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Specification

BTEC Specialist qualifications

Edexcel BTEC Level 3 Diploma in Advanced Forgework Skills (QCF)

First teaching December 2011

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Authorised by Martin Stretton
Prepared by Matt Gregory

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BTEC Specialist qualification title covered by this specification

Edexcel BTEC Level 3 Diploma in Advanced Forgework Skills (QCF)

This qualification has been accredited to the Qualifications and Credit Framework (QCF) and is eligible for public funding as determined by the Department for Education (DfE) under Section 96 of the Learning and Skills Act 2000.

The qualification title listed above features in the funding lists published annually by the DfE and the regularly updated website www.education.gov.uk. The QCF Qualification Number (QN) should be used by centres when they wish to seek public funding for their learners. Each unit within a qualification will also have a QCF unit code.

The QCF qualification and unit codes will appear on learners' final certification documentation.

The QN for the qualification in this publication is:

Edexcel BTEC Level 3 Diploma in Advanced Forgework Skills (QCF)	600/3898/6

This qualification title will appear on learners' certificates. Learners need to be made aware of this when they are recruited by the centre and registered with Edexcel.

Welcome to the Edexcel BTEC Level 3 Diploma in Advanced Forgework Skills (QCF)

We are delighted to introduce our new qualification, available for teaching from December 2011. This qualification has been revised and conforms with the requirements of the new QCF (Qualifications and Credit Framework).

Straightforward to implement, teach and assess

Implementing BTECs couldn't be easier. They are designed to fit easily into your curriculum and can be studied independently or alongside existing qualifications, to suit the interests and aspirations of learners. The clarity of assessment makes grading learner attainment simpler.

Engaging for everyone

Learners of all abilities flourish when they can apply their own knowledge, skills and enthusiasm to a subject. BTEC qualifications make explicit the link between theoretical learning and the world of work by giving learners the opportunity to apply their research, skills and knowledge to work-related contexts and case studies. These applied and practical BTEC approaches give all learners the impetus they need to achieve and the skills they require for workplace or education progression.

Recognition

BTECs are understood and recognised by a large number of organisations in a wide range of sectors. BTEC qualifications are developed with key industry representatives and Sector Skills Councils (SSC) to ensure that they meet employer and learner needs — in this case the Lantra SSC. Many industry and professional bodies offer successful BTEC learners exemptions from their own accredited qualifications.

All you need to get started

To help you off to a flying start, we've developed an enhanced specification that gives you all the information you need to start teaching BTEC qualifications. This includes:

- a framework of equivalencies, so you can see how this qualification compares with other Edexcel vocational qualifications
- information on rules of combination, structure and quality assurance, so you can deliver the qualification with confidence
- explanations of the content's relationship with the learning outcomes
- guidance on assessment, and what the learner must produce to achieve the unit.

Don't forget that we're always here to offer curriculum and qualification updates, local training and network opportunities, advice, guidance and support.

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What are BTEC Specialist qualifications?

BTEC Specialist qualifications are qualifications at Entry level to level 3 in the Qualifications and Credit Framework (QCF) and are designed to provide specialist work-related qualifications in a range of sectors. They give learners the knowledge, understanding and skills that they need to prepare for employment. The qualifications also provide career development opportunities for those already in work. Consequently, they provide a course of study for full-time or part-time learners in schools, colleges and training centres.

BTEC Specialist qualifications provide much of the underpinning knowledge and understanding for the National Occupational Standards for the sector, where these are appropriate. They are supported by the relevant Standards Setting Body (SSB) or Sector Skills Council (SSC). A number of BTEC Specialist qualifications are recognised as the knowledge components of Apprenticeships Frameworks.

On successful completion of a BTEC Specialist qualification, learners can progress to or within employment and/or continue their study in the same, or related vocational area.

The QCF is a framework which awards credit for qualifications and units and aims to present qualifications in a way that is easy to understand and measure. It enables learners to gain qualifications at their own pace along flexible routes.

There are three sizes of qualification in the QCF:

- Award (1 to 12 credits)
- Certificate (13 to 36 credits)
- Diploma (37 credits and above).

Every unit and qualification in the framework will have a credit value.

The credit value of a unit specifies the number of credits that will be awarded to a learner who has achieved the learning outcomes of the unit.

The credit value of a unit is based on:

- one credit for those learning outcomes achievable in 10 hours of learning
- learning time – defined as the time taken by learners at the level of the unit, on average, to complete the learning outcomes of the unit to the standard determined by the assessment criteria.

The credit value of the unit will remain constant in all contexts, regardless of the assessment method used for the qualification(s) to which it contributes.

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

Edexcel BTEC Level 3 Diploma

The Edexcel BTEC Level 3 Diploma extends the work-related focus from the Edexcel BTEC Level 3 Certificate. There is potential for the qualification to prepare learners for employment in a particular vocational sector and it is suitable for those who have decided that they wish to enter a specific area of work.

Key features of the Edexcel BTEC Level 3 Diploma in Advanced Forgework Skills (QCF)

The Edexcel BTEC Level 3 in Advanced Forgework Skills (QCF) has been developed to give learners the opportunity to:

- achieve a focused and alternative, level 3 vocationally-related qualification that reflects the needs of blacksmithing and metalworking crafts
- engage in learning that is relevant to them and which will provide opportunities to develop a range of skills and techniques, personal skills and attributes essential for successful performance in working life
- progress to employment in a particular vocational sector
- progress to related general and/or vocational qualifications.

National Occupational Standards

Where relevant, Edexcel BTEC qualifications are designed to provide some of the underpinning knowledge and understanding for the National Occupational Standards (NOS), as well as developing practical skills in preparation for work and possible achievement of NVQs in due course. NOS form the basis of National Vocational Qualifications (NVQs). Edexcel BTEC (QCF) qualifications do not purport to deliver occupational competence in the sector, which should be demonstrated in a work context.

Edexcel BTEC Level 3 Diploma in Advanced Forgework Skills (QCF)

The Edexcel BTEC Level 3 Diploma in Advanced Forgework Skills (QCF) is a 80-credit and 480-guided learning hour (GLH) qualification that consists of 20 mandatory credits plus optional credits that provide for a combined total of 80 credits.

Edexcel BTEC Level 3 Diploma in Advanced Forgework Skills (QCF)			
Unit	**Mandatory units**	**Credit**	**Level**
1	Understanding and Using Forging Techniques for Blacksmithing and Metalworking	10	3
2	Undertake Forge Practice for Blacksmithing and Metalworking	10	3
Unit	**Optional units**		
3	Undertake Drawing Practice for Blacksmithing and Metalworking	10	3
4	Undertake Blacksmithing Processes	10	3
5	Understanding and Using Blacksmithing and Construction Skills	10	3
6	Understanding and Using Blacksmithing Installation Skills	10	3
7	Understanding Principles and Methods of Design for Blacksmithing and Metalworking	10	3
8	Undertake Small Scale Design for Blacksmithing and Metalworking	10	3
9	Undertake Small Scale Working for Blacksmithing and Metalworking	10	3
10	Undertake Large Scale Design for Blacksmithing and Metalworking	10	3
11	Undertake Large Scale Working for Blacksmithing and Metalworking	10	3
12	Undertake Repoussé and Other Decorative Skills for Blacksmithing and Metalworking	10	3

Assessment

The units within this qualification are internally assessed. The qualification is criterion referenced, based on the achievement of all the specified learning outcomes.

To achieve a 'pass' a learner must have successfully passed **all** the assessment criteria.

Guidance

The purpose of assessment is to ensure that effective learning has taken place to give learners the opportunity to:

- meet the standard determined by the assessment criteria and
- achieve the learning outcomes.

Assignments created by centres should be reliable and fit for purpose, and should be built on the unit assessment criteria. Assessment tasks and activities should enable learners to produce valid, sufficient and reliable evidence that relates directly to the specified criteria. Centres should enable learners to produce evidence in a variety of different forms, including performance observation, presentations and posters, along with projects, or time-constrained assessments.

Centres are encouraged to emphasise the practical application of the assessment criteria, providing a realistic scenario for learners to adopt, and making maximum use of practical activities. The creation of assignments that are fit for purpose is vital to learner achievement and their importance cannot be over-emphasised.

The assessment criteria must be indicated clearly in the assignments briefs. This gives learners focus and helps with internal verification and standardisation processes. It will also help to ensure that learner feedback is specific to the assessment criteria.

When designing assignments briefs, centres are encouraged to identify common topics and themes. A central feature of vocational assessment is that it allows for assessment to be:

- current, ie to reflect the most recent developments and issues
- local, ie to reflect the employment context of the delivering centre
- flexible to reflect learner needs, ie at a time and in a way that matches the learner's requirements so that they can demonstrate achievement.

Qualification grade

Learners who achieve the minimum eligible credit value will achieve the qualification at pass grade.

In Edexcel BTEC level 3 Specialist qualifications each unit has a credit value which specifies the number of credits that will be awarded to a learner who has achieved the learning outcomes of the unit. This has been based on:

- one credit for those learning outcomes achievable in 10 hours of learning time
- learning time being defined as the time taken by learners at the level of the unit, on average, to complete the learning outcomes of the unit to the standard determined by the assessment criteria
- the credit value of the unit remaining constant regardless of the method of assessment used or the qualification to which it contributes.

Quality assurance of centres

Edexcel BTEC level 3 qualifications provide a flexible structure for learners enabling programmes of varying credits and combining different levels. For the purposes of quality assurance, all individual qualifications and units are considered as a whole.

Centres delivering Edexcel BTEC level 3 qualifications must be committed to ensuring the quality of the units and qualifications they deliver, through effective standardisation of assessors and verification of assessor decisions. Centre quality assurance and assessment is monitored and guaranteed by Edexcel.

The Edexcel quality assurance processes will involve:

- centre approval for those centres not already recognised as a centre for BTEC qualifications
- approval for Edexcel BTEC level 3 qualifications and units
- **compulsory** Edexcel-provided training and standardisation for internal verifiers and assessors leading to the accreditation of lead internal verifiers via the OSCA system
- quality review of centre verification practice
- centre risk assessment by Edexcel of overarching processes and quality standards
- remedial training and/or assessment sampling for centres identified through standardisation or risk assessment activities as having inadequate quality, assessment or internal verification processes.

Approval

Centres are required to declare their commitment to ensuring the quality of the programme of learning and providing appropriate assessment opportunities for learners that lead to valid and accurate assessment outcomes. In addition, centres will commit to undertaking defined training and online standardisation activities.

Centres already holding BTEC approval are able to gain qualification approval online. New centres must complete a centre approval application.

Quality Assurance Guidance

Details of quality assurance for Edexcel BTEC level 3 qualifications are set out in centre guidance which is published on our website (www.edexcel.com).

Programme design and delivery

Mode of delivery

Edexcel does not normally define the mode of delivery for Edexcel BTEC Entry to level 3 qualifications. Centres are free to offer the qualifications using any mode of delivery (such as full time, part time, evening only, distance learning) that meets their learners' needs. Whichever mode of delivery is used, centres must ensure that learners have appropriate access to the resources identified in the specification and to the subject specialists delivering the units. This is particularly important for learners studying for the qualification through open or distance learning.

Learners studying for the qualification on a part-time basis bring with them a wealth of experience that should be utilised to maximum effect by tutors and assessors. The use of assessment evidence drawn from learners' work environments should be encouraged. Those planning the programme should aim to enhance the vocational nature of the qualification by:

- liaising with employers to ensure a course relevant to learners' specific needs
- accessing and using non-confidential data and documents from learners' workplaces
- including sponsoring employers in the delivery of the programme and, where appropriate, in the assessment
- linking with company-based/workplace training programmes
- making full use of the variety of experience of work and life that learners bring to the programme.

Resources

Edexcel BTEC level 3 qualifications are designed to give learners an understanding of the skills needed for specific vocational sectors. Physical resources need to support the delivery of the programme and the assessment of the learning outcomes, and should therefore normally be of industry standard. Staff delivering programmes and conducting the assessments should be familiar with current practice and standards in the sector concerned. Centres will need to meet any specific resource requirements to gain approval from Edexcel.

The specific resources required for this qualification have been indicated in the unit specifications.

Delivery approach

It is important that centres develop an approach to teaching and learning that supports the vocational nature of Edexcel BTEC level 3 qualifications and the mode of delivery. Specifications give a balance of practical skill development and knowledge requirements, some of which can be theoretical in nature. Tutors and assessors need to ensure that appropriate links are made between theory and practical application and that the knowledge base is applied to the sector. This requires the development of relevant and up-to-date teaching materials that allow learners to apply their learning to actual events and activity within the sector. Maximum use should be made of learners' experience.

Centres must facilitate access to safe out of class learning for learners such as visits to appropriate outdoor environments and work-related land-based sites, wherever possible, in the context of unit learning outcomes. Centres must ensure all learners are given as much opportunity as possible to experience safe and meaningful out of class learning. Such experiences must recognise and fit reasonably with each learner's physical and mental abilities.

Additional and Specialist Learning

Additional and Specialist Learning (ASL) consists of accredited qualifications at the same level as, or one level above a 14-19 Diploma course of study, which have been approved under Section 96 of the Learning and Skills Act 2000. The ASL may include BTEC qualifications which are also available to learners not following a 14-19 Diploma course of study.

ASL qualifications are listed on the 14-19 Diploma Catalogue which is available on the Register of Regulated Qualifications (www.ofqual.gov.uk). The catalogue will expand over time as more qualifications are accredited and approved.

Centres undertaking, or preparing to undertake, ASL should refer regularly to the Edexcel website for information regarding additions and the 14-19 Diploma Catalogue for the latest information.

Access and recruitment

Edexcel's policy regarding access to its qualifications is that:

- they should be available to everyone who is capable of reaching the required standards
- they should be free from any barriers that restrict access and progression
- there should be equal opportunities for all wishing to access the qualifications.

Centres are required to recruit learners to BTEC qualifications with integrity. This will include ensuring that applicants have appropriate information and advice about the qualifications and that the qualification will meet their needs. Centres should take appropriate steps to assess each applicant's potential and make a professional judgement about their ability to successfully complete the programme of study and achieve the qualification. This assessment will need to take account of the support available to the learner within the centre during their programme of study and any specific support that might be necessary to allow the learner to access the assessment for the qualification. Centres should consult Edexcel's policy on learners with particular requirements.

Centres will need to review the entry profile of qualifications and/or experience held by applicants, considering whether this profile shows an ability to progress to a higher level qualification.

Restrictions on learner entry

The Edexcel BTEC Level 3 Diploma in Advanced Forgework Skills (QCF) is accredited on the QCF for learners aged 16 and above.

Access arrangements and special considerations

Edexcel's policy on access arrangements and special considerations for BTEC and Edexcel NVQ qualifications aims to enhance access to the qualifications for learners with disabilities and other difficulties (as defined by the Equality Act 2010) without compromising the assessment of skills, knowledge, understanding or competence.

Further details are given in the policy document *Access Arrangements and Special Considerations for BTEC and Edexcel NVQ Qualifications*, which can be found on the Edexcel website (www.edexcel.com). This policy replaces the previous Edexcel policy (Assessment of Vocationally Related Qualifications: Regulations and Guidance Relating to Learners with Special Requirements, 2002) concerning learners with particular requirements.

Recognition of Prior Learning

Recognition of Prior Learning (RPL) is a method of assessment (leading to the award of credit) that considers whether a learner can demonstrate that they can meet the assessment requirements for a unit through knowledge, understanding or skills they already possess and so do not need to develop through a course of learning.

Edexcel encourages centres to recognise learners' previous achievements and experiences whether at work, home and at leisure, as well as in the classroom. RPL provides a route for the recognition of the achievements resulting from continuous learning.

RPL enables recognition of achievement from a range of activities using any valid assessment methodology. Provided that the assessment requirements of a given unit or qualification have been met, the use of RPL is acceptable for accrediting a unit, units or a whole qualification. Evidence of learning must be sufficient, reliable and valid.

Unit format

All units in Edexcel BTEC level 3 Specialist qualifications have a standard format. The unit format is designed to give guidance on the requirements of the qualification for learners, tutors, assessors and those responsible for monitoring national standards.

Each unit has the following sections.

Unit title

The unit title is accredited on the QCF and this form of words will appear on the learner's Notification of Performance (NOP).

Unit code

Each unit is assigned a QCF unit code that appears with the unit title on The Register of Regulated Qualifications (register.ofqual.gov.uk).

QCF level

All units and qualifications within the QCF will have a level assigned to them, which represents the level of achievement. There are nine levels of achievement, from Entry level to level 8. The level of the unit has been informed by the QCF level descriptors and, where appropriate, the NOS and/or other sector/professional benchmarks.

Credit value

All units have a credit value. The minimum credit value that may be determined for a unit is one, and credits can only be awarded in whole numbers. Learners will be awarded credits for the successful completion of whole units.

Guided learning hours

Guided learning hours are defined as all the times when a tutor, trainer or facilitator is present to give specific guidance towards the learning aim being studied on a programme. This definition includes lectures, tutorials and supervised study in, for example, open learning centres and learning workshops. It also includes time spent by staff assessing learners' achievements. It does not include time spent by staff in day-to-day marking of assignments or homework where the learner is not present.

Unit aim

The aim provides a clear summary of the purpose of the unit and is a succinct statement that summarises the learning outcomes of the unit.

Unit introduction

The unit introduction gives the reader an appreciation of the unit in the vocational setting of the qualification, as well as highlighting the focus of the unit. It gives the reader a snapshot of the unit and the key knowledge, skills and understanding gained while studying the unit. The unit introduction also highlights any links to the appropriate vocational sector by describing how the unit relates to that sector.

Learning outcomes

The learning outcomes of a unit set out what a learner is expected to know, understand or be able to do as the result of a process of learning.

Assessment criteria

The assessment criteria of a unit specify the standard a learner is expected to meet to demonstrate that a learning outcome, or set of learning outcomes, has been achieved. The learning outcomes and assessment criteria clearly articulate the learning achievement for which the credit will be awarded at the level assigned to the unit.

Unit content

The unit content identifies the breadth of knowledge, skills and understanding needed to design and deliver a programme of learning to achieve each of the learning outcomes. This is informed by the underpinning knowledge and understanding requirements of the related National Occupational Standards (NOS), where relevant. The content provides the range of subject material for the programme of learning and specifies the skills, knowledge and understanding required for achievement of the unit.

Each learning outcome is stated in full and then the key phrases or concepts related to that learning outcome are listed in italics followed by the subsequent range of related topics.

Relationship between content and assessment criteria

The learner should have the opportunity to cover all of the unit content.

It is not a requirement of the unit specification that all of the content is assessed. However, the indicative content will need to be covered in a programme of learning in order for learners to be able to meet the standard determined in the assessment criteria.

Content structure and terminology

The information below shows how the unit content is structured and gives the terminology used to explain the different components within the content.

- Learning outcome: this is shown in bold at the beginning of each section of content.
- Italicised sub-heading: it contains a key phrase or concept. This is content which must be covered in the delivery of the unit. Colons mark the end of an italicised sub-heading.

- Elements of content: the elements are in plain text and amplify the sub-heading. The elements must be covered in the delivery of the unit. Semi-colons mark the end of an element.
- Brackets contain amplification of content which must be covered in the delivery of the unit.
- 'eg' is a list of examples, used for indicative amplification of an element (that is, the content specified in this amplification could be covered or could be replaced by other, similar material).

Essential guidance for tutors

This section gives tutors additional guidance and amplification to aid understanding and a consistent level of delivery and assessment. It is divided into the following key sections.

- *Delivery* – explains the content's relationship to the learning outcomes and offers guidance about possible approaches to delivery. This section is based on the more usual delivery modes but is not intended to rule out alternative approaches.
- *Assessment* – gives amplification about the nature and type of evidence that learners need to produce in order to achieve the unit. This section should be read in conjunction with the assessment criteria.
- *Essential resources* – identifies any specialist resources needed to allow learners to generate the evidence required for each unit. The centre will be asked to ensure that any requirements are in place when it seeks approval from Edexcel to offer the qualification.
- *Indicative resource materials* – gives a list of learner resource material that benchmarks the level of study.

Units

Unit 1: Understanding and Using Forging Techniques for Blacksmithing and Metalworking 15

Unit 2: Undertake Forge Practice for Blacksmithing and Metalworking 23

Unit 3: Undertake Drawing Practice for Blacksmithing and Metalworking 33

Unit 4: Undertake Blacksmithing Processes 43

Unit 5: Understanding and Using Blacksmithing and Construction Skills 53

Unit 6: Understanding and Using Blacksmithing Installation Skills 63

Unit 7: Understanding Principles and Methods of Design for Blacksmithing and Metalworking 73

Unit 8: Undertake Small Scale Design for Blacksmithing and Metalworking 83

Unit 9: Undertake Small Scale Working for Blacksmithing and Metalworking 91

Unit 10: Undertake Large Scale Design for Blacksmithing and Metalworking 101

Unit 11: Undertake Large Scale Working for Blacksmithing and Metalworking 111

Unit 12: Undertake Repoussé and Other Decorative Skills for Blacksmithing and Metalworking 119

Unit 1: Understanding and Using Forging Techniques for Blacksmithing and Metalworking

Unit code: Y/602/0493

QCF level 3: BTEC Specialist

Credit value: 10

Guided learning hours: 60

Unit aim

This unit aims to introduce learners to the forging techniques used in blacksmithing and metalworking and how they can be applied in practice. It is designed for learners in centre-based settings looking to progress within the sector or on to further or higher education.

Unit introduction

Forging techniques are essential elements of the blacksmithing and metalworking industries. This unit introduces the underpinning knowledge and forging skills that are the basis of all blacksmithing production in the forge environment. It introduces learners to:

- forging – hammering metal into different shapes and sections on the anvil
- forming – the skills of bending and twisting metal
- cutting – hot punching and cutting
- joining of hot worked steel using forge welding and riveted joints.

Learners will look at techniques which are used in the workshop forge to produce easily repeatable artefacts or products. They will cover the management of the forge fire and forge workshop safety. Efficient fire control is essential for the quality forging of metal, and learners will be shown how to recognise, service and maintain the forge hearth and fire safely during the working process. Recognition and safe use of common forgework tools are important aspects of the work process and learners are expected to inspect, report faults and demonstrate the safe use of tools for set tasks. Working within the capabilities of the forged material is an important component of the blacksmith's craft and learners will explore the effects of forgework and heat on steel.

Learning outcomes and assessment 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 determine the standard required to achieve the unit.

On completion of this unit a learner should:

Learning outcomes	Assessment criteria
1 Be able to demonstrate commonly used forgework techniques	1.1 Carry out common forging techniques to meet a given specification 1.2 Carry out common forming techniques to meet a given specification 1.3 Carry out common cutting techniques to meet a given specification 1.4 Carry out common joining techniques to meet a given specification
2 Be able to demonstrate solid fuel forge hearth control	2.1 Maintain and control a solid fuel forge hearth safely to meet given objectives 2.2 Describe the safe and efficient control and operation of the solid fuel forge with a specified range of fuels
3 Be able to maintain common forge tooling	3.1 Prepare and use an inspection and maintenance checklist and report on the condition of a range of common forge equipment
4 Understand the effects of forgework and heat on steel	4.1 Carry out common heat treatments of normalising and annealing on forged steel and control the effects of oxidation and overheating

Unit content

1 Be able to demonstrate commonly used forgework techniques

Forging by hand: upsetting; drawing down; spreading; sets; transitions

Forming techniques by hand: bending; twisting; spot heat techniques

Cutting techniques by hand: punching; cutting

Joining techniques by hand: riveting; forge-welded joint (lap); flux types

Health and safety: safe working practices in the forge eg tong set up; personal protective equipment (PPE); relevant current legislation; risk assessment

2 Be able to demonstrate solid fuel forge hearth control

Maintenance and control of the solid fuel forge hearth: solid fuels eg coke, coal, charcoal; fuel costs; fuel performance; ease of use; fire lighting; use of appropriate working heats; control of air flow eg slide valve, variable resistor

Health and safety: safe working practices eg maintaining water boshes, preheating fuel, PPE; relevant current legislation; risk assessment

Areas of the fire: oxidising; neutral; reducing/carburising

The forge hearth: parts of the solid fuel forge hearth eg chimney, hood, fire bed, slide valve, tue iron, back bosh, front bosh, air supply; hearth tools eg rake, shovel, poker

3 Be able to maintain common forge tooling

Forge hand tooling and equipment: recognition and maintenance requirements of common hand tools and equipment eg hammers, tongs, punches, chisels, anvil, leg vice, swage block; methods used to maintain and store hand tools; tooling and equipment costs; maintenance costs; health and safety; PPE; relevant current legislation; risk assessment

4 Understand the effects of forgework and heat on steel

Effects of forging: types of commonly used steels; grain compaction and distortion; the effects of bending and twisting on the grain structure of steel

Effects of heating: recrystalisation of metals; effects of oxidation; giant grain growth and its control; normalising; annealing; effects of poor fire control

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical assessment, written assessment, visits to suitable collections and will link to work 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 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 before any work-related activities, so that naturally occurring evidence can be collected at the time. For example, learners may have the opportunity to apply forgework techniques and show finish quality, 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.

Whichever delivery methods are used, it is essential that tutors stress the importance of sound environmental management and the need to manage the resource using legal methods. Visiting expert speakers could add to the relevance of the subject. For example, an experienced blacksmith manager 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 reinforced regularly, and risk assessments must be undertaken before practical activities. Adequate Personal Protection 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 covers the principles and practice of commonly used forgework techniques. This is likely to be delivered through formal lectures, discussion, site visits, supervised practicals and independent learner research. At first, the techniques may be delivered as separate elements. As learners gain confidence and competence, a more holistic approach can be adopted with the introduction of more complex tasks requiring the use of a combination of several techniques.

Learning outcomes 2 and 3 are directly linked. They cover the principles and practice of solid fuel forge hearth control and the safe use of common forge tooling and equipment. Learners will be encouraged to gain an understanding of proper fire/forge control using industrially relevant forge equipment. Learners must be introduced to the forge, the anvil and to the hand tools appropriate to the skills they are practising. Actual tools and equipment should be used wherever possible to illustrate maintenance and health and safety issues.

Learning outcome 4 looks at the effects of forgework and heat on steel. Differing sections and sizes of mild steel should be used during practical work.

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: Fire Control and Common Forgework and Heat Treatment Techniques (AC1.1, AC1.2, AC1.3, AC1.4, AC2.1, AC4.1)
Tutor introduces the assignment.
Following the introduction of tutor-set components/artefacts, including specifications, the learner produces fit for purpose component(s)/artefacts(s) using the required fire control and forging techniques.
Learners should be given the opportunity to select and combine techniques.
Tutor demonstrations of the safe use and operation of the solid fuel hearth and common forging and heat treatment processes as appropriate during the project.
Learners practise techniques and production of components/artefacts.
Learner research and production of workshop records.
Learner assessment/feedback.
Assignment 2: Maintenance of Common Forge Equipment (AC3.1)
Tutor introduces the assignment.
Assignment 3: The Solid Fuel Forge Hearth (AC2.2)
Tutor introduces the assignment.

Assessment

For AC1.1, AC1.2, AC1.3 and P4, learners must carry out common forgework techniques of forging, forming, cutting and joining to meet given objectives. Tutors should identify the objectives or agree them through discussion with learners. The objectives may be the same as those used to provide evidence for other assessment criteria. Where possible, to ensure assessment is fair, the size and complexity of the tasks should be the same for all learners.

For AC1.1, AC1.2, AC1.3 and P4 learners 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, 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 AC2.1, learners must maintain, control and describe the safe and efficient use of a solid fuel forge hearth to meet given objectives. Tutors should identify the objectives or agree them through discussion with learners. The objectives may be

the same as those used to provide evidence for other assessment criteria. Where possible, to ensure assessment is fair, the size and complexity of the tasks should be the same for all learners. Evidence could be in the same form as for AC1.1, AC1.2, AC1.3 and AC1.4.

For AC2.2, learners should describe the safe operation of the solid fuel forge hearth and discuss the advantages and disadvantages of selected solid fuels (coke, coal, charcoal). Evidence for P6 could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector) or a written assignment.

For AC3.1, learners must inspect and report on the maintenance requirements of selected common hand tools. Tutors should identify the hand tools or agree them in discussion with learners. The hand tools may be the same as those used to provide evidence for other assessment criteria. Where possible, to ensure assessment is fair, the size and complexity of the tasks should be the same for all learners. Learners are expected to provide evidence for at least six types of hand tools.

For AC4.1, learners must carry out the common heat treatments of normalising and annealing on three types of forged steel and control the effects of oxidation and overheating. Learners are expected to provide evidence for at least three types of steel and cover the range of techniques listed in the unit content.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the assessment criteria. 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
AC1.1, AC1.2, AC1.3, AC1.4, AC2.1, AC4.1	Fire Control and Common Forgework and Heat Treatment Techniques	You are attending an interview for a job as blacksmith at a forge and have been asked to produce a series of forged samples covering the core forgework skills and demonstrating your control of the solid fuel hearth.	Practical production of samples and components/ artefacts. Observation records completed by learners and the tutor. Worklogs or other relevant learner notes and drawings. Witness statements.
AC3.1	Maintenance of Common Forge Equipment	You have taken over an existing workshop. The previous blacksmith has also sold a lot of his tools and you are inspecting them and listing the requirements to bring them back into service. You have also outsourced	Oral questioning. Written assignment or presentation. Maintenance checklist. Tooling and forged examples.

Criteria covered	Assignment title	Scenario	Assessment method
		the making of a series of components from a fellow smith. He has provided samples for you to evaluate against the specification.	Visual records. Research.
AC2.2	The Solid Fuel Forge Hearth	The solid fuel forge is still the core piece of equipment used to heat metal for forging. As a working smith you may have to operate different forge types and use a variety of fuels when forging a range of metals. As such you are asked to research and describe the efficient use of the hearth and link this to the available fuels.	Oral questioning. Written assignment or presentation. Tooling examples. Visual records. Worklogs or other relevant learner notes and drawings. Research.

Essential resources

Learners will need supervised access to workshops and classrooms appropriate to their specialist pathways.

These should contain a comprehensive range of blacksmithing and forge tools and equipment, including solid fuel forge hearths, anvils and leg vices supported by a range of tongs, hammers, swages, fullers and other ancillary equipment.

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

Learners must have access to a sufficiently diverse range of materials and stock sizes/sections to explore this unit fully.

This unit requires vocationally specific craft knowledge and appropriately qualified tutors to deliver it.

Indicative resource materials

Textbooks

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

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

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

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

Rural Development Commission – *The Blacksmith's Craft 2nd 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

Forge

The Worshipful Company of Blacksmiths Newsletter

Websites

www.baba.org.uk	British Artist Blacksmiths Association
www.blacksmithscompany.org.uk	The Worshipful Company of Blacksmiths
www.hse.gov.uk	Health and Safety Executive
www.forgemagazine.co.uk	British Farriers and Blacksmiths Association

Unit 2: Undertake Forge Practice for Blacksmithing and Metalworking

Unit code: M/602/0497

QCF level 3: BTEC Specialist

Credit value: 10

Guided learning hours: 60

Unit aim

This unit aims to introduce learners to the skills and knowledge needed to carry out a wide range of forging techniques for blacksmithing and metalworking. This includes setting, forged transitions producing fundamental joints by forge welding and riveting, and how they can be applied in practice. The unit is designed for learners in centre-based settings looking to progress into the sector or on to further or higher education.

Unit introduction

Forging techniques are essential elements of the blacksmithing and metalworking industries. Within this unit learners will be introduced to a wider and developing range of forging techniques and equipment, including the skills of setting, forged transitions and producing fundamental joints by forge welding and riveting. As learners become more familiar with the underlying processes they will have the opportunity to expand their knowledge of specialised tooling and related maintenance requirements.

For learning outcome 1, learners will look at the principles and practice of forging processes. Some tasks should involve learners working together in a smith and striker situation. Learners will take on greater responsibility for themselves and their colleagues in the workshop environment, with particular reference to the management of their own workspace and the use of associated processes and tooling.

Learning outcome 2 explores the condition and maintenance of forge tools. Starting material allowances, movement and wastage will be addressed for the forged, formed, cut and welded elements.

Learning outcome 3 covers the principles and practice of gas furnace control. Although the majority of the production would take place using a solid fuel forge hearth, learners will be introduced to the types, operation and maintenance requirements of the gas furnace.

In learning outcome 4, learners will consider health and safety procedures whilst working within the forge environment. The specific health and safety issues of working with, and in close proximity to, others will be emphasised in relation to blacksmithing processes and the general workshop environment.

Learning outcomes and assessment 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 determine the standard required to achieve the unit.

On completion of this unit a learner should:

Learning outcomes	Assessment criteria
1 Be able to demonstrate principles and practice of forging processes	1.1 Combine forging processes by hand to produce a simple component/artefact to meet a given specification 1.2 Combine forging processes by smith and striker to produce a simple component/artefact to meet a given specification 1.3 Combine hot forging cutting processes by hand to produce a simple component/artefact to meet a given specification 1.4 Combine hot forging cutting processes by smith and striker to produce a simple component/artefact to meet a given specification 1.5 Combine forming processes to produce a simple component/artefact to meet a given specification 1.6 Combine joining processes to produce a simple component/artefact to meet a given specification
2 Be able to assess the condition of and maintain forge tooling	2.1 Assess the condition and identify appropriate maintenance procedures for specified forge tooling
3 Be able to demonstrate principles and practice of gas furnace control	3.1 Set up and use a selected gas furnace to meet given objectives
4 Understand health and safety management requirements in the forge environment	4.1 Identify and explain health and safety work policies and practices within a selected forge environment

Unit content

1 **Be able to demonstrate principles and practice of forging processes**

Forging: upsetting; sets; transitions; drawing down; spreading by hand; smith and striker; materials estimation

Forming: bending; twisting; dishing; by hand; materials estimation

Cutting: punching; drifting; splitting; chasing; by hand; materials estimation

Joining: rivet making; riveting eg fixed joint, moveable joint; fire welding eg butt/scarf weld, lap weld; materials estimation

Heat ranges: forging; fire welding; finishing

Health and safety: safe working practices in the forge eg personal protective equipment (PPE); relevant current legislation eg Health and Safety at Work Act (HASAWA) 1974; risk assessment

2 **Be able to assess the condition of and maintain forge tooling**

Large forge tooling: reasons for maintaining large forge tooling eg health and safety, reducing costs, economics; forge tooling eg fly press, mandrels; use of tools; condition and maintenance of tools; acceptable repair procedures; tooling costs; maintenance costs

Anvil and power hammer tools: reasons for maintaining anvil and hammer tools eg health and safety, reducing costs, economics; types eg horns, top and bottom tools, spring tools, setting blocks; use of tools; condition and maintenance of tools; acceptable repair procedures; tooling costs; maintenance costs

Health and safety: safe working practices in the forge eg Personal Protection Equipment (PPE); relevant, current legislation; risk assessment

3 **Be able to demonstrate principles and practice of gas furnace control**

Forge/furnace: types eg venturi, fan assisted; differences between furnace types; operating parameters; uses (production processes); costs; lining types eg reflective, refractive; maintenance of forge/furnace; control mechanisms; methods of use

Areas of fire: oxidising; carburising/reducing; neutral; position of work piece within the fire; effects of air blast; management of fire

Health and safety: safe working practices in the forge eg Personal Protection Equipment (PPE); relevant current legislation; risk assessment

4 **Understand health and safety management requirements in the forge environment**

Health and safety: reasons for maintaining a safe working environment; implications of accidents at work for the individual, the business and the national economy; safe working policies and practices; risk assessment (workshop and processes); hazards; tooling assessment; first-aid requirements; relevant current legislation; general duties of employees and employers; communications; working in teams; accident reporting procedures; Personal Protection Equipment (PPE)

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical assessments, written assessment, visits to suitable collections and will link to work 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 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 before any work-related activities, so that naturally occurring evidence can be collected at the time. For example, learners may have the opportunity to produce forged elements 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.

Whichever delivery methods are used, it is essential that tutors stress the importance of sound environmental management and the need to manage the resource using legal methods.

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 reinforced regularly, and risk assessments must be undertaken before practical activities. Adequate 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 covers the principles and practice of forging processes. Learners could develop the skills needed by undertaking a number of practical exercises in the forge environment. Tutor 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 produce complex artefacts for themselves requiring the use of several techniques. Supporting knowledge should be delivered in the workshop and classroom environment via set and learner project work. The process of smith and striker is potentially dangerous, and a comprehensive induction, demonstration and close surveillance by the tutor are essential.

In learning outcome 2, learners will assess the condition of and maintain forge tooling. This is likely to be delivered using formal lectures, discussion, site visits, supervised forge practicals and independent learner research. Tutors could require learners to assess and maintain tools that they use within the forge. A collection of tools in various conditions could be kept and used for delivery of this unit. Any maintenance work must be of an acceptable standard before the tool is reused.

Learning outcome 3 covers the principles and practice of gas furnace control. Learners must be encouraged to gain an understanding of the correct fire/forge control using industrially relevant forge equipment. They will need to research the properties of a range of fuels and forge types and gain knowledge of managing these different working environments. This is likely to be delivered through formal lectures, discussion, site visits, supervised forge practicals and independent learner research.

In learning outcome 4 learners will consider the requirements for the management of health and safety in the forge environment. This is likely to be delivered through formal lectures, discussion, site visits and independent learner research. Tutors need to stress health and safety throughout the delivery of this unit, in particular before the start of any practical activities. Tutors could compare the policies and practices of different forges during delivery of the unit.

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: Producing a Simple Component/Artefact (AC1.1, AC1.2, AC1.3, AC1.4, AC1.5, AC1.6, AC3.1)
Tutor introduces the assignment.
Following the introduction of tutor-set components/artefacts, including specifications, the learner produces component(s)/artefacts(s) using the required forging processes within the tolerances.
Learners should be given the opportunity to select the process and equipment.
Tutor demonstrations of gas furnace operation and forging processes by hand and using smith and striker as appropriate during the project.
Learners practise and producing of components/artefacts.
Learner research and production of workshop records.
Learner assessment/feedback.
Assignment 2: Economics and Safety Issues for Forge Tooling (AC2.1, AC4.1)
Tutor introduces the assignment.
Learners are asked to produce a presentation, plus related risk assessments, covering the economics and safety issues involved with selecting, sourcing, installing, operating and maintaining selected forge tooling (four items) including a specified gas furnace. Learners could include forge tooling that they have worked within Assignment 1.

Learners provide evidence (either orally, written or as a presentation) for at least four items of tooling, two of which should be classed as large forge tools and two as anvil and power hammer tools. Evidence could be in the form of written or verbal feedback using workshop maintenance systems.
Research and assignment preparation/writing.
Learner assessment/feedback.
Unit review.

Assessment

For AC1.1, AC1.2, AC1.3, AC1.4, AC1.5 and AC1.6, learners must combine forging processes to produce a simple component/artefact to meet a given specification. Tutors should identify the specification or agree it through discussion with learners. The specification should cover normal factors that can be found in industry, for example design criteria, measurements, materials, finish tolerances and any relevant standards. Where possible, to ensure assessment is fair, the size and complexity of the task should be the same for all learners.

For AC1.1, AC1.2, AC1.3, AC1.4, AC1.5 and AC1.6 learners 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, accompanied by appropriate work logs 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 AC2.1, learners must assess the condition of and identify appropriate maintenance procedures for selected forge tooling. Tutors should identify the tooling or agree it through discussion with learners. Where possible, to ensure assessment is fair, the size and complexity of the tasks should be the same for all learners. Learners are expected to provide evidence for at least four items of tooling, two of which should be classed as large forge tools and two as anvil and power hammer tools. Evidence could be in the form of written or verbal feedback using workshop maintenance systems.

For AC3.1, learners are required to set up and use a selected gas furnace to meet given objectives. Tutors should identify the gas furnace and the objectives or agree them through discussion with learners. Where possible, to ensure assessment is fair, the size and complexity of the task should be the same for all learners. Evidence could be in the same form as for AC1.1, AC1.2, AC1.3, AC1.4, AC1.5 and AC1.6.

For AC4.1, learners must identify and explain health and safety work policies and practices within a selected forge environment. Tutors should identify the forge environment or agree it through discussion with learners.

The forge environment may be the same as that used to provide evidence for other assessment criteria. Where possible, to ensure assessment is fair, the size and complexity of the task should be the same for all learners.

Evidence for AC4.1 could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector) or a written assignment.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the assessment criteria. 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
AC1.1, AC1.2, AC1.3, AC1.4, AC1.5, AC1.6, AC3.1	Producing a Simple Component/ Artefact	As a working blacksmith you will be required to produce components or finished artefacts that correspond to set specifications. These can often involve working in a team as a smith and striker as well as by hand. Within this craft you will have to select and combine forging processes to produce simple components or artefacts that demonstrate these skills to a high standard.	Practical production of samples and components/ artefacts. Observation records completed by learners and the tutor. Worklogs or other relevant learner notes and drawings. Witness statements.
AC2.1, AC4.1	Economics and Safety Issues for Forge Tooling	When setting up and operating your blacksmithing workshop, you will have to select, source, install and maintain your equipment. One of these pieces of equipment is the gas furnace that is often used in production work, especially when using longer heats for forging and bending. You should be able to prepare a reasoned case discussing the issues involved in purchasing and operating this type of equipment.	Oral questioning. Written assignment or presentation. Risk assessment. Tooling examples. Visual records. Research.

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 and has particular links with:

Unit 5: Understanding and Using Blacksmithing and Construction Skills

Unit 6: Understanding and Using Blacksmithing Installation Skills

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

Essential resources

Learners will need supervised access to workshops and classrooms appropriate to their specialist pathways.

These should contain a comprehensive range of blacksmithing and forge tools, including solid fuel forge hearths, gas furnaces, anvils, leg vices, fly presses, mandrels, power hammers supported by a range of tongs, hammers, swages, fullers, setting blocks and other ancillary equipment.

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

Learners must have access to a sufficiently diverse range of materials and stock sizes/sections to explore this unit fully.

This unit requires vocationally specific craft knowledge and requires appropriately qualified staff to deliver it.

Indicative resource materials

Textbooks

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

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

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

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

Rural Development Commission – *The Blacksmith's Craft 2nd 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

www.baba.org.uk	British Artist Blacksmiths Association
www.blacksmithscompany.org.uk	The Worshipful Company of Blacksmiths
www.hse.gov.uk	Health and Safety Executive
www.forgemagazine.co.uk	British Farriers and Blacksmiths Association

Unit 3: Undertake Drawing Practice for Blacksmithing and Metalworking

Unit code: D/602/0494

QCF level 3: BTEC Specialist

Credit value: 10

Guided learning hours: 60

Unit aim

This unit aims to introduce learners to the skills in, and knowledge of, drawing practice for blacksmithing and metalworking and how they 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

When translating two-dimensional drawings into a three-dimensional form, whether as a forged item or a fabrication, it is essential to understand and communicate visual information. Learners will be taught about the technical and freehand methods that designers/makers use to communicate visual information within the metalworking industry, particularly in relation to the production of working patterns or specifications for the workshop environment.

Learning outcomes 1 and 2 relate to fabrication drawing and emphasise orthographic viewing, ie 2D viewing of 3D objects, and presenting a number of them to communicate a 3D shape and its dimensions. Learners are also introduced to surface development, using 'parallel line' development, where the 2D shape of a 3D sheet metal component is developed on drawing paper enabling it to be transferred to a metal surface at a later time.

In learning outcomes 3 and 4 learners' artistic skills can be directed and developed into recording ideas which can be adapted and later translated into metal. Organic and geometric forms are drawn using various media, and diminishing perspective is explored, with the intention of leading to design ideas. Learners will develop their skills in a largely practical situation, using a range of drawing equipment and mediums. These skills add another dimension when communicating information to architects/designers, potential customers and possibly third parties.

Learning outcomes and assessment 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 determine the standard required to achieve the unit.

On completion of this unit a learner should:

Learning outcomes	Assessment criteria
1 Be able to produce simple technical drawings in a format that conforms to relevant industrial conventions	1.1 Produce a simple technical drawing in orthographic format that conforms to relevant industrial conventions and meets given specifications 1.2 Produce a simple technical drawing in a pictorial format that conforms to relevant industrial conventions and meets given specifications
2 Be able to apply the parallel line and radial line surface development methods to produce a working pattern	2.1 Use the parallel line method of surface development for a set task and produce a working pattern to meet given specifications 2.2 Use the radial line method of surface development for a set task and produce a working pattern to meet given specifications
3 Be able to produce observed drawings	3.1 Produce observed drawings of simple natural and geometric forms using line to meet given specifications 3.2 Produce observed drawings of simple natural and geometric forms using tone to meet given specifications
4 Be able to apply scale, proportion and perspective to effect and produce presentational/working drawings	4.1 Use scale, proportion and perspective when producing an observed drawing to meet given specifications 4.2 Use scale, proportion and perspective when producing a presentational drawing to meet given specifications

Unit content

1 **Be able to produce simple technical drawings in a format that conforms to relevant industrial conventions**

Industrial conventions within the chosen specialism: working drawings; specifications appropriate to the workshop environment eg orthographic projections, pictorials, geometric construction; use of drawing boards and equipment; measurement; scaling; mark-marking; presentation

2 **Be able to apply the parallel line and radial line surface development methods to produce a working pattern**

Pattern development techniques: radial and parallel line surface development; understanding of templates; 2D shapes; production of hollow forms; sources of error

3 **Be able to produce observed drawings**

Line, tone and colour: methods used to translate directly observed shapes, form, texture and colour to a 2D format

Basic media: pencil; graphite stick; charcoal; pastel; ink; paint

Drawing practice: understanding; measurement methods; sight sizing; use of grids

Visual resources: forms in nature; structural artefacts; architectural forms

4 **Be able to apply scale, proportion and perspective to effect and produce presentational/working drawings**

Scale, proportion and perspective: effects of scale, proportion and perspective on directly observed objects; viewpoint; possible design proposals

Accurate communication: observed elements from the natural and constructed worlds; possible design proposals and presentational drawings

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical assessment, written assessment, visits to suitable collections and will link to work 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 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 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 before any work-related activities are undertaken, so that naturally occurring evidence can be collected at the time.

For example, learners may have the opportunity to produce drawings, and they should 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.

Whichever delivery methods are used, it is essential that tutors stress the importance of drawing conventions, sound environmental management and the need to manage the resource using legal methods.

Health and safety issues relating to working with blacksmithing and metalworking materials must be stressed and reinforced regularly, and risk assessments must be undertaken before any practical activities. Adequate personal protective equipment (PPE) must be provided and used following the production of suitable risk assessments.

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

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.

This unit should be delivered mainly in the classroom where a practical, hands-on approach to learning should be adopted wherever possible, with tutors demonstrating techniques and providing relevant examples of the application of theory in practice.

There should be, wherever possible, links to work in progress to reinforce the relationship of the unit to the production process. The most likely way to achieve this is through a series of tasks covering the main topic areas. Learners' practice/project work outside of the centre environment will also be beneficial in broadening their experience and enhancing their drawing abilities.

Learning outcomes 1 and 2 are directly linked. These are likely to be delivered through formal lectures, discussions, site visits, supervised practicals and independent learner research. This delivery is likely to take place within the

drawing office or studio but there should be directed and personal opportunities for research, for

example via information and learning technologies supported by some formal classroom activity.

For learning outcomes 3 and 4 learners have the opportunity to produce observed drawings and apply scale, proportion and perspective to effect and produce presentational/working drawings. This is likely to be delivered through formal lectures, discussions, site visits, supervised practicals and independent learner research.

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: Producing Orthographic and Pictorial Drawings (AC1.1, AC1.2)
Tutor introduces the assignment.
Introduce the principles of orthographic viewing.
Practical application of orthographic viewing.
Introduce the principles of pictorial viewing.
Practical application of pictorial viewing.
Assignment 2: Parallel Line and Radial Line Templates (AC2.1, AC2.2)
Tutor introduces the assignment.
Introduce the principles of parallel line development.
Practical application of parallel line development.
Introduce the principles of radial line development.
Practical application of radial line development.
Undertake analysis of surface development work and discuss opportunities for improvement.
Assignment 3: Observed Drawing (AC3.1, AC3.2, AC4.1)
Tutor introduces the assignment.
Introduce the principles of observed drawing.
Practical application of observed drawing.
Assignment 4: Presentational Drawing (AC4.2)
Tutor introduces the assignment.

Introduce the principles of producing presentational drawings.
Practical application of the principles of producing presentational drawings.
Undertake a presentational drawing proposal combining freehand and technical drawing.
Unit review.

Assessment

For AC1.1, learners must produce a simple technical drawing in orthographic format that conforms to relevant industrial conventions and meets given specifications. Tutors should identify the specifications or agree them through discussion with learners. The specifications may be the same as those used to provide evidence for other assessment criteria. They should cover usual factors that would be found in industry, for example design criteria, measurements, materials, finish tolerances and any relevant standards.

Where possible, to ensure assessment is fair, the size and complexity of the task should be the same for all learners. AC1.1 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, 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.

Alternatively, evidence for AC1.1 could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector) or a written assignment.

For AC1.2, learners must produce a simple technical drawing in pictorial format that conforms to relevant industrial conventions and meets given specifications. Tutors should identify the specifications or agree them through discussion with learners. The specifications may be the same as those used to provide evidence for other assessment criteria. They should cover usual factors that would be found in industry, for example design criteria, measurements, materials, finish tolerances and any relevant standards. Where possible, to ensure assessment is fair, the size and complexity of the task should be the same for all learners.

AC1.2 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, 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.

Alternatively, evidence for AC1.2 could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector) or a written assignment.

For AC2.1, learners must use the parallel line method of surface development for a set task and produce a working pattern to meet given specifications. Tutors should identify the specifications or agree them through discussion with learners. The specifications may be the same as those used to provide evidence for other assessment criteria.

AC2.1 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 AC2.2, learners must use the radial line method of surface development for a set task and produce a working pattern to meet given specifications. Tutors should identify the specifications or agree them through discussion with learners. The specifications may be the same as those used to provide evidence for other assessment criteria.

AC2.2 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 work logs or other relevant learner notes. If assessed during a placement, witness statements should be provided by a suitable representative and verified by the tutor.

AC3.1 requires learners to produce observed drawings of simple natural and geometric forms using effective and appropriate line to meet given specifications. Tutors should identify the specifications or agree them through discussion with learners. The specifications may be the same as those used to provide evidence for other assessment criteria. Evidence could be in the same form as for AC1.1.

AC3.2 requires learners to produce observed drawings of simple natural and geometric forms using effective and appropriate tone to meet given specifications. Tutors should identify the specifications or agree them through discussion with learners. The specifications may be the same as those used to provide evidence for other assessment criteria. Evidence could be in the same form as for AC1.1.

For AC4.1, learners must use scale, proportion and perspective when producing an observed drawing to meet given specifications. Tutors should identify the specifications or agree them through discussion with learners. The specifications may be the same as those used to provide evidence for other assessment criteria. Evidence could be in the same form as for AC1.1.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the assessment criteria. 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
AC1.1, AC1.2	Producing Orthographic and Pictorial Drawings	You intend to sub-contract the making of a fabricated steel component. Produce orthographic and pictorial drawings of the design.	Practical observation and assessment.
AC2.1, AC2.2	Parallel Line and Radial Line Templates	The final stage of a forge chimney, ie the last pipe and a 'chinaman's hat' are needed. Produce templates for them and discuss the potential sources of error in the production of these working patterns.	Practical observation and assessment. Written work.
AC3.1, AC3.2, AC4.1	Observed Drawing	Produce an observed drawing as directed, using a wide range of professional skills and media.	Practical observation and assessment.
AC4.2	Presentational Drawings	You are competing for a contract to supply a complex forged steel artefact to a potential customer. Produce presentational drawings of your proposal, utilising technical and freehand drawing.	Practical observation and assessment

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 and has particular links with:

Unit 5: Understanding and Using Blacksmithing and Construction Skills

Unit 6: Understanding and Using Blacksmithing Installation Skills.

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

Essential resources

Learners will need supervised access to workshops and classrooms appropriate to their specialist pathways.

These should contain a comprehensive range of blacksmithing and forge tools, including solid fuel forge hearths, gas furnaces, anvils, leg vices, fly presses, mandrels, power hammers supported by a range of tongs, hammers, swages, fullers, setting blocks and other ancillary equipment.

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

Learners must have access to a sufficiently diverse range of materials and stock sizes/sections to explore this unit fully.

This unit requires vocationally specific craft knowledge and requires appropriately qualified staff to deliver it.

Indicative resource materials

Textbooks

Andrews J – *New Edge of the Anvil: A Resource Book for the Blacksmith*

(Skipjack Press, 1994) ISBN 9781879535091

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

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

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

Rural Development Commission – *The Blacksmith's Craft 2nd 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

www.baba.org.uk	British Artist Blacksmiths Association
www.blacksmithscompany.org.uk	The Worshipful Company of Blacksmiths
www.hse.gov.uk	Health and Safety Executive
www.forgemagazine.co.uk	British Farriers and Blacksmiths Association

Unit 4: Undertake Blacksmithing Processes

Unit code: A/602/0499

QCF level 3: BTEC Specialist

Credit value: 10

Guided learning hours: 60

Unit aim

This unit aims to introduce learners to the skills and knowledge needed to carry out blacksmithing processes and how they can be applied in practice. The unit is designed for learners in centre-based settings looking to progress into the sector or on to further or higher education.

Unit introduction

Blacksmithing processes are the essential requirements used in the production of the tooling and motifs that are the foundation of the blacksmith's vocabulary. Tooling production is a core skill for the blacksmith craft, not only when making forging tools but also when producing them for customers working in other crafts such as woodworking.

The motifs included in this unit are common throughout the history of blacksmith both a practical joining and construction viewpoint and the generic aesthetic that recurs in decorative work over the centuries. A thorough knowledge of the production processes involved in the forging of these elements is essential, for example when producing reproductions or restoring forged ironwork artefacts. This unit gives learners the opportunity to develop their abilities in these blacksmithing processes.

Learners are expected to develop an awareness of the standards of quality and production demanded by the industry as a whole. A deeper understanding of the materials used in the forging processes and working temperature ranges applicable to them will also be explored.

Learning outcomes 1 and 2 look at the principles and practice of the processes used to produce tooling and decorative elements/motifs.

Learning outcome 3 covers the principles and practice of the heat treatment processes. In learning outcome 4, learners will manage common blacksmithing faults.

Learning outcomes and assessment 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 determine the standard required to achieve the unit.

On completion of this unit a learner should:

Learning outcomes	Assessment criteria
1 Be able to demonstrate principles and practice of the processes used to produce tooling	1.1 Produce a hand tool using blacksmithing processes to meet a given specification 1.2 Produce an anvil tool using blacksmithing processes to meet a given specification 1.3 Produce a press/power hammer tool using blacksmithing processes to meet a given specification
2 Be able to demonstrate principles and practice of the processes used to produce and finish decorative elements/motifs	2.1 Forge decorative elements/motifs using blacksmithing processes to meet given specifications 2.2 Join decorative elements/motifs using blacksmithing processes to meet given specifications 2.3 Finish decorative elements/motifs using blacksmithing processes to meet given specifications
3 Be able to demonstrate principles and practice of the heat treatment processes	3.1 Use selected heat treatment processes on steel to meet given specifications 3.2 Describe the process and effects of heat treatment on selected high carbon steel tools
4 Understand common blacksmithing faults	4.1 Recognise causes of common production faults in selected decorative elements and motifs 4.2 Explain the causes of common production faults in selected decorative elements and motifs

Unit content

1 **Be able to produce simple technical drawings in a format that conforms to relevant industrial conventions**

Tooling used in the production of artefacts within the workshop: types eg hand tools, anvil tools, press/power hammer tools; development of tools; uses of tooling; health and safety; risk assessment

Methods of producing tooling: equipment required; materials used; production methods; health and safety; risk assessment

2 **Be able to demonstrate principles and practice of the processes used to produce tooling**

Production processes in the forge: for scrolls eg ribbon, fishtail; wraps; collars eg welded, forged; simple tennons; square corner; decorative twists; health and safety; risk assessment

Techniques used to finish forged metalwork: brushing; waxing; oiling; health and safety; risk assessment

3 **Be able to demonstrate principles and practice of the processes used to produce and finish decorative elements/motifs**

Heat treatment: processes involved in the heat treatment of tool steels eg normalising, annealing, edge hardening, point tempering, case hardening; physical properties; the effects of heat treatments; hot and cold working on metals eg steel, iron, copper, bronze, brass, aluminium; health and safety; risk assessment

4 **Understand common blacksmithing faults**

Faults: types eg burns, galls, internal/external cracking, surface defects, coldshuts, over/under forging, bends, kinks, incomplete/open jointing; causes of faults; effects of faults; remedial action for common faults; health and safety; risk assessment

Quality control: methods used to identify unsatisfactory work; reasons for quality control

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical assessment, written assessment, visits to suitable collections and will link to work 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 forge 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 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 use heat treatment processes 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.

Whichever delivery methods are used, it is essential that tutors stress the importance of sound environment management and the need to manage the resource using legal methods.

Visiting expert speakers could add to the relevance of the subject. 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 before any 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 outcomes 1 and 2 look at the principles and practice of the processes used to produce tooling and decorative elements/motifs. Learners should undertake practical exercises in the forge environment. Explanation and demonstration will be followed by opportunities for learners to practise and develop their techniques and finish quality. As learners become more competent in individual techniques they could be encouraged to design artefacts for themselves requiring the use of several techniques. Supporting knowledge should be delivered in the workshop and classroom environment via set and learner project work.

Learning outcome 3 covers the principles and practice of heat treatment processes. Using industrially relevant workshops and forge equipment, learners need to research the properties of a range of materials and gain knowledge of managing different working environments. Differing sections and sizes of metals should be used to produce the samples to stretch learners' range of experiences.

In learning outcome 4, learners will look at the management requirements of common blacksmithing faults.

This is likely to be delivered through formal lectures, discussion, site visits, supervised forge practicals and independent learner research.

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: Producing Blacksmithing Tooling** (AC1.1, AC1.2, AC1.3, AC3.1) Tutor introduces the assignment. Following the introduction of tutor-set tooling, including specifications, the learner produces tooling using the required forging processes within the tolerances. Learners should be given the opportunity to select process and equipment. Tutor demonstrations of tool production as appropriate during the project. Learners practice and produce of tooling. Learner research and production of workshop records. Learners assessment/feedback. **Assignment 2: Producing Decorative Elements/Motifs** (AC2.1, AC2.2, AC2.3) Tutor introduces the assignment. Following the introduction of tutor-set decorative elements/motifs including specifications, the learner produces tooling using the required forging processes within the tolerances. Learners should be given the opportunity to select process and equipment. Tutor demonstrations of decorative elements/motifs as appropriate during the project. Learners practise and produce of decorative elements/motifs. Learner research and production of workshop records. Learner assessment/feedback. **Assignment 3: Process and Effects of Heat Treatment** (AC3.2, AC4.1, AC4.2) Tutor introduces the assignment. Learners are asked to produce a presentation describing the process and effects of heat treatment on selected high carbon steel tools and the recognising and explaining of the causes of common production faults in selected decorative elements and motifs.

Discussion of the issues of health and safety, forging and fault correction when forging, heating and heat treating high carbon steels and non-ferrous metals in the blacksmith's workshop.

Tutor theory presentations as appropriate during the project.

Learners provide evidence for at least two items of tooling and two examples of forged decorative elements/ motifs.

Evidence could be in the form of actual examples and a written assignment or presentation.

Learner research and assignment preparation/writing.

Learner assessment/feedback.

Unit review.

Assessment

For AC1.1, AC1.2 and AC1.3, learners must produce tools using blacksmithing processes to meet a given specification. Tutors should identify the specification or agree it through discussion with learners. The specification should cover normal factors that can be found in industry, design criteria, measurements, materials, finish tolerances and any relevant standards. Where possible, to ensure fairness of assessment, the size and complexity of the task should be the same for all learners.

For AC1.1, AC1.2 and AC1.3, learners 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, 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 AC2.1, AC2.2 and AC2.3, learners must produce and finish decorative elements/motifs using blacksmithing processes to meet given specifications. Tutors should identify the specifications or agree them through discussion with learners. The specification should cover normal factors that can be found in industry, for example design criteria, measurements, materials, finish tolerances and any relevant standards. Where possible, to ensure fairness of assessment, the size and complexity of the tasks should be the same for all learners. Learners are expected to provide evidence for at least four types of element/motif. Evidence could be in the same form as for AC1.1, AC1.2 and AC1.3.

AC3.1 and AC3.2 require learners to use selected heat treatment processes on steel to meet given specifications. Tutors should identify the heat treatment processes and specifications 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. Learners are expected to provide evidence for at least four types of heat treatment.

Evidence could be in the same form as for AC1.1, AC1.2 and AC1.3, and linked to other assessment criteria.

For AC4.1 and AC4.2, learners must recognise and explain the causes of selected common blacksmithing faults. Tutors should identify the blacksmithing faults. Where possible, to ensure fairness of assessment, the size and complexity of the tasks should be the same for all learners. Learners are expected to provide evidence for at least six types of common fault. Evidence could take the form of a

pictorial presentation with notes (possibly using appropriate software or an overhead projector) or an assignment.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the assessment criteria. 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
AC1.1, AC1.2, AC1.3, AC3.1	Producing Blacksmithing Tooling	You have just received confirmation that you have been accepted to make a pair of traditionally forged gates and railings for which you need to produce appropriate tooling for the production of related elements and motifs.	Practical production of forge tooling. Observation records completed by learners and the tutor. Work logs or other relevant learner notes and drawings. Witness statements.
AC2.1, AC2.2, AC2.3	Producing Decorative Elements/Motifs	As a blacksmith working within the field of restoration or reproduction you need to produce historically accurate samples of forged elements and motifs to develop efficient process, to highlight any quality issues that may arise and to inform the quoting process.	Practical production of elements and motifs. Observation records completed by learners and the tutor. Work logs or other relevant learner notes and drawings. Witness statements.
AC3.2, AC4.1' AC4.2	Process and Effects of Heat Treatment	As a working Blacksmith you need to understand the issues involved with working safely in the forge. Effective heat treatment and forging process are critical when making tools and forged elements. This needs to be related to the potential materials that	Oral questioning. Written assignment or presentation. Forged examples. Visual records. Work logs or other

Criteria covered	Assignment title	Scenario	Assessment method
		can be used in a variety of situations.	relevant learner notes and drawings. Research.

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 and has particular links with:

Unit 1: Understanding and Using Forging Techniques for Blacksmithing and Metalworking

Unit 3: Undertake Drawing Practice for Blacksmithing and Metalworking

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

Essential resources

Learners will need supervised access to workshops and classrooms 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. Areas for fitting and finishing should be available, with access to suitable application and coating facilities.

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

Learners must have access to a sufficiently diverse range of materials and stock sizes/sections to explore this unit fully, for example mild steel, tool steels, alloys, both ferrous and non-ferrous, for example copper, bronze, brass, stainless steel, aluminium.

This unit requires vocationally specific craft knowledge and demands appropriately qualified tutors to deliver it.

Indicative resource materials

Textbooks

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

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

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

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

Ross R – *Metallic Materials Specification Handbook 4th Edition* (Kluwer Academic Publishers, 1991) ISBN 9780412369407

Rural Development Commission – *The Blacksmith's Craft 2nd 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

www.baba.org.uk	British Artist Blacksmiths Association
www.blacksmithscompany.org.uk	The Worshipful Company of Blacksmiths
www.hse.gov.uk	Health and Safety Executive
www.forgemagazine.co.uk	British Farriers and Blacksmiths Association

Unit 5: Understanding and Using Blacksmithing and Construction Skills

Unit code: D/602/0673

QCF level 3: BTEC Specialist

Credit value: 10

Guided learning hours: 60

Unit aim

This unit aims to introduce learners to blacksmithing and construction skills and how they 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

Blacksmiths are often required to produce complex, practical or decorative work. This unit expands learners' skills and understanding of the work of the blacksmith by developing a greater breadth and depth of understanding and expertise when producing complex forged artefacts to meet professional expectations and industrial specifications in the workshop.

Learning outcome 1 looks at blacksmithing construction methods. It focuses on developing learners' experience of the range of materials, motifs and construction techniques used by blacksmiths, for example when producing work for typical commission-based gates or railings. This demands a rigorous and professional approach when producing workshop drawings and specifications.

Learning outcome 2 covers the principles and practice of working with dissimilar metals. Learners will produce forged artefacts that demand a broad range of forged elements linked together using a predominance of traditional blacksmith jointing techniques.

In learning outcome 3, learners will produce a finished, forged complex element/motif. The finishing requirements for completed work for interior and exterior environments will be addressed. Learners should produce specifications covering corrosion control and aesthetic considerations of a variety of finishing processes and coatings.

Learning outcome 4 looks at the production of workshop drawings for complex elements/motifs. Learners should be given the opportunity to research and design their own artefact based on traditional or contemporary form while still satisfying established blacksmithing-based construction methods.

Learning outcomes and assessment 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 determine the standard required to achieve the unit.

On completion of this unit a learner should:

Learning outcomes	Assessment criteria
1 Be able to use blacksmithing construction methods	1.1 Use forged joining techniques to meet given objectives 1.2 Use mechanical joining techniques to meet given objectives 1.3 Use forge welded joining techniques to meet given objectives
2 Be able to demonstrate principles and practice of working with dissimilar metals	2.1 Forge dissimilar metals to meet given objectives 2.2 Form dissimilar metals to meet given objectives
3 Be able to produce a finished, forged, complex element/motif	3.1 Produce a forged complex element/motif to meet a given specification 3.2 Use finishing techniques on a complex element/motif to meet a given specification
4 Be able to produce accurate workshop drawings for complex elements/motifs	4.1 Produce accurate workshop drawings to meet a given specification for a complex element/motif 4.2 Use workshop drawings to meet a given specification for a complex element/motif

Unit content

1 **Be able to use blacksmithing construction methods**

Construction joint types and methods: tenons eg cut, forged, upset, offset; pierced/pass through; collars; wraps; rivets; halving joints; forge welds eg box, corner, branch, 'T', cage; mechanical fixings eg bolts, wedges, screws, pins; advantages and disadvantages of each method; health and safety; risk assessment

Production: specialised tooling; historical and contemporary methods eg drilling, punching, use of pre-cut profiles; accuracy eg bend and stretch allowances; marking out eg use of datums, measuring tools; stock estimation; health and safety; risk assessment

2 **Be able to demonstrate principles and practice of working with dissimilar metals**

Materials: metals used within the forge eg steel, stainless steel, copper, bronze, brass, aluminium, bar, sheet; physical properties; advantages and disadvantages of using different metals in the forge; historical and contemporary use

Forging techniques: methods used to forge and join dissimilar metals in the forge; effects of these methods on metals; effects of hot and cold working on dissimilar metals; health and safety; risk assessment

3 **Be able to produce a finished, forged, complex element/motif**

Processes: complex decorative forged elements eg penny, snub, bolt, bevel, blown back and branch welded scrolls, twists, waterleaves; decorative chiselling/chasing; specialised tooling; health and safety; risk assessment

Finishing: reasons for using finishes; techniques commonly used to finish forged metalwork eg brushing, grinding, filing, etching, waxing, oiling, patination, metal coating, painting; corrosion control methods eg electrolytic, hot metal, paints, powders, dips, sacrificial anodes; historical and contemporary development; health and safety; risk assessment

4 **Be able to produce accurate workshop drawings for complex elements/motifs**

Drawings: development process; setting out; transfer to metal plate; conventions; material estimations; specifications; resource requirements; scaling; health and safety; risk assessment

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical assessment, written assessment, visits to suitable collections and will link to work 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 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 before 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 element/motif 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.

Whichever delivery methods are used, it is essential that tutors stress the importance of sound environment management and the need to manage the resource using legal methods.

Visiting expert speakers could add to the relevance of the subject. 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 before any 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 blacksmithing construction methods. Delivery is likely to be through formal lecture, discussion, workshop practicals, site visits and independent learner research.

Learning outcome 2 covers the principles and practice of working with dissimilar metals. This is likely to be delivered through formal lecture, discussion, workshop practicals, site visits and independent research. Learners should be encouraged to develop a consistent approach to the manufacturing process across all the learning outcomes by producing more complex artefacts covering a broadening range of skills.

Learning outcome 3 covers the production of finished, forged complex elements/motifs. This is likely to be delivered through formal lecture, discussion, workshop practicals, site visits and independent learner research. Using industrially relevant forge equipment, learners need to research the properties of a range of materials and finishing processes to gain knowledge of managing different working environments. Differing sections and sizes of mild steel should be used to produce the samples so learners gain as broad as possible experience of the elements.

Learning outcome 4 looks at the production of workshop drawings. This is likely to be delivered through formal lecture, discussion, drawing studio/office and workshop practicals, site visits and independent learner research. As learners become more competent in individual techniques they should be encouraged to design artefacts requiring the use of several techniques based on traditional or contemporary form.

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: Workshop Drawings** (AC4.1, AC4.2) Tutor introduces the assignment brief. Following the introduction of tutor-set components/artefacts including tolerances, the learner produces drawings and estimations incorporating the required construction and finishing specifications. Tutor introduction and demonstration of drawing methods as appropriate during the project. Learners practise and produce drawings. Learner assessment/feedback. **Assignment 2: Using Construction Techniques To Produce a Complex Artefact** (AC1.1, AC1.2, AC1.3, AC2.1, AC2.2, AC3.1, AC3.2) Tutor introduces the assignment brief. Following the introduction of tutor-set components/artefacts, including specifications, the learner produces component(s)/artefacts(s) using the required construction and finishing processes within the set tolerances. Learners evaluate process and product as set against specifications and make recommendations for improvement. When finishing, external services such as galvanisers could be introduced and used where appropriate. Tutor introduction and demonstration of construction and finishing processes as appropriate during the project. Learners practise and produce of components/artefacts. Research, production of workshop records and final evaluation. Learner assessment/feedback. Visiting lecturer, workshop/site visit to metal finishers. Unit review.

Assessment

For AC1.1, AC1.2 and AC3.1, learners must use selected blacksmithing construction methods to meet given objectives. Tutors should identify the construction methods and objectives or agree them through discussion with learners. The construction methods and objectives may be the same as those used to provide evidence for other assessment criteria. Where possible, to ensure fairness of assessment, the size and complexity of the tasks should be the same for all learners.

Learners are expected to provide evidence covering all the construction methods listed in the unit content. AC1.1, AC1.2 and AC1.3 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, 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 AC2.1 and AC2.2, learners must work with dissimilar metals to meet given objectives. Tutors should identify the metals and objectives or agree them through discussion with learners. The metals and objectives may be the same as those used to provide evidence for other assessment criteria. Where possible, to ensure fairness of assessment the size and complexity of the task should be the same for all learners. Learners are expected to provide evidence for at least two dissimilar metals. Evidence could be in the same form as for AC1.1, AC1.2 and AC1.3.

For AC2.3 and AC3.1 learners need to produce a finished, forged complex element/motif to meet a given specification. Tutors should identify the specification or agree it through discussion with learners. The specification may be the same as that used to provide evidence for other assessment criteria. Where possible, to ensure fairness of assessment the size and complexity of the task should be the same for all learners. The specification should cover normal factors that can be found in industry, for example design criteria, measurements, materials, finish tolerances and any relevant standards. Evidence could be in the same form as for AC1.1, AC1.2, AC1.3, AC2.1 and AC2.2.

For AC3.2 and AC4.1, learners must produce and use accurate workshop drawings to meet a given specification for a complex element/motif. Tutors should identify the specification or agree it through discussion with learners. The specification may be the same as that used to provide evidence for other assessment criteria.

Where possible, to ensure fairness of assessment, the size and complexity of the task should be the same for all learners. The specification should cover normal factors that can be found in industry, for example design criteria, measurements, materials, finish tolerances and any relevant standards. Evidence could be in the same form as for AC1.1, AC1.2, AC3.1, AC2.1 and AC2.2.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the assessment criteria. 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
AC4.1, AC4.2	Workshop Drawings	You are working as a self-employed blacksmith and have asked another smith to make some components for a job you are doing. You need to prepare working drawings and specifications for the components.	Drawings and specifications. Forging estimations.
AC1.1, AC1.2, AC1.3, AC2.1, AC2.2, AC3.1, AC3.2	Using Construction Techniques To Produce a Complex Artefact	As a blacksmith working within the field of restoration or reproduction you have been asked by English Heritage to produce accurate samples of forged components/artefacts by working to drawings and specifications using a range of construction techniques.	Practical production of elements and motifs. Observation records completed by learners and the tutor. Worklogs or other relevant learner notes and drawings. Witness statements.

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 and has particular links with:

Unit 1: Understanding and Using Forging Techniques for Blacksmithing and Metalworking

Unit 3: Undertake Drawing Practice for Blacksmithing and Metalworking.

This unit also has links with Level 3 National Occupational Standards in Fabrication and Welding, 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. A sufficiently diverse range of materials and stock sizes/sections, for example 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, for example 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 resource materials

Textbooks

Andrews J – *New Edge of the Anvil: A Resource Book for the Blacksmith*

(Skipjack Press, 1994) ISBN 9781879535091

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

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

Parkinson P – *The Artist Blacksmith: Design and Techniques*

(The Crowood Press, 2001) ISBN 9781861264282

Ross R – *Metallic Materials Specification Handbook 4th Edition*

(Kluwer Academic Publishers, 1991) ISBN 9780412369407

Rural Development Commission – *The Blacksmith's Craft 2nd 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

www.baba.org.uk	British Artist Blacksmiths Association
www.blacksmithscompany.org.uk	The Worshipful Company of Blacksmiths
www.hse.gov.uk	Health and Safety Executive
www.forgemagazine.co.uk	British Farriers and Blacksmiths Association

Unit 6: Understanding and Using Blacksmithing Installation Skills

Unit code: M/602/0676

QCF level 3: BTEC Specialist

Credit value: 10

Guided learning hours: 60

Unit aim

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 needed to work independently to meet the exacting standards of customers and other professionals.

This unit focuses on developing learners' experience of the range of processes used in blacksmithing, 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 and assessment 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 determine the standard required to achieve the unit.

On completion of this unit a learner should:

Learning outcomes	Assessment criteria
1 Understand the methods used for site evaluation	1.1 explain suitable methods used to evaluate a given site 1.2 survey a given site to meet specified objectives 1.3 produce site records needed to meet defined specifications
2 Understand construction and installation costings and records	2.1 explain the reasons for costing projects and for keeping records in the blacksmith environment 2.2 produce detailed workshop job time sheets relating to work done
3 Be able to produce a complex blacksmithing construction	3.1 use specified construction methods to meet a given specification 3.2 produce specified structural elements to meet a given specification 3.3 produce specified decorative elements to meet a given specification
4 Be able perform site installation operations	4.1 perform site installation operations to meet a given specification.

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 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

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical assessment, written assessment, visits to suitable collections and will link to work 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 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 before 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 before any 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 other learning outcomes in 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 need 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 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 (AC1.1, AC1.2, AC1.3, AC2.1, AC2.2)
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
(AC3.1, AC3.2, AC3.3, AC4.1)
Tutor introduces the assignment brief.
Following the introduction of complex construction techniques, including specifications, the learner produces complex items and elements using the required processes.
Learners evaluate process as set against specifications and make recommendations for improvement.
Learner assessment/feedback.
Visiting lecturer, workshop/site visits.
Unit review.

Assessment

For AC1.1, AC1.2 and AC1.3, 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 AC2.1 and AC2.2, learners must produce detailed workshop timesheets and explain 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 AC1.1.

For AC3.1, AC3.2 and AC4.1 learners need to produce complex blacksmithing construction methods and elements to meet a given specification. Tutors should identify the specification or agree it 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 assessment 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 AC4.1, 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 assessment 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 AC3.1.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the assessment criteria. 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
AC1.1, AC1.2, AC1.3, AC2.1, AC2.2	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.
AC3.1, AC3.2, AC3.3, AC4.1	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. Worklogs 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 and has particular links with:

Unit 1: Understanding and Using Forging Techniques for Blacksmithing and Metalworking

Unit 3: Undertake Drawing Practice for Blacksmithing and Metalworking.

This unit also has links with Level 3 National Occupational Standards in Fabrication and Welding, 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, including measuring, fixing and installation equipment, is also required. A sufficiently diverse range of materials and stock sizes/sections, for example 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, for example 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 resource materials

Textbooks

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

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

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

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

Ross R – *Metallic Materials Specification Handbook 4th Edition* (Kluwer Academic Publishers, 1991)

ISBN 9780412369407

Rural Development Commission – *The Blacksmith's Craft 2nd 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

www.baba.org.uk	British Artist Blacksmiths Association
www.blacksmithscompany.org.uk	The Worshipful Company of Blacksmiths
www.hse.gov.uk	Health and Safety Executive
www.forgemagazine.co.uk	British Farriers and Blacksmiths Association

Unit 7: Understanding Principles and Methods of Design for Blacksmithing and Metalworking

Unit code: Y/602/0719

QCF level 3: BTEC Specialist

Credit value: 10

Guided learning hours: 60

Unit aim

This unit aims to introduce learners to the principles and methods of design for blacksmithing and metalworking, 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

Developing an understanding of the key principles which govern design practice, and applying these to realistic situations, extends the range of possible solutions to manufacturing problems. Designers of fabricated products are directed and influenced in determining product appearance and function by the design brief, which in turn is influenced by the environment as well as by social and cultural influences.

Learning outcomes 1 and 2 introduce and encourage learners to develop their own distinctive approach to design practice and to work effectively within a team. Learners will develop an understanding of the importance of using appropriate design methods to achieve their creative intentions. The application of a design methodology will ensure that all significant factors are considered within a structure of development and that briefs are carried out thoroughly.

Learning outcome 3 looks at social and cultural impacts on the design process.

Learning outcome 4 covers design for need and the designer's responsibilities to the wider community. The design process requires skills of analysis as well as synthesis, time management, teamwork and organisation.

Learners will be introduced to the skills needed to work through the design development cycle to produce successful design outcomes.

Learning outcomes and assessment 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 determine the standard required to achieve the unit.

On completion of this unit a learner should:

Learning outcomes	Assessment criteria
1 Understand design processes	1.1 Explain the principle of how form relates to function in relation to a selected design 1.2 Undertake a client brief, explaining the importance and influence of this on the requirements of the finished design
2 Understand the design development cycle and its phases	2.1 Explain the phases of the design development cycle in relation to a selected project
3 Understand cultural association	3.1 Explain the importance of cultural association in the design of artefacts 3.2 Discuss the designer's responsibilities to the client
4 Understand design for need and the designer's responsibilities to the wider community.	4.1 Explain the relationship between the client brief and the requirements of the finished design 4.2 Explain the principle of design for need 4.3 Explain the designer's responsibilities to the wider community

Unit content

1 Understand design process

Principle of how 'form relates to function' (or purpose): client brief and relationship to finished design; methods used to create finished work to meet defined functional requirements

Considerations in meeting metalwork design requirements: fashionable periods eg avant garde, post-modern or historical; the functional requirements of the design; structural qualities eg strength, weight, flexibility, durability; visual qualities eg colour, surface, texture, opacity, transparency or pattern; surface qualities eg texture, smooth, reflective, matt, soft, soothing or exciting; making use of the qualities and characteristics of selected materials to create effective visual relationships and to explore the visual dynamics between different materials in meeting their creative intentions and the requirements of the brief; the symbolic significance of the type of product being designed eg historical or contemporary (cultural, social or religious)

2 Understand the design development cycle and its phases

Design development cycle: analysis and clarification of the brief eg by careful reading, consultation and discussion, analysis of design requirements, initial ideas, confirmation of brief; planning eg a sequence of development, timing and time management, resource allocation and organisation, costing and consultation; research eg identification of relevant information from primary and secondary sources, collection, investigation and selection, use of databases, market intelligence (about competitors, market and consumer needs); ideas development eg origination and exploration of initial ideas or 'brainstorming', development of a range of alternative solutions, exploration or investigation of suitable materials, techniques and technology; review and modification eg alteration of work in hand, to the design development cycle; development of potential outcomes eg proofs, mock-ups, samples, 2D visualisation, models, maquettes and/or prototypes for testing; consultation eg with clients, users, colleagues and other interest groups; final outcome eg artefacts, designs for production, presentation of designs in response to brief; evaluation of whole cycle eg research methods, making processes and final outcome against the brief

3 Understand cultural association

Cultural association: definition and importance of cultural association; aesthetic values and issues of 'taste' of different user groups in creating design solutions; user groups eg individuals, cultural/social groups, commercial organisations or target market groups; western and non-western, historical and contemporary eg trends, fashion, individual or group identity; cultural significance of signs, symbols and stylistic conventions, commercial identity, propaganda, ethical and environmental issues

4 Understand design for need and the designer's responsibilities to the wider community

Design for need and responsibilities to the wider community: the key needs of a client brief or design problem eg 'who and/or where is it for?', 'what is its purpose?', 'how can the needs best be met within the identified constraints?'; designer's responsibilities to eg client, the public, specified users, members of the manufacturing team and the environment; designer's responsibilities relating to other issues eg contracts, value for money, practicality of construction, quality control, health and safety; development of personal approaches to design; methods of working effectively in teams; relevant current legislation eg Health and Safety at Work Act 1974, Copyright, Designs and Patents Act 1988

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical assessment, written assessment, visits to suitable collections and will link to work 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 design and 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 before any work-related activities so that naturally occurring evidence can be collected at the time. For example, learners may have the opportunity to use design processes, 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.

Whichever delivery methods are used, it is essential that tutors stress the importance of work planning, sound environmental management and the need to manage the resource using legal methods.

Health and safety issues relating to working in the forge and machine workshop must be stressed and reinforced regularly, and risk assessments must be undertaken before any 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.

It is recommended that this unit is linked with other practical units within the blacksmith and metalwork programme, rather than being delivered as a stand-alone unit. This will enable learners to gain an understanding of design methods through experience, rather than just theory. This unit can be taught effectively using an integrated project with other compatible units. In particular, learners should gain enough exposure to professional practice to recognise the significance of using a methodical approach to solve design problems, particularly within a team. It is equally important to demonstrate that creative work requires a wide range of methods and processes to meet specified design requirements.

Learning outcomes 1 and 2 are directly linked. These are likely to be delivered through formal lectures, discussion and independent learner research of one or more case studies. Learners will be aware of the methods and associated activities commonly used within the design process and the implementation of the design development cycle. Visiting expert speakers could add to the relevance of the subject. For example, local designers within blacksmithing and metalwork, or other design fields, could talk about their work, the situations they face and the methods they use.

Learning outcome 3 covers social and cultural impacts on the design process. Delivery techniques should be varied and can be linked to the delivery of learning outcomes 1 and 2. It is expected that formal lectures, discussions and site visits could form a major part of the delivery of this learning outcome.

Learning outcome 4 looks at the methods commonly used to establish a link between the expectation of a design brief and the final piece. This could include the establishment of the brief and investigation of the external influences affecting the designed work. Delivery techniques should be varied. It is expected that formal lectures, demonstrations, workshops and supervised site visits could form a major part of the delivery of this learning outcome. Visiting clients and actual design commissions (real or simulated) could add to the relevance and validity of the set work.

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: The Design Cycle – Evolution, Development and Evaluation (AC1.1, AC1.2, AC2.1, AC4.2)
Tutor introduces the assignment.
Discuss relationship between the development of a design development cycle, form and function, and satisfying client need.
Undertake development of an example design development cycle.
Undertake review of design cycle.
Assignment 2: Cultural Brief (AC3.1)
Tutor introduces the assignment.
Undertake a design brief with cultural associations.
Undertake review of cultural brief.
Assignment 3: The Designer's Responsibilities (AC3.2, AC4.1, AC4.3)
Tutor introduces the assignment brief.
Discuss the blacksmith's responsibilities in relation to a particular brief.
Unit review.

Assessment

For AC1.1, learners must explain the relationship between form and function in relation to a selected design. Learners could include examples of finished designs that they have seen or been involved in during the delivery of this unit as part of their evidence. This could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector) or a written assignment.

For AC1.2, learners must explain the relationship between the client brief and the requirements of the finished design. Learners could include examples of client briefs that they have seen or been involved with during the delivery of this unit as part of their evidence. This could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector) or a written assignment.

For AC2.1, learners are required to explain the phases of the design development cycle in relation to 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 assessment criteria. Where possible, to ensure assessment is fair, the size and complexity of the task should be the same for all learners.

AC2.1 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 work logs or other relevant learner notes. If assessed during a placement, witness statements should be provided by a suitable representative and verified by the tutor.

Alternatively, evidence for AC2.1 could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector) or a written assignment.

AC3.1 requires learners to explain the importance of cultural association in the design of artefacts. Learners could include as part of their evidence examples of artefacts that they have seen or been involved with during the delivery of this unit. These could take the same form as for AC1.1. Tutors should identify the selected artefact and client brief or agree them through discussion with learners. The selected artefact and client brief may be the same as those used to provide evidence for other grading criteria. Where possible, to ensure assessment is fair, the size and complexity of the task should be the same for all learners. Evidence could be in the same form as for AC1.1.

For AC3.2, learners must discuss the designer's responsibilities to the client. Learners could use a case study approach. Evidence could be in the same form as for AC1.1.

For AC4.1, learners must explain the relationship between the client brief and the requirements of the finished design. Tutors should identify the finished design and client brief or agree them through discussion with learners. The finished design and client brief may be the same as those used to provide evidence for other assessment criteria. Where possible, to ensure assessment is fair, the size and complexity of the task should be the same for all learners. Recommendations for improvement must be appropriate and viable. Evidence could be in the same form as for AC1.1.

For AC4.2, learners are required to explain the principle of 'design for need'. Tutors should identify at least three different artefacts or agree them through discussion

with learners. The artefacts may be the same as those used to provide evidence for other assessment criteria. Where possible, to ensure assessment is fair, the size and complexity of the task should be the same for all learners. Evidence could be in the same form as for AC1.2.

For AC4.3, learners must explain the designer's responsibilities to the wider community. Learners could use a case study approach. Evidence could be in the same form as for AC1.1.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the assessment criteria. 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
AC1.1, AC1.2, AC2.1, AC4.2	The Design Cycle– Evolution, Development and Evaluation	The design process involves a number of well-established elements which lead to a design with integrity and appropriateness to the brief. You are to discuss the principles of the process in relation to the cycle, form and function, and satisfying need. This will culminate with a developed example design cycle, with an evaluation.	Written work. Observation and assessment of practical work.
AC3.1	Cultural Brief	You have undertaken a design brief with cultural associations. You are to develop a design which takes account of these, with justification.	Written work. Observation and assessment of practical work.
AC3.2, AC4.1, AC4.3	The Designer's Responsibilities	In relation to a specified brief, you are to explain the relationship between the client brief and the wider community, the client and the requirements of the finished design.	Written work.

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 and has particular links with level 3:

Unit 3: Undertake Drawing Practice for Blacksmithing and Metalworking

Unit 8: Undertake Small scale Design for Blacksmithing and Metalworking

Unit 9: Undertake Small scale Working for Blacksmithing and Metalworking

Unit 10: Undertake Large Scale Design for Blacksmithing and Metalworking.

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

Essential resources

Learners will 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, for example drawing boards, compasses, set squares, measuring equipment and consumables.

Library and IT facilities should also be available, with access to unit-specific examples of drawing practice and internet facilities to enable research into techniques, materials, equipment and work examples.

Tutors delivering this unit should have vocationally specific craft knowledge.

Indicative resource materials

Textbooks

Dormer P – *Design Since 1945* (Thames & Hudson, 1993) ISBN 9780500202616

Gregory R L – *Eye and Brain: The Psychology of Seeing 5th Edition* (Oxford University Press, 1997) ISBN 9780198524120

Grillo P – *Form, Function and Design* (Dover Publications Inc, 1975) ISBN 9780486201825

Kepes G – *Module, Symmetry, Proportion* (Studio Vista, 1966) ASIN B0000CN82F

McDermott C – *Essential Design* (Bloomsbury Publishing Plc, 1992) ISBN 9780747508960

Powell D – *Presentation Techniques* (Little, Brown, 1990) ISBN 9780316912433

Rural Development Commission – *Wrought Ironwork Gates* (Countryside Agency, 1992) ISBN 9781869964221

Sausmarez M – *Basic Design: Dynamics of Visual Form 3rd Edition* (Herbert Press, 2002) ISBN 9780713652413

Journals

Artist Blacksmith

Forge

The Worshipful Company of Blacksmiths newsletter

Websites

www.baba.org.uk	British Artist Blacksmiths Association
www.blacksmithscompany.org.uk	The Worshipful Company of Blacksmiths
www.hse.gov.uk	Health and Safety Executive

Unit 8: Undertake Small Scale Design for Blacksmithing and Metalworking

Unit code: R/602/0721

QCF level 3: BTEC Specialist

Credit value: 10

Guided learning hours: 60

Unit aim

This unit aims to introduce learners to the skills and knowledge needed for small scale design for blacksmithing and metalworking, 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/higher education.

Unit introduction

Communicating with clients to establish a working design brief and the ability to research and establish potential solutions to the established brief play a major role in successful design. Communicating technical information about design development and experimenting with alternative ideas are at the core of this unit.

In learning outcome 1, learners will understand and work to a brief for a small scale design project. They will be introduced 2D and 3D design methods and problem solving and production techniques used to manufacture small scale models or prototypes.

Learning outcome 2 looks at developing and communicating design ideas effectively using a variety of media.

The considerations and experimentation within the design process, and the construction of prototypes, are all important skills within the communication process and are fundamental to this unit.

In learning outcome 3, learners will make models and prototypes which satisfy functional and aesthetic criteria supported by purposeful research. Learners will develop a clear understanding of the importance of anticipating manufacturing problems in the early design stages before construction of the final pieces, and understand the economic impact this has on the success of a product.

Learning outcome 4 covers the analysis, review and evaluation of working methods to realise an effective design outcome.

Learning outcomes and assessment 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 determine the standard required to achieve the unit.

On completion of this unit a learner should:

Learning outcomes	Assessment criteria
1 Understand a small scale design project brief	1.1 produce relevant aesthetic research for a selected small scale design project to meet given objectives 1.2 produce relevant research for a selected small scale design project to meet functional requirements 1.3 produce a brief for a selected small scale design project to meet given objectives
2 Be able to develop and communicate small scale design ideas	2.1 produce a range of initial concept proposals to meet a selected small scale design brief 2.2 develop selected concept proposal(s) to final specification stage to meet a selected small scale design brief 2.3 produce appropriate working specifications and drawings to meet a selected small scale design brief 2.4 present and explain design ideas to meet a selected small scale design brief
3 Be able to make small scale models and prototypes	3.1 make a model and/or samples which satisfy given functional and aesthetic criteria
4 Be able to assess working methods to realise an effective design outcome.	4.1 review working methods and final design for a selected project

Unit content

1 **Understand a small scale design project brief**

Interpretation and analytical techniques to assess the requirements of a brief for small scale designs: brief variations according to the nature of the 3D design eg sculptural, architecture, mechanical, educational or retail; brief clarification (clear communication, identifying aesthetic and functional requirements together with the needs of the client, consumer and others)

2 **Be able to develop and communicate small scale design ideas**

Small scale design brief investigation, planning and implementation: information sources eg personal, ergonomic, economic, environmental, health and safety factors; client and/or user needs in terms of aesthetic and functional factors, materials, techniques and processes; production of effective concept and detailed plans for small scale design projects using drawings, photographs and visual presentations; scheduling time management, materials preparation, making processes, sequences, modifications and the involvement of clients, consumers and/or users towards a final design solution; costs

3 **Be able to make small scale models and prototypes**

Production method for models, mock-ups and samples of an appropriate scale and precision for small scale 3D products: material selection and construction methods to meet the brief requirements (strength, durability, weight, size, manageability, one-off or mass manufacture processes); client requirements; ergonomics and situation dimensions; safety and functional considerations tested and assessed using the model to demonstrate the potential of design ideas; health and safety; risk assessment; Personal Protective Equipment (PPE)

4 **Be able to assess working methods to realise an effective design outcome**

Ongoing analysis to review the progress of design work in the production of small scale 3D products to meet set briefs: review of design outcomes to evaluate time management, costs, development of analytical skills and understanding; communication and presentation of design ideas and devising evaluation criteria to make judgements about aesthetic and functional qualities of work under consideration

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical assessment, written assessment, visits to suitable collections and will link to work 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 practicals, internet and/or library-based research 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 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 before any work-related activities, so that naturally occurring evidence can be collected at the time. For example, learners may have the opportunity to produce scaled models, 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.

Whichever delivery methods are used, it is essential that tutors stress the importance of health and safety within practical sessions, sound time management and the need to log and credit the research sources.

Health and safety issues relating to working in the workshop, welding and fabrication must be stressed and regularly reinforced, and risk assessments must be undertaken before any practical activities.

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 outcomes 1 and 2 should, where possible, use realistic practical credible briefs which will give integrity to interaction between client and designer and personal development. These learning outcomes are likely to be delivered through lectures, group and client discussions, workshop development and independent learner research.

Learning outcome 3 covers the practical application and technical skills needed within the unit. This learning outcome should be delivered through demonstration, practical and workshop activity and group discussion.

Learning outcome 4 looks at the analytical review of the proposed design process and the resultant product. This could be achieved through formal lectures, presentations, testing and product evaluation techniques.

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: Small Scale Design (AC1.1, AC1.2, AC1.3)
Tutor introduces the assignment brief.
Interpretation and analytical techniques to assess the requirements of a brief for small scale designs.
Learner research of design considerations.
Learner assessment/feedback.
Assignment 2: Practical Small Scale Design (AC2.1, AC2.2, AC2.3, AC2.4, AC3.1, AC4.1)
Tutor introduces the assignment brief.
Production method for models, mock-ups and samples of an appropriate scale and precision for small scale 3D products.
Learners review and evaluate small scale design project and make recommendations for improvement.
Learner assessment/feedback.
Guest speaker, workshop/site visits.
Unit review.

Assessment

For AC1.1, AC1.2 and AC1.3, learners must research and provide information on a brief for a selected small scale design project to meet given objectives. Tutors should identify the design project and objectives or agree them through discussion with learners. Objectives could be based on research needed, client/tutor interaction etc. Learners must communicate with a client (actual or simulation) and record the design requirements clearly. Evidence could take the form production of a detailed brief with supporting notes and data.

For AC2.1, AC2.2, AC2.3 and AC2.4 need learners to develop and communicate design ideas to meet a selected small scale design brief. Tutors should identify the small scale design brief or agree this through discussion with learners. Learners should use a range of communication media and established design processes to produce a possible solution to the brief. This could take the form of scrapbooks of design solutions using photos, sketches, plans and illustrations. A final detailed plan would evolve from this draft work, giving technical details as required from in brief.

For AC3.1, learners must make a model and/or prototypes which satisfy given functional and aesthetic criteria. Tutors should identify the functional and aesthetic

criteria 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. They should construct a model or working prototype which communicates the design idea/ideas developed within AC1.2 to a satisfactory standard. The assessment of the finished model or prototype could play an important part of P3 but could also 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.

For AC4.1 learners need to review selected design proposals to realise an effective final outcome. Tutors should identify the design proposals or agree them through discussion with learners. These are likely to be the proposals developed for AC1.2 and AC1.3. Where possible, to ensure fairness of assessment, the size and complexity of the tasks should be the same for all learners. Learners could analyse and evaluate their own work throughout the design process and make improvements and recommendations for improvement. Evidence could be in the form of a report or project that includes an evaluation of the final work.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the assessment criteria. 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
AC1.1, AC1.2, AC1.3, AC2.2, AC2.3,	Small Scale Design	You are working as a self-employed designer and have been contracted to produce a design for a new installation. You must research interpretative and analytical techniques for small scale design.	Assignment. Project.
AC2.1, AC2.2, AC2.3, AC2.4, AC3.1, AC4.1	Practical Small Scale Design	You need to plan, undertake and review the small scale design project.	Practical design. Observation evidence. Worklogs 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 and has particular links with Level 3:

Unit 7: Understanding Principles and Methods of Design for Blacksmithing and Metalworking

Unit 8: Undertake Small Scale Working for Blacksmithing and Metalworking.

Essential resources

Learners will need access to a range of visual and technical resources. The workshop should be equipped to a good standard for working with a wide range of materials and should include a separate area for model making, a heat treatment area with appropriate extraction facilities, a clean area for drawing and preparation, a finishing area and storage space for work in progress. Appropriate facilities for the preparation and presentation of finished work should be available.

Resources for research should include a permanent collection of reference material for ongoing work, display facilities, Personal Computers (preferably with internet connection), as well as access to a good library containing a wide reference to design.

Indicative resource materials

Textbooks

Grillo P – *Form, Function and Design* (Dover Publications Inc, 1975) ISBN 9780486201825

Heskett J – *Industrial Design* (Thames & Hudson, 1980) ISBN 9780500201817

Huygen F – *British Design: Image and Identity* (Thames & Hudson, 1989) ISBN 9780500275580

Powell D – *Presentation Techniques* (Little, Brown, 1990) ISBN 9780316912433

Journals

Creative Review

Design

Unit 9: Undertake Small Scale Working for Blacksmithing and Metalworking

Unit code: Y/602/0722

QCF level 3: BTEC Specialist

Credit value: 10

Guided learning hours: 60

Unit aim

This unit aims to introduce learners to the skills and knowledge needed for small scale working for blacksmithing and metalworking, 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/higher education.

Unit introduction

The modern blacksmith is required to design and produce high quality innovative products across a range of decorative functional and artistic forgework artefacts. The professional production of small scale work is gaining in importance within blacksmithing craft and there are many opportunities for direct or indirect marketing of these items through, for example, shops, galleries and craft fairs. The possibilities for small batch production will be explored with, for example, specialist tool production, use of pre-cut profiles etc to facilitate efficiency and cost reduction in the production process.

In learning outcome 1, learners will develop creative ideas. The learning outcome gives learners an understanding of the scope of small scale 3D design and manufacture for blacksmithing and metalworking.

In learning outcome 2, learners will produce decorative forged samples. The range of small scale working covered could include design of domestic ware and utensils, architectural detailing, fixtures and fittings and small decorative artefacts.

Learning outcome 3 looks at recording, analysing and presenting the results of investigations and experimental work.

In learning outcome 4, learners will produce a small scale decorative forged artefact. Learners will develop skills in small scale design for blacksmithing and metalworking production by exploring the range of work possible and experimenting with appropriate materials, techniques and processes.

Learning outcomes and assessment 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 determine the standard required to achieve the unit.

On completion of this unit a learner should:

Learning outcomes	Assessment criteria
1 Be able to develop creative ideas	1.1 Carry out visual research to generate creative ideas 1.2 Carry out analysis to generate creative ideas 1.3 Develop selected creative ideas to produce designs
2 Be able to produce decorative forged samples	2.1 Produce selected forged samples exploring materials 2.2 Produce selected forged samples exploring surface texture 2.3 Produce selected forged samples exploring finishes
3 Be able to record, analyse and present the results of investigations and experimental work	3.1 Record, analyse and present the results of selected investigations and experimental work
4 Be able to produce a small scale decorative forged artefact	4.1 Use forging to produce a small scale decorative forged artefact to given specifications 4.2 Use joining techniques to produce a small scale decorative forged artefact to given specifications

Unit content

1 **Be able to develop creative ideas**

Research: sources of visual information eg primary and secondary sources, (books, pictures, internet, actual objects) sketchbook; ergonomics; breadth; range; drawing skills eg perspective, line, tone, scaling

Design analysis: function; form; quality; aesthetics

Design ideas: development of design initiatives

2 **Be able to produce decorative forged samples**

Exploring and experimenting: materials eg combinations of materials, metals (ferrous, non-ferrous); forging methods eg joints, surface textures; coatings eg applications and treatments; health and safety; Personal Protective Equipment (PPE); risk assessment

3 **Be able to record, analyse and present the results of investigations and experimental work**

Investigations and experimental work: professional practice eg record, analyse, present results; recording methods eg drawing, annotations, word processing, photography, samples

Working processes: selection and use of eg media, techniques

4 **Be able to produce a small scale decorative forged artefact**

Making processes: forgework eg forging, forming, cutting, constructing, finishing; working to drawing; health and safety; Personal Protective Equipment (PPE)

Small batch production: processes eg potential of, limitations; suitability to eg replicate, scale up or down

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical assessment, written assessment, visits to suitable collections and will link to work experience placements.

Tutors delivering this unit have opportunities to use as wide a range of techniques as possible. Lectures, discussions, seminar presentations, heritage garden visits, internet and/or library-based research and the use of personal and/or industrial experience would all be suitable.

Work placements should be monitored regularly 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 before any work-related activities, so that naturally occurring evidence can be collected at the time. For example, learners may have the opportunity to produce forged samples, 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 example, forge workers could talk about their work, the situations they face and the methods they use. Whichever delivery methods are used, it is essential that tutors stress the importance of sound environment management and the need to manage the resource using legal methods.

Health and safety issues relating to working in the forge environment must be stressed and regularly reinforced, and risk assessments must be undertaken before any 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.

For learning outcome 1, learners will develop creative ideas. Learners will need to use a variety of recording methods (for example drawing, annotations, word processing, photography and/or video) suitable for the scale of their work. Delivery is likely to be in the form of lectures, practical workshop sessions, site visits and independent learner research.

In learning outcome 2, learners will produce decorative forged samples. Differing sections and sizes of metals should be used to produce the samples for learners to gain a broad experience of the elements. Delivery is likely to be in the form of lectures, demonstration, supervised workshop sessions and independent learner research.

Learning outcome 3 looks at recording, analysing and presenting the results of investigations and experimental work. Learners will need to use the results of their investigations to help develop ideas for small scale outcomes. This will involve identifying sources of information and selecting relevant topics for research, originating ideas from a range of information and stimuli and developing them to meet specified intentions.

Learners will need to be taught how to record, analyse, modify, adapt and refine ideas for 3D outcomes. When reviewing, learners will need to analyse their work in terms of the successes and/or failures of working processes selection and use of media, techniques function, form, quality and aesthetics. Delivery is likely to be in the form of lectures, practical workshop sessions, site visits and independent learner research.

In learning outcome 4, learners will produce a small scale decorative forged artefact. Learners will undertake a number of practical exercises in the forge and studio environment. When making modifications learners will need to refine and clarify their intentions and working practices. Learners will need to use their experimental results, own views and feedback from others to inform their work. They will need to investigate the potential and limitations of technology and making processes for small-batch production of small scale outcomes. Delivery is likely to be in the form of lectures, demonstration, supervised workshop sessions and independent learner research.

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: Small Scale Working (AC1.1, AC1.2, AC1.3)
Tutor introduces the assignment brief.
Research to assess the requirements of a design for small scale working.
Learner research of design considerations.
Learner assessment/feedback.
Assignment 2: Practical Small Scale Working (AC2.1, AC2.2, AC2.3, AC3.1, AC4.1, AC4.2)
Tutor introduces the assignment brief.
Production methods for forged samples/artefacts.
Learner review and evaluate small scale artefact process and make recommendations for improvement.
Learner assessment/feedback.
Guest speaker, workshop/site visits.
Unit review.

Assessment

For AC1.1, AC1.2 and AC1.3, learners must develop creative ideas from their investigations. They should identify the creative ideas and agree them through discussion with the tutor. 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), an annotated poster or a project.

For AC2.1, AC2.2 and AC2.3, learners must produce decorative forged samples. Tutors should identify the samples or agree them through discussion with learners. These assessment criteria could be assessed through the presentation of a number of pieces and presentations that show competence in the range of techniques. Learners could be assessed on a continuous basis by producing project work, using direct observation and questioning the design process. Results of experiments and records of exploration should be collated carefully and could be presented within a portfolio learners have arranged to show the range of work covered and the skills acquired.

For AC3.1, learners must record, analyse and present the results of selected investigations and experimental work. Tutors should identify the investigations and experimental work or agree them through discussion with learners. These are likely to be based on the work completed for AC1.3, AC2.1, AC2.2 and AC2.3. 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 a similar format as that suggested for AC1.1.

For AC4.1 and AC4.2, learners must use techniques to produce a small scale decorative forged artefact. This 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.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the assessment criteria. 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
AC1.1, AC1.2, AC1.3, AC2.1,	Small Scale Working	You are working as a self-employed designer and have been contracted to produce small scale artefacts. You must research and create ideas for small scale artefacts.	Practical production of forge tooling. Observation records completed by learners and the tutor. Worklogs or other relevant learner notes and drawings. Witness statements.
AC2.1, AC2.2, AC2.3, AC3.1, AC4.1, AC4.2,	Practical Small Scale Working	You need to plan, undertake and review the small scale artefact project.	Practical production of elements and motifs. Observation records completed by learners and the tutor. Work logs or other relevant learner notes and drawings. Witness statements.

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 and has particular links with *Unit 3: Undertake Drawing Practice for Blacksmithing and Metalworking.*

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

Essential resources

Learners must have access to a sufficiently diverse range of materials and stock sizes/sections to explore this unit fully, for example mild steel, tool steels. Consideration should also be given to other materials such as alloys, both ferrous and non-ferrous.

Learners will need access to sufficient library and information technology facilities to enable research into techniques, materials, equipment, existing work examples and a range of visual and technical resources, including photographic facilities.

Workshops and classrooms appropriate to learners' specialist pathways will be needed, including a finishing area and storage space for work in progress. These should offer a comprehensive range of blacksmithing and forge tools, including solid fuel forge hearths, gas furnaces, anvils, leg vices, fly presses, mandrels, power hammers supported by a range of tongs, hammers, swages, fullers, setting blocks and other ancillary equipment.

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

Tutors delivering this unit should have vocationally specific craft knowledge.

Indicative resource materials

Textbooks

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

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

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

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

Ross R – *Metallic Materials Specification Handbook 4th Edition* (Kluwer Academic Publishers, 1991) ISBN 9780412369407

Rural Development Commission – *The Blacksmith's Craft 2nd 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

www.baba.org.uk	British Artist Blacksmiths Association
www.blacksmithscompany.org.uk	The Worshipful Company of Blacksmiths
www.hse.gov.uk	Health and Safety Executive
www.forgemagazine.co.uk	British Farriers and Blacksmiths Association

Unit 10: Undertake Large Scale Design for Blacksmithing and Metalworking

Unit code: D/602/0723

QCF level 3: BTEC Specialist

Credit value: 10

Guided learning hours: 60

Unit aim

This unit aims to introduce learners to the skills and knowledge needed for large scale design for blacksmithing and metalworking, 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/higher education.

Unit introduction

Communication with an individual client or development group in the designing and implementation of a large scale commissioned piece has its own challenges and complexity. Large-scale blacksmithing or metalwork is a hybrid of technical knowledge, engineering skills, creative ingenuity and flair.

Having the confidence and technical knowledge to present and express concepts and design ideas to meet aesthetic and technical engineering challenges is demanding of any designer.

In learning outcome 1, learners will analyse a brief for a large scale design project through client interaction and purposeful research. They will develop a clear understanding of the technical problems associated with large scale construction in metalwork, and the blacksmithing skills needed to meet this challenge.

The presentation of detailed working drawings, material lists and working schedules are all key to the successful large scale design.

Learning outcomes 2 and 3 introduce 2D and 3D large scale design methods, problem solving and one-off production techniques to manufacture scaled models or prototypes. The construction of scaled and working prototypes and models is an important tool with which the designer can problem solve and communicate ideas.

In learning outcome 4, learners will analyse, review and evaluate working methods to realise an effective final outcome.

Learning outcomes and assessment 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 determine the standard required to achieve the unit.

On completion of this unit a learner should:

Learning outcomes	Assessment criteria
1 Understand a large scale design project brief	1.1 produce relevant aesthetic research for a selected large scale design project to meet given objectives 1.2 produce relevant research for a selected large scale design project to meet the functional requirements 1.3 produce a brief for a selected large scale design project to meet given objectives
2 Be able to develop and communicate large scale design ideas	2.1 produce a range of initial concept proposals to meet a selected large scale design brief 2.2 develop selected concept proposal(s) to final specification meet a selected large scale design brief 2.3 produce appropriate working specifications and drawings to meet a selected large scale design brief 2.4 explain design ideas to meet a selected large scale design brief
3 Be able to make large scale models and prototypes	3.1 make a model and/or samples which satisfy given functional and aesthetic criteria
4 Be able to assess working methods to realise an effective design outcome	4.1 review working methods and final design for a selected project

Unit content

1 **Understand a large scale design project brief**

Interpretation and analytical techniques to assess and establish an understanding of the aesthetic and functional requirements of a brief for large scale space: brief variations according to the scale and nature of the design eg exhibitions, displays and environments; brief clarification (aesthetic requirements eg appearance, style, fashion and relationship to wider environment); functional requirements eg type, size, volume, performance, durability and serviceability; the needs of the audience/consumer eg end user, client, market and competition; any constraints eg costs, time, materials and technology

2 **Be able to develop and communicate large scale design ideas**

Investigation, researching and recording of findings to meet a large scale design brief: effective planning and working drawings for a large scale design project; time management, material selection, making processes and sequences, site visits, modifications and the involvement of clients and/or users

Design process: identification of information sources eg ecological, environmental, planning regulations, public health and safety factors; site survey (site analysis); investigation of client and/or user needs eg in terms of aesthetic and functional factors, materials, techniques and processes; producing initial ideas and models eg drawings, photographs or audio-visual presentation; consulting clients and/or users; development of designs and preparation of working drawings and orthographic representations and/or illustrations; presentation of proposed solution, rationale, alternatives eg through computer-aided design (CAD), accompanying drawings, models and samples

3 **Be able to make large scale models and prototypes**

Development of skills and understanding in how to produce models and/or prototypes of an appropriate scale and precision for large scale spaces: materials and methods selection; construction of models or prototypes to scale and of an appropriate standard for presentation; testing eg in terms of requirements of the brief, accuracy, fitness for purpose, aesthetic appeal; demonstrating the potential of design ideas; demonstrating production methods for the final commission; health and safety; Personal Protective Equipment (PPE); risk assessment

4 **Be able to assess working methods to realise an effective design outcome**

Ongoing review, analysis and evaluation of the progress of blacksmith and metal design work in large scale to meet set briefs: planning and time management of construction; costs of constructing final project to required specifications; development of analytical skills and understanding; communication and presentation of design work; evaluation criteria that are appropriate to the brief eg fitness for purpose, suitability of materials, effectiveness of making process, relationship of final piece to original brief,

overall quality; judgements about the aesthetic and functional qualities of the final outcome

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical assessment, written assessment, visits to suitable collections and will link to work 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, internet and/or library-based research 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 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 before any work-related activities, so that naturally occurring evidence can be collected at the time. For example, learners may have the opportunity to produce scaled models, 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 example, designers, engineers, artists and model makers could talk about their work, the situations they face and the methods they use.

Whichever delivery methods are used, it is essential that tutors stress the importance of copyright law and the importance of independent work using approved methods, for example sourcing material on the internet.

Health and safety issues relating to working in the workshop, welding and fabrication must be stressed and regularly reinforced, and risk assessments must be undertaken before any practical activities and before learners visit any proposed site. 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 outcomes 1 and 2 are directly linked. These are likely to be delivered through formal lectures, discussion, client consultation, site visits, studio work and independent learner research. Learners will be aware of the methods and associated activities commonly used to complete a site analysis and client brief.

Learning outcome 3 covers the use and construction of models and prototypes to communicate ideas and the potential of a proposed metalwork artefact or sculpture to meet a client brief. Delivery techniques for learning outcome 3 should be varied and could be linked to delivery of learning outcomes 1 and 2. It is expected that formal lectures, discussions, supervised fabrication practicals and formal presentations will form part of the delivery of this learning outcome.

Learning outcome 4 looks at evaluation and analysis methods which should be used throughout the project to produce a final outcome that exploits the potential and limitations of large scale 3D design for further improvement. The evaluation must be linked to and integrated throughout learning outcomes 1, 2 and 3. Model making

is likely to play a significant part in this process but there should be some opportunity to review and evaluate scaled prototypes.

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: Large Scale Design (AC1.1, AC1.2, AC1.3)
Tutor introduces the assignment brief.
Interpretation and analytical techniques to assess the requirements of a brief for large scale designs.
Learner research of design considerations.
Learner assessment/feedback.
Assignment 2: Practical Large Scale Design (AC2.1, AC2.2, AC2.3, AC2.4, AC3.1, AC4.1)
Tutor introduces the assignment brief.
Production method for models, mock-ups and samples of an appropriate scale and precision for large scale design.
Learners review and evaluate large scale design project and make recommendations for improvement.
Learner assessment/feedback.
Guest speaker, workshop/site visits.
Unit review.

Assessment

For AC1.1, AC1.2 and AC1.3, learners must provide evidence of research and a brief for a selected large scale design project to meet given objectives. Tutors should identify the design project and objectives or agree them through discussion with learners. Objectives could be based on research needed, client/tutor interaction etc.

Where possible, to ensure fairness of assessment, the size and complexity of the tasks should be the same for all learners. Learners should communicate with a client or interest group (actual or simulation) and record clearly the design requirements for a large scale design in metalwork. Evidence could take the form of the production of a detailed brief with site analysis and supporting.

For AC2.1, AC2.2, AC2.3 and AC2.4 learners need to develop and communicate design ideas to meet a selected large scale design brief. Tutors should identify the large scale design brief or agree it through discussion with learners.

This is likely to be the brief created for AC1.3. Where possible, to ensure fairness of assessment, the size and complexity of the tasks should be the same for all learners. Learners should use a range of communication media and established design processes to produce a possible solution to the large scale brief.

This could take the form of concept notes of design solutions using photographs, sketches, plans and illustrations. A final detailed plan would evolve from this draft work, giving technical details as required by the brief.

For AC3.1, learners must make a model and/or prototypes which meet the criteria of a selected design brief.

Tutors should identify the design brief or agree it through discussion with learners. This is likely to be the brief developed for AC1.3. Where possible, to ensure fairness of assessment, the size and complexity of the tasks should be the same for all learners. Learners could construct a model or working prototype of suitable scale which communicate the design idea(s) developed within AC1.2 to a satisfactory standard. The assessment of the finished model or prototype could play an important part for AC1.3 but could also 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.

For AC4.1 learners need to review working methods and the final design for a selected project. Tutors should identify the project or agree it through discussion with learners. This is likely to be the project used for AC2.1, AC2.2 and AC2.3. Learners should analyse and evaluate their own work throughout the design process and make improvements and recommendations for improvement. Evaluation of the final work would also be expected. Evidence for AC4.1 could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector), an annotated poster or a project.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the assessment criteria. 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
AC1.1, AC1.2, AC1.3, AC2.1, AC2.2	Large Scale Design	You are working as a self-employed designer and have been contracted to produce a large scale design for a client. You must research interpretative and analytical techniques for large scale design.	Assignment. Project.
AC2.1, AC2.2, AC2.3, AC2.4, AC3.1, AC4.1	Practical Large Scale Design	You need to plan, undertake and review the large scale design project.	Practical design. Observation evidence. Worklogs 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 and unit has particular links with Level 3:

Unit 7: Understanding Principles and Methods of Design for Blacksmithing and Metalworking

Unit 11: Undertake Large Scale Working for Blacksmithing and Metalworking.

Essential resources

Learners will need access to a range of visual and technical resources. The workshop should be equipped to a good standard for working with a wide range of materials and include a separate area for model making, a welding and forging area with appropriate extraction facilities, a clean area for drawing and preparation, a finishing area and storage space for work in progress. Appropriate facilities for the preparation and presentation of finished work should be available.

Resources for research should include a permanent collection of reference material for ongoing work, display facilities, PC's (preferably with internet connection), as well as access to a good library containing a wide reference to design.

Indicative resource materials

Textbooks

Grillo P – *Form, Function and Design* (Dover Publications Inc, 1975) ISBN 9780486201825

Heskett J – *Industrial Design* (Thames & Hudson, 1980) ISBN 9780500201817

Hohauser S – *Architectural and Industrial Models: Design and Construction 2nd Edition* (John Wiley & Sons Inc, 1984) ISBN 9780442236687

Huygen F – *British Design: Image and Identity* (Thames & Hudson, 1989) ISBN 9780500275580

McDermott C – *Essential Design* (Bloomsbury Publishing Plc, 1994) ISBN 9780747519362

Powell D – *Presentation Techniques* (Little, Brown, 1990) ISBN 9780316912433

Journals

Creative Review

Design

Design Week

Fine Scale Modeller

Modelmaker

Unit 11: Undertake Large Scale Working for Blacksmithing and Metalworking

Unit code: H/602/0724

QCF level 3: BTEC Specialist

Credit value: 10

Guided learning hours: 60

Unit aim

This unit aims to introduce learners to the skills and knowledge needed for large scale working for blacksmithing and metalworking, 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/higher education.

Unit introduction

This unit is one of two designed to give learners an understanding of the scope of large scale 3D design and manufacture for blacksmithing and metalworking.

The professional production of large scale work, especially to commission, is a core part of blacksmithing and there are many opportunities for developing this type of work in areas such as restoration, reproduction and contemporary design.

In learning outcome 1, learners will explore the use of ironwork in a historical perspective in areas such as architecture, architectural ironwork, public artworks and large scale domestic ironwork. Learners will gain an awareness of future career possibilities.

In learning outcome 2, learners will develop skills in large scale design for blacksmithing and metalworking production, by exploring the range of work possible and experimenting with appropriate materials, techniques and processes. The modern blacksmith is required to design and produce high quality innovative products across a range of decorative functional and artistic forgework artefacts.

Learning outcome 3 explores the possibilities for improving efficiency and cost reduction in the production process, for example by the use of specialist tool production, pre-cut profiles, efficient record keeping.

In learning outcome 4, learners will produce a large scale decorative forged artefact. This could include design and making of, for example, gates, railings, sculpture, garden/public space ironwork, exterior/interior furniture.

Learning outcomes and assessment 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 determine the standard required to achieve the unit.

On completion of this unit a learner should:

Learning outcomes	Assessment criteria
1 Know the history of ironwork	1.1 Describe a given type or period of large scale forged ironwork
2 Be able to explore and develop large scale creative ideas	2.1 Carry out visual research to generate creative ideas for large scale objectives 2.2 Carry out analysis to generate creative ideas for large scale objectives 2.3 Develop selected creative ideas to produce designs for large scale objectives
3 Be able to record information, analyse and present the results	3.1 Record information, analyse and present the results of selected investigations and experimental work 3.2 Produce accurate workshop specifications for a large scale decorative forged artefact
4 Be able to produce a large scale decorative forged artefact	4.1 Use forging to produce a large scale decorative forged artefact to given specifications 4.2 Use joining techniques to produce a large scale decorative forged artefact to given specifications 4.3 Use finishing techniques on a large scale decorative forged artefact to given specifications

Unit content

1 **Know the history or ironwork**

Research: Use of ironwork eg architecture, public artwork, large scale domestic ironwork; primary and secondary sources of visual information eg books, pictures, internet, actual objects; ethnic influences eg European, Asian, worldwide; styles/movements eg Gothic, Renaissance, Art Nouveau, arts and crafts; makers eg historical, contemporary; career opportunities

2 **Be able to explore and develop large scale creative ideas**

Design analysis: function; form; quality; aesthetics

Design ideas: development of design initiatives; production of working specifications eg working drawings, estimations, computer-aided design; drawing skills eg perspective, line, tone, scaling; learning about construction and decoration techniques; ergonomics; range eg architectural, external, domestic, public art

3 **Be able to record information, analyse and present the results**

Recording information: using drawing eg freehand studies, conventional orthographic drawings; timesheets; production routes; materials eg cutting list, forging estimations

Planning: how the design will be realised eg construction, installation; information technology eg computer-aided design, spreadsheets, word processing

Evaluation: review and analysis of recorded information

4 **Be able to produce a large scale decorative forged artefact**

Making processes: artefacts eg gates, railings, sculpture, garden/public space ironwork, exterior/interior furniture; forgework eg forging, forming, cutting, constructing, finishing; working to drawing/specification; health and safety; Personal Protective Equipment (PPE); risk assessment

Efficient production: specialist tooling; processes eg potential of, limitations; suitability to eg replicate, scale up or down

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical assessments, written assessment, visits to suitable collections and will link to work experience placements.

Tutors delivering this unit have opportunities to use as wide a range of techniques as possible. Lectures, discussions, seminar presentations, site visits, internet and/or library-based research 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 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 before any work-related activities, so that naturally occurring evidence can be collected at the time. For example, learners may have the opportunity to create large scale designs, 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, professional blacksmiths could talk about their work, the situations they face and the methods they use.

Whichever delivery methods are used, it is essential that tutors stress the importance of sound environment management and the need to manage the resource using approved methods.

Health and safety issues relating to forgework must be stressed and regularly reinforced, and risk assessments must be undertaken before any practical activities. Adequate 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 history of ironwork. This is likely to be delivered through formal lectures, discussion, site visits, supervised practical sessions and independent learner research.

In learning outcome 2, learners will develop large scale creative ideas. This is likely to be delivered through formal lectures, discussion, site visits and supervised practical sessions and independent learner research.

In learning outcome 3, learners will need to be taught how to record, analyse, modify, adapt and refine ideas for 3D outcomes. Learners will need to use a variety of recording methods for example drawing, annotations, word processing, photography and/or video suitable for the scale of their work. When reviewing, learners will need to analyse their work in terms of the successes and/or failures of working processes, selection and use of media, techniques, and function, form, quality and aesthetics.

Learners will need to use the results of their investigations to help develop ideas for large scale outcomes.

This will involve identifying sources of information and selecting relevant topics for research, originating ideas from a range of information and stimuli and developing them to meet specified intentions.

Learning outcome 4 covers the production of a large scale decorative forged artefact. Learners will need to use their experimental results, own views and feedback from others to inform their work. Supporting knowledge should be delivered in the workshop and classroom environment via set and learner project work. Differing sections and sizes of metals should be used to produce the samples so learners gain as broad as possible experience of the elements.

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: History of Ironwork (AC1.1)
Tutor introduces the assignment brief.
Research into the history of ironwork.
Learner research into historical influences and styles.
Learner assessment/feedback.
Assignment 2: Practical Large Scale Working (AC2.1, AC2.2, AC2.3, AC3.1, AC3.2, AC4.1, AC4.2, AC4.3)
Tutor introduces the assignment brief.
Production methods for forged artefacts.
Learners review and evaluate large scale artefact process and make recommendations for improvement.
Learner assessment/feedback.
Guest speaker, workshop/site visits.
Unit review

Assessment

For AC1.1, learners must describe a given type or period of large scale forged ironwork. Where possible, to ensure fairness of assessment, the size and complexity of the task 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), an annotated poster or a project.

For AC2.1, AC2.2 and AC2.3, learners must explore and develop selected large scale creative ideas. Tutors should identify the large scale creative ideas or agree them through discussion with learners. These could be learner ideas developed from the work undertaken for AC1.1. Evidence could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector), an annotated poster or a project.

For AC3.1 and AC3.2, learners must record information, analyse and present results. This could be linked to the large scale creative ideas developed for AC2.1. Evidence could be in a similar format to that suggested for AC2.1.

For AC4.1, AC4.2 and AC4.3, learners must produce a large scale decorative forged artefact. This 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.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the assessment criteria. 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
AC1.1	History of Ironwork	You are working as a self-employed designer and have been asked to submit an article on the history of ironwork to a design periodical. You have to produce a brief history of ironwork in the UK.	Assignment. Project.
AC2.1, AC2.2, AC2.3, AC3.1, AC3.2, AC4.1, AC4.2, AC4.3	Practical Large-scale Working	You need to plan, undertake production of, and review a large scale artefact.	Practical design. Observation evidence. Worklogs 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 and unit has particular links with *Unit 10: Undertake Large Scale Design for Blacksmithing and Metalworking.*

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

Essential resources

Appropriate workshops and classrooms will be needed, including a finishing area and storage space for work in progress. These should contain a comprehensive range of blacksmithing and forge tools, including solid fuel forge hearths, gas furnaces, anvils, leg vices, fly presses, mandrels, power hammers supported by a range of tongs, hammers, swages, fullers, setting blocks and other ancillary equipment.

Health and safety considerations require that sufficient facilities be provided to allow for one forging station per learner.

Learners must have access to a sufficiently diverse range of materials and stock sizes/sections to explore this unit fully, for example mild steel, tool steels. Consideration should also be given to other materials such as alloys, both ferrous and non-ferrous.

Learners should have access to sufficient library and information technology facilities to enable research into techniques, materials, equipment and existing work examples. Learners will need access to a range of visual and technical resources, including photographic facilities.

Indicative resource materials

Textbooks

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

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

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

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

Ross R – *Metallic Materials Specification Handbook 4th Edition* (Kluwer Academic Publishers, 1991) ISBN 9780412369407

Rural Development Commission – *The Blacksmith's Craft 2nd Edition* (Countryside Agency, 1990) ISBN 9781869964146

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

Journals

Artist Blacksmith

The Artists Newsletter

Crafts

Forge

Websites

www.baba.org.uk	British Artist Blacksmiths Association
www.blacksmithscompany.org.uk	The Worshipful Company of Blacksmiths
www.hse.gov.uk	Health and Safety Executive

Unit 12: Undertake Repoussé and Other Decorative Skills for Blacksmithing and Metalworking

Unit code: K/602/0725

QCF level 3: BTEC Specialist

Credit value: 10

Guided learning hours: 60

Unit aim

This unit aims to introduce learners to the skills and knowledge needed for repoussé, other decorative work and blacksmithing restoration, and how these can be applied in practice. Learners will also be introduced to the history of blacksmithing. This unit is designed for learners in centre-based settings looking to progress into the sector or on to further/higher education.

Unit introduction

Blacksmithing is an ancient craft that still has significant relevance in the modern world and the blacksmith has the opportunity to work on historical ironwork from many periods of history. This unit will give learners to an appreciation of the development of the craft and its aesthetic progression over the centuries.

Learning outcomes 1 and 2 cover repoussé techniques and decorative skills. Learners will develop the craft processes and knowledge of repoussé and other specialised decorative skills. Learners will work independently to meet the exacting standards of other professionals and customer requirements.

Learning outcome 3 looks at the techniques of blacksmithing restoration. Learners will develop their experience of the range of processes used in blacksmithing, for example when producing work for blacksmithing restoration purposes. The important skills and knowledge requirements of researching and recording information as an essential component of the successful restoration of historical artefacts will also be addressed. The relative merits of restoration, conservation and preservation will be discussed in relation to the historical significance of forged artefacts.

Learning outcome 4 covers the history of decorative ironwork. The use and production of specialised tooling for the production of repoussé and decorative elements is covered in relation to materials and processes that were used within the traditional context.

Learning outcomes and assessment 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 determine the standard required to achieve the unit.

On completion of this unit a learner should:

Learning outcomes	Assessment criteria
1 Be able to use repoussé techniques	1.1 Carry out repoussé techniques to meet given objectives 1.2 Produce repoussé punches to meet given specification 1.3 Produce repoussé stakes to meet given specification
2 Be able to employ decorative skills	2.1 Produce cupped repoussé work to meet given specification 2.2 Produce faced repoussé work to meet given specification 2.3 Produce an element with attached repoussé work to meet given specification
3 Know the techniques of blacksmithing restoration	3.1 Describe techniques of blacksmithing conservation for given scenarios 3.2 Describe techniques of corrosion control for given scenarios
4 Understand the history of decorative ironwork	4.1 Discuss the architectural periods for ironwork in Britain from 1000 AD to the present day

Unit content

1 **Be able to use repoussé techniques**

Repoussé: uses of the technique eg motifs, masks, shells, weathervanes, coats of arms, figurative; materials eg iron, steel, copper, brass, aluminium; methods eg stake, pitch block, lead block, annealing; tools and equipment eg punches, chasing tools, horns and sand bags; health and safety; Personal Protective Equipment (PPE); risk assessment

2 **Be able to employ decorative skills**

Decorative: element types eg complex scroll forms, rosettes, twists, leaves (water, blown back, bevel, acanthus faced, acanthus cupped, heavy incised); figurative eg animals, birds; methods eg appliqué, piercing, chasing, chiselling; health and safety

3 **Know the techniques of blacksmithing restoration**

Blacksmithing restoration: methods eg restoration, conservation, preservation; materials; record keeping; corrosion control eg materials, methods, electrochemical series, coatings; researching eg process, heritage organisations

4 **Understand the history of decorative ironwork**

Historical heritage of blacksmithing: perspective from 1000 AD to the present day eg aesthetic periods, European architectural periods; materials eg types, modes of supply; blacksmithing methods used during different historical periods; context eg functional, decorative

Essential guidance for tutors

Delivery

Delivery of this unit will involve practical assessments, written assessment, visits to suitable collections and will link to work experience placements.

Tutors delivering this unit have opportunities to use as wide a range of techniques as possible. Lectures, discussions, seminar presentations, heritage garden visits, internet and/or library-based research and the use of personal and/or industrial experience would all be suitable. Work placements should be monitored regularly 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 before any work-related activities, so that naturally occurring evidence can be collected at the time. For example, learners may have the opportunity to restore a blacksmithing artefact 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, a forge worker could talk about their work, the situations they face and the methods they use.

Whichever delivery methods are used, it is essential that tutors stress the importance of sound environment management and the need to manage the resource using approved methods.

Health and safety issues relating to working in the forge environment must be covered and reinforced regularly, and risk assessments must be undertaken before practical activities take place. Adequate 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 outcomes 1 and 2 cover repoussé techniques and decorative skills. Learners should be encouraged to develop a cohesive approach to the making process across all the learning outcomes by producing more complex blacksmith constructions relevant to specified historical periods. 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 requiring the use of several techniques based on traditional forms. Differing sections and sizes of metals should be used to produce tooling and artefacts so learners gain as broad as possible experience of the elements. Non-ferrous materials should also be used as appropriate. Delivery is likely to be in the form of formal lectures, demonstration, supervised workshop sessions, site visits and independent learner research.

Learning outcome 3 looks at the techniques of blacksmithing restoration. Where appropriate learners should be exposed to examples of historical decorative ironwork that could potentially benefit from restoration techniques; Learners could use these examples to prepare a proposal for blacksmithing restoration. Delivery is

likely to be in the form of formal lectures, seminars, demonstration, supervised workshop sessions, site visits and independent learner research.

Learning outcome 4 covers the history of decorative ironwork. Learners should have a series of lectures, historical and museum visits that illustrate the broad development of ironwork over the last millennium, with particular reference to function and decorative styles in the UK and Europe. Delivery is likely to be in the form of formal lectures, demonstration, supervised workshop sessions, site visits and independent learner research.

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: Practical Repoussé Techniques (AC1.1, AC1.2, AC1.3, AC2.1, AC2.2, AC2.3)
Tutor introduces the assignment brief.
Development of repoussé techniques and skills.
Learner assessment/feedback.
Assignment 2: Blacksmithing Conservation (AC3.1, AC3.2)
Tutor introduces the assignment brief.
Learners investigate conservation techniques and issues.
Methods; records; corrosion control.
Student assessment/feedback.
Guest speaker, workshop/site visits.
Assignment 3: History of Decorative Ironwork (AC4.1)
Tutor introduces the assignment brief.
Historical heritage of the blacksmith's craft.
Learner assessment/feedback.
Guest speaker, workshop/site visits.
Unit review.

Assessment

For AC1.1, AC1.2 and AC1.3, learners must carry out repoussé techniques to meet given objectives/specification. Tutors should identify the objectives/specification or agree these 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 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 AC2.1, AC2.2 and AC2.3, learners must demonstrate decorative skills to meet the given specification. Tutors should identify the specification or agree this through discussion with learners. Evidence could be in a similar format to that suggested for AC1.1.

For AC3.1 and AC3.2, learners must describe techniques of blacksmithing restoration for given scenarios. Tutors should identify the scenarios or agree them through discussion with learners. Evidence could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector), an annotated poster or a project.

For AC4.1, learners must discuss the architectural periods for ironwork in Britain from 1000 AD to the present. Evidence could take the form of a pictorial presentation with notes (possibly using appropriate software or an overhead projector), an annotated poster or a project.

Programme of suggested assignments

The following table shows a programme of suggested assignments that cover the assessment criteria. 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
AC1.1, AC1.2, AC1.3, AC2.1, AC2.2, AC2.3	Practical Repoussé Techniques	You need to plan, and undertake a design project using practical repoussé techniques.	Practical design. Observation evidence. Worklogs or other relevant learner notes and drawings.
AC3.1, AC3.2	Blacksmithing Conservation	You have been asked to submit an article on blacksmithing conservation.	Assignment.
AC4.1	History of Decorative Ironwork	You have been asked to submit an article on the history of decorative ironwork.	Assignment. Finished articles.

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 and has particular links with:

Unit 1: Understanding and Using Forging Techniques for Blacksmithing and Metalworking

Unit 3: Undertake Drawing Practice for Blacksmithing and Metalworking.

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

Essential resources

Learners will need access to a sufficiently diverse range of materials and stock sizes/sections, for example mild steel, tool steels, alloys, both ferrous and non-ferrous copper, bronze, brass, stainless steel, aluminium.

Workshops appropriate to learners' specialist pathways will be needed. 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.

Areas for fitting and finishing should be available, with access to suitable application and coating facilities. Drawing offices and classrooms are also a requirement to allow for the delivery and development of the specific knowledge required for the unit.

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.

Learners should have access to sufficient library and information technology facilities to enable them to research techniques, materials, equipment, examples of historical decorative ironwork and existing work examples. Tutors delivering this unit should have vocationally specific craft knowledge.

Indicative resource materials

Textbooks

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

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

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

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

Ross R – *Metallic Materials Specification Handbook 4th Edition* (Kluwer Academic Publishers, 1991)

ISBN 9780412369407

Rural Development Commission – *The Blacksmith's Craft 2nd 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

www.baba.org.uk	British Artist Blacksmiths Association
www.blacksmithscompany.org.uk	The Worshipful Company of Blacksmiths
www.hse.gov.uk	Health and Safety Executive
www.forgemagazine.co.uk	British Farriers and Blacksmiths Association

Further information

For further information please call Customer Services on 0844 576 0026 (calls may be recorded for quality and training purposes) or visit our website (www.edexcel.com).

Useful publications

Related information and publications include:

- *Guidance for Centres Offering Edexcel/BTEC QCF Accredited Programmes* (Edexcel, distributed to centres annually)
- Functional Skills publications – specifications, tutor support materials and question papers
- *Regulatory arrangements for the Qualification and Credit Framework* (published by Ofqual) August 2008
- the current Edexcel publications catalogue and update catalogue.

Edexcel publications concerning the Quality Assurance System and the internal and external verification of vocationally related programmes can be found on the Edexcel website and in the Edexcel publications catalogue.

NB: Some of our publications are priced. There is also a charge for postage and packing. Please check the cost when you order.

Professional development and training

Edexcel supports UK and international customers with training related to BTEC qualifications. This support is available through a choice of training options offered in our published training directory or through customised training at your centre.

The support we offer focuses on a range of issues including:

- planning for the delivery of a new programme
- planning for assessment and grading
- developing effective assignments
- building your team and teamwork skills
- developing student-centred learning and teaching approaches
- building Functional Skills into your programme
- building in effective and efficient quality assurance systems.

The national programme of training we offer can be viewed on our website (www.edexcel.com/training). You can request customised training through the website or by contacting one of our advisers in the Training from Edexcel team via Customer Services to discuss your training needs.

Our customer service numbers are:

BTEC and NVQ	0844 576 0026
GCSE	0844 576 0027
GCE	0844 576 0025
The Diploma	0844 576 0028
DiDA and other qualifications	0844 576 0031

Calls may be recorded for training purposes.

The training we provide:

- is active – ideas are developed and applied
- is designed to be supportive and thought provoking
- builds on best practice.

Our training is underpinned by the LSIS standards for those preparing to teach and for those seeking evidence for their continuing professional development.

Annexe A

The Edexcel/BTEC qualification framework for the environmental and land-based sector

Progression opportunities within the framework.

Level	General qualifications	BTEC full vocationally-related qualifications	BTEC specialist courses	NVQ/occupational
5		Edexcel BTEC Level 5 HND Diplomas in Animal Management, Environmental Conservation, Horse Management, Horticulture (QCF)		
4		Edexcel BTEC Level 4 HNC Diplomas in Animal Management, Environmental Conservation, Horse Management, Horticulture (QCF)		
3		Edexcel BTEC Level 3 Certificates, Subsidiary Diplomas, Diploma and Extended Diplomas in Agriculture, Animal Management, Blacksmithing and Metalworking, Countryside Management, Fish Management, Floristry, Forestry and Arboriculture, Horse Management, Horticulture, Land-based Technology (QCF)		Edexcel Level 3 Diploma in Work-based Environmental Conservation (QCF) Edexcel Level 3 Award, Certificate and Diploma in Work-based Animal Care (QCF)

Level	General qualifications	BTEC full vocationally-related qualifications	BTEC specialist courses	NVQ/occupational
2	Edexcel GCSE in Science, Additional Science	Edexcel BTEC Level 2 Certificate, Extended Certificate and Diploma in Agriculture, Animal Care, Blacksmithing and Metalworking, Countryside and Environment, Fish Husbandry, Floristry, Horse Care, Horticulture, Land-based Technology (QCF)		Edexcel Level 2 Diploma in Work-based Environmental Conservation (QCF) Edexcel Level 2 Award, Certificate and Diploma in Work-based Animal Care (QCF)
1		BTEC Foundation Learning in Land-based Studies (QCF)		Edexcel Level 1 Award, Certificate and Diploma in Work-based Animal Care (QCF)
Entry	Edexcel Entry Level Certificate in Science	BTEC Foundation Learning in Land-based Studies (QCF)		

Annexe B

Wider curriculum mapping

Study of Edexcel BTEC level 3 qualifications gives learners opportunities to develop an understanding of spiritual, moral, ethical, social and cultural issues as well as an awareness of citizenship, environmental issues, European developments, health and safety considerations and equal opportunities issues.

Spiritual, moral, ethical, social and cultural issues

The qualification contributes to an understanding of social and cultural issues for example around the design and use of metals to meet client requirements and the cultural contexts of different ornamental designs.

Citizenship

Learners undertaking this qualification will have the opportunity to develop their understanding of citizenship issues.

Environmental issues

Developing a responsible attitude towards the care of the environment is an integral part of this qualification which focuses on the use of materials and fuel usage. Learners are encouraged to minimise waste and work in a environmentally sustainable manner.

European developments

Much of the content of the qualification applies throughout Europe, even though the delivery is in a UK context.

Health and safety considerations

Health and safety is embedded within the unit in this qualification. Learners will consider their own health and safety at work, how to identify risks and hazards and how to minimise those risks.

Equal opportunities issues

Equal opportunity issues are implicit throughout the qualification.

Annexe C

Glossary of Accreditation Terminology

The following is a table of terms related to accreditation of this qualification.

Accreditation start/end date	The first/last dates that Edexcel can register learners for a qualification.
Certification end date	The last date on which a certificate may be issued by Edexcel.
Credit value	All units have a credit value. The minimum credit value that may be determined for a unit is one, and credits can only be awarded in whole numbers. Learners will be awarded credits for the successful completion of whole units.
Guided Learning Hours (GLH)	Guided learning hours are defined as all the times when a tutor, trainer or facilitator is present to give specific guidance towards the learning aim being studied on a programme. This definition includes lectures, tutorials and supervised study in, for example, open learning centres and learning workshops. It also includes time spent by staff assessing learners' achievements. It does not include time spent by staff in day-to-day marking of assignments or homework where the learner is not present.
Learning Aims Database	Link to the Learning Aims Database, which features detailed funding information by specific learning aim reference.
Learning Aim Reference	Unique reference number given to the qualification by the funding authorities on accreditation.
Level	The level at which the qualification is positioned in the Qualifications and Credit Framework (QCF).
Performance tables	This qualifications is listed on the Department for Education (DfE) website School and College Achievement and Attainment Tables (SCAAT) as performance indicators for schools and colleges.
Qualifications Number (QN)	Unique reference number given to the qualification by the regulatory authorities on accreditation.
Register of Regulated Qualifications	Link to the entry on the Register of Regulated Qualifications for a particular qualification. This database features detailed accreditation information for the particular qualification (see register.ofqual.gov.uk).

Section 96	Section 96 is a section of the Learning and Skills Act 2000. This shows for which age ranges the qualification is publicly funded for under-19 learners.
Title	The accredited title of the qualification.

Annexe D

BTEC Specialist and Professional qualifications

BTEC qualifications on the NQF	Level	BTEC Specialist and Professional qualifications on the QCF	BTEC qualification suites on the QCF
BTEC Level 7 Advanced Professional qualifications BTEC Advanced Professional Award, Certificate and Diploma	7	**BTEC Level 7 Professional qualifications** BTEC Level 7 Award, Certificate, Extended Certificate and Diploma	
BTEC Level 6 Professional qualifications BTEC Professional Award, Certificate and Diploma	6	**BTEC Level 6 Professional qualifications** BTEC Level 6 Award, Certificate, Extended Certificate and Diploma	
BTEC Level 5 Professional qualifications BTEC Professional Award, Certificate and Diploma	5	**BTEC Level 5 Professional qualifications** BTEC Level 5 Award, Certificate, Extended Certificate and Diploma	**BTEC Level 5 Higher Nationals** BTEC Level 5 HND Diploma
BTEC Level 4 Professional qualifications BTEC Professional Award, Certificate and Diploma	4	**BTEC Level 4 Professional qualifications** BTEC Level 4 Award, Certificate, Extended Certificate and Diploma	**BTEC Level 4 Higher Nationals** BTEC Level 4 HNC Diploma
BTEC Level 3 qualifications BTEC Award, Certificate, Extended Certificate and Diploma	3	**BTEC Level 3 Specialist qualifications** BTEC Level 3 Award, Certificate, Extended Certificate and Diploma	**BTEC Level 3 Nationals** BTEC Level 3 Certificate, Subsidiary Diploma, Diploma and Extended Diploma

BTEC qualifications on the NQF	Level	BTEC Specialist and Professional qualifications on the QCF	BTEC qualification suites on the QCF
BTEC Level 2 qualifications BTEC Award, Certificate, Extended Certificate and Diploma	2	**BTEC Level 2 Specialist qualifications** BTEC Level 2 Award, Certificate, Extended Certificate and Diploma	**BTEC Level 2 Firsts** BTEC Level 2 Certificate, Extended Certificate and Diploma
BTEC Level 1 qualifications BTEC Award, Certificate, Extended Certificate and Diploma	1	**BTEC Level 1 Specialist qualifications** BTEC Level 1 Award, Certificate, Extended Certificate and Diploma	**BTEC Level 1 Qualifications** BTEC Level 1 Award, Certificate and Diploma (vocational component of Foundation Learning)
	E	**BTEC Entry Level Specialist qualifications** BTEC Entry Level Award, Certificate, Extended Certificate and Diploma	**BTEC Entry Level Qualifications (E3)** BTEC Entry Level 3 Award, Certificate and Diploma (vocational component of Foundation Learning)

NQF = National Qualifications Framework

QCF = Qualifications and Credit Framework

For most qualifications on the **NQF**, the accreditation end date is normally 31 August 2010 or 31 December 2010.

For qualifications on the **QCF**, the accreditation start date is usually 1 September 2010 or 1 January 2011.

QCF qualification sizes	
Award	1-12 credits
Certificate	13-36 credits
Diploma	37+ credits

Publications Code BN029961 December 2011

For more information on Edexcel and BTEC qualifications please
visit our website: www.edexcel.com