Specifying and designing public sector low carbon buildings - the productivity design approach

Delivering the future, today

Executive summary
Introduction

There is a significant need to improve the quality of new and refurbished buildings to deliver sustainable, low carbon properties that not only meet or exceed legislative targets but also provide a productive working environment. The Carbon Trust Scotland’s *Delivering the future, today* pack provides the step-by-step process and tools to achieve this goal, guiding the reader on the specification and design requirements through to monitoring the finished project. There follows an overview of the series of guides available in the *Delivering the future, today* pack, which comprises:

**Documents**
- Executive summary
- Setting the scene
- The project owner’s guide
- The project manager’s guide

**Tools**
- Client value preparation tool
- Skills, knowledge and experience tool
- Low carbon tracker.

**Authors**

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**Renate Powell**, CEng BEng, has been an energy efficiency consultant for almost 20 years, and has worked with the Carbon Trust in Scotland for seven years. During the past four years Renate has developed the support offered by the Carbon Trust, for new builds and refurbishments, assisting with the process from specification, through design, to operation. For Renate, energy efficiency is a passion in both her personal and professional life.
The ultimate aim of procurement is to create a productive workplace, which is also energy efficient. Current legislation provides for compulsory measures and incentives to guide the design process for a ‘fit for purpose’ building but this does not mean that problems are avoided: there can be a shortfall between the specification and what the end user expects. This needs to be addressed to achieve the aim as noted above.

There are four key areas which, when compromised, can affect a productive workplace as well as impact on the building’s energy use:

1. Temperature i.e. Overheating; building too cold on a Monday morning
2. Daylight i.e. Too little natural light; glare
3. Ventilation i.e. Stuffy rooms; draughts from ventilation

Introducing operational targets at the outset, in addition to Building Standards’ design targets, to define how the building will perform in use, can transform a project. The designers are challenged to make the building shape and glazing work to minimise the services demands as a first design step, rather than needing to adapt internal fit-out as an afterthought.

Thanks to setting operational targets, any design changes can be discussed with both cost and carbon impact considered.

There are time and cost implications with a low carbon build project: more time is required for design meaning a rebalancing of capital spending and there may be minor increases in capital costs. However, these should be compensated for by the resulting reduction in the revenue budget.

To manage this process it is essential that all individuals involved in a project have access to the skills, knowledge and tools that they need. This includes understanding and use of a whole life costing procedure with realistic assumptions on future energy and carbon prices.

Angus Council’s Seaview Primary School won the Carbon Trust Scotland Low Carbon Building Award for a new building in 2010. They used an in-house team to manage the development process consisting of architects, interior designers, mechanical and electrical engineers, quantity surveyors as well as staff from the Council’s energy and maintenance teams. Natural ventilation by automated high level windows is controlled by the BMS based on inside and outside temperatures and internal CO₂ levels.

Where mechanical ventilation is required, heat recovery is used to temper the incoming air. The school optimises its use of daylight using clerestory windows and skylights, combined with lighting controls based on occupancy detection and dimming when there is enough daylight.

Seaview Primary School had no overall cost premium over a comparable building with higher usage. The energy consumption is 49.8% lower than a typical new build primary school resulting in an annual cost saving of 67.7%. The lower energy consumption at the school will provide cost savings year-on-year through the life of the building.

Executive summary

‘Setting the scene’ looks at the challenges and opportunities facing organisations when procuring new buildings or refurbishments. This is a brief summary of that document.
Step-by-step guide

The Carbon Trust has developed a five-step process to help the procurement process progress smoothly and efficiently. It covers the whole procurement process from initial project inception to post-occupancy evaluation.

The five steps are as follows:
Project owner’s and manager’s guides

The project owner’s guide and the project manager’s guide describe the five-step process and associated tools in detail.

The project owner’s guide
The project owner’s overview and understanding is essential to the realisation of a low carbon building project. This guide is tailored to the person requiring such an understanding by providing a high level description of each step in the Carbon Trust five-step process to successfully procure a new build or refurbished building. Appreciating that the project owner needs to ensure the project remains focused, on track, and to budget, there are also recommended checklists for each step of the way to support this.

The project manager’s guide
This is a more in-depth guide for the project manager and members of the design team as it lays out the five-step process with more detail, including template documents and targets to support the procurement process at all stages. If followed, it should ensure that a sustainable, low carbon building representing best value with minimum whole life costs should be delivered.

These guides include processes such as:
- Ensuring that the organisation’s required values for the project are identified at project inception
- Putting together a robust business case based on whole life costing
- Ensuring that the existing building is fully evaluated, in the case of refurbishment
- Evaluation of the in-house team, external advisers and bidding teams’ skills and experience to ensure no gaps
- Ensuring the building design meets robust operational targets
- Reflecting those targets in the project documentation
- Implementing a comprehensive commissioning and post-occupancy regime to ensure that the completed building reflects the design intent and is operating to the operational targets.
Conclusion

The Delivering the future, today pack developed by the Carbon Trust Scotland will guide those involved in procuring a new build or refurbishment project to deliver a low carbon, efficient, user-friendly building.

Each individual section of the pack is tailored to the reader, giving for example a concise overview of how to progress such a project for the project owner, with a more detailed investigation of the core five-step process for the project manager. Together, the elements of the Delivering the future, today pack provide each member of the team with a comprehensive understanding of the procurement and delivery process, giving advice, real-life exemplars of both good and bad practice, activity checklists for each step, and templates for required and useful documentation.

Ultimately the aim is to help procurers avoid many of the pitfalls that are known to impinge on both new build and refurbishment projects today.

Best practice at work

Great Glen House, the headquarters of Scottish Natural Heritage in Inverness, has some excellent design features that contribute to its sustainable reputation. Its exposed concrete ceilings allow the thermal mass of the building to dampen the effects of temperature variations. On a hot summer day in 2006 outside temperatures reached 26°C and the temperature inside did not rise above 22°C. Acoustic treatment is integrated in the lighting trays in the offices and behind the wood panelling in the atrium.
The Carbon Trust is a not-for-profit company with the mission to accelerate the move to a low carbon economy. We provide specialist support to business and the public sector to help cut carbon emissions, save energy and commercialise low carbon technologies. By stimulating low carbon action we contribute to key UK goals of lower carbon emissions, the development of low carbon businesses, increased energy security and associated jobs.

We help to cut carbon emissions now by:

- providing specialist advice and finance to help organisations cut carbon
- setting standards for carbon reduction.

We reduce potential future carbon emissions by:

- opening markets for low carbon technologies
- leading industry collaborations to commercialise technologies
- investing in early-stage low carbon companies.

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