

# House of Tomorrow Factsheet

## Energy Efficient Refurbishment of 100 Dublin City Flats



### Project Details:

<b>Project Start:</b>	May 2003
<b>Project Completion:</b>	December 2004
<b>Client:</b>	Dublin City Council
<b>Project Co-ordinator:</b>	CODEMA
<b>Architects:</b>	Dublin City Architects Shay Cleary Architects
<b>Consulting Engineers:</b>	Arup Consultants PH McCarthy & Partners Homan O'Brien Associates
<b>Building Contractors:</b>	Gowna Construction Ltd Glenman Corporation Ltd Pierce Contracting Ltd



### Key Suppliers:

<b>Windows:</b>	Wrights Windows Systems www.wrightwindows.ie Norman Pratt Group www.normanpratt.ie
<b>Insulation:</b>	Xtratherm Ltd www.xtratherm.com Kingspan Group plc www.kingspan.com
<b>Lightweight thermal blocks:</b>	Quinn Group www.quinn-group.com
<b>Gas fired boilers:</b>	D. Harris Heating & Plumbing dharris@harrisheating.ie Glow Heating Ltd www.glowheating.com

The refurbishment of 100 Dublin City flats at Queen Street, Ballybough and Bridgefoot Street demonstrates how simple solutions can provide a high standard of energy efficiency in the refurbishment of social housing units.

The flats were constructed in the 1960s and major refurbishment was considered necessary, as the fabric of the buildings had deteriorated significantly, in particular the windows, roof and concrete works.

Refurbishment was considered in the context of several priorities:

- a. Reduction of greenhouse gases
- b. Combating fuel poverty
- c. Preservation of housing stock

The performance of the refurbished buildings relative to their original performance:

- Fuel Costs 52% reduction (savings of €3.70/m<sup>2</sup>/yr)
- Energy Usage 52% reduction\* (savings of 855kWh/m<sup>2</sup>/yr)
- CO<sub>2</sub> emissions 88% reduction (savings of 318kg/m<sup>2</sup>/yr)

The superior energy features of the refurbishment project was awarded a grant of €500,000 through Sustainable Energy Ireland's House of Tomorrow Programme, which is funded by the National Development Plan and is managed by Sustainable Energy Ireland. The City of Dublin Energy Management Agency (CODEMA) co-ordinated this House of Tomorrow project on behalf of Dublin City Council.

\* Calculation based on a theoretical HER of 340 kWh/m<sup>2</sup>/yr for a typical flat. Using a 35% efficiency factor to account for the solid fuel giving a BER of 971kWh/m<sup>2</sup>/yr. New rating based on a HER of 92kWh/m<sup>2</sup>/yr and a 75% efficiency giving a BER of 116kWh/m<sup>2</sup>/yr programme on behalf of Dublin City Council.

### Key Energy Features Include:

**Orientation:** South-facing aspect retained to optimise passive solar gain.

**Heating system:** Highly efficient conventional natural gas boilers replaced solid fuel open fires.

**Balconies:** South facing balconies are enclosed and incorporated into living space. This overcomes the problem of heat loss from overhanging floors and ceilings due to walkways.

**Windows:** New high performance windows are double glazed, argon filled, low-e, timber frame, reducing the U-value from 5.0 W/m<sup>2</sup>K to 1.5 W/m<sup>2</sup>K.

**Fabric elements:** Retrofit wall insulation reduced wall U-values from 1.90 W/m<sup>2</sup>K to 0.2 W/m<sup>2</sup>K. In the Ballybough and Bridgefoot street refurbishments, a new pitched roof was added over the existing uninsulated concrete deck. Mineral fibre quilt insulation (100mm) between joists and 150mm above joists give a U-value of 0.16W/m<sup>2</sup>K from an initial value of 1.94 W/m<sup>2</sup>K. In general, the upgrading of the walls, roofs and ground floors of all 100 flats resulted in an average overall U-value reduction of 33%.

**Smart Card:** User-friendly smart cards allow residents to pre-pay for their gas consumption, allowing them to budget on a weekly basis. This also helps create an energy awareness among the residents of their fuel consumption.

### Site planning and design

The project was carried out within an overall integrated area plan for social, economic & environmental regeneration of the inner city. While the flats were structurally sound, they required major works to bring them up to modern standards of comfort, security and energy efficiency. Refurbishment work sought to repair the urban fabric, integrating energy efficiency design and creating diverse and cohesive living city quarters while keeping the existing close-knit community together. This provides a variety of housing and outdoor urban spaces.

The compact built form was maintained to minimise heat loss surfaces and apartment blocks with a southerly aspect were retained. The existing balconies presented a significant exposed surface to the floor of the bedroom overhead and to the ceiling of the bedroom underneath. As these areas were not insulated, they represented a large heat loss and contributed greatly to the heating and dampness problems of the apartments. Balconies to the south were incorporated into the (enlarged) living room, greatly reducing heat loss through the building fabric.

### Heating system

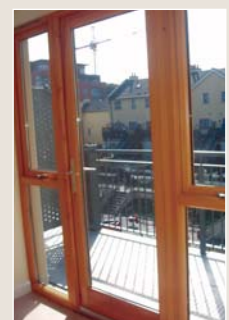
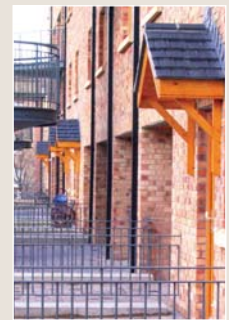
The new heating system is a highly efficient conventional natural gas boiler, with hot water radiators and cylinder for domestic hot water. The boiler is SEDBUK "A-rated" and incorporates a programmable time and temperature controller. This allows for independent control of the hot water and space heating systems while insuring maximum comfort and the most efficient and economical operation of the system. Condensing gas boilers were considered, but they would not be cost effective on a life cycle analysis, due to the very small heat demand of the well-insulated dwelling. This efficient and effective heating system replaces an inefficient and ineffective solid fuel open fire or stove with an efficiency at best 35% and high carbon dioxide emissions, supplemented by portable electric or bottled gas heaters.

### Energy and environment technology specifications

The flats were originally constructed with little or no thermal insulation, single glazed windows etc. resulting in problems such as dampness and condensation meaning the flats were difficult to heat. In addition to the upgrading of the fabric using high specification CFC and HCFC free insulation, the refurbishment also incorporated low u-value glazing, low energy lighting and low flush 6 litre toilets.

### Social and consumer issues

Fuel poverty arises as a result of living in poorly insulated dwellings with inadequate heating systems where tenants are unable to achieve a reasonable degree of comfort at reasonable cost. The replacement of solid fuel with a gas fired central heating system not only reduces heating costs for the resident but also greatly improves thermal comfort. Prior to refurbishment, a tenant would have to spend approximately €1000/year to adequately heat a typical flat using solid fuel. In reality, residents were paying approximately €480/year to heat one room only, through solid fuel such as peat briquettes or coal. With the inclusion of additional insulation and other energy features, tenants are now paying on average €250 per year to heat the whole apartment to a comfortable level. The 'smart card' method of payment enables residents to budget on a weekly basis. It works on a principle similar to a mobile phone top-up-card and is recharged at a local shop, allowing the resident to budget on a weekly basis.



### 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](http://www.sei.ie)