Appendix 1– Preliminary Design (Proposed)

To meet Part L1B 2010 Building Regulations
Energy Evaluation Ref:
Dwellings at Rodney Court, Chippenham and Salford Court
Rowlinson Construction
Thermal and Fabric Data

Dwellings with upgraded thermal elements and services

Item	Brief description	Confirm	Notes.
	The following information is required for the Design submission (as per requirements of approved doc L1B).		Please note submission is now in two stages. A) **Design**, B) As installed
1	Building Regulations Part L1B 2010 apply		
2	Post code of site is?		
3	Electricity is supplied by standard tariff rather than economy 7, 10 or 24.		
4	The dwellings have a high thermal mass parameter.		
5	Ground floor is 150mm existing solid concrete with no insulation to achieve the U-value opposite.		U= 0.54 W/m²K
6	Main external walls are upgraded to achieve the U-value opposite.		U = 0.24 W/m²K
6A	Party walls are solid to achieve the U value indicated opposite.		U = 0.0 W/m²K
7	Roofs are upgraded to achieve the U value opposite.		U= 0.12 W/m²K
8	Corridors are assumed to be heated; therefore doors to corridors will not be included in the assessment.		
9	All double glazed windows are from uPVC/Aluminium with Low-e glass soft coating. To achieve the U Value indicated opposite.		U = 1.4W/m²K
10	No air permeability test will be carried out due to being a refurbishment.		
11	No open flues or chimneys are present anywhere.		
12	Extract fans are installed in every wet area.		These are standard devices.
13	There is only one main heating system installed.		No secondary heating.
14	Heating is provided by a communal gas boiler. Pre insulated low temp variable flow (1991 or later).		2009 SEDBUK efficiency: 95%
15	The heating system has Flat rate charging, programmer, and room thermostat.		
16	Radiators are installed throughout.		
17	No water cylinders are located in the dwellings, central hot water storage only.		
18	Water usage per person per day is ≤125 Litres.		
19	No accredited methods of limiting thermal bridging are installed. Therefore, the default Y value is 0.15.		
20	Low energy (LE) lights are installed throughout.		
21	Trickle ventilator are fitted to most windows.		
22	Windows can be half opened in summer to prevent overheating.		
23	There are no cooling systems specified.		
24	The top of the site layout plan for Rodney Court is North.		Drawing number SK002A
25	Floor to ceiling heights are 2.4m.		No sections available

Signed by.....On behalf of……..... Dated ……

Appendix 1B – Preliminary Design (Proposed)

To meet Part L1B 2010 Building Regulations
Energy Evaluation Ref: 61887
Dwellings at Rodney Court, Chippenham and Salford Court
Rowlinson Construction
Thermal and Fabric Data

Dwellings with upgraded thermal elements, Gas & Biomass Heating

Item	Brief description	Confirm	Notes.
	The following information is required for the Design submission (as per requirements of approved doc L1B).		Please note submission is now in two stages. A) **Design**, B) As installed
1	Building Regulations Part L1B 2010 apply		
2	Post code of site is?		
3	Electricity is supplied by standard tariff rather than economy 7, 10 or 24.		
4	The dwellings have a high thermal mass parameter.		
5	Ground floor is 150mm existing solid concrete with no insulation to achieve the U-value opposite.		U= 0.54 W/m²K
6	Main external walls are upgraded to achieve the U-value opposite.		U = 0.24 W/m²K
6A	Party walls are solid to achieve the U value indicated opposite.		U = 0.0 W/m²K
7	Roofs are upgraded to achieve the U value opposite.		U= 0.12 W/m²K
8	Corridors are assumed to be heated; therefore doors to corridors will not be included in the assessment.		
9	All double glazed windows are from uPVC/Aluminium with Low-e glass soft coating. To achieve the U Value indicated opposite.		U = 1.4W/m²K
10	No air permeability test will be carried out due to being a refurbishment.		
11	No open flues or chimneys are present anywhere.		
12	Extract fans are installed in every wet area.		These are standard devices.
13	There is only one main heating system installed.		No secondary heating.
14	Heating is provided by communal Gas and Biomass boilers. Pre insulated low temp variable flow (1991 or later).		
14A	Gas Boilers will provide 67% of the heating load.		Seasonal Efficiency – 95%
14B	Biomass Boilers will provide 33% of the heating load.		Seasonal Efficiency – 90.5%
15	The heating system has Flat rate charging, programmer, and room thermostat.		
16	Radiators are installed throughout.		
17	No water cylinders are located in the dwellings, central hot water storage only.		
18	Water usage per person per day is ≤125 Litres.		
19	No accredited methods of limiting thermal bridging are installed. Therefore, the default Y value is 0.15.		
20	Low energy (LE) lights are installed throughout.		
21	Trickle ventilators are fitted to most windows.		
22	Windows can be half opened in summer to prevent overheating.		
23	There are no cooling systems specified.		
24	The top of the site layout plan for Rodney Court is North.		Drawing number SK002A
25	Floor to ceiling heights are 2.4m.		No sections available

Signed by.....On behalf of……..... Dated ……

Appendix 1C – Preliminary Design (Proposed)

To meet Part L1B 2010 Building Regulations
Energy Evaluation Ref: 61887
Dwellings at Rodney Court, Chippenham and Salford Court
Rowlinson Construction
Thermal and Fabric Data

Dwellings with upgraded thermal elements & Biomass Heating

Item	Brief description	Confirm	Notes.
	The following information is required for the Design submission (as per requirements of approved doc L1B).		Please note submission is now in two stages. A) **Design**, B) As installed
1	Building Regulations Part L1B 2010 apply		
2	Post code of site is?		
3	Electricity is supplied by standard tariff rather than economy 7, 10 or 24.		
4	The dwellings have a high thermal mass parameter.		
5	Ground floor is 150mm existing solid concrete with no insulation to achieve the U-value opposite.		U= 0.54 W/m²K
6	Main external walls are upgraded to achieve the U-value opposite.		U = 0.24 W/m²K
6A	Party walls are solid to achieve the U value indicated opposite.		U = 0.0 W/m²K
7	Roofs are upgraded to achieve the U value opposite.		U= 0.12 W/m²K
8	Corridors are assumed to be heated; therefore doors to corridors will not be included in the assessment.		
9	All double glazed windows are from uPVC/Aluminium with Low-e glass soft coating. To achieve the U Value indicated opposite.		U = 1.4W/m²K
10	No air permeability test will be carried out due to being a refurbishment.		
11	No open flues or chimneys are present anywhere.		
12	Extract fans are installed in every wet area.		These are standard devices.
13	There is only one main heating system installed.		No secondary heating.
14	Heating is provided by communal Biomass boilers. Pre insulated low temp variable flow (1991 or later).		Seasonal Efficiency – 90.5%
15	The heating system has Flat rate charging, programmer, and room thermostat.		
16	Radiators are installed throughout.		
17	No water cylinders are located in the dwellings, central hot water storage only.		
18	Water usage per person per day is ≤125 Litres.		
19	No accredited methods of limiting thermal bridging are installed. Therefore, the default Y value is 0.15.		
20	Low energy (LE) lights are installed throughout.		
21	Trickle ventilators are fitted to most windows.		
22	Windows can be half opened in summer to prevent overheating.		
23	There are no cooling systems specified.		
24	The top of the site layout plan for Rodney Court is North.		Drawing number SK002A
25	Floor to ceiling heights are 2.4m.		No sections available

Signed by.....On behalf of……..... Dated ……

Appendix 1D – Preliminary Design (Existing)

To meet Part L1B 2010 Building Regulations
Energy Evaluation Ref:
Dwellings at Rodney Court, Chippenham and Salford Court
Rowlinson Construction
Thermal and Fabric Data

Dwellings with existing thermal elements and services

Item	Brief description	Confirm	Notes.
	The following information is required for the Design submission (as per requirements of approved doc L1B).		Please note submission is now in two stages. A) **Design**, B) As installed
1	The dwellings have a high thermal mass parameter.		
2	Ground floor is 150mm existing solid concrete with no insulation to achieve the U-value opposite		U= 0.54 W/m²K
3	Main external walls are 100mm clay brick, 50mm clear cavity, 100mm block and 13mm lightweight plaster to achieve the U-value opposite.		U = 1.59 W/m²K
3A	Party walls are solid to achieve the U value indicated opposite.		U = 0.0 W/m²K
4	Flat Roofs are 150mm solid concrete with 100mm Asphalt topping to achieve the U value opposite.		U= 2.0 W/m²K
5	Corridors are assumed to be heated; therefore doors to corridors will not be included in the assessment.		
6	All windows are single glazed. To achieve the U Value indicated opposite.		U = 4.8W/m²K Default U-Value for single glazing
7	No air permeability test will be carried out due to being a refurbishment.		
8	No open flues or chimneys are present anywhere.		
9	Extract fans are installed in every wet area.		These are standard devices
10	There is only one main heating system installed.		No secondary heating.
11	Heating is provided by electric panel heaters.		Efficiency = 100% Default value
12	The heating system has a programmer, and room thermostat.		
13	A 150litre hot water cylinder with electric immersion is located in each dwelling.		Insulated with 50mm spray foam insulation
14	Water usage per person per day is ≤125 Litres.		
15	No accredited methods of limiting thermal bridging are installed. Therefore, the default Y value is 0.15.		
16	No low energy (LE) lights are installed.		
17	Trickle ventilators are fitted to most windows.		
18	Windows can be half opened in summer to prevent overheating.		
19	There are no cooling systems specified.		
20	The top of the site layout plan for Rodney Court is North.		Drawing number SK002A
21	Floor to ceiling heights are 2.4m		No sections available

Signed by.....On behalf of……..... Dated ……

Miles Platting Tower Blocks - CO2 Emissions comparison calculations

Communal Areas

Block	Area	Existing BER (kgCO2/m2/Annum)	Proposed BER (kgCO2/m2/Annum)	Total Existing CO2 Emissions (kgCO2/Annum)	Total Proposed CO2 Emissions (Gas only) (kgCO2/Annum)	Total Proposed CO2 Emissions (Biomass & Gas) (kgCO2/Annum)	Total Proposed CO2 Emissions (Full Biomass) (kgCO2/Annum)
Rodney	688	0	27.2	0	18713.6	11789.568	3418.97472
Chippenham	643	0	26	0	16718	10448.75	2873.40625
Salford	643	0	26	0	16718	10448.75	2873.40625
Total	1974	0	79.2	**0**	**52149.6**	**32687.068**	**9165.78722**

Dwellings

Block	Type	Area	Number	Total Area / Type	Existing DER (kgCO2/m2/Annum)	Proposed DER (Gas Only) (kgCO2/m2/Annum)	Proposed DER (Biomass & Gas) (kgCO2/m2/Annum)	Proposed DER (Full Biomass) (kgCO2/m2/Annum)	Total Existing CO2 Emissions (kgCO2/Annum)	Total Proposed CO2 Emissions (Gas Only) (kgCO2/Annum)	Total Proposed CO2 Emissions (Biomass & Gas) (kgCO2/Annum)	Total Proposed CO2 Emissions (Full Biomass) (kgCO2/Annum)
Rodney	2B Grd Flr (61890)	57.78	4	231.12	84.12	27.57	20.01	4.66	19441.81	6371.98	4624.71	392.00
Rodney	2B Upper Flr (61891)	57.78	60	3466.8	70.76	17.91	13.25	3.78	245310.77	62090.39	45935.10	267.47
Rodney	2B Top Flr (61892)	53.3	4	213.2	123.49	22.73	16.63	4.24	26328.07	4846.04	3545.52	523.60
Chippenham	2B Grd Flr (61887)	56.33	4	225.32	82.69	27.57	20.12	4.7	18631.71	6212.07	4533.44	388.64
Chippenham	2B Upper Flr (61888)	56.33	56	3154.48	65.61	17.47	12.94	3.76	206965.43	55108.77	40818.97	246.69
Chippenham	2B Top Flr (61889)	56.33	4	225.32	114.46	21.43	15.72	4.13	25790.13	4828.61	3542.03	472.72
Salford	2B Grd Flr (61887)	56.33	4	225.32	82.69	27.57	20.12	4.7	18631.71	6212.07	4533.44	388.64
Salford	2B Upper Flr (61888)	56.33	56	3154.48	65.61	17.47	12.94	3.76	206965.43	55108.77	40818.97	246.69
Salford	2B Top Flr (61889)	56.33	4	225.32	114.46	21.43	15.72	4.13	25790.13	4828.61	3542.03	472.72
Area-weighted Totals			196	11121.36	803.89	201.15	147.45	37.86	**793855.19**	**205607.29**	**151894.21**	**3399.18**

Total Area 13095.36

Total CO2 Emissions per Block

Block	Total Existing CO2 Emissions (kgCO2/Annum)	Total Proposed CO2 Emissions (Gas Only) (kgCO2/Annum)	Total Proposed CO2 Emissions (Biomass & Gas) (kgCO2/Annum)	Total Proposed CO2 Emissions (Full Biomass) (kgCO2/Annum)	Percentage Improvement upon existing CO2 Emissions (Gas Only)	Percentage Improvement upon existing CO2 Emissions (Biomass & Gas)	Percentage Improvement upon existing CO2 Emissions (Full Biomass)
Rodney	291080.65	73308.40	65894.90	4602.04	**74.82**	**77.36**	**98.42**
Chippenham	251387.27	66149.45	59343.19	3981.46	**73.69**	**76.39**	**98.42**
Salford	251387.27	66149.45	59343.19	3981.46	**73.69**	**76.39**	**98.42**

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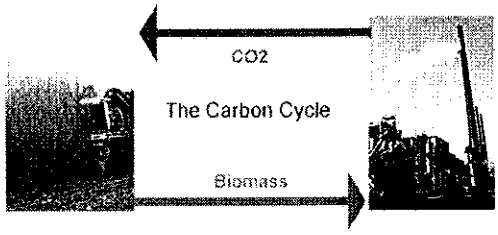
Biomass for heating and electricity generation



- Biomass' refers to a fuel that is produced by **organic** means.
- It is very nearly '**carbon neutral**', limited by the need to transport the fuel.
- Biomass is produced in two formats.
  - As a fuel directly grown as an '**energy crop**' eg wood, high yield
  - As a **waste bi product** eg agricultural residue, industrial waste and co-products
- Energy from biomass is generated at different scales
  - **Large / grid scale**, from dedicated and co-firing power stations
  - **Medium / district scale** power plants that provide energy to eg schools and housing schemes
  - **Small / Domestic** scale biomass boilers

The 'Carbon Cycle'

The central principle of biomass is that it takes carbon out of the atmosphere during growth and returns it when burnt





A 'closed carbon cycle' is maintained where the biomass is harvested as part of a constantly replenished crop. Harvesting is followed by replanting, with the new growth taking up the CO2 from the atmosphere released by the combustion of the previous harvest.

Large / grid scale biomass power plants



At the grid scale the Government is using the Renewable Obligation scheme to promote the development of large-scale integrated biomass generation. Because of the ease and low-risk of retrofitting fossil-fuel power plants to enable 'co-firing' (where both fossil and biomass fuels are used together), most of the initial expansion was in the area of existing power stations. But as the production and delivery of biomass at an industrial scale has become more refined, we are starting to witness a growth of the dedicated biomass power plant.

Examples

- The Eccleshall plant near Stafford generates 0.65 MW of electricity, enough to power some 2,000 households. The fuel is Miscanthus (an SRC, see below) grown within a 35 mile radius. The ash residue will be used as fertiliser on local farms.
- The world's largest biomass power plant is being planned at Port Talbot. The 350MW station will be wood-burning with fuel being imported from sustainable sources in North America.

Fuels being used in large scale power plants

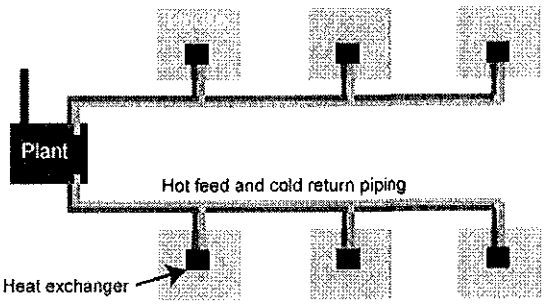
The Renewables Obligation defines a number of eligible renewable energy sources which include combustion of biomass in dedicated plant, co-firing of biomass and energy crops and pyrolysis, gasification & anaerobic digestion of biomass and biomass/waste blends.

- **Short-rotation coppice** (SRC): Fast growing trees that provide the bulk of fuel being currently used. SRC can be used alongside coal in co-firing power plants.
- **Wood waste:** The waste from forest maintenance, other timber industries and other crop residues is commonly transformed into compact fuel pellets.
- **Municipal solid waste**: An increasing amount of waste previously destined to landfill is being used to generate both heat and power on a municipal scale.



Medium / district scale power plants (15 – 1000 kW)

Biomass district energy systems are those that feed energy from a centralised location to a number of units eg flats, houses, offices, industrial units. Heat generated centrally is piped to each building where it feeds a heat exchanger. Likewise, electricity generated in a CHP process is fed to each building as required.



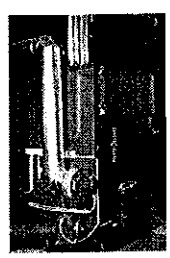


District heating and power systems are common in Europe. The UK is only beginning to progress from a long-term base of around 1% of heating provided by district heating systems, compared with, say, Denmark (60%) or even Germany (12%). But with the drive towards CO_2 reduction and the development of boiler technologies, along with more secure fuel planning, district heating systems are becoming increasingly viable and popular. CHP systems on the other hand are still in the early-days of development – though they offer much promise, experience of early systems, such as that at BedZED have been disappointing.



District heating and power – pros & cons

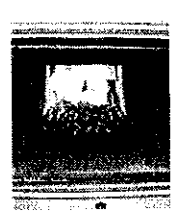
- Heating systems are an established and tested technology in Europe
- District heating boilers are more efficient than individual domestic boilers
- No individual fuel storage is required
- Houses / premises can be individually metered
- Maximises space within dwellings
- CHP plant has the potential to save 20% of energy, compared to the separate generation of heat and electricity
- Setting up agreements for multiple private customers can be complex.
- Systems require long-term planning for fuel supply and maintenance
- Higher initial capital investment compared with domestic boilers
- Boilers are large and expensive
- Around 10% of heat can be lost in distribution
- CHP systems are still being developed. It is not yet a reliable technology



Small / Domestic scale biomass boilers (typically 15 kW)



Biomass is beginning to compete in the domestic market alongside gas and oil as a fuel. Most boilers are imported from Austria where currently 80% of all boilers installed are wood pellet boilers. More costly than wood chip fuel boilers, wood pellet boilers are more like conventional boilers, including self-igniting and self-regulating. They are also more efficient, typically burning at up to 94% efficiency. As the technology develops, domestic-scale CHP boilers are also likely to feature on the market in the future.



Small scale heating - pros & cons

- Heating systems are an established and tested technology in Europe
- Ideal for where mains gas is not available
- Can accommodate a range of fuels
- Use of local fuels minimises transport and can contribute to the local economy

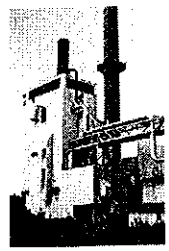
- Combustion and supply of heat can be easily decoupled through use of hot water storage
- Small-scale CHP remains relatively undeveloped for widespread use
- Boilers are expensive
- The smallest boilers (10 - 12kW) can often be 2-3 x the designed capacity
- Biomass boilers can require more space than gas boilers - usually in excess of 1 x 1.5m
- Fuel storage and feed to the boiler are an extra demand
- Feed supply blockages to the boiler can be common
- Flues need regular cleaning
- Wood burning can become a pollution issue
- Fuel costs are variable - dependent on source, distance from supplier and quantity purchased



Wood fuel types

Wood chip – 10kW – 10MW

- More suitable for medium / large scale operations
- A local supplier is needed
- Quality tends to be variable
- Fuel reception design is key and can be expensive
- Fuel does not flow and is difficult to handle
- Care should be taken when using recycled wood because of the risk of contaminates such as formica or melamine, plastics and paint



Wood pellet – 10 kw – 1000kW

- More suitable for small / medium scale operations
- The fuel is usually made from compressed sawdust and wood shavings but can be made from moist biomass material (eg straw, forestry residues and specially grown energy crops)
- Pellets are usually produced at an industrial scale, though developing technology is enabling smaller-scale production
- There isn't yet a consistent quality of pellet in the UK. Pellets vary according to source. Care should be taken when using recycled wood because of the risk of contaminates
- Pellets are more expensive than wood chip / logs
- Sources are unlikely to be local – necessitating transportation over long distances – so adding to cost and carbon emissions
- Fuel is delivered by blower – fuel storage is generally simpler and cheaper than for other wood fuels
- Unlike other wood fuels, pellets 'flow' – resulting in simple delivery to combustion.
- Pellet quality is crucial – boilers can be 'intolerant' to certain sources.

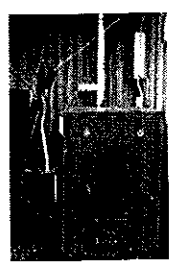
Logs – 15kW – 70kW



- More suitable for small operations
- Logs are easy to handle.
- Logs are more often sourced from a known and existing supply chain.
- They can be produced from small scale woodland
- They need to be loaded manually at least once a day

Design considerations

- Capacity: Calculate peak heat loss (which in a district system will include distribution losses)
- Network design in district systems
- Wood fuel selection:
  - Either chip (including moisture and particle size), pellet or log
  - Availability and price
  - Wood fuel specification and boiler type
  - Wood fuel delivery and fuel store design
- Think carefully about where to locate plant in relation to the thermal / airtightness envelope - putting a wood-fired system within the envelope can lead to significant heat loss owing to its contribution to air leakage and thermal bridging
- Space and access for biomass boiler plant
  - Fuel delivery, receipt, storage options and delivery vehicle needs
- Planning issues
  - Visual
  - Air quality. In smokeless zones, wood can only be burnt in exempted appliances
  - Traffic
  - Noise
- User controls



Movies

A walk around a 25kW wood-fuel boiler at the RJ Mitchell Primary School

Barnsley Council creates a local biomass economy

Downloads

- *Case study: Sheffield Road Flats, Barnsley* - (Forestry Commission)
- *Case study: Pennard's, Aberaeron* - (Wood Energy Business Scheme)
- *Biomass as a Renewable Energy Source'* - (Royal Commission on Environmental Pollution, 2004)
- *'A Woodfuel Strategy for England'* - (Forestry Commission)

Further information

- The BioMass Energy Centre - (www.biomassenergycentre.org.uk)
- The Log Pile Web site– an online database of wood fuel suppliers - (www.nef.org.uk/logpile)
- Wood Energy Business Scheme - (www.forestry.gov.uk/woodenergywales)

» Biomass boiler products on GreenSpec

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