Extra Care Housing: Designing, assessing and delivering sustainable homes

This Technical Brief summarises current policy with respect to BREEAM Multi Residential (MR) and the Code for Sustainable Homes assessment methodology when applied to Extra Care Housing developments highlighting examples of best practice sustainable eco-friendly development culminating in a model 'assisted living' zero carbon community. This Technical Brief builds upon an earlier Housing LIN Factsheet No.13,Eco Housing: Taking extra care with environmentally friendly design.

Material has been prepared using material based upon the BREEAM: MR:2008 assessors guidance manual plus examples of good practice supplied by clients and consultants named in the respective articles. Context references are also included to the Code for Sustainable Homes (CSH).

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Introduction and Future Context – late 2010 to 2016

The demand for specialist Extra Care Housing models and Retirement Community developments is set to rise steeply over the next two decades as the demand for high quality post war 'baby boomer' generation retirement housing peaks.

In parallel with this demand, enhanced environmental sustainability targets in new buildings now being demanded as a result of global climate change and additionally recognised by the recent *Housing our Ageing Population: Panel for Innovation* (HAPPI) report as one of the key aspiration drivers for successful older persons housing, are setting exciting and innovative challenges to all responsible building designers as we move towards the target of 'zero carbon' by 2016 or even 'carbon negative' developments thereafter.

These two inescapable facts, when successfully combined in environmentally responsible Extra Care Housing developments, will set the framework for successful, attractive low carbon, low energy consumption housing models seeking public sector grant levels. For example, from the Homes and Communities Agency (HCA) by not only exceeding the lower carbon emission requirements of the enhanced Part L of the 2010 Building Regulations but also by meeting the current 'higher than baseline' expectations of Local Authority Planning and Government Departments when considering new Extra Care Housing developments.

Current and proposed legislation milestone targets related to the 2006 Building Regulations, and currently out for consultation as part of the CLG document *Sustainable New Homes – The Road to Zero Carbon* (at the time of writing) are as follows:-

CSH Code Level	Current energy standard (% improvement over BR 2006 Part L)	Date of regulation implementation	2009 CSH consultation proposals
1	10%		24%
2	18%		25%
3	25% mandatory	2010 – October – Revised Part L due	25%
4	44%	2013	44%
5	100% regulated emissions		70% onsite + 30% allowable solutions
6	Zero Carbon on site plus appliances (equivalent to approx 150% in total)	2016	'Zero Carbon Home' 70% onsite + allowable solutions to reach zero carbon

It is interesting to note that, in the CLG consultation document, the 16.criteria set out under Lifetime Homes standards are proposed to become mandatory only for CSH Level 6, being voluntary for all other levels until further assessment takes place in 2010.

Additionally, the 'Zero Carbon Hub' task group was set up in 2009 in order to advise upon the 'minimum energy efficiency for zero carbon dwellings'. With regards to a typical 4 storey apartment block such as utilised for Extra Care dwellings, the recommended maximum energy demand has been calculated as 39 kWh/m2/yr based upon current SAP modelling and is subject to reassessment under the SAP 2009 programme.

The task group concluded that the above minimum energy efficiency standards for apartments can be achieved using a wide variety of products and techniques and are based upon the following building fabric performance targets:-

- Wall U-value 0.18 W/m2K
- Floor U- value 0.18 W/m2K

- Roof U- value 0.13 W/m2K
- Window U- value 1.4 W/m2K
- Air Permeability 3 m3/m2/hr @ 50Pa
- Thermal bridging y-value 0.05 W/m2K

Clearly, the last two enhanced performance requirements necessitate high levels of quality workmanship to be observed on site during the construction process.

The 2009 HAPPI Report states that:-

> *"a sustainable way of thinking benefits everyone, but older people in particular. As we get older, we are less able to control our own body temperature and get too hot or too cold more easily. Because we spend more time at home, we spend more money on lighting, heating and cooling, unless our homes are well designed".*
>
> *"it is perhaps unexpected to find that older person's housing could lead the way in terms of sustainable environmental design, but it makes sense that it should".*

1. Current Legislative Framework – early 2010

Currently in early 2010 (the time of writing), the planning departments of most local authorities, in response to Government targets, are imposing a minimum Code for Sustainable Homes (CSH) Level 3 on all proposed new developments. Some major cities are imposing a requirement that minima of between 10% and 20% of all new building energy demands are met through renewable energy sources. This requirement, when utilised on larger scale Extra Care development reaps the benefits of economies of scale in terms of reduced payback time per pound invested.

When assessing buildings using the CSH methodology however, it is important to note that only the individual apartments of a multi-occupancy building such as an Extra Care development are normally assessed thereby ignoring the benefits to the community at large of the sustainable design and renewable technology embodied within the whole building envelope.

The BREEAM Multi Residential methodology assessment however provides a whole building envelope appraisal which can be applied to Extra Care developments where a minimum of 10% of the total net floor area consists of communal areas.

Where both CSH and BREEAM Multi Residential assessments are applicable, should the building commissioner wish to pursue both assessment methodologies, for instance, where the Extra Care development or Retirement Village are of mixed tenure and include apartments for sale, then evidence collected for the CSH assessment can be used towards the Multi Residential assessment and vice versa to avoid unnecessary assessment duplication.

In this Technical Brief, we are going to present an overview of a sustainable overall design feasibility approach as well as the consideration and application of renewable energy utilising the BREEAM Multi Residential assessment procedure as an informative working design tool (whilst respecting the mandatory requirements of CSH such as carbon emissions and water consumption). This will take into account the whole building fabric which can be used to support a successful HCA bid grant and renewable energy grant funding taking into account the benefits of the forthcoming electricity 'feed in tariff' (FIT) returns, (due to come into force on April 2010) where larger scale developments can earn revenue when generating surplus power).

2. A Sustainable Design Approach to Extra Care Housing

In order to demonstrate a responsible approach to tackling climate change whilst meeting the HAPPI Report's recommendations in terms of Energy Efficiency and Sustainable Design in housing for older people which *"should become an exemplar for mainstream housing, and meet higher design standards for space and quality"* the following measures should be taken into account at the building design, specification, construction and operational stages of any Extra Care Housing development:-

Stage 1 – Feasibility Design:-

- Make most effective use of land and local microclimate by considered building orientation with main elevations facing within 30 degrees west or east of due south also ensuring designs make the most of natural ground modelling around the building – see Appendix E.2.
- Manage flood risk by avoiding flood plain development if possible and the adoption of sustainable drainage systems (SUDS) and flood resilient design for infrastructure and property.
- Avoid creation of adverse local climate conditions, avoid over shading due to nearby trees and buildings wherever possible and plant shelter belts at 90 degrees to the prevailing wind direction on larger sites to help reduce wind chill in winter.
- Work with the natural free energy resources before considering renewable technology by:-
    - Good passive low energy solar design along the 'Passivhaus' or Rural Zed principles whilst avoiding internal overheating by external shading yet designing in thermal storage to minimise heating requirements; considered thermal modelling by maximising natural ventilation through the 'stack effect'; retention of rainwater by harvesting for reuse and specifying green roofs which are attractive for wildlife are all highlighted in the recent HAPPI Report which found that even on the hottest days older persons housing developments visited in Europe remained cool and comfortable.
    - Indeed in Europe, green roofs, passive stack ventilation and sun awnings are everyday environmental solutions in the best examples of housing rather than 'extras'.
- Design the structure of new buildings to be adaptable and flexible enough for re-use and modification based upon users changing needs throughout their lifetime.

Stage 2 – Technical Development:-

- Specify materials with minimum embodied carbon during production and reuse materials wherever possible. Some materials such as 'Hemcrete' are actually better than zero carbon and whilst expensive to construct at present their popularity will reduce costs over time.
- Procure materials and labour sustainably using local suppliers wherever possible
- Consider and utilise renewable energy technologies efficiently by carrying out pre-specification 'cost in use analyses' over the building's lifetime for each option taking into account the payback period and potential income generation from the forthcoming 'feed in tariff' (FIT) with respect to the production of surplus energy on larger Extra Care developments.
- Minimise light lost to the sky, particularly from street-lights.
- Ensure Extra Care developments are comfortable and secure for users.
- Conserve and enhance the natural environment, particularly in relation to biodiversity and enable easy access to open spaces.

Stage 3 – Site Construction Management and Building Operations:-

- Promote good quality workmanship with a rigid Quality Assurance monitoring procedure to ensure good air tightness of building envelopes.
- Reduce air and water pollution both from construction activities and from the operation of the building.
- Promote sustainable waste behaviour in new developments, including support for local integrated recycling schemes and other waste treatment options.
- Reduce adverse noise impacts both during construction and from the operation of the building.
- Ensure effective operation and management of a Green Travel Policy for staff and residents wherever possible.

Local Authorities are increasingly requiring all planning applications for major developments to include a statement on the potential implications of the development on sustainable design and construction principles. This statement should address demolition, construction and long-term management.

Designers and contractors should ensure that developments minimise the use of new aggregates and do not use insulating and other materials containing substances which contribute to climate change through ozone depletion.

Developers should use best practice and appropriate mitigation measures to reduce the environmental impact of demolition and construction.

3. Renewable Energy Options Reporting

A key piece of recommended good practice work that is recognised in both the BREEAM MR & CSH appraisal methodology is the production of a renewable energy options report taking into account scheme specific matters related to the site, environment, user groups, planning requirements, available grants and lifetime costs with respect to the desired outcome.

As part of the BREEAM MR appraisal process under Ene 5 - Low or Zero Carbon Technologies, the production of a renewable energy options report is mandatory in consideration of Excellent or Outstanding accreditation.

Matters that a typical report should investigate are as follows:-

i) Consideration of the Planning Authority Requirements on Energy Policy.

ii) The Extra Care Developments' Energy Usage Profile.

iii) Each Available Low & Zero Carbon (LZC) Technology should be investigated with respect to:-

- Influencing Factors of Visual, Noise and Pollution Impact of both servicing and use
- Building occupation peak demand and LZC availability
- Energy Generated and Carbon Savings
- Cost Effectiveness
- Costs In Use and Payback Period

iv) The potential Grant Assistance available

v) Low and Zero Carbon (LZC) Recommendations for Adoption and Implementation in the Specific Extra Care development.

vi) Financial Assessment of Recommendations with Capital Cost and 'Costs In Use' / Payback Profiles taking into account any 'Feed In Tariff' (FIT) advantages.

A good example of how the production of a detailed renewable energy options report informed the client decision making process and influenced the building specification is included within Appendix C.1

4. Assessment Methodology Stages

Design Stage – leading to an Interim BREEAM Certificate

The Design Stage (DS) assessment with subsequent interim BREEAM Certification represents the performance of the building at the design stage only prior to the beginning of site operations and whilst this may be referred to at Planning Application, for Cost Estimating and to obtain Contract Tender Costs, it represents only the design specification not the final 'as built' installation.

To complete the formal assessment at this stage the design must be advanced to the point where the relevant information is available to enable the BREEAM assessor to demonstrate, in a robust manner, the building's performance against the reporting and evidential requirements of the BREEAM MR Technical Guidance. The formal DS assessment may only then be carried out at the scheme design or detailed design stages.

Post Construction Stage – leading to a Final BREEAM Certificate

The Post Construction Stage (PCS) assessment with subsequent Final BREEAM Certification represents the final 'as built' performance and BREEAM Rating. A PCS assessment is carried out after practical completion of the building works but before handover and occupation of the building.

There are two approaches to assessment at the post-construction stage:-

1. A post-construction review of an interim design-stage assessment serving to confirm the interim BREEAM rating achieved at the design stage in accordance with the evidential requirements of the BREEAM Technical Guidance.
2. A full post-construction (PCS) assessment may be carried out where a formal interim DS assessment has not been carried out and a BREEAM assessment and rating is required

5. BREEAM MR Application to Building Types & Accommodation

BREEAM Multi Residential Assessment and Certification is appropriate to the following types of buildings:-

- Completely new Extra Care developments
- Major refurbishments of existing buildings involving the replacement of all of the fixed building services and / or renovation of the thermal elements but retention of some of the existing shell albeit heavily modified (e.g. if converting an existing redundant sheltered bedsit scheme into new independent Extra Care flats where a minimum of 10% of the finally redesigned total net floor area consists of communal areas).
- New build extensions to existing buildings and a combination of new-build and existing building refurbishment. Detailed guidance is available from the BRE based upon individual merit.
- Minor refurbishment is <u>not suitable</u> for a BREEAM MR assessment.

Appropriate Extra Care Room Functions for inclusion in a BREEAM MR assessment:-

The building room functions/areas listed below are covered by the scope of BREEAM Multi Residential where they form part of a typical Extra Care development where communal areas are greater than 10% of the total Net Internal Floor area:-

- All Independent self contained dwellings (which may also require a CSH Certificate)##
- Catering kitchens, including serveries, dining areas, restaurants and coffee bar areas.
- General communal areas including lounges, day rooms and reading rooms.
- Offices, administration areas, IT rooms.
- Meeting rooms, training rooms, conference rooms.
- Leisure areas including gyms, fitness rooms, therapy rooms and hairdressers.
- Health areas including consulting rooms, medical rooms treatment rooms.
- Laundry including communal laundry and drying rooms.
- Other spaces such as small internal shop or kiosk, workshop spaces, craft and activity rooms.

For decisions on other unlisted accommodation, the building plans need to be submitted to the BRE for individual determination.

6. BREEAM Multi Residential and the Code for Sustainable Homes (CSH)

For all new self contained dwellings constructed in England since 1st May 2008 it is now mandatory that they are provided with a Code for Sustainable Homes (CSH) Certificate in the Home Information Pack (HIP) as this is required as a condition of putting the dwelling on sale.

Where a building contains other functions in addition to the dwellings BREEAM Multi Residential may be used to provide a whole building assessment and rating where required (i.e. under Conditional Planning Approval). Indeed this is the preferred and fully comprehensive assessment route

In such cases, evidence collected for the Code Assessment can be used towards BREEAM MR and vice-versa, to avoid duplication. A large number of issues within MR are assessed on the same basis as the CSH and where such similarities exist this has been noted in the compliance notes for each MR issue in order to simplify the assessment process.

For ease of CSH credit actions the ## symbol has been included within the tables.

For a BREEAM Multi Residential Guidance Flow Chart see Appendix A

7. BREEAM - MR Assessment Fees and Scope of Service

In seeking fee quotations from the BREEAM MR Consultant, the following scope of service is seen as the basic minima to enable an informative and comprehensive service to be delivered to the design and procurement team:-

- Assistance and advice at the concept stage, allowing development of the feasibility designs and specifications.
- A Provisional Pre Assessment Rating Calculation using the BREEAM Estimator Spreadsheet Tool.

- Holding a BREEAM Design Team Assessment Workshop
- Full Design Stage (DS) Review and Certification
- Collating information from the Contractor enabling production of a Full Report leading to Final Certification
- Post Construction Stage (PCS) Assessment and Certification

At the time of writing (January 2010), the BREEAM MR certification fees (in addition to those of the consultant) were as follows:-

- Design and Construction Interim Certificate Fee - £950
- Post Construction (Final Certificate) - £380
- Post Construction (without D& C Interim) - £1330

Should a CSH assessment also be required for the individual dwellings, the client should certainly seek to offset some of the fee levels against BREEAM MR, as many of the same criteria are assessed for both assessment methodologies. The following tables will highlight these areas of similarity.

8. Effective Design / Cost Team & Contractor Considerations

Design and Cost Team Consultants:-

The first matter to consider is the appointment of other consultants. To obtain the full co-operation of the whole design team it is important that they all understand the principles of BREEAM Multi Residential, and are prepared to provide the additional information required within the scope of their fee appointment.

For example, the architect may need to technically appraise alternative materials; the M&E engineer may have to prepare some additional calculations together with cost benefit analyses of renewable energy options; the Structural Engineer may need to research recycled aggregates or innovative foundation solutions; and the SI report will have to investigate previous uses of the site with the inclusion of an Ecologist Report. All this information must be provided to the Assessor by the design team

It may also be necessary to appoint specialist sub-consultants. Some Credits can be achieved by working on advice from a qualified ecologist, acoustician, etc. So, it is important to determine who to appoint before too many decisions are made.

Main Contractor Tendering Clauses:-

It is important to ensure that the tendering building contractors allow for the management time and costs required in order to procure and collate the required information to assist the assessors in producing a CSH or BREEAM MR Assessment for a particular development.

In recognition of this, robust clauses should be included within the preliminary section of all Employer's Requirements or tendering documents cross referenced to the requirements of the CSH or BREEAM MR Technical Guidance in order to remove any element of doubt regarding the obligation of the main building contractor in obtaining the required documentation for the assessor. A reluctance to carry out this work by the main contractors often gives rise to a delay in producing assessments.

9. Achieving High BREEAM Multi Residential Scores

To achieve high level BREEAM MR scores it is essential to engage an Assessor at the feasibility stage of the project in order to develop a sustainable eco-friendly brief in collaboration with all members of the design team. This is especially important where the building developer is new to BREEAM MR. For instance, valuable Credits can be gained by evaluating the form and orientation of the building in the early design feasibility stages (suitably documented). Room depth and view out are also established at this point. Note that several Credits rest on these parameters.

Also, there are several Credits which require work at RIBA Stage A/B and C, so once the design is fixed these will be lost. Remember the 'Passivhaus' or Rural Zed principles of good design before considering renewable energy sources.

From the outset it is important to **develop a schedule which identifies which member of the Design Team will take ownership of each particular credit.** It is then their responsibility to do everything they can to achieve those credits. The lead consultant also needs to ensure this is adhered to.

If the building is in an urban area, it will probably attract several credits automatically. The site is likely to be near a bus route and may have no ecological impact. If it is set in the countryside, a lot of these will be precluded so the Design Team must diligently target the remaining credits to achieve a high score.

It may be necessary to have specific BREEAM design meetings to ensure that the details required for the Assessment are incorporated into the design. This is especially important for cross-discipline issues such as façade materials. The details must be correctly recorded in the specification and/or on the drawings.

Whilst going through the process it is important to keep an eye on costs. Some Credits can be achieved at a lower cost than others. Many can be incorporated from accumulated experience of low cost solutions. Others should be compared for best value to achieve the target.

Careful attention needs to be given to the Mechanical Engineering solution. This is one of the main carbon producers of the building and has a large weighting within the methodology. A strategy should be drawn up based upon a feasibility study report (Appendix C.1), and will need to include some form of renewable energy.

Note that there are studies which indicate that on brownfield sites a 'very good' rating can be achieved at no extra cost to the project, provided the BREEAM process is started early enough.

Indicative Site Selection, Specification and Construction Approach leading to an Excellent score:-

Maximise credits within the Management sections and aim to achieve high scores in the following areas:-

- Health & Well Being
- Transport
- Land Use & Ecology
- Pollution

Indicative Environmental Features leading to BREEAM MR Excellent

- High Levels of Insulation
- High Levels of Air Tightness achieved through high quality workmanship and detailing well in excess of Building Regulations standard

- Mechanical Heat Recovery Ventilation Systems with up to 80% heat recovery efficiency
- Low NOx A rated gas condensing boilers
- Solar Water Heating System
- Building Energy Management System
- Low Water Use Aerating Taps, Low Flow Showers, Dual Flush WC's
- SUDS (Sustainable drainage) with attenuation and rainwater harvesting for WC flushing and garden irrigation
- Full low energy lighting with PIR controls in communal areas
- High levels of acoustic performance
- Dimensioning to accommodate standard building material sizes minimising waste
- Simple plan configuration
- Use of A-rated Green Guide Products
- FSC certified timber
- Ecologists recommendations implemented
- Recycling storage space

10. BREEAM MR Scoring & Rating Guidance

The following text in this section is taken from the BREEAM MR:2008 Scoring and Rating Guidance for Assessors:-

There are a number of elements that determine the BREEAM rating; these are as follows:-

1. BREEAM rating benchmarks
2. BREEAM environmental weightings
3. Minimum BREEAM standards
4. BREEAM credits for Innovation

In addition, there are specific conditions that must be met in order to award an assessed building a '*BREEAM Outstanding'* rating, the highest achievable BREEAM rating. See tables on the following pages.

Table 10.1 - BREEAM 2008 RATING BENCHMARKS

The rating benchmarks for the 2008 version of BREEAM are outlined below for new buildings and major refurbishments:-

BREEAM Rating	% Score
Unclassified	**<30**
PASS	**≥30**
GOOD	**≥45**
VERY GOOD	**≥55**
EXCELLENT	**≥70**
OUTSTANDING*	**≥85**

* Please note, there are additional requirements for achieving a *BREEAM Outstanding* rating.

Table 10.2 - BREEAM ENVIRONMENTAL WEIGHTINGS

Environmental weightings are applicable to the nine BREEAM sections applicable for the appraisal of Multi Residential buildings and the design team should aim to maximise scores in sections where the weighting is highest:-

BREEAM Section		Weighting (%)
		New builds, extensions & major refurbishments
Management	Overall policy and procedural issues	**12**
Health & Well Being	Indoor and external issues affecting occupants	**15**
Energy	Operational energy and CO_2 issues	**19**
Transport	Transport related CO_2 and locational issues	**8**
Water	Consumption and leakage related issues	**6**
Materials	Environmental implications of material selection	**12.5**
Waste	Environmental implications of waste	**7.5**
Land Use & Ecology	Greenfield/brownfield and ecological value site issues	**10**
Pollution	Air and water pollution issues (excluding CO_2)	**10**

Table 10.3 - MINIMUM BREEAM STANDARDS related to Required Ratings (showing CSH credit actions)

To achieve a BREEAM rating, the minimum percentage score (from table 1) must be achieved and the minimum standards (i.e. number of credits achieved) applicable to that rating level (table 3) must be complied with.

BREEAM Issues Highlighting Code for Sustainable Homes credit areas **(CSH credits)** and sections where Exemplary Performance may count towards Innovation Credits **(EP).**		**BREEAM Rating / Min number of credits for each section**				
		PASS	**GOOD**	**VERY GOOD**	**EXCELLENT**	**OUTSTANDING**
Management						
Man 1	Commissioning	**1**	**1**	**1**	**1**	**2**
Man 2	Considerate Constructors (## CSH credits) **(EP)**	-	-	-	**1**	**2**
Man 3	Construction Site Impacts (## CSH credits)	-	-	-	-	-
Man 4	Building User Guide (## CSH credits)	-	-	-	**1**	**1**
Man 5	n/a					
Man 6	Consultation	-	-	-	-	-
Man 7	n/a					
Man 8	Security (## CSH credits)	-	-	-	-	-
Man 9 -12	n/a					
Heath & Well Being						
Hea 1	Daylighting (## CSH credits) **(EP)**	-	-	-	-	-
Hea 2	View Out	-	-	-	-	-
Hea 3	Glare Control	-	-	-	-	-
Hea 4	High Frequency Lighting	**1**	**1**	**1**	**1**	**1**
Hea 5	Internal & External Lighting Levels	-	-	-	-	-
Hea 6	n/a					
Hea 7	Potential for Natural Ventilation	-	-	-	-	-
Hea 8	Indoor Air Quality	-	-	-	-	-
Hea 9	Volatile Organic Compounds	-	-	-	-	-
Hea 10	Thermal Comfort	-	-	-	-	-
Hea 11	Thermal Zoning	-	-	-	-	-
Hea 12	Microbial Contamination	**1**	**1**	**1**	**1**	**1**
Hea 13 – 14	n/a					
Hea 15	Outdoor Space (## CSH credits)	-	-	-	-	-
Hea 16 - 19	n/a					
Hea 20	Home Office (## CSH credits)	-	-	-	-	-
Hea 21	Sound Insulation (## CSH credits)	-	-	-	-	-

Table 10.3 - MINIMUM BREEAM STANDARDS related to Required Ratings (continued)

Energy						
Ene 1	Reduction of CO_2 emissions (## CSH credits) **(EP)**	-	-	-	**6**	**10**
Ene 2	Sub-Metering of Substantial Energy Uses	-	-	**1**	**1**	**1**
Ene 3	n/a					
Ene 4	External Lighting (## CSH credits)	-	-	-	-	-
Ene 5	Low or Zero Carbon Technologies (## CSH credits) **(EP)**	-	-	-	**1**	**1**
Ene 6 - 14	n/a					
Ene 15	Provision of Energy Efficient White Goods (## CSH credits)	-	-	-	-	-
Ene 16 - 17	n/a					
Ene 18	Drying Space (## CSH credits)	-	-	-	-	-
Transport						
Tra 1	Provision of Public Transport	-	-	-	-	-
Tra 2	Proximity to Amenities	-	-	-	-	-
Tra 3	Cyclist Facilities	-	-	-	-	-
Tra 4	Pedestrian and Cycle Safety	-	-	-	-	-
Tra 5	n/a	-	-	-	-	-
Tra 6	Maximum Car Parking Capacity	-	-	-	-	-
Water						
Wat 1	Water Consumption (## CSH credits)	-	**1**	**1**	**1**	**2**
Wat 2	Water Meter **(EP)**	-	**1**	**1**	**1**	**1**
Wat 3	Major Leak Detection	-	-	-	-	-
Wat 4	n/a					
Wat 5	Water Recycling – see Wat 1					
Wat 6	Irrigation Systems	-	-	-	-	-
Materials						
Mat 1	Materials Specification (Major Building Elements) (## CSH credits) **(EP)**	-	-	-	-	-
Mat 2	Hard Landscaping & Boundary Protection	-	-	-	-	-
Mat 3	Re-use of Building Façade	-	-	-	-	-
Mat 4	Re-use of Building Structure	-	-	-	-	-
Mat 5	Responsible Sourcing of Materials (Basic Building Elements) (## CSH credits) **(EP)**	-	-	-	-	-
Mat 6	Insulation	-	-	-	-	-
Mat 7	Designing for Robustness	-	-	-	-	-
Mat 8	Responsible Sourcing of Materials (Finishing Elements) (## CSH credits)	-	-	-	-	-

Table 10.3 - MINIMUM BREEAM STANDARDS related to Required Ratings (continued)

Waste						
Wst 1	Construction Site Waste Management (## CSH credits) **(EP)**	-	-	-	-	-
Wst 2	Recycled Aggregates	-	-	-	-	-
Wst 3	Recyclable Waste Storage (## CSH credits)	-	-	-	**1**	**1**
Wst 4	n/a					
Wst 5	Composting (## CSH credits)	-	-	-	-	-
Land Use & Ecology						
LE 1	Re-use of Land	-	-	-	-	-
LE 2	Contaminated Land	-	-	-	-	-
LE 3	Ecological Value of Site AND Protection of Ecological Features (## CSH credits)	-	-	-	-	-
LE 4	Mitigating Ecological Impact (## CSH credits)	-	-	**1**	**1**	**1**
LE 5	Enhancing Site Ecology (## CSH credits)	-	-	-	-	-
LE 6	Long Term Impact On Biodiversity	-	-	-	-	-
Pollution						
Pol 1	Refrigerant GWP – Building Services					
Pol 2	Preventing Refrigerant Leaks					
Pol 3	n/a					
Pol 4	NOx Emissions from Heating Source (## CSH credits)					
Pol 5	Flood Risk (## CSH credits)					
Pol 6	Minimising Water Course Pollution					
Pol 7	Reduction of Night Time Light Pollution					
Pol 8 - 9	n/a					

As can be appreciated from the wider scope of sections covered, the BREEAM MR method of appraisal of the whole building to include all communal activity spaces is far more comprehensive than appraisal of individual dwellings under CSH.

BREEAM CREDITS FOR INNOVATION

Innovation credits provide additional recognition for a building that innovates in the field of sustainable performance above and beyond the level that is currently recognised and rewarded within standard BREEAM issues. Innovation credits therefore enable clients and design teams to boost their building's BREEAM performance and in addition, help support the market for new innovative technologies and practices.

An additional 1% score can be added to a building's final BREEAM score for each Innovation credit achieved. The maximum number of Innovation credits that can be awarded for any one building assessed is 10, therefore the maximum available score for 'innovation' is 10%. Innovation credits can be awarded regardless of the final BREEAM rating (i.e. they are awardable at any BREEAM rating level)

Innovation credits may be obtained in two different ways:-

1. By meeting exemplary performance requirements for existing BREEAM issues – see table 3 (EP). The technical guidance in respect of the relevant issue indicates details of the exemplary performance level requirements.
2. By successful application to BRE Global by the BREEAM assessor to have a particular building feature, system or process recognised as 'Innovative' where evaluated against the relevant eligibility criteria. Fees for this will apply and the BREEAM Technical Guidance gives further details.

Table 10.4 BREEAM SCORE & RATING EXAMPLE (Based upon Information extracted from a typical scheme specific Pre Assessment Estimator Tool)

BREEAM Section	Credits Achieved	Credits Available	% of Credits Achieved	Section Weighting	Section Score
Management	**7**	**10**	**70%**	**0.12**	**8.4%**
Health & Well Being	**11**	**14**	**79%**	**0.15**	**11.79%**
Energy	**10**	**21**	**48%**	**0.19**	**9.05%**
Transport	**5**	**10**	**50%**	**0.08**	**4.00%**
Water	**4**	**6**	**67%**	**0.06**	**4.00%**
Materials	**6**	**12**	**50%**	**0.125**	**6.25%**
Waste	**3**	**7**	**43%**	**0.075**	**3.21%**
Land Use & Ecology	**4**	**10**	**40%**	**0.10**	**4.00%**
Pollution	**5**	**12**	**42%**	**0.10**	**4.17%**
			Total Score	**54.87%**	
			Innovation Credits Achieved (for each Innovation Credit Achieved)	**1%**	
			FINAL BREEAM Score	**55.87%**	
			BREEAM RATING	**VERY GOOD**	

Minimum Standards for BREEAM Very Good Rating	Achieved?
Man 1 – Commissioning	✓
Hea 4 - High Frequency Lighting	✓
Hea 12 - Microbial Contamination	✓
Ene 2 - Sub Metering of Substantial Energy Uses	✓
Wat 1 - Water Consumption	✓
Wat 2 - Water Meter	✓
LE 4 - Mitigating Ecological Impact	✓

BREEAM MR Outstanding Rating:-

In order to achieve an Outstanding Rating, the following criteria must be met:-

- The Building must achieve a score equal to or greater than 85%
- The minimum performance standards (Table 3) must have been met for an Outstanding rating
- Provision of material for the production of a Case Study must have been produced and submitted to the BRE for the building to be presented as an exemplar for the industry.
- Additionally the building is required to obtain a BREEAM In Use Certification of Performance within the first 3 years of operation and use in order to maintain this rating.

Summary

We can see that by setting up a structured and methodical approach to implementing BREEAM Multi Residential or Code for Sustainable Homes Assessments with each member of the design team buying in to their particular specialism, the client can be fully informed to enable a rational decision making process to be carried out.

Above all:-

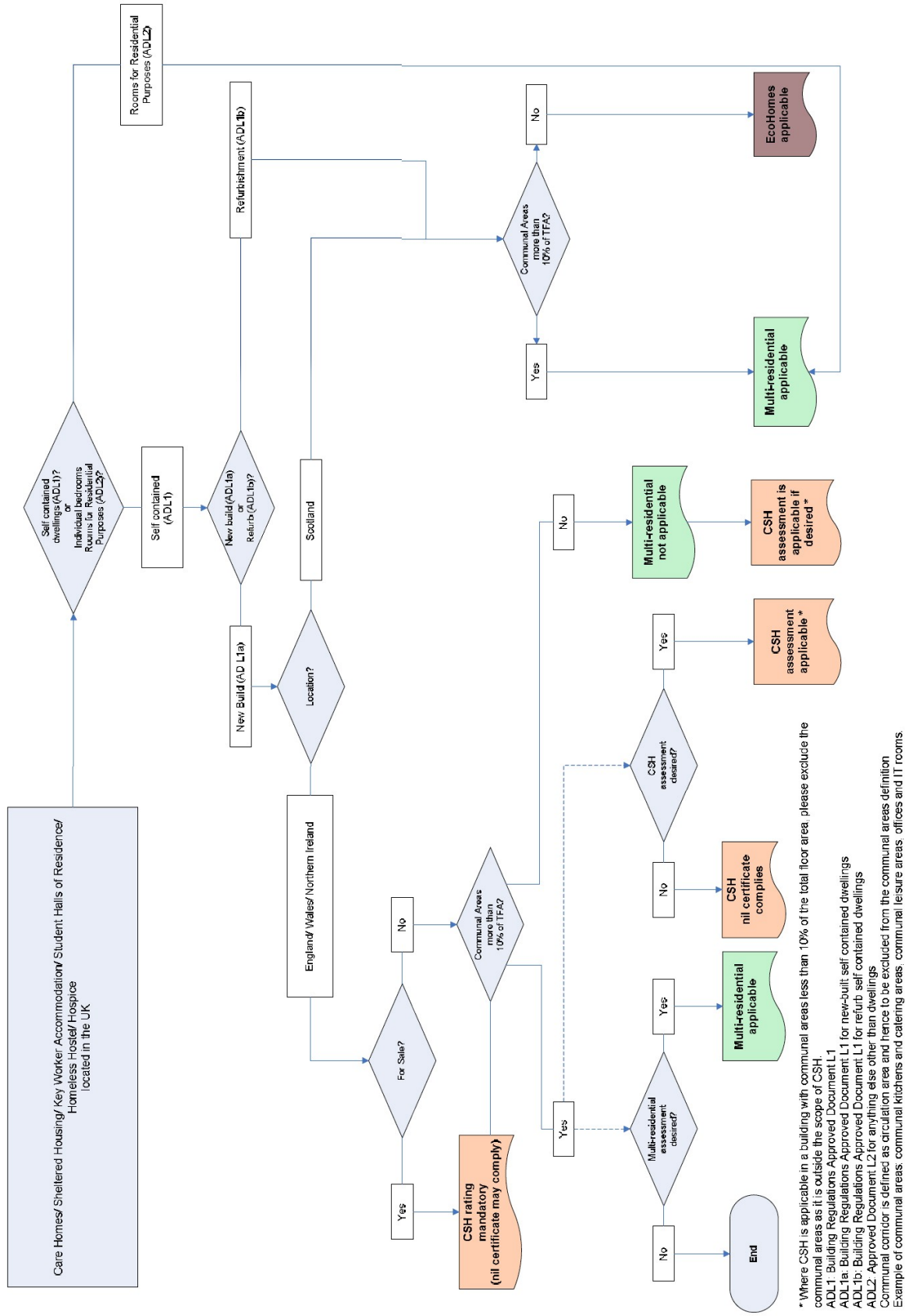
- Firstly, ensure that the feasibility and initial designs are in harmony with nature and the site environment using the building form and fabric to best advantage by the use of good passive solar and thermal design.
- Secondly, ensure that a full options cost benefit appraisal of appropriate renewable energy technology is carried out to aid logical decision making.
- Maximise the easy accreditation scores wherever possible such as Health & Well Being; Transport; Land Use & Ecology; Water and Pollution whilst thoroughly investigating the most cost effective implementation of those harder to obtain credits within the passively designed building layout.
- Ensure enhanced performance requirements are realised by the implementation of strict supervision of site operations leading to high levels of quality workmanship during the construction process. The sub contractors and clerk of works need to fully understand the importance of this otherwise all can be lost through poorly installed insulation or a lack of care to detailing thereby compromising air tightness or sound attenuation!

- Ensure that the occupiers of the building fully understand the operation of the inbuilt passive design and renewable technology incorporated into the building by supplying ‘green guide information packs’ to all resident’s from the outset, together with a presentation, ideally given by the building designers, to explain and answer questions about the functioning of the building to allow ‘best efficiency in use’ to be obtained. – see Appendix B.

The following appendices aim to illustrate by way of a series of differing and diverse developments (from urban to rural settings), how successfully performing Extra Care developments can be designed to meet the client’s high scoring sustainable aspirations whilst informing him of the costs in use, availability of grants and revenue tariffs. The final Appendix E.2 describes innovative design approaches to sustainability concluding with a zero carbon ‘Assisted Living’ Community (Extra Care Village) model illustrating innovative approaches by working with the environment as well as utilising renewable energy technology.

The built examples are preceded by the BRE flowchart which is used to assist in deciding whether to choose BREEAM Multi Residential or the Code for Sustainable Homes appraisal process, or perhaps a combination of both for reasons as described earlier and an indication of requirements in respect of ‘green guide information packs’ for new residents.

Appendix A – BREEAM Multi Residential or CSH? – A Guidance Flowchart



Appendix B – Green Guide Information Packs

It must be remembered that it is unlikely that new residents will be familiar with the latest sustainably designed buildings and therefore the provision (in addition to the usual Landlords Operation & Maintenance Manual) of 'green guide information packs' at first occupation to all residents is key to realising the aspirations of the sustainable concept. The information should aim to explain to non-technical persons, the operation of the passive solar and thermal building design as well as the functioning and 'best practice' operation of any renewable energy technology to ensure maximum benefit in terms of reduced energy costs and carbon emissions. This will supplement any manufacturer's information supplied with the different sections ideally being written by the respective and most appropriate member of the design team:-

Ensure that the following information is included (the list is not exhaustive!):-

- An overview of the building services information within the dwelling, emphasising the benefits to be gained by using the controls sensitively related to seasons of the year in order to minimise energy consumption and carbon emissions.
- An overview of the energy efficient features and environmental strategy of the building. This would include information and advice on the building structure air tightness; solar and thermal passive design; heat recovery ventilation systems; sub metering arrangements; water harvesting and water saving features included. Basic information should be given on condensation avoidance, maximising the benefits of solar gains in the evenings and operation of the heating and lighting systems.
- A copy of the BREEAM MR or CSH Certificate referencing the environmental features integrated in to the building together with best practice information of purchasing energy saving appliances together with energy saving tips in their operation.
- The provision of information about local area amenities, organic grocery stores, recreation centres and parks, GP surgeries, post offices, transport routes with timetables, 'green transport' initiatives, cycle routes, shared pool car use (where appropriate) and web links to give an understanding of the neighbourhood.
- The provision of recycling facilities both within the building and in the immediate neighbourhood. This would also include a directory of charity shops and electrical goods disposal facilities together with local authority waste tips.
- Details for reporting faults to, or obtaining advice from the buildings Facilities Manager.
- The provision of emergency services locations and telephone call out numbers

Appendix C.1 – Renewable Energy Options Reporting BREEAM MR Excellent

Example:- SANCTUARY HOUSING ASSOCIATION – Leicester Road BARNET Matthew Lloyd Architects and BES Consulting Engineers

The Tamarisk Trust together with Sanctuary Housing Association, acting as their development agents and ultimate building owners, were desirous of developing their existing site in Barnet with a small 18 unit Extra Care scheme for residents with learning difficulties.

The Planning Authority were keen to promote highly sustainable buildings and in consequence, a BREEAM Multi Residential score of 70+ 'Excellent' became a Planning Condition.

In addition, Code for Sustainable Homes Level 4 (with a mandatory 44% carbon reduction) was required in order to take advantage of grant funding through the 'Renewable Construction Demonstration Programme' by the utilisation of timber frame with natural insulation and finishes products. (see Fig.C.1.1)

Design Philosophy:-

The project has been designed by Matthew Lloyd Architects with sustainability as a key driver, this being most clearly demonstrated through the use of natural and recyclable materials, the use of green roofs wherever possible, rainwater attenuation, efficient use of water, high insulation values and a high degree of purpose designed front and rear landscaped gardens surrounding a building orientated to derive maximum benefit from solar gain.

The design allows for high thermal efficiency in wall, floor and roof constructions to meet U-values showing at least a 15% improvement on the current (as in force in July 2009) Building Regulations with the party floors attaining enhanced sound attenuation standards well in excess of Building Regulations. (see Fig.C.1.3)

Mechanical & Electrical Sustainability Options Reporting:-

In recognition of attaining a BREEAM Multi Residential score of 'Excellent', an RIBA Stage C Renewable Energy Options Report based upon the developments energy usage profile was produced by the M&E consultants - BES Consulting Engineers; consideration by Sanctuary HA of the following points included in the report lead to the measures described being adopted:-

Renewable Energy:-

It was recognised early on in the design feasibility stage that adoption of a Biomass Boiler plant would greatly assist the attainment of a BREEAM MR Excellent score and CSH Level 4, an added advantage being that up to 40% grant funding of the difference in cost between a biomass boiler and its fossil fuel alternative was available through the latest round of the Bio Capital Energy Grants programme; albeit the design had to accommodate the storage of biomass fuel plus onerous Planning obligations being placed upon the developer through Planning Conditions in terms of delivery restrictions, noise and emissions associated with the biomass plant.

Biomass Boilers serving the heating and hot water installations were adopted (with high efficiency gas fired condensing boilers as a backup) but the biomass storage requirement was increased to accommodate 8 weeks total supply leading to economies of scale in delivery costs and a reduction in the number of deliveries.

BES Consulting Engineers calculated that a 30kW biomass wood pellet boiler would provide 28.1% of the estimated annual energy usage by renewable methods and would meet 19.4% reduction in carbon emissions, falling just short of the London Plan requirement of a 20% reduction (– not in force at the time of the planning application).

It was pointed out that further reductions in the carbon emissions to above 20% could be obtained by the adoption of Solar Thermal Panels which are fine in winter but in the summer would tend to run in conflict with the biomass boiler, both attempting to heat the hot water at the same time, however at that time of year the boiler may not be required to be fired up as the solar thermal installation would supply the bulk of the demand.

However, the need to meet CSH Level 4 as a prerequisite in order to obtain renewable material installation grant funding through the 'Renewable Construction Demonstration Programme', lead to discussions over the merits of installing Solar Photo Voltaic Panels on the south facing roof slopes that faced away from the street elevation.

It was pointed out that the forthcoming 'Feed In Tariff' programme for the generation of on-site electricity by renewable energy methods made the installation of PV panels a viable option when the partial protection afforded by income generation offsetting rising energy costs are accounted for.

BES Consulting Engineers produced scheme specific cost-payback analyses as part of their report taking both grant funding and the 'Feed In Tariff' programme into account in respect of:-

- 30m2 of Solar PV Panels
- 120m2 Solar PV Panels
- 22m2 Solar Thermal Panels

After presentation of the SAP calculations (with indicative U-values) it was agreed that as 30m2 of Solar PV Panels together with Biomass Boiler Plant and Whole House Ventilation with Heat Recovery (assuming an average air permeability of 5.0) resulting in a carbon reduction of at least 44% meeting CSH Level 4 was to be adopted. This also enables the 20% CO_2 reduction to be met, although not a planning requirement in this instance. (see Fig.C.1.2)

Ventilation System:-

A whole house heat recovery installation (MVHR system) was adopted extracting humid air from the flat kitchens and shower rooms with a supply of tempered make up air from the habitable rooms. Discharge duct work utilising the system as shown on the elevations.

Rainwater Harvesting:-

It was decided to proceed with a rainwater harvesting system with underground storage tanks located under the car parking areas allowing flushing of all the flat and landlord's WC's plus a garden irrigation system.

Smart Metering and Monitoring:-

To aid compliance with the BREEAM Excellent requirements and CSH Level 4 it was agreed that an automatic metering and targeting system was to be installed with check meters to each sub mains cabling with pulsed output to allow interrogation and recording by a BMS system with an alarm function should the consumption be recorded as being 'out of range'.

Additional Measures:-

In addition low energy lighting complete with PIR detection and daylight sensing controls is to be adopted across the whole development together with the supply of A+ rated best practice appliances to all flats. Low water consumption appliances together with water saving fittings to all outlets are to be specified.

Proposed elevation along Warwick Road

Fig. C.1.1

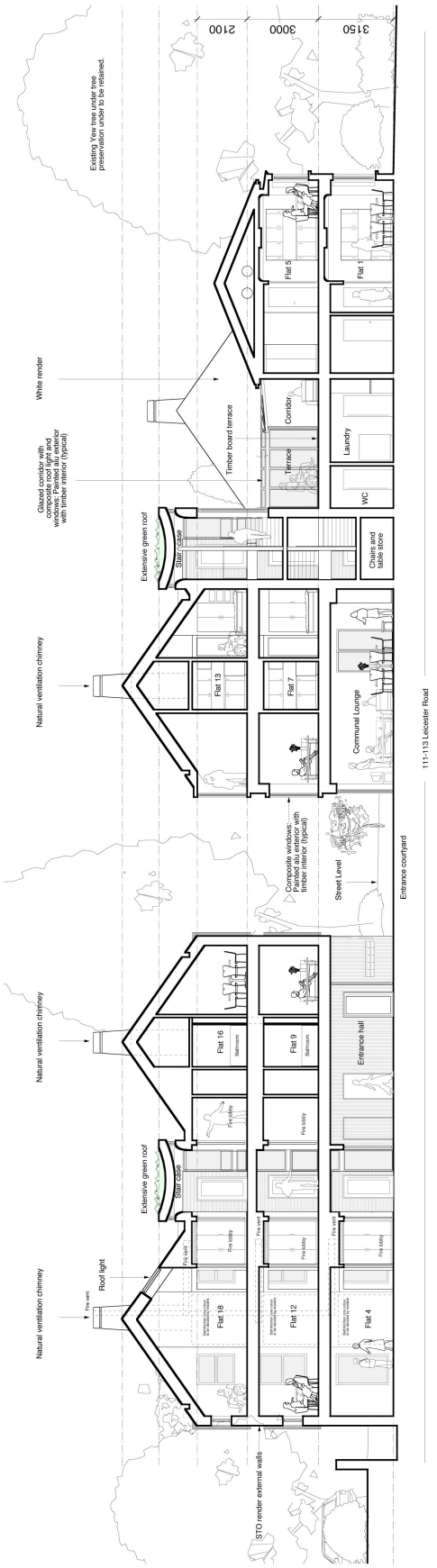


Fig. C.1.2

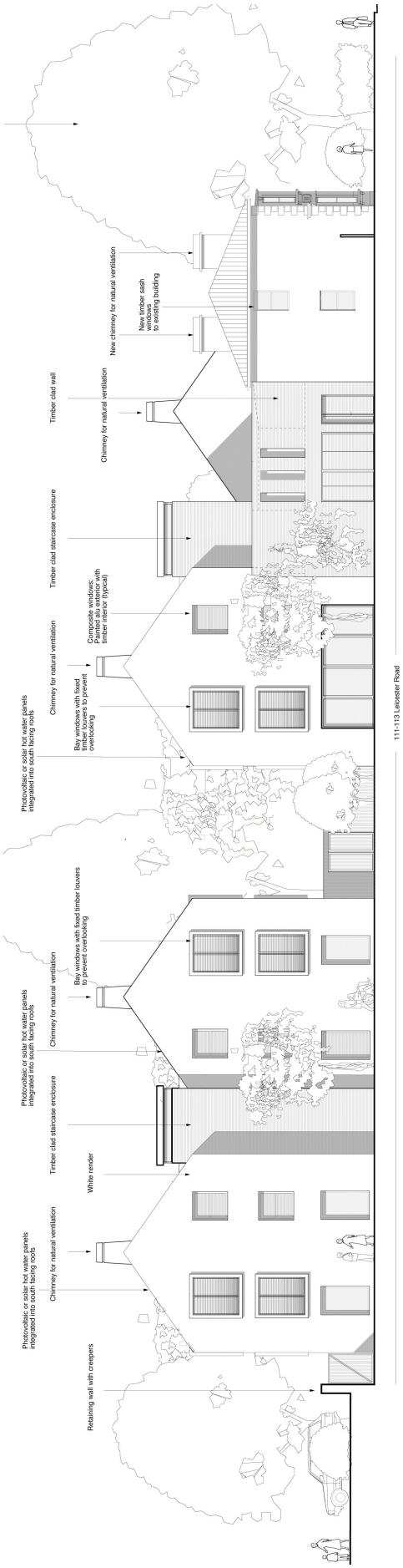
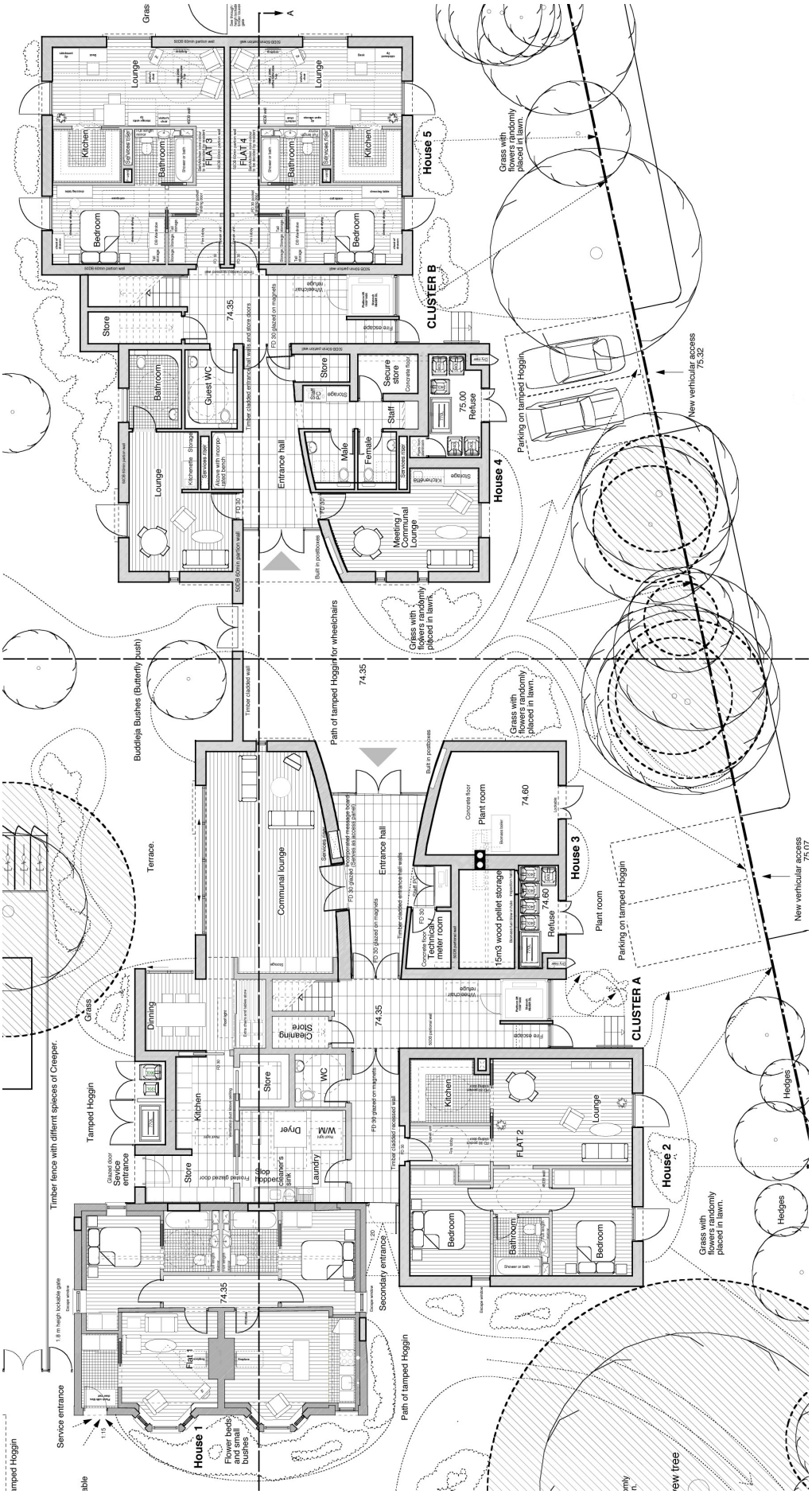


Fig. C.1.3


House 1
House 2
House 3
House 4
House 5
CLUSTER A
CLUSTER B
Flat 1
FLAT 2
FLAT 3
FLAT 4
Communal lounge
Entrance hall
Plant room
15m3 wood pellet storage
Meeting / Communal Lounge
Parking on tamped Hoggin
Path of tamped Hoggin for wheelchairs
Secondary entrance
Service entrance
Terrace.
Grass with flowers randomly placed in lawn.
Hedges
New verhicular access 75.32
New verhicular access 75.07

Appendix D.1 – Code for Sustainable Homes Level 3 /4

EXTRA CARE HOUSING - CSH Level 3 minimum, Level 4 aspirational:-

Example:- HILL HOMES & ONE HOUSING GROUP – Trees, Broadlands Road, HIGHGATE: PRP Architects

The client's aspiration for this scheme from the outset was that it would provide an exemplar service in an environmentally friendly building of architectural distinction.

The 40 unit affordable rent Extra Care apartment scheme for older people located in a conservation area, responds to the site context by being expressed as 3 villas connected with lightweight glazed links. Piled foundations were selected allowing the existing beautiful and mature trees to be retained whilst the building operations had minimal impact upon the root protection zones.

The design aims to maximise natural light within the building and offer views into the landscaped gardens. It will exceed minimum standards, not only in terms of space but also in sustainability, including ecologically friendly design features and low carbon technologies as standards.

The Code for Sustainable Homes (CSH) assessment method is being used as this was requested by the client. This means that the individual flats will be assessed for their environmental performance but not the communal areas.

A separate BREEAM assessment could be under taken in respect of the whole building, however this would entail additional costs for the client and some duplication of work.

The advantage of using the CSH for flats is that their performance can be compared with that of conventional new build housing, although there are likely to be some credits which are not appropriate for older peoples' housing such as cycle storage as residents may not be as active.

Energy efficiency measures include very good building fabric performance gained through enhanced building fabric U-values

Mechanical ventilation with heat recovery (MVHR) is installed to all apartments together with dedicated low energy light fittings throughout.

Natural daylight was maximising in the design thereby reducing the need for artificial lighting.

Energy is supplied using gas / biodiesel boilers linked to a mini CHP system.

Appendix D.2 – BREEAM Multi Residential Very Good

EXTRA CARE HOUSING – BREEAM MR – Design Aspiration Very Good – 62%

Example:- SANCTUARY HOUSING ASSOCIATION – Exning Court, SUFFOLK PRP Architects & PRP Environmental

This two storey extra care development built on the outskirts of Exning village in Suffolk, incorporates 34 flats, communal lounges, a dining room, internet room, assisted bathrooms and WCs and ancillary accommodation comprising offices, laundry, kitchen, hairdresser, boiler room and staff facilities. (see Fig.D.2.1)

PRP Environmental worked closely with the architects to develop an appropriate BREEAM MR strategy for the scheme, which despite not having access to public transport links, scored 62% and achieved a BREEAM MR Very Good rating at initial design stage.

Located on a green field site, it was important that the impact on the existing ecology and biodiversity was minimised. Existing tall hedges bounding the site were protected and retained, and the landscape strategy developed to enhance natural landscape and amenity for the residents.

Rainwater is collected from the roofs being used for external irrigation.

The central courtyard provides a protected environment for residents to sit out in and enjoy as well as providing visual amenity from inside the building.

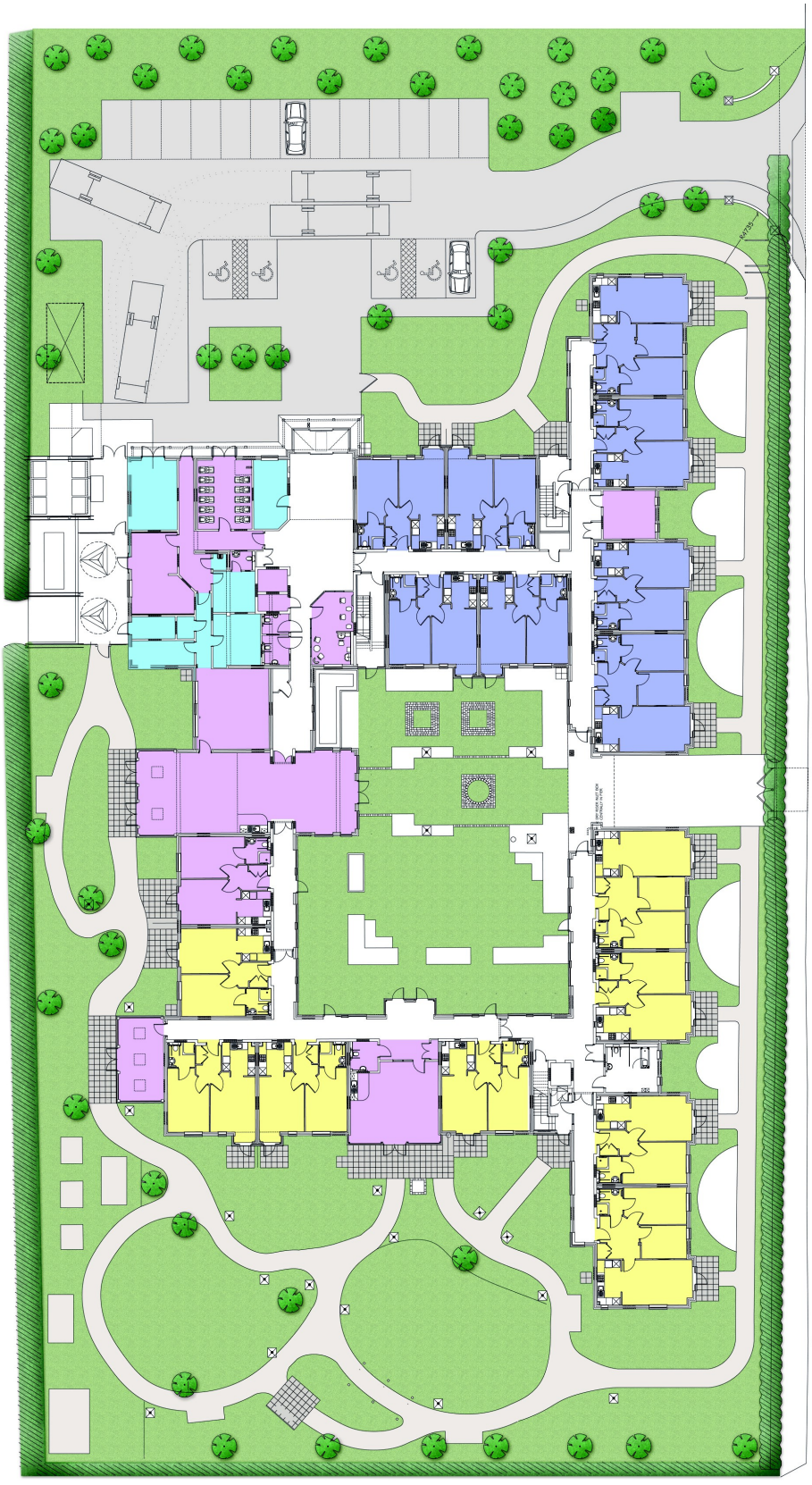
The building fabric specification reduced CO2 emissions by a 15% improvement compared to Building Regulations Part L requirements current at the time and with heating and with hot water supplied by two 90% efficiency communal LPG boilers, the total anticipated CO2 emissions were approximately 31.2 CO2 / m2. Flats and communal areas have under floor heating with panel radiators provided in corridor and circulation areas, and dedicated energy efficient light fittings throughout.

The layout of the building allows all flats to be accessed from single banked corridors arranged around the courtyard for good daylight access and natural ventilation.

The central lounge area is double height with generous windows for natural daylight and passive solar gain, with an upper floor balcony and roof overhang to mitigate overheating in summer.

Upon design stage assessment the building scored Very Good accreditation.

Fig. D.2.1



Appendix D.3 – BREEAM Multi Residential Excellent

EXTRA CARE HOUSING – BREEAM Multi Residential Excellent:-

Example:- SOUTH YORKSHIRE HOUSING ASSOCIATION – Jordanthorpe, SHEFFIELD: Bramall Construction with West & Machell Architects

Contractor's Design & Build Approach:-

Bramall Construction design and build the vast majority of their clients' Extra Care developments to achieve a BREEAM Multi Residential "Very Good" accreditation as standard, this benchmark therefore formed a good starting point to work from when designing the White Willows, Jordanthorpe development in Sheffield with their Architects in order to realise both Sheffield City Council and South Yorkshire Housing Association's aspiration for a BREEAM MR "Excellent" rating.

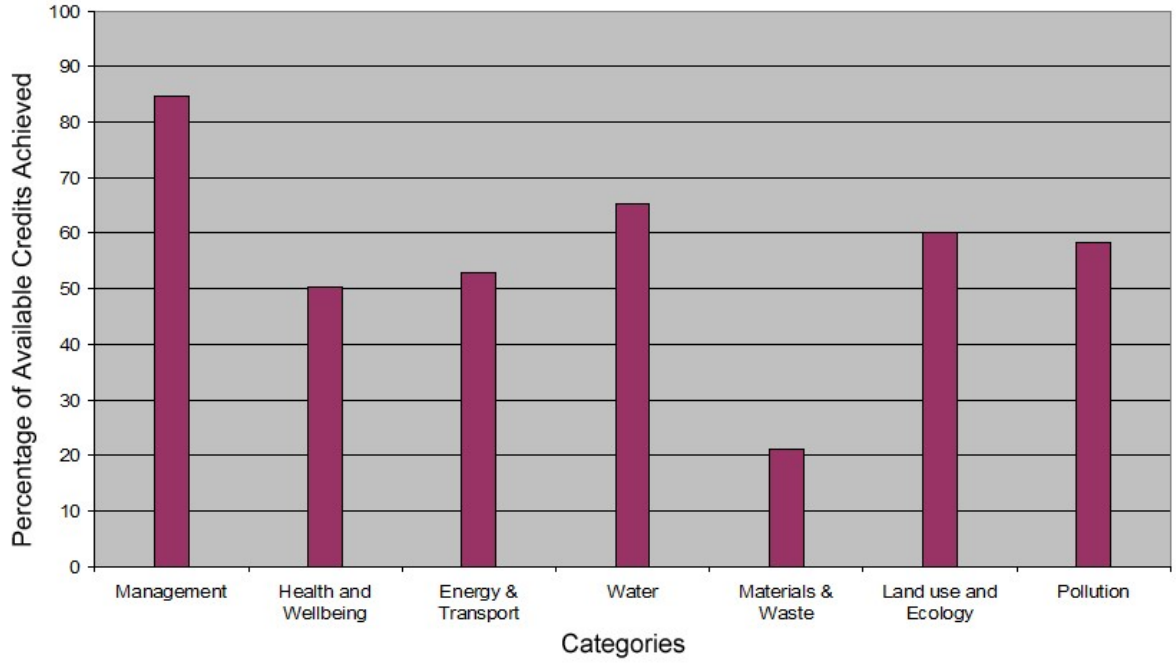
In order to achieve the benchmark BREEAM MR "Very Good" rating for a typical Extra Care development, the usual approach undertaken by Bramall Construction is as follows:

In addition to the mandatory requirements, the design team aims to achieve over 50% of the available credits in the following sections:-

- Management
- Health and Wellbeing
- Energy and Transport
- Water
- Land Use and Ecology

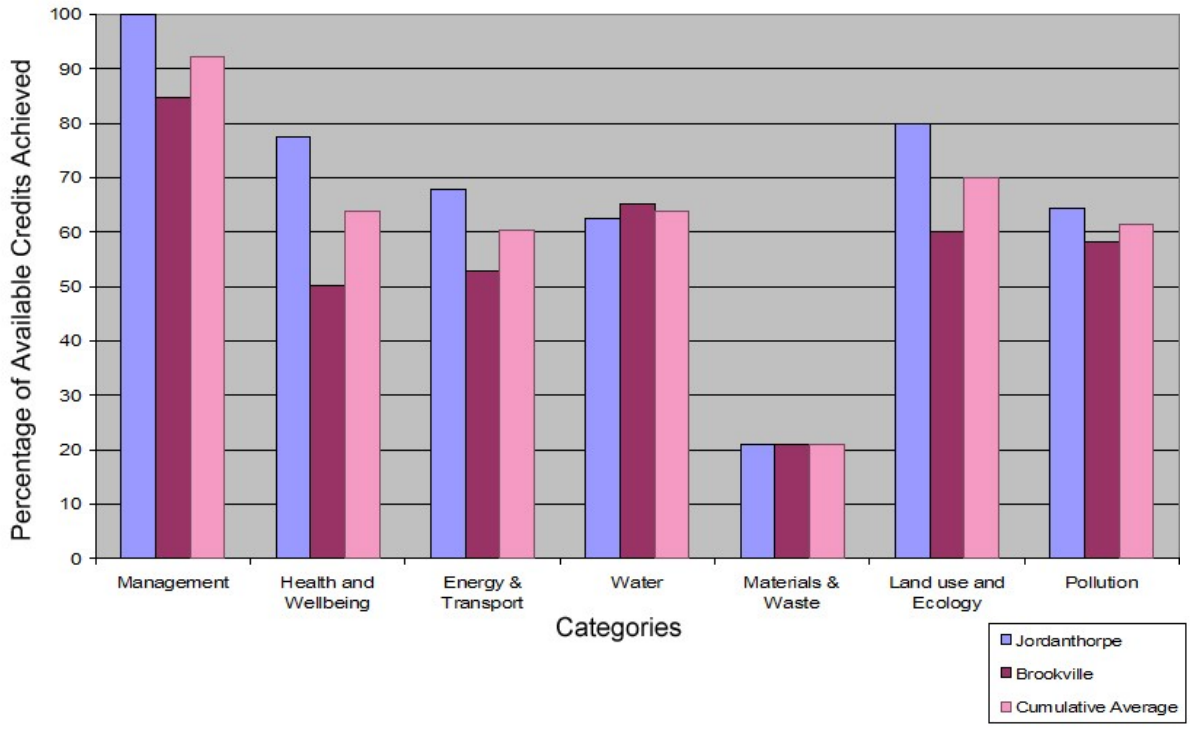
The graph on the next page shows the percentage of the available credits Bramall achieved on the Brookville Extra Care Development at Whitworth, Lancashire which recently achieved a BREEAM MR "Very Good" rating. The graph is typical of scores which Bramall Construction can expect to achieve as standard on their Extra Care developments.

Breakdown of BREEAM Credits



Working from this standard benchmarked approach it was decided that Bramall Construction would endeavour to achieve “Excellent” in the most cost effective manner for their client. Through our pragmatic approach and good management we have achieved in excess of the required score of 70% (subject to BRE QA) at no significant extra cost to the contract. The graph below shows where we have achieved extra credits in comparison to the “Very Good” extra care model detailed above.

Breakdown of BREEAM Credits



Initially, Bramall Construction evaluated which credits could be achieved at little/no cost, then focussing a great deal of time and effort into achieving those credits which are normally disregarded as being difficult or exceptionally time consuming to achieve. The graph above shows the effect this process had on the credits achieved comparative to the “Very Good” rating awarded at Brookville.

Local Authority & Client Aspirations.

The Local Authority Planning Department deemed a renewable energy target was not to be a requirement for this project, however the Client had the aspiration to incorporate an element of renewable technology to showcase the project as a sustainable development.

The clients preferred method of achieving this was to install a solar photovoltaic (PV) array which could have the added benefit of taking advantage of the 'feed in tariff' initiative being implemented in 2010.

BREEAM Workshops as part of Design Team Meetings.

Throughout the design development for the White Willows Extra Care facility at Jordanthorpe, the design team and client meetings were held on a monthly basis. The BREEAM multi residential assessment was a topic of discussion on each of these meetings agendas. Working in partnership in this way we were able to create a mutually agreeable strategy for achieving the required rating.

During these meetings we discussed our usual approach to achieving a "Very Good" rating, with the Client agreeing that this would form the basis of the way forward and that we would look at the most economical route to achieving the further credits which were required for the "Excellent" rating.

At face value, White Willows in Jordanthorpe seemed like an ordinary straight forward Extra Care Housing Scheme, yet in fact it was a challenge in waiting. Primarily set out as a new build to achieve a BREEAM MR rating of "Very Good", it wasn't long before this was moved swiftly to an "Excellent" rating at a BREEAM MR pre-assessment meeting. With the combined skills and experience of the Contractor together with the design team and the positive open minded client, it was felt that this was an ideal moment to take the current level of design of Extra Care Housing schemes to a new level.

Architectural & Sustainable Design Philosophy:-

As Architects, West and Machell consider that it is imperative that the brief set by the client is their primary concern and is tackled in a way so that it is fulfilled to a level of complete satisfaction. As Architects it is also our duty to enlighten the client, to open people's eyes to the current climate, both environmental and economic and to push the limits of design to new heights.

It was decided that the design development of White Willows would be undertaken over two phases. The primary phase would include the development of the site layout within its context, internal layout of spaces, making sure that the relationship of spaces worked and the look of the building both pleased the client and yet aesthetically explored and emphasised the notion of being both sustainable, efficient, contemporary, and yet friendly and inviting. It was at this stage that the ALO, (Architectural Liaison Officer) was consulted as to integrate the required security yet in a way that it would not compromise the aesthetic appearance that had been agreed. (see Fig. D.3.1)

The second phase would then take each of the individual elements of the building, i.e. the roof, walls, floor and spaces and break them down so that the specification and workings of each could be re-examined on a smaller scale and improved upon but not to an extent that would compromise the working building model that had already been completed.

The design conclusions from the second phase included:

- Two residential wings off a central entrance, creating an efficient fire strategy and minimal walking.
- The new entrance being widened with floors above being cut back on one side and a second entrance being placed opposite the first to create a light and spacious atrium which in turn allows natural ventilation of the community spaces.
- Large amounts of glazing to be positioned on the south elevation to allow for controlled solar gains to be used to heat the atrium space, which in turn filtered into each wing being absorbed by large areas of exposed thermal mass; the heat then

being expelled at night as the external temperature drops thus reducing the required mechanical services heating input.

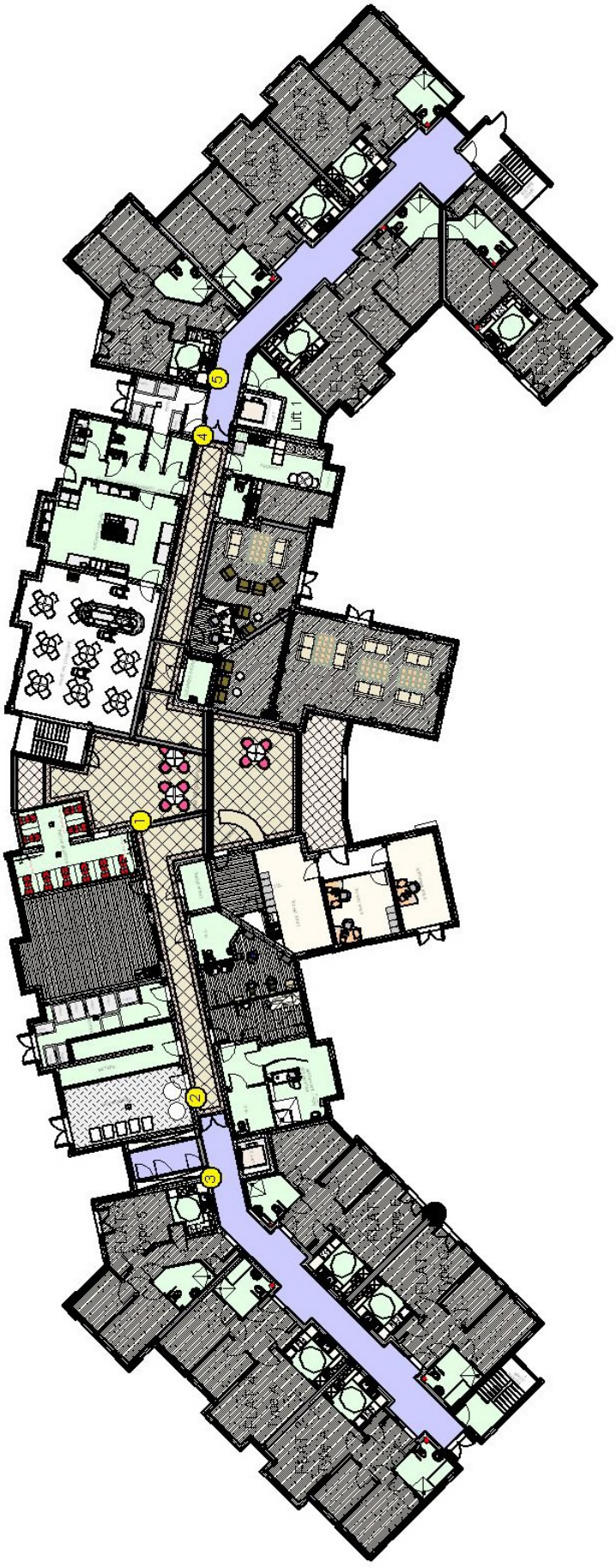
- Full fill cavity insulation within walls ceilings with high U-values for an efficient thermal envelope.
- Energy efficient under floor heating was installed throughout the communal ground floor
- A Solar Photo Voltaic panel array (80m2. 10kWp) was installed on south facing roofs allowing surplus electricity to be fed back into the mains, taking the revenue advantage of the forthcoming 'feed in tariff' initiative and offsetting some of the landlords mains electricity loadings.
- A 'green' sedum roof (encouraging wildlife to the site) is located on the opposite side to the Photo Voltaic panels increasing the roof insulation by enhanced U-values and also reducing the roof water run-off thereby decreasing the required surface water attenuation works.
- Water harvesting of both roof and surface water 'run off' has the dual benefit of providing not only stored water for flushing the toilets throughout the development but also acts as a reservoir for the fire sprinkler / misting system.

Assessment Outcome.

The BREEAM MR assessor selected for this development was NHBC Sustainability Services. Their final report stated that the site achieved a score of 70.4% and has therefore achieved the BREEAM Multi Residential "Excellent" rating required.

The assessment report was submitted to the BRE and was awarded an Excellent accreditation in December 2009.

Fig. D.3.1



Appendix D.4 – BREEAM Multi Residential Excellent

EXTRA CARE HOUSING - BREEAM Multi Residential Excellent

Example:- GATEWAY & HIGGINS – Thomas House Extra Care, 4 West Arbour St, London: PRP Architects

St Thomas House represents an example of a 6 storey Extra Care development consisting of 40no. Apartments with communal facilities due for completion in Spring 2011.

Features include a protected courtyard to the rear of the building with raised planters and seating areas for the residents. Rainwater is collected from roofs and reused for irrigation, and living roofs help to attract biodiversity and provide a habitat for wildlife. (see Fig.D.4.1)

The top floor is set back to reduce the impact of the development from pedestrian view, and this creates a roof terrace along the length of West Arbour Street.

Balconies or juliettes are provided to all flats and flats on the ground floor have their own small private patio area.

The energy strategy for the building started with improving the building fabric performance beyond the current requirements of building regulations to reduce energy demand and bills for residents. Renewable energy technologies have been introduced to achieve the 20% reduction in the total carbon dioxide emissions, as specified in the London Plan.

Heating and hot water is supplied from 1no mini gas CHP boiler providing a 15.5% reduction in CO2 emissions, with 48no. Photo Voltaic panels on the roof providing electricity and meeting the additional 4.5% CO_2 reduction required.

More than 90% of the internal and external lighting will use energy efficient fittings and all external lighting will be controlled by a daylight sensor.

Above that, the performance standards of the internal walls sound insulation have been enhanced to achieve values beyond the performance standards set out in approved Document E.

A BREEAM MR Design Stage assessment has been undertaken and an Interim ‘Excellent’ rating was recently awarded by BRE.

Fig. D.4.1

GROUND FLOOR PLAN

Fig. D.4.2


SECOND FLOOR PLAN
Landscaped Sedum Roof (Maintenance Access Only)
Quiet Room
Lift 1
Lift 2
TYPE A 1B Flat (50 sqm)
TYPE A 1B Flat (51 sqm)
TYPE A 1B Flat (51 sqm)
TYPE B 1B Flat (53 sqm)
TYPE B 1B Flat (54 sqm)
TYPE A 1B Flat (51 sqm)
TYPE D 2B Flat (66 sqm)
TYPE E 2B Flat (67 sqm)
FIRST FLOOR PLAN
Obscured glass windows
TYPE C 1B Flat (68 sqm)
TYPE A 1B Flat (50 sqm)
Ass. Bath
glazed roof
Lift 1
Lift 2
TYPE A 1B Flat (50 sqm)
TYPE A 1B Flat (51 sqm)
TYPE A 1B Flat (51 sqm)
TYPE B 1B Flat (53 sqm)
TYPE B 1B Flat (54 sqm)
TYPE A 1B Flat (51 sqm)
TYPE D 2B Flat (66 sqm)
TYPE E 2B Flat (67 sqm)

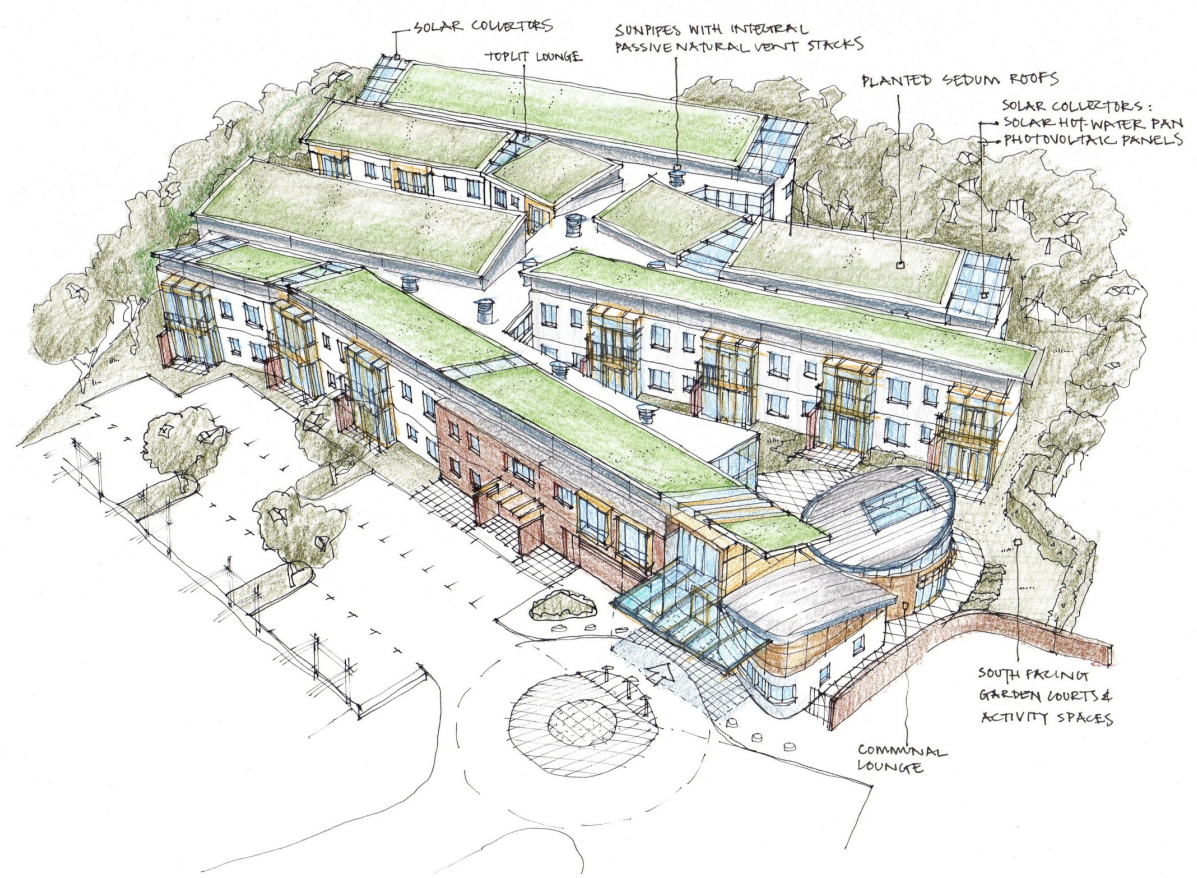
Appendix E.1 – Sustainable Design Approaches

EXTRA CARE & GENERAL NEEDS HOUSING COMMUNITY

A SUSTAINABLE DESIGN APPROACH TO HOUSING

Example:- EDEN HOUSING ASSOCIATION in partnership with Carlisle City Council and Cumbria County Council: Day Cummins Architects

This aerial feasibility view of Eden HA's 40 unit Extra Care development as part of a community development illustrates many of the sustainable 'first principles' design approach as detailed in Section 2 of this technical brief integrated with renewable technology.



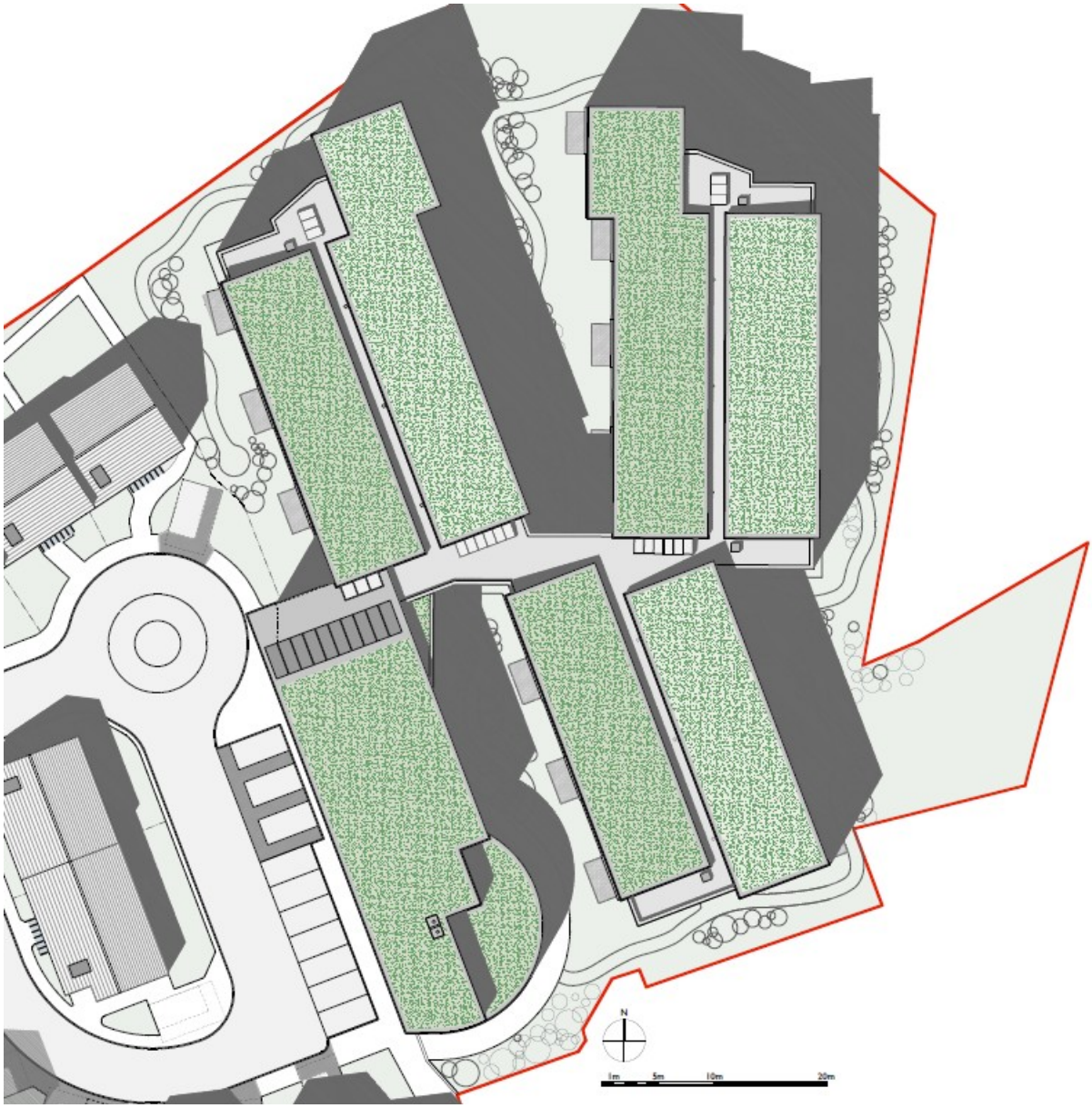
The Carlisle Extra Care project – Heysham Gardens – successfully attracted Government funding of £4.7million from the Department of Health in July 2008. Outline planning approval was granted in April 2008 for this new extra-care housing project providing very sheltered accommodation for older people in Carlisle.

The scheme is designed to avoid the institutional character sometimes associated with residential care homes and housing for older people, and incorporates 'street' circulation routes and views of communal gardens / activity spaces from each dwelling and from the shared / social areas.

Sustainability is a key consideration in the overall design approach, with the concept and client brief embracing renewable technology from the outset. The scheme features modern methods of construction (timber frame with high thermal performance) and a range of sustainability-enhancing features.

Renewable energy technologies introduced include a borehole-type ground source heat pump system serving under floor heating to the apartments, and solar panels providing domestic hot water. Surface water is attenuated by extensive underground tanks, with run-off rates reduced at source by sedum roofing to most areas. The sedum roof also offers ecological benefits, together with landscape planting proposals and wildlife habitat features.

Design team members with significant involvement on sustainability aspects include M&E services consultant BES Consulting Engineers (building services design, renewable energy, low carbon methodology) and civil & structural consultant RG Parkins & Partners (surface water drainage design). The Extra Care apartments and adjacent dwellings within the overall development are being appraised under Code for Sustainable Homes criteria and are to achieve a minimum of CSH Level 3.



Roof Plan indicating extent of Sedum Roofing Areas

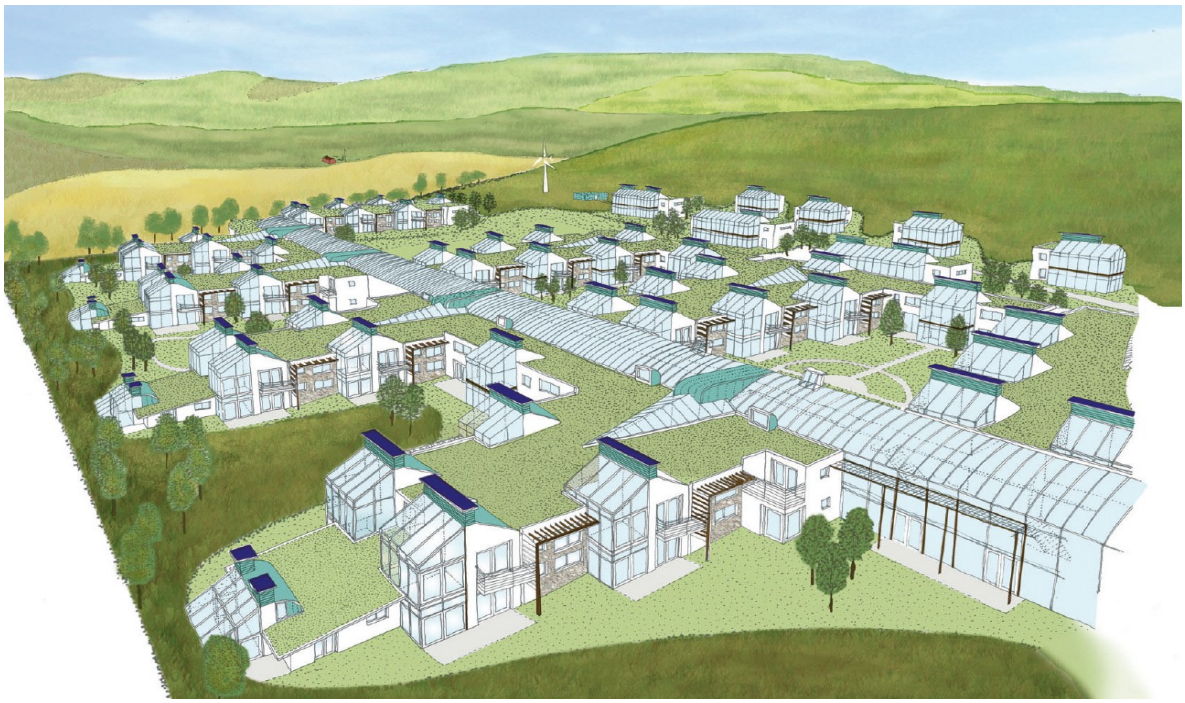
Appendix E.2 – Sustainable Design Zero Carbon

EXTRA CARE RETIREMENT VILLAGE

SUSTAINABLE DESIGN APPROACHES - A ZERO CARBON ASSISTED LIVING COMMUNITY

Example:- ECO RETIREMENT VILLAGE – A Theoretical Study: PRP Architects

The concept research presents a unique opportunity for the development of up to 300 dwellings in a 'model' Eco 'Assisted Living' Community which has the potential to become an iconic project of national significance.



The design proposal combines a Zero Carbon Development with an Assisted Living Community (Extra Care Village) whilst being sensitively designed to blend into a rural gently sloping south facing landscape to work with the natural landscape. If realised, the nearby landfill site would be utilised to provide a source of energy provided by harvesting the methane gas produced.

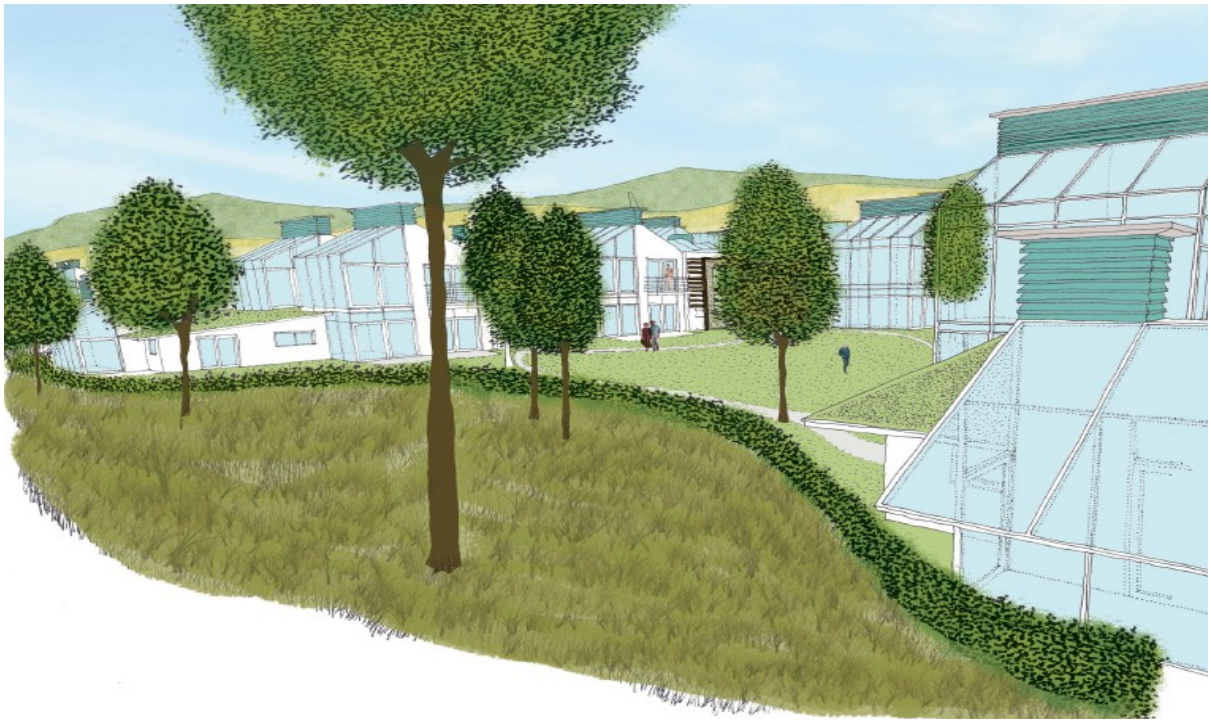
The proposed Extra Care Village could accommodate between 250 to 300 dwellings generating cost benefits from a range of facilities for self sufficiency and economic care delivery. The model could be developed as a response to demand in areas with a very high proportion of older people who could be supported from a care team from within the development and for whom the communal and healthy living facilities within the village could be made available whilst offering high quality accommodation with very low building fabric operational costs.

The design is based on a busy internal street linking clusters of east or west facing apartments, but all apartments having the benefit of south facing winter rooms acting a 'solar collectors'.

There would be a low impact in terms of traffic movement as car ownership and usage is lower for this resident group especially as the 'village' will be largely self-contained.

There would be individual houses to the north of the development fading into a sloping hillside.

The natural landscape is brought into the heart of the development, and wraps around the edges and over the green roofs to minimise the visual impact to the south.

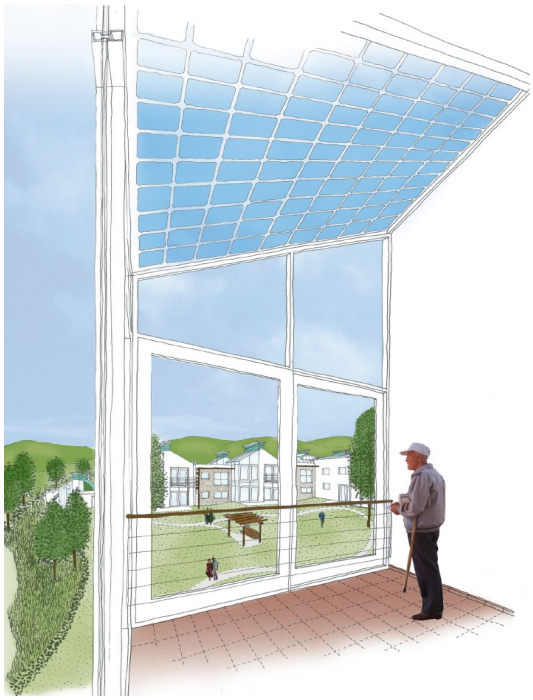


The main internal street will be alive with activity, having lounges, dining rooms, hobby rooms, shops, a library, therapy rooms, sports clubs etc along its length, and at three different levels.

Section through the Main Internal Street indicating passive solar and thermal design

Each cluster would open up to an external court, each with a different feel, with the apartments entered from internal courts that can be used as winter gardens, meeting areas, or cafes as indicated below.

Apartment Cluster with Craft Rooms Lounges and Cafe entered from Flexible Use Internal Courtyard



Apartments have Winter Rooms as Semi Private Amenity Space acting as a Solar Receptors Assisting Thermal Modelling

Sustainable Design Aspirations:-

In addition to the adoption of a highly site sensitive design maximising the benefits of solar gains, it was intended that the development will be constructed wherever possible using natural or recycled materials in addition to the adoption of renewable energy sources to provide all of the required heating, hot water, cooling and power.

The development proposes to use the methane produced as a by product of the adjacent landfill site to power a Combined Cooling Heat and Power (CCHP) plant in a dedicated Energy and Visitors Centre at the heart of the site. This would provide 60% of the heating requirement, 60% of the electricity and 80% of the cooling. Three medium sized wind turbines would provide a further 30% of the electricity with the remaining 10% provided by photo-voltaic panels. Winter rooms and ground coupling will pre-heat the fresh air in winter mode to supply the remaining heating load, with the ground coupling pre-cooling the supply air in summer mode to provide the cooling requirement. Solar Water heaters mounted above the stack vents will provide the remaining hot water requirement.

Stack Vents are provided to each dwelling and much of the public space. These use the natural buoyancy of warm air rising to pull air through the buildings supplied from the low level fresh air supplies. These vents will all have passive heat recovery units to remove at least 80% of the heat from the stale air before dumping it outside. This heat is then used to help warm the fresh air supply at low level.

The photovoltaic installation is in the form of glass and panels built into the roof sections of the winter rooms and also the roof over the proposed internal street. These act as solar shading as well as a source of electricity. The winter rooms are also used to pre-heat the incoming air entering the stack vents which will provide additional buoyancy on hotter days thereby providing more air changes per hour within the dwellings.

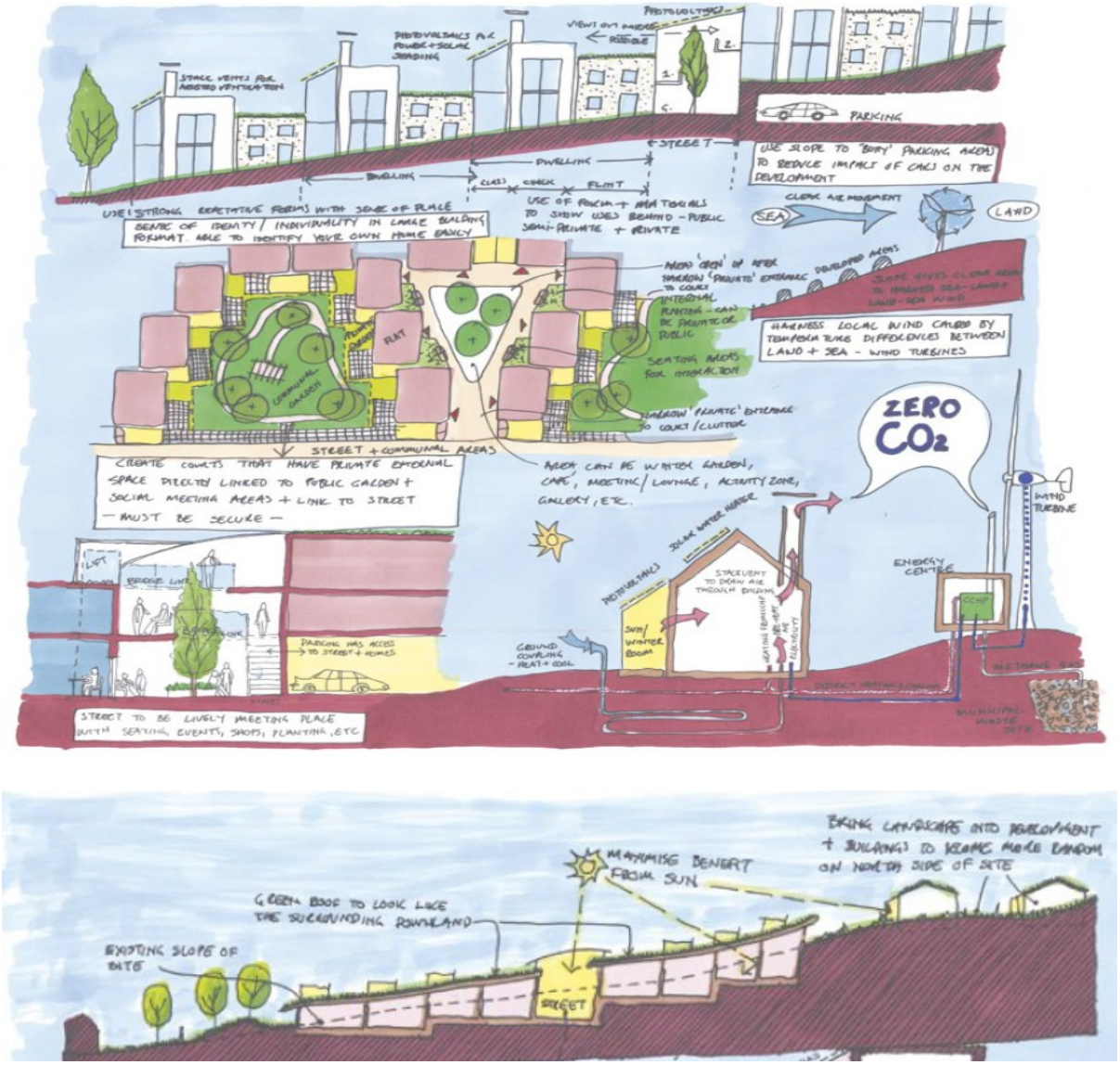
Similar principles are used to power, heat and cool the public areas. The internal street would not necessarily be heated to the same degree as the dwellings and ancillary rooms

but will obtain base heating from solar gains and ground coupling and base cooling through stack ventilation and ground coupling. A computerised Building Management System (BMS) will ensure adequate heating and cooling should the temperatures not remain within the required parameters or if the CCHP has surplus heating / cooling output at any time.

Lighting, cooling and heating input into public areas and offices would be occupancy sensor controlled through the BMS, with lighting and heat gains being detected and accordingly adjusted to maintain a pleasant environment, reduce electricity loadings and ensure efficiency. The vent stacks are also linked into the BMS for efficient operation providing responsive cooling with tempered input air.

In the public areas, the structure will have a high thermal mass allowing for a natural cooling effect in summer and acting as a heat sink in winter seasons.

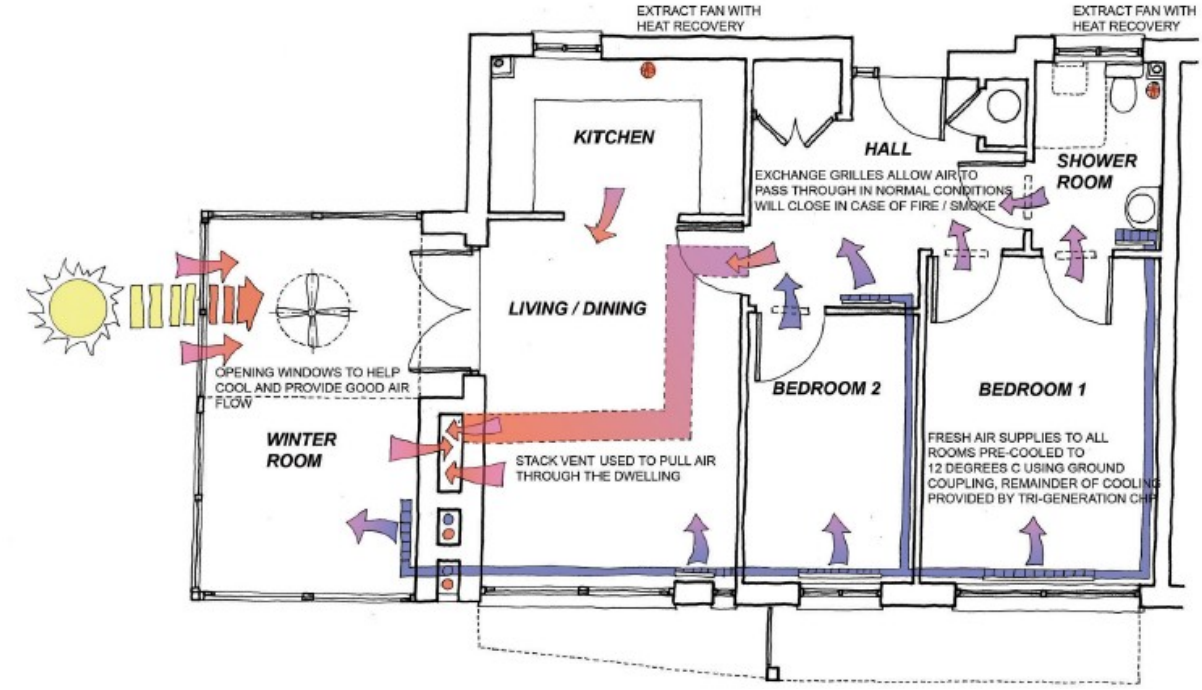
The buildings will be super-insulated thereby reducing the amount of heating input. To give an indication of the building fabric's insulation efficiency, on the current building regulations (at the time of writing), it has been calculated that it is possible to save over 20% of the Carbon Emissions from the development by increasing insulation and reducing the air leakage rate through the fabric.

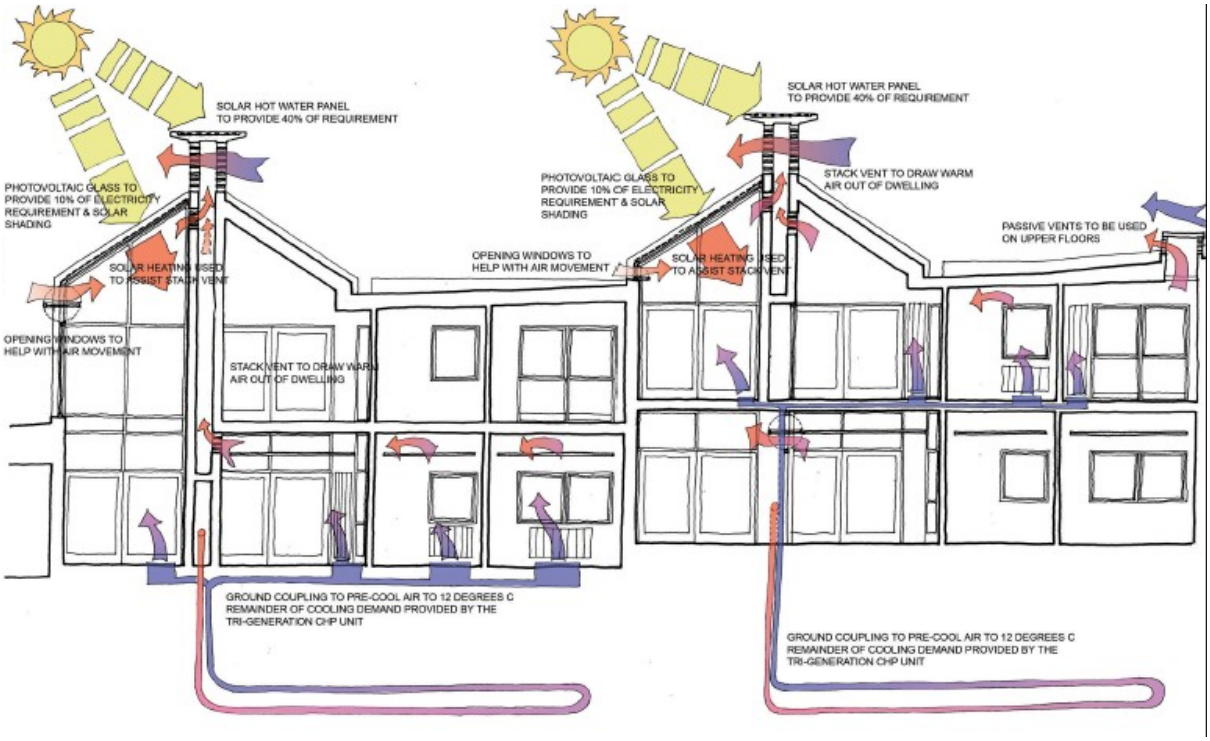


Site section indicating working with the natural site slope and maximising the solar gains whilst providing temperature stabilisation and water conservation and reduced run off by the adoption of a sedum roof.

Diagrammatic illustrations of thermal modelling of Ground Floor Apartments

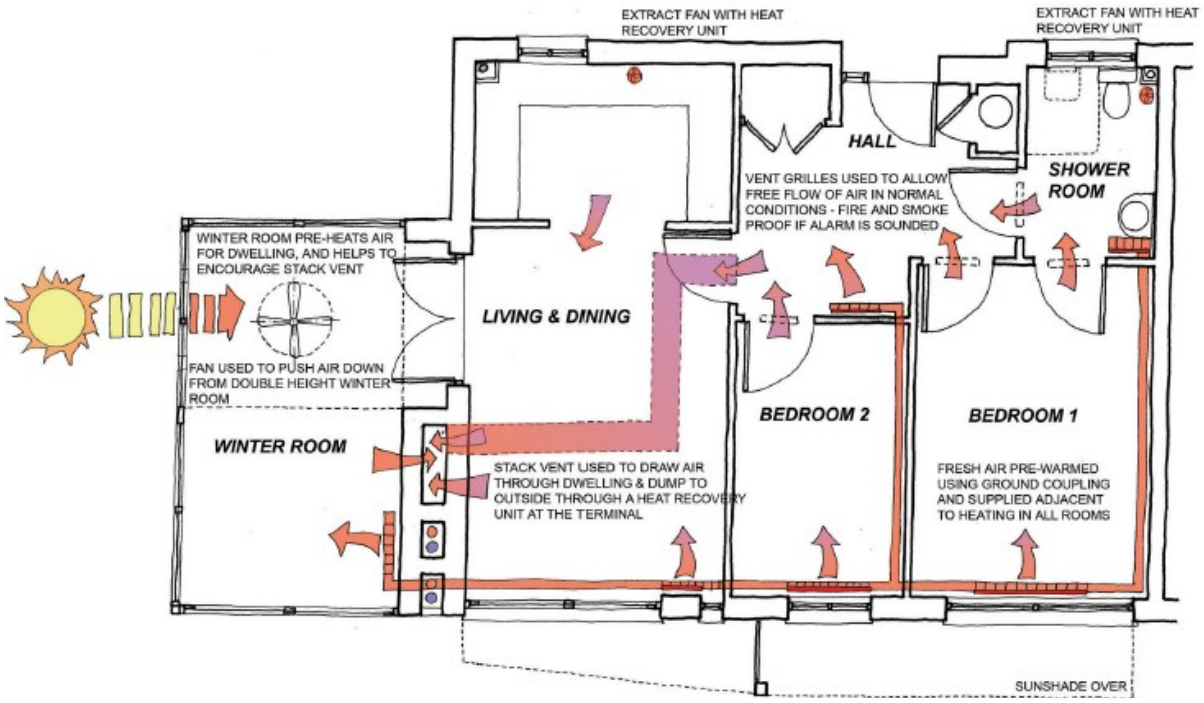
SUMMER CONDITION

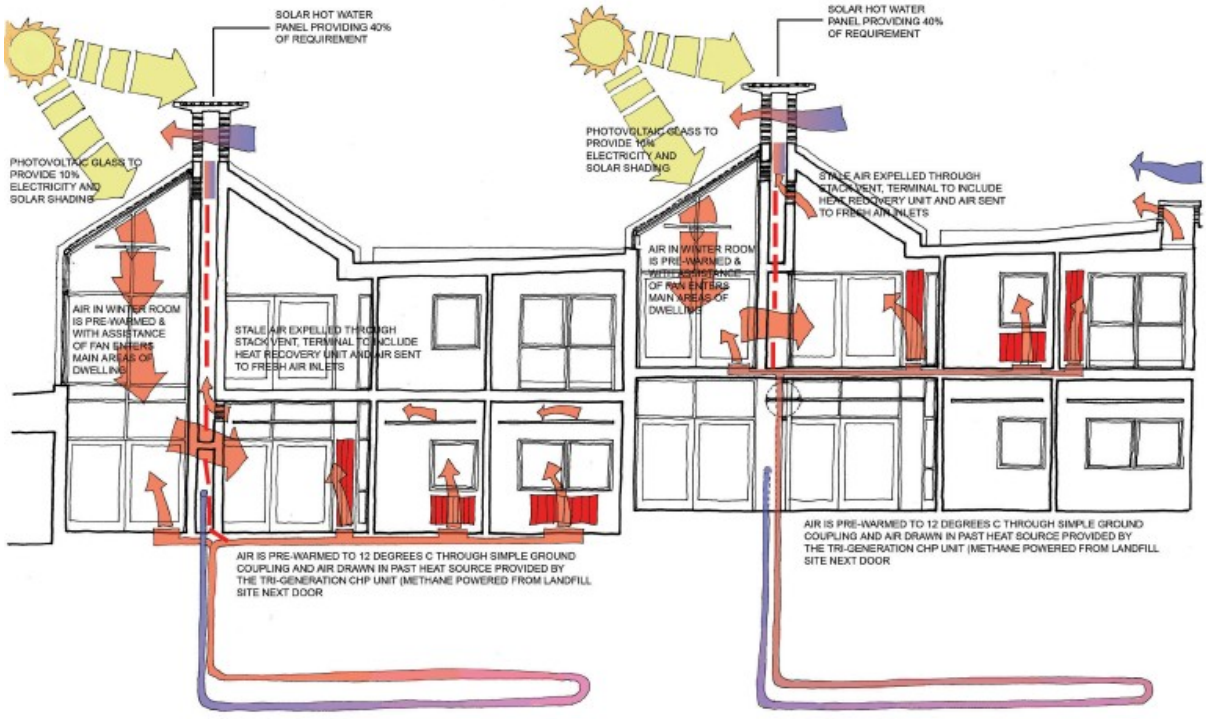




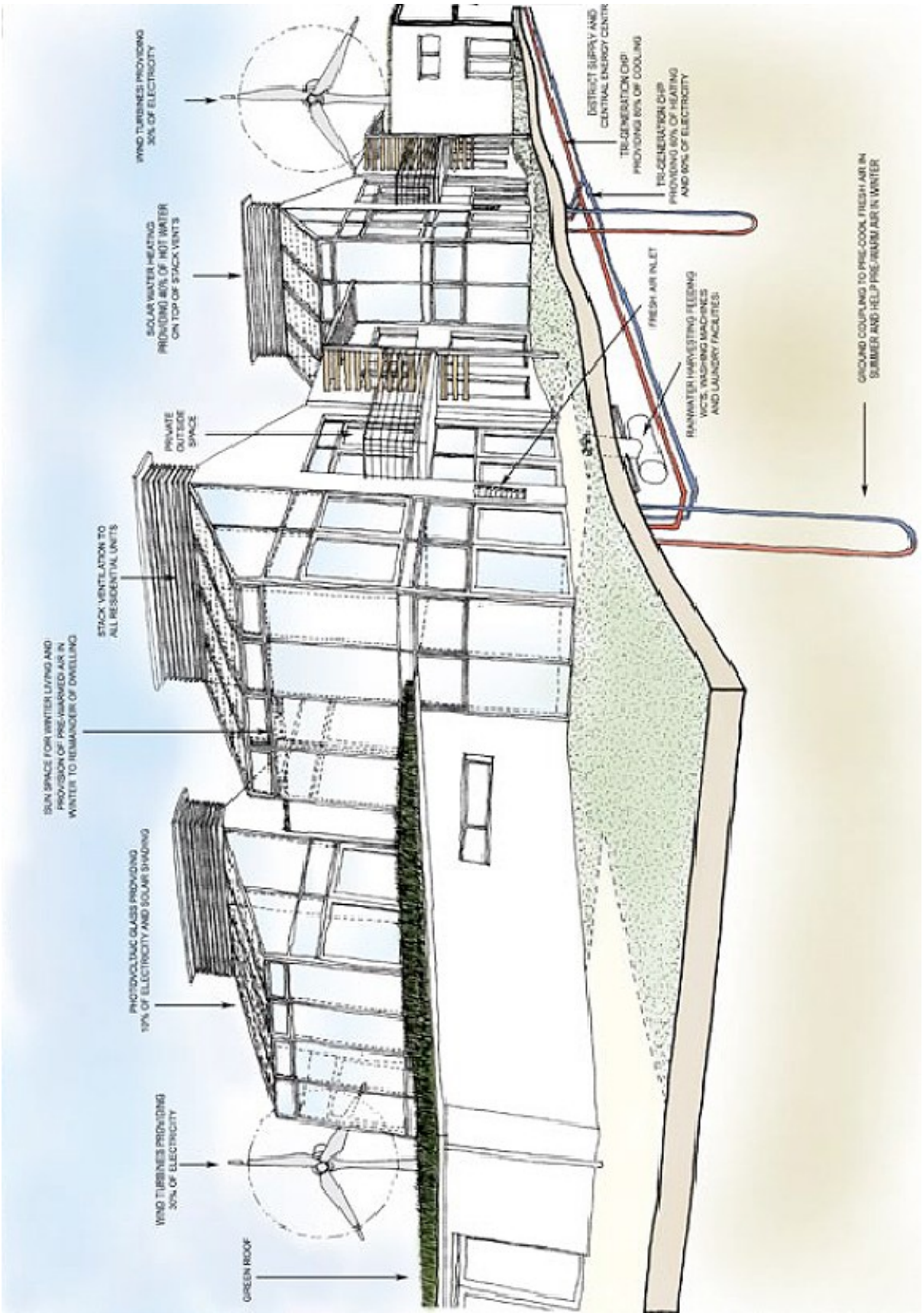
Diagrammatic illustrations of thermal modelling of Ground Floor Apartments

WINTER CONDITION





This diagram explains how the development will achieve a zero carbon footprint through the use of CCHP for electricity, heating and cooling, Wind Turbines, Photovoltaic Panels, Solar Water Heating. Stack Ventilation and Ground Coupling. It also shows that there will be filtered rainwater harvesting in order to flush WC's, feed washing machines and central laundry facilities.



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BREEAM: Multi Residential 2008 / CSH Guidance Note 29/09/09 and Flow Chart:
http://www.breeam.org/filelibrary/BREEAM_Multi-residential_Information_Sheet_Rev_02.pdf

http://www.breeam.org/page.jsp?id=2

http://www.breeam.org/filelibrary/Multi-residential_scheme_classification_flowchart.pdf

Code for Sustainable Homes Technical Guide – May 2009 Version 2:
http://www.communities.gov.uk/publications/planningandbuilding/codeguide

Public Folder – Code for Sustainable Homes:
http://www.breeam.org/extranet/document.jsp?pid=38

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Appendix A

BREEAM Multi Residential Flow Chart
http://www.breeam.org/filelibrary/Multi-residential_scheme_classification_flowchart.pdf

Appendix C.1

http://www.matthewlloyd.co.uk/

Appendices D.1 - 4

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Appendix E.1 – Sustainable Design Approaches

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Appendix E.2 – Sustainable Design - Zero Carbon

http://www.prparchitects.co.uk/our-sectors/sustainable-design/eco-retirement-village.html

Zero Carbon Hub:
http://www.zerocarbonhub.org/index.aspx

Task Group Recommendations:
http://www.zerocarbonhub.org/resourcefiles/FEES_ExecSummary_Final_for_Web.pdf

Acknowledgements

Those Housing LIN members who gave their time to comment on earlier drafts, BREEAM and All Consultants named who greatly assisted the production of this technical brief by their provision of material contribution in respect of the appendices.

Siobhan Masters, Lucy Francis, Sean Lockie and Martin Wynne of Faithful+Gould and Atkins

Edited by Jeremy Porteus, Housing Learning and Improvement Network, Department of Health

A full range of Housing LIN resources can be seen and downloaded at our website:
www.dhcarenetworks.org.uk/housing

The Housing LIN welcomes contributions on a range of issues pertinent to Extra Care housing. If there is a subject that you feel should be addressed, please contact us.

Published by:
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