

Design Requirements – Biomass Boilers

1.0 Introduction

1.1 Role & purpose of this document

The purpose of this document is to set out The Highland Council's design requirements for the installation of solar thermal systems in residential properties in the Highland region. The council's intention is that all residential properties are sustainable, energy efficient, low carbon and of a high standard of design, minimising management and maintenance problems in the future.

The general mechanical design requirements defined herein form the basis of the design for the mechanical components and systems.

However, The Highland Council does not intend that this document restricts the consultant's scope to find creative solutions for each project. Nonetheless, consultants should inform the council's Energy & Sustainability Team when requirements within this document cannot be met or if an alternative solution is believed to be more beneficial to the project.

Furthermore, the council's Energy & Sustainability Team must be informed of any variations between the actual project design and the design requirements set out in this document. All variations to these design requirements must be agreed with the Energy & Sustainability Team in advance of the tender submission.

Finally, nothing within this document should lessen the professional responsibility of the consultant and they should inform the council's Energy & Sustainability Team as early as possible if the requirements of the brief conflict with the financial constraints of the project, any statutory requirements, good practice or their professional judgement.

1.2 Related documents

This design requirements document should be used along with the other regulation publications governing M&E design –

- British Standards
- Building (Scotland) Regulations
- CIBSE Guides
- BREEAM
- IEE Wiring Regulations (BS 7671)

The requirements set out in this document may require systems to be designed over and above these guides, regulations and standards.

The design and specification of all Highland Council tender submissions shall remain in full accordance with all applicable guides, regulations and standards.

2.0 General Principles

2.1 Who do these requirements apply to?

All design consultants employed by The Highland Council must design the M&E services using these design requirements along with all other relevant regulation publications.

2.2 What do these standards apply to?

These requirements apply to all biomass systems installed or design for installation within Highland Council properties, including new builds, conversions and refurbishment projects.

3.0 Biomass Boiler Requirements

Biomass boilers are a favoured heating choice for The Highland Council due to the ease of installation, lower running costs (compared to oil and LPG) and reduced Carbon emissions.

However, due to the varied maintenance requirements of different biomass boiler manufacturers along with the differing system designs among consultants The Highland Council has produced this document in order to ensure that it receives a system design and installation which it is happy with.

3.2 Preparation

Every property being considered for a biomass boiler installation must be thoroughly surveyed in order to ascertain the best position, set-up and maintenance regime.

3.3 Scope of works

The consultant is expected to create a scope of works for the project which will include the following -

- A general description of the building and requirements for the biomass system along with existing plant room schematics and building layouts.
- Feasibility study including required kW rating of boiler, integration with M&E systems (existing and new), fuel store size and location, biomass boiler location, biomass 'Energy Centre' construction (if applicable) along with details of any underground pipework requirements.
- Information on RHI requirements i.e. heat meter locations, expected annual RHI generation figures.

The scope of works should give a full overview of the project plan and details of how the biomass will integrate into the existing building (if being retrofitted).

3.4 Boiler House

When considering a new building project which will be utilising a biomass boiler it is fundamental that the biomass boiler is not located in an external, stand-alone building. The biomass boiler must be installed within the main building without the use of any external or underground pipework. Siting the biomass boiler in its own 'Energy Centre' or containerised plantroom causes various issues when applying for RHI accreditation and it must therefore be avoided.

When retrofitting a biomass boiler into an existing building the use of underground or external pipework must also be avoided where possible; if the containerised plant or Energy Centre can be sited directly against the existing building or if the biomass boiler could be installed within the existing plantroom then this would be the preferred option.

For RHI application purposes our aim is to ensure that as many of the biomass installations as possible are classed as 'Simple' and not 'Complex'.

3.6 Biomass Fuel

Due to fuel quality issues when using wood chip The Highland Council has decided that all future biomass installations will use wood pellet fuel.

The wood pellet will be supplied through The Highland Councils fuel supply and maintenance agreement.

3.7 Biomass Boiler

Due to the varying quality and maintenance regimes encountered across the range of biomass boiler manufacturers any biomass boiler specified for inclusion in a council project must comply with the following –

The boiler must hold a CE marking and conform to all the appropriate European Directives covering automatic wood fuelled boilers.

The boiler grate system should be suitable for wood pellet fuel.

The boiler should provide an efficiency of >80%; the efficiency should be independently verified in accordance with EN303-5.

The boiler turn down range should accurately match the range of outputs likely to be experienced at each specific site (i.e. during winter and summer loads).

Three stage burn-back protection, including a drop cell with rotary valve, water dousing system and a flame detection or thermal cut-out device is essential for boiler located in or adjacent to occupied buildings. Otherwise, a more basic two-stage protection system comprising a water dousing system and a sealed airtight fuel store may be acceptable for boiler located in a boilerhouse set some distance from occupied buildings.

Automatic de-ashing is a necessity on all biomass boilers in order to reduce the amount of manual intervention required by the building staff; the emptying of the ash from the boiler will be carried out by the fuel delivery company only when fuel is delivered to the site, creating an irregular attendance pattern for de-ashing.

A second/spare de-ashing bin will be provided for all sites so that, in the event that the ash bin becomes full prior to a fuel delivery/de-ashing visit, the property janitor/facilities manager can simply remove the full bin, setting it aside for emptying by the fuel delivery contractor at a later date and replace it with the empty bin.

3.14 Boiler Maintenance

Boiler maintenance is a huge cost issue for The Highland Council. It is therefore important that any biomass boiler installed within a Highland Council property requires minimal maintenance requirements.

Excessive maintenance requirements i.e. monthly maintenance which requires a contractor attending site to carry out, is not an option.

Maintenance costs must be kept to a minimum with an external contractor only being required to attend site on a yearly basis to carry out yearly maintenance.

All other maintenance of the boiler must be able to be carried out by the building janitor or facilities manager with minimal training being required.

3.8 Fuel Store & Feed System

The fuel store must be designed specifically for wood pellet fuel and must be designed as a low-maintenance system; this may be in the form of an augur system or vacuum feed tubes dependant on site conditions.

The Highland Council would request that multi augur fuel feed systems are avoided and instead a vacuum feed tube system used in this instance; multiple augurs create additional maintenance issues and fuel delivery problems should one interconnecting augur fail.

Fuel level within the biomass fuel store must be clearly seen via glass fuel level windows as well as the installation of an electronic fuel level warning system. Fuel store windows must be located as to give an accurate fuel level reading when viewed.

Consideration must be given to how the delivery fuel into the store will take place. This typically requires both vehicular access and a conventional way to transfer the fuel from the delivery lorry into the store.

With regards to wood pellets in particular, it is important to ensure that they are handled and delivered correctly as they can disintegrate into sawdust causing difficulties for combustion; it generally considered best practice to minimise the number of handling steps with wood pellets.

3.9 System Integration

All biomass boilers must be connected in parallel with existing or back-up oil/LPG/Gas boilers; this allows the biomass boiler to operate independently of the back-up boilers and also allows the system to operate without issues should the biomass boiler be non-operational.

Additionally, buffer tanks connected to the biomass side of the installation should be connected in series, allowing each buffer tank to heat systematically.

Individual flow and return headers should be utilised following the buffer vessels and not a looped header; this has proven to cause short-circuiting issues previously and should be avoided.

Finally, each biomass boiler system which falls into the 'Complex' metering guidelines should be separated, via a plate heat exchanger, from any existing heating systems i.e. back-up boilers which are being retained. This allows the RHI metering requirements to be easily achieved.

3.15 Controls

The biomass boiler must always be the primary heat source for any building it's installed into; any back-up boilers should supplement the biomass as required.

Multiple biomass boiler must always work together with one boiler initialising when there is a heat demand and the other(s) initialised if the heat demand continues and the first boiler needs assistance to meet the demand.

3.13 Buffer Tanks

Buffer tank sizing should take into account the building size, not only the biomass boiler size; enlarging the buffer capacity can ensure that the boiler performs at its optimum for a greater period of time while achieving heat demand.

Enlarging the buffer capacity can also increase the boiler ability to cope with an increased heat demand should the biomass boiler not be sized to take full building load.

3.14 Heat Meters

Heat meters should be installed within all biomass boiler installations and should be located so that the installation meets the RHI metering requirements whether it's a 'Simple' or 'Complex' site.

All RHI heat meters should comply fully with the RHI metering requirements and be installed as per manufacturer's instructions.

5.0 Drawings

All design submissions must contain all relevant and accurate M&E information including –

- The actual position of the biomass boiler, buffer vessels, fuel store etc. in relation to the main building/boiler house – shown on site plans and elevations.
- Schematic drawings of the biomass system
- Schematic drawings of how the biomass system will integrate into the existing heat distribution system.
- The location of heat meters; ensuring full compliance with RHI's metering requirements.

The purpose of the design drawings is to provide as much accurate information as possible so that the project can be accurately tendered and additional costs during the works are kept to a minimum. The individual property survey is the key to this.