Unit 311: Manufacture bespoke products

# Delivery guide

Unit information

This unit is about fitting and assembling plain and circular bespoke products for architectural joinery including doors, windows, staircases, handrails, and balustrades.

Learners may be introduced to this unit by asking themselves questions such as:

* How is a wreathed string formed for a geometrical staircase?
* How is a segmental headed box frame window assembled?
* When do I need to use a vacuum press?

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

* 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

* Burdfield, M., Jones, S., Redfern, S., Fearn, C. (2020) *The City & Guilds Textbook: Site Carpentry & Architectural Joinery for the Level 3 Apprenticeship (6571), Level 3 Advanced Technical Diploma (7906) & Level 3 Diploma*. London: Hodder Education.

ISBN 978-1-5104-5815-4

Websites

* [CADW | Conservation Principles in Action](https://cadw.gov.wales/advice-support/conservation-principles/conservation-principles-action)
* [BWF | Homepage](https://www.bwf.org.uk/)
* [TRADA | Publications](https://www.trada.co.uk/publications/)
* [TRADA | Lists of British Standards June 2021](https://www.trada.co.uk/publications/british-standards-lists/list-of-british-standards-june-2021/)
* [BRE | Certification and Listings](https://www.bregroup.com/services/certification-and-listings/)
* [HSE | Construction dust: Cutting and Sanding Wood](https://www.hse.gov.uk/construction/healthrisks/hazardous-substances/cutting-and-sanding-wood.htm)
* [James Latham | Products](https://www.lathamtimber.co.uk/products?utm_medium=organic&utm_source=bing)

British Standards

* BS 459:1988 *Specification for matchboarded wooden door leaves for external use*.
* BS 476-7:1997 *Fire tests on building materials and structures. Method of test to determine the classification of the surface spread of flame of products*.
* BS 476-31.1:1983 *Fire tests on building materials and structures. Methods for measuring smoke penetration through doorsets and shutter assemblies. Method of measurement under ambient temperature conditions*.
* BS EN ISO 585:1999 *Plastics. Unplasticized cellulose acetate. Determination of moisture content*.
* BS 644:2012 *Timber windows and doorsets. Fully finished factory-assembled windows and doorsets of various types. Specification*.
* BS EN 942:2007 *Timber in joinery. General requirements*.
* BS 1186-3:1990 *Timber for and workmanship in joinery. Specification for wood trim and its fixing*.
* BS 1192:2000 *Doors. Classification of strength requirements*.
* BS EN ISO 9001:2000 *Quality systems. Model for quality assurance in design, development, production, installation and servicing*.

Legislation

* [HSE | PUWER](https://www.hse.gov.uk/work-equipment-machinery/puwer.htm)
* [HSE | RIDDOR](https://www.hse.gov.uk/riddor/)
* [HSE | COSHH](https://www.hse.gov.uk/coshh/)
* [HSE | LOLER](https://www.hse.gov.uk/work-equipment-machinery/loler.htm)
* [HSE | Health and Safety at Work etc Act (HASAWA) 1974](https://www.hse.gov.uk/legislation/hswa.htm)
* [HSE | ACOPs](https://www.hse.gov.uk/legislation/legal-status.htm)
* [HSE | PPE](https://www.hse.gov.uk/toolbox/ppe.htm)
* [GOV.UK | The Personal Protective Equipment at Work Regulations 1992](https://www.legislation.gov.uk/uksi/1992/2966/contents/made)
* [GOV.UK | The Manual Handling Operations Regulations 1992](https://www.legislation.gov.uk/uksi/1992/2793/made)
* [GOV.UK | The Control of Noise at Work Regulations 2005](https://www.legislation.gov.uk/uksi/2005/1643/made#:~:text=SCHEDULE%203%20Revocations%20%20%20%20Regulations%20revoked,2%20Part%20IX%20%202%20more%20rows%20)
* [GOV.UK | The Building Regulations 2010 (as appropriate to joinery products)](https://www.legislation.gov.uk/uksi/2010/2214/contents/made)

| **Learning outcomes** | **Criteria** | **Delivery guidance** |
| --- | --- | --- |
| 1. Understand resource selection | * 1. Characteristics of the resources | * Learners to know the characteristics and suitability of resources when selecting them for manufacturing bespoke products. * Using online sources, learners can create a table showing the information available including grading of timber, appearance, strength and durability for the following timbers (this can include density, ability to take a finish and workability): * European redwoods and whitewoods * Douglas fir * Oregon pine * European and American oak * beech (steamed and unsteamed) * ash * walnut * poplar * cedar * Iroko * meranti * sapele * utile * idigbo * cherry * maple * sycamore * accoya * thermowood and other acetylated/heat treated softwoods. * Similarly, learners can produce a table for the following materials identifying common sizes/thicknesses, types, special features and suitable uses: * plywood * fibreboard * laminated boards * glass (single, double, treble and secondary glazing) * metal (aluminium, copper, galvanized steel and stainless steel) * fabrics (rattan) * veneers (pre-veneer manufactured boards, sapele, oak, ash, walnut, maple, beech) * laminate (decorative plastic laminate, high pressure laminates). * Learners can be given a range of boards with the following defects and asked to identify them. In addition learners should research how this fault has occurred and what can be done to mitigate the fault and/or state how these can be removed during the selection and machining process, particularly in respect to producing shaped joinery: * knots * twist * bowing * cupping * sloping grain * heart, cup, star and thunder shakes * case hardening * end checks * waney edge. |
| * 1. Use of resources | * Learners should review the table produced for 1.1 and be given various scenarios for which materials are required (internal, external, high class, clear and painted finish joinery) and then write a specification for the work. * Learners to know how and when to report problems with resources when producing bespoke products to minimise delay and additional costs. |
| * 1. Organisational procedures to select resources | * Learners to research the following and other similar sources and present a synopsis of their findings to their group: Timber Research and Development Association (TRADA), BRE (Building Research Establishment), Finnish Timber Council and timber suppliers. |
| * 1. Hazards | * Learners to be given naturally occurring scenarios present in a joinery manufacturing environment and ask them in pairs/groups to identify the hazards and risks associated with common activities undertaken by joiners and then compare their findings with their peers: * including Local Exhaust Ventilation (LEV) during the manufacturing process, both with power tools and machinery to reduce the hazards of dust from timber solids and manufactured products including respiratory problems (asthma, emphysema) * with the use of fixed wood working machinery and orbital power tools including projectiles, cutter contact, noise, dust, vibration, entanglement and electric shock * using appropriate manual handling techniques (carrying, pushing, assessing weight, manual assistance where required, strains) and how to prevent musculoskeletal disorders. * Learners can be given a range of tasks related to this qualification and in groups identify relevant safety legislation that will apply and the PPE required to safely undertake the tasks. * Learners should be able to set up machinery in a safe manner which will take into account the following risks: * cuts, bruising, lacerations, projectiles, cutter contact, noise, dust, vibration, electrocution, slips, trips, falls and entanglement, orifical bodily entry, skin penetration (pneumatic supply). |
| 1. Understand working to a contract specification | * 1. Methods of work | * Learners to be given production drawing of joinery products without the jointing methods shown and asked in pairs to detail the joint construction suitable for the product. The results are to be compared with others and discussed in the group as a whole. The joinery products should include opportunities for the following joints to be selected: * including mortice and tenon (barefaced, double, twin, long short shoulder, loose/false tenons, diminished shoulder, stub and hammer headed), widening joints (loose tongue, solid tongue and groove, biscuit, butt), other joints (housing, dovetail), mouldings, grooves and rebates from the marking out process. * Using the above drawings, learners should mark out for one-off and batched produced joinery products, check for errors and be able to understand the consequence of those errors. * Learners to understand how to: * fit up and carry out quality checks to ensure conformity with the specification * assemble joinery products using a variety of methods as fit for that product * prepare the surfaces (prior to and following assembly) for finishes (paint, clear, stained types and microporous) * identify position and location, protect and store finished items of joinery ready for transportation and delivery * report any problems. |
| * 1. Tools and equipment | * Learners should, when manufacturing the above products, set up and use hand tools, power tools and associated fixed machinery including the correct setting of safety guarding, fence and stop settings, blade replacement and setting, cutter replacement and setting along with abrasive loadings. * Fixed machines to include: * dimension saw * cross cut saw * rip saw * surface planer * thicknesser * morticer * band saw * spindle moulder * finishing sander * drum/straight belt sander. * Power tools to include: * circular saw * guide rails * router (handheld and inverted) * jigsaw * cordless drill driver * biscuit jointer * random orbital sander * belt sander * laminate trimmer * brad nailer. * Equipment to include: * squaring rods * bench bearers * sash cramps * G/F cramps * toggle cramps * cramping devices (draw pins, dogs, vacuum press, band cramp). * Hand tools to include: * tenon saw * mallet * chisels * gouges * coping saw * shoulder plane * smoothing plane * block plane * compass plane * concave and convex spokeshaves * cork rubber * cabinet scraper * draw pins * square * centre finder * mitre template * cutting gauge * hammer * nail punch * pincers. |
| 1. Comply with the given contract information to carry out the work safely and efficiently to the required specification | * 1. Demonstrate work skills to measure, mark out, manufacture, assemble and finish bespoke joinery products | * Learners should be given set tasks incorporating parts or sections of models of the products listed below, allowing them the opportunity to set up machines and manufacture these items: * door sets (including inward and outward opening, garage, storey, vestibule, combination, single and double action, curved in elevation, curved on plan, circle on circle (double curvature) with parallel and radiating jambs) * ledged, ledged and braced, framed ledged and braced, panelled, glazed, fire, soundproof, flush, single and double margin, curved on plan doors * traditional and high-performance casement and box frame windows * kitchen, vanity, built-in, library, ecclesiastical units and/or fitments * dado, frieze and full height panelling (panelled and flush), radiator casings * internal and external jointing details and quantities for cladding * straight staircases and staircases with turns (landings and winders) with closed, open and cut string * handrails and balustrading (easings, ramps, knees, swan and goose necks, horizontal and vertical scrolls). * Learners should be given the opportunity for the ancillary materials listed below to be incorporated into joinery tasks: * glass, metal, fabrics, veneers, laminates. * Learners should be given the opportunity to manufacture joinery products with single and double curvature features in the above types of products as required, such as rake to level handrail wreath. * Learners should select, safely set up, use and maintain the different types of hand tools, power tools and associated equipment. * Learners to be able to select, safely handle, stack and store resources using correct manual handling techniques. |
| * 1. Use and maintain hand and power tools to fit and assemble to form bespoke manufactured products to given working instruction, at least three items from the following: * door sets * doors * windows with opening lights * units and/or fitments * panelling or cladding * joinery products incorporating any of the following: glass; metal; fabrics; veneers and laminate * staircases (straight and with turns) * handrails and balustrades * joinery products with single curvature features * joinery products with double curvature features |