Standards & Specifications

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October 2014
Coverage.

- What Is a Building Energy Management System
- What is the aim
- Building Lifecycle
- Driving a BEMS design from A – L
- Pre Contract Stages of Influence
- Post Occupancy influence
The Building Energy Management System

Inputs

Outputs

logs

time

alarms

£

CO₂

kWh

PID

maths

logic

TREND

INTEGRATED

BMS
What are we really trying to achieve?

The Ideal Result – A compliant, Sustainable and Resilient System
The ideal result explored

Sustainable

• Most effective
• Efficient
• Innovative
• Flexible
• Sustainable

Compliant

Resilient
Building lifecycle 10:80:10
Value Engineering

Unreasonable value engineering erodes away the ideal

Collaborative value engineering has a positive outcome

Communication is key
LACK OF SUSTAINABILITY
Up to 84% of energy usage can be controlled by a Building Energy Management System

• Expensive To Run
• Excessive resource To Manage
• Can cause fundamental flaws in operation

LACK OF COMPLIANCE
System performance failure can result in lost opportunity through low staff moral or in medical scenarios worse

• High Danger of being uncomfortable
• Unacceptable risk taken with the building users

LACK OF RESILIENCE
A poor quality system design will prove more difficult to maintain and interact with

• Poor System Robustness
• Poor Flexibility / expansion
• Poor Interoperability
Driving a BEMS design.

Statutes, Legislation, Law?
Scope & Specification

• A structured list of Building Automation and Control system (BACS) and Technical building Management functions which have an impact on the energy performance of a building

• Methodology to define minimum requirements regarding BACS and TBM functions to be implemented in buildings of different complexities

• Factor based method to get a first estimation of the impact of these functions on typical buildings

• Detailed methods to assess the impact of these functions on a given building. These methods enable to introduce the impact of these functions of energy performance ratings and indicators calculated by the relevant standards
BS: EN15 232 Affecting a Standard Grade office.

- **A** Energy Performance Room Control
- **B** Partially Optimised Room Control
- **C** Standard Room Control
- **D** No Room Control

**Example office building:** control reduces primary energy requirements by more than 35%
Other Mechanisms

<table>
<thead>
<tr>
<th>BREEAM Rating</th>
<th>% Score</th>
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<tbody>
<tr>
<td>Outstanding</td>
<td>≥85</td>
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<tr>
<td>Excellent</td>
<td>≥70</td>
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<tr>
<td>Very Good</td>
<td>≥65</td>
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<tr>
<td>Good</td>
<td>≥45</td>
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<tr>
<td>Pass</td>
<td>≥30</td>
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</table>
EU.BAC Bringing things together

Certification
- Fulfilment of EU directives and national regulations
- Implementation of certification and test method
- Provision of certification system for national regulations

Standardization
- Calculation methods for energy savings

Legislation
Product certification

- Zone Controllers
- Terminal Unit Controllers

Tested in labs

System certification

- Complete installations in individual buildings

Inspected on site

Combining the two maximizes the assurance that the products and systems meet the requirements and will provide the opportunity of achieving the best energy performance in buildings.
Pre Contract Stages of influence?

Standardised Specifications, CPD’s, Training
Specifications, Timing, Level of Detail and Owner

- **Descriptive**
  - Stage B, C
  - Consultant
  - Early design / low level of outline detail

- **Open Prescriptive**
  - Stage D – E
  - Consultant
  - Final design 70% detail for tender

- **Prescriptive**
  - Stage F – K
  - Specialist contractor / consultant
  - Final design 100% detail
Management Contract

Client
100% of the risk!

Design Team
Architect
Consultant
QS

Construction Manager
QS

Works Contractor
Traditional Contract

Client
50% of the risk!

Nomination of Sub Contractors
Direct Works e.g. Hospitals

Design Team
Architect
Consultant
Quantity Surveyor

Main Contractor
Design & Build Novated or Not?

Client
- 10% of the risk

Design & Build Company
- M & E
- Structural
- Interior

Employers Agent
- Architect
- QS
- Consultant

Sub Contractor Specialist
The Future - Building Information Modelling (BIM)

- Virtual Design To Construct
  - Sizing and placement components made easier
  - M & E and other co-ordination clashes are eradicated.
  - Just in Time Delivery rather than stockpiling
  - Suitability and fit for purpose tests
  - The future? With the addition of design details, VE could be visualised!
Post Occupancy Influence

Seasonal commissioning, Soft – Landings - Auditing
up to 84% of energy usage can be controlled by a Building Energy Management System
84% of Carbon Emissions

Heating
Lighting
Cooling and ventilation
Hot water

Chart ES-b: Carbon emissions by end use in the UK’s non-domestic buildings, %

100% = 166MtCO₂
Source: BRE (2005); Carbon Trust analysis
Typical Post Occupancy Opportunities Identified.

- Poor Human Behaviour: 48%
- Poor BEMS Commissioning: 19%
- Poor Co-ordination of sub system: 24%
- Value Engineering / Innovation: 7%
- Poor control: 2%
Post Occupancy follow-up can deliver improvements.

### Trend Controls Energy Audit statistics from 2008 – 2011

Trend has conducted a large number of controls energy audits for our customers that provided instant, same day savings in excess of £9m, and saved 147,827 tonnes of CO\(^2\). The audits then also identified additional energy saving opportunities of £7m.

<table>
<thead>
<tr>
<th>Metric</th>
<th>Value</th>
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<tbody>
<tr>
<td>Number of audits completed</td>
<td>933</td>
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<tr>
<td>Number of audit days on site</td>
<td>3,420</td>
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<tr>
<td>Annualised savings achieved during the audits</td>
<td></td>
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<tr>
<td>(£)</td>
<td>£9,505,692</td>
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<tr>
<td>(kWh)</td>
<td>194,878,252</td>
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<tr>
<td>(CO(^2) tonnes)</td>
<td>147,827</td>
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<tr>
<td>Projected additional annualised savings from further investment</td>
<td>£7,133,259</td>
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<tr>
<td>Average payback time for investment in audit</td>
<td>3 months</td>
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Thank you