Advantage

Structural Defects Insurance

# AHCI HANDBOOK

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## INTRODUCTION

The AHCI Handbook has been produced for the purposes of identifying compliance with the Contractors Liability period for policies underwritten by the partners of AHCI Ltd.

### AHCI Handbook

Essential requirments can be identified throughout that must be met to achieve warranty standards and which are supported by guidance that provides a suggested method(s) for satisfying these essential requirements.

It should be noted that there are alternative methods and/or solutions which may be available and adopted providing that these are endorsed by a suitably qualified person(s) and/or organisation and approved in principle with AHCI Ltd.prior to construction,installation and/or use.

### Scope of the Handbook

This handbook has listed the requirments and/or details of what will be expected for a variety of build scenarios and as a minimun standard all works should meet the requirements of the Building Regulations. All materials, products and building systems shall be appropriate and fit for purpose for their intended use. The structure shall withstand beyond the life of the policy, the design and specifications shall provide a clear indication of the design intent and demonstrate a satisfactory level of performance. Structural elements outside the parameters of the Approved Documents will require to be supported by relevant structural design information provided by a suitably qualified person who must possess the appropriate professional Indemnity.

All workmanship must be in accordance with Document 7 of the Building Regulations and carried out by a technically competent person(s) to an acceptable standard and workmanlike manner. Third party certification will also be required for any work completed/installed by an approved contractor.

The structure shall, unless specifically agreed otherwise with the AHCI Ltd. have a life of **not less than 10 years** including Individual components and assemblies, not integral to the structure.

All designs and specifications must provide a clear indication of intent and demonstrate a suitable level of performance.

Structural elements outside the parameters of the Approved Documents must be supported by specifications and calculations provided by a suitably qualified professional.

The materials, design and construction must meet the relevant Building Regulations, British Standards, Euro codes and other relevant statutory requirements.

# CONTENTS

# 1. MATERIALS

## 1.1 Concrete

Any specialist work must be supported by structural design information completed by a suitably qualified Engineer.
Structural elements manufactured off site must be endorsed by the relevant manufacturer**.**

- The minimum working temperature should not fall below 2oC.
- It is important that the temperature of fresh concrete should not fall below 5oC at the time of delivery. For further information refer to BS8500 and BSEN206-1.
- Measures should also be implemented to ensure concrete is prevented from freezing before sufficient strength has been achieved.

**Expansion / movement joints;**

- Expansion and/or movement joints should be provided as specified by the appointed Design Engineer or as per the requirements of the relevant British Standard and/or Eurocode.

**For further information and /or terms of reference, please refer to;**

**BS 8110** – 'Structural use of concrete ',
**BSEN 1992 – 1 – 1**; 'Design of Concrete Structures'.
**BS 8500** – Concrete
**BSEN 206 – 1** – 'Concrete, Specification, performance and conformity'.

## 1.2 Masonry

**Protection of masonry**

- Any new wall will require protection from temperatures which are below 2$^{o}$C
- Bricks should be fit for purposes and have the appropriate durability.
- The type of brick specified will affect the type of mortar to be used.
- Bricks with greater durability should be used where there is likely to be a potential for higher exposure to saturation or wind driven rain.
- External rendering should only be undertaken where the outside temperature is 2 Degrees Celcius or more.
- There should be no frost within the make - up of the structure to be rendered.
- Likewise, no plastering or screeding should be undertaken unless the structure is frost free.

For further information and /or terms of reference, please refer to;
PD 6697:2010,BS EN 1996 – 3 2006, BS EN 1996 – 2006 and BS EN 1996 -1 2: 2005.**BSEN 998** – 'Specification for mortar for Masonry'.
**BS 7543** – 'Guide to durability of buildings and building elements, products and components ',
Where developments are within 3 Km of the shoreline, structures and/or protective materials should be assessed for potential risk of corrosion and durability.

The person specifying the works must provide a suitable detail of any requirement regarding maintenance or protective measures for the building and materials, as well as specific products needed for the exposure such as brick,

cladding, doors and windows (specifying weathering rebates if needed) products which are not suitably denoted with CE markings must be referred to AHCI prior to installation.

## 2. SITE INVESTIGATION

A Site Investigation Report must always be supplied, they are categorised into two types Phase one (Desktop) and Phase two (Ground Investigation). The level of requirement will be deemed as required relevant to the risks posed by the lands past use.

Site Investigations and required procedures must meet the relevant Building Regulations, British Standards, Euro codes.

To ensure a comprehensive Site Investigation report and/or Desk Top Study is undertaken, AHCI Ltd. would recommend that this is undertaken by a chartered professional.

The aim of a Geological Assessment is to identify specific characteristics of the site which may affect the proposed method of foundation construction and any environmental issues associated with the site. Any issues specifically excluded should also be highlighted.

The following information is normally associated with the study;

- Site description including address, grid references and topography of site,
- Site History which will crucially identify previous uses of the site e.g. potential sources of soil and/or water contamination,
- Geology of the site which should be published on historical geological maps and may indicate issues such as previous mining areas, potential flood risk, migration of landfill gases such as Radon, Japanese Knotweed or other substances which may attack building materials and/or services.

Following on from the initial Desk Top Study, it may be necessary for an intrusive investigation to be carried out on the site.

An acceptable intrusive investigation may comprise any number of the following;

- Trial Pitting,
- Window Sampling,
- Shell and Auger boring,
- Rotary Drilling

It is important to note that during the construction phase, if any unforeseen conditions are encountered then the Developer should notify the appointed consultant immediately and undertake any further instruction considered necessary.
The report should make recommendations and state measures to be taken concerning any and all remediation, water table issues, and drainage concerns i.e. if not suitable for soakaways, past chemical use still identified within the soils and any flora or fauna which may cause instability to the foundations

## 3. FOUNDATIONS

The Specifications and Designs of any proposed foundation should be fit for purpose and the design must be endorsed by a suitably qualified Engineer and works undertaken by a specialist approved foundation contractor. Designs of specialist foundations such as Raft or Pile should be submitted on by the appointed approved consultant and/or contractor on letter headed paper and accompanied by the following information;

### 3.1 Pile Foundation

- Foundation Drawings Designs, pile layouts,

- Site Investigation to below the depth of the pile,
- Calculations, loadings, derived individually (each pile) heave forces and pile set,
- Testing data for static dynamic testing including cube concrete tests if required by the Structural Engineer.

## 3.2 Raft Foundation

- Site Investigation report identifying ground types,
- Calculations to show that raft can span a 3 metre 'soft spot' or cantilever 1.5 metres,
- Details of any engineered granular fill below the raft and its compaction specification,
- Confirmation that all made ground beneath the foundation has / will be removed or treated,
- Details of any ground treatment,
- Substructure & superstructure calculations by the Structural Engineer (calculations need to include the information with respect to the loads etc. showing that the foundations will support the structure including internal structures such as walls, stairs etc.
- Drawings of all sectional details and reinforcement specifications for rafted designs.

There are however, some situations where this may not be possible and therefore AHCI Ltd. may not be able to provide cover for the development. Such instances include;

- Where the original ground or sub strata is unstable or will continue to settle,
- Sites where soft clays exist with a low bearing capacity (30Kn/m2 un-drained),
- Filled ground where high levels of voids are anticipated,
- Clay type where water could disrupt the foundation or where a collapse may occur.
- Clay soils with neighbouring treelines

## 3.3 Strip & Mass Filled Foundation

- This type of foundation should only bear onto virgin ground and be reinforced if specified by a Structural Engineer.
- Settlement of the foundations will not exceed 25mm
- The width of Strip foundations should be a minimum dimension of 600mm for external walls but for single leaf walls up to 150mm thick this may be reduced to 450mm.The minimum thickness of foundations should be 150mm and should be situated centrally below the wall(s). Any discrepancies should be reported immediately to the Design Engineer and any agreed variations distributed to all relevant parties including AHCI Ltd.
- The depth of foundations should reflect site conditions and should bear onto original previously undisturbed sub strata. Usually a minimum 450mm depth measured from finished ground level when founded in rock.
- In clay soils with Plasticity index greater than or equal to 10% the depth should be taken to a level where anticipated ground movement will not impair the stability of any part of the building with the influence of vegetation and any adjacent trees also being taken into consideration. The depth of foundations (measured to the underside of the dig) should not be less than 750mm which is measured from finished ground level but depths may need to be increased dependent on design loadings to ensure loads are transferred to suitable sub strata.
- To avoid frost damage to foundations the depth in susceptible ground should be a minimum of 450mm below ground level and if levels are to change, should be measured from the existing ground level.
- Prior to concreting, excavations should be removed of all spoil to ensure all debris, soft spots and/or excessive water are removed prior to the concrete being placed.
- For detailed information concerning stepped foundation works refer to appointed Structural Engineers details and/or Approved Document A – Structure – Section 2E, Diagrams 21.

These types of foundations are usually the most simplistic and cost - effective foundation design for low rise buildings on original ground and should follow the diagram below;


**Figure 3.1 - Strip Foundation**

1. Bottomed Trench to desired depths
2. The width of Strip foundations should be a minimum dimension of 600mm for external walls but for single leaf walls up to 150mm thick this may be reduced to 450mm.The minimum thickness of foundations should be 150mm

## 3.4 Foundation & Ground Floor Slab - Essential Requirements

Designs should adhere to the following criteria wherever possible; should this not be possible please consult your Site Surveyor prior to commencing works;

- Conventional strip foundations may be constructed practically and economically to a depth of 2.5 metres,
- Where foundation depths are in excess of 2.5m, they must be designed by a suitably qualified person e.g. Chartered Structural Engineer,
- Raft foundations are generally not suitable on sites with a high risk of shrinkage or clay heave due to adjacent trees,
- Ground bearing slabs should not be used if the foundation depth is greater than 1 metre,
- A suspended floor slab should be incorporated adopting either a void or proprietary compressible material to the underside of the floor,
- The thickness of the void should be in accordance with the below Table 1.0 or if a compressible material is used it should be capable of compressing to provide a void of equivalent thickness,
- If trees have been removed prior to construction precautions should be taken against potential rehydration and swelling of the soil foundations should be designed in the same manner as if the tree were remaining as per Table 1.0 below
- If the height and/or species is not known, then it should be assumed to be of high water demand and assumed to be 20m in height.

**Table 1 - Heave Precaution Dimensions**

| Soil Plasticity | Foundation Depths (m) | Clay Board Thickness or void to side of foundation | Clay board Thickness or void to beneath the slab in addition to insulation material |
|---|---|---|---|
| 20 or less | 1.5 – 2.5 | N/A | 50mm |
| 20 to 40 | 1.5 – 2.5 | 25mm | 75mm |
| 40 | 1.5 – 2.5 | 35mm | 100mm |

**Table 2 - Foundation Depths in Clay**

| Species | Distance From Building | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 1m | 2m | 4m | 6m | 8m | 10m | 12m | 14m | 16m | 18m | 20m | 22m | 24m |
| English Oak | * | * | * | 2.4 | 2.2 | 2 | 1.8 | 1.7 | 1.5 | 1.25 | 1.2 | 1 | |
| Black Poplar | * | * | * | * | 2.4 | 2.3 | 2.2 | 2 | 1.9 | 1.8 | 1.7 | 1.6 | 1.5 |
| Weeping Willow | * | * | * | 2.3 | 2.1 | 1.9 | 1.7 | 1.4 | 1.2 | 1 | 1 | 1 | 1 |
| Hawthorn | * | * | 2.2 | 1.9 | 1.6 | 1.25 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Cypress Leilani | * | * | 2.1 | 1.8 | 1.4 | 1.2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Cedar | 1.9 | 1.8 | 1.6 | 1.4 | 1.25 | 1.2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Douglas Fir | 1.8 | 1.6 | 1.25 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Pine | 1.8 | 1.6 | 1.25 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Spruce | 1.7 | 1.5 | 1.2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Horse Chestnut | 1.85 | 1.8 | 1.6 | 1.5 | 1.4 | 1.2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Ash | 1.9 | 1.8 | 1.7 | 1.5 | 1.4 | 1.25 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Lime | 1.9 | 1.8 | 1.5 | 1.4 | 1.4 | 1.2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Sycamore | 1.9 | 1.8 | 1.6 | 1.5 | 1.4 | 1.2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Pear | 1.8 | 1.6 | 1.4 | 1.2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Orchard Cherry | 1.8 | 1.6 | 1.4 | 1.2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Alder | 1.8 | 1.7 | 1.6 | 1.4 | 1.25 | 1.1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Maple | 1.8 | 1.7 | 1.6 | 1.4 | 1.25 | 1.1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Beech | 1.8 | 1.65 | 1.55 | 1.5 | 1.25 | 1.2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Plum | 1.7 | 1.55 | 1.3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Laurel | 1.7 | 1.55 | 1.25 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Apple | 1.7 | 1.55 | 1.3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| Silver Birch | 1.25 | 1.2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

This table is based on a clay strata site with a gradient of 1 in 7 or less. Excavations greater than 2.5 metres must be designed by a structural engineer. All excavations greater than 1.5 metres should be fitted with heave precautions as listed in table 1.

# 4.0 SUBSTRUCTURE

- Walls below DPC should be designed to reduce saturation and sulphate attack (where required).
- Suitability of the design and specified materials should be defined prior to construction
- Mortars below DPC should be more robust in specification as a higher durability is required
- Cavities below DPC may be required to be filled by a Structural Engineer, specifications and details are required by AHCI prior to installation, if cavities can remain clear they should be maintained below the lowest DPC level by 225mm.

## 4.1 Retaining Walls

A retaining wall is a structure designed and constructed to resist the lateral pressure of soil, when there is a desired change in ground elevation that exceeds the angle of repose of the soil. A basement wall is an example of a retaining wall. Retaining walls are vertical or near-vertical structures designed to retain material on one side, preventing it from collapsing or slipping or preventing erosion. They provide support to terrain where the soil's angle of repose is exceeded and it would otherwise collapse into a more natural form. The principal characteristic of a retaining wall is being able to withstand the pressure exerted by the retained material, which is usually soil.

The main uses of retaining walls are to help prevent soil erosion, create usable beds out of steep terrain and to provide decorative or functional landscaping features. They may be independent structures or may be part of a wider construction works, such as a building.

Structural failure can be devastating. It is important therefore to select an individual and/or company that has a good track record and experience in structurally similar projects. Suitably qualified professionals will generally be Chartered or Incorporated Engineers who are members of the Institution of Civil Engineers and/or the Institution of Structural Engineers. In all cases of design Advantage will require the appointed Engineer's design calculations and supporting design drawings for assessment and/or approval.

## 4.2 Damp Proof Courses

- DPC material should be flexible and specifically designed for use in this situation
- The DPC will be located a minimum 150mm above finished ground level,
- Engineering bricks and/or slates will not be acceptable to use as a damp proof course
- A DPC should be laid on a mortar bed and correctly lapped at junctions and corners with the length of the lap equal to the width
- A DPC should not bridge cavities unless being used as a cavity tray as seen below in Figure 4.2.

## 4.3 Damp Proof Membrane

- DPM should be provided beneath ALL ground supported or cast in-situ slabs,
- All membranes must be linked to the DPC and a minimum 0.30 mm (commonly known as 1200 gauge) as identified in Figure 4.1 below
- Membranes should be laid either onto a concrete slab or on the sub floor preparation protected by a minimum 25mm of sand blinding,
- A DPM is required to be continuous where floors are stepped and span internal walls as identified in Figure 4.1 below
- Should a Site Investigation require a more robust detail such as a gas rated membrane or radon barrier a design should be sought from a suitably qualified person and installed in accordance to the manufacturer's details and Building Regulations.


**Figure 4.1 - DPM Installation**

DPM being installed continually over the dividing walls

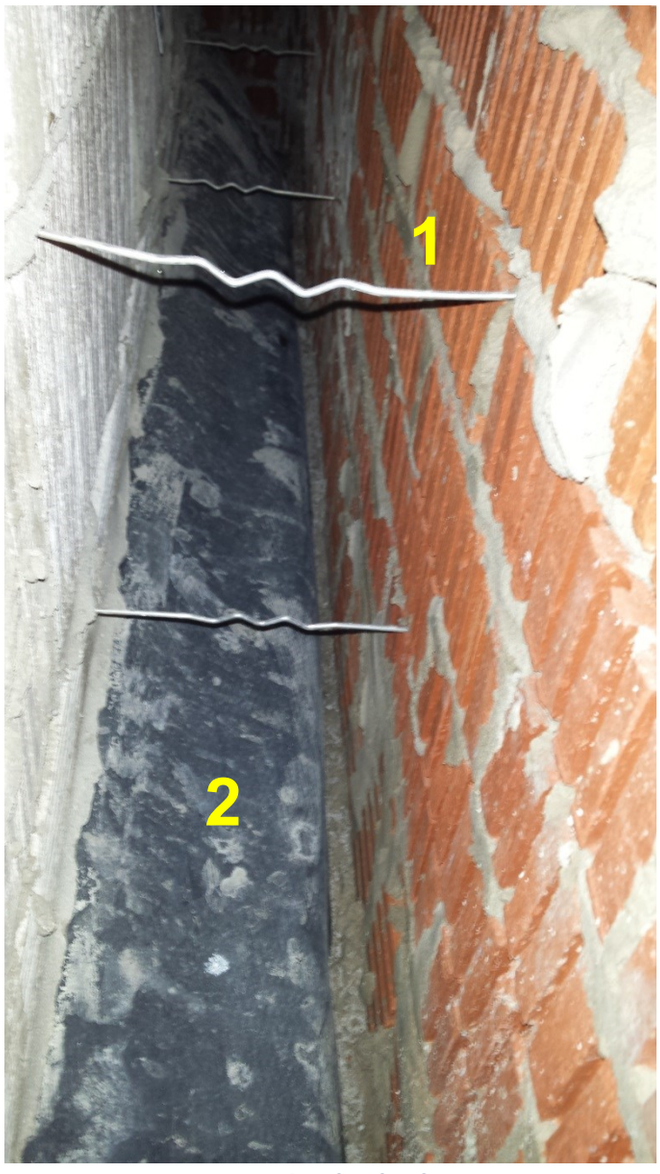



**Figure 4.2 - Cavity Tray Detail**

1. Suitable end bearing of wall ties to provide 62.5mm of overlap to ensure 50mm end bearing falling towards the outer leaf of masonry and free of mortar deposits.
2. Cavity tray free of mortar deposits and angled towards the outer leaf.

## 4.4 Pre-cast Beam & Block Floors

All Engineered flooring systems must have suitable third party certification or accreditation and calculations confirming spans and loadings have been accounted for. The details and specification must include;

- Structural design information of the pre – cast floor beams, loadings and span calculations
- Suitability and durability of walls supporting the beam and block floor,
- Recommended blocks for infilling between the beams which should include compressive strength and thickness of the block.

All beam and block floors installed should meet the following criteria;

- A mortar bed used below blockwork bearing onto a loadbearing wall should be suitable for the location
- Beams and blocks should be grouted using a sand and cement mix with a ratio of 6:1,
- The beam and block floor should NOT be used to support load bearing walls, without loadbearing walls beneath onto suitable foundations
- Holes must NOT be made through the floor beams, and damaged beams are to be replaced, any service penetrations should only pass through holes made in the infill blocks and filled with concrete (C15) mix before screed application,
- ALL organic material should be removed and the ground level should be a minimum of 150mm
- The substructure floor shall be designed to prevent water ingress

- Land drainage should be considered on sloping sites to ensure ground water does NOT affect either the foundation and/or sub floor

**Using a Damp Proof Membrane**

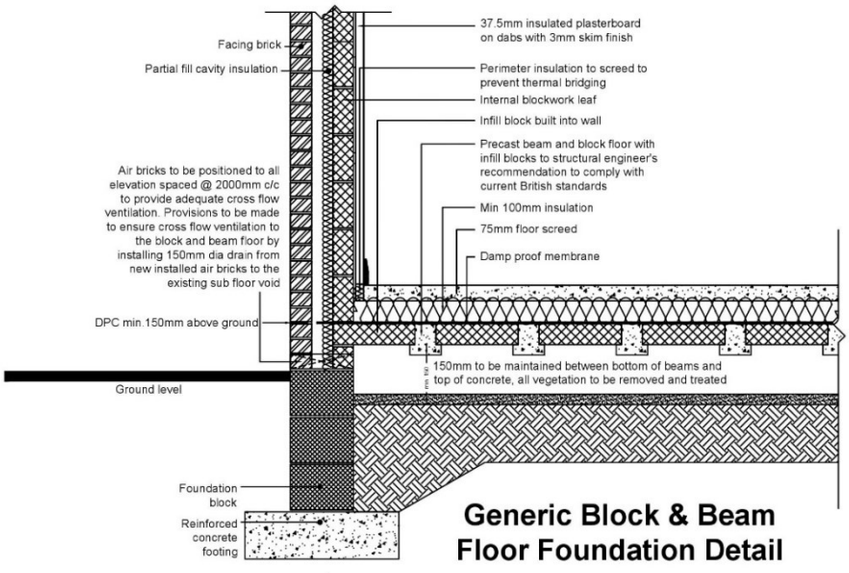
- This should be placed below the screed or insulation,
- The floor void should be appropriately vented, ensuring cross flow of air between two external opposing walls,
- The minimum area of ventilation should equate to 1500mm$^2$ per metre

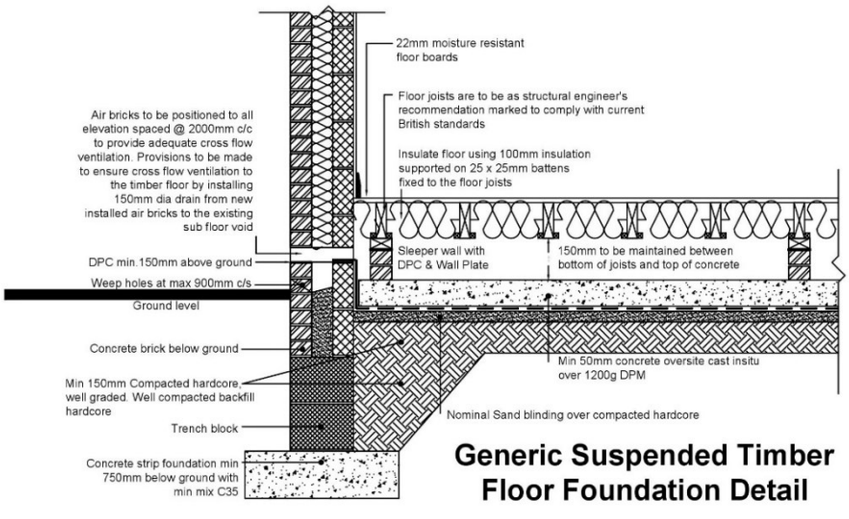
**No Damp Proof Membrane (as above but in addition);**

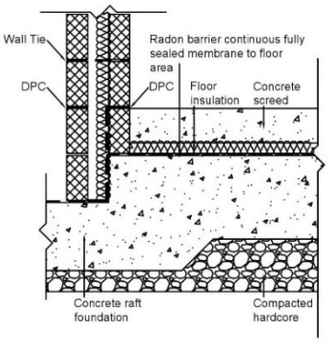
- The beam and block floor MUST be laid above the DPC, this is a requirement of the BBA certificate and is to protect the pre-stressed steel within the beam should it be exposed.
- To protect the exposed rebar at the ends of the beams from slight and/or significant corrosion so as not to be detrimental to the lifetime performance of the floor beam, it is recommended that exposed ends are either treated with a proprietary waterproofing product or wrapped in a proprietary damp proof course especially in areas subject to extreme exposure conditions.
- The surface and subsoil levels must be at the same level as the external ground level.
- Any insulation provided to a beam and block floor should be placed above it and in accordance with the manufacturer's instructions. It is important that the insulation is' fit for purpose' in terms of durability to withstand floor loadings and moisture.
- Any insulation provided to a beam and block floor should be placed above it and in accordance with the manufacturer's instructions. It is important that the insulation is 'fit for purpose' in terms of durability to withstand floor loadings and moisture.

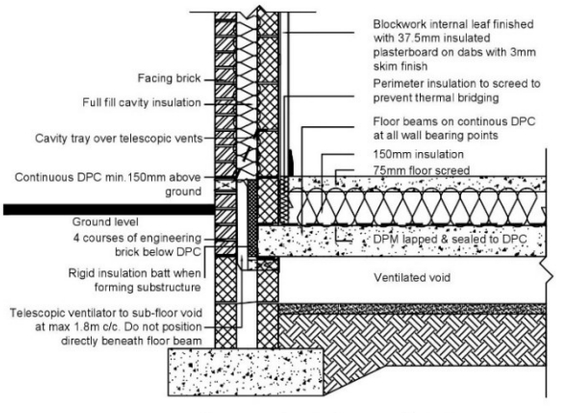
**Sub floor ventilation:**

- Ventilation in floors, especially suspended timber floors is very important so as not to facilitate the build - up of moisture within the floor structure. This moisture build - up can cause deterioration not only the timber joists but also any coverings placed over the joists. Ventilation in suspended timber floors can be achieved by installing vents below the joist level in opposite walls of the building and if possible on all sides of the building (see figure 4.3).




**Figures 4.3 - Ground Floor Details**

- These vents must be enclosed to prevent air circulating into the cavity of block wall construction. These vents will facilitate cross flow ventilation below the joists. Often these vents can be blocked, restricting the amount of ventilation being achieved. They can be blocked in a number of ways including, higher ground level externally, vegetation growing, footpaths and also builder's rubbish/rubble left under the joists. Another common way these vents may be blocked is by any extension work with a solid floor being built onto a property without consideration to the original vents. The recommended minimum area of ventilation required for a suspended timber floor is 1500mm$^2$ for every metre of perimeter of the structure.

- Along with moisture build up, the lack of or sub-standard ventilation in timber floors may lead to a build - up of gasses such as radon. With modern construction a radon barrier is installed to reduce the risk of such gasses entering the building.

**Figure 4.4 - Example of a Correctly Installed Beam & Block Floor**

1. Suitable end bearing onto DPC

## 4.5 Internal Drainage

The spoil excavated from the trench may be appropriate for backfilling above the internal drainage.
General backfill materials must be free from:

- Large stones, vegetation and building waste
- Backfill must be positioned in layers, be well compacted and not deeper than 300mm,
- Drains are to be located so that foundation/floor loads are not transmitted to the pipes.
- Trenches should not fall within the line of repose of the foundations 1

Walls should accommodate movement where drains pass through any substructure by:

- Providing a minimum 50mm clearance all round,
- A sleeve with a 50mm clearance (if built in),
- A connection on both sides of the wall to pipes with flexible joints located no more than 150mm from the face of the wall commonly termed as ‘rocker pipes’,
- Where ground movement is likely to occur, flexible drainage systems should be provided, e.g. filled sites,
- Drains should be laid to a uniform gradient on a suitable granular material and designed to falls as recommended by the pipe manufacturer and as identified below in Figure 4.5,
- Drainage Top Hats should be used where specified and are designed to form an effective seal where a pipe, duct or service penetrates a construction membrane. The top hat should be of a material that has the same properties as the membrane type being used, in order to provide continuous barrier against volatile organic compounds (VOC’s), ground gases and/or damp protection.

**Figure 4.5 - Suitable Gradient of Internal Drainage**

## 4.6 Above Ground Drainage

Gutters and rainwater pipes should be design in accordance with Approved Document H3 of the Regulations and reference should be made to Tables 1 and 2 for calculations relating to drained areas, gutter sizes and outlets.

Built in gutters serve a function that is special in architectural design because they are more hidden than gutters that are exposed.

- Materials needs to be corrosion resistant. Copper or stainless steel is favoured. Galvanized steel may be used in a galvanized steel roof system.
- Built in gutters must be adequately supported. Continuous support is favoured. This will provide better support than the blocks alone.
- The underlayment serves to minimize condensation build-up on the underside of the metal gutter lining, and it should lap in the same direction as the seams.
- Outlets should only be fitted to the base of gutters. Clearance must be permitted at the gutter outlets to allow for expansion and contraction.

## 5. SUPERSTRUCUTRE

- Areas plagued with extreme weathers and temperatures should be considered and superstructures designed accordingly. Materials to be used must carry suitable manufacturer's acceptance for location and temperature or third - party testing certification such as BBA. BRE Report 262 identifies suitable superstructures and insulating material for extreme weathers.

The following Essential Functions should also be maintained;

- A mortar type above DPC should be used as per recommended by the brick/block manufacturer to ensure durability, strength and workability.
- Cement and sand alone should NOT be used unless specifically required and approved by AHCI.
- Precautions should be taken when necessary to maintain the temperature of bricks, blocks and mortar above 3°C. The use of antifreeze as a frost resistant additive in mortar however is NOT permitted.
- Note that full fill insulation used in porous or fair faced masonry must carry an accreditation for this scenario if not provided a 50mm residual cavity is to be maintained at all times.

A traditional wall should be formed using an internal wall tied to the external facing masonry with a cavity that adheres to the following

- Be a minimum width of 50mm,
- Kept clear of mortar deposits to ensure that the cavity is NOT bridged,
- The two leaves should be appropriately tied, (as per figure 4.2) and Table 3
- The cavity can be fully or partially insulated, depending on exposure to wind driven rain (as detailed previously). For partial fill insulation, a minimum clear cavity of 50mm should always be provided (please refer to BS8104),
- Full filled cavity should be maintained and clear of mortar deposits as seen in Figure 5.3 Board and Mineral Wool Full Fill Scenario.

The specification of masonry walls must meet the provisions of Part A of the Building Regulations, however a Structural Engineer may provide an alternative solution, this must be submitted to AHCI prior to construction and accompanied with calculations, designs and professional indemnity insurance covering the design and if required supervision of the works.

**Table 3 - Wall Tie Length & Cavity Width Requirements**

| Cavity width in millimetres | Wall tie recommended length |
|---|---|
| 50-75 | 200 |
| 76-100 | 225 |
| 101-125 | 250 |
| 126-150 | 275 |
| 151 + | To be designed by a structural engineer for type and spacings |

**Figure 5.3 - Board and Mineral Wool Full Fill Scenario**

## 5.1 Restraints of Walls

Walls should be constructed as per the requirements of the Building Regulations, restraints may be deemed as suitable if they are lateral restraint straps, joist hangers, or restraint straps or as per a structural engineer's specifications. If using Hangers, it is important to ensure the following requirements are maintained.

- bedded directly onto the masonry and there are no gaps between the hanger back plate and face of the masonry wall,
- At least 450mm of masonry is provided above the hanger,
- Hangers are spaced at centres with floor joists as specified with the design,
- Are suitable for the loadings and masonry strength,
- Lateral restraint straps to floors and roofs running parallel to walls should be galvanised or stainless steel and be 30mm*2.5mm*1.2m and fitted at 2m centres.

Wall ties should meet the following provisions;

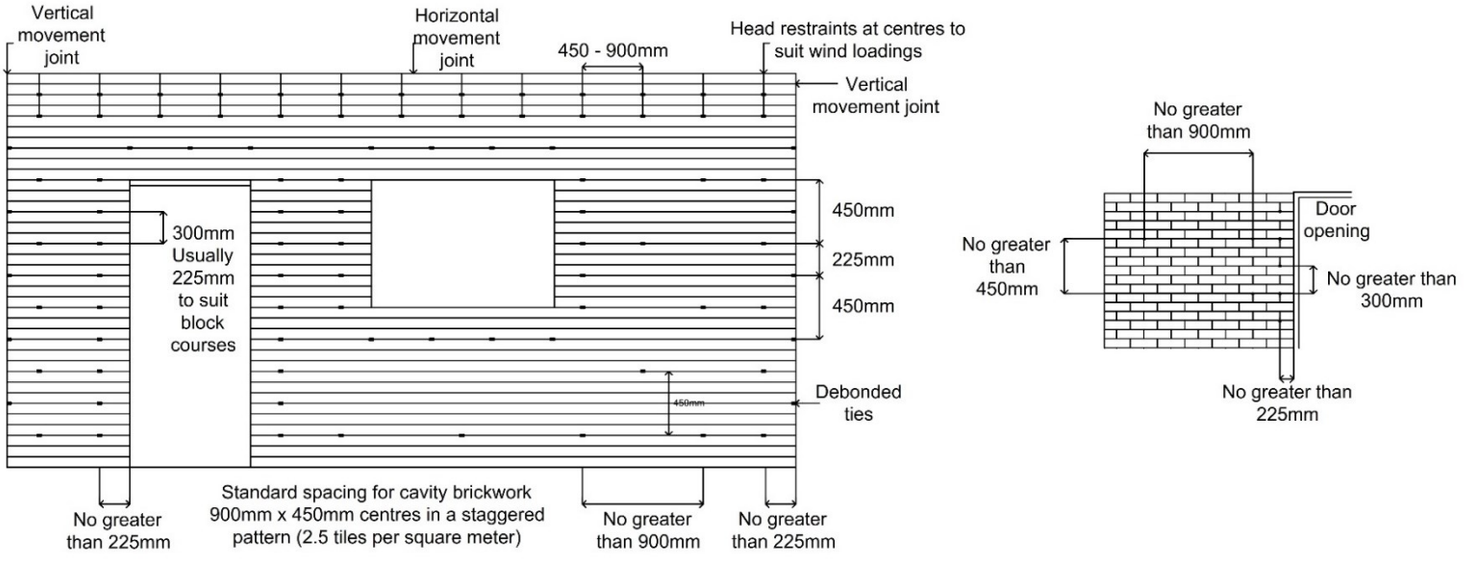
- Designed to BSEN845-1 or have appropriate third - party certification,
- The overall length must be enough to ensure at least 62.5mm overlap onto each leaf of masonry to achieve 50mm minimum length of bedding on the mortar, (as per figure 4.2)
- Be laid to a slight fall towards the outer leaf and have the ability to hold insulation against an internal leaf for partial fill scenarios,
- Be made of stainless steel,
- Be used in the correct situation (please refer to Figure 4.2 & Table 3 for placement guidance),
- Comply with the relevant thickness as specified in BS5628-2005,
- Proprietary insulation retaining clips should be compatible with the tie where partial fill is used.

When bonding internal walls to external walls;

- Tooth every alternative course or butt and tie OR

- Where blocks are of a different density, always use a butted joint or carry the wall through on party walls or butt the inner leaf using proprietary bed joint, reinforce or suitably tie at each block course,
- Vertical movement joints should be provided to the outer leaf of cavity walls,
- Where the finished ground level is 600mm or greater below the horizontal DPC, the movement joint should be continued within the external leaf of the substructure and the DPC should be lapped a minimum of 100mm to accommodate any movement,
- Movement joints below DPC should also be provided at major changes in foundation levels or foundation design,
- Wall ties should be provided at maximum 300mm centres on each side of the movement joint,
- Compressible material should be used to form the expansion joint and not permit water ingress such as a neoprene material.

**Figure 5.4 – Wall Ties Layout**




**Typical Layout of Wall Ties Indicating Maximum Spacing**

## 5.2 Expansion Joints

An expansion joint separates brick masonry into segments to prevent cracking caused by changes in temperature, moisture expansion, elastic deformation, settlement and creep. Expansion joints may be horizontal or vertical.

In general, experience suggests that movement joints in clay brickwork should be spaced at approximately 10 - 12 metres. PD 6697 states that in no case should joints exceed 15 metres and the spacing of the first joint from an internal or external angle should not exceed half of the general spacing.

An expansion joint in brickwork and blockwork is a means of solving potential problems caused by movement. This movement could be a result of thermal expansion, moisture movement, creep and structural loading or the effect of chemical changes. In building construction, an expansion joint is a mid-structure separation designed to relieve stress on building materials caused by building movement induced by; thermal expansion and contraction caused by temperature changes, sway caused by wind, seismic events, etc.

## 5.3 Lintel Placement

Correct specification of lintel is essential, a minimum end bearing of 150mm should be maintained. Lintels spanning both leaves of masonry should be insulated to prevent cold bridging.

## 5.4 Cavity Trays

Cavity trays are to be provided in the following locations;

- At all disruptions likely to direct water across the cavity,
- Above cavity insulation that is not taken to the top of the wall unless the area of wall is protected by impervious cladding,
- Above lintels in walls subject to severe exposure or where the lintel is not corrosion resistant and not intended to act as its own cavity tray with suitable 'stop ends' fitted,
- Continuously above lintels where openings are separated by short piers,
- Above openings where the lintel supports a brick soldier course.

Cavity trays should rise at least 150mm from the outer to the inner leaf and have the joints lapped and sealed as seen below in Figure 5.5 *Cavity Tray over Openings.*

## 5.5 Weep Holes

- Must be installed at no more than 900mm centres to drain water from cavity trays. When the wall is to be fully filled, it is advisable to reduce this spacing.
- At least two weep holes are to be provided to drain cavity trays above openings.
- Where the whole façade is externally rendered, the weep holes are NOT deemed necessary for cavity wall construction.
- Weep holes situated in severe exposure areas should be designed to prevent wind driven rain.
- Cavity trays should have stop ends to prevent water running into the adjacent cavity.
- Stop ends should be bonded or clipped to the lintel so that a stop to the cavity is at least 75mm in height

**Figure 5.5 Cavity Tray over Openings**

Cavity tray in place to inner leaf with 150mm falls to outer leaf and passing the window formers by 150mm, trays must be fitted with two weep holes per opening or no more than 900mm apart whichever is greater.

## 5.6 Essential Requirements for Superstructure

- For brick, block or stonework, lead cover flashings should be linked into the cavity tray,
- Duct work which disrupts the waterproof envelope should be suitably sealed to prevent ingress of moisture and in accordance with the manufacturer's instructions,
- External meter boxes should be as specified by the local providers and furnished with a cavity tray above and where required fitted with a vertical DPC,
- Insulating material for cavity walls must be fitted to a suitable standard of workmanship to avoid water ingress to voids,
- All cavity wall insulation should have the appropriate third - party certification and installed as per the manufacturer's instructions,
- Insulation should not be cut or pierced to accommodate wall ties. Ties should coincide with the insulation joints,
- For full fill cavities it is recommended that mortar joints to external leaves are NOT recessed,
- The minimum thickness and maximum height of parapet walls should be in accordance with Building Regulations, cavity trays may be required and should discharge externally from the building, a DPC should also be placed beneath any copings or capping which should be mechanically fixed where possible. As parapets are varied in design, guidance for all details should be sought from AHCI Ltd prior to the installation of any works.

- Raking Parapets wherever possible should be precluded and alternative designs sourced, in exposed areas these are to be avoided,
- When constructing using natural stone it is imperative to consider the severity of the weather,
- Where exposure is rated as moderate or worse a residual cavity should be maintained where possible,
- Stone used in walling construction must not be less in thickness than 100mm,
- The Mortar for use with Stone should comply with the relevant British Standards for sand, lime and cement,
- Full fill cavity insulation should only be considered if third party accreditation is provided,
- Jambs and Mullions must be installed using stainless steel fixings,
- A minimum of 75mm bearing is required for floor joists OR as required by the recommendations of the manufacturer if a proprietary system is to be adopted.
- Structural timber for solid joists is normally specified as strength Class C16 or C24 – refer to TRADA Span Tables.
- I - joists and metal web joists should be specified in accordance with the manufacturer's instructions and deflection limits based on total dead and imposed loads for combined bending and shear; 0.003 times the span with a maximum deflection of 14mm if strutting is provided or 12mm if strutting is not provided.
- I - joists and metal web joists should not be used in situations where any part of the joist is exposed to external conditions.
- The structure should be constructed to meet the requirements of Approved Document A (Structure) of the Building Regulations in all cases.

# 6. ROOFS

Roofs are defined in this Handbook as any final coverings to a building or section of a building, this can include, balconies, flat roofs and pitched roofs.

## 6.1 Roof Coverings

Roof coverings are to be specified at the earliest opportunity in the design stage, until further notice AHCI Ltd will NOT be able to accept slates sourced from China or Brazil, this is due to a delamination issue that we are currently monitoring but until such time as this issue has been resolved we are unable to approve such materials for site use.
All roofs using slate and tile are to be fixed in accordance to BS 5534 and BS 8612: Dry Fixed Ridge and Verge Systems for Slating and Tiling. Details are to be sought from the supplier / manufacturer prior to fixing. Figure 6.1 and 6.2 Slate Fixing identifies details of a roof stage inspection where the nailing and clipping details are visible this is to be arranged with the on - site Surveyor and the site specific fixing specification from the manufacturer is to be available in order to ensure the details are followed;

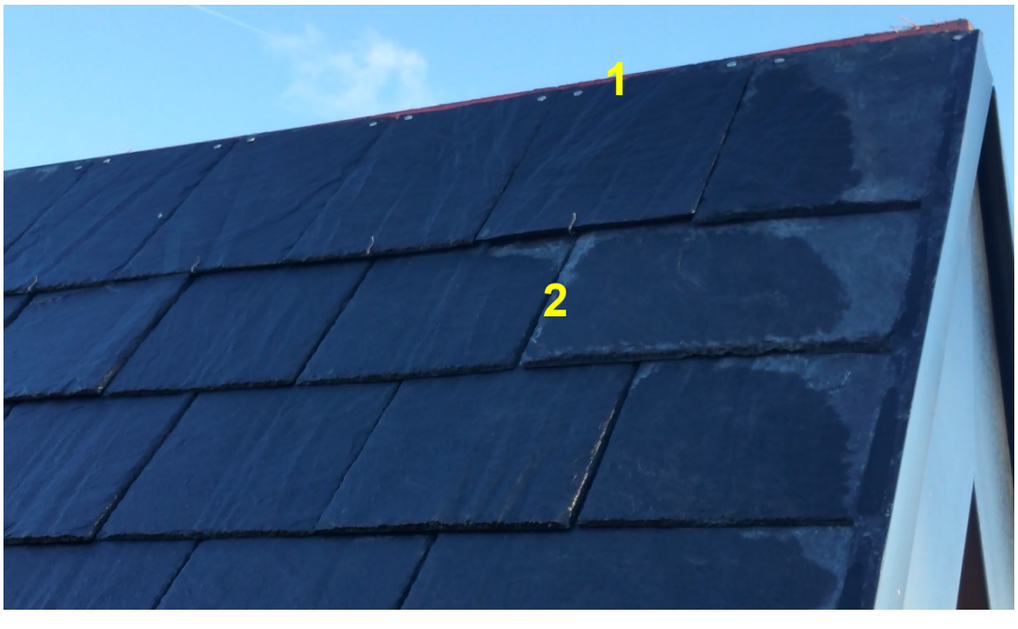



**Figure 6.1 - Roof Covering**

Roof coverings with nailing (1) and clipping (2) details visible for inspection, note the end slate is not clipped this has been specified as a dry verge system and therefore the final clip has been omitted, this type of detail is acceptable providing the manufacturers details can confirm suitability and are in line with the guidance of BS 5534.

**Figure 6.2 - Slate Roofing Details to Chimney**

Slates are all double nailed and dressed using a Code 4 Lead as a soaker.

**Table 4 - Batten Sizes**

| RECOMMENDED TABLE OF BATTEN SIZES FROM BS5534:2003 CODE OF PRACTICE FOR SLATING AND TILING | | | | |
|---|---|---|---|---|
| APPLICATION | BASIC MINIMUM SIZE OF BATTEN | | | |
| | UP TO 450MM SPAN | | UP TO 600MM SPAN | |
| **SLATES (DOUBLE-LAP)** | WIDTH (mm) | DEPTH (mm) | WIDTH (mm) | DEPTH (mm) |
| Natural: Sized or Random | 50 | 25 | 50 | 25 |
| Fibre-cement or concrete | 38 | 25 | 50 | 25 |
| **CLAY & CONCRETE TILES** | | | | |
| Double-lap | 38 | 25 | 38 | 25 |
| Single-lap | 38 | 25 | 50 | 25 |

## 6.2 Pitched & Flat Roof

A pitched roof is a roof that slopes downwards, typically in two parts at an angle from a central ridge, but sometimes in one part, from one edge to another. The ‘pitch’ of a roof is its vertical rise divided by its horizontal span and is a measure of its steepness.

A pitched roof is in contrast to a flat roof which, technically, is any roof with a slope less than 10°; however, in practise they tend to be much shallower, commonly being expressed as a gradient and usually from 1:40 to 1:80.

## 6.3 Flat Roofs

Precast concrete construction should be designed in accordance with BS 8110. Manufacturer's specifications should be sought and followed with expansion joints specified so as not to interfere with drainage.

## 6.4 Selection of System Type

A cold deck roof system will not be acceptable for roofs or terraces that form part of an occupied area, a warm deck system should be specified and the following points;

- Roof zone depth (height from ceiling to termination of waterproofing),
- Likely point loading,
- Construction process (a complete inverted warm deck roof, with suitable protection and which may be suitable for storage or access by other trades (a warm deck roof may not be suitable for storing heavy loads).

Design for loadings must comply with the Building Regulations. All loadings other than self-weights should be calculated by a Structural Engineer, all roofing designs for warm deck and inverted warm decks must be submitted and approved prior to installation. All up stands should be a minimum of 150mm with a reduction to 75mm to door thresholds.

## 6.5 Resistance to Wind Load

All flat roofs must be calculated to resist wind loads as detailed in BS EN 1991-1-4 and designed by a suitable person, the guarding selection will greatly affect the wind loadings impact any alterations to the design will need to be assessed by AHCI prior to installation.

## 6.6 Falls & Drainage

The requirements of BS 6229 should be identified and adhered to in all situations regardless of the waterproof membranes fitted.

All efforts should be made to design falls of all balconies away from the building, if this is not achievable drainage provisions should be installed across the thresholds and elevations of the building to avoid water ingress.
On large balconies additional drainage points will be required in order to reduce standing water build up or potential issues of water ingress.

If a balcony has only one drainage point an additional overflow should be fitted not within 50mm above the waterproof membrane Flashings and weatherings should be created using lead of a Code 4 or greater.

Bitumen membranes should be protected from solar radiation. This should be by integral protection provided in the product in the form of:

- Mineral granules
- Metal foil

Liquid-applied membranes - The European Technical Approval Guideline ETAG 005 Part 1 – General gives overall guidance on assessment of fitness for use.

Mastic asphalt - Products used for flat roofing should comply with BS 6925:1988 Specification for mastic asphalt for buildings and civil engineering (limestone aggregate).

Products suitable for roofing should have current certification by one of the following:

- British Board of Agrément
- Another member of the uEAtc

The separating membrane should be one of the following, and should be laid directly under the mastic asphalt:

- Sheathing felt, comprising a base of flax or jute or other suitable fibres, impregnated with bitumen.
- Glass fibre tissue.

Bitumen-coated plain expanded metal lathing should be in accordance with BS EN 13658-2.
Stone chippings (bedded) for use as a protective topping should be washed, crushed rock, normally10mm–14mm nominal size aggregate, bedded in a proprietary gritting solution over the mastic asphalt membrane.
Green roof: a roof or deck onto which vegetation is intentionally grown or habitats for wildlife are established, including extensive, intensive and semi-intensive roofs, roof gardens, bio diverse roofs, brown roofs and public and private amenity spaces.

NOTE
A roofing contractor's own guarantee can cover faulty workmanship and materials, but only if the company is still trading.
A Confederation of Roofing Contractors (CORC) trade IBG (Insurance Backed Guarantee) should protect your financial investment by covering off on the terms of your contractor's original guarantee should they cease trading.

The IBG can protect your project from commencement to completion and beyond and it can cover stage payments made to your contractor and the work in progress. If your original contractor fails to complete, the CORC will even help you to find a new, approved contractor to commence or recommence the project.

The IBG can also be transferred to any new owner of the property.

All members of the Confederation of Roofing Contractors should offer this service and so seek advice from your appointed Contractor concerning the inclusion of an IBG within their contract.

IBG's can only usually be obtained by roofing companies who are a member of the Confederation of Roofing Contractors.
AHCI insist on the provision of an IBG for all flat roofing calculated at approximately greater than 10% of the total roof area.

## 7. CHIMNEYS

Chimney designs are to be carried out by a suitably qualified person ensuring all draws, corbelled sections and cavity tray placements are identified. Chimneys should meet the requirements of the building regulations for all aspects.

GRP Chimneys are to be set into the roof structure and not situated onto the gable brick work and they must be accommodated by the roof design and saddle boards fitted beneath to fully support the additional weights. Additional trusses may also be required and should be designed by the manufacturers.

Flashing details should be as per the manufacturer of the roof finishes design and where lead work is required Code 4 lead is to be used as a minimum

## 8. EXTERNAL WORKS

External landscaping and pathways are NOT incorporated into the policy coverage however design elements should be considered to maintain 150mm minimum distance between all external works and the DPC and where possible drainage channels or chippings should be considered to eliminate standing water being held against the structure as identified in figure 8.1. Rendered sections should also maintain 150mm distance between external finishes. Should a level access requirement cause a bridge this should be incorporated into the design brief, one acceptable method that may be considered is a double DPC with a cavity tray and ventilated perp joints or weep vents.

**Figure 8.1 - External Pathways**

External pathways with gravel channel to encompass downspouts and soil pipes, this ensures that drainage to the perimeter of the dwelling is maintained and all are maintained at 150mm below the DPC, please note the DPC is also fitted beneath the door set.

## 9. TIMBER FRAME

Timber Frame systems made off site under factory conditions are erected on site and must adhere to quality control systems such as TRADA BM and BOPAS (Built Off site Property Assurance Scheme).
Timber frame external walls are generally considered to consist of;

- Load – bearing solid timber studs fixed at regular centres with insulation between them,
- A lined structural sheathing board,
- A breather membrane,
- Drained cavity and cladding,
- A vapour check layer and
- Internal finish such as plasterboard.

Bespoke timber frame systems not carrying a suitable Quality Audit procedure will need to be accredited by an independent structural engineer assuring that the loading capabilities are suitable for the location and requirement, they will need to monitor the installation and completion of the system in order to meet the requirements of the Warranty

### 9.1 Green Oak

Green Oak cannot be used in an external walling scenario where it will be exposed to weathering and acting as a structural element and should be fitted only for decorative purposes not as part of the waterproof envelope. However, internal works may be constructed of Green Oak.
A Structural Engineer must provide calculations and a suitable assessment identifying the weathering capabilities and potential movement, shrinkages and how this will be accommodated by the cladding systems or masonry

### 9.2 Structurally Insulated Panels SIPs

All loadings imposed on the panelling system both internally (live and dead loads) and externally such as wind loadings should be encompassed into the design, in accordance with Euro codes 5 and supplied with the following quality assurances;

- BMI TRADA Mark for timber frame,
- ISO 9001,
- CE Marking.

All load bearing timbers must be dry graded C16 minimum and clearly marked at a dimensional width no less than 37mm.

All load bearing timber components shall be either naturally durable or treated in accordance with BS8417: Preservation of Wood Code of Practice. Any site cut and exposed ends should be treated with a compatible preservative with the original treatment used.
The first element of the timber frame installed is the sole plate as seen in figure 9.1.
All structural timbers should be 150mm above the external ground level except for ramped access to the thresholds. Drainage channels and ventilation should still be provided and not inhibited by the ramp or entrance steps.

**Figure 9.1 - Sole Plate Detail**

Sole plate located flush with the grounding and fitted with a DPC continuous through the entire base.

The soleplates should be fitted level onto a DPC in line with the foundations external face (+/- 10mm overhang) as seen in Figure 9.1 above with either shot fired nails or proprietary soleplate fixings, anchors, brackets or straps may be used subject to suitable third party certification or as specified by a Structural Engineer.
All sole plates are to be ventilated at 1350mm centres with full perp weep openings.
Structural packing's may be required under soleplates to level them and transfer vertical loads as advised by the appointed Structural Engineer.

Structural packing's should;

- Be non - compressible and inert,
- Be located under every vertical member, not within the void,
- Provide an equal cross - sectional area to the studs they support,
- NOT exceed a total of 10mm in height without the appointed Structural Engineer's approval.

## 9.3 Sheathing Boards

Sheathing boards must be secured to the timber frame as per Figure 9.2 below in order to provide racking resistance to the structure and may be constructed of any of the following;

- Orientated Strand Board (OSB) – grade 3 or 4 (BS EN 300),
- Plywood – class 3 (BS EN 363),
- Impregnated soft board (to BS EN 622-4),
- Medium board (to BS EN 622 – 3),
- Tempered hardboard (BS EN 622 – 2),
- Other board material with suitable third - party certification for primary racking resistance.

All wood - based panel products should comply with BS EN 13986.

**Figure 9.2 - OSB Structural Boarding**

Orientated Strand Board or OSB is commonly used to give structural stability to the timber uprights.

Structural sheathing boards may be fixed with either nails or staples which should be stainless steel, galvanised and sherardized.

Timber frames should be furnished with a Breather Membrane fitted over the supporting sheathing, this is for protection during and post construction and must remain intact with no tears or open edges, membranes should comply with BS 4016 as identified in Figure 9.3 the membranes should be fitted and lapped into the Vapour Control Layer and an air and moisture barrier be fitted between to still accommodate movement as identified in Figure 9.1.

**Figure 9.3 - Breather Membrane**

Breather membranes should be lapped by a min of 100mm at all horizontal junctions and 150mm for all vertical intersections, where panels are jointed an additional 300mm strip should be added centrally to span the joints, and be left as 25mm below the sole plate

Insulating material selected for within the timber frame should be a breathable mineral wool, other materials may be used however acceptance must be sought from the timber frame manufacturer prior to installation
Insulation may be specified in any of the following locations;

- Between load bearing studs,
- On the outer face of the timber frame,
- On the inner face of the timber frame.

A Vapour Control Layer is a moisture resistant material installed to the internal face of the timber frame and may take the form of;

- A vapour control plasterboard comprising a metallised polyester film bonded to the back of the plasterboard,
- A minimum 125 microns thick (500 gauge) polythene sheet
- A third party approved proprietary vapour control membrane product. (as seen below in figure 9.4)

Internal wall linings of the timber frame wall may be required to perform four functions;

- Provide the finish or substrate to accept the finish on the inner face of the wall,
- Contribute to the racking resistance of the wall,
- Contribute to the fire resistance of the wall and
- Contribute to the acoustic performance of the wall.

**Figure 9.4 - VCL Product**

Vapour Control Layers are to be fitted internally with all penetrations sealed with a suitable tape to ensure air tightness is maintained.

## 9.4 Wall Ties

Wall ties and fixings between the timber frame and masonry cladding should;

- Comply with BS EN 845,
- Be constructed from stainless steel,
- Accommodate all anticipated differential movement,
- Be of adequate length and masonry bond to provide a clear cavity of at least 50mm.

The manufacture of timber frame external wall panels shall;

- Be manufactured in accordance with the appointed Structural Engineer's design,
- Consist of solid timber studs and rails,
- Have studs at a maximum of 600mm centres and be braced with a structural sheathing board.

**Figure 9.5 - Typical Panel & Floor Joist layout**

Panel set up prior to insulating material with trimming for openings and situated onto a DPC, panels that are assembled on site must be as per manufacturer's specifications and designs, they must also be inspected at agreed stages with AHCI Ltd to ensure all standards are met.

Timber frames structural members should have a moisture content of 20% or less and the following tolerances adhered to;

- Length: +0mm, - 5mm,
- Height: +/-3mm, diagonals should be equal, acceptable deviation is +/-5mm,
- Opening dimensions: +/-3mm.

All fixings securing the structural sheathing board should be located into the structural members, centres should be maintained at 150mm to the outer edges and 300mm in the central sections. Caution should be taken not to over drive the fixings into the face of the board. A suitable void should be maintained between sheathing to allow for expansions and contractions. Cripple studs should be situated to transfer loads through the structure into the foundations, if these are not supplied from the factory manufacturing process they will need to be fitted on site, these should be specified by a Structural Engineer as identified in Figure 9.6.

All openings including doors, windows, flues, ductworks, should be designed and constructed to maintain structural performance in that;

- A lintel may be required where openings do not fall between studs unless vertical load is adequately transferred by other elements,

- Lintels will require support by cripple studs, (as identified in Figure 9.6),

- Studs should be provided around window and door openings and adjacent to movement joints to allow the installation of wall ties or other cladding fixings.

The location of solid timber studs should be clearly marked on the outer face of the breather membrane to ensure that cladding fixings are installed into solid timber.

**Figure 9.6 - Cripple Studs & Bolting Details**

Steel beams are bolted as per the Structural Engineers designs and on the neutral axis, with additional plating to the base to ensure a solid fixing to the cripple studs.

Caution must be taken when transporting timber panelling (closed or open) as damaged panels must not be fitted as these will not be accepted under the Warranty.

At pre – commencement stage and to ensure that the building is constructed as designed, all necessary detailed design information, drawings, specifications and fixing schedules should be provided to site **BEFORE** work commences. It is important that the tight tolerances for timber frame are understood and ensuring the correct location and level of the foundation is one of the most important stages of the build process.

The foundation that supports the timber frame should be set out to the dimensions noted on the Timber Frame drawings and design;

- Within +/- 10mm in length, width and line,
- Diagonals within +/- 5mm up to 10m and +/- 10mm if more than 10m and
- Levelled to +/- 5mm from datum.

## 9.5 Gas Membrane

If a gas membrane is required, the placement should not hinder the ventilation of the sole plate, cavity trays will be required and placed in an area allowing for sole plate ventilation and moisture repelling away from the frame.

## 9.6 Claddings

Self-supporting (masonry) claddings should be connected to the timber frame using wall ties should be as follows;

- Fitted into the structural timbers not the sheathing material,
- Fitted to drain moisture away from the timber frame,
- Installed at a maximum of 600mm centres, 375mm vertically and a maximum of 525mm vertically where timbers are at 400mm centres,
- In accordance with BS 5268-6,
- Installed at a maximum of 300mm centres vertically and 225mm horizontally around openings and movement joints,
- Installed within 225mm of the head of a wall.

Cavity ventilation in masonry cladding should:

- Be provided with full height open perpends at a maximum of 1350mm centres or equivalent open area,
- Be fitted in the brick or block course below the lowest timber sole plate, above external finished ground level and below DPC,
- Cavity ventilation should provide an open area of not less than 500mm2 per metre run,
- Above horizontal cavity barriers/trays,
- Allowing differential movement to occur while retaining an adequate gap,
- With openings protected by a mesh to prevent the passage of insects.

Allowance should be made for differential movement to occur at floor zones, if engineered timbers are to be used such as metal web floor joists an allowance of and 3mm at the ground floor should be made beneath ALL openings/external wall penetrations with an additional 6mm per storey. If solid timbers are to be used, then an additional 9mm should be added for each storey starting with 3mm at the ground floors, or as per the manufacturer's guidance.
All external wall claddings should be separated from the timber frame structure and drained. If partial fill cavity insulation is to be used, a 50mm residual cavity must be maintained. Table 6 identifies the required cavity widths, if a cladding is to be used that does not fall within the listed details please contact AHCI Ltd for further guidance prior to installation.

**Table 6 - Cladding Cavity Requirements**

| CLADDING TYPES | MINIMUM WIDTH |
|---|---|
| Masonry | 50mm |
| Render on unbacked laths | 50mm |
| Render on backed Laths or boarding | 25mm |
| Timber cladding | 19mm |
| Hanging tiles | 25mm |

## 9.7 References for further Timber Frame Guidance

- References include BS EN 1995-1-1: 2004+A1: 2008 Euro code 5 Design of timber structures. General. Common rules and rules for buildings.
- BS 5268-2: 2002 Structural use of timber. Code of Practice for permissible stress design, materials and workmanship.BS 5268-3: 2006 Structural use of timber. Code of Practice for trussed rafter roofs.
- BS 5268-4 Section 4.1: 1978 Structural use of timber.
- Part 4 Fire resistance of timber structures. Section 4.1 Recommendations for calculating fire resistance of timber members.

- BS 5268-4 Section 4.2: 1990 Structural use of timber. Part 4 Fire resistance of timber structures. Section 4.2 Recommendations for calculating fire resistance of timber stud walls and joisted floor constructions.
- BS 5268-6.1: 1996 Structural use of timber. Code of Practice for timber frame walls. Dwellings not exceeding seven storeys.
- BS 5268-6.2: 2001 Structural use of timber. Code of Practice for timber frame walls. Buildings other than dwellings not exceeding four storeys.
- BS EN 14081-1: 2005 Timber structures. Strength graded structural timber with rectangular cross section. General requirements.
- BS 8417: 2003 Preservation of timber. Recommendations.
- BS EN 13986: 2006 Wood-based panels for use in construction. Characteristics, evaluation of conformity and marking.
- BS EN 300: 2006 oriented strand boards (OSB). Definitions, classification and specifications.
- BS EN 636: 2003 Plywood. Specifications.
- BS EN 622-4: 2009 Fibreboards – Specifications. Requirements for soft boards.
- BS EN 622-3: 2004 Fibreboards – Specifications. Requirements for medium boards.
- BS EN 622-2: 2004 Fibreboards – Specifications. Requirements for hardboards.
- BS 4016: 1997 Specification for flexible building membranes (breather type).
- BS EN 845-1: 2003+A1: 2008 Specification for ancillary components for masonry. Ties, tension straps, hangers and brackets.
- EN 14732: 2011 Timber structures. Prefabricated wall, floor and roof elements. Requirements draft.

# 10. CONCRETE FRAME

The structural design principles of a concrete building are to provide a safe structure complying with the user's requirements. The design should provide a solution for safety and serviceability throughout the design life.
The designer must therefore ensure that the structural element is safe and strong, the deflection is not excessive. This limit state usually controls the depth of the section. These span/effective depth ratios should be modified depending on the amount tension steel and compression steel required in the section.

## 10.1 Corrosion of Steel Reinforcement

Concrete structures may require treatments. This occurs because of inefficient design/ drafting and poor quality construction. To avoid corrosion of reinforcement, special care has to be taken regarding the following;

- Design mix,
- Water cement ratio,
- curing time of the concrete,
- monitoring of cement content,
- use of quality cement,
- aggregate and water,
- cover to reinforcement,
- monitoring of compaction,
- admixtures,
- Treatment to exposed surfaces,
- Environmental conditions.

Therefore, it is suggested that the dampness which is the main cause for corrosion should be avoided by good design and quality construction to achieve dense concrete.

BS8539 is the Code of Practice for the selection and installation of post - installed anchors in concrete and masonry.

BS8539 was the first British Standard to provide recommendations for the safe selection and fitting of anchors for use in

masonry and concrete and practical guidance for designers, manufacturers, specifiers, contractors, installers and testers of anchors. This regulation is also linked to the relevant European regulations, particularly in relation to the selection of products with the correct ETA's for the application (European Technical Approval).

BS8539 is restricted to the use of anchors inserted into concrete and masonry drilled holes only and is aimed at everyone involved in the use of fixings from designers and specifiers to manufacturers, suppliers, contractors, testers and installers who are obligated to adhere to these regulations and codes to ensure that the work they are undertaking is safe, reliable and effective.

Before testing can begin the anchors should be installed as per the manufacturer's instructions and in the locations detailed by the contractor or specifier. The results should be recorded in a full and comprehensive manner and relayed to the specifier or contractor.

Pull out testing involves attaching a small piece of equipment to the exterior bolt, nut, screw or fixing. This is then pulled to the designated stress load level to determine how strong and secure the fixing is. Even though materials used for bonding may be different, this method remains the same for all types of fixings.

# 11. LIGHT STEEL FRAMED BUILDINGS

The structural design should be in accordance with BS5950 - 5:1998 and loads calculated in accordance with BSEN1991. Detailed plans and section layouts are required to be submitted for approval to AHCI prior to commencing works.

Steel fixings should be appropriately selected for the design and protected against any corrosion. All loadbearing walls should be transferred to the foundations.

Internal bracing can also be provided by internal floors, external claddings should be suitable in design and specified for the steel frame building.

## 11.1 Site Tolerances

For Light Steel Frame structures are as follows;

- Length of wall frame; +/- 10mm in 10 metres,
- Line of wall frame; +/- 5mm from outer face of plate,
- Level of base of wall frame; +/- 5mm over complete wall line.
- Some packing may be needed to achieve the required tolerances;
- Less than 10mm, pack under each steel with pre – galvanised steel shims,
- 10 – 20 mm, pack under each steel with steel shims and grout over the length of the sole plate,
- Over 20mm, reference should be made to the Frame Designer.

Mechanical fixings should be used to secure the frames to substructures. Fixings may be galvanised or preferably stainless steel that are fixed to the superstructure steel walls and attached to masonry supports or concrete foundation or holding down bolts fixed to the concrete slab.

Stainless steel straps should be certified to BSEN 10088 and fitted with suitable grommets or washers.
Framed walls should be plumb and level without twist and securely fixed to supporting structures. Vertical tolerances are;

- +/- 15mm in overall height of wall for 3 storeys,
- +/- 10mm in overall height of wall for 2 storey or
- +/- 5mm in storey height (approximately 2.5m).

Walls that are not identified as loadbearing should have suitable strength to accommodate voids for services without compromising the integrity of the wall following the guidance of BS8000:5.

## 11.2 Thermal Insulation

The use of any thermal insulation should be placed in contact with the structural members to minimise air gaps and prevent local condensation and be installed as per the manufacturer's specification. Suitable cavities should be maintained as per the details in Table 6.

## 11.3 Breather Membranes

Membranes should allow moisture from within the structure to evaporate whilst protecting any sheathing material, this should be accompanied with a foil lined insulating material.

## 11.4 Vapour Control Layers

The VCL is fitted to the inner face of the framework to resist the passage of water from within the building. This is to be lapped into the DPM to ensure a continuous seal, any penetrations through the VCL should be taped sealed.

# 12. CONVERSION & REFURBISHMENT

Requirements for conversion works may vary depending on the scope of works and retained elements, this handbook is to clarify the initial requirements for AHCI Ltd in order for us to consider the works suitable for the provision of Structural Insurance.

## 12.1 Initial Assessment

Prior to works commencing a scope of works or schedule is required in order to ascertain what works are being proposed. Firstly, a structural assessment is required in order to identify the risks associated with the project, this should be undertaken by a suitably qualified person but preferably a Structural Engineer with suitable experiences and Professional Indemnity covering the assessment and supervision works undertaken. The following points are to be included in the initial assessment criteria:

- Any issues in relation to an unstable foundation are to be detailed and an underpinning schedule is to be drawn up with details listed on the depths and requirements of the underpinning, this also requires supervision to be carried out by a suitably qualified professional,
- Structural stability of any existing retained elements,
- Internal floors acting as diaphragms for the structure that may be compromised are to be inspected and embedded timbers are to be assessed and where possible replaced with a suitable new element,
- All insecticides or treatment for rot should be logged and reported,
- Drainage which is being retained should be inspected with CCTV and accepted by the sewerage undertaker,
- Roof coverings and roof structure should be assessed and confirmed by the Structural Engineer as suitable to remain,
- External doors and windows should also be assessed for suitability and confirmed to last for as long as the life of the policy.

## 12.2 Superstructure

External levels of new or existing path and roads should be assessed and considered prior to any internal works commencing to the substructures or ground floors. Damp Proof Courses should be provided to all ground floors and external walling by a suitably qualified person who has taken into account the type of structure and end uses. Works to the superstructure should be in accordance to the recommendations of the Structural Engineer with any balcony or flat roof sections designed accordingly and approved by AHCI before works commence.

## 12.3 Internal Linings

Internal linings are to be fitted independently from the existing structure where an existing cavity structure does not exist. These are to be fixed at the sole and head plates with suitable fixings and where lateral restraints are required lining fixings should be used i.e. aluminium straps that will not allow the passage of moisture to the lining. Treated timbers used for internal linings are to be fitted with a vapour control layer internally and a breather membrane within the cavity, restraints fixings should also not allow the passage of moisture.

## 12.4 External Works

External pathways or drives should not compromise the DPC and have a distance of 150mm from the highest point to the DPC. All external landscaping and pathways must be 150mm from the base of any render or cladding systems, where ramped access is proposed this is to be maintained from the highest point and where necessary a secondary DPC and cavity tray may be required.

## 12.5 Third Party Guarantees/Warranties

Refer to Section 14 but Advantage will require such guarantees/warranties for design or construction of basements, retaining walls, waterproofing and/or tanking systems, flat roof, balcony or parapet wall structures associated with such conversion or refurbishment works.

# 13. MODULAR BUILDINGS

Modular buildings and modular homes are prefabricated buildings or houses that consist of repeated sections called modules. "Modular" is a construction method that involves constructing sections away from the building site, then delivering them to the intended site. Installation of the prefabricated sections is completed on site. The modules can be placed side-by-side, end-to-end, or stacked, allowing a variety of configurations and styles. After placement the modules are joined together using inter-module connections, also known as inter-connections. The inter-connections tie the individual modules together to form the overall building structure.

The BRE Product Standard 7014 (BPS 7014) is designed to specify performance and verification requirements for modular building systems and components, to be used in UK residential construction, which are constructed using advanced manufacturing processes.

It provides a route to certification for modular systems for use in the construction of residential buildings. The key objectives of the standard being:

- to encourage new methods of construction and advanced manufacturing techniques whilst maintaining acceptable levels of safety and durability,
- to create confidence in the use of such methods in residential construction,
- to demonstrate compliance with relevant building regulations and national house building codes, as well as enhancing characteristics where appropriate,
- to identify/quantify the comfort and wellbeing benefits to the householder of such construction.

The Standard primarily focuses on the certification of modular building systems for residential construction that they:

- are not wholly covered under current recognised standards and codes and/or
- have a limited track record of service in the UK.

This objective is achieved by setting out requirements for performance in a number of areas to address the needs of all standards for Modular Systems for Dwellings Modular construction is where a building is constructed off - site under controlled factory conditions. The building is designed and produced either whole, or for larger projects, in transportable modules – with the same focus on using environmentally focused, high quality materials and meeting relevant Building Regulation and performance standards as traditional construction.

Once completed off - site, including for internal fit-out, the modules are delivered to site, where they are installed, checked, tested and signed over.

The purpose of the Standard, being:

- to help manage this risk for modular building systems by demonstrating that they have been subjected to a rigorous independent review, testing and certification process and
- to provide assurance to purchasers, insurers, lenders, designers, and other stakeholders using modular building methods, that they are at least equivalent to, if not better than, currently applied methods.

Whilst Advantage acknowledge such systems are used in construction, it is important that we are furnished with all design information from appointed designers and/or engineers so that an assessment of the building type may be undertaken and importantly the interface of the foundation work and/or substructure in relation to the support of the unit(s) is/are acceptable.

It will also be expected that the modular build will have accreditation to BPS 7014 or will have certification/approval from accredited third parties who will provide specific guarantees/warranties for the structure or build type.

The CE mark is a construction norm that guarantees the user of mechanical resistance and strength of the structure. It is a label given by European community empowered authorities for end – to - end process mastering and traceability.
All manufacturing operations should be monitored and recorded so that:

- Suppliers have to be known and certified,
- Raw materials and goods being sourced are to be recorded by batch used,
- Elementary products are recorded and their quality is monitored,
- Assembly quality is managed and assessed on a step by step basis,
- When a modular unit is finished, a whole set of tests are performed and if quality standards are met, a unique number and EC stamp is attached to and on the unit.

The EC certification guaranties standards in terms of structural durability, resistance against wind and earthquakes.
BOPAS - The Build offsite Property Assurance Scheme is a risk - based evaluation which demonstrates to funders, lenders, valuers and purchasers that homes built from non - traditional methods and materials will stand the test of time for at least 60 years.

For funders and lenders, it provides confidence that the construction system is fit for purpose and removes the uncertainty of the construction for valuation purposes. This removes the risk of mortgages for developers being declined and improves the business and technical risks to manufacturers of the construction system.

The scheme provides an assurance of the integrity of off - site construction systems delivered in a consistent and competent manner conforming to contract specifications.

The BOPAS assessment involves all aspects of the business operation including systems processes and procedures, together with handover interfaces, from design through off - site manufacture and construction/assembly to client handover; all being tested against the arrangements for sustaining quality delivery, dealing with environmental and project changes and the control measures that are applied to mitigate delivery risks.

## 13.1 Workmanship

Should be in accordance with Document 7 and BS 1186-2:1998

## 13.2 Roof Lights

Should be fitted within a suitable opening pre - formed to ensure structures are not compromised and weather seals provided to co - exist with the coverings fitted.

## 13.3 Non-timber Components

Should follow the guidance within the following;

- BS 4873 Aluminium windows,
- BS 5286 Specification for aluminium framed sliding,
- BS 6375 for resistance to wind driven rain.
- BS EN 514 PVC-u windows,
- BS 7412 PVC-u windows,
- BS 6510 Steel windows and doors.

# 14 WINDOWS AND DOORS

All external doors and windows should be supplied and fitted ensuring weather tightness in accordance with the exposure levels as identified in BS 6375 this may include a checked rebate and should be considered as part of the design stages prior to works commencing on site. All windows and doors must be tested and certified to BS 6375 for resistance to wind driven rain.

External Joinery should be suitably selected with wood type and dimensions as per BS EN 942 or as specified in TRADA Guidance documentation.

Sealing of windows within timber frame structures – advisory notes;

- A soft and flexible material such as an open cell polyurethane foam should be used,
- The foam is impregnated with an acrylic based resin,
- The tape is water repellent and offers a resistance to wind driven rain in most exposure limits, this should be fitted to all openings and penetrations through external masonry wrapping a timber frame in order to allow the movement required without causing window sill movement and potential water ingress,
- It is supplied as pre-compressed rolls with a self - adhesive side to aid initial location and is weather tight against the most severe combinations of wind and rain,
- It is advised that the Developer/Contractor consults the Timber Frame manufacturer/supplier for further detail and guidance prior to installation.

# 15 THIRD PARTY DESIGN AND/OR CONSTRUCTION

It is important to note that any third - party contractor work and/or design MAY require insurance backed guarantees and/or evidence from appointed professionals that they possess adequate professional indemnity insurance should a claim prevail. Examples of this may be the design or construction of basements, retaining walls, waterproofing and/or tanking systems, flat roof, balcony or parapet wall structures. In such cases Advantage will require relevant third party guarantees or insurances.

## 15.1 Insurance Backed Guarantees

An insurance backed guarantee provides valuable consumer protection for homeowners and increases customer confidence that the installer is reliable and trustworthy.

Although a workmanship guarantee sets out the installing contractor's obligation to rectify defects in the installation carried out, unfortunately this does not guarantee that they will be trading for the life of the policy.

The purpose of an insurance backed guarantee is to honour the terms of the installing contractor's own guarantee, where unfortunately the installing contractor has ceased to trade and is therefore unable to satisfy remedial claims made against their workmanship guarantee.

Should a homeowner find themselves in this unfortunate situation, they can claim against the insurance backed guarantee should there be a defect with the workmanship and the installing contractor has ceased to trade.

## 15.2 Professional Indemnity Insurance

Professional indemnity insurance, often referred to as professional liability insurance or PI insurance, covers legal costs and expenses incurred, as well as any damages or costs that may be awarded, should third parties provide inadequate advice, services or designs that result in a claim having to be pursued.

# FIGURES AND TABLES



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