Building Performance Evaluation Study
part-funded by the Technology Strategy Board 2011/12
“the award-winning project offering super-low energy bills”
What will cover

1. Background about the Quarries
2. Impact of technology on the occupants
3. How are housing associations investing in technology?
4. What are the impacts of this investment?
5. Do the consumers understand the technology?
6. How does the building affect the occupants?
7. Summary / actual energy consumption
Quarries are located in Hyvot Mill Road, Edinburgh EH17 8QA
The Quarries are...

- ...part of the regeneration of 787 new and refurbished mixed tenure homes
- transformed over a 10 year period, at a cost of almost £70 million
Moredun & Hyvots

- **Subsidence** due to old lime quarries and coal works.
- *Blighted by social and environmental problems*
- Cold, dampness, fuel poverty
History...

- **Stock transfer** from City of Edinburgh Council to Dunedin Canmore HA (DCHA)
- DCHA appointed **lead developer** in 2003
- **sustainable housing** was a major focus during the **six phases of the redevelopment**
The Design Team

- Assist Design Architects
- Pottie Wilson QS
- Wren & Bell Structural Engineers
- Allan Cumming M&E Engineers
- Hart Builders
Authors of POE

Julio Bros Williamson – Scottish Energy Centre, Napier University
Misia Jack – Misia Jack Consultancy
Euan Whitmore – Assist Design Architects
The Quarries

- 58 flats
- age exclusive (from 55 years of age)
- All level access
- visiting management staff (Concierge) and community alarm service
- lift, lounge, laundry
- Courtyard garden with exercise equipment, a pond and park benches
- recognised as one of the most sustainable and energy efficient social housing scheme of its type constructed in Scotland to date: Sustainable Larger Housing Project of the Year in the 2013 UK Sustainable Housing Awards
Key objectives

• Promoting healthy living
• Ensuring that residents energy bills were kept to a minimum (originally all heating set at £12.93 per month).
• Achieving low carbon housing through
  – Highest possible airtightness
  – use of renewables
  – sustainable materials
  – waste reduction while on site
• Reduced maintenance costs
• Within tight cost limits
Environmentally sustainable design features

- Designed to achieve a **40% improvement on U-values** over 2010 Building Standards
- **improved air tightness**
- **Passive solar gain**
- A communal gas-fired, low temperature heating system with three boilers – low cost planned maintenance
- A **passive solar corridor**
- MVHR drawing air from the solar corridor and using exhaust air from the kitchen and bathroom, to **pre-heat the incoming fresh air**.
- **enhanced thermal mass**; with a super-insulated masonry wall
- pre-cast concrete flooring / **underfloor heating**.
- **Sedum roof** to reduce water runoff
- **Sustainable materials etc**
New technologies

• An 80 m² Photovoltaic array to provide electricity to power the communal area and stair lighting

• The whole house ventilation (MVHR) system - a Greenwood Airvac Fusion HRV2

• Energy efficient and motion detector activated artificial lighting
Changes to the design

In the original design the corridor was going to be a **double height atrium** with overheating controlled by

- **timber louvres** on the south-facing **tilted wall**,
- **timber windows with automatic window openers** and
- **deciduous trees**

However,

- The corridor had to be **compartmentalised with kitchen widows overlooking the corridor** stipulated as un-openable
- the louvres were omitted for **cost reasons**
- **trees were deleted from the atrium garden** due to concerns over maintenance implications

**Centralised MVHR** was swapped into **individual MVHR systems** on the grounds that there was **limited experience about centralised MVHR systems in UK.**
Changes while on site...

- change of the **client group** from ‘sheltered residents’ - typically retired people over 65’s - to the younger, economically and physically active – over 55’s group

- **new performance requirements** in the kitchens which were not intended for daily cooking and baking of full meals.

- **sedum roof** to the internal pitch amended to **concrete tile** due to concerns regarding maintenance
Post Occupancy Evaluation from user’s perspective
POE from client’s perspective

1. Occupant Survey (BUS)
2. Evaluation of handover procedure
3. Evaluation of Guidance provided
4. + Design changes...
User Feedback

• Visiting homes and the face to face interviews of residents
• 75% response rate to occupant survey
• The study revealed exceptionally high levels of satisfaction with their homes, location, appearance, comfort levels, environment and services
Dwelling operation and usage patterns

Interviewing staff and project team:
• Development Officer of DCHA
• Sustainability and Energy Coordinator of DCHA
• Housing Officer of DCHA
• Caretaker of DCHA
• Maintenance Officer of DCHA
• Project architect and lead architect & M&E Engineer
• Project manager of the building company Harts
Feedback

1. **Smoke detectors** appear to be too sensitive and set off fire alarm very easily

2. **Mechanical Ventilation Heat Recovery Systems** (MVHR) either not working or if working – the units are reported to be too noisy in many flats

3. Internal kitchens become **rapidly hot during cooking**; of full meals even though MVHR designed in line with BS (fixed windows)

4. **Door closers on pass doors, to the are too heavy** for frail elderly to operate

5. There is **condensation** in the south facing external walkway which during sunny spells also **overheats**
The issues

1. MVHR, about half of units which appeared not to be working correctly were **not identified as defective** as occupants were unaware of how they should work in practice
2. Problems with **dirty filters / noisy units**
3. Problems with occupants’ not being trained sufficiently to operate MVHR and the CH programmers
4. **Lack of awareness in particular** about how MVHR should perform – and to refrain from opening windows
Unintended consequence…

• …of the flat rate charge for heating costs – thermostats set above 21°C and in some cases at 31°C while the windows and doors were open for ventilation

• MVHR on but redundant

• 30 l/s air exchange from MVHR being insufficient
DCHA sets a new charge...

- In 2013-14 DCHA set a new charge on *actual heating and hot water used*, which has been much higher than estimated & combined with increased gas prices has resulted in an increase

The local paper reported....

- “DCHA advised tenants that from April 2014 their monthly heating bills would be rising from £12.93 a month to £35.20 – a rise of 172 per cent”
“We’re very disappointed not to have been told about this increase, which seems difficult to justify on the face of it”
The issues continued

- **Train their front line housing staff** about energy efficiency and MVHR systems so that in turn, they can educate occupants how to correctly operate those systems.

- **MVHR should increasingly** be perceived as an **appliance** like a cooker hood or a vacuum cleaner, which needs to be serviced by the occupant.
• **Handover Procedure** good but has gaps
• Advice on operating central heating tended to be offered only if a tenant asks for it
• the **Occupant’s Handbook** is short of addressing issues such as energy ad resource efficiency or the relevance of Energy Performance Certificate
• Appended to the Tenant Handbook are **manufacturer’s instructions**
• **Training that was provided to staff & occupants was ineffective**
Outcomes

- Both floors on the south-facing corridor are **prone to overheating** due to design changes.
- As the kitchen windows are fixed, simple issues such as burning toast tend to set the fire alarms off.
- The design intent of a free heat-catch, aimed at benefiting the environment and the tenants has been compromised.
- More rigorous design analysis of the extremities of solar gain should have been undertaken in the course of the design change.
- Louvers, blank panels opening hoppers and TREES should not have been subject to cost saving.
Conclusions/questions

- Most of the objectives achieved
- Some objectives compromised due to savings
- Reduced cost of maintenance has been achieved
- Could heating and hot water consumption in the dwellings be lower without increasing charges?
Conclusions

HA’s in Scotland are committed to providing low carbon developments but they appear to lack confidence/resources in being able to influence occupant behaviour

• face to face advice by trained practitioners
• ‘real life’ instructions presented on U-tube,
• DVD format and/or Apps promoting energy efficiency

may help…
Structured training for housing staff

- Staff who have day to day contact with the occupants need to undergo structured training in:
  - setting heating controls,
  - energy efficiency as well as
  - new technologies and in particular –
  - MVHR.

There is a significant role for both - maintenance and housing staff to be skilled in assisting occupants.
The customer ‘change ladder’

AWARE
I know about it

ENGAGED
I’m inspired to change

CONSIDER
I think I can change

COMMIT
I decide to change

INFORMED
I know how to change

CONVERT
I change!

PERSIST
I do it again and again
Thank you

misia@misiajack.com