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.

Digital design

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

Sector specific

House-building regulations and planning

Commercial building regulations and planning

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
Building Services Engineer

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/FdSc 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 ✓✓

Sector specific

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

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

Preferred training delivery methods

Online

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Work-based /on-the-job

●●●

Classroom delivery

●●●

Blended learning

●●●

KEY:

● Very few or no employers expressed a preference

●● Some employers expressed a preference

●●● Most or all employers expressed a preference

Estimating/commercial

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)
Developing tenders
Obtaining prices and dealing with variations
Planning
Producing product/service specifications
Reading technical drawings
Risk assessment

Sector specific

Differences between Scotland and England for timber frame costing

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

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Logistics

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

Sector specific

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

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

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

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Offsite manufacture

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 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
- 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
Factory Manager
Plant 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 ✓✓✓
- 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

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Preferred training delivery methods

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Work-based /on-the-job

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Classroom delivery

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Blended learning

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Onsite placement and assembly

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

Sector specific

House-building regulations and planning

Commercial building regulations and planning

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

Job roles

Skilled worker

Assembly Technician Erectors: Steel; Precast Concrete Operatives: Groundworks; Roofing, Banksman/ Signaller, Crane Operator, Forklift Driver Trades: Plumber, Electrician, Painter/Decorator, Joiner Tunnelling Operative

Supervisor

Chargehand
Site supervisor

Manager

Project Manager
Site Manager
Site Inspector

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 ✓✓✓
Innovative Modern Methods of Construction (Construction): Steel frame assembly/construction ✓✓✓
NVQ/SVQ level for traditional trades e.g. joinery, plastering ✓

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) ✓

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

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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
Reading technical drawings
Risk assessment
Supply chain management ("re-engineering the supply chain")
Time management

Sector specific

House-building regulations and planning

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Degrees of tolerance/accuracy
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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

Site Manager
Project Manager
Construction Manager
Logistics Manager
Compliance Manager

Senior Manager-Professional

Site Inspector

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

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