VITAL ENERGi

CASE STUDY

Keele University

ENERGY CENTRE EXTENSION & DISTRICT HEATING EXPANSION

OVERVIEW

Keele University has a firm commitment to reducing its energy usage and carbon emissions and wanted to integrate low-carbon, sustainable energy technology to meet the needs of its expanding campus.

The project saw Vital Energi expand and improve the existing Horwood Energy Centre and extend the district heating network, ensuring it was suitable not only for the present needs, but could also meet the demands of the University's planned future developments.

CHALLENGE

We have worked with over 20 Higher Education clients in the UK and fully understand the need to minimise disruption to staff and students whilst maintaining the highest levels of safety on busy campuses. Our approach is to begin working with the client and relevant stake holders at the earliest opportunity to create a construction plan which takes into consideration the needs of the university. This is especially important with the district heating works which generally take place in public areas and can involve the creation of temporary walkways.

During the design period our preconstruction team began planning and delivering the preparations for the project. This saw them undertake a range of services including beginning the procurement process, undertaking a detailed asbestos survey and plan a detailed construction schedule which met the University's Heat On date.

Developing A Tree Protection & Landscaping Policy

One of the University's core concerns, which was mirrored in planning permission requirements, was to make tree preservation and landscaping a priority. The client hired a specialist Arbocultural consultant to undertake a detailed tree survey and identify the number and classification of trees which would be affected by the construction works.

This report also detailed the methodology and strategies which were necessary to ensure a minimal impact on the tree population and landscaping and set out our requirements as contractors. By working with the local authority, client and consultant we ensured compliance

PROJECT SUMMARY:

CLIENT
Keele University

PROJECT
Energy Centre Extension

TIMESCALE:
Jan 2018 – Aug 2018

CONTRACT VALUE:
£1.279m

THE BENEFITS:

> Low disruption construction plan

> Future Proofed scheme designed and delivered with the universities upcoming development in mind

> Minimal impact on trees and landscaping

Part of the works included installing Solar PV panels at three of the Council's premises. These will save 43 tonnes of carbon emissions per annum

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THE SOLUTION

with the planning permission and agreed a replacement tree planting scheme which would see us plant 3 trees for each one which was felled.

The report stated that seven trees would be affected by the works and each of them were "low value" category C trees. In total, 3 trees would need to be felled and another 4 trees could be adversely affected if a tree protection plan was not drafted and implemented.

To meet these requirements Vital Energi developed a tree protection plan which created an exclusions zone around the 4 trees which could be affected by construction. As the primary purpose of this exclusion zone was to ensure full root protection, no groundworks were allowed in this area and entry was strictly by permit only.

To ensure the tree felling was done to the highest standards we hired a local tree surgeon who developed a method statement and risk assessment which was approved by the University's consultant before works were undertaken.

The planning conditions stipulated that replacements should be planted during the next "planting & seeding season" and it was agreed that these works would be undertaken in late autumn. Similarly planning stipulated that three of these trees should be ornamental cherries of 2-3 years of age. These were planted as close to the original trees as possible.

As well as replacing the three trees which were cut down, an additional 6 trees (3 Golden Weeping Willows and 3 Malus Golden Hornets) were planted. Each of these was a "Standard" which meant that they were 3m tall and 8-10cm in girth.

Evolving The Energy Centre Extension Design

One of our core responsibilities was to develop the energy centre and network design to RIBA stage 4 which is the standard needed to begin construction. As the project involved an extension to the existing energy centre our designers undertook a detailed survey, capturing detailed measurements for all existing architectural and plant elements.

Once this survey had been completed, we used the information to design the 70m L-shaped wraparound extension and mechanical plant layout. To ensure full compatibility our CAD team created a 3D model of the existing energy centre and the new extension.

In addition to creating a design which housed the additional plant and equipment, our designers also "future-proofed" the scheme, leaving space for additional plant to be added at a later date as demand increased. By taking this long-term approach to planning the energy centre will not only perform optimally for the current demand, but will be able to cope with the University's future needs.

Building Relationships, Educating Stakeholders & Developing Ownership

As Universities have a wide range of customers, service users and stake holders it was important to create a comprehensive liaison and engagement plan which would both educate them initially and give them a continued involvement throughout the project.

During the preconstruction phase we held local drop-in sessions and question and answer sessions and worked with the Student Union leadership who consulted with the disabled and partially sighted students and staff effected by the works to see how we could create the least disruption for them.

We continued this approach with weekly meetings with all stakeholders for each construction zone. In addition to consultation and feedback, we ensured there was a constant stream of accurate information using a wide range of channels such as the University's official social media, electronic noticeboards and reports to the weekly stakeholder committee.

As a result of our consultation, and our previous experience on University Campuses we implemented a range

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of measures designed to reduce the impact of construction works on staff and students. This include scheduling potentially noisy and disruptive works between January and May so they wouldn't impact the exam and resit periods or graduations.

Additionally, a common approach to district heating installation can be to dig long trenches, but Vital chose to excavate in smaller "zones" which kept the open trenches to a minimum, reducing health and safety risks and having the smallest impact on the campus. With the help of the University, we also identified low noise requirement areas, such as the library on Central Drive which was open 24 hours a day, seven days per week and delivered the nearby works accordingly.

Delivering a Solution for an Expanding Campus

As part of their £40+m investment into their Faculty of Natural Sciences facilities the University have built the Central Science Laboratories which comprise a four-floor state-of-the-art building for both undergraduates and post graduates. The building houses open-plan teaching and research laboratories, IT provision and student social learning spaces. To connect this building Vital Energi installed over 400m of pre-insulated district heating pipework running from the newly expanded energy centre.

Vital worked with the University's consultants to identify and implement the best route for the district heating spine, taking into account tree preservation orders. Our designers were able to plan a route which would avoid clashes while still delivering optimised performance.

Several other buildings on the campus had previously been heated by local plant rooms. The new system allowed these buildings to be connected to the central energy centre which would be more efficient in addition to lowering CO2 emissions. An additional advantage would be that operation and maintenance costs could be reduced as the existing plant rooms would be decommissioned.

One of the core aims of our designers is to future-proof district heating schemes to make future expansion easier. Vital Energi liaised closely with the University to understand their future plans for the campus and ensured that the pipework could be easily modified to reach and supply future buildings.

Constructing a Future-Proofed Energy Centre.

To meet this increased demand we designed a 70m2 extension to the existing Horwood Energy Centre which could not only meet the campus's current demands, but will also be able to cater for further planned developments. This phase of the project involved a 12 week construction period to deliver the extension and a 7 week fit out schedule which would see the plant, equipment, electrics and building management controls installed.

During the construction phase we oversaw the full construction process from the ground up, initially undertaking the necessary ground works before moving onto steelwork, blockwork and roofing, finishing the building in a specific wooden cladding which was requested by the University.

The L-shaped extension wrapped around the side of the building, with the original external walls demolished to create a large, more useful space.

The original energy centre was installed in 2015 and housed a 125kWe CHP engine and boilers to meet demand. The extension had been designed to cater for additional equipment which includes two 1.3MW boilers, a new district heating pumping system and space for plant to be added as demand increases.

Creating a Flue System to Meet Planning Requirements

Air quality is a core concern and in addition to ensuring our solutions lower CO2 emissions by the maximum amount, we also undertake extensive flue dispersion modelling to ensure we meet local, regional and national legislation. On this project planning stipulated that the flue needed to be at least 12.67m high with an efflux velocity (Average speed of gasses out of the top of a chimney) of 10m/s

On the University of Keele project we installed three DSEAR compliant flues within a steel windshield, giving the impression that it is a single chimney. Two of the flues are necessary for the current plant and equipment, but the third was added as a future-proofing feature which will enable the easy addition of a third boiler when demand increases.