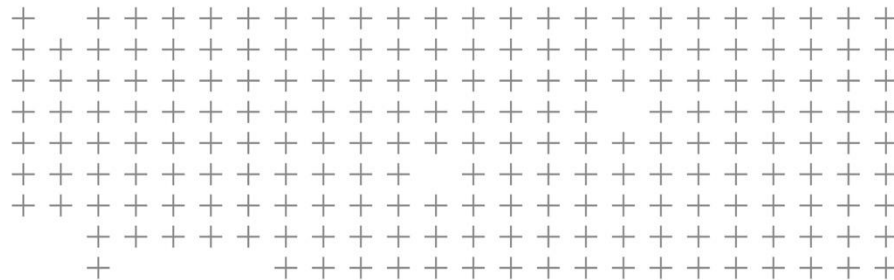


How construction needs to change to reap the benefits of both processes

Duncan Reed, Digital Construction Process Manager, Trimble Solutions (UK) Ltd



DfMA & BIM – hot topics or misunderstood processes?



DfMA – Design for Manufacture & Assembly

Level 4

Complete buildings

Lboro BOS

Units that enclose useable space and actually form part of the completed building or structure. Typically fully factory finished internally (and possibly externally).

Level 3

Volumetric preassembly

Lboro BOS

Units that enclose useable space and are then installed within or into a building or structure. Typically fully factory finished internally.

Level 2

Non-volumetric preassembly

Lboro BOS

Units do not enclose useable space. Applications may be skeletal, planar or complex.

Level 1

Component subassembly

Lboro BOS

Relatively small scale items (compared to the whole project) that are invariably assembled offsite

OSM-

Volumetric

HC MMC

3D

Volumetric construction

The Concrete Centre

'Modular' Building

Units make up the complete building e.g. hotels, prisons, schools, healthcare.

OSM-Hybrid

HC MMC

Pods

e.g. toilets, bathrooms, kitchens, plantrooms

OSM-panelised

HC MMC

Pre-cast foundations

The Concrete Centre

Building services

e.g. horizontal or vertical distribution

Pre-cast flat panel system

The Concrete Centre

Panels

e.g. SIPs, precast, cladding.

OSM-

Subassemblies and components

HC MMC

Hybrid concrete construction

The Concrete Centre

Structural members

e.g. steel or pre-cast concrete or timber

Non-OSM-Modern Methods

HC MMC

Flat slabs, tunnel form, thin jointed blockwork, insulating concrete formwork

Fixtures and fittings

e.g. light fittings, windows, ceiling systems, door sets.

Level 4

Complete buildings

Lboro BOS

Units that enclose useable space and actually form part of the completed building or structure. Typically fully factory finished internally (and possibly externally).

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3D
Volumetric
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*The Concrete
Centre*

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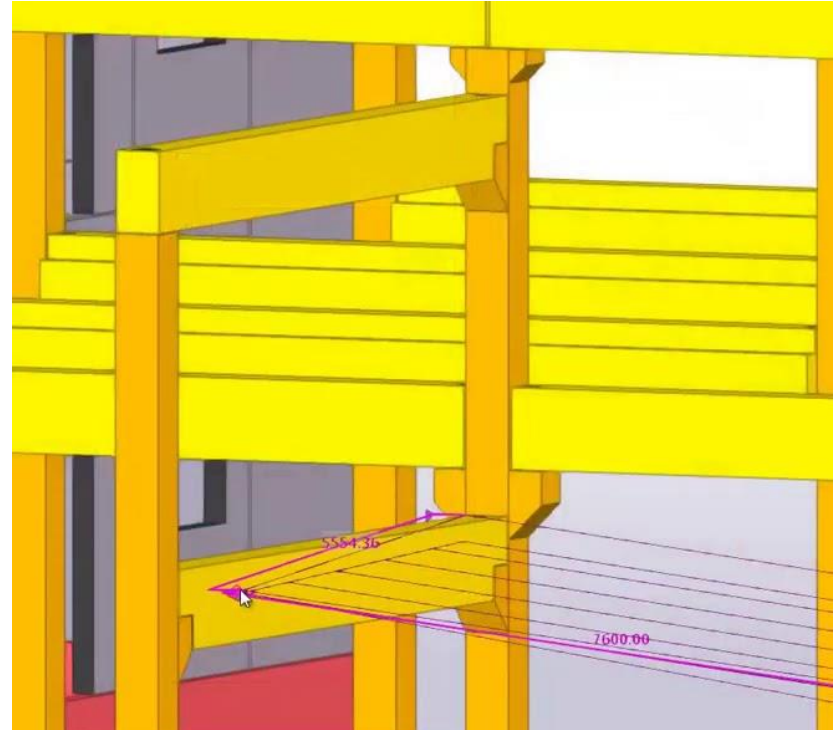
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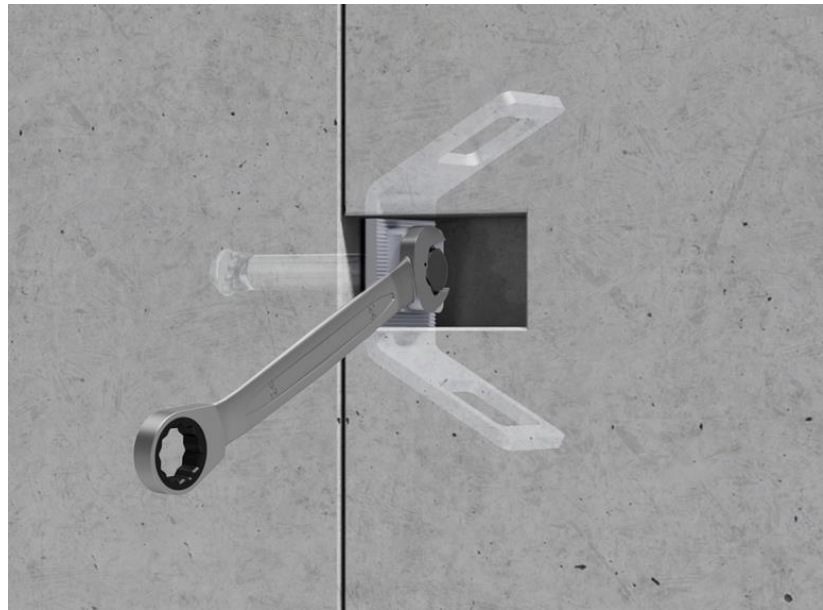
DfMA Principles

- Minimise the number of components: Thereby reducing assembly and ordering costs, reducing work-in-process, and simplifying automation
- Design for ease of part-fabrication: The geometry of parts is simplified and unnecessary features are avoided
- Tolerances of parts: Part should be designed to be within process capability
- Clarity: Components should be designed so they can only be assembled one way



DfMA Principles

- Minimise the use of flexible components: Parts made of rubber, gaskets, cables and so on, should be limited as handling and assembly is generally more difficult.
- Design for ease of assembly: e.g. the use of snap-fits and adhesive bonding rather than threaded fasteners such as nuts and bolts. Where possible a product should be designed with a base component for locating other components quickly and accurately.
- Eliminate or reduce required adjustments: Designing adjustments into a product means there are more opportunities for out-of-adjustment conditions to arise.

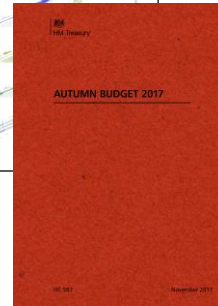
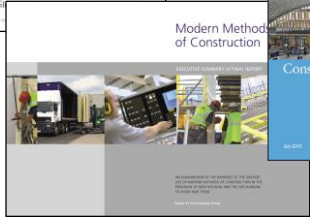
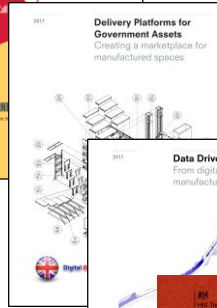
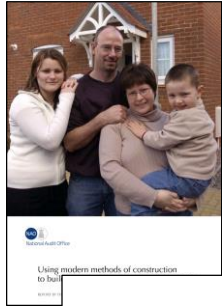


The UK Offsite / MMC / DfMA Timeline

2005 2006 2013 2016

2017

2018 2019

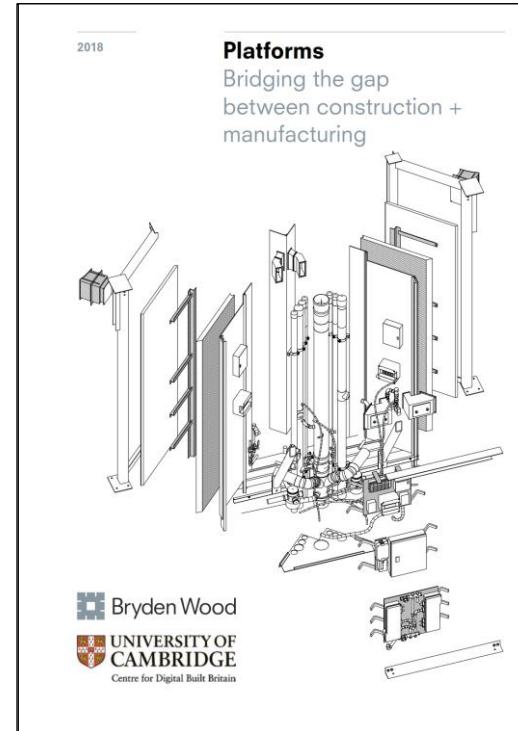


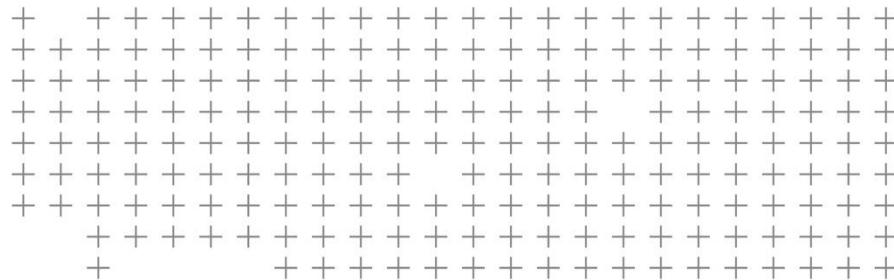
Infrastructure delivery

4.52 Construction – The government is taking a series of steps to improve the cost effectiveness, productivity and timeliness of infrastructure delivery. **The government will use its purchasing power to drive adoption of modern methods of construction, such as offsite manufacturing.** Building on progress made to date, the Department for Transport, the Department of Health, the Department for Education, the Ministry of Justice, and the Ministry of Defence **will adopt a presumption in favour of offsite construction by 2019** across suitable capital programmes, where it represents best value for money.

The background to P-DfMA


- In November 2018, as part of the National Infrastructure and Construction Pipeline 2018, the government committed to increasing the use of prefabrication and other off-site construction methods on public projects
- Details of a preferred approach were published, called 'Platform Approach to Design for Manufacture and Assembly' (P-DfMA).



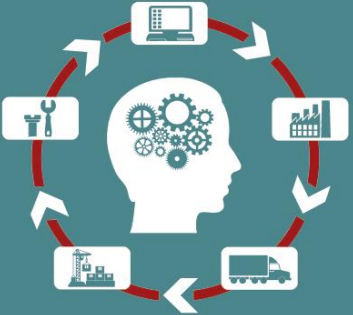



DfMA – Design for Manufacture & Assembly

RIBA Plan of Works - DfMA



RIBA Plan of Work 2013 Designing for Manufacture and Assembly



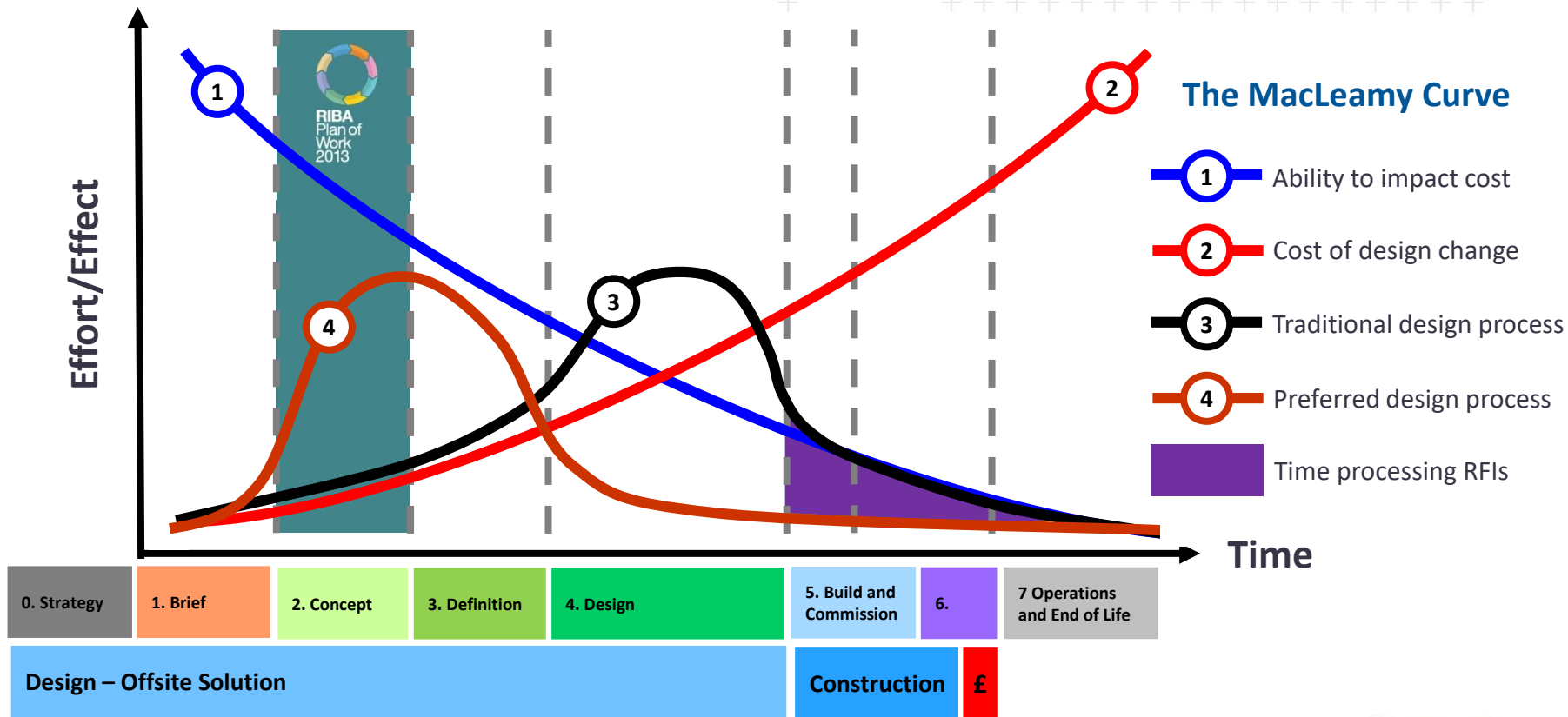


www.offsiteschool.com/DfMA

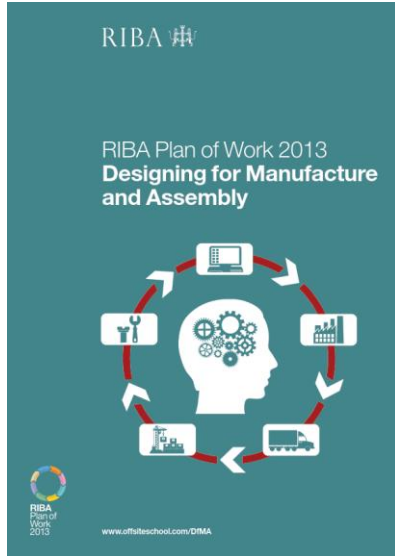
RIBA Plan of Work 2013								www.offsiteschool.com/DfMA	
<div> <div> </div> <div> <div>Stages</div> <div>0</div> <div>1</div> <div>2</div> <div>3</div> <div>4</div> <div>5</div> <div>6</div> <div>7</div> </div> </div>									
<div> <div>Tasks</div> <div>Strategic Definition</div> <div>Preparation and Brief</div> <div>Concept Design</div> <div>Developed Design</div> <div>Technical Design</div> <div>Construction</div> <div>Handover and Close Out</div> <div>In Use</div> </div>									
<div> <div>Core Objectives from the RIBA Plan of Work</div> <div>DfMA Strategy</div> <div>Suggested BIM Tasks for DfMA</div> <div>Suggested Procurement Tasks for DfMA</div> </div>	<div> <div>Identify client's Business Case and Strategic Brief and other core project requirements.</div> </div>		<div> <div>Develop Project Objectives, including Quality Objectives and Project Outcomes, Sustainability Aspirations, Project Budget, other primary Client Information along with relevant Project Strategies in accordance with the Design Programme. Agree alternatives to brief and issue Final Project Brief.</div> </div>		<div> <div>Prepare Concept Design, including outline proposals for structural, building services systems, building envelopes, and other primary Client Information along with relevant Project Strategies in accordance with the Design Programme. Agree alternatives to brief and issue Final Project Brief.</div> </div>		<div> <div>Prepare Developed Design, including coordinated and updated proposals for structural design, building services systems, building envelopes, and other primary Client Information along with relevant Project Strategies in accordance with the Design Programme.</div> </div>		
	<div> <div>Consider opportunities for applying DfMA across portfolios or programmes of projects.</div> <div>Consider how DfMA might impact on the Business Case or Strategic Brief.</div> <div>Consider whole life issues in the Strategic Brief including options for reuse or reprogramming and recycling of components at the end of the building's life.</div> <div>Consider Research and Development that might assist Feasibility Studies of the Concept Design including intellectual property issues.</div> </div>		<div> <div>Initiate DfMA thinking and incorporate client requirements into the Initial Project Brief. This should include high-level targets for the extent of DfMA adoption and the cost/health savings against traditional building types.</div> <div>Consider opportunities for 'representative' intelligent components, Research and Development and early input required from specialist subcontractors.</div> <div>Consider best practice DfMA examples for comparable projects.</div> <div>Test the feasibility of high-level DfMA objectives included in the Initial Project Brief using the Information and Feasibility Studies.</div> </div>		<div> <div>Test initial Concept Design options against the DfMA aspirations set out in the Initial Project Brief. Identify opportunities for the greatest impact and initiate any Research and Development required to integrate DfMA into the Concept Design.</div> <div>Prepare the Construction Strategy considering high-level DfMA benefits including safety, productivity, quality and sustainability, considering factors such as eliminating scaffolding, wet or hot works, the delivery methodology and the suitability of proposed systems.</div> <div>Consider DfMA aspects in Risk Assessments and the Health and Safety and Maintenance and Operational Strategies.</div> <div>Ensure that the Construction Strategy takes account of the DfMA technologies that will be in the Construction Strategy.</div> </div>		<div> <div>Update the Construction Strategy taking into account DfMA opportunities appropriate to the Developed Design and the construction activities. Prepare a schedule of DfMA components and consider national or other standards appropriate for DfMA.</div> <div>Consider buildability, including how the erection sequence, fabrication or manufacturing techniques and subcontractors impact on the delivery methodology and the suitability of proposed systems.</div> <div>Update Cost Information taking into account discussions with potential contractors, specialist subcontractors and suppliers.</div> <div>Update Risk Assessments and the Health and Safety and Maintenance and Operational Strategies taking into account DfMA considerations.</div> </div>		
	<div> <div>Analyse data from the existing building to identify key metrics for success.</div> <div>Gather cost and programme data from previous projects to set benchmarks.</div> <div>Consider establishing a BIM object library if components are going to be used across multiple projects.</div> </div>		<div> <div>Use BIM for the preparation of Feasibility Studies including data-rich 'visualisation' objects with the preparation of Cost Information. Use BIM to optimise the Initial Project Brief.</div> <div>Include the Level of Development required of each stage when preparing the Design Responsibility Matrix. Consider the implications for professional services contracts and the Design Responsibility Matrix where a client is using their own BIM library including intellectual property and professional indemnity insurance.</div> </div>		<div> <div>Develop the BIM model and components to test Level of Development set out in the Design Responsibility Matrix. Validate the model against the brief.</div> <div>Consider DfMA tolerances in the development of the BIM model.</div> </div>		<div> <div>Progress the BIM model and components to test Level of Development set out in the Design Responsibility Matrix. Validate the model against the brief.</div> <div>Use digital technologies as part of coordination exercises.</div> </div>		
	<div> <div>Feedback - Ensure lessons learned from previous projects have been incorporated.</div> <div>Consider how DfMA impacts on the assembly of the project team including how the project team will achieve a collaborative approach and how innovation can be incentivised.</div> </div>		<div> <div>Update the Procurement Strategy and hold discussions with contractors and specialist subcontractors relevant to the procurement route to test DfMA objectives set out in the Concept Design including the Construction Strategy.</div> <div>Consider the appropriateness of early contractor involvement (ECI).</div> </div>		<div> <div>Hold further discussions with contractors and specialist subcontractors relevant to the procurement route to test DfMA objectives set out in the Developed Design including the Construction Strategy.</div> </div>		<div> <div>Capture Feedback including lessons learned from site installation to inform the Procurement Strategy of future projects.</div> </div>		
	<div> <div>Provide Feedback on the capability and performance of specialist subcontractors who delivered DfMA aspects.</div> </div>		<div> <div>Ensure that As-Constructed information relating to DfMA elements has been delivered including Feedback on information to inform the client's in-house BIM object library.</div> </div>		<div> <div>Offsite manufacturing and on-site construction in accordance with the Construction Programme and resolution of Design Queries from site as they arise.</div> </div>		<div> <div>Handover of building and conclusion of the Building Contract.</div> </div>		
	<div> <div>Underlie in Use services in accordance with Schedule of Services.</div> </div>		<div> <div>Monitor the performance of standardised components and equipment and provide Feedback.</div> </div>		<div> <div>Monitor disassembly or potential reuse of materials during demolition at the end of the stage and provide Feedback.</div> </div>		<div> <div>Consider any Feedback during the In Use stage necessary to inform future projects.</div> </div>		

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Digital offsite - delivering greater benefits



RIBA DPoW - DfMA Overlay



**0. Strategic
Definition**

2. Concept Design

4. Technical Design

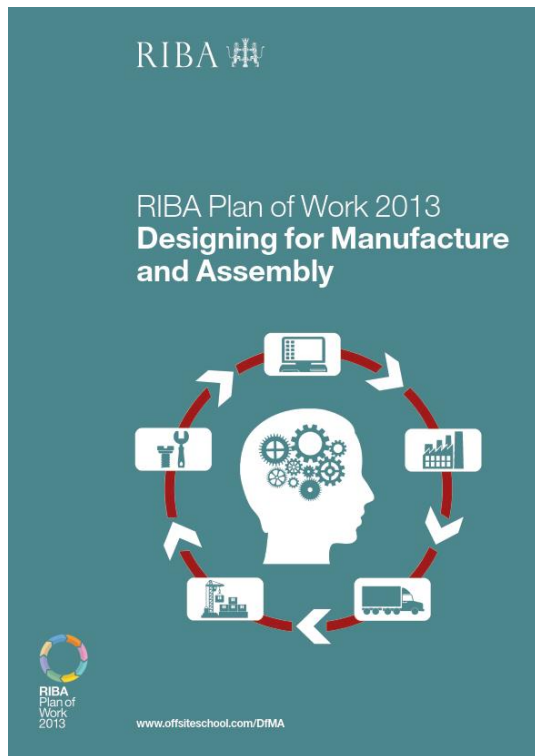
**6. Handover and
Close Out**

**1. Preparation
and Brief**

**3. Developed
Design**

5. Construction

7 In Use

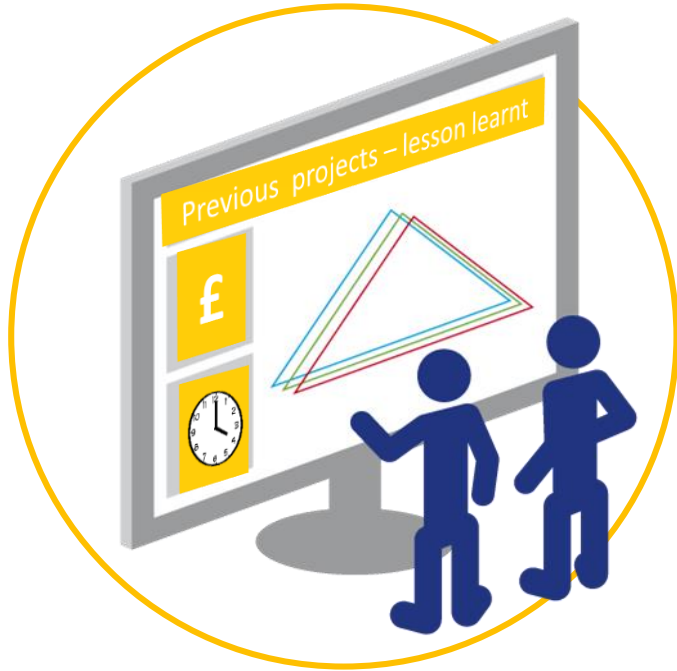
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DfMA Core Requirements – Stage 0

- Identify client's Business Case and Strategic Brief and other core project requirements



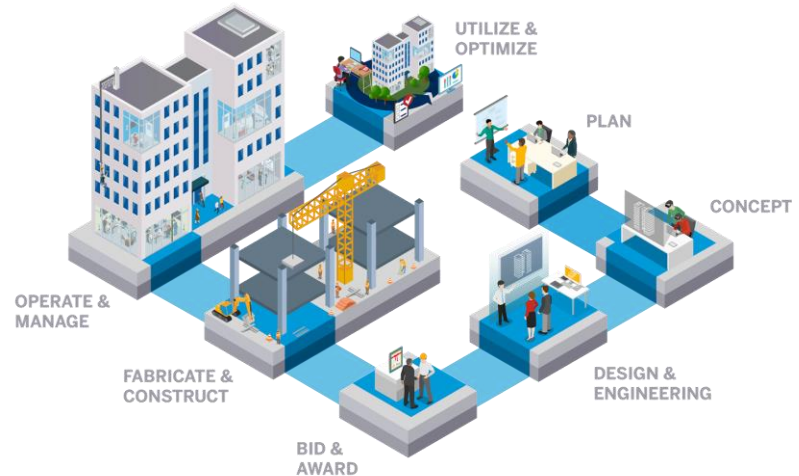
DfMA Overlay – Stage 0



- Analyse data from the existing building to identify key metrics for success
- Gather cost and programme data from previous projects to set benchmarks
- Consider establishing a BIM object library if components are going to be used across multiple projects



DfMA Core Requirements – Stage 1

- Develop Project Objectives, including Quality Objectives and Project Outcomes, Sustainability Aspirations, Project Budget, other parameters or constraints and develop Initial Project Brief. Undertake Feasibility Studies and review of Site Information



DfMA Overlay – Stage 1



Design Responsibility Matrix						
	2 - Concept Design 			3 - Developed Design 		
Aspect of design	Design team			Design team		
	Design responsibility	Level of design	Information exchange	Design responsibility	Level of design	Information exchange
15 PREPARATORY ELEMENTS						
20 WHOLE-ENTITY STRUCTURAL ELEMENTS						
25 WALL AND BARRIER ELEMENTS						
30 ROOF, FLOOR AND PAVING ELEMENTS						
35 FIXED ACCESS, TUNNEL, SHAFT, VESSEL AND TOWER ELEMENTS						
40 SIGNAGE AND FITTINGS, FURNISHINGS AND EQUIPMENT (FF&E) ELEMENTS						
40-10 Signage						
40-10-30 External signage	LKJ Landscapes	Outline	1:100	LKJ Landscapes	Performance	1:100
40-10-40 Internal signage	City Centre Architects	Outline	1:100	City Centre Architects	Full (generic)	1:200
40-10-85 Signage power supply and protection	Wires & Pires Ltd	Outline	1:100	Wires & Pires Ltd	Performance	1:50
40-15 Fittings, furnishings and equipment (FF&E)	City Centre Architects	Outline	1:100	City Centre Architects	Outline	1:50
45 FLORA AND FAUNA ELEMENTS						1:50

- Use BIM to prepare **Feasibility Studies** including ‘placeholder’ objects to assist in the preparation of **Cost Information**
- Use BIM to test and optimise the **Initial Project Brief**
- Prepare the **Design Responsibility Matrix**. Consider implications of professional services contracts, client BIM library, intellectual property & professional indemnity insurance

DfMA Procurement Tasks – Stage 1

- Consider how to emphasise the importance of DfMA in the Initial Project Brief when assembling the project team and developing the Procurement Strategy, including how to select design team members with DfMA experience.

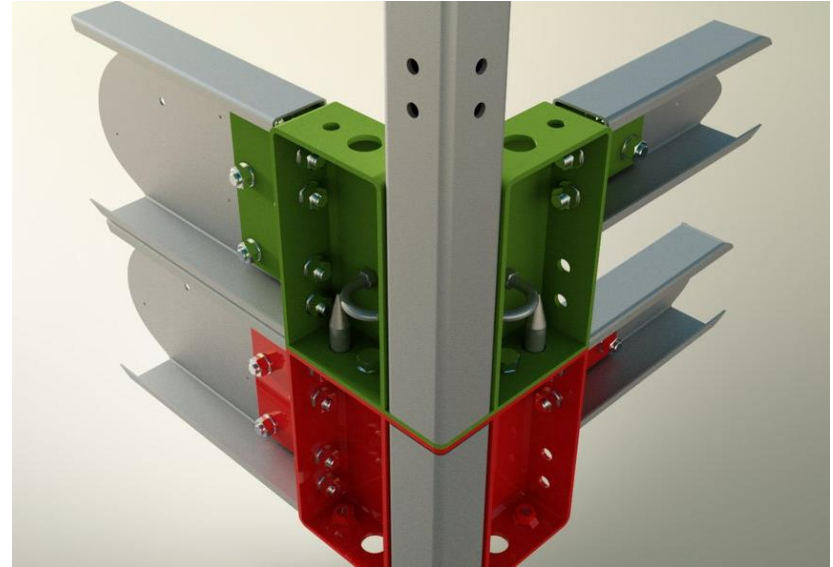


Image courtesy of McAvoy Group; from the MTC SeISmic project – Standardisation of School Components

DfMA Overlay – Stage 2



BS EN ISO 19650-1:2018
ISO 19650-1:2018(E)

5.2 Organizational information requirements (OIR)

OIR explain the information needed to answer or inform high-level strategic objectives within the appointing party. These requirements can arise for a variety of reasons, including:

- strategic business operation;
- strategic asset management;
- portfolio planning;
- regulatory duties; or
- policy-making.

OIR can exist for reasons other than asset management, for example in relation to submitting annual financial accounts. These OIR are not considered further in this document.

5.3 Asset information requirements (AIR)

AIR set out managerial, commercial and technical aspects of producing asset information. The managerial and commercial aspects should include the information standard and the production methods and procedures to be implemented by the delivery team.

The technical aspects of the AIR specify those detailed pieces of information needed to answer the asset-related OIR. These requirements should be expressed in such a way that they can be incorporated into asset management appointments to support organizational decision-making.

A set of AIR should be prepared in response to each trigger event during asset operation and where appropriate should also refer to security requirements.

Where there is a supply chain, the AIR received by a lead appointed party can be sub-divided and passed on in any of its own appointments. AIR received by a lead appointed party can be augmented with its own information requirements.

Across an asset management strategy and plan there can exist several different appointments. The AIR from all these should form a single coherent and coordinated set of information requirements, sufficient to address all the asset-related OIR.

5.4 Project information requirements (PIR)

PIR explain the information needed to answer or inform high-level strategic objectives within the appointing party in relation to a particular built asset project. PIR are identified from both the project management process and the asset management process.

A set of information requirements should be prepared for each of the appointing party's key decision points during the project.

Repeat clients may develop a generic set of PIR that can be adopted, with or without amendment, on all of their projects.

5.5 Exchange information requirements (EIR)

EIR set out managerial, commercial and technical aspects of producing project information. The managerial and commercial aspects should include the information standard and the production methods and procedures to be implemented by the delivery team.

The technical aspects of the EIR should specify those detailed pieces of information needed to answer the PIR. These requirements should be expressed in such a way that they can be incorporated into project-related appointments. EIR should normally align with trigger events representing the completion of some or all project stages.

10

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- Develop the BIM model and components to the Level of Information Need set out in the **Design Responsibility Matrix**
- Validate the model against the client's information requirements
- Consider DfMA tolerances in the development of the BIM model

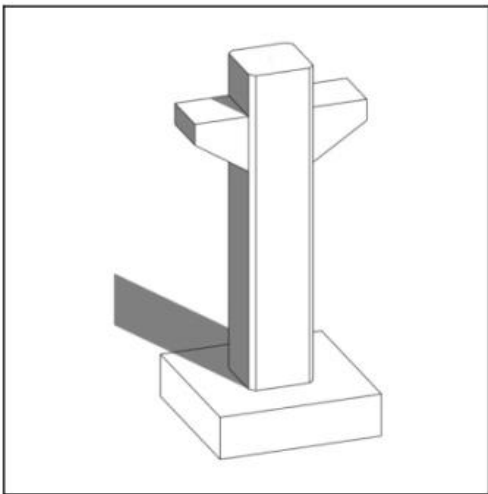
DfMA Overlay – Stage 2



RIBA Plan of Work								www.offsiteschool.com/DfMA	
Designing for Manufacture and Assembly overlay									
This Overlay to the RIBA Plan of Work 2013 includes additional task bars to support Designing for Manufacture and Assembly. It is designed in conjunction with the RIBA Plan of Work 2013: www.ribaplannetwork.com									
www.offsiteschool.com/DfMA									
Stages	0	1	2	3	4	5	6	7	
Tasks	Strategic Definition	Preparation and Brief	Concept Design	Developed Design	Technical Design	Construction	Handover and Close Out	In Use	
Core Objectives from the RIBA Plan of Work	Identify client's Business Case and Strategic Brief and other core project requirements.	Develop Project Objectives , including Quality Objectives and Project Outcomes , Sustainability Appraisal , Project Budget , and parameters or constraints and develop Initial Project Brief . Undertake Feasibility Studies in review of site information.	Prepare Concept Design , including outline proposals for structural design, building services systems, outline specifications and preliminary Cost Information along with relevant Project Strategies in accordance with the Design Programme . Agree structures to brief and issue Final Project Brief .	Prepare Developed Design , including coordinated and updated proposals for structural design, building services systems, outline specifications, outline architectural, structural and building services information, specialist subcontractor design and specifications, in accordance with the Design Programme .	Prepare Technical Design in accordance with the Design Programme . Prepare Responsibility Matrix and Project Strategies to include architectural, structural and building services information, specialist subcontractor design and specifications, in accordance with the Design Programme .	Offsite manufacturing and onsite construction in accordance with the Construction Programme and inclusion of Design Queries from site as they arise.	Handover of building and conduct of the Building Contract .	Underline in Use services in accordance with Schedule of Services .	
DfMA Strategy	Consider opportunities for applying DfMA across portfolio or programmes of projects. Consider how DfMA might impact on the Business Case or Strategic Brief . Consider where the issues in the Strategic Brief including options for reuse or reprogramming and anything of components at the end of the building's life. Consider Research and Development that might assist Feasibility Studies of the Concept Design including intellectual property issues.	Integrate DfMA thinking and incorporate client requirements to the extent of DfMA adoption and time cost/benefit savings against traditional benchmarks. Consider opportunities for reprogrammability, site/operational constraints, Research and Development and early input required from specialist subcontractors. Consider best practice DfMA templates for design projects.	Test initial Concept Design options against the DfMA objectives set out in the Initial Project Brief . This should include high-level targets for the extent of DfMA adoption and time cost/benefit savings against traditional benchmarks. Prepare the Construction Strategy considering high-level DfMA benefits including safety, productivity, quality and sustainability, considering topics such as minimising scaffolding, wet or hot works, the delivery methodology and the suitability of proposed systems. Consider DfMA aspects in Risk Assessments and the Health and Safety and Maintenance and Operational Strategies . Ensure that the Cost Information takes account of the DfMA methodologies set out in the Construction Strategy .	Issue the Construction Strategy and the Responsibility Matrix and Project Strategies appropriate to the Developed Design and Construction Strategy . Prepare a schedule of DfMA components and consider national or other research appropriate for DfMA. Consider buildability, including how a erection sequence, fabrication manufacturing techniques and interfaces, such as minimising scaffolding, wet or hot works, the delivery methodology and the suitability of proposed systems. Issue Risk Assessments and the Health and Safety and Maintenance and Operational Strategies taking into account DfMA considerations.	Update the Construction Strategy considering the lifting, handling and transportation strategy for each component and sub-assembly. Consider manufacturing and assembly risks in the proposed Risk Assessments and the Health and Safety and Safety Strategy . Develop a commissioning plan optimising the use of factory acceptance testing.	Update the Construction Strategy including a sign-off plan that ensures the right materials, plant and operations are deployed in the right place at the right time. Commission the building progressively and capture As-Constructed information. Consider how DfMA impacts the Construction Programme .	Consider how to capture commissioning and 'As-Constructed' information in a manner that will assist the In Use stage including the potential dissimilarity of the building. Monitor the performance of standardized components including maintenance and replacement and provide Feedback . Monitor dissimilarity or potential reuse of materials during demolition at the end of the stage and provide Feedback .		
Suggested BIM Tasks for DfMA	Analyse data from the existing building to identify key metrics for assessment. Sather cost and programme data from previous projects to set benchmarks. Consider establishing a BIM object library if components are going to be used across multiple projects.	Use BIM for the preparation of Feasibility Studies including assessment of the building's limited geometry to assist in the preparation of Cost Information . Use BIM to test and optimise the Initial Project Brief . Include the Level of Development required at each stage when preparing the Design Responsibility Matrix . Consider the implications for professional services contracts and the Design Responsibility Matrix , where a client aims to use the data and data including intellectual property and professional indemnity insurance.	Develop the BIM model and components to the Level of Development set out in the Design Responsibility Matrix . Validate the model against the client's information requirements. Consider DfMA tolerances as part of the development of the BIM model.	Agree the BIM model and components to the Level of Development set out in the Design Responsibility Matrix . Validate the model against the client's information requirements. Use digital technologies as part of the development exercises.	Progress the BIM model and components to the Level of Development set out in the Design Responsibility Matrix . Validate the model against the client's information requirements. Use digital technologies to test and validate the model against the client's information requirements.	Use digital technologies to track each step of the manufacturing, production, logistics and delivery process. Ensure any relevant documentation relating to DfMA components is included in the Feedback , including lessons learned and potential reusing process.	Consider configuration management techniques to maintain an up-to-date record of the building's BIM model. Ensure any relevant documentation relating to DfMA components is included in the Feedback , including lessons learned and potential reusing process.		
Suggested Procurement Tasks for DfMA	Feedback - Ensure lessons learned from previous projects have been incorporated. Consider how DfMA impacts on the assembly of the project team including how the project team will achieve a collaborative approach and how innovation can be incorporated.	Consider how to incorporate the importance of DfMA in the Initial Project Brief when assembling the project team and developing the Procurement Strategy , including how to select design team members with DfMA experience. Ensure that any information encourages the behaviours required to achieve the DfMA objectives.	Update the Procurement Strategy also including discussions with contractors and specialist subcontractors relevant to the procurement route to test DfMA, responses and coordination for the Developed Design including the Construction Strategy . Consider the appropriateness of early contractor involvement (ECI).	Use further discussions with contractors and specialist subcontractors relevant to the procurement route to test DfMA, responses and coordination for the Developed Design including the Construction Strategy .	Use further discussions with contractors and specialist subcontractors relevant to the procurement route to test DfMA, responses and coordination for the Developed Design including the Construction Strategy .	Use further discussions with contractors and specialist subcontractors relevant to the procurement route to test DfMA, responses and coordination for the Developed Design including the Construction Strategy .	Use further discussions with contractors and specialist subcontractors relevant to the procurement route to test DfMA, responses and coordination for the Developed Design including the Construction Strategy .	Use further discussions with contractors and specialist subcontractors relevant to the procurement route to test DfMA, responses and coordination for the Developed Design including the Construction Strategy .	

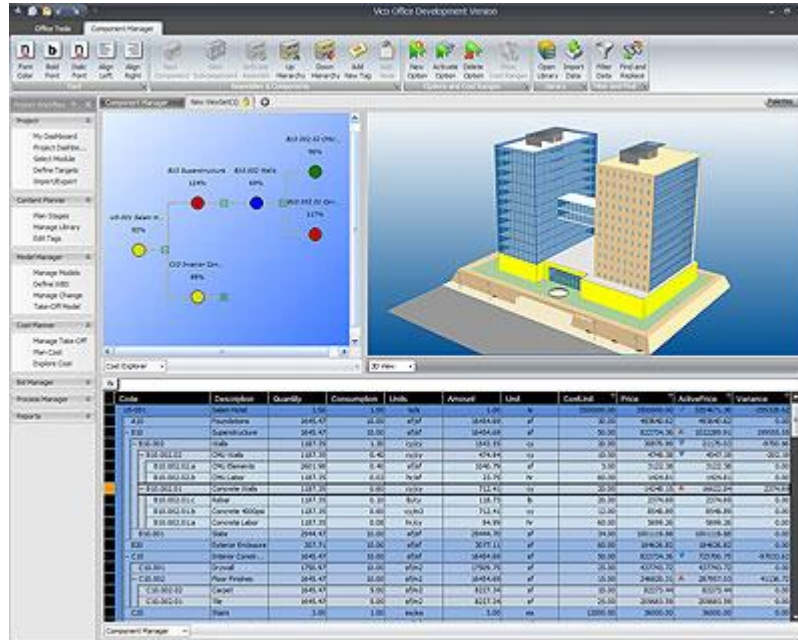
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DfMA Overlay – Stage 3



- Progress the BIM model and components to next Level of Development as set out in the **Design Responsibility Matrix**
- Validate the model against the client's information requirements
- Use digital technologies as part of coordination exercises

DfMA Overlay – Stage 4



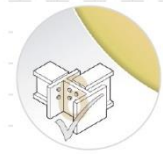
- Progress model & components to next Level of Information Need as set out in the **Design Responsibility Matrix**
- Validate the model against the client's information requirements
- Use 4D technologies to test and rehearse the sequencing set out in the **Construction Strategy**, including manufacture, logistics & assembly before work starts on site

DfMA Overlay – Stage 5



- Use BIM to train site operatives
- Use digital technologies to track manufacturing, packing, logistics and delivery process
- Consider recording the complete history and location of every component for future use
- Link components to assembly manuals, method statements and quality records including identifying any aspects of the design which may be reused

DfMA Overlay – Stage 6



- Ensure any relevant documentation relating to DfMA components is linked to BIM components for **Feedback**, including lessons learned and potential repurposing

NBS BIM Toolkit

SEARCH DEFINITIONS... PROJECTS CONTENT SUPPORT SIGN IN / REGISTER

PRECAST CONCRETE MODULAR TANKS

Precast concrete modular tanks are described by characteristics such as dimensions, imposed loading and tank volume (minimum).

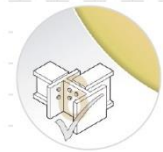
Uniclass2015 - Pr_60_50_10_66 Precast concrete modular tanks [Show classification mappings](#)

Level of detail Level of information

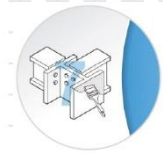
6 Provide the information specific to the installed deliverable that is required for operation and maintenance. Information covering the detailed maintenance should also be provided in the associated PDF manuals.

Name	Definition
Asset type	An indication of whether the object is fixed or movable.
Manufacturer	Email address for the organisation responsible for supplying or manufacturing the object.
ModelNumber	The product, item or unit number assigned by the manufacturer of the object.
Warranty guarantee (parts)	Email address for the organisation responsible for the parts warranty.
Warranty duration (parts)	Duration of parts warranty.
Warranty guarantee (labour)	Email address for the organisation responsible for the labour warranty.
Warranty duration (labour)	Duration of labour warranty.
Warranty duration unit	Duration of warranties (typical value is 'years').
Replacement cost	An indicative cost for unit replacement.
Expected life	The typical service life of the object.
Duration unit	Duration of expected life (typical value is 'years').
Warranty description	Description of the warranty content and any exclusions.
Nominal length	Typically the larger or primary horizontal dimension.
Nominal width	Nominal width of product, typically the characteristic or secondary horizontal or characteristic dimension.
Nominal height	Typically the vertical or secondary characteristic dimension.
ModelReference	The name of the object as used by the manufacturer.
Shape	Characteristic shape of product.

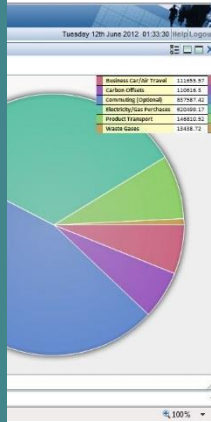
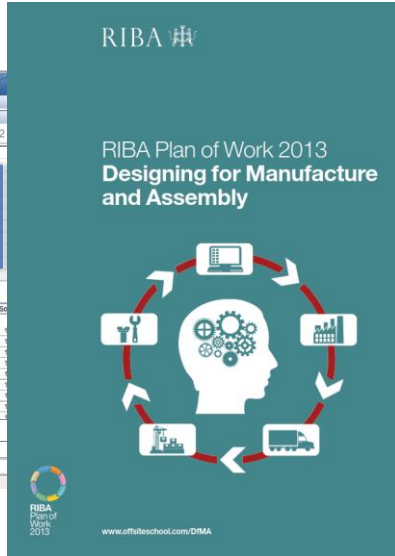
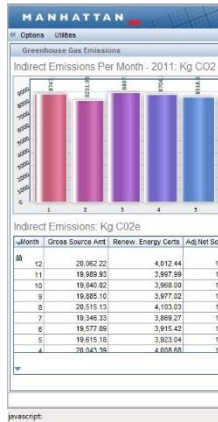
DfMA Overlay – Stage 6



DfMA Overlay – Stage 7



- Consider configuration management techniques to maintain an up-to-date record (BIM model) of the building

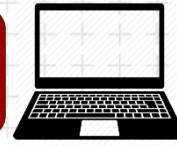




**Best in Class
Maintenance**



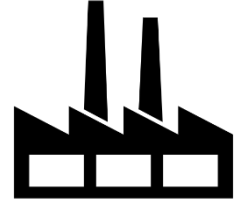
**Design
Product &
Process**



Supply
Chain
Management

Leadership &
Culture

Change
Management



**Office
Process**

Marketing &
Business
Development

Innovation



Project
Management

Quality
Management

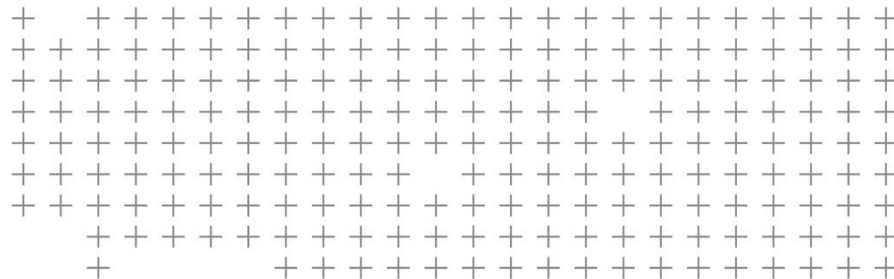
Collaborate



**Onsite
Process**

Logistics





Conclusion

Benefits of DfMA



- 20%–60% reduction in construction programme time
- Greater programme certainty
- 20%–40% reduction in construction costs
- 70%+ reduction in onsite labour, with subsequent improvements in health and safety
- Reduced need for skilled labour on site
- Better construction quality
- Better environmental outcomes, including reduced waste
- Fewer queries from site

UK Government view on DfMA

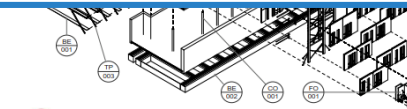
- Leverage benefits by using standard, repeatable designs and processes
- Standardisation
 - Site wide elements
 - Room types

2017

Delivery Platforms for Government Assets

Creating a marketplace for manufactured spaces

DfMA is an approach which allows designers to maximise value for clients, maintain control over the delivery of their designs and facilitate the adoption of emerging methods, materials and technologies in construction best practices. It is important to stress that DfMA is a design activity driven by an understanding of a Client's requirements



Digital Built Britain



Digital + DfMA

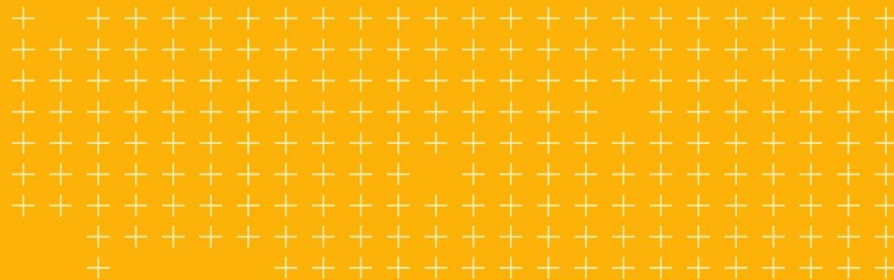


- Digital processes have a part to play
 - Accurate data sets for decision making
 - 2D digital documentation for improved commercial, contractual, health, safety, quality & environmental procedures
 - 3D graphical digital information for better coordination, collaboration, stakeholder engagement & sequencing

Summary

- Why DfMA?
 - Proven to improve time, quality and cost
- Why BIM?
 - BIM = Better Information Management
 - Aligns decision making to maximise offsite
 - Reduced/zero RFIs
- Why DfMA + BIM?
 - To improve your business bottom line





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Thank You