

# BTEC Construction Revision Guide



A building is made up of foundations, walls, floors and roofs...

These are called **the elements of a building**, and they need to be strong enough to support various loads...

**Loads are classified as live, dead or dynamic.**

- Dead Load 

Dead loads are loads that do not move such as the weight of the building itself
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- Dynamic Load 

These are the loads that can change during the use of a building: for example the weight of people and furniture
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- Impact / Live Load 

This is when something hits a building or falls on it: for example snow, rain and wind
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The foundation of a building is the base in which the building sits on.

**The foundation does a number of important things:**

- It provides a flat level surface in which to build on
- It transfers loads safely to the ground
- It carries the weight of the building
- It spreads the weight of the building

**There are four different types of foundation:**

- **Strip foundation** – this is used when soil quality is good
- **Trench fill foundation** – this is also used when soil quality is good but when loads are heavier.
- **Raft foundation** – this is used when a building is large and heavy loads are expected
- **Pile foundation** – this foundation is used when soil quality is weak

## Thermal insulation

Buildings have to be heated to make them comfortable to live in. However buildings are not air tight, so they lose heat through gaps in their structure.

**This is why buildings need thermal insulation.**

A **U- Value** is the measure of heat loss from a building.

There are different parts of a building where heat can escape:

- The roof
- Walls
- Floors
- Windows
- Doors

Heat loss can be reduced using a range of different measures:

- **Loft insulation** forms a layer between the loft and the rest of the house. This helps to reduce heat loss through the roof.
- **Installing a carpet and good quality underlay** which is laid underneath the carpet will help reduce the heat loss for floors. **Sheep's wool** is a good material for underlay.

For solid floors or laminate floors, laying a rug down on top of the floor will help reduce heat loss also

- **Draught strips** are hairy or spongy strips that can be used to close the gaps around doors.
- **Insulation can be added to walls** to prevent heat loss from walls. **Mineral wool or cellulose** are good types of insulation for cavity walls.
- **Insulated plasterboard** can be added to existing plaster to help reduce heat loss from walls.
- **Double glazing** windows can be installed to reduce heat loss from windows. Also fitting draught strips and curtains can prevent draughts leaving a house and so reduce heat loss.

Fire resistant buildings can save lives and damage to property.

Fire resistance can make sure a building stays standing after a fire.

There are a number of different ways a building can be made fire resistant:

- Fire barriers can be installed – fire barriers **stop the spread of through a building.**

Fire barriers include:

- Fire walls
- Separate floors made out of concrete
- Door closures
- Fire resistant doors – made from steel

- Fire Compartments can be added into the design of a building

A building is usually divided up into sections. **These are called fire compartments**

If there is a fire in one compartment, it will not affect other compartments.

Construction materials are tested to make sure they are strong enough

**Concrete** is commonly **used in foundations and floors.** Its strength is crucial.

Two tests are carried out to make sure the concrete is strong enough:

- Slump testing
- Compression testing

**Slump testing** – checks the ratio of water and cement in wet concrete.

**Compression testing** – checks that the hardened concrete is strong enough to withstand loads.

**Timber is used in** structures such as **building frames and roof trusses**, as well as in **doors and windows**

**The strength** of various types of timber **is tested**.

**Timber is then sorted into groups**. This process is called **stress grading** and **strength grading**.

When being specified, **the letter C (coniferous) means softwood** and **the letter D (deciduous) means hardwood**.

**External walls** - Mainly constructed as cavity walls using bricks and blocks.

They are constructed in two halves;

- a brick skin
- and a block skin

The gap between the two skins is called the cavity. This is filled with insulation.

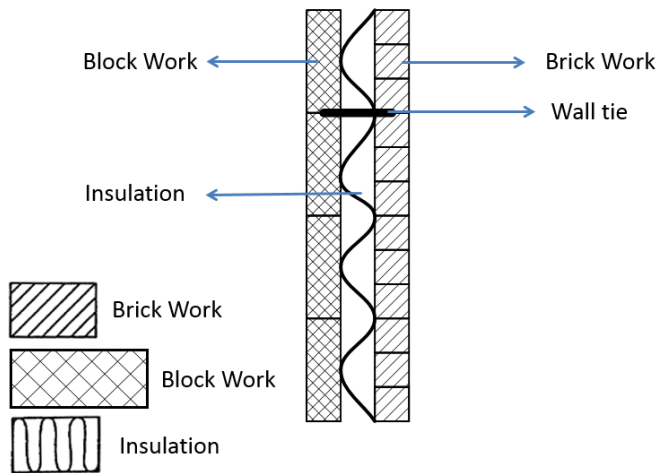
Below ground level the cavity is filled with concrete to make it stronger and more stable

A **wall tie** is used to connect the two halves of a cavity wall together. A wall tie keeps the wall stable and prevent movement

**Below is a cross section drawing of a cavity wall**.

You may be asked in the exam to draw this diagram. You must remember how to draw it and remember the different labels.

## Cavity Wall – Cross section drawing



### Sustainability

A sustainable building is designed and constructed to make as small an impact on the natural environment as possible.

#### Sustainability has four key purposes:

- Reduce building energy use
- Conserve finite resources – oil, coal and gas
- Reduce carbon emissions released into the atmosphere
- Reduce pollution and wastage

### Methods of sustainable construction

In order to construct a sustainable building, sustainability must be part of its design.

To achieve sustainability, the following things can be done:

- **Reuse Brownfield sites** instead of building on Greenfield sites. Brownfield sites are sites that have usually been built on before. Greenfield sites are natural land unspoilt by any construction work.

- **Position a building so that it gets the maximum amount of natural light.**

A building should be positioned so it is south facing. This can reduce the amount of electricity the building uses as the use of natural light can be maximised.

- **Reducing time and wastage when constructing** – reduce transport pollution by purchasing materials from local supplies, ordering the right amount of materials, **using prefabricated part / materials.**

**Prefabricated** is a term to describe parts of a building or materials that are made in a factory and brought to site for assembly only.

- **Recycle site waste** – separate it into different skips and reuse what you can.
- **Use recycled materials** in the construction of the building.  
Recycled materials use less energy to be produce and thus **have a lower embodied energy**
- **Use sustainable materials** from renewable sources in the construction of the building.

Using sustainable materials is an important part of construction today.

They ensure that we do not waste our natural resources.

Below is a list of sustainable materials along with their uses.

Sustainable material	Use
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<b>Hemp</b>	Hemp can be used as insulation.
<b>Lime</b>	Can be used as a replacement to cement when making mortar for bricklaying. Can also be uses as a render.
<b>Cedar</b>	A type of wood used for exterior cladding.
<b>Softwoods</b>	Can be used to construct timber frame buildings. Softwood trees can be regrown quickly in a sustainable way.
<b>Straw</b>	Straw bales can be used to build walls, even entire houses.
<b>Sheep's wool</b>	This can be used as insulation.
<b>Aluminium</b>	Can be used instead of PVC plastic to make guttering and down pipes.

Damp proof course (dpc) and damp proof membrane (dpm) are installed when a solid floor is constructed.

Damp proof course (dpc) is layed ontop of the brick and block work.

- Damp proof course stops moisture coming through the walls of the foundation
- Damp proof course overlaps as it is laid and prevents moisture passing through



Damp proof membrane (dpm) is laid underneath the concrete of the soild floor.

Damp proof membrane stops moisture coming through the floor of the foundation

- Damp proof membrane overlaps the damp proof course as it is laid and prevents moisture passing through

Sub-structure ground works involve all the construction work below ground level.

An important opporation at this stage is excavation. This means digging the ground so that foundations can be constructed.

Earthwork supports are used to support the sides of an excavation

There are different methods of earthwork support that can be installed depending on the needs of the site and the type of soil you are excavating.

These are:

- Steel trench sheets
- Aluminum walling
- Timbering
- Hydraulic trench support

There are a number of different hazards associated with sub-structure ground works.

These are:

- **Gas pipes** - it is very important that all plans and local maps are studied for the position of gas pipes. They should be avoided at all times.
- **The collapse of the sides of an excavation** - earthwork supports are put in place to prevent this.
- **Presence of ground water** – there is a potential risks are flooding or drowning.

To avoid this sump pumps need to be put into place to pump out existing water or drainage needs to be installed.

- **Confined spaces** - use the appropriate PPE and reduce the amount of work done in confined spaces.
- **Existing services such as gas mains, water pipes or electricity cables** - Potential hazards include, injury, flooding, death or power outages.

To avoid this locate all existing services before the work begins