

NET ZERO ROUNDTABLE

DELIVERING NET ZERO SCHOOLS

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1 Introduction

1.1 Net Zero

The Net Zero Carbon agenda affects different sectors in different ways. Elementa Consulting have gathered a cross section of industry leaders and clients from different disciplines to discuss the benefits, challenges, and solutions in building Net Zero Carbon school environments.

1.2 Elementa Consulting

Elementa Consulting provide a full range of MEP, sustainable design and diverse consultancy services for projects in the UK and across the world.

We operate in all sectors of the built environment, providing sustainable, energy efficient, performance focused practical solutions for all stages of a buildings lifecycle to provide great environments while reducing costs and carbon footprint.

1.3 LETI

In 2017, Elementa launched the London Energy Transformation Initiative (LETI), which has now grown into a network of over 1,000 professionals within the built environment, that are working together to put London on the path to a zero-carbon future.

In January 2020, LETI released their Climate Emergency Design Guide, which sets out the approach, targets and benchmarks that developments in the UK need to achieve to reach Net Zero Carbon in operation. One of our Associate sustainability engineers, Clara Bagenal George led the delivery of this document, acting as the lead editor and coordinator.

LETI has done the collaborative research and goal setting, the next step is for designers to work towards the delivery of buildings that meet these targets. As it stands today, there is a small handful of developments that have managed to achieve or have come close to achieving this challenging benchmark.

Why is that? And what can we do to change that metric, to mitigate or even reverse, the current climate emergency. What can we do in building design and construction to meet the commitments required?



2 Roundtable Participants

| | | |
|----------|------------------|--------------------------|
| Nathan | Millar | Elementa |
| Simon | Ebbatson | Elementa |
| Rob | Harris | Elementa |
| Adeel | Ahmed | Elementa |
| Joanna | Mitchel | LTS Architects |
| Alastair | Mallett | Noviun |
| Andrew | Fifield | Architecture PLB |
| Susan | Mantle | Heyne Tillett Steel |
| Michael | Fisher | Pure structures |
| Steve | Murphy | Net Zero Buildings |
| Eliana | Linares Gonzalez | Peter Marsh Consulting |
| Richard | Daniels | Department for Education |
| Daniel | Bradder | Department for Education |
| Andrew | Spencer | Department for Education |



3 Summary of the Roundtable

Over the course of the discussion, the group shared some of their personal experiences, identifying some of the benefits and barriers to building Net Zero, what they believe the effect of Covid-19 might be on the Net Zero agenda, and what are some of the steps that we as industry leaders can take to achieve Net Zero as a standard means of building delivery.

Of the many great points raised, one of the key takeaways was the need for longer-term planning and focus at every stage of a project. Much of the embodied carbon in buildings could be saved if more thoughtful planning and intelligent decisions are incorporated at the earliest stage of building and also when making adaptations or extensions to existing stock.

The idea of compromising the future for immediate cost or time savings is no longer acceptable when considering embodied carbon. Reuse and re-purpose are also essential strategies for the industry to embrace and when building new is necessary, modular construction and off-site pre-fabrication have the highest chances of delivering the efficiency that they were designed for.

System choices and specifications are also something that should be interrogated. For example, in many cases, ceiling fans are a perfectly good alternative to air conditioning. Finally, there is a deep need for greater collaboration and information sharing of Net Zero project experience. With little data to inform decisions and limited buy-in from clients and developers, the best resources available are other industry peers and the lessons learnt from both successful and challenging Net Zero projects.

3.1 What are the benefits to you of building Net Zero buildings?

The group initially looked at the benefits and opportunities that building to Net Zero Carbon can bring to the Schools sector.

Financials:

- Some Net Zero buildings can generate up to five times the amount of electricity that they consume. This can then be sold back into the grid, creating ongoing passive income for the building owners

Differentiate:

- From a manufacturer and contractor point of view demonstrating they can deliver Net Zero is a huge added value advantage

Design:

- Net Zero promotes a focus on performance design and not the usual tick box design methodology that promotes oversizing

Construction:

- Quality is key - Longevity of building life is important vs speed and economy of construction (academic year)

Operational:

- Better and more efficient energy and operational characteristics.



3.2 What barriers can you see to building Net Zero buildings?

Having discussed the benefits and opportunities that delivering Net Zero Carbon buildings can bring, the group moved to discuss some of the barriers they have experienced.

Design:

- Each system needs to have a defined benchmark
- Structural design life is down to 60 years which has negative implications for whole life carbon emissions. Considering the fact, that many Victorian buildings are still operational and able to be retrofitted to a very high standard of energy efficiency, we should be aiming to extend the lifespan of structures to around 150 years.

Construction:

- Not good enough supervision in the delivery of schools typically.
- PassivHaus performs better because of the overall focus on site quality.
- There is no supply chain buy-in to delivery outcomes (not committed to the cause)
- Doubt whether contractors, in general, have the necessary capability to deliver. sometimes even simple details need explaining on site (lack of education)
- The design v delivery gap must be closed.
- On-site builders can cause a perfectly designed building to perform badly through lack of care when interpreting the design specifications.

Handover:

- Site maintenance teams often have limited ability to cope with the new and complex buildings they are being given

Refurbishments:

- Existing stock is a critical issue
- Retrofitting and repairing buildings can contribute up to 30% of a building's whole life carbon emissions.

Accurate measurements and metrics:

- Proper U value, condensation and detail calculations are integral to success

Accountability:

- People are not reporting against benchmarks and performance

Knowledge gap:

- Lack of sufficient number of skilled Air Source Heat Pumps install and maintenance specialists in the UK at present

3.3 How do we believe the COVID-19 pandemic will affect the pursuit of Net Zero?

- There is now huge importance put on the ability to get outside and the revision of use of indoor/outdoor spaces
- The ability to purge air from spaces is now perceived as more important than previously.
- It has pushed a much greater focus on outside learning opportunities and comfort levels
- Schools need clearer guidance. For example, there are huge health and legal implications between 1 and 2 meter social distancing guidelines



- Could have a big effect on operational energy due to the perceived need to open buildings up to change the air
- It will have big impacts on the use of space. Teaching requirements and occupancies will change
- There is a move towards natural ventilation or MVHR as opposed to hybrid mechanical ventilation as it brings in fresh air rather than recycled air

3.4 How do we as a group achieve Net Zero buildings as a standard means of building delivery?

Walk the talk:

- Working with existing stock is difficult but has distinct advantages in bringing distressed and inappropriate buildings back into life. Doing this economically is very important while improving operational and comfort characteristics.
- The best way to save carbon is not to build in the first place. Don't solve the problem by building new but re-orientating the old where possible and focus in bigger more long-term investments

Financials:

- Buildings can produce more energy than they need which can produce revenue streams
- If funding entities required sustainable carbon standards to be met as a requirement for accessing funds, this would help clients and developers prioritise a Net Zero agenda

Clients:

- Briefing and communicating what the users are going to get is really important and they need context. Temperatures and air change rates don't mean a lot to most. Need to make it tangible and overcome the barriers perceived in standards such as PassivHaus or technical jargon
- Accept that sometimes decision making is not obvious and must be interrogated

Planning:

- Need to link feasibility to operational connectivity
- Passive fabric should be the primary focus
- We need to think about whole-site future flexibility. Considerations must be given to any and all possible future refurbishment and extensions when designing for a current need. This will ensure that we do not compromise future flexibility. When compromises have been made, expansion requirements often force new sites to be used, less appropriate extensions or demolish and rebuild. All of which increase embodied carbon and costs.
- Need to think more holistically with the authorities themselves
- Space planning and layout are critical to achieving maximum space efficiency and therefore energy and cost efficiency. – How a building is going to be used deserves an in-depth analysis.
- 50% of schools have had to be re-orientated to make use of natural passive principles such as daylight - early involvement of specialists is key to avoiding these later adaptations.
- In the future we may not be able to demolish a building because of the amount of carbon embodied in it and the carbon that it would take to replace it. Therefore, buildings with flexibility of use and passive design strategies will be of higher value as they will be easier to modify.

Design:

- Overheating is as big a challenge. The obvious solution has been to install AC. However, if we are to design for future resilience from a climate change perspective, we need to be looking at other more sustainable options. Design right, so systems don't become the answer
- Example in Australia where they look to avoid AC so why can't we do it? Look elsewhere for the best examples. Ceiling fans being installed instead of AC is viable despite it being unusual in UK



- Focus on the whole life of the building and flexibility of modification. Temporary, lightweight buildings have a lower capital expenditure, but much higher environmental cost due to embodied carbon used. By planning for the long term right from the beginning, a building can become an asset to its local environment, rather than a liability.
- Shift towards lightweight buildings to save costs is not future ready.
- Design for flexibility needs to be very carefully considered
- Architects may have to relax their commitment to aesthetics in order to achieve Net Zero in their projects

Materials:

- Focus on circular economy materiality. Carefully consider the refit programme

Construction:

- Don't default to AC - Net Zero design route makes you think more carefully?
- In the future, we cannot waste the embodied carbon in our existing buildings. It must be carefully considered and integrated
- Using modular structures or building off-site creates a more controlled environment for quality control and can mitigate on-site contractor delivery and quality issues

Handover:

- Needs a focus on soft landings to get performance as designed
- Effective handover of information will help to educate building operators in the best ways to maintain their building

Data:

- Whole life costing is very important
- Real data leads to informed decisions – without the right data we can never truly understand the design \ performance gap (Lessons learnt)
- We need to get much better at post-evaluative studies of our projects, so that we are making informed decisions rather than just guessing

Differentiate:

- There is a huge advantage to contractors that can prove and demonstrate their ability to deliver Net Zero

Collaboration and Information sharing:

- Post evaluative studies are fundamental and clear from the conversation that not a lot is being shared in an effective way currently
- A higher focus on early options analysis needs to be more prevalent. The architect cannot be making the first move anymore. Collaboration from the word go. Give up ideas around aesthetics more often and challenge planners for example, as well as ourselves. Need to truly put zero-carbon first

Education:

- Existing stock from the 60's is a burden, often built cheap and fast with no regard for environmental impact. We need to make sure we have learned from history and we head on this journey in a well-rounded researched, sustainable and performance-focused way
- There are real educational benefits to designing in this way that can improve comfort and cognitive function
- Require more training for site operatives to be more effective in conjunction with quality control



3.5 Key Takeaways

Reuse + Refurbishments:

Avoid new builds whenever possible – minimise whole life carbon emissions by reuse and refurb strategies

Flexibility of design:

Think about the long-term masterplan of a school, with possible future extensions and adaptations. Even if that's not part of the immediate plan. Flexibility should be considered whole site wide rather than siloed to specific spaces or functions.

Re-evaluate requirements:

Avoid AC where possible. Ceiling fans are a viable option.

Off-site + Modular:

Increase the use of modular construction and off-site pre-fabrication to improve quality control and workmanship to balance speed of delivery

Transparency:

Information sharing and accurate data is key to success. Need much greater collaboration within the industry on this topic.

