A post occupancy evaluation of the Dundee Maggie Centre

Final Report for Sust.
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An evaluation of the Dundee Maggie’s Centre was commissioned by Sust. The Lighthouse on Sustainability in October 2005 and completed in March 2007 by EDG (Ecological Design Group) at the School of Architecture, University of Dundee in association with Bute Medical School, The University of St. Andrews and the Maggie’s Centres. The Dundee Maggie’s Centre is one of five completed projects in Scotland, with a further 10 projected for completion in the UK. The fundamental remit of the Maggie’s Centres, which were inspired by Maggie Jencks, is to provide information and psycho-social support for carers and people with experience of cancer.

The aims of pilot study were to evaluate:

- visitor and staff responses as users of the building
- physical performance of the building
- design and construction process

and:

- develop a cross-evaluative methodology for wider use in small scale healthcare buildings in order to improve the briefing process.

The evaluation aimed to establish:

a) the effectiveness of the design concept in terms of the original brief and care model
b) the overall user satisfaction with the building
c) the extent to which people perceive the building as contributing to their sense of comfort, wellbeing and health, and the reasons for this
d) the comparison of the ease, speed, and cost of construction with a standard domestic scale palliative care building
e) the building’s physical performance and sustainability, including management and maintenance issues, and the level of energy costs compared to normative measures
f) recommendations for the future Maggie Centre briefing process and further development of the evaluation methodology for other small scale health care buildings.

Semi-structured interviews were undertaken with 4 staff and 2 volunteers, as well as an architect representative and the Centre Head. Questionnaires were completed by 34 visitors. Fuel bills were obtained for a one year period from the energy supplier and compared to users comments.

The results of the small pilot survey indicate that the building has successfully achieved the following objectives of the brief:

- a highly effective design concept in relation to the Maggie Centre’s care model
- very high user satisfaction overall, with facilities providing a calm and friendly space and an appropriate degree of privacy
- high level of overall comfort
- users perception of increased health and wellbeing due to visiting the building
- particular appreciation of the views out of the building
- low level of maintenance required

The building has been less successful in achieving the remaining objectives:

- flexible office space which is separate yet visible from welcome area
- adequate storage facilities for the office area and other activities
- thermal comfort
Evidence on running costs from fuel bills obtained for a full year indicates that energy use was well within government energy targets of 35-55 GJ/100 cu.m for new buildings in the NHS Estate (2001-2010), coming in at 29.4 GJ/100 cu.m. Energy running costs were £64 per week for 286 kwh/m². Total carbon emissions for the building were 4.4 tonnes for the year.

Additional issues which emerged from the survey included:

a) a degree of overheating due to solar gain, lack of cross-ventilation and poor heating system control
b) a degree of glare due to low angle solar penetration in the kitchen area
c) the difficulty of having an office area immediately at the entrance
d) user dissatisfaction with seating ergonomics
e) lack of adequate car-parking facilities
f) flexibility of smaller therapy rooms

The high level of overall user satisfaction validates a design approach which has placed an emphasis on the quality of the internal space. Good design also gives the building a high “forgiveness” factor in relation to issues of thermal comfort, ventilation, glare and lack of humidity.

There are a number of areas where the briefing process for the Maggie’s Centres could be strengthened in order to improve the overall performance of their buildings, including the requirement for:

a) simple to understand and easy to use heating systems, controls and programmers which can respond to rapidly changing occupancy levels
b) low-noise mechanical ventilation equipment in user environments
c) adequate solar shading and provision of cross-ventilation
d) specific storage areas and facilities to be more clearly identified or system for removing items
e) adequate circulation in office areas
f) sustainable design and specification within cost constraints.

The following aspects present opportunities for further research:

• a wider study of all Maggie Centres using a further refinement of the methodology established in this pilot study to ascertain specific outcomes and research questions which examine key design features in relation to user’s perception health and wellbeing.

• a wider study of the relationship between user’s ability to control their environment and their perceived state of health and well being.

• the design of ventilation and heating strategies in relation to the presence, or absence, of thermal mass in small-scale healthcare buildings and the effect this has on energy efficiency and comfort.

“Maggie’s welcomes the report’s positive and constructive findings. Suggestions for change have been noted and where appropriate incorporated within the management of the Centre whilst at no time compromising the relaxed and non-institutional ethos which underpins the Maggie’s environmental and programme objectives.”

Laura Lee, Chief Executive, Maggie’s Centres
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The research team for this project was:

**Dr. Fionn Stevenson**  Principal Investigator, University of Dundee
**Professor Gerry Humphris**  Co-investigator, University of St.Andrews
**Lesley Howells**  Client Representative, Centre Head, Dundee
**Maggie’s Centre**
**Anita Laidlaw**  Postdoctoral Psychologist, University of St Andrews
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The authors would also like to thank the other staff and users of Dundee Maggie’s Centre who kindly gave their time for interviews or completed the questionnaire – without them, this work would not be possible.
1. Introduction

1. The Lighthouse Centre for Architecture, Design and the City based in Glasgow, Scotland aims to develop the links between design, architecture, and the creative industries, seeing these as interconnected social, educational, economic and cultural issues of concern to everyone. As part of its promotion of sustainable design, this study was independently commissioned in October 2005 by the Sust. programme, to fill a gap in the knowledge concerning the design and small scale healthcare buildings in relation to the user experience and building performance in Scotland. It was completed in January 2007 by EDG (Ecological Design Group) at the School of Architecture, University of Dundee in association with Bute Medical School, The University of St.Andrews, and the Maggie’s Centres.

2. It is only within the last few years that environmental issues, beyond the need for energy conservation, have been considered within healthcare building design strategies, but as yet there is little “joined up” thinking which directly links environmental performance with quality of design and user satisfaction. This case study, drawing on the innovative typology of the Maggie’s Centres, evaluated both these elements and then cross-validated them in order to provide a uniquely holistic appraisal of a particular building solution.

3. Underlying a sustainable design strategy for small scale healthcare environments are two prerequisites:

- The recognition that environmental design is an intrinsic part of healthcare design and provides multiple benefits including: economic, psychological and social.
- The understanding of design within an ecological framework, recognising that the design of buildings is fundamentally a process rather than just a product.

4. A primary way of improving the design of small scale healthcare buildings is by focusing on how users experience them, both in terms of orientation and their senses. The role that the environment plays in this can be most effectively assessed through analysis which combines both qualitative and quantitative methods.

5. This study introduces the development of a post occupancy evaluation and briefing process that can be applied to all Maggie’s Centres. The design lessons may be extended to other similar healthcare typologies.
2. Background

1 The UK government response to the need for greater quality of design and sustainability in hospitals has focused on several initiatives. The NHS now has specific targets for achieving sustainability as well as an independent body to promote good design in hospitals\(^1\). In Scotland, the NHS currently uses a tool known as “Greencode” for the evaluation of its estate in relation to key environmental performance indicators, which are reported on an annual basis\(^2\). At the same time CABE has prioritised the development of quality design in healthcare environments, most recently with a limited competition to explore ideas as well as a detailed look at the relationship between health and the built environment\(^3\). Architecture and Design Scotland, in relation to CABE, has taken a similar interest with its own colloquium on the design of healthcare buildings in 2006.

2 Post occupancy evaluation (POE) provides a more detailed means of examining the performance of the NHS estate on a building-by-building basis. The highly successful PROBE programme, which carried out POE on a number of different buildings during the 1990’s, only examined one healthcare building\(^4\). To date there has been no systematic evaluation and cross comparison of healthcare building typologies in the UK, although there have been a number of important individual studies elsewhere\(^5\).

3 Seminal POE work by Professor Lawson and colleagues in Sheffield University has proven the link between good design and improved bed-patient recovery times, demonstrating the importance of patients being able to view nature, good daylighting, ventilation and patient’s ability to control their environmental conditions\(^6\). The findings have informed a revised version of AEDET, the NHS tool for auditing design quality in hospitals. At the same time, Charles Jencks, an architect and critic with international stature, has pioneered a new healing typology, The Maggie Centre, which aims to empower cancer day-care patients and their carers\(^7\).

4 The Maggie’s Centres organisation has four main goals:

- To lower the stress level of a patient
- To provide psychological support
- To help patients navigate the information-explosion on cancer
- To provide peaceful and striking environments with an important place for art and gardens

5 There are currently five Maggie’s Centres open in Scotland, with ten more being developed in the UK. As bespoke and distinctive healing environments, they represent an alternative approach to the traditional cost-driven design of healthcare buildings by deliberately fore-grounding design as a key factor in promoting wellbeing.

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1 The Future Healthcare Network is a learning network to explore the shape of healthcare and what will be required by 2010 and beyond; the website is www.nhsconfed.org/finn.
2 See http://www.show.scot.nhs.uk/pat/guest/ for latest report. NHS Scotland also run a Property and Environment Forum which is based at the same website.
4 See “Building and Research Information”, Vol 29, Number 2, March-April 2001 which is a Special Issue on Post-occupancy Evaluation, and has a number of papers reporting on the PROBE experience. Vol 33, Number 4, September 2005 provides an update on this area. See also www.usablebuildings.co.uk for an up to date account of POE studies in the UK.
7 See Jenks, C. The Maggie Centres Movement Eight Years In…, Fourth Door Review, Nos.7, 2005 pp.30-33
The Dundee Maggie’s Centre, which is the subject of this study, was designed by Frank Gehry and opened in September 2003. In response to this, The University of Dundee hosted a one day international symposium, “Breathing Space”, at the same time, which generated significant discussion on the relationship between architectural design and cancer care, including the role of sustainable design and materiality. The proposal for this study grew out of the findings of the symposium.

Large scale hospital typologies have received the greatest attention in terms of post occupancy evaluation, but with the shift in government policy towards delivery of health care in small scale environments where practical, it was felt timely to examine such typologies. The development of the Maggie’s Centres as a small scale independent new building typology afforded a unique opportunity to learn from high quality design environments and provide a benchmark from which to measure the combinatorial values of sustainable design and health promoting design in all small-scale healing environments.

A number of the papers presented have been subsequently published in the international “Fourth Door Review”, Nos.7, 2005, pg26-50, including Stevenson, F. “Environmental architecture and the health building; the materiality perspective” pp.38-42
1. The overall aim of this study was to provide a detailed post occupancy evaluation of a small scale healthcare environment which can in turn inform the future design of similar typologies within the NHS and other healthcare agencies.

2. The study had four key objectives:
   1. To carry out an in-depth qualitative review of users response to the Dundee Maggie Centre
   2. To carry out a technical review of the building’s physical performance
   3. To evaluate the design and construction process
   4. To develop a cross-evaluative methodology for wider use in small scale healthcare buildings in order to improve the briefing process

3. The study specifically aimed to establish:
   a) the effectiveness of the design concept in terms of the original brief and care model
   b) the overall user satisfaction with the building
   c) the extent to which people perceive the building as contributing to their sense of comfort, wellbeing and health, and the possible mechanisms for this
   d) the comparison of the ease, speed, and cost of construction with a standard domestic scale palliative care building
   e) the building’s physical performance and sustainability, including management and maintenance issues, and the level of energy costs compared to normative measures
   f) recommendations for the future Maggie’s Centres briefing process and further development of the evaluation methodology for other small scale health care buildings.
4. Methodology

1 A small Steering Group, which consisted of the Dundee Maggie’s Centre Head, a previous user of the Centre as well as the two principal research contractors, was initially formed to guide the project. The Professional Advisory Group from the Maggie’s Centres commented on the design and format for the post-occupancy evaluation questionnaire.

2 An initial desk top review of existing literature on the evaluation of healthcare and other buildings in the UK and elsewhere was undertaken. It was felt that while the AEDET EVOLUTION and ASPECT tools for the NHS provided a valuable means of auditing the design quality of healthcare buildings, the pre-defined statements approach did not allow for a more open ended form of inquiry which might reveal hidden factors. By contrast, the approach developed by Building Use Studies Ltd. and adopted by PROBE asks the user to offer up factors which work or do not work well. This provides a more fundamental appraisal of design quality as it is directly experienced by the user.

3 As a result of the desk top review, it was decided to adopt a ‘mixed methods’ approach, involving 6 semi-structured interviews with 2 full-time staff, 2 part-time staff and 2 volunteers, and a PROBE-style questionnaire for visitors. Both activities were carried out within the building over the period of one day on March 23rd 2006. A standard questionnaire on its own was rejected on the grounds that it would not yield a “rich” texture of information. The aim of the in-depth semi-structured interviews was to supplement the questionnaire with the collection of more detailed insights from participants.

4 A number of qualitative questions were devised with advice from the Maggie’s Centres Chief Executive, Programme Director and Client Representative, to ascertain responses to the design (see appendix I and V). These augmented the initial standard post-occupancy evaluation questions provide by Building Use Studies Ltd. which concentrated on comfort issues and work conditions. The additional questions were drawn from AEDET and ASPECT, but were rephrased to allow for a more open ended response. Two key questions on visitor’s sense of their own health and quality of life were drawn from the EORTC® standardised questionnaire for oncology. The initial questionnaire was then successfully piloted with no major changes required.

5 Visitors to the centre were discreetly approached by a research assistant on entry and handed a questionnaire to complete in their own time and post anonymously into a box placed near the entrance of the building. Staff were interviewed using the interview guide and a taped recording was made of the interview. Additionally, the interviewer observed how the users and staff interacted with the building during breaks in the day. Anything unusual that might influence the effectiveness of the design principles involved was noted.

6 Fuel bills for a one year period for the Dundee Maggie Centre were obtained from The Maggie’s Centres HQ. These were related to the current benchmarks for energy efficiency promoted by the UK government for the NHS Estate.

7 Copies of the original brief and working drawings were obtained as reference point for users experience and examined in terms of healthcare design, energy efficiency, flexible design, and use of sustainable and local materials as well as efficient construction principles. The drawings were used as a basis for the technical analysis undertaken on the day of the survey which involved the use of a multi-modal meter to measure temperature, humidity, lighting and noise levels both inside and outside of the building at five strategic points.
8 The interviews with staff and the technical team were used to further establish if there were any significant work issues arising from the innovative design of the project over the two and a half years since its completion (see Appendices I and II).

9 All findings from the interviews with the technical and staff teams were compared to those from the user questionnaire to establish points of convergence and divergence. This was carried out in recognition of the intersubjectivity involved in the study and the need to understand and analyse all points of view.

10 The qualitative findings from all the interviews and questionnaires were cross-evaluated against the observed environment behaviour, the brief/drawings/specifications and the physical data obtained on the day, to determine if the issues raised were reinforced or contradicted. A “walk-through” tour of the building was conducted with the Client Representative to help clarify contradictory findings and provide further information on issues raised.

11 Finally, a SWOT analysis was used to establish the overall efficacy of the design and future strategies in relation to the results of the interviews and fuel cost assessments and the initial project objectives.
Given the complexity of the area under investigation, carefully defined parameters were drawn to produce a manageable workload within the timescale allowed. The work fell into 6 distinctive phases: development, survey, analysis, cross evaluation, draft and final report.

Programme for Dundee Maggie's Centre Pilot Study

1. Development of formats
   Arrangements for visits, interviews, data gathering
   Gathering of technical data

2. Interviews, Survey
   Questionnaires

3. User analysis
   Technical analysis

4. Cross-evaluation

5. Draft Report
   Comment on Draft Report/meetings

6. Final Report
   Steering Group meetings x 3
1. The analysis of the project was broken down into 8 evaluative stages:

A) background demographics
B) environment behaviour
C) the building design
D) the visit
E) comfort issues
F) sense of wellbeing and health
G) staff and volunteer perspective
H) the building process

A Background demographics

2. The users of the Dundee Maggie Centre can be split into four groups: staff, volunteers, carers and those currently suffering from cancer or in remission.

3. A basic demographic description of the 34 visitors who responded to the questionnaire (Table 1 in Appendix V) shows that the typical Dundee Maggie centre visitor was over 30, likely to be female and suffering from cancer, although just under a third of visitors were carers. The overwhelming mode of transport was by private car with most visitors having returned 5 or more times for varying lengths of time. The most common visiting length was one or two hours. Visitors generally rated their own health as being above average with over half rating their quality of life as above average also, although the level of ratings were generally lower than the average for those suffering from cancer (see section 6.f).

B Environment behaviour

1. On the day which the interviews and questionnaire survey was carried out, the interviewer took time to observe visitors’ behaviour in the building at regular intervals and over an extended luncheon period. This section briefly describes those observations to provide a picture of the building in use.

2. The building was open from 9a.m. -5p.m. and very busy, with a Tai Chi class at 1.30pm, a relaxation class at 3p.m., as well as a benefits advice drop in service all morning. The kitchen was particularly busy at luncheon, just before the Tai Chi class, but not overcrowded. The main room was used primarily by groups, while the smaller retreat room downstairs was used for the study interviews. The upper room was used on an intermittent basis.

3. The use of the open plan space demonstrated a relaxed and sensitive interaction between staff and visitors, with the entrance area acting as a permeable threshold for arrivals. Often staff appeared from either the kitchen or library to greet arrivals at the entrance. New arrivals appeared to hover in the entrance area by the desk rather than come directly into the kitchen area, until they were met. At one point in the afternoon a formal fundraising meeting took place in the kitchen area, which was relatively quiet as other spaces were occupied. This seemed to work well, and suggested a very fluid and mobile way of using the space, but one which demanded that staff and visitors were tolerant of other activities within the vicinity.

4. Visitors, both first timers and regulars, congregated in the kitchen area, with subtle levels of interaction that saw some sitting quietly away from the table conversation, while others engaged more directly with each other. With all facilities in the kitchen being immediately accessible and with plenty of room, there was a sense of ease with which people seemed to negotiate the space. The library appeared less well used and the common room was used only for the group events that day.

6. Results and analysis

Visitors tended to chat in the bright kitchen; the common room was used for group activities
5 The office area was busy with the fund-raiser, Centre Head, information support officer as well as others trying to use the area and the phone. It was noted that due to lack of storage space, large amounts of filing and other paperwork were stored in boxes under the desk area in the designated foot space. Additional items were stored throughout the building, including a number of items in the boiler room, on the seating area behind the office, and in the group room.

6 No windows were open in the morning, but by lunchtime one window in the kitchen area had been opened as well as a window in the common room. By the end of the afternoon, three windows had been opened in the kitchen as well as the door leading onto the balcony.

7 The woodstove-effect gas fire was generally left on in the upper floor room, even when nobody was there, leading to increased and unnecessary heating. It was observed that the fire takes considerable time to start up and this might explain a general reluctance to switch it on and off.

8 Artificial lighting was generally left on throughout the building apart from upstairs. This might relate to the care-model adopted and the intention for the lighting to provide a welcoming signal, but it also might relate to the slow response of the low-energy light bulbs. The blinds on the lower part of the windows facing the hospital were pulled up, which while providing additional privacy, tended to make these north-facing rooms slightly darker.

9 Externally, it was noted that the car park was full from early on, with people resorting to parking on the verges and the driveway approaching the car park as a result.

Conclusions:

10 The behaviour of users in the building suggests that while they are generally very much at ease in the building, there is a distinct issue with ventilation control with occupants trying to increase the ventilation in order to reduce overheating using what means they have available.

11 The principal means of access is by car despite the direct public transport that is available on site. It may be that future Maggie’s Centres will need to consider a larger, landscaped car park facility, particularly as rural visitors are often poorly served by public transport. People may also tend to use a car rather than public transport due to the nature of their treatment in hospital before or after their visit to the Maggie’s Centre.

12 The small amount of circulation space in the office has led to staff “choreographing” their use of the space, which is not always conducive to effective working.
C The building design

1 The Dundee Maggie’s Centre is located on the western outskirts of Dundee, within the Ninewells Teaching Hospital Campus. It sits to the south of several large hospital buildings, on a raised grassy plain, adjacent to the hospital’s helipad and on the edge of woodland. The site was chosen for its spectacular views over the Tay Estuary, which are considered some of the finest in the UK. The budget for the building was £0.97m for a floor area of 225m², working out at £4311 per m² which is about one and half times the cost per square metre for an equivalent healthcare building. The justification for this is perceived to be in the iconic nature of the building, the specific requirements of the brief, and in the initial high capital investment in order to minimise future maintenance costs.

2 The building, which has been occupied for over two and half years since it opened, consists of four main areas (office, library, kitchen/dining, common room) linked by a central entrance lobby and stairwell rising to a retreat space on the first floor (see Appendix III).

3 The questionnaire prompted visitors to comment on the building’s image, layout, use of space, their needs and the views both within and looking out of the building. These were rated in terms of effectiveness, with additional comments made where necessary.

4 The overall building design was rated very highly (Table 2, Appendix V), although about a quarter of visitors expressed some difficulty in understanding the layout. The most positive impression of the building was of the views outside, which received the highest rating of any aspect of the design. There were slightly lower ratings for functional aspects such as layout, use of space and meeting people’s needs.

5 A wide variety of images were associated with the building by visitors including:

   “special, quality not cheap!, bird, light, comfort, enveloping, home, beautiful, waves…..I think the round central part is like a ship’s funnel rising from the waves. A brilliant concept!”

6 The layout of the building, while being generally well appreciated, presented particular challenges for first time visitors such as: finding the toilet which had no sign on its door, and the location of the office area, summarised by one visitor who found it “protrudes slightly too far and limits the use of the central space in front of the door”. The space in the building was generally perceived to be well used.
Visitors were very impressed by both the internal views through the open plan building and from the building across the Tay estuary. For some, the natural view was quite transcendental with comments such "very meditative" and "Absolutely spectacular and conducive to calm reflection and awareness of God." Other comments were more specific such as "I love the light and the wood" and "Height offers a useful perspective".

Conclusions:

The overall design of the building is very much appreciated. Visitors would appear to positively "trade off" certain design qualities of the building such as the exploitation of external views and its overall impression against certain functional aspects such as layout, use of space and people’s needs. This leads to the building having a high “forgiveness” factor, whereby people are willing to "forgive" functional issues because of their appreciation of other design qualities.

D The visit

The purpose of the visit made by visitors is summarised in Table 3 (Appendix V). The purpose for the majority of the visitors on the day of the study observation was to attend group activities.

In terms of the actual visit itself (Table 4, Appendix V), visitors were most positive about their freedom to use the building and felt very much at ease in it. They were slightly less comfortable about talking to others and slightly less positive about the building meeting their specific needs, although nearly 78% thought that the building met their needs well or very well.

In relation to their specific needs, visitors felt hindered by a lack of car-parking spaces and the coldness of the common room at times. By far the greatest number of negative comments related to the practicality and comfort of the furnishings. This was summed up by one visitor as “The seating could be more for comfort rather than look – this the only thing I would suggest”.

Comments about hindrances during a visit were heavily outweighed by positive comments about things which worked well in the building. These focussed on the kitchen area which “encourages everyone to gather and chat”, the open plan layout, and the “abundance of natural light”. Despite the questions being directed towards the nature of the building, visitors consistently referred to the “open and encouraging staff ” which perhaps demonstrates a tendency by users to view the building and the people within it as one entity.
Conclusions:

13 Visitors clearly felt “at home” in the building but it is unclear how much of this can be attributed to the building itself and how much to the welcome and support provided by staff. This reflects the Maggie’s Centres ethos of solving problems by working with people in an uplifting environment. It suggests future studies concerned with visitors in healthcare buildings will have to either be more carefully tailored to separate out staff-related observations from observations about the building, or alternatively accept a hybrid model of analysis which acknowledges the influence of staff on visitors’ perceptions of the building. The latter model is more appropriate for the Maggie’s Centres.

14 The strength of feeling about the furnishings exhibited by visitors suggests that future briefing needs to take greater account of ergonomic requirements in relation to aesthetic appearance.

15 The existing brief has been particularly successful in terms of the kitchen area and centralised kitchen island unit, which visitors comment on very favourably. Visitors also felt very much at ease in the building – a positive reflection on the original brief requirement for a welcoming building.

E Comfort issues

1 A major aspect of post occupancy evaluation is the degree of comfort which users experience in a building. This is particularly important in healthcare buildings where visitors are likely to be extra sensitive to environmental conditions due to their relatively poor state of health.

2 Visitors were asked to rate their perception of temperature, air quality, ventilation, noise, lighting and overall comfort in relation to the building. Noise was generally not an issue for visitors; intriguingly, however, over a third felt that there was not enough noise from outside. Although the lighting overall was felt to be very positive, 40% of visitors felt there was too much natural light and 28% experienced some degree of glare. It is unclear why 66% of visitors experienced some glare from artificial lighting as well, when over three quarters found overall comfort level of the artificial lighting to be just right. Nearly 90% of visitors felt the building was comfortable overall, despite about half this number complaining about a degree of overheating, excessive natural light and dryness of the air.

3 The top ratings for comfort were generally lower than those for the building design overall (Table 5, Appendix V) again suggesting that there may be is a kinaesthetic compensatory factor at work with visitors also “trading off” the appreciation of the views, image and overall quality of design against comfort factors.

4 Visitors comments related mainly to the issue of overheating and variability of temperature between the North and South side of the building with one observing that “Sometimes (if the sun is shining!?) some areas become too hot but other days the big room was too chilly for sitting comfortably”.

6.
Visitor’s comments and ratings of comfort conditions were corroborated by the physical readings taken on the day (Table 10, Appendix V). Indoor temperature readings on the day of the questionnaire were surprisingly high and reached a peak of 24.4˚C by midday indoors on a cold March day, even though the main heating control was set to 22˚C. Humidity readings were relatively low inside the building, averaging around 30%, compared to an outside humidity level of 50%. This would account for a significant percentage of visitors experiencing the air as being dry. Lighting levels in the building were relatively low apart from in the upper level room which was flooded with light from the large skylight. With it being a sunny day outside, the contrasting low levels of internal light exacerbated the glare from the south facing windows. Noise levels, on the other hand, were at a normal conversational level in most parts of the building apart from the upper level space. This area was relatively quiet despite conversation carrying on below.

Visitors were then asked to consider the degree to which they had personal control over their comfort conditions (Table 6, Appendix V). Nearly half felt they had absolutely no control over the heating or noise conditions, with around a third feeling they had no control over cooling, ventilation and lighting. Interestingly, despite the various comfort issues raised, the overwhelming majority of users stated that a personal degree of control over comfort conditions was not important. This suggests that either they rely on the staff to deal with these aspects, or that other aspects of the building, such as the views and warmth of welcome, compensate for these issues. An interesting issue that was tested with the questionnaire data was the degree of the relationship between the sense of control that the visitors had about the comfort features of the building and their own self-reported ratings of health, well being and quality of life (see section 6.f).

In terms of benchmarking, the Dundee Maggie Centre performs exceptionally well with a significant number of variables against over 50 other buildings in the UK that have been evaluated using the BUS questionnaire (see table 11). Despite the issues raised in relation to the control of heating and other areas, the ratings of these variables are no different from the average building. The only two variables that would appear to fall significantly below the benchmark are the relative stillness of air in the building and the apparently excessive amount of natural light. The latter finding is curious, given that a number of visitors commented favourably on the amount of natural light in the building.
Conclusions:

There are a number of complex interacting factors which may account for the mild overheating of the building and recommendations are related to these for future briefing and design purposes:

Open plan layout:
The open plan layout of the building means that the users have to heat all the main areas to the same temperature, regardless of function. Inevitably, the warm air will rise and cause the upper storey retreat area to be even warmer than the other areas below. This is best mitigated by adequate ventilation.

Thermal mass, heating systems and programmers:
There is much debate on the virtues of lightweight v. heavyweight construction in the UK in terms of heating strategies. Lightweight construction is seen as being more suitable for quick response heating systems, whereas heavyweight construction can work well with a slow response heating system, such as under floor heating, in helping to even out changes in temperature. In theory, the heating system specified for this building would seem to ideally compliment the large amount of thermal mass present. In fact, the significant time lag in responding to temperature changes afforded by the heating system (2 hours) combined with the slow response of the thermal mass in the building has led to a degree of confusion by staff attempting to heat and cool the space quickly in response to rapid changes in occupancy levels. This is not helped by the relatively complexity of the main underfloor heating programmer (Honeywell Hometronic HCU 30 Remote Setpoint Adjuster) situated by the entrance, which also perplexed staff. The guidance for simply operating the programmer is twenty one pages long, which speaks for itself. Programmers which are relatively easy to understand and operate by non-technical staff should be selected in preference to more complex ones.

Solar Gain and ventilation:
The lack of adequate external shading to the southern windows, combined with inadequate cross-ventilation, points to the need for careful design when using natural ventilation, if overheating is to be avoided. One solution to this problem would be to ensure that there is adequate cross-ventilation provided through the layout of rooms and that the need for external solar shading is taken fully into account through careful design analysis. Shading needs to take account of low-level as well as high level sun penetration. There are a number of mechanical extract fans in the building to help with ventilation, but these are particularly noisy in the kitchen area, making staff reluctant to use them while people are trying to talk.

User strategies for heating and ventilating:
It is clear from the analysis that staff and users are not able to optimise their heating and ventilation systems and have adopted the common strategy of overheating the building to ensure that it does not get too cold. Excess heat must then be ventilated out of the windows. Due to the low-level placement of restricted window openings, there is a build up of heat in the main volume and users have resorted to opening doors in an attempt to compensate for the lack of ventilation needed to clear this build up. High level ventilation points would solve this issue in future buildings.

The need for user education:
Lack of specific training on the heating and ventilation controls for users at the outset in this innovative project, and on an ongoing basis for new staff, may also have contributed to the use of inappropriate strategies for heating and ventilating. User induction is a vital aspect of building procurement and management.
Choice of heating system:
The sole reliance on an under floor heating system of the type specified, which is relatively unresponsive to change, must be questioned for future centres of this kind unless there is an adequate top up system and good ventilation options. The heating system is predicated on a steady state scenario and does not respond quickly to the rapid changes in temperature which occur with varying numbers of users and activities. The heating manual recommends a two hour lead-in time to obtain the desired heat level from the system. The staff must therefore attempt to predict temperatures ahead of time and this can lead to the system failing to provide adequate temperatures, if the weather or occupancy level changes suddenly. The supplementary air-blown heating system in the kitchen and group room appears not to be used to great effect. The reliance on gas as a fossil fuel, without the benefit of renewable energy technologies will inevitably lead to a relatively high carbon dioxide output. This could be relatively easily addressed if the requirement for renewable energy were built into the brief from the outset.

Although the overall level of natural lighting is clearly appreciated by a number of visitors through their comments, a significant number felt there was a glare issue and too much natural light. The latter finding is unusual in studies of this kind and may be attributable to visitors’ state of health. It warrants further investigation in order to establish appropriate natural light levels in buildings for cancer sufferers. Glare could be caused by excessive amounts of unshaded low-level sunlight or from the skylights.

10 The quality of design would seem to suggest that visitors also have a high degree of “forgiveness” for lower comfort ratings. At the same time, although the building performs well against the BUS benchmark for all building types, it should be remembered that visitors using this building do not occupy it for any great length of time and are in a particular state of mind due to their health situation. Both these factors may tend to result in more positive reporting than usual and mask underlying issues generally experienced by those who use the building for greater periods of time.

F Sense of wellbeing and health

1 The questionnaire contained two questions taken from the European Organisation for the Recognition and Treatment of Cancer Quality of Life Core Questionnaire (30 Item version). The two questions adopted from the Core Questionnaire were chosen as they assess simple global ratings by the respondent themselves (as opposed to the clinician) of their health and health-related quality of life. The ratings are given in response to 7 point Likert scales. The answers to these two questions can be compared to numerous other studies that have employed these items in their assessments.

2 The overall self-reported rating of global health (over past week) demonstrated that their view was moderate only for these visitors. Typically the EORTC norm for cancer survivors for this rating is around 75% (that is those scoring 5 to 7 on the 1–7 rating scale) and for the sample included in the survey we found that this per cent was 64. The general health rating therefore was somewhat less than expected.

3 Likewise the quality of life (over the past week) rating for the visitors was 57% (i.e. scoring 5, 6 or 7) which is also lower than might have been expected in cancer survivors.

4 Over all quality of life over the past week was found to positively relate significantly to the length of visit ($r = 0.45$, $p<.05$). This would appear to show that the longer the visitor spends in the centre the greater the likelihood that their rating of quality of life will be high. This effect is relatively weak. However with a relatively small sample it is suggestive that the experience of visiting the building has a dose–response effect (test for linearity: $F=4.22$, df(1,19), $p = .05$). That is, the longer the person reports that they spend in the building the more positive they regard their quality of life. Such a finding requires replication as this would be supportive evidence for the effort spent on providing as considerate an environment as possible for the visitor. Caution therefore should be expressed not to over-stress this positive relationship.
They were then asked to rate the degree to which they perceived the building itself impacting on their sense of wellbeing and health.

Although the study did not aim to prove a direct connection between design and health benefits, it was felt important to ascertain whether or not visitors themselves perceived such a link and whether this related in any way to their perceived quality of life and health status at the time of the questionnaire. Three sets of associations were inspected and the results are discussed in the next three sections.

Correlations were calculated between the self-reported ratings of quality of life and health (over the past week), and the perception of the features of the building. In addition the ratings for how the building influenced their wellbeing and health were also inspected. Spearman's correlation coefficients were adopted as the index of association. Statistical assumptions simply required the ratings to be rank order scales, which this questionnaire design satisfied. Hence interpretation is straightforward. It was predicted that positive ratings of the building would be associated with similar positive ratings of health. On the whole these predictions were confirmed for many aspects of the building and the visitors' ratings of their wellbeing and health (Table 6, Appendix V). Only one correlation was found that was close to significance among the quality of life ratings and that was the association with the ability to 'talk to others'. Hence those who rated their quality of life strongly also felt that they regarded the building was amenable for conversation with other people.

The lack of further significant correlations between the health and quality of life ratings and the other aspects of the building can be explained by the nature of the questions. The visitors were invited to give their rating of health and quality of life OVER THE PAST WEEK. It would not be surprising that visitors referring to their health status over a week would not associate strongly with their opinion of the building during their visit on the day of the questionnaire completion. In support of this view were the strong correlations between the health and well being ratings and the building feature perceptions. The questions on health and wellbeing are 'state' measures asking the visitor to offer their opinion on how they felt about how the building was influencing either their health or well being at the time of answering the questionnaire. Hence the relationships between these two 'state' question items and the perception of the building features show significant relationships. However the interpretation of these associations is not altogether straightforward.

On first glance (Table 7, Appendix V) it would appear that positive perceptions of the building features are linked with higher ratings of health and wellbeing. This may well be the case especially as the questions on wellbeing and health are invited with reference in particular to how the building influences their health and wellbeing. It is possible however that the pattern of causality may be the reverse. That is, those visitors who rated their health or well being positively may feel able to rate the building enthusiastically. Specific points from the individual items worth noting are:

a. First and lasting impressions of the building were strongly positively related.

b. The visitors' needs being met within the building was associated with their perceptions of the building influencing their health in a positive manner.

c. A significant relationship was found with the building setting the person at ease and a perception of a stronger self-reported rating of health.

d. Surprisingly the inner and outer views were not significantly associated with ratings of health or well being. This result appears to contradict the many positive comments that visitors made to the views. This discrepancy may be explained by the fact that the range of values for the questions concerning the perception of views was small (i.e. positive and very few negative ratings). From a technical point of view this restricts the size of the correlation. In other words the positive data collected on the perception of views may have prevented a strong correlation with health and well being. This is an area for further investigation.
10 The second set of associations that was inspected was the comfort ratings of the building by the health and well being ratings (Table 8, Appendix V). Well being was weakly associated with the comfort ratings. Of significance was the association of noise experienced inside the building and the sense of wellbeing from the building. That is, those who rated their wellbeing positively perceived the noise level as towards the ‘too little’ end of the interior noise rating scale. All measures of ‘overall’ comfort satisfaction (namely: temperature, comfort, noise level and lighting) were strongly correlated with the rating of health.

11 Of particular interest is the relationship of control with self perception of health. Visitors who are surviving cancer may find the ability to exert some control of the environment they are in contact with satisfying and life confirming, especially when the disease itself may have fostered the view that their body has been ‘out-of-control’. Alternatively, the psychological literature on the effects of the environment on the individual who is compromised through severe illness shows that with increasing lack of function, the environment exerts greater effects on the individual’s health status. Hence it was important to test the associations between the sense of control that the visitors indicated and their perception of health.

12 Significant correlations were found between the self reports of ‘wellbeing’ in the visitors and their perception of control of the ‘cooling’ and ‘ventilation’ (Table 9, Appendix V). It would appear that if control was considered to be available this had a positive effect on wellbeing. Weak effects were also found for ‘lighting’ and ‘heating’. Only one effect (and this was weak) was found for ‘cooling’ control and self perceived ‘health’.

13 The fact that there were consistent positive relationships found across the various comfort features, their control and ratings of well being introduces a fascinating area of study. It could be argued that these results reinforce the view that making an environment easy ‘to read’ by virtue of offering systems to allow changing comfort parameters will enhance wellbeing and possibly self reported health. This interpretation is speculative but would be a fascinating area to confirm in a further investigation and could develop our understanding of this person-environment interaction.

14 Positive comments from visitors in relation to health and wellbeing included:

“Feelings of calm”

“The building is a place where I have moved from ill-health to health by visiting regularly”

“The building/space and light lend themselves to people feeling welcome and safe –safe to explore difficult issues.”
Conclusions:

15 Given the above results and discussion there are several issues that should be considered in relation to the future briefing and design of Maggie’s Centres and potentially other similar typologies. It is clear from the study that there is a positive correlation between many design aspects of the building and visitors' sense of health and wellbeing at the time. What is not clear is whether visitors' sense of well being and health is influencing their perception of the building's qualities, or whether the building's qualities are affecting visitors’ perception of their health and wellbeing. Additional visitors’ comments would seem to suggest the latter, but this is not proven and is clearly an area for further investigation.

16 The findings relating health and wellbeing to visitors’ sense of control over ventilation and cooling are important and suggest that greater attention needs to be paid to the design and specification of heating, ventilating and cooling controls, if visitors’ sense of health and wellbeing are to be further improved. What is particularly striking, is that while visitors consciously stated that having a degree of control in these areas was not important to them, the degree of control perceived to be available clearly affected their sense of wellbeing and health. In other words, they may like to feel “in control” of ventilation and cooling (“I can always open a window if I want to”), but without necessarily having to resort to actually controlling these themselves.

17 The ability for visitors to be able to control their environment ties in closely with the Maggie’s Centres ethos of empowering people to be able to adapt to their surroundings and take control rather than being controlled as passive recipients in a care system.

G Staff and volunteer perspective

1 The interview guide for the staff and volunteers deliberately adopted the same questions as the visitor questionnaire for comparative purposes, but diverged in relation to the nature of activity in the building (Appendix I). Many of the responses echo views of the visitors.

2 Only two Maggie’s Cancer Caring Trust full time members of staff took part in the evaluation, in addition three sessional workers and one volunteer were included in interview. The Client Representative was not included in this interview process but participated in a “walk-through” discussion at a later stage. All staff lived relatively locally and almost all commuted to work by car with an average journey time 20 minutes. Most had worked in the building for two to two and half years. They had very variable work patterns, with relatively little use of VDUs and tended to be continuously on the move in the building.

3 A surprising variety of images were associated with the building with the building being seen as contemporary, unique, welcoming and calm in a vein similar to the visitor responses. The building was perceived to be well used and in lots of different ways. Generally the building met the staff needs apart from some key issues which are outlined in the rest of this section.

4 Levels of privacy were perceived to be good for visitors, but not so good for staff who felt they didn’t have a private space to ‘escape’ to. Part of the Maggie’s Centres ethos, however, is to ensure that staff are always aware of visitors. This necessarily entails staff being visible most of the time. The library was not seen as an ideal place for conversation with people in distress as it was directly opposite the front door.

5 The layout of the building was felt to be welcoming, easy to understand and open. One member of staff suggested that the therapy and retreat rooms should be knocked together to create a more useful space, because both were too small on their own. Another volunteer was unclear what these small rooms were for.
Several issues in relation to the office area were identified: visitors tended to wander into the office, not knowing quite what it was for, the desk area was awkward because it tended to suggest a reception point, which it was not meant to be, and the office area was perceived to be a bit “weird” – nobody was clear what the seating at the back of the office was for and as a result it had been adopted as a temporary storage place. It was suggested that the office might be better located upstairs, but this wasn’t necessarily perfect either, as staff needed to be seen by visitors. The office was generally felt to be too small, with not enough space for storage. One interviewee summed this up: “I can’t bear the lack of space in the office area; the chairs are too close and there are no filing cabinets and no straight walls.”

Like the visitors, all interviewees very much appreciated the views within the building, with the height of rooms giving an additional sense of space. They were particularly fond of the views across the Tay Estuary with one commenting that “I love the views – they change all the time and raise my spirits. They never cease to – the trees, tide, sky and colours – they change all the time. A real joy”. Views to the north of the building were seen to be not so important but could be improved possibly with treescaping.

Staff carried out a very wide variety of work functions which the facilities generally provide for. It was felt that the glass window in the main desk partition gave the wrong impression and that people tended to wait at the entrance area. This view was backed up by the behaviour of visitors independently observed on the day of the interviews. There was a suggestion that it might be better to have the kitchen area right next to the entrance to help encourage people to come into the building.

Like the visitors, interviewees thought that some of the furniture was not appropriate. The seating was felt to be too low and didn’t have armrests for people to help themselves up with. The chairs were seen to be good looking but not always functional. The seating in the common room was not felt to be conducive to meetings and was designed more for individual relaxation. The outwardly curved desk in the office was found to be awkward. It was pointed out that the building needs to cater for the full spectrum of conditions and people and that there should be more variety in the crockery provided (older people may prefer a cup and saucer, rather than a mug).

The lack of storage space in the building brought out the strongest reaction among staff, who ended up storing things in the boiler cupboard, creating a potential health and safety issue, and generally spreading items around the building as discreetly as possible.
Key things which usually worked well for the interviewees included: the atmosphere of the place and feeling of relaxation, the kitchen and specifically the kitchen table which were seen to be the best aspects of the building, functioning as an automatic meeting point and being perfect for talking. The common room worked well for relaxation classes.

Despite certain issues, the building design overall was highly rated suggesting that its overriding qualities outweigh the issues with a similar “forgiveness” factor operating for staff and volunteers as that noted for visitors.

Interviewees’ views on comfort also echoed those of the visitors. The main comfort issues were overheating, inadequate ventilation and solar glare in the winter from low angle sunlight streaming into the kitchen area. Venetian blinds were suggested for the kitchen to counteract glare issues. Noise was not normally a problem as staff had learned to live with it and it didn’t generally interfere with their work. There was a real issue of the front door banging, especially when it was left open in order to try and ventilate the building. The quality of natural light was perceived to be very good despite the issue of solar glare and the kitchen was felt to be the brightest area. The common room and smaller therapy rooms were felt to be a bit dark by comparison. The big spotlights upstairs were felt to be too bright and needed to be re-angled.

Interviewees, in common with visitors, felt they had little control over comfort conditions, with virtually no-one understanding how the heating worked, but recognized that the building was slow to respond to changing conditions, which led to overheating. The window ventilation was felt to be inadequate and the mechanisms for opening them rather impractical. Interviewees had resorted to leaving the front and back door open to try and create cross-ventilation, but recognized that there was little control over this means of ventilation. Being able to personally control the heating was seen to be more important than controlling lighting or noise.

Despite the significant issue of overheating and lack of office space, staff rated the overall comfort conditions as being very good, suggesting that they, like the visitors, also “forgave” the building’s particular comfort problems due to its overall design quality.

In terms of wellbeing, health and productivity, no overall conclusion could be drawn from interviewee’s perceptions about whether or not the conditions of the building actually affect these, with two saying that the conditions improved both their wellbeing sense of health and productivity, and the rest stating that it made no difference.

Conclusions:

From the above it can be seen that the views of the staff and volunteers are very similar to those of the visitors. Additional issues raised by staff include: poor ergonomic design in the office area combined with lack of space, an ambiguous reception area, lack of storage and unfamiliarity with the heating controls. It can be anticipated from previous post occupancy evaluation studies that the longer someone has worked in a building the more they become aware of any deficiencies. In this sense, it is vital that the briefing process and resultant building design take careful account of staff requirements as well as the needs of the users.

Recommendations for future briefing and design of Maggie’s Centres arising from the interview findings include:

a) the requirement for discreet and flexible storage facilities related to the office. These could be designed to look domestic, e.g. built in shelving and filing systems with doors to close off views of paperwork. Base units containing filing facilities and other storage should be designed to be moveable to enable office use to be reconfigured as necessary according to who is using it.

b) the requirement for adequate space in the office area for all office stations to be used at the same time if necessary.
c) separating the office area off from the entrance, while still maintaining adequate sight lines. Sight lines need to be carefully checked at design stage.

d) providing a sound-proof but moveable partition between the smaller retreat room and therapy room to allow these to be opened up for more flexible use.

H The building process

1 An Architect representative was interviewed separately using questions which related specifically to the construction of the building, maintenance, management and energy efficiency in a separate Technical Interview Guide (Appendix I). The results of the interview were analysed in relation to a careful examination of the working drawings, specifications and heating bills for the building to provide an overall appraisal of sustainability. A “walk through” with the Client Representative was used to further clarify identified issues. The benefit of hindsight was used to establish what, if any, additional changes might be made to the future briefing, design, specification and construction of small-scale healthcare buildings such as Maggie Centres.

Construction process

2 From the local architect’s point of view, there had been no problems during the planning stage and the iconic status of the building had very much helped in this respect. The construction had been equally straightforward apart from the roof, for which the holding of design and construction workshops before going on site had eased matters. The specialised “angel hair” finish to the stainless steel roof had to be carried out in the USA because no one would do it in the UK. The construction process had turned out to be slower but not greatly so. The build contract had been for 12 months when normally it would have been 6-8 months. There had been no particular problems during the defect stage because people had taken a real pride in the job.

Maintenance

3 According to the local architects and staff, ongoing maintenance requirements for the building had been relatively low at the time of this study although, from records analysed, there had been a number of call outs relating to the poor performance of the heating system and the non-disabled w.c. Any maintenance required had been arranged on a relatively informal basis by the Centre Head with the NHS estates department, the local architects or agents responsible for maintaining the services.

4 The hooded effect of the roof had helped to shelter some of the exposed timber, although it was thought that the external timber on the south/south west would deteriorate unless it is regularly maintained. The external timber seating will need particular attention in this regard. The design architects had specified a vertical grain imported Douglas Fir for aesthetic reasons, even although the local architects had recommended a more durable hardwood because of the severe rainfall in Scotland.

5 Walling areas which were subject to significant wear through furniture abrasion and handprints had been repainted and were likely to need repainting relatively frequently.

6 Generally the finishes to the building were felt to be of good quality, apart from the external timber, and it was anticipated that the higher capital cost and investment in better quality materials should result in less maintenance.
A tower will be required to change the internal lighting, and it was recommended by the architects that the low-energy light bulbs were replaced all in one go when the first one goes. A cherry picker will be needed to service the roof because of its particular design. The architect did not feel that maintenance expenditure on the building had been excessive to date.

It should be added that no life cycle costing had been specifically carried out on this development at the design stage to minimise future maintenance costs.

Management

According to the local architect, the performance of the building had generally fulfilled the brief requirements apart from the office area, where the ergonomics were not thought to be operable. The office did not comply with the Disability Discrimination Act, because it was not possible for a wheelchair user to work in the office. It would be possible, however, for a wheelchair user to be accommodated elsewhere, given the flexibility of the building.

The building was perceived to be very flexible in use by the local architect, who pointed out that a laptop facility had recently been added to the kitchen table area to enable people to use IT while having a cup of tea. It was suggested that there was lots of opportunity for this kind of flexibility. Storage areas, however, were felt to be relatively unprovided for and the local architects suggested that the client will need to re-examine the requirement for this.

Generally, although the building was felt to work well and had a complete lack of institutional feeling, the local architect suggested that the brief was not comprehensive enough. Nevertheless the design was rated by him as “pretty close to excellent”.

The “walk through” revealed that sightlines from the PC information station and the kitchen areas to the entrance door were blocked to a degree, leading to staff having to position themselves carefully at all times to ensure that they could hear/see visitors arriving. This was, however, viewed positively as it ensured that staff remained attentive to all parts of the building.

Energy efficiency

The primary means of heating the building was by under floor heating using a domestic 30 kW combination gas boiler for the ground floor wet system and electricity for the upper floor under floor heating. A 6.6 kW woodstove-effect gas fire provided additional heating to the upper level area above the library. The wet system was designed to be run at a constant temperature setting of around 18°C with localised heating elements in the kitchen area and large group room to top this up as required. The under floor heating was split up to eight different zones relating to different parts of the building, each with a separate thermostat. These could only be adjusted by one or two degrees, however, from the main programme setting. The local architect was not convinced by the control mechanism for the localised heating element and at the time of this study the heating coil itself appeared to be malfunctioning.
14 Service engineer’s reports noted several times that the heating programmer was on the wrong settings and had to be reset. There had also been some past problems with the heater under the bench unit in the kitchen and in the office area. It is quite clear from the engineer’s reports that staff regularly reported problems with the heating which were largely related to the complexity of the programmer. The author also observed the complexity of using the programmer during the “walk through”.

15 The local architect observed that there was considerable solar gain in the building as noted also by users. One design suggestion had been to use fritted glass for the large skylight over the concrete floor in the centre of the building to prevent excessive heat build up, but the design architects had been adamant that the users should be able to see the sky just as it was. The local architect also stressed the need to continuously educate the staff on how to use the heating system due to the inevitable turnover of personnel.

16 The building was designed to be naturally ventilated apart from areas with no outside wall, which were served by mechanical ventilation. The local architect recognised that the shape and volume of the main spaces together with natural ventilation only occurring through the low-level sash windows, was not altogether helpful in this regard. It was suggested that a rapid extract system combined with heat recovery may help to overcome any ventilation or overheating issues.

17 The levels of insulation installed (60mm Rockwool HP in the external walls, 35mm rigid insulation in the floor, and 80mm Foamglass in the roof) were thought to be in excess of the building regulations at the time and the local architect felt that the building should be very good in terms of energy efficiency. Best practice in this area would however suggest doubling these levels of insulation in future projects in order to reduce carbon dioxide emissions to a sustainable rate which will mitigate climate change in future12.

18 Evidence on the running costs from fuel bills obtained for a full year (Table 12, Appendix V) indicates that, despite the heating control issues identified, the energy use was well within the government energy target of 35-55 GJ/100 cu.m for new buildings in the NHS Estate (2001-10), coming in at 29.4 GJ/100cu.m. Energy running costs were £64 per week for 286 kWh/m². Total carbon emissions for the building were 4.4 tonnes for the year.

Overall sustainability

19 An appraisal of the overall sustainability of the Dundee Maggie Centre building involved an assessment of a number of interrelated areas: resource use, pollution, biodiversity, healthy environments, people and communities and the building process itself drawing on the headings in Table 13. The limitation of this study did not permit a full assessment to be made, and what follows is a brief overview following scrutiny of the drawings and specification together with visits to the building and interviews with various parties.

20 Resource Use:
The design of the building itself has reduced environmental impact through the extensive use of renewable timber in the structural framing, windows, doors and cladding. However it should be noted that there is likely to have been a significant amount of embodied energy tied up in the transportation of certain elements, such as the steel cladding for the roof, which had to be transported to the US and back again for finishing, and the timber structural beams which were manufactured in Finland. The extensive use of building products and materials bonded together by strong adhesives will make it difficult to recycle these components at the end of their life, although the main timber elements could in theory be re-used.

21 Pollution and Biodiversity:
Almost all users were commuting by car, a relatively pollution-intensive form of transport, despite accessible public transport facilities on site. The solution to this lies beyond the control of the Maggie’s Centres, possibly in the form of less polluting cars. The materials and products used in the building were relatively standard and no particular attempt had been made to specify low pollutants beyond regulatory practice. Biodiversity on the site remained relatively unaffected because the site itself had no particular merit to start with. Although no attempts had been made to enhance biodiversity to date, the potential is offered through future landscaping initiatives.

22 Healthy Environment:
There had been significant emphasis on creating a healthy environment within the building through the specification of low-emission paint and varnish finishes, the extensive use of natural materials inside the building, the use of natural ventilation and daylight. There was, however, no particular requirement in the brief to minimise toxicity or to optimise humidity levels, both of which help prevent allergic reactions. Nevertheless the perception by users was that the air quality in the building was relatively good, possibly due to the generous volumes provided by the design which provided a degree of buffering in terms of air quality.
23 People and Communities:
The outstanding design quality of the building had greatly benefited the local community in terms of raising Dundee’s profile as a city, although the direct benefits to the local construction and manufacturing economy were relatively minimal given that most products for the building had been imported to the region. There were no “local labour” clauses specified in the contract as such, to help promote the local economy.

24 Building Process:
The building process did not utilise any particular sustainability tools or benchmarks and post occupancy evaluation was not specified as part of the briefing process as such. There was, however, extensive pre-evaluation of the design with the client body and a very close and continuous relationship with the architect. Future expansion of services had been considered and rather than expand the building, the client would consider building another building instead. Future-proofing the building in terms of future legislative requirements or upgrading elements was difficult to anticipate and potentially expensive. Although the brief specifically required that the building should economical to maintain, there was no brief for the architect or contractor to provide sustainable methods of construction that minimised waste, energy use and addressed climate change beyond statutory requirements.

Conclusions:
a) Design issues:
1 The domestic nature of the design resulted in a relatively straightforward construction process apart from the roof. The contract length was slightly longer than for a building of a similar size, but the difference is relatively insignificant.

2 In terms of maintenance, it is important to take account of the local climate when designing and specifying external timber elements. Large flat timber surfaces, such as the seating on the “jetty” should be avoided as water will sit on these and lead to premature decay.

3 Although the provision of an environmentally sustainable development was not a primary aim of the original project, the design has addressed these on a number of levels including good levels of daylighting, passive solar gain and durability. It has also minimised environmental impact to a degree through the specification of relatively low embodied energy timber for primary and secondary elements of the development. Incorporating the briefing requirements related to resource use, pollution, biodiversity, healthy environments, people and communities and the building process, would improve performance in all these areas.

4 There is also scope for future Maggie’s Centres to reduce carbon dioxide emissions to a more sustainable level, for relatively little extra capital outlay, by introducing “quick wins” to the brief which recognise the cost constraints of an organisation dependent on fundraising. These include:
   • increased loft insulation
   • use of materials and products with recyclate in them
   • waste minimisation procedures during construction
   • minimal use of timber treatments
   • category “A” boilers.

b) User related issues:
5 The maintenance and running of the building is relatively straightforward apart from the heating system. At present maintenance is carried out on a relatively informal basis. It may be useful for the Maggie’s Centres, at this stage of development as an organisation, to consider employing a permanent buildings manager for their stock, who would be able help staff understand problems related to heating, ventilation and general maintenance and ensure continuing induction for new staff unfamiliar with how to run their building. This person could also be charged with cyclical maintenance planning and brought in on the briefing process for new projects in order to provide technical feedback on proposed specifications related to the actual requirements of users.
7. Conclusions and Recommendations

1. The limited scope of this short study presents a snapshot of the Dundee Maggie’s Centre and cannot seek to replicate a full monitoring exercise over a longer period of time.

2. The methodology adopted has however, revealed a great deal of both subjective and factual information which has provided a rich picture of how well the building is performing and could be replicated for future buildings.

3. The results of the small pilot survey indicate that the building has successfully achieved the following objectives of the brief:

   • a highly effective design concept in relation to the Maggie’s Centre’s care model
   • very high user satisfaction overall, with facilities providing a calm and friendly space and an appropriate degree of privacy
   • high level of overall comfort
   • users perception of increased health and wellbeing due to visiting the building
   • particular appreciation of the views out of the building
   • low level of maintenance required

4. The building has been less successful in achieving the following objectives:

   • flexible office space which is separate yet visible from welcome area
   • adequate storage facilities for the office area and other activities
   • thermal comfort

5. Evidence on the running costs from fuel bills obtained for a full year (Table 12, Appendix V) indicates that, despite the heating control issues identified, the energy use was well within the government energy target of 35-55 GJ/100 cu.m for new buildings in the NHS Estate (2001-10), coming in at 29.4 GJ/100cu.m. Energy running costs were £64 per week for 286 kwh/m². Total carbon emissions for the building were 4.4 tonnes for the year.

6. The high level of overall user satisfaction validates a design approach which has placed an emphasis on the quality and generous size of internal spaces. Good quality internal design also gives the building a high “forgiveness” factor in relation to comfort issues concerning overheating, humidity, ventilation and glare.

7. There are a number of issues arising from the evaluation in the light of the original brief and developed proposal which should be investigated further to help improve the design quality of Maggie’s Centres and other small scale healthcare buildings:

   **Design Issues:**
   
a) large areas of south facing glazing can lead to overheating, unless adequate external solar shading and ventilation measures are taken

   b) the size of the office should take account of the need for flexibility, storage and adequate circulation

   c) the specification of the underfloor heating system needs an adequate and instantaneous top-up system in the light of the fluctuating numbers which use a Maggie’s Centre.

   d) the specification and design of windows must allow for adequate ventilation at high level and should be designed to allow easy opening by one individual

   e) adequate cross ventilation is needed between rooms if this size of building is to be naturally ventilated

   f) the possibility of providing a sound-proof moveable partition between the smaller retreat room and therapy room to allow for more flexible use.
User-related issues:

a) user induction should be an inherent feature of any new building and needs to be continuous, especially in relation to heating and ventilation controls, to avoid potential misunderstanding

b) complex heating programmers should be avoided – the design team need to ensure they are simple to understand with no unnecessary options for settings

c) the position of the office should be considered carefully in relation to staff requirements as well as user requirements, and avoid being seen as a “reception area”. The kitchen should ideally lead immediately off the main entrance, as the primary social space, to avoid first time visitors “hovering” at the entrance

d) the use of chairs without armrests or adequate back support for conversational mode is not recommended for ambulant disabled users

e) there is a need for increased car parking provision at peak times.

Design principles:

a) emphasis on external views of nature from the building, which are natural and uplifting for users

b) relatively generous space standards and volume combined with a carefully designed abundance of natural lighting, which allows air to remain fresh

c) the use of high quality materials and finishes to minimise maintenance costs and increase durability

d) the use of timber for both the primary and secondary elements of construction to minimise environmental impact.

User-related principles:

a) open plan layout, which while providing a sense of welcome also makes circulation and internal management relatively easy

b) the generous “farmhouse” kitchen as the primary social space, which is the key to the success of the Maggie’s Centre

c) the inclusion of a variety of different types of spaces which allow different activities to occur in them.

Positive outcomes that should be adopted from the building design in future briefing include the use of:

a) simple to understand and easy to use heating systems, controls and programmers which can respond to rapidly changing occupancy levels

b) low-noise mechanical ventilation equipment in user environments which don’t interfere with quiet conversation

c) adequate solar shading and provision of cross-ventilation

d) specific storage areas and facilities to be more clearly identified or system for removing items

e) adequate circulation in office areas

f) sustainable design and specification which draws on “quick wins” within cost constraints.

There are a number of areas where the briefing process for the Maggie’s Centres could be strengthened in order to improve the overall performance of their buildings, including the requirement for:

A SWOT analysis based on the study findings to establish the overall efficiency of the design and future strategies in relation to the initial project objectives is shown overleaf.
SWOT analysis of Dundee Maggie’s Centre

**Strengths**

- successful design concept in relation to Maggie Centre care model
- qualitative nature of design brief
- outstanding scenic views from building
- quality and abundance of natural light
- open plan layout
- welcoming and engaging kitchen area
- flexibility of design for different uses
- staff ethos

**Weaknesses**

- inadequate ventilation design and lack of solar shading leading to overheating
- poor thermal comfort conditions due to underfloor heating system and thermal mass which cannot respond quickly to rapid changes in user activities and numbers.
- complicated heating programmer
- unergonomic chairs and seating
- relatively undeveloped briefing documentation and feedback procedures for projects

**Opportunities**

- add moveable solar shading to south facing kitchen windows to reduce glare
- remodel office area
- continuous user induction to help understand the building’s heating and ventilation and control it better.
- improved design brief to take account of identified design, sustainability, and maintenance issues
- employment of buildings manager to provide strategic support

**Threats**

- staff dissatisfaction with working conditions in office area
- future legislative requirements in relation to sustainable design
- increasing energy bills for fossil fuels
- long term maintenance of exposed timber

11 The following aspects present opportunities for further research:

- a wider study of all Maggie Centres using a further refinement of the methodology established in this pilot study to ascertain specific outcomes and research questions which examine key design features in relation to user’s perception health and wellbeing.
- a wider study of the relationship between user’s ability to control their environment and their perceived state of health and well being.
- the design of ventilation and heating strategies in relation to the presence, or absence, of thermal mass in small-scale healthcare buildings and the effect this has on energy efficiency and comfort.
8. Bibliography

Association for Environmentally Conscious Builders article on Lightweight v. Heavyweight construction, Vol.11, no.3 pp.30-34 Winter 2001-02


Building and Research Information, Vol 29, Number 2, March-April 2001 Special Issue on Post-occupancy Evaluation

Building and Research Information, Vol 33, Number 4, September 2005


Jencks, C. The Maggie Centres Movement Eight Years In..., Fourth Door Review, Nos.7, 2005 pp.30-33


Stevenson, F. (2005) Environmental architecture and the health building; the materiality perspective, Fourth Door Review, Nos.7, pp.38-42


Appendix 1
User Interview Guide

Staff Interview Prompt Sheet for Questions

Interviewer:
I am carrying out this interview as part of a study to help with future planning and design of Maggie Centres. The information collected will be treated as completely confidential. The final report of the study will use summaries of the information and not reveal the identities of any individuals. Any notes on the interview will be destroyed at the end of the study.

The interview will last about an hour and it would be helpful if you could answer as many questions as you can.

A Background Questions:
1. What is your age?
2. What is your sex?
3. What is your home postcode?
4. How did you get here?
5. Do you sit next to a window at your normal workplace?
6. How long have you worked in this building?
7. How many days do you spend in the building in a normal week?
8. How many hours per day do you spend at your desk or in your normal work area on a normal working day?
9. How many hours per day do you normally spend working with a computer screen (VDU)?

B The Building Overall
10. What image do you feel the building projects?
11. How would you describe the levels of privacy it provides?

prompts
- for your work
- for visitors

12. How do you find the layout of the building?

prompts
- how easy to understand
- how practical

13. How well do think the space is used in the building as a whole?
14. Does the building as a whole meet your needs?
15. How would you describe the views inside of the building?
16. How would you describe the views from the inside to the outside of the building?
17. What do you think of the storage arrangements in the building?

prompts
- for your work

18. All things considered, how do rate the building design overall?

19. Please briefly describe the work that you carry out in this building

20. Specifically for the purpose of your work, how well do the facilities meet your needs?

21. Can you give examples of things which can hinder effective working?

22. Can you give examples of things which usually work well?

23. How do you rate the usability of the furniture provided at your desk or normal work area?

24. Do you have enough space at your desk or normal work area?

C Your Work Requirements

25. How would you describe the comfort conditions in the building?

prompts:
- temperature
- air quality

26. How would you describe noise in the building?

prompts:
- noise from other people
- other noise from inside
- noise from outside

27. How would you describe the quality of lighting in the building?

prompts:
- lighting overall
- natural light
- glare from sun and sky
- artificial light
- glare from lights
E Personal Control

28. How much control do you personally have over the following aspects of the building during your visit?
- heating
- cooling
- ventilation
- lighting
- noise

29. How important is it to be able to control these factors?

30. All things considered, how would you rate the overall comfort of the building environment?

31. Is your overall wellbeing increased or decreased by the environmental conditions in this building?

32. Do you feel that the building affects your health by making you feel more or less healthy?

33. Do you think your productivity at work is decreased or increased by the environmental conditions in this building?

34. Any others comments?
Appendix II
Technical Interview Guide

Thank you for agreeing to take part in this interview, which should take about 45 minutes. Can I assure you that no records of the interview will be kept with your name on them. I will be taping this interview but the tape will be destroyed once I have made anonymous notes. Can you please try to answer all questions as fully as you can.

Background:
1. How often have you visited the building (once it was complete)
2. What was your involvement with the building?

Section A: Performance Aspects
3. How do you think the development has measured up to the original expectations of the brief?

Probes
- layout
- use of space
- views inside
- views outside
- flexibility
- privacy

Section B: Construction
4. Was construction easier or more difficult compared to standard small scale palliative care design?

Probes
- structure
- superstructure
- foundations
- services
- fittings
- finishes

5. Was construction faster or slower compared to standard small scale palliative care design?

Probes
- structure
- superstructure
- foundations
- services
- fittings
- finishes

6. Were there any problems during the planning stage of the scheme?

7. Were there any problems during the construction stage of the scheme?

8. Were there any problems during the defects stage of the scheme?

9. How easy is the building to maintain and clean?

Probes
- maintenance difficulties
- cleaning difficulties
- lifecycles for materials, finishes

Section C: Heating, Ventilation and Lighting
11. How is the building meant to be heated?

Probes
- when during day/season
- using what

12. How well has the heating system in the building performed?

Probes
- comfort levels
- temperatures in all seasons
- ease of use
- responsiveness
- quality of heat
- any problems

13. How is the building meant to be ventilated?

Probes
- when during day/season
- using what

14. How well has the ventilation strategy in the building performed?

Probes
- comfort levels
- ease of use
- responsiveness
- air quality
- any problems

15. How is the building meant to be lit?

Probes
- natural
- artificial

16. How well has the lighting strategy performed?

17. How energy efficient is the building in your view?

18. What improvements would you make to the heating, ventilation or lighting in hindsight if any?
Section D: Flexibility

19. How flexible is the building in accommodating user needs?

probes
use of rooms
workspace
acoustic privacy

20. How well do you think the building could accommodate future user needs?

probes
- storage
- disability
- growing use
- workspace/IT

21. What improvements would you make to the scheme in terms of flexibility in hindsight if any?

Section E: General

22. Please give examples of things about the building which work well?

23. Please give examples of things about the building which hinder its effective operation?

24. In one word what image do you feel the building projects?

25. All things considered, how do you rate the design overall?

26. Are there any other comments you’d like to make?
Appendix III
Drawings – plans/sections/elevations

Ground Plan
Appendix III

Section looking North

Section looking North
## Appendix IV
Benchmarking for fuel costs

Table x: Energy/ CO$_2$ Benchmarking for Fuel Costs

<table>
<thead>
<tr>
<th>Building Type</th>
<th>Total Volume M$^3$</th>
<th>Kwh/m$^2$/year</th>
<th>CO$_2$/tonnes/m$^2$/year</th>
<th>NHS Estates Benchmark (2001-2010) GJ/m$^3$/year</th>
</tr>
</thead>
<tbody>
<tr>
<td>New buildings</td>
<td></td>
<td></td>
<td></td>
<td>35-55</td>
</tr>
<tr>
<td><strong>Dundee</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Maggie’s Centre</strong></td>
<td>785</td>
<td>286</td>
<td>0.07</td>
<td>29.4</td>
</tr>
</tbody>
</table>
## 1: User Demographics (Questionnaire)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Over 30 yrs =</th>
<th>97%</th>
<th>Under 30 yrs =</th>
<th>3%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sex</td>
<td>Female =</td>
<td>69%</td>
<td>Male =</td>
<td>29%</td>
</tr>
<tr>
<td>Status</td>
<td>Suffering from cancer = 71%</td>
<td>Carer =</td>
<td>29%</td>
<td></td>
</tr>
<tr>
<td>Travel mode</td>
<td>Car =</td>
<td>82%</td>
<td>Walk =</td>
<td>9%</td>
</tr>
<tr>
<td>Nos. of visits</td>
<td>5 times or more =</td>
<td>73%</td>
<td>first time =</td>
<td>12%</td>
</tr>
<tr>
<td>Length of visits</td>
<td>Variable</td>
<td></td>
<td>1-2 hours =</td>
<td>43%</td>
</tr>
<tr>
<td>Rating of health in past week</td>
<td>62% above average</td>
<td>19% under average</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rating of quality of life in past week</td>
<td>56% above average</td>
<td>10% under average</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

## 2: Visitor Satisfaction (Questionnaire)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Criteria</th>
<th>Nos. of visitors rating this at top of scale (1-7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>image</td>
<td>very good</td>
<td>71%</td>
</tr>
<tr>
<td>lasting impression</td>
<td>very good</td>
<td>68%</td>
</tr>
<tr>
<td>layout</td>
<td>easy to understand</td>
<td>53%</td>
</tr>
<tr>
<td>space use</td>
<td>effectively</td>
<td>41%</td>
</tr>
<tr>
<td>meeting my needs</td>
<td>very well</td>
<td>52%</td>
</tr>
<tr>
<td>views inside</td>
<td>good</td>
<td>76%</td>
</tr>
<tr>
<td>views to the outside</td>
<td>good</td>
<td>82%</td>
</tr>
<tr>
<td>design overall</td>
<td>satisfactory</td>
<td>70%</td>
</tr>
</tbody>
</table>
3: Purpose of visit (Questionnaire)

<table>
<thead>
<tr>
<th>Reason stated</th>
<th>N</th>
</tr>
</thead>
<tbody>
<tr>
<td>Counselling/chat</td>
<td>5</td>
</tr>
<tr>
<td>Before / after treatment</td>
<td>2</td>
</tr>
<tr>
<td>Women's group</td>
<td>6</td>
</tr>
<tr>
<td>Relaxation group</td>
<td>10</td>
</tr>
<tr>
<td>Carer's group</td>
<td>5</td>
</tr>
<tr>
<td>Medical student placement</td>
<td>1</td>
</tr>
<tr>
<td>Care of plants</td>
<td>1</td>
</tr>
<tr>
<td>Volunteer</td>
<td>1</td>
</tr>
<tr>
<td>Collect Information</td>
<td>1</td>
</tr>
<tr>
<td>Not ascertained</td>
<td>2</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>34</strong></td>
</tr>
</tbody>
</table>

4: Specific Needs for Visit (Questionnaire)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Criteria</th>
<th>Nos. of visitors rating this at top of scale (1-7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>meeting my needs</td>
<td>very well</td>
<td>52%</td>
</tr>
<tr>
<td>talking to others</td>
<td>very comfortable to</td>
<td>67%</td>
</tr>
<tr>
<td>feeling at ease</td>
<td>at ease</td>
<td>72%</td>
</tr>
<tr>
<td>freedom to use the building</td>
<td>a lot</td>
<td>76%</td>
</tr>
</tbody>
</table>
## 5: Comfort (Questionnaire)

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Criteria</th>
<th>Nos. of visitors rating this at top of scale (1-7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Comfort overall</td>
<td>satisfactory</td>
<td>58%</td>
</tr>
<tr>
<td>Noise overall</td>
<td>satisfactory</td>
<td>58%</td>
</tr>
<tr>
<td>Lighting overall</td>
<td>satisfactory</td>
<td>58%</td>
</tr>
</tbody>
</table>

## 6: Personal Control

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Criteria</th>
<th>Nos. of visitors rating this at top of scale (1-7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heating</td>
<td>no control</td>
<td>46%</td>
</tr>
<tr>
<td>Cooling</td>
<td>no control</td>
<td>35%</td>
</tr>
<tr>
<td>Ventilation</td>
<td>no control</td>
<td>35%</td>
</tr>
<tr>
<td>Lighting</td>
<td>no control</td>
<td>27%</td>
</tr>
<tr>
<td>Noise</td>
<td>no control</td>
<td>42%</td>
</tr>
</tbody>
</table>
7: Relationship of Features with Health Ratings (Questionnaire)

Self Reported Ratings Scales

<table>
<thead>
<tr>
<th></th>
<th>Overall* Health Past week</th>
<th>Overall QoL Past week</th>
<th>Well being*</th>
<th>Health*</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st Impression</td>
<td></td>
<td></td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Lasting Impression †</td>
<td></td>
<td></td>
<td>++</td>
<td></td>
</tr>
<tr>
<td>Layout</td>
<td></td>
<td></td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Space Use</td>
<td></td>
<td></td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>Needs</td>
<td></td>
<td></td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Views Inside</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Views Outside</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Visit Needs</td>
<td></td>
<td></td>
<td>+++</td>
<td>+++</td>
</tr>
<tr>
<td>Talk to others</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>At ease</td>
<td></td>
<td></td>
<td>+++</td>
<td>++</td>
</tr>
<tr>
<td>Freedom of use</td>
<td></td>
<td></td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>Overall design</td>
<td></td>
<td></td>
<td>+++</td>
<td>+</td>
</tr>
</tbody>
</table>

* high Score is positive rating
† low score is positive rating
   blank cell represents no consistent relationship found
- weak negative relationship (p < .1)
-- moderate negative relationship (p < .05)
--- strong negative relationship (p < .01)
+ weak positive relationship (p < .1)
++ moderate positive relationship (p < .05)
+++ strong positive relationship (p < .01)
### 8: Self Reported Rating Scales

<table>
<thead>
<tr>
<th></th>
<th>Well being*</th>
<th>Health*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Overall Temperature*</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Overall Comfort</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td>Noise Overall*</td>
<td>+++</td>
<td></td>
</tr>
<tr>
<td>Noise from Inside†</td>
<td>--</td>
<td>--</td>
</tr>
<tr>
<td>Noise from Outside†</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>Lighting* Overall</td>
<td>+</td>
<td>+++</td>
</tr>
</tbody>
</table>

* high Score is positive rating
† low score denotes ‘too little’ noise
- weak negative relationship (p < .1)
-- moderate negative relationship (p < .05)
--- strong negative relationship (p < .01)
+ weak positive relationship (p < .1)
++ moderate positive relationship (p < .05)
+++ strong positive relationship (p < .01)

### 9: Self Reported Rating Scales

<table>
<thead>
<tr>
<th>Control of...</th>
<th>Well being*</th>
<th>Health*</th>
</tr>
</thead>
<tbody>
<tr>
<td>... Heating</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>... Cooling</td>
<td>++</td>
<td>+</td>
</tr>
<tr>
<td>... Ventilation</td>
<td>++</td>
<td></td>
</tr>
<tr>
<td>... Lighting</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>... Noise</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Appendix V
### Tables

#### 10: Technical Measurements on 24th March 2006 in Dundee Maggie Centre

<table>
<thead>
<tr>
<th>Time</th>
<th>Outside</th>
<th>Reception</th>
<th>Kitchen</th>
<th>Main room</th>
<th>Upstairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Noise levels dB</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 am</td>
<td>65</td>
<td>52</td>
<td>50</td>
<td>32</td>
<td>31</td>
</tr>
<tr>
<td>1 pm</td>
<td>65</td>
<td>62</td>
<td>66</td>
<td>32</td>
<td>45</td>
</tr>
<tr>
<td>5 pm</td>
<td>53</td>
<td>62</td>
<td>55</td>
<td>31</td>
<td>31</td>
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</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Outside</th>
<th>Reception</th>
<th>Kitchen</th>
<th>Main room</th>
<th>Upstairs</th>
<th>Lux levels dB</th>
<th></th>
<th></th>
<th></th>
<th>187</th>
<th>797</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 am</td>
<td>1200</td>
<td>288</td>
<td>269</td>
<td>187</td>
<td>797</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 pm</td>
<td>900</td>
<td>350</td>
<td>218</td>
<td>209</td>
<td>1900</td>
<td></td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>5 pm</td>
<td>271</td>
<td>314</td>
<td>748 (light)</td>
<td>131 (off)</td>
<td>400</td>
<td></td>
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<table>
<thead>
<tr>
<th>Time</th>
<th>Outside</th>
<th>Reception</th>
<th>Kitchen</th>
<th>Main room</th>
<th>Upstairs</th>
<th>Relative Humidity</th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>9 am</td>
<td>n/a</td>
<td>33</td>
<td>31</td>
<td>31</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 pm</td>
<td>51</td>
<td>46</td>
<td>31</td>
<td>29</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 pm</td>
<td>n/a</td>
<td>n/a</td>
<td>30</td>
<td>29</td>
<td>31</td>
<td></td>
<td></td>
<td></td>
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<table>
<thead>
<tr>
<th>Time</th>
<th>Outside</th>
<th>Reception</th>
<th>Kitchen</th>
<th>Main room</th>
<th>Upstairs</th>
<th>Temp C</th>
<th></th>
<th></th>
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<tbody>
<tr>
<td>9 am</td>
<td>19.7</td>
<td>21</td>
<td>20.5</td>
<td>21.7</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>1 pm</td>
<td>11.4</td>
<td>23.3</td>
<td>23.8</td>
<td>24.2</td>
<td>24.4</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 pm</td>
<td>n/a</td>
<td>22.8</td>
<td>23.4</td>
<td>23.8</td>
<td>22.5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time</td>
<td>Outside</td>
<td>Reception</td>
<td>Kitchen</td>
<td>Main room</td>
<td>Upstairs</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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</tr>
<tr>
<td>9 am</td>
<td>no</td>
<td>no</td>
<td>yes (1)</td>
<td>no</td>
<td>no</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1 pm</td>
<td>no</td>
<td>yes (1)</td>
<td>yes (1)</td>
<td>no</td>
<td>no</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 pm</td>
<td>no</td>
<td>yes (3)</td>
<td>no</td>
<td>no</td>
<td>no</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Other things - draughts, smells etc.**
no smells/draughts

**General Comments:**
- Very sunny all day, little wind, average humidity. Snow melting.
- Tai Chi class at 1.30
- Relaxation class at 3
- Benefits advisor in morning
- Busy in kitchen at lunchtime
- Building open from 9-5pm.
- Main room unused in morning, but all other rooms used.
- Need to check boiler room.
11: Variables better than BUS benchmark

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air in Winter:</td>
<td>fresh/stuffy</td>
</tr>
<tr>
<td>Comfort:</td>
<td>overall</td>
</tr>
<tr>
<td>Design:</td>
<td></td>
</tr>
<tr>
<td>Health (perceived):</td>
<td></td>
</tr>
<tr>
<td>Image to visitors:</td>
<td></td>
</tr>
<tr>
<td>Lighting:</td>
<td>artificial light, glare from lights, overall</td>
</tr>
<tr>
<td>Needs:</td>
<td></td>
</tr>
<tr>
<td>Noise:</td>
<td>overall, noise from other people</td>
</tr>
<tr>
<td>Space in the building:</td>
<td></td>
</tr>
<tr>
<td>Temperature:</td>
<td>overall</td>
</tr>
</tbody>
</table>

Summary: Variables no different from BUS benchmark

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air in Winter:</td>
<td>dry/humid Control over cooling, heating, lighting, noise, ventilation</td>
</tr>
<tr>
<td>Lighting:</td>
<td>glare from sun and sky</td>
</tr>
<tr>
<td>Noise:</td>
<td>other noise from inside, noise from outside</td>
</tr>
<tr>
<td>Temperature:</td>
<td>hot/cold, stable/varies</td>
</tr>
</tbody>
</table>

Summary: Variables worse than BUS benchmark

<table>
<thead>
<tr>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air in Winter:</td>
<td>still/draughty</td>
</tr>
<tr>
<td>Lighting:</td>
<td>natural light</td>
</tr>
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</table>
### 12: Heating costs and CO² emissions

<table>
<thead>
<tr>
<th>Heating Period</th>
<th>Cost</th>
<th>Units</th>
<th>Energy, CO² and Carbon Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oct – Dec 2005</td>
<td>Electricity £525</td>
<td>4084</td>
<td>These were calculated using the Energy Saving Trust “energy calculator” at <a href="http://www.est.org.uk">www.est.org.uk</a></td>
</tr>
<tr>
<td>Oct – Dec 2005</td>
<td>Gas £320</td>
<td>1357</td>
<td></td>
</tr>
<tr>
<td>Jan – March 2006</td>
<td>Electricity £679</td>
<td>5347</td>
<td></td>
</tr>
<tr>
<td>Jan – March 2006</td>
<td>Gas £456</td>
<td>1858</td>
<td></td>
</tr>
<tr>
<td>April –Sept 2006</td>
<td>Electricity £1048</td>
<td>7261</td>
<td></td>
</tr>
<tr>
<td>April –Sept 2006</td>
<td>Gas £281</td>
<td>1003</td>
<td></td>
</tr>
<tr>
<td>Totals for year</td>
<td>Electricity £2252</td>
<td>16692</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Gas £1057</td>
<td>4218</td>
<td></td>
</tr>
<tr>
<td>kwh/pa</td>
<td>Electricity (1 kwh/unit)</td>
<td>16692kwh (60 GJ)</td>
<td>7044 kg CO² / pa</td>
</tr>
<tr>
<td></td>
<td>Gas (11.31 kwh/unit)</td>
<td>47705kwh (172 GJ)</td>
<td>9254 kg CO² / pa</td>
</tr>
<tr>
<td>Total overall</td>
<td>£3309/pa (£64 p.w.)</td>
<td>232 GJ/pa</td>
<td>16.3 tonnes CO² /pa</td>
</tr>
<tr>
<td>energy cost and CO²</td>
<td>64397 kwh/pa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>emissions/pa</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total carbon</td>
<td>4.4 tonnes carbon/pa</td>
<td></td>
<td></td>
</tr>
<tr>
<td>emissions/pa (0.019 tonnes carbon/sq.m/pa)</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Overall energy</td>
<td>£15 /sq.m (225 sq.m total floor area)</td>
<td>1.03 GJ/sq.m (286kwh/sq.m)</td>
<td>0.07 tonnes CO²/sq.m/pa</td>
</tr>
<tr>
<td>cost and CO²</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>emissions/pa/sq.m</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Government energy</td>
<td>225x3.5m av.height = 787.5 cu.m</td>
<td>Target = 35-55 GJ/100 cu.m</td>
<td></td>
</tr>
<tr>
<td>target for new build</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>in NHS Estate (2001-10)</td>
<td>Actual = 232 GJ /7.87</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>= 29.4 GJ/100cu.m</td>
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</table>
### 13: Distilled Parameters for Evaluating Sustainable Construction

<table>
<thead>
<tr>
<th>Principle Parameters</th>
<th>Factors to consider</th>
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</thead>
<tbody>
<tr>
<td>1. Design for Effective Resource Use</td>
<td>Waste minimisation in production, recycling and landfill</td>
</tr>
<tr>
<td></td>
<td>Conserve non-renewable resources</td>
</tr>
<tr>
<td></td>
<td>Minimising rate of use of renewable resources</td>
</tr>
<tr>
<td></td>
<td>Design for lean construction, repair, re-use, flexibility and deconstruction</td>
</tr>
<tr>
<td></td>
<td>Re-use and improve existing built assets</td>
</tr>
<tr>
<td></td>
<td>Design with climate/microclimate</td>
</tr>
<tr>
<td></td>
<td>Design for soil retention</td>
</tr>
<tr>
<td>2. Minimising Pollution</td>
<td>Minimise air, water and land pollution in relation to building use and design specification</td>
</tr>
<tr>
<td></td>
<td>Relate land-use planning to transport infrastructure and strategy</td>
</tr>
<tr>
<td></td>
<td>Locate appropriately</td>
</tr>
<tr>
<td></td>
<td>Minimise light pollution</td>
</tr>
<tr>
<td></td>
<td>Life Cycle studies</td>
</tr>
<tr>
<td></td>
<td>Waste minimisation and treatment</td>
</tr>
<tr>
<td>3. Respect for People, Communities, and Local Environment</td>
<td>Design quality</td>
</tr>
<tr>
<td></td>
<td>Benefiting local economy and ecology</td>
</tr>
<tr>
<td></td>
<td>Minimise Fuel poverty</td>
</tr>
<tr>
<td></td>
<td>Access/Safety issues</td>
</tr>
<tr>
<td>4. Promoting Biodiversity</td>
<td>Global ecology and production of materials and components</td>
</tr>
<tr>
<td></td>
<td>Habitat creation and conservation</td>
</tr>
<tr>
<td></td>
<td>Water features/SUDS</td>
</tr>
<tr>
<td></td>
<td>Locate buildings appropriately (local)</td>
</tr>
<tr>
<td></td>
<td>Preserve and enhance existing local biodiversity</td>
</tr>
<tr>
<td>5. Creating Healthy Environments</td>
<td>Optimise humidity levels</td>
</tr>
<tr>
<td></td>
<td>Minimise toxicity</td>
</tr>
<tr>
<td></td>
<td>Indoor air quality</td>
</tr>
<tr>
<td></td>
<td>Optimise natural ventilation</td>
</tr>
<tr>
<td></td>
<td>Optimise light quality</td>
</tr>
<tr>
<td></td>
<td>Optimise personal control of environment</td>
</tr>
<tr>
<td>6. Managing the Build Process</td>
<td>Contractor requirements (sustainable const.)</td>
</tr>
<tr>
<td></td>
<td>Future proofing —legislation</td>
</tr>
<tr>
<td></td>
<td>Critical Path, tools and benchmarks</td>
</tr>
<tr>
<td></td>
<td>Log books</td>
</tr>
<tr>
<td></td>
<td>Pre- and Post Occupancy Evaluation</td>
</tr>
</tbody>
</table>
Appendix VI
Architectural brief

Suggestions towards requirements

Purpose of Buildings:

- To provide non-residential support and information facilities for people with cancer, their families and friends.
- The buildings will offer their users a calm friendly space where they can spend time thinking about what they think will suit them in the way of support of their medical treatment.
- They will be able if they so wish, to have a private conversation with the programme director or the clinical psychologist about their situation and needs.
- On offer, within the building will be a free programme, which will include group support, family friends support, relaxation sessions, information access, and benefits advice. (see Maggie’s Centre booklets on programme and timetable).
- They may choose ‘to do any’ of this programme or none of it. Some people will want to use the building/centre to have a cup of tea and a quiet pause. Others will be helped by offering volunteer services themselves, such as gardening. Others again, will want to join support groups and actively participate.
- We do not want to suggest there are better or worse ways of dealing with cancer. Any way that ‘helps’ anybody going through cancer to feel better is fine, with the important proviso that any service offered in the building will be approved by the Professional Advisory Board and will be complementary and not alternative to orthodox medical treatment.

Requirements for building, in more detail

1. Entrance, obvious, welcoming, not intimidating.
2. Small coat hanging, brolley space.
3. Welcome, sitting, information & library area, from which the layout of the rest of the building should be clear. There should be as much light as possible. There should be views out to grass/trees, sky. You should be able to see where the kitchen area is, equally the sitting room and fireplace-area (hearth & home). Maggie suggested a fish tank.
4. Office - space for a) Programme Director and b) fundraiser/deputy which should be easily accessible from the welcome area so that either person working at a desk can see when somebody comes in to the Centre, in order to welcome them. Their space should be separate enough that the welcome area does not seem like an office or a “reception” area. There should be storage space for stationary/pamphlets/bumph accessible to the office space. Space should be allocated for a photocopier, printer, server and other office machinery. Each workstation needs a telephone, computer point and light, shelf and drawer space. As well as the main ones there should be 4 other workstations that can be quite small. Somewhere for staff to hang coats.
5. A video viewing and computer link information area or bay for the use of 2 people - within shouting distance of the programme director’s office area, so that he/she can help if necessary.
6. A kitchen area, like a ‘country’ kitchen, with room for a large table to sit 12, which could be used for demonstrations/seminars, discussion groups. The kitchen should be relaxed and inviting enough for anybody to feel welcome, to help themselves to coffee or tea. A central ‘island’ on which cooking demonstrations could take place would be helpful.
Appendix VI
Architectural brief

7. A large room for relaxation groups/lectures/meetings. A space sufficient to take 12 people lying down. Storage space for relaxation/folding chairs. As much as possible, you should be able to open & shut walls (between this and welcome area/kitchen area?) to have flexi space, for more or less privacy, as occasion demands.

8. A smaller sitting/counselling room for 12 people with a fireplace or stove. - this doesn't have to be very big; it makes for a friendlier atmosphere if people have to huddle up a bit.

9. 2 small rooms for counselling or therapy, preferably with big windows looking out to grass/trees. They should be sound proof. One should be able to take a treatment bed, preferably facing a window.

10. Lavatories, with washbasins and mirrors, one at least, big enough to take a chair and a bookshelf, and not all in a row with gaps under the doors. Private enough to have a cry.

11. A very small quiet space to have a rest/lie down.

12. Outside - garden areas, and parking (10) spaces.

Practical

We have got to do this as economically as possible without compromising what we are trying to offer: we know that any kind of "complex" building costs more to build, but it will have to be borne in mind, at design level, that we have a small building budget and that subsequent building maintenance and cleaning should be as cheap as possible. (wood floors/ease of access/light fittings preferable to 56)

It might help to think of this as a "positive" restraint, not an economical constraint, in the sense that the aim of this project is to build a modest, humane building, which will encourage and not intimidate.

Overall:

Areas interesting to think about: - we want to make spaces which make people feel better rather than worse (most hospitals)

Some things are obvious:

- As much light as possible.
- Important to be able to look out and even step out from as many 'rooms' as possible into something like a garden or 'nature', a courtyard?
- The interior spaces shouldn't be so open to the outside that people feel naked and unprotected. They should feel safe inside enough that they can look out and even go out if they wanted.
- This describes a state of mind, doesn't it?
- We want to have the minimum possible 'administration offices' type atmosphere. No doors with "fundraiser" on the outside. We want the ethos and scale to be domestic. We need to think of all the aspects of hospital layouts, which reinforce "institution" - corridors, signs, secrets, confusion - and then unpick them. As a user of the building, we want you to approach the building, and see an obvious and enticing door. When you come in, we want the first impression to be welcoming: - people will come to 'have a look', the first time. We want them to feel encouraged and not daunted: they are likely to be feeling frightened and very low anyway. We want them to have an idea of what is going on in the whole building when they come in. We want users to feel they have come into a family community in which they can participate, make their own tea or coffee, use a computer, sit down and borrow a book, even somewhere they might have a sleep for half an hour. Things shouldn't be too perfect. The rooms used for counselling should be completely private when they are in use;
but it would be no bad thing if they could be opened up when they were not. We want users to know that they can say things in confidence; and be quiet, but also be conscious that are other things going on around them they might be interested in. For instance, they might be able to see what is going on in the kitchen but will not necessarily participate in the kitchen chat – in other words; we want it to feel like a home they wouldn’t have quite dared build themselves, and which makes them feel that there is at least one positive aspect about their visit to the hospital which they may look forward to.

We want the building to make you feel, as Maggie made you feel when you had spent time with her, more buoyant, more optimistic, that life was more ‘interesting’ when you left the room with her in it, than when you walked into it - ambitious but possible?