Faster, Smarter, More Efficient: Building Skills for Offsite Construction

Personas

The following personas list all the skills and knowledge needs identified which are applicable to that particular function. They also show training and qualifications available and the gaps in relation to these, as well as the preferred methods of training delivery identified via the research.

They are intended to provide a useful reference for assessing the suitability of training provision and the development of new content that meets the competency requirements.
The critical difference between design for traditional construction and design for offsite, is that the latter needs to design specifically for manufacture and subsequent assembly, using appropriate technology and digital skills.

### Technical skills
- BIM-enabled design
- Creating 3D models
- Developing a value proposition (cost, durability, low carbon, aesthetic)
- Digital design software use e.g. AutoCAD, Revit
- Digital skills (e.g. scheduling and specific IT)
- Generating 2D fabrication drawings and site drawings
- Obtaining prices and dealing with variations
- Producing product/service specifications
- Reading technical drawings
- Risk assessment

### Knowledge
- Appreciation of how buildings are constructed
- Current and emerging technologies
- Degrees of tolerance/accuracy
- IT tools
- Lean methodologies
- New technologies e.g. 3D printing
- Order of sequence
- Processes used to assemble buildings
- Quality assurance
- Relevant design codes and standards
- Understanding of full range of materials and products used (weights, volumes, dimensions etc.)
- Understanding of relevant products and systems
- Understanding of the materials being produced and energy efficiency ratings, U-values etc.
- Waste management
- Weight and robustness of materials

### Soft Skills
- Accuracy
- Attention to detail
- Business case for offsite
- Effective and on-going communication
- Problem-solving
- Team-working
- Working to tight deadlines

### Job roles
#### Skilled worker
- 3D Visualiser
- CAD Modeller

#### Supervisor
- Architectural Technician
- BIM Technician
- Pre-Construction Designer

#### Manager
- Electrical Engineer

#### Senior Manager-Professional
- Architect
- Design Engineer
- Structural Engineer

### Available qualifications
- Modern Methods of Construction (MMC) Level 2
- HNC/D (e.g. Architectural Technology)
- HNC/PdSc Sustainable Construction & Built Environment
- BIM and Integrated Design
- MSc/PgDip/PgCert
- SVQ (e.g. Built Environment Design)
- Modern Apprenticeships (e.g. Timber Manufacture Design)
- Construction Technologies Theory Level 3

### Available training
- Specialist design software e.g. AutoCAD, Tekla
- BIM training
- Steel Construction Institute courses/webinars in steel design
- Mitek (or other timber engineering software)

### Gaps and issues – training & qualifications
- Limited training in design explicitly for manufacture and assembly
- Software training does not typically cater for offsite specifically
- Limited coverage of offsite construction in most degree design courses
- Shortage of tutors able to deliver offsite specific design courses

### Preferred training delivery methods

<table>
<thead>
<tr>
<th>Method</th>
<th>Online</th>
<th>Work-based/on-the-job</th>
<th>Classroom delivery</th>
<th>Blended learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Preferred</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### KEY:
- Very little or no content directly aimed at offsite construction
- Some content directly aimed at for offsite construction
- Good amount of content directly aimed at offsite construction

### Gaps and issues – qualifications

- Very little or no content directly aimed at offsite construction
- Some content directly aimed at for offsite construction
- Good amount of content directly aimed at offsite construction

### KEY:
- Very few or no employers expressed a preference
- Some employers expressed a preference
- Most or all employers expressed a preference
Estimating is a crucial element of delivering the fundamental cost savings of offsite (compared with traditional) construction, but is subject to substantial skills shortages.

### Technical skills
- Analysis of tender documents/contract terms and conditions
- BIM-enabled design
- Costing/developing whole life cycle costs
- Developing sub-contract terms and conditions
- Developing a value proposition (cost, durability, low carbon, aesthetic)
- Obtaining prices and dealing with variations
- Planning
- Producing product/service specifications
- Reading technical drawings
- Risk assessment

### Knowledge
- Appreciation of how buildings are constructed
- Contract law
- Current and emerging technologies
- IT tools
- Lean methodologies
- Quality assurance
- Typical associate costs
- Understanding of full range of materials and products used (weights, volumes, dimensions etc.)
- Waste management

### Soft Skills
- Accuracy
- Attention to detail
- Business case for offsite
- Commercial awareness
- Effective and on-going communication
- Problem-solving
- Team-working
- Working to tight deadlines

### Job roles
- **Skilled worker**
- **Supervisor**
- **Manager**
  - Contracts Manager
  - Commercial Manager
  - Risk Manager
  - Business Development Manager
  - Sales Manager
- **Senior Manager-Professional**
  - Estimator
  - Quantity Surveyor
  - Planner

### Available qualifications
- BSc Quantity Surveying
- BTEC Level 3 Advanced Certificate in Surveying and Estimating
- Level 3 NVQ Diploma in Construction Contracting Operations – Estimating
- Level 6 NVQ Diploma in Construction Contracting Operations Management - Estimating

### Available training
- Specialist estimating software e.g. Swiftest
- Forecasting tools e.g. spreadsheets

### Gaps and issues – training & qualifications
- No training readily available to offer ‘overview’ or introduction to offsite for estimators/commercial roles
- Existing training is available in estimating but does not typically cater for offsite specifically
- Limited coverage of offsite construction in most quantity surveying courses
- Shortage of tutors able to deliver offsite specific estimating courses

### Preferred training delivery methods
- **Online**
- **Work-based/on-the-job**
- **Classroom delivery**
- **Blended learning**

### KEY:
- **Very little or no content directly aimed at offsite construction**
- **Some content directly aimed at offsite construction**
- **Good amount of content directly aimed at offsite construction**
Logistics in this context spans the product: planning, transportation, scheduling, goods in/goods out, and also supply chain management. This function spans offsite and onsite.

### Technical skills
- Budget and financial management
- Control and management of inventory
- Digital skills (e.g., scheduling and specific IT)
- Health & safety
- Lifting and handling
- Planning
- Process management
- Project management
- Quality control
- Reading technical drawings
- Risk assessment
- Supply chain management ("re-engineering the supply chain")
- Time management
- Working at heights

### Knowledge
- Appreciation of how buildings are constructed
- Degrees of tolerance/accuracy
- Integrating onsite and offsite
- IT tools
- Lean methodologies
- Low carbon agenda
- Offsite manufacturing processes
- Order of sequence
- Processes used to assemble buildings
- Quality assurance
- Safe lifting and handling
- Scheduling
- Site specifics
- Understanding of the materials being produced and energy efficiency ratings, U-values etc.
- Waste management
- Weight and robustness of materials

### Soft Skills
- Accuracy
- Attention to detail
- Business case for offsite
- Commercial awareness
- Customer service
- Effective and on-going communication
- Negotiation
- Problem-solving
- Process improvement
- Team-working
- Working to tight deadlines

### Sector specific
Potential issues for education and healthcare deliveries to site, notably to minimise disruption

### Job roles
- Skilled worker
  - Administrator
  - Banksman/Signaller
- Supervisor
  - Dispatch Leader
  - Crane Specialist
  - Plant Support Services Coordinator
  - Site Supervisor
- Manager
  - Logistics/Plant Manager
  - Dispatch Manager
  - Transport Manager
  - Construction Manager
  - Sales Manager
  - HR/Training Manager
- Senior Manager-
  - Professional

### Available qualifications
- Level 2 NVQ Diploma in Site Logistics Operations (Construction)
- BSc Logistics Management
- NVQ/SVQ level 2 (Slinging and Signalling, Plant Operations)
- Level 4 NVQ Diploma in Controlling Lifting Operations

### Available training
- Use of specific planning software/other tools
- Security Industry Authority (SIA) licence

### Gaps and issues – training & qualifications
Existing training is available in logistics but does not typically cater for offsite specifically or illustrate differences between on and offsite logistics

- No training readily available to offer ‘overview’ or introduction to offsite for logistics function
- Shortage of tutors that would be able to deliver offsite specific training

### Preferred training delivery methods
- **Online**
  - Very little or no content directly aimed at offsite construction

- **Work-based/on-the-job**
  - Some content directly aimed at for offsite construction

- **Classroom delivery**
  - Good amount of content directly aimed at offsite construction

- **Blended learning**

### KEY:
- **Very little or no content directly aimed at offsite construction**
- **Some content directly aimed at for offsite construction**
- **Good amount of content directly aimed at offsite construction**
Offsite manufacture refers to the creation of components, modules or entire buildings that are subsequently taken to, and assembled/installed onsite.

### Technical skills
- BIM-enabled design
- Health & safety
- Relevant trade skills (joinery, plastering, operating site machinery, welding)
- Lifting and handing
- Machine plant operation
- Measuring to precise specifications
- Multiskilling (e.g. combination of various technical skills)
- Process management
- Project management
- Quality control
- Reading technical drawings
- Risk assessment
- Supply chain management ("re-engineering the supply chain")
- Time management
- Use of hand tools
- Working at heights

### Knowledge
- Appreciation of how buildings are constructed
- Basic design
- Degrees of tolerance/accuracy
- Impacts for site if manufacture is at fault
- Lean methodologies
- New technologies e.g. 3D printing
- Offsite manufacturing processes
- Order of sequence
- Processes used to assemble buildings
- Quality assurance
- Relevant design codes and standards
- Safe lifting and handling
- Scheduling
- Understanding of full range of materials and products used (weights, volumes, dimensions etc.)
- Understanding of relevant products and systems
- Waste management
- Weight and robustness of materials

### Soft skills
- Accuracy
- Adaptability
- Attention to detail
- Effective and on-going communication
- Problem-solving
- Process improvement
- Team-working
- Working to tight deadlines

### Job roles
- **Skilled worker**
  - Wood Machinist, Multi-Skilled Operative, Steel Fixer, Welding Fabricator, Trades: Joiner; Kitchen Fitter, Forklift driver
  - Trades: Plumber; Electrician; Painter & Decorator; Floorlayer/Tiler; Cavity Insulation Installer

- **Supervisor**
  - Factory Supervisor

- **Manager**
  - Project Manager

- **Senior Manager-Professional**
  - Factory Manager
  - Plant Manager

- **Skilled worker**
  - Wood Machinist, Multi-Skilled Operative, Steel Fixer, Welding Fabricator, Trades: Joiner; Kitchen Fitter, Forklift driver
  - Trades: Plumber; Electrician; Painter & Decorator; Floorlayer/Tiler; Cavity Insulation Installer

### Available qualifications
- Modern Methods of Construction (MMC) level 2
- NVQ in Modular Construction level 2
- Level 2 NVQ Diploma in Innovative/MMC – Modular/Portable Buildings
- Steel frame assembly/construction
- Trailblazer Construction Assembly Technician (multi-skilled)
- Scottish Modern Apprenticeship - Timber Frame Manufacture
- Level 3 Diploma Engineering Technical Certification
- Level 3 NVQ Diploma Engineering Technical Support

### Available training
- Modular and portable building association in-company training (bespoke)
- Timber Frame Competency Award Scheme (Structural Timber Association)
- Scottish Adult Upskilling Programme - Timber Frame Manufacturing
- Steel Construction Institute (SCI) courses and webinars

### Gaps and issues – training & qualifications
- Offsite manufacture specific training (e.g. specific to a material or product such as steel, some of which is developed by federations) not taken up/offered by providers who cannot get funding to run these courses
- Traditional training in 'silos' not multi-skilling
- Employers largely unaware of relevant training that exists
- Difficult for employers to release operatives for training; preference for On-site Assessment and Training (OSAT)
- Shortage of assessors and tutors

### Preferred training delivery methods
- **Online**
  - Very little or no content directly aimed at offsite construction

- **Work-based/on-the-job**
  - Some content directly aimed at for offsite construction

- **Classroom delivery**
  - Good amount of content directly aimed at offsite construction

- **Blended learning**
  - Very few or no employers expressed a preference

  - Some employers expressed a preference

  - Most or all employers expressed a preference

### KEY:
- Very little or no content directly aimed at offsite construction
- Some content directly aimed at for offsite construction
- Good amount of content directly aimed at offsite construction
Onsite construction requires precise, accurate placement of components, modules and buildings prior to full assembly. This level of precision is the nucleus of a successful project.

**Technical skills**
- Health & safety
- Relevant trade skills (joinery, plastering, operating site machinery, welding)
- Laying groundworks
- Lifting and handling
- Machine plant operation
- Measuring to precise specifications
- Multiskilling (e.g. combination of various technical skills)
- Process management
- Project management
- Quality control
- Reading technical drawings
- Risk assessment
- Time management
- Use of hand tools
- Working at heights

**Knowledge**
- Degrees of tolerance/accuracy
- Impacts for site if manufacture is at fault
- Integrating onsite and offsite
- Lean methodologies
- Order of sequence
- Processes used to assemble buildings
- Quality assurance
- Safe lifting and handling
- Scheduling
- Site specifics
- Understanding of full range of materials and products used (weights, volumes, dimensions etc.)
- Waste management
- Weight and robustness of materials

**Soft Skills**
- Accuracy
- Adaptability
- Attention to detail
- Effective and on-going communication
- Negotiation
- Problem-solving
- Process improvement
- Team-working
- Working to tight deadlines

**Onsite placement and assembly**

<table>
<thead>
<tr>
<th>Job roles</th>
<th>Available qualifications</th>
<th>Available training</th>
</tr>
</thead>
<tbody>
<tr>
<td>Skilled worker</td>
<td>Modern Methods of Construction (MMC) level 2</td>
<td>Modular and portable building association in-company training (bespoke)</td>
</tr>
<tr>
<td>Supervisor</td>
<td>NVQ in Modular Construction level 2</td>
<td>Required training for traditional trades: health and safety, working at heights etc. (can be part of qualification)</td>
</tr>
<tr>
<td>Manager</td>
<td>Level 2 NVQ Diploma in Innovative/MMC – Modular/Portable Buildings</td>
<td></td>
</tr>
<tr>
<td>Site Inspector</td>
<td>Innovative Modern Methods of Construction (Construction): Steel frame assembly/construction</td>
<td></td>
</tr>
<tr>
<td>Site Manager</td>
<td>NVQ/SVQ level for traditional trades e.g. joinery, plastering</td>
<td></td>
</tr>
<tr>
<td>Skilled worker</td>
<td>NVQ in Modular Construction level 2</td>
<td></td>
</tr>
<tr>
<td>Site Manager</td>
<td>Level 2 NVQ Diploma in Innovative/MMC – Modular/Portable Buildings</td>
<td></td>
</tr>
<tr>
<td>Site Inspector</td>
<td>Innovative Modern Methods of Construction (Construction): Steel frame assembly/construction</td>
<td></td>
</tr>
<tr>
<td>Site Inspector</td>
<td>NVQ/SVQ level for traditional trades e.g. joinery, plastering</td>
<td></td>
</tr>
</tbody>
</table>

**Gaps and issues – training & qualifications**
- Offsite is not typically covered in traditional trade training
- Traditional training in ‘silos’ not multi-skilling
- Employers largely unaware of relevant qualifications such as the NVQ in Modular Construction
- Shortage of assessors and tutors

**Preferred training delivery methods**

<table>
<thead>
<tr>
<th>Delivery method</th>
<th>Online</th>
<th>Work-based/on-the-job</th>
<th>Classroom delivery</th>
<th>Blended learning</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very few or no employers expressed a preference</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some employers expressed a preference</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most or all employers expressed a preference</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Site management and integration

Offsite construction site management hinges on being able to integrate the offsite and onsite functions, which requires a comprehensive understanding of both aspects.

### Technical skills

- Budget and financial management
- Digital skills (e.g. scheduling and specific IT)
- Health & safety
- Information management (project delivery and design management)
- Measuring to precise specifications
- Multiskilling (e.g. combination of various technical skills)
- Process management
- Project management
- Quality control
- Risk assessment
- Supply chain management ("re-engineering the supply chain")
- Time management

### Knowledge

- Degrees of tolerance/accuracy
- Impacts for site if manufacture is at fault
- Integrating onsite and offsite
- IT tools
- Lean methodologies
- Order of sequence
- Processes used to assemble buildings
- Quality assurance
- Safe lifting and handling
- Scheduling
- Site specifics
- Understanding of relevant products and systems
- Waste management
- Weight and robustness of materials

### Soft Skills

- Accuracy
- Adaptability
- Attention to detail
- Effective and on-going communication
- Negotiation
- Problem-solving
- Process improvement
- Team-working
- Working to tight deadlines

### Job roles

- Skilled worker
- Supervisor
- Manager
- Senior Manager-Professional

### Available qualifications

- Modern Methods of Construction (MMC) level 2
- NVQ in Modular Construction level 2
- Level 2 NVQ Diploma in Innovative/MMC – Modular/Portable Buildings
- Construction Project Management – MSc
- HNC in Construction & Built Environment
- HNC in Building Studies

### Available training

- Modular and portable building association in-company training (bespoke)
- Required training for traditional trades: health and safety, working at heights etc. (can be part of qualification)
- Site safety management

### Gaps and issues – training & qualifications

- Construction project management MSc includes one module on ‘innovation in construction’ i.e. not explicitly covering offsite construction
- Onsite behaviours and attitudes (e.g. collaborative approach) are not included in traditional training
- Generic project management qualifications do not have substantial coverage of offsite
- Shortage of assessors and tutors

### Preferred training delivery methods

- Online
- Work-based/on-the-job
- Classroom delivery
- Blended learning

### KEY:

- Very little or no content directly aimed at offsite construction
- Some content directly aimed at for offsite construction
- Good amount of content directly aimed at offsite construction
- Very few or no employers expressed a preference
- Some employers expressed a preference
- Most or all employers expressed a preference