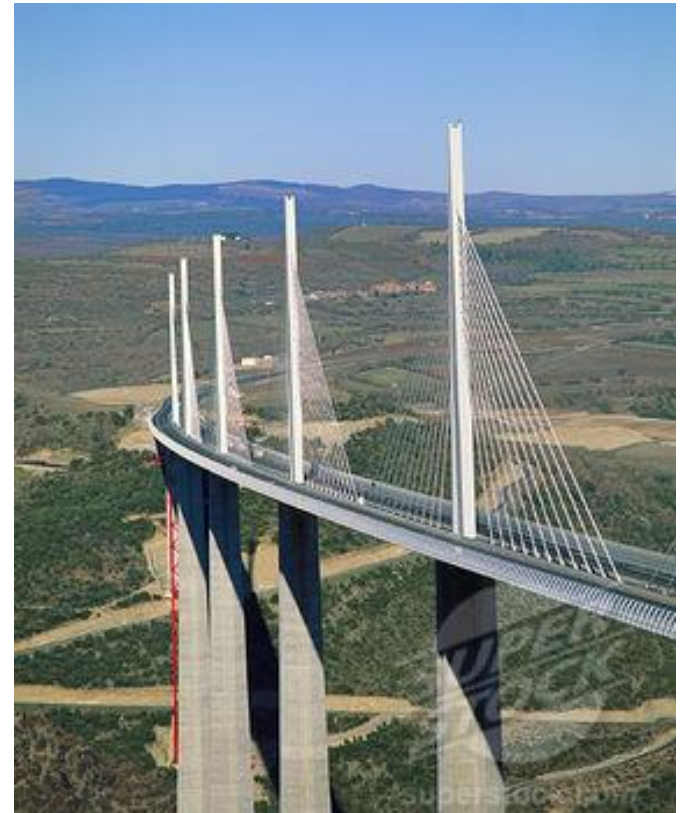


Built Environment Portfolio

Technology III



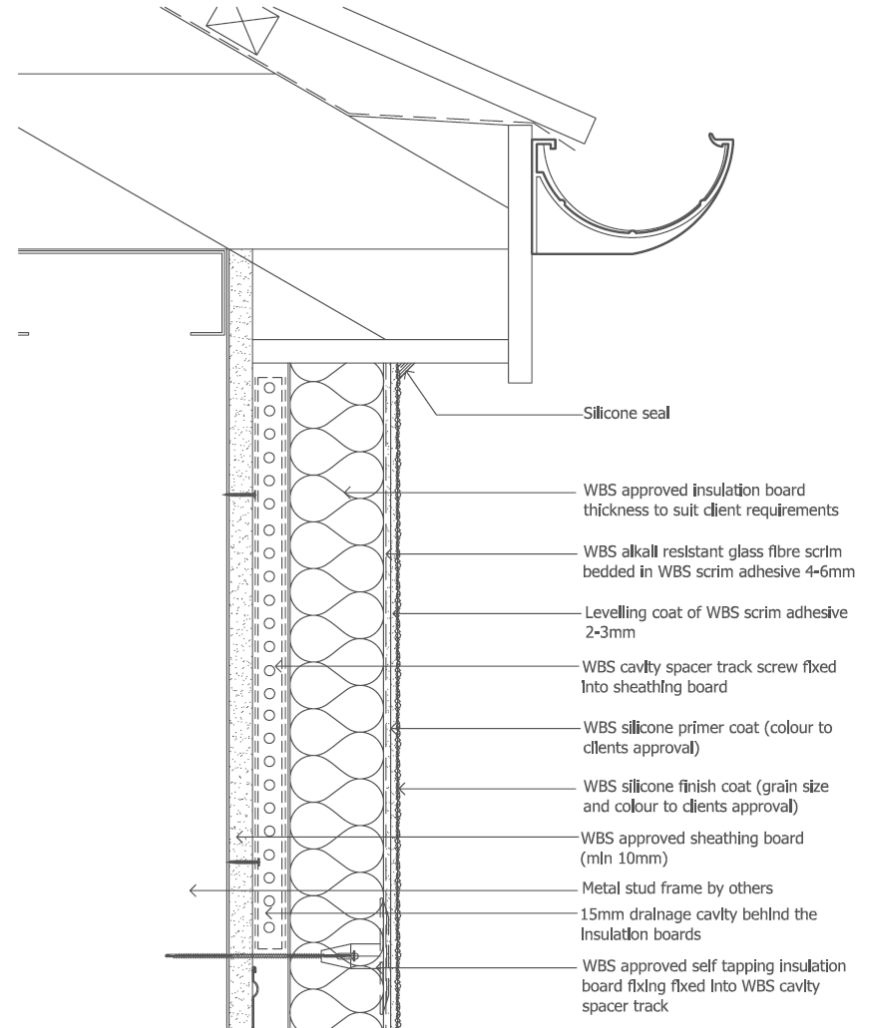
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- ...about better processes and products
- Better management
- Better effectiveness and efficiency
- Better quality
- Better environmental performance
- Better customer satisfaction
- Better procurement

Not always about changing technology!



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Types of MMC..

Panellised

Volumetric



Hybrids and pods

Non off-site methods

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Panellised system
Tilt up



Cost - extremely competitive

Speed - fast start, fast build,
pre-planning...

Ease of construction - factory
process on site

Durability - compare favourably
with metal system failures
and accidental damage

Security - used for prisons and
security walls

Fire resistance - 2+ hours
inherent resistance

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Panellised systems

SIPS

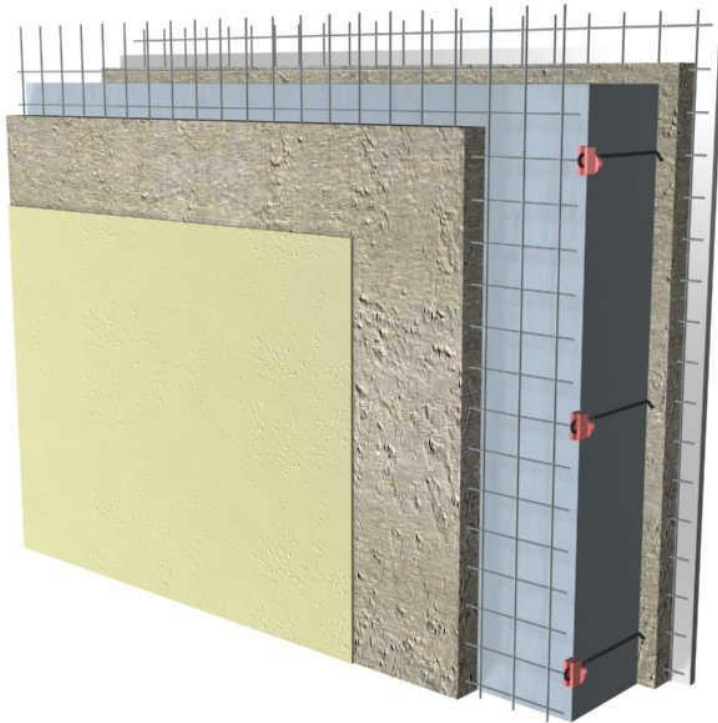
- Structural
- Aesthetics
- Insulation



- Design flexibility
- Tight high-performance
- Speed



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Volumetric



- Volumetric offsite construction can help reduce the production of waste to as little as 1.8%
- Allows for efficient design and continuous process improvement
- Involvement of the supply chain as well as procurement strategies helps achieve time and cost savings

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Table 6: Summary of Potential of Key Types of MMC for Reducing Site Waste

Solution ratings: **3** = significant reduction, **2** = moderate reduction, **1** = limited impact, blank = no reduction, or N/A = not applicable

	Packaging material waste streams							Building product/material waste streams							
	Wood pallets	Shrink wrap	Card-board	Metal tins – paint, pres.	Plastic tubs & guns – mastics etc*	Plastic bags	Paper	Timber	Con-crete	Plaster-board	Panel board prods ***	Sheet or roll insulation.	Bricks, blocks tiles	Cement mortar plaster	Bldg services prods
Volumetric	3	3	3	3	3	3	3	3	3	3	3	3	3	3	2
Timber frame*	3	3	1	1	1	1	2	3	1	3	2	1	3	2	N/A
Pre-cast panels	3	3	2	1	1	1	2	3	2	2		3	3	3	N/A
Steel frame	3	3	2	1	1	1	2	3	3		1	3	2	3	N/A
SIPS/SIRPs	3	3	2	1	1	1	2	3	2		3	2	3	3	N/A
Composite panels	2	2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	3	N/A	N/A	N/A
Pre-cast cladding	3	3	2	N/A	N/A		N/A	3	N/A	N/A	N/A	2	2	N/A	N/A
LSF (open)	3	3	2	N/A	2	2	N/A	3		N/A	3	1	3	3	N/A
LSF (closed)	3	3	3		2	2		3		N/A	3	3	3	3	N/A
Pods	3	3	3	2	2	2	2	1	1	2	N/A	1	2	2	2
Pre-cast structural**			N/A	N/A	N/A	N/A	N/A	3	3	N/A	N/A	N/A	N/A	3	N/A
Insulating concrete formwork	2	2	N/A	N/A	N/A	N/A	N/A	2	2			2		3	N/A
Tunnel form	3	3	N/A	N/A	N/A	N/A	N/A	3	3	1	2	N/A	3	3	N/A

Source: AMA Research/trade estimates

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National Audit Office Findings

- Labour and time savings
- Cost reductions
- Quality improvements
- Effective risk management



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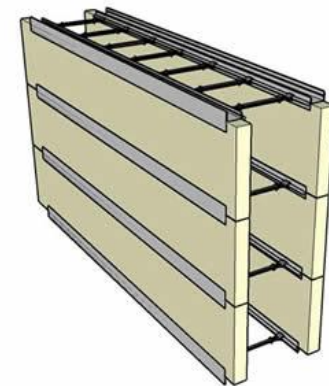
Steel frame

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Innovative methods

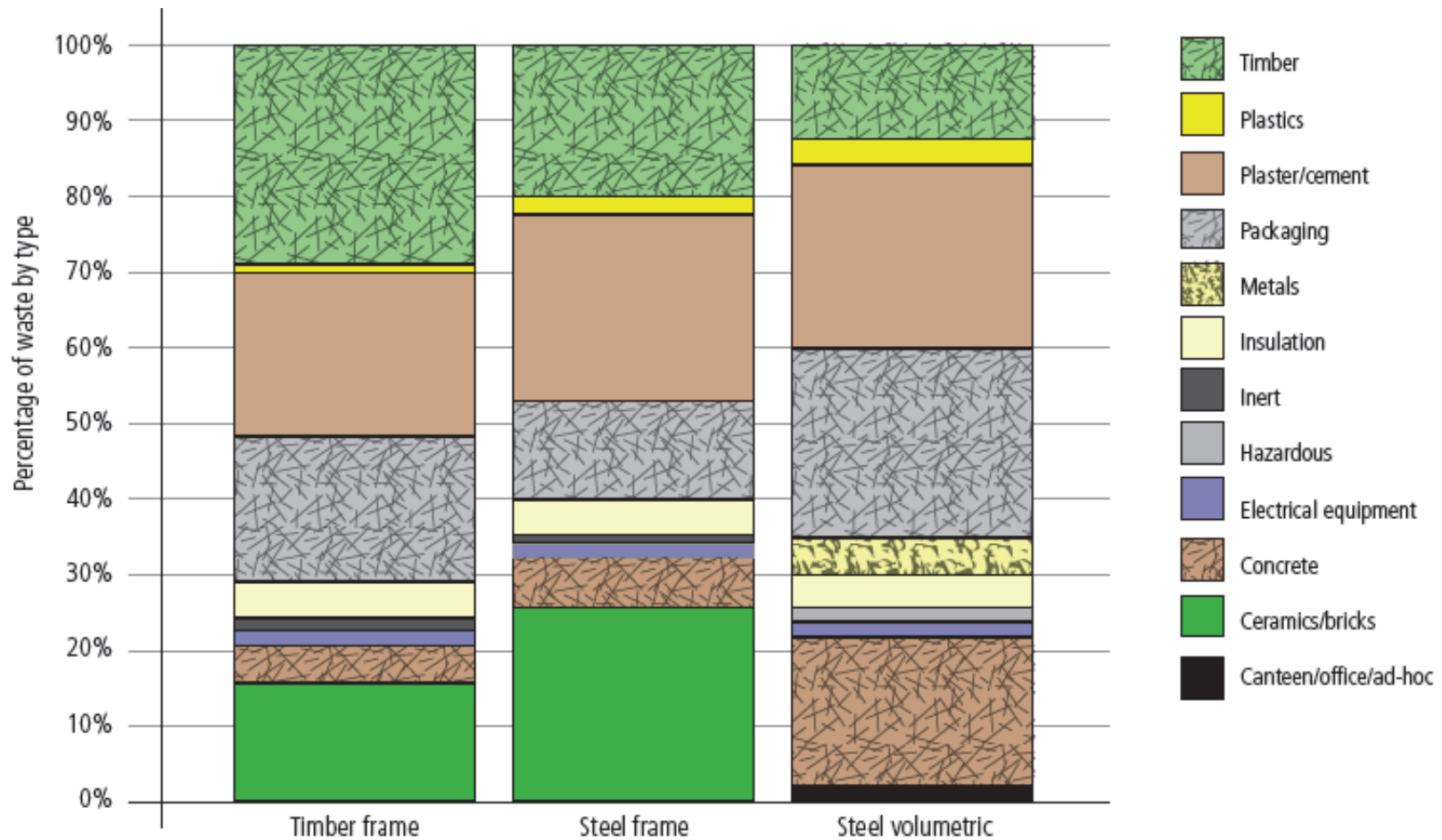
Insulating concrete formwork

- Speed
- Strength
- Efficiency
- Concrete curing
- Reduces thermal shrinkage



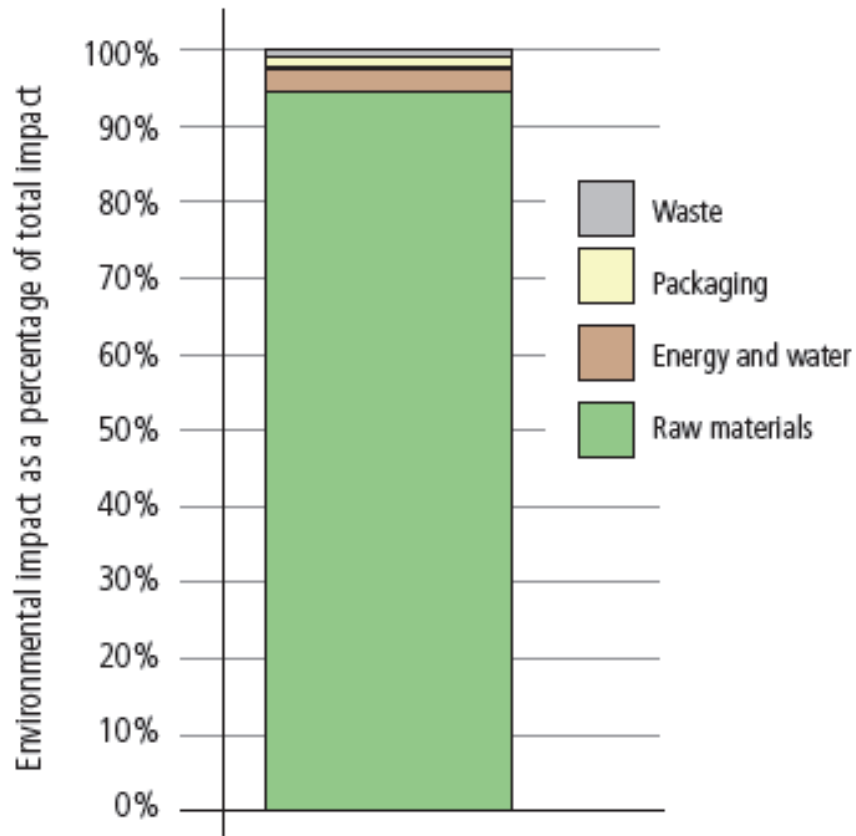
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Composition of waste in different MMC projects

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Average MMC Environmental Impact

- Greatest impact is in the raw materials
- Mainly from packaging
 - Polythene sheet/wrap
 - Cardboard
 - Metal
 - Plastic
 - Timber
 - Paper sacks

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Non off-site methods



Tunnel forms



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Non off-site methods



Slip forming

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- Timber frame
 - Renewable material
 - Flexibility
 - Thermal
 - Dry construction
 - Speed
 - Complete package

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Why MMC?

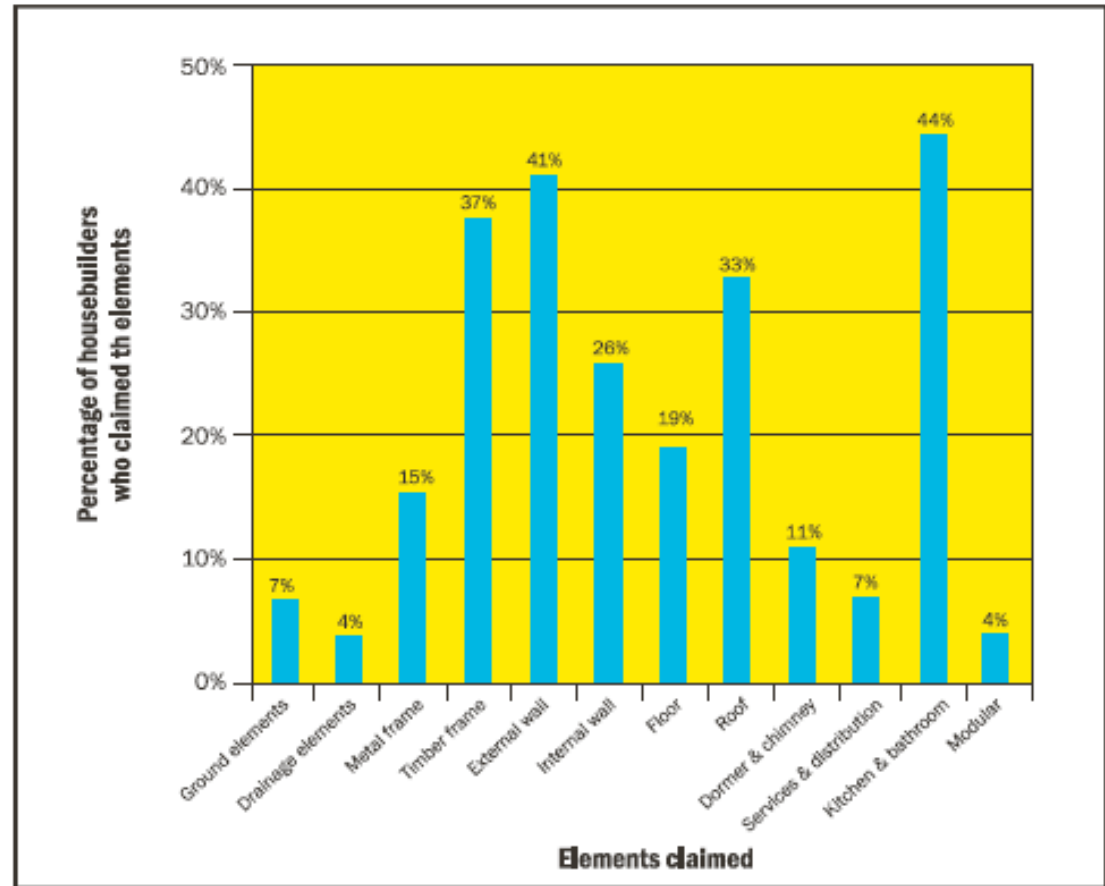
- Reduction in embodied energy used in construction
- Reduction in energy consumption;
- Reduction in water consumption;



- Reduction in construction waste;
- Reduction in defects;
- Can include facilities for recycling and the ability to make use of alternative renewable energy sources

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- Good environmental design which can add value
- Fits well into BREEAM, CSH etc
- Innovative use of volume and space
- Flexibility and adaptability
- Can provide good acoustic insulation
- Can provide good thermal insulation
- Others!

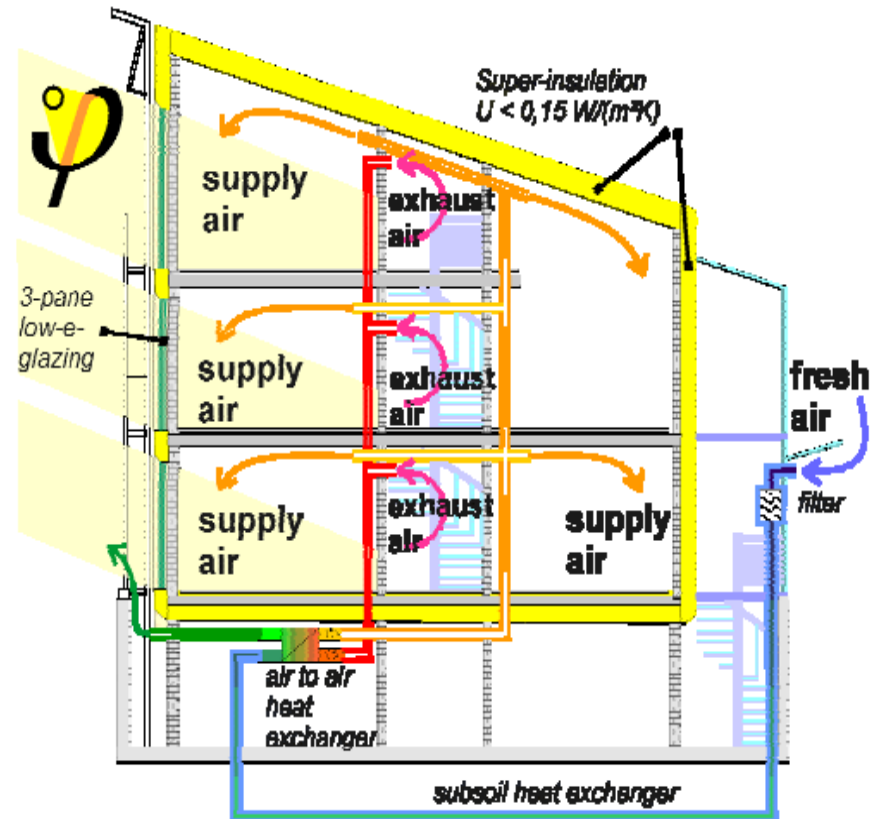


Elements which offer greatest potential for offsite MMC

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Innovative methods

- Passive design
- Native landscape
- Attention to power
- Water conservation
- Reduction of emissions
- Design for operation and maintenance
- Materials efficiency
- Design for recycling



Perhaps an intelligent approach!

Source: Passive House Institute

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Tyre bale use in embankments

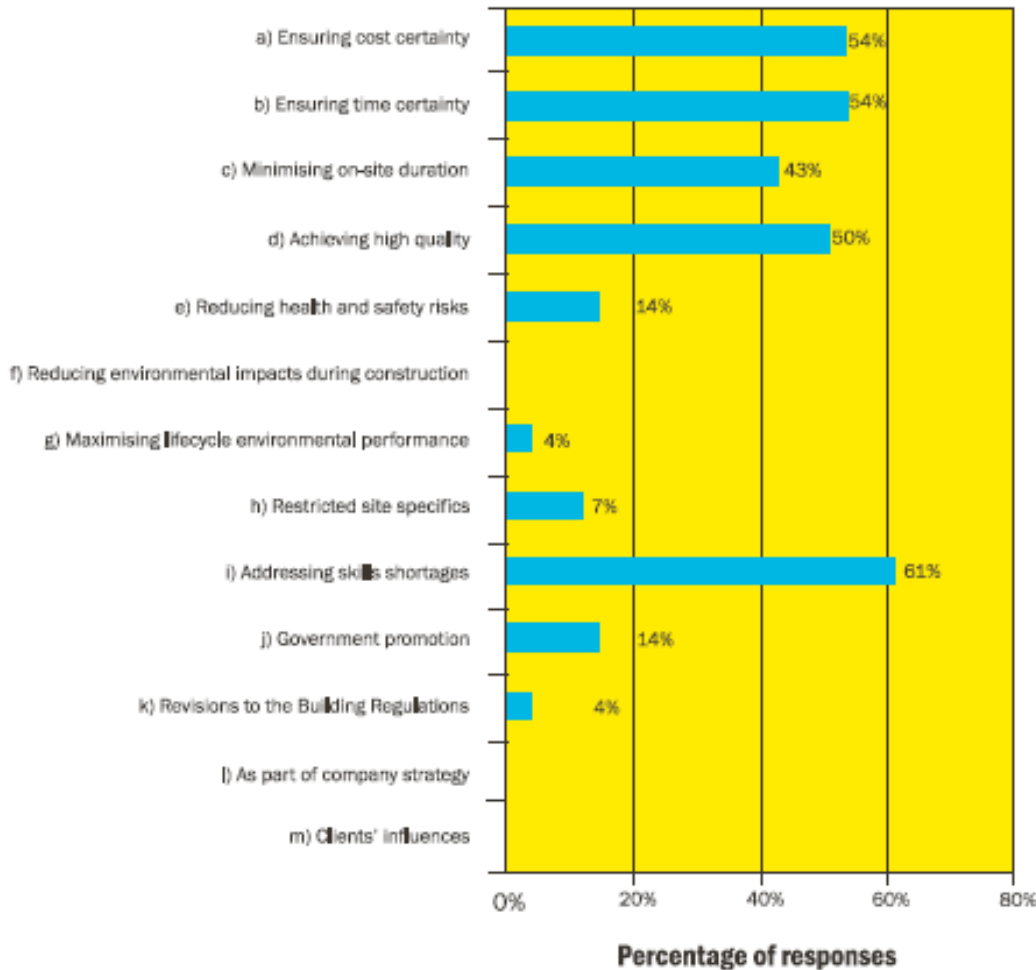


- First UK use
- Alternative to concrete
- Improved drainage and slope stabilisation
- Environmental impact reduced
- Cost and environmental benefits



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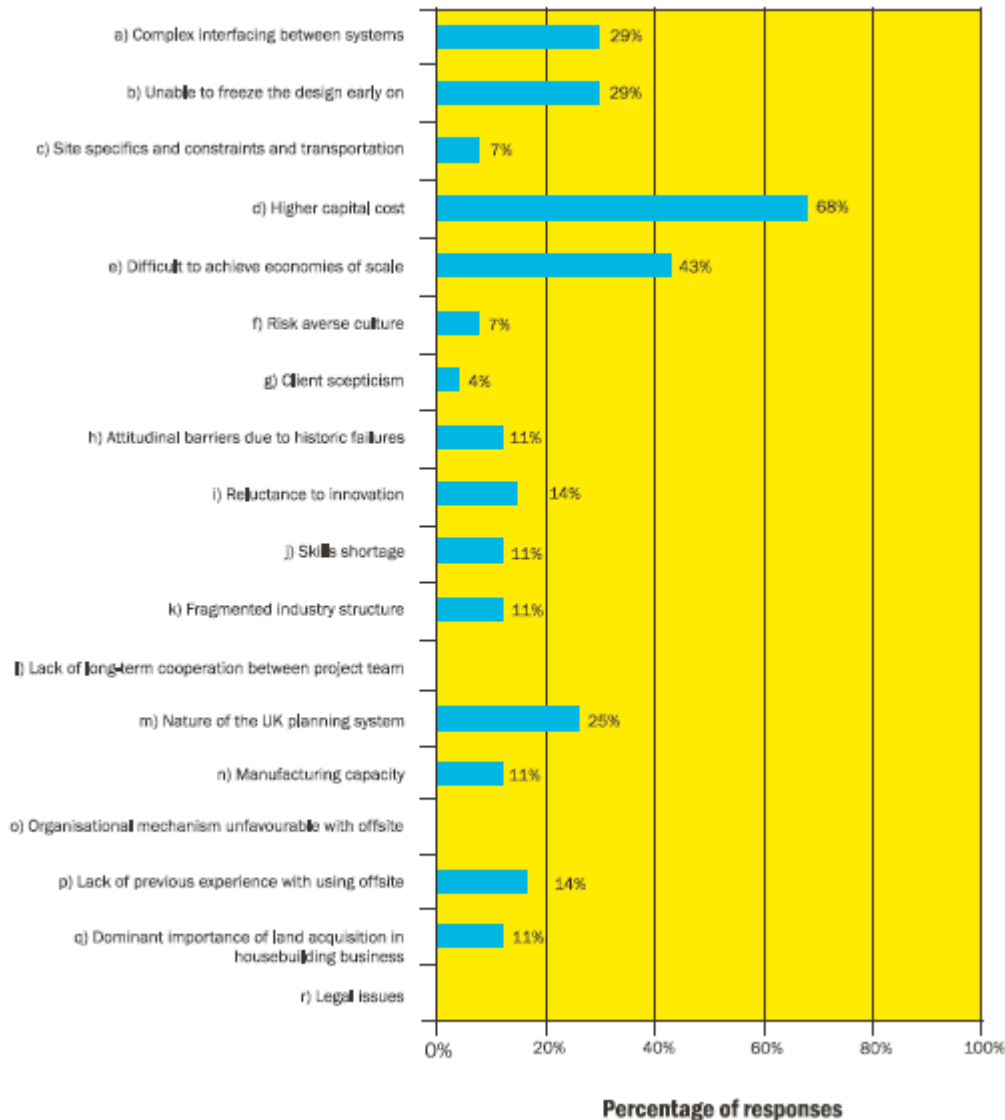
Housing market



Most important industry-wide drivers for using Offsite-MMC – the top100's view

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Housing market



Most significant industry-wide barriers against the use of Offsite-MMC – the top 100's view

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Civil engineering

Design with innovation in mind

Sustainability credentials

Meeting the needs of client and society



Life cycle analysis

Buildability

Cost benefit analysis

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Workshop

Examine the key factors that will affect MMC's role to minimise construction site waste.



Research other modern methods of construction and evaluate the challenges such methods will have on their integration with management and other technologies.

Modern Methods of Construction

References

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Passive House Institute