Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE 2008

MARKING SCHEME

CONSTRUCTION STUDIES

HIGHER LEVEL

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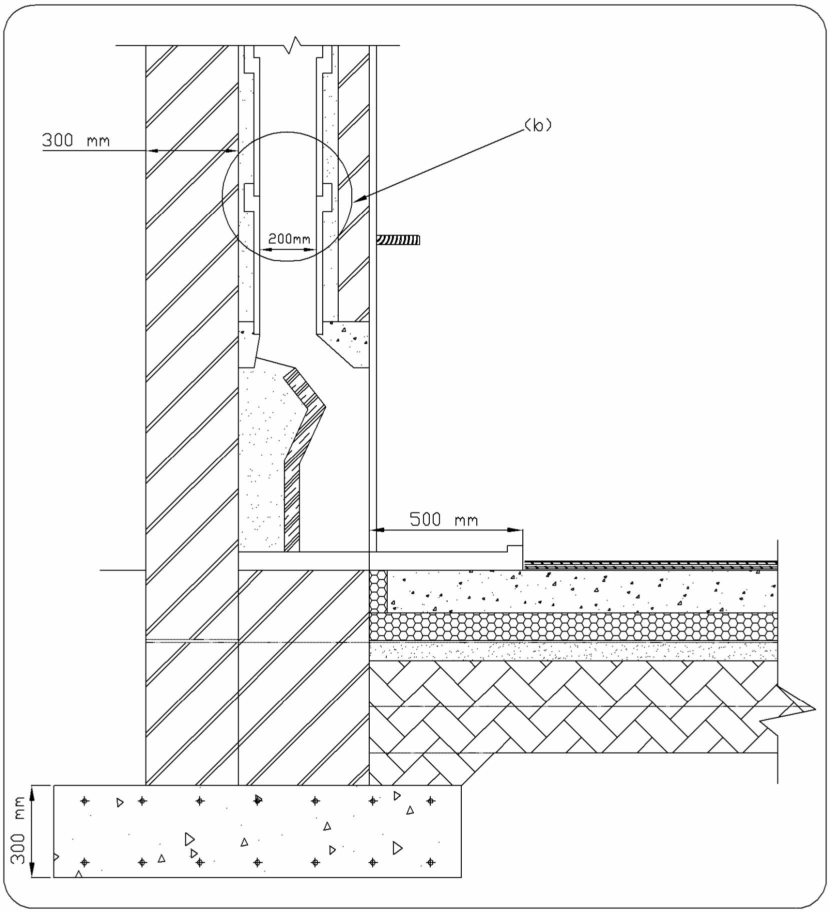
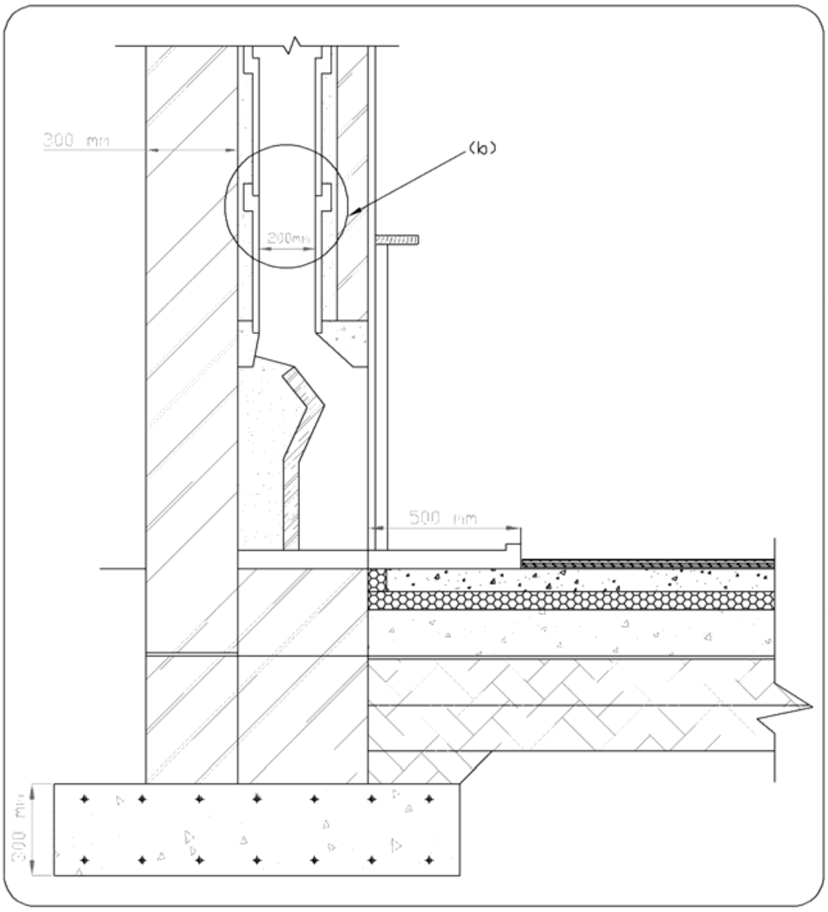
Ceist 1 (a)



Alternative solution



Ceist 2

(a) Personal risks associated with

(i) Fitting a concrete window cill on the second storey of a dwelling house

- Risk of back injury due to lifting excessive weight
- Risk of a personal injury due to a fall
- Risk of injury to people below due to falling materials/tools

(ii) Laying Pipes in a deep trench

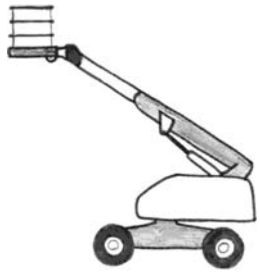
- Risk of the trench collapsing and crushing the workers inside
- Risk of falling into the trench
- Risk the excavation might undermine other structures and cause them to become unstable or collapse.
- Risk of trench collapsing due to machinery

(iii)Excavating in an area where there are underground cables

- Risk of exposing live electrical cables
- Risk of severe burns
- Risk of electrocution due to inadvertent striking of cables.

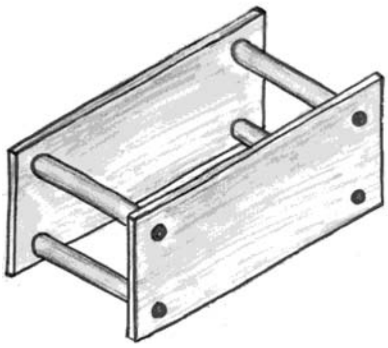
(b) Safety procedures to eliminate risk

(i) Fitting a concrete window cill on the second storey of a dwelling house



- Ensure a safe work platform such as scaffolding
- Max 25KG lifting load per person
- Use correct lifting procedure to minimise back injury
- Have enough personnel to lift the lintel safely into place
- Use of lifting system such as a cherry picker/ teleporter to transport the lintel to the second storey
- Platform height important to reduce risk of injury from above-shoulder lifting.

(ii) Laying Pipes in a deep trench



- Trench box to protect workers
- Sloping back (battering back) the sides of the trench to reduce the risk of the trench collapsing.
- Exclusion zone around open trench. Railings and warning signs to prevent workers, machinery or pedestrians from falling in - temporary covering for safety

(iii)Excavating in an area where there are underground cables

- Refer to plans of buried services
- Contact suppliers of electrical services
- Make sure the power is turned off
- Locate buried pipes using electronic subsurface survey equipment e.g. metal detectors, Ground penetrating radar (GPR)
- Services should then be marked with pegs/paint
- Dig trial holes by hand to confirm the location of wires and other services

(c) Two reasons why younger workers are more vulnerable to accidents

- Less experience than older workers
- Doing jobs outside their experience
- Ignoring advice
- More likely to take chances/risks
- Lack of proper training – not familiar with site, plant , machinery
- Enthusiasm, invincibility of youth – see or hear no danger

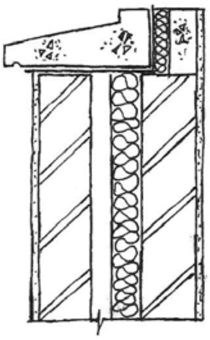
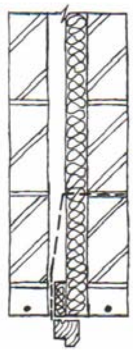
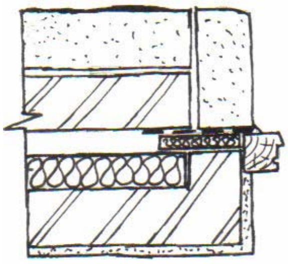
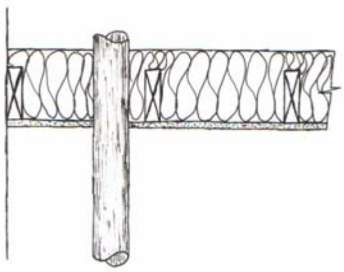
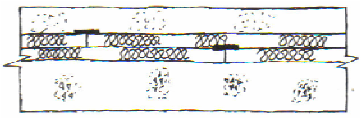
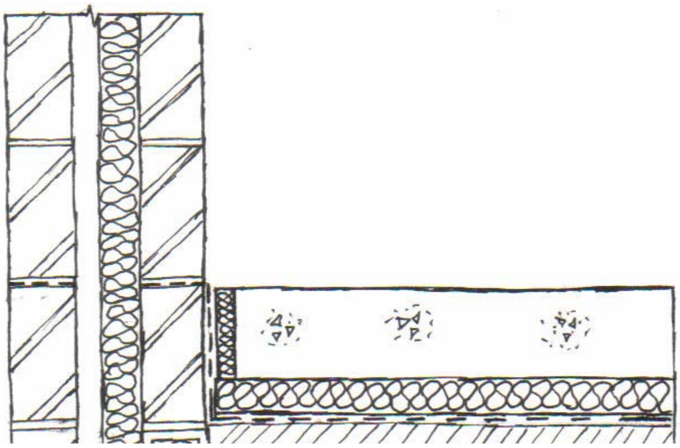
Three strategies to encourage a safety culture in younger workers

- Buddy system, The younger worker is paired with a more experienced worker
- Ensure younger workers are fully trained to carry out required tasks
- Regular appraisal by management to ensure safe practice
- Safe pass course
- Frequent site safety meetings

Any other relevant details

Ceist 3 (a)

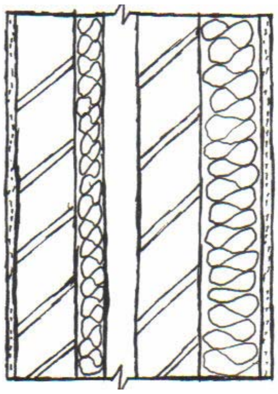
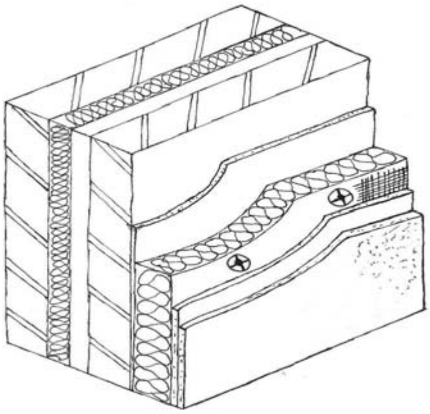
- Openings in external cavity wall
  - Head
  - Cill
  - Jamb
- Gaps in insulation in floors
- Service ducts through ceiling
- External wall to floor

(b)

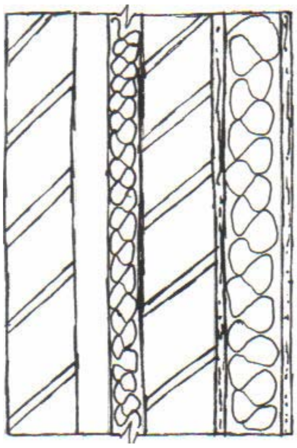
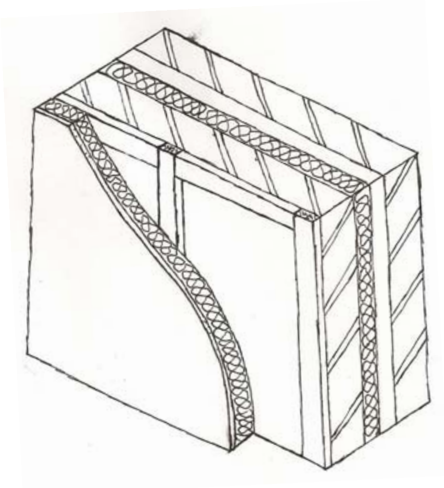
Method 1: Externally fixed insulation

- Rigid phenolic insulation core with a tissue based facing on both sides.
- Mechanically fixed to external leaf of wall finished with polymer modified render.

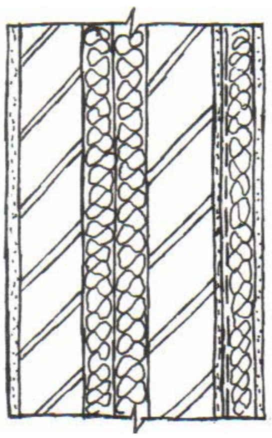
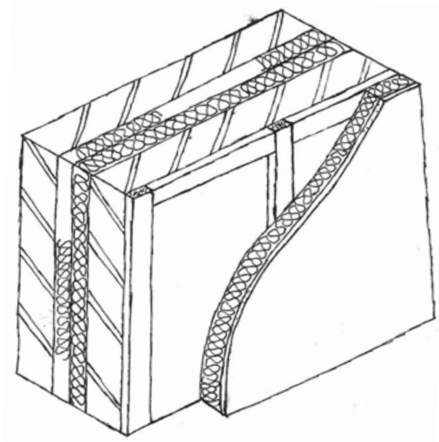
Method 2: Dry-lining method

- 12.5 mm plasterboard facing bonded to rigid phenolic insulation.
- Mechanically fixed to timber battens which are fixed to internal leaf of wall.

Method 3: Dry-lining and cavity fill insulation

- Dry-lining as above and cavity fill insulation
- The cavity filled with insulation compatible to expanded polystyrene
- Inner leaf is dry-lined.

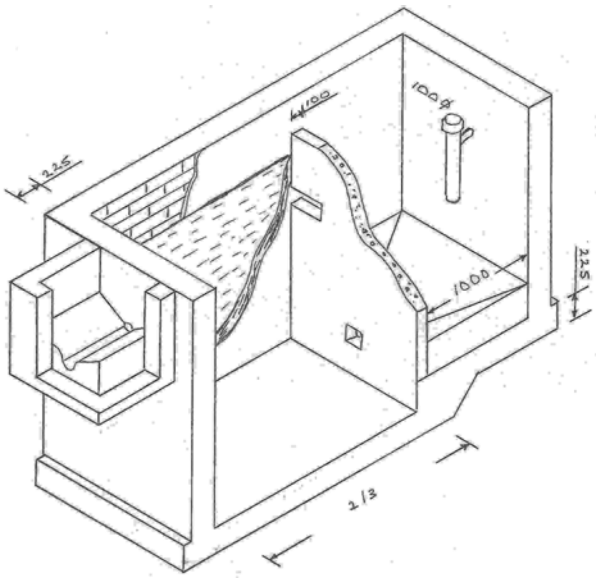
Any other relevant details

Ceist 4

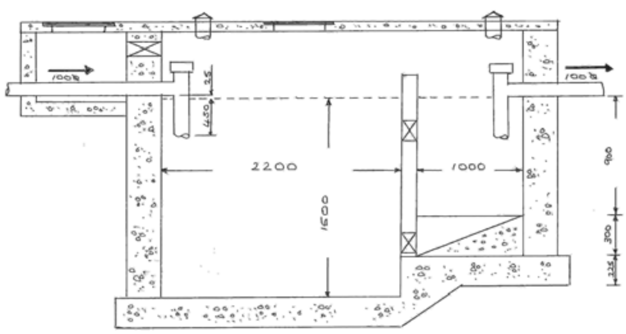
(a) Functional requirements of a wastewater treatment system

- Collect all wastewater from the house
- Separate suspended solid waste from wastewater
- Allow decomposition of solids
- Prevent the build-up of foul gasses
- Adequate capacity
- Access for cleaning and servicing
- Prevent pollution by direct discharge of untreated wastewater into local ground water and surface water
- Minimise risk of blockage and leakage
- Prevent human health hazard
- Percolation area is sufficiently permeable to filter effluent
- Operate with minimal maintenance
- Long lifespan

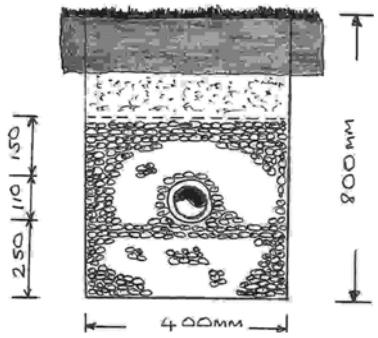
Septic tank details



- Capacity – 2720 litres minimum, C=(180*P)+2000, P = No. of persons, min four
- Longer tank better for settlement of solids, 2 to 3:1 length to width of tank ratio
- Two compartments, inlet compartment two thirds to three quarters total length
- Concrete floors minimum thickness 225 mm;
- Walls a minimum of 100 mm thick reinforced concrete or equivalent such as 225 mm solid block rendered wall
- Baffle wall to prevent solids passing to outlet compartment
- Inlet (dip pipe) and outlet pipes 100mm minimum, 25-75mm difference in height between pipes
- 100mm pipe in roof with cowl for ventilation
- Septic tanks may be cast in-situ, prefabricated from steel, reinforced concrete, glass-fibre reinforced concrete or plastic.
- Two-chambered tanks connected together using a tee-piece baffle in each tank.
- The principles given for rectangular tanks should be followed for cylindrical tanks



Percolation area details



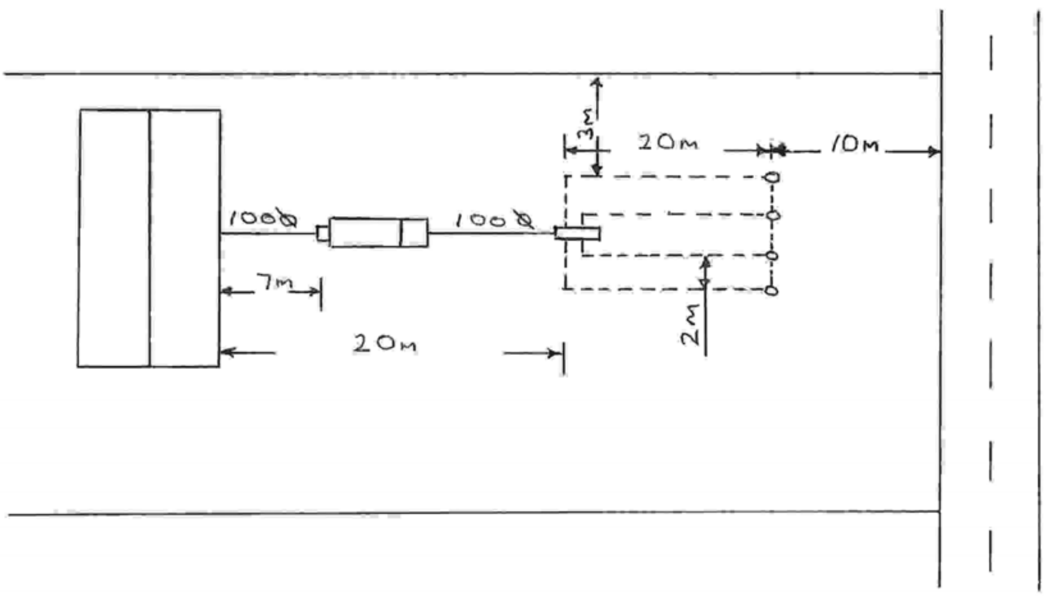
- Watertight 100mm pipe from septic tank to distribution box
- Gravity flow, 1:60 in uPVC pipe
- Slope of percolation trenches 1:200, 100mm perforated pipes
- Length of percolation pipe 20m, 2m separation between pipes, 2.45m c/c
- Percolation pipes vented and interconnected at end of pipe runs
- Width of trench 450mm, depth of trench 800mm
- Backfilling of trench - 250mm of 20-30 mm washed gravel or broken stone aggregate underneath; pipe surrounded by 20-30mm clean washed gravel or broken stone aggregate and with 150 mm of similar aggregate over pipe; geo-textile layer followed by topsoil to ground surface.

Alternative solutions

The wastewater from a septic tank can be treated by the following filter systems:

- A soil percolation system such as an intermittent soil filter system
- An intermittent sand filter followed by a polishing filter
- An intermittent peat filter followed by a polishing filter
- An intermittent plastic and other media filter followed by a polishing filter
- A constructed wetland followed by a polishing filter.

(b) Outline of typical wastewater treatment plant for single house

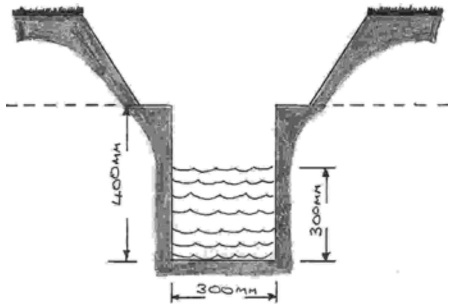


(c) Site suitability test

Types of test

- Visual assessment
    - Topography and landscape, shape, slope and form of site
    - Water level in ditches and wells
    - Presence and types of rock outcrops
    - Proximity to adjacent percolation areas and/or houses
    - Land use and type of grassland surface
    - Proximity to wells on-site and off-site, water supply Indicates targets at risk sources, groundwater, streams

- Percolation test
    - Hole size 0.3m x 0.3 x 0.4m deep
    - Hole dug in percolation area and top of hole to be at invert level of percolation pipes
    - Sides and bottom of hole scratched to a natural soil finish
    - Test hole filled to a depth of 0.3m and kept to this level until subsoil has become swollen and saturated
    - Thereafter the time required for the water level to drop from 300mm to 200mm shall be measured
    - This time is divided by 4 to get the time for a drop of 25mm which is known as the percolation value 't'
    - The same procedure should be repeated in the second hole and the average value for both should be taken as 't'



- Trial hole
    - Determines the depth of the water table, the depth to bedrock and the soil and subsoil characteristics
    - Size 1m x 1m x 2m deep.
    - Minimum depth 1.5m below the invert level of the lowest percolation pipe.
    - Be covered for a minimum of 48 hours, the depth of water if any should then be measured.
    - Test may be unreliable after periods of dry weather in such cases local information should be used to indicate the likely wet weather result.
    - Sometimes it may be necessary to dig more than 1 trial hole (large sites, slopes greater than 1:20 or rock in the trial hole).

Any other relevant details

Question 5

(a)

Material Element	**Conductivity k**	**Resistivity r**	**Thickness T(m)**	**Resistance R**
Single Glazing	1.02	____	0.005	0.0049
Int. Surface	____	____	____	0.122
Ext. Surface	____	____	____	0.08
				0.2069 (R^t)
Material Element	**Conductivity k**	**Resistivity r**	**Thickness T(m)**	**Resistance R**
Double Glazing	1.02	____	0.008	0.007843
Space	____	____	0.012	0.170
Int. Surface	____	____	____	0.122
Ext. Surface				0.08
				0.3798(R^t)

Formulae: **R= T/k** **R=Txr** **$U=1/R^t$**

Single Glazing; $U = 1 / R^t$ **= 1 / 0.2069 = 4.83 W/m²/°C.**

Double Glazing; $U = 1 / R^t$ **= 1 / 0.3798 = 2.63 W/ m²/°C.**

(b) Cost of Heat Lost per year through;

(i) Single Glazed Window

Heat Loss: = U-Value x Area x Temp. Diff

4.83 x 25 x 13 = 1569.75 Watts

1569.75 Watts = 1569.75 Joules / sec

Annual heating period: hours/secs = 60 x 60 x 11 x 7 x 40 = 380 hours (11088000secs)

$\frac{60 \times 60 \times 11 \times 7 \times 40 \times 1569.75}{1000}$ = 17405388 kj (per annum)

Note: Calorific Value of 1 Litre oil **=** 37350kj

$\frac{17405388}{37350}$ = 466 Litres oil

1 Litre Oil costs - 80c;

Cost per annum: 466 x 0.80 **= €372.80**

(ii) Double Glazed Window

4.83 = 372.80

2.63 = X

4.83X = 2.63 x 372.80

$X = \frac{2.63 \times 372.80}{4.83}$

X = **€202.99**

(iii) Low-e Double Glazed Window

4.83 = 372.80

1.1 = X

4.83X = 1.1 x 372.80

$X = \frac{1.1 \times 372.80}{4.83}$

X = **€84.90**

(b) Alternative Method - Cost of Heat Loss per year through;

(ii) Double Glazed Window

Heat Loss: = U-Value x Area x Temp. Diff

2.63 x 25 x 13 = 854.75 Watts

854.75 Watts = 854.75 Joules / sec

Annual Heating Period **(**secs) = 60 x 60 x 11 x 7 x 40

$\frac{60 \times 60 \times 11 \times 7 \times 40 \times 854.75}{1000}$ = 9477468 kj/per annum

` **Note:** Calorific Value of 1 Litre Oil = 37350kj

$\frac{9477468}{37350}$ = 253.75 Litres Oil

1 Litre Oil costs 80c

Cost per annum: = 253.75 x 0.80 **= €202.99**

(iii) Low-e Double Glazed Window

Heat Loss: = U-Value x Area x Temp.

1.1 x 25 x 13 = 357.5 Watts

357.5 Watts= 357.5 Joules / sec

Annual Heating Period **(**secs) = 60 x 60 x 11 x 7 x 40

$\frac{60 \times 60 \times 11 \times 7 \times 40 \times 357.5}{1000}$ = 3963960 kj/per annum

` **Note:** Calorific Value of 1 Litre Oil = 37350kj

$\frac{3963960}{37350}$ = 106.13 Litres Oil

1 Litre Oil costs 80c

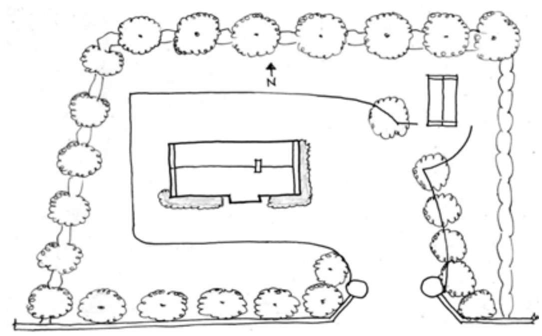
Cost per annum = 106.13 x 0.80 **= €84.90**

(c) Possible reasons for recommendation

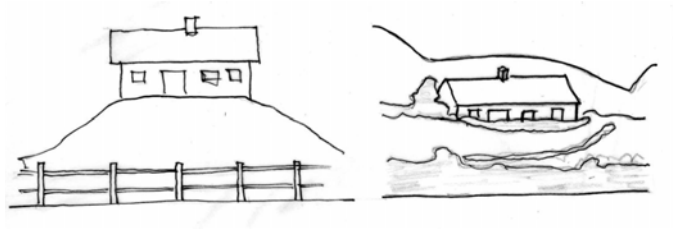
- Comparison of costs associated with heat lost for each window type for one year:
  (i) S.G. €372.80; (ii) D.G. €202.99; (iii) Low-e D.G. €84.90
- Low-e Double Glazing window type recommended.
- Four times more efficient than single glazing.
- Two and a half times more efficient than double glazing.
- Costs of low-e double glazed window type recouped over a shorter time (5-8 years)
- Price of home heating oil is predicted to rise.

Ceist 6

(a) Location of a house in the landscape



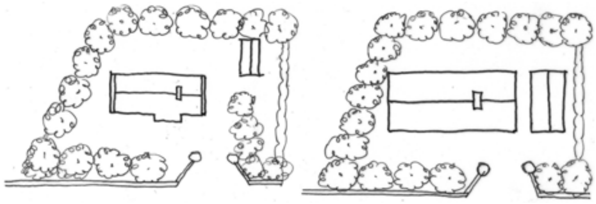
- House should not break the skyline waterline.
- In coastal areas avoid building on seaward side of the road.
- Avoid linear development – obscures & detracts from landscape.
- Position house in a fold or dip to avoid prominence and provide shelter.
- Retain existing trees, hedgerows or natural boundaries.
- Plant trees, shrubs and plants indigenous to area.
- Early and appropriate landscaping helps integrate the building into the landscape.



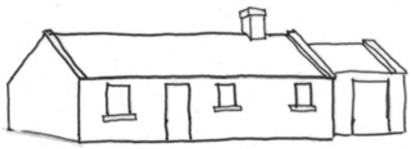
- Keep “golf lawns” to a minimum.
- Plant close to the external wall of the house.
- Avoid planting exotic and evergreen trees along site boundaries.
- Conserve and retain existing stone walls.
- New stone walls should utilise local stone and complement existing styles or tradition.
- Refrain from using block or brick walls, ranch type concrete or timber fencing.
- Avoid hard tarmacadam surfaces on driveways.
- Shale or gravel surfaces facilitate disposal of ground water and minimise the visual and environmental impact on landscape
- Locate garage and car parking to rear or in a screened area.
- Entrance piers should compliment local styles / tradition.
- Avoid high /siege type gates or over ornate lamps on piers.

Scale of House

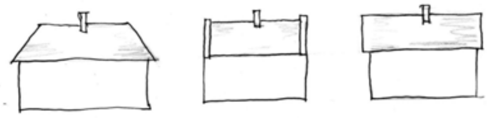
- Scale of house relative to those adjacent or in close proximity
- Scale of house relative to the site size
- A large house requires a large site in a large scale landscape with long views and mature elements such as trees, hedgerows etc.
- Scale to be kept to a human scale – the less is the more
- If a larger house is required then deep plan, high two storey buildings to be avoided, design by stepped back elements to the sides of the main building.

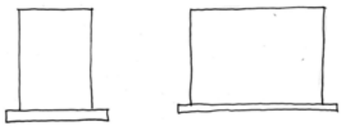


House Form

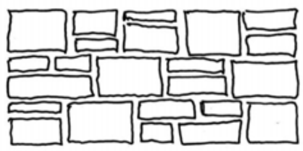


- Study and identify house types/styles of the locality and use these indigenous forms as inspiration for contemporary house design.
- Employ single storey or two storey dwellings in keeping with existing local tradition.
- Single room wide dwellings.
- Porch – where appropriate.
- Careful detailing of gabled or hipped Roof.
- Roof Pitch – 35 to 45 degrees.
- Verge detail in line with gable wall.
- High mass to void ratio on principal elevation for window and door openings.
- Windows to have a vertical rather than horizontal emphasis.
- Dormers to be used with caution – only if found locally in existing traditional housing.- preferably with the front wall carried up as the face of the dormer.

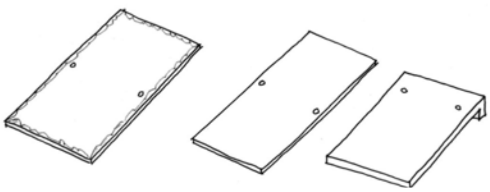




Choice of Materials



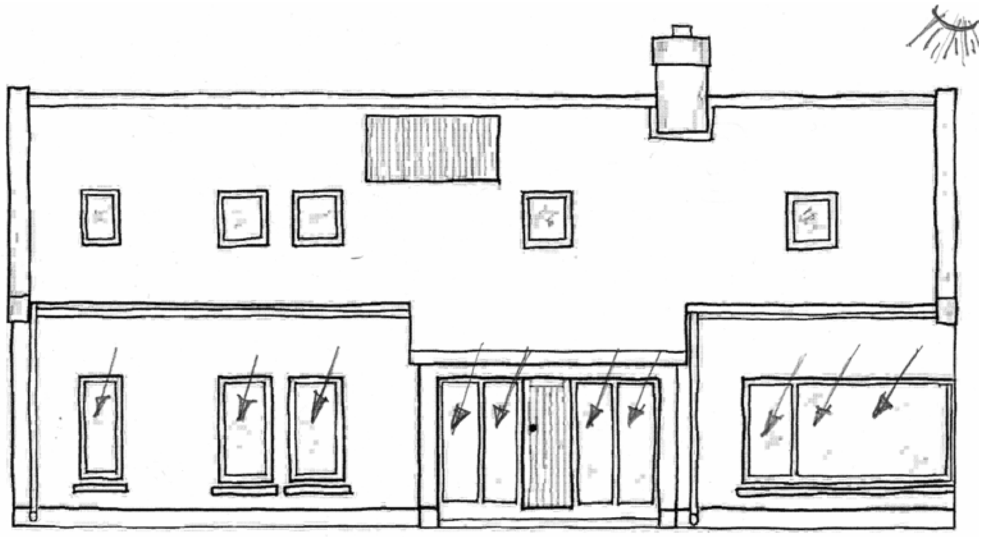
- Where stone is used, employ local stone e.g. limestone or granite window cills or chimney cappings.
- Use traditional roof coverings e.g. natural slate; manufactured slate or tiles preferably of a dark colour.
- Smooth or rough cast render finishes to building.
- Avoid buildings constructed entirely of brick, however, many period buildings used brick around door and window openings.



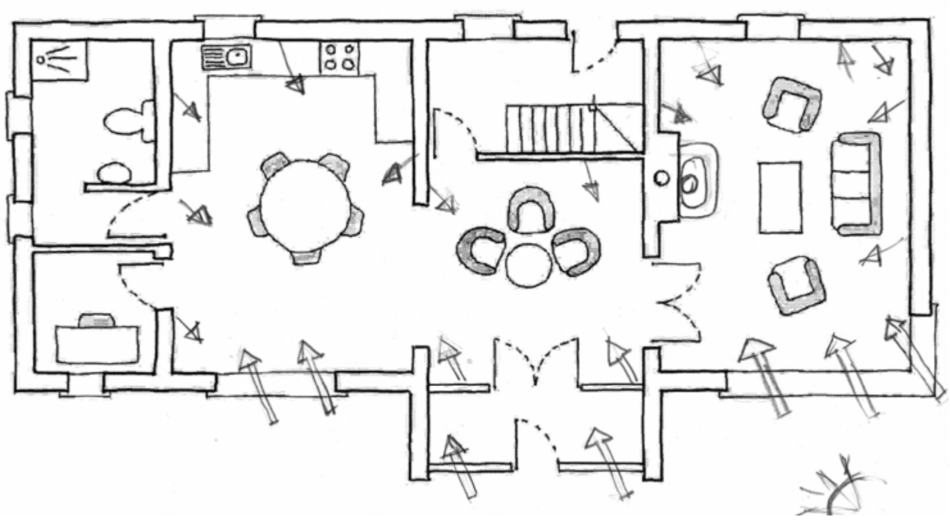
- Avoid vertical “crazy paving” or imitation stone cladding.
- Use locally available materials such as dry stone fill from the local quarry.
- The use of locally available materials reduces transport costs together with reducing CO_2 emissions from the burning of fossil fuels.

(b) Three Features of the Design

- This dwelling is small in scale – intentionally sized rooms to reduce energy demands requires smaller quantities of materials and therefore less embodied energy to build.
- Narrow plan, one room wide allows passive solar energy to reach all rooms thereby reducing energy demands and in particular a dependence on dwindling fossil fuels.



- Multi purpose kitchen and dining area that is economical on space - using less materials and therefore less embodied energy.
- Stairs lobby is partitioned off and separated by a door which minimises heat loss to the ground floor room.
- Porch – has large glazed area that attracts solar heat which may be allowed to pass into main house by opening inside double doors (see sketch)
- Upstairs bedrooms utilise roof space. This avoids the need for a building with a larger footprint – less materials – less embodied energy
- Solar panels on roof help heat domestic water (up to 60%) and therefore reduce the overall energy requirement
- Glazing to south elevation and corner window allow heat and natural light enter. This reduces the need for artificial lighting and thus conserves energy.

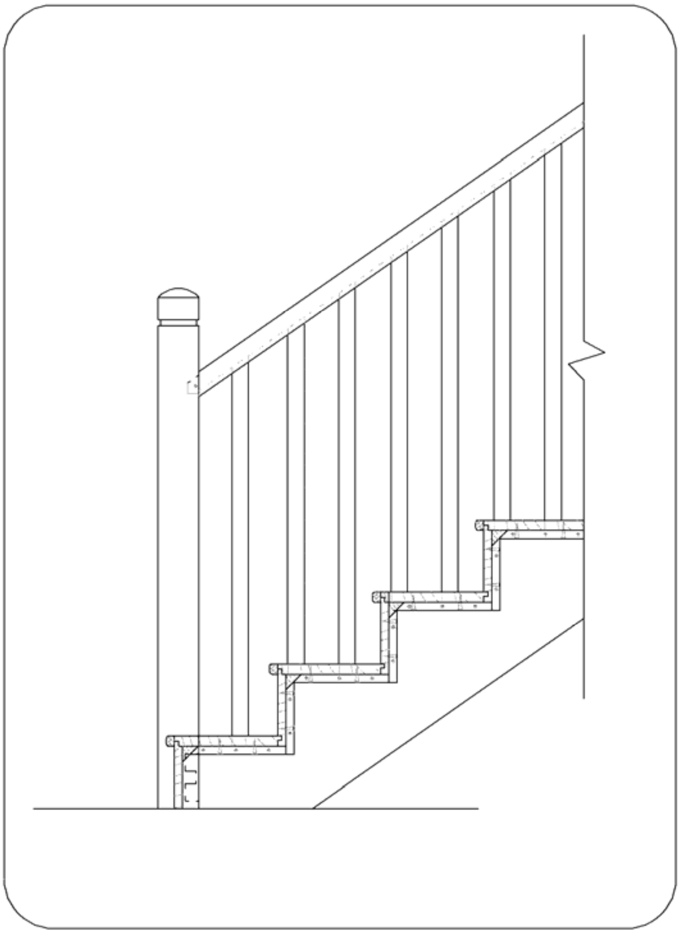


- Large south facing glazed area to the living room enables passive solar gain – provided the windows are well insulated/have a high U-value, i.e. triple glazed, low-e coating, (see sketch)
- Floor tiles in the dining area store solar gain from the tall windows on the south facing elevation and reflect heat back into rooms as house cools
- The double doors off the living room and open plan layout enable the warm air obtained through passive solar gain to circulate to other parts of the building.
- A wood burning stove on an internal wall as backup for solar gain, carbon neutral
- Some heat will be radiated back from mass walls 225mm thick in ground floor(sketch)
- Rooms are of a scale and size that are economical in terms of space. This conserves heat and reduces energy needs in addition to requiring fewer materials and therefore less embodied energy.
- The small scale design of this narrow plan building enables the use of timbers of minimum cross section, capable or being harvested from sustainable forests and perhaps regionally grown.
- **Definition:** Embodied Energy: The embodied energy of a house refers to the energy it takes to build it. This includes the energy used for extraction, processing, manufacture and transportation costs of the raw materials as well as the energy used to prepare the site including the installation of the services and the construction of the house.

Any other relevant details

Ceist 7

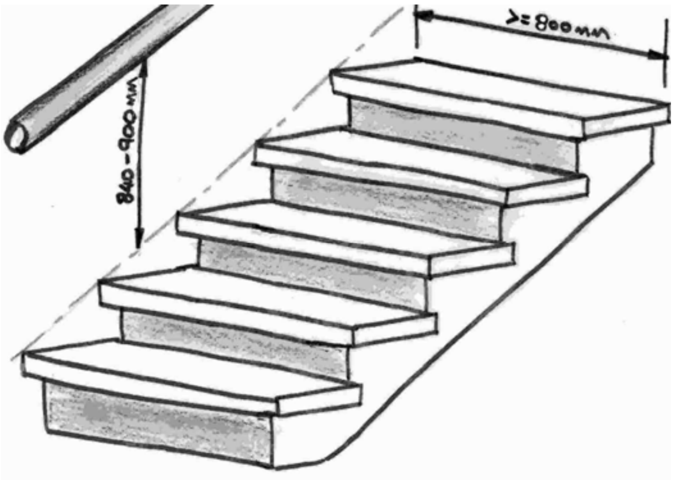
(a)

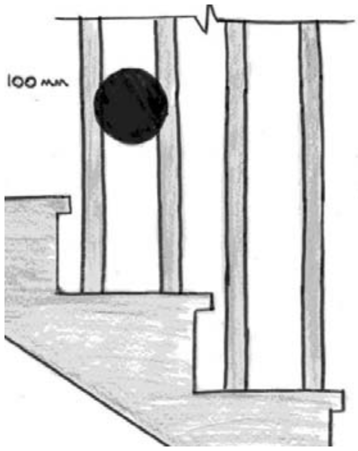


(b) Design features that ensure that the stairs is safe for all users.

- 2R+G to be between 550mm and 700mm
- Going :-220mm min (250 optimum)
- Rise 220mm Max (175 optimum)
- Minimum stairs width 800mm
- Maximum pitch 42°
- Minimum Headroom 2M when measured from pitch line.
- No more than 16 risers in any one flight
- Stairs should be guarded at the sides and should not allow a 100mm sphere to pass through any of the openings
- Guarding should not be easily climbed by children
- A landing to be provided at the top of every flight
- Handrail should be provided on any stairs wider than 1000mm

- Handrails should be placed at a height of 840mm-900mm (when measured from the pitch line)
- Guarding on landing should be a minimum height of 900mm

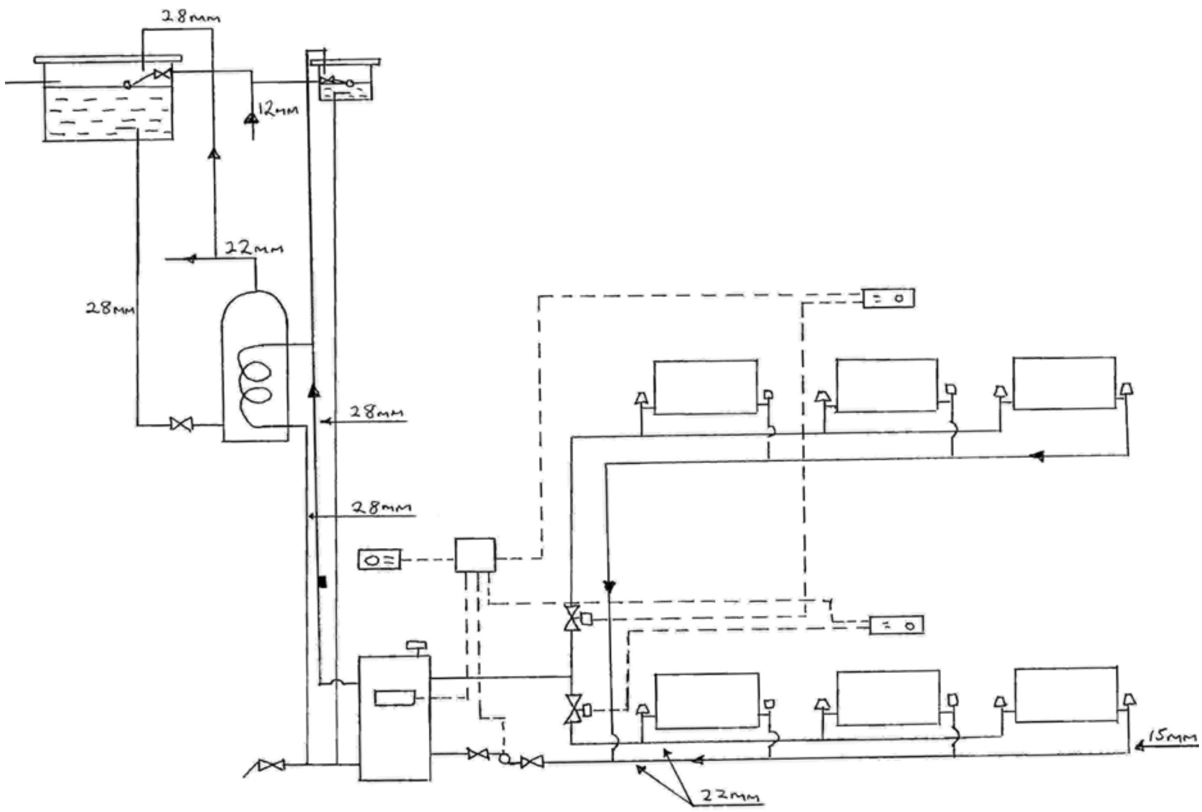




Any other relevant details

Ceist 8

(a) Oil fired central heating and hot water system

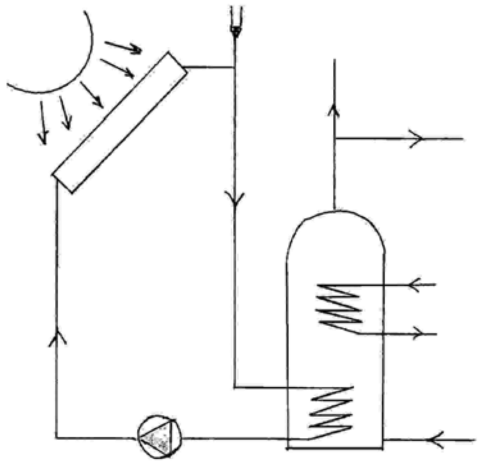


Control Valves: Handwheel valve or thermostatic valves, lockshield valves, three-port motorised valves

Independent Control: Timer, room thermostats, heating programmer

(b) Alternative hot water system

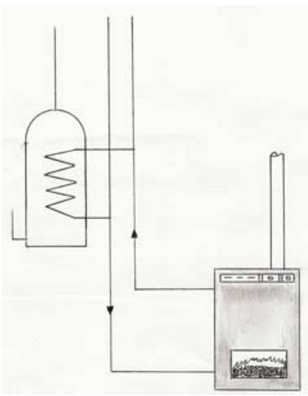
- Boiler in traditional wood burning stove - usually cast iron – carbon neutral and renewable
- Wood pellet boiler – self feed hopper
- Solar panel – flat panel or evacuated tube for water heating (see sketch)
- Heat exchange system

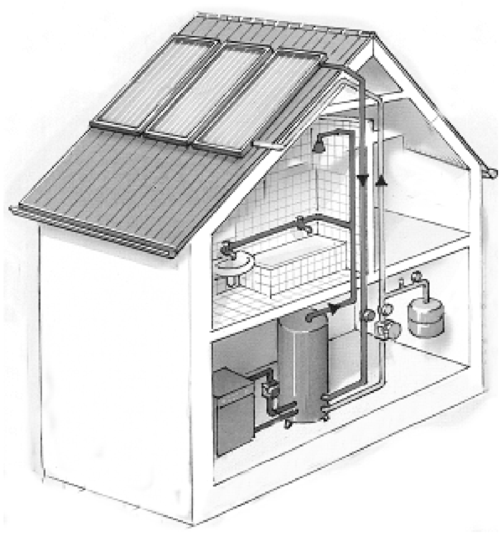


Advantages

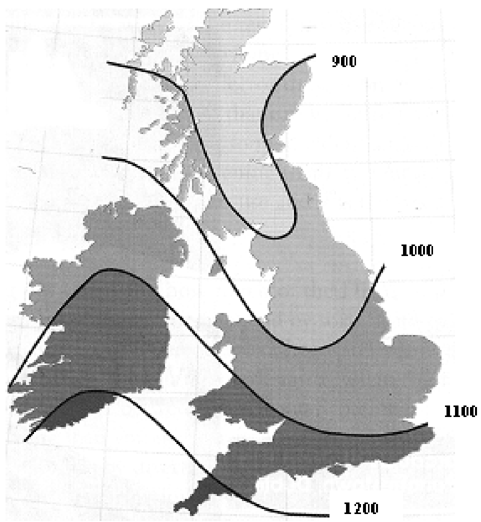
- Continuous supply of hot water over 10 month period approx if solar
- Substantial savings compared to oil or gas
- Cost will not increase
- Energy sources are renewable and sustainable
- Environmentally friendly, no CO_2 released
- Requires no extra space in house
- Can be supplemented by boiler
- Easy to install
- Maintenance free and long lasting

Wood-burning stove





Map showing annual total solar irradiation: kWh/m^2



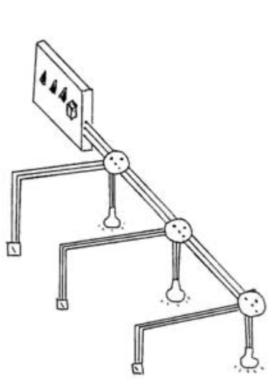
Any other relevant details

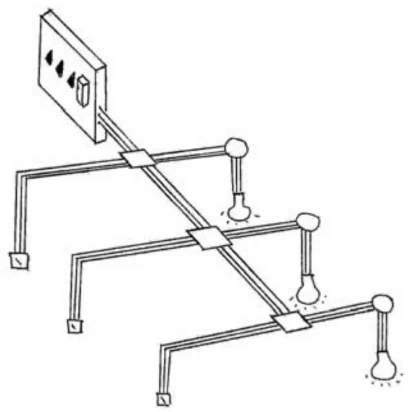
Ceist 9

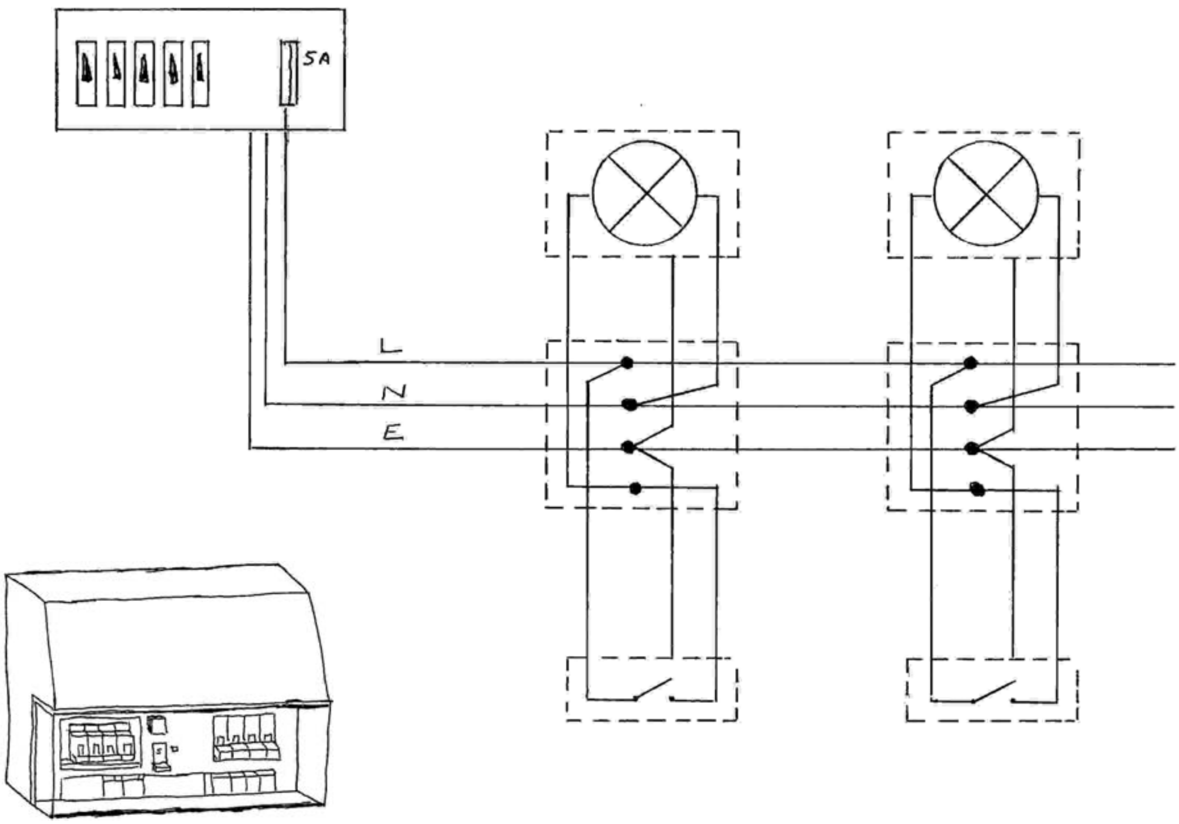
(a) Radial circuit for two lights and two switches

- Two possible radial circuits
  - Ceiling rose – loop-in system
  - Junction box system

- Characteristics
  - 1.5mm^2 Twin and earth cable
  - 1mm^2 can be used with restrictions, 1mm^2 often used in drop to switch
  - Brown – live, blue – neutral, yellow/green – earth

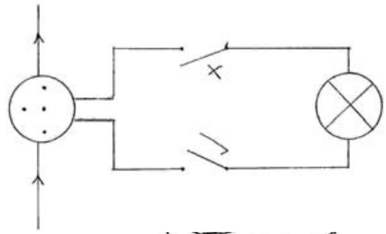






(b) ***Two safety features***

- 5A fuse or 6A miniature circuit breaker (MCB) connected to each circuit
- 30mA Residual Current Device, RCD
- 1200W maximum load per radial circuit, 10 x 100w lights
- Appropriately sized cables
- All switches, ceiling roses, junction boxes and light fittings including plastic fittings to be earthed – may change to metal fittings later
- No earth or neutral connection taken from another circuit
- Switch located on the live side of the light – never on the neutral side.



(b) **Two design features**

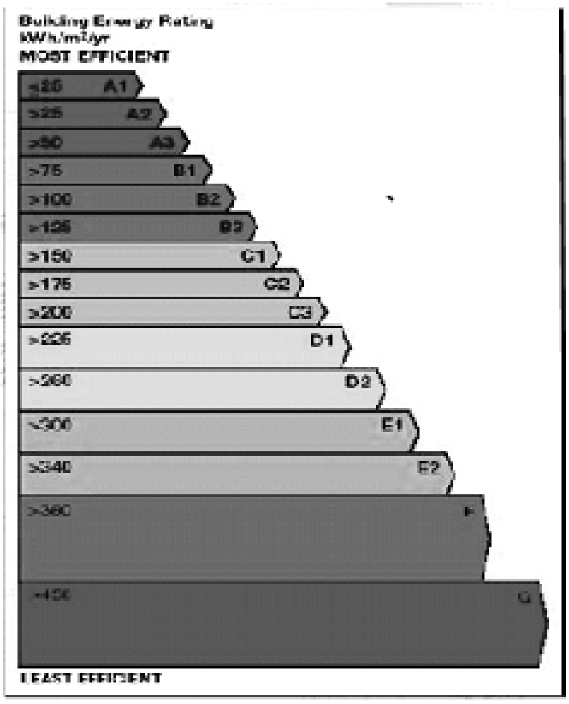
- Lighting controls
  - Automated control - occupancy sensors, motion sensors, timers to control on/off
  - Dimmer switches – vary output according to lighting requirements
- Localised lighting – task lighting with local lights (lamps) for task lighting, zone lighting circuits
- Use Compact Fluorescent Lamps (CFL's) and LEDs
- Photovoltaic cells and mini wind turbine to provide power
- Reduce need for artificial lighting by
  - Maximise use of daylight
  - Walls painted light colours to reflect 80% incident light

Any other relevant details

Ceist 10 (a) Designing a Passive Solar house

Insulation

- Passivhaus Institute, Darmstadt, Germany researched and developed design concept of the passive house along with the PHPP (Passive House Planning Paket) for calculating the overall energy requirements of a design. Passivhaus standard to become the EU standard
- Fundamentals of passive solar house:
- A1 Building Energy rating (BER) <25 kWh/m^2/yr (see BER rating scale opposite)
- Super insulated building envelope
- Airtight envelope
- High performance windows and doors – triple glazing, double draught proof

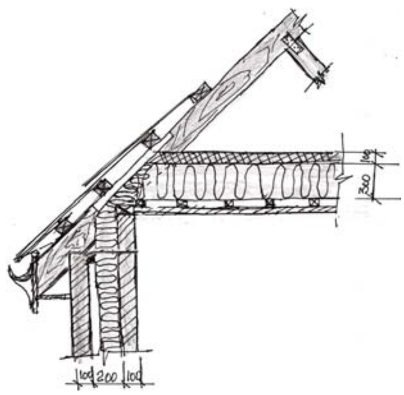


Passive House	U-Value
Walls	<0.175 W/m^2/K
Roof	<0.15 W/m^2/K
Floor	<0.15 W/m^2/K
Door & window frames	<0.8 W/m^2/K
Glazing (triple)	<0.15 W/m^2/K

Current Building Regs	U-Value
Walls	0.27 W/m^2/K
Roof - pitched	0.16 W/m^2/K
Roof – insulation on slope	0.22 W/m^2/K
Floor	0.25 W/m^2/K
Door & windows	2.00 W/m^2/K

- Low thermal bridging – very high spec detailing
- Significantly reduced structural air infiltration – blow door test to measure airtightness
- Optimal use of passive solar design and internal heat gains - compulsory renewable technology as pert of the energy provision in revised Building Regulations (2008)
- Efficient space and water heating - energy requirements of a house built to the Passivehaus Standard: a yearly space heating requirement of 15 kWh/m^2/K and an 86% reduction on current energy use
- Mechanical Heat Recovery and Ventilation (MHRV) system
- New levels of insulation to achieve much better U-values

Walls

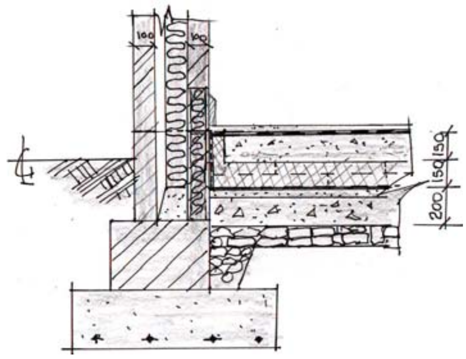


- Cavity wall construction to have cavity width 200mm to 300mm
- Walls to have U-value of 0.175 W/m^2/K
- Wider inner leaf in timber frame for greater thickness of insulation
- Taped joints at all junctions to increase air tightness
- Air leakage not to exceed 0.6 air changes per hour using 50Pascals overpressurisation and underpressurisation testing

Roof

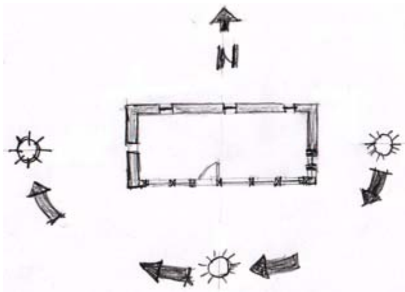
- Roof to have U-value of 0.15 W/m^2/K
- Greater width of rafter for insulation
- Insulation laid between rafters and across rafters – thickness of 400 mm to 600 mm
- Insulation such as rigid urethane board fitted to underside of rafters where attic has living space
- All joints taped to increase air tightness

Floors

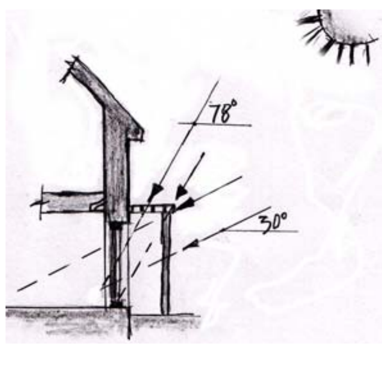


- Floor to have U-value of 0.15 W/m^2/K
- Two layers of floor insulation, joints staggered and taped to prevent thermal bridges
- Edge insulation to floor slab
- Insulated internal blockwork from foundation slab to obviate thermal bridge (sketch)
- Insulate the floor slab to prevent heat loss into ground
- Finish floor materials to have thermal mass, such as quarry tiles, terra cotta tiles etc.
- Taped joints at junctions to increase air tightness

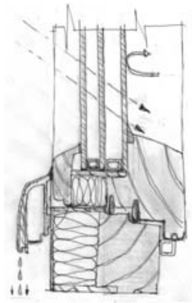
Orientation and shade



- East west orientation allowing longest facade of house facing south, as shown
- Triple glazing low-e argon filled to the south to maximise solar gain
- Reduced glazing to the north
- Living rooms on the southern elevation
- Utility and circulation spaces on the northern elevation
- Correct orientation can achieve 30% saving of fossil fuels
- Compact form to minimise surface to volume ratio
- Balcony, large roof overhang, brise-soleil to shade and reduce overheating in summer
- To prevent overheating provide shading devices - blinds, awnings, roof overhang

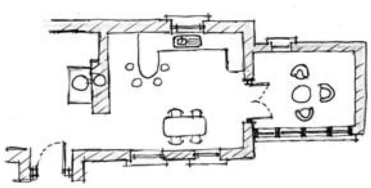


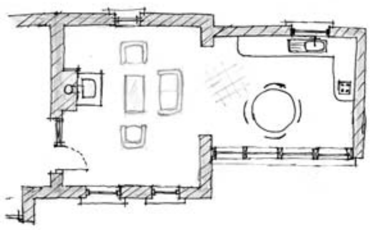
Energy efficient glazing and frames for passive house standard



- Windows should be appropriately sized - larger to south, small to north
- Use high performance glazing - triple glazed, low-e, argon filled
- U-value of frames to be 0.8 $W/m^2/K$ and of glass 0.15 $W/m^2/K$
- Provide shutters, blinds, curtains, overhangs awnings, brise-soleil, to shade and prevent overheating
- Low-emissivity (low-e) coating on inside of outer two panes reduces heat loss back out through the glass
- Frames to be insulated and thermally broken to prevent heat loss through frame
- Double rebates and double weather gaskets to improve airtightness of windows
- Many such windows are outward opening, do not reduce room space

(b) Suggested layout of rooms adjoining sunspace to maximise solar gain





- Most frequently used living areas should directly adjoin sun space to maximise solar gain
- Provide direct access from living areas to sunspace
- Multi function space e.g. kitchen/dining/study
- If double glazed, provide isolating doors to sunspace to store heat gain at night in adjoining rooms
- If triple glazed, may be open plan design
- Internal mass in walls and floors to store heat gain
- Most time spent in living rooms, optimise benefit of solar gains
- Pleasant atmosphere in open plan spacious living areas
  Any other relevant details

Ceist 10 (Alternative)

Points may include:

All we ask is that they keep us warm and dry and protect us from intruders

- External envelope fulfils these functions – traditional breathing walls - thick walls of stone, earth or brick with lime plaster - allow internal moisture to pass through and thick walls with lime plaster to absorb rain
- Mass of thick walls acts as heat sink, stores and releases heat
- Modern walls - two leaves with cavity - external leaf absorbs moisture, cavity to prevent ingress of moisture, insulation to inside leaf to keep inner leaf warm
- Single leaf with vapour barriers, insulation and waterproof outer skin
- Secure, sturdy doors and windows for protection against intruders

Waste of energy –

- Design without regard to energy costs results in huge carbon footprint using imported materials - sourced from all over world – e.g. tropical and American hardwoods, Canadian and Scandinavian softwoods, marbles, tiles from China, slates from Spain, steels from Germany, huge energy and transportation costs and carbon footprint
- An new environmental awareness requires a new design paradigm with designs based on use of local materials and skills
- Lower transportation costs, reduction of CO_2, houses to reflect the surrounding environment, built using local materials - stone, earth, clays, woods – a new local

- Modern interpretation of vernacular as inspiration for new house design, unmistakably modern but linked to existing vernacular traditions

Cheap fuel has made us lazy

- poor environmental awareness, pattern book house designs with no regard for local sources or local palette of materials and skills
- energy cost of transportation or of embodied energy of materials, impact of climate change

Learn from our architectural heritage of vernacular buildings and add to this our contemporary know-how and intellectual cleverness

- Architect with a sense of the local to design and specify materials through lens of the local
- Vernacular buildings of modest scale, careful use of resources-most sourced locally
- Respectful of traditional deep knowledge and observation of place, the geomantic art of siting a house properly - siting for sun, shade and shelter
- Skills supplied by local workforce, designers, masons, carpenters, thatchers, weavers, etc
- Vernacular- restrained use of materials giving clean lines and simplicity of form
- Contemporary know-how and intellectual cleverness - such as passive solar design, use of modern glass technology and orientation to store sun's energy, airtight and mechanical ventilation, heat recovery (MVHR) to control flow of fresh, preheated air,
- Smart metering and smart technologies to reduce energy needs e.g. LEDS for lighting
- Purposeful eco- friendly design in choice of materials having low embodied energy to reduce carbon footprint, use of green building techniques, elimination of materials using toxins such as toxins in preservatives, glues, varnishes, paints etc.
- Size and scale of house to met needs of inhabitants, no trophy houses – modesty of scale
- Building for longevity, accessible to all, open plan multi-use room layout, no long dark corridors, re-use and recycling of materials
- Use of renewable energies - solar panels to heat water, on-site generation of electricity where possible, A-rated appliances, energy saving electrical fittings and appliances
- Smart metering to raise awareness of energy use and energy conservation
- Water conservation, low-use water appliances - toilets, washing machines, shower heads etc. – separate storage and use of rainwater for toilets, reuse of grey water
- Natural means of sewage treatment - polishing filters and reed beds

Houses as balanced part of landscape not hosted on it

- Careful siting, choice of materials, scale and form of house, use of local materials, reduction in energy needs, eco-friendly design, low-environmental impact houses

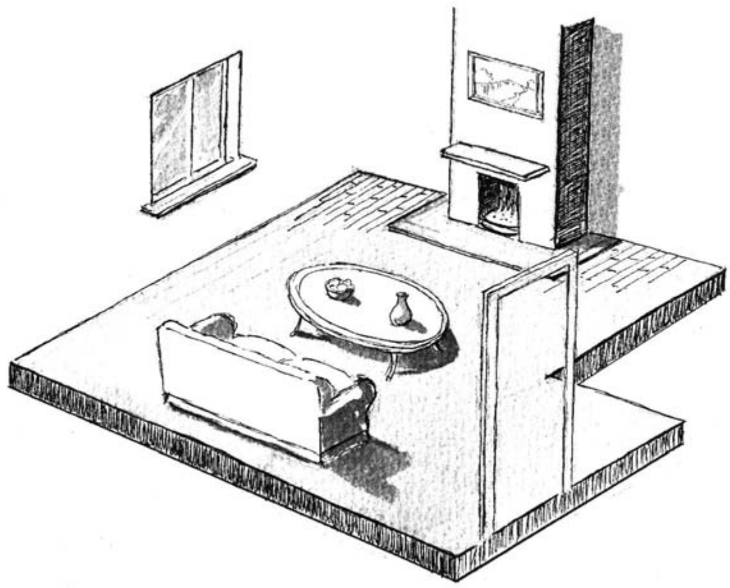
Three recommendations for sustainable housing development…such as

- Energy analysis of any design…low embodied energy design
- Ethical designing, energy consideration for future generations
- Non-toxic materials
- Modest scale to meet needs – reduction in needs, a light footprint on the planet
- Build close to amenities where possible – save energy
- Build in clusters where possible – community life, safety
- Use sustainable energies –wind, solar, geothermal etc.
- Grants to encourage sustainable design – especially for old and poor

Any other relevant recommendations supported by cogent argument and development.

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Staidéar Foirgníochta
Teoiric – Ardleibhéal



Construction Studies
Theory – Higher Level

Scéim Mharcála
Marking Scheme

CEIST 1

PERFORMANCE CRITERIA	MAXIMUM MARK
Any 12 points x 4 marks (Drawing 3 Annotation 1)	
Extended foundation	**4**
Party wall	**4**
Hardcore min 150 mm	**4**
Blinding sand	**4**
Radon barrier/DPM	**4**
100/150 mm Polystyrene Insulation or equivalent	**4**
150mm concrete floor	**4**
Woodblock floor	**4**
Hearth	**4**
Fireback and Fill	**4**
Flue gathering / lintel	**4**
Smoke shelf	**4**
Throat	
Flue liners	
Fill around flue liners	
Four typical dimensions	**4**
Scale & Drafting	**4**
(b) ***4 marks for indicating how flue liners are joined***	
Design detail	**4**
TOTAL	**60**

Ceist 2

PERFORMANCE CRITERIA	MAXIMUM MARK
(a) ***Two*** *possible risks to personal safety (3x6 marks each)*	
Fitting a concrete window cill on the second storey of a dwelling house	**3** **3**
Laying Pipes in a deep trench	**3** **3**
Excavating in an area where there are underground cables	**3** **3**
(b) ***Two safety*** *precautions to eliminate each risk (3x8 marks each)*	
Fitting a Concrete Cill Notes Sketch	**4** **4**
Laying Pipes in a deep trench Notes Sketch	**4** **4**
Excavating in an area where there are underground cables Notes Sketch	**4** **4**
(c) ***Two reasons why younger workers are more vulnerable to accidents (2x3 marks each)***	
Discussion of risk number 1 Discussion of risk number 2	**3** **3**
Three strategies to encourage a safety culture in younger workers (3x4 marks each) Strategy 1 Strategy 2 Strategy 3	**4** **4** **4**
Total	**60**

Ceist 3

PERFORMANCE CRITERIA	MAXIMUM MARK
(a) *Outline 3 areas (3 × 6 marks each)* ***Correct design detail (3 × 6 marks each)***	
Area 1. Thermal Bridge.	**6**
Correct design detail.	**6**
Area 2. Thermal Bridge.	**6**
Correct design detail.	**6**
Area 3. Thermal Bridge.	**6**
Correct design detail.	**6**
(b)*Two methods of upgrading thermal properties (2x12 marks each)*	
Design sketch	**6**
Design note	**6**
Design sketch	**6**
Design note	**6**
Total	**60**

Ceist 4

PERFORMANCE CRITERIA	MAXIMUM MARK
(a) ***Three Functional Requirements (3x8 marks each)*** ***(Sketch or note only maximum 6 marks)***	
Note and Sketch 1	**8**
Note and Sketch 2	**8**
Note and Sketch 3	**8**
(b) ***On-Site Waste Water Treatment System (2x12 marks each)*** ***Dimensions (2 marks each)***	
Sketch of Typical Waste Water System	**12**
Note on Typical Waste Water System	**6**
Three Main Dimensions	**6**
(c) ***Test :- Note and Sketch (2x6 marks each)***	
Note	**6**
Sketch	**6**
Total	**60**

Ceist 5

PERFORMANCE CRITERIA	MAXIMUM MARK
(a) ***12** points x **3 marks** for each point*	
Correct Tabulation	**3**
Single Glazing	**3**
Internal Surface	**3**
External Surface	**3**
Total Resistance for Single Glazing	**3**
U-Value for Single Glazing (Formula 1 mark)	**3**
Double Glazing	**3**
Space	**3**
Internal Surface	**3**
External Surface	**3**
Total Resistance for Double Glazing	**3**
U-Value for Double Glazing (Formula 1 mark)	**3**
(b) (3 x 6 marks) 1 mark for each of the following: ***Formula, Apply Formula, Heating Period, Kj Lost per Annum, Litres per Annum, Cost***	
Annual Cost of Heat loss for Single Glazing	**6**
Annual Cost of Heat Loss Double Glazing	**6**
Annual Cost of Heat Loss Low-e Double Glazing	**6**
(c) ***(3 x 2 marks)*** **RECOMMENDATION**	**2**
REASON 1 **Reason 2**	**2** **2**
Total	**60**

CEIST 6

PERFORMANCE CRITERIA	MAXIMUM MARK
(a) Siting a House (4 x9 marks) Sketch or note only max 7 marks	
Point 1 Note & Sketch	**9**
Point 2 Note & Sketch	**9**
Point 3 Note & Sketch	**9**
Point 4 Note & Sketch	**9**
(b) ***3 Features for low environmental impact (3x8 Marks)*** ***Sketch or note only max 6 marks***	
Feature 1 Note & Sketch	**8**
Feature 2 Note & Sketch	**8**
Feature 3 Note & Sketch	**8**
Total	**60**

CEIST 7

PERFORMANCE CRITERIA	MAXIMUM MARK
(a) Any 8 points x 5 marks each *(Drawing 4 Annotation 1)*	
Cut String Riser Thread Newel Post Thread Support Blocks Handrail Glue Blocks Balusters Jointing of string to Newel post Jointing of Handrail to Newel post Jointing of Balusters to Thread Jointing of Balusters to Handrail	**5** **5** **5** **5** **5** **5** **5** **5**
Typical Dimensions of 4 Structural members	**4**
Scale and Drafting	**6**
(b) *Two design features that ensure the stairs is safe (2 x 5 marks)*	
Notes and Sketches 1	**5**
Notes and Sketches 2	**5**
Total	**60**

CEIST 8

PERFORMANCE CRITERIA	MAXIMUM MARK
(a) Any 8 x 4marks (Sketch 3 Annotation 1)	
Rising main + Ballcock + overflow – *any two*	**4**
Cold water storage tank + cold feed	**4**
Indirect cylinder + expansion pipe	**4**
Primary flow and return	**4**
Hot water take-off	**4**
Boiler	**4**
Radiators	**4**
Header or expansion tank	**4**
Flow and return pipes to radiators	
Valves (2)	
Sizes of pipework (2)	
Indicate : Independent Control : Control Valves (2x4 marks)	
Independent Control	**4**
Control Valves (2)	**4**
(b) Alternative System	
Sketch: Energy source, storage, heating circuit	**12**
Advantage 1	**4**
Advantage 2	**4**
Total	**60**

CEIST 9

PERFORMANCE CRITERIA	MAXIMUM MARK
(a) Any 10 x 3marks (Sketch 2 Annotation 1)	
Live Earth Neutral Ceiling Rose x2 Light x2 Switch x2 Live wiring to switch Live wiring to light Earth to Light Earth to Switch Neutral to Switch Neutral to Light Consumer Unit	**3** **3** **3** **3** **3** **3** **3** **3** **3** **3**
Sizes and Colour Coding (2x3 marks)	
Typical Sizes	**3**
Colour Coding	**3**
(b) Safety Features (2 x 6 marks)	
Note & Sketch 1 Note & Sketch 2	**6** **6**
(c) Economical use of electricity (2 x 6 marks)	
Note & Sketch 1 Note & Sketch 2	**6** **6**
Total	**60**

Ceist 10

PERFORMANCE CRITERIA	MAXIMUM MARK
(a) ***Design of Passive Solar House (3x8marks)*** ***(Sketch or note only maximum 6 marks)***	
Insulation Note and Sketch	**8**
Orientation and Shade Note and Sketch	**8**
Energy Efficient Glazing and Frames Note and Sketch	**8**
(b) ***Design Layout (2x10marks)***	
Note	**10**
Sketch	**10**
(c) ***2 Reasons for Layout (2x8marks)***	
Reason 1	**8**
Reason 2	**8**
Total	**60**

Ceist 10 (*Alternative*)

PERFORMANCE CRITERIA	MAXIMUM MARK
Discussion of Statement (3x10 marks)	
Discussion – point 1 Discussion – point 2 Discussion – point 3	**10** **10** **10**
Recommendations and Discussion (3 x10 marks)	
Recommendation and discussion 1	**10**
Recommendation and discussion 2	**10**
Recommendation and discussion 3	**10**
Total	**60**

Coimisiún na Scrúduithe Stáit
State Examinations Commission

LEAVING CERTIFICATE 2008

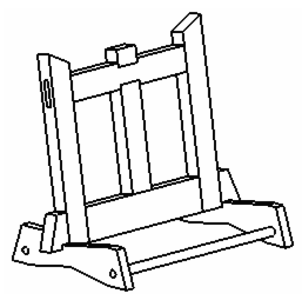
MARKING SCHEME

CONSTRUCTION STUDIES –

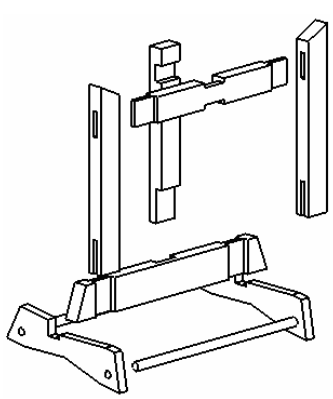
Practical Test

Construction Studies 2008
Marking Scheme – Practical Test

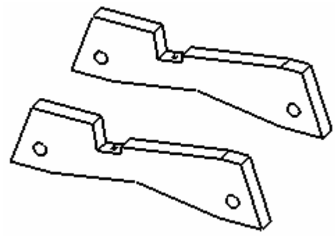
Note:
The test piece is to be hand produced by candidates without the assistance of machinery – except a battery powered screwdriver which is allowed.
Where there is evidence of the use of machinery for a particular procedure a penalty applies. The component is marked out of 50% of the marks available for that procedure.

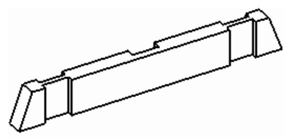


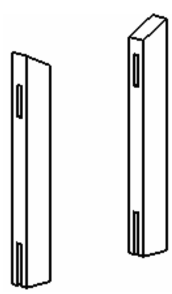
A	OVERALL ASSEMBLY	MARKS
1	Overall quality of assembled artifact	**9**
2	Dowels located and fitted correctly	**4**
3	Design and applied shaping of edge • design *(4 marks)* • shaping *(4 marks)*	**8**
	Total	**21**

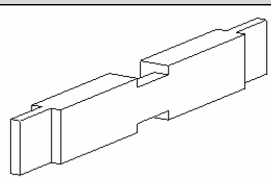


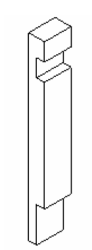
B	MARKING OUT	Marks
1	Left side - vertical: • joints *(2 x 2 marks)* • slope *(1 mark)*	**5**
2	Right side - vertical • joints *(2 x 2 marks)* • slope *(1 mark)*	**5**
3	Bottom rail • joints *(3 x 2 marks)* • slopes to ends *(2 x 1 marks)*	**8**
6	Top rail • tenons *(2 x 2 marks)* • halving *(3 marks)*	**7**
7	Middle vertical • top halving • bottom halving *(2 x 2 marks)*	**4**
	Left leg to frame • notched joint *(4 x1 marks)* • slopes *(4 x1 marks)*	**8**
	Right leg to frame • notched joint *(4 x1 marks)* • slopes *(4 x1 marks)*	**8**
	Total	**45**

LEGS TO FRAME	C	PROCESSING	Marks
	1	Shaping sloped ends ***(4 x 1 mark)***	**4**
	2	Shaping bottom ***(4 x 1 mark)***	**4**
	3	Shaping top - long slope ***(2 x 1 mark)*** • short cuts to notch ***(2 x 2 marks)*** • pare trenches ***(2 x 1 mark)***	**8**
	4	Drilling and countersinking screws ***(2 x 2 marks)***	**4**
		Total	**20**

BOTTOM RAIL	D	PROCESSING	Marks
	1	Shaping sloped ends ***(2 x 1 marks)***	**2**
	2	Trenches • Cut and pare ***(5 x 3 marks)***	**15**
		Total	**17**

TWO SIDES	E	PROCESSING	Marks
	1	Shaping sloped ends ***(2 x 1 mark)***	**2**
	2	Two mortices ***(2 x 5 marks)***	**10**
	3	Two bridles ***(2 x 5 marks)***	**10**
		Total	**22**

TOP RAIL	F	PROCESSING	Marks
	1	Two end tenons ***(2 x5 marks)***	**10**
	2	Centre trenches ***(3 x3 marks)***	**9**
		Total	**19**

MIDDLE RAIL	G	PROCESSING	Marks
	1	Trench	**3**
	2	Tee-halving • sawing with grain ***(2 marks)*** • sawing across grain ***(1 mark)***	**3**
		Total	**6**