



LENDERS' HOUSEBUILDING CONFERENCE

Lending Policy meets House Building Reality

Modern Methods of Construction (MMC) & Eco-Building



Now & The Future



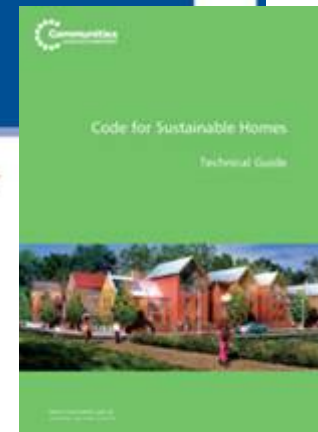
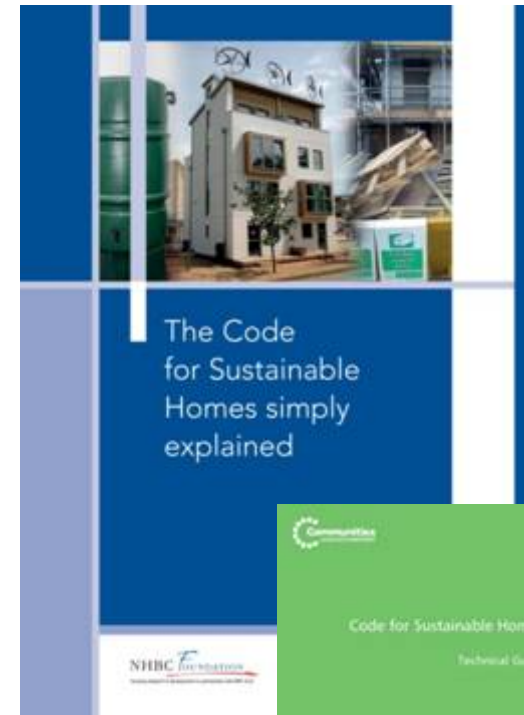
Presentation:

To Begin – Setting the Scene:

- Modern Methods of Construction (MMC) is being driven by legislation – Materials, Components & Systems are all being developed at a greater pace than ever before in the Construction Industry to provide greater Energy Efficient Buildings.
- What are the Materials, Components & Systems we have to lend on in the future?

To End – Barriers against Lending?:

- Warrantors & Insurance Risks?
- Assessment & Control?



Bench Mark – Traditional Build?

Traditional Build in the UK - Often referred to as a 'brick & block' cavity wall, but in reality the first cavity wall constructed as we know it was not in evidence until the early 1920's!

(Cavity not insulated at that time).



'Traditional' – Typical Example:

- Brick or Stone External Skin
- 50mm Cavity (Non Insulated Traditionally)
- Block Inner Skin
- Clay, Concrete or Slate Tiled Roof
- Internal Loadbearing Concrete Block Walls

(Foundations and Ground Slabs not Considered for this discussion)

Legislation Forcing Change:

Climate Change is forcing an Industry accused of being 'reluctant to change' into adopting new technologies which reduce our 'Carbon Footprint'

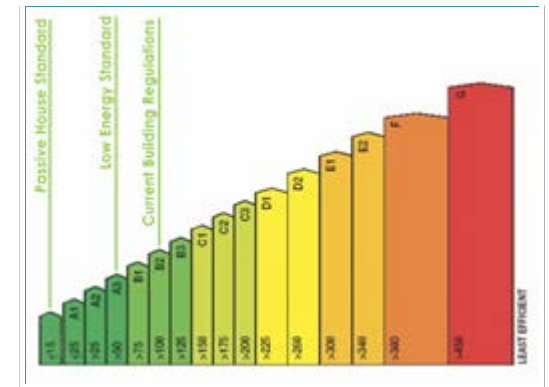


The Code for Sustainable Homes represents a 'Step - Change in Sustainable Home Building Practice'

The standard for key elements of design and construction which affect the sustainability of a new home. It will become the single national standard for sustainable homes, used by home designers and builders as a guide to development, and by home-buyers to assist in their choice of home.

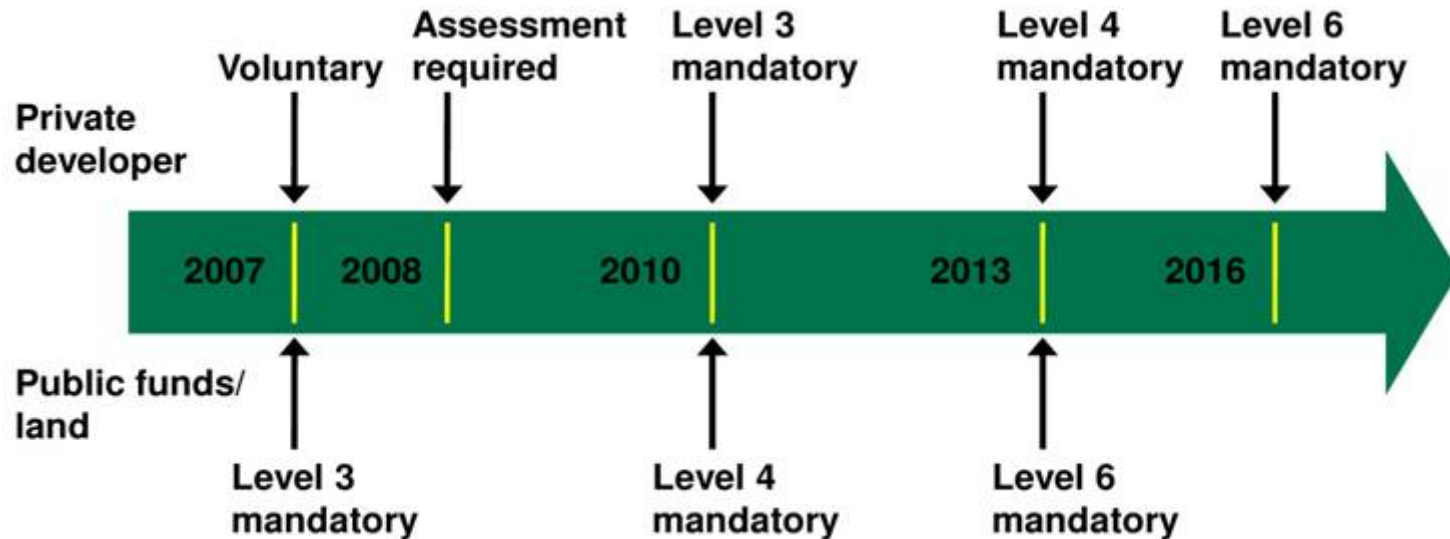


Passive House is a performance based building standard resulting in a house that consumes as little as 10% of the total heating and cooling energy used by a house built to the 2006 building code.

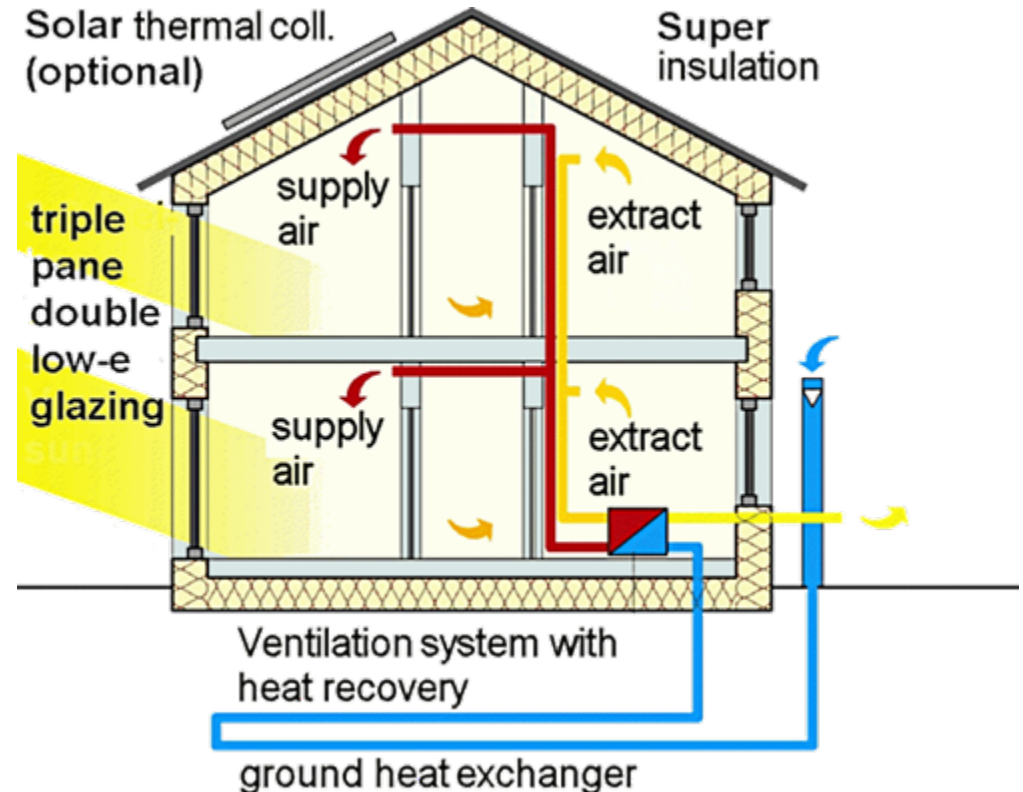


The Code for Sustainable Homes:

| Minimum Standards | | | |
|-------------------|---|----------------|--|
| Code Level | Standard (Percentage better than Part L 2006) | Points Awarded | Additional Points Required to achieve the Code Level |
| 1 * | 10 | 1.2 | 33.3 |
| 2 ** | 18 | 3.5 | 43.0 |
| 3 *** | 25 | 5.8 | 46.7 |
| 4 **** | 44 | 9.4 | 54.1 |
| 5 ***** | 100 | 16.4 | 60.1 |
| 6 ***** | A zero carbon home | 17.6 | 64.9 |



Passive House Standard (PassivHaus):



Passive buildings rely on high levels of insulation and tight control over airtightness – Buildings built to this standard can run effectively on low-volume heat recovery ventilations systems required to maintain air quality.

Definitions: MMC & Eco Building

MMC

Offsite refers to modern methods of construction which has predominantly been manufactured & assembled in a factory controlled environment



Onsite refers to modern methods of construction which brings together systems or components which are predominantly assembled onsite



Eco Building (Green Building) refers to construction methods both 'modern' & 'old' that embrace ecological & environmental building techniques, which includes 'Natural Buildings'



Systems, Components & Materials:

Systems - define methods of building or techniques which comprise the majority of a building thus defining it as a system rather than a component alone:

Timber Frame System, Steel Frame System, etc.

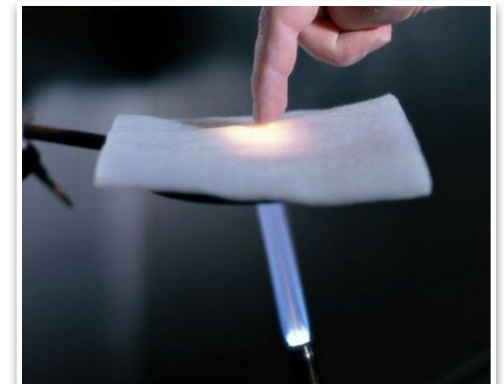


Components - parts of a building made up from singular or multiple materials which can be offsite or site assembled and can be used in a variety of 'System Types'

I Joists, Roof Trusses, SIP's Roof Cassettes, etc.



Materials - individual elements which combine to make component parts or full systems. 'New Materials' are being designed as single elements, components & the basis for full Building Systems



MMC – Offsite / Benefits:

The 'Eternal Triangle' states that you cannot alter any one facet without it directly affecting the other two.

- ❖ Quicker = More cost or less quality
- ❖ Cheaper = Lower quality
- ❖ Higher Quality = More time and money



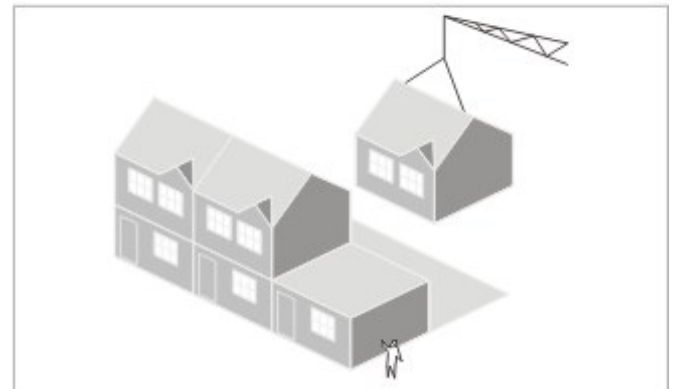
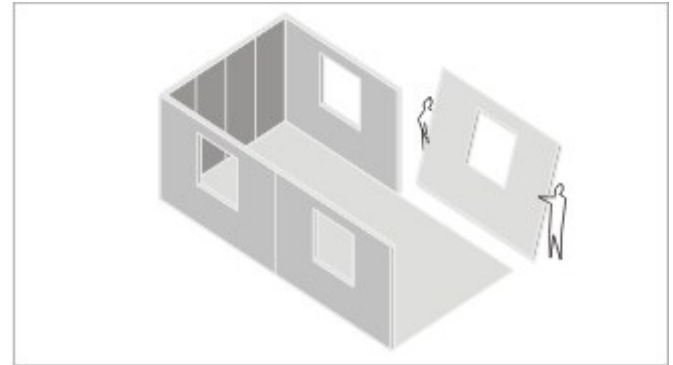
Offsite Production Benefits = Increased Quality and Reduced Time & Cost.

- 1) Reduced Prelims due to shorter time on site
- 2) Reduced Project Management costs
- 3) Reduced Professional Fees
- 4) Reduced Programme Times
- 5) Reduced Defects and Rework due to high first time quality
- 6) Reduced Wastage on site
- 7) Reduced Weather Dependency
- 8) Increased Procurement Strategies
- 9) Reduced Reliance on Transient Labour
- 10) Increased Health and Safety on Site

MMC – Offsite Types:

Panelised Construction describes the process of manufacturing & assembling components & materials to form external & internal Walling & Flooring assemblies for rapid erection on site (Panels can be fully assembled & have services pre-installed)

Volumetric Construction describes the process of manufacturing & assembling components & materials to form entire buildings or rooms which are then transported to site & erected (Rooms or Buildings can be completely finished, serviced & decorated ready for immediate occupation)



MMC – Offsite Systems (Volumetric & Panelised):

1) Timber Frame:

- Closed Cell
- Filled Cell
- Open Cell



2) Lightweight Steel Frame

- Closed Cell
- Open Cell
- Braced Frame



3) Structurally Insulated Panels (SIP's)

4) Semi SIP's (Structural Insulation & Frame)

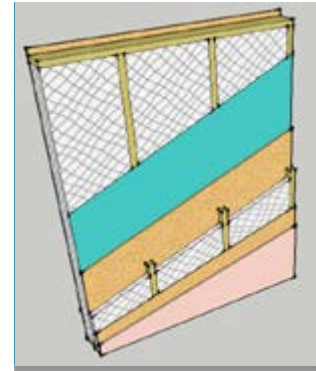
5) Multi-layered Engineered Timber (Solid)

6) Precast Concrete Panels

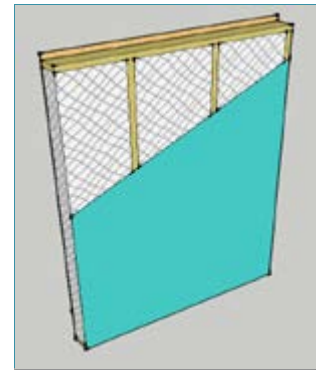


MMC – Offsite Timber / Steel Frame:

Closed Cell Systems - panels which usually have insulation, VCL, plasterboard, services & factory fitted windows (varies in complexity depending upon system type)



Filled Cell Systems - panels which are similar to Closed Cell Systems but usually do not have the internal lining board fitted (plasterboard) which enables site fitted services to be easily installed & negates damage to often fragile finishing boards

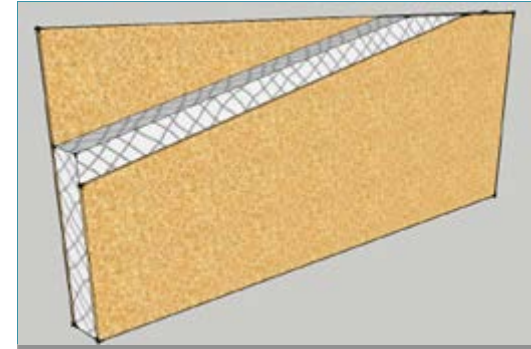


Open Cell Systems - panels which comprise the structural materials only, requiring the insulation, VCL, services & lining boards to be completed on site

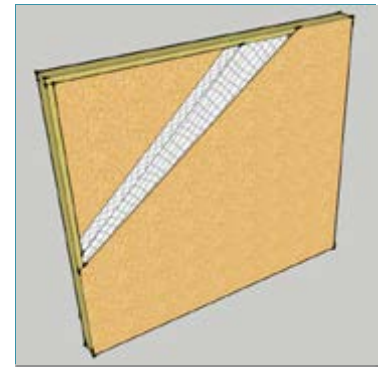


MMC – Offsite SIP's / Semi SIP's / Solid Panels:

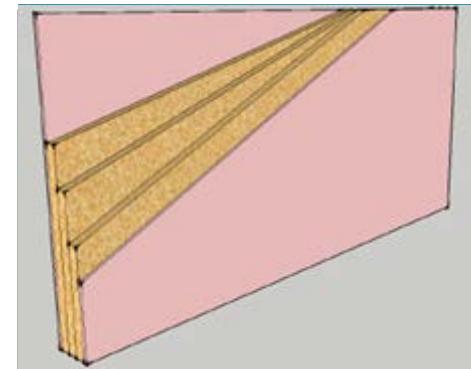
Structurally Insulated Panels (SIP's) comprise a Structural Core of Insulation which is glue bonded on each face to a racking board – Materials for the board varies with manufacturers but typically are Plywood, OSB or one of the new Composite Boards



Semi SIP's Panels comprise a Semi Structural Core of Insulation which is glue bonded on each face to a racking board but also has a Timber Framework around the perimeter of the panel and all window & door penetrations – Insulation can be Rigid or Foamed depending upon design

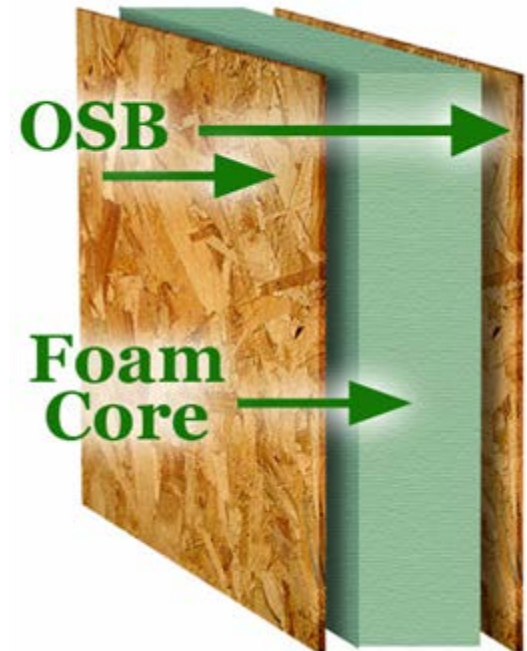
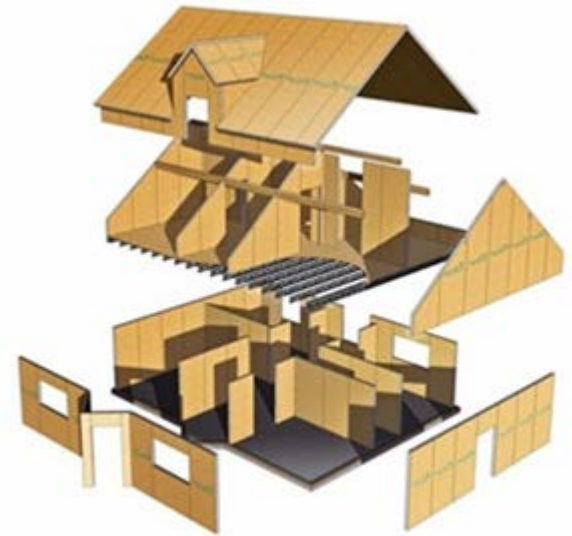


Solid Wood / Laminated Core Panels comprise a solid core of Timber or Laminated / Engineered Timber glued and bonded to form one element – Depending upon the design, this can have additional Insulation applied & factory finished





Precast Concrete & SIP's Panels



MMC – Onsite Systems:

Onsite Systems comprise many methods which benefit from the use of modern materials. As the name implies, these systems are mainly assembled or constructed 'Onsite' – The methods are many and varied, the 'Systems Approach' leads to increased speed & quality.

Typical Onsite MMC System Types:

- Stick Build Timber Frame
- Insulated Concrete Formwork (ICF)
- Thin Joint Blockwork / Clay Blocks
- Oak Framed Buildings (Site Assembled)
- Glulamined Framed Building (Site Assembled)



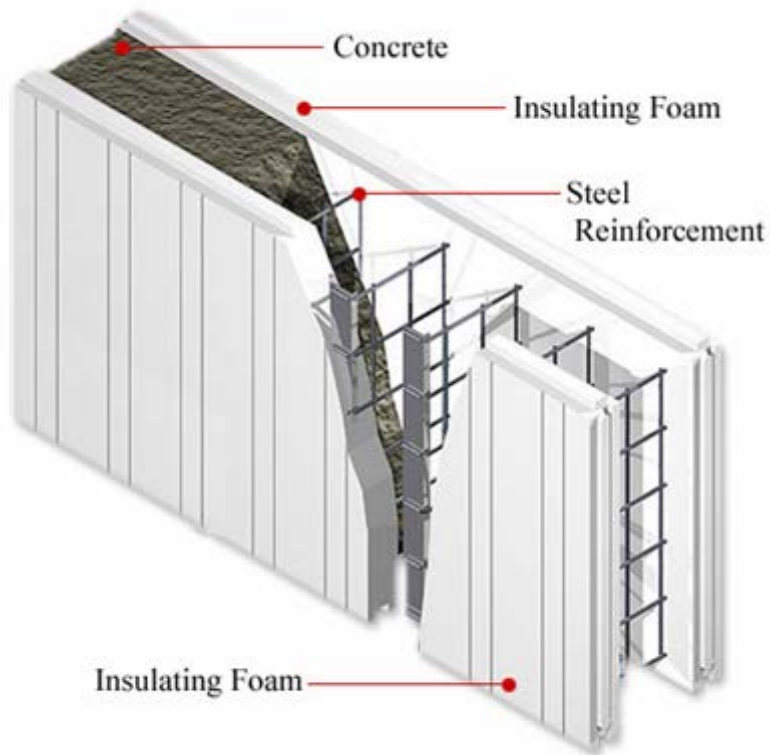
MMC – Onsite Systems:

Timber Frame – Stick Build enables ‘tight sites’ or customised ‘Site Assembly’ of timber frames to be provided, there are a number of assembly methods but essentially the end results are similar. – Often a good choice if the complexity of the required building challenges the Factory Manufacturing Process.

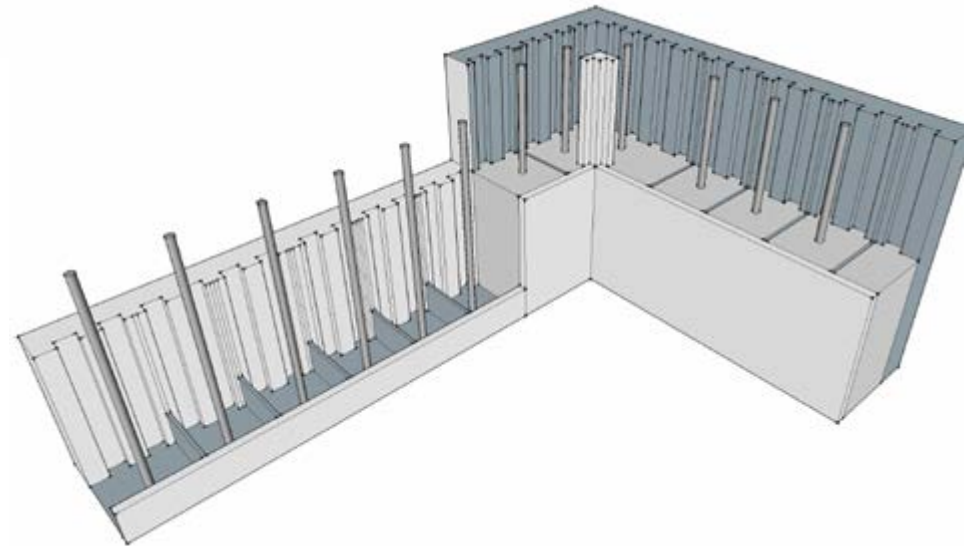


Insulated Concrete Formwork (ICF's) – Essentially a Manufactured Prefabricated Insulated Shutter which is built from individual ‘Blocks’ which are then reinforced & the voids are then Concrete Filled.





**ICF's – Insulated
Concrete Formwork
On Site MMC**



MMC – Onsite Systems:

Oak & Glulam Framed Buildings – Post & Beam type systems can still be classified as MMC as often the framework is used as the Primary Structure & Insulated Panels are used to provide the walling elements.



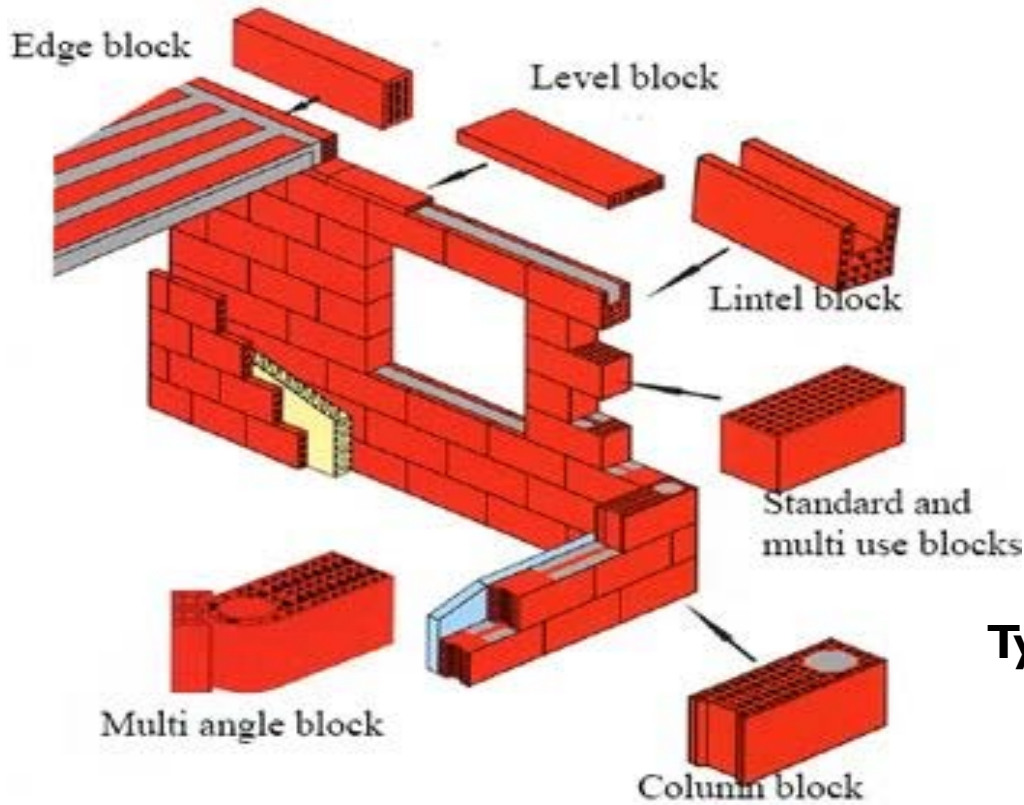
Thin Joint Blockwork & Clay Blocks – Manufactured to high tolerances which enables very thin joints between blocks to be made - Increasing the thermal performance by reducing the joint thickness & improving Air Tightness, other benefits include increased speed on site and wastage reduction.





On Site Framing Systems





Typical Lightweight Thin Joint Blockwork On Site MMC

Eco Building (Green Buildings):

Eco Buildings, Green Buildings & Natural Buildings – Range of Systems with a major emphasis on Sustainability using natural resources with minimal processing.

(This can include recycled or salvaged products, such as Car Tyres & Glass Bottles)

Typical Eco Building System Types:

- Subterranean
- Earth Sheltered (Bermed)
- Earth Buildings (Rammed Earth, Earth Bag, Cob)
- Hempcrete
- Straw
- Recycled Car Tyres & Glass Bottles (Earthship)





Eco Green Buildings



Eco Building Systems Examples:

Hempcrete & Earth Buildings (Rammed Earth, Cob & Earth Bag)

Buildings constructed using natural materials such as Hemp Stalks & Lime, Straw, Clay & Sand, and Sturdy Bags filled with Sand, Gravel & Clay or materials found locally on site.



Earth Sheltered & Bermed

Can be completely subterranean or partly above ground with part or whole of the building covered with earth usually 'bermed' against the wall panel.

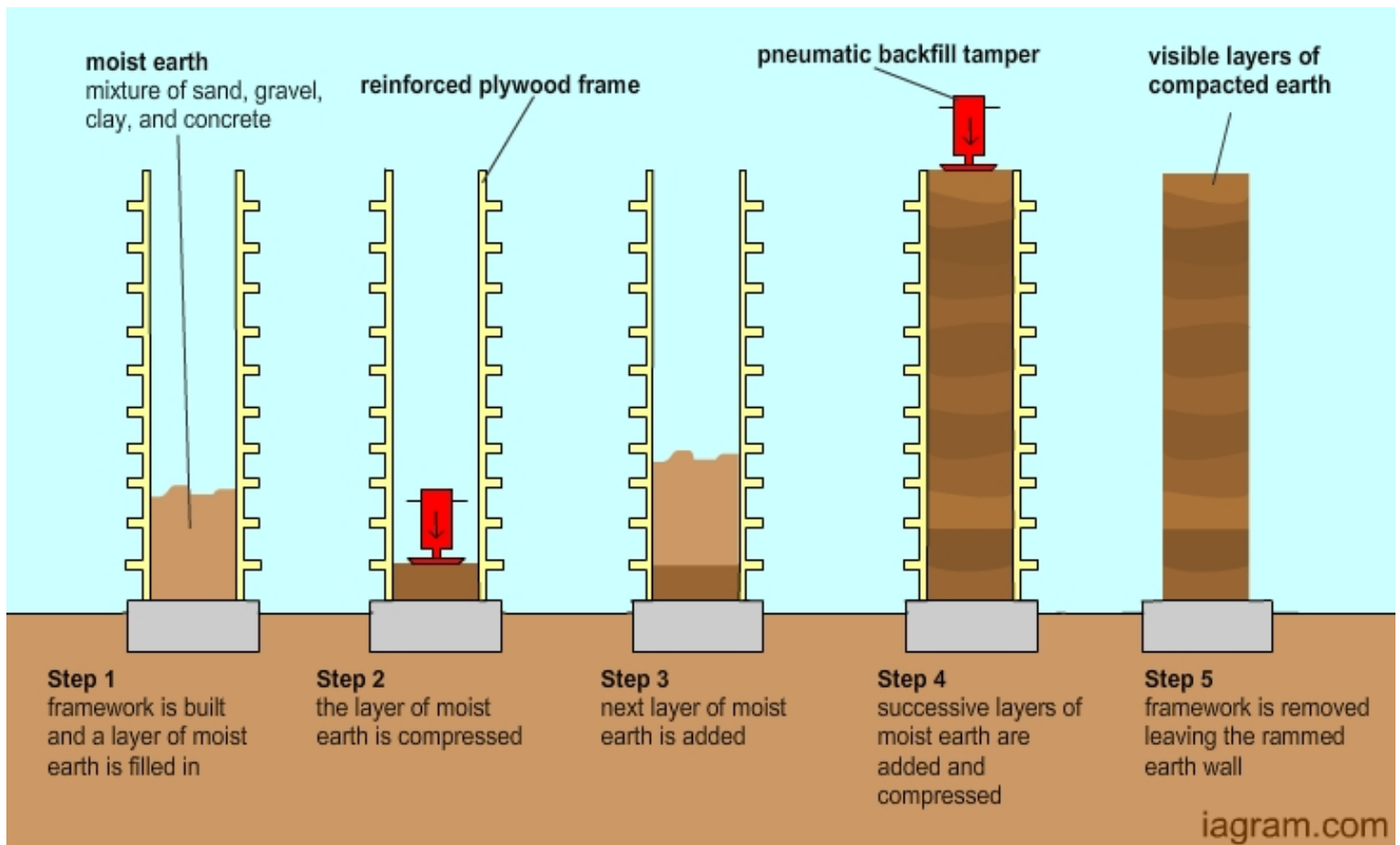
The type of structure can be varied depending upon the design.





Earth Based Green Build Systems





Rammed Earth

MMC – Components & Materials:

MMC is not limited to Systems, it embraces Components & Materials which make up the components themselves.

Components can form individual elements, or the assembly of many materials & Sub Components which can be used on a variety of System types previously looked at.

Typical MMC Components:

- SIP's Roof Cassettes
- Pre Assembled Roof Structures
- Pre Assembled Floor Cassettes
- I joists
- Box Beams
- Open Web Joists
- Trussed Rafters



MMC Flat Roofing Materials:

Flat Roofing Options:

Bituminous Felt

- The cheapest option usually installed under guarantee
- Limited life span
- Deteriorates in ultra violet light

Fibreglass:

- Built up on site, multi operation
- Bullet proof but not so flexible

Lead:

- Fantastic product and the longest life span
- But the most expensive option

Single Ply Membranes:

- Single Ply membranes (Sarnafil)
- Often used with green roof construction
- Specialist installation – fully guaranteed

MMC – Materials for the Future:

1. There are many new materials which are being specifically designed to solve many of the problems which we now face in daily construction.
2. Technology can help with the Sustainability of new construction systems by designing new materials which are deemed 'intelligent' and can function on a number of levels.
3. There are far too many new material innovations to discuss with any detail here, but it should be realised that as the speed for change increases, so does the introduction of new materials to deal with those changes.



MMC – Phase Change Materials (PCM's):

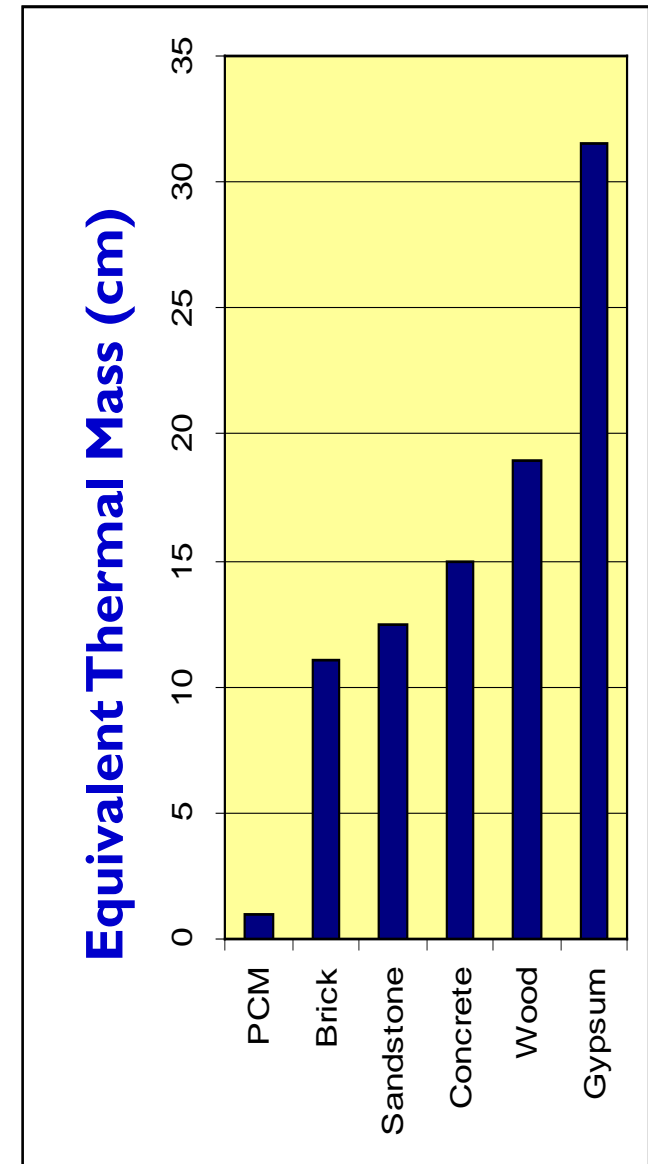
Phase Change Materials (PCM's)

Thermal Mass, as its name implies, involves using 'mass' to absorb & release heat to help regulate our buildings.

PCM's provide a lightweight solution which has been termed 'lightweight thermal mass' or 'virtual mass' and there are a number of products which are becoming mainstream.

PCM's are ones which change their phase from one state to another when absorbing or releasing energy. – Water / Ice / Water

Micro – Encapsulated Wax performs well but has to be contained & protected from fire, new PCM's are now being put in fire proof structural & non structural boards.



Source: International Energy Agency

MMC – Phase Change Materials (PCM's):

- Phase Change Materials are those which change state from liquid to solid and back again over a given temperature range and timescale. (Basically melting and freezing or vice versa from its initial state – e.g. Water to Ice).
- To be effective in domestic and commercial applications, the phasing should be geared at day and night periods and ideally have a temperature differential of 10 degrees between each for complete cycling.



- For UK climate designed here at 21 degrees and a 7 hour peak heat storage in direct sunlight on the Southern Face.

Ideal solution for lightweight structures for both cooling and heating as PCM can store heat and “coolth”.

MMC – Boards & Thin Insulation:

New Construction Boards:

With the advent of new glue & resin technologies, it is possible to formulate boards which perform on a number of levels, providing structural rigidity, fire proofing, breathability & in this photo contain Micro Encapsulated Wax PCM's.



Thin Insulations:

As the drive for thinner materials continue, insulation is a prime contender as usually additional insulation requires additional thickness.

Using Nano Technology, modern insulation materials can be thin & high performing – 10mm thick Aerogel = 20mm rigid and 50mm Glasswool



Regulation & Lending:

Generic Approval of Materials & System Types:

All building systems (whatever their make up) have to pass Building Regulations in the UK, so systems which have Generic Approval are those which in 'whole or part' are acceptable to the LA.

Other materials and systems are not necessarily precluded from meeting the Building Regulation Standards, they must provide enough back up information and warranties to prove their compliance.

Generic Approval:

1. Building Regulations set the standards which have to be met.
2. Warranties and Approvals are based on Building Regulation Compliance
3. Some lending Institutions will only lend on building covered by NHBC (Warrantors)
4. Warrantors only provide warranties on Systems with BBA and BRE approval



Regulation & Lending:

Conclusion:

1. **As Legislation forces change**
2. **Manufacturers continue to innovate**
3. **Systems continually evolve**
4. **Authorities/Warrantors become more integrated**
5. **Training skills develop**
6. **Lenders rely on improved overall standards**