AN ROINN OIDEACHAIS AGUS EOLAÍOCHTA | DEPARTMENT OF EDUCATION AND SCIENCE

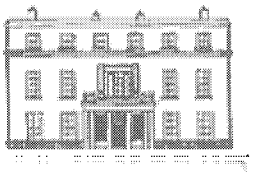
Scéimeanna Marcála — *Scrúduithe Ardteistiméireachta, 2001*

Staidéar Foirgníochta — *Ardleibhéal*

Marking Scheme — *Leaving Certificate Examination, 2001*

Construction Studies — *Higher Level*

An Roinn Oideachais & Eolaíochta
DEPARTMENT OF EDUCATION & SCIENCE



SCRÚDUITHE ARDTEISTIMÉIREACHTA

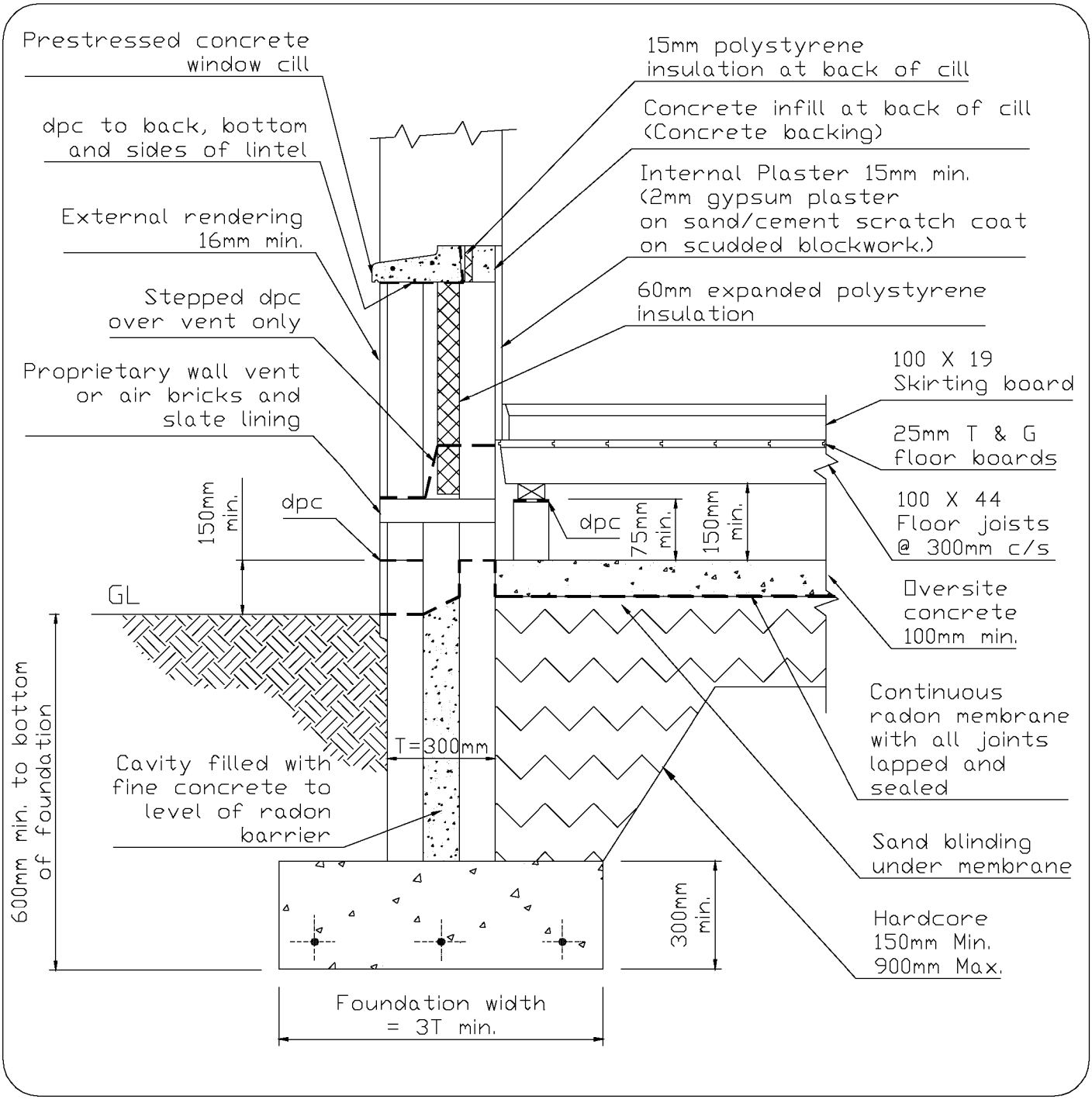
LEAVING CERTIFICATE

2001

STAIDÉAR FOIRGNÍOCHTA - ARDLEIBHÉAL

CONSTRUCTION STUDIES - HIGHER LEVEL

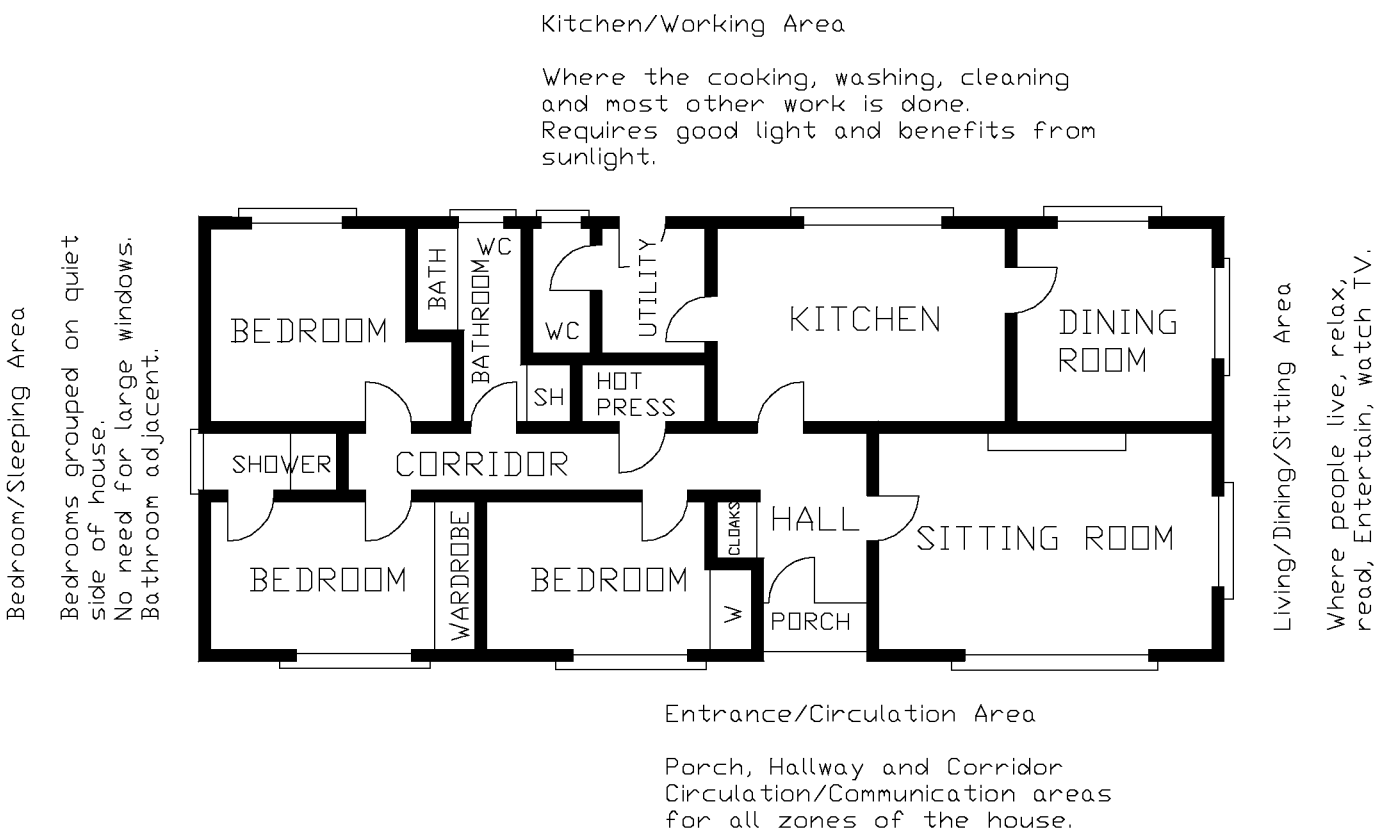
CEIST 1


Prestressed concrete window cill
dpc to back, bottom and sides of lintel
External rendering 16mm min.
Stepped dpc over vent only
Proprietary wall vent or air bricks and slate lining
150mm min.
dpc
GL
600mm min. to bottom of foundation
Cavity filled with fine concrete to level of radon barrier
T=300mm
Foundation width = 3T min.
300mm min.
15mm polystyrene insulation at back of cill
Concrete infill at back of cill (Concrete backing)
Internal Plaster 15mm min. (2mm gypsum plaster on sand/cement scratch coat on scudded blockwork.)
60mm expanded polystyrene insulation
dpc
75mm min.
150mm min.
100 X 19 Skirting board
25mm T & G floor boards
100 X 44 Floor joists @ 300mm c/s
Oversite concrete 100mm min.
Continuous radon membrane with all joints lapped and sealed
Sand blinding under membrane
Hardcore 150mm Min. 900mm Max.

CEIST 1

PERFORMANCE CRITERIA	MAXIMUM MARK
Reinforced concrete strip foundation correctly shown	5
Correct depth of trench correctly shown (graphically or otherwise)	5
Cavity wall c/w cavity fill correctly shown	5
Cavity insulation correctly shown	5
DPC in cavity wall correctly shown	5
Air vent c/w stepped DPC over correctly shown	5
Concrete cill c/w DPC correctly shown	5
Insulation and backing behind cill correctly shown	5
External rendering and internal plastering to wall correctly shown	5
Hardcore correctly shown	5
Site concrete correctly shown	5
Tassel wall correctly shown	5
Wallplate c/w DPC under correctly shown	5
Floor joists correctly shown	5
Flooring correctly shown	5
Skirting board correctly shown	5
TOTAL (maximum of 12x5, 4 marks for drawing + 1 for annotation in each case)	60

CEIST 2
(a)



(b)

- The orientation of the house in relation to the North-South axis has a big bearing on the layout and positioning of the different areas in the plan of the dwelling. The sun rises in the east in the morning, moves around south and sets in the west. It is very advantageous to have the sun shining in on the living working zones of the house.
- The bedrooms, being occupied mainly during the night, are best suited to the north side of the house, from where no sunlight comes.
- The kitchen will benefit from the incoming sun and heat, if it is facing south, particularly during the winter-time.
- The dining and sitting rooms will also get heat and light in the evening sun.
- The kitchen-utility, are kept together as they are the working areas of the house. Adjacent to them is the dining area or room. Close by there is the sitting room as this is the area to relax, read watch TV.
- The kitchen, dining, sitting or living rooms are grouped together. They are the action / living areas and occupied during the day mostly.
- The bedrooms are grouped together as they are on the quiet side of the house.
- The bathroom is usually in between the sleeping area and the living / working area, so they are used from either and both areas.
- The utility room and rear door, mean goods and household necessities can be taken in to the kitchen and utility room easily.
- Heating can be provided to the different zones with greater flexibility and more economically when properly planned.

CEIST 2

PERFORMANCE CRITERIA	MAXIMUM MARK
(a)	
Neat annotated sketch showing given areas:	
Entrance (**3marks** for sketching, **2 marks** for positioning doors and windows)	5
Living area (**3marks** for sketching, **2 marks** for positioning doors and windows)	5
Kitchen and dining room (**3marks** for sketching, **2 marks** for positioning doors and windows)	5
Bedrooms (**3marks** for sketching, **2 marks** for positioning doors and windows)	5
Bathroom (**3marks** for sketching, **2 marks** for positioning doors and windows)	5
Other areas (**3marks** for sketching, **2 marks** for positioning doors and windows)	5
(b)	
(Explain in detail **6 design considerations,** 6 x **5 marks** each)	
Design Consideration, No. 1	**5**
Design Consideration, No. 2	**5**
Design Consideration, No. 3	**5**
Design Consideration, No. 4	**5**
Design Consideration, No. 5	**5**
Design Consideration, No. 6	**5**
TOTAL	**60**

CEIST 3

(i) Interstitial condensation

- Interstitial condensation occurs within the construction or fabric of a building
- Most building materials are to some extent permeable to water vapour at the dew point temperature, condensation will begin to occur inside the structure.
- Interstitial condensation can damage important structural materials such as structural steelwork and can make insulation materials less effective.

(ii) Dew Point

- The Dew Point is the temperature at which a fixed sample of air becomes saturated
- If moist air is cooled the at a certain temperature the air becomes saturated with water vapour
- When this saturated air comes in contact with a surface that is at or below this temperature then a thin film of liquid will form. This effect is known as dew or condensation.
- Unit °c or K.

(iii) Relative Humidity

- The relative humidity (RH) of a sample of air compares the actual amount of moisture in the sir with the maximum amount of moisture the sir can contain at that temperature.

The correct definition of Relative Humidity is:

$$\text{Relative Humidity} = \frac{\text{Vapour pressure of sample}}{\text{S.V.P. of sample at same temperature}} \times 100$$

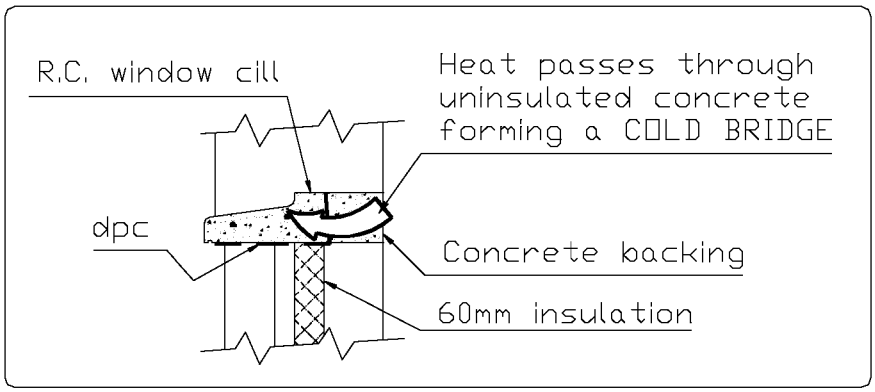
- Unit: per cent R.H. at a specified temperature. It is also common practice to describe humidity in terms of percentage saturation.

(iv) Cavity Insulation

- In order to maintain a constant temperature within a building it is necessary to restrict heat loss, keeping heat inside a building for as long as possible to conserve energy and reduces heating costs.
- Aerated lightweight concrete, aeroboard, expanded polystyrene, fibreglass may be used in the cavity to prevent heat loss
- Loose fill materials, expanded polystyrene granules, reflective materials, e.g. aluminium foil may also be used in some situations

(v) Cold Bridge

- Where materials of high thermal conductivity pass completely through a wall, floor or roof without insulation.
- Condensation and mould growth may occur.



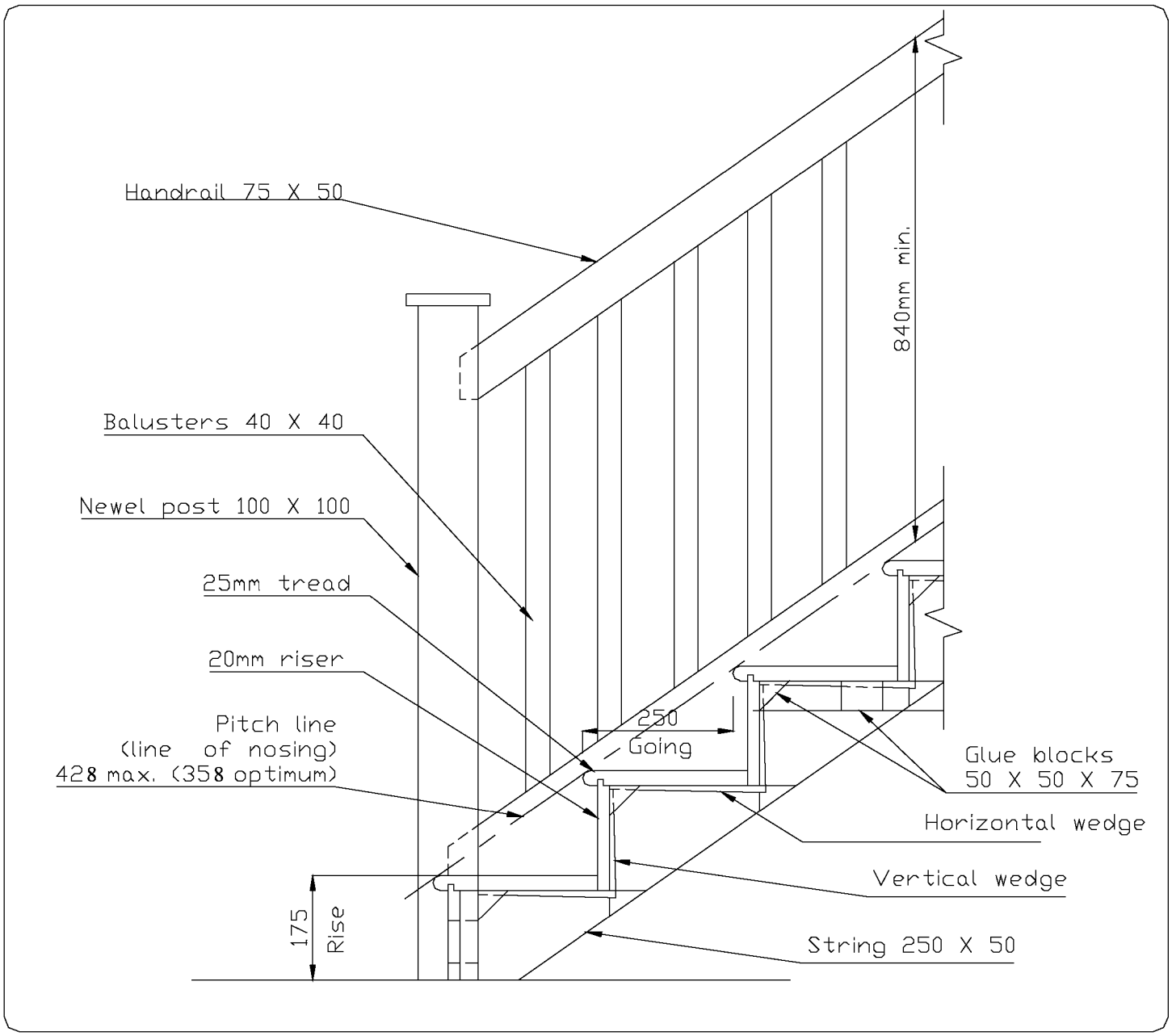
(vi) Vapour Barrier

- A layer of building material which has a high resistance to the passage of water vapour.
- Needs to be installed when there is danger of interstitial condensation.
- Must block water vapour before it meets an environment below the dew point temperature.
- Must be installed on warm side of insulation layer.
- Examples: foils, liquid films, bituminous solutions, rubberised or siliconised paints, gloss paints.

CEIST 3

PERFORMANCE CRITERIA	MAXIMUM MARK
6 explanations, **10 marks each** (notes and/or sketches)	
Explanation No. 1	**10**
Explanation No.2	**10**
Explanation No.3	**10**
Explanation No.4	**10**
Explanation No.5	**10**
Explanation No. 6	**10**
TOTAL	**60**

CEIST 4
(a)


Handrail 75 X 50
840mm min.
Balusters 40 X 40
Newel post 100 X 100
25mm tread
20mm riser
Pitch line
(line of nosing)
428 max. (358 optimum)
250
Going
Glue blocks
50 X 50 X 75
Horizontal wedge
Vertical wedge
String 250 X 50
175
Rise

(b) Design Considerations to Ensure Safety:

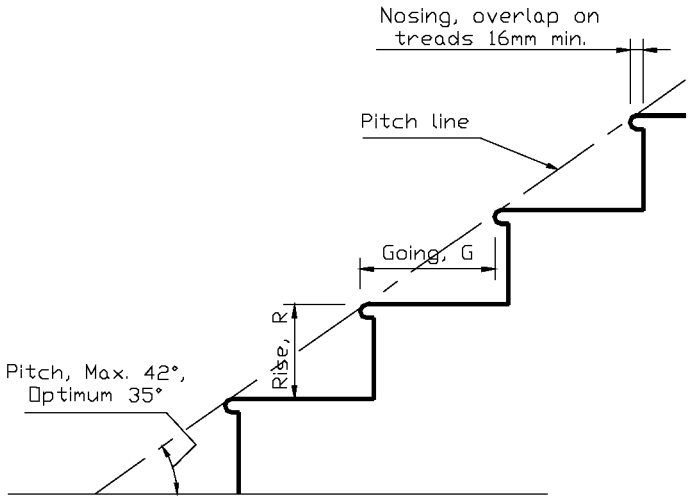
1. Pitch not more than 42°.

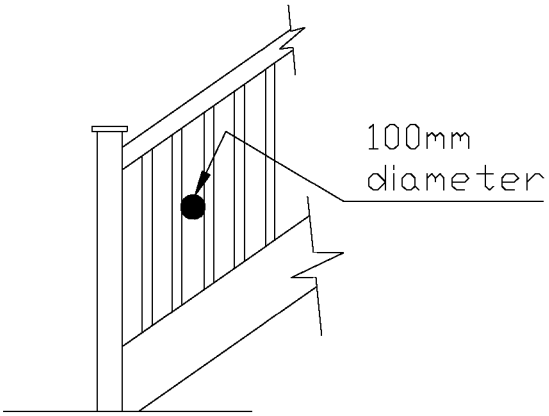
2. Correct relationship between rise and going (550 < 2R + G < 700) and maximum riser and tread sizes.

3. Consistency in tread and riser sizes.

4. Maximum of 16 treads per flight.

5. Winders should be avoided if possible - if unavoidable should be placed at bottom of flight.



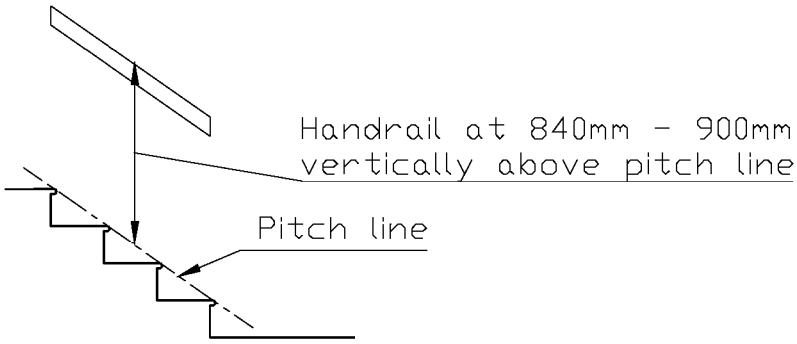


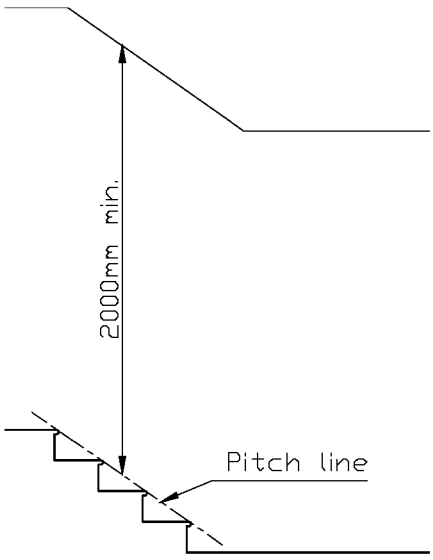
6. Nosing overlaps on tread 16mm min.

7. Proper guarding provided.

8. Guarding will not allow a 100mm diameter sphere to pass through

9. Handrails constructed to ensure firm support, secure fixing, safe use, ease of grip, avoids trapping or injuring hands, does not project to catch clothing etc., allows uninterrupted hand freedom along the length of the flight.





10. Guarding cannot be climbed easily by children.

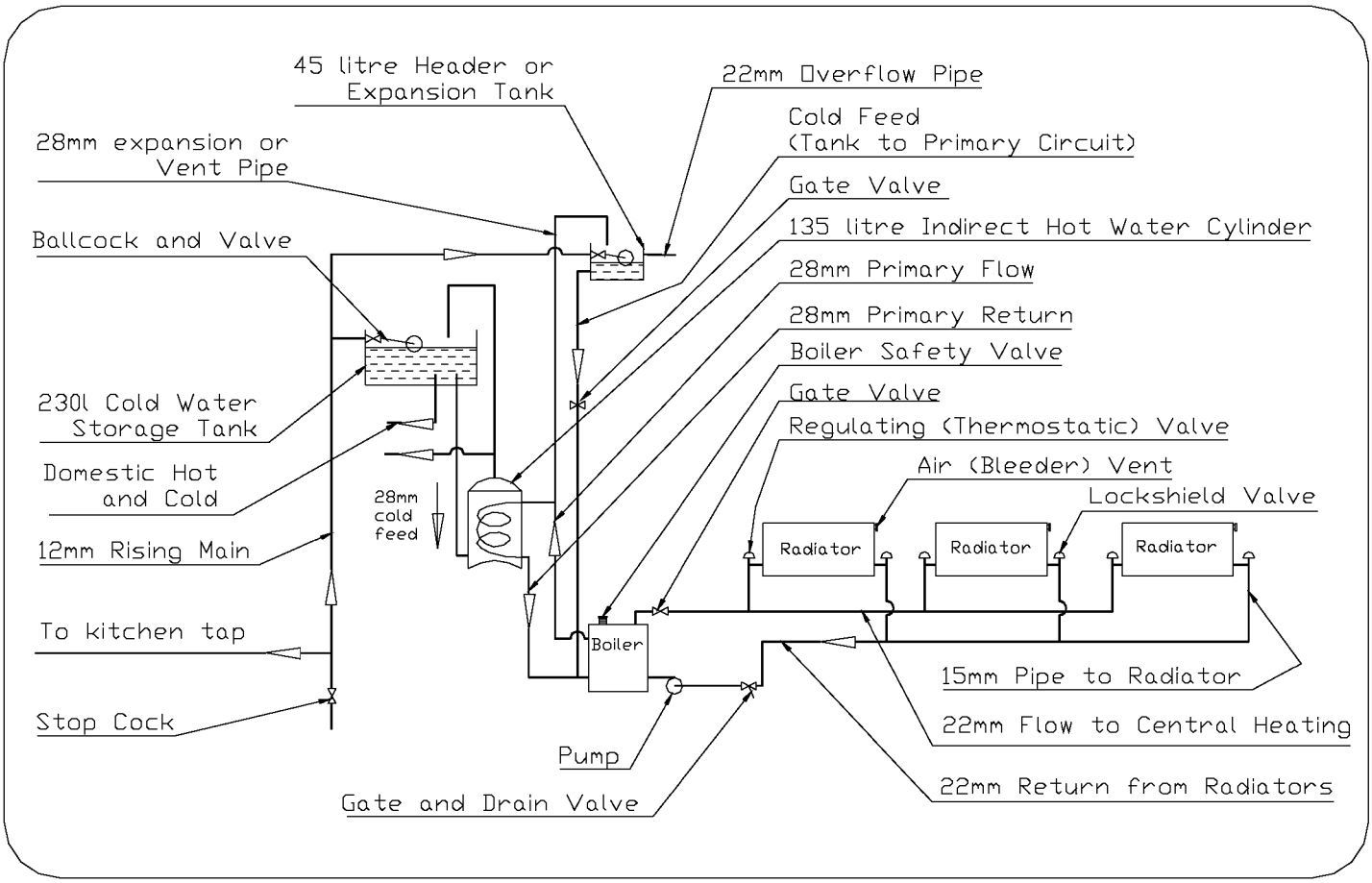
11. Sufficient headroom provided.

12. Surfaces of treads provide sufficient grip.

CEIST 4

PERFORMANCE CRITERIA	MAXIMUM MARK
(a)	
String correctly shown	**4**
Newel correctly shown	**4**
Pitch, rise and going correctly shown	**4**
Treads correctly shown	**4**
Risers correctly shown	**4**
Handrail and guarding correctly shown	**4**
Guarding/balustrade correctly shown	**4**
Wedges correctly shown	**4**
Glue blocks correctly shown	**4**
(b)	
Design considerations, noted (**3 x 4 marks** each)	**4**
Note, No. 1	**4**
Note, No. 2	**4**
Note, No. 3	
Design considerations, well sketched (**3 x 4 marks** each)	**4**
Sketch, No. 1	**4**
Sketch, No. 2	**4**
Sketch, No. 3	
TOTAL	**60**

CEIST 5
(a)



(b)

- House zoned in two at least; upstairs (usually bedrooms and bathroom), downstairs (could be further zoned). More flexibility by heating only areas required at particular time.
- Use time switches to heat only when needed.
- Bathrooms in separate zone for round-the-clock heating if needed separate from other zones.
- Thermostatic valves on radiators to shut off heat to radiator when it reaches a set temperature, saving rather than overheating room to discomfort of occupants. (Particularly effective in kitchens or other rooms with open fireplaces or stoves.)
- Grouping of plumbing and planning of layout of rooms to avoid long pipe runs. Always advisable to have boiler/heating unit, bathroom, kitchen and utility room close together for savings in installation costs and also for reduction in running costs later on.
- Solid fuel boiler and hot press on internal walls as far as possible.
- Ensure that plumbing piping is adequately lagged.
- Time switch on immersion heater.
- Back boiler installed to provide economical heat to the central heating system.
- Boiler and cylinder kept as close as possible to each other.

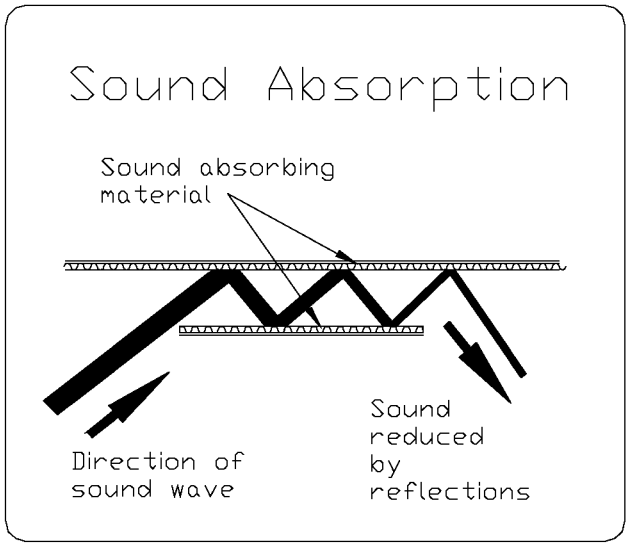
CEIST 5

PERFORMANCE CRITERIA	MAXIMUM MARK
(a)	
Boiler	**3**
Regulating (thermostatic) valve	**3**
Radiators	**3**
Lockshield valve	**3**
Air (bleeder) valve	**3**
Flow pipe to central heating	**3**
Return pipe from radiators	**3**
Gate and drain valve	**3**
Primary flow	**3**
Primary return	**3**
Cold feed (tank to primary circuit)	**3**
Vent pipe	**3**
Indirect cylinder	**3**
Header or expansion tank	**3**
3 marks for each of above shown on sketch to **maximum of 36**	
(b)	
4 marks each for **sketches** of **3 design features** Sketch, No. 1 Sketch, No. 2 Sketch, No. 3	 **4** **4** **4**
4 marks each for **notes** on **3 design features** Note, No. 1 Note, No. 2 Note, No. 3	 **4** **4** **4**
TOTAL	**60**

CEIST 6
(a)

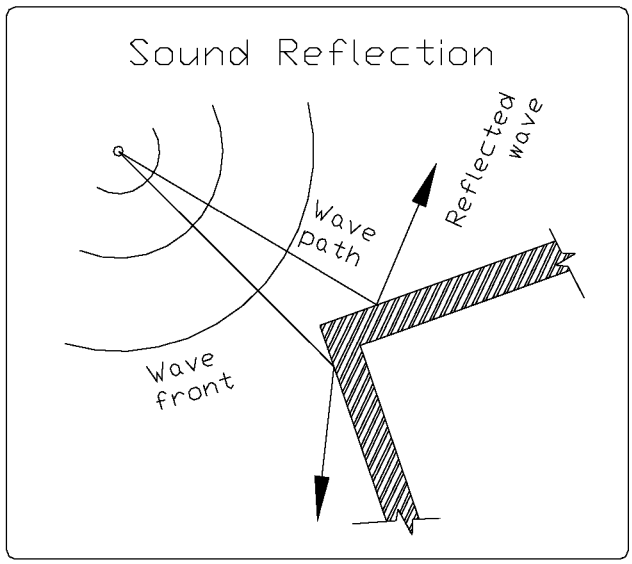
(i) Sound Absorption

Reduction in the sound energy reflected by the surfaces of the room. Hard flat surfaces absorb very little sound whereas soft surfaces, such as curtains, some wallpapers absorb much of the sound and do not reflect it. Sound waves lose intensity as they are absorbed at each reflection.



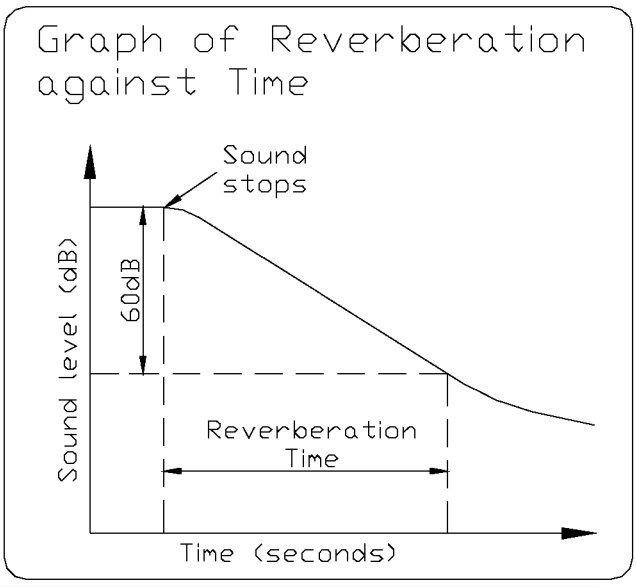
(ii) Sound Reflection

Sound is reflected in the same way as light, i.e. angle of reflection is equal to angle of incidence of wave. Reflecting surfaces in rooms are used to help even distribution of sound and increase the overall sound levels.

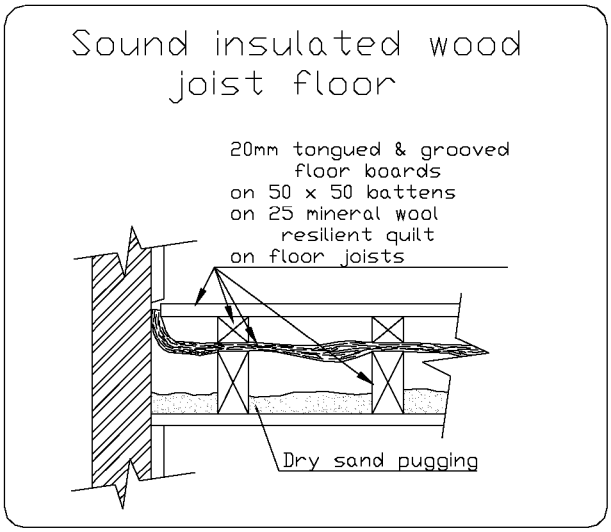


(iii) Reverberation Time

The time taken for a sound to die away by an arbitrary amount, normally taken to be 60dB. Reverberation time depends on the nature of the surfaces in the room, reflecting surfaces give a long reverberation time, absorbing surfaces have a short reverberation time.

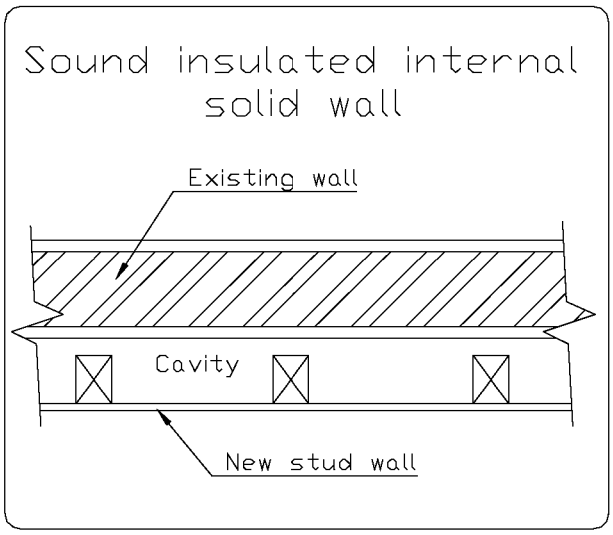


(b)



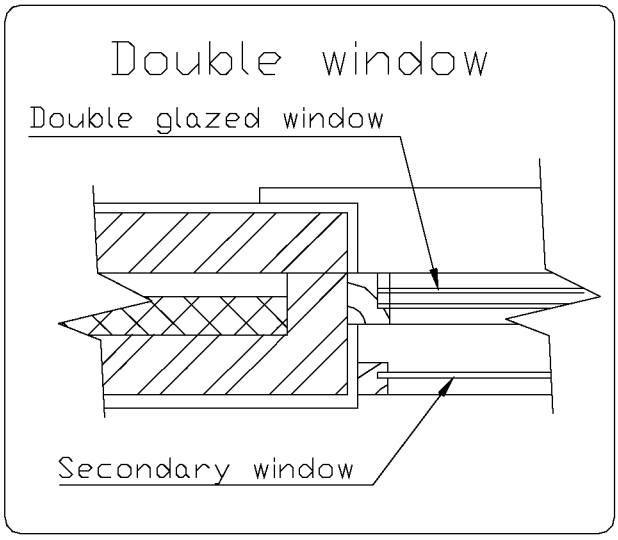
Floor

Wooden (joists) floors can be made more soundproof by putting a resilient layer of material between the supporting joists and the battens resting on top of them (not nailed). This along with sound absorbing material such as fibreglass or other insulating material on top of the ceiling will help reduce airborne and impact sound passing through.



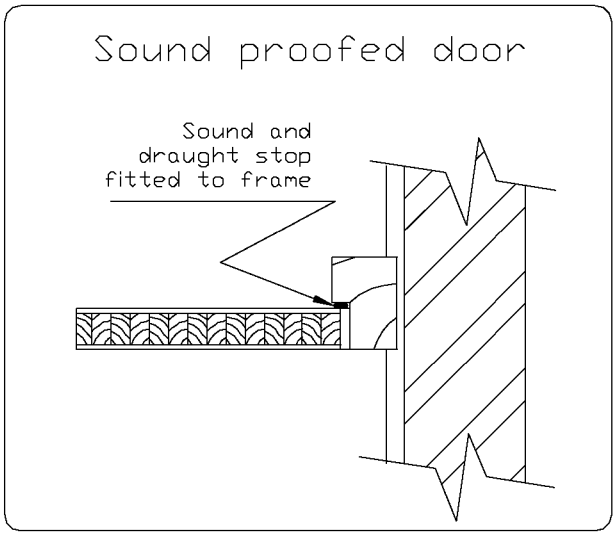
Walls (Internal)

A separate stud wall constructed alongside but not touching existing internal wall with min.12.5 mm slab and plaster finish, creating cavity of at least 150mm will help prevent much of the sound travelling to the adjacent area/room.



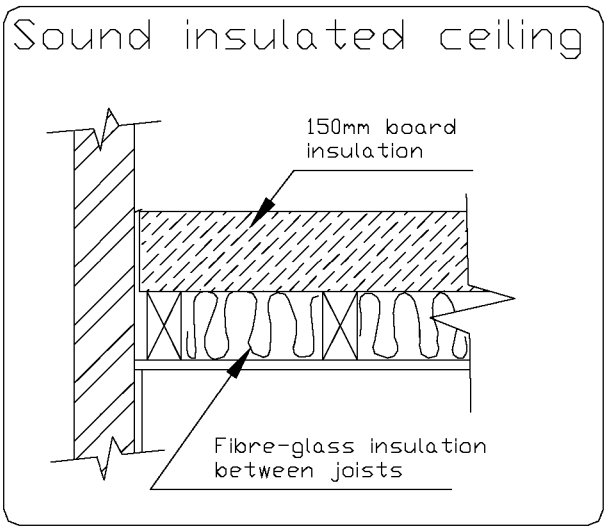
Walls (External)

Double glazing or even treble glazing to the window would reduce sound nuisance to outside. Additional window fitted to give cavity of 150 to 200mm would give greater insulation.



Door

To reduce sound coming through doorway it would be necessary to fit a solid door on a good sound door frame and door saddle with draught/sound stoppers to prevent any gaps or possibility of air passage around the door opening.



Ceiling

To help prevent sound travelling through via the ceiling to other areas of the house it will be necessary to put at least 200mm of board or fibre insulation between and on top of the ceiling joists.

Note - It is important that there is flanking to all cavities and passage ways to prevent sound travelling and that all air pores and gaps everywhere in the structure are filled.

- Good sound absorbing materials could be used for covering the floor, for curtains/drapes and for wall finishes.

CEIST 6

PERFORMANCE CRITERIA	MAXIMUM MARK
(a)	
Explain each of **3 given terms** (10 marks each)	
Explanation, No. 1	**10**
Explanation, No. 2	**10**
Explanation, No. 3	**10**
(b)	
Sketch 3 design features (5 marks each)	
Sketch, No. 1	**5**
Sketch, No. 2	**5**
Sketch, No. 3	**5**
Notes on **3 design features** (5 marks each)	
Note, No. 1	**5**
Note, No. 2	**5**
Note, No. 3	**5**
TOTAL	**60**

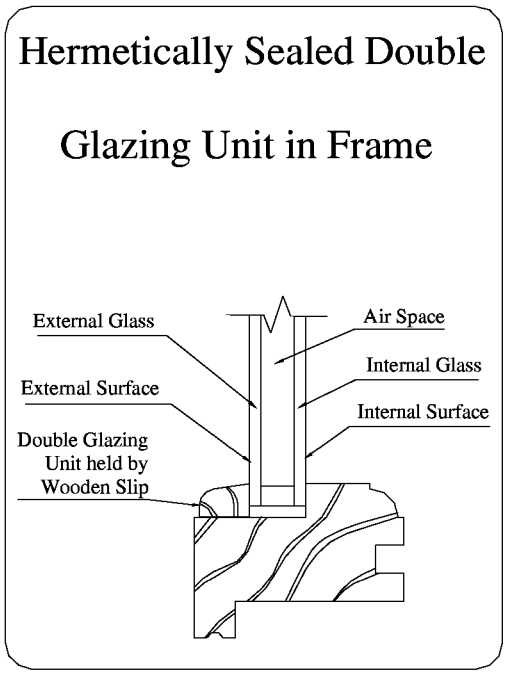
CEIST 7

(a)

(i) Single Glazing

Layer	Thickness (m)	Conductivity (W/m°C)	Resistance (m^2°C/W
Glass	0.004	1.02	0.00392
Int. Surface	-	-	0.12
Ex. Surface	-	-	0.08
		Total Resistance	0.20392

U-Value = 1/Total Resistance = **4.90388 w/m^2°C**



(ii) Double Glazing

Layer	Thickness	Conductivity	Resistance
Int. Surface	-	-	0.12
Int Glass	0.004	1.02	0.00392
Airspace	-	-	0.17
Ex. Glass	0.004	1.02	0.00392
Ex. Surface	-	-	0.08
		Total Resistance	0.37784

U- value = 1/Total Resistance = **2.64662 w/m^2°C**

(iii)

Rate of heat loss through S.G. window	= 4.90388 x 20 x 8	= 784.6208W
Daily energy loss (W x secs)	= 784.6208 x 24 x 60 x 60 J	= 67791.2371 kJ
Rate of heat loss through D.G. window	= 2.64662 x 20 x 8	= 423.4592W
Daily energy loss (W x secs)	= 423.4592 x 24 x 60 x 60 J	= 36586.8749 kJ
Difference in daily energy loss	= 67791.2371 - 36586.8749	= 31204.3622 kJ
Reduction in oil requirement	= 31204.3622 / 37350 litres	= 0.8355 litres
Daily savings	= 0.8355 x 40	= **33.42p**

(b)

- Improved comfort in dwelling, reduced draughts, warmer rooms.
- Conservation of heat by reducing heat loss.
- Substantial savings in fuel costs.
- Prevention of condensation, moisture-laden air will not condense readily onto double glazing units.
- Sound proofing, wider vacuum gives improved sound proofing. Sound cannot travel in a vacuum.
- Increased availability of floor space allowing use of previously cold room areas.
- Enhanced property value.

CEIST 7

PERFORMANCE CRITERIA	MAXIMUM MARK
(a)	
(i) **6 lines** of calculations **x 2 marks**	**2** **2** **2** **2** **2** **2**
(ii) **8 lines** of calculations **x 2 marks**	**2** **2** **2** **2** **2** **2** **2** **2**
(iii) **7 lines** of calculations **x 2 marks**	**2** **2** **2** **2** **2** **2** **2**
(b)	
6 marks for each of **3 merits discussed in detail** No. 1 No. 2 No. 3	**6** **6** **6**
TOTAL	**60**

CEIST 8

(a)

- Respect character and age of existing house
- Examine extent of degradation
- Roof/Walls
- Chimneys
- Electrical installation
- Sympethic heating system
- Windows, doors in keeping with original
- Solid floors, slates or tiles
- Internal walls, condition
- Covings, centre pieces, plaster mouldings
- Internal woodwork - skirtings, dado, rails etc.
- Sanitary ware retained, repaired if viable

(b)

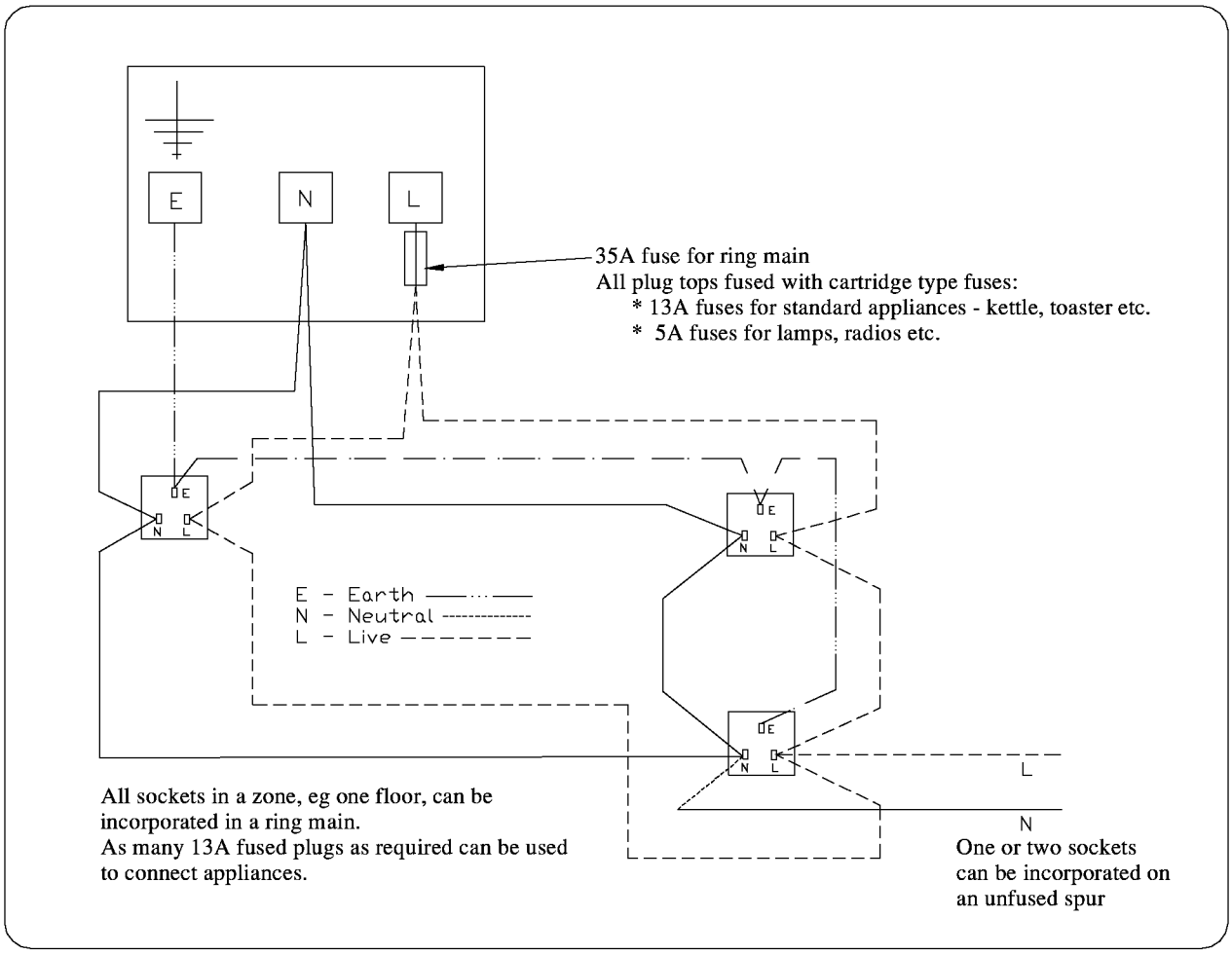
- Roof/walls - scaffolding protective mesh etc.
- Chimneys - old flues replaced, chimney pots to match original
- Electrical - re-wiring
- Heating - open fire/back boiler convector units etc.
- Windows/doors - use of wood, fenestration in design and materials, same as original
- Floors - quarry tiles (salvaged)
- Internal walls - old plaster removed and re-plastered to reflect original contours
- Covings, centre pieces, plaster mouldings - retain where possible
- Internal woodwork - skirtings, dado rails etc. - retain where possible or replace with similar section
- Sanitary ware - refurbish, to maintain character of original period.
- Craft skills of same standard of original work

CEIST 8

PERFORMANCE CRITERIA	MAXIMUM MARK
(a)	
4 suggested renovations listed, **5 marks** each	
Renovation, No.1	**5**
Renovation, No.2	**5**
Renovation, No.3	**5**
Renovation, No.4	**5**
(b)	
4 renovations, **5 marks** for **note** on each	
Note, No. 1	**5**
Note, No. 2	**5**
Note, No. 3	**5**
Note, No. 4	**5**
Sketches of each of **4 renovations, 5 marks** for each	
Sketch, No. 1	**5**
Sketch, No. 2	**5**
Sketch, No. 3	**5**
Sketch, No. 4	**5**
TOTAL	**60**

CEIST 9

(a)



(b)

- Earthing ensures that current is transferred safely to ground and is neutralised preventing the possibility that a person might become the conductor resulting in injury or death.
- Earthing is a safety measure in the case of failure of the neutral.
- Earth leakage circuit breaker on consumer unit trips if there's any leakage to earth.
- $10mm^2$ earth wire to all metal pipes and fittings such as cast iron baths. All pipes earthed or bonded.
- Earthed to 2m steel rod driven into ground.
- $16mm^2$ earth cable from rod to consumer unit
- Earth leakage CB on power circuits only. Prevents mishaps in case of corrosion.
- Earth wire bonded to top of earth rod and taped to prevent corrosion.

(c)

- Transformer used to convert 220V supply to 110V
- Out-of doors should always be 110V supply, shocks are usually not fatal to healthy.
- Sealed plug tops used
- Power tools not used in rainy or wet conditions
- Heavy duty extension cable used.
- Cable protected when taken across areas used by traffic.
- Suitable protective clothing (goggles, safety boots with steel toe-caps, helmets etc.) used

CEIST 9

PERFORMANCE CRITERIA	MAXIMUM MARK
(a)	
10 Marks for well produced accurate sketch	**10**
10 Marks for accurate annotation	**10**
(b)	
4 Marks each for **3 descriptions**	
Description, No. 1	**4**
Description, No. 2	**4**
Description, No. 3	**4**
4 Marks each for **3 sketches**	
Sketch, No. 1	**4**
Sketch, No. 2	**4**
Sketch, No. 3	**4**
(c)	
2 Marks each for **3** listed procedures	
Procedure, No. 1	**2**
Procedure, No. 2	**2**
Procedure, No. 3	**2**
3 Marks each for each explanation to **maximum of 10**	**10**
TOTAL	**60**

CEIST 10

- Architecture evolved through peoples needs
- In Ireland buildings utilised local materials - limestone, granite, sandstone
- Tradesmen travelled following the work
- Roof development from rounded ended thatched roofs to modern pitched roofs
- Damp proof courses, slates, lead, wain scotting up to one metre in houses, schools DPM's
- Traditional villages, folk-parks, heritage towns, old mills etc.
- Retaining facades, Georgian buildings, grain stores etc.
- A little of us remains where we have been, retention of part or our historic past
- Old skills, crafts preserved
- Part of our cultural heritage for all to see.

CEIST 10

PERFORMANCE CRITERIA	MAXIMUM MARK
Any **6 points** from the above or other relevant points clearly stated and **supported by discussion.** (**5 marks** each for each point stated and **5 marks** each for each discussion to a maximum of 60 marks)	
Point No. 1 (Statement **5 marks**, Discussion **5 marks**)	**10**
Point No. 2 (Statement **5 marks**, Discussion **5 marks**)	**10**
Point No. 3 (Statement **5 marks**, Discussion **5 marks**)	**10**
Point no. 4 (Statement **5 marks**, Discussion **5 marks**)	**10**
Point no. 5 (Statement **5 marks**, Discussion **5 marks**)	**10**
Point no. 6 (Statement **5 marks**, Discussion **5 marks**)	**10**
TOTAL	**60**

CEIST 10 (ALTERNATIVE)

(a) In favour of the reconstruction of the building

- Building should not have been demolished
- Preservation order violated
- To rebuild using some materials
- Plans and photographs of old building would help
- Condition to rebuild would deter others
- Landmark with past destroyed forever, if not rebuilt
- To rebuild even part/portion of the building with additions - museum etc.
- Structure serving needs of community incorporated
- Focal point in town/village now needed.

(b) In favour of an alternative approach, not involving the reconstruction of the building

- Reconstructing a similar building/replacement building should be a monument in its own time as the listed building was.
- Salvaging stonework etc. and providing an alternative structure
- Fountain / garden / small park with seating
- Memory of old structure maintained by commemoration project
- Local competition to select suitable structure / monument etc.
- New alternative should maintain the memory of the demolished structure
- Plaque to highlight the legend of the demolished structure
- Museum constructed from salvaged stone with model of demolished structure having a central setting.

CEIST 10 (ALTERNATIVE)

PERFORMANCE CRITERIA	MAXIMUM MARK
3 well discussed **points in favour of the reconstruction** (maximum of **10 marks** each based on the quality of the cogent argument)	
Point No. 1	**10**
Point No. 2	**10**
Point No. 3	**10**
3 well discussed **points in favour of the alternative approach** (maximum of **10 marks** each based on the quality of the cogent argument)	
Point No. 1	**10**
Point No. 2	**10**
Point No. 3	**10**
TOTAL	**60**