
massbespoke

an overview of the system

A parametric construction system for bespoke design

MassBespoke™ is a construction system, that joins parametric design & digital prefabrication to assist self/custom home builders

In-built engineering design

MassBespoke™ has been developed in conjunction with ARUP to offer automated structural engineering design based on any faceted geometry.

High quality control

MassBespoke™ utilises CNC fabrication technology to enable ease of construction & allows distributed fabrication. Those with limited experience can build to a high quality, whilst meeting ambitious performance standards where desired, at a lower cost than traditional building methods.

Increased cost certainty

MassBespoke™ brings increased level of cost/build certainty to early design stages, making building easier to engage with.

Geometries Generated

Any given faceted form generated in BIM or other 3D software, such as SketchUp

Geometries Analysed

Digital design phase using Grasshopper plug-in for Rhino

Automated Engineering Design

Engineering design is processed automatically, including building regulations reports

Fabrication Model

The fabrication model outputs G-Code data, along with other information for fabricators

Assembly

Parts are fabricated and assembled into panels in a factory environment

Construction

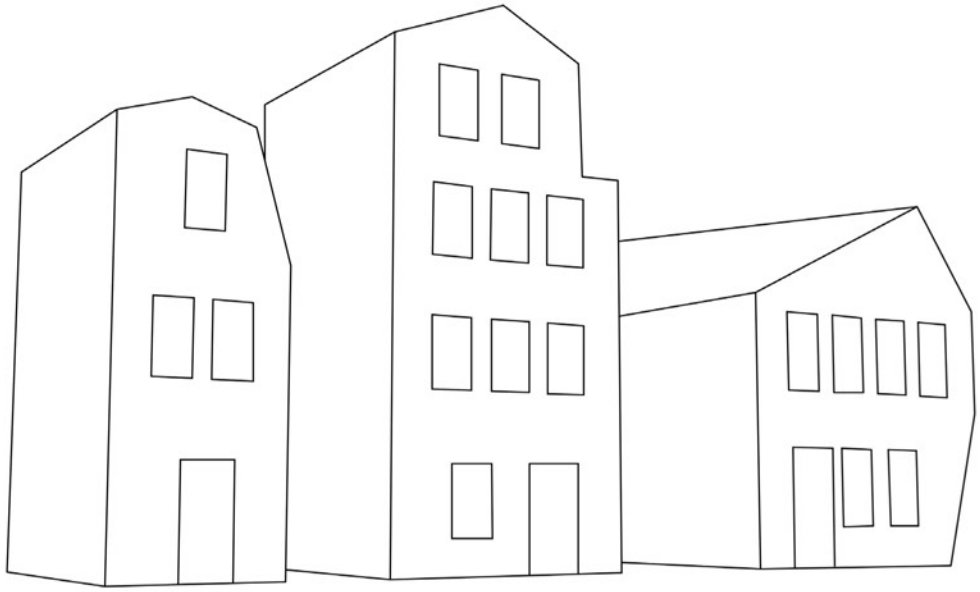
Panels are erected on site

vision and aims

Up to 4 storey structures

Infinitely variable geometric possibilities

Any CNC millable sheet material



MassBespoke™ outputs:

Performance, cost & quantity information up-front

Automated integration of engineering that responds to changes to geometries and components

4D data ready for BIM co-ordination

Automated reports for building regulation

G-code files for prefabrication of components

end users

Developers, self-builders and custom build developers

MassBespoke is suitable for one-off dwellings, or groups of houses, up to 4 storeys, but also for non-residential buildings.

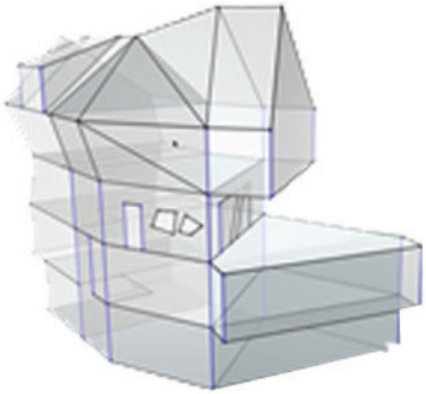
Architects

Architects will be able to use the parametric model to generate specific designs for their clients, with automated costing feedback which can inform their design choices early on.

Fabricators

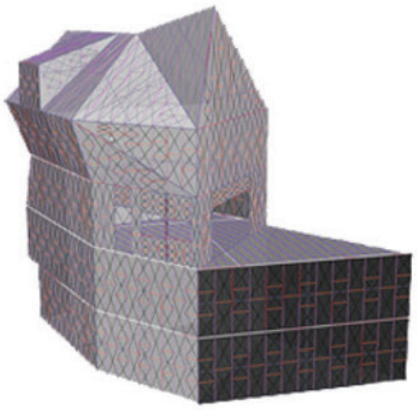
With construction technology moving ever closer to factory based fabrication, MassBespoke aims to establish a supply chain that engages an existing fabrication capacity of small workshops that are currently excluded from the wider construction industry.

how it works



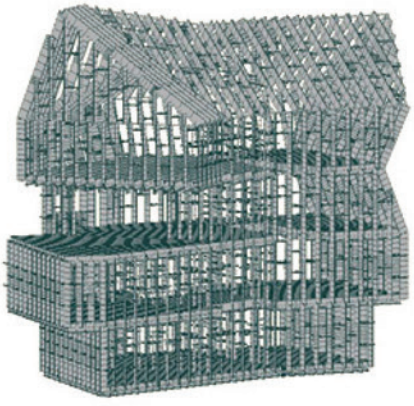
Geometry is defined

This can be carried out using widely available software, from simple interfaces such as SketchUp, to integrated BIM models



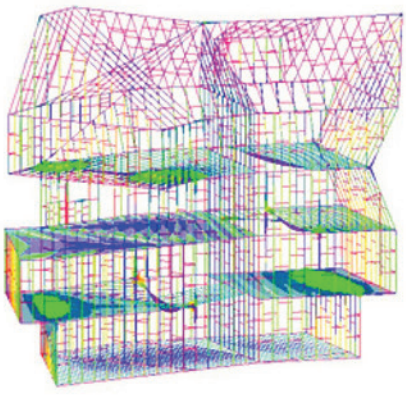
Geometry is broken down

The primary parametric model (PPM) breaks down the given form into logical structural framework



Structural elements are generated

ARUPs structural parametric model (SPM) populates the framework with structural sections



Structure is analysed and optimised

The SPM analyises structural model to determine correct section sizes

parametric integration

Primary parametric model

Concept geometry is used to generate a **structural wireframe model** from any surface model

Structural parametric model

The **structural analysis model** (SAM) runs automatically and returns results which are checked against the structural design calculations

Structural members are **automatically resized** as necessary and the model is rerun until all elements are shown to pass the **structural design checks**.

Automated reports

The structural design complies with **Approved Document A** of The Building Regulations (2010) and the system outputs these reports as an automated function.

Automated costing

Cost outputs are fed by a global database that draws **live data** directly from suppliers and feed back to the designer in real-time as the design is edited.

Fabrication parametric model

G-Code outputs are generated for CNC fabrication, along with additional information for the fabricator.

potential of the system

Respond to individual needs with bespoke design

Repetitive design does not fit with people's emotional and practical need to customise their homes and buildings. MassBespoke™ uses parametric design to achieve bespoke, modular, prefabricated houses, that can respond to varying land shape & form and overcome the constraints of repetition.

Re-think the vulnerabilities of centralised prefabrication

The high set up costs makes centralised factories vulnerable to notorious fluctuations in the construction market. However, MassBespoke could be poised to challenge this constraint by utilising a wider network of smaller scale fabricators as part of an integrated supply chain.

Using new technologies to make bespoke design affordable

Parametric design, coupled with digital fabrication methods has the potential to make bespoke home design affordable. Alongside this, new browser based platforms will enable customers to design their homes on tablets, sending fabrication orders for do-it-for-me services or lowered-skill-entry level for self-builders.

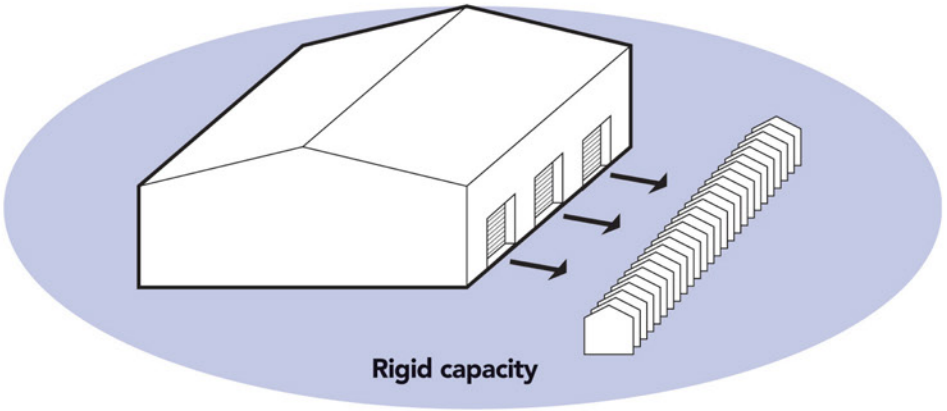
Address the need for housing

Britain is experiencing a significant shortfall of 150,000 new homes a year. To ameliorate this the government is incentivising custom- and self-build, which is simultaneously expected to encourage more diversity and innovation in the market.

disrupting the off-site industry

Utilising a wider fabrication capacity...

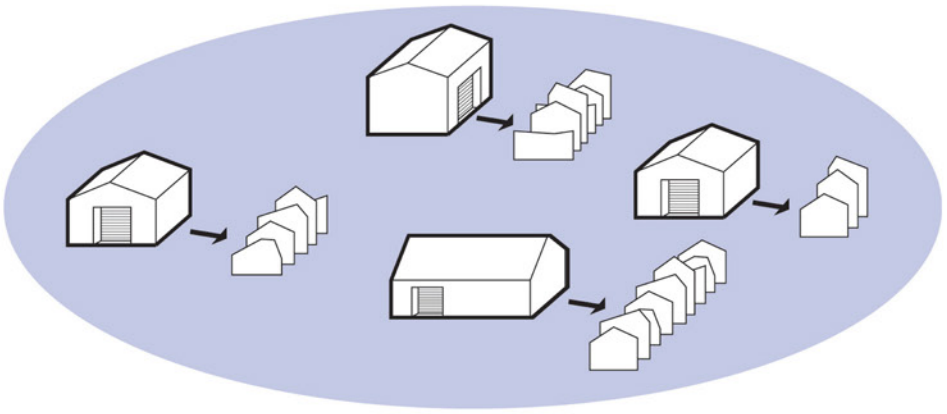
We have found that many small workshops with the means to produce MassBespoke often have fluctuating capacity in their normal workload. Our goal is to leverage this spare capacity to affordably manufacture MB panels.



Rigid capacity

... but also taking advantage of existing market efficiencies

MassBespoke utilises materials that are widely available and works with data from very simple, widely available software, such as Sketch Up, but also with data from more complex BIM programs.



Dynamic, flexible capacity

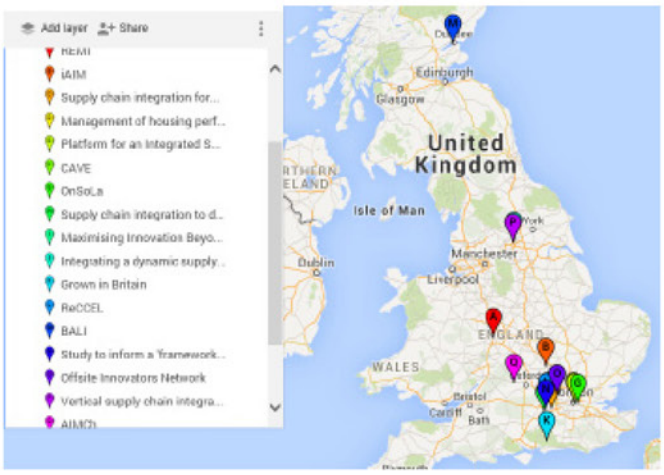
Innovate UK funding

MassBespoke™ has received three phases of funding:

- Innovate UK SMART R&D proof of concept
- Innovate UK Supply Chain Integration
- Innovate UK funded Full scale Prototype

Going forward

We are now working in partnerships with ARUP on a two year demonstrator project to build a MassBespoke house on site in Leeds by 2017.



Map of Innovate UK funded projects

We are keen to grow culture of innovation within the construction industry in the North of England as recent statistics show we are lagging significantly behind the south in this respect.

research so far Q&A

Feasibility of resources

Q: Is the time taken to generate a full iteration feasible? Are other resources needed also attainable?

A: We now have the proof of concept that the system is achievable.

Validity of outputs

Q: Is it capable of 4 stories? Is the output valid for building regulations ?

A: We now have Proof of Concept that the structure can be 4 storeys high and that structural calculations can be generated automatically to the satisfaction of Building Control.

Capability to meet variants

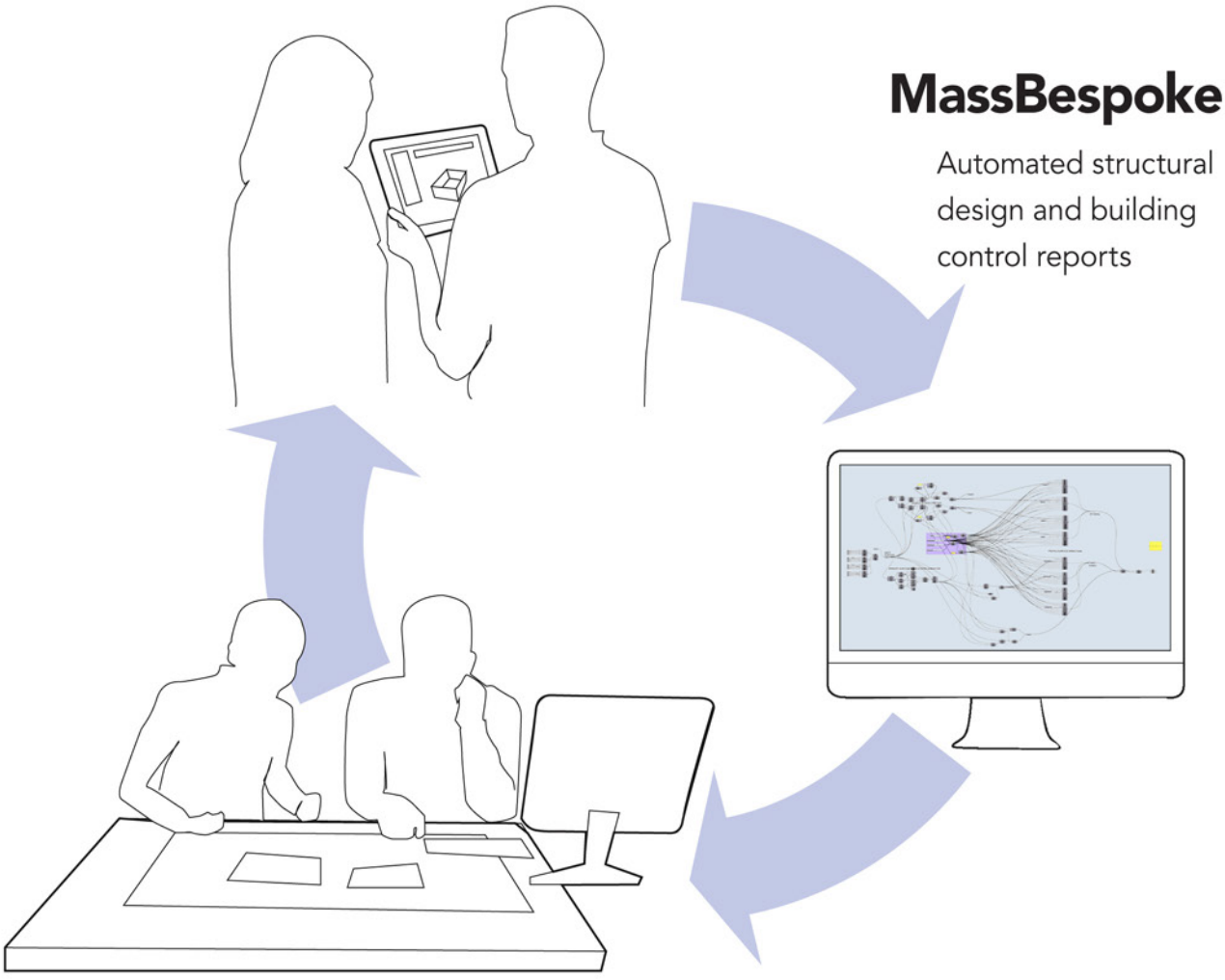
Q: How flexible is it?

A: We have tested great many variants - the system will be able to adjust to unique requirements of sites and customer.

engaging with custom build

Configurator

MassBespoke is well suited to be offered as an integrated part of a custom build configurator software



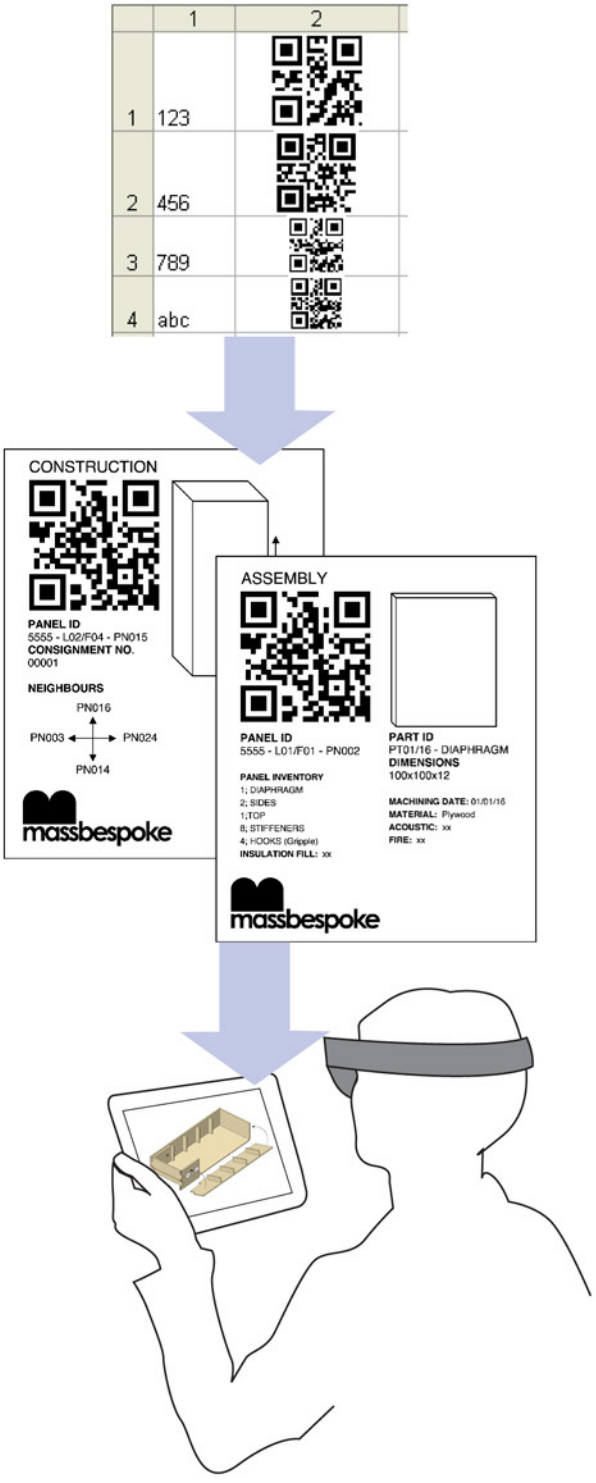
MassBespoke

Automated structural design and building control reports

Design decisions

Automated costing feedback in real-time to inform design decisions

engaging with automation



Automated excel outputs using flux.io

QR codes are generated based on data that is output by the Fabrication Parametric Model (FPM).

Labels for parts and panels

Labels are generated and fixed to panels to assist in the assembly and construction processes.

Assembly aided by augmented reality

The QR codes link fabricators to augmented reality assembly instructions, which can be also be applied in the construcution stages.

massbespoke collaborators

Concept design and product development by:

BaumanLyons ARCHITECTS

Engineering design and development by:

ARUP

Other collaborators include:

BASF We create chemistry

NVELOPE MAKING CLADDING HAPPEN

GRIPPLE

ISO CHEMIE

Norbord