



Rewarding Learning

General Certificate of Secondary Education
January 2011

Construction and the Built Environment

Assessment Unit 1

assessing

The Construction Industry for the 21st Century

[GCB11]

TUESDAY 11 JANUARY, AFTERNOON

**MARK
SCHEME**

Section A

AVAILABLE MARKS

1 (a) Label the cross section in Fig.1 below using the following terms

Dig up and remove ground floor and replace with new insulated solid concrete floor as specified.

Purlin

Sole plate of stud partition

Ceiling constructed from 12.5mm plasterboard

Wall plate

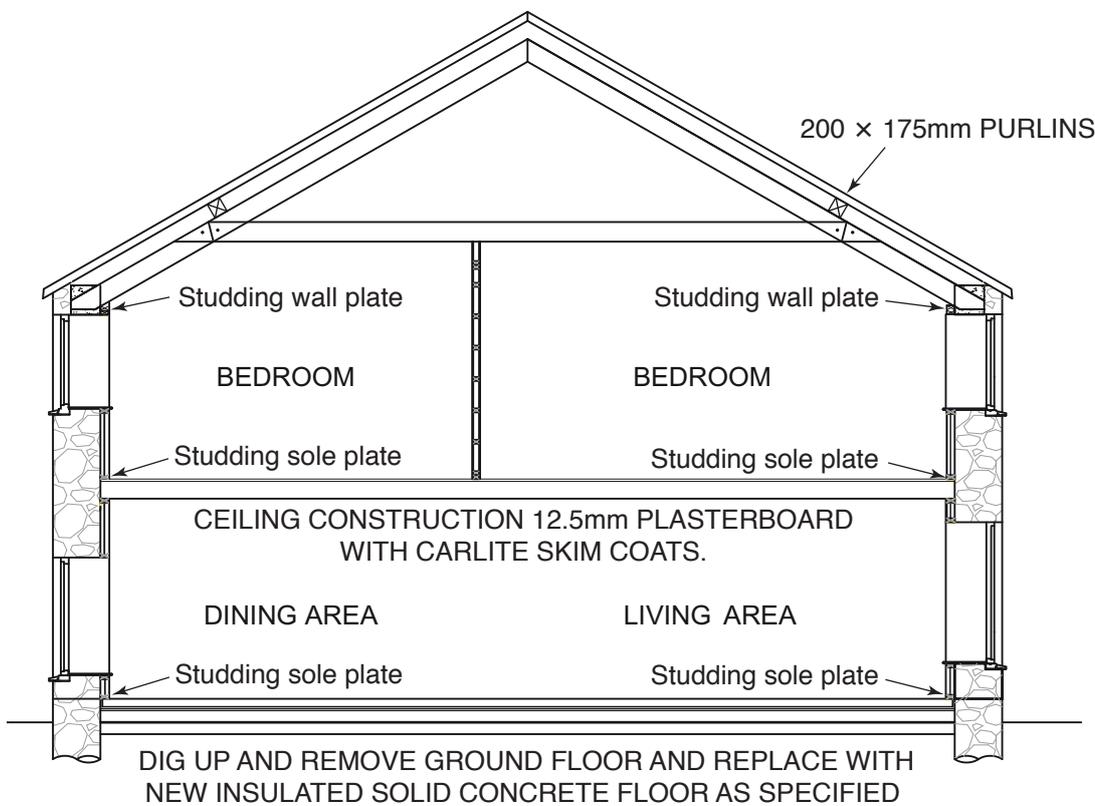


Fig. 1

[1] Per different response up to a maximum of [5]

[5]

(b) What do the following symbols indicate?

- | | | | |
|------|---|-----|--------------------|
| (SA) | Smoke Alarm with sounder or smoke alarm | [1] | AVAILABLE
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| (SG) | Safety glazing | [1] | |
| (HD) | Heat detector with sound or heat detector | [1] | |

(c) What is the width of the structural opening required for an internal door?

926mm wide structural opening [1]

(d) How thick is the insulation which is required for the external walls?

100mm thick [1]

(e) What is the cross sectional size of the timber studs required for the stud walls?

100mm × 38mm studding [1]

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2 Candidates should relate the following responses to the pre-release, including issues related to the barn conversion.

(a) Architect

Any **three** from the following or other appropriate response:

- Plan restoration of the barn
- Sketch proposals for the development
- Design internal layout
- Working drawings
- Making application for Planning and Building Control approval
- Supervise work on site

[1] per principle role up to a maximum of [3]

[3]

Any **three** from the following or other appropriate response:

(b) Joiner

Any **three** from the following or other appropriate response:

- Prepare a quotation for the cost of joinery work
- Repair roof structure
- Fix slated roof on barn
- Make and fit door frames
- Make stud partition and fit it as dry lining to stone wall
- Fix plasterboard to walls and ceilings
- Nail down timber floors
- Hang doors

[1] per activity role up to a maximum of [3]

[3]

(c) Plasterer

Any **three** from the following or other appropriate response:

- Plan plastering work including costs for barn conversion
- Fix plasterboard to walls and ceilings
- Bond and or skim plasterboard
- Scratch solid stone wall where necessary
- Floating coat to walls
- Skim walls and ceilings

[1] per activity role up to a maximum of [3]

[3]

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- 3 For each of the following answers the dimensions must be accurate and given in millimetres only to receive [2] marks.

If a dimension is provided within tolerance or with an incorrect unit then only [1] mark will be given.

- (a) The length and width of the lounge.

Length 6800mm Width 6000mm [4]

The length and width of the utility room

Length 3400 or 3250 Width 2950mm [4]

Tolerance on scaled dimension +/- 100mm

- (b) The overall length of the barn from the outside of the walls.

Length 17100mm [2]

Tolerance on scaled dimension +/- 100mm

- (c) The width and height of the dining area window at the rear of the house. Take this height at the highest point of the window.

Width 1900mm Height 1500mm [4]

Tolerance on scaled dimension +/- 100mm

- (d) The total floor area of the Entrance Hall including the area under the stairs in square metres.

Floor area 6100mm × 2850mm = 17.4 metres square [2]

Tolerance on calculated area +/- 500mm square

- (e) The floor to ceiling height of the rooms downstairs

Height 2550mm [2]

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4 (a) Name the type of building structure shown in Fig 2.

Steel framed structure [1]

Steel Portal framed structure or portal frame [2]

Maximum marks [2] [2]

(b) List three examples of the type of building occupancy this type of structure would be used for?

Any **three** from the following or other appropriate response.

Factory Farm Building

Warehouse Market

Shopping Centre

[1] Per building occupancy up to a maximum of [3] [3]

(c) Why does this type of structure make it particularly well suited to the types of building occupancies listed above.

Any **two** from the following or other appropriate response

Portal frame has a clear unobstructed floor area available.

With single storey buildings natural lighting is gained by placing clear sheets in roof layout.

Speed and ease of erection.

Building can be quickly closed in and made water tight.

[1] Per activity up to a maximum of [2] [2]

(d) List two disadvantages of using a framed structure like the one shown in Fig 2.

Any **two** from the following or other appropriate response.

Although steel is incombustible it has a poor resistance to fire as it bends easily when hot.

Subject to corrosion.

[1] Per activity up to a maximum of [2] [2]

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- (e) List four advantages of using a framed structure like the one shown in Fig 2.

Any **four** from the following or other appropriate response.

Speed and ease of erection.

Building can be quickly closed in and made water tight.

Framework prefabricated in a workshop and not affected by weather.

Site works such as drainage, roads etc can be carried out until framework is ready for erection.

No weather hold up during erecting the framework.
Connected together in factories by welding. Site connections should be bolted.

Gives a large floor space.

[1] Per activity up to a maximum of [4]

[4]

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- 5 Three different materials have been outlined below. Provide **one** example of each material and **two** examples of where these materials would be used in a domestic dwelling.

Hardwoods

- (a) Any **Hardwood** from the following list [1] and a further [2] for suitable uses of this type of timber.

Other appropriate answers will be accepted

- (1) Hardwood Ash,
 Oak
 Sycamore
 Beech
 Mahogany
 Teak
 Horse Chestnut
 Elm
 Lime or other appropriate answer.

(2 and 3) Any appropriate use in association with domestic construction such as the manufacture of doors, windows, furniture etc. [3]

- (b) Any **Softwood** from the following list [1] and a further [2] for suitable uses of this type of timber.

- (1) Softwood Spruce
 Larch
 Pine
 Douglas fir

(2 and 3) Any appropriate use in association with domestic construction such as roof members, floor joist, stair construction. [3]

- (c) Any type of paint from the following list [1] and a further [2] for suitable uses of this type of paint.

- (1) Paint type Oil based
 Water based
 Emulsion

Other appropriate answer will be accepted

(2 and 3) Any appropriate use in association with domestic construction such as painting walls with emulsion paint or painting windows with oil based paints. [3]

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Section B

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6 (a) List five types of renewable energy which could be used to heat the Barn conversion.

1. Wind
2. Solar
3. Geothermal
4. Biomass
5. Water turbine

[1] Per resource up to a maximum of [5]

(b) Demonstrate a knowledge and understanding of two of the above types of renewable energy and how they could be applied to the Barn conversion shown in the pre-release materials.

[4] for a response which shows an understanding of any two of the above.

[4] × 2 = [8]

Wind

Wind energy is generated by harnessing the power of wind using a turbine to generate electricity.

Solar

Energy from the Sun can be harnessed to generate Electricity or heat water.

Geothermal

Ground source heat pumps are one of the most common types of heat pumps. Typically a cold fluid at about 5 degrees Celsius is circulated around a network of plastic pipes buried in the ground. As the fluid passes through the pipe it absorbs heat energy from the surrounding earth. The fluid returns to the heat pump slightly warmer than it left. The heat pump upgrades the heat to a higher level of 40 to 50 degrees Celsius to provide heating in the home. This water can then be circulated around radiators, under floor heating pipes or provide domestic hot water.

Biomass

Biomass is the harvesting of young trees usually (willow) to provide fuel for a central heating burner. The willow is grown in a short crop rotation which is harvested every 2 to 3 years.

Water turbine

The stream adjacent to the barn is used to harness energy using a water turbine

[8]

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7 List four methods of construction, which could be used in the barn conversion, which will reduce the impact the construction process will have on the environment.

- (a) Recycling
Modern quarry practice
Reusing
Site waste management

[1] Per construction method up to a maximum of [4] [4]

- (b) Explain how and why both the client and contractor would want to reuse all of the existing materials from the site in the barn conversion where possible.

The following points should be considered in relation to reusing:

If materials are reused they do not have to be bought in thus reducing costs.

Eliminates land fill costs of site waste.

Reduces the carbon footprint of sourcing new materials.

Keeps building looking original.

(Or any other suitable suggestion)

Level 1 ([1]–[4])

Candidate identifies the reusing process using at least two of the above processes (or has included other appropriate responses). Their level of accuracy for spelling, punctuation and grammar is limited. They discuss the reusing process in a limited form and style of writing. Their discussion is not fully coherent or organized and there is little use of specialist terms.

Level 2 ([5]–[7])

Candidate identifies the reusing process using at least three of the above processes (or has included other appropriate responses). Their level of accuracy for spelling, punctuation and grammar is satisfactory. They discuss the reusing process using a satisfactory form and style of writing. Their discussion is coherent or organized in most cases they use a range of specialist terms.

Level 3 ([8]–[10])

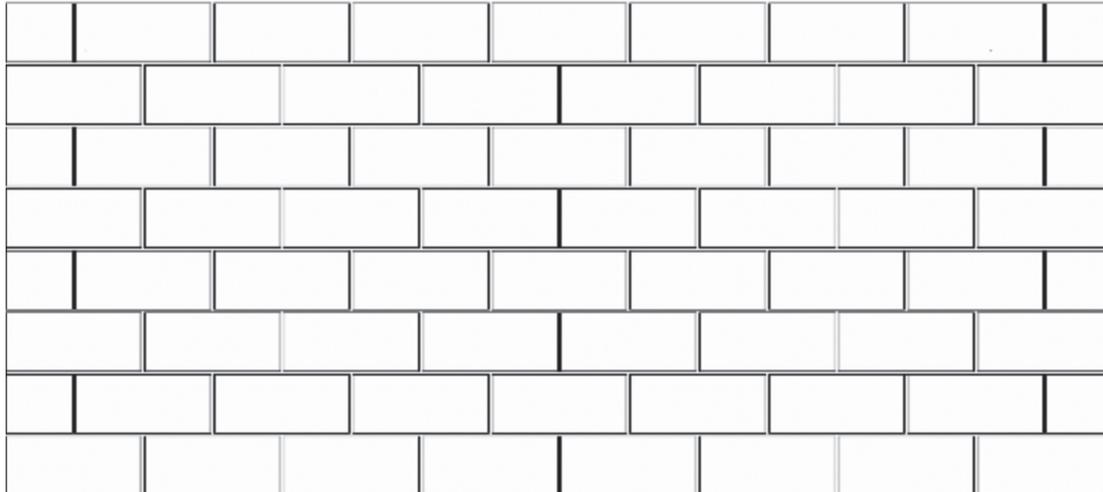
Candidate identifies the reusing process using at least four of the above processes (or has included other appropriate responses as well). Their level of accuracy for spelling, punctuation and grammar is excellent. They discuss the tender process using an excellent form and style of writing. Their discussion is coherent and very well organized and they use a wide range of specialist terms.

When a response is not worthy of credit a [0] mark should be awarded. (AO1 [5], AO2 [5]) [10]

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- 8 (a) Drawing should be completed as shown with no annotations.
Allowance will be made for regional variations.



- [1] Mark for completing three horizontal bed joints correctly
 [1] Further mark for completing all six horizontal bed joints correctly
 [1] Mark for the correct positioning of vertical joint in three courses
 [1] Further mark for the correct positioning of vertical joint in all six courses
 [2] Marks for a well presented drawing

[1] or [2] for each correctly shown up to a maximum of [6] [6]

- (b) What is the typical horizontal spacing of wall ties?

900mm horizontal spacing [2]

- (c) What is the typical vertical spacing of wall ties?

450mm vertical spacing [2]

- (d) What is the vertical spacing of wall ties at window and door Jambs?

300mm vertical spacing [2]

- (e) Name one material from which wall ties would commonly be made?

Stainless steel [1]

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- 9 The pitched roof of the barn shown in the pre-release materials are constructed using solid oak timbers and natural slate.

The way in which roof structures and their coverings has changed over the last two centuries has changed considerably in the United Kingdom. Using notes and annotated sketches show some of the stages in this development.

The following statement may help you with your answer.

Thatch roofing with natural timbers.

Traditional cut roof structure.

Trussed rafters.

Composite sheet coverings.

Thatch roofing with natural timbers

- Thatched roofs were the traditional roof coverings for much of Ireland. The timbers which supported the thatch were initially straight branches which had been cut from the local area. Gradually the rough timbers gave way to sawn timbers.
- The thatch in Ireland was often reeds which were found in many parts of the country.

Traditional cut roof structure

- A traditional cut roof was the first development away from a thatched roof.
- This type of roof structure is still widely used for individual dwellings or for roofs of a complicated shape.
- The timbers rafters are cut individually and nailed into position.
- A purlin is often placed half way up the length of the rafter to help support the roof and allow smaller sections of timber to be used.

Trussed rafters

A high percentage of roofs designed now are constructed using prefabricated trussed rafters. They have been developed since the mid 1960's.

Small and lighter sections of timber can be used with this type of roof construction. This is possible by the introduction of intermediate timber members.

Composite sheet coverings

This type of covering is not used all that often in domestic construction. This type of covering is mild steel sheeting covered with plastic or paint.

Level 1 ([1]–[8])

Candidates compare two methods of roof construction covering few of the attributes listed above (or have included other appropriate responses). Their level of accuracy for spelling, punctuation and grammar is limited. They compare two methods of roof construction using a limited form and style of writing. Their comparison is not fully coherent or organized and there is little use of specialist terms.

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Level 2 ([9]–[14])

Candidates compare three methods of roof construction covering some of the attributes listed above (or have included other appropriate responses). Their level of accuracy for spelling, punctuation and grammar is satisfactory. They compare three methods of construction using a satisfactory form and style of writing. Their comparison is coherent or organized in most cases they use a range of specialist terms.

Level 3 ([15]–[20])

Candidates compare four or more methods of roof construction covering the majority of the attributes listed above (or have included other appropriate responses as well). Their level of accuracy for spelling, punctuation and grammar is excellent. They compare four methods of construction using an excellent form and style of writing. Their comparison is coherent and very well organized and they use a wide range of specialist terms.

When a response is not worthy of credit a [0] mark should be awarded.

(AO3 [20])

[20]

20

Total

120

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