Coimisiún na Scrúduithe Stáit
State Examinations Commission

Scrúdú Ardteistiméireachta 2006

Staidéar Foirgníochta

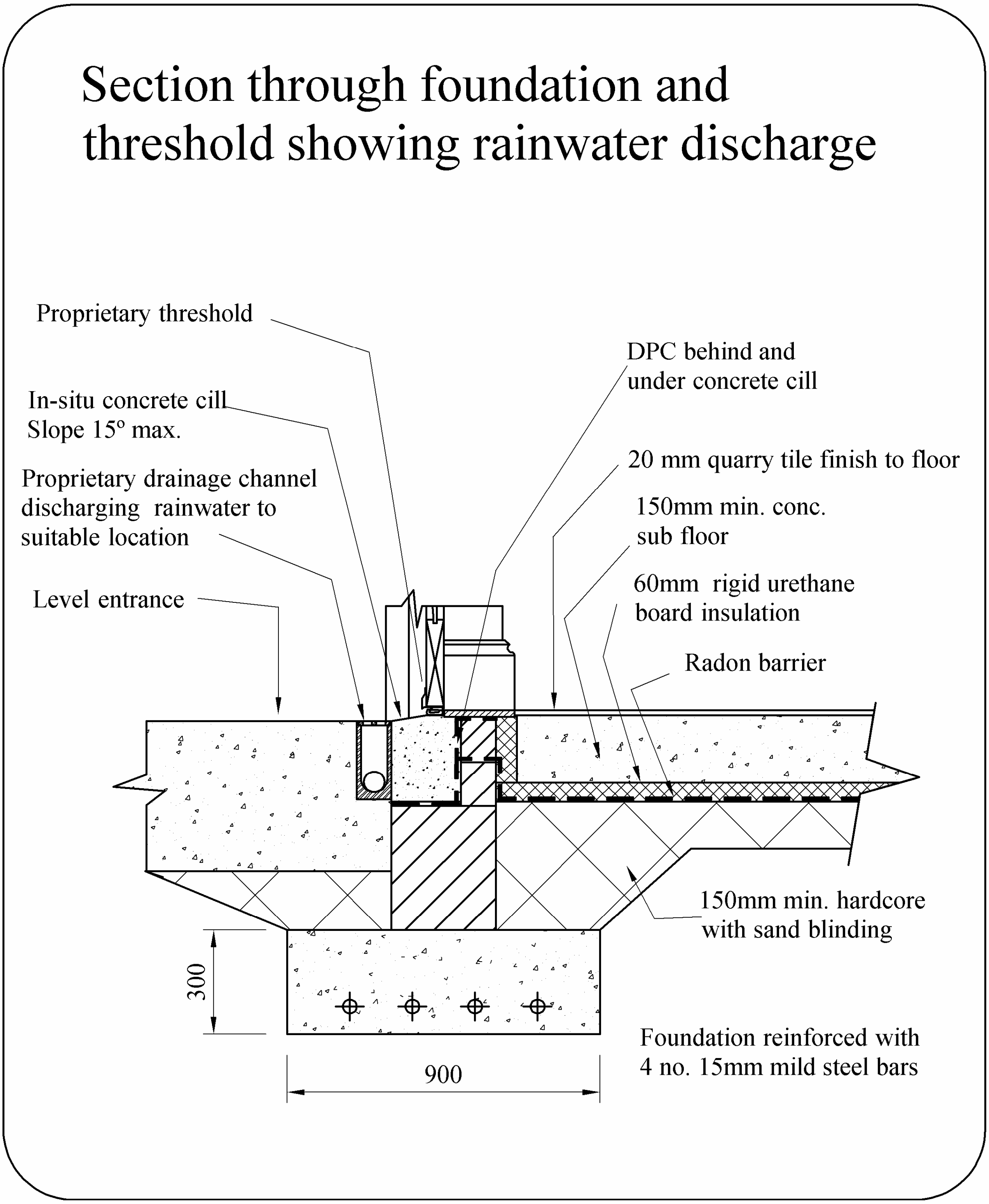
Teoiric – Ardleibhéal

Construction Studies

Theory – Higher Level

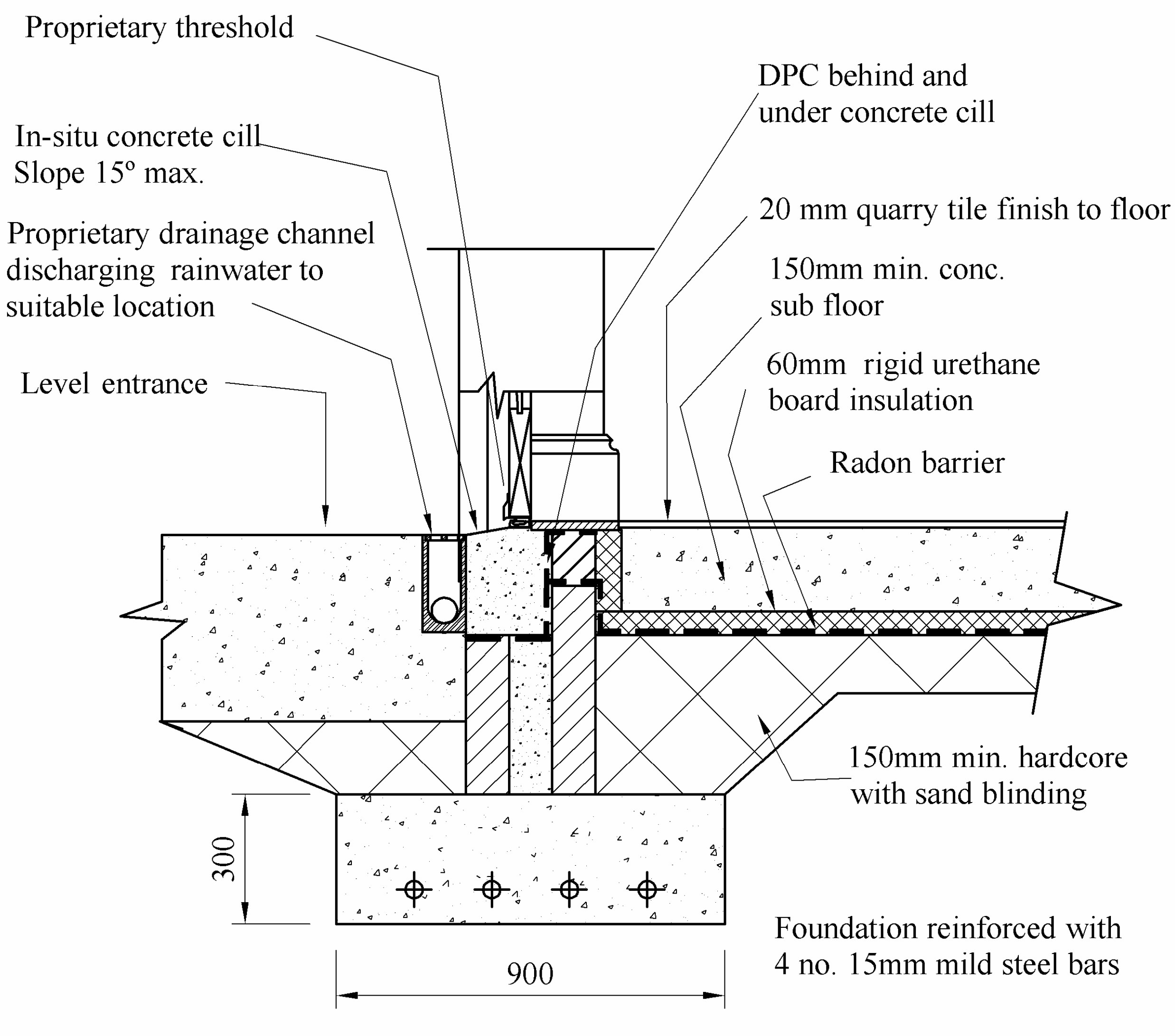
FREAGRAÍ
SOLUTIONS

Ceist 1


Section through foundation and threshold showing rainwater discharge
Proprietary threshold
In-situ concrete cill
Slope 15° max.
Proprietary drainage channel discharging rainwater to suitable location
Level entrance
DPC behind and under concrete cill
20 mm quarry tile finish to floor
150mm min. conc. sub floor
60mm rigid urethane board insulation
Radon barrier
150mm min. hardcore with sand blinding
300
900
Foundation reinforced with 4 no. 15mm mild steel bars

Ceist 1 – Alternative Detail

Section through foundation and threshold showing rainwater discharge



Ceist 2
(a) ***Risks associated with:***

Scaffolding

- Collapse due to instability. Scaffolding placed on a soft or uneven surface. Inadequate bracing/ties
- Risk of accident to member of the public
- Risk of a fall due to inadequate guard rails. Missing or loose boards
- Incorrect use of scaffolding. Overloading with building materials such as blocks/brick
- Failure to tie ladders to the scaffolding increasing the risk of a fall
- Object falling from scaffold on workers

Deep excavation

- Excavation and trenches deeper than 1.25 deep can cause serious accidents from the collapse of their side resulting in the injury or crushing of workers in the trench.
- Risk of people falling into excavations.
- Risk the excavation might undermine other structures and cause them to become unstable or collapse.
- Ensure all underground/overground services are located before excavation. Risk of hitting underground cables which could result in electrocution.

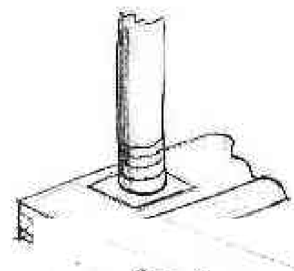
Use of electrical tools out of doors

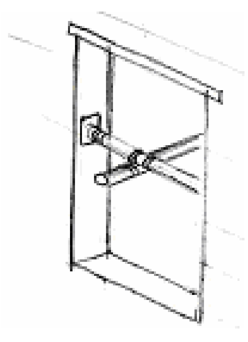
- Using electrical tools outside on a wet day may result in electrocution
- Use of inappropriate cabling and a 220 volt supply not suitable for outdoor use
- All power tools on site must use a 110 volt supply
- Failure to use appropriate safety equipment such as earmuffs, safety glasses, masks - resulting in personal injury
- Risk of electrocution as a result of cutting the power cord by accident
- Where possible, use cordless tools.

Any other relevant information

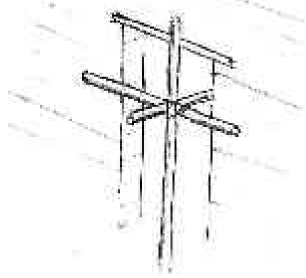
2(b) ***Scaffolding***

Detail A. shows a timber sole plate which distributes the load evenly. This prevents part of the scaffolding sinking on soft ground.

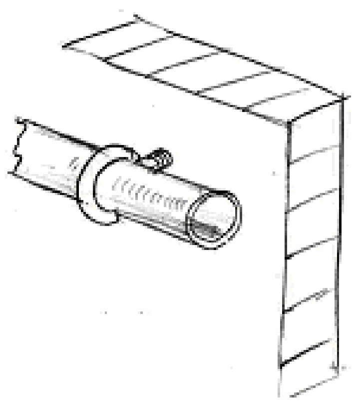




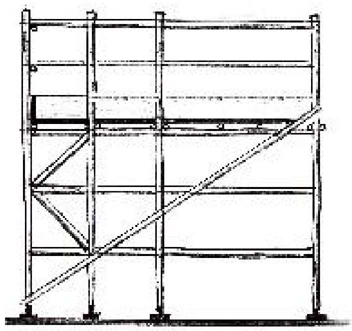
Detail B. The main way of achieving stability is to tie them to the structure they are serving. A through tie is secured through a window or other opening.



Detail C. Reveal tie which is wedged in the reveal of a window or other opening. They are not as strong as other ties. No more than 50% of the ties can be reveal ties.



Detail D. Here a drilled in anchor is used to secure the scaffold to the structure.

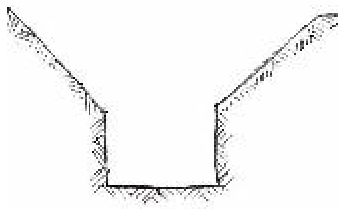


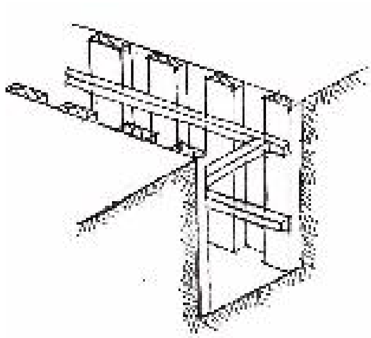
Detail E.
Use of toe boards and handrails to prevent objects falling from platform. Diagonal bracing and triangulation to strengthen the overall structure.

Other relevant information

(b) ***Deep excavation***

Battering back requires the sides of the trench to be sloped back to a safe angle, making the sides of the excavation stable and thereby preventing the sides of the excavation from collapse.





Trench support

This gives temporary support to the wall of a trench by placing sheeting along its walls with sufficient props both vertically and horizontally to support the walls of the excavation.

Exclusion zone

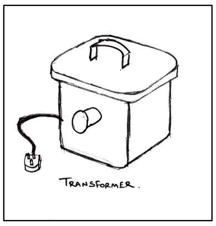
A barrier should be erected around an open trench to reduce the risk of an accidental fall. This will also keep people away from working machinery.

No undermining
Before work begins the adjacent area should be checked to ensure that the excavation will not cause other structures to become unstable. Propping and underpinning may be required to secure the structure before work begins.

Any other relevant information

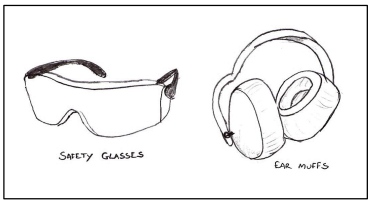
Use of electrical tools out of doors

110 volt power supply.



Tools that use a 110 volt power supply must be use on site. The reduced current (over 220 volt) greatly reduces the risk of fatal electrocution. All tools should be double-insulated, properly earthed and serviced regularly.

Safety equipment



Power tools should always be used with suitable safety equipment. Goggles and other safety gear: a face shield, dust mask, hard hat, ear protection, gloves or safety shoes should be used depending on the situation. Keep cords out of your path or work area. Throwing the cord over your shoulder may help.

Water and Electricity do not mix

Keep electrical equipment covered and dry in between uses. Use waterproof cabling suitable for outdoor use and ensure all connections are sealed. When working outside with electrical power tools ensure that conditions are dry. Electricity always seeks a path to ground. All electrical contact accidents occur when a person accidentally becomes part of electricity's pathway to the ground. Water conducts electricity and can cause the operator (people also contain water) to become the path by which electricity returns to ground. This may electrocute the operator.

Any other relevant information

2(c) ***Benefits of having a safety statement for employees in the construction industry***

Under section 20 of the Safety, Health and Welfare at Work Act 2005, every employer should have a written programme to safeguard:

- The safety and health of employees while they work.
- The safety and health of visitors and other people who might be at the workplace and
- To provide a safer working environment.

Benefit to the employee.

- To identify hazards and to reduce the associated risk of injury.
- To reduce the risk of injury to employees on site and make the workplace a safer place Employers are obliged to carry out a safety audit to assess possible risks. The safety statement should outline how risks can be removed or reduced.
- A safety statement must also have an emergency plan outlined in the case of an accident. In the event of an emergency immediate action can be taken to ensure the treatment of the injured party.

- Safe system of work should be outlined with clear operating procedures. Employers are also obliged to provide appropriate information, training and supervision. They are also obliged to assess each employee's capabilities and give suitable work.

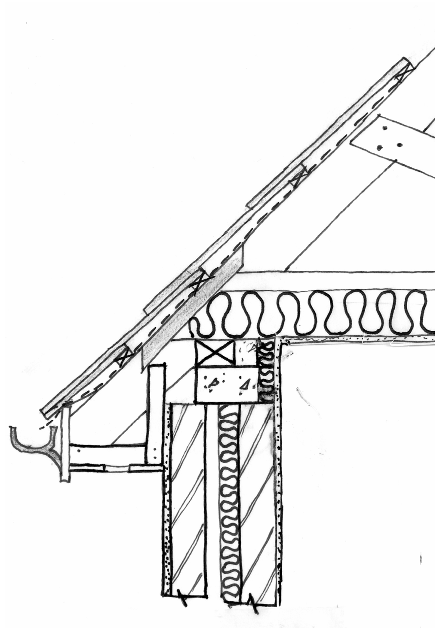
- Employers are also obliged to appoint a designated safety officer who has responsibility for reviewing and updating the safety plan on a regular basis. This is to identify new hazards and develop safe working practices to remove or reduce the associated risk.

- Employees are encouraged to take ownership of the safety statement and actively contribute to improving safety on site.

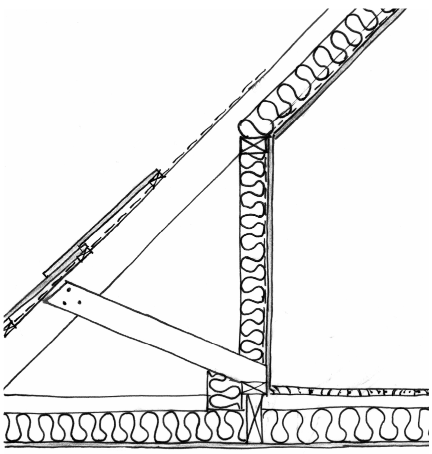
Ceist 3 (a)

Typical detail at eaves

- Air vent at eaves
- 1 $^{1}/_{2}$ slates at eaves
- Eaves ventilator
- Ceiling joist 230x50 or RSJ
- Wallplate 100x75
- Cavity closer (block on flat)
- 600x300 slate on
- 50x30 batten
- 16mm external plaster
- 15mm internal plaster
- 100mm internal block
- 100mm external block
- 100mm expanded polystyrene insulation or equivalent in cavity wall



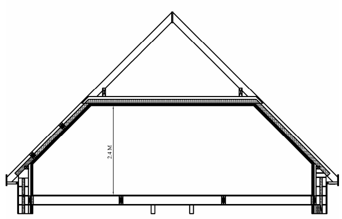
Typical detail at strut/purlin

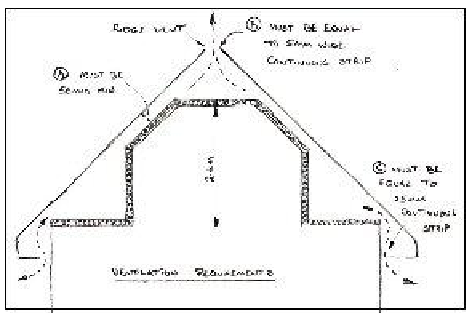


- Rafter 200x50mm
- Purlin 100x50
- Strut 100x50
- Brace 100x50
- Plasterboard (screwed to rafter)
- Vapour control layer behind plasterboard.
- Runner 100x75 - typical
- 20mm T&G flooring or equivalent.
- Solid bridging (fire block)
- 50mm ventilation space
- Insulation min, 100mm urethane board to achieve U-value of 0.25Wm^{2} °K

Insulation and Ventilation

Insulation can vary from 50mm upwards depending on insulation type. Ideally the roof structure should have a U-value of not more than 0.25W/M^{2}K

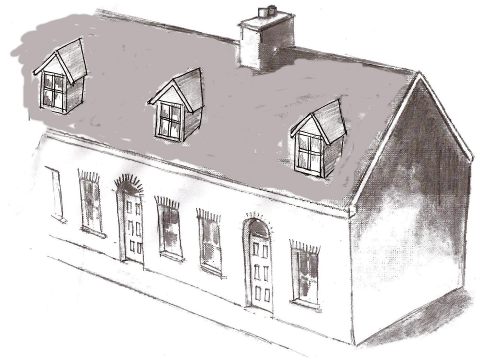




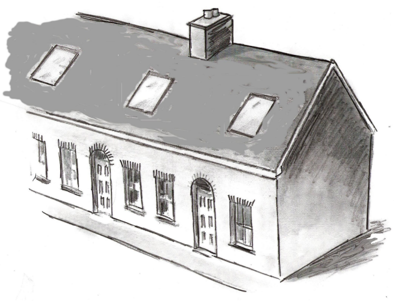
(b) ***Factors to consider in redesigning the dormer windows.***

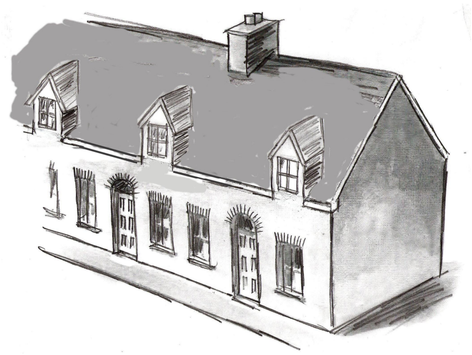
- Dormers should be in proportion and in keeping with the existing terrace.
- Windows should have a vertical emphasis and the design should be in keeping with the existing house windows. The use of white PVC, side cladding, box fascias and soffits should be avoided.

- The design should be simple and the dormers should be arranged in a symmetrical way to reflect the symmetry of the original fenestration.
- Simple lines complement the original simplicity, charm and grace of original terrace
- Use of rain water pipes must be carefully considered.
- Should conform to existing fire and safety legislation.



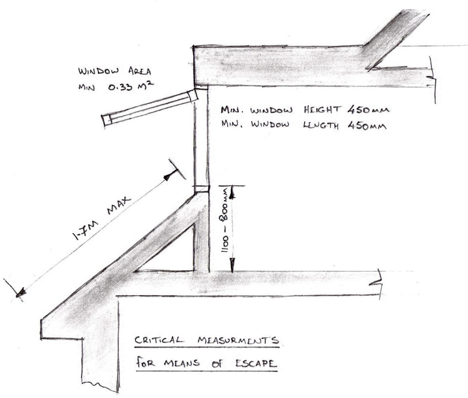
Possible solutions and other as appropriate





Regulations regarding fire and means of escape

- The bottom of the window opening must be between 800mm and 1100mm above floor level.
- The window opening must have a min clear unobstructed area of 0.33 m^2
- The bottom of the window must be no more than1.7m from the eaves. Top hung windows should be capable of remaining in the open position.



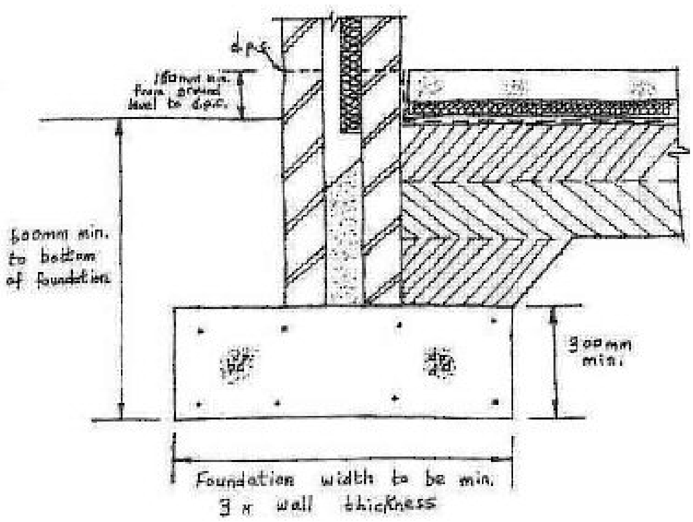
CEIST 4

(a) Strip Foundation

4 (b)

Traditional Strip Foundation - reasons

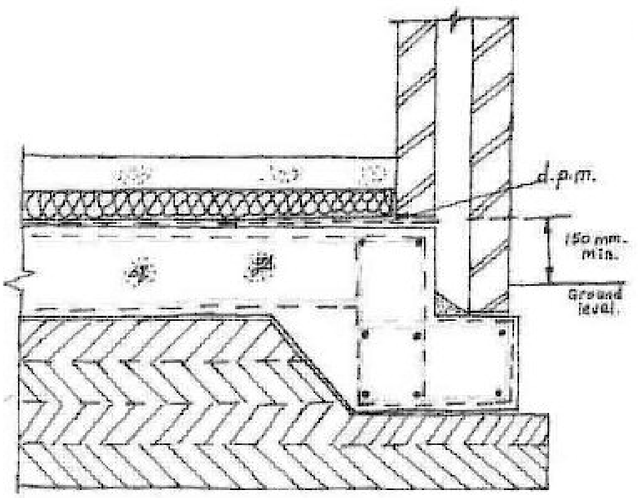
- Suitable for moderately firm clay sub soil of this type,
- Easily constructed, easily filled and levelled
- Economical in terms of materials, especially aggregate, cement and mild steel, therefore a light ecological footprint in that there is no over specifying of materials
- Spreads the load of wall using minimum materials
- Economical in terms of labour.



Raft Foundation

Raft Foundation - reasons

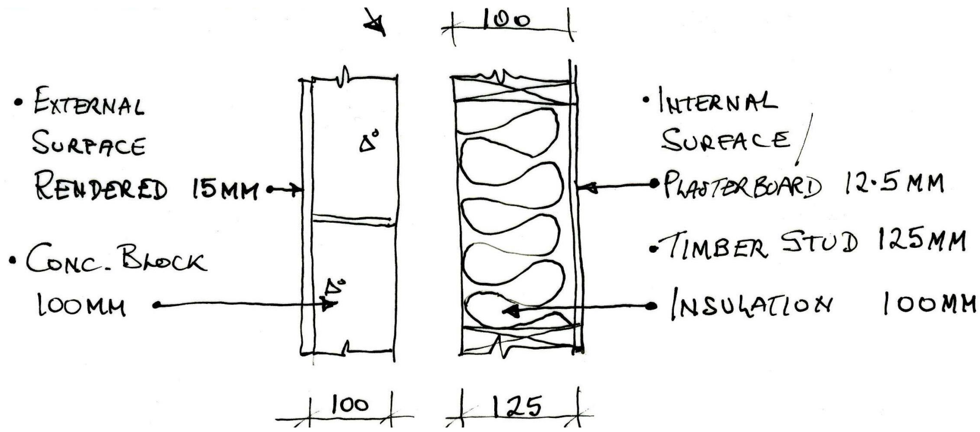
- Suitable for soils of poor load bearing capacity
- The loads are spread evenly over the entire area of the house which will reduce settlement
- Mesh reinforcing reduces possibility of differential settlement
- Less deep excavation needed
- Easy to set-out – monolith- and level



4 (c) Strength of concrete in foundation

- Poor design detailing e.g. reinforcing too near the surface, incorrect sizing, incorrect concrete strength specification - should be designed by structural engineer,
- Placing of blockwork too soon on fresh foundation slab
- Excessive amounts of chemicals/sulphates in soil
- Incorrect depth of foundation - possibility of further settlement
- Insufficient reinforcing, misplacing of reinforcing,
- Incorrect Water/Cement ratio
- Insufficient vibration/compaction of concrete
- Poor /dirty aggregate, incorrect proportions and sizing of aggregates
- Placing of concrete in conditions that are too hot – evaporation of water before setting
- Placing of concrete in conditions that are too cold – freezing of water before setting.

Ceist 5



Material Element	conductivity k	resistivity r	Thickness mtrs. t	Resistance R
Ext. So	____	____	____	0.048
Ext. Plaster	____	2.170	0.015	0.03255
Ext. Block	1.320	____	0.100	0.0757
Cavity	____	____	____	0.170
Stud Part.	____	____	____	____
Ureth Bd	0.023	____	0.100	4.3478
Int. Plaster	0.16	____	0.0125	0.0781
Int. Si	____	____	____	0.104
				4.856 Total R

U = 1/Total R = 1/4.856 = 0.2059 W/M^2 °C.

U Value = 0.21 W/M^2 °C.

Formula: U = 1/Total R; R = t/k; R = Tx r

Ceist 5 (b)

Formula: U Value x Area x Temp Diff = Heat Loss

0.21 x 125 x 12 = 315 Watts or 3/5 J.S.

Note: Calorific Value of 1 Litre Oil = 37350 K.J.

One Litre lasts for $\frac{37350 \text{ K.J.}}{0.315 \text{ K.J./S}}$ = 118571.4 Seconds

118571.4 Seconds = 32.9 hours

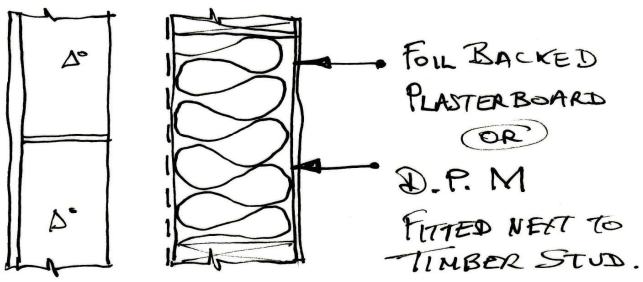
Heating Period of Timber Framed House = 12 hrs x 7 days x 40 weeks = 3,360 hours

Annual cost of heat lost:

Oil used: $\frac{3360}{32.9}$ = 102.1 litres

Oil costs 65cent per litre; Cost p/ a = 102.1 litres @ 65c per litre = **€66.36 Heat Lost / p/a**

Ceist 5 (c)



Interstitial Condensation

Condensation occurs when warm moisture-laden air – generally found in kitchens or bathrooms – comes into contact with cold surfaces at, or below, the dew point of the air. "Dew point" refers to the temperature at which saturated air condenses. Condensation that occurs **in** the wall or partition is known as interstitial condensation. Water vapour present on the insulation reduces its effectiveness by conducting heat out of the building faster than if the insulation were dry. Damp moist air inside the timber partition generates mould and fungal growth as well as causing wet rot. Interstitial condensation may be prevented by placing a sheet of 500 gauge polythene on the inner surface of the partition next to the plaster board – on the warm side of the insulation. Alternatively, foil backed plasterboards may be used. Both methods prevent the passage of warm, saturated air from passing into the partition wall and therefore eliminate any possibility of interstitial condensation occurring.

Ceist 6(a)

Local authority planning guidelines for new rural dwellings:

1. Impact on the rural landscape.
2. Traditional building forms, scale and features.
3. Traditional materials and finishes.
4. Landscaping of the site.

1. Impact on the rural landscape.

- Examine and replicate alignment and orientation of traditional houses; Position entrance to one side; Locate garage and car parking to rear (or) screened at side; House set back from road; Use local gravels / stone for driveways; Avoid black tarmacadam and decorative lamps atop large piers; Retain existing hedgerows and stone walls; Avoid block or brick walls, ranch style concrete or timber fencing.

2 Traditional building forms, scale and features.

- New rural dwellings should incorporate traditional building forms, scale and features of the region where sited;
- **Form: S**imple with good proportions; Narrow plan; Roof pitch 30 – 45 degrees; Low eaves; Vertical emphasis to gables – narrow rather than wide; High solid to void ratio / relationship; Narrowest elevation to the prevailing wind.
- **Scale: One aspect of proportion: The size of something relative to what is around it.** Rural buildings traditionally have human scale in that the sizes of door openings, first floor heights and eve heights are closely related to the size of a person; the designers of new rural dwellings should consider the scale of the house relative to: the site itself; adjacent field patterns and existing traditional neighbouring buildings; Large dwellings require large sites with long views or prospects, large field patterns and a mature landscape having features i.e. trees with greater prominence than the proposed dwelling; Mass may be broken down using traditional scale and proportions.

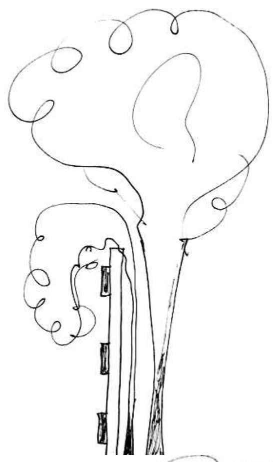
Features.

- **Fenestration – the eyes of a building:** Windows are perhaps the most difficult part of house design to get right. (Not less than 10% of floor area). Traditional windows – size of opes determined by nature and type of construction materials available then; Traditional windows – tended to have a vertical emphasis; Traditional windows had strong sturdy appearance – high solid to void relationship; Minimise range of ope sizes and shapes / forms; Position FF windows directly above GF windows; Position windows centrally on gable axis or well off centre; Position large glazed areas in main living areas and preferably on an elevation screened from public road; Large glazed areas on principal elevations fronting onto roads require very careful design; Should retain proportions – Square, Double Square, Diagonal of Square and Golden Section.
- **Chimneys:** Project through the ridge of the roof; If located on gables then make flush with gable; Cappings should be sturdy - modern, thin concrete ones not suitable.
- **Dormers & roof lights:** Dormers should be used only with restraint and care; Two storey buildings may be preferable to dormer bungalows; May be located on roof planes hidden from public road; Locate dormers on Wall Plate preferably; Avoid box fascia and cladding in PVC; Consider rain water down pipes – can cause clutter to elevation; Roof lights that sit flush in roof plane preferred (sit flush with slates or roof coverings); They provide greater light and are less obtrusive in the roof plane
- **Porches:** Rural single storey dwellings occasionally incorporated small porches or canopies while two storey dwellings did not generally do so on account of the low window sill at FF level; Small canopies do not require rain water goods; Avoid white PVC, “mock” materials or brick / stone elements; Classical porches are not suitable to traditional rural dwellings.
- **Door:** Proportion, colour and detail are fundamental to making external doors an attractive feature of a house; Sustainable hardwood, sheeted or paneled painted doors are preferred; Strong contrast in colours between the door and walls introduce significant visual interest and style; Large glazed panels to be avoided. Fanlights or side lights acceptable.
- **Colour:** Use colours traditionally used i.e. parts of any one county can differ in the range of colours employed; White wash a very traditional colour used on buildings and walls; Light colours to walls. Strong colours to doors and windows.

3. Traditional Materials and Finishes.

- Incorporate local stone, natural slate or thatch ; Stone laid in its natural horizontal bed; Stone walls reflect local pattern or style; Cappings to stone walls require careful consideration; Roof coverings such as natural slate and thatch very important in Vernacular Architecture; Vertical slate hanging to buildings particular to Kinsale, New Ross et al. Brick used around door and window opes, chimneys and cornices. These features were sometimes plastered or rendered over; Lime rendering; Avoid imitation stone cladding; white PVC; mock tudor timbering or hoods; "all brick" dwellings; marble chip - dry dash; ornate chimney pots; decorative ridge cappings.

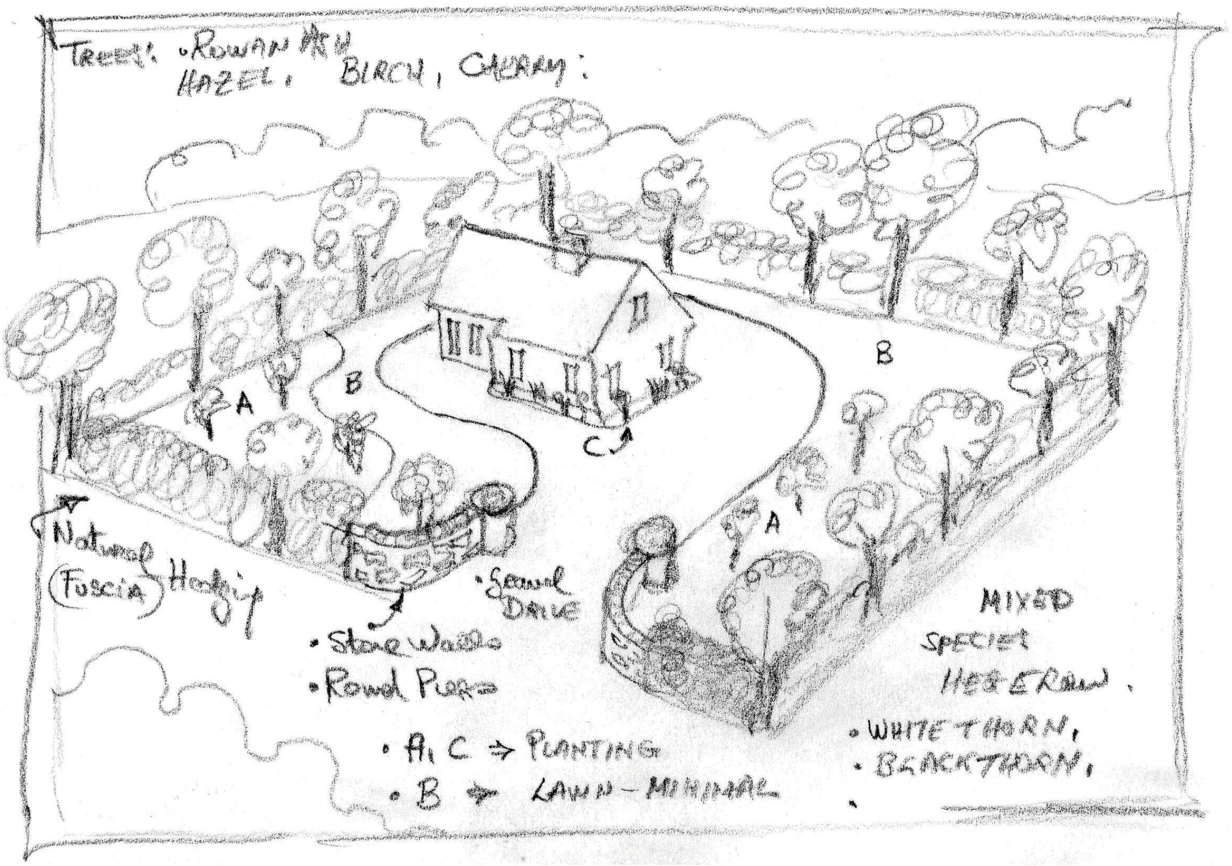
Q6 (b) Integration of the new rural dwelling in the landscape



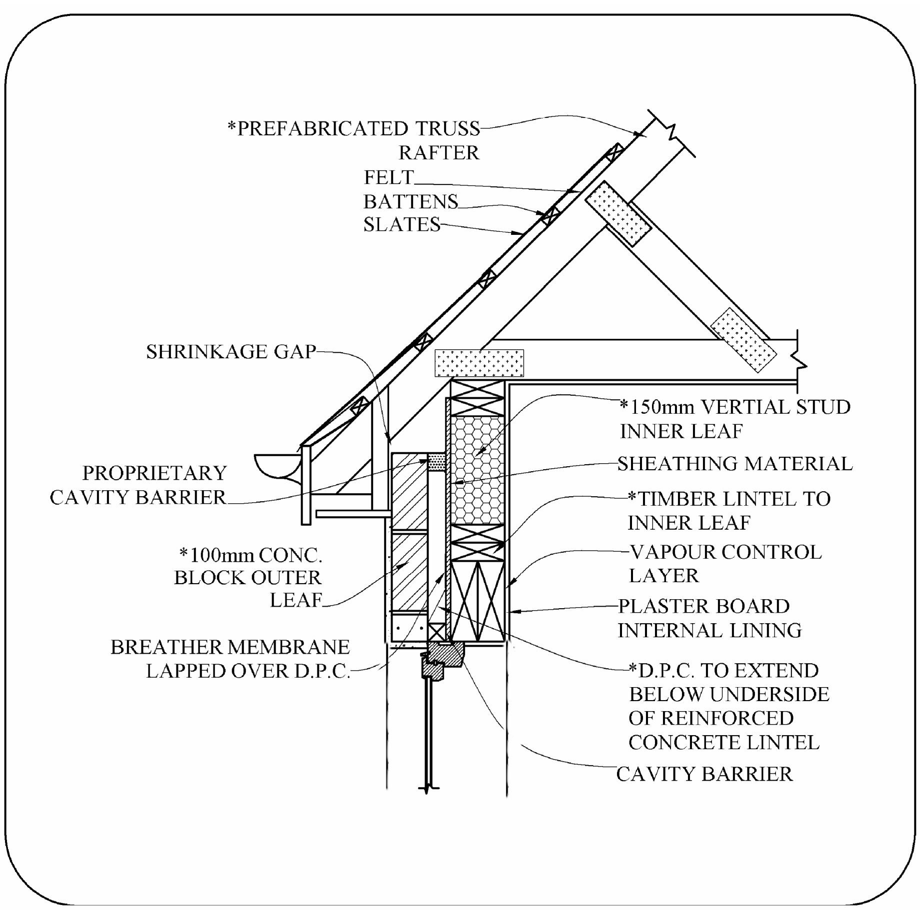
- Landscaping should occur prior to, in conjunction with building work or within one / two years of commencing work on the site;
- Retain any, or as much as possible, of existing boundaries like hedgerows and shrubbery;
- Utilise indigenous local species of trees, plants and shrubs in order to provide shelter, shade and help screen the building;
- Rural gardens traditionally have a semi wild habitat and landscaping should reflect this by utilizing species that will attract and support wild life;
- Create new mixed species of hedgerows that maintain biodiversity and regional ecological diversity;

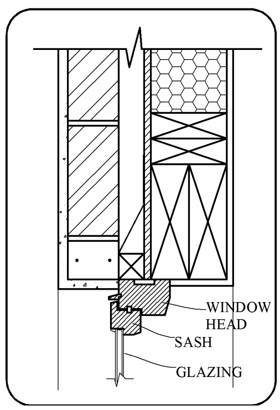
- Keep "golf type lawns" to a minimum
- Use free-flowing gentle curves on kerbing;
- Plant close to the external wall of the house;
- Avoid planting exotic trees, Leylandii and Dwarf conifers where they are visible from the public road;
- Position entrance to one side;
- Locate garage and car parking to rear (or) screened at side;
- House set back from road;
- Use local gravels / stone for driveways;
- Avoid decorative lamps atop large piers;

- Retain existing hedgerows and stone walls;
- Avoid block or brick walls, ranch style concrete or timber fencing
- Incorporate stone walls that reflect local patterns and style and laid in their natural horizontal bed.
- Avoid imitation stone cladding.


TREES: ROWAN ASH
HAZEL, BIRCH, CHERRY:
A
B
C
B
A
Natural (Fuscia) Hedging
Stone Walls
Round Piers
A, C → PLANTING
B → LAWN - MINIMAL
MIXED
SPECIES
HEDGEROW.
WHITE THORN,
BLACKTHORN,

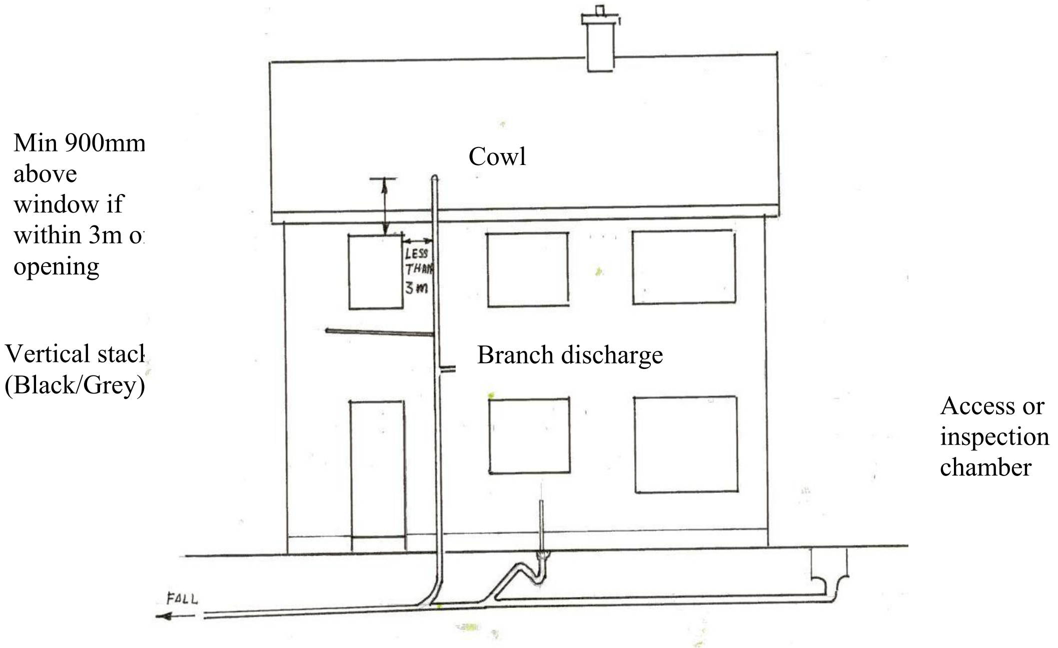
Ceist 7

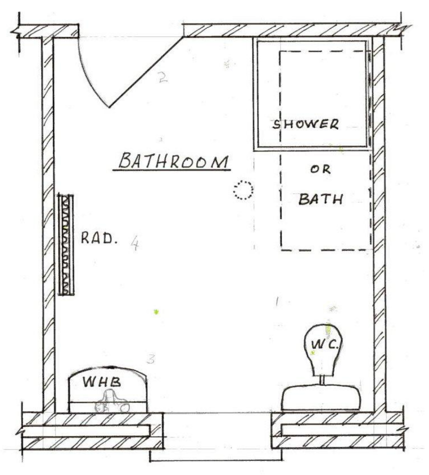

*PREFABRICATED TRUSS
RAFTER
FELT
BATTENS
SLATES
SHRINKAGE GAP
PROPRIETARY
CAVITY BARRIER
*100mm CONC.
BLOCK OUTER
LEAF
BREATHER MEMBRANE
LAPPED OVER D.P.C.
*150mm VERTIAL STUD
INNER LEAF
SHEATHING MATERIAL
*TIMBER LINTEL TO
INNER LEAF
VAPOUR CONTROL
LAYER
PLASTER BOARD
INTERNAL LINING
*D.P.C. TO EXTEND
BELOW UNDERSIDE
OF REINFORCED
CONCRETE LINTEL
CAVITY BARRIER


WINDOW
HEAD
SASH
GLAZING

Ceist 8 **(a)**

- A single-stack, that is a 100 mm uPVC soil pipe to transfer soil and waste from upper floors to the sewerage system under the ground.
- The stack must extend up above the top of any nearby windows and ventilates the system - preventing any foul odours from entering the dwelling.
- Branch discharge pipes from the W.C. are connected directly to the vertical stack. Discharge pipes from the WHB, bath and shower may be connected into another branch pipe or to the stack directly. Branch pipes connecting to the main stack should be arranged so as to not have cross flow into another pipe as this could cause a blockage, siphonage or back pressure. They should be offset as in sketch.





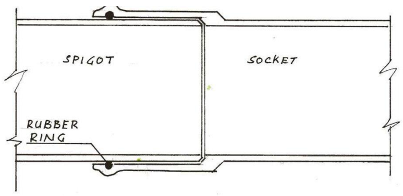
Design considerations for bathrooms

- WC. near to window for natural ventilation.
- Door position and opening to prevent direct view to WC.
- WHB adjacent to window for light but not under the window, to facilitate mirror over.
- Radiator/towel rail not close to WC. for hygienic reasons.
- Extractor fan adjacent to shower to minimise condensation.

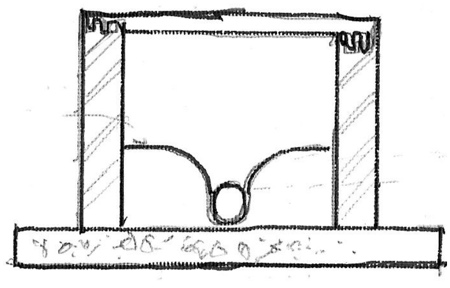
- Branch discharge pipe, 100 mm diameter from the WC. should not exceed 6 metres in length.
- Branch discharge pipes from sinks, baths and showers are normally 40 mm diameter and should not exceed 3 metres in length or 50mm diameter pipes can be used but they should not exceed 4 metres in length.
- Wash Hand Basins may have 32mm diameter waste pipes for a short distance, and are then connected to 40 mm or 50m waste
- Where it is necessary to go beyond the above distances the branch discharge pipes would have to be ventilated to prevent the water seals in the traps being lost due to the pipe running at full bore creating a vacuum at the end of the trap and sucking out the seal.
- Traps must remain sealed at all times to prevent gasses and odours entering the building.

8 (b)

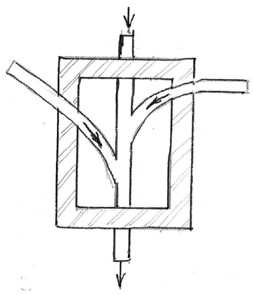
- Make sure that the rubber sealing ring is inserted properly.
- Mark the distance the pipe/spigot end must go in to the socket.
- Apply lubricant to the socket and spigot
- Pipes are cut square and are bevelled
- Lintel as pipe passes through walls
- Sufficient depth of trench



- Ensure that the benching around the channel in the manhole rises up almost vertically and is rounded off smoothly and then almost level.
- Ensure that there is no leaking along the half channel or splashing out and also is level for workers to stand on when rodding or inspecting in the access junction/manhole.



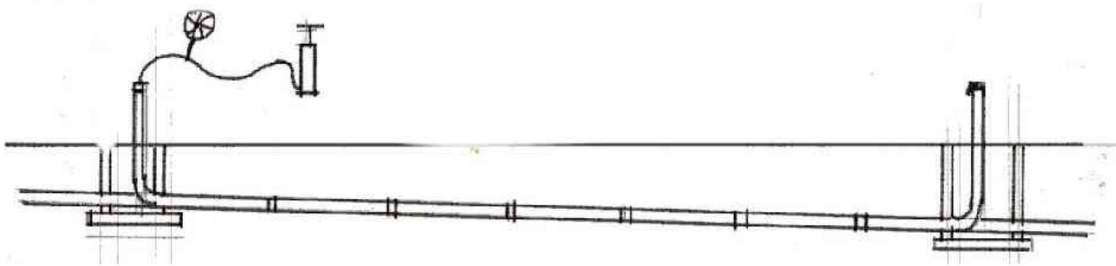
- Pipes must be laid in straight lines from junction to junction and to an even constant gradient so that there is no water or effluent lying or ponding in the pipeline.
- Where there is a change of direction these must be in an access chamber or manhole and standard fittings used.



8(c)

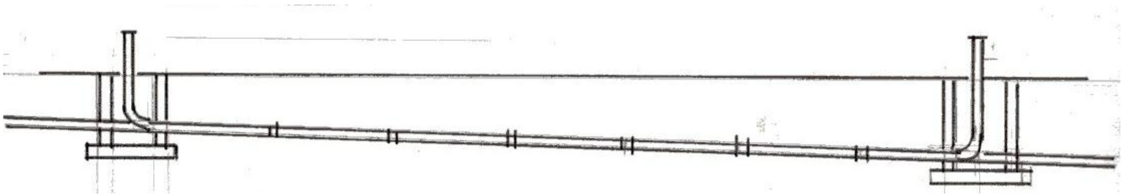
Three methods for testing underground drainage systems, Air, Water and Smoke.
Pipes should be tested before backfilling the trench. The pipework will have passed if there is no escaping of air, water or smoke. Further test may be carried out when later when all backfilling and other work is completed. An entire underground system can be tested, manholes/access junctions etc. using the water test provided it is not too long or levels too great.

Air test



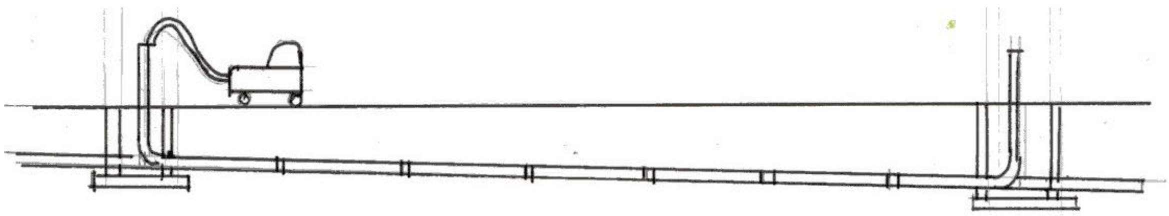
Temporary upstand pipes with 90° bends are inserted into the ends of the pipe run. One end is sealed and an airline with pump (or compressor) connected at the other. Air is pumped into the system and the pressure is maintained for three minutes. This is quite an easy test to carry out with instant results.

Water test



The water test is carried out by filling the pipeline and the upstands and maintaining this over a twenty four hour period. If this is being done before backfilling of the, leaks can be observed if weather conditions are dry. This is the most popular and reliable test. Pressure can be increased by extending the height of the upstands.

Smoke test



The smoke test is carried in much the same way as the air test with smoke being pumped into the pipe runs. Pressure is maintained and observed the see if it is going down and if it is to see where the smoke is escaping. When starting it is necessary to pump the smoke through the pipeline out through the far end before putting in the stopper/seal. Smoke test not recommended for uPVC pipework

9 (a) Restrict spread of fire

- Concrete blocks laid on flat make up the party wall. (440 x 215 x 120mm) (Fig. 9.1)
- Blocks finish 25 – 30mm below the top edge of the rafters or trussed rafters (B) positioned on both sides of the party wall.
- This 25-30mm distance follows the pitch of the roof and is maintained by placing a bed of mortar on top of the concrete blocks.
- Mineral fibre, wool quilt is then placed in this 25-30mm gap and made friction fit between the rafters. It is placed in mild compression when the underlay (A) and roofing battens are laid.
- Another layer of mineral fibre quilt is then placed on top of the felt (C) between the roofing battens along the entire party wall.
- Semi rigid, reinforced mineral fibre is also positioned at the eves. (Fig. 9.2)
- Adequate mortar must also be used on all perpendicular joints of the party wall.
- The "cavity" in a standard cavity wall is closed at Wall plate level and at the jambs of door and window openings. (Fig. 9.3)

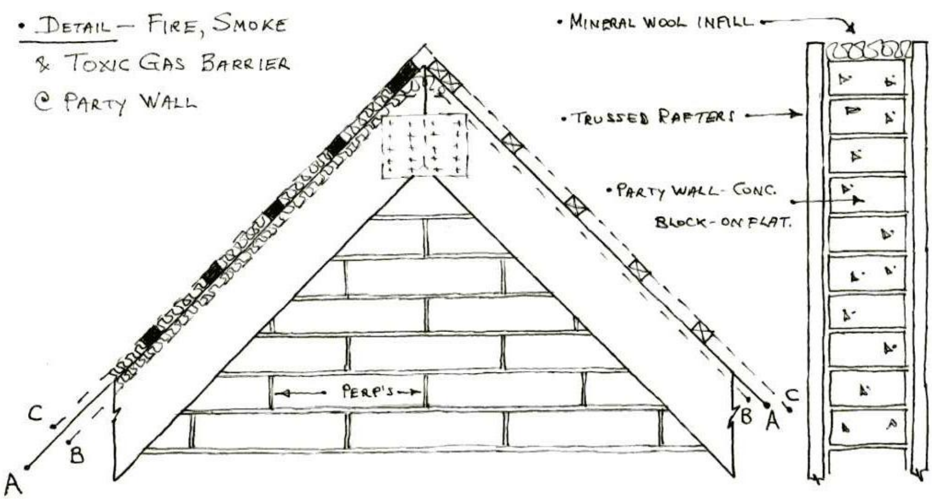


Fig 9.1

9 (a)

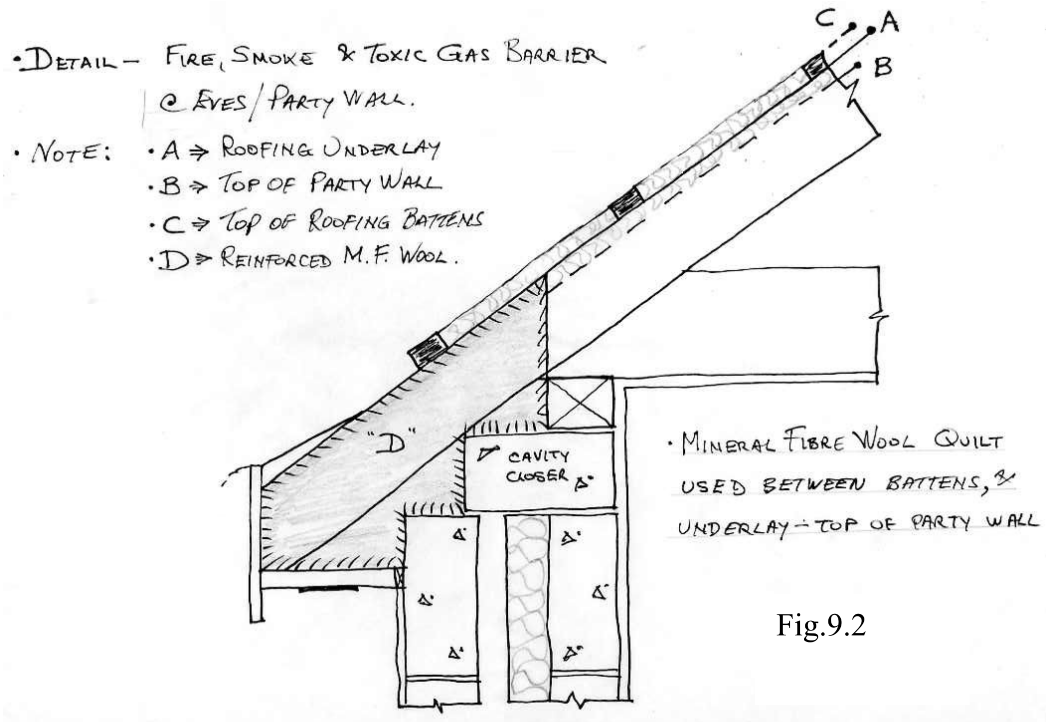


Fig.9.2

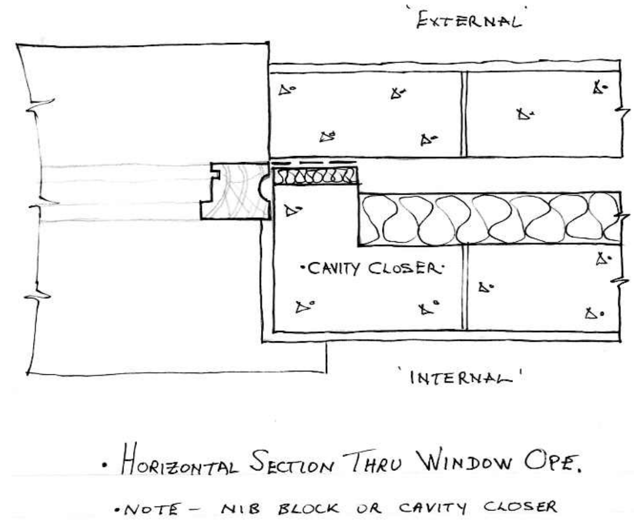
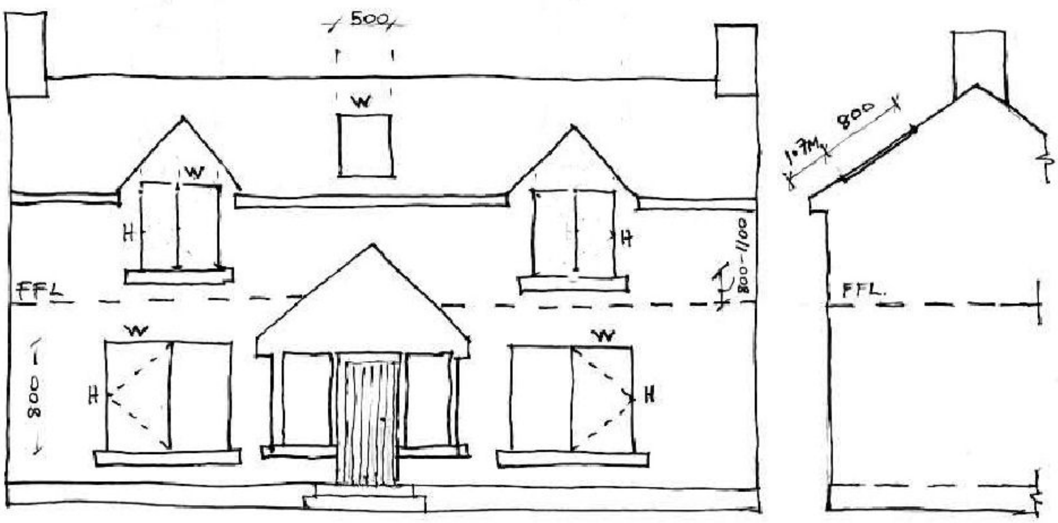


Fig.9.3

Q 9 (b) Windows

- Windows, dormer windows and roof lights in habitable rooms must have minimum clear openings of 0.33m^2.
- The bottom of the window must be positioned 800 – 1100mm above first floor level
- No lockabe fasteners to be used

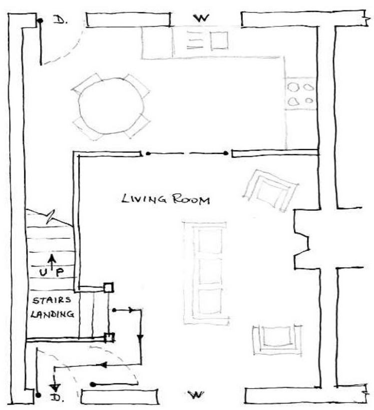


MINIMUM & MAXIMUM DIMENSIONS FOR WINDOWS & ROOFLIGHTS.

The bottom of roof lights must be positioned 600 – 1100mm above F.F. level.
Distance from eves to roof light max. 1.7m.
Roof must be structurally adequate to support person
Escaping - not glass roof or conservatory beneath

9 (b) Stairs

- Stairs must not exit into kitchens.
- Where a stair exits into another room (living room) the distance from the bottom step to the external door must not exceed 4-5m.
- Max. number of risers in one straight flight – 16 risers.
- Max. pitch 42 degrees / preferred 35 degrees.
- Min. width 800 – clear of handrails.



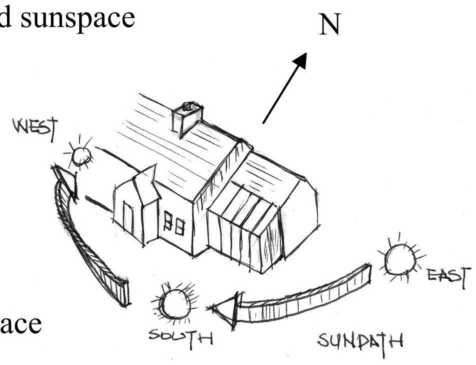
• GROUND FLOOR PLAN – SEMI D. & TERRACED HSE
STAIRS EXITS INTO LIVING ROOM – MAXIMUM DISTANCE OF 4·5 M FROM BOTTOM STEP TO EXTERNAL DOOR.

Fig. 9.5

9 (c)

- Battery powered only – or stand alone type fire detection and alarm systems no longer comply with the building regulations -Fire detection and alarm units must be wired directly to the mains electrical supply.
- All habitable rooms must have a unit - Units must also be interconnected.
- Heat detector unit is fitted in kitchen area
- Landings must have a unit installed on the ceiling.
- Corridors, depending on their length, may require more than one detection and alarm unit as max. distance between units 7.5m.
- Place all detection and alarm units on ceilings preferably and not within 300mm of light fittings.

Ceist 10 (a) Two considerations when incorporating a fully glazed sunspace



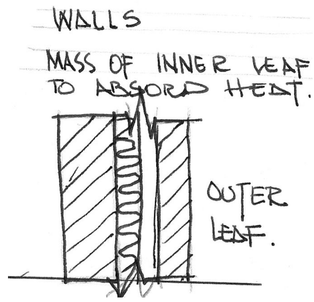
Considerations

- To reduce glare
- To reduce heat loss, especially at night time and through the winter months
- Locating sun space on southern elevation
- Ensure main habitable rooms, e.g. sitting room, kitchen are located adjacent to sunspace
- Avoid long corridors, have direct access rooms off sun space to get direct solar benefit

To reduce glare

- Use special tinted glass to reduce glare
  Use blinds/curtains that can be closed to reduce glare
- Shade the sun space with deciduous trees that filter the sun in summer time and provide maximum exposure through branches at winter, need careful selection and siting

To reduce heat loss



- Increased glazed areas maximise solar gain from the passive energy of the sun, but with fully glazed area the gain can be negated through heat loss at night
- Low e-argon double and triple glazing to maximise passive solar gain
- Provide for mass in both floors and walls to act as heat sink and store the heat – trombe walls and/or increase width of inner leaf (see sketch
- Provide shutters, blinds, curtains that can be closed as an insulation layer
- Provide isolating doors between sun space and adjoining rooms to retain heat gain

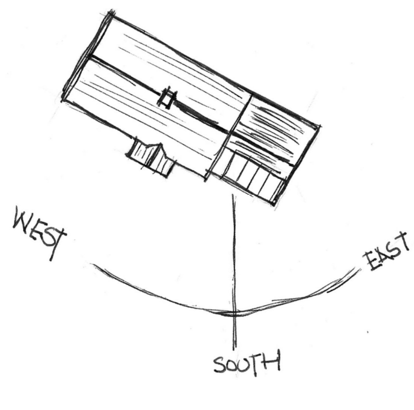
To reduce overheating during the summer months

- Provide adequate ventilation, opening sashes
- Provide shutters, blinds, curtains that can be closed
- Provide tree belt as shading, needs careful consideration
- Building mass stores the heat, quarry /terra cotta tiles on floor
- Thick inside leaf to store heat, especially on adjoining rooms and in sun space
- Choose dark colours for floors/trombe walls to increase absorption of surfaces

10(b)

Orientation

- Orientate the house so that the sunspaces faces south or at ± 15° to due south, allowing for the longest possible exposure to the sun
- Correct orientation and correct design can achieve 30% saving on fossil fuel energy

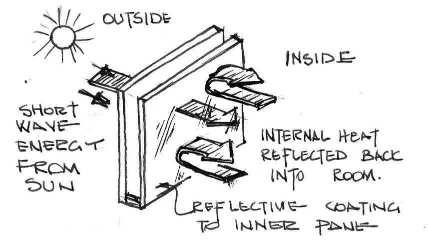


10(c)

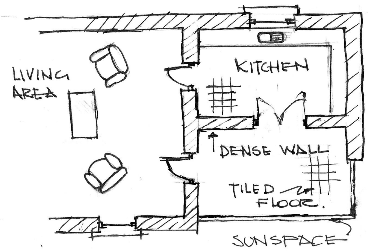
Considerations to help maximise solar gain

- Include thermal mass in walls ands floor see sketch to store the heat that is gained during the day time
- Design to ensure distribution of heat from sun space throughout the house
- Fully glazed roof poses design problems, if not properly designed, heat gained during the day will be lost through the glazing over the longer night time period of no heat.

- All glazing units to be specified to have high U-value to store the sun's passive energy, especially in the winter months.
- Glazing to have reflective film to allow short waves from sun penetrate and inner coating to reflect heat back into building to retain heat
- The roof, walls and floors of house must be well insulated to retain passive solar gain
- Thermal mass - thick insulated walls, trombe walls, thick insulated floor slab with tiled surface to increase thermal mass

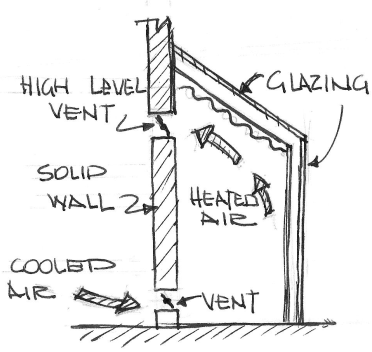


- Main living areas to adjoin sun space to gain maximum benefit from solar gain (see sketch)
- Sun space must have possibility to be isolated from main rooms to retain solar gain especially at night and during winter – doors that can be closed - see sketch
- Heavy curtains/blinds/shutters to help heat retention in sun space at night time and during winter



Ensure even distribution of heat from sun space throughout the house

- Provide connecting doors that can be opened
- Design open plan social/living areas adjoining sun space for maximum gain
- Provide vents and ducting to transfer warm air to other rooms
- Manual or automatic control of vents to regulate circulation of air/ - winter/summer, day/night (see sketch)
- Southern orientation of sun space - particularly important when the elevation of the mid summer sun at solar noon for Ireland is 78° and at 30° during the winter months



Ceist 10 (Alternative)

"The sustainable neighbourhood is, in many respects, based on the traditional urban neighbourhoods common in cities over many centuries. The pattern has numerous advantages over that of suburban sprawl. It involves much less car dependence for daily tasks and can be much more easily served by effective public transport".
Discuss the above statement in detail and outline **three** recommendations to the planning authorities which would create better planned urban neighbourhoods and reduce dependency on the private car.

Points may include:
Traditional urban neighbourhoods

- As oil and gas supplies are depleted and energy becomes scarce, we will need to reconfigure how we live
- Traditional urban neighbourhoods provide a model that can be used for future development.
- There is a need to involve people in decisions about how and where they want to live - there is often a lack of personal agency regarding urban development, people have little option or influence in planning their neighbourhood, yet they have to live in these neighbourhoods
- Traditional urban neighbourhoods contain mixed use development, with work locations, leisure areas and recreational space being integrated and sited in close proximity

Advantages of the traditional model of urban development

- This traditional mixed use model of urban development respects the human desire to belong to a place, to work, to play and to socialise together as a community
- The concept of multi use buildings is central to this development - the family living over the business maintains vibrant communities and an integrated way of life where both old and young can meet and mingle and the centre of towns are not deserted when commercial life ceases after 6.00pm.
- Traditional town development has its own configuration of streets and lanes as well as public areas such as parks and squares, giving continuity, directness and safety – there are always people going about the business of living
- In such development the local school is nearby and children can walk safely to schools, playgrounds, church etc and exercise is built into the routine of everyday living
- These traditional models of urban development are sustainable communities, facilities are provided locally, thus they have lower energy needs than those of suburban estates
- These neighbourhood share facilities and public spaces such as playgrounds, libraries leading to the development of a community spirit and community cohesion

Suburban sprawl

- Concept of sustainability: using the earth's resources in a moral and ethical way, so as not to jeopardise the needs of future generations to meet their needs through the use of the finite resources of the planet.
- The model of suburban development of Ireland from the 1960s onwards was largely characterised as urban sprawl – large horizontally-spread suburban estates consisting of detached or semi-detached houses,
- Suburban estates of low density consisting of detached or semi-detached houses on their own site - considered the ideal with each house having its own piece of the country – a back and front garden
- This paradigm of low density resulted in spread-out estates which were difficult to service and particularly difficult to service with an economical transport service/bus service
- These low density, low rise developments generated the description suburban sprawl

- These suburban housing estates consisted almost exclusively of residential dwellings – this meant that places of work were often located in technology parks removed from the place of work
- Schools and social amenities were often a distance from these estates and not integrated into the neighbourhood - oftentimes children could not walk to school from home
- There were no safe routes or green routes or pedestrian routes provided for children to walk safely to school.
- This leads to increasing separation between home, work and town centre with consequent increased private car use, making roads unsafe for children to walk or cycle to school
- Parents have to drive their children to school from the suburbs leading to increased congestion on roadways, resulting in longer journey times and increased use of depleting fossil fuels – petrol and diesel
- The suburban sprawl development is unsustainable and does not consider the energy needs of future generations

It involves much less car dependence for daily tasks and can be much more easily served by effective public transport.

- Traditional urban neighbourhoods were built before the rise in private car ownership, so facilities were near at hand – schools shops parks, playgrounds. People could easily walk or cycle to such places, resulting in less car dependency
- The local shop was feature of urban layout, people could walk/cycle to the shop and did not have to depend on the car
- Out-of-town shopping malls force people to use the car to do basic shopping - leading to congestion on the roads and an unnecessary waste of a depleting resource - oil
- An effective public transport systems need population density, dispersed suburban development does not provide this critical mass necessary to sustain frequent bus and rail service, many suburbs have poor public transport services owing to the lack of this critical mass and become isolated and unattractive places in which to live
- Lack of adequate public transport leads to the isolation of many - especially the old and those with disabilities
- Depletion of the fossils fuels and consequent rise in price forces us to restructure the way we build our dwellings and communities

Three recommendations - supported by cogent argument such as;

- Providing active social areas such as dedicated safe play areas for children with amenities such as playground equipment and playing fields and leisure facilities for teenagers and adults
- Providing passive social areas such as parks and open green areas where older people can walk, sit and enjoy the outdoor environment
- Make walking and cycling attractive, raise awareness of the necessity for exercise as part of the daily routine so that people do not automatically think of using the car for short journeys
- Through models of good planning, revitalise the decline of centres of towns and cities and provide integrated walking and cycle tracks to reduce car dependency
- Educate people to learn to live, not in isolation, but in connectedness with others
- Encourage the provision of a mixture of ground floor trading and work spaces, an residential accommodation overhead so that home and work are in close proximity for many, obviating the need to use a car
- Provide financial incentives to first time occupants and buyers to live in town and city centres

- Promote and plan for more intentional lifestyles, close to amenities such as schools, churches, libraries, leisure centres, playing fields and save the fossil fuels
- Provide proper supervision for social areas, so that these areas are at all times safe for both children and elders
- Limit the effect of the motor car on urban communities by providing dedicated parking areas, pedestrianised town centres, with dedicated areas for family relaxation
- Provide incentives to promote the use of community cars, as is done in some purpose planned sustainable urban communities, so that every person does not need to own a car
- Provide cycle lanes and green walking routes especially to schools for safety of children
- Plan mixed dwellings in town and city centres for old, middle age and young, many old people return to the security of planned urban living and proximity to facilities
- Provide incentives for people to buy houses in urban areas, such as for first time buyers
- Plan for apartments of adequate floor area to accommodate families in town and city centres
- Provide incentive for smaller trading outlets, family businesses, mixed living and trading
- Develop model urban areas, where a the traditional model of urban living can be observed and appreciated
- Move away from urban sprawl and design high quality, higher density mixed accommodation that can be served by adequate transport system
- Ensure adequate floor are for apartments so that they are suitable for lifelong dwelling
- Make sustainability principles the principles informing all planning decisions

Any other relevant recommendations supported by cogent argument and development.

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Scrúdú Ardteistiméireachta 2006

Staidéar Foirgníochta
Teoiric – Ardleibhéal

Construction Studies
Theory – Higher Level

Scéim Mharcála
Marking Scheme

CEIST 1

PERFORMANCE CRITERIA	MAXIMUM MARK
Any 8 points x6 marks (5 for sketch 1 for annotation)	
900 x 300 reinforced foundation Blockwork Concrete floor tile on 75mm concrete screed 50mm high density insulation Radon barrier 150mm min sub floor Hardcore min 150mm with sand blinding Proprietary threshold Sloped concrete cill Drainage channel Level entrance DPC behind and underneath concrete cill Max threshold height 15mm Bottom rail of door	**6** **6** **6** **6** **6** **6** **6** **6**
Scale & Drafting	**6**
(b) ***3 marks*** *for each of* ***2*** *applicable design details*	
Design detail 1 - Channel Design detail 2 – Sloped cill (max 15º) Vertical DPC or threshold seal	**3** **3**
TOTAL	**60**

CEIST 2

PERFORMANCE CRITERIA	MAXIMUM MARK
(a) ***Two*** *possible risks to personal safety to be identified*	
Scaffolding	4 4
Deep Excavation	4 4
Use of electrical tools out-of doors	4 4
(b) ***Two safety*** *precautions to eliminate each risk at (a)*	
Scaffolding Notes Sketch	5 5
Deep excavation Notes Sketch	5 5
Use of electrical tools out-of doors Notes Sketch	5 5
(c) ***Two benefits*** *of having a safety statement*	
Discussion of benefit number 1 Discussion of benefit number 2	3 3
TOTAL	**60**

CEIST 3

PERFORMANCE CRITERIA		MAXIMUM MARK
(a) *Any **8 points x 4 marks** each (3 for sketch 1 for annotation.)*		
Rafters		4
Flooring joists		4
Purlin		4
Strut		4
Runner		4
Wallplate		4
Slates/felt		4
Ridge board		4
Flooring/sheeting		
Breather membrane		
Plasterboard		
Ventilation	Notes & Sketches	6
Insulation	Notes & Sketches	6
(b)		
Design sketch		8
Design note		8
TOTAL		**60**

CEIST 4

PERFORMANCE CRITERIA	MAXIMUM MARK
(a)	
Sketch 1 Note 1 Sketch 2 Note 2	**10** **8** **10** **8**
(b)	
Recommendation	**6**
Reason 1	**6**
Reason 2	**6**
(c)	
Factor 1 Factor 2	**3** **3**
TOTAL	**60**

CEIST 5

PERFORMANCE CRITERIA	MAXIMUM MARK
(a) ***Ten*** *points x* ***3 marks*** *for each point*	
Correct Tabulation	**3**
External Plaster	**3**
Block Outer Leaf	**3**
Urethane board insulation	**3**
Plasterboard	**3**
External and Internal surface resistance	**3**
Cavity resistance	**3**
Total resistance (R)	**3**
U value formula	**3**
U Value	**3**
(b) Six points x 3 marks for each point	
Heat loss formula and calculation	**3**
Heating duration for 1 litre	**6**
Heating period for 1 year	**3**
Number of litres of oil used	**3**
Annual cost of heat lost	**3**
(c) ***2 Points x 6 marks each***	
Sketch	**6**
Note	**6**
TOTAL	**60**

CEIST 6

PERFORMANCE CRITERIA	MAXIMUM MARK
(a) *Any* ***3 points x 10*** *each*	
Planning guideline 1	**10**
Planning guideline 2	**10**
Planning guideline 3	**10**
(b) *Any 2 proposals x 15 marks each.*	
Proposal 1 sketch	**8**
Proposal 1 notes	**7**
Proposal 2 sketch	**8**
Proposal 2 notes	**7**
TOTAL	**60**

CEIST 7

PERFORMANCE CRITERIA	MAXIMUM MARK
Scale and drafting	**4**
a) *3 details @ 4 marks each*	
Window – three points Window head Sash Glazing Drip moulds Position in wall	**4** **4** **4**
4 details @ 4 marks each	
Wall – three points External block leaf and lintel Internal timber stud leaf Insulation of timber frame Internal lintel Cavity barriers D.P.C. Sheathing material and breather membrane Vapour control layer	**4** **4** **4** **4**
3 details @ 4 marks each	
Roof – three points Trussed rafter Gang-nail plate Fascia and soffit Ventilation strip Gutter Felt and battens Slates	**4** **4** **4**
(b) *Any 4 relevant structural members @ 4 marks each*	**16**
Total	**60**

CEIST 8

PERFORMANCE CRITERIA	MAXIMUM MARK
(a)	
Note on a single stack system	**6**
Detailed sketch	**10**
Design Consideration 1	**5**
Design Consideration 2	**5**
Pipe sizes ***(3x 2 marks)***	**6**
(b) *Pipe work in underground drainage system*	
Design Detail 1	
Note	**4**
Freehand Sketch	**4**
Design Detail 2	**4**
Note	**4**
Freehand Sketch	
(c) *Details on any one test*	
Details - (***2 marks*** for correct naming of test)	**6**
Freehand sketch	**6**
TOTAL	**60**

CEIST 9

PERFORMANCE CRITERIA	MAXIMUM MARK
(a) 2 design details x 12 marks each	
Design detail 1 sketch	**6**
Design detail 1 notes	**6**
Design detail 2 sketch	**6**
Design detail 2 notes	**6**
(b) 2 Design details x 12 marks each	
Design detail 1 sketch	**6**
Design detail 1 notes	**6**
Design detail 2 sketch	**6**
Design detail 2 notes	**6**
(c) 2 Considerations x 6 marks each	
Consideration 1	**6**
Consideration 2	**6**
TOTAL	**60**

Ceist 10

PERFORMANCE CRITERIA	MAXIMUM MARK
(a) ***2 considerations***	
Sketch 1	**5**
Note 1	**5**
Sketch 2	**5**
Note 2	**5**
(b) ***2 reasons for preferred orientation***	
Sketch	**10**
Reason 1 Reason 2	**5** **5**
(c) ***2 considerations to maximize solar gain***	
Design Consideration No. 1 Notes Sketch	**5** **5**
Design Consideration No. 2 Notes Sketch	**5** **5**
TOTAL	**60**

CEIST 10 (ALTERNATIVE)

PERFORMANCE CRITERIA	MAXIMUM MARK
Analysis of statement Discussion of main statement – major point 1, point 2, point 3	**15**
Recommendation 1 Recommendation 1 - supported by discussion	**15**
Recommendation 2 Recommendation 2 - supported by discussion	**15**
Recommendation 3 Recommendation 3 - supported by discussion	**15**
TOTAL	**60**

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2006

Construction Studies

Ordinary Level and Higher Level

Marking Scheme

Practical Coursework

(150 Marks)

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Form A

Leaving Certificate Examination 2006

Construction Studies

School Assessment of Candidates' Practical Coursework

Name of Candidate:………………………………………….… *Examination Number:* [ ]

Type of Project:

- ☐ Practical Craft
- ☐ Building Science
- ☐ Written/Drawn with Scale Model
- ☐ Composite

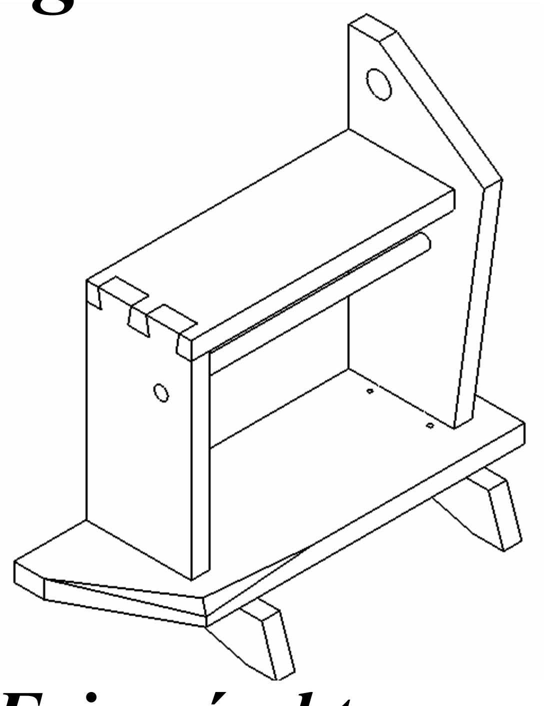
	Marking Scheme	Maximum Marks	Marks Awarded
A	**Planning of Project** • Ability to design an appropriate plan of procedure • Evidence of research • Preparation of working drawings/use of models as graphic aids		
	Subtotal	**30**	
B	**Report Writing** • Design folio detailing planning, execution and evaluation of project • Critical appraisal of project for quality, function and finish • Conclusions from practical experience of project work		
	Subtotal	**30**	
C	**Manipulative Skills** • Skills in preparation and finishing of materials • Safe use of tools and machines - Hand /Power/CNC • Skills in assembly of materials		
	Subtotal	**30**	
D	**Presentation of Project** • Task completed to acceptable standard • Appropriate use of materials • Satisfactory knowledge of construction technology		
	Subtotal	**30**	
E	**Experiments** • Evidence of ability to plan and carry out **three** experiments *Experiments should be related to the project work or selected from the suggested experiments outlined in the syllabus for Construction Studies.* Experiment **1** Experiment **2** Experiment **3**		
	Subtotal	**30**	
	TOTAL:	**150**	

Signature of Teacher: ………………………………………………… *Date:* ………………………

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Scrúdú Ardteistiméireachta 2006
Leaving Certificate Examination 2006

Scéim Mharcála
Marking Scheme
(150 marc)

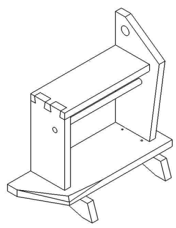


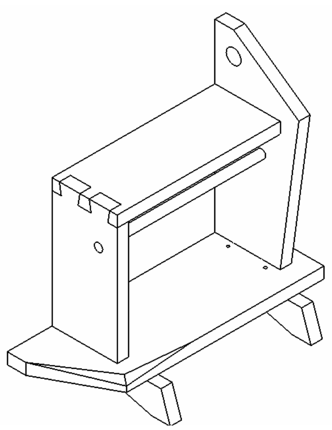
Staidéar Foirgníochta
Triail Phraiticiúil

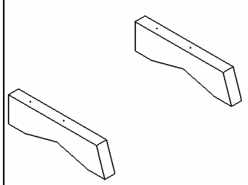
Construction Studies
Practical Test

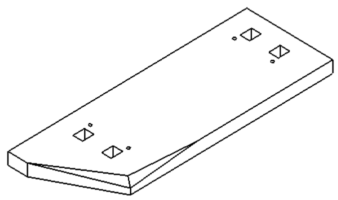
Construction Studies 2006
Marking Scheme – Practical Test

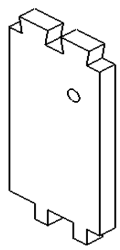
Note:
The artifact is to be hand produced by candidates without the assistance of machinery. However the use of a battery powered screwdriver is allowed.
Where there is evidence of the use of machinery for a particular procedure a penalty applies.
Component is marked out of 50% of the marks available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

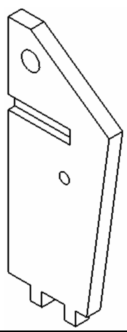
	A	**OVERALL ASSEMBLY**	**MARKS**
	1	Overall quality of assembled artifact	**8**
	2	Dowel located and fitted correctly ***(4 x 1 marks)***	**4**
	3	Edge of right side - (i) design (ii) shaping ***(2 x 4 marks)***	**8**
		Total	**20**

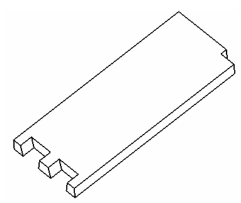
	B	**MARKING OUT**	**Marks**
	1	Left leg to base ***(4 x 1 marks)***	**4**
	2	Right leg to base ***(4 x 1 marks)***	**4**
	3	Base –	
		(i) mortices ***(4 x 2 marks)***	**8**
		(ii) slope and chamfers ***(3 x 1 marks)***	**3**
	4	Left side: ***(4 x 2 marks)***	**8**
	5	Right side –	
		(i) tenons ***(2 x 2 marks)***	**4**
		(ii) trench ***(2 marks)***	**2**
		(iii) slopes and hole ***(3 x 1 mark)***	**3**
	6	Top horizontal ***(3 x 2 marks)***	**6**
	7	Top and left side - correct length ***(2x1 marks)***	**2**
		Total	**44**

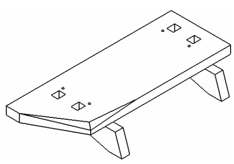
SUPPORTS	**C**	**PROCESSING**	**Marks**
	1	Shaping sloped ends ***(2 x 1 mark)***	**2**
	2	Shaping bottom ***(6 x 1 mark)***	**6**
		Total	**8**

BASE	D	PROCESSING	Marks
	1	Four mortices *(4 x 4 marks)*	**16**
	2	Shaping sloped edge	**2**
	3	Forming two chamfers *(2 x 2 marks)*	**4**
		Total	**22**

LEFT SIDE	E	PROCESSING	Marks
	1	Two tenons *(2 x4marks)*	**8**
	2	Two dovetails *(2 x 5 marks)*	**10**
		Total	**18**

RIGHT SIDE	F	PROCESSING	Marks
	1	Two tenons *(2 x 4 marks)*	**8**
	2	Trench	**6**
	3	Shaping of sloped edges *(2 x 2 marks)*	**4**
	4	Drilling hole	**2**
		Total	**20**

TOP	G	PROCESSING	Marks
	1	Two dovetail pins – (i) vertical sawing (ii) cutting across grain *(4 x 2 marks)*	**8**
	2	Stopped housing	**2**
		Total	**10**

ASSEMBLY	H	PROCESSING	Marks
	1	Drilling and countersinking	**4**
	2	Fitting 4 screws in correct position	**4**
		TOTAL	**8**