Enabling collaboration in offsite construction

Residential Hub meeting

JCB

25.02.2020
Agenda

- 13:30 – Welcome
- 14:00 – 14:10: Chair Introduction to the session – Tom Eshelby
- 14:10 – 14:45: Flagship Group presenting their progress to date and strategy for MMC delivery – Andrew Yuill, Director of Business Growth
- 14:45 – 15:00: Teesside University presenting their research project on “Putting people at the heart of future social housing design & manufacture” – Professor Paul van Schaik
- 15:00 – 15:20: Audience discussion – How we measure ‘quality’ of housing, with specific reference to the DfMA revolution. How do we improve on status quo to match tenant hopes?
- 15:20 – 15:30: Comfort Break
- 15:30 – 15:50: Osco Homes to present their business model for low cost manufactured housing and how they train and recruit ex-offenders to deliver their projects – Gwen Beeken, MD of Osco Homes
- 15:50 – 16:15: Helen Greig, Project Director at Building Better to present how they are aggregating demand among Housing Associations to optimise the path to MMC delivery for those members
- 16:15 – 16:30: Questions and summary of audience feedback
Our MMC progress so far and strategy for MMC delivery

Residential Hub
25 February 2020
4 homes in Newmarket...

30 manufacturers...

1 academic report...

1 3D printed bridge...

1 firm of architectural consultants...
Agenda

Context – introducing Flagship Group

Why are we interested in MMC?

Progress to date

Issues / questions we face

Our strategy
Context – a brief introduction to Flagship
31,000 homes across East of England
£220m turnover, 70% from social housing letting
1,200 local people employed
‘not for profit’
700+ new homes
£60m maintaining homes
Our housing stock

- Low rise – 2 or 3 storey houses or blocks of flats
- Rural / market towns
- Buying c70% of our affordable stock from developers under S106
- Development sites of 25-300 homes
- Regeneration – estates and garage sites
- 22 different local authorities – huge variety in planning requirements
Why are we pursuing MMC?
Housing Associations compared to commercial developers

According to a major landowner….

- HA build costs typically 25% higher
- Sales values 5% lower
- Overheads 10% higher
- Professional fees 400% higher
- Finance costs 200% higher
- HA contingency usually 3-5% but zero (declared!) for commercial developers

- BUT – HA’s don’t need to build at sales pace; can build at construction pace
“Architects like Frank Lloyd Wright and Walter Gropius believed passionately in the life-enhancing potential of prefabrication as a sustainable housing system. In other words, as a means to more means, not the devalued and impoverished architecture-of-the last resort that came to be associated with prefabs. Today, with this new market opening up, we are once again at the forefront of engineering new ways of living.”

Ima Ebong
What are we looking to achieve?

• Improved quality – S106 acquisition issues
• Greater sustainability / environmentally better
• Moving towards net carbon zero
• Improved energy efficiency – reduced costs for our customers
• Quicker build times and improved timetable certainty
• Workforce availability (& improved gender balance)
• Better working conditions, fewer accidents
• Lower build costs
• To be ambitious, bold, at the forefront, to do it better, to do the very best for our customers
Progress to date
Research

• Review of previous MMC experience (houses built in the 'noughties')

• 2017 UWE research paper

• Multiple manufacturer / site meetings and visits
  • UK first
  • 2019: widened to Europe (Germany, Netherlands, Sweden) and Japan

• Team drawn from Development, Housing, Asset Management, Business Growth, Finance, IT, working with Surface to Air
Building Better

- Part of the NHF Creating Our Future innovation programme

- Bringing Housing Associations together to aggregate their MMC efforts

- Flagship was part of the original team in 2018 … now umming and ahing about whether we join

- Will Housing Associations play together well?
  - Are we ready to accept standardisation at scale?
Newmarket – A Pilot
Newmarket – A Pilot
Newmarket – A Pilot

- Specific issues we encountered
  - Think MMC from the outset
  - Cost v ‘traditional’ build methods
  - Pre-manufactured proportion
  - Supply chain
  - QA in the factory
  - Site access requirements
  - Selection of main contractor and contractor relationships
  - Use an architect with experience of MMC and retained for post-contract works

- 4 Shared Ownership homes – all sold on day 1
Issues we face, questions we have to ask
MMC is commonly perceived as an ‘all or nothing’ construction option. In reality there is a sliding scale for the client to choose from when utilising MMC – from 10% to 100%.
Asset

- Performance of the asset
- Maintenance – training for repairs staff
- Standardisation – producing a detailed spec
- Accreditations

Finance

- Cost
  - Do we build fewer at higher cost / quality?
- Procurement
- Borrowing against the properties we build and retain
Cultural change

- Board support?
- Development reticence?
- Change management required
- Are these houses not for sale products?
- Planners’ views

Implementation

- Construction management and contractual arrangements
- Use of BIM / VR
- Training (staff and users)
- Immaturity of the UK market
- Own manufacturing facility? Arms length buyer? Partnership?
Funders

• Retail mortgageability vs our funders’ attitudes
• Is it the funders or the valuers?
• Bond investors more accepting
• Work is going on to address the situation
Our strategy
Our strategy

• Committed to using MMC on all land-led developments from 2023/24, unless there is a good reason not to
• Additional garage/ infill and regeneration sites
Potential MMC build programme*

*excludes major regeneration & infill sites
Our strategy

- Committed to using MMC on all land-led developments from 2023/24, unless there is a good reason not to
- Additional garage/ infill and regeneration sites
- Not distinguishing between ‘affordable’ and open market sale homes
- Creating an outstanding living experience for our customers, cheaper to run
- Moving towards net carbon zero
- A number of decisions we still have to make / issues we face
Questions?

andrew.yuill@flagship-group.co.uk
PUTTING PEOPLE AT THE HEART OF FUTURE SOCIAL HOUSING DESIGN AND MANUFACTURE

Professor Nashwan Dawood (Principal Investigator)
Professor Paul van Schaik (Co-Investigator)
Dr Sergio Rodriguez (Co-Investigator)
Dr Huda Dawood (Co-Investigator)
Dr Joao Patacas (Research Associate)
Mr Atif Hafeez (PhD Researcher)
THE TRANSFORMING CONSTRUCTION NETWORK PLUS

The Transforming Construction Network Plus is funded by UK Research and Innovation through the Industrial Strategy Challenge Fund.

The N+ unites construction’s academic and industrial communities to create a new research and knowledge base, dedicated to addressing the systemic problems holding back the sector.

The N+ is a joint project between UCL, Imperial College London and WMG, University of Warwick.

More information about the N+ can be find:
PROJECT AIM

- **Project aim:** to systematically integrate user experience (UX) and design parameters in the design of social housing
- **User experience:** the extent to which residents’ needs are fulfilled as the result of living in their home
- **Research question:** how can user needs be systematically incorporated in housing design?
THE DESIGN SPACE OF SOCIAL HOUSING

- The design space
- Identifying factors in the design space
- Mapping factors in the design space
- Prioritising factors in the design space
- Prioritising mappings in the design space
- Representing the design space
THE DESIGN SPACE

Attributes:
the how-question

Values:
the why-question

Value creators:
the what-question
IDENTIFYING FACTORS IN THE DESIGN SPACE BY INTERVIEW – METHOD

- **Aim**: identify values/UX factors, value creators and design factors and their relationships
- **Background**: literature review
- **Design**: laddering interview
- **Participants**: social-housing tenants, social-housing providers, architects, off-site construction manufacturers, others
- **Materials**: description, images and drawings of a social-housing development
- **Procedure**: working from the middle out (Moghimi et al., 2016)
  - Systematic procedure
  - Identified value creators are followed up with values/UX factors and design factors
- **Data preparation**: transcribe relevant answers
IDENTIFYING FACTORS IN THE DESIGN SPACE BY INTERVIEW – METHOD (2)
IDENTIFYING FACTORS IN THE DESIGN SPACE BY INTERVIEW – METHOD (3)
IDENTIFYING FACTORS IN THE DESIGN SPACE BY INTERVIEW – METHOD (5)

• **Value creators**
  • “Can you tell me *what* the indoor environment of the house should provide to if you were living in it?”

• **Values/UX factors**
  • “Can you tell me *why* this is important to you?”

• **Design attributes**
  • “Can you tell me *how* you think this can be achieved?”
IDENTIFYING FACTORS IN THE DESIGN SPACE BY INTERVIEW – ANALYSIS

• From the answers, identify value creators, values/UX factors and design attributes

• Use coding categories from literature review where appropriate and create new codes otherwise

• For each value creator, identify related UX factor(s) and design attribute(s)

• Record results in NVivo

• Example of interview coding
<table>
<thead>
<tr>
<th>UX factors</th>
<th>Frequency</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Privacy</td>
<td>7</td>
<td>&quot;The house looks like the minimum standards, not flexible, each piece of space is constraint to the purpose. This adds pressure to people, in terms of not having options to use their space. Also space is needed if people want to do separate activities - lack of space makes people like they're on top of each other.&quot;</td>
</tr>
</tbody>
</table>
| Safety & Security | 6        | • Creating safe spaces for parking.  
• Reduce street space and increase pedestrian space.  
• Safe space for children. |
<p>| Mental health  | 5         | &quot;Interaction and engaging is important. Evidence show that families together have better mental health, factor in stress, and wellness. Kitchens opened to the living room reduce these factors.&quot; |
| Family        | 3         | “Space to live and eat for the family members and provide opportunities to spend time with the kids.&quot; |
| Social        | 3         | “Provide opportunities to convene together&quot; |</p>
<table>
<thead>
<tr>
<th>Name</th>
<th>Frequency</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sufficient storage space</td>
<td>9</td>
<td>“Lack of storage space can lead to frustration and disorder”</td>
</tr>
<tr>
<td>Flexibility of the use of living space</td>
<td>6</td>
<td>“People like to stay in the same place”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Starter home vs. home for life: e.g. “for a young couple a 2-bedroom house would be enough, but as families grow, so do their space requirements”</td>
</tr>
<tr>
<td>Natural light</td>
<td>4</td>
<td>“As much light as possible, bigger windows”</td>
</tr>
<tr>
<td>Layout</td>
<td>4</td>
<td>“Different families have different preferences and life style younger families prefer more modern houses; older families prefer traditional design/layout.”</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Different cultures/religions need to be catered for</td>
</tr>
<tr>
<td>Aesthetic appeal</td>
<td>3</td>
<td>“Aesthetically pleasing and attractive house leads to pride in where you live.”</td>
</tr>
<tr>
<td>Design Factors</td>
<td>Frequency</td>
<td>Example</td>
</tr>
<tr>
<td>-----------------------------------</td>
<td>-----------</td>
<td>---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Interior Storage</td>
<td>9</td>
<td>“Typical storage provided in social housing is not sufficient (e.g. storage under the stairs). Dead spaces can be considered for additional internal storage. Purpose-built structures can be considered for external storage.”</td>
</tr>
</tbody>
</table>
| Ventilation design                | 7         | “Airy space in summer, ventilated space in winter  
Example: Positive Input Ventilation system to reduce/avoid dampness”                                                                                                                                 |
| Consideration for quality public space  | 6         | “External or defensible space not clearly defined, and not appropriate for family houses.”  
Need to consider:  
• Safety for pedestrians;  
• Clear pavements, limit parking within house space (one car per house);  
• Creating safe spaces for parking;  
• Reduce street space and increase pedestrian space.” |
| Bathroom                          | 5         | “Number of bathrooms depend on size of household. Consider walk in showers for elderly residents.”                                                                                                      |
| Density of space                  | 5         | “Feeling of being on top of each other. In typical housing each piece of space is constraint to the purpose. This adds pressure to people, in terms of not having options to use their space.”  |
# REPRESENTATION OF THE DESIGN SPACE

<table>
<thead>
<tr>
<th>UX factor</th>
<th>Pride to live in house</th>
<th>Pleasure/stimulation</th>
<th>Experienced comfort</th>
<th>Well-being</th>
</tr>
</thead>
<tbody>
<tr>
<td>Value creator</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Design attribute</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Aesthetic appeal of exterior</td>
<td>Maintenance effort/time</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Use of colour in house</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>exterior materials</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>External architectural features</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
CONCLUSION

• Laddering interview
  • Identify values/UX factors, value creators and design attributes
  • Map values/UX factors, value creators and design attributes
• Analytical hierarchy process survey
  • Prioritise factors
  • Prioritise mappings
• Representation of design space
• Approach explicitly links users’ needs with building performance and housing design
SMALL-GROUP EXERCISE: WHAT DOES ‘QUALITY’ MEAN IN SOCIAL HOUSING?

• **Background**: three-dimensional design space
  • **Design attributes**: aspects of the actual building design or building design requirements
    • **Example**: size of windows
  • **Value creators**: aspects of actual building performance or building performance requirements
    • **Example**: natural lighting
  • **Values**: actual user experience or user needs
    • **Example**: well-being
WHAT DOES ‘QUALITY’ MEAN IN SOCIAL HOUSING? – INSTRUCTIONS

- **Before answering** the questions
  - In the top-left hand corner of your work sheet, write the **business types** that are represented in your group –
    - $H =$ housing association; $A =$ architecture; $M =$ manufacturing
  - **divide** the separately provided work sheet into three columns to record your answers:

<table>
<thead>
<tr>
<th>Question 2: user needs</th>
<th>Question 1: building performance</th>
<th>Question 3: design attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

- **Images** of a social-housing development are provided separately
- **When answering** the questions, imagine and bear in mind how residents would live in this social-housing development
WHAT DOES ‘QUALITY’ MEAN IN SOCIAL HOUSING? – QUESTION 1

• **What** should the indoor environment of the house provide to its residents?
• Produce **a few answers** as you find useful before going to the next question
• **Record** your answers in **Column 2**

<table>
<thead>
<tr>
<th>Question 2: user needs</th>
<th>Question 1: building performance</th>
<th>Question 3: design attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Natural lighting</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
WHAT DOES ‘QUALITY’ MEAN IN SOCIAL HOUSING? – QUESTION 2

- **Follow up each of your answers** to Question 1 regarding building performance by answering the following question.
- **Why** this is important from the perspective of social-housing tenants?
- **Record** each of your answers in **Column 1**
- **Connect** each answer in **Column 1** with your linked answer(s) in **Column 2**

<table>
<thead>
<tr>
<th>Question 2: user needs</th>
<th>Question 1: building performance</th>
<th>Question 3: design attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well-being</td>
<td>Natural lighting</td>
<td></td>
</tr>
</tbody>
</table>

Teesside University CATAPULT Energy Systems
**WHAT DOES ‘QUALITY’ MEAN IN SOCIAL HOUSING? – QUESTION 3**

- **Follow up each of your answers** to Question 1 regarding building performance by answering the following question.
- ***How* can this be achieved?**
- **Record each of your answers** in **Column 3**
- **Connect** each answer in **Column 3** with your linked answer(s) in **Column 2**

<table>
<thead>
<tr>
<th>Question 2: user needs</th>
<th>Question 1: building performance</th>
<th>Question 3: design attributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well-being</td>
<td>Natural lighting</td>
<td>Size of windows</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Placement of windows</td>
</tr>
</tbody>
</table>
WHAT DOES ‘QUALITY’ MEAN IN SOCIAL HOUSING? – BEFORE WE START

• Any **questions**?
• Taking part in the exercise is **voluntary**
• The **information** that you provide on the work sheets will be analysed **confidentially** only by the research team
• Please **raise your hand** if you would like to take part
XXXXX XXXXX

- XXXXXX Xxxxx
- XXXXXX Xxxxx
- XXXXXX Xxxxx
- XXXXXX Xxxxx
The Beginning

• Analysis of different offsite technologies
• Costs & build times
• DfMA

• Single contractor, field to handover
• Time & cost certainty
• NHBC & HCA requirements
Osco Homes

- Design led to intelligent supply chain facilitates mixed skill build
- Quality controlled
- Field to front door solution
- If a bin lorry can get there, so can we!
- Comparable(?) cost to traditional construction
- Faster?
- Reduced re-offending to <6% against national average of 60%
St Hilda’s

Location
Leeds, West Yorkshire

Time-lapse build
Over 3x days
“My new home is nice and cosy, I would recommend an Osco House 100%”

• Mia Fay Maudson

“The speed and quality achieved as the homes came together towards the end of the project was impressive”
Skills & People

- Skills shortage
- Construction Strategy, Construction leadership council - offsite
- SMEs
- Quality
### Skills & People

#### HMP Hindley

<table>
<thead>
<tr>
<th>Total number engaged in factory</th>
<th>Completed 6 months training</th>
<th>Employed by Osco</th>
<th>Supported into alternative employment</th>
<th>Referred to LEG</th>
<th>Re-offended</th>
</tr>
</thead>
<tbody>
<tr>
<td>75</td>
<td>19</td>
<td>6</td>
<td>6</td>
<td>5</td>
<td>1</td>
</tr>
</tbody>
</table>
Ideas to Construction
Develop the Brief
Visualise
Visualise
Flexible internal design

Jurby Avenue, Blackley

Model Types

Option 1: GIFA= 70sqm
- Separate Kitchen/Dining from Living Room
- 1 x Double Bedroom and 1 x Twin bedroom Layout 1

Option 2: GIFA= 70sqm
- Joint Kitchen/Dining and Living Room with single door
- 1x Double Bedroom and 1x Twin Bedroom Layout 2

Option 3: GIFA= 70sqm
- Joint Kitchen/Dining and Living Room with separate doors
- 1x Double Bedroom and 1x Twin Bedroom Layout 3
Production Engineering
Manufacturing Packs
Factory Manufacture
Factory on a Site
What Next?
ZERO Carbon

NEVER STOP IMPROVING

Increase PMV

OSCO
Website

Great big bedrooms provide plenty of space for little monsters to play.

Osco Homes works in an entirely new way. We deliver tomorrow’s housing solutions today, uniting new thinking, engineering expertise and the latest technology.
Ensuring quality sits at the heart of the home-building process through collaborating from concept to completion

@BuildingBetterX
What we’ll be covering

- What is Building Better?
- Primary ambition: pipeline aggregation & how we’ll get there
- Wider ambition: better design & better data
What is Building Better?
5 people
100 interviews over 4 months

@BuildingBetterX
1 idea

Housing associations can become lead housebuilders within a generation
3 aims achieved by HAs working together

1. Deliver more homes with MMC
2. Reduce operating costs by using data effectively
3. Happier tenants involved in the design process
Team of 1.5
- Full time project director
- Part time project manager
We work in partnership with Mark Farmer & Cast Consultancy
1 road map setting out the BB vision & how we’ll get there produced in partnership with Cast
We’ve pitched BB up & down the country

9 housing associations committed
Pilots are testing the road map
Primary ambition: sign deal with manufacturer (& how we’ll get there)
Places for People bets £100m on modular housing

Investment represents a "huge vote of confidence" in modern prefabs, says Homes England

Places for People announces £100m modular homes deal

750 units will be purchased under the partnership to develop affordable and market-priced housing.

FINANCIAL TIMES

@BuildingBetterX
Building Better consortium to procure minimum of 500 homes from manufacturer (June 2020)
How we’ll get there

1. Scale of the opportunity
2. Product & specification
3. Market engagement
4. Legal structure
Scale of the opportunity
Product & specification
Market engagement
Legal structure
How we’ll get there

1. Scale of the opportunity (January)
2. Product & specification (end of February)
3. Market engagement (February-June)
4. Legal structure (February-June)
Wider ambition: better design & better data
Design event with Ilke
Data event with Amazon
Get involved
Questions

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jay.mistry@rhp.org.uk
@jaymmistry