Unit 220: Erect timber roof structures

# Delivery guide

Unit information

This unit is about erecting timber roof structures. Learners may be introduced to this unit by asking themselves questions such as:

* What does stress grading mean?
* What is a live load?
* How do I know which truss type to use?
* How can I reduce the risks of working at height?
* How do I plan a sequence of operations to erect a hip ended roof?
* Why do roofs have to have bracings built in?

Learning outcomes

1. Understand resource selection
2. Understand working to a contract specification
3. Comply with the given contract information to carry out the work safely and efficiently to the required specification

Suggested resources

Textbooks

* Peter Brett, P. (2010) *Carpentry and Joinery: Book One Job Knowledge,* 3rd edition. Cheltenham: Nelson Thornes.

ISBN 978-1-4085-0650-9

* Peter Brett, P. (2010) *Carpentry and Joinery: Book Two: Practical Activities*, 3rd edition (Complete Reference Guide). Cheltenham: Nelson Thornes. ISBN 978-1-4085-0648-6
* Chudley, R. and Greeno, R. (2020) *Chudley and Greeno’s Building Construction Handbook*, 12th edition. Oxford: Routledge.

ISBN 978-0-3671-3543-0

* Jones, S., Redfern, S., Fearn, C. (2019) *The City & Guilds Textbook: Site Carpentry and Architectural Joinery for the Level 2 Apprenticeship (6571), Level 2 Technical Certificate (7906) & Level 2 Diploma (6706)*. London: Hodder Education. ISBN 978-1-5104-5813-0

Websites

* [Homepage | Cadw (gov.wales)](https://cadw.gov.wales/)
* [Home Building & Renovating | Timber Frame: The Fast, Flexible & Energy Efficient Build System](https://www.homebuilding.co.uk/advice/timber-frame-guide)
* [Vision Development | About Timber Frame](https://www.timber-frame-suppliers.co.uk/about-timber-frame/)
* [TRADA | Timber Research and Development Association](https://www.trada.co.uk/)
* [Pasquill | The Different Type of Roof Trusses and their Uses](https://www.pasquill.co.uk/the-different-types-of-roof-trusses-and-their-uses/)
* [Rafferty Roof Trusses Ltd | The Ultimate Guide To Roofing Trusses](https://www.raffertyrooftrusses.co.uk/the-ultimate-guide-to-roofing-trusses)
* [GOV.UK | Building regulations approval](https://www.gov.uk/building-regulations-approval)
* [HSE | RIDDOR Reporting of Injuries, Diseases and Dangerous Occurrences Regulations 2013](https://www.hse.gov.uk/riddor/)
* [Gannt.com | What is a Gantt Chart?](https://www.gantt.com/)
* [HSE | Personal Protective Equipment (PPE) at work](https://www.hse.gov.uk/pubns/indg174.pdf)
* [HSE | Good handling technique](https://www.hse.gov.uk/msd/manual-handling/good-handling-technique.htm)
* [netregs | A simple guide to site waste management plans](https://www.netregs.org.uk/media/1718/a-simple-guide-to-site-waste-management-plans.pdfnetregs)

| **Learning outcomes** | **Criteria** | **Delivery guidance** |
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| 1. Understand resource selection | * 1. Characteristics of the resources   . | * Learners to understand how sustainability can be applied to roof construction and the benefits of using sustainable materials and to show examples. * Learners to understand the characteristics and limitations of the material used in structural and non-structural roof components, load and non-loadbearing components, Unplasticized Polyvinyl Chloride (UPVC), timber types (hardwood, softwood), grading, sustainability and timber defects. * Learners to know the advantages of using locally sourced materials, e.g. enhanced material properties (energy saving), lower carbon footprint (to include embodied carbon), and how they relate to protecting the natural environment, controlling waste management, energy loss prevention and thermal transmittance (U-Values). * Learners to know and state key points from *Building Regulations Approved Document A – Structure*, that applies to the use of timber roof structures. * Learners to understand the types of load, including dead, live, dynamic (e.g. wind). * Learners to understand the fundamental difference between truss and traditional cut roofs.   Truss roof   * Learners to know the different types of truss rafter roofs, including fink, fan, king post, queen post, attic, girder, mono. * Learners to know the different components required to erect a trussed roof, including truss rafter roof hips, valleys, diminishing trusses, gable, ladder, wall plate, eaves, verge, straps, wall plate and restraint, bracing, lateral, diagonal and chevrons, truss clip, temporary bracing. * Learners to know the different types of eaves (open, closed, flush, sprocketed) and materials used (hardwood, softwood, UPVC). * Learners to know the different types of verge (closed, flush, plastic and dry systems).   Traditional cut gable end and flat roofs   * Learners to know the different types of traditional cut roof construction (single, double, gable, lean to, couple, close couple, collared, flat). * Learners to know the different components used to construct traditional gable end and flat roofs. * Gable end roofs: wall plate, ridge board, common rafter, purlins, sprocket ends, ceiling rafter, collar ties, binders, gable ladder, eaves, verges, fascias, bargeboards, soffits, soffit brackets, straps, lateral and diagonal bracings. * Flat roofs: wall plate, ceiling rafter, strutting, fillets and firrings, fascias, soffits, cold and warm decking, decking materials. * Learners to understand the importance of design for manufacture, off-site construction and modern methods of timber construction; the concept of fabric first principles and building performance in terms of acoustic and thermal performance (including sound transfer, airtightness, ventilation, airflow, U-Values, cold bridging). * Learners to know the importance of quality control, quality assurance, certification and warranties in reducing the performance gap and the role of Building Control, Local Authority Building Control (LABC) and the National House Building Council (NHBC) as examples in this process. |
| * 1. Use of resources | Truss roof   * Learners to know how to install trusses and to understand the importance of lateral bracing, diagonal bracing, chevron bracing, lateral restraints, wall plate, gable ladder, straps (wall plate and lateral) and truss clips.   Traditional cut   * Learners to understand the methods for determining lengths and cuts of common rafters, including plumb cut, seat cut and third/pitch line and to understand the importance of wall plate, ridge board, purlins, gable ladder, bracings and straps (wall plate and lateral).   Eaves and verge finishes   * Learners to know the methods of forming closed, open, sprocketed and flush eaves, including soffit brackets, soffits, tilting fillet, fascias, bargeboard, proprietary ventilation systems, dry verge finishes, plastic and cement systems. * Learners to know the personal protective equipment (PPE) requirements for erecting roof structures, including harnesses, as referred to in [the Personal Protective Equipment at Work Regulations](https://www.legislation.gov.uk/uksi/1992/2966/contents/made) 1992. * Learners to know the collective protective measures, PPE and Respiratory Protective Equipment (RPE). * Learners to know the access equipment required for work in relation to the Working at Height Regulations (WAH) 2005. * Learners to know the procedures for reporting problems related to resources (hierarchy charts, company structures, architect’s role, terms of contracts, and changes to specifications, variation orders and architect instructions). |
| * 1. Organisational procedures to select resources | * Learners to understand the benefits of planning the sequence of materials and labour requirements using Gantt charts and critical path analyses, including stock systems, stock control and lead times. * Learners to be familiar with the use of Bills of Quantities (BOQ). * Learners to know the purpose of schedules and specifications. |
| 1.4 Hazards | * Learners to understand their responsibilities in relation to the potential hazards when erecting timber roof structures. * Learners to know how to select correct PPE, including harnesses, lanyards, helmet, boots, high visibility (Hi-Viz) jackets, and collective protective measures requirements. * Learners to know how hazards can be created by changing circumstances in the workplace, including construction site developments and ongoing work, plant and vehicles and periods of extreme weather. |
| 2. Understand working to a contract specification | * 1. Methods of work   . | Truss   * Learners to know how to measure, mark out, fit, align, finish, position and secure truss rafter roofs. * Learners to understand the implications, advantages and disadvantages of constructing trussed rafter roof structures at ground level.   Traditional Cut   * Learners to know how to measure, mark out, fit, align, finish, position and secure traditional cut roofs, including single, double, gable, lean to, couple, close couple, collared, flat. * Learners to understand the importance of working to drawings, specifications and schedules and the interaction of the documentation. * Learners to know how to extract information from working drawings, schedules and specifications for position, size and fixing. |
| 2.2 Tools and equipment | * Learners to be able to select, sharpen, maintain and store the necessary tools required for timber roof erection using information taken from the specification, including saws, hammers, chisels, screwdrivers, electric drills, cordless drills, drill bits, powered nailer, battery powered tools, tape measure, try square, spirit level, plumb bob, string line. |
| 3. Comply with the given contract information to carry out the work safely and efficiently to the required specification | 3.1 Demonstrate work skills to measure, mark out, fit, align, position and secure  . | * Learners to be able to: * select and fix the different components required to erect a trussed roof, including truss rafter, gable, ladder, wall plate, eaves, verge, straps, wall plate and restraint bracing, lateral, diagonal, truss clip, temporary bracing * mark out, fit, align, finish, position and secure traditional cut roofs to include single, gable and flat. |
| 3.2 Use and maintain hand tools, portable power tools and ancillary equipment to construct, erect and/or install the following roof structures to given working instructions:   * + in-situ roofs (manually handled) | * Learners to be able to select, safely set up, use and maintain: * measuring equipment (rulers, tape measures, digital measuring equipment) * saws (hand and PPT, including chop saw, circular saw) * squares (including roofing, adjustable bevel, 90 degree) * claw hammer, framing nailer * string line, chalk line, straight-edge * levels (optical, laser, 600mm, 1000mm, 1800mm). * Learners to be able to select, safely handle, stack and store resources using correct manual handling techniques as stated in *Manual handling at work – A brief guide* by the Health and Safety Executive. |