Building Performance Evaluation
Matt Harrison - White Design with Piers Sadler Consulting

Oakham C of E Primary School
Rutland
6 month design construction and handover review
Breeam excellent EPC B (26)

Rogiet Primary School
Monmouthshire
as above plus 2 year monitoring
highest BREEAM rating for school at the time
- obtain information
- uncover the issues
- share and discuss
  - recommend
- monitor, resolve, remediate, (ROGIET)
2FE school
SEN facility
hydrotherapy pool
IFE school
Early years
Community facility
Interviews with key design team members
- Design process - what changed?
- Handover process
- Operation and maintenance

BUS survey (Arup methodology)
- Building in use

Design and systems audit
- Does the building operate as designed/predicted?
Interviews held with
- Joan Gibson
- Jim French
- Richard Lambert
- Terry Downes
- T Clarke

Key points for further investigation:
- Training
- BMS/Operation of windows
- Maintenance costs

Transcripts and notes fed into report
BUS results show that this is one of the major causes for discomfort during rainy weather
- 13 comments about stuffy rooms when it is raining

- Positive in terms of feeling that “nothing was taken out”
- Storage issue in BUS (average score, but 21 comments on insufficient storage)

- Air permeability
- U value?
- Effect on operation of actuators?

“We did value engineering very subtly by shrinking the building down. For example, rather than removing a room we subtly changed floor sizes etc...”

“The Value Engineering decision was to link the Window master hardware to the Trend BMS. The Trend system opens and closes the windows based on internal temperature and restricts opening if it is raining or too windy. This less sophisticated system can cause problems if it is warm or stuffy inside when it is raining.”

“The Sarpa aluminum windows we have ended up with represented a massive saving compared to Velfac, but they will not reach the air permeability and performance of Velfac. I feel Velfac should have been on Wish List”
“Removal of the solar thermal array was also discussed at the VE stage, but eventually this was kept in.”

“The twin wall system was almost lost because of cost, only saved thanks to a low quote late in the day.”

“Similarly, the use of heat recovery from the extract fans providing frost protection for the kitchen AHU intake was discussed at length, but this feature was maintained.”

- Twin wall system is a key to successful performance of the building
- Loss of this system would have had huge consequence on building fabric performance

- Further investigation in Design Investigation will draw conclusions here

- Further investigation in Design Investigation will draw conclusions here
“The Support package is excellent so far. The Willmott Dixon back up system I would praise very highly, it is excellent.”

“when we were asked to take over the building we were told the building was ready - we had supposedly had training on the building systems operation - it wasn’t adequate and it was much too early.”

“Lots of technical data about specific bits of kit, but not much overall guidance e.g. where the bit of kit is in the building

- Overall comments about the handover process were positive
- Training needs to be timely and adequate
- Expectations also need to be met - full knowledge of systems may not be needed by all team members
- O&M Manual and Building User Guide - ensure there is a user-friendly guide available
General feeling is positive

All of the overall variables were above average
First focus is on those questions with below average results:

- Temperature is too hot and variable
- There is too much natural light
- Air during hot weather is too dry

Comments on forms help e.g.
- On hot rainy days windows don’t open

But
- No space provided on the BUS form to comment on “air”
- Enables wider set of views to be heard

- Answers and comments on 54 questions enables overall picture to be built up

- Allows comparison with 80 others on database

- 95% of school staff reached
Oakham BPE - the main learning points

1. Buffer zones design and education requirements

2. Natural ventilation - when a simple system becomes a complex system

3. Lifecycle costing and Renewable energy benefits - remembering build in not bolt on - Insulation vs Renewable systems

4. Processes and ownership for understanding the whole building (Soft Landings, ownership for M+E coordination in Design and Build projects)
External Buffer Zones - cloakrooms

- Act as a buffer between outdoors and indoors

- Key part of natural ventilation and airtightness strategy

- On our visit (warm but rainy day) at least 3 classrooms had propped doors open for ventilation

The flow of children through cloakrooms to the outside space works really well

It’s difficult to let the children out as the doors are very heavy — tend to leave them propped open during playtime/end of the day

I like the two doors for cloakroom area for foundation stage, so they can come in in winter and keep classroom clean.
The specification for the room is over and above that for lobby room, so falls within BB guidelines and is treated as part of overall building footprint.
Poor combination underfloor heating and direct access. Use group space as lobby in winter for younger children?

Plan first group space activity to not require significant setting up.
Ensure clarity in who takes ownership for understanding the interface between, weather systems, controls, actuators and window system.

Consider vertical opening windows or more sensitive controls where possible to avoid rain sensors closing windows when high level ventilation still needed.

- High level window and rooflight automated to provide cross ventilation
- Manual low level windows for additional ventilation in hot weather
- Windowmaster hardware with Trend software / controls - allows link to heating system
rooflights changed from 2 to one
cloakroom space opened to rest of classroom
lux levels 350-500 within BB guidelines 300-500

<table>
<thead>
<tr>
<th>Project</th>
<th>Area (m²)</th>
<th>Glazing (m²)</th>
<th>Rooflight glazing (m²)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rogiet</td>
<td>70 (inc original cloakroom space)</td>
<td>5.9</td>
<td>1.57 (total = 1 rooflight)</td>
</tr>
<tr>
<td>Ynyswen</td>
<td>66.2 (inc cloakroom space)</td>
<td>7.5</td>
<td>1.79 (total = 2 rooflights)</td>
</tr>
<tr>
<td>May Park</td>
<td>54</td>
<td>6.4</td>
<td>- (total = 0 rooflights)</td>
</tr>
<tr>
<td>Anns Grove</td>
<td>55</td>
<td>4.3</td>
<td>1.33 (total = 1 rooflight)</td>
</tr>
</tbody>
</table>
Other Issues
Colour on internal face of wall
Canopy addition to north facing classrooms
Colour on the canopy design

Opportunities
- Paint inside face of wall
- Reposition coloured canopies
- Make the rooflight blind open position the default
  e.g. implement whiteboard screen monitor, screen saver
Rogiet Primary School - Room Control Guidance

Recommendations

There are some simple things that can be done within the classroom environment to make changes.

Over and above the simple changes the system settings can be changed.

If it is regularly too hot or too cold the heating settings should be changed.

If the classrooms regularly feel stuffy or draughty the ventilation system should be adjusted.

too gloomy?

What can I do?
- Ensure roof window blind is open
- Remove artwork from windows to maximise incoming light.
- Slide back fully the window blinds rather than leave in the open position.

too hot?

What can I do?
- In summer open manual windows and doors to allow more fresh air in.
- Use remote control to open the roof-light wider if it is not raining.

What can the building do?
- Reduce the length of time the heating is on.
- Reduce the window/master temperature set point
- Enable Night Cooling

too stuffy?

What can I do?
- In summer and winter open manual windows and doors to allow more fresh air if provided this does not make the classroom too cold.

What can the building do?
- Increase opening time or opening width of windows using the Window/master control.

too bright?

What can I do?
- Use roof blind as required to minimise glare. Possibly install “student lighting monitor” to assist with control of roof blind.
- Consider repositioning tables to avoid potential glare from single roof-light.

too cold?

What can I do?
- In winter reduce use of the classroom door to the playground to prevent unwanted heat loss.
- Close the classroom to corridor door and close any manually operable windows.

What can the building do?
- Increase the length of time the heating is on and/or the morning start time.

too draughty?

What can I do?
- Close the classroom/door.
- Ensure manually operable windows are closed.

What can the building do?
- Reduce opening time or opening width of windows using the Window/master control.
Recommendations

Rogiet Primary School - Room Control Guidance

- **too gloomy?**
  - Ensure roof blinds and window blinds are open.

- **too stuffy?**
  - Open manual windows, doors and rooflight.

- **too hot?**
  - Open manual windows, doors and rooflight.

- **too bright?**
  - Use blind as required to minimise glare.

- **remember!**
  - In winter if the classroom door is open for 37 mins, this loses the same amount as Carbon Dioxide as used to make one third of a hamburger.

- **too draughty?**
  - Close the classroom/corridor door and ensure manually openable windows are closed.

- **too cold?**
  - Reduce use of the door from classroom to playground and close door to corridor.

Technology Strategy Board
Driving Innovation
Building Performance Evaluation Programme
Lifecycle costing and Renewable energy benefits –
Insulation vs Renewable systems

**Maintenance costs**
Design and Build
BREEAM
Local Authority Funding processes Capital budgets and
Maintenance budgets

Political will!
ROGIET EXAMPLE of wind turbine and frost protection
### BSRIA Process

**Q. Who else should champion Soft Landings**

**Could have prevented Nat. vent coordination issues**

<table>
<thead>
<tr>
<th>RIBA Plan of Work 2008</th>
<th>Soft Landings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stage letter and name</td>
<td>Main activities</td>
</tr>
<tr>
<td>A Appraisal</td>
<td>Identify client needs.</td>
</tr>
<tr>
<td>B Design brief</td>
<td>Develop an initial statement of requirements and procurement methods</td>
</tr>
<tr>
<td>C Concept</td>
<td>Implement and expand the brief; prepare the concept design; review the procurement route</td>
</tr>
<tr>
<td>D Design development</td>
<td>Develop concept design; Update outline specification and costs; Complete project brief</td>
</tr>
<tr>
<td>E Technical design</td>
<td>Prepare technical design and specification sufficient for coordination and information for statutory standards</td>
</tr>
<tr>
<td>F Production information</td>
<td>Prepare detailed information for construction; review information provided by specialists</td>
</tr>
<tr>
<td>G Tender documentation</td>
<td>Prepare or collate tender information</td>
</tr>
<tr>
<td>H Tender action</td>
<td>Identify and evaluate potential contractor and/or subcontractors; Submit recommendations to client</td>
</tr>
<tr>
<td>J Mobilisation</td>
<td>Let the contract issue information to the contractor; Arrange site handover to the contractor</td>
</tr>
<tr>
<td>K Construction to practical completion</td>
<td>Administer the contract; Provide further information as required; Review information provided</td>
</tr>
<tr>
<td>L Use</td>
<td>Post-practical completion</td>
</tr>
<tr>
<td></td>
<td>Review of building performance in use</td>
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</tbody>
</table>

**Not Completed**

- Bespoke process for job
- Carried out

**Q. Who else should champion Soft Landings**

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**BSRIA Process**

**Q. Who else should champion Soft Landings**

**Could have prevented Nat. vent coordination issues**
Bicester Eco School
Zero Carbon Brief regulated and unregulated emissions.

Achievement of regulated performance contractual requirement

Soft landings and performance review process being built in throughout - key gateway stages.

Natural ventilation with high performance fabric and district heating with PVs.

Applying the learning
Reaction and Discussion BPE

Who takes ownership for performance?
How does design and build factor in these processes?
Need to consider whole life carbon emissions not just energy cost?
Who pays for the process?