Building carbon negative student facilities as part of a campus redevelopment
Nottingham Trent University, United Kingdom

Background

Nottingham Trent University (NTU), situated in the East Midlands of England and home to nearly 27,000 students, has a target to reduce carbon emissions by 48% by 2020 (against a 2005/2006 baseline).

As part of the ‘Heart of the Campus’ project in Clifton – which aimed to regenerate the existing 1960s campus – a new building and plaza was constructed to provide a focal point to the site and cater to a variety of collaborative learning and social needs of students.

The resulting ‘Pavilion’ building opened in September 2014. It includes two levels of social study space, as well as enclosed learning pods, collaborative booths and a coffee shop. The Pavilion has been fitted with energy efficient glazing, 94kW solar panels on the roof, and a high thermal mass. It has achieved carbon negative status and has been awarded an Energy Performance Certificate (EPC) rating of A+ (that is, very efficient).

Procurement objectives

NTU required that the Pavilion building meet a minimum BREEAM score of ‘Excellent’. That is, built using best practice methods to be in the top 10% for sustainability of new non-domestic buildings in the UK. This requires good performance in energy, water, and waste, as well as attention to responsible sourcing, the use of responsible construction practices and stakeholder participation.

The Pavilion building was also required to be carbon neutral – as defined by the BRUKL Building Emission Rate (BER) rating of 0’ or less (carbon negative) – to be achieved through a combination of energy efficient building design, passive measures (solar heating, natural ventilation etc.), effective controls, and the installation of renewable energy generators on the building.

A Contract Notice was published in the Official Journal of the European Union in November 2013 to establish main contractor interest in providing tenders. A restricted procedure then followed, where a Pre-Qualification Questionnaire/Process (PQQ) was used to establish a refined list of contractors able to meet the established selection criteria.

Criteria used

Subject matter of the contract:
Construction of a new Teaching Building, a Pavilion Building and external landscaping.

Selection criteria:

A PQQ process was used to ensure that interested tenderers were able to carry out the project to the standards expected by the University. Seven selection criteria were used (and weighted accordingly):

- About your Business (3%)
- Health and Safety (15%)
In practice

Environmental (14%)
• Experience and Technical compliance (40%) and Quality Assurance (8%)
• Financial (10%)
• Equality and Diversity (5%)
• Insurances (5%)

The environmental category consisted of several criteria, including: recent completion of a project using secondary and recycled aggregates; ISO 14001 (or equivalent) accreditation and operation of an environmental management system; and monitoring of supply chain operations facilities to ensure compliance with supply chain policies or directly with the International Labour Organisation’s Conventions on Labour Rights.

Technical specifications:
The contractor was expected to use the principles contained in the BRE “Green Guide to Specifications” in order to ensure that the final building met the BREEAM Excellent standard:

• Concrete used achieves the best available green standards by the use of recycled aggregates and cement replacement;
• Timber used meets the criteria of Forest Stewardship Council (FSC) label (or equivalent);
• Roof-mounted photovoltaic panels;
• High performance envelope utilising exposed, high-quality plain cement concrete (PCC) floor and roof slabs for thermal mass benefits;
• Combined heat and power unit; and
• High level of building air sealing to achieve low air leakage standard, coupled with very high levels of insulation.

Award criteria:
Post-tender contractor interviews were scored based on two elements: quality (proposed team and experience, programme, methodology, health and safety, etc.) and commercial (where the lowest priced compliant tender achieved the maximum score and the subsequent tenders were marked proportionally).

Contract performance clauses:
The contract was monitored using an Employers Agent appointed by the University. A change control process was introduced to manage any variations to the contract documentation. The University also appointed an external Design Manager to review the developing design prepared by the contractor to ensure alignment with the University’s aspirations.

Results
Following the PQQ, six invitations to tender were issued together with the tender documents in January 2014 (with a return date set for April 2014). Tender documentation was clear and robust to ensure zero or minimal ambiguity in the market responses. Mid-tender interviews took place in March to answer any questions from potential bidders, and three complete tenders were received thereafter.

All three tenders were over the pre-tender estimate prepared by consultants. Therefore, a review of the design and specifications, particularly those significantly over cost plan allowances was necessary. Value engineering options which did not compromise the principles of the project team were identified and incorporated into the final contract documents.

The project build cost was approximately 13 million British pounds and was awarded as a single contract, which captured both buildings and all associated project works utilising a Joint Contracts Tribunal (JTC) Design & Build form of contract. Work commenced in June 2014 and was completed in September 2015.

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Environmental impacts

The Pavilion building was the first building from NTU to be awarded a carbon-negative EPC rating of A+ with a score of 9 (the average EPC rating of UK buildings is E or a score of 46).

The building has been designed to be as sustainable and energy efficient as possible. It has energy efficient glazing and a large 94kW array of solar panels on the roof. It has also been built with good insulation properties with a high thermal mass, meaning that it retains the heat to keep the building warm in the winter whilst keeping it cool in the summer. It also uses sustainably sourced materials in the construction of the new building. The Pavilion has been built utilizing a lot of natural light and LED (light-emitting diodes) lights that switch off automatically when it is sunny. It is also naturally ventilated, reducing the need for air conditioning units, except in essential areas such as the computer room (source).

The long lifespan of buildings means that poor planning in the design and construction phase can lock-in high environmental impacts over decades to come, particularly when considering that:

- Buildings are responsible for 42% of EU final energy consumption and 35% of all greenhouse gas emissions;
- More than 50% of all materials extracted from the earth are transformed into construction materials and products; and
- Construction and demolition activities account for about 33% of waste generated annually (source).

Lessons learned

* Clear and simple tender documentation and mid-tender meetings with potential contractors ensure minimal ambiguity and a better understanding of the project’s requirements.
* A realistic programme for the tender process should be established, which must then be strictly followed.
* Do not introduce significant variations to standard forms of contract, and instead focus on a select few items that may need commercial negotiation with the contractor.
* Leave any value engineering discussions until tenders are returned and ensure you have a pre-prepared schedule agreed with stakeholders; this can be issued with tender documents and then can be selected as part of the tender review.

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For related information, please see European GPP criteria for Office Building Design, Construction and Management and the Technical Background Report.