



CHP and District Heating Case Study

Bridgefield and Pappan Grove achieve NZEB standards using natural gas

Cosgrave Developments, one of Ireland's leading developers, has built over 250 apartments, installing a natural gas district heating system supplemented by a Combined Heat and Power (CHP) solution in combination with heat pump technology, in order to meet Part L 2019 of the building regulations.

Benefits of the district heating and CHP system:

A2 BER rating

Lower energy costs for residents

On-site electricity generation used for communal electrical loads

Hot water available on demand 24 hours a day



Bridgefield and Pappan Grove, Northwood, Santry, Dublin 9, achieve A2 BER rating with natural gas.

A2 rated apartments with natural gas

Bridgefield and Pappan Grove are located in the centre of Northwood, Santry, close to Gulliver's Retail Park. The development is comprised of three six-storey buildings and one five-storey building incorporating 250 apartments, which are built over a basement car park.

A district heating system comprising of central gas boilers, gas-fuelled CHP units and central electric heat pumps, provides space heating and hot water for the entire development. The apartments have a BER rating of A2 and meet Part L 2019 of the building regulations, commonly referred to as Nearly Zero Energy Buildings (NZEB).

Heat metering control systems from Prepagio allow residents to control and monitor the heating and hot water in their apartments from the convenience of their phone.

What are NZEB standards?

Every new home built in Ireland must meet stringent building standards as set out by the Department of Housing, Planning and Local Government (DHPLG). The Technical Guidance Document (TGD) Part L 2019 – Conservation of Fuel and Energy, contains strict criteria which must be met when building new homes. This document sets out the minimum requirements for the building elements including, levels of insulation, window details, thermal bridging, ventilation and the heating system, as well as renewable energy requirements.

This document was updated in 2019 and is commonly referred to as NZEB. The updated building regulations require new residential buildings to have a very high energy performance. The low amount of energy (nearly zero) that these buildings require should, to a very significant extent, come from renewable sources produced on-site or nearby.

Heat Recovery Ventilation

The Heat Recovery Ventilation (HRV) system is designed to remove stale air from homes and provide a constant supply of clean, filtered air. It operates by gently ventilating the property at a rate of about half an air change per hour, removing the stale air from the kitchen, bathrooms and toilets and extracting it to the outside.

Combined Heat and Power

The Combined Heat and Power (CHP) units run on natural gas to generate electricity on-site. The electricity generated is then used to power the heat pumps and some public lighting. This provides electricity at a significantly lower rate than grid electricity, saving the residents on energy costs. Generating electricity in this way also produces heat that is captured and used to generate space heating and hot water for all of the apartments.



Combined Heat and Power unit.

Bridgefield and Pappan Grove apartments are a mix of 1, 2 and 3-bedroom homes achieving NZEB standards



Bridgefield and Pappan Grove achieve NZEB standards using natural gas.

Building Fabric:	Actual	Part L 2019 (NZEB) requirement
Floor (W/m ² .K):	0.14	0.18
Walls (W/m ² .K):	0.16	0.18
Roof (W/m ² .K):	0.16	0.16 (0.20 for flat roof)
Windows (W/m ² .K):	1.40	1.40
Thermal Bridging Factor (W/m ² .K):	0.08	0.15

Heating System: ≥90% efficient gas boilers in combination with CHP system

The district heating system in this development combines CHP, gas boilers and heat pump technology to meet the renewable contribution as set out under Part L 2019 of the building regulations. The gas boilers installed are Buderus GE 402 units with a net efficiency of 94%. The CHP engines, by SenerTec (Dachs), are 65% efficient (heat generation/condensing function) and 24% efficient (electricity production).

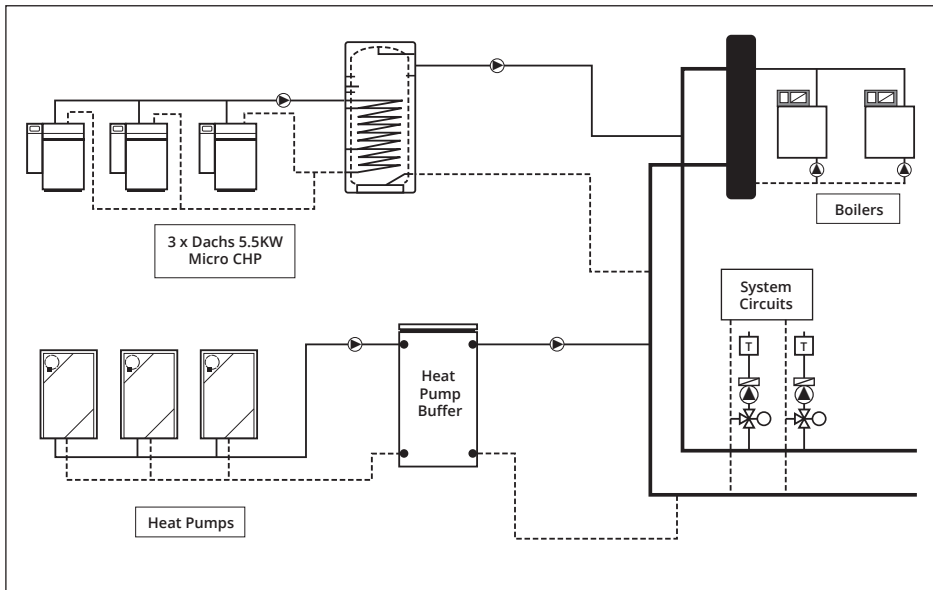
Ventilation: Mechanical ventilation throughout the home

These apartments contain double-glazed windows, which help with background ventilation, combined with a mechanical ventilation system and an air permeability of 3m³/(h.m²) at 50 pa. This exceeds the minimum TGD Part L requirement of 5m³/(h.m²) at 50 pa.

Renewable Energy Contribution: ≥20% of energy requirements

This development utilises a CHP system comprising of three 5.5kW Dachs micro CHP units, with thermal outputs of 14.7kW, in combination with three air-to-water heat pumps. Each electric heat pump is rated to 16kW output. The renewable energy contribution from this solution is the equivalent to over 20% of the buildings primary energy demand. This meets the renewable energy requirements of Part L 2019 of the building regulations.

Performance coefficients	Part L (2019)	Actual
Carbon Performance Coefficient (CPC)	<0.35	0.25
Energy Performance Coefficient (EPC)	<0.30	0.25
Primary Energy Value (kWh/m²/yr)	<=50kWh/m ² /yr	35kWh/m ² /yr



Meets Part L 2019 and (NZEB) requirements

The combination of natural gas, CHP, heat pumps, heat recovery ventilation and insulation means this development meets all of the Part L 2019 (NZEB) building regulations.

Hybrid system

This district heating system is a hybrid system. The renewable output from the heat pumps is injected into the coldest part of the heating cycle. The heat from the heat pumps is the primary contributor followed by the CHP engines and, at periods of peak demand, the natural gas boilers are switched on to supplement heating demand.

The electricity generated from the CHP units drive the heat pumps and the heat is captured and reused. All of the elements of this system work together to help this development achieve NZEB standards.

Heating control

With the swipe of a finger on a smart phone, or even by SMS, the next generation Prepaggo heating control systems allows residents to control and monitor their apartment's heating system remotely. Hot water is heated centrally and is available to all residents on tap. As a result there is a constant supply of hot water. Residents only pay for what they use.

Benefits of heating control system

- Without the requirement for a gas boiler or hot water tank in individual apartments, residents save on much-needed space
- Hot water is always available
- All rooms are thermostatically controlled
- Low maintenance

Award-winning standards

Cosgrave Developments is committed to Energy Efficient Design and has been recognised by the Sustainable Energy Authority of Ireland (SEAI) for its efforts in sustainable development, winning a SEAI Environment Award. Cosgrave Developments, in conjunction with M&P Mechanical, have also been awarded the Plumbing and Heating "District Heating Project of the Year 2019" award for this development.



Development features

- Combined Heat and Power
- Heat Recovery Ventilation
- Excellent levels of air tightness
- Two 1,500 litre buffer water cylinders
- High levels of insulation with double glazed windows

“The versatility of natural gas made Combined Heat and Power the most logical option”

Richard McElligott, Director
McElligott Consulting Engineers Ltd

Builder

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This information is only a guideline to the different products available for use with natural gas in new development construction. Users should ensure that products are suitable for the specific circumstances in which they seek to apply them. Contact the supplier or manufacturer directly for specific information on building requirements and materials needed for installation. Professional advice specific to the project should always be sought. The current Irish Gas Standards and Technical Guidance Documents (Building Regulations) override all contents. Users should ensure they always have the most up to date information.