SCANDINAVIAN HOMES LTD

Baltica 117 with 35° roofpitch and 22m^2 L-extension. Nordic timber panel exterior.

Technical Guide

Energy efficient features

An energy efficient house functions as a system. When all parts of the system are designed to be compatible, each operates more effectively and efficiently. In a house with a leaky building envelope, neither the insulation nor a well designed and installed ventilation and heat-recovery system will function advantageously. Similarly, a building with a very tight envelope will not be energy efficient without sufficient insulation of the walls, windows, floors and roof.

- Dry construction
- 145mm (6") insulation in walls
- 400mm (16") insulation over ceiling
- Concrete foundation insulated around and under
- Triple glazing
- Controlled ventilation

Moisture

Strong driving rain and wet ground conditions helps water to penetrate houses. These problems can only be solved at the construction stage of a building. There are many ways for moisture to enter a building:

- Through the wall, if the wall is constructed of materials that can soak moisture.

  Our exterior wall is a dry construction with a ventilation cavity inside the cladding through which air can flow freely. The actual wall always stays dry and the cladding will dry from both inside and outside after each rainfall.

- Between window/door frames and wall, if the construction method does not prevent it.

  Our timber framed windows will expand and contract in harmony with the timber framed wall. Factory installed flashings made of galvanised & plastic coated steel ensures no leaks.

- Through the foundation, if the construction method does not prevent it.

  A Scandinavian Homes foundation has clean broken stones under the slab for good drainage. Condensation takes place on the cold side of an insulated construction and moisture transport moves from the warm side, down through the insulation into the hard-core. Your floor will be dry and warm. This will be achieved only if the right type and amount of insulation is carefully installed under and around the concrete slab.

- Wind presses water up under the roof-tiles and in under the felt unless it is thoroughly fixed.

  Our solution to this is to install a structurally very solid roof construction. Solid timber sarking is covered with a permeable mineral felt. The felt is overlapping and closely nailed. Counter battens as well as tile battens ensures good ventilation between felt and roof tiles. Good ventilation is achieved between the sarking and the insulation with a ventilation gap along the length of the entire building on both sides. A galvanised steel rodent stopper and insect mesh is installed in this gap.

Walls and roof

The most basic characteristic of an energy efficient house is highly insulated roof and walls. A house can be insulated to very high levels by applying insulation at ceiling joist level. Scandinavian Homes houses have 400mm mineral wool insulation at this point. (Irish building regulation requires 150mm). The walls usually have 145mm of mineral wool wall insulation. It is fire-proof, non-toxic and non-biodegradable.

Floors

The amount of insulation required in floors varies depending on the type of floor and foundation used. At Scandinavian Homes we use a concrete slab, insulated around the circumference with our special base unit and from below with 60-120mm expanded polystyrene and extruded polyurethane.

Windows and doors

Because windows and doors make up such a large proportion of the facade of a building, they play a considerable part in determining it's energy requirements. Night time transmission losses through windows represent a major portion of heat losses during the winter. Our triple glazed windows and thermally insulated doors are of rigid construction to prevent warping. Effective seals ensure a tight fit. The windows are made up of three panes of 4mm glass with two 12mm cavities. One pane is coated with a low emission shield which lets short-wave radiation, i.e. light through but which acts as a barrier for long wave radiation, i.e. heat. The cavities are filled with argon gas which further improves their performance. A higher indoor window surface temperature is achieved and it is no longer necessary to place radiators under windows to avoid draughts from cold window surfaces. Within the external doors there are steel sheets on both sides of a double, insulated framework. The steel sheet not only prevents the spread of humidity but also makes sure that the door does not warp or twist.

Airtightness

By making buildings as airtight as possible, draughts caused by leaks in the building envelope are eliminated. Good airtightness reduces the amount of noise, dust, pollen etc. that enters the building. More importantly, it is one of the most cost effective ways of increasing the energy efficiency of a building. An important prerequisite for achieving airtight construction is that the installation of the insulation and the air seals is carried out with great care to ensure that no gaps or splits occur in the airtight layer. Even small gaps can result in the admission of air leading to energy wastage. Air/vapour control membranes consisting of high quality 0,2mm polythene film are applied on the inside of the building envelope. It is important that the membrane has overlapped and sealed joints and that all necessary penetrations from pipes and ducts are carefully sealed. The polythene membrane also obviates the risk of condensation within the wall structure. Airtightness and ventilation go hand in hand. An airtight building must be properly ventilated to provide fresh air to the occupants – see chapter on ventilation.

Ventilation

Indoor air quality

Most people spend more than 90% of their time indoors, most of that in their own home. The quality of indoor air is vitally important for our health. All buildings need good ventilation in order to maintain high indoor air quality and a long life, especially damp masonry constructions and modern highly insulated buildings. A healthy indoor environment depends largely on the removal of contaminated air and an ample supply of fresh air. Provisions must be made for air entering, as well as for air leaving the building. The aim is to have a continuous supply of fresh air and a continuous extraction of stale air and to "recapture" the heat from the stale air before it leaves the building. These seemingly conflicting imperatives of energy preservation and ventilation can however be mastered with the use of a heat-recovery ventilation system.

Problems associated with poor ventilation

- Allergies
- Asthma
- Radon
- Dustmites
- Mould
- Fungus
- Headaches
- Tiredness
- Moisture
- Damp stains
- Condensation
- Deterioration of decor
- Smoke stains on ceiling and walls
- Build up of dirt

Causes of poor air quality

- High relative humidity inside house. Dustmites, fungus and mould occur when the relative humidity is above 70%, and/or if there is dampness in the house. The level of dampness and the relative humidity level are two separate but related issues. To dry out a damp floor or a damp wall, the water in liquid form must change to vapour and be ventilated away to the outside. Compare it with the drying of laundry on a line on a sunny and windy day (heat and ventilation), as opposed to doing it in a cold basement. If there is a low temperature inside a damp house, the water in the structure will evaporate slowly – especially if the rooms are not continuously ventilated. Turning up the heat in a damp house will only cause relative humidity levels to explode unless there is sufficient ventilation. Dampness in the structure of a building is largely dependent upon the construction method used. In a dry type of construction that is well-insulated and warm, the humidity levels will be much lower than in a masonry construction with low levels of insulation.

  High relative humidity causes condensation on cold surfaces in the house, such as window panes, cold walls and uninsulated water pipes. Formaldehyde and other harmful substances are released at an even higher rate than usual when certain artificial building components such as flooring materials, chipboard, putty, adhesives, paints etc. come in contact with moisture.

Nordica 94 built together with an Atlantica 61.

- Emission of pollutants from various sources. A normal house contains a multitude of substances – paint or varnish on furniture and toys, flame retardants, detergents, chemical treatment of fabrics, the presence of cigarette smoke, use of antifungicides and of chemical fragrances etc. ... the list is endless. All substances constantly emit particles to the surrounding air. Under certain conditions, radon gas can enter houses from the ground below. All these particles and gases form a complex mix in the indoor air which presents unknown dangers for people. In the years to come, with increased levels of insulation and better sealed houses, the problems of radon, mould and a generally unhealthy indoor climate will be staggering if the ventilation of private houses is not improved.

Conventional ventilation – the hole in the wall method

Natural convective ventilation

In older buildings, air finds its way into the structure through chinks or other defects and is exhausted through vents or chimneys. The traditional open fireplace is a very ineffective source of heat, but under certain conditions it provides good air extraction in the room which it serves. Today, conventional houses usually rely on a 80x80mm wall-mounted vent to extract air in every room. Fresh air is expected to enter the building through the various cracks and gaps. The rate of ventilation depends on many factors. These include wind and temperature (highest ventilation in cold and windy weather), the occupant's window-opening habits and tendencies to seal off the vents to "stop the draught". Generally speaking there is poor ventilation in most weather conditions: virtually no ventilation at all when it is mostly needed (on still, humid days) and draughts in cold windy weather.

Additional extractor fans

In an attempt to solve the worst problems in bath and shower rooms, many houses today are equipped with fan extractors. The present building regulations encourage this solution. Wall-mounted extraction fans service WC and bathrooms. These extractor fans have to run for many hours a day in order to do the job properly, resulting in considerable heat-losses. (The fresh air is still supposed to enter the house through the cracks and gaps!)

Heat-recovery ventilation system

Fresh air

A constant replacement of all air, with as little heat loss as possible, is the ideal condition for all houses. When the sole concern is fresh air, simple fans may be used to continuously exhaust stale air from specific rooms, with fresh air entering through controllable slots in external walls. However the higher the price of energy, the more economically attractive the concept of heat-recovery. A heat-recovery ventilation system without an air-heater does not provide any "new" heat – it only saves existing heat. To heat the house, any source or form of heat, such as underfloor heating, radiators, stoves, etc. run by oil, gas, sun, solid fuel or electricity may be used in conjunction with the system if necessary.

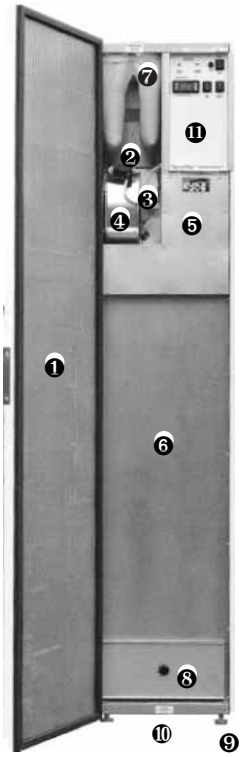
TemoVex 480S ventilation unit

Compact all in one ventilation and heat recovery unit.

The outer body is made of hot-dipped galvanised sheet metal with mineral wool insulation between the sheets.

The large counterflow heat exchanger has an average efficiency of 82%. A built-in bypass function makes it possible to cool the house when desired

The bag filters are of class EU5 for supply air and class EU3 for extract air.



Location guide to 480S ventilation unit

1. Door with magnetic ledges
2. Exhaust air filter
3. By-pass damper
4. Exhaust air fan
5. Supply air fan
6. Heat exchanger
7. Outdoor air filter
8. Access door
9. Adjustable feet
10. Condensation conductor
11. Control panel

A simple Scandinavian Homes heat-recovery ventilation system consists of a main-unit, steel air-ducts and ceiling vents which service all rooms in a building. The stale air is continuously extracted from ceiling vents in "dirty" rooms such as bath, laundry and kitchen. Before the stale air leaves the house, it will go through the heat-recovery unit where it releases its heat to (but does not mix with) the incoming air – so the fresh incoming air is heated for free. The preheated new air is then supplied to "clean" living areas and bedrooms through ceiling vents. The air-flow is directed from "clean" to "less clean" rooms so that all parts of the building are constantly supplied with fresh pre-heated air. The ventilation is balanced and controlled. The airflow rate for every room is carefully calculated. For example, a café with smokers needs a much faster rate of air-exchange than a bedroom. Air flows are measured in m3/h, or litres/second.

Dry result

With proper ventilation a house stays dry. Many problems caused by moisture such as mould, fungus growth and decor deterioration will be solved or at least improved with the installation of a heat-recovery ventilation system. With greatly reduced ventilation heat-losses, the temperature will increase and this helps the drying process. In shower and bathrooms, warm damp air is generated regularly. This air contains a lot of energy which is used in the heat-recovery process. First the heat from the warm damp air is transferred to the incoming air. Then the moisture in the warm damp air is condensed to water and this releases even more energy, which goes to towards further heating the incoming air.

Energy savings

The fact that the fresh new air is preheated in the heat exchanger at no cost is the obvious benefit. Another energy benefit is that a dryer house is easier to heat, and that a higher degree of comfort is achieved at a lower temperature when the moisture level is lower.

Health benefits

Constant extraction of exhaust air and constant supply of fresh air means that the levels of airborne pollutants are greatly reduced. Unhealthy particles and gases are quickly swept away outside before they have time to settle.

Heat recovery unit

The heat-recovery units from Scandinavian Ventilation Systems are designed to run at all times, day and night, all year round. They are equipped with heat exchanger banks, made of aluminium plates. Two adjacent plates form a narrow duct for either supply or exhaust-air. The supply-air passes through on one side of the plate and the exhaust-air on the other. The heat in the exhaust-air is transferred to the supply-air via the plate. When the exhaust-air condenses, the heat effect increases on the supply-air side. Condensed water on the exhaust side can freeze if the temperature drops to under –5°C, but this would not be of any concern in the mild Irish climate. The design of the heatexchanger allows no inter-leakage between the different media. For this reason, odours, bacteria and radon-daughters in the exhaust air cannot contaminate the supply air. The Scandinavian Ventilation Systems main unit for domestic use is equipped with one or two large heat exchange banks. The efficiency grade is very high: 70–85%

Service and cleaning

The filters in the main-unit has to be inspected and cleaned or replaced 2-3 times per year. This is very important – otherwise the airflow will be reduced dramatically. The louver and mesh at the air-intake to the house should be inspected once a year and cleaned.

When damp air is being extracted from the house, condensation takes place inside the main unit. This is normal. The water should continuously drain away through a drain-pipe. If any water collects in the unit the drain pipe has to be checked and cleared.

Apart from this cleaning the heat-recovery unit requires no service or maintenance at all.

Ducts and fittings

The overall quality and long-term performance of a ventilation system depends on many factors, ranging from the overall system layout, to the quality of the different components. To help the air-flow through the system, we avoid using small diameter ducting. We use professional quality Spiro-type galvanised steel ducts. For private houses the dimensions are: Ø100mm, Ø125mm, Ø160mm and Ø200mm. The ducts are rigid and made of solid steel and are smooth inside. Strong rigid components prevent collapsing of ducts and fittings if someone walks on them in the attic. The fittings, such as bends, T-pieces, mufflers and reducers feature built-in rubber seals to make the system absolutely airtight. They are pressed from long-lasting galvanised steel. Air-leaks from badly taped and sealed connections are eliminated.

Specification for typical main unit in a private house: (Balanced ventilation, filters, air to air heat-recovery, installed in laundry room standing like a tall refrigerator)

Flow range:	30 – 100 l/s (100 – 350 m³/h)	Weight:	90 kg
Temp eff.grade:	75 – 85 %	*Filters:*	Two bag-type class EU5 & EU3
Insulation:	Fire resistant hard rockwool, 30 mm	*Fans:*	Two radial type
Measurement:	1900 x 430 x 600 mm (h x w x d)	*Fan motor:*	Two, 230 V, 0.8 A
		Connections:	Four Ø160 mm with rubber seals

Heating

The amount of heating needed in a house depends on many factors. There are heat losses – through walls, floors, windows & doors, roof , ventilation; there are also heat gains – sun through the windows, appliances such as refrigerators, heat generated by people. All these factors have to be taken into account when the type and size of the heating system is planned. Scandinavian Homes houses need comparably much less heat than other houses. This means that any source of heat and method of distribution can be considered.

Ways of heating

Underfloor heating

Possibly the most comfortable way of heating a home. The entire floor is turned into a low temperature heat store and the heat is released slowly into the house. Heated floors means that a wide choice of floor-cover materials can be used. When floor-heat is used it is important that the level of insulation under the slab is sufficient. There are two reasons for this. The obvious one is to prevent heat-losses downwards. The other reason has to do with moisture movements, as is explained in the foundation section.

- Electric heating cables are installed into the foundation of every Scandinavian Homes house. The electric effect can vary from 20 to 50 Watt per square meter. The layout and effect of the heating-cable is decided in conjunction with the buyer at the planning stage, so that they can decide in what part of the house they want more or less heat. Floor-heat in the slab makes it possible to use night-saver electricity for all, or part of the heating supply. The underfloor heating is very slow to react, it takes a long time to heat up and a long time to cool down. It is controlled with a simple timer. When the house needs more heat you run the timer for longer periods, and vice versa.

Nordica 115 ajoining a Baltica 72.

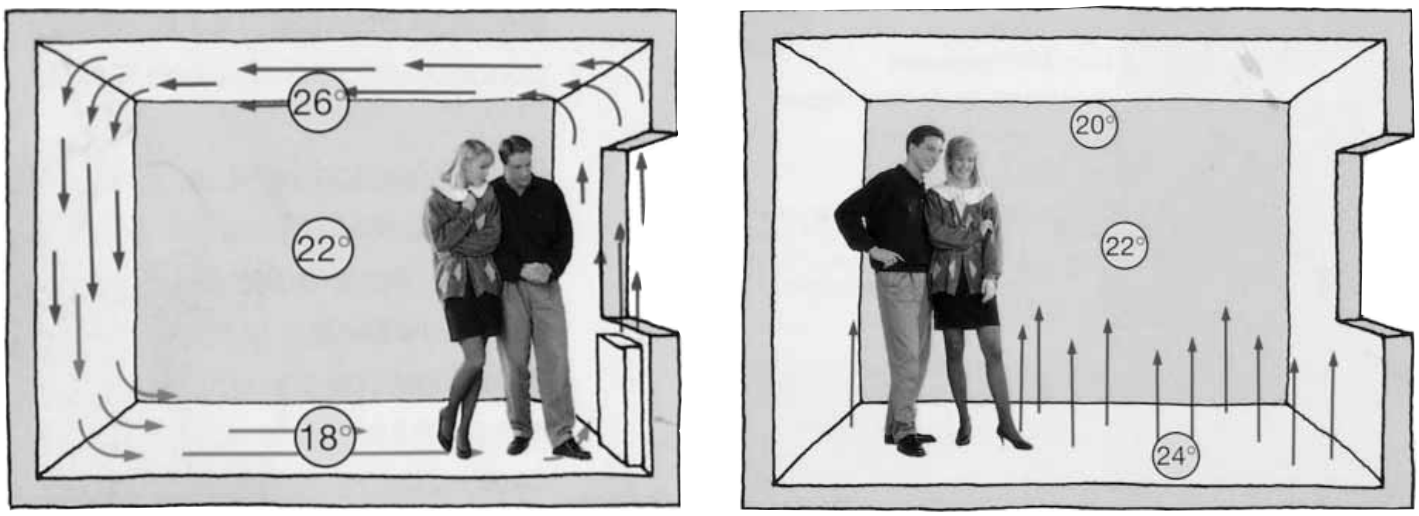
- Water-conducted underfloor heating is the option of installing a conventional central-heating boiler and water-conducted floor-heat pipes in the concrete slab. This gives a versatile system that can be adopted to any fuel in the future. The draw back is the relatively high installation cost.

Air-heat

The total heat requirement of a house can be taken care of by the ventilation system. Individual houses have different heat requirements. A Scandinavian Homes low-energy house with 3-glazing and high levels of insulation needs little heating effect. In such a house an electric duct-heater which boosts the temperature of the preheated incoming air can work successfully.

- Electric air heat: An electric duct-heater is an electric element which boosts the temperature of the pre-heated air coming from the main unit if necessary. A single thermostat in the house controls the heater. Individual rooms cannot be controlled separately. One drawback compared to electric storage heating is that night-rate electricity cannot be utilised to its full potential. This type of air-heat is usually included in Scandinavian Homes houses as a complement to the floor-heat.

- Water conducted air-heat: As an alternative, a hot-water heater is installed in the duct to heat the fresh preheated air. This is connected to a conventional oil- or gas-boiler which provides the hot water for this system. This arrangement is especially economical when an existing boiler can be used. In larger buildings this form of heat is often utilised.



The above illustrates the significant advantage that under floor heating has over conventional wall mounted radiator heating systems.

Fireplace

Some owners of Scandinavian Homes houses have installed a cast-iron stove. A total independence from electricity for space-heating can be accomplished this way. A stove with a metal flue-pipe can be installed anytime, it doesn't have to be incorporated into the design at the planning stage. With the relatively small amounts of heat needed for our houses, one stove can be sufficient for the entire house. Clean fuels, such as fire-wood or turf briquettes can be used with minimum costs. A conventional open fireplace with chimney can, of course, be built into the houses. However, the open type is not recommended because of it's inefficiency and air pollution. In a Scandinavian Homes type house, there is a very high return on heat from a small stove. When a fire is lit, the room where the stove is located heats up quickly. The heat will spread indirectly around the whole house through the ventilation-system. One cannot expect to use the stove very often, as it would become to warm for comfort. For this reason a back-boiler in a stove to heat tap-water is difficult to utilise in a Scandinavian Homes house.

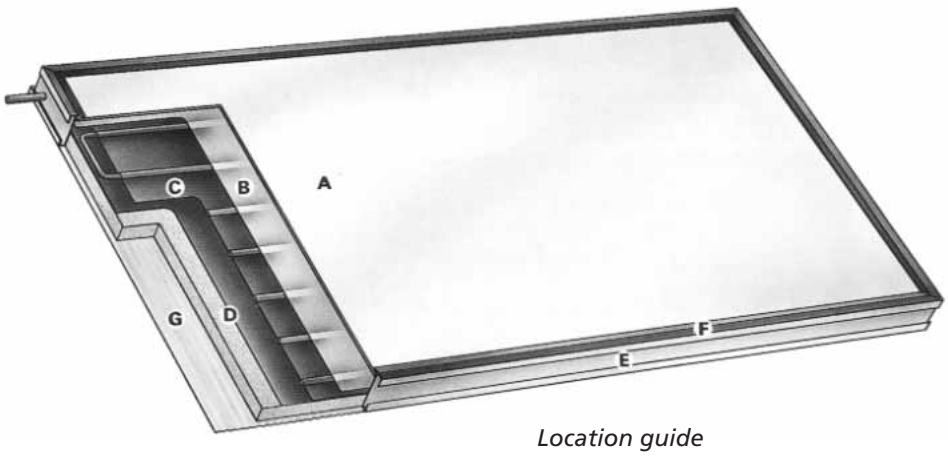
Any type of small cast iron stove can successfully be installed in a Scandinavian Homes' house.

Solar

To some extent all Scandinavian Homes houses utilise passive solar heating. The triple glazing lets through the heat from the sun-light, and most of the heat is then trapped inside the house. By locating as many windows as possible to the south and avoiding windows on the north side, this effect is increased.

Active solar heating can also be incorporated. It is an especially attractive option for the heating of tap-water. A relatively simple solution incorporates a well-insulated storage tank connected to solar-panel(s). The cold water supply to the electric immersion-heater goes through a coil in the storage tank before it enters the electric water heater tank. Most of the energy used for hot tap-water would come from the solar-panel(s). The electric heater would only "top-up" the temperature of the hot-water. The result would depend on the efficiency and the size of the solar panel(s).

A simple system for heating tap water can consist of two collectors, a small circulation pump and a heat-exchanger connected to the regular hot water cylinder. Larger systems with several collectors connected to an accumulation tank can be designed.



Solar collector for water systems, this one is from TeknoTerm.

Each collector has a surface area of 2.5m², and can collect 400kWh per m² per year. Weight 40kg. It has an expected life length of 30–40 years.

Location guide

A. Hardened glass with low ironoxide content
B. Teflon layer
C. Absorption layer with patented technique
D. Insulation with fibreglass surface
E. Aluminium frame
F. Sealant strip in EPDM-rubber
G. Back made of corrugated aluminium

Example

Before the Scandinavian Homes showhouse in Galway was extended, it was a Nordica 83. During these six years it was heated solely by one 1200W duct heater in the ventilation system. (This is the same electrical effect as 12 ordinary 100W lightbulbs!) The heater is thermostatically controlled from the hall. This effect was sufficient to keep the temperature in the entire house at around 22°C almost all year around. During the coldest, cloudy and windy days in the winter, the inside temperature dropped to around 18°C. If 18° can be considered acceptable we may conclude that the minimum heating requirement for a 83m² Nordica type of house located on an exposed site in the west of Ireland is 1200W. Translated into Watts per square meter (W/m²) it works out as 14W/m².

In order to save money one would like to use the cheap ESB night-rate. The concrete slab is an ideal storage place for the electric heat used during the night. We must use the same amount of electricity in 8 hours as we would do in 24 hours in the show-house example above. In a 83m² house we need: 1200kW = 1.2kW x 24 hours = 28.8kWh per 24 hours; 28.8kW/8 hours = 3.6kW. We would need an effect of 3.6kW for the night-heater to fully equal the continuos use of 1.2kW in the example above. This equals an effect per m² of: 43W/m² The installed effect in each individual house is usually lower than this. This can be discussed at planning stage.

Water

Water supply

The heating of tap-water accounts for a large percentage of a household's energy consumption. An efficient plumbing arrangement keeps hot water pipes as short as possible and effective insulating lagging on all pipes helps to minimise energy wastage. Our type of pressurised water saving system is used all over the world apart from the British isles. It is basically a very simple system with a minimal amount of components and potential problems. Direct pressure from a mains supply, or your own pump, feeds the house. After the internal stopcock it is divided into two branches. One branch feeds all the cold water points through a manifold. The other branch goes into the hot water heater and from there to the hot water points through a manifold.

Hot water heater-tank

Usually referred to as the immersion heater tank. It is constructed to withstand the direct pressure.(Ordinary copper cylinders cannot do this). The tank is made of steel with a porcelain coating that repels bacteria and calcification. The water does not come in contact with copper in the tank – a clear health advantage. Another important detail is the quality of the thermostat – the temperature is infinitely adjustable in the range 5°C to 65°C. The heat losses are minimal because of superior insulation and therefore the heater can be left switched on at all times. Alternatively, night-rate electricity can be used with a time-switch installed; the small heat-losses mean that the water will stay hot from morning to evening.

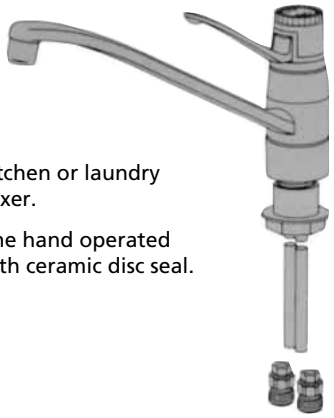
Metro hot water heater

The unit is usually wall mounted in the laundry room. Capacity of 35–450 litres.

Behind the attractive case it is well insulated – it will retain the water temperature for a full week if no water is used.

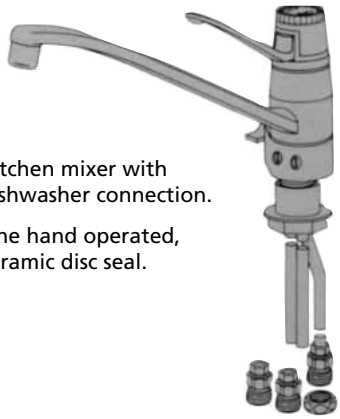
Location Guide

1. Steel housing
2. Heat insulation
3. Emapan protection of all surfaces in contact with water
4. Heater protected from calcification in pipe
5. Magnesium anode for additional corrosion protection
6. Indicator light
7. Temperature adjustment and off switch
8. The hot water is tapped from the top of the tank
9. Temperature sensor
10. Safety thermostat



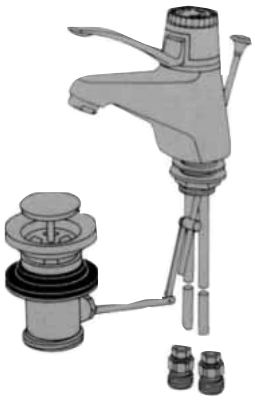
Kitchen or laundry mixer.

One hand operated with ceramic disc seal.



Kitchen mixer with dishwasher connection.

One hand operated, ceramic disc seal.



Hand basin mixer set.

One hand operated with ceramic disc seal.

The heatlosses from the unit are exceedingly small so a traditional hotpress arrangement cannot be used as the surrounding cupboard will not get heated. The electric heating element is built into a ceramic-covered tube in the tank. Therefore the water does not come in direct contact with the heater. This precludes lime build-up on the heating-element. It is dismountable for inspection. The unit's clean-cut design resembles a refrigerator and it does not have to be built-in. They are available in many sizes: 35, 60, 110 or 160 litres. The effect of the heating element varies between 1000–1500 Watt, single phase 230 V. They are pressure tested to 13.5bar.

Plumbing

All plumbing is concentrated to the laundry room. This room, as well as bath and shower rooms are waterproofed and equipped with a floor-trap. The water-supply pipe enters the house here, the water-heater is located here, and all water-pipes originate here. Manifolds divide the hot and cold water supply to cross-link polyethylene pipes that run without interruptions or hidden connectors, directly from the manifold to each tap. This makes the system leak-proof. All hot and cold water pipes are thermally insulated.

Mixers

The greatest advantage of a high pressure system lies in the saving of water used in each mixer. There is an air injection in the nozzle of the taps which gives the user the feeling of a powerful water-flow. In fact, less water is used in these taps than in ordinary taps. The mixer-taps are one-hand operated. You get the desired temperature almost immediately. The shower mixer is noticeably more comfortable and economical to use than the usual type on sale in Ireland. The kitchen mixer has a built-in safety valve for dishwasher connection. All mixers (except shower) have a ceramic-disc seal which is maintenance free and does not need replacement.

Alternative arrangements

Any type of water system can be installed in a Scandinavian Homes house. From the ordinary indirect system with an open tank in the attic to modern solar powered arrangements. We are interested in developing alternative systems for further heating/heat-recovery of water. Please talk to us about this if you have any ideas for your house.

Waste water

All sewage pipes are cast into the foundation in precise positions. The sewage ventilation pipe starts in the foundation and is connected to a vent tile through the roof. There are no unsightly and easily damaged piping arrangements on the outside walls. The pipe dimensions for grey-water waste are larger than usual in order to minimise the risks of reduced flow and blockages in the future. All pipes in the house are connected to one central outlet for further connection to septic tank / treatment system / sewage system. We can supply biological dry toilets, "Bio-let", that need no sewage connection at all. Alternatively, Swedish watersaving toilets that use only 2 or 4 litres for flushing (compared to 9 litres for the regular type on sale here) can be installed.

Foundation

Most important of all in a sound house is a sound foundation.

1 Structural strength

2 Moisture resistance against rain and damp rising from the ground

3 Good thermal insulation.

By using the laws of physics instead of fighting them Scandinavian Homes can provide concrete rafts of extraordinary quality. By carefully insulating the raft from below with a permeable insulation, a moisture-mechanical advantage is attained – moisture will travel from the warmer concrete into the colder ground. Provided that this insulation is continued under and around the circumference of the entire foundation, a uniquely dry foundation is the result.

Base unit

Scandinavian Homes uses a specially insulated base unit around the perimeter of the foundation. It has a core of expanded polystyrene surrounded by fibreglass-reinforced concrete. Moisture cannot penetrate the base unit because of the moisture mechanical advantage. The heat-losses are greatly reduced with all cold-bridges eliminated. The base unit provides a

finished surface which can be left as it is or plastered, painted or whitewashed. The base unit acts as shuttering when the concrete slab is poured. It is strong enough to support a non load-bearing brick wall, but primary loads should not rest on the base unit.

Under-slab insulation

60mm continuous and carefully fitted insulation of expanded polystyrene under the entire concrete slab ensures a dry and warm foundation. This can be increased to 120mm if desired. Where structural loads are carried by the foundation, an extruded high-density polyurethane insulation is used.

Plumbing and phone

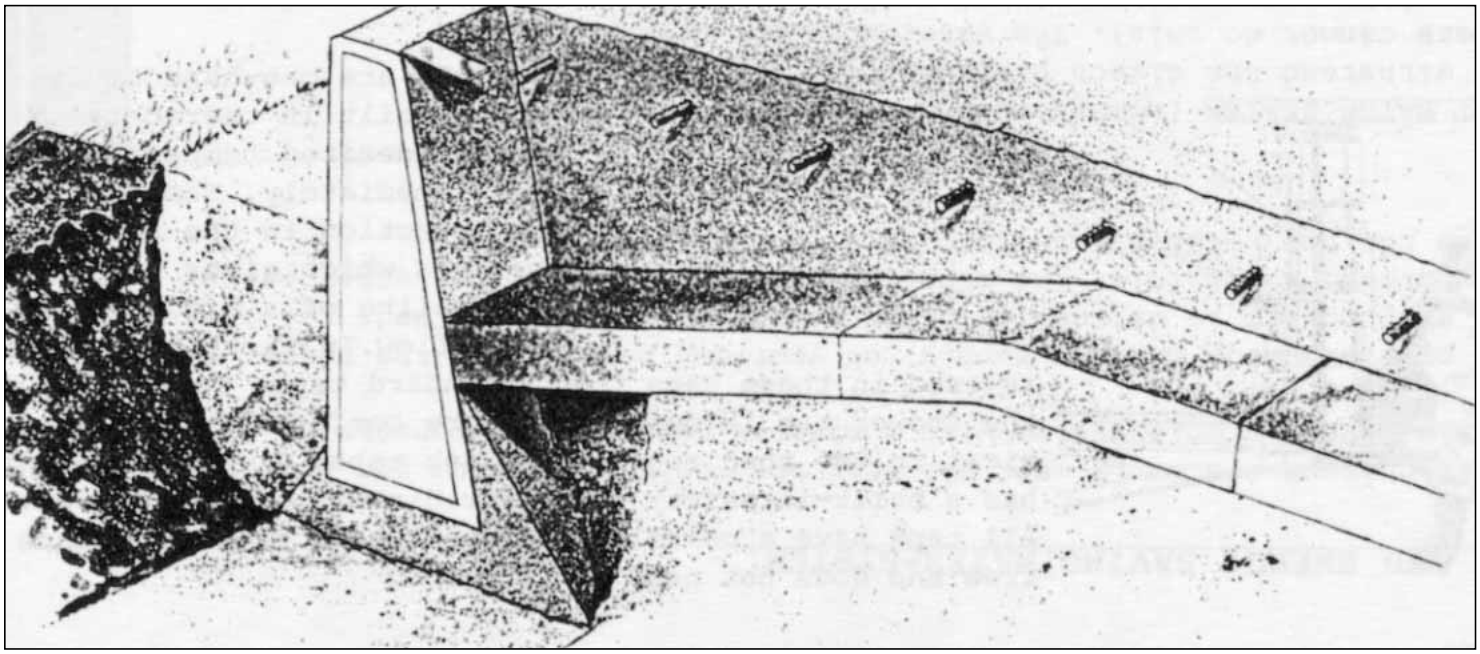
All sewage plumbing is precision fitted into the foundation. There is no unsightly plumbing around the outside of the house – only one central outlet. In bath and laundry rooms a slightly recessed floor trap is installed. This means that water damage in the future is eliminated because if a leak does occur, all water will find its way out through the floor-traps. The supply-water pipe and telephone duct is also built into the foundation.

Underfloor heating

By utilising the large mass and thermal heat capacity of the entire concrete slab, very effective storage heating is acquired. Special floor-heat-cable is installed in all foundations. The effect varies, depending on house and client requirements. For a normal family home of 100m^2, about 3000 Watt is sufficient. This can be compared with a standard ESB 3000 Watt storage heater that usually serves only one room! The Scandinavian Homes heat-storage arrangement has a storage capacity that is many times larger, and thanks to this the floor will never be particularly warm. The occupants control the heat from the floor by regulating the length of time it is running with a simple wall-mounted timer.

Powerfloating

Conventional steel enforcement is used and when the concrete is poured, careful power-floating ensures a smooth surface. There is no need for more layers of screed. Later, carpets or timber can be installed directly onto the concrete surface.



Moisture mechanical advantage

When a raft foundation is insulated underneath with a permeable insulation, a moisture mechanical advantage is gained with the moisture travelling from the slab into the ground. How can this be possible? The ground has 100 % RH (relative humidity) and a definite temperature, for example 17°C. This gives a moisture pressure of 1937 Pa. The insulation gives the underpart of the concrete a higher temperature than the ground temperature, for example 20°C. The condensation moisture-pressure (at RH 100 %) is 2338 Pa at this temperature. Because the moisture pressures strive to be equal, there is a moisture movement downwards. This moisture movement will continue until the moisture pressure is the same in ground and slab. In the example above this will be when the slab has a 83 % RH. This moisture level is acceptable in most situations. To create a safe, dependable moisture movement downwards, a temperature difference of at least 2° is necessary. This occurs with 30–40mm insulation, when the foundation is not wider than approx. 15m. From a heat-insulation point of view, a thicker insulation is preferable as this gives an even better protection against moisture. The insulation has to be installed under the whole slab with no exceptions. In the spring, when the floor-heat is switched off, a situation can arise where an under-foundation ground temperature is higher than the temperature of the concrete slab, with a reversed upward moisture movement as a result. To avoid the risk of this happening Scandinavian Homes take the following precautions:

- Limits the heating effect to around 50W/m^2,
- Careful installation of 60mm (optional 120mm) insulation,
- Includes polyethylene vapour barrier under the concrete.

Environmental aspects

Green alternative

As we become more and more conscious of the detriment that is caused to the environment in order to achieve our basic housing needs, we often choose a "green alternative" which may unfortunately be more expensive than the regular more unsound product – naturally grown vegetables is one example.

Increased standard of living

In a timber frame house from Scandinavian Homes however, the opposite is true. The standard of living is substantially increased while the cost of living is substantially decreased and at the same time the method of building and running the house is environmentally friendly.

Fight the greenhouse effect

To start with, our houses are built from a natural resource, coniferous trees from managed forests in Scandinavia. These trees are not only replaced at a greater rate than they are being cut down but the material itself is helping to combat the greenhouse effect. All trees reduce CO^2 and produce oxygen which is vital to the living air that we breathe. What right does this generation of people in Europe and North America have to use up our planets fossil resources for thoughtless heating of poorly built houses? The massive combustion of oil and coal for production and running of environmentally unfriendly houses creates massive air pollution's which causes acid rain.

Energy waste and pollution in the production of a house

Considerably less energy is used to produce a timber frame house compared to a house with masonry walls. Timber requires relatively small amounts of energy to grow and process, and there is no need for huge environmentally unsound processing plants with smoke-emitting chimneys. The production does not create permanent scars and damage to nature as the production of concrete and steel does. Timber is also lightweight in relation to its size and strength which makes it economical to transport and to work with. Another bonus is that the waste from primary processing of timber can be used to make particle boards. Timber is a low pollution material – in felling, processing, use and disposal. Preservative treatments are needed for timber in some cases, and the treatment must to be carried out under properly controlled conditions. But in contrast to most other building materials it does not contribute to the "sick building" syndrome. This is usually caused by moisture penetrating and staying in the walls of houses with masonry outer walls.

Nordica 94 with upstairs door for proposed balcony.

Life length and maintenance

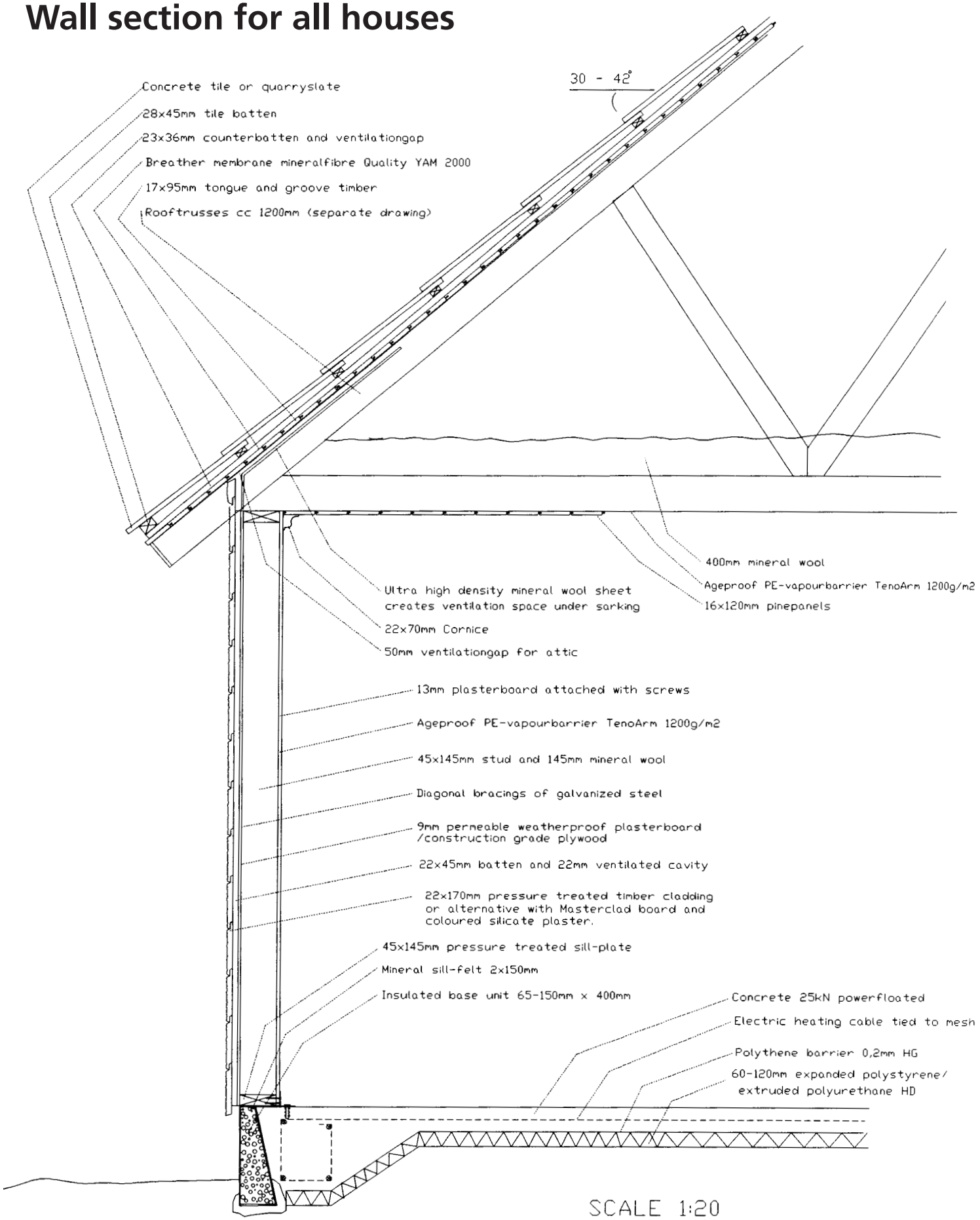
The expected life length of the house – and the time before major repairs are necessary – is an important environmental as well as economic issue. A house that works well over a long period of time will naturally be a lesser burden on the environment than one that needs frequent overhauls. A standard house with plaster outside of cement blocks will need some type of re-painting with very short intervals if it is to stay looking good. A stained timber panel would need new stain every 4–8 years for visual reasons. The plastered wall usually needs major repairs after 30–50 years. The effects of water and frost can cause cracks and movements of the cement blocks which makes the plaster fall off in places. The timber cladding is made of close grained pine with high levels of natural resin and also pressure treated. It is generally estimated that the cladding will last for 100 years in a maritime climate.

The fact that different types of materials, such as brick, PVC, aluminium and wood shrink and expand differently, is important for the maintenance and the life-span as well. In a house built of a mix of different materials, such as a regular cement block house, the following happens: Different parts of the house contracts and expands variously. Problems with cracks, leakage's and the deterioration of decoration details will occur quite rapidly. A timber frame house never develops these problems because the whole structure moves in the same way when temperature and moisture levels change over the year.

Energy savings in the running of a house

By far the most important aspect of the issue is the enormous saving on energy that living in a carefully constructed timber frame house entails. Houses consume almost two thirds of Ireland's annual energy bill. If regular houses were insulated to Swedish standards, heating bills would be cut by 90%. When you think about it – there must be something wrong somewhere. The average outside temperature in Ireland is +10.1°C. The desired inside temperature is about +20°C (which very few ordinary houses can give its occupants today). The difference is only 10°! It should not take much energy to make up this difference. In northern countries the difference between inside and outside temperature is often between 30° and 50° and people manage without paying high energy costs – because they just had to develop better houses. Ireland could save an awful lot of fuel, money and decrease the amounts of air pollution. All this at the same time as the standard of living would increase dramatically with houses that are warm and habitable in all rooms all the time!

Wall section for all houses



SCALE 1:20

SCANDINAVIAN HOMES LTD MOYCULLEN GALWAY IRELAND Tel 091-555 808 Fax 091-556 808	SCANDINAVIAN HOMES LTD Skottegatan 15 LYSEKIL SWEDEN Tel 0523-10820 Fax 0523-611161
WALLSECTION ALL HOUSES	1994.02.16 LARS PETTERSSON
DRAWING # WALLSEC	REV #

Features

Windows are all triple glazed with low emission glass on the inside and argon gas in the two 12 millimetre gaps between the panes.

External doors are all insulated to give a U-value of W/m²k.

External walls are insulated with 145mm mineral wool (optionally increased to 240mm).

Concrete foundation slab is fully insulated underneath with 60 mm expanded polystyrene/extruded polyurethane (optionally increased to 120mm), and around the edges with a special base unit which has a thickness of between 65mm and 120mm.

The attic is insulated with 400mm mineral wool in between and over the rafters.

There is the option of having an attic structural conversion included with all our houses, except Atlantica with 30° roofpitch.

All our houses are constructed using a modular production system.

Four Series of houses

We offer four series of houses (Atlantica, Baltica, Nordica and Hibernia). All houses are built to the same basic specification. The series differ from each other only in the width of the main body of the building.

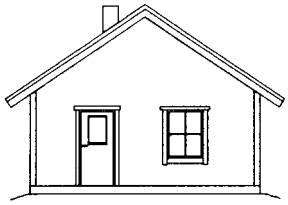
Within each series the width of all houses are the same and variations are achieved by increasing the lenght only.

Each house number corresponds to the actual floor area of that house. Here are examples of popular dimensions:

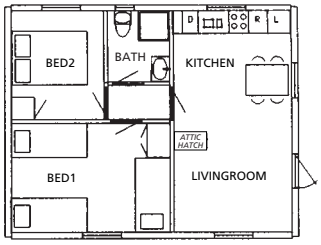
House type	*Internal width (mm)*	*External width (mm)*	*Internal length (mm)*	*Floor area (m²)*
Atlantica	5,684	6,106	9,600	55
Baltica	7,484	7,906	9,600	72
Nordica	8,684	9,106	9,600	83
Hibernia	10,484	10,906	9,600	101

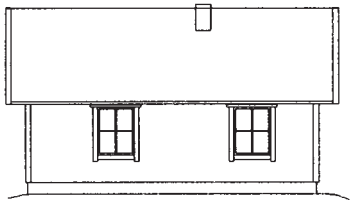
Atlantica Series

Internal width: 5.7 metres. A standard roof pitch of 30° can be increased to 40°. This is the narrowest house from our range. It has the same external width as the traditional cottages of rural Ireland, but is much wider inside because the external walls are not as thick. An Atlantica size can be increased simply by adding to the overall length. For example, an Atlantica 147 is 5.7 metres wide and 25.5 metres long. It is a fact however, that a long, narrow house will be more expensive to build, per square metre, and will cost more to heat than a square shaped house.

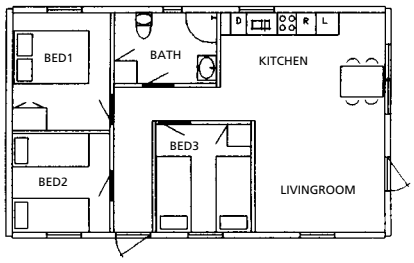


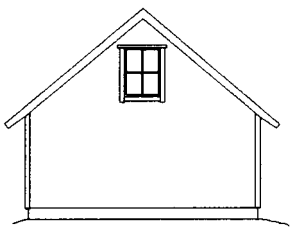
ATLANTICA 41
Floor area 41m² – 428sqft



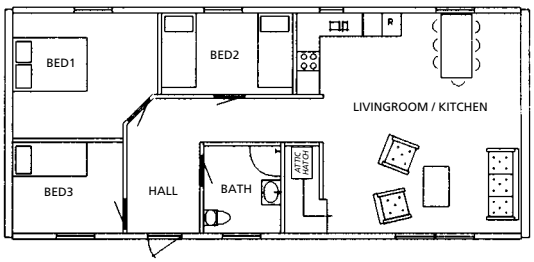


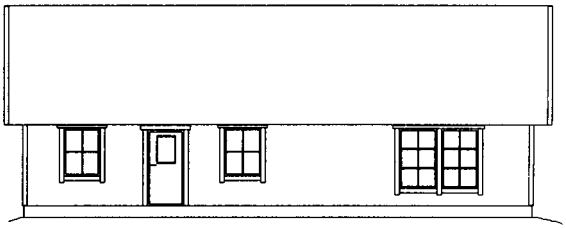
ATLANTICA 55
Floor area 55m² – 587sqft





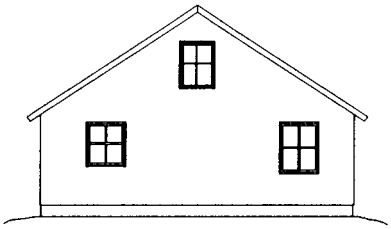
ATLANTICA 75
Floor area 75m² – 807sqft

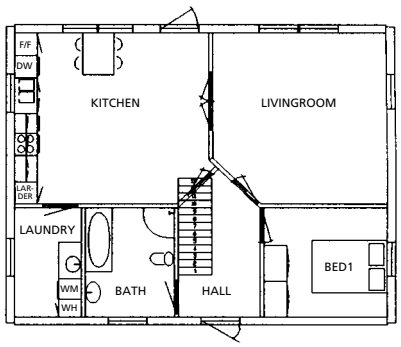




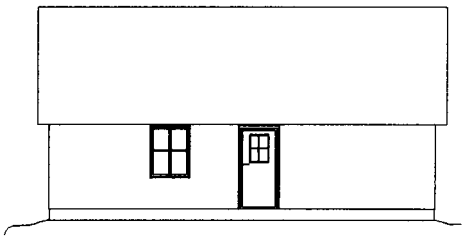
Baltica Series

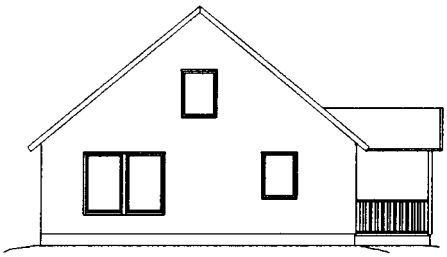
Internal width: 7.5 metres. A standard roof pitch of 35° can be increased to 42°. The Baltica is also a relatively narrow structure, and with increased roof pitch, it's dimensions are similar and in proportion to the traditional farmhouses in the Irish landscape. This feature makes it a good choice in locations where an indigenous shape is preferable or is stipulated in the planning regulations. As with all our houses, it can be finished with timber cladding, or with a modern silicate plaster on a fibre silicate board.



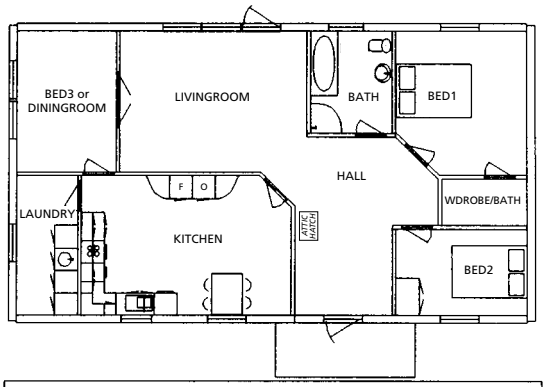


BALTICA 72
Floor area 72m² – 773sqft

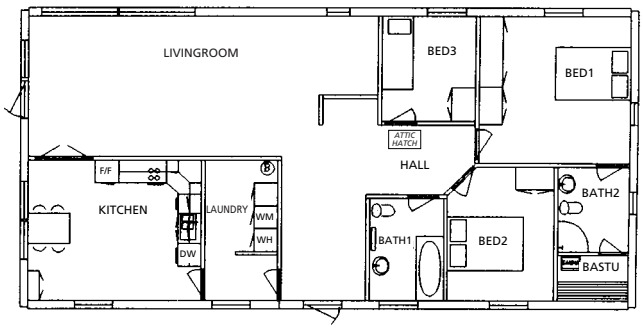


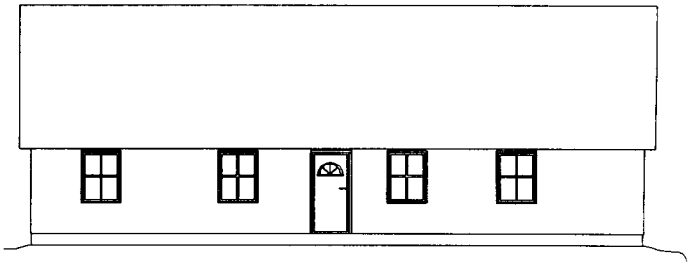


BALTICA 99
Floor area 99m² – 1066sqft



BALTICA 117
Floor area 117m² – 1260sq ft

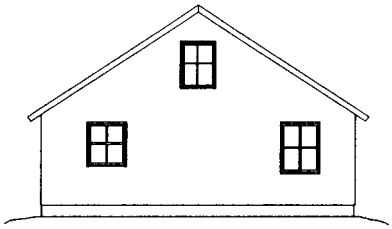


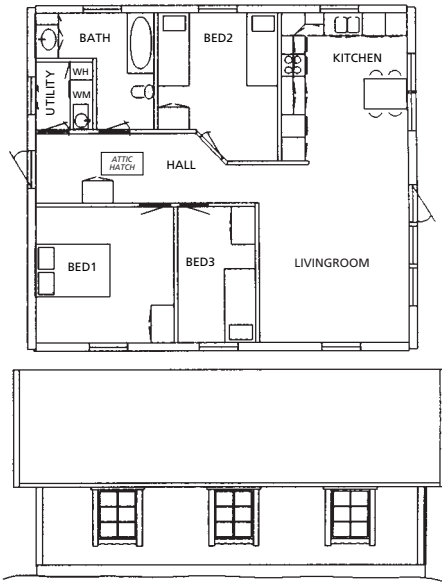


Nordica Series

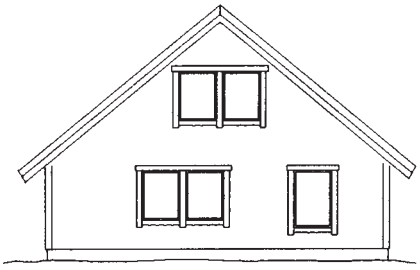
Internal width: 8.7 metres. A standard roof pitch of 30° can be increased to 40°. This is the best-selling house type in the range. It is a relatively wide structure, and therefore has a relatively small surface area. This characteristic makes the Nordica more economical to produce and very energy efficient to operate – especially if the site allows the windows to be positioned so as to get maximum benefit from passive solar radiation. South, east and west-facing windows optimise solar heat gain.

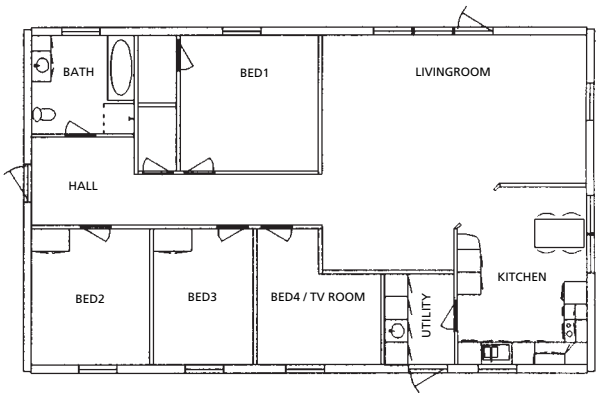
Before it was extended, our show house in Galway was constructed as a Nordica 83. The Nordica 94 is now the most economical size of house available. It is also the most popular size of all our houses.



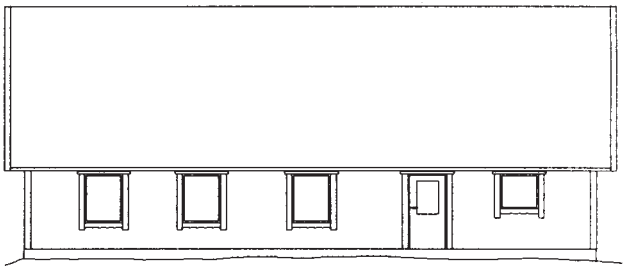


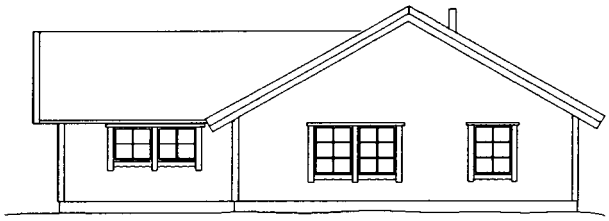
NORDICA 83
Floor area 83m² – 897sqft

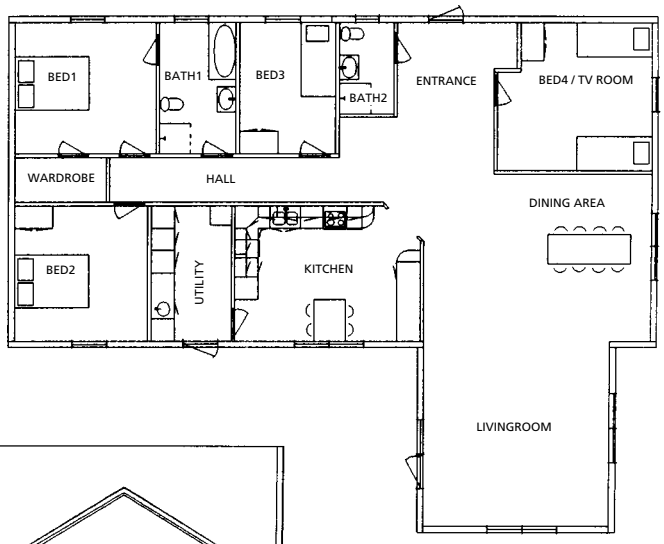




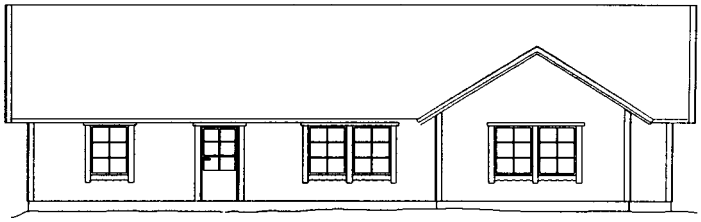
NORDICA 125
Floor area 125m² – 1345sqft







NORDICA 146 + L-extension
Floor area 146m2 – 1570sqft excluding L
168m2 – 1808sqft including L

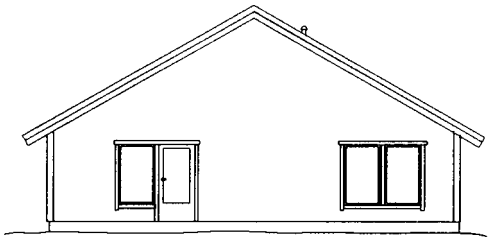


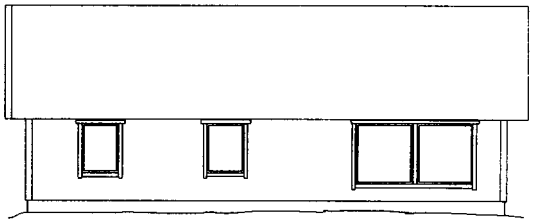
Hibernia Series

Internal width: 10.5 metres. A standard roof pitch of 30° can be increased to 40°. This is the latest house type in our range. It is a wide bodied structure which is suitable as a large home or for other uses. An Hibernia 63-type has been added to our show house in Galway (previously, a Nordica 83).

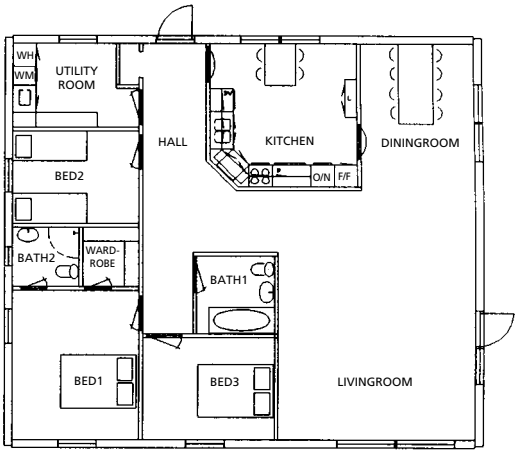
Having a relatively wide structure means the Hibernia is energy efficient because of it's small surface area relative to floor area.

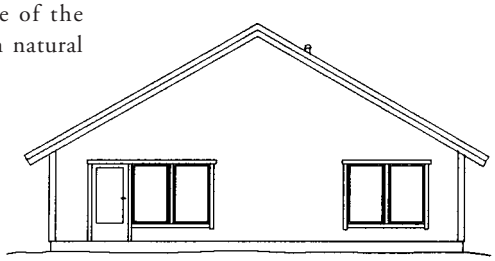
Our challenge is to design the Hibernia to prevent the house becoming too dark inside due to a lack of natural light. For this reason, the addition of extra light shafts from the options list ensures that all the rooms towards the centre of the house will receive as much natural light as possible.

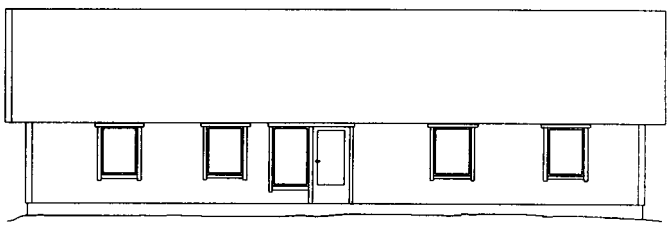




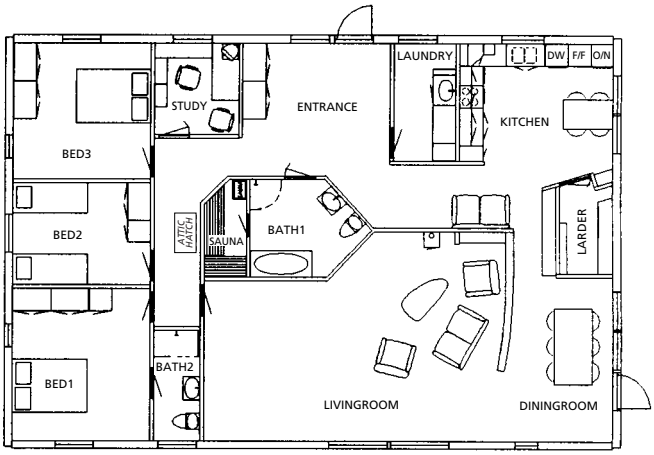
HIBERNIA 126
Floor area 126m² – 1354sqft

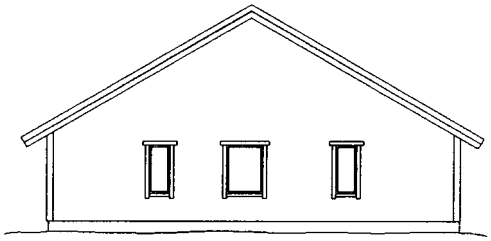




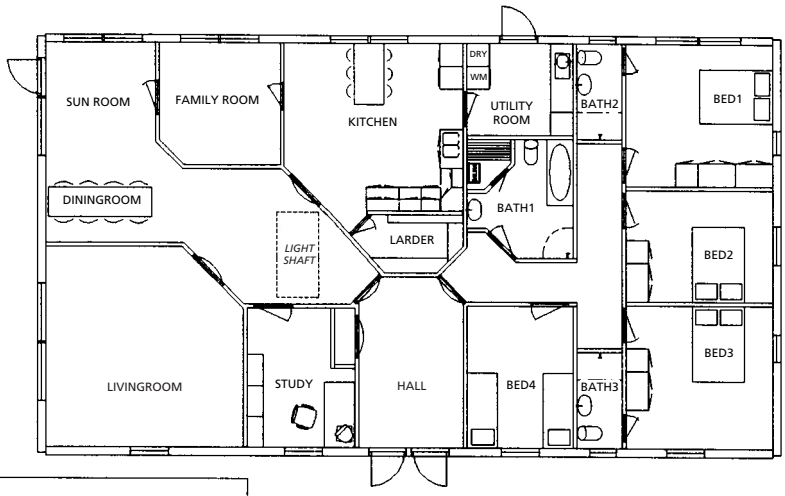


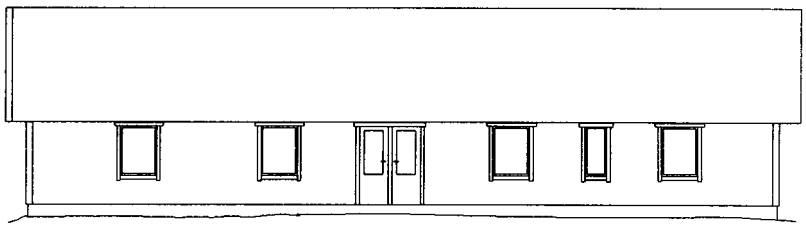
HIBERNIA 164
Floor area 164m² – 1760sqft





HIBERNIA 201
Floor area 201m² – 2166sqft





Nordica 94 with Nordic timber panel exterior.

SCANDINAVIAN HOMES LTD

Moycullen Galway Ireland Telephone 091-555 808 Fax 091- 556 808

Nordica (with Hibernia extension) and Atlantica show houses are located in Poulnaclough, between the villages of Moycullen and Barna in Co. Galway. Only 10 km from Galway city. From Galway city, take the Cliften road. After 6 km turn left onto the Barna road. Drive straight ahead for 2.5 km, pass two timber houses on right hand side. Take the first road bearing off to the right. After 20m you will see our sign for the showhouse.

Showhouse open every Wednesday, 3 – 6 p.m. or by appointment.