Hereford Archive and Records Centre

Early Design Decisions

Jonathan Hines, Managing Director, Architype

ukpassivhaus conference2016

bre


simplicity
evidence


“The simplest way to achieve simplicity is through thoughtful reduction”
John Maeda, Simplicity law 1
(with thanks to Nick Grant)


simplicity
evidence

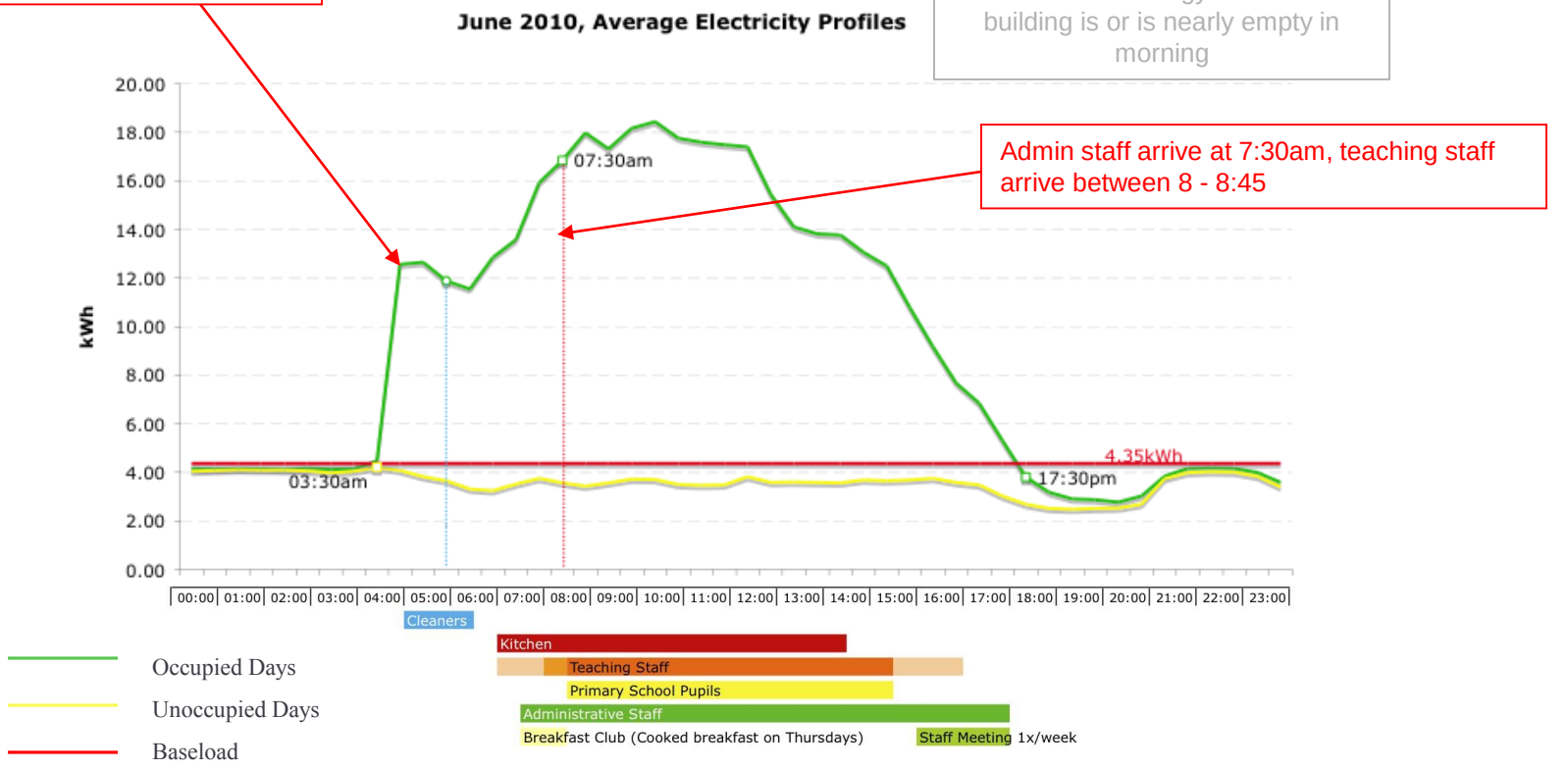
Major electrical use before building is occupied, in both summer and winter

(6 cleaners arrive @ 5am)

A-Typical Summer Profile Shape

substantial energy use when building is or is nearly empty in morning

Admin staff arrive at 7:30am, teaching staff arrive between 8 - 8:45

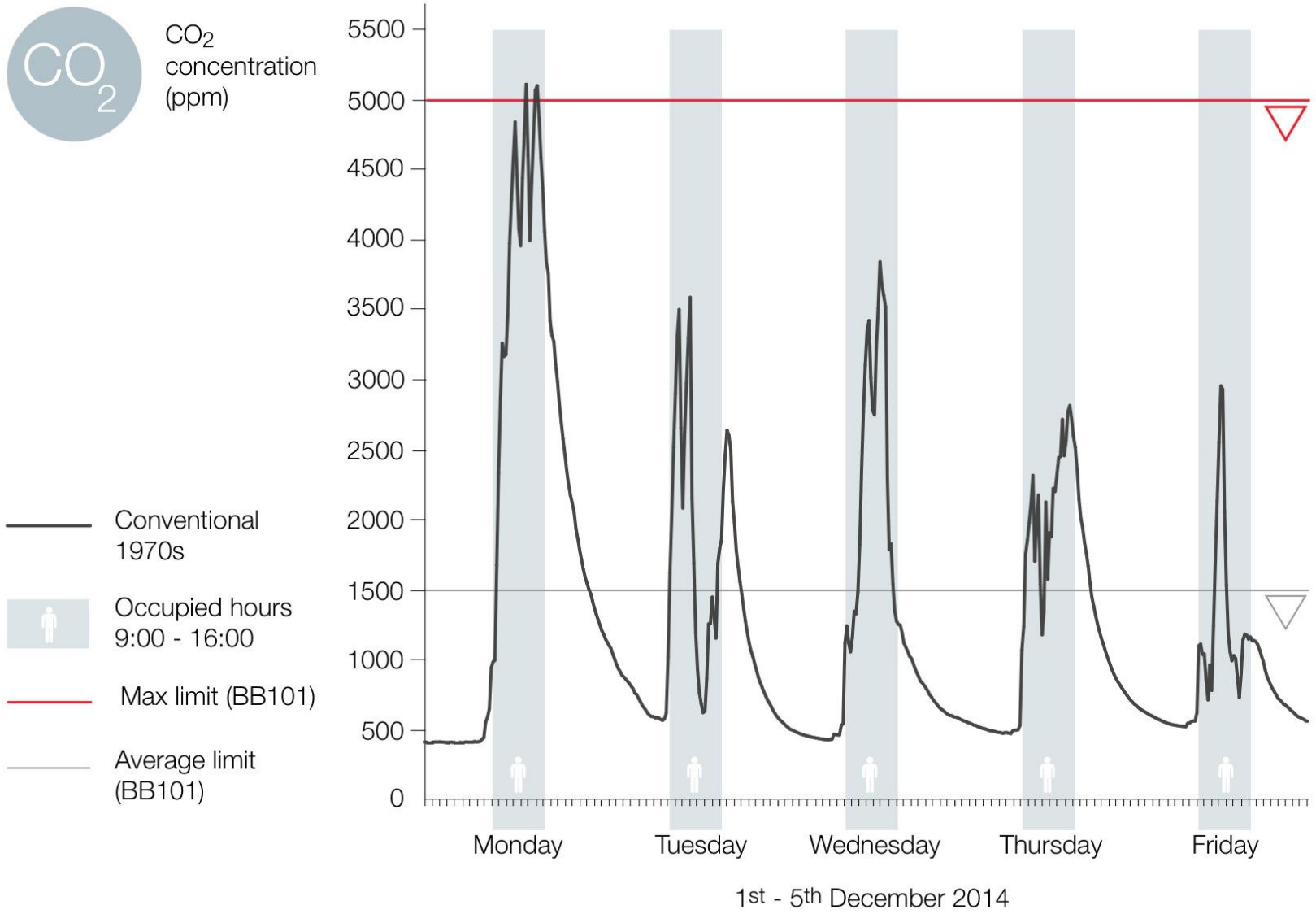



Bushbury Hill Primary School


Wilkinson
Primary School


LOOK

Indoor air quality in winter



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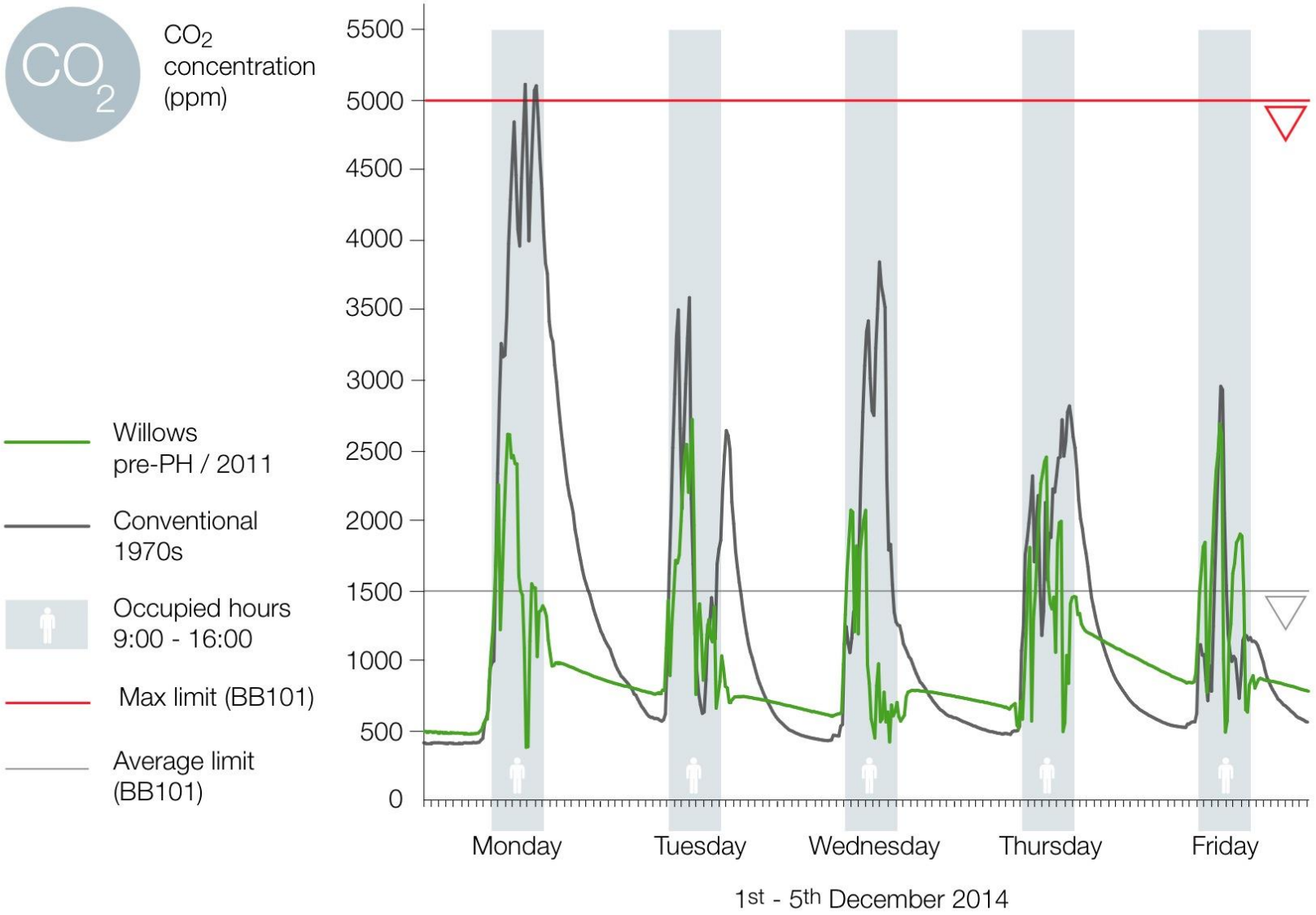

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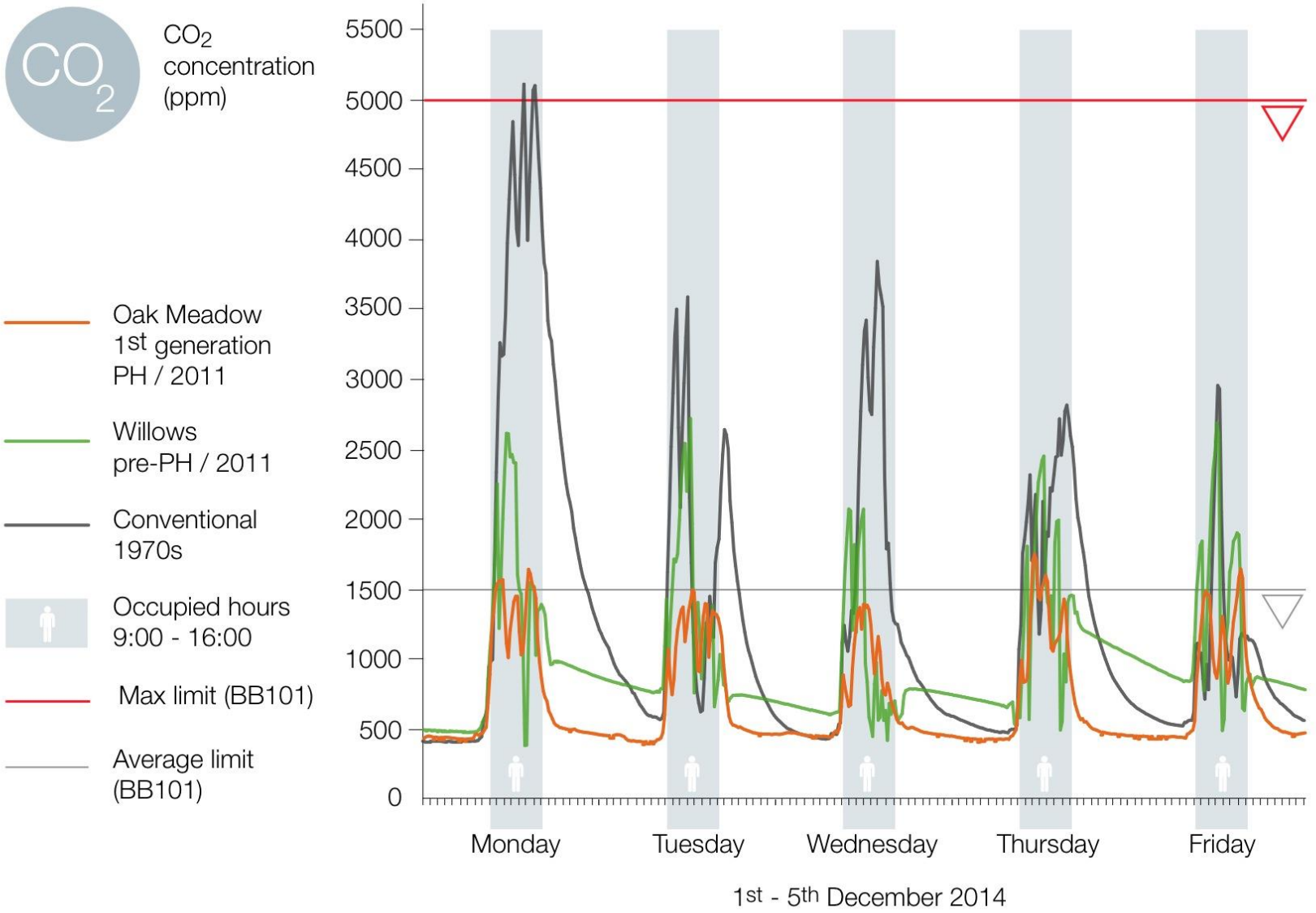

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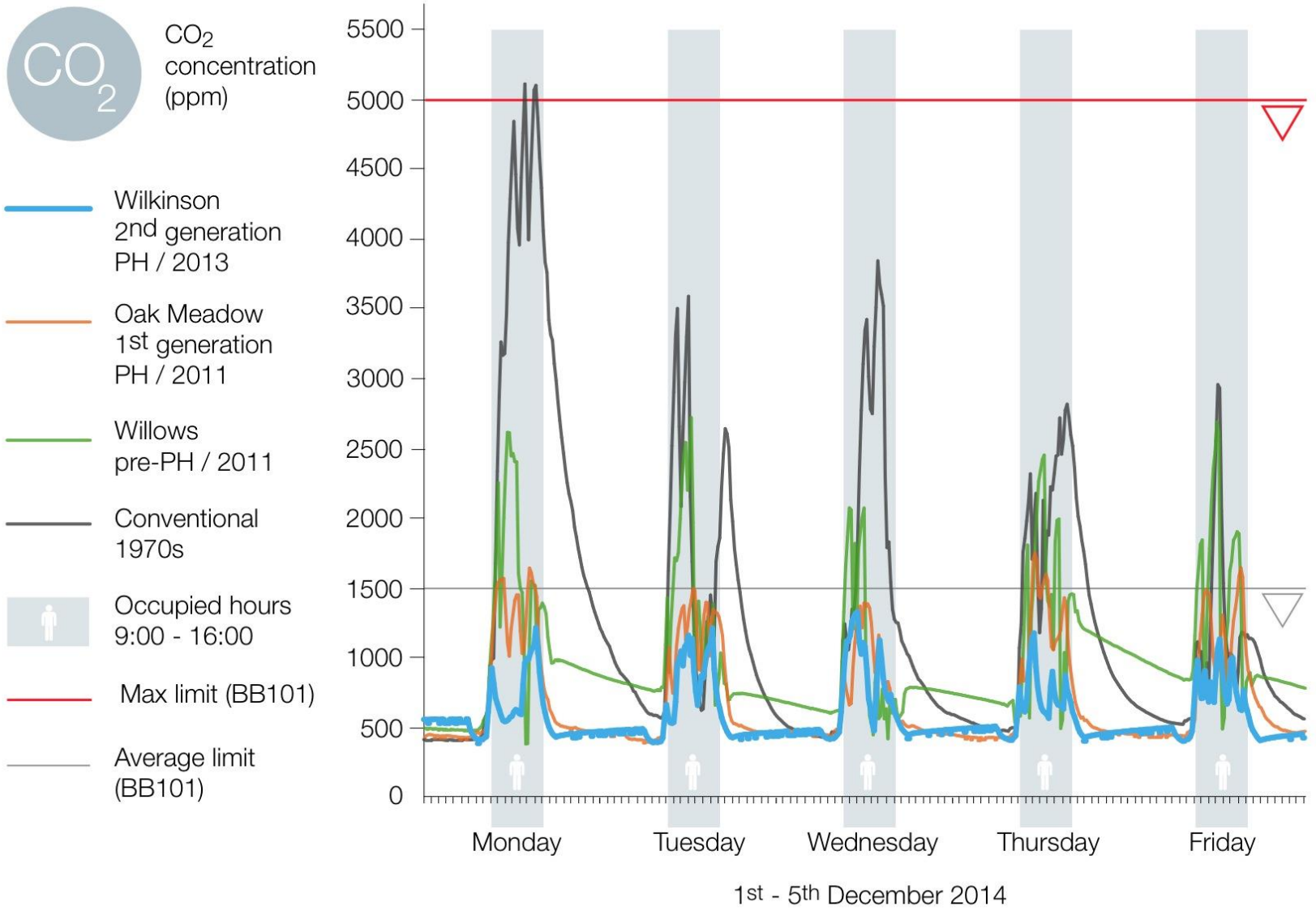
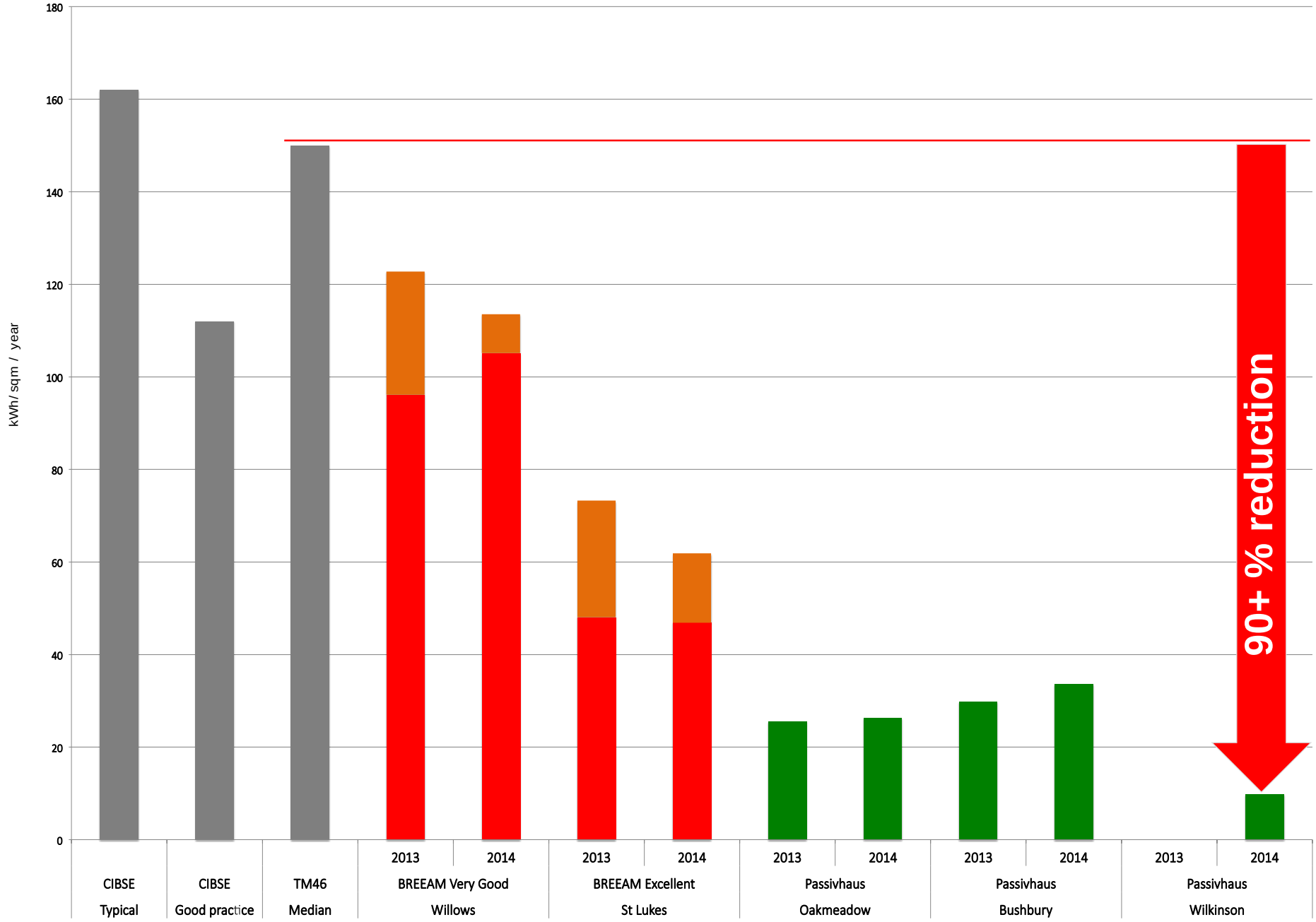



kWh/ sqm / year
180
160
140
120
100
80
60
40
20
0
90+ % reduction
2013
2014
2013
2014
2013
2014
2013
2014
2013
2014
CIBSE
Typical
CIBSE
Good practice
TM46
Median
BREEAM Very Good
Willows
BREEAM Excellent
St Lukes
Passivhaus
Oakmeadow
Passivhaus
Bushbury
Passivhaus
Wilkinson

HARC – two parts of the brief….

1. public access rooms and library, exhibition space, conservation studios, office space

etc

= standard comfort requirements

HARC – two parts of the brief….

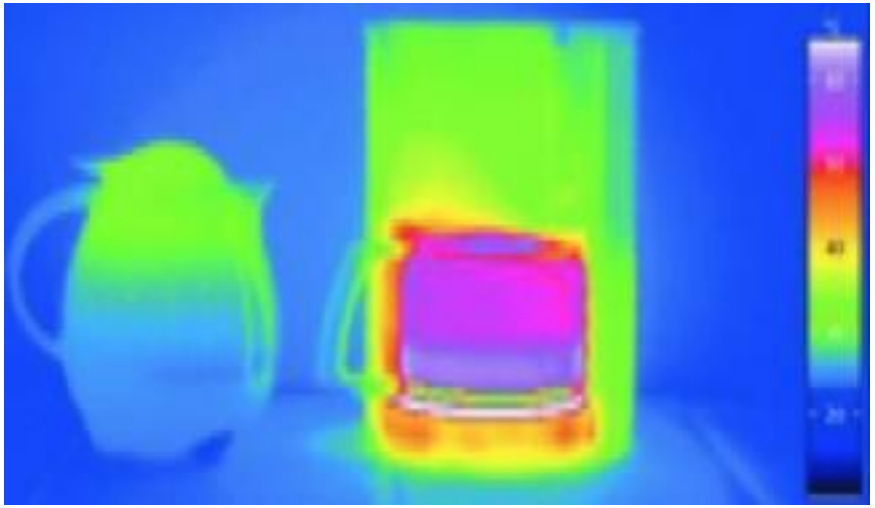
2. archive storage for historic records, parchments, maps, books, artefacts etc

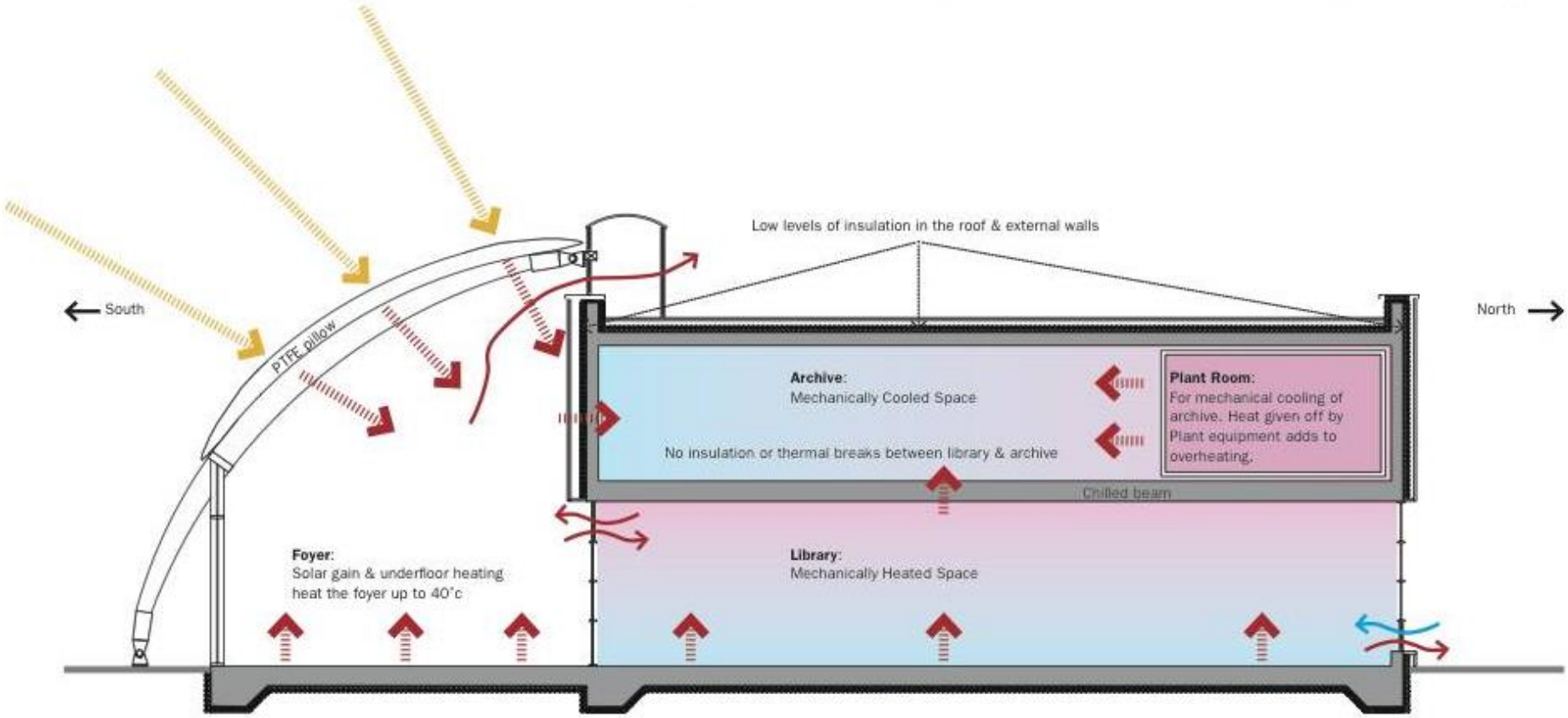
= very specific environmental requirements

…….defined in ‘PD 5454:2012’

- slow changing temperature 13-20 deg C
- constant humidity 30-60% RH

Two ways of designing an archive

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South
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PTFE pillow
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Mechanically Cooled Space
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For mechanical cooling of archive. Heat given off by Plant equipment adds to overheating.
No insulation or thermal breaks between library & archive
Chilled beam
Foyer:
Solar gain & underfloor heating heat the foyer up to 40˚c
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Mechanically Heated Space

Past

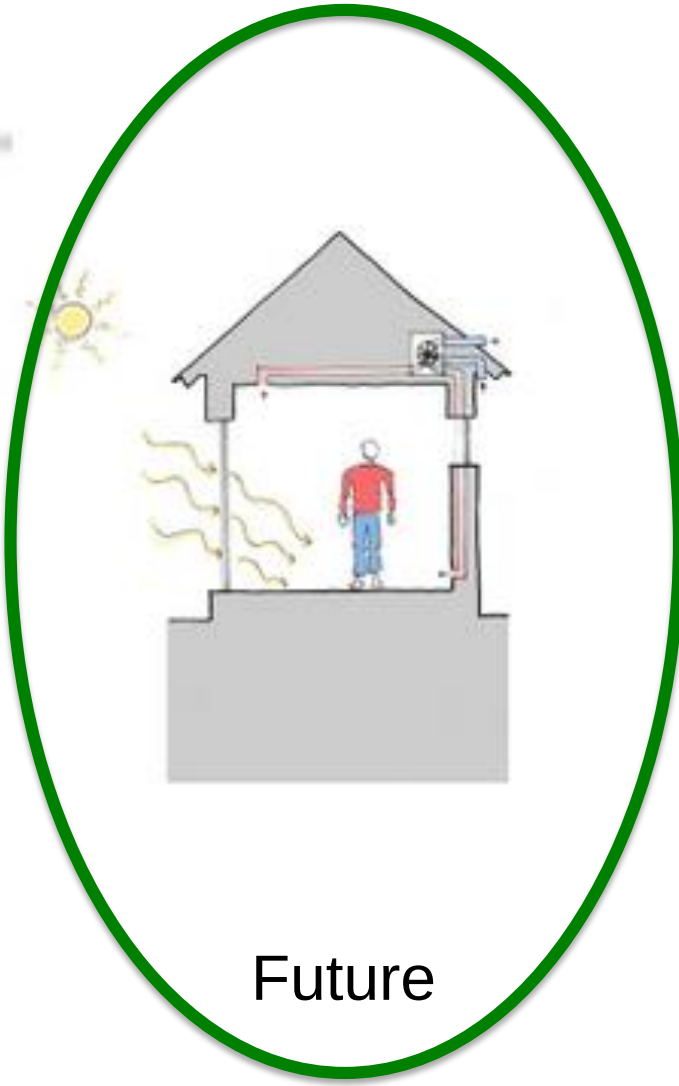
simple
energy consuming
uncomfortable

Current

complex
energy offsetting
unsustainable

Future

simple
energy saving
comfortable



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energy saving
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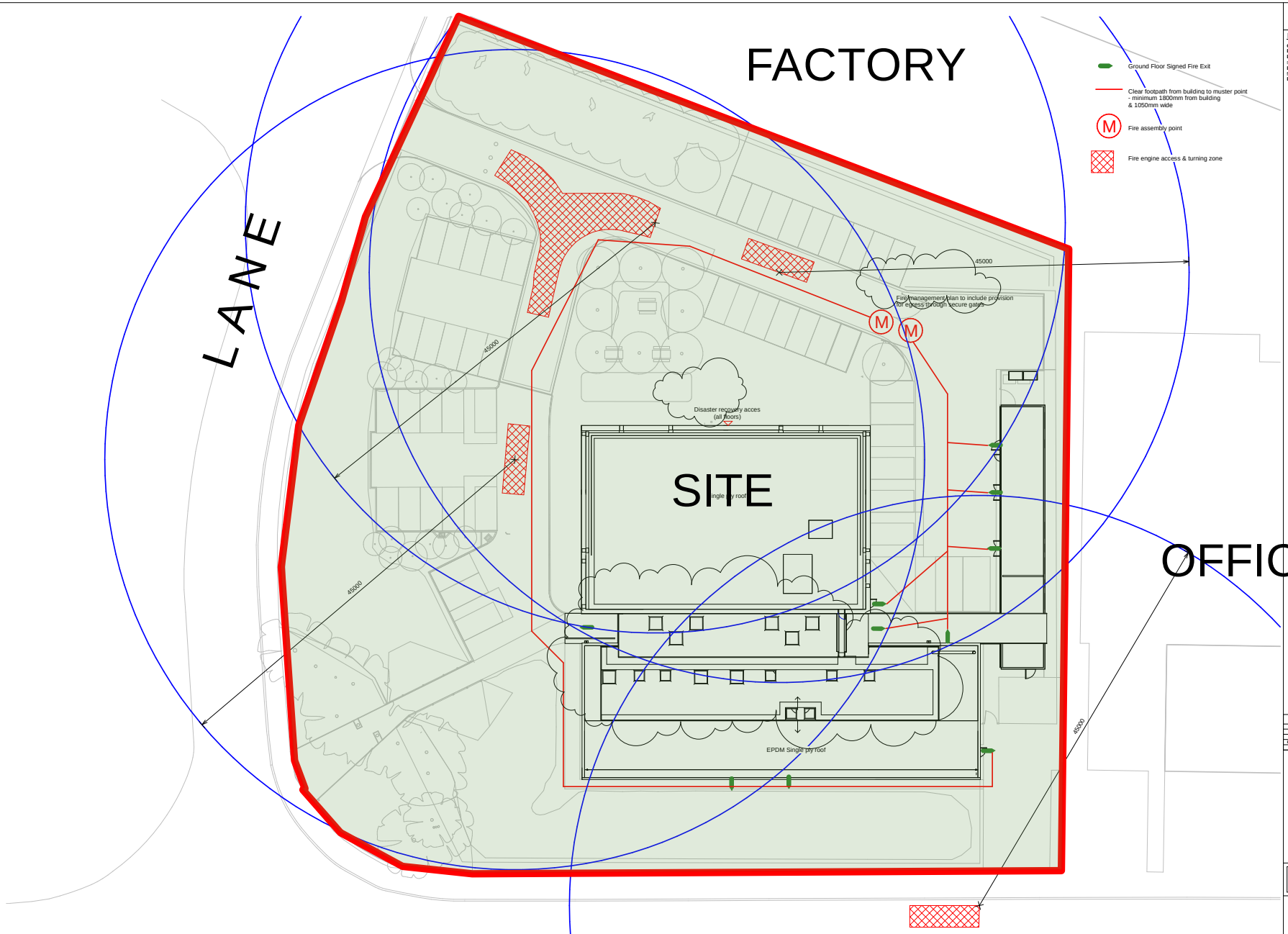
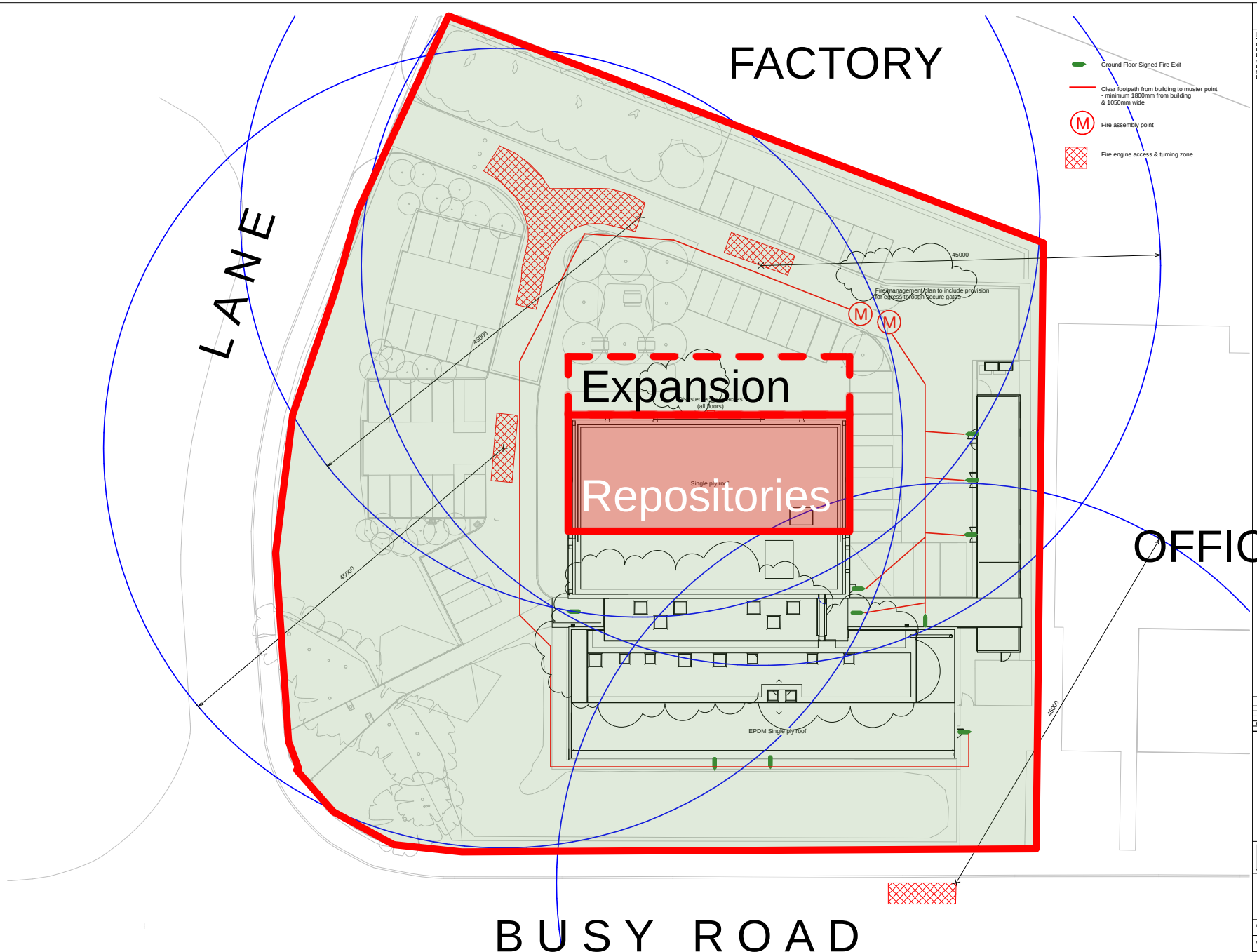
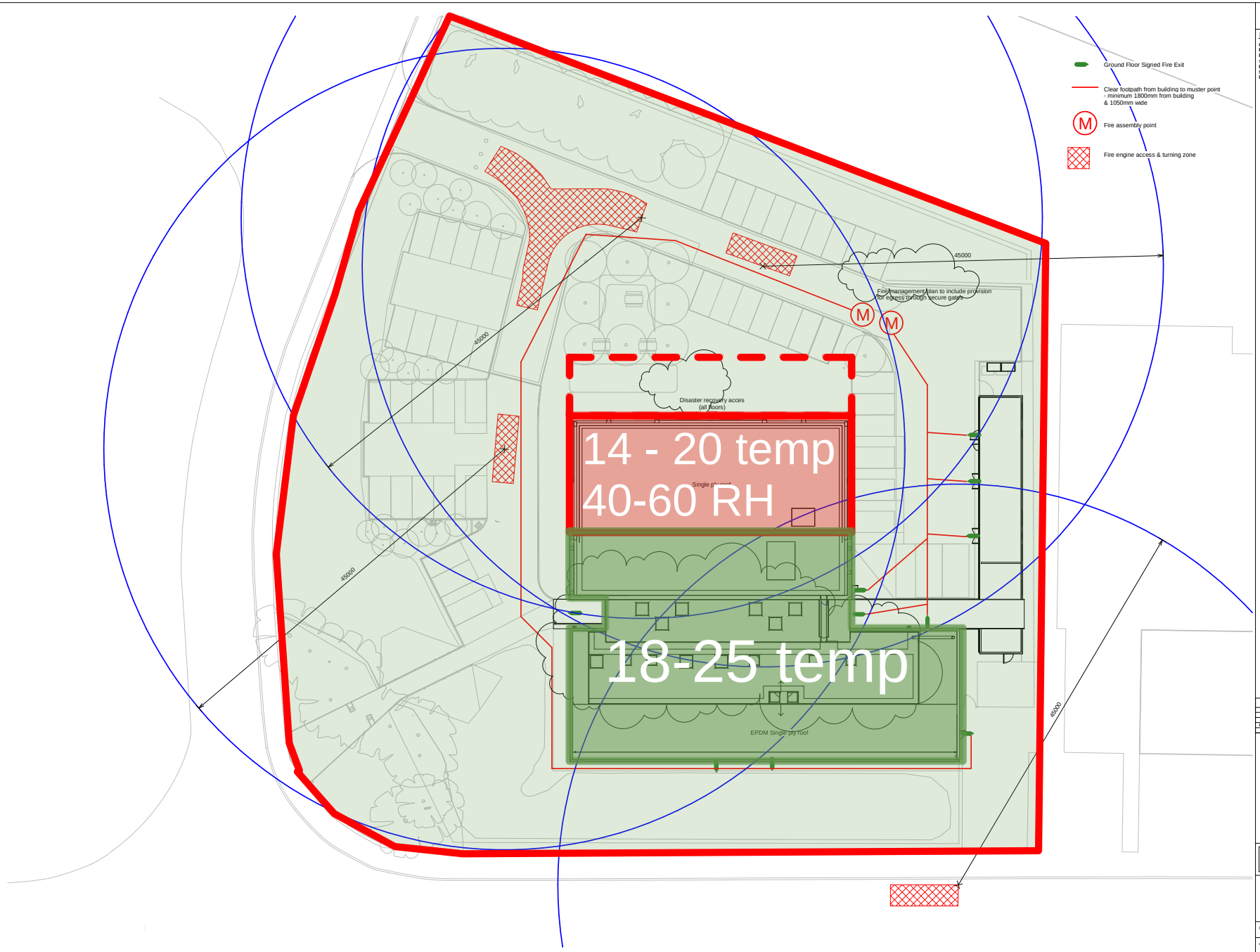
Simple design strategy

Design strategy that reflects different functional and environmental requirements of the brief

- keep the overall form simple
- keep the building zoning simple
- keep the systems simple
- keep the controls simple


FACTORY
LANE
SITE
OFFIC
BUSY ROAD
Ground Floor Signed Fire Exit
Clear footpath from building to muster point - minimum 1800mm from building & 1050mm wide
Fire assembly point
Fire engine access & turning zone
45000
Fire management plan to include provision for access through secure gates
M
M
Disaster recovery acces (all floors)
Single ply roof
EPDM Single ply roof
45000
45000
45000


FACTORY
LANE
Expansion
Repositories
OFFIC
BUSY ROAD
Ground Floor Signed Fire Exit
Clear footpath from building to muster point - minimum 1800mm from building & 1050mm wide
Fire assembly point
Fire engine access & turning zone
45000
Fire management plan to include provision for access through secure gates
Muster point (all floors)
Single ply roof
EPDM Single ply roof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Fire assembly point
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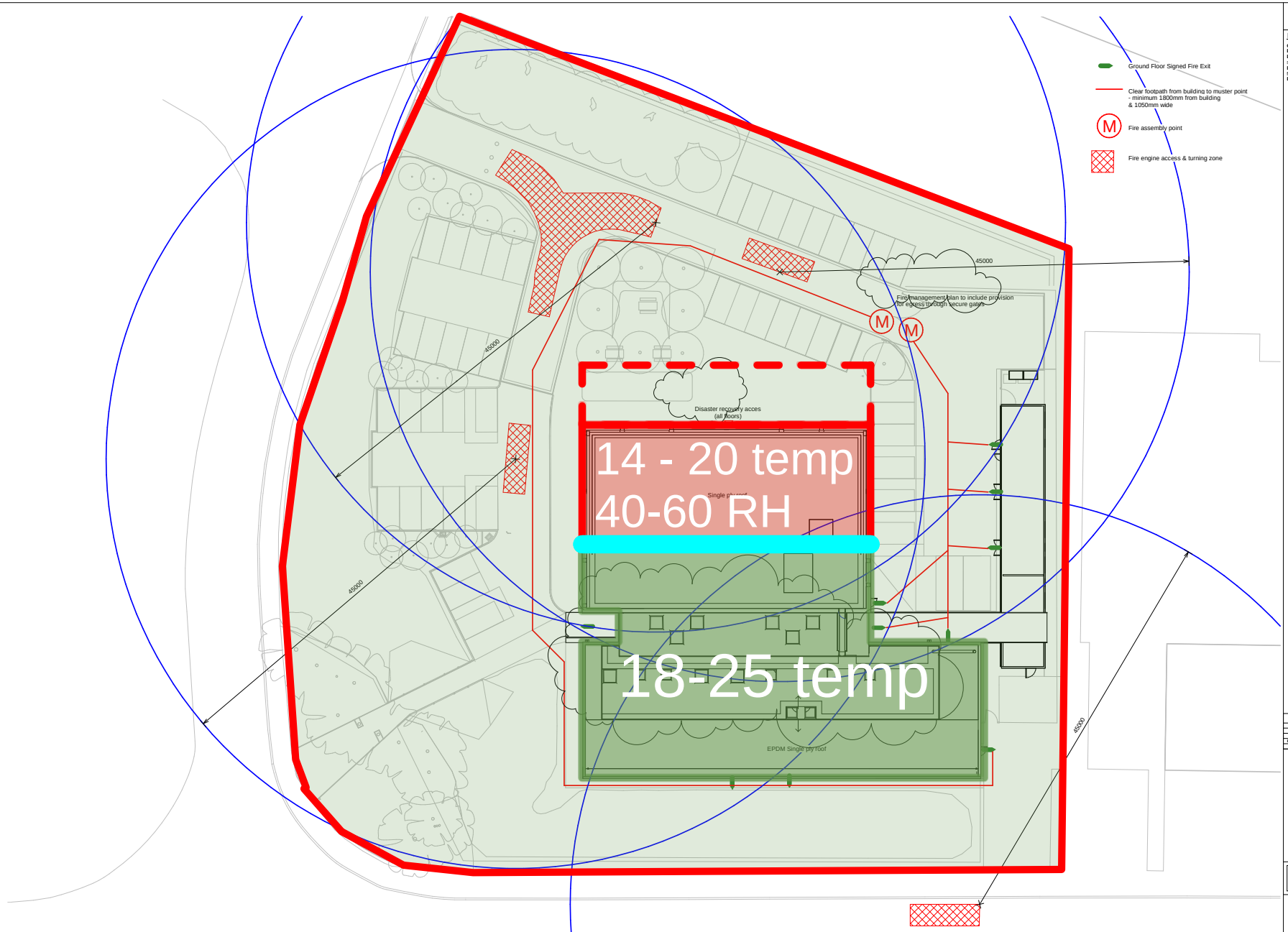
M
Disaster recovery acces (all floors)
14 - 20 temp
40-60 RH
18-25 temp
EPDM Single ply roof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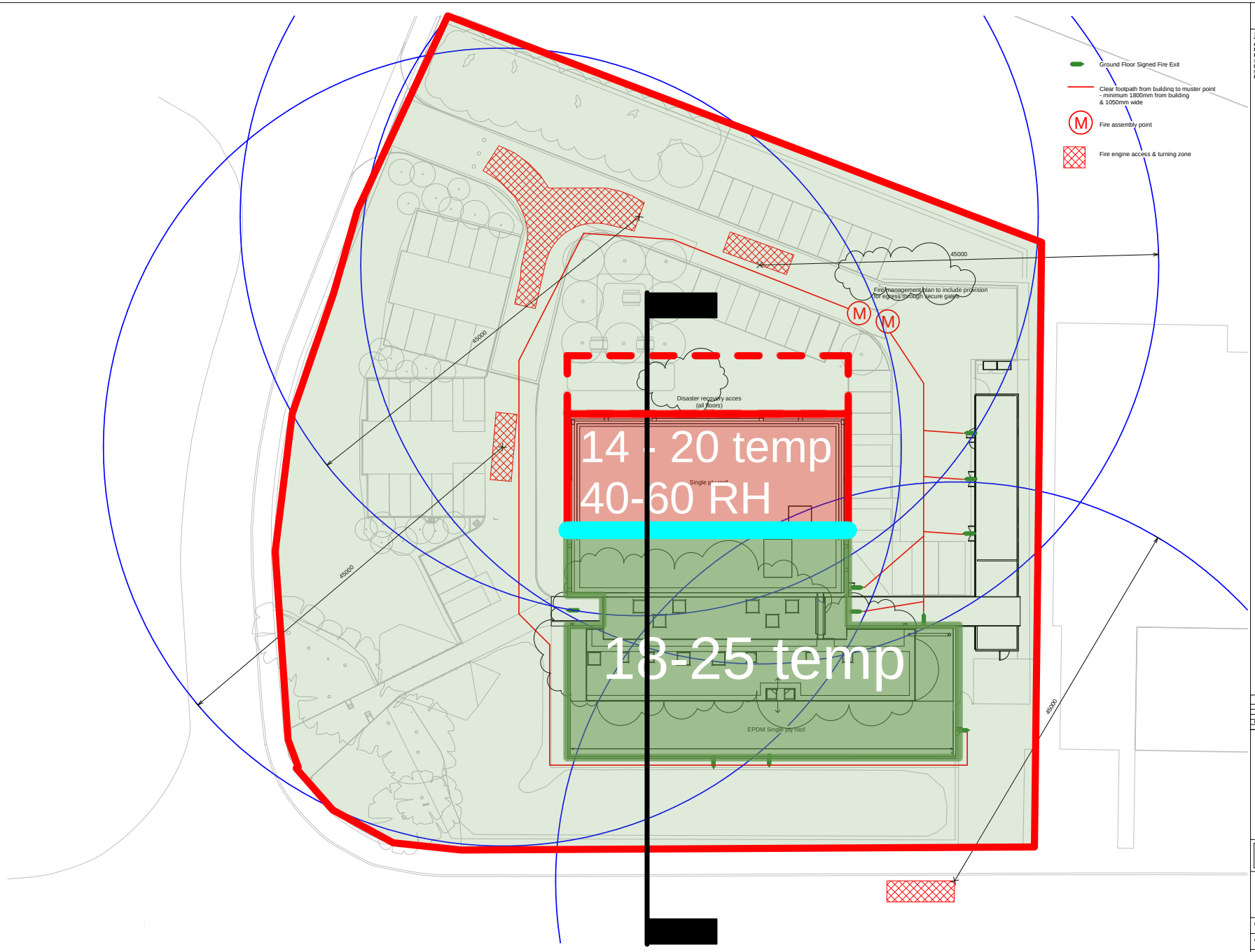
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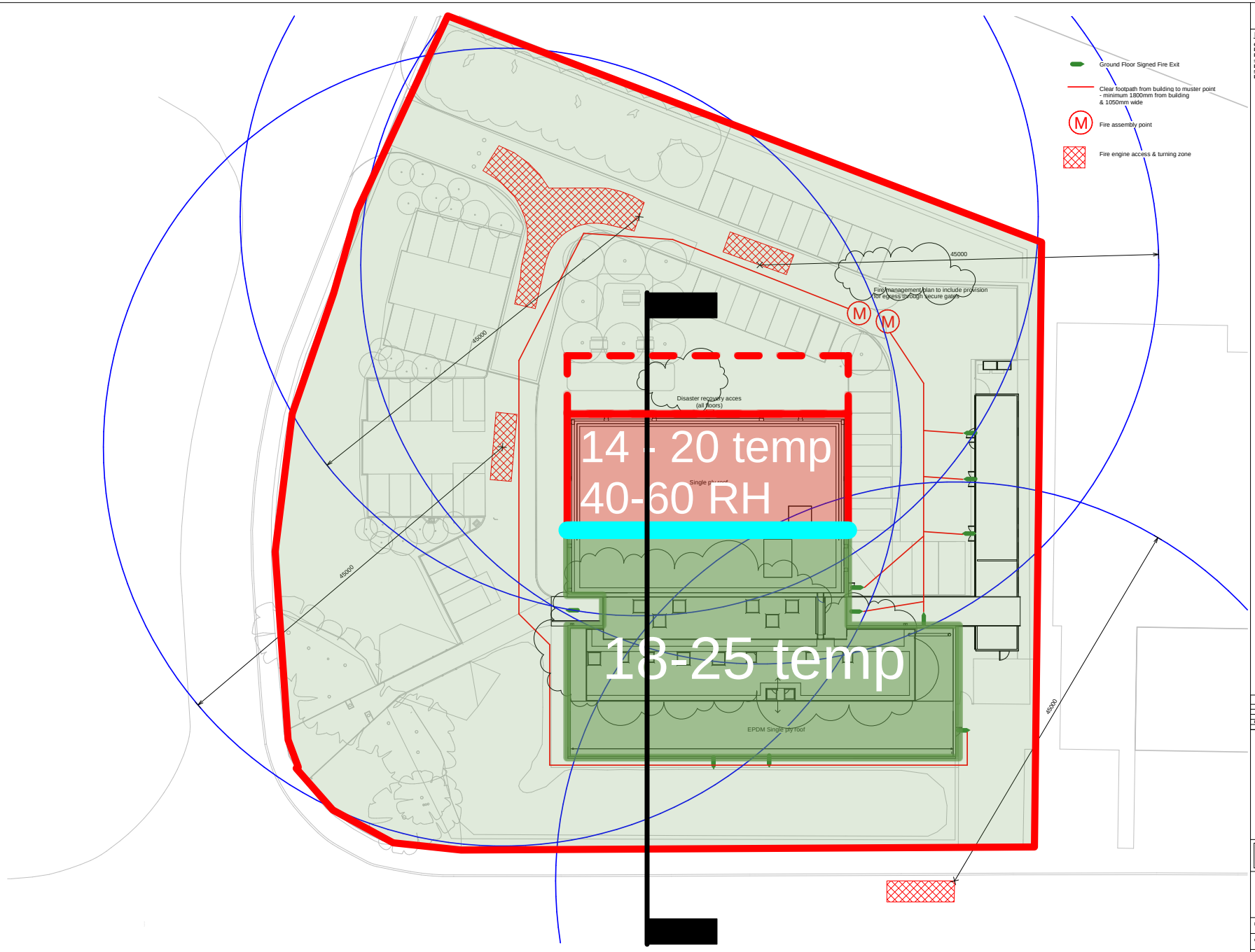
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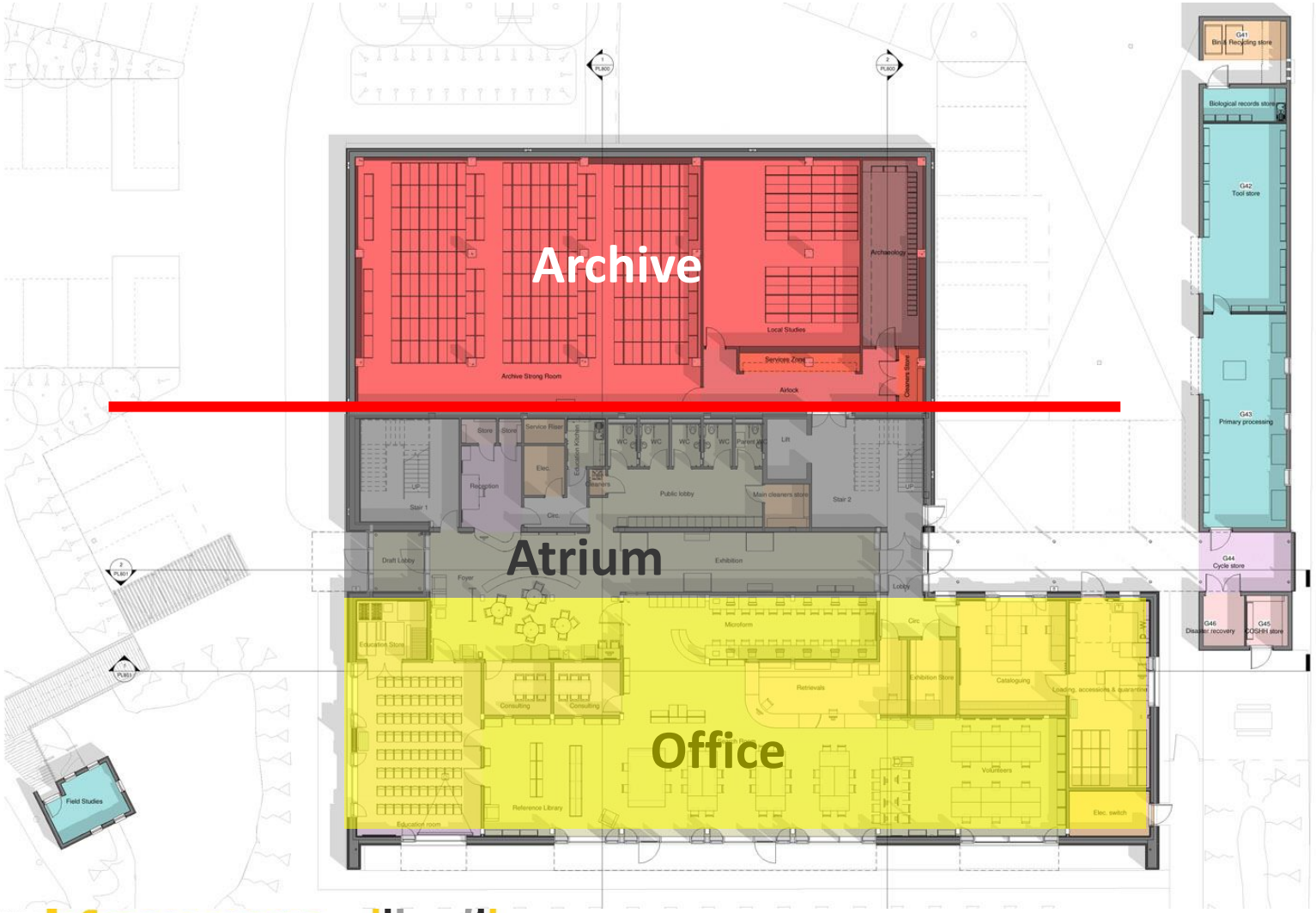
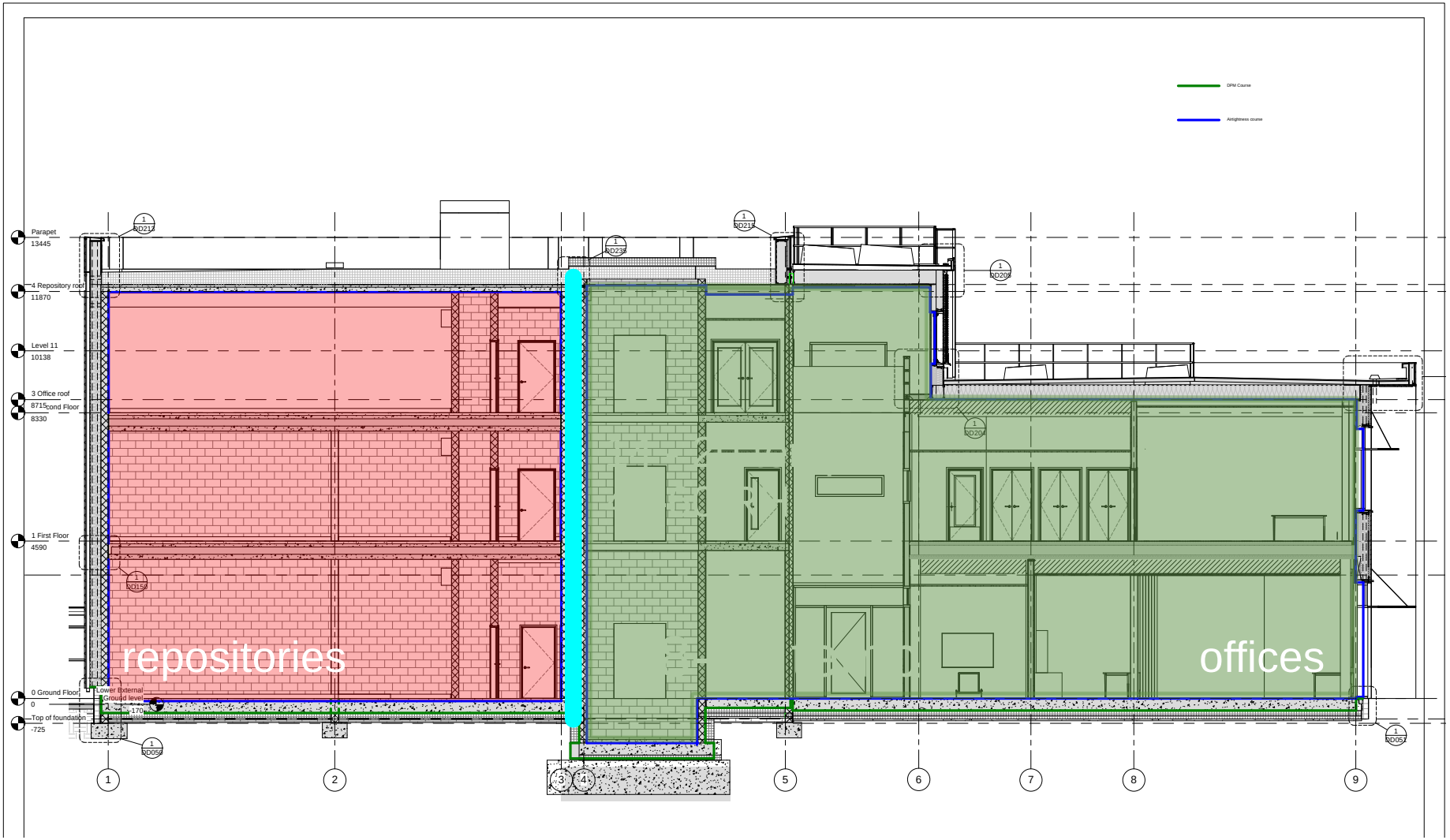
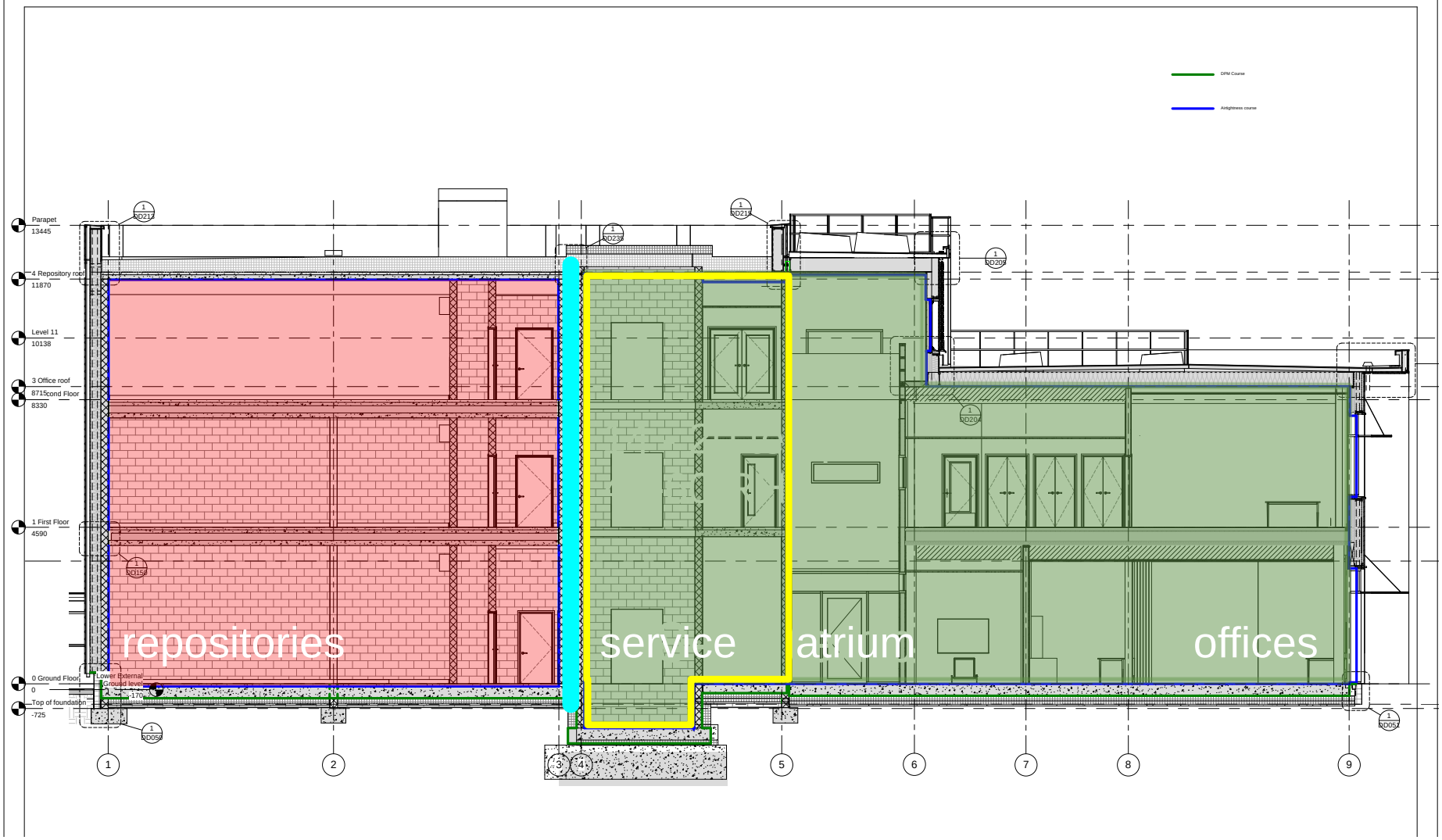

Archive
Atrium
Office
Archive Strong Room
Local Studies
Archaeology
Airlock
Public lobby
Exhibition
Foyer
Lobby
Microform
Retrievals
Cataloguing
Exhibition Store
Reference Library
Volunteers
Consulting
Field Studies
Biological records store
G42 Tool store
G43 Primary processing
G44 Cycle store
G46 Disaster recovery
G45 COSHH store


DPM Course
Airtightness course
Parapet
13445
4 Repository roof
11870
Level 11
10138
3 Office roof
8715
cond Floor
8330
1 First Floor
4590
0 Ground Floor
0
Top of foundation
-725
Lower External
Ground level
-170
repositories
offices
1
2
3
4
5
6
7
8
9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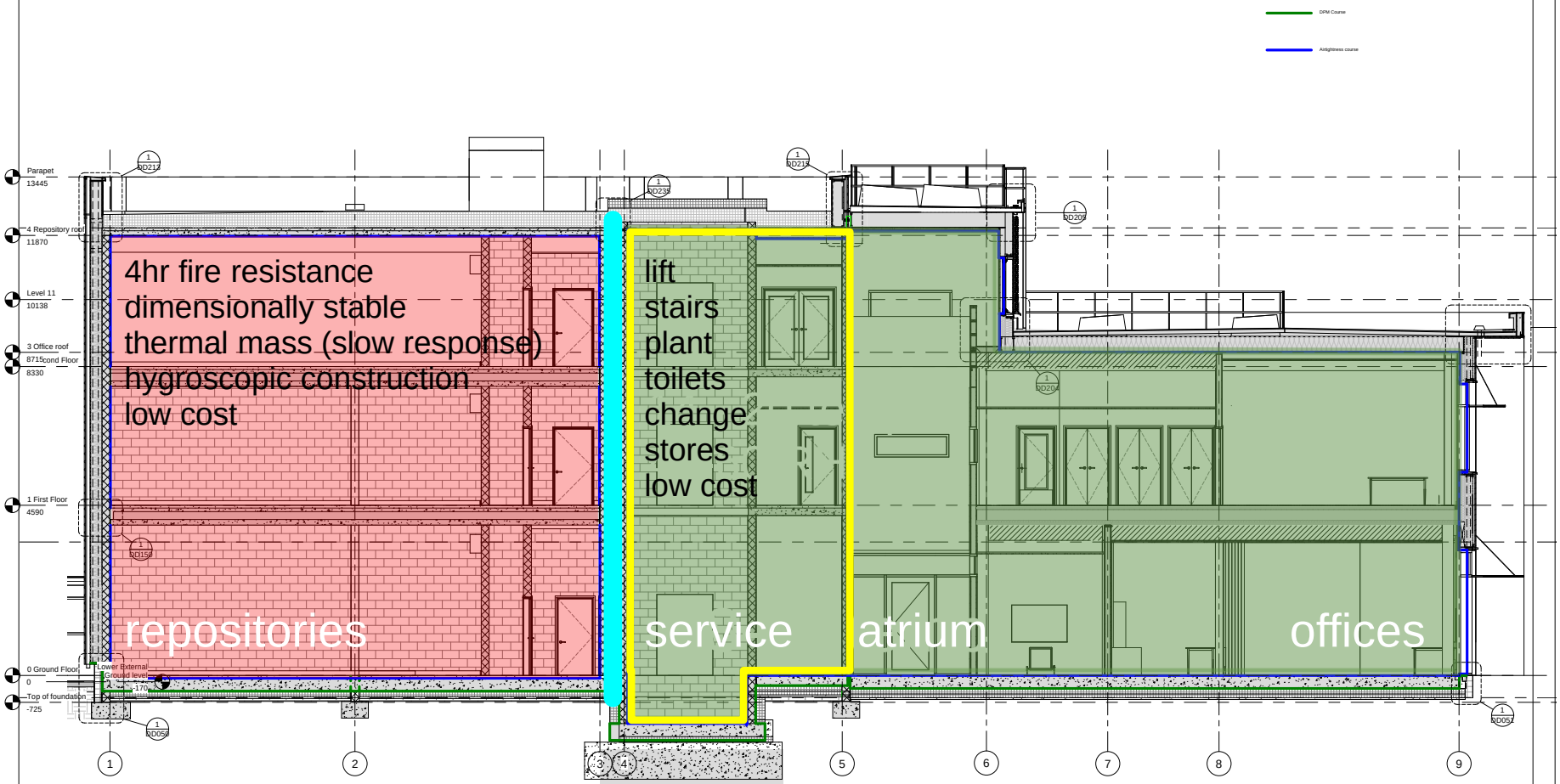
service
atrium
offices
1
2
3
4
5
6
7
8
9



Notes

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Rev	Date	Description	Drawn	Checked
1	23 Mar 13	Construction Issue	LW	MB

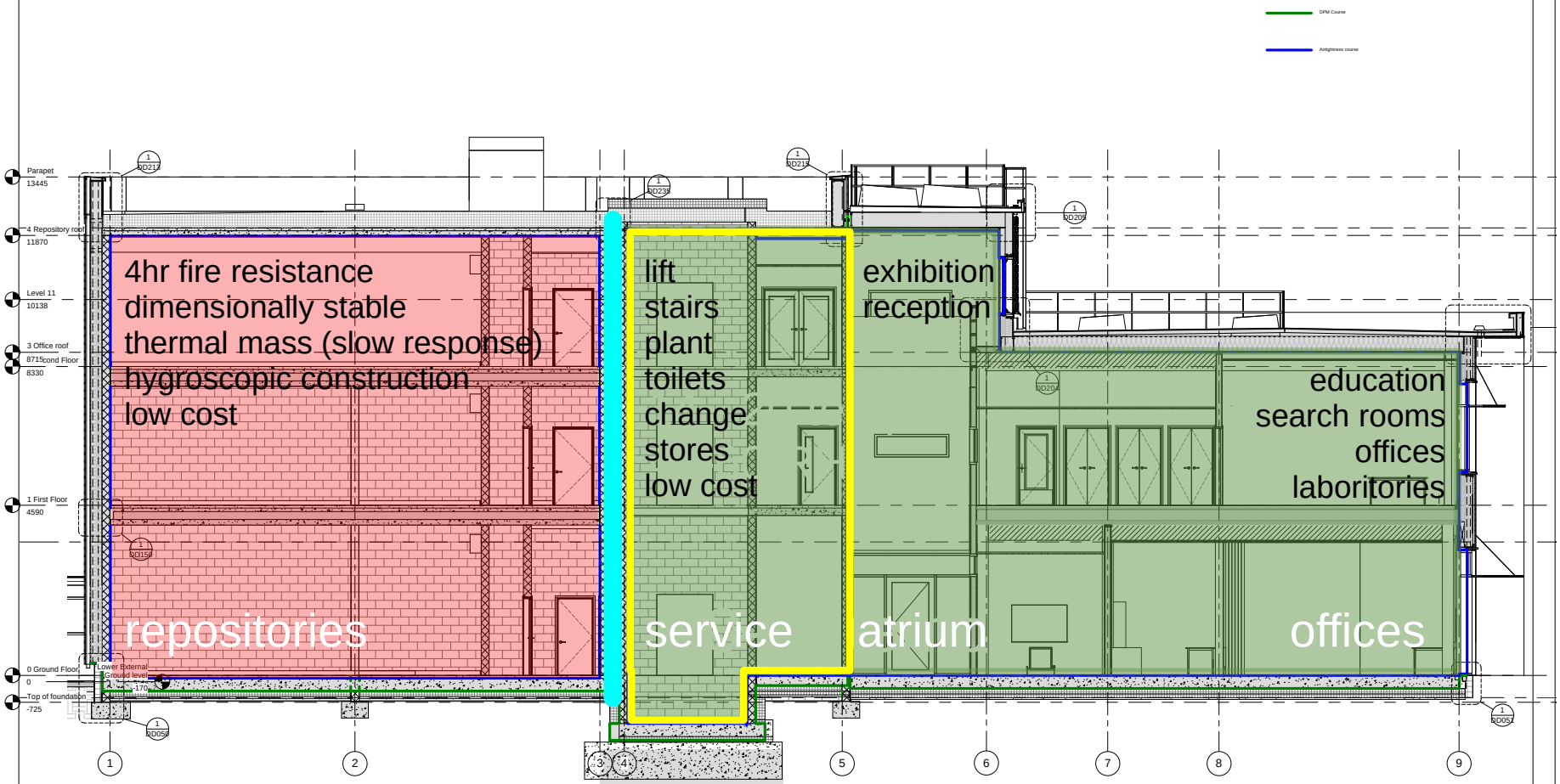
Revision Schedule

CONSTRUCTION

ARCHITYPE

Architype, Upper Twyford, Hereford, HR2 8AD
T 01981 542111 F 01981 542112 E westlibrary@architype.co.uk www.architype.co.uk

Project	Herefordshire Archive & Records Centre
Client	Herefordshire Council
Dwg Title	Airtightness Detail Section
Dwg no.	6920 DD021
Revision	1
Scale	1 : 50 @ A1
Date	01 Aug 2013
Drawn by	RE
Checked by	MB



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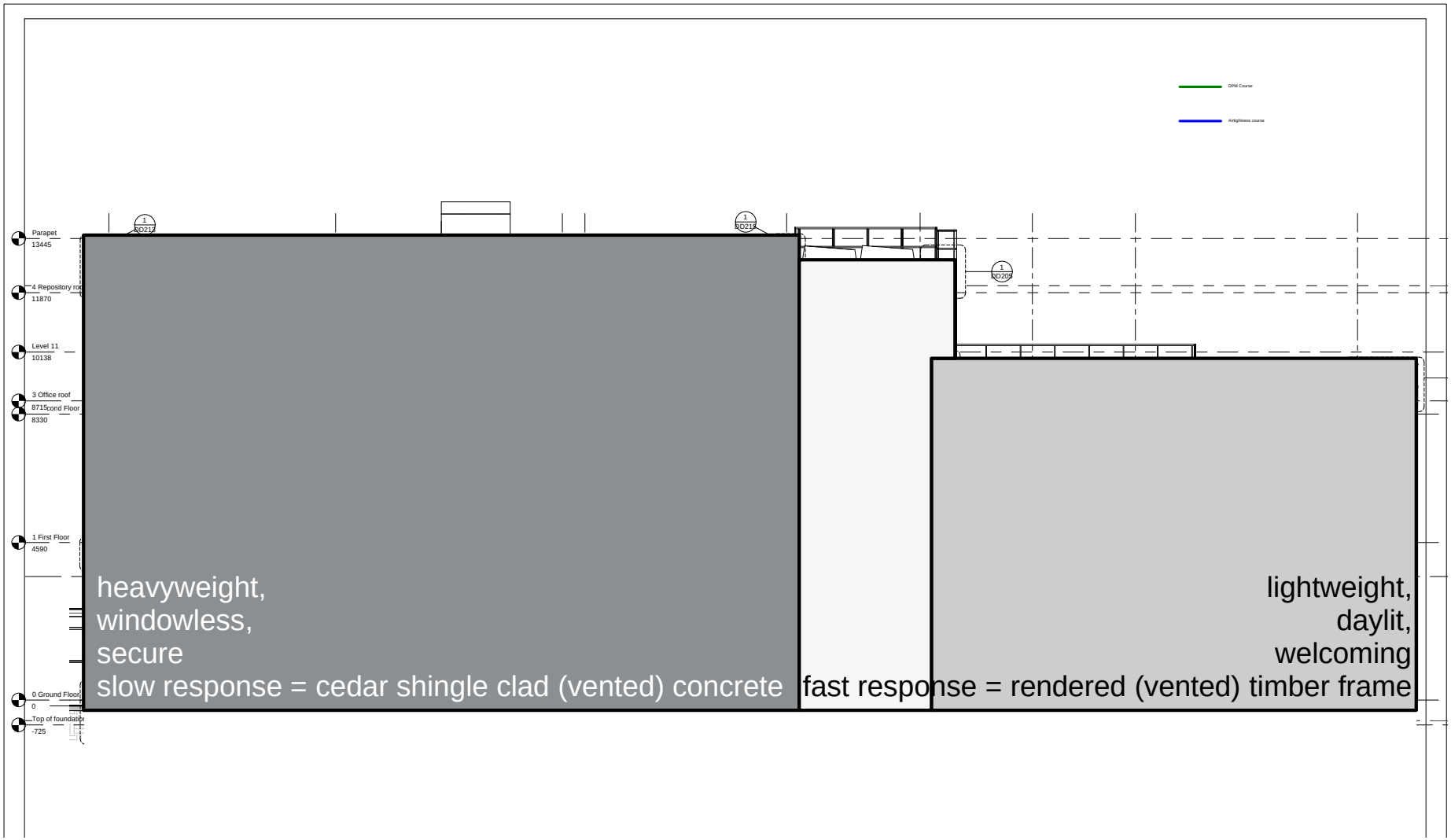
Keep Cool
(Passive)

north

Keep Warm (Passivhaus)

south

Image Nick Grant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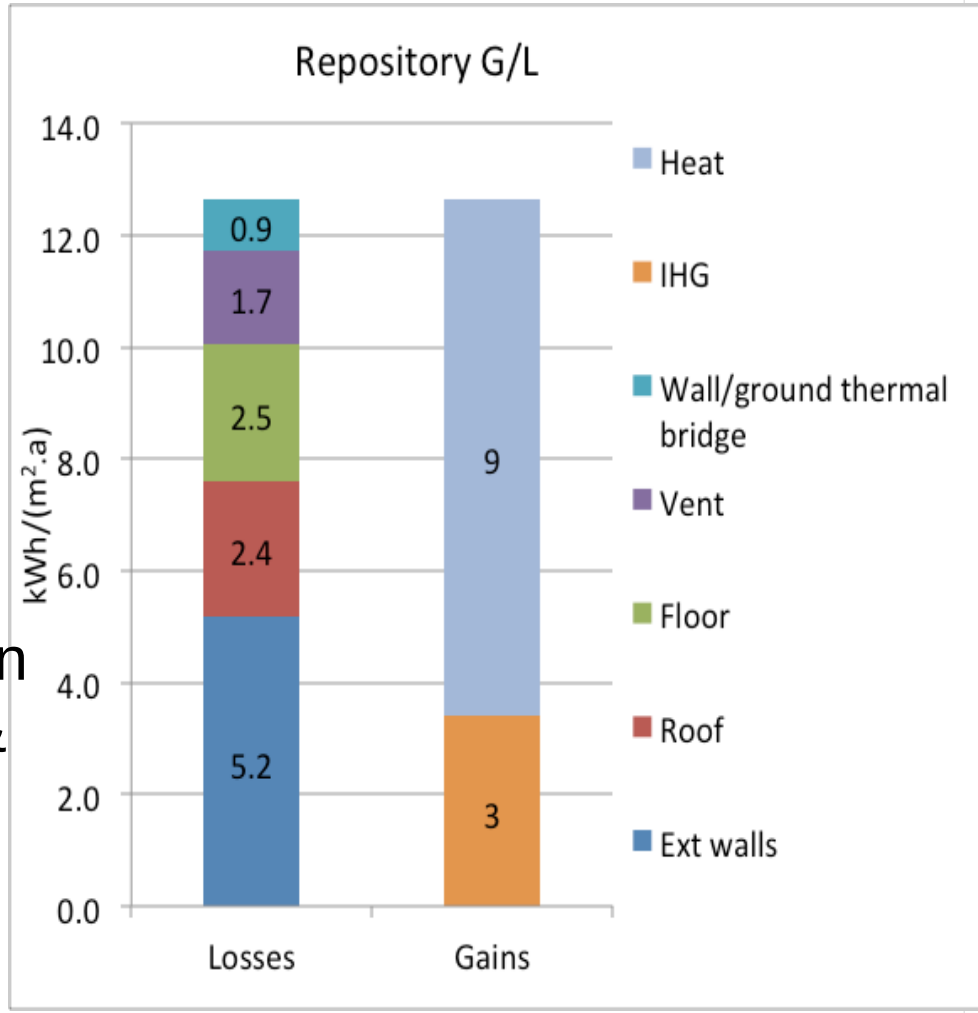
0 Ground Floor
0
Top of foundatio
-725
heavyweight,
windowless,
secure
slow response = cedar shingle clad (vented) concrete
fast response = rendered (vented) timber frame
lightweight,
daylit,
welcoming

Energy balance using PHPP

- Simplest form
- Low IHGs 0.6W/m^2
- c.a. 1 air change/day
- No HRV
- RH 40-60%
- RH buffering by contents
- Temp 14°C-20°C
- No cooling
- Supply air dehumidification
- Inspired by Tim Padfield & Danish archives

www.conservationphysics.org




REMINGTON

Passivhaus v Conventional….

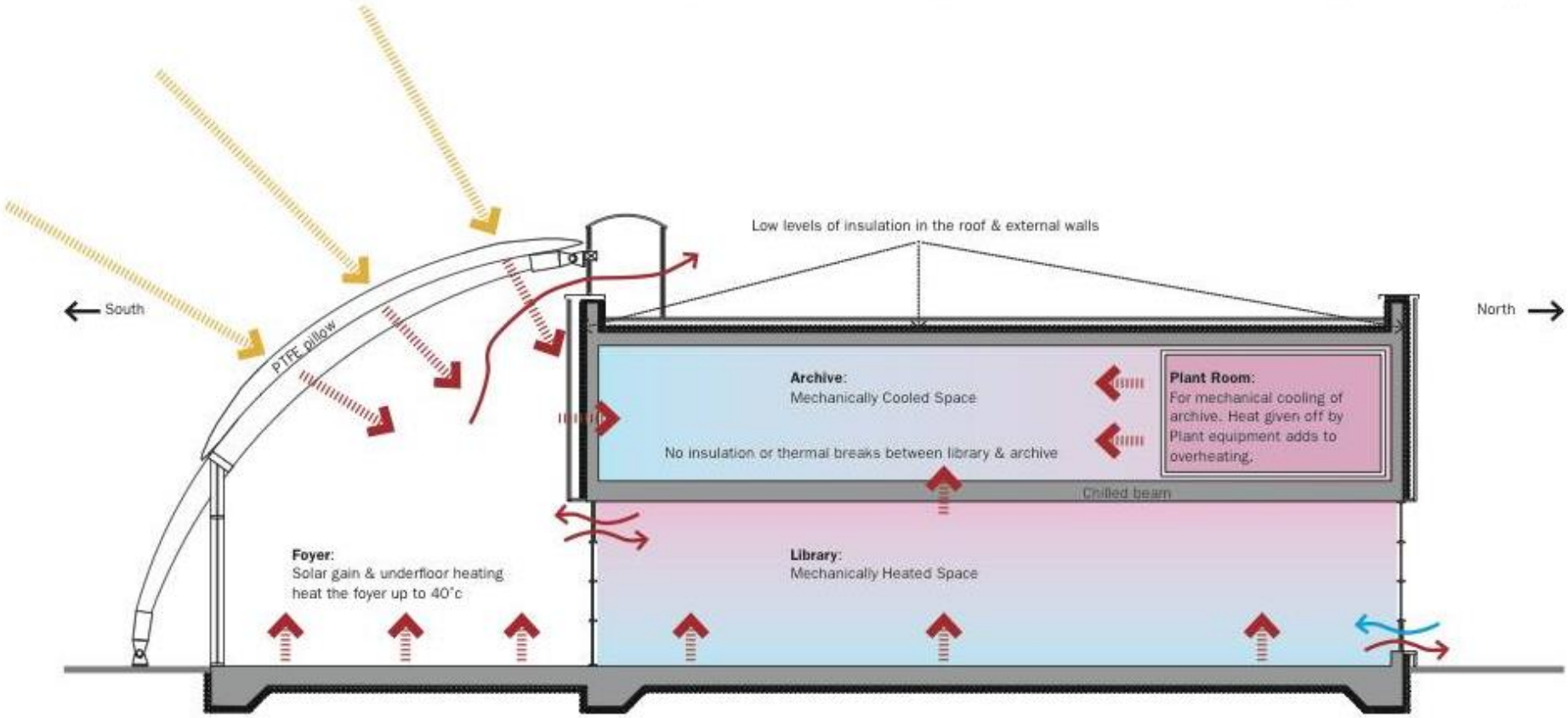
Passivhaus v Conventional….

Energy comparison:

Passivhaus v Conventional….

Energy comparison:

- passivhaus 80% less overall energy consumption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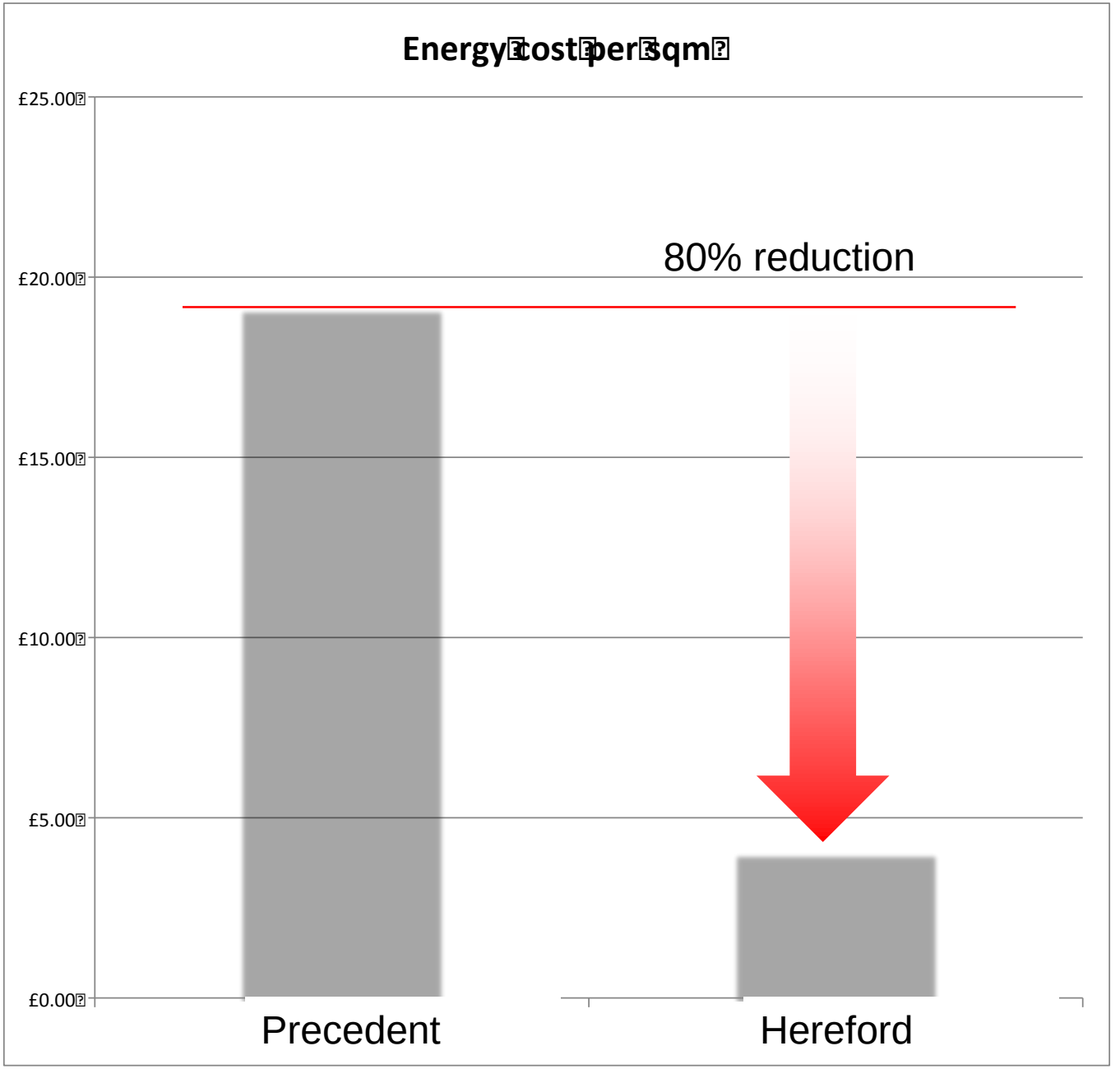

Energy cost per sqm
£25.00
£20.00
£15.00
£10.00
£5.00
£0.00
80% reduction
Precedent
Hereford

Passivhaus v Conventional….

Cost comparison:

Passivhaus v Conventional….

Cost comparison:

- passivhaus 5% cheaper to build

Passivhaus v Conventional….

Cost comparison:

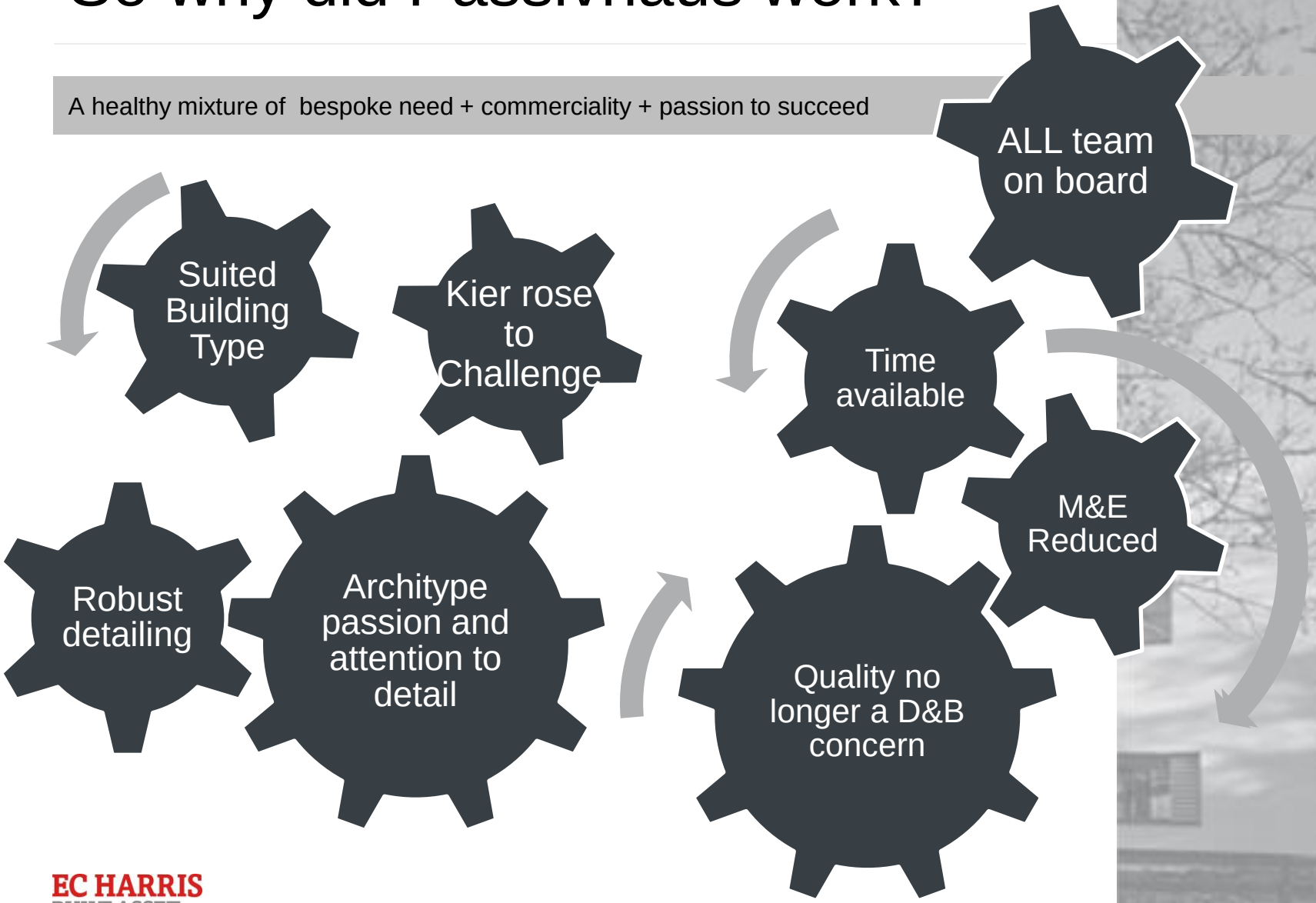
- HARC 35% cheaper than benchmark archive costs

Passivhaus v Conventional….

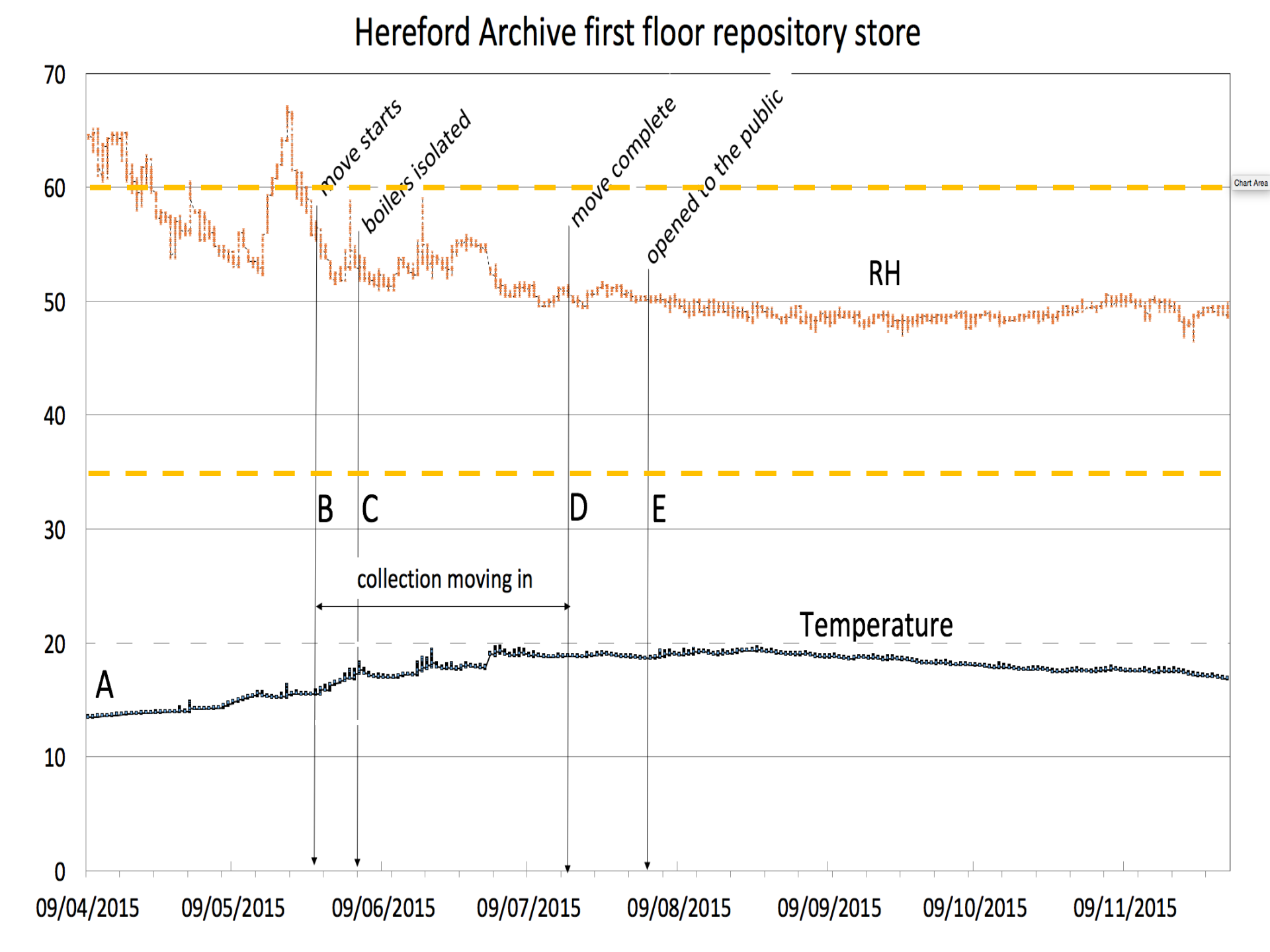
- £1,935 / m^2
- of which M&E = £307 / m2

So why did Passivhaus work?

A healthy mixture of bespoke need + commerciality + passion to succeed



EC HARRIS
BUILT ASSET CONSULTANCY
AN ARCADIS COMPANY

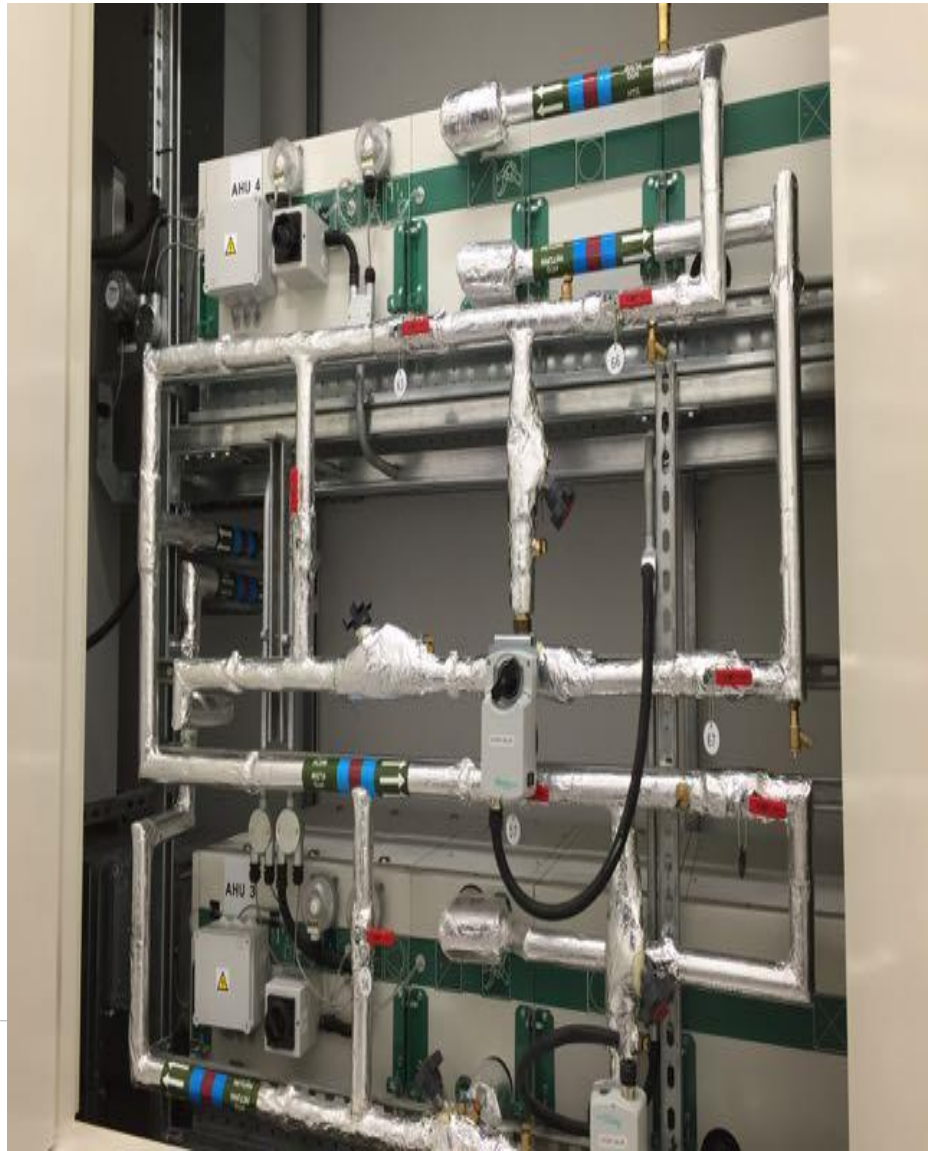

Hereford Archive first floor repository store
70
60
50
40
30
20
10
0
move starts
boilers isolated
move complete
opened to the public
RH
B
C
D
E
collection moving in
Temperature
A
09/04/2015
09/05/2015
09/06/2015
09/07/2015
09/08/2015
09/09/2015
09/10/2015
09/11/2015

Troubleshooting 1

Hot water through repository pipework.

Losses from insulated pipe was enough to heat the building!

Valves shut manually.



Troubleshooting 2

Photostore dehumidifier installed backwards so running inefficiently and generating unwanted heat in the service core.

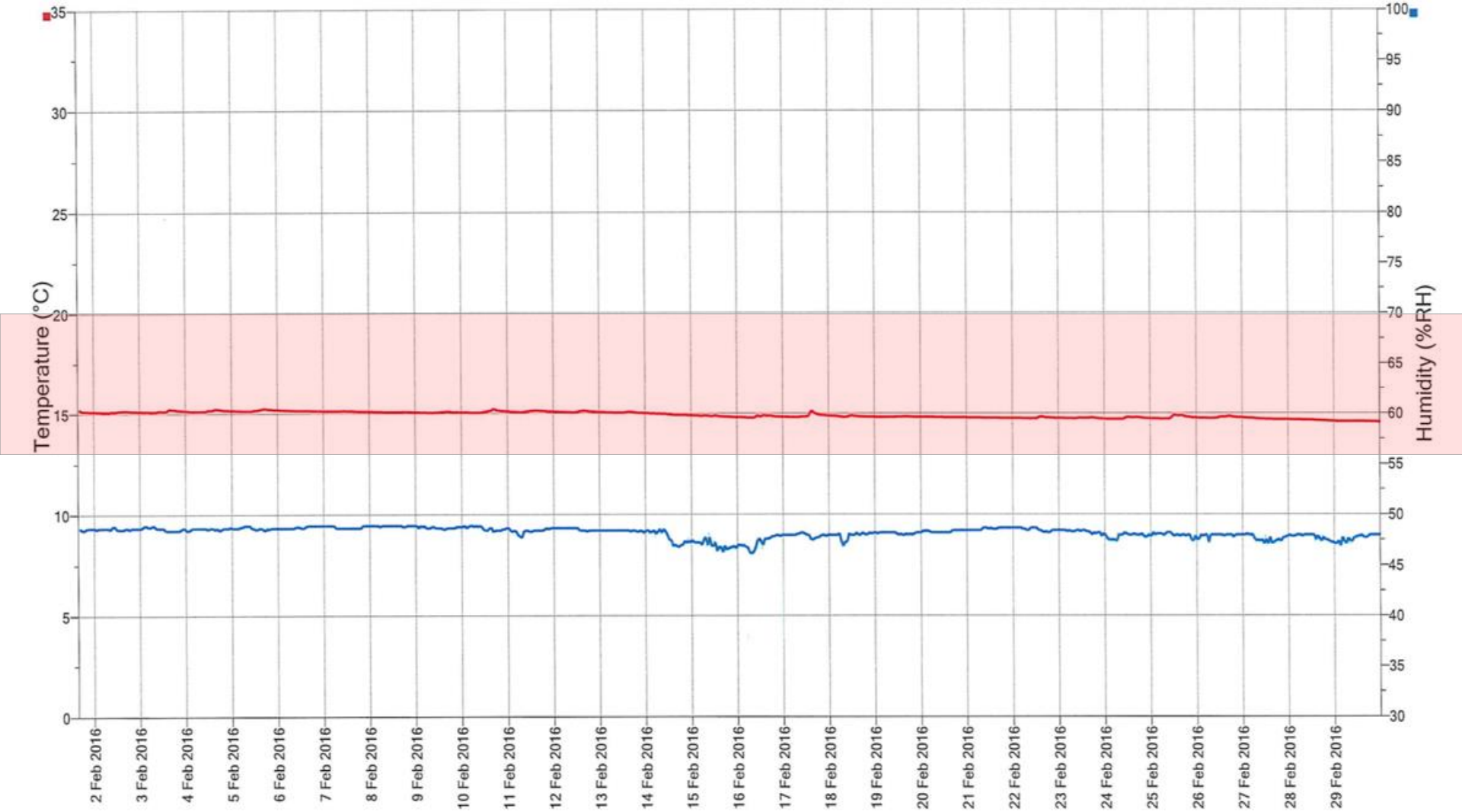
Fixed in June 2015

Troubleshooting 3

Faulty sensor wiring made the heating come on when well above set-point!

How fast/automatic does heating response need to be?

Feb 2016 (no heating since June)



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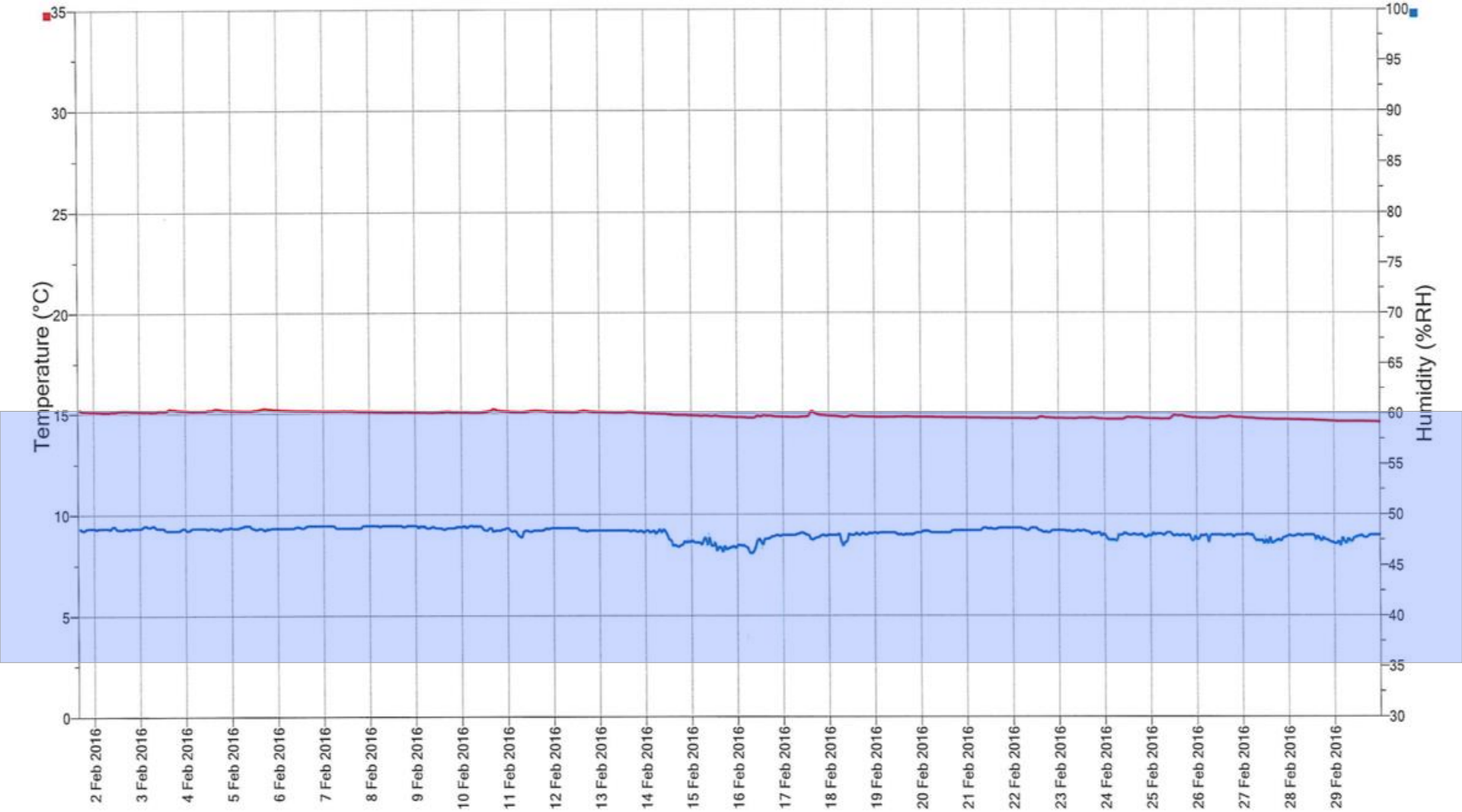
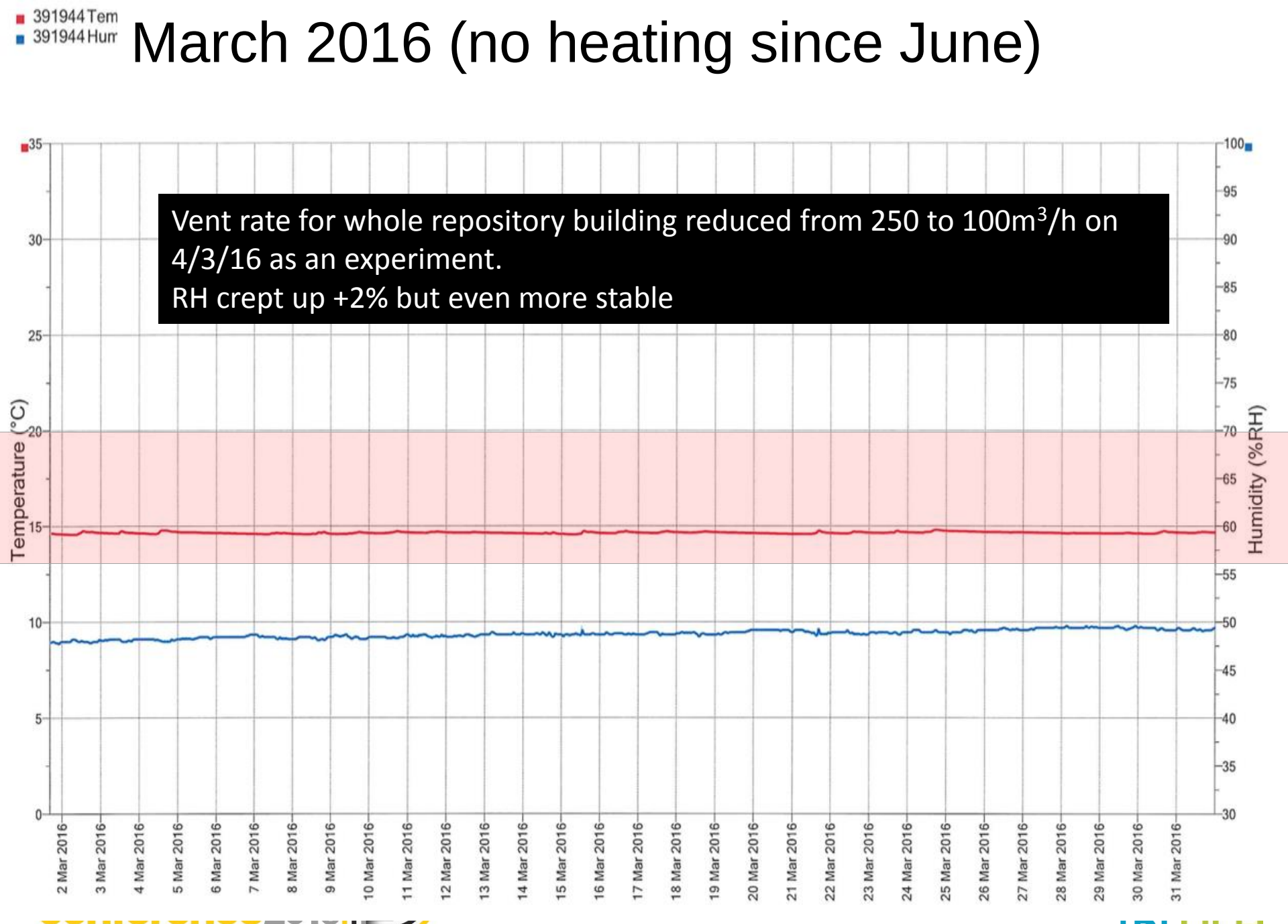


March 2016 (no heating since June)



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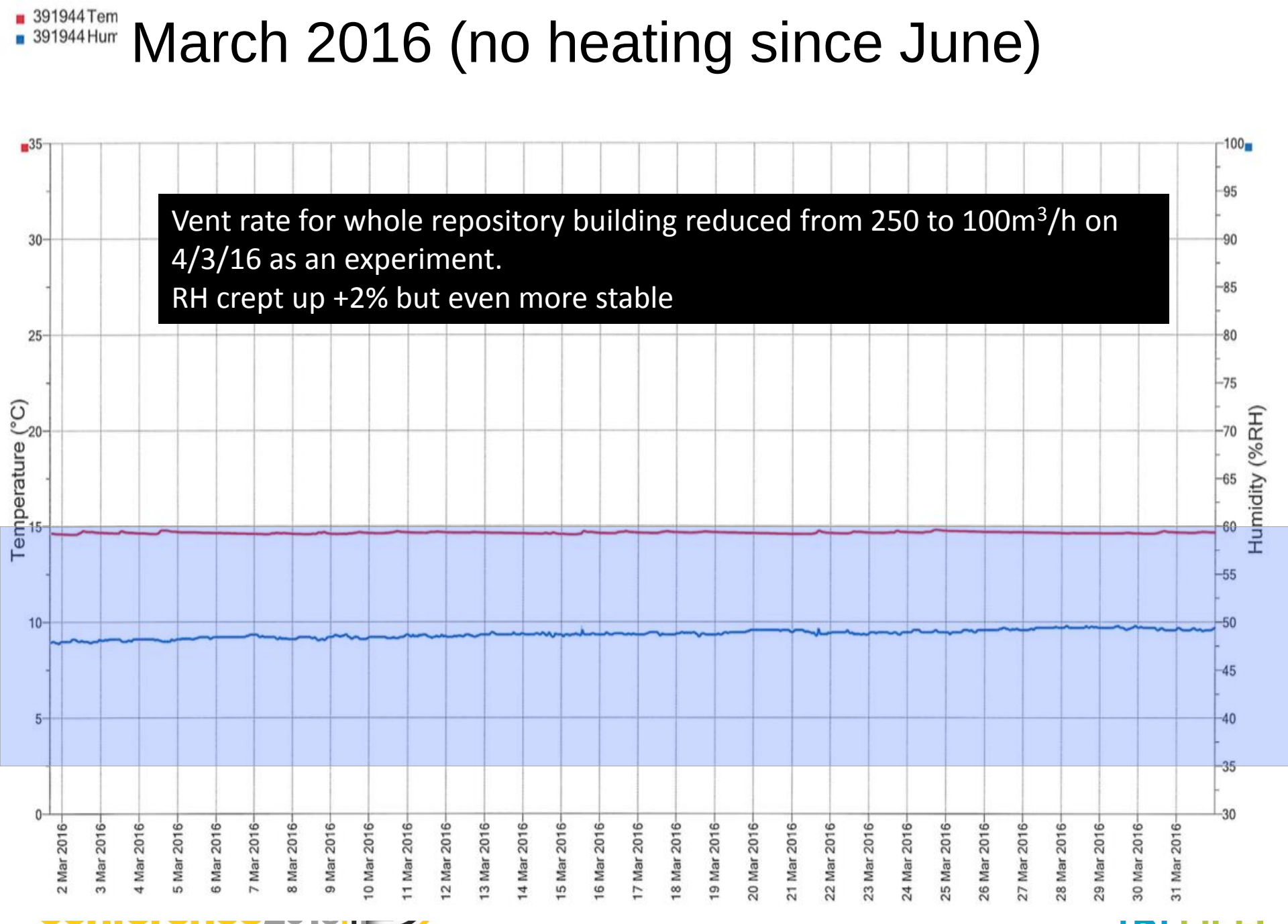
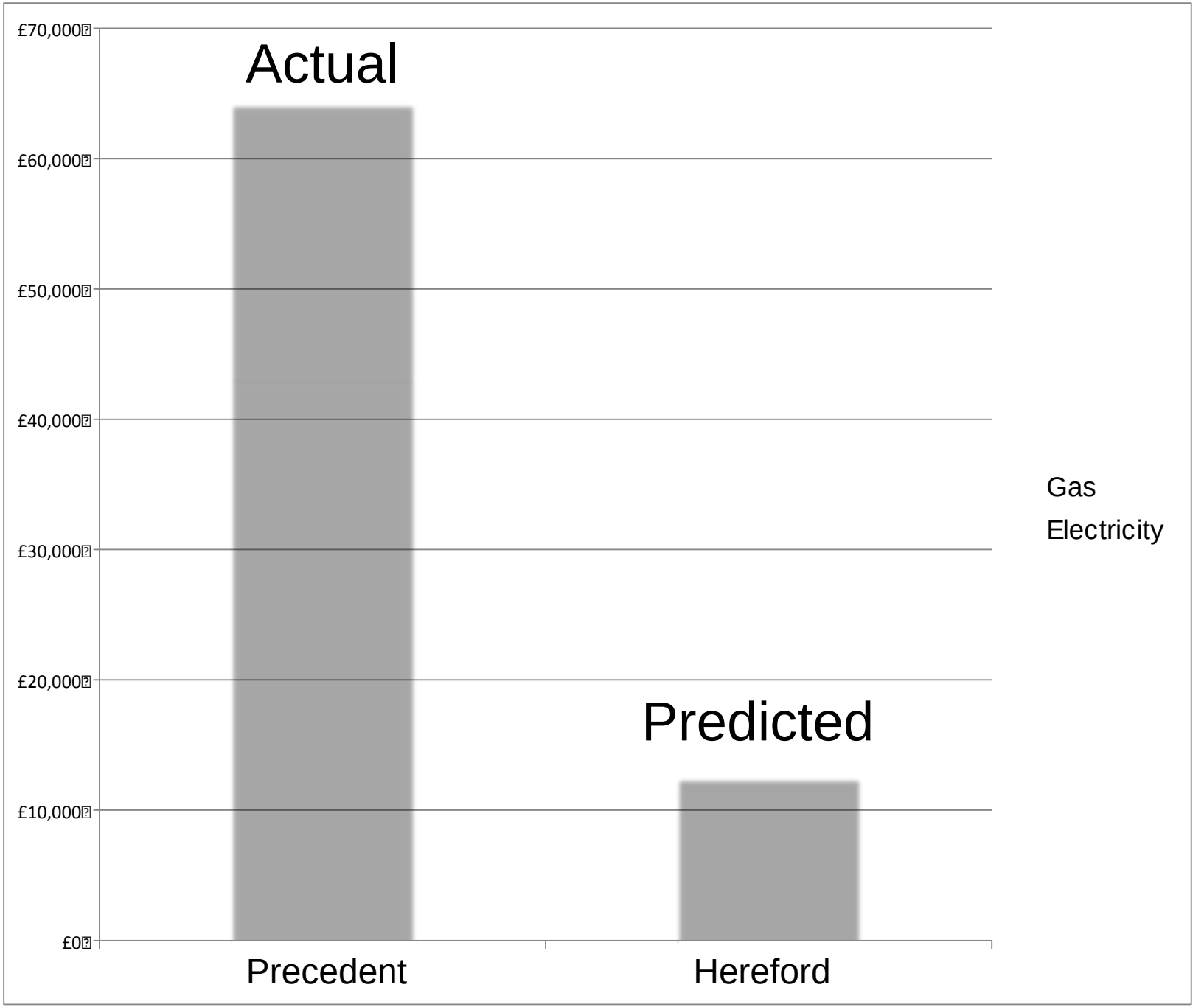
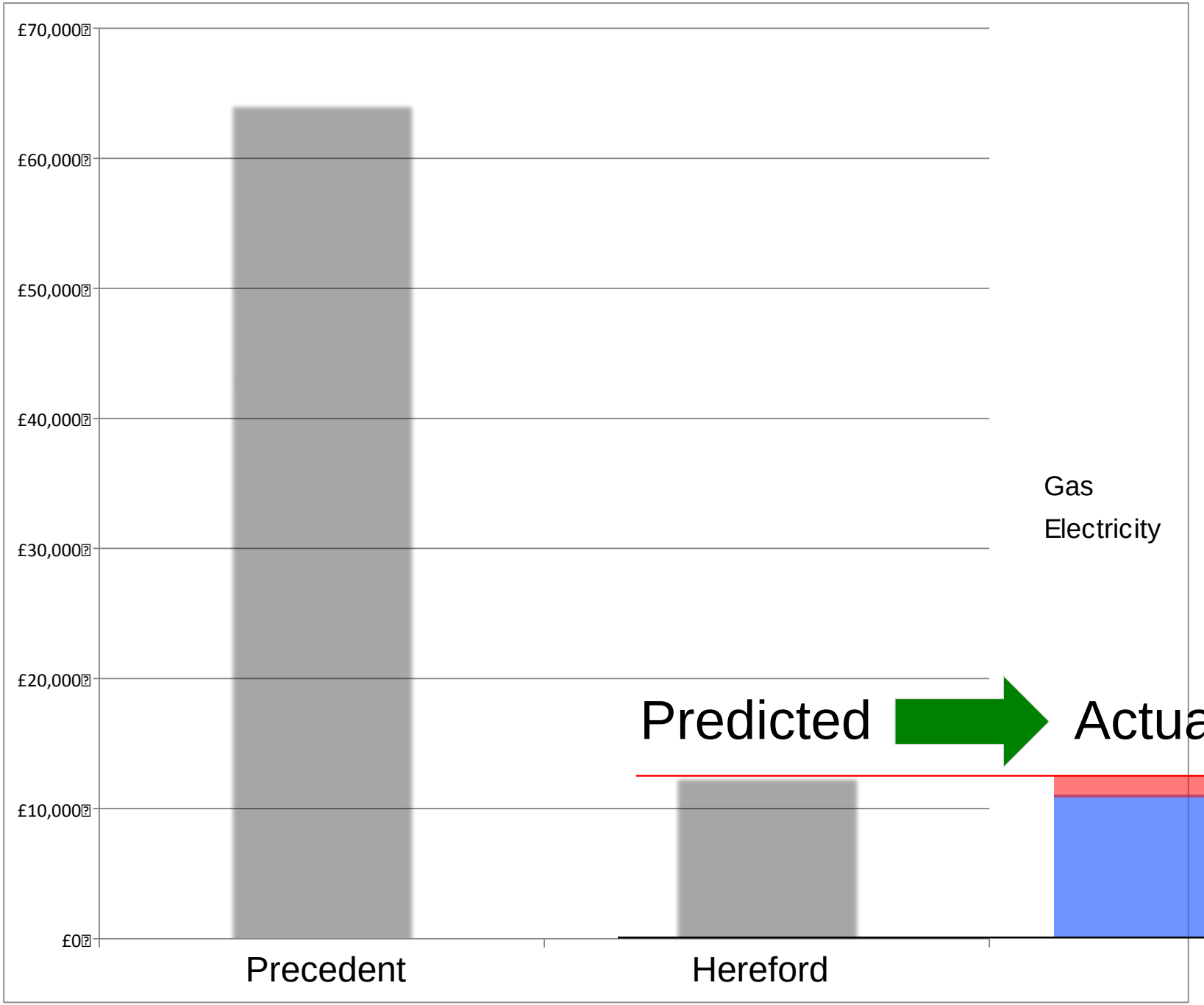



£70,000
£60,000
£50,000
£40,000
£30,000
£20,000
£10,000
£0
Actual
Predicted
Precedent
Hereford
Gas
Electricity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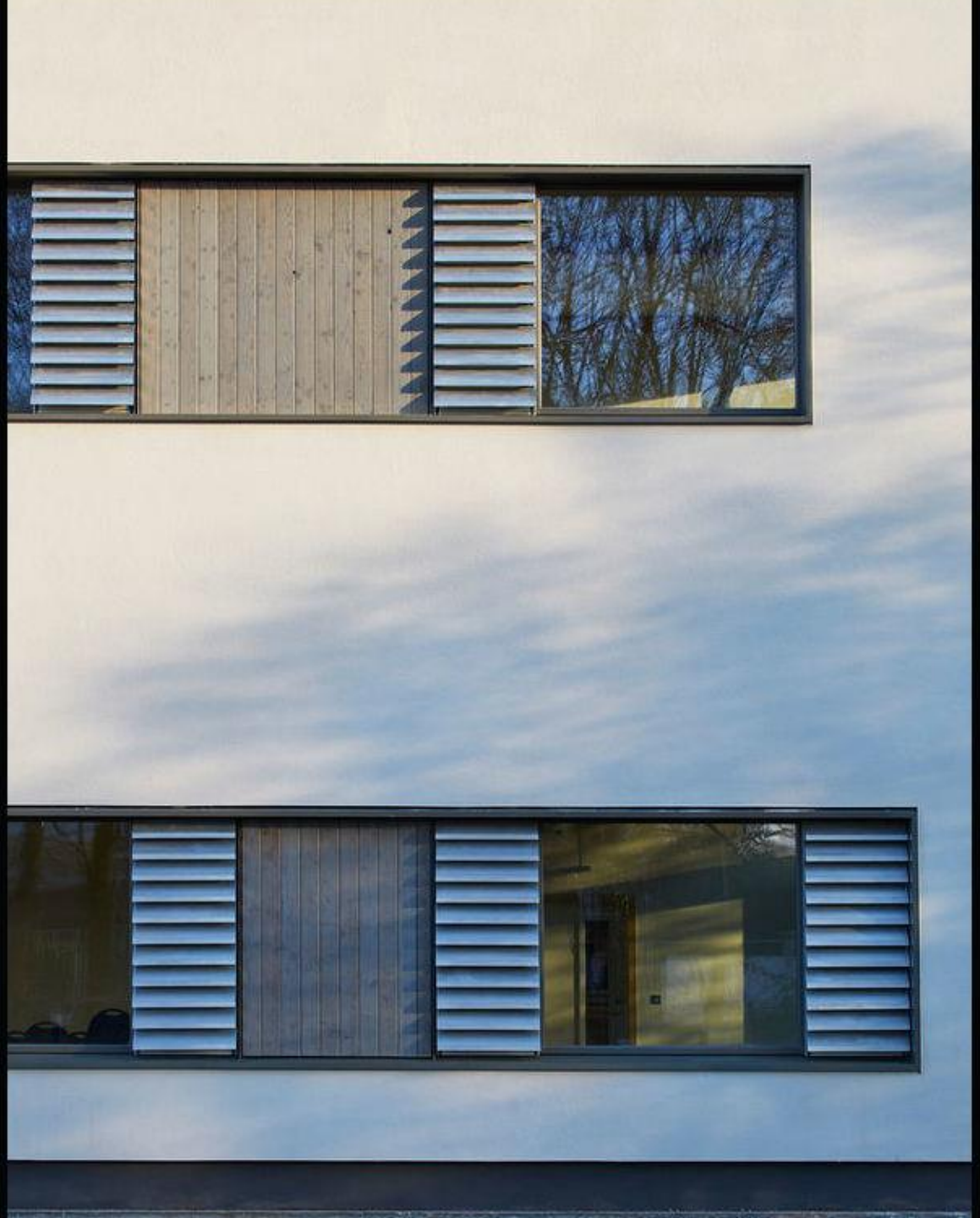
Hereford



Lessons

Get the early design decisions right!

- keep passivhaus at the heart of everything
- keep thinking logically
- keep the overall form and zoning simple
- keep the systems and controls simple

Lessons

Don’t give up!

- keep arguing the case at every stage
- keep working together throughout
- keep monitoring and fixing things

Thank you !

Jonathan Hines

jonathan.hines@architype.co.uk
mob: 07802 202397
@ArchitypeUK