St. John's Close, Virginia, Co Cavan

Project Details:

Location:	In the grounds of St. Joseph's Nursing Home, Virginia, Co Cavan
Project Start:	May 2002
Project Completion:	Practical Completion was in July 2003 with residents moving in from September 2003
Client:	Masonic Havens Ltd
Project Co-ordinator:	Ryan O'Brien Handy
Architects:	Ryan O'Brien Handy
Civil and Structural Engineers:	Clifton Cannel Emerson
Building Services Engineers:	Glenelco Ltd
Quantity Surveyors:	Austin Reddy & Company
Builder:	McAleer and Teague

Key Suppliers:

NuTech Consultants:	Design and Supply of Renewable Energy Technology Systems, Design and Installation of Sunwarm Air Solar Heating, Ventilation and Hot Water systems, Supply of Electronic Control systems
NuAire Ltd:	Manufacturer of the Sunwarm Air Solar Collectors and Air Handling Units
ITEC:	Supply of timber frame units
Moy Isover:	Mineral wool insulation
Kingspan:	High performance roof insulation
Rationel Vinder Ltd:	External doors and windows

The Masonic Havens development in Virginia Co Cavan is a House of Tomorrow supported project that employs sustainable design and innovative practice in the construction of a community complex consisting of 26 sheltered houses for the elderly.

The houses are single-storey, with two bedrooms, are built to full accessibility standards, suitable for older and disabled people and designed to promote extended independent living.

The main aims of the project were to demonstrate that sheltered housing can be designed and built to a high standard of sustainability while showing that a high level of comfort can be achieved (in an area of Ireland that is both cold and windy) without an enormous energy penalty and consequent large CO_2 emissions.

The sustainable design of the houses, in conjunction with the materials and equipment employed in the construction, ensure that energy savings of greater than 55%, in comparison to a similar house built to the proposed 2002 Building Regulations TGD Part L, are achieved. The air tight construction gives a basic infiltration rate of less than 0.4 air changes per hour. Fresh air intake, with heat recovery ventilation, gives rise to approximately one air change per hour when the heating system is on.

The heat recovery ventilation system in addition to an air solar heating system provides the majority of the energy required for space heating. Auxiliary heat is supplied by a condensing gas boiler.

The project demonstrates that this type of sustainable approach can be replicated in all future housing. In particular it can be followed in sheltered housing and nursing home schemes where high comfort levels with low running costs are both welcomed and necessary.

Key Energy Features Include:

- All 26 houses are within an old walled garden and are protected from winds by stone walls on three sides. The south facing open side has been planted with trees and vegetation which act as a shelter belt.
- Insulation levels throughout the fabric of the building are well in excess of the levels as required by the Elemental Method in Part L of the 2002 Building Regulations
- The building is of air-tightened timber frame construction. The principles of 'Build Tight – Ventilate Right' were followed
- High performance Rationel windows were used
- A Sunwarm Air Solar Heating, Ventilation and Hot Water system was fitted including a Heat Recovery Ventilation module
- The Sunwarm system uses DC motor technology to reduce the amount of electricity used for fan power
- The houses have a balanced Thermal Capacity to make best use of solar and incidental gains that prevail in the Irish Climate
- A Horstmann 2-channel timer was fitted to separate the requirements for space and water heating that is provide by the back-up high efficiency LPG gas boiler
- The control of the solar heating, ventilation and hot water system and the gas boiler is achieved by way of a Programmable Logic Controller that was programmed by NuTech Consultants

House of Tomorrow Factsheet

St. John's Close

Site planning and design

The houses are set in lands owned by St. Josephs Nursing Home. The high walls of the garden act as a wind barrier on three sides of the site –the fourth side faces south and slopes gently down to the lake. This side has been planted with trees and vegetation to act as a shelter belt.

The design of the complex is such that a reasonably compact built form results. The houses are designed as groups of terraces and are built around a central quadrangle. They make reasonable use of daylight to reduce the electrical demand for auxiliary lighting.

Insulation of the building fabric

The houses are insulated to a level that exceeds the requirements of the Elemental Method as set out in TGD Part L of the 2002 Building Regulations.

The floors are insulated with 150mm of high density expanded polystyrene. The U-value of the floor is less than 0.20 W/m^2K.

The main structure of the house is constructed in timber frame. The walls have a 140mm stud and were insulated with 150mm fibre glass insulation that was compressed into the 140 gap. The fibreglass insulation has a density of 18 kg/m^3. The inside face of the external walls were further insulted with plasterboard lined with 50mm of Kingspan PIR insulation. The achieved U-value in the external wall is less than 0.20 W/m^2K.

The roof had 200mm of fibreglass insulation of 18 kg/m^3 fitted in between the rafters. A further insulation layer of 75mm of Kingspan PIR foam was fitted along the slope. All joints were sealed and the PIR insulation was sealed at the eaves to form an air-tight barrier. This continuous layer of foil backed insulation also formed the vapour barrier to the roof. The U-value of the roof is less than 0.15 W/m^2K.

The windows are high performance Rationel windows with good seals to aid the overall air-tightness of the building.

The heating, ventilation and hot water system

The Sunwarm Air Solar Heating, Ventilation and Hot Water system was used with a Heat Recovery Ventilation module attached. The objective with the design of this system was to meet the heating and ventilation requirements of the house without having to fit a conventional radiator type heating system thereby reducing overall costs.

The 4-panel Sunwarm system has $12m^2$ (gross) of solar collector. During the day the fresh intake air, having recovered heat from the HRV module is fanned over the solar collectors, if appropriate, and this solar heated air is then used to heat the house. This means that the house is ventilated with a 'zero energy penalty' during this mode of operation. During periods of high solar radiation in winter, the air from the solar collectors can be in excess of 70˚C. Heat is taken from this air and is passed over an air to water heat exchanger and heat is thereby pumped to the solar coil at the bottom of the hot water cylinder. The balance of the heated air is used to heat the house. If the house is warm enough, this being determined by the electronic thermostat, then all of the solar heat is put into the domestic hot water system. In summer, all of the solar heat is given to producing hot water and no heat goes to the house unless the resident desires it i.e. by turning up the thermostat. At night time the ventilation air is constantly fed to the house via the HRV system. This means that the house is constantly ventilated and gives high levels of fresh air throughout the day and night.

A back-up LPG fire gas boiler is integrated into the system. This is used by the resident in the same way as any conventional heating system i.e. it is controlled by way of the Horstmann timer and the house thermostat. An important feature of the system is that if the house is warm enough the boiler will not 'fire', this means that 'dry-cycling' of the boiler is avoided.

The ventilation of the house is achieved by way of the HRV system that is built into the Sunwarm system.

All of the logic for the solar heating, hot water and ventilation strategy of the house is controlled by way of the Programmable Logic Controller that has been programmed by NuTech Consultants. The resident does not have to make any decisions regarding the control of the system other than deciding the house temperature by way of the thermostat and the times that the back-up boiler may be required i.e. by using the Horstmann boiler timer.

A simple 'Homeowners Guide' for the use of the system was provided to each resident. This is in the form of a laminated 1 page A4 sheet.

About the House of Tomorrow Programme

The House of Tomorrow Research, Development & Demonstration Programme is administered by Sustainable Energy Ireland (SEI) under the Economic & Social Infrastructure Operational Programme of the National Development Plan (2000 - 2006). The principal objective of the programme is to generate results from funded projects which can lead to more sustainable energy practices in Irish housing, both new build and existing stock.

For more information log on to www.sei.ie

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NDP NATIONAL DEVELOPMENT PLAN