

The logo for Laing O'Rourke is centered at the top of the slide. It consists of a black rectangular background. Inside this rectangle, the name "LAING O'ROURKE" is written in white, uppercase, sans-serif font. The text is positioned between two horizontal lines: a yellow line above and a red line below.

LAING O'ROURKE

DfMA Alliance Launching & CITAC Conference  
DESIGN FOR MANUFACTURE AND ASSEMBLY  
A NEW MODEL FOR CONSTRUCTION

19 MARCH 2019

ALAN CLUCAS FICE. DIRECTOR EXPLORE MANUFACTURING

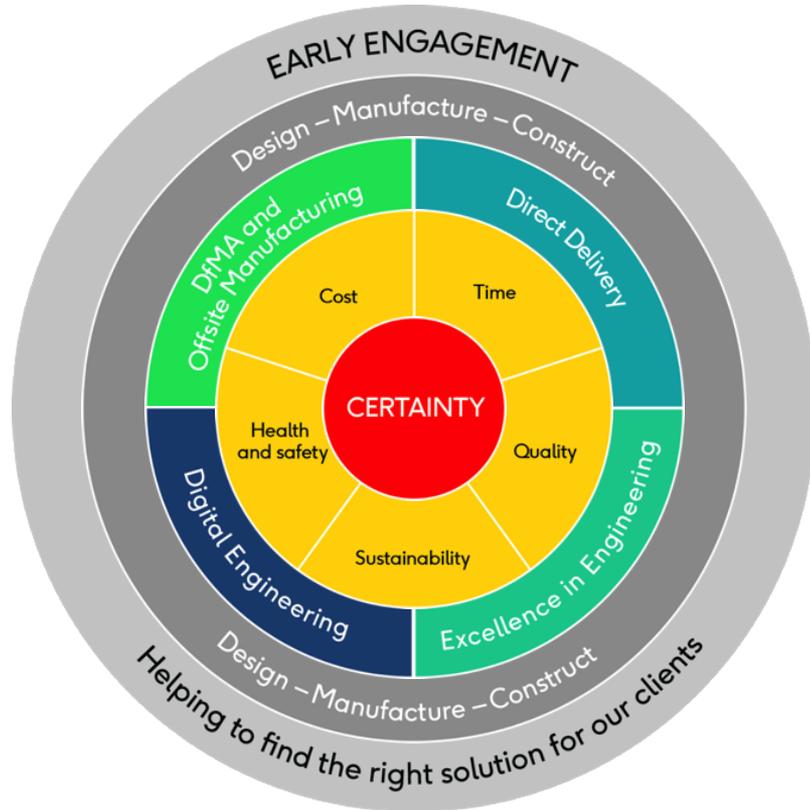


# A New Model for Construction



# The Laing O'Rourke Approach – Our Operating Model

Driving Certainty Into Construction – Delivering Unique Solutions As An Engineering Enterprise

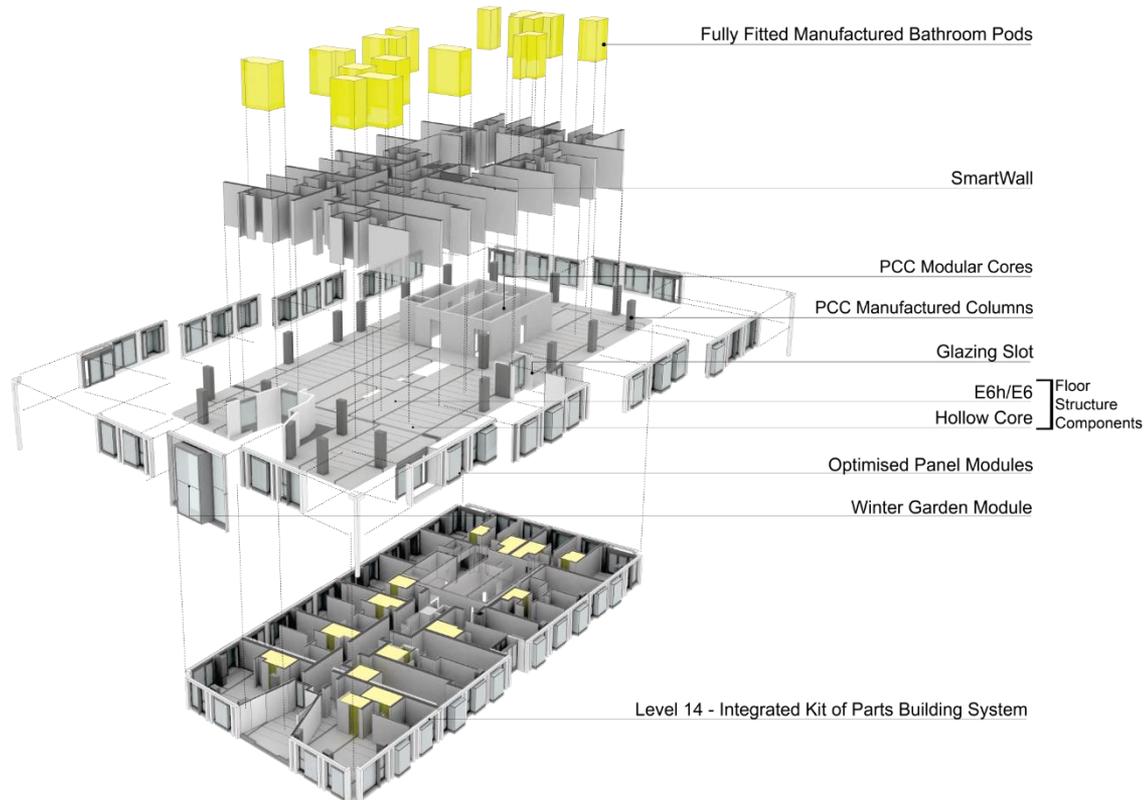


- Collaborative **early engagement** into projects to influence solutions upstream
- Deploy a consistent **operating model** & **management system** to guide delivery methodology
- Drive **four key enablers**:
  - Design for Manufacture and Assembly (DfMA) & Offsite Manufacture
  - Direct Delivery
  - Digital Engineering
  - Excellence in Engineering



# Construction Becomes Assembly

A "Kit of Parts" Approach



## Driving DfMA & Offsite Advantages onto Projects

- Delivery programme reductions
- Reduced workforce required on site

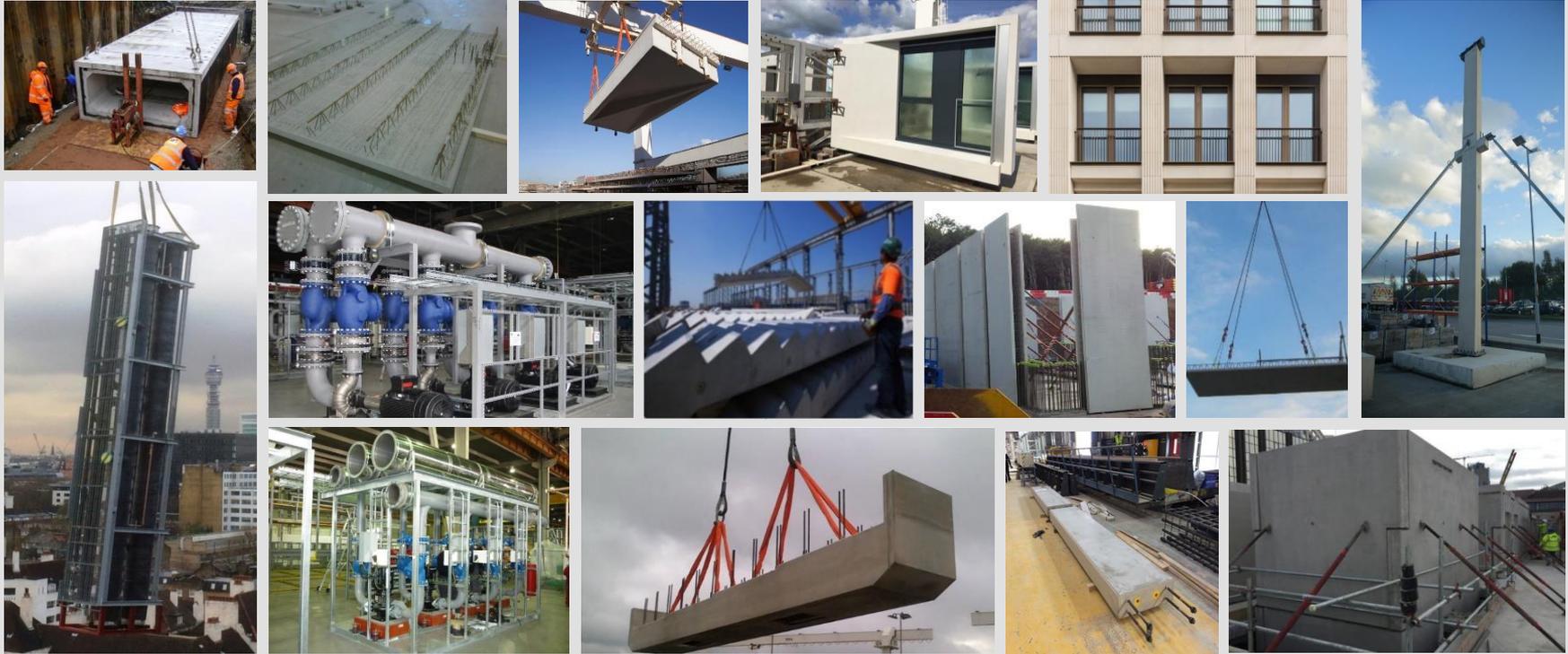
*Additionally....*

- Improved safety
- Factory quality control delivered
- Risk & uncertainty reduced
- Construction waste control & reduction
- Reduced on-site noise & disruption
- A positive shift to factory based jobs
- Distribution of economic activity away from major cities & hubs
- Reduced water consumption



# DfMA – A Kit of Parts Approach Enabling Bespoke Outcomes

A wide array of manufactured building products to suit all sectors – growing to suit emerging demands



# Our manufacturing capability

Portfolio of innovative brands



Crown House



Select



Vetter

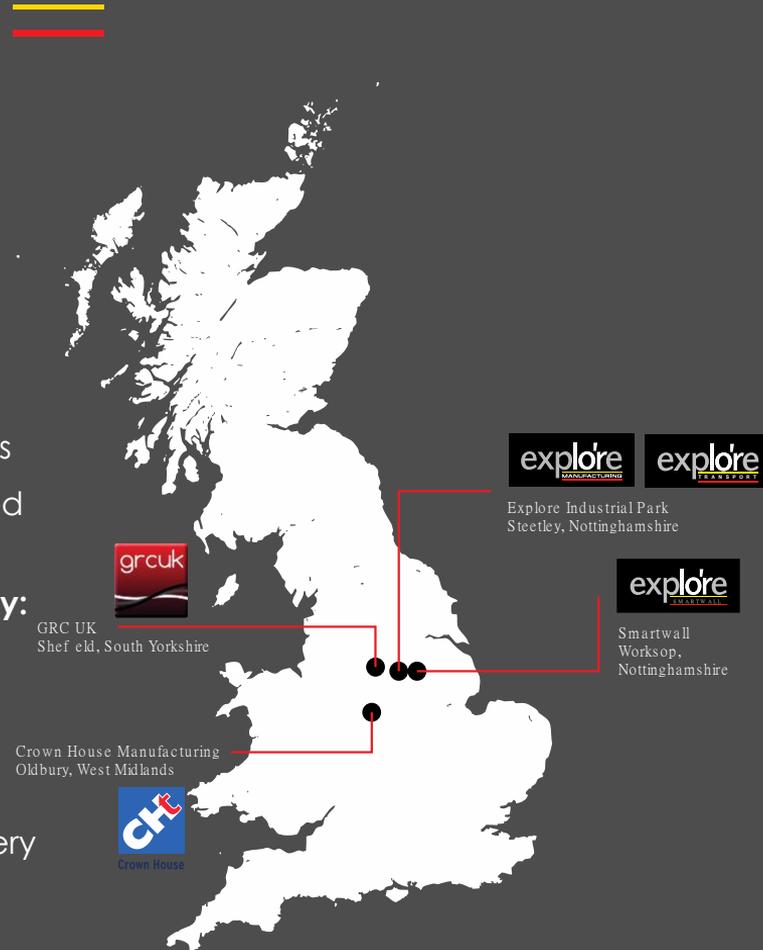


# Explore Manufacturing

## Locations and capability

Comprises 5 businesses

- **Explore Manufacturing, Steetley:** Structural and architectural concrete solutions
- **Explore Transport, Steetley:** JV between LOR and Stobarts for logistics
- **Smartwall, Worksop:** Modular serviced internal serviced partitions
- **Crown House Manufacturing, Oldbury:** Offsite manufactured MEP modules
- **GRCUK, Sheffield:** Glass fibre reinforced concrete lightweight facades
- All Midlands located to ensure delivery in one day to all major conurbations



## Explore Industrial Park

30 acres developed on 215 acre site

Most modern concrete products factory in Europe opened in 2009

400+ jobs created since opening

85% of workforce recruited locally

75% of raw materials sourced within 50 miles of plant

Investment to date exceeds £150m

Manufacturing apprentices recruited annually

Excellent relationships with local schools



Explore Industrial Park Fly through

# Smartwall.

Modular internal walling products



# CHtM and Smartwall

Bathroom pods – Residential, Medical, Industrial



# CHtM and Smartwall

Services / Utility Cupboards



# CHt Manufacturing.

Plant rooms, boiler skids, pump assemblies, distribution & bathroom pods



CHt Manufacturing established March 1995.





# The Implementation of Laing O'Rourke's Offsite Manufacturing Strategy





# Product Development and Testing

Trials, prototypes and systems tests underpinning confidence



Nuclear industry



Superstructure



Joint strength



Manufacturing trials



Fire performance



# Digital Engineering Enables the Operating Model

A Single Central Digital Asset





# A Total Logistics Solution

Explore Transport Ensures Timely Delivery to all Projects



Customised fleet carries bespoke products



Nationwide logistics command centre



Digitised component tracking





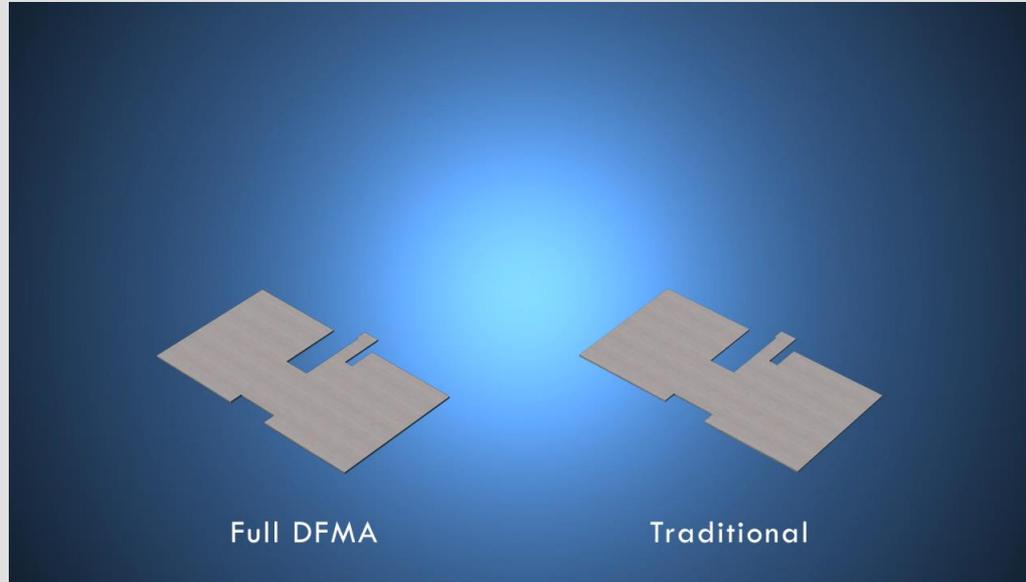
# Our Operating Model in Delivery

Construction case studies



# Residential Developments

New Mid-Market Solutions





# Two Fifty One, Southwark – Optimising DfMA on Mid-Rise, City Centre Residential Developments



**Delivering high quality projects at significant scale with high proportion of manufactured products**

**41 storey residential tower**

- GIFA 36,500m<sup>2</sup>
- 335 apartments

**Project Value:** £120m

**Programme:** 176 weeks

**Client:** Oakmayne/ECA Developments

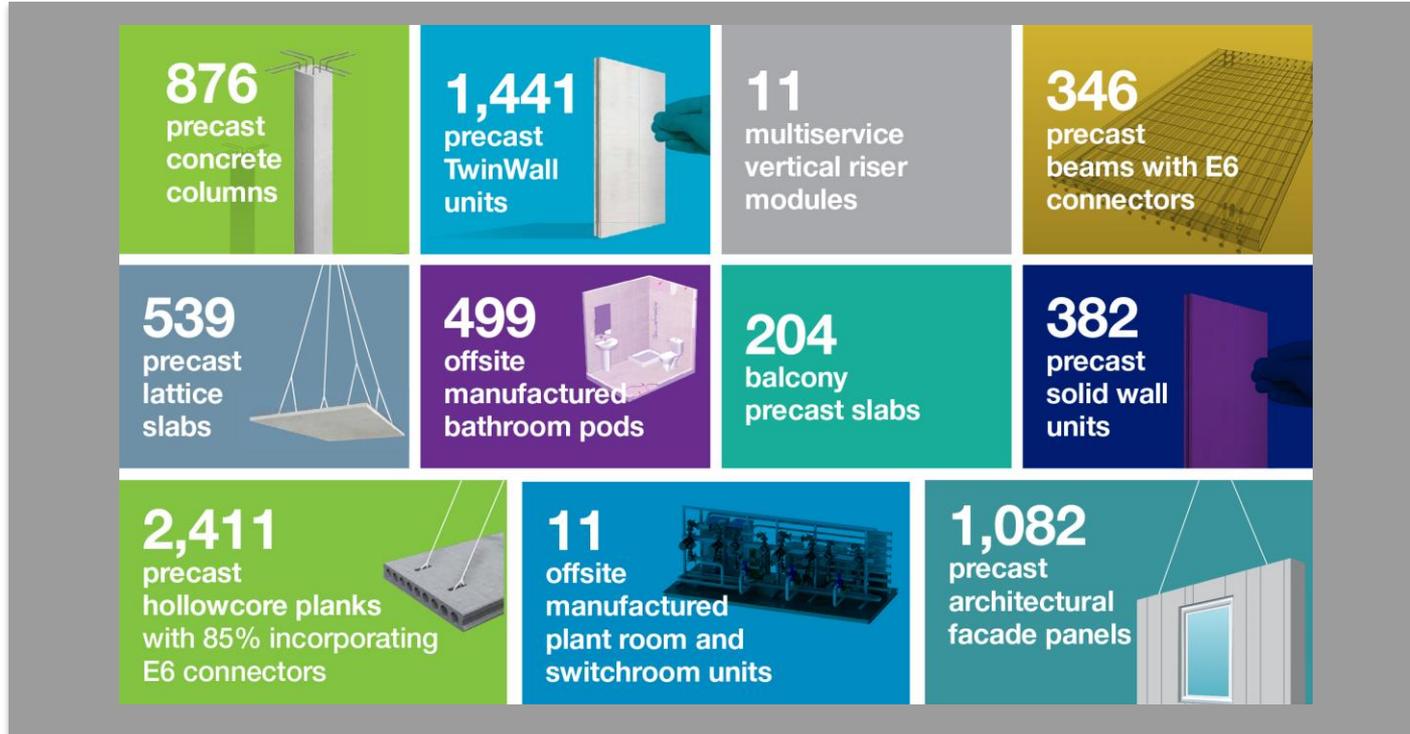
**Architect:** Allies & Morrison

**SMEP Engineer:** Waterman



# Two Fifty One, Southwark

## Component count



# Two Fifty One, Southwark





# Oxford Westgate

Twinwall core / hollowcore plank





# Oxford Westgate

Brick slip facade





# Oxford Westgate

Brick Slip Facade





# Oxford Westgate

## Productivity



- 4 times the size
- 3 operatives
- 1 crane driver
- no scaffolding
- 40% faster completion

38,000t embodied carbon saving

24 bricklayers, full scaffold



# Grange University Hospital

Cymbran, Wales





# Grange University Hospital

## Structure



**1200** Twinwall panels  
**216** Solid walls



**1590** Lattice planks



800 single storey columns reduced to **614**

- Double height
- 140 casting drawings
- 20 main column types



Delta beam and hollowcore

All collaboration and approvals executed in digital BIM environment. (Building Information Modelling)

- BDP Architects
- WSP Engineers
- EIP PDET (Precast Design & Engineering Team)



# Grange University Hospital

## Facades



**774** Sandwich panels  
3 types by mix & finish  
20 types by geometry  
and window openings

Design complete and  
fully integrated before  
manufacture.

**8** panels per day.





# Sir Henry Royce Institute, Manchester

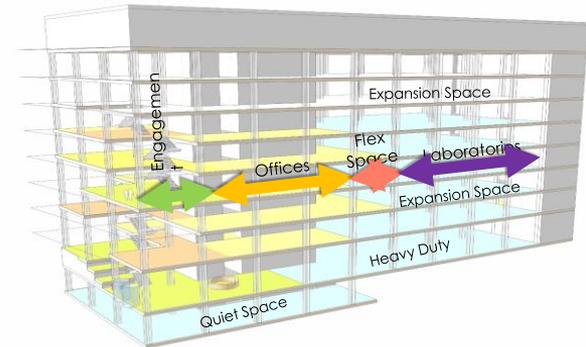
'The Crick' of the North.



**Client: University of Manchester,**  
**completion Feb 2020 £225m**

Post doctoral research facility. 16000m<sup>2</sup> building.  
Laboratories - M4DE, AMP, 2D Nano, Biomedical, Chemical & Nuclear Materials, and 3D Printing

Early Engagement with the client from RIBA Stage 2.



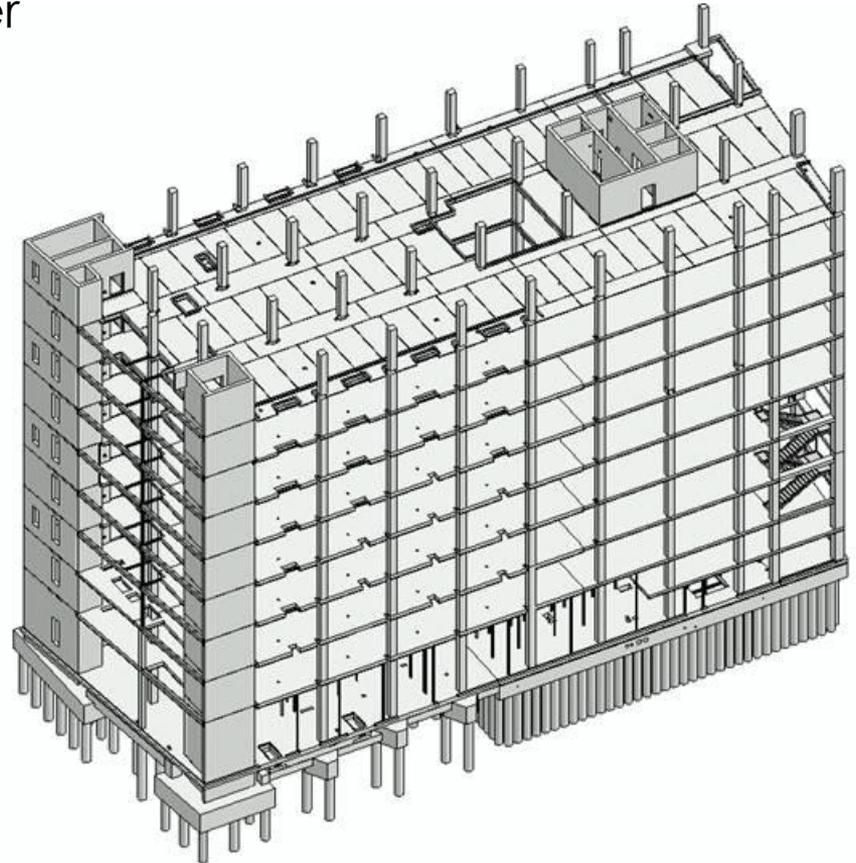


# Sir Henry Royce Institute, Manchester

Pre-cast manufactured frame – Product led design

Early engagement and collaborative working with Ramboll has delivered highly coordinated optimised 'product led' design:

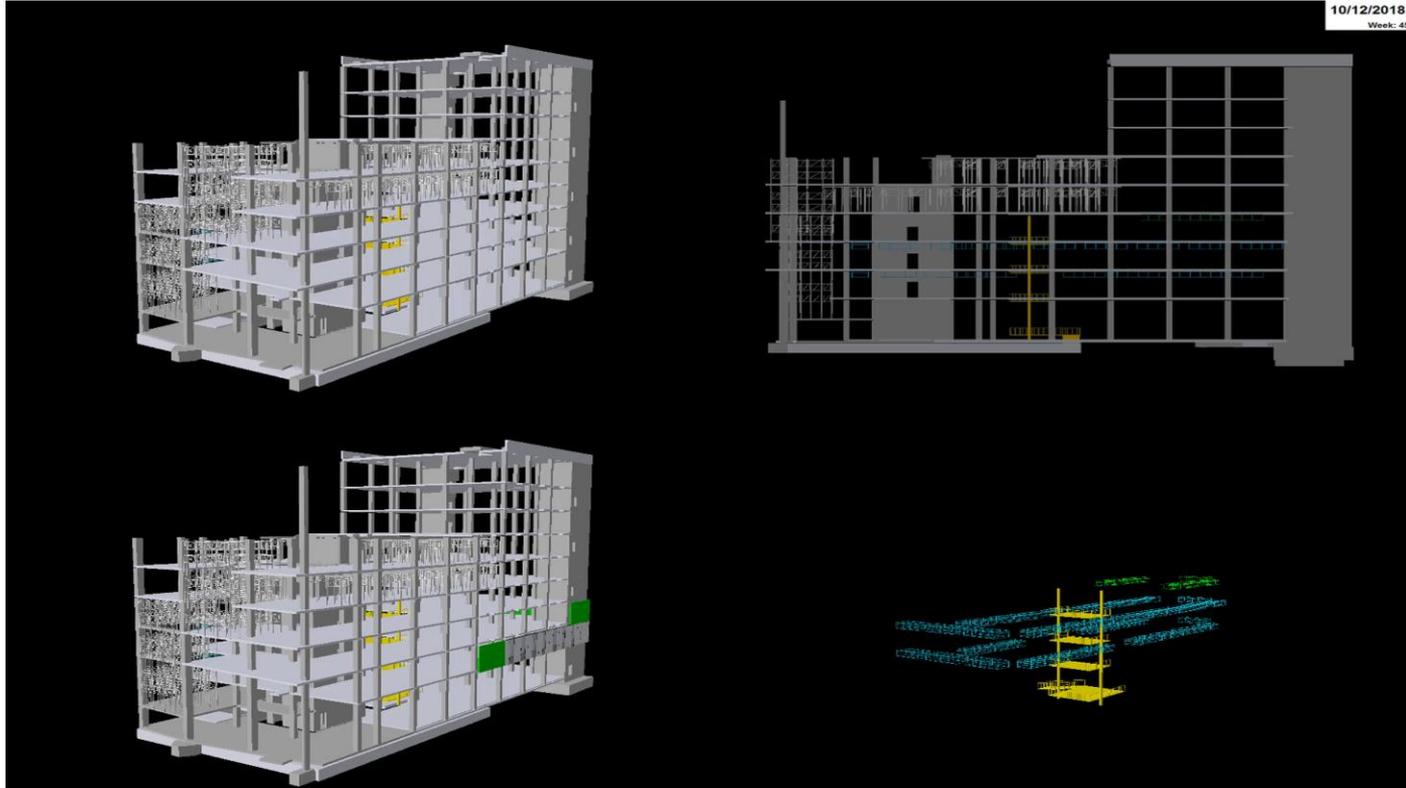
- **323 columns**, rebar reduced by 30t, 58 unique column drawings, manufactured from 7 mould types.
- **906 Lattice planks**, 12 approval drawings
- **586 Twin wall units** for 3 cores. Detailing completed in 2 weeks, previously 5 months.





# Sir Henry Royce Institute, Manchester

Fully integrated Structure and MEP programme



# Sir Henry Royce Institute, Manchester

## Integrated MEP delivery

Project Name: Sir Henry Royce Institute  
 Client: The University of Manchester  
 Project Title: The Sir Henry Royce Institute For Advanced Materials



**Laing O'Rourke**  
 Digital Engineering Execution Plan  
 The Sir Henry Royce Institute for Advanced Materials


**Crown House Technologies**  
 BIMBA Strategy  
 Project Number: 11021  
 Client: The University of Manchester  
 Project Title: The Sir Henry Royce Institute For Advanced Materials

Rev	Date	Revision Description	Prepared By
01	17 Jun 2017	Prepared BIMBA Strategy	CB
02	17 Jun 2017	Revised BIMBA Strategy	CB
03	17 Jun 2017	Revised BIMBA Strategy	CB

Document Approval Sign-off  
 Approved By: Paul Loftus

Project BIMBA Strategy Sign-off  
 Approved By:

Update Database

Module Information

Line Item	Level	Area/Zone	Module Ref	Product Type	Module Type	MS Pictorial Reference / Module Description	Length [mm]	Width [mm]	Depth [mm]	Weight [kg]	Comments	Budget Value	Baseline Site Required Date	Revised / Current Site Required Date	Baseline Planned Module Drawing Date	Current Planned Module Drawing Date
1	GF		M1		Mech riser		3500	7500	1000				26-Mar-18			11-Sep-18
1	GF		P501		PFD plant skid		7500	3100	3000				24-Jul-18			5-Mar-18
1	GF		P502		Pump skid		7500	3100	3000				24-Jul-18			5-Mar-18
1	GF		G1		Horizontal module		6000	2400	600				26-Nov-18			5-Mar-18
1	GF		G2		Horizontal module		6000	2400	600				26-Nov-18			5-Mar-18
1	GF		G3		Horizontal module		6000	2400	600				26-Nov-18			5-Mar-18
1	GF		G4		Horizontal module		6000	2400	600				26-Nov-18			5-Mar-18
1	GF		G5		Horizontal module		6000	2400	600				26-Nov-18			5-Mar-18
1	Mce2		M1		Horizontal module		6000	2400	600				26-Nov-18			11-Jun-18
1	Mce2		M2		Horizontal module		6000	2400	600				26-Nov-18			11-Jun-18
1	Mce2		M3		Horizontal module		6000	2400	600				26-Nov-18			11-Jun-18
1	Mce2		M4		Horizontal module		6000	2400	600				26-Nov-18			11-Jun-18
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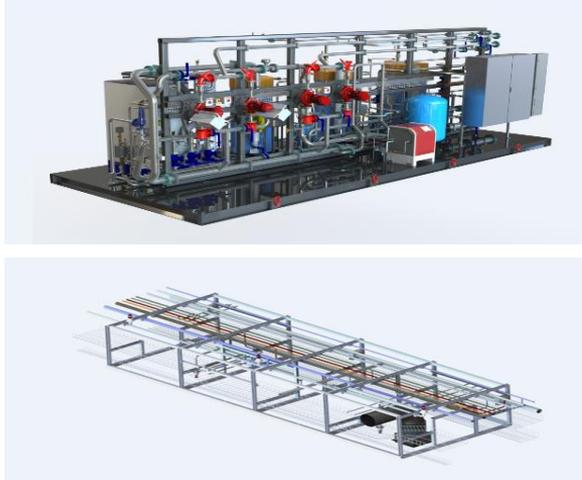
Project Lookups | Module Schedule

150 distribution modules, 3 'mega' risers, plant skids

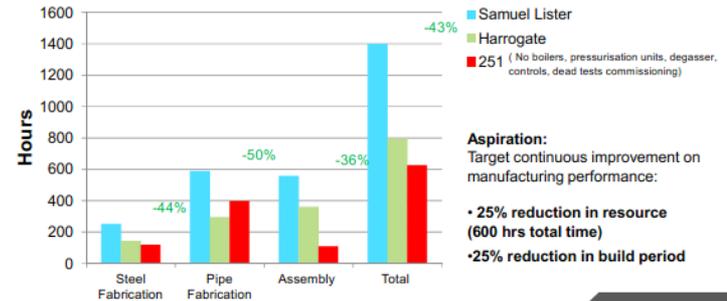


# Advanced MEP Product Sets

AMEP Programme – Parametric Design & Manufacture of Packaged Mechanical & Electrical Plant & Distribution Modules



- Domestic hot water (DHW) plant rooms
- Chilled water (CHW) plant rooms
- Low temp hot water (LTHW) plant rooms
- Horizontal distribution modules
- Vertical distribution modules (risers)



# Manchester Airport Service Risers



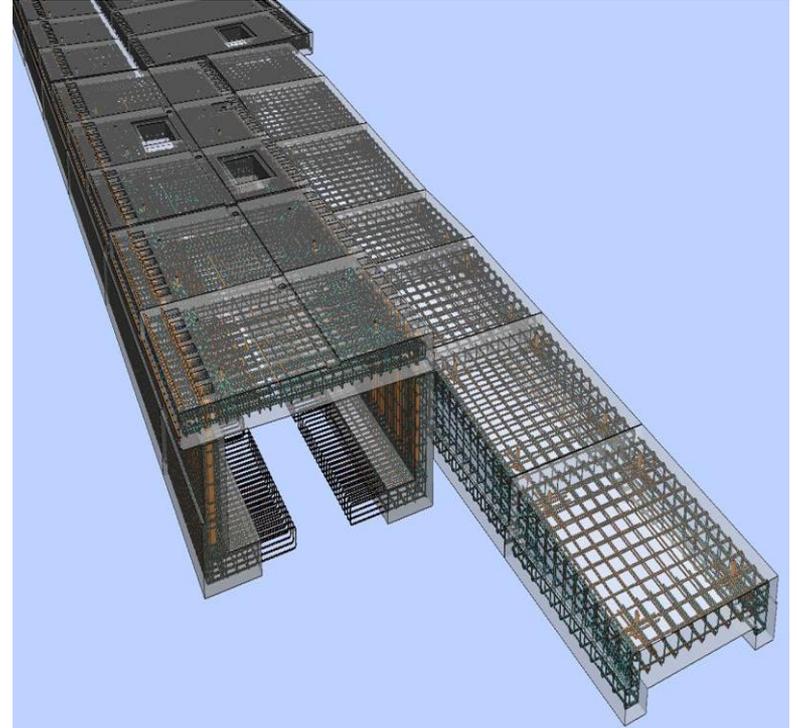
# Our Operating Model in Delivery

Infrastructure case studies



# Case study – Manchester Metro

The first fully DfMA platform and station design.





# Case study – Manchester Metro

Fully DfMA tram stop.

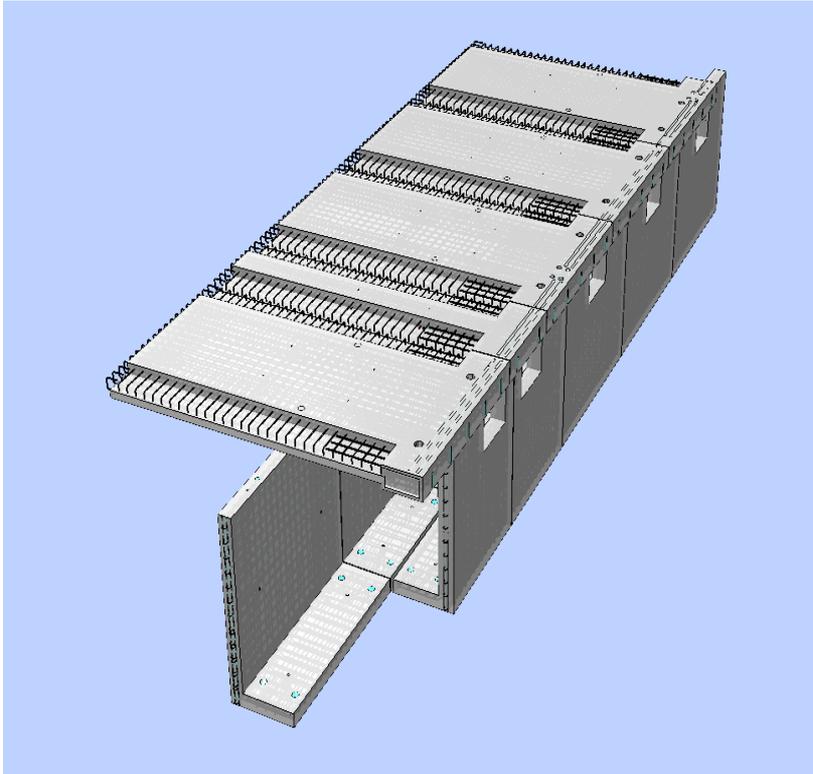


**Five weeks** traditional construction; **Four days DfMA**



# Case Study – Liverpool St Crossrail station

Process engineered precast solution



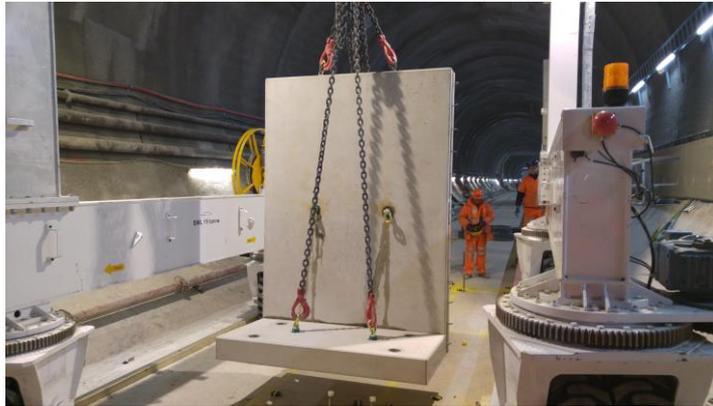


# Case Study – Liverpool St Crossrail station





## Case Study – Liverpool St Crossrail station





# Case Study – Liverpool St Crossrail station



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**LAING O'ROURKE**



# Crossrail – Liverpool St Station

MEP Mega Risers



# Crossrail Liverpool St. – MEP Mega Risers

Manufacture





# Crossrail Liverpool St. – MEP Mega Risers

Transport





# Crossrail Liverpool St. – MEP Mega Risers

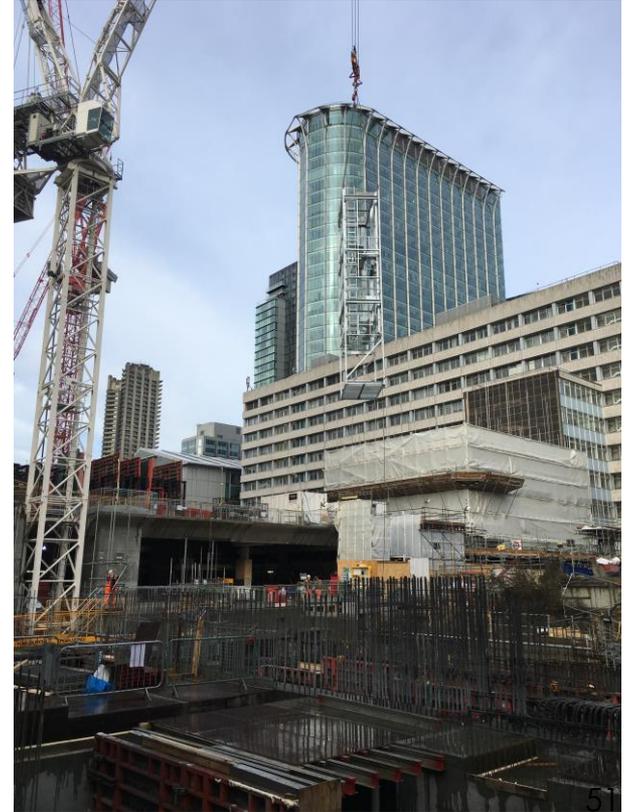
Pitching & Lifting





# Crossrail Liverpool St. – MEP Mega Risers

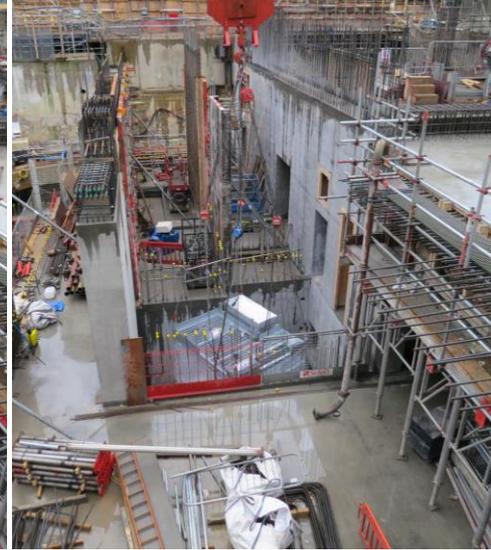
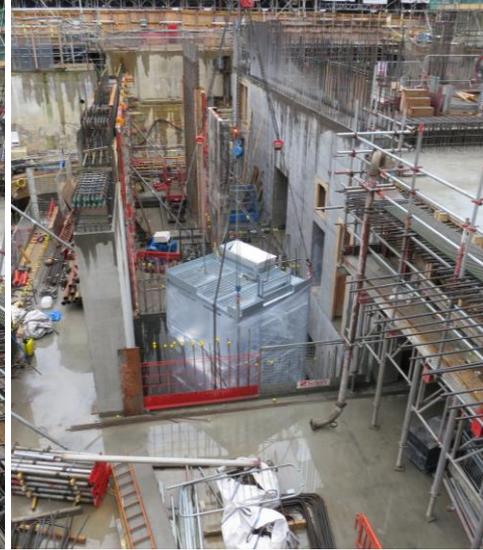
Lifting





# Crossrail Liverpool St. – MEP Mega Risers

Lifting



Crossrail Liverpool St service mega riser



# Driving Industry Leading Productivity – A Summary

## Our Lessons Learned & The Key Issues



- A team with a broader set of skills & a more diverse background
- In a supportive culture
- Embracing offsite manufacture of an established kit of parts
- Enabled by digital technologies and data
- Engaging at the earliest point in projects as a fully integrated design & delivery team - incl supply chain
- Facilitated by new Delivery Partner procurement models
- Delivered to new but consistent design & delivery processes
- With good team-based governance
- Cross-team shared knowledge & expertise
- And a commitment to continuous learning & improvement



Thank you

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