RIBA CPD Core Curriculum
Study Notes

10 Design, construction and technology

Understanding, and keeping up to date with, the technical, design, engineering, services and technological issues, trends and changes. Having the knowledge and skills to deliver a successful building process using the latest technology, in a rapidly changing industry and profession.

Fire safety strategy and legislation

RIBA Plan of Work

- Knowledge of the RIBA Plan of Work stages:
  - Knowledge of the DfMA overlay to the RIBA Plan of Work *https://www.architecture.com/-/media/gathercontent/riba-plan-of-work/additional-documents/ribaplanofworkdfmaoverlaypdf.pdf*
- Knowledge of the sustainability checkpoints in each stage.
- Familiarity with the suggested key support tasks.
- Learning to adapt stages 0 and 7 to use them on briefing and evaluation.
- Ability to adapt the plan, and manipulate the task bars, to your own use.
- Knowledge of specific touchpoints and aspects: health and safety, sustainability, information exchanges, design management, project leadership, contract administration, town planning and conservation.

Techniques for developing a design brief

- Knowledge of evidence-based design and briefing.
- Understanding of client leadership and collaboration.
- Listening to the client.
- Advising clients in terms of appropriate and effective means of procurement, and forms of contract which will enable greater efficiency, including the increasing use of pre-manufactured elements, and improved outcomes in terms of time, cost and quality.
- Establishing change management procedures.
- Minimising change and the cost, disruption and potential waste that it represents.

Sector-specific building uses and types

Knowledge of client needs and sectors and design for:

- Housing – volume.
- Housing – individual.
- Retail.
- Leisure.
- Hotels.
- Sports.
- Commercial.
- Offices.
- Educational.
- Religious.
- Industrial.

Structures and services: understanding of:

- Using relevant specialist consultants.
- Integration and coordination of teams into the design and project.

- Systems for environmental comfort within the relevant precepts of sustainable design.
- Strategies for building services and their integration within a design project.
- Optimum physical, thermal and acoustic environments.

Specification and materials: understanding of:

- Technical innovations in materials.
- Working with suppliers and manufacturers.
- Specification writing and selecting materials and products.
- Production information.
- Classification systems: Uniclass 2015 and CI/SfB.
- Alternative structural, construction and material systems.
- Ethical supply chains and products.
- Production information.
- Design proposals and detailing, complete and fully coordinated before construction commences, to avoid delays, disruption and change resulting in waste and additional cost.
- Understanding waste in all its forms: physical, time and intellect, and seeking to minimise it.

Digital design and construction

> This is not just digitalisation as an end in itself, but a means to improve the construction process and productivity. Consider how digitisation can improve the information for construction, a means to collaborate with others contributing to the design and correctly integrate their work (including pre-manufactured elements), to avoid errors, potential site delays and costs and to visualise work so that its assembly can be fully understood and planned, including construction logistics, enable the application of lean thinking and through building visualisation enable the client to be fully engaged with project development to minimise or eliminate later, disruptive change.
>
> **Roger Burton, Envirohaus**

Knowledge of the changes and drivers to architecture and construction with digital technology, and resulting improvements, such as:

- Data-driven and digital design.
- 3D modelling.
- 3D and 4D printing.
- Advanced robotics.
- Parametric design.
- The Internet of Things (in design and in buildings and cities).
- Smart cities, planning and architecture.
- Smart buildings.
- Using, leveraging and understanding big data.
- Artificial reality, enhanced reality and virtual reality for presentation (and improvements in client engagement and briefing), for information exchange on projects and for training (e.g. health and safety).
- CAD, modelling and mapping.
- Wireless technology.
- User feedback loops.
- Familiarity with presentation platforms and technologies.

Building Information Modelling (BIM)

Building Information Modelling (BIM) is the management of information through the whole life cycle of a built asset, from initial design all the way through to construction, maintaining and finally de-commissioning, through the use of digital modelling. BIM is all about collaboration - between engineers, owners, architects and contractors in a three dimensional virtual construction environment (common data environment), and it shares information across these disciplines.

Building Information Modelling allows design and construction teams to communicate about design and coordinate information across different levels that has been unseen before. This information remains with the project, from before beginning construction, right throughout its lifetime. It also helps to analyse any potential impacts.

David Miller, David Miller Architects

- Understanding your BIM maturity amongst the four levels thereof.
- Understanding the context and requirements of BIM Level 2.
- Speaking 'BIM' by understanding the terms and acronyms.
- The detailed foundations of BIM Level 2:
  - Employers Information Requirements (IERs).
  - BIM Execution Plan (BEP).
  - Project Information Model (PIM).
- BIM Level 2 standards, with particular reference to:
- Understanding the role of the information manager.
- Understanding BIM as a management and collaboration tool.
- Understanding the benefits of BIM to your business and clients.
- Developing your BIM strategy and implementation.
- Using common data environments and applying the Standards:
  - BS 1192:2007 +A2:2016.
  - PAS 1192-2:2013.
  - (PAS 1192-3: 2014).
  - PAS 1192-4: 2014.
  - CIC BIM Protocol.
- Understanding Design Responsibility and the Digital Plan of Work (NBS BIM Toolkit).
- Understanding BIM security issues – PAS 1192-5: 2015.
- Understanding intellectual property/ liability in the BIM context.
- Applying (Government) Soft Landings and briefing for FM (BS 8536-1: 2015).

Offsite construction and modern methods of construction: understanding of:

- The use of pre-manufactured elements with a view to improving cost, time and quality parameters and gaining improvements in productivity.
- Design for manufacture and assembly(DfMA) and RIBA Plan of Work (PoW) DfMA overlay.
- Developing your DfMA strategy, and with particular reference to Stage 2 of RIBA Plan of Work (PoW).
- The benefits of modern methods of construction and pre-manufactured elements.

- See also 'Building Offsite: An Introduction' by Dr Robert Hairstans, Napier University *http://www.napier.ac.uk/~/media/worktribe/output-173370/buildingoffsiteanintroductioncompressedpdf.pdf*
  - Time: shorter time onsite, predictable completion dates, levels of productivity.
  - Improving information flow and sharing.
  - Cost certainty and reduction and reduced risk.
  - Better construction quality.
  - Choosing more efficient components and systems.
  - Improving health and safety.
  - Better environmental outcomes and performance, and waste reduction.
  - Site improvements: improved safety, reduced noise and dust, less storage space, fewer deliveries.
- The stages of construction industrialisation:
  - Design for manufacture and assembly.
  - Offsite manufacture.
  - Logistics.
  - Onsite assembly.
  - Design for maintenance.
- The levels of building offsite:
  - Level 1: Component sub-assembly.
  - Level 2: Non-volumetric preassembly.
  - Level 3: Volumetric preassembly.
  - Level 4: Complete buildings.
  - Flat-pack.
  - Hybrids or semi-volumetric.

Level 1: Component sub-assembly
Covers approaches that fall short of being classified as offsite systems. Typically, the term refers to simplified components like stairs, doors and windows which are manufactured in factories.

Level 2: Non-volumetric preassembly
Either classified as 'open' or 'closed' with open panels normally being non-insulated and closed panels being insulated. Enhanced panels are also referred to, and these panelised systems have been enhanced beyond the closed state to include windows and doors, services (electrical or plumbing) or other finishes such as external cladding or internal lining.

Level 3: Volumetric preassembly
'Volumetric' is the term used to describe units prefabricated in a factory that enclose usable space and are typically fully finished internally, such as toilet/ bathroom pods and plant rooms, which are then installed within or onto a building or structure.

Level 4: Modular buildings
As volumetric, but where the completed useable space forms part of the completed building or structure finished internally (lined) and externally (clad).

Flat-pack
Prefabricated elements or systems that are transported to site as 2D elements, rather than modular units.

Hybrids or semi-volumetric
A combination of more than one discrete system or approach, and normally a combination of both volumetric and panelised systems.

- Manufacturing processes:
  - Offsite supply chain.
  - Right first time/ quality.
  - Lean thinking.
  - Continuous improvement process.
  - Mass customization.
  - Timber hybrid structures.
  - 3D printing.
  - Open-source architecture.
- Construction logistics:
  - Just-in-time delivery.
  - Consolidated logistics.
  - Flying factories.
  - Kit of parts.
  - Materials handling design.
  - Integration with design and development stage.
- Onsite processes:
  - Impact on programme, quality, safety, waste and environmental sustainability.
  - Lean construction.
  - Timber frame.
  - Light steel frame.
  - Precast concrete.
  - Hybrid systems.
  - Multi-skilled operatives.
- Design for maintenance and for whole life:
  - Intelligent and Smart (monitored and controllable) components.
  - Building performance monitoring.
  - Post-occupancy evaluations.
  - Predictive maintenance.
  - Condition-based monitoring.
  - Mean time to repair.

Links to other organisations and resources

Background
NBS *www.theNBS.com*
RIBAJ *www.ribaj.com*

DfMA and Offsite
Supply Chain School *https://www.supplychainschool.co.uk/uk/default-home-main.aspx*
Build Offsite *http://www.buildoffsite.com/*

BIM
UK BIM Alliance *http://www.ukbimalliance.org/*
BIM Task Group *http://www.bimtaskgroup.org/*

Other professional bodies
Chartered Institute of Building Services Engineers (CIBSE) *www.cibse.org*
The Chartered Institute of Architectural Technologists (CIAT) *www.ciat.org.uk*
British Standards Institute (BSI) *www.bsigroup.com*
Institution of Civil Engineers (ICE) *www.ice.org.uk*
Institution of Structural Engineers (IstructE) *www.istructe.org*
Royal Institution of Chartered Surveyors (RICS) *www.rics.org*

Innovation and digital
NESTA *http://www.nesta.org.uk/*
Digital Catapult *https://digital.catapult.org.uk/*
McKinsey resources on digital disruption *http://www.mckinsey.com/global-themes/digital-disruption*
Dezeen resources on digital design *https://www.dezeen.com/tag/digital-design/*

Research
Construction Industry Research and Information Association (CIRIA) *www.ciria.org*
Building Services Research and Information Association (BSRIA) *www.bsria.co.uk*
Designing Buildings Wiki *https://www.designingbuildings.co.uk/wiki/Home*
Building Research Establishment (BRE) *www.bre.co.uk*