Multi Comfort
BY SAINT-GOBAIN

MARK ALLEN

BARTHOLOMEW BARN

2016.10.20

SAINT-GOBAIN

OVERVIEW

WARM: Low Energy Building Practice

Shireconsulting

FUTUREKOMFORT
Passive & Low Energy Buildings...

Multi Comfort
BY SAINT-GOBAIN

Design and Built to Multi-comfort – PC Jan 2016.

Glulam portal frames with timber I beam infill.

Kings Hawford primary school – New sports hall and drama facility.

AssociatedArchitects

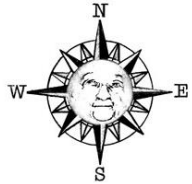
SpellerMetcalfe

Kings
WORCESTER

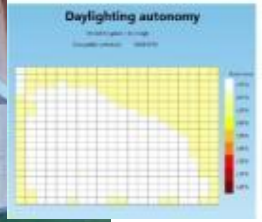
SAINT-GOBAIN

SITE


Playground
Portakabin
Classroom Block
Classroom Block
Hard Landscaping
HAWFORD LODGE
CAR PARK
Classroom Block
Reception
Old School Hall
Swimming Pool
Glasshouse
Residence
Headmaster's house
Garage
CAR PARK
1
2
3
4
THE BARN
Landform
LOCK LANE


N
W
E
S

THE KING'S SCHOOL, WORCESTER UK – 'BARTHOLOMEW BARN'



Average value for daylight autonomy :
86 %

THE KING'S SCHOOL, WORCESTER UK – 'BARTHOLOMEW BARN'

DESIGN TO CONSTRUCTION PROCESS

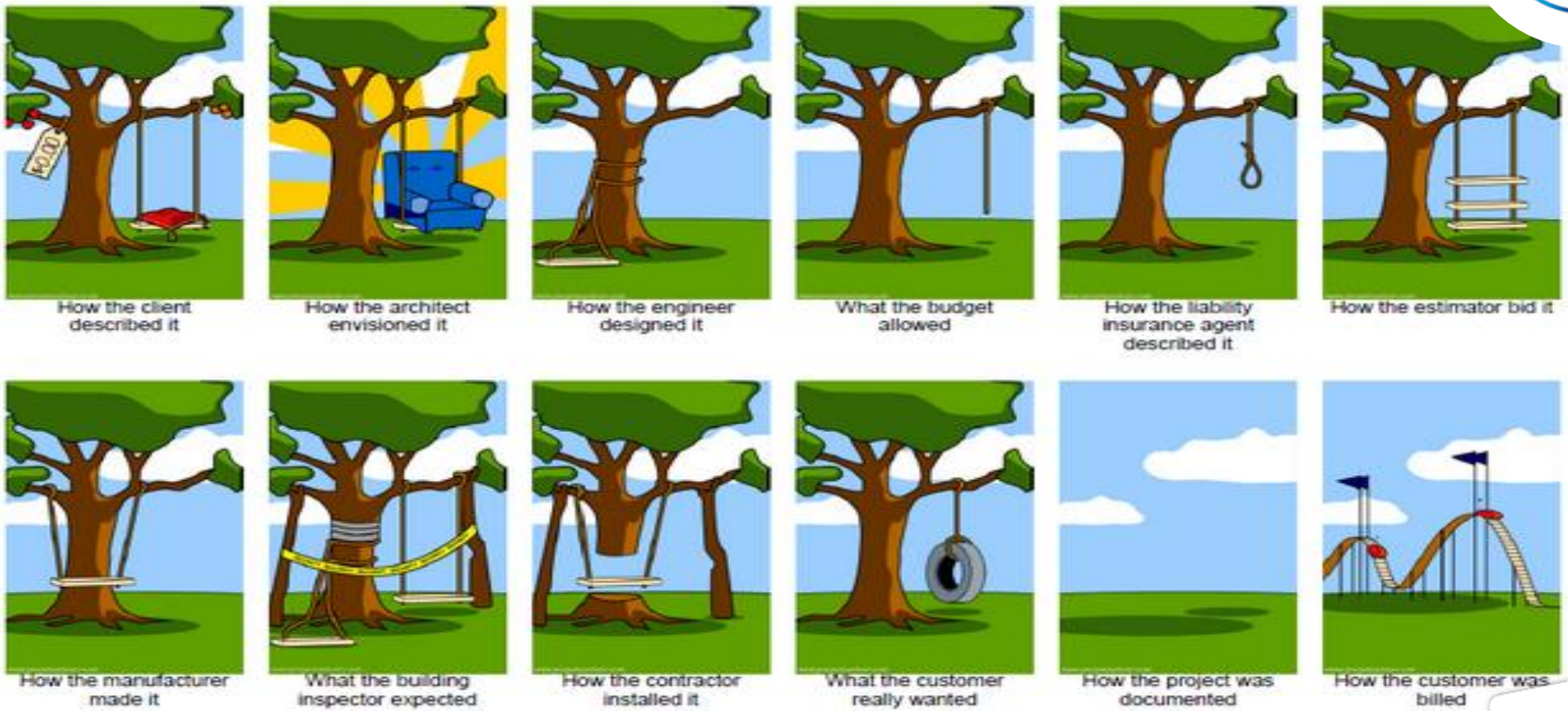
CREATE SIMPLE METRICS

DESIGNING TO PERFORMANCE METRIC WITH RESULTANT OUTPUTS – PERFORMANCE SET IN CONTRACTS

my comfort by Saint-Gobain

			RESIDENTIAL New-Build	RESIDENTIAL Renovation	NON-RESIDENTIAL New-Build	NON-RESIDENTIAL Renovation
THERMAL	Heating & Cooling Energy Demand	PH	15kWh/m²/p.a *or* 10W/m²	25kWh/m²/p.a	15kWh/m²/p.a *or* 10W/m²	25kWh/m²/p.a
	Relative Humidity [12]		40-60%		40-70% [11]	
	Overheating Prevention [2]	PH	Limit Value: 10%		Limit Value: 10% [3]	
	Thermal Bridging	PH	0.01 W/mK	0.01 W/mK [9]	0.01 W/mK	0.01 W/mK [9]
AUDIO	Acoustic Sound Insulation (Design Values)		+3dB of current acoustic regulation level for building type [4]		+3-6dB of current acoustic regulation and/or guidance level for building type [4]	
	Acoustic Absorption		N/A in most cases [5]		In line with currect reverberation control regulation and/or guidance level for building type	
	Speech Clarity/ Intelligibility (c50)		N/A		In line with currect regulation and/or guidance level for building type	
	Harmonious Resonance		Due consideration to be given to frequency transfer of noise based on selection of structural materials			
VISUAL	Daylight Autonomy [13]		8am - 6pm DA 60% at 300lux	Optimise existing openings through glazing spec. [5]	BREEAM [16]	Optimise existing openings through glazing spec. [5]
INDOOR AIR	Airtightness (n50)	PH	0.6 V/h @ 50pa	Limit: <1.0V/h@50pa Target: <0.6V/h@50pa	0.6 V/h @ 50pa	Limit: <1.0V/h@50pa Target: <0.6V/h@50pa
	Ventilation [14,15]	PH	30m³/hr/person [8]	30m³/hr/person [8]	To be agreed with Passivhaus Institute (PHI) based on a review of planned occupany patterns/ratios [8]	
	Control of VOC's (3 routes to compliance)		Use of EN15616 tested materials *or* [18]			
			Internal materials finishes that remove VOC concentration *or* [19]			
			Total VOC Concentration <300µg/m³ + Formaldehyde levels <100µg/m³ [17]		Total VOC Concentration <150µg/m³ + Formaldehyde levels <100µg/m³ [17]	
	Primary Energy Demand	PH	120kWh/m²/p.a		To be agreed with Passivhaus Institute (PHI) based on a	

COMPLEXITY OFTEN ISN'T COMMUNICATED EFFECTIVELY



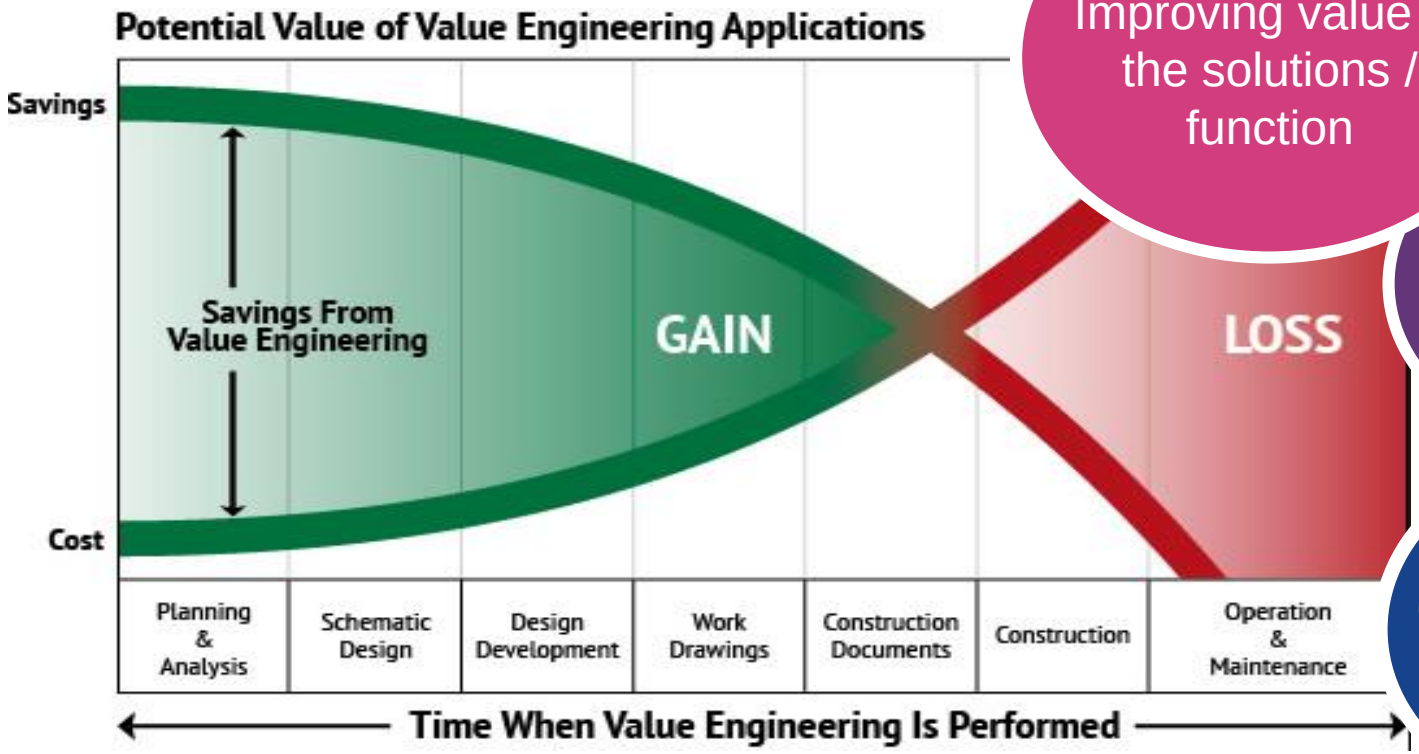
COLLABORATION IS KEY TO MAKING IT WORK.

Early engagement of the contractor - sequencing

“reduces the risk ”

Tool box talks – especially on new products / solutions

VALUE ENGINEERING



Improving value of the solutions / function

Skills, raw materials etc shortage

Or reduce the cost for the same performance / function

VALUE ENGINEERING EXAMPLE

Figure 6: Internal acoustic finishes, Drama format

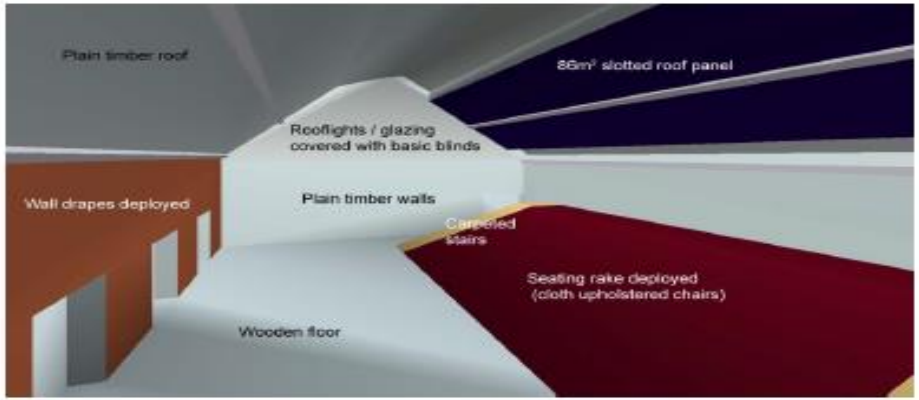
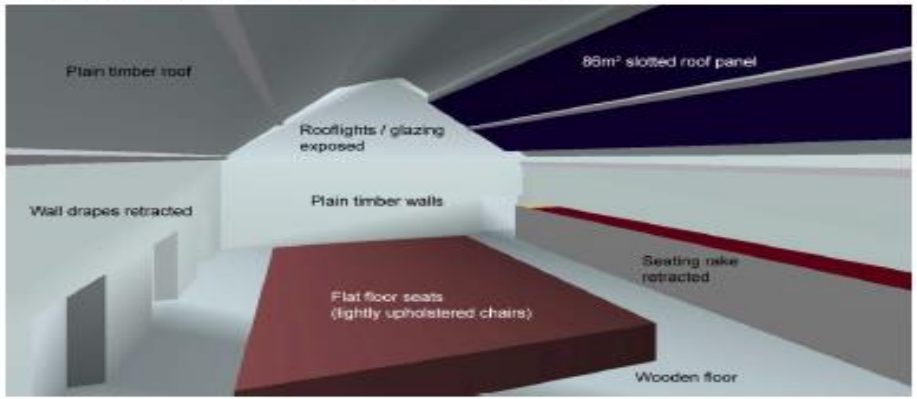


Figure 7: Internal acoustic finishes, Social Event format



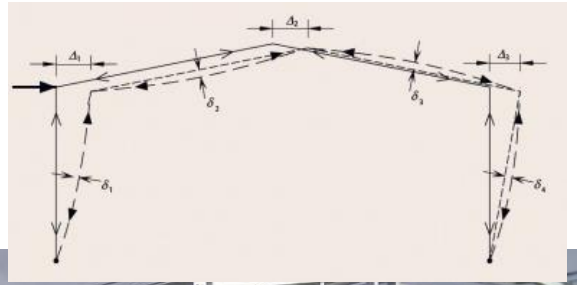
Salford Uni HEAD study – 30% uplift in achievement by reducing background noise

WHO – Now linked ADHD with quality of learning environment

40% of children in primary schools have a form of hearing impairment – permanent or illness.

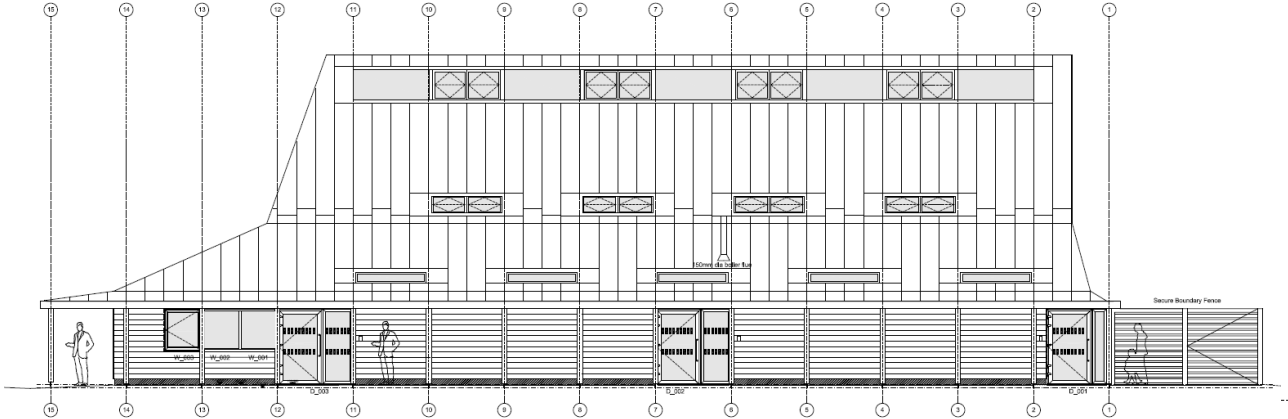
PORTAL FRAME DESIGN

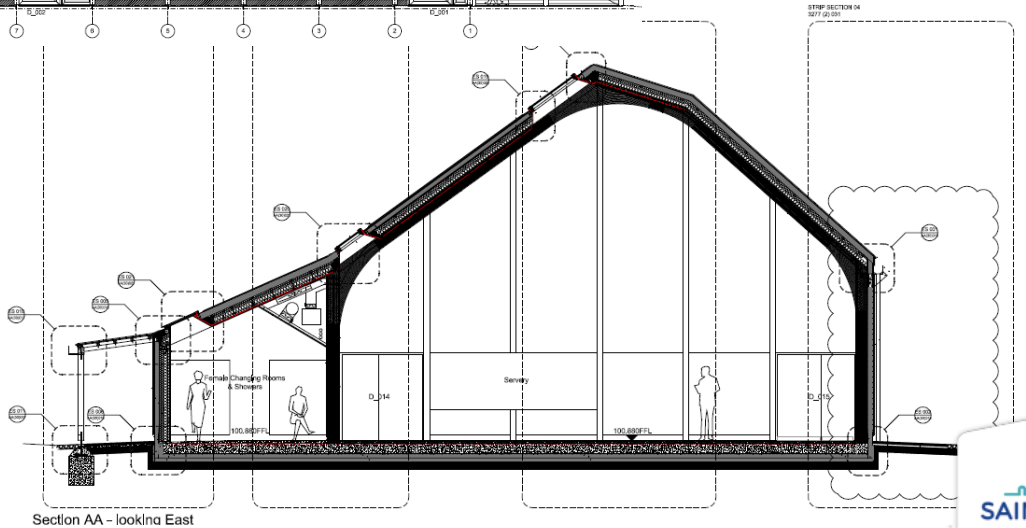
Typical metal portal structure



Can either use cross bracing, or Stiffen up the frame and channel all the loads through the foundations.

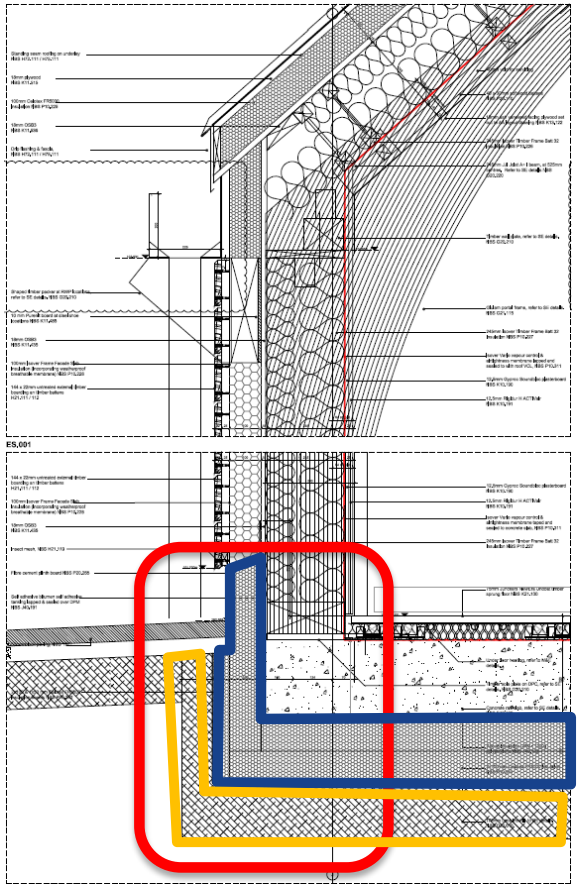
PORTAL FRAME DESIGN





Section AA - looking East

INCREASE IN FOUNDATION



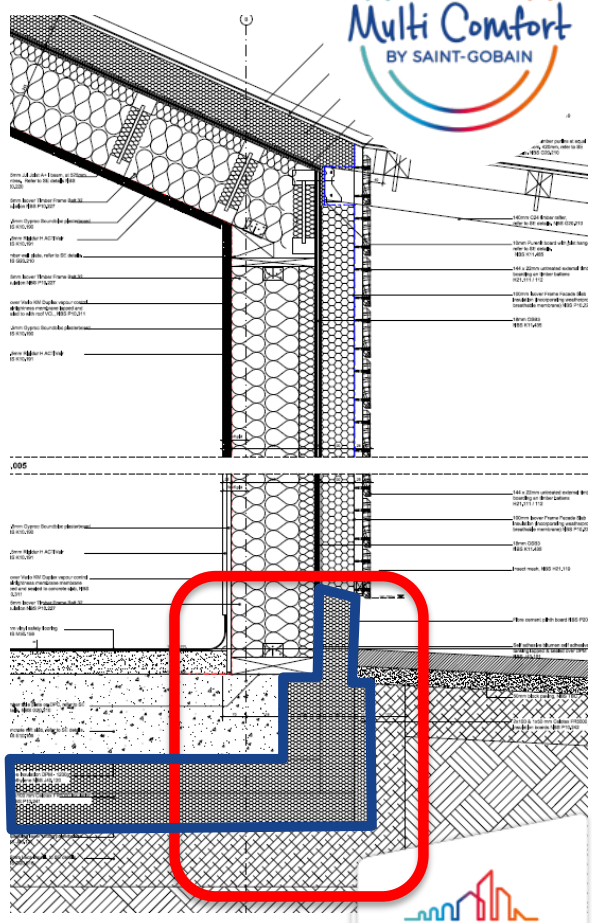
To offset turning moments foundation is larger at the base of the portals

Reduces insulation – in blue

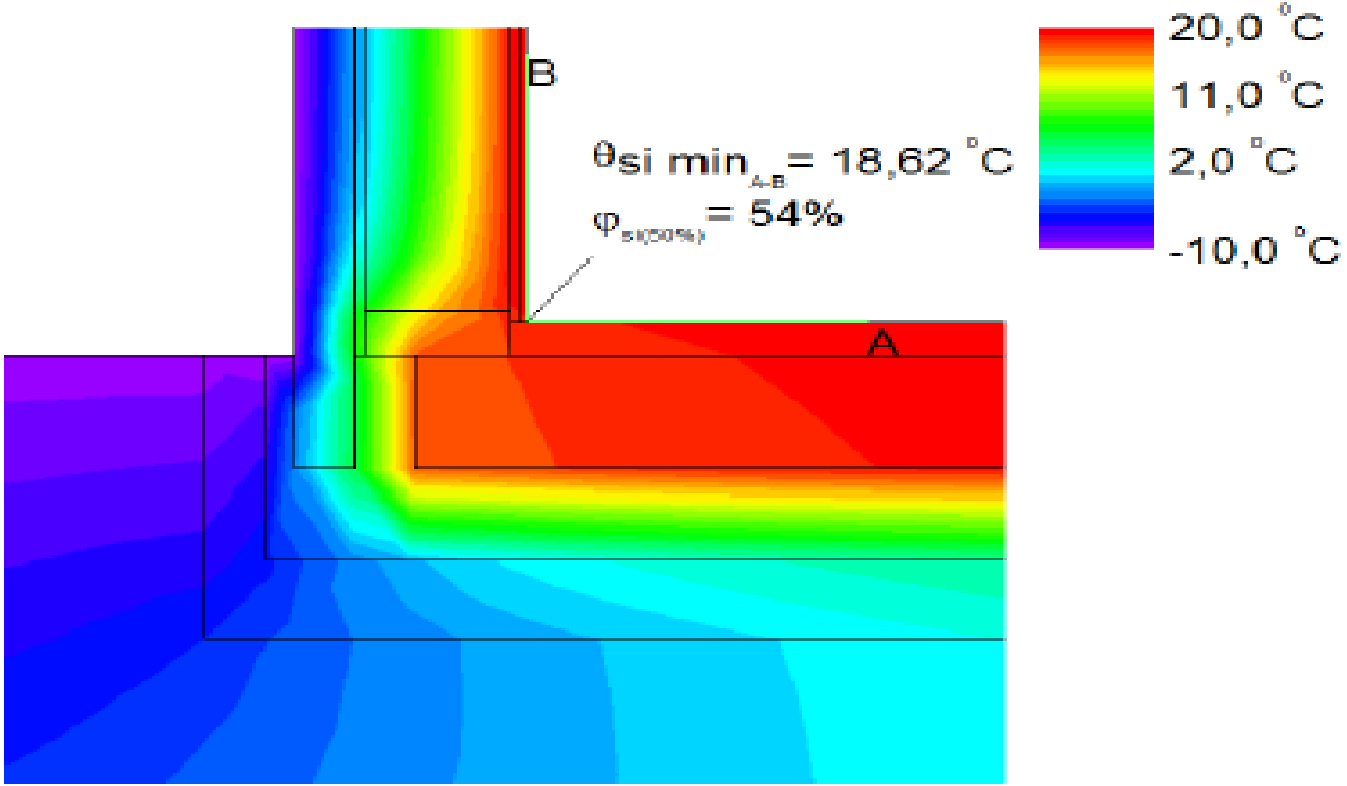
Used leca under pathways in orange.

Leca also remove the need for sand blinding under DPM and reduced the overall reduced dig on site.

Lesson learnt – rolling down the hill.



OFFSETTING THE THERMAL BRIDGE



SUPER STRUCTURE

No large cross bracing

Reduced framing costs

Racking from OSB grade 3

Easier for insulation installation

Lesson learnt – structural spacing to material manufacturing sizing – reduce waste on site.

AIRTIGHTNESS BARRIER LOCATION

The barrier was taken around the frame

Wufi assessments carried out to ensure moisture wooden vapour diffuse through the glue in the glulam structure.

AIR TESTING PROBLEMS

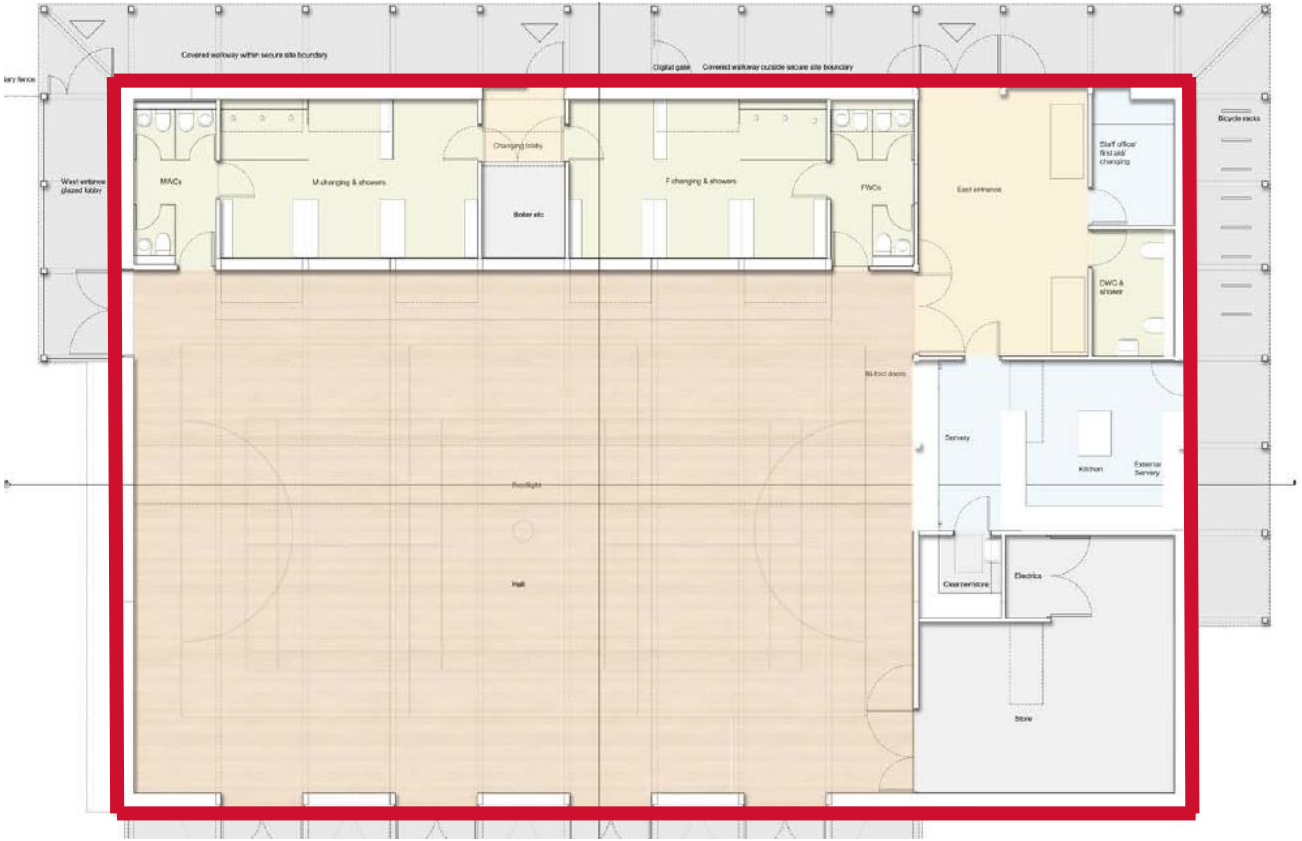
Barrier stapled with no battens for service void.

Pressurization test was fine.

Lesson learnt - Depressurization test started to rip the barrier from the engineered timber.

Many of the hall areas we did not have service voids. Sport England hall recommend size determined the limits.

SERVICES



Services keep from external walls

Reduce chance of damage to barrier now and future adaptability.

Where required new service voids created.

WALL DESIGN
MOISTURE TRANSFER

Isover Frame façade slab

Wufi assessment carried out.

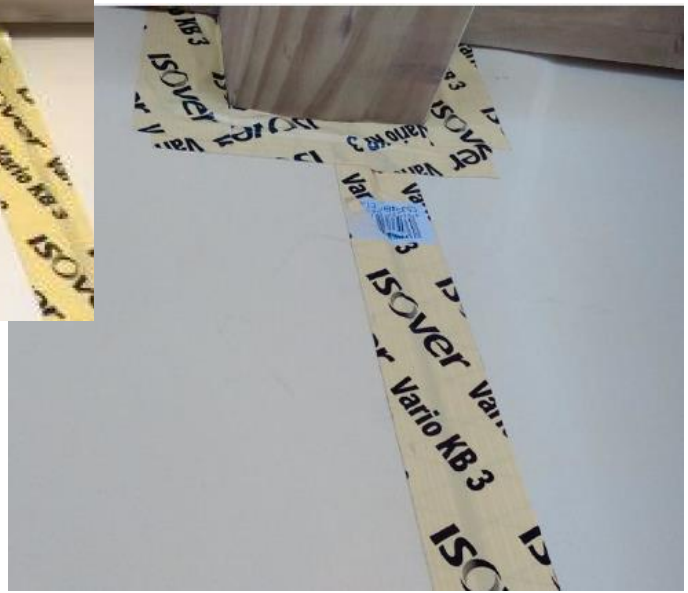
External is a breather-able membrane on mineral wool backer

Plastic spaces fixed through the frame façade and carry the batten.

Barrier taped.

Lesson learnt :- Meets up of two insulation types – cutting rigid insulation straight?

LESSONS LEARNT – TOLERANCE / MATERIAL MANUFACTURE

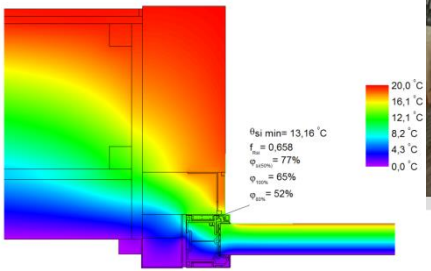


CLADDING FINISH

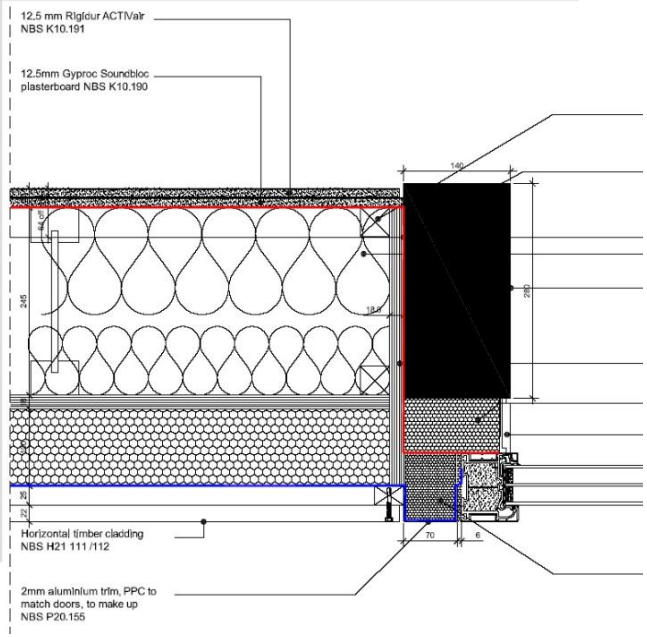
CHANGING WINDOW SPECIFICATION

At south windows, Purenit boards have been fitted behind the timber window fixing blocks as agreed by e-mail.

AI will confirm.



Psi(ins.) = 0.051 W/(m*K)



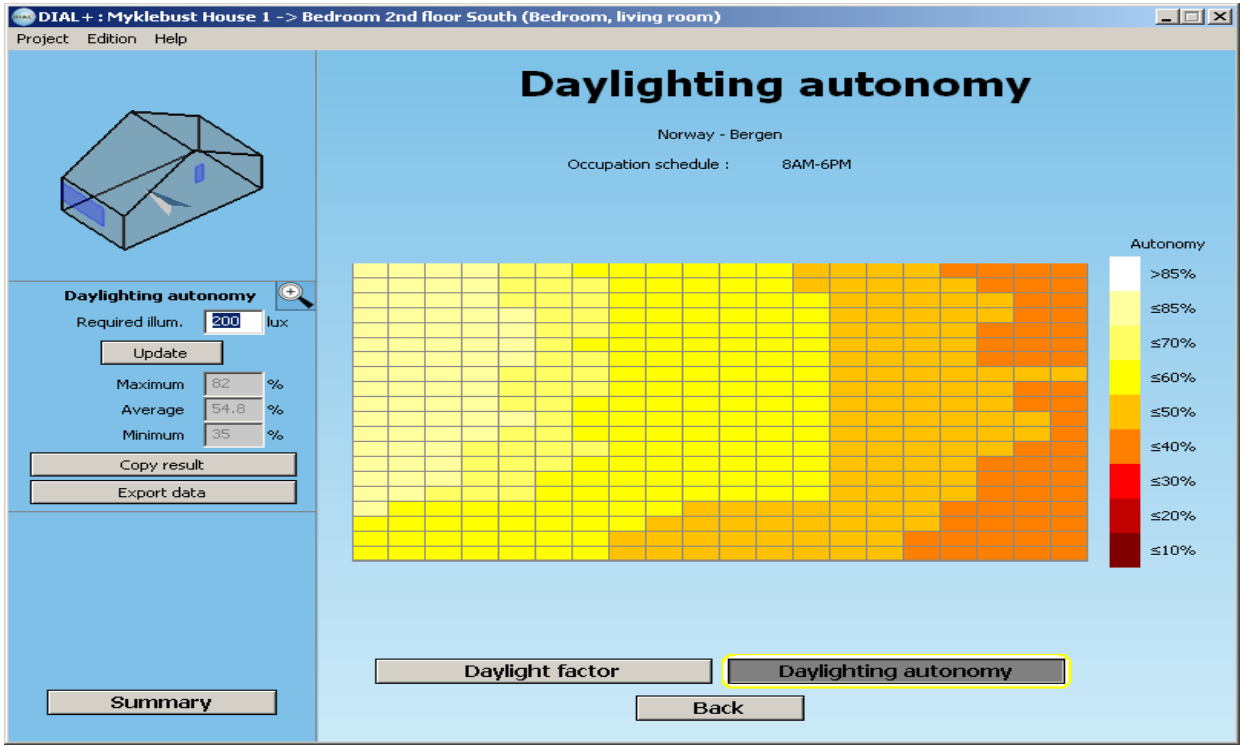
Original window company changed.

Fixing details altered.

Frame performance changed altering from 13kWh to 16kWh.

Luckily we had time to engineer the detail and other thermal bridges.

DAYLIGHTING
DAYLIGHTING AUTONOMY V DAYLIGHTING FACTORS.



Autonomy :-

Orientation, Location, glazing specification.

Not only did it impact the thermal but also the LTV for the building.

Luckily we built enough tolerance into the PHPP and daylighting autonomy originally.

THE KING'S SCHOOL, WORCESTER UK – 'BARTHOLOMEW BARN'

MONITORING PARAMETERS

Feel

- Thermography
- QUB and Co-heating(?)
- Internal temperature stratification
- Through wall temperature stratification
- Airtightness testing 0, 24 months post completion

See

- Daylighting autonomy study
- SGR lux measurements
- PIR sensors to identify use

£

- Pulse monitoring of electric and oil supply

Hear

- SGR Acoustic testing development
- External acoustic survey
- Internal acoustic
- POE survey

Breathe

- Continuous CO_2 metering
- Continuous relative humidity metering

CONCLUSION

- **Work with the contractor to mitigate risk**
- **Know the material characteristics and constraints.**
- **Changing specifications may not just incur one consequence.**
- **Value engineering if carried out at the right time can have good consequences.**
- **Monitoring results coming back favorable on performance of all characteristics.**
- **Our build cost is neutral and inline with Education funding agency assessment on 36 builds carried out in 2015 to standard build regs requirements.**

STRUCTURAL TIMBER AWARDS
19.10.2016

Finalist:
education project of the year
&
Finalist:
low energy project of the year

Multi Comfort BY SAINT-GOBAIN

Building AWARDS 2016
08.11.16 GROSVENOR HOUSE HOTEL, LONDON

Finalist:
sustainability project of the year

SAINT-GOBAIN