
CLADE
LARCH CASCADE HEAT PUMP //
R290 & R600A //
Jan 23 //

THE LARCH CASCADE HEAT PUMP //

What is a Larch heat pump?

The Clade Larch Cascade heat pump is actually two heat pumps working together to produce temperatures that can directly replace a boiler, for example 82ºC flow, 71ºC return.

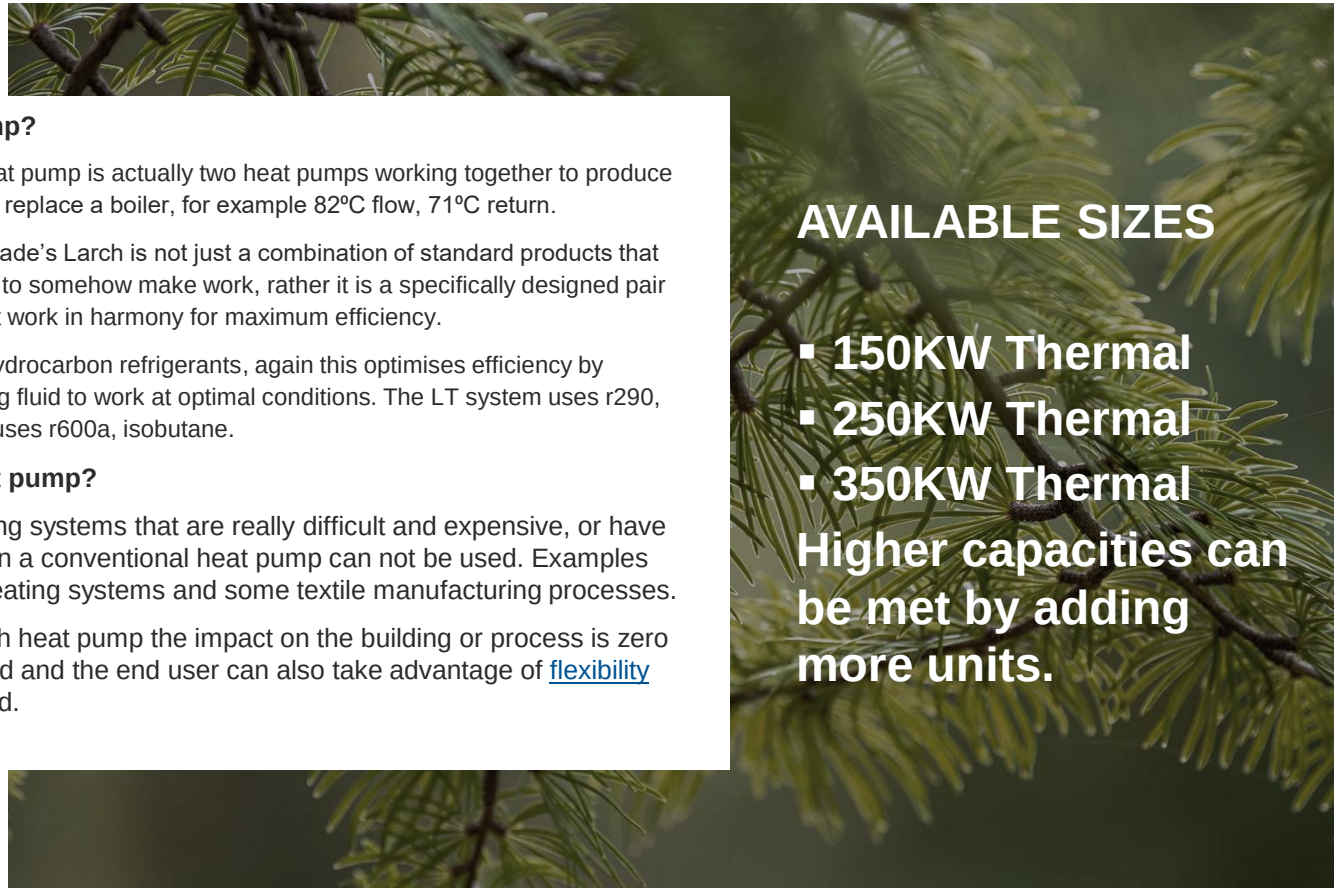
Unlike other manufacturers Clade's Larch is not just a combination of standard products that the designer and installer has to somehow make work, rather it is a specifically designed pair of LT and HT heat pumps that work in harmony for maximum efficiency.

Clade use a combination of hydrocarbon refrigerants, again this optimises efficiency by allowing each different working fluid to work at optimal conditions. The LT system uses r290, propane, and the HT system uses r600a, isobutane.

Why specify a Larch heat pump?

Some buildings have heating systems that are really difficult and expensive, or have critical processes that mean a conventional heat pump can not be used. Examples include historic one pipe heating systems and some textile manufacturing processes.

By specifying a Clade Larch heat pump the impact on the building or process is zero yet the heat is decarbonised and the end user can also take advantage of flexibility incentives on the power grid.



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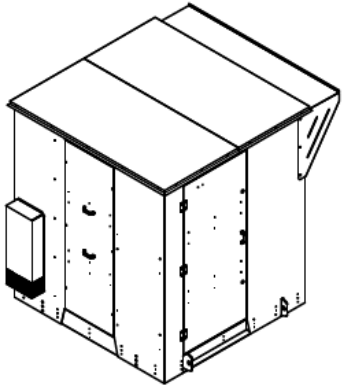
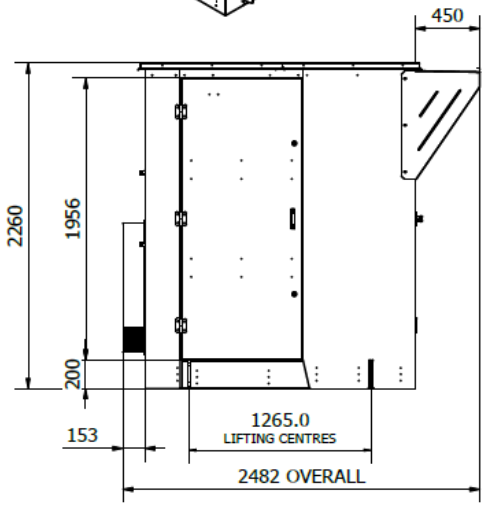
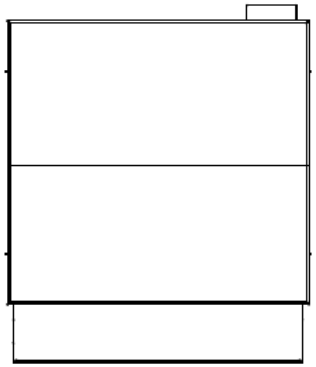
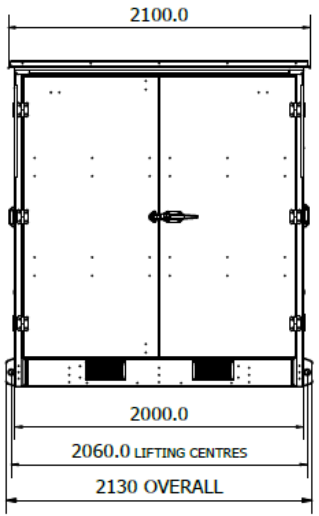
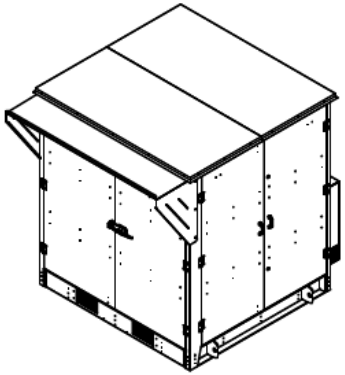
TYPICAL DIMENSIONAL DRAWINGS HT //

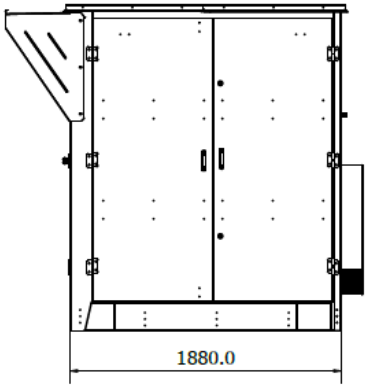




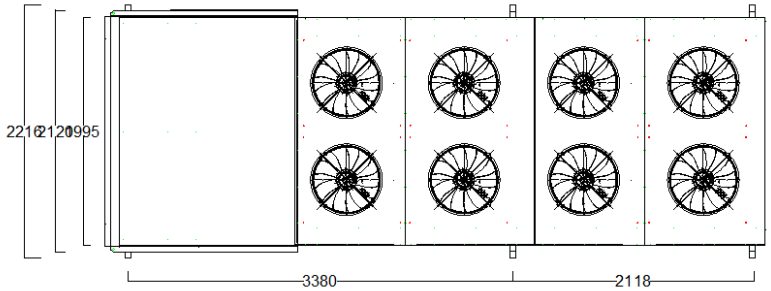


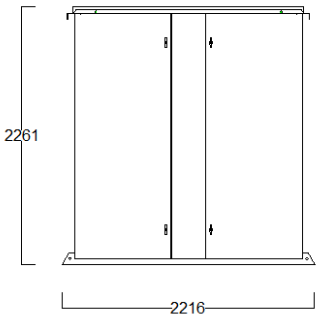


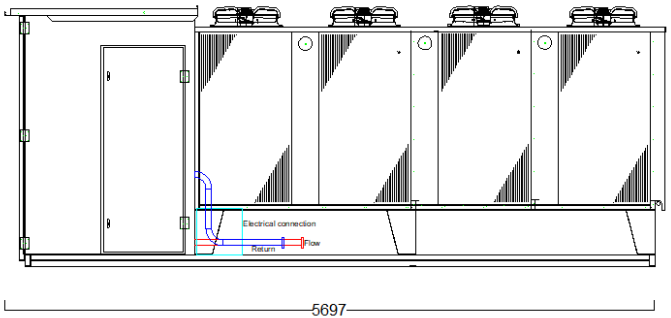


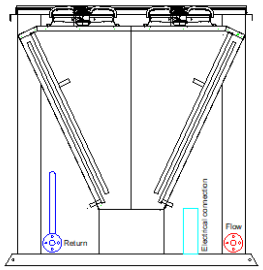


TYPICAL DIMENSIONAL DRAWINGS LT //

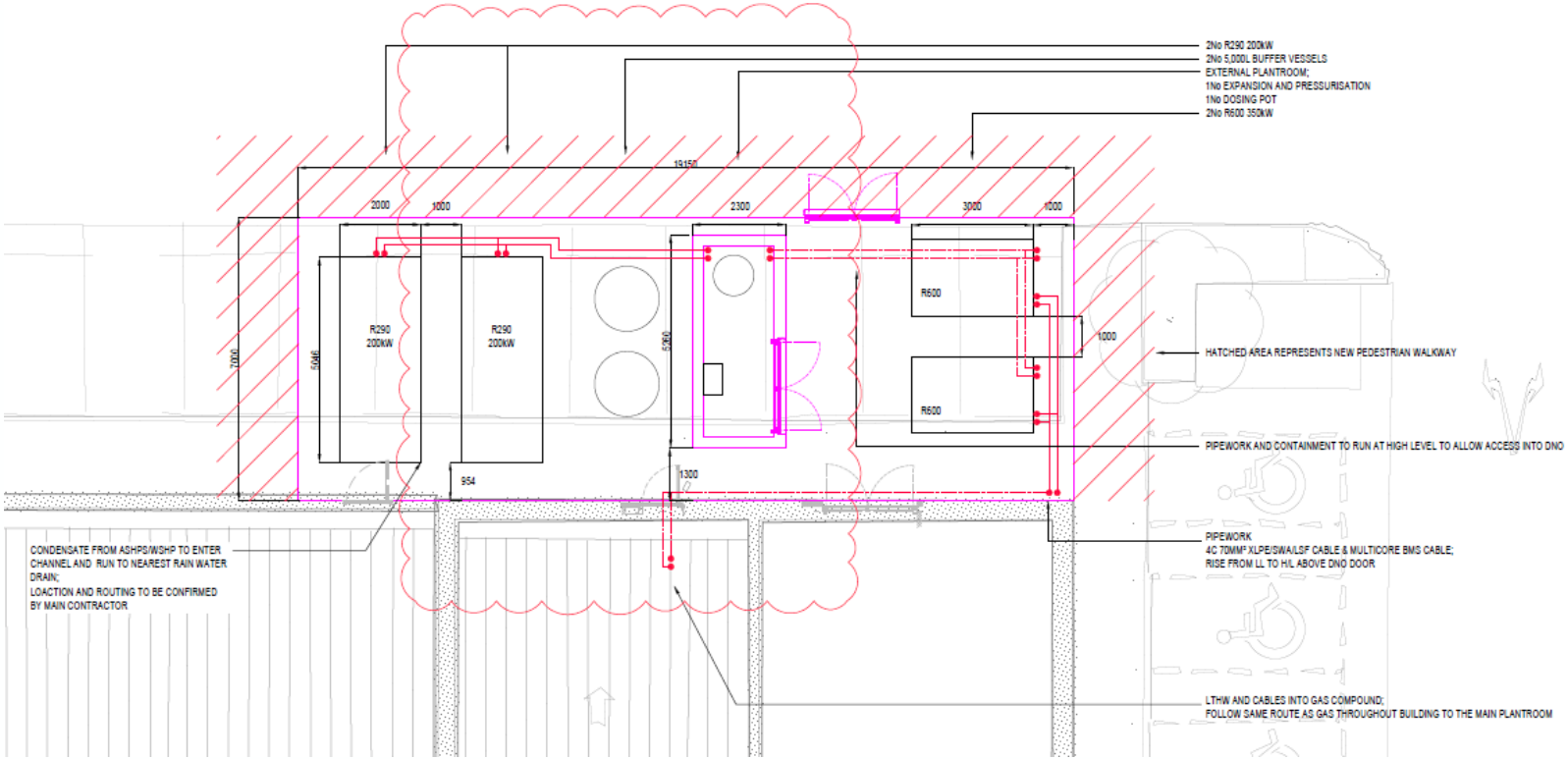




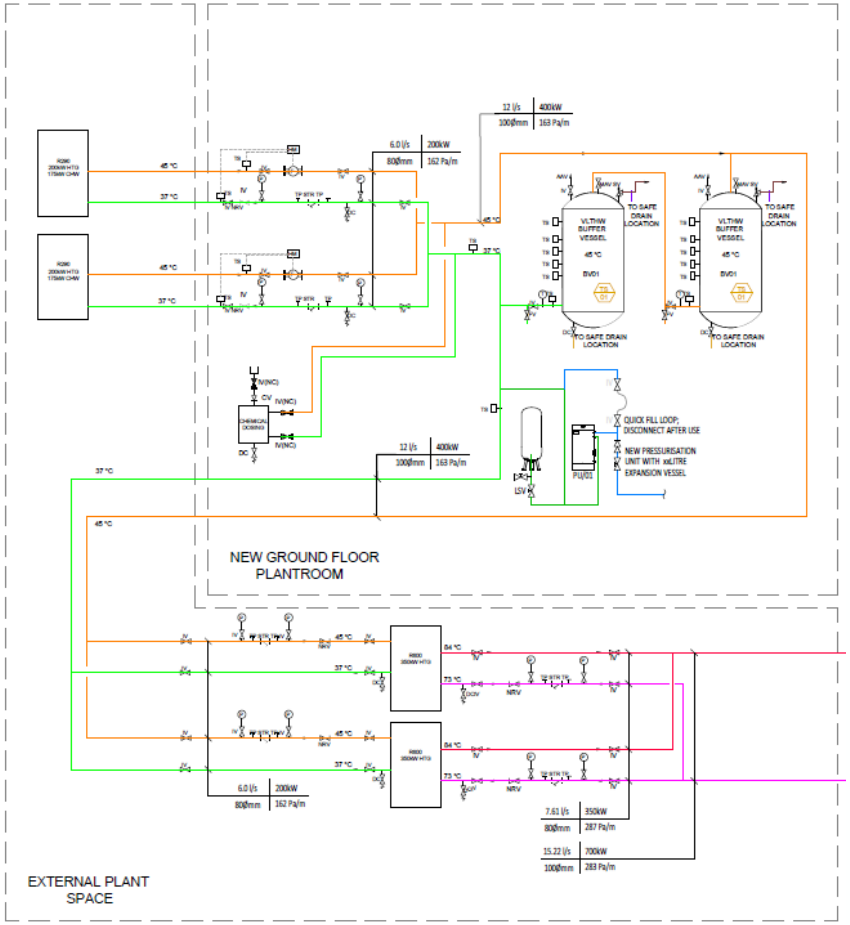




TYPICAL PLANT LAYOUT //



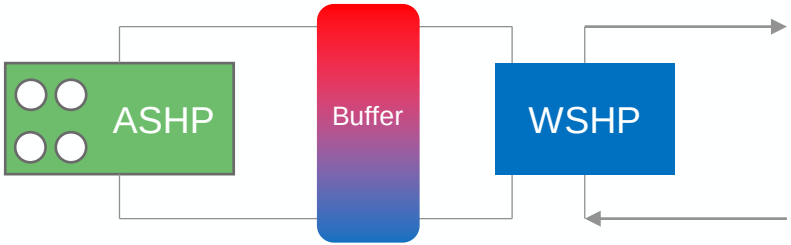
LARCH SYSTEM P&ID //



The Larch is a more complex heat pump than a conventional appliance. However, Clade take care of all of this with a cleverly designed complete system that also incorporates a degree of flexibility in the arrangement and location of the component parts. This means a Larch can fit on to most sites.

The major components are:

- The low temperature air source heat pump(s)
- The high temperature water source heat pump(s)
- The intermediate plant room with buffers, controls, pumps etc.



CASE STUDY //

This leisure centre example installation demonstrates the characteristics of a cascade heat pump system. In this instance the system is designed to deliver the full building duty of 560KW at 80/70ºC. The size of the demand requires two LT ASHP and two HT WSHP connected by buffer tanks that aid smooth and therefore efficient operation.

The advantage of this arrangement is the direct replacement of boiler technology without affecting the wider heating system. No work was necessary in the building, the heat pump simply connected in to the boiler headers.

This example was installed early in 2022 but had to wait for DNO connections to be completed prior to commissioning. Subsequently there have been issues with the power supply and BMS which have lead to some outages etc.

This re-enforces Clades preference for a period of optimisation after commissioning to tune up heat pumps. Retro-fit is rarely simple!

Expected performance at 82/71ºC at -5ºC ambient

- 2 x 280kw r600a high temperature WSHP with a COP of 3.89
- 2 x 160kw r290 low temperature ASHP with COP of 2.81

Theoretical system **COP of 2.1**

Note that a cascade system uses two sets of compressors for one thermal out put unlike a conventional heat pump which is one to one. This means the power consumption is higher and therefore the COP is lower.

The end user and designer must evaluate the relative benefits of modification to the building systems vs. lifetime cost of lower COPs.

Over the recent December cold period this heat pump has actually achieved a COP of 1.9.

The ambient dropped below design point and there were various service interruptions caused by external factors which are difficult to evaluate.

Clade will continue to monitor and work with the data to achieve the target outcomes.

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ABOUT CLADE //

// Empowering our customers for a greener future

- UK based
- 35 years of engineering experience
- Leeds manufacturing division
- Committed to sustainable business and sustainable products
- Investing in people, diversity & inclusion
- Non leveraged, owner operated

ACCREDITATIONS

ISO 9001: 2015

ISO14001: 2015

OHSAS ISO 18001: 2007

CERTIFICATIONS

Altius Assured Vendor Award

Altius CDM Vendor Award

CHAS

Sales Contractor

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