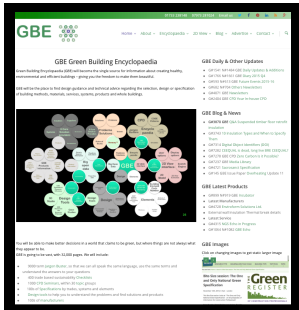

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(22) Internal Partitions

G14 Light steel frame • G20 Light Timber framed • K10 Plasterboard • K30 Panel Partitions • K32 Cubicle Partitions

LSBU Tech & Env 2 Lecture

- Domestic, Small & Medium size buildings
- Construction methods, materials, services and systems
- Internal walls and partitions

Performance Requirements

Principles of Element Design

THIRD EDITION

PRINCIPLES OF element design

Peter Rich &
Yvonne Dean

ARCHITECTURE/DESIGN

PRINCIPLES OF element design THIRD EDITION

Peter Rich & Yvonne Dean

- **Unique in its approach to detail design**
- **Invaluable for both students and practising architects, builders and surveyors**
- **Completely updated in a convenient reference sheet format**

The construction of buildings is learnt through experience and the inheritance of a tradition in forming buildings over several thousand years. Successful construction learns from this experience which becomes embodied in principles of application. Though materials and techniques change, various elements have to perform the same function. **Principles of Element Design** identifies all the relevant elements and then breaks these elements down into all their basic constituents, making it possible for students to fully understand the given theory and principles behind each part. As all building projects are subject to guidance through the Building Regulations and British Standards, this book gives an immediate reference back to relevant information to help practitioners and contractors identify key documents needed.

Peter Rich AA Dipl (Hons) Architect, started his career with 14 years' experience as a qualified architectural technician. He then joined the AA School of Architecture, working with Bill Allen and John Bickerdike after his graduation, later becoming a partner of Bickerdike Allen Rich and Partners. He also taught building construction at the Bartlett School of Architecture, University College London, and architectural design at the Polytechnic of North London. He now acts as a Consultant.

Yvonne Dean B.A. (Hons) B.A. (Oxon) ARA, is an architect, energy consultant and materials technologist. She also has 15 years' experience as a lecturer, travels widely and is a guest lecturer at many universities. She pioneered an access course for Women into Architecture and Building, which has been used as a template by others, and has been instrumental in helping to change the teaching of technology for architects and designers.

ISBN 0-7506-3113-9

Architectural Press
An imprint of Butterworth-Heinemann
http://www.bh.com

9 780750 631136

Wall Actions

- Gravity: downward pull
- Wind: Motive, Destructive, Penetrative
- Rain: Moisture deposition, penetration
- Snow: Moisture deposition, loading
- Moisture vapour: permeation, condensation, insulation impaired, material degradation
- Sun: Temp variation, thermal movement, heat gains, Chemical decomposition
- Dirt and Dust: infiltration, deposition, surface pollution
- Chemicals: corrosion, disintegration, decomposition
- Sound: Noise nuisance, from within and from without
- Attack: Manual, Ballistics, Bomb Blast
- Thermal: heat loss, radiant coolth, condensation, stack effect

Wall Reactions

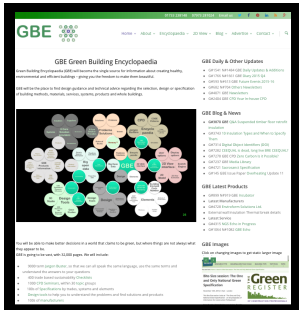
- Gravity: Support & restraint
- Wind: rigidity, resilience, sealing, air tightness layers and detailing
- Rain: deflection, impervious skin, absorption and drainage, sealing
- Moisture vapour: resistance, hygroscopicity, permability, breathing, moisture mass
- Snow: deflection, impervious skin, absorption and drainage, sealing
- Sun: movement joints, insulation, shielding, invulnerable materials
- Dirt and Dust: repulsion, exclusion, sheilding, cleaning
- Chemicals: invulnerable materials, exclusion,
- Sound: Insulation, absorption, acoustic mass, separation, isolation,
- Attack: toughness, lamination, edge restraint, edge protection
- Insulating: thermal insulation, thermal mass, U value, G value, cold bridge avoidance/minimisation

Partition properties

- Wall Categories
- Appearance
- Structural strength and stability
  - Wind post, stiffening posts, head and abutment restraint, joint reinforcement
- Fire Protection
  - Fire resistance, spread of flame
- Durability and maintenance
- Thermal performance
  - Insulation, thermal mass, cold bridge avoidance, air tightness
- Acoustic performance:
  - Noise barrier, sound absorption, flanking sound,

Partition Properties

- **Movement**
  - Thermal, structural, moisture
- **Security**
- **Party walls**
  - Structural fire precautions, structural stability, Condensation and Insulation, sound control
- **Compartment Walls**
- **Fixed Partitions**
- **Relocateable Partitions**
- **Cubicles**
- **Mobile Partitions**



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Load-bearing Timber blockwork

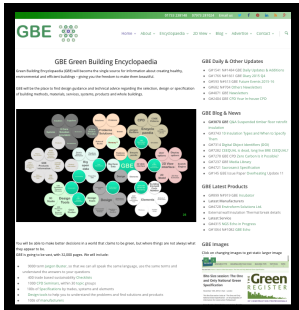
Opaque Timber Walls
Timber Constructions

STEKO
Load-bearing timber blockwork

Construction Resources Showrooms Southwark London

STEKO

Load-bearing timber blockwork



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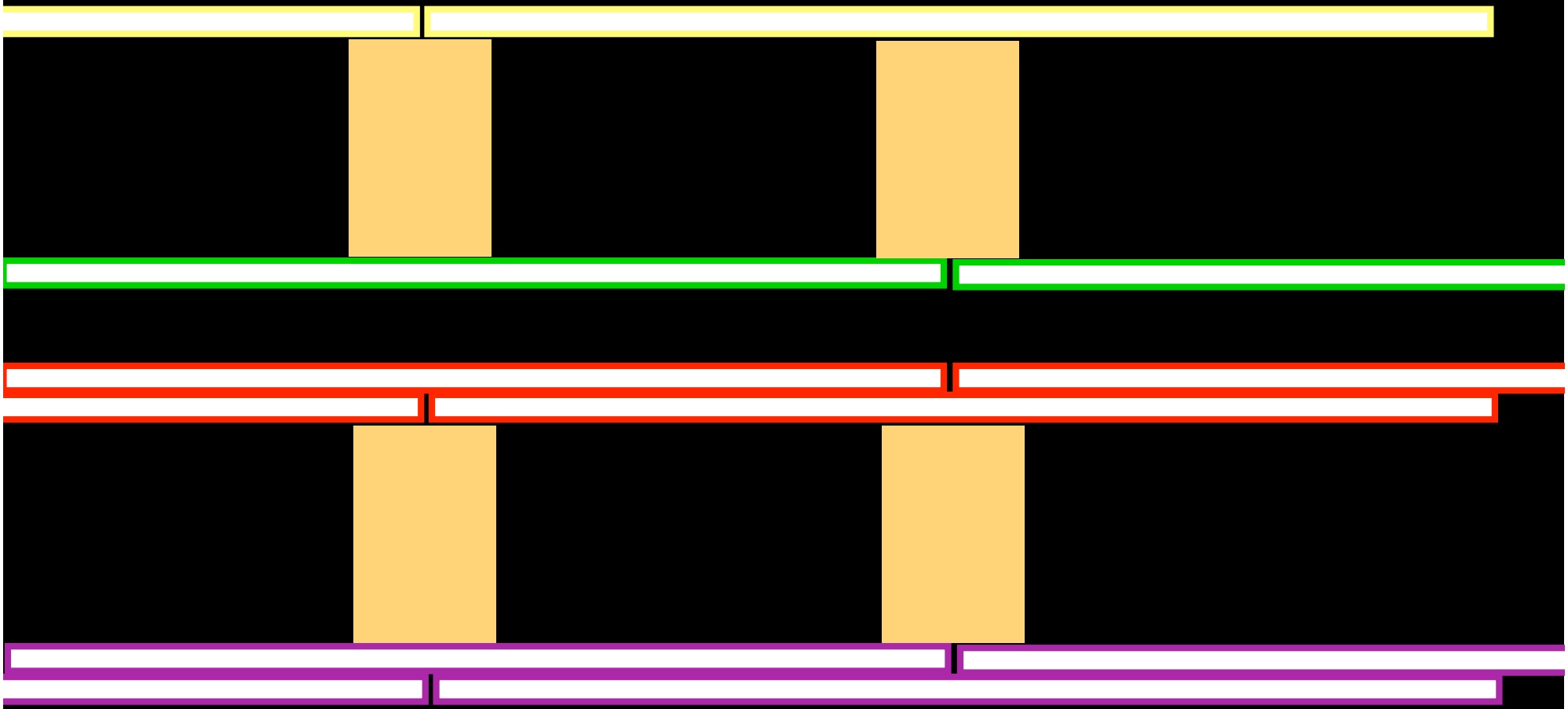
Timber stud partitions

Plasterboard lined

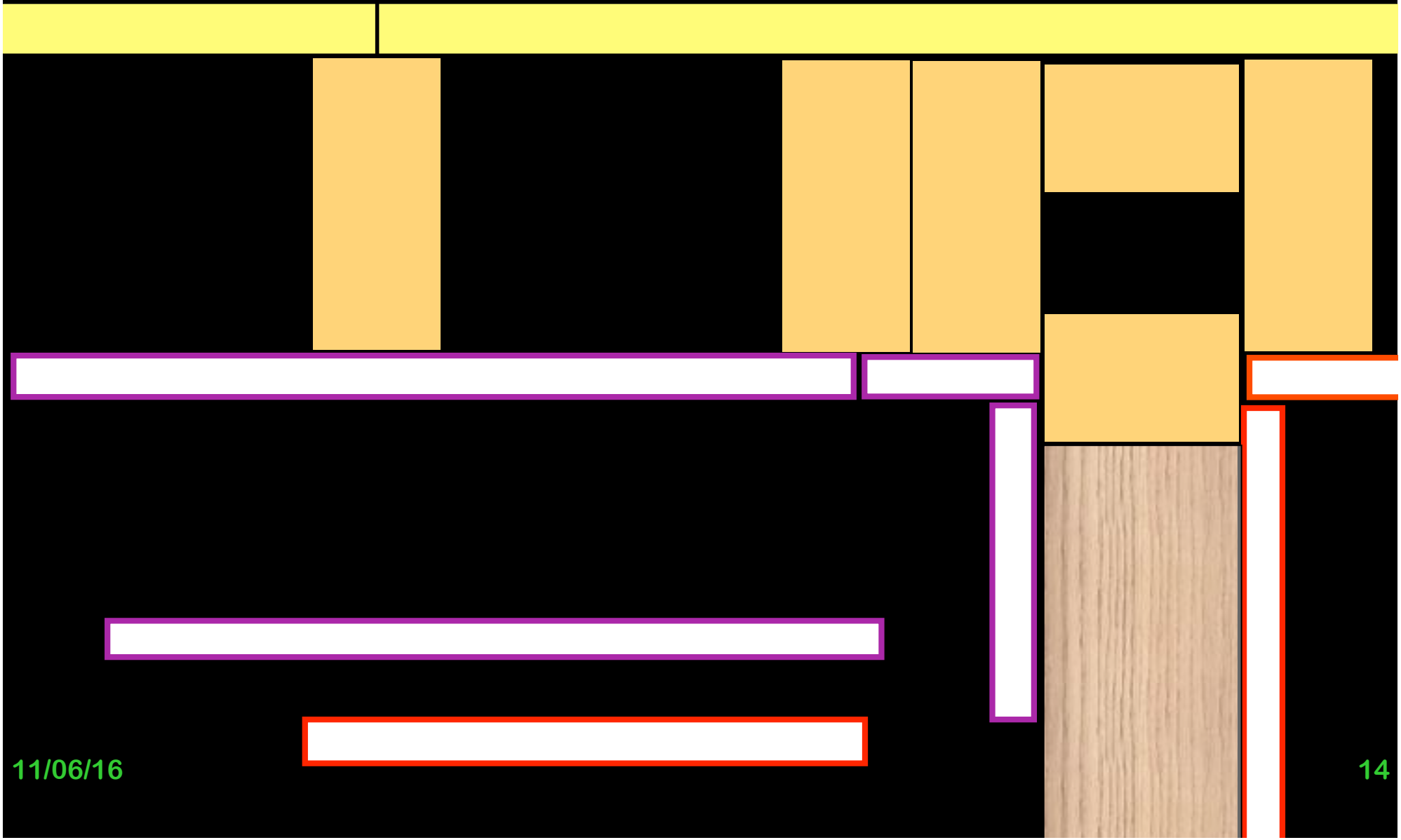
Timber stud partition



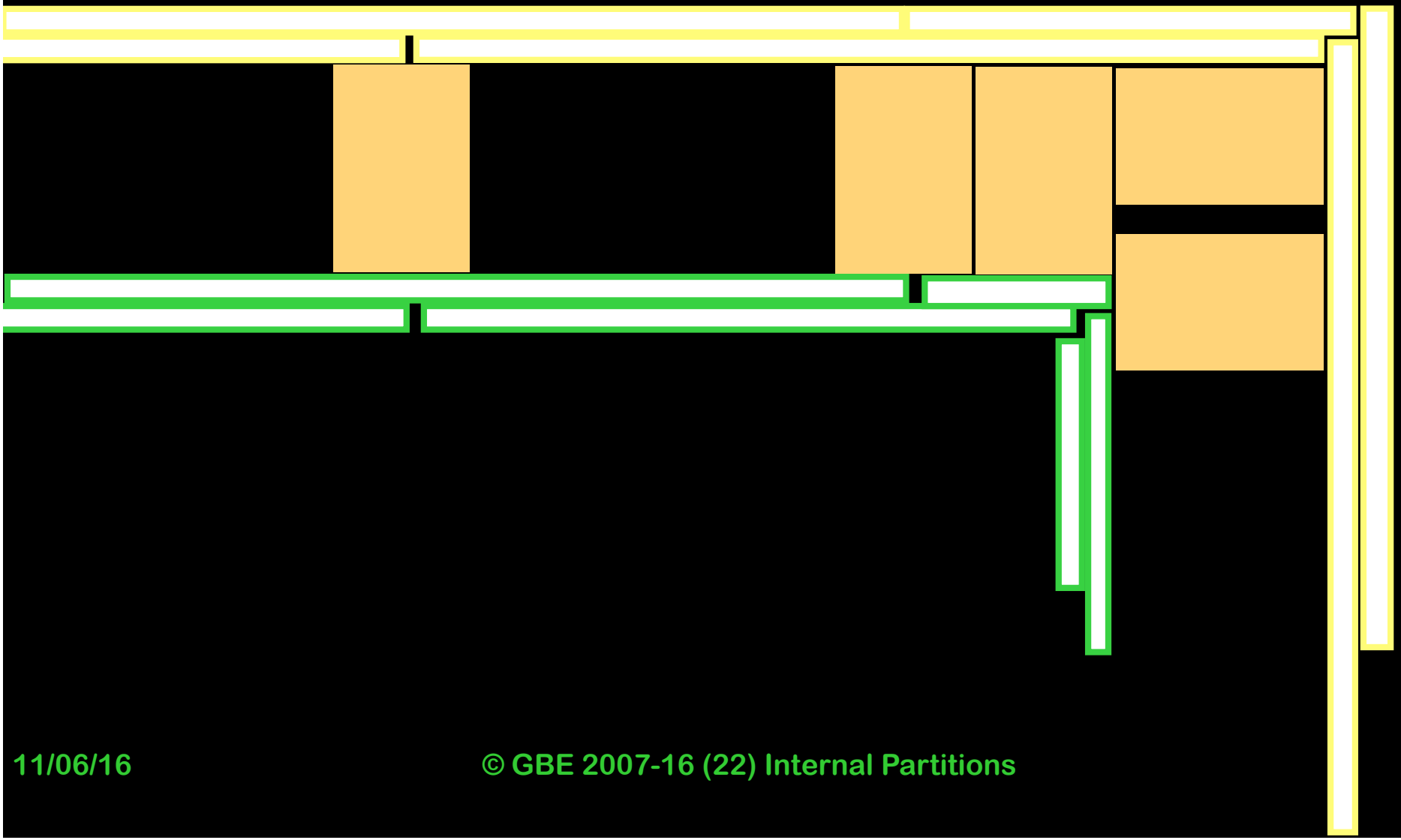
Moisture resistance, Fire resistance
Acoustic insulation, Robustness, Thermal insulation.

© GBE 2007-16 (22) Internal Partitions

Partition head/Floor junction



Partition change of direction



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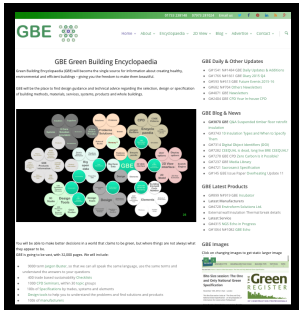

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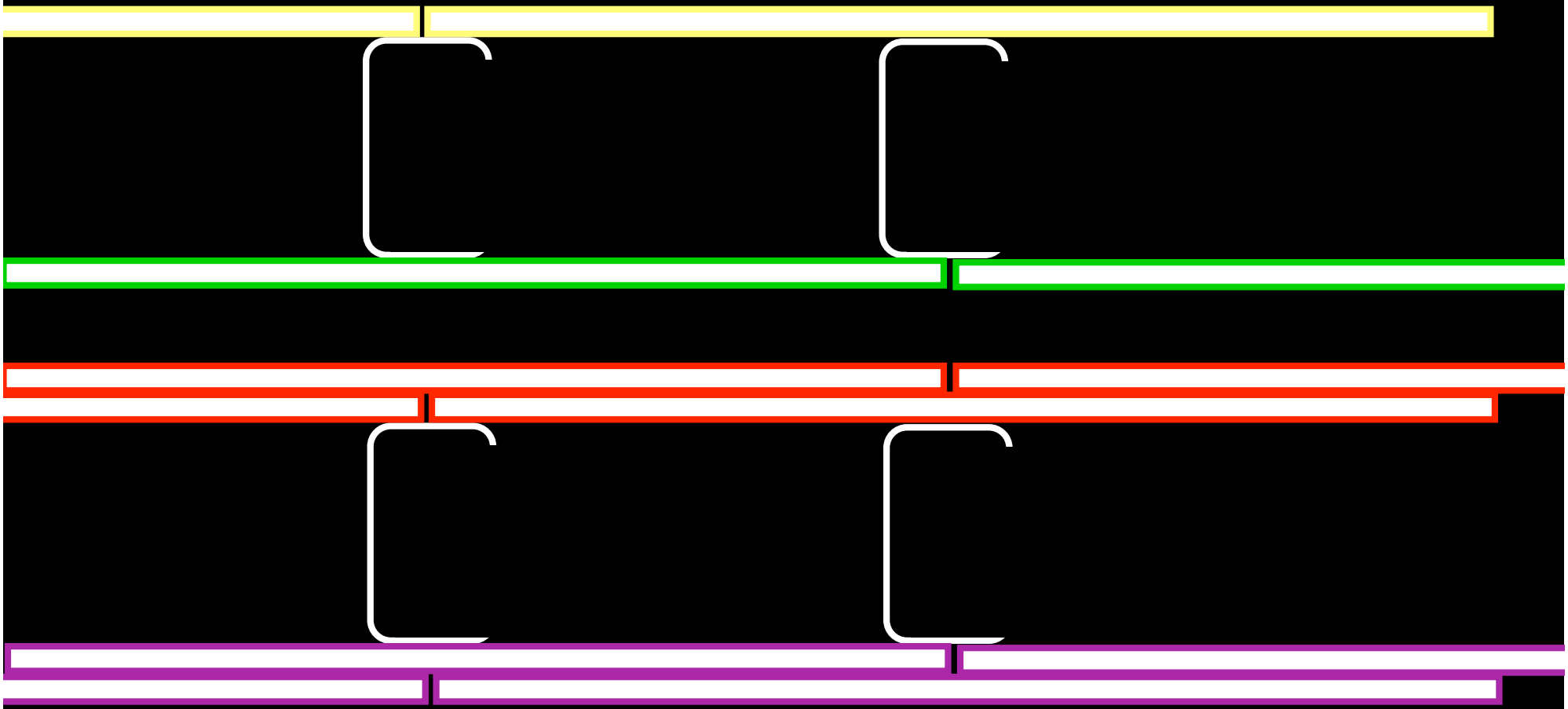
Metal stud partitions

Plasterboard lined

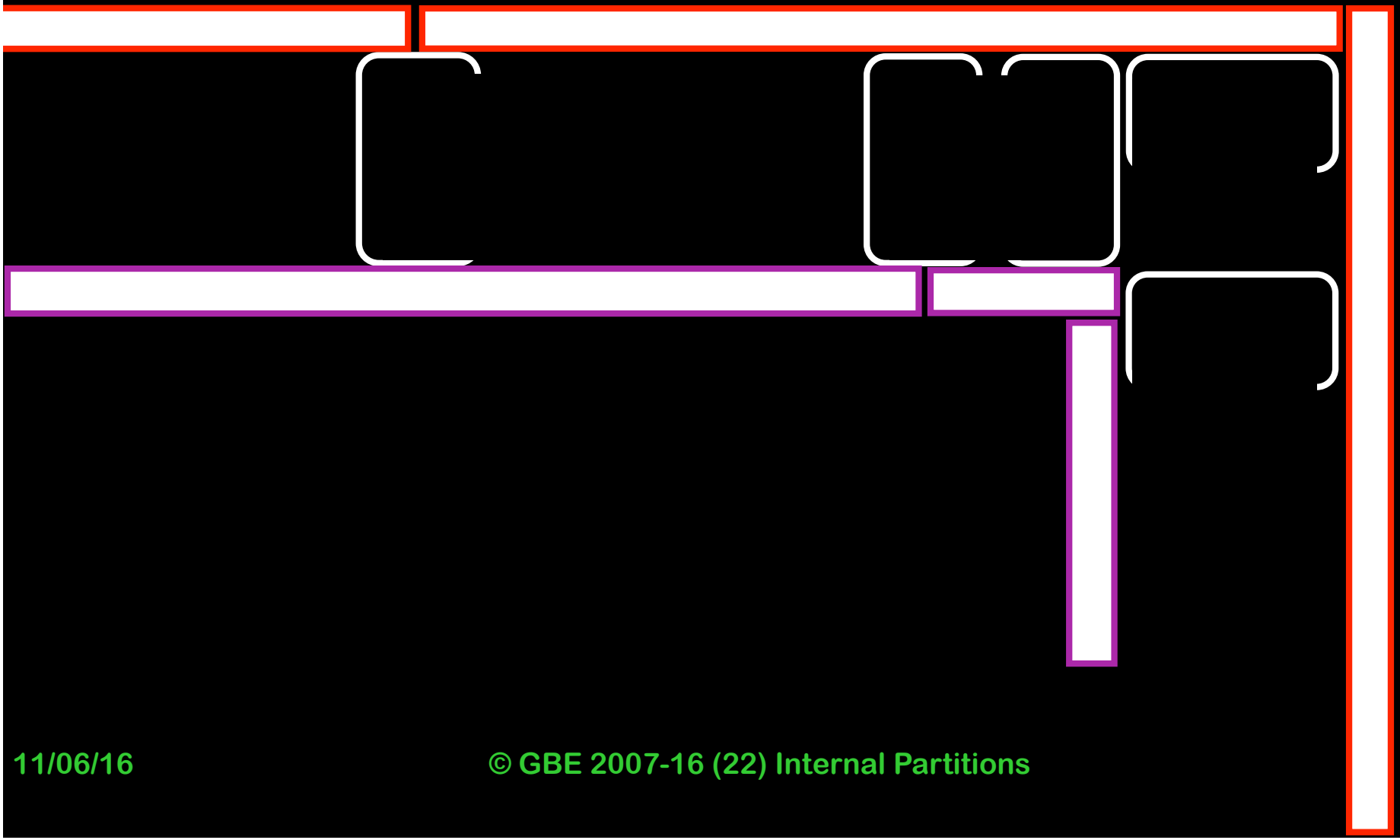
Timber stud partition



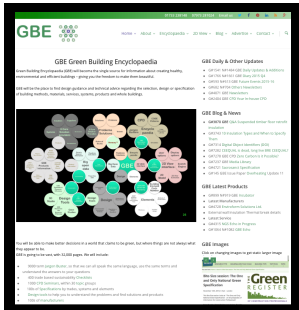
Moisture resistance, Fire resistance
Acoustic insulation, Robustness, Thermal insulation.

© GBE 2007-16 (22) Internal Partitions

Partition change of direction



© GBE 2007-16 (22) Internal Partitions



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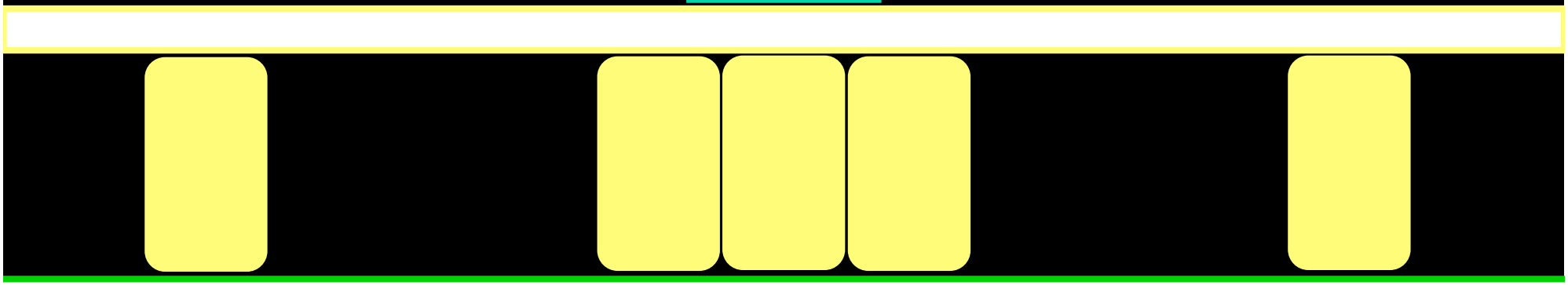
Partition Supports

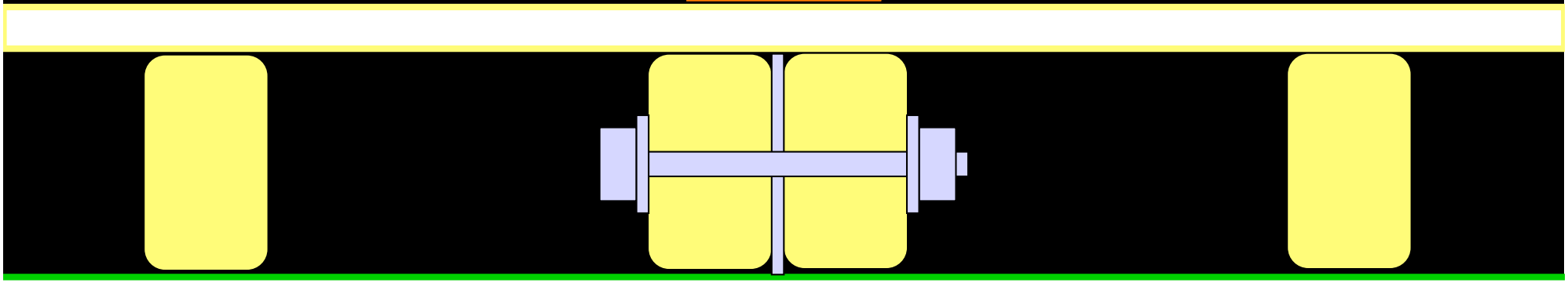
Upper floors

Joists & Partitions

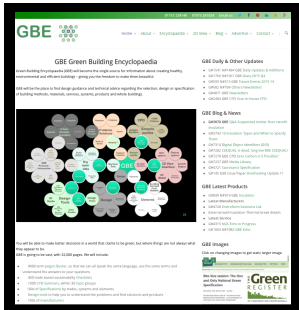


Multiple section simplifies design

Floor Joists/Beams & Partitions



Multiple section with flitch plate of steel bolted together



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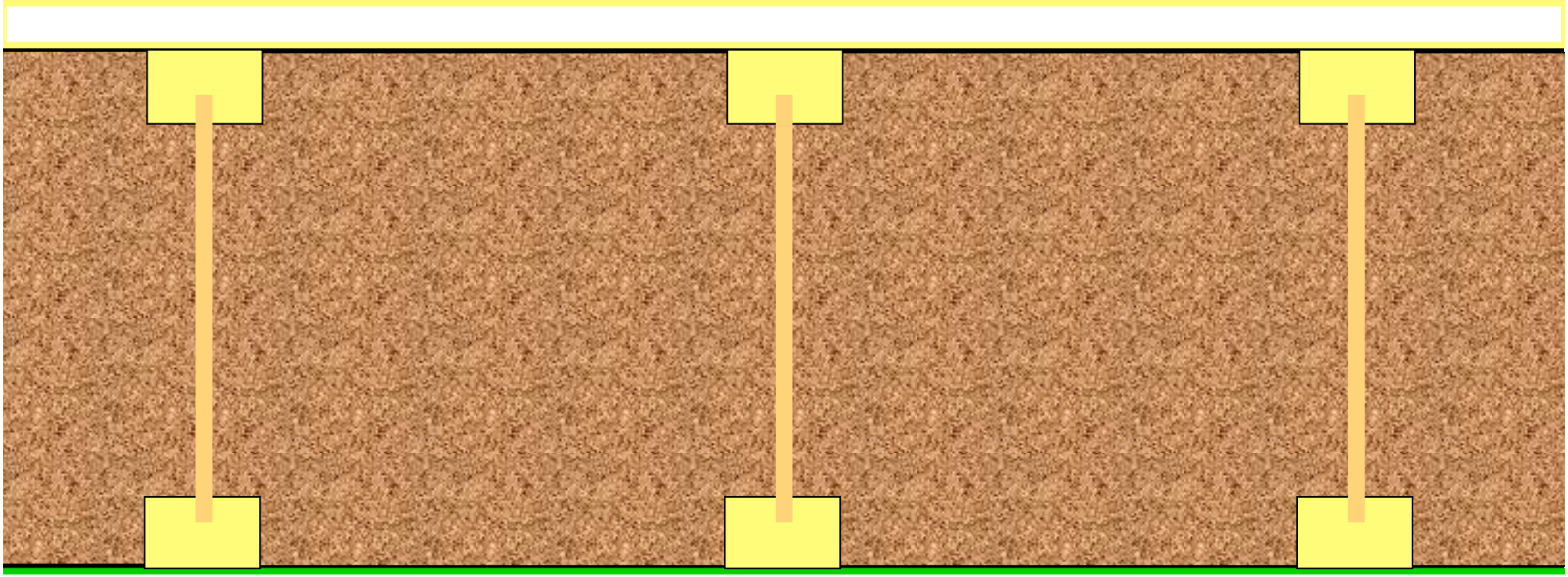
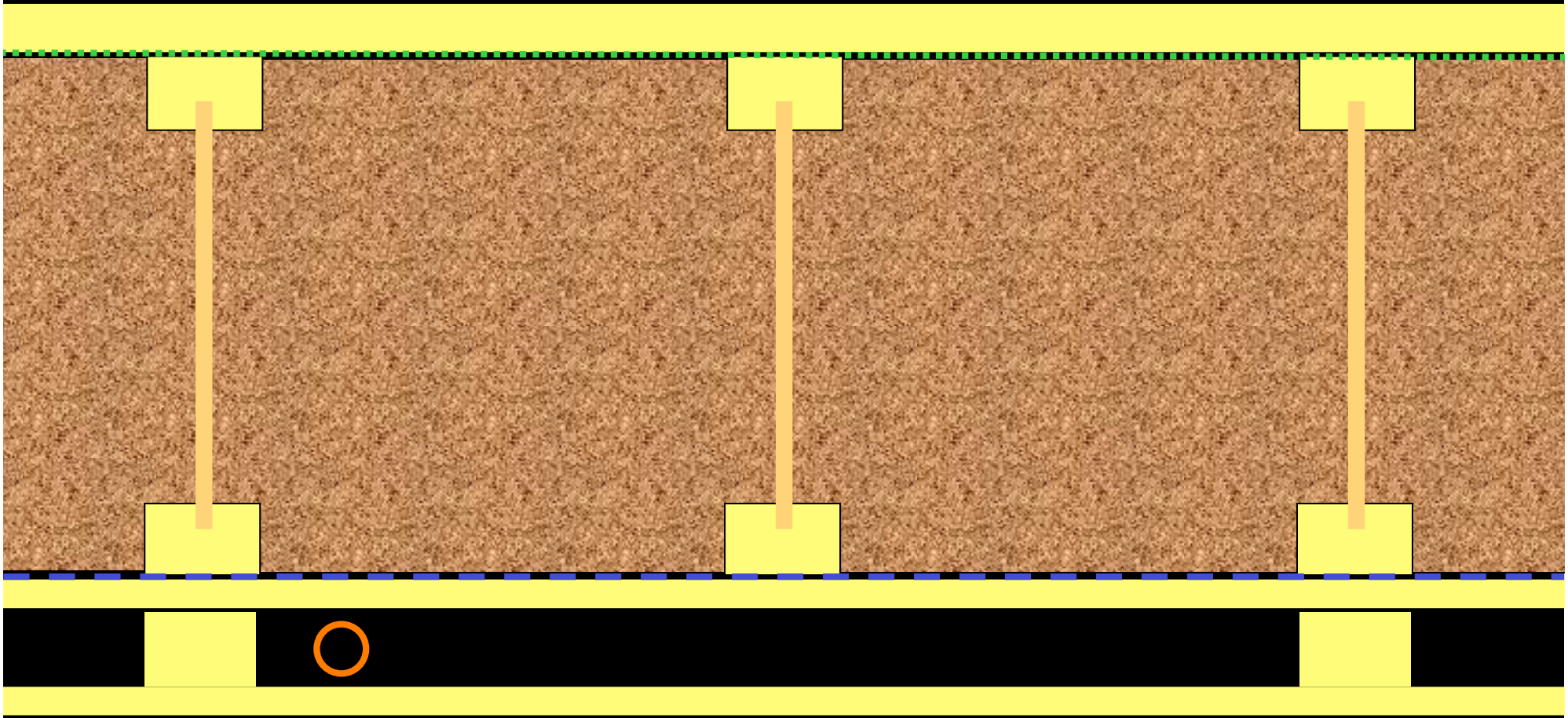
Timber partitions

Compound stud ‘I beams’ to accommodate more acoustic insulation



Compound section reduces amount of materials used and weight

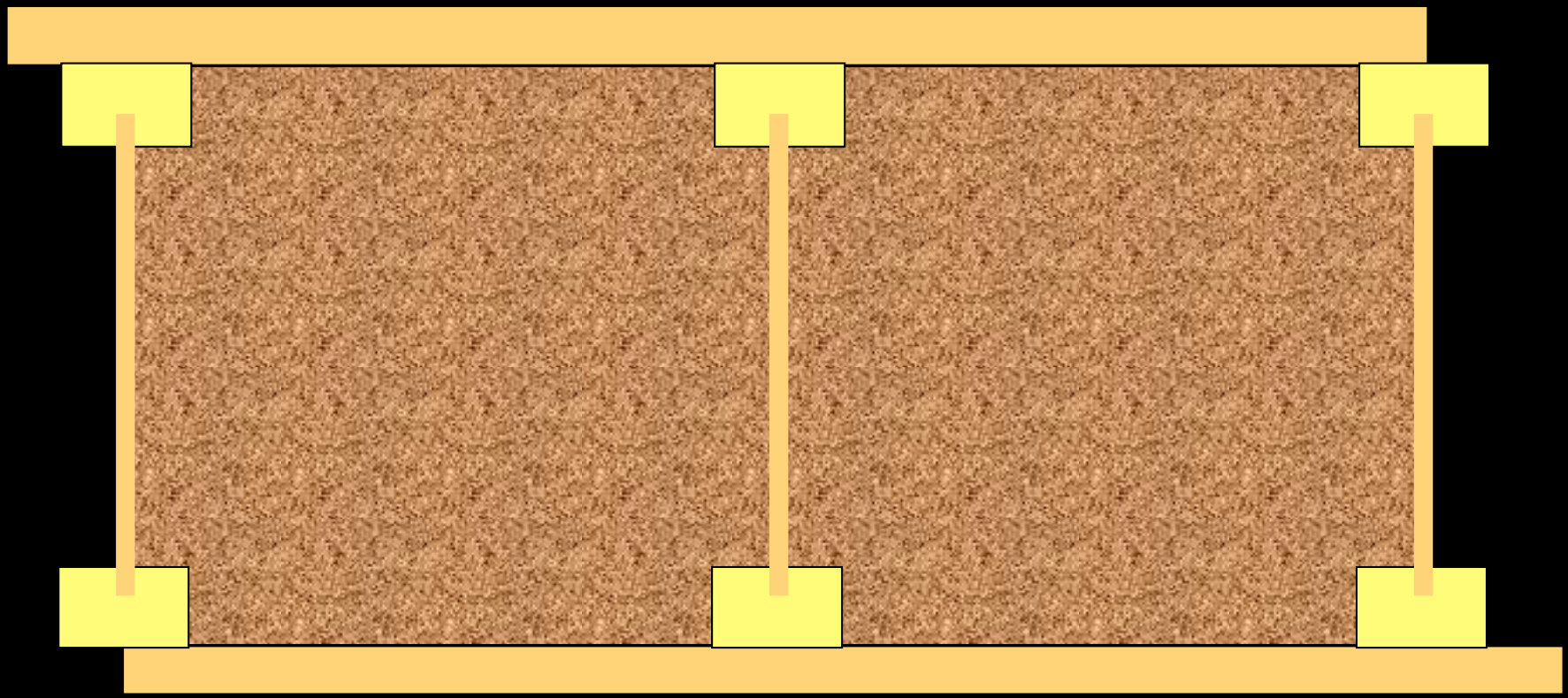
Compound Studs ‘I Studs’ to accommodate more thermal insulation



Compound section reduces amount of materials used, weight, cold-bridging

Layering: Services Zone simplify installation & avoid penetrations

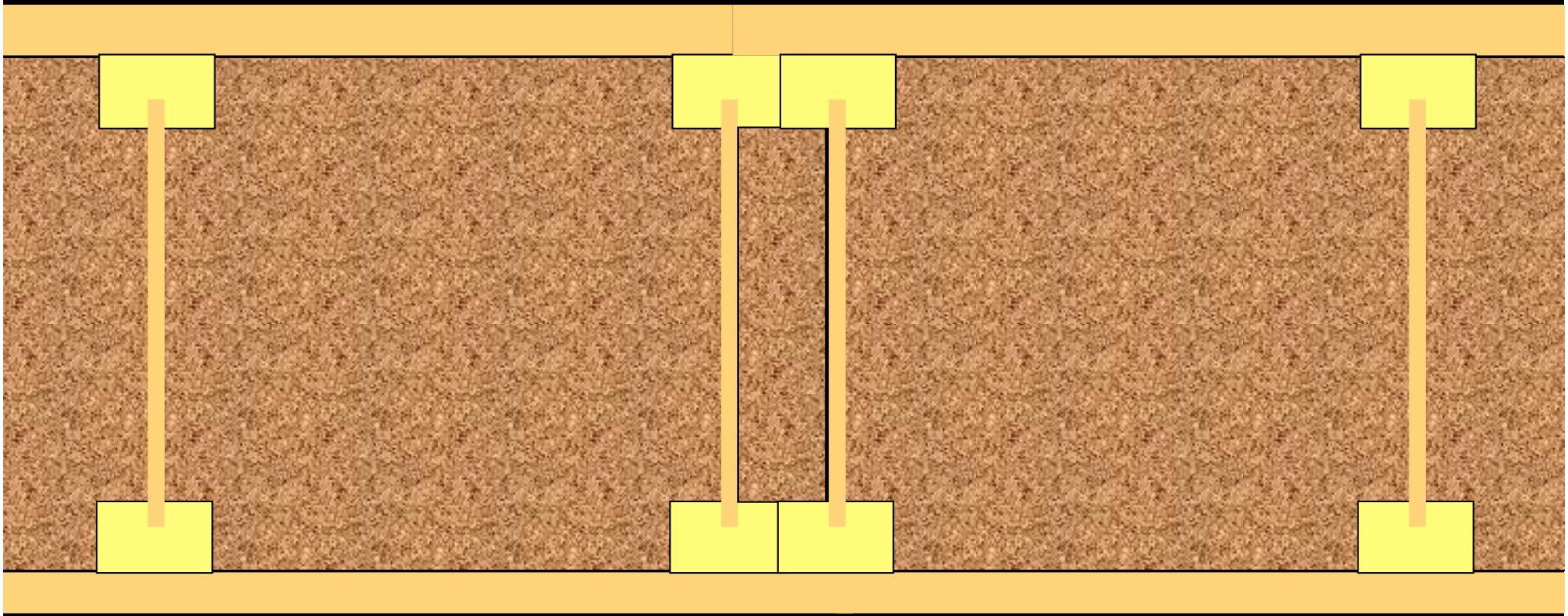
Compound stud ‘I beams’, inner and outer boards and acoustic insulation



Prefabricated internal wall panel

© GBE 2007-16 (22) Internal Partitions

Compound stud ‘I beams’, inner and outer boards and acoustic insulation



Prefabricated internal wall panel

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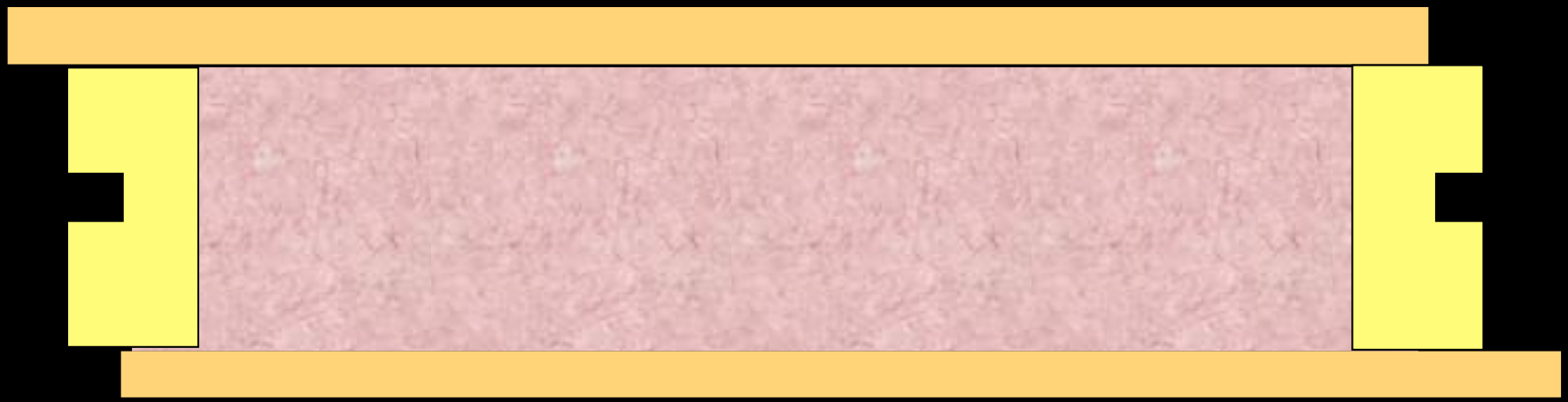
SIP Structural Insulated Panel



Prefabricated internal wall panel

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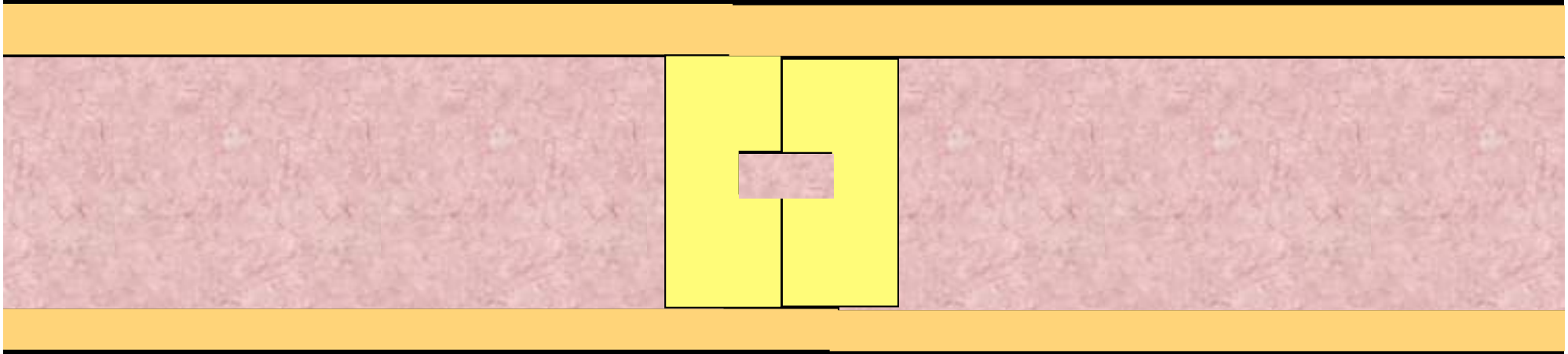
SIP Structural Insulated Panel



Prefabricated internal wall panel

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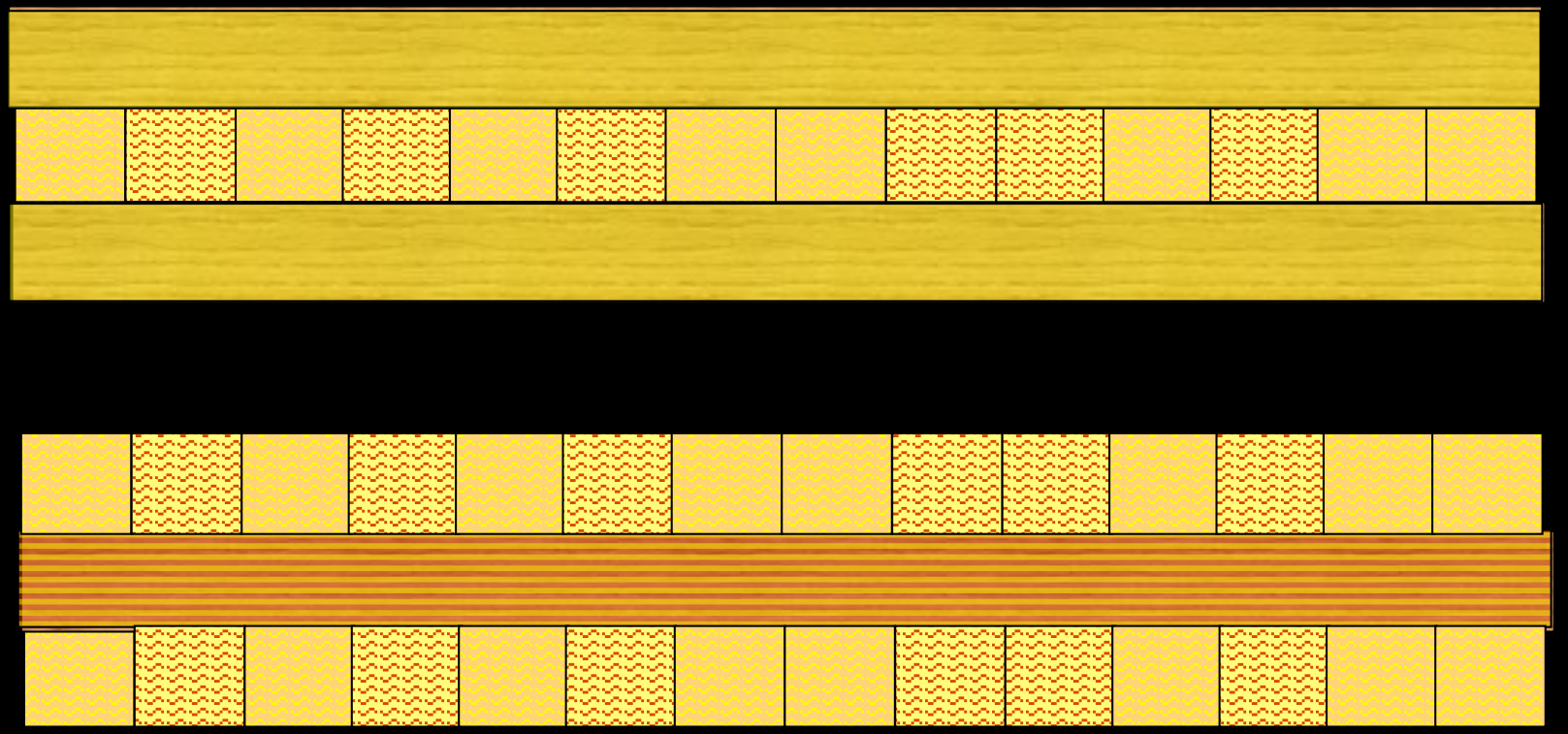
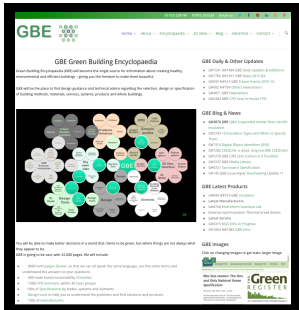
Load-bearing Structural Timber Panel



Prefabricated wall or partition panel



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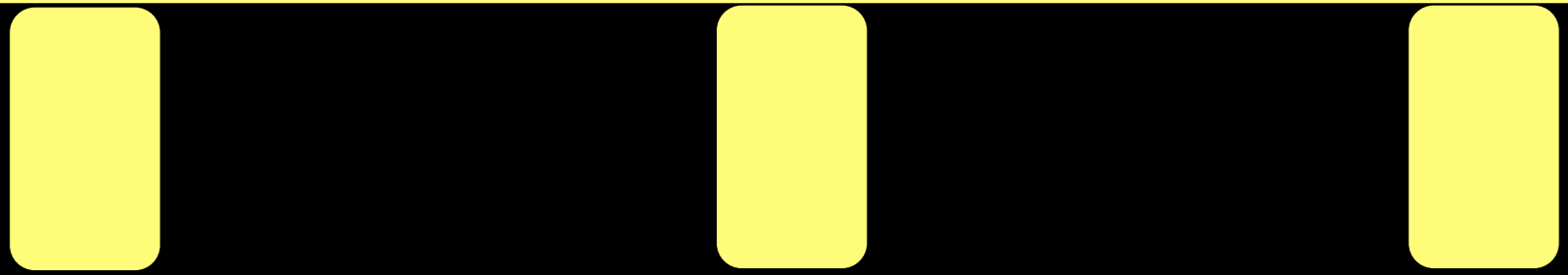
Thermal Insulation

Arup/B Dunster Report

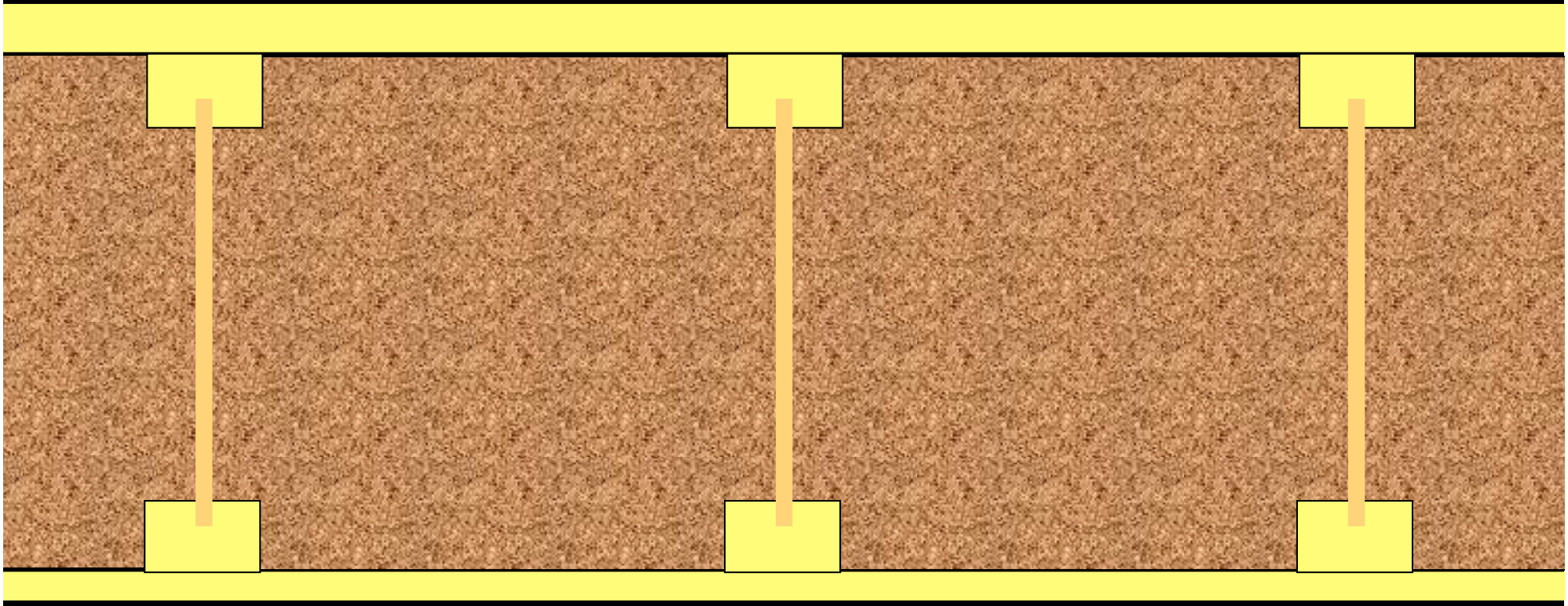
- As UK climate approaches Mediterranean temperatures we need to adopt mediation techniques
- Solar shading at window
- Internal doors on closers to control heat flow from warm to cool side
- Internal partitions need to be insulated

Insulating of stud partitions



Softwood studs simple design
Insulation applied from one side
blown, sprayed or installed then lined

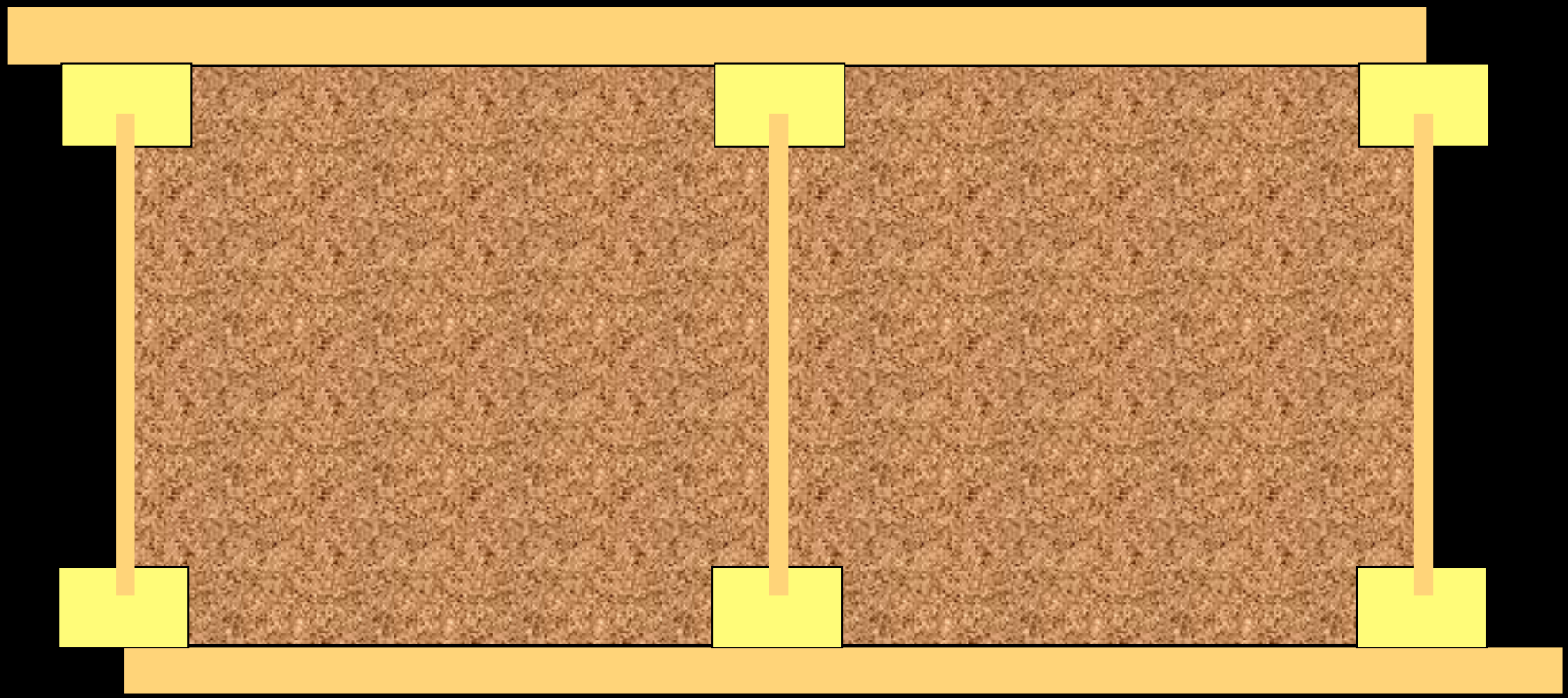
Insulation installation



Injected after assembly

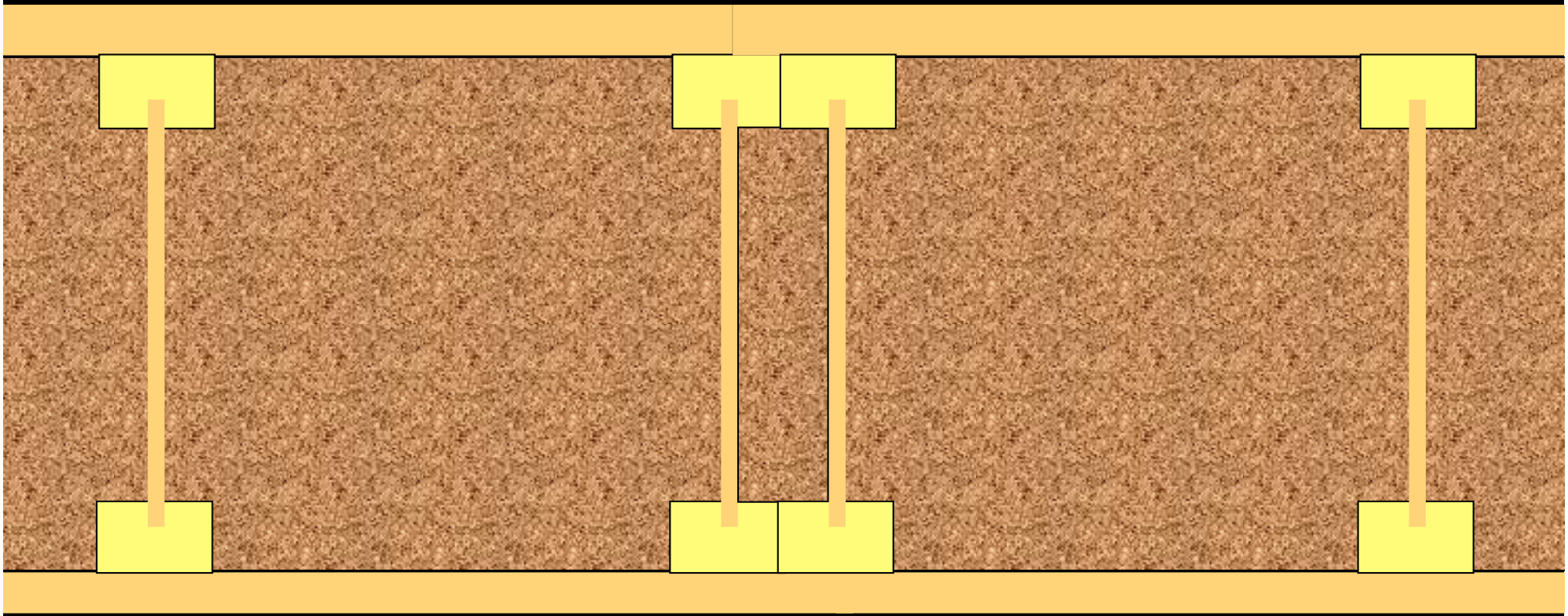
© GBE 2007-16 (22) Internal Partitions

‘Tradis’ insulated panels



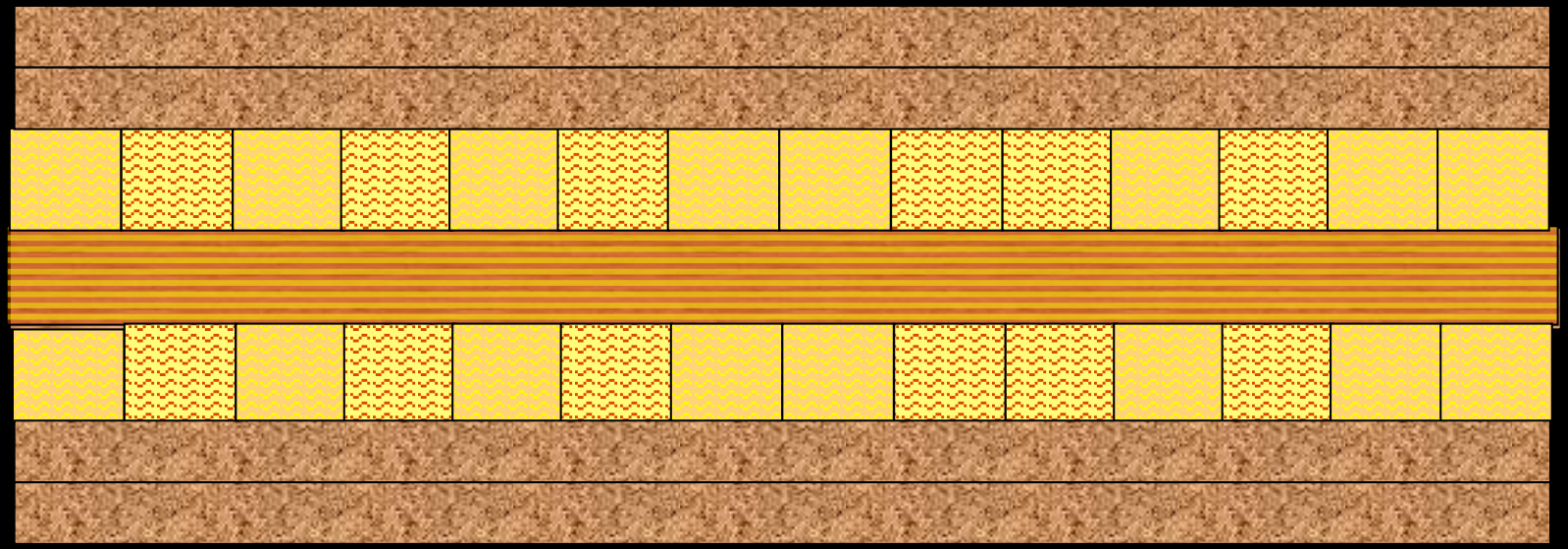
Prefabricated wall panel pre-insulated in factory

Tradis Panels

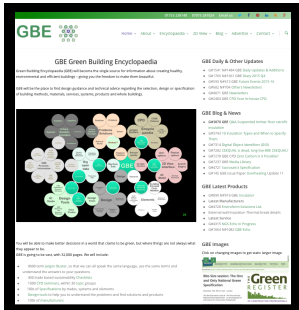


Pre-insulated injected panels joint insulated with batt during assembly

Load-bearing Structural Timber Panel



Prefabricated partition panel insulated on surfaces



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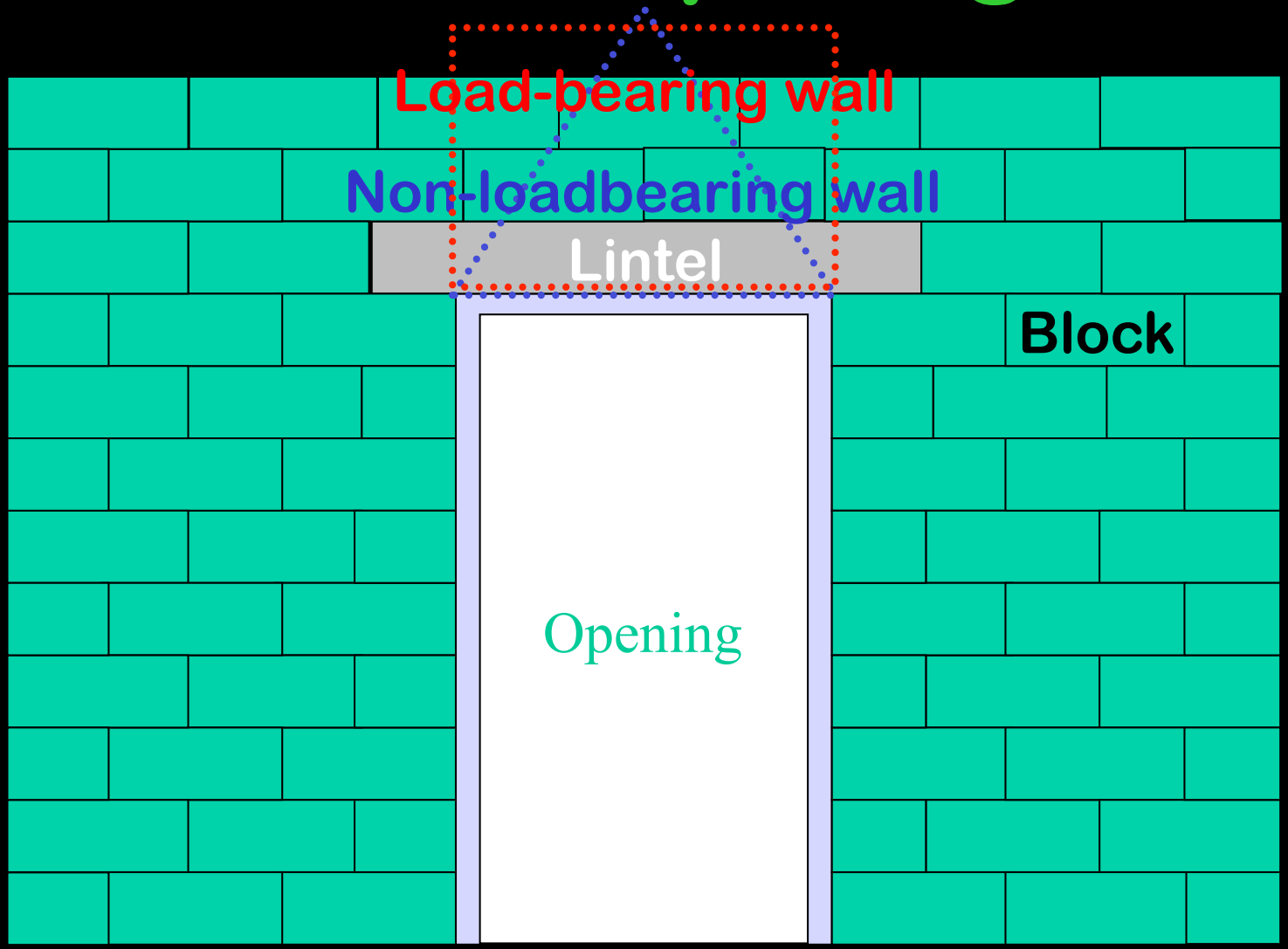
Unfired Clay Block Partitions

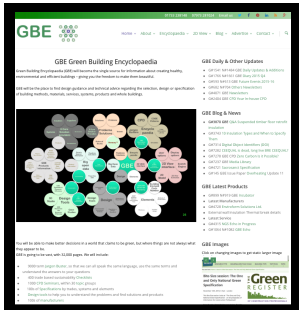
CI/SfB (22) internal Partitions

Unfired clay and straw

Wall & opening



© GBE 2007-16 (22) Internal Partitions



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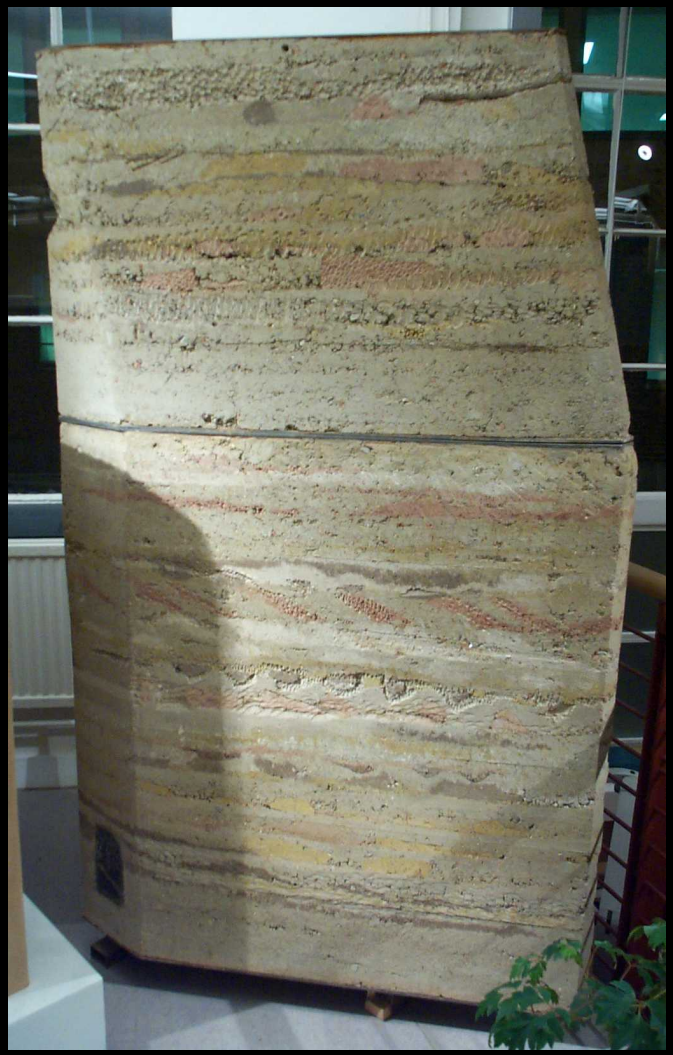
Clay Rammed Earth Partitions

CI/SfB (22) internal Partitions

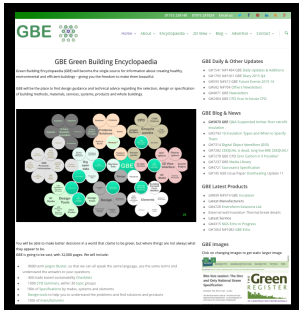
Rammed Earth Walls



any shape
many ingredients
colours & textures

thermal mass

Load-bearing
but dynamic



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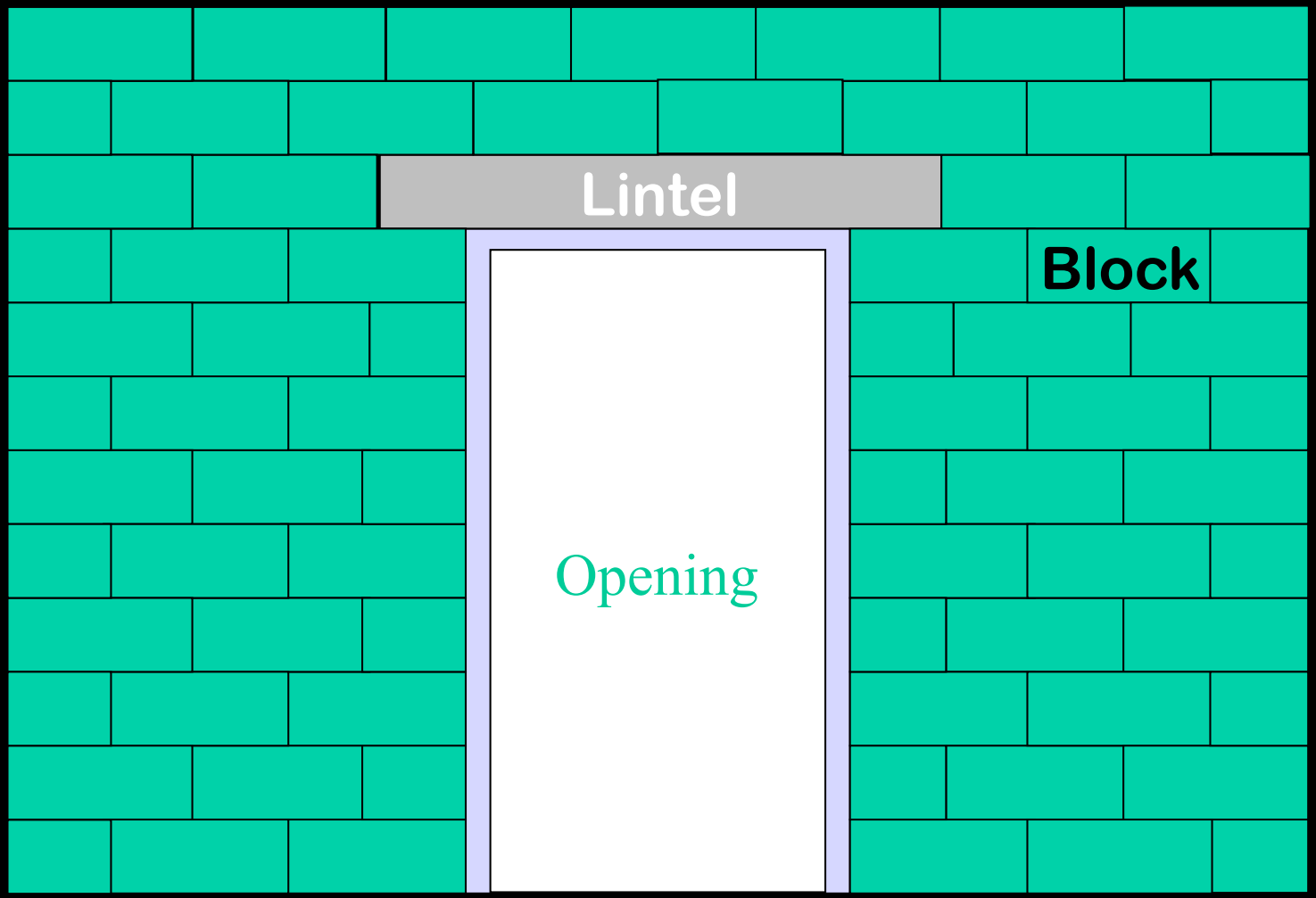
Masonry Partitions

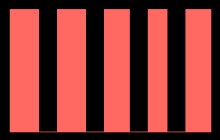
CI/SfB (22) internal Partitions

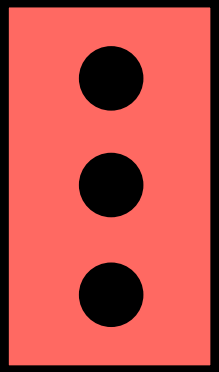
Wall & opening



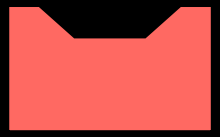
Lintels for masonry walls

Perforated Brick

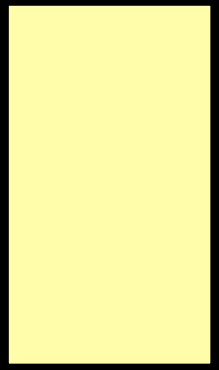




Brick

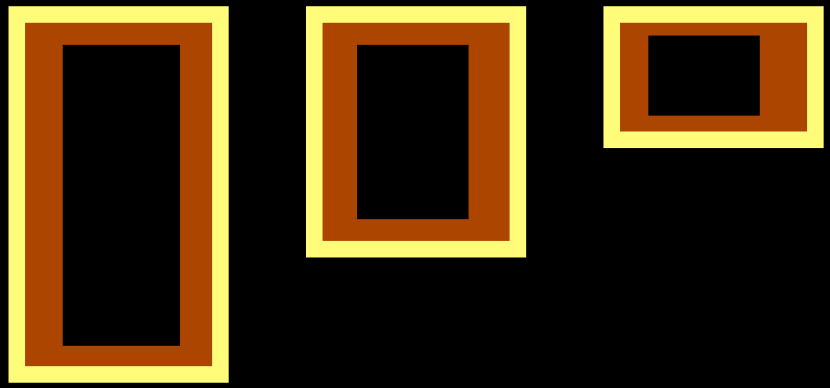


Frogged Brick



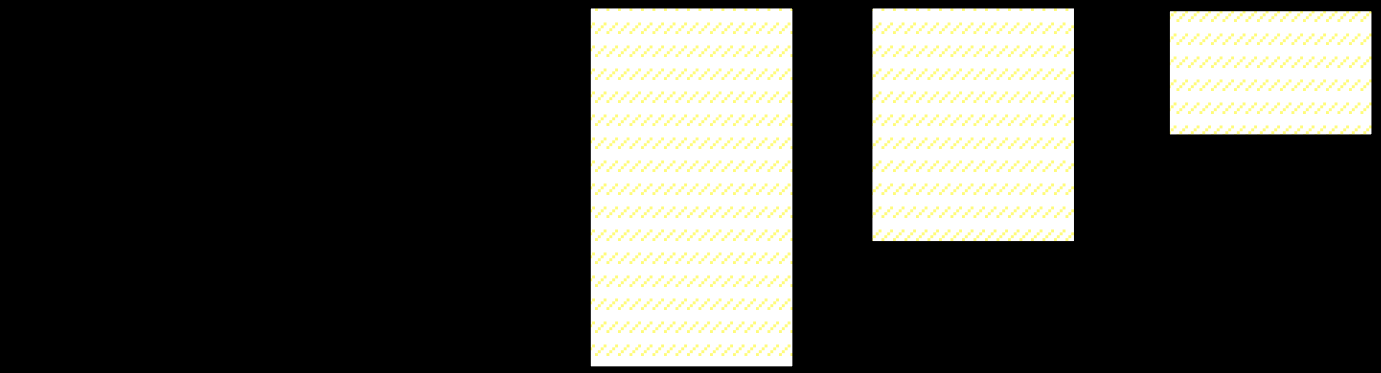
Stone

Hollow block
Saves clay
Weight
Firing time
Transport

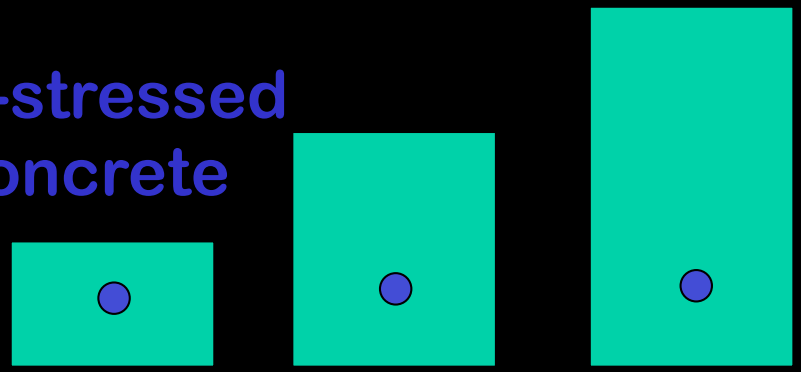


Terracotta
Faïence

Lintels for masonry partitions

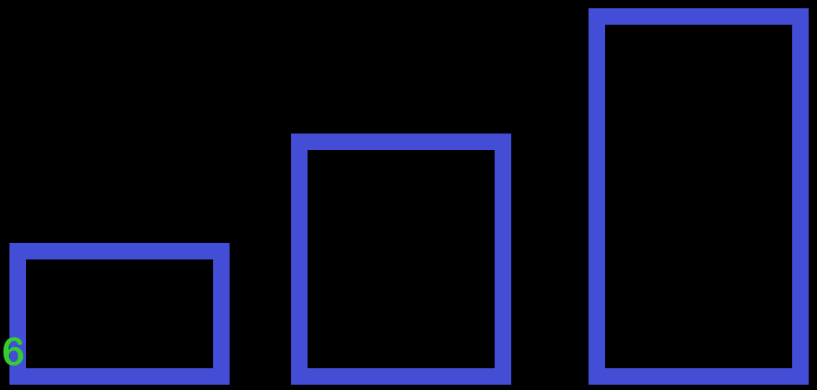


Timber

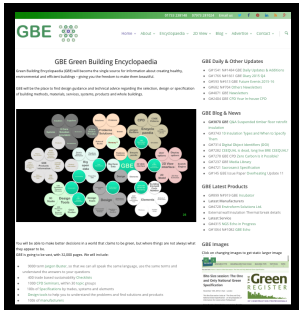


Pre-stressed Concrete

Reinforced Concrete



Steel



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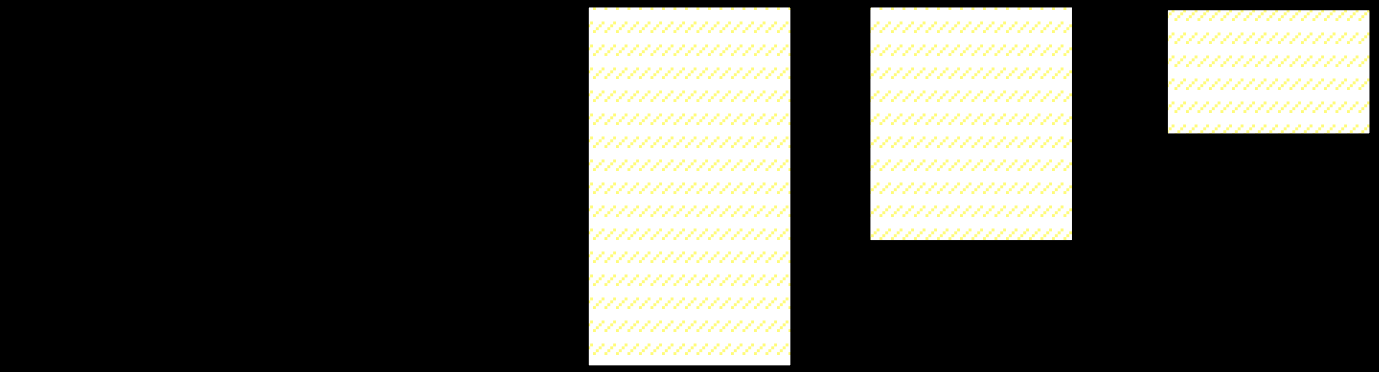
Concrete Block Partitions

CI/SfB (22) internal Partitions

Violet Materials: Concrete & Blocks

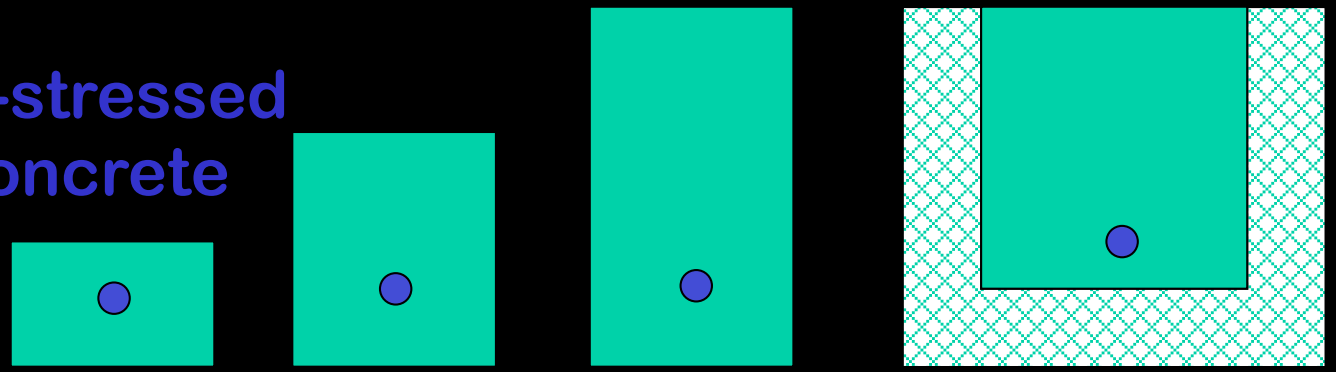
Another GBE CPD/Lecture file to download and www.greenbuildingencyclopaedia.uk

Lintels for conc. block partitions



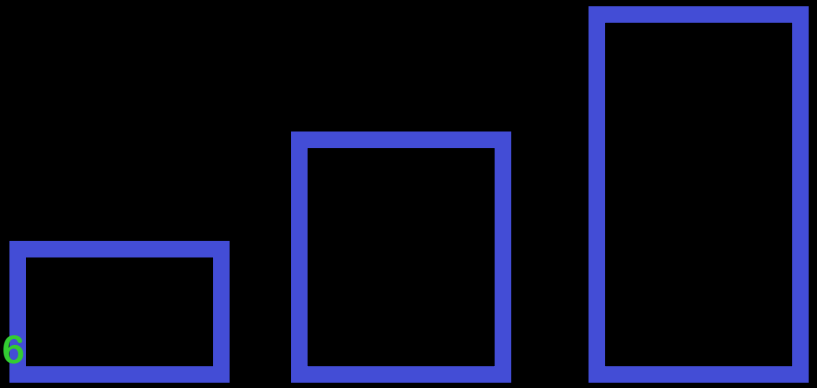
Timber

Pre-stressed Concrete



Reinforced Concrete

Trough block

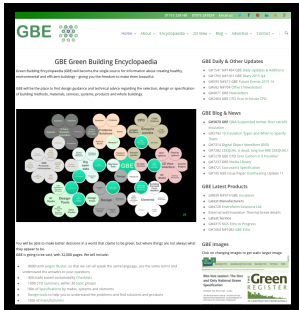


Steel

Floor & Wall Junctions

CI/SfB (21) External Walls

Acoustic construction



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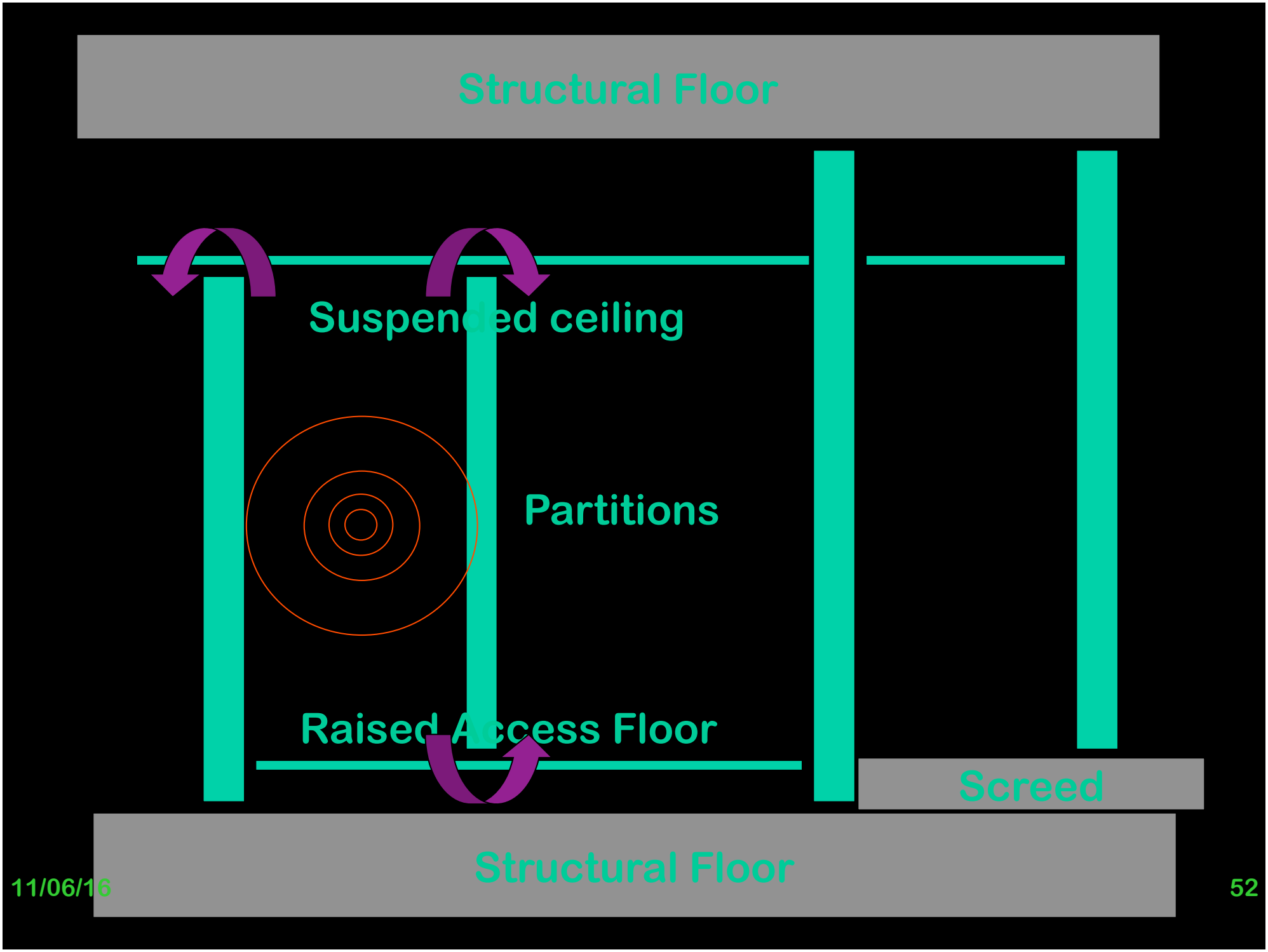
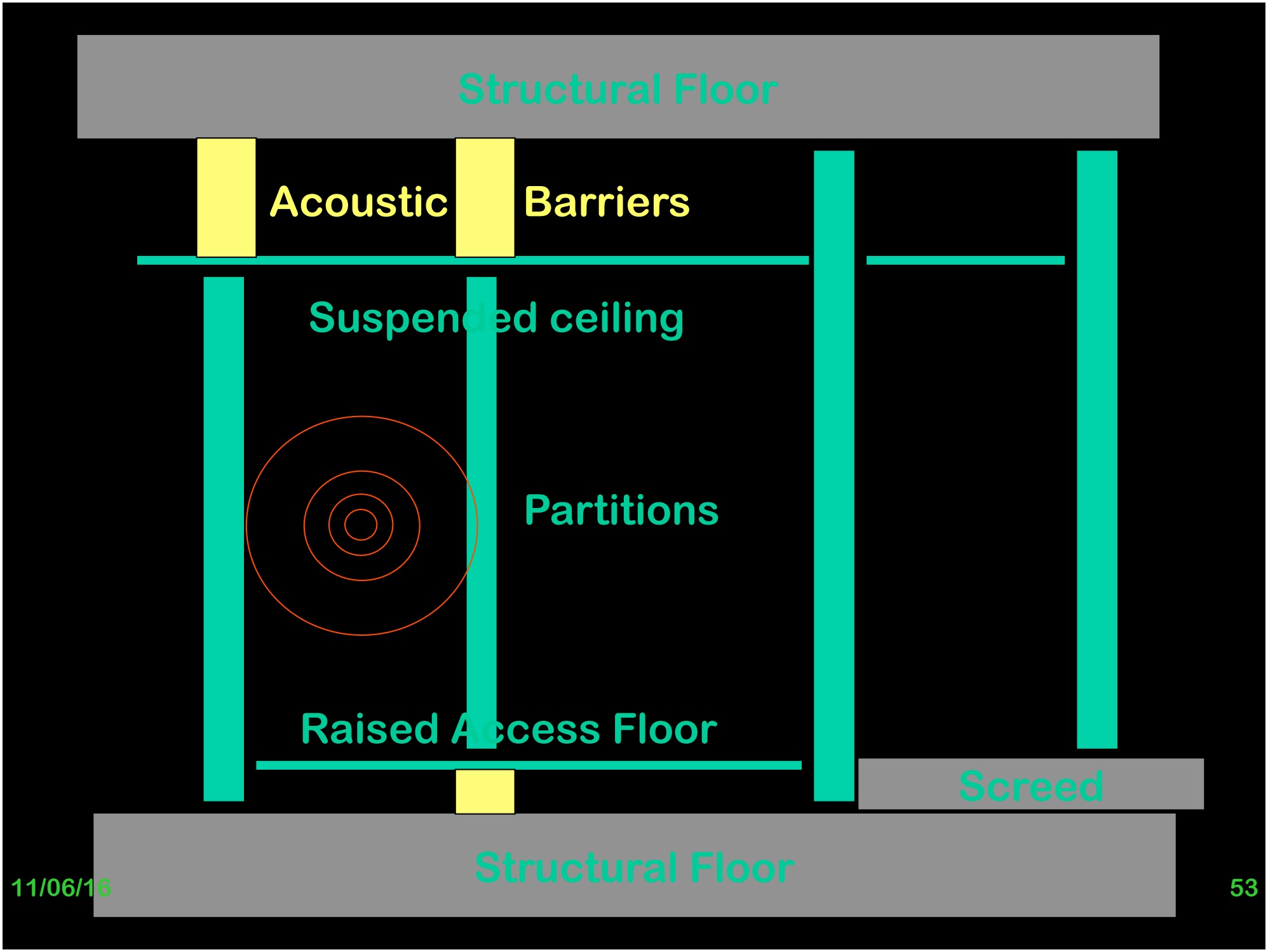
Acoustics

Flanking Sound

- Air paths around barriers
- Partitions are barriers, but sound can flank around them behind wall linings, over ceilings and below floors
- Barriers are needed in those cavities, aligned with the partitions
- They usually need density or air tightness to be effective

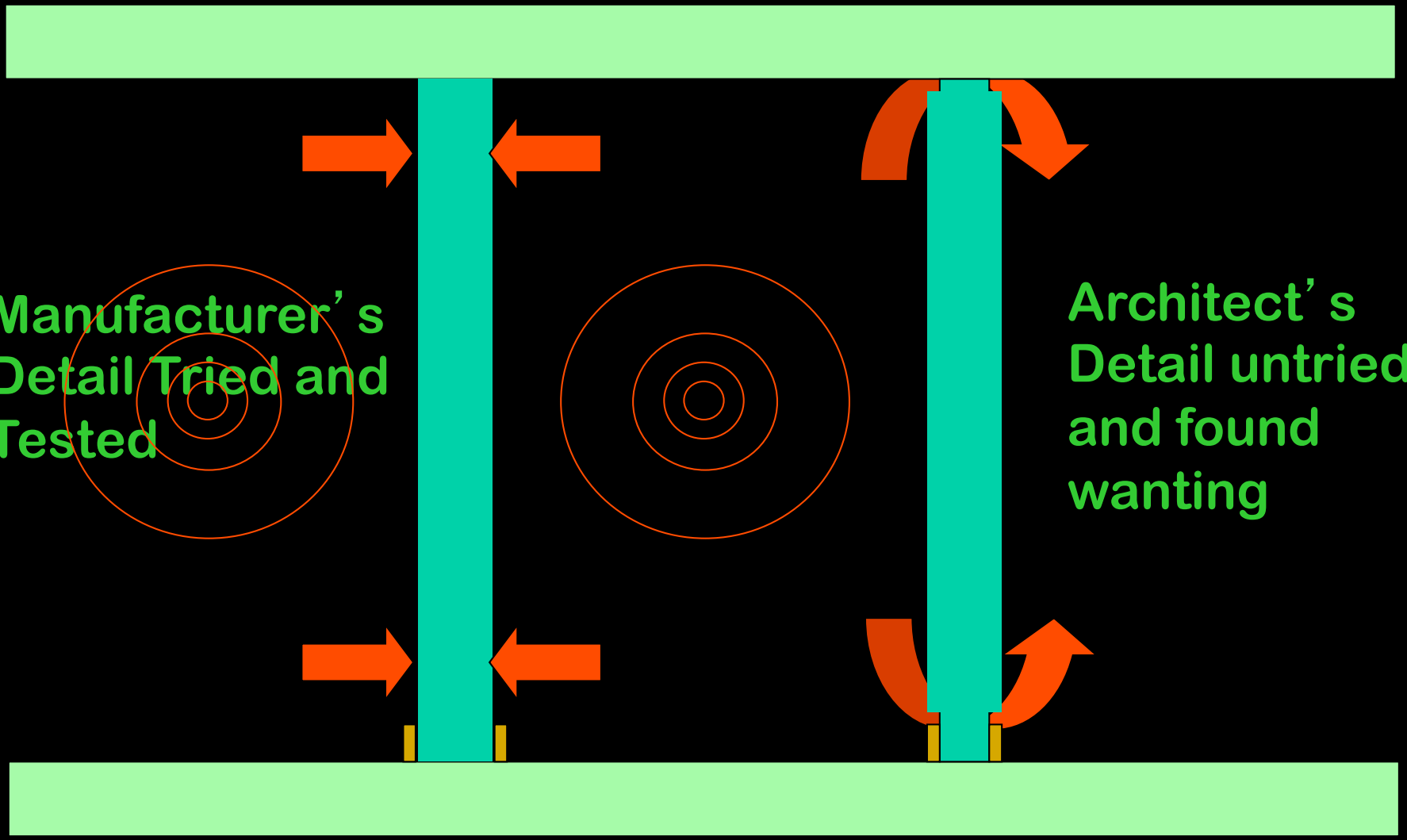

Structural Floor
Suspended ceiling
Partitions
Raised Access Floor
Screed
Structural Floor

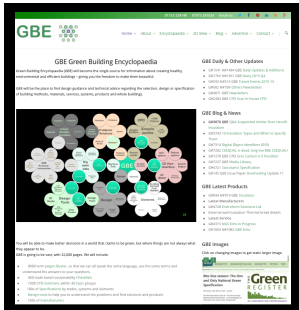

Structural Floor
Acoustic
Barriers
Suspended ceiling
Partitions
Raised Access Floor
Screed
Structural Floor

Hiccup Details

- Flash-gaps
- Usually happens when we modify the manufacturer's standard details
- Diminish the performance of elements
- Hiccups meeting hiccups can lead to problems and have been know to make holes through elements
- Fire, Acoustics, Airtightness

Hiccup Details (flash gaps)





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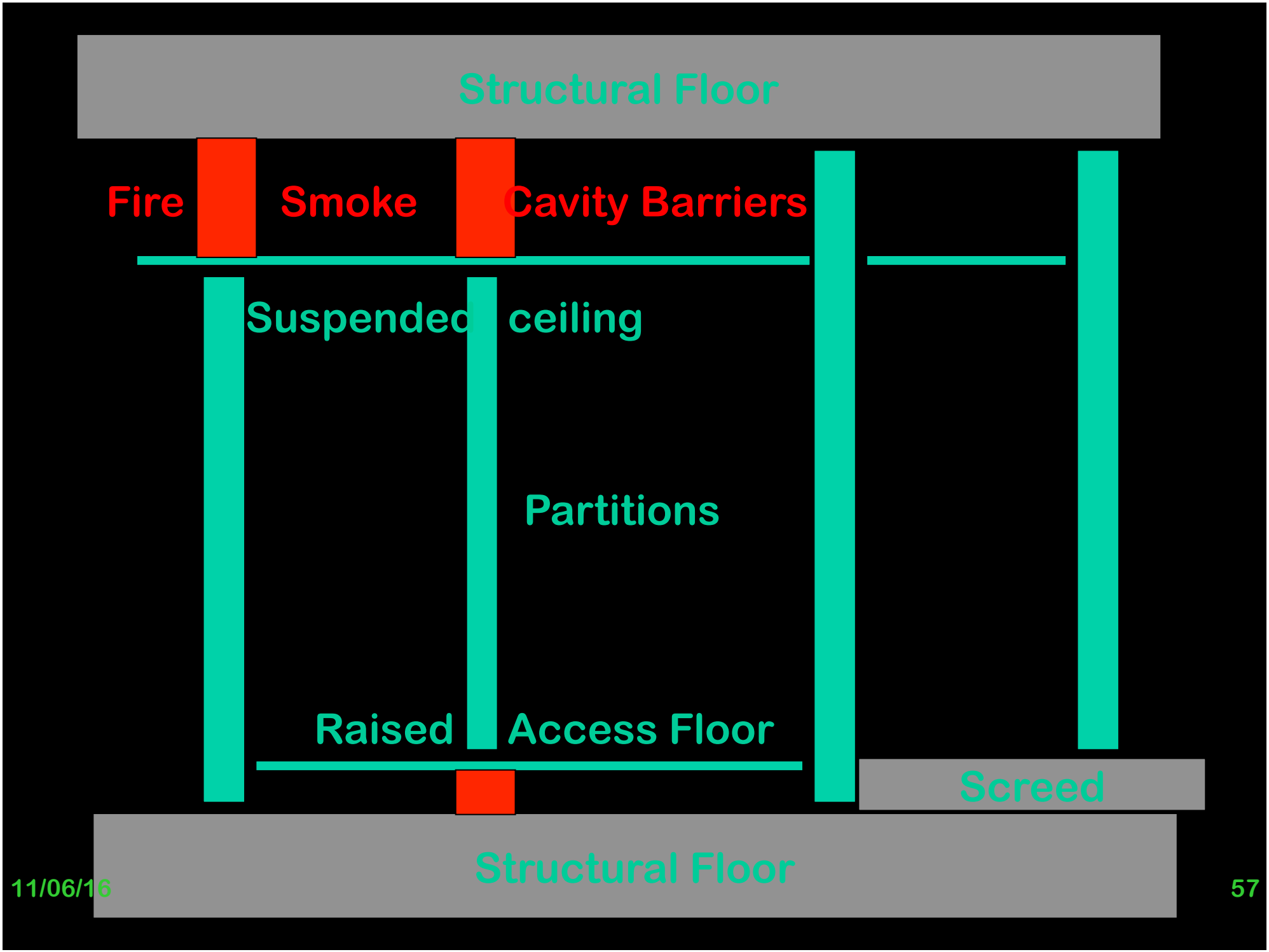
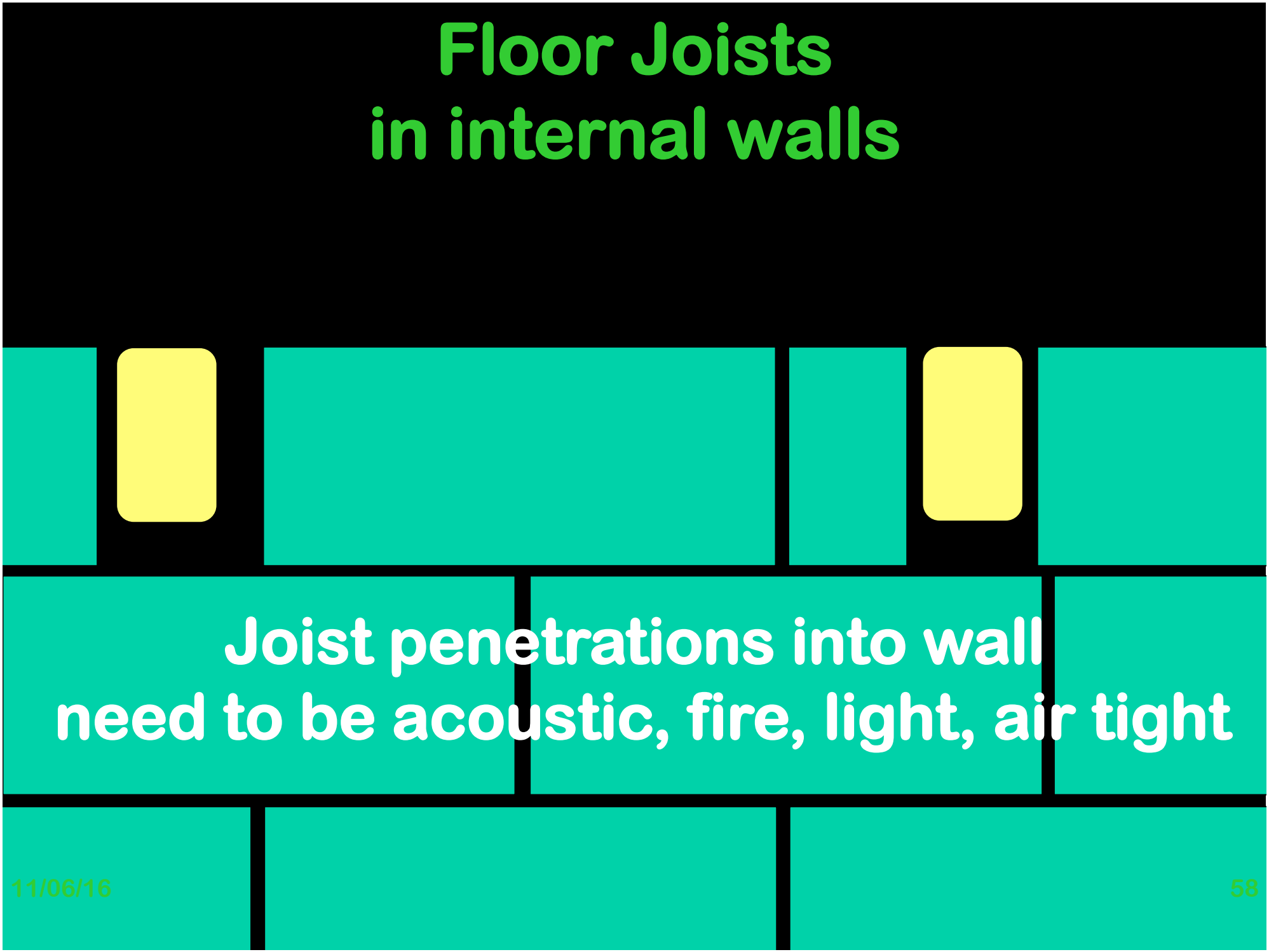
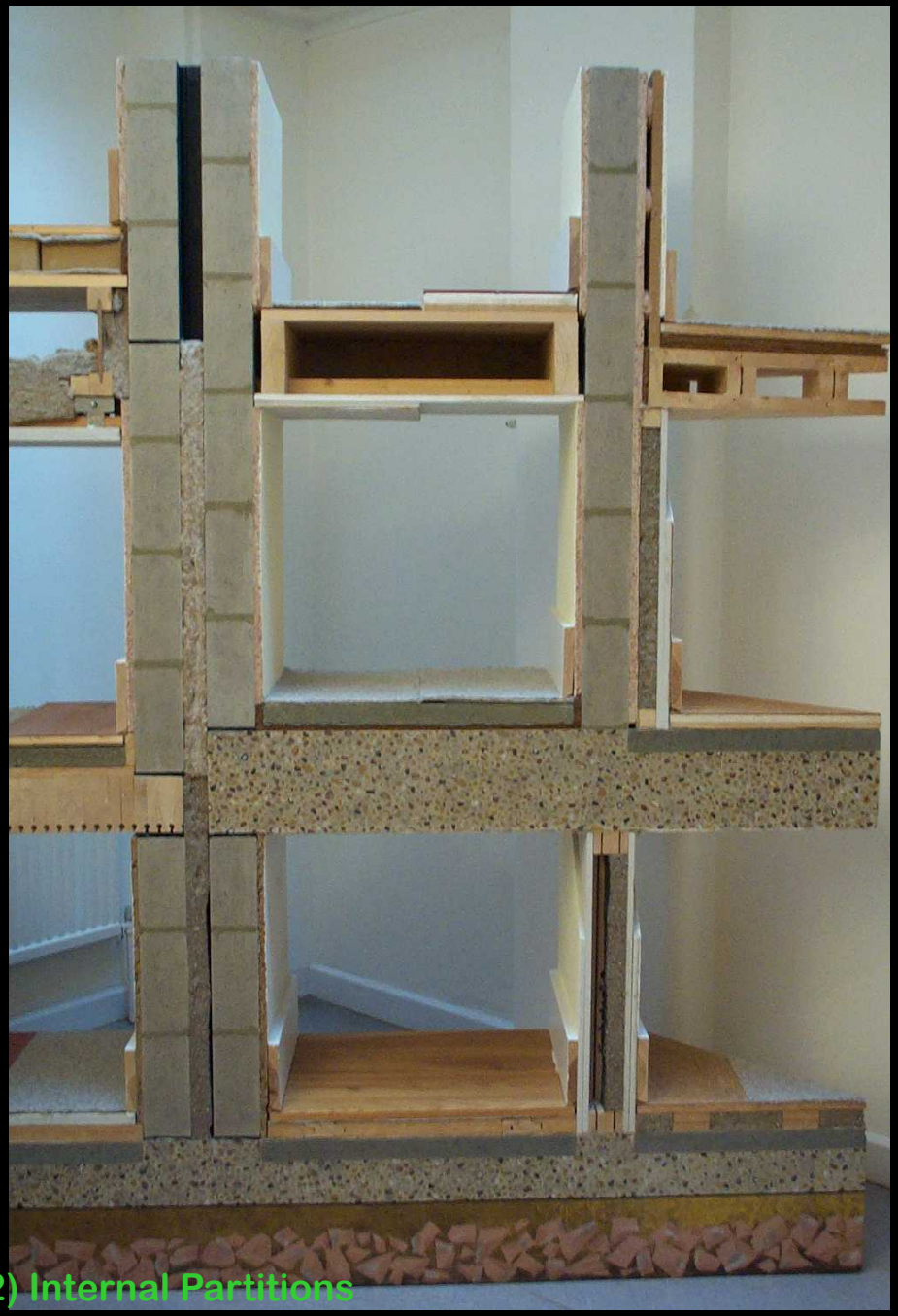
Fire


Structural Floor
Fire
Smoke
Cavity Barriers
Suspended ceiling
Partitions
Raised Access Floor
Screed
Structural Floor

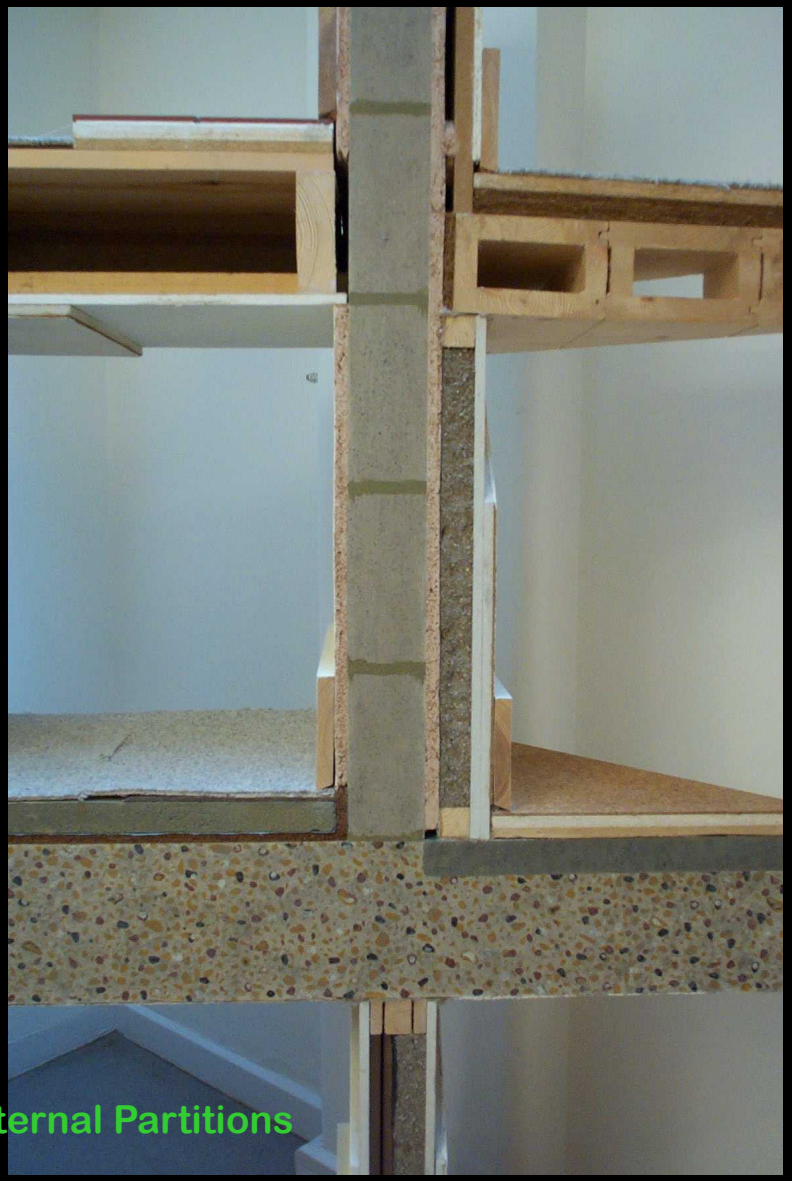
Floor Joists in internal walls

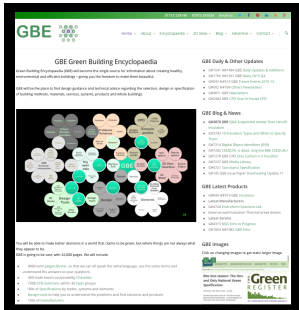


Cavity party walls
Solid walls and lightweight partitions



Acoustic Constructions





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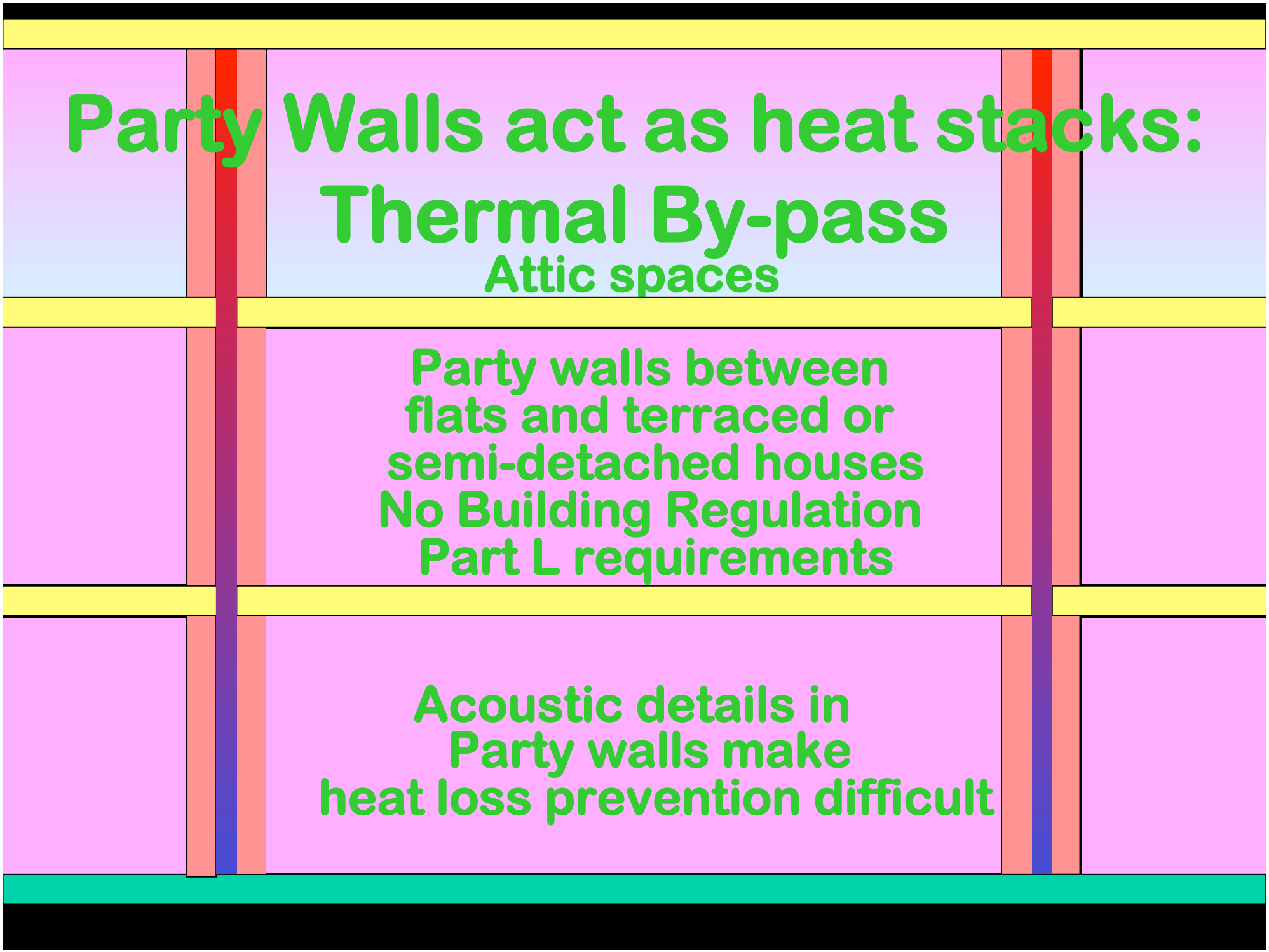
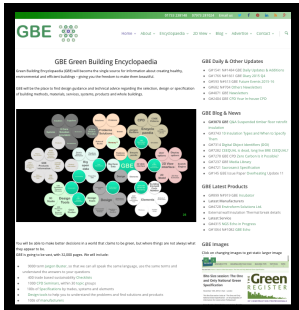
Heat loss & Heat transfer


Party Walls act as heat stacks:
Thermal By-pass
Attic spaces
Party walls between
flats and terraced or
semi-detached houses
No Building Regulation
Part L requirements
Acoustic details in
Party walls make
heat loss prevention difficult



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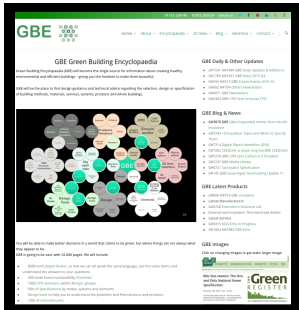
BedZED research

- When the sun shines and one side of the building warms up
- Then its better to keep the heat on that side to keep one side cooler for respite
- Add conductivity thermal insulation in all internal partitions and floors
- If the partition is warmed by the sun then decrement delay characteristic is essential too
- Self closing doors are essential to make this work



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Resource Efficiency

© GBE 2007-16 (22) Internal Partitions

Design to Reduce Waste

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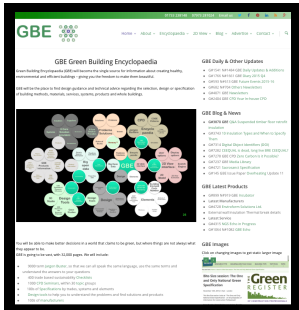

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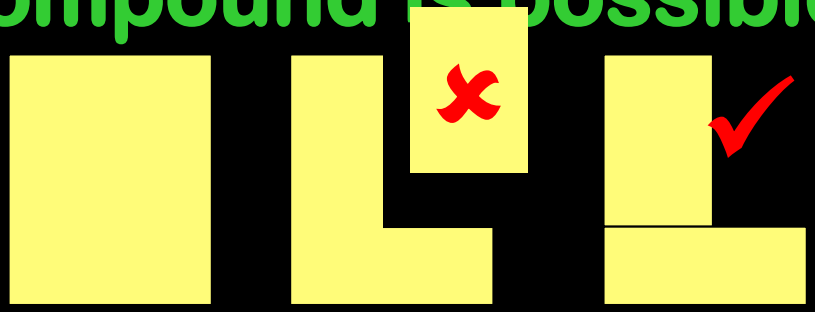
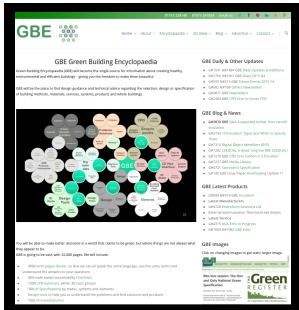
Reduce Demand

- Don't over design structure
- Except if long design life demands it
- Don't oversize
- Don't cut section from solid if compound is possible



© GBE 2007-16 (22) Internal Partitions



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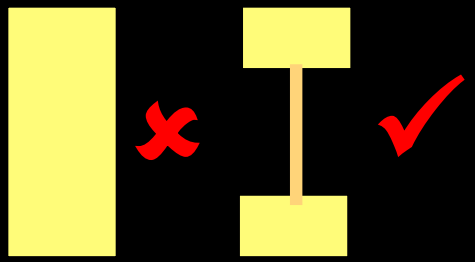
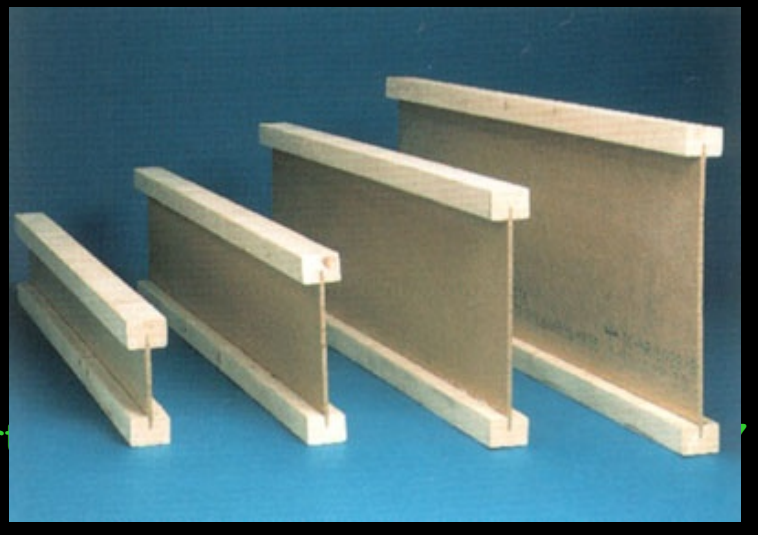
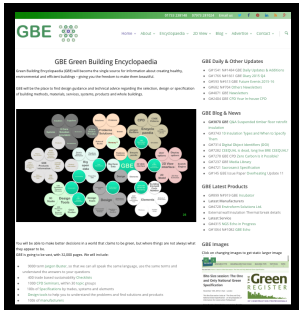
Reduce Demand

- Don't cut section from solid if compound is possible
- Reduce solid sections to compound to reduce weight and materials used





© GBE 2007-16 (22) Internal Part



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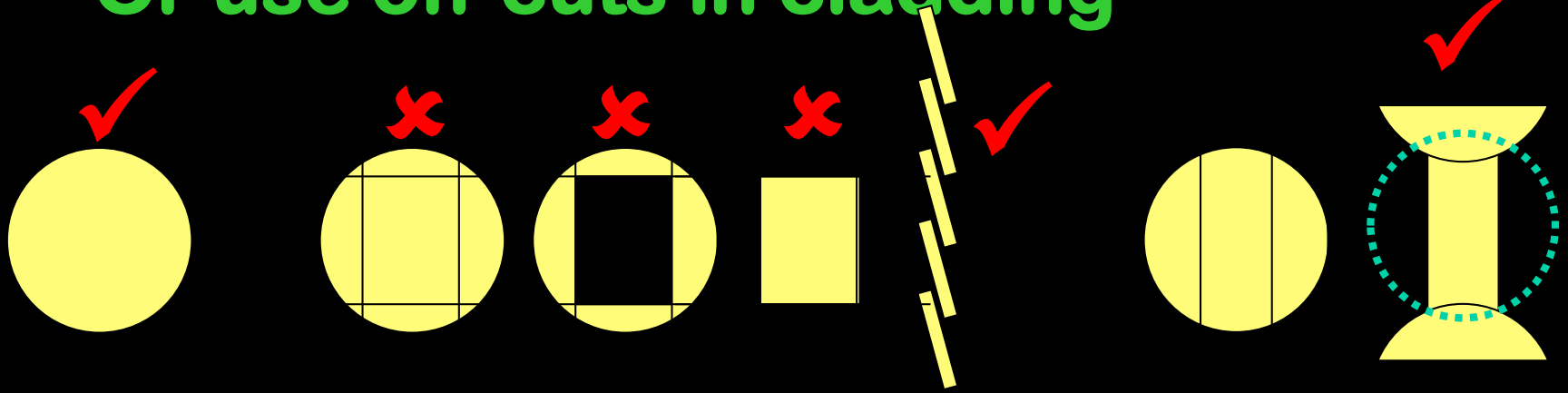
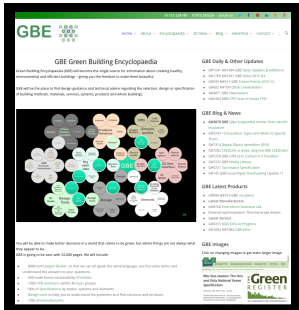
Reduce Demand

- Consider use of materials as found:
- Round pole structures
- Or compound sections without waste
- Or use off-cuts in cladding





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Resource Efficiency Plasterboard & stud partitions

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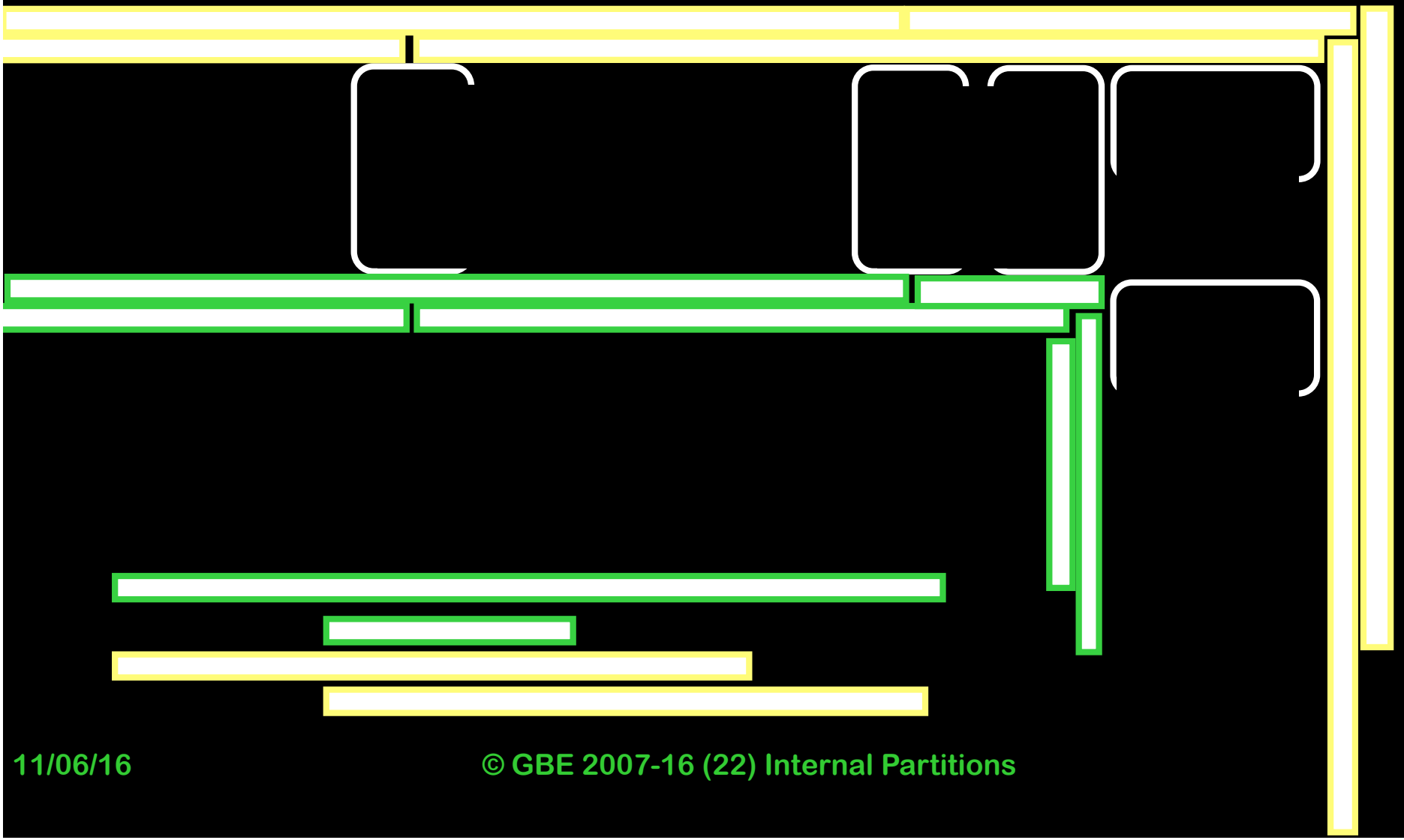
1 layer or 2?

Tolerances? Moisture resistance
Nothing gained

Robustness? Fire Performance?
Acoustic performance?

2 layers = 2 x materials &
2 layers = 2 x off-cuts



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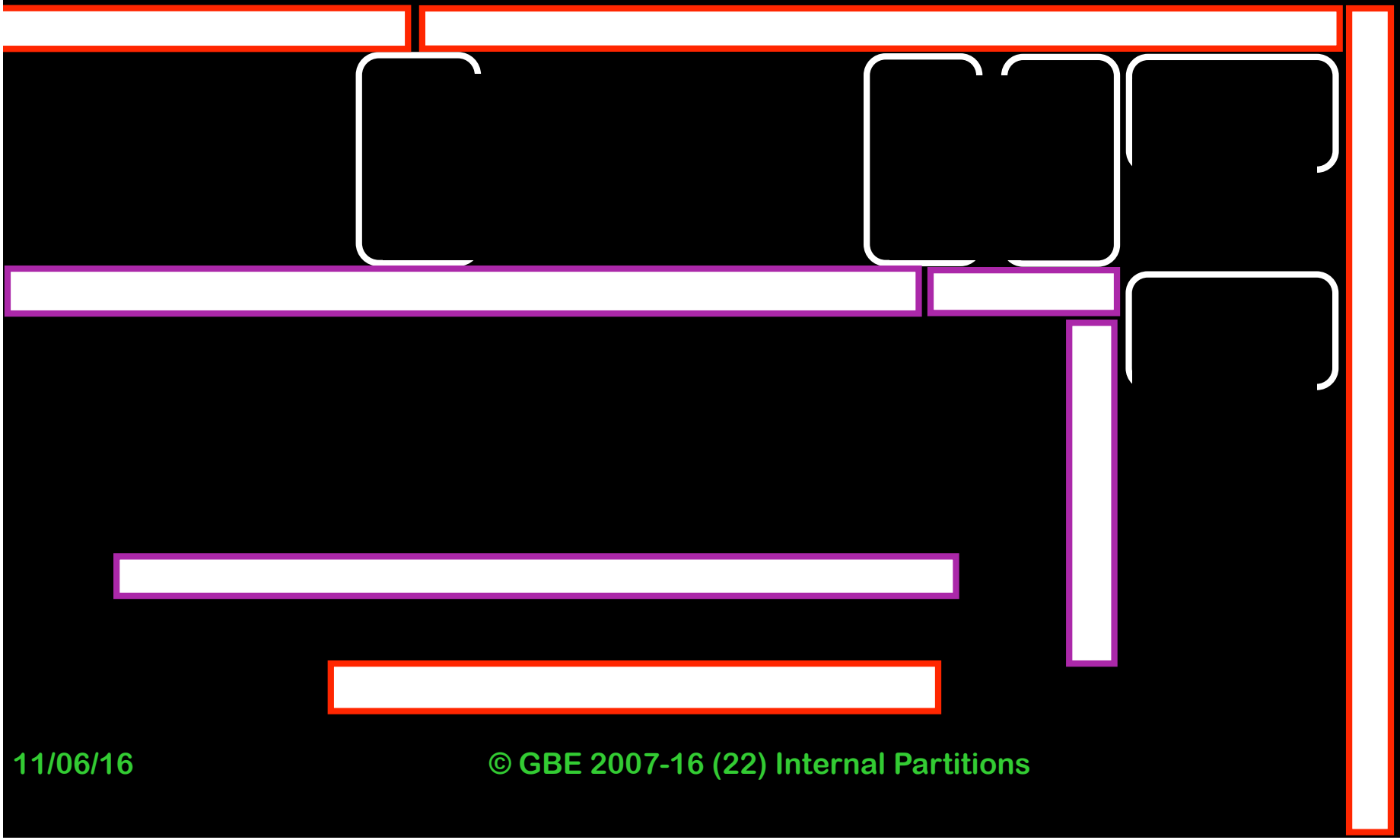
1 thicker layer of different grade = 1 x off-cuts



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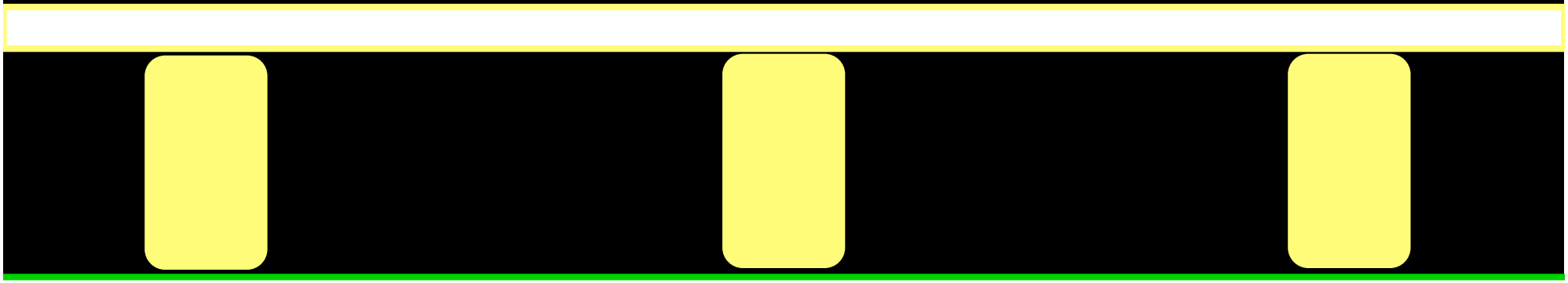
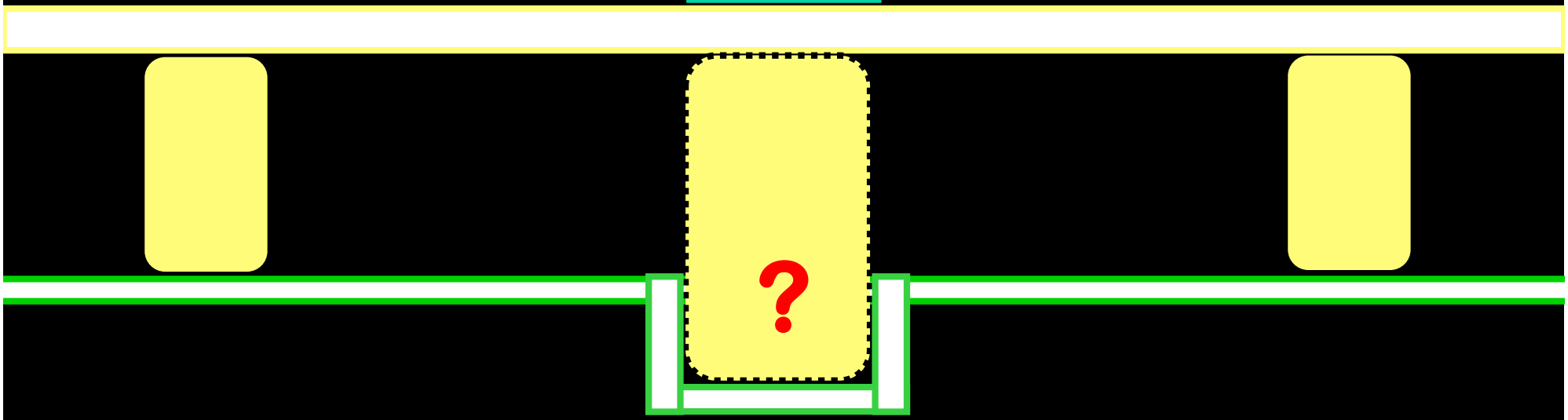
Joists



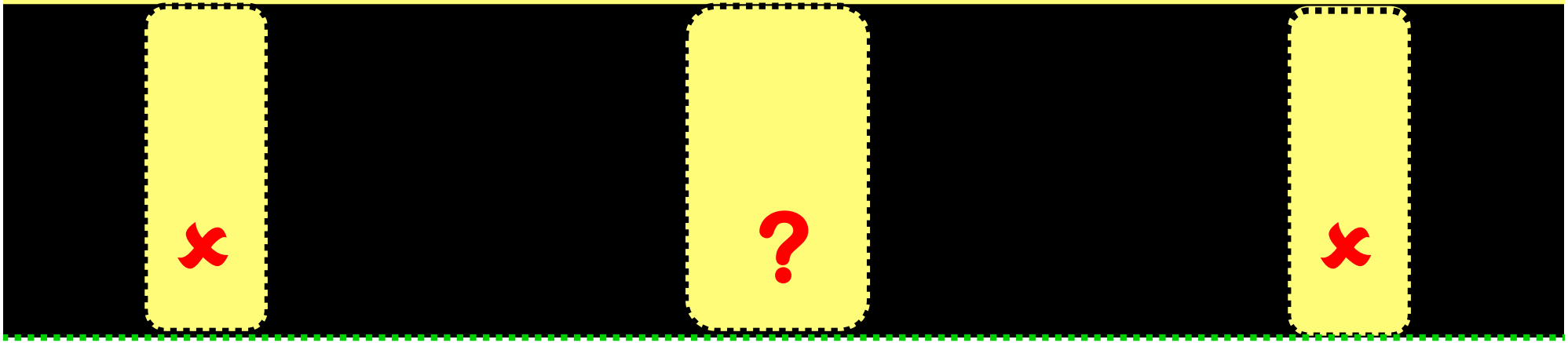
Multiple section simplifies design

Joists/Beams & Partitions



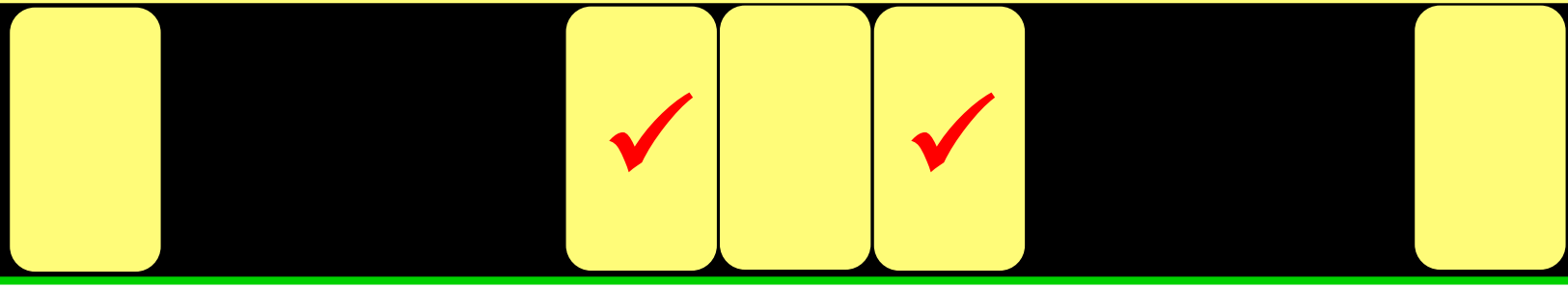
Different section complicates detail
Creates off-cuts and waste
Changes appearance below

Joists/Beams & Partitions



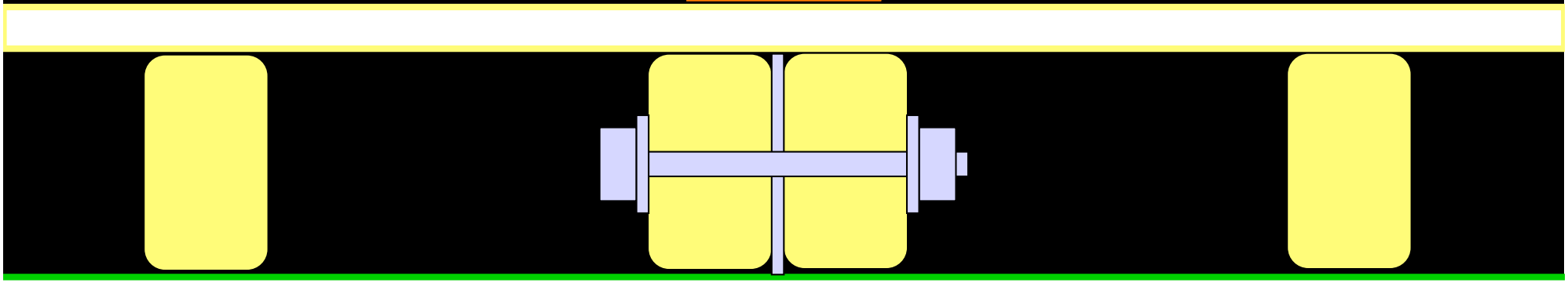
Standardising size leads to over-design of many for the one

Joists/Beams & Partitions



Multiple section simplifies design

Floor Joists/Beams & Partitions



Multiple section with flitch plate of steel bolted together

Partition plan section

Lazy Structural Design: less calculation, more structure
Avoid over design of structural supports or around openings
Avoid creating wide cold bridges through insulation
Avoid chopping standard width insulation rolls: more waste

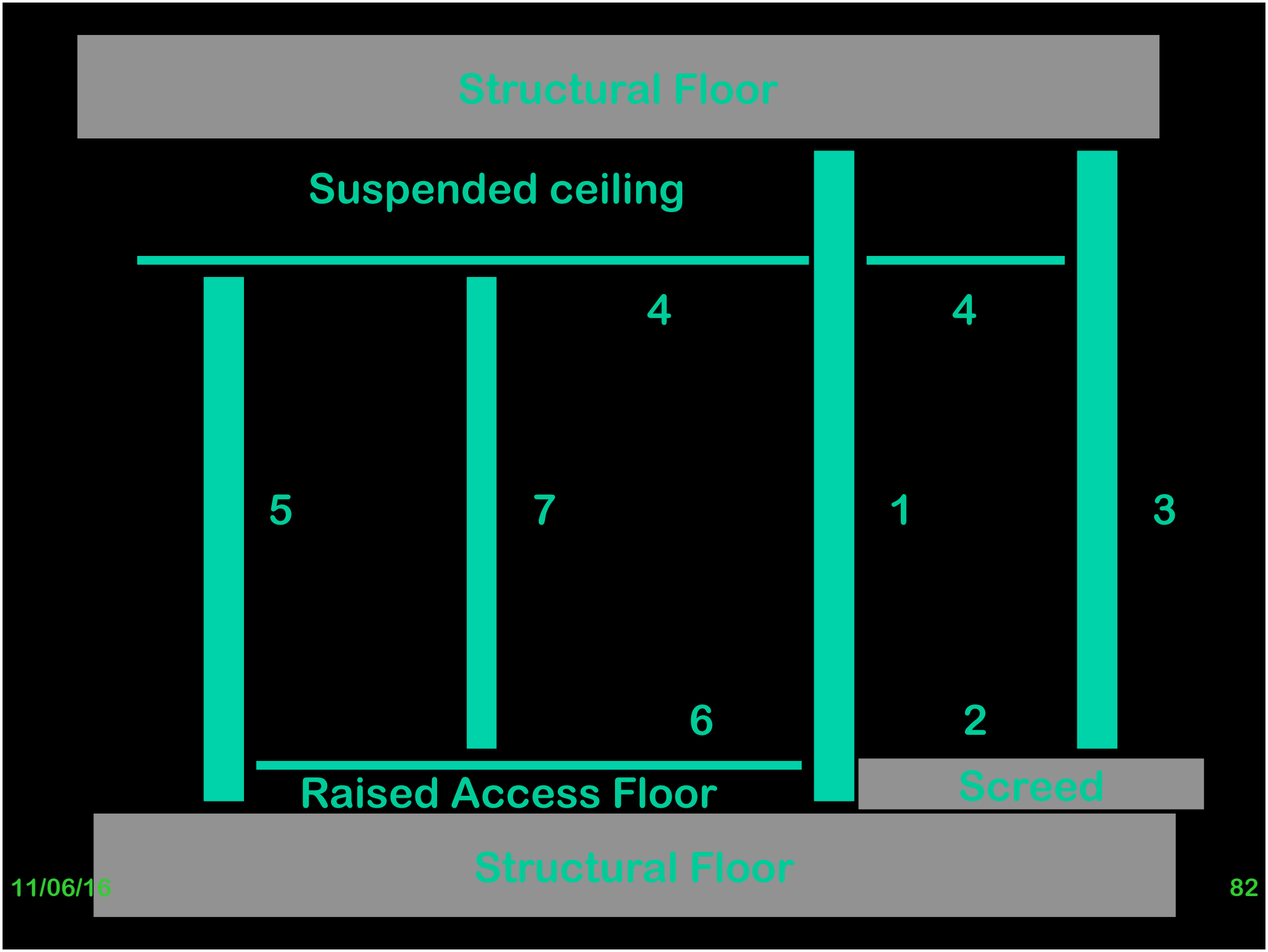
Reused wood better than new

BedZED Beddington Sutton Architect: Dr Bill Dunster,
Reclaim: BioRegional ReCLAIMED

© NGS

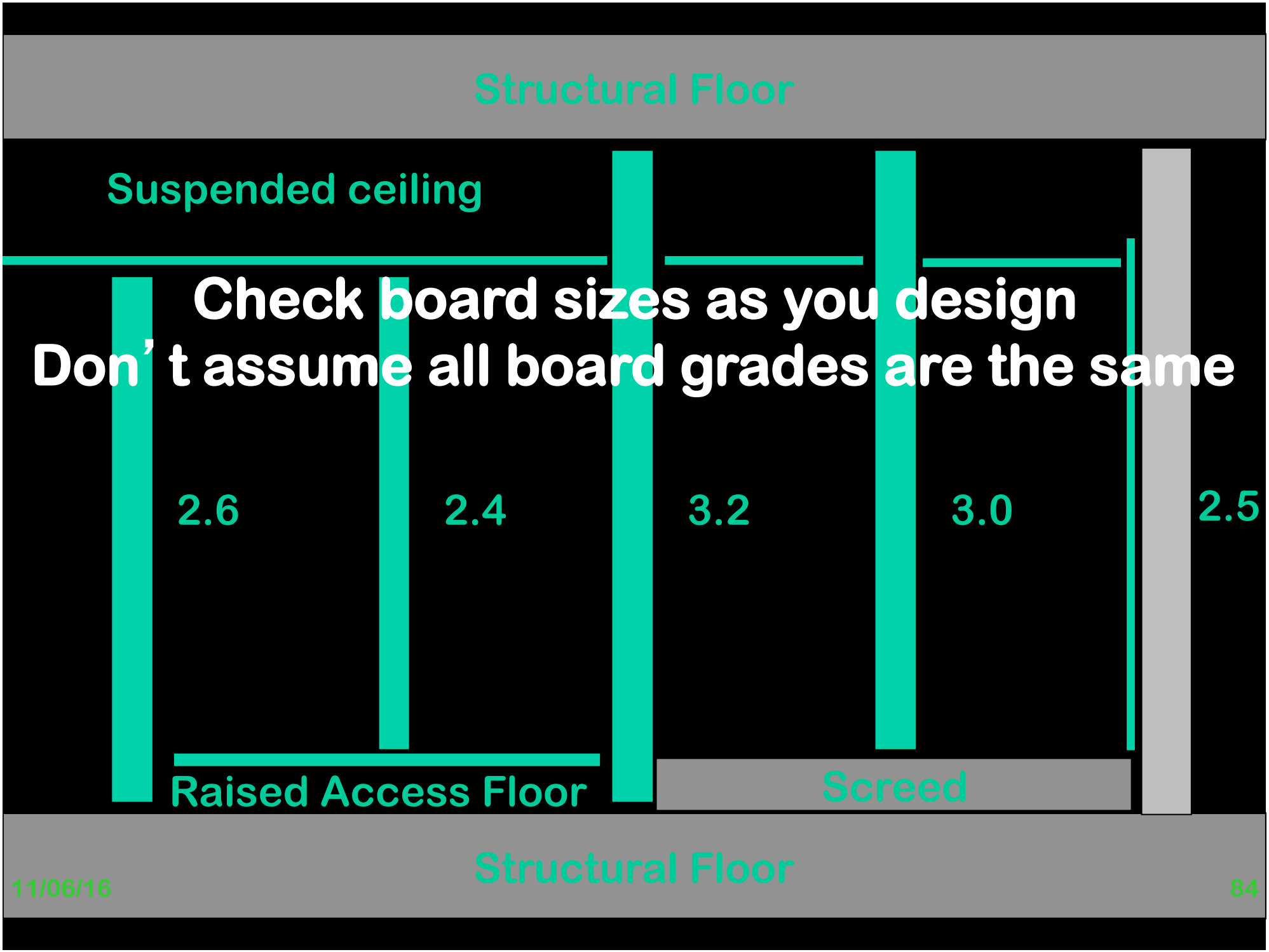
Design dictates Sequence

- The details at the abutments dictate the sequence of assembly
- Whether the designer likes it, admits it or not
- Consider wet trades first, dry second
- Consider working top down to minimise damage of floors by following trades


Structural Floor
Suspended ceiling
4
4
5
7
1
3
6
2
Raised Access Floor
Screed
Structural Floor

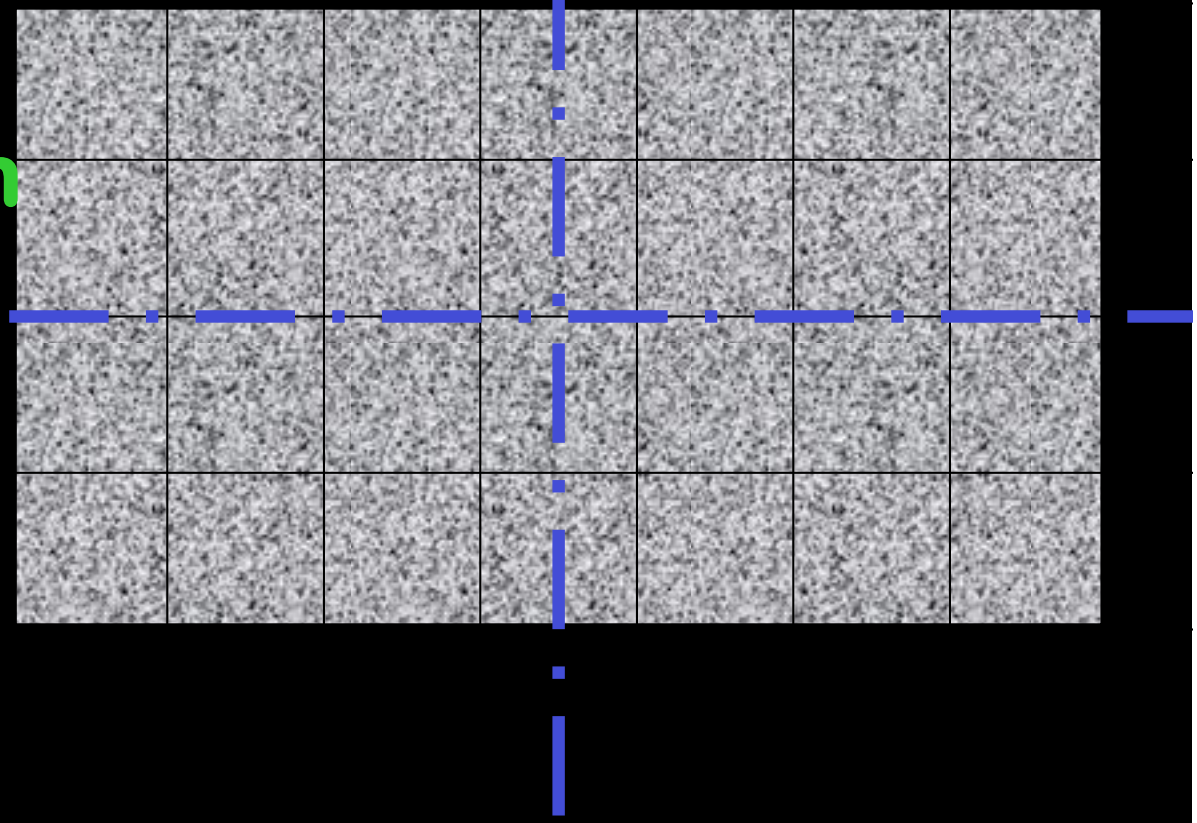
Design details create waste

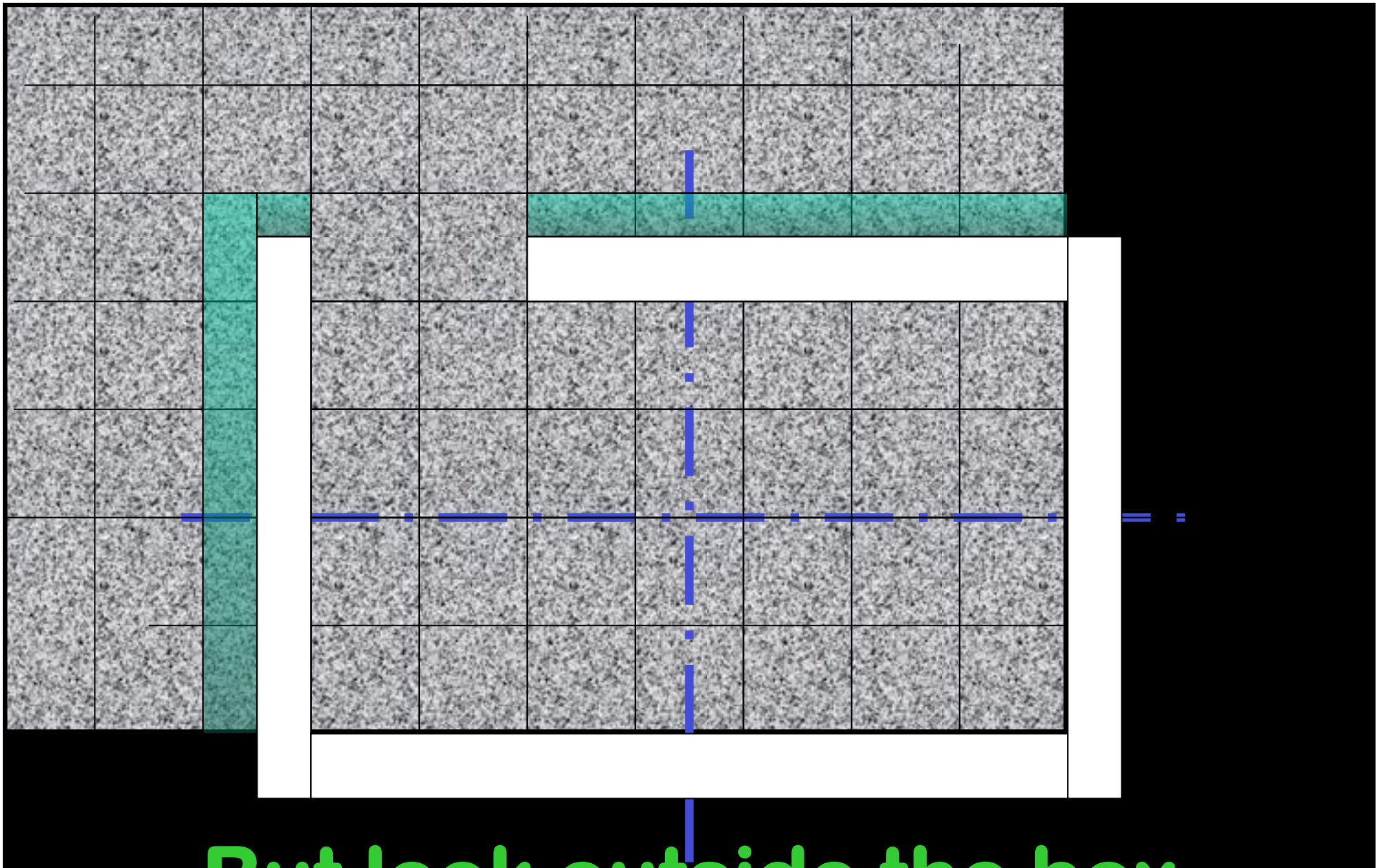
- Many heights of partitions and linings
- Creates demand for different height boards
- 1 maker provide an off-cut take-back scheme (BG but not comprehensive)
- Others provide purpose made boards cut to height (if the job is big enough)
- Others cut board to size (F)
- How many sizes does your job need?


Structural Floor
Suspended ceiling
Check board sizes as you design
Don’t assume all board grades are the same
2.6
2.4
3.2
3.0
2.5
Raised Access Floor
Screed
Structural Floor

Controlled Sizing: Reduces Waste

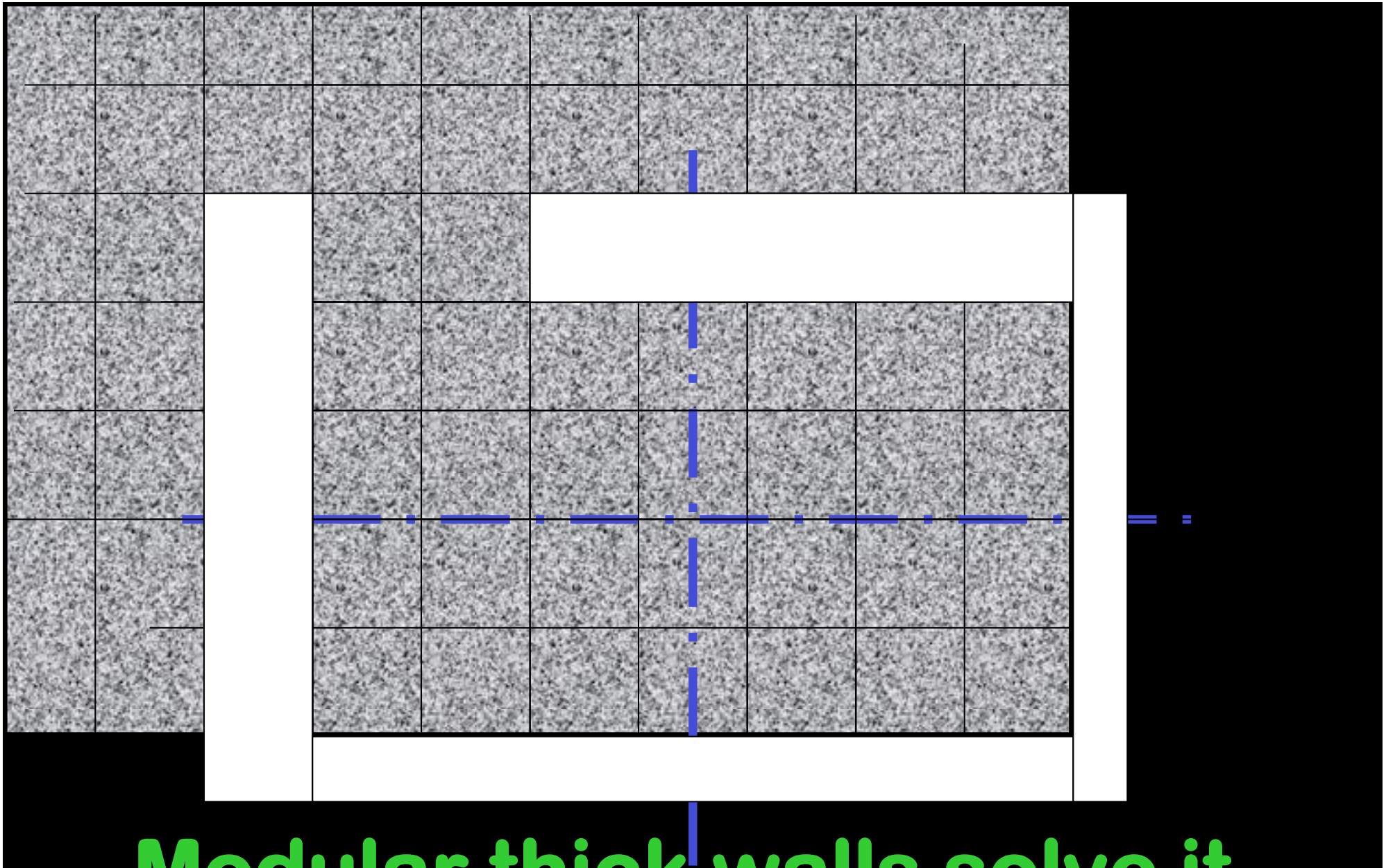
- Dimensional co-ordination
- Room sizes match Tile modules
- No waste



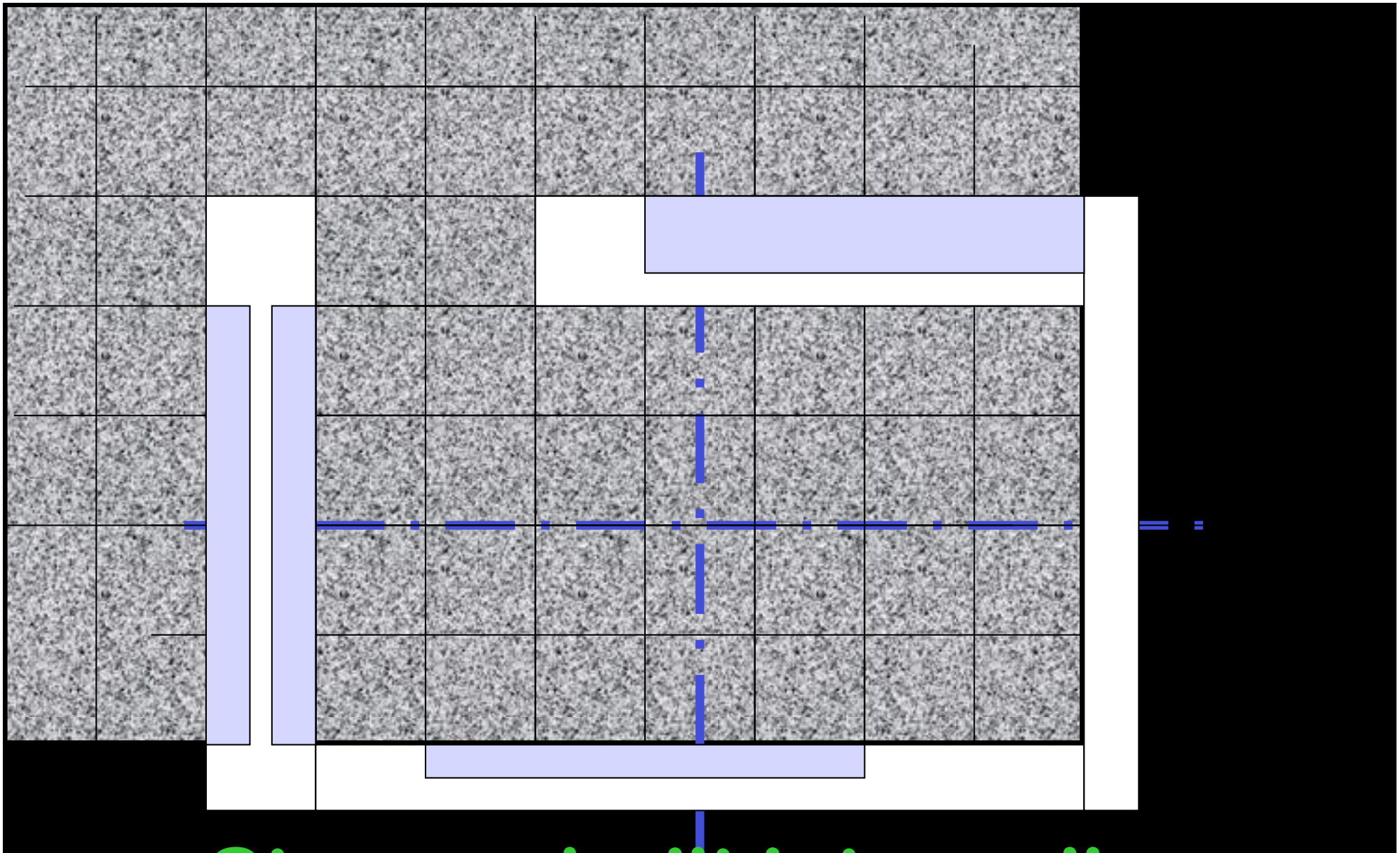


But look outside the box

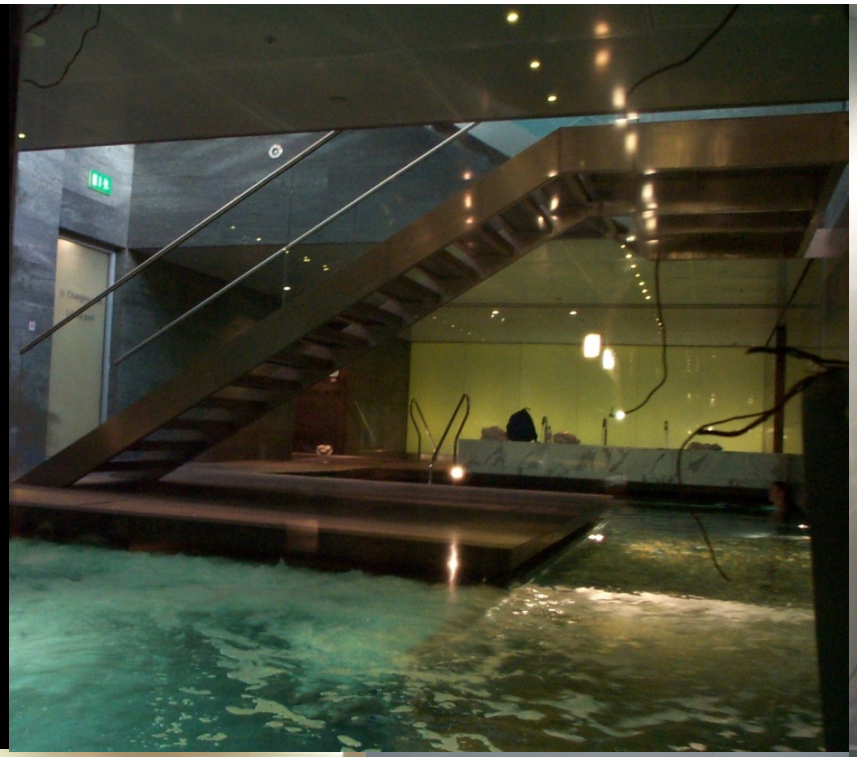
© GBE 2007-16 (22) Internal Partitions



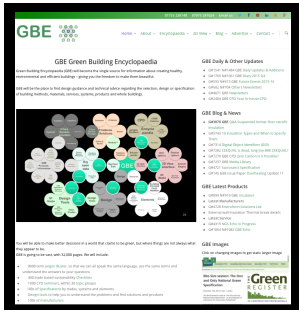
Modular thick walls solve it



Storage built into walls



Architects: Walters & Cohen
Holmes Place Health Club Canary Wharf



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Resource Efficiency Blockwork partitions

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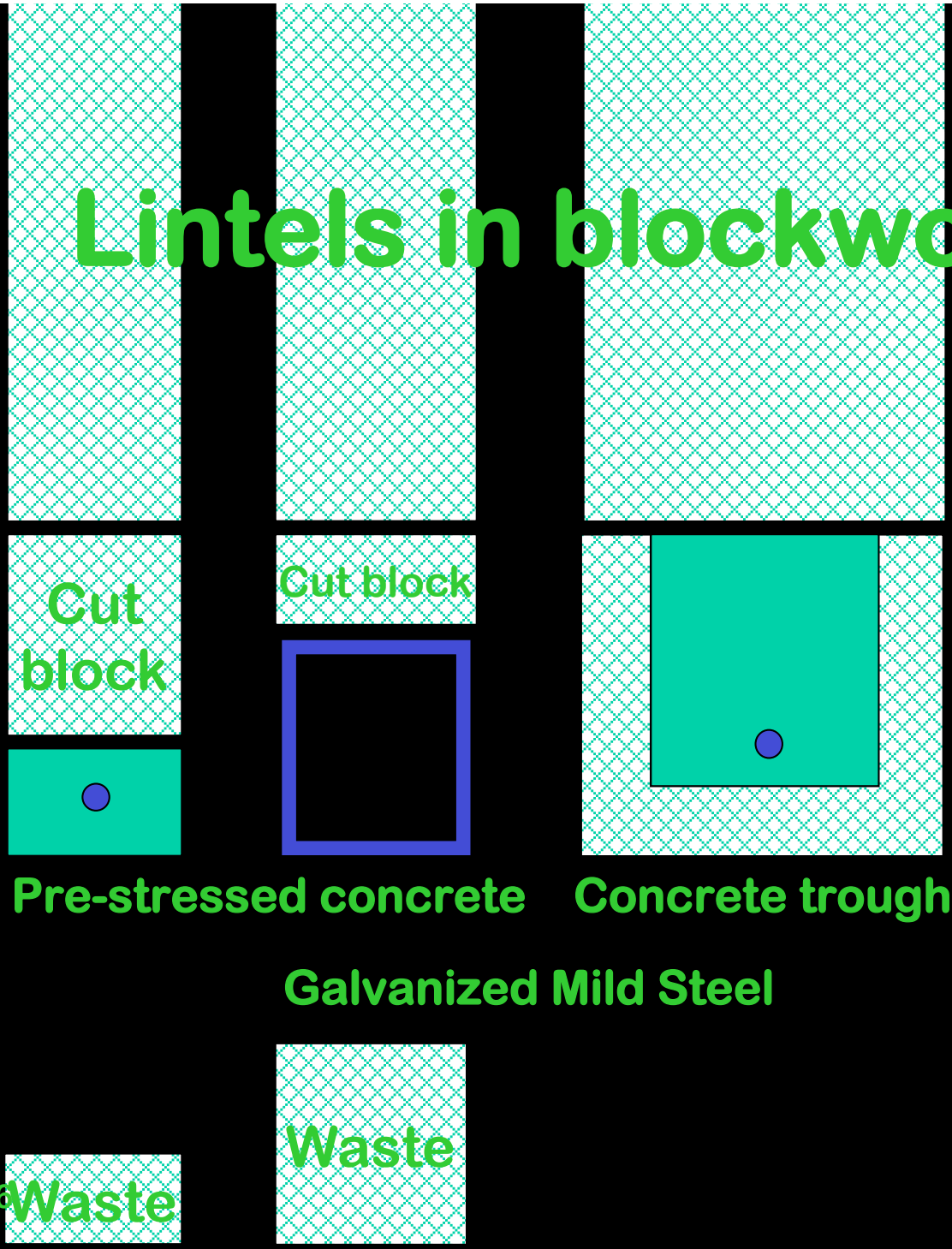
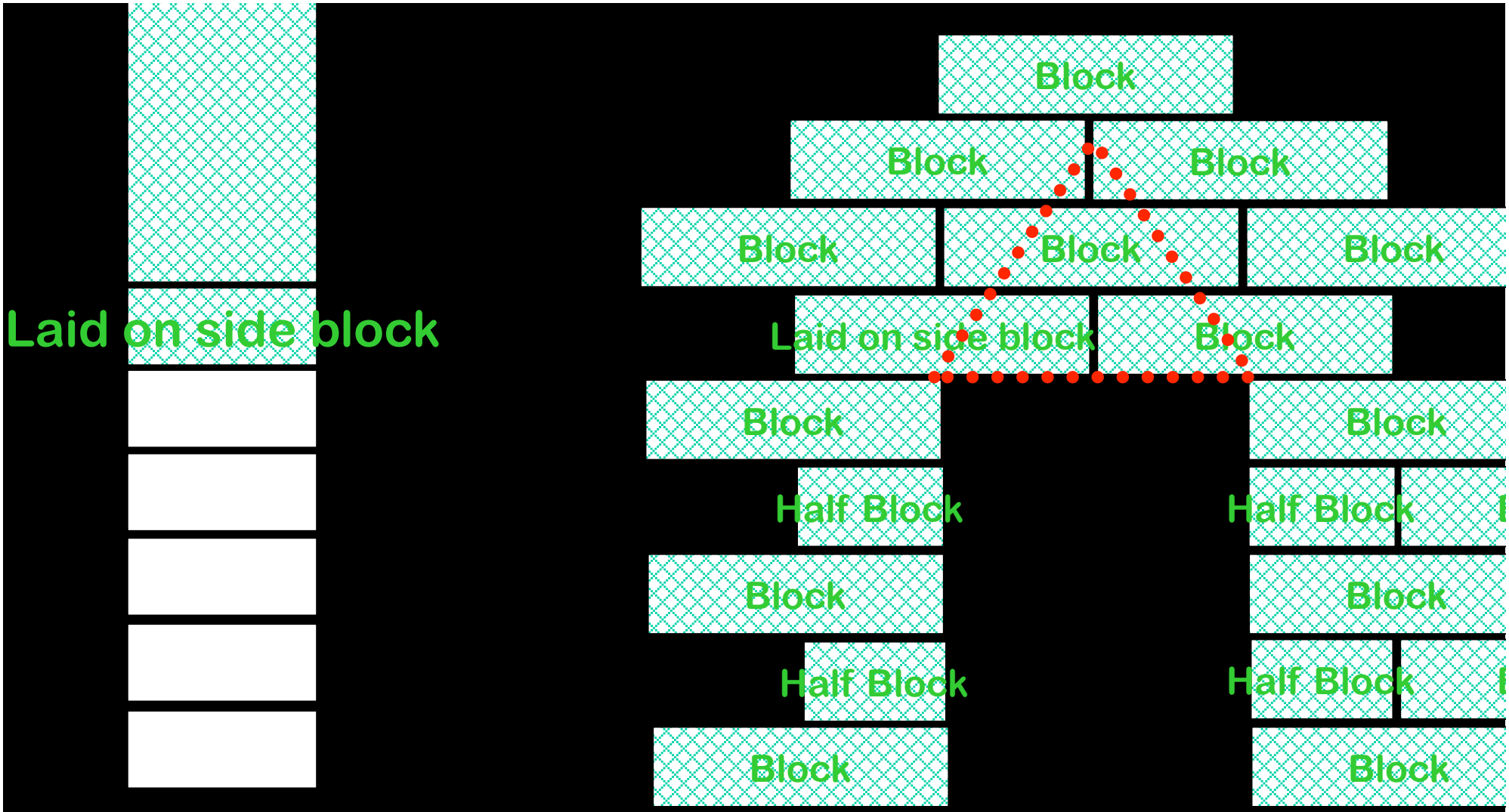
Lintels in blockwork walls



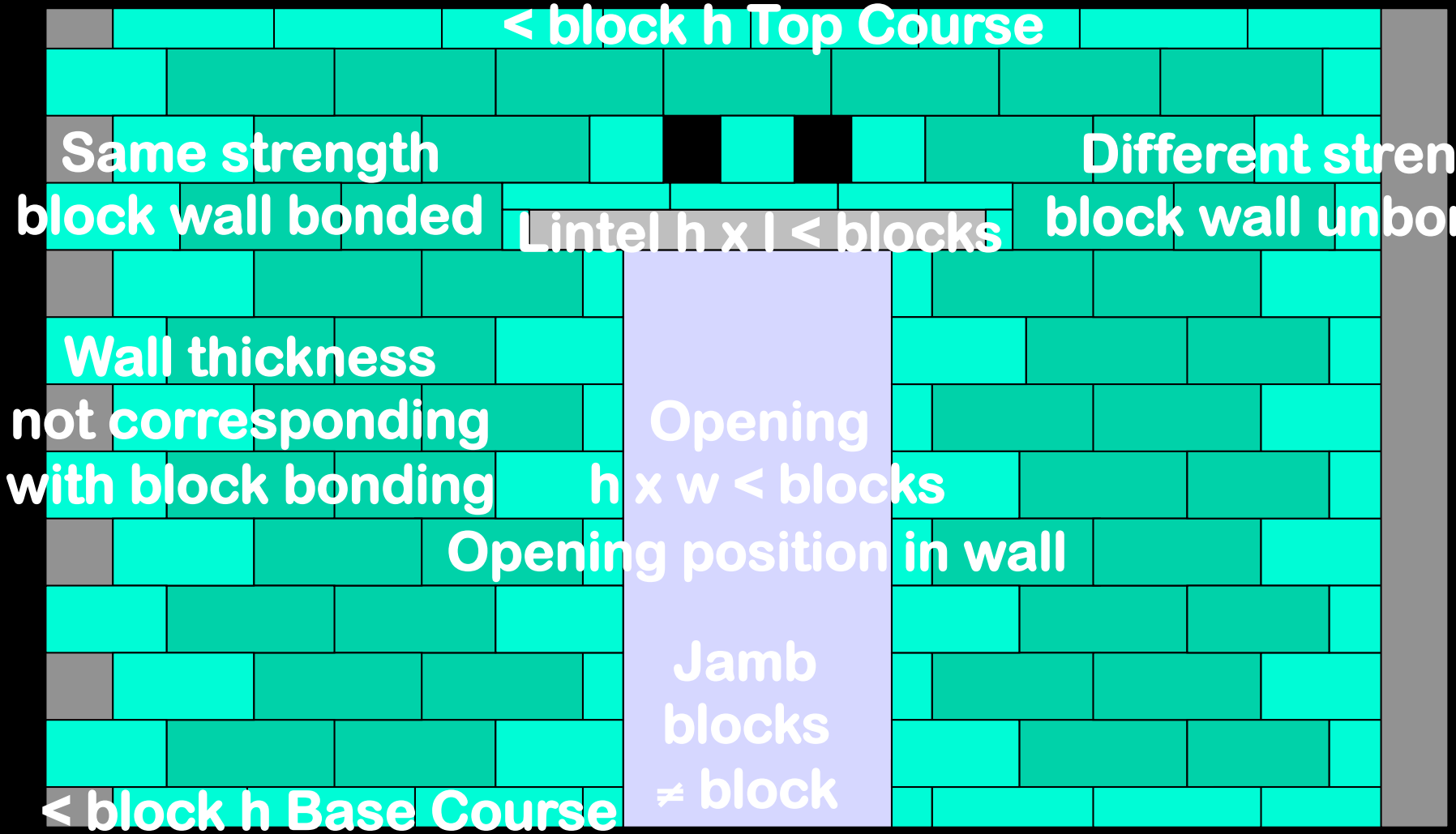
Minimise Waste

- Co-ordinate block course and lintel heights to minimise waste from cut blocks
- 215 mm. bearings
- Design openings to be block and half block sized

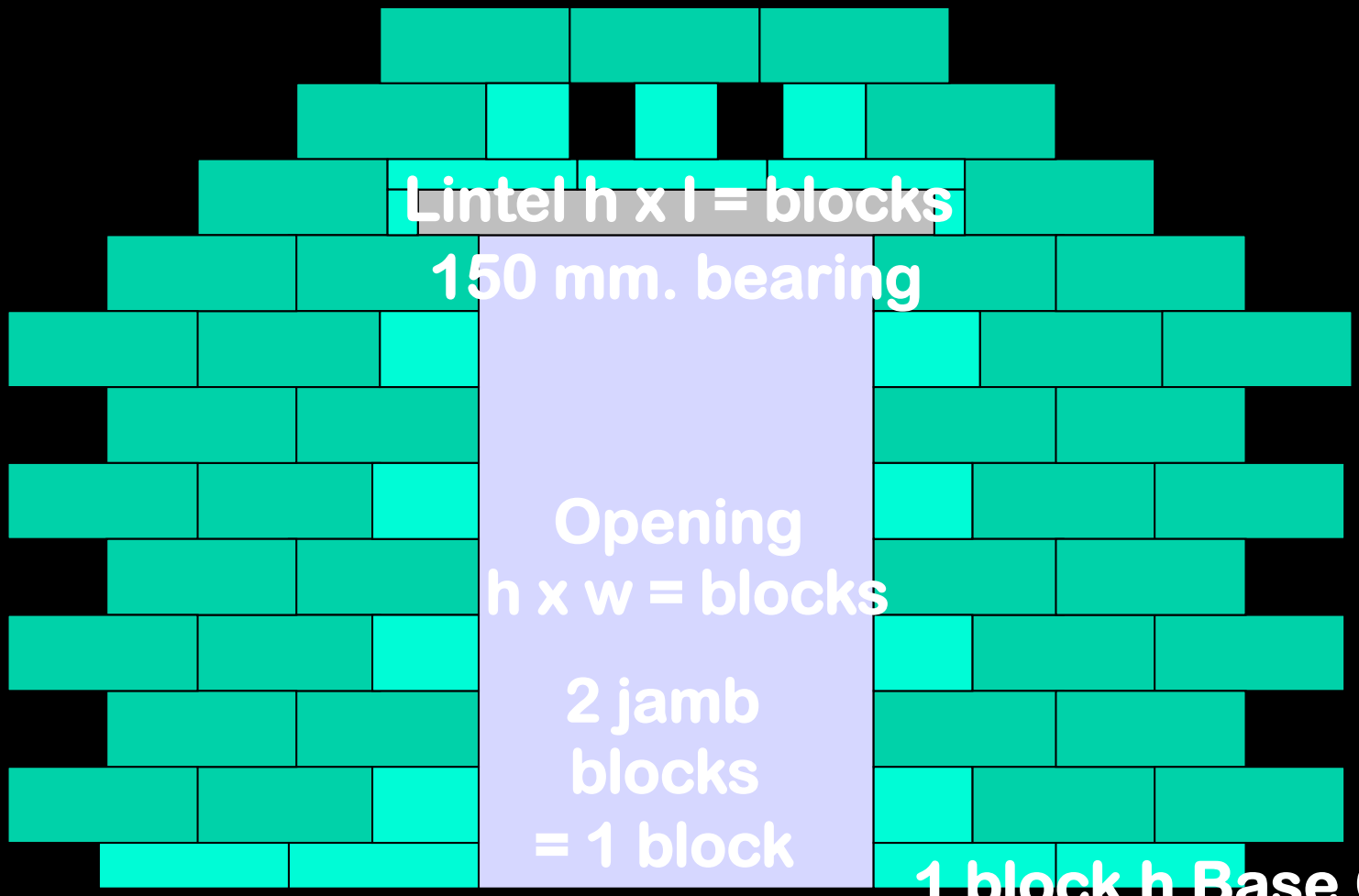


Concrete blocks forming lintel in walls over opening of max 440 mm.

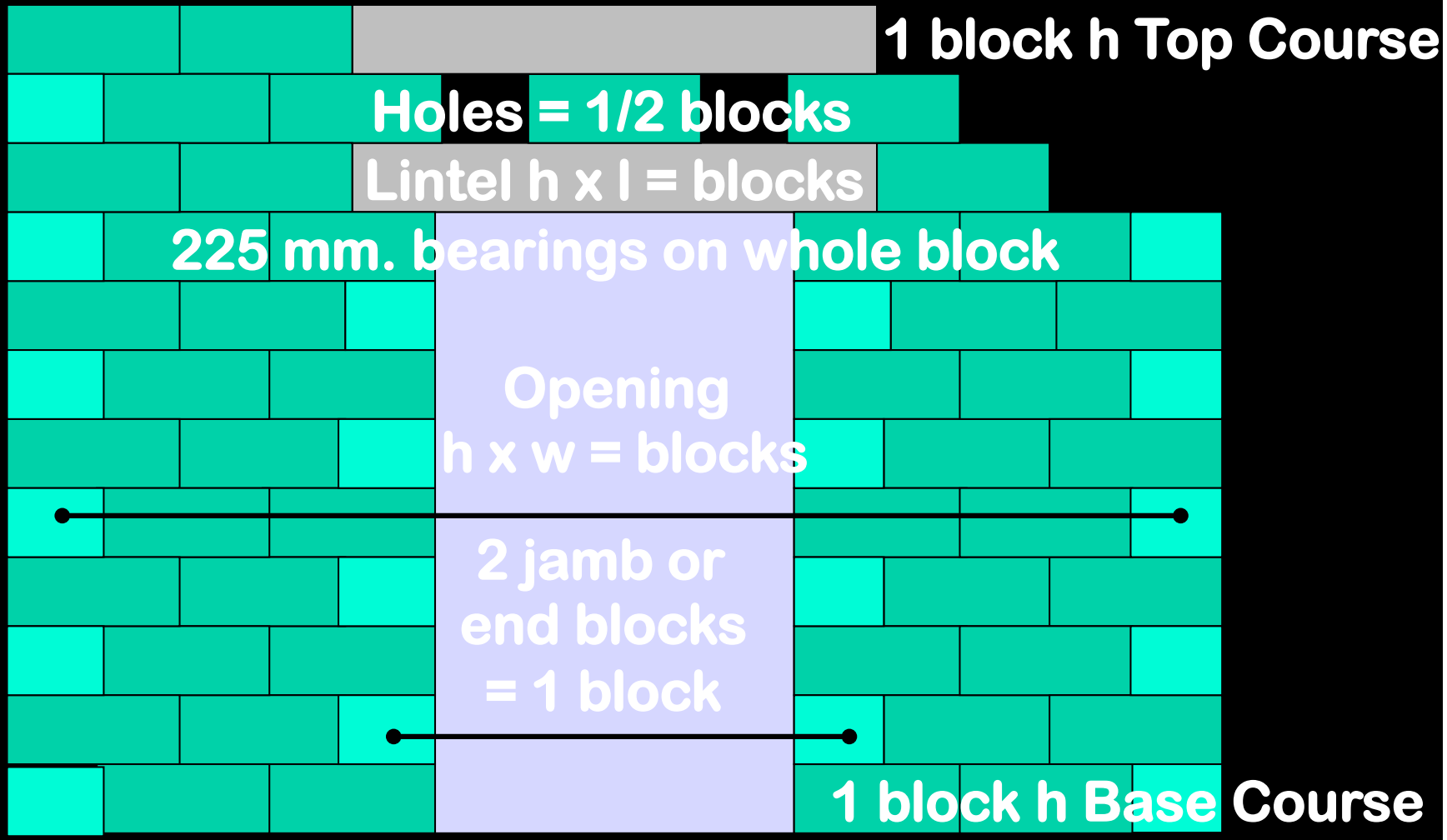
No Design: Offcuts 33%+



Offcuts 33%


Lintel h x l = blocks
150 mm. bearing
Opening
h x w = blocks
2 jamb
blocks
= 1 block
1 block h Base Course

Modular design: considerably less than 33%



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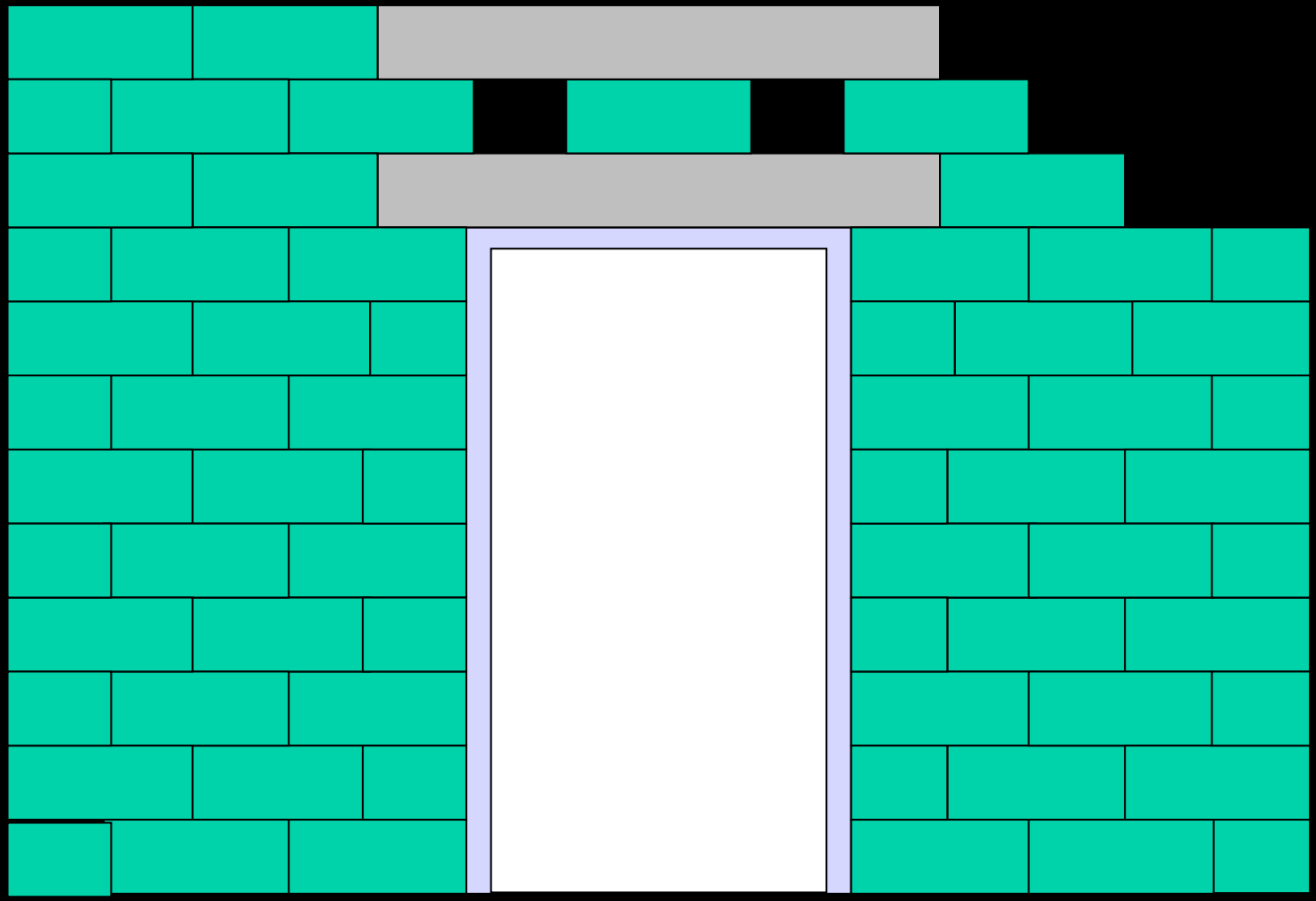
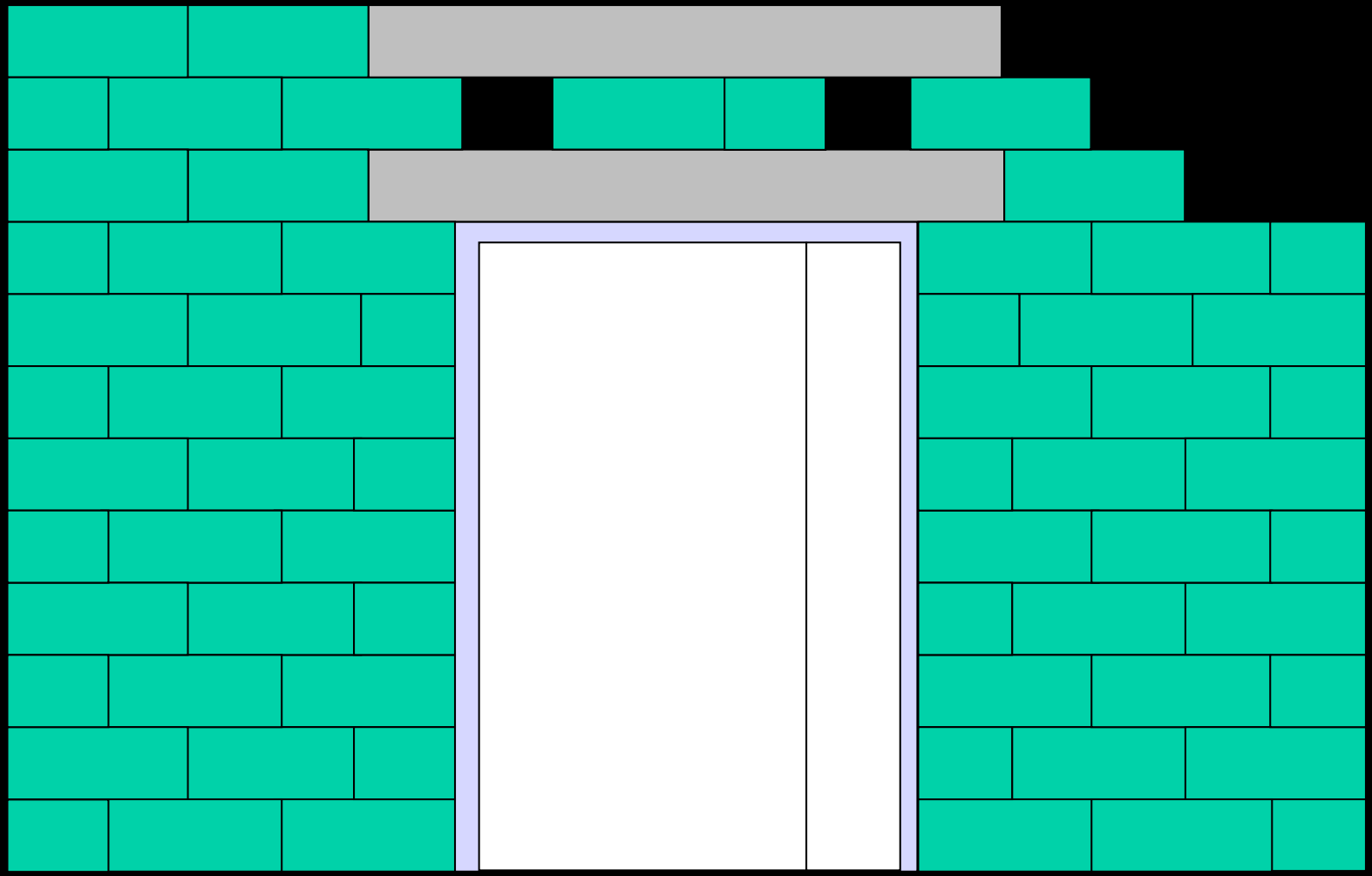
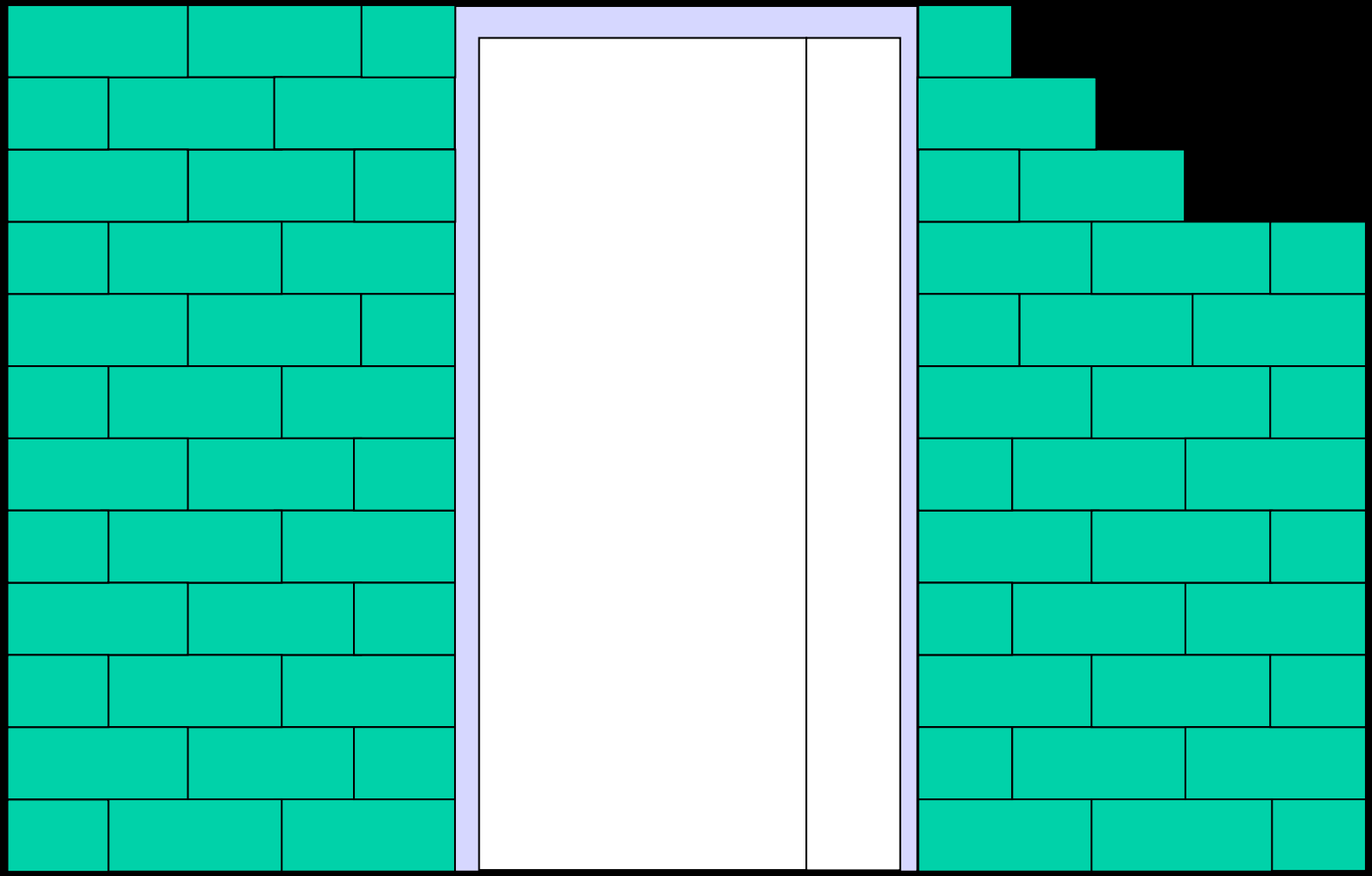
Doorsets to fit openings



Fire Doorsets to fit block openings



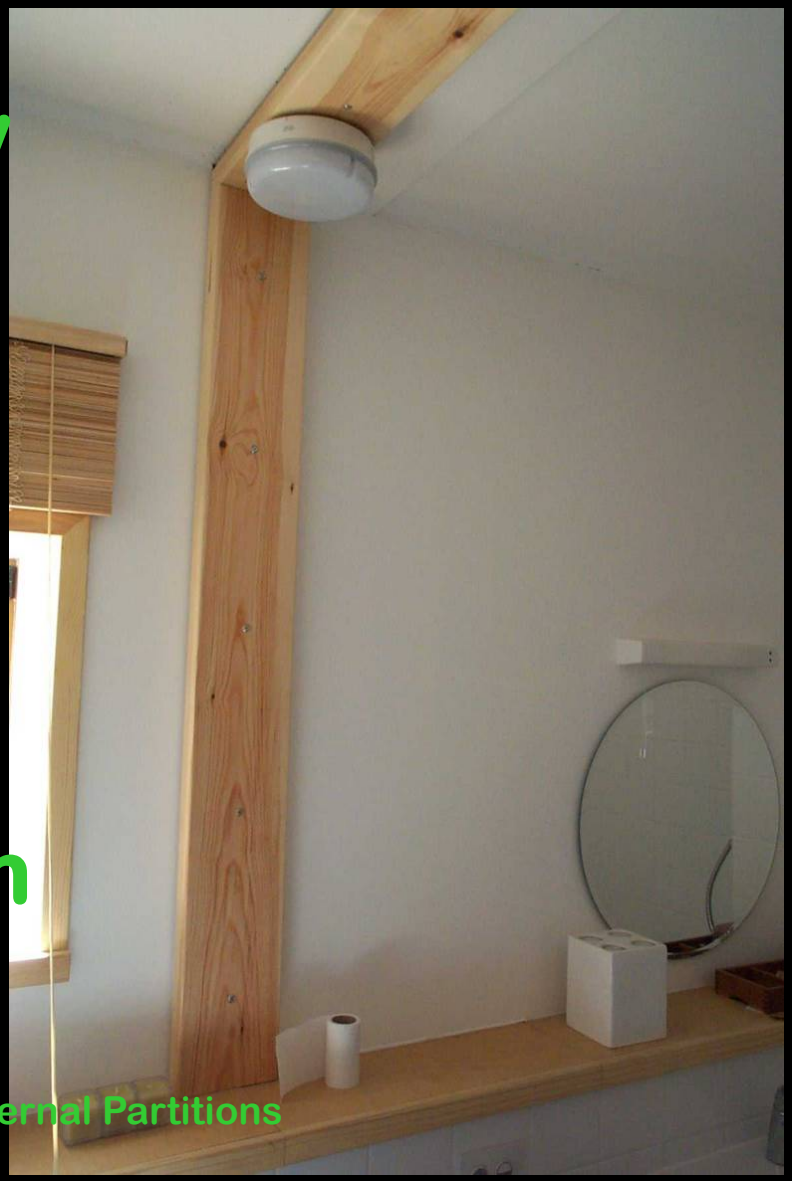
Doorsets to fit floor heights

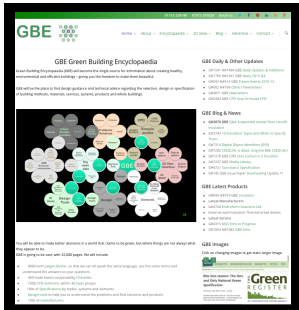


Layered Construction

Avoid chasing masonry
Avoid waste materials
Avoid masonry dust
Avoid conduits
Avoid Rendering-in

Surface mount all services and cover with hollow Skirtings, dado, etc.





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Cycle Assessment Procedure for Eco-impacts of Materials

Investing in Opportunities

This project has received European Regional Development Funding through INTERREG IV B.

INTERREG IVB

Resource Efficiency cubicle partitions

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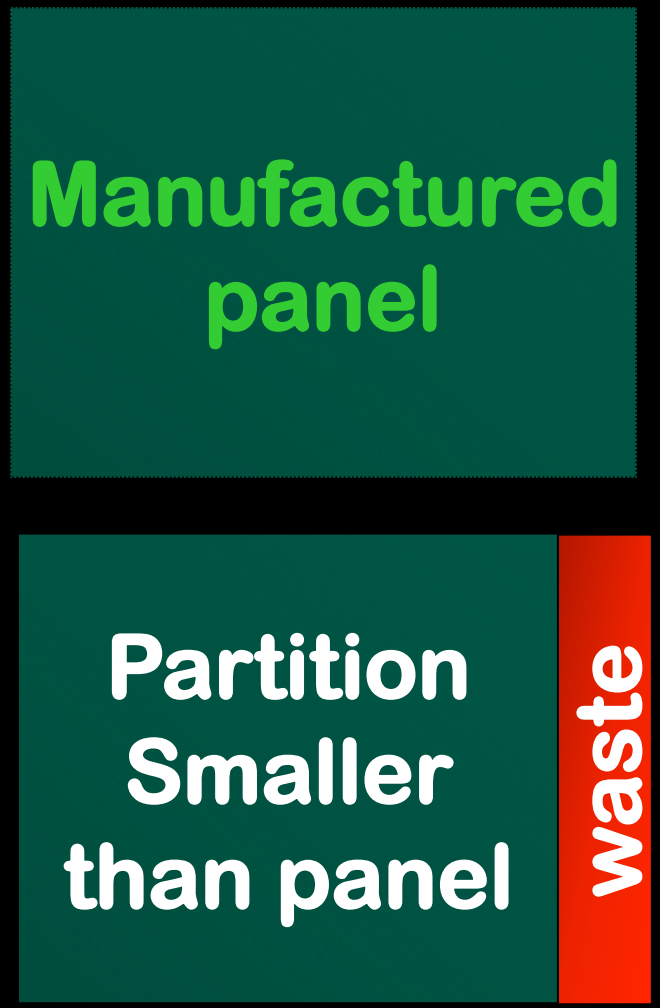
Cubicle & Modular Partitions created from panels

Manufactured Panel

Partition same size as panel = No waste

Price will reflect no waste

Cubicle & Modular Partitions created from panels



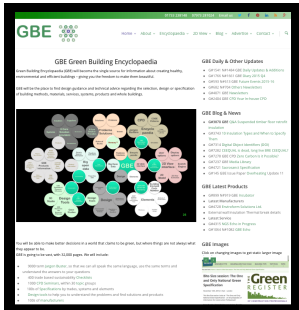
Cubicle & Modular Partitions created from panels

Manufactured panel	Requires second panel
Partition larger than Manufactured panel	And more waste

Price will reflect high wastage

Design for Deconstruction

- Demountable
- Reclaimable Partition
- Reusable Partition
- Recyclable panel material
- Reusable fixings and fasteners



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INTERREG IVB

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