

Our
united
future

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CONTRACTOR OF THE FUTURE

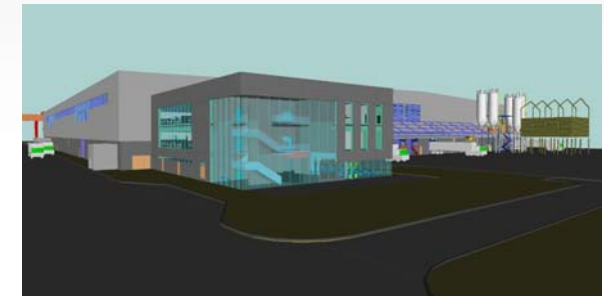
The LOR Manufacturing Vision

'We have a vision for the future of our industry and we want to shape that future. Construction will move beyond tradition and accept innovation. In doing so, it will be safer and more predictable.'

At Steetley in the East Midlands, we are preparing to create the most advanced facility in the UK for the manufacture of construction modules, thereby revolutionising the industry in the UK and challenging the image of what construction is and the way it is done...'



(LOR Annual Review 2007)



New offerings

Turn traditional processes upside down

Drive Business Efficiency through Workflow Efficiency



Change the way people think

- Clients prepared to take lead
- Contractors core values
- Architects & Engineers
- Workforce training
- Supply Chain engagement

Change the way we do work

- BIM's
- Contractor engagement
- Design methods
- Production methods
- Delivery mechanisms

Challenge & Change

Direction of Control	Tools to ...	Types of Models	Characteristics
<p>Controlled by construction = lowest initial, highest lifetime cost</p>  <p>Controlled by workflow = highest value, lowest lifetime cost</p> 	<p>Design</p> <p>Bid</p> <p>Build</p>	<p>The 20th Century Way:</p> <ul style="list-style-type: none"> ▶ 1-dimensional model = planar representation or verbal description ▶ 2-dimensional model = CAD plan ▶ 3-dimensional model = Extruded CAD or isometric view tied to Cartesian coordinates along X-Y-Z axes, created and displayed by raster technology ▶ 4-dimensional model = 3-dimensional model with a non-integrated Bill of Materials (BOM) or project management plan 	<ul style="list-style-type: none"> ▶ Fixed dimensions (size and coordinates) ▶ Closed system ▶ Static
	<p>Design and Build</p>	<p>The Turn of the Century Way:</p> <ul style="list-style-type: none"> ▶ 3-dimensional model = Parametric model with unlimited Points-of-View (POVs) created and displayed by vector technology; the whole or any of its parts may be moved or resized on the fly and affected components will be altered according to the parameters and constraints defined by the user ▶ 4-dimensional model = 3-dimensional model with integrated project management, containing parametrizable quality, scope, time and cost information (including BOM) 	<ul style="list-style-type: none"> ▶ Flexible dimensions (size, coordinates and parameters) ▶ Open system ▶ Dynamic ▶ Relational ("complex")
	<p>Design, Build and Operate Building</p> <p>Operate Business</p>	<p>The 21st Century Way — BIM:</p> <ul style="list-style-type: none"> ▶ 5-dimensional model = 4-dimensional model capable of receiving readings and information from sensors and intelligent components of the structure and sending control instructions back ▶ 6-dimensional model = 5-dimensional structural model with integrated parametric workflow model 	<ul style="list-style-type: none"> ▶ Flexible dimensions (size, coordinates and parameters) ▶ Open system ▶ Dynamic ▶ Relational ("complex") ▶ Bi-directional

Benefits of BIM

- **Changes the process of design & build**
 - Compels you to work better, earlier.
 - 3-D design process is so front-loaded forcing upfront disciplines
 - Compresses the overall project schedule
 - Allows project costs to be fixed earlier.
 - Reduces likelihood of escalation of costs,
 - Shorter project cycle
 - Earlier handover of risk to the builder is attractive.
- It's green. (Or will be.): Can reduce paper waste by working from a digital model.

An Improved delivery processes

- Helps demonstrate entire building life cycle including the processes of construction and facility operation.
- Eases extraction of material quantities and properties
- Easy Isolation of changes to scope of works
- Visual Management: Show assemblies, and sequences in relative scale for an entire facility or group of facilities
- Real Improvements by modeling actual parts and pieces being used to build a building. (A substantial shift from the traditional)
- Bridges information loss associated with handing a project from design team, to construction team and to building owner/operator
- Allows each group to add to and reference back to all information they acquire during their period of contribution to the BIM model.
- Requires changes to the definition of traditional architectural phases and more data sharing than most architects and engineers are used to

Benefits to the Contractor

- Visualize what is to be built
- Collaborative review
- Interference checks (e.g., fire suppression piping running through the ductwork)
- Rehearse construction plans and sequences
- Rehearse heavy lifts and difficult carry-in movements
- Rehearse yard operation and site logistics
- More "what if" scenarios made possible by the sum total of all the "rehearsal" options
- Plan errors are found when building the models. Hence, fewer errors and omissions requiring corrections by the contractor and additional bills to owners.
- Saves time in staking out the project
- Enable GPS driven machine control equipment
- Provide a platform to study, plan and insert temporary construction such as scaffolding
- Fewer surprises in the field
- **More prefabrication of materials and even some assembly in a controlled, factory environment which typically results in higher quality at a lower cost.**
- Makes it possible for non-technical people to better visualize the final result
- Fewer callbacks and lower warranty costs
- Reduced risk
- Less construction material waste

What does BIM mean to off-site manufacturing

- Greater definition of preferred solution up front
- Enhances ability to achieve true design for manufacture
- Greater definition of building milestones and assembly sequencing
- Supports accurate demand management prior to production start
- Reduces waste during the manufacturing stages

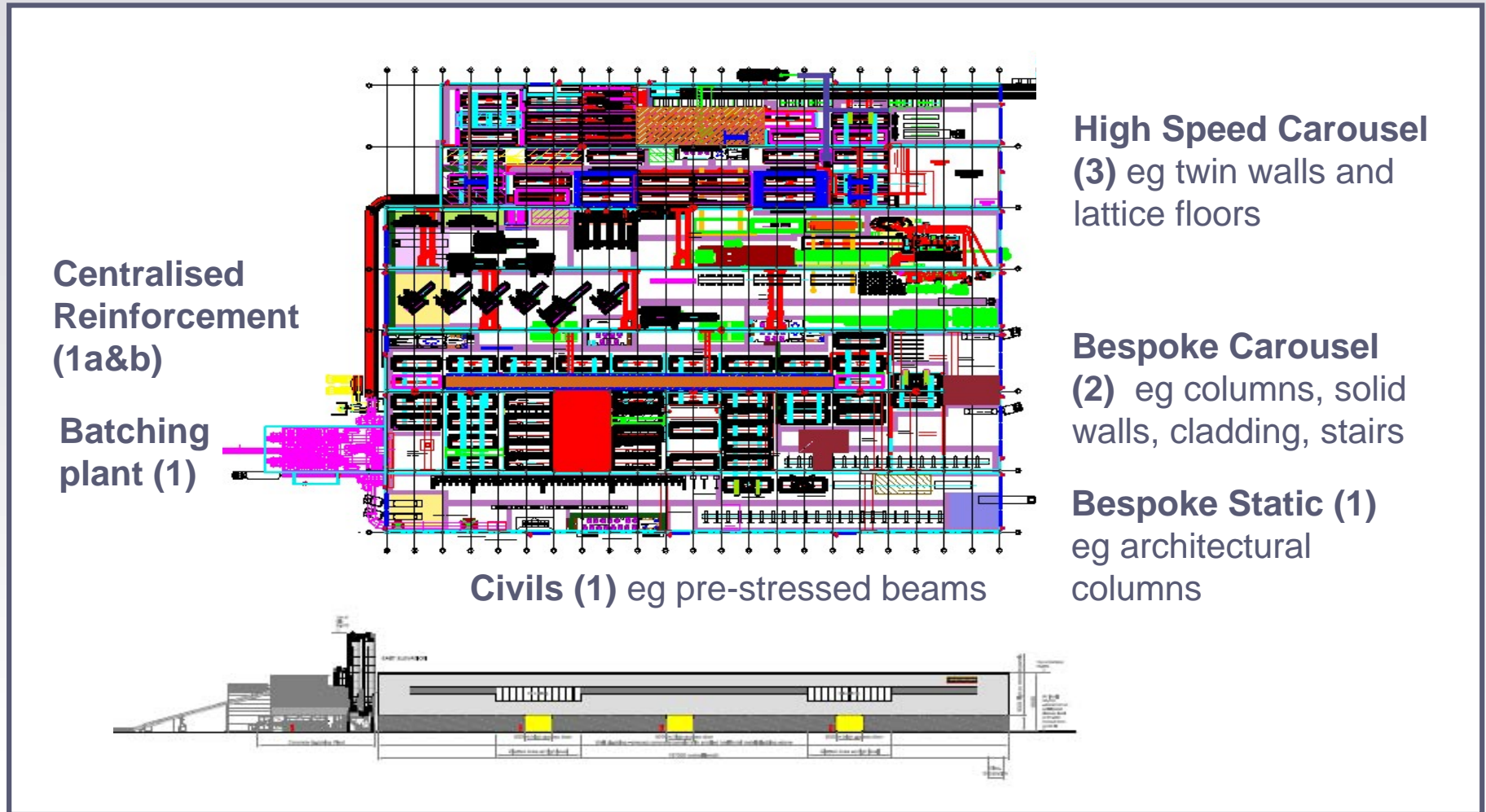
Steetley - A 'State of the Art' Pre-cast Facility supporting the drive towards greater workflow efficiency



The traditional ways of working helped build this industry but you do not meet the stretching goals we have set ourselves without being constantly attuned to advances in our processes – and our thinking. The proportion of projects created off site will increase rapidly and standardisation will become the norm.'

Tony Douglas, Chief Operating Officer,
LOR, **infoworks**, Autumn 2007

Where we are – Phased production start up



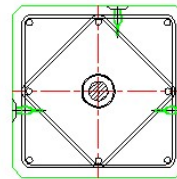
A 'State of the Art' Pre-cast Capability

- A component set of pre-engineered customisable 3-D CAD models
- Modular moulds, and flexible formwork including robot placed shuttering systems
- Flexible automation including single piece work flow -carousels
- CAD/CAM data set used to drive numerically controlled process machines e.g. mesh or cage fabrication and placement in the mould, concrete batching.
- Enterprise resource planning systems enabling the optimisation of production scheduling and resource management.

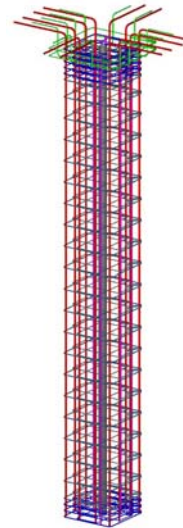
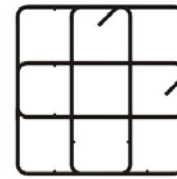
Column Cage Example

•Dfma

Current Design



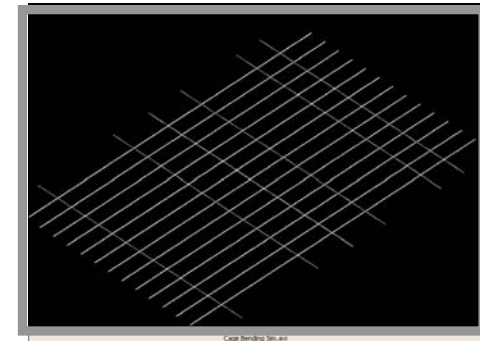
Proposed Design



Automated Mesh Making



Automated Cage Forming



Cage Assembly