0.6m above the ridge
- Outside of a zone measured 2.3m horizontally from the roof slope
- 0.6m above an adjoining or adjacent building that is within 2.3m measured horizontally (whether or not beyond the boundary)

Please refer to Diagram 18 of ADJ for flue positions on easily ignited roofs (i.e. thatch)

Repair/relining of existing flues
Repair /relining of existing flues to be carried out by a suitably qualified and experienced specialist. Re-use of existing flues to be inspected, tested and certified by a suitably qualified and experienced specialist prior to use as suitable for solid fuel appliances.

Relining of existing flues to be carried out in compliance with BS EN 1443:2003: designation: T400 N2 D 3 G with minimum diameters in compliance with guidance table above using lining systems suitable for solid fuel appliances as follows:

(i) Factory made flue lining systems in compliance with BSEN1856-1:2003 or BSEN1856-2:2004
(ii) Cast in-situ flue lining system in compliance with BSEN1857:2003+A1:2008

Notice plates for hearths and flues
Notice plates for hearths and flues must be permanently displayed next to the flue (or electricity consumer unit or water stop tap) detailing the property address; location of installation (room); type of installation the flue is suitable for; size and construction of flue, if suitable for condensing appliance, installation date, and any other information (optional).

Appliances other than solid fuel

Gas heating appliances up to 70kw

Gas burning appliances up to 70kW are out of the scope of this guidance and to be installed, commissioned and tested in compliance with Section 3 of ADJ, and BS 5440, BS 5546, BS 5864, BS 5871, BS 6172, BS 6173, BS 6798, and the Gas Safety (installation and use) Regulations. All works to be to be carried out by an installer registered with Gas Safe. Copy of commissioning certificates are to be issued to Building Control on completion of the works.

Interaction of mechanical extract vents and opened flue gas combustion appliances

Where a kitchen etc contains an opened flue gas appliance and a mechanical extract vent, the rate of the extract fan should not exceed 20l/s (73m^3/hour) and the appliance should be tested and certificated by a suitable qualified and registered gas engineer that the combustion appliance operates safely whether or not the fans are running.

Oil heating appliances up to 45kW

Oil burning appliances up to 45kW are out of the scope of this guidance and to be installed, commissioned and tested in compliance with Section 4 of ADJ and BS 5410, BS 799. All works should be carried out by an installer registered with OFTEC. Copies of commissioning certificates are to be issued to Building Control on completion of the works.

Interaction of mechanical extract vents and opened flue oil combustion appliances

Where a kitchen etc contains an opened flue oil appliance and a mechanical extract vent, the rate of the extract fan should not exceed 40 l/s for an appliance with a pressure jet burner and 20l/s for an appliance with a vaporising burner and the appliance should be tested and certificated by a suitable qualified and registered OFTEC engineer that the combustion appliance operates safely whether or not the fans are running.

Fuel storage tanks

LPG tanks and cylinders up to 1.1 tonnes

LPG tanks up to 0.25 tonne capacity s to be positioned in the open air at least 2.5m from buildings or boundaries and 1.1 tonne tanks positioned 3m from buildings or boundaries . Cylinders to be positioned in the open air on a minimum 50mm thick concrete base, securely chained to the wall and positioned at least 250mm below and 1m from any openings horizontally into the building such as windows, combustion vents or flue terminals and 2m from un-trapped drains or cellar entrances. See Section Diagram 43 and 44 and Section 5 of ADJ for full details

Oil tanks up to 3500 litres

Oil tanks up to 3500 litres to be positioned in the open air on a concrete base with a minimum thickness of 50mm extending a minimum of 300mm beyond the tank base and be positioned a minimum of 1.8m from buildings or flues and 760mm from boundaries. They should also be provided with a proprietary fire resistant pipe and valve system. Where there is a risk of pollution to water courses, open drains including inspection chambers with loose covers, the tank should be either internally bunded or be provided with an impervious masonry bund equal to capacity of 110% of its volume. Where any of the above requirements cannot be met- please contact Building Control for further guidance. See Section 5 of ADJ for full details

Renewable energy/micro regeneration Installations

Renewable energy systems must be installed, commissioned, calibrated and certified by a suitably qualified person or specialist installer registered with an appropriate competent persons scheme (where applicable) and details supplied to building control and the owner along with the operating manuals, etc for the following installations:

- Solar photovoltaic (pv) roof/wall panels for producing electricity
- Biomass boiler for space heating and hot water systems
- Wind energy turbines for producing electricity
- Hydro-power systems for producing electricity
- Solar thermal water heating roof/wall panel systems, fitted with an additional heating source to maintain an adequate water temperature
- Ground/air source heat pumps for space heating and hot water systems
- Micro - combined heat and power(CHP) systems (low carbon technology that is similar to conventional gas boilers but also produce electricity)

All roof / wall structures must be adequate to support the above installations in compliance with manufacturer's details, additional calculations/details may also be required from a suitably qualified person if requested by building control, which must be approved before works commence on site. Installations must be installed in accordance with manufacturer's details to prevent ingress of water/moisture into the building. Electrical works should comply with Approved Document P

Further information on renewable energy/micro regeneration Installations are available from the following sources:

BS EN 12975-2:2006: Thermal solar systems and components
ER G59/2: Recommendations For The Connection of Generating Plant To The Distribution Systems of Licensed Distribution Network Operators
ER G83/1: Recommendations for the connection of small scale embedded generators (up to 16 A per phase) in parallel with public low voltage distribution networks
BRE Digest 489: Wind loads on roof based photovoltaic systems
BRE Digest 495: Mechanical installation of roof mounted photovoltaic systems
The HVCA guide to Good Practice Installation of Biofuel Heating (TR/38)
The HVCA guide to Good Practice Installation of Heat pumps (TR/30)
British Wind Energy Association: Small Wind Turbine Performance and Safety Standard
Photovoltaics in buildings: Guide to the installation of PV systems. 2nd Edition (DTI publication 06/1972)
CE72: Energy Efficiency Best Practice in Housing- Installing small wind powered electricity generating systems
CE131: Energy Efficiency Best Practice in Housing- Solar water heating systems

Provision of information- commissioning certificates (testing)

Copy of installers commissioning certificate to be sent to building control on completion of the work.

Part K: Protection from falling, collision and impact (including glazing)

Please refer fully to Approved Document K: Protection from falling, collision and impact (including safety glazing which replaces Approved Document N) (2013 edition)

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- Rise and going
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- Handrails
- Internal guarding (external guarding details below)
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Part K: Protection from falling, collision and impact (including glazing)

Internal stairs, guarding and landings for changes in level of 600mm or more

Private stairs (used for only one dwelling) to be constructed in accordance with BS 5395 and BS 585 as detailed in the following guidance details and diagrams below:-
(Spiral and helical stairs to be designed to BS 5395: Part 2)

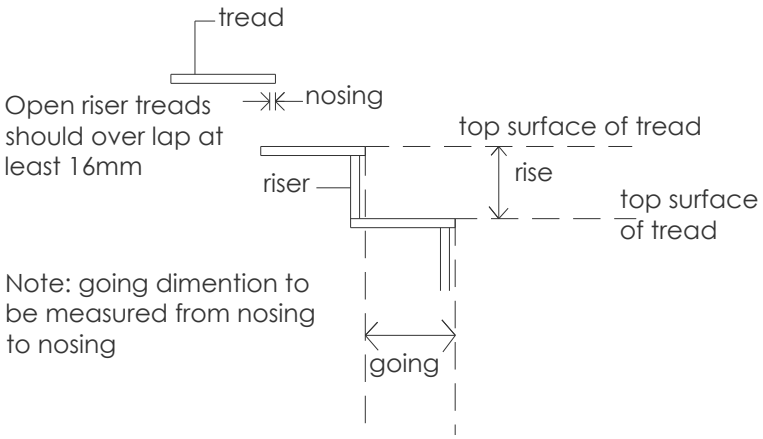
Stair pitch
Stair pitch must not to exceed 42°

Headroom
Stair to have a minimum headroom of 2m above the pitch line of the stairs

Rise and going
Rise and going to be level and equal to all steps and to fall within the following separate classes:-

- Any rise between 155mm-220mm used with any going between 245mm- 260mm, or
- Any rise between 165mm-200mm used with any going between 223mm- 300mm.

(The sum of twice the rise plus the going must be between 550 and 700mm)
Guidance Diagram 52: Measuring rise and goings (not to scale)
See Diagrams 1.1, 1.2 & Table 1.1 of ADK for full details



Landings
Landings to be provided at the top and bottom of the stair equal in length to the width of the stairs and clear of any door opening onto it. If a door open across the bottom of a landing (or cupboard doors open in a similar at the top and bottom of a flight) a clear 400mm space must be maintained across the width of the flight. in compliance with Diagrams 1.7 and 1.8 of ADK

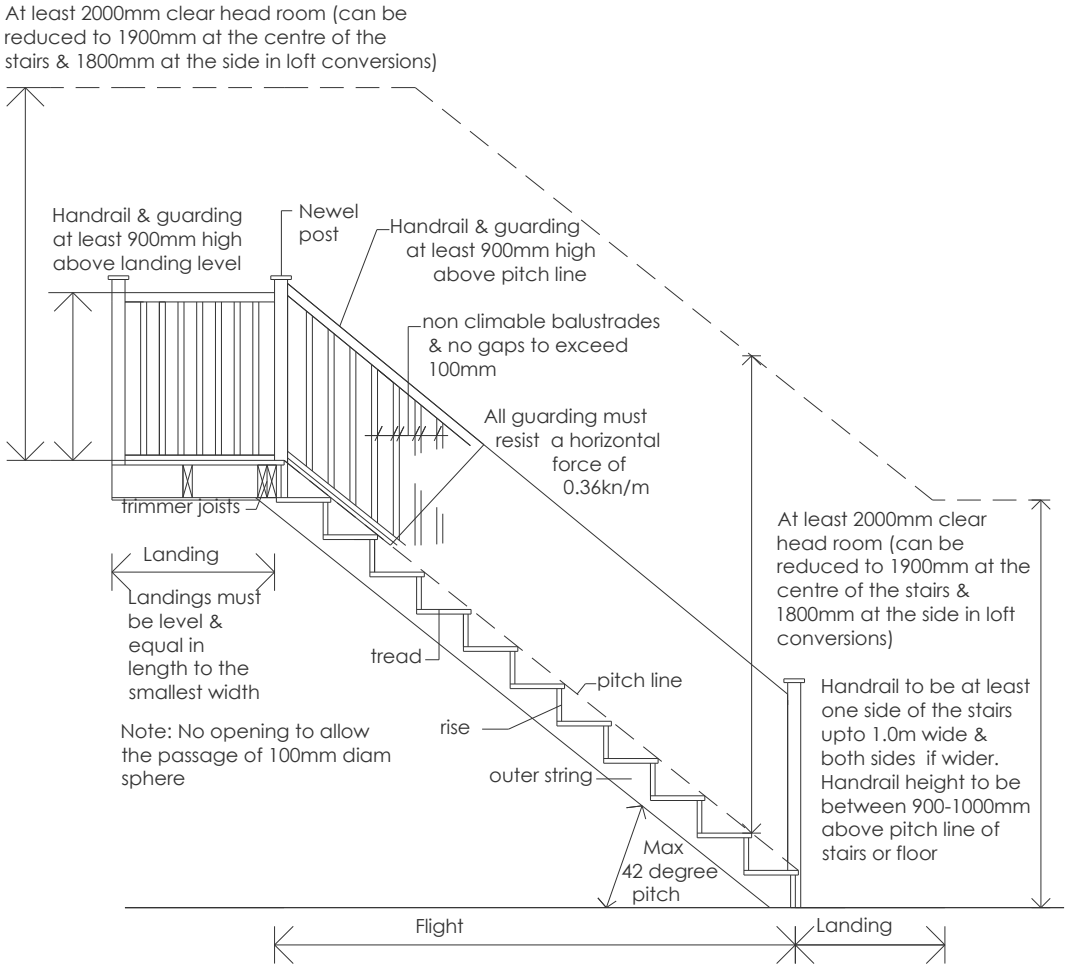
Stair width
There is no minimum stair width for new extensions or replacement stairs in existing dwellings but should be safe and practicable. Treads should be slip resistant where open to the weather or in wet areas.

Handrails
Handrails must be provided on one side of the stairs if they are less than 1m wide and they should have one on each side if they are wider. Handrails to provide a firm handhold with a minimum clearance of 25 - 50mm between the handrail and wall to prevent trapping of hands and securely fixed at a height 900-1000mm above floor/nosing levels and must be continuous throughout their length.

Internal guarding (external guarding details below)
Stair flights, landings, ramps and edges of **internal** floors to be guarded at a minimum height of 900mm, measured from the floor/pitch line of the stairs (across the nosings) to the top of the handrail and be continuous throughout their length, fitted with non climbable vertical balustrading, with no gaps to exceeding 100mm (in which a 100mm diameter sphere cannot pass through) and all constructed to resist a horizontal force of 0.36kN/m. All open treads, gaps etc should not exceed 100mm. See Diagram 3.1 of ADK for full details; BS EN 1991-1-1 for minimum horizontal loadings and BS6180 for the design of protective barrier/infill panels.

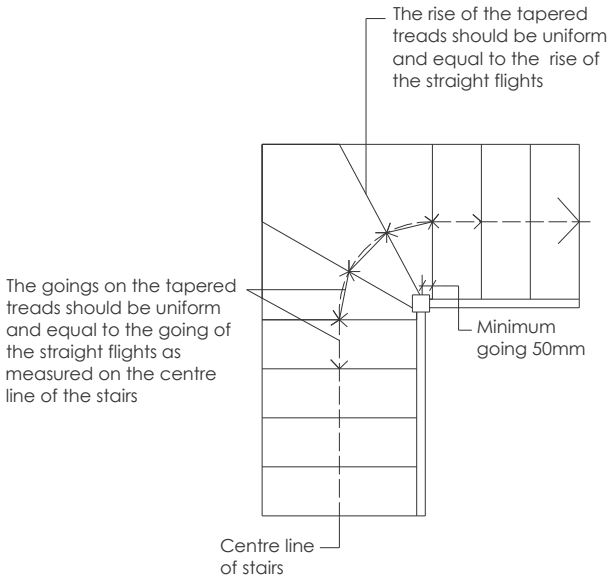
Length of flights
Stairs having more than 36 risers in consecutive flights should have a landing between flights which should be equal in length to the width of the stairs and make a change of direction of at least 30^{o} in compliance with Diagram 1.6 of ADK

Guidance Diagram 53: Typical internal stair case and guarding construction details (not to scale) See diagram 1.3 of ADK for full details



Note: Landings to be clear of any obstructions. A door may swing accross a landing at the bottom of a flight but must allow a 400mm min clear space accross the full width of the flight clear of any door swing

Guidance Diagram 54: Typical internal tapered tread stair case (not to scale)
The rise of tapered treads should be uniform and equal to the rise of the straight flight.
The going on the tapered treads should be uniform and equal to the going of the straight flights as measured on the centre line of the stairs as detailed in the guidance diagram below.
(See Diagram 1.9 of ADK for full details)



Typical internal staircase construction details
Typical staircase construction details: side strings ex. 230 X 35mm, capping ex. 32 X 63mm, treads 25mm thick, risers in 12.5mm thick plywood, newel posts ex. 75 X 75mm, handrails ex. 75 X 63mm, balustrades ex. 32 X 32mm at 125mm ctrs fixed into proprietary timber head and base rebated capping.

External stairs, guarding and landings for changes in level of 600mm or more

External stairs and landings
As internal stair guidance details above

External guarding
Stair flights, landings, ramps and edges of **external** floors to be guarded at a minimum height of 1100mm, measured from the floor/pitch line of the stairs (across the nosings) to the top of the handrail and be continuous throughout their length, fitted with non climbable vertical balustrading, with no gaps to exceeding 100mm (in which a 100mm diameter sphere cannot pass through) and all constructed to resist a horizontal force of 0.74kN/m. All open treads, gaps etc should not exceed 100mm. See Diagram 3.1 of ADK for full details; BS EN 1991-1-1 for minimum horizontal loadings and BS6180 for the design of protective barrier/infill panels.

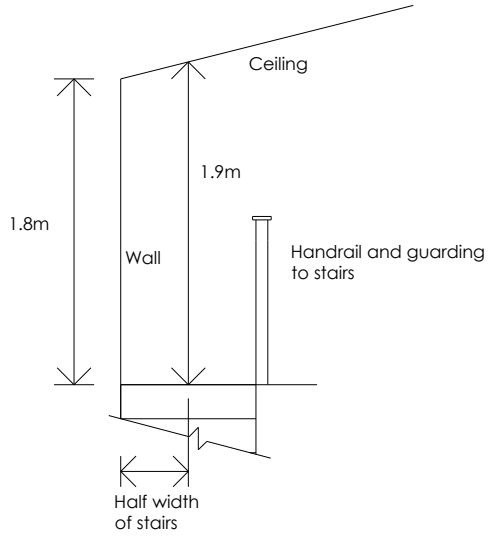
Guarding to upper storey window openings/other openings within 800mm of floor level

Opening windows located above the ground floor storey with openings within 800mm of floor level must be provided with non climbable containment/guarding or proprietary catches which should be removable (but child proof) to means of escape windows in the event of a fire. All gaps etc to containment/guarding should not exceed 100mm.

Loft conversion stairs

Reduced headroom to stairs in loft conversions
Where there is not enough space to achieve a 2.0m clear head room it can be reduced to 1.9m at the centre of the stairs and 1.8m at the side in loft conversions as detailed in the guidance diagram below.

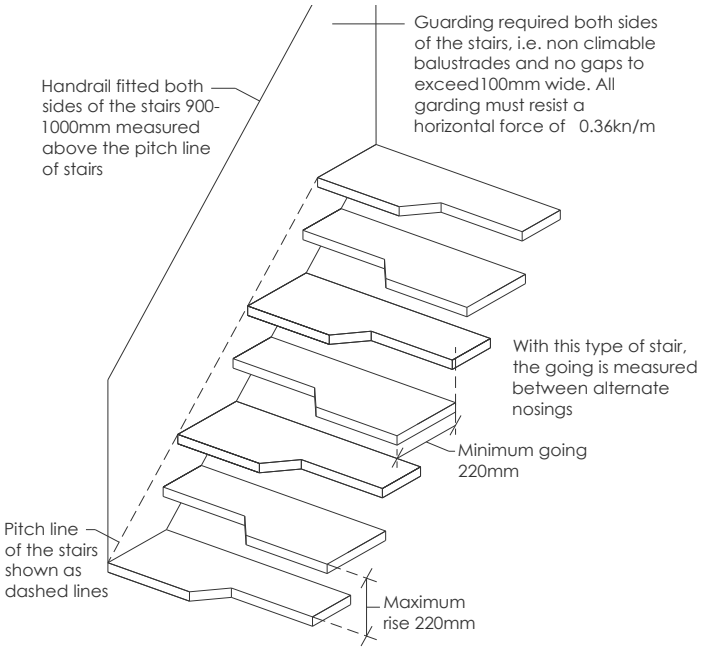
Guidance Diagram 55: Reduced headroom to stairs in loft conversions (not to scale)
See Diagram 1.4 of ADK for full details



Alternating tread stairs for loft conversions
Alternating tread stairs are only suitable for loft conversions and should only be installed in one or more straight flights and then only where there is not enough space to accommodate a stairs in accordance with guidance diagrams above. It should only be used to access one habitable room together with a bath/shower room or wc, providing it is not the only wc in the dwelling. The user relies on familiarity and regular use for reasonable safety. The alternating tread stairs should be constructed as follows and in accordance with the guidance diagram below: (See diagram 1.10 of ADK for full details).

- Steps should be uniform with parallel nosings
- Treads should be slip resistant
- Tread sizes over the wider part of the step should be in accordance with the dimensions in the guidance above with a maximum rise of 220mm and a minimum going of 220mm.
- Handrails to be fitted to both sides and guarded in accordance with the above guidance details for internal stairs

Guidance Diagram 56: Alternating tread stairs for loft conversions (not to scale)
See Diagram 1.10 of ADK for full details



Fixed Ladders for loft conversions
Fixed ladders should only be used in certain circumstances in accordance with paragraphs 1.31 - 1.32 of ADK, subject to building control approval.

Ramps

See section 2 of ADK for full details. See ramp requirements for new dwellings in part M of this guidance and ADM.

Protection against impact with glazing Please refer fully to K4 of ADK

Glazing in critical locations

Doors and adjacent sidelights/windows in critical locations i.e. within 1500mm of floor/ground level and 300mm of doors and windows within 800mm of floor/ground as detailed in the guidance diagram below to comply with one of the following:

1. **Safety glass** in accordance with BS EN 12600 and BS 6206 (to ensure it breaks safely)
2. **Annealed glass** in accordance with Diagram 5.2 of ADK (**or polycarbonate or glass blocks** fixed in accordance with manufacturer's details suitable for size of openings)
3. **Small panes of glass** should not exceed 0.5m^2 in area and should have one dimension smaller than 250mm measured between glazing beads. Glass should be annealed and not less than 6mm thick. See Diagram 5.3 of ADK for full details

Guidance Diagram 57: Critical locations for use of safety glass in doors/side screens and windows. See Diagram 5.1 of ADK for full details

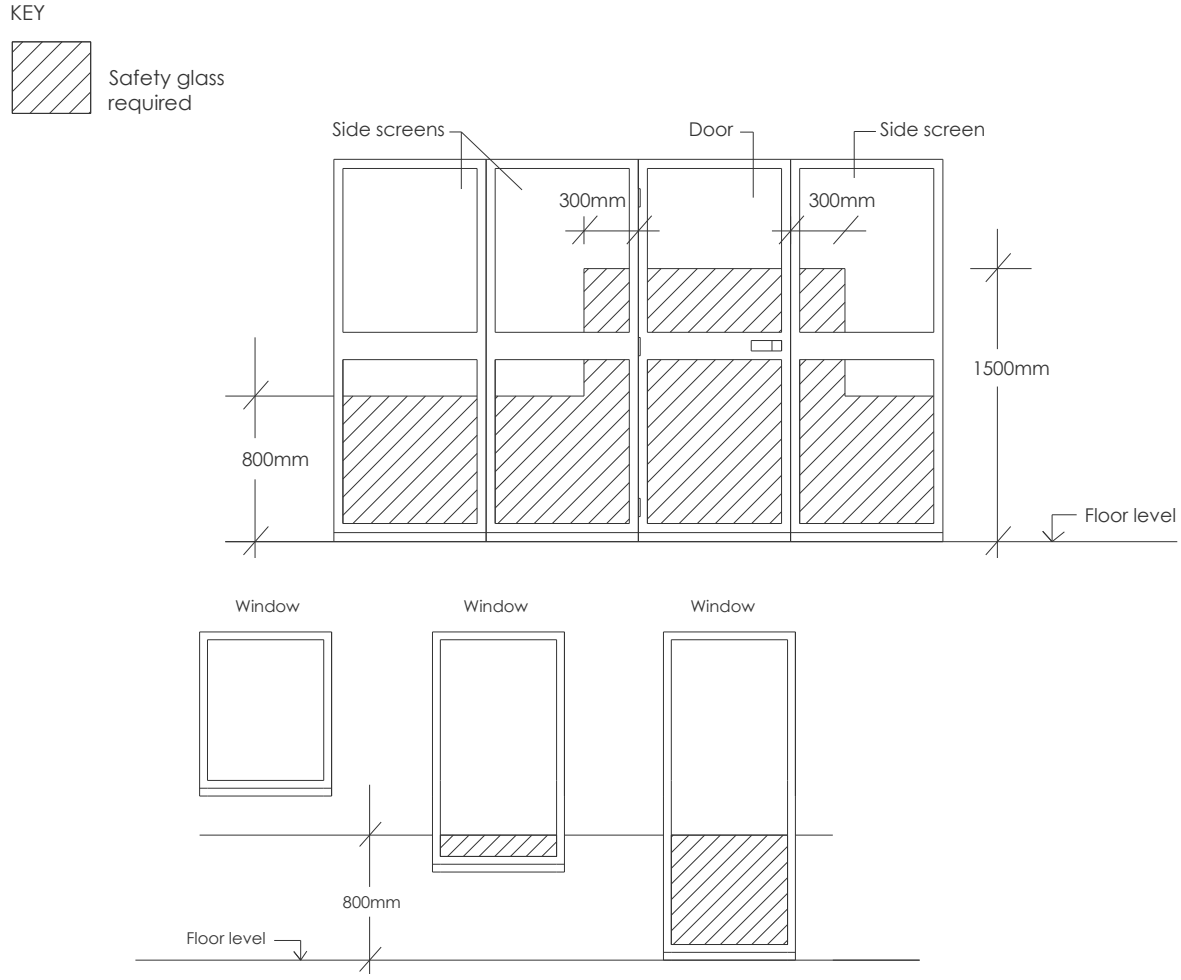


Diagram notes: 1. Where safety glazing is required in part of an opening as indicated by hatched lines in the above guidance diagram- that complete pane must be in safety glass. 2. Glass thickness must be suitable for dimension limits and opening sizes in accordance with glass manufacturer's details. 3. Glazing to be installed in accordance with manufacturer's details.

Marking of safety glass

Safety glazing to have clear and indelible markings on each piece of safety glazing within critical locations with the following information: name/ trade mark of the manufacturer/ merchant/ installer, standard the glass complies to and classification in accordance with BS EN 12600

Part L1B: Conservation of fuel and power (Existing dwellings)

Please refer fully to Approved Document L1B: Conservation of fuel and power in existing dwellings (2010 edition with 2010, 2011, & 2013 amendments)

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Part L1B: Conservation of fuel and power (Existing dwellings)

Listed buildings, conservation areas and ancient monuments

If the proposed energy efficiency requirements will unacceptably alter the character or appearance of a historic/listed building/ancient monument or building within a conservation area, then the energy efficiency standards may be exempt or improved to what is reasonably practical or acceptable and would not increase the risk of deterioration of the building fabric or fittings in consultation with the local planning authorities conservation officer in compliance with paragraphs 3.6- 3.14 of AD L1B.

Areas of external windows, roof windows and doors

Area of external windows, roof windows and doors should not exceed the sum of:
(i) 25% of the floor area of the extension, plus
(ii) the total area of any windows or doors which as a result of the extension works, no longer exists or are no longer exposed.

Notes:
1. Area of glazing less than 20% of the total floor area, may result in poor levels of daylight in the extension and dwelling.
2. Areas of glazing greater than 25% may be acceptable in certain circumstances, i.e. to make the extension consistent with the external appearance of the host building, in such cases the U-value of the window should be improved in accordance with Par 4.1b of ADL1B or other compensation measure as Par 4.4 -4.7 of ADL1B.
3. Where necessary, SAP calculations can be submitted to building control to confirm how compensating measures can provide flexibility where area of external windows, roof windows and doors exceed 25% of the floor area of the extension.

New thermal elements

External glazing

External glazing insulation details to comply with U-values for external windows, doors and roof lights in compliance with paragraphs 4.19- 4.22 and Table 1 of ADL1B and guidance tables as follows: (Note: All external doors, windows, roof lights etc to be factory draft stripped)

Guidance Table 52: U-value requirements for external windows and doors including roof windows. See Table 1 of ADL1B for full details

Fitting	Insulation standard U-value not worse than:
Windows, roof window or roof light	1.6 (or Window energy rating (WER) as Band C of par 4.22 of ADL1B)
Doors with more than 50% glazing	1.8
Other doors	1.8
Replacement windows/doors	As above or 1.2 centre pane- if external appearance of facade or character of the building is to be maintained

Guidance Table 53: U-values for double glazing

Pilkington Glass	Outer pane	Cavity/spacer/gas	Inner pane	U-value
IGU	Optifloat	16mm air filled	K-Glass	1.7
EnergiKare	Optiwhite	16mm argon filled with aluminium spacer bar	K-Glass	1.5
Classic			K-Glass OW	
EnergiKare	Optiwhite	16mm argon filled with warm edge spacer bar	K-Glass	1.5
Classic			K-Glass OW	

Guidance Table 54: U-values for triple glazing- Pilkington EnergiKare glazing system

	Cavity	Middle pane	Cavity	Inner pane	U-value
Optiwhite	12mm argon	K Glass T	12mm Argon	K-Glass	1.0
Optiwhite	16mm argon	K Glass T	16mm Argon	K-Glass	0.8
Optiwhite	12mm argon	K Glass OWT	12mm Argon	K-Glass OW	1.0
Optiwhite	16mm argon	K Glass OWT	16mm Argon	K-Glass OW	0.8
Optiwhite	12mm Krypton	K Glass OWT	12mm Krypton	K-Glass OW	0.7

Closing around window and door openings

Checked rebates should be constructed to window/door reveals or alternatively a proprietary finned insulated closers should be used. Checked rebates are where the outer skin masonry/skin projects across the inner skin by at least 25mm, the cavity is closed by an insulated closer and the window or door is fully sealed with mastic or similar externally.

Sealing and draught proofing measures

All external door and window frames, service penetrations to walls, floors and ceilings, etc, should be sealed both internally and externally with proprietary sealing products such as proprietary waterproof mastic, expanding foam or mineral wool or tape to ensure air tightness.

Energy efficient lighting

Fixed internal lighting

Fixed internal energy efficient lighting in new extensions must not be less than 75% of all the fixed low energy light fittings (fixed lights or lighting units) in the main dwelling spaces (excluding cupboards and storage areas), fitted with lamps which must have a luminous efficiency greater than 45 lumens per circuit-watt and a total output greater than 400 lamp lumens. Light fittings to be either dedicated fittings which only take low energy lamps or standard fittings which take low energy lamps. (Note: light fittings with supplied power less than 5 circuit-watts are excluded from the overall count of the total number of light fittings)

Fixed external lighting

Fixed external energy efficient lighting in new extensions must consisting of either;
(i) Lamp capacity not greater than 100 lamp-watts per light fitting and fitted with automatic switch off between dawn and dusk and when lit area becomes unoccupied; or
(ii) Lamp efficacy greater than 45 lumens per circuit-watt; and fitted with automatic switch off between dawn and fitted with manual controls.

Insulation of pipe work to prevent freezing

All hot and cold water service pipe work, tanks and cisterns should be located within the warm envelope of the building to prevent freezing.

Where hot and cold water service pipe work, tanks and cisterns are located in unheated spaces they should be insulated to prevent freezing in compliance with BS 6700 and BS 8558, and typically as follows:
(i) All tanks and cisterns should be thermally insulated to prevent freezing with proprietary insulated systems in compliance with manufacturer's systems (insulation normally omitted from below tank where it benefits from heat in the heated area below).
(ii) Pipe work should be insulated with proprietary insulated sleeves of phenolic/ polyosocyanurate/ polyurethane foam having a minimum wall thickness of 30mm for 15mm diameter pipes and 12mm for pipes 22mm diameter pipes, (or other approved) and fixed in accordance with manufacturer's details.

External walls, roofs, floors and swimming pool basin

External Walls, roofs, floors and swimming pool basin to comply with new thermal element requirements in compliance with paragraphs 5.1- 5.6 and Table 2 of ADL1B as follows:

Guidance Table 55: U-values for external walls, roofs, floors and swimming pool basin
See Table 2 of ADL1B for full details

Element [1](see construction details in part A)	**Insulation standard U-value:** W/m^2.K
Walls (exposed and semi exposed)	0.28[2]
Pitched roof and dormer windows with insulation at ceiling level	0.16
Pitched roof and dormer windows with insulation at rafter level	0.18
Flat roof or roof with integral insulation	0.18
Floors[3]	0.22[4]
Swimming pool basin (walls and floor)	0.25

Notes: 1. Roof includes the roof parts of dormer windows, and wall includes the wall parts (cheeks) of dormer windows.
2. Area -weighted average values
3. A lesser provision may be appropriate where meeting such a standard would reduce the floor area by 5% in the room bounded by the wall.
4. A lesser provision may be appropriate where meeting such a standard would cause significant problems in relation to adjoining floor levels. The U-value of the floor of the extension can be calculated using the exposed perimeter and the floor area of the whole enlarged dwelling.

Renovation/upgrading of existing thermal elements

Where the existing walls, roof or floor is to be retained and become part of the thermal envelope or renovated or subject to a material change of use and are insulated below the threshold values in column (a) of table below then the thermal elements should be thermally renovated/upgraded to the U-values in column (b) in table below. (Note: renovation of existing thermal elements only applies where the area to be renovated is more than 50% of the surface area of the individual element and 25% of the total building envelope, and renovation/upgrading of the existing thermal elements only applies where it is technically and functionally feasible with a simple payback of 15 years +). See Section 5 of ADL1B for full details

Guidance Table 56: Renovation/upgrading of existing thermal elements

See Table 3 of ADL1B for full details

Element[1]	**(a) Threshold U-value W/m².K**	**(b) Upgraded U-value W/m².K**
Cavity walls[2] (where suitable for filling with insulation)	0.7	0.55
Solid walls (external or internal insulation)[3]	0.7	0.30
Floors [4,5]	0.7	0.25
Pitched roof- insulation at ceiling level	0.35	0.16
Pitched roof- insulation between rafters[6]	0.35	0.18
Flat roof or roof with integral insulation[7]	0.35	0.18

Notes: 1. Roof includes the roof parts of dormer windows, and wall includes the wall parts (cheeks) of dormer windows.
2. This only applies if the cavity wall is suitable for the installation of cavity wall fill as ADD, otherwise, insulation should be fixed internally or externally.
3. A lesser provision may be appropriate where meeting such a standard would reduce the floor area by 5% in the room bounded by the wall.
4. The U-value of the floor of the extension can be calculated using the exposed perimeter and the floor area of the whole enlarged dwelling.
5. A lesser provision may be appropriate where meeting such a standard would cause significant problems in relation to adjoining floor levels.
6. A lesser provision may be appropriate where meeting such a standard would create limitations on headroom. In such cases the depth of insulation and required air gap should be at least to the depth of the rafter, using insulation to achieve the best practical U-value
7. A lesser provision may be appropriate if there are problems associated with the load bearing capacity of the frame or up-stand height.

Consequential improvements (applies to existing buildings with a total useful floor area exceeding 1,000m²)

Consequential improvements (additional works) are required to make an existing building more energy efficient which has a total useful floor area exceeding 1,000m² and is subject to an extension or provision of fixed building service in compliance with paragraphs 6.1- 6.5 of ADL1B and section 6 of ADL2B

Commissioning of fixed building services

Copy of commissioning certificate for fixed building services is to be sent to Building control within 5 days of completion of the commissioning work being carried out (or within 30 days for works commissioned by a person registered with a competent persons scheme)

Providing information -building log book

Log book containing the following information is to be provided in the dwelling on completion:

- Operating and maintenance instructions for fixed building services
- Instructions how to make adjustments to timing and temperature control settings etc
- Instructions on routine maintenance requirements for fixed building services in compliance with manufacturer's details

Part M: Access and use of buildings (For disabled Persons)

Please refer fully to Approved Document M: Access to and use of buildings: Volume 1: Dwellings (2015 edition)

ADM of the building regulations do not apply to extensions to existing buildings, unless it is an extension of a dwelling where ADM of the building regulations would have applied and the proposed extension will make things worse, for example removal of an access ramp or a down stairs wc- unless it is to be reinstated as part of the proposed works in compliance with ADM. Please contact your building control department for their specific requirements.

Part P: Electrical safety (Dwellings)

Please refer fully to Approved Document P: Electrical safety in dwellings (2013);

Electrical Installations

All fixed electrical wiring installed in dwellings in England (and excepted energy buildings in Wales as defined by the Welsh Ministers (Transfer of Functions) (no2) Order 2009) and must comply with Part P of the Building Regulations. All work performed on new or existing electrical circuits or systems must be designed, installed, inspected, tested and certified by a competent person in accordance with the current version of the IEE Regulations as documented in BS 7671.

For notifiable works, an installer who is not a registered competent person may use a registered third party to certify notifiable electrical installation work as an alternative to using a building control body.

The competent electrician must provide signed copies of an electrical installation certificate conforming to BS 7671 for the owner of the property and for notifiable works a copy of the completion certificate must be forwarded to the Building Control surveyor for approval at completion, so the Building Control completion certificate can be issued.

Guidance Table 57: Notifiable work for electrical installations that need to be notified to building control (See Regulations 12(6A & 9 and contained within Par 25 of ADP for full details)

Notifiable work
Where the electrical works consist of: • Installation of a new circuit • replacement of a consumer unit[1] • any addition or alteration to existing circuits in a special location*
*Special location meaning: • within a room containing a bath or shower, the space surrounding a bath tap or shower head, where the space extends[2] (see diagram 2 of ADP): - vertically from the finished floor level to: - a height of 2.25m or - the position of the shower head where it is attached to a wall or ceiling at a point higher than 2.25m from that level; and - horizontally: - where there is a bath tub or shower tray, from the edge of the bath tub or shower tray to a distance of 0.6m; or - where there is no bath tub or shower tray, from the centre point of the shower head where it is attached to the wall or ceiling to a distance of 1.2m • a room containing a swimming pool or sauna heater
Notes: 1. Consumer units must be fixed above any flood level and must be generally accessible for use by responsible persons in the house hold and they should not be installed where young children might interfere with them. 2. Socket outlets should not be located within 3m of a bath tub or shower tray

Guidance Table 58: Non- notifiable work for electrical installations that is not notified to building control

Non- notifiable work
Where the electrical works consist of: • Additions and alterations to existing installations outside special locations. • Replacements, repairs and maintenance anywhere • Installing a built in cooker unless a new cooker circuit is required • Connecting an electric gate or garage door to an existing isolator switch unless a new circuit from the consumer unit to the isolator switch is required • Installing prefabricated modular wiring (i.e. kitchen lighting systems) linked by a plug and socket connectors

Part Q: Security (Dwellings)

Please refer fully to Approved Document Q: Security (2015 edition)

ADQ of the building regulations do not apply to extensions to existing buildings (only new dwellings), unless it is an extension of a dwelling where ADQ of the building regulations would have applied and the proposed extension will make things worse. Please contact your building control department for their specific requirements.

Materials and workmanship

Please refer fully to Approved Document: Regulation 7: Materials and workmanship (2013 edition)

Materials and workmanship

All materials used for a specific purpose should be assessed for suitability using the following aids: (See Approved Document: Regulation 7: Materials and Workmanship for full details)

- British Standards or European Standards (or other acceptable national and international technical specifications and technical approvals)
- Product Certification Schemes (Kite marks)
- Quality Assurance Schemes
- British Board of Agreement Certificates (BBA)
- CE marking under the Construction Products Regulations
- CE marking under other EU Directives and Regulations
- Local Authority National Type Approvals (System Approval Certification)
- In certain circumstances, materials (and workmanship) can be assessed by past experience, for example a building already in use- providing it is capable of performing a function for which it was intended- subject to building control approval.

All materials must be fixed in strict accordance with manufacturer's printed details. Workmanship should be in strict accordance with Regulation 7 and BS 8000: Workmanship on Building Sites: should be in compliance with Parts: 1 to 16. Where materials, products and workmanship are not fully specified or described, they are to be 'fit for purpose' stated or inferred and in accordance with recognized best practice. Testing to be carried out if required by building control to ensure workmanship is appropriate.

External works

(These details do not form part of the building regulations except drainage of paved areas)

External works- paths, private drives, patios and gardens

The guidance below for external surface finishes do not form part of the building regulations and are for domestic guidance use only, associated commercial uses should be designed by a suitably qualified specialist.

Concrete areas and paths etc

- 100mm thick concrete, shuttered with temporary or permanent edge restraint or kerbs. Mix type PAV 1, max bay size 6m with bitumen impregnated fiber board isolated Joints to BS 8110/5328, laid over;
- 100-150mm minimum thick course of Type 1 sub base, sand blinded and mechanically compacted to refusal in 150mm thick layers with a geotechnical membrane underneath, laid over firm sub soils

Tarmac areas:

- 20mm thick mechanically rolled wearing course of 100-150 pen grade bituminous coated macadam using 0-6mm aggregate sizes (to BS 4987), with permanent edge restraint or kerbs, laid over;

- 60mm thick mechanically rolled base course of 100-150 pen grade bituminous coated macadam using 0-20mm aggregate sizes (to BS 4987), laid over;
- 100-150mm minimum thick course of Type 1 sub base, sand blinded and mechanically compacted to refusal in 150mm thick layers with a geotechnical membrane underneath, laid over firm sub soils

Block pavers:

- 60mm pre-cast self draining concrete block paving to clients choice, laid in compliance with manufacturer's details, to BS 6717 with permanent edge restraint or kerbs, laid over;
- 100-150mm minimum thick course of Type 1 sub base, sand blinded and mechanically compacted to refusal in 150mm thick layers with a geotechnical membrane underneath, laid over firm sub soils

Precast concrete or natural stone slabs

- 50mm precast concrete/natural stone slabs laid in compliance with manufacturer's details to BS 7263:1, (Typically fully bedded and pointed in 25mm thick sand/cement mortar 1:4 mix or other approved in accordance with manufacturer's details)
- 100-150mm minimum thick course of Type 1 sub base, sand blinded and mechanically compacted to refusal in 150mm thick layers with a geotechnical membrane underneath, laid over firm sub soils

Gravel

- 100mm gravel, laid in compliance with manufacturer's details to BS 7263:1
- 100-150mm minimum thick course of Type 1 sub base, sand blinded and mechanically compacted to refusal in 150mm thick layers with a geotechnical membrane underneath, laid over firm sub soils

Drainage of paved areas:

To be carried out in accordance with BS 6367:1983 A1 84, ADH and Part H of this guidance. Paths and paved areas to have a non slip finish with a fall of 1:80 and a reverse gradient of at least 500mm away from walls of building unless using proprietary porous self draining systems. Surface water to be disposed of by an adequately sized and roddable drainage system via soakaways, or other approved means. Paved areas are normally set 5mm above drainage channels or gullies etc. The Local Authority Planning Department may have additional requirements for the drainage of paved areas and should be consulted before works commence.

APPENDIX 1: The Construction (Design and Management) Regulations 2015

Duty Holders and their responsibilities under The Construction (Design and Management) Regulations 2015

Duty Holders*	Duty Holders responsibilities
Clients	
Organisations or individuals for whom a construction project is carried out.	Make suitable arrangements for managing a project. This includes making sure that: • other duty holders are appointed • sufficient time and resources are allocated. Clients must also make sure that: • relevant information is prepared and provided to other duty holders • the principal designer and principal contractor carry out their duties • welfare facilities are provided.
Domestic clients	
People who have construction work carried out on their own home, or the home of a family member, that is **not** done in furtherance of a business, whether for profit or not.	Domestic clients are in scope of CDM 2015, but their duties as a client are normally transferred to: • the contractor, on a single contractor project, or • the principal contractor, on a project involving more than one contractor. However, the domestic client can choose to have a written agreement the principal designer to carry out the client duties.
Principal designers**	
Designers appointed by the client in projects involving more than one contractor. They can be an organisation or an individual with sufficient knowledge, experience and ability to carry out the role.	Plan, manage, monitor and co-ordinate health and safety in the preconstruction phase of a project. This includes: • identifying, eliminating or controlling foreseeable risks • ensuring designers carry out their duties. Prepare and provide relevant information to other duty holders. Liaise with the principal contractor to help in the planning, management, monitoring and co-ordination of the construction phase.
Designers	
Those who, as part of a business, prepare or modify designs for a building, product or prepare or modify designs to system relating to construction work.	When preparing or modifying designs, eliminate, reduce or control foreseeable risks that may arise during: • construction • the maintenance and use of a building once it is built. Provide information to other members of the project team to help them fulfil their duties.
Principal contractors	
Contractors appointed by the client to co-ordinate the construction phase of a project where it involves more than one contractor.	Plan, manage, monitor and co-ordinate the construction phase of a project. This includes: • liaising with the client and principal designer • preparing the construction phase plan • organising co-operation between contractors and co-ordinating their work. Ensure that: • suitable site inductions are provided • reasonable steps are taken to prevent unauthorised access • workers are consulted and engaged in securing their health and safety • welfare facilities are provided.
Contractors	
Those who do the actual construction work. They can be either an individual or a company.	Plan, manage and monitor construction work under their control so that it is carried out without risks to health and safety. For projects involving more than one contractor, co-ordinate their activities with others in the project team – in particular, comply with directions given to them by the principal designer or principal contractor. For single-contractor projects, prepare a construction phase plan.
Workers	
The people who work for or under the control of contractors on a construction site	They must: • be consulted about matters which affect their health, safety • and welfare • take care of their own health and safety and that of others • who may be affected by their actions • report anything they see which is likely to endanger either • their own or others' health and safety • co-operate with their employer, fellow workers, contractors • and other duty holders.

Key
***** Organisations or individuals can carry out the role of more than one duty holder, provided they have the skills, knowledge, experience and (if an organisation) the organisational capability necessary to carry out
****** Principal designers replace the role undertaken by CDM co-ordinators under CDM 2007.

Notes:

- The CDM-Coordinator role (CDMC) will no longer exist under the new legislation and the focus of the duties previously held by the CDMC will fall to the Principle Designer (PD)
- Clients are required to appoint a Principle Designer (PD) and Principle Contractor (PC) for all projects involving more than one contractor.
- CDM duties apply to domestic projects
- Construction Phase Plan (CPP) required for all projects with more than one contractor (Client to ensure this is provided from the Principle Contractor prior to any works commencing)
- The threshold for notification has changed. Notification to the HSE is required for any project exceeding 30 construction days with 20 or more workers working simultaneously, or if the project exceeds 500 person days.
- Current CDM-C's can offer consultancy work to Clients, Designers and Contractors to ensure they meet with their respective requirements, but they will no longer be a duty holder (CDMC's were one of the duty holders under CDM2007)
- Client duties extended - many clients, in particular, domestic clients, will need support and information to ensure they fore fill their obligations. Currently, this is expected to be led from the Designers, who will, typically, be the Client's first contact with regards to any potential development works.
- Many Architects, Designers, Structural Engineers, Architectural Practices etc may take the new PD role on themselves or can sub this role out to CDM Consultants (Client will be liable to pay for this additional service).
- Architects / designers / Technologists / Technicians / Engineers etc appointed, will need to inform Clients at the earliest possible moment of their interactions / quote / of the legislation Change and the various duty holders' responsibilities.

For further information:
1. Association for Project Safety (APS) Midlands Region (covering GL postcodes) http://regions.aps.org.uk/page.php?id=46
https://www.aps.org.uk/cdm2015 Section specifically for the CDM2015 changes FAQ's etc
2. Construction Industries Training Board. *www.**citb**.co.uk/.../construction-design-and-management-regulations/*
3. Health & Safety Executive: www.hse.gov.uk

Acknowledgements for contributions to the guidance document

Name	Contribution	Contact details
Herts Technical Forum	tracts of thermal insulation values d tables taken from Technical Note : U-Values of Elements	Trevor Clements www.north-herts.gov.uk/gold_guide_tech_note_10_2010-3.pdf
Sovereign Chemicals (Bostik)	Guidance on tanking systems	Mark Gillen www.sovchem.co.uk
Ty -Mawr ecological building products	Breathable buildings & product	Joyce & Nigel Gervis www.lime.org.uk
Kingspan Insulation	Insulation values, & calculations	Peter Morgan www.kingspaninsulation.co.uk
Celotex Insulation	Insulation values, & calculations	Tom technical@celotex.co.uk 01473 822093
Knauf Insulation	Insulation values, & calculations	Chris Roughneen Chris.roughneen@knaufinsulation.com
Nationwide Fire Sprinklers	Guidance for domestic sprinklers and fire consultant	Keith Rhodes www.nationwidefiresprinklers.co.uk
Geomex	Span tables for solid timber members and structural consultant	Paul Smith Eur.Ing, DipHI, BEng, MSc, C.Eng, MICE, MCMI, MIHT, MCIOB. www.geomex.co.uk
Rockwool	Insulation values, & calculation	James Rees technical.solutions@rockwool.co.uk
Lifetime Homes	Lifetime Homes guidance	Chris Goodman www.habinteg.org.uk
Midland Energy Services (MES)	Code for Sustainable Homes & PassivHaus guidance and Sustainable Building Solutions	MES Energy Services w: www.mesenergyservices.co.uk e: info@ mesenergyservices.co.uk t: 01636 653055
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Cordek	Clay heave product details	Alistair Seaton

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Liddell Associates (Architects)	Plans	Chris McGonagle cm@liddellachitects.co.uk
Apex Architecture	Front cover diagram	Richard Jones www.apexarchitecture.com
Neil J Dransfield PPCIAT MCIAT MCIArb FCIOB Chartered Architectural Technologist	Guidance on The Party Wall Act	Neil J Dransfield www.dransfield.org.uk
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About the author

Anthony Gwynne MRICS; MIFireE, is a Chartered Surveyor and Fire Engineer and has 40 years' experience in the construction industry. He is one of two team leaders in the building control section and has been in building control for over 27 years. He has been responsible for overseeing the building control function of major developments including commercial, industrial, healthcare, residential, housing developments, bespoke dwellings, extensions, conversions and works to heritage buildings. He is currently studying for an MSc in Sustainable Building Conservation (Historic Buildings) at Cardiff University

1986- 1993; was a Building Surveyor with a local authority, dealing with the repair and planned maintenance of buildings including contract procurement and contract administration.

1977- 1986; apprenticed as a banker mason and was responsible for conservation projects with CADW (Welsh historic monuments and buildings) and following further academic study was later with English Heritage as a professional and technical officer, responsible for historic monuments in the South of England.

1976-1977 Worked in Canada on construction projects

Guidance notes copyright

Building control guidance book available

1. A Welsh Version of this document has been produced by the author of this guidance and is available to download at:www.fdean.gov.uk

2. 'Guide to Building Control for Domestic Buildings' has been produced as a book by the author of this guidance and is published by Wiley- Blackwell. www.wiley.com/go/construction. ISBN 978-0-470-65753-9 and is available to purchase on line at: www.amazon.co.uk.

The book clarifies the practical requirements of the Building Regulations and is presented in an easy to understand format, clear concise and is fully illustrated. Guidance is given for domestic buildings up to 3 storeys in England including extensions, loft conversions, new dwellings, conversions of garages, basements and barns and upgrading of existing buildings including the use of natural breathable lime mortars, plasters, renders and paints. There are clear explanations of how the technical design and construction requirements of the Building Regulations can be met with sufficient information to draw up an effective specification and design to be developed