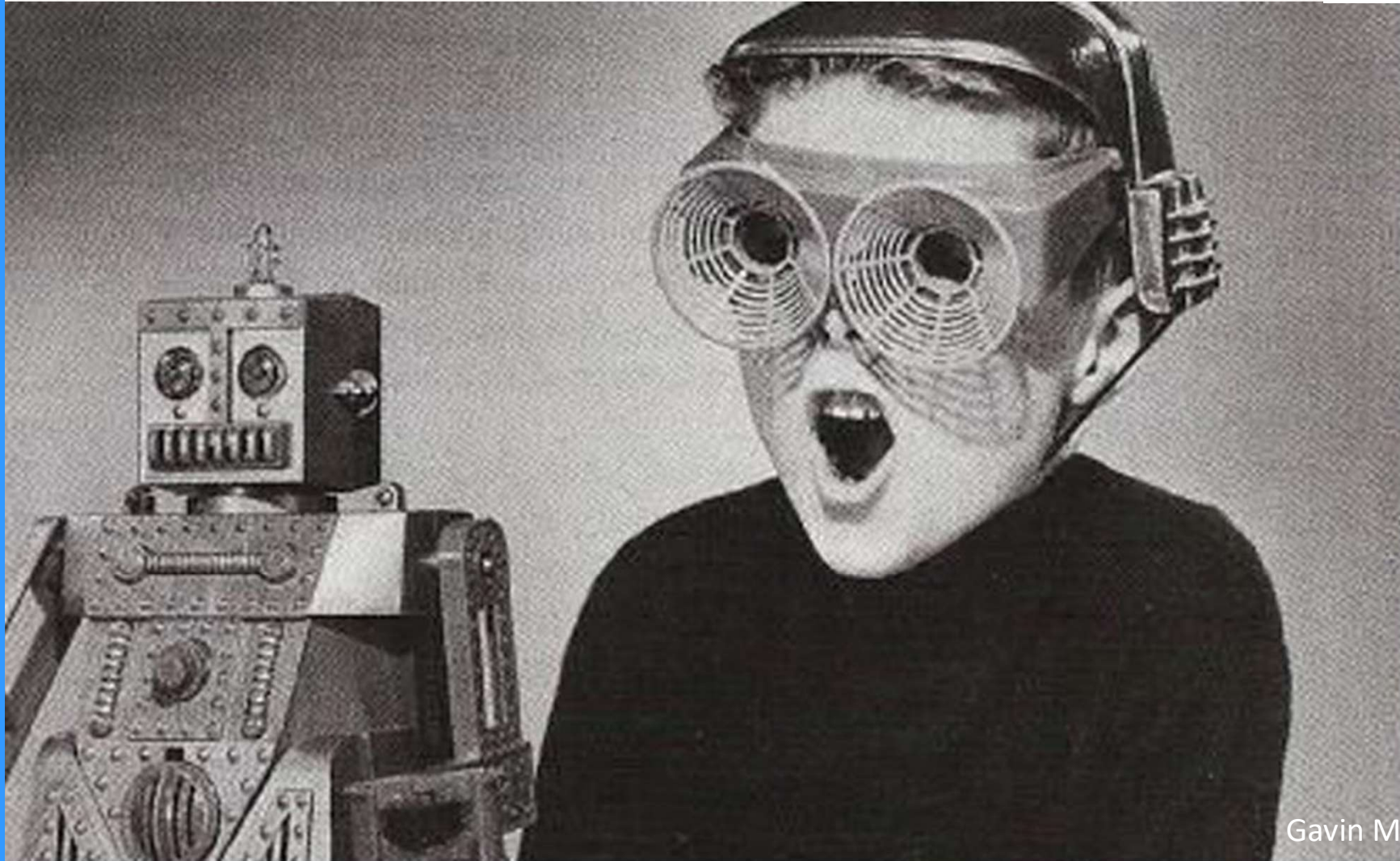


Session 4: Advanced Technology



Gavin M

Activity

Chat

Teams

Assignments

Calendar

Calls

OneDrive

mConnect

Apps

< All teams

SY

SSoA Year 4_M.Arch_2025-26_GRP

...

Home page

Class Notebook

Classwork

Assignments

Grades

Reflect

Insights

▼ Main Channels

General

ACAA6005 Advanced Technology

ACAA6006 Architecture Studio A

ACAA6007 Current Issues

ACAA7000 Architecture Studio B

ACAA7001 Architecture Studio C

ACAA7002 Research Methods for Architects

Program of Studies Handbook

Search (Ctrl+E)

SY

ACAA6005 Advanced Technology

Posts

Files ▾

Notes

+

+ New ▾

↑ Upload ▾

Edit in grid view

Share

Copy link

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ACAA6005 Advanced Technology

Name ▾	Modified ▾	Modified By ▾	+ Add column
Assessments	A few seconds ago	Gavin Traylor	
Lecture Notes	A few seconds ago	Gavin Traylor	

What is it all about?

AIM(S)

- To review the principles of structural design, building construction and environmental science covered in the Part 1 qualification and encountered during professional experience.
- To allow students to investigate and share the latest developments in structural design, building materials, construction techniques, Fire and Safety Design and sustainable design.

LEARNING OUTCOMES

Upon the successful completion of this module, the student should be able to:

- demonstrate a systematic understanding of the main concepts of structural design, building construction and environmental science as they relate to the construction of buildings, including the science of fire, smoke generation and spread and design principles to minimise the risk of smoke and fire;
- outline the main current developments in structural design, building materials, construction techniques and sustainable design;
- explain the methods of investigation and information resources available to establish the state of current knowledge in construction technology;
- communicate the methods of utilising fabric first thermal efficiency, regenerative design solutions and ethical sourcing of products.

Core Themes

Understanding Buildings
Technology for creating data rich building stock
How Buildings Learn
Retrofit
Elemental Construction Methods
Structural Systems and Frames
Offsite
Material Science
Environmental & Low Carbon Approach
Fire Safety

Assessed through a Case Study
CW1 Technical Portfolio
CW2 Presentation

Week 4 Overview:

The story so far....

- BIM Design Construct Operate and Maintain - One truth
- Challenging Questions of BIM
- Use of Digital Technologies as Interoperable platforms
- Challenges of existing Building Stock, Decarbonisation and Building Typology
- How Buildings Learn – Parallel Ideology
- Decarbonisation New Technologies - Early Adopters Buildings as Power Stations?
- Creating a Data Rich Building Stock.

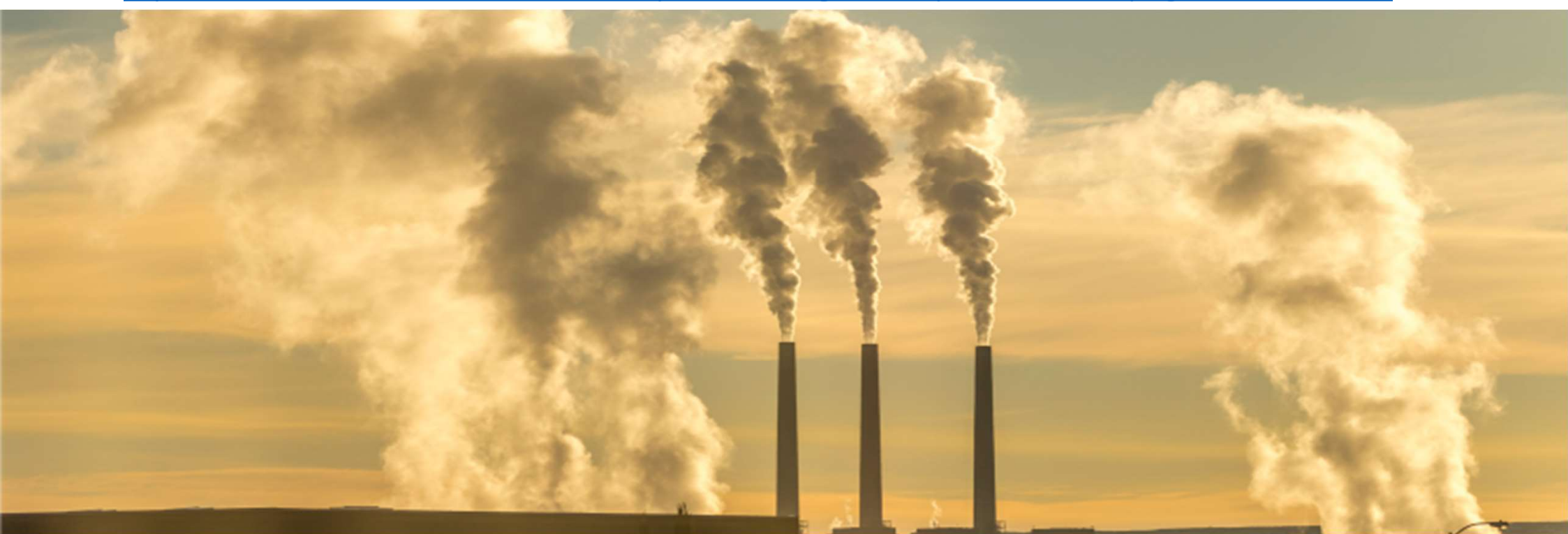
What about existing building stock?
What challenges do we face?

Challenges of Decarbonisation

Speaking at the CN [Decarbonising Construction](https://www.constructionnews.co.uk/sustainability/consultant-urges-delivery-of-mass-retrofit-programme-30-09-2020/) conference, Sonal Jain warned viewers that the UK Government's target of a net-zero carbon economy by 2050 is at risk because 80 per cent of the buildings that will be around in that year have already been built.

Jain said: "Because 80 per cent of the building stock for 2050 already exists, we cannot deliver on our net-zero goal without fully upgrading this. There is a limited time to upgrade the existing building stock, and delivering net-zero will require deep retrofits of these buildings."

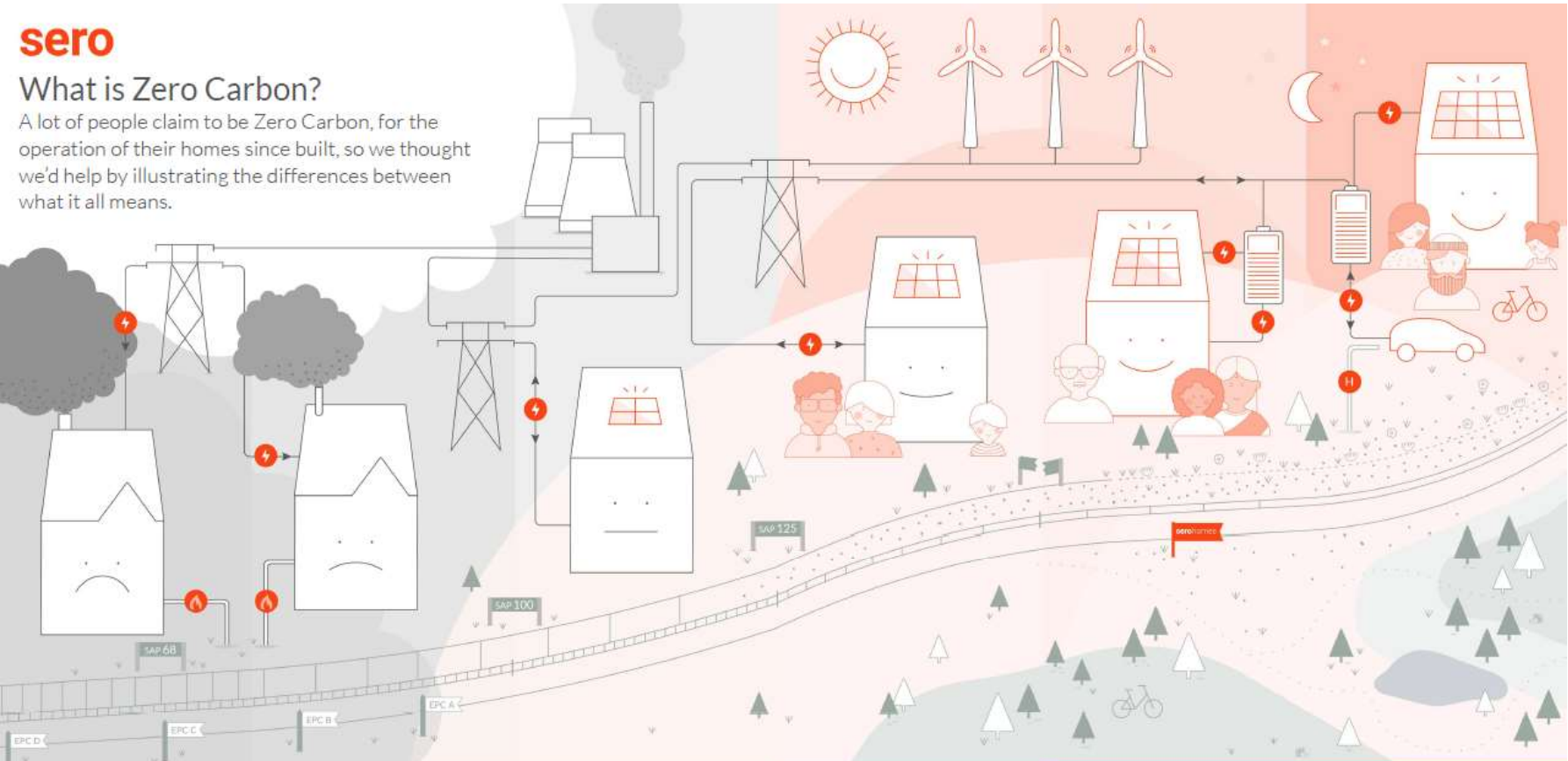
<https://www.constructionnews.co.uk/sustainability/consultant-urges-delivery-of-mass-retrofit-programme-30-09-2020/>



sero

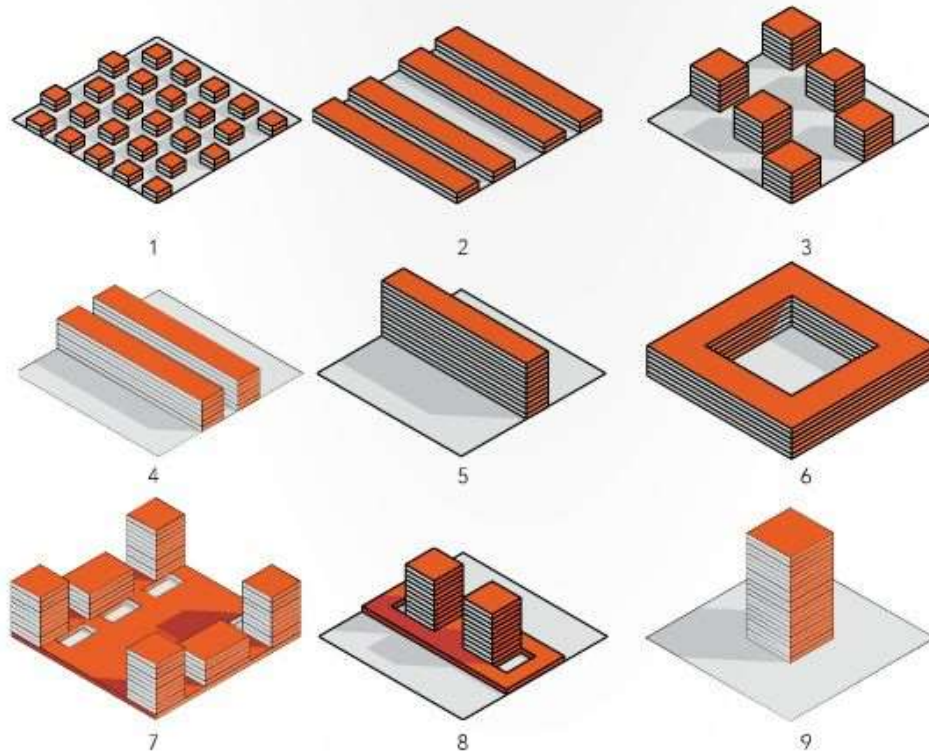
What is Zero Carbon?

A lot of people claim to be Zero Carbon, for the operation of their homes since built, so we thought we'd help by illustrating the differences between what it all means.



8,159 kgCO _{2e}	2,704 kgCO _{2e}	1,165 kgCO _{2e}	143 kgCO _{2e}	0 kgCO _{2e}	... kgCO _{2e}
Average Home	New Build Home	Zero Regulated Energy	Zero Energy	Zero Carbon	Beyond Zero Carbon
What's average? Well, every home is different, but for this we've used a typical 100m ² 1930's UK semi-detached home with a family of four living in it, using an efficient gas condensing boiler for heating and hot water. We've used reliably published data for occupancy energy demand and National Grid electricity carbon intensity data for 2019 (thanks www.CarbonIntensity.org.uk/ !)	We've transported our family of four into a new home that's the same size, built to 2014 Building Regulations with an efficient gas boiler for heating and hot water. We've assumed the house is actually built as it was designed, so haven't made an allowance for any issues with construction faults or failures (we know, that might be a bit optimistic of us!).	This is basically everything without a plug socket. So it includes extract fans, fixed lights, heating and hot water, but not washing machines, floor lamps and so on. The oven is in, the fridge & freezer isn't! Zero means that over a year, the home generates as much energy as it needs to power the regulated equipment. To do this, our family are now in a matching size home that has a 14 panel photovoltaic array on the roof, facing South.	This is the first level to allow our family's to plug in their stuff = home + humans! All the energy used in the home over the course of a year, whether from kettles, games consoles, heating, lights or mobile phone charging, is balanced by the same amount of power being generated. Our much-relocated family have now moved into an efficient home with a pretty big PV array on the roof, generating just over 9MWh of electricity a year!	Our family can finally settle down! Their zero carbon home goes beyond the zero energy home by using energy storage, so the electricity they generate can be stored for their use, or exported to the National Grid when it can help avoid the most carbon emissions. This supports the National Grid to decarbonise their large scale generation, and with intelligent energy services from Sero, our family also get cheaper electricity bills too.	At Sero, we're aiming to go beyond zero carbon homes with humans in them, we also want to cover our family for their transport. With electrification of cars and bikes, we're working to include the energy demands of these into our intelligent systems. So our families can live, work and play, knowing they're effortlessly zero carbon and saving money. Happy Days!
We're happy to discuss our workings if you'd like to get in touch. We might even buy the coffee...					seroenergy.com

Challenges of Building Typologies



Functions of Buildings

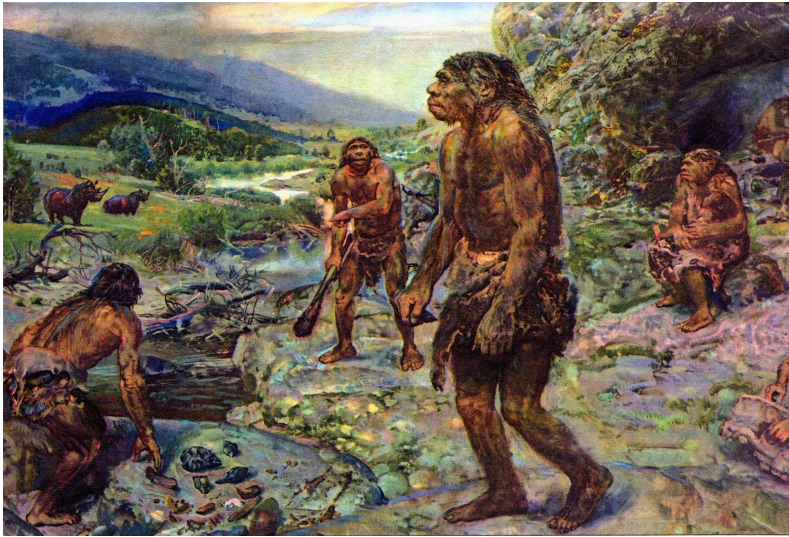
Why do we Build?

The use of buildings as protective structures or enclosures.

Since fire was first used by primitive people to provide light and heat, the use of energy to aid in environmental moderation has developed internal environments that reduce the effects and extremes in the external climate.



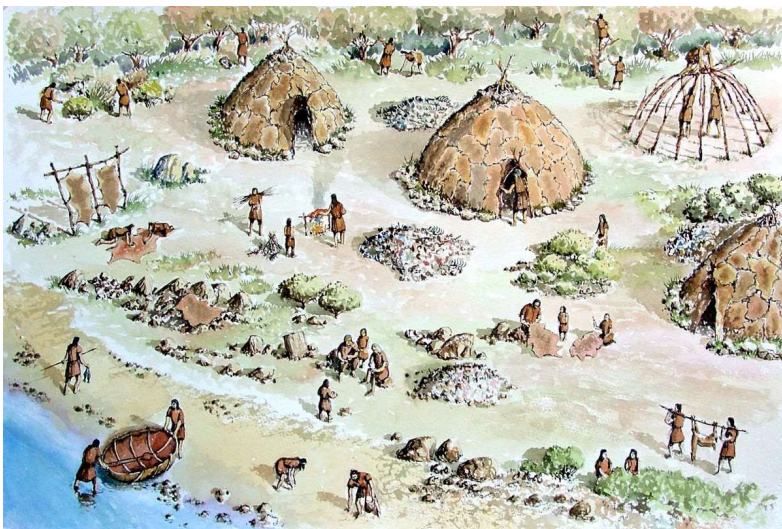
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http://4.bp.blogspot.com/-6CWvcEKKHBV/T6CVotA7KyI/AAAAAAAAGTU/ySJecOU92LQ/s1600/the_neanderthal_encampment_by_zdenek_burian_1950.JPG



https://kise.i3investor.com/files/my/blog/img/b1338_gonnersdorfsettlement.jpg



<https://i.pinimg.com/originals/41/ce/63/41ce63be5c59f90e1150a7ea6d97de51.jpg>



<https://museum.wales/stfagans/buildings/bryneryr/>

The use of buildings to house people, equipment and processes have resulted in the development of buildings that can control these internal environments with greater accuracy.

As well as protection and enclosure we can now consider:

- Thermal Insulation and temperature control
- Acoustic insulation
- Provision of Light (natural and artificial)
- Controls for humidity and ventilation
- Exclusion of contaminants.



Case study 1: Styles of buildings

Thermally light structures in Thailand

These dwellings are located in Thailand. The lightweight construction form is created by the use of locally available materials. The large openings allow air to pass through the building to cool the interior quickly. Thermally light structures of this type are common throughout the Far East. They utilise local materials that are readily available. However, with the advent of more modern construction forms and the incorporation of air conditioning systems they are now restricted to rural areas.



European vernacular buildings

These are examples of heavyweight construction forms found in England and France. The use of local stone and slate for the walls and roofing reflects regionally available materials, although the 'gothic' style of the building above is actually a copy of earlier styles. The building was constructed in the Victorian period. The windmill, in contrast, is typical of simple rural building styles.



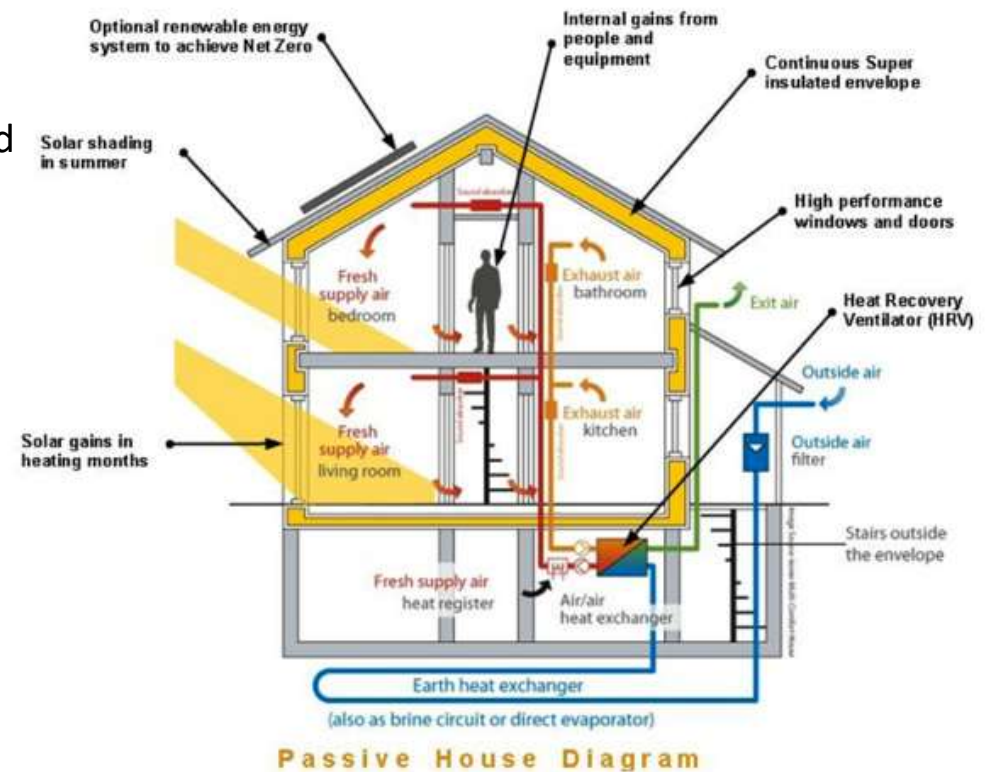
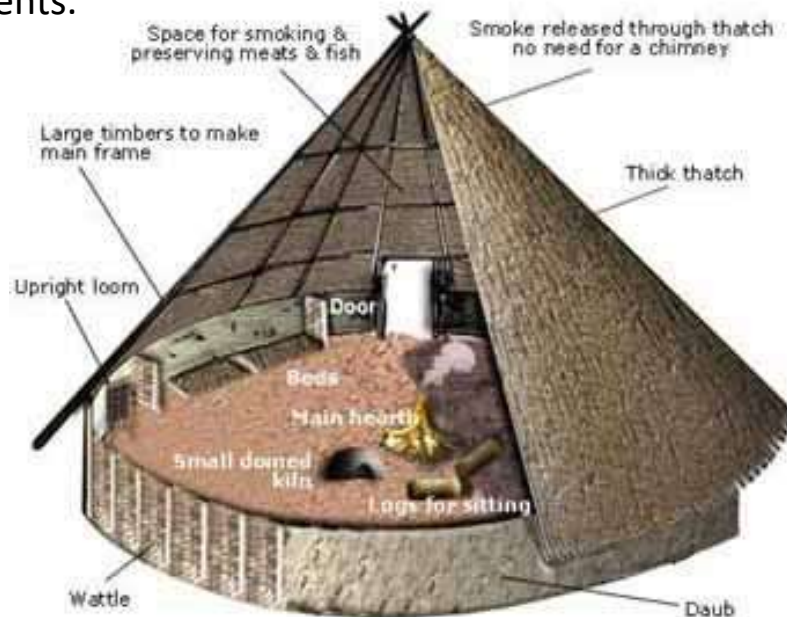
A simple cottage dwelling located in the North of England is above. The use of slate for the roof and brick for the external walls is typical of many buildings of this age and type. In contrast, the buildings in the right-hand picture reflect an earlier form of building in which a structural timber frame is used rather than loadbearing external walls. Note that the upper floors project outwards over the street. This allows more floor area to be created within the dwelling while minimising the area of land utilised. This style was actually driven by economics rather than functionality. At the time of its construction taxes were based on the ground floor area of the building.



Building Styles:

A vernacular building style is specific to a region and uses the local materials available in its construction to form the building fabric.

Modern House construction uses a wide variety of materials and techniques and is not specific to any particular region. Construction methods, materiality of the building envelope and performance of the building fabric can be modified to suit the requirements.



Thermally Light V's Thermally Heavy:

Thermally light buildings are physically light in weight and have a fabric which has little capacity to absorb heat. Such buildings respond quickly to changes in external temperatures.



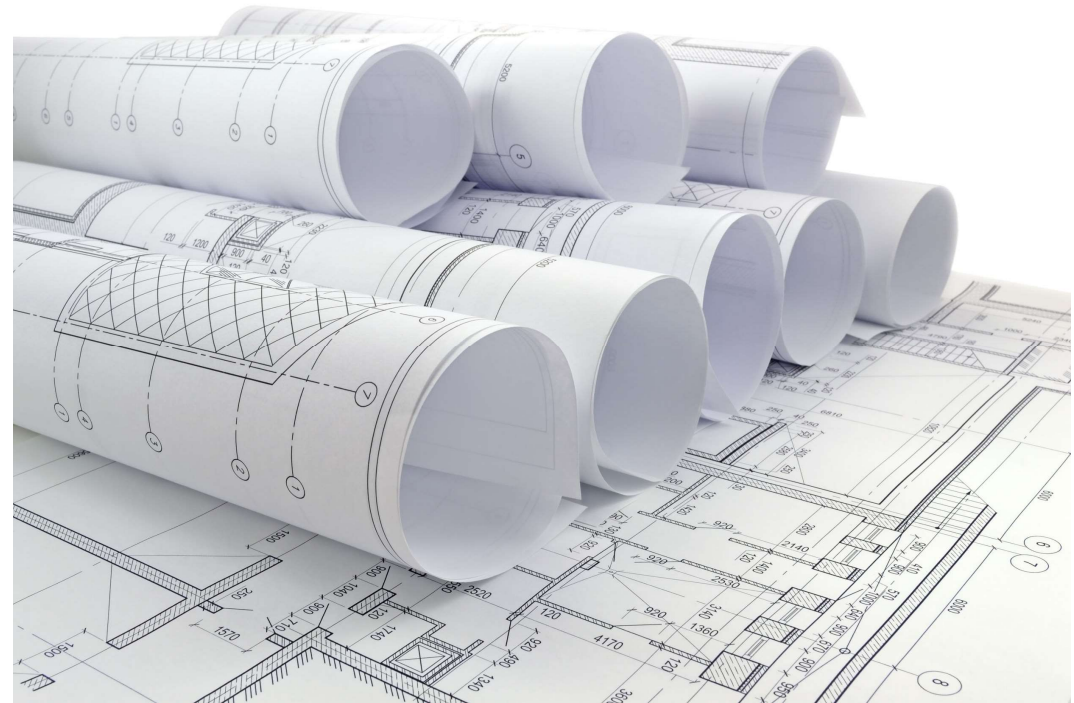
By contrast thermally heavy often have a heavy dense fabric which reflects some heat and absorbs much of the rest. They insulate the interior by reacting slowly to variations in external temperature.



Performance Requirements of the Building Fabric

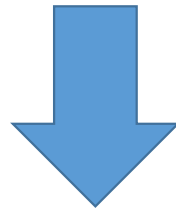
What are the key drivers in providing a building that is suitable for the need?

- Structurally Stable
- Durability
- Thermal insulation
- Protection from weather and exclusion of moisture
- Acoustic performance
- **Flexibility to change to changing needs**
- Aesthetics
- Buildability
- Sustainability

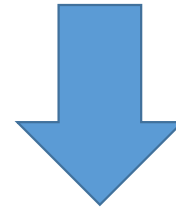


Trigger events?

Flexibility to change to changing needs



How Buildings Learn



How Digital Technologies can Assist

Creating a Data Rich Building Stock

FOCUS ON NEW BUILD

Other methods are useful for digitizing an estate

Data Availability

New Build

- Accurate geometry
- Asset data available



Laser Scan and Model

- Accurate geometry
- Very limited data available



Conversion of Existing 2D information

- Inaccurate geometry
- Data limited to drawing notes





St Mary's Church – Grade II listed.



St Mary's Church – Grade II listed.

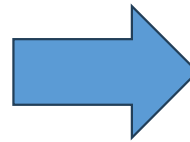
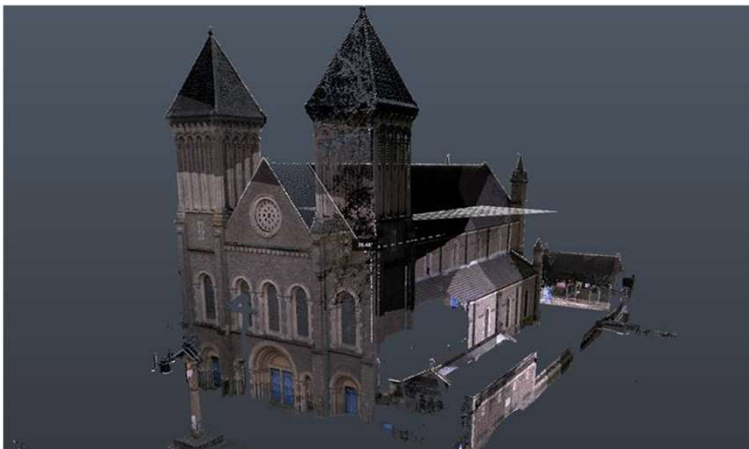


St Mary's Church – Grade II listed.



Swansea city to Youtube here: <https://youtu.be/uYdlqqvqhsW>

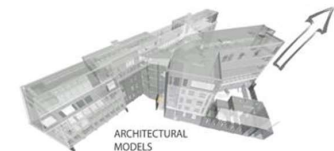
A full building scan <https://youtu.be/pyfHtGJyxU0>



How can we create data rich intelligent models?

Tools such as Revit enable intelligent 3D Modelling that can be linked into a BIM Process.

 **AUTODESK®
REVIT®**



Origins in UK



Sir Michael **Latham** described as 'ineffective', 'adversarial', 'fragmented' and 'incapable of delivering for its customers'.



Flexibility to change to changing needs
How Buildings Learn

FLOW

<https://youtu.be/maTkAcDbrEY>

<https://learningonscreen.ac.uk/ondemand/playlists/384826>



CHANGE

<https://youtu.be/ZSaWdp833YM>

<https://learningonscreen.ac.uk/ondemand/playlists/384826>



**Every building
is a prediction
and every prediction
is wrong.**

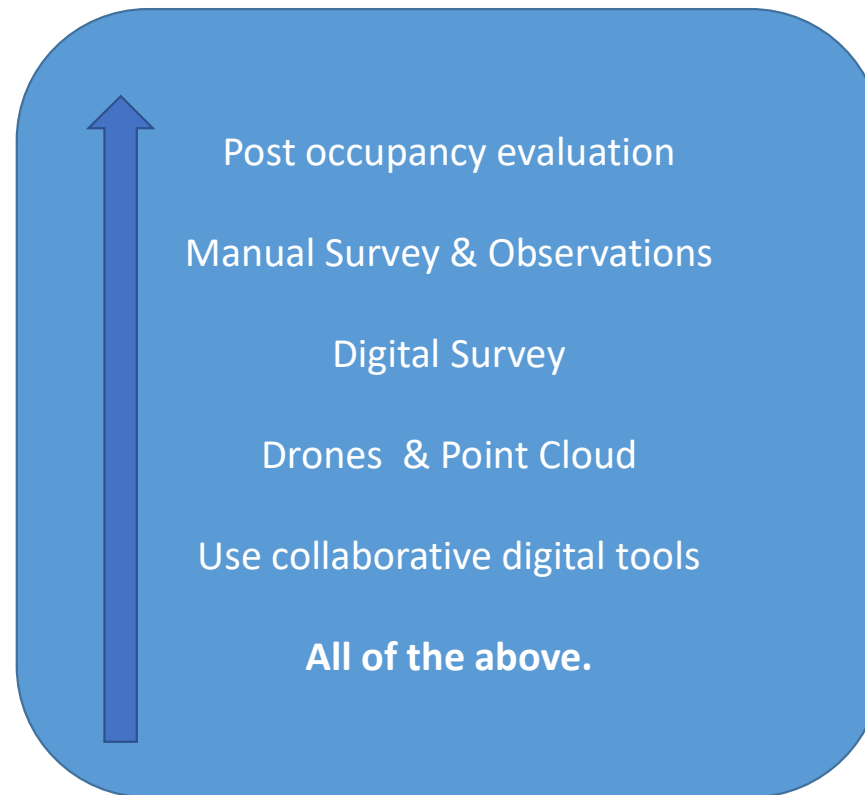
Stewart Brand — 'How buildings learn'

How do we evaluate?

How can we improve?

What can we learn?

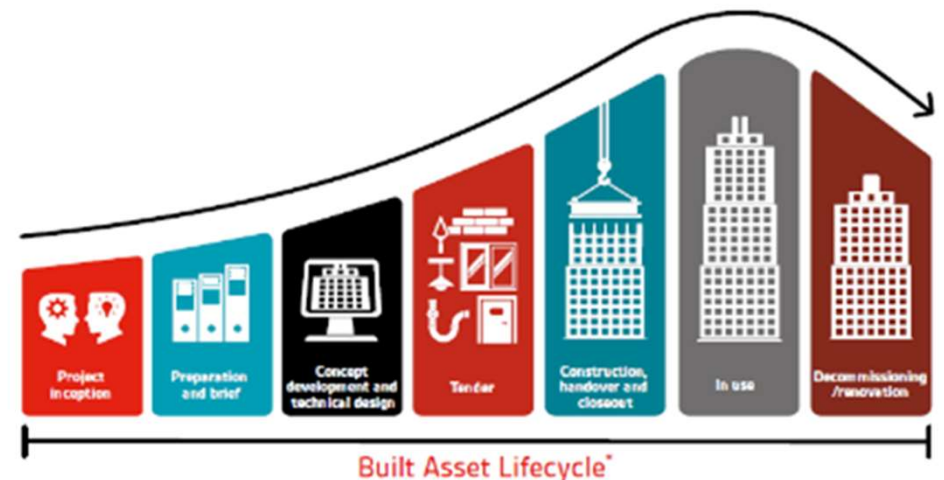
How do we evaluate?



How is this managed?

Life Cycle of the Asset that considers:

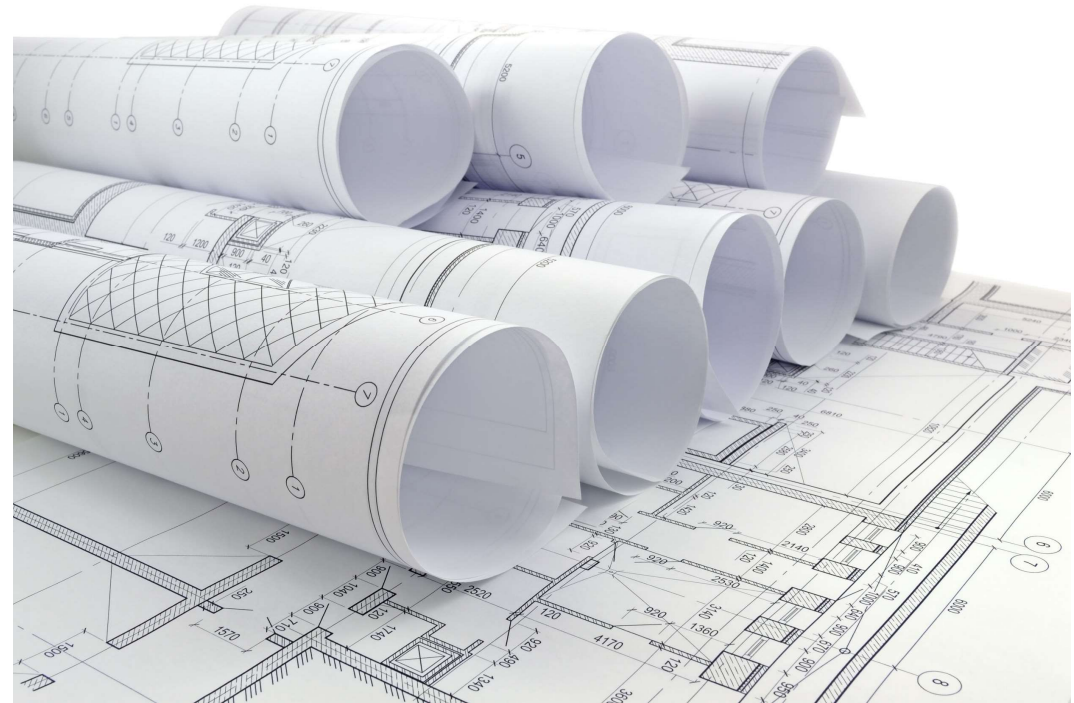
- Management and Controls for Maintenance
- Introduction of Sustainability Measures
- Monitoring Energy Performance
- Health and Safety - Statutory Observations
- Management of Alterations, Adaptations and Refurbishment
- Introduction of New Technologies



Performance Requirements of the Building Fabric

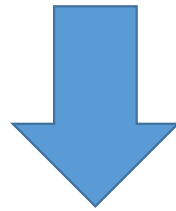
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- **Flexibility to change to changing needs**
- Aesthetics
- Buildability
- Sustainability

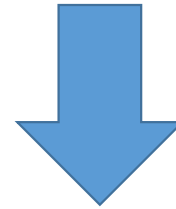


Trigger events?

Flexibility to change to changing needs



How Buildings Learn



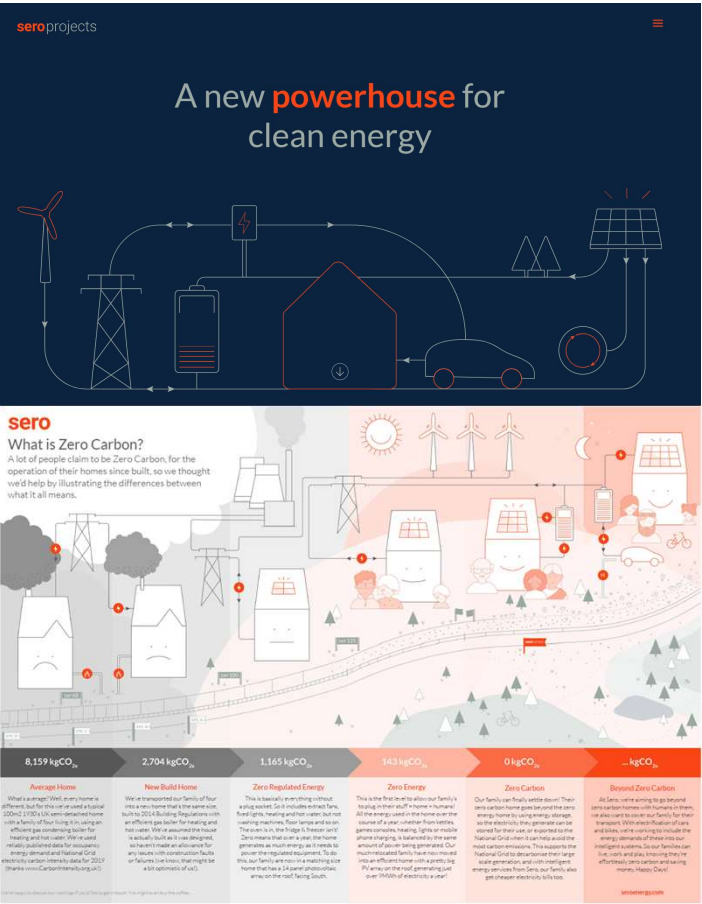
How Digital Technologies can Assist

Challenges and Opportunities



New Technology (Early Adopters – Driving Change)

Our Vision - Sero Homes



The Active Building Centre Research Programme - Welcome

Our innovative Active Buildings® are generating, storing and releasing their own energy - Swansea University



OUR CHALLENGE

The UK Government is committing to ambitious targets for the UK to reach net zero carbon emissions by 2050.

Funded through the Transforming Construction Challenge, the Active Building Centre seeks to transform the way the UK designs, constructs and operates buildings.

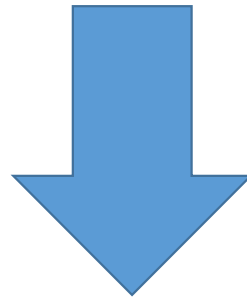
Active Buildings have the potential to substantially reduce both the operational costs of buildings and their demand on the UK energy infrastructure.

ACTIVE OFFICE

ACTIVE HOMES NEATH

ACTIVE CLASSROOM

There is a limited time to upgrade the existing building stock, and delivering net-zero will require deep retrofits of these buildings.



Can BIM tools help us evaluate our Building Stock?

Creating a Data Rich Building Stock

Methods for digitizing an Estate

New Build

- Accurate geometry
- Asset Data available

Existing Buildings:

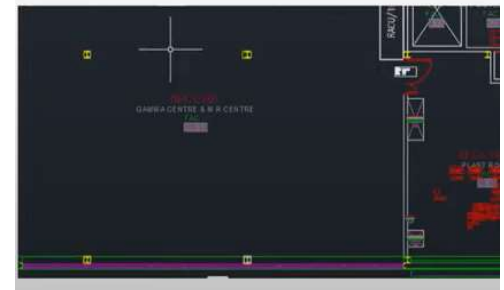
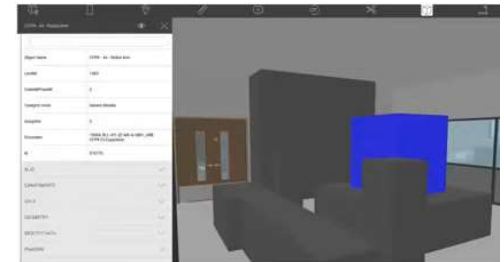
Laser scan and Model

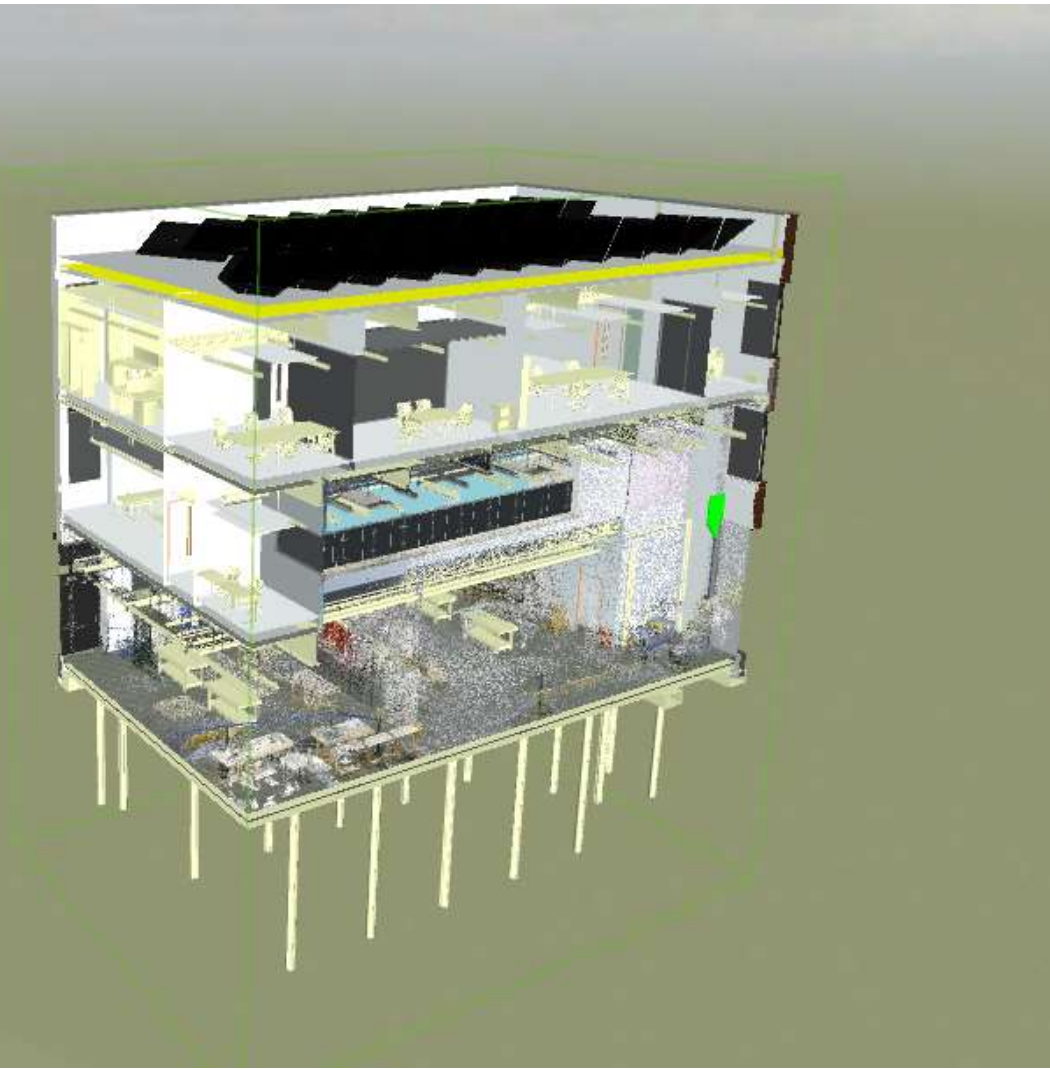
- Accurate geometry
- Limited data

Conversion of Existing 2D records

- Inaccurate Geometry
- Data limited to annotations

Data Availability





Creating a Data Rich Building Stock

Taking Precedent:

Utilizing collaborative platforms to assist with



- Accurate geometry
- Accurate Data
- Snagging, Defects
- Monitoring / Reporting / Allocating
- Asset Tagging (QR codes)

Creating a Data Rich Building Stock

Putting Theory into Practice

Utilizing collaborative platforms to assist with



revizto™

- | | | |
|---------------------------------------|---|-------------------|
| • Accurate geometry | → | Laser Scan |
| • Accurate Data | → | Add Asset Data |
| • Snagging, Defects | → | Create Stamps |
| • Monitoring / Reporting / Allocating | → | Assign Issues |
| • Asset Tagging | → | Generate QR Codes |

Assessment 1 (50%)

Submission
deadline:

24th March 2026 (portfolio)
Note interim deadlines

Module Learning Outcomes (from module syllabus)

Demonstrate a systematic understanding of the main concepts of structural design, building construction and environmental science as they relate to the construction of buildings, including the science of fire, smoke generation and spread and design principles to minimise the risk of smoke and fire;

outline the main current developments in structural design, building materials, construction techniques and sustainable design;

explain the methods of investigation and information resources available to establish the state of current knowledge in construction technology;

communicate the methods of utilising fabric first thermal efficiency, regenerative design solutions and ethical sourcing of products.

Assessment 1 (50%)

Submission
deadline:

24th March 2026 (portfolio)
Note interim deadlines

How Buildings Learn: The challenges of decarbonisation in the existing building stock.

The Government is committed to a reduction in carbon emissions by 2050. A vast majority of buildings will require deep retrofitting to meet the ambitious targets in the drive towards net zero.

Technical Portfolio: Case study (100%)

Over the course of the year, students shall develop a technical portfolio that will critically analyse and assess an existing case study building to evaluate the technological challenges of retrofitting. Investigation shall initially focus on the existing as built information available and coordination of new and historical data streams utilizing an interoperable collaborative platform. Your research shall consider five key themes and findings shall be compiled throughout the year and collated in an A3 format portfolio. Students will be guided on specific areas of focus within the themes below.

1. Building Appraisal & Digital Analysis (20%)
2. Retrofit and Thermal Performance (20%)
3. Construction & Structural Design: Opportunities/Constraints /New technology (20%)
4. Environmental Design & Energy Performance (20%)
5. Fire Safety Compliance (20%)

Assessment 1 (50%)

Submission
deadline:

24th March 2026 (portfolio)
Note interim deadlines

How Buildings Learn: The challenges of decarbonisation in the existing building stock.

The portfolio shall be methodically structured and presented in a professional manner, highly graphical with the use of analytical diagrams, digital media and models. Appropriate referencing shall be included where applicable.

Timetable of portfolio submission:

It is envisaged that your portfolio is developed incrementally over the academic year to allow transferable skills to the studio modules. Interim deadlines as follows:

Parts 1 & 2: 9th December 2025

Parts 3 & 4: 24th February 2026

Part 5: 24th March 2026

Final Portfolio submission on all aspects 24th March 2026

Assessment 1 (50%)

Submission
deadline:

24th March 2026 (portfolio)
Note interim deadlines

Engagement with Literature Skills

You must demonstrate wider reading around the subject, as well as where your information has come from. In doing so, you must demonstrate that you know where to search for information, that it is credible and that it relates to the topic area.

Knowledge and Understanding Skills

You must show that you understand the issues around the topics covered within the body of work.

Cognitive and Intellectual Skills

The case study should address the themes highlighted in the scenario by means of research, critical analysis and evaluation.

Practical Skills

Application of the real world scenario within the Case Study, should challenge current thinking and demonstrate the appropriateness of application of new technology and methods of practice.

Transferable Skills for Life and Professional Practice:

The work must be professionally presented as a technical Case Study report.

STUDENT FEEDBACK FORM		
This section details the extent to which the assessment criteria are demonstrated by you, which in turn determines your mark. The marks available for each category of skill are shown. Lecturers will use the space provided to comment on the achievement of the task(s), including those areas in which you have performed well and areas that would benefit from development/improvement.		
Generic Assessment Criteria	Marks available	Marks awarded
1. Engagement with Literature Skills	15	
2. Knowledge and Understanding Skills	25	
3. Cognitive and Intellectual Skills	25	
4. Practical Application Skills	25	
5. Transferable Skills for Life and Professional Practice	10	
Assessment Mark (Assessment marks are subject to ratification at the Exam Board. These comments and marks are to give feedback on module work and are for guidance only until they are confirmed.)	Late Submission Penalties (tick if appropriate) Up to 1 week late (20% Max.) Over 1 week late (0%)	%

Assessment 2 (50%)

Submission
deadline:

21st April 2026

Module Learning Outcomes (from module syllabus)

Demonstrate a systematic understanding of the main concepts of structural design, building construction and environmental science as they relate to the construction of buildings, including the science of fire, smoke generation and spread and design principles to minimise the risk of smoke and fire;

outline the main current developments in structural design, building materials, construction techniques and sustainable design;

explain the methods of investigation and information resources available to establish the state of current knowledge in construction technology;

communicate the methods of utilising fabric first thermal efficiency, regenerative design solutions and ethical sourcing of products.

Assessment 2 (50%)

Submission
deadline:

21st April 2026

How Buildings Learn:

'Buildings keep on growing. A building is not something you finish it's something you start. '
Brand 1995

The Government is committed to a reduction in carbon emissions by 2050. A vast majority of buildings will require deep retrofitting to meet the ambitious targets in the drive towards net zero. The latest custodians of the case study property wish to prepare a 5-point strategy to ensure that building will develop and adapt to meet new demands.

With reference to the research aspects undertaken in coursework 1, prepare a PowerPoint presentation that crystalises the research themes investigated in your portfolio case study.

Propose a phased strategy of interventions that will enable the building to adapt to meet the new requirements, be flexible to future changing needs and adhere to the commitment to reduce carbon emissions by 2050.

Your presentation should include an outline timeline that considers short-, medium- and long-term interventions.

Your presentation should be methodically structured, highly graphical with the use of analytical diagrams and digital media. Appropriate referencing shall be included where applicable.

Assessment 2 (50%)

Submission
deadline:

21st April 2026

Engagement with Literature Skills

You must demonstrate wider reading around the subject, as well as where your information has come from. In doing so, you must demonstrate that you know where to search for information, that it is credible and that it relates to the topic area.

Knowledge and Understanding Skills

You must show that you understand the issues around the topics covered within the body of work.

Cognitive and Intellectual Skills

The presentation should address the themes highlighted in the scenario by means of research, critical analysis and evaluation.

Practical Skills

Application of the real world scenario within the Case Study, should challenge current thinking and demonstrate the appropriateness of application of new technology and methods of practice.

Transferable Skills for Life and Professional Practice:

The work must be professionally presented.

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THE DYLAN THOMAS CENTRE

REFERENCE
NUMBER: 11643

GRADE II*

STATUS:
DESIGNATED

DATE OF DESIGNATION:
30/03/1987

THE OLD GUILDHALL (FORMER ANNEXE TO DYNEVOR COMPREHENSIVE SCHOOL)

Interior retains classical detailing to main lateral staircase with arched coffered ceiling; top flight with trabeated columned archway flanked by niches etc leads to monumental entrance hall with ribbed ceiling and massive doorcases. Good classical interiors to former Council Chamber and Court Rooms I and II. Vaulted ground floor rooms and passages, brick cells to rear.

EASTING: 266079

NORTHING: 192929



THE DYLAN THOMAS CENTRE

ADVANCED ENDS, 1ST FLOOR
AEDICULES

CENTRE BAYS

TALL ARCHED WINDOWS WITH
ARCHITRAVES

SOLID PARAPETS
(BALUSTRADES AND URNS
REMOVED)

THREE QUARTER COLUMNS

DEEP CORNICE TO
ENTABLATURE

BLOCK PEDESTALS TO
COLUMNS LINKED BY CILL
BANDS (BALUSTRADE APRONS
REMOVED)



IMPOST BANDS + SASH
WINDOWS WITH GLAZING
BARS

OPENINGS WITH KEYBLOCKS
AND RECESSED FRAMES

TWIN PILASTERED DOOR
CASES WITH VOLUTES AND
ARCHED ARCHITRAVES

BLIND LUNETTES AND
DOUBLE PANELLED DOORS

LATER 3 STOREY EXTENSIONS WITH LARGE GROUND FLOOR ARCHES
TO LEFT SIDE CONCEALING ORIGINAL REAR ELEVATIONS

CHANNELLED RUSTICATION
UNDER BAND COURSE TO
GROUND FLOOR

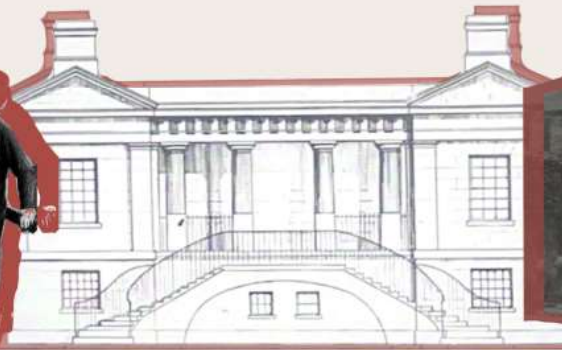
HISTORY OF THE DYLAN THOMAS CENTRE

1825

Work begins to build Swansea's Guildhall in the Maritime Quarter. 28th of September 1825.



"The new guildhall on the burrows was an attractive building with a 'handsome Graecian Doric freestone front'. Its main entrance was at first-floor level, via a grand, external double staircase in stone, which led to a balcony fronted with four doric columns. Accomodation was provided for the corporation and for the meetings of Petty Sessions and Quarter Sessions." - The Guildhall, Swansea by J.R.Alban (1984)



1827

Original budget £3,725. The original design of the building was by William Jernegan, architect from the Channel Islands, responsible for many buildings in Swansea, working with John Collingwood, architect from Gloucester. Completed in 1827.

Work was not finished until October 1829 - final cost £6,369 & 16s.

As grand as the building may have been, it was soon found too small for the needs of the government and the developing town. Many internal alterations were made but by 1848 it was not enough and they decided to extend.

1848

William Richards, began work on the extended building with its new facade. The walls of the extension were built of pennant sandstone from local quarries, although the fronts were wholly cased in bath stone. The walls of the entrance hall, principle staircase and vestibule were entirely rendered in Martin's cement.



1919

The guildhall is the venue for victory marches by returning regiments.

1914

Dylan Thomas was born. 27 October 1914.

HISTORY OF THE DYLAN THOMAS CENTRE

1953

9 November 1953 (aged 39)



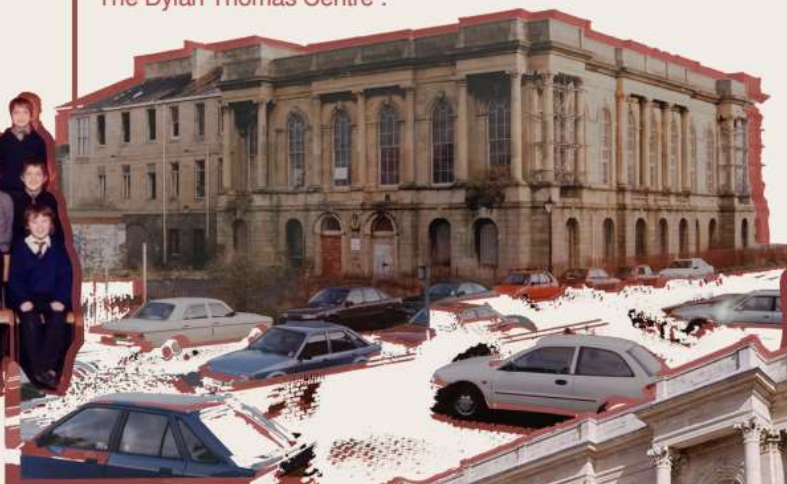
1970

Technical College moves to Tycoch. Old Guildhall becomes an annexe for Dynevor Comprehensive.



1995

1995 Year of Literature – Tŷ Llen / The Dylan Thomas Centre renovated and officially named 'The Dylan Thomas Centre'.



1995

Bono was interviewed as part of the 1995 Year of Literature and Writing in The Grand Theatre, Swansea.



1954 - 1960

1954 Technical School becomes a 'boys only' school.
1947-1960 Secondary Technical School Youth Employment Bureau.
1960 Boys' Technical School Closed Replaced by Technical College.

1982

Dynevor annexe closes. Building is uninhabited.



HISTORY OF THE DYLAN THOMAS CENTRE



1995

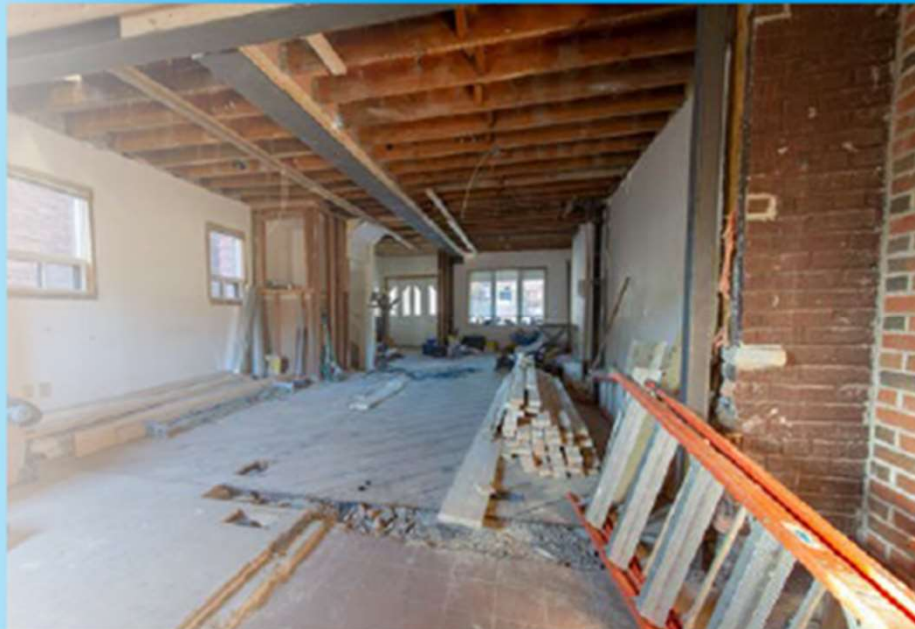
1995 Year of Literature – The Dylan Thomas Centre opened by former US President Jimmy Carter. Jimmy Carter in a group photo, taken after the concert at The Talbot Hotel, Tregaron, which includes First Lady Rosalynn and their daughter Amy.



1995 - 2025

A year round programme of events continues beyond the Year of Literature and a permanent Dylan Thomas Exhibition is developed. 'Love the Words'.

- Current refurbishment practice.
- Guidance for retrofit
- PAS 2035 for Domestic
- PAS 2038 for non-Domestic / Commercial
- What about Historic Buildings?



Refurbishment

or

Retrofit

Dictionary

Definitions from [Oxford Languages](#) · [Learn more](#)



refurbishment

/rɪˈfɜːbɪʃm(ə)nt/

noun

the renovation and redcoration of something, especially a building.

"the theatre reopened following major refurbishment"

Dictionary

Definitions from [Oxford Languages](#) · [Learn more](#)



retrofit

/ˈrɛtrə(ʊ).fɪt/

verb

add (a component or accessory) to something that did not have it when manufactured.

"motorists who retrofit catalysts to older cars"

noun

an act of retrofitting a component or accessory.

"uninsulated and oddly designed dream houses that are badly in need of a retrofit"

PAS 2035:2019

Incorporating Corrigendum No. 1

Retrofitting dwellings for improved energy efficiency – Specification and guidance



PAS 2038:2021

Retrofitting non-domestic buildings for improved energy efficiency – Specification

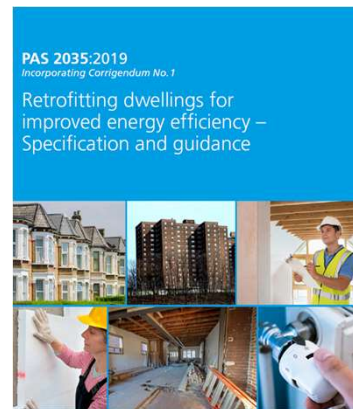


Retrofit Considerations

Adhering closely to the PAS 2035 Optimised Retrofit guidelines.

Project Considerations.

- Performance & Budget
- Fabric First Initiatives
- Systems
- Renewables



Department for
Business, Energy
& Industrial Strategy

bsi.

Figure D.1 – The measures interaction matrix

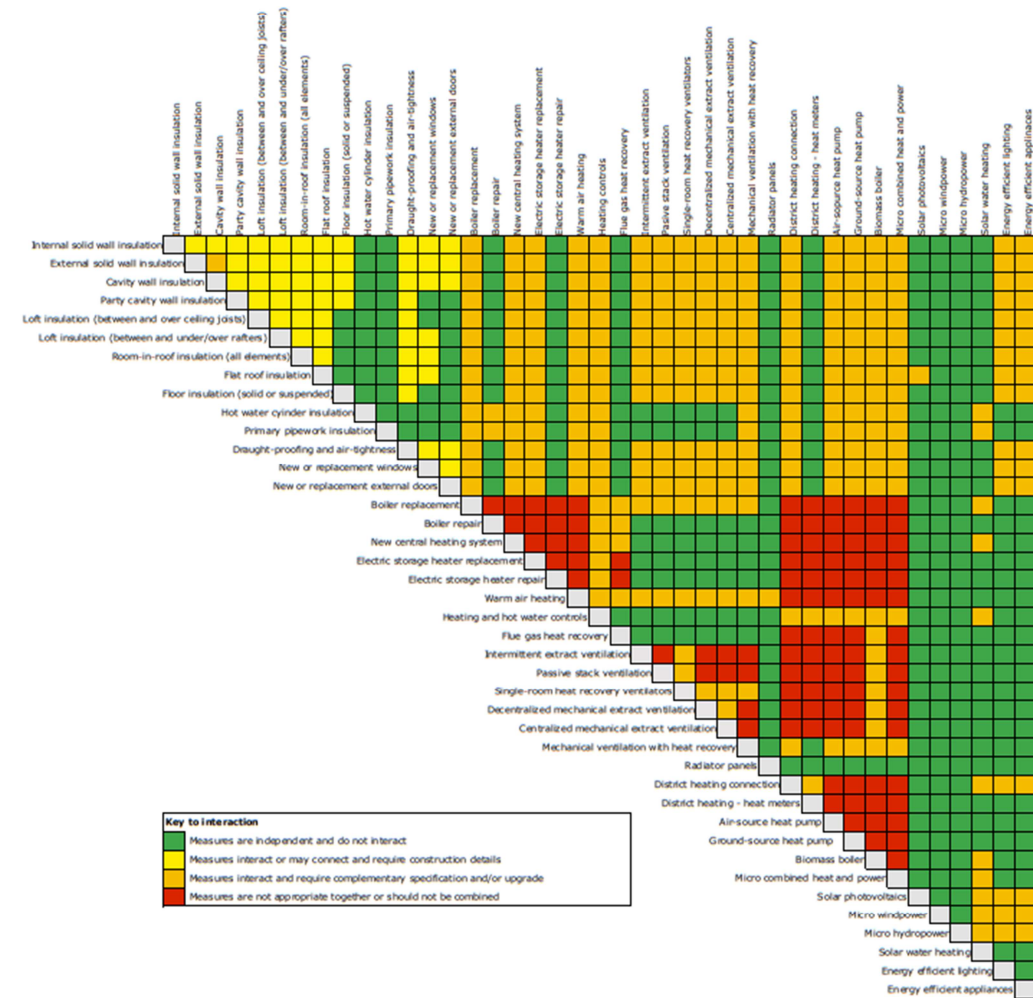
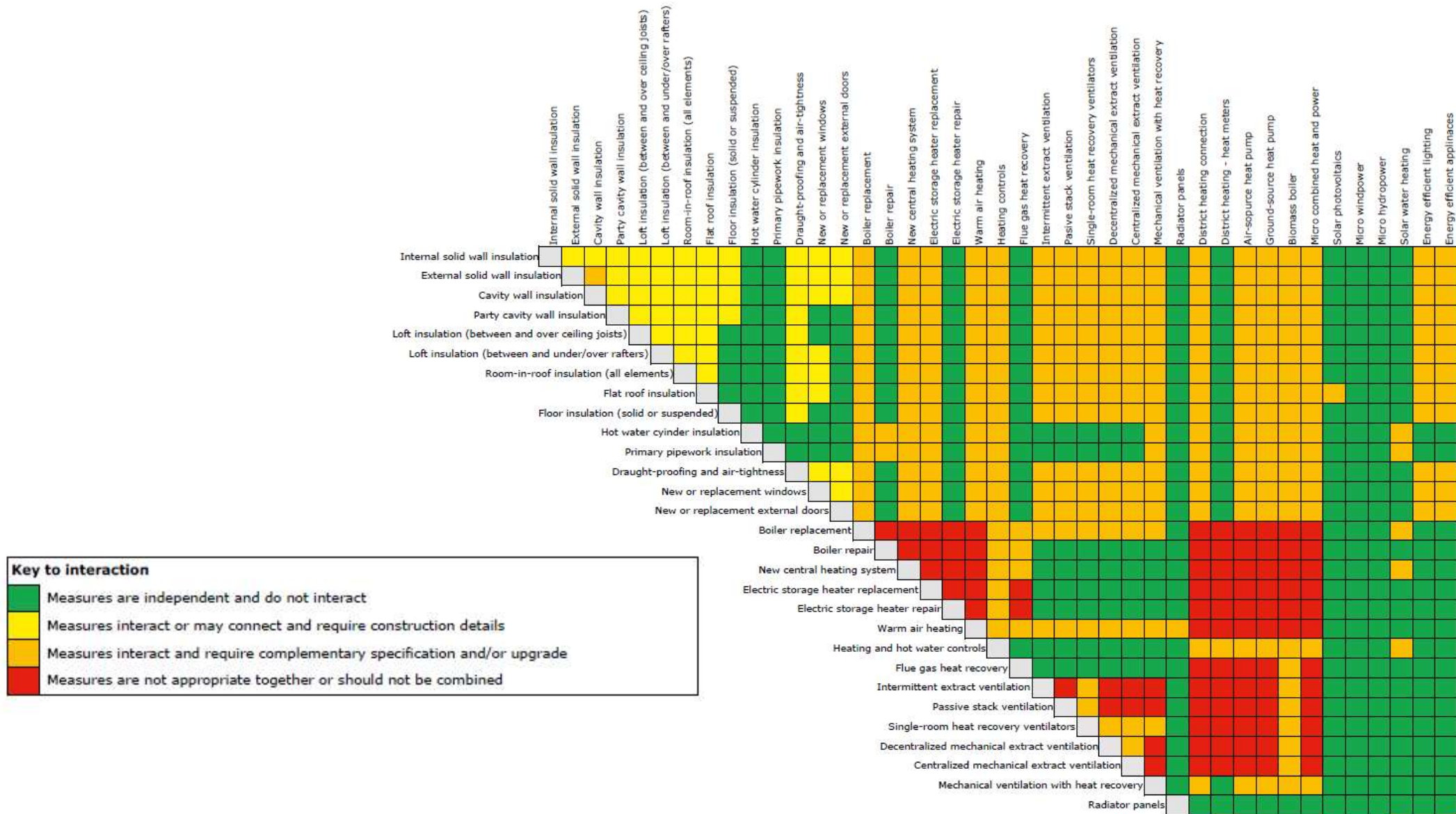


Figure D.1 – The measures interaction matrix



Performance and Budget

- Existing Building:
Walls Roofs Floors Windows and Doors
- Consideration of Budget:
Essential and Desirable.
Short Term and Long Term Benefits.
- Possible future areas of investment.
- What is captured in the Scope
Planning / Building Regulations,
Tender Documentation



Fabric First

The Building Envelope

- Walls, Roof, Floor Windows and Doors.
- Existing U Values / Part L and beyond.
- How can these be improved.



Building Systems

- Air Source Heat Pump
- Ground Source Heat Pump
- Infra Red
- Biomass?



Heating Hot water Renewables

Vaillant Group UK Ltd.
Nottingham Road, Belper, Derbyshire DE56 1JT
Telephone 0345 602 2922
www.vaillant.co.uk
info@vaillant.co.uk

aroTHERM split air source heat pumps



The aroTHERM split has the additional benefit that the outdoor unit can be installed up to 25m away from your property. Plus, as the external pipe work is transferring refrigerant rather than water it removes any risk of freezing in extreme weather.

	aroTHERM split
Heat source	Air
Output range (kW)	3.5, 5, 7, 10, 12
Usage	New buildings, renovation, replacement
Heat emitters	Underfloor heating and radiators
House size	Up to 300m ² in new build
Voltage	230V
Decibel level (sound power)	As low as 54dB
Energy efficiency	Heating A+++/A++ (A+++ - D)
SCoP rating	up to 4.69

The benefits of the aroTHERM split

- The outdoor unit can be discreetly installed, wall-mounted or floor-standing
- The wall-hung indoor module has a similar footprint to a standard combi boiler
- Available in various outputs to suit different types of properties
- Extremely low noise emissions - all outputs accredited with the Quiet Mark

Compatible with smart heating controls



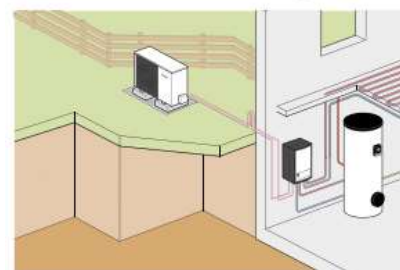
sensoCOMFORT



VRG 700



Smartphone app



aroSTOR domestic hot water air source heat pump cylinder



	aroSTOR domestic hot water heat pump
Heat source	Air
Usage	New buildings, renovation, replacement
Size	200 and 270ltr
Amount of usable hot water	367 and 495ltrs *based on stored water at 65°C
Energy efficiency	A+

The benefits of aroSTOR

- Highly efficient heat pump cylinder has the best possible ErP label of A+
- The stainless steel tank comes with a five year guarantee (two years for other components)
- A small footprint and range of 360° air duct accessories offers flexible options for siting of the appliance
- Extremely quiet operation, advance insulation and use of rubber on the compressor for quiet operation
- Self managing hot water comfort with electrical back up heater for hot water boost (and Legionella protection)
- aroSTOR heat pumps cylinders come with their own control fixed to the unit. This is a simple turn dial and push button control that has been specifically designed for the aroSTOR.

The aroSTOR range of domestic hot water heat pump cylinders include 200 and 270 litre models. It is perfect for additional hot water requirements in larger homes or small businesses where there is a high hot water demand.

This heat pump cylinder is incredibly efficient and sustainable, using thermal energy to heat hot water. This thermal energy can be collected via an external air duct, or it can recycle hot air from within the room where it's installed, provided there is sufficient ventilation. The only other energy needed is the electricity to run the appliance.



Air

Air source (also known as air-to-water) heat pumps have an outdoor unit that extracts thermal energy (heat) from the surrounding air and converts this into heating and hot water. Air source heat pumps require a small amount of outdoor space connected to an indoor module and a cylinder if hot water is required. As air is an easily accessible source of energy it is a less expensive option than using ground or water source heat pumps and is suitable for most property types in the UK.

Building Systems

- Discrete Heat
- LST Rad
- Underfloor
- Radiant Panels

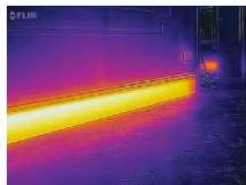
ThermaSkirt - the advantage



Patented design gives unparalleled performance and amazing aesthetics

Only ThermaSkirt^{H2O} features the unique elliptical flow and return pipes to not only achieve a super slim 20mm profile, but also to maximise heat output.

Providing a profile that replicates a typical skirting board not only creates incredible aesthetics, but the increased turbulence created by the elliptical tubes ensures more heat from the water is transferred to the radiant surface. This coupled with a high quality aluminium polymer alloy ensures a high heat output per metre and an even spread of heat across the length and breadth of the system.



A conventional round pipe creates a 'bullseye' effect whereby the hot water travels down the centre, limiting heat transfer to the surface.



ThermaSkirt's patented Oval pipe creates tremendous turbulence releasing the heat and significantly improving output per metre.



Designed for safety

As well as providing the same energy saving radiant & heat distribution characteristics of the H₂O heating version, ThermaSkirt^e has another unique and important benefit – safety.

Unlike conventional electric panel or storage heaters, ThermaSkirt^e utilises a specially developed fire safe heating element that will not over heat, even if covered over by insulating materials such as books or bedding. Furthermore, the heating system continues to work wherever it is not covered over without fusing or burning itself out.

The maximum operating temperature of the system is fixed, even wherever there is a thermal obstruction.

Whenever the thermal obstruction is removed, ThermaSkirt^e naturally re-sets itself and recommences heating as normal.

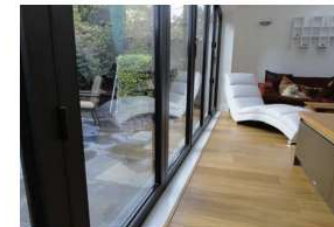
DiscreteHeat Company Limited
1 Victoria Works Industrial Estate,
Atherton, Manchester, M46 0FY.

01942 88 00 66
info@discreteheat.com
www.discreteheat.com



ThermaSkirt - versatile, innovative space saving solutions

With over 45,000 installations worldwide, there aren't many applications we haven't heated or problems we've had to overcome.. Here are just a few examples of just how versatile ThermaSkirt can be.



Bay Windows & Odd Angles

Flexible connectors and configurable covers cope with any angle.

Across Patio & Bi-fold doors

Architects and home-owners love to bring the outside-in-side with large floor to ceiling walls and doors – but where is the heating going to go?

ThermaSkirt can provide a heated 'threshold' solution to provide the heat just where it's needed most.



Under Doorways & Openings

Sub-floor connections allow bridging of doors, archways and fireplaces with ease.



Energy Generation

Renewables.

- Solar PV
- Solar HW
- Wind



Generating renewable energy

Solar panels

Home ▶ Energy at home ▶ Generating renewa... ▶ Solar panels



Costs



Average cost

The average domestic solar PV system is **3.5kWp** and costs around **£4,800**.



South England

A 3.5kWp system in the south of England can generate around **3,700 kilowatt hours** of electricity a year – that's the same amount of electricity as it takes to turn the London Eye 49 times. It will save around **one tonne of carbon dioxide** every year.



Scotland

A 3.5kWp system in Scotland can generate about **2,850 kilowatt hours** of electricity a year – that's the same amount of electricity as it takes to turn the Falkirk Wheel 1,900 times. It will save approximately **0.8 tonnes of carbon dioxide** every year.

Space is a key consideration. As a general guide, a roof area of 10–20 square metres would be enough to deliver between 20% and 45% of the typical household's electricity needs.

This roof space will ideally face South, will be unshaded, and at a pitch angle of about 30 or 40 degrees.

East- or West-facing roofs could still be considered, but North-facing roofs are not recommended.

Any nearby buildings, trees or chimneys could shade your roof and have a negative impact on the performance of your system.

[A comprehensive guide to solar panels - Energy Saving Trust](#)

PAS 2038:2021

Retrofitting non-domestic buildings for improved energy efficiency – Specification



5.1 Requirement for assessment prior to retrofit

Every building that is subject to retrofit compliant with this PAS shall first be assessed by a person or persons suitably qualified as specified in 4.2 and 4.3, and hereafter referred to as the assessor(s), to provide information about the building for use in preparation of a retrofit design. Where more than one assessor (possibly with different specialisms) is required, one of them shall be designated the lead assessor, with responsibility to coordinate the assessment work.

NOTE Assessments of buildings will vary in detail according to the types and sizes of the buildings and the nature of the improvements proposed. However, all assessments should include collation of information in at least four categories.

- 1) *Context – the building's architectural, cultural and historic context, and its physical setting, including aspect and exposure, access, planning constraints, etc.*
- 2) *Condition – the building's structural condition, and its construction, services and controls, the presence of defects and the need for repairs or maintenance (especially any essential precursors to retrofit work).*
- 3) *Occupancy – the number of occupants and their pattern of use of the building, including heating, cooling, ventilation and lighting regimes and controls, the use of hot water and small power, and the arrangements for ensuring occupants' health and safety.*
- 4) *Energy performance – how much energy the building uses, broken down by end uses and fuel types, and how its energy performance relates to typical and/or good practice benchmarks (if available).*

5.2 Scope of assessment

The assessment shall include:

- a) an appraisal of the building's heritage, architectural features, structure, construction and condition and the installed building services to establish the suitability of the building for improvement;
- b) identification of any constraints imposed by the site, e.g. elevation and exposure (to sun, wind and rain, flood risk, adjacent major roads and industrial activity), radon exposure, access, party walls, rights of light, and consideration of adjoining properties;
- c) identification of any constraints and regulatory requirements related to improvement of the building (including requirements for energy

efficiency, fire safety, planning permission, and any arising from Listing as of Special Architectural or Historic Interest, location in a Conservation Area, Tree Preservation Orders or archaeological investigation);

d) identification of:

- 1) the location and severity of any existing construction defects, structural defects or leaks;
- 2) any moisture accumulation, condensation or mould growth and the need for specialist investigation; and
- 3) any improvement measures (e.g. additional insulation) previously installed;

e) an appraisal of existing occupancy, including:

- 1) the number of occupants and regular visitors;
- 2) the hours of occupancy and business;
- 3) any special considerations such as the presence of vulnerable persons; and
- 4) the types of occupants and their requirements for indoor environmental quality;

f) a measured survey to establish the following:

- 1) the overall dimensions of the building's heat loss envelope (including any basements and attics);
- 2) the dimensions of all building elements (exposed floors, external walls, roofs); and
- 3) the dimensions of all window and door openings;

NOTE 1 Items 1) to 3) are all sufficient for accurate plans, sections and elevations of the building to be prepared (unless such drawings already exist).

NOTE 2 Where drawings of the building already exist, a measured survey might not be necessary, but the drawings should be checked for accuracy and corrected if appropriate. Where drawings of the building do not already exist, the preparation of drawings is recommended, but for some small, simple buildings annotated and dimensioned sketch plans and sections, supplemented by photographs, may suffice.

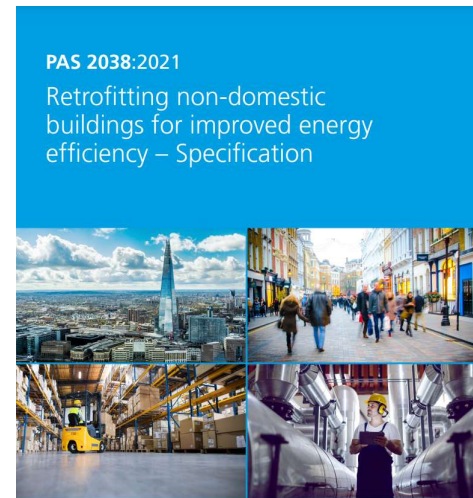
g) an appraisal of the building's construction to establish the thermal and moisture properties of the main building elements (exposed floors, walls and roofs) and the suitability of each element for improvement;

NOTE 3 Where an Energy Performance Certificate (EPC) assessment has been completed, the thermal properties of the main building elements might already be recorded, but they should be checked for any obvious inaccuracies, and corrected if appropriate.




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Holistic Approach

Holistic Approach
You need to
understand what
you have before
you make
recommendations

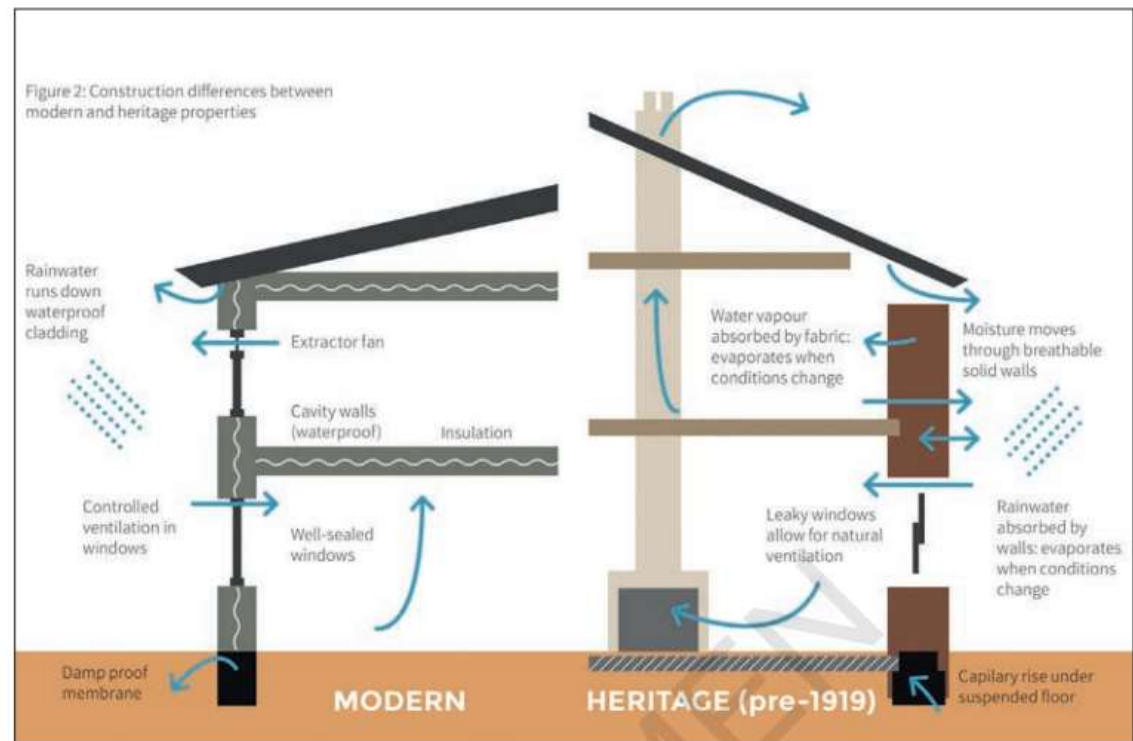


Fig 3.1: Comparison of the performance of modern and traditional buildings¹¹

Retrofit

- Performance Standards
- Passivhaus
- ACTIVE House
- LEED
- BREEAM
- EnerPHit
- SKA



What about Historic Buildings?

Understanding Buildings

