
SEE THE LIGHT
The sustainable building conference for professionals
GEARING UP FOR 2020
13 NOV 2015


ARCHITYPE

University of East Anglia
The Enterprise Centre
Exemplary Low Carbon Building

OJEU Design Competition

Project: ‘The Enterprise Centre’
AKA ‘Exemplar Low Carbon Building Project’

Client: University of East Anglia (UEA)

Key Stakeholders and Partners: UEA, InCrops, Norwich Research Park (NRP), European Regional Development Fund (ERDF), BBSRC, BRE, Fraunhofer IWM, Kingston University

Funding: ERDF, UEA, NRP, BRE & BBSRC

Single Point Delivery Team

Morgan Sindall - Contractor
Architype – Architect, Passivhaus Designer, Embodied Carbon
BDP – Structure & MEP
Churchmans – Landscape Architect

MORGAN SINDALL

Churchman landscape architects

ARCHITYPE

BDP.

BIDWELLS

adap+

Centre for the Built Environment

UEA University of East Anglia

norwich research park

bre

EUROPEAN UNION Investing in Your Future European Regional Development Fund 2007-13

ERDF

Communities and Local Government

BBSRC bioscience for the future

The Brief

Brief - Standards and Qualitative

‘A World Class Building’ - Exemplary Academic and Workspace Environment

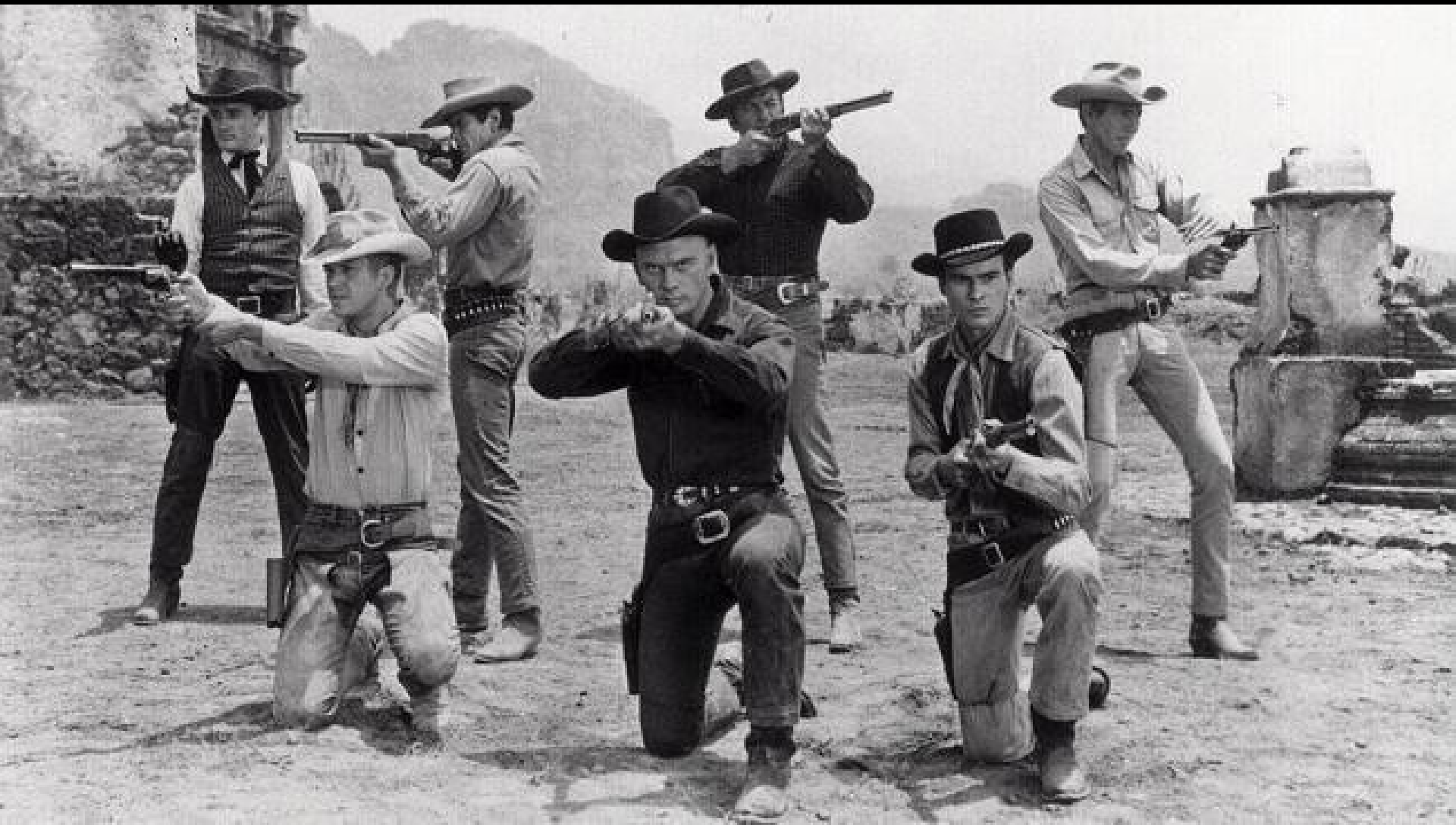
‘Gateway to the University’ and sympathetic to Earlham Park Context

Flexible, Adaptable and Ability to hold Conferences and other Events

Showcase of Sustainability

- **100 Year Design Life, including adaptation for Climate Change**
- **Passivhaus Certification**
- **Breeam Outstanding**
- **Very Low Embodied Energy and High Sequestered Carbon: Ultimate Aim to be a ‘Carbon Sink’**
- **Focus on Local Supply Chains**
- **High Use of Renewable Materials**
- **Soft Landings and 3 Year Post Occupancy Evaluation**

The ‘Magnificent 7’



Brief - Functional

Demonstration and Business Support Delivery

- **Built Environment Centre Demonstration and Exhibition Area**
- **Dynamic Testing Suite - Built Environment**
- **Offices for Business Support (ERDF & NRP)**

Lettable Floor Space

- **Hot Desk Area**
- **Start-up Units**
- **Expansion Units**

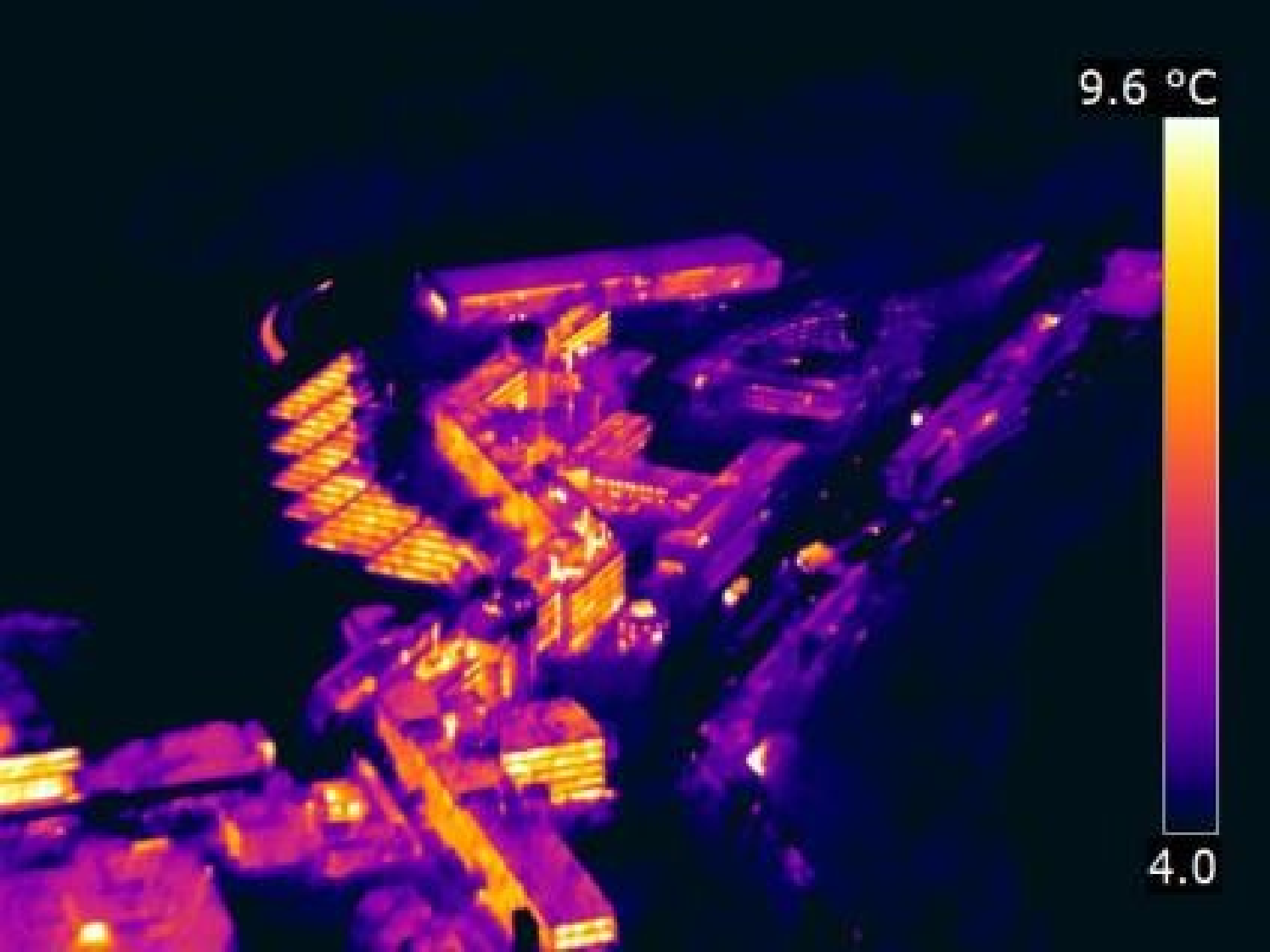
Academic Teaching and Learning Space

- **300 Seat Lecture Theatre**
- **Seminar Rooms**
- **Social Work Areas**
- **Offices**

The Context

Aerial Photo of Site from the West; VADD


computers and blues
THE STREETS


9.6 °C
4.0

BUILDING SERVICES journal
The magazine of the CIBSE

The best building ever?

PROBE Team's verdict on the Elizabeth Fry Building

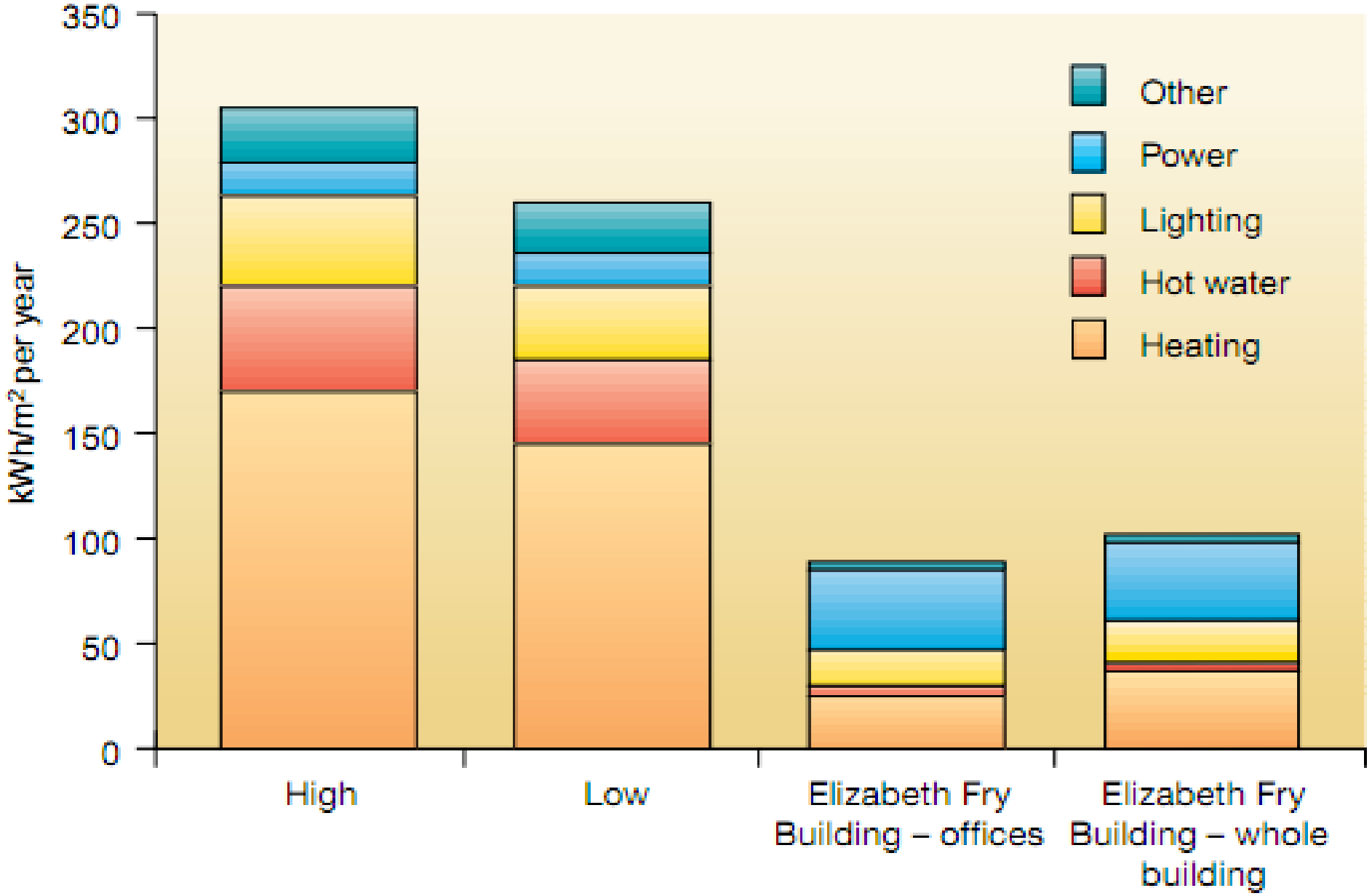


Figure 4 Annual energy consumption compared to DETR's 'low' and 'high' benchmarks

InCrops Project

Low carbon supply chains for forest products in the East of England

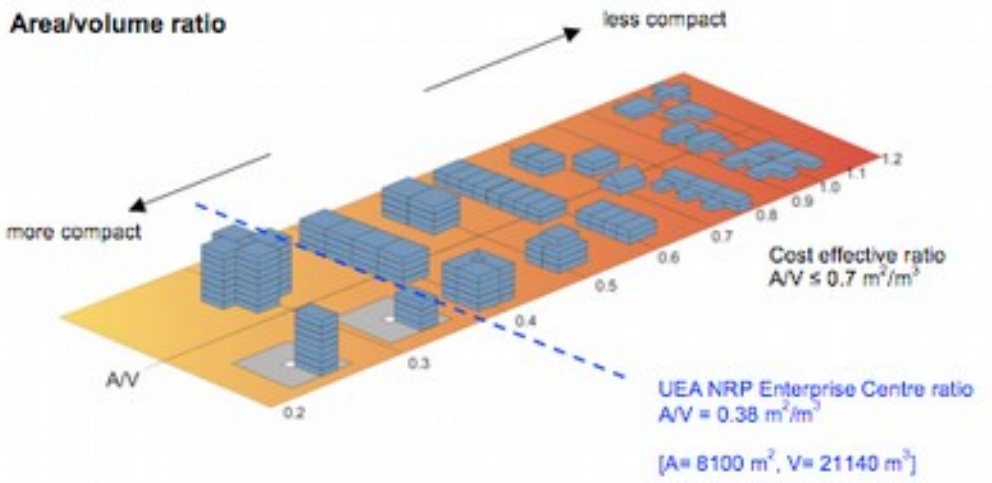
John French, Benedict Binns, Mark Coleman InCrops Ltd, UEA
Ed Suttie, Chris Holland and Martin Glynn BRE
Steve Scott, Mark Broadmeadow, Forestry Commission
Barry Haines, Norwich Business School, UEA

A report commissioned by the East of England Development Agency and produced by InCrops Ltd with BRE, Forestry Commission and Norwich Business School

ERDF EEDA UEA University of East Anglia

The Competition Response


the site



Sketch Aerial Perspective from South West

materials map

Chalk
Norwich, Norfolk

Hemp
Lime Technology, Suffolk
or
Black Mountain, Suffolk

Earth and Reed
Needham Market, Suffolk

Lime Mortar
Ashfield Traditional
Needham Market, Suffolk

Anglia Lime
Sudbury, Suffolk

New World Timber Frame
Saffron Waldon, Essex

Timber
Thetford Forest, Norfolk

East Anglia

North Norfolk Reed Cutters Association
Cley-next-the-Sea, Norfolk

Flint Cobbles
Norfolk

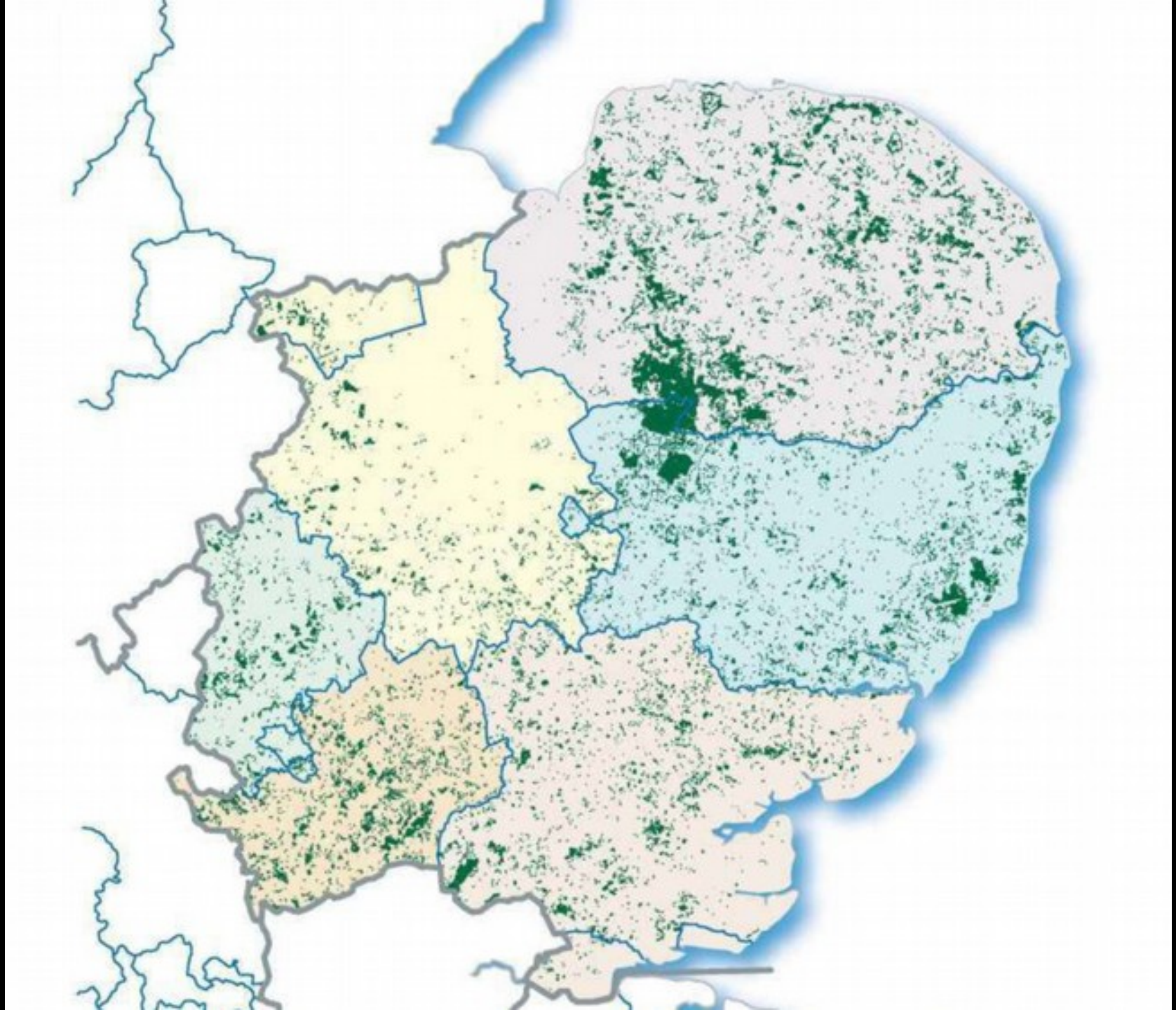
Gerald Barnes
Norwich, Norfolk

H. Gingell Ltd
Hornsea, Cambridge

Paul Bellinger
Beccles, Suffolk

Norfolk Straw Products Ltd.
Dereham, Norfolk

A large proportion of materials will be sourced from East Anglia. Where this is not possible, the majority of materials will be sourced elsewhere within the UK.



Eastern Daily Press, Saturday, January 28, 2012

FARM&COUNTRY
in association with BROWN & Co

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It's the return of the reed cutters

For centuries they have symbolised a Broadland way of life but in recent years have become as threatened as the bittern. **STEPHEN PULLINGER** reports on pioneering Broads Authority plans to revive the number of reed cutters and increase the areas commercially harvested.

Until the tide of sweeping change brought by the First world war, the tamed marshmen was a common sight throughout the Broads, carrying out commercial reedcutting as one of his duties.

However, a gradual decline in numbers over the decades accelerated in the closing years of the last century to the point where there were fewer than 30 reed cutters working on the Broads.

The legendary and much photographed reed cutter, Eric Edwards, long since retired from the Broads Authority but still working the marshes into his 70s, runs the fact that modern-day youngsters have no appetite for the rigours of hard winter toil.

Uncertain per dependent on the harvest, a scarcity of marsh work outside the January to March cutting season and increasing competition from imported reed have all conspired to deter a new generation of reed cutters.

While the formation of the Broads Reed and Sedgecutters Association (Broacs) in 2003 - promoting a fresh image of reed cutters using modern machinery - has undoubtedly helped to stabilise numbers, the future of the industry has again been threatened in recent years by landowners taking reeds out of commercial management.

However, the Broads Authority has announced a bold action plan to address the decline and significantly increase the area of Broads reed beds being commercially cut.

Andrea Kelly, the authority's senior ecologist, said: "We know there are almost 2,000 hectares of open fen on the Broads and our aim is to see 25pc of that managed commercially."

With less than 10pc of fen currently being commercially cut, achieving that target would require retrofitting the cutting on certain reed beds and bringing other neglected ones back into production.

Working on a projected reed beds map of the Broads, she said that to preserve biodiversity it was important to surround fens being commercially cut by a "mosaic" of other habitats, including wet woodland areas and fens cut in the summer rather than winter for conservation purposes.

Ms Kelly said: "There will be benefits to people, protecting the opportunities for them to live and work on the Broads, and we will also facilitate new uses for reed crops, such as compost and bioenergy to help manage the Broads."

Underlining the importance of managing the landscape to preserve the four rich biodiversity she said: "We all know the government are expecting society to find other ways to pay for conservation management.

"This plan will help to put land management on a sustainable footing."

She said landowners, who would still have a duty to manage ancient sites even if they lost government conservation payments, had already been very positive about the initiative and were beginning to employ the local cutters to undertake all sorts of wetland work.

Aiming to start implementing the action plan as early as next winter, she said: "Its other organisation is working with cutters in the same way."

Part of the plan has already seen the provision of training for new reed cutters and addressing the issue of availability of work by providing them with six-week clearance contracts outside the cutting season.

CHECKING THE CROP: Paul Eldridge gets a closer look at some of the reeds growing at Hickling Broad, while, below, Rowan Nichols is engaged in cutting duties.

Efforts would also be made to expand the market by looking for opportunities to sell lower-grade reed for thatching outbuildings. The first step has been the appointment of reed cutter Gary Elliott, 41, to carry out a survey of Broads reed beds.

Mr Elliott, who was brought up in Catfield and cuts reed at Barton Turf and Boardsman's Marsh, Catfield, will be contacting about 80 landowners and visiting sites all around the Broads to assess the quantity and quality of reed.

Priority areas will be the Ant and Bure valleys and one of the sites Mr Elliott will be inspecting is the Broads Authority-owned Stubbs Marsh, near Ludham, to see if the site - created out of grazing marsh about 10 years ago - has potential for commercial cutting.

A reed cutter for 20 years, Mr Elliott said: "Until you get to the marsh and feel the quality of the reed in your hand, you don't know."

He said he would be checking the viability of sites for expansion, looking at issues such as access and how easy it would be to remove the reed.

On reed beds which had partly turned to scrub, he would be estimating how costly it would be to restore them to a commercial quality.

Highlighting his love for the job, deeply connected to a passion for wildlife - "at Barton Turf I have even had harrier chicks visiting my benches" - Mr Elliott praised the action plan to preserve the area's heritage and "keep people in the Broads".

"We can see a future for living and working on the Broads now whereas before there did not appear to be any future," he said.

While "tips of reed is currently imported from places as far afield as China and Ukraine, he said there was a quality assurance in the case of reed cut locally.

He said: "There is a link between the cutter, thatcher and householder. Sometimes we might be supplying reed to a house in our village so we are not going to be giving them poor quality reed."

Mr Elliott said the potential for sourcing the business was shown by the fact that "everything we cut is sold before we cut it".

His optimism is shared by Paul Eldridge, 51, and Rowan Nichols, 29, who represent the new breed of reed cutters having entered the industry five years ago on a Broads Authority training scheme funded by the Heritage Lottery Fund.

Mr Eldridge, a former industrial cleaner, and Mr Nichols, who used to work on a local fruit farm, cut reed together on the Norfolk Wildlife Trust reserve at Hickling Broad.

> **"Every thatcher we have supplied was previously having to import reed and they are very excited to have English reed again. They prefer it to the foreign stuff; one reported having to take three weeks to clean out a container load of imported reed."**
>
> Paul Eldridge

Despite a frosty start to the day Mr Eldridge, who lives with his partner Natalie Deldjoo in Norwich, is completely sold on his new outdoors life despite annual earnings of only £17,000 - £2,000 for reed cutting and £15,000 for conservation work.

"Although Natalie, who is a teacher, thinks I am mental, I enjoy the outdoors life and being my own boss," he said.

"I also love the wildlife - I spotted a bittern last week and saw the cranes earlier this week."

As he and Mr Nichols have grown in experience they have doubled the pace of their work and "on a good day" cut up to 200 bundles of reed.

Praising the Broads Authority's new action plan, Mr Eldridge said the appetite for local reed was clear.

"Every thatcher we have supplied was previously having to import reed and they are very excited to have English reed again," he said. "They prefer it to the foreign stuff; one reported having to take three weeks to clean out a container load of imported reed.

"And their customers are also delighted to find out where the reed has come from locally."

The pair, who also cut reed at Ranworth, St Olaves, Somerleyton and How Hill, agree that the co-operation of landowners - for example in controlling water levels - will be crucial for the expansion plans to work.

Broacs chairman Richard Starling, 66, who lives in Somerton and cuts reed at nearby Blomes Broad, said he was "very positive" about the new initiative which he saw as a way of "reconnecting conservation with sustainable management again".

He said: "At the moment, thatchers have little choice but to use imported reed owing to the limited availability of UK reed.

"Sadly traditional and sustainable reed bed management ceased on many sites in favour of longer-term recreational cutting and burning.

"Other issues impacting on production include access problems, changing water-level regimes, the cessation of traditional clearance/cutting in excessive areas of spoil and scrub encroachment."

Mr Starling said the Broads Authority's new initiative should be developed across the UK to create new employment opportunities.

"There are several thousand hectares of reed beds throughout the UK but I understand that it is only in the Broads where there is a desire to encourage further commercial participation in reed bed management," he added.

■ **To watch a video of Eric Edwards demonstrating reed cutting visit www.edp24.co.uk**

STRUCTURE

'Brettstapel' is used for the walls. It's a high strength solid timber construction system, which is super low embodied energy and needs no glue or metal fixings. It is made from local timber sourced from Thetford Forest

Larsen trusses sit outside the Brettstapel system forming a 'duvet' layer. The trusses are filled with hemp insulation to achieve the U-values required for Passivhaus

CLADDING AND RENDER

A striking feature is the thatch cladding which marks the entrance to the building. Long straw thatch panels made in barns around Norfolk have been brought to site, bringing thatch into the 21st century

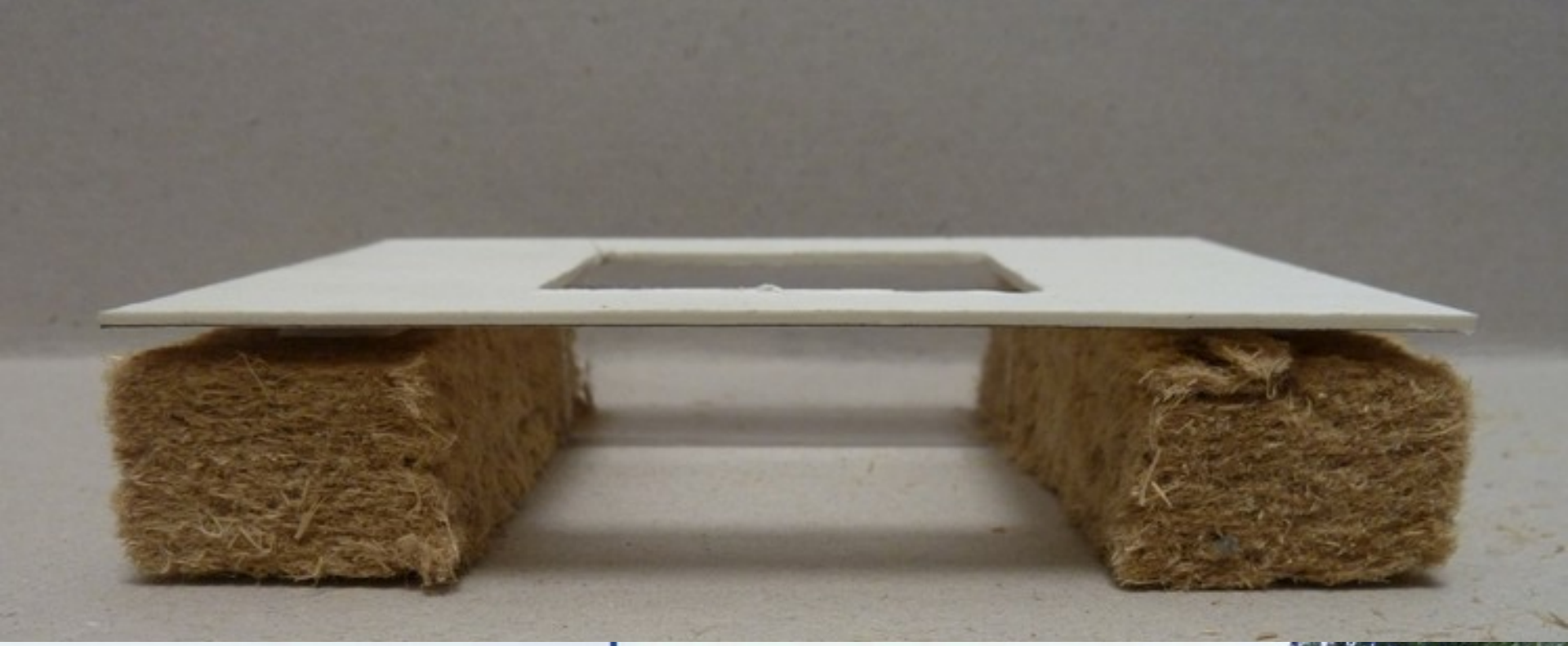
The lecture theatre is finished with lime render which creates a light and reflective surface

NATURAL INTERIORS

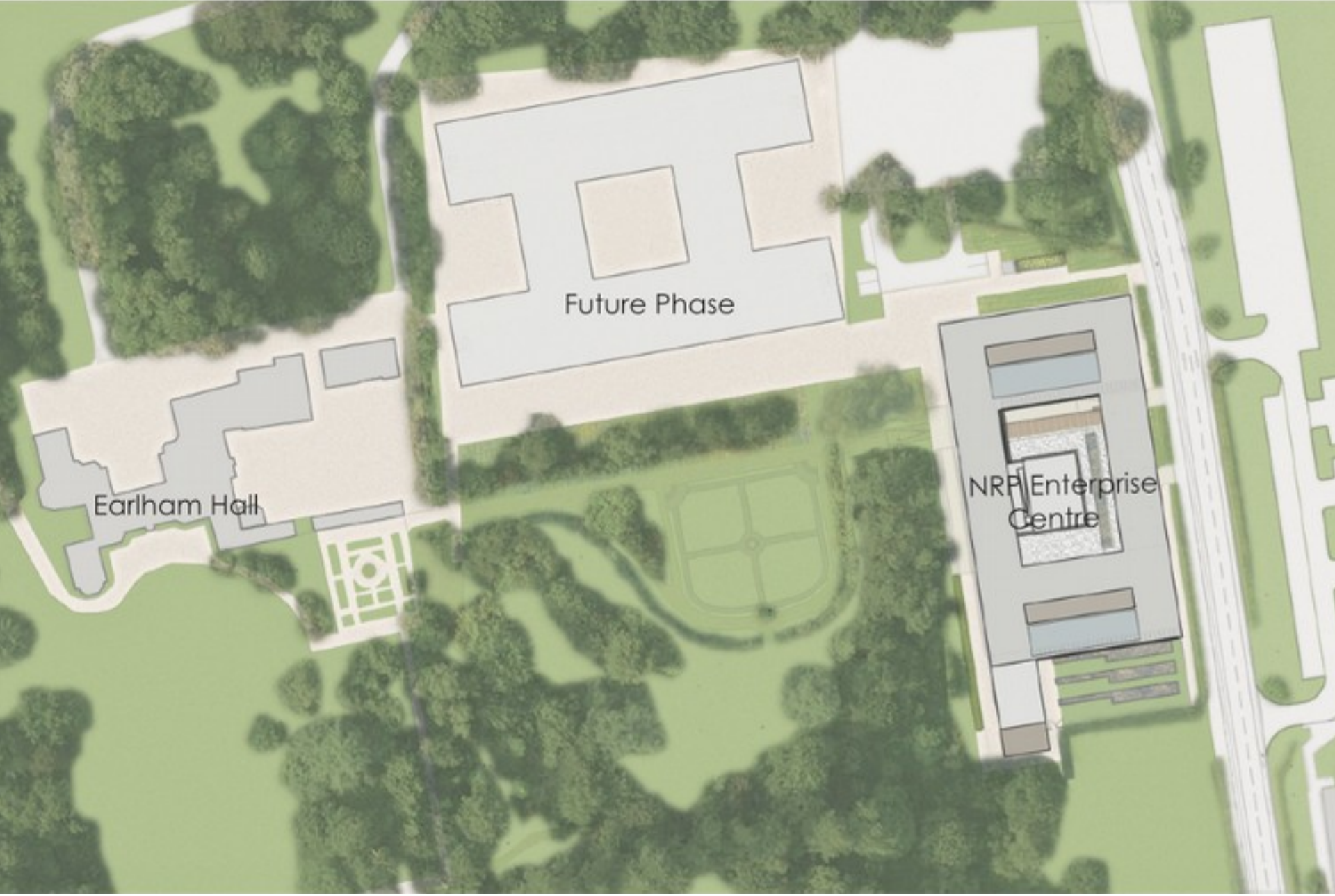
Local joiners are helping to build timber staircases, with hardwood treads and handrails that are robust and resilient

Highest quality Glulam frames are used inside the building. These create flexible spaces that are warm, textural and super eco

Acoustic ceilings will be made from Troldtekt, which is a high performance and visually interesting wood-wool material




UEA



Competition Masterplan

Competition Ground Floor Plan

PASSIVHAUS

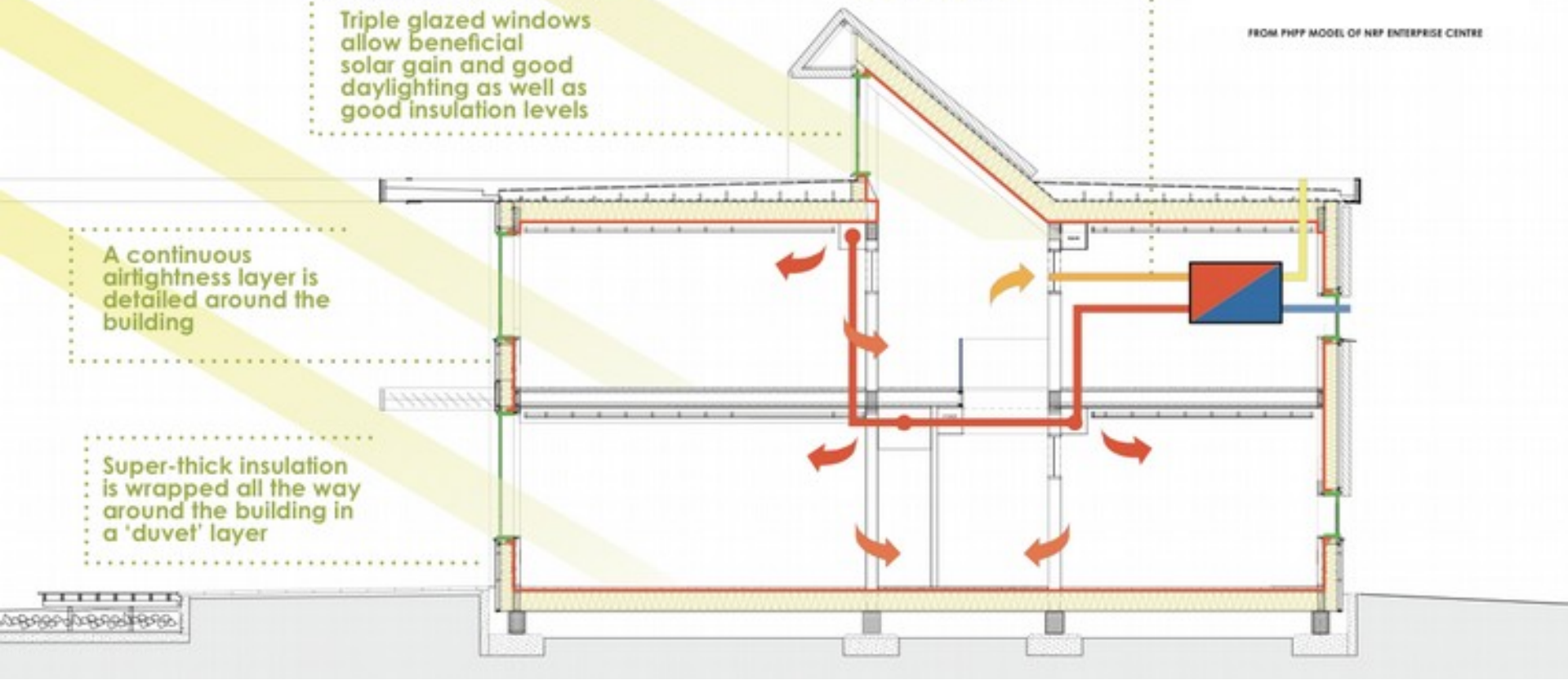
The NRP Enterprise Centre will be designed to achieve Passivhaus certification, which provides a comfortable internal environment along with radically reduced energy usage. Designing to meet Passivhaus requires attention to key design features.

Mechanical ventilation with heat recovery (MVHR) is used to provide fresh air to all spaces. Additional summer ventilation is provided by opening windows and louvres, stack effect and high-level exhaust

Triple glazed windows allow beneficial solar gain and good daylighting as well as good insulation levels

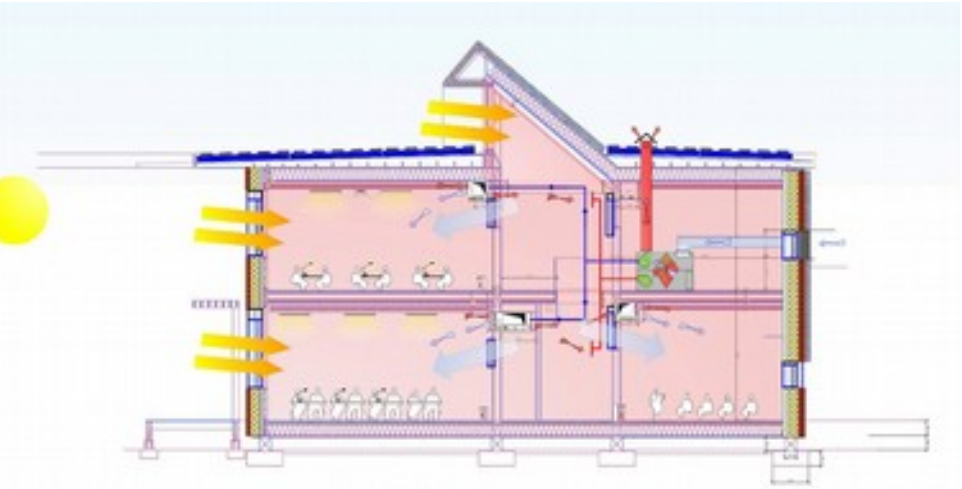
A continuous airtightness layer is detailed around the building

Super-thick insulation is wrapped all the way around the building in a 'duvet' layer

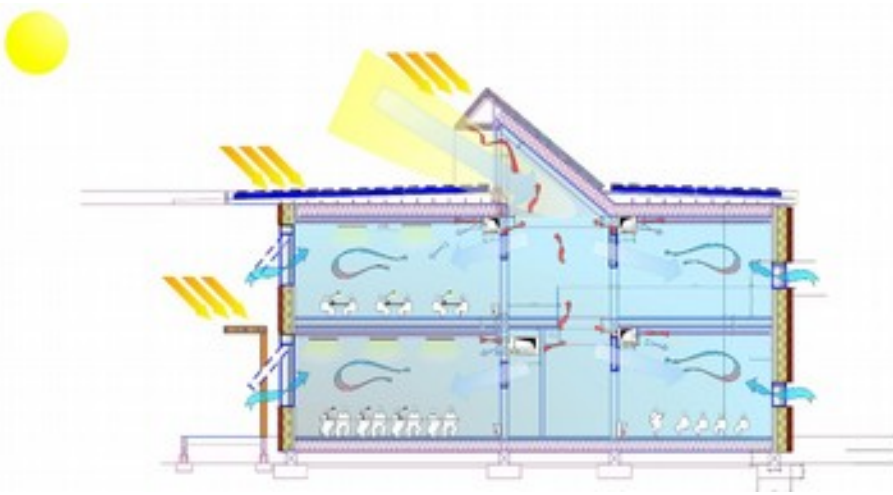


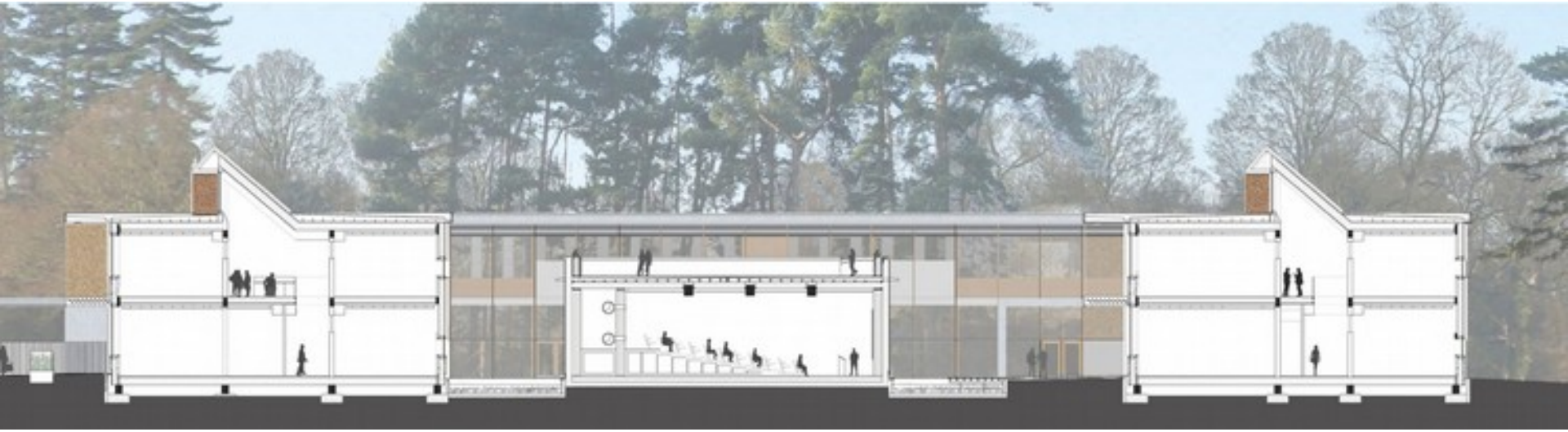
FROM PHPP MODEL OF NRP ENTERPRISE CENTRE

Winter Strategy



Summer Strategy





North South Section

Design Response

STAGE 1 INCEPTION AND BRIEFING

B2 Review past experience

-The Good, The Bad & The Ugly

MORGAN SINDALL ARCHITYPE

STAGE 1 CHECKLIST: INCEPTION AND BRIEFING

SUPPORTING NOTES

B1. Define roles and responsibilities
Roles and kinds of responsibility must be spelt out clearly from the very beginning. If nothing else, this will highlight any gaps. Sometimes the project leader may also need to review how well certain individuals are suited to their assumed roles. It is not enough to have the right job titles: individuals also need the right mix of ability, experience and temperament.

To ensure that the design reflects operational needs, it is important to involve the client's facilities management team early on, ideally with the individuals who will take over the installed systems. If staff are not yet appointed (for example, because the building will be sold on, or operations outsourced), then independent advice will often be desirable.

B2. Review past experience
Past experiences of team members and others will benefit the briefing, design, and construction process, and allow better and more realistic targets to be set. The project manager should seek to elicit all relevant experiences - good and bad - in a spirit of openness. These will be hugely beneficial to the project.

B3. Plan for intermediate evaluations and reality checks
The programme should incorporate opportunities for intermediate evaluation workshops. These will help to ensure that stakeholders are fully engaged as the design develops and that input from key users is obtained and not lost along the way. The workshops will help to flush out misconceptions on all sides. Topics will also come up which may seem incidental at the time but which can help to identify and sometimes to resolve decisions on things which might otherwise be overlooked, or taken for granted.

B4. Set environmental and other performance targets
The processes of target setting, prediction and measurement will highlight the need for roles and expertise on the client side. Clients may not have anticipated some of the skills and activities required. Targets will normally have to satisfy the criteria of being unambiguous, measurable and of some value. An independent occupant questionnaire survey will normally be a standard part of Stage 5: Years 1 to 3 Aftercare. The results should be benchmarked against the database of the survey providers, and published.

B5. Sign-off gateways
Premature decision-taking can stunt innovation. However, there will be no chance of optimum success if one leaves too many loose ends for too long. Sign-off gateways create the structure for fixing decisions. Gateways are both entry and exit points, but different criteria may be applied depending on entry and on exit, after which the requirements will be more binding on all parties.

B6. Incentives related to performance outcomes
For the environmental and other targets set in B4, the team needs to agree how to measure performance in use, and what action is appropriate if anything falls short. A suitable action might be for the design and building team to agree to follow up any shortcomings and to suggest how performance might be improved.

Clarity on the client side is absolutely essential, particularly in defining responsibilities, identifying the chain of command and agreeing the decision-making protocols. If any independent advisors are involved, it is important to clarify what authority they have, and that everyone in the project team is aware of it.

Teams should identify a Soft Landings Champion who has the responsibility to ensure that the Soft Landings process is developed to suit the project, is followed through the entire procurement process and on into use. The Champion should also ensure that Soft Landings principles take their proper place as part of the routine management of the project and are properly resourced. The Champion needs to be someone who has an interest in the in-use performance of the building, and is likely to be on the team for the full duration of the project, for example the client representative, the job architect, or the project manager.

Communication between designers and facilities managers can be difficult owing to their often very different perspectives. It is unlikely to happen automatically, so the client's project manager needs to make sure that it does. If not, some clients and designers may well have ideas that in practice prove to be too complicated, or too difficult to look after. As commonsense complexity is often the prime cause of occupant dissatisfaction with the indoor environment (and of excessive energy use), it is vital to address complexity problems by designing for usability and manageability, either simplifying the solutions or increasing the levels of facilities management budget and skills.

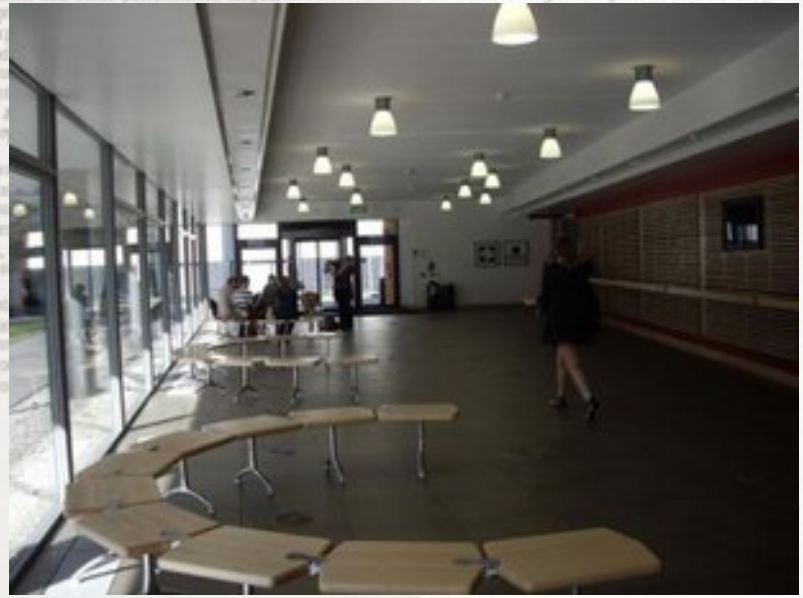
Where quantified targets are not practicable, for example owing to the difficulty of calculation, or a lack of suitable metrics, qualitative indicators (for example, on a scale of good practice - best practice - innovative - pioneering) can be useful guides in helping to calibrate client aspirations, and to orient them during design reviews. A suitable action might be for the design and building team to agree to follow up any shortcomings and to suggest how performance might be improved.

Some people would like to see financial incentives, such as a bonus to the design and building team for meeting certain performance levels. Penalties for falling short are more contentious and could be expensive and complicated to make legally bullet-proof: a requirement to investigate and report may be preferable.

STAGE 1 INCEPTION AND BRIEFING

B2 Review past experience

-The Good, The Bad & The Ugly



MORGAN SINDALL ARCHITYPE

STAGE 1 INCEPTION AND BRIEFING

B2 Review past experience

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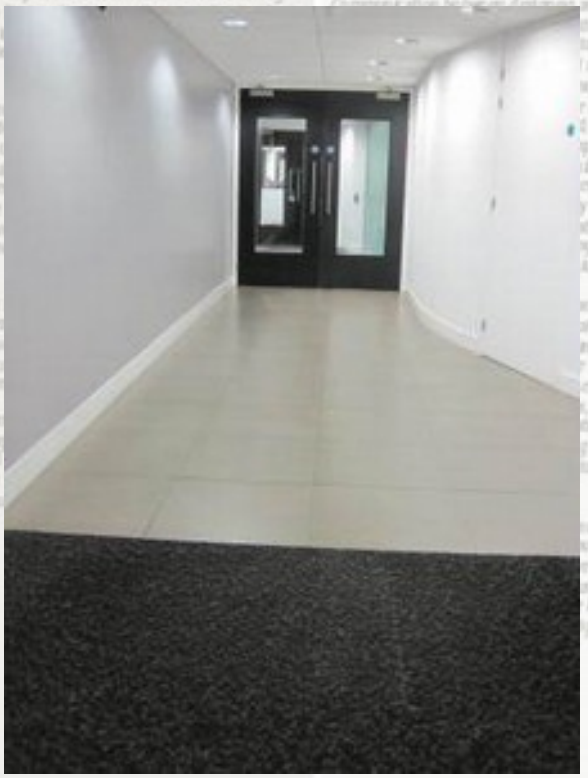

MORGAN SINDALL ARCHITYPE

STAGE 1 INCEPTION AND BRIEFING

B2 Review past experience

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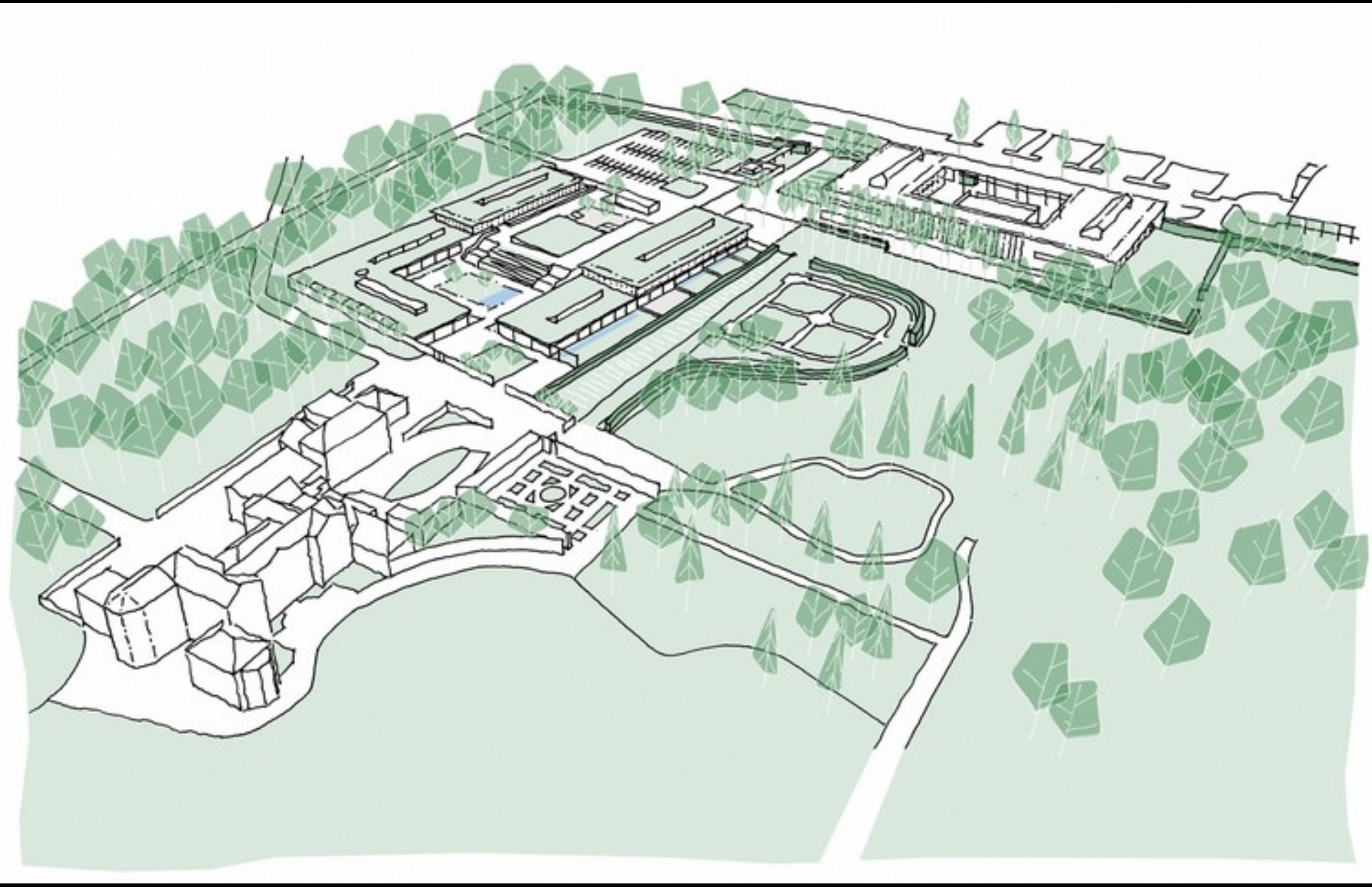
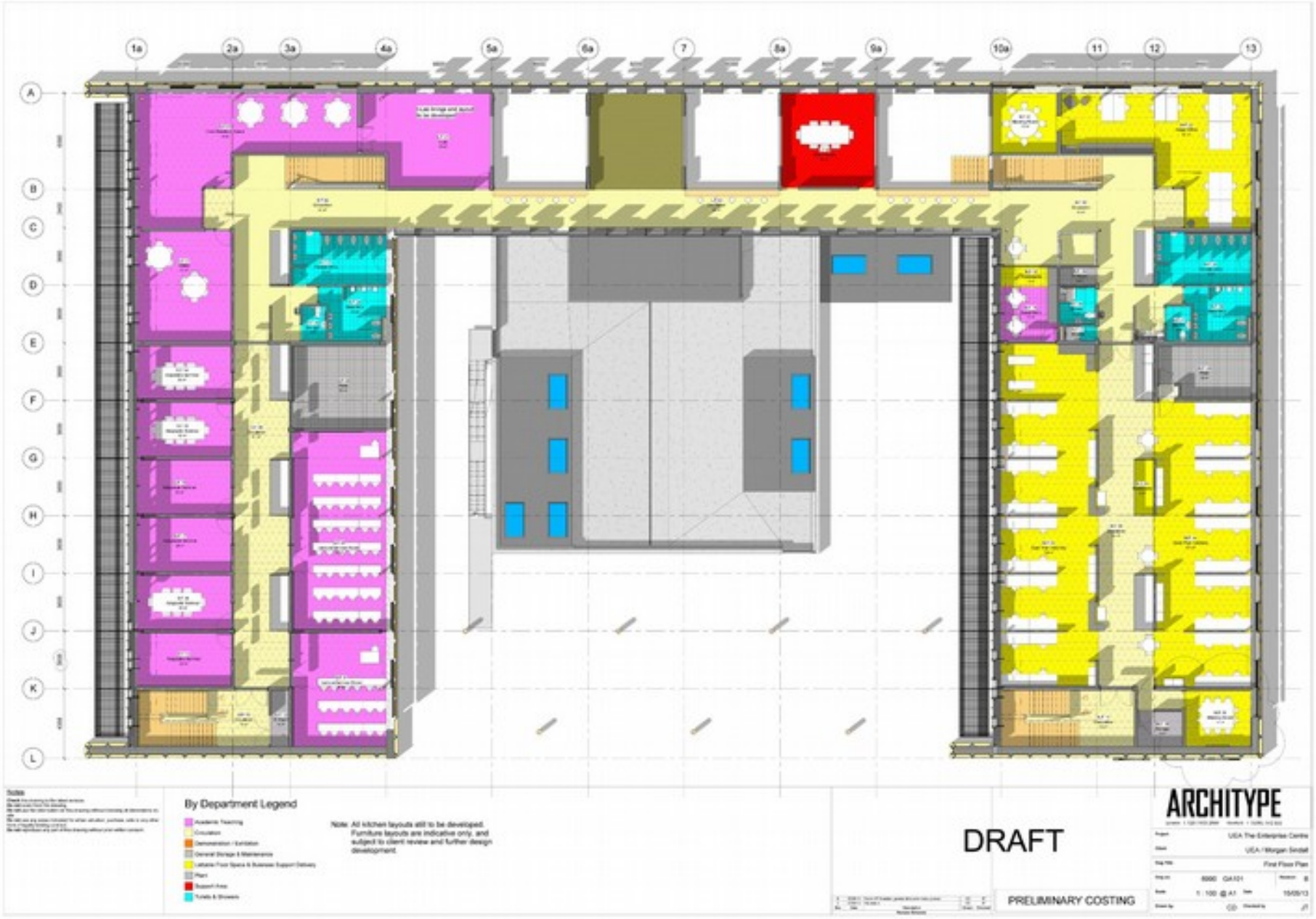
MORGAN SINDALL ARCHITYPE




UEA Academic Building
Future Development
Car Park
Earlham Hall
Car Park
Access Gate
Terraces
Memorial Garden
Kirkhouse Gardens
Main Entrance
University Drive
Earlham Park


60 spaces currently
energy centre / bins
4 disabled spaces
drop off
testing pavilion
82 No.' double decker' cycle stands
Exhibition Garden
Terraces
Visitor Entrance
ed Herbaceous Border and edging
University Drive
70 spaces currently
NRP Enterprise Centre
Terrace with rail
Main Entrance
12 no. cycle stands
Memorial Garden

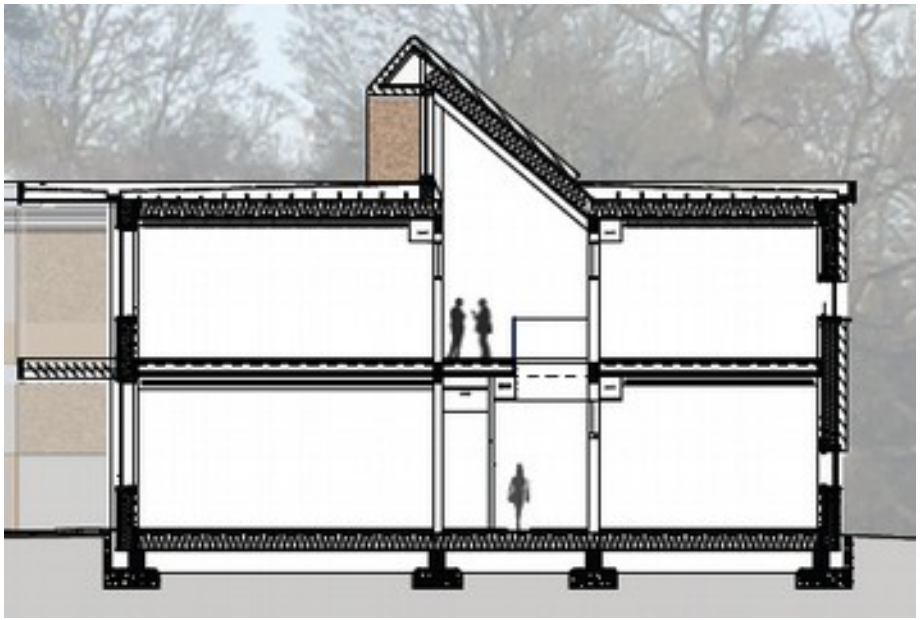
Ground Floor Plan



First Floor Plan


UEA

- **PHPP model** completed to assess fabric thermal efficiency
- Preliminary calculations completed to assess gas vs district heat
- Design was developed to a high level of detail to ensure compliance with PH.



Passive House Verification

Building:	NSF Enterprise Centre	
Location and Climate:	East Anglia	East Anglia
Street:	University Drive	
Postcode/City:	Norwich	
Country:	UK	
Building Type:	University teaching, small businesses and exhibition/conference	
Home Owner(s) / Client(s):	UEA	
Street:		
Postcode/City:	Norwich	
Architect:	Architype	
Street:	18 Leathermarket St	
Postcode/City:	London SE1 3JA	
Mechanical System:	NSF	
Street:	16 Brewhouse Yard	
Postcode/City:	London	
Year of Construction:	2013	
Number of Dwelling Units:	n/a	Interior Temperature: 20.0 °C
Enclosed Volume V_e:	m³	Internal Heat Gains: 3.5 W/m²
Number of Occupants:	570.0	

Specific Demands with Reference to the Treated Floor Area

Treated Floor Area: 3222.8 m²

	Applied		Monthly method	PH Certificate	Fulfilled?
Specific Space Heating Demand:	7	kWh/(m²a)		15 kWh/(m²a)	Yes
Heating Load:	9	W/m²		10 W/m²	
Pressurization Test Result:	0.6	h⁻¹		0.6 h⁻¹	Yes
Specific Primary Energy Demand (DHW, Heating, Cooling, Auxiliary and Household Electricity):		kWh/(m²a)		120 kWh/(m²a)	
Specific Primary Energy Demand (DHW, Heating and Auxiliary Electricity):		kWh/(m²a)			
Specific Primary Energy Reduction through Solar Electricity:		kWh/(m²a)			
Frequency of Overheating:	4	%	over 25 °C		
Specific Useful Cooling Energy Demand:		kWh/(m²a)		15 kWh/(m²a)	
Cooling Load:	4	W/m²			

We confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The calculations with PHPP are attached to this application.

Issued on:

signed:

VERIFICATION PAGE EXTRACT FROM PHPP, SHOWING CURRENT RESULTS

Primary Energy (PE)

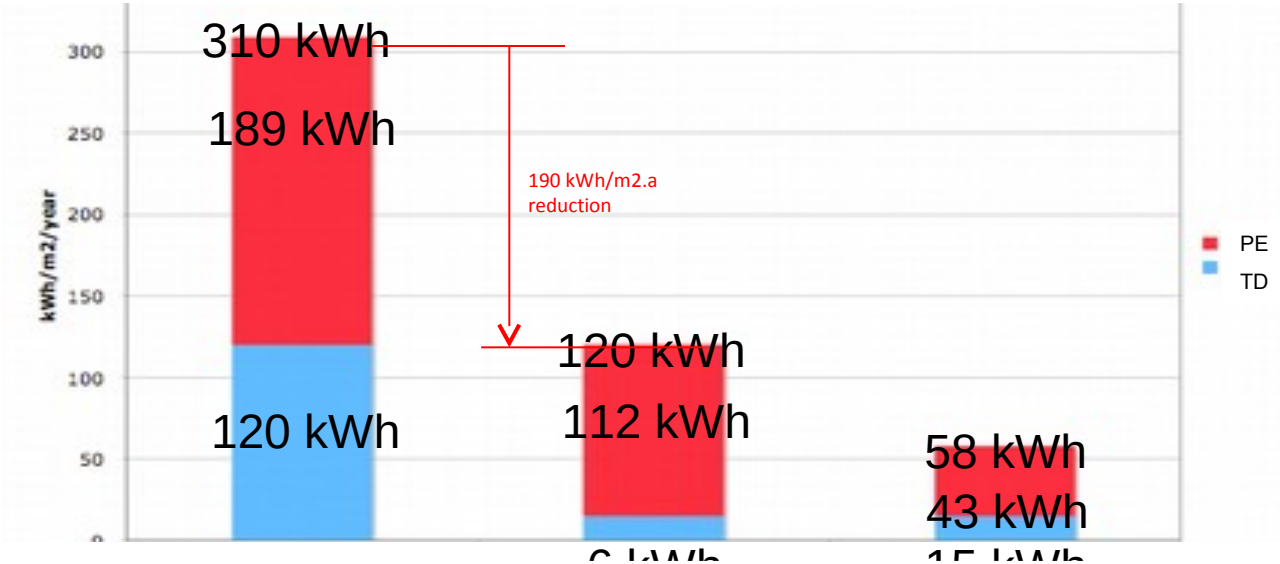
A total Primary Energy of 120kWh/m2.a will be achieved

This figure includes grid loses at a rate of x2.6, and is before renewables inclusion

This figure includes all electricity use, including small power and HVAC.

Key factors to achieve this target include:

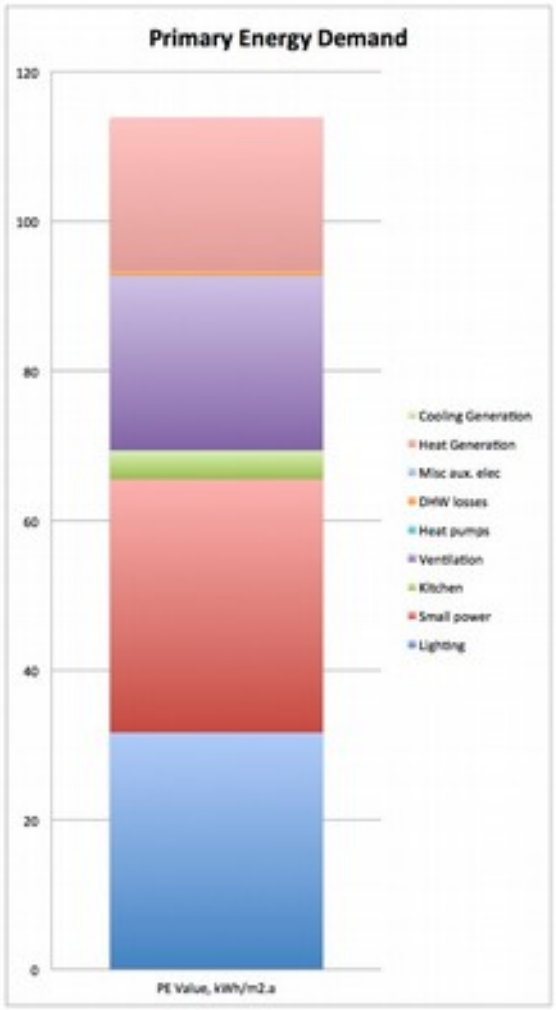
- **Extremely efficient HVAC systems**
- **Energy efficient lighting and sensible controls**
- **Good daylight design**
- **Optimised kitchen design**
- **Efficient thermal energy supply**



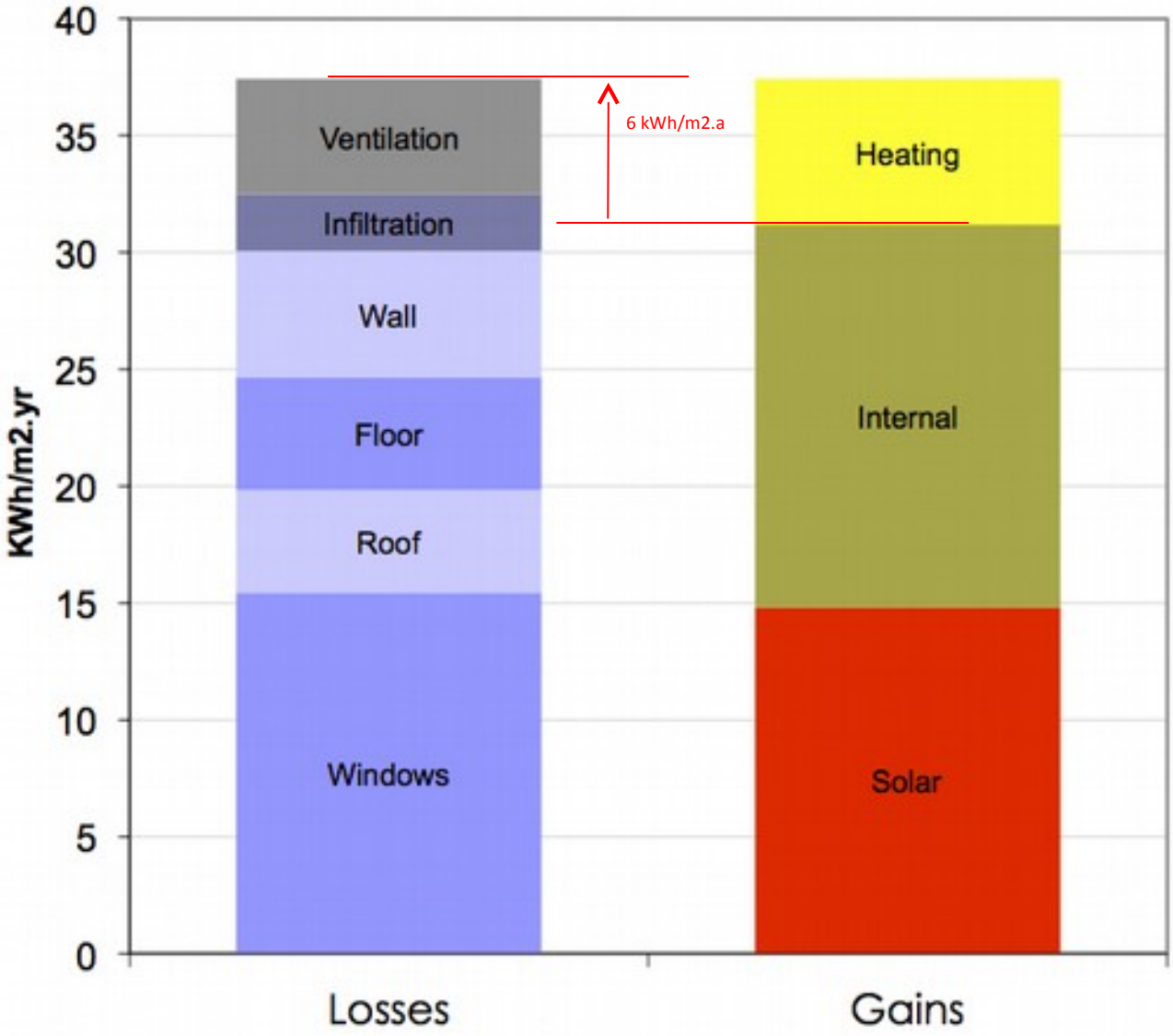
Typical Education

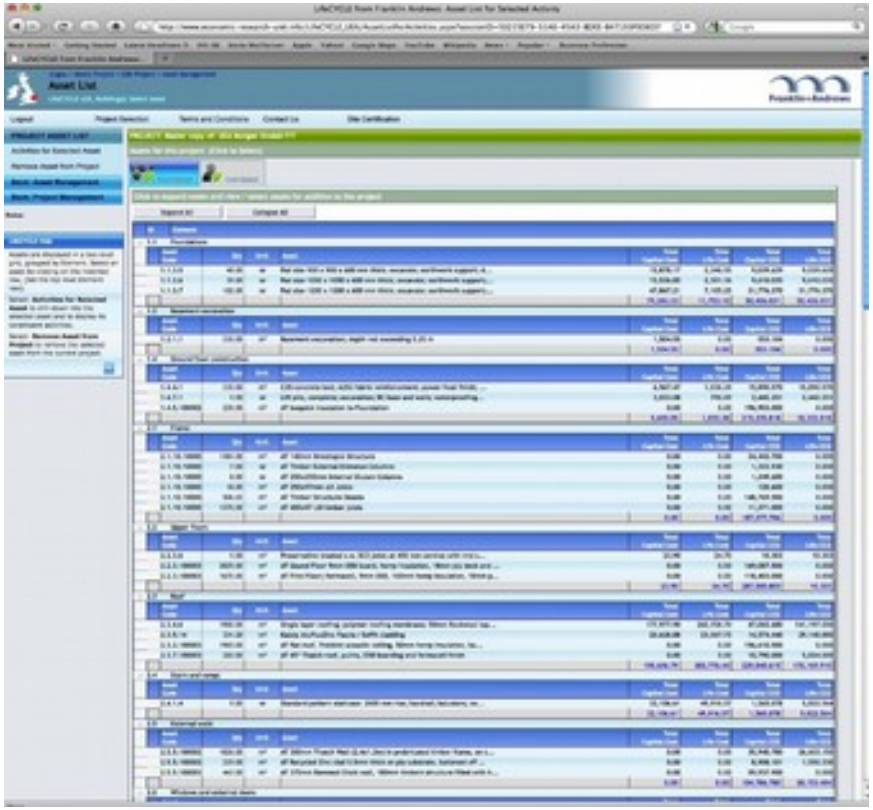
UEA NRP Building (Predicted)

Frankfurt Passivhaus School (Actual)



UEA NRP Building (Current PHPP Breakdown)


40
35
30
25
20
15
10
5
0
KWh/m2.yr
Ventilation
Infiltration
Wall
Floor
Roof
Windows
6 kWh/m2.a
Heating
Internal
Solar
Losses
Gains



LifeCYCLE by Franklin + Andrews

Data base system for recording all building components in a conventional QS measuring way, with additional capital & lifecycle Carbon added to this – suitable for a fully design building Carbon calculation only.

RAPIER by Architype

Rapid modelling tool to asses the impacts of design changes on Cost, Carbon & Energy, optional analysis can be done in minutes – suitable for early design stage Carbon calculation through to detailed design.

Web based user interface:

Desktop, Laptop, Mobile, Tablet

Powerful cloud based processing

Rapid results

MULTI PLATFORM

Rapiere is compatible with all media platforms, including desktop, mobile and tablet, allowing access in 'real time' wherever you are.

"Love the user interface"

Paul Woddy
BIM Expert and member of original Autodesk Revit Team

Hemp Insulation

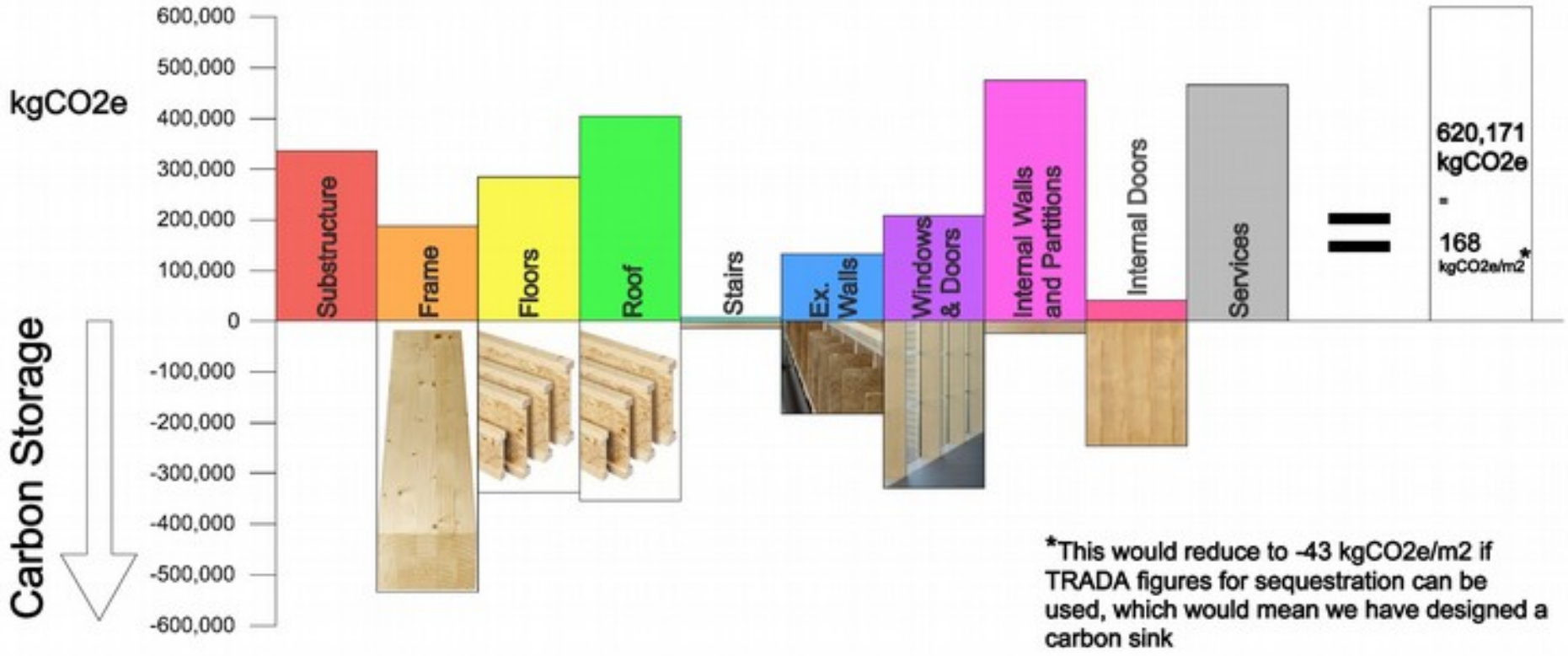
-173,000 kgCO2e

Thatch Cladding

-28,000 kgCO2e

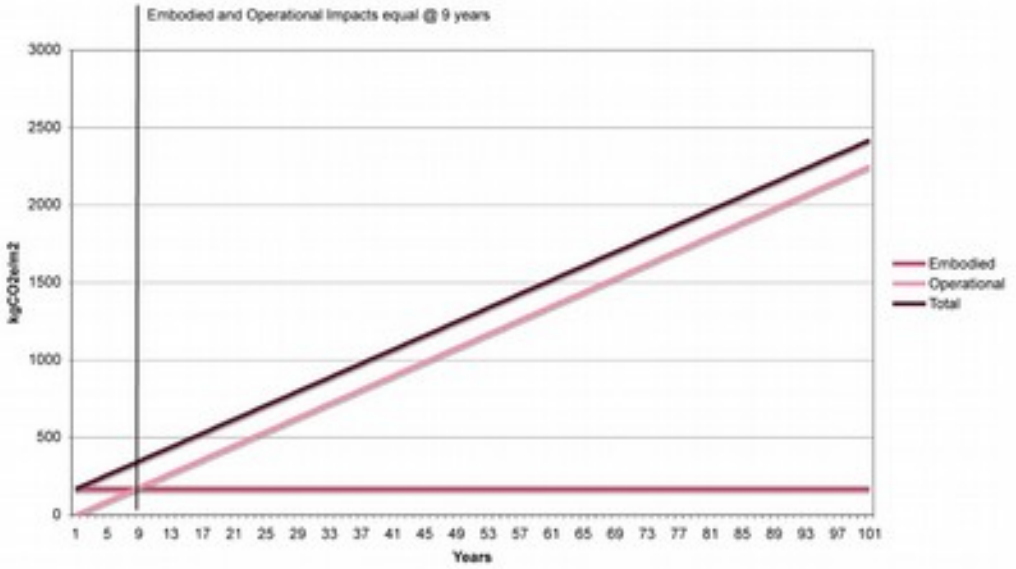
Timber Structure

-1,821,000 kgCO2e


kgCO2e
600,000
500,000
400,000
300,000
200,000
100,000
0
-100,000
-200,000
-300,000
-400,000
-500,000
-600,000
Carbon Storage
Substructure
Frame
Floors
Roof
Stairs
Ex. Walls
Windows & Doors
Internal Walls and Partitions
Internal Doors
Services
620,171 kgCO2e
=
168 kgCO2e/m2*
*This would reduce to -43 kgCO2e/m2 if TRADA figures for sequestration can be used, which would mean we have designed a carbon sink

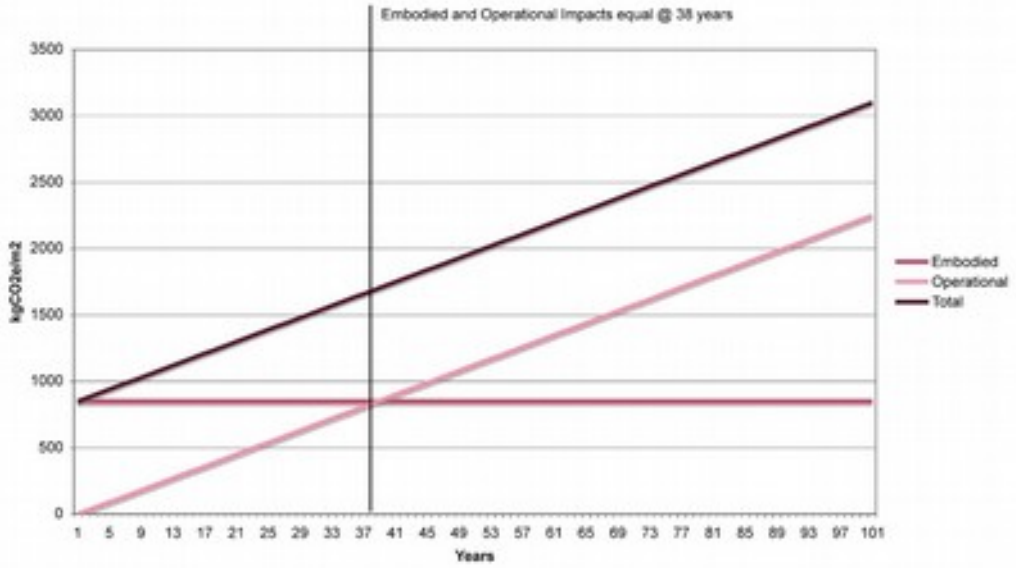
UEA - Low Embodied Energy

Embodied vs. Operational - cumulative kgCO2e emissions

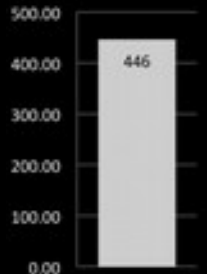


UEA - Conventional Construction

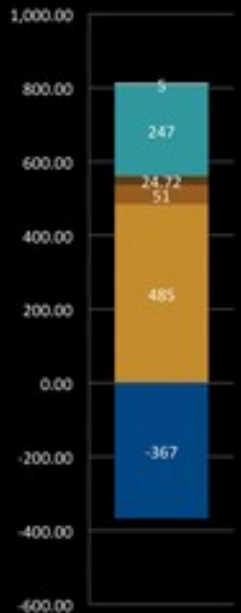
Embodied vs. Operational - cumulative kgCO2e emissions



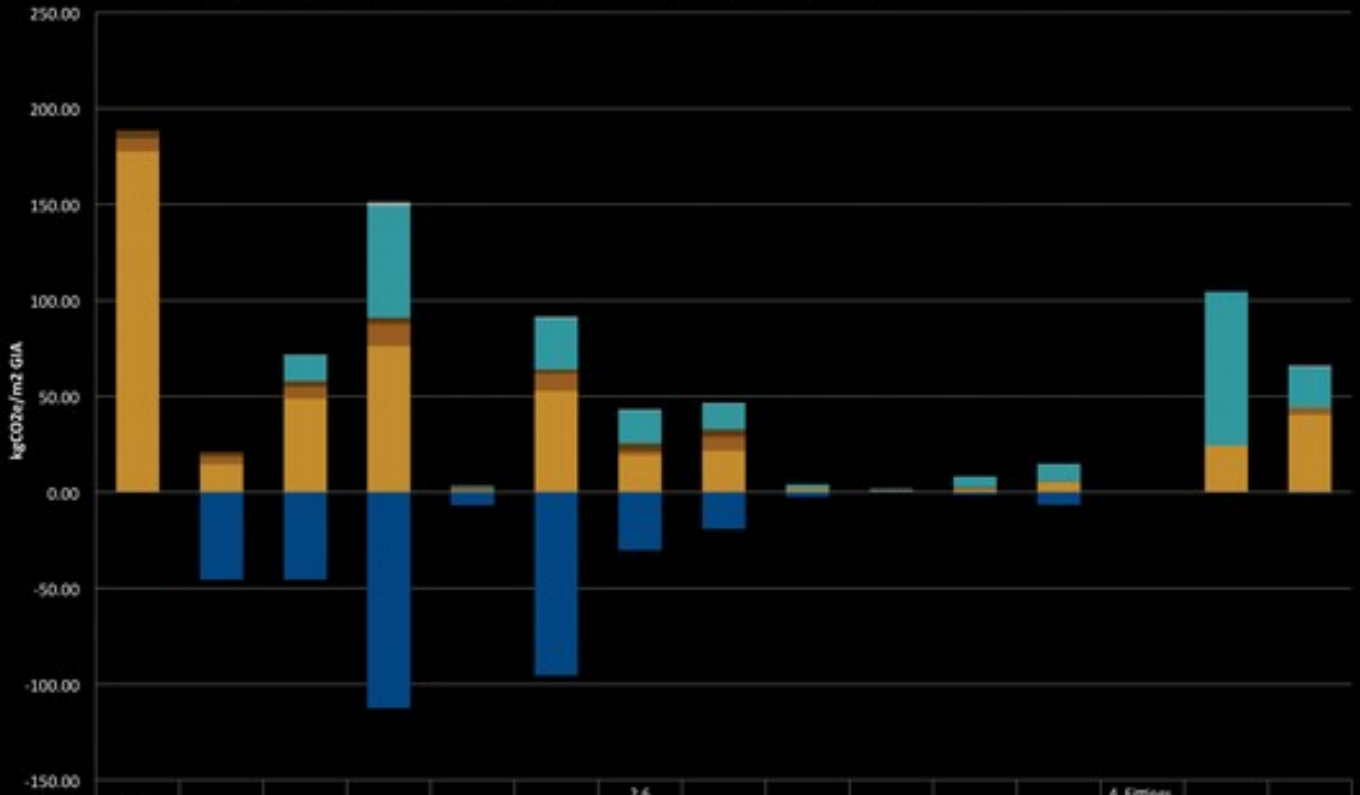
Total Embodied Impact



Total Embodied Lifecycle Emissions



Lifecycle Embodied Carbon Emissions by Building Element



	1.1 Substructure	2.1 Frame	2.2 Upper Floors	2.3 Roofs	2.4 Stairs and ramps	2.5 External walls	2.6 Windows & External Doors	2.7 Internal Walls	2.8 Internal Doors	3.1 Wall Finishes	3.2 Floor Finishes	3.3 Ceiling Finishes	4. Fittings, Furnishings & Equipment	5. Services	8. External Works
Biogenic carbon stored yr 0, kgCO2e/FU	0.00	-45.61	-45.62	-112.57	-6.84	-95.53	-30.34	-19.28	-2.33	-0.05	-1.42	-6.64	0.00	0.00	-0.73
C1-C4, disposal, kgCO2e/FU	0.00	0.00	0.40	1.75	0.03	0.80	0.51	0.39	0.06	0.02	0.16	0.26	0.00	0.00	0.64
B1-B5, maintenance, repair and replacements, kgCO2e/FU	0.00	0.00	13.25	58.20	0.93	26.57	17.03	13.15	2.04	0.59	5.43	8.69	0.00	80.00	21.23
A5, Site works, kgCO2e/FU	3.93	2.31	2.89	3.44	0.92	1.96	4.01	4.04	0.00	0.39	0.66	0.15	0.00	0.00	0.00
A4, transport, kgCO2e/FU	6.94	3.99	6.22	11.39	0.04	9.14	2.08	7.25	0.33	0.05	0.14	0.20	0.00	0.00	3.68
A1-A3, design and manufacturing, kgCO2e/FU	177.52	14.42	48.73	76.12	0.93	52.72	19.35	21.52	1.35	0.39	1.69	5.28	0.00	24.39	40.28

Future Climate Analysis

- UEA Colin Harpham, produced reference climate data through UKCIP for 2030 – 2080 based on a medium forecast of carbon emission reductions and translated into PHPP format.

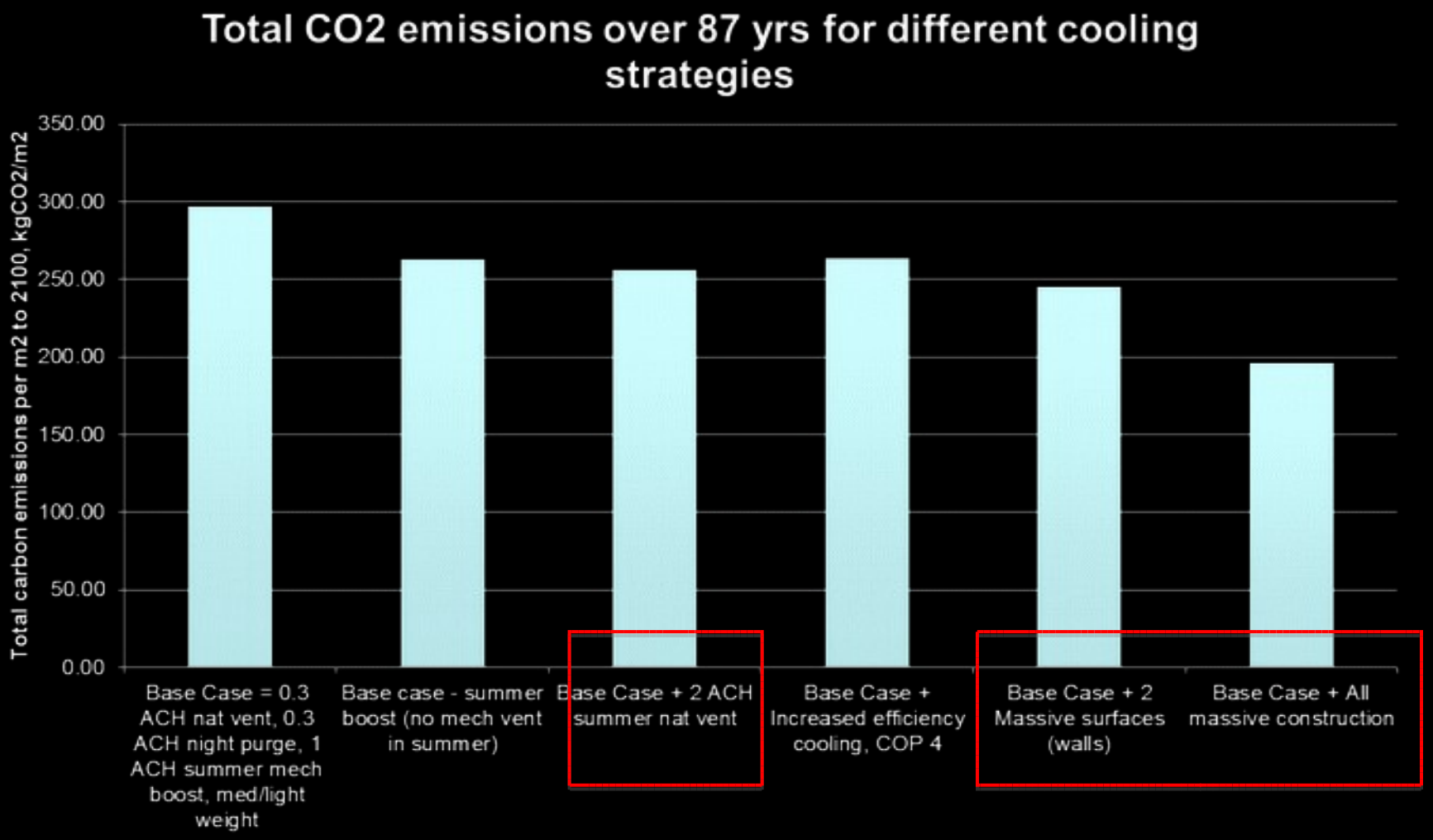
- Architype input the data and compared four climate change scenarios.

- BDP validating with a dynamic model inputting the weather files as TRY, again produced by UEA.

- Weather 1 and Weather 2 files are not produced.

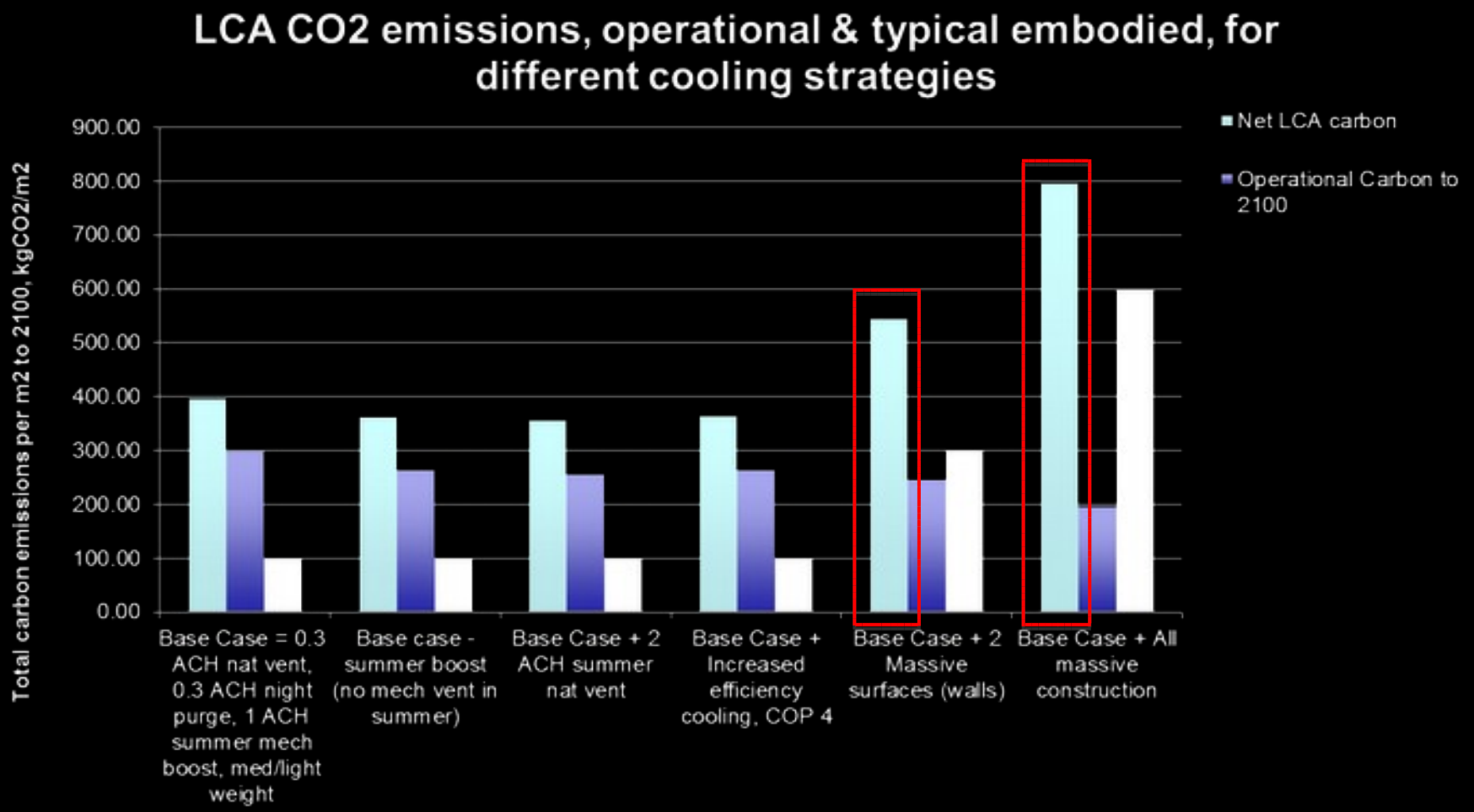
- MED CO_2 mitigation scenarios used as gave the most stable results

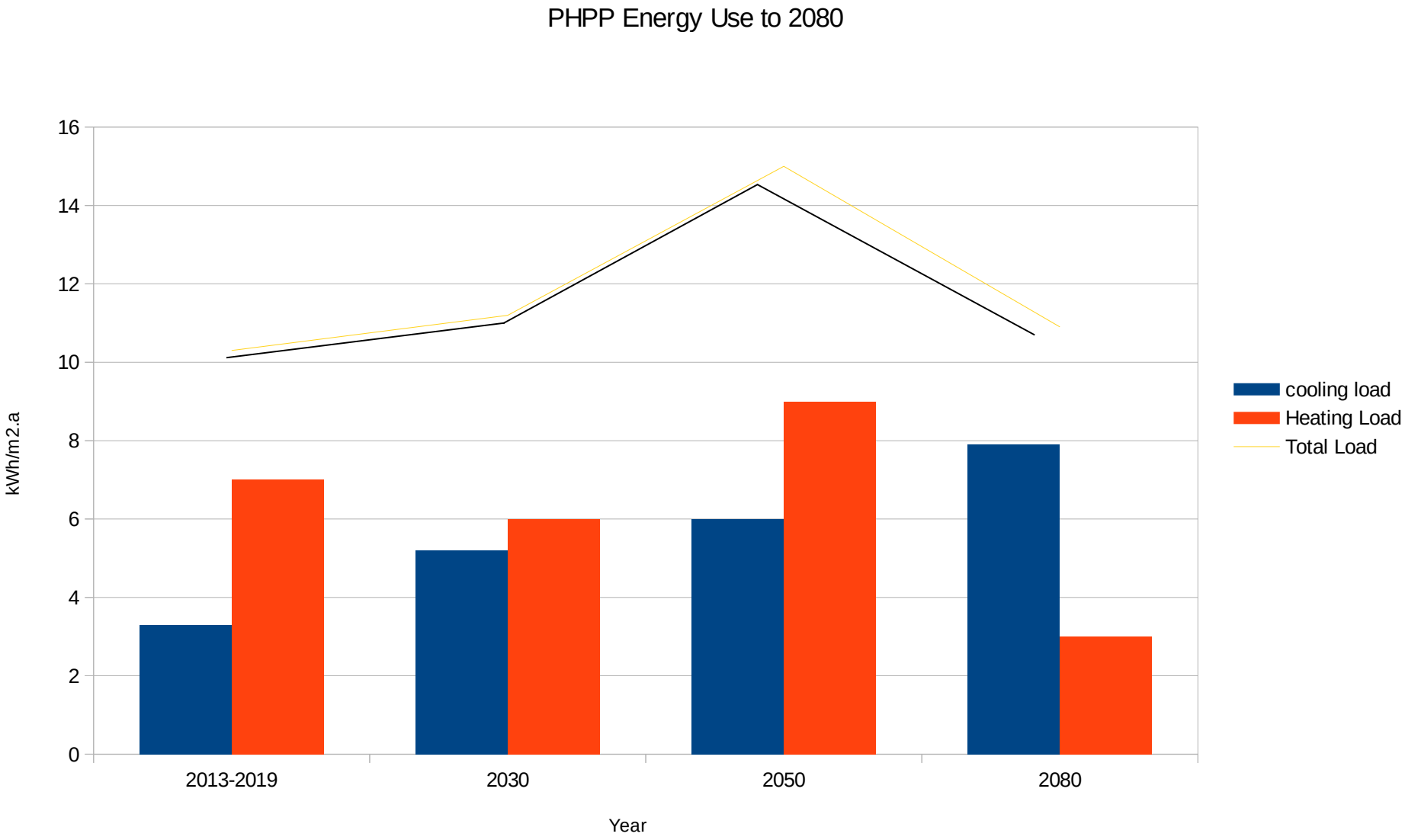
Summary Results



But….This doesn’t take account of Embodied Carbon…

Operational Results + *Typical* Embodied Carbon




PHPP Energy Use to 2080
16
14
12
10
8
6
4
2
0
kWh/m2.a
2013-2019
2030
2050
2080
Year
cooling load
Heating Load
Total Load

Construction Stage

Ground Floor & Foundations

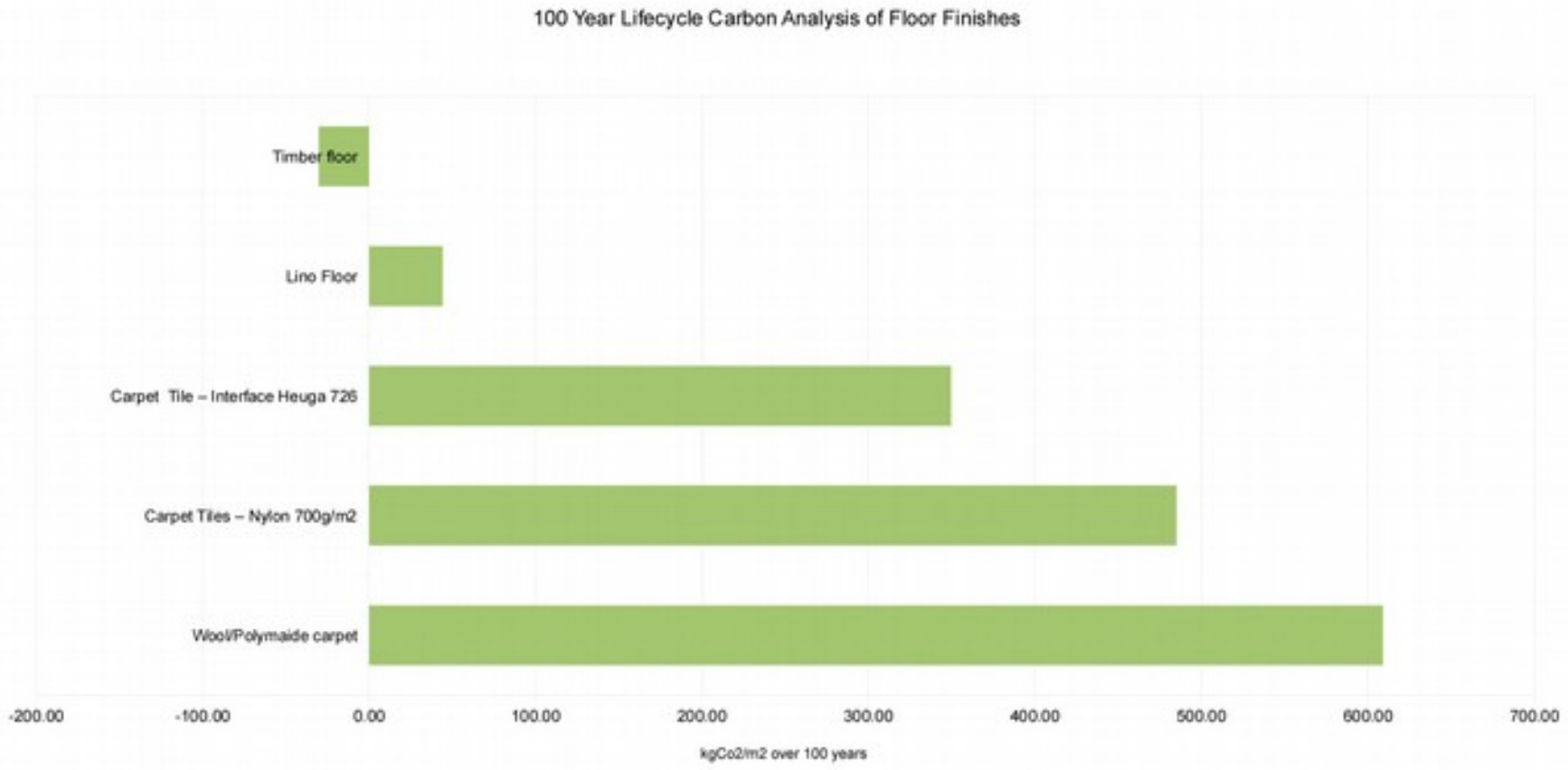
	Alternative designs and 60-year life cycle costs				
Design decision	Base Case	Alt 1	Alt 1(A)	Alt 2	Alt 3
Energy source	Mains gas £1,786,000	Anaerobic digester + mains gas £1,842,000	Anaerobic digester + district heating £1,850,000	Air source heat pumps £1,954,000	District heating £1,771,000
Building overheating	Fermacell wall board £77,000	Plasterboard £97,000			
Roof covering and PV	Metal roof + crystalline PV £295,000	Membrane roof + crystalline PV £267,000		Membrane roof + thin film PV £302,000	
Window frames	All wood frames £963,000	Wood frames + aluminium external facing £745,000			
Hard landscaping	Purbeck stone + timber deck £1,013,000	Resin gravel + timber deck £1,029,000		Resin gravel throughout £887,000	Purbeck stone throughout £880,000
Internal lighting	LED (with some CFL/T5) £285,000	CFL/T5 (with some LED) £356,000			
Floor finishes	Mixed scheme (carpet, wood, lino) £532,000	Wood flooring throughout £902,000		Carpet tiles throughout £347,000	

Lifecycle Costs

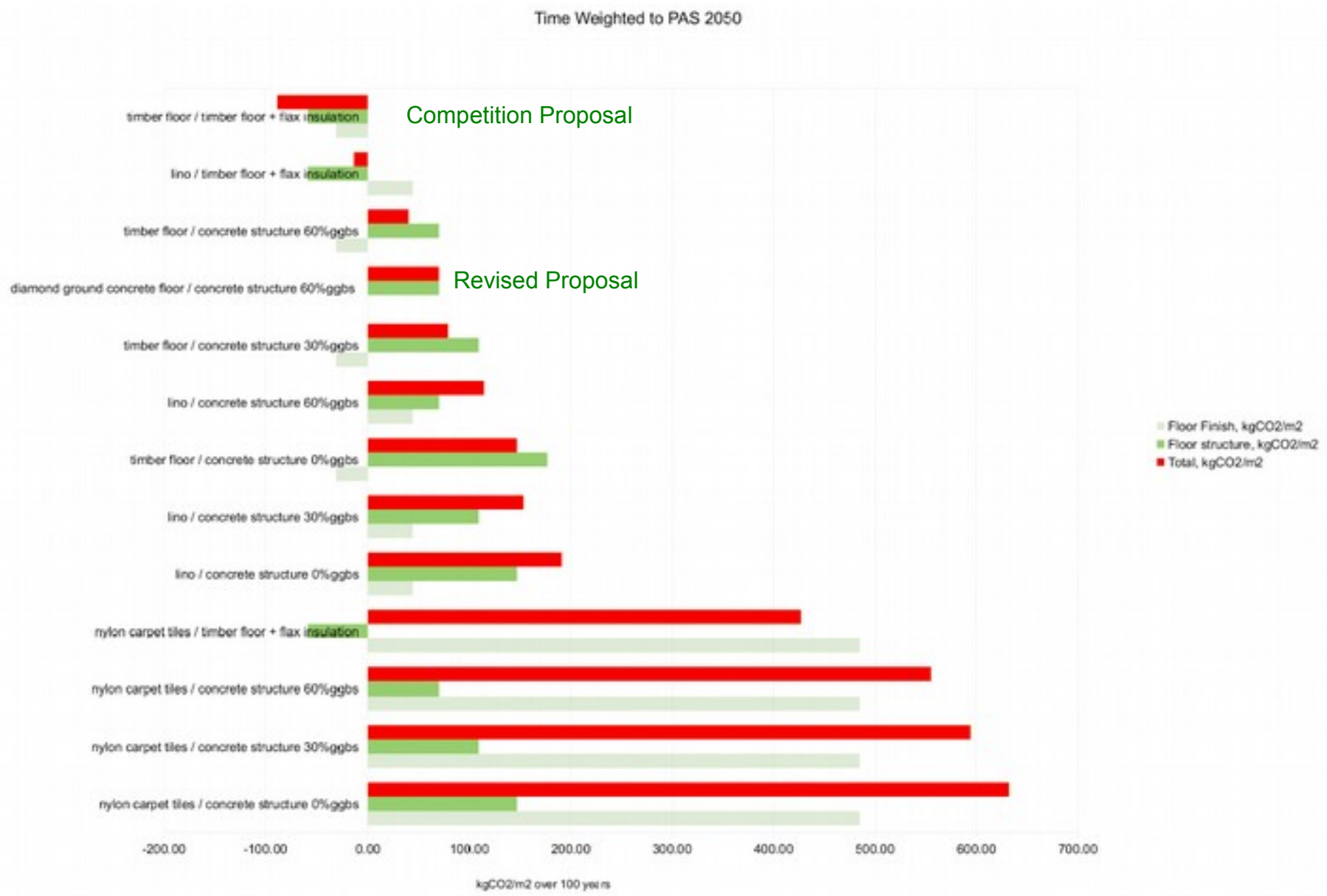
Life Cycle Carbon Analysis of Floor Finishes

Date: *01/01/13* Rev: *A* By: *Gareth Selby*

Floor construction	*Time Weighted Total, kgCO2/m2*	*Non Time weighted Total, kgCO2/m2*
Wool/Polymaide carpet	609.12	1163.76
Carpet Tiles – Nylon 700g/m2	485.15	925.36
Carpet Tile – Interface Heuga 726	349.59	664.67
Lino Floor	44.25	73.24
Timber floor	-30.10	-28.90



Complete Floor Construction Lifecycle Carbon Analysis




200 GRIT
800 GRIT
TEST AREA FOR
CONCRETE GRIND OFF
HTC650RX

Timber Frame

Grown in Britain

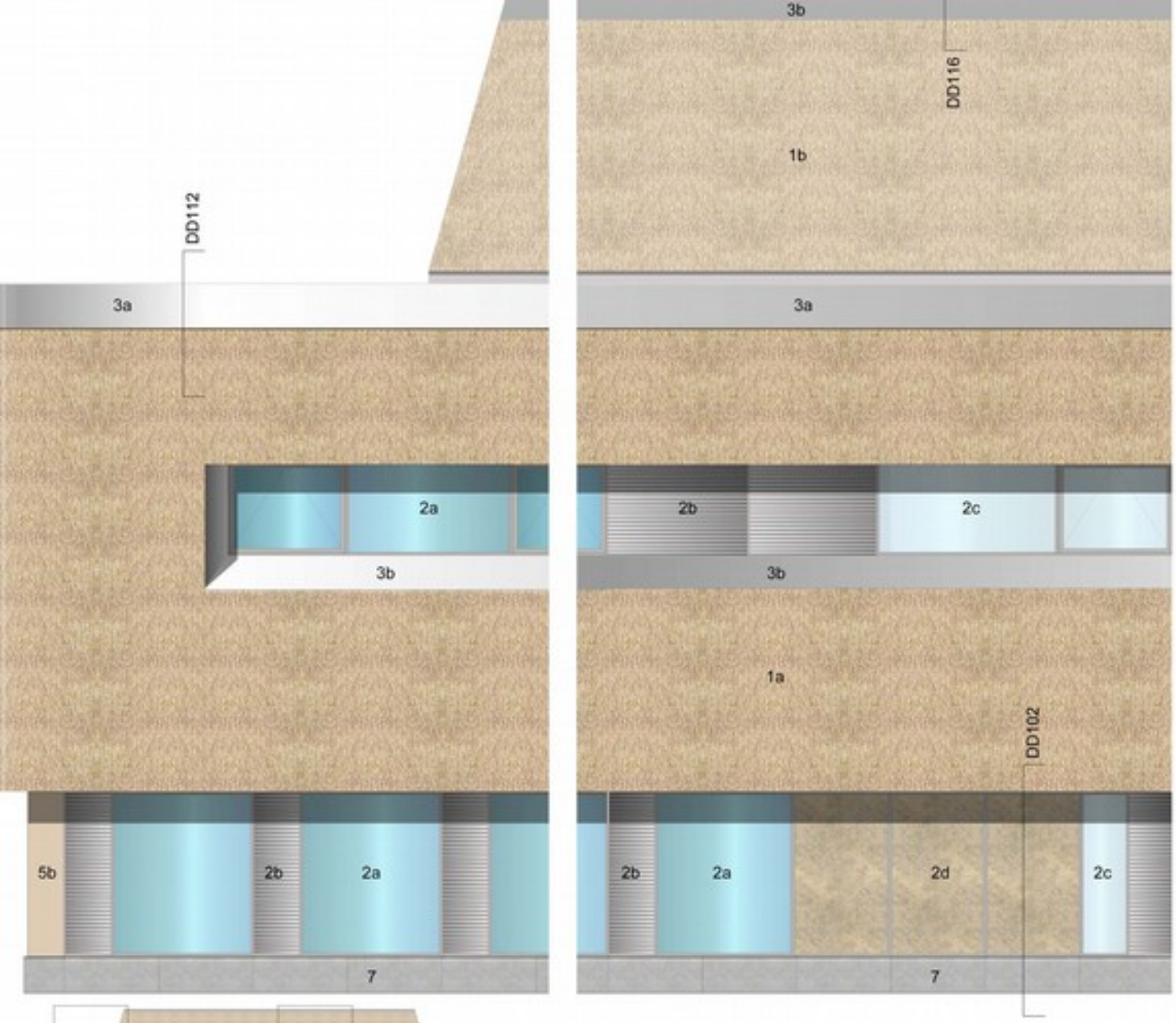
Working with BRE and the Forestry Commission to test Local Timber for Frame


1245
SS
23


Platforms


MORGAN
SINDALL
Gate 3
morgansindall.com
DANGER
CONSTRUCTION SITE
Risk of Serious Injury
KEEP OUT

Thatch
Wheat Straw & Reed



KEY

1 **Thatch Cladding & Roofing**

1a Thatch cladding - wheat straw
Prefabricated vertical thatch cladding panels installed to form a continuous surface. Wheat Straw sourced from Norfolk & Suffolk
1b Thatch roofing - reed

2 **Composite anodised aluminium / timber glazing facade**

2a Protec - triple glazed composite facade
2b Anodised aluminium ventilation louvre panel
2c Obscure glazed panel
2d Clear glazed demonstration panel
2e Raico or similar - triple glazed Doors

3 **Anodised Aluminium Fascias and Flashings**

3a Anodised Aluminium continuous roof fascia panel
3b Anodised Aluminium flashings to glazing and thatch reveals
3c Anodised Aluminium fascia to front of brise soleil
3d Anodised Aluminium spout discharging to perimeter pool

4 **Vertical timber fins**

5 **Bioresin cladding**

5a Bioresin cladding - South facade infill panels
5b Bioresin cladding - Low level cladding panels
5c Bioresin cladding - High level vertical strips to East facade
5d Bioresin cladding - Lining to entrance lobbies

6 **Lime Render**

7 **Concrete Plinth**

8 **Larch Columns**
English (European / Hybrid) Larch from East Anglia finger-jointed, laminated and turned to form 275mm diameter structural columns. Finished with clear DEKS oil coating.

9 **Glass Balustrade**

Status: FOR PLANNING

ARCHITYPE

Project: MAP Enterprise Centre

Client: MORGAN SINDALL / University of East Anglia

Dwg Title: External Materials - Typical North Elevation 2

Dwg No: 6060 PL 62

Rev:

Scale: 1:20 @ A1 1:50 @ A3

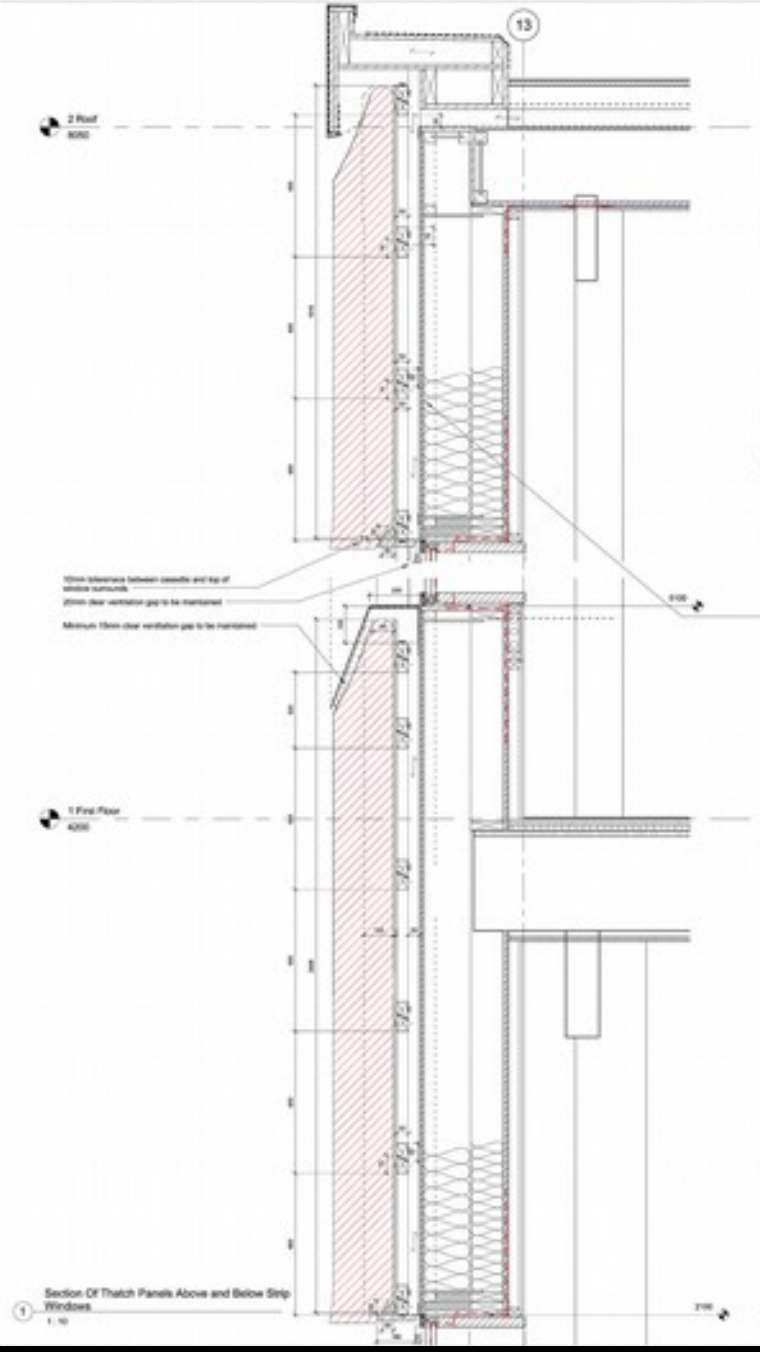
Date: 01.04.2014

Drawn by: JT

Checked by: GS


JCB

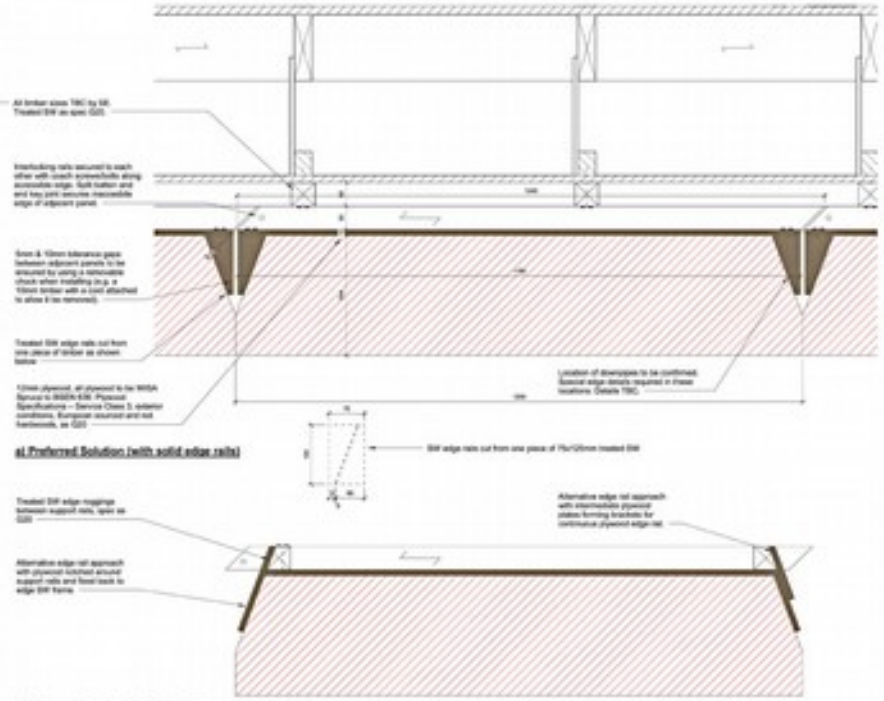

JCB



1 Section Of Thatch Panels Above and Below Strip Windows
1 : 10

Sketch 3D - Front of Panels and Support Rails

Sketch 3D - Back of Cassettes Showing Support Rails



a) Preferred Solution (with solid edge rails)

b) Optional Solutions For Edge Rail

2 Thatch Cassettes Plan & Options
1 : 5

NOTE:
All fixings and support rail sizings TBC by SE for loading and wind suction.

Cassettes are screwed along the edge of 1 horizontal and 1 vertical edge. All other edges restrained by interlocking rails.

FOR INFORMATION

ARCHITYPE

Project	UEA Exemplary Low Carbon Building Project
Client	UEA / Morgan Sindall
Drawing Title	Thatch Panels - Around Strip Windows
Drawing no.	6990 DD120
Revision	
Scale	As indicated @ A1
Date	07/05/14
Drawn by	GS/JT
Checked by	JT/GS


UK Forks
0800 123 4567
540-170
V43871
JCB

Reclaimed Iroko Cladding


LIGHT SANDED
SAWN
PLAINED
FULL SANDED

Fit Out

Architype

Private

CONSTRUCTION MATERIALS

ECONOVATE ECONOBLOCK
£1 / block

2 2

IBSTOCK ECOTERRE unfired clay

2

HEMPCRETE BLOCK

1 3

Add a card...

INTERNAL MATERIALS

NETTLE FABRIC

2 3

MOSS WALL TILES

2 4

3Form

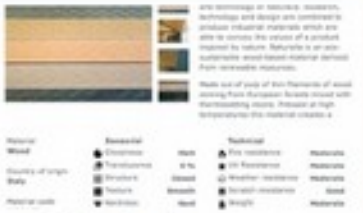
1 2

Add a card...

Bioresin cladding ideas

BIOTEX

4 9



woo165 naturalia

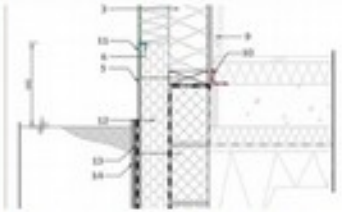
1

ona337 Richlite Rainshadow

1

Add a card...

EXTERNAL CLADDING



NBT RENDER SYSTEMS £65 supply £130-140 installed

2 3

RESISTA £45/m2 supply

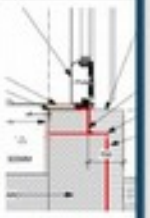
2 3

TRESPA £45/m2 supply

2 2

Add a card...

EXTERNAL



PRECAST C
FOR 277LIN

4 2

JACKON INS

1 3

HYDRODUC

2

Add a card...

Materials Database

TERIALS

d costs

OXIDE

lab

INTERNAL MATERIALS

MOSS WALL TILES

2 4

3Form

1 2

PORCELAIN FLOOR / WALL TILES

1 1

COCO MATTING - HADLEIGH

2

LOCAL EARTH PRODUCTS

1

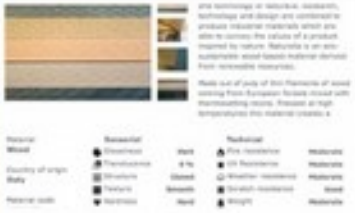
CLAYTEC CLAY BOARD

Add a card...

Bioresin cladding ideas

BIOTEX

4 9



woo165 naturalia

1

ona337 Richlite Rainshadow

1

woo182 UPM Profi Composite

1

Add a card...

EXTERNAL CLADDING

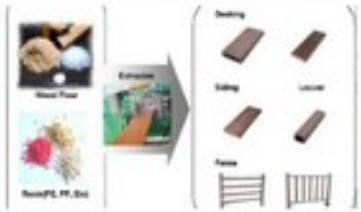
2 2

MEDITE TRICOYA £25/m2 supply

1 3

OTHER ...

1 1



WOOZEN (WOOD FLOUR)

1 2

Add a card...

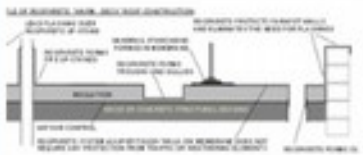
EXTERNAL ELEMENTS

HYDRODUCT 200

2

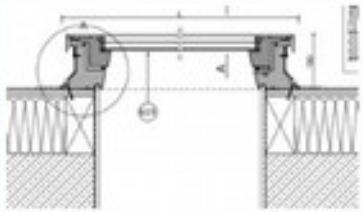
ISOQUICK

4



ROOFKRETE

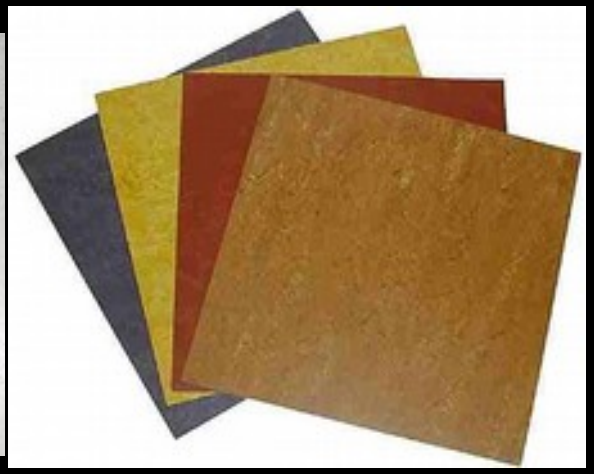
1 3



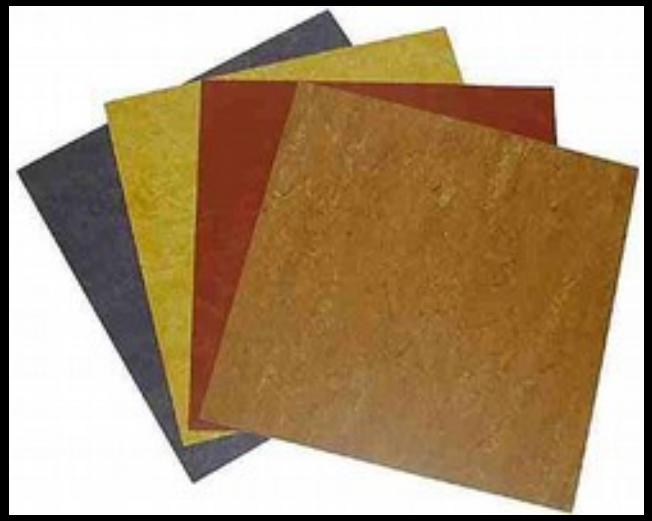
FAKRO FLAT ROOFLIGHTS

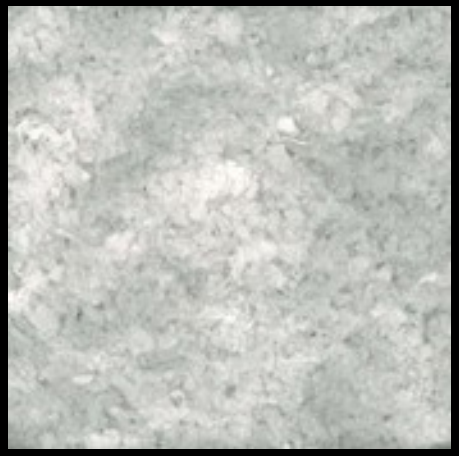
2 5

Add a card...



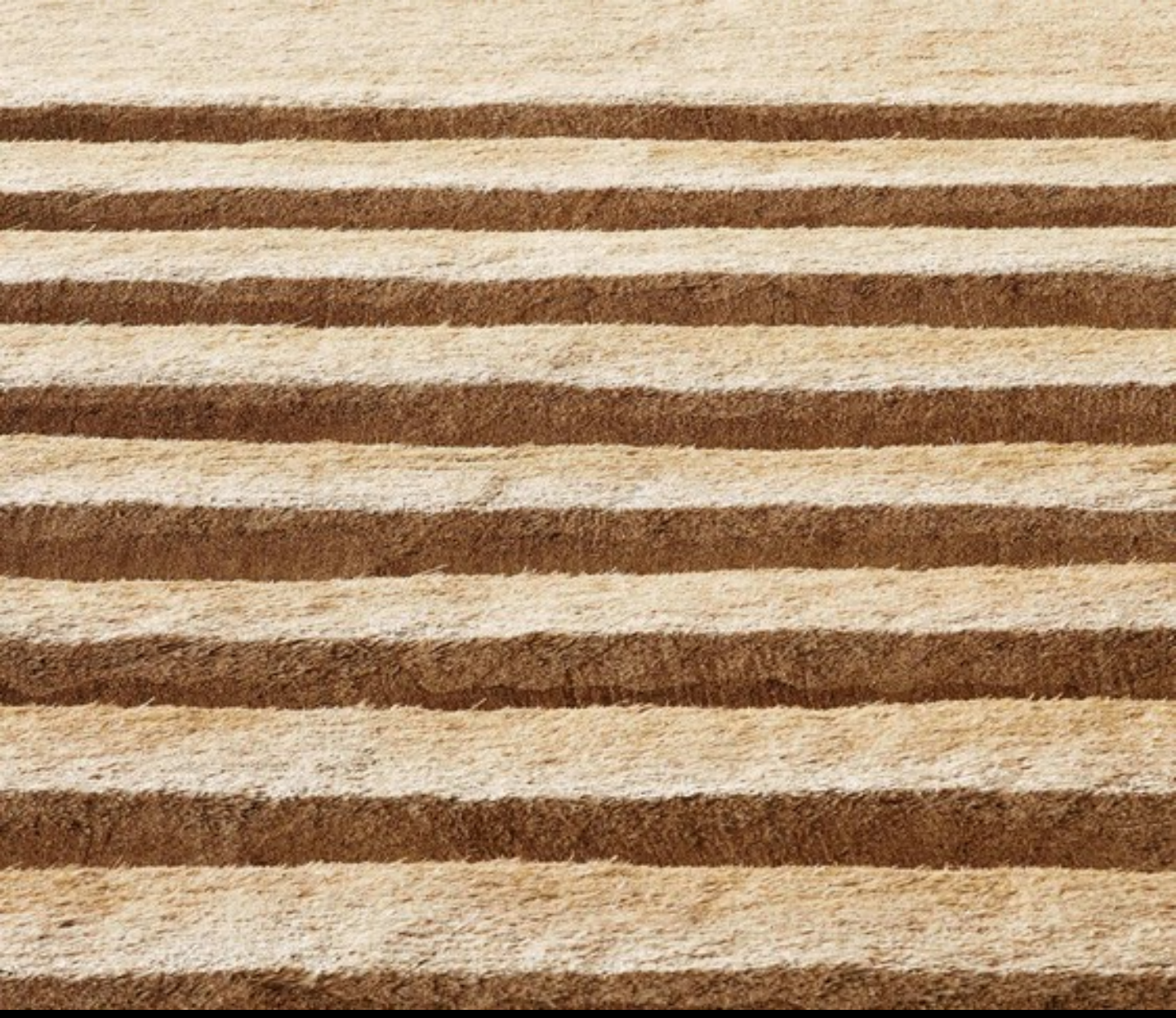


Enhanced Handover

Soft Landings and 3 Year POE

Completed Building


©Dennis Gilbert/VIEW



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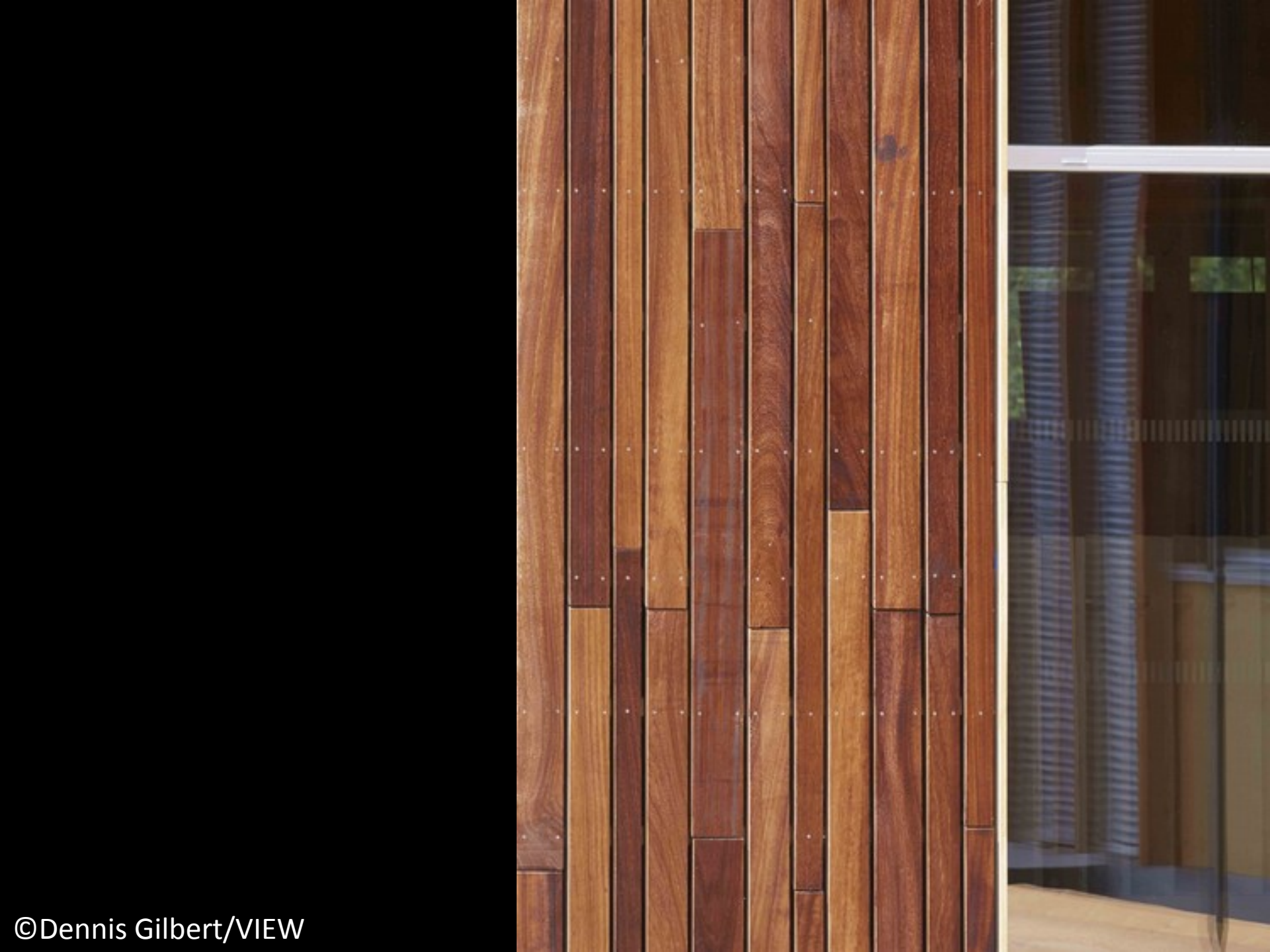

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SUSAN GUNN .CO.UK

Passivhaus

Passive House Verification

Building:	NRP Enterprise Centre	
Location and Climate:	East Anglia	East Anglia
Street:	University Drive	
Postcode/City:	Norwich	
Country:	UK	
Building Type:	University teaching, small businesses and exhibition/conference	
Home Owner(s) / Client(s):	UEA	
Street:		
Postcode/City:	Norwich	
Architect:	Architype	
Street:	1B Leathermarket St	
Postcode/City:	London SE1 3JA	
Mechanical System:	BDP	
Street:	16 Brewhouse Yard	
Postcode/City:	London	
Year of Construction:	2013	
Number of Dwelling Units:	n/a	
Enclosed Volume V_e:		m³
Number of Occupants:	570.0	
Interior Temperature:	20.0	°C
Internal Heat Gains:	3.5	W/m²

Specific Demands with Reference to the Treated Floor Area

Treated Floor Area: 3222.8 m²

	Applied:	Monthly method	PH Certificate:	Fulfilled?
Specific Space Heating Demand:	7	kWh/(m²a)	15 kWh/(m²a)	Yes
Heating Load:	9	W/m²	10 W/m²	
Pressurization Test Result:	0.6	h⁻¹	0.6 h⁻¹	Yes
Specific Primary Energy Demand (DHW, Heating, Cooling, Auxiliary and Household Electricity):		kWh/(m²a)	120 kWh/(m²a)	
Specific Primary Energy Demand (DHW, Heating and Auxiliary Electricity):		kWh/(m²a)		
Specific Primary Energy Reduction through Solar Electricity:		kWh/(m²a)		
Frequency of Overheating:	4	%	over 25 °C	
Specific Useful Cooling Energy Demand:		kWh/(m²a)	15 kWh/(m²a)	
Cooling Load:	4	W/m²		

We confirm that the values given herein have been determined following the PHPP methodology and based on the characteristic values of the building. The calculations with PHPP are attached to this application.

Issued on:

signed:

VERIFICATION PAGE EXTRACT FROM PHPP, SHOWING CURRENT RESULTS

BREEAM Outstanding

BREEAM® UK

Code for a Sustainable Built Environment
www.breeam.org

Interim Certificate – Design Stage

This is to certify that:

UEA Enterprise Centre
University Drive
Norwich
Norfolk
NR4 7TJ

has been assessed to:

BREEAM New Construction 2011: Education
(Fully Fitted)

by a licensed assessor for:

Morgan Sindall

and has achieved a score of **90.8%**

Outstanding

★★★★★

Certificate Number: **BREEAM-0045-6509** Issue: **01**

12 August 2015 Date of Issue	BDP Assessor Company
 Signed on behalf of BRE Global Ltd.	Philip Gray Licensed Assessor
Gavin Dunn Director, BREEAM	PG21 Assessor Number
Morgan Sindall Principal Contractor	Architype Architect
rfl 3PM Project Management	BDP Building Services / Structural Engineer
Morgan Sindall - Stuart Thompson BREEAM Accredited Professional	Churchman Landscape Landscape Architect

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bre

In Occupation

All office suites and co-working desks are either contracted or under firm commitment

Tenants range from the built environment sector to finance and business to business development companies

Co-working desks sold to a number of companies who have come into the building to meet with our earliest arrival tenants

Currently there are 4 virtual tenants with the likelihood of more

12 different reservations for conferences, including up to next summer

21 room bookings taken, including some which have already taken

Students now in the building

Press Coverage

Building

Local Hero

Architype's low-energy Enterprise Centre at Norwich Research Park pairs vernacular materials with Passivhaus principles

Words

Photos

Left
The Enterprise Centre forms a new gateway to UEA's Norwich Research Park and features an innovation lab, a 300-seat theatre, flexible workspaces, teaching and learning facilities, as well as business hatcheries and incubator units for SMEs and start-ups in the low carbon sector. By placing academic and business users side by side, the centre aims to foster innovation, stimulate smarter ways of working, promote industry standards and create new supply chains. It was delivered using a Single Point Delivery form of contract that promotes collaborative working practice, with main contractor Morgan Sindall as the Single Point Deliverer.

Below
The reception desk, designed by Foster Associates, was recycled from the university's Sainsbury Centre for Visual Arts (1978).

The Enterprise Centre at the University of East Anglia's Norwich Research Park, built by a team including architect Architype and intended to encourage the cooperation of academia and new business, is described as the UK's greenest commercial building.

In terms of sustainability, its distinguishing feature is that it has been constructed in such a way that its embodied energy is virtually negative. Photosynthesis combines water and carbon dioxide using solar energy and releasing oxygen. The process produces plant material, most of which decomposes as fast as it is made and returns the carbon dioxide to the atmosphere. The carbon cycle in nature is in equilibrium until we start to burn carbon fuels. When we fix plant material into a building for 100 years or so, that is an offset for whatever carbon fuel we have burnt elsewhere.

Architype's embodied energy calculations give a figure of 440kgCO2/sqm across the 100-year life cycle. This equates to a quarter of the lifetime emissions of a conventionally constructed university building of equal size, but I am surprised that it isn't a negative number.

Almost every part of the building is based on timber or cellulose, though there are exceptions; the ground floor was going to be suspended timber until it was replaced by a low-carbon concrete raft for economic reasons. The timber sheathing that replaces plasterboard raises the thermal capacity of the building, and is a favourite material for art gallery walls. Wood wool acoustic boards also offer low embodied energy. The attention to the possibilities inherent in the material shows in every part of the construction detail.

Press Coverage

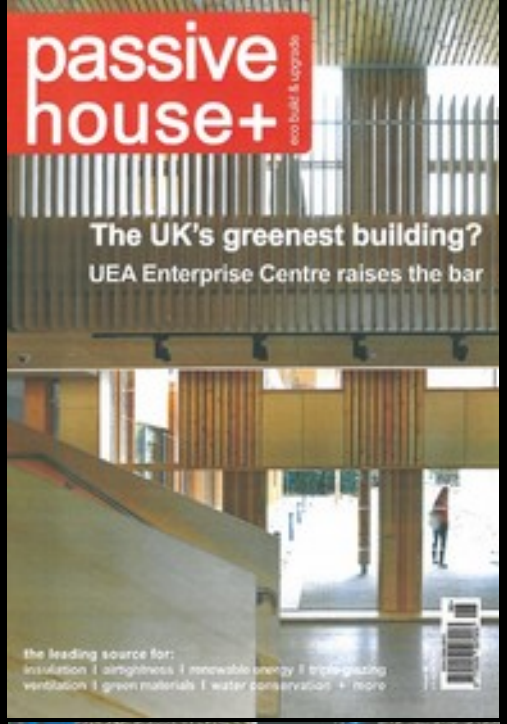
It's only natural

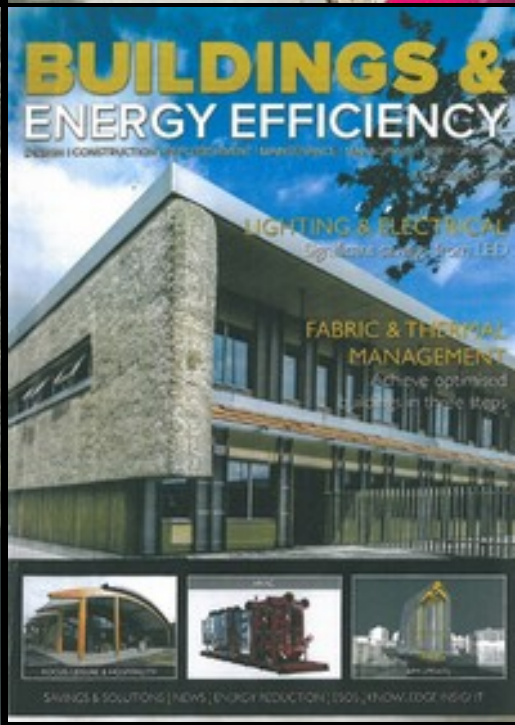
When Adapt Low Carbon asked Architype to design its Enterprise Centre, a bio-building was the obvious choice

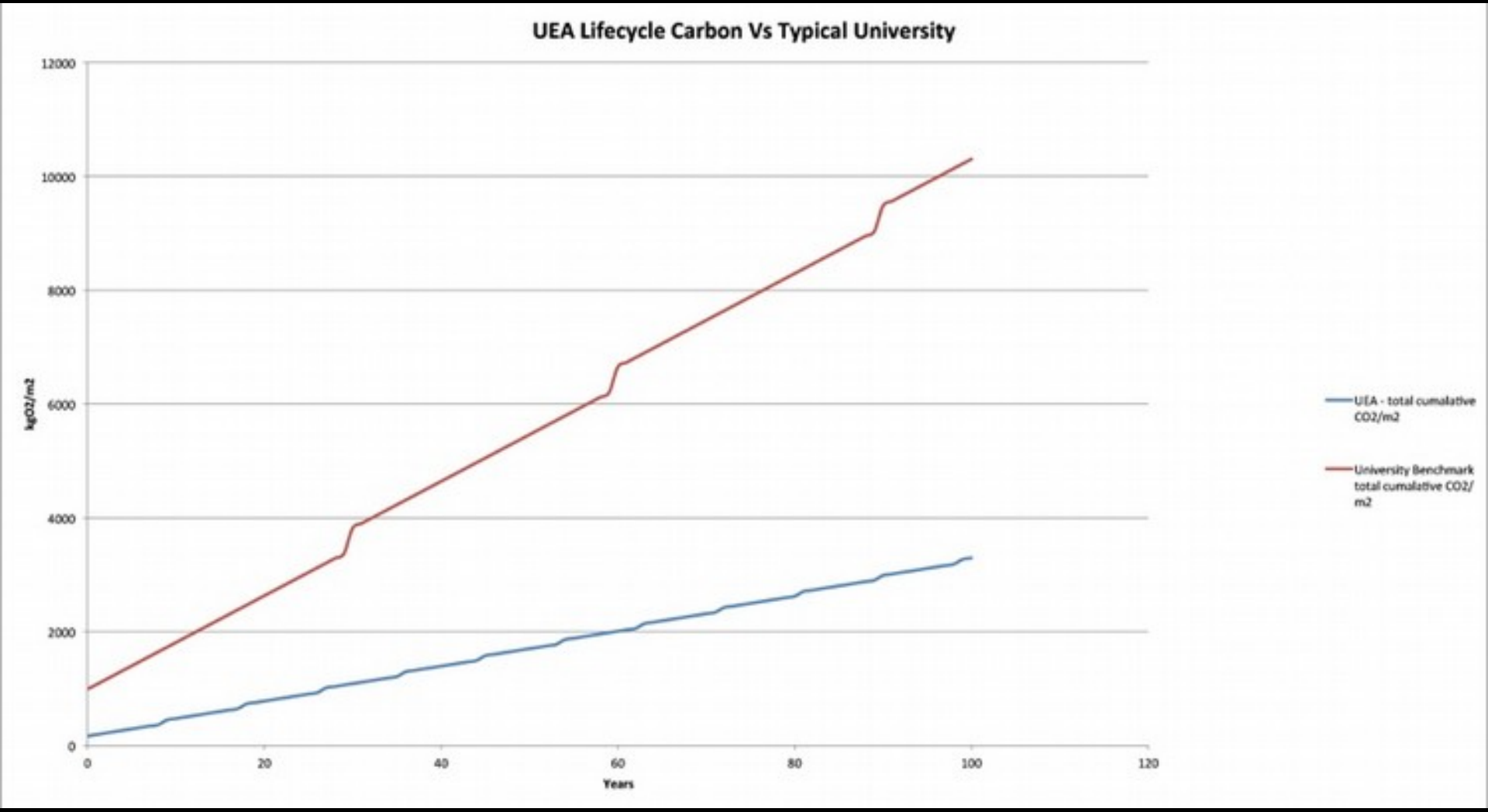
Words: Eleanor Young Photographs: Dennis Gilbert

Right With thatch as a rainscreen cladding, the highly insulated walls appear even deeper. Left The closer you get the hairier the thatch appears.

Press Coverage






UEA Lifecycle Carbon Vs Typical University
12000
10000
8000
6000
4000
2000
0
kgO2/m2
0
20
40
60
80
100
120
Years
UEA - total cumulative CO2/m2
University Benchmark total cumulative CO2/m2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