DfMA Overlay to the RIBA Plan of Work

The MMC categories

Category 1: 3D primary structural systems

Category 2: 2D primary structural systems

Category 3: Non-systemised primary structures

Category 4: Additive manufacturing

Category 5: Non-structural assemblies and sub-assemblies

Category 6: Traditional building product-led site labour reduction/ productivity improvements

Category 7: Site process-led site labour reduction/productivity/ assurance improvements

Construction Strategy

A strategy that considers specific aspects of the design that may affect the procurement, buildability, manufacturing, assembly or logistics of constructing a project or that may impact health and safety aspects.

The **Construction Strategy** comprises items such as the craneage strategy, site access and welfare accommodation locations, reviews of the supply chain and sources of materials, and specific buildability considerations, such as the choice of frame (steel/concrete/timber) or the installation of larger items of plant.

	0 Strategic Definition	1 Preparation and Briefing	2 Concept Design	3 Spatial Coordination	4 Technical Design	5 Manufacturing and Construction	6 Handover	7 Use
	Projects span from Stage 1 to Stage 6; the outcome of Stage 0 may be the decision to initiate a project and Stage 7 covers the ongoing use of the building							
Stage Outcome at the end of the stage	The best means of achieving the **Client Requirements** confirmed If the outcome determines that a building is the best means of achieving the **Client Requirements**, the client proceeds to Stage 1	**Project Brief** approved by the client and confirmed that it can be accommodated on the site	**Architectural Concept** approved by the client and aligned to the **Project Brief** The brief remains 'live' during Stage 2 and is derogated in response to the **Architectural Concept**	Architectural and engineering information **Spatially Coordinated**	All design information required to manufacture and construct the project completed Stage 4 will overlap with Stage 5 on most projects	Manufacturing, construction and **Commissioning** completed There is no design work in Stage 5 other than responding to **Site Queries**	Building handed over, **Aftercare** initiated and **Building Contract** concluded	Building used, operated and maintained efficiently Stage 7 starts concurrently with Stage 6 and lasts for the life of the building
Core DfMA Tasks	Developing a programme-level platform will follow Stages 0–4, concluding in a library of systems to technical design level information and the use of these systems on a project will provide significant optimisation of Stages 1–4							
	Consider opportunities for applying the seven MMC categories across portfolios or programmes of projects Consider how DfMA might impact on the **Business Case** or **Client Requirements** including repurposing of a building and reuse or recycling of components at the end of the building's life Consider how different MMC strategies might impact the set up of the project team	Initiate DfMA thinking including opportunities for repeatability of elements on future projects and consider how to incorporate the seven MMC categories into the **Project Brief** and **Project Programme** Undertake **Research and Development** with manufacturers to determine supply chain capability prior to design commencing Consider DfMA solutions when undertaking **Feasibility Studies** considering best practice DfMA exemplars from comparable projects Consider how different MMC categories impact the set up of the project team including the **Responsibility Matrix** and professional services contracts including intellectual property issues	Embed appropriate MMC categories into the **Architectural Concept** Identify DfMA solutions to **Sustainable Outcomes** in the **Concept Design** Ensure that the **Cost Plan**, **Construction**, **Sutainability**, **Plan for Use** and **Health and Safety Strategies** consider DfMA, liaising with supply chain as required Consider **Strategic Engineering** aspects including floor-to-floor heights, spans, space requirements and foundation design Consider early discussions with the planning and transport authorities to safeguard the **Architectural Concept**	Update the **Construction Strategy** and the **Cost Plan** taking into account discussions with potential contractors and the supply chain Consider buildability, including how the erection sequence, fabrication or manufacturing techniques and tolerances impact on interfaces in the **Construction Strategy** Check warranty provision for the proposed MMC systems	Consider how DfMA impacts on **Building Systems** including 'plug and play' connectors and interfaces Develop the DfMA components more accurately considering interfaces and specifications including structural, water/ moisture/vapour penetration and acoustic issues Consider prototyping and other methods of quality assurance Consider manufacturing and assembly risks in the updated **Health and Safety** and **Construction Strategies**	Update the **Construction Strategy**, including a logistics plan, considering lifting, handling and transportation for each component and sub-assembly Monitor quality of offsite manufacturing Consider **Commissioning**, optimising the use of factory acceptance testing	Provide **Feedback** on defects and how these might be avoided on future projects Provide **Feedback** on the DfMA process for consideration in future projects	Consider any **Feedback** during the in-use stage necessary to inform future projects Monitor the performance of standardised components including maintenance and replacement and provide **Feedback** Provide **Feedback** on what aspects have been identified for reuse or recycling at the end of the building's useful life and how the building can be adpated rather than demolished
	Technical design activities may commence in Stage 2 in order to verify DfMA concepts							
Suggested Digital Tasks for DfMA	Analyse data, including cost and programme, from previous DfMA projects in order to set benchmarks	Use BIM for the preparation of **Feasibility Studies** Consider using or establishing a digital library including DfMA objects and components and how this may be used across multiple projects Confirm **Information Requirements** (or Exchange Information Requirements (EIRs) under the UK BIM Framework) including Asset Information Management (AIM) requirements and develop BIM execution plan	Develop digital information including data rich DfMA content possibly from a digital library of Stage 4 ready objects Validate the model against the **Information Requirements** Consider DfMA tolerances in the development of the BIM model Use digital tools and technologies including VR to improve client experience	Update digital information including data rich DfMA content possibly from a digital library of Stage 4 ready objects and consider impact on **Final Specification** Validate the model against the **Information Requirements** Use digital tools and technologies as part of coordination exercises including 4D (time)	Update digital information including information from supply chain Validate the model against the **Information Requirements** Use 4D technologies to scenario test and rehearse the sequencing set out in the **Construction Strategy**, including manufacturing, logistics and assembly, before work starts on site	Use tools and technologies to train site operatives and access digital information including setting out, method statements or product manuals Use digital technologies to track manufacturing, packing, logistics and delivery process Use digital tools to compare actual against planned progress on site and to inspect **Construction Quality**	Ensure digital information relating to DfMA components is linked to **Feedback**, including lessons learned and potential repurposing	Consider configuration management techniques to update digital **Asset Information** during the life of the building Consdier use of **Digital Twin** and smart building technolgies aligned to Internet of Things and cloud technologies to obtain data from in-use activities

Procurement Strategy

ER Employer's Requirements

CP Contractor's Proposals

Traditional	Appoint client team including MMC adviser	Appoint design team			Tender; Appoint contractor			Appoint facility and asset management team, and strategic advisers as needed
Design & Build 1 Stage					ER; CP; Appoint contractor			
Design & Build 2 Stage			ER	Pre-contract services agreement	CP; Appoint contractor			
Management Contract/ Construction Management			Appoint contractor					
Contractor-led			ER	Preferred bidder	CP; Appoint contractor			
MMC Categories 1, 2 and 4	Ensure client team has the requisite knowledge of MMC and DfMA in order to deliver the best solution	Review possible subcontractors and consider manufacturers and how they relate to contractor appointment						
MMC Categories 3 and 5			Consider specialist subcontractors and any constraints and embed into design					
MMC Categories 6 and 7					Low impact on procurement			

RIBA Architecture.com

Core RIBA Plan of Work terms are defined in the *RIBA Plan of Work 2020 Overview* and glossary and set in **Bold Type**.

Further guidance is included in *'Mainstreaming DfMA in Construction'*