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



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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

Manager

Electrical Engineer

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**

Senior Manager-Professional

Architect **Desian 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

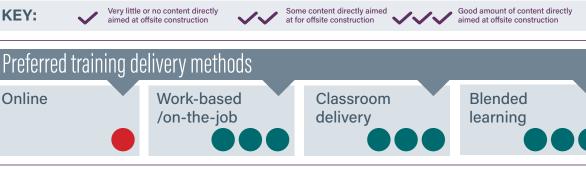


Mitek (or other timber engineering software)

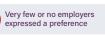
Gaps and issues – training & qualifications

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:





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



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

Available training

Specialist estimating software e.g. Swiftest Forecasting tools e.g. spreadsheets



Senior Manager-

Estimator Quantity Surveyor Planner

Professional

Available qualifications

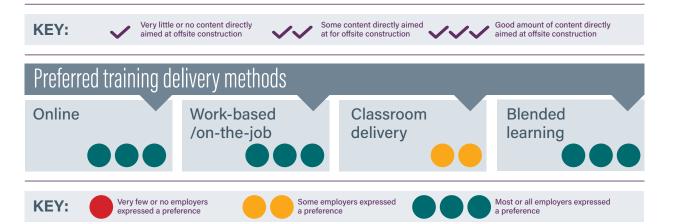
BSc Quantity Surveying BTEC Level 3 Advanced Certificate in Surveying and Estimating Level 3 NVQ Diploma in Construction Contracting Operations - Estimating Level 6 NVQ Diploma in Construction Contracting Operations Management - Estimating

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Gaps and issues – training & <u>qualifications</u>

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

No training readily available to offer 'overview' or introduction to offsite for estimators/



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 ΗĤ minimise disruption

Job roles

Skilled worker Administrator Banksman/Signaller

Supervisor Dispatch Leader Crane Specialist Plant Support Services Coordinator Site Supervisor

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

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 buildinas 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

Manager Logistics/Plant Manager Dispatch Manager Transport Manager Construction Manager Sales Manager

Senior Manager-

Professional

Available training

HR/Training Manager

Use of specific planning software/other tools

Security Industry Authority (SIA) licence

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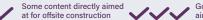
Gaps and issues training & qualifications

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

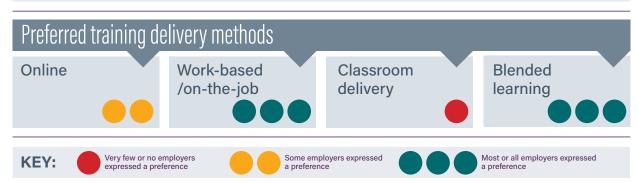
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KEY:





Good amount of content directly aimed at offsite construction



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



Traditional training in 'silos' not multi-skilling

Employers largely unaware of relevant training that exists

Available training

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

Difficult for employers to release operatives for training; preference for On-site Assessment and Training (OSAT)

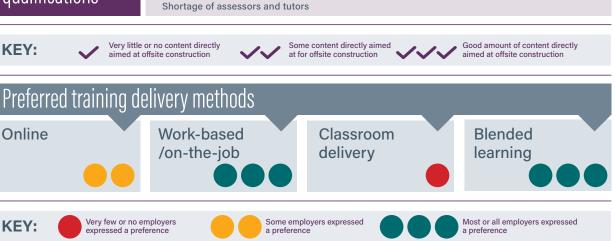
Modular and portable building association in-company training (bespoke) Timber Frame Competency Award Scheme (Structural Timber Association) Scottish Adult Upskilling Programme -Timber Frame Manufacturing Steel Construction Institute (SCI) courses and webinars



Gaps and issues – training & qualifications

KEY:

KEY:



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

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

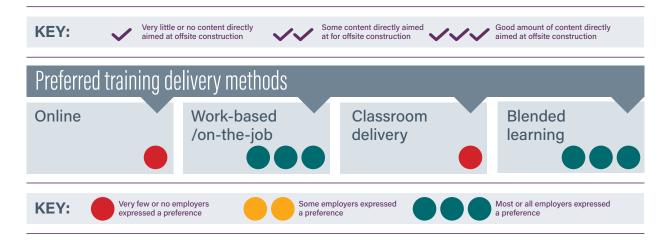
Modular and portable building association in-company training (bespoke)

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



Know<u>ledge</u>

- 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

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 |
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| 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

Commercial building regulations and planning

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



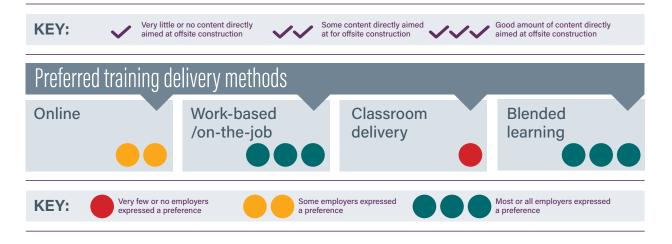
Available training

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



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

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

Soft Skills