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RIBA CPD Core Curriculum

CONTINUING  
PROFESSIONAL  
DEVELOPMENT





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# RIBA

## CPD Core Curriculum

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The RIBA has responded to members feedback and your stated learning needs, and the drastic changes and disruption in architecture and construction. The result is a modern update of the RIBA CPD Core Curriculum, fit for 21st century practice, a changing world, and your needs as architects and business people. This is a CPD curriculum to help you to contend with disruption, to future-proof yourself, and to help your practices flourish.

We have also introduced an entirely new topic: architecture for social purpose. This is where we and you can make a positive impact. This exciting new topic is about understanding the social value and, economic and environmental benefits architecture brings for individuals and communities – improving life chances, social identity and cohesion, and well-being, and having the knowledge and skills to make informed, fair, and ethical choices and influence the project team and supply chain.

The RIBA's mandatory CPD curriculum 2017 update is now in place, and outlined in this document.

### What is the RIBA CPD Core Curriculum?

The RIBA CPD Core Curriculum defines ten key mandatory topics of yearly study within your CPD obligations. All chartered members are expected to obtain at least two hours of learning in each of the ten every year, utilising proper knowledge management and research methodology.

(Knowledge management is the systematic organisation of a practice's knowledge to create value and facilitate organisational learning. Research is a process of systematic and original investigation undertaken in order to gain knowledge and understanding and to de-risk innovation.)

This approach helps members to spend their CPD time maintaining competence in basic architectural skills. At the same time, it gives them the freedom to tailor their CPD to their personal and professional needs and circumstances. As members are obliged to attain 35 hours CPD a year, the core requirement represents only a portion of the yearly attainment.



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### **What is this document?**

This document sets out a comprehensive, but not exclusive, framework of what target issues practitioners might wish to engage with in each topic, by which ever method and from whatever source.

These study notes represent scores of possible learning in each of the ten mandatory topics. In other words, they are potential approaches to competency in each of the ten. The notes are merely a guide and are not mandatory.

### **What kind of CPD can I do?**

Can you learn from it? Then it can count as CPD. By “CPD” we mean any relevant learning activity, from informal microlearning to advanced skills. The CPD you do depends on your circumstances. Most members will be doing microlearning or general awareness in the ten just through activities such as reading, knowledge transfer and similar. The more detail you need for your own personal and professional circumstances, the more detailed your CPD is likely to be. Thus anything from reading to additional qualifications can count as CPD, with numerous allowable activities in between those extremes.

### **How does it pertain to me?**

The curriculum is mandatory for all chartered members. You are however expected to personalise it to your own circumstances. How you manage the obligation however is entirely up to you. You are invited to – and expected to – make all your CPD relevant to your circumstances. The RIBA's approach allows for both the maintenance of competence, and the personal and professional future-proofing.

### **Can I choose my own learning?**

Yes, you are encouraged to do so. You can choose the learning level, medium, type (structured or informal), subject, supplier and more. The RIBA doesn't specify how you have to obtain your CPD. We do provide CPD for you, but you are not obliged to use ours.

### **What if I am doing other things?**

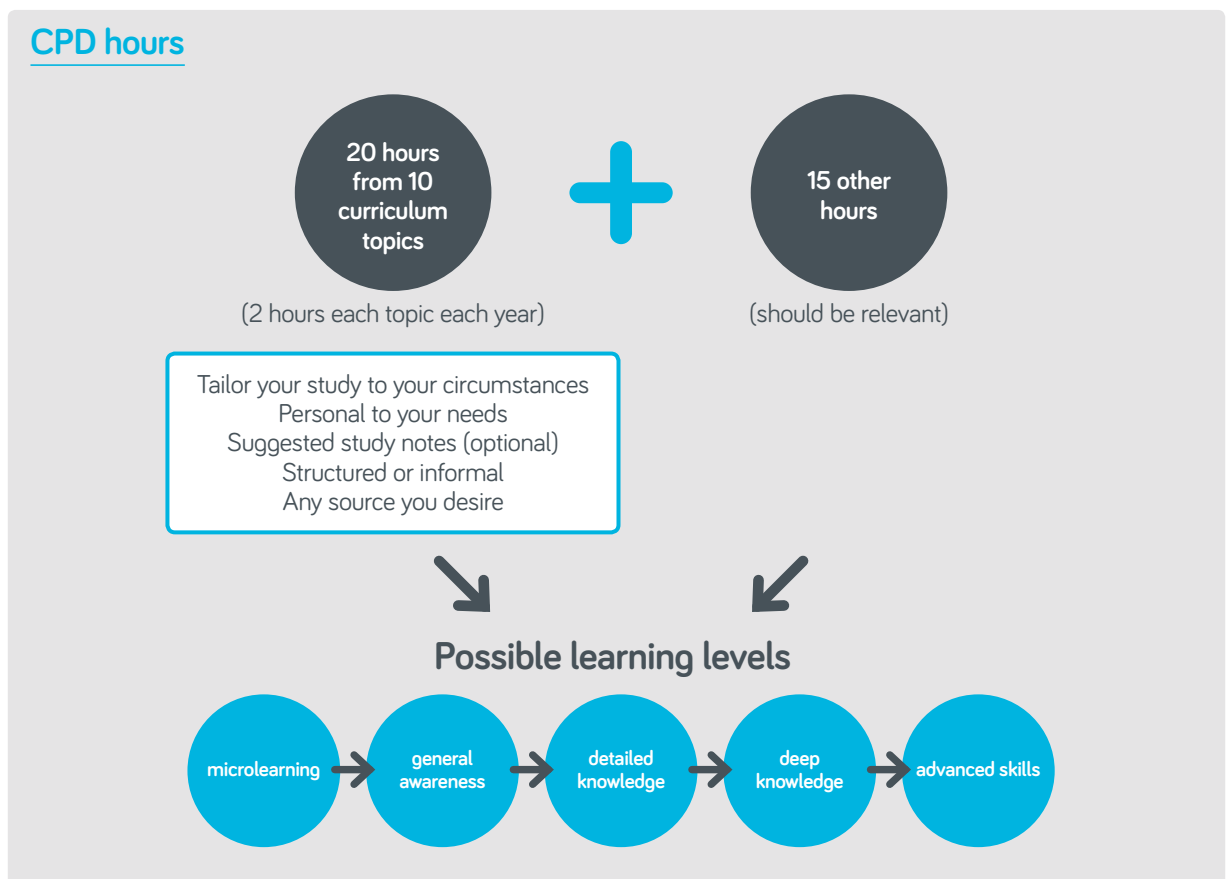
Again, the curriculum is general enough to ensure that most people will attain at least two hours per year in each of the ten. This represents a mere 25 minutes per week at the minimum. Many people exceed this because the definition of what counts is so broad. Also, as learning becomes more organically integrated into practice and personal life, many of us are learning constantly.

**What are the learning levels? Whether face to face, online or distance, these are the possible levels:**

- Microlearning: quick informal updates of up to 30 minutes, usually digital, and self-directed
- General awareness: usually free, one hour's duration: doesn't lead to expertise
- Detailed knowledge: structured CPD of two hours to a half day's duration
- Deep learning: courses on a single subject of one or two days' duration
- Advanced learning: courses of at least three days' duration potentially leading to additional specialisations, certification or qualifications

**Finally a note on time**

35 hours per year equals 45 minutes per week: the 20 hour core requirement within that 35 hours equates to only 20 minutes per week.



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# Topic 1

## Architecture for social purpose

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*This competency potentially covers*

### Background

The positive impact of architecture and the social value and economic and environmental benefits it brings for individuals and communities – improving life chances, social identity and cohesion, and wellbeing.

### Codes and modes of conduct and duty of care

Current RIBA and ARB codes of conduct and discipline, including professional ethics and business ethics

RIBA Guidance Note 8: Employment and creating equal opportunities

The architect's obligation to society and the protection of the environment

Equality Act 2010 and understanding the 9 protected characteristics

#### **The nine protected characteristics under the Equality Act 2010:**

Age  
Disability  
Gender reassignment  
Marriage and civil partnership (in employment only)  
Pregnancy and maternity  
Race  
Religion and belief  
Sex  
Sexual orientation

### Professionalism in a global context

The UN Global Compact: how it affects you and your company

[www.architecture.com/about/ungc](http://www.architecture.com/about/ungc)

Ethical and sustainable sourcing, specification and supply chains

Working ethically in other countries in the absence of legislation: cultural awareness, respect and how to make decisions

Disaster preparedness, relief and reconstruction, and how to work with and for the benefit of affected communities

International development work and relief and humanitarian shelter and settlement coordination

Design appropriate and sympathetic to local culture and history

## Topic 1

# Architecture for social purpose

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### Ethics of architecture, construction and business management

Developing ethical, social and environmental awareness

Understanding the ethics of regeneration

Social purpose in building conservation and heritage

Social purpose of health, safety and wellbeing

Fire safety strategy and legislation

Understanding and knowing how to calculate social value

**The Social Value Act** came into force in April 2013. The Act requires public authorities to have regard to economic, social and environmental wellbeing in connection with public services contracts; and for connected purposes. It applies to all English and some Welsh public bodies, including the NHS, local authorities, other government departments, housing associations and emergency services.

Equitable and inclusive planning and placemaking

#### **Equitable placemaking**

Mechanisms and processes that make people of all backgrounds feel welcome, as co-creators and collaborators, in the making of their communities, and in communities they feel reflects them.

### Collaboration and respect: staff, clients, stakeholders and communities

Understanding community engagement

Effective engagement with stakeholders

Understanding who should be your key stakeholders

The importance of maintaining professional relationships

Achieving effective client interaction

Creating a stable work/life balance for your employees

Understanding team working in the professional environment

Community regeneration and how you can help

Understanding Local Authorities' development plans for creating better environments for their communities

Understanding and ensuring positive community engagement

Working pro-actively with communities and stakeholders

Engaging with clients and understanding the economics of architecture with social purpose



## Equality, diversity and inclusion

Understanding and promoting the business benefits of equality, diversity and inclusion in the workplace and in your work and projects

Understanding inclusive environments and accessible buildings

Developing ethnic and cultural awareness

Understanding mental health issues

Understanding the difference between equality, diversity and inclusion

**Equality** is the quality or state of being equal; of knowing and understanding that everybody's value in terms of status, rights or opportunities is the same and, by extension, treating them equally. In order to achieve equality, individuals must be fair and respect differences in people and their characteristics, recognising that such differences should not justify different or unfair treatment and that all people should be afforded the same rights and opportunities, irrespective of their differences.

**Diversity** is the quality or state of being diverse; it encompasses all the characteristics that make people different from each other. Diversity is a state of having and accepting differences, including age, condition, race, gender, religion or belief and sexual orientation.

**Inclusion** is the action or state of positively including and being included within a group, structure or organisation; ensuring all people are embraced and not excluded. Inclusion is about removing or altering 'barriers' that may discourage people from actively participating – often the things that we cannot see, such as attitudes and prejudice.

## Outreach: mentoring, volunteering and architecture in education

Understanding how to effectively volunteer your time and skills

Understanding your role as a mentor or a mentee

Secondary school and sixth form engagement

Understanding your non-executive role in the third sector (eg. school governor, parish councillor)

How to deliver workshops and presentations to schools on architecture as a career choice

Transferring your knowledge through design tutoring

Charity movements in architecture: how you can get involved

Giving your skills to your church, mosque, synagogue or temple

Reflecting on and assessing the soft or technical skills you gain from volunteering.



## Topic 2

# Health, safety and wellbeing

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*This competency potentially covers*

### Legislative framework

Construction (Design and Management) (CDM) Regulations 2015 (and see below)

Health and Safety at Work etc. Act 1974 (HSWA)

The Construction (Health, Safety and Welfare) Regulations 1996

The Management of Health and Safety at Work Regulations 1999

The Regulatory Reform (Fire Safety) Order 2005

- Fire safety strategy and legislation

Work at Height Regulations 2005

Corporate Manslaughter and Corporate Homicide Act 2007

Control of Asbestos Regulations 2012

Personal Protective Equipment Regulations 2002

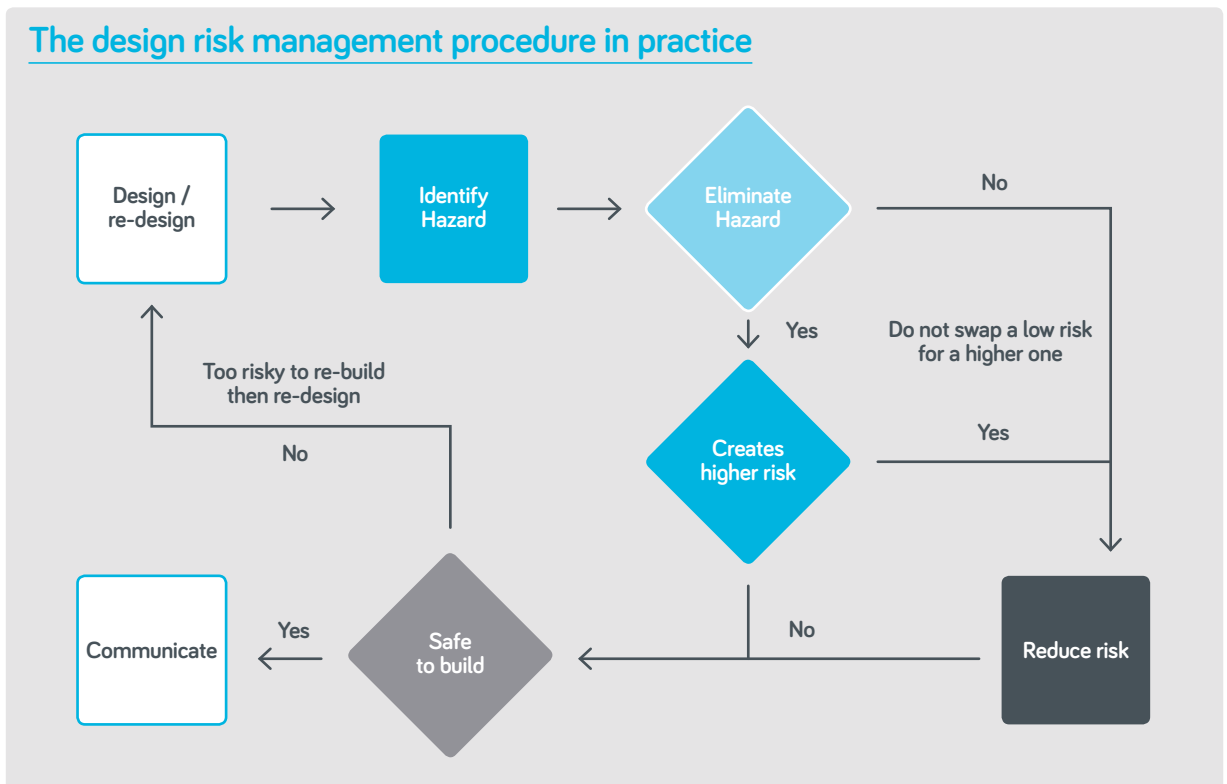
Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013 (RIDDOR)

### **CDM Regulations (acquaintance with the terms and L153 locations)**

- Duty Holders – their roles and responsibilities
- Advising the client
- Differences for domestic' projects
- Design risk identification and management methodology
- The Principles of Prevention and their proportionate application to design
- Absolute and qualified duties in CDM 2015
- Identification of “Significant” design risks, not ‘all risks’
- Pre-Construction Information- deliverables
- Construction Phase health and safety plan
- Health and safety file
- HSE and industry guidance
- Understanding of the concept of “so far as is reasonably practicable” (SFARP) and its application
- Notification of HSE by client
- CDM identification on drawings
- CDM analysis methods,
- Tracking of design risk management process
- Case studies and exemplar projects

### The design risk management process

- RIBA Plan of Work – health and safety
- Understanding pre construction information
- CDM strategy brief
- Designer’s duties and liabilities
- Concept of ‘so far as reasonably practicable’ SFARP
- Absolute and Qualified Duties under CDM 2015
- Exemplar design risk management processes
- Risk review meetings at all stages collaboratively
- Principles of Prevention a Framework for consideration for health and safety in design
- Hazard Awareness and Risk Identification
- Design risk registers and analysis of significant and unusual risks/hazards
- Communicating risk by visual methods
- What is not required!



© RIBA Publishing and APS 2015 from *Principal Designer's Handbook and Guide to the CDM 2015 Regulations*

### Designing for safety and health

Constructability analysis

Designing to improve the long-term health prospects of workers

Safety issues, including temporary works

Health issues, including asbestos, dust and particulates, noise and vibration

Safe access for maintenance and repair

Visiting the site safely

Wellness accreditation systems

### The project hazards and risks

Hazard identification and control with respect to designers

- Hazardous substances
- Physical and ergonomic hazards (noise, manual handling)
- Biological hazards
- Hygiene and welfare facilities
- Working at heights and depths
- Excavations and confined spaces
- Site electricity (overhead, overground and underground)
- Fire during construction and in use
- Plant /moving vehicles
- Temporary works, underpinning
- Trespass and security
- Protection of the public

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### Practice management

Employers' and employees' responsibilities  
Risk assessments  
Fire safety strategy and legislation  
Electrical safety  
COSHH  
First aid  
Lone working  
Staff safety out of office – on site (CSCS) and/or surveying  
Managing health and safety at special events  
Mental health  
Visiting the site safely; provision and use of PPE

### Health, safety and wellbeing accreditation systems

Safety schemes in procurement including CHAS, SSIP, SMAS  
Considerate Constructors  
Safe Contractor  
CSCS card scheme  
BS OHSAS 18001 – to be replaced by ISO 45001  
Occupational health and safety management systems (2018)  
WELL Building Standard



# Topic 3

## Business, clients and services

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*This competency potentially covers these knowledge areas and skills*

### The legislative framework and due diligence

Intellectual property rights, copyright law

Insurance, employers, PI and liability

Duty of care, professional liability, negligence and professional indemnity, including insurance warranties

Obligations to stakeholders, warranties and third party rights

Employment law [www.gov.uk/browse/employing-people](http://www.gov.uk/browse/employing-people)

The Equality Act 2010 and the 9 protected characteristics

Health and Safety at Work Act [www.hse.gov.uk/legislation/hswa.htm](http://www.hse.gov.uk/legislation/hswa.htm)

Workplace pension provision [www.gov.uk/browse/employing-people/pensions](http://www.gov.uk/browse/employing-people/pensions)

Risk management strategies

Data protection and data management policies and strategies

(See also the [Architecture for social purpose](#) and [Legal, regulatory and statutory topics](#))

### Contracts, client agreements and forms of appointment

Understanding the different contracts and forms of appointment

Contracts for professional services

Contracts for building projects

RIBA agreements for the appointment of architects and specialist consultants

Architects' contracts (eg, as lead or sub consultant), terms of engagement, scope of services, clear letters of appointment, relevant legislation

Advising the client on the right/best form of contract to be used, and keeping up to speed on updates and amends on the various forms of contract.

(see also the [procurement](#) and [contracts](#) topic)

### Overall business set up and strategy

Practice structures and legal status

Business styles

Time management, recording, planning and review

Practice finance, business planning, funding and taxation

Administration,

Quality management, QA systems

## Topic 3

### Business, clients and services

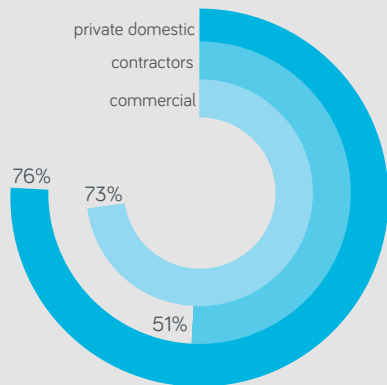
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Recording and review  
Risk management strategies  
Project management  
Having an effective data management strategy and approach  
Succession planning and retirement planning  
Proprietary business management software

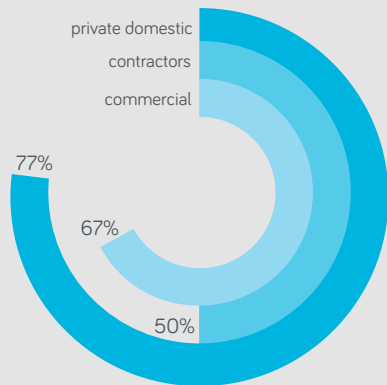
#### The client offer

Please see the RIBA Client Services publication, **What Do Clients Think of Architects**  
<https://www.architecture.com/-/media/gathercontent/working-with-architects-survey/additional-documents/ribaclientsurveyfinalscreenwithoutappendixpdf.pdf>

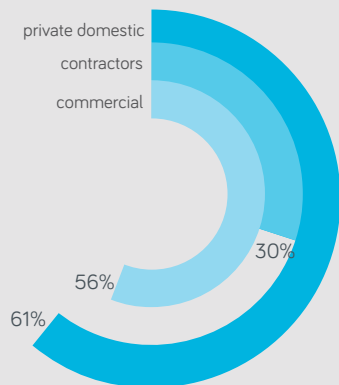
Client relationship management  
Understanding your client's language and requirements  
Developing and interpreting the brief  
Knowing how to explain design proposals  
Effective communication, presentation, pitching, confirmation and recording  
Understanding the client's commercial drivers, and having commercial understanding  
Value adding activities through design and services  
Having a clear technical design specification  
Communication, progress reporting and appropriate and timely advice  
Understanding engagement and consultation  
Systems for adhering to the programme  
Post occupancy evaluation  
Managing the handover process  
The effect the project has on the function and maintenance of the building



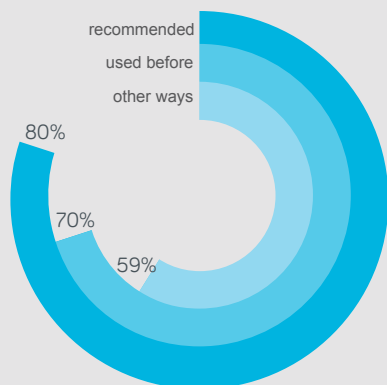
← Per cent of clients who are 'very' or 'fairly' satisfied with the project, overall



← Per cent of clients who are 'very' or 'fairly' satisfied with architects' technical design performance (mean average of all scores)



← Per cent of clients who are 'very' or 'fairly' satisfied with architects' process management performance (mean average of all scores)



← Per cent of clients who are 'very' or 'fairly' satisfied with architects' design performance (mean average of all scores)



## Topic 3

### Business, clients and services

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#### Selling and marketing strategy

Marketing and promoting the practice  
Building a brand and reputation  
Building and maintaining a website  
Having a strategy for social media, and understanding what to use and when  
Blogging, using press, and case histories  
Agreeing a social media policy and strategy  
Good photography and leveraging Instagram and Pinterest  
Leveraging Google and other search engines and understanding search engine optimisation (SEO)  
Competitions, procurement and bids strategies (see [Procurement](#) and [Contracts](#) topic)

#### Financial management

Fee calculation, costing, pricing, negotiation, and bidding  
Resource management and job costing  
Cash flow monitoring and control  
Cost monitoring and control and financial management  
Programming of services appropriate to appointment  
Taxation accounting and planning  
Foreign exchange planning  
Macro-economic monitoring  
Contingency planning  
Management accounting

#### Project management

Project Management qualifications  
Project management soft skills  
Programming of services appropriate to appointment  
Coordination and integration of design team input  
Time management, recording, planning and review  
Quality control  
Tools and checks for adhering to budgets

### Team and people management

Employment contracts  
Equality, diversity and inclusion in the workplace  
Staff management and development  
A CPD management system  
Performance reviews and appraisals  
Team working, team building and leadership  
Recruitment strategy and hiring the right people  
Staff retention strategy  
Retirement planning  
Understanding mental and emotional wellbeing of your team

### Going digital: developing understanding of

Collaboration tools  
Knowledge and document management software  
Digital platforms for team collaboration such as Yammer, Trello and Slate  
Leveraging Google and other search engines for your commercial benefit  
Knowledge of coding and programming  
(see also design, construction and technology topic)

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### Embedding research in practice

Research strategy for practice, including a research impact strategy

Qualitative and quantitative research methods

Developing a research proposal

Undertaking literature reviews

Systematic reviews vs rapid appraisals

Modelling vs experimentation

Formalising case study approaches for client persuasion

Using research to inform projects

Capitalising on skills relating to uncertainty and risk

- Appraisal of financial viability
- Ability to maximise investment potential
- Efficient business practice
- Conversance with patterns of consumption
- Maintaining standards while maximising value

Writing up research

Accessing tax credits for research and development

Please see the RIBA's resources on this issue [www.architecture.com/knowledge-and-resources/resources-landing-page/knowledge-and-research-in-practice](http://www.architecture.com/knowledge-and-resources/resources-landing-page/knowledge-and-research-in-practice)

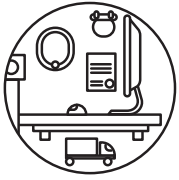


## Topic 4

# Legal, regulatory and statutory compliance

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*See the relevant notes on the other nine topics.*



# Topic 5

## Procurement and contracts

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*This competency potentially covers*

### The legislative framework

WTO GPA (World Trade Organisation Government Procurement Agreement)

EU Directive 2014/24

Public Contract Regulations 2015 and what it allows and requires

The Social Value Act

Small Businesses and Enterprise Bill

English, Welsh, Scottish and Northern Ireland Regulations and authorities standing orders

Threshold values of OJEU (Official Journal of the European Union)

Obligations on tenders below thresholds under trade treaties and regulations

Restraint on abnormally low tenders

RIBA Plan of Work 2013: procurement task bar

RIBA Ten Principles for Procuring Better Outcomes [www.architecture.com/knowledge-and-resources/resources-landing-page/ten-principles-for-procuring-better-outcomes](http://www.architecture.com/knowledge-and-resources/resources-landing-page/ten-principles-for-procuring-better-outcomes)

### What is possible and what to look out for

Preliminary Market Engagement (PME)

How procurement tender and its value is defined

Award criteria: cost effectiveness, life cycle costing, balanced score cards and MEAT (most economically advantageous tender)

Appropriate cost/quality ratio

Understanding requirements and evaluating detailed brief requirements

The programme, resources and cost of competing

### Reading an OJEU notice

The contract value

The contracting authority

The object of the contract, including whether variants are acceptable and consortia are allowed

Legal, financial and technical information

Economic and financial ability and whether the service is reserved for a particular profession

Likely number of procurement stages

The cost quality weighting in the assessment

The procedural type route and contract terms and conditions revealed

Complementary information

## Topic 5

### Procurement and contracts

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Accessing detailed briefs and bid uploading facilities

Understand OJEU layouts, notice access, the CPV (common procurement vocabulary) and NUTS (Nomenclature of Territorial Units for Statistics) codes

#### Developing a proactive practice procurement strategy

How to decide which competitions to enter and being clear on why you are entering

How to evaluate your chances and if you meet the baseline criteria

Attend preliminary market engagement opportunities to learn what the client is looking for

How to evaluate the time, effort and level of competition and opportunity of different procedures

Learn how and when to consider consortia or partnerships to meet economic, capacity and experience requirements

#### Tactics in tendering for work

##### **Pre qualification:**

how to use centralised purchasing arrangements and pre qualification services;

learn what a good EOI (expression of interest) looks like

learn how to complete a PQQ (pre qualification questionnaire);

learn how to demonstrate track record and previous experience.

##### **Tendering:**

What a good tender return looks like

How to submit cost effective bids

How to demonstrate social value demanded by a Social Value Levy

How to demonstrate cost-effectiveness through quality criteria (MEAT and balanced score cards)

How to demonstrate a design approach that meets client outcomes

How to demonstrate that you understand and can deliver client outcomes in a negotiation or dialogue

How to get onto frameworks and getting called off

##### **Frameworks**

Selection off a framework by mini competition

The third competitive stage assessment

Assessment models for design, fee bid or other

## Topic 5

### Procurement and contracts

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Other techniques: full house or pack thinned; by lot, rotational, randomised, ranking from initial assessment, level playing fields

#### **Understanding the client (see also core topic, Business, Clients and Services)**

Understand client drivers in consultant selection: eg, project certainty, complexity, design solution or team, capacity or emerging talent, design approaches and previous projects, project definition, time pressure

How to have positive conversations with clients in interviews to demonstrate your interest and capability

Understanding the client's fields of enquiry and their weighting matrix for assessment

#### **Things to do better**

Understand your practice strengths and weaknesses

Identify your practice's unique qualities and distinctions and learn how to articulate them

Learn how to communicate your values

Ensure that your fee bid or matrix is well considered and researched

Respond in clear, succinct and simple language, and relevantly to the specific questions, in the format requested

When writing text, avoid excessive listings of matters

Wherever possible, allow sufficient time to get oversight on your bid

Network and establish bid ready consortia

Develop arrangements in consortia for regularly screening bids, and doing the initial evaluations, consideration and reporting

Share consortia bid costs and feedback

#### **Procurement methods**

Selecting the appropriate procurement method

Nature and scope of work proposed;

How the risks are to be apportioned

How and where design responsibility is placed

How the work is coordinated

On what price basis the contract is to be awarded.

- Traditional
- Design and build
- Management

## Topic 5

### Procurement and contracts

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The effect of different procurement routes on programme, cost, risk, quality  
Design responsibility and third-party rights  
Claims, litigation and alternative dispute resolution methods  
Collaboration and briefing in construction and provisions for team working  
Site processes, quality monitoring, progress recording, payment and completion

#### The right contract

Understanding the different contracts and forms of appointment  
Advising the client on the right/best form of contract to be used, and keeping up to speed on updates and amends on the various forms of contract.  
Duties and powers of a lead consultant and contract administrator  
Agreeing and knowing how specific contracts are to be adjudicated and adjudication agreements  
Collateral warranties  
Contract law and case law

Contracts for professional services  
Contracts for building projects

- Standard forms of contract
- Non standard forms of contract

Selecting the appropriate type of contract

#### **Traditional**

- Lump sum
- Measurement
- Cost reimbursement

#### **Management**

- Management contracts
- Construction management contracts
- Design, manage, construct and in some cases maintain

#### **Design and build**

**RIBA Contracts for domestic and simple commercial projects**

**RIBA agreements for the appointment of architects and specialist consultants**



## Topic 5

### Procurement and contracts

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#### **Other types of contracts and agreements for specific issues:**

Public sector consultancy agreements

Framework agreements and guides

Homeowner contracts

Intermediate building contracts

Major projects

Minor works

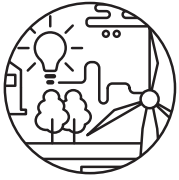
Pre-construction services

Prime cost

Repair and maintenance

The authors are indebted to Walter Menteth and Lucy Carmichael.

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# Topic 6

## Sustainable architecture

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*This competency potentially covers*

### Background and context: understanding of

Climate change and climate change science and impact of both mitigation and adaptation

The impact and magnitude the built environment has on greenhouse gas emissions

Sustainable design from inception to completion and handover including post-occupancy evaluation and feedback and how this fits within a wider aim of resource efficiency

The links and differences between low energy and low carbon design

Design decisions on the whole life of our built environment, including how to design with total cost in mind (including maintenance, durability and end of life scenarios) and the role of data to assist with smarter buildings and cities

The link with digital construction as an enabler for creating more stable built environments

Sustainability checkpoints in the RIBA Plan of Work

**See also [Targeting Zero](https://www.ribabookshops.com/item/targeting-zero-embodied-and-whole-life-carbon-explained/86504/) by Simon Sturgis from RIBA Publishing [www.ribabookshops.com/item/targeting-zero-embodied-and-whole-life-carbon-explained/86504/](https://www.ribabookshops.com/item/targeting-zero-embodied-and-whole-life-carbon-explained/86504/)**

### Legislation: understanding of

#### **Primary legislation (acts or orders) such as**

Clean Air Act

Clean Neighbourhoods and Environment Act

Climate Change Act

Energy Act

Environmental Protection Act

Flood and Water Management Act

Natural Environment and Rural Communities Act

Water Resources Act

Wildlife and Countryside Act

The key points laid out in NPPF regarding presumption in favour of sustainable design

#### **Secondary legislation (regulations) and standards such as**

Relevant Building Regulations such as L1 and L2 and the devolved nations' equivalents

Conservation of Habitats and Species Regulations

Energy Performance of Buildings (Certificates and Inspections) (England and Wales) Regulations

BS EN 15978:2011 Sustainability of Construction Works. Assessment of environmental performance of buildings. Calculation method

BS EN 15804:2012 Environmental product declarations. Core rules for the product category of construction products

RICS Professional Statement: Whole Life Carbon: Implementation in the built environment, 2017

Environmental Permitting (England and Wales) Regulations

Site Waste Management Plan Regulations

Town and Country Planning Regulations (environmental impact assessment) (England and Wales)

SUDS legislation and the need to respond to predicted future flood conditions

Code for Sustainable Homes

The PassivHaus Standard

BREEAM standards

PAS 1192

ISO 20400: Sustainable Procurement Standard

Fire safety strategy and legislation

### Client briefing and management

Understanding and prioritising energy efficiency in low carbon design over whole life

Energy efficiency as underpinning the more general aim of low carbon emissions

Communicating the ethical and pragmatic importance of low carbon design

Low energy and high comfort together resulting in good outcomes for client and planet

Communicating the importance of the selection of low carbon materials and systems

The importance of life cycle analysis in aiding the understanding of a buildings physical performance over its life

Understanding stakeholders, clients, planning and legislative authorities

Defining the brief whilst balancing sustainability targets

Importance of commissioning and building management – soft landings as a process from start to finish

Building performance metrics such as kWh/m<sup>2</sup>a kgCO<sub>2</sub>/m<sup>2</sup>

KPI's and which ones should be used and comfort indices such as IAQ, CO<sub>2</sub> levels, temperature.

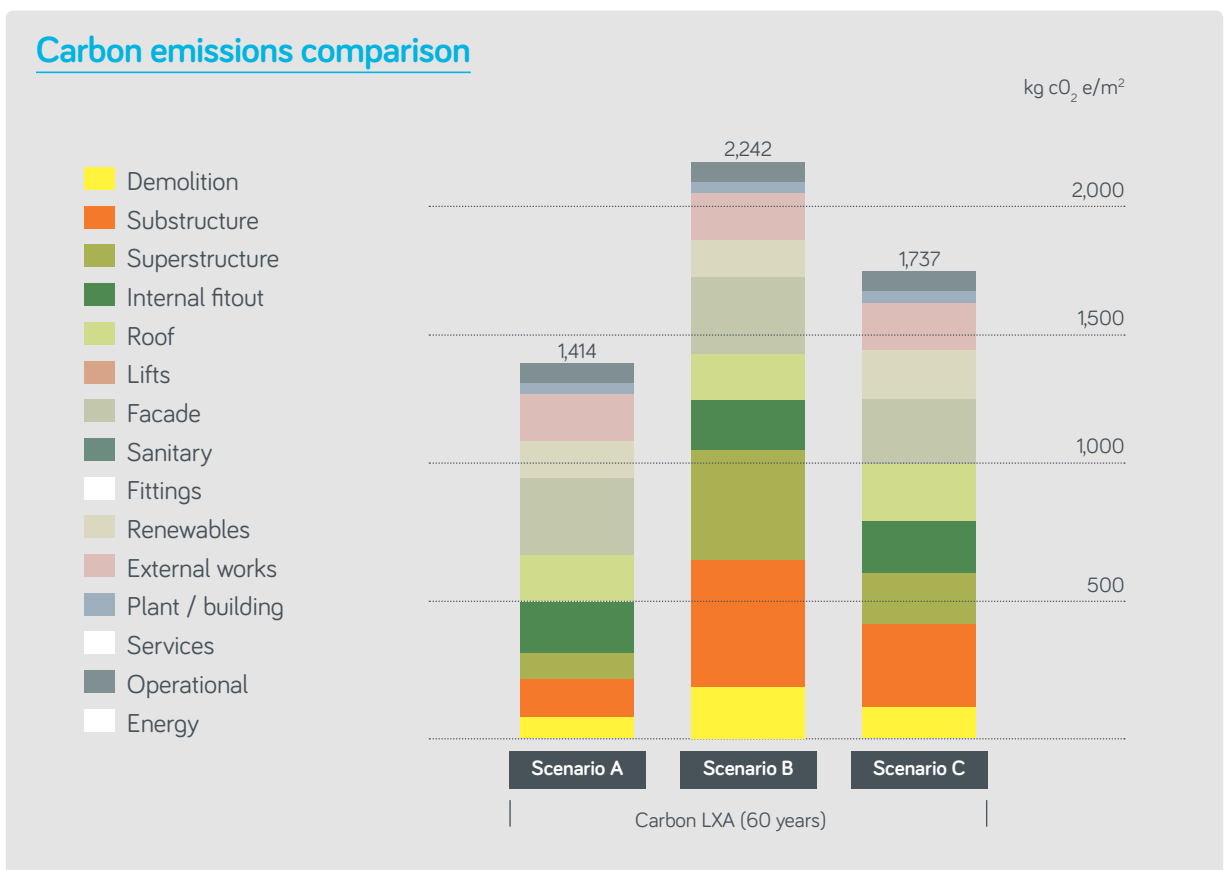
### Knowledge of low carbon skills and energy literacy

**The thermal implications of building form and fabric, and how thermal performance can be improved**

- The effects of location, shelter and shading on thermal performance and allied issues such as moisture

## Topic 6 Sustainable architecture

- The effects of building form on heat loss and solar aperture and how these can be modelled using software or simple maths
- The use of solar and internal heat gains and their contribution to overheating if not managed
- The use of building form to promote natural ventilation and cooling where appropriate
- Understanding the difference between summer and winter ventilation
- The importance of the continuity of insulation and air-tightness within a ventilation strategy
- The importance of minimising thermal bridging and air leakage
- Deploying constructions of high and low thermal mass appropriately
- Understanding how light and heavy structures can influence performance and may be appropriate or less so to certain building types
- U value and  $\Psi$  value calculations



© RIBA Publishing and Simon Sturgis: From **Targeting Zero** by Simon Sturgis

**Building services systems that contribute to low carbon performance, and understanding the pros and cons of:**

- Reducing cooling loads to avoid the need for cooling or air conditioning
- Ventilation options including natural cross-ventilation, passive stack ventilation, and mechanical supply and/or extract ventilation
- Ensuring efficient and responsive heating and cooling plant and heat emitters
- Responsive systems and controls to improve efficiency and permit the use of solar and internal gains
- Efficient internal and external lighting systems and controls, and understanding how to keep systems simple and not rely on bms

**New and renewable energy systems and the ability to compare and evaluate systems**

- Understanding how these systems work and what variables contribute to saving carbon
- Heat pumps
- Combined heat and power including micro CHP
- Solar water heating
- Biofuel heating systems
- Photovoltaic arrays
- Wind turbines

**Embodied and Whole Life Carbon assessments for new construction work.**

- Embodied carbon assessments through RIBA work stages.
- Optimize recycled content compatible with low carbon objectives.
- Life Cycle Analysis (LCA)
- LCA to establish durability of components, and flexibility of completed project.
- LCA to establish maintenance and replacement cycles.
- LCA to include 'end of life' assessment to ascertain resource efficient demolition and capacity for reuse of components and materials.

**Energy and environmental assessment for new and existing buildings**

- Domestic energy rating (SAP and NHER) including performance certification
- Understanding of SAP as current compliance tool. Knowledge of other modelling tools such as IES and PHPP and understanding which model for which job.
- Non domestic energy rating systems (SBEM, etc) including performance certification
- Environmental assessment methodologies such as BREEAM and LEED
- Code for Sustainable Homes

- Domestic energy survey techniques and assessments
- Housing stock assessment and stock profiling
- Non domestic energy surveys

#### **Airtightness and performance**

- Building physics
- Condensation risk calculations, moisture management and avoidance of moisture
- Movement of moisture in building fabric
- Relative humidity, internal moisture control and moisture buffering
- Closing the performance gap and understanding the phenomena that create performance gap in the first place then understanding how to eliminate these issues
- Heat loss parameters and understanding the relationship between air tightness, insulation, glazing, heat loss and solar gain
- Understanding and designing for thermal comfort and the need for overheating risk mapping for future conditions
- Health and wellbeing, including indoor air quality

#### **Whole building overview and process**

Strategic definition: RIBA stage 0

Specification and tender

Procurement and cost management

Material selection, embodied energy, recycling and minimising waste

Whole life carbon foot printing

Life Cycle Analysis

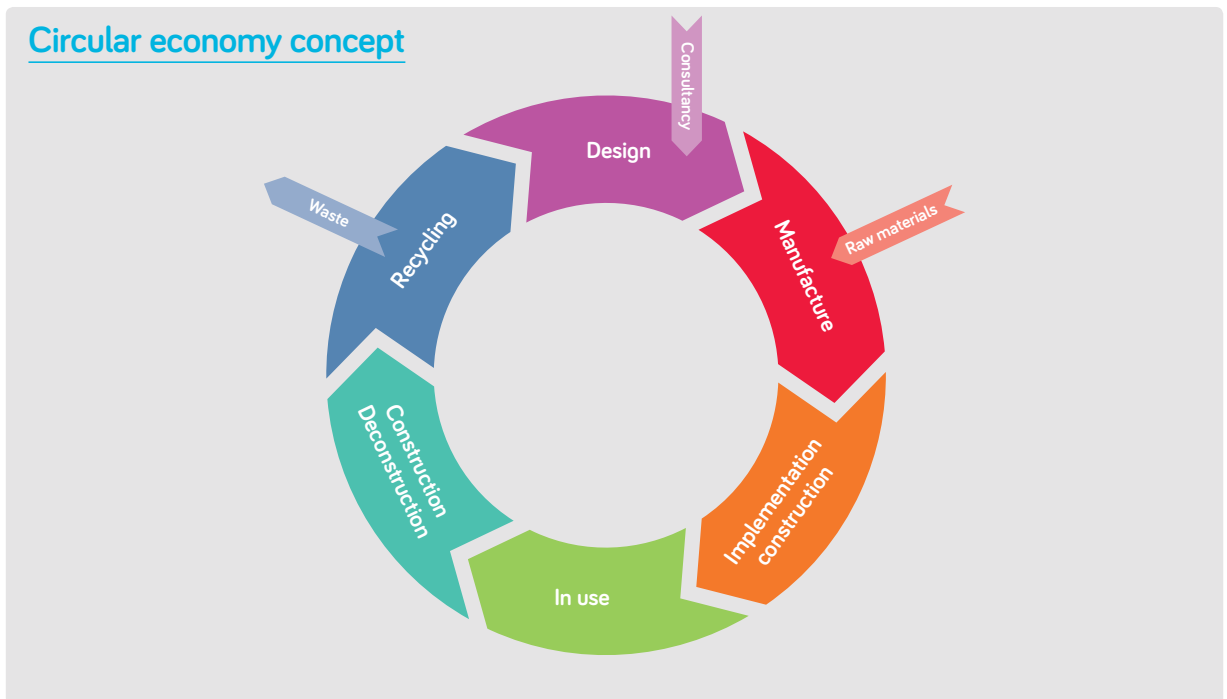
Resource energy efficiency, materials, water, energy and behaviour

Thermal upgrade of historic and listed buildings

Using relevant insulation for listed buildings

Design for deconstruction, recycling and reuse (and reduction of waste)

Construction processes to mitigate impact – use of off-site construction (see also design, construction and technology core topic)



### Water efficiency and flood resilience

Understanding and prioritising flood resilient design in new build and retrofit projects

Reducing demand: efficient systems and technologies

Rain water harvesting, grey water recycling, and re-use

Reducing run-off: site water management

Green roofs

Permeable paving

Sustainable Urban Drainage (SUDS) legislation

### Energy efficiency and listed buildings: understanding of

Series of relevant published guidance by Historic England

Published guidance on responsible retrofit of Traditional Buildings by the STBA (sponsored by Historic England)

SPAB Energy Efficiency reports

Understanding the special interest of the listed building and how thermal upgrading may be effected without it being compromised

Understanding the requirement for listed building consent and the exemptions provided by approved document L (also in the case of buildings of traditional construction)

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Thermal upgrade of listed buildings, buildings in conservation areas, and of buildings of traditional construction

The use of the right insulation

The correct window upgrades

Understanding defects and behaviours of various materials

Approaches to repair and conservation techniques

### **Post occupancy evaluation and building performance evaluation**

[www.architecture.com/knowledge-and-resources/resources-landing-page/post-occupancy-evaluation#available-resources](http://www.architecture.com/knowledge-and-resources/resources-landing-page/post-occupancy-evaluation#available-resources)

Project delivery (client and project team experiences)

Project outcomes (review strategic brief, business case and sustainability aspirations)

Building use and occupant behaviour: analyse: building layout, building fabric and detailing, occupants use of building and systems, occupation patterns

Occupant feedback (surveys and interviews)

Energy use analysis (utility invoices and meter readings, metering strategy, equipment survey, embodied carbon, measurement and verification survey)

System behaviour (facilities managers experience): analysis of strategies: H+S, ventilation, heating and cooling, lighting, control, maintenance)

Environmental performance: measure: light levels, thermal comfort, indoor air quality, acoustics, air tightness, heat loss (thermal imaging)

Comparison (intended building use and design performance predictions against actual, benchmark against public datasets)

Reporting (clients, FM, users, project team, open dissemination to industry)





# Topic 7

## Inclusive environments

*This competency potentially covers*

### Understanding and context

#### **The five principles of inclusive design (Design Council CABE)**

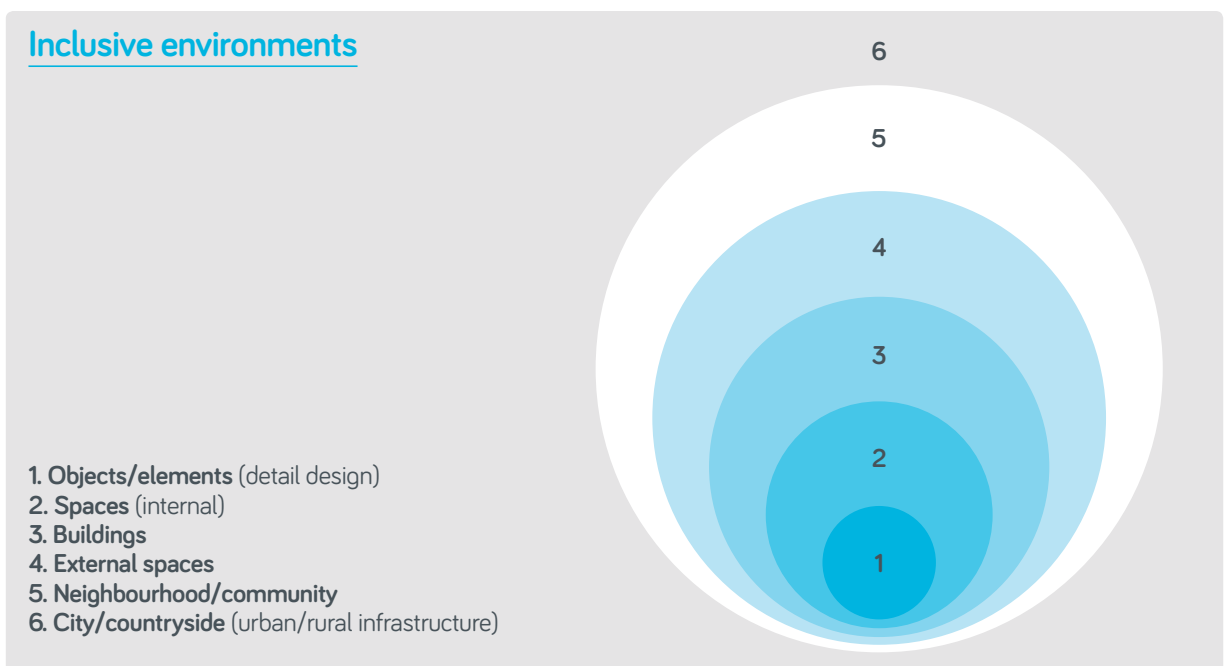
[www.designcouncil.org.uk/what-we-do/inclusive-environments](http://www.designcouncil.org.uk/what-we-do/inclusive-environments)

1. Diversity and difference, placing people at the heart of the design process
2. Offer choice when a single design solution cannot accommodate all users
3. Provision of flexibility in use
4. Communities that offer plenty of services, facilities and open space
5. Buildings and environments that are convenient and enjoyable for everyone to use

#### **Four principles of an inclusive environment for built environment professionals from the Construction Industry Council**

<http://cic.org.uk/networks-and-committees/essential-principles-guide.php>

1. Buildings, places and spaces that can be used easily, safely, and with dignity, by all of us, regardless of age, disability or gender
2. Provides choice, is convenient and avoids unnecessary effort, separation or segregation
3. Goes beyond meeting minimum standards or legislative requirements
4. Recognises that we all benefit from improved accessibility



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### Legislation, regulations and best practice: understanding of

The Equality Act 2010

Regulatory Reform (Fire Safety) Order 2005 (RRO)

Special Educational and Disability Act 2001 (SENDA)

The 9 protected characteristics listed in the Equality Act

The relevant building regulations

Approved Document M, K and B

British Standards: BS 8300: 2009 + A1: 2010, 9999:2016 and BS9266:2013

Design standards and policy

Principal guidance standards

National Planning Policy Frameworks and SPG's

Fire safety strategy and legislation

Various sector specific documents, as necessary, but not limited to:

- Accessible Stadia and SGSA Supplementary Guidance
- Green Guide to Safety at Sports Grounds Sport England – Accessible Sports Facilities 2010
- Health Building Notes
- Happi
- Inclusive Mobility

### Planning and placemaking: understanding of (and see also **Places, Planning and Communities** topic)

Equality and inclusion in placemaking

Accessible pedestrian environments and routes

Planning and access

Consultation of user groups

Design reviews and appraisal

Community consultation and engagement and working with user groups

Support for planning, including access statements

Accessible neighbourhoods, homes for life, wheelchair and specialist

Creation of safe places in which to play, socialise and participate

Creation of green spaces in proximity to where people live

Equitable placemaking, shaped by and for the diverse communities they serve

## Topic 7

### Inclusive environments

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#### **London Legacy Development Corporation (LLDC) inclusive design strategy for the 2012 London Olympics**

Planning neighbourhoods with facilities that allow a wide range of disabled and older people to live independently within a community  
Social infrastructure that provide places for everyone to meet  
Housing that caters to changing needs over a person's lifetime  
Suitable homes for wheelchair users that allow people, their equipment and their families to live together as a part of the community  
Providing larger and affordable homes that can help create mixed, sustainable neighbourhoods  
Accessible pedestrian routes that are designed to minimise travel distances  
Accessible public toilets with separate baby changing facilities allowing all users to participate fully in community life  
Street furniture that is positioned to create a feeling of confidence and security to allow especially people who have dementia or Alzheimer's to move around confidently and independently  
Designing out crime by creating public spaces that are overlooked and less isolated  
External environments that ensure wayfinding for all

<http://learninglegacy.independent.gov.uk/publications/inclusive-design-strategy.php>

#### **Buildings and places in use: understanding of:**

Inclusive lighting design  
Accessible information  
Accessible bathrooms  
Wayfinding and signage  
Refurbishment of historic and listed buildings and access  
Analysis of the building management policies against legislative requirements  
Different buildings and their uses and users  
Using plans and understanding building access  
Special issues for fire, security and egress

#### **Detail design**

The use of colour and contrast and understanding Light Reflectance Values (LRV's)  
Acoustics and sound enhancement  
Fixtures, fittings and equipment  
Doors and ironmongery, receptions and other fixed furniture  
Relevant product specification  
Lifts, sizing and suitability  
Accessible bedrooms (hotels and student accommodation)

## Topic 7

### Inclusive environments

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Changing places  
Sanitary and changing facilities  
Kitchens  
Wayfinding, signage and communications

#### Understanding all users, and the nine protected characteristics with particular reference to people with disabilities

Designing for diverse community, age, gender, religion, race ...  
Designing for those with multiple or profound needs  
Designing for an aging population  
Designing for dementia  
Cognitive accessibility  
Designing for those with sensory impairments (people with hearing impairments and who are deaf and those with visual impairments or blind).  
Designing for those with physical limitations, dexterity, ambulant disabilities and wheelchair users

#### Access statements and strategies

Understanding, writing and implementing access statements  
Access statements and strategies and how to write them  
Access auditing and the Equality Act  
Access audits of existing schemes audit of existing premises  
Design reviews of schemes



# Topic 8

## Places, planning and communities

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*This competency potentially covers*

### Background and context

The theories and objectives of urban design and the core characteristics that create successful places

- The relationship between the forms of any development (layout, scale, mass, materials) and the characteristics that create successful places.
- The importance of designing for the location and context of each development scheme and the role this has in reinforcing and creating positive local identity and character.
- Understanding of the importance of design at different spacial scales and the influence each can have on users, neighbours, communities, sites, places, neighbourhoods, cities and rural areas and landscapes.
- That design is both a process and an outcome, and the importance of putting people, those who will be effected by development, at the heart of both.
- Understanding the structure of places, the spatial interweaving and interrelationship between buildings, what they are used for, movement opportunities and public space networks and patterns,
- Understanding the relationship between objectives set out in planning and other policies (such as public health, inclusion, carbon reduction or crime prevention) and how these can be met.

### The legal basis of planning and governmental policy

Statutory instruments: Town and Country planning regulations  
Acts of Parliament

- The Housing and Planning Act
- The Environmental Protection Act
- Infrastructure Act
- Localism Act
- Local Democracy, Economic Development and Construction Act
- General Permitted Development Order (GPDO)
- The London Plan

Assets of Community Value

National Planning Policy Framework (NPPF) <https://www.gov.uk/guidance/national-planning-policy-framework>

National Planning Policy Guidance (NPPG)

S106 (Section 106) obligations

## Topic 8 Places, planning and communities

Community Infrastructure Levy  
Building Control  
Community Right to Build Order  
Approved Documents  
Fire safety strategy and legislation

### Planning and placemaking processes

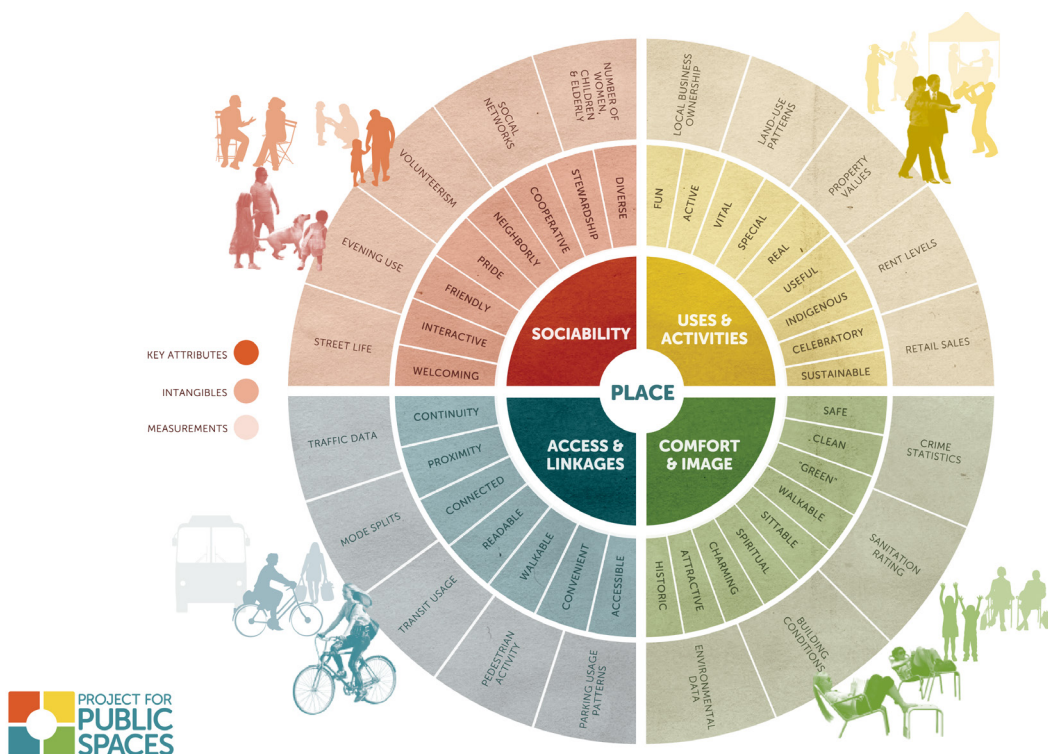
Understand scheme development, negotiation, consultation and approval processes (pre app, app, plan making, formal and informal engagement, committee decisions, use of conditions and legal agreements)

Understand the different people involved in such processes, their roles and how these overlap (councillors, planners, communities, non architect professionals)

Know how to make good, and responsible, use of graphical and other communication materials (such as CGI's plans, photomontages, concept drawings)

See the Project for Public Spaces online publication [What is Placemaking](http://www.pps.org/reference/what_is_placemaking)  
[www.pps.org/reference/what\\_is\\_placemaking](http://www.pps.org/reference/what_is_placemaking)

### What Makes A Great Place?



© Project for Public Spaces 2017 <https://www.pps.org/reference/grplacefeat/>

### Changing demographics, ways of living and public health issues

Designing cities and places changing and ageing populations

Designing for dementia

Designing age-friendly environments (cross-generational)

Lifetime homes and lifetime neighbourhoods

Co and communal housing, pocket living and other emerging housing forms

The impact of the built environment on health and well being, obesity, mental health, access to healthy food and health services

### Engagement with clients and communities

The needs and aspirations of communities, and space and building users

Engaging with and understanding different stakeholders and their needs

Working with neighbourhood forums and parish councils

Community consultation and co design

Creating neighbourhood plans

- How neighbourhood planning works and how to work with neighbourhood planning forums and develop neighbourhood plans space and building users
- Community co design

### Fairness, regeneration and community development

Understanding briefing, engagement, empowerment, cohesion and leadership and their impact on creating successful communities

The ethics of building and regeneration

The effects of regeneration on communities

Equitable and inclusive approaches to placemaking and cities

Stakeholders and their differing interests, including the agencies involved

Promoting urban social integration

Understanding place and poverty factors

## Topic 8

### Places, planning and communities

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#### Place poverty factors are

Affordable, quality housing  
Access to services  
Availability and quality of green spaces  
Access to educational opportunities  
Availability of public transport  
Access to jobs  
Local air quality pollution  
Access to shops and healthy foods  
Rates of crime and anti social behaviour

Courtesy of Royal Town Planning Institute (RTPI) [www.rtpi.org.uk/media/1811222/poverty\\_place\\_and\\_inequality.pdf](http://www.rtpi.org.uk/media/1811222/poverty_place_and_inequality.pdf)

### Rural planning issues

#### Understanding of

The changing nature of rural areas, including the main agencies involved

Reconciling competing views of what the countryside is

Approaches to rural housing provision, including the exceptions policy

Approaches to rural settlement planning

Service provision and maintaining the local community

Planning for rural transport, and approaches to recreational transport

Conflicts between agriculture and the environment

Policies for forests, woodlands, water provision and management

The authors were inspired by the work of the Action with Communities in Rural England, The Citizens Institute on Rural Design, and UWE Bristol.

### Environmental issues

*Growth management (and managed change and decline)*

- Regeneration and community development
- Resilient environments – places and buildings
- Environmental performance – places and buildings
- Protecting and enhancing valued landscapes
- Minimise impact on and enhance biodiversity



## Topic 8

### Places, planning and communities

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#### *Daylight, sunlight, wind effects on microclimates*

- Dwelling indoor daylight
- Sunlight for dwellings
- Sunlight for outdoor spaces
- Light pollution
- Wind effects around tall buildings
- Street pollution flushing

#### *Issues relating to climate change*

- Energy targets and parts L and P of the Building Regulations
- Renewable energy generation
- Energy efficiency in buildings
- Embodied energy
- Dwelling over-heating
- Avoiding urban heat islands: very low energy buildings, electric vehicles, urban vegetation, avoiding continuous street canyons, use of vegetation canopies
- Flooding and flood prevention measures: sustainable urban drainage systems (SuDS), public-realm planting, streets trees, permeable surfaces
- Climate change minimization, adaptation and mitigation – including green and blue infrastructure
- Water management

### Development and conservation

“Heritage Assets” – designated and undesignated – and the principle of assessed harm to them.

NPPF and PPG and positive strategies for the conservation and enjoyment of the historic environment.

Issues to manage and consider

- Significance, and handling significance
- Establishing an evidence base
- Identifying non-designated heritage assets
- Impact and harm
- Enabling development

## Topic 8

### Places, planning and communities

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- Setting
- Heritage statements
- Heritage at risk
- Conservation advice

#### Public spaces

The distinction between public space and publicly accessible private space

The difference between formal and informal spaces

Forms of regulation for public spaces

- Planning controls to sanction new public space proposals
- Highway orders, focusing on changes to the highways themselves
- Listed building consents
- Street trading licensing

Creating diverse, safe and inclusive public spaces

Designing for long-term maintenance

Designing public spaces that are

- Delineated: clearly public or clearly private
- Have designed in active uses where appropriate
- Incorporated amenities and features
- Encouraging for social engagement
- Balanced between traffic and pedestrians
- Comfortable, safe and relaxing
- Robust, adaptable and distinct

#### Small scale development

Assessing small schemes

Local design guidance on residential or small scale development

Management of issues such as

- Siting
- Context and character

## Topic 8

### Places, planning and communities

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- Massing and building height
- Facades and windows
- Sunlight, daylight, privacy and outlook
- Outdoor space and access
- Recycling, rubbish and services
- Safety and security
- Car and cycle parking

#### Housing

Delivering a wide choice of high-quality homes for different users, for current and future needs

Self-build and custom build housing

Volume housing/large scale development and offsite construction

Understanding the allowance for windfall sites

Housing White Paper

Lifetime Homes and Lifetime Neighbourhoods

Viability and affordable housing --- including coverage of the different types of affordable housing which have differing affects on viability

Right to Buy

#### Layout, density and typology

Density and methods of measuring, presenting and using density data

The density performance of differing typologies

Public transport, accessibility, supporting walking, cycling and public transport, and reducing the need to own and use cars.

Parking – amounts and handling

Smart cities, planning, data and IOT

Design Review – purposes, practices etc. What to expect as someone who sits on a panel; and what to expect as someone presenting.

Mixed use building and neighbourhood solutions

### Tall buildings

Height and planning policies

Suitable locations for tall buildings

The role of tall buildings in an area

Accommodating floor space

The parts of a tall building and their various zones of impact (base for surrounding streets, middle for the neighbourhood, top for the skyline)

Fire safety and relevant Building Regulations

Fire management strategies

Negotiating tall building proposals

Assessing a scheme

- Availability of execution
  - Wind and microclimate
  - Sun, sky, and shadow
  - Visual impact
  - Function and impact
- a. Local transport
  - b. Amenities
  - c. Geographical access
  - d. Flow of people
  - e. Deliveries and maintenance

### Landscape design

#### **Principles of landscape design**

Different elements of landscape from structural to individual plants or pieces of furniture

Understanding potential use of space and how this can be accommodated and managed

Using landscape to support and complement the use of buildings

- Well-maintained spaces
- Designs consider the long term
- Designs support the proposed use of the space

## Topic 8

### Places, planning and communities

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- Designs allow for different uses to co-exist
- Elements have more than one function
- Desire lines have shaped the design
- Aspect and topography have been taken into account
- The scheme supports biodiversity
- Leftover space is managed carefully

#### Elements to consider

- Structural planting
- Pathways
- Drainage
- Boundary treatments
- Water features
- Seating
- Lighting
- Art and culture
- Plants, trees, wildlife-friendly planting and biodiversity

### Streets

Understand the modal hierarchy set by government and applicable to street design and management: pedestrian, cyclists, public transport user, private vehicle user

#### Streets that are designed to be

- Accommodating and balancing a locally appropriate mix of movement and place-based activities
- Functional and accessible for all
- Safe and attractive public spaces
- Reflective of urban design qualities as well as traffic management considerations

#### Understanding how decisions about streets are made

##### Understanding important design considerations

- Function of the street
- Degree of separation
- Reflecting character
- High quality materials and workmanship

## Topic 8

### Places, planning and communities

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- Avoiding over-elaboration
- Thinking of local needs
- Clean, simple and straightforward
- Designed for what they need to do

#### **Understanding the language of streets**

- User hierarchy
- Highways
- Carriageways
- Pavements
- Junctions
- Sightlines and radiuses
- Traffic calming
- Segregation, separation and shared space
- Level surfaces
- Tactile paving

#### **Masterplanning: understanding of:**

Differences between strategic (cities, regions) or project based (specific sites with definable boundaries) masterplans

#### **Preparing for the masterplanning process**

Defining who the client is and work the client has done to support the masterplan

Assembling the client team

Key drivers that have brought about the masterplan (economic, or social regeneration, environmental improvements, rebranding)

Other relevant issues (social context, environmental context, infrastructure and services, energy sources, connectivity, future needs)

The physical changes required

#### **Managing the design process**

Defining and preparing the project brief

Generating and testing detailed options

Adopting of approving a master plan

Preparing the design brief

Designing the final masterplan

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### Managing implementation

Implementing the masterplan and managing that implementation

Developing mechanisms to deliver quality

Preparing a design code

### Safer places

#### **The attributes of safer places and Secured by Design Principles (with thanks to Secured by Design and Police Crime Prevention Initiatives)**

Access and movement: places with well-defined routes, spaces and entrances that provide for convenient movement without compromising security

Structure: places that are structured so that different uses do not cause conflict

Surveillance: places where all publicly accessible spaces are overlooked

Ownership: places that promote a sense of ownership, respect, territorial responsibility and community

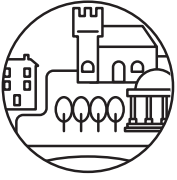
Physical protection: places that include necessary, well-designed security features

Activity: places where the level of human activity is appropriate to the location and creates a reduced risk of crime and a sense of safety at all times

Management and maintenance: places that are designed with management and maintenance in mind, to discourage crime in the present and the future

[www.securedbydesign.com/wp-content/uploads/2014/02/Safer-Places-The-Planning-System-And-Crime-Prevention.pdf](http://www.securedbydesign.com/wp-content/uploads/2014/02/Safer-Places-The-Planning-System-And-Crime-Prevention.pdf)

*The authors are indebted to invaluable advice provided by Urban Design London, and The Design Companion for Planning and Placemaking (RIBA Publishing, 2017, Principal Author Esther Kurland, Urban Design London; Editor Rob Cowan, Urban Design Skills) [www.ribabookshops.com/item/the-design-companion-for-planning-and-placemaking/89458/](http://www.ribabookshops.com/item/the-design-companion-for-planning-and-placemaking/89458/)*



# Topic 9

## Building conservation and heritage

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*Please note that some of these topics are more relevant to accredited conservation professionals and crafts people*

*This competency potentially covers*

### Background and context: understanding of

Historic Assets (buildings, areas, monuments, gardens and parks, whether designated yet or not) and their settings

Designations

National and international organisations and charters

International Council on Monuments and Sites (ICOMOS) guidelines

Understanding common conservation terms

The repair, alteration/extension, refurbishment and management of historic assets

### Legislation and published governmental and other guidance

Planning (Listed Buildings and Conservation Areas) Act 1990;

BS7913: 2013

NPPF and government policy

Assets of Community Value

Special considerations in the application of approved documents (including Building Regulations)

The Equality Act

Fire safety strategy and legislation

Statutory consents, requirements and processes

Enabling Development and the Conservation of Heritage Assets

UNESCO conventions and recommendations

### Significance: understanding of

- Historical significance
- Social, cultural and emotional significance
- Architectural and aesthetic significance

How to determine significance based on evidence and plan for conservation

Researching the historic development of a building and its setting using archival sources

New designs in designated and historic contexts



### Making judgments and collaboration: ability to

Make balanced judgements based on shared ethical principles,  
Accept responsibility for the long-term welfare of cultural heritage;  
Recognise when advice must be sought by different specialists  
Give expert advice on maintenance strategies, management policies and the policy framework for environmental protection and preservation  
Document works executed and make same accessible  
Work in multi-disciplinary groups using sound methods  
Work with inhabitants, administrators and planners to resolve conflicts and to develop conservation strategies appropriate to local needs, abilities and resources

### Reading and understanding a monument: ability to

Read a monument, ensemble or site  
Identify its emotional, cultural and use significance  
Understand the history and technology in order to define their identity, plan for their conservation  
Interpret the results of this research  
Understand the setting in relation to other buildings, gardens or landscapes  
Find and absorb all available sources of relevant information

### International and historic context: understanding of

Antiquity  
C18 Grand Tour  
C19 restoration and the search for antiquity  
Early C20 legislation  
C20 architecture  
Post war developments

### Surveys and investigations: understanding of

Site surveys  
Destructive and non-destructive analysis  
Recording, documentation and communication  
Reading the building

## Topic 9

### Building conservation and heritage

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#### Determining and understanding defects and causes of decay

Understanding defects and behaviours of various materials

Approaches to repair and conservation techniques

Lime mortar

Cleaning historic buildings

#### Materials: understanding of

Traditional and modern

The conservation of stonework, brickwork, timber and concrete

Thermal upgrade of listed buildings, buildings in conservation areas, and of buildings of traditional construction

The use of the right insulation

The correct window upgrades

Breathability of fabric

#### Conservation strategy: understanding of

Grants, funds and funding organisations

Climate change and special considerations applicable to the historic environment

Implementation and management of conservation works

Procurement and contract administration

Being accredited as a recognised conservation architect



# Topic 10

## Design, construction and technology

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*This topic potentially covers any of the following competencies*

### Legislative framework

Building Regulations and Approved Documents  
British Standards  
Party Wall Act  
Fire safety strategy and legislation  
(see also relevant legislation in the other topics)

### RIBA Plan of Work

#### **Knowledge of the RIBA Plan of Work stages**

- Knowledge of the DfMA overlay to the [RIBA Plan of Work](http://www.architecture.com/-/media/gathercontent/riba-plan-of-work/additional-documents/ribaplanofworkdfmaoverlaypdf.pdf) [www.architecture.com/-/media/gathercontent/riba-plan-of-work/additional-documents/ribaplanofworkdfmaoverlaypdf.pdf](http://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 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, 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.

Establish change management procedures.

Minimising change and the cost, disruption and potential waste 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 the 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

Alternative structural, construction and material systems

Ethical supply chains and products

Production information.

Design proposals and detailing complete and fully co-ordinated before construction commences to avoid delays, disruption and change resulting in waste and additional cost

Classification systems: Uniclass and CiSFB

Alternative structural, construction and material systems

Understanding waste in all its forms, physical, time, intellect, and seek to minimise

### 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, nvirohaus**

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 (eg, 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:

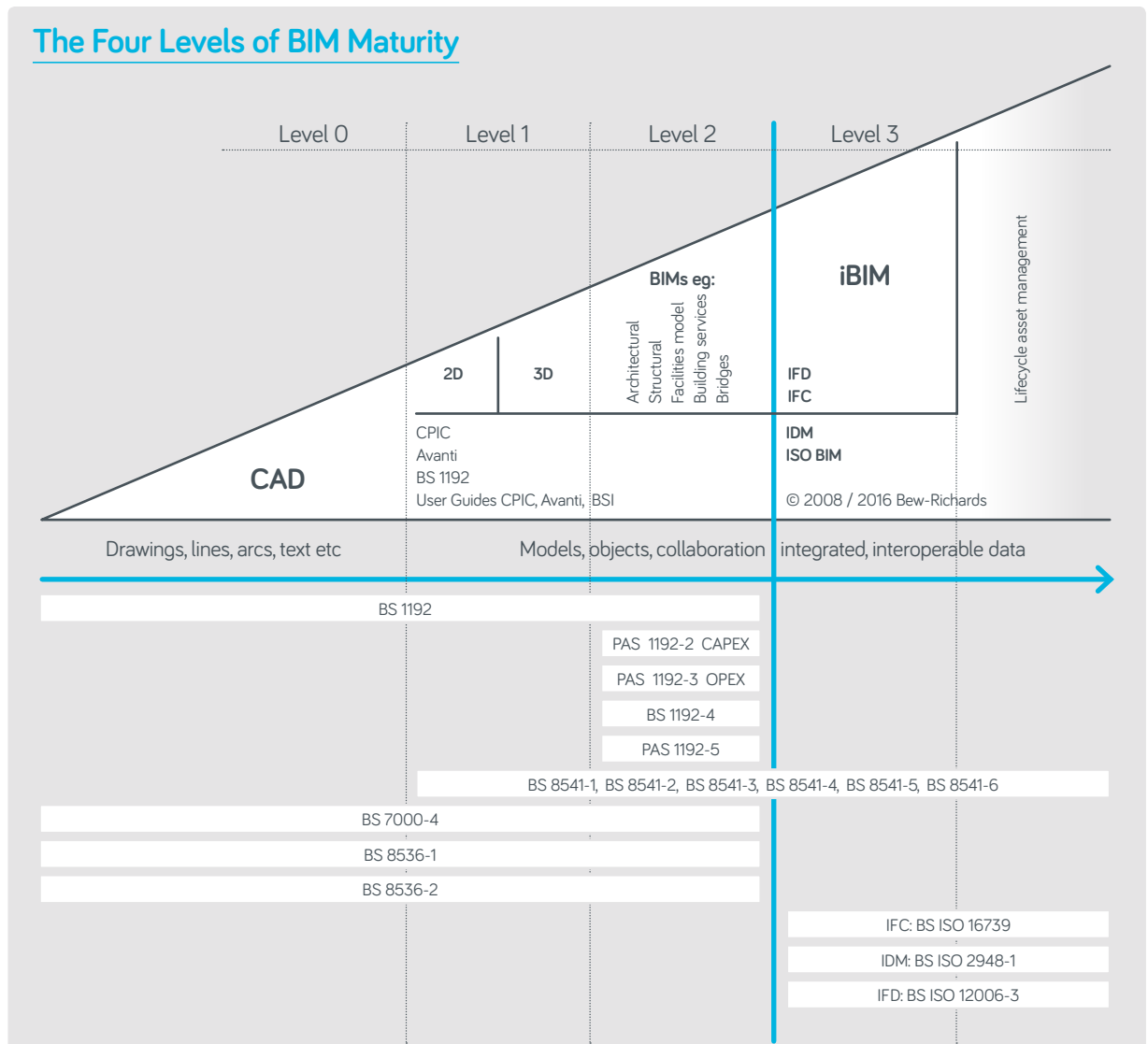
- BS 1192:2007 +A2:2016
- PAS 1192-2:2013
- PAS 1192-3: 2014
- PAS 1192-4: 2014
- CIC BIM Protocol

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)



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### 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 POW DfMA overlay

Developing your DfMA strategy, and with particular reference to Stage 2 of RIBA PoW

## The Periodic Table of BIM

1 <b>Bs</b> BIM Strategy																		2 <b>Su</b> Surveys and Reports	
3 <b>Fr</b> Framework	4 <b>Cu</b> Culture and behaviour	<div style="display: flex; justify-content: space-around; font-size: 0.8em;"> <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="display: flex; align-items: center;"><span style="width: 10px; height: 10px; background-color: #2e8b57; margin-right: 5px;"></span> Strategy</div> <div style="display: flex; align-items: center;"><span style="width: 10px; height: 10px; background-color: #d2691e; margin-right: 5px;"></span> Foundations</div> <div style="display: flex; align-items: center;"><span style="width: 10px; height: 10px; background-color: #4169e1; margin-right: 5px;"></span> Collaboration</div> </div> <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="display: flex; align-items: center;"><span style="width: 10px; height: 10px; background-color: #4682b4; margin-right: 5px;"></span> Process</div> <div style="display: flex; align-items: center;"><span style="width: 10px; height: 10px; background-color: #ffd700; margin-right: 5px;"></span> People</div> <div style="display: flex; align-items: center;"><span style="width: 10px; height: 10px; background-color: #4682b4; margin-right: 5px;"></span> Technology</div> </div> <div style="display: flex; flex-direction: column; gap: 5px;"> <div style="display: flex; align-items: center;"><span style="width: 10px; height: 10px; background-color: #2e8b57; margin-right: 5px;"></span> Standards</div> <div style="display: flex; align-items: center;"><span style="width: 10px; height: 10px; background-color: #d2691e; margin-right: 5px;"></span> Enabling Tools</div> <div style="display: flex; align-items: center;"><span style="width: 10px; height: 10px; background-color: #696969; margin-right: 5px;"></span> Resources</div> </div> </div>														5 <b>Bt</b> BIM Toolkit	6 <b>Lod</b> Level of detail	7 <b>Loi</b> Level of Information	8 <b>Vi</b> Videos
9 <b>Co</b> Common methods	10 <b>Po</b> Process	11 <b>As</b> Assessment and need	12 <b>Eir</b> Employers info requirements	13 <b>Cm</b> Communication	14 <b>In</b> Investment	15 <b>Sf</b> Software	16 <b>Cd</b> Capital delivery phase	17 <b>Cl</b> Collaborative Business relationships	18 <b>Li</b> Library objects	19 <b>Cs</b> Classification	20 <b>An</b> Analysis tools	21 <b>Ev</b> Events							
22 <b>Pr</b> Procurement route	23 <b>Fo</b> Forms of procurement	24 <b>Ex</b> Execution	25 <b>Bep</b> BIM execution plan	26 <b>So</b> Soft skills	27 <b>Ch</b> Change process	28 <b>Ha</b> Hardware	29 <b>Op</b> Operational phase	30 <b>Pt</b> Protocol	31 <b>Pe</b> Prequalification questionnaires	32 <b>Cafm</b> Computer-Aided Facilities Management	33 <b>Ct</b> Cost tools	34 <b>Fu</b> Forums and user groups							
35 <b>Ca</b> Capacity and capacity	36 <b>Di</b> Digital tools	37 <b>De</b> Delivery	38 <b>Midp</b> Master information delivery plan	39 <b>Cp</b> Cooperation	40 <b>Sh</b> Share success	41 <b>Tr</b> Training	42 <b>Fm</b> Facilities management	43 <b>Qu</b> Quality management systems	44 <b>Bsdd</b> buildingSMART data dictionary	45 <b>Pg</b> Programme tools	46 <b>Ad</b> Administration tools	47 <b>Sc</b> Social media							
48 <b>St</b> Standardisation and interoperability	49 <b>Ma</b> Maintenance and use	50 <b>Cde</b> Common data environment	51 <b>Ci</b> Champion	52 <b>Av</b> Availability	53 <b>Fi</b> File storage	54 <b>Dg</b> Digital security	55 <b>Ds</b> Design management systems	56 <b>lfc</b> Industry foundation classes	57 <b>Au</b> Authoring tools	58 <b>Mo</b> Model viewers and checkers	59 <b>Bl</b> Blog posts								
60 <b>Dpow</b> Digital Plan of Work	61 <b>If</b> Information exchange	62 <b>Sp</b> Support	63 <b>En</b> Engage	64 <b>Ir</b> Infrastructure	65 <b>Br</b> Briefing	66 <b>Am</b> Asset management	67 <b>Idm</b> Information delivery manual	68 <b>Sp</b> Specification tools	69 <b>Fl</b> File sharing and collaboration	70 <b>Bo</b> Books									
Digital Plan of Work stages																			
71 <b>Sr</b> Strategy	72 <b>Bi</b> Brief	73 <b>Df</b> Definition	74 <b>Dn</b> Design	75 <b>Bu</b> Build and commission	76 <b>Hn</b> Handover and closeout	77 <b>Oe</b> Operation	78 <b>Ed</b> End of life												



Find support on your BIM journey at [theNBS.com/BIM](https://theNBS.com/BIM)

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The benefits of modern methods of construction and pre-manufactured elements

- 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



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The stages of construction industrialisation

- Design for manufacture and assembly
- Offsite manufacture
- Logistics
- Onsite assembly
- Design for maintenance

The levels of building off site

- 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 that 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 usable 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 customisation
- 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, 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

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## **Other organisations**

The NBS  
RIBA Bookshop  
Design Council CABE  
Construction Industry Council  
Project for Public Spaces  
Town and Country Planning Association  
ACRE (Action With Communities in Rural England)  
Buildoffsite  
Supply Chain School  
The Royal Town Planning Institute  
Urban Design London  
Secured by Design  
Police Crime Prevention Initiatives  
Green Register

# Links to other organisations

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## Architecture for Social Purpose

ASF-UK [www.asf-uk.org](http://www.asf-uk.org)

UN Global Compact [www.architecture.com/about/ungc](http://www.architecture.com/about/ungc)

Equality & Human Rights Commission (EHRC) [www.equalityhumanrights.com/en](http://www.equalityhumanrights.com/en)

Equality Act [www.legislation.gov.uk/ukpga/2010/15/contents?](http://www.legislation.gov.uk/ukpga/2010/15/contents?)

Modern Slavery Act 2015 [www.legislation.gov.uk/ukpga/2015/30/contents/enacted](http://www.legislation.gov.uk/ukpga/2015/30/contents/enacted)

Fluid Diversity Mentoring Programme <https://fluidmentoring.org>

The Joseph Rowntree Foundation [www.jrf.org.uk](http://www.jrf.org.uk)

## Health, Safety and Wellbeing

HSE, CDM Legislation and legal guidance [www.hse.gov.uk/Construction](http://www.hse.gov.uk/Construction)

International Institute of Risk and Safety Management (IIRSM), risk management advice, training and updates [www.iirsm.org](http://www.iirsm.org)

Association for Project Safety (APS) [www.aps.org.uk](http://www.aps.org.uk)

CIC, Health and Safety Committee reports and papers <http://cic.org.uk/networks-and-committees/health-safety-panel.php>

Construction Industry Advisory Committee (CONIAC) Industrywide H&S Committee guidance and papers} [www.hse.gov.uk/aboutus/meetings/iacs/coniac/index.htm](http://www.hse.gov.uk/aboutus/meetings/iacs/coniac/index.htm)

Designers Initiative on Health and Safety (DIOHAS) Architectural practice events and guidance on CDM & H&S [www.diohas.org.uk](http://www.diohas.org.uk)

Design Best Practice (DBP) CDM Case Studies [www.dbp.org.uk](http://www.dbp.org.uk)

CITB, Industry CDM Guidance [www.citb.co.uk/health-safety-and-other-topics](http://www.citb.co.uk/health-safety-and-other-topics)

WELL Certified [www.wellcertified.com](http://www.wellcertified.com)

## Business, Clients and Services

ACAS [www.acas.org.uk](http://www.acas.org.uk)

CIPD (Chartered Institute of Personnel and Development) [www.cipd.co.uk](http://www.cipd.co.uk)

APM (Association for Project Management) [www.apm.org.uk](http://www.apm.org.uk)

Confederation of British Industry (CBI) [www.cbi.org.uk](http://www.cbi.org.uk)

Business in the Community (BITC) [www.bitc.org.uk/](http://www.bitc.org.uk/)

Institute of Directors (IoD) [www.iod.com/](http://www.iod.com/)

Chambers of Commerce [www.britishchambers.org.uk/](http://www.britishchambers.org.uk/)

Federation of Small Businesses [www.fsb.org.uk/](http://www.fsb.org.uk/)

The Freelancer and Contractor Services Association [www.fcsa.org.uk](http://www.fcsa.org.uk)

The Creative Industries Federation [www.creativeindustriesfederation.com](http://www.creativeindustriesfederation.com)

Barclays Digital Wings <https://digital.wings.uk.barclays/for-everyone>

British Library Business and Intellectual Property Centre [www.bl.uk/business-and-ip-centre](http://www.bl.uk/business-and-ip-centre)

Enterprise Nation [www.enterprisenation.com](http://www.enterprisenation.com)

## Procurement and Contracts

RIBA Bookshops [www.ribabookshops.com/topic/construction-contracts-and-forms-riba-jct-nec-icc-fidic-and-more/02/](http://www.ribabookshops.com/topic/construction-contracts-and-forms-riba-jct-nec-icc-fidic-and-more/02/)

Joint Contracts Tribunal (JCT) [www.jctltd.co.uk](http://www.jctltd.co.uk)

OJEU [www.ojeu.com](http://www.ojeu.com)

## Sustainable Architecture

Forest Stewardship Council [www.fsc-uk.org/en-uk](http://www.fsc-uk.org/en-uk)

WWF [www.wwf.org.uk](http://www.wwf.org.uk)

Green Register [www.greenregister.org.uk](http://www.greenregister.org.uk)

BedZed [www.bioregional.com/bedzed](http://www.bioregional.com/bedzed)

American Institute of Architects sustainable architecture resources [www.aia.org/topics/41-energy](http://www.aia.org/topics/41-energy)

UK Green Building Council (UK-GBC) [www.ukgbc.org](http://www.ukgbc.org)

Business Green [www.businessgreen.com](http://www.businessgreen.com)

The Woodland Trust [www.woodlandtrust.org.uk](http://www.woodlandtrust.org.uk)

BatConservation Trust [www.bats.org.uk](http://www.bats.org.uk)

And other organisations listed here [www.sustainabilityexchange.ac.uk/organisations](http://www.sustainabilityexchange.ac.uk/organisations)

# Links to other organisations

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LEED <https://new.usgbc.org>

BREEAM [www.breeam.com](http://www.breeam.com)

Carbon Buzz [www.carbonbuzz.org](http://www.carbonbuzz.org)

Build Up: The European Portal for Energy in Buildings [www.buildup.eu/en](http://www.buildup.eu/en)

## Inclusive Environments

RNIB [www.rnib.org.uk/rnib-business](http://www.rnib.org.uk/rnib-business)

Design Council CABE [www.designcouncil.org.uk/what-we-do/inclusive-environments](http://www.designcouncil.org.uk/what-we-do/inclusive-environments)

Centre for Accessible Environments <http://cae.org.uk>

National Register of Access Consultants (NRAC) [www.nrac.org.uk](http://www.nrac.org.uk)

Access Association [www.accessassociation.co.uk](http://www.accessassociation.co.uk)

Sport England [www.sportengland.org/facilities-planning/design-and-cost-guidance/accessible-facilities](http://www.sportengland.org/facilities-planning/design-and-cost-guidance/accessible-facilities)

Disabled Persons Transport Advisory Committee (DPTAC) [www.gov.uk/government/organisations/disabled-persons-transport-advisory-committee](http://www.gov.uk/government/organisations/disabled-persons-transport-advisory-committee)

The Arts Council [www.artscouncil.org.uk/community-and-place/disability-arts-and-cultural-sector-workforce-england](http://www.artscouncil.org.uk/community-and-place/disability-arts-and-cultural-sector-workforce-england)

Habiteng [www.habinteg.org.uk](http://www.habinteg.org.uk)

The Thomas Pocklington Trust [www.pocklington-trust.org.uk](http://www.pocklington-trust.org.uk)

Action for Hearing Loss [www.actiononhearingloss.org.uk](http://www.actiononhearingloss.org.uk)

The National Autistic Society [www.autism.org.uk/about/what-is/asd.aspx](http://www.autism.org.uk/about/what-is/asd.aspx)

## Places, Planning and Communities

Royal Town Planning Institute (RTPI) [www.rtpi.org.uk](http://www.rtpi.org.uk)

Town and Country Planning Association (TCPA) [www.tcpa.org.uk](http://www.tcpa.org.uk)

Action with Communities in Rural England (ACRE) [www.acre.org.uk](http://www.acre.org.uk)

Urban Design London (UDL) [www.urbandesignlondon.com](http://www.urbandesignlondon.com)

Project for Public Spaces (PPS) [www.pps.org](http://www.pps.org)

Urban Design Skills [www.urbandesignskills.com](http://www.urbandesignskills.com)

Campaign for the Protection of Rural England (CPRE) [www.cpre.org.uk](http://www.cpre.org.uk)

Planning Aid Direct <https://planningaid.zendesk.com/hc/en-us>

Landscape Institute [www.landscapeinstitute.org](http://www.landscapeinstitute.org)

Citizens Institute on Rural Design <http://rural-design.org>

## Building conservation and heritage

RIBA Conservation Course and Register [www.architecture.com/education-cpd-and-careers/membership-and-accreditation/join-the-riba-conservation-register](http://www.architecture.com/education-cpd-and-careers/membership-and-accreditation/join-the-riba-conservation-register)

International Council on Monuments and Sites (ICOMOS) [www.icomos.org/en](http://www.icomos.org/en)

Society for the Protection of Ancient Buildings (SPAB) [www.spab.org.uk](http://www.spab.org.uk)

Institute of Conservation <https://icon.org.uk>

Council on Training in Architectural Conservation (COTAC) [www.cotac.org.uk](http://www.cotac.org.uk)

Understanding Conservation [www.understandingconservation.org](http://www.understandingconservation.org)

The Institute of Historic Building Conservation (IHBC) [www.ihbc.org.uk](http://www.ihbc.org.uk)

Ecclesiastical Architects' and Surveyors' Association (EASA) [www.easanet.co.uk](http://www.easanet.co.uk)

Sustainable Traditional Buildings Alliance <http://stbauk.org>

Historic England: [www.historicengland.org.uk](http://www.historicengland.org.uk)

Heritage Lottery Fund: [www.hlf.org.uk](http://www.hlf.org.uk)

Church Buildings Council [www.churchcare.co.uk/churches/church-buildings-council](http://www.churchcare.co.uk/churches/church-buildings-council)

Victorian Society [www.victoriansociety.org.uk](http://www.victoriansociety.org.uk)

Georgian Group <https://georgiangroup.org.uk>

20th Century Society <https://c20society.org.uk>

Canal and River Trust <https://canalrivertrust.org.uk>

# Links to other organisations

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## Design, Construction and Technology

### Background

NBS [www.thenbs.com](http://www.thenbs.com)

RIBA J [www.ribaj.com](http://www.ribaj.com)

### Design for Manufacture and Assembly (DfMA) and offsite construction

Supply Chain School [www.supplychainschool.co.uk/uk/default-home-main.aspx](http://www.supplychainschool.co.uk/uk/default-home-main.aspx)

Build Offsite [www.buildoffsite.com](http://www.buildoffsite.com)

### BIM

UK BIM Alliance [www.ukbimalliance.org](http://www.ukbimalliance.org)

BIM Task Group [www.bimtaskgroup.org](http://www.bimtaskgroup.org)

NBS BIM knowledge resources <https://www.thenbs.com/knowledge/bim-building-information-modelling>

## Other professional bodies

Chartered Institute of Building Services Engineers (CIBSE) [www.cibse.org](http://www.cibse.org)

The Chartered Institute of Architectural Technologists (CIAT) [www.ciat.org.uk](http://www.ciat.org.uk)

British Standards Institute (BSI) [www.bsigroup.com](http://www.bsigroup.com)

Institution of Civil Engineers (ICE) [www.ice.org.uk](http://www.ice.org.uk)

Institution of Structural Engineers (IstructE) [www.istructe.org](http://www.istructe.org)

Royal Institution of Chartered Surveyors (RICS) [www.rics.org](http://www.rics.org)

Constructing Excellence <http://constructingexcellence.org.uk>

British Institute of Interior Design [www.biid.org.uk](http://www.biid.org.uk)

## Innovation and digital

NESTA [www.nesta.org.uk](http://www.nesta.org.uk)

Digital Catapult <https://digital.catapult.org.uk>

McKinsey resources on digital disruption [www.mckinsey.com/global-themes/digital-disruption](http://www.mckinsey.com/global-themes/digital-disruption)

Dezeen resources on digital design [www.dezeen.com/tag/digital-design](http://www.dezeen.com/tag/digital-design)

## Research

Construction Industry Research and Information Association (CIRIA) [www.ciria.org](http://www.ciria.org)

Building Services Research and Information Association (BSRIA) [www.bsria.co.uk](http://www.bsria.co.uk)

Designing Buildings Wiki [www.designingbuildings.co.uk/wiki/Home](http://www.designingbuildings.co.uk/wiki/Home)

Building Research Establishment (BRE) [www.bre.co.uk](http://www.bre.co.uk)

