SCOTTISH
QUALIFICATIONS
AUTHORITY

2006 Building & Architectural Technology

Higher

Finalised Marking Instructions

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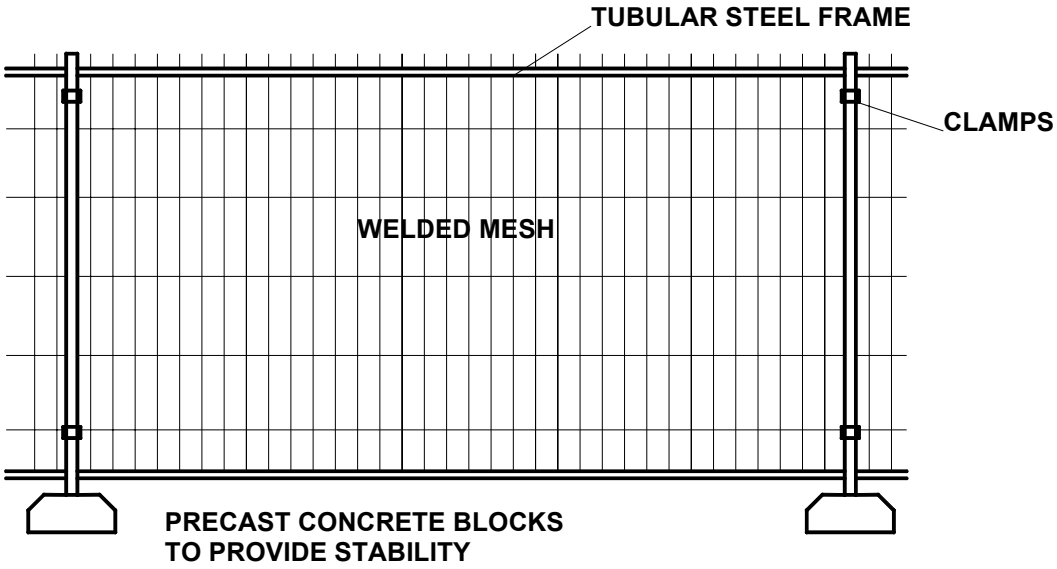
SECTION A

Attempt all the questions in this Section (total 40 marks)

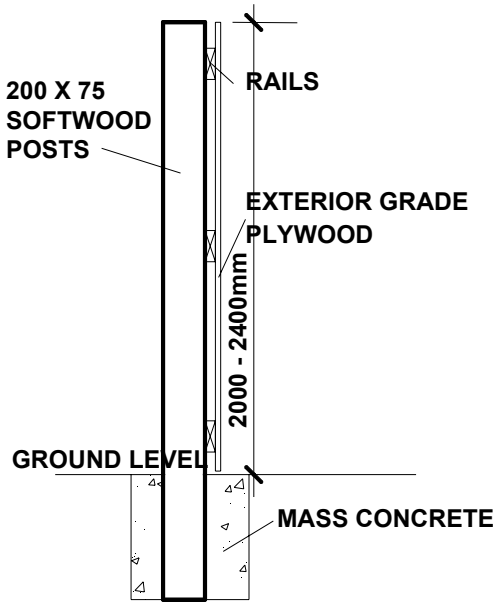
1. (*a*) *State **four** temporary services which should be connected to a site at an early stage in the construction process.* 2

Electricity
Drainage
Water
Telephone

(*b*) *Briefly describe, with the aid of annotated sketches, **two** common methods of preventing the public from entering a construction site.* 4



HERAS FENCING
Propriety wire fencing manufactured in sections approx. 3.5m long. The fence has a tubular frame with welded mesh insert. Vertical tubes are push fitted into concrete blocks which provide stability.



TIMBER HOARDING
Constructed from posts at 1.5m centres set in concrete. Timber rails between the posts provide a fixing for the plywood finish on the external face.

(*c*) *State **two** welfare facilities which should be provided on larger building sites.* 2

Two from the following or reasonable alternatives:
Sanitary and washing facilities
Canteen/rest facilities
Facilities to store and change clothing
First aid facilities

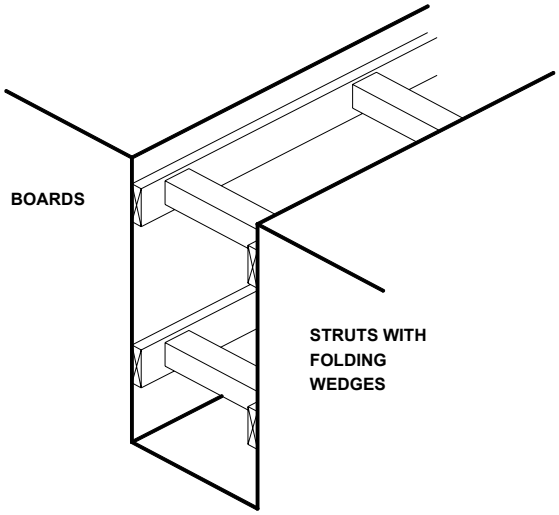
(8)

2 (*a*) *State **three** characteristics of a site which could be observed from a desk study.* 3

Three from the following or reasonable alternatives:

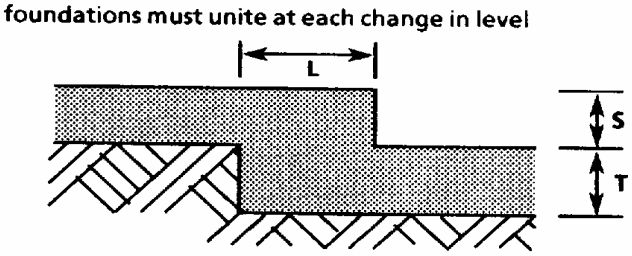
- Transport access
- Position of surrounding services
- Adjoining properties
- Position of OS Bench Marks
- Possible problems with underground workings, streams etc

(*b*) *Briefly describe, with the aid of an annotated sketch, a method of supporting the sides of a trench excavation which is over 2m deep.* 3



TRENCH SUPPORT
Alternative proprietary systems acceptable

(*c*) *Strip foundations are to be constructed on a sloping site.*
*Describe, with the aid of an annotated sketch, **two** dimensions which current standards require for the steps in the foundation.* 2



minimum overlap L = twice height of step, or thickness of foundation or 300mm, whichever is the greatest

S must **not** be greater than T in a plain concrete foundation, otherwise reinforcement is required.

(8)

3 (*a*) *Briefly describe the sequence of operations in erecting a timber frame wall panel on a prepared base.* 2

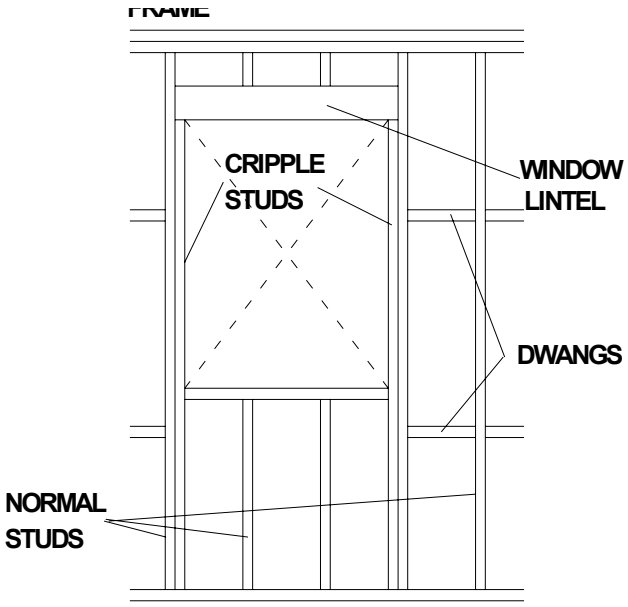
- The position of the panel should be marked on the base
- Fixings for the panel, bolts or straps, should be fixed to the base
- The panel should be brought to the base position – safe handling
- The panel should be located relative to the fixings
- The panel should be raised to the vertical and in position
- Checks should be made on position and verticality
- Temporary supports should be fixed
- Final fixing should be done when all panels are correctly positioned

(*b*) *State **four** reasons why timber frame construction has become more common than traditional masonry construction for small domestic buildings.* 4

- Site erection time greatly reduced
- Factory control of the structure
- Thermal insulation standards are more easily achieved
- Alteration to the building are simpler
- Dry construction

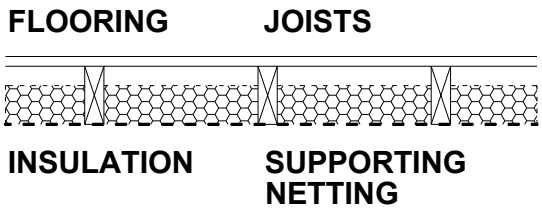
(*c*) *Briefly describe, with the aid of an annotated sketch, the function of a cripple stud in timber frame construction.* 2

Cripple studs provide extra strength and rigidity at openings in timber frame construction. This is especially required in wide openings.

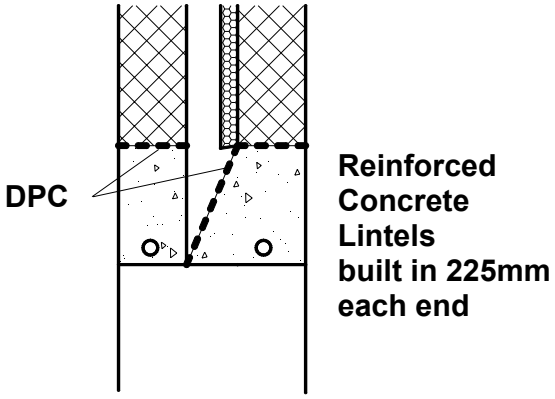


(8)

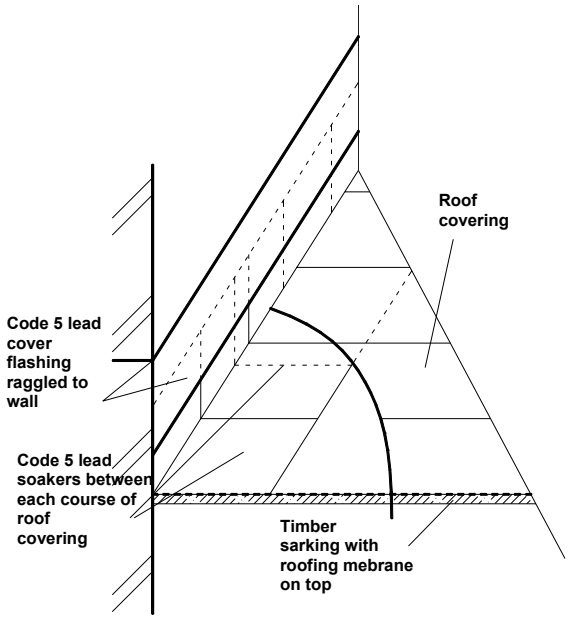
4 (*a*) *Briefly describe, with the aid of an annotated sketch, how thermal insulation might be included in the construction of a timber suspended ground floor.* 2



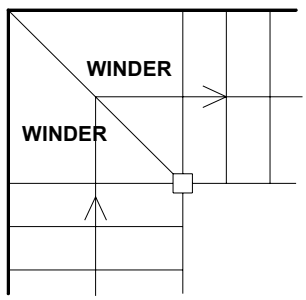
(*b*) *Briefly describe, with the aid of an annotated sketch, how the masonry above an opening in a traditional cavity wall may be supported.* 2



(*c*) *Briefly describe, with the aid of an annotated sketch, how water is prevented from entering a building where a tile roof meets an abutment.* 2



(d) *Briefly explain, with the aid of an annotated sketch, the term winder in stair construction.* 2



Winders are used in stairs to reduce the space taken up by the stair. The space normally taken up by a landing can be used and the stair rises by the number of winders used.

(8)

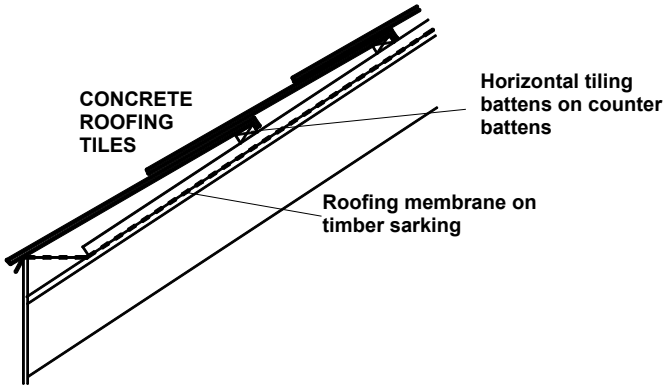
5 (*a*) *State **four** factors which should be considered when choosing floor finishes for a building.* 2

Four from the following or reasonable alternatives:

- Hard wearing
- Not noisy
- Soft for comfort
- Easy to maintain
- Reasonable price
- Attractive

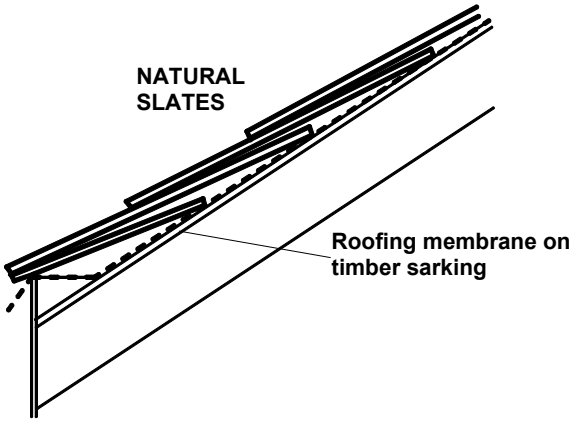
(*b*) *Explain, with the aid of annotated sketches, how the following roofing materials would be applied and fixed to the structure:*

- *concrete interlocking tiles*



There must be sufficient overlap on each course of tiles.

- *natural Welsh slates*. 6



There should be a double overlap on each course of slates.

(8)

[END OF SECTION A]

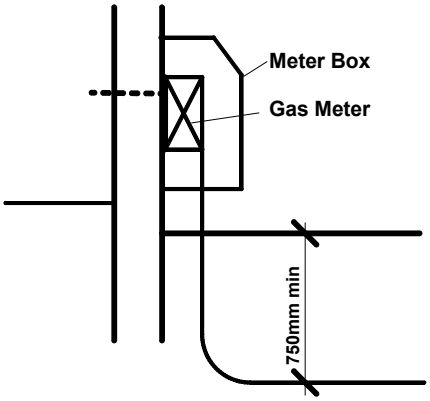
SECTION B

Attempt any THREE questions in this Section (total 60 marks)

6 (a) *Describe how bagged cement should be stored on site.* 2

Bagged cement must be stored in a dry, weatherproof enclosed hut with a dry floor. Best on a timber platform away from the walls and covered with polythene. Do not stack too high and use in rotation – first in first out.

(b) *Describe, with the aid of an annotated sketch, how a domestic gas service should be brought into the house.* 2



(c) *List the sequence of operations from the site being made secure to the point where the first walls are built.* 4

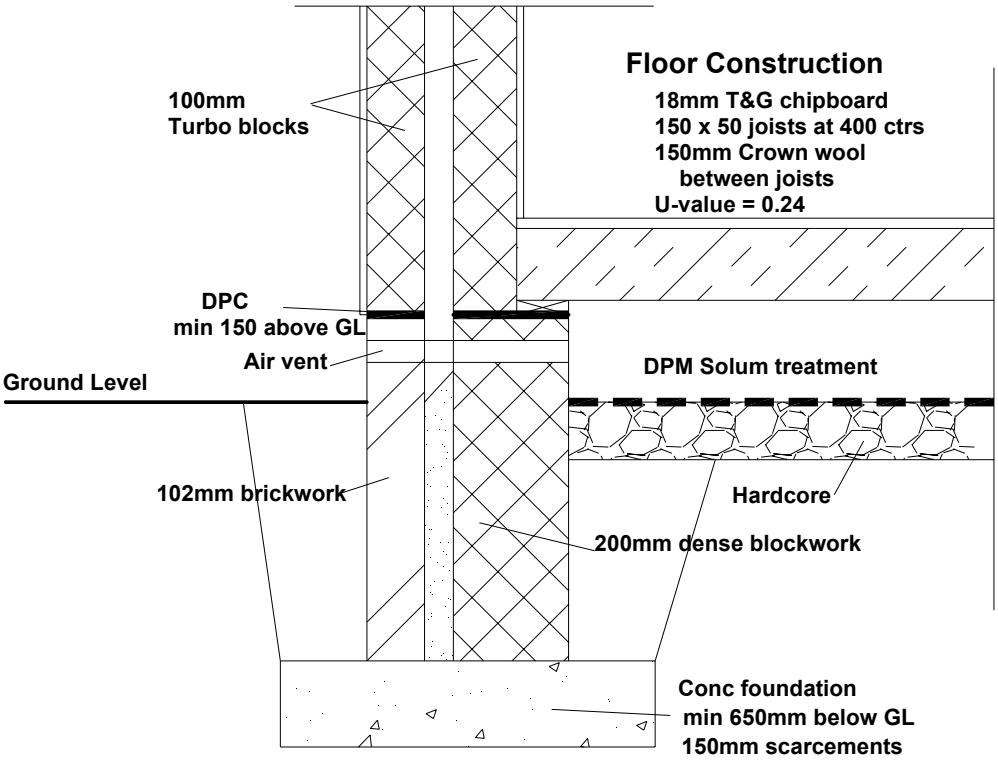
- Construct temporary roads
- Install temporary services
- Set up site accommodation
- Excavate to reduced levels
- Mark out positions of foundations and walls with profile boards
- Excavate foundations
- Pour foundations
- Mark out wall positions using profiles

(d) *Explain two reasons why deep strip (trench fill) foundations might be used in preference to strip foundations.* 4

Working in strip foundations can be difficult if at depth, this can result in extra time being required. If the trench is filled to a workable depth then the cost of concrete can be offset by the speed of building.

(e) *Sketch a vertical cross-section through a suspended timber ground floor where it meets a traditional masonry cavity wall, showing details of:* 8

- *thermal insulation*
- *solum construction*
- *damp proofing*
- *joist support.*



(20)

7 (a) *Current Building Regulations have lowered the allowable U-values for walls in domestic buildings.*

(i) *Explain how this has affected forms of domestic wall construction.* 3

Lower U-values has meant that manufacturers have had to develop new techniques for domestic wall construction. Timber frame construction with higher insulating materials have been used as well as increasing the thickness of the walls and insulation. Masonry construction has been developed with lighter-weight blocks being used and thin bed jointing.

(ii) *Describe, with the aid of an annotated sketch,* ***one*** *method of achieving this U-value.* 5

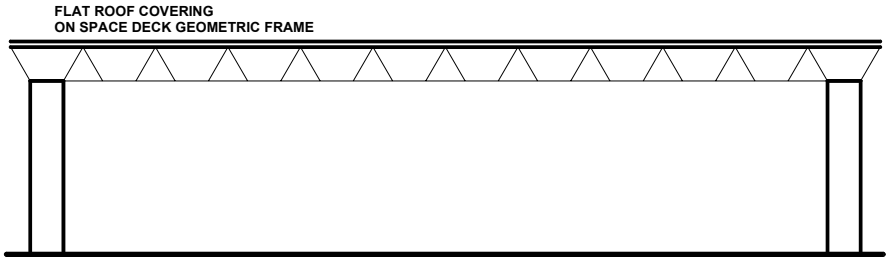
Sketch of either turbo block masonry construction or suitable timber frame with 150mm min studs and insulation.

(b) *A large sports hall is at the design stage.*

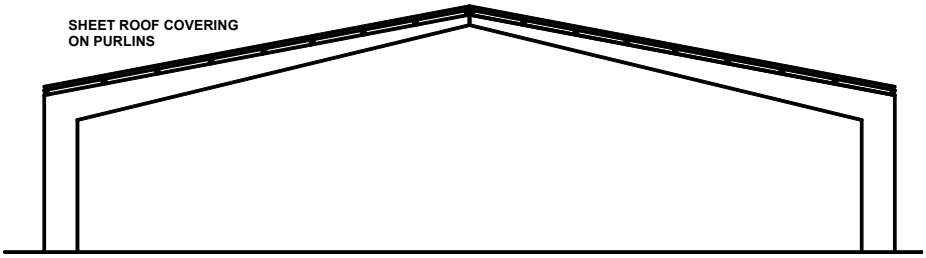
(i) *Briefly describe* ***four*** *design factors to be considered when selecting a form of roof structure.* 4

- Appearance
- Cost
- Clear span
- Maintenance

(ii) *Illustrate, with the aid of annotated sketches,* ***two*** *solutions for the roof.* 4



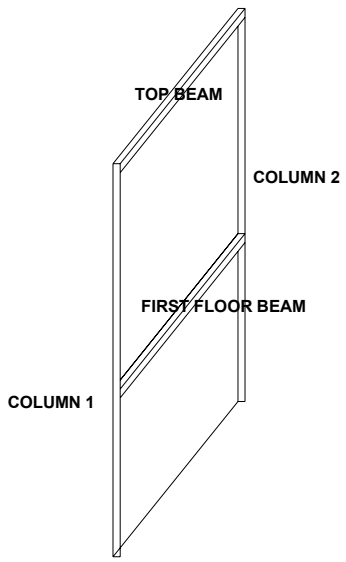
SPACE DECK CONSTRUCTION



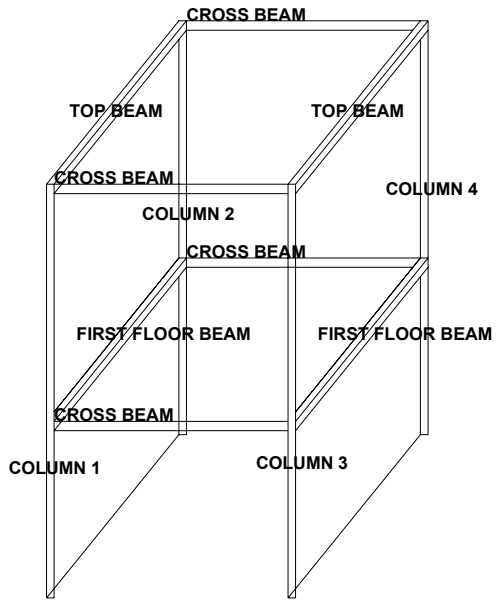
PORTAL FRAME CONSTRUCTION

(c) *Describe, with the aid of annotated sketches, the erection of a two-storey steel skeleton frame.* 4

- Mark out the position of the column bases
- Excavate and pour the bases – insert holding down bolts
- Erect one column on its base
- Plumb the column and hold with temporary braces
- Do the same with the next column
- Fix first floor beams and top beams checking levels
- Move to the next bay on the grid and erect the columns which make up a bay
- Fix beams at first floor and top to complete the bay
- Check all levels and plumb
- Continue with the subsequent bays



First Stage



Subsequent Stages

(20)

8 (a) *Describe, with the aid of an annotated sketch, how the current Building Regulations intend to limit the spread of flame and smoke in two-storey timber frame domestic construction. Show all relevant dimensions .* 6

A Cavity Barrier is a device placed within the external cavity between the timber frame and a brick or block veneer. It limits the area of the cavity through which flame and smoke may spread.

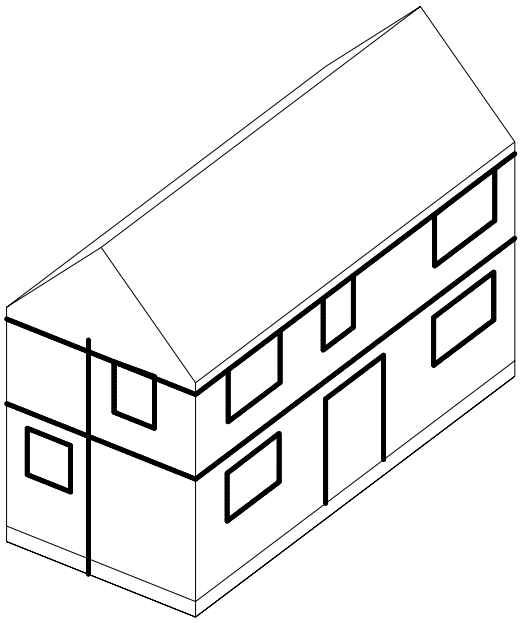
Materials for cavity barriers can be:

- Plasterboard at least 12.5mm thick
- Sheet steel at least 3mm thick
- Timber at least 38mm thick
- Wire reinforced mineral wool blanket at least 50mm thick
- Cement mortar, plaster or other non-combustible material at least 25mm thick
- Any other construction giving at least half an hour fire resistance

A Fire Stop is a non-combustible material provided to seal any imperfections of fit between building elements or where openings are made through structural elements for services.

Materials for fire stops can be:

- Cement mortar
- Gypsum based plaster
- Cement or gypsum based vermiculite/penlite mixes
- Glass, crushed rock, blast furnace slag or ceramic based products
- Intumescent mastics
- Any other non-combustible material provided it is suited to the position in which it is to be fixed.

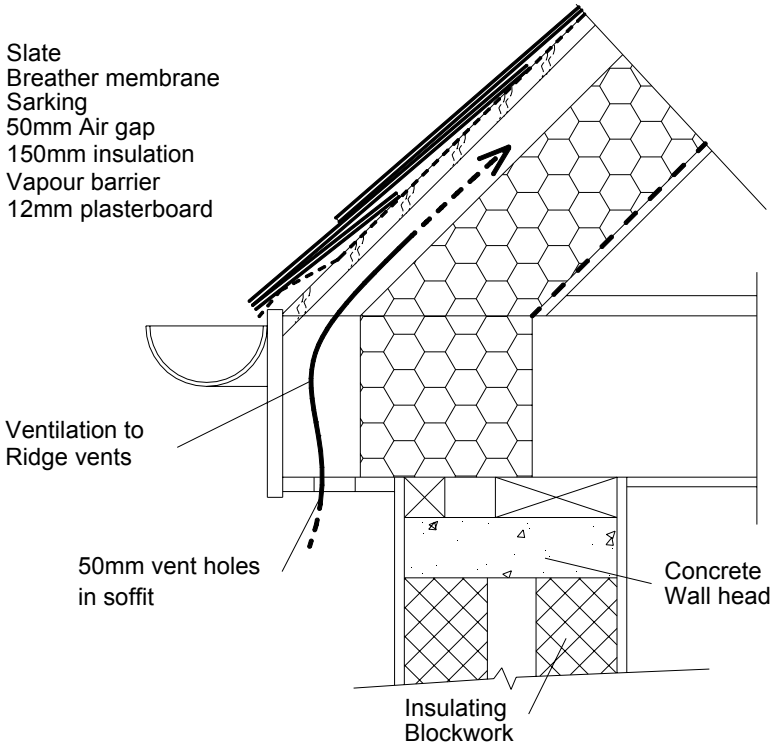


Cavity barriers are shown round all openings, at wall head and floor level. Vertical barriers should be at not more than 8m spacing.

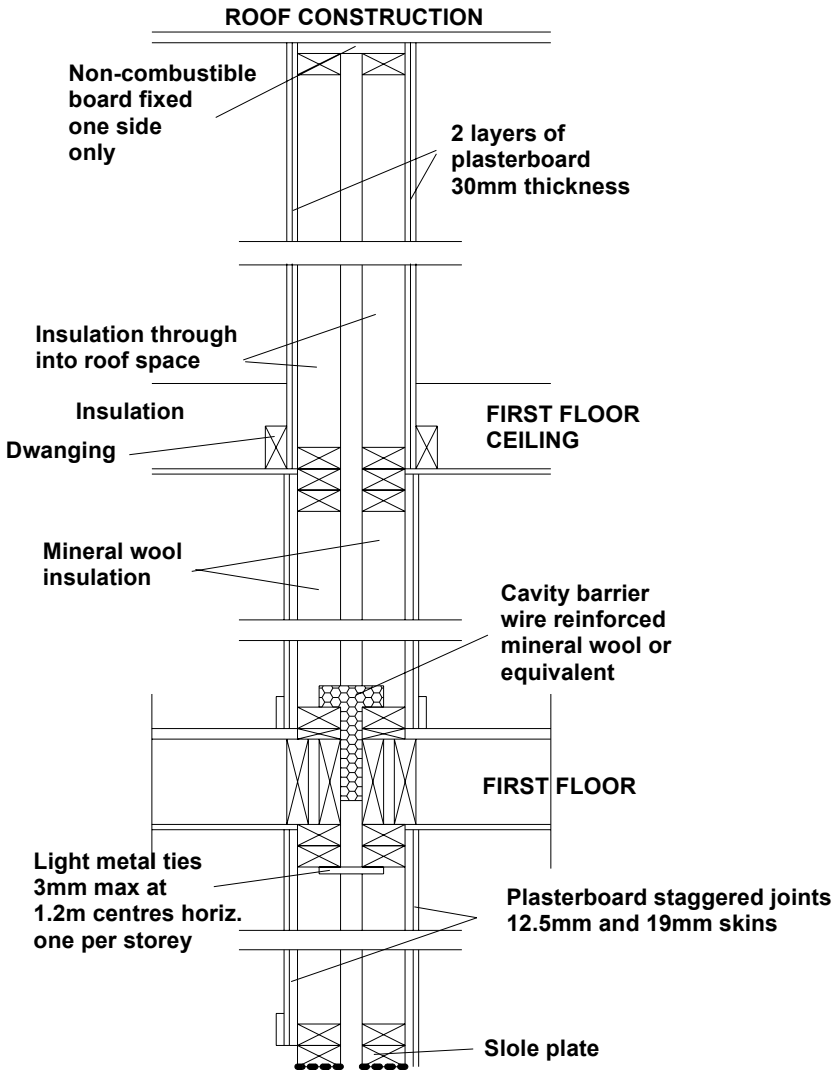
(b) *Describe, with the aid of an annotated sketch, the junction at the head of an external timber framed wall and a slated roof in traditional Scottish construction.*

The eaves overhang should be approximately 75mm and there is a requirement for living space in the roof.

Clearly show all ventilation requirements and thermal insulation. 8



(c) *Describe, with the aid of an annotated sketch, the construction of a timber framed party wall between semi-detached houses.* 6



(20)

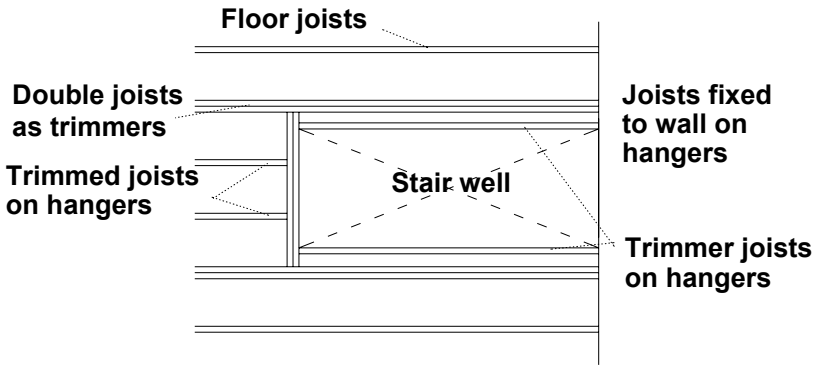
9 (a) *Private stairs have certain design requirements in current Building Regulations.*

State the requirements for:

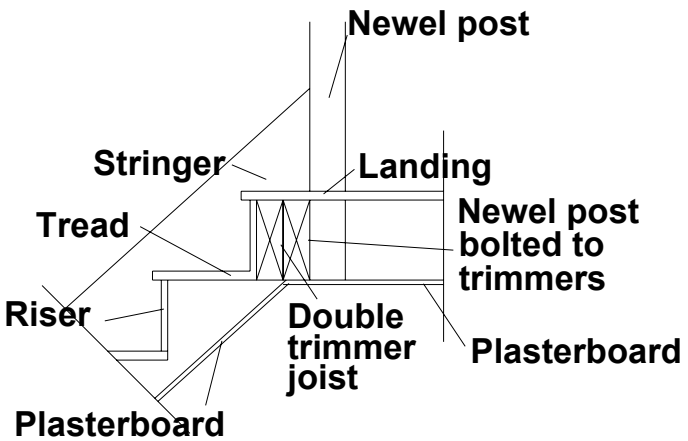
- *pitch of the stair* Max 42^0
- *length of going* 225mm Min
- *stair width when serving more than one room* 900mm between handrails and obstructions
- *height of handrail.* Between 840 and 1000mm 4

(b) *A stair is to be incorporated into the middle of a joisted upper floor. Describe, with the aid of annotated sketches :*

(i) *how a sufficiently-sized opening may be formed in the floor to accommodate the stair* 4

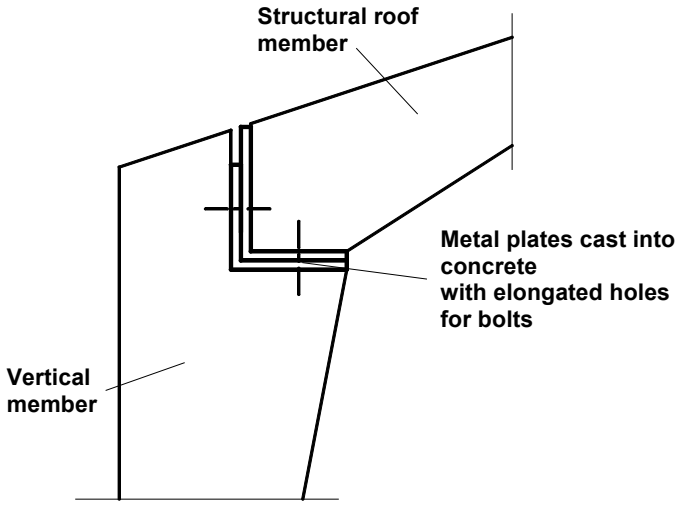


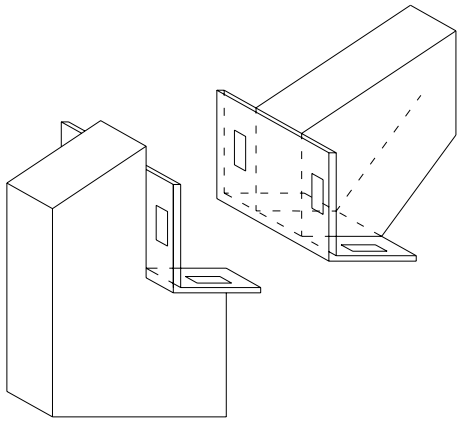
(ii) *how the stair meets the upper landing showing all the relevant parts.* 4



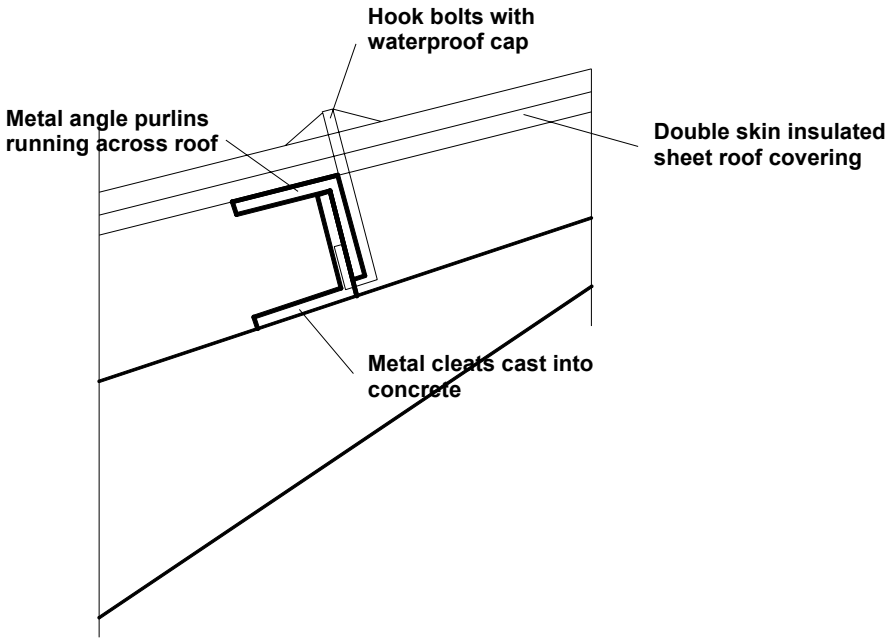
(c) *A pre-cast concrete portal frame is to be used in the construction of a workshop building.*

(i) *Describe, with the aid of an annotated sketch, how the structural roof members may be joined to the vertical members.* 4





(ii) *Describe, with the aid of an annotated sketch, a roof covering system for this building.* 4



(20)

10 (a) *Internal finishes have to be chosen for a proposed veterinary surgery.*

Select suitable wall and floor finishes for the following locations, giving reasons for your choice.

(i) *The reception area.* 4

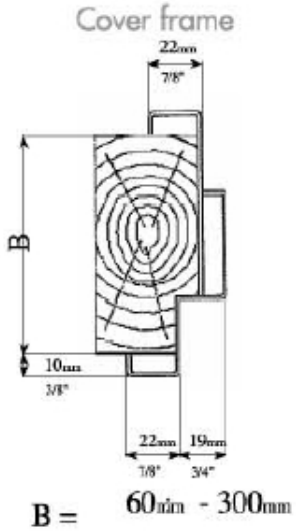
Floors contract carpeting with stain protection – hardwearing, attractive, warm, easy maintenance.
Walls plaster with vinyl wall paper – attractive and easily maintained.

(ii) *The operating room.* 4

Floors ceramic tiles with medically approved grout – hard wearing, easily maintained, attractive.
Walls ceramic wall tiles with medically approved grout – easily maintained, attractive.

(b) *Describe, with the aid of an annotated sketch, a suitable door and frame construction, including ironmongery, which would provide a secure entrance to a house.* 6

A High Security Steel Door could be made of two 1.25mm thick galvanised steel casings. Vertical steel bars are placed between the casings and welded at over 200 different points reinforcing the door leaf. The number of vertical steel bars depends on the leaf width.
The space between the casings and crossbars can be filled with polystyrene foam (with a density of 13kg/m3) to provide thermal and acoustic insulation.
The door leaf is normally 50mm thick.
Provided with a 4-way door lock with four (4) 10mm front bolts, and a spring-loaded latch.
The lock also activates upper and rear 13mm bolts and a lower 13mm bolt mechanism.



FRAME DETAIL

(c) *An external render with a dry dash finish is to be applied to a background of concrete blocks in a moderately exposed location.*

(i) *Prepare a list of suitable materials for the two-coat render.* 4

First coat of sand and cement mix approx. 8mm thick.
Final coat of white cement and clean white sand.
White spar chippings.
Clean water.
Plasticiser admixture.

(ii) *State the mix proportions to be used for this situation.* 2

Mix proportions should be 1 part cement to 5 or 6 parts sand.

(20)

[END OF MARKING INSTRUCTIONS]