Comment on a planning application to build a primary school at Ensleigh 15/04633/REG03

Transition Bath would like to comment on the planning application (15/04633/REG03) to build a single form entry primary school at Ensleigh on matters narrowly relating to 'sustainability'.

We are supportive of the location of this school minimising traffic in the area, but would hope the council would learn from the 2013 Verco Energy Survey of 72 B&NES schools which demonstrated that recently built local schools have no better, and often worse energy consumption than Victorian schools despite much better insulation. We would hope that feedback from the surveys would allow B&NES to design and build a school with only 30% of the average energy consumption of the other B&NES school, removing the design mistakes inherent in recently built schools. There is nothing in the application's Sustainability Statement which would suggest that this school will be any better than any other recently built school in B&NES.

From our perspective we would like the design to include the following:

- The objective of meeting a DEC 'A' rating as has been targeted by the award winning Keynsham Civic Centre
- Include lessons learnt from the Verco Energy Survey:
    1. Install responsive heating which heats the building up quickly (i.e. not underfloor heating, or traditional wet systems)
    2. Focus on ventilation with heat recovery rather than insulation. Install good thermostatic control – TRVs on radiators often don't work well
    3. Use point of use electric water heaters for the toilets rather than distributing hot water on a circulatory system from a central boiler
    4. Install as many zones as feasible, with separate time control on each, so the whole school doesn't need to be kept warm for occasional evening or holiday use
    5. Use low energy LED lighting with ambient light dimming and occupancy control. We support the application's PIR controlled security lighting

    Further detail and evidence on each of the issues is provided on the subsequent pages
- We support the installation of solar PV on the school's roof although the size of the array is not specified

We would be happy to engage with B&NES council to improve the design of the school and to help the council learn the lessons from the 2013 Verco Schools Energy Survey in which Transition Bath was involved and create an exemplar development. Reducing energy consumption will allow the school to divert money to improve the education of the pupils.

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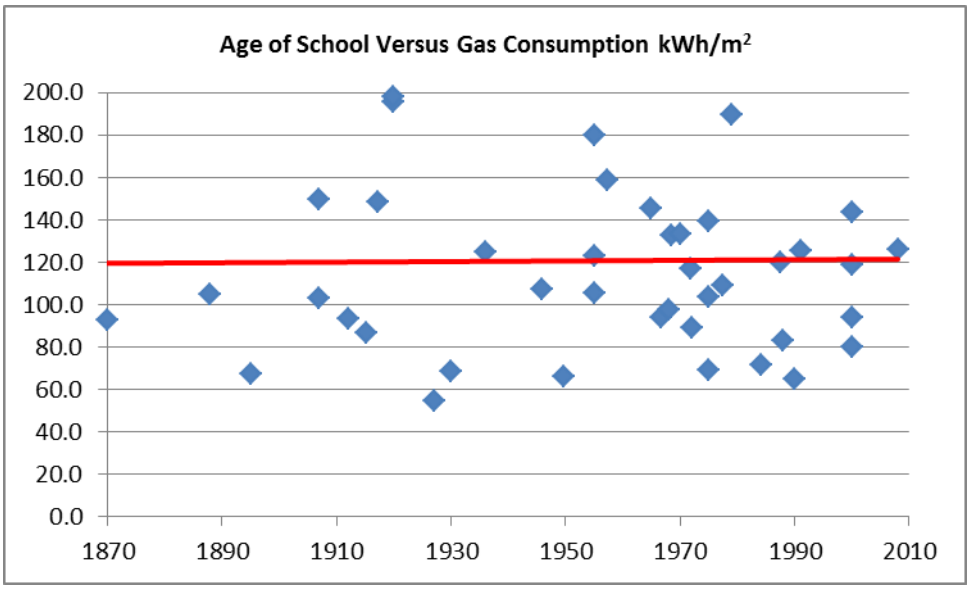
Location

We are very supportive of the location of this school as it will reduce the need for children to be transported to St Stephens or Weston All Saints primary schools both of which are a considerable distance away. This location will be better for the children – easy access by walking or cycling (steep hills?), reduced vehicle movement and therefore reduced pollution and CO2 emissions. The school would also foster the formation of a community in the new Ensleigh estate.

2013 Verco Energy Surveys: New schools consume the same energy as Victorian schools

We feel the council who are acting as the client for the school should learn from the 2013 Verco Energy survey of 72 schools in Bath that they paid for and ensure that the new school has a low energy demand. This is something which has not happened for all the recently built schools in the area. Transition Bath was involved in these energy surveys and therefore have an intimate knowledge of why modern well insulated schools have no better energy consumption than their Victorian counterparts. Many of the measures that would reduce demand cost little or nothing but need to be designed in at an early stage. Reducing energy demand is not only better for the environment but will reduce the running costs of the school freeing money up for educational purposes.

The graph below shows the gas consumption (heating and hot water) per floor area (m2) per year for each of the schools in the 2013 survey versus the date when the school was built. Exemplar new build schools elsewhere in the UK are achieving less than 20 kWh/m^2/yr – 6 times better than the B&NES average.



Frustratingly it demonstrates that there is no apparent difference in gas consumption between Victorian and modern schools in B&NES, but there should be because of better levels of modern insulation. The main reasons for this lack of better performance in modern schools is down to design mistakes.

Detailed Explanation of Issues

1. Install responsive heating which heats the building up quickly

Schools are only occupied for 15% of the year, the rest of the time – overnight, weekends and holidays they are unoccupied. They are therefore unheated for long periods and need to be brought up to temperature for the short periods they are occupied. A number of recently built schools have used underfloor heating, which is unresponsive and takes a long time to heat schools up. As a result, the heating period for these modern school is often double that of the occupancy period, a good example is Batheaston Primary whose 3-year-old building has very similar heating costs per floor area (m2) to the much older Victorian half of the building – some of this is down to the underfloor heating in the new school.

The best source of heating for getting a school up to temperature is an air based system, either centrally provided via ducts and vents (MVHR) and/or by fan assisted radiators. Wet radiator systems, although not as bad as underfloor heating are still slow to heat buildings.

2. Focus on ventilation with heat recovery rather than insulation. Install good thermostatic control – TRVs on radiators often don't work well.

B&NES currently have a policy for insulating new schools to building regulations plus 25%, but as far as we know has no guidance on ventilation.

Schools have high occupation density and thus high internal gain (30 children plus electrical equipment generate perhaps 4 kW of heat per classroom). This should be enough in most weather with reasonable insulation to not require heating. To provide a simplistic example, if you assume a classroom has

- an external net wall area of 35 m^2 with a U value of 0.25 $W/m^2/K$
- window area of 15m^2 with a U value of 1.4 $W/m^2/K$
- roof/floor area of 60 m^2 with a U value of 0.15 $W/m^2/K$

Then the heat loss at 5C ambient, with a 20C internal temperature is only 600W compared with the internal heat gain of 4 kW.

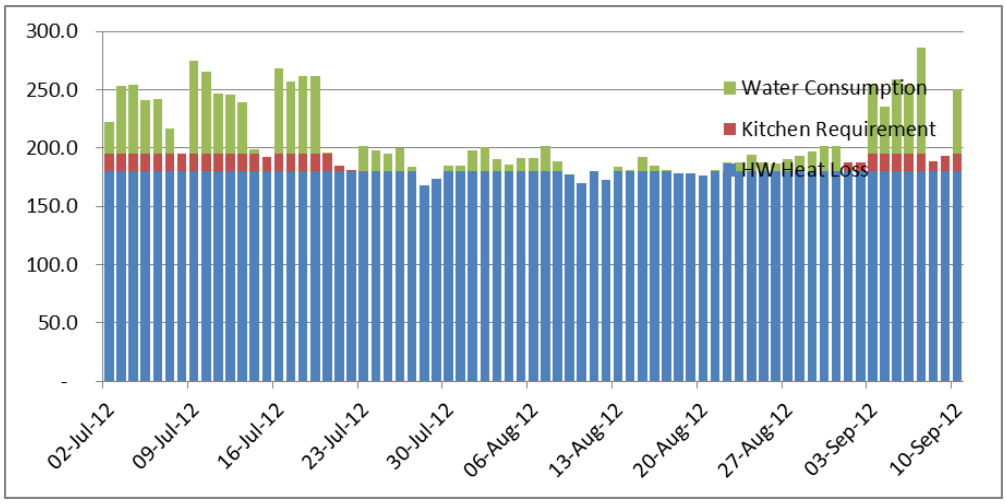
One consistent observation from the energy surveys is that windows are left open more often in winter in better insulated schools, which is a likely reason why modern schools underperform. Ventilation is required to maintain a healthy level of CO2 in classrooms, but this is only efficient when natural ventilation is combined with MVHR. A study of 24 classrooms from schools of differing ages, which is soon to be published will demonstrate excessive winter levels of CO2 in classrooms, including those of modern schools with designs similar to that being proposed on this site. The best

performing of these schools combine natural ventilation and MVHR deliver gas consumption of 20 kWh/m^2/yr 6 times less than recently built schools in B&NES.

In addition, classrooms can be made more comfortable if careful attention is paid to thermostatic control. Recommendations for improving this include weather compensated boilers, and avoiding standard radiator TRVs as these generally don't work well in schools.

3. Hot water: avoid circulatory hot water distribution systems as they are less than 20% efficient

This is the daily summer gas consumption of a primary school built in Bath in 2010:



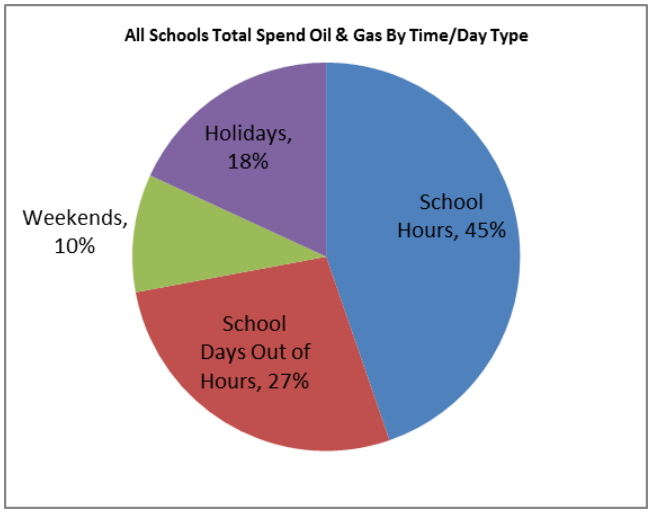
either side of a summer holiday when the school was unoccupied. The green represents hot water consumed by the school, the blue the gas consumed just to keep the system running – losses from the circulatory hot water system. The system is less than 20% efficient – it should be at least 90% efficient.

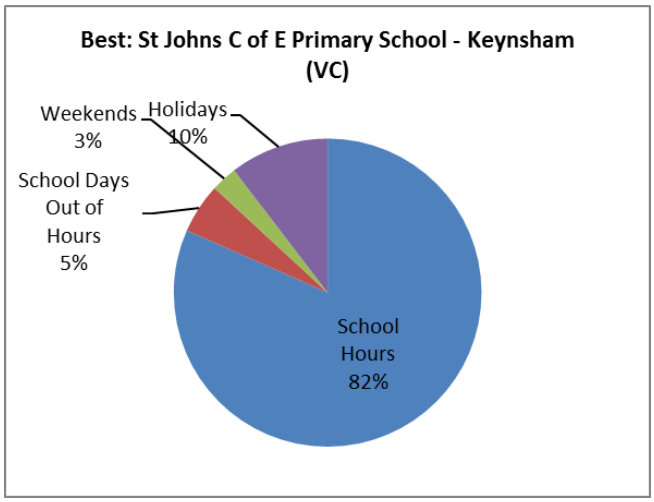
The lesson learnt from this is to avoid circulatory systems, which transmit hot water over long pipe runs within the school and even if insulated because of the high temperatures much of this heat is lost. Concerns over legionella in these circulatory systems make them difficult to design. Solving this problem is best achieved by point of use electric heaters, or smaller gas systems where you have a cluster of hot water taps. The Ensleigh floorplans suggest this could easily be achieved by having a gas system boiler in the plant room just supplying the kitchen, plus a point of use electric heater, or a small gas system boiler servicing the cluster of toilets in the centre of the school. It is likely this solution would not only be cheaper but save significant running costs – about £2,000 per year in the example of the school above, which is about 50% of their gas bill.

4. Install as many zones as feasible, with separate time control on each, so the whole school doesn't need to be kept warm for occasional evening or holiday use

Schools are increasingly being used out of standard hours and in holidays by the community, pre and post school clubs and teachers catching up on marking and preparation. Often during these times only 1 or 2 rooms in the whole school are occupied but the rest of the school is heated as zoning in

schools is typically poor. The graphs of consumption from the 2013 Verco survey of 72 schools in B&NES demonstrate this issue:





The graph on the left demonstrates that only 45% on average of school gas consumption in B&NES is actually during and just before school hours when the building is heating up. The graph on the right is the best performing school in B&NES where 82% is consumed in school hours. Heating the school unnecessarily out of hours, accounts for 35% of schools' gas consumption in B&NES.

As a minimum the following should be on separately timed zones:

- The hall – set at a lower thermostatic set point for activities, and for community events
- The staff room – so staff can work over holidays without the whole school being heated
- Kitchen – should have a separate heating system, and be sealed from the rest of the school, as commercial extractors often suck all the hot air out of the rest of the school
- Classrooms

Controls for these zones need to be simple to set and use, preferably with an online based calendar system, which can define holidays and events at least 1 year in advance. Linking the system to the school's main calendar would be very helpful, so the data doesn't need to be set twice.

5. Use low energy preferably LED lighting with ambient light dimming and occupancy control

Building regulations requires the installation of low energy lighting, which is typically via T5 florescent lighting in modern schools. We would like to see LEDs installed instead as they can be 20% more efficient and they are easier to control electronically. Occupancy, automatic ambient lighting dimming, with manual override would all make the lighting more efficient and less onerous to manage. A particular issue with primary schools is the careful placement of white boards. Often they are set opposite windows, and can't be seen unless blinds are drawn, creating similar summer to winter lighting energy consumption, and losing the benefits of natural lighting.

Conclusion

There are many more detailed suggestions we could make but for brevity we have limited our evidence to the 5 main points above. We would however hope that the council can learn from these surveys and incorporate lessons learnt from the shortcomings of recently built schools discovered during the 2013 Verco study into this new school's design so it can act as an exemplar for other schools in future. Many of these recommendations will not cost more, and will significantly reduce the running costs of the school freeing up spending for materials required to support the pupils learning. Transition Bath would be happy to help and support the council with the development of this school.