

#UKPHC19

ARCHITYPE



Design and construction - planning the first UK Passivhaus Secondary School

Harris Academy, Sutton

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Harris Academy, Brief

Client: London Borough of Sutton

Contractor: Willmott Dixon

End user: Harris Academy

Budget: £38 million

Gross Internal Area: 10,625m²

1,275 pupils: Six form entry plus 6th form

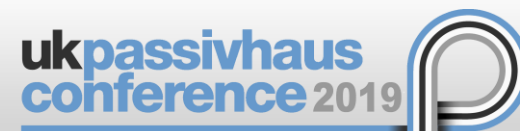
Completed: September 2019

First Passivhaus Secondary School in UK

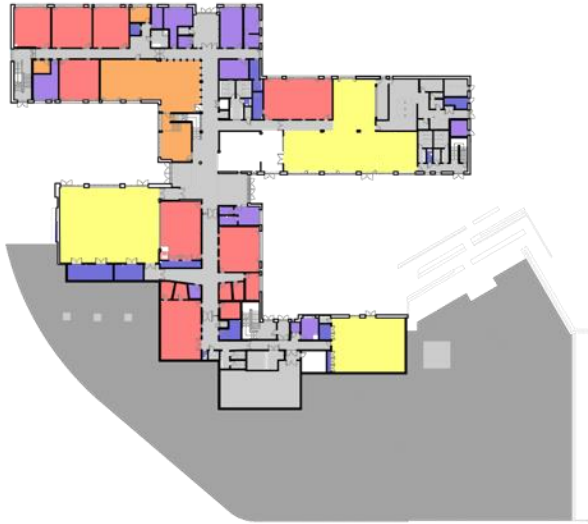


Above: New Cancer Hub Masterplan

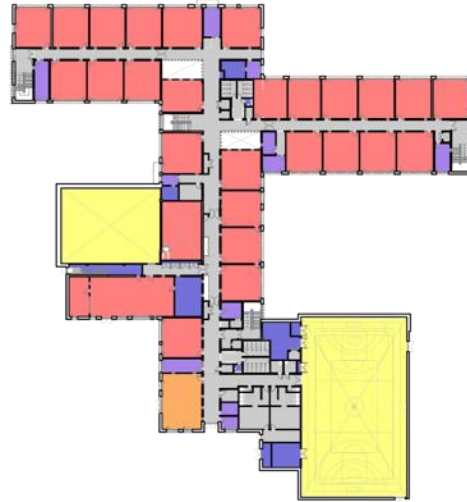
Left: Approach to Sutton Secondary School from North-West Corner



Harris Academy; Floor Plans



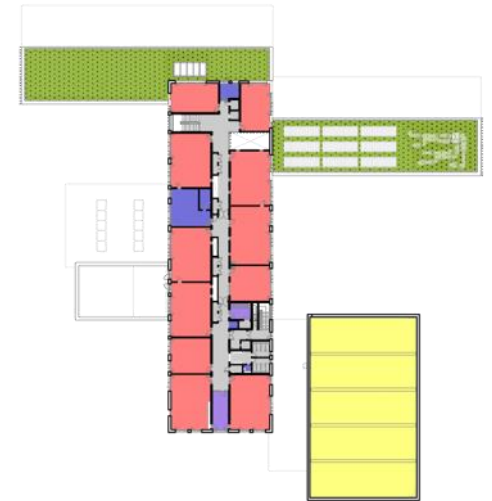
Ground Floor



First Floor



Second Floor



Third Floor



Reasons for choosing Passivhaus

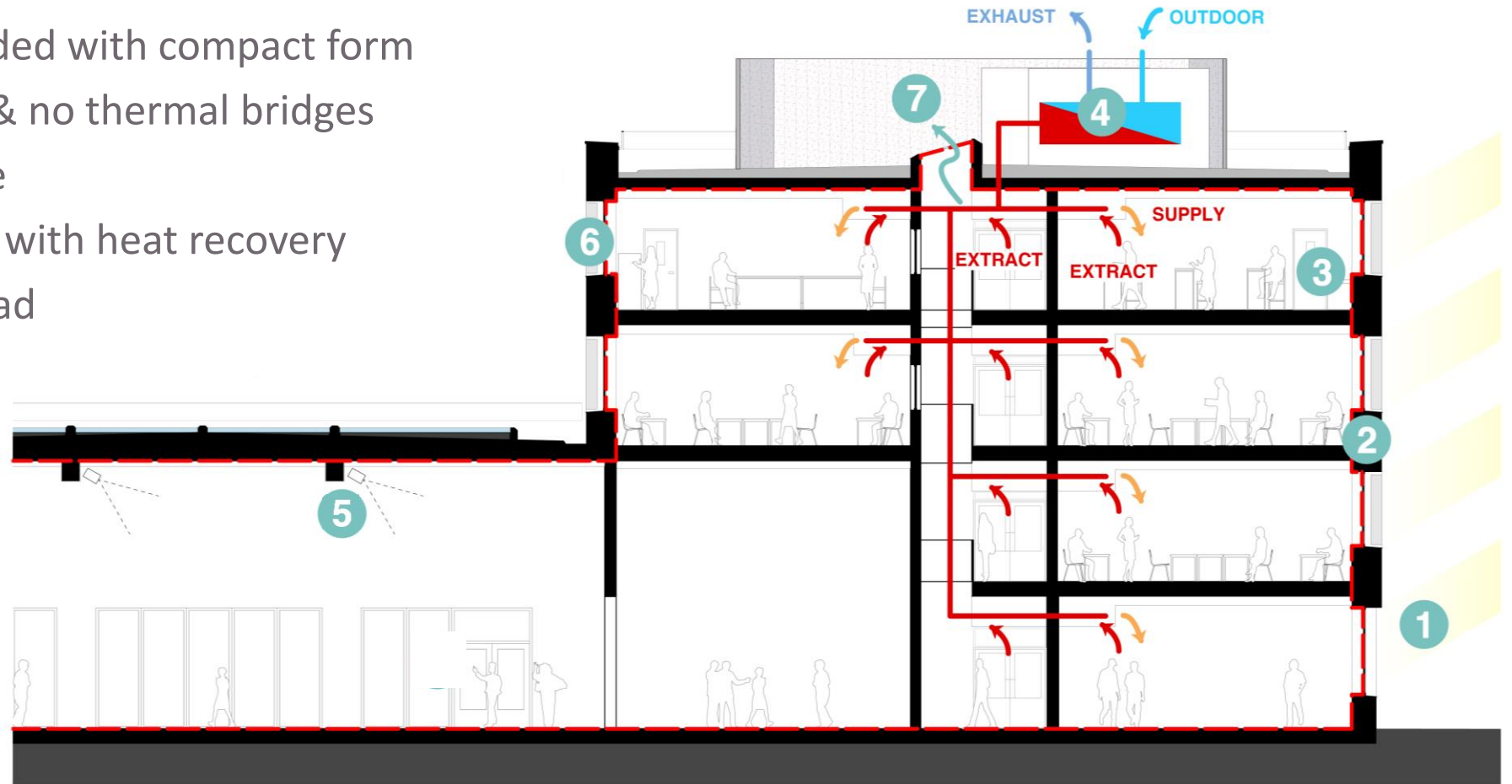


- a rigorous **energy** standard
- a rigorous **comfort** standard
- a rigorous **evidence** based standard
- a rigorous **quality assurance** standard



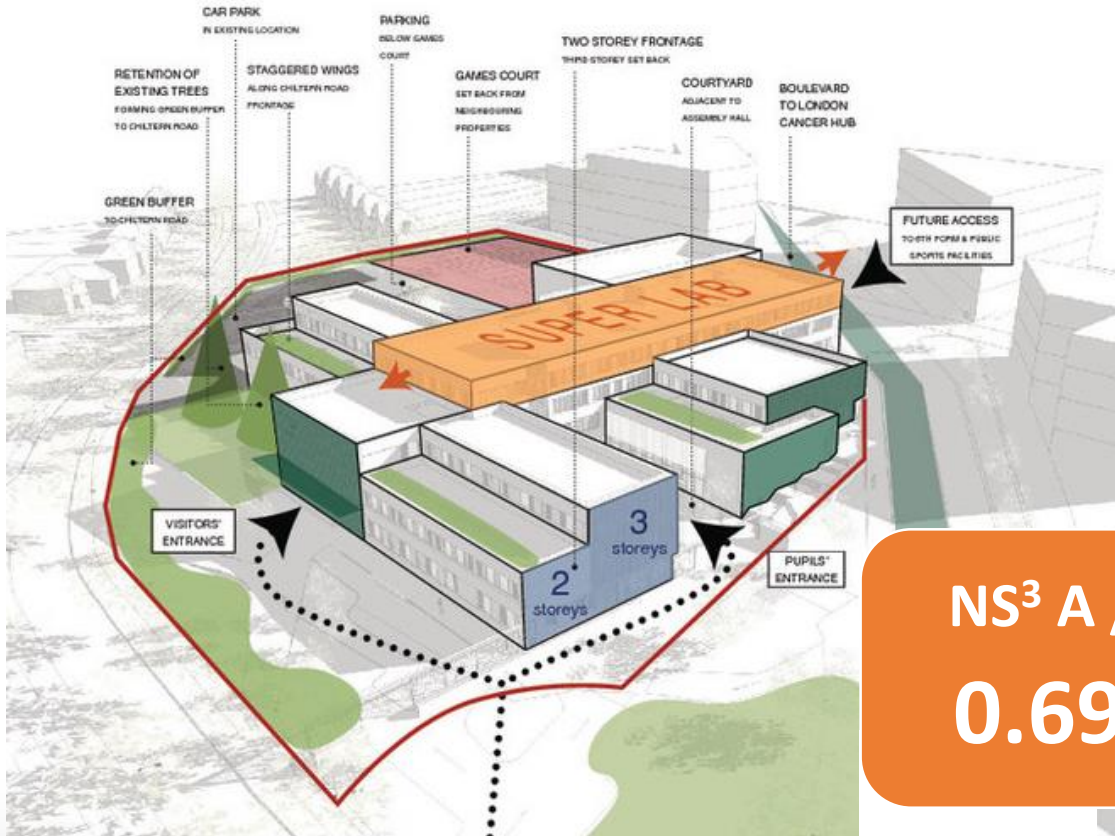
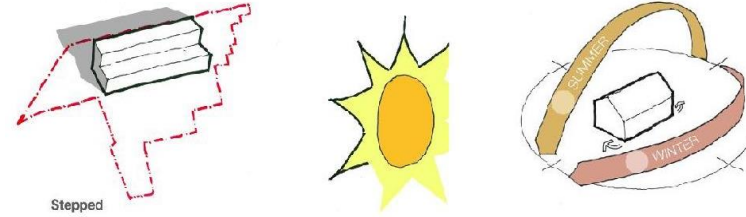
Passivhaus Strategy Overview

1. Solar orientated & shaded with compact form
2. Continuous insulation & no thermal bridges
3. Continuous airtight line
4. Mechanical ventilation with heat recovery
5. Reduce small power load
6. Triple glazing
7. Natural ventilation in temperate months



Optimising Orientation & Form

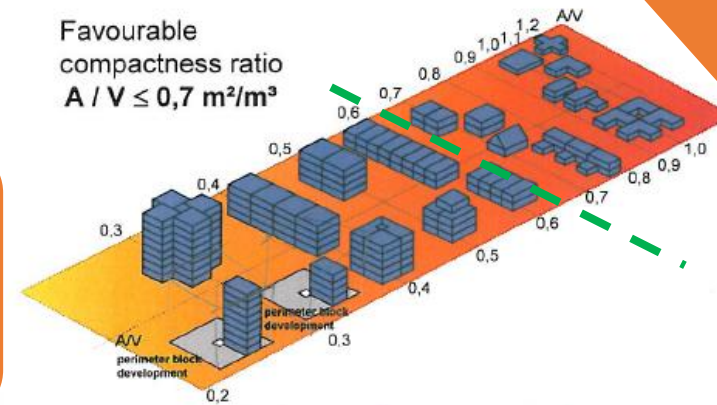
Relationship between surface area and volume of building has a major impact on its efficiency



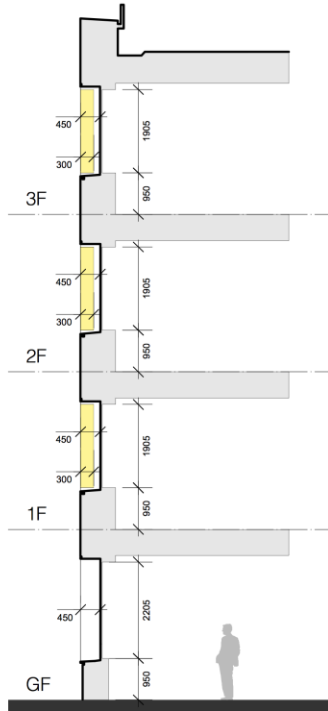
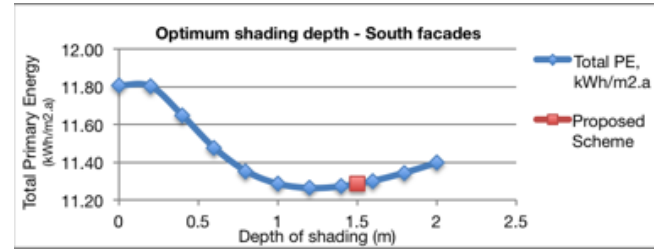
$$NS^3 A / V = 0.69 \text{ m}^2/\text{m}^3$$

$$A / V \leq 0.7 \text{ m}^2/\text{m}^3$$

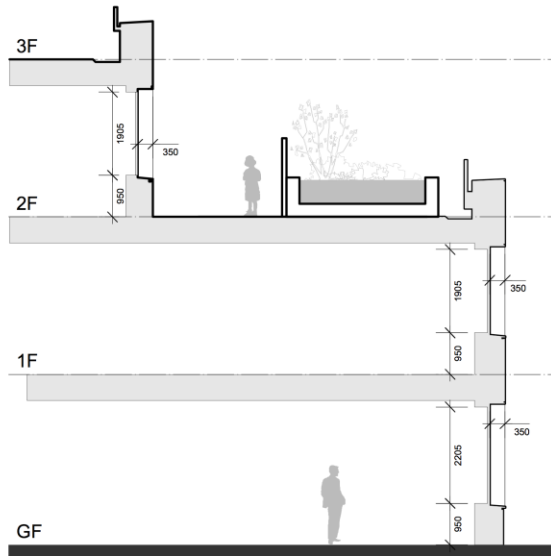
Aim: Minimise surface area / volume



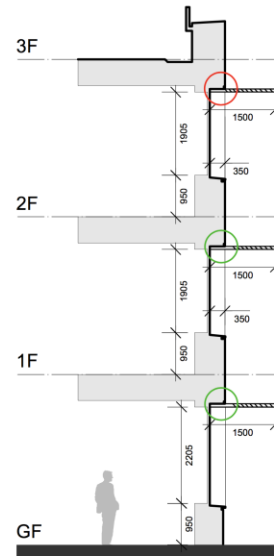
Solar Gain & Shading



East & West Facade
 > Recessed glazing
 > Vertical Fins on mullion lines



North Facade
 > Recessed glazing

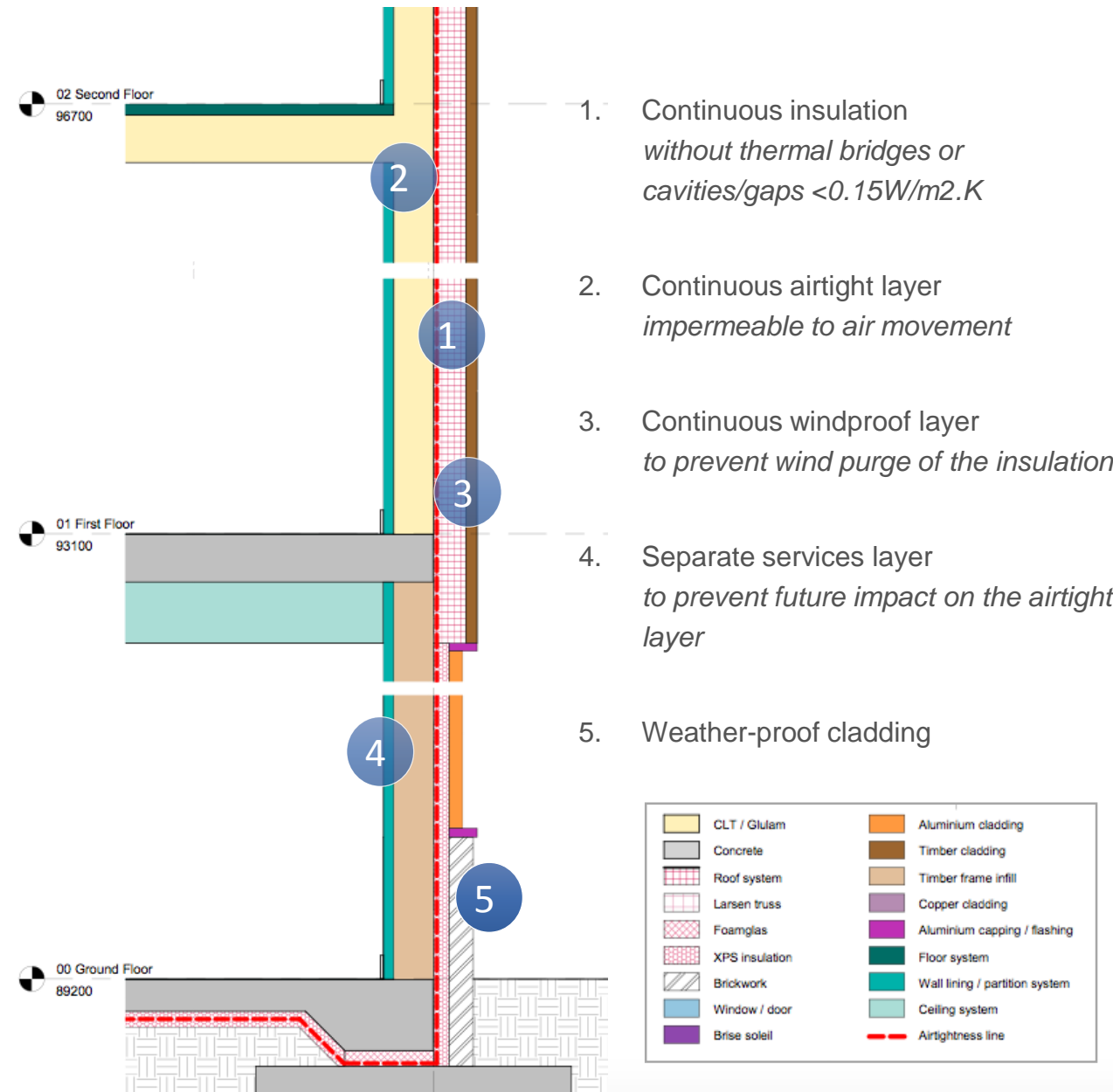


South Facade
 > Recess glazing
 > 1.5m horizontal brise-soleil



Develop a clear Airtightness Strategy

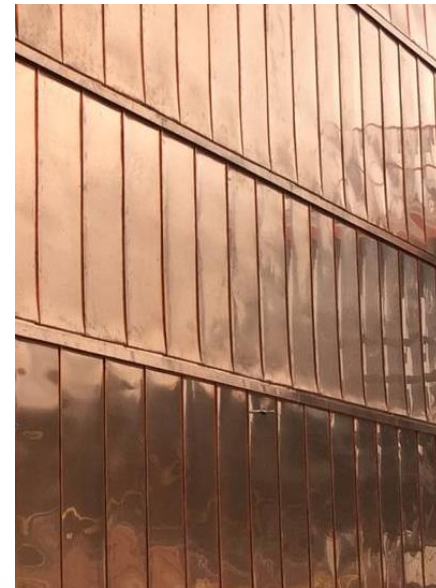
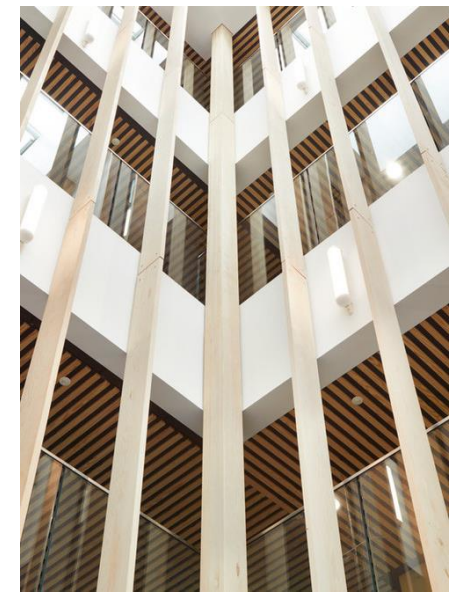
Airtightness membrane on the exterior of the structure wraps the entire building



Materiality

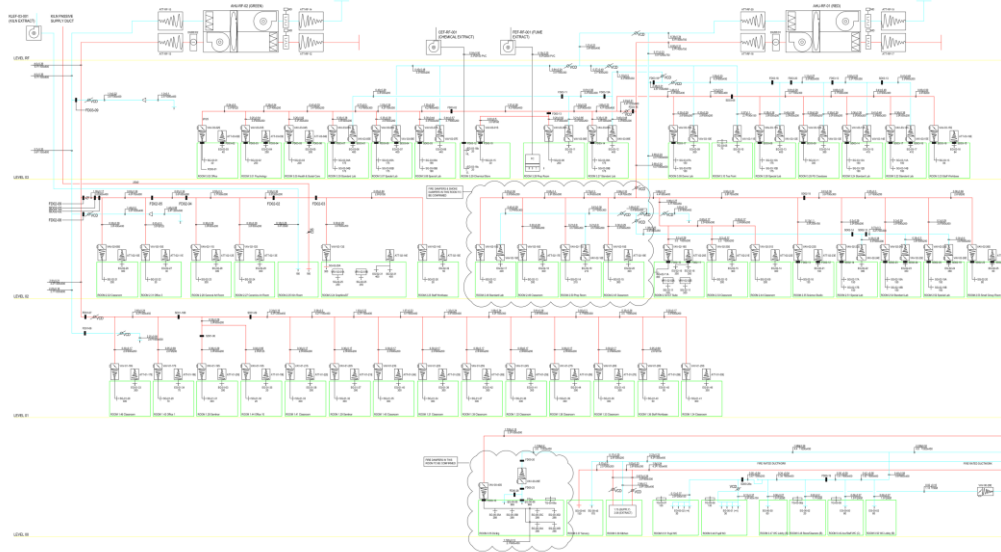
Passivhaus does limit this, but its essential to be thought about from the beginning:

- > We had raw internal finishes - exposed Cross Lamintaed Timber (CLT) & fair faced concrete soffits and walls.
- > Robust materials externally - Douglas Fir timber, copper cladding with brick at low level.



Plan the Mechanical Ventilation Routes

The larger scale project means large ductwork, make sure this is designed in detail early to minimise issues on site



Reduce Small Power Load

Focus on targeting high impact areas such as:

- Computers & interactive white boards
- Servers
- Lighting
- Catering equipment
- Refrigerator display units
- Cold water supply dishwasher



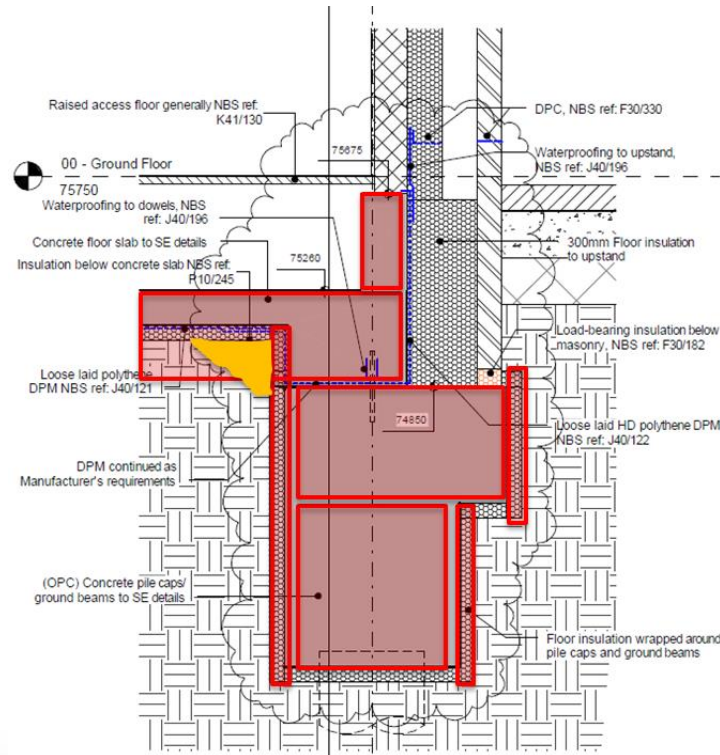
Note: we still had to get dispensation as over the
Primary Energy Target with all the equipment required

Energy		Washing machine
Manufacturer Model		
More efficient A B C D E F G Less efficient		A
Energy consumption kWh/cycle (based on standard test results for 60°C cotton cycle) <small>Actual energy consumption will depend on how the appliance is used</small>		0.95
Washing performance <small>A: higher G: lower</small>		A B C D E F G
Spin drying performance <small>A: higher G: lower</small> Spin speed (rpm)		1400
Capacity (cotton) kg		5.0
Water consumption l		55
Noise (dB(A) re 1 pW)	Washing	5.2
	Spinning	7.0
<small>Further information is continued in product brochures</small>		

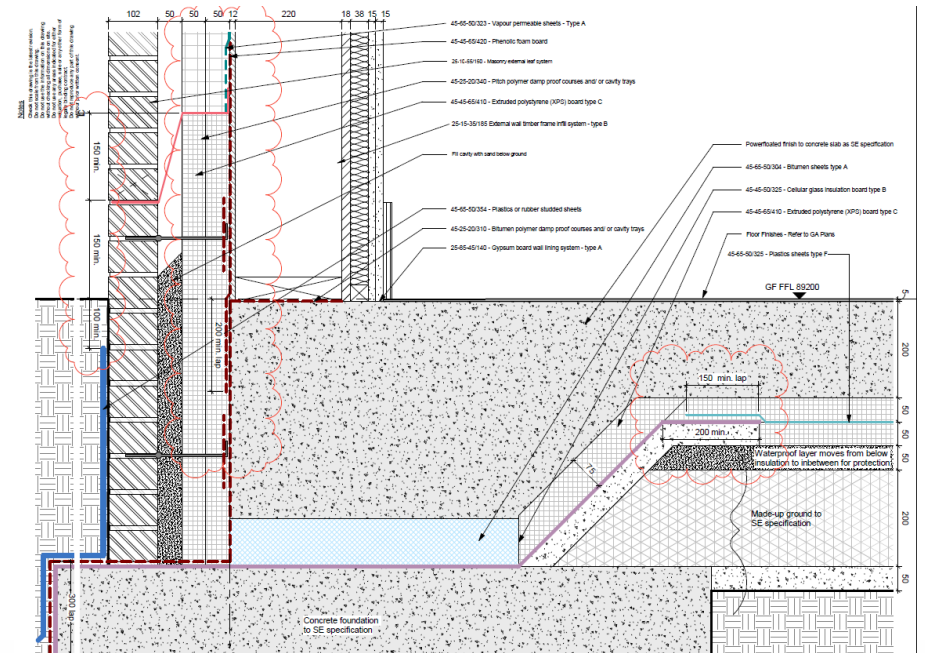


Let the difficult details guide your choice of construction

- Very complicated detail
- Vertical insulation difficult to cut and keep in place before pouring concrete
- Several operations to cast each concrete element
- Different types of insulation used
- 3D Thermal Bridge



- Light weight structure (CLT)
- No piles needed
- Improved insulation continuity



Skills, training & mock-ups

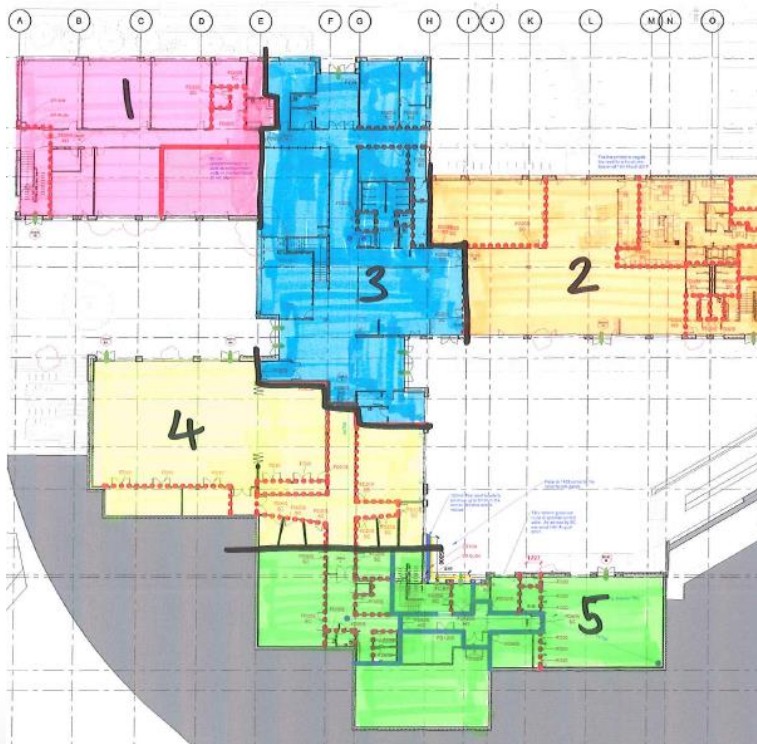


- Lessons learnt workshops
- Trades person training
- Passivhaus induction for operatives
- Setting the expectations on quality



Planning and program

- Involve supply chain early on - design input and collaboration
- Different sequencing (i.e. to allow sectional airtightness tests)



Learn from past projects

George Davies Centre
(Leicester Medical)



1st Large Scale Passivhaus by Willmott Dixon

3 attempts to get A/T target of 0.3ach

Sutton Secondary School



2nd Large Scale WD Passivhaus

1st full envelope test A/T target of 0.29ach

Quality Processes

LOCATION VIEW | PLAN VIEW

PROJECT: > E00548 - Sutton Secondary School > Defect Management > External penetrations > North Elevation

RECENT | LIBRARY | DETAILS

Task Type: Record of Site Works

Description: ! Example

Location: North Elevation

Status: Record of Works

Issued to: ! Willmott Dixon Construction

Photo:

Comments:

Save To Library?

- Don't reinvent the wheel
- Integrate Passivhaus Q/D in existing processes

ukpassivhaus conference 2019



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Thank you...

