

Unit 10: Understanding and Using Blacksmithing Installation Skills

Unit reference number:	M/602/0676
QCF Level 3:	BTEC National
Credit value:	10
Guided learning hours:	60

● Aim and purpose

This unit aims to introduce learners to blacksmithing installation skills and how these can be applied in practice. It is designed for learners in centre-based settings looking to progress into the sector or on to further or higher education.

● Unit introduction

Installing the artefacts they produce is an essential part of a blacksmith's work. This unit develops a cohesive and professional approach to the production and installation of complex constructions. It aims to equip learners with the skills to work independently to the exacting standards of customers and other professionals.

This unit focuses on developing learners' experience of the range of processes used in the craft of the blacksmith, for example when producing work for commission-based gates or railings. This links to the need for a rigorous and professional approach when costing artefacts to workshop specifications.

Learning outcome 1 looks at methods used for site evaluation.

Learning outcome 2 looks at workshop-based costings and records. It addresses the important skills and knowledge requirements for recording site information, an essential component of the successful installation of many large, forged artefacts.

In learning outcome 3, learners will produce a complex blacksmithing construction. Learners should be able to produce forged artefacts that demand a broad range of forged elements linked using a predominance of traditional blacksmithing jointing techniques, for example an infill within a framework that is site specific. Learners should be given the opportunity to research and design artefacts based on traditional or contemporary forms.

Learning outcome 4 covers installation operations. It introduces learners to the common site installation fixings and methods used within the blacksmithing industry.

● Learning outcomes

On completion of this unit a learner should:

- 1 Understand the methods used for site evaluation
- 2 Understand construction and installation costings and records
- 3 Be able to produce a complex blacksmithing construction
- 4 Be able to perform site installation operations.

Unit content

1 Understand the methods used for site evaluation

Site evaluation: equipment, eg levels, lasers, cameras; site surveying methods; mapping and plotting; drawings and conventions; building regulations; access; health and safety; risk assessment

2 Understand construction and installation costings and records

Costings: reasons for calculating job costings; materials eg estimations; cutting lists; wastage; workshop costs eg rent, rates, utilities, clerical, insurances, depreciation, equipment, consumables, transport; value added tax; labour costs (man hours to plan, cost and complete job, hourly rate)

Records: reasons for keeping records; record sheets eg work schedules, job work sheets, materials stock records, manual, electronic; quotations and estimates; relevant current legislation

3 Be able to produce a complex blacksmithing construction

Complex construction techniques: methods used to construct complex items in the forge eg frameworks, infill; setting out; fitting, eg clamping, tenoning, bolting, riveting; industrial tolerances; health and safety; risk assessment

Structural: element types eg hinges, locks, heel bars, joints, railings, pailings, braces, front and back stiles; uses

Decorative elements: types eg scrolls, rosettes, twists, appliqué, piercing, repoussé (motif, masks, figurative), leaves (water, blown back, bevel, acanthus faced, acanthus cupped)

4 Be able to perform site installation operations

Fixing operations: fixing methods eg temporary, permanent loose fixings eg bolts, studs, screws; health and safety; risk assessment

Permanent fixings: types eg lead, 'chem fix', cement, concrete; tools and equipment; health and safety; risk assessment

Assessment and grading criteria

In order to pass this unit, the evidence that the learner presents for assessment needs to demonstrate that they can meet all the learning outcomes for the unit. The assessment criteria for a pass grade describe the level of achievement required to pass this unit.

Assessment and grading criteria		
To achieve a pass grade the evidence must show that the learner is able to:	To achieve a merit grade the evidence must show that, in addition to the pass criteria, the learner is able to:	To achieve a distinction grade the evidence must show that, in addition to the pass and merit criteria, the learner is able to:
P1 explain suitable methods used to evaluate a given site	M1 produce an hourly workshop rate, proposed construction and installation costing for a selected project	D1 evaluate the process used to produce the complex construction making recommendations for improvement.
P2 survey a given site to meet specified objectives		
P3 produce site records needed to meet defined specifications [IE]		
P4 explain the reasons for costing projects and for keeping records in the blacksmith environment	M2 use blacksmithing techniques to produce a complex construction to meet the requirements of a given site and specification.	
P5 produce detailed workshop job time sheets relating to work done		
P6 use specified construction methods to meet a given specification		
P7 produce specified structural elements to meet a given specification		
P8 produce specified decorative elements to meet a given specification [CT, SM]		
P9 perform specified site installation operations to meet a given specification. [TW, EP]		

PLTS: This summary references where applicable, in the square brackets, the elements of the personal, learning and thinking skills applicable in the pass criteria. It identifies opportunities for learners to demonstrate effective application of the referenced elements of the skills.

Key	IE – independent enquirers	RL – reflective learners	SM – self-managers
	CT – creative thinkers	TW – team workers	EP – effective participators

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical assessments, written assessment, visits to suitable collections and will have links to industrial experience placements.

Tutors delivering this unit have opportunities to use as wide a range of techniques as possible. Lectures, discussions, seminar presentations, site visits, supervised workshop practicals, research using the internet and/or library resources and the use of personal and/or industrial experience would all be suitable. Delivery should stimulate, motivate, educate and enthuse learners.

Work placements should be monitored regularly in order to ensure the quality of the learning experience. It would be beneficial if learners and supervisors were made aware of the requirements of this unit prior to any work-related activities so that naturally occurring evidence can be collected at the time. For example, learners may have the opportunity to produce a complex blacksmithing construction, and they should be encouraged to ask for observation records and/or witness statements to be provided as evidence of this. Guidance on the use of observation records and witness statements is provided on the Edexcel website.

Visiting expert speakers could add to the relevance of the subject for learners. For example, experienced blacksmiths could talk about their work, the situations they face and the methods they use.

Health and safety issues relating to working in the forge environment must be stressed and regularly reinforced, and risk assessments must be undertaken prior to practical activities. Adequate personal protective equipment (PPE) must be provided and used following the production of suitable risk assessments.

Tutors should consider integrating the delivery, private study and assessment for this unit with other relevant units and assessment instruments learners are taking as part of their programme of study.

Learning outcome 1 looks at the methods used to evaluate sites for the installation of artefacts produced by blacksmiths. This is likely to be delivered through formal lectures, discussion, site visits, practicals and independent learner research. Tutors have the opportunity to integrate this learning outcome with the others for this unit.

Learning outcome 2 covers the methods used to cost the construction and installation of blacksmithing and metalworking jobs and the records that are required to be taken and kept. This is likely to be delivered through formal lectures, discussion, site visits and independent learner research. Tutors are encouraged to deliver this using actual projects as examples.

In learning outcome 3, learners will look at the production of complex blacksmithing constructions. Explanation and demonstration should be followed by opportunities for learners to practise and develop their techniques and finish quality. As learners become more competent in individual techniques they should be encouraged to design artefacts that require the use of several techniques based on traditional or contemporary form. Supporting knowledge will be delivered within the workshop and classroom environment via project work.

Learning outcome 4 covers installation operations. This is likely to be delivered through formal lectures, discussion, site visits, practicals and independent learner research. Differing sections and sizes of mild steel and non-ferrous materials should be used as appropriate. Learners should be encouraged to develop a cohesive approach to the making process across all of the learning outcomes by producing more complex blacksmith constructions relevant to a specified site(s) with associated costings and installation recommendations. Using industrially relevant forge and site equipment learners should research a range of materials and methods and learn how to manage different working environments.

Outline learning plan

The outline learning plan has been included in this unit as guidance and can be used in conjunction with the programme of suggested assignments.

The outline learning plan gives **an indication of the volume of learning it would take the average learner** to achieve the learning outcomes. It is **indicative and is one way of achieving the credit value**.

Learning time should address all learning (including assessment) relevant to the learning outcomes, regardless of where, when and how the learning has taken place.

Topic and suggested assignments/activities and/assessment
Introduction and overview of the unit.
Assignment 1: Site Survey and Workshop (P1, P2, P3, P4, P5, M1) Tutor introduces the assignment brief. Site evaluation, costings and records. Demonstration of surveying evaluation techniques as appropriate during the project. Learner site evaluation. Learner research, production of workshop records and other documentation. Learner assessment/feedback.
Assignment 2: Performing Complex Blacksmithing Construction and Site Installation (P6, P7, P8, P9, M2, D1) Tutor introduces the assignment brief. Following the introduction of complex construction techniques including specifications, the learner produces complex item and elements using the required processes. Learners evaluate process as set against specification and make recommendations for improvement. Learner assessment/feedback.
Visiting lecturer, workshop/site visits.
Unit review.

Assessment

For P1, P2 and P3, learners must provide information on a given site. Tutors should identify the site and objectives or agree them through discussion with learners. Where possible, to ensure fairness of assessment, the size and complexity of the tasks should be the same for all learners. Evidence could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector) or an assignment.

For P4 and P5, learners must produce detailed workshop job time sheets and provide an explanation of the reasons for costing projects and for keeping records in the blacksmith environment. Learners could give examples of records that they have kept or seen being kept as part of their evidence. Evidence could be in the same form as for P1.

P6, P7 and P8 require learners to produce complex blacksmithing construction methods and elements to meet a given specification. Tutors should identify the specification or agree them through discussion with learners. Where possible, to ensure fairness of assessment, the size and complexity of the tasks should be the same for all learners. These criteria could be assessed directly by the tutor during practical activities. If this format is used then suitable evidence from guided activities would be observation records completed by learners and the tutor and accompanied by appropriate worklogs or other relevant learner notes. If assessed during a placement, witness statements should be provided by a suitable representative and verified by the tutor.

For P9, learners must perform site installation operations to meet a given specification. Tutors should identify the operations and specification or agree them through discussion with learners. The operations and specification may be the same as those used to provide evidence for other grading criteria. Where possible, to ensure fairness of assessment, the size and complexity of the tasks should be the same for all learners. Evidence could be in the same form as for P6.

For M1, learners must produce an hourly workshop rate, proposed construction and installation costing for a selected project. Tutors should identify the project or agree it through discussion with learners. The project may be the same as that used to provide evidence for other grading criteria. Where possible, to ensure fairness of assessment, the size and complexity of the task should be the same for all learners. Evidence could be in the same form as for P1 and P3.

M2 requires learners to use blacksmithing techniques to produce a complex construction to meet the requirements of a given site and specification. Tutors should identify the construction and specification or agree them through discussion with learners. The construction and specification may be the same as those used to provide evidence for other grading criteria. The specification should cover normal factors that can be found in industry, such as design criteria, measurements, materials, finish tolerances and any relevant standards. Evidence could be in the same form as for P3.

For D1, learners must evaluate a complex blacksmithing process used to produce the complex construction and make recommendations for improvement. Tutors should identify the construction or agree this through discussion with learners. The construction and specification may be the same as those used to provide evidence for other grading criteria. Evidence could be in the same form as for P1 and P3.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the pass, merit and distinction criteria in the grading grid. This is for guidance and it is recommended that centres either write their own assignments or adapt any Edexcel assignments to meet local needs and resources.

Criteria covered	Assignment title	Scenario	Assessment method
P1, P2, P3, P4, P5, M1	Site Survey and Workshop	You are working as a self-employed blacksmith and have been asked to undertake an installation project. You need to survey the site of the proposed installation work. You must also provide information on workshop use, costings and records.	Completed survey and site records. Installation proposal. Workshop job time sheets and rates.
P6, P7, P8, P9, M2, D1	Performing Complex Blacksmithing Construction and Site Installation	You need to undertake the complex blacksmithing construction methods and produce the elements required. You must install the project using appropriate fixings and methods.	Practical production of elements. Observation evidence. Work logs or other relevant learner notes and drawings.

Links to National Occupational Standards, other BTEC units, other BTEC qualifications and other relevant units and qualifications

This unit forms part of the BTEC land-based sector suite. This unit has particular links with:

Level 2	Level 3
Building an Art and Design Portfolio	Understanding and Using Forging Techniques for Blacksmithing and Metalworking
Introduction to Forgework Construction Techniques	Undertake Drawing Practice for Blacksmithing and Metalworking
Working with Blacksmithing Specifications and Calculations	Business Management for Land-based Industries
	Undertake Forge Practice for Blacksmithing and Metalworking
	Undertake Blacksmithing Processes
	Understanding and Using Blacksmithing and Construction Skills
	Undertake Fabrication Drawing for Blacksmithing and Metalworking
	Computer Aided Design for Blacksmithing and Metalworking

This unit also has links with Level 3 National Occupational Standards in Fabrication and Welding Engineering and Farriery.

Essential resources

Learners will need supervised access to sufficiently resourced forge workshops appropriate to their specialist pathways. These should contain a comprehensive range of blacksmithing and forge tools, including solid fuel forge hearths, anvils, leg vices, power hammers supported by a range of tongs, hammers, swages, fullers and other ancillary equipment.

Access to an appropriate site evaluation/fixing environment supported by the equipment necessary, including measuring, fixing and installation equipment, is also required. A sufficiently diverse range of materials and stock sizes/sections, eg mild steel, tool steels, alloys both ferrous and non-ferrous copper, bronze, brass, stainless steel, aluminium will also be required. Areas for fitting and finishing should be available, with access to suitable application and coating facilities.

Learners will also need access to a drawing office/studio space suitable for the observational and technical drawing activities. The principal features and items of equipment should include technical drawing equipment and art materials, eg drawing boards, compasses, set squares, measuring equipment and consumables. Library and IT facilities should be available, with access to unit-specific examples of drawing practice and internet facilities to enable research into techniques, materials, equipment and work examples.

Health and safety considerations require sufficient facilities to be provided to allow for one forging station per learner. Additional health and safety information and support should be provided.

Tutors delivering this unit should have vocationally specific craft knowledge.

Indicative reading for learners

Textbooks

Andrews J – *New Edge of the Anvil: A Resource Book for the Blacksmith* (Skipjack Press, 1994)
ISBN 9781879535091

Baur-Heinhold M – *Decorative Ironwork: Wrought Iron Gratings, Gates and Railings* (Schiffer Publishing, 1996)
ISBN 9780764301537

Bealer A – *The Art of Blacksmithing* (Castle, 1996) ISBN 9780785803959

Blandford P – *Practical Handbook of Blacksmithing and Metal Work* (Bantam Doubleday Dell Publishing Group, 1998) ISBN 9780318148915

Bray S – *Metalworking: Tools and Techniques* (The Crowood Press, 2003) ISBN 9781861265739

Campbell M – *Decorative Ironwork* (V & A Publications, 2002) ISBN 9781851771967

Chatwin A – *Into the New Iron Age: Modern British Blacksmiths* (Coach House Publishing, 1995)
ISBN 9780952510505

Hughes R and Rowe M – *The Colouring, Bronzing and Patination of Metals* (Watson-Guptill Publications, 1991)
ISBN 9780823007622

Lucie-Smith E – *The Art of Albert Paley: Iron, Bronze, Steel* (Harry N Abrams Inc, 1996) ISBN 9780810937482

Marlow F – *Welding Fabrication & Repair Tips: Questions and Answers* (Industrial Press Inc, 2002)
ISBN 9780831131555

McDaniel R – *Blacksmithing Primer: A Course in Basic and Intermediate Blacksmithing*
(Dragonfly Enterprises, 2004) ISBN 9780966258912

Meilach D – *Architectural Ironwork* (Schiffer Publishing, 2001) ISBN 9780764313240

Meilach D – *The Contemporary Blacksmith* (Schiffer Publishing, 2000) ISBN 9780764311062

Parkinson P – *Forged Architectural Metalwork* (The Crowood Press Ltd, 2006) ISBN 9781861268174

Parkinson P – *The Artist Blacksmith: Design and Techniques* (The Crowood Press, 2001)
ISBN 9781861264282

Ross R – *Metallic Materials Specification Handbook—Fourth Edition* (Kluwer Academic Publishers, 1991)
ISBN 9780412369407

Rural Development Commission – *The Blacksmith's Craft—Second Edition* (Countryside Agency, 1990)
ISBN 9781869964146

Rural Development Commission – *Wrought Ironwork: A Manual of Instruction for Craftsmen*
(Rural Industries Bureau, 1957) ASIN B0000EEYT5

Journals

Artist Blacksmith

The artists newsletter

Crafts

Forge

Websites

blacksmith.forge.cc/blinks.htm

www.abana.org

www.az-blacksmiths.org

www.baba.org.uk

www.blacksmithingebooks.com

www.blacksmithscompany.org.uk

www.blacksmithsjournal.com

www.centaurforge.com

www.craftscouncil.org.uk

www.hse.gov.uk

www.nafbae.org

www.naturalengland.org.uk

Blacksmith Forge Links

The Artist-Blacksmith's Association of North America

The Arizona Artist Blacksmith Association

British Artist Blacksmiths Association

Blacksmithing e-books

The Worshipful Company of Blacksmiths

Blacksmith's Journal

Centaur Forge

Crafts Council

Health and Safety Executive

National Association of Farriers, Blacksmiths and
Agricultural Engineers

Natural England

Delivery of personal, learning and thinking skills (PLTS)

The following table identifies the PLTS opportunities that have been included within the assessment criteria of this unit:

Skill	When learners are ...
Independent enquirers	explaining suitable methods used to evaluate a given site
Creative thinkers	producing specified methods to meet a given specification
Team workers	performing specified site installation operations
Self-managers	producing specified methods to meet a given specification.
Effective participators	

Although PLTS opportunities are identified within this unit as an inherent part of the assessment criteria, there are further opportunities to develop a range of PLTS through various approaches to teaching and learning.

Skill	When learners are ...
Reflective learners	evaluating the process used to produce the complex construction.