Building Leakage Test

Cambridge Building Science
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Date of Test :	31/01/10	Performed By :	Alexander Rice
Customer :	Argyll St Co-Op 3 Fletcher's Terrace Cambridge CB1 1LU	Building Address :	8 Argyll St. Cambridge CB1 1LU

Test Results

Airflow @ 50Pa (m^3/h)	0.49
Air changes per hour @ 50Pa (/h)	5.3
Envelope Permeability @ 50Pa (m3/h/m2 surface area)	5.25
Normalised Permeability @ 50Pa (m3/h/m2 floor area)	12.7
Equivalent Leakage Area @ 10 Pa (cm^2)	422
Normalised ELA @ 10 Pa (cm^2/m^2 of surface area)	1.12
Equivalent Leakage Area @ 4 Pa (cm^2)	386
Normalised ELA @ 4 Pa (cm^2/m^2 of surface area)	0.97

Testing

Inside Temperature (°C)	17	Test Mode	Depressurisation
Outside Temperature (°C)	5	Wind Class	1 – Light Air

Building Preparation

- Extractor fans sealed in bathroom
- Windows closed
- Trickle vents closed
- Water traps filled
- Internal doors opened

Building Information

Rooms

Bedrooms	6
Bathrooms	2
Kitchens	1
Other	0

Significant Penetrations

Personnel Doors	2
Windows	15
Flues	1

Construction

Construction Date	1980s
Construction	Cavity Wall, Room in Roof, Slab on Grade

Dimensions

Exposed Floor Area (m^2)	139
Exposed Ceiling Area (m^2)	43
Height Between Storeys (m)	2.4
Storeys	3
Volume (m^3)	333
Perimeter (m)	27.3
Exposed Wall Area (m^2)	197
Exposed Surface Area (m^2)	378

Locations of Significant Infiltration

- In 2nd floor bathroom above ceiling, communicating into boiler cupboard.
- Service duct in ground floor bathroom connects to outside via dropped ceiling in 2nd floor bathroom
- Boiler cupboard contains two unnecessary vent bricks which connect to the ceiling above the 2nd floor bathroom
- Continuous crack at ceiling height in 2nd floor bathroom
- Service duct in 2nd floor bathroom connects to outside via dropped ceiling
- Small cracks around most windows

Interpretation of Results

Indoor Air Quality & Ventilation

The minimum ventilation rate for this building under part F of the building regulations if this building were built today would be 33 l/s. The presence of second-hand tobacco smoke would raise the recommended ventilation rate to 10 ACH.

If the fire doors are operating as they are designed to, and preventing air leakage then the total ventilation rate for the building will be far below this recommended level. This tallys with occupant reports that even if they open a window and attempt to purge the room it takes a long time for it to have a noticeable effect.

With all internal doors open the present the total ventilation rate is around 20 l/s. Although there's around 24 l/s of infiltration this is not contributing effectively to ventilation of the building. The air exchange rate of the stairwell is high, but that in individual rooms is low.

The airtightness test suggests that on average there will be around 0.25 natural air changes an hour without mechanical ventilation. The addition of the continuously running bathroom fans brings this up to about 0.5 ACH.

The current locations of the sources of natural infiltration do not make them effective for ventilation, and in the case of the second floor bathroom they are contributing to problems with high humidity and mould growth.

Energy Cost of Infiltration

At present infiltration (excluding ventilation) consumes around 2800 kWh of gas per year, compared to a total consumption of around 16700 kWh. This is about 16% of your total gas consumption. This is mostly to heat the stairwell.

Recommended Actions

I recommend sealing unintentional penetrations, particularly those in the area of the second floor bathroom and relying on trickle vents and the existing mechanical extractor fans to provide ventilation. These unintentional penetrations are using energy, causing problems and not contributing to effective ventilation.

I recommend that the Co-op further investigates whether the fire doors are providing such an effective air seal that the fans in the bathrooms do not contribute to the ventilation of the building. If this is the case the ventilation of the building requires further consideration.

I recommend that the Co-op consider the impact of cigarette smoke on the overall ventilation strategy. At present the ventilation rate is just barely enough to provide adequate IAQ in the absence of cigarette smoke. Non-smokers in the same building as smokers are likely to be exposed to continuous levels of carcinogenic substances that are considerably higher than would be acceptable in public buildings and places of work, with possible negative health impacts. Air quality analysers are available which would give a more definitive answer to this question.

If smoking in rooms is permitted I recommend that the Co-op aims to significantly increase the ventilation of the buildings. Ideally this would be done using mechanical ventilation with heat recovery to minimise the energy costs associated with this, but since the buildings were not designed with an air handling system in mind this may prove difficult. A lower first cost option may be a central mechanical supply to the stairwell with vents in all the fire doors to rooms with intumescent seals to retain the fire rating. Further work is needed to decide what is the most cost effective option in the long term.